

# TEST REPORT

ACCORDING TO: FCC 47CFR part 27

FOR:

**Corning Optical Communication Wireless  
HX-4 MIMO Remote Unit  
Model: HX-4 MIMO  
FCC ID:OJFHXCPL70MAM**

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## 1 Applicant information

**Client name:** Corning Optical Communication Wireless  
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**Telephone:** +001 (703) 714-7920  
**Fax:** +001 (703) 848-0280  
**E-mail:** riazih@corning.com  
**Contact name:** Mr. Habib Riaz

## 2 Equipment under test attributes

**Product name:** HX-4 MIMO remote unit  
**Product type:** Mid-Power Remote Unit  
**Model(s):** HX-4 MIMO  
**Part number:** KHW\_3R5BT40A  
**Serial number:** KRWH14050142  
**Software release:** 7.4  
**Receipt date** 12-Sep-16

## 3 Manufacturer information

**Manufacturer name:** Corning Optical Communication Wireless  
**Address:** 13221 Woodland Park Rd Suite 400, VA, USA  
**Telephone:** +001 (703) 714-7920  
**Fax:** +001 (703) 848-0280  
**E-Mail:** riazih@corning.com  
**Contact name:** Mr. Habib Riaz

## 4 Test details

**Project ID:** 28707  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 15-Sep-16  
**Test completed:** 31-Oct-16  
**Test specification(s):** FCC 47CFR part 27

## 5 Tests summary

| Test                                                  | Status                                                  |
|-------------------------------------------------------|---------------------------------------------------------|
| <b>Transmitter characteristics</b>                    |                                                         |
| Section 27.50, Automatic gain control (AGC) threshold | Pass                                                    |
| Section 2.1049, Occupied bandwidth                    | Pass                                                    |
| Section 27.50(d), Mean output power and booster gain  | Pass                                                    |
| Section 2.1049, Out-of-band rejection                 | Pass                                                    |
| Section 27.53, Out-of-band emissions at RF connector  | Pass                                                    |
| Section 27.53, Conducted spurious emissions           | Pass                                                    |
| Section 27.53, Radiated spurious emissions            | Pass                                                    |
| Section 27.52, RF exposure                            | Pass, exhibit provided in Application for certification |

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

|                     | Name and Title                               | Date              | Signature                                                                             |
|---------------------|----------------------------------------------|-------------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. S. Samokha, test engineer                | October 31, 2016  |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer  | November 14, 2016 |  |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager | December 5, 2016  |  |

## 6 EUT description

### 6.1 General information

The EUT is a mid-power remote unit of industrial booster MA2000.

### 6.2 Transmitter characteristics

|                                                         |                                                                                                          |                                                           |                                                               |      |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|------|
| <b>Type of equipment</b>                                |                                                                                                          |                                                           |                                                               |      |
| V                                                       | Stand-alone (Equipment with or without its own control provisions)                                       |                                                           |                                                               |      |
|                                                         | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                                           |                                                               |      |
|                                                         | Plug-in card (Equipment intended for a variety of host systems)                                          |                                                           |                                                               |      |
| <b>Intended use</b>                                     |                                                                                                          | <b>Condition of use</b>                                   |                                                               |      |
| V                                                       | fixed                                                                                                    | Always at a distance more than 2 m from all people        |                                                               |      |
|                                                         | mobile                                                                                                   | Always at a distance more than 20 cm from all people      |                                                               |      |
|                                                         | portable                                                                                                 | May operate at a distance closer than 20 cm to human body |                                                               |      |
| <b>Assigned frequency range</b>                         |                                                                                                          | 2110.0 – 2180.0 MHz                                       |                                                               |      |
| <b>Operating frequency</b>                              |                                                                                                          | 2110.0 – 2180.0 MHz DL<br>1710-1780 MHz UL                |                                                               |      |
| <b>Maximum rated output power</b>                       |                                                                                                          | At maximum gain, output port                              | 33 dBm                                                        |      |
|                                                         |                                                                                                          | Aggregate power from two RF chains                        | 36.55 dBm                                                     |      |
| <b>Is transmitter output power variable?</b>            | V                                                                                                        | No                                                        |                                                               |      |
|                                                         |                                                                                                          | Yes                                                       | continuous variable                                           |      |
|                                                         |                                                                                                          |                                                           | stepped variable with stepsize                                | 1 dB |
|                                                         |                                                                                                          |                                                           | minimum RF power                                              | NA   |
|                                                         |                                                                                                          | maximum RF power at antenna connector                     | 33 dBm                                                        |      |
| <b>Antenna connection</b>                               |                                                                                                          |                                                           |                                                               |      |
| unique coupling                                         | V                                                                                                        | standard connector                                        | Integral                                                      |      |
|                                                         |                                                                                                          |                                                           | with temporary RF connector<br>without temporary RF connector |      |
| <b>Antenna/s technical characteristics</b>              |                                                                                                          |                                                           |                                                               |      |
| Type                                                    | Manufacturer                                                                                             | Model number                                              | Gain                                                          |      |
| External                                                | Any                                                                                                      | Any                                                       | 12.5 dBi                                                      |      |
| <b>Transmitter aggregate data rate/s, MBps</b>          |                                                                                                          |                                                           |                                                               |      |
| Transmitter 99% power bandwidth                         |                                                                                                          | Type of modulation                                        |                                                               |      |
|                                                         |                                                                                                          | AWGN                                                      | GSM                                                           |      |
|                                                         |                                                                                                          | NA                                                        | NA                                                            |      |
| <b>Transmitter power source</b>                         |                                                                                                          |                                                           |                                                               |      |
|                                                         |                                                                                                          | Nominal rated voltage                                     | Battery type                                                  |      |
| V                                                       | DC                                                                                                       | Nominal rated voltage                                     | 48 VDC                                                        |      |
|                                                         | AC mains                                                                                                 | Nominal rated voltage                                     | Frequency                                                     |      |
| <b>Common power source for transmitter and receiver</b> |                                                                                                          | V                                                         | yes                                                           |      |
|                                                         |                                                                                                          |                                                           | no                                                            |      |

|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50, AGC threshold test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

## 7 Transmitter tests according to 47CFR part 27

### 7.1 AGC Threshold level test

#### 7.1.1 General

This test was performed to measure the AGC threshold of the EUT.

#### 7.1.2 Test procedure

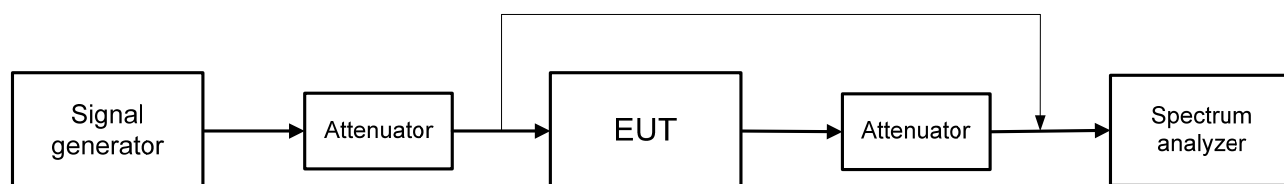
**7.1.2.1** The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

**7.1.2.2** The signal generator output was raised until 1 dB increase in the input signal power no longer caused a 1 dB increase in the output power.

**7.1.2.3** The mean input and output power was measured with spectrum analyzer as provided in Table 7.1.2.

**7.1.2.4** The test results are provided in the table below and the ssociated plots.

Figure 7.1.1 AGC Threshold level test setup





|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.50, AGC threshold test</b> |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 | <b>Verdict: PASS</b>           |                               |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

Table 7.1.1 AGC Threshold level test results

ASSIGNED FREQUENCY RANGE: 2110 – 2180 MHz  
DETECTOR USED: Average  
MODULATING SIGNAL: PRBS  
MEASUREMENT METHOD: Spectrum Analyzer

CONFIGURATION: Downlink transmit mode Chain 1

| Frequency, MHz                  | Input level, dBm | SA reading, dBm | AGC threshold level, dBm | Margin*, dB | Verdict |
|---------------------------------|------------------|-----------------|--------------------------|-------------|---------|
| <b>MODULATING SIGNAL: AWGN</b>  |                  |                 |                          |             |         |
| 2145.0                          | -21.53           | 33.18           | -21.53                   | NA          | Pass    |
| <b>MODULATING SIGNAL: GSM</b>   |                  |                 |                          |             |         |
| 2145.0                          | -21.29           | 33.12           | -21.29                   | NA          | Pass    |
| <b>MODULATING SIGNAL: WCDMA</b> |                  |                 |                          |             |         |
| 2145.0                          | -21.25           | 32.60           | -21.25                   | NA          | Pass    |

ASSIGNED FREQUENCY RANGE: 2110 – 2180 MHz  
DETECTOR USED: Average  
MODULATING SIGNAL: PRBS  
MEASUREMENT METHOD: Spectrum Analyzer

CONFIGURATION: Downlink transmit mode Chain 2

| Frequency, MHz                  | Input level, dBm | SA reading, dBm | AGC threshold level, dBm | Margin*, dB | Verdict |
|---------------------------------|------------------|-----------------|--------------------------|-------------|---------|
| <b>MODULATING SIGNAL: AWGN</b>  |                  |                 |                          |             |         |
| 2145.0                          | -20.76           | 33.15           | -20.76                   | NA          | Pass    |
| <b>MODULATING SIGNAL: GSM</b>   |                  |                 |                          |             |         |
| 2145.0                          | -20.53           | 33.36           | -20.53                   | NA          | Pass    |
| <b>MODULATING SIGNAL: WCDMA</b> |                  |                 |                          |             |         |
| 2145.0                          | -20.53           | 33.47           | -20.53                   | NA          | Pass    |

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

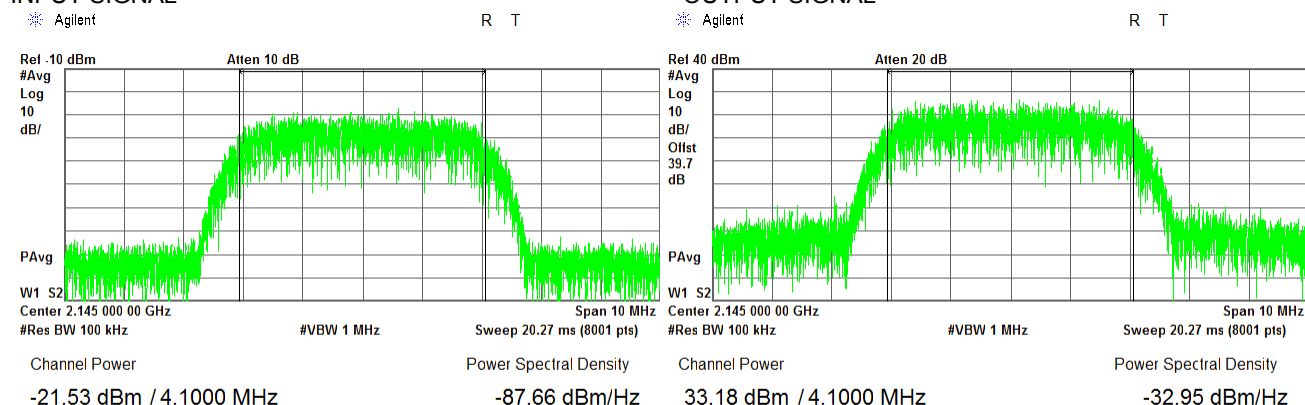
Full description is given in Appendix A.

|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50, AGC threshold test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

**Plot 7.1.1 AGC Threshold test results at mid frequency carrier**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

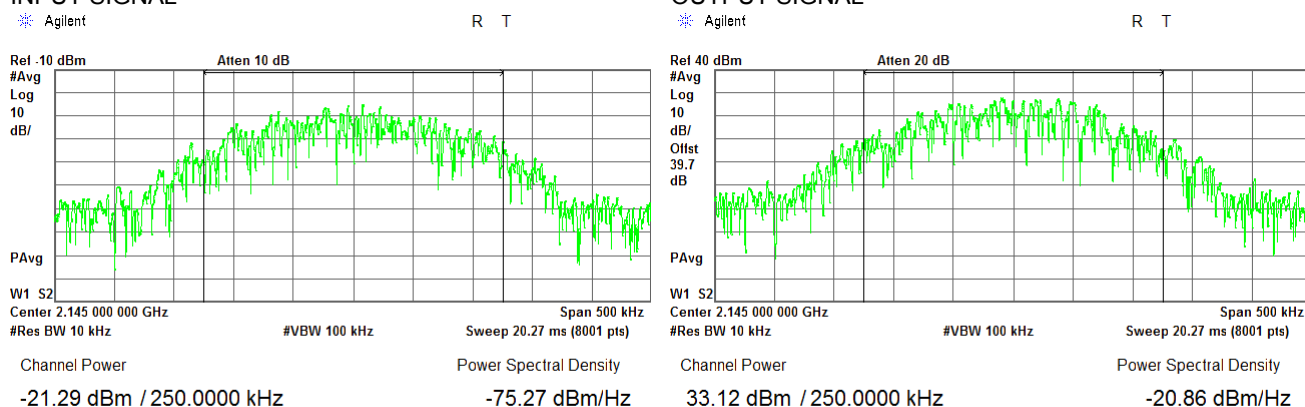
2110.0 – 2180.0 MHz  
AWGN downlink transmit  
Chain 1  
OUTPUT SIGNAL



**Plot 7.1.2 AGC Threshold test results at mid frequency carrier**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
GSM downlink transmit  
Chain 1  
OUTPUT SIGNAL

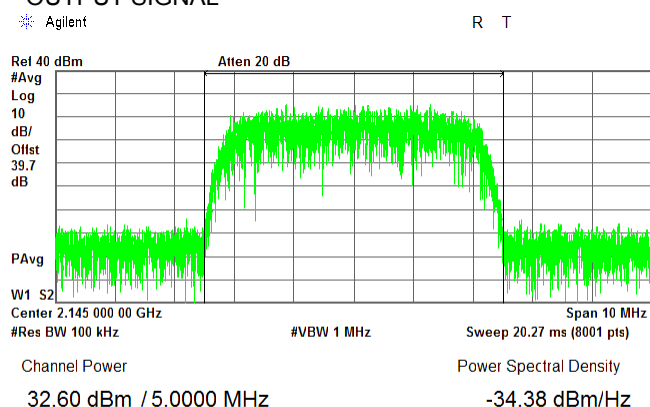
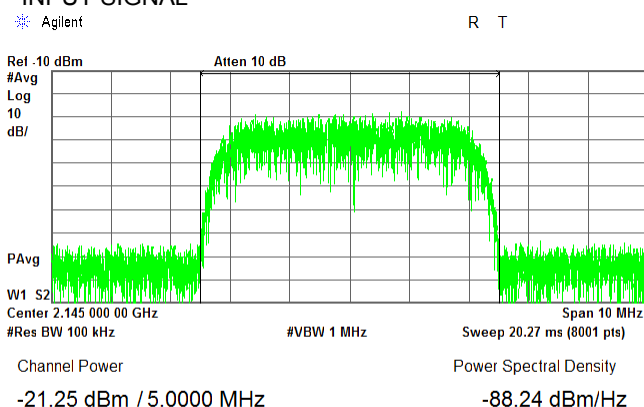


|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50, AGC threshold test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

Plot 7.1.3 AGC Threshold test results at mid frequency carrier

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
WCDMA downlink transmit  
Chain 1  
OUTPUT SIGNAL

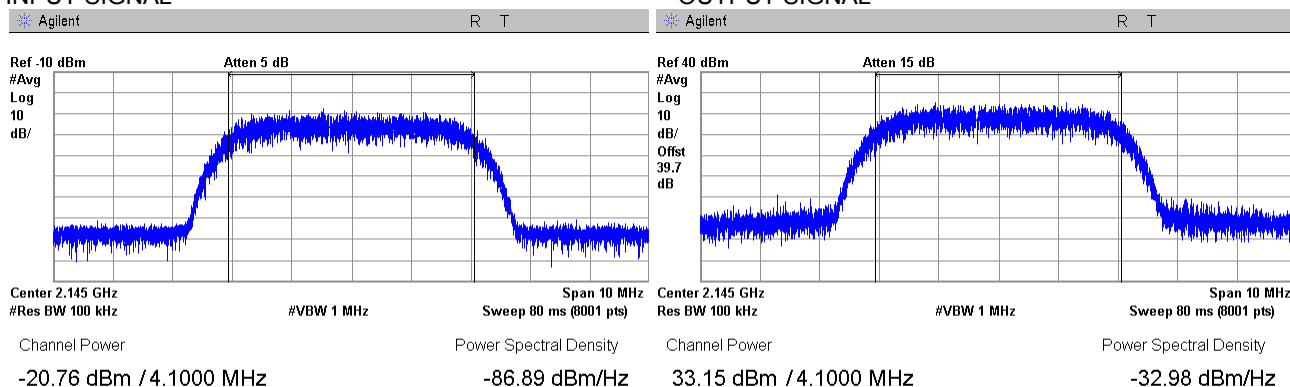


|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50, AGC threshold test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

**Plot 7.1.4 AGC Threshold test results at mid frequency carrier**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

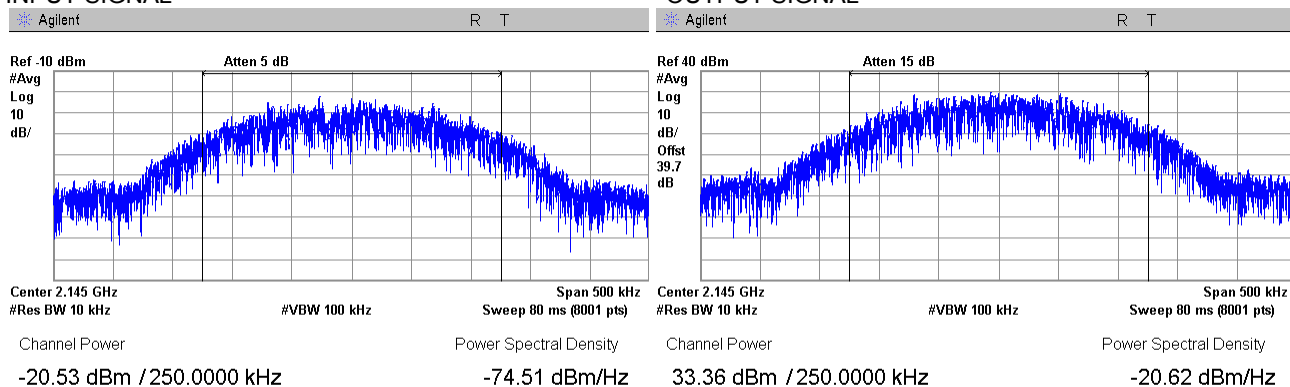
2110.0 – 2180.0 MHz  
AWGN downlink transmit  
Chain 2  
OUTPUT SIGNAL



**Plot 7.1.5 AGC Threshold test results at mid frequency carrier**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
GSM downlink transmit  
Chain 2  
OUTPUT SIGNAL

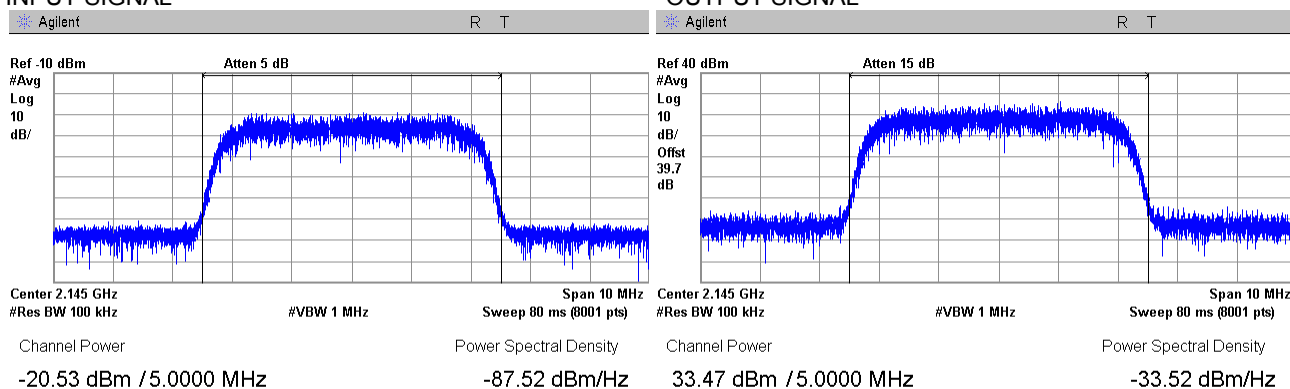


|                                                              |                                |                               |                      |
|--------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50, AGC threshold test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                 |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 15-Sep-16                                    |                                |                               |                      |
| <b>Temperature:</b> 27 °C                                    | <b>Relative Humidity:</b> 47 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                              |                                |                               |                      |

Plot 7.1.6 AGC Threshold test results at mid frequency carrier

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
WCDMA downlink transmit  
Chain 2  
OUTPUT SIGNAL





|                                                                      |                                |                               |                      |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.4            |                                |                               |                      |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                      |
| <b>Date(s):</b> 27-Sep-16                                            |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                            | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                      |                                |                               |                      |

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

| Assigned frequency,<br>MHz | Modulation envelope reference points,<br>% | Maximum allowed bandwidth,<br>kHz |
|----------------------------|--------------------------------------------|-----------------------------------|
| 2110.0 – 2180.0            | 99                                         | NA                                |

### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit the normally modulated carrier.

7.2.2.3 The transmitter occupied bandwidth was measured with power bandwidth function of the spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





|                                                                      |                                |                               |                      |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.4            |                                |                               |                      |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                      |
| <b>Date(s):</b> 27-Sep-16                                            |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                            | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                      |                                |                               |                      |

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
MODULATION ENVELOPE REFERENCE POINTS: 99%

RESOLUTION BANDWIDTH: 100 kHz (0.5-2% of OBW)  
VIDEO BANDWIDTH: 1000 kHz

| Carrier frequency, MHz |  | 99% Occupied bandwidth, kHz |           | Limit, kHz | Margin, kHz | Verdict |
|------------------------|--|-----------------------------|-----------|------------|-------------|---------|
|                        |  | Below AGC                   | Above AGC |            |             |         |
| MODULATION: AWGN       |  |                             |           |            |             |         |
| 2145.0                 |  | 4160.1                      | 4147.1    | NA         | NA          | Pass    |
| MODULATION: WCDMA      |  |                             |           |            |             |         |
| 2145.0                 |  | 4193.7                      | 4194.9    | NA         | NA          | Pass    |

RESOLUTION BANDWIDTH: 3 kHz (0.5-2% of OBW)  
VIDEO BANDWIDTH: 30 kHz

| VIDEO BANDWIDTH:          |                         |           | 55 KHz     |             |         |
|---------------------------|-------------------------|-----------|------------|-------------|---------|
| Carrier frequency,<br>MHz | Occupied bandwidth, kHz |           | Limit, kHz | Margin, kHz | Verdict |
|                           | Below AGC               | Above AGC |            |             |         |
| MODULATION: GSM           |                         |           |            |             |         |
| 2145.0                    | 244.991                 | 245.709   | NA         | NA          | Pass    |

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

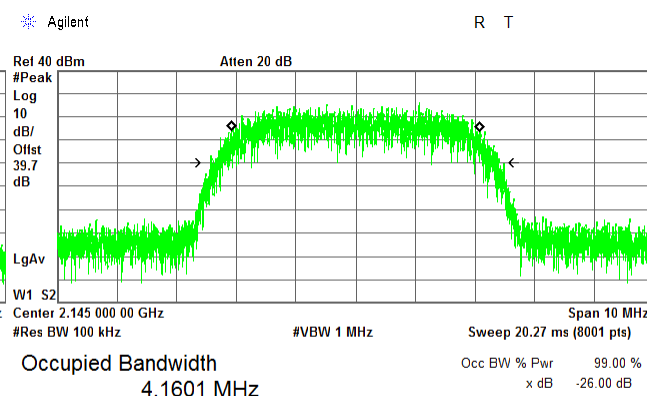
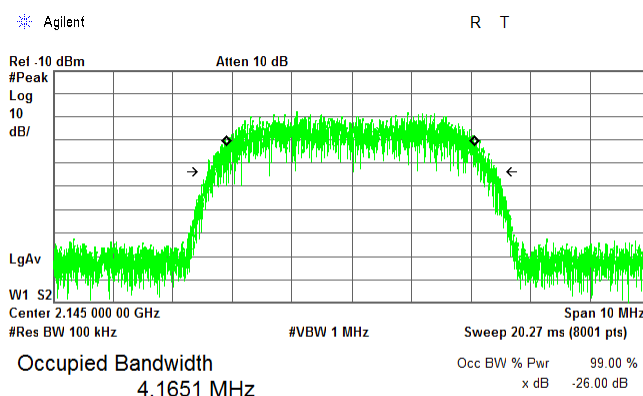
Full description is given in Appendix A.

|                                                                      |                                |                               |                      |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.4            |                                |                               |                      |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                      |
| <b>Date(s):</b> 27-Sep-16                                            |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                            | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                      |                                |                               |                      |

Plot 7.2.1 Occupied bandwidth test result at mid frequency carrier

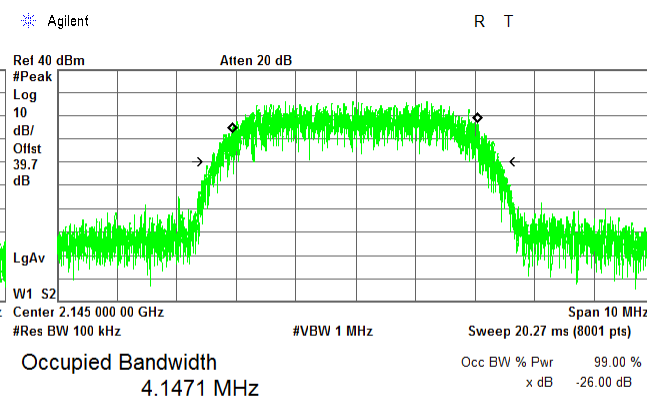
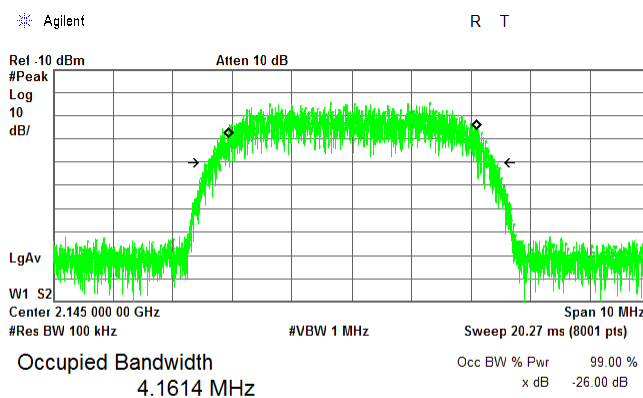
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
AWGN uplink transmit  
Below AGC threshold  
OUTPUT SIGNAL



Transmit Freq Error -7.012 kHz  
Occupied Bandwidth 4.820 MHz\*  
CONFIGURATION:  
INPUT SIGNAL

Transmit Freq Error -7.769 kHz  
Occupied Bandwidth 4.826 MHz\*  
Above AGC threshold +3 dB  
OUTPUT SIGNAL



Transmit Freq Error 2.053 kHz  
Occupied Bandwidth 4.825 MHz\*

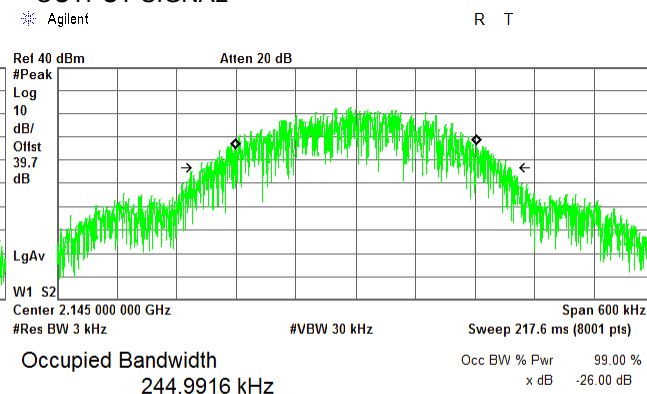
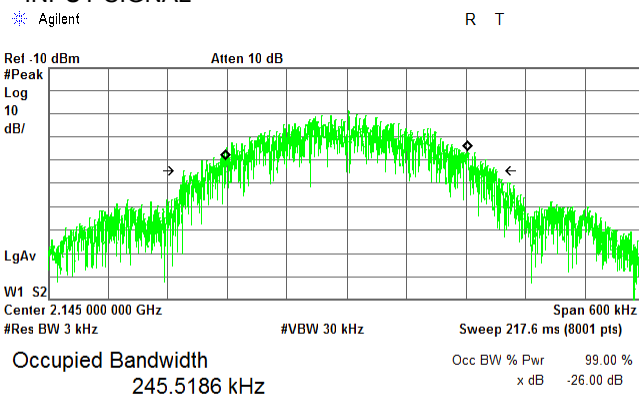
Transmit Freq Error -3.017 kHz  
Occupied Bandwidth 4.817 MHz\*

|                                                               |                                |                               |                      |
|---------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 2.1049, Occupied bandwidth |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.4     |                                |                               |                      |
| <b>Test mode:</b> Compliance                                  |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                     |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                     | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                               |                                |                               |                      |

Plot 7.2.2 Occupied bandwidth test result at mid frequency carrier

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110.0 – 2180.0 MHz  
GSM uplink transmit  
Single Channel  
OUTPUT SIGNAL

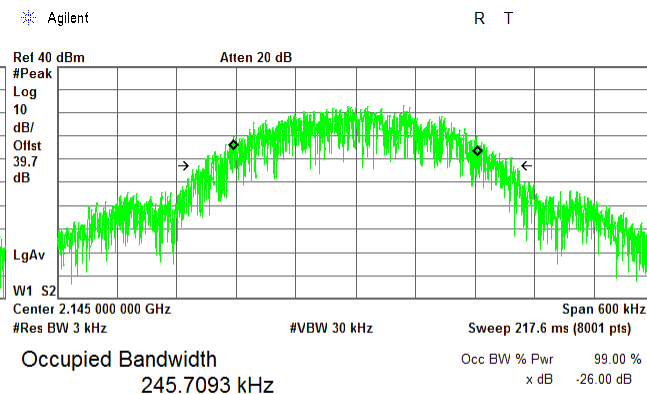
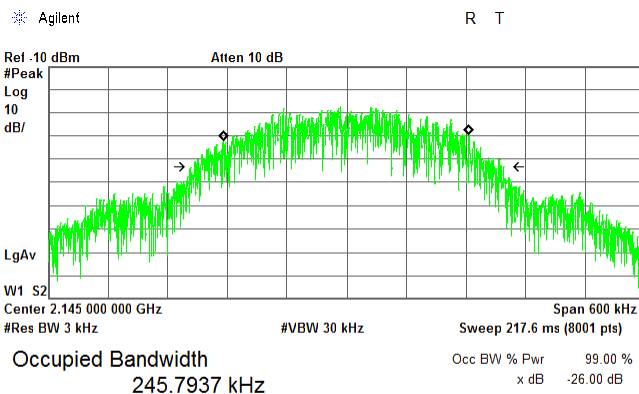


Transmit Freq Error -307.200 Hz  
Occupied Bandwidth 308.536 kHz\*

Transmit Freq Error 639.887 Hz  
Occupied Bandwidth 302.314 kHz\*

CONFIGURATION:  
INPUT SIGNAL

Single Channel  
OUTPUT SIGNAL



Transmit Freq Error -139.522 Hz  
Occupied Bandwidth 307.101 kHz\*

Transmit Freq Error -561.501 Hz  
Occupied Bandwidth 305.005 kHz\*

|                     |                         |                                    |               |
|---------------------|-------------------------|------------------------------------|---------------|
| Test specification: |                         | Section 2.1049, Occupied bandwidth |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.4 |               |
| Test mode:          |                         | Verdict: PASS                      |               |
| Date(s):            |                         |                                    |               |
| 27-Sep-16           |                         |                                    |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa             | Power: 48 VDC |
| Remarks:            |                         |                                    |               |

Plot 7.2.3 Occupied bandwidth test result at mid frequency carrier

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

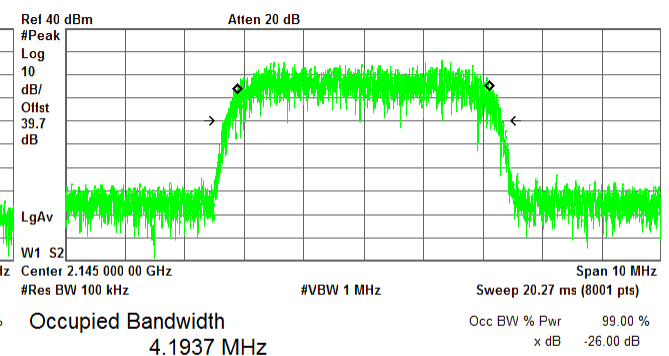
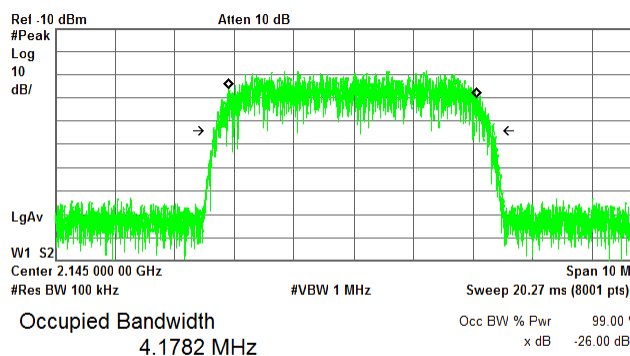
2110.0 – 2180.0 MHz  
WCDMA uplink transmit  
Below AGC threshold  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



Transmit Freq Error -3.783 kHz  
Occupied Bandwidth 4.651 MHz\*

Transmit Freq Error 3.558 kHz  
Occupied Bandwidth 4.652 MHz\*

CONFIGURATION:  
INPUT SIGNAL

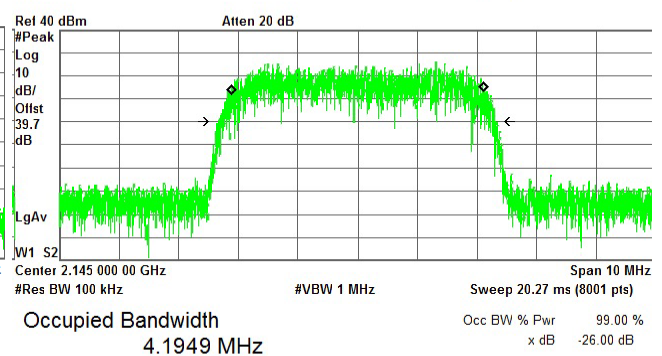
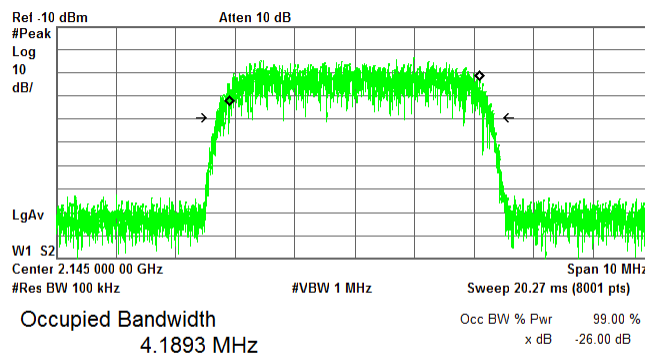
Above AGC threshold +3 dB  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



Transmit Freq Error 444.393 Hz  
Occupied Bandwidth 4.643 MHz\*

Transmit Freq Error 3.558 kHz  
Occupied Bandwidth 4.652 MHz\*

|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

## 7.3 Mean nput and output power and booster gain test

### 7.3.1 General

This test was performed to measure the mean input and output power at RF antenna connector and to calculate corresponding EUT gain. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Mean output power and booster gain test limits

| Transmitter type        | Assigned frequency range, MHz | Maximum peak output power, ERP |      |
|-------------------------|-------------------------------|--------------------------------|------|
|                         |                               | W                              | dBm  |
| Base and fixed stations | 2110 – 2180                   | 1640.0                         | 62.4 |

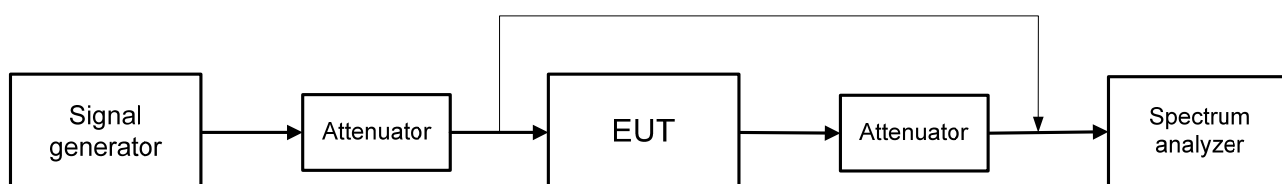
  

| Assigned frequency range, MHz | Tested frequency range | Maximum allowed Gain versus frequency response, dB |
|-------------------------------|------------------------|----------------------------------------------------|
| 2110.0 – 2180.0               | $F_0 \pm 250\% BW$     | Output power (dBm) – input power (dBm)             |

### 7.3.2 Test procedure

- 7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.
- 7.3.2.2 The signal generator power was adjusted to a level just below the AGC threshold but not more than 0.5 dB below.
- 7.3.2.3 The mean output power was measured with the spectrum analyzer as provided in Table 7.3.2, Table 7.3.3 and the associated plots.
- 7.3.2.4 The corresponding input power was measured with the same settings of the spectrum analyzer.
- 7.3.2.5 The above measurements were repeated with input signal adjusted to be 3 dB above the AGC threshold.
- 7.3.2.6 The EUT gain was calculated as a difference between output and input signal levels.

