# RADIO TEST REPORT

## No. 1713846STO-002, Ed. 2

## RF Performance

### EQUIPMENT UNDER TEST

| | |
|---|---|
| Equipment: | Remote head |
| Type/Model: | DDU-850 |
| Manufacturer: | Deltanode Solutions AB |
| Tested by request of: | Deltanode Solutions AB |

### SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

47 CFR Part 2, subpart J, 47 CFR Part 22 Subpart H

RSS-131 Issue 3, RSS-132 Issue 3,

RSS-GEN Issue 4 (2014): General requirements of compliance of radio apparatus (2014).

For details, see clause 2 – 4.

Date of issue: 2018-05-22

Tested by: Matti Virkki

Approved by: Stefan Andersson

**Revision History**

| Edition | Date | Description | Changes |
|---|---|---|---|
| 1 | 2017-12-29 | First release | |
| **2** | **2018-05-22** | **2$^{na}$ release** | **Change of model name. Typing error corrections** |

**CONTENTS**

## 1 CLIENT INFORMATION

The EUT has been tested by request of

| | |
|---|---|
| Company | Deltanode Solutions AB<br>Hammarby fabriksväg 61 6tr<br>120 33 Stockholm<br>Sweden |
| Name of contact | Daniel Kerek |

## 2 EQUIPMENT UNDER TEST (EUT)

### 2.1 Identification of the EUT

| | | |
|---|---|---|
| Equipment: | Remote head | |
| Tested Model: | DDU-850 | |
| Brand name: | Deltanode Solutions AB | |
| Serial number: | 999895 | |
| Manufacturer: | Deltanode Solutions AB | |
| Transmitter frequency range: | 869 – 894 MHz MHz | |
| Receiver frequency range: | 824 – 849 MHz | |
| Frequency agile or hopping: | ☐ Yes | ☒ No |
| Antenna: | ☐ Internal antenna | ☒ External antenna |
| Antenna connector: | ☐ None, internal antenna | ☒ Yes, N |
| Rating RF output power: | +46 dBm rms | |
| Rated gain | +67 dB | |
| Type of modulation: | Tested with GMSK, QPSK | |
| Temperature range: | ☐ Category I (General): -20°C to +55°C<br>☐ Category II (Portable equipment): -10°C to +55°C<br>☐ Category III (Equipment for normal indoor use): +5°C to +35°C<br>☒ Other: <-30°C to +55°C | |
| Power rating: | 120 V, 60 Hz | |
| Transmitter standby mode supported: | ☒ Yes | ☐ No |

## 2.2 Additional information about the EUT

The EUT consists of the following hardware and firmware:

| Unit | Type |
|---|---|
| PA Type | 14:01 Multisystem DAPD 850MHz band ver. 0.0 prod. 2015W45 SN:0001-00108 |
| PA HW-version | KS50.1 P1A 2015W45 LH00108 |
| PA Bootloader | BF002007 0.0.0p Boot DAPD 2015-11-10 17:29:27 |
| PA Application | AF002009 0.0.1p DAPD 2016-11-03 16:37:24 |
| PA Loaded ver | AF002009 0.0.1p DAPD 2016-11-03 16:37:24 |
| Available PA upgrade | AF002009 0.0.1 DAPD 2016-11-07 16:17:46 |
| Linearizer version | HW 94.4.2, FW 4.1.03.08, band 04(Low) |
| Available Linearizer upgrade | Exists, 57343 bytes, CRC 8A5Bh, LRC 00h, key 5394h |
| PA SWL Status | Idle |
| VGA Type | 82:01 Multisystem VGA2 850MHz band ver. 0.0 prod. 2016W36 SN:0004-00111 |
| VGA HW-version | KS55.9 P1A 2016W36 BH00111 |
| VGA Bootloader | BF002008 0.0.0 Boot VGA2 2016-04-20 14:58:25 |
| VGA Application | AF002011 0.0.0 VGA2 2016-09-29 10:19:30 |

## 2.3 Peripheral equipment

Peripheral equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

| Equipment | Type / Model | Manufacturer |
|---|---|---|
| Fiber Optical Interface | FOI | Deltanode Solutions AB |
| Ethernet gateway | | Deltanode Solutions AB |
| PC | | Dell |

## 2.4 Test signals

Continuous transmission on full power
As requested in KDB 935210 D05 V01r01

Narrow band signal: GSM with GMSK modulation
Wide band signals : AWGN 4.11 MHz 99% OBW

# 3 TEST SPECIFICATIONS

## 3.1 Standards

Requirements:
47 CFR Part 2 subpart J , Part 22 subpart H
RSS-131 Issue 3, RSS-132 Issue 3

Test methods in:

KDB 935210 D05 Industrial booster Basic measurement

ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters Used in License Radio Services

## 3.2 Additions, deviations and exclusions from standards and accreditation

RSS-131 Issue 3 and RSS-132 Issue 3 are not within Intertek Semko's accreditation scope.
No other additions, deviations or exclusions have been made from standards and accreditation.

## 3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

| Measurement Chamber | Type of chamber | IC Site filing # |
|---|---|---|
| BJÖRK HALLEN | Semi-anechoic 3 m | 2042G-1 |

## 3.4 Mode of operation during the test

The EUT was tested with 120 V, 60 Hz.

## 4 TEST SUMMARY

The results in this report apply only to sample tested:

| Standard | Description | Result |
|---|---|---|
| | **Emission** | |
| **§2.1046**<br>**§27.50**<br><br>**RSS-GEN 6.12**<br>**RSS-131 5.2.3**<br>**RSS-139** | **RF output power, AGC threshold, linearity and amplifier gain**<br><br>The EUT complies with the limits. | **PASS** |
| **§2.1047**<br><br>**RSS-131 5.2.2**<br>**RSS-139** | **Modulation characteristics input versus output signal comparison**<br><br>The EUT complies with the limits. | **PASS** |
| **§2.1049**<br><br>**RSS-GEN 6.6**<br>**RSS-131 5.2.1** | **Occupied bandwidth Out of band rejection**<br><br>The EUT complies with the limits. | **PASS** |
| **§2.1051**<br>**§27.53**<br><br>**RSS-GEN 6.13**<br>**RSS-139** | **Spurious emissions, Intermodulation and band edge measurements at antenna terminals**<br><br>The EUT complies with the limits. | **PASS** |
| **§2.1053**<br>**§27.53**<br><br>**RSS-GEN 6.13**<br>**RSS-139** | **Field strength of spurious radiation**<br><br>The EUT complies with the limits. | **PASS** |
| **§2.1055**<br>**§27.54**<br>**KDB935210 D05 v01r01 3.7**<br><br>**RSS-GEN 6.11**<br>**RSS-131 5.2.4** | **Frequency stability**<br><br>The EUT does not have input signal processing capability | **Not Applicable** |

## 5 AGC TRESHOLD, RF OUTPUT POWER AND LINEARITY

| | | | |
|---|---|---|---|
| Date of test: | 2017-11-02 | Test location: | EMC Center |
| EUT Serial: | - | Ambient temp. ˚C | 21˚C |
| Tested by: | MTV | Relative humidity | 43 % |
| Test result: | Pass | Margin: | 10.5 dB |

### 5.1 Requirement

Reference: CFR 47 §2.1049, §22.913(a), KDB 935210 D05 clauses 3.2 and 3.5
RSS-131 Clauses 5.2.3 and 6.2, RSS-132 clause 5.4

### 5.2 Test set-up

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to signal analyser via rf cables and a directional coupler.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

The output power was measured with EUT amplification set to 67 dB and input signal was increased until Automatic Gain Control threshold was reached but did not affect the gain. The EUT output response was monitored when input signal level was increased and the response is linear until AGC threshold is reached.

The test was then repeated with 3 dB higher input signal level so that AGC limited the gain.

The peak power was measured using signal analyser's CCDF measurement function. The value that is exceeded less than 0.1% time is reported as a peak to average ratio.

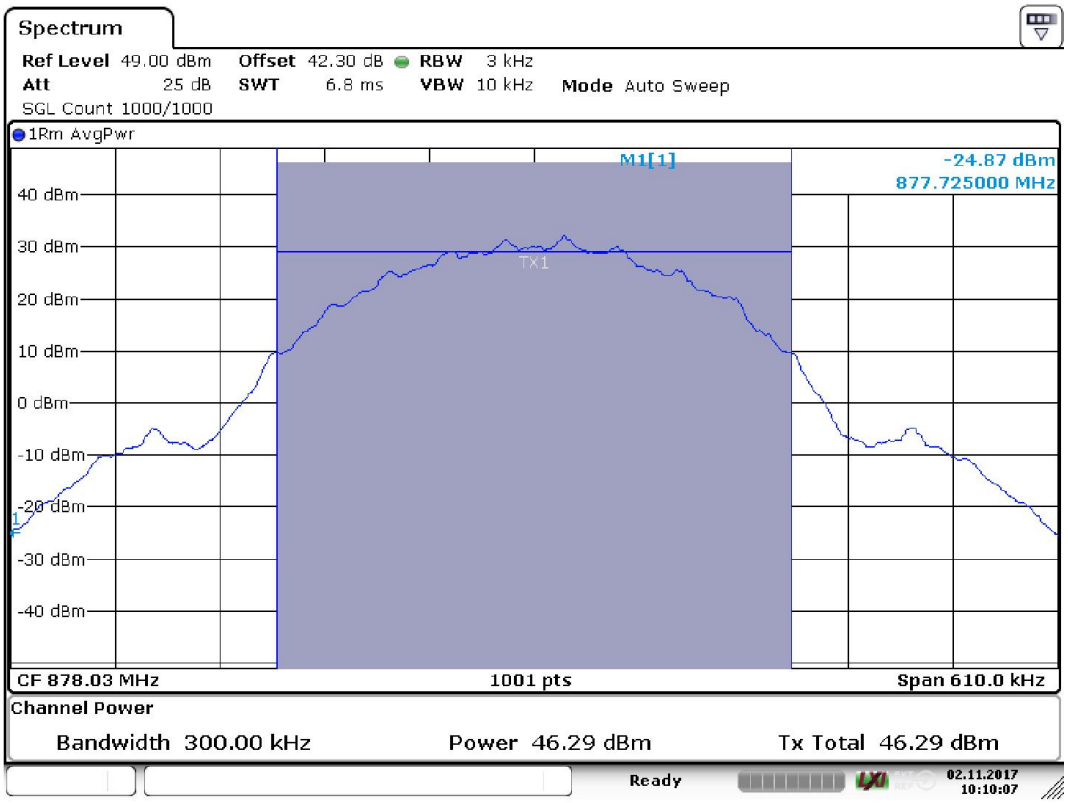
### 5.3 Test data

AWS GSM

| Frequency MHz | Average power dBm | Automatic level control | Limit ERP dBm | Peak to avg ratio dB | Peak to avg ratio limit dB |
|---|---|---|---|---|---|
| 878.03 | 46.3 | off | 57 | 0.6 | NA |
| 878.03 | 46.5 | on | 57 | 0.6 | NA |

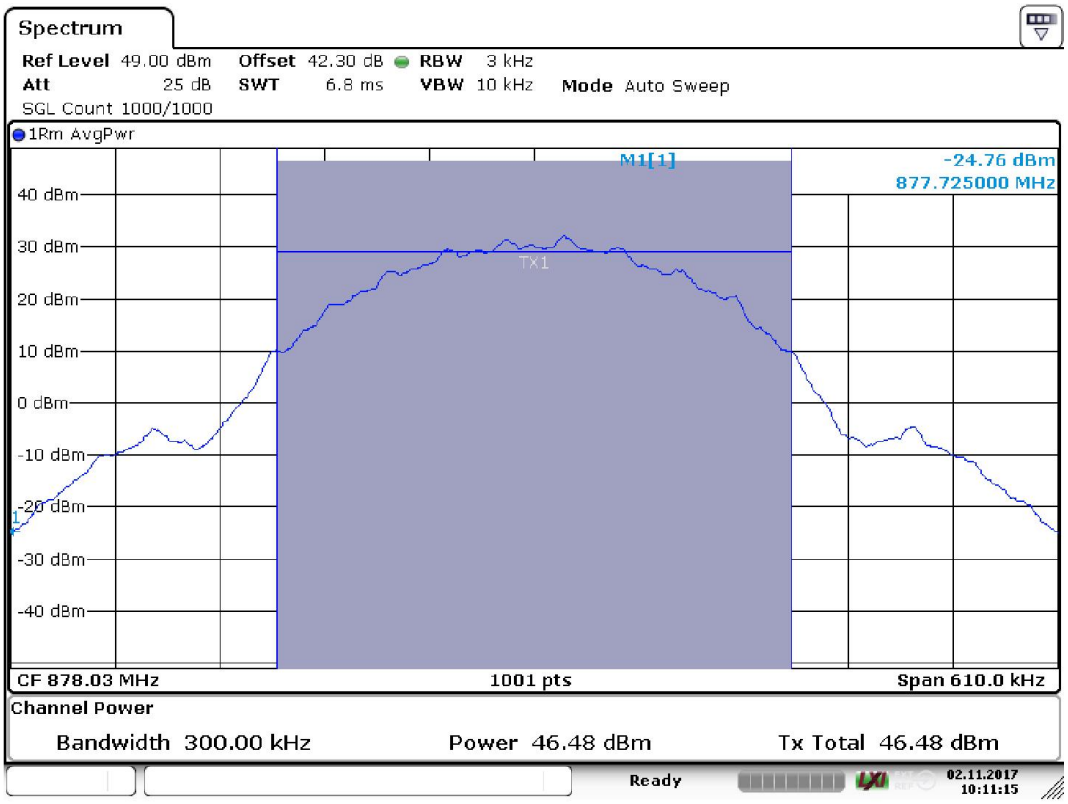
AWS WCDMA

| Frequency MHz | Average power dBm | Automatic level control | Limit ERP dBm | Peak to avg ratio dB | Peak to avg ratio limit dB |
|---|---|---|---|---|---|
| 878.03 | 46.1 | off | 57 | 4.7 | 13 |
| 878.03 | 46.2 | on | 57 | 4.6 | 13 |




Date: 2.NOV.2017 10:10:07

GSM AGC off

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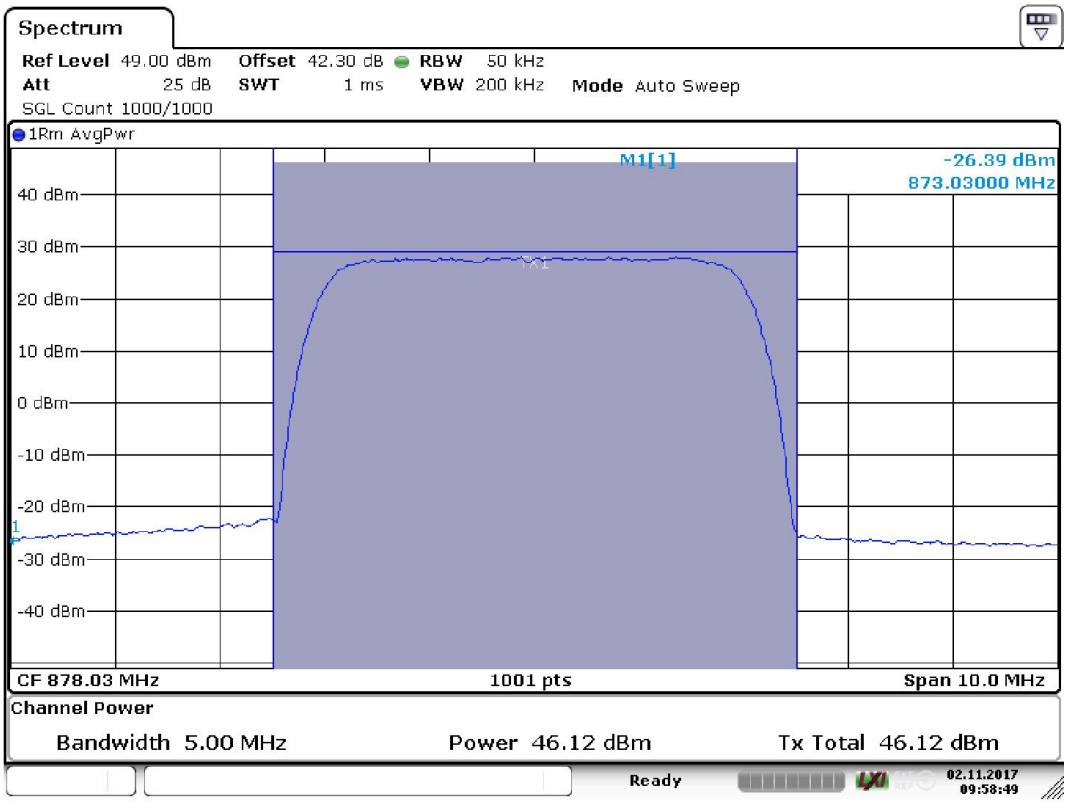
GSM AGC on

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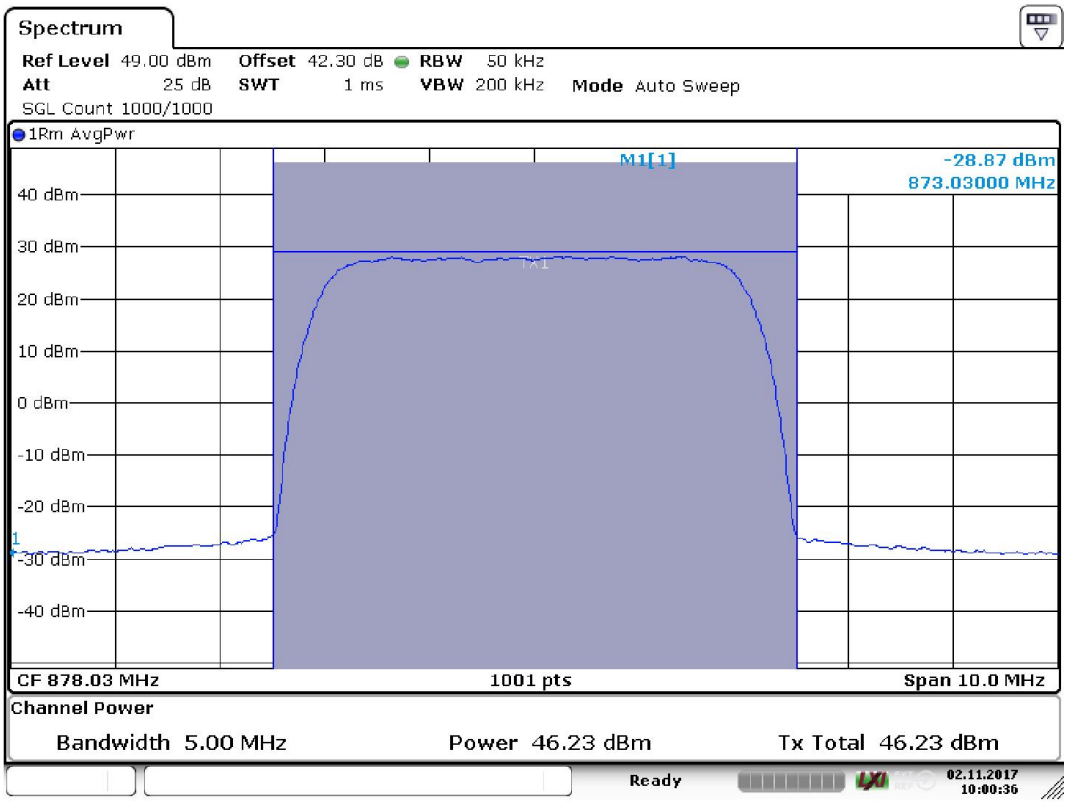
AWGN AGC off




Date: 2.NOV.2017 10:00:36

AWGN AGC on

### 5.4 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Spectrum analyser | Rohde & Schwarz | FSV | 32594 | 7/2018 |
| Rf-attenuator | Narda | 776B-10 | 8337 | 7/2018 |
| Rf-attenuator | Huber Suhner | 5920_N-50-010/199_N | 32697 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39076 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39077 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39079 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMIQ03B | 12792 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMBV100 | 32593 | 7/2018 |

## 6 OCCUPIED BANDWIDTH INPUT VS OUTPUT COMPARISON

| | | | |
|---|---|---|---|
| Date of test: | 2017-10-05 | Test location: | EMC Center |
| EUT Serial: | 999895 | Ambient temp. ˚C | 21 ˚C |
| Tested by: | MTV | Relative humidity | 37 % |
| Test result: | Pass | Margin: | -- |

### 6.1 Requirement

KDB 935219 D05:
The spectral shape of the rf-output shall look similar to input for all modulations.

RSS-131 5.2.2:
The spectral growth of the 99 % bandwidth of the output signal shall be less than 5% of the input signal spectrum.

