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Rev.1: 2012-07-13

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Class II permissive change measurements on RRUS 11 B4 1700/2100 MHz radio equipment with FCC ID: TA8AKRC161254-2 and IC: 287AB-AS1612542 (8 appendices)

Rev.1, 2012-07-13: Updates in appendix 1 & 2 due to typing errors.

Test object

RRUS 11 B4, KRC 161 254/2, Rev R1G

Summary

Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-139		
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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Appendix 1

Description of the test object

Equipment: Radio equipment RRUS 11 B4 supporting single and multi-standard (CDMA and CDMA/ LTE) configured for single and multi-carriers

Antenna ports: 2 TX/RX ports

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

Nominal output power per antenna port: Single carrier: 1x 46.0 dBm (1x 40W)
Multi carrier: 2x 43.0 dBm (2x 20W)

Nominal power voltage: -48 VDC

CDMA
Modulations: QPSK, 8-PSK and 16QAM
Channel bandwidth: 1.25 MHz

LTE (mixed mode LTE+CDMA)
Modulations: QPSK, 16QAM and 64QAM
Channel bandwidth: 3 MHz, 5 MHz, 10 MHz and 15 MHz

Tested configurations

CDMA

Configuration 1:

	(40 W)
Downlink	25 (2111.25 MHz)
Uplink	25 (1711.25 MHz)
Modulation	QPSK

Configuration 2:

	(40 W)
Downlink	450 (2132.5 MHz)
Uplink	450 (1732.5 MHz)
Modulation	QPSK

Configuration 3:

	(40 W)
Downlink	875 (2153.75 MHz)
Uplink	875 (1753.75 MHz)
Modulation	QPSK

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Appendix 1

Configuration 4:

	(40 W)	(40 W)
Downlink	450 (2132.5 MHz)	475 (2133.75 MHz)
Uplink	450 (1732.5 MHz)	475 (1733.75 MHz)
Modulation	QPSK	QPSK

Configuration 5:

	(40 W)	(40 W)
Downlink	25 (2111.25 MHz)	75 (2113.75 MHz)
Uplink	25 (1711.25 MHz)	75 (1713.75 MHz)
Modulation	QPSK	QPSK

Configuration 6:

	(40 W)	(40 W)
Downlink	825 (2151.25 MHz)	875 (2153.75 MHz)
Uplink	825 (1751.25 MHz)	875 (1753.75 MHz)
Modulation	QPSK	QPSK

Configuration 7:

	(40 W)	(40 W)
Downlink	450 (2132.5 MHz)	500 (2135.0 MHz)
Uplink	450 (1732.5 MHz)	500 (1735.0 MHz)
Modulation	QPSK	QPSK

Configuration 8:

	(40 W)	(40 W)
Downlink	220 (2121.0 MHz)	620 (2141.0 MHz)
Uplink	220 (1721.0 MHz)	620 (1741.0 MHz)
Modulation	QPSK	QPSK

Configuration 9:

	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	800 (2150.0 MHz)	825 (2151.25 MHz)	850 (2152.5 MHz)	875 (2153.75 MHz)
Uplink	800 (1750.0 MHz)	825 (1751.25 MHz)	850 (1752.5 MHz)	875 (1753.75 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK

CDMA + LTE

Configuration 10:

CDMA				LTE
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	825 (2151.25 MHz)	850 (2152.5 MHz)	875 (2153.75 MHz)	2209 (2135.9 MHz)
Uplink	825 (1751.25 MHz)	850 (1752.5 MHz)	875 (1753.75 MHz)	20209 (1735.9 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	1.25 MHz	1.25 MHz	1.25 MHz	3 MHz

Configuration 11:

CDMA				LTE
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	25 (2111.25 MHz)	50 (2112.5 MHz)	75 (2113.75 MHz)	2141 (2129.1 MHz)
Uplink	25 (1711.25 MHz)	50 (1712.5 MHz)	75 (1713.75 MHz)	20141 (1729.1 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	1.25 MHz	1.25 MHz	1.25 MHz	3 MHz

Configuration 12:

CDMA				LTE
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	825 (2151.25 MHz)	850 (2152.5 MHz)	875 (2153.75 MHz)	2341 (2149.1 MHz)
Uplink	825 (1751.25 MHz)	850 (1752.5 MHz)	875 (1753.75 MHz)	20341 (1749.1 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	1.25 MHz	1.25 MHz	1.25 MHz	3 MHz

Configuration 13:

CDMA				LTE
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	25 (2111.25 MHz)	50 (2112.5 MHz)	75 (2113.75 MHz)	2009 (2115.9 MHz)
Uplink	25 (1711.25 MHz)	50 (1712.5 MHz)	75 (1713.75 MHz)	20009 (1715.9 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	1.25 MHz	1.25 MHz	1.25 MHz	3 MHz

Configuration 14:

CDMA				LTE
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	25 (2111.25 MHz)	50 (2112.5 MHz)	75 (2113.75 MHz)	2009 (2115.9 MHz)
Uplink	25 (1711.25 MHz)	50 (1712.5 MHz)	75 (1713.75 MHz)	20009 (1715.9 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	1.25 MHz	1.25 MHz	1.25 MHz	3 MHz

Configuration 15:

	CDMA	LTE
	(20 W)	(20 W)
Downlink	85 (2114.25 MHz)	1965 (2111.5 MHz)
Uplink	85 (1714.25 MHz)	19965 (1711.5 MHz)
Modulation	QPSK	QPSK
Bandwidth	1.25 MHz	3 MHz

Configuration 16:

	CDMA	LTE
	(20 W)	(20 W)
Downlink	505 (2135.25 MHz)	2175 (2132.5 MHz)
Uplink	505 (1735.25 MHz)	2015 (1732.5 MHz)
Modulation	QPSK	QPSK
Bandwidth	1.25 MHz	3 MHz

Configuration 17:

	CDMA	LTE
	(20 W)	(20 W)
Downlink	815 (2150.75 MHz)	2385 (2152.5 MHz)
Uplink	815 (1750.75 MHz)	20385 (1752.5 MHz)
Modulation	QPSK	QPSK
Bandwidth	1.25 MHz	3 MHz

CDMA operation mode during measurements

Measurements were performed with the test object transmitting in 1xRTT and EVDO configurations. 1xRTT is defined in 3GPP2 C.S0002-D-V1.0 and EVDO is defined in TIA 856-B. In 1xRTT mode the test object supported QPSK modulation with supported data rates of 9.6 kbps and 153.6 kbps. In EVDO mode the test object supported QPSK modulation with supported data rate of 614.4 kbps, 8-PSK modulation with supported data rate of 921.6 kbps and 16QAM modulation with supported data rate of 2457.6 kbps.

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

QPSK modulation
Channel rate: 9.6 kbps
Channel bandwidth: 1.25 MHz

LTE operation mode during measurements

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM and test model E-TM3.1 to represent 64QAM payload modulation. The setting TX single carrier with test model E-TM1.1 in channel bandwidth configuration 3 MHz was found to be representative for all traffic scenarios when several settings with different modulations and channel bandwidth configurations were compared to find a worst case setting. This setting was used for all measurements unless otherwise noted.

Conducted measurements

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

Radiated measurements

The test object was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmit power. The configurations below are the tests performed for radiated spurious emission measurements.

The RF output power port was via a RF attenuator connected to functional test equipment for supervision.

Tested configurations during radiated measurements**CDMA**

Configuration 1
Configuration 2
Configuration 3
Configuration 4
Configuration 9 ¹⁾

CDMA + LTE

Configuration 10 ¹⁾
Configuration 11
Configuration 12
Configuration 13

¹⁾ The configuration represents worst case

Purpose of test

The purpose of this test is to justify a Class II Permissive Change of the test object to include the use of the access technology CDMA and the use of multi- standard radio (MSR) for access technologies CDMA and LTE running in Contiguous and Non- contiguous mode.
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 1st, 2011
CFR 47 part 27, October 1st, 2011
3GPP TS 25.141, version 8.9.0
RSS-Gen Issue 3
RSS-139 Issue 2

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
Control computer with 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
Boonton RF Peak power meter/analyzer	2012-11	503 144
Boonton Power sensor 56518-S/4	2012-11	503 145
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 2012-05-28.

Manufacturer's representative

Christer Gustavsson, Ericsson AB.

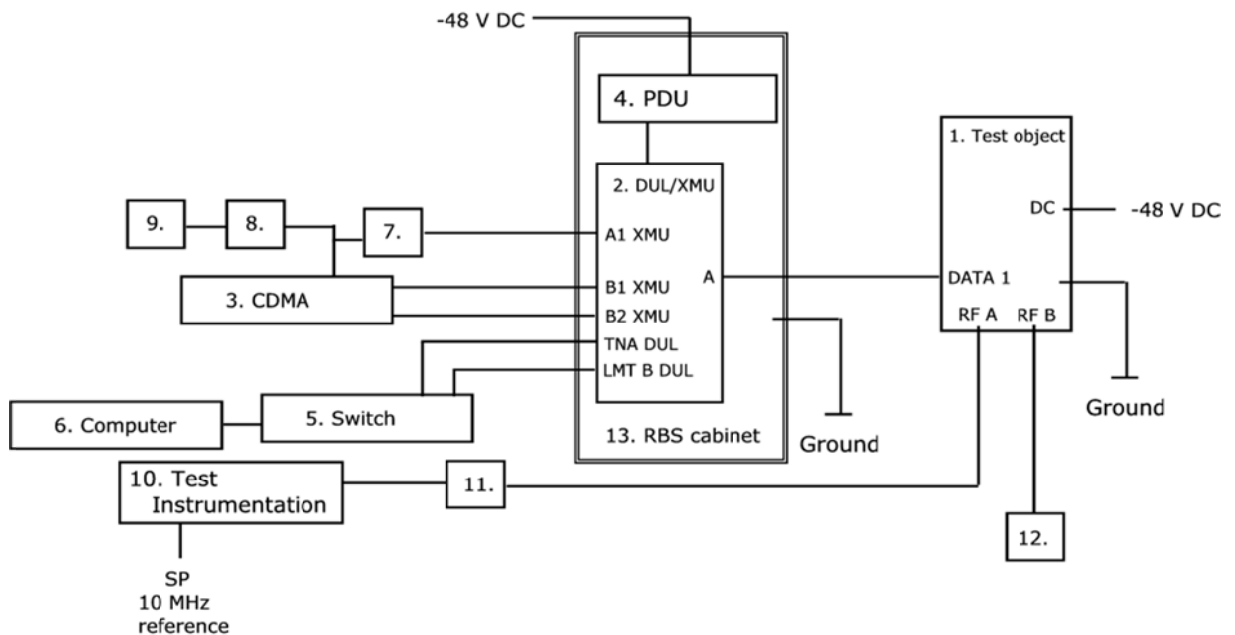
Test engineers

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

Test participants

Martin Ivanovic and Patrik Hellström, Ericsson AB (Partly present)

Test set-up conducted measurements TX



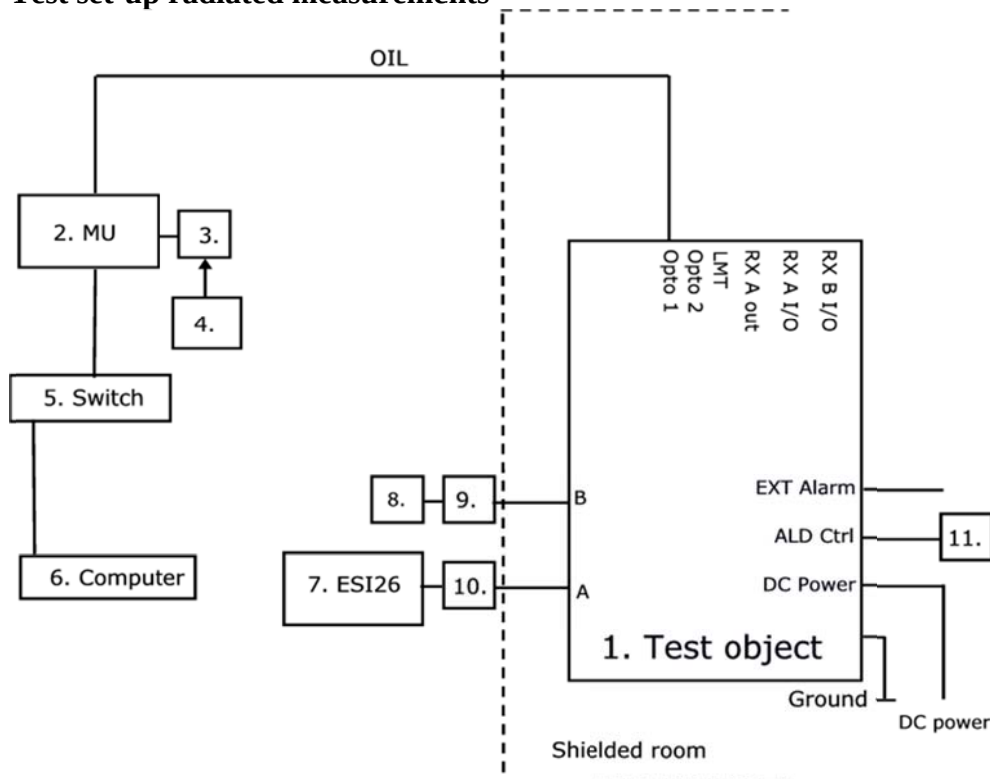
Test object

1. RRUS 11 B4, KRC 161 254/2, revision R1G, S/N: CB4M131209 (FCC ID: TA8AKRC161254-2 / IC: 287AB-AS1612542) with software (PIS): CXP 901 3268/6 rev. R48YA

Functional test equipment

2. DU 1: DUL 02 01, KDU 137 533/4, Rev R1C, S/N: C825151647 and DU 2: XMU 02 01, KDU 137 745/1, Rev R2A, S/N: C825513804
3. EMC CDMA NR: 0708, see details on the following page
4. PDU 02 01, BMG 980 336/4 Rev R2A, S/N: BJ31528316
5. Fast Ethernet switch, Netgear GS108E
6. Computer HP Elitbook 8540w, BAMS – 1001052043
7. GPS splitter KRY 101 1946/1 P1B BU91444275
8. GPS 0201 NCD 901 41/1 R1D A401724356
9. GPS antenna
10. SP test instrument according measurement equipment list
11. SP test instrument according measurement equipment list
12. Attenuator/ terminator
13. RBS 6201 cabinet, BAMS – 1000778792

Test set-up radiated measurements



Test object

1. RRUS 11 B4, KRC 161 254/2, revision R1G, S/N: CB4M131209
(FCC ID: TA8AKRC161254-2 / IC: 287AB-AS1612542)
with software (PIS): CXP 901 3268/6 rev. R48YA

Functional test equipment

2. DU 1: DUL 02 01, KDU 137 533/4, Rev R1C, S/N: C825151647 and
DU 2: XMU 02 01, KDU 137 745/1, Rev R2A, S/N: C825513804
EMC CDMA NR: 0708, see details on the following page
3. Jointing Box, NCD 901 40/1, rev. R1D, s/n: A401724356
4. GPS antenna
5. Fast Ethernet switch, Netgear GS108 BAMS-1000840042
6. Computer HP Elitebook BAMS-1001052043
7. Spectrum analyser ESI26 SP 503292
8. Terminator
9. Attenuator
10. Attenuator
11. RET – Remote Electrical Tilt unit

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Appendix 1

Test object interfaces
Type of port:

Power: -48 VDC	DC Power
Antenna port (A), 7/16 connector, terminated	Antenna
Antenna port (B), 7/16 connector, terminated	Antenna
Opto 1, Optical Interface Link, single mode opto fibre	Telecom
Opto 2, not supported	Telecom
LMT, for maintenance use only	Telecom
RX A Out, not supported	Antenna
RX A I/O, not supported	Antenna
RX B I/O, not supported	Antenna
EXT Alarm, shielded multi-wire	Signal
ALD Ctrl, shielded multi-wire	Signal
Ground wire	Ground

EMC CDMA NR: 0708, BAMS – 1001029599

Product name	Product number	R-state	Serial number
PDU 02 01	BMG 980 336/4	R2B	C941002722
X-CEEM	NTLK86AAE5 02	-	NNTMPX00PKM1
PWR	NTLK70AA 06	-	NNTMPX00MMNN
PWR ALM	NTLK75AA 03	-	NNTMPX00PR83
DOM-A	NTLK78AAE5 03	-	NNTMPX00R3JV
DOM-A	NTLK78AAE5 03	-	NNTMPX00R3KX
X-CEEM	NTLK86AAE5 02	-	NNTMPX00MRRK
POWER SUPPLY SM 52-30	-	-	BAMS – 0000012187

RBS software

	Software	Revision
DUL	CXP 102 051/16	R15AVXMU2
XMU	Vortex ver. 1804_12wk07	-

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

Date	Temperature	Humidity
2012-06-19	23 °C ± 3 °C	35 % ± 5 %
2012-06-25	21 °C ± 3 °C	46 % ± 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

CDMA

Single carrier: Rated output power level at RF A connector 1x 46 dBm

Tested configurations	Transmitter power RMS (dBm) / PAR (dB)
Configuration 1:	45.4/ 6.6
Configuration 2:	45.7/ 6.8
Configuration 3:	45.7/ 6.6

Multi carrier 1x2: Rated output power level at RF A connector 2x 43 dBm

Tested configurations	Transmitter combined power RMS (dBm) / PAR (dB)
Configuration 5:	44.4/ 8.0
Configuration 7:	44.4/ 8.6
Configuration 6:	45.0/ 8.1

Single carrier: Rated output power level at RF B connector 1x 46 dBm

Tested configurations	Transmitter power RMS (dBm) / PAR (dB)
Configuration 2:	45.7/ 6.7

CDMA + LTE

Multi carrier:1x LTE 1x CDMA: Rated output power level at RF A connector 2x 43 dBm

Tested configurations	Transmitter combined power RMS (dBm) / PAR (dB)
Configuration 15:	44.1/ 8.2
Configuration 16:	44.4/ 8.2
Configuration 17:	44.4/ 8.2

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Appendix 2

CDMA

Single carrier:

Diagram 1: Configuration 1

Diagram 2: Configuration 2

Diagram 3: Configuration 3

Multi carrier:

Diagram 4: Configuration 5

Diagram 5: Configuration 7

Diagram 6: Configuration 6

Single carrier RF B

Diagram 7 Configuration 2

CDMA + LTE

Multi carrier:1x LTE 1x CDMA

Diagram 8: Configuration 15

Diagram 9: Configuration 16

Diagram10: Configuration 17

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.

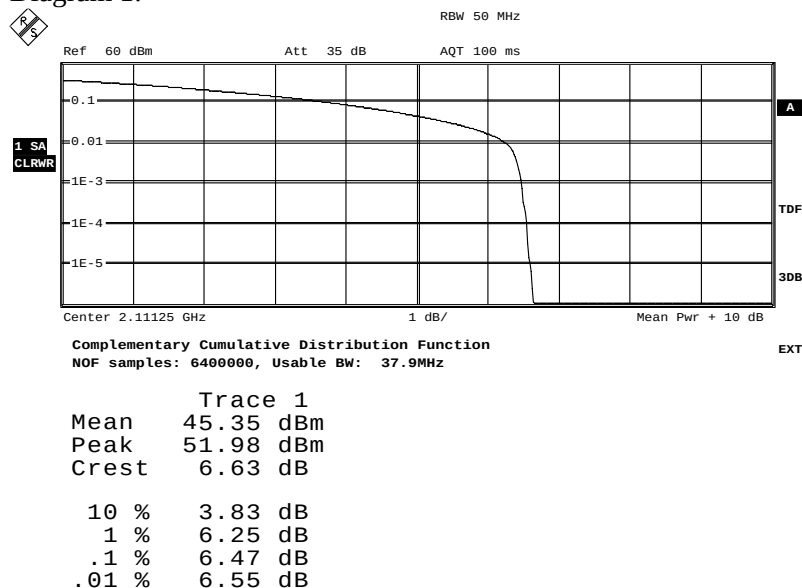
Complies?	Yes
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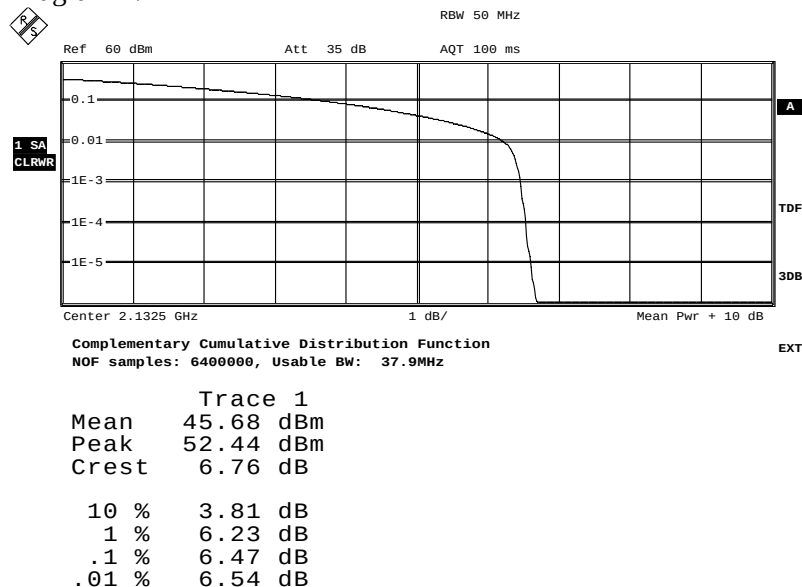
Appendix 2

Diagram 1:



Date: 19.JUN.2012 10:44:09

Diagram 2:



