

Ericsson AB
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Radio measurements on RUS 01 B14 700 MHz radio equipment with FCC ID:TA8AKRC11895-1

(9 appendices)

Test object

RUS 01 B14, KRC 118 95/1 Rev R1C

Summary

Standard	Compliant	Appendix
FCC CFR 47		
2.1046 / RF power output	Yes	2
2.1049 / Occupied bandwidth	Yes	3
2.1051 / Band edge	Yes	4
2.1051 / Spurious emission at antenna terminals	Yes	5
2.1053 / Field strength of spurious radiation	Yes	6
2.1055 / Frequency stability	Yes	7
15.111 / Receiver spurious emissions	Yes	8

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Electronics - EMC

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Appendix 1

Description of test object

Equipment:	Radio equipment RUS 01 B14 running in LTE mode	
Frequency bands:	TX: 758 – 768 MHz RX: 788 – 798 MHz The highest and lowest EARFCNs and the corresponding frequencies for each supported channel BW configuration are listed below and are pursuant to 3GPP TS 36.141 section 5.7 Channel arrangement	
Supported channel bandwidth configurations	5 MHz and 10 MHz	
Modulation and access scheme	OFDMA in FDD	
OFDM subcarrier modulation	System information and pilots use BPSK and QPSK. For payload data QPSK, 16QAM and 64QAM can be used.	
Maximum rated output power:	Single carrier 1x 47.8 dBm (1x60 W)	
Number of antenna ports:	TX/RX: 1	RX only: 1
Nominal supply voltage:	-48 VDC	

Tested frequencies and EARFCNs for TX measurements

EARFCN	Frequency [MHz]	Comment
Downlink		
5305	760.5	TX bottom (B) frequency in 5 MHz BW configuration
5330	763.0	TX band mid (M) frequency in 10 MHz BW configuration
5355	765.5	TX top (T) frequency in 5 MHz BW configuration

Tested frequency and EARFCN for RX measurement

EARFCN	Frequency [MHz]	Comment
23305	790.5	RX band bottom (B) frequency in 5 MHz BW configuration
23355	795.5	RX band bottom (T) frequency in 5 MHz BW configuration

Each corresponding uplink (RX) channel was offset by +18000 from above given downlink EARFCN.

Note: EARFCN are derived according 3GPP TS 36.141, table 5.7.3-1.

Appendix 1

Operation modes 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 with test model E-TM1.1 was found to be representative for all traffic scenarios when several settings with different modulations were compared to find a worst case setting. This setting was used for all measurements unless noted otherwise.

The test object was powered with -48 VDC unless noted otherwise. All measurements were performed with the test object configured for maximum transmit power.

Conducted measurements

The EUT was mounted into a RBS 6202 cabinet and supplied by the cabinet's internal -48 V DC. TX parameters were measured at port RF A. RX spurious emission conducted was measured at port RF B with port RF A activated with E-TM1.1. Port RF A was terminated into 50 ohm.

Radiated measurements

The test object was tested stand-alone. It was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmitter output power at port RF A. Antenna port RF B was unterminated.

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable parts of FCC CFR 47.

References

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

ANSI C63.4-2009

ANSI/TIA/EIA-603-C-2004

3GPP TS 36.141, version 8.5.0

CFR 47 part 2, October 1st, 2010

CFR 47 part 27 Subpart N, October 1st, 2010

CFR 47 part 90 Subpart R, October 1st, 2010

Appendix 1

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2012-10	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 8.20.1	-	503 479
High pass filter	2012-07	504 199
High pass filter	2012-07	504 200
High pass filter	2012-07	503 739
High pass filter	2012-07	503 740
RF attenuator	2012-07	503 249
RF attenuator	2012-07	504 159
RF attenuator	2012-07	900 233
Boonton RF Peak power meter/analyzer	2011-10	503 144
Boonton Power sensor 56518-S/4	2012-10	503 145
Chase Bilog Antenna CBL 6111A	2011-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 20240-20	-	503 674
μComp Nordic, Low Noise Amplifier	2012-07	504 160
MITEQ Low Noise Amplifier	2012-07	503 285
Temperature cabinet	-	503 360
Multimeter Fluke 87	2012-05	502 190
Testo 625, Temperature and humidity meter	2012-06	504 188
Testo 635 Temperature and humidity meter	2012-05	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).

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: 2011-09-08.

Manufacturer's representative

Christer Gustavsson, Ericsson AB

Test engineers

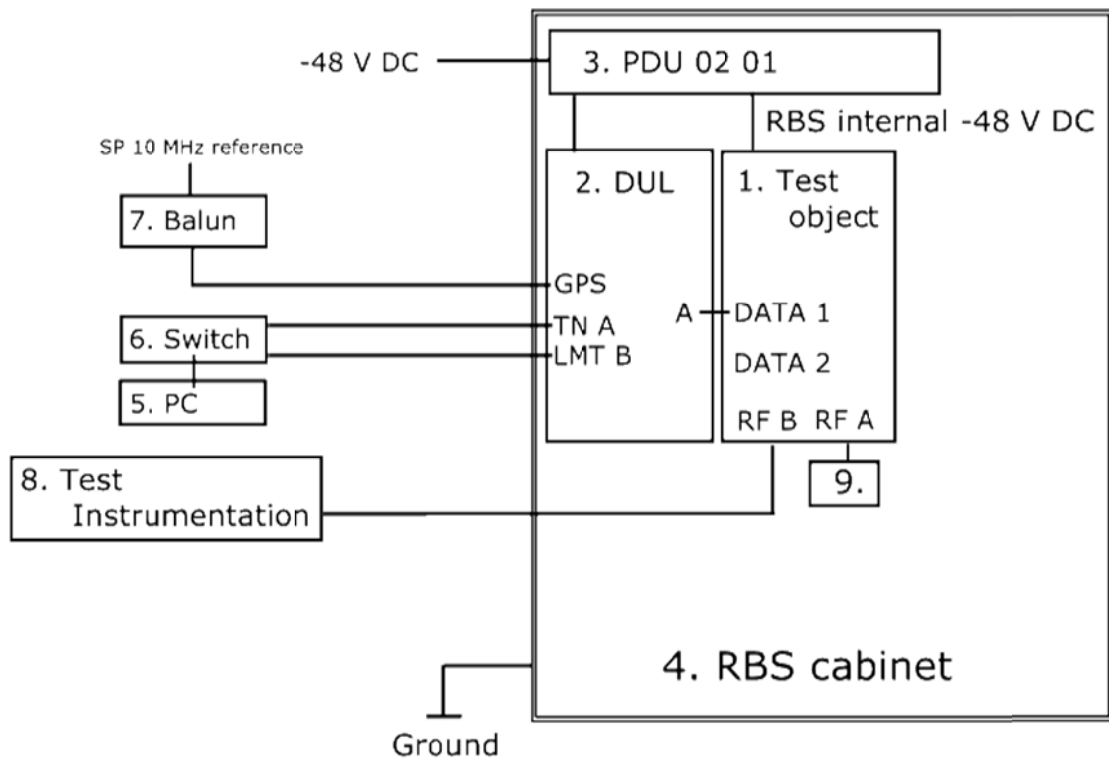
Andreas Johnson, Tomas Lennhager, Jörgen Wassholm and Jonas Bremholt

Test participants

None

Appendix 1

Test set-up conducted RX measurements at port RF B



Test object

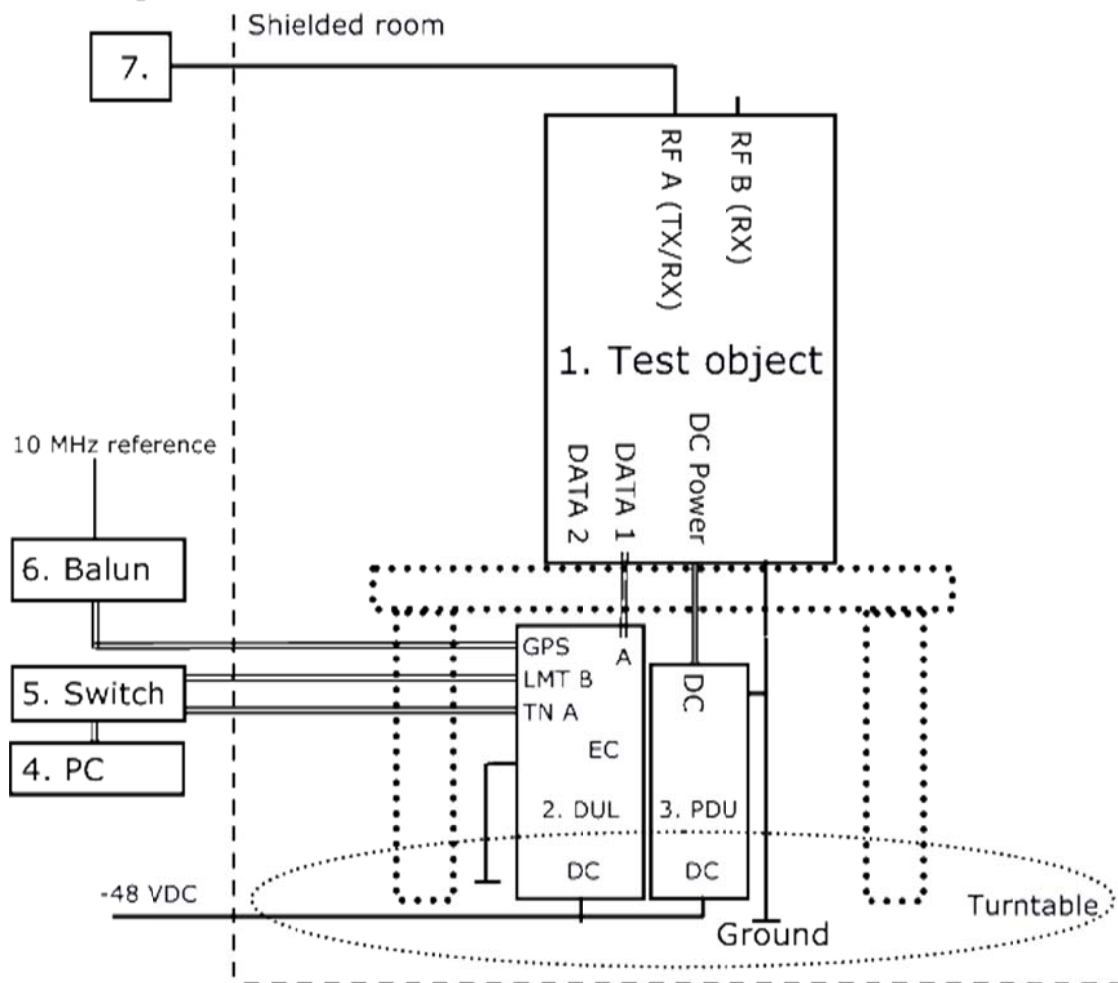
1. RUS 01 B14, KRC 118 95/1, revision R1C, S/N: C825156890
FCC ID:TA8AKRC11895-1

Functional test equipment

2. DUL 20 01, KDU 137 533/4, revision R1C, S/N: C824461313
3. PDU 02 02, BMG 980 336/5, revision R1E, S/N: C941030896
4. RBS 6202 cabinet, BAMS 1000961945
5. Controlling laptop HP Elitebook 8730w, , BAMS 1000757968
running software MOSHELL V8.0k
6. Fast Ethernet Switch: NETGEAR 10/100 Mbps model: FS108
7. Balun for 10 MHz reference, converting BNC to RJ-45 connector
8. SP test instrument according measurement equipment list
9. 50 ohm termination

Appendix 1

Test set-up, radiated measurements



Test object

- 1 RUS 01 B14, KRC 118 95/1, rev. R1C, s/n: C825156897
(FCC ID:TA8AKRC11895-1)

Functional test equipment

2. DUL 20 01, KDU 137 533/4, revision R1C, S/N: C824455128,
hosted in SUP 6601 1/BFL 901 009/1 Rev R3B, S/N: BR81262561
3. Power Distribution Unit PDU 02 01, BMG 980 336/4 Rev R2A, S/N: BJ31534775
4. Laptop computer: Mobile Workstation, HP EliteBook 8540wBAMS – 1001052060 with
MOSHELL Ver. 8.0k
5. Fast Ethernet Switch: NETGEAR 10/100 Mbps model: FS108
6. Balun for 10 MHz reference, converting BNC to RJ-45 connector
7. 50 ohm terminator

Appendix 1

Test object ports

Interface:	Type of port:
Ground connection during stand alone radiated emission test, in normal use grounded via cabinet	Ground
Supply power -48 VDC	DC Power
Antenna port 1 "RF A", 7/16 connector, female, combined TX/RX	Antenna
Antenna port 2 "RF B", 7/16 connector, female, RX only	Antenna
Data 1, connected to Port "A" at DUL	Signal
Data 2, unused	Signal
RXA I/O cross connector, unused	Signal
RXA OUT cross connector, unused	Signal
RXB I/O cross connector, unused	Signal

RBS software

Software	Revision
CXP 102 051/12	R18AK

Appendix 2

RF power output measurements according to CFR 47 §27.50 and §90.542

Date 2011-09-11 to 2011-10-03	Temperature 23-25 °C ± 3 °C	Humidity 42-47 % ± 5 %
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Test set-up and procedure

The test object was connected to a power analyzer measuring peak and RMS output power in CDF mode.

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
RF attenuator	900 229
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Results

Measured output power level at connector RF A

Test conditions	Transmitter power RMS (dBm) / PAR (dB)		
	Frequency B	Frequency M	Frequency T
BW configuration 5 MHz	47.4/ 6.7	N/A	47.5/ 7.5
BW configuration 10 MHz	N/A	47.4/ 7.7	N/A

Limits

§27.50 Power limits and duty cycle

(b) The following power and antenna height limits apply to transmitters operating in the 746–763 MHz, 775–793 MHz and 805–806 MHz bands:

(4) Fixed and base stations transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

§90.542 Broadband transmitting power limits

(a) The following power limits apply to the 763–768/793–798 MHz band: (3) Fixed and base stations transmitting a signal in the 763–768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

Complies?	Yes
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Appendix 3

Occupied bandwidth measurements according to CFR 47 2.1049

Date	Temperature	Humidity
2011-09-11	23 °C ± 3 °C	47 % ± 5 %
2011-10-11	23 °C ± 3 °C	43 % ± 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

Purpose

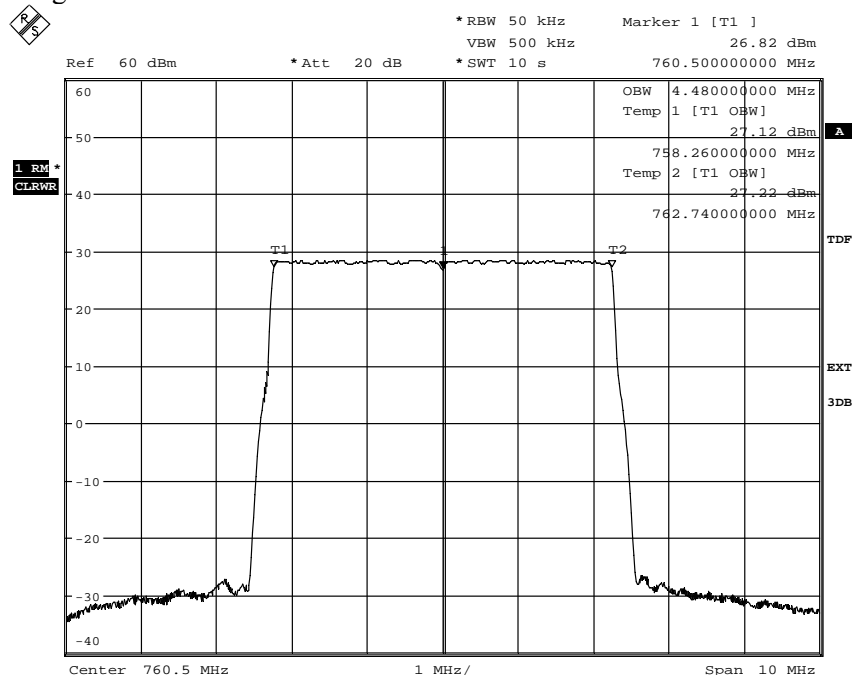
The measurements are performed to determine the occupied bandwidth of the EUT pursuant to §2.1049.