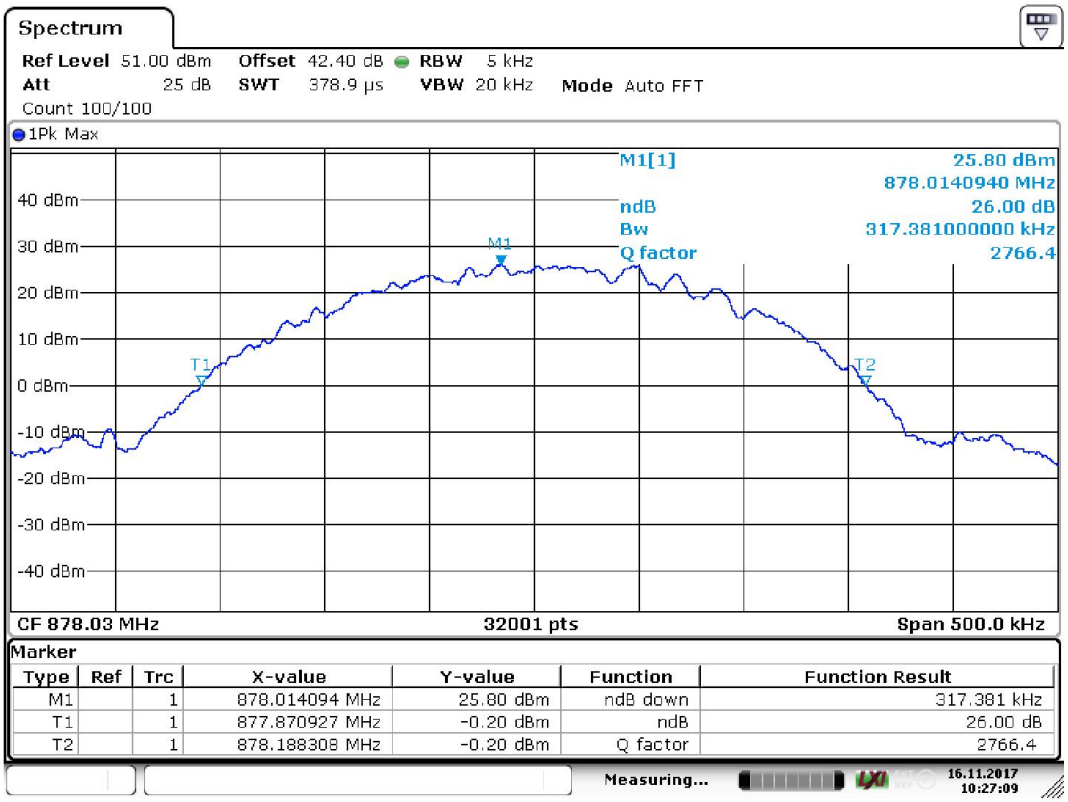
### 6.2 Test set-up

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to signal analyser via rf cables and a directional coupler.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

The 99% occupied bandwidth was measured using spectrum analyser's occupied bandwidth function.
The EUT was set to use 60 dB gain and input signal was adjusted so that Automatic Gain Control did not yet limit the output power.
The test was then repeated with higher input signal level so that AGC limited the output power.
Finally occupied bandwidth of signal generator was measured and input signal output was compared to EUT outputs.

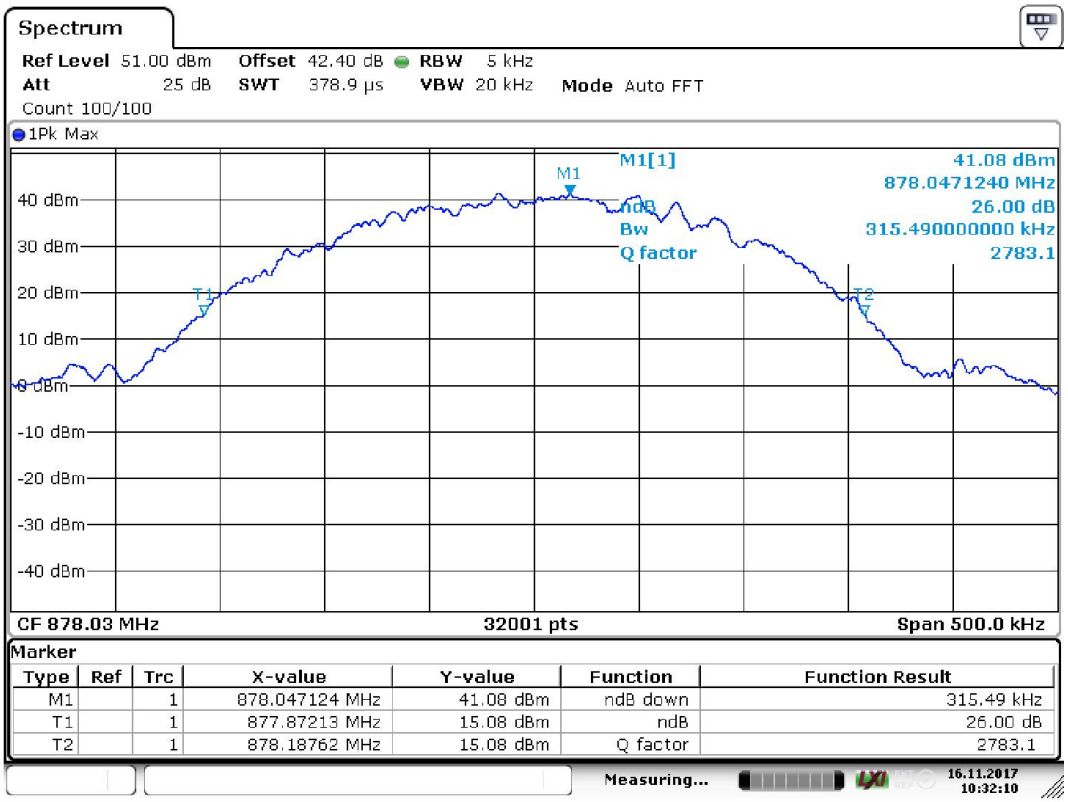
### 6.3 Test data

| Frequency MHz | Signal type | 99% Occupied band width Input (kHz) | 99% Occupied band width output (kHz) | 99% Occupied band width output with AGC (kHz) | Difference % |
|---|---|---|---|---|---|
| 878.03 | GSM | 317.38 | 315.48 | 317.37 | 0.0 |
| 878.03 | WCDMA | 4603.36 | 4609.54 | 4565.29 | 0.2 |



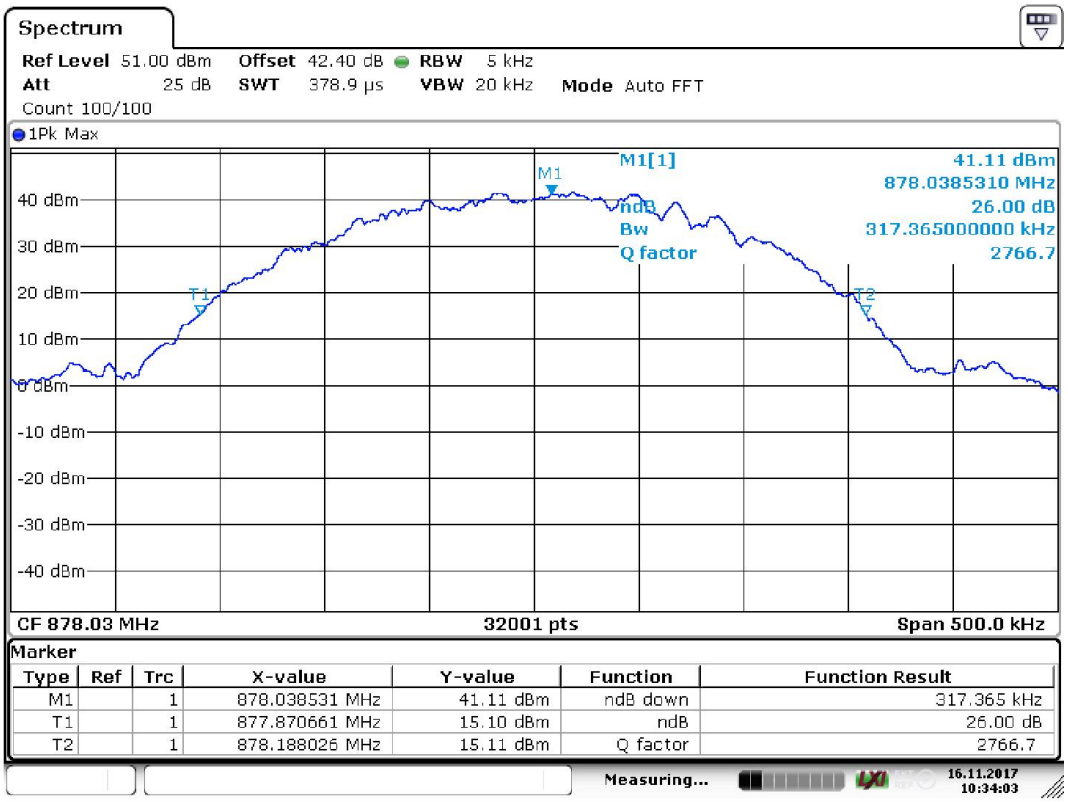

Date: 16.NOV.2017 10:27:09

Occupied bandwidth GSM input



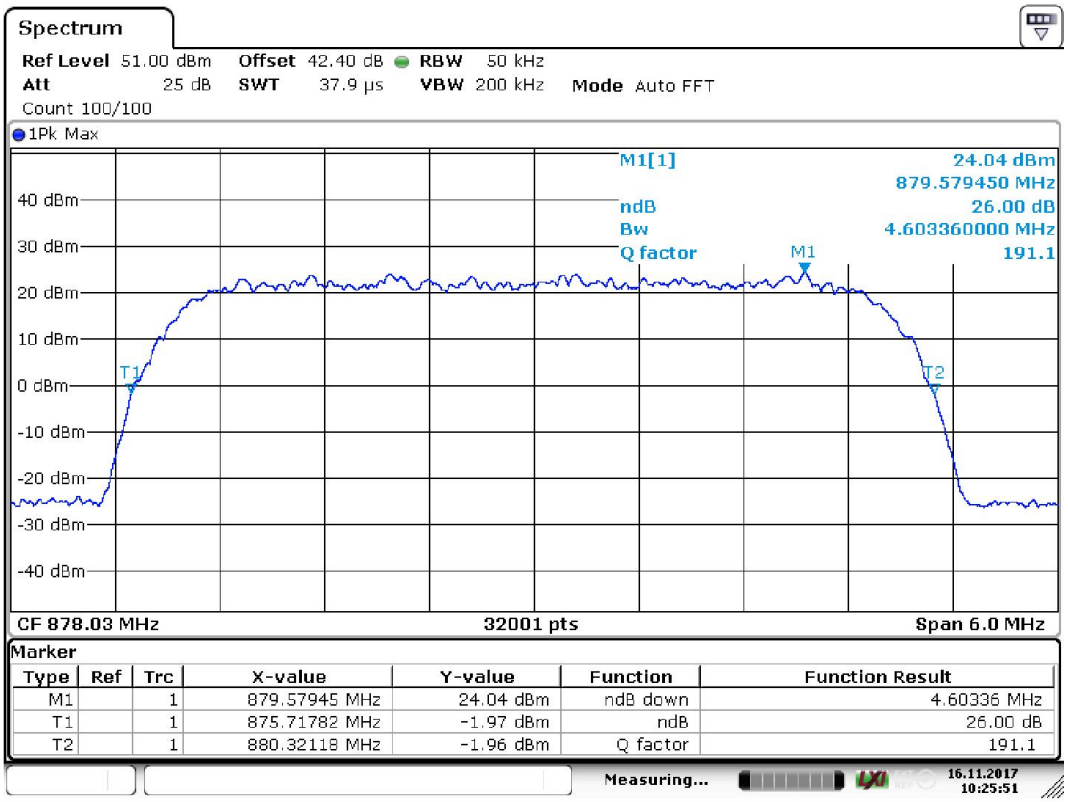

Date: 16.NOV.2017 10:32:11

Occupied bandwidth GSM agc off



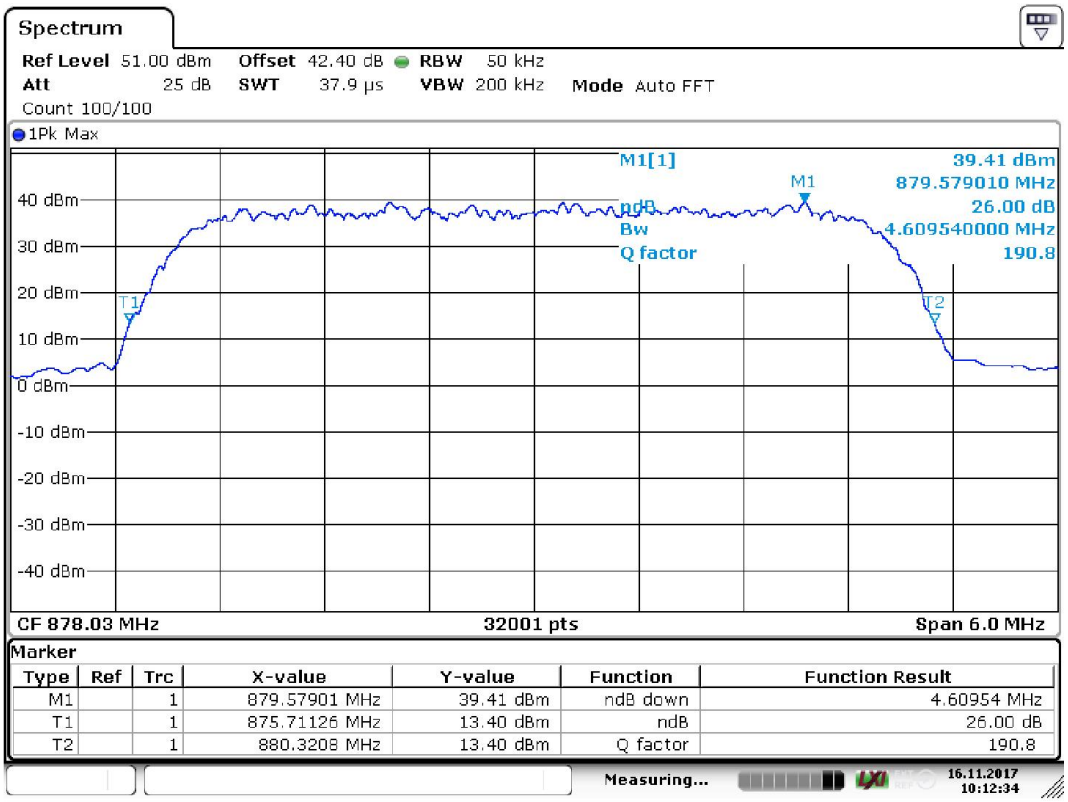

Date: 16.NOV.2017 10:34:03

Occupied bandwidth GSM agc on




Date: 16.NOV.2017 10:25:51

Occupied bandwidth WCDMA input

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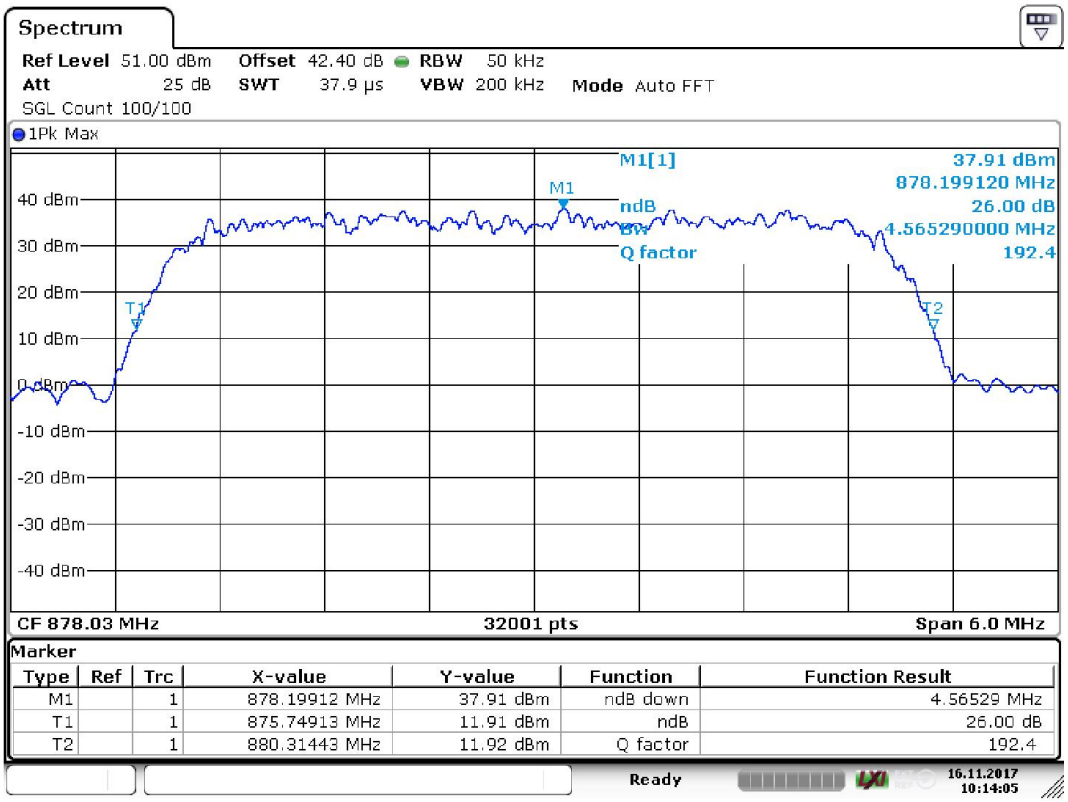
AWS Occupied bandwidth WCDMA agc off




Date: 16.NOV.2017 10:14:06

AWS Occupied bandwidth WCDMA agc on

### 6.4 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Spectrum analyser | Rohde & Schwarz | FSV | 32594 | 7/2018 |
| Rf-attenuator | Narda | 776B-10 | 8337 | |
| Rf-attenuator | Huber Suhner | 5920_N-50-010/199_N | 32697 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39076 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39077 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39079 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMIQ03B | 12792 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMBV100 | 32593 | 7/2018 |

## 7 PASSBAND GAIN AND BANDWIDTH

| | | | |
|---|---|---|---|
| Date of test: | 2017-11-02 | Test location: | EMC Center |
| EUT Serial: | 999895 | Ambient temp. ˚C | 21 ˚C |
| Tested by: | MTV | Relative humidity | 37 % |
| Test result: | Pass | Margin: | - |

### 7.1 Requirement

RSS-131 clause 6.1

The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

### 7.2 Test set-up

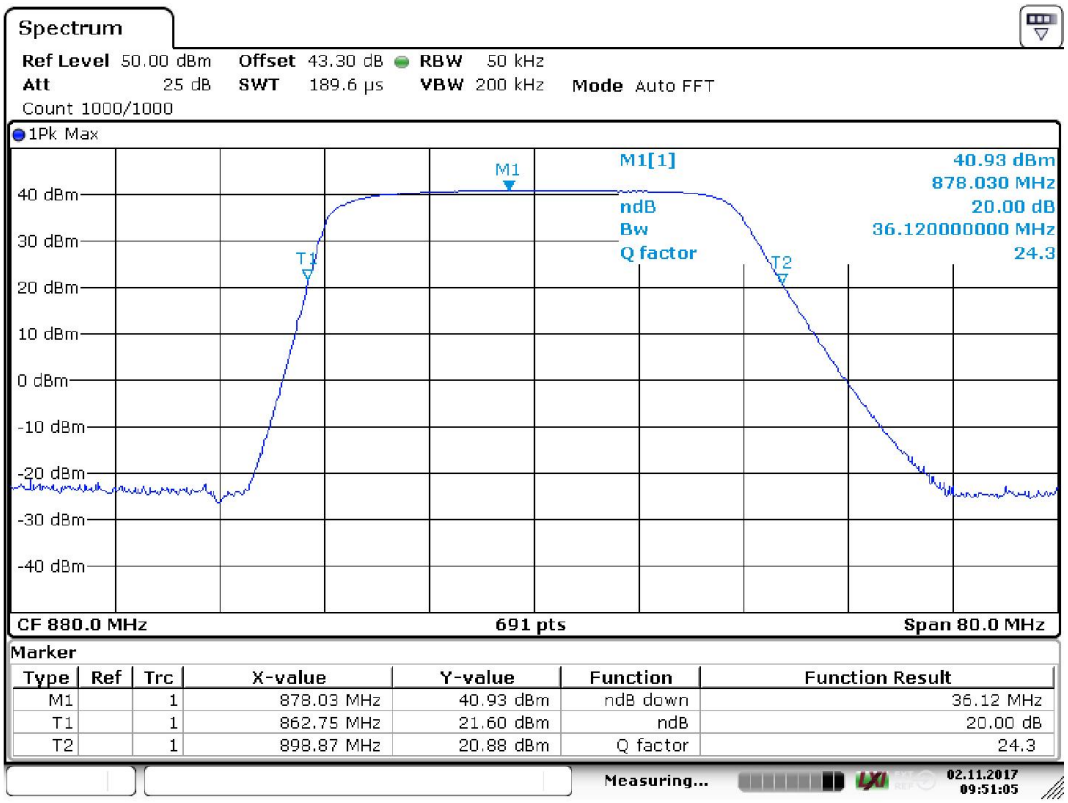
Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to spectrum analyser via rf cables and 30 dB attenuator.
The power amplifier gain was set to 60 dB
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

### 7.3 Test data

| Frequency MHz | Signal type | Occupied 20 dB band width (MHz) |
|---|---|---|
| 880.0 | CW | 36.12 |

The pass band maximum gain is measured from FOI unit's rf input to EUT output.
This is not same as EUT's power amplifier gain.
The EUT requires a professional installation and output power is set by trained technician.

| Frequency MHz | Gen. out (dBm) | Pathloss (dB) | Measured output (dBm) | Gain dB |
|---|---|---|---|---|
| 878.03 | -30.1 | 3.1 | 46.3 | 79.5 |




Date: 2.NOV.2017 09:51:05

Passband bandwidth

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Spectrum analyser | Rohde & Schwarz | FSV | 32594 | 7/2018 |
| Rf-attenuator | Narda | 776B-10 | 8337 | 7/2018 |
| Rf-attenuator | Huber Suhner | 5920_N-50-010/199_N | 32697 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39076 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39077 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39079 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMIQ03B | 12792 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMBV100 | 32593 | 7/2018 |

## 8 BAND EDGE EMISSION AND INTERMODULATION

| | | | |
|---|---|---|---|
| Date of test: | 2017-11-17 | Test location: | Wireless centre |
| EUT Serial: | - | Ambient temp. | 21˚C |
| Tested by: | MTV | Relative humidity | 37 % |
| Test result: | Pass | Margin: | 0.2 dB |