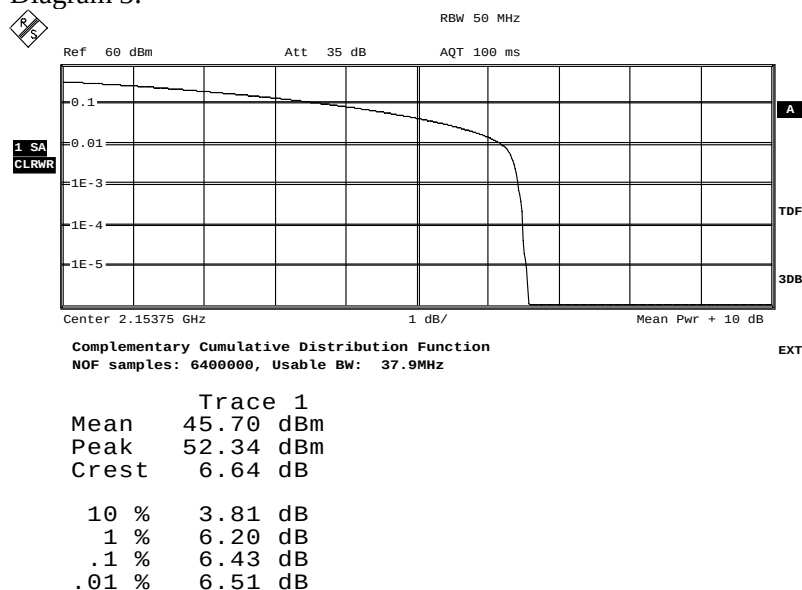
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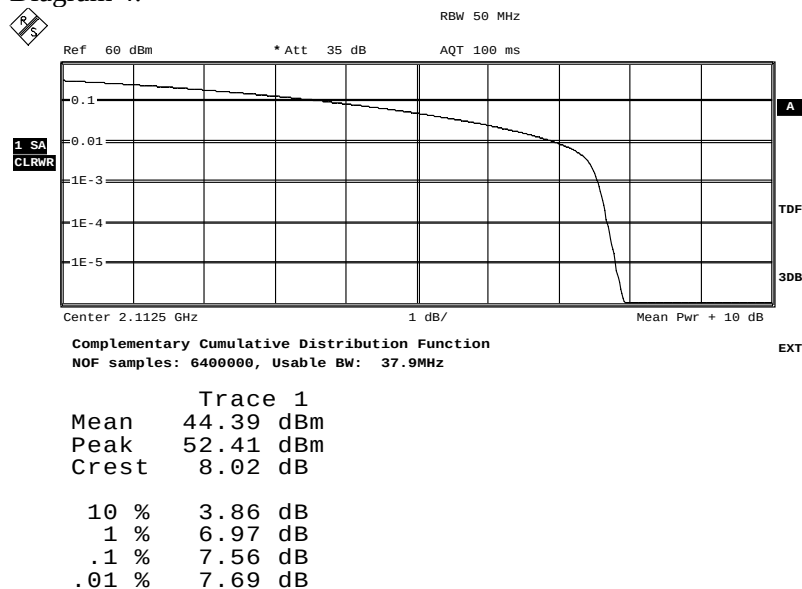
Appendix 2

Diagram 3:



Date: 19.JUN.2012 12:48:06

Diagram 4:



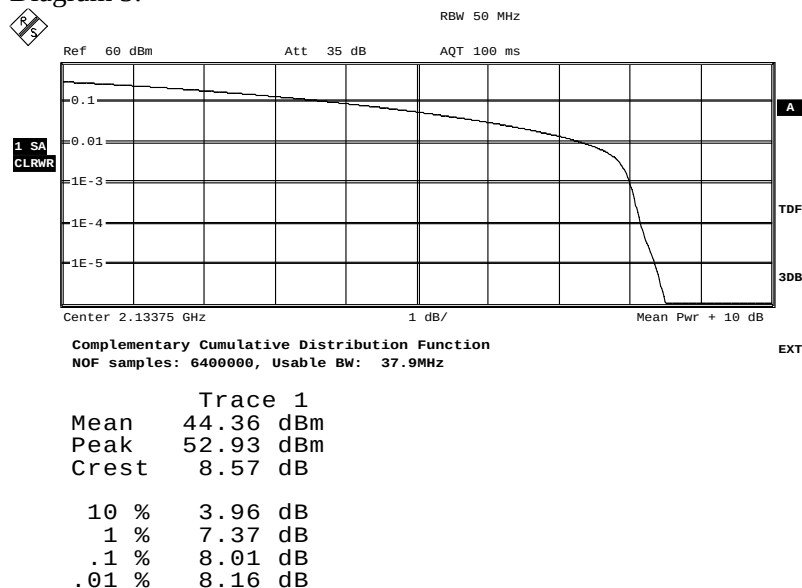
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FCC ID:TA8AKRC161254-2
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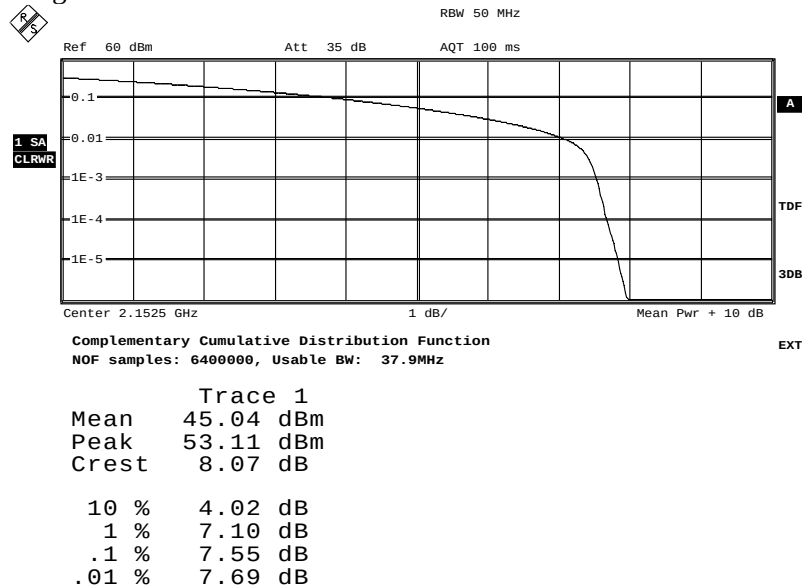
Appendix 2

Diagram 5:



Date: 20.JUN.2012 09:09:59

Diagram 6:



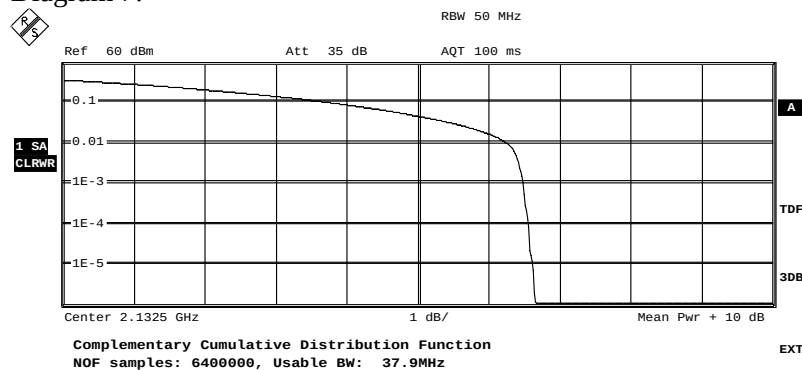
Date: 19.JUN.2012 19:20:03

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Appendix 2

Diagram 7:



Trace 1
Mean 45.72 dBm
Peak 52.44 dBm
Crest 6.72 dB

10 % 3.81 dB
1 % 6.25 dB
.1 % 6.49 dB
.01 % 6.57 dB

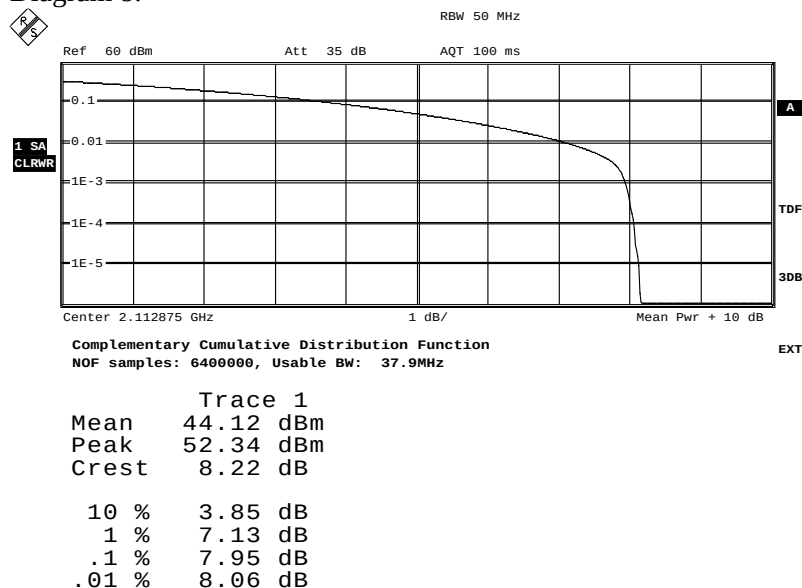
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FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

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2012-07-13

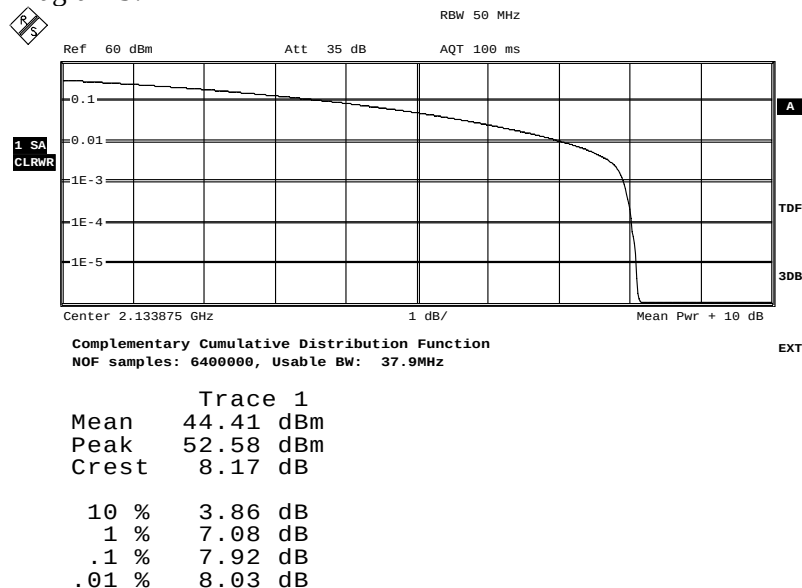
Appendix 2

Diagram 8:



Date: 25.JUN.2012 11:25:46

Diagram 9:



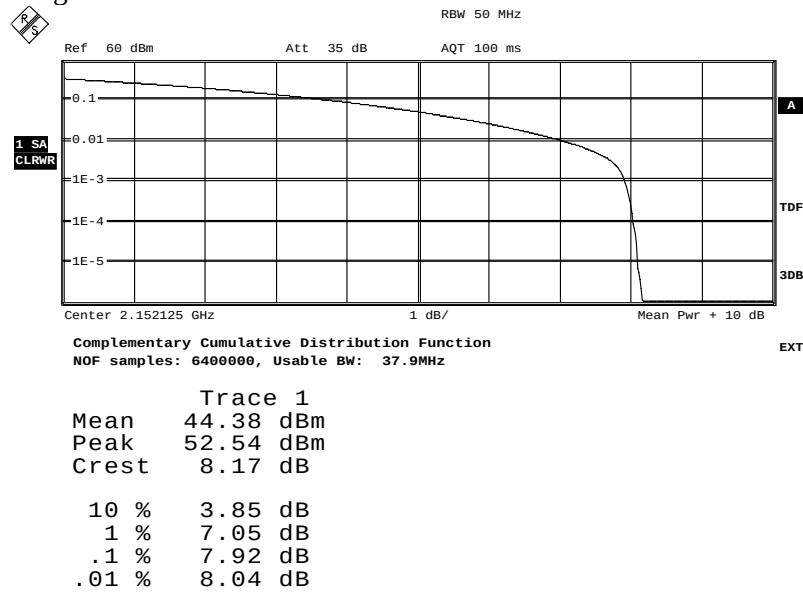
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Appendix 2

Diagram 10:



Date: 25.JUN.2012 13:04:10

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

Date 2012-06-19	Temperature 23 °C ± 3 °C	Humidity 35 % ± 5 %
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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

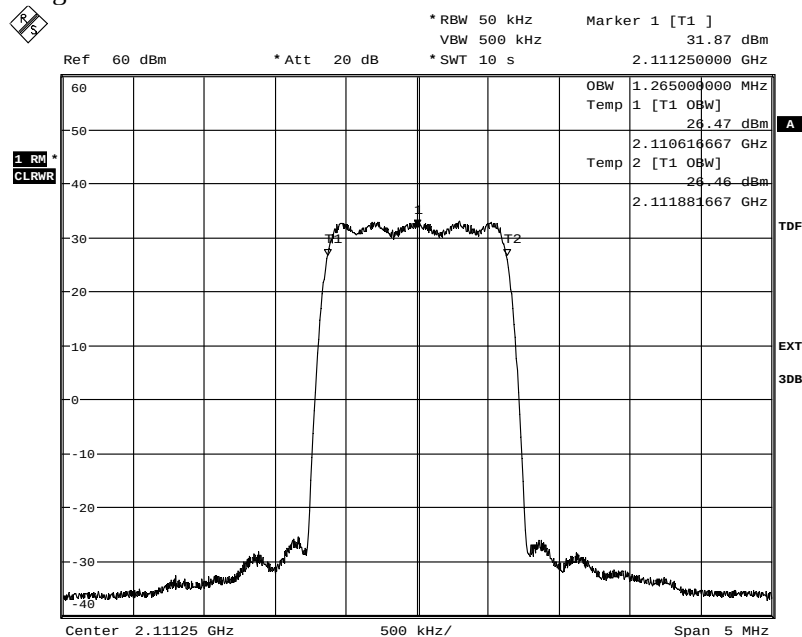
CDMA

Diagram	BW configuration	Tested configurations	Occupied BW (99%) [MHz]
1	1.25 MHz	Configuration 1	1.265
2	1.25 MHz	Configuration 2	1.265
3	1.25 MHz	Configuration 3	1.265
4	1.25 MHz	Configuration 2, RF B	1.263

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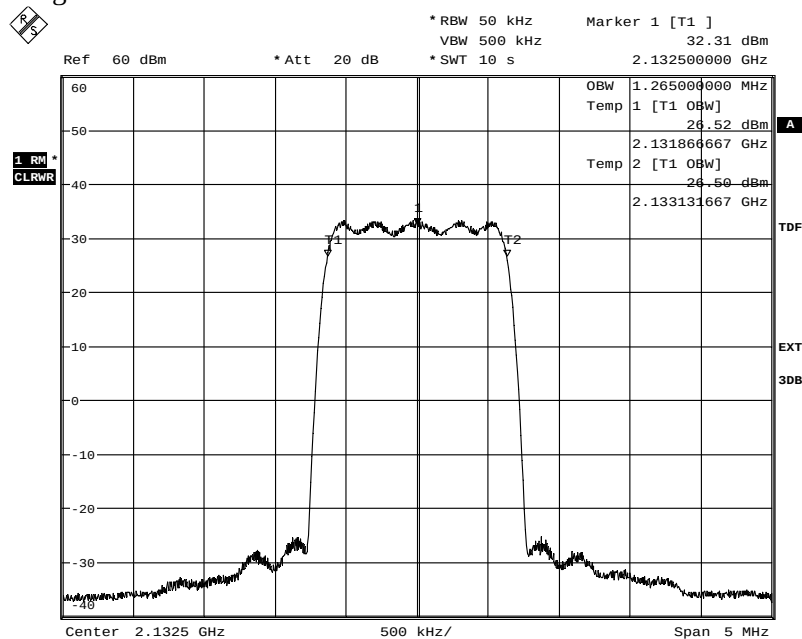
Appendix 3

Diagram 1



Date: 19.JUN.2012 10:55:20

Diagram 2

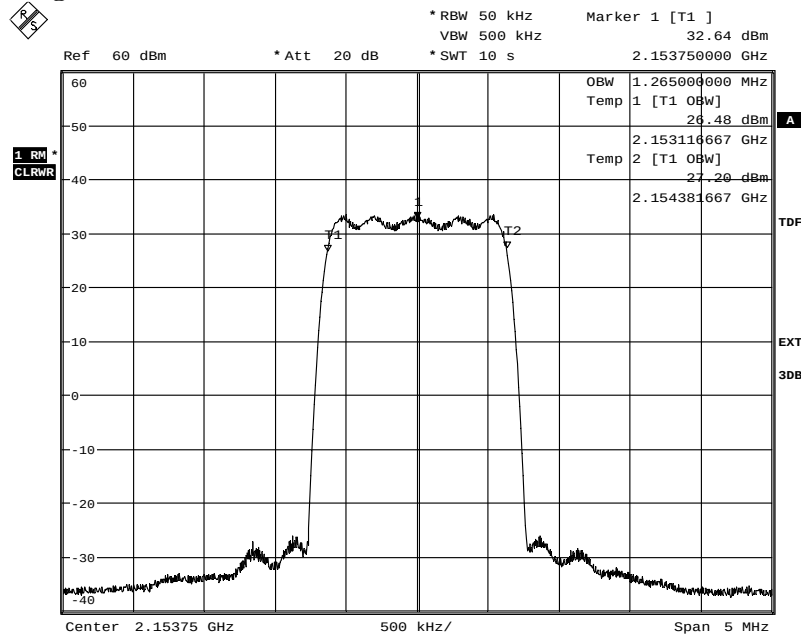


Date: 19.JUN.2012 12:20:41

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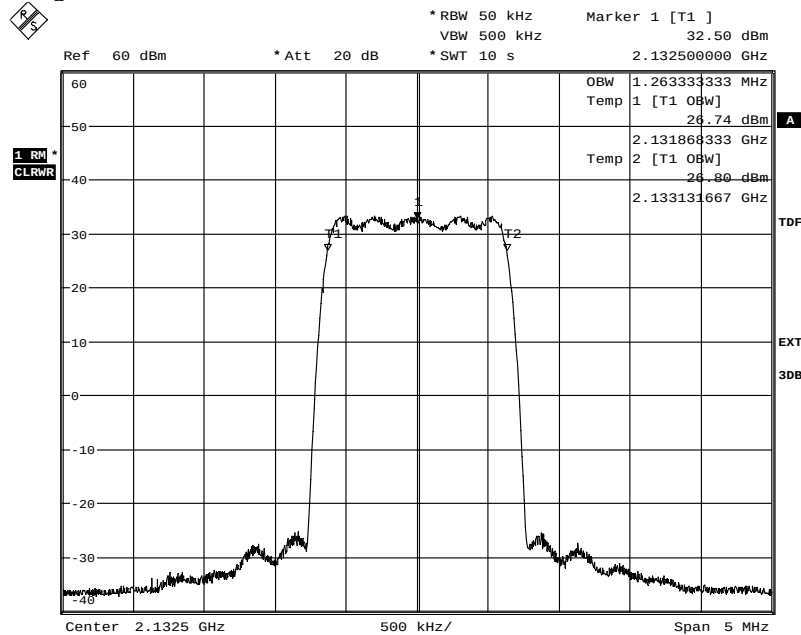
Appendix 3

Diagram 3



Date: 19.JUN.2012 12:49:19

Diagram 4



Date: 19.JUN.2012 14:15:10

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

Date 2012-06-19	Temperature 23 °C ± 3 °C	Humidity 35 % ± 5 %
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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 200 kHz was used 1 MHz to 6 MHz away from the band edges, to compensate for the reduced resolution bandwidth the limit was adjusted by 7 dB to -20 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

CDMA

Single carrier

Diagram 1 a-c: Configuration 1

Diagram 2 a-c: Configuration 3

Single carrier, RF B

Diagram 3 a-c: Configuration 1

Diagram 4 a-c: Configuration 3

Limits

CFR 47 §27.53(h) and RSS-139 6.5

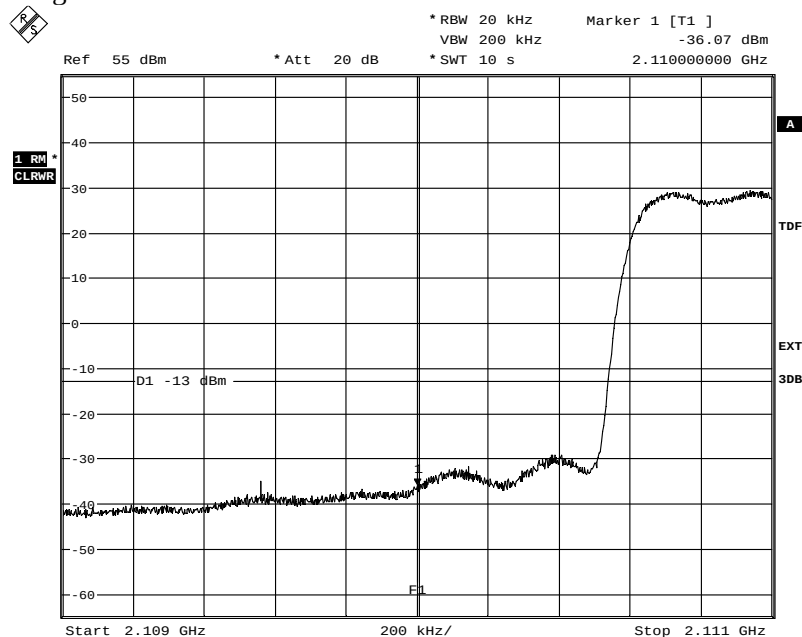
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm.