Figure 7.3.1 Mean output power and booster gain test test setup





|                     |                         |                                                                     |               |
|---------------------|-------------------------|---------------------------------------------------------------------|---------------|
| Test specification: |                         | Section 27.50(d), Mean input and output power and booster gain test |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.5                                  |               |
| Test mode:          |                         | Verdict: PASS                                                       |               |
| Date(s):            |                         |                                                                     |               |
| 27-Sep-16           |                         |                                                                     |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa                                              | Power: 48 VDC |
| Remarks:            |                         |                                                                     |               |

Table 7.3.2 Mean output power and booster gain test results, Chain 1

ASSIGNED FREQUENCY RANGE:

2110.0 – 2180.0 MHz

DETECTOR USED:

Average

MODULATING SIGNAL:

PRBS

TRANSMITTER OUTPUT POWER SETTINGS:

Maximum

| Carrier frequency, MHz | Input signal | SA reading, dBm |        | Booster gain**, dB | Antenna gain, dBi | EIRP***, dBm | Limit, dBm | Margin*, dB | Verdict |
|------------------------|--------------|-----------------|--------|--------------------|-------------------|--------------|------------|-------------|---------|
|                        |              | Input           | Output |                    |                   |              |            |             |         |
| MODULATION: AWGN       |              |                 |        |                    |                   |              |            |             |         |
| 2133.5                 | Below AGC    | -20.93          | 33.07  | 54.00              | 12.50             | 45.57        | 62.40      | -16.83      | Pass    |
|                        | Above AGC    | -16.71          | 33.27  | 49.98              | 12.50             | 45.77        | 62.40      | -16.63      | Pass    |
| 2112.5                 | Below AGC    | -20.92          | 33.00  | 53.92              | 12.50             | 45.50        | 62.40      | -16.90      | Pass    |
|                        | Above AGC    | -16.92          | 33.24  | 50.16              | 12.50             | 45.74        | 62.40      | -16.66      | Pass    |
| 2145.0                 | Below AGC    | -21.53          | 33.18  | 54.71              | 12.50             | 45.68        | 62.40      | -16.72      | Pass    |
|                        | Above AGC    | -17.40          | 33.26  | 50.66              | 12.50             | 45.76        | 62.40      | -16.64      | Pass    |
| 2177.5                 | Below AGC    | -19.75          | 33.41  | 53.16              | 12.50             | 45.91        | 62.40      | -16.49      | Pass    |
|                        | Above AGC    | -15.77          | 33.61  | 49.38              | 12.50             | 46.11        | 62.40      | -16.29      | Pass    |
| MODULATION: GSM        |              |                 |        |                    |                   |              |            |             |         |
| 2133.5                 | Below AGC    | -22.00          | 33.25  | 55.25              | 12.50             | 45.75        | 62.40      | -16.65      | Pass    |
|                        | Above AGC    | -18.13          | 33.44  | 51.57              | 12.50             | 45.94        | 62.40      | -16.46      | Pass    |
| 2110.0                 | Below AGC    | -20.38          | 32.53  | 52.91              | 12.50             | 45.03        | 62.40      | -17.37      | Pass    |
|                        | Above AGC    | -16.54          | 33.29  | 49.83              | 12.50             | 45.79        | 62.40      | -16.61      | Pass    |
| 2145.0                 | Below AGC    | -21.29          | 33.12  | 54.41              | 12.50             | 45.62        | 62.40      | -16.78      | Pass    |
|                        | Above AGC    | -17.00          | 33.15  | 50.15              | 12.50             | 45.65        | 62.40      | -16.75      | Pass    |
| 2180.0                 | Below AGC    | -19.75          | 33.25  | 53.00              | 12.50             | 45.75        | 62.40      | -16.65      | Pass    |
|                        | Above AGC    | -15.80          | 33.34  | 49.14              | 12.50             | 45.84        | 62.40      | -16.56      | Pass    |
| MODULATION: WCDMA      |              |                 |        |                    |                   |              |            |             |         |
| 2133.5                 | Below AGC    | -21.63          | 33.21  | 54.84              | 12.50             | 45.71        | 62.40      | -16.69      | Pass    |
|                        | Above AGC    | -17.78          | 33.39  | 51.17              | 12.50             | 45.89        | 62.40      | -16.51      | Pass    |
| 2112.5                 | Below AGC    | -19.42          | 32.38  | 51.80              | 12.50             | 44.88        | 62.40      | -17.52      | Pass    |
|                        | Above AGC    | -15.48          | 32.39  | 47.87              | 12.50             | 44.89        | 62.40      | -17.51      | Pass    |
| 2145.0                 | Below AGC    | -21.25          | 32.60  | 53.85              | 12.50             | 45.10        | 62.40      | -17.30      | Pass    |
|                        | Above AGC    | -17.14          | 32.61  | 49.75              | 12.50             | 45.11        | 62.40      | -17.29      | Pass    |
| 2177.5                 | Below AGC    | -19.39          | 33.04  | 52.43              | 12.50             | 45.54        | 62.40      | -16.86      | Pass    |
|                        | Above AGC    | -15.42          | 33.22  | 48.64              | 12.50             | 45.72        | 62.40      | -16.68      | Pass    |

\* - Margin, dB = Limit EIRP, dBm - RF output power EIRP\*, dBm

\*\* - Booster Gain = Output SA reading – Input SA reading

\*\*\* - EIRP, dBm = SA reading average, dBm + Antenna gain, dBi



|                     |                         |                                                                     |               |
|---------------------|-------------------------|---------------------------------------------------------------------|---------------|
| Test specification: |                         | Section 27.50(d), Mean input and output power and booster gain test |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.5                                  |               |
| Test mode:          |                         | Verdict: PASS                                                       |               |
| Date(s):            |                         |                                                                     |               |
| 27-Sep-16           |                         |                                                                     |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa                                              | Power: 48 VDC |
| Remarks:            |                         |                                                                     |               |

Table 7.3.3 Mean output power and booster gain test results, Chain 2

ASSIGNED FREQUENCY RANGE: 2110.0 – 2180.0 MHz  
DETECTOR USED: Average  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Carrier frequency, MHz | Input signal | SA reading, dBm |        | Booster gain**, dB | Antenna gain, dBi | EIRP,*** dBm | Limit, dBm | Margin*, dB | Verdict |
|------------------------|--------------|-----------------|--------|--------------------|-------------------|--------------|------------|-------------|---------|
|                        |              | Input           | Output |                    |                   |              |            |             |         |
| MODULATION: AWGN       |              |                 |        |                    |                   |              |            |             |         |
| 2113.0                 | Below AGC    | -20.86          | 32.98  | 53.84              | 12.50             | 45.48        | 62.40      | -16.92      | Pass    |
|                        | Above AGC    | -16.91          | 32.82  | 49.73              | 12.50             | 45.32        | 62.40      | -17.08      | Pass    |
| 2112.5                 | Below AGC    | -21.49          | 32.95  | 54.44              | 12.50             | 45.45        | 62.40      | -16.95      | Pass    |
|                        | Above AGC    | -17.56          | 33.03  | 50.59              | 12.50             | 45.53        | 62.40      | -16.87      | Pass    |
| 2145.0                 | Below AGC    | -20.76          | 33.15  | 53.91              | 12.50             | 45.65        | 62.40      | -16.75      | Pass    |
|                        | Above AGC    | -16.70          | 33.19  | 49.89              | 12.50             | 45.69        | 62.40      | -16.71      | Pass    |
| 2177.5                 | Below AGC    | -19.21          | 33.24  | 52.45              | 12.50             | 45.74        | 62.40      | -16.66      | Pass    |
|                        | Above AGC    | -15.09          | 33.46  | 48.55              | 12.50             | 45.96        | 62.40      | -16.44      | Pass    |
| MODULATION: GSM        |              |                 |        |                    |                   |              |            |             |         |
| 2113.0                 | Below AGC    | -21.55          | 33.22  | 54.77              | 12.50             | 45.72        | 62.40      | -16.68      | Pass    |
|                        | Above AGC    | -17.55          | 33.20  | 50.75              | 12.50             | 45.70        | 62.40      | -16.70      | Pass    |
| 2110.0                 | Below AGC    | -20.37          | 32.90  | 53.27              | 12.50             | 45.40        | 62.40      | -17.00      | Pass    |
|                        | Above AGC    | -16.23          | 32.84  | 49.07              | 12.50             | 45.34        | 62.40      | -17.06      | Pass    |
| 2145.0                 | Below AGC    | -20.53          | 33.36  | 53.89              | 12.50             | 45.86        | 62.40      | -16.54      | Pass    |
|                        | Above AGC    | -16.59          | 33.15  | 49.74              | 12.50             | 45.65        | 62.40      | -16.75      | Pass    |
| 2180.0                 | Below AGC    | -18.15          | 33.43  | 51.58              | 12.50             | 45.93        | 62.40      | -16.47      | Pass    |
|                        | Above AGC    | -14.59          | 33.40  | 47.99              | 12.50             | 45.90        | 62.40      | -16.50      | Pass    |
| MODULATION: WCDMA      |              |                 |        |                    |                   |              |            |             |         |
| 2113.0                 | Below AGC    | -20.57          | 33.12  | 53.69              | 12.50             | 45.62        | 62.40      | -16.78      | Pass    |
|                        | Above AGC    | -16.65          | 33.01  | 49.66              | 12.50             | 45.51        | 62.40      | -16.89      | Pass    |
| 2112.5                 | Below AGC    | -21.48          | 33.09  | 54.57              | 12.50             | 45.59        | 62.40      | -16.81      | Pass    |
|                        | Above AGC    | -17.46          | 33.15  | 50.61              | 12.50             | 45.65        | 62.40      | -16.75      | Pass    |
| 2145.0                 | Below AGC    | -20.53          | 33.47  | 54.00              | 12.50             | 45.97        | 62.40      | -16.43      | Pass    |
|                        | Above AGC    | -16.64          | 33.46  | 50.10              | 12.50             | 45.96        | 62.40      | -16.44      | Pass    |
| 2177.5                 | Below AGC    | -18.73          | 33.70  | 52.43              | 12.50             | 46.20        | 62.40      | -16.20      | Pass    |
|                        | Above AGC    | -14.70          | 33.76  | 48.46              | 12.50             | 46.26        | 62.40      | -16.14      | Pass    |

\* - Margin, dB = Limit EIRP, dBm - RF output power EIRP\*, dBm

\*\* - Booster Gain = Output SA reading – Input SA reading

\*\*\* - EIRP, dBm = SA reading average, dBm + Antenna gain, dBi

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

Full description is given in Appendix A.



|                     |                         |                                                                     |               |
|---------------------|-------------------------|---------------------------------------------------------------------|---------------|
| Test specification: |                         | Section 27.50(d), Mean input and output power and booster gain test |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.5                                  |               |
| Test mode:          |                         | Verdict: PASS                                                       |               |
| Date(s):            |                         |                                                                     |               |
| 27-Sep-16           |                         |                                                                     |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa                                              | Power: 48 VDC |
| Remarks:            |                         |                                                                     |               |

Table 7.3.4 Mean output power and booster gain test results, Chains 1 and 2

ASSIGNED FREQUENCY RANGE: 2110.0 – 2180.0 MHz  
DETECTOR USED: Average  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
NUMBER OF CHAINS: N = 2

MODULATION: AWGN

| Carrier frequency, MHz | Input signal | SA reading, dBm |         | Total power**, dBm | Antenna gain, dBi | EIRP, dBm*** | Limit, dBm | Margin *, dB | Verdict |
|------------------------|--------------|-----------------|---------|--------------------|-------------------|--------------|------------|--------------|---------|
|                        |              | Chain 1         | Chain 2 |                    |                   |              |            |              |         |
| 2112.5                 | Below AGC    | 33.00           | 32.95   | 35.99              | 12.50             | 48.49        | 62.4       | -13.91       | Pass    |
|                        | Above AGC    | 33.24           | 33.03   | 36.15              | 12.50             | 48.65        | 62.4       | -13.75       | Pass    |
| 2145.0                 | Below AGC    | 33.18           | 33.15   | 36.18              | 12.50             | 48.68        | 62.4       | -13.72       | Pass    |
|                        | Above AGC    | 33.26           | 33.19   | 36.24              | 12.50             | 48.75        | 62.4       | -13.65       | Pass    |
| 2177.5                 | Below AGC    | 33.41           | 33.24   | 36.34              | 12.50             | 48.84        | 62.4       | -13.56       | Pass    |
|                        | Above AGC    | 33.61           | 33.46   | 36.55              | 12.50             | 49.06        | 62.4       | -13.34       | Pass    |

MODULATION: GSM

| Carrier frequency, MHz | Input signal | SA reading, dBm |         | Total power**, dBm | Antenna gain, dBi | EIRP, dBm*** | Limit, dBm | Margin *, dB | Verdict |
|------------------------|--------------|-----------------|---------|--------------------|-------------------|--------------|------------|--------------|---------|
|                        |              | Chain 1         | Chain 2 |                    |                   |              |            |              |         |
| 2110.0                 | Below AGC    | 32.53           | 32.90   | 35.73              | 12.50             | 48.23        | 62.40      | -14.17       | Pass    |
|                        | Above AGC    | 33.29           | 32.84   | 36.08              | 12.50             | 48.60        | 62.40      | -13.80       | Pass    |
| 2145.0                 | Below AGC    | 33.12           | 33.36   | 36.25              | 12.50             | 48.75        | 62.40      | -13.65       | Pass    |
|                        | Above AGC    | 33.15           | 33.15   | 36.16              | 12.50             | 48.68        | 62.40      | -13.72       | Pass    |
| 2180.0                 | Below AGC    | 33.25           | 33.43   | 36.35              | 12.50             | 48.85        | 62.40      | -13.55       | Pass    |
|                        | Above AGC    | 33.34           | 33.40   | 36.38              | 12.50             | 48.90        | 62.40      | -13.50       | Pass    |

MODULATION: W-CDMA

| Carrier frequency, MHz | Input signal | SA reading, dBm |         | Total power**, dBm | Antenna gain, dBi | EIRP, dBm*** | Limit, dBm | Margin *, dB | Verdict |
|------------------------|--------------|-----------------|---------|--------------------|-------------------|--------------|------------|--------------|---------|
|                        |              | Chain 1         | Chain 2 |                    |                   |              |            |              |         |
| 2112.5                 | Below AGC    | 32.38           | 33.09   | 35.76              | 12.50             | 48.26        | 62.40      | -14.14       | Pass    |
|                        | Above AGC    | 32.39           | 33.15   | 35.80              | 12.50             | 48.31        | 62.40      | -14.09       | Pass    |
| 2145.0                 | Below AGC    | 32.60           | 33.47   | 36.07              | 12.50             | 48.57        | 62.40      | -13.83       | Pass    |
|                        | Above AGC    | 32.61           | 33.46   | 36.07              | 12.50             | 48.58        | 62.40      | -13.82       | Pass    |
| 2177.5                 | Below AGC    | 33.04           | 33.70   | 36.39              | 12.50             | 48.89        | 62.40      | -13.51       | Pass    |
|                        | Above AGC    | 33.22           | 33.76   | 36.51              | 12.50             | 49.02        | 62.40      | -13.38       | Pass    |

\* - Margin, dB = EIRP, dBm - Limit, dBm

\*\* - Total power =  $10 \log\{10^{(P(\text{dBm}, \text{Ant1})/10)} + 10^{(P(\text{dBm}, \text{Ant2})/10)}\}$ , dBm

\*\*\* - EIRP, dBm = Total power, dBm + Antenna gain, dBi

#### Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

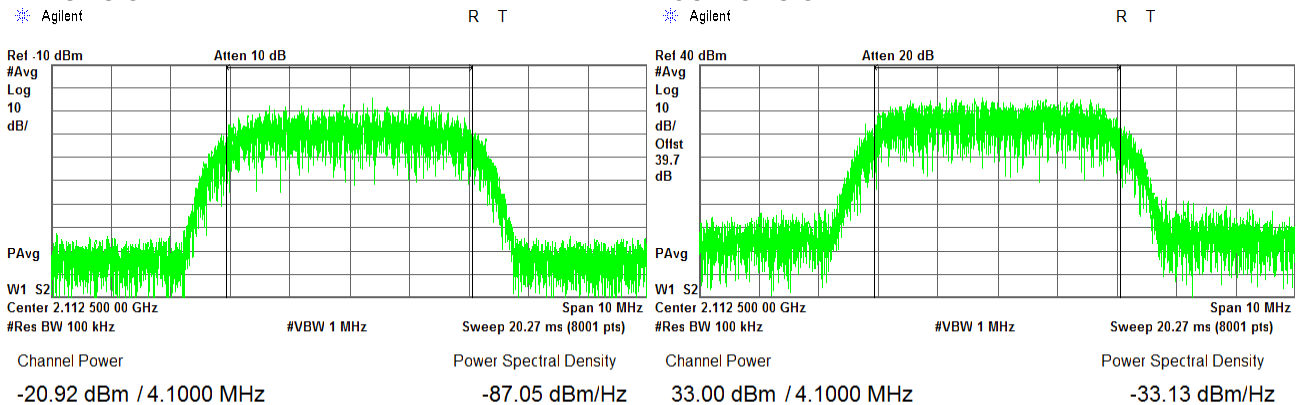
Full description is given in Appendix A.

|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.1 Mean output power and booster gain test results at low frequency, Chain1

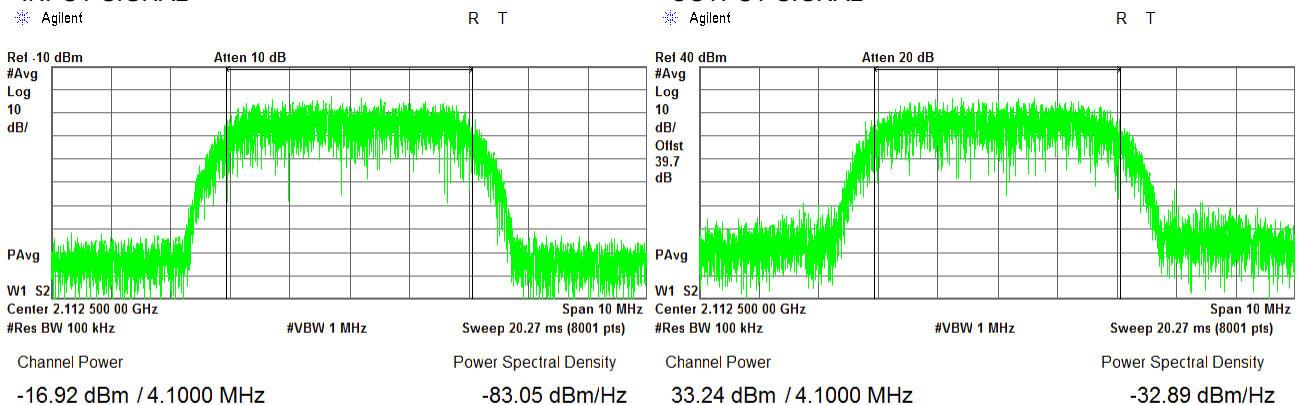
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

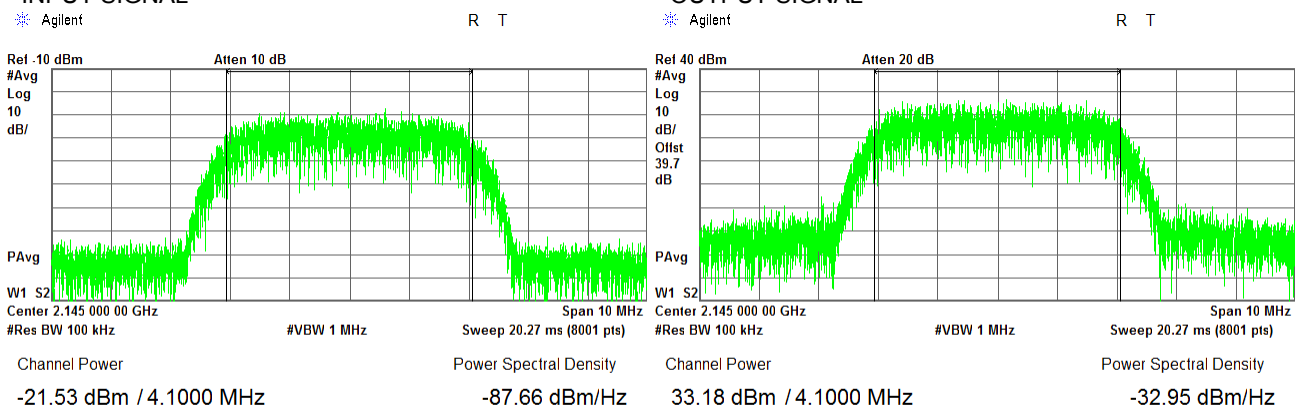


|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.2 Mean output power and booster gain test results at mid frequency, Chain1**

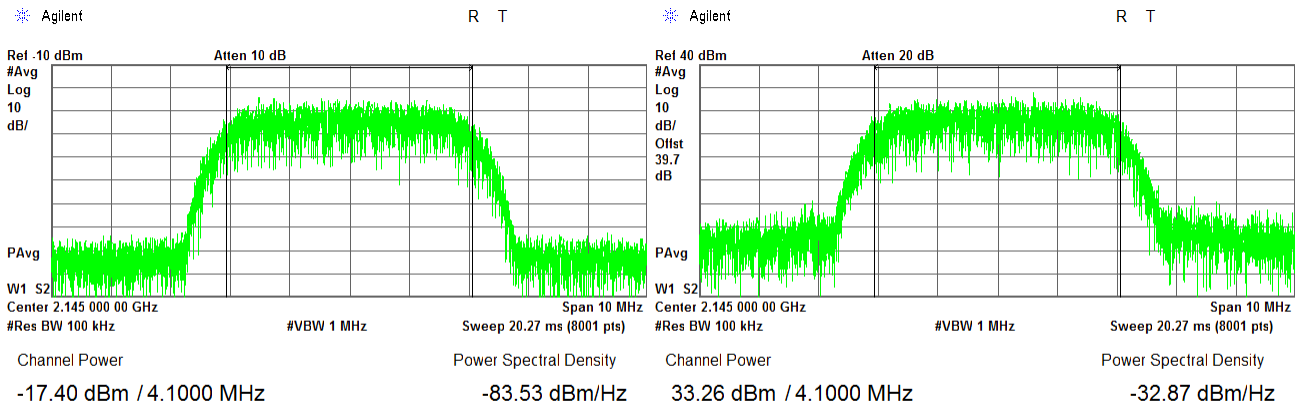
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.3 Mean output power and booster gain test results at f0 frequency, Chain1

FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

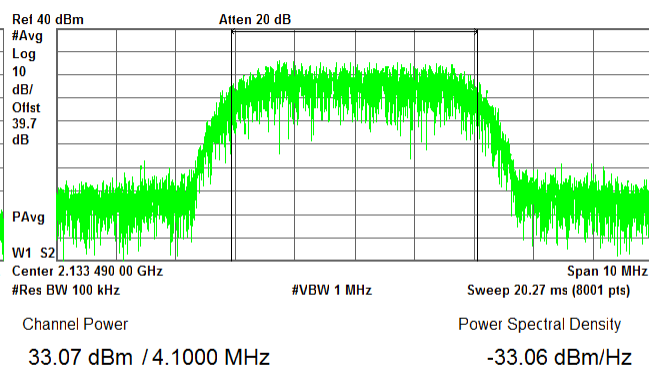
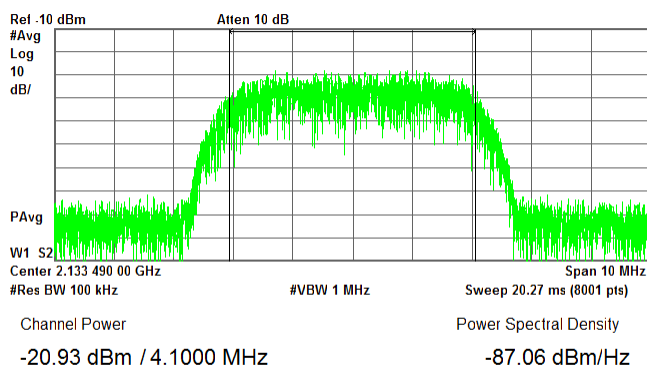
2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



CONFIGURATION:  
INPUT SIGNAL

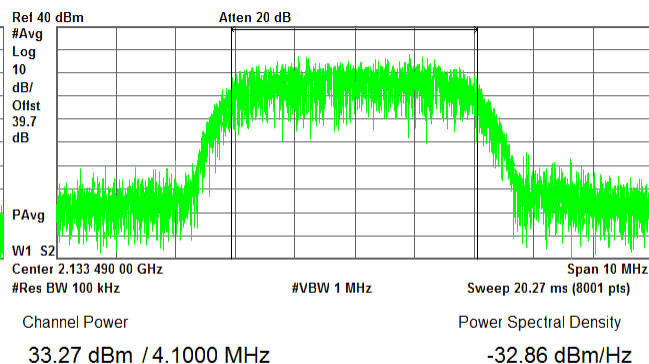
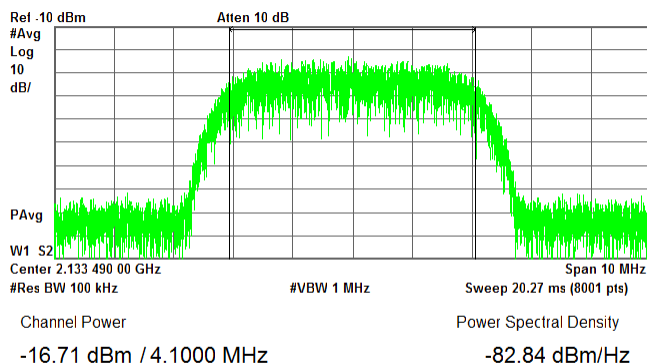
Above AGC threshold +3dB  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

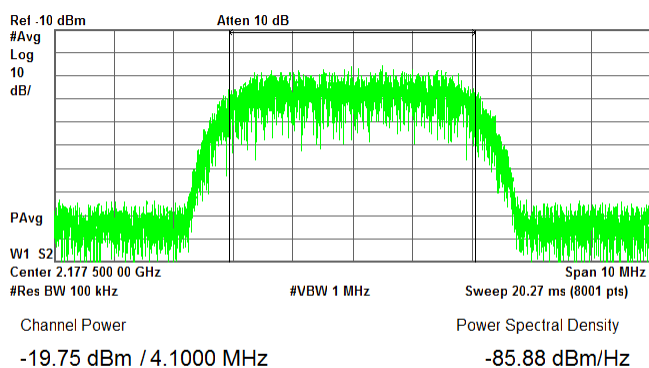
Plot 7.3.4 Mean output power and booster gain test results at high frequency, Chain1

FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL

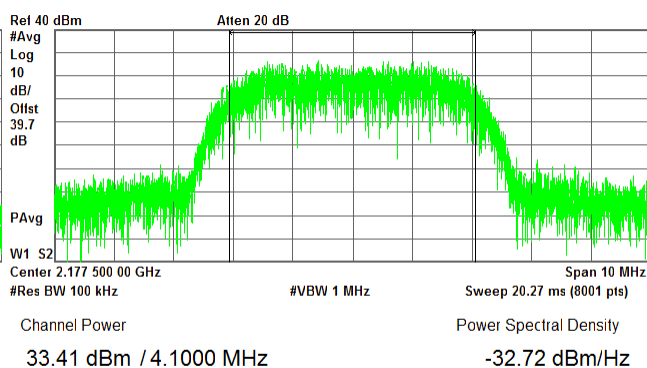
Agilent

R T



Agilent

R T

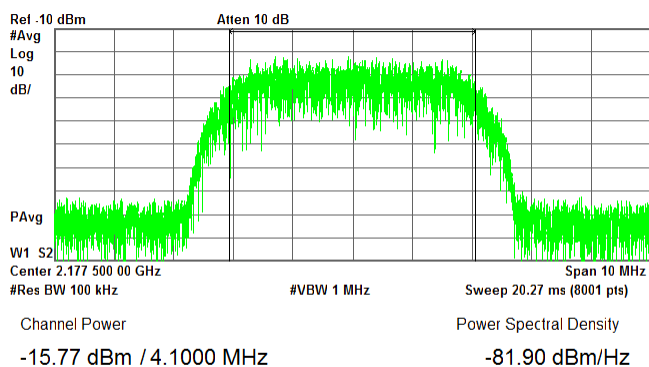


CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

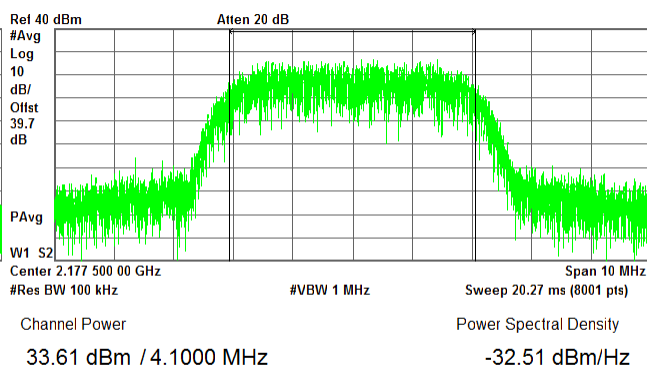
Agilent

R T



Agilent

R T

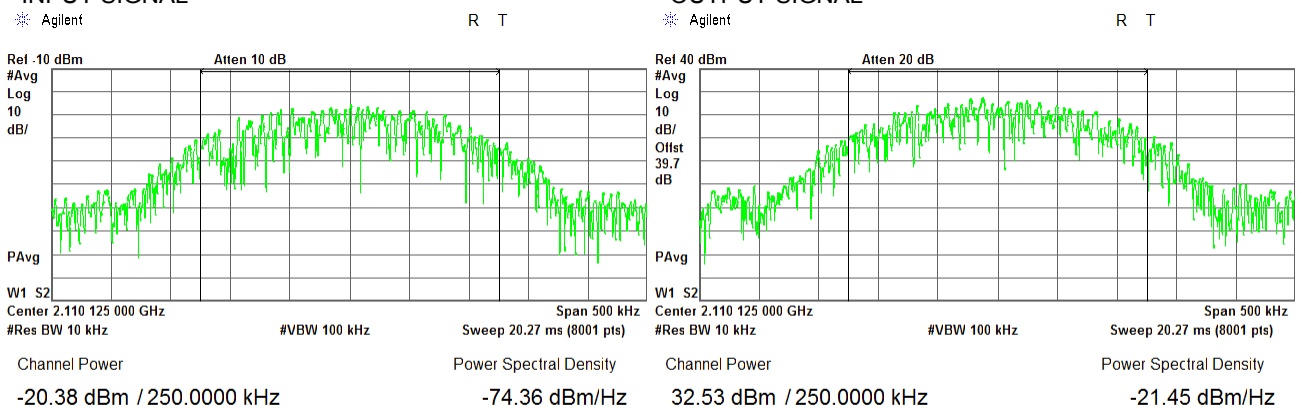


|                     |                         |                                                                     |               |
|---------------------|-------------------------|---------------------------------------------------------------------|---------------|
| Test specification: |                         | Section 27.50(d), Mean input and output power and booster gain test |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.5                                  |               |
| Test mode:          |                         | Verdict: PASS                                                       |               |
| Date(s):            |                         |                                                                     |               |
| 27-Sep-16           |                         |                                                                     |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa                                              | Power: 48 VDC |
| Remarks:            |                         |                                                                     |               |

Plot 7.3.5 Mean output power and booster gain test results at low frequency, Chain1

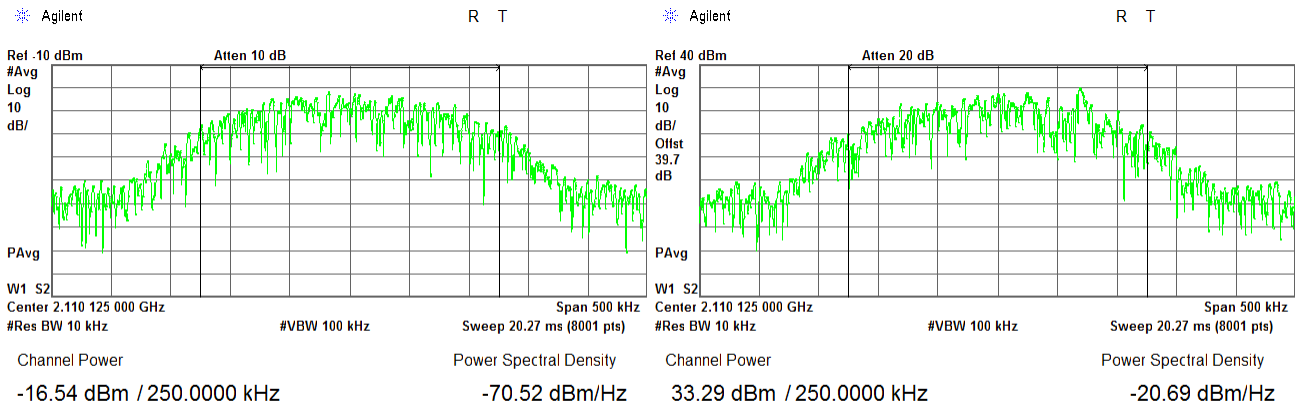
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
GSM downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                     |                         |                                                                     |               |
|---------------------|-------------------------|---------------------------------------------------------------------|---------------|
| Test specification: |                         | Section 27.50(d), Mean input and output power and booster gain test |               |
| Test procedure:     |                         | KDB 935210 D05 v01r01, section 3.5                                  |               |
| Test mode:          |                         | Verdict: PASS                                                       |               |
| Date(s):            |                         |                                                                     |               |
| 27-Sep-16           |                         |                                                                     |               |
| Temperature: 28 °C  | Relative Humidity: 43 % | Air Pressure: 1012 hPa                                              | Power: 48 VDC |
| Remarks:            |                         |                                                                     |               |

**Plot 7.3.6 Mean output power and booster gain test results at mid frequency, Chain1**

FRQUENCY RANGE:

2110 – 2180 MHz

OPERATIONAL MODE:

GSM downlink transmit

CONFIGURATION:

Below AGC threshold

INPUT SIGNAL

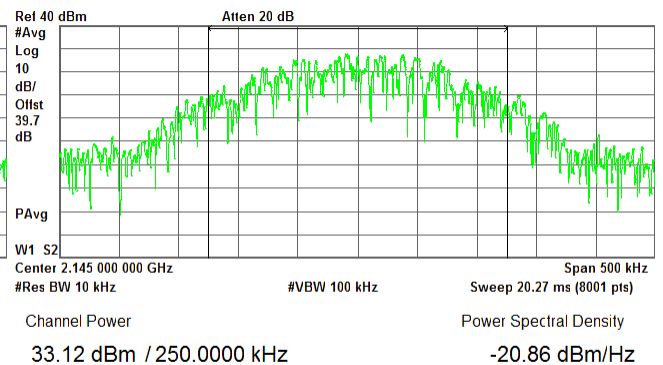
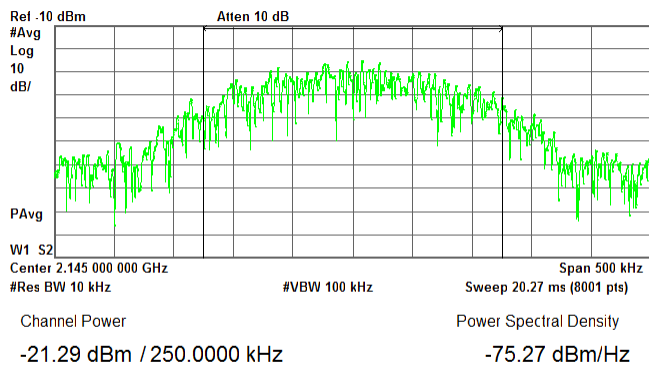
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



CONFIGURATION:

Above AGC threshold +3dB

INPUT SIGNAL

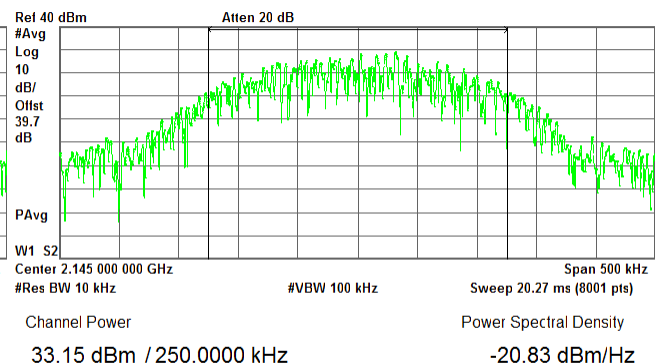
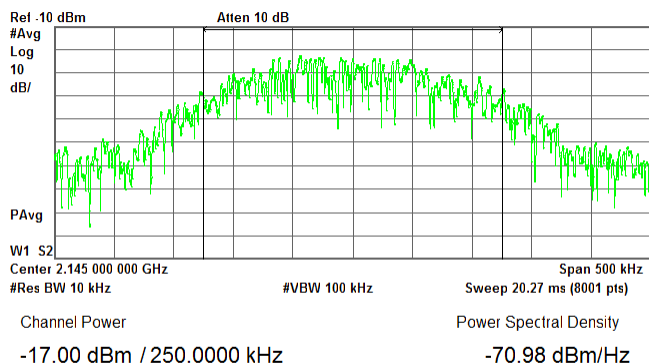
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.7 Mean output power and booster gain test results at f0 frequency, Chain1**

FRQUENCY RANGE:

2110 – 2180 MHz

OPERATIONAL MODE:

GSM downlink transmit

CONFIGURATION:

Below AGC threshold

INPUT SIGNAL

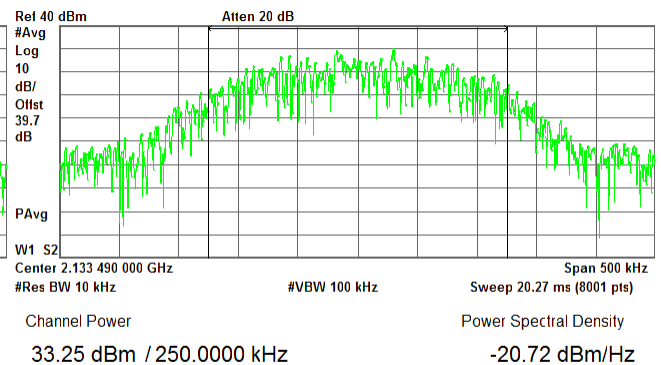
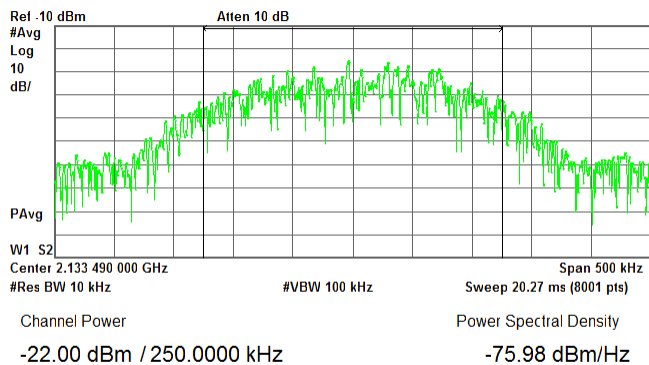
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



CONFIGURATION:

Above AGC threshold +3dB

INPUT SIGNAL

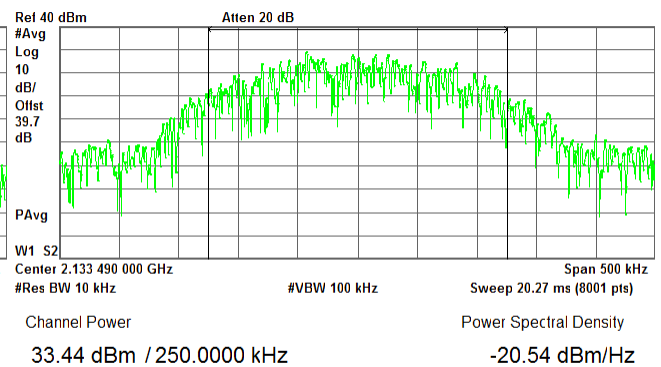
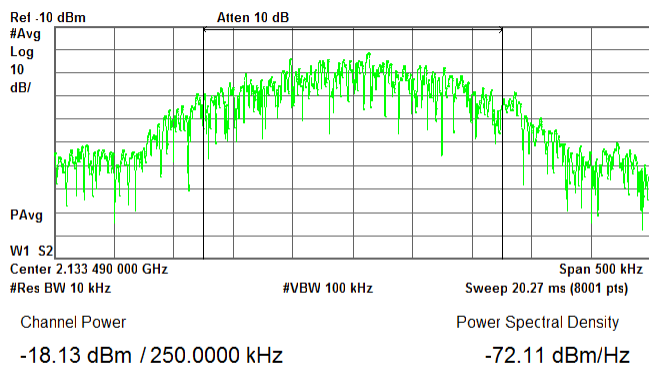
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



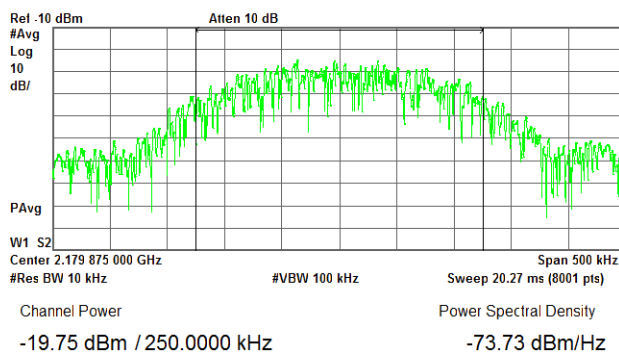
|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.8 Mean output power and booster gain test results at high frequency, Chain1**

FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

Agilent

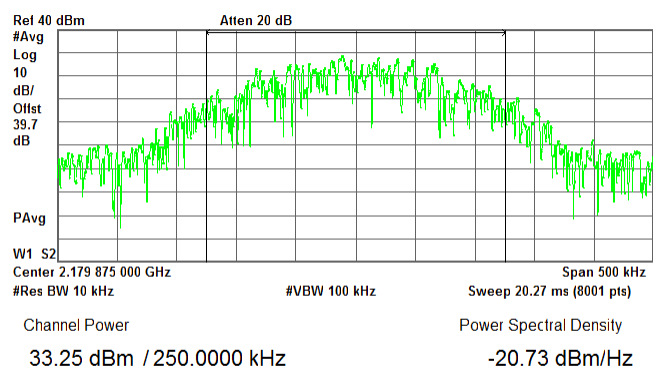
R T



2110 – 2180 MHz  
GSM downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL

Agilent

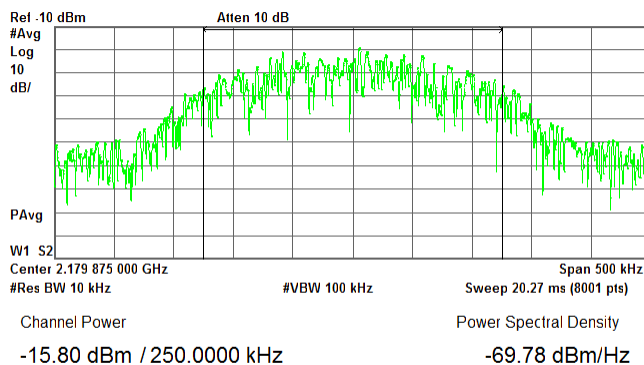
R T



CONFIGURATION:  
INPUT SIGNAL

Agilent

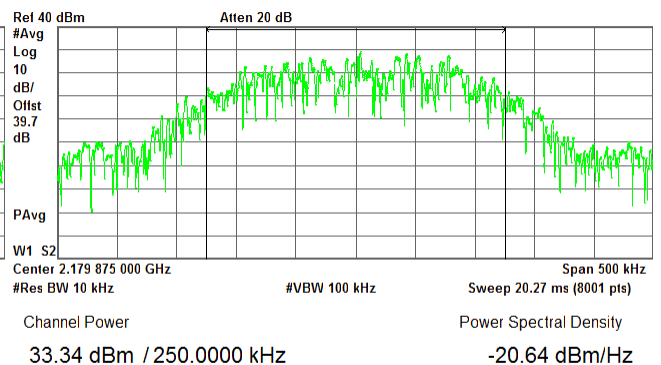
R T



Above AGC threshold +3dB  
OUTPUT SIGNAL

Agilent

R T

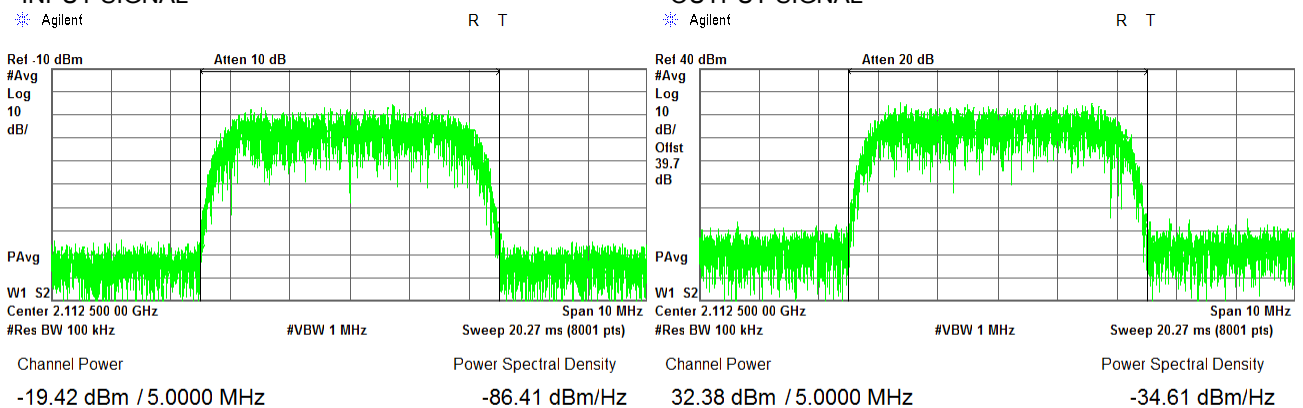


|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.9 Mean output power and booster gain test results at low frequency, Chain1**

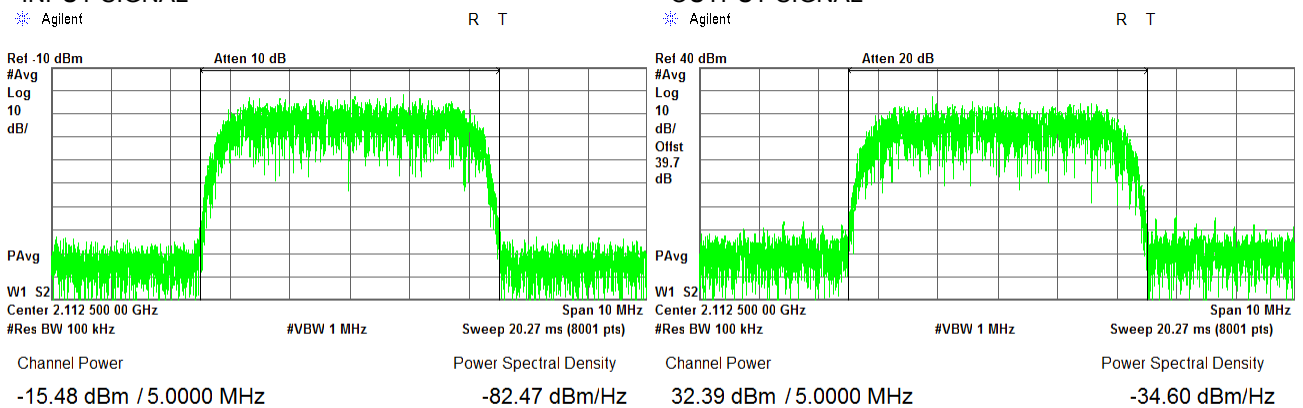
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



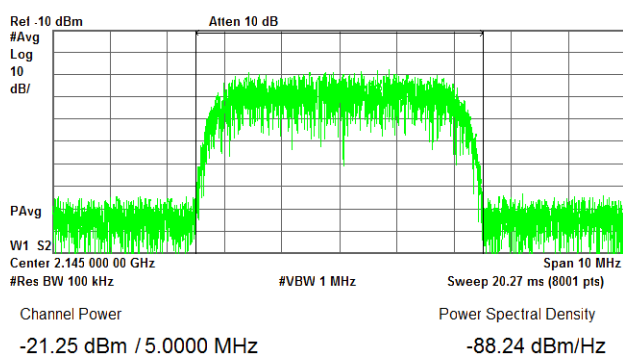
|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.10 Mean output power and booster gain test results at mid frequency, Chain1

FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

Agilent

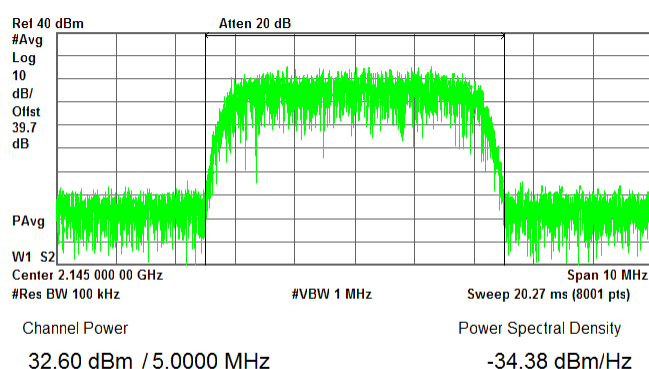
R T



2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL

Agilent

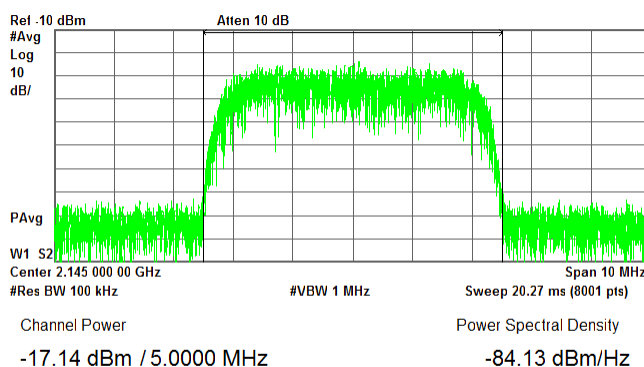
R T



CONFIGURATION:  
INPUT SIGNAL

Agilent

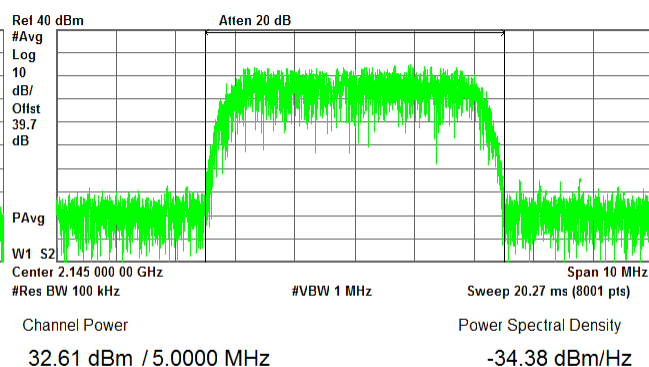
R T



Above AGC threshold +3dB  
OUTPUT SIGNAL

Agilent

R T



|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.11 Mean output power and booster gain test results at f0 frequency, Chain1**

FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

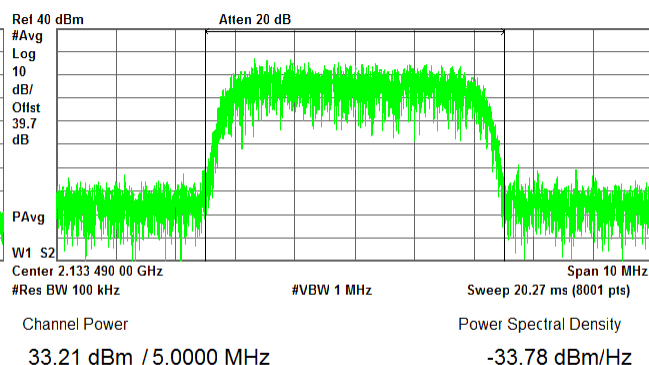
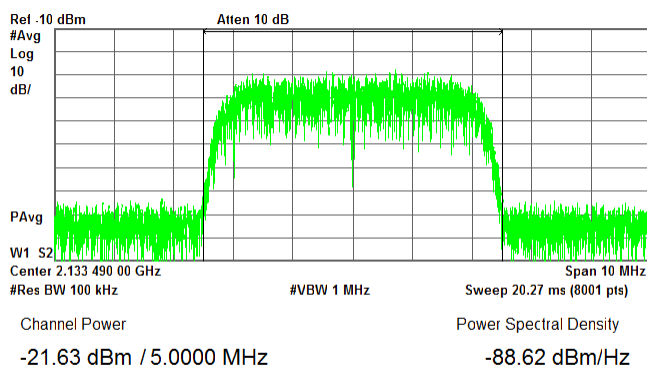
2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T



CONFIGURATION:  
INPUT SIGNAL

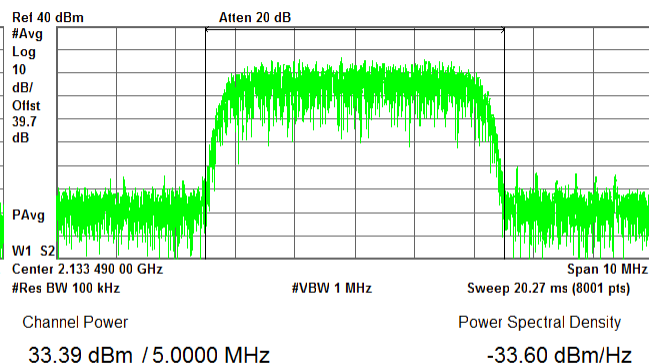
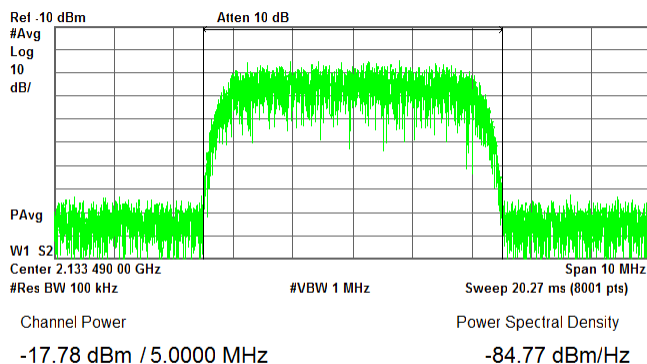
Above AGC threshold +3dB  
OUTPUT SIGNAL

Agilent

R T

Agilent

R T

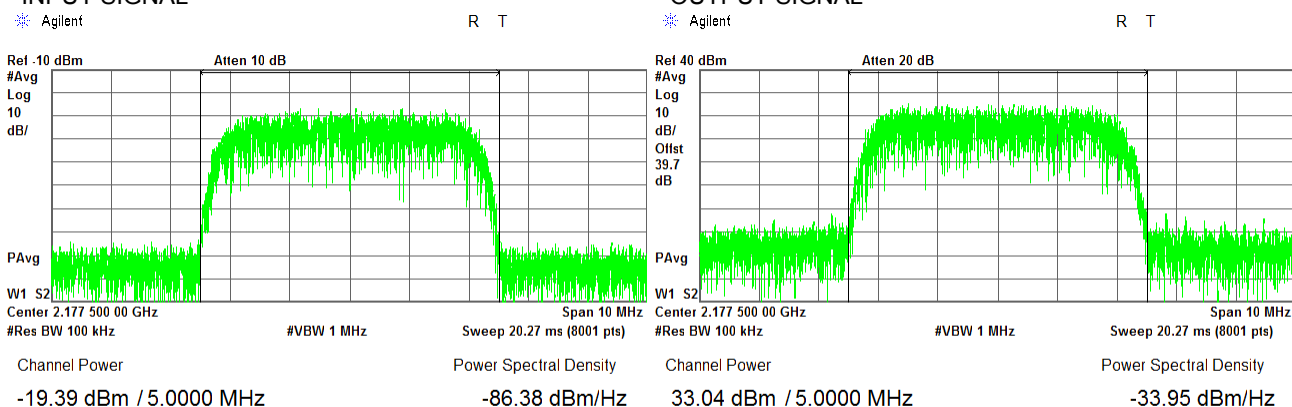


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.12 Mean output power and booster gain test results at high frequency, Chain1

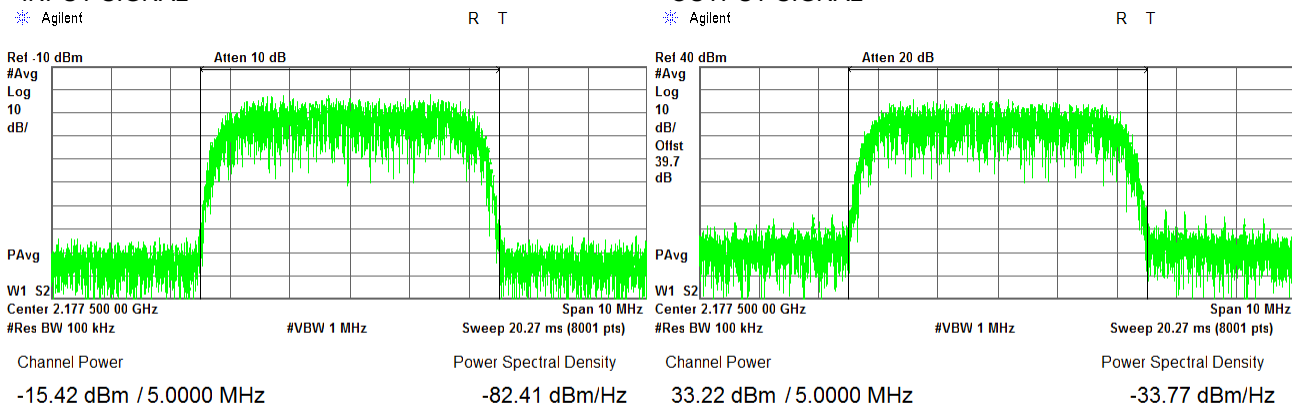
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

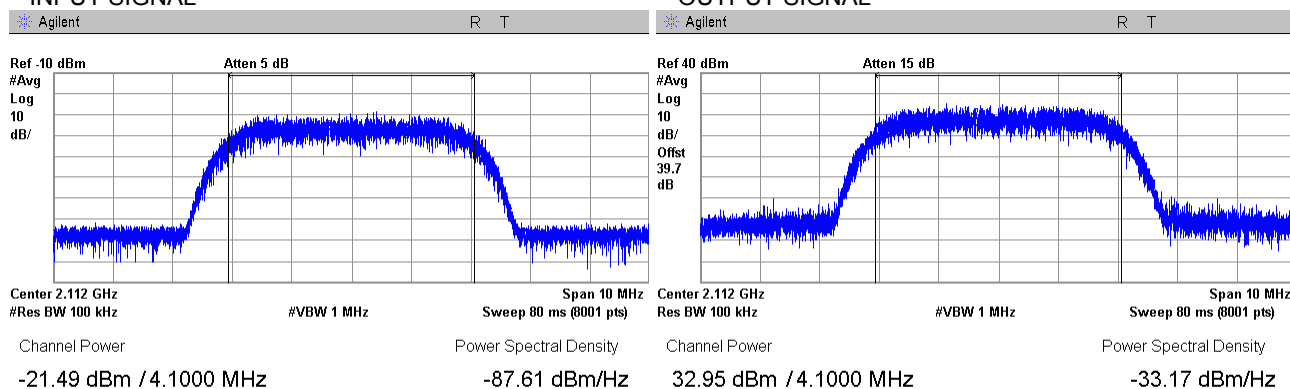


|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.13 Mean output power and booster gain test results at low frequency, Chain 2

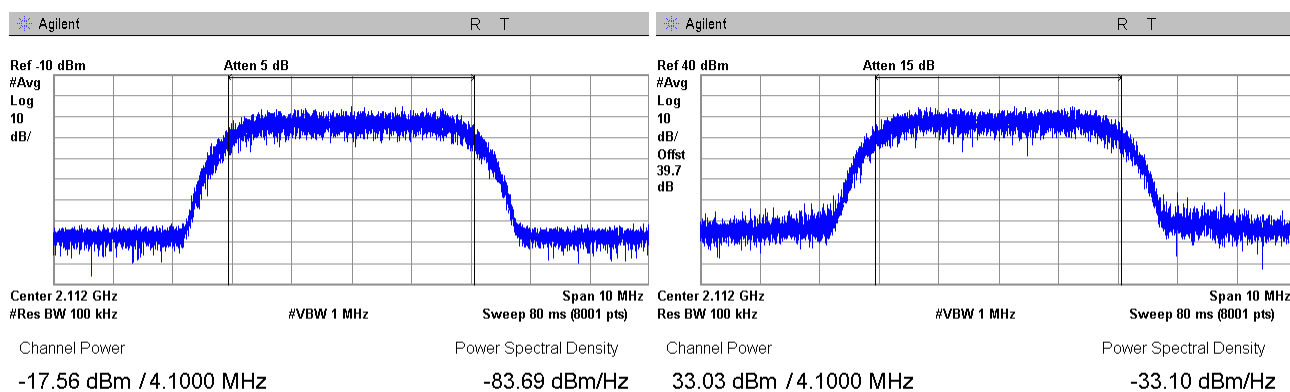
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

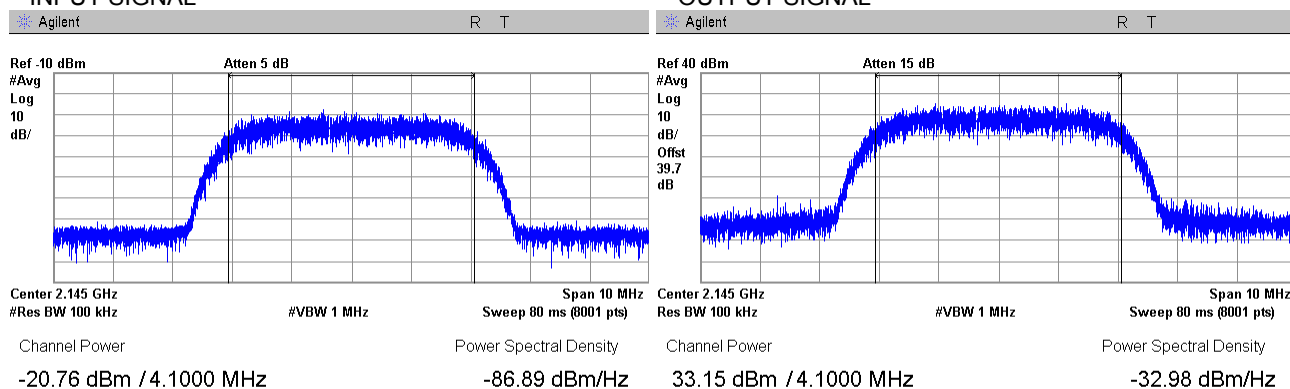


|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.14 Mean output power and booster gain test results at mid frequency, Chain 2

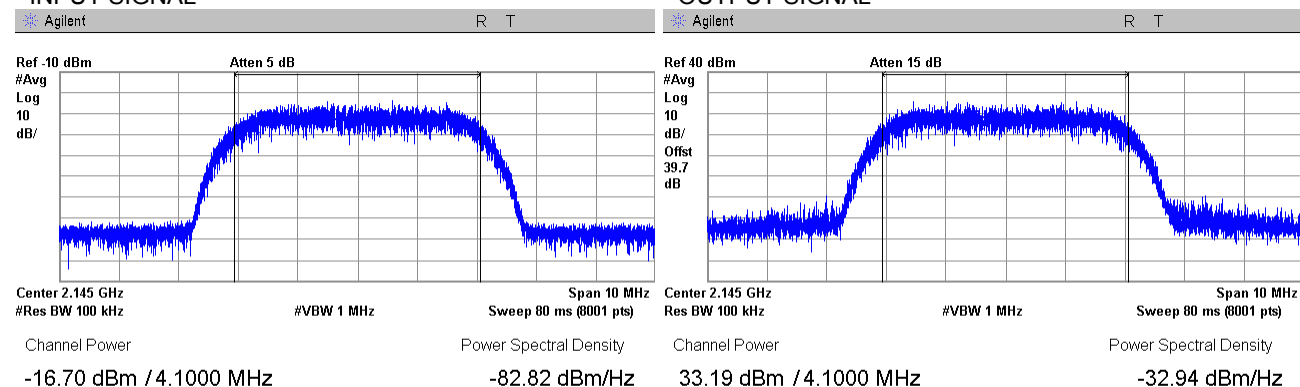
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

**Plot 7.3.15 Mean output power and booster gain test results at f0 frequency, Chain 2**

FRQUENCY RANGE:

OPERATIONAL MODE:

CONFIGURATION:

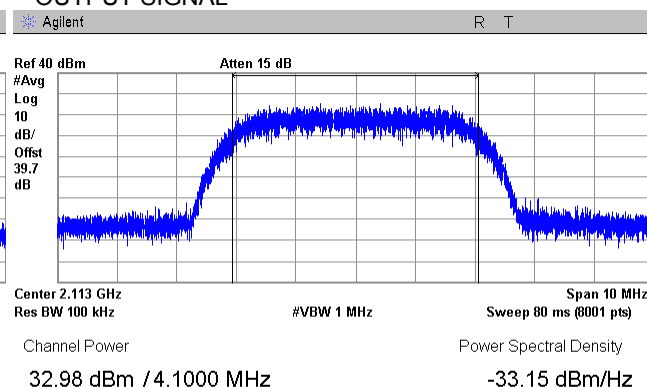
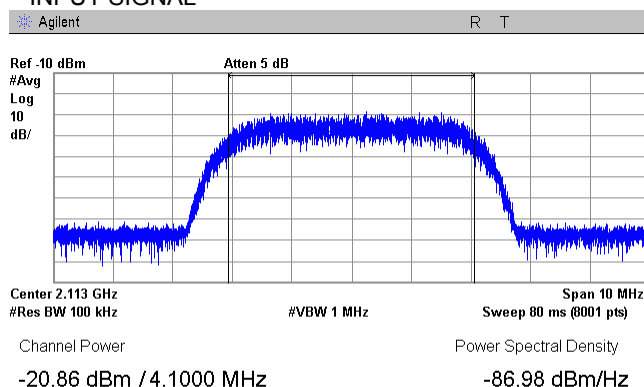
INPUT SIGNAL

2110 – 2180 MHz

AWGN downlink transmit

Below AGC threshold

OUTPUT SIGNAL

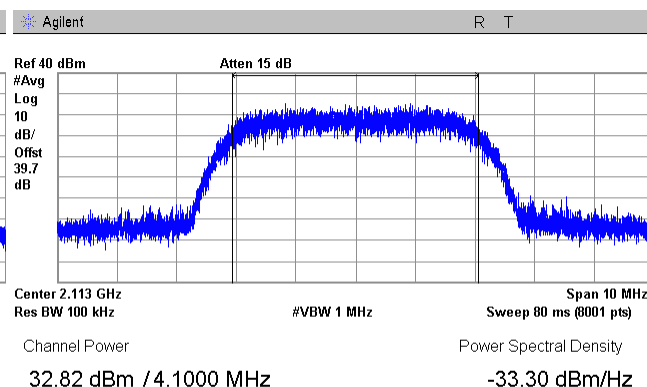
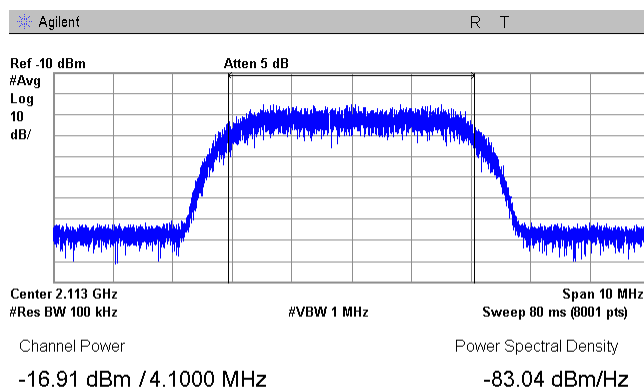


CONFIGURATION:

INPUT SIGNAL

Above AGC threshold +3dB

OUTPUT SIGNAL

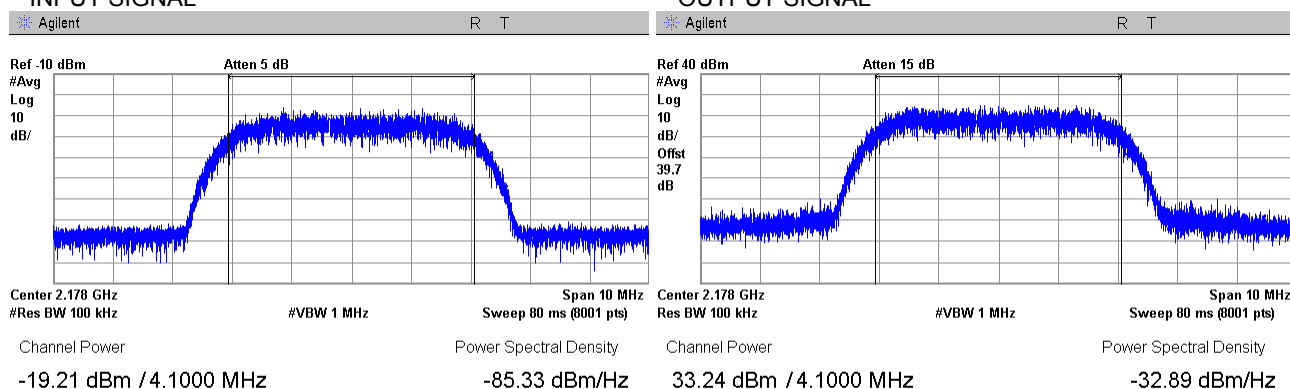


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.16 Mean output power and booster gain test results at high frequency, Chain 2

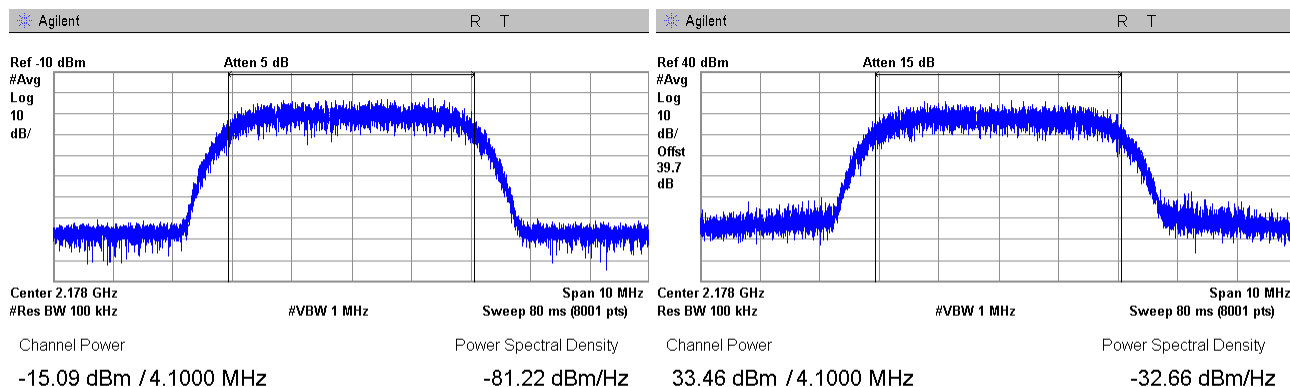
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.17 Mean output power and booster gain test results at low frequency, Chain 2

FRQUENCY RANGE:

OPERATIONAL MODE:

CONFIGURATION:

INPUT SIGNAL

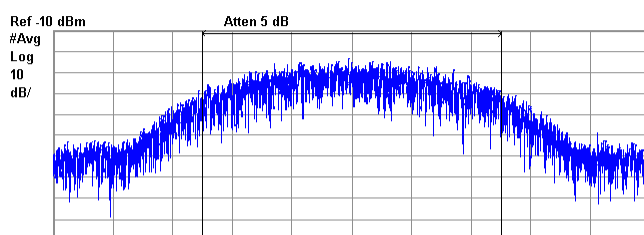
2110 – 2180 MHz

GSM downlink transmit

Below AGC threshold

OUTPUT SIGNAL

Agilent R T



Center 2.11 GHz Span 500 kHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 80 ms (8001 pts)

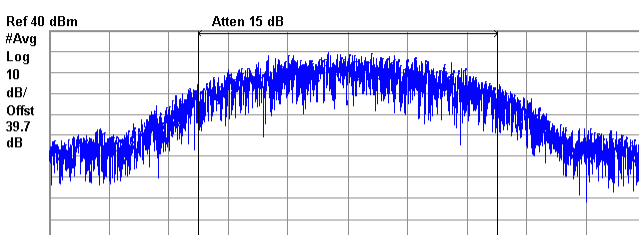
Channel Power

-20.37 dBm / 250.0000 kHz

Power Spectral Density

-74.34 dBm/Hz

Agilent R T



Center 2.11 GHz Span 500 kHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 80 ms (8001 pts)

Channel Power

32.90 dBm / 250.0000 kHz

Power Spectral Density

-21.08 dBm/Hz

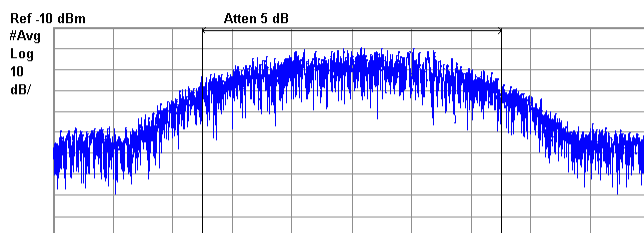
CONFIGURATION:

INPUT SIGNAL

Above AGC threshold +3dB

OUTPUT SIGNAL

Agilent R T



Center 2.11 GHz Span 500 kHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 80 ms (8001 pts)

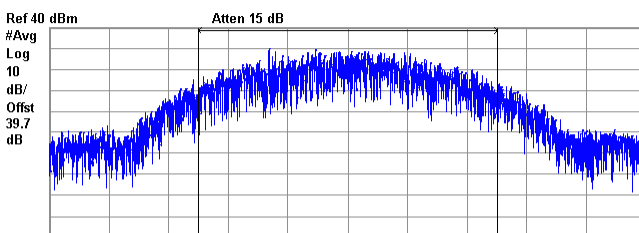
Channel Power

-16.23 dBm / 250.0000 kHz

Power Spectral Density

-70.21 dBm/Hz

Agilent R T



Center 2.11 GHz Span 500 kHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 80 ms (8001 pts)

Channel Power

32.84 dBm / 250.0000 kHz

Power Spectral Density

-21.14 dBm/Hz

|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.18 Mean output power and booster gain test results at mid frequency, Chain 2

FREQUENCY RANGE:

OPERATIONAL MODE:

CONFIGURATION:

INPUT SIGNAL

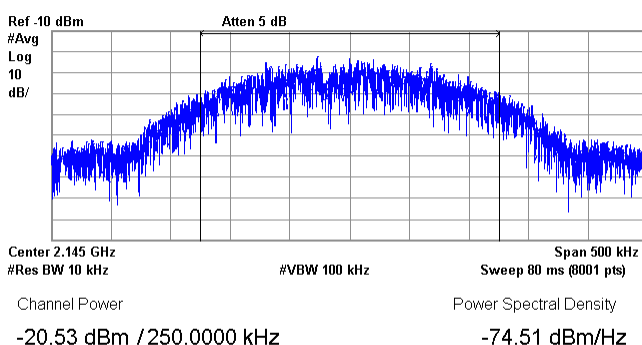
2110 – 2180 MHz

GSM downlink transmit

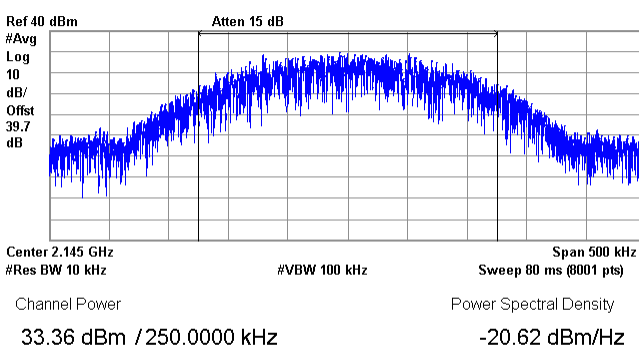
Below AGC threshold

OUTPUT SIGNAL

Agilent R T



Agilent R T



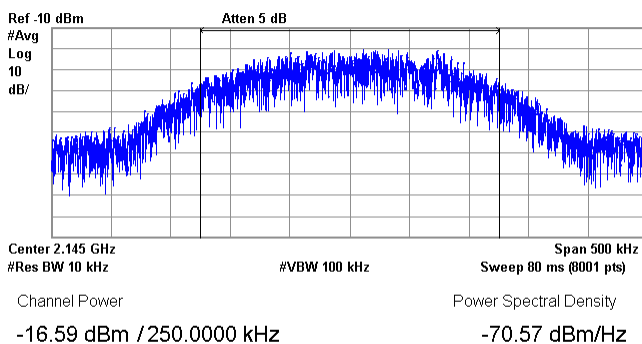
CONFIGURATION:

INPUT SIGNAL

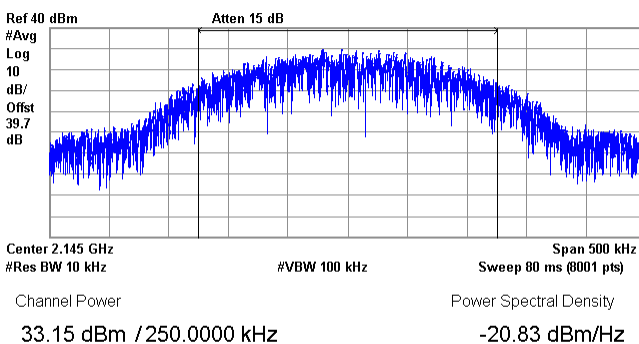
Above AGC threshold +3dB

OUTPUT SIGNAL

Agilent R T



Agilent R T

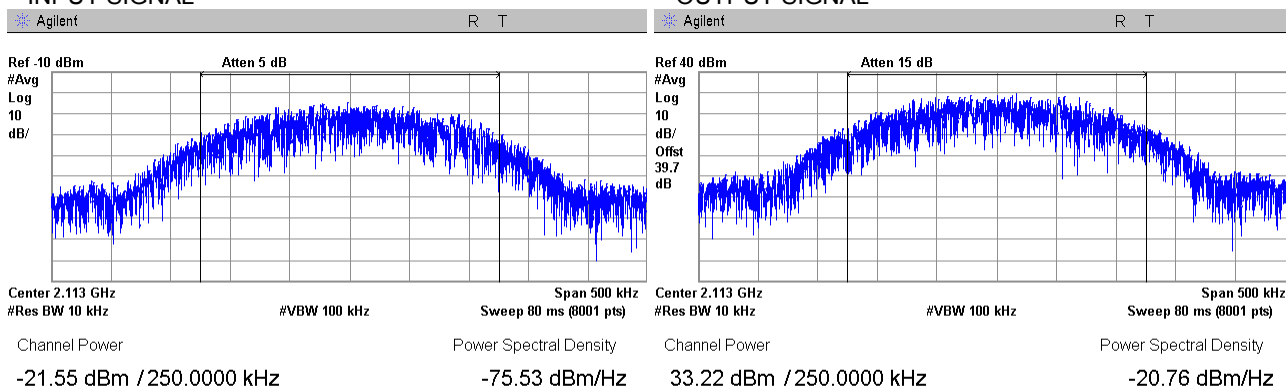


|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.19 Mean output power and booster gain test results at f0 frequency, Chain 2

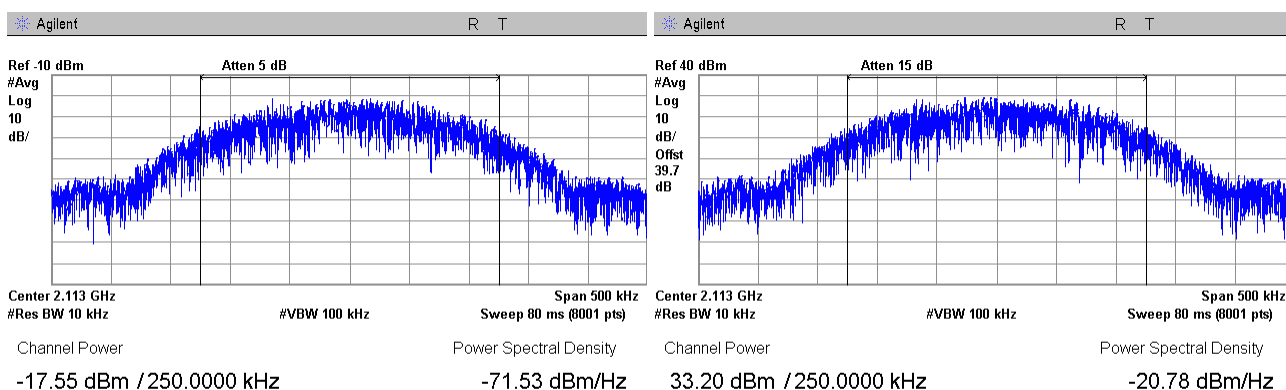
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
GSM downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

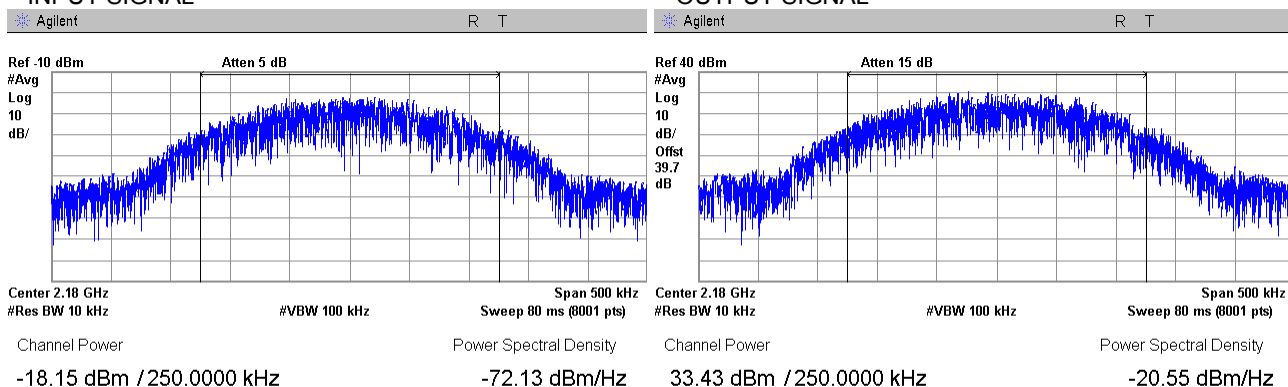


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.20 Mean output power and booster gain test results at high frequency, Chain 2

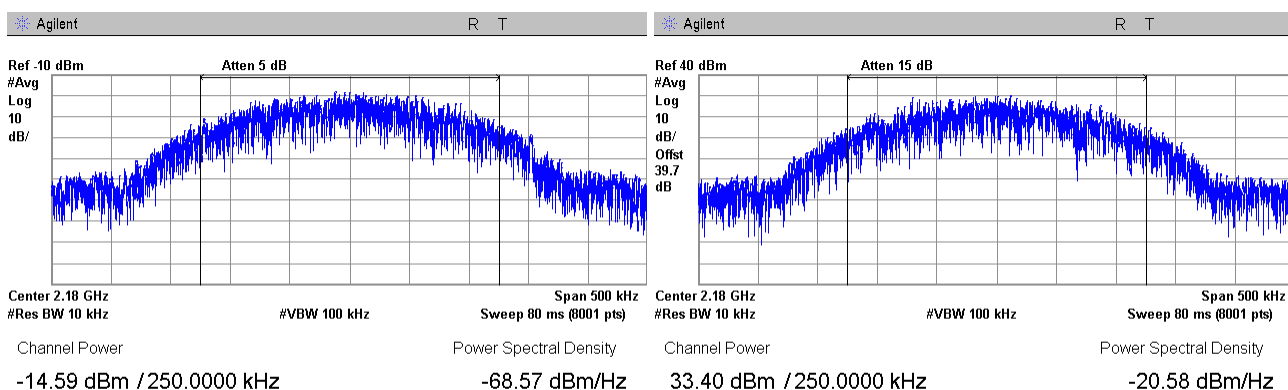
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
GSM downlink transmit  
Below AGC threshold



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

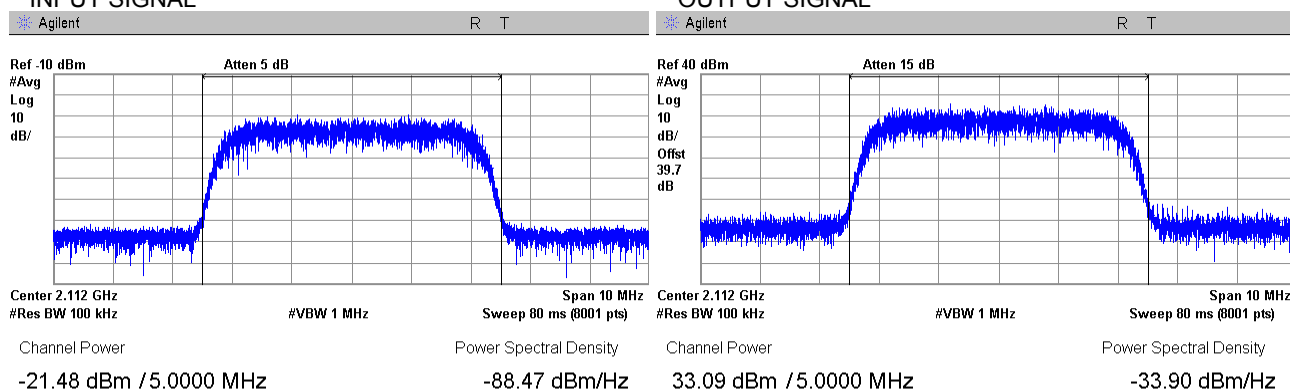


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.21 Mean output power and booster gain test results at low frequency, Chain 2

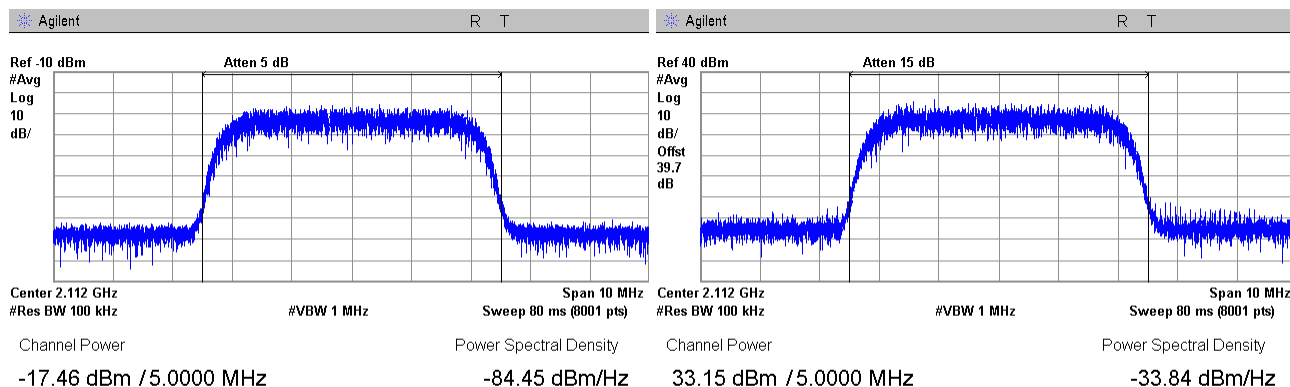
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                                                                                         |                         |                        |               |
|-----------------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.50(d), Mean input and output power and booster gain test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.5                                      |                         |                        |               |
| Test mode: Compliance                                                                   |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                                      |                         |                        |               |
| Temperature: 28 °C                                                                      | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                                |                         |                        |               |

Plot 7.3.22 Mean output power and booster gain test results at mid frequency, Chain 2

FRQUENCY RANGE:

OPERATIONAL MODE:

CONFIGURATION:

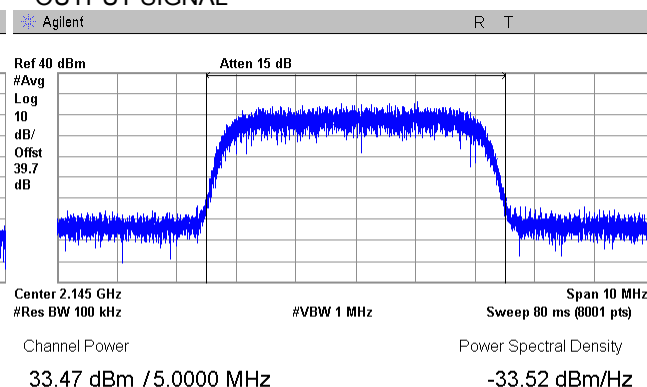
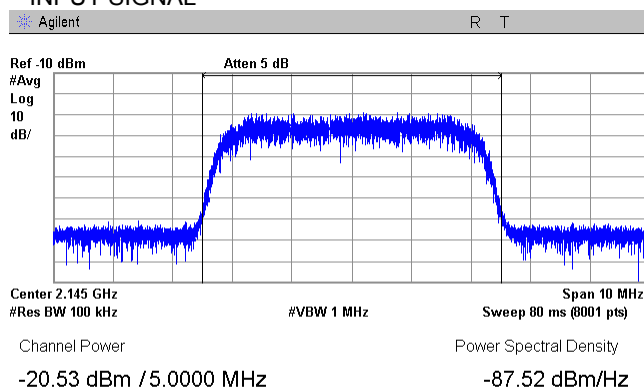
INPUT SIGNAL

2110 – 2180 MHz

WCDMA downlink transmit

Below AGC threshold

OUTPUT SIGNAL

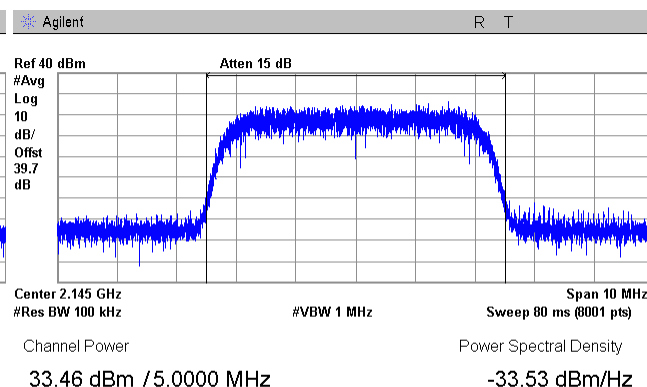
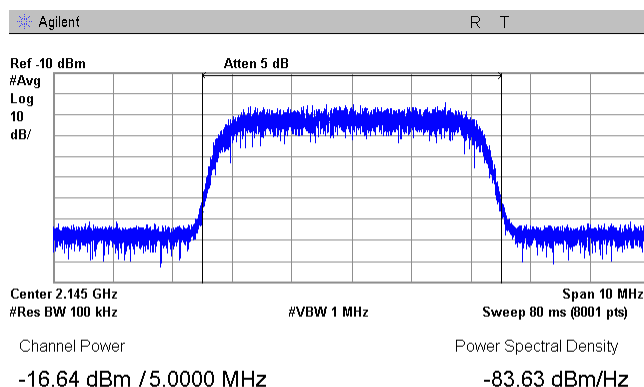


CONFIGURATION:

INPUT SIGNAL

Above AGC threshold +3dB

OUTPUT SIGNAL

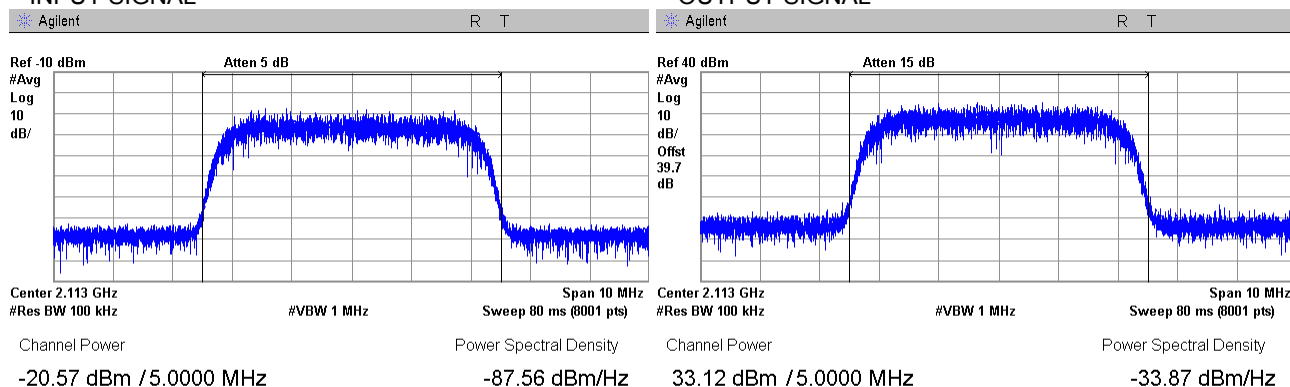


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.23 Mean output power and booster gain test results at f0 frequency, Chain 2

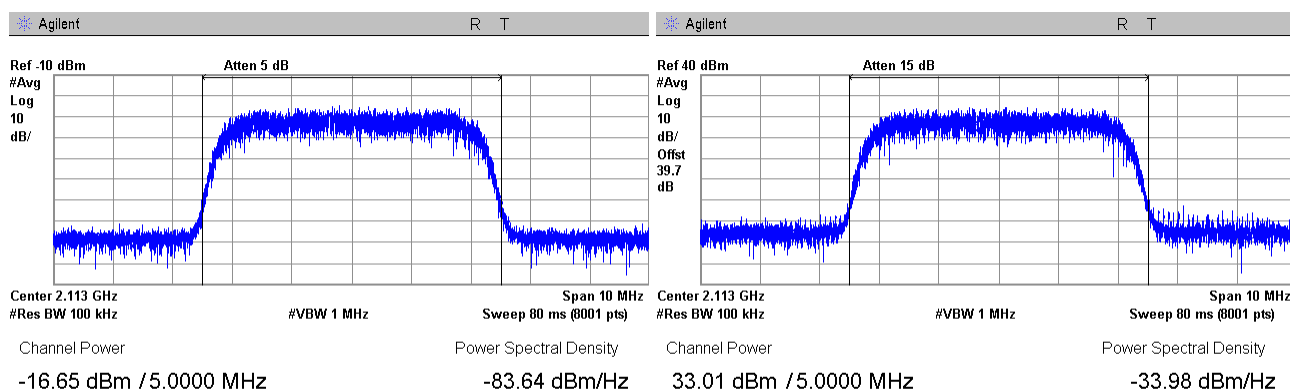
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL

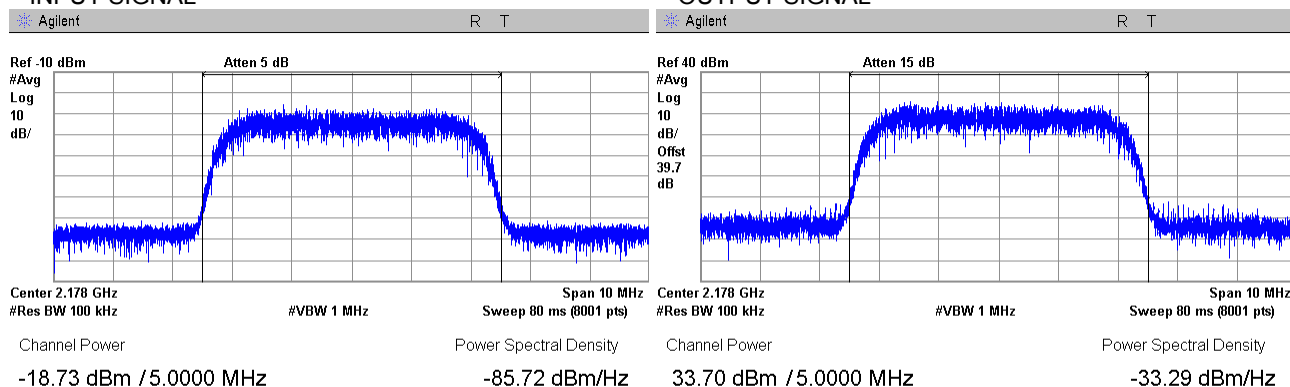


|                                                                                                |                                |                               |                      |
|------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.50(d), Mean input and output power and booster gain test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.5                                      |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                                   |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                                      |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                                      | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                                |                                |                               |                      |

Plot 7.3.24 Mean output power and booster gain test results at high frequency, Chain 2

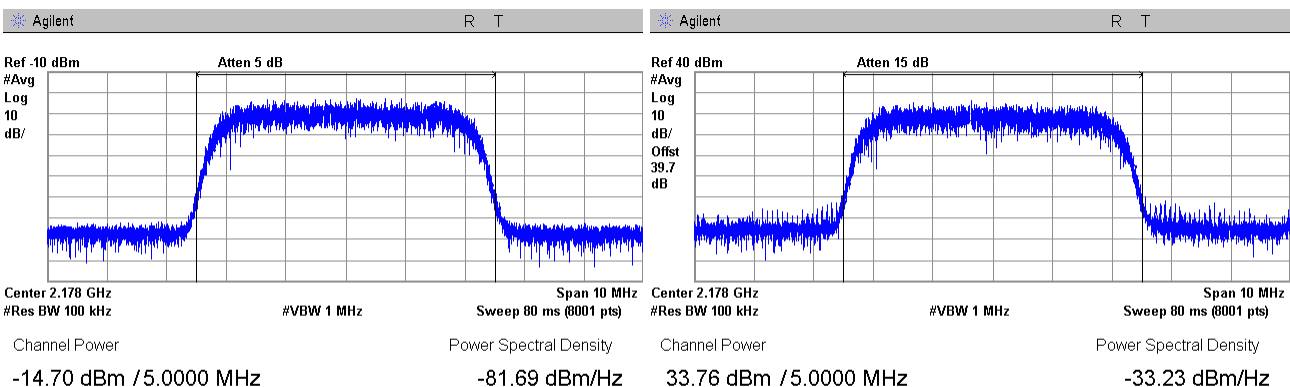
FRQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:  
INPUT SIGNAL

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC threshold  
OUTPUT SIGNAL



CONFIGURATION:  
INPUT SIGNAL

Above AGC threshold +3dB  
OUTPUT SIGNAL



|                                                                       |                                |                               |                      |
|-----------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 2.1049, Out-of-band rejection test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.3             |                                |                               |                      |
| <b>Test mode:</b> Compliance                                          |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 18-Sep-16                                             |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                             | <b>Relative Humidity:</b> 36 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                       |                                |                               |                      |

## 7.4 Out-of-band rejection test

### 7.4.1 General

This test was performed to measure amplifier pass bandwidth. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Out-of-band rejection limits

| Assigned frequency range, MHz | Tested frequency range | Modulation envelope reference points*, dBc |
|-------------------------------|------------------------|--------------------------------------------|
| 2110.0 – 2180.0               | $F_0 \pm 250\% BW$     | 20                                         |

\* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

### 7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

7.4.2.2 The EUT was set to amplify the unmodulated carrier and the reference peak power level was measured.

7.4.2.3 The tested frequency range was swept with the signal generator and the amplifier 20 dB bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on power envelope and provided in Table 7.4.2 and the associated plots.