### 8.1 Requirement

CFR 47 part 22.917

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

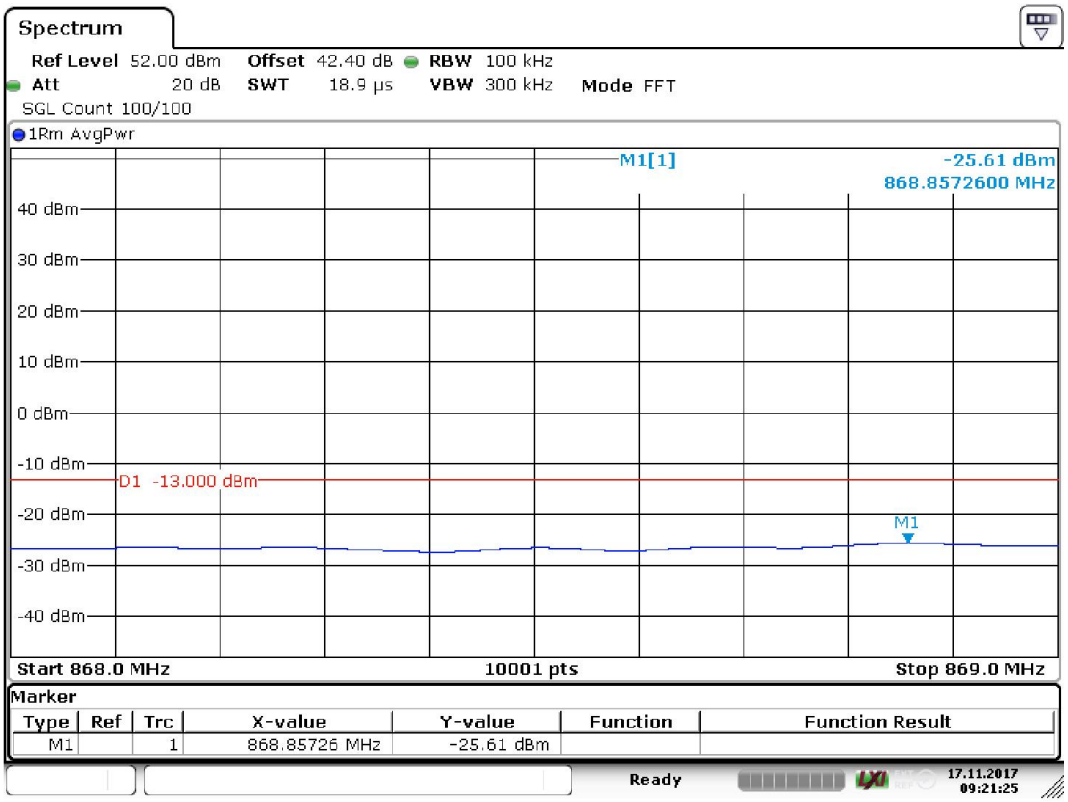
RSS-132 5.5

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P ( dBW) by at least 43 + 10 $\log_{10}$p (watts).
After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$ p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

### 8.2 Test set-up

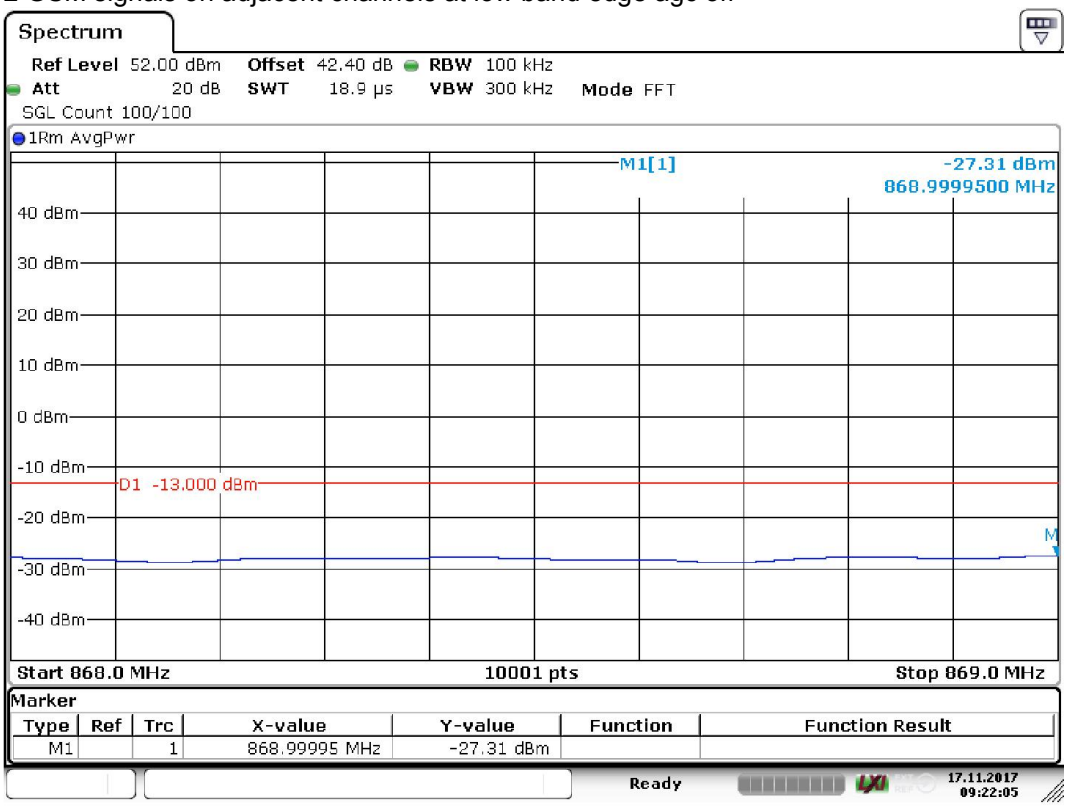
2 Signal generators were connected to power combiner who was then connected to the FOI unit.
Signals were placed on two lowest adjacent channels of the band.
The test was repeated on 2 highest channels.

## 8.3 Test data



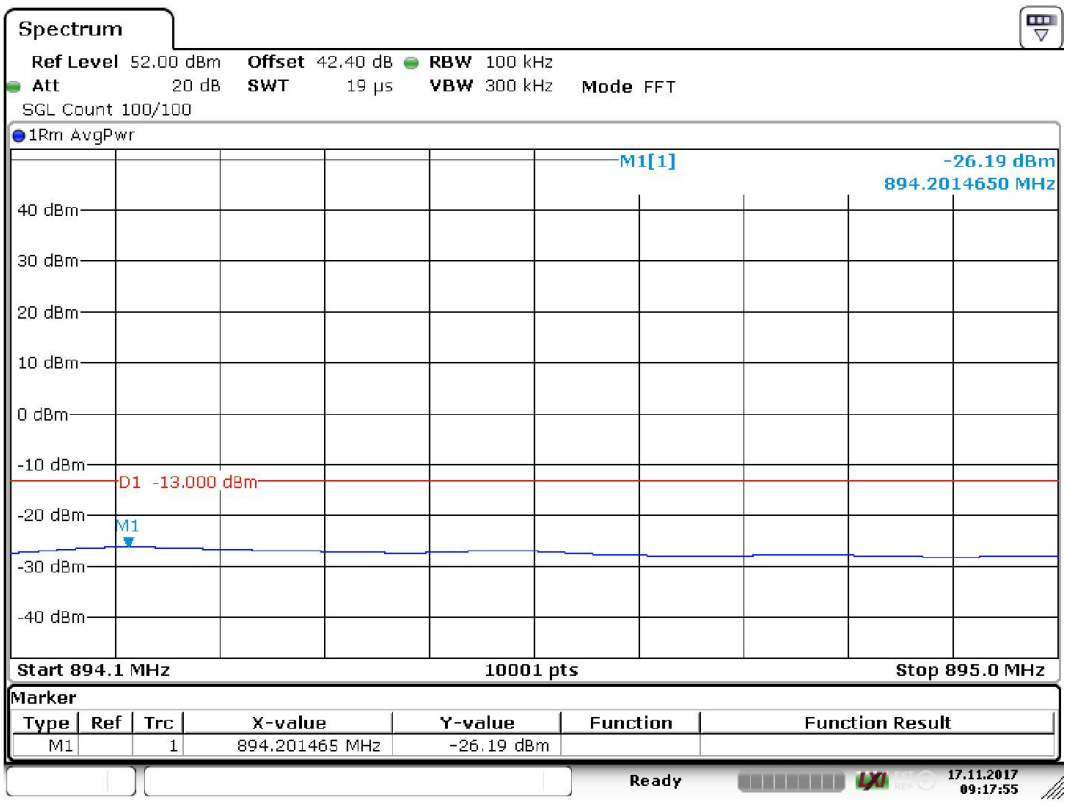

Date: 17.NOV.2017 09:21:26

2 GSM signals on adjacent channels at low band edge agc off



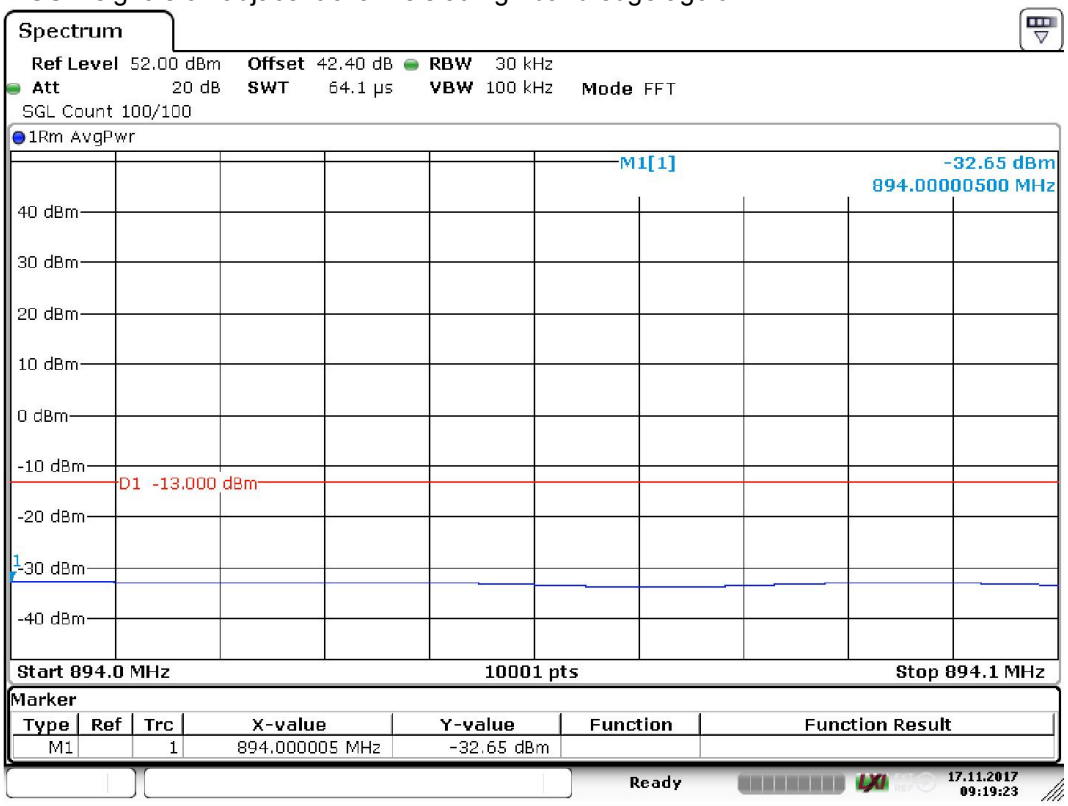

Date: 17.NOV.2017 09:22:05

2 GSM signals on adjacent channels at low band edge agc on



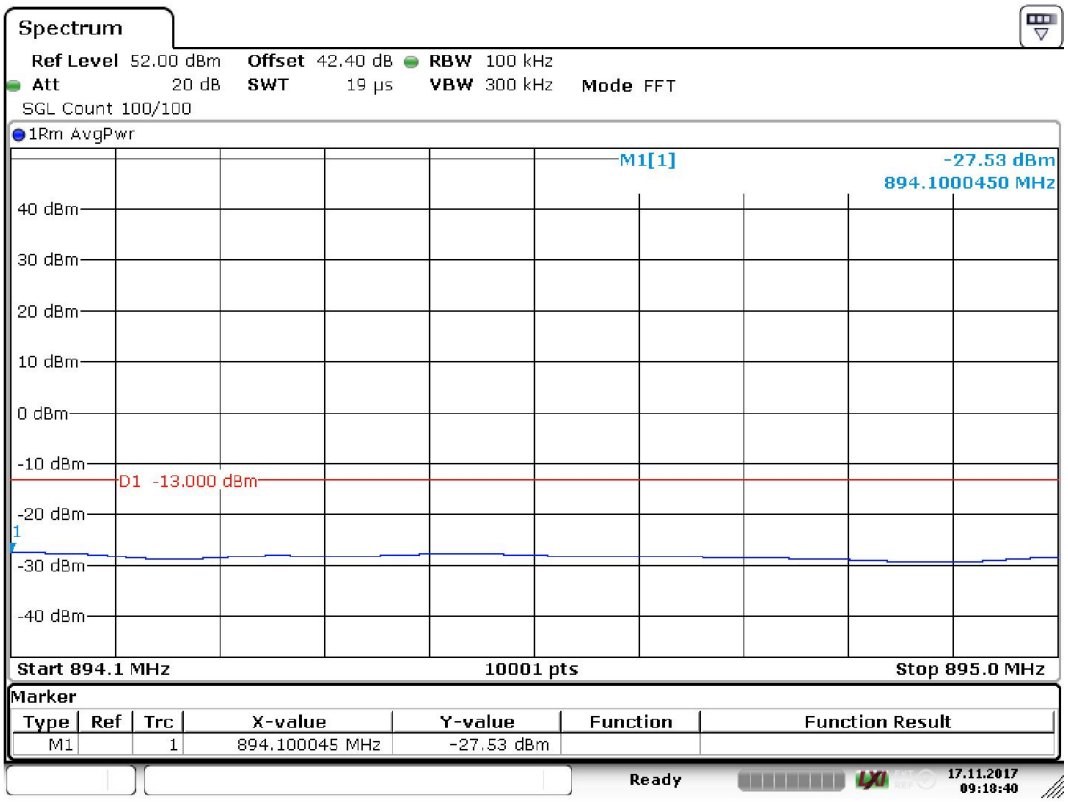

Date: 17.NOV.2017 09:17:55

2 GSM signals on adjacent channels at high band edge agc off




Date: 17.NOV.2017 09:19:23

2 GSM signals on adjacent channels at high band edge agc on

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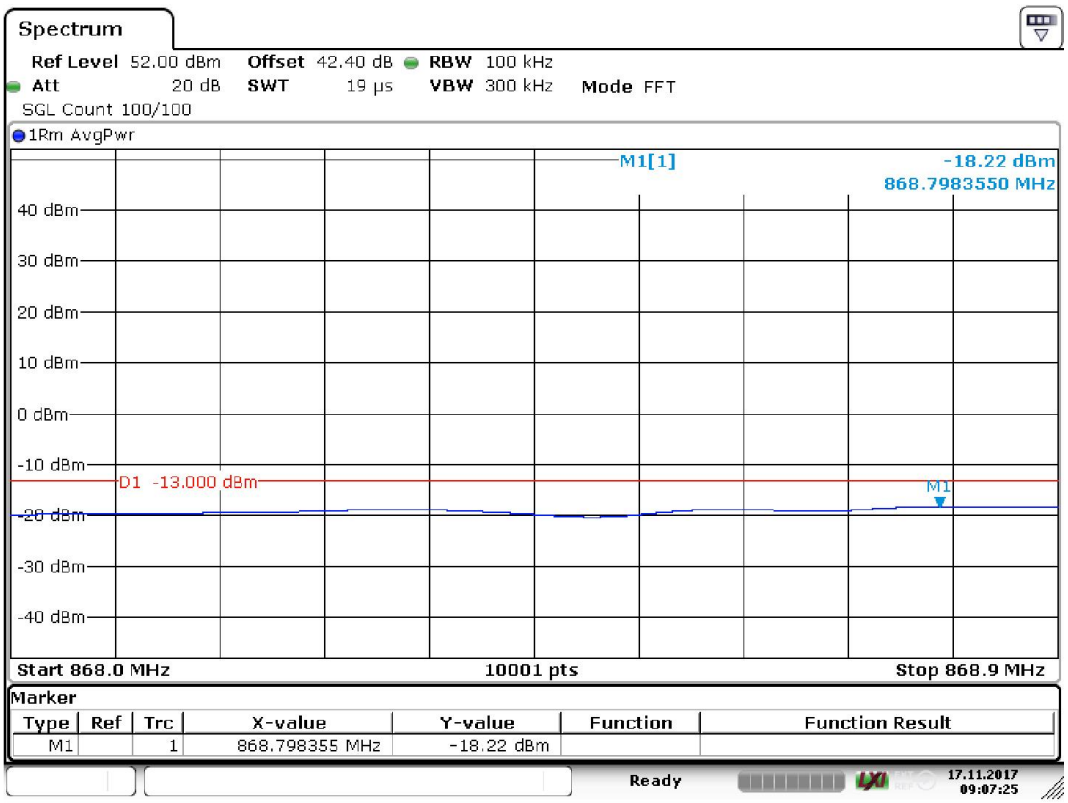
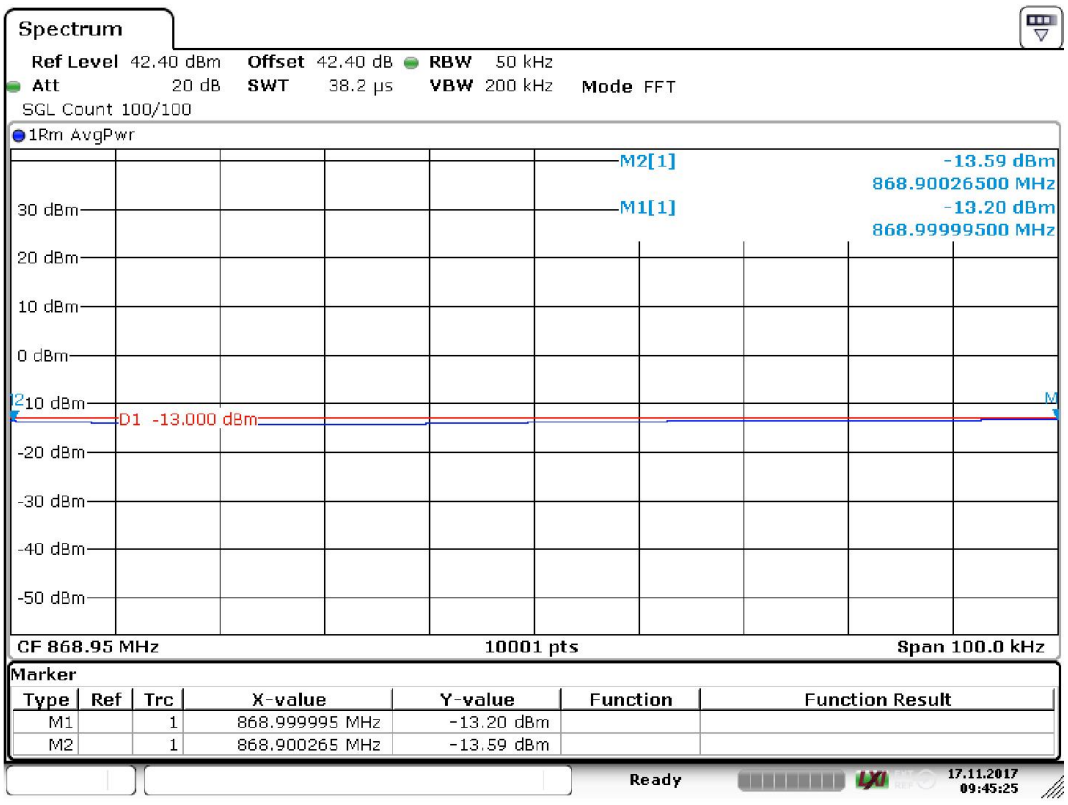



Date: 17.NOV.2017 09:07:25

2 WCDMA signals on adjacent channels at low band edge agc off

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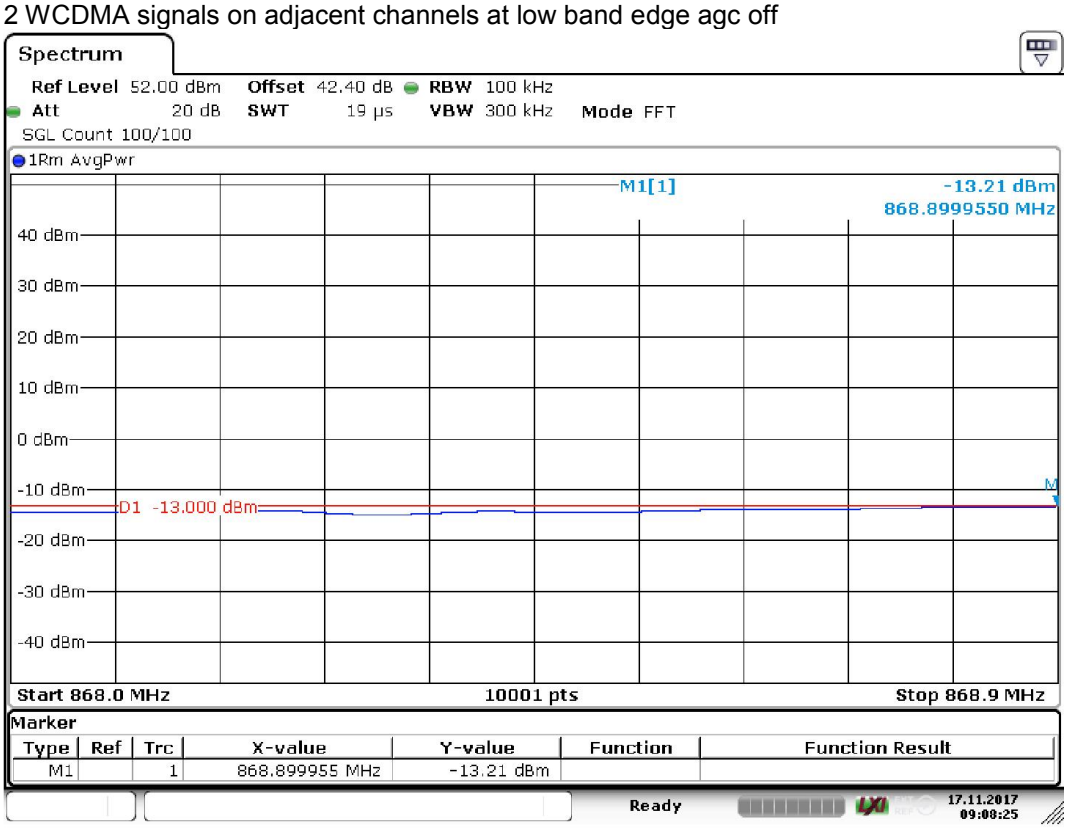