Complies?	Yes
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FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

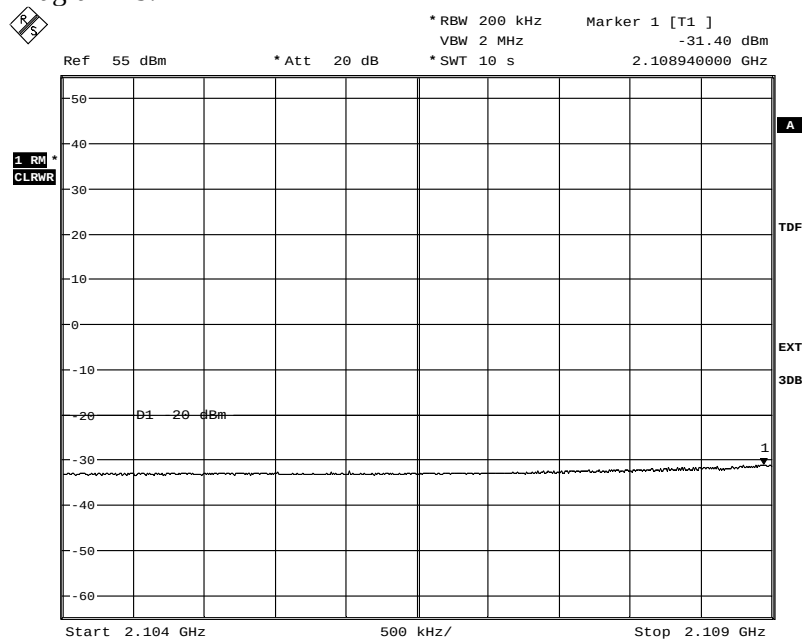
Appendix 4

Diagram 1a:



Date: 19.JUN.2012 10:37:13

Diagram 1b:

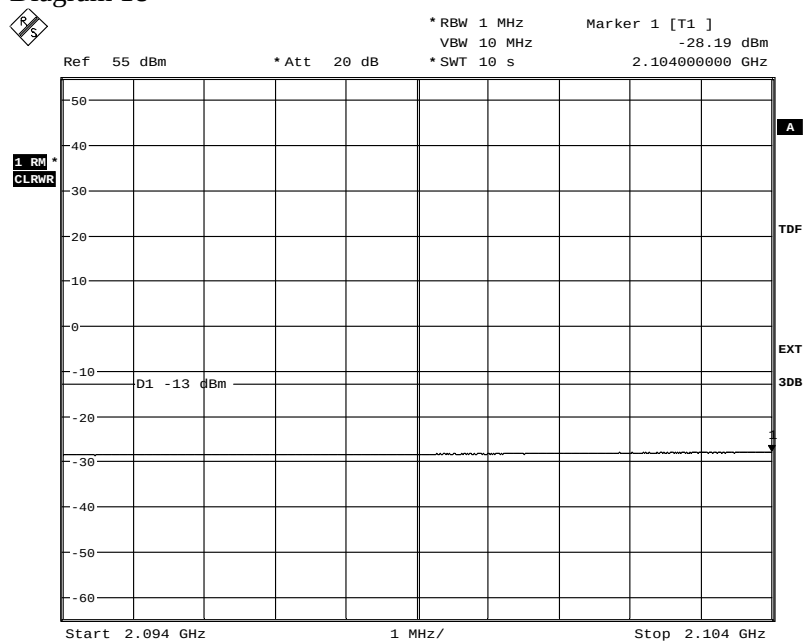


Date: 19.JUN.2012 10:38:23

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 4

Diagram 1c

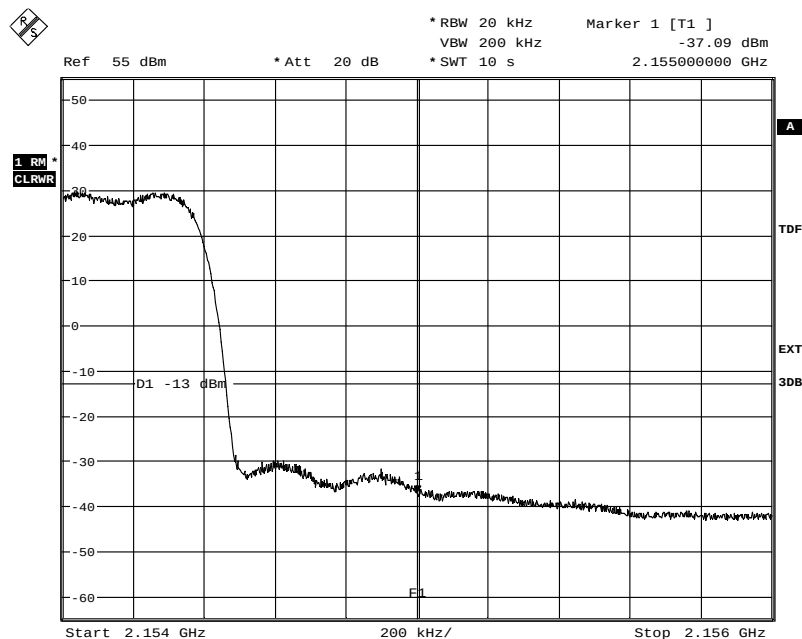


Date: 19.JUN.2012 10:39:04

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

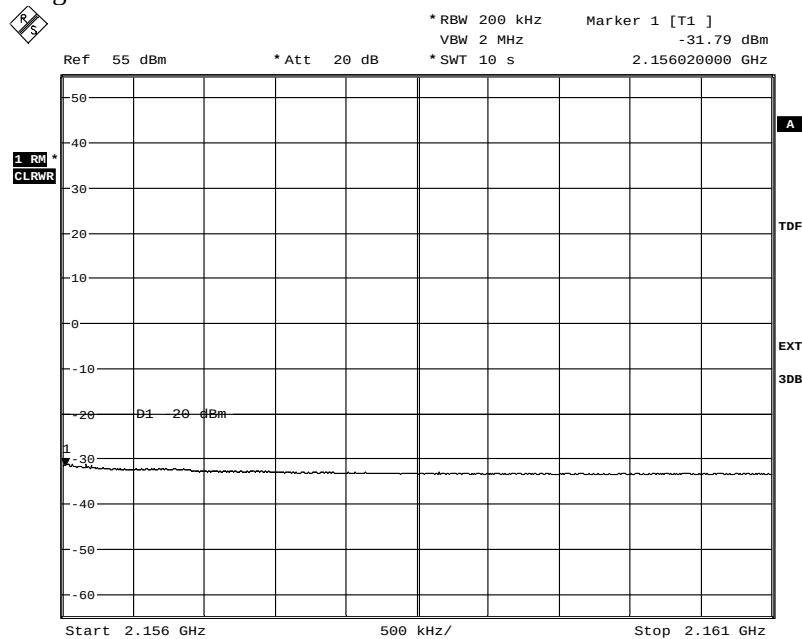
Appendix 4

Diagram 2a:



Date: 19.JUN.2012 12:51:41

Diagram 2b:

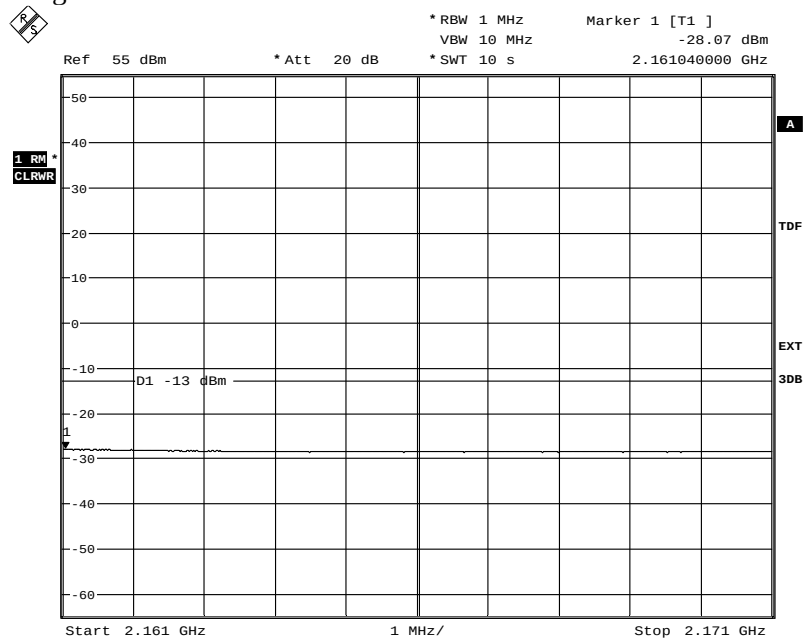


Date: 19.JUN.2012 12:53:02

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 4

Diagram 2c:

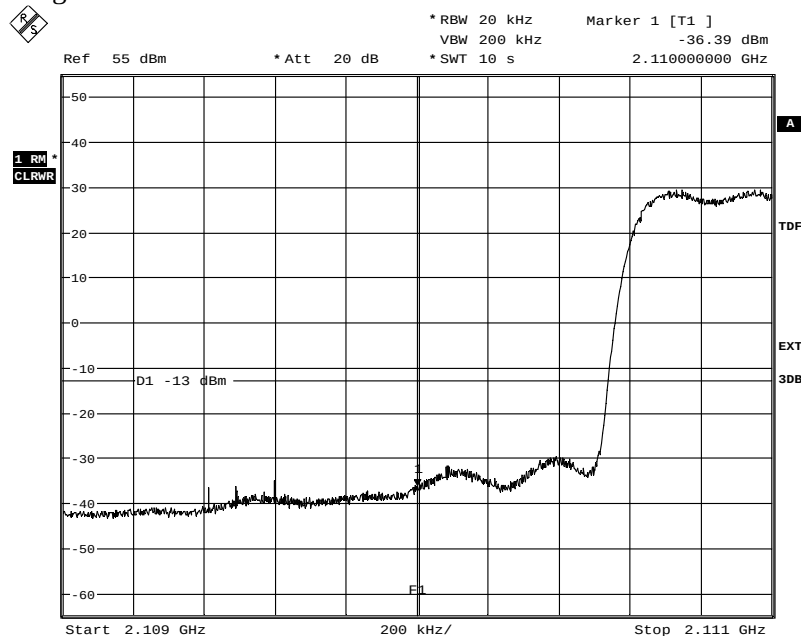


Date: 19.JUN.2012 12:53:56

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

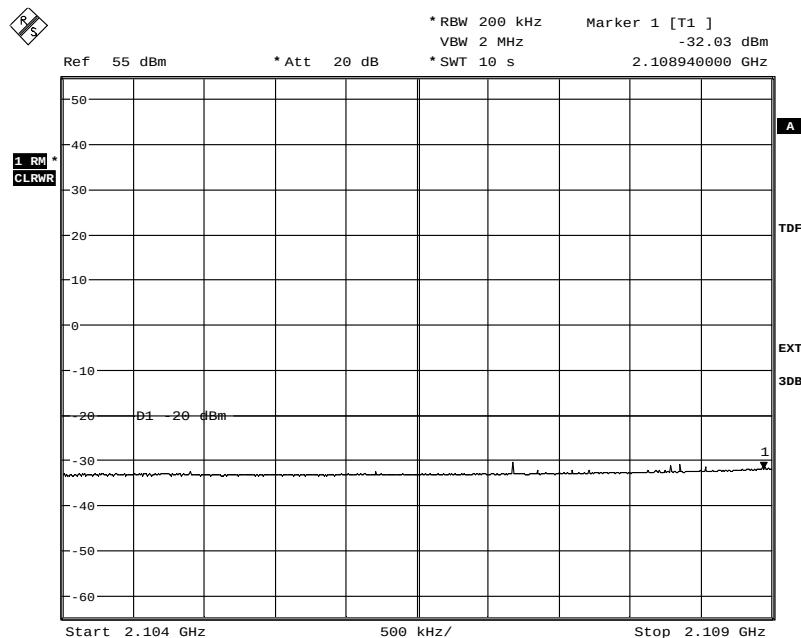
Appendix 4

Diagram 3a:



Date: 19.JUN.2012 13:41:06

Diagram 3b:

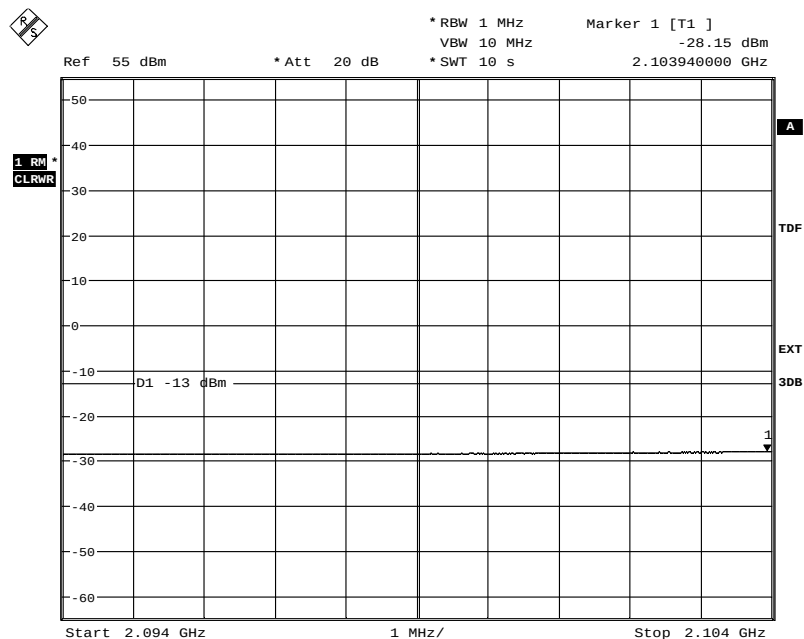


Date: 19.JUN.2012 13:42:10

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 4

Diagram 3c:

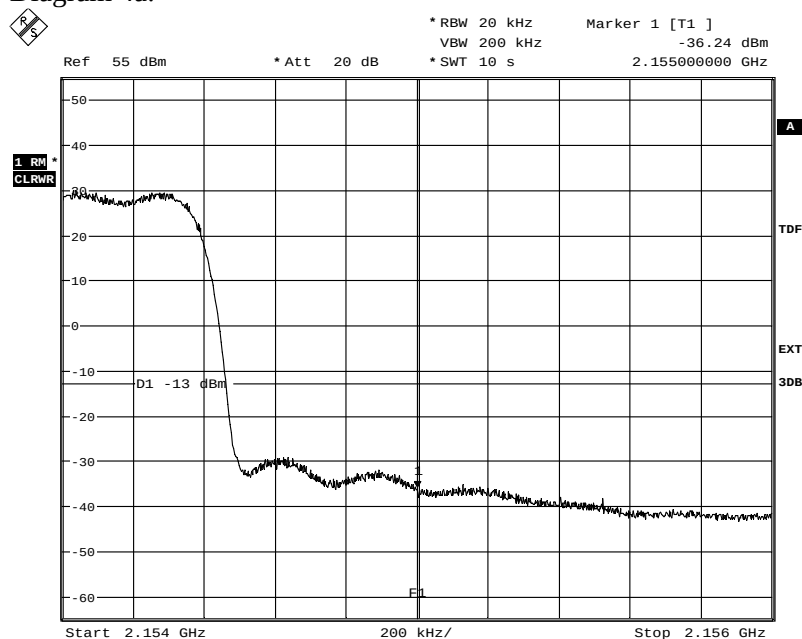


Date: 19.JUN.2012 13:42:49

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

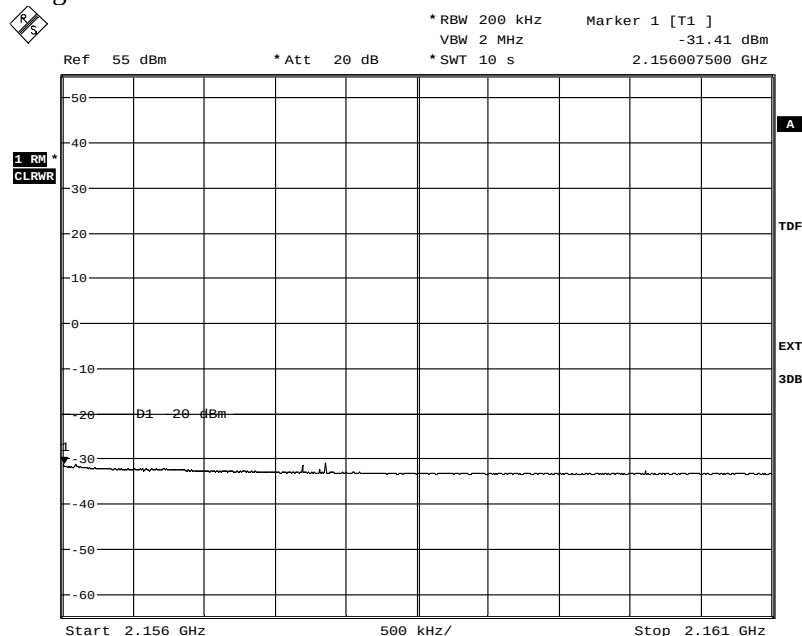
Appendix 4

Diagram 4a:



Date: 19.JUN.2012 13:59:59

Diagram 4b:

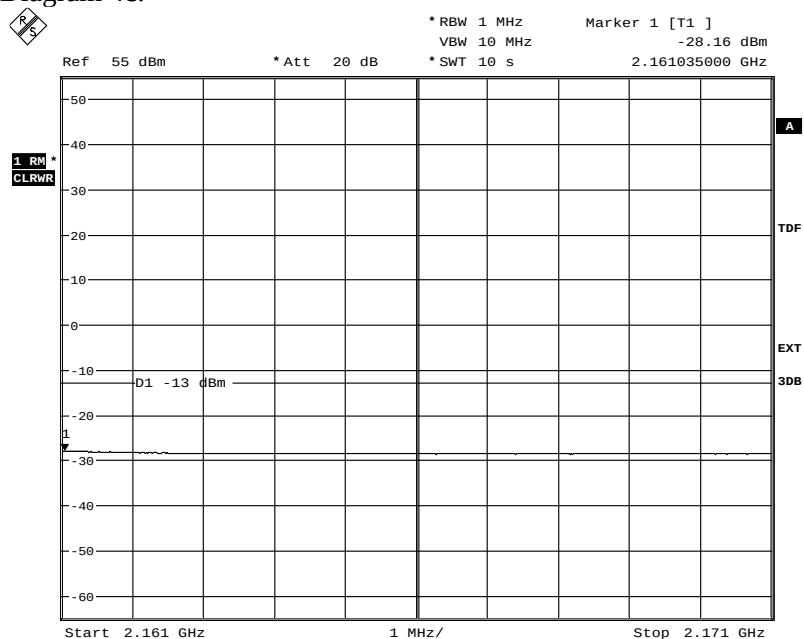


Date: 19.JUN.2012 14:01:13

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 4

Diagram 4c:



Date: 19.JUN.2012 14:01:51

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

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

Date	Temperature	Humidity
2012-06-19	23 °C ± 3 °C	35 % ± 5 %
2012-06-25	21 °C ± 3 °C	46 % ± 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.

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

CDMA

Single carrier:

Diagram 1 a-d: Configuration 1

Diagram 2 a-d: Configuration 2

Diagram 3 a-d: Configuration 3

Multi carrier:

Diagram 4 a-e: Configuration 5

Diagram 5 a-d: Configuration 7

Diagram 6 a-e: Configuration 6

Single carrier RF B

Diagram 7 a-d: Configuration 2

Multi carrier RF B

Diagram 8 a-e: Configuration 6

CDMA + LTE

Multi carrier: 1x LTE 1x CDMA

Diagram 9 a-e: Configuration 15

Diagram10 a-d: Configuration 16

Diagram11 a-e: Configuration 17

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.

Limits

§27.53(h) and RSS-139 6.5

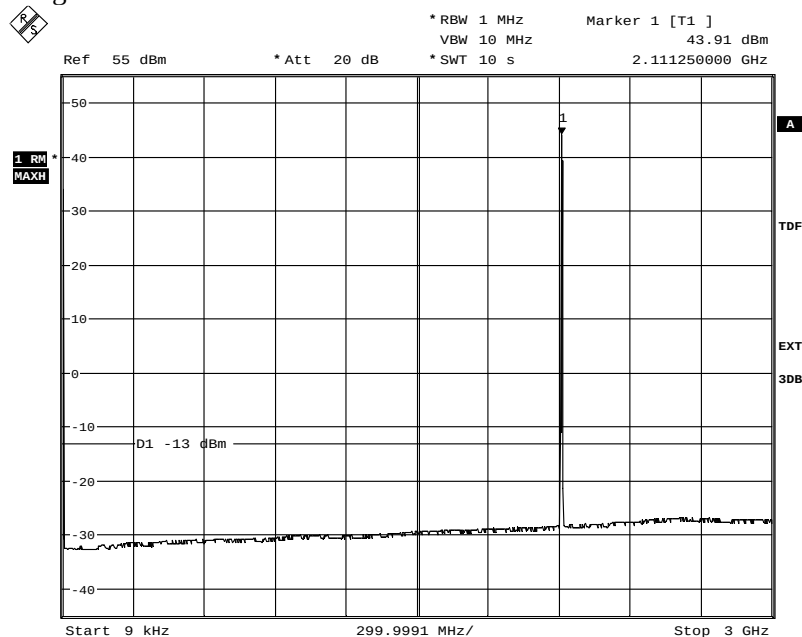
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P) \text{ dB}$, resulting in a limit of -13 dBm per 1 MHz RBW.