Figure 7.4.1 Out-of-band rejection test setup





|                                                                       |                                |                               |                      |
|-----------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 2.1049, Out-of-band rejection test |                                |                               |                      |
| <b>Test procedure:</b> KDB 935210 D05 v01r01, section 3.3             |                                |                               |                      |
| <b>Test mode:</b> Compliance                                          |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 18-Sep-16                                             |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                             | <b>Relative Humidity:</b> 36 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                       |                                |                               |                      |

Table 7.4.2 Out-of-band rejection test results

FREQUENCY RANGE: 2110.0 – 2180.0 MHz Downlink  
 MIDBAND FREQUENCY: 2145.0 MHz  
 SWEEP FREQUENCY RANGE: 1970.0 – 2320.0 MHz  
 DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 1 MHz  
 VIDEO BANDWIDTH: 3 MHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc

| Input Power,<br>dBm | Start Band<br>frequency, MHz | Stop Band<br>frequency, MHz | Occupied<br>bandwidth, MHz | Limit,<br>MHz | Verdict |
|---------------------|------------------------------|-----------------------------|----------------------------|---------------|---------|
| Chain 1             |                              |                             |                            |               |         |
| -24.00              | 2089.39                      | 2196.52                     | 107.42                     | NA            | Comply  |
| Chain 2             |                              |                             |                            |               |         |
| -23.55              | 2085.83                      | 2190.96                     | 105.15                     | NA            | Comply  |

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

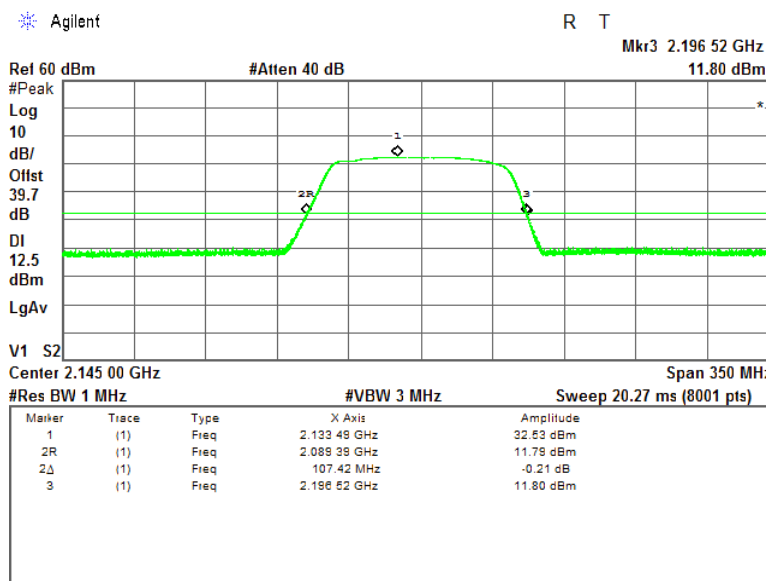
Full description is given in Appendix A.



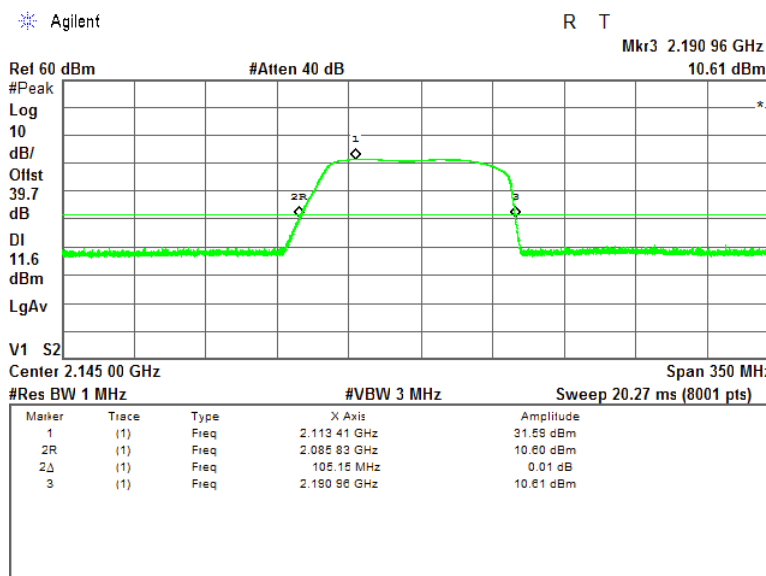
HERMON LABORATORIES

|                                                                |                         |                        |               |
|----------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 2.1049, Out-of-band rejection test |                         |                        |               |
| Test procedure: KDB 935210 D05 v01r01, section 3.3             |                         |                        |               |
| Test mode: Compliance                                          |                         | Verdict: PASS          |               |
| Date(s): 18-Sep-16                                             |                         |                        |               |
| Temperature: 28 °C                                             | Relative Humidity: 36 % | Air Pressure: 1011 hPa | Power: 48 VDC |
| Remarks:                                                       |                         |                        |               |

Plot 7.4.1 Out-of-band rejection test result Chain 1



Plot 7.4.2 Out-of-band rejection test result Chain 2



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Out-of-band emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

## 7.5 Out-of-band emissions at RF connector test

### 7.5.1 General

This test was performed to measure out-of-band spurious emissions at the channel edge at the RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Out-of-band spurious emission limits

| Channel                      | Frequency range | Attenuation below carrier, dBc | RBW     | Limit, dBm |
|------------------------------|-----------------|--------------------------------|---------|------------|
| <b>Modulation AWGN/WCDMA</b> |                 |                                |         |            |
| Low                          | 2109 - 2110     | 43+ 10*Log (P*)                | 100 kHz | -13.0      |
|                              | 2107 - 2109     | 43+ 10*Log (P*)                | 1 MHz   | -13.0      |
| High                         | 2180 - 2181     | 43+ 10*Log (P*)                | 100 kHz | -13.0      |
|                              | 2181 - 2183     | 43+ 10*Log (P*)                | 1 MHz   | -13.0      |
| <b>Modulation GSM</b>        |                 |                                |         |            |
| Low                          | 2109 - 2110     | 43+ 10*Log (P*)                | 3 kHz   | -13.0      |
|                              | 2107 - 2109     | 43+ 10*Log (P*)                | 1 MHz   | -13.0      |
| High                         | 2180 - 2181     | 43+ 10*Log (P*)                | 3 kHz   | -13.0      |
|                              | 2181 - 2183     | 43+ 10*Log (P*)                | 1 MHz   | -13.0      |

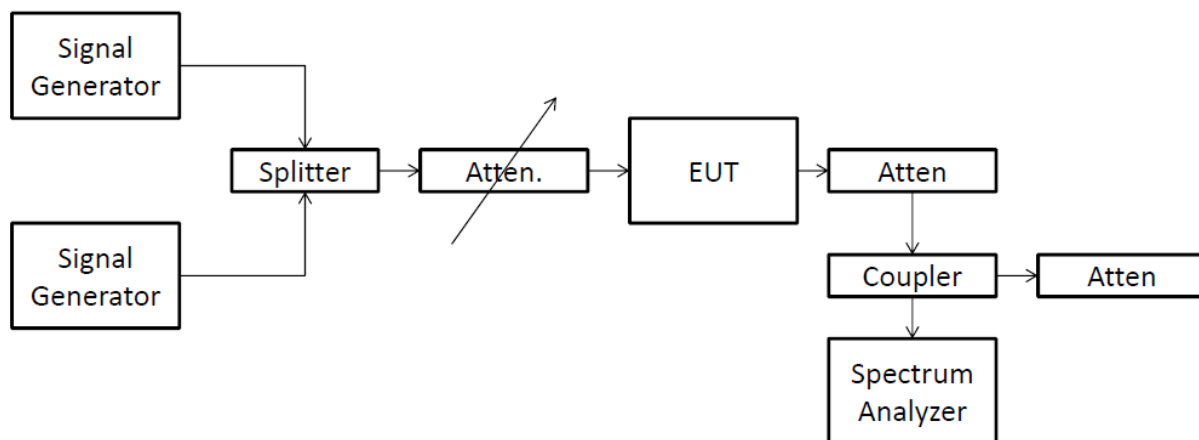
\* - P is transmitter output power in Watts

### 7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and the associated plots.

Figure 7.5.1 Out-of-band spurious emission test setup



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Out-of-band emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Table 7.5.2 Out-of-band spurious emission Modulation test results**

ASSIGNED FREQUENCY 2110 – 2180 MHz  
RANGE:  
DETECTOR USED: Average  
VIDEO BANDWIDTH: ≥ Resolution bandwidth  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT Maximum  
POWER SETTINGS:

| POWER SETTINGS:       |                 |              |             |                                   |                              |                                                   |               |                |         |
|-----------------------|-----------------|--------------|-------------|-----------------------------------|------------------------------|---------------------------------------------------|---------------|----------------|---------|
| Frequency,<br>MHz     | SA reading, dBm |              | RBW,<br>kHz | Integrated over<br>bandwidth, kHz | Spurious<br>emission,<br>dBm | Spurious<br>emission with<br>two channels,<br>dBm | Limit,<br>dBm | Margin,<br>dB* | Verdict |
|                       | Below<br>AGC    | Above<br>AGC |             |                                   |                              |                                                   |               |                |         |
| Composite Test Signal |                 |              |             |                                   |                              |                                                   |               |                |         |
| Modulation AWGN       |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2108.50               | -24.18          | -21.53       | 100         | 1000                              | -21.53                       | -18.53                                            | -13.0         | -5.53          | Pass    |
| 2110.00               | -19.51          | -19.00       | 100         | 1000                              | -19.00                       | -16.00                                            | -13.0         | -3.00          | Pass    |
| 2180.00               | -16.78          | -17.17       | 100         | 1000                              | -16.78                       | -13.78                                            | -13.0         | -0.78          | Pass    |
| 2181.50               | -23.84          | -19.09       | 100         | 1000                              | -19.09                       | -16.09                                            | -13.0         | -3.09          | Pass    |
| Modulation GSM        |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2108.50               | -24.85          | -26.10       | 100         | 1000                              | -24.85                       | -21.85                                            | -13.0         | -8.85          | Pass    |
| 2110.00               | -17.18          | -16.45       | 3           | NA                                | -16.45                       | -13.45                                            | -13.0         | -0.45          | Pass    |
| 2180.00               | -16.58          | -16.75       | 3           | NA                                | -16.58                       | -13.58                                            | -13.0         | -0.58          | Pass    |
| 2181.50               | -24.94          | -26.45       | 100         | 1000                              | -24.94                       | -21.94                                            | -13.0         | -8.94          | Pass    |
| Modulation WCDMA      |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2109.500              | -22.79          | -23.87       | 100         | 1000                              | -22.79                       | -19.79                                            | -13.0         | -6.79          | Pass    |
| 2180.500              | -20.41          | -20.79       | 100         | 1000                              | -20.41                       | -17.41                                            | -13.0         | -4.41          | Pass    |
| Single Test Signal    |                 |              |             |                                   |                              |                                                   |               |                |         |
| Modulation AWGN       |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2108.50               | -23.29          | -23.78       | 100         | 1000                              | -23.29                       | -20.29                                            | -13.0         | -7.29          | Pass    |
| 2110.00               | -16.53          | -16.56       | 100         | 1000                              | -16.53                       | -13.53                                            | -13.0         | -0.53          | Pass    |
| 2180.00               | -18.40          | -18.47       | 100         | 1000                              | -18.40                       | -15.40                                            | -13.0         | -2.40          | Pass    |
| 2181.50               | -21.34          | -21.86       | 100         | 1000                              | -21.34                       | -18.34                                            | -13.0         | -5.37          | Pass    |
| Modulation GSM        |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2108.50               | -25.46          | -26.76       | 100         | 1000                              | -25.46                       | -22.46                                            | -13.0         | -9.46          | Pass    |
| 2110.00               | -16.58          | -16.24       | 3           | NA                                | -16.24                       | -13.24                                            | -13.0         | -0.24          | Pass    |
| 2180.00               | -16.29          | -16.27       | 3           | NA                                | -16.27                       | -13.27                                            | -13.0         | -0.27          | Pass    |
| 2181.50               | -24.84          | -26.32       | 100         | 1000                              | -24.84                       | -21.84                                            | -13.0         | -8.84          | Pass    |
| Modulation WCDMA      |                 |              |             |                                   |                              |                                                   |               |                |         |
| 2109.500              | -23.32          | -24.00       | 100         | 1000                              | -23.32                       | -20.32                                            | -13.0         | -7.32          | Pass    |
| 2180.500              | -21.19          | -21.84       | 100         | 1000                              | -21.19                       | -18.19                                            | -13.0         | -5.19          | Pass    |

**Reference numbers of test equipment used**

|         |         |         |         |         |         |         |        |
|---------|---------|---------|---------|---------|---------|---------|--------|
| HL 2011 | HL 2909 | HL 3433 | HL 3472 | HL 3474 | HL 3787 | HL 3788 | HL3901 |
| HL 4354 |         |         |         |         |         |         |        |

Full description is given in Appendix A.

|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

### Plot 7.5.1 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge

OPERATING FREQUENCY RANGE:

DETECTOR USED:

CONFIGURATION:

MODULATION:

COMPOSITE INPUT SIGNAL:

CONFIGURATION: Below AGC threshold

2110 – 2180 MHz

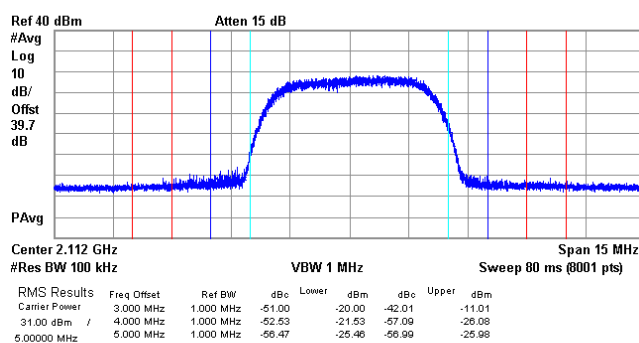
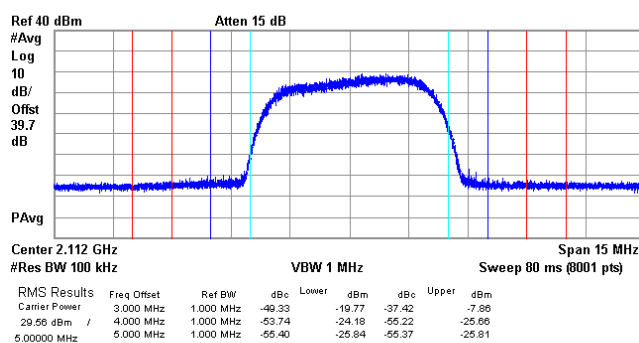
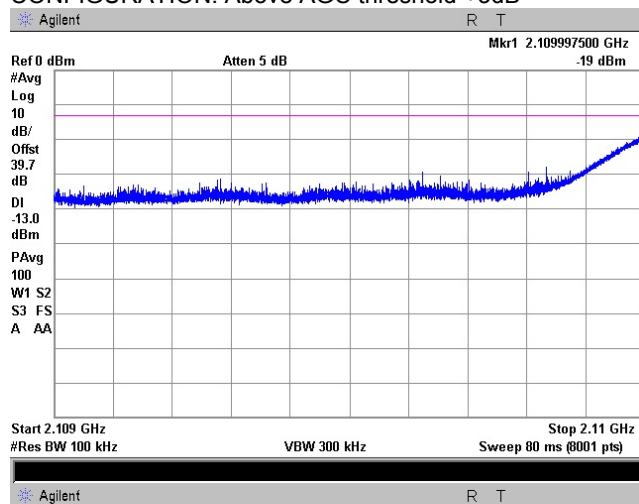
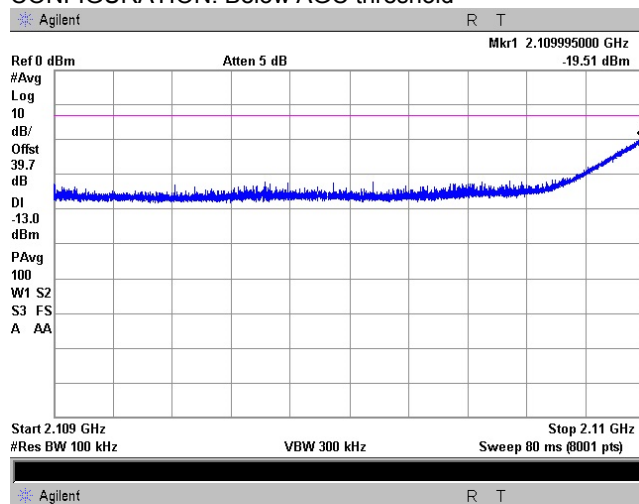
Average

Downlink

AWGN/AWGN

-19.4 dBm

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Plot 7.5.2 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge**

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

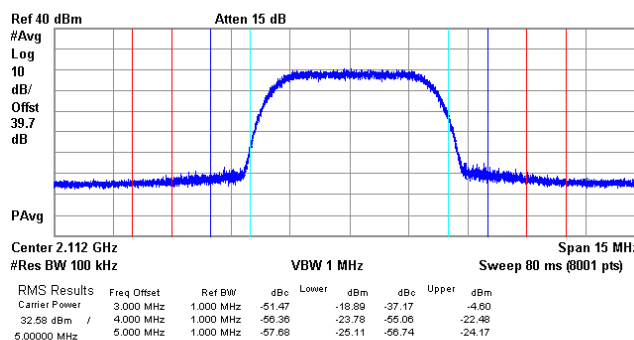
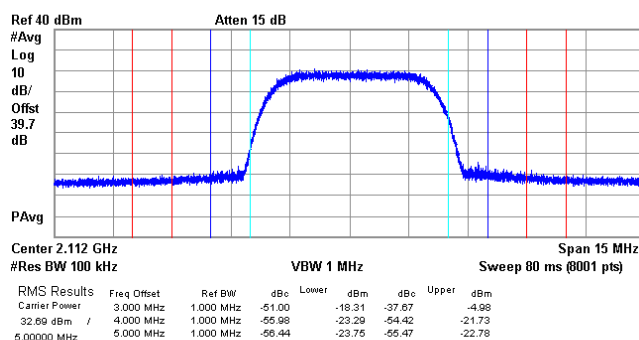
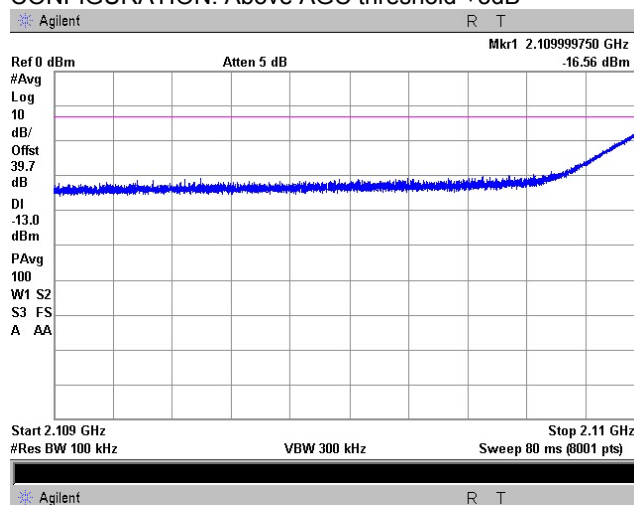
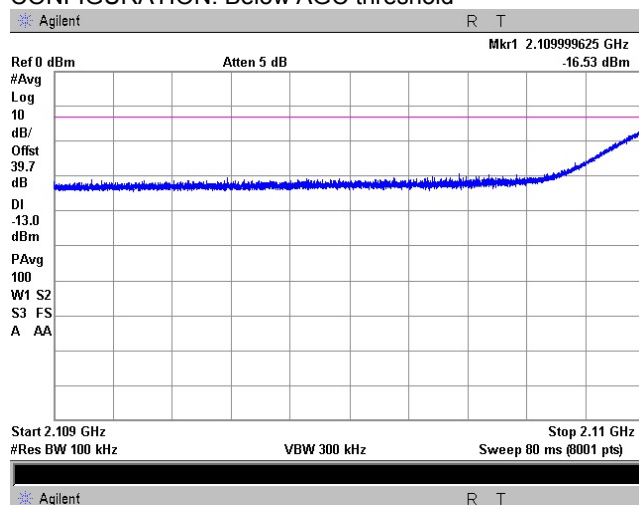
AWGN/AWGN

SINGLE TEST SIGNAL INPUT:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Out-of-band emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

Plot 7.5.3 Out-of-band spurious emission test results at high carrier frequency, Upper band Edge

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

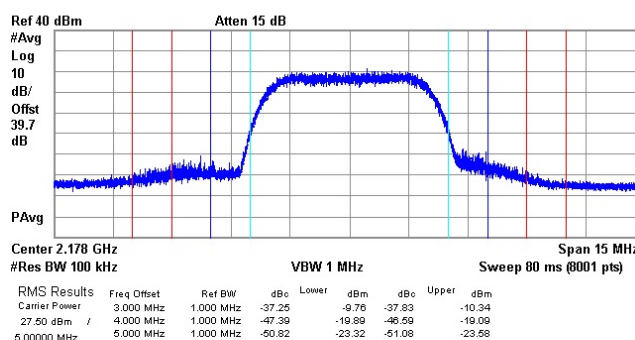
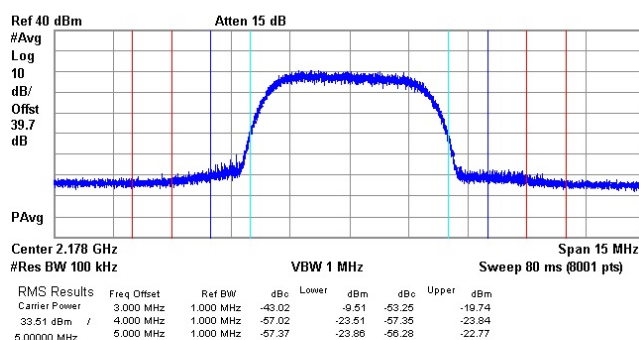
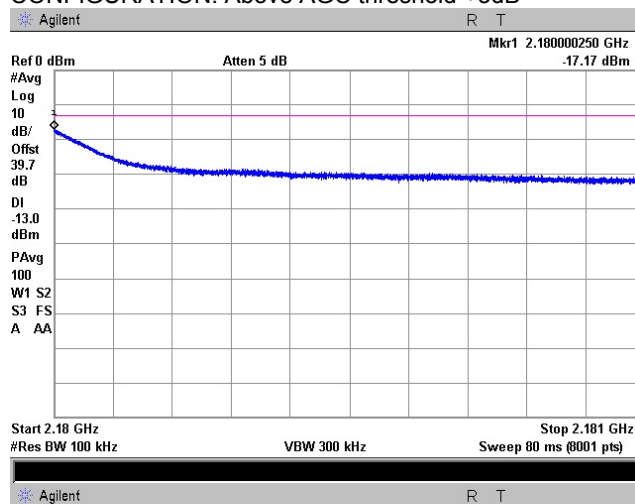
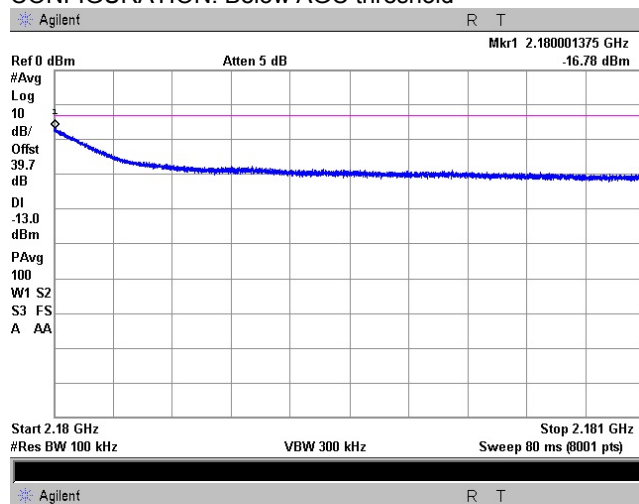
AWGN/AWGN

COMPOSITE INPUT SIGNAL:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Plot 7.5.4 Out-of-band spurious emission test results at high carrier frequency, Upper band Edge**

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

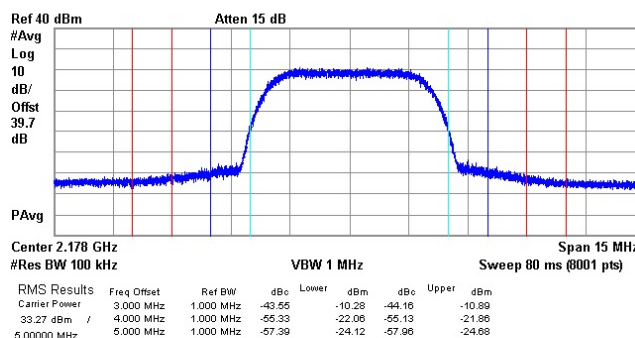
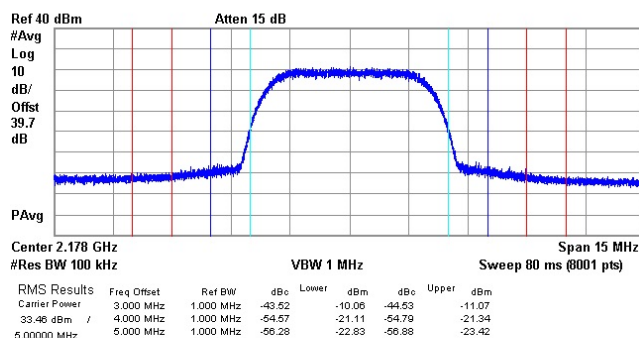
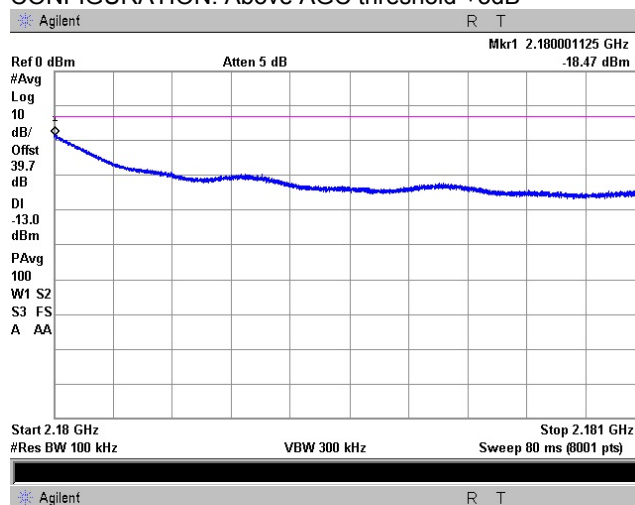
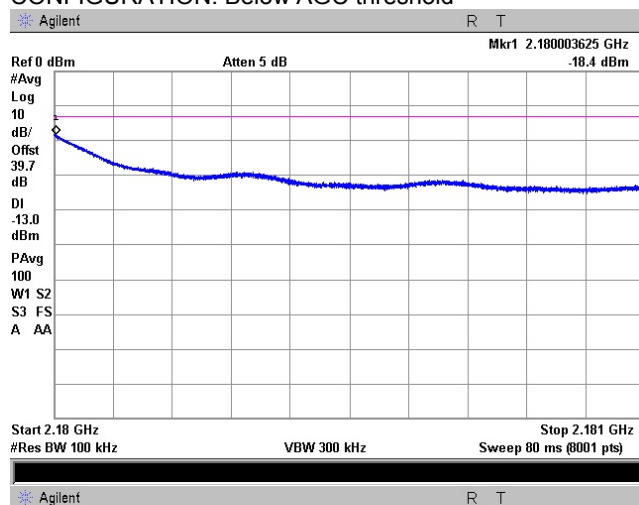
AWGN/AWGN

SINGLE TEST SIGNAL INPUT:

-19.4 dBm

CONFIGURATION: Below AGC threshold

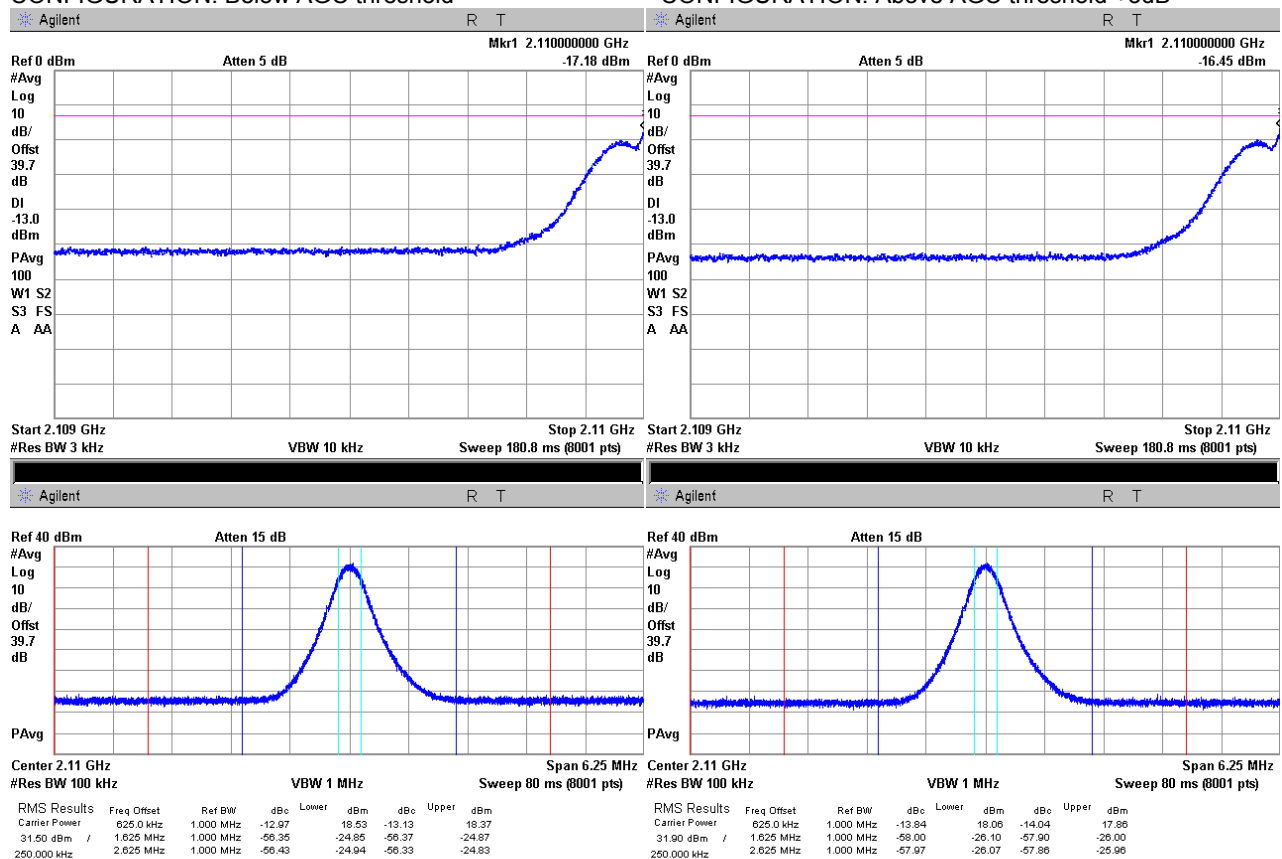
CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Plot 7.5.5 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge**

OPERATING FREQUENCY RANGE: 2110 – 2180 MHz  
DETECTOR USED: Average  
CONFIGURATION: Downlink  
MODULATION: GSM/GSM  
COMPOSITE INPUT SIGNAL: -19.4 dBm  
CONFIGURATION: Below AGC threshold  
CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Plot 7.5.6 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge**

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

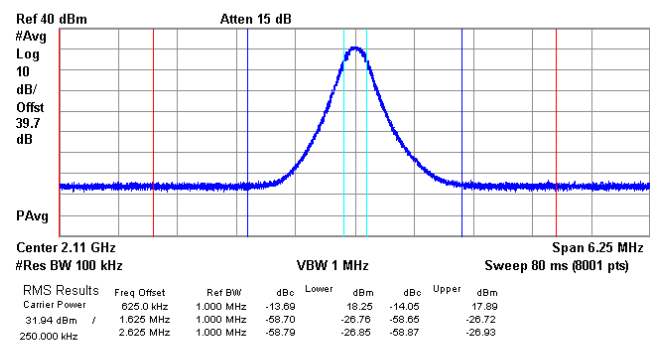
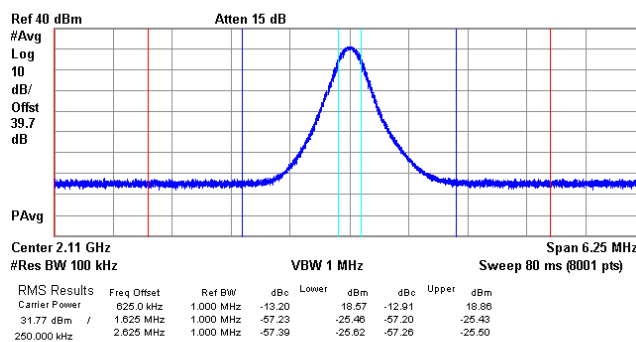
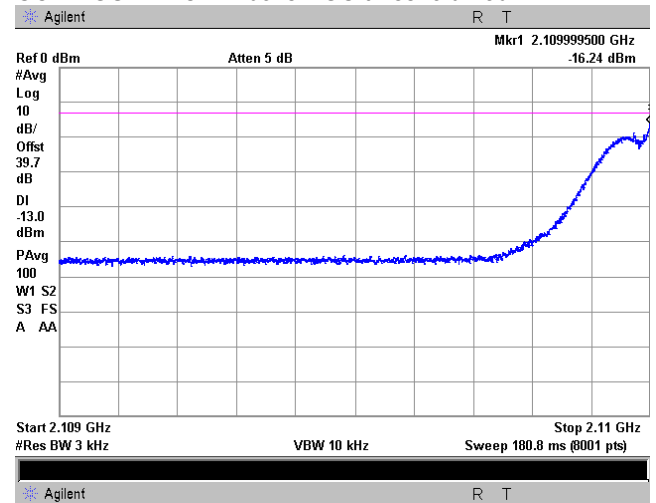
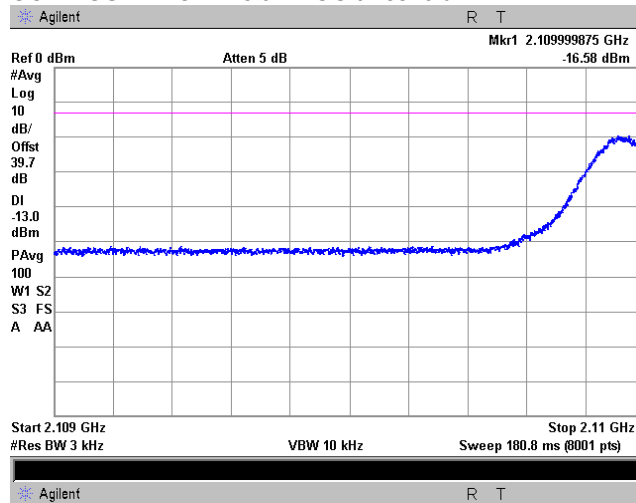
GSM/GSM

SINGLE TEST SIGNAL INPUT:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Out-of-band emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

Plot 7.5.7 Out-of-band spurious emission test results at high carrier frequency, Upper band Edge

OPERATING FREQUENCY RANGE:

DETECTOR USED:

CONFIGURATION:

MODULATION:

COMPOSITE INPUT SIGNAL:

CONFIGURATION: Below AGC threshold

2110 – 2180 MHz

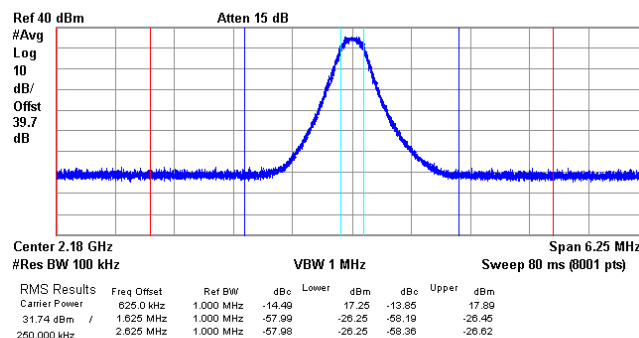
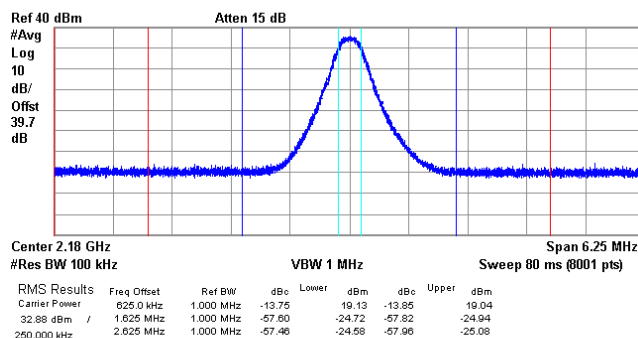
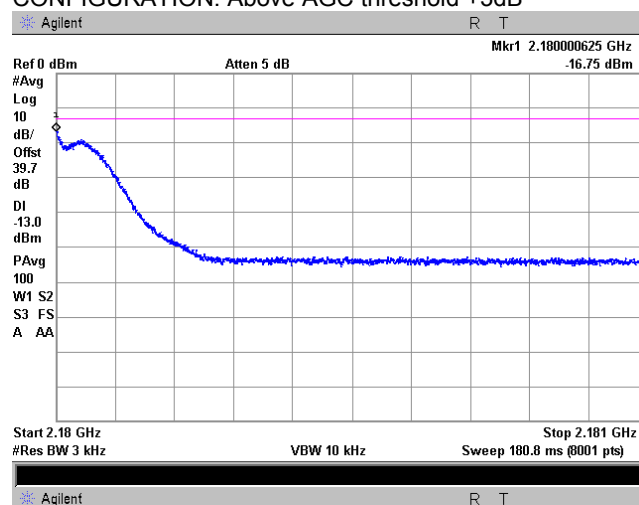
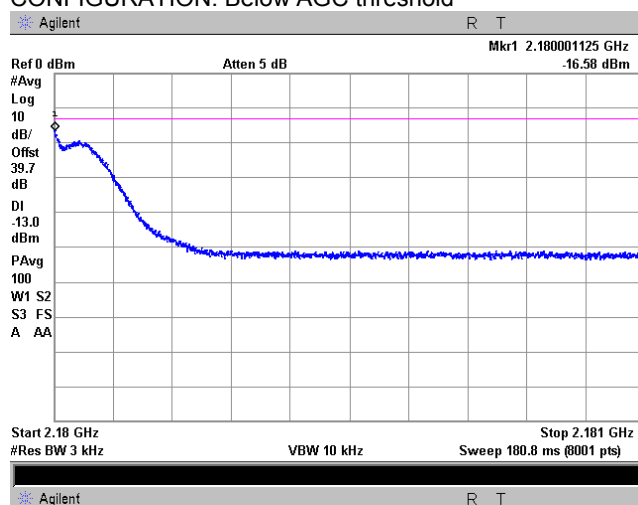
Average