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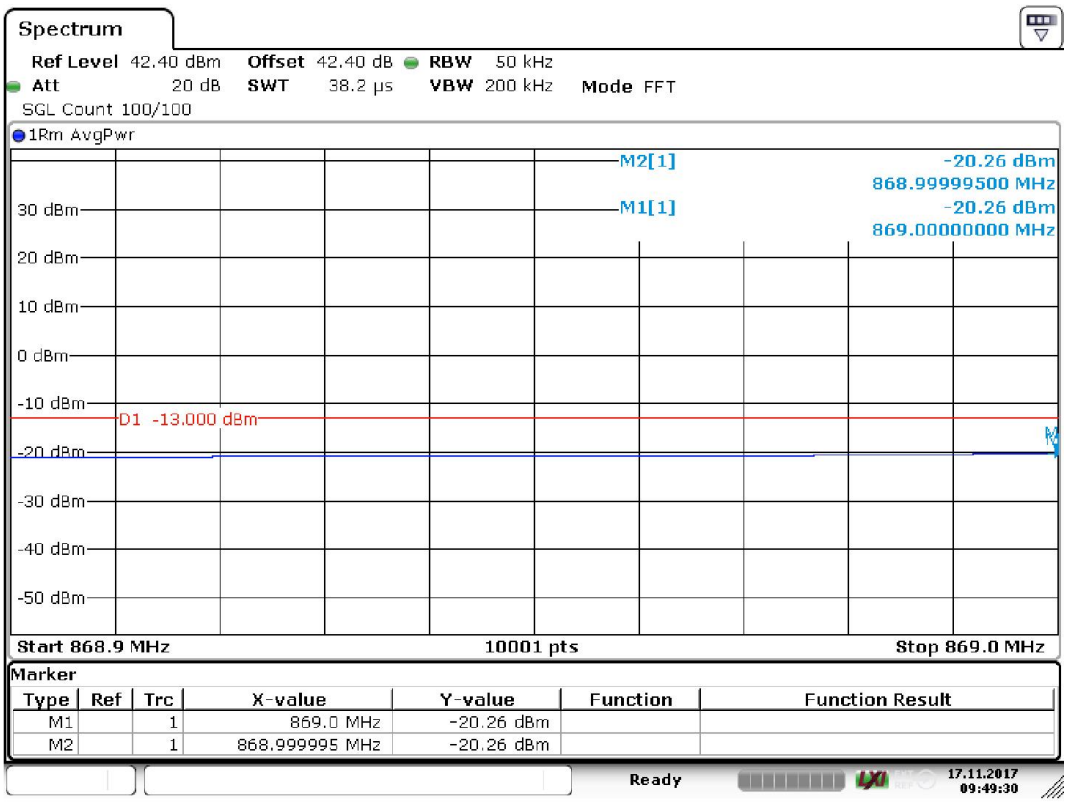
WCDMA signals on adjacent channels at low band edge agc on

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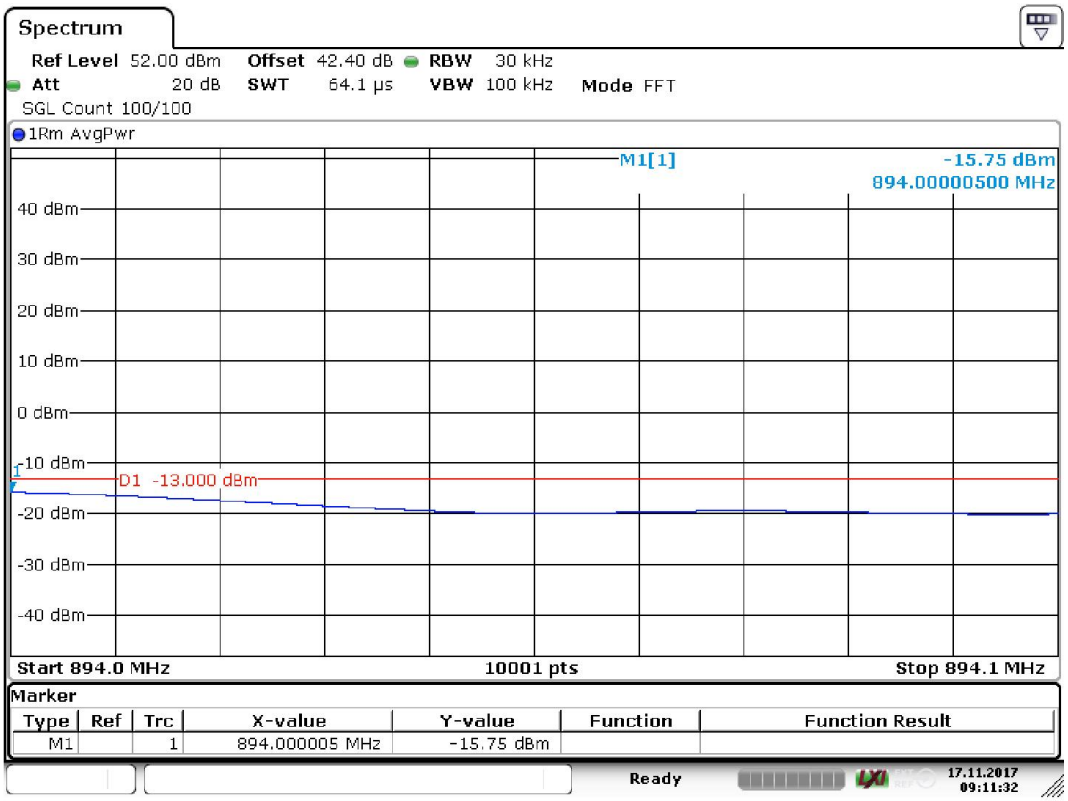
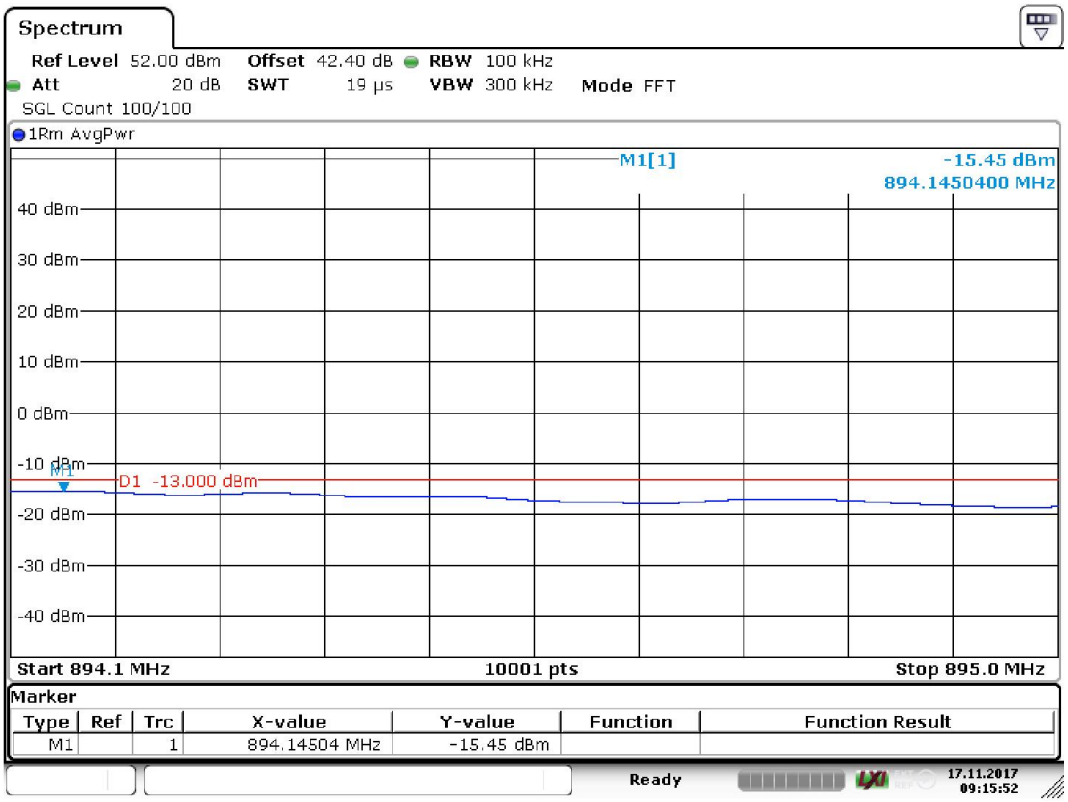
WCDMA signals on adjacent channels at low band edge agc on



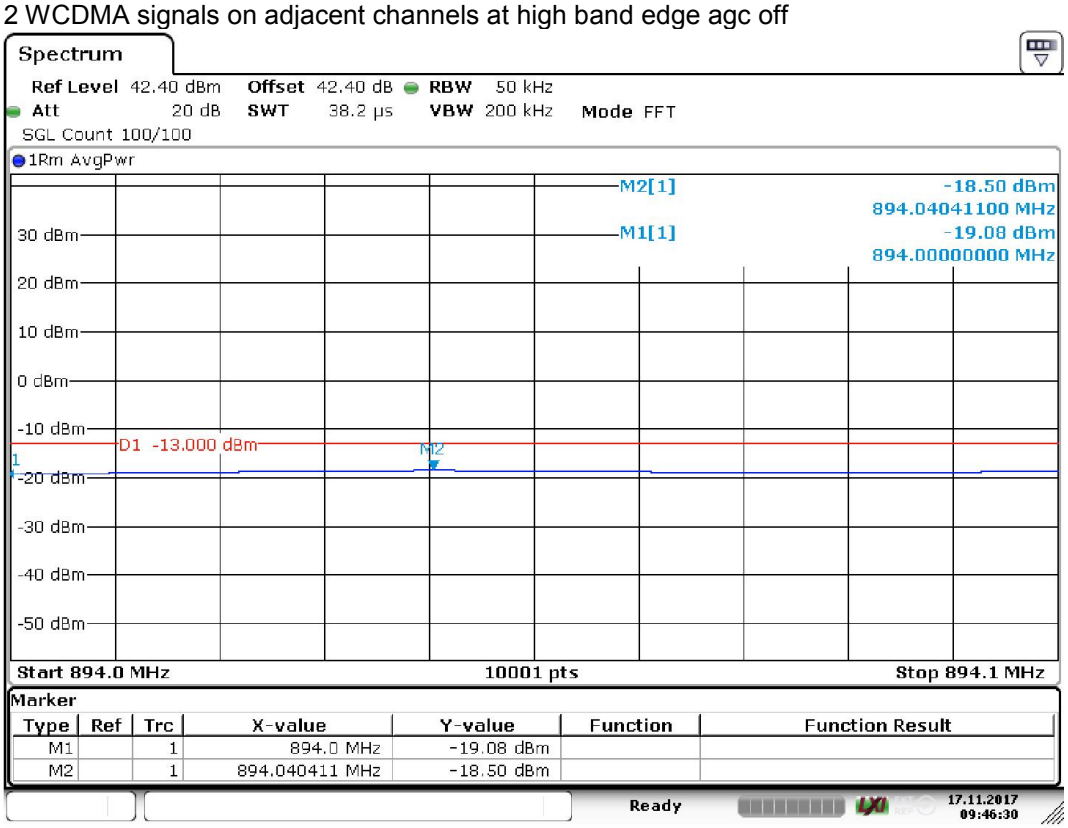

Date: 17.NOV.2017 09:11:32

2 WCDMA signals on adjacent channels at high band edge agc off



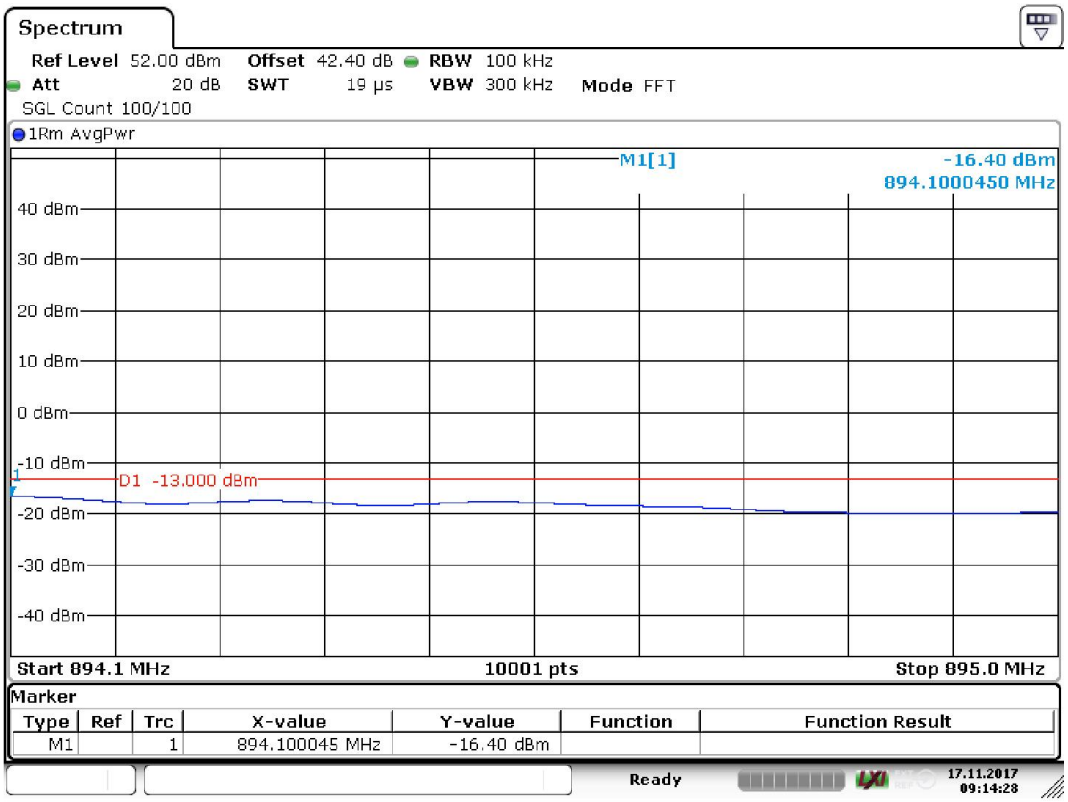

Date: 17.NOV.2017 09:15:51

2 WCDMA signals on adjacent channels at high band edge agc off




Date: 17.NOV.2017 09:46:30

2 WCDMA signals on adjacent channels at high band edge agc on




Date: 17.NOV.2017 09:14:28

2 WCDMA signals on adjacent channels at high band edge agc on

### 8.4 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Spectrum analyser | Rohde & Schwarz | FSV | 32594 | 7/2018 |
| Rf-attenuator | Narda | 776B-10 | 8337 | 7/2018 |
| Rf-attenuator | Huber Suhner | 5920_N-50-010/199_N | 32697 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39076 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39077 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39079 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMIQ03B | 12792 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMBV100 | 32593 | 7/2018 |

## 9 CONDUCTED SPURIOUS EMISSION FROM ANTENNA PORT

| | | | |
|---|---|---|---|
| Date of test: | 2017-11-16 | Test location: | Wireless centre |
| EUT Serial: | 999895 | Ambient temp. | 21˚C |
| Tested by: | MTV | Relative humidity | 37 % |
| Test result: | Pass | Margin: | 0.6 dB |

### 9.1 Requirement

CFR47 §22.917

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

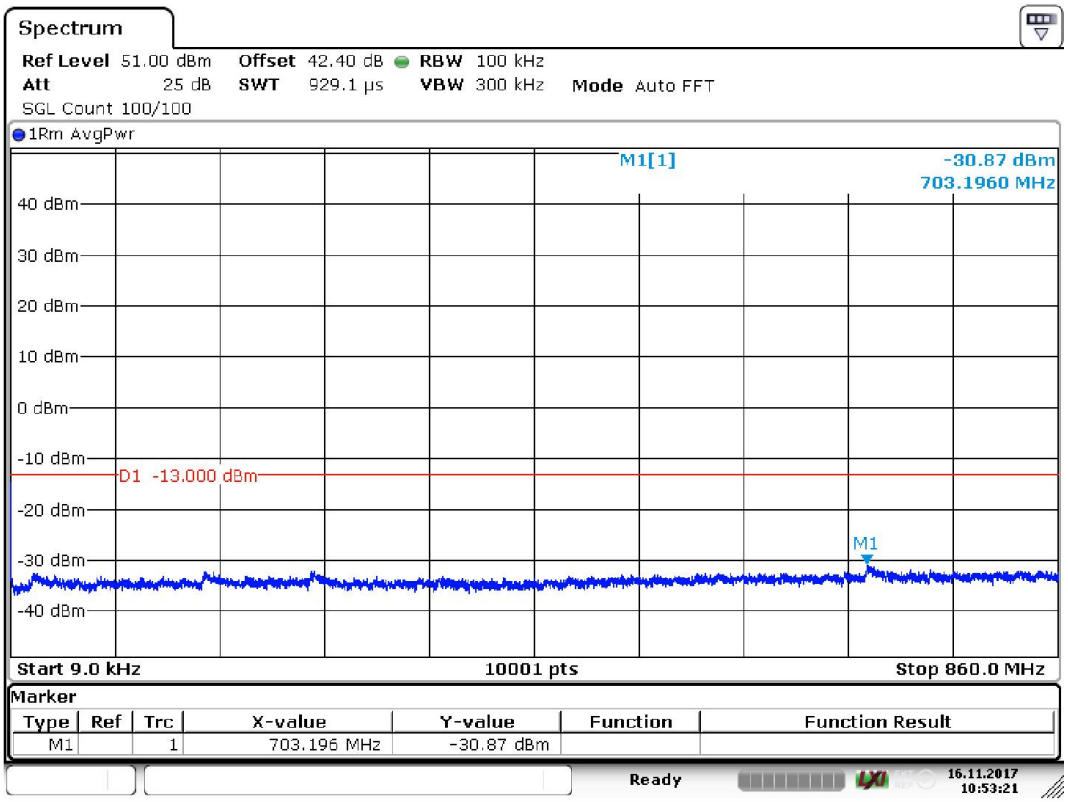
RSS-132 clause 5.5

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P ( dBW) by at least 43 + 10 $\log_{10}$p (watts).
ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$ p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

### 9.2 Test set-up

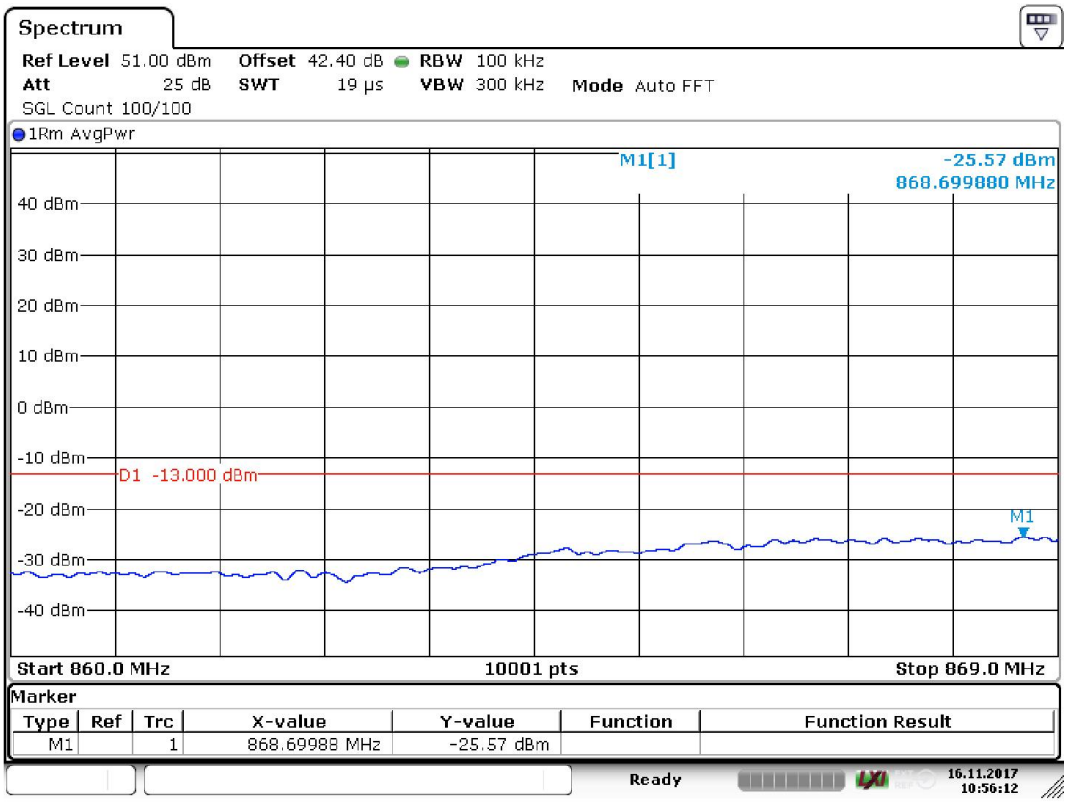
Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was connected to spectrum analyser via rf cables and band reject or high pass filter.
A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

