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## Radio measurements on AIR 21 B4A/ B12P B5P 1700/ 2100 MHz radio equipment with FCC ID:TA8AKRC118048-1 and IC:287AB- AS1180481 (8 appendices)

### Test object

AIR 21 B4A/ B12P B5P, KRC 118 048/1 Rev R1A

### Summary

| Standard                                                    | Compliant | Appendix |
|-------------------------------------------------------------|-----------|----------|
| <b>FCC CFR 47 / IC RSS-139</b>                              |           |          |
| 2.1046 / RSS-139 6.4 RF power output                        | Yes       | 2        |
| 2.1049 / RSS-Gen 4.6.1 Occupied bandwidth                   | Yes       | 3        |
| 2.1051 / RSS-139 6.5 Band edge                              | Yes       | 4        |
| 2.1051 / RSS-139 6.5 Spurious emission at antenna terminals | Yes       | 5        |
| 2.1053 / RSS-139 6.5 Field strength of spurious radiation   | Yes       | 6        |
| 2.1055 / RSS-139 6.3 Frequency stability                    | Yes       | 7        |

Note: Above RSS-139 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

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Performed by



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Examined by



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## Appendix 1

### Description – Test object

Equipment: Radio equipment AIR 21 B4A/ B12P B5P running in WCDMA mode supporting single and multi-carrier.

Antenna ports: 2 TX ports configured for single antenna.

Frequency bands: TX: 2110 – 2155 MHz  
RX: 1710 – 1755 MHz

Modulations: QPSK, 16QAM and 64QAM

Nominal output power per antenna port: Single carrier: 1x 44.8 dBm (1x 30W)  
Multi carrier: 2x 41.8 dBm (2x 15W)  
3x 40.0 dBm (3x 10W)  
4x 48.8 dBm (4x 7.5W)

Channel bandwidth: 4.2 to 5 MHz (configurable in steps of 100/200 kHz)

Channel spacing: 4.4 to 5 MHz (configurable in steps of 100/200 kHz)

Nominal power voltage: -48 VDC

### Tested channels

| Channel | Downlink   |        | Uplink     |        |
|---------|------------|--------|------------|--------|
|         | Frequency* | UARFCN | Frequency* | UARFCN |
| B       | 2112.4     | 1537   | 1712.4     | 1312   |
| B+5     | 2117.4     | 1562   | 1717.4     | 1337   |
| B+10    | 2122.4     | 1587   | 1722.4     | 1362   |
| B+15    | 2127.4     | 1612   | 1727.4     | 1387   |
| M       | 2132.6     | 1638   | 1732.6     | 1413   |
| T-15    | 2137.6     | 1663   | 1737.6     | 1438   |
| T-10    | 2142.6     | 1688   | 1742.6     | 1463   |
| T-5     | 2147.6     | 1713   | 1747.6     | 1488   |
| T       | 2152.6     | 1738   | 1752.6     | 1513   |

\* Frequency in MHz

### Operation mode during measurements

Measurements were performed with the test object transmitting the Test model 1 which are defined in 3GPP TS 25.141. Test model 1 (TM1) uses the QPSK modulation only. Test model 5 (TM5) includes the 16QAM modulation and Test model 6 (TM6) includes the 64QAM modulation.

The settings below were found to be representative for all traffic scenarios when several settings with the different modulations, channel bandwidths and the number of carriers were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted.

Single carrier

TM1: 64 DPCH:s at 30 ksps (SF=128)

Multi carrier

TM1: 32 DPCH:s at 30 ksps (SF=128) in each carrier (Two carriers activated)

Channel bandwidth 5 MHz

**Conducted measurements**

The EUT was a pole mounted unit supplied with -48 VDC by an external power supply. All RF conducted measurements were performed with the test object configured for maximum transmit power on both RF output ports. Complete measurements were made on RF A with additional measurements on RF B to verify that the ports are identical.

**Radiated measurements**

The test object was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmit power on both RF output ports. The RF A output power port was via a RF attenuator connected to functional test equipment for supervision. RF B output power port was terminated in a 50 ohm load.

**Purpose of test**

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-139 and RSS-Gen.

**References**

Measurements were done according to relevant parts of the following standards:

ANSI 63.4-2009

ANSI/TIA/EIA-603-C-2004

CFR 47 part 2, October 1<sup>st</sup>, 2011

CFR 47 part 27, October 1<sup>st</sup>, 2011

3GPP TS 25.141, version 8.9.0

RSS-Gen Issue 3

RSS-139 Issue 2

## Measurement equipment

| Measurement equipment                                      | Calibration Due | SP number |
|------------------------------------------------------------|-----------------|-----------|
| Test site Tesla                                            | 2014-01         | 503 881   |
| R&S FSIQ 40                                                | 2012-07         | 503 738   |
| R&S FSQ 40                                                 | 2012-07         | 504 143   |
| R&S ESI 26                                                 | 2012-07         | 503 292   |
| R&S FSQ 40, BAMS - 1000294394                              | 2013-03         | -         |
| Control computer with<br>R&S software EMC32 version 8.52.0 | -               | 503 479   |
| High pass filter                                           | 2012-07         | 504 199   |
| High pass filter                                           | 2013-01         | 901 373   |
| High pass filter                                           | 2012-07         | 503 739   |
| High pass filter                                           | 2012-07         | 503 740   |
| RF attenuator                                              | 2012-07         | 504 159   |
| RF attenuator                                              | 2012-07         | 900 233   |
| Chase Bilog Antenna CBL 6111A                              | 2013-10         | 503 182   |
| EMCO Horn Antenna 3115                                     | 2014-01         | 502 175   |
| Std.gain horn FLANN model 20240-20                         | -               | 503 674   |
| µComp Nordic, Low Noise Amplifier                          | 2013-03         | 901 545   |
| MITEQ Low Noise Amplifier                                  | 2012-07         | 503 285   |
| Temperature cabinet                                        | -               | 503 360   |
| Testo 635 Temperature and humidity meter                   | 2013-05         | 504 203   |

## Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The uncertainties are calculated with a coverage factor  $k=2$  (95% level of confidence).

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

## Reservation

The test results in this report apply only to the particular test object as declared in the report.

## Delivery of test object

The test object was delivered 2012-08-30.

## Manufacturer's representative

Christer Gustavsson, Ericsson AB

## Test engineers

Andreas Johnson, Tomas Isbring, Hyder Khalaf, Kexin Chen, Jörgen Wassholm, and Martin Theorin, SP

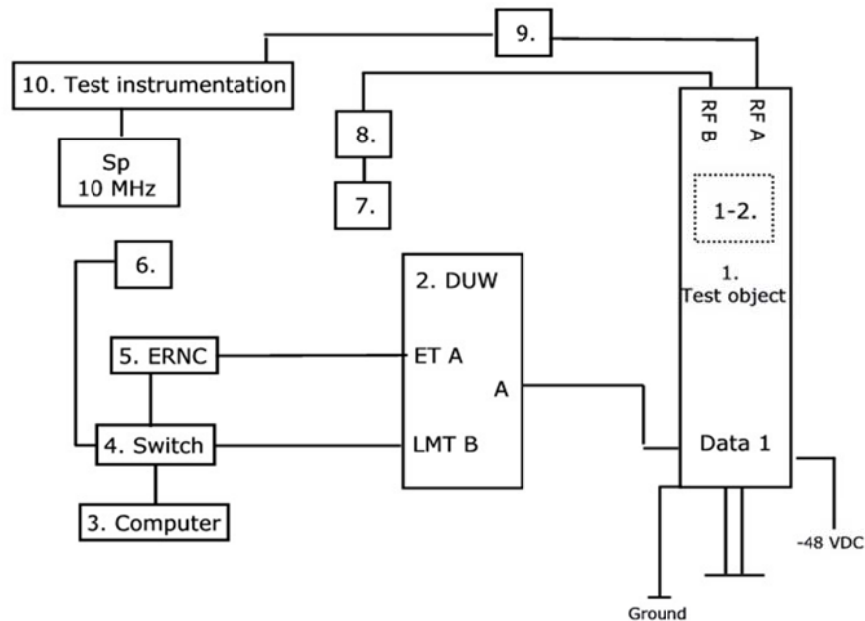
## Test participant

Mikael Jansson, Ericsson AB (Partially present).

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## Appendix 1

### Test set-up conducted measurements TX



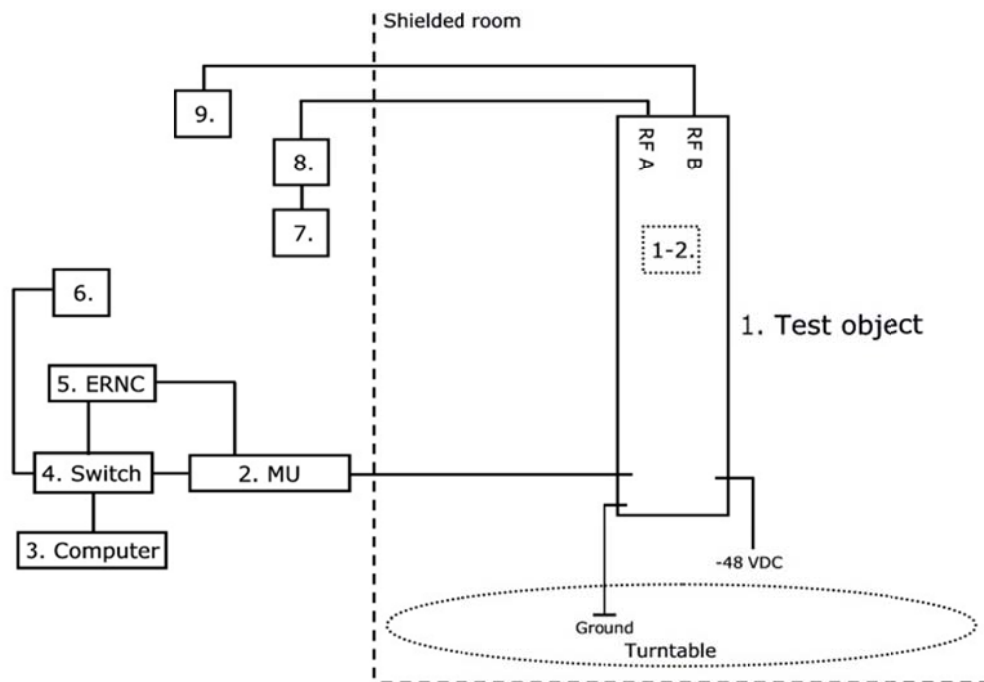
#### Test object

1. AIR 21 B4A/B2P, KRC 118 046/1, revision R1B, S/N: CQ30001893 with software (PIS): CXP 901 3268/6 rev. R44GK  
1-2 Transceiver, ARUS B4 1/KRC 118 046, revision R1A

#### Functional test equipment

2. DU 1: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825385045 and DU 2: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825542090
3. Computer HP Elitebook 8540w, BAMS – 1001052061
4. Fast Ethernet switch, Netgear FS276T
5. ERNC-SIM 130, BAMS – 1000660991
6. Rubidium Frequency Standard Symmetricom 8040, BAMS – 1000714189
7. Terminator
8. Attenuator
9. SP test instrument according measurement equipment list
10. SP test instrument according measurement equipment list

## Test set-up radiated measurements



### Test object

1. AIR 21 B4A/ B12P B5P, KRC 118 048/1, revision R1A, S/N: CQ30020326  
(FCC ID:TA8AKRC118048-1 / IC:287AB-AS1180481)  
with software (PIS): CXP 901 3268/6 rev. R44GK  
1-2 Tranceiver, ARUS B4 1/KRC 118 046, revision R1A

### Functional test equipment

2. DU 1: DUW 30 01, KDU 127 161/3, Rev R4C, S/N: C825194294
2. SUP 6601, 1/BFL 901 009/1, Rev R2B, S/N: BR80882600
3. Computer HP Elitebook 8540w, BAMS – 1001052042
4. Fast Ethernet switch, Netgear FS276T
5. ERNC-SIM 129, BAMS – 1000660990
6. Rubidium Frequency Standard Symmetricom 8040, BAMS – 1000714188
7. R&S FSIQ 40 for monitoring the RF signal
8. Attenuator
9. Terminator

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Appendix 1

**Test object interfaces**

**Type of port:**

|                                                             |          |
|-------------------------------------------------------------|----------|
| Power configuration: -48 VDC                                | DC Power |
| Antenna port (A), 7/16 connector, N/A in this configuration | Antenna  |
| Antenna port (B), 7/16 connector, N/A in this configuration | Antenna  |
| Opto 1, Optical Interface Link, single mode optical fibre   | Telecom  |
| Opto 2, N/A in this configuration                           | Telecom  |
| Ground wire                                                 | Ground   |

**RBS software**

| Software       | Revision |
|----------------|----------|
| CXP 901 8350/1 | R5C01    |

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## Appendix 2

### RF power output measurements according to CFR 47 §27.50 / IC RSS-139 6.4

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2012-06-12 | 22 °C ± 3 °C | 39 % ± 5 % |
| 2012-06-13 | 17 °C ± 3 °C | 50 % ± 5 % |

#### Test set-up and procedure

The test object was connected to a signal analyzer measuring peak and RMS output power in CDF mode. A resolution bandwidth of 50 MHz was used.

| Measurement equipment                     | SP number |
|-------------------------------------------|-----------|
| R&S FSQ 40                                | 504 143   |
| RF attenuator                             | 504 159   |
| Testo 635, temperature and humidity meter | 504 203   |

**Measurement uncertainty:** 1.1 dB

#### Results

Single carrier: Rated output power level at RF A connector 1x 44.8 dBm

| UARFCN | Result RMS (dBm) | 10log(N) <sup>1)</sup> (dBm) | Result RMS (dBm/ MHz) <sup>2)</sup> |
|--------|------------------|------------------------------|-------------------------------------|
| B      | 44.6             | 47.6                         | 41.4                                |
| M      | 44.7             | 47.7                         | 41.5                                |
| T      | 44.7             | 47.7                         | 41.5                                |

Multi carrier 1x2: Rated output power level at RF A connector 2x 41.8 dBm

| UARFCN   | Result RMS 2 carrier combined power (dBm) | 10log(N) <sup>1)</sup> (dBm) | Result RMS (dBm/ MHz) <sup>2)</sup> |
|----------|-------------------------------------------|------------------------------|-------------------------------------|
| B+(B+10) | 44.7                                      | 47.7                         | 38.5                                |
| M+(M+10) | 44.6                                      | 47.6                         | 38.4                                |
| T+(T-10) | 44.7                                      | 47.7                         | 38.5                                |

Multi carrier 1x4: Rated output power level at RF A connector 4x 38.8 dBm

| UARFCN                | Result RMS 4 carrier combined power (dBm) | 10log(N) <sup>1)</sup> (dBm) | Result RMS (dBm/ MHz) <sup>2)</sup> |
|-----------------------|-------------------------------------------|------------------------------|-------------------------------------|
| B+(B+5)+(B+10)+(B+15) | 44.7                                      | 47.7                         | 35.5                                |
| (M-5)+M+(M+5)+(M+10)  | 44.7                                      | 47.7                         | 35.5                                |
| T+(T-5)+(T+10)+(T+15) | 44.6                                      | 47.6                         | 35.4                                |

Single carrier: Rated output power level at RF B connector 1x 44.8 dBm

| UARFCN | Result RMS (dBm) | 10log(N) <sup>1)</sup> (dBm) | Result RMS (dBm/ MHz) <sup>2)</sup> |
|--------|------------------|------------------------------|-------------------------------------|
| B      | 44.6             | 47.8                         | 41.6                                |

<sup>1)</sup>: 2 outputs summed power according to FCC KDB662911 Multiple transmitter output v01r01

<sup>2)</sup>: Power density (dBm/MHz) for a 5 MHz BW= Output power -10log(OBW/1MHz)

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## Appendix 2

Single carrier:

Diagram 1: B

Diagram 2: M

Diagram 3: T

Multi carrier:

Diagram 4:  $B+(B+10)$

Diagram 5:  $M+(M+10)$

Diagram 6:  $T+(T-10)$

Diagram 7:  $B+(B+5)+(B+10)+(B+15)$

Diagram 8:  $(M-5)+M+(M+5)+(M+10)$

Diagram 9:  $T+(T-5)+(T-10)+(T-15)$

Single carrier RF B

Diagram 10 B

### Limits

§27.50: The maximum output power may not exceed 1640 W (EIRP) / MHz.  
The Peak to Average Ratio (PAR) may not exceed 13 dB.

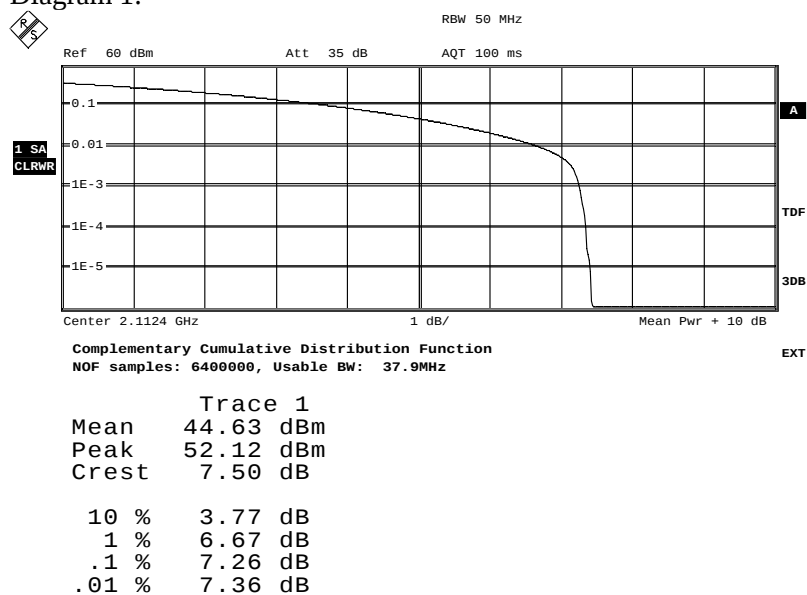
RSS-139 6.4: The average equivalent isotropically radiated power (e.i.r.p.) limits in SRSP-513 apply, resulting in a maximum EIRP of 1640 W / MHz for the scope of this report. The peak-to-average ratio of the power shall not exceed 13 dB.

|           |     |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

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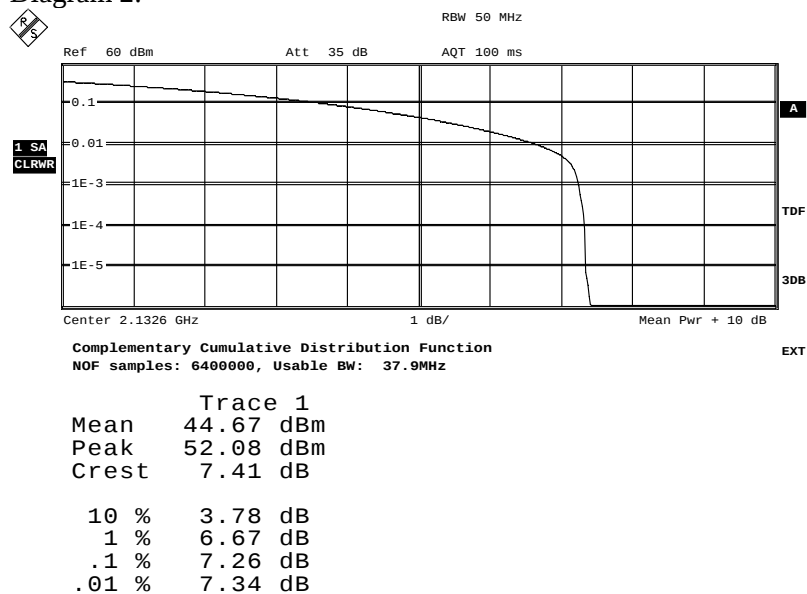
## Appendix 2