Downlink

GSM/GSM

-19.4 dBm

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

**Plot 7.5.8 Out-of-band spurious emission test results at high carrier frequency, Upper band Edge**

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

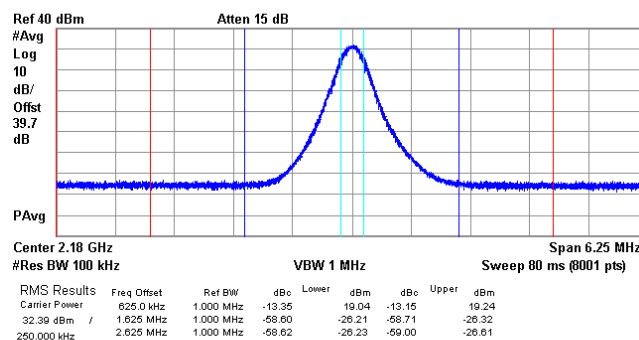
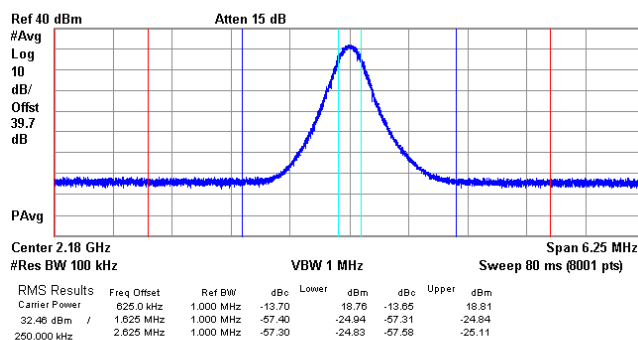
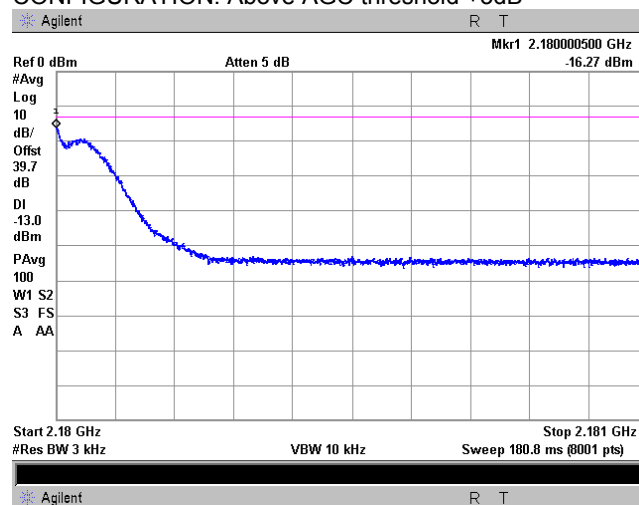
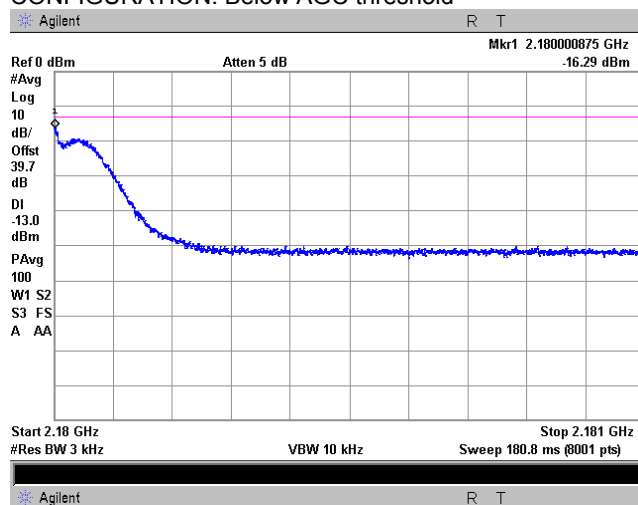
GSM/GSM

SINGLE TEST SIGNAL INPUT:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

### Plot 7.5.9 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

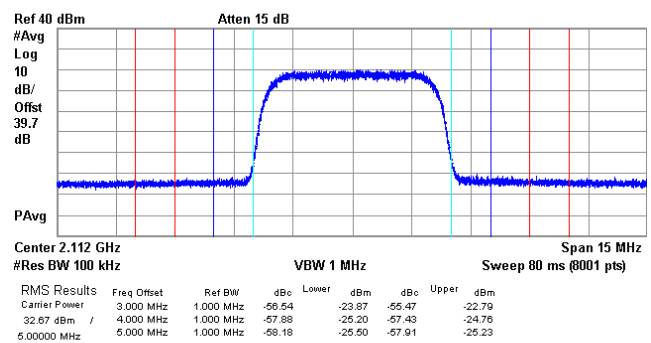
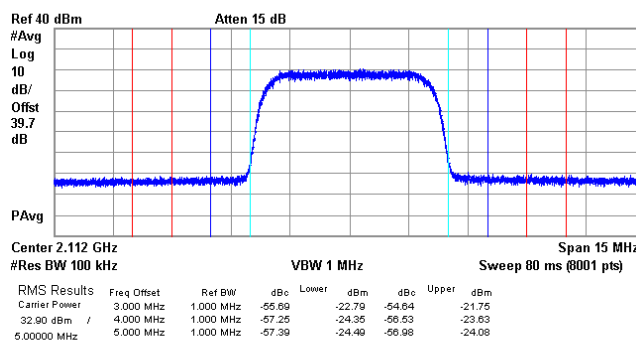
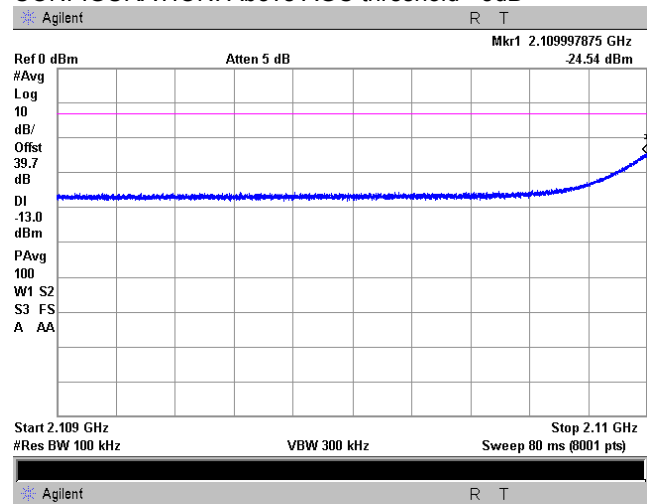
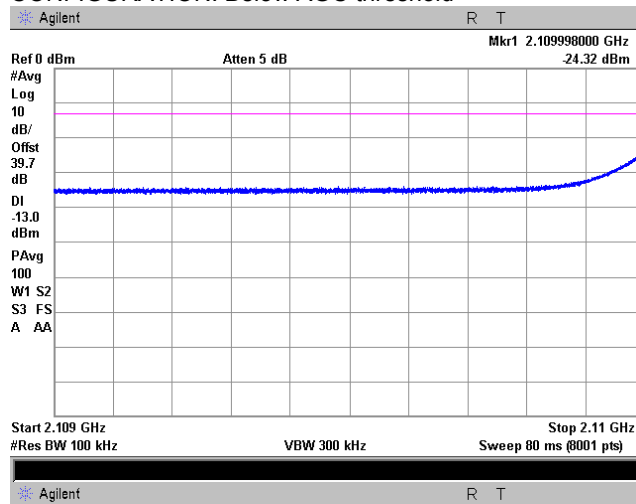
WCDMA/WCDMA

COMPOSITE INPUT SIGNAL:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

Plot 7.5.10 Out-of-band spurious emission test results at low carrier frequency, Lower band Edge

OPERATING FREQUENCY RANGE:

DETECTOR USED:

CONFIGURATION:

MODULATION:

SINGLE TEST SIGNAL INPUT:

CONFIGURATION: Below AGC threshold

2110 – 2180 MHz

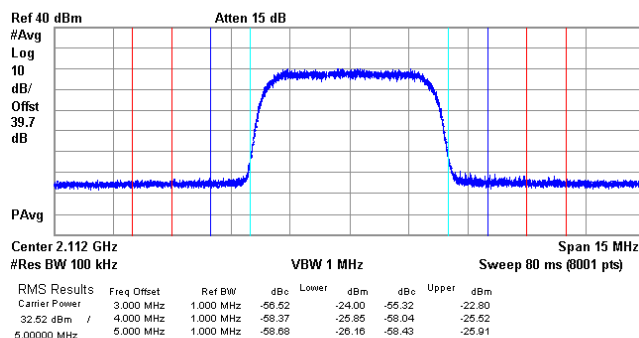
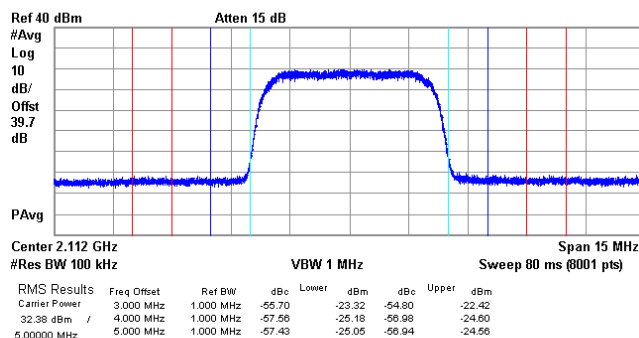
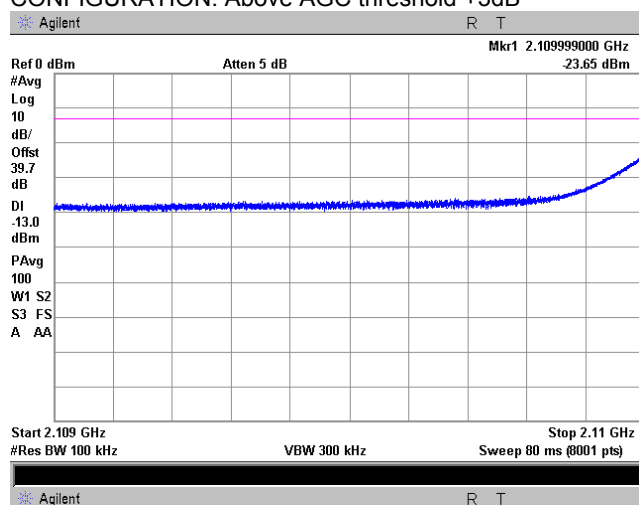
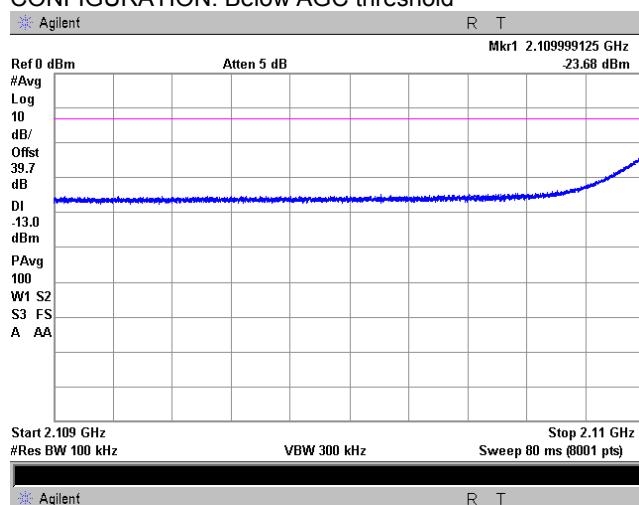
Average

Downlink

WCDMA/WCDMA

-19.4 dBm

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Out-of-band emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

Plot 7.5.11 Intermodulation test results in the 2110.0 – 2180.0 MHz frequency range, Upper band Edge

OPERATING FREQUENCY RANGE:

DETECTOR USED:

CONFIGURATION:

MODULATION:

COMPOSITE INPUT SIGNAL:

CONFIGURATION: Below AGC threshold

2110 – 2180 MHz

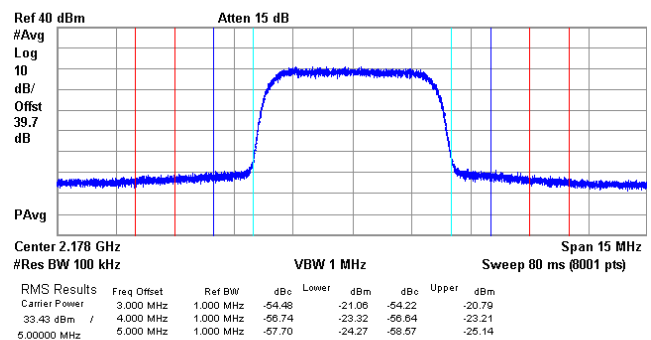
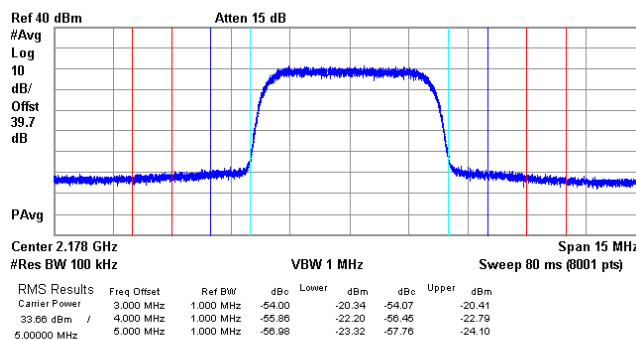
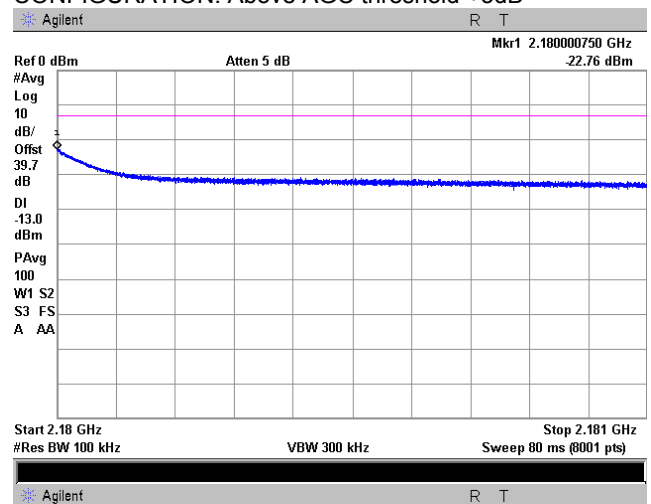
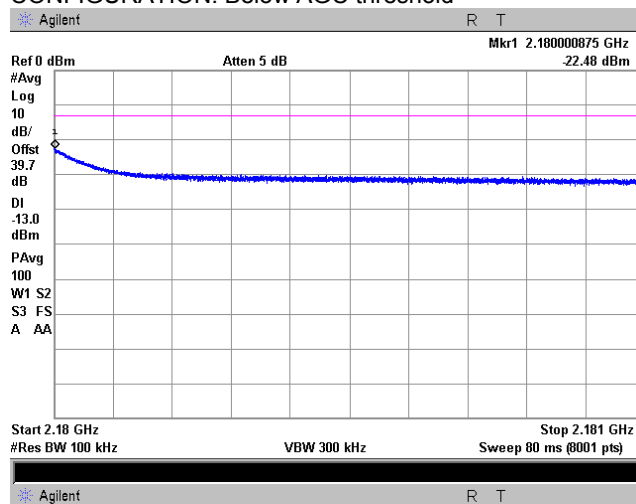
Average

Downlink

WCDMA/WCDMA

-19.4 dBm

CONFIGURATION: Above AGC threshold +3dB



|                                                                                        |                                |                               |                      |
|----------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Out-of-band emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01, section 3.6.2   |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                           |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 11-Oct-16                                                              |                                |                               |                      |
| <b>Temperature:</b> 25 °C                                                              | <b>Relative Humidity:</b> 42 % | <b>Air Pressure:</b> 1014 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                        |                                |                               |                      |

Plot 7.5.12 Intermodulation test results in the 2110.0 – 2180.0 MHz frequency range, Upper band Edge

OPERATING FREQUENCY RANGE:

2110 – 2180 MHz

DETECTOR USED:

Average

CONFIGURATION:

Downlink

MODULATION:

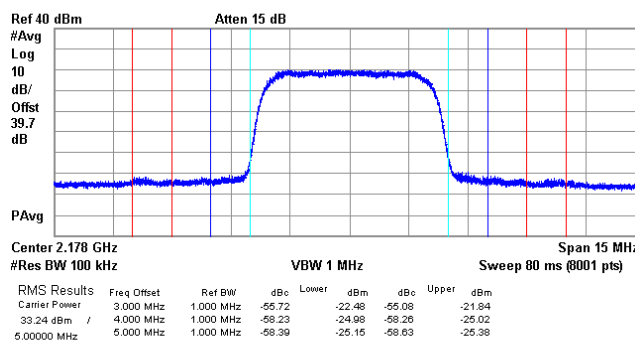
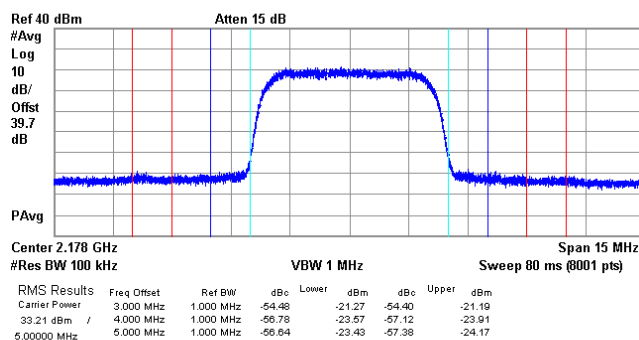
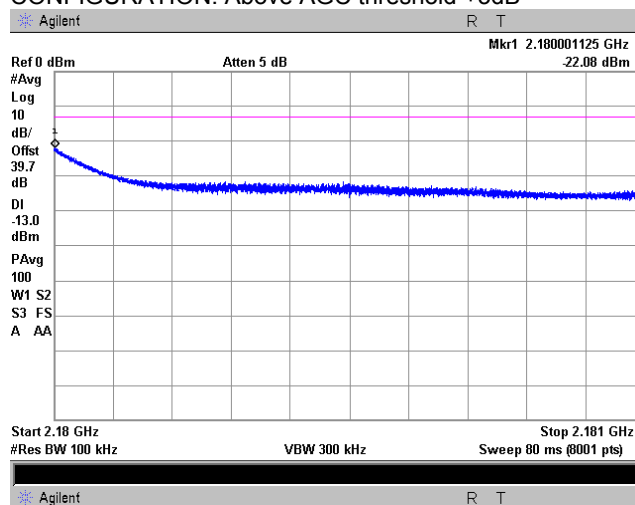
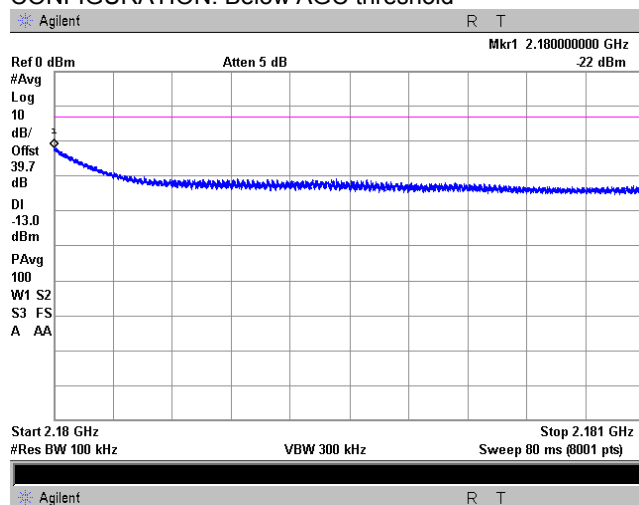
WCDMA/WCDMA

SINGLE TEST SIGNAL INPUT:

-19.4 dBm

CONFIGURATION: Below AGC threshold

CONFIGURATION: Above AGC threshold +3dB



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

## 7.6 Spurious emissions at RF antenna connector test

### 7.6.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Spurious emission limits

| Frequency, MHz         | Attenuation below carrier, dBc | Spurious emissions, dBm |
|------------------------|--------------------------------|-------------------------|
| 0.009 – 10th harmonic* | $43+10\log P^{**}$             | -13.0                   |

\* - spurious emission limits do not apply to the in band emission within  $\pm 250$  % of the authorized bandwidth from the carrier; investigated in course of emission mask testing

\*\* - P is a transmitter output power in watts.

### 7.6.2 Test procedure

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.

7.6.2.2 The EUT was adjusted to produce maximum available for end user RF output power.

7.6.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.6.2 and associated plots.

Figure 7.6.1 Spurious emission test setup, single output





|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification: Section 27.53, Spurious emissions conducted measurements</b> |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        | <b>Verdict: PASS</b>           |                               |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Table 7.6.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 2110.0 – 2180.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 22000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 NUMBER OF CHAINS: N = 2

MODULATION: AWGN

| Frequency, MHz                | SA reading, dBm | Attenuation, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm* | Limit, dBm | Margin, dB** | Verdict |
|-------------------------------|-----------------|-----------------|----------------|----------|-------------------------|------------|--------------|---------|
| <b>Low carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2106.72                       | -17.39          | Included        | Included       | 1000     | -14.39                  | -13.0      | -1.39        | Pass    |
| 2183.10                       | -17.54          | Included        | Included       | 1000     | -14.54                  | -13.0      | -1.54        | Pass    |
| <b>Mid carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2106.03                       | -16.49          | Included        | Included       | 1000     | -13.49                  | -13.0      | -0.49        | Pass    |
| 2183.31                       | -16.34          | Included        | Included       | 1000     | -13.34                  | -13.0      | -0.34        | Pass    |
| <b>High carrier frequency</b> |                 |                 |                |          |                         |            |              |         |
| 2104.51                       | -16.06          | Included        | Included       | 1000     | -13.06                  | -13.0      | -0.06        | Pass    |
| 2183.31                       | -16.66          | Included        | Included       | 1000     | -13.66                  | -13.0      | -0.66        | Pass    |

MODULATION: GSM

| Frequency, MHz                | SA reading, dBm | Attenuation, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm* | Limit, dBm | Margin, dB** | Verdict |
|-------------------------------|-----------------|-----------------|----------------|----------|-------------------------|------------|--------------|---------|
| <b>Low carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2103.68                       | -17.11          | Included        | Included       | 1000     | -14.11                  | -13.0      | -1.11        | Pass    |
| 2185.96                       | -18.57          | Included        | Included       | 1000     | -15.87                  | -13.0      | -2.87        | Pass    |
| <b>Mid carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2106.45                       | -17.32          | Included        | Included       | 1000     | -14.32                  | -13.0      | -1.32        | Pass    |
| 2184.63                       | -17.53          | Included        | Included       | 1000     | -14.53                  | -13.0      | -1.53        | Pass    |
| <b>High carrier frequency</b> |                 |                 |                |          |                         |            |              |         |
| 2105.89                       | -17.99          | Included        | Included       | 1000     | -14.99                  | -13.0      | -1.99        | Pass    |
| 2183.10                       | -16.29          | Included        | Included       | 1000     | -3.29                   | -13.0      | -0.29        | Pass    |

MODULATION: WCDMA

| Frequency, MHz                | SA reading, dBm | Attenuation, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm* | Limit, dBm | Margin, dB** | Verdict |
|-------------------------------|-----------------|-----------------|----------------|----------|-------------------------|------------|--------------|---------|
| <b>Low carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2106.86                       | -17.01          | Included        | Included       | 1000     | -14.01                  | -13.0      | -1.01        | Pass    |
| 2184.43                       | -18.90          | Included        | Included       | 1000     | -15.90                  | -13.0      | -2.90        | Pass    |
| <b>Mid carrier frequency</b>  |                 |                 |                |          |                         |            |              |         |
| 2106.17                       | -16.25          | Included        | Included       | 1000     | -13.25                  | -13.0      | -0.25        | Pass    |
| 2183.71                       | -17.32          | Included        | Included       | 1000     | -14.32                  | -13.0      | -1.          | Pass    |
| <b>High carrier frequency</b> |                 |                 |                |          |                         |            |              |         |
| 2107.00                       | -18.82          | Included        | Included       | 1000     | -15.82                  | -13.0      | -2.82        | Pass    |
| 2183.31                       | -16.62          | Included        | Included       | 1000     | -13.62                  | -13.0      | -0.62        | Pass    |

\*- Margin = Spurious emission – specification limit.

\*\*- Spurious emission = SA reading + 10\*log(N)

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2909 | HL 3433 | HL 3787 | HL 3788 | HL 3901 | HL 4354 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

Full description is given in Appendix A.

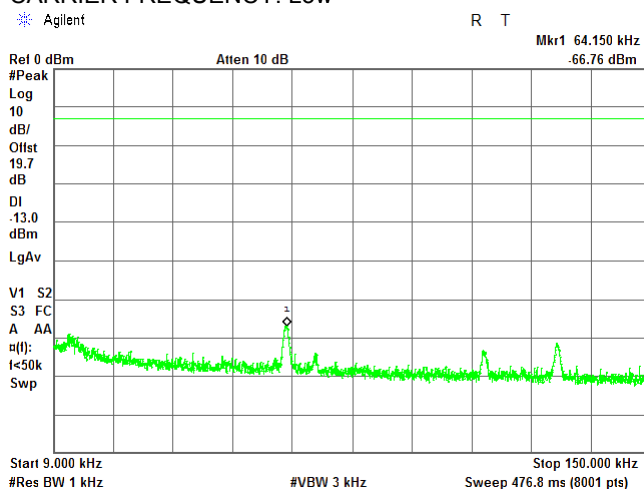
|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Spurious emissions conducted measurements |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                           |                         |                        |               |
| Temperature: 28 °C                                                           | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

Plot 7.6.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

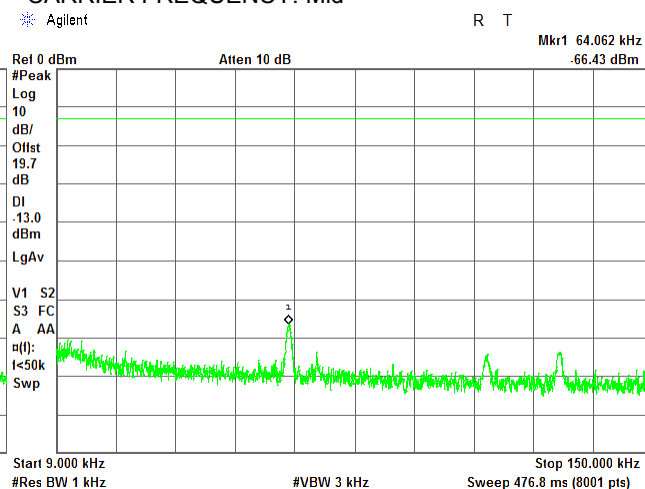
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

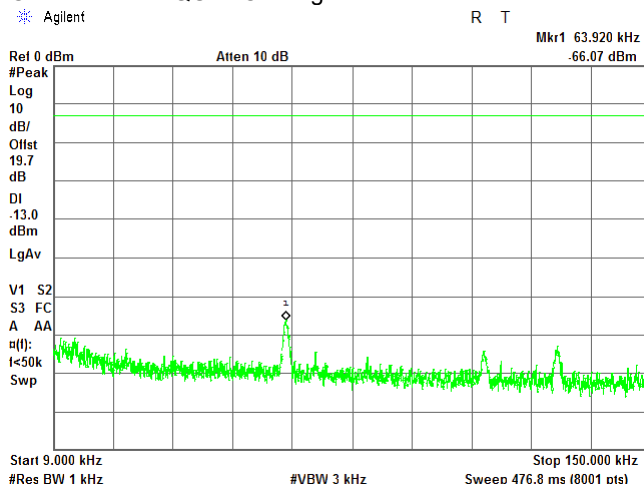
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

### Plot 7.6.2 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

FREQUENCY RANGE:

2110 – 2180 MHz

OPERATIONAL MODE:

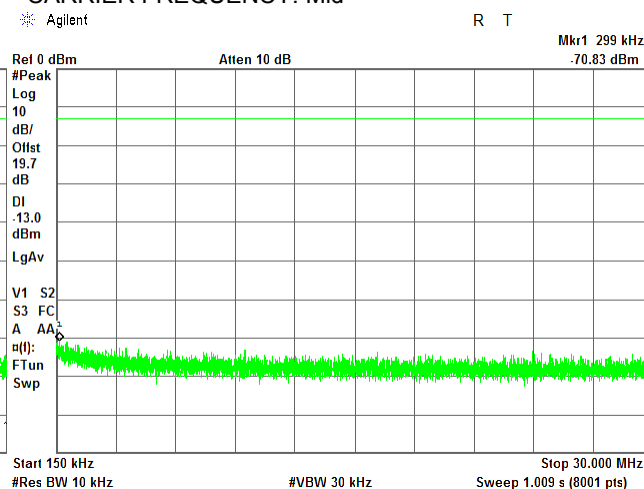
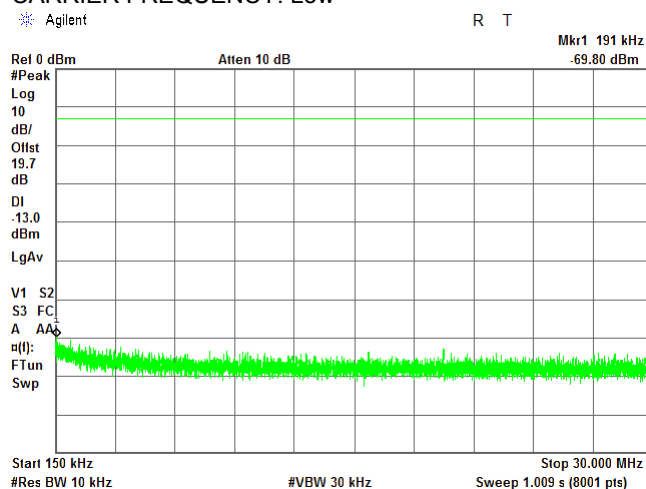
AWGN downlink transmit

CONFIGURATION:

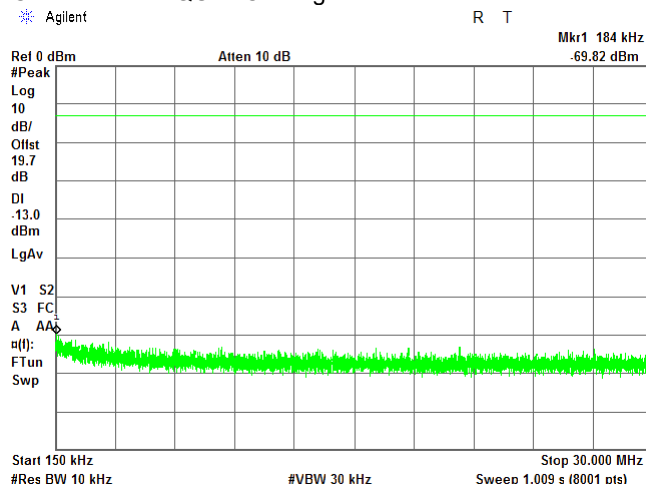
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



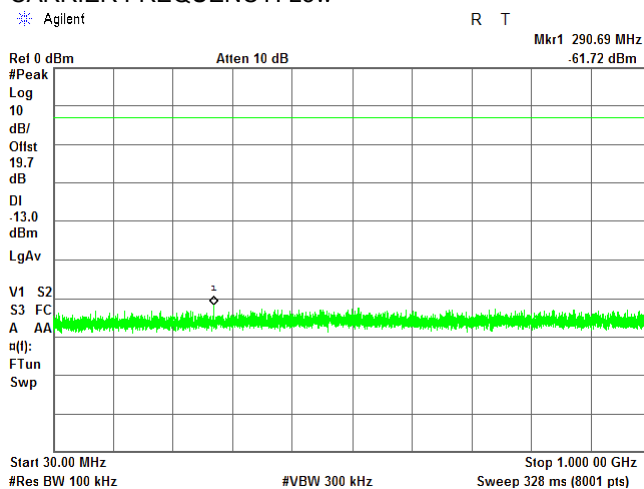
|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

**Plot 7.6.3 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency**

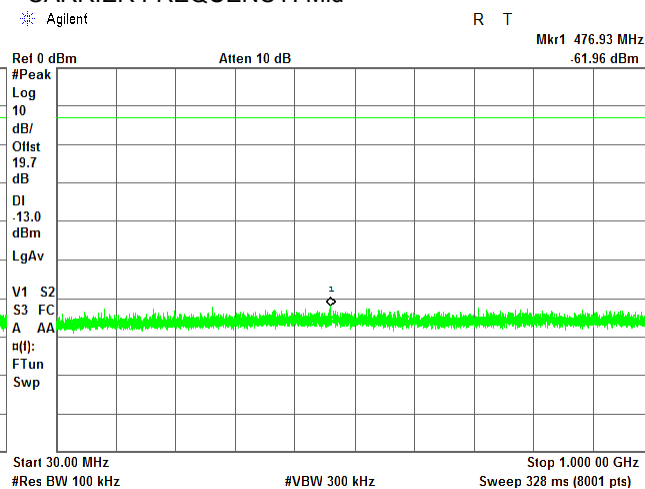
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

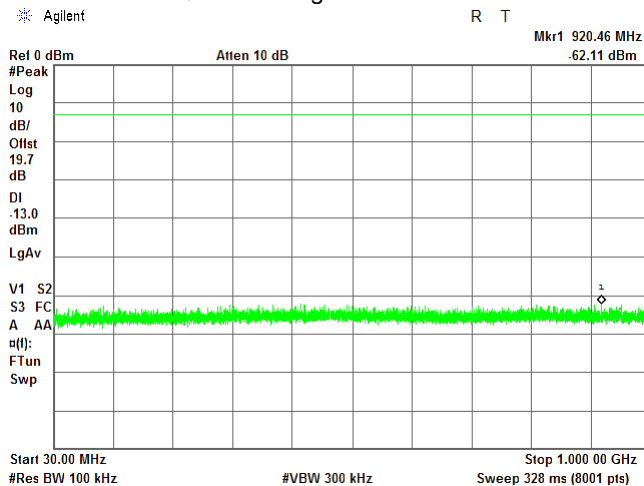
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



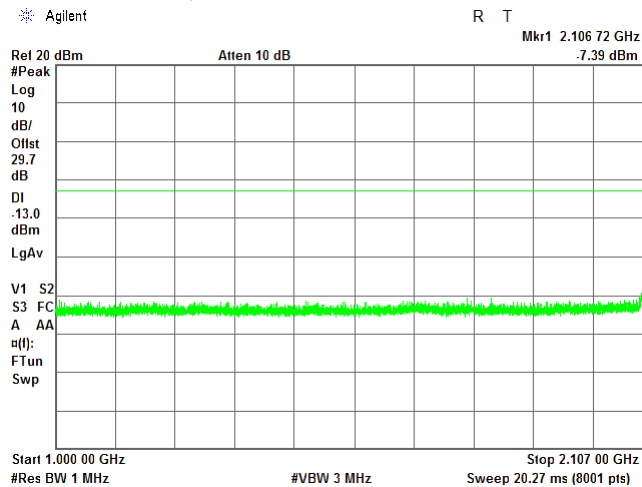
|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

**Plot 7.6.4 Spurious emission measurements in 1000 - 2107 MHz range at low carrier frequency**

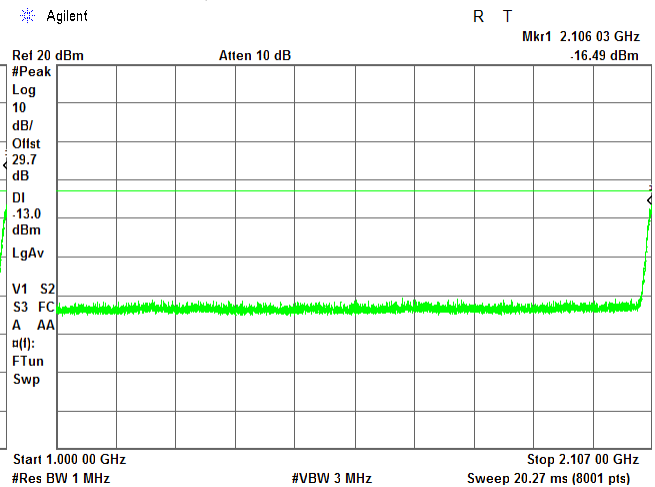
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

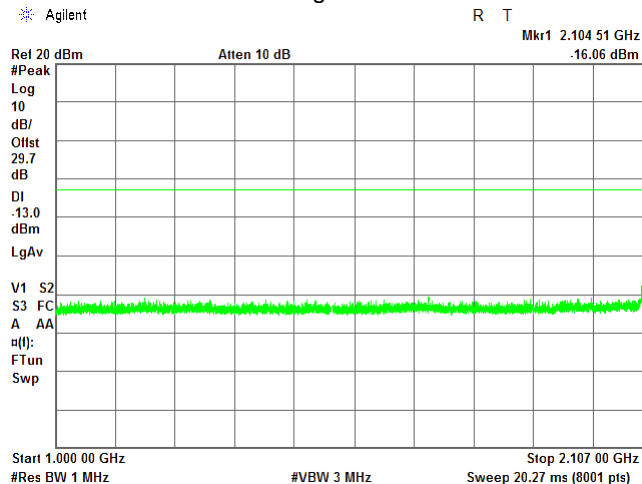
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

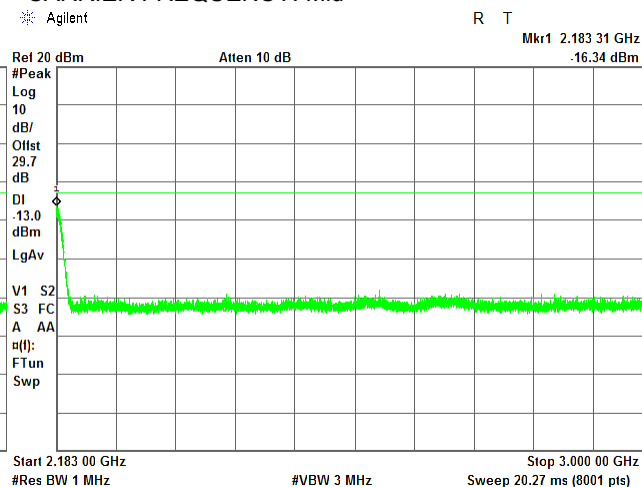
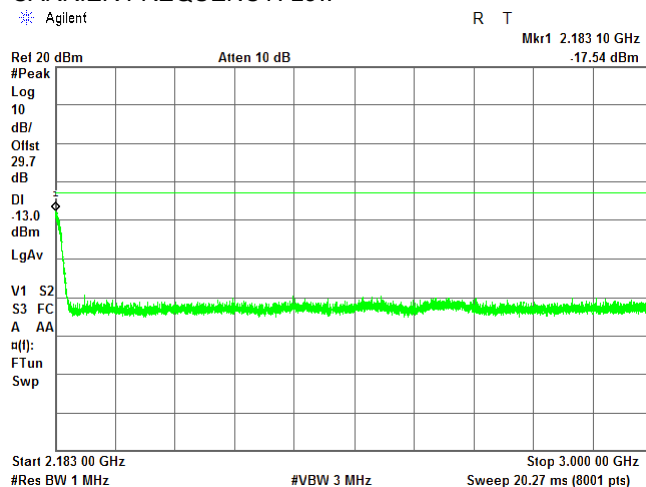
**Plot 7.6.5 Spurious emission measurements in 2183 - 3000 MHz range at low carrier frequency**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

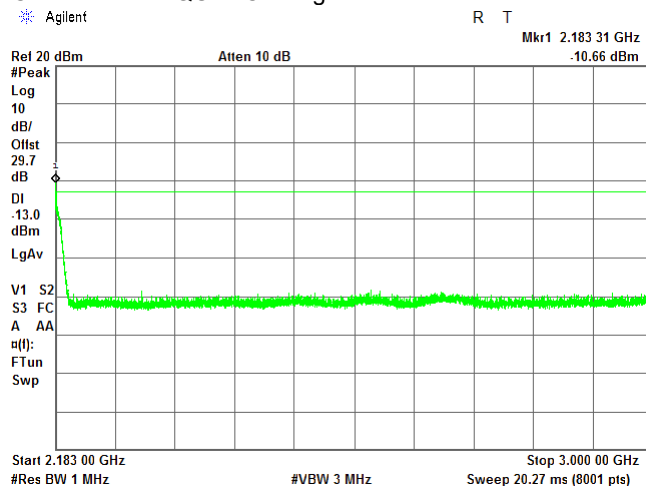
2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

**Plot 7.6.6 Spurious emission measurements in 3000 - 10000 MHz range at carrier frequency**

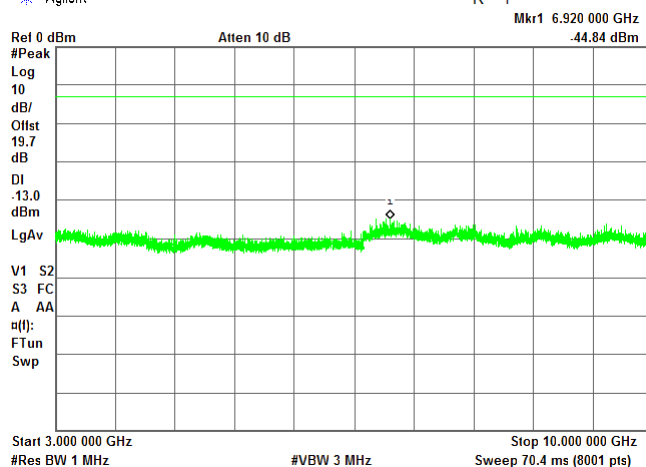
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

Agilent

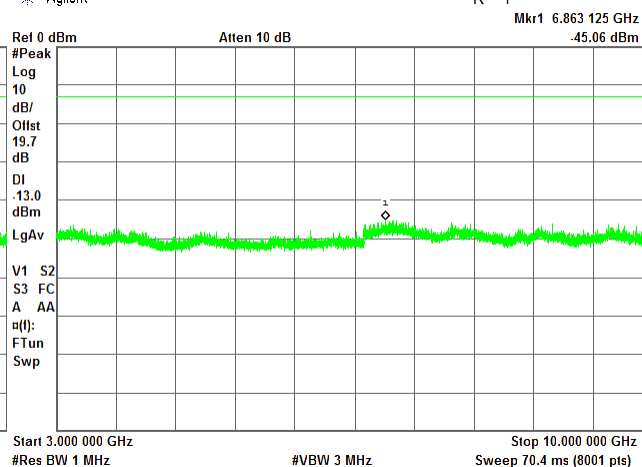
R T



CARRIER FREQUENCY: Mid

Agilent

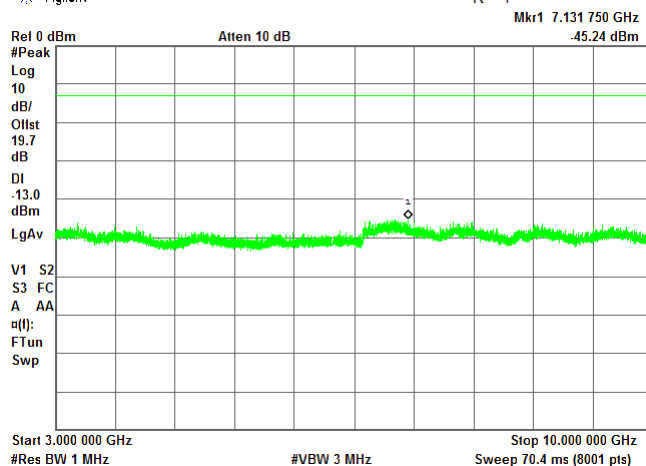
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.7 Spurious emission measurements in 10000 - 22000 MHz range at carrier frequency