## 9.3 Test data



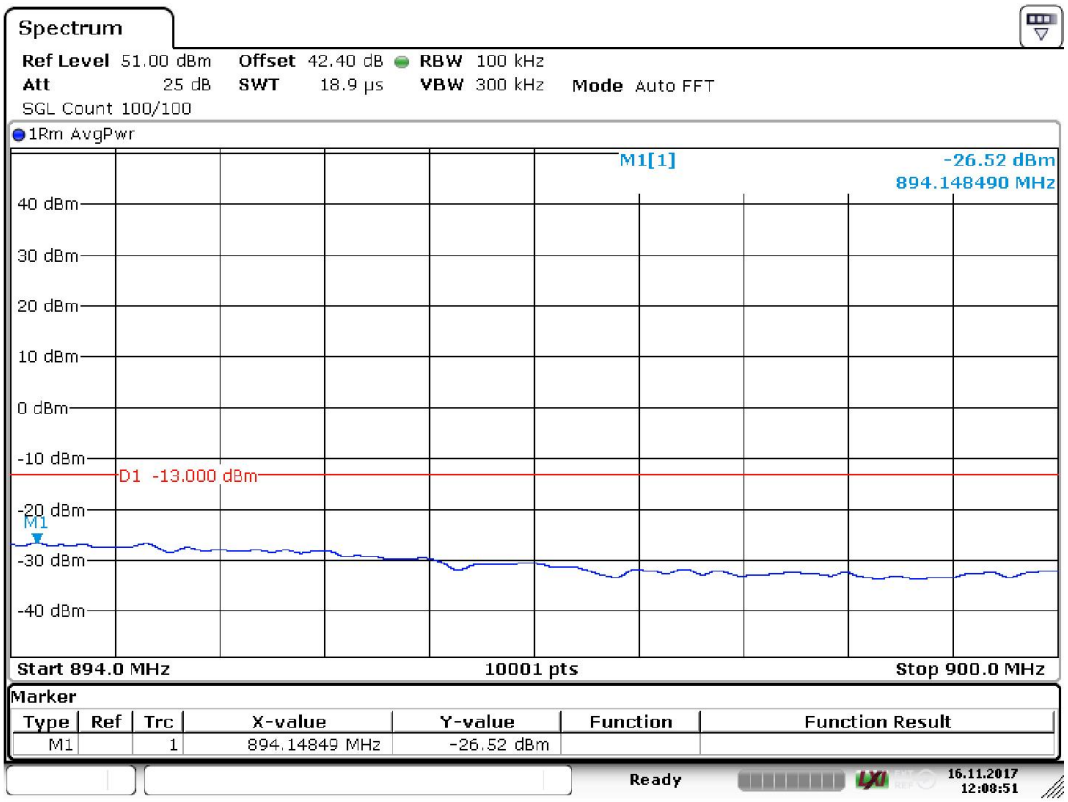

Date: 16.NOV.2017 10:53:21

9 kHz – 860 MHz GSM low channel



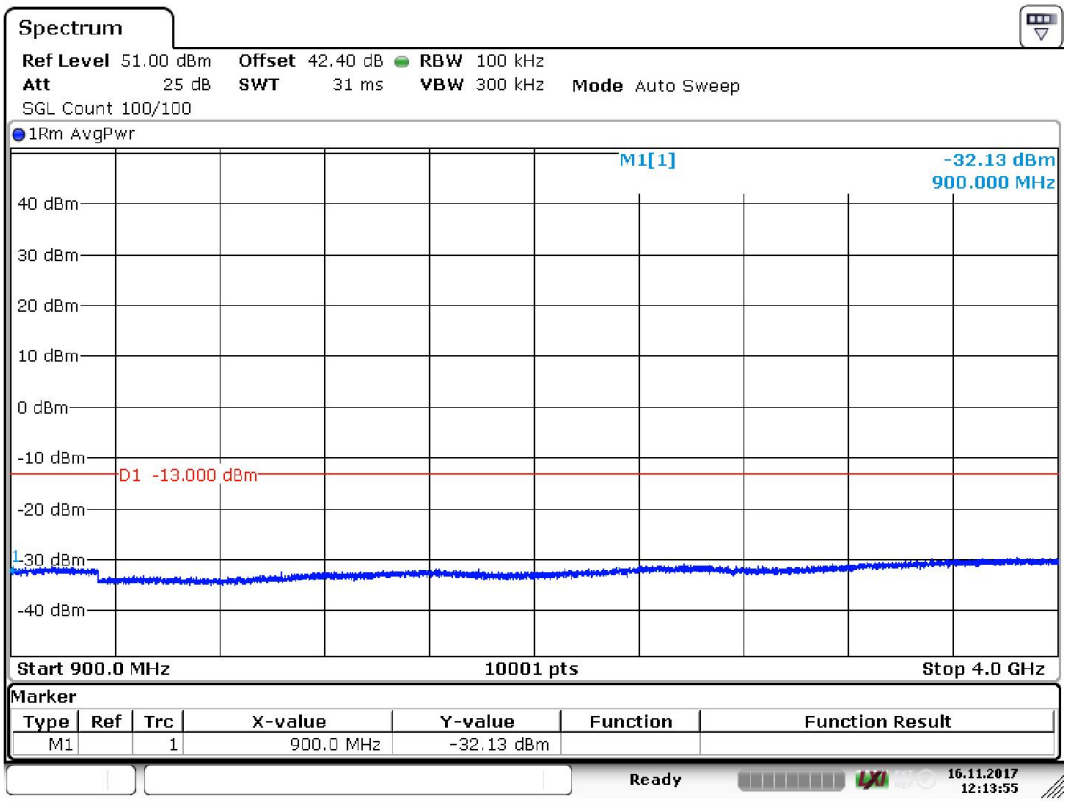

Date: 16.NOV.2017 10:56:12

860 – 869 MHz GSM low channel



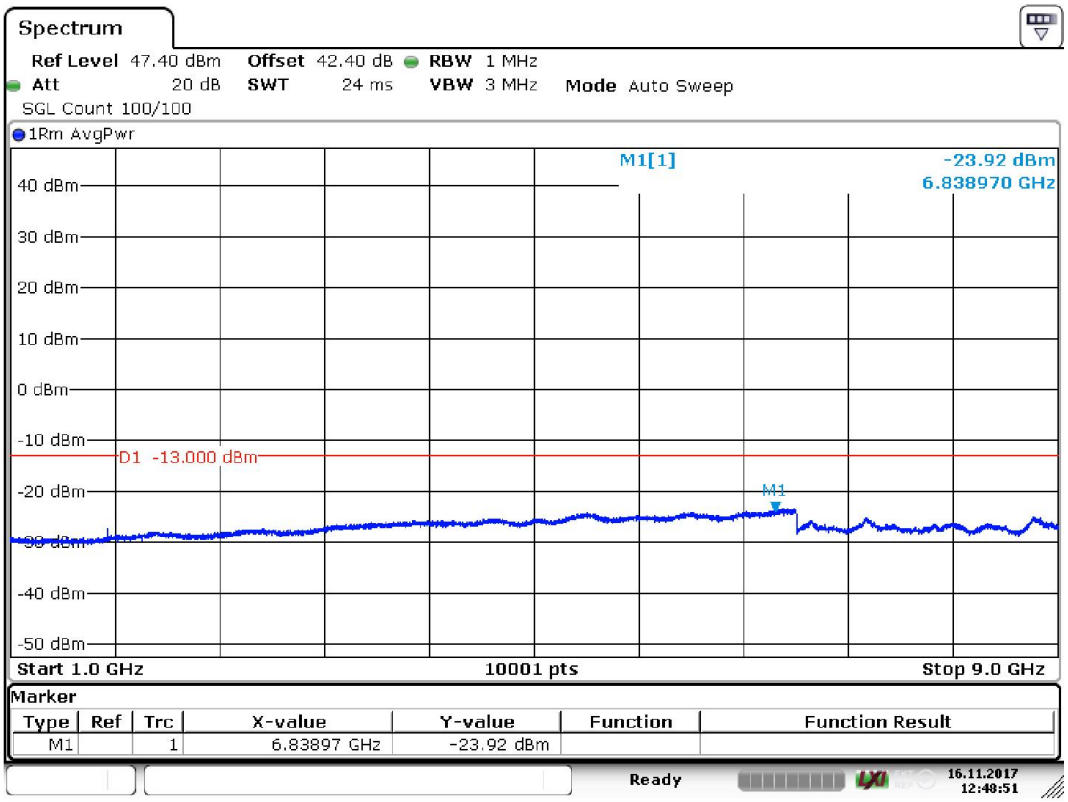

Date: 16.NOV.2017 12:08:52

894 – 900 MHz GSM low channel



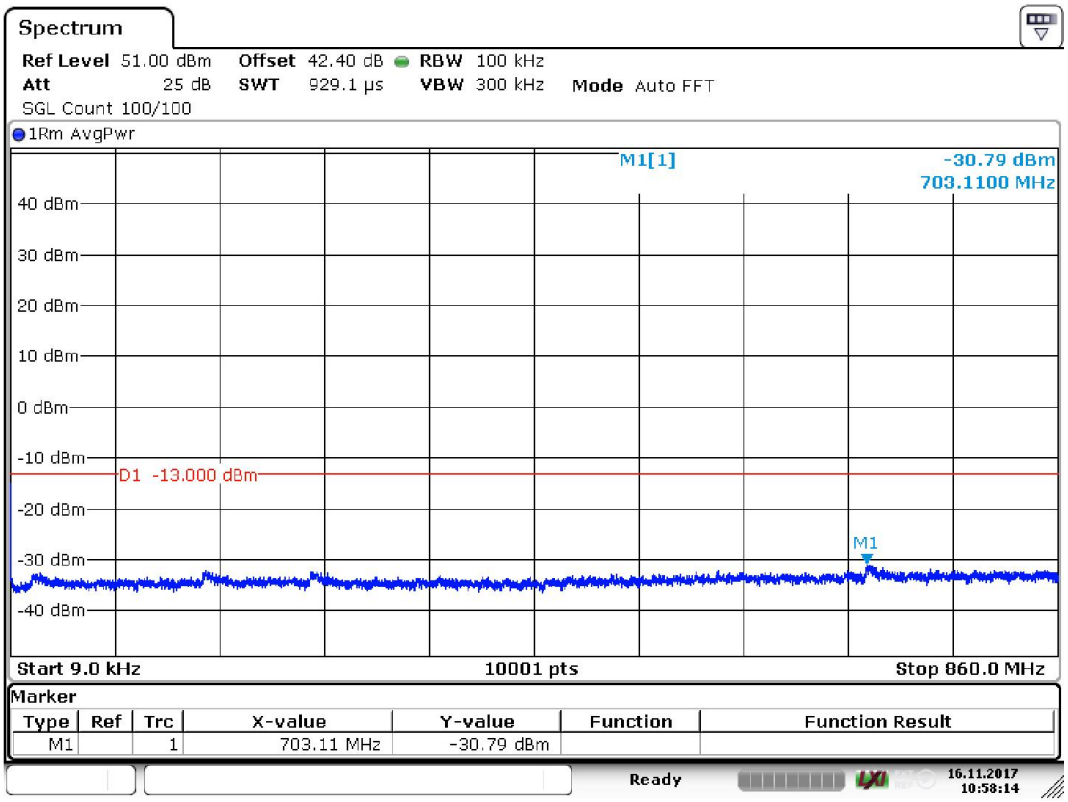

Date: 16.NOV.2017 12:13:56

900 – 4000 MHz GSM low channel



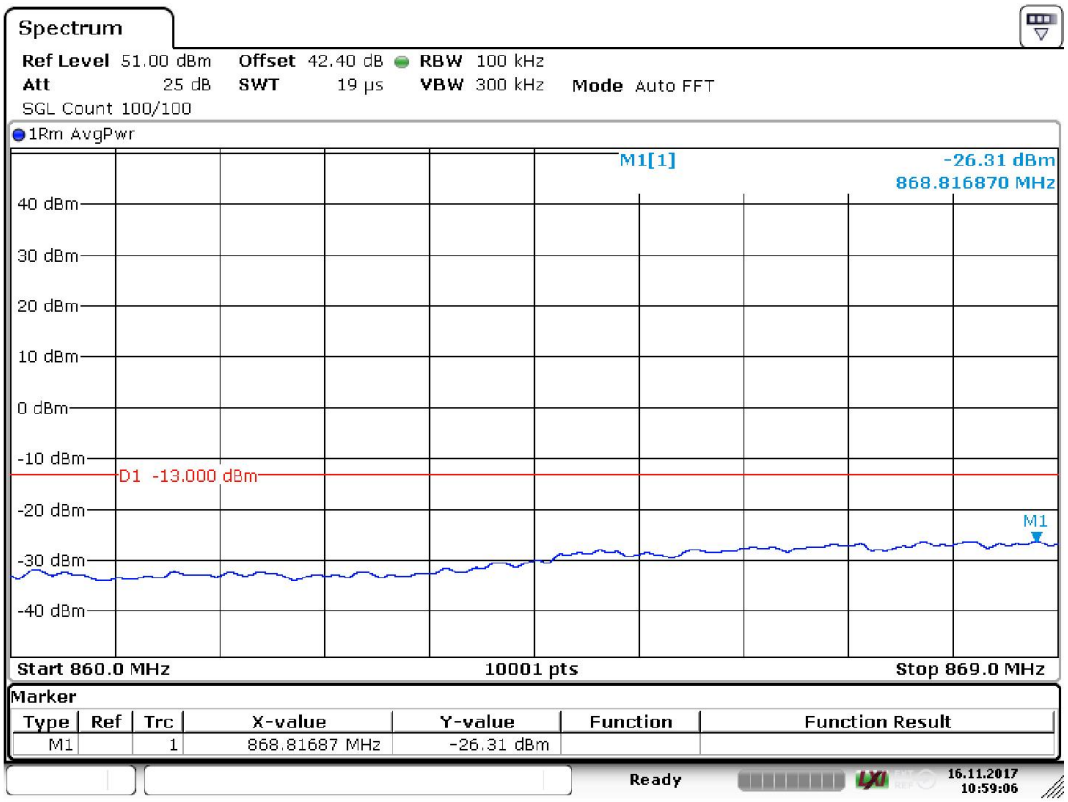

Date: 16.NOV.2017 12:48:52

1 – 9 GHz GSM low channel



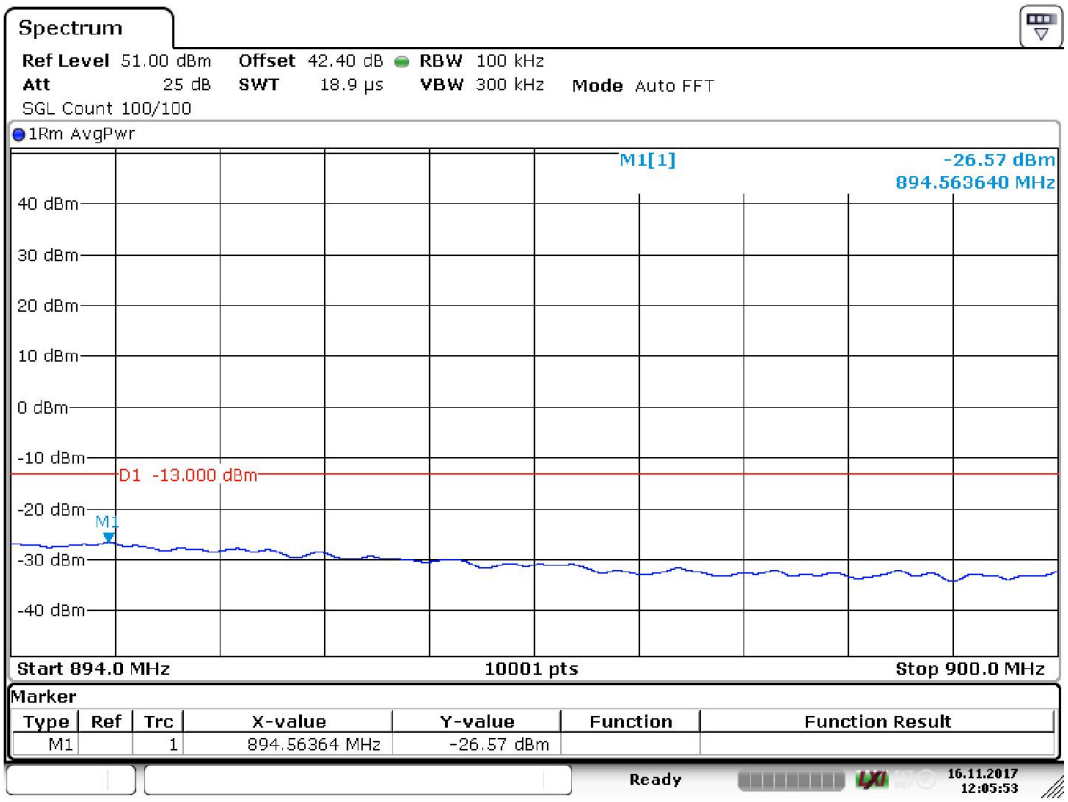

Date: 16.NOV.2017 10:58:14

9 kHz – 860 MHz GSM middle channel



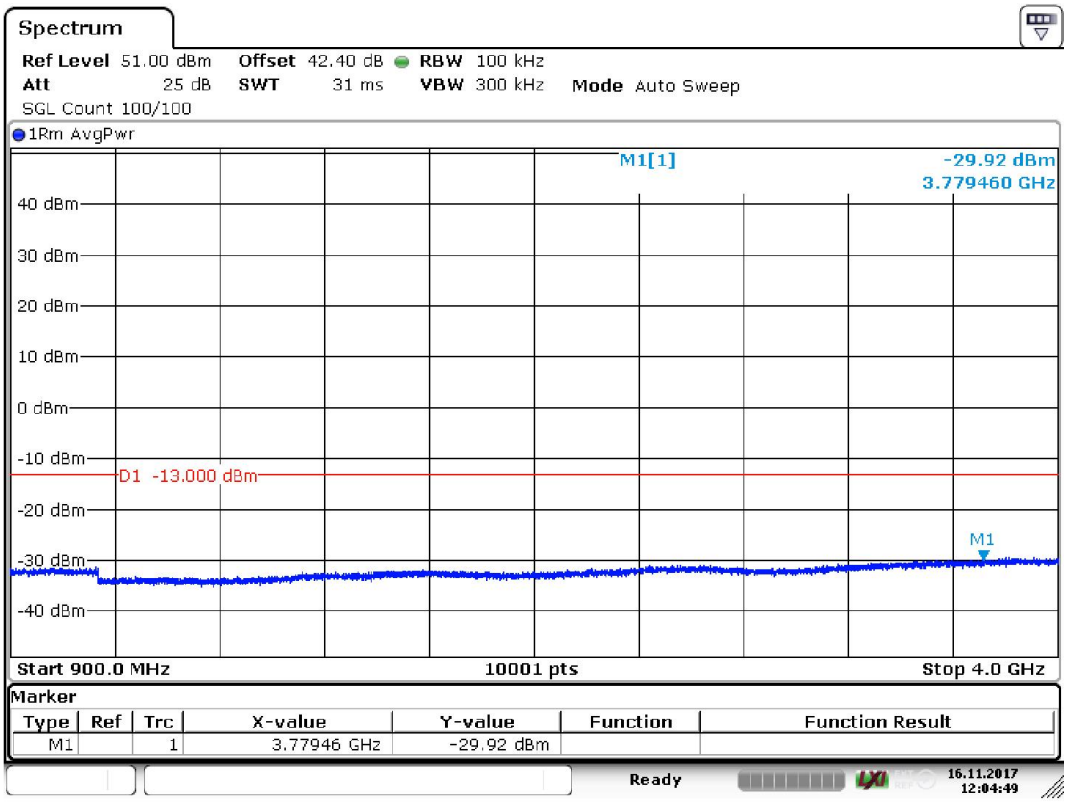

Date: 16.NOV.2017 10:59:06

860 – 869 MHz GSM middle channel



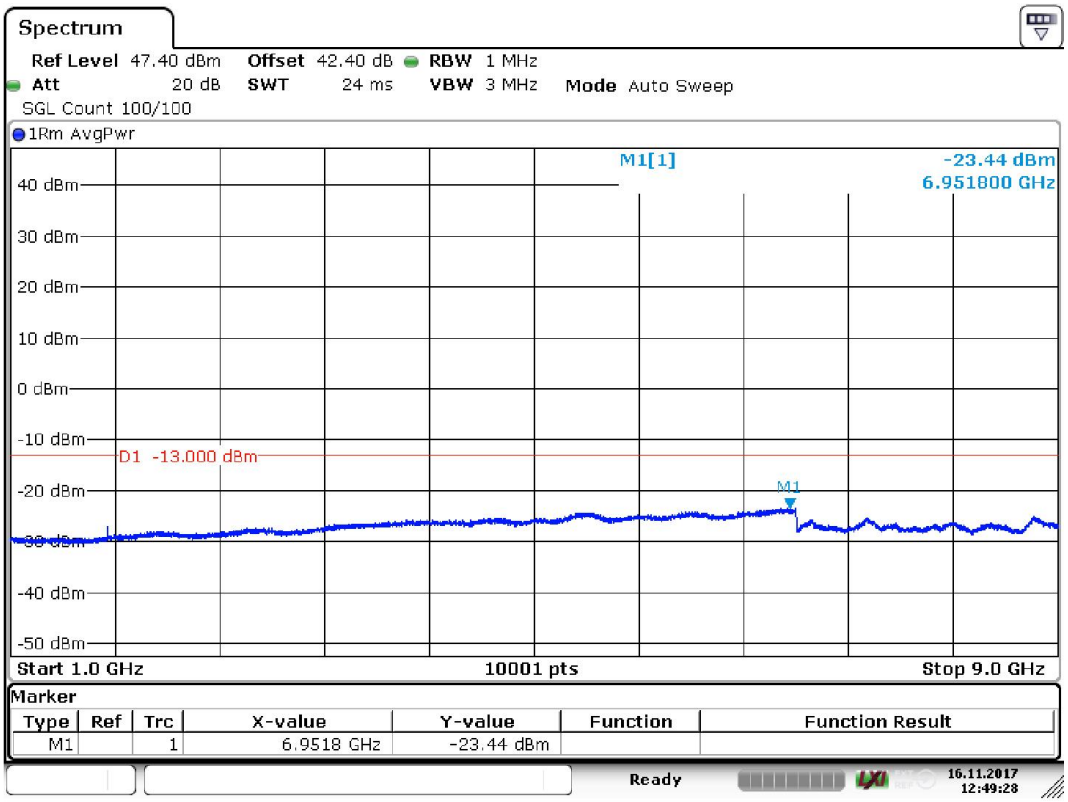

Date: 16.NOV.2017 12:05:53

894 – 900 MHz GSM middle channel



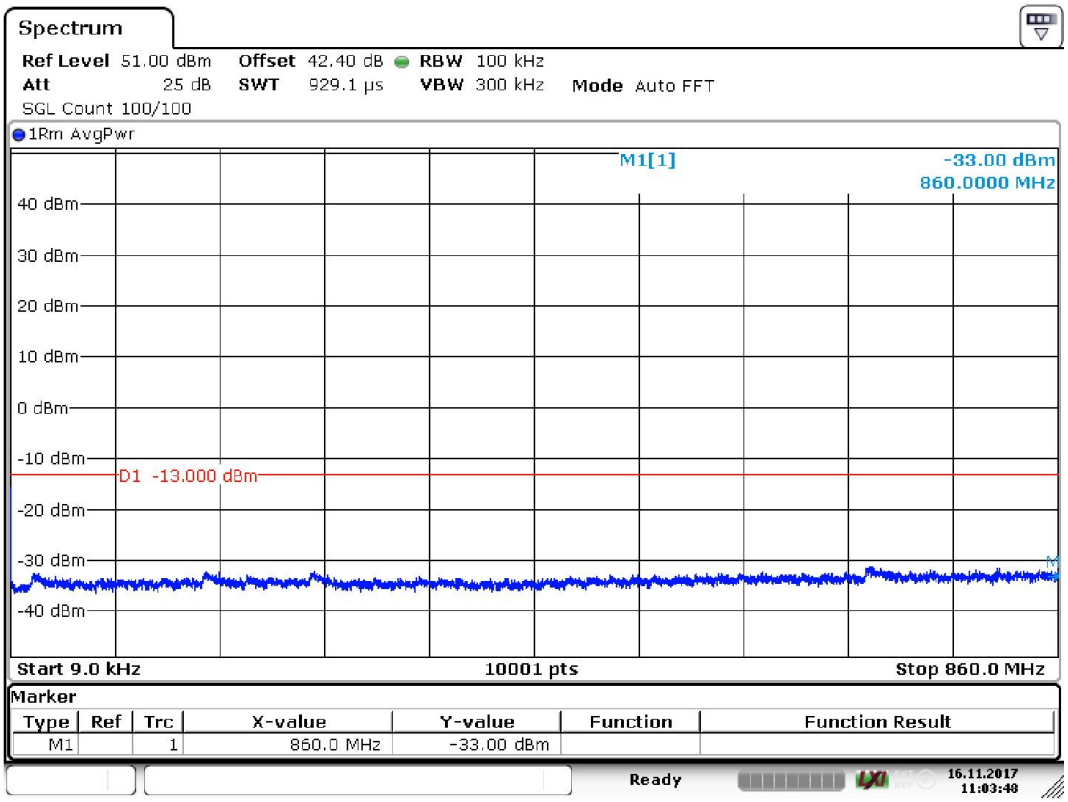

Date: 16.NOV.2017 12:04:49

900 MHz – 4 GHz GSM middle channel



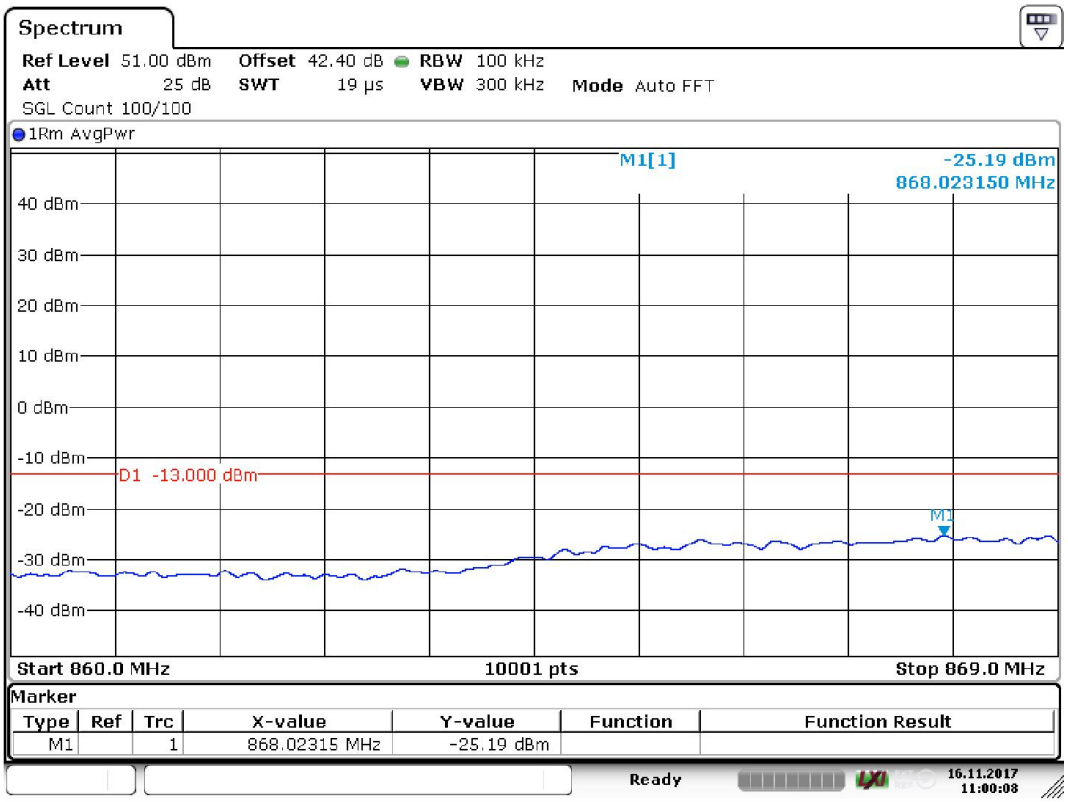

Date: 16.NOV.2017 12:49:28

1 – 9 GHz GSM middle channel



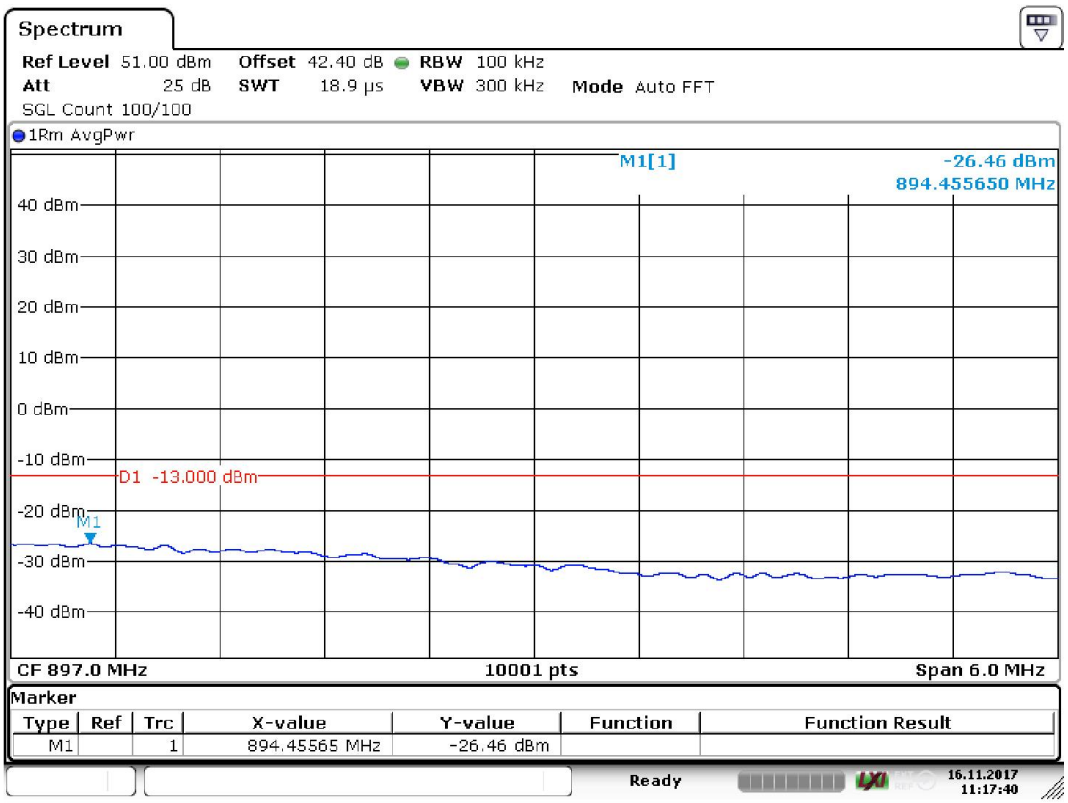

Date: 16.NOV.2017 11:03:49

GSM 9 kHz – 860 MHz high channel



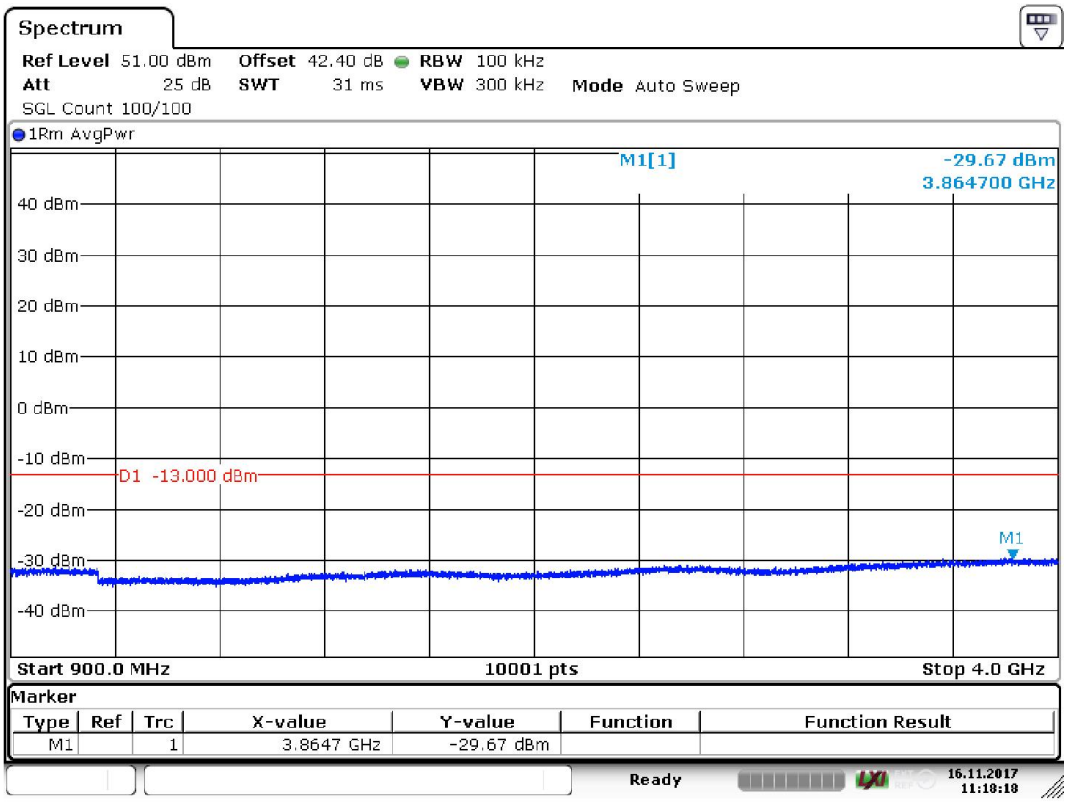

Date: 16.NOV.2017 11:00:08

GSM 860 – 869 MHz high channel