Complies?	Yes
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FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

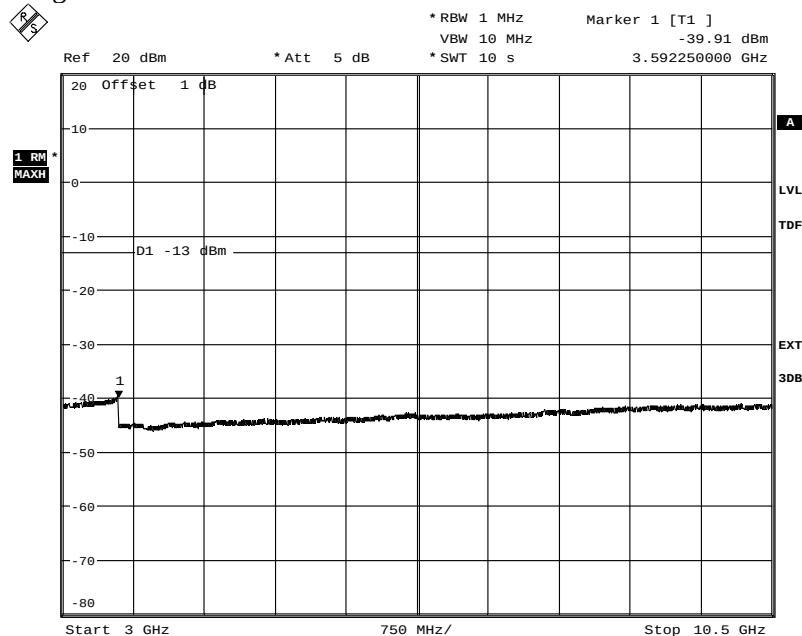
Diagram 1a



Date: 19.JUN.2012 10:45:55

The emissions around the carrier are within the operating frequency band

Diagram 1b

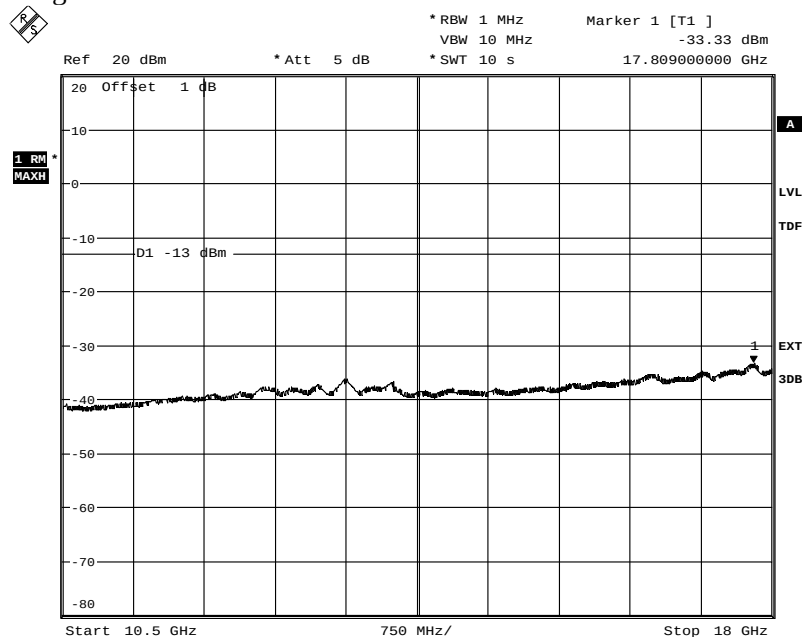


Date: 19.JUN.2012 10:49:56

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

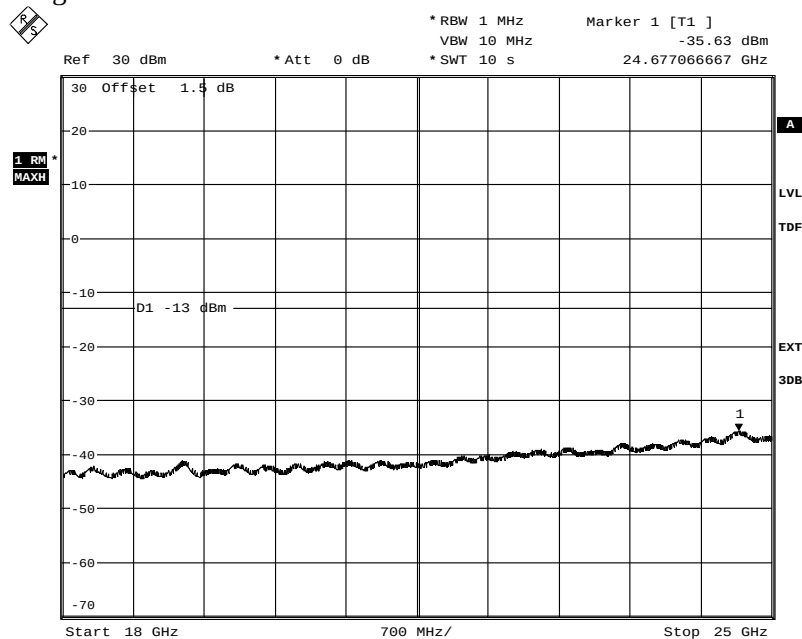
Appendix 5

Diagram 1c



Date: 19.JUN.2012 10:50:48

Diagram 1d

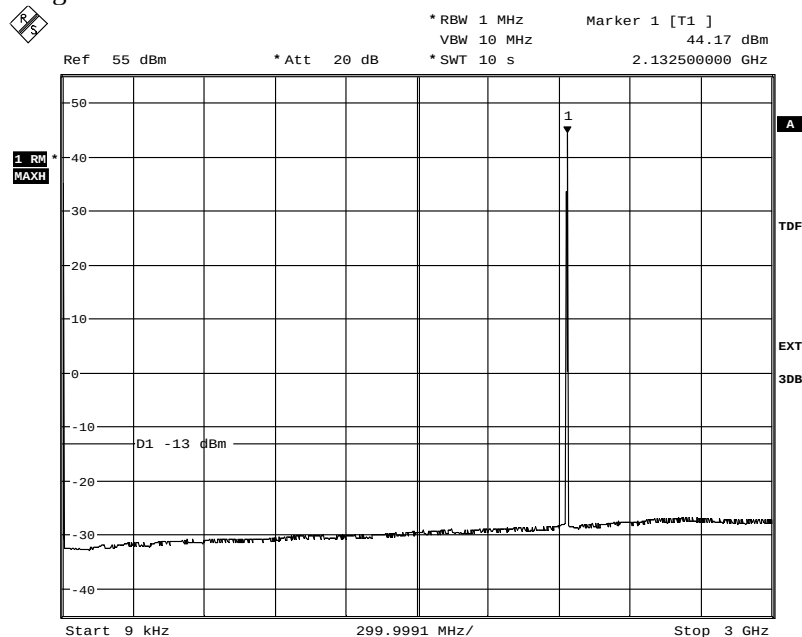


Date: 19.JUN.2012 11:01:55

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IC:287AB-AS1612542

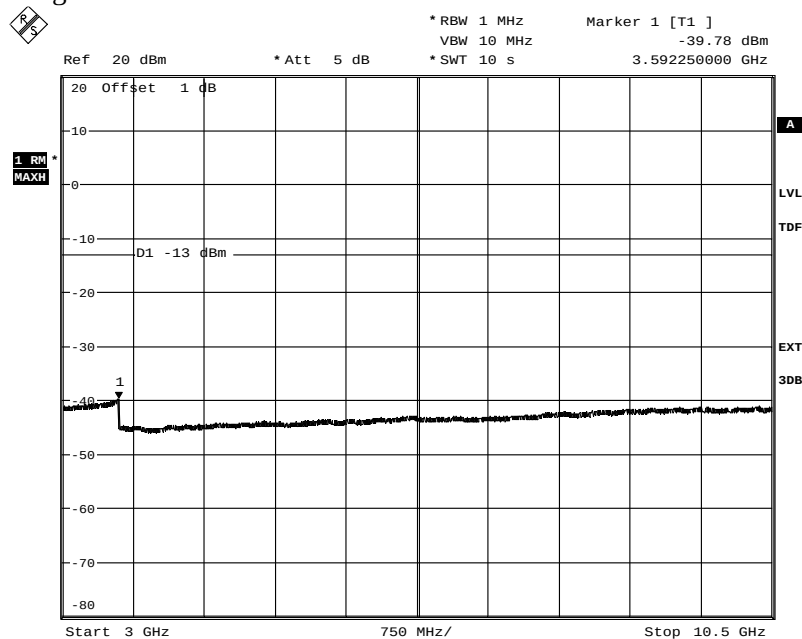
Appendix 5

Diagram 2a



Date: 19.JUN.2012 12:21:49

Diagram 2b

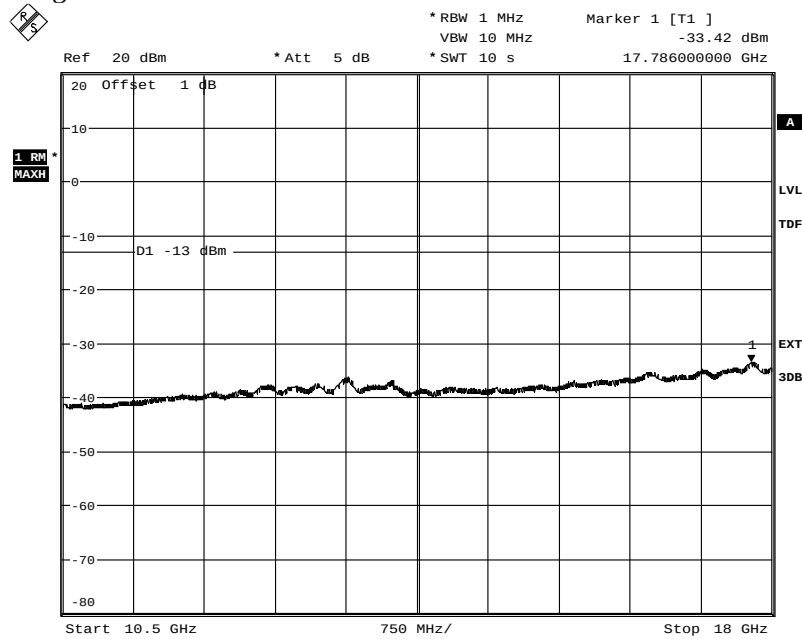


Date: 19.JUN.2012 12:23:04

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

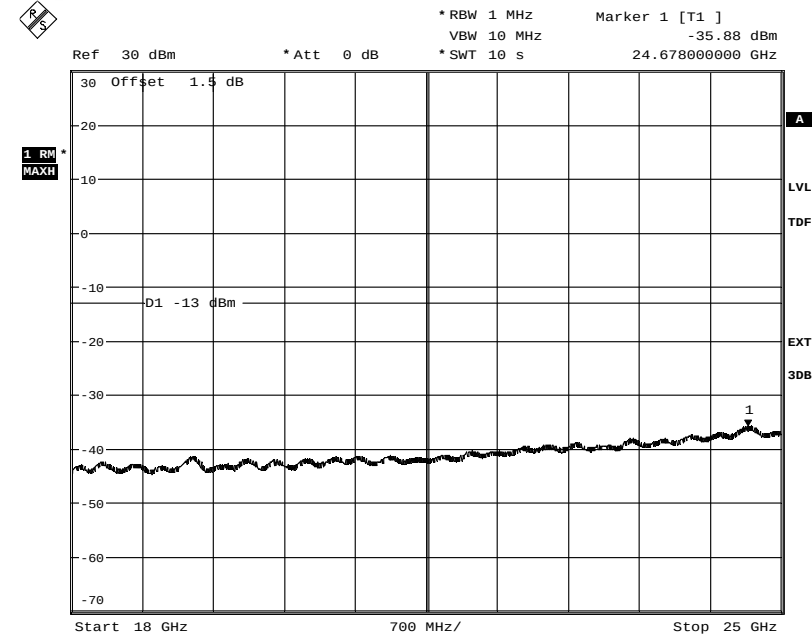
Appendix 5

Diagram 2c



Date: 19.JUN.2012 12:23:48

Diagram 2d

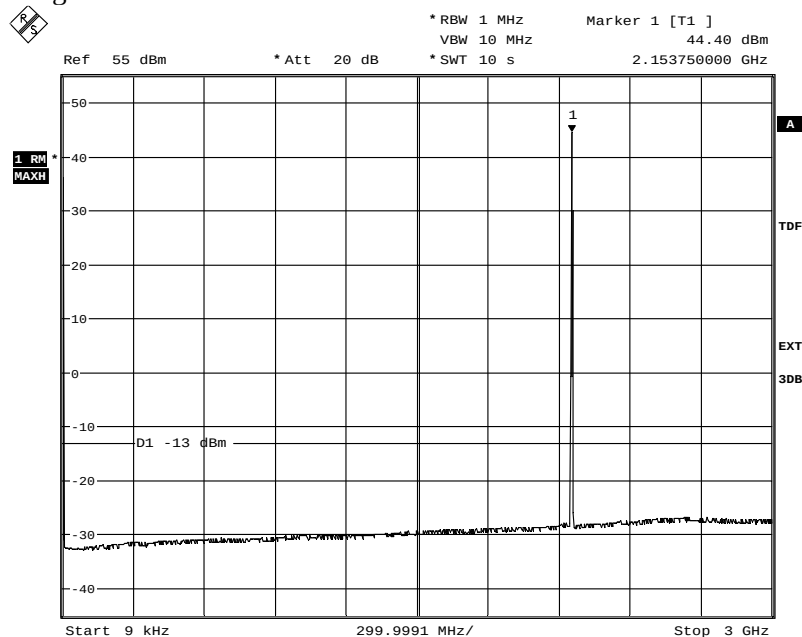


Date: 19.JUN.2012 12:25:29

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

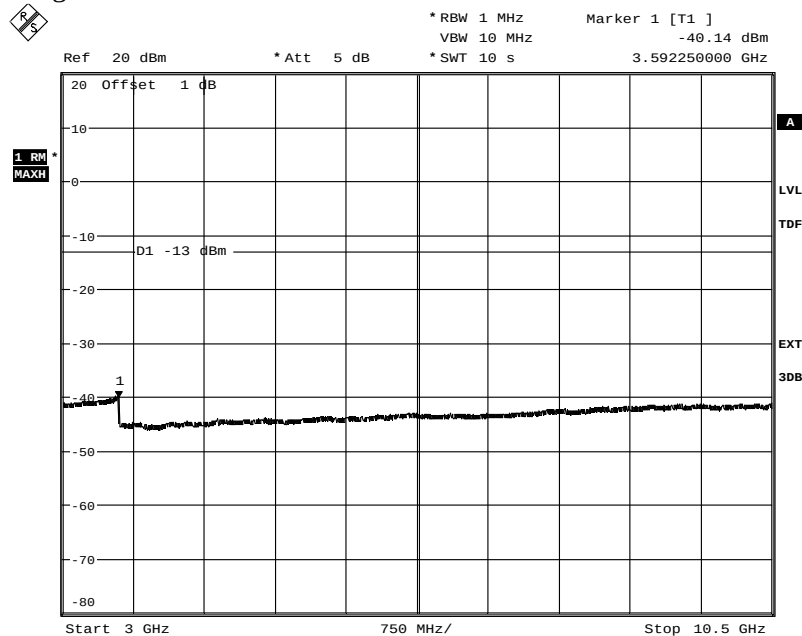
Diagram 3a



Date: 19.JUN.2012 12:55:25

The emissions around the carrier are within the operating frequency band

Diagram 3b

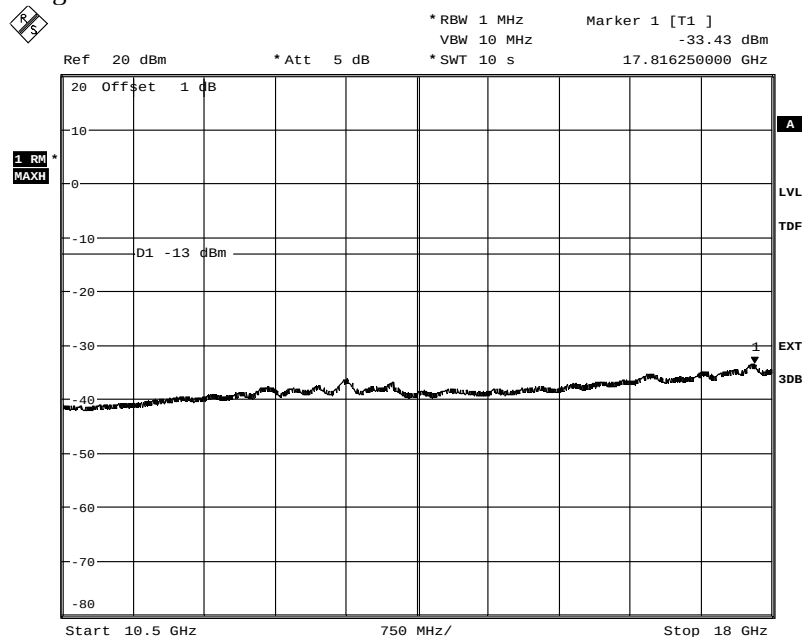


Date: 19.JUN.2012 12:56:47

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

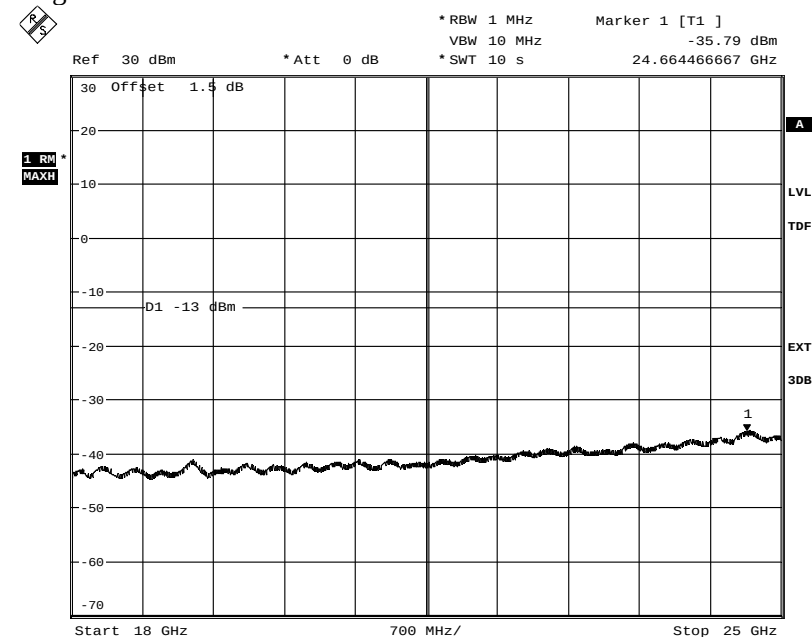
Appendix 5

Diagram 3c



Date: 19.JUN.2012 12:57:41

Diagram 3d

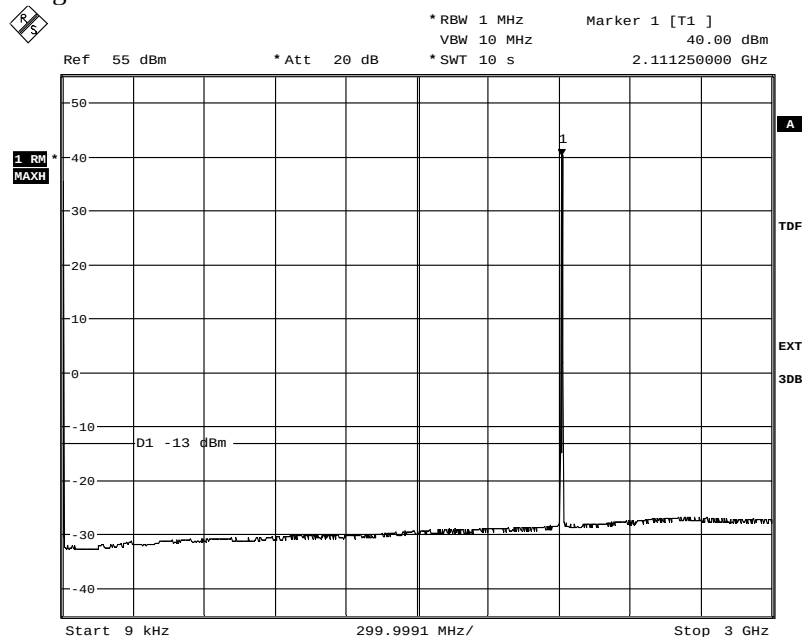


Date: 19.JUN.2012 12:59:44

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

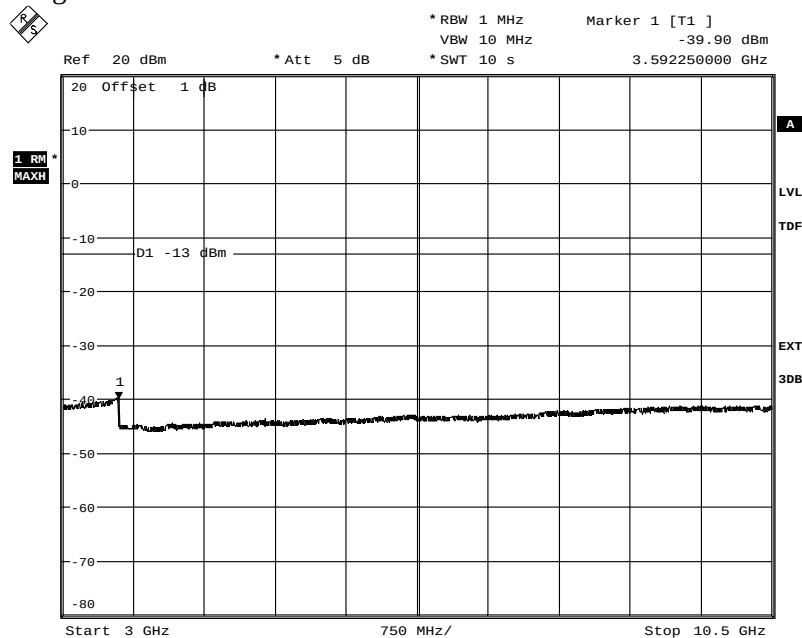
Diagram 4a



Date: 19.JUN.2012 18:27:34

The emissions around the carriers are within the operating frequency band

Diagram 4b