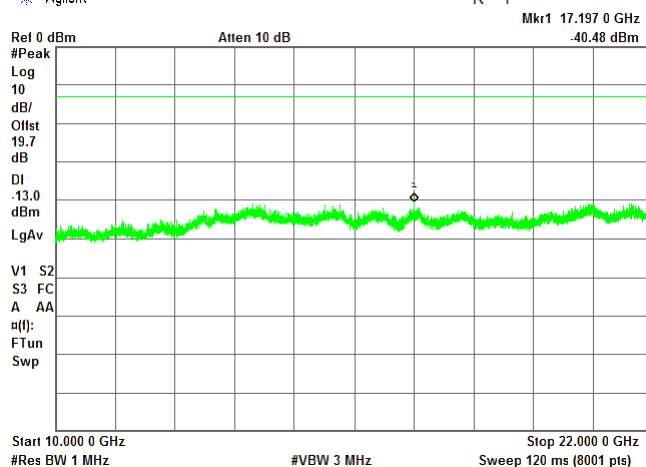
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
AWGN downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

Agilent

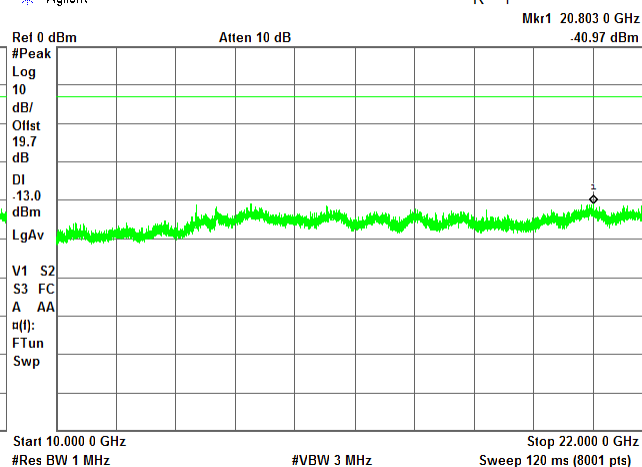
R T



CARRIER FREQUENCY: Mid

Agilent

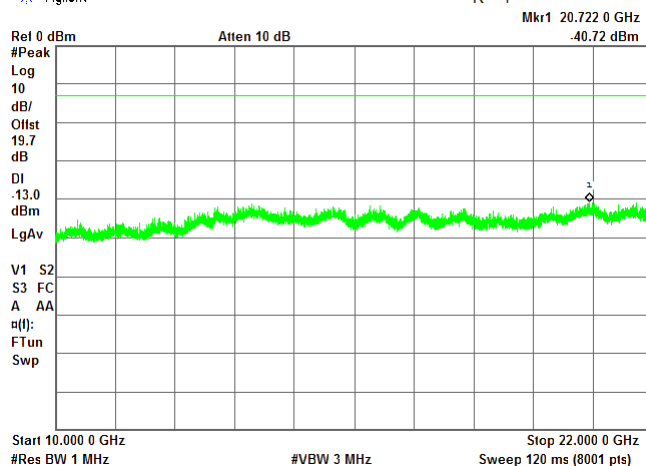
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

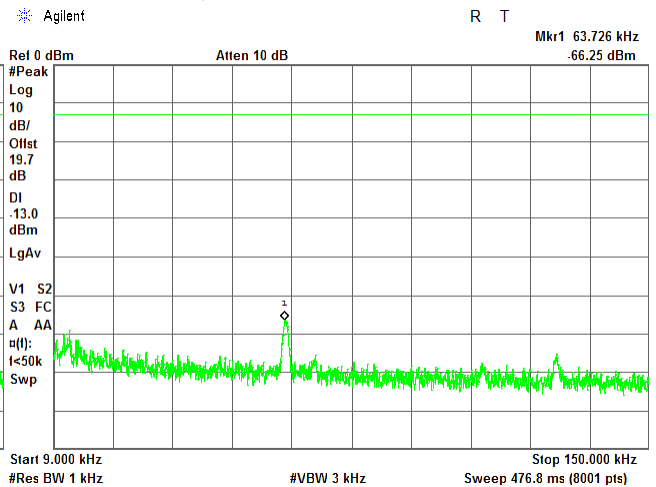
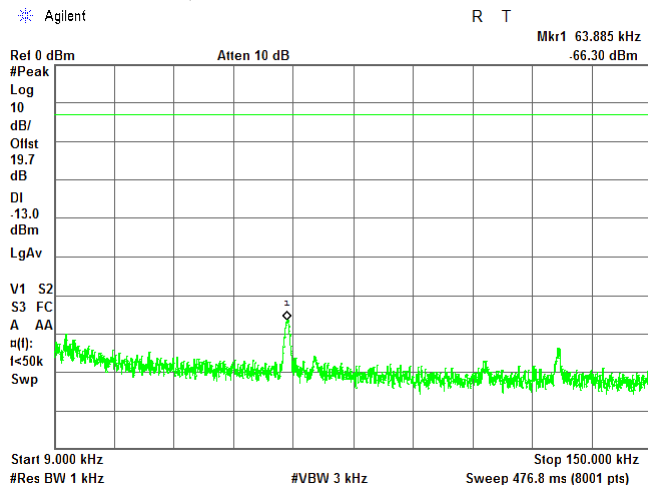
Plot 7.6.8 Spurious emission measurements in 9 - 150 kHz range at carrier frequency

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

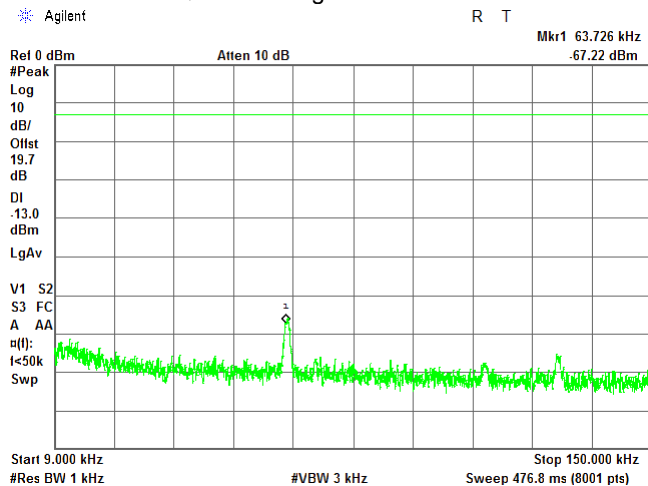
2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

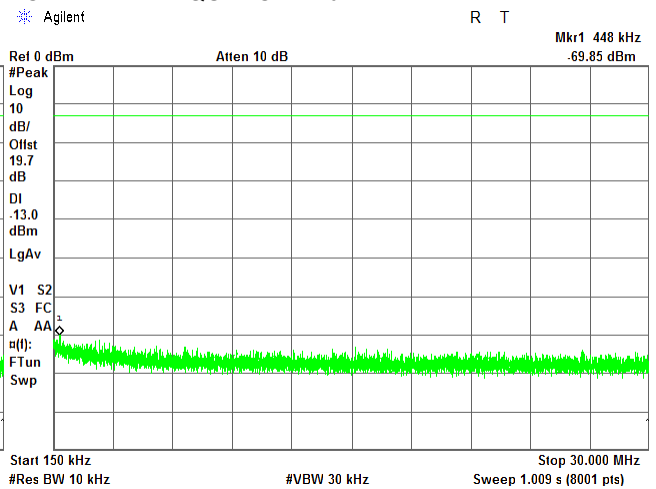
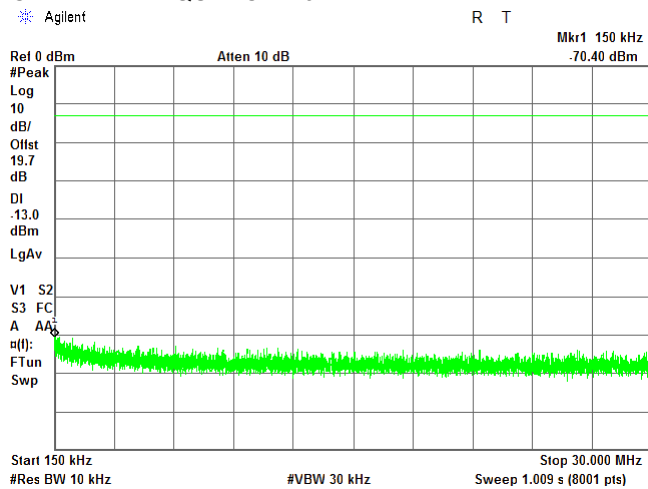
Plot 7.6.9 Spurious emission measurements in 0.15 - 30.0 MHz range at carrier frequency

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

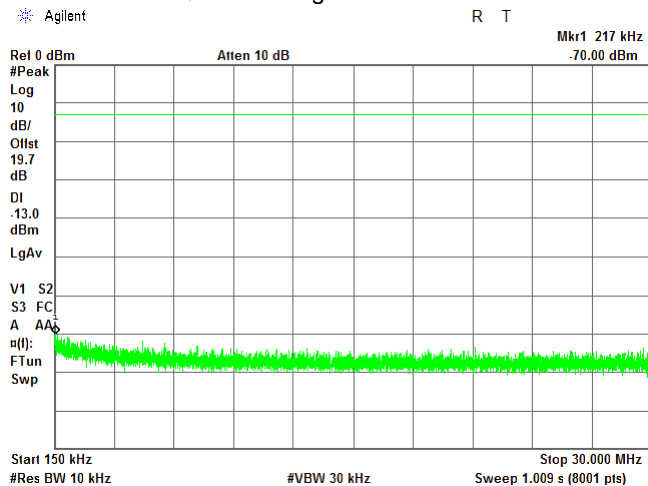
2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

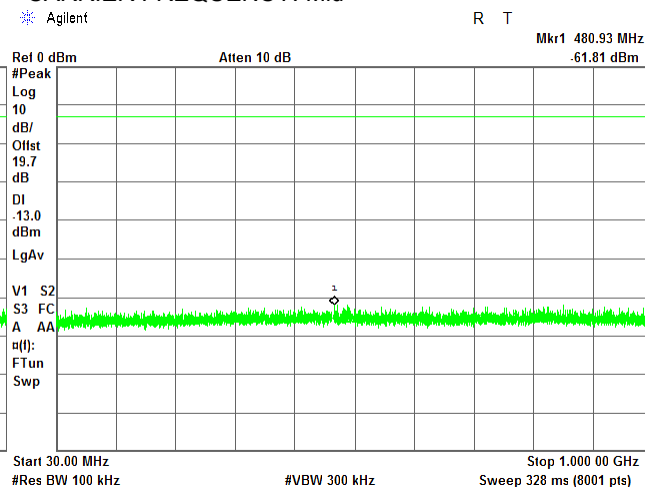
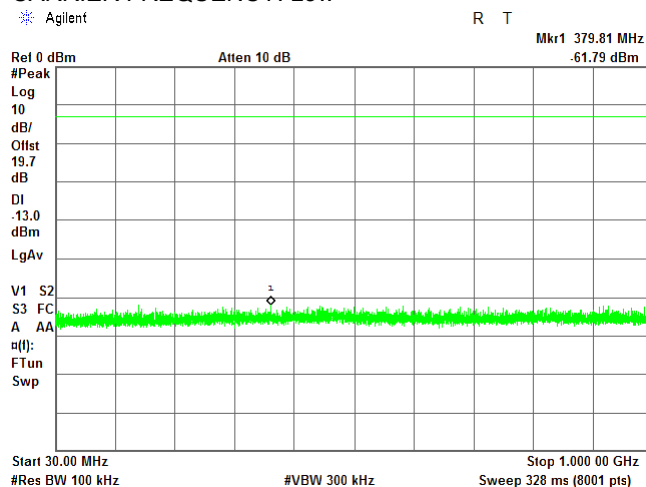
**Plot 7.6.10 Spurious emission measurements in 30.0 - 1000 MHz range at carrier frequency**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

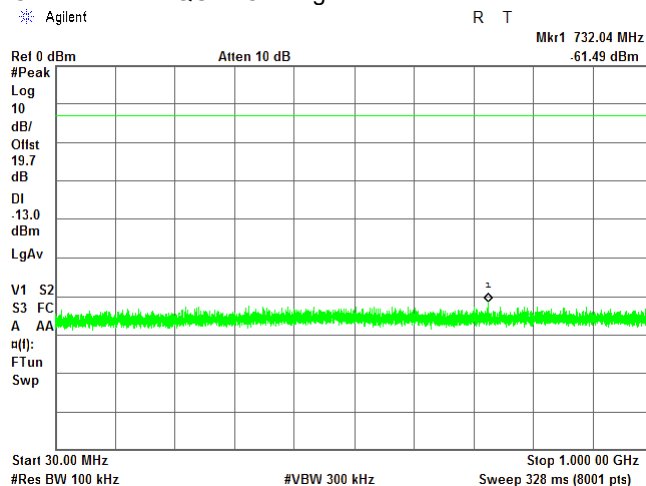
2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

**Plot 7.6.11 Spurious emission measurements in 1000 - 2107 MHz range at carrier frequency**

FREQUENCY RANGE:

2110 – 2180 MHz

OPERATIONAL MODE:

GSM downlink transmit

CONFIGURATION:

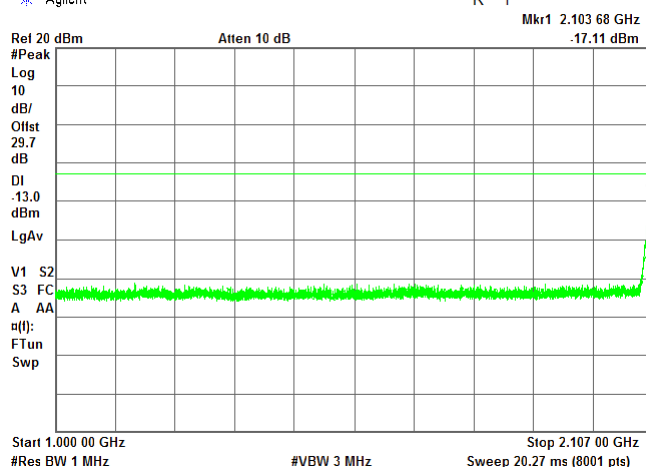
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid

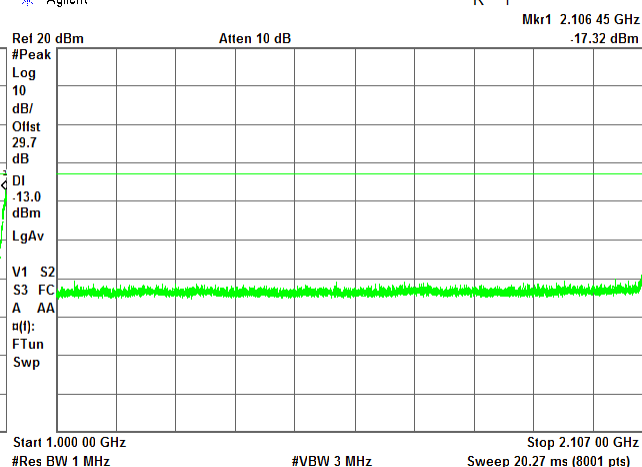
Agilent

R T



Agilent

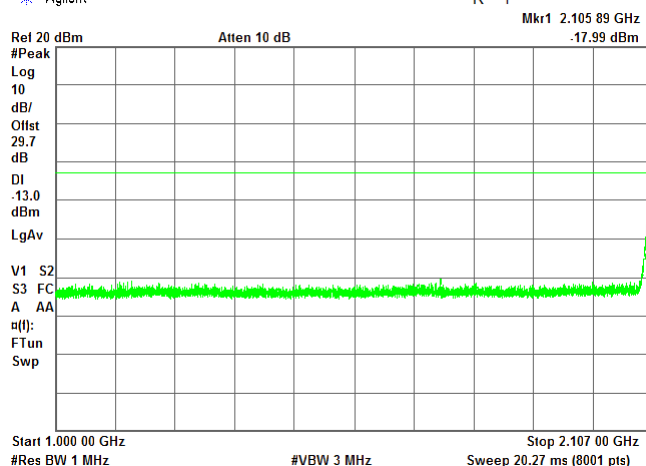
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.12 Spurious emission measurements in 2183 - 3000 MHz range at carrier frequency

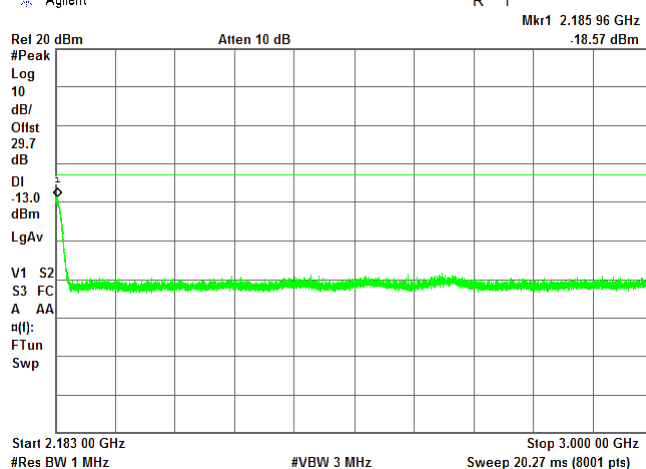
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

Agilent

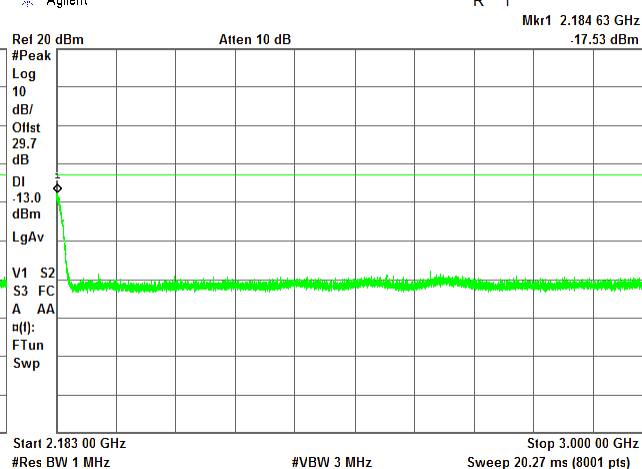
R T



CARRIER FREQUENCY: Mid

Agilent

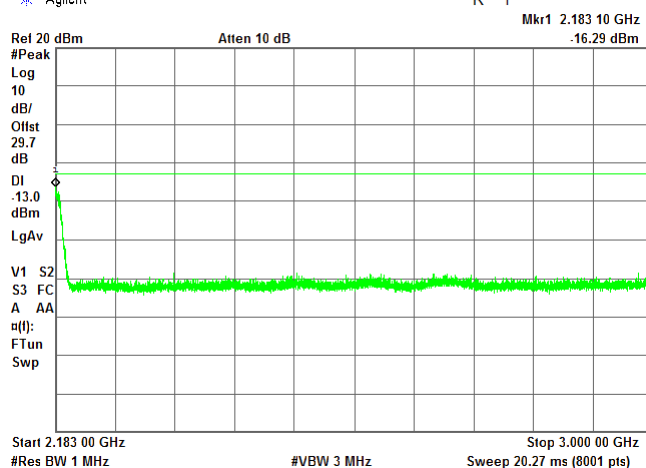
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

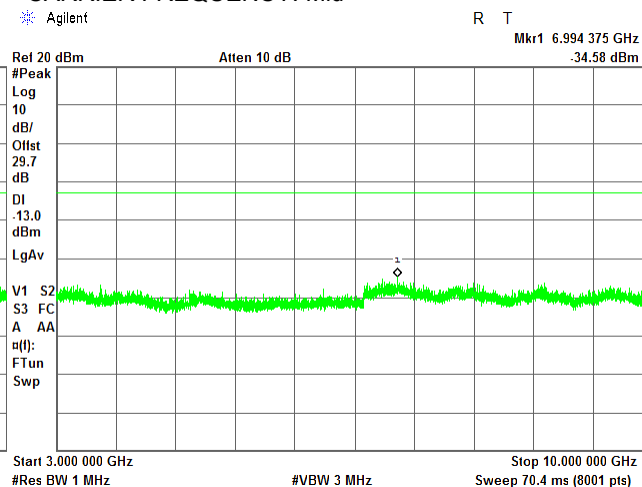
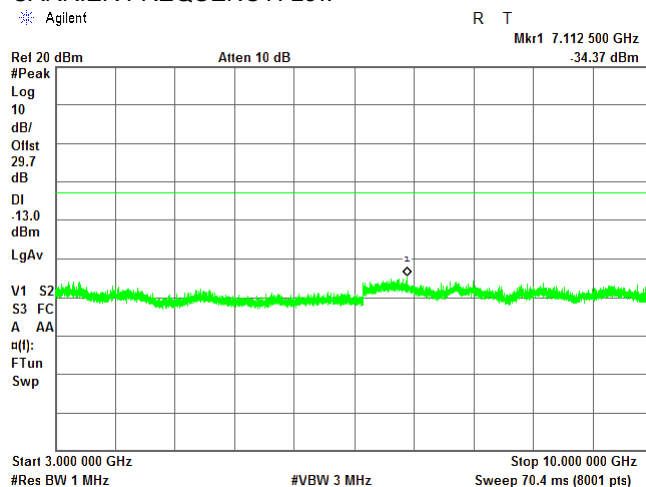
Plot 7.6.13 Spurious emission measurements in 3000 - 10000 MHz range at carrier frequency

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

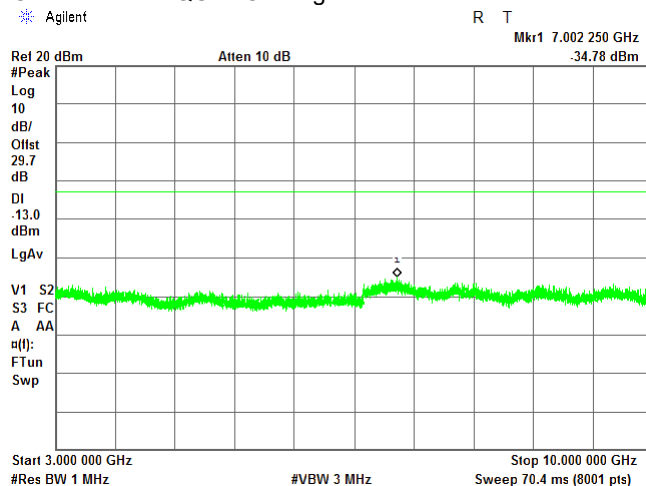
2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High





HERMON LABORATORIES

|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Spurious emissions conducted measurements |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                           |                         |                        |               |
| Temperature: 28 °C                                                           | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

Plot 7.6.14 Spurious emission measurements in 10000 - 22000 MHz range at carrier frequency

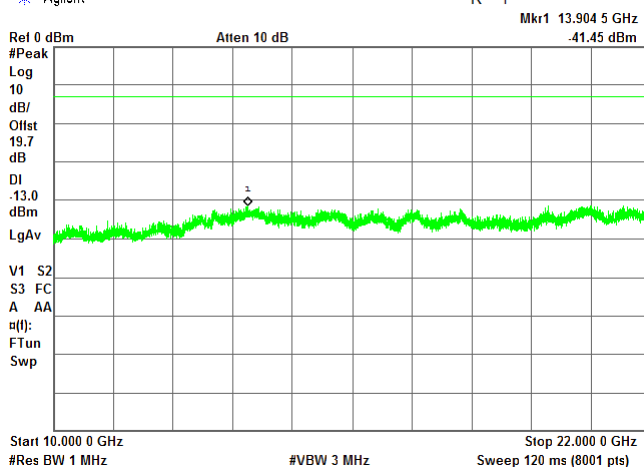
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
GSM downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

Agilent

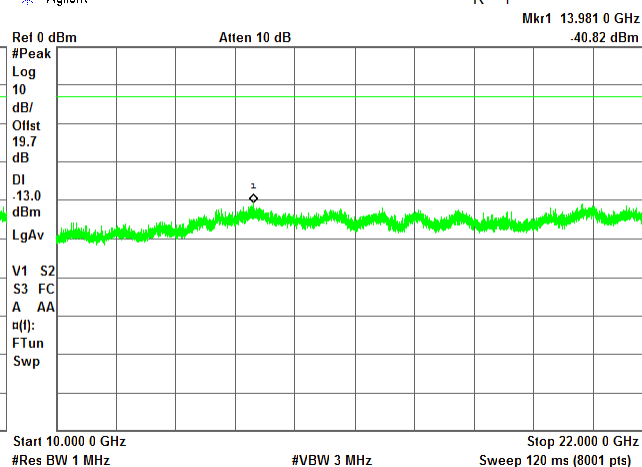
R T



CARRIER FREQUENCY: Mid

Agilent

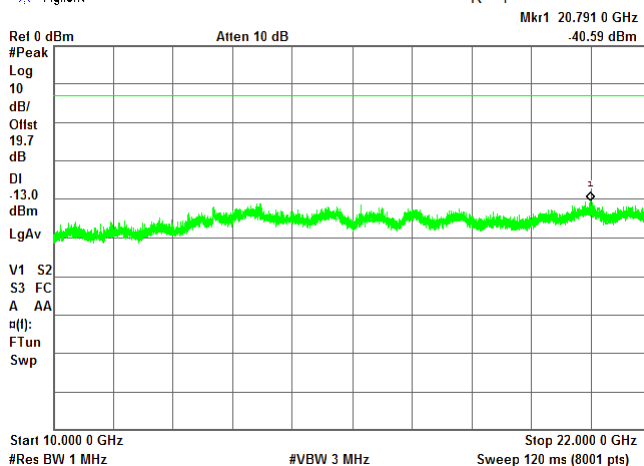
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.15 Spurious emission measurements in 9 - 150 kHz range at carrier frequency

FREQUENCY RANGE:

2110 – 2180 MHz

OPERATIONAL MODE:

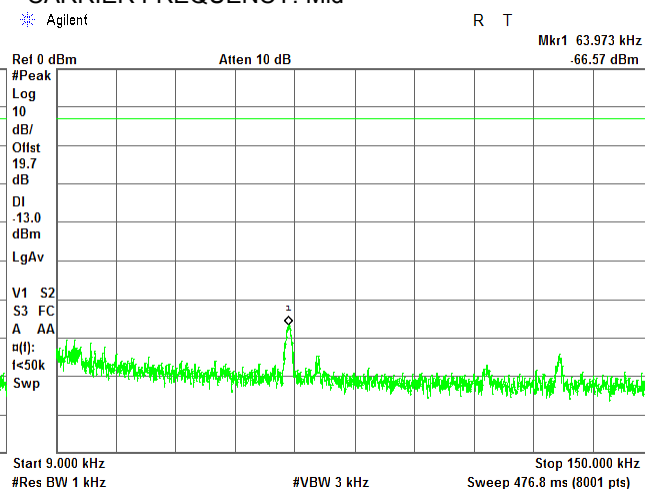
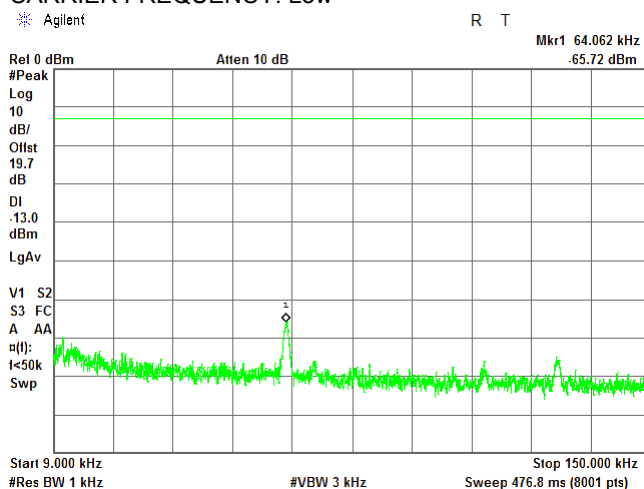
WCDMA downlink transmit

CONFIGURATION:

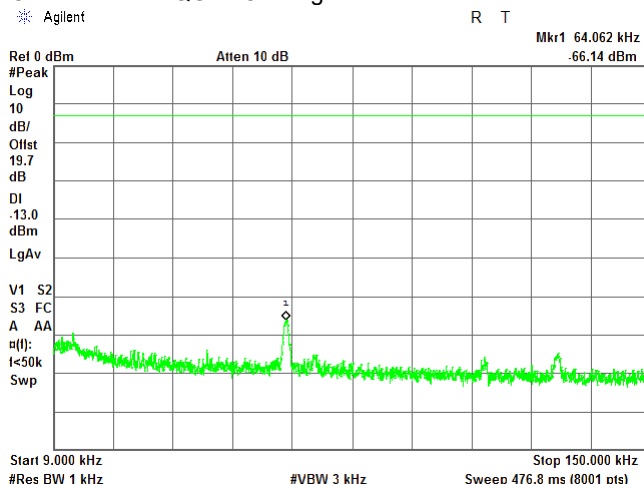
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



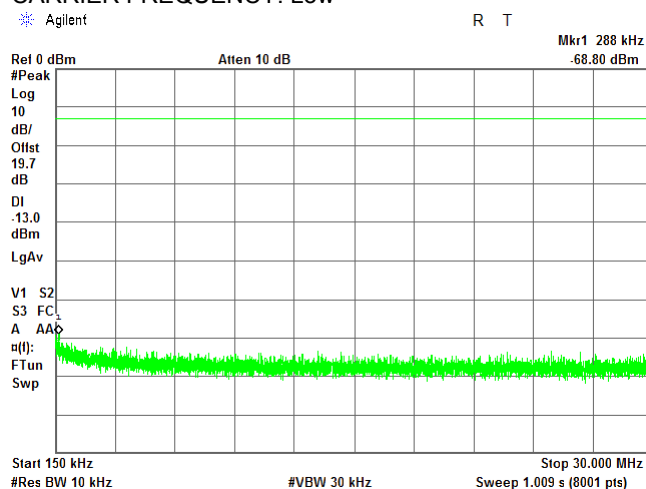
|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.16 Spurious emission measurements in 0.15 - 30.0 MHz range at carrier frequency

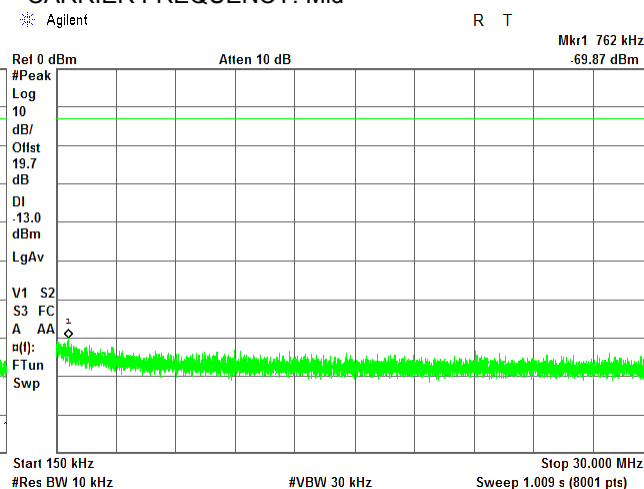
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

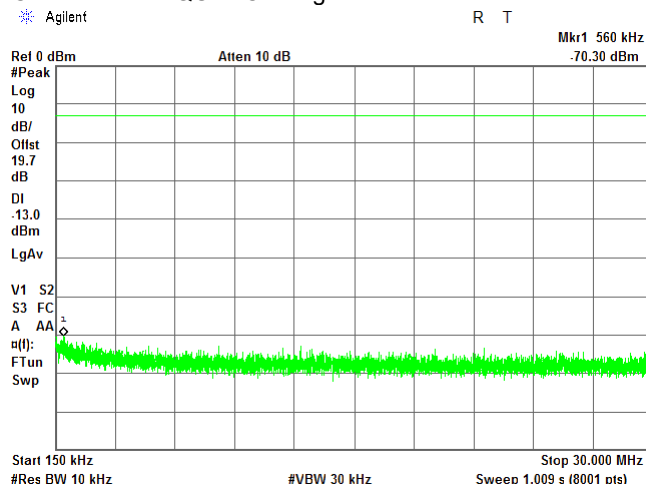
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



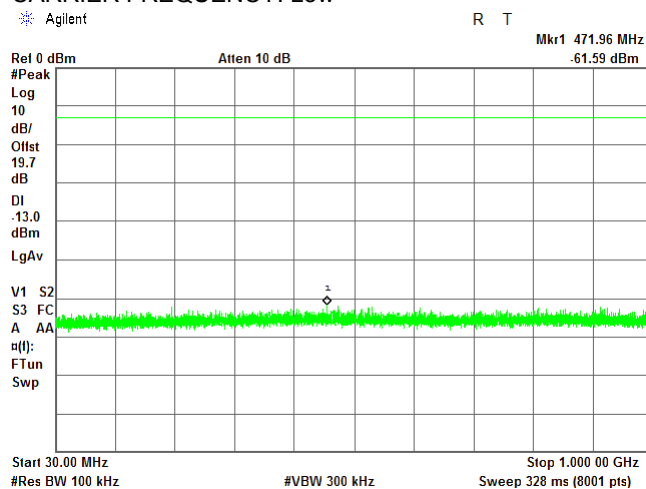
|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Spurious emissions conducted measurements |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                           |                         |                        |               |
| Temperature: 28 °C                                                           | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

Plot 7.6.17 Spurious emission measurements in 30.0 - 1000 MHz range at carrier frequency

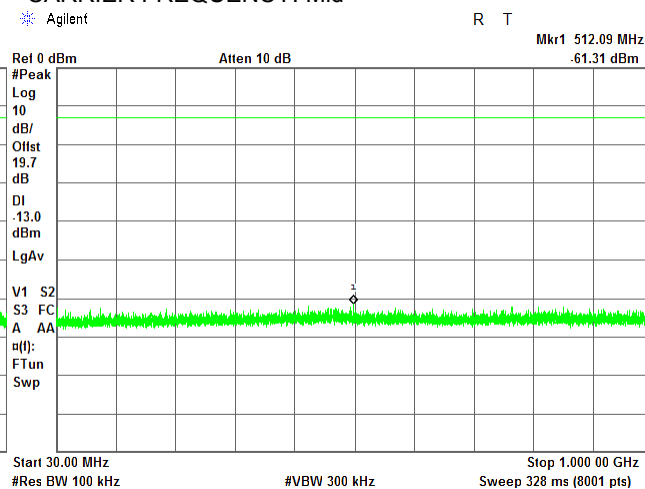
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

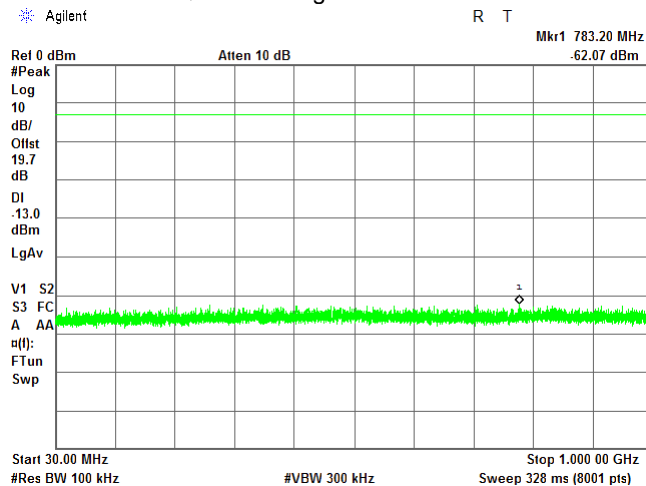
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



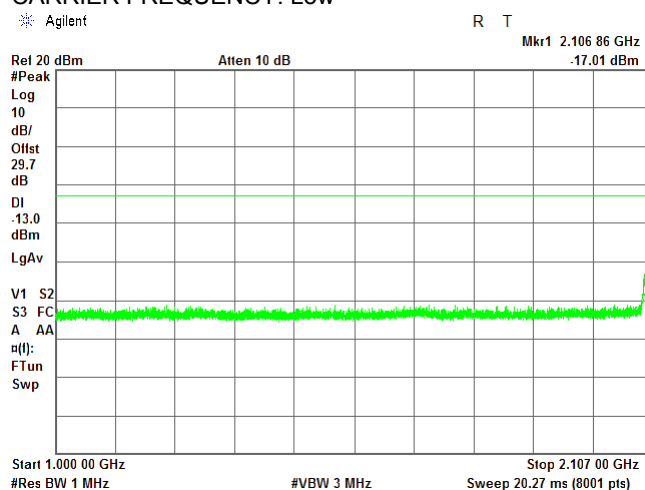
|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.18 Spurious emission measurements in 1000 - 2107 MHz range at carrier frequency

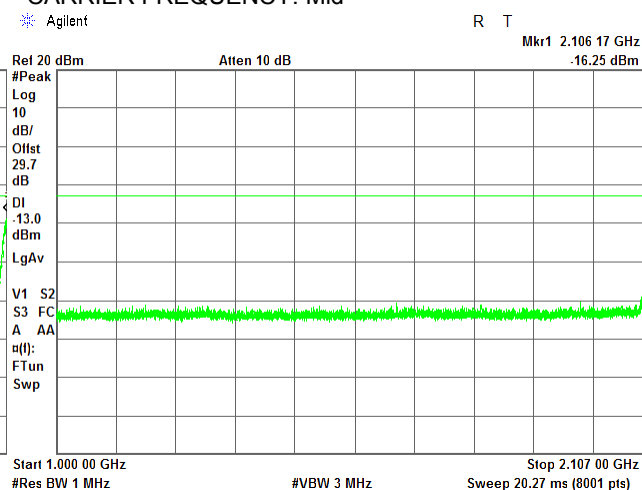
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

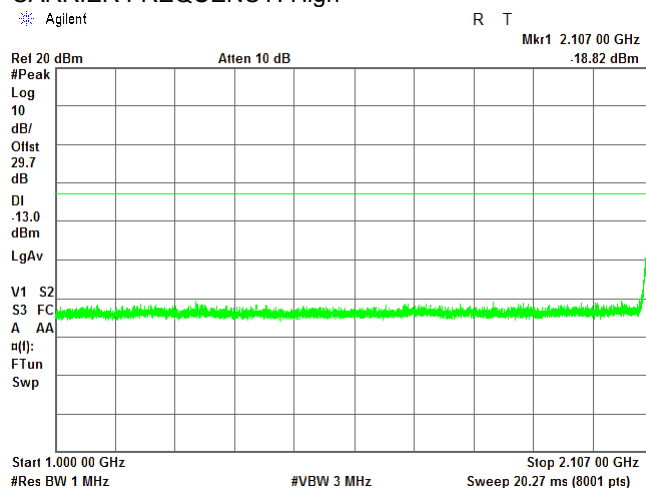
CARRIER FREQUENCY: Low



CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions conducted measurements |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 27-Sep-16                                                           |                                |                               |                      |
| <b>Temperature:</b> 28 °C                                                           | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1012 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.6.19 Spurious emission measurements in 2183 - 3000 MHz range at carrier frequency

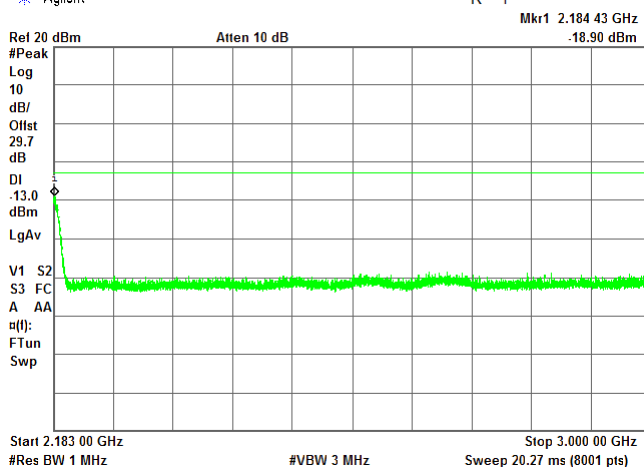
FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

Agilent

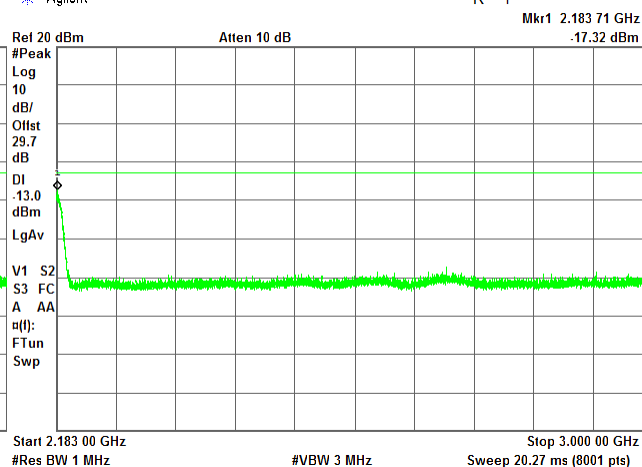
R T



CARRIER FREQUENCY: Mid

Agilent

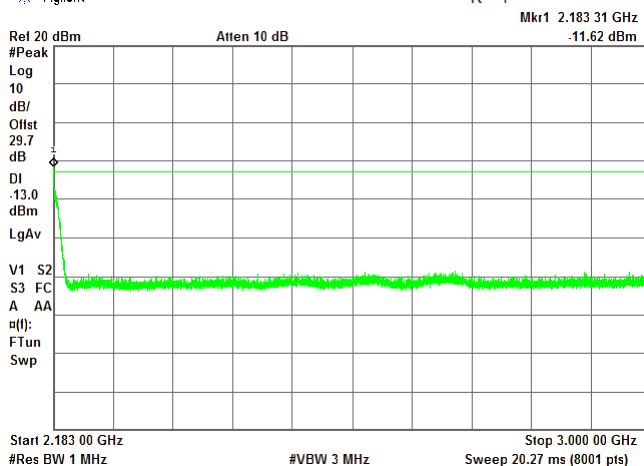
R T



CARRIER FREQUENCY: High

Agilent

R T



|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Spurious emissions conducted measurements |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                           |                         |                        |               |
| Temperature: 28 °C                                                           | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