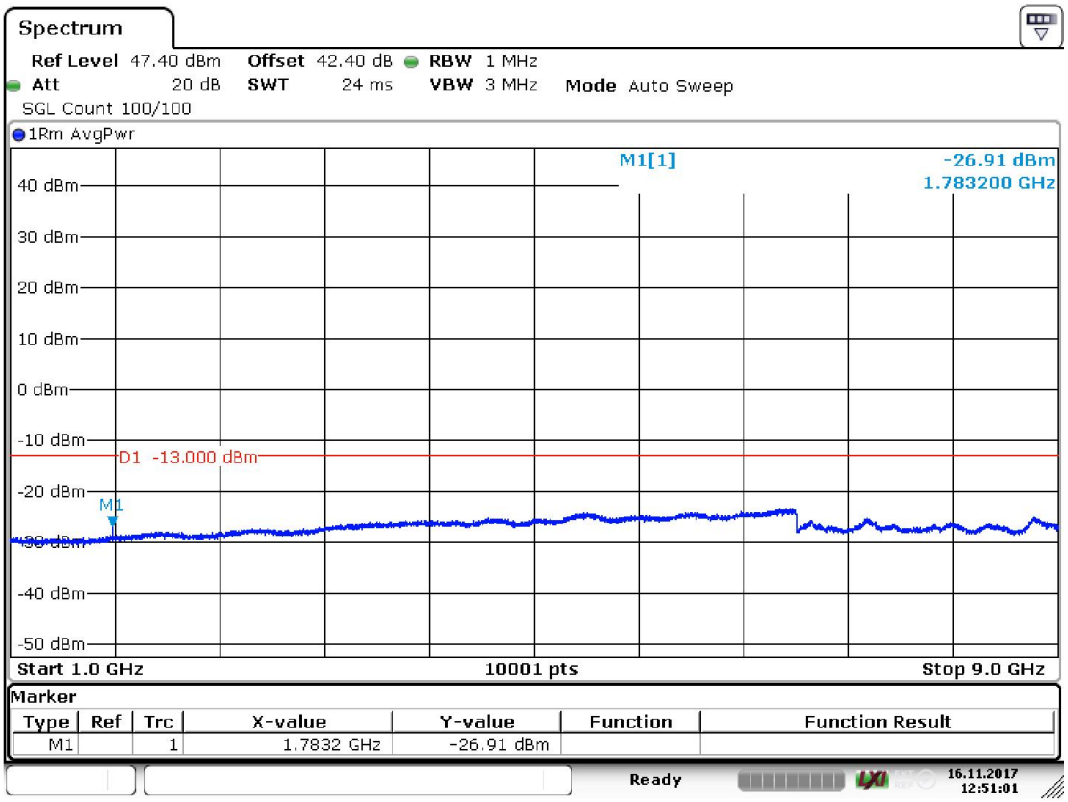

Date: 16.NOV.2017 11:17:40

GSM 894 -900 MHz high channel



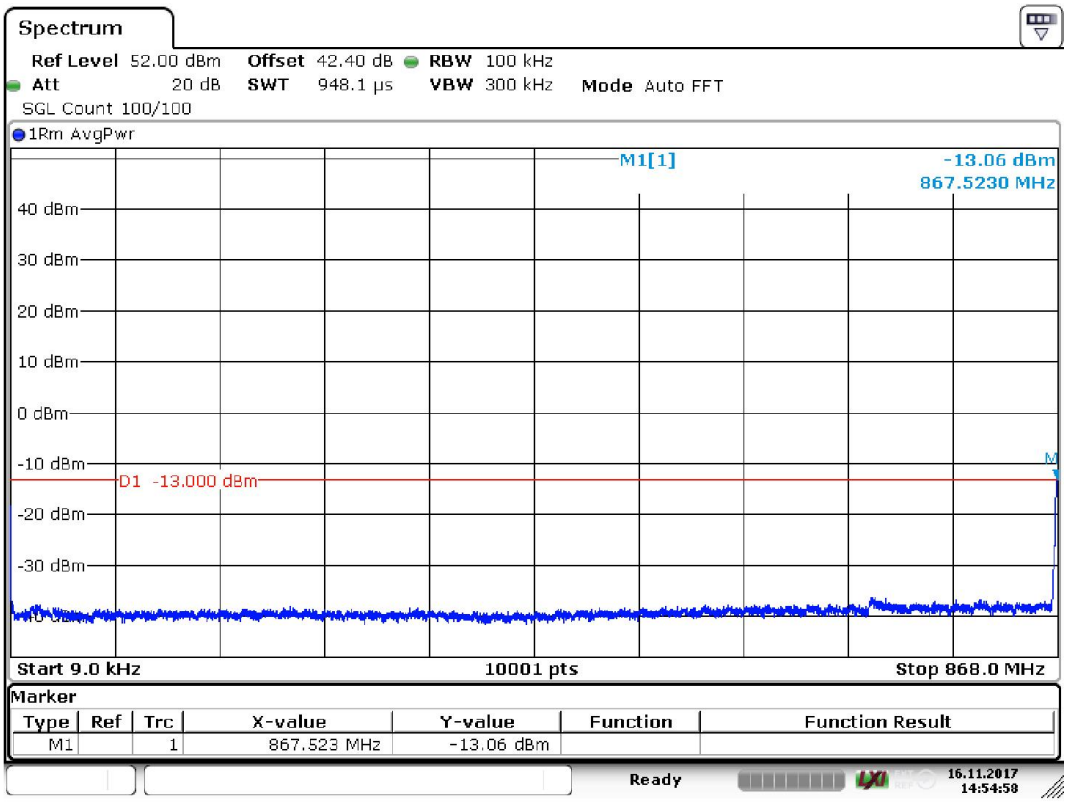

Date: 16.NOV.2017 11:18:19

GSM 900 – 4000 MHz high channel



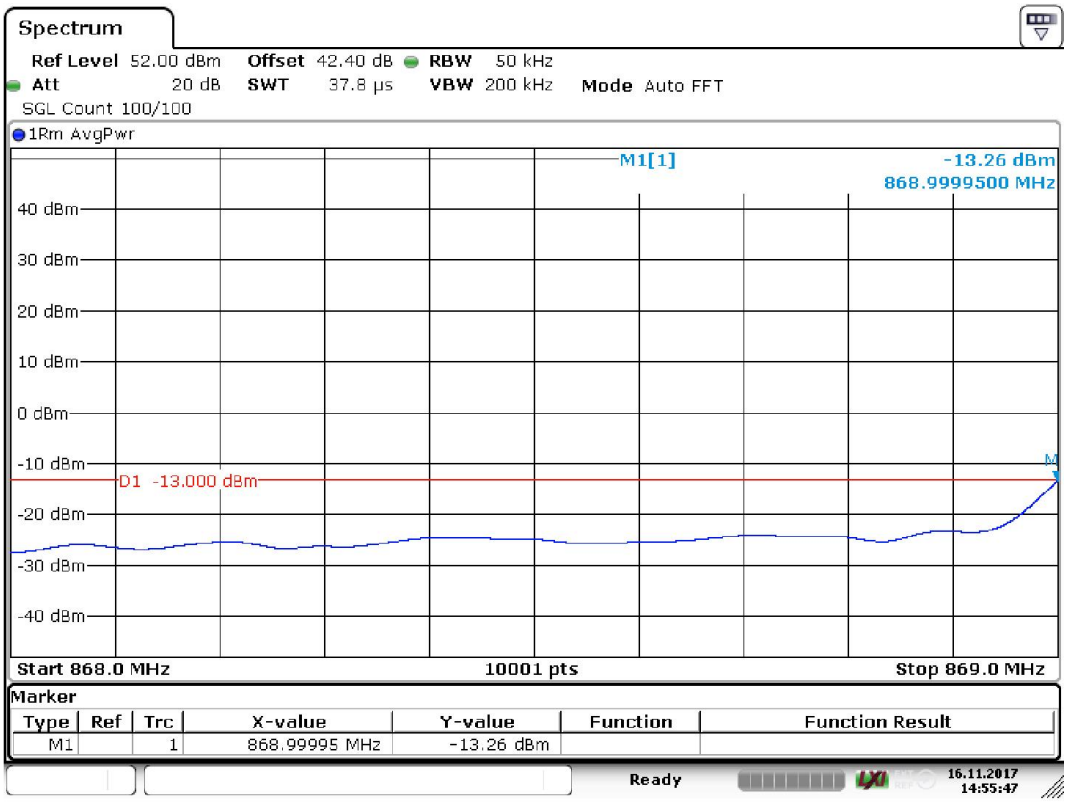

Date: 16.NOV.2017 12:51:01

GSM 1 – 9 GHz high channel



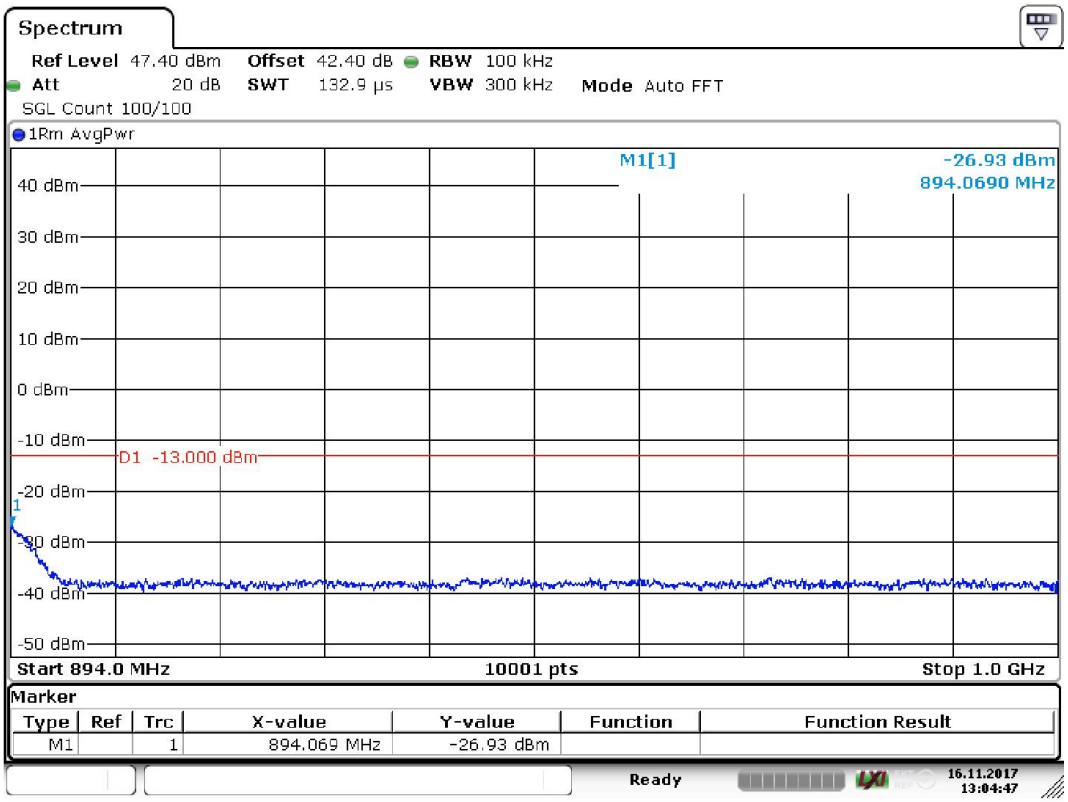

Date: 16.NOV.2017 14:54:58

WCDMA 9 kHz – 868 MHz low channel



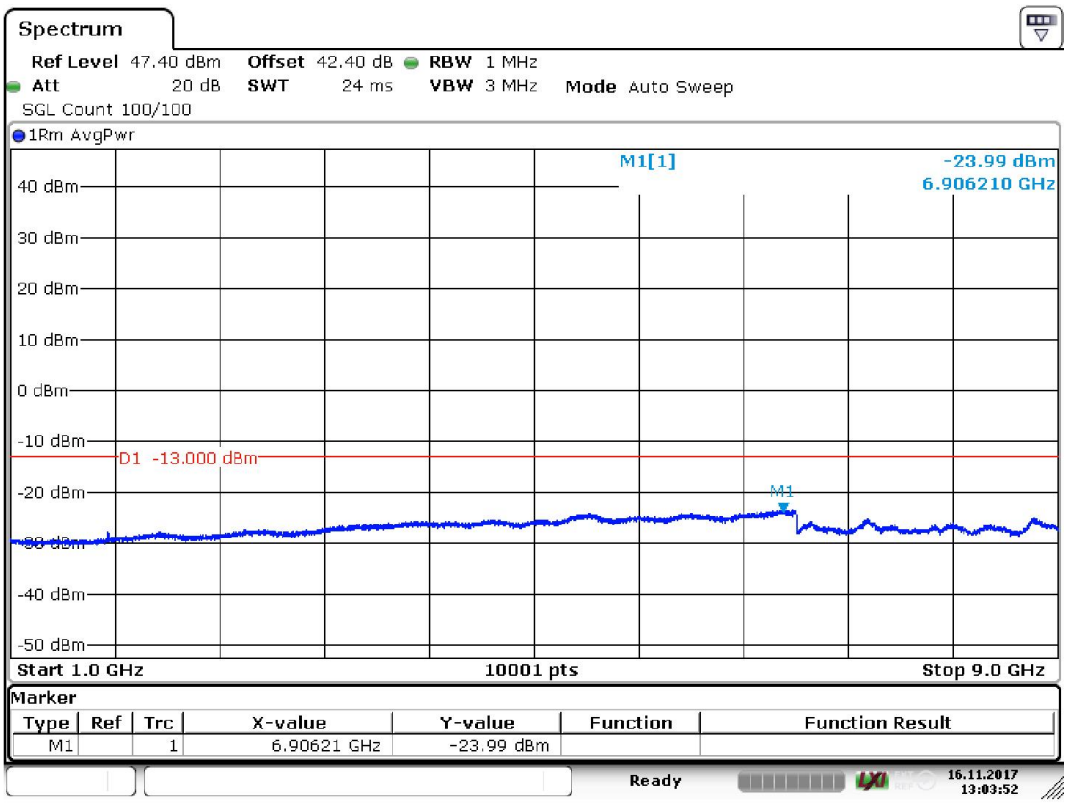

Date: 16.NOV.2017 14:55:47

WCDMA 868 – 869 MHz low channel



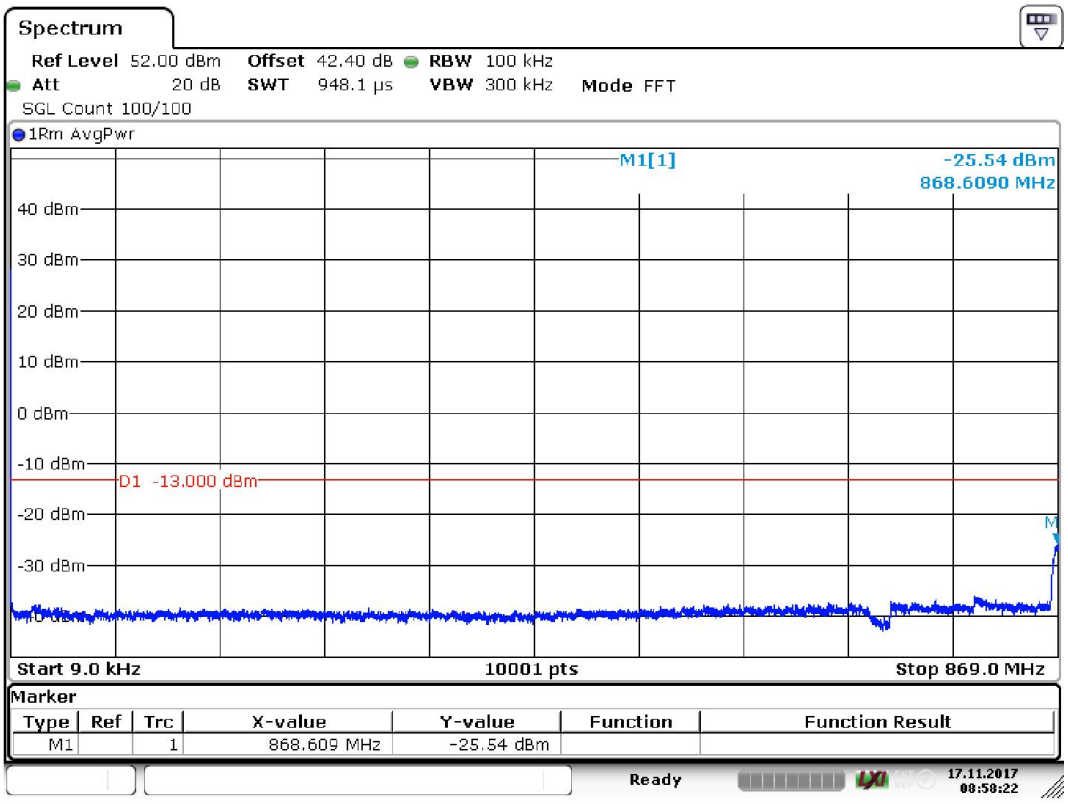

Date: 16.NOV.2017 13:04:47

WCDMA 894 – 1000 MHz low channel



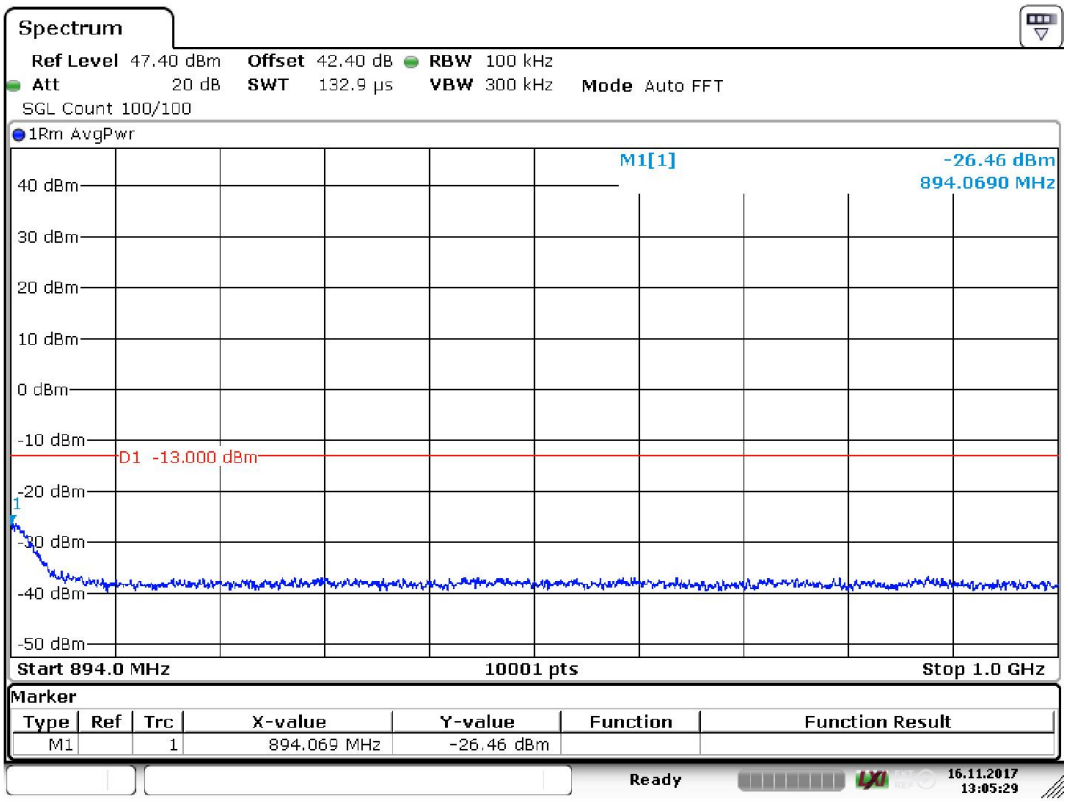

Date: 16.NOV.2017 13:03:52

WCDMA 1 – 9 GHz low channel.



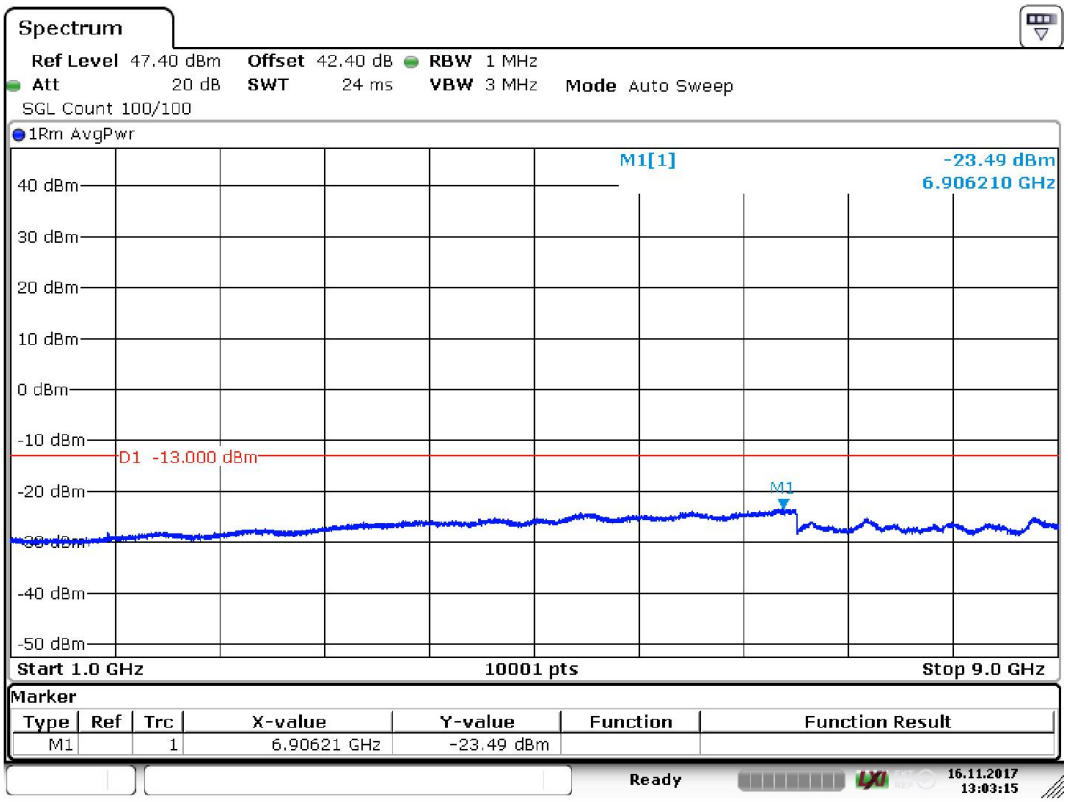

Date: 17.NOV.2017 08:58:23

WCDMA 9 kHz – 869 MHz middle channel



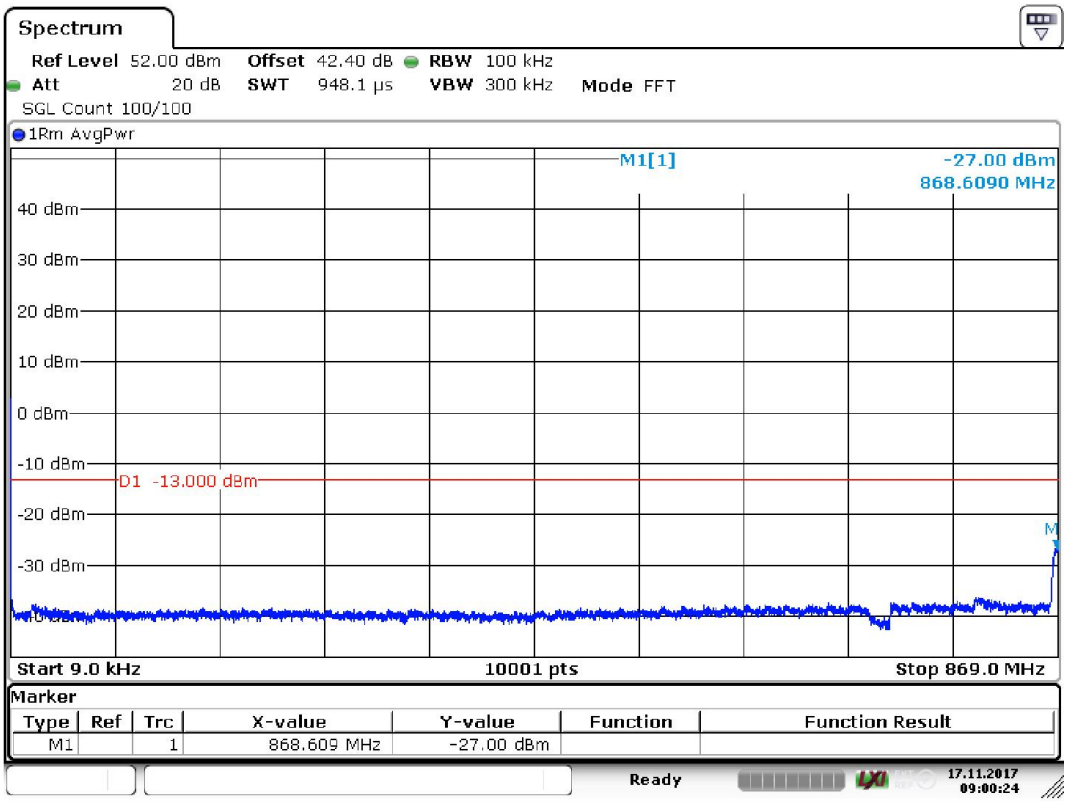

Date: 16.NOV.2017 13:05:29

WCDMA 894 – 1000 MHz middle channel



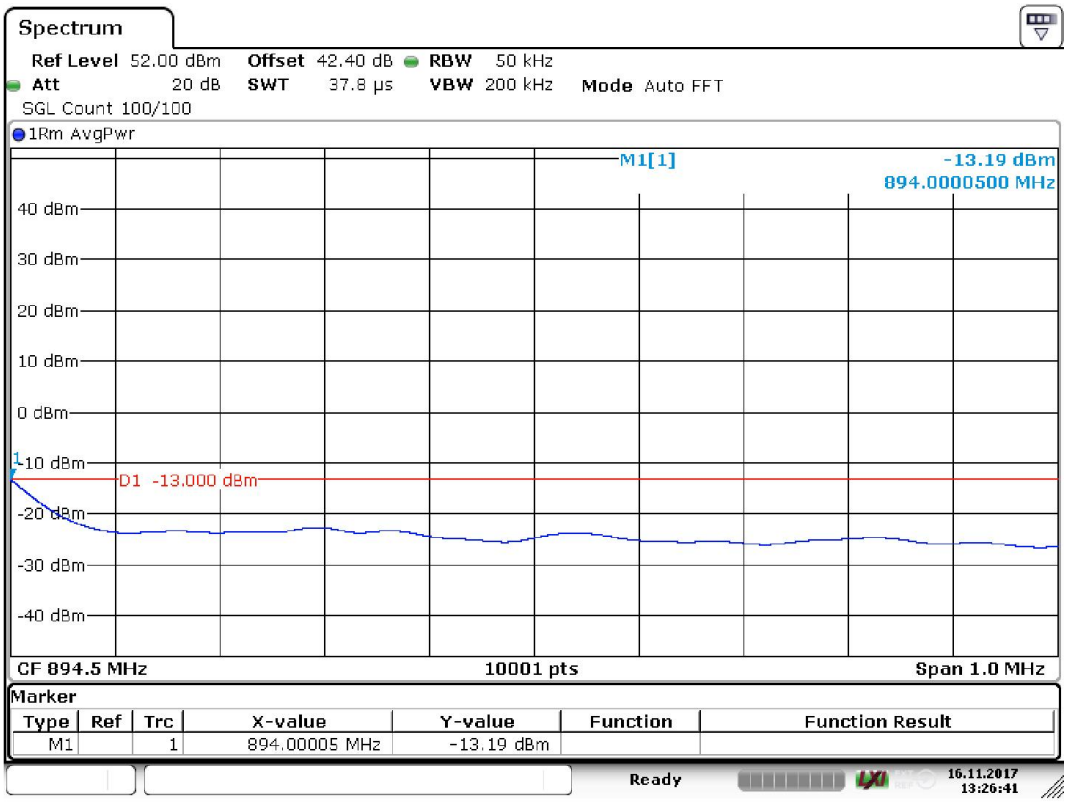

Date: 16.NOV.2017 13:03:16

WCDMA 1 – 9 GHz middle channel



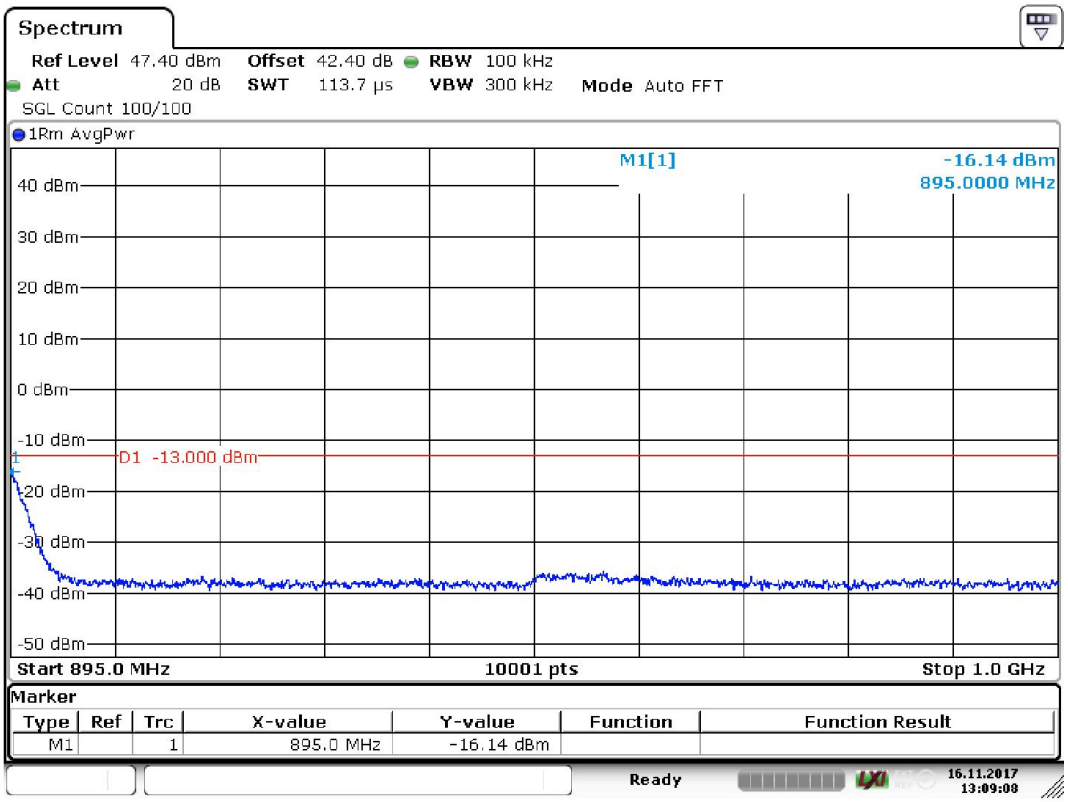

Date: 17.NOV.2017 09:00:24

WCDMA 9 kHz – 869 MHz high channel



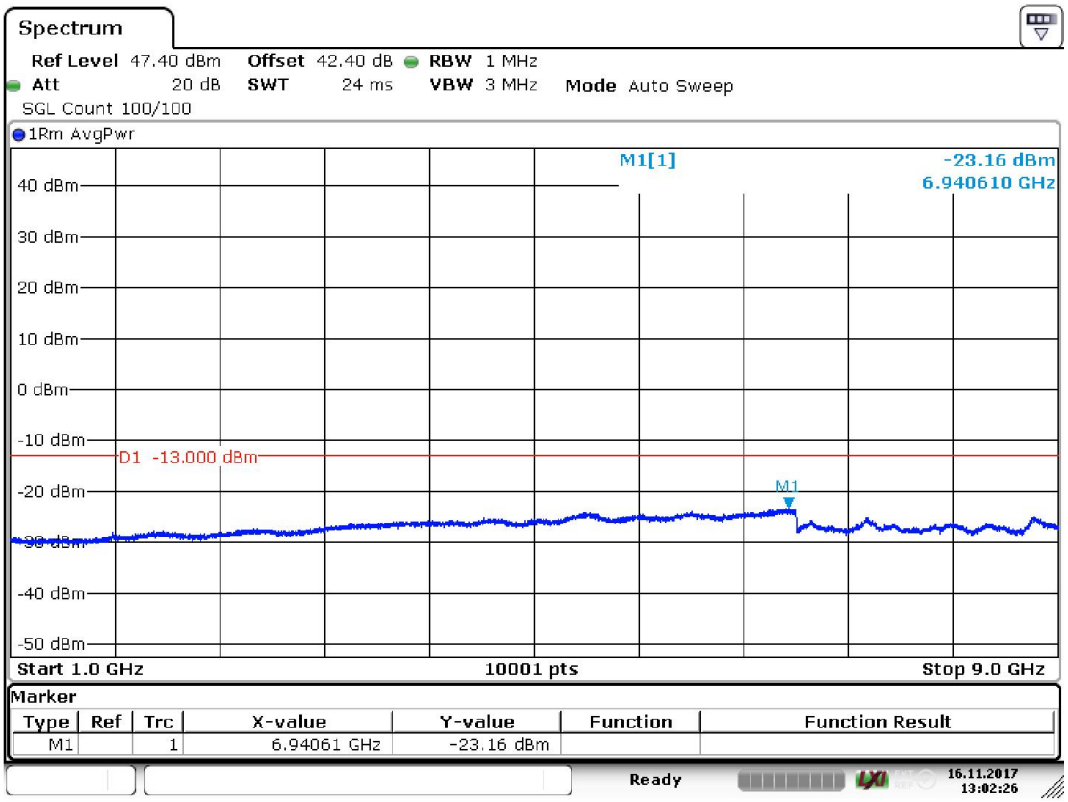

Date: 16.NOV.2017 13:26:42

WCDMA 894 – 895 MHz high channel