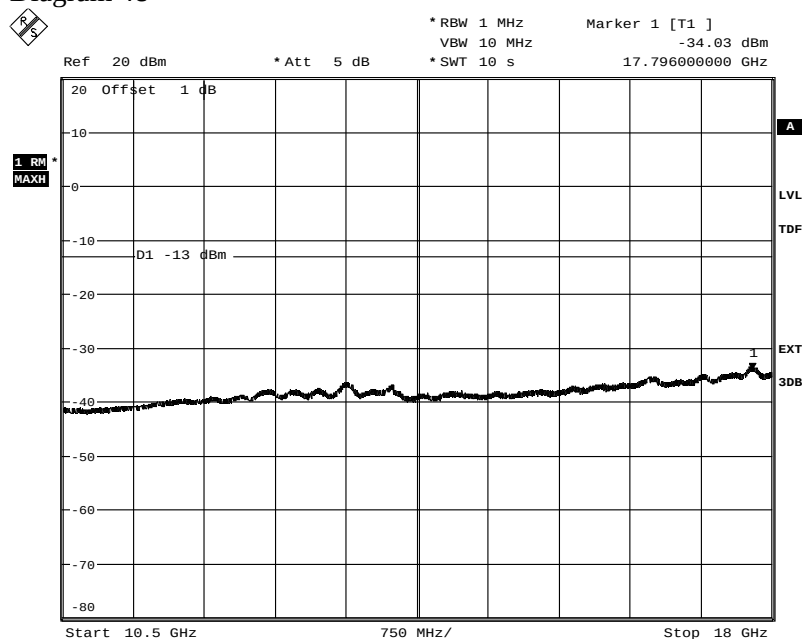


Date: 19.JUN.2012 18:50:56

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

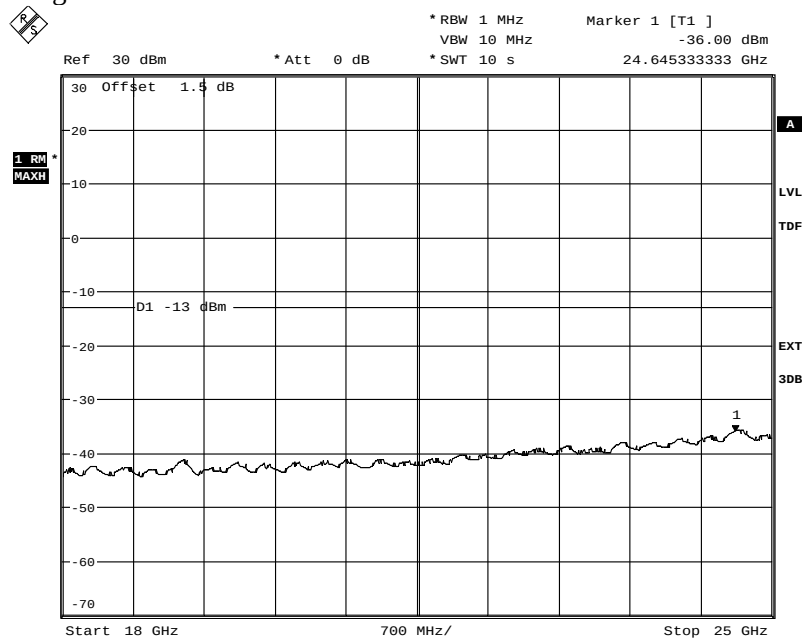
Appendix 5

Diagram 4c



Date: 19.JUN.2012 18:51:52

Diagram 4d

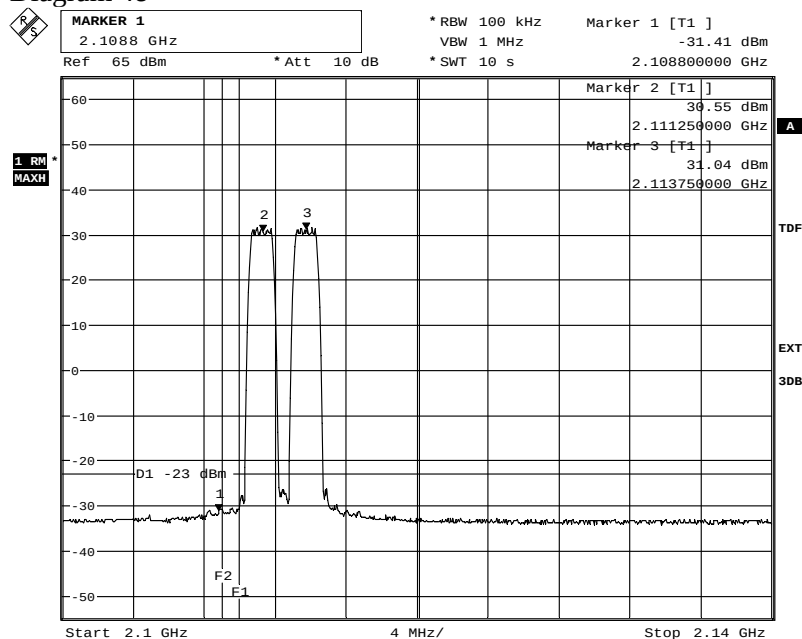


Date: 19.JUN.2012 18:55:12

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

Diagram 4e



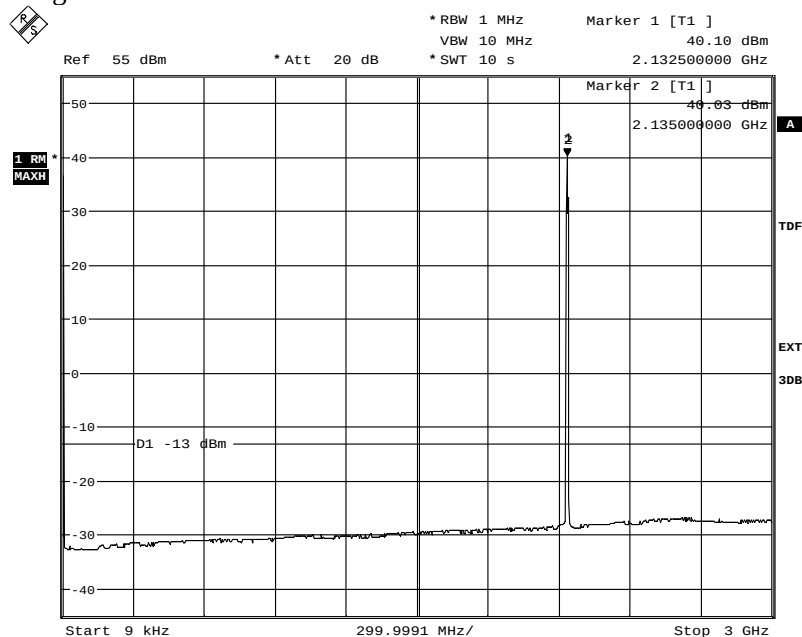
Date: 19.JUN.2012 18:33:22

The emission at 2108.8 MHz was -25.71 dBm measured with the channel power method with 1 MHz channel bandwidth.

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

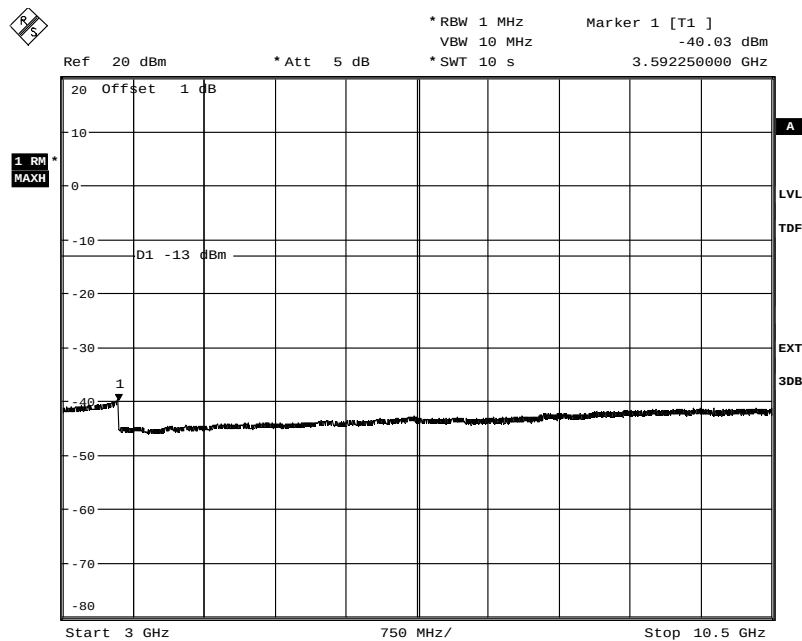
Diagram 5a



Date: 20.JUN.2012 09:11:50

The emissions around the carriers are within the operating frequency band

Diagram 5b

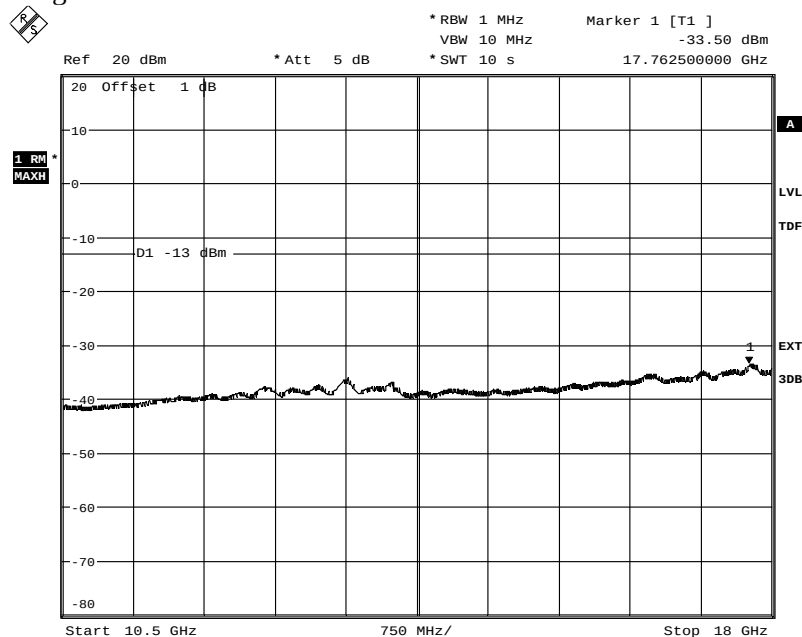


Date: 20.JUN.2012 09:15:05

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

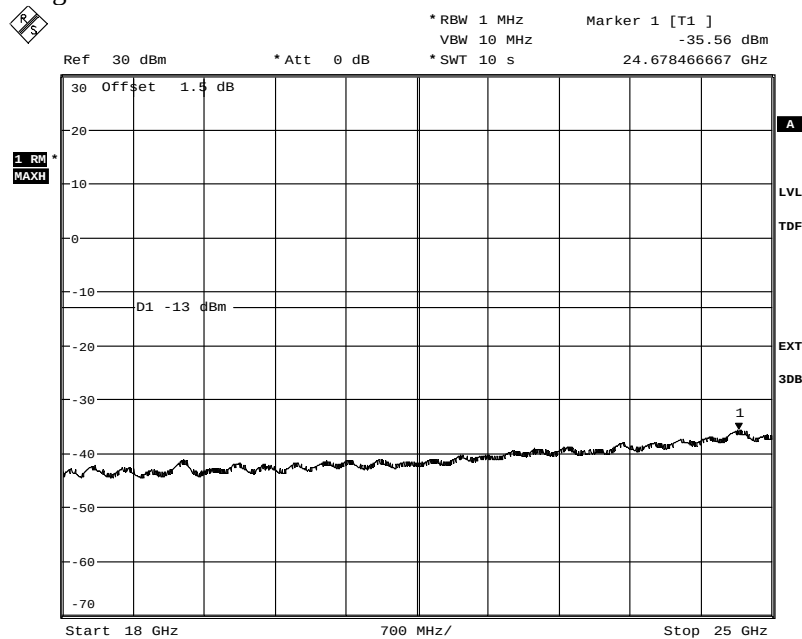
Appendix 5

Diagram 5c



Date: 20.JUN.2012 09:24:08

Diagram 5d

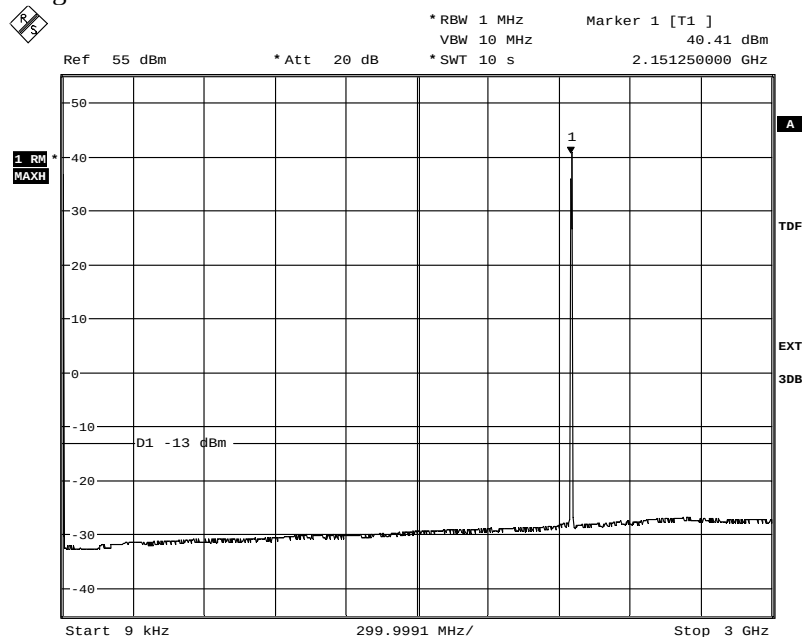


Date: 20.JUN.2012 09:26:25

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

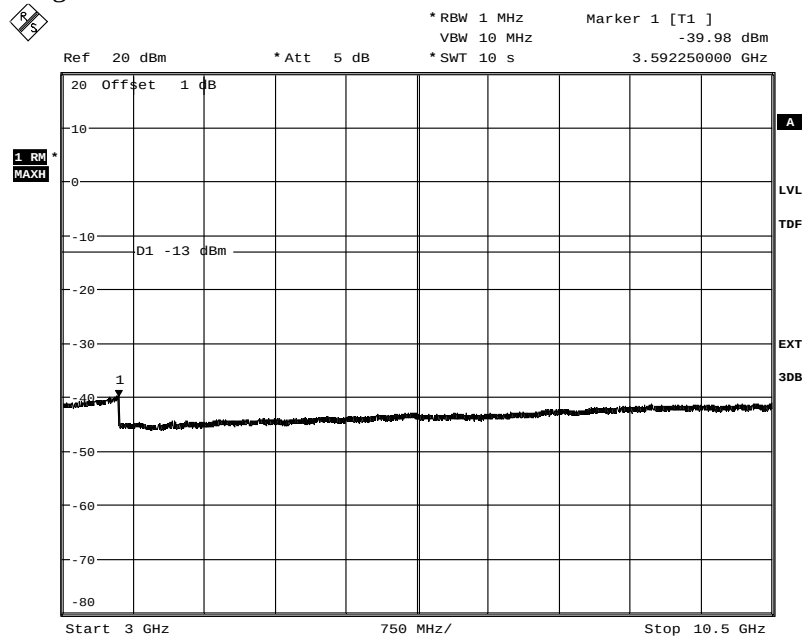
Diagram 6a



Date: 19.JUN.2012 19:18:08

The emissions around the carriers are within the operating frequency band

Diagram 6b

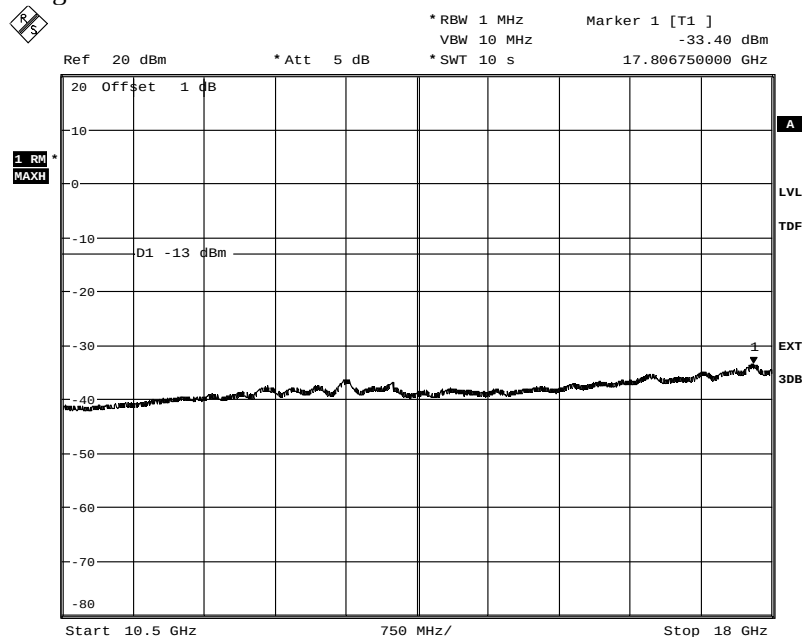


Date: 19.JUN.2012 19:16:39

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

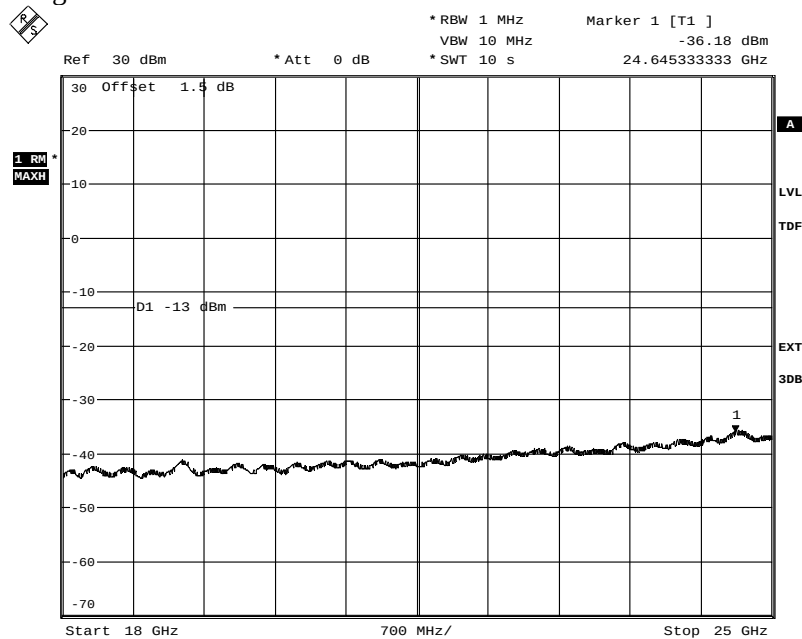
Appendix 5

Diagram 6c



Date: 20.JUN.2012 11:29:30

Diagram 6d

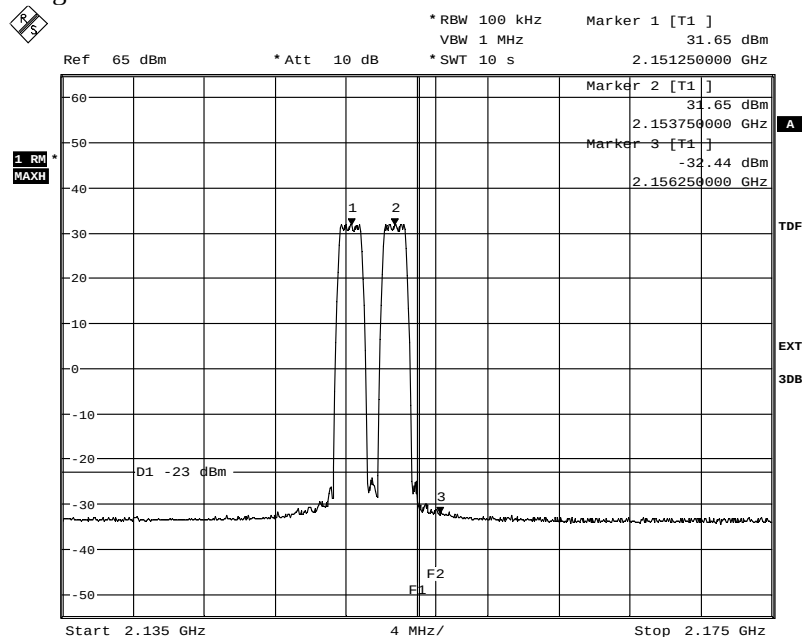


Date: 19.JUN.2012 19:09:16

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

Diagram 6e



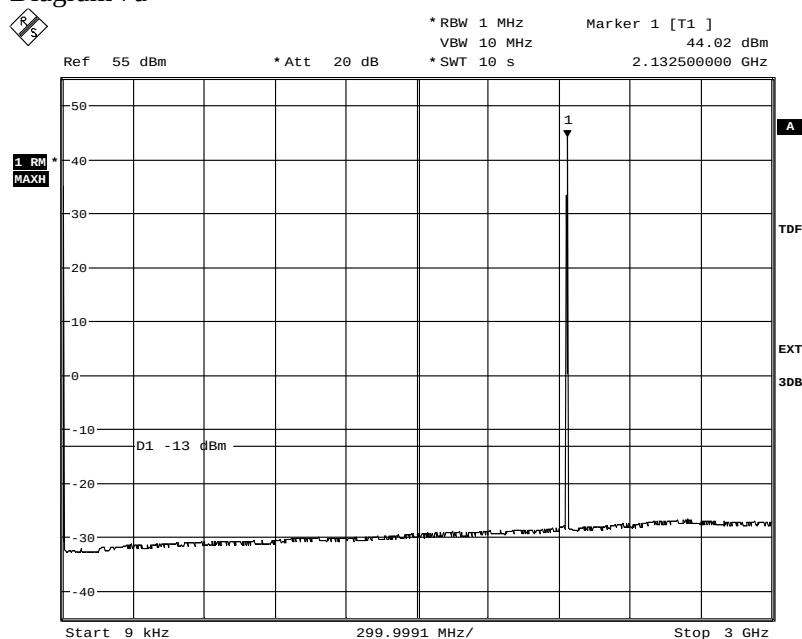
Date: 19.JUN.2012 19:22:33

The emission at 2156.25 MHz was -26.28 dBm measured with the channel power method with 1 MHz channel bandwidth.

