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Class II permissive change measurements on RRUS 11 B25 1900 MHz radio equipment withFCC ID: TA8AKRC131146-1 and IC: 287AB-AS1311461

(7 appendices)

Test object

RRUS 11 B25, KRC 131 146/1

Summary

Appendix 1 describes the test object and set-ups during test.
Appendix 7 presents photos of the test object.

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133			
2.1046 / RSS-133 6.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-133 6.5	Band edge	Yes	4
2.1051 / RSS-133 6.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-133 6.5	Field strength of spurious radiation	Yes	6

Note: Above RSS-133 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

SP Sveriges Tekniska Forskningsinstitut
Electronics - EMC

Performed by

Jörgen Wassholm

Examined by

Krister Kilbrandt

Table of contents

Description of the test object

Equipment:	Radio equipment RRUS 11 B25 supporting single and multi-standard (LTE and CDMA/ LTE) configured for single and multi-carriers
Antenna ports:	2 TX/RX ports
Frequency bands LTE:	TX: 1930 – 1995 MHz RX: 1850 – 1915 MHz
Frequency bands CDMA:	TX: 1930 – 1990 MHz RX: 1850 – 1910 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	
Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidth:	3, 5, 10 and 20 MHz

LTE:

Tested frequencies and EARFCNs for TX measurements

EARFCN Downlink	Frequency [MHz]	Comment
8055	1931.5	TX bottom (B) frequency in3 MHz BW configuration
8140	1940.0	TX bottom (B) frequency in 20 MHz BW configuration
8365	1962.5	TX band mid (M) frequency in all BW configurations
8590	1985.0	TX top (T) frequency in 20 MHz BW configuration
8675	1993.5	TX top (T) frequency in 3 MHz BW configuration

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

LTE+CDMA

Tested configurations

Configuration 1:

	Port A		**Port B**	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8075 (1933.5 MHz)	25 (1931.25 MHz)	50 (1932.5 MHz)	75 (1933.75 MHz)
Uplink	26075 (1853.5 MHz)	25 (1851.25 MHz)	50 (1852.5 MHz)	75 (1853.75 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 2:

	Port A		**Port B**	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8365 (1962.5 MHz)	600 (1960.0 MHz)	625 (1961.25 MHz)	650 (1962.50 MHz)
Uplink	26365 (1882.5 MHz)	600 (1880.0 MHz)	625 (1881.25 MHz)	650 (1882.50 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 3:

	Port A		Port B	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8675 (1993.5 MHz)	1175 (1988.75 MHz)	1150 (1987.5 MHz)	1125 (1886.25 MHz)
Uplink	26675 (1913.5 MHz)	1175 (1908.75 MHz)	1150 (1907.50 MHz)	1125 (1906.25 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 4:

	Port A		Port B	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8199 (1945.9 MHz)	625 (1961.25 MHz)	650 (1962.5 MHz)	675 (1963.75 MHz)
Uplink	26153 (1865.3 MHz)	625 (1881.25 MHz)	650 (1882.5 MHz)	675 (1883.75 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 5:

	Port A		Port B	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8331 (1959.1 MHz)	625 (1961.25 MHz)	650 (1962.5 MHz)	675 (1963.75 MHz)
Uplink	26365 (1879.1 MHz)	625 (1881.25 MHz)	650 (1882.5 MHz)	675 (1883.75 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 6:

	Port A		Port B	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8055 (1931.5 MHz)	75 (1933.75 MHz)	100 (1935 MHz)	125 (1936.25 MHz)
Uplink	26055 (1851.5 MHz)	625 (1881.25 MHz)	650 (1882.5 MHz)	675 (1883.75 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	1.25 MHz

Configuration 7:

	Port A		Port B	
	LTE	**CDMA**	**CDMA**	**CDMA**
	(20 W)	(20 W)	(20 W)	(20 W)
Downlink	8675 (1993.5 MHz)	1175 (1988.75 MHz)	1150 (1987.5 MHz)	1125 (1986.25 MHz)
Uplink	26675 (1913.5 MHz)	1175 (1908.75 MHz)	1150 (1907.5 MHz)	1125 (1906.25 MHz)
Modulation	QPSK	QPSK	QPSK	QPSK
Bandwidth	3 MHz	1.25 MHz	1.25 MHz	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.
All measurements were performed with the test object configured for maximum transmit power.

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

Conducted measurements

The test object was supplied with -48 VDC by an external power supply. All TX parameters were measured at on port RF A with port RF B terminated into 50 ohm.

Radiated measurements

The test object was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmit power at port RF A and RF B.

Purpose of test

The purpose of the test is to verify compliance of applicable parts of FCC CFR 47 for the bandwidths of 3 and 20 MHz.

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 , 2011
CFR 47 part 24 Subpart E, October 1st, 2011
RSS-Gen Issue 3
RSS-133 Issue 5

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2014-01	503 881
R&S FSIQ 40	2013-07	503 738
R&S FSQ 40	2013-07	504 143
R&S ESU 26	2013-03	901 553
Control computer with R&S software EMC32 version 8.52.0	-	503 479
High pass filter	2013-07	504 199
High pass filter	2013-07	901 502
High pass filter	2013-01	901 373
High pass filter	2013-08	503 739
High pass filter	2013-07	503 740
High pass filter	2013-08	504 200
RF attenuator	2013-07	504 159
RF attenuator	2012-10	900 233
RF attenuator	2013-01	901 374
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	2013-08	503 285
Temperature cabinet	-	503 360
Testo 635 Temperature and humidity meter	2013-05	504 203
Testo 625 Temperature and humidity meter	2013-05	504 188

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: 2012-04-13.

Manufacturer's representative

Christer Gustavsson, Ericsson AB

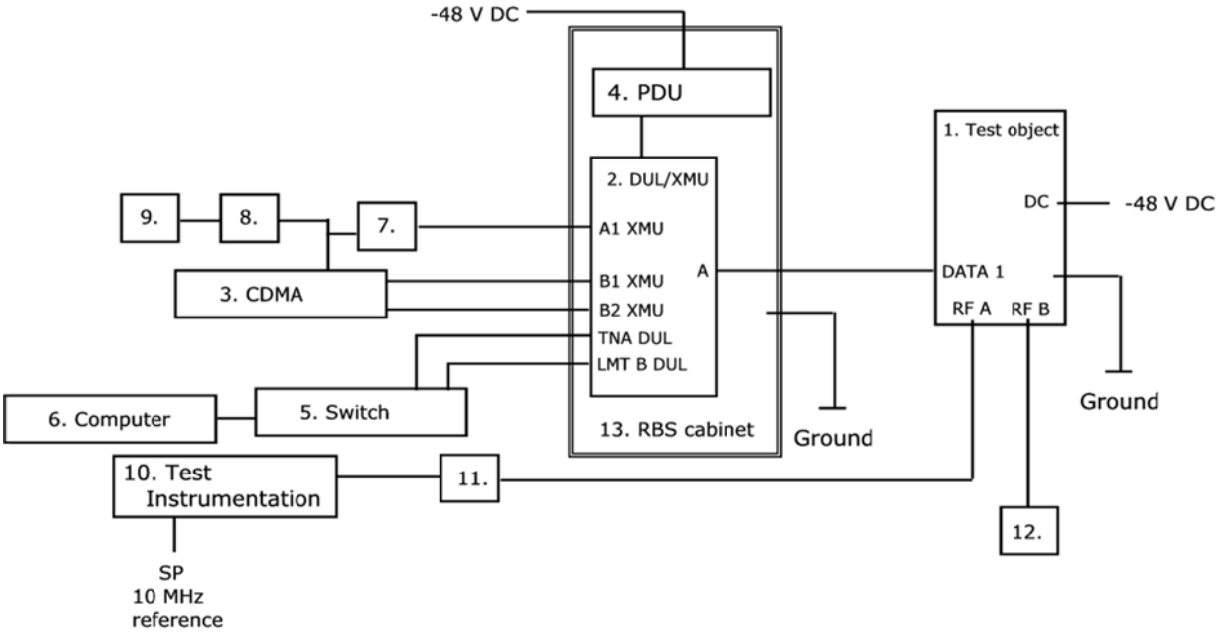
Test engineers

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

Test participant

None

Test set-up conducted measurements TX



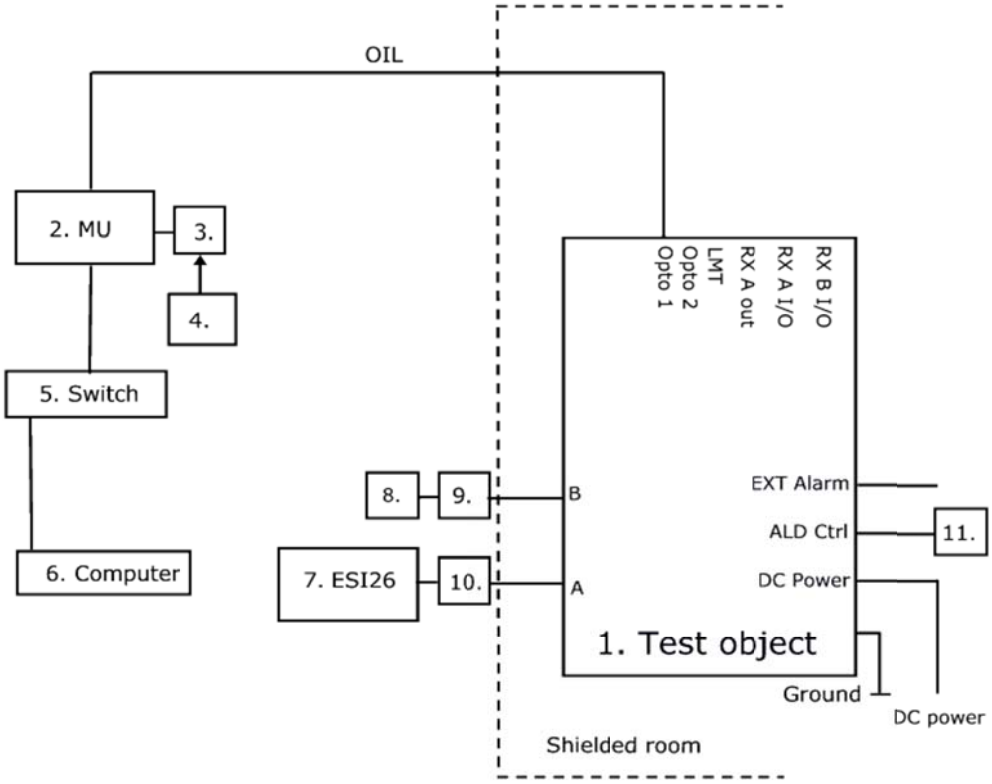
Test object

1. RRUS 11 B25, KRC 131 146/1, rev. R3B, s/n: C826008765
   (FCC ID: TA8AKRC131146-1 / IC: 287AB-AS1311461)
   with software (PIS): CXP 901 7316/1 rev. R44FK and unlocked working software:
   CXP 901 3268/6 rev. R48ZG

Functional test equipment

2. DU 1: DUL 02 01, KDU 137 533/4, Rev R1F, S/N: CC49392150 and
   DU 2: XMU 02 01, KDU 137 745/1, Rev R2A, S/N: C825744858
3. EMC CDMA NR: 0708, see details on the page 11
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 B25, KRC 131 146/1, rev. R3B, s/n: C826008765
(FCC ID: TA8AKRC131146-1 / IC: 287AB-AS1311461)
with software (PIS): CXP 901 7316/1 rev. R44FK and unlocked working software:
CXP 901 3268/6 rev. R48ZG

Functional test equipment

2. RBS 6601 Main Unit, see table below and EMC CDMA rack NR:0708 BAMS-1001029599
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-1001052032
7. Spectrum analyser ESI26 SP 503292
8. Terminator
9. Attenuator
10. Attenuator
11. RET – Remote Electrical Tilt unit

Test object ports

Interface:	Type of port:
Power: -48 VDC	DC Power
Antenna port (A) ”RF A”, 7/16 connector	Antenna
Antenna port (B) ”RF B”, 7/16 connector	Antenna
Opto 1, Optical Interface Link, single mode opto fibre	Telecom
Opto 2, Optical Interface Link, no opto attached	Telecom
LMT, for maintenance use only	Telecom
RX A Out, no cable attached	Antenna
RX A I/O, no cable attached	Antenna
RX B I/O, no cable attached	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 6601 Main Unit

Product name	Product number	R-state	Serial number
DUL 20 01	KDU 137 533/4	R1F	CC49392150
XMU 02 01	KDU 137 745/1	R2A	C825744858
SUP 6601	1/BFL 901 009/1	R3B	BR81174230

RBS software

LTE:

Software	Revision
CXP 102 051/16	R1521BV

CDMA:

Software	Revision
Vortex ver. 1804_12wk07	-

RF power output measurements according to CFR 47 §24.232 / IC RSS-133 6.4

Date	Temperature	Humidity
2012-08-31	22 °C ± 3°C	47 % ± 5 %
2012-09-04	21 °C ± 3°C	61 % ± 5 %
2012-09-06	22 °C ± 3°C	40 % ± 5 %
2012-09-10	20 °C ± 3°C	56 % ± 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
RF attenuator	900 233
Testo 635, temperature and humidity meter	504 203
Rhode & Schwarz FSQ 40	504 143

Measurement uncertainty: 1.1 dB

Results

LTE:

Rated output power level at port RF A (maximum): 46.0 dBm

BW configuration (MHz)	Frequency	RMS Pwr (dBm)	PAR
3	B	45.76	Diagram 1
20	B	45.66	Diagram 2
3	M	45.64	Diagram 3
20	M	45.61	Diagram 4
3	T	45.59	Diagram 5
20	T	45.50	Diagram 6

LTE+ CDMA:

Rated output power level at port RF A (maximum): 46.0 dBm

Configuration	RMS Pwr (dBm)	PAR
Configuration 1	45.26	Diagram 7
Configuration 2	45.47	Diagram 8
Configuration 3	44.99	Diagram 9

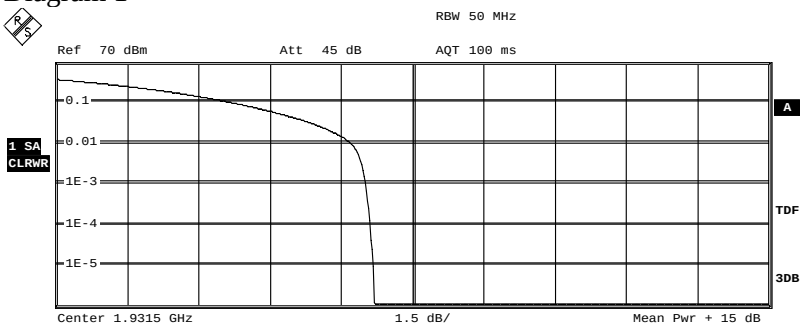
Limits

§24.232 Federal Register / Vol. 73, No. 86
The maximum output power may not exceed 1640 W/MHz (EIRP).
The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-133: The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio(PAR) of the power shall not exceed 13 dB.