Results

Diagram	BW configuration	Tested frequency	Occupied BW (99%) [MHz]	Emission BW (99.75%) [MHz]
1	5 MHz	B	4.480	4.540
2	10 MHz	M	8.925	9.045
3	5 MHz	T	4.473	4.533

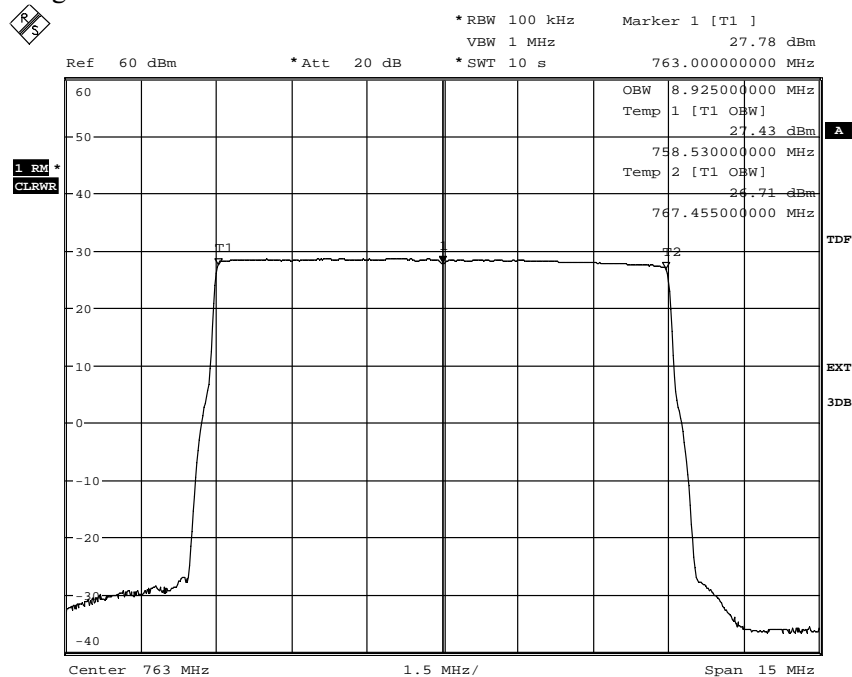
Appendix 3

Diagram 1



Date: 3.OCT.2011 21:51:16

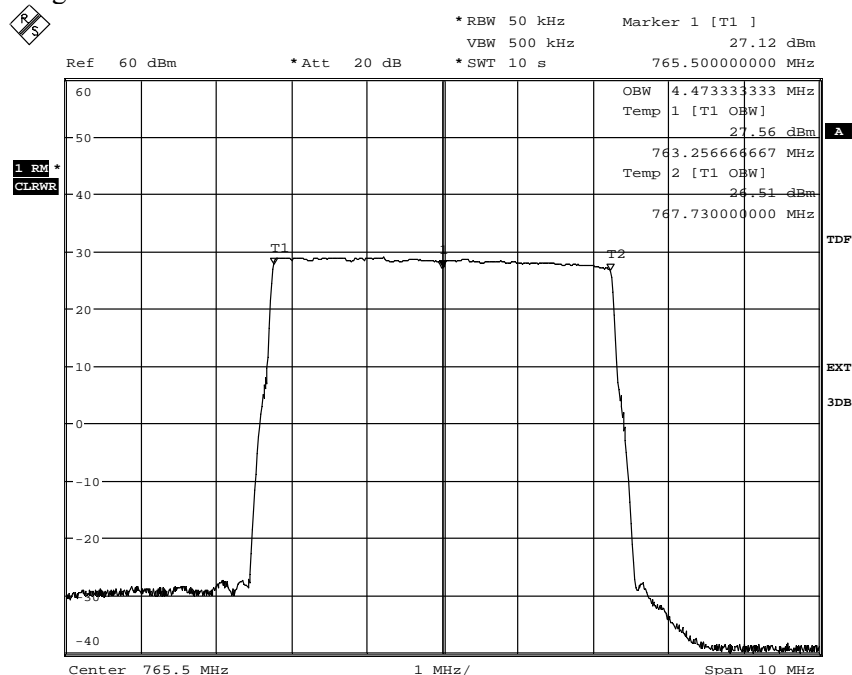
Diagram 2



Date: 11.OCT.2011 13:30:48

Appendix 3

Diagram 3



Date: 11.OCT.2011 13:19:03

Appendix 4

Band edge measurements according to CFR 47 §27.53 and 90.543

Date 2011-09-11 and 2011-10-10	Temperature 23 °C ± 3 °C	Humidity 47-49 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §27.53. The test object 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.

The FCC rules, specifying a RBW of at least 30k up to 100 kHz away from the band edges and a RBW of at least 100 kHz for measurements of emissions more than 100 kHz away from the band edges.

In cases where a smaller RBW was used than that specified by the rules, the limit was adjusted to compensate for the reduced RBW.

Measurement equipment	SP number
R&S FSQ	504 143
RF attenuator	900 223
Testo 615 temperature and humidity meter	503 498

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration	Tested frequency
1 a-d	5 MHz	B
2 a-d	10 MHz	M
3 a-d	5 MHz	T

Limits

§27.53

(d) For operations in the 758–763 MHz and 788–793 MHz bands, the power of any emission outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of -46 dBm.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB; resulting in a limit of -13 dBm.

(5) Compliance with the provisions of paragraph (d)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Appendix 4

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to –70 dBW/MHz (-40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

§90.543

(e) For operations in the 763–768 MHz and the 793–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

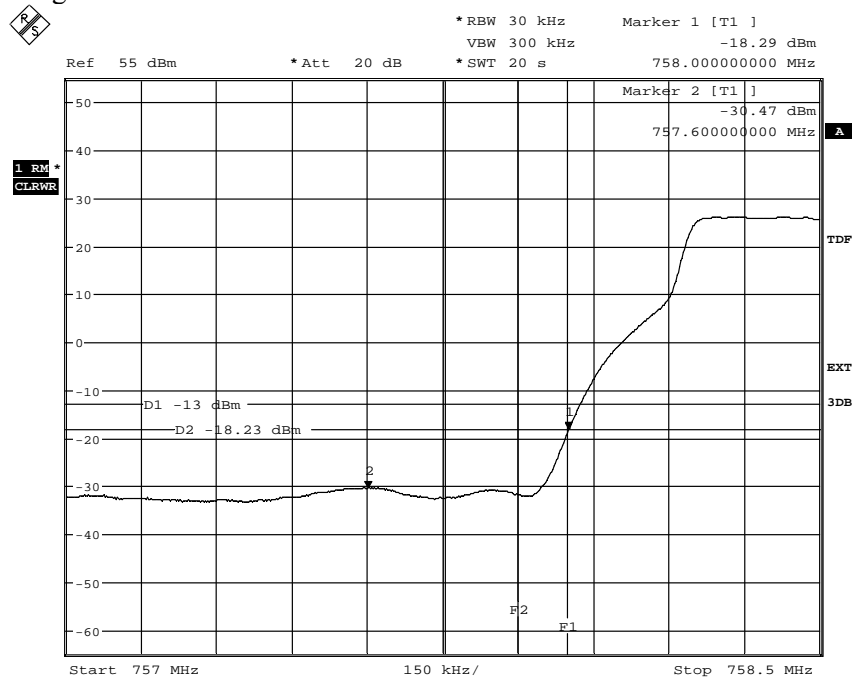
(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of -46 dBm..

(f) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Complies?	Yes
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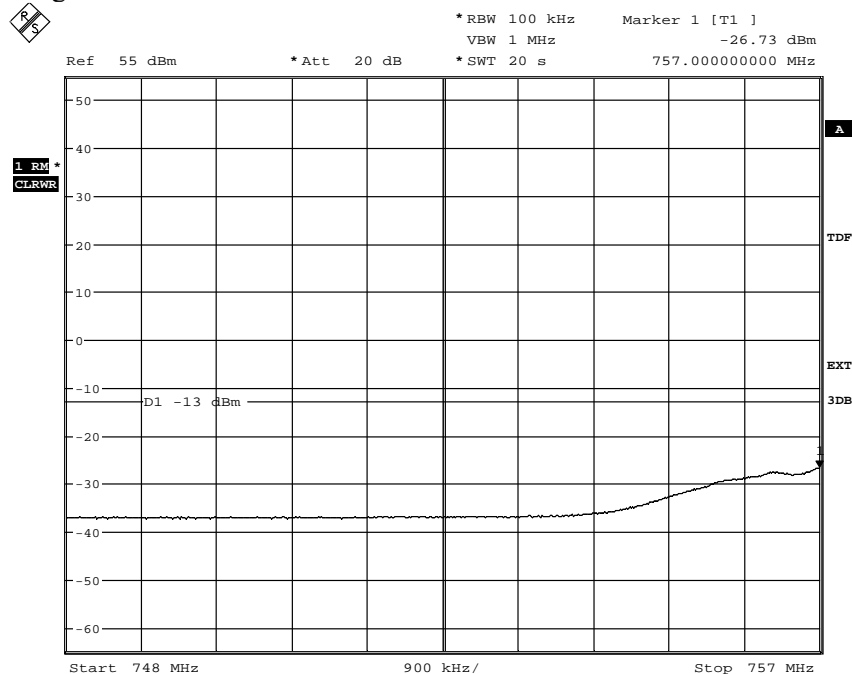
Appendix 4