Diagram 1:



Date: 12.JUN.2012 21:14:52

Diagram 2:

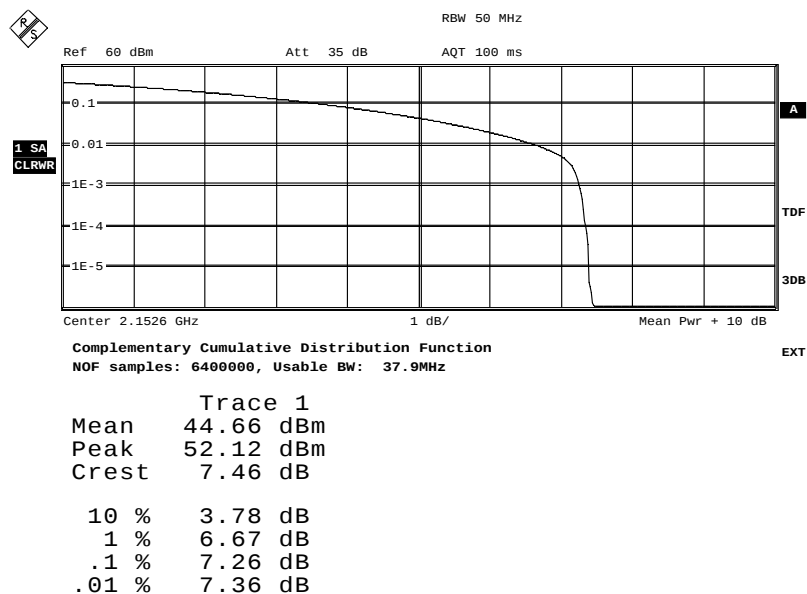


Date: 12.JUN.2012 17:02:52

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

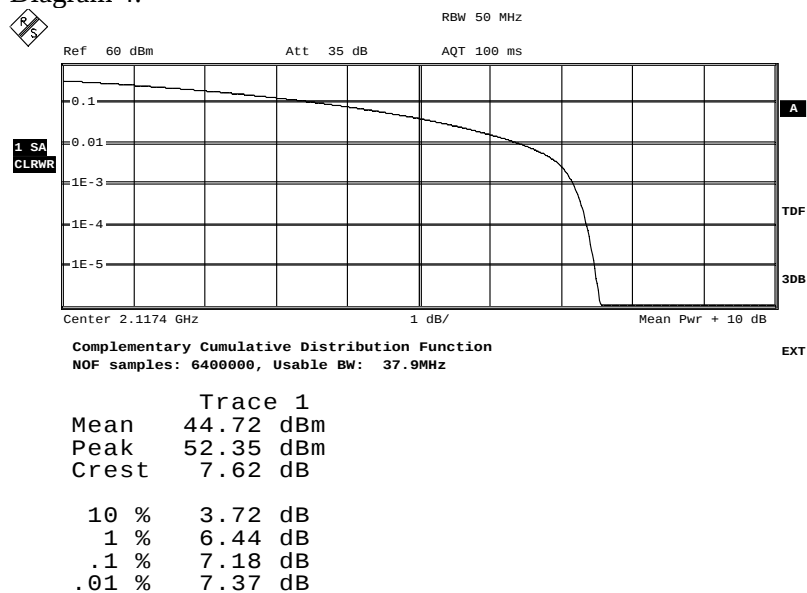
## Appendix 2

Diagram 3:



Date: 12.JUN.2012 21:35:32

Diagram 4:

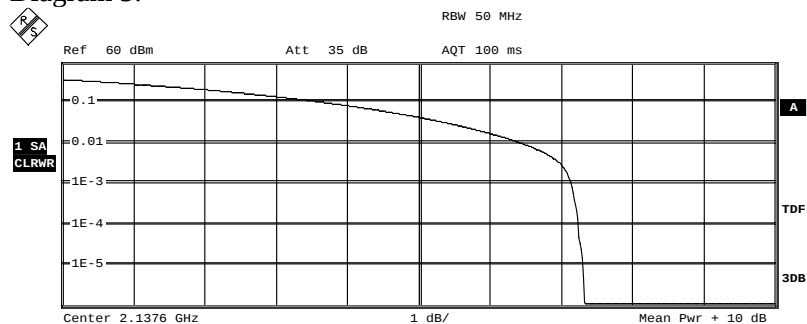


Date: 13.JUN.2012 10:48:48

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 2

Diagram 5:



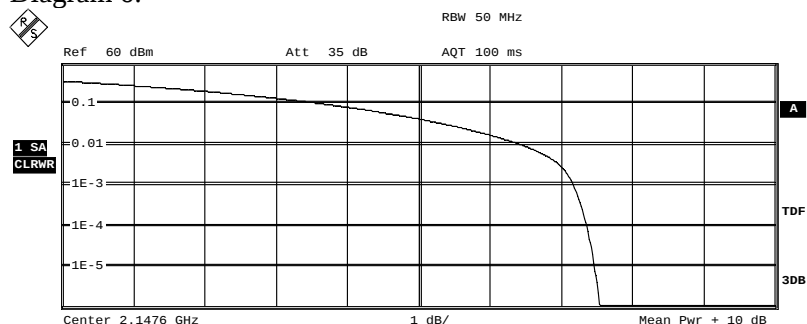
Complementary Cumulative Distribution Function  
NOF samples: 6400000, Usable BW: 37.9MHz

Trace 1  
Mean 44.63 dBm  
Peak 52.02 dBm  
Crest 7.39 dB

10 % 3.72 dB  
1 % 6.44 dB  
.1 % 7.15 dB  
.01 % 7.24 dB

Date: 13.JUN.2012 10:56:44

Diagram 6:



Complementary Cumulative Distribution Function  
NOF samples: 6400000, Usable BW: 37.9MHz

Trace 1  
Mean 44.65 dBm  
Peak 52.25 dBm  
Crest 7.60 dB

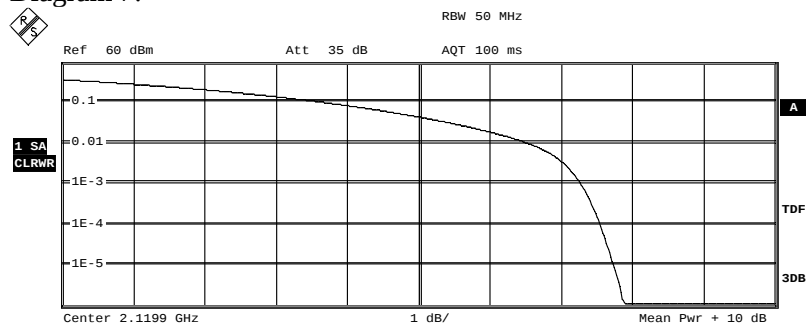
10 % 3.72 dB  
1 % 6.44 dB  
.1 % 7.18 dB  
.01 % 7.37 dB

Date: 13.JUN.2012 10:26:56

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 2

Diagram 7:



Complementary Cumulative Distribution Function  
NOF samples: 6400000, Usable BW: 37.9MHz

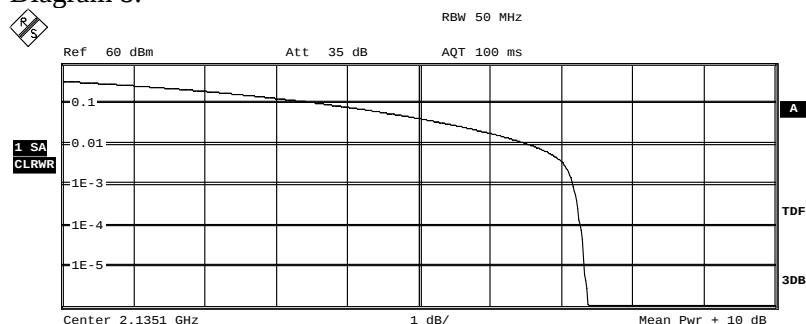
EXT

Trace 1  
Mean 44.71 dBm  
Peak 52.78 dBm  
Crest 8.06 dB

10 % 3.72 dB  
1 % 6.54 dB  
.1 % 7.28 dB  
.01 % 7.55 dB

Date: 13.JUN.2012 13:12:55

Diagram 8:



Complementary Cumulative Distribution Function  
NOF samples: 6400000, Usable BW: 37.9MHz

EXT

Trace 1  
Mean 44.70 dBm  
Peak 52.09 dBm  
Crest 7.39 dB

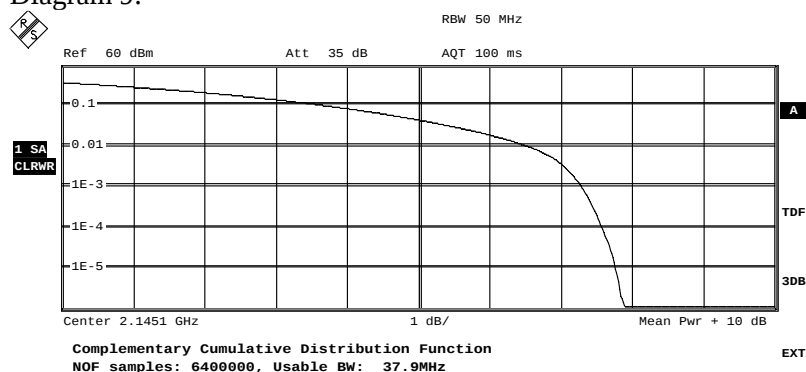
10 % 3.72 dB  
1 % 6.57 dB  
.1 % 7.18 dB  
.01 % 7.28 dB

Date: 13.JUN.2012 15:20:11

FCC ID:TA8AKRC118048-1  
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Appendix 2

Diagram 9:

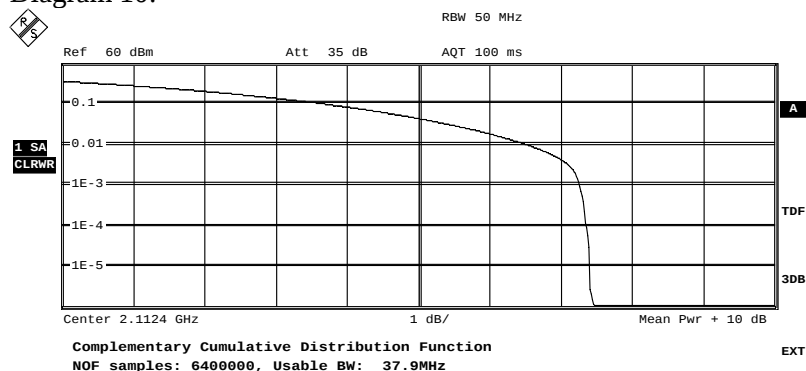


Trace 1  
Mean 44.62 dBm  
Peak 52.60 dBm  
Crest 7.97 dB

10 % 3.72 dB  
1 % 6.52 dB  
.1 % 7.29 dB  
.01 % 7.58 dB

Date: 13.JUN.2012 12:43:07

Diagram 10:



Trace 1  
Mean 44.58 dBm  
Peak 52.05 dBm  
Crest 7.48 dB

10 % 3.73 dB  
1 % 6.52 dB  
.1 % 7.26 dB  
.01 % 7.36 dB

Date: 13.JUN.2012 16:01:58

### Occupied bandwidth measurements according to 47 CFR 2.1049 / RSS-Gen 4.6.1

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2012-06-12 | 22 °C ± 3 °C | 39 % ± 5 % |
| 2012-06-13 | 17 °C ± 3 °C | 50 % ± 5 % |

#### Test set-up and procedure

The measurements were made per definition in §2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40    | 504 143   |
| RF attenuator                            | 504 159   |
| Testo 615 temperature and humidity meter | 503 498   |

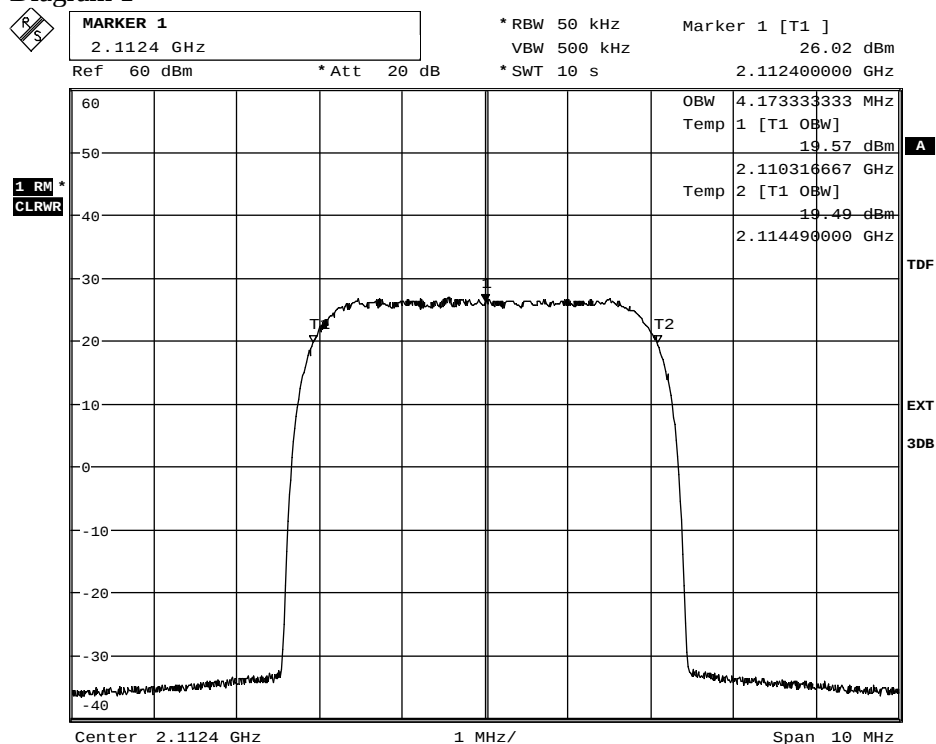
Measurement uncertainty: 3.7 dB

| Diagram | BW configuration | Tested frequency | Occupied BW (99%) [MHz] |
|---------|------------------|------------------|-------------------------|
| 1       | 5.0 MHz          | B                | 4.17                    |
| 2       | 5.0 MHz          | M                | 4.17                    |
| 3       | 5.0 MHz          | T                | 4.17                    |
| 4       | 4.2 MHz          | B                | 3.85                    |
| 5       | 4.2 MHz          | M                | 3.85                    |
| 6       | 4.2 MHz          | T                | 3.85                    |
| 7       | 5.0 MHz          | M, RF B          | 4.18                    |

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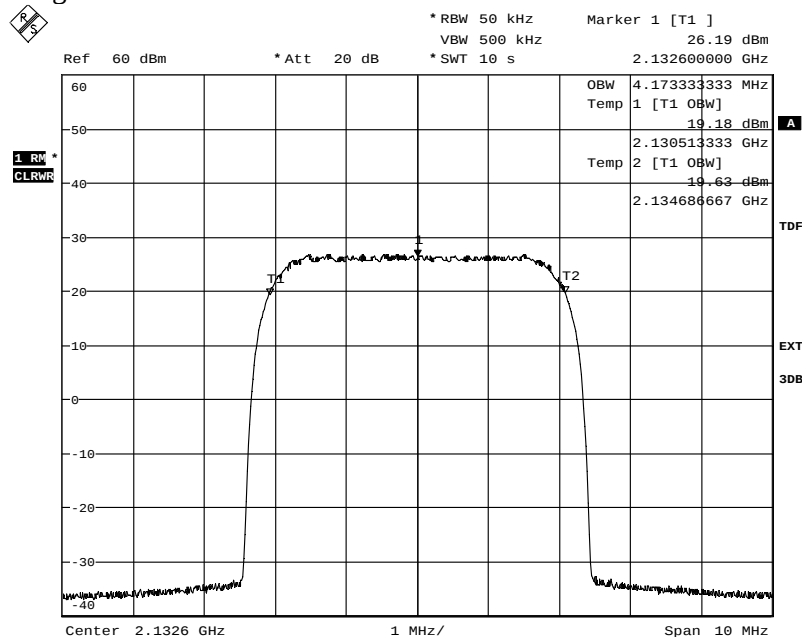
## Appendix 3