Date: 16.NOV.2017 13:09:08

WCDMA 895 – 1000 MHz high channel




Date: 16.NOV.2017 13:02:26

WCDMA 1 – 9 GHz high channel

### 9.4 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Spectrum analyser | Rohde & Schwarz | FSV | 32594 | 7/2018 |
| Rf-attenuator | Narda | 776B-10 | 8337 | 7/2018 |
| Rf-attenuator | Huber Suhner | 5920_N-50-010/199_N | 32697 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39076 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39077 | 7/2018 |
| Rf cable | Huber Suhner | Sucoflex 104PE | 39079 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMIQ03B | 12792 | 7/2018 |
| Signal generator | Rohde & Schwarz | SMBV100 | 32593 | 7/2018 |

## 10 RADIATED SPURIOUS EMISSION

| | | | |
|---|---|---|---|
| Date of test: | 2017-03-07 | Test location: | Björk hallen |
| EUT Serial: | 99992 | Ambient temp. | 21ºC |
| Tested by: | MTV | Relative humidity | 32 % |
| Test result: | Pass | Margin: | > 20 dB |

### 10.1 Test set-up

The test method is in accordance with ANSI C63.26 and ANSI-TIA-603-D-2010.
Both receiver and transmitter are active during the tests.
The EUT was placed on an insulating support above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated. Above 1 GHz both peak and average detector is activated.