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

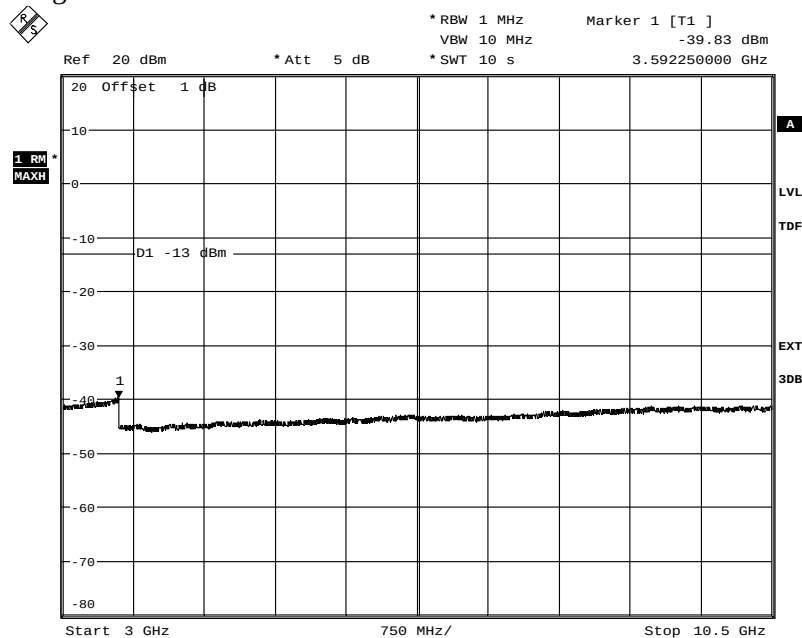
Appendix 5

Diagram 7a



Date: 19.JUN.2012 14:15:55

Diagram 7b

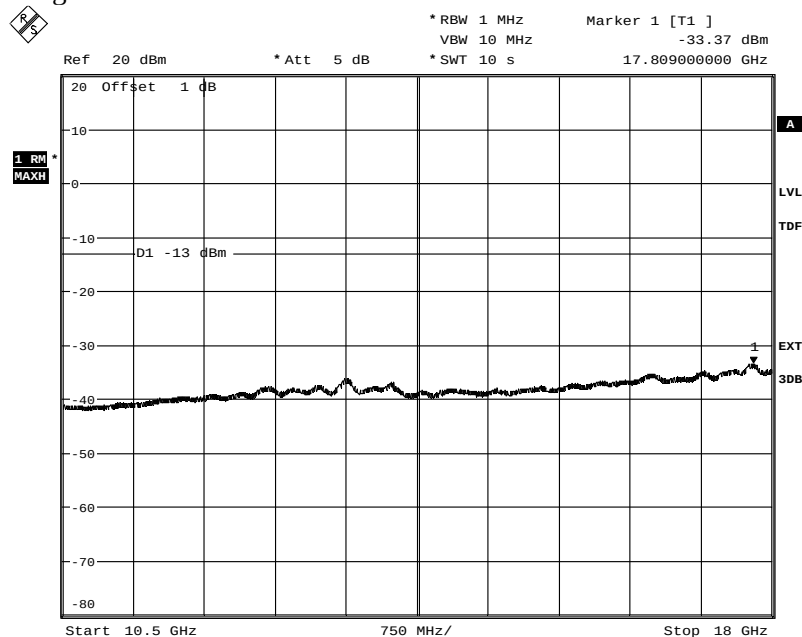


Date: 19.JUN.2012 14:19:22

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

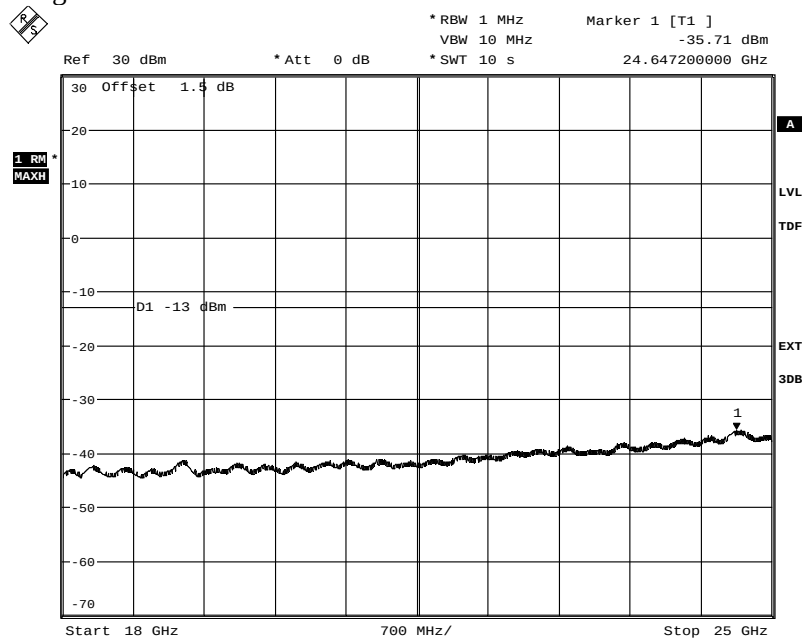
Appendix 5

Diagram 7c



Date: 19.JUN.2012 14:20:13

Diagram 7d

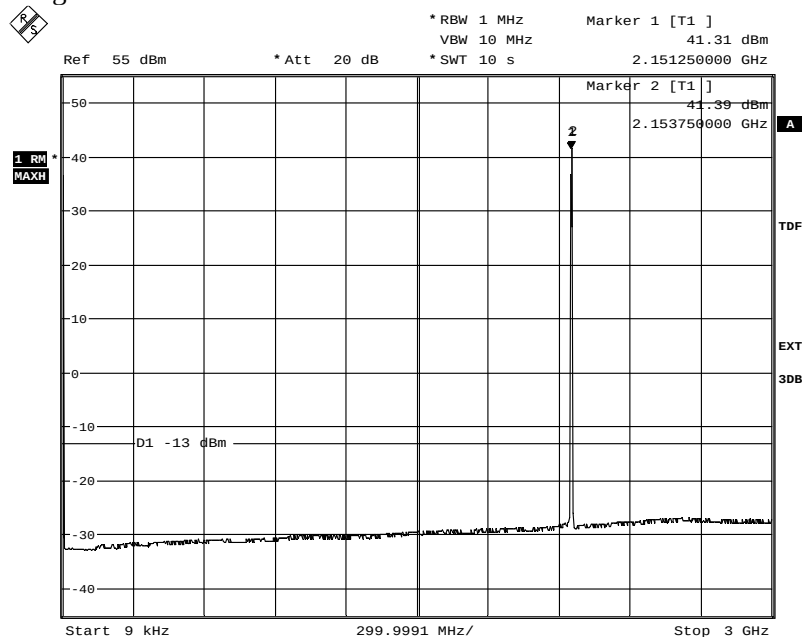


Date: 19.JUN.2012 14:22:06

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

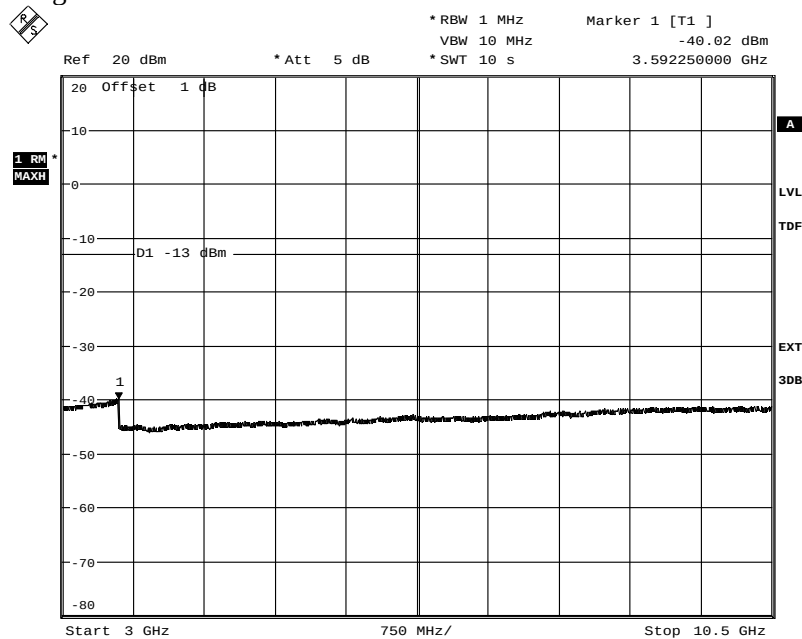
Appendix 5

Diagram 8a



Date: 20.JUN.2012 12:47:23

Diagram 8b

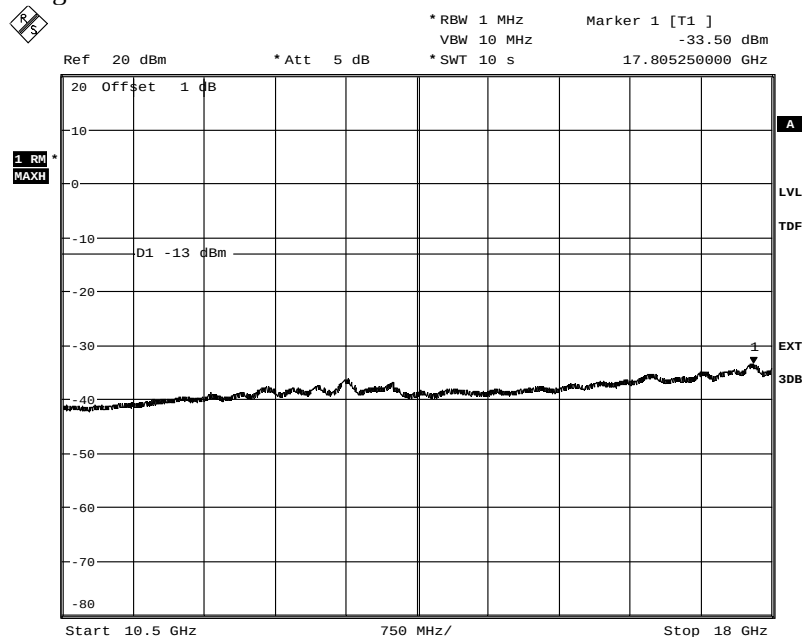


Date: 20.JUN.2012 12:49:41

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

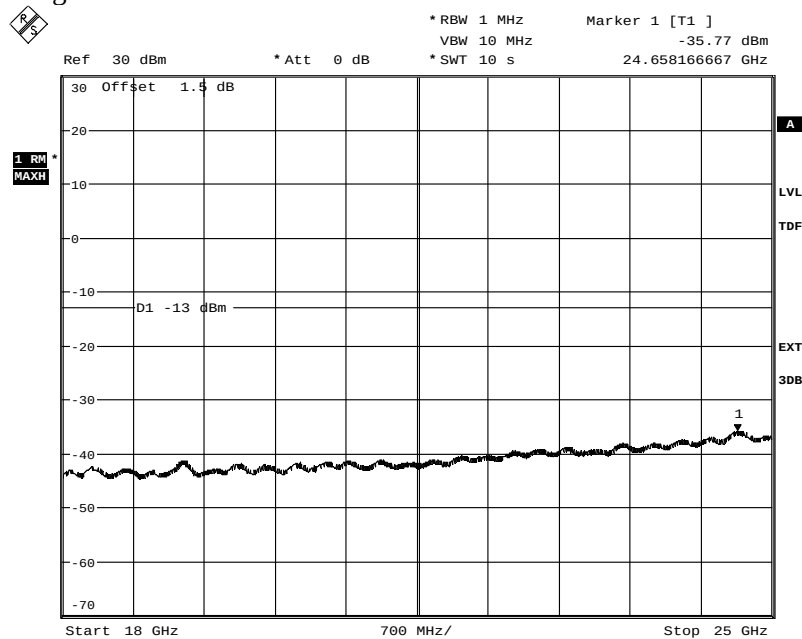
Appendix 5

Diagram 8c



Date: 20.JUN.2012 12:50:30

Diagram 8d

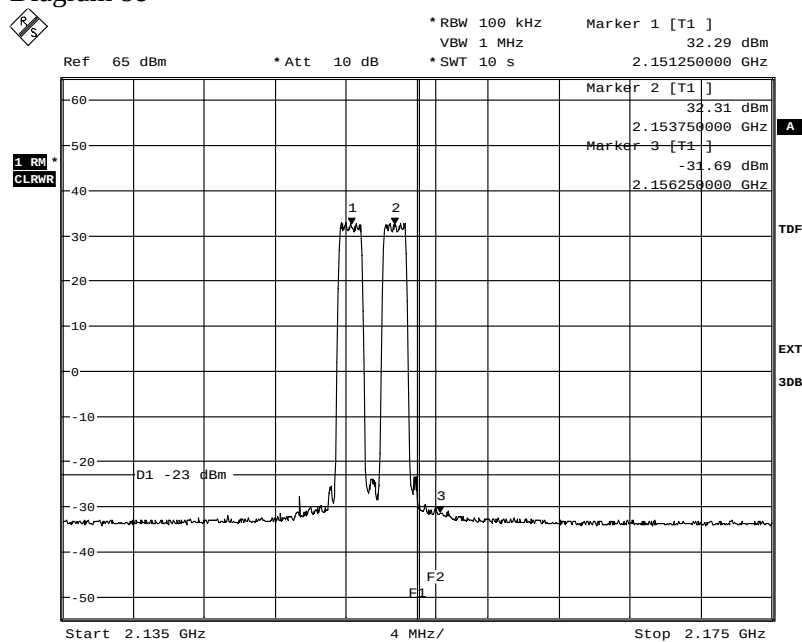


Date: 20.JUN.2012 12:52:37

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

Diagram 8e



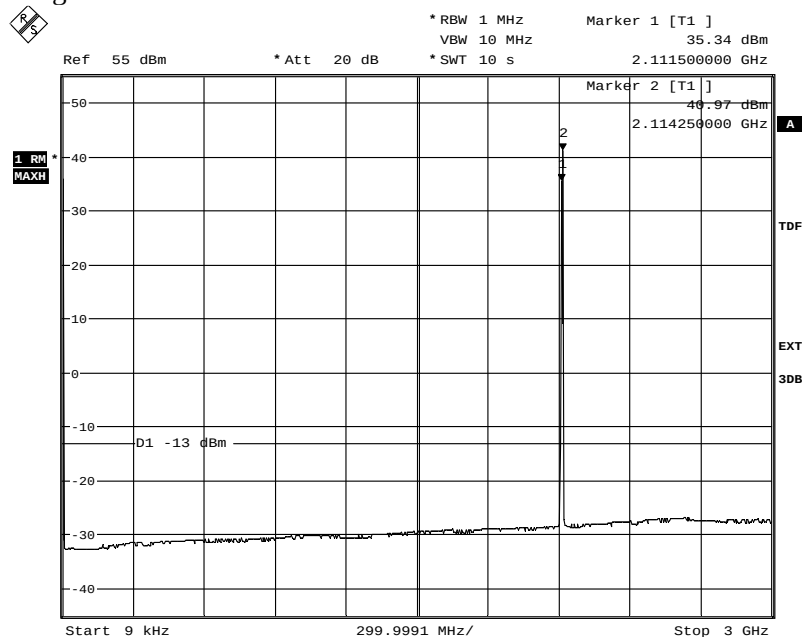
Date: 20.JUN.2012 12:42:49

The emission at 2156.25 MHz was -24.26 dBm measured with the channel power method with 1 MHz channel bandwidth.

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

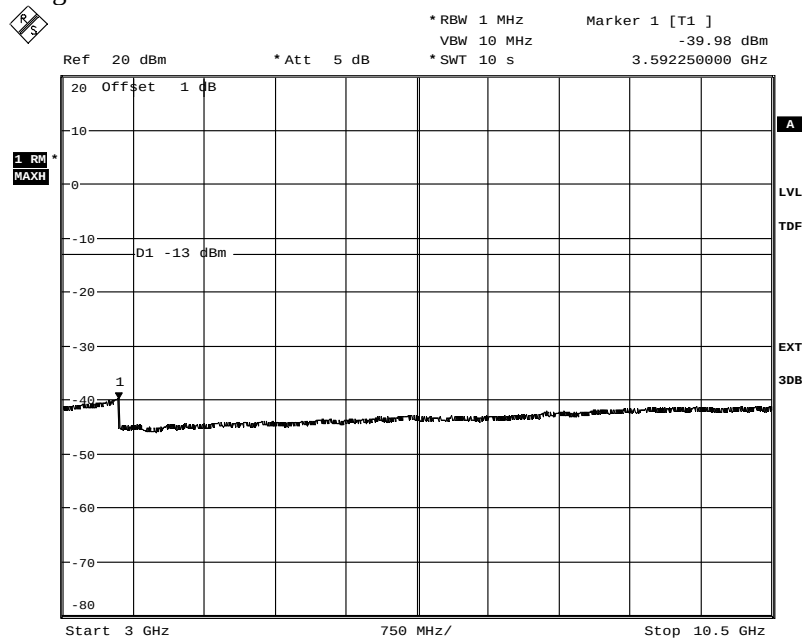
Appendix 5

Diagram 9a



Date: 25.JUN.2012 11:18:00

Diagram 9b

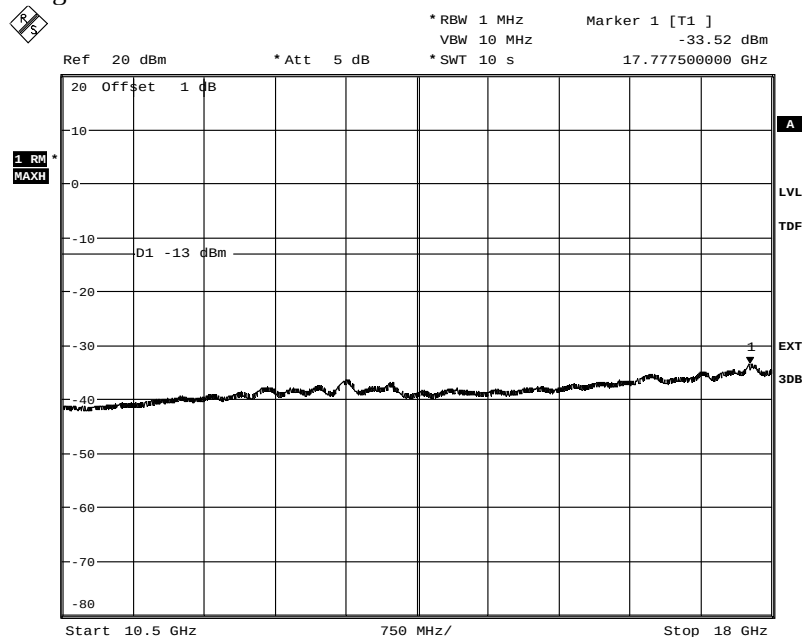


Date: 25.JUN.2012 11:20:06

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

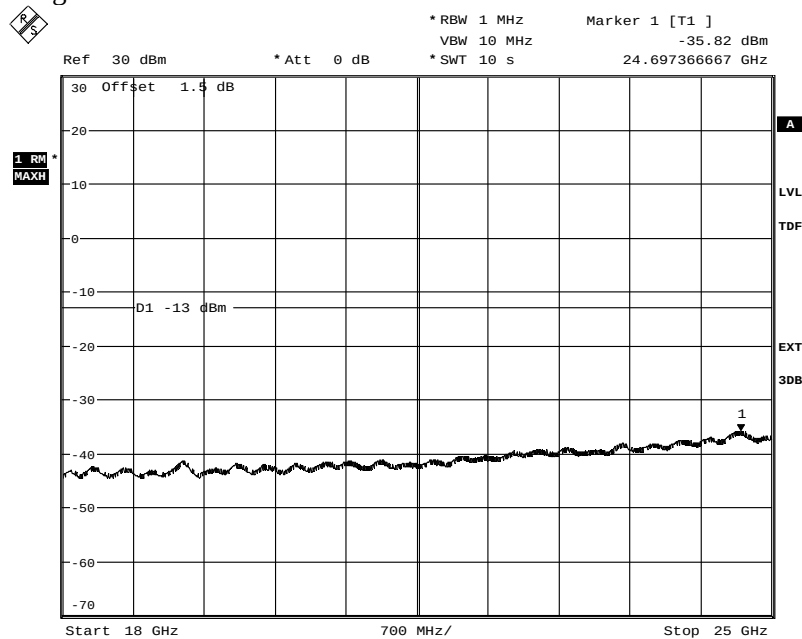
Appendix 5

Diagram 9c



Date: 25.JUN.2012 11:21:05

Diagram 9d

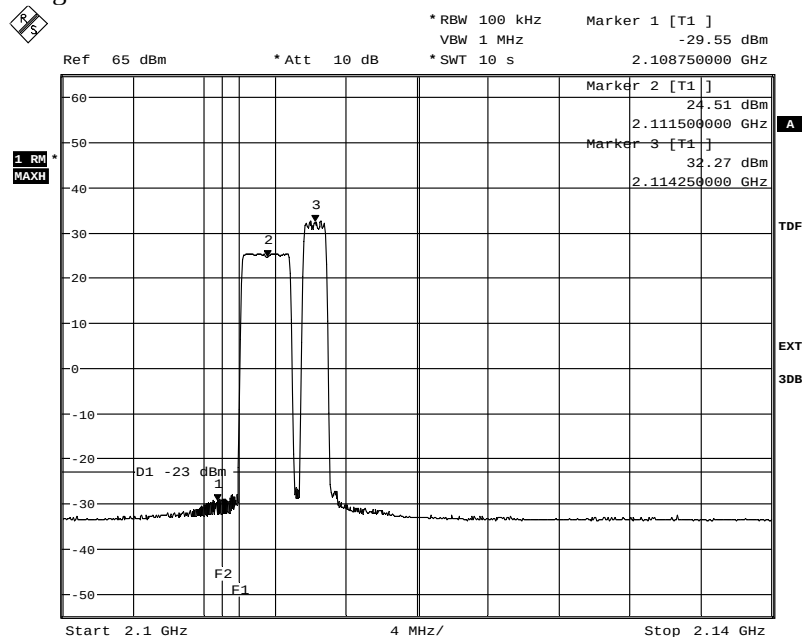


Date: 25.JUN.2012 11:23:29

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

Appendix 5

Diagram 9e



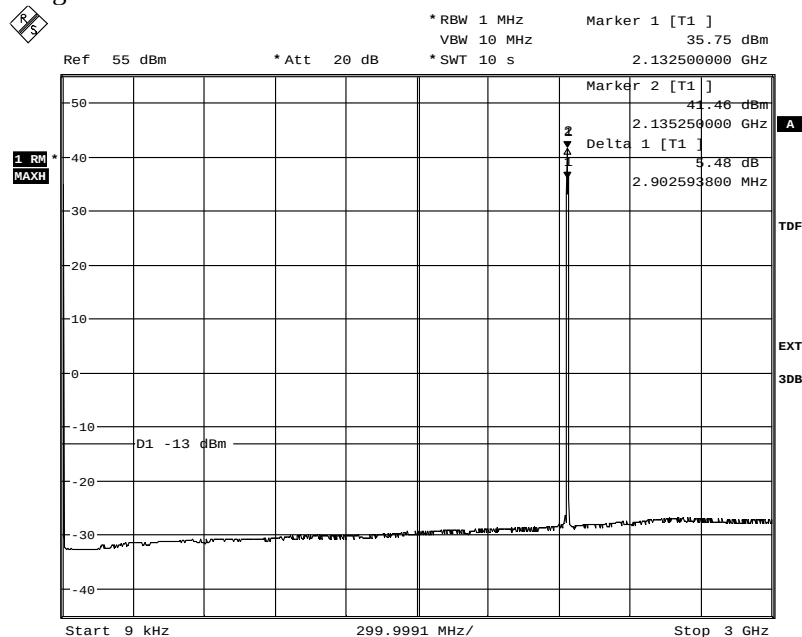
Date: 25.JUN.2012 11:14:45

The emission at 2108.75 MHz was -24.99 dBm measured with the channel power method with 1 MHz channel bandwidth.