Diagram 1



Date: 12.JUN.2012 21:11:42

Diagram 2

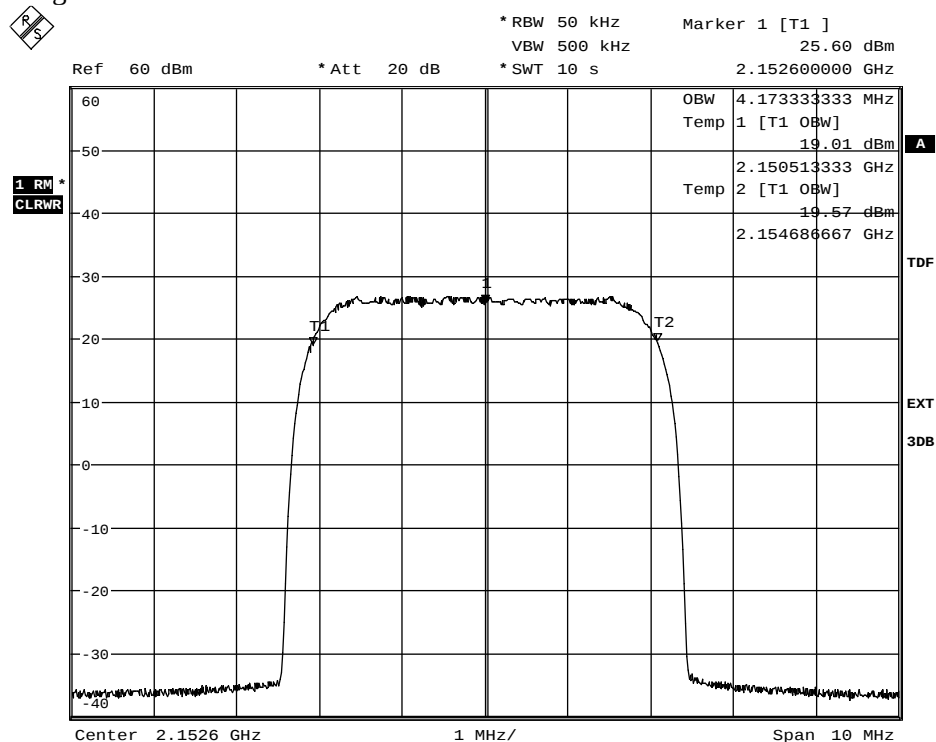


Date: 12.JUN.2012 17:26:34

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

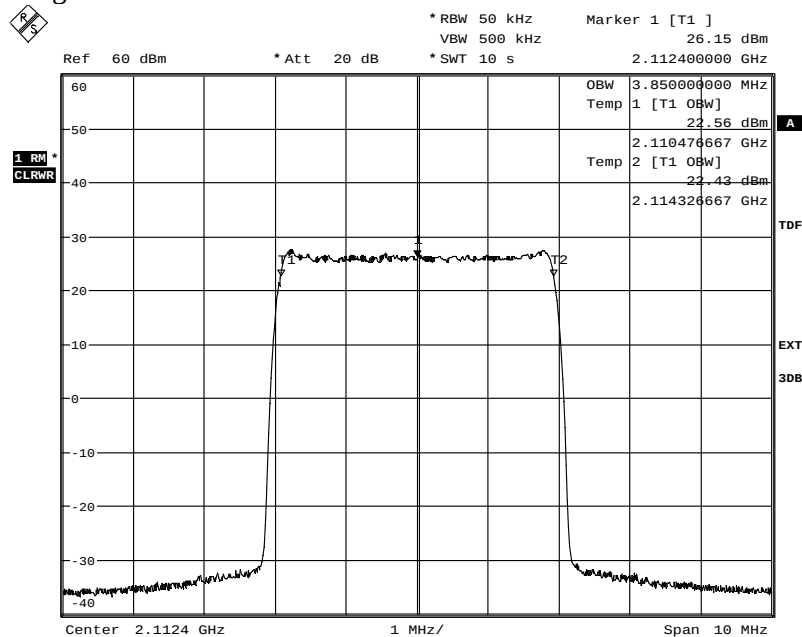
### Appendix 3

Diagram 3



Date: 12.JUN.2012 21:33:02

Diagram 4

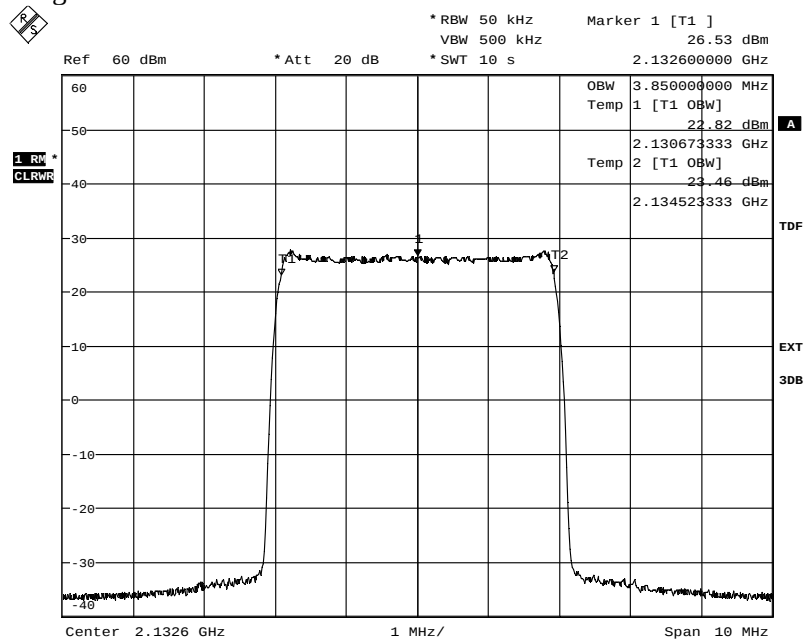


Date: 13.JUN.2012 07:44:34

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

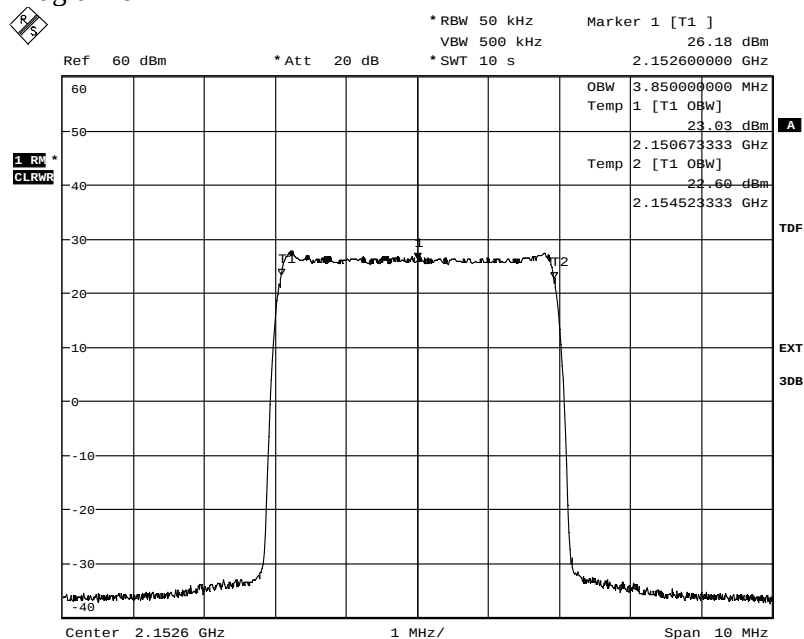
Appendix 3

Diagram 5



Date: 12.JUN.2012 19:01:40

Diagram 6

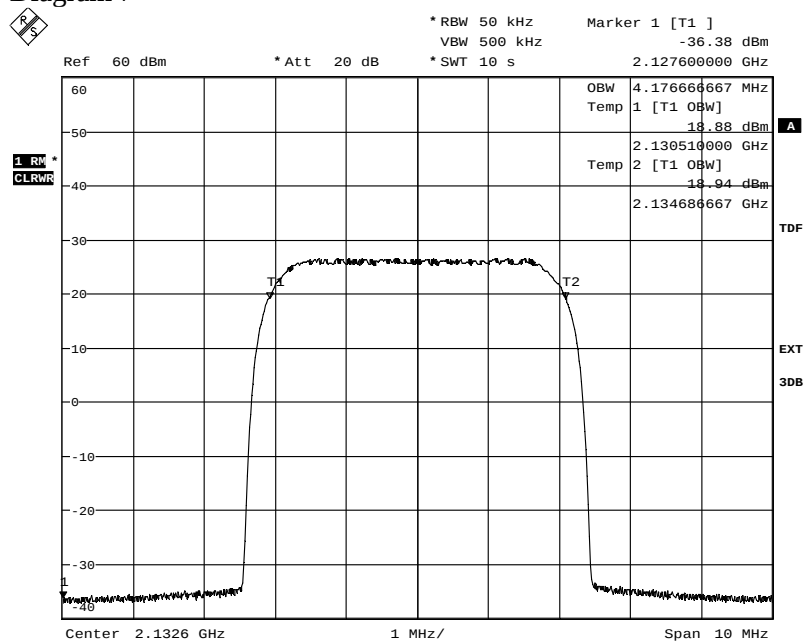


Date: 12.JUN.2012 19:27:23

FCC ID:TA8AKRC118048-1  
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Appendix 3

Diagram 7



Date: 13.JUN.2012 16:10:41

FCC ID:TA8AKRC118048-1  
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## Appendix 4

### Band edge measurements according to CFR 47 §27.53(h) / IC RSS-139 6.5

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2012-06-12 | 22 °C ± 3 °C | 39 % ± 5 % |
| 2012-06-13 | 17 °C ± 3 °C | 50 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in §27.53(h). The output was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. A resolution bandwidth of 30 kHz was used up to 1 MHz away from the band edges. 30 kHz is <1% of the Emission BW (4.37 MHz between the 26 dB points for 5 MHz nominal BW setting). To compensate for the reduced resolution bandwidth, and 10 log (N) according to FCC KDB662911, the limit was adjusted with 4.6 dB to -17.6 dBm. A resolution bandwidth of 200 kHz was used 1 MHz to 6 MHz away from the band edges, to compensate for the reduced resolution bandwidth and 10 log (N) according to FCC KDB662911, the limit was adjusted by 7 dB to -23 dBm.

| Measurement equipment                     | SP number |
|-------------------------------------------|-----------|
| R&S FSQ                                   | 504 143   |
| RF attenuator                             | 504 159   |
| Testo 635, temperature and humidity meter | 504 203   |

Measurement uncertainty: 3.7 dB

### Results

Single carrier:

Diagram 1 a-c: B

Diagram 2 a-c: T

Multi carrier:

Diagram 3 a-c: B+(B+5)

Diagram 4 a-c: T+(T-5)

Diagram 5 a-c: B+(B+5+5+5)

Diagram 6 a-c: T+(T-5-5-5)

Single carrier: RF B

Diagram 7 a-c: B

Diagram 8 a-c: T



## REPORT

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FCC ID:TA8AKRC118048-1  
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### Appendix 4

#### Limits

CFR 47 §27.53(h) and RSS-139 6.5

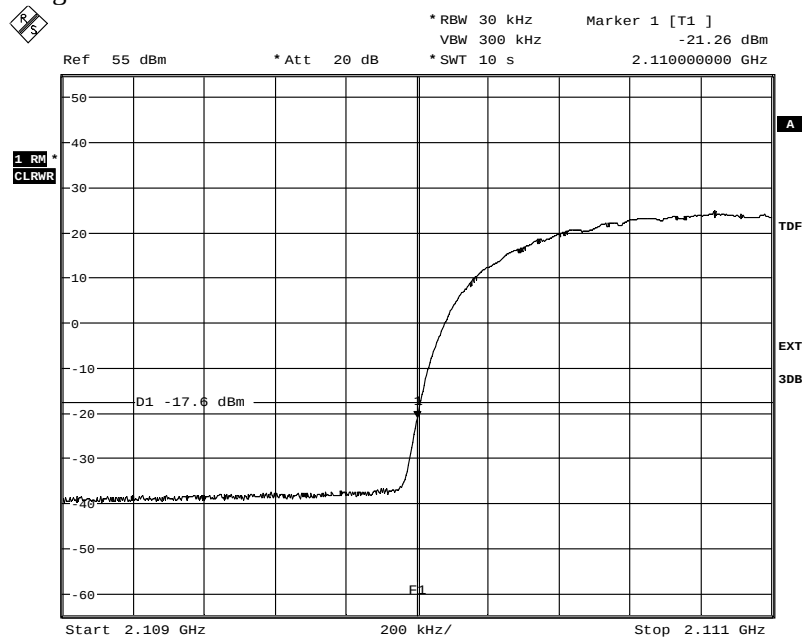
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm.

|           |     |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

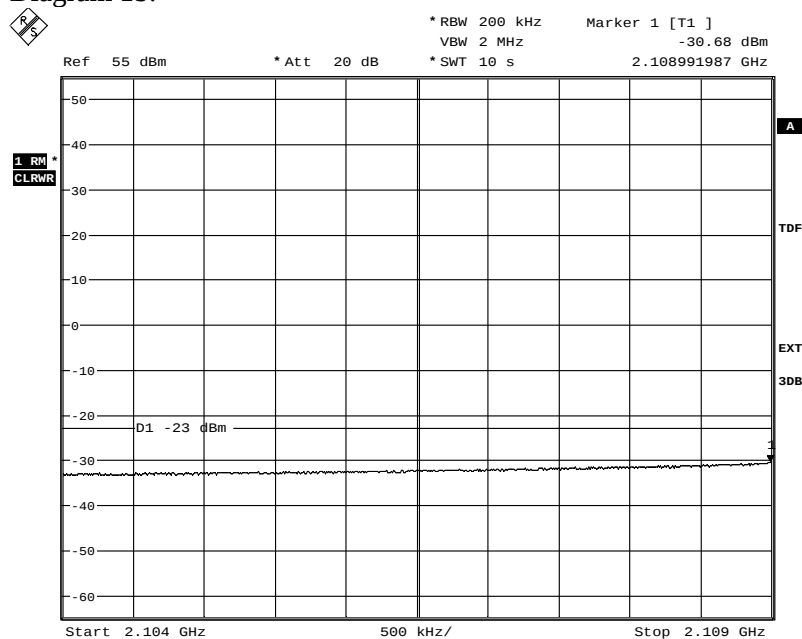
## Appendix 4

Diagram 1a:



Date: 13.JUN.2012 08:16:04

Diagram 1b:

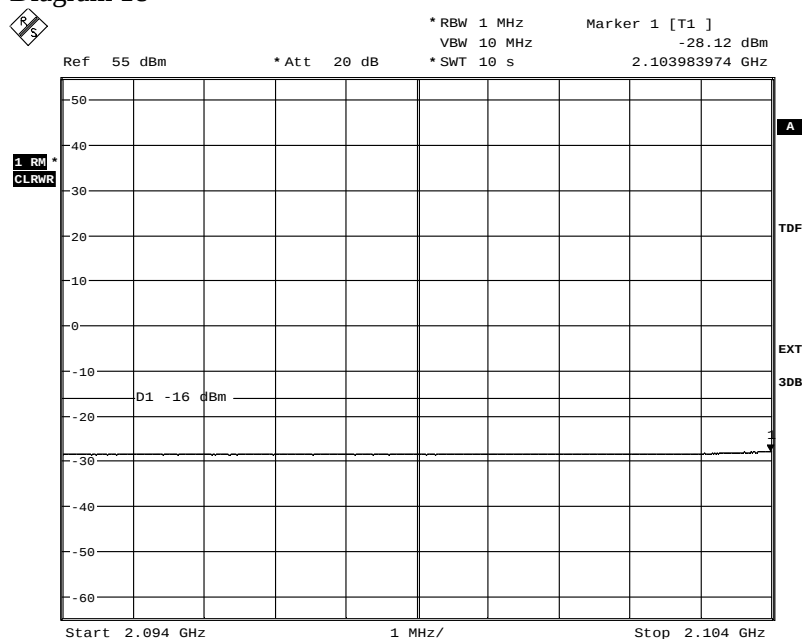


Date: 13.JUN.2012 08:16:58

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 1c

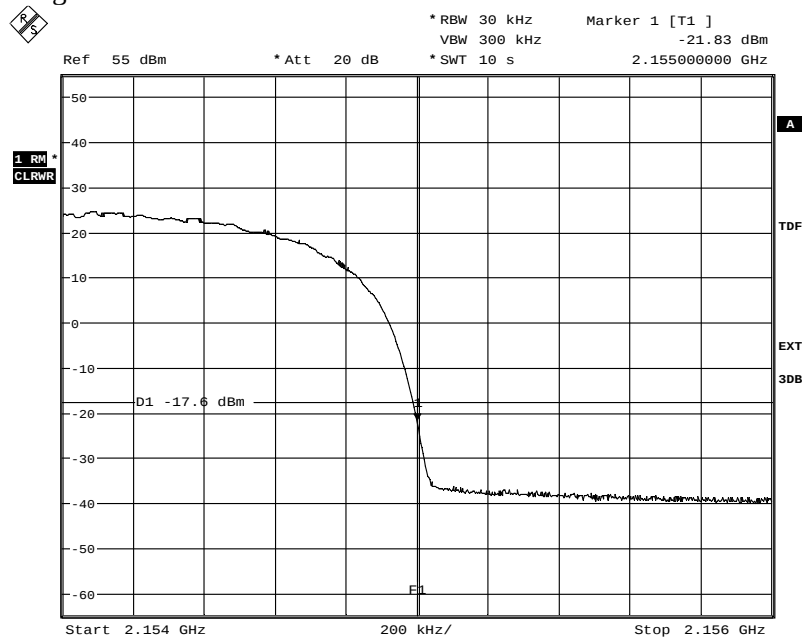


Date: 13.JUN.2012 08:17:59

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

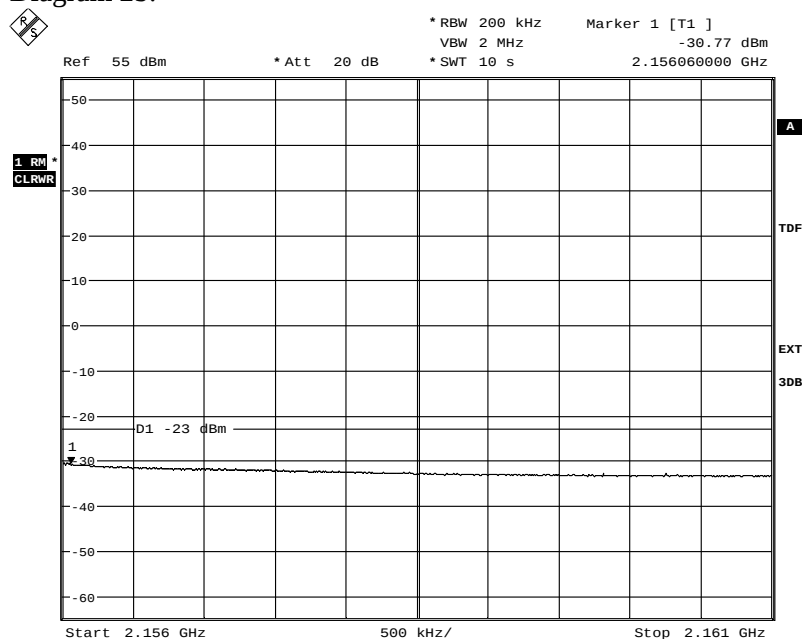
Appendix 4

Diagram 2a:



Date: 13.JUN.2012 09:58:57

Diagram 2b:

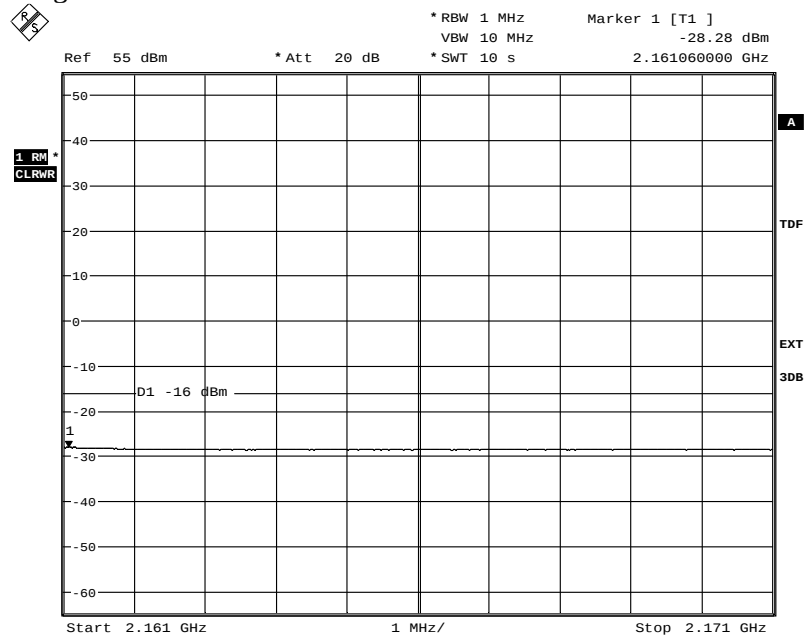


Date: 13.JUN.2012 10:00:39

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 4

Diagram 2c:

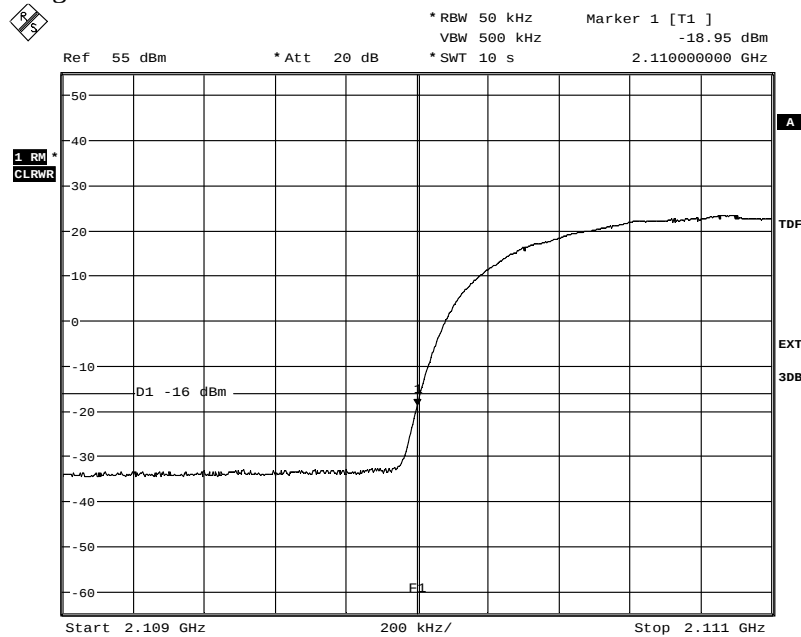


Date: 13.JUN.2012 10:01:36

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

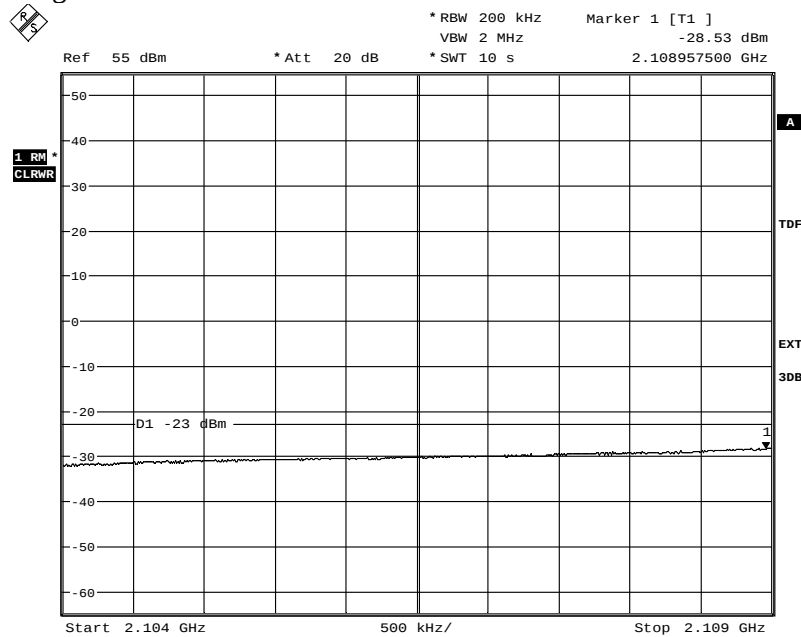
## Appendix 4

Diagram 3a:



Date: 13.JUN.2012 11:50:35

Diagram 3b:

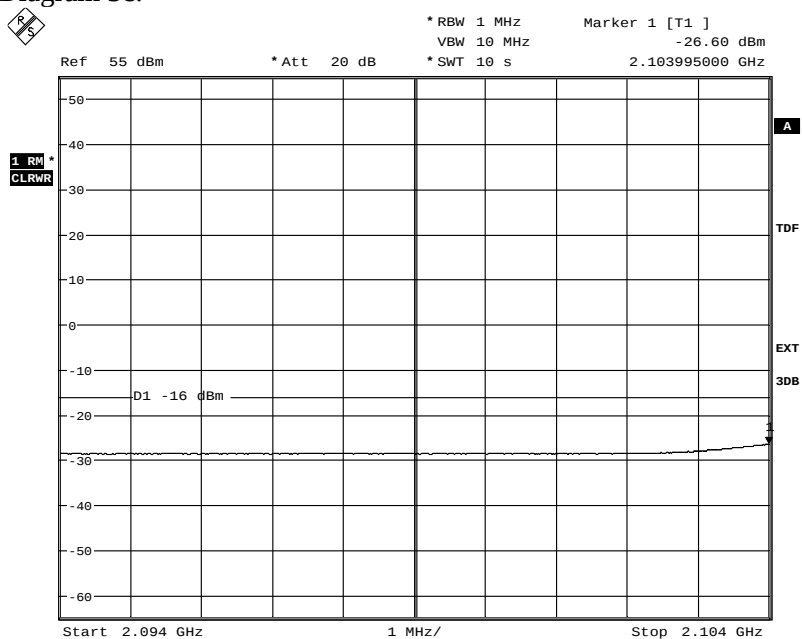


Date: 13.JUN.2012 11:51:40

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 3c:

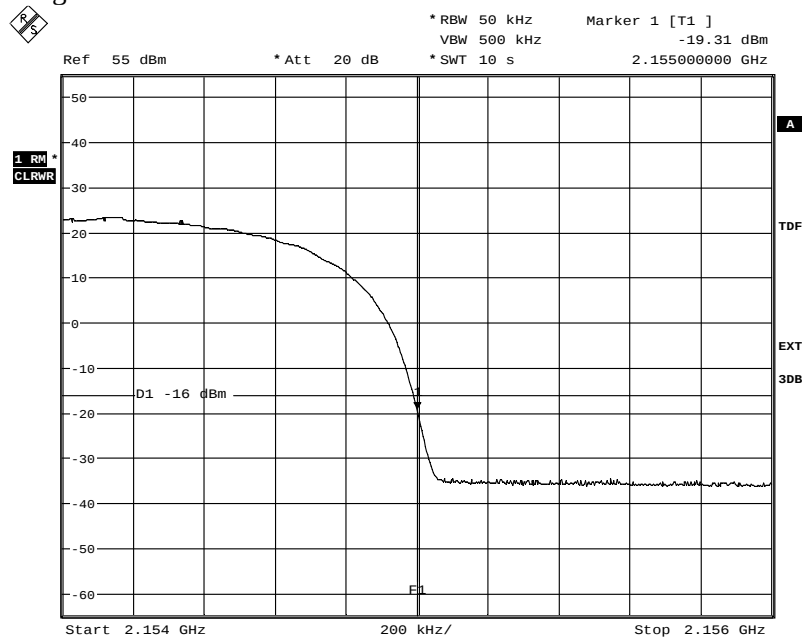


Date: 13.JUN.2012 11:52:23

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

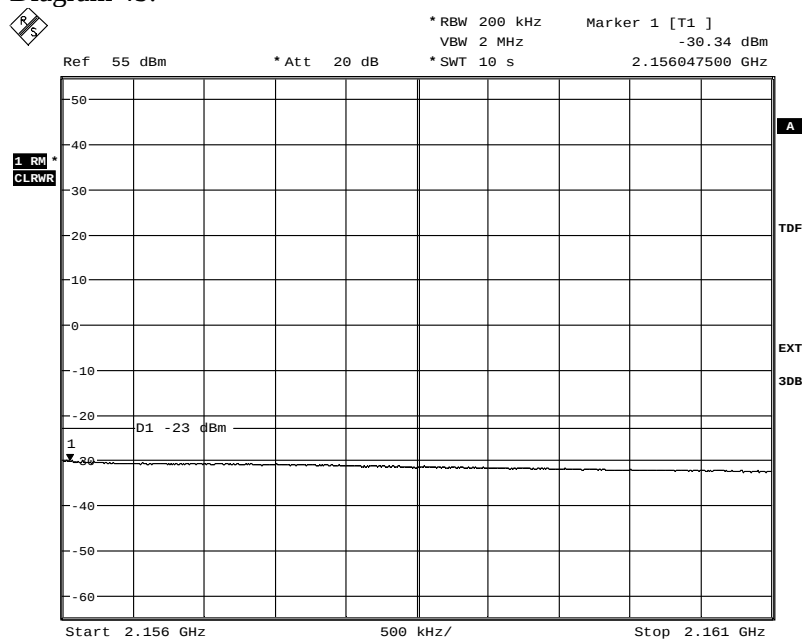
Appendix 4

Diagram 4a:



Date: 13.JUN.2012 11:59:49

Diagram 4b:

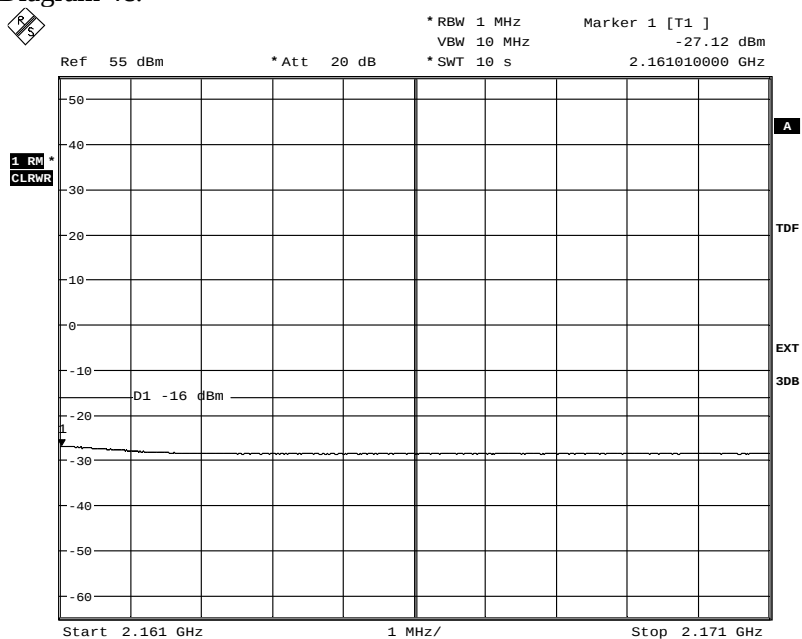


Date: 13.JUN.2012 12:00:41

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 4c:

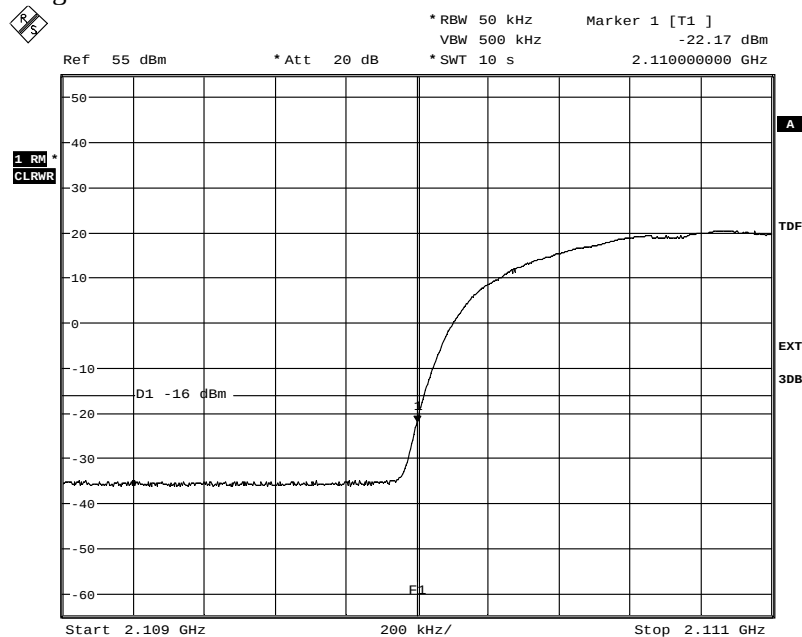


Date: 13.JUN.2012 12:01:28

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

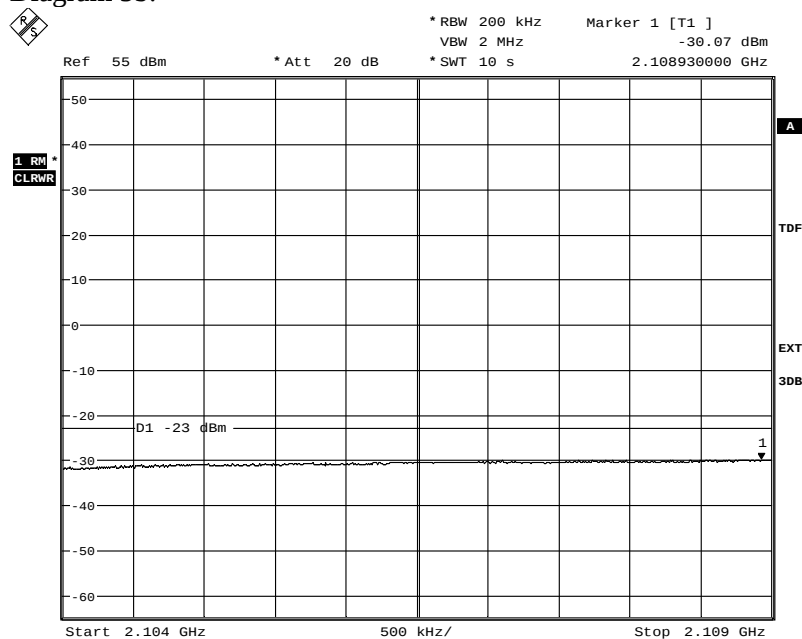
## Appendix 4

Diagram 5a:



Date: 13.JUN.2012 13:15:55

Diagram 5b:

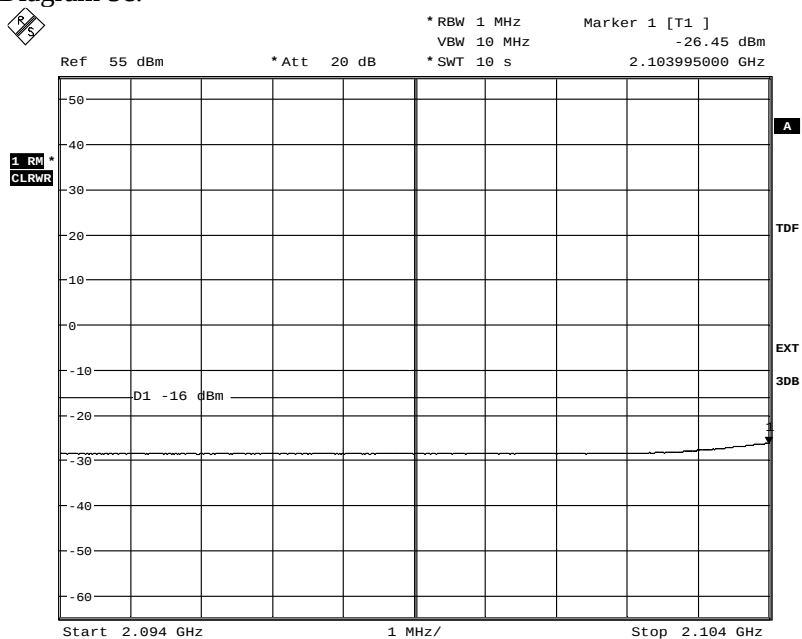


Date: 13.JUN.2012 13:16:54

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 5c:

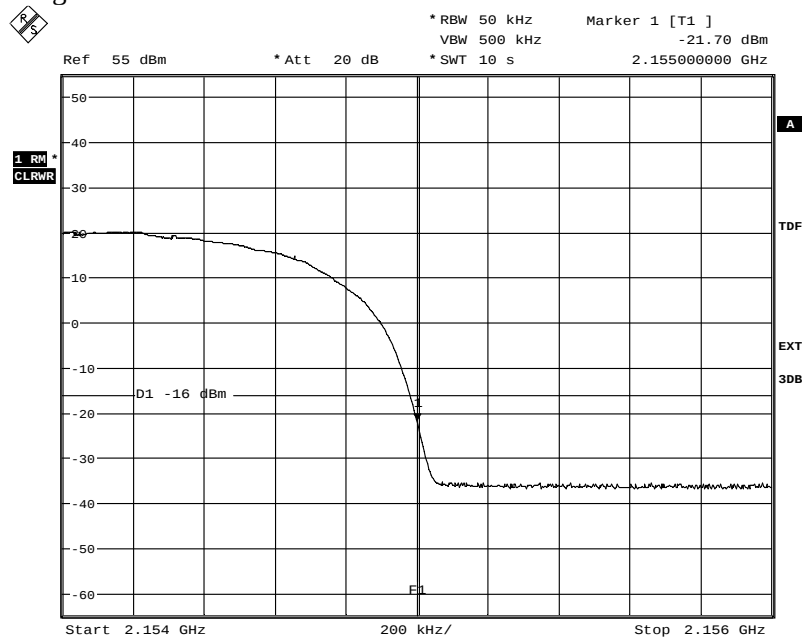


Date: 13.JUN.2012 13:18:05

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

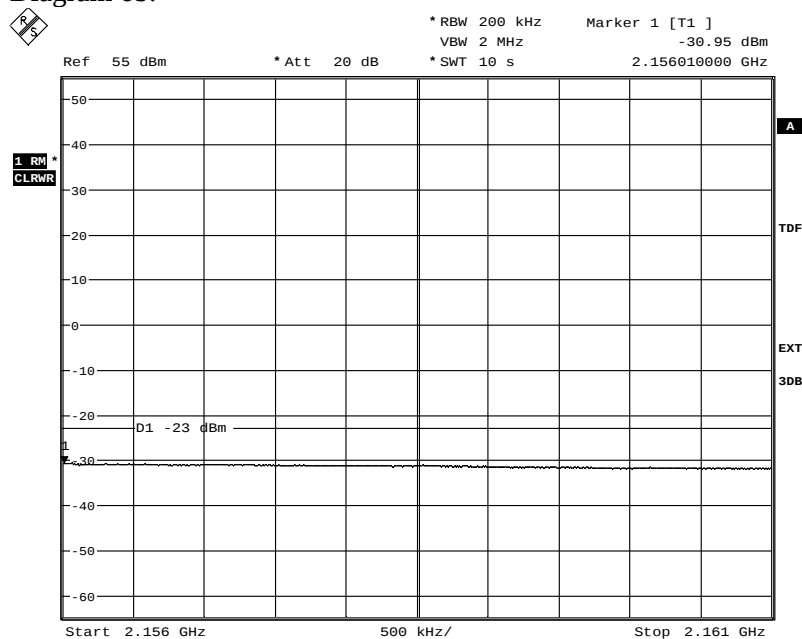
## Appendix 4

Diagram 6a:



Date: 13.JUN.2012 12:45:47

Diagram 6b:

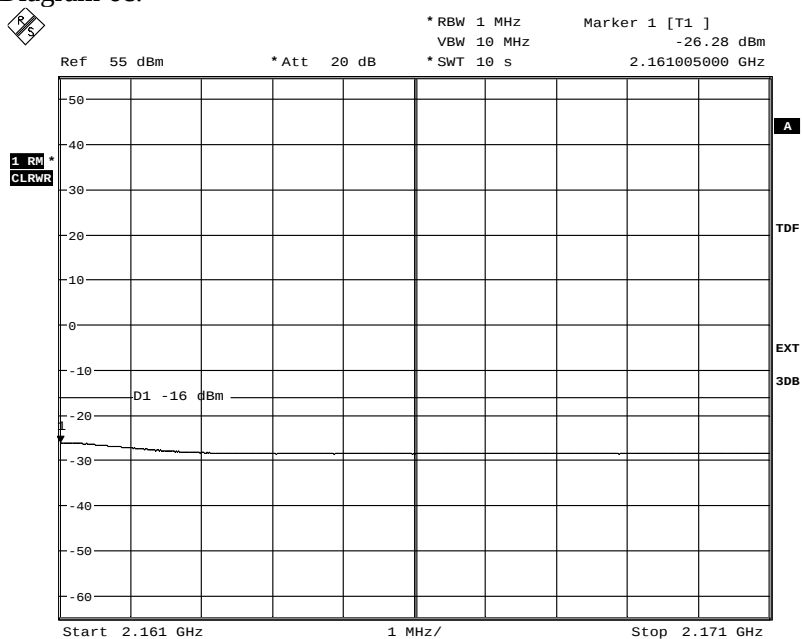


Date: 13.JUN.2012 12:46:37

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 6c:

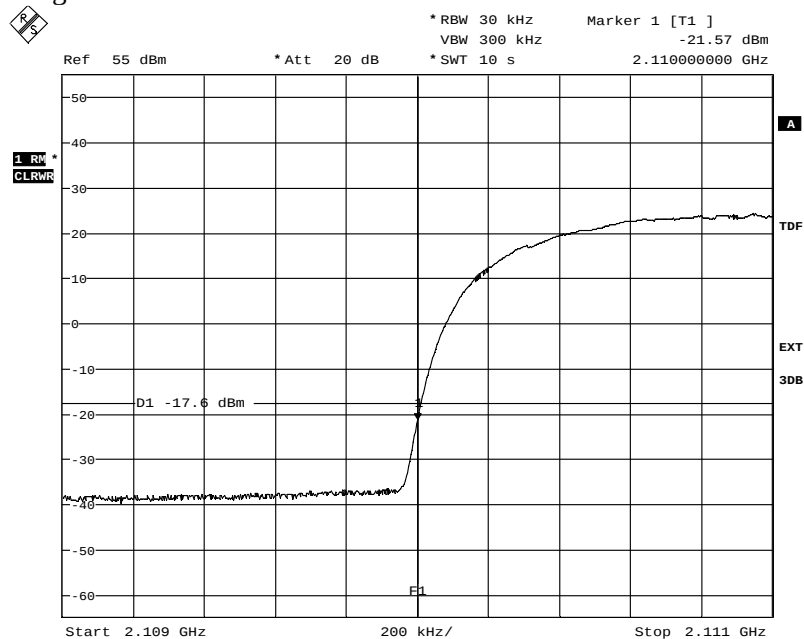


Date: 13.JUN.2012 12:47:18

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IC:287AB-AS1180481

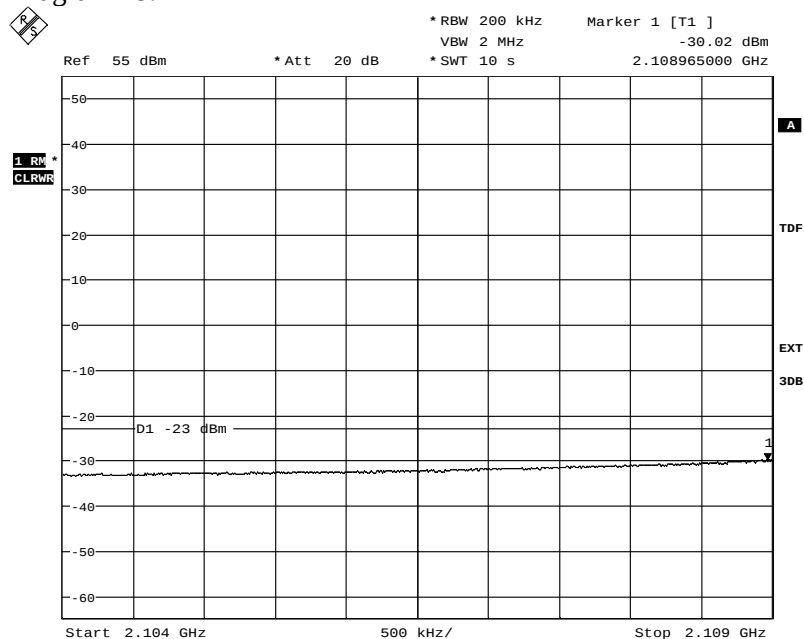
## Appendix 4

Diagram 7a:



Date: 13.JUN.2012 16:38:24

Diagram 7b:

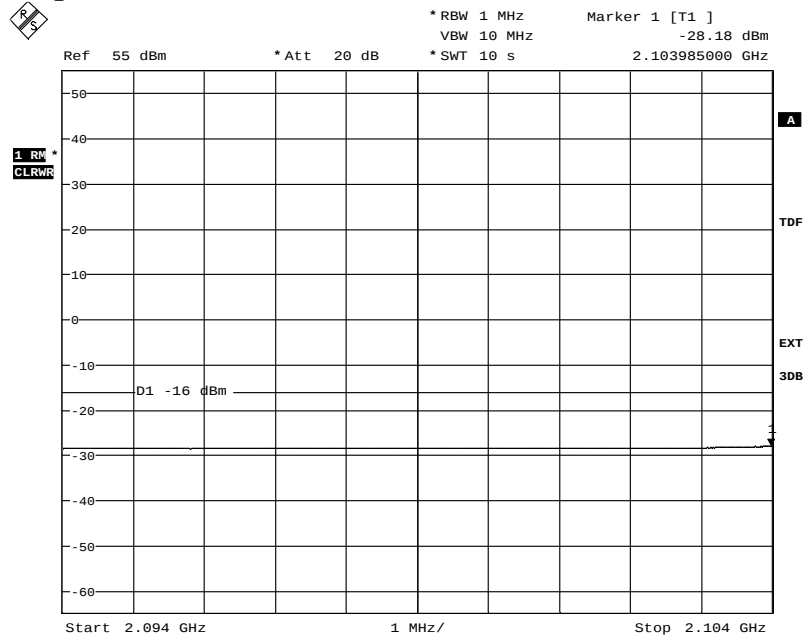


Date: 13.JUN.2012 16:39:01

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 7c:

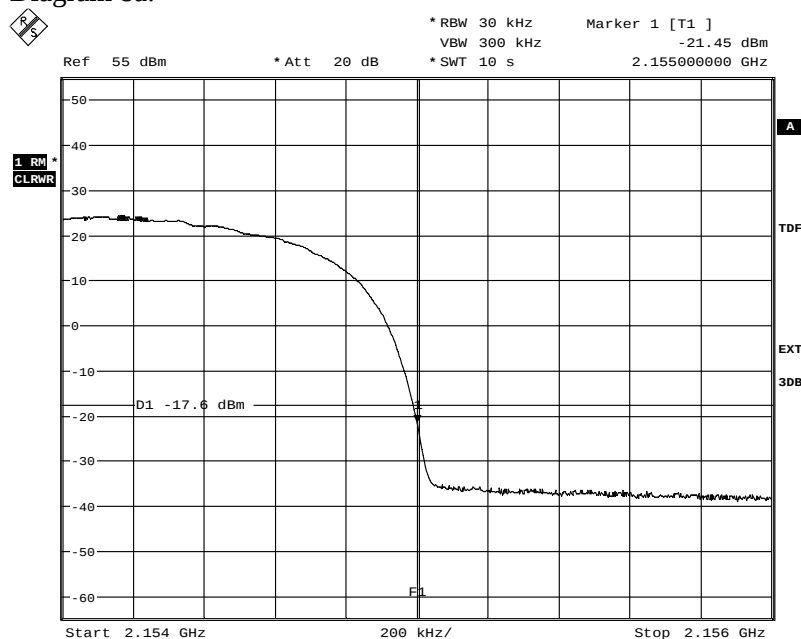


Date: 13.JUN.2012 16:39:49

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

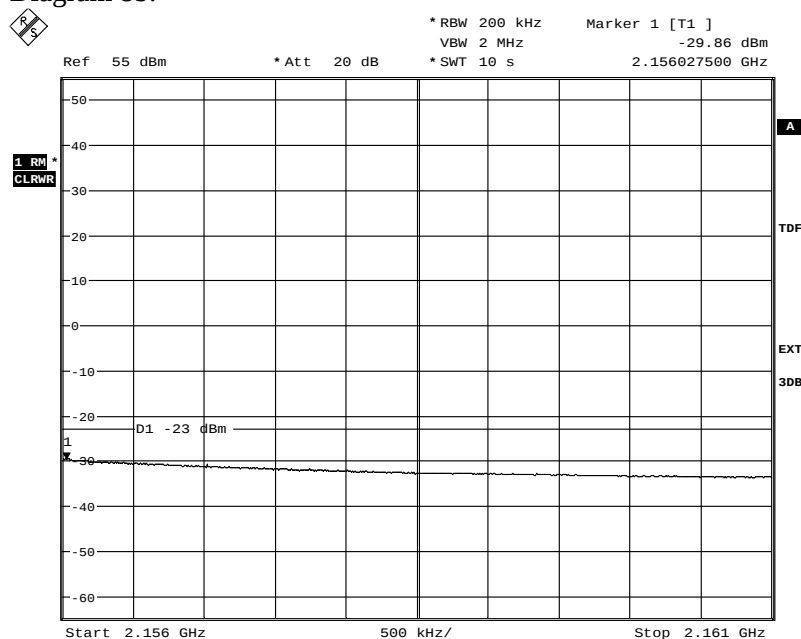
## Appendix 4

Diagram 8a:



Date: 13.JUN.2012 16:46:37

Diagram 8b:

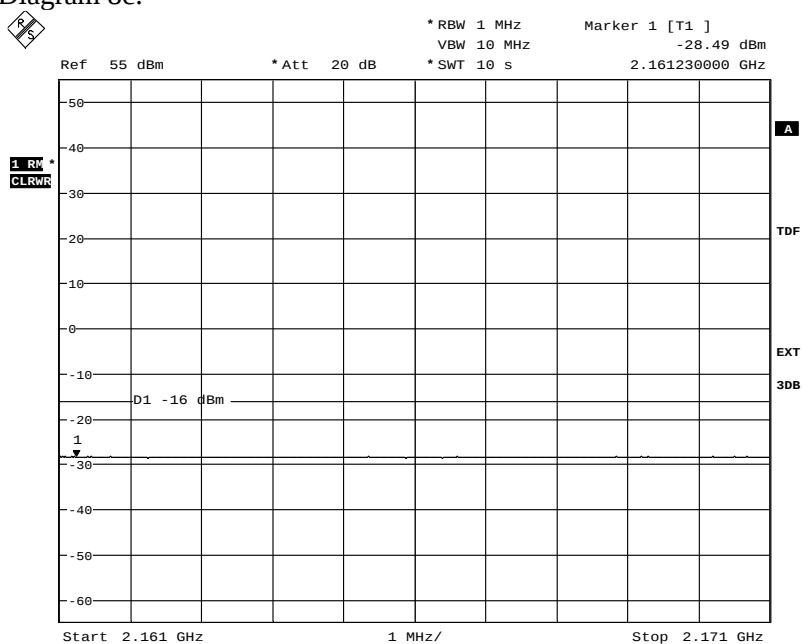


Date: 13.JUN.2012 16:47:36

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

Appendix 4

Diagram 8c:



Date: 13.JUN.2012 16:49:53

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

## Conducted spurious emission measurements according to CFR 47 §27.53(h)/ IC RSS-139 6.5

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2012-06-12 | 22 °C ± 3 °C | 39 % ± 5 % |
| 2012-06-13 | 17 °C ± 3 °C | 50 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in §27.53(h). The output was connected to a spectrum analyzer with a RBW setting of 1 MHz and RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. The limit was adjusted with 3 dB to -16 dBm to compensate for TX diversity according to FCC KDB662911 [10 log (N)].

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| R&S FSQ                                  | 504 143   |
| RF attenuator                            | 504 159   |
| High pass filter                         | 503 739   |
| RF attenuator                            | 900 229   |
| High pass filter                         | 503 740   |
| Testo 635 temperature and humidity meter | 504 203   |

Measurement uncertainty: 3.7 dB

### Results

Single carrier:

Diagram 1: B

Diagram 2: M

Diagram 3: T

Multi carrier:

Diagram 4: B+(B+10)

Diagram 5: T+(T-10)

Diagram 6: B+(B+5+5+5)

Diagram 7: T+(T-5-5-5)

Single carrier RF B

Diagram 8: M

### Remark

The emission at 9 kHz on the plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through.

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to  $10 \times 2.5 \text{ GHz} = 25 \text{ GHz}$  for emission measurements.



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### Appendix 5

#### Limits

§27.53(h) and RSS-139 6.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm per 1 MHz RBW.

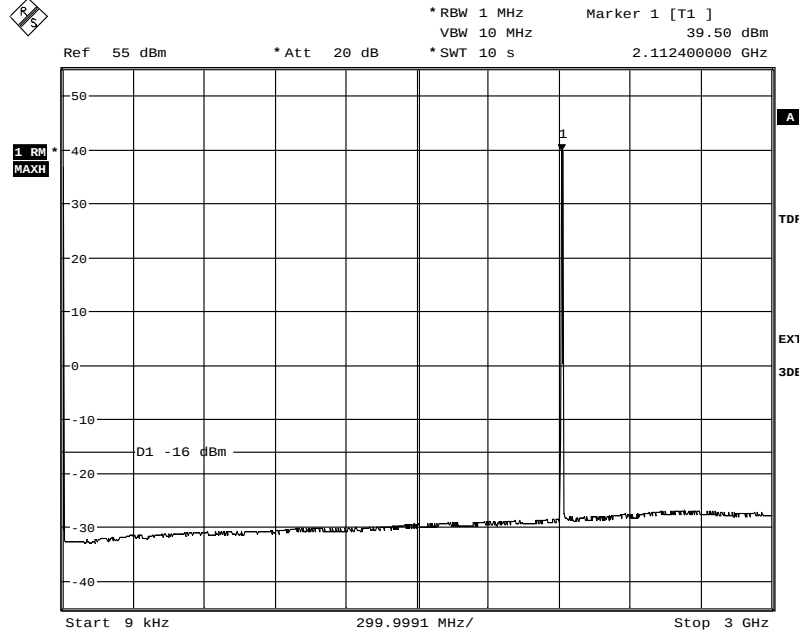
Remark: To compensate for TX diversity the limit was adjusted to – 16 dBm per 1MHz RBW.