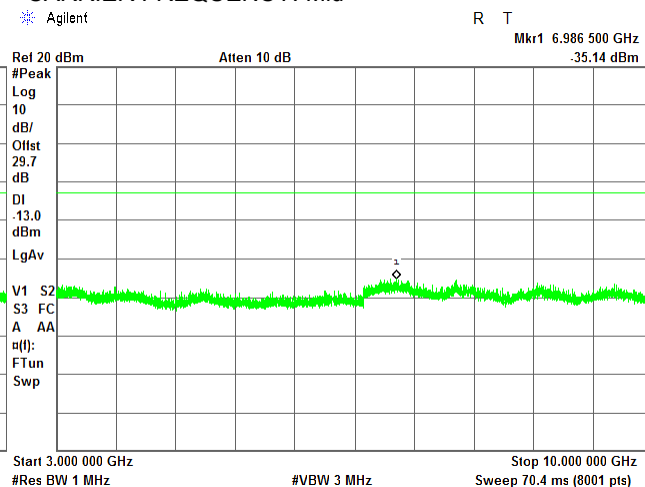
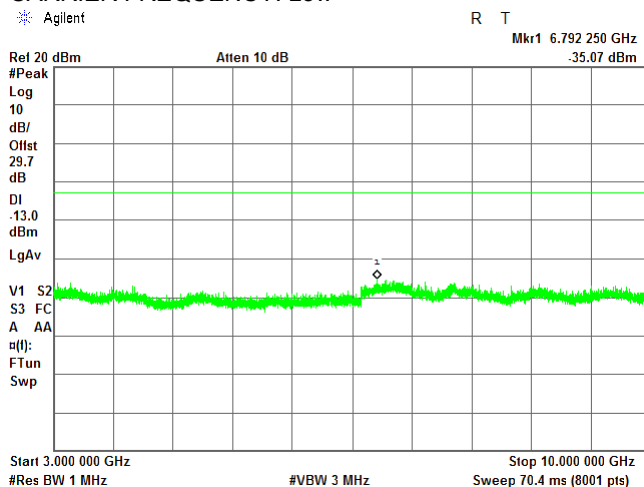
**Plot 7.6.20 Spurious emission measurements in 3000 - 10000 MHz range at carrier frequency**

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

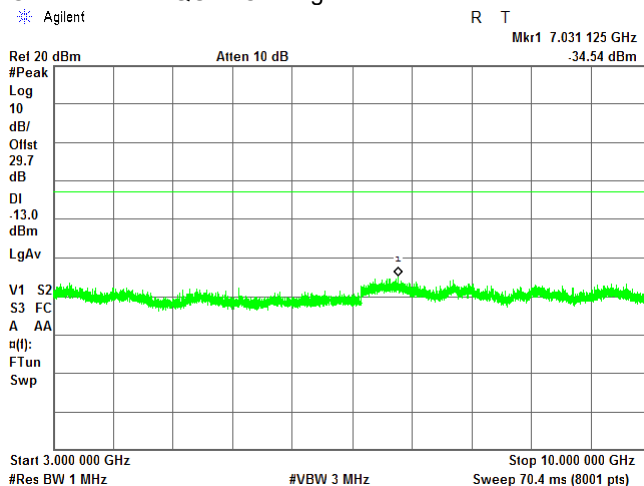
2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High





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|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Spurious emissions conducted measurements |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1051; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 27-Sep-16                                                           |                         |                        |               |
| Temperature: 28 °C                                                           | Relative Humidity: 43 % | Air Pressure: 1012 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

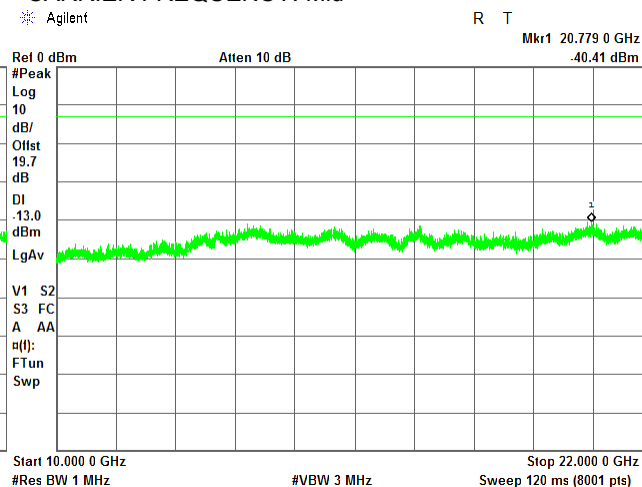
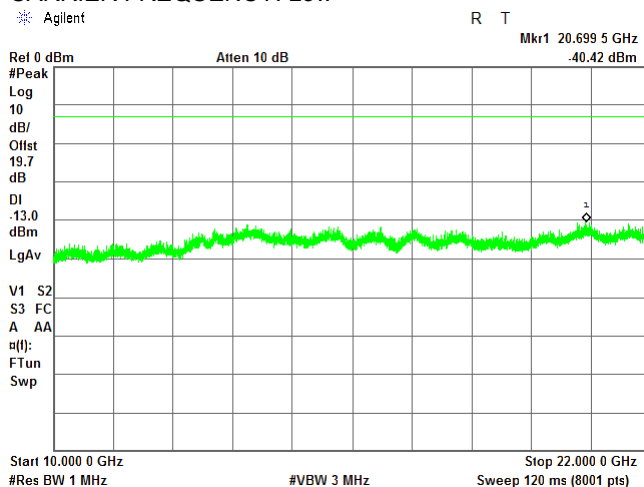
Plot 7.6.21 Spurious emission measurements in 10000 - 22000 MHz range at carrier frequency

FREQUENCY RANGE:  
OPERATIONAL MODE:  
CONFIGURATION:

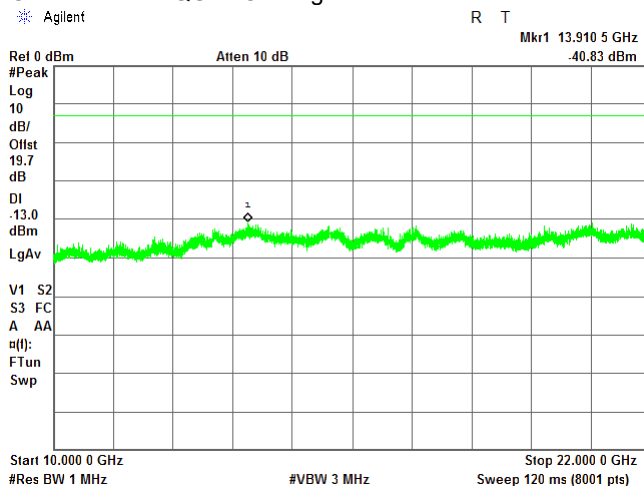
2110 – 2180 MHz  
WCDMA downlink transmit  
Below AGC level

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High





|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

## 7.7 Radiated spurious emission measurements

### 7.7.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.7.1.

**Table 7.7.1 Radiated spurious emission test limits**

| Frequency,<br>MHz                  | Attenuation below carrier,<br>dBc | ERP of spurious,<br>dBm | Equivalent field strength limit @ 3m,<br>dB(μV/m)*** |
|------------------------------------|-----------------------------------|-------------------------|------------------------------------------------------|
| 0.009 – 10 <sup>th</sup> harmonic* | 43+10logP**                       | -13                     | 84.4                                                 |

\* - Excluding the band emission

\*\* - P is transmitter output power in Watts

\*\*\* - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:  
 $E = \sqrt{30 \times P \times 1.64} / r$ , where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

### 7.7.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

**7.7.2.1** The EUT was set up as shown in Figure 7.7.1, energized and the performance check was conducted.

**7.7.2.2** The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

**7.7.2.3** The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

### 7.7.3 Test procedure for spurious emission field strength measurements above 30 MHz

**7.7.3.1** The EUT was set up as shown in Figure 7.7.2, energized and the performance check was conducted.

**7.7.3.2** The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

**7.7.3.3** The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Figure 7.7.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

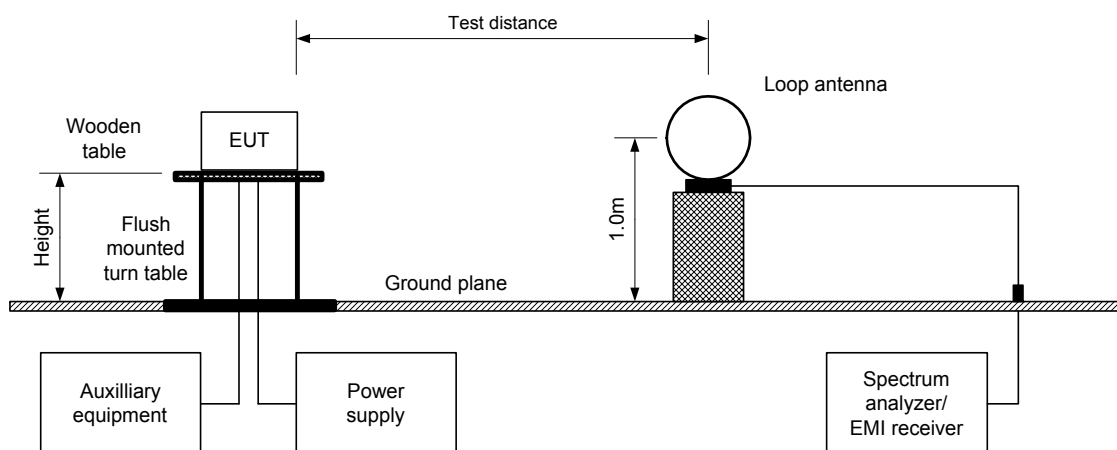
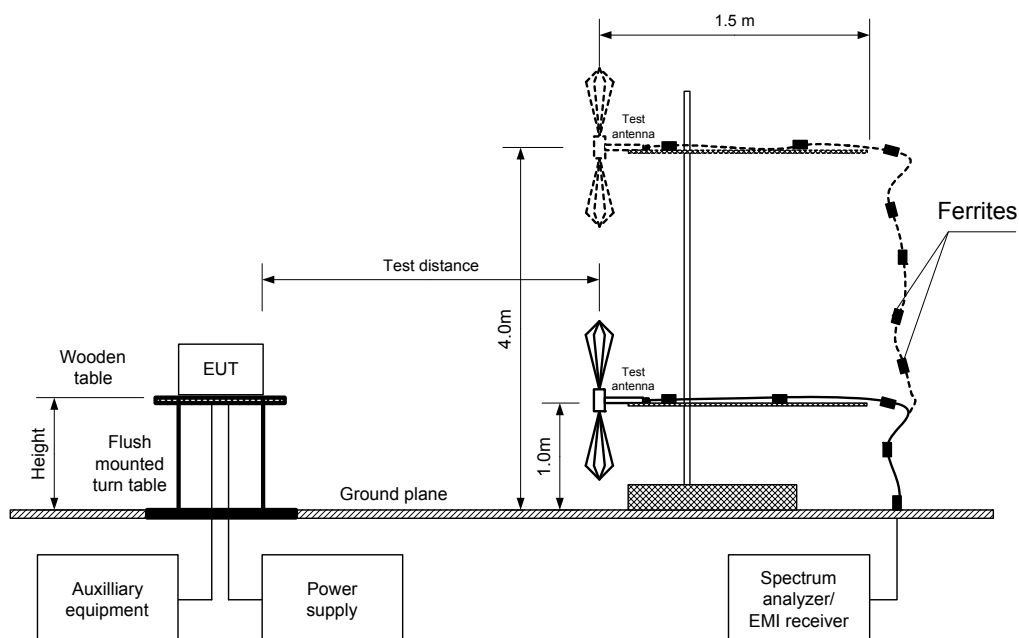


Figure 7.7.2 Setup for spurious emission field strength measurements above 30 MHz





|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Table 7.7.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 2110.0 – 2180 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber / OATS  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 22 000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Horn (above 1000 MHz)  
 MODULATION: Unmodulated  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency, MHz                    | Field strength, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | RBW, kHz | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|-----------------------------------|--------------------------|-----------------|-------------|----------|----------------------|-------------------|--------------------------------|---------|
| <b>Low carrier frequency MHz</b>  |                          |                 |             |          |                      |                   |                                |         |
| 4219.98                           | 61.35                    | 84.4            | -23.05      | 1000     | Vertical             | 1.0               | 150                            | Pass    |
| 6330.03                           | 51.16                    | 84.4            | -33.24      | 1000     | Vertical             | 1.1               | 10                             | Pass    |
| <b>Mid carrier frequency MHz</b>  |                          |                 |             |          |                      |                   |                                |         |
| 4289.98                           | 61.53                    | 84.4            | -22.87      | 1000     | Vertical             | 1.0               | 180                            | Pass    |
| 6435.06                           | 57.34                    | 84.4            | -27.06      | 1000     | Vertical             | 1.1               | 15                             | Pass    |
| <b>High carrier frequency MHz</b> |                          |                 |             |          |                      |                   |                                |         |
| 4360.00                           | 64.50                    | 84.4            | -19.90      | 1000     | Vertical             | 1.0               | 185                            | Pass    |
| 6539.94                           | 58.28                    | 84.4            | -26.12      | 1000     | Vertical             | 1.2               | 10                             | Pass    |

\*- Margin = Field strength of spurious – calculated field strength limit.

\*\* - EUT front panel refers to 0 degrees position of turntable.

## Reference numbers of test equipment used

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0521 | HL 0604 | HL 2909 | HL 4222 | HL 4278 | HL 4353 | HL 4372 |
| HL 4933 | HL 4956 | HL 5112 |         |         |         |         |         |

Full description is given in Appendix A.

|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

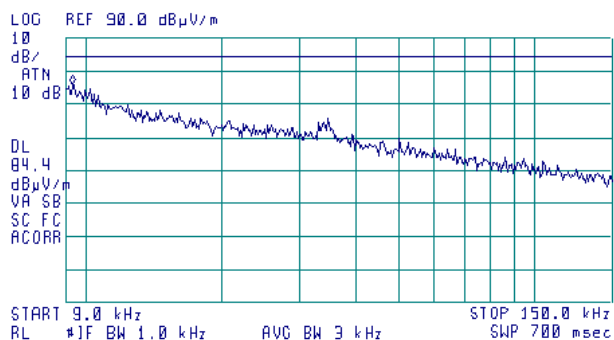
### Plot 7.7.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

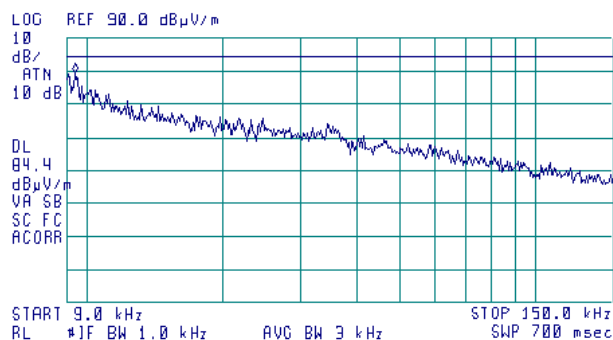
Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 9.4 kHz  
76.01 dBμV/m



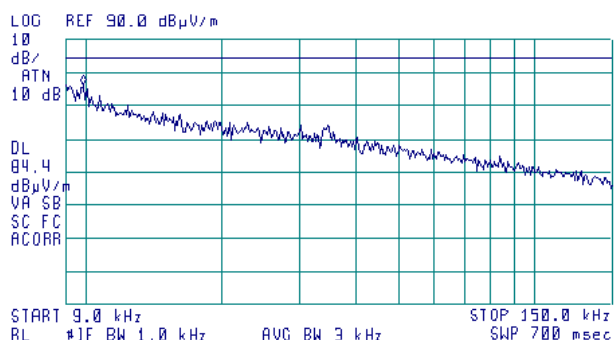
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 9.5 kHz  
79.48 dBμV/m



CARRIER FREQUENCY: High



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 9.9 kHz  
76.37 dBμV/m



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

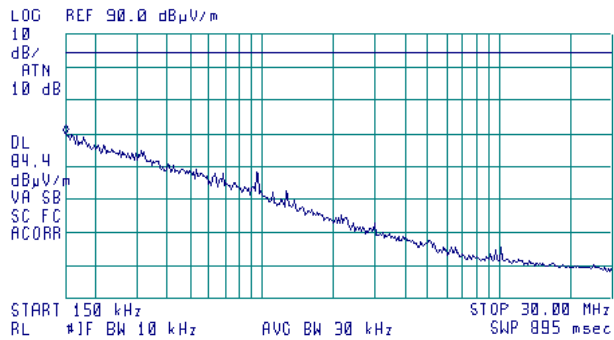
### Plot 7.7.2 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

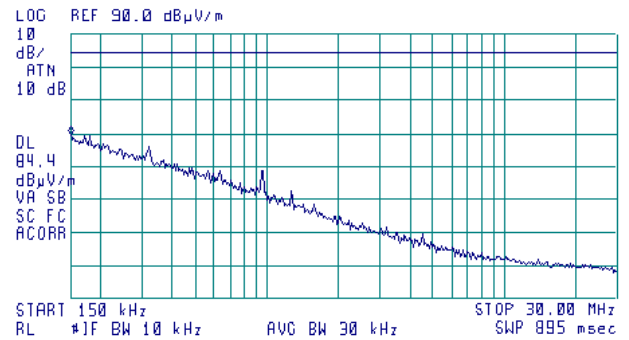
Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
59.64 dBμV/m



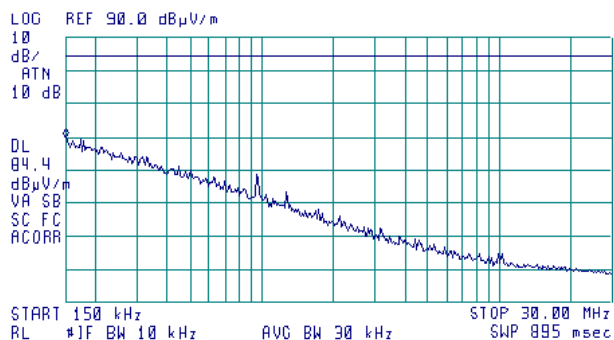
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
59.50 dBμV/m



CARRIER FREQUENCY: High



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
59.80 dBμV/m





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|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Radiated spurious emissions               |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 19-Sep-16 - 21-Sep-16                                               |                         |                        |               |
| Temperature: 31 °C                                                           | Relative Humidity: 48 % | Air Pressure: 1009 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

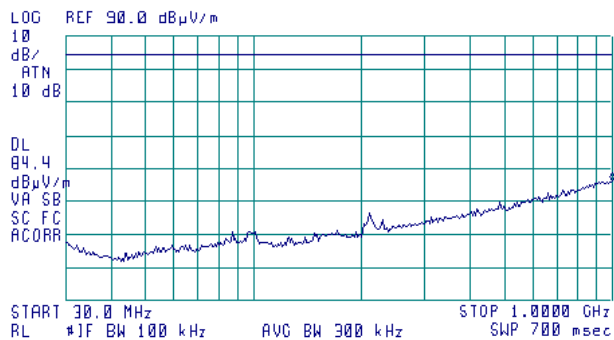
### Plot 7.7.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

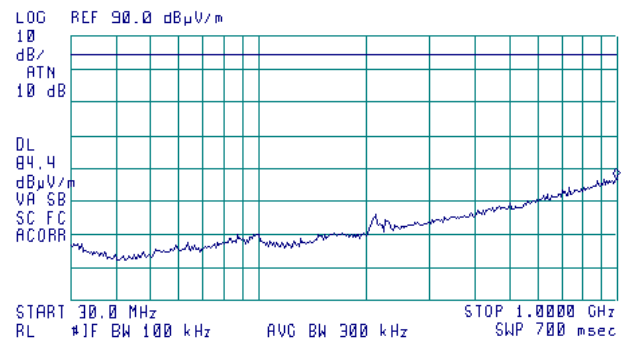
Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.0000 GHz  
46.02 dBµV/m



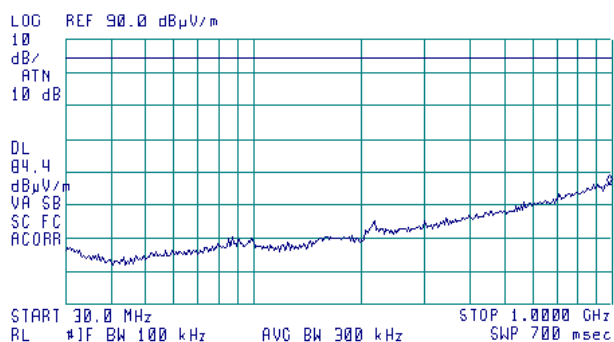
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 990.5 MHz  
46.86 dBµV/m



CARRIER FREQUENCY: High



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 990.9 MHz  
46.23 dBµV/m

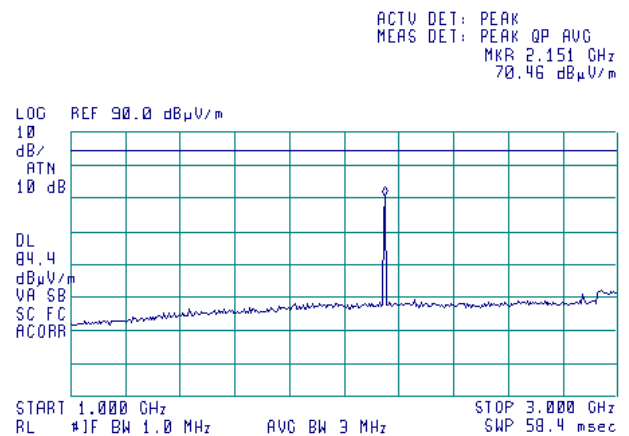
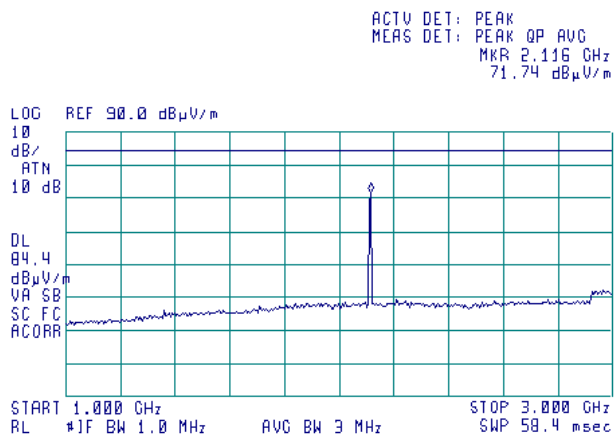


|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

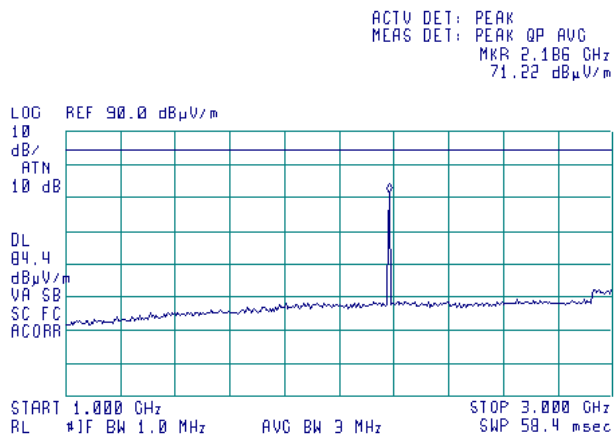
#### Plot 7.7.4 Radiated emission measurements in 1000 – 3000 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

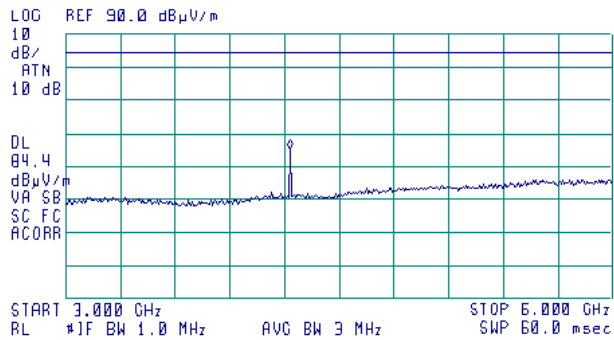
### Plot 7.7.5 Radiated emission measurements in 3000 – 6000 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

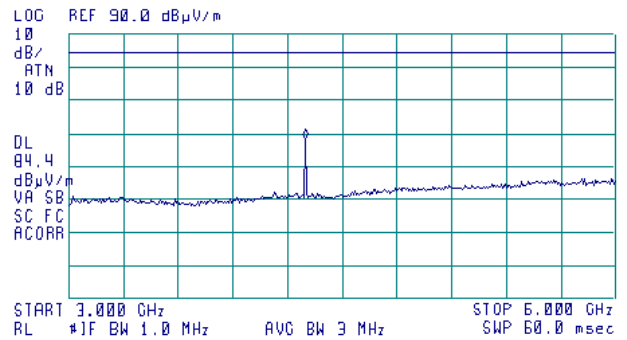
Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.230 GHz  
55.13 dBμV/m



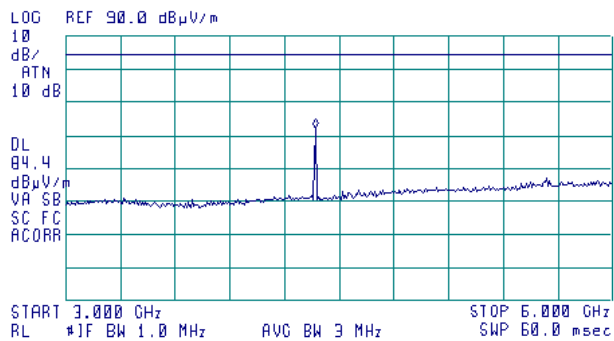
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.298 GHz  
58.47 dBμV/m



CARRIER FREQUENCY: High



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.373 GHz  
62.02 dBμV/m

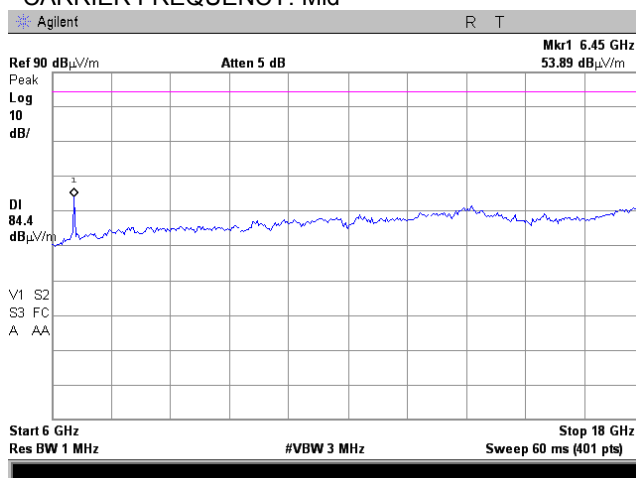
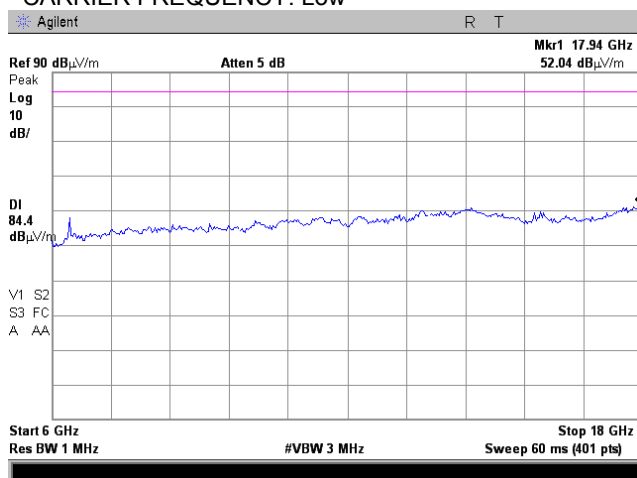


|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

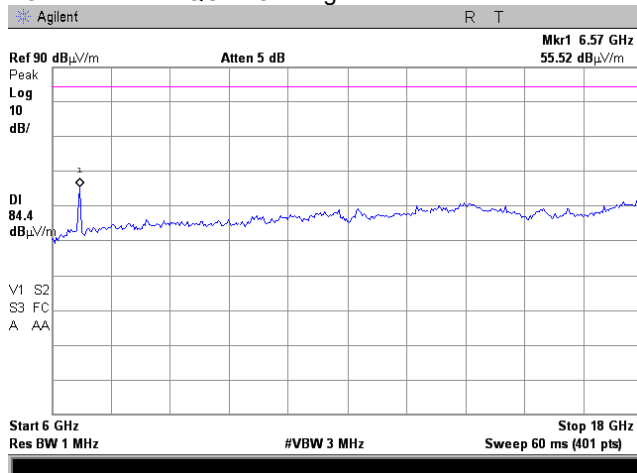
### Plot 7.7.6 Radiated emission measurements in 6000 – 18000 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

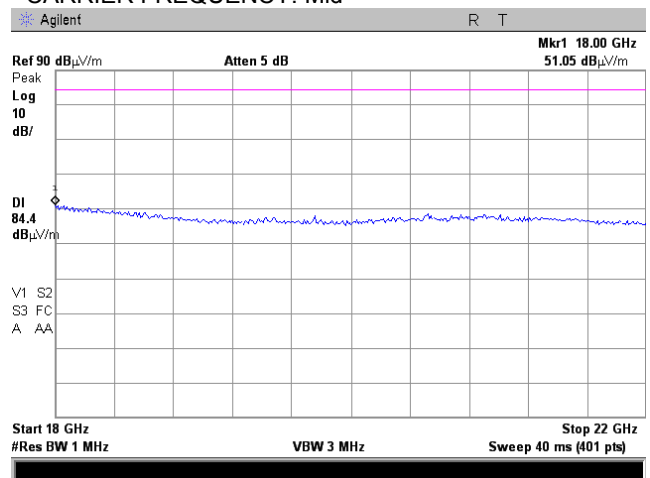
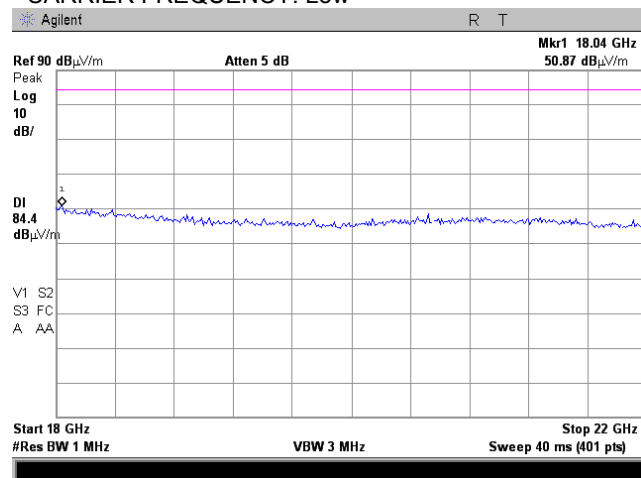


|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

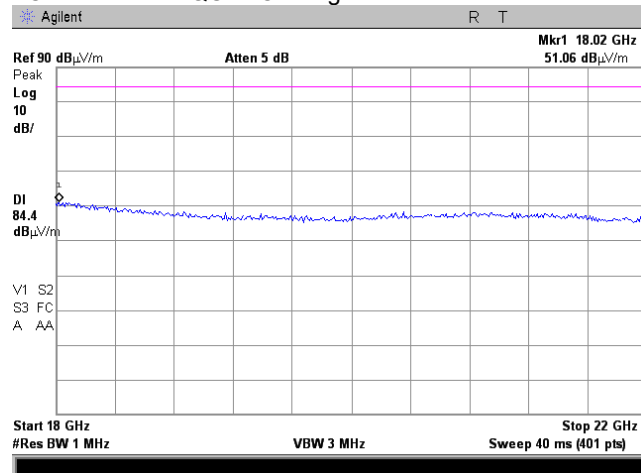
### Plot 7.7.7 Radiated emission measurements in 18000 – 22000 MHz range

TEST SITE:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
Vertical and Horizontal  
3 m  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

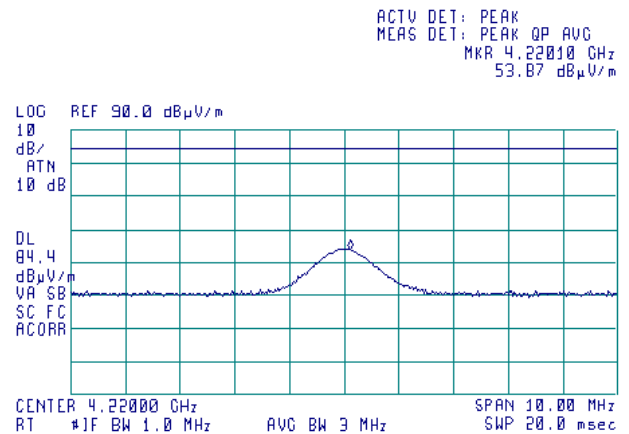
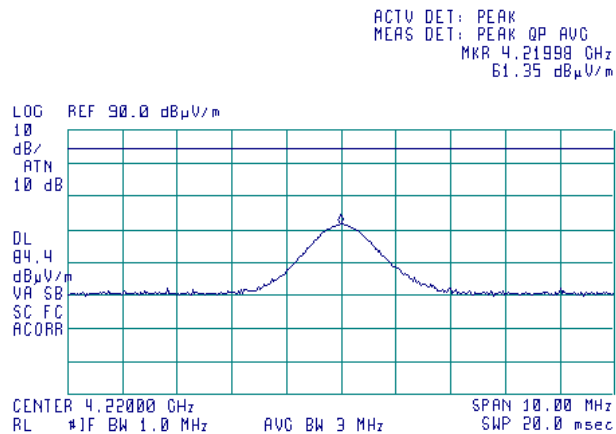


|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.7.8 Radiated emission measurements at the 2<sup>nd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical

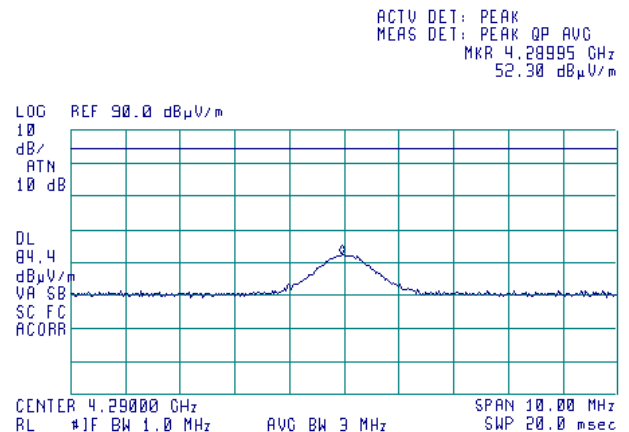
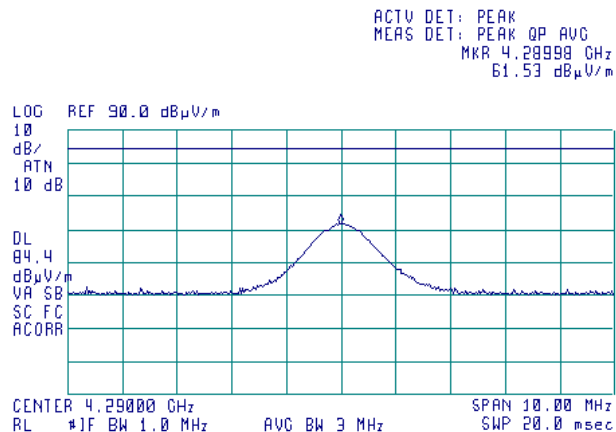
OATS  
Low  
3 m  
ANTENNA POLARIZATION: Horizontal



Plot 7.7.9 Radiated emission measurements at the 2<sup>nd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical

OATS  
Mid  
3 m  
ANTENNA POLARIZATION: Horizontal





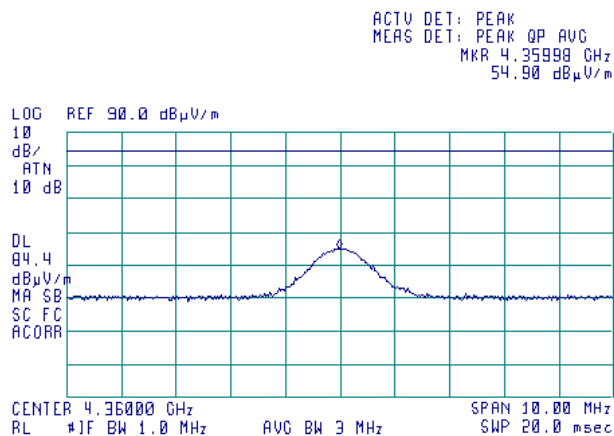
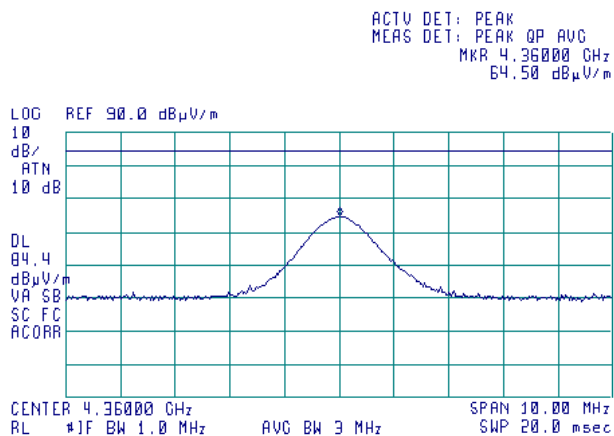
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|                                                                              |                         |                        |               |
|------------------------------------------------------------------------------|-------------------------|------------------------|---------------|
| Test specification: Section 27.53, Radiated spurious emissions               |                         |                        |               |
| Test procedure: 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                         |                        |               |
| Test mode: Compliance                                                        |                         | Verdict: PASS          |               |
| Date(s): 19-Sep-16 - 21-Sep-16                                               |                         |                        |               |
| Temperature: 31 °C                                                           | Relative Humidity: 48 % | Air Pressure: 1009 hPa | Power: 48 VDC |
| Remarks:                                                                     |                         |                        |               |

Plot 7.7.10 Radiated emission measurements at the 2<sup>nd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical

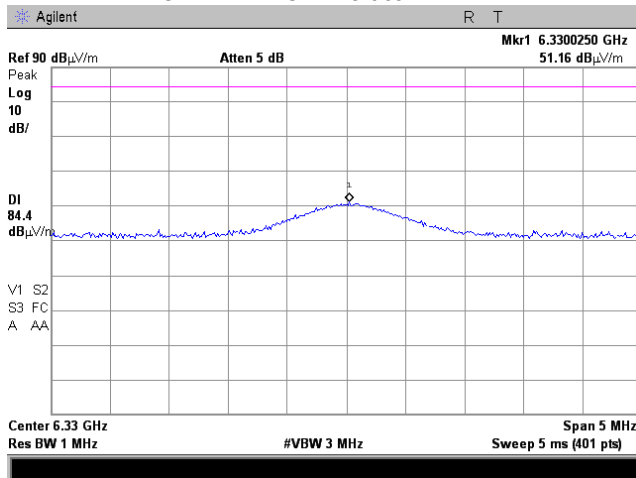
OATS  
High  
Vertical  
3 m  
ANTENNA POLARIZATION: Horizontal



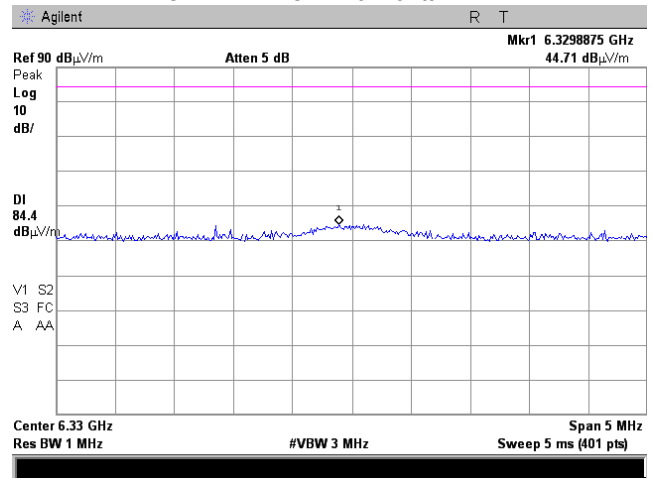
|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.7.11 Radiated emission measurements at the 3<sup>rd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical

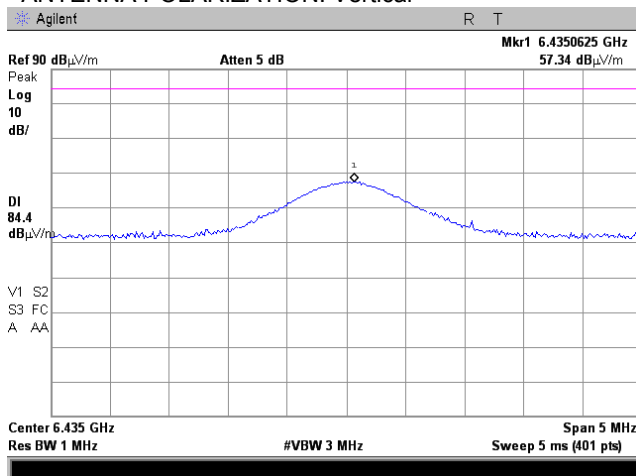


OATS  
Low  
3 m  
ANTENNA POLARIZATION: Horizontal

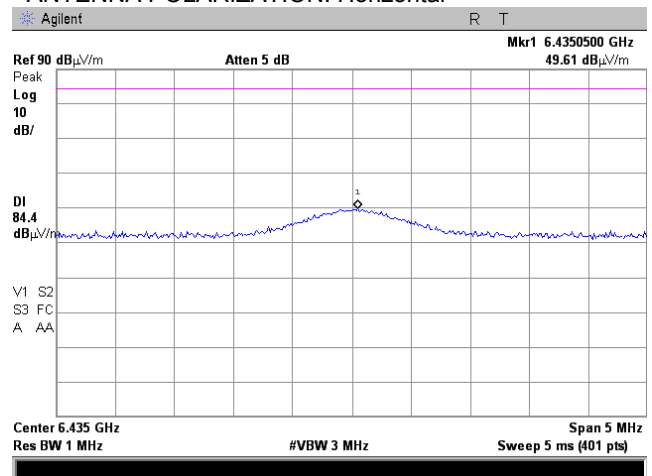


Plot 7.7.12 Radiated emission measurements at the 3<sup>rd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical



OATS  
Mid  
3 m  
ANTENNA POLARIZATION: Horizontal

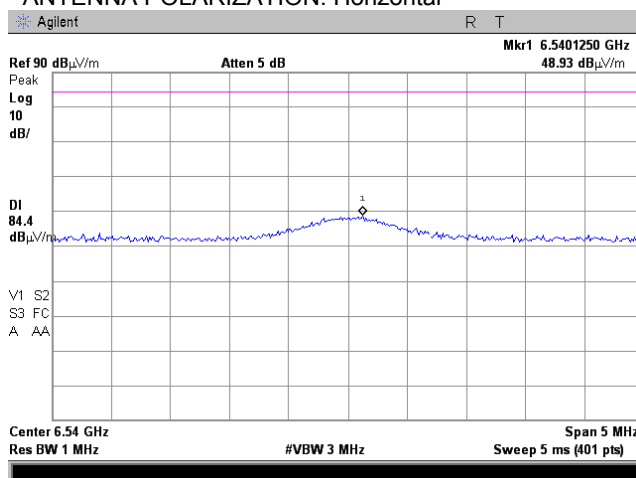
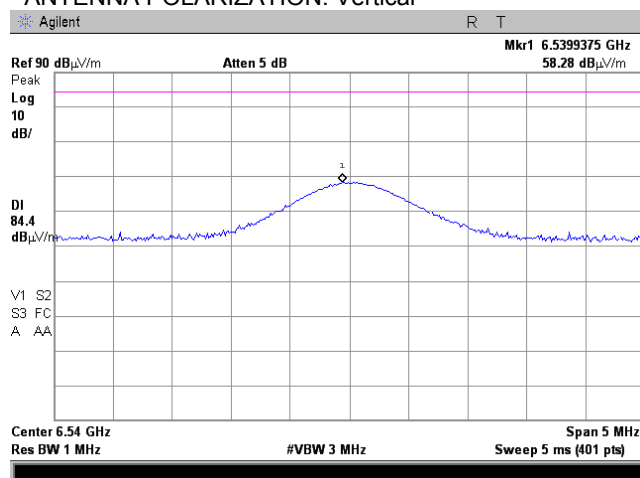


|                                                                                     |                                |                               |                      |
|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions               |                                |                               |                      |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; KDB 935210 D05 v01r01 section 3.6.3 |                                |                               |                      |
| <b>Test mode:</b> Compliance                                                        |                                | <b>Verdict:</b> PASS          |                      |
| <b>Date(s):</b> 19-Sep-16 - 21-Sep-16                                               |                                |                               |                      |
| <b>Temperature:</b> 31 °C                                                           | <b>Relative Humidity:</b> 48 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 48 VDC |
| <b>Remarks:</b>                                                                     |                                |                               |                      |