Diagram 1 a



Date: 11.SEP.2011 18:06:39

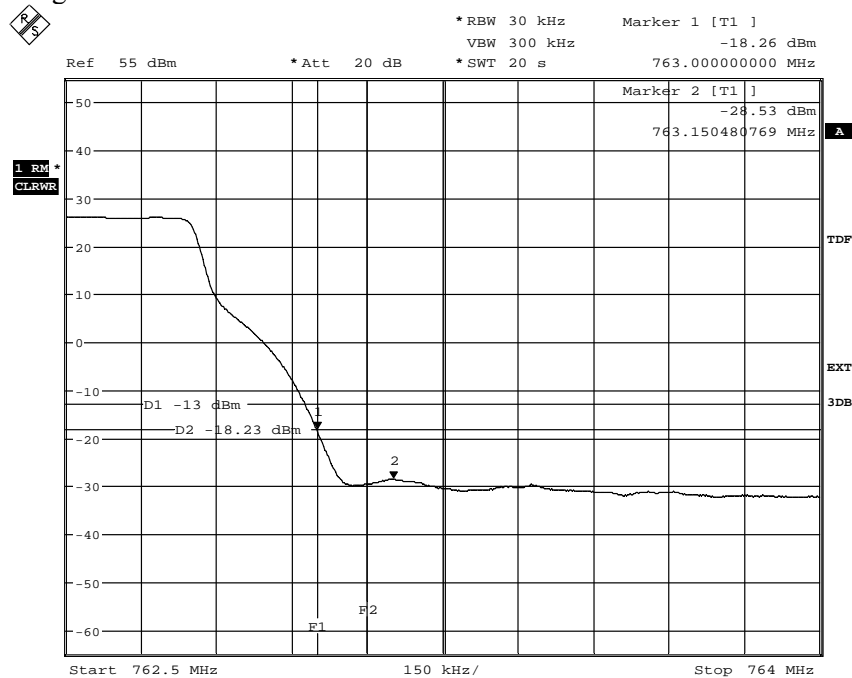
Diagram 1 b



Date: 11.SEP.2011 17:54:19

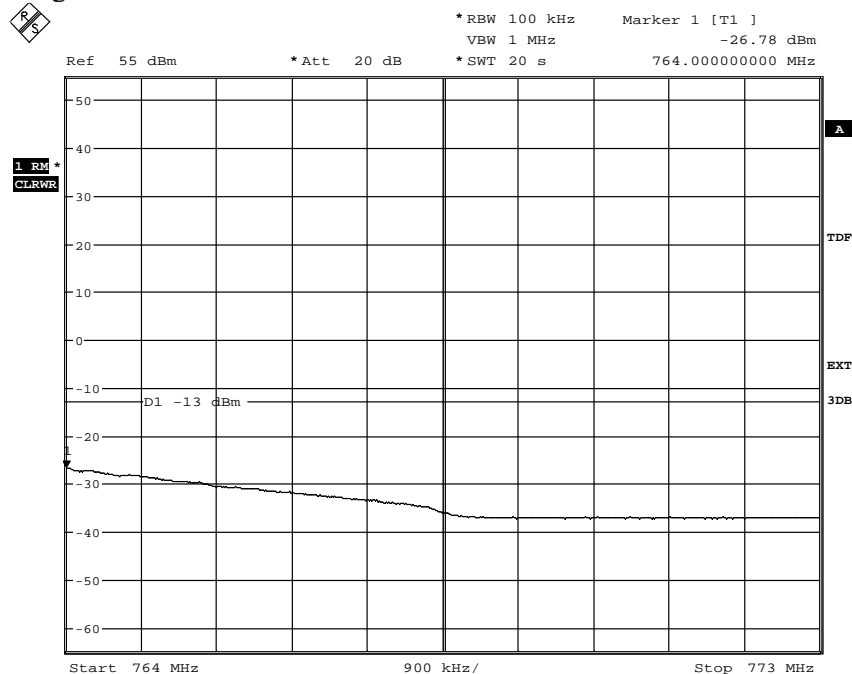
Appendix 4

Diagram 1 c



Date: 11.SEP.2011 17:47:42

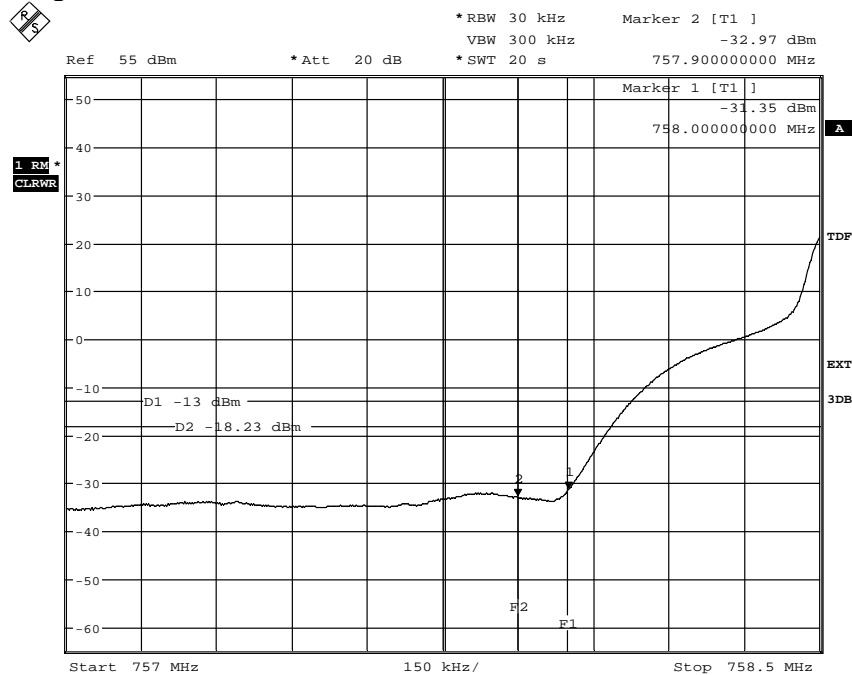
Diagram 1 d



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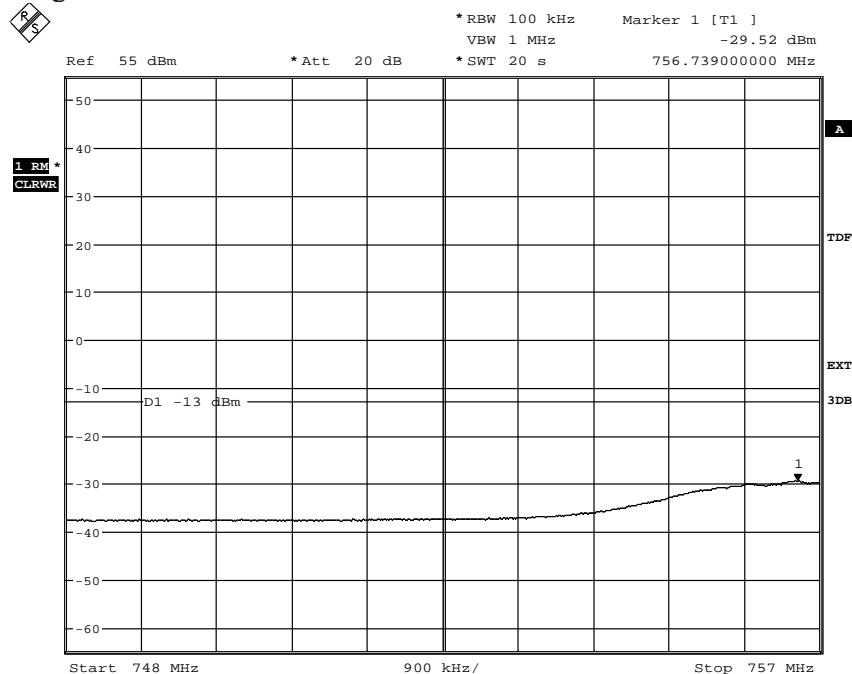
Appendix 4

Diagram 2 a



Date: 3.OCT.2011 18:45:35

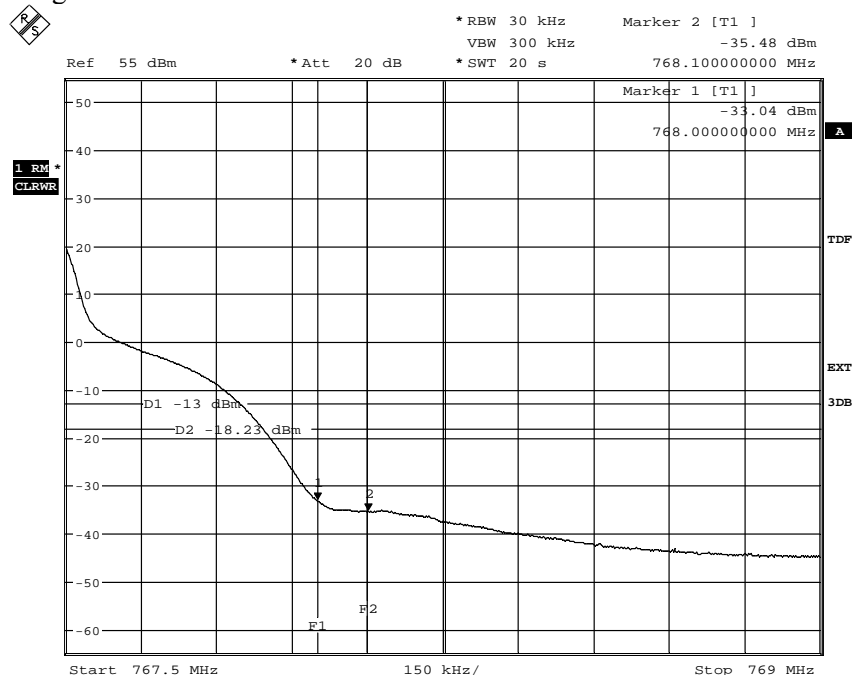
Diagram 2 b



Date: 3.OCT.2011 19:56:55

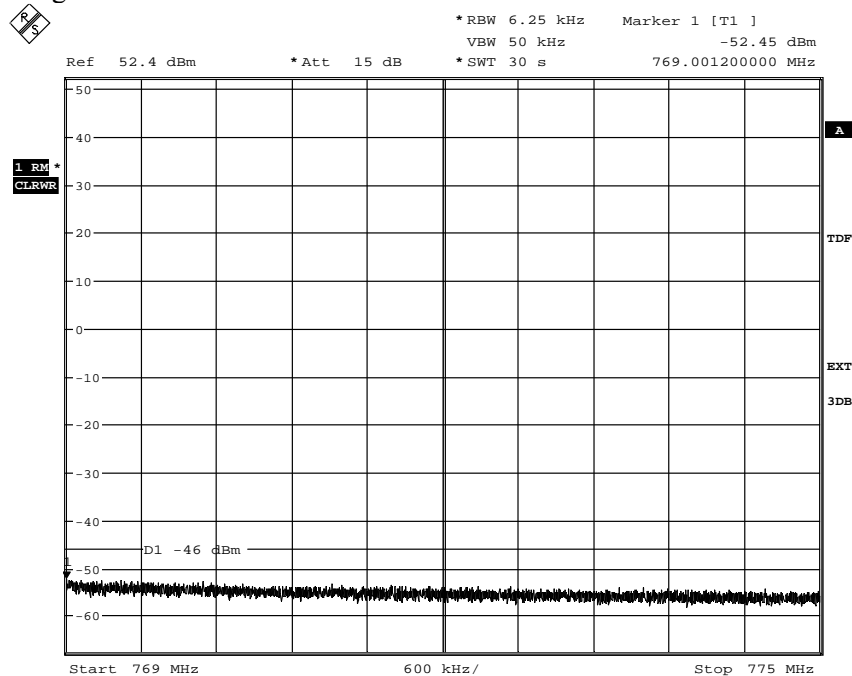
Appendix 4

Diagram 2 c



Date: 3.OCT.2011 20:03:18

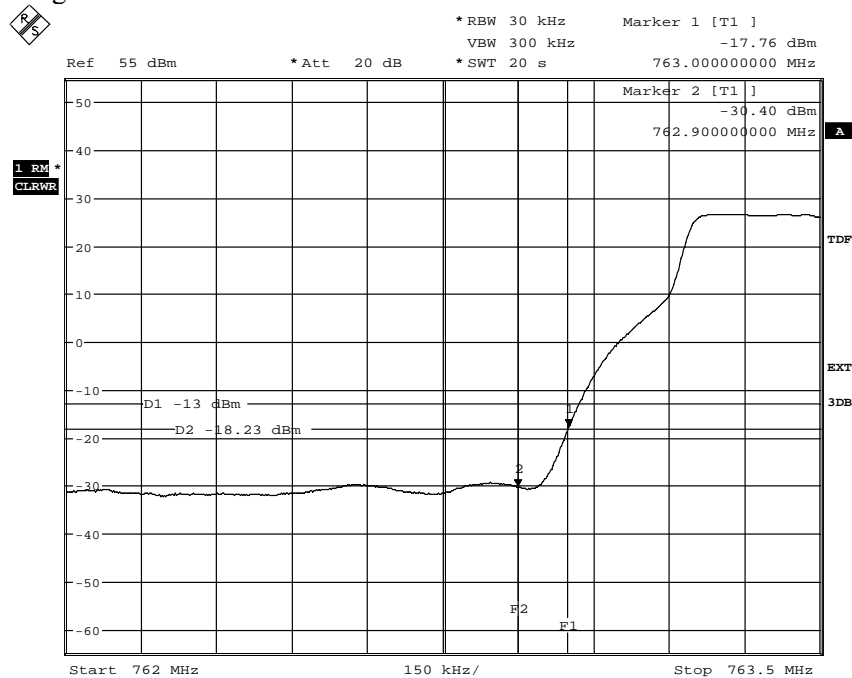
Diagram 2 d



Date: 3.OCT.2011 18:40:30

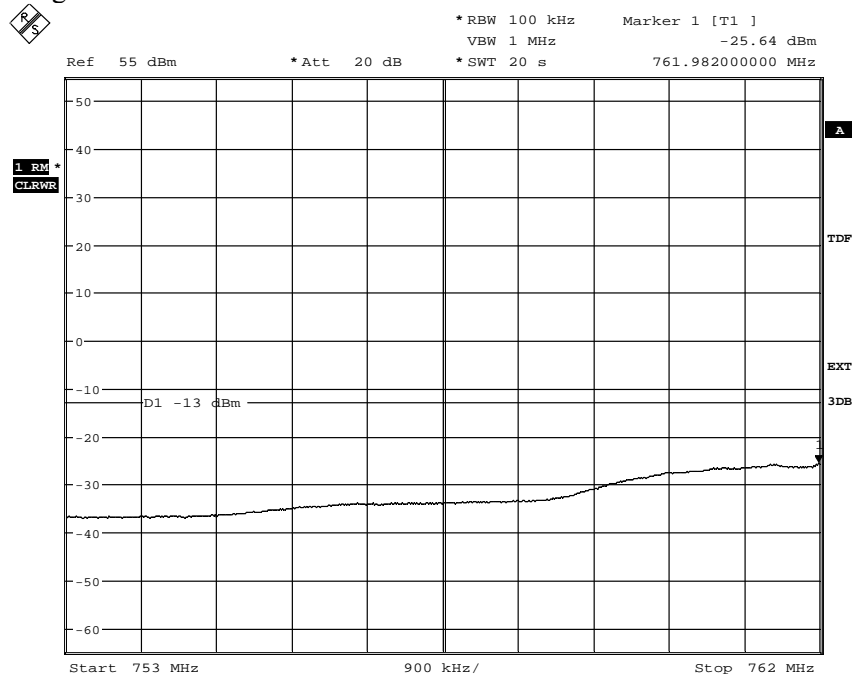
Appendix 4

Diagram 3 a



Date: 10.OCT.2011 12:49:33

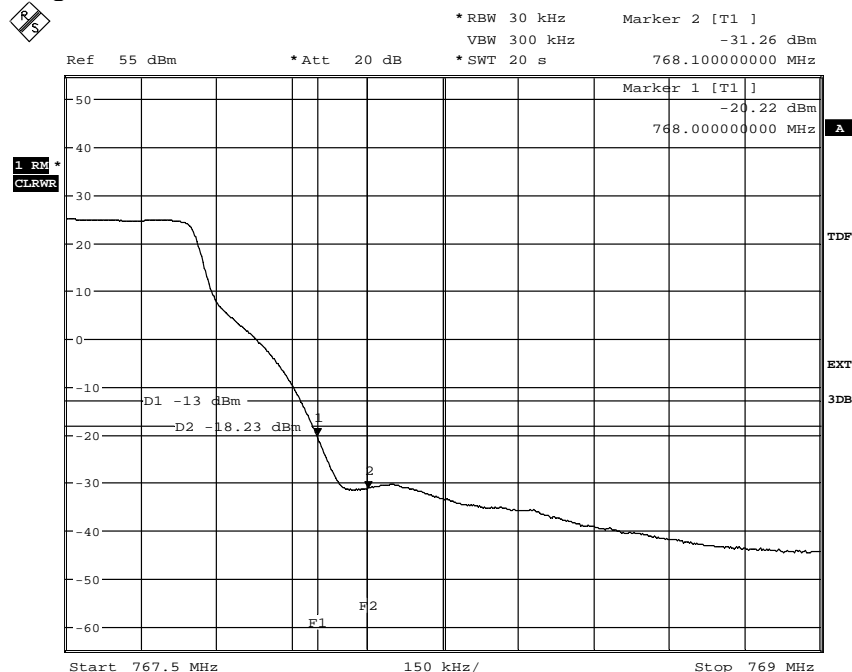
Diagram 3 b



Date: 10.OCT.2011 13:33:38

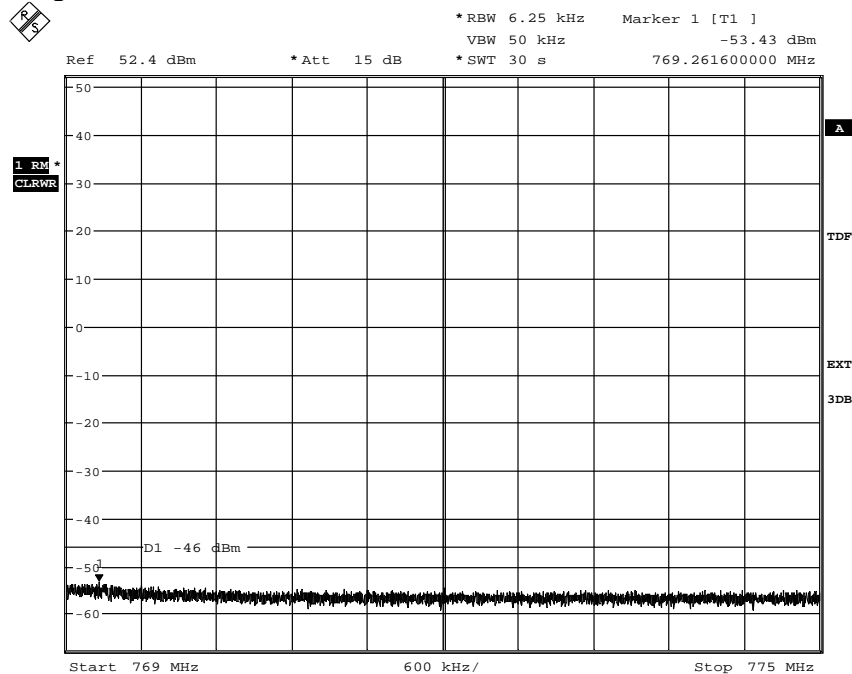
Appendix 4

Diagram 3 c



Date: 10.OCT.2011 13:13:39

Diagram 3 d



Date: 4.OCT.2011 10:59:05

Appendix 5

Conducted spurious emission measurements according to CFR 47 §27.53 and §90.543

Date 2011-10-03 to 2011-10-10	Temperature 22-23°C ± 3 °C	Humidity 42 to 53% ± 5 %
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Test set-up and procedure

The measurements were made per definition in §27.53. The output was connected to a spectrum analyzer with a RBW setting of 1 MHz and RMS detector activated. Additional measurements in the frequency range 769-775 and 779-805 were made with a RBW setting of 6.25 kHz. 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	900 229
High pass filter	504 199
High pass filter	504 200
High pass filter	503 740
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration / [MHz]	Tested frequency
1 a-g	5	B
2 a-g	10	M
3 a-g	5	T

Remark

The emission at 9 kHz on some 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

CFR 47 §27.53

(d) For operations in the 758–763 MHz and 788–793 MHz bands, the power of any emission outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P) \text{ dB}$ in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of -46 dBm.