|           |     |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

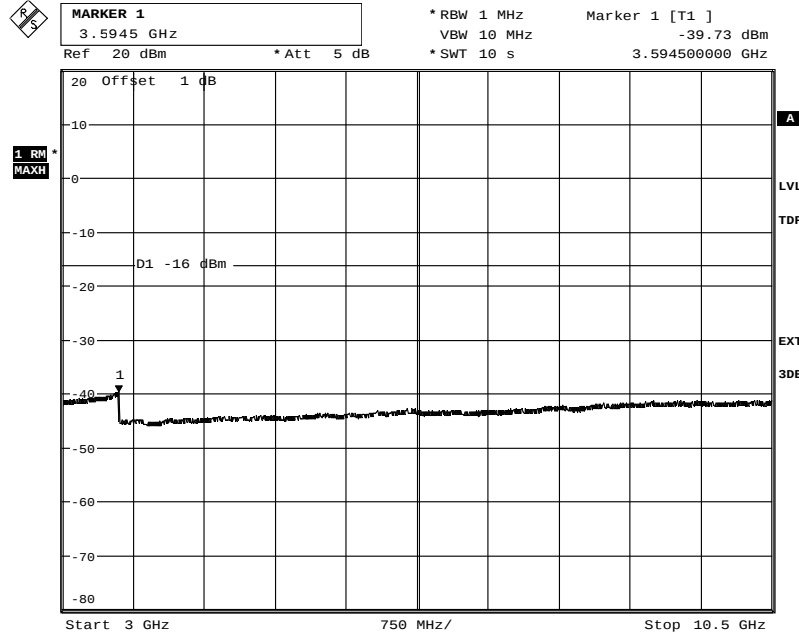
Diagram 1a



Date: 12.JUN.2012 21:08:32

The emissions around the carrier are within the operating frequency band

Diagram 1b

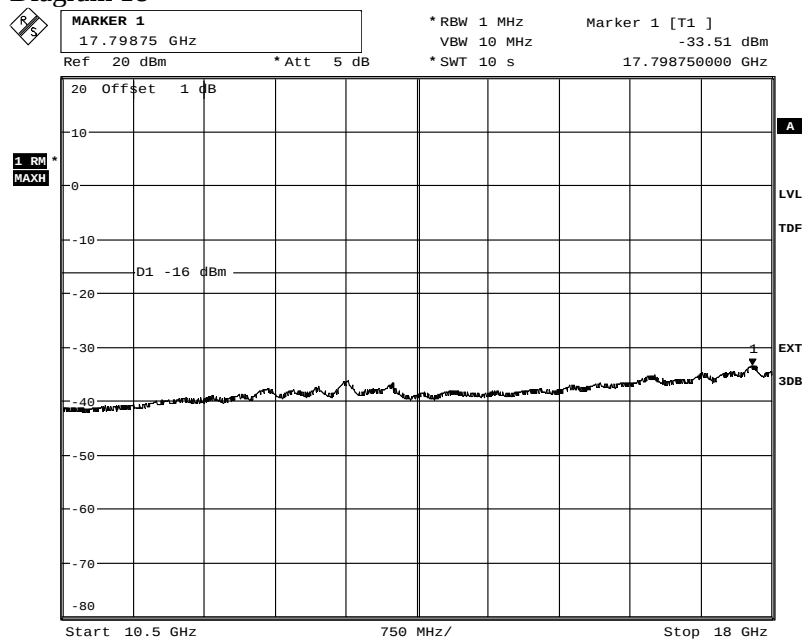


Date: 12.JUN.2012 21:17:22

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

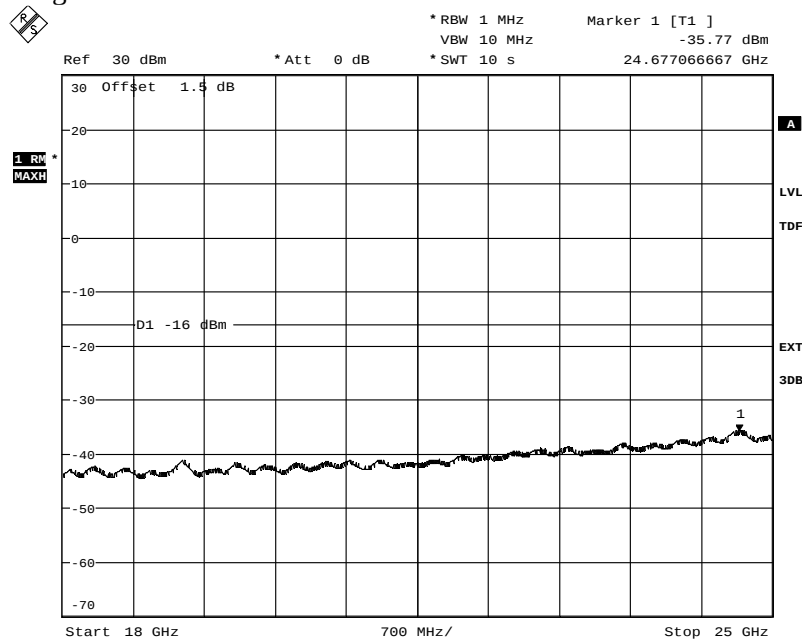
Appendix 5

Diagram 1c



Date: 12.JUN.2012 21:21:47

Diagram 1d

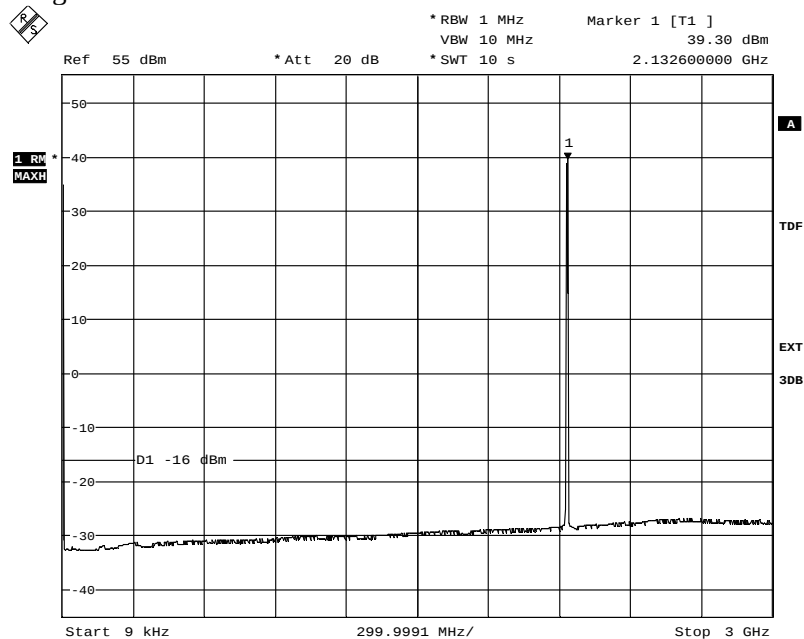


Date: 13.JUN.2012 15:39:51

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

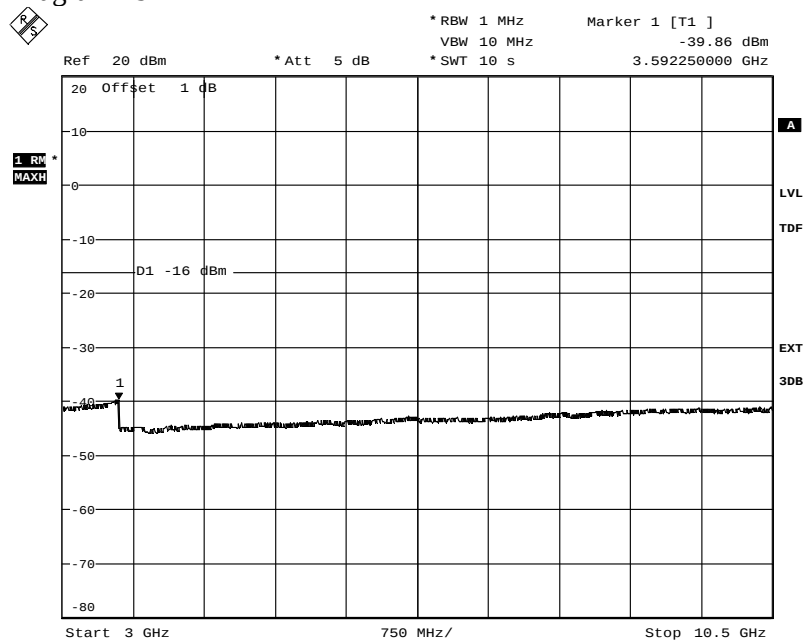
## Appendix 5

Diagram 2a



Date: 12.JUN.2012 17:06:05

Diagram 2b

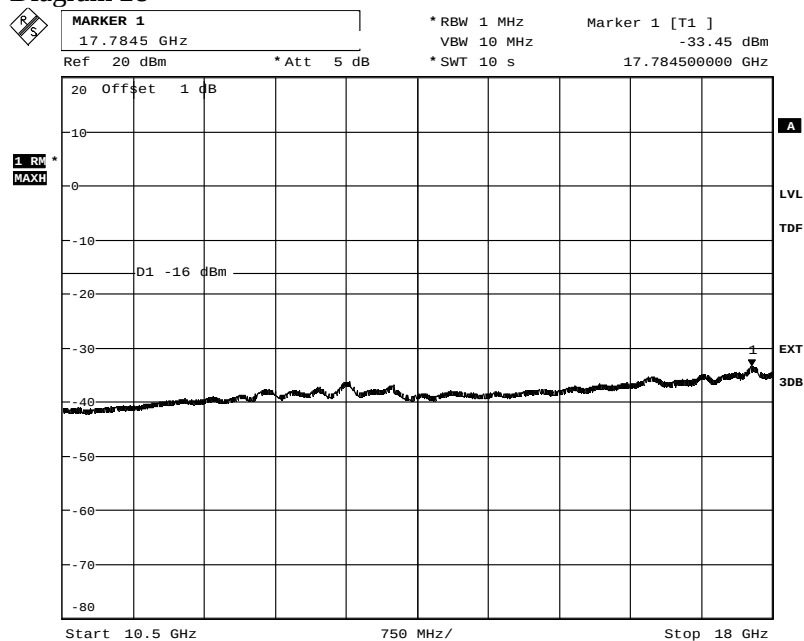


Date: 12.JUN.2012 17:09:18

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IC:287AB-AS1180481

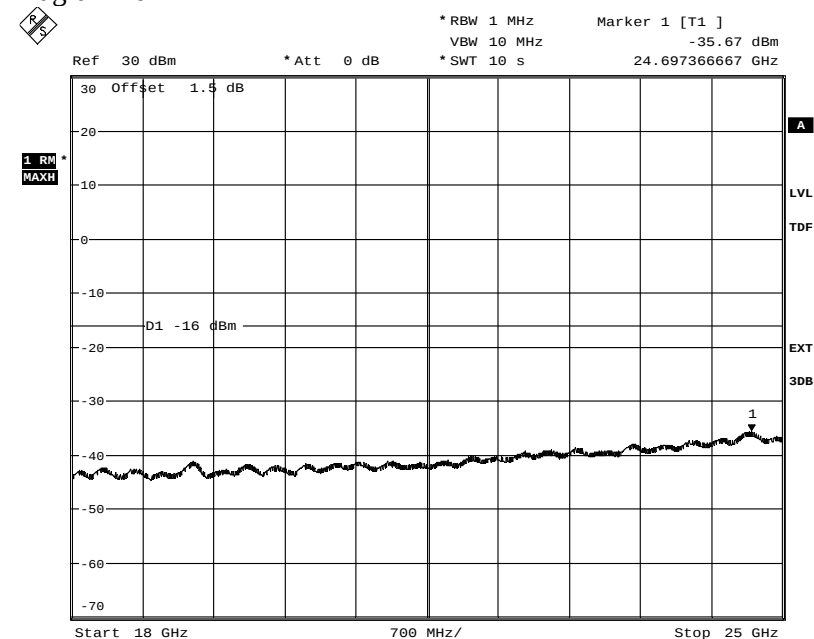
## Appendix 5

Diagram 2c



Date: 12.JUN.2012 17:11:44

Diagram 2d

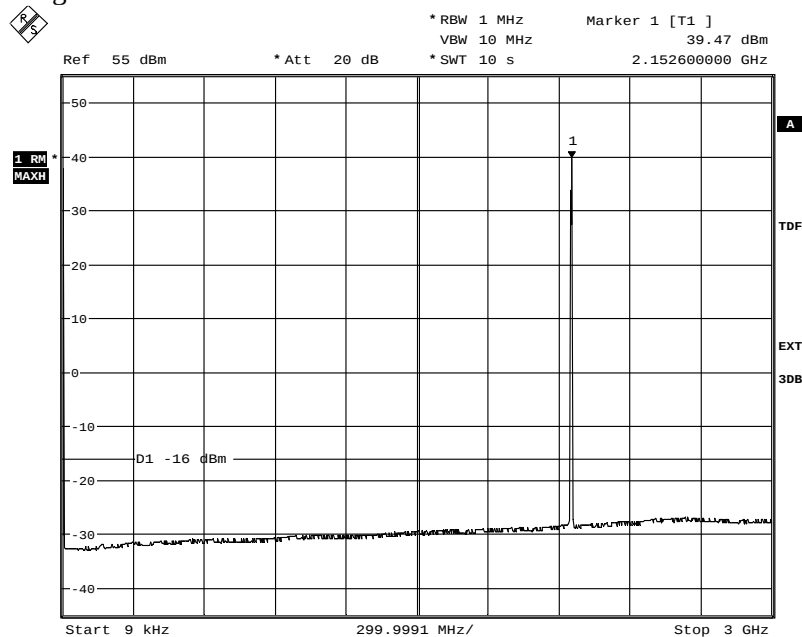


Date: 12.JUN.2012 15:41:46

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

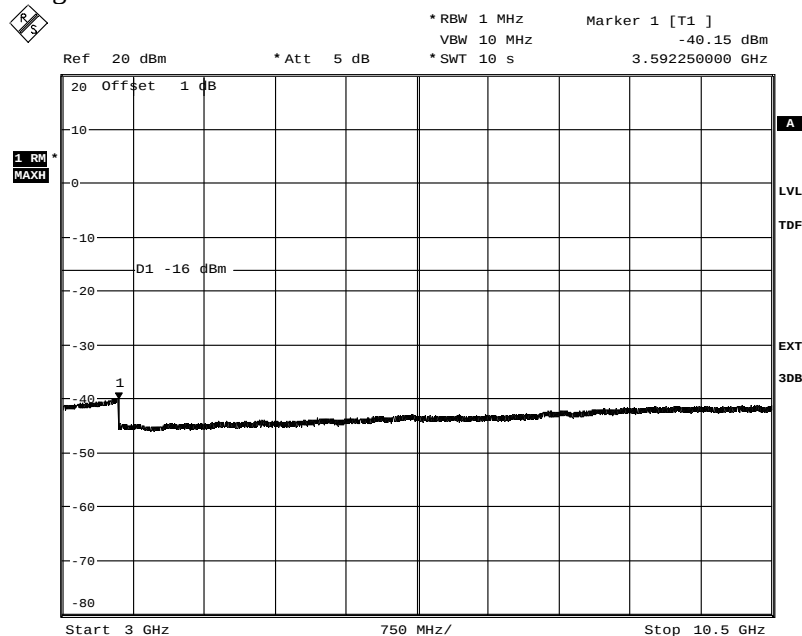
Diagram 3a



Date: 12.JUN.2012 21:31:38

The emissions around the carrier are within the operating frequency band

Diagram 3b

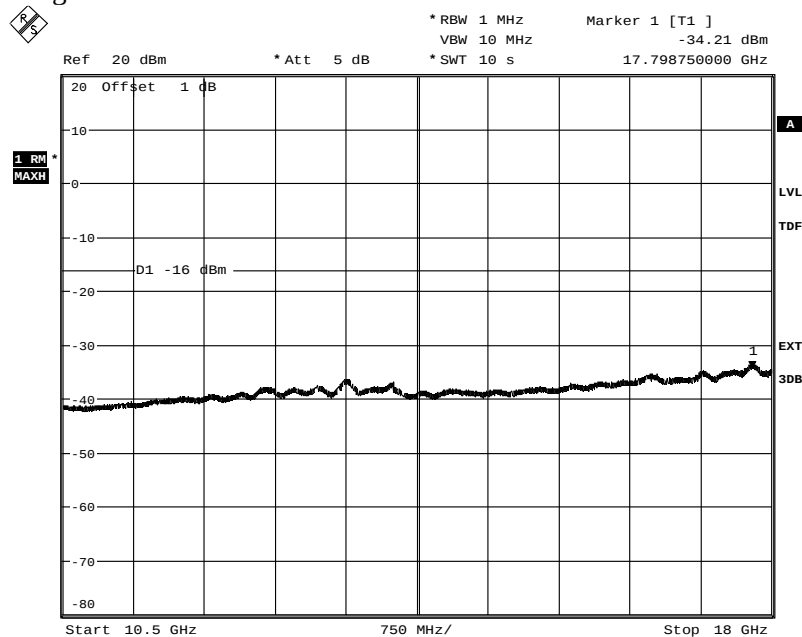


Date: 12.JUN.2012 21:30:21

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IC:287AB-AS1180481

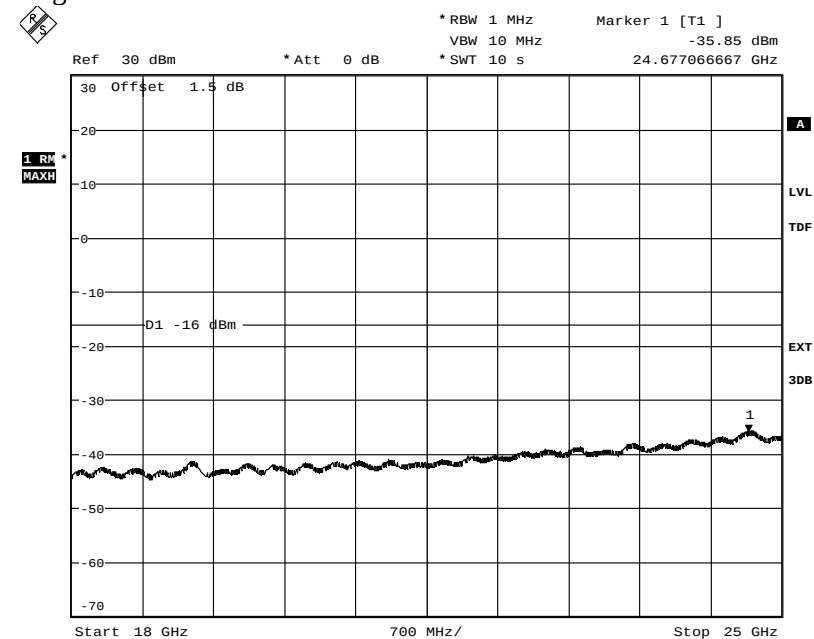
Appendix 5

Diagram 3c



Date: 12.JUN.2012 21:29:31

Diagram 3d

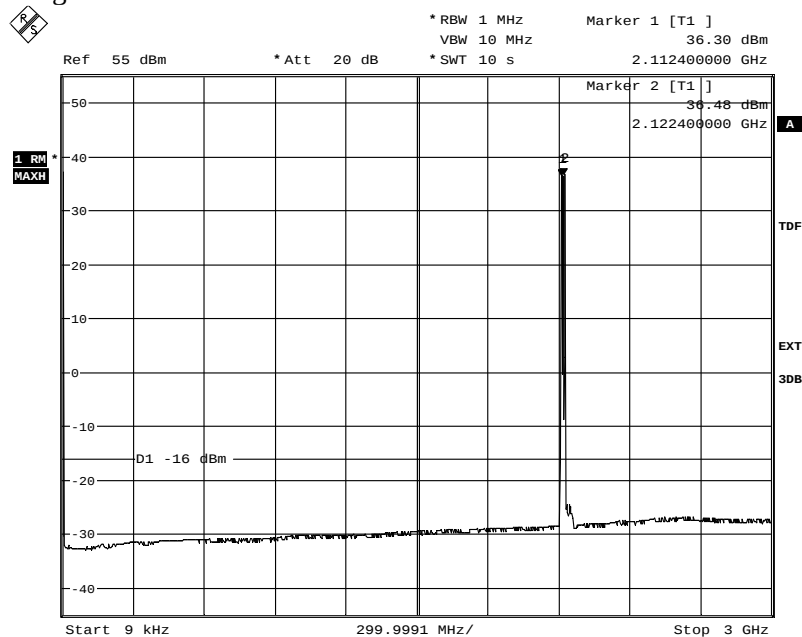


Date: 13.JUN.2012 15:47:31

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

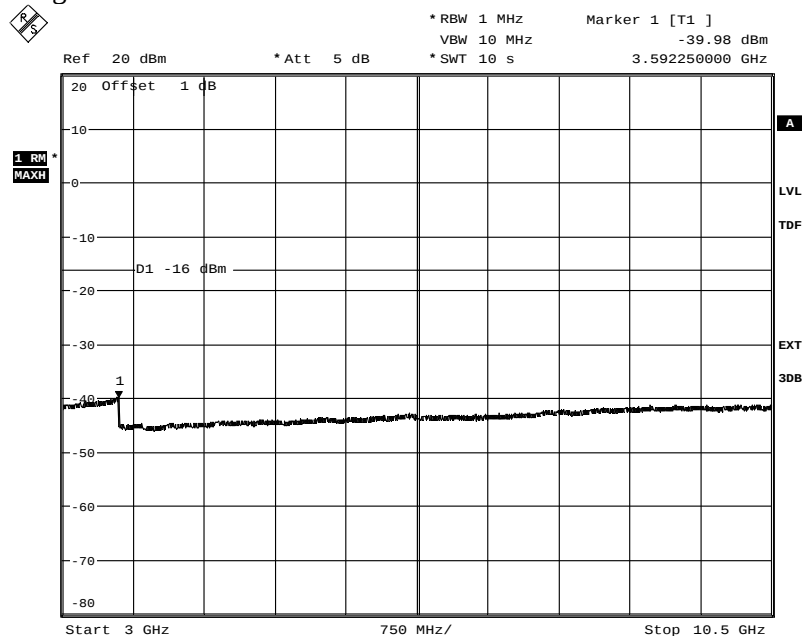
Diagram 4a



Date: 13.JUN.2012 10:47:36

The emissions around the carriers are within the operating frequency band

Diagram 4b

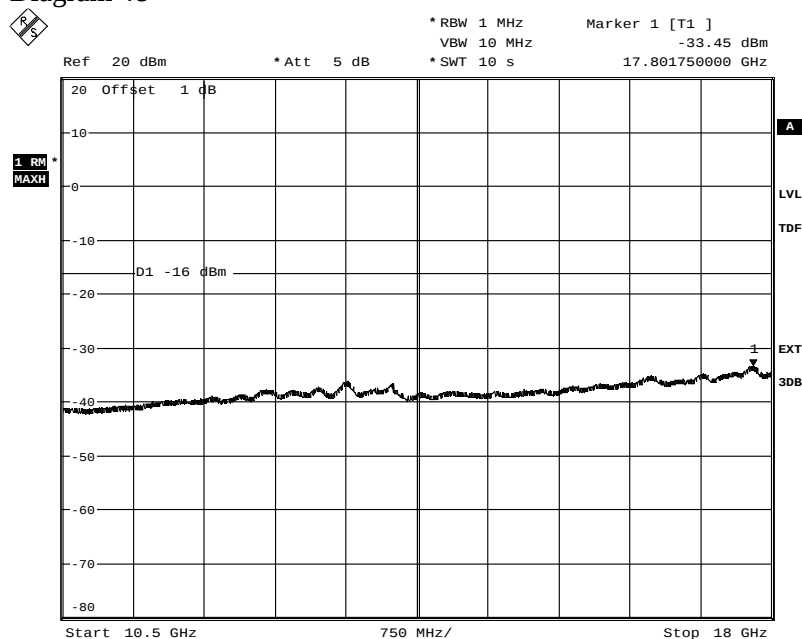


Date: 13.JUN.2012 10:45:59

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IC:287AB-AS1180481

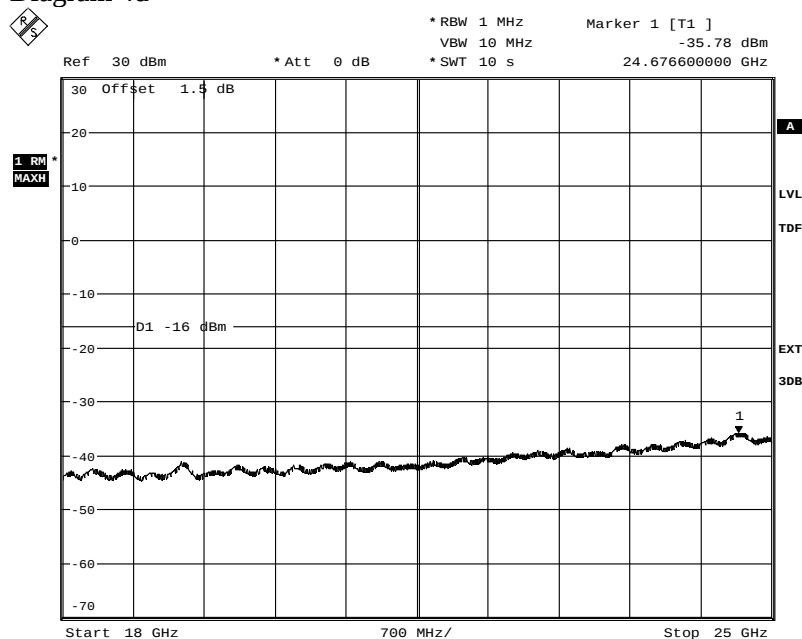
Appendix 5

Diagram 4c



Date: 13.JUN.2012 10:44:34

Diagram 4d

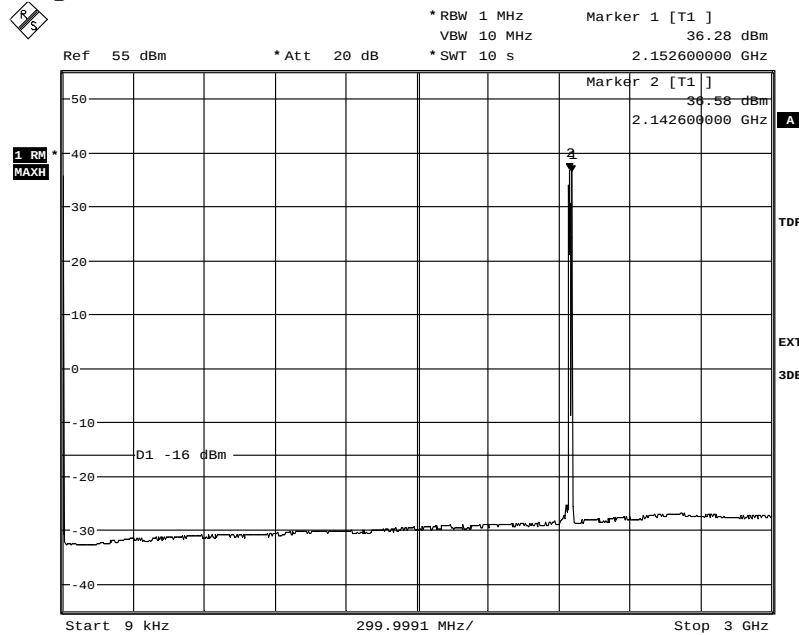


Date: 13.JUN.2012 10:42:04

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

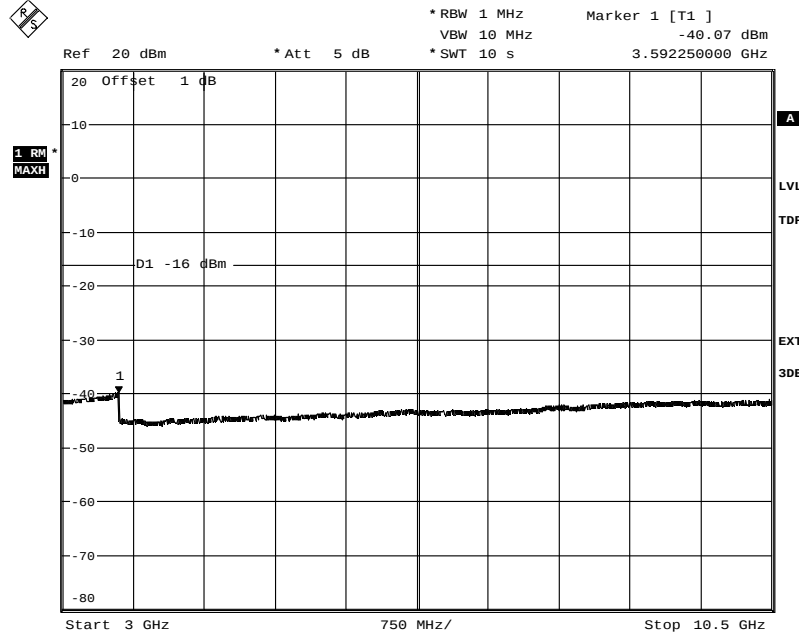
Diagram 5a



Date: 13.JUN.2012 10:29:00

The emissions around the carriers are within the operating frequency band

Diagram 5b

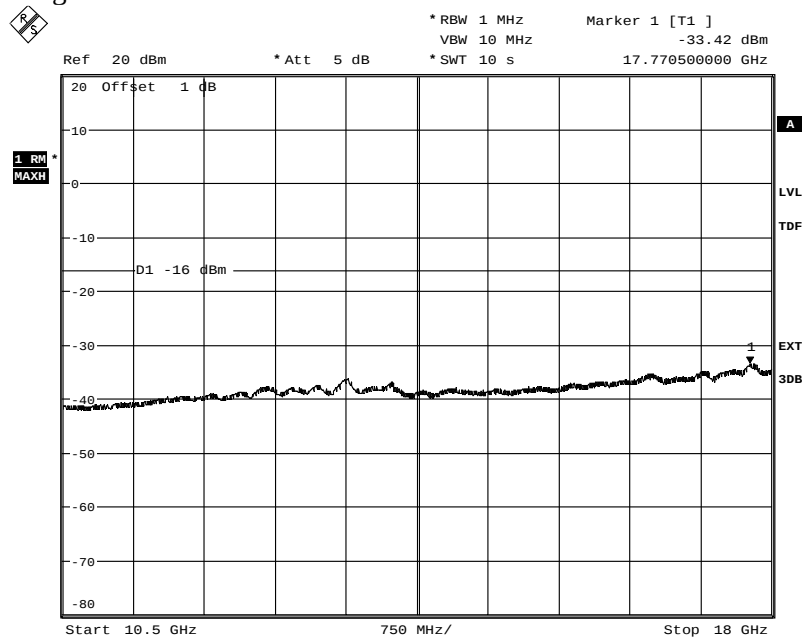


Date: 13.JUN.2012 10:30:39

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

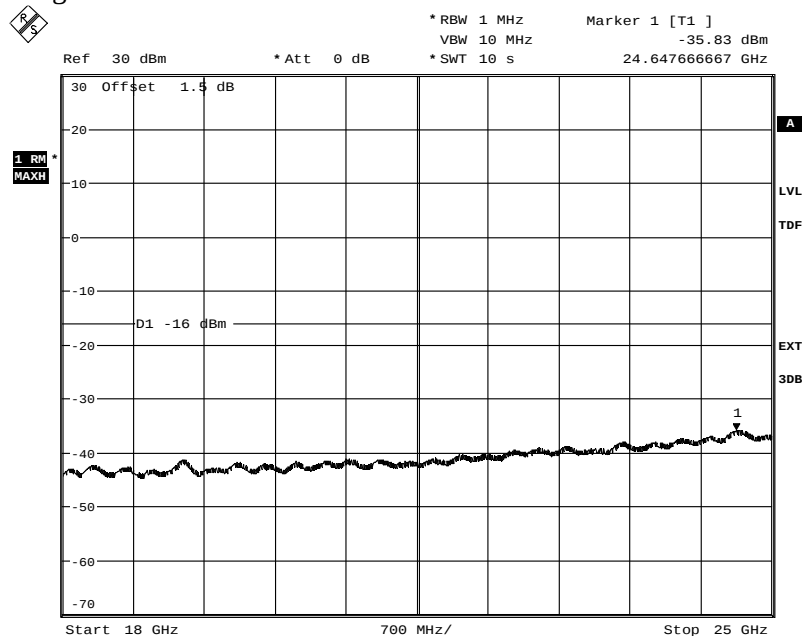
Appendix 5

Diagram 5c



Date: 13.JUN.2012 10:31:43

Diagram 5d

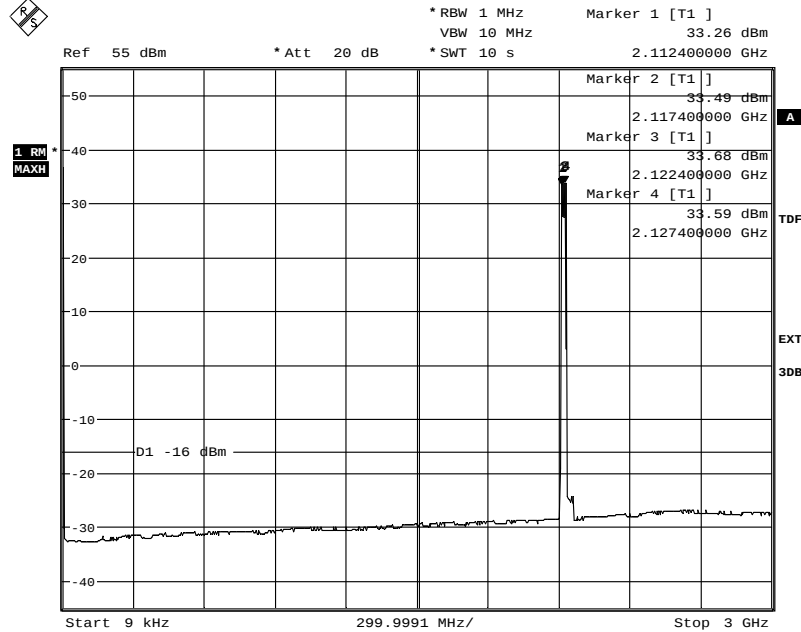


Date: 13.JUN.2012 10:34:10

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

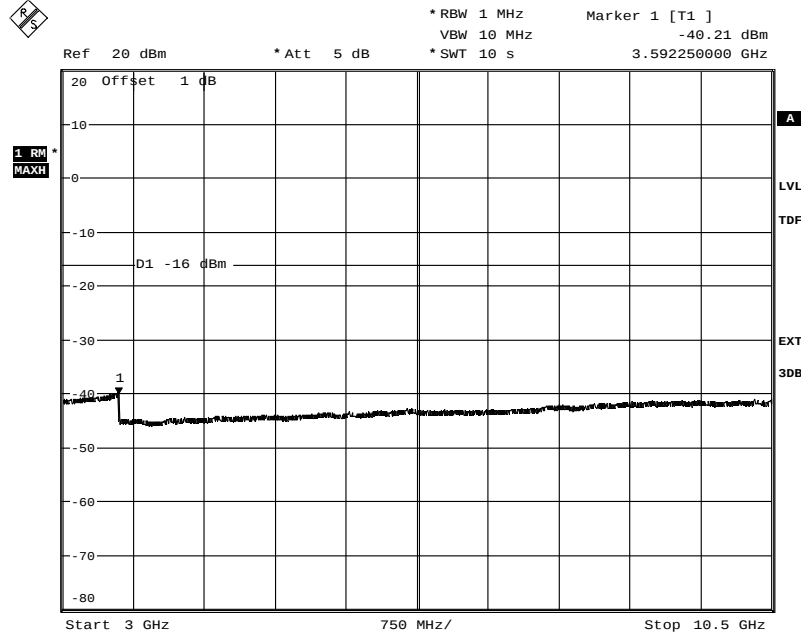
Diagram 6a



Date: 13.JUN.2012 13:14:45

The emissions around the carriers are within the operating frequency band

Diagram 6b

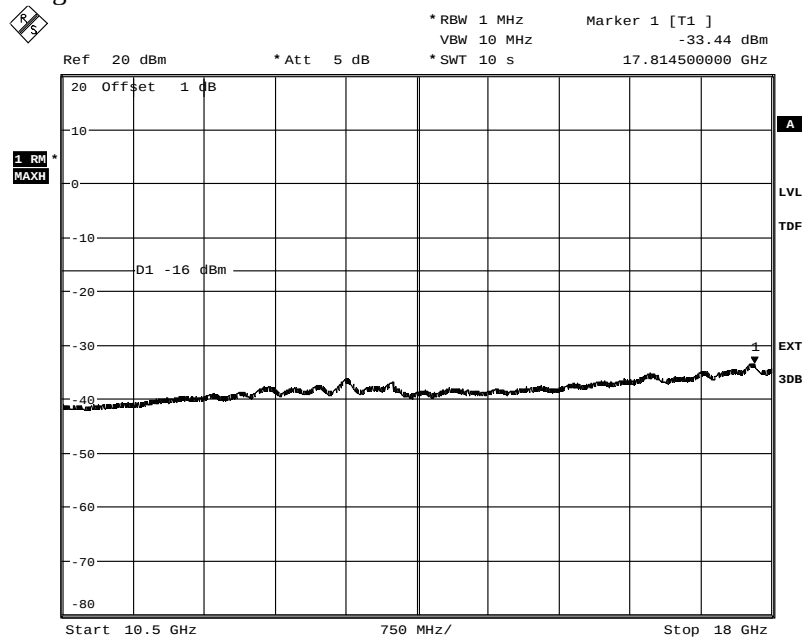


Date: 13.JUN.2012 13:20:51

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IC:287AB-AS1180481

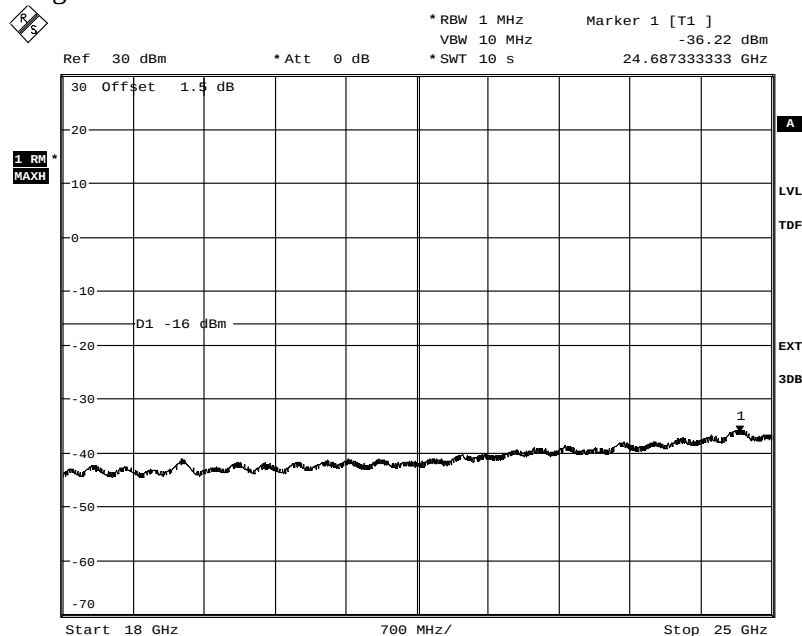
Appendix 5

Diagram 6c



Date: 13.JUN.2012 13:19:51

Diagram 6d

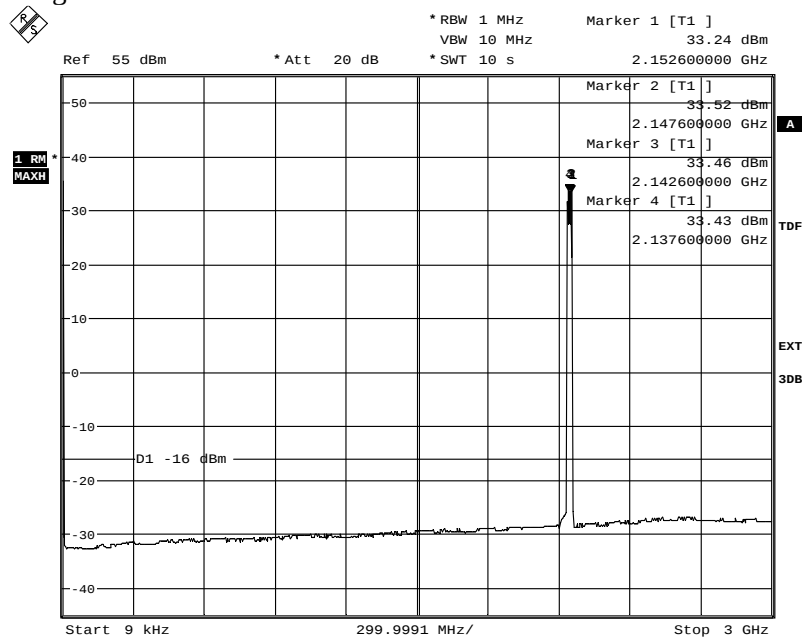


Date: 13.JUN.2012 13:09:44

FCC ID:TA8AKRC118048-1  
IC:287AB-AS1180481

## Appendix 5

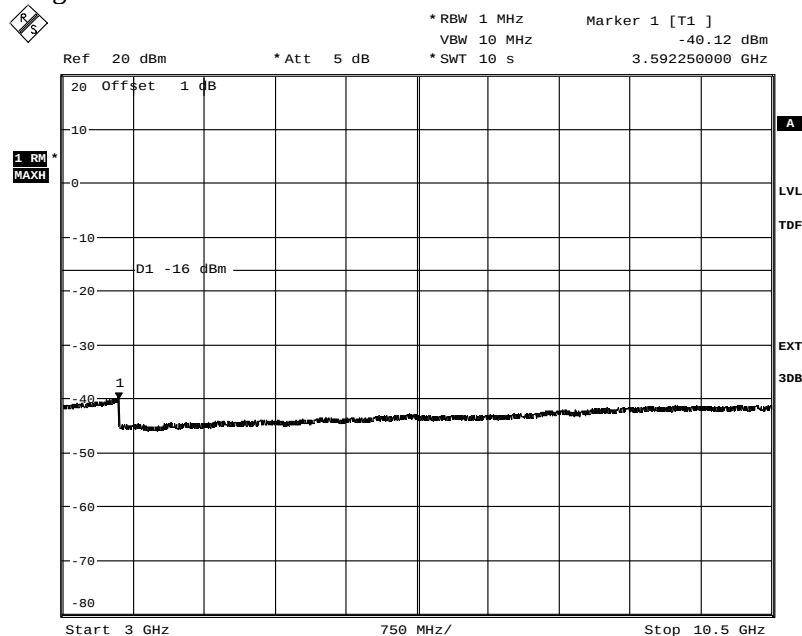
Diagram 7a



Date: 13.JUN.2012 12:48:36

The emissions around the carriers are within the operating frequency band