Plot 7.7.13 Radiated emission measurements at the 3<sup>rd</sup> harmonic

TEST SITE:  
CARRIER FREQUENCY:  
ANTENNA POLARIZATION:  
TEST DISTANCE:  
ANTENNA POLARIZATION: Vertical

OATS  
High  
Vertical  
3 m  
ANTENNA POLARIZATION: Horizontal



## 8 APPENDIX A Test equipment and ancillaries used for tests

| HL No | Description                                                           | Manufacturer                      | Model                                | Ser. No.                          | Last Cal./ Check | Due Cal./ Check |
|-------|-----------------------------------------------------------------------|-----------------------------------|--------------------------------------|-----------------------------------|------------------|-----------------|
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz                                | EMCO                              | 6502                                 | 2857                              | 18-Jan-16        | 18-Jan-17       |
| 0521  | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard                   | 8546A                                | 3617A<br>00319,<br>3448A002<br>53 | 27-Oct-16        | 27-Oct-17       |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz               | EMCO                              | 3141                                 | 9611-1011                         | 10-May-16        | 10-May-17       |
| 2011  | Power Divider, 0.5-18.0 GHz, 80 W                                     | Omni Spectra                      | 2090-6204-00                         | NA                                | 01-Dec-14        | 01-Dec-16       |
| 2909  | Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz                          | Agilent Technologies              | E4407B                               | MY414447<br>62                    | 21-Feb-16        | 21-Feb-17       |
| 3433  | Test Cable , DC-18 GHz, 1.5 m, SMA - SMA                              | Mini-Circuits                     | CBL-5FT-SMSM+                        | 25679                             | 20-Mar-16        | 20-Mar-17       |
| 3472  | Cable, Coax, Microwave, DC-18 GHz, SMA-SMA, 0.6 m                     | Gore                              | GORE<br>65474                        | 1003478                           | 30-May-16        | 30-May-17       |
| 3474  | Cable, Coax, Microwave, DC-18 GHz, SMA-SMA, 0.6 m                     | Gore                              | GORE<br>65475                        | 1640102                           | 30-May-16        | 30-May-17       |
| 3787  | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz          | Mini-Circuits                     | BW-S10W5+                            | NA                                | 01-Dec-15        | 01-Dec-16       |
| 3788  | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz          | Mini-Circuits                     | BW-S10W5+                            | NA                                | 01-Dec-15        | 01-Dec-16       |
| 3901  | Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA                    | Huber-Suhner                      | SUCOFLE<br>X 102A                    | 1225/2A                           | 15-Feb-16        | 15-Feb-17       |
| 4222  | High Pass Filter, 50 Ohm, 3150 to 6500 MHz                            | Mini-Circuits                     | VHF-2700+                            | NA                                | 01-Oct-15        | 01-Oct-17       |
| 4278  | Test Cable , DC-18 GHz, 4.6 m, N/M - N/M                              | Mini-Circuits                     | APC-15FT-NMNM+                       | 0755A                             | 26-Sep-16        | 26-Sep-17       |
| 4353  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M    | MegaPhase                         | NC29-N1N1-244                        | 12025101<br>003                   | 15-Mar-16        | 15-Mar-17       |
| 4354  | Vector Signal Generator, 100 kHz to 6.0 GHz                           | Rohde & Schwarz                   | SMJ 100A                             | 1403.4507<br>K02-<br>101777-rc    | 27-Jun-14        | 27-Jun-17       |
| 4372  | High Pass Filter, 50 Ohm, 8.0 to 18.0 GHz, SMA-FM / SMA-FM            | Tiger Micro-Electronics Institute | TGF-A2118-001                        | r-<br>JSFG308-001                 | 08-May-16        | 08-May-17       |
| 4933  | Active Horn Antenna, 1 GHz to 18 GHz                                  | Com-Power Corporation             | AHA-118                              | 701046                            | 14-Oct-16        | 14-Oct-17       |
| 4956  | Active horn antenna, 18 to 40 GHz                                     | Com-Power Corporation             | AHA-840                              | 105004                            | 09-Nov-16        | 09-Nov-17       |
| 5112  | RF cable, 40 GHz, 5.5 m, K-type                                       | Huber-Suhner                      | SF102EA/<br>11SK/11S<br>K/5500M<br>M | 502494/2E<br>A                    | 26-Jul-16        | 26-Jul-17       |

## 9 APPENDIX B Measurement uncertainties

### Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

| Test description                                                        | Expanded uncertainty                                                                                                                                                                                                        |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmitter tests</b>                                                |                                                                                                                                                                                                                             |
| Carrier power conducted at antenna connector                            | $\pm 1.7$ dB                                                                                                                                                                                                                |
| Carrier power radiated (substitution method)                            | $\pm 4.5$ dB                                                                                                                                                                                                                |
| Occupied bandwidth                                                      | $\pm 8\%$                                                                                                                                                                                                                   |
| Conducted emissions at RF antenna connector                             | 9 kHz to 2.9 GHz: $\pm 2.6$ dB<br>2.9 GHz to 6.46 GHz: $\pm 3.5$ dB<br>6.46 GHz to 13.2 GHz: $\pm 4.3$ dB<br>13.2 GHz to 22.0 GHz: $\pm 5.0$ dB<br>22.0 GHz to 26.8 GHz: $\pm 5.5$ dB<br>26.8 GHz to 40.0 GHz: $\pm 4.8$ dB |
| Spurious emissions radiated 30 MHz – 40 GHz (substitution method)       | $\pm 4.5$ dB                                                                                                                                                                                                                |
| Frequency error                                                         | 30 – 300 MHz: $\pm 50.5$ Hz (1.68 ppm)<br>300 – 1000 MHz: $\pm 168$ Hz (0.56 ppm)                                                                                                                                           |
| Transient frequency behaviour                                           | 187 Hz<br>$\pm 13.9\%$                                                                                                                                                                                                      |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements        | $\pm 1.0\%$                                                                                                                                                                                                                 |
| <b>Unintentional radiator tests</b>                                     |                                                                                                                                                                                                                             |
| Conducted emissions with LISN                                           | 9 kHz to 150 kHz: $\pm 3.9$ dB<br>150 kHz to 30 MHz: $\pm 3.8$ dB                                                                                                                                                           |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization | Biconilog antenna: $\pm 5.3$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.3$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB                                                                        |
| Vertical polarization                                                   | Biconilog antenna: $\pm 6.0$ dB<br>Biconical antenna: $\pm 5.7$ dB<br>Log periodic antenna: $\pm 6.0$ dB<br>Double ridged horn antenna: $\pm 6.0$ dB                                                                        |

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

## 10 APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports). The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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Person for contact: Mr. Alex Usoskin, CEO.

## 11 APPENDIX D Specification references

|                                  |                                                                                                                           |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 27: 2015              | Private land mobile radio services                                                                                        |
| 47CFR part 1: 2015               | Practice and procedure                                                                                                    |
| 47CFR part 2: 2015               | Frequency allocations and radio treaty matters; general rules and regulations                                             |
| ANSI C63.2: 1996                 | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications. |
| ANSI/TIA/EIA-603-D:2010          | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                       |
| KDB 935210 D05 v01r01:12.02.2016 | Measurements Guidance for Industrial and Non-consumer Signal Booster, Repeater and Amplifier Devices                      |

## 12 APPENDIX E Test equipment correction factors

Antenna factor  
Active loop antenna  
Model 6502, S/N 2857, HL 0446

| Frequency,<br>MHz | Magnetic antenna factor,<br>dB | Electric antenna factor,<br>dB |
|-------------------|--------------------------------|--------------------------------|
| 0.009             | -32.8                          | 18.7                           |
| 0.010             | -33.8                          | 17.7                           |
| 0.020             | -38.3                          | 13.2                           |
| 0.050             | -41.1                          | 10.4                           |
| 0.075             | -41.3                          | 10.2                           |
| 0.100             | -41.6                          | 9.9                            |
| 0.150             | -41.7                          | 9.8                            |
| 0.250             | -41.6                          | 9.9                            |
| 0.500             | -41.8                          | 9.8                            |
| 0.750             | -41.9                          | 9.7                            |
| 1.000             | -41.4                          | 10.1                           |
| 2.000             | -41.5                          | 10.0                           |
| 3.000             | -41.4                          | 10.2                           |
| 4.000             | -41.4                          | 10.1                           |
| 5.000             | -41.5                          | 10.1                           |
| 10.000            | -41.9                          | 9.6                            |
| 15.000            | -41.9                          | 9.6                            |
| 20.000            | -42.2                          | 9.3                            |
| 25.000            | -42.8                          | 8.7                            |
| 30.000            | -44.0                          | 7.5                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).

**Antenna factor**  
**Biconilog antenna EMCO Model 3141**  
**Ser.No.1011, HL 0604**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|-------------------|----------------------------|-------------------|----------------------------|
| 26                | 7.8                        | 580               | 20.6                       | 1320              | 27.8                       |
| 28                | 7.8                        | 600               | 21.3                       | 1340              | 28.3                       |
| 30                | 7.8                        | 620               | 21.5                       | 1360              | 28.2                       |
| 40                | 7.2                        | 640               | 21.2                       | 1380              | 27.9                       |
| 60                | 7.1                        | 660               | 21.4                       | 1400              | 27.9                       |
| 70                | 8.5                        | 680               | 21.9                       | 1420              | 27.9                       |
| 80                | 9.4                        | 700               | 22.2                       | 1440              | 27.8                       |
| 90                | 9.8                        | 720               | 22.2                       | 1460              | 27.8                       |
| 100               | 9.7                        | 740               | 22.1                       | 1480              | 28.0                       |
| 110               | 9.3                        | 760               | 22.3                       | 1500              | 28.5                       |
| 120               | 8.8                        | 780               | 22.6                       | 1520              | 28.9                       |
| 130               | 8.7                        | 800               | 22.7                       | 1540              | 29.6                       |
| 140               | 9.2                        | 820               | 22.9                       | 1560              | 29.8                       |
| 150               | 9.8                        | 840               | 23.1                       | 1580              | 29.6                       |
| 160               | 10.2                       | 860               | 23.4                       | 1600              | 29.5                       |
| 170               | 10.4                       | 880               | 23.8                       | 1620              | 29.3                       |
| 180               | 10.4                       | 900               | 24.1                       | 1640              | 29.2                       |
| 190               | 10.3                       | 920               | 24.1                       | 1660              | 29.4                       |
| 200               | 10.6                       | 940               | 24.0                       | 1680              | 29.6                       |
| 220               | 11.6                       | 960               | 24.1                       | 1700              | 29.8                       |
| 240               | 12.4                       | 980               | 24.5                       | 1720              | 30.3                       |
| 260               | 12.8                       | 1000              | 24.9                       | 1740              | 30.8                       |
| 280               | 13.7                       | 1020              | 25.0                       | 1760              | 31.1                       |
| 300               | 14.7                       | 1040              | 25.2                       | 1780              | 31.0                       |
| 320               | 15.2                       | 1060              | 25.4                       | 1800              | 30.9                       |
| 340               | 15.4                       | 1080              | 25.6                       | 1820              | 30.7                       |
| 360               | 16.1                       | 1100              | 25.7                       | 1840              | 30.6                       |
| 380               | 16.4                       | 1120              | 26.0                       | 1860              | 30.6                       |
| 400               | 16.6                       | 1140              | 26.4                       | 1880              | 30.6                       |
| 420               | 16.7                       | 1160              | 27.0                       | 1900              | 30.6                       |
| 440               | 17.0                       | 1180              | 27.0                       | 1920              | 30.7                       |
| 460               | 17.7                       | 1200              | 26.7                       | 1940              | 30.9                       |
| 480               | 18.1                       | 1220              | 26.5                       | 1960              | 31.2                       |
| 500               | 18.5                       | 1240              | 26.5                       | 1980              | 31.6                       |
| 520               | 19.1                       | 1260              | 26.5                       | 2000              | 32.0                       |
| 540               | 19.5                       | 1280              | 26.6                       |                   |                            |
| 560               | 19.8                       | 1300              | 27.0                       |                   |                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).



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Antenna factor, HL 4933

**Active Horn Antenna Factor Calibration**

1 GHz to 18 GHz

| <b>Equipment:</b>                                                         |                              |                                          | <b>ACTIVE HORN ANTENNA</b> |                              |                                          |
|---------------------------------------------------------------------------|------------------------------|------------------------------------------|----------------------------|------------------------------|------------------------------------------|
| <b>Model:</b>                                                             |                              |                                          | <b>AHA-118</b>             |                              |                                          |
| <b>Serial Number:</b>                                                     |                              |                                          | <b>701046</b>              |                              |                                          |
| <b>Calibration Distance:</b>                                              |                              |                                          | <b>3 Meter</b>             |                              |                                          |
| <b>Polarization:</b>                                                      |                              |                                          | <b>Horizontal</b>          |                              |                                          |
| <b>Calibration Date:</b>                                                  |                              |                                          | <b>11/12/2014</b>          |                              |                                          |
| Frequency<br>(GHz)                                                        | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) | Frequency<br>(GHz)         | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) |
| 1                                                                         | 40.96                        | -16.47                                   | 10                         | 40.94                        | -1.97                                    |
| 1.5                                                                       | 41.21                        | -14.53                                   | 10.5                       | 40.63                        | -1.06                                    |
| 2                                                                         | 41.44                        | -13.30                                   | 11                         | 40.74                        | -1.50                                    |
| 2.5                                                                       | 41.71                        | -12.87                                   | 11.5                       | 40.65                        | -0.52                                    |
| 3                                                                         | 41.96                        | -12.26                                   | 12                         | 40.76                        | -0.15                                    |
| 3.5                                                                       | 42.14                        | -11.77                                   | 12.5                       | 41.03                        | -0.85                                    |
| 4                                                                         | 42.13                        | -10.91                                   | 13                         | 41.37                        | -0.81                                    |
| 4.5                                                                       | 41.79                        | -9.41                                    | 13.5                       | 41.18                        | 0.05                                     |
| 5                                                                         | 41.44                        | -7.54                                    | 14                         | 40.98                        | 0.36                                     |
| 5.5                                                                       | 40.91                        | -6.47                                    | 14.5                       | 40.81                        | 1.26                                     |
| 6                                                                         | 40.69                        | -5.48                                    | 15                         | 40.65                        | 0.25                                     |
| 6.5                                                                       | 40.64                        | -5.53                                    | 15.5                       | 40.93                        | -1.05                                    |
| 7                                                                         | 40.76                        | -4.12                                    | 16                         | 41.31                        | -1.44                                    |
| 7.5                                                                       | 40.94                        | -3.12                                    | 16.5                       | 40.96                        | -0.80                                    |
| 8                                                                         | 40.68                        | -1.69                                    | 17                         | 40.64                        | -0.02                                    |
| 8.5                                                                       | 40.08                        | -1.71                                    | 17.5                       | 40.57                        | 1.81                                     |
| 9                                                                         | 40.41                        | -1.86                                    | 18                         | 40.08                        | 3.63                                     |
| 9.5                                                                       | 41.21                        | -2.73                                    |                            |                              |                                          |
| Calibration according to ARP 958                                          |                              |                                          |                            |                              |                                          |
| <b>Antenna Factor to be added to receiver reading:</b>                    |                              |                                          |                            |                              |                                          |
| Meter Reading (dBuV) + Antenna Factor (dB/m) = Corrected Reading (dBuV/m) |                              |                                          |                            |                              |                                          |

Antenna factor, HL 4956



## Active Horn Antenna Factor Calibration

18 GHz to 40 GHz

| <b>Equipment:</b>            |                              |                                          | <b>ACTIVE HORN ANTENNA</b> |                              |                                          |
|------------------------------|------------------------------|------------------------------------------|----------------------------|------------------------------|------------------------------------------|
| <b>Model:</b>                |                              |                                          | <b>AHA-840</b>             |                              |                                          |
| <b>Serial Number:</b>        |                              |                                          | <b>105004</b>              |                              |                                          |
| <b>Calibration Distance:</b> |                              |                                          | <b>3 meter</b>             |                              |                                          |
| <b>Polarization:</b>         |                              |                                          | <b>Horizontal</b>          |                              |                                          |
| <b>Calibration Date:</b>     |                              |                                          | <b>1/26/2015</b>           |                              |                                          |
| Frequency<br>(GHz)           | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) | Frequency<br>(GHz)         | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) |
| 18                           | 38.83                        | -1.06                                    | 29.5                       | 42.47                        | -5.33                                    |
| 18.5                         | 39.34                        | -2.65                                    | 30                         | 41.91                        | -4.86                                    |
| 19                           | 39.71                        | -3.88                                    | 30.5                       | 41.60                        | -4.64                                    |
| 19.5                         | 39.87                        | -4.35                                    | 31                         | 41.52                        | -4.60                                    |
| 20                           | 39.98                        | -3.97                                    | 31.5                       | 41.56                        | -4.79                                    |
| 20.5                         | 40.42                        | -3.68                                    | 32                         | 41.80                        | -5.21                                    |
| 21                           | 41.12                        | -4.06                                    | 32.5                       | 42.29                        | -5.54                                    |
| 21.5                         | 41.74                        | -5.46                                    | 33                         | 42.79                        | -5.63                                    |
| 22                           | 42.14                        | -6.22                                    | 33.5                       | 42.88                        | -5.38                                    |
| 22.5                         | 42.35                        | -6.42                                    | 34                         | 42.62                        | -4.76                                    |
| 23                           | 42.50                        | -6.59                                    | 34.5                       | 42.63                        | -4.84                                    |
| 23.5                         | 42.65                        | -6.82                                    | 35                         | 43.15                        | -5.13                                    |
| 24                           | 42.81                        | -7.01                                    | 35.5                       | 43.91                        | -5.83                                    |
| 24.5                         | 42.86                        | -7.37                                    | 36                         | 44.59                        | -6.39                                    |
| 25                           | 42.73                        | -7.53                                    | 36.5                       | 45.04                        | -6.64                                    |
| 25.5                         | 42.77                        | -7.45                                    | 37                         | 45.08                        | -6.40                                    |
| 26                           | 42.85                        | -7.21                                    | 37.5                       | 44.82                        | -5.75                                    |
| 26.5                         | 42.98                        | -7.17                                    | 38                         | 44.16                        | -4.58                                    |
| 27                           | 43.14                        | -7.22                                    | 38.5                       | 42.90                        | -2.66                                    |
| 27.5                         | 43.18                        | -7.32                                    | 39                         | 42.39                        | -1.71                                    |
| 28                           | 43.04                        | -7.10                                    | 39.5                       | 43.76                        | -2.49                                    |
| 28.5                         | 43.01                        | -6.73                                    | 40                         | 45.98                        | -5.21                                    |

Calibration per ANSI C63.5: 2006

**Standard Site Method, Equations 1-6 (3-antenna)**

Corrected Reading (dBμV/m) = Meter Reading (dBμV) + AFE(dB/m)

**Cable loss**  
**Test Cable, Mini-Circuits, CBL-5FT-SMSM+, SMA-SMA, 18 GHz, 1.5 m, S/N 25679**  
**Mini-Circuits, HL 3433**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 10.0              | 0.06              | 9000              | 2.01              |
| 100               | 0.17              | 9500              | 2.06              |
| 500               | 0.41              | 10000             | 2.05              |
| 1000              | 0.58              | 10500             | 2.18              |
| 1500              | 0.72              | 11000             | 2.26              |
| 2000              | 0.86              | 11500             | 2.28              |
| 2500              | 0.96              | 12000             | 2.43              |
| 3000              | 1.04              | 12500             | 2.53              |
| 3500              | 1.13              | 13000             | 2.52              |
| 4000              | 1.23              | 13500             | 2.56              |
| 4500              | 1.31              | 14000             | 2.60              |
| 5000              | 1.41              | 14500             | 2.59              |
| 5500              | 1.49              | 15000             | 2.67              |
| 6000              | 1.55              | 15500             | 2.76              |
| 6500              | 1.63              | 16000             | 2.86              |
| 7000              | 1.71              | 16500             | 2.91              |
| 7500              | 1.78              | 17000             | 2.95              |
| 8000              | 1.86              | 17500             | 3.02              |
| 8500              | 1.92              | 18000             | 3.07              |

**Cable loss**  
**Cable coaxial, Microwave, SMA-SMA, 18 GHz, 1.0 m**  
**Gore, HL 3472**

| Frequency,<br>MHz | Cable<br>loss,<br>dB | Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB |
|-------------------|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.01                 | 5000              | 0.47              | 10200             | 0.72              | 15500             | 0.75              |
| 30                | 0.03                 | 5100              | 0.47              | 10300             | 0.67              | 15600             | 0.89              |
| 50                | 0.04                 | 5200              | 0.47              | 10400             | 0.77              | 15700             | 0.82              |
| 100               | 0.04                 | 5300              | 0.47              | 10500             | 0.67              | 15800             | 0.89              |
| 200               | 0.08                 | 5400              | 0.49              | 10600             | 0.74              | 15900             | 0.89              |
| 300               | 0.11                 | 5500              | 0.48              | 10700             | 0.81              | 16000             | 0.93              |
| 400               | 0.11                 | 5600              | 0.49              | 10800             | 0.77              | 16100             | 0.90              |
| 500               | 0.12                 | 5700              | 0.49              | 10900             | 0.82              | 16200             | 0.92              |
| 600               | 0.14                 | 5800              | 0.51              | 11000             | 0.86              | 16300             | 0.90              |
| 700               | 0.15                 | 5900              | 0.50              | 11100             | 0.78              | 16400             | 0.94              |
| 800               | 0.16                 | 6000              | 0.51              | 11200             | 0.82              | 16500             | 0.93              |
| 900               | 0.18                 | 6100              | 0.53              | 11300             | 0.77              | 16600             | 0.95              |
| 1000              | 0.17                 | 6200              | 0.52              | 11400             | 0.84              | 16700             | 0.98              |
| 1100              | 0.19                 | 6300              | 0.53              | 11500             | 0.74              | 16800             | 1.00              |
| 1200              | 0.22                 | 6400              | 0.54              | 11600             | 0.81              | 16900             | 0.94              |
| 1300              | 0.21                 | 6500              | 0.55              | 11700             | 0.73              | 17000             | 1.00              |
| 1400              | 0.22                 | 6600              | 0.54              | 11800             | 0.75              | 17100             | 0.93              |
| 1500              | 0.23                 | 6700              | 0.57              | 11900             | 0.73              | 17200             | 1.00              |
| 1600              | 0.24                 | 6800              | 0.54              | 12000             | 0.75              | 17300             | 0.93              |
| 1700              | 0.24                 | 6900              | 0.58              | 12100             | 0.66              | 17400             | 0.93              |
| 1800              | 0.25                 | 7000              | 0.58              | 12200             | 0.66              | 17500             | 0.96              |
| 1900              | 0.26                 | 7100              | 0.58              | 12300             | 0.72              | 17600             | 0.94              |
| 2000              | 0.28                 | 7200              | 0.61              | 12400             | 0.64              | 17700             | 0.99              |
| 2100              | 0.27                 | 7300              | 0.59              | 12500             | 0.75              | 17800             | 0.97              |
| 2200              | 0.29                 | 7400              | 0.55              | 12600             | 0.67              | 17900             | 0.90              |
| 2300              | 0.29                 | 7500              | 0.63              | 12700             | 0.75              | 18000             | 0.78              |
| 2400              | 0.30                 | 7600              | 0.60              | 12800             | 0.66              |                   |                   |
| 2500              | 0.30                 | 7700              | 0.61              | 12900             | 0.81              |                   |                   |
| 2600              | 0.32                 | 7800              | 0.64              | 13000             | 0.75              |                   |                   |
| 2700              | 0.32                 | 7900              | 0.60              | 13100             | 0.80              |                   |                   |
| 2800              | 0.33                 | 8000              | 0.58              | 13200             | 0.80              |                   |                   |
| 2900              | 0.34                 | 8100              | 0.61              | 13300             | 0.81              |                   |                   |
| 3000              | 0.34                 | 8200              | 0.62              | 13400             | 0.88              |                   |                   |
| 3100              | 0.35                 | 8300              | 0.62              | 13500             | 0.82              |                   |                   |
| 3200              | 0.35                 | 8400              | 0.68              | 13600             | 1.00              |                   |                   |
| 3300              | 0.36                 | 8500              | 0.63              | 13700             | 0.93              |                   |                   |
| 3400              | 0.37                 | 8600              | 0.61              | 13800             | 0.86              |                   |                   |
| 3500              | 0.38                 | 8700              | 0.63              | 13900             | 0.84              |                   |                   |
| 3600              | 0.38                 | 8800              | 0.62              | 14000             | 1.00              |                   |                   |
| 3700              | 0.40                 | 8900              | 0.64              | 14100             | 0.86              |                   |                   |
| 3800              | 0.40                 | 9000              | 0.62              | 14200             | 0.98              |                   |                   |
| 3900              | 0.40                 | 9100              | 0.64              | 14300             | 0.99              |                   |                   |
| 4000              | 0.40                 | 9200              | 0.62              | 14400             | 0.82              |                   |                   |
| 4100              | 0.43                 | 9300              | 0.62              | 14600             | 0.89              |                   |                   |
| 4200              | 0.43                 | 9400              | 0.62              | 14700             | 0.84              |                   |                   |
| 4300              | 0.43                 | 9500              | 0.63              | 14800             | 0.90              |                   |                   |
| 4400              | 0.44                 | 9600              | 0.64              | 14900             | 0.89              |                   |                   |
| 4500              | 0.45                 | 9700              | 0.60              | 15000             | 0.89              |                   |                   |
| 4600              | 0.45                 | 9800              | 0.65              | 15100             | 0.86              |                   |                   |
| 4700              | 0.46                 | 9900              | 0.60              | 15200             | 0.87              |                   |                   |
| 4800              | 0.46                 | 10000             | 0.67              | 15300             | 0.86              |                   |                   |
| 4900              | 0.46                 | 10100             | 0.69              | 15400             | 0.87              |                   |                   |

**Cable loss**  
**Cable coaxial, Microwave, SMA-SMA, 18 GHz, 0.6 m**  
**Gore, HL 3474**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 10             | 0.00           | 4800           | 0.43           | 9800           | 0.63           | 14900          | 0.89           |
| 30             | 0.02           | 4900           | 0.44           | 9900           | 0.58           | 15000          | 0.96           |
| 50             | 0.03           | 5000           | 0.44           | 10000          | 0.67           | 15100          | 0.90           |
| 100            | 0.03           | 5100           | 0.44           | 10100          | 0.69           | 15200          | 0.96           |
| 200            | 0.07           | 5200           | 0.44           | 10200          | 0.72           | 15300          | 0.90           |
| 300            | 0.10           | 5300           | 0.44           | 10300          | 0.68           | 15400          | 0.95           |
| 400            | 0.11           | 5400           | 0.46           | 10400          | 0.75           | 15500          | 0.84           |
| 500            | 0.12           | 5500           | 0.45           | 10500          | 0.64           | 15600          | 0.95           |
| 600            | 0.14           | 5600           | 0.46           | 10600          | 0.75           | 15700          | 0.82           |
| 700            | 0.14           | 5700           | 0.47           | 10700          | 0.80           | 15800          | 0.94           |
| 800            | 0.15           | 5800           | 0.48           | 10800          | 0.77           | 15900          | 0.91           |
| 900            | 0.18           | 5900           | 0.48           | 10900          | 0.80           | 16000          | 0.91           |
| 1000           | 0.17           | 6000           | 0.49           | 11000          | 0.79           | 16100          | 0.86           |
| 1100           | 0.18           | 6100           | 0.51           | 11100          | 0.70           | 16200          | 0.86           |
| 1200           | 0.21           | 6200           | 0.50           | 11200          | 0.76           | 16300          | 0.86           |
| 1300           | 0.20           | 6300           | 0.50           | 11300          | 0.70           | 16400          | 0.84           |
| 1400           | 0.21           | 6400           | 0.51           | 11400          | 0.73           | 16500          | 0.83           |
| 1500           | 0.22           | 6500           | 0.51           | 11500          | 0.67           | 16600          | 0.87           |
| 1600           | 0.23           | 6600           | 0.52           | 11600          | 0.74           | 16700          | 0.90           |
| 1700           | 0.23           | 6700           | 0.54           | 11700          | 0.64           | 16800          | 0.91           |
| 1800           | 0.24           | 6800           | 0.51           | 11800          | 0.68           | 16900          | 0.90           |
| 1900           | 0.25           | 6900           | 0.55           | 11900          | 0.67           | 17000          | 0.97           |
| 2000           | 0.27           | 7000           | 0.54           | 12000          | 0.71           | 17100          | 0.94           |
| 2100           | 0.26           | 7100           | 0.55           | 12100          | 0.64           | 17200          | 1.01           |
| 2200           | 0.28           | 7200           | 0.55           | 12200          | 0.64           | 17300          | 0.97           |
| 2300           | 0.28           | 7300           | 0.54           | 12300          | 0.71           | 17400          | 1.02           |
| 2400           | 0.28           | 7400           | 0.52           | 12400          | 0.62           | 17500          | 1.06           |
| 2500           | 0.29           | 7500           | 0.58           | 12500          | 0.80           | 17600          | 1.01           |
| 2600           | 0.30           | 7600           | 0.56           | 12600          | 0.69           | 17700          | 1.10           |
| 2700           | 0.31           | 7700           | 0.57           | 12700          | 0.85           | 17800          | 1.16           |
| 2800           | 0.32           | 7800           | 0.62           | 12800          | 0.67           | 17900          | 1.12           |
| 2900           | 0.32           | 7900           | 0.57           | 12900          | 0.84           | 18000          | 1.00           |
| 3000           | 0.32           | 8000           | 0.55           | 13000          | 0.76           |                |                |
| 3100           | 0.33           | 8100           | 0.59           | 13100          | 0.85           |                |                |
| 3200           | 0.33           | 8200           | 0.59           | 13200          | 0.77           |                |                |
| 3300           | 0.35           | 8300           | 0.60           | 13300          | 0.82           |                |                |
| 3400           | 0.35           | 8400           | 0.66           | 13400          | 0.79           |                |                |
| 3500           | 0.36           | 8500           | 0.60           | 13500          | 0.82           |                |                |
| 3600           | 0.36           | 8600           | 0.59           | 13600          | 0.91           |                |                |
| 3700           | 0.37           | 8700           | 0.59           | 13700          | 0.81           |                |                |
| 3800           | 0.38           | 8800           | 0.58           | 13800          | 0.76           |                |                |
| 3900           | 0.38           | 8900           | 0.60           | 13900          | 0.75           |                |                |
| 4000           | 0.38           | 9000           | 0.60           | 14000          | 0.81           |                |                |
| 4100           | 0.41           | 9100           | 0.60           | 14100          | 0.77           |                |                |
| 4200           | 0.40           | 9200           | 0.57           | 14200          | 0.89           |                |                |
| 4300           | 0.41           | 9300           | 0.57           | 14300          | 0.92           |                |                |
| 4400           | 0.42           | 9400           | 0.58           | 14400          | 0.78           |                |                |
| 4500           | 0.43           | 9500           | 0.60           | 14600          | 0.85           |                |                |
| 4600           | 0.42           | 9600           | 0.62           | 14700          | 0.83           |                |                |
| 4700           | 0.44           | 9700           | 0.58           | 14800          | 0.95           |                |                |

**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A**  
**HL 3901**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.09              | 9500              | 4.29              | 21000             | 6.67              |
| 100               | 0.41              | 10000             | 4.40              | 22000             | 6.92              |
| 500               | 0.93              | 10500             | 4.52              | 23000             | 7.00              |
| 1000              | 1.33              | 11000             | 4.64              | 24000             | 7.18              |
| 1500              | 1.63              | 11500             | 4.76              | 25000             | 7.29              |
| 2000              | 1.90              | 12000             | 4.87              | 26000             | 7.55              |
| 2500              | 2.12              | 12500             | 4.99              | 27000             | 7.70              |
| 3000              | 2.33              | 13000             | 5.11              | 28000             | 7.88              |
| 3500              | 2.50              | 13500             | 5.20              | 29000             | 8.02              |
| 4000              | 2.67              | 14000             | 5.31              | 30000             | 8.15              |
| 4500              | 2.82              | 14500             | 5.42              | 31000             | 8.35              |
| 5000              | 2.99              | 15000             | 5.51              | 32000             | 8.40              |
| 5500              | 3.16              | 15500             | 5.58              | 33000             | 8.62              |
| 6000              | 3.32              | 16000             | 5.68              | 34000             | 8.73              |
| 6500              | 3.51              | 16500             | 5.78              | 35000             | 8.78              |
| 7000              | 3.65              | 17000             | 5.91              | 36000             | 8.94              |
| 7500              | 3.79              | 17500             | 5.99              | 37000             | 9.21              |
| 8000              | 3.92              | 18000             | 6.07              | 38000             | 9.37              |
| 8500              | 4.04              | 19000             | 6.36              | 39000             | 9.45              |
| 9000              | 4.18              | 20000             | 6.49              | 40000             | 9.52              |

**Cable loss**  
**Test cable, Mini-Circuits, S/N 0755A, 18 GHz, 4.6 m, N/M - N/M**  
**APC-15FT-NMNM+, HL 4278**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 10             | 0.24           | 4900           | 4.19           | 10000          | 6.47           | 15100          | 8.33           |
| 30             | 0.26           | 5000           | 4.25           | 10100          | 6.50           | 15200          | 8.35           |
| 50             | 0.34           | 5100           | 4.29           | 10200          | 6.52           | 15300          | 8.37           |
| 100            | 0.50           | 5200           | 4.32           | 10300          | 6.57           | 15400          | 8.40           |
| 200            | 0.72           | 5300           | 4.38           | 10400          | 6.59           | 15500          | 8.42           |
| 300            | 0.90           | 5400           | 4.41           | 10500          | 6.61           | 15600          | 8.46           |
| 400            | 1.06           | 5500           | 4.46           | 10600          | 6.64           | 15700          | 8.50           |
| 500            | 1.20           | 5600           | 4.51           | 10700          | 6.64           | 15800          | 8.52           |
| 600            | 1.32           | 5700           | 4.56           | 10800          | 6.65           | 15900          | 8.56           |
| 700            | 1.44           | 5800           | 4.59           | 10900          | 6.68           | 16000          | 8.61           |
| 800            | 1.54           | 5900           | 4.64           | 11000          | 6.68           | 16100          | 8.64           |
| 900            | 1.64           | 6000           | 4.69           | 11100          | 6.69           | 16200          | 8.66           |
| 1000           | 1.74           | 6100           | 4.72           | 11200          | 6.70           | 16300          | 8.70           |
| 1100           | 1.83           | 6200           | 4.77           | 11300          | 6.74           | 16400          | 8.73           |
| 1200           | 1.92           | 6300           | 4.80           | 11400          | 6.78           | 16500          | 8.74           |
| 1300           | 2.01           | 6400           | 4.83           | 11500          | 6.81           | 16600          | 8.75           |
| 1400           | 2.09           | 6500           | 4.89           | 11600          | 6.84           | 16700          | 8.78           |
| 1500           | 2.18           | 6600           | 4.90           | 11700          | 6.87           | 16800          | 8.79           |
| 1600           | 2.25           | 6700           | 4.95           | 11800          | 6.92           | 16900          | 8.81           |
| 1700           | 2.33           | 6800           | 5.01           | 11900          | 6.98           | 17000          | 8.85           |
| 1800           | 2.39           | 6900           | 4.99           | 12000          | 7.02           | 17100          | 8.90           |
| 1900           | 2.47           | 7000           | 5.04           | 12100          | 7.08           | 17200          | 8.95           |
| 2000           | 2.53           | 7100           | 5.11           | 12200          | 7.15           | 17300          | 8.99           |
| 2100           | 2.60           | 7200           | 5.14           | 12300          | 7.20           | 17400          | 9.03           |
| 2200           | 2.67           | 7300           | 5.21           | 12400          | 7.26           | 17500          | 9.07           |
| 2300           | 2.73           | 7400           | 5.29           | 12500          | 7.31           | 17600          | 9.11           |
| 2400           | 2.80           | 7500           | 5.33           | 12600          | 7.36           | 17700          | 9.15           |
| 2500           | 2.87           | 7600           | 5.38           | 12700          | 7.41           | 17800          | 9.19           |
| 2600           | 2.93           | 7700           | 5.46           | 12800          | 7.46           | 17900          | 9.24           |
| 2700           | 3.00           | 7800           | 5.52           | 12900          | 7.51           | 18000          | 9.28           |
| 2800           | 3.06           | 7900           | 5.58           | 13000          | 7.55           |                |                |
| 2900           | 3.12           | 8000           | 5.64           | 13100          | 7.59           |                |                |
| 3000           | 3.18           | 8100           | 5.69           | 13200          | 7.65           |                |                |
| 3100           | 3.24           | 8200           | 5.75           | 13300          | 7.69           |                |                |
| 3200           | 3.30           | 8300           | 5.80           | 13400          | 7.72           |                |                |
| 3300           | 3.35           | 8400           | 5.84           | 13500          | 7.78           |                |                |
| 3400           | 3.42           | 8500           | 5.90           | 13600          | 7.82           |                |                |
| 3500           | 3.46           | 8600           | 5.97           | 13700          | 7.86           |                |                |
| 3600           | 3.52           | 8700           | 5.99           | 13800          | 7.91           |                |                |
| 3700           | 3.57           | 8800           | 6.04           | 13900          | 7.96           |                |                |
| 3800           | 3.61           | 8900           | 6.10           | 14000          | 8.01           |                |                |
| 3900           | 3.67           | 9000           | 6.13           | 14100          | 8.06           |                |                |
| 4000           | 3.71           | 9100           | 6.17           | 14200          | 8.10           |                |                |
| 4100           | 3.77           | 9200           | 6.23           | 14300          | 8.13           |                |                |
| 4200           | 3.83           | 9300           | 6.27           | 14400          | 8.16           |                |                |
| 4300           | 3.89           | 9400           | 6.30           | 14500          | 8.19           |                |                |
| 4400           | 3.94           | 9500           | 6.35           | 14600          | 8.21           |                |                |
| 4500           | 4.00           | 9600           | 6.37           | 14700          | 8.23           |                |                |
| 4600           | 4.05           | 9700           | 6.40           | 14800          | 8.26           |                |                |
| 4700           | 4.10           | 9800           | 6.44           | 14900          | 8.28           |                |                |
| 4800           | 4.16           | 9900           | 6.45           | 15000          | 8.30           |                |                |

**Cable loss**  
**Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,**  
**NC29-N1N1-244S/N 12025101 003,**  
**HL 4353**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 50                | 0.20              | 9000              | 2.71              |
| 100               | 0.27              | 9500              | 2.81              |
| 300               | 0.47              | 10000             | 2.90              |
| 500               | 0.61              | 10500             | 2.97              |
| 1000              | 0.87              | 11000             | 3.06              |
| 1500              | 1.07              | 11500             | 3.13              |
| 2000              | 1.24              | 12000             | 3.20              |
| 2500              | 1.39              | 12500             | 3.26              |
| 3000              | 1.53              | 13000             | 3.34              |
| 3500              | 1.65              | 13500             | 3.39              |
| 4000              | 1.77              | 14000             | 3.47              |
| 4500              | 1.89              | 14500             | 3.54              |
| 5000              | 1.99              | 15000             | 3.62              |
| 5500              | 2.07              | 15500             | 3.69              |
| 6000              | 2.20              | 16000             | 3.76              |
| 6500              | 2.30              | 16500             | 3.83              |
| 7000              | 2.39              | 17000             | 3.86              |
| 7500              | 2.51              | 17500             | 3.94              |
| 8000              | 2.58              | 18000             | 4.02              |
| 8500              | 2.65              |                   |                   |

**Cable loss**  
**RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,**  
**SF102EA/11SK/11SK/5500MM, S/N 502494/2EA**  
**HL 5112**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 100               | 0.69              | 20500             | 10.18             |
| 200               | 0.97              | 21000             | 10.32             |
| 300               | 1.18              | 21500             | 10.47             |
| 500               | 1.52              | 22000             | 10.60             |
| 1000              | 2.14              | 22500             | 10.75             |
| 1500              | 2.62              | 23000             | 10.87             |
| 2000              | 3.03              | 23500             | 11.00             |
| 2500              | 3.40              | 24000             | 11.12             |
| 3000              | 3.73              | 24500             | 11.23             |
| 3500              | 4.04              | 25000             | 11.35             |
| 4000              | 4.33              | 25500             | 11.52             |
| 4500              | 4.60              | 26000             | 11.64             |
| 5000              | 4.86              | 26500             | 11.73             |
| 5500              | 5.10              | 27000             | 11.84             |
| 6000              | 5.34              | 27500             | 11.93             |
| 6500              | 5.57              | 28000             | 12.05             |
| 7000              | 5.79              | 28500             | 12.19             |
| 7500              | 6.00              | 29000             | 12.33             |
| 8000              | 6.21              | 29500             | 12.44             |
| 8500              | 6.43              | 30000             | 12.53             |
| 9000              | 6.62              | 30500             | 12.58             |
| 9500              | 6.82              | 31000             | 12.71             |
| 10000             | 7.01              | 31500             | 12.86             |
| 10500             | 7.17              | 32000             | 13.00             |
| 11000             | 7.34              | 32500             | 13.11             |
| 11500             | 7.51              | 33000             | 13.24             |
| 12000             | 7.68              | 33500             | 13.33             |
| 12500             | 7.84              | 34000             | 13.44             |
| 13000             | 8.00              | 34500             | 13.58             |
| 13500             | 8.16              | 35000             | 13.69             |
| 14000             | 8.32              | 35500             | 13.81             |
| 14500             | 8.48              | 36000             | 13.93             |
| 15000             | 8.63              | 36500             | 14.05             |
| 15500             | 8.77              | 37000             | 14.24             |
| 16000             | 8.92              | 37500             | 14.28             |
| 16500             | 9.08              | 38000             | 14.38             |
| 17000             | 9.23              | 38500             | 14.50             |
| 17500             | 9.37              | 39000             | 14.61             |
| 18000             | 9.51              | 39500             | 14.70             |
| 18500             | 9.66              | 40000             | 14.83             |
| 19000             | 9.78              |                   |                   |
| 19500             | 9.92              |                   |                   |
| 20000             | 10.07             |                   |                   |

## 13 APPENDIX F Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| AM             | amplitude modulation                        |
| AVRG           | average (detector)                          |
| BB             | broad band                                  |
| cm             | centimeter                                  |
| dB             | decibel                                     |
| dBm            | decibel referred to one milliwatt           |
| dB( $\mu$ V)   | decibel referred to one microvolt           |
| dB( $\mu$ V/m) | decibel referred to one microvolt per meter |
| dB( $\mu$ A)   | decibel referred to one microampere         |
| DC             | direct current                              |
| EIRP           | equivalent isotropically radiated power     |
| ERP            | effective radiated power                    |
| EUT            | equipment under test                        |
| F              | frequency                                   |
| GHz            | gigahertz                                   |
| GND            | ground                                      |
| H              | height                                      |
| HL             | Hermon laboratories                         |
| Hz             | hertz                                       |
| k              | kilo                                        |
| kHz            | kilohertz                                   |
| LO             | local oscillator                            |
| m              | meter                                       |
| MHz            | megahertz                                   |
| min            | minute                                      |
| mm             | millimeter                                  |
| ms             | millisecond                                 |
| $\mu$ s        | microsecond                                 |
| NA             | not applicable                              |
| NB             | narrow band                                 |
| OATS           | open area test site                         |
| $\Omega$       | Ohm                                         |
| QP             | quasi-peak                                  |
| RE             | radiated emission                           |
| RF             | radio frequency                             |
| rms            | root mean square                            |
| Rx             | receive                                     |
| s              | second                                      |
| T              | temperature                                 |
| Tx             | transmit                                    |
| V              | volt                                        |

END OF DOCUMENT