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

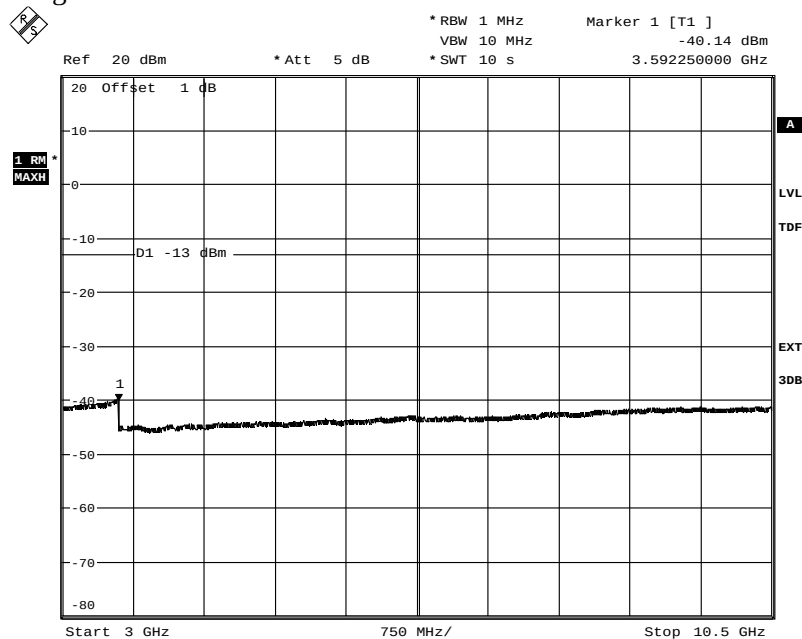
Appendix 5

Diagram 10a



Date: 25.JUN.2012 12:37:16

Diagram 10b

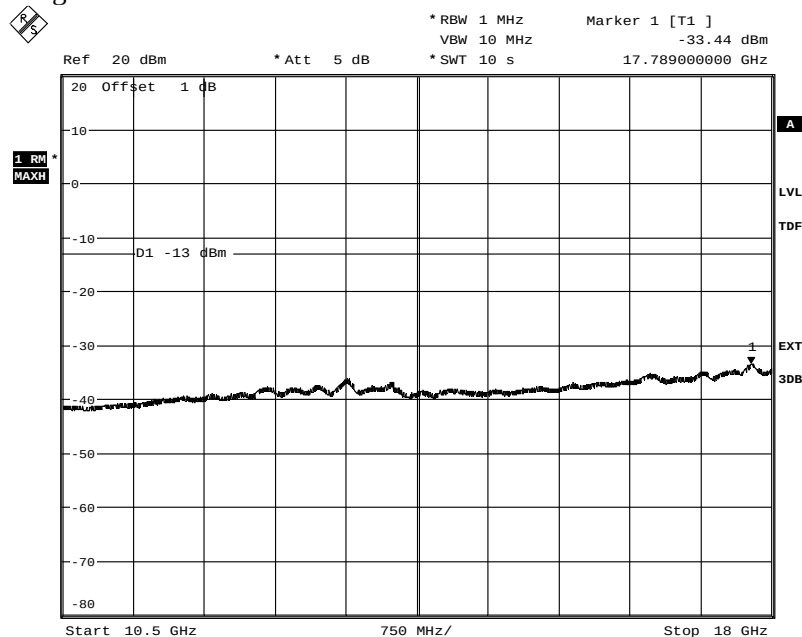


Date: 25.JUN.2012 12:38:50

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

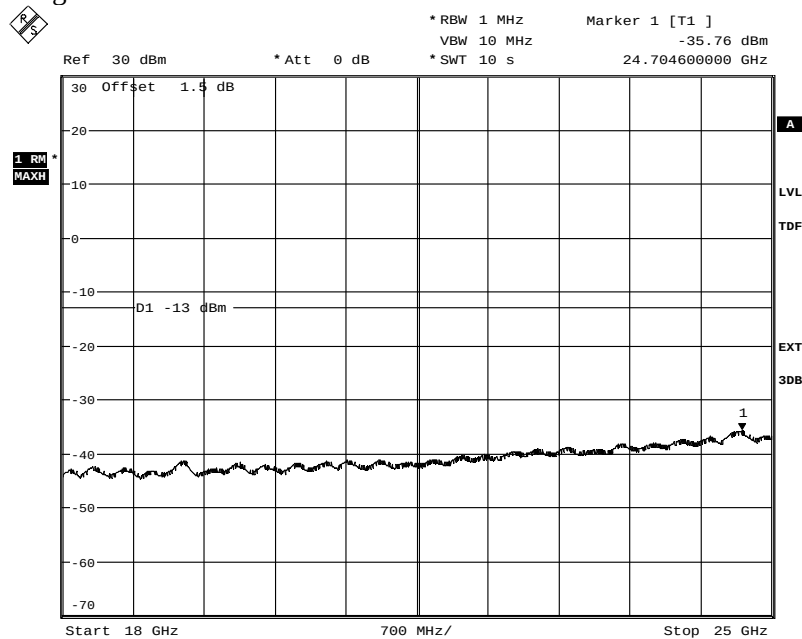
Appendix 5

Diagram 10c



Date: 25.JUN.2012 12:39:42

Diagram 10d

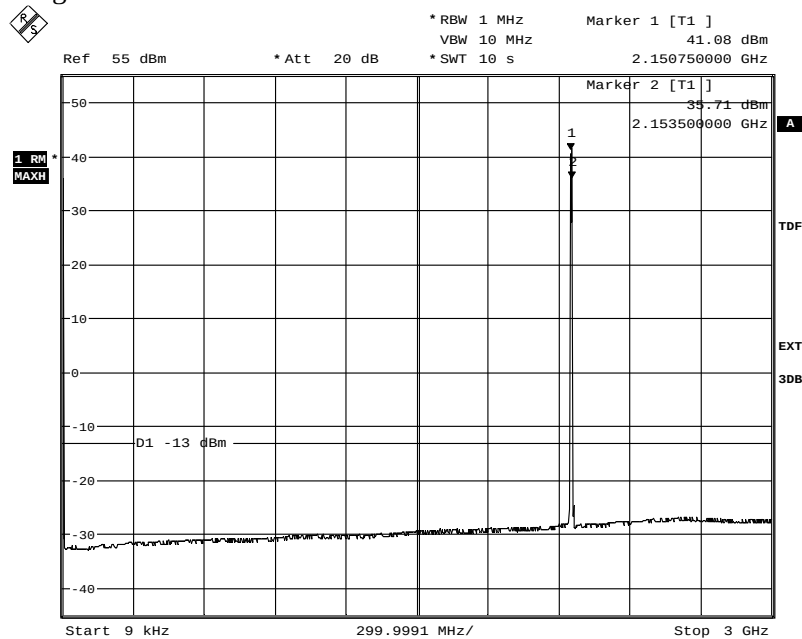


Date: 25.JUN.2012 12:41:44

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

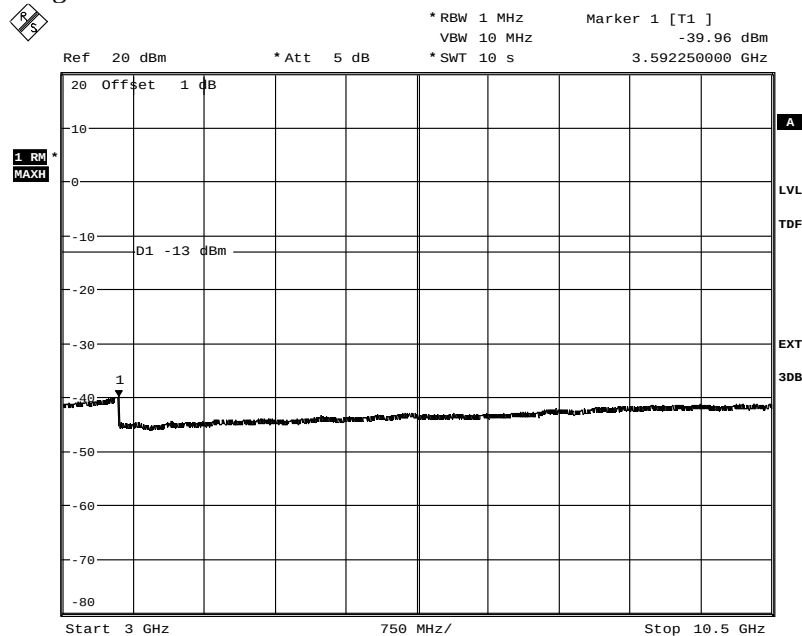
Appendix 5

Diagram 11a



Date: 25.JUN.2012 13:14:28

Diagram 11b

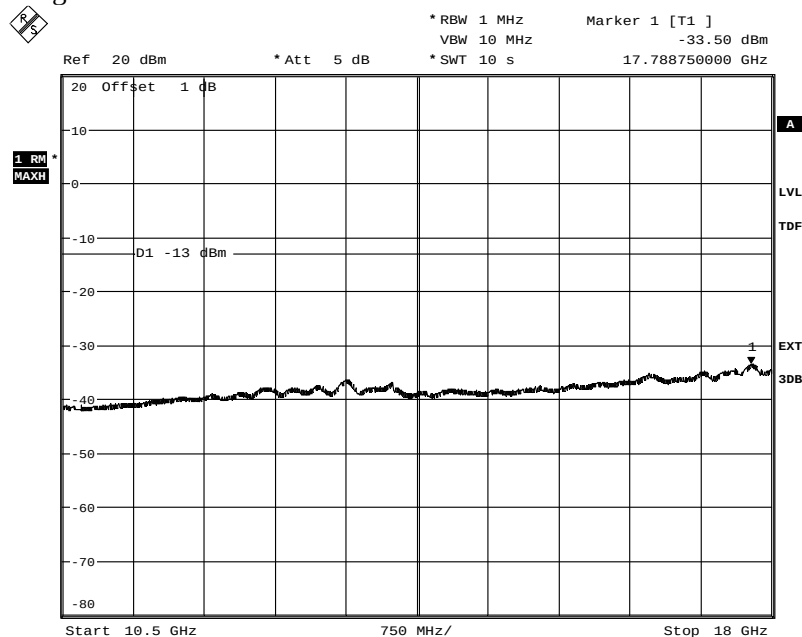


Date: 25.JUN.2012 13:16:12

FCC ID:TA8AKRC161254-2
IC:287AB-AS1612542

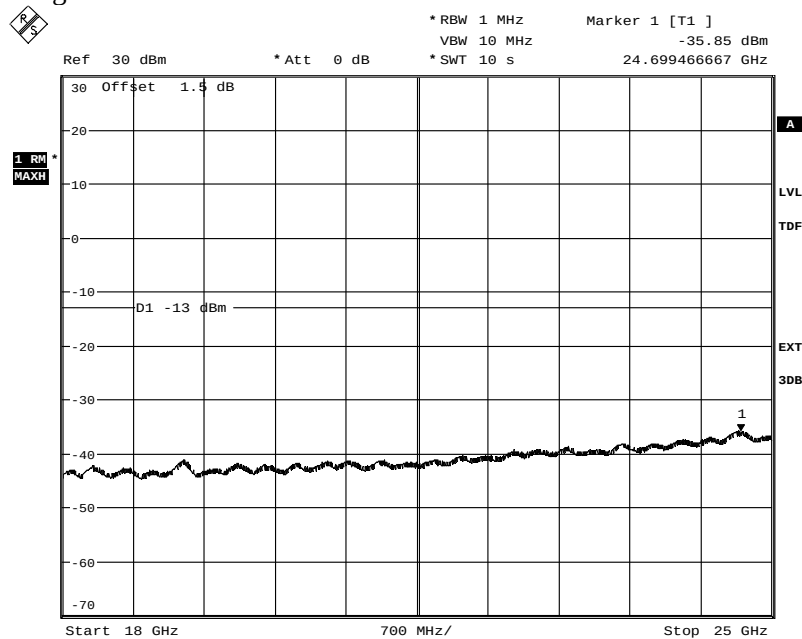
Appendix 5

Diagram 11c



Date: 25.JUN.2012 13:17:07

Diagram 11d

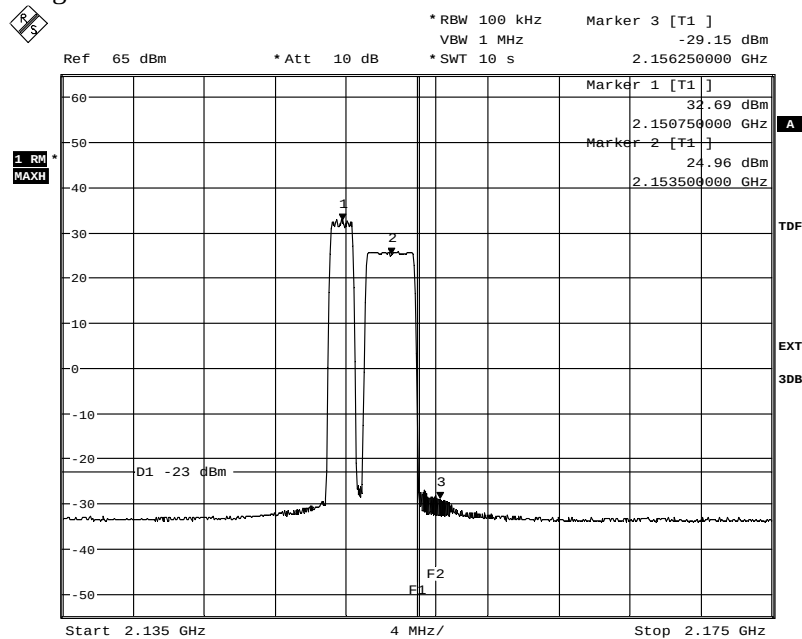


Date: 25.JUN.2012 13:19:09

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Appendix 5

Diagram 11e



Date: 25.JUN.2012 13:02:12

The emission at 2156.25 MHz was -24.42 dBm measured with the channel power method with 1 MHz channel bandwidth.

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

Date	Temperature	Humidity
2012-06-04	22°C ± 3°C	35 % ± 5 %
2012-06-05	23°C ± 3°C	38 % ± 5 %
2012-06-07	22°C ± 3°C	43 % ± 5 %
2012-06-11	23°C ± 3°C	47 % ± 5 %
2012-06-12	22°C ± 3°C	48 % ± 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.

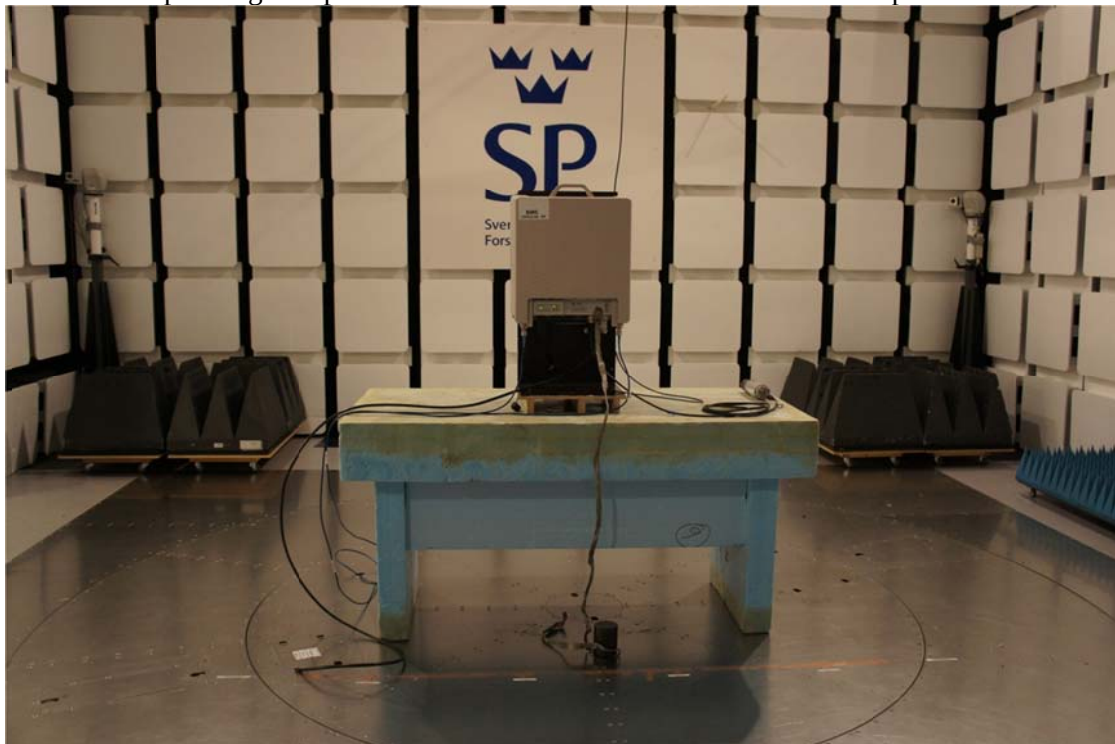
In the frequency range 30 MHz - 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

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

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 ESU 26	901 553
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

Tested configurations

CDMA

Configuration 1
Configuration 2
Configuration 3
Configuration 4
Configuration 9

CDMA + LTE

Configuration 10
Configuration 11
Configuration 12
Configuration 13

Results, representing worst case

CDMA

Configuration 9

Diagram 1:a-d

CDMA + LTE

Configuration 10

Diagram 2:a-d

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:

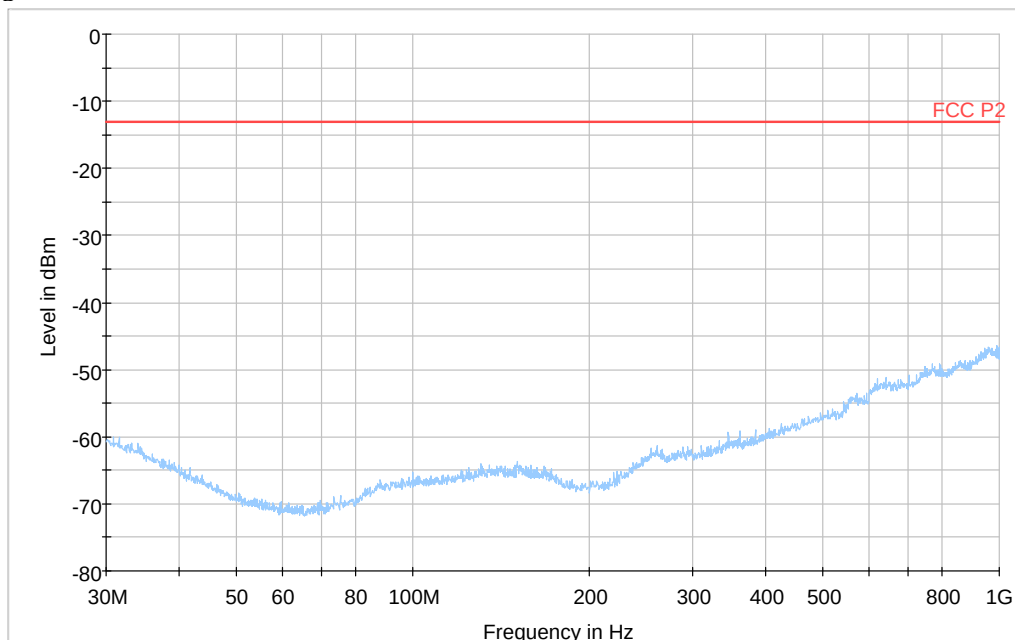
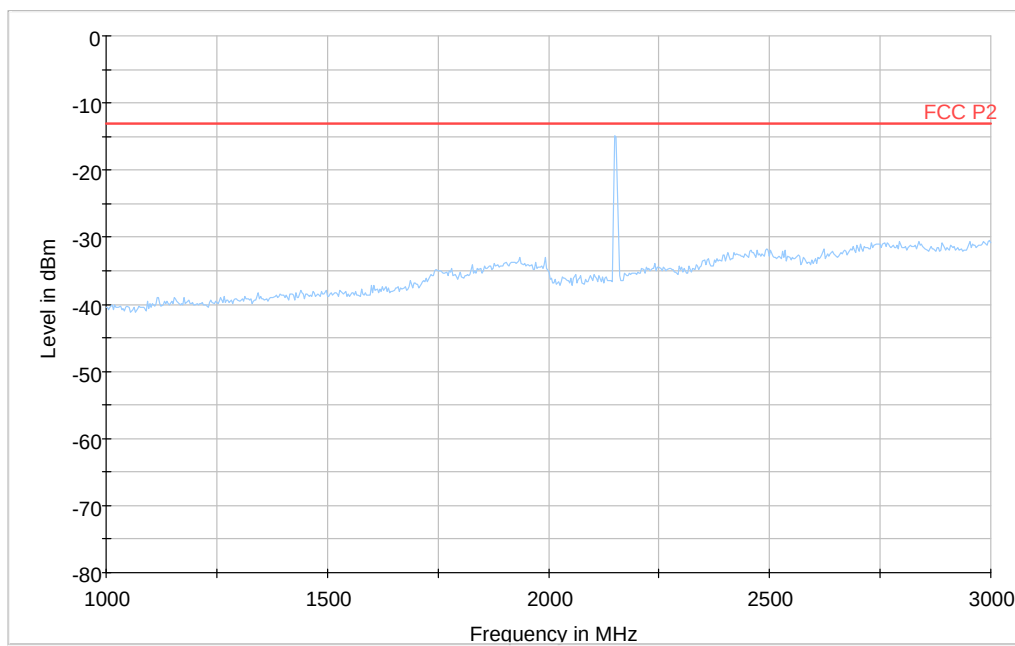


Diagram 1b:



Note: The emission between 2150 MHz and 2154 MHz is the carrier frequencies and shall be ignored in the context.