Diagram 7b

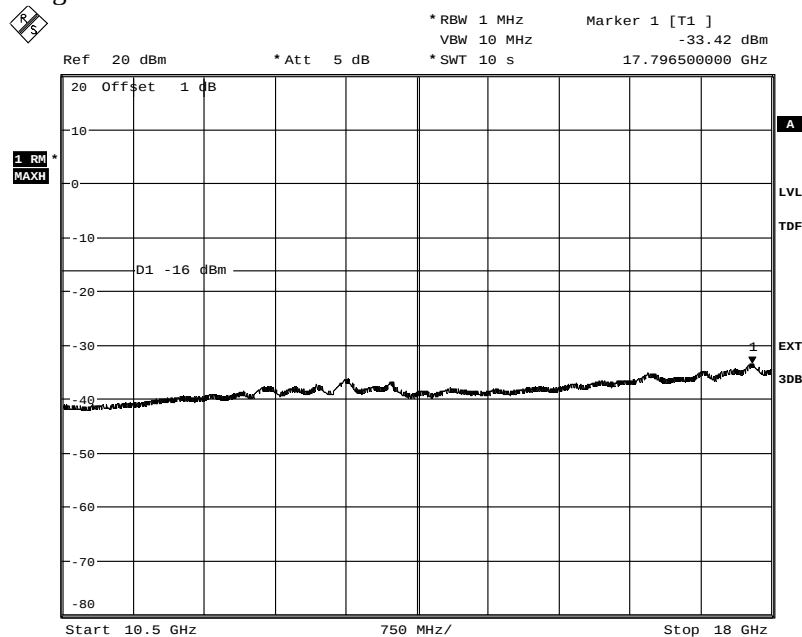


Date: 13.JUN.2012 12:55:03

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IC:287AB-AS1180481

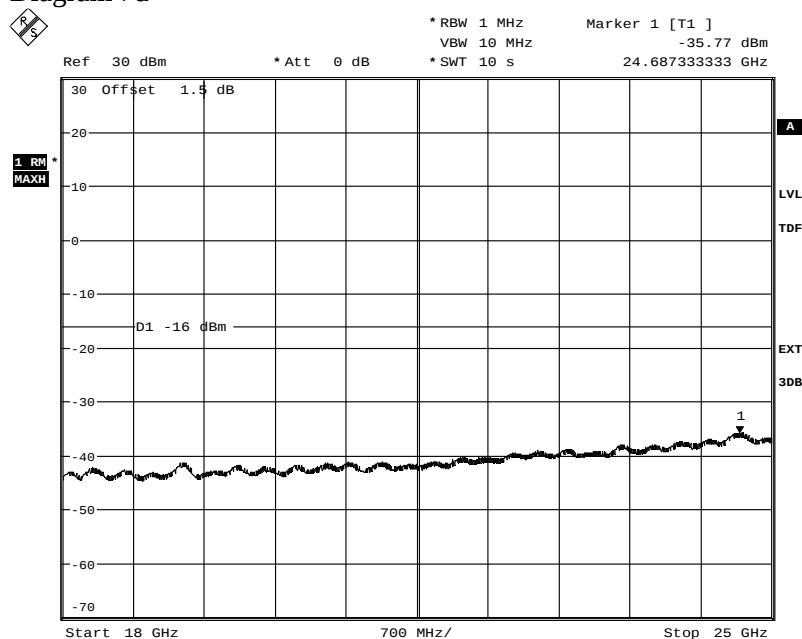
Appendix 5

Diagram 7c



Date: 13.JUN.2012 12:55:54

Diagram 7d

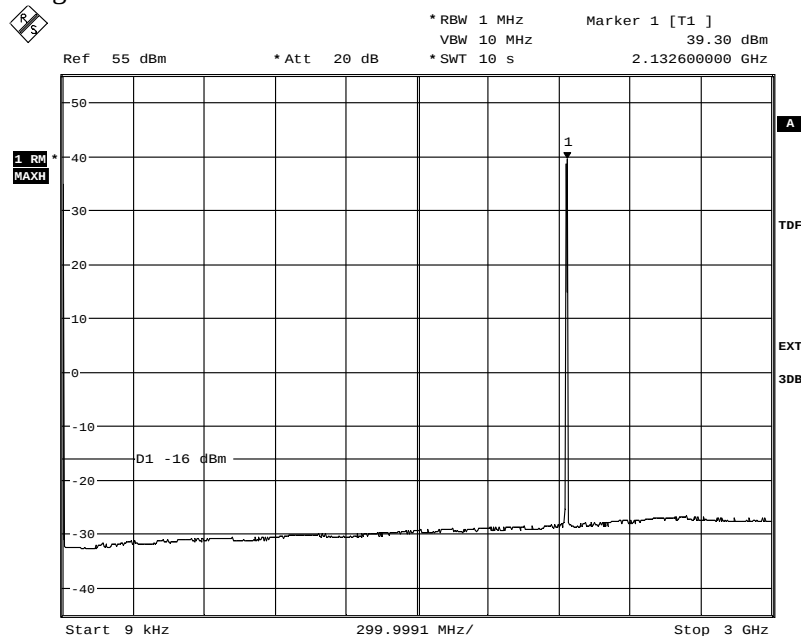


Date: 13.JUN.2012 12:58:15

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IC:287AB-AS1180481

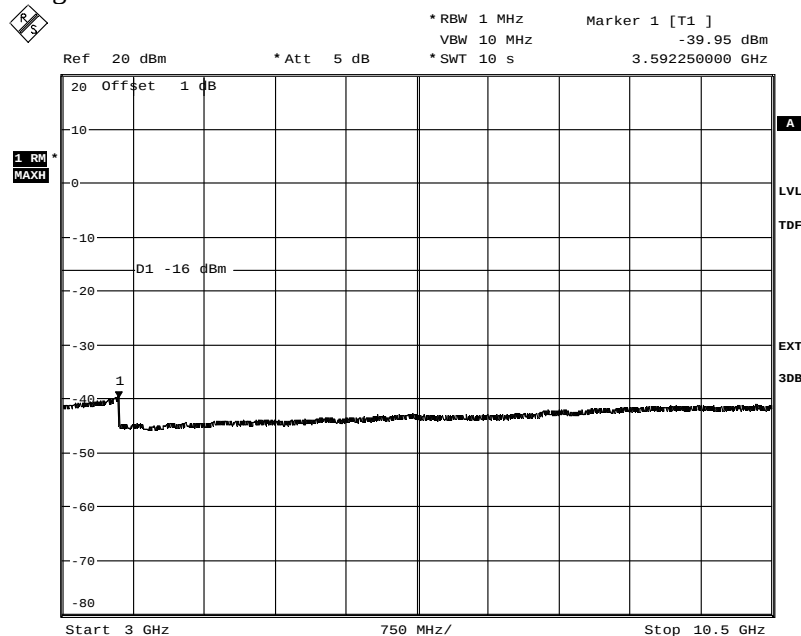
## Appendix 5

Diagram 8a



Date: 13.JUN.2012 16:24:36

Diagram 8b

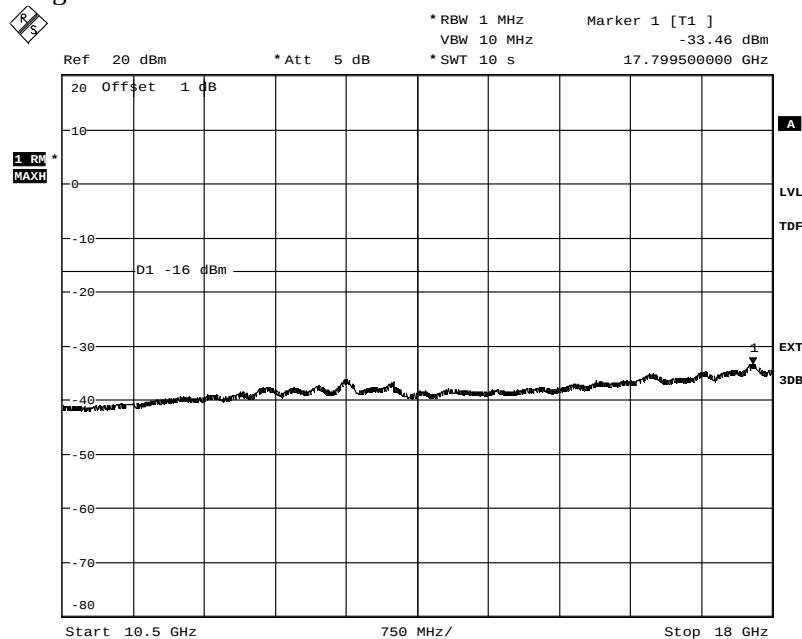


Date: 13.JUN.2012 16:27:12

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IC:287AB-AS1180481

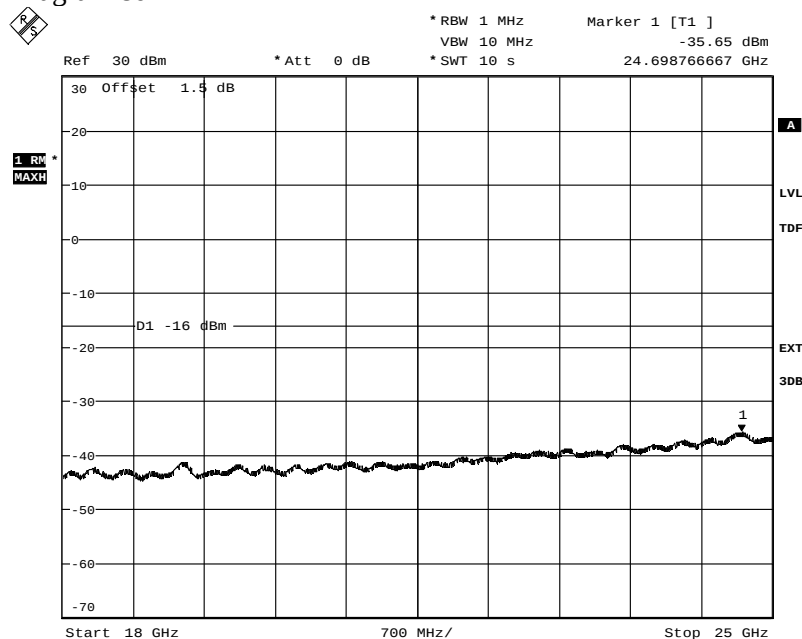
Appendix 5

Diagram 8c



Date: 13.JUN.2012 16:28:45

Diagram 8d



Date: 13.JUN.2012 16:31:07

## Field strength of spurious radiation measurements according to 47 CFR 27.53 (h) / IC RSS-139 6.5

| Date       | Temperature | Humidity   |
|------------|-------------|------------|
| 2012-09-06 | 21°C ± 3°C  | 40 % ± 5 % |
| 2012-09-07 | 23°C ± 3°C  | 42 % ± 5 % |

### Test set-up and procedure

The test sites are listed at FCC, Columbia with registration number: 93866. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18 - 25 GHz.

In the frequency range 30 MHz - 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

$$\gamma = 20 \log \left( \frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

The measurement procedure was as the following:

1. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to the standard.

The test set-up during the spurious radiation measurements is shown in the picture below:



### Measurement equipment

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Test site Tesla                          | 503 881   |
| R&S ES1 26                               | 503 292   |
| Control computer                         | -         |
| R&S FSIQ 40                              | 503 738   |
| Software: R&S EMC32, ver. 8.52.0         | 503 745   |
| Chase Bilog antenna CBL 6111A            | 503 182   |
| µComp Nordic, Low Noise Amplifier        | 901 545   |
| Miteq, Low Noise Amplifier               | 503 285   |
| EMCO Horn Antenna 3115                   | 502 175   |
| Standard gain antenna 20240-20           | 503 674   |
| High pass filter, Wainright              | 504 200   |
| High pass filter, RLC Electronics        | 503 739   |
| Testo 635 Temperature and humidity meter | 504 203   |

## Results

Diagram 1:a-d 0.03-25 GHz TM1 BW 5.0 MHz (T), representative for worst case

| Frequency (MHz) | Spurious emission level (dBm)    |                                  |
|-----------------|----------------------------------|----------------------------------|
|                 | Vertical                         | Horizontal                       |
| 30-25 000       | All emission > 20 dB below limit | All emission > 20 dB below limit |

## Measurement uncertainty:

3.2 dB up to 18 GHz, 3.6 dB above 18 GHz

## Limits

§27.53(h) and RSS-139 6.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm per 1 MHz RBW.

|           |     |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

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## Appendix 6

Diagram 1a:

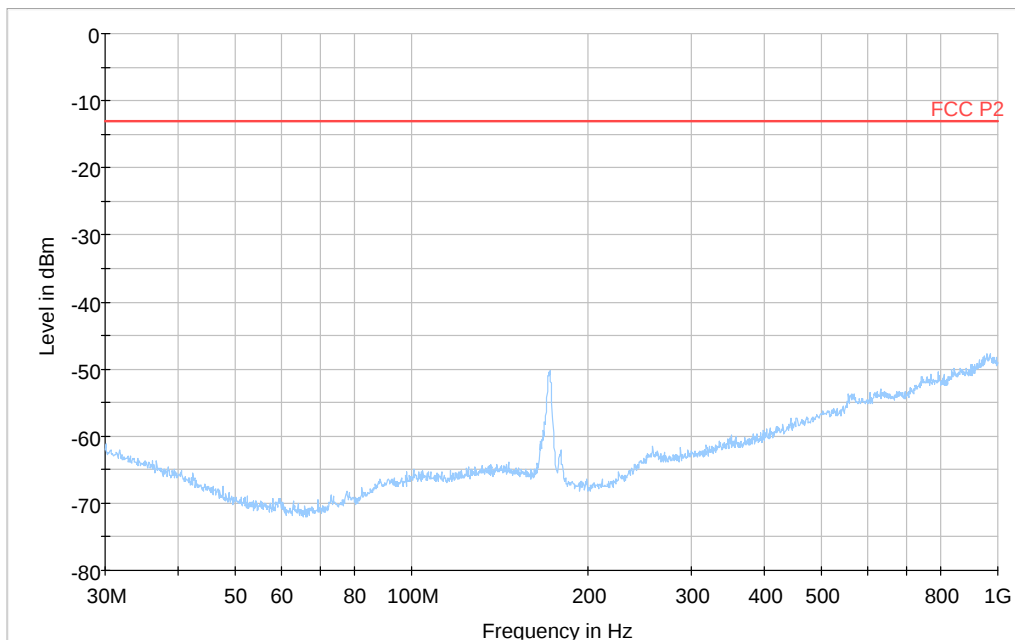
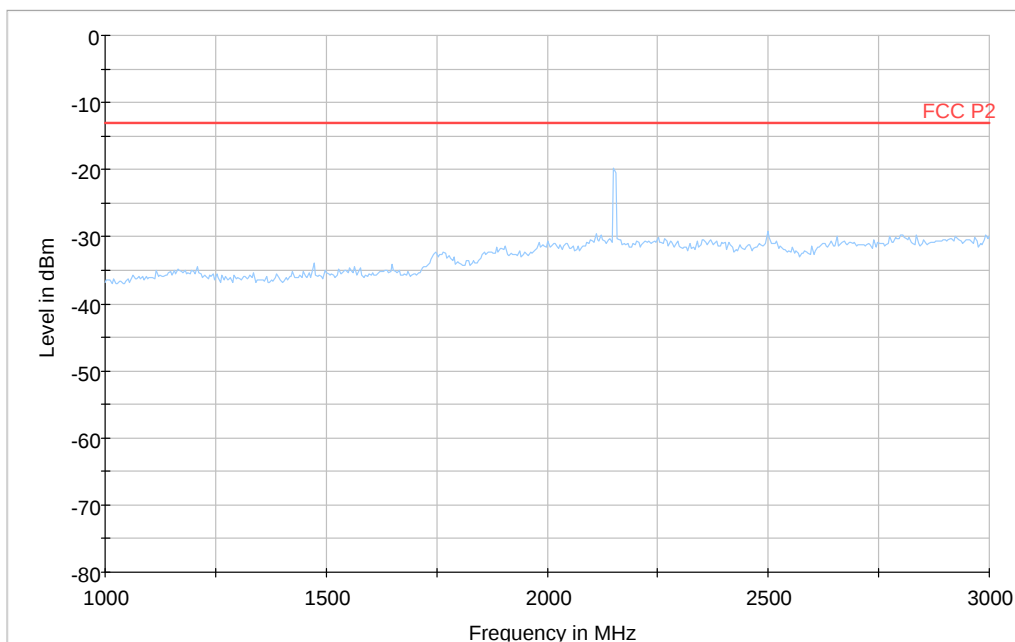


Diagram 1b:

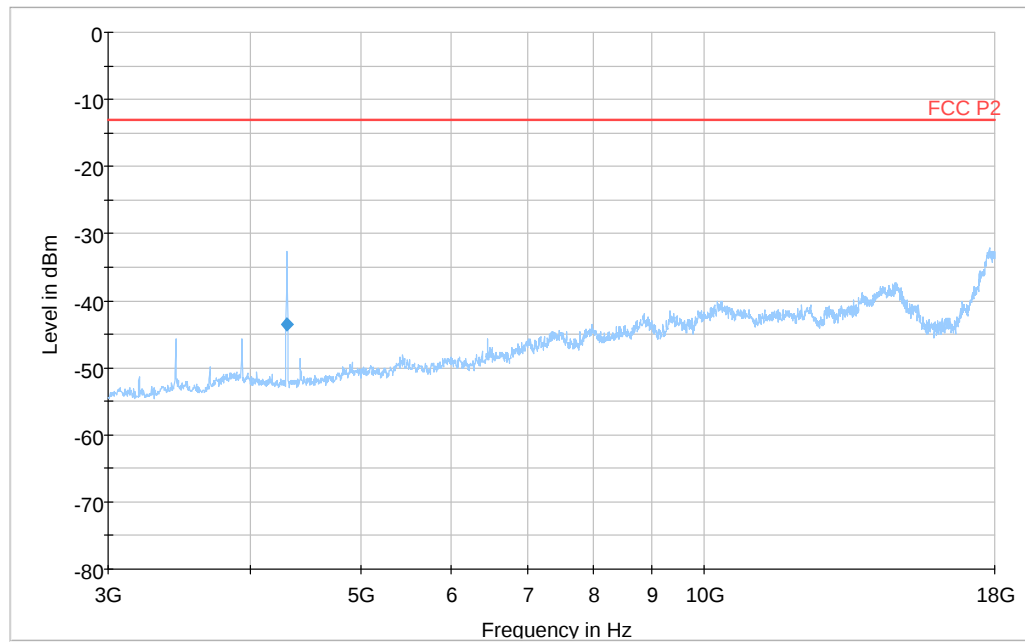