Appendix 5

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB; resulting in a limit of -13 dBm.

(4) Compliance with the provisions of paragraphs (d)(1) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment;

(5) Compliance with the provisions of paragraph (d)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz (-40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

§90.543 Emission limitations

Transmitters designed to operate in 769–775 MHz and 799–805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Transmitters operating in 763–768 MHz and 793–798 MHz bands must meet the emission limitations in (e) of this section.

(e) For operations in the 763–768 MHz and the 793–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of -46 dBm.

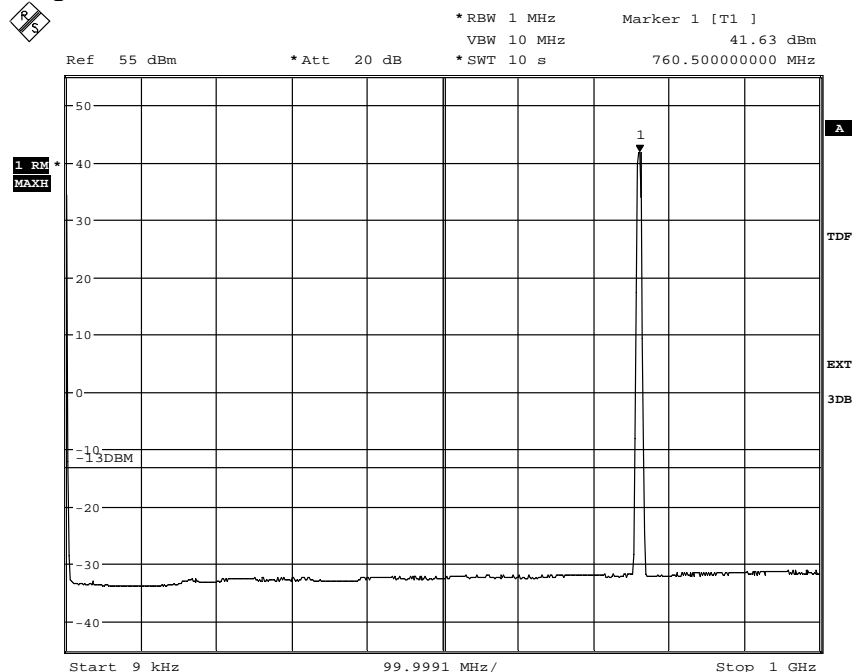
(3) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz (-40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Complies?	Yes
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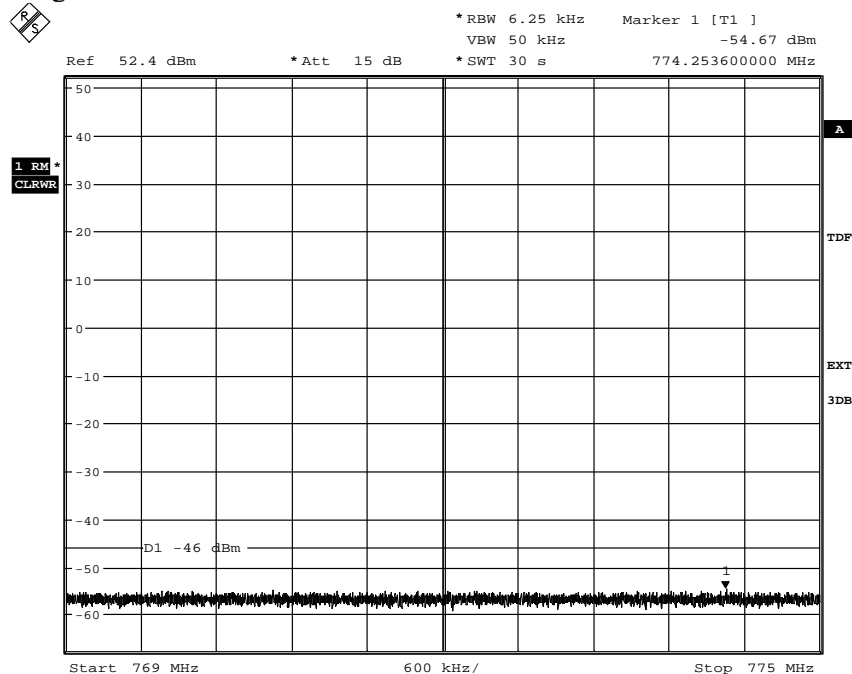
Appendix 5