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Appendix 6

Diagram 1c:

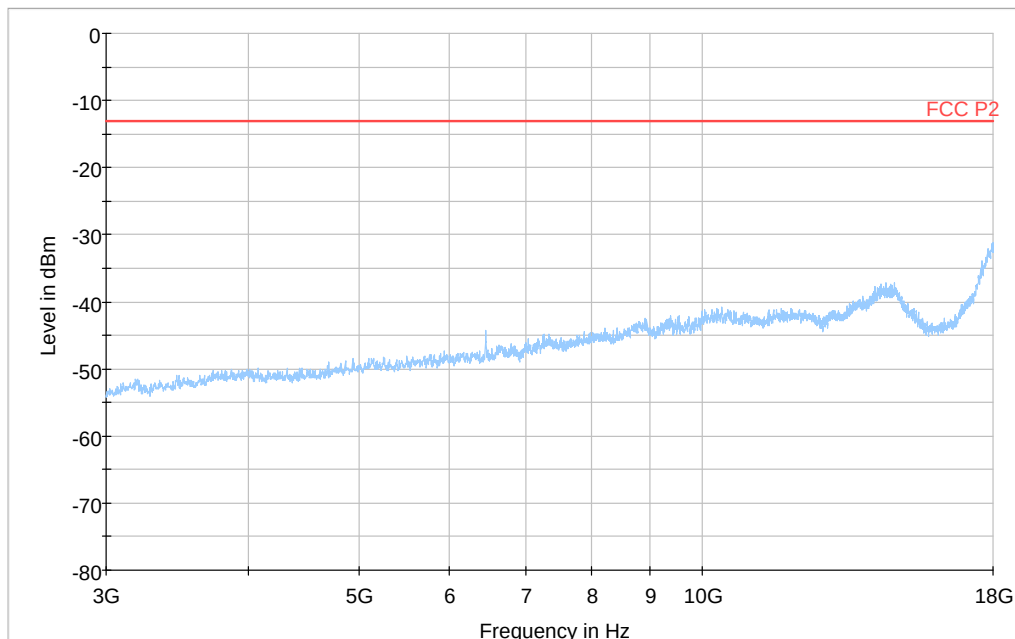
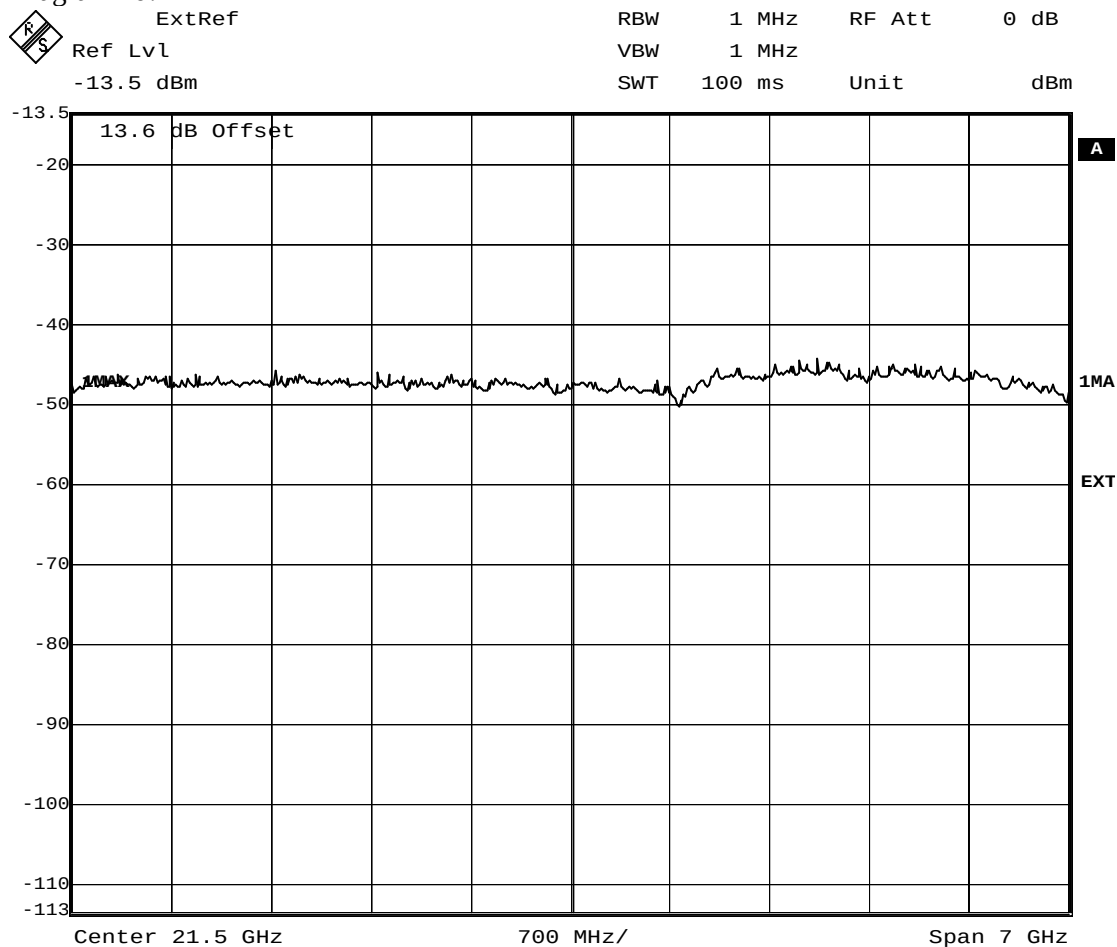


Diagram 1d:



Date: 5.JUN.2012 18:52:06

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IC:287AB-AS1612542

Appendix 6

Diagram 2a:

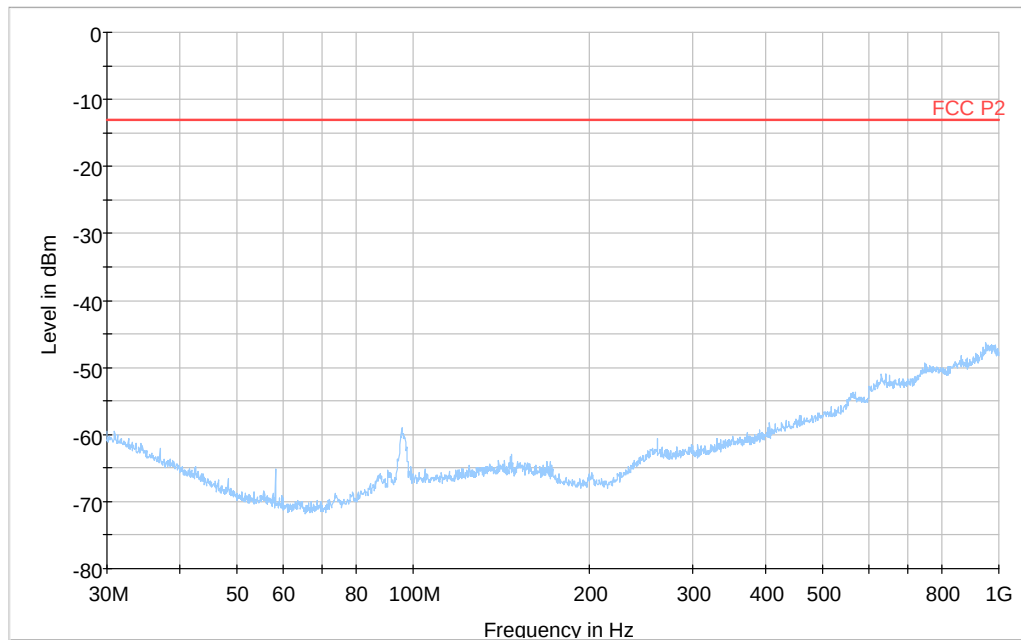
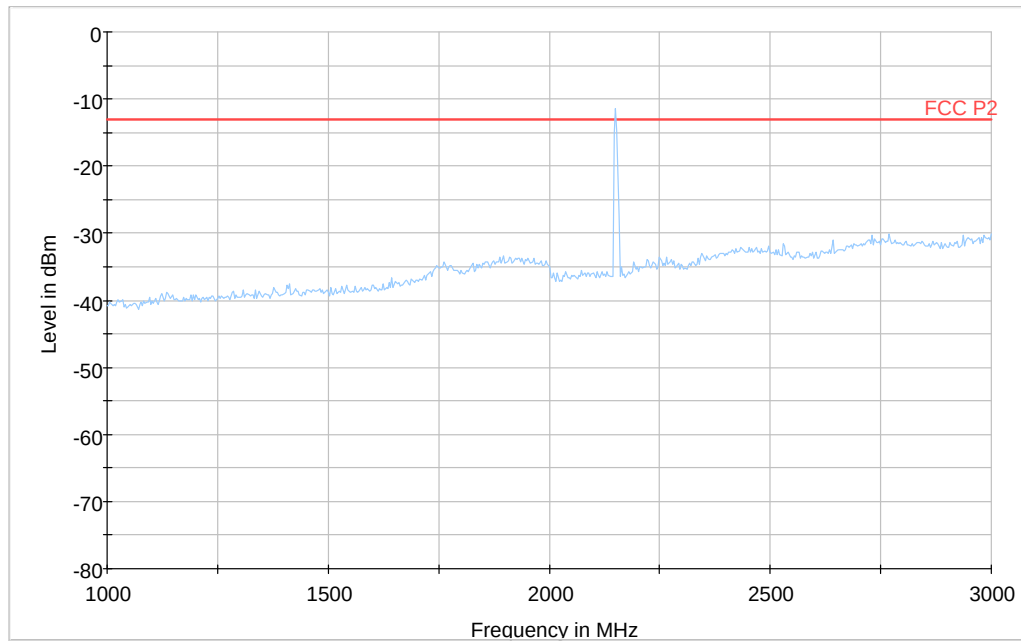


Diagram 2b:



Note: The emission between 2136 MHz and 2154 MHz is the carrier frequencies and shall be ignored in the context.

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Appendix 6

Diagram 2c:

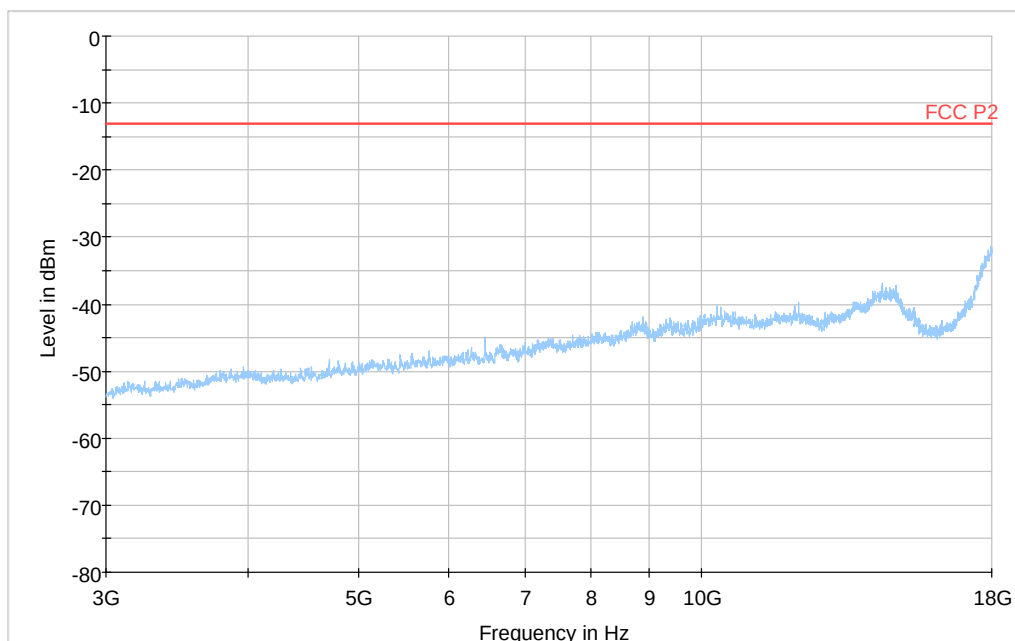
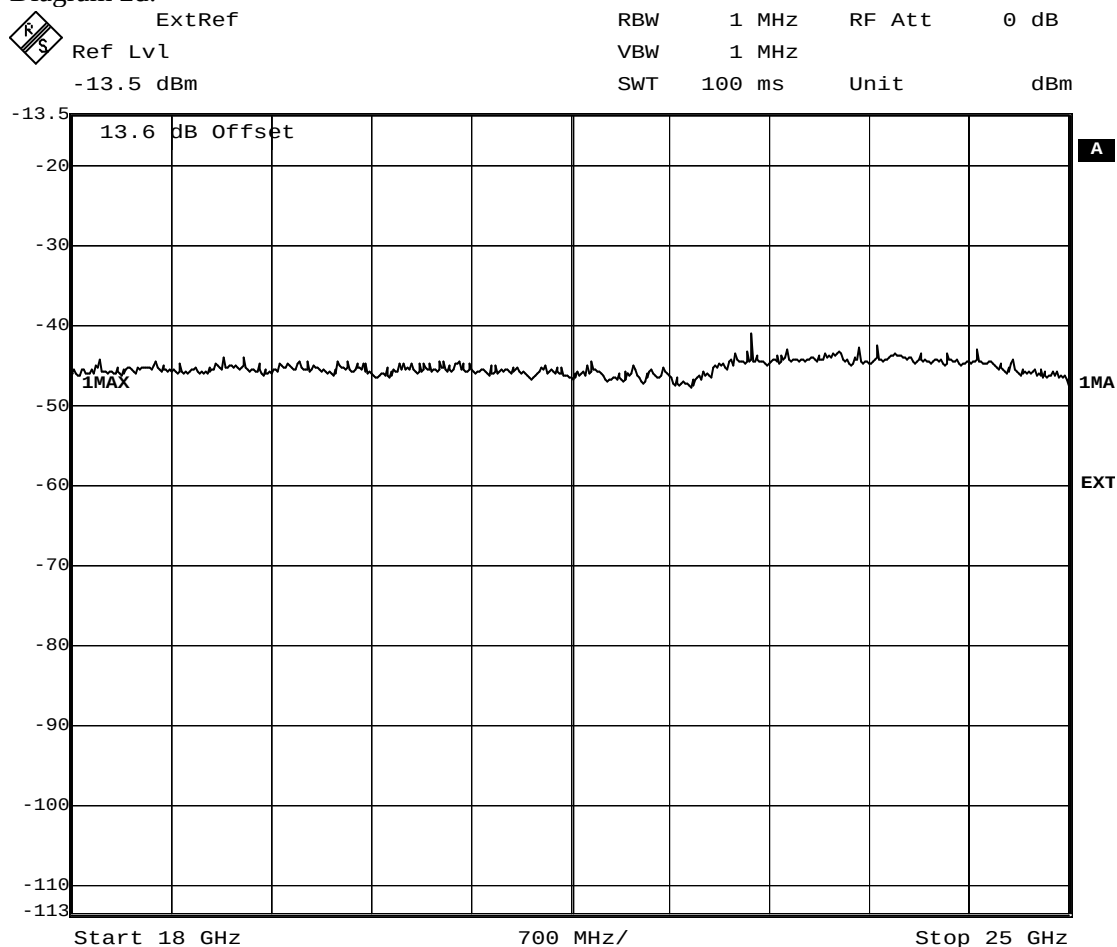


Diagram 2d:



Date: 7. JUN. 2012 20:48:37

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IC:287AB-AS1612542

Appendix 7

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

Date 2012-06-18 to 2012-06-20	Temperature (test equipment) 21-22 °C ± 3 °C	Humidity (test equipment) 37-49 % ± 5 %
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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 FSW, R&S 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 configuration 2

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	-41
-55.2	+20	-41
-40.8	+20	-41
-48.0	+30	-40
-48.0	+40	-42
-48.0	+50	-41
-48.0	+10	-41
-48.0	0	-42
-48.0	-10	-42
-48.0	-20	-41
-48.0	-30	-42
Maximum freq. error (Hz)		42
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (109.9 Hz).

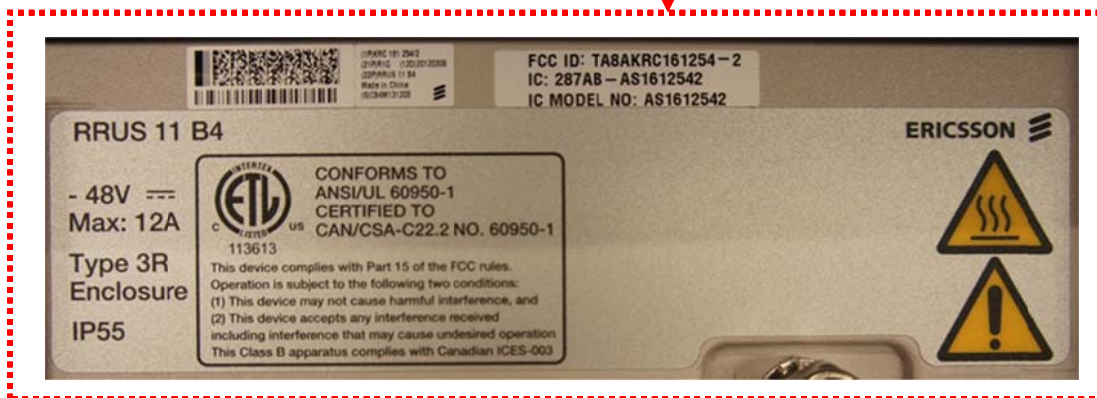
Complies?	Yes
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Appendix 8

External photos

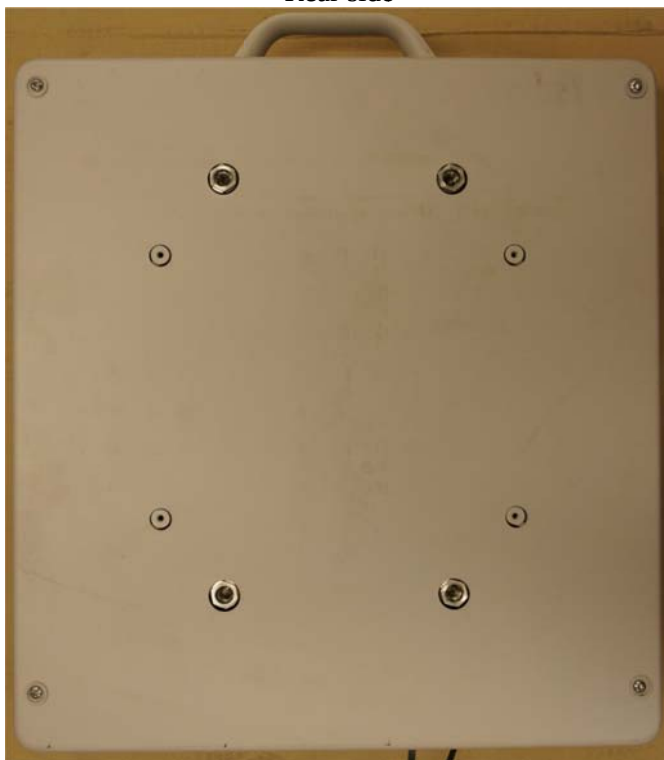
Front side



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IC:287AB-AS1612542

Appendix 8

Rear side



Left side



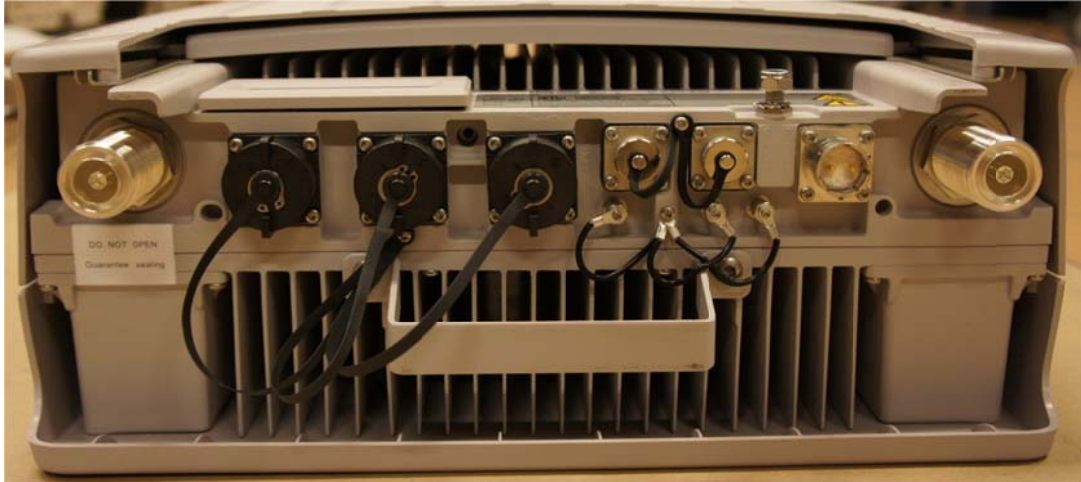
Right side



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IC:287AB-AS1612542

Appendix 8

Bottom side



Top side