Complies?	Yes

Diagram 1

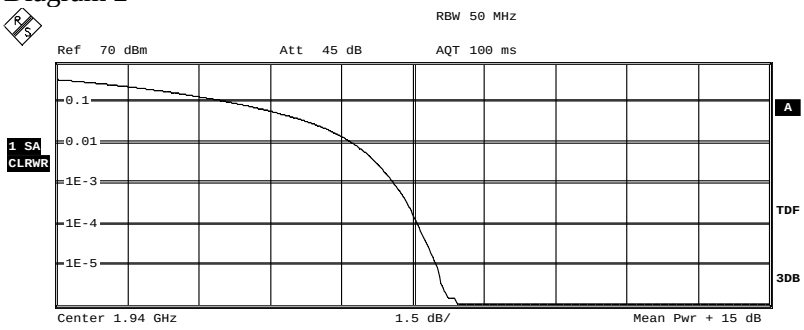


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	45.76 dBm
Peak	52.52 dBm
Crest	6.75 dB
10 %	3.73 dB
1 %	6.20 dB
.1 %	6.51 dB
.01 %	6.61 dB

Date: 4.SEP.2012 13:27:31

Diagram 2

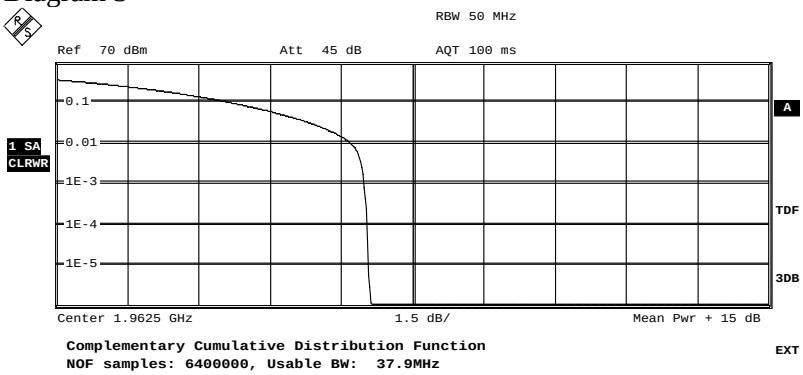


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	45.66 dBm
Peak	54.24 dBm
Crest	8.58 dB
10 %	3.73 dB
1 %	6.23 dB
.1 %	7.09 dB
.01 %	7.60 dB

Date: 4.SEP.2012 12:42:26

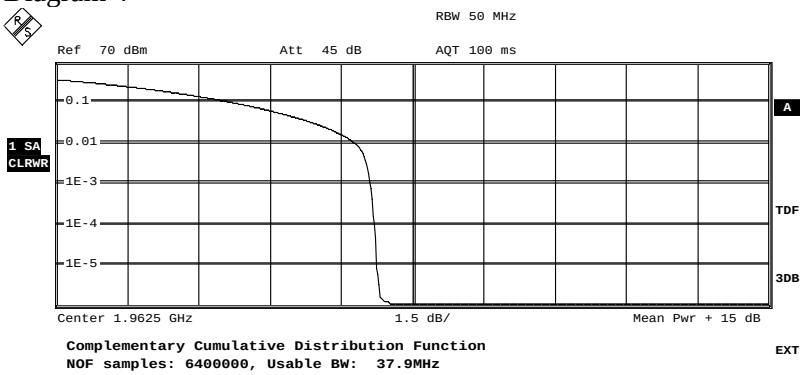
Diagram 3



	Trace 1
Mean	45.64 dBm
Peak	52.27 dBm
Crest	6.63 dB
10 %	3.73 dB
1 %	6.20 dB
.1 %	6.49 dB
.01 %	6.56 dB

Date: 31.AUG.2012 08:05:10

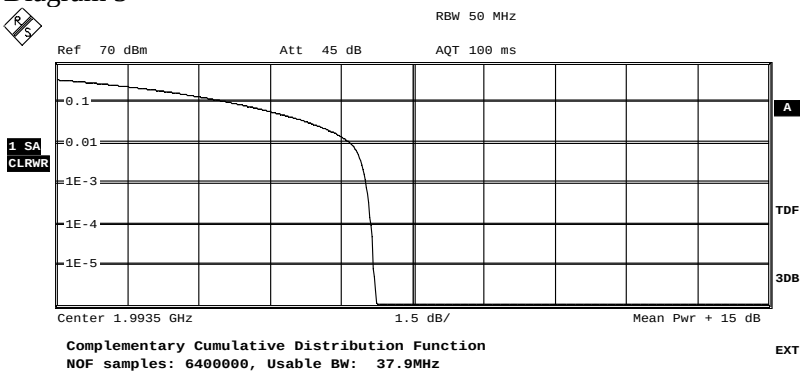
Diagram 4



	Trace 1
Mean	45.61 dBm
Peak	52.91 dBm
Crest	7.30 dB
10 %	3.75 dB
1 %	6.27 dB
.1 %	6.61 dB
.01 %	6.71 dB

Date: 4.SEP.2012 11:04:19

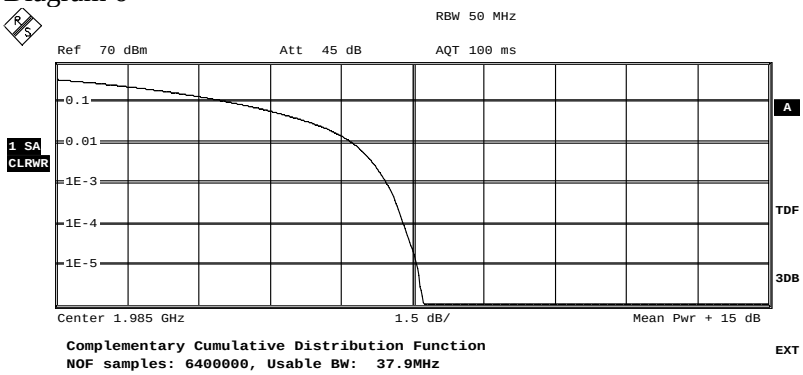
Diagram 5



	Trace 1
Mean	45.59 dBm
Peak	52.33 dBm
Crest	6.74 dB
10 %	3.73 dB
1 %	6.20 dB
.1 %	6.51 dB
.01 %	6.63 dB

Date: 4.SEP.2012 14:04:28

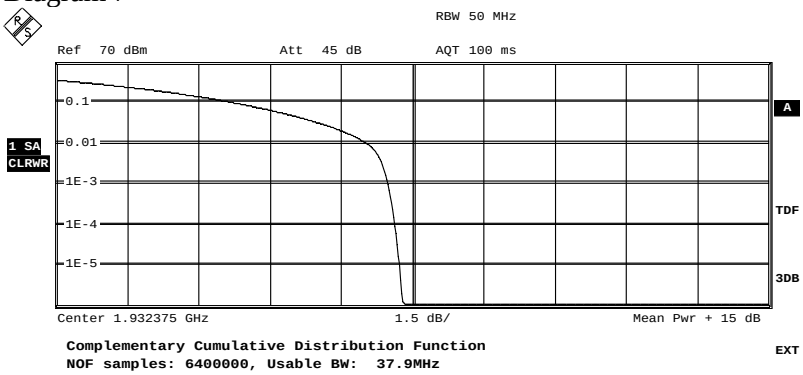
Diagram 6



	Trace 1
Mean	45.50 dBm
Peak	53.30 dBm
Crest	7.80 dB
10 %	3.73 dB
1 %	6.25 dB
.1 %	6.97 dB
.01 %	7.31 dB

Date: 4.SEP.2012 15:42:55

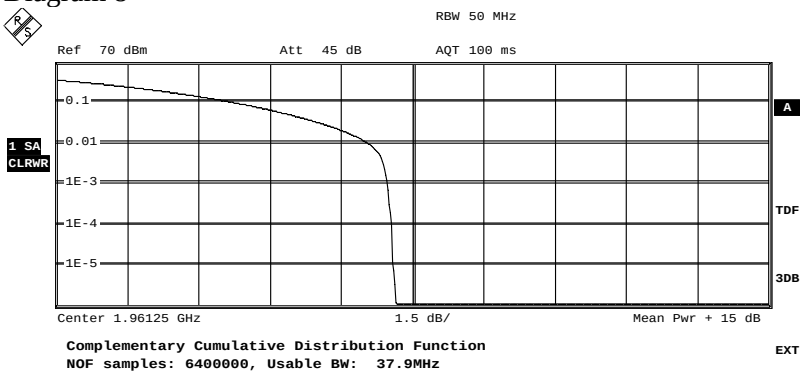
Diagram 7



	Trace 1
Mean	45.26 dBm
Peak	52.66 dBm
Crest	7.40 dB
10 %	3.80 dB
1 %	6.54 dB
.1 %	7.00 dB
.01 %	7.14 dB

Date: 10.SEP.2012 09:44:01

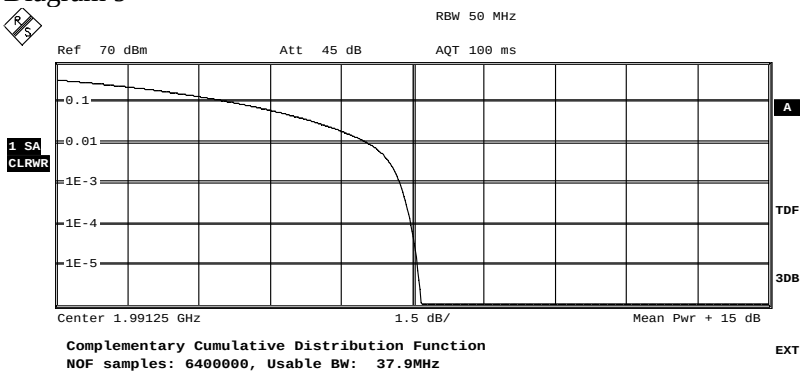
Diagram 8



	Trace 1
Mean	45.47 dBm
Peak	52.62 dBm
Crest	7.15 dB
10 %	3.77 dB
1 %	6.56 dB
.1 %	6.97 dB
.01 %	7.07 dB

Date: 10.SEP.2012 10:33:00

Diagram 9



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

	Trace 1
Mean	44.99 dBm
Peak	52.75 dBm
Crest	7.75 dB
10 %	3.77 dB
1 %	6.56 dB
.1 %	7.24 dB
.01 %	7.48 dB

Date: 6.SEP.2012 15:38:40

Occupied bandwidth measurements according to CFR 472.1049 / IC RSS-Gen 4.6.1

Date	Temperature	Humidity
2012-09-04	21 °C ± 3°C	61 % ± 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	900 233
Testo 615 temperature and humidity meter	503 498

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration	Tested frequency	OBW / [MHz]
1	3 MHz	B	2.69
2	20 MHz	B	17.85
3	3 MHz	M	2.69
4	20 MHz	M	17.87
5	3 MHz	T	2.69
6	20 MHz	T	17.87

Diagram 1

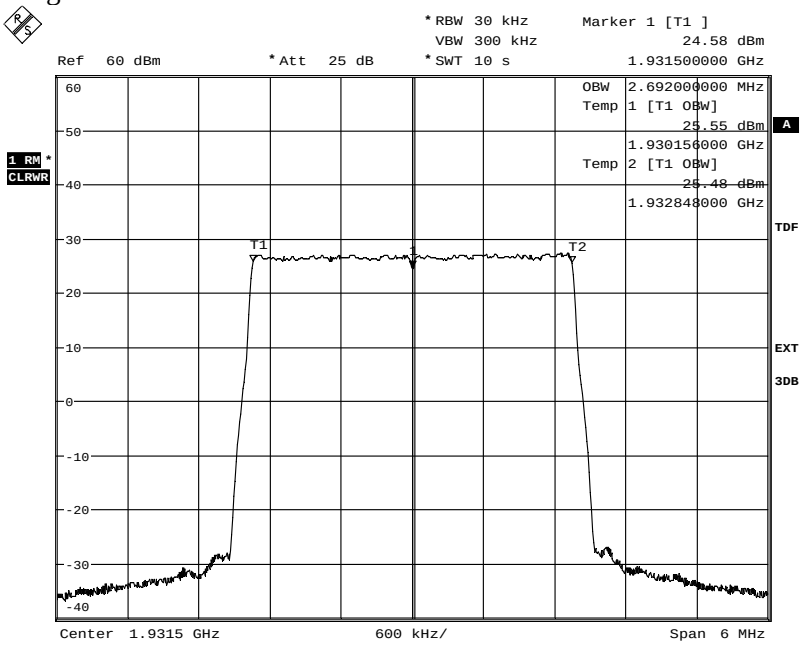


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Diagram 2

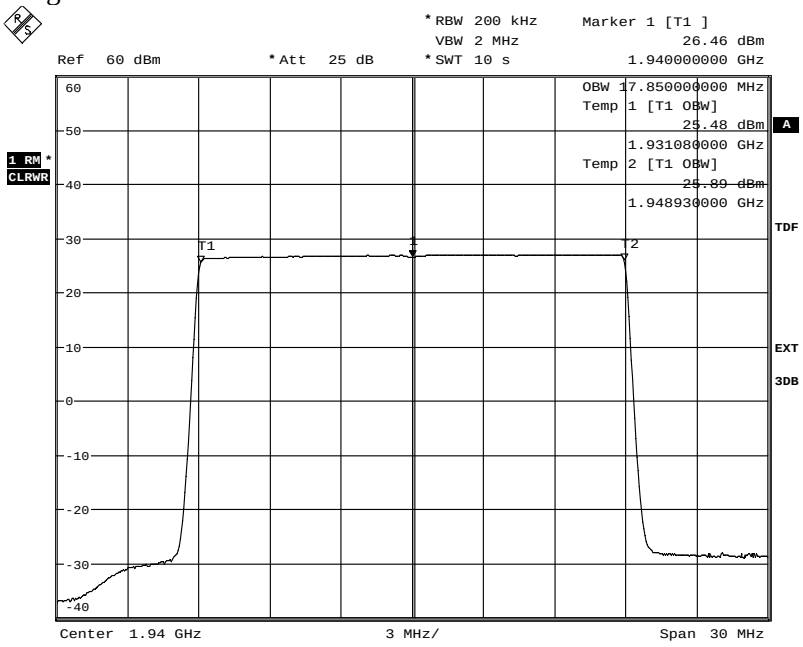

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Diagram 3

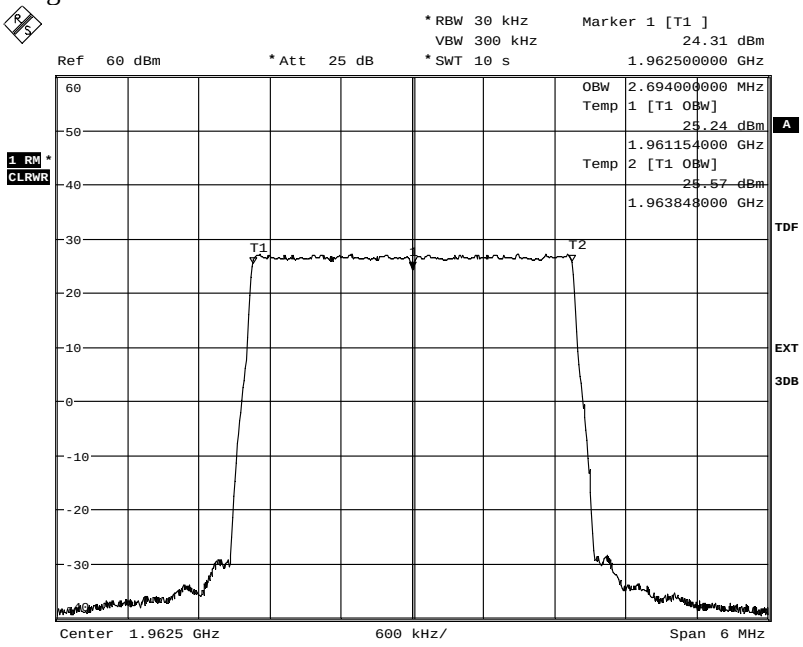

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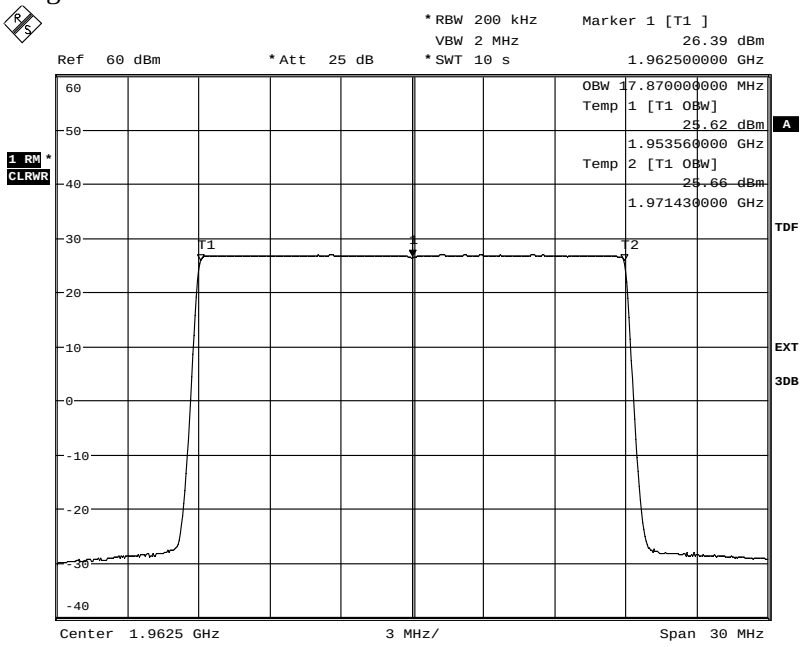
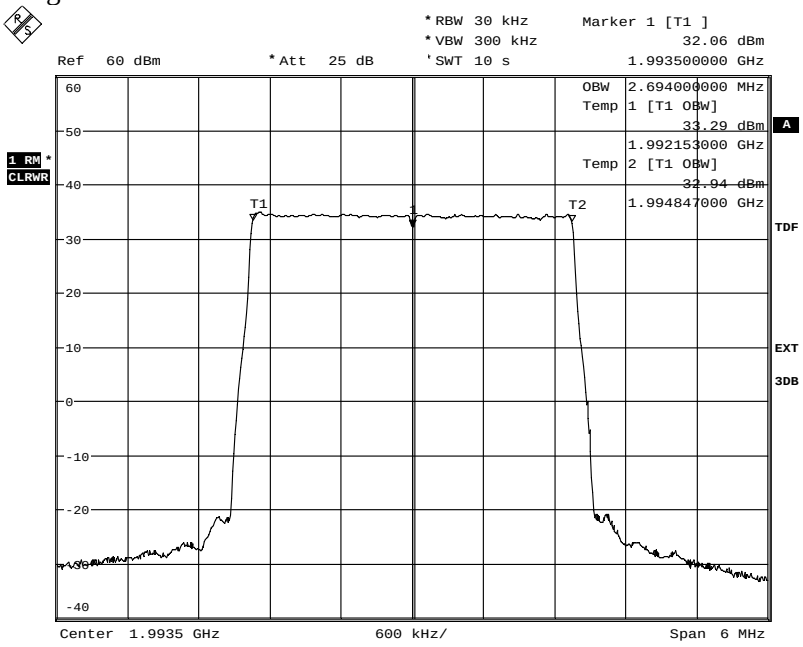
Diagram 4