Signal generator was connected to the FOI unit which converted rf signal to optical signal. The optical signal was then fed via fibre to the EUT.
The EUT's output port was terminated to the 50 Ω terminator.

A PC was connected to FOI via Ethernet hub. The PC was then used to control the EUT.

### 10.2 Test conditions

**Test set-up:** **30 MHz to 1000 MHz**
Test receiver set-up:
Preview test: Peak, RBW 120 kHz, VBW 1 MHz
Final test: Quasi-Peak, RBW 120 kHz, VBW 1 MHz
Measuring distance: 3 m
EUT height above ground plane: 0.8 m
Measuring angle: 0 – 359□
Antenna
Height above ground plane: 1 – 4 m
Polarisation: Vertical and Horizontal
Type: Bilog

**Test set-up:** **1 GHz – 22 GHz**
Test receiver set-up:
Preview test: Peak, RBW 1 MHz, VBW 3 MHz
Average, RBW 1 MHz, VBW 3 MHz
Final test: Average, RBW 1 MHz, VBW 3 MHz
Peak, RBW 1 MHz, VBW 3 MHz
Measuring distance: 3 m
EUT height above ground plane: 1.5 m
Measuring angle: 0 – 359□
Antenna
Height above ground plane: 1 – 4 m
Polarisation: Vertical and Horizontal
Type: Horn
Antenna tilt: Activated

### 10.3 Requirement

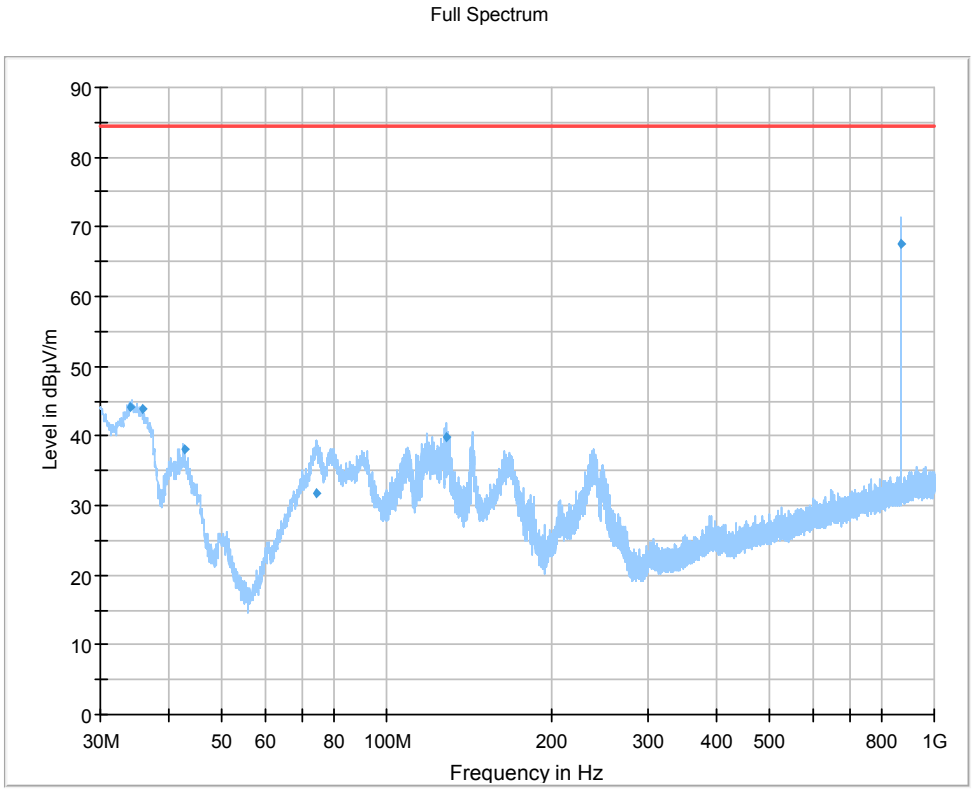
CFR47 §22.917
(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-132 clause 5.5
i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P ( dBW) by at least 43 + 10 log10p (watts).
ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

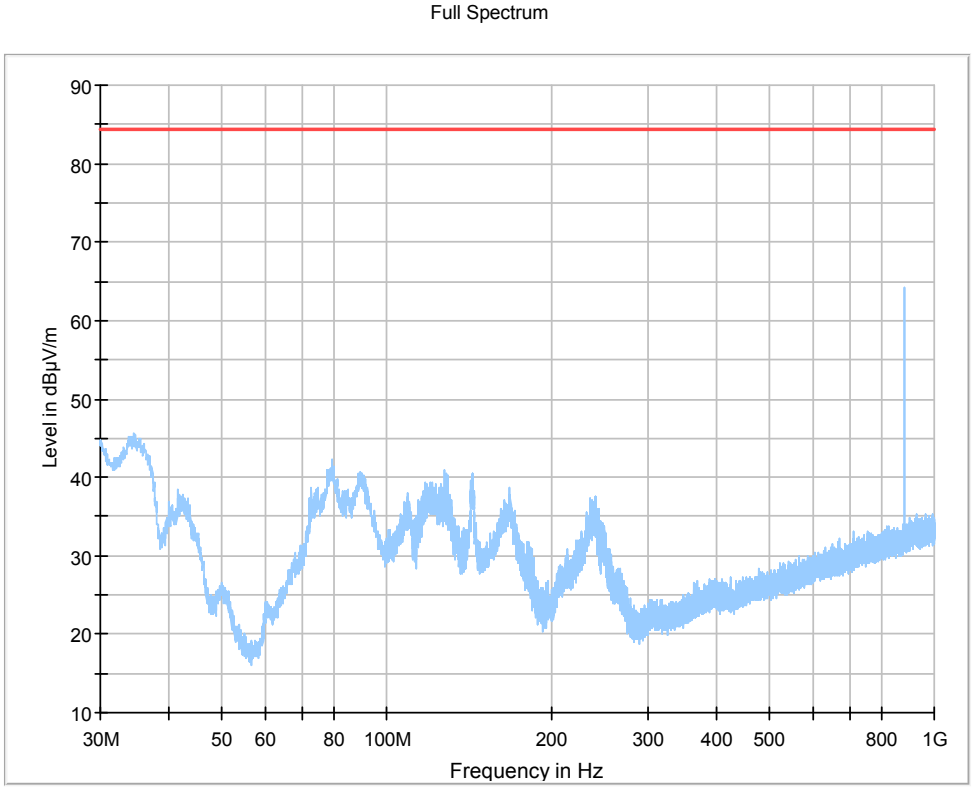
The frequency range to be inspected is up to the tenth harmonics of the highest fundamental frequency according to 47 CFR 2.1057 and RSS-Gen Section 6.13.
The field strength limit is calculated using the plane wave relation.
$GP/4\pi R^2 = E^2 / 120\pi$

G: antenna gain
P: power (W)
R: measurement distance (m)

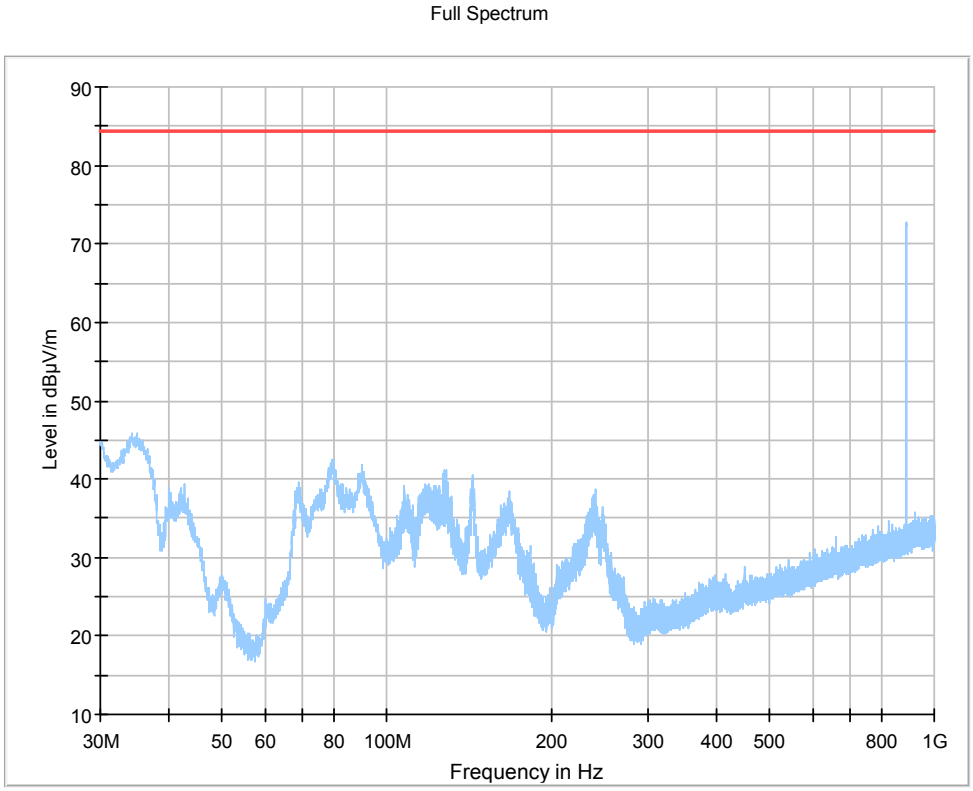
## 10.4 Test results



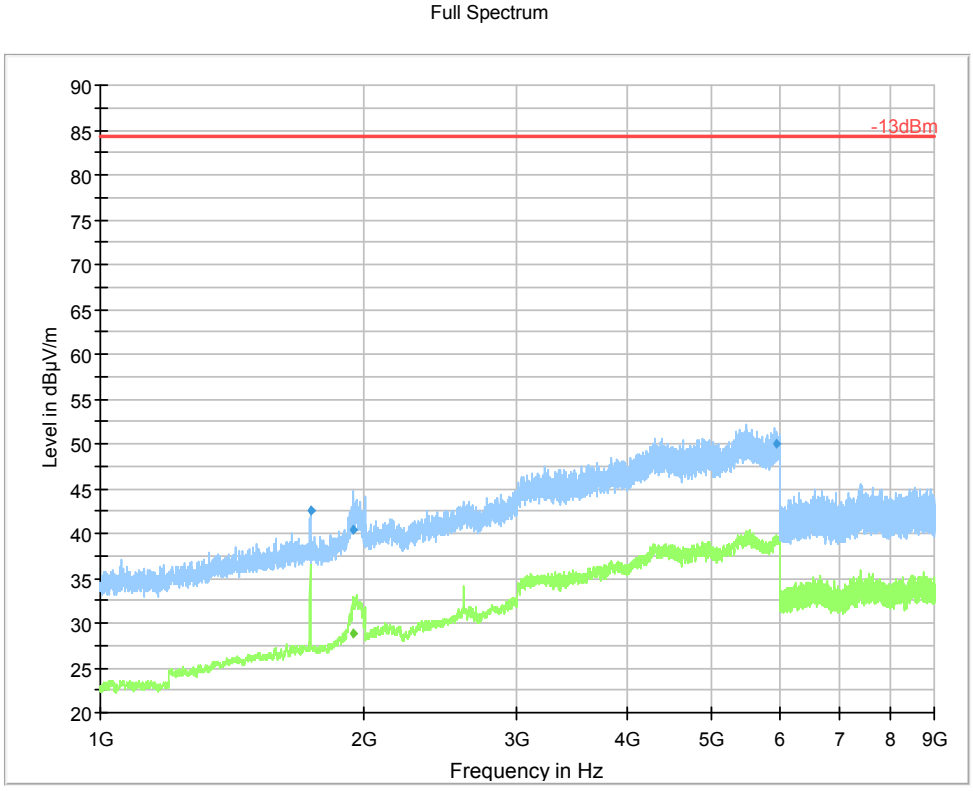

30 MHz – 1000 MHz low channel



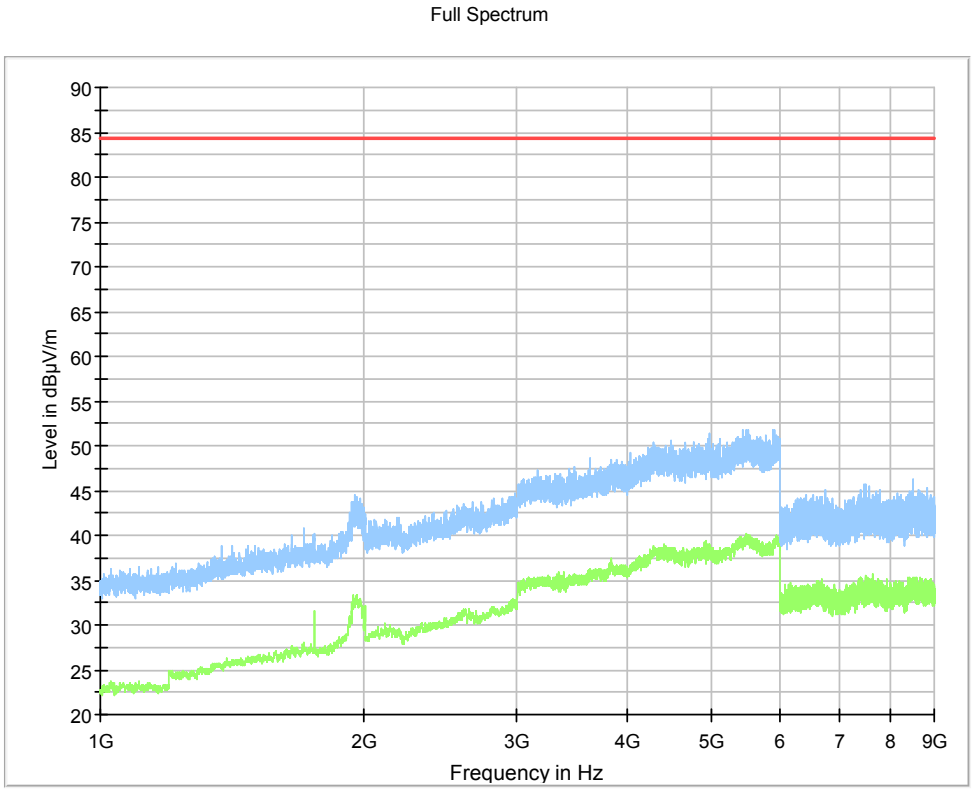

30 MHz – 1000 MHz middle channel



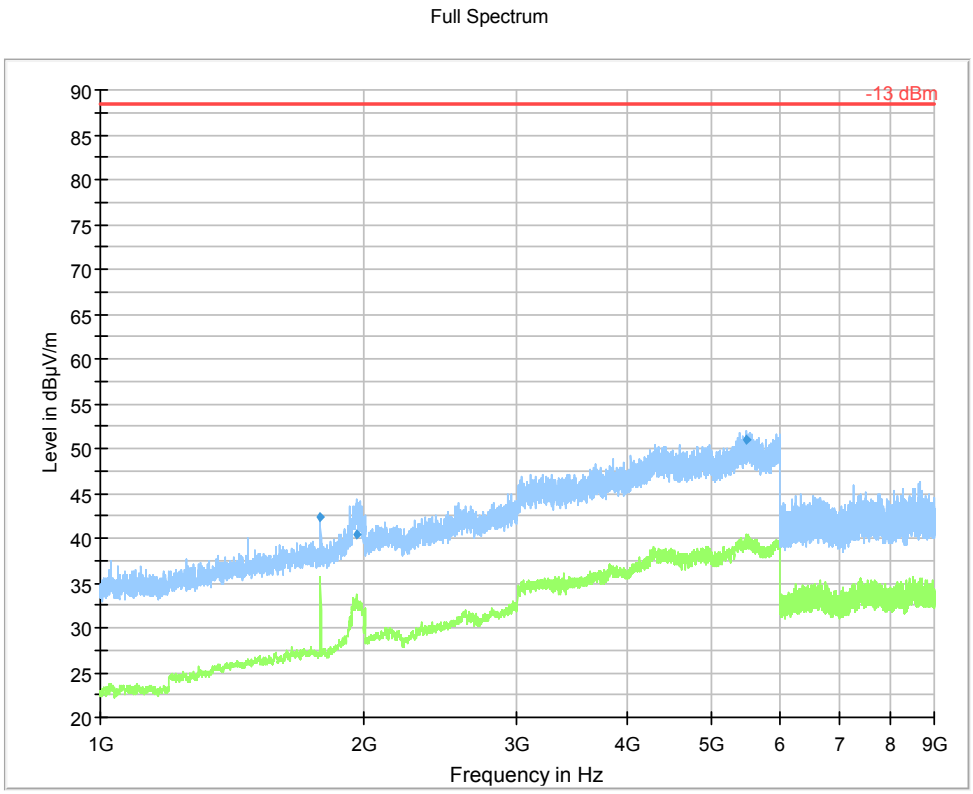

30 MHz – 1000 MHz high channel




1-9 GHz low channel




1-9 GHz middle channel




1-9 GHz high channel

### 10.5 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Cal. due date |
|---|---|---|---|---|
| Measurement receiver | Rohde & Schwarz | ESI 26 | 32291 | 7/2018 |
| Measurement receiver | Rohde & Schwarz | ESU 40 | 13178 | 7/2018 |
| UltraLog antenna | Rohde & Schwarz | HL562 | 30711 | 12/2018 |
| Horn antenna | Rohde & Schwarz | HF907 | 32307 | 7/2018 |
| Pre amplifier | Rohde & Schwarz | TS-pre1 | 32306 | 7/2018 |
| Horn antenna + preamp | Bonn | BLMA 1826-5A | 31247 | 1/2020 |
| Rf cable | Megaphase | GC12-K1K1-315 | 39127 | 7/2018 |

## 11 MEASUREMENT UNCERTAINTY

Measurement uncertainty for radiated disturbance

| | |
|---|---|
| Uncertainty for the frequency range 0.09 to 30 MHz at 10 m | ± 3.2 dB |
| Uncertainty for the frequency range 30 to 1000 MHz at 3 m | ± 5.1 dB |
| Uncertainty for the frequency range 30 to 1000 MHz at 10 m | ± 5.0 dB |
| Uncertainty for the frequency range 1.0 to 18 GHz at 3 m | ± 4.7 dB |
| Uncertainty for the frequency range 18 to 26 GHz at 3 m | ± 4.8 dB |
| Uncertainty for the frequency range 26 to 40 GHz at 3 m | ± 5.7 dB |

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.
The measurement uncertainty is given with a confidence of 95 %.

Measurement uncertainty for antenna port measurements

| | |
|---|---|
| Uncertainty for conducted spurious emission | ± 2,5 dB |
| Uncertainty for carrier power | ± 1,3 dB |

Frequency error

| Frequency to be measured [MHz] | Expanded (k=1,96) Measurement Uncertainty [Hz] | Expanded (k=1,96) Measurement Uncertainty [%] |
|---|---|---|
| 25 | 0,34 | $1,36 \times 10^{-8}$ |
| 433 | 3,40 | $7,90 \times 10^{-9}$ |
| 868 | 3,40 | $3,91 \times 10^{-9}$ |
| 1900 | 33,95 | $1,79 \times 10^{-8}$ |
| 2483,5 | 33,96 | $1,37 \times 10^{-8}$ |
| 5850 | 34,00 | $5,81 \times 10^{-9}$ |

Measurement uncertainty is calculated in accordance with ETSI TS 100028.
The measurement uncertainty is given with a confidence of 95 %.

## 12 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 1713846STO-001 Annex 1.
Test set up photos are in separate document 1718386STO-01 Annex 2.