Diagram 1 a



Date: 3.OCT.2011 21:30:44

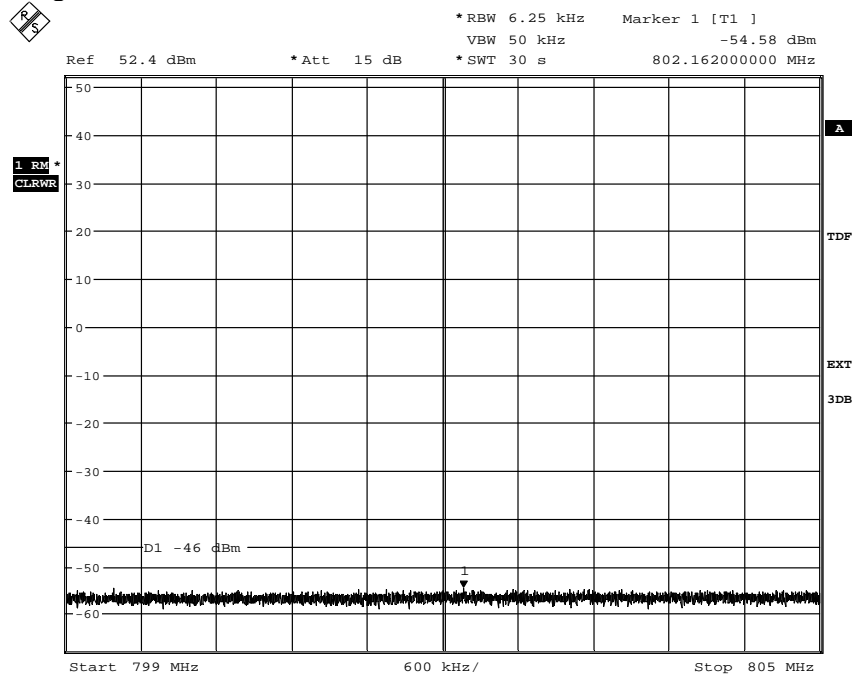
Diagram 1 b



Date: 3.OCT.2011 21:33:32

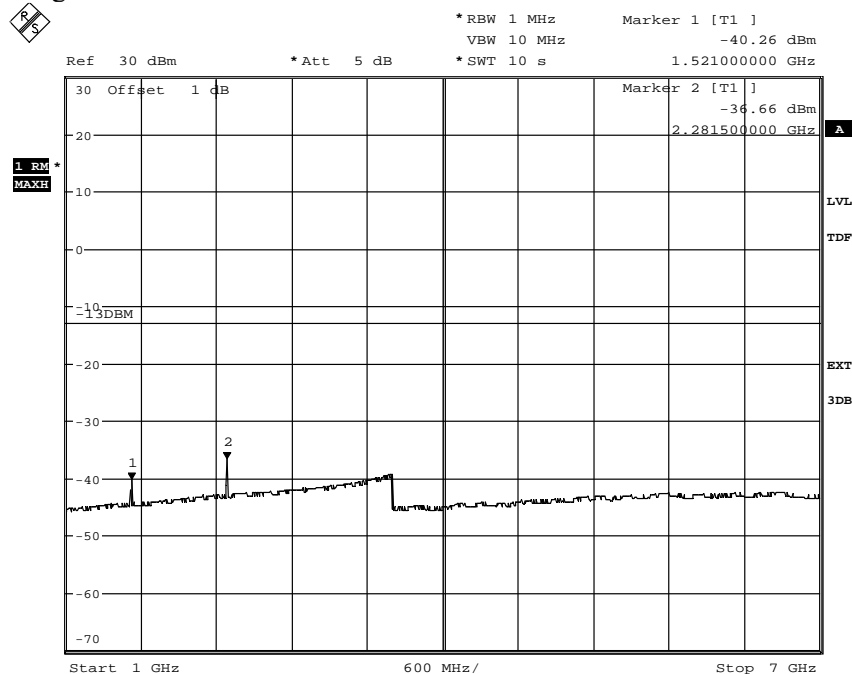
Appendix 5

Diagram 1 c



Date: 3.OCT.2011 21:37:58

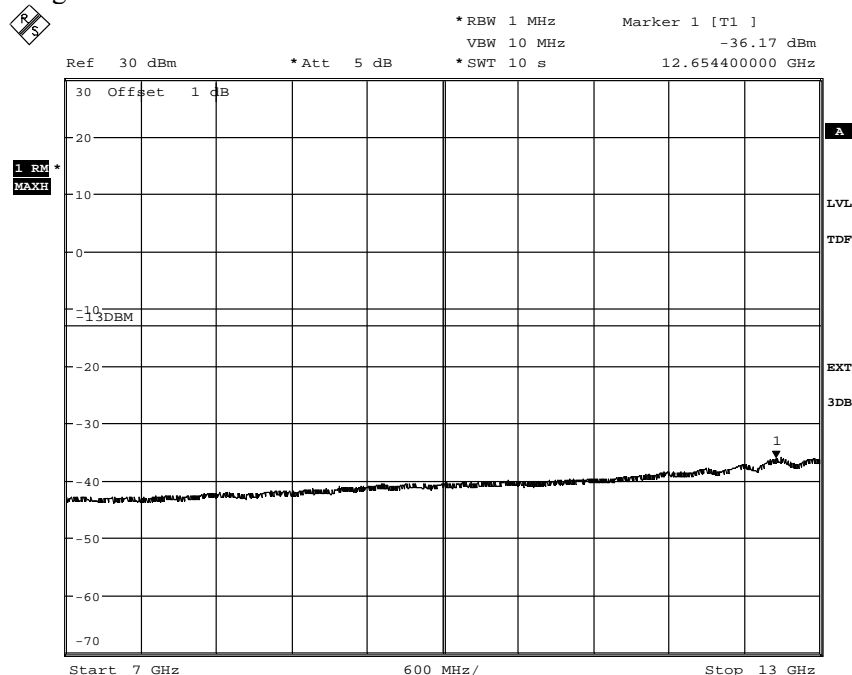
Diagram 1 d



Date: 3.OCT.2011 21:24:00

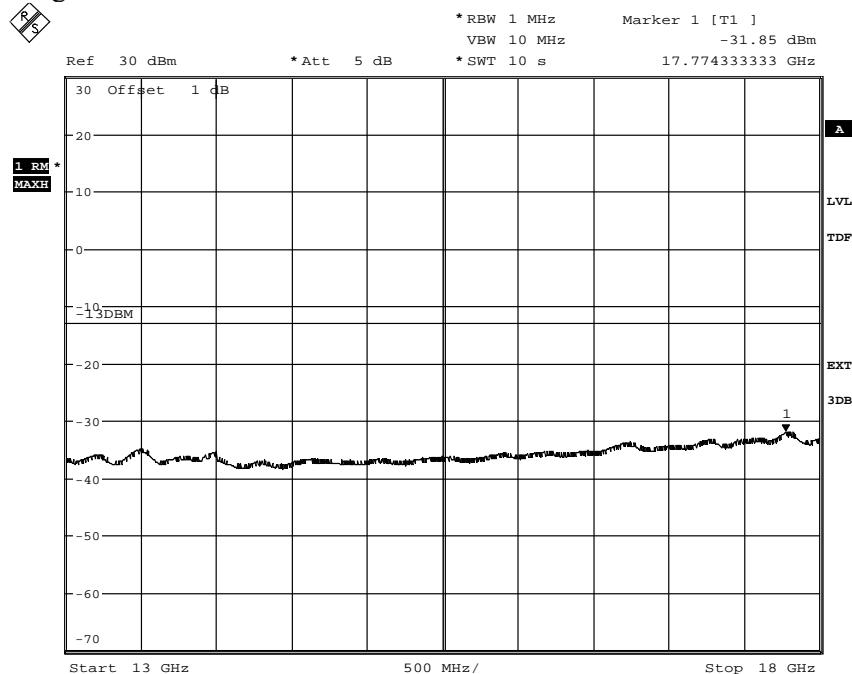
Appendix 5

Diagram 1 e



Date: 3.OCT.2011 21:26:25

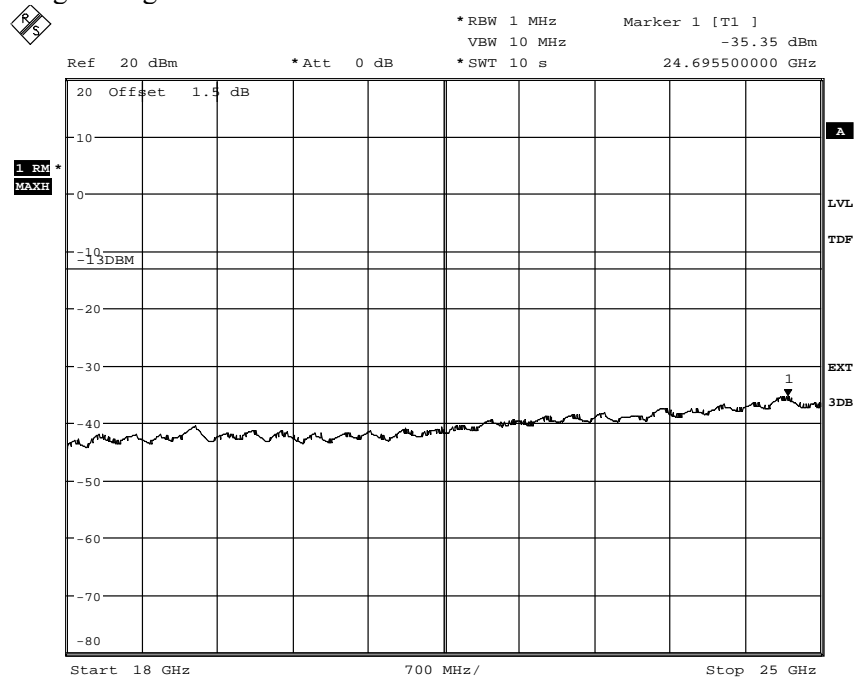
Diagram 1 f



Date: 3.OCT.2011 21:28:38

Appendix 5

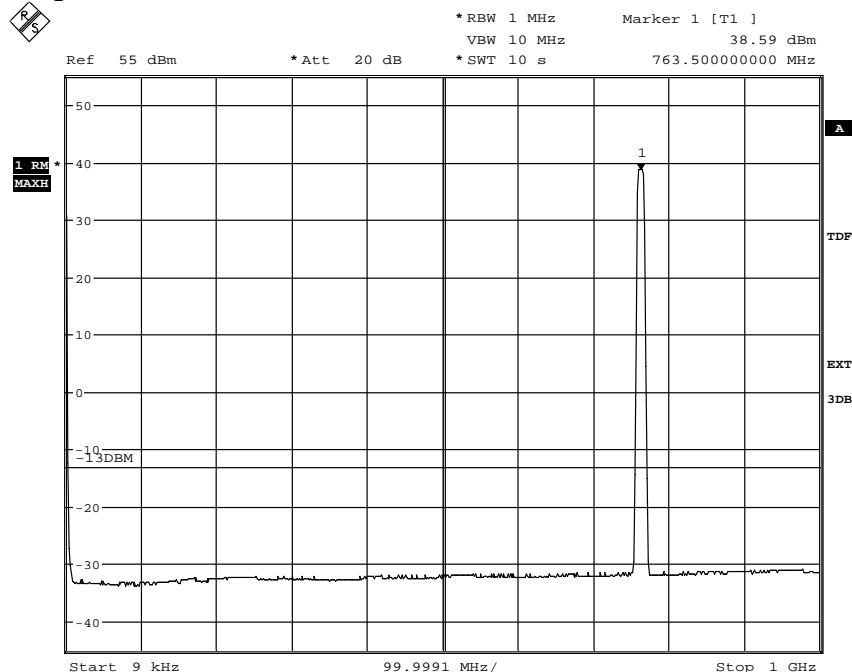
Diagram 1 g



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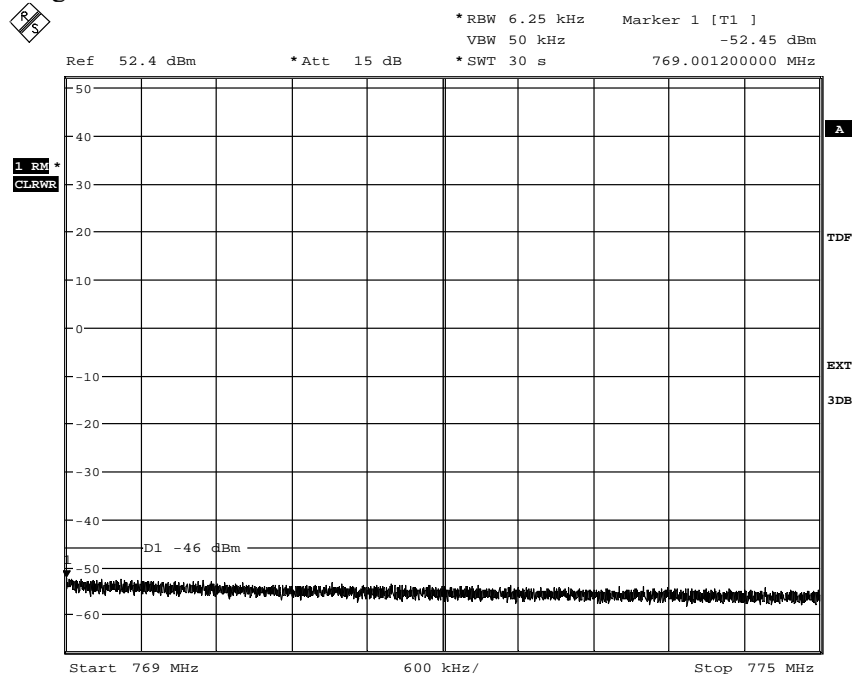
Appendix 5

Diagram 2a:



Date: 3.OCT.2011 20:27:38

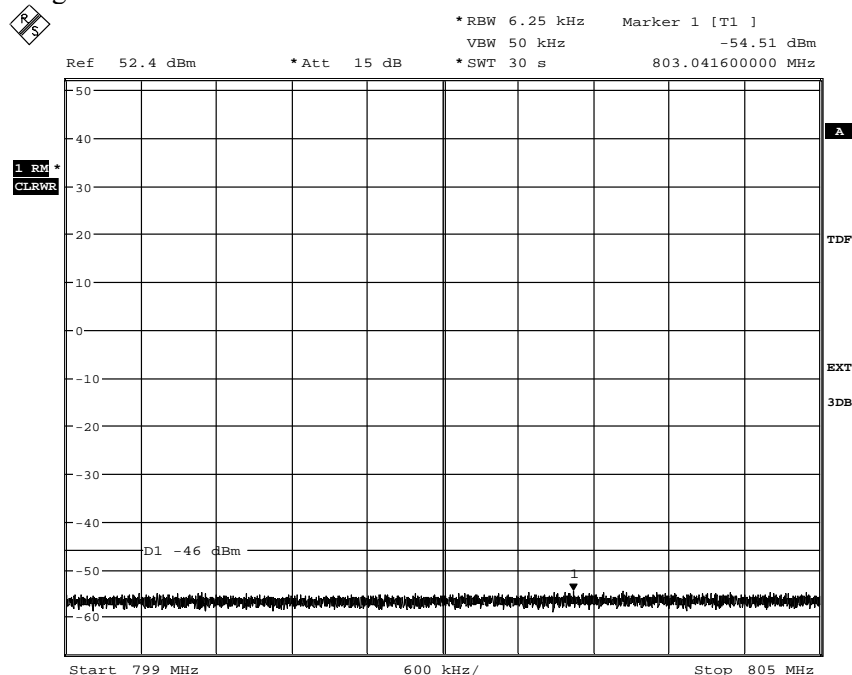
Diagram 2b:



Date: 3.OCT.2011 18:40:30

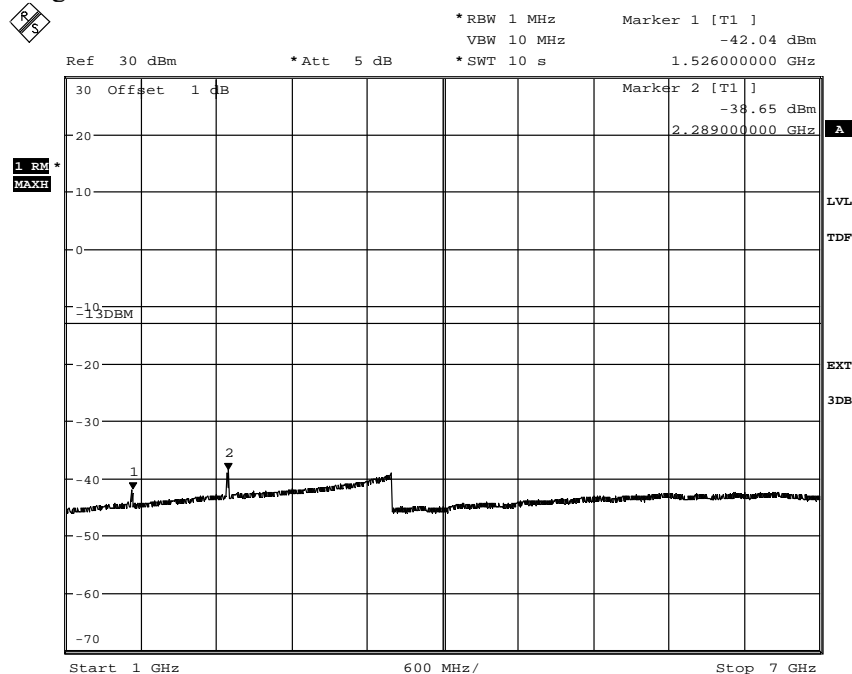
Appendix 5

Diagram 2c:



Date: 3.OCT.2011 19:41:56

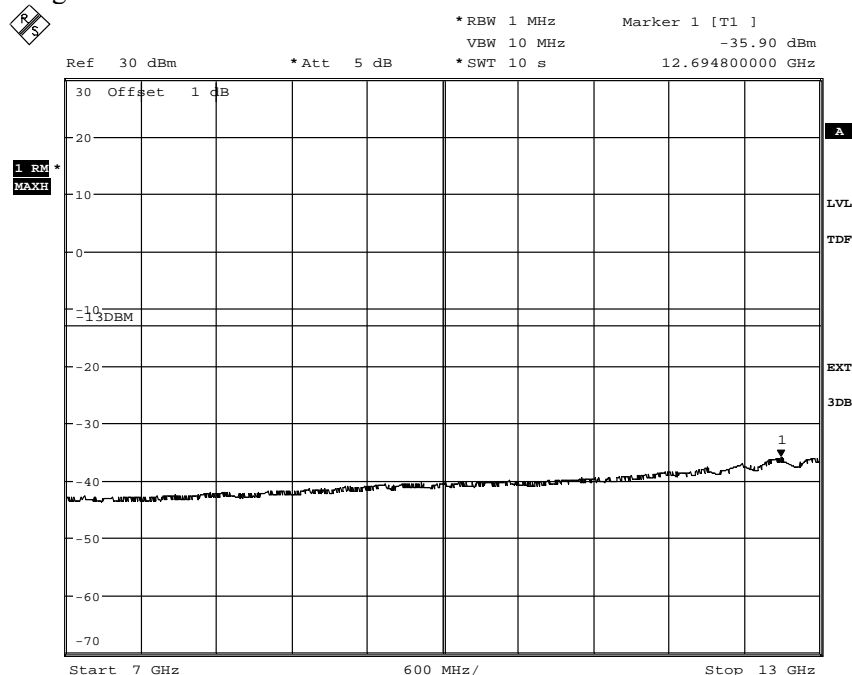
Diagram 2d:



Date: 3.OCT.2011 20:51:45

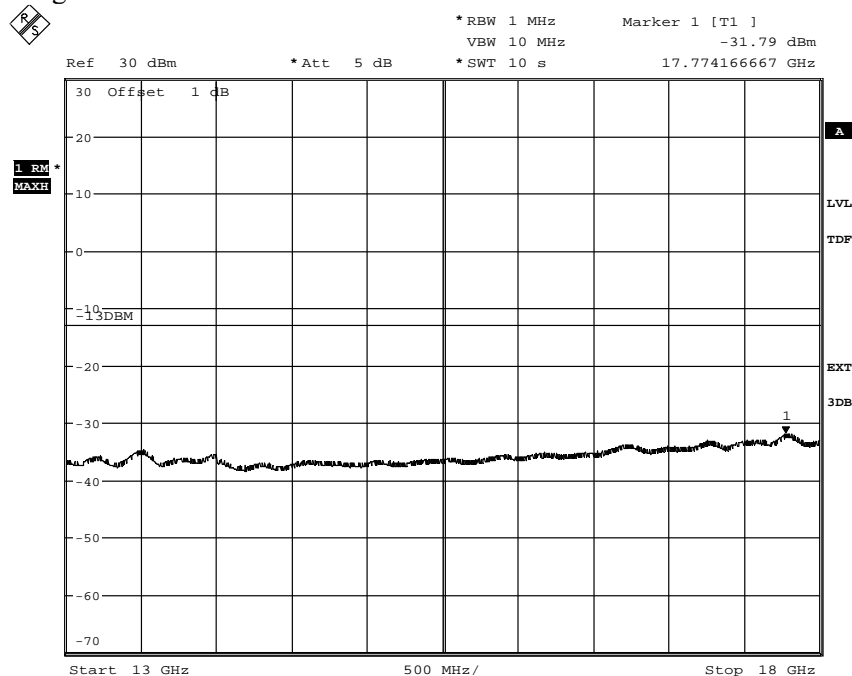
Appendix 5

Diagram 2e:



Date: 3.OCT.2011 20:44:52

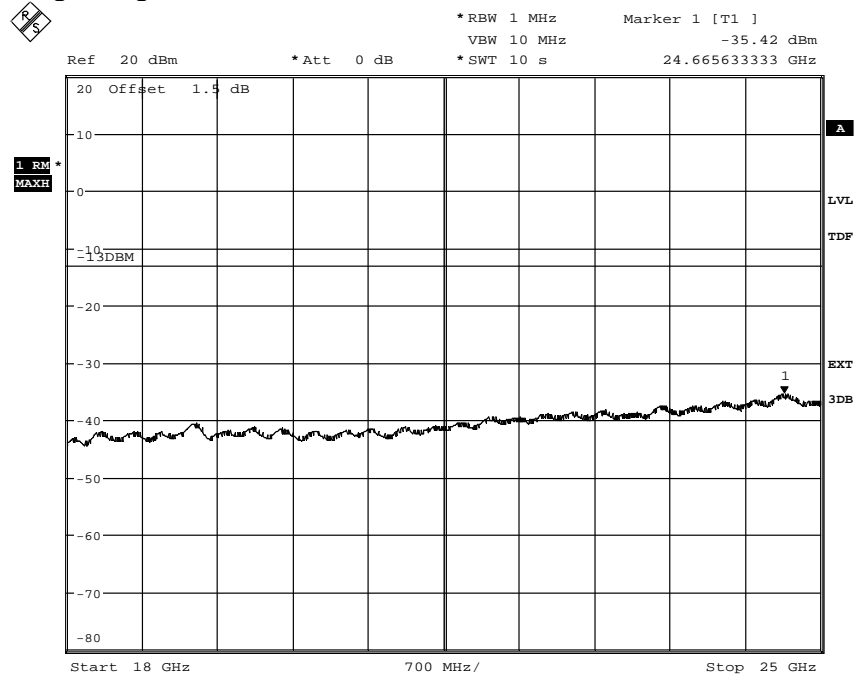
Diagram 2f:



Date: 3.OCT.2011 20:46:15

Appendix 5

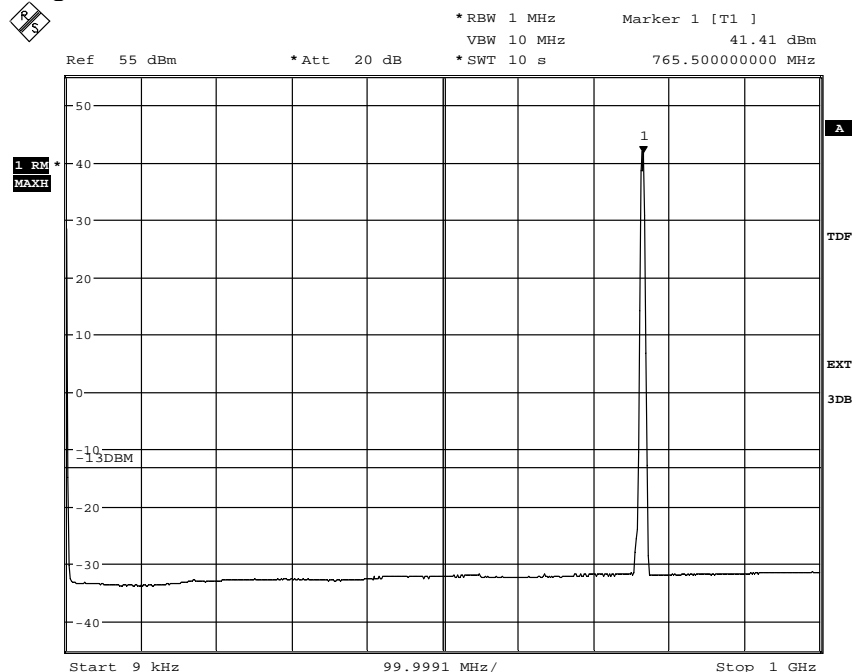
Diagram 2g:



Date: 3.OCT.2011 21:09:07

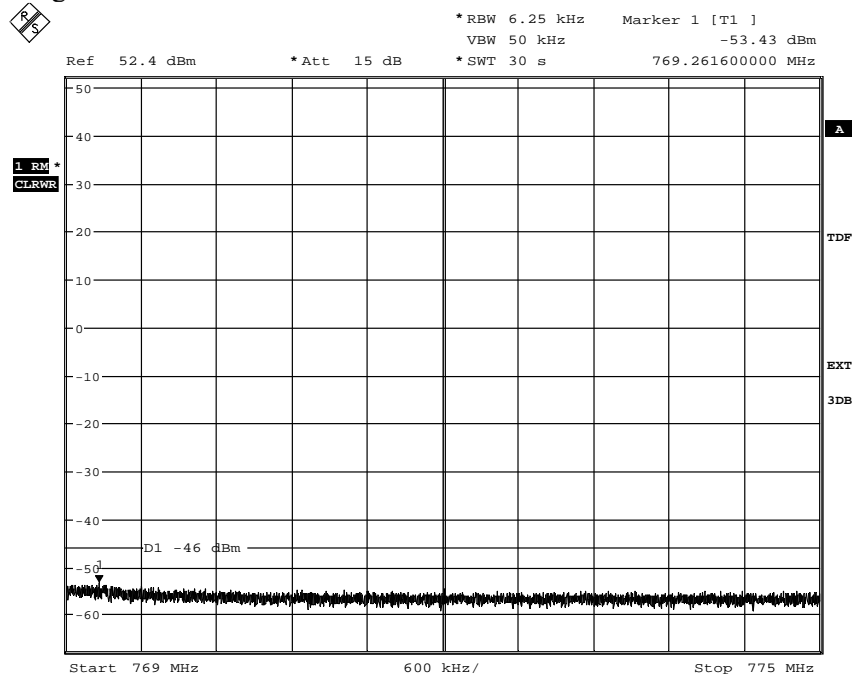
Appendix 5

Diagram 3a:



Date: 4.OCT.2011 10:54:47

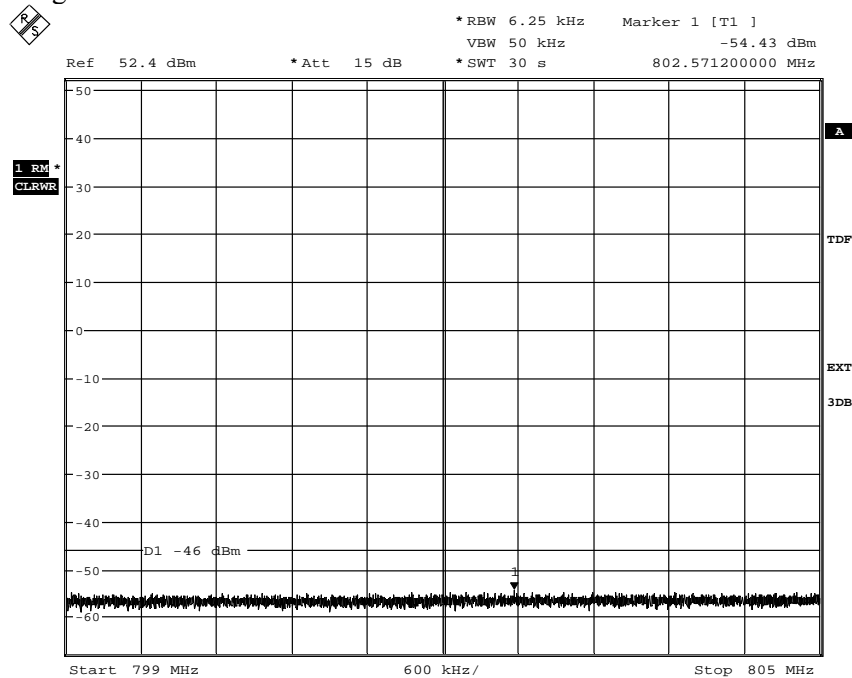
Diagram 3b:



Date: 4.OCT.2011 10:59:05

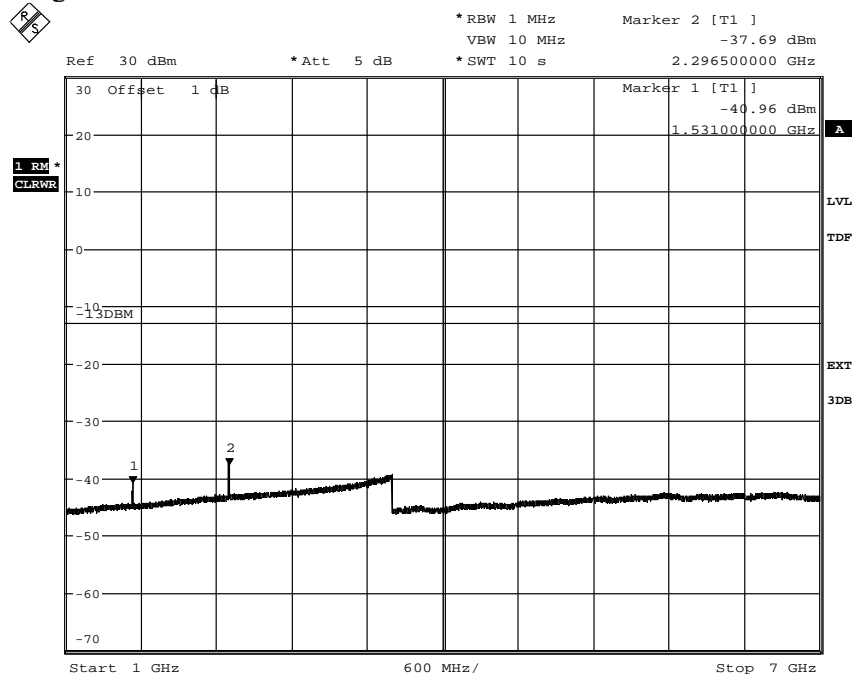
Appendix 5

Diagram 3c:



Date: 4.OCT.2011 11:00:59

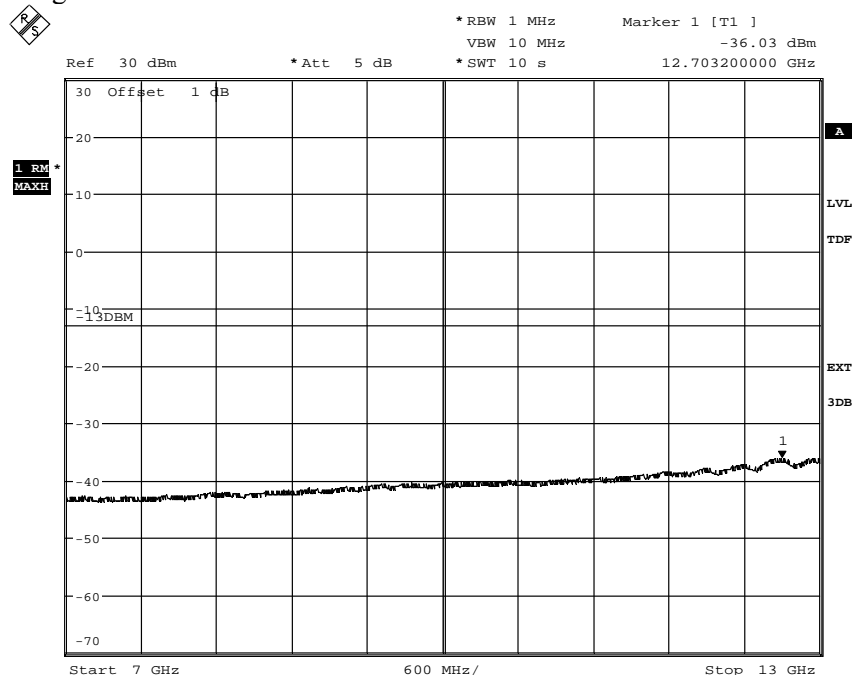
Diagram 3d:



Date: 4.OCT.2011 10:48:07

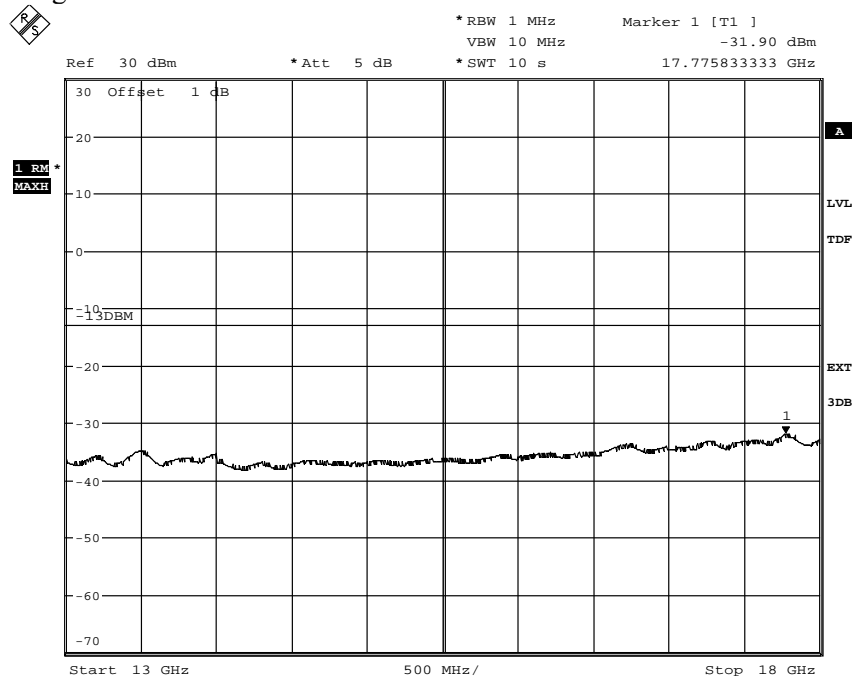
Appendix 5

Diagram 3e:



Date: 4.OCT.2011 10:50:21

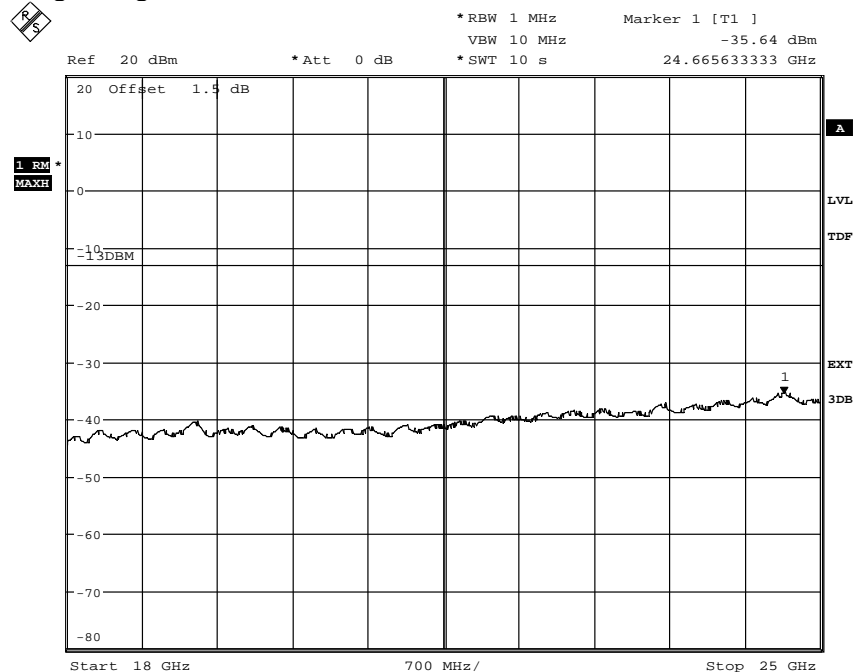
Diagram 3f:



Date: 4.OCT.2011 10:53:08

Appendix 5

Diagram 3g:



Date: 10.OCT.2011 13:37:22

Appendix 6

Field strength of spurious radiation measurements according to CFR 47 §27.53 and 90.543

Date 2011-09-10 to 2011-09-30	Temperature 22-23°C ± 3°C	Humidity 48-61 % ± 5 %
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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.