Date: 4.SEP.2012 12:28:57

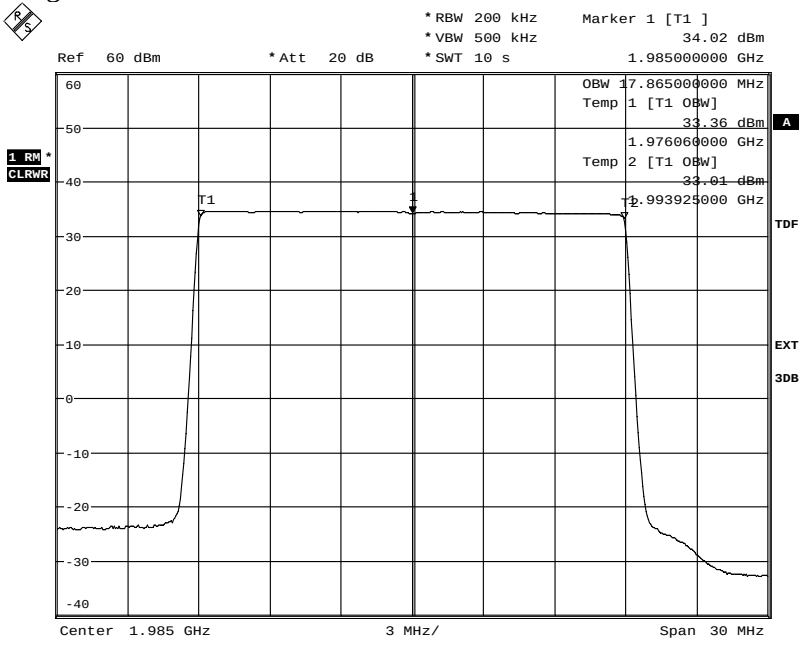
Diagram 5



Date: 4.SEP.2012 14:31:53

Note: The measurement was performed with incorrect attenuation factors. The error does not affect the specific test.

Diagram 6



Date: 4.SEP.2012 15:40:15

Band edge measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-09-04	21 °C ± 3°C	61 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238 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.

Beyond the 1st MHz off the band edges the limit was adjusted to compensate for reduced measurement bandwidths pursuant to the FCC rules, specifying a RBW of at least 1% of the fundamental emission bandwidth up to 1 MHz away from the band edges and a RBW of 1 MHz for measurements of emissions more than 1 MHz away from the band edges.
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 -20 dBm.

Measurement equipment	SP number
RF attenuator	900 233
Testo 635, temperature and humidity meter	504 203
Rhode & Schwarz FSQ 40	504 143

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration	Tested frequency
1 a+b+c	3 MHz	B
2 a+b+c	20 MHz	B
3 a+b+c	3 MHz	T
4 a+b+c	20 MHz	T

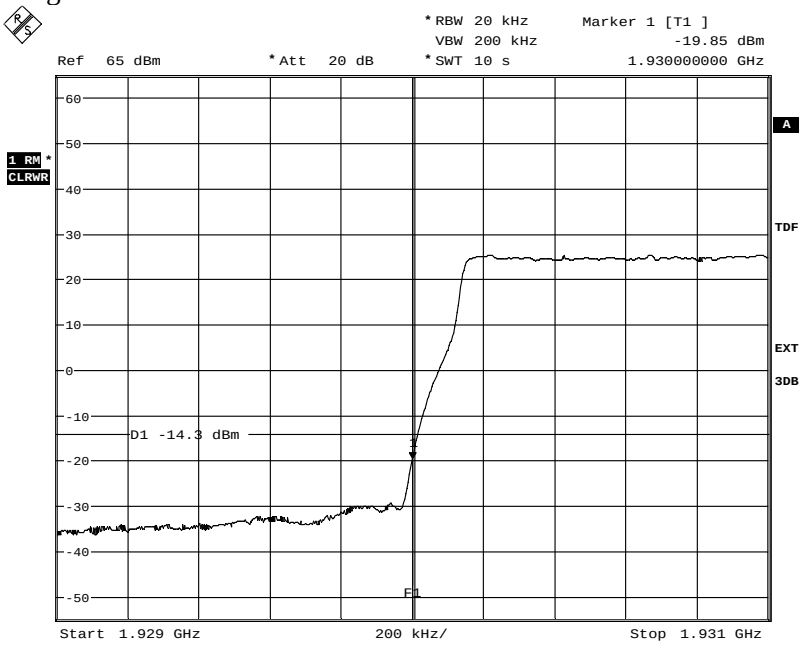
Limits

CFR 47 §24.238 and RSS-133 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.

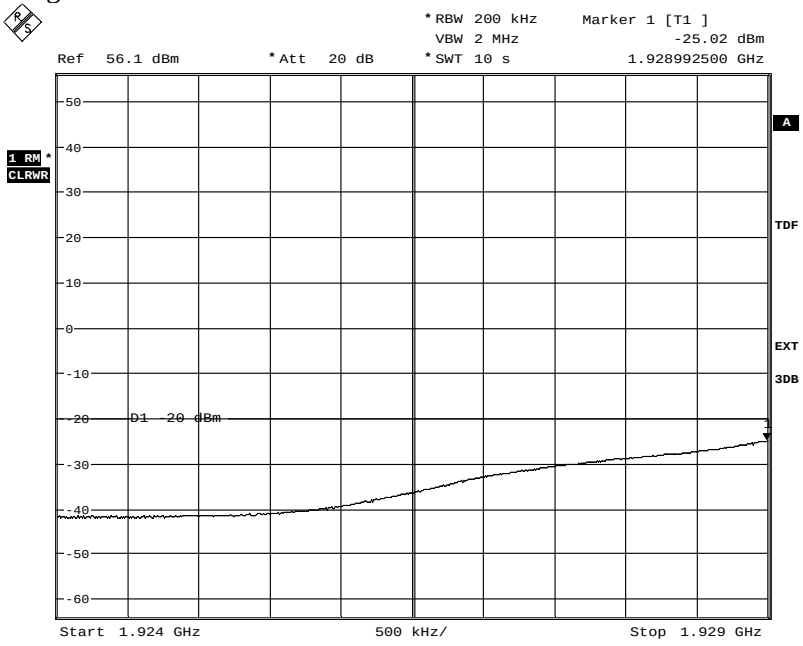
Complies?	Yes

Diagram 1 a



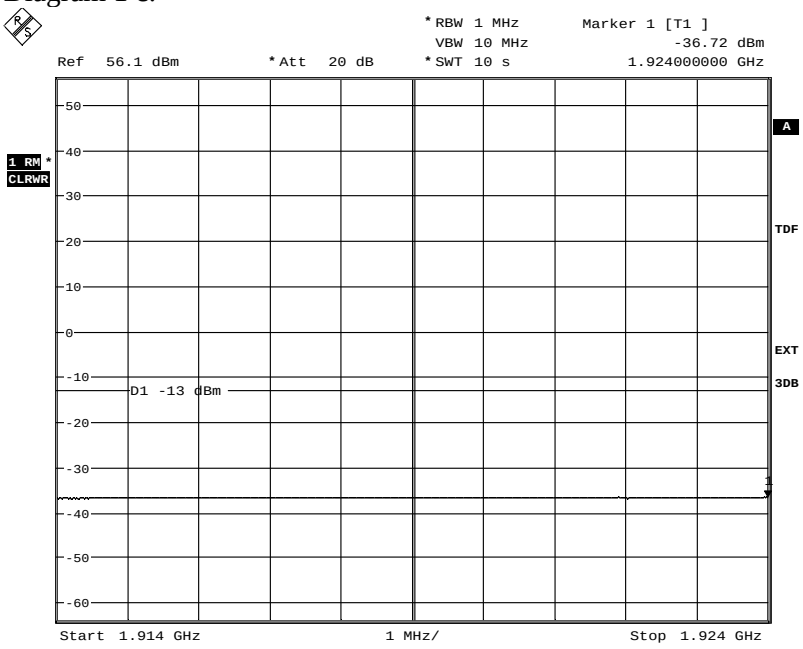
Date: 4.SEP.2012 13:22:36

Diagram 1 b



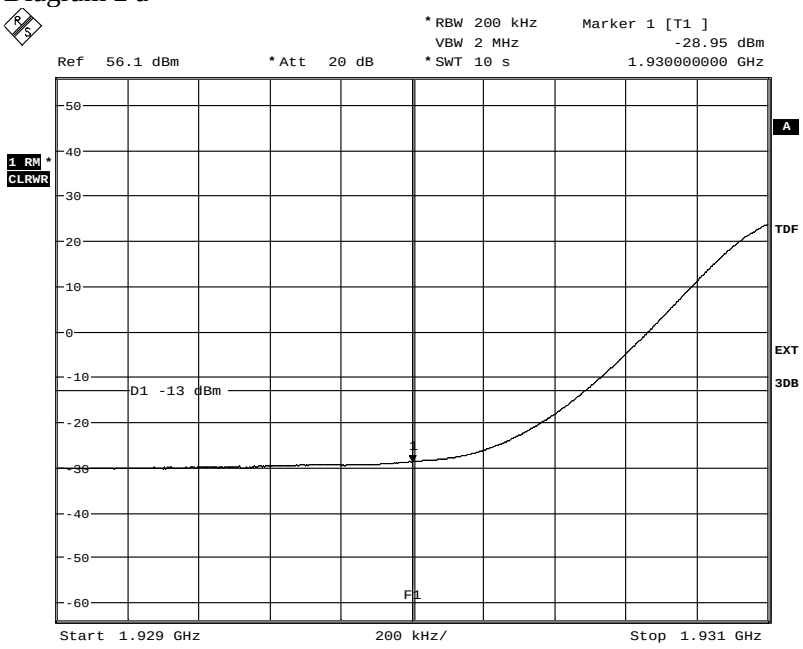
Date: 4.SEP.2012 13:23:40

Diagram 1 c:



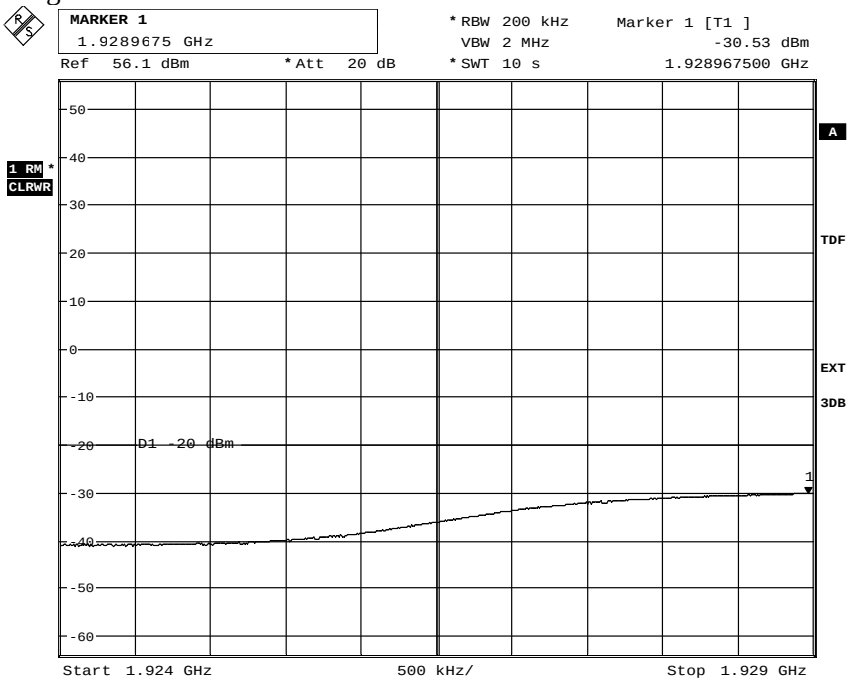
Date: 4.SEP.2012 13:25:03

Diagram 2 a



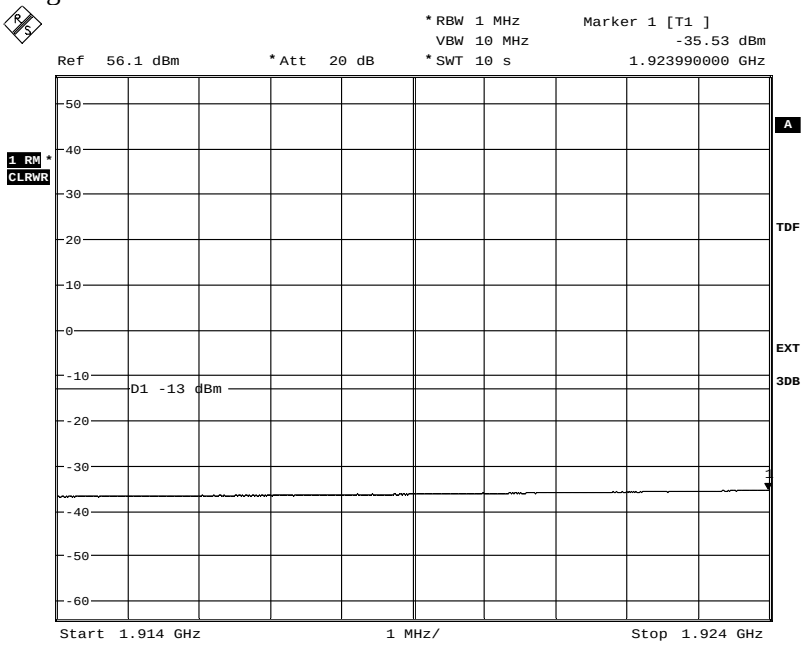
Date: 4.SEP.2012 13:12:18

Diagram 2 b



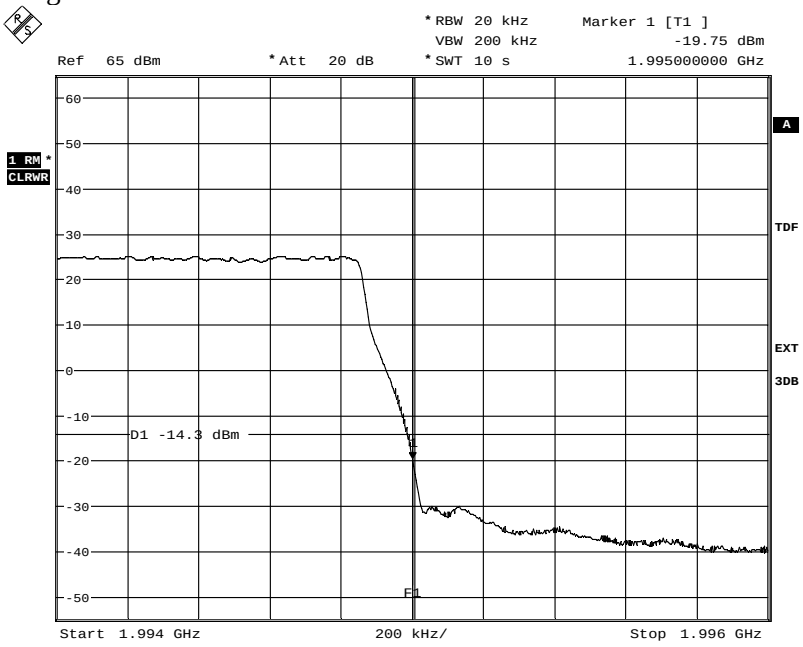
Date: 4.SEP.2012 13:10:38

Diagram 2 c



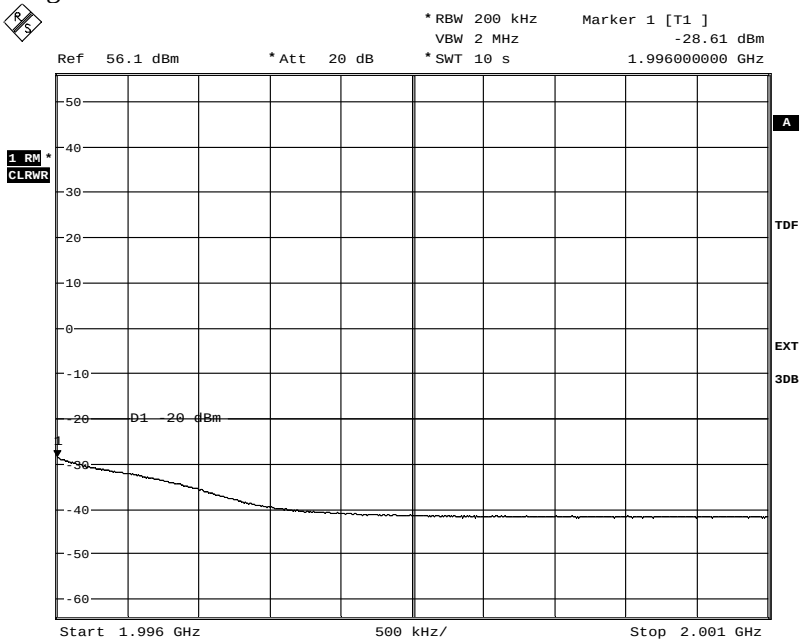
Date: 4.SEP.2012 13:09:23

Diagram 3 a



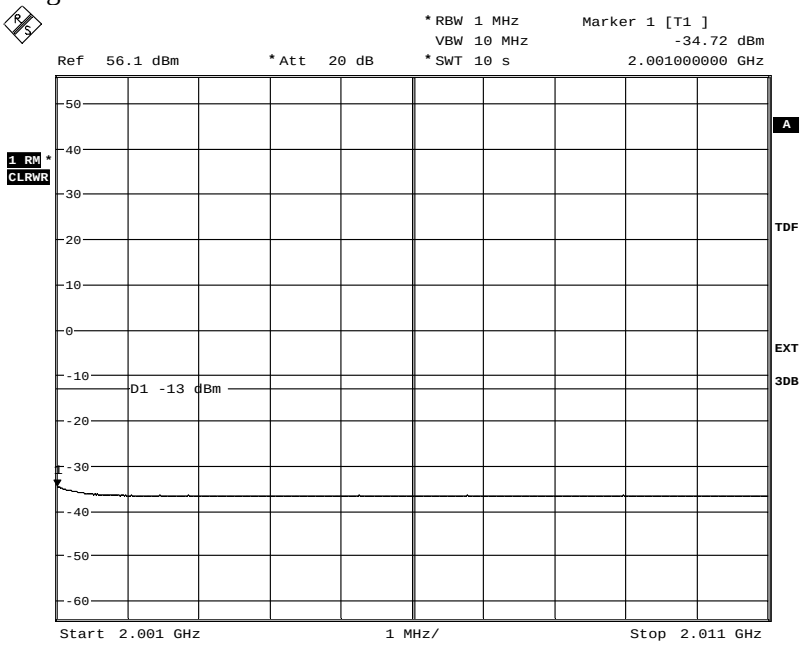
Date: 4.SEP.2012 14:17:19

Diagram 3 b



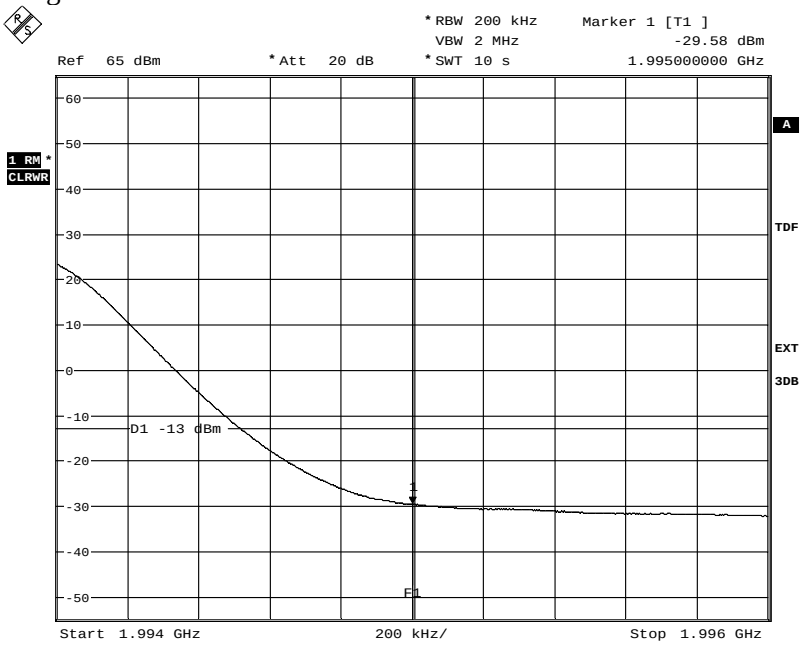
Date: 4.SEP.2012 14:25:30

Diagram 3 c



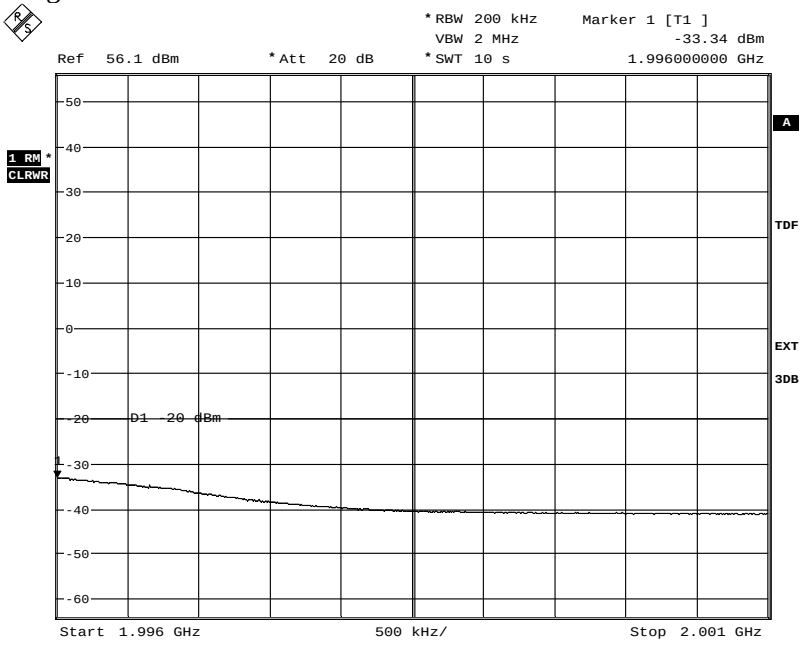
Date: 4.SEP.2012 14:28:01

Diagram 4 a



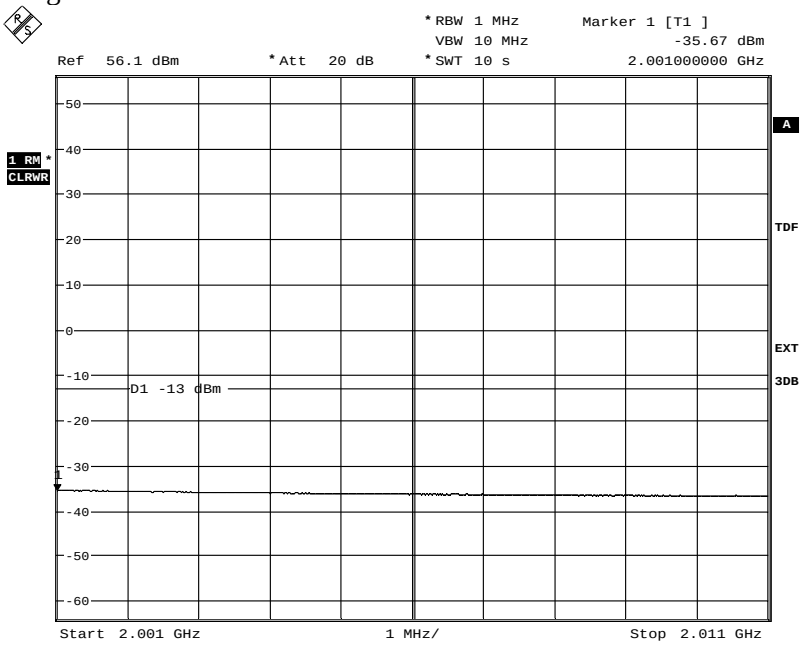
Date: 4.SEP.2012 15:35:12

Diagram 4 b



Date: 4.SEP.2012 15:37:22

Diagram 4 c



Date: 4.SEP.2012 15:38:24

Conducted spurious emission measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-08-31	22 °C ± 3°C	47 % ± 5 %
2012-09-04	21 °C ± 3°C	61 % ± 5 %
2012-09-06	22 °C ± 3°C	40 % ± 5 %
2012-09-10	20 °C ± 3°C	56 % ± 5%

Test set-up and procedure
The measurements were made per definition in §24.238. 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
RF attenuator	900 233
RF attenuator	901 374
HP filter	901 502
Rhode & Schwarz FSQ 40	504 143
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

LTE

Diagram	BW configuration / [MHz]	Tested frequency
1 a-d	3	B
2 a-d	20	B
3 a-d	3	M
4 a-d	20	M
5 a-d	3	T
6 a-d	20	T

LTE+CDMA

Diagram	Configuration
7 a-e	1
8 a-d	2
9 a-e	3

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 10x2.5 GHz = 25 GHz for emission measurements.

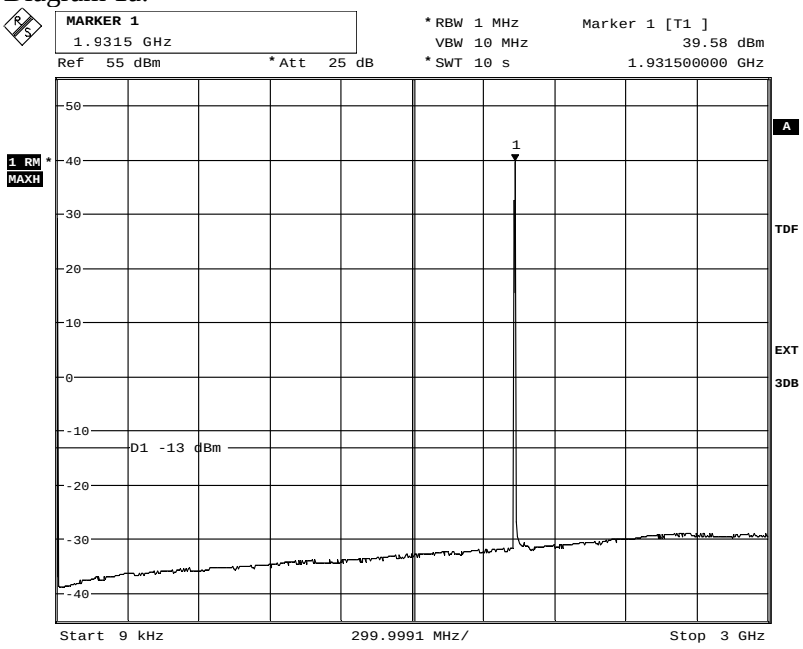
Limits

§24.238 and RSS-133 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.

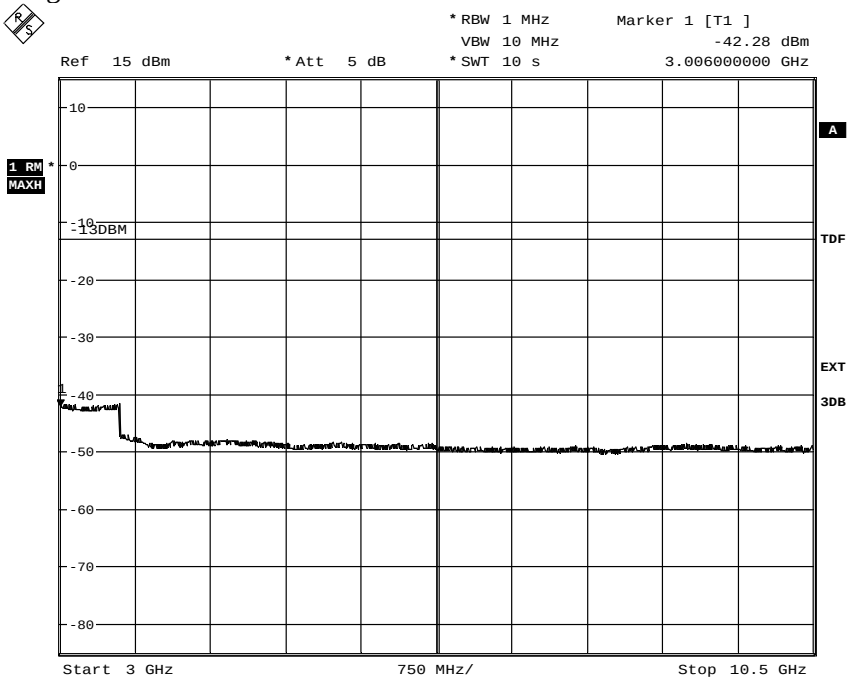
Complies?	Yes

Diagram 1a:



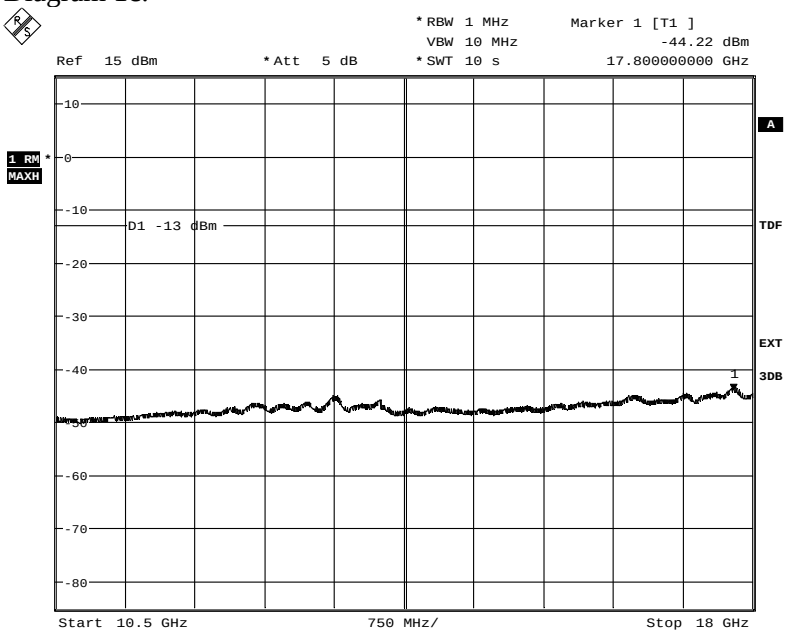
Date: 4.SEP.2012 13:30:37

Diagram 1b:



Date: 4.SEP.2012 13:32:05

Diagram 1c:



Date: 4.SEP.2012 13:33:11

Diagram 1d:

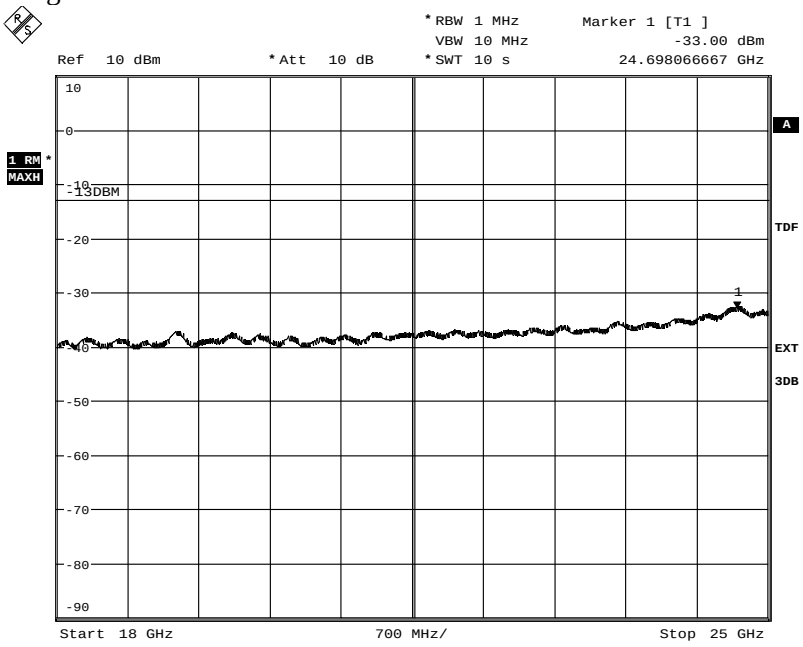


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Diagram 2a:

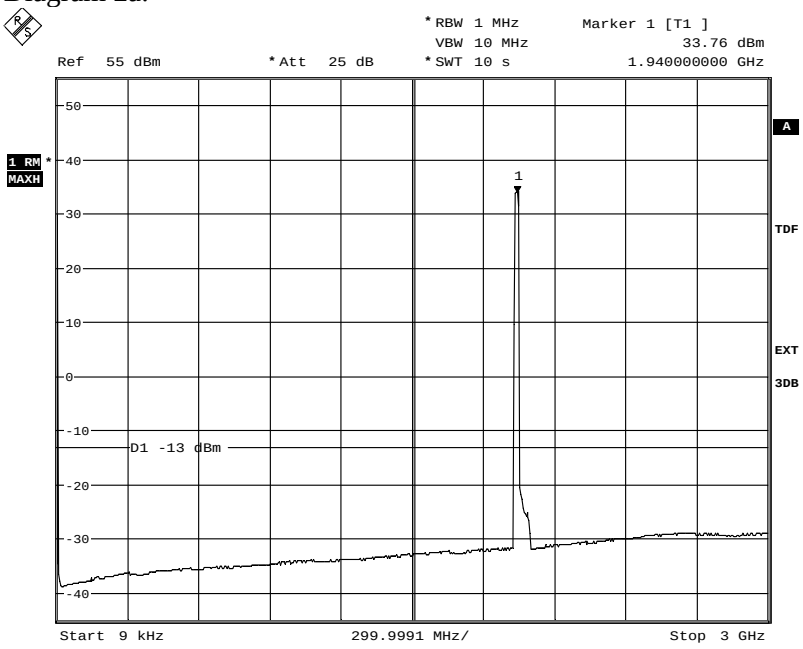

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Diagram 2b:

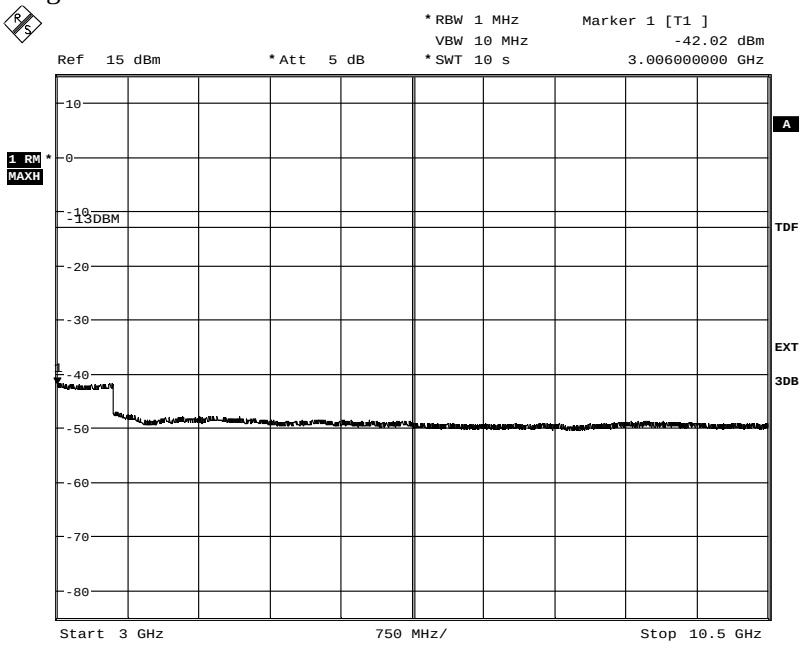

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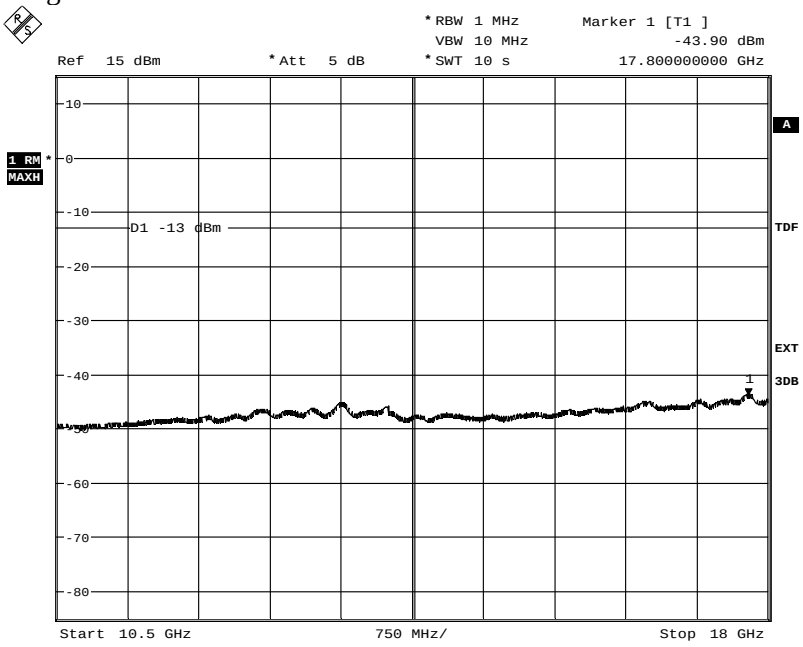
Diagram 2c:



Date: 4.SEP.2012 12:47:19

Diagram 2d:

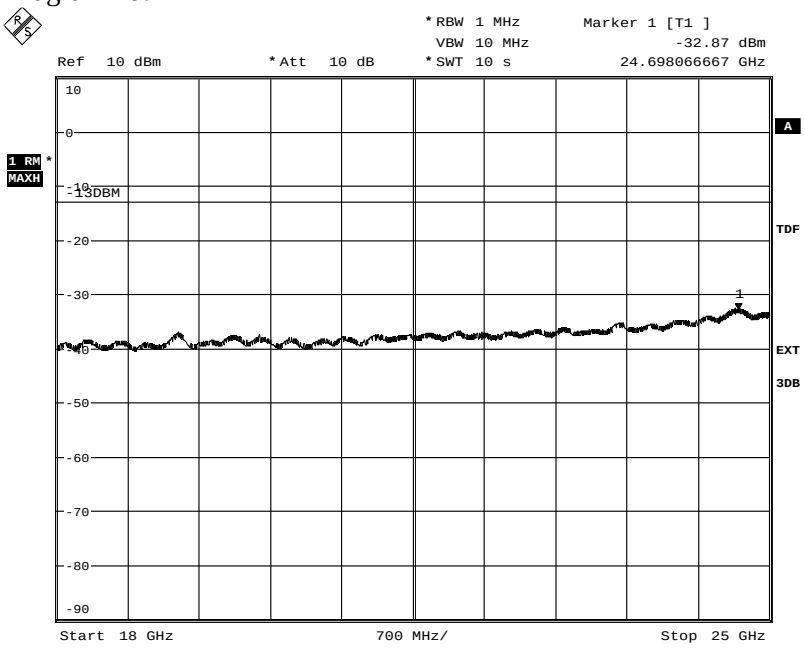


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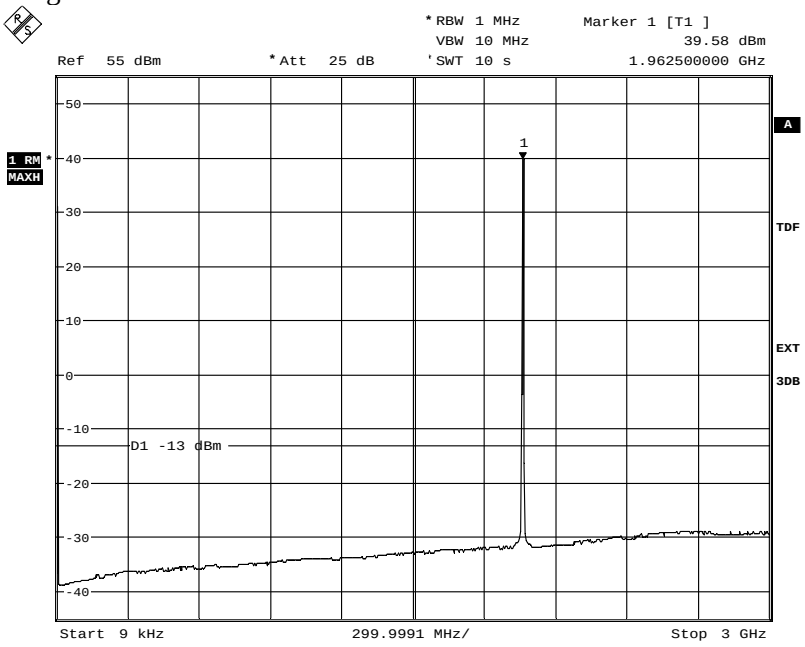
Diagram 3a:



Date: 31.AUG.2012 08:34:47

Diagram 3b:

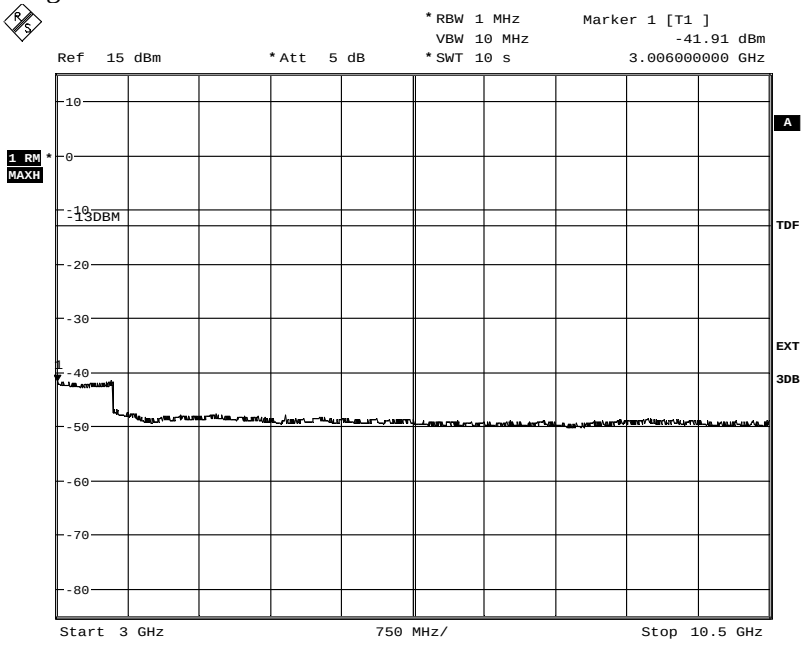


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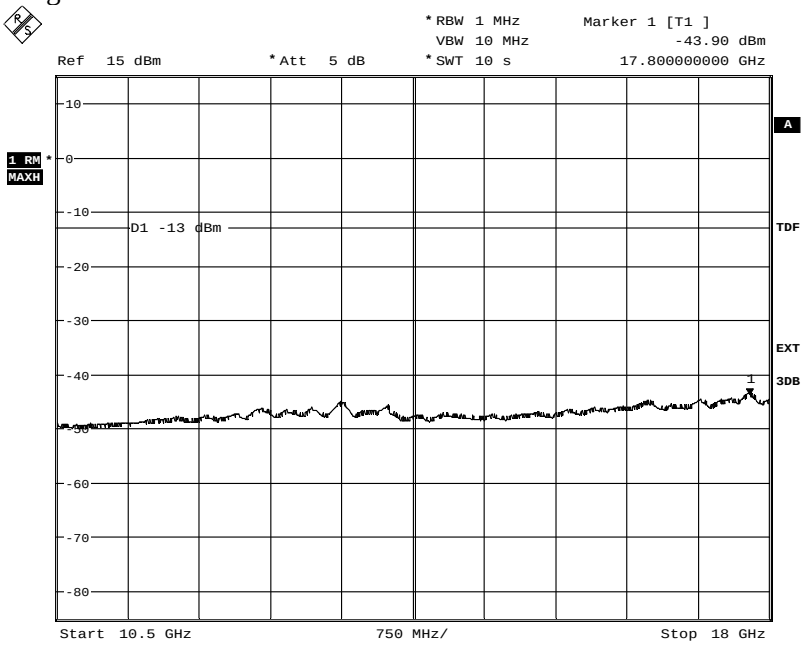
Diagram 3c:



Date: 31.AUG.2012 09:02:06

Diagram 3d:

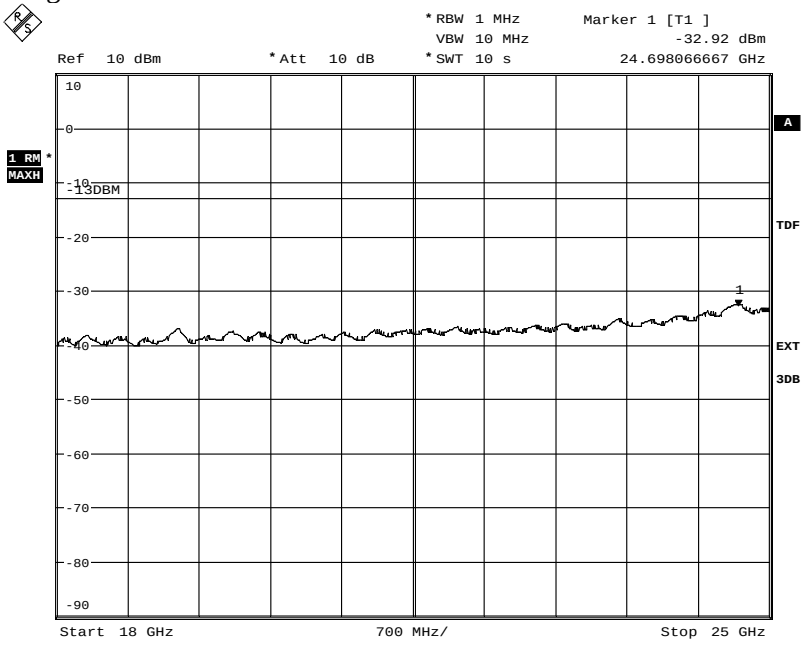


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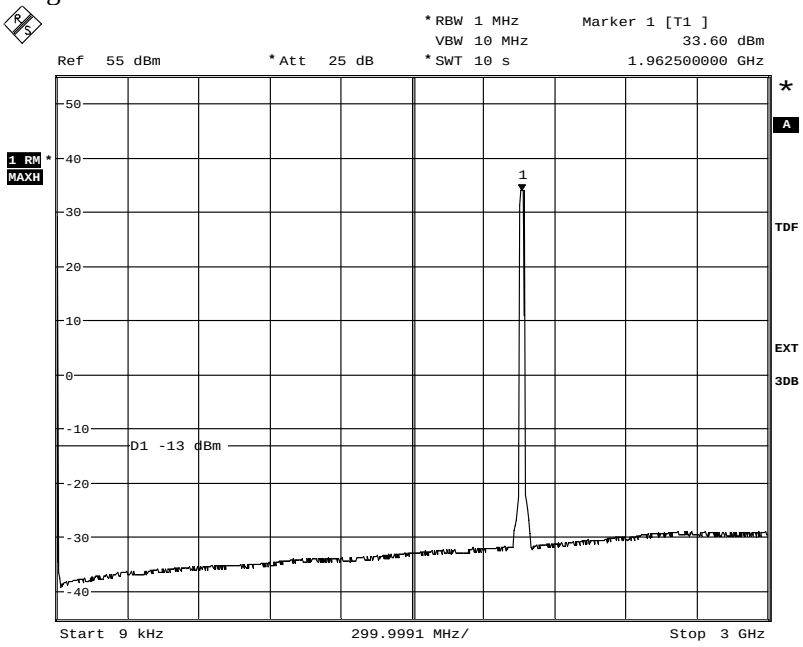
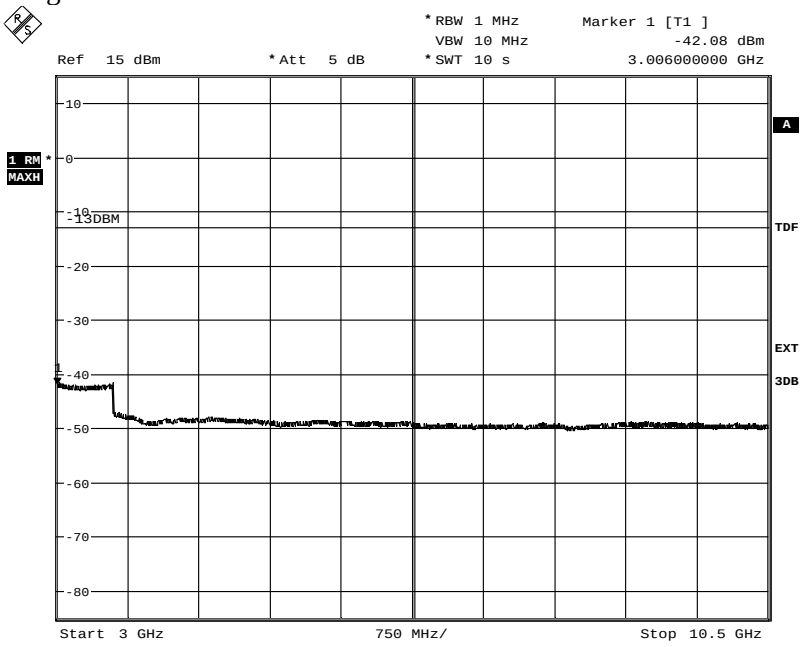
Diagram 4a:



Date: 4.SEP.2012 12:29:59

Diagram 4b:



Date: 4.SEP.2012 11:56:33

Diagram 4c:

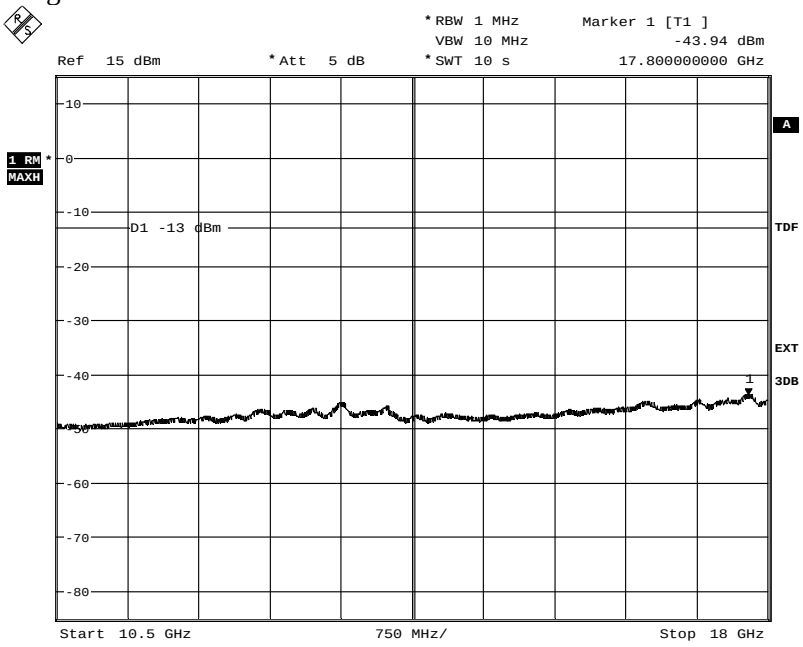


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Diagram 4d:

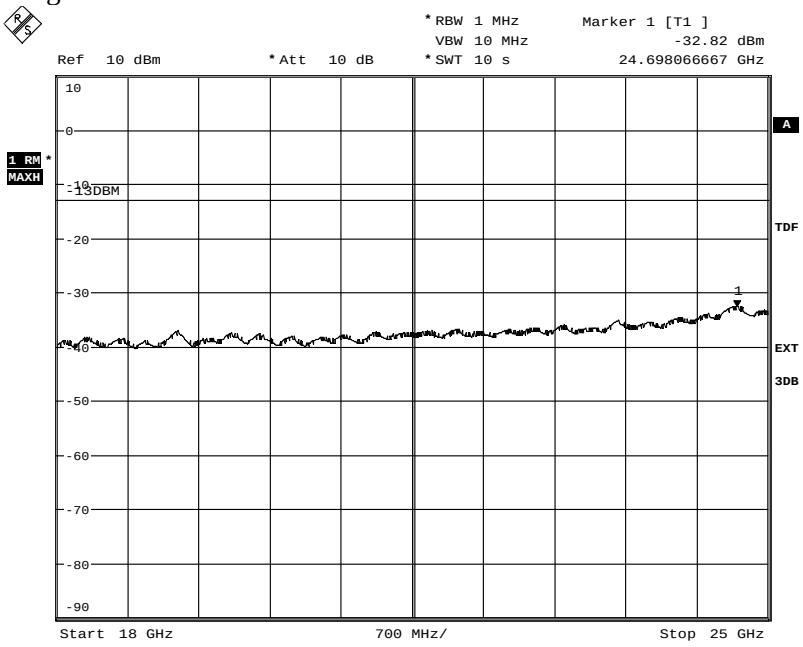

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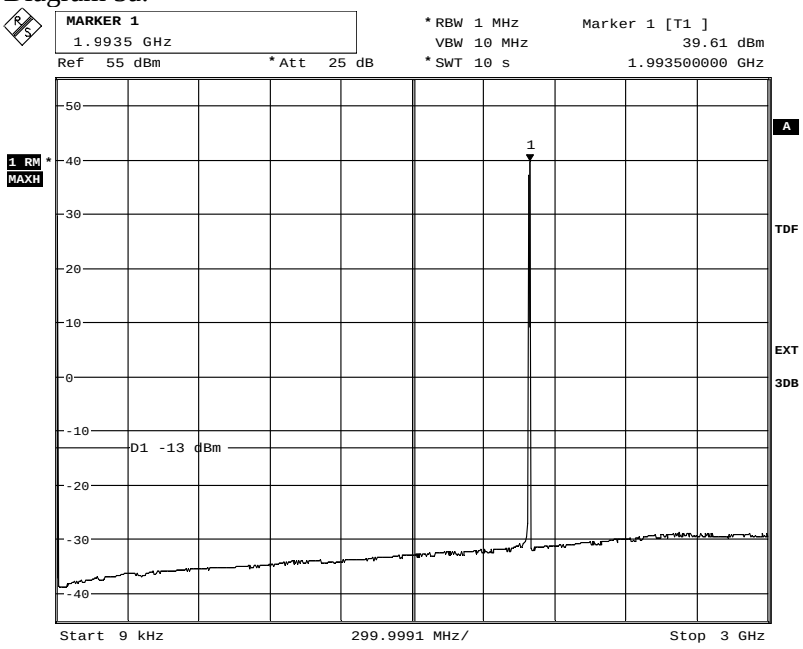
Diagram 5a:



Date: 4.SEP.2012 14:05:36

Diagram 5b:

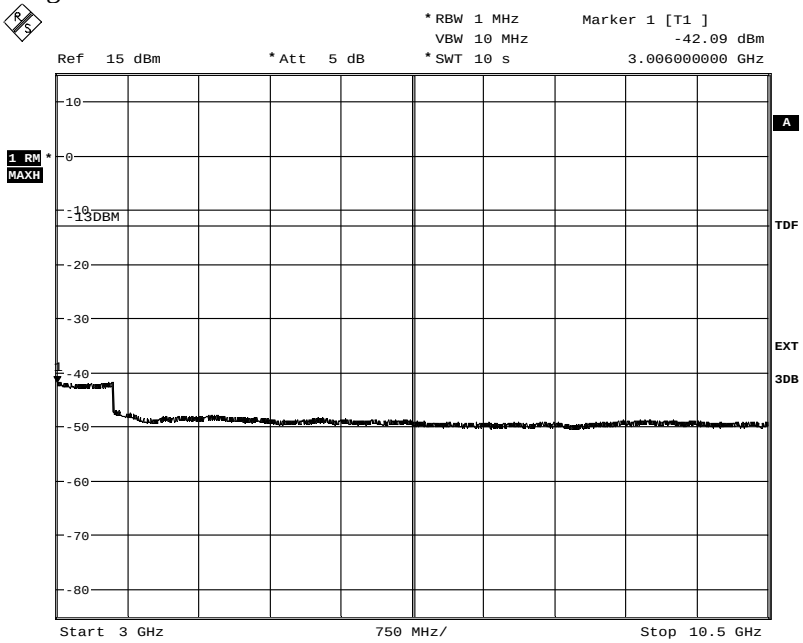


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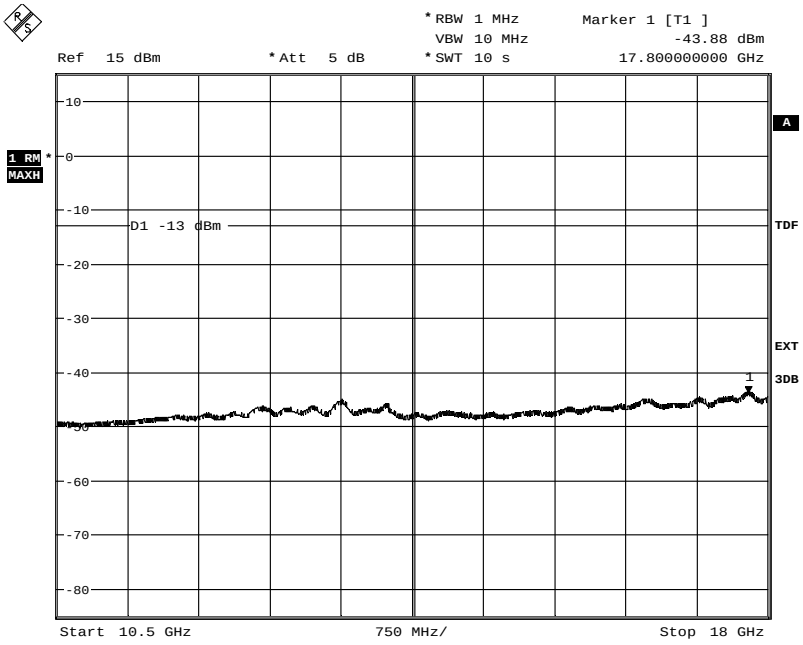
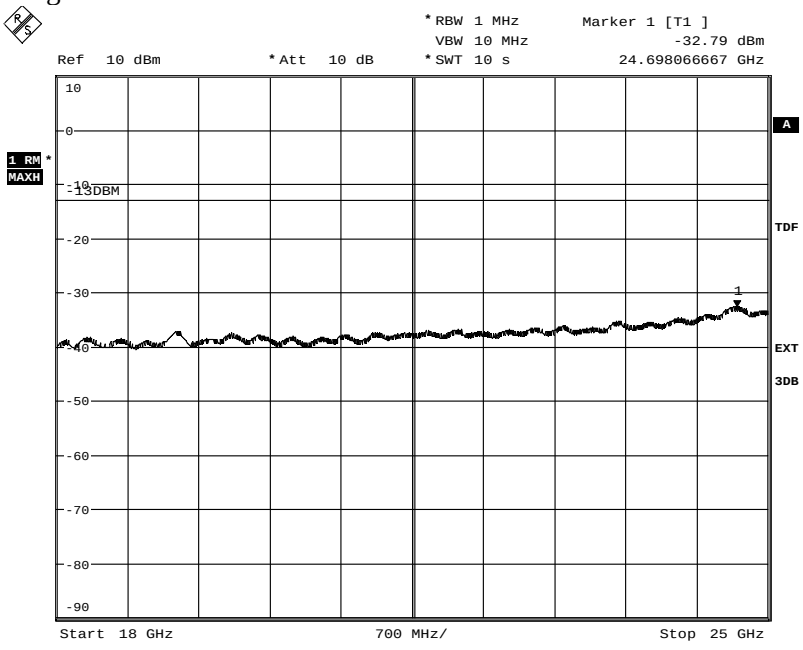
Diagram 5c:



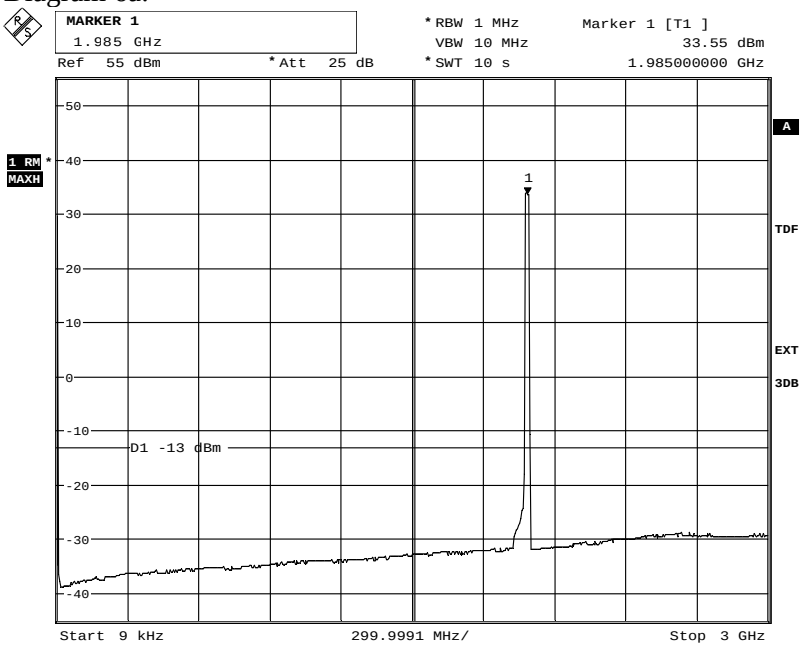
Date: 4.SEP.2012 14:08:17

Diagram 5d:



Date: 4.SEP.2012 14:09:29

Diagram 6a:



Date: 4.SEP.2012 15:44:23

Diagram 6b:

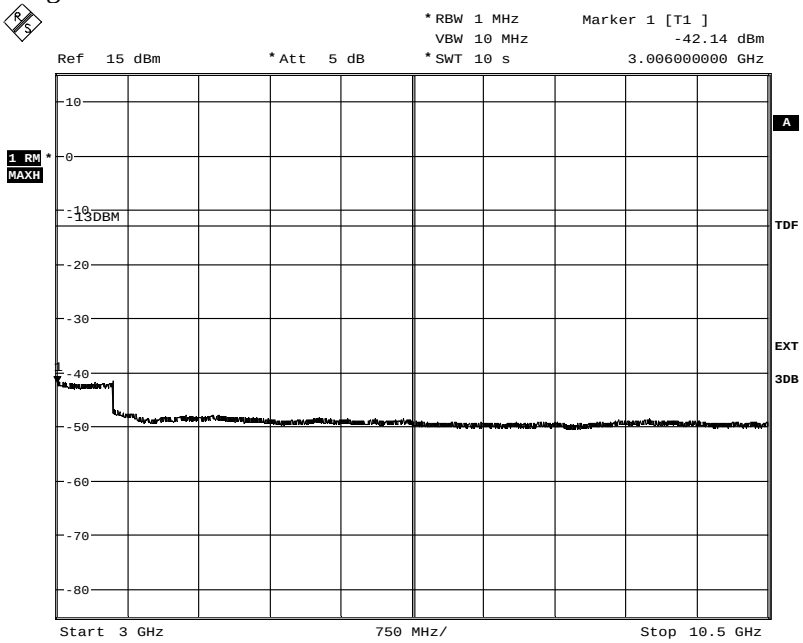


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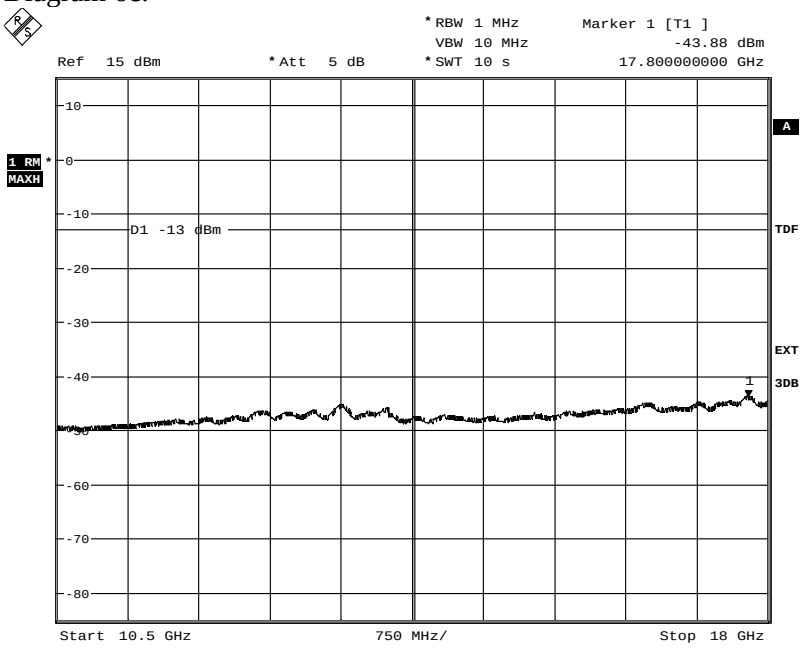
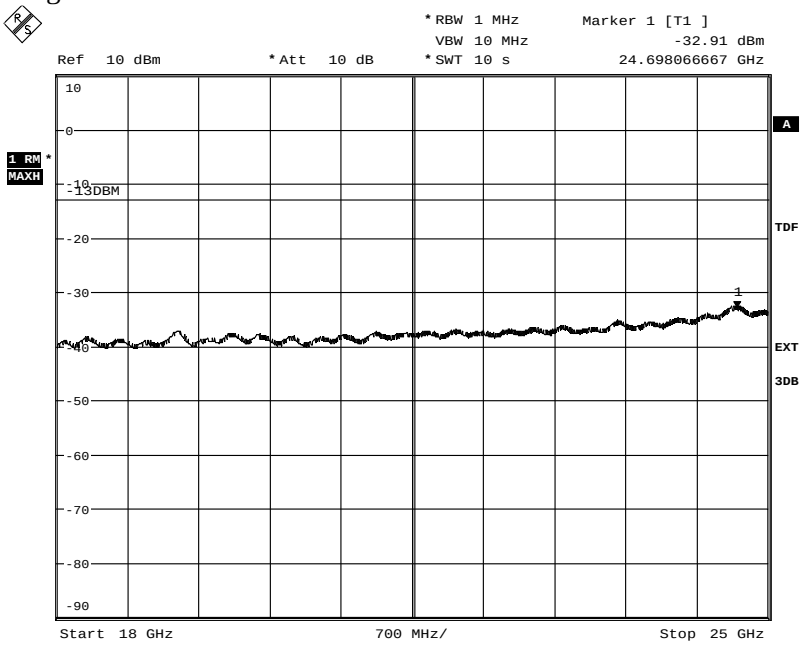
Diagram 6c:



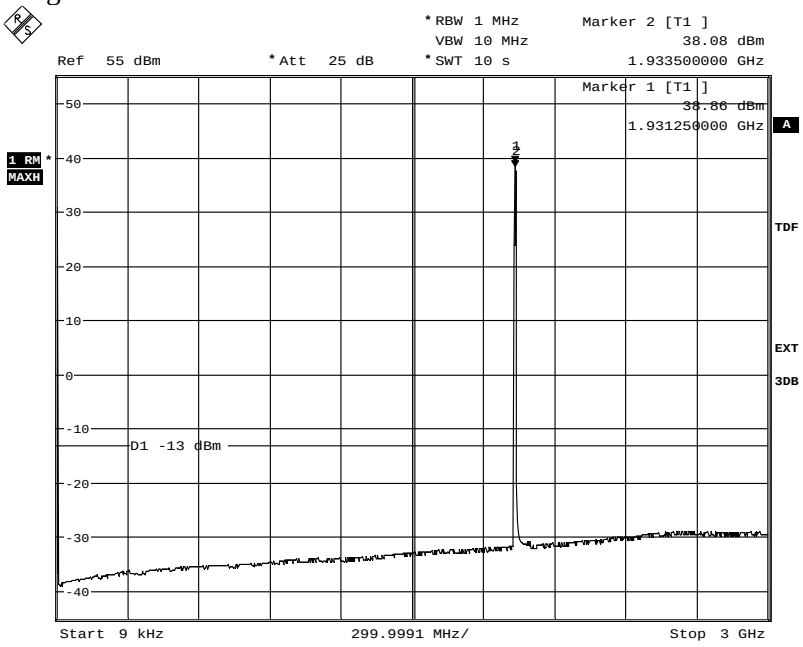
Date: 4.SEP.2012 15:47:27

Diagram 6d:



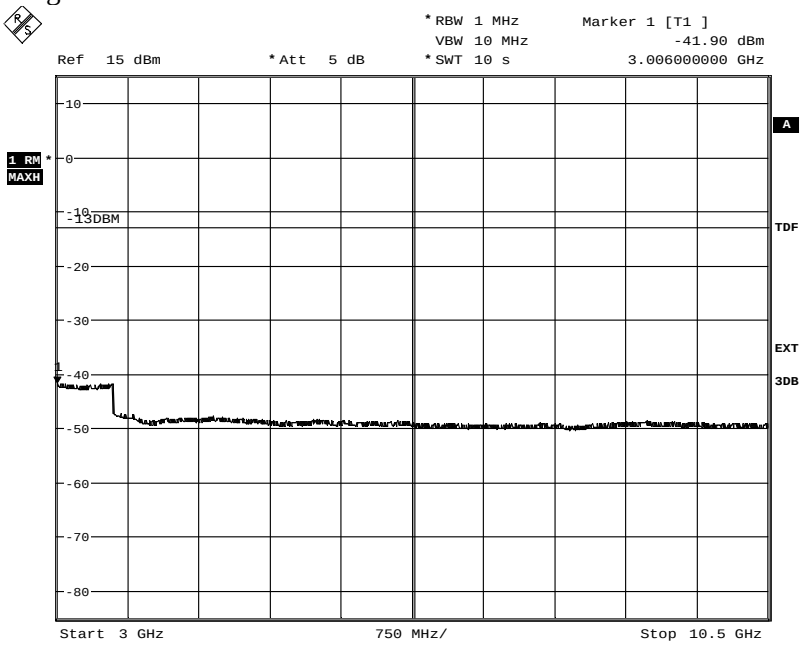
Date: 4.SEP.2012 15:49:02

Diagram 7a:



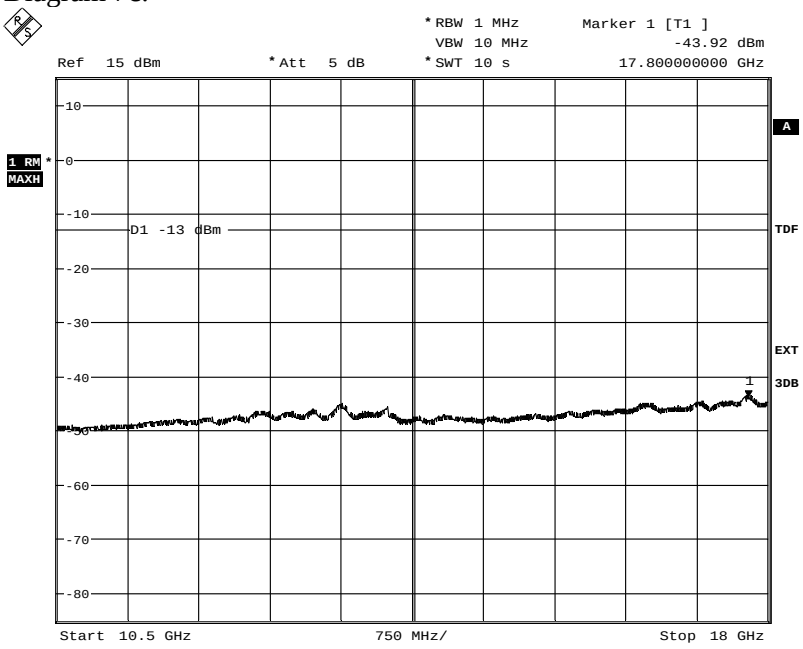
Date: 10.SEP.2012 09:39:36

Diagram 7b:



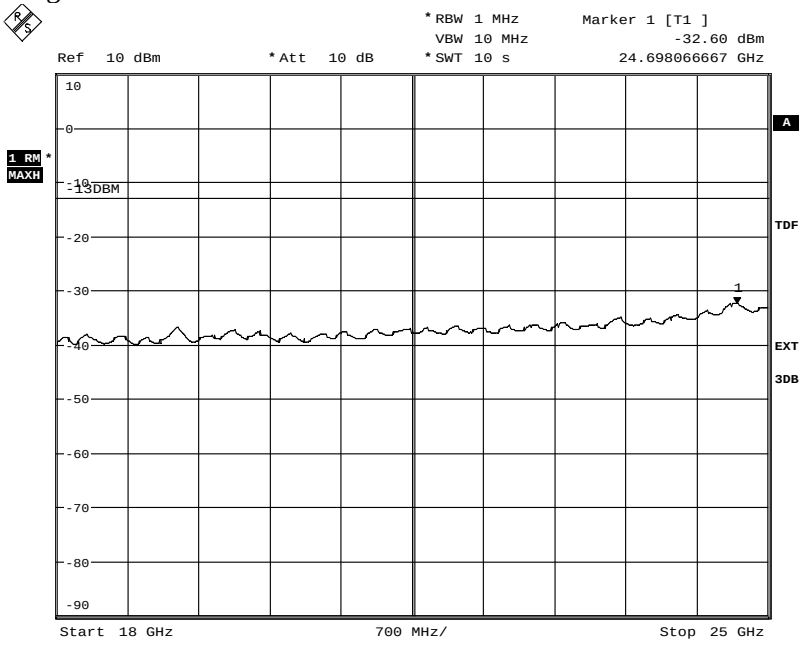
Date: 10.SEP.2012 09:53:49

Diagram 7c:



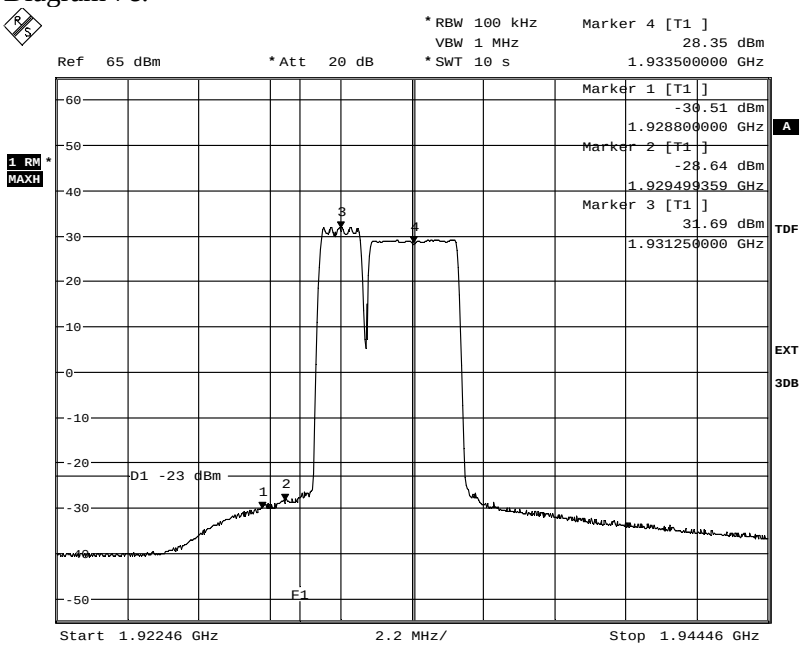
Date: 10.SEP.2012 09:54:27

Diagram 7d:



Date: 10.SEP.2012 10:04:18

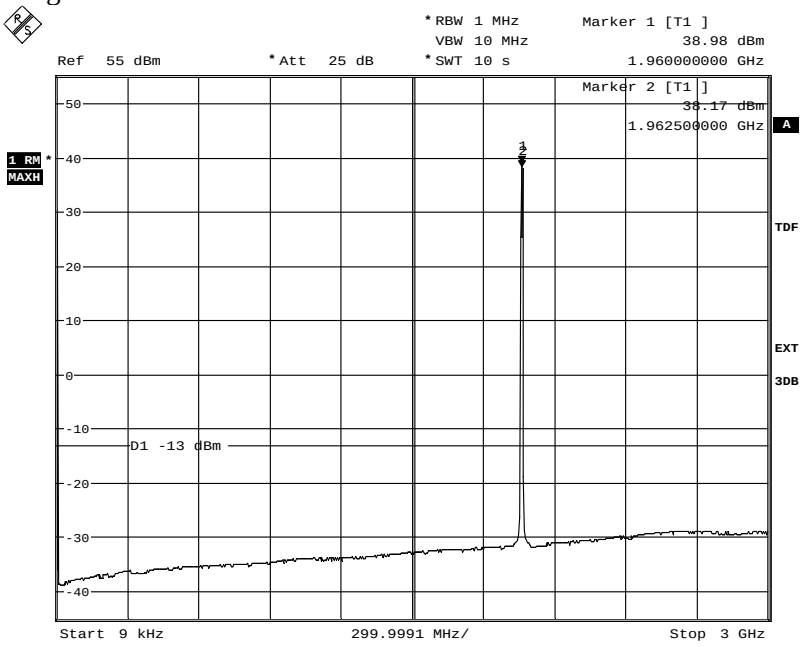
Diagram 7e:



Date: 10.SEP.2012 09:52:31

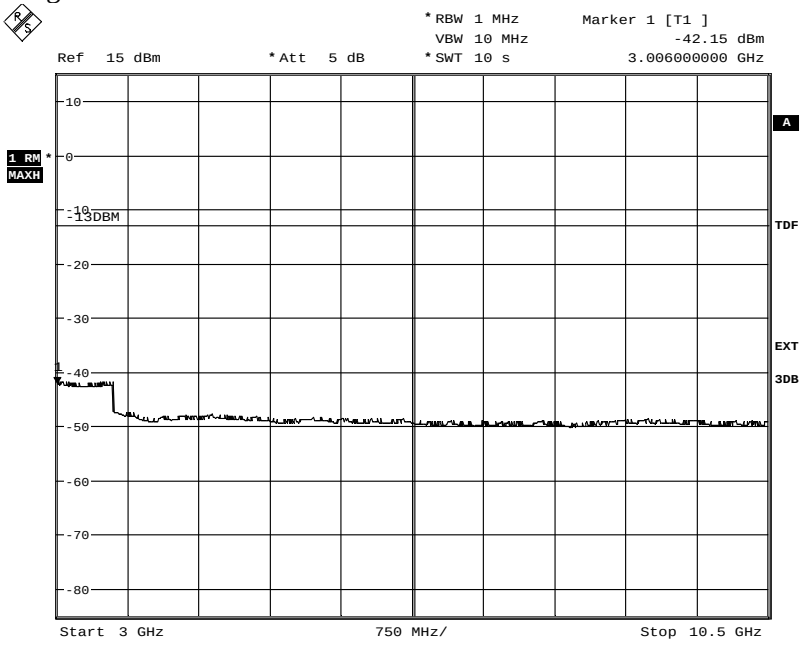
The emission at 1928.8 MHz was -19.52 dBm measured with the channel power method with 1 MHz channel bandwidth

Diagram 8a:



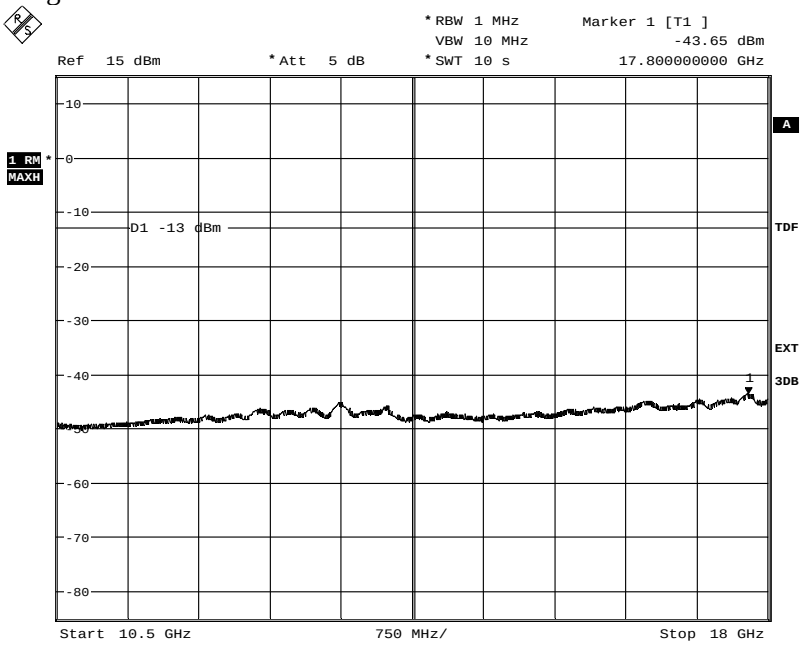
Date: 10.SEP.2012 10:34:00

Diagram 8b:



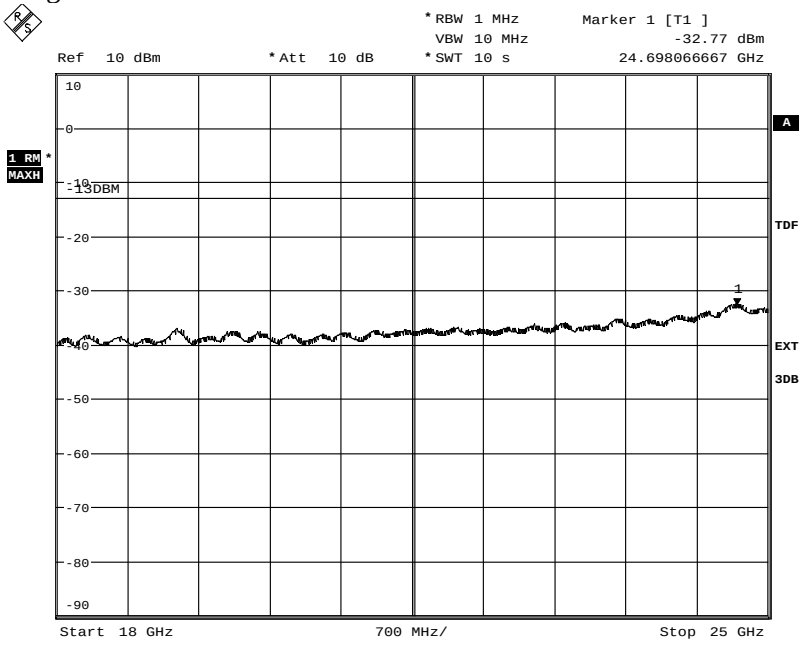
Date: 10.SEP.2012 10:35:51

Diagram 8c:



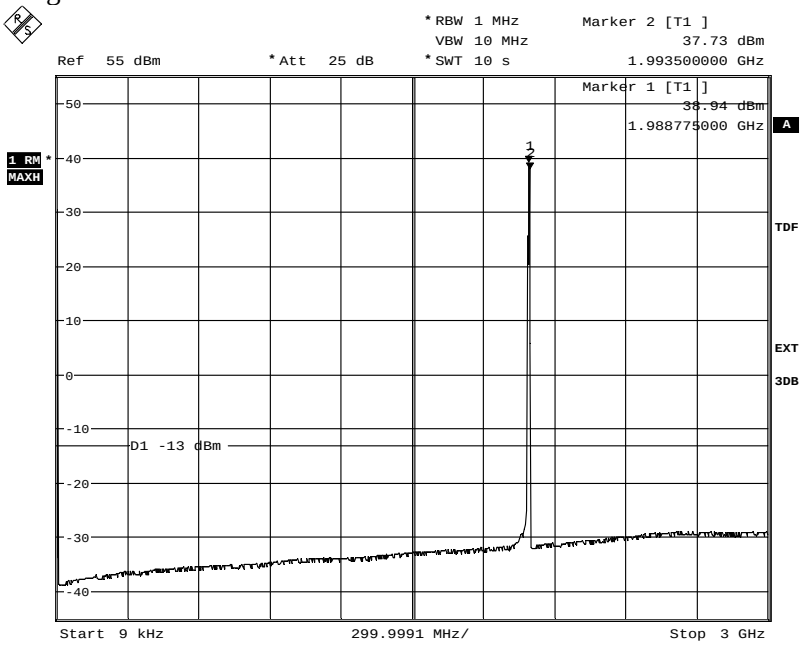
Date: 10.SEP.2012 10:36:32

Diagram 8d:



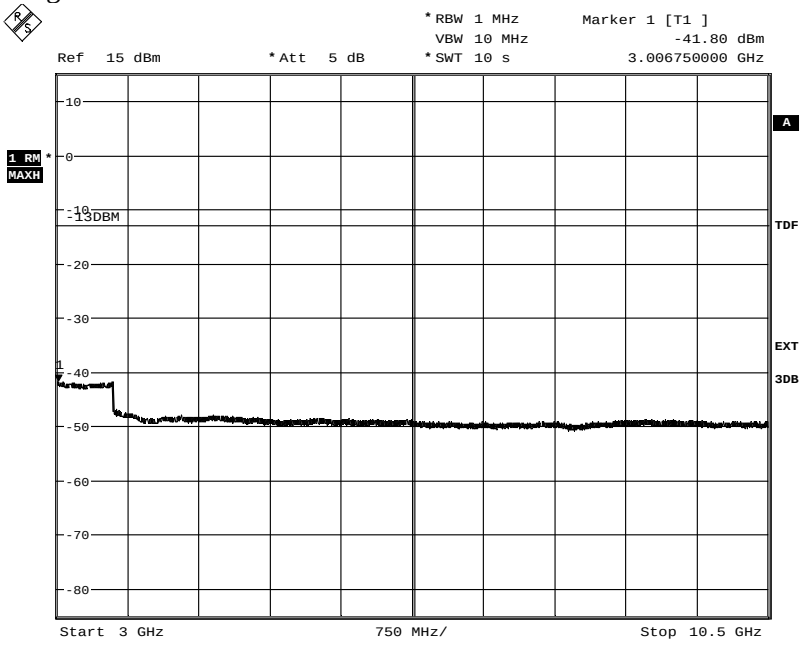
Date: 10.SEP.2012 10:37:23

Diagram 9a:



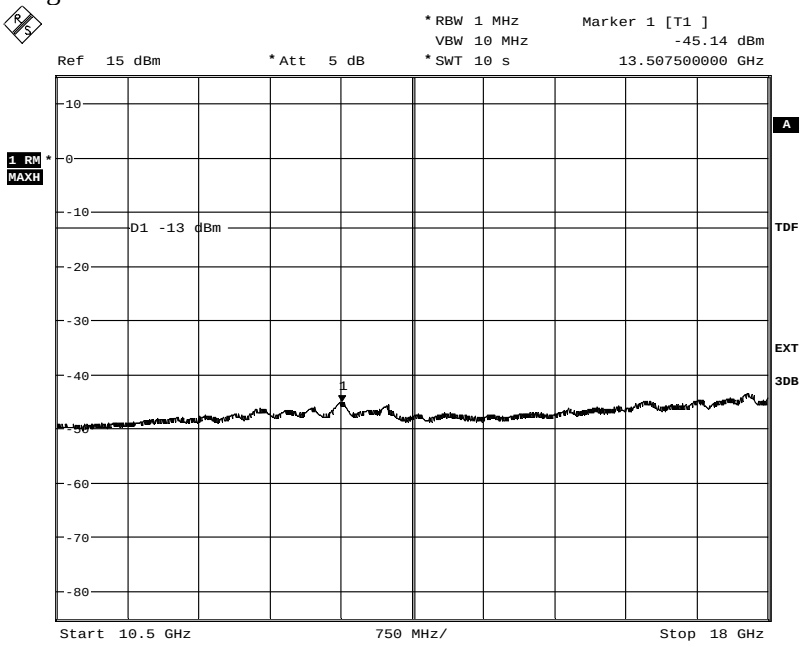
Date: 6.SEP.2012 15:37:39

Diagram 9b:



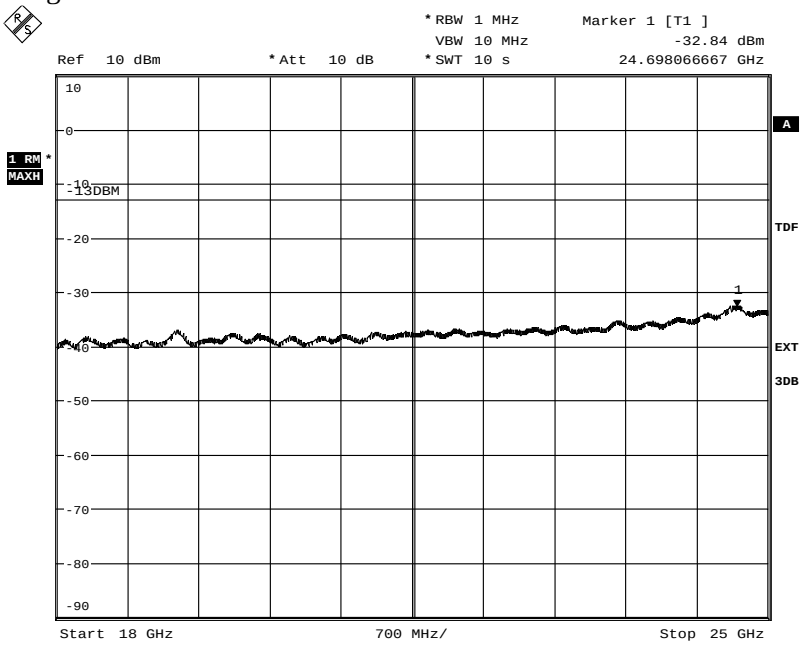
Date: 6.SEP.2012 15:39:49

Diagram 9c:



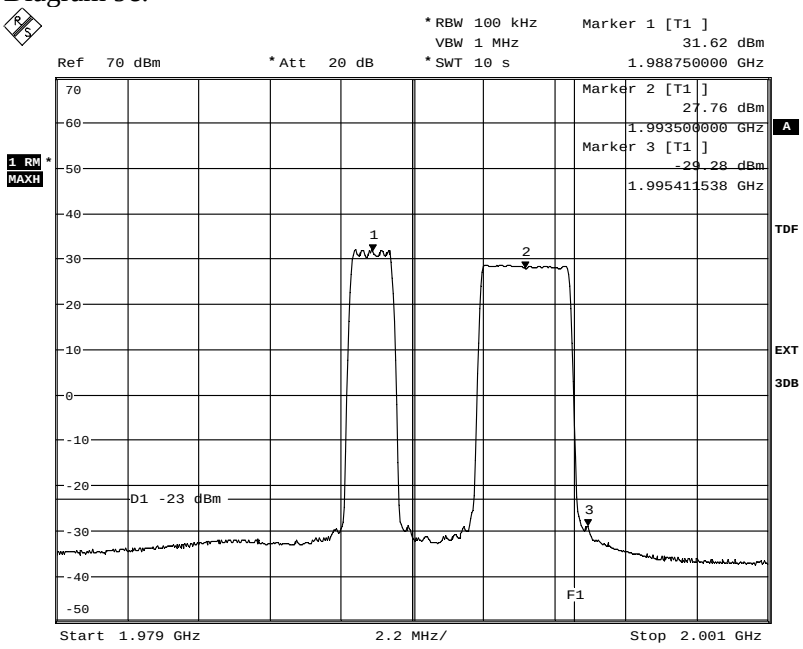
Date: 6.SEP.2012 15:40:31

Diagram 9d:



Date: 6.SEP.2012 15:41:17

Diagram 9e:



Date: 6.SEP.2012 15:33:20

The emission at 1996.2 MHz was -25.66 dBm measured with the channel power method with 1 MHz channel bandwidth

Field strength of spurious radiation measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-08-23	22°C ± 3 °C	59 % ± 5 %
2012-08-24	23°C ± 3 °C	53 % ± 5 %
2012-08-27	23°C ± 3 °C	38 % ± 5 %
2012-08-28	23°C ± 3 °C	55 % ± 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.

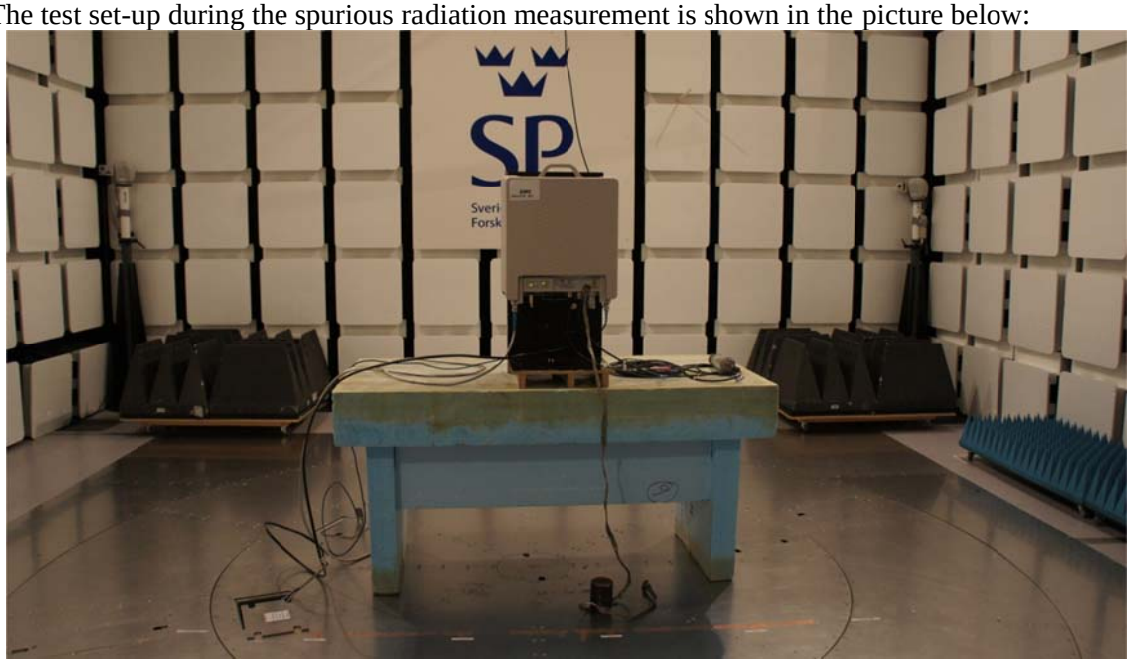
The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18 - 25 GHz.

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 $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D 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:



Measurement equipment

Measurement equipment	SP number
Test site Tesla	503 881
R&S ESU 26	901 553
EMC 32 ver. 8.52.0	503 745
Chase Bilog antenna CBL 6111A	502 181
EMCO Horn Antenna 3115	502 175
Standard gain antenna 20240-20	503 674
HP-filter 3-18 GHz	504 200
µComp Nordic, Low Noise Amplifier	901 545
Miteq, Low Noise Amplifier	503 285
Schwarzbeck BBV9742, Low Noise Amplifier	504 085
Temperature and humidity meter, Testo 625	504 188

Tested configurations

LTE

BW configuration/ / [MHz]	Tested frequency
3	B
3	M
20	M
3	T

LTE+ CDMA

Configuration 4
Configuration 5
Configuration 6
Configuration 7

Results, representing worst case

Configuration 7

Diagram 1: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

§24.238 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

Diagram 1a:

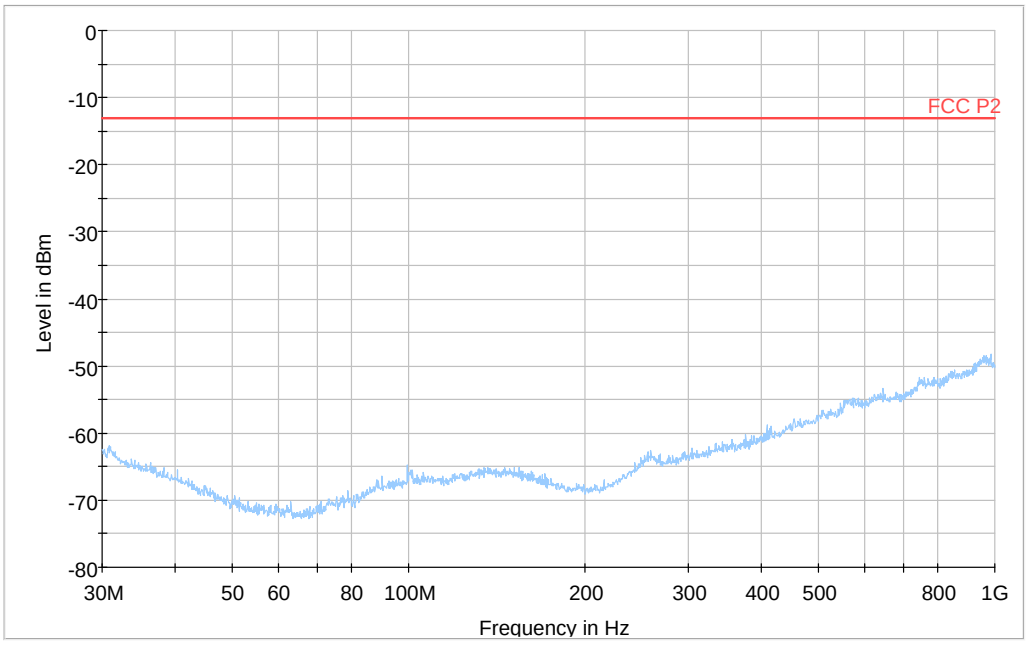