Note: The emission at 2152.6 MHz is the carrier frequency and shall be ignored in the context.

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## Appendix 6

Diagram 1c:



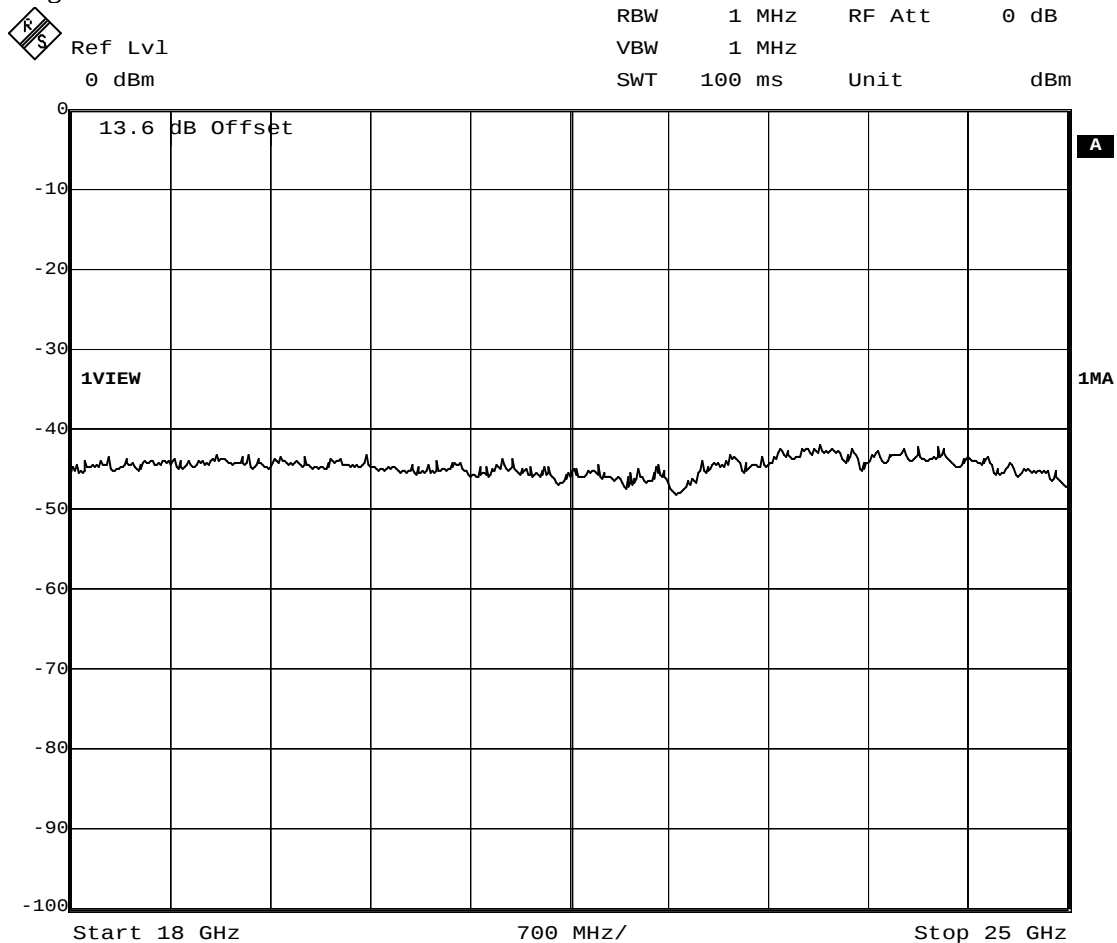
## Final RMS Result

| Frequency (MHz) | RMS (dBm) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBm) |
|-----------------|-----------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|-------------|
| 4306.722        | -43.5     | 5000.0          | 1000.000        | 100.0       | H            | 225.0         | -103.2     | 30.5        | -13.0       |

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Appendix 6

Diagram 1d:



Date: 7.SEP.2012 12:29:33

## Frequency stability measurements according to CFR 47 §27.54 / IC RSS 139 6.3

|                                  |                                                 |                                            |
|----------------------------------|-------------------------------------------------|--------------------------------------------|
| Date<br>2012-06-08 to 2012-06-13 | Temperature (test equipment)<br>22-23 °C ± 3 °C | Humidity (test equipment)<br>36-47 % ± 5 % |
|----------------------------------|-------------------------------------------------|--------------------------------------------|

### Test set-up and procedure

The measurement was made per 3GPP TS 25.141. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment                                | SP number |
|------------------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40, EAB equipment | -         |
| RF attenuator                                        | 503 870   |
| Testo 635, Temperature and humidity meter            | 504 203   |
| Temperature cabinet                                  | 503 360   |

### Results

Nominal Voltage -48 V DC

Maximum output power at mid channel (M)

| Test conditions          |        | Frequency error (Hz)     |
|--------------------------|--------|--------------------------|
| Supply voltage<br>DC (V) | T (°C) |                          |
| -48.0                    | +20    | +7                       |
| -55.2                    | +20    | +6                       |
| -40.8                    | +20    | +8                       |
| -48.0                    | +30    | -7                       |
| -48.0                    | +40    | +7                       |
| -48.0                    | +50    | -5                       |
| -48.0                    | +10    | +6                       |
| -48.0                    | 0      | +9                       |
| -48.0                    | -10    | -9                       |
| -48.0                    | -20    | +7                       |
| -48.0                    | -30    | -13                      |
| Maximum freq. error (Hz) |        | 13                       |
| Measurement uncertainty  |        | $< \pm 1 \times 10^{-7}$ |

Limits (according to 3GPP TS 25.141)

The frequency error shall be within  $\pm 0.05$  PPM  $\pm 12$  Hz (109.9 Hz).

|           |     |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

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## Appendix 8

### External photos

Front side



Rear side



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Appendix 8

Left side



Right side



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## Appendix 8

Top side



Bottom side