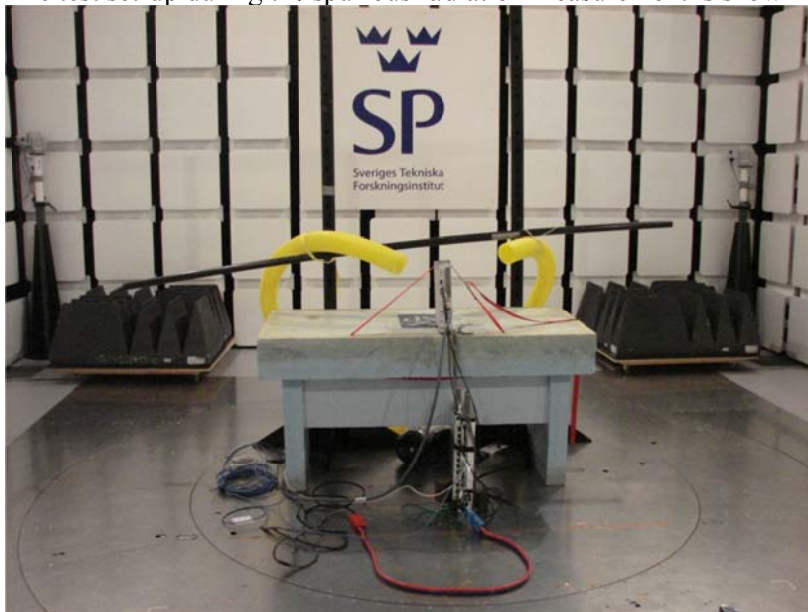
In the frequency range 30 MHz – 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

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

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 measurement is shown in the picture below:



Appendix 6

Measurement equipment

Measurement equipment	SP number
Test site Tesla	503 881
R&S ESI 26	503 292
Control computer	503 479
Software: R&S EMC32, ver. 8.20.1	503 745
Chase Bilog antenna CBL 6111A	503 182
µCorp Nordic, Low Noise Amplifier	504 160
Miteq, Low Noise Amplifier	503 285
EMCO Horn Antenna 3115	502 175
Standard gain antenna 20240-20	503 674
High pass filter, Wainright	504 199
High pass filter, Wainright	504 200
High pass filter, RLC Electronics	503 739
Testo 625 temperature and humidity meter	504 188

Results

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

CFR 47 §27.53

(d) For operations in the 758–763 MHz and 788–793 MHz bands, the power of any emission outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of -46 dBm.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB; resulting in a limit of -13 dBm.

(4) Compliance with the provisions of paragraphs (d)(1) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment;

(5) Compliance with the provisions of paragraph (d)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

Appendix 6

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to –70 dBW/MHz (–40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW (–50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

§90.543 Emission limitations

Transmitters designed to operate in 769–775 MHz and 799–805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Transmitters operating in 763–768 MHz and 793–798 MHz bands must meet the emission limitations in (e) of this section.

(e) For operations in the 763–768 MHz and the 793–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; resulting in a limit of –46 dBm..

(3) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 763–775 MHz and 793–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to –70 dBW/MHz (–40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW (–50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Complies?	Yes
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Appendix 7

Frequency stability measurements according to CFR 47 § 27.54

Date 2011-09-27 to 2011-09-28	Temperature (test equipment) 22-24°C ± 3 °C	Humidity (test equipment) 43-48% ± 5 %
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Test set-up and procedure

The measurement was made per 3GPP TS 36.141. The output was connected to a spectrum analyser. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Temperature cabinet	503 360
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	504 159
Testo 635, Temperature and humidity meter	504 203
Multimeter Fluke 87	502 190

Results

Nominal transmitter frequency was 765.5 MHz in channel bandwidth configuration 5 MHz. with setting for maximum output power.

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	Test model E-TM1.1
-48.0	+20	-8
-55.2	+20	-4
-40.8	+20	-3
-48.0	+30	-4
-48.0	+40	-3
-48.0	+50	-3
-48.0	+10	-3
-48.0	0	-3
-48.0	-10	-3
-48.0	-20	+6
-48.0	-30	-3
Maximum freq. error (Hz)		8
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Appendix 7

Limits

According to 3GPP TS 36.141, section 6.5.1.5:

The frequency Error shall be within $\pm(0.05 \text{ PPM} + 12 \text{ Hz})$ ($\pm 50.28 \text{ Hz}$).

§ 27.54 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Complies?	Yes
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Appendix 8

Receiver spurious emissions measurements according to CFR 47 § 15.111

Date 2011-10-07	Temperature 23 °C ± 3 °C	Humidity 43 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4.

Measurements were performed on port “RF B”. The measurement was first performed with peak detector. Emission on frequencies close to or above the limit was re-measured with quasi-peak detector below 1 GHz and with average detector above 1GHz.

During the measurement at the receiver port “RF B” the combined TX/RX port “RF A” was terminated into 50 ohm. The TX was activated at maximum power transmitting test model E-TM1.1 during the measurements.

Measurement equipment	SP number
R&S FSQ40	504 143
RF attenuator	503 249
RF attenuator (RF A)	900 229
Testo 635, Temperature and humidity meter	504 203

Result

	Channel	Tested port, frequency range
Diagram 1a+b+c	dl 5305, B	RX B, 9 kHz – 12.5 GHz
Diagram 2a+b+c	dl 5330, M	RX B, 9 kHz – 12.5 GHz
Diagram 3a+b+c	dl 5355, T	RX B, 9 kHz – 12.5 GHz

A frequency component at 474.2 kHz was measured to -57.1 dBm with Quasi-peak detector activated.

Remark

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to $5 \times 2.5 \text{ GHz} = 12.5 \text{ GHz}$ for emission measurements.

Limit

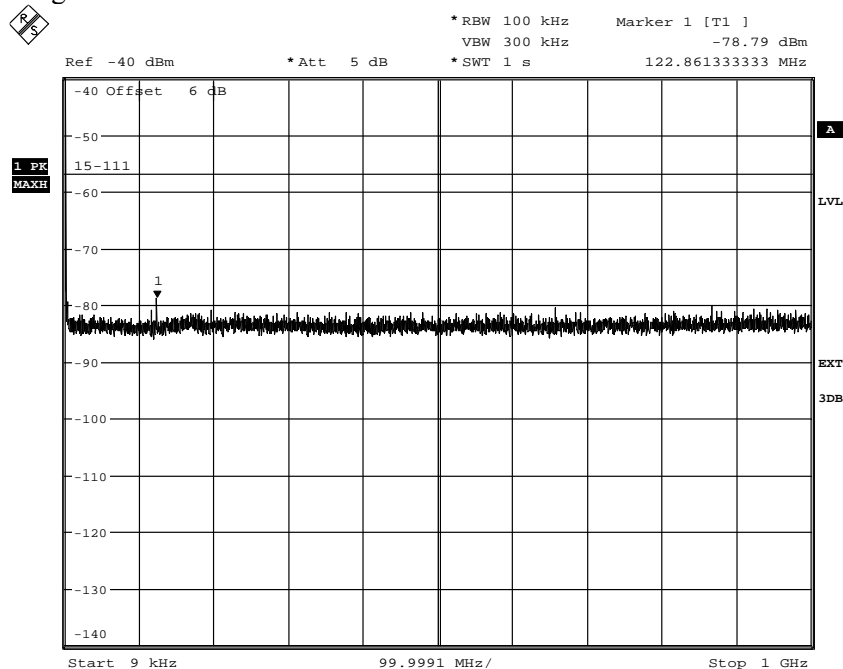
§15.111 Antenna power conduction limits for receivers

The power at the antenna terminal at any frequency within the range of measurements specified in §15.33 shall not exceed 2.0 nanowatts (-57 dBm).

Emission below limit?	Yes
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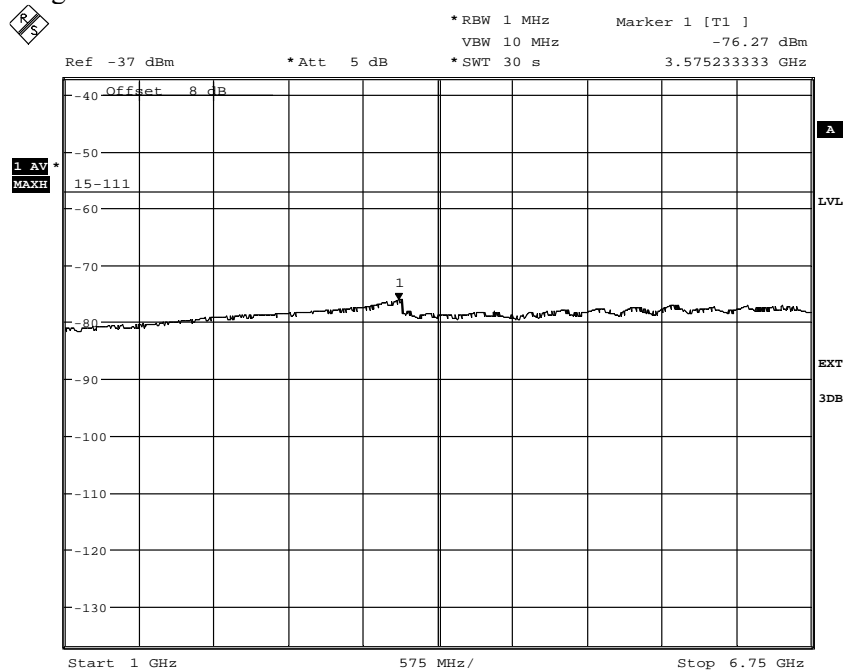
Appendix 8

Diagram 1a:



Date: 7.OCT.2011 14:07:40

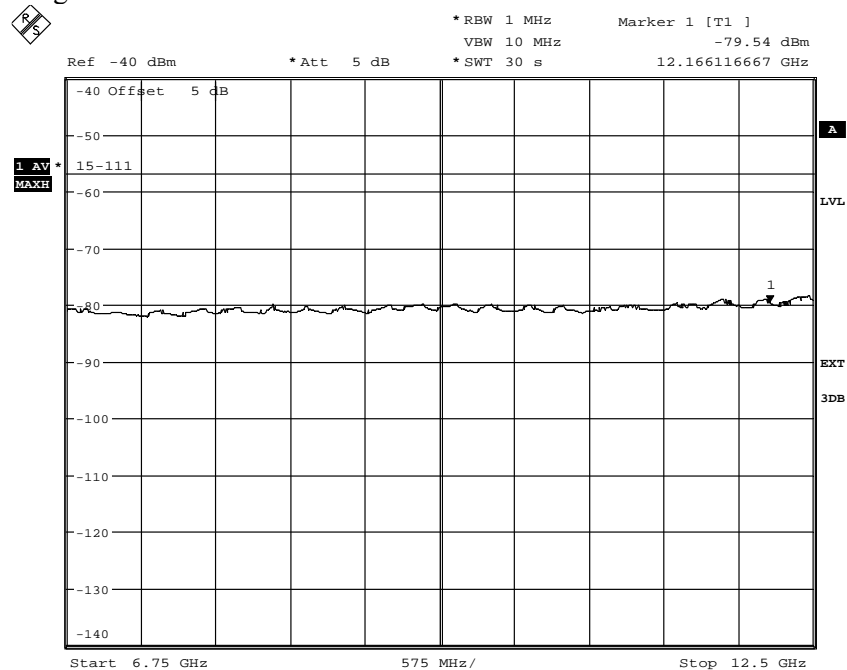
Diagram 1b:



Date: 7.OCT.2011 14:14:07

Appendix 8

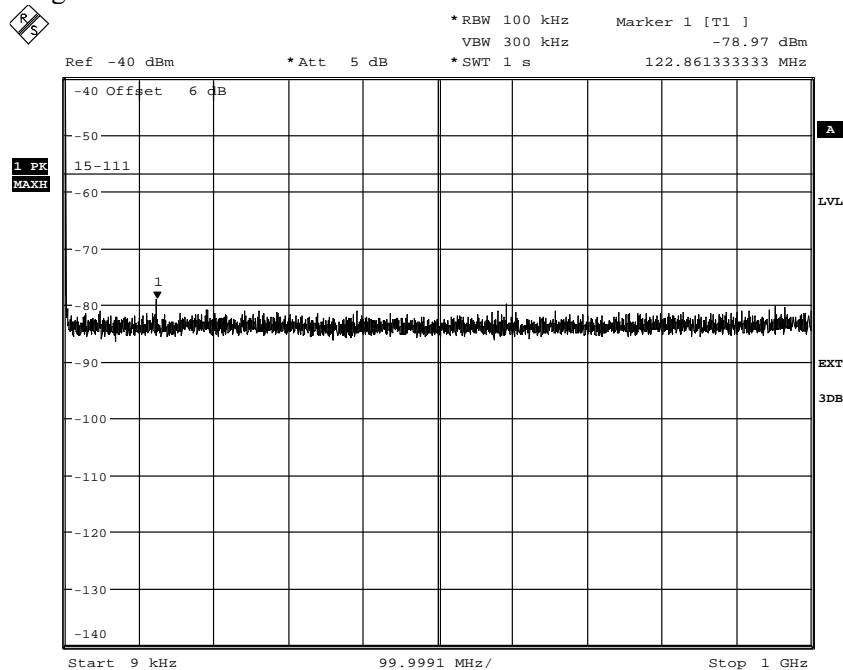
Diagram 1c:



Date: 7.OCT.2011 14:15:55

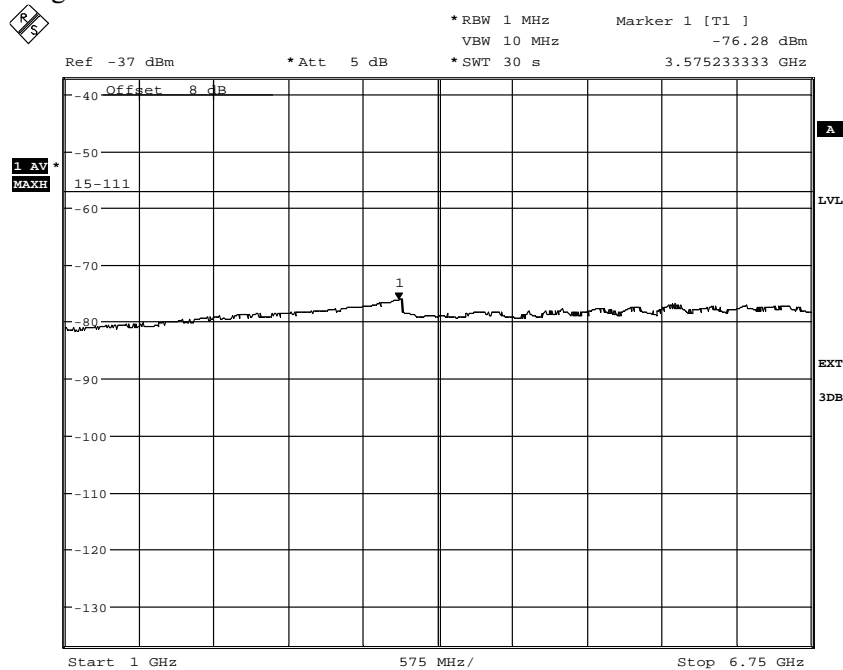
Appendix 8

Diagram 2a:



Date: 7.OCT.2011 14:22:11

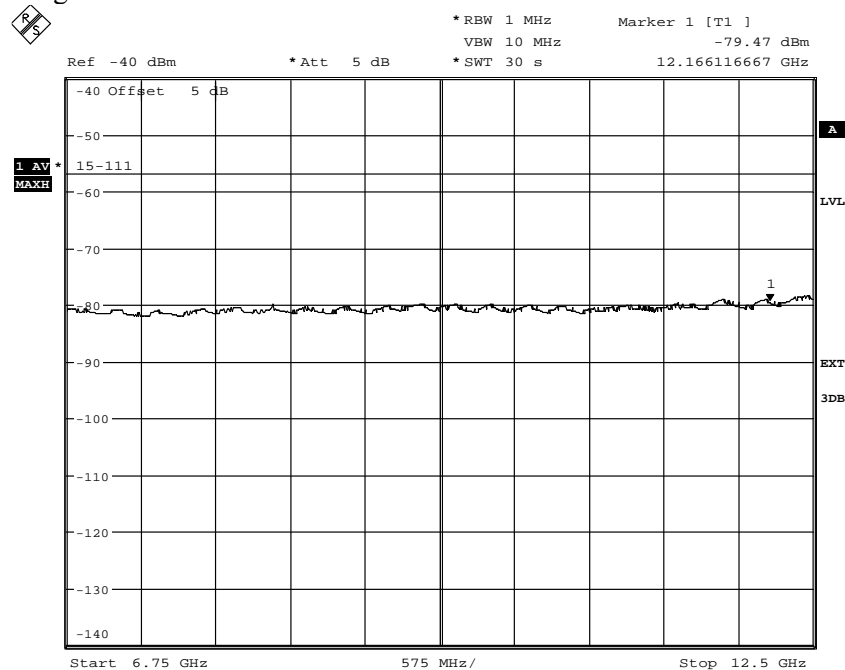
Diagram 2b:



Date: 7.OCT.2011 14:21:34

Appendix 8

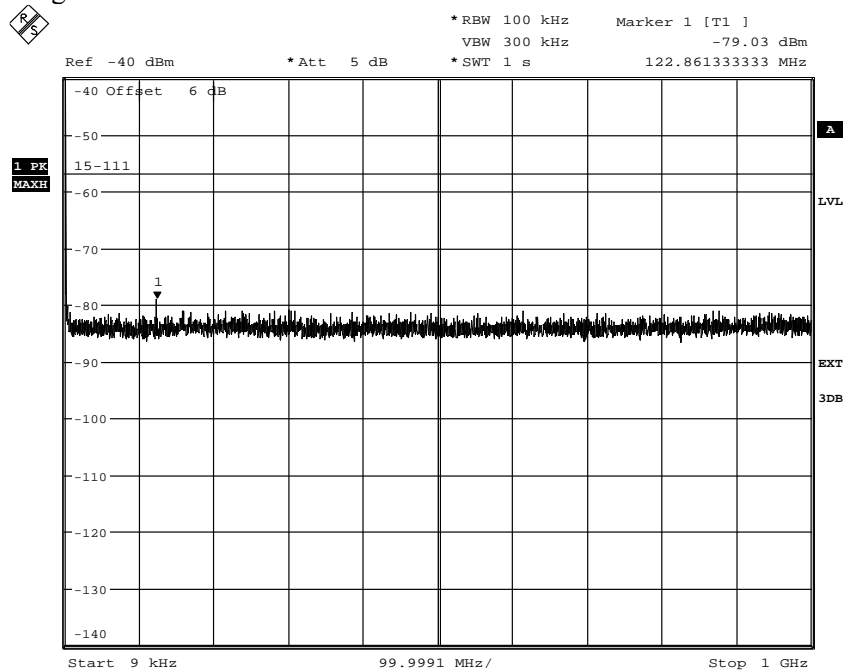
Diagram 2c:



Date: 7.OCT.2011 14:20:18

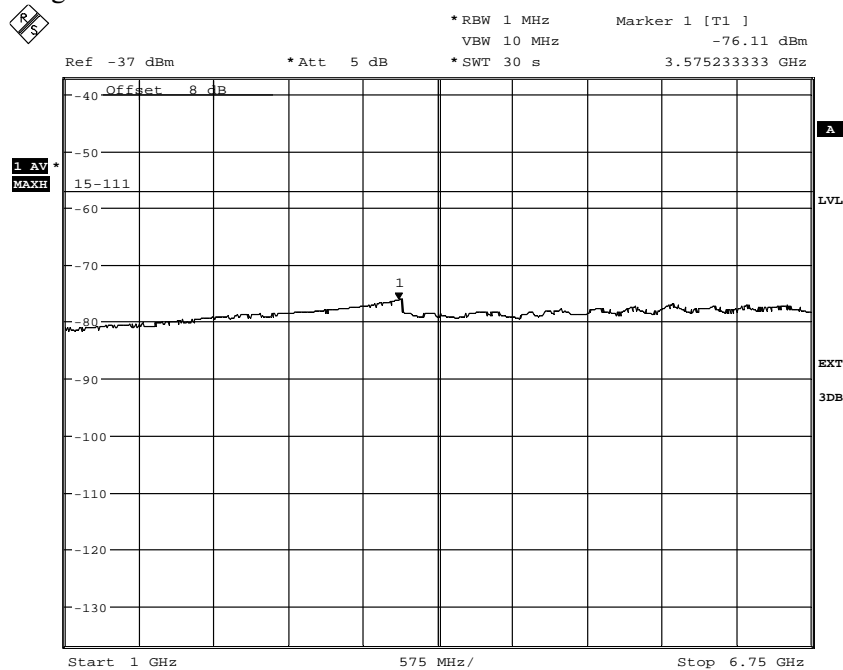
Appendix 8

Diagram 3a:



Date: 7.OCT.2011 14:28:16

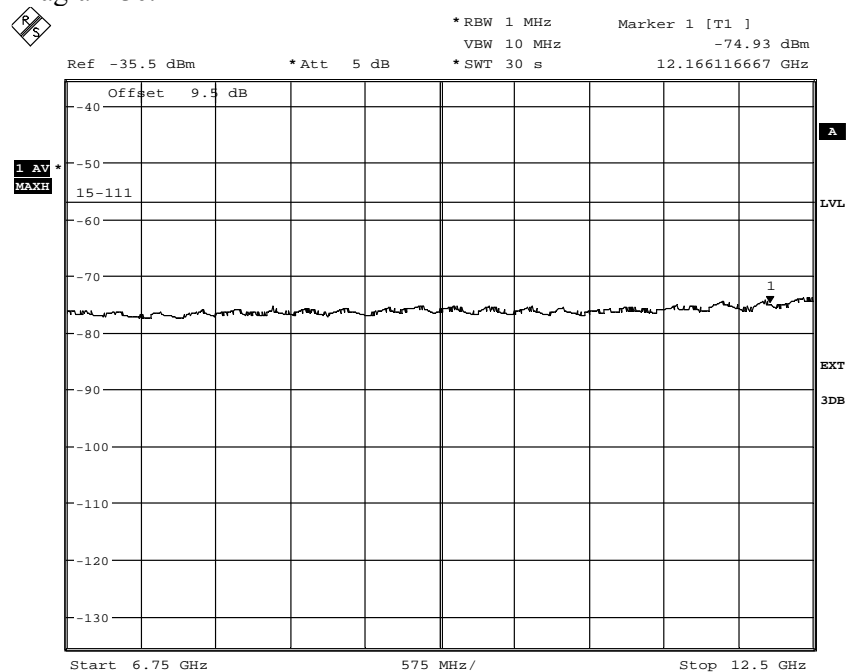
Diagram 3b:



Date: 7.OCT.2011 14:32:26

Appendix 8

Diagram 3c:

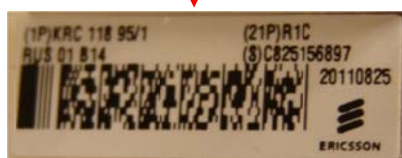
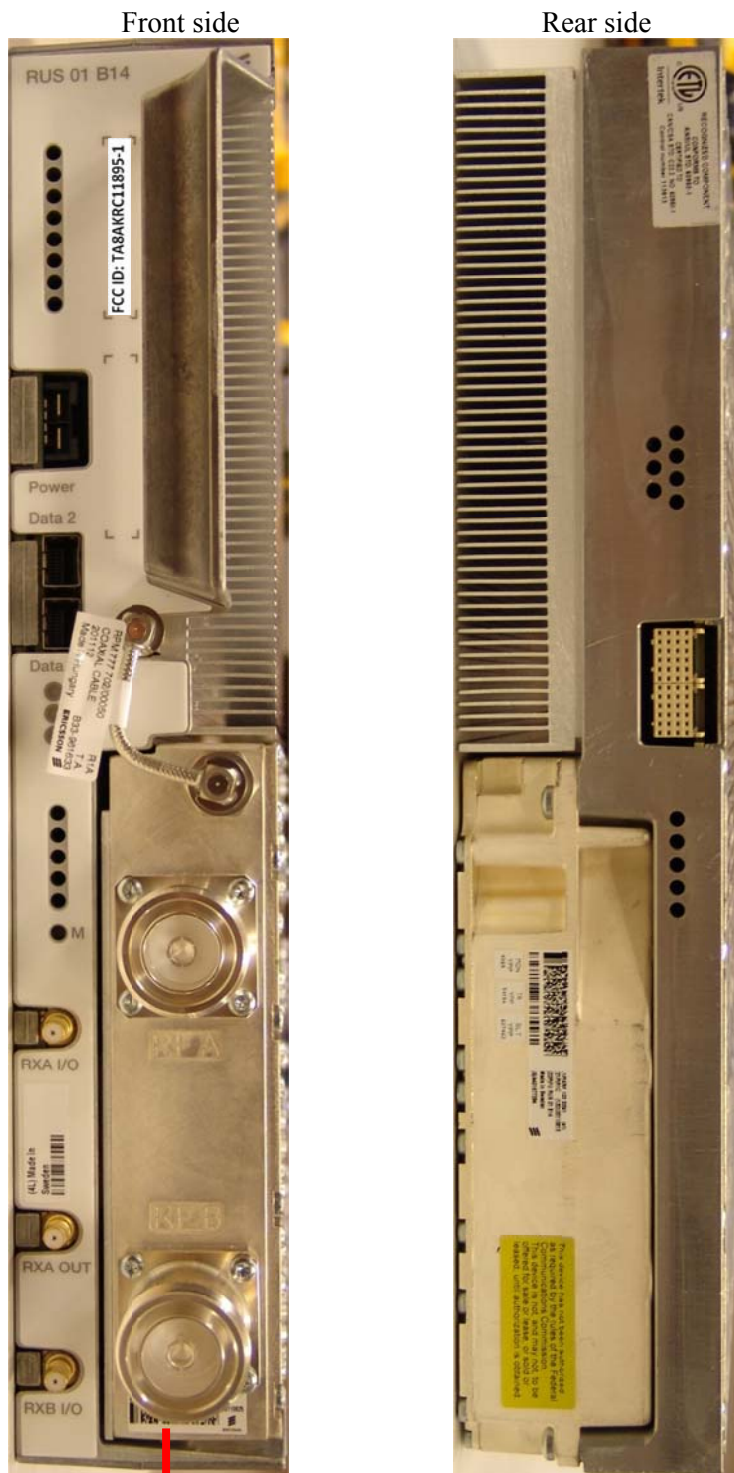


Date: 7.OCT.2011 14:33:26

Appendix 9

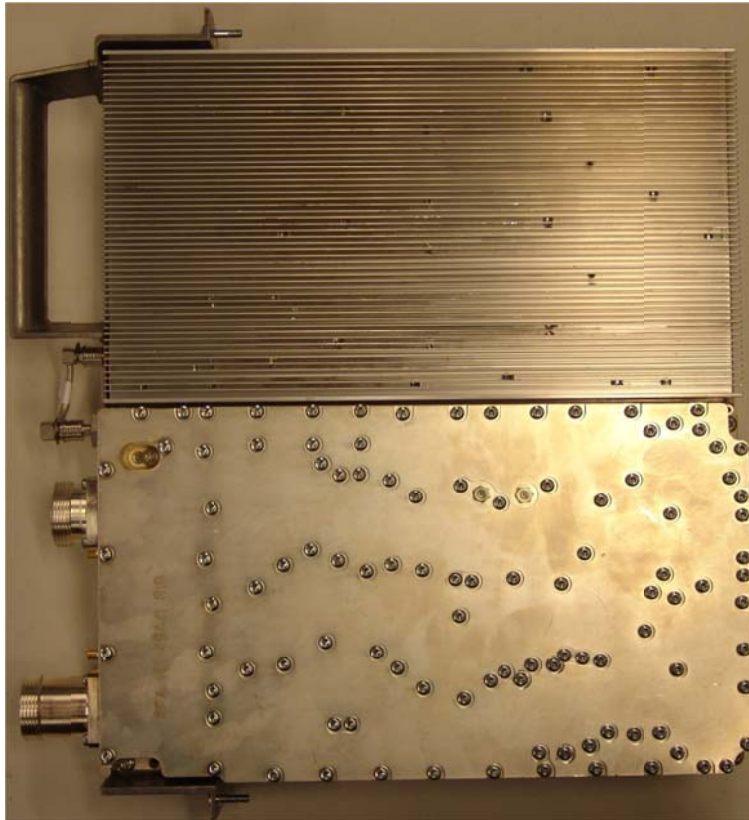
External photos

The photo below shows the unit tested for radiated spurious emission.

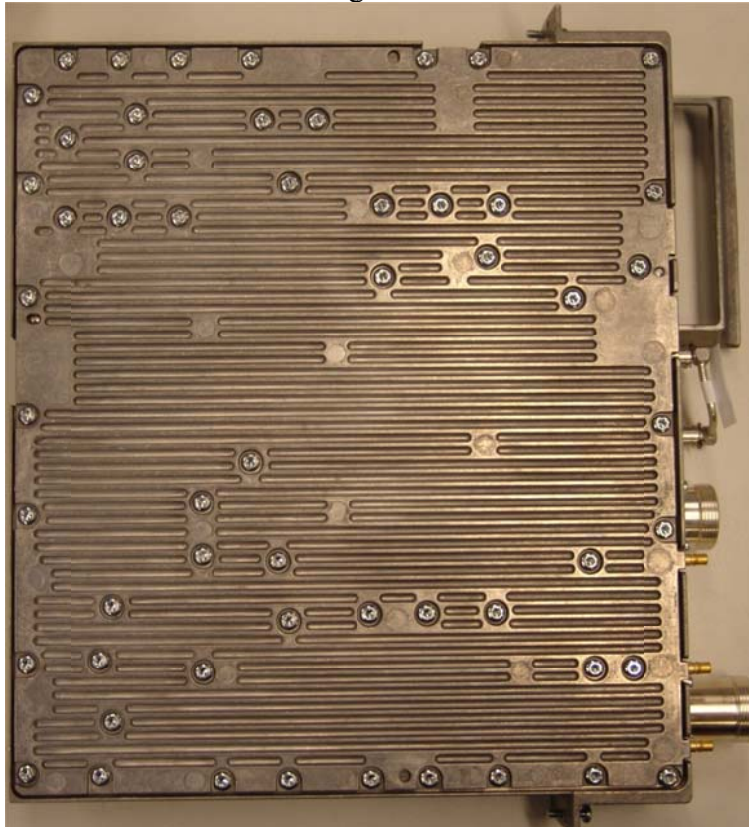


Appendix 9

Left side



Right side



Appendix 9

Bottom side



Top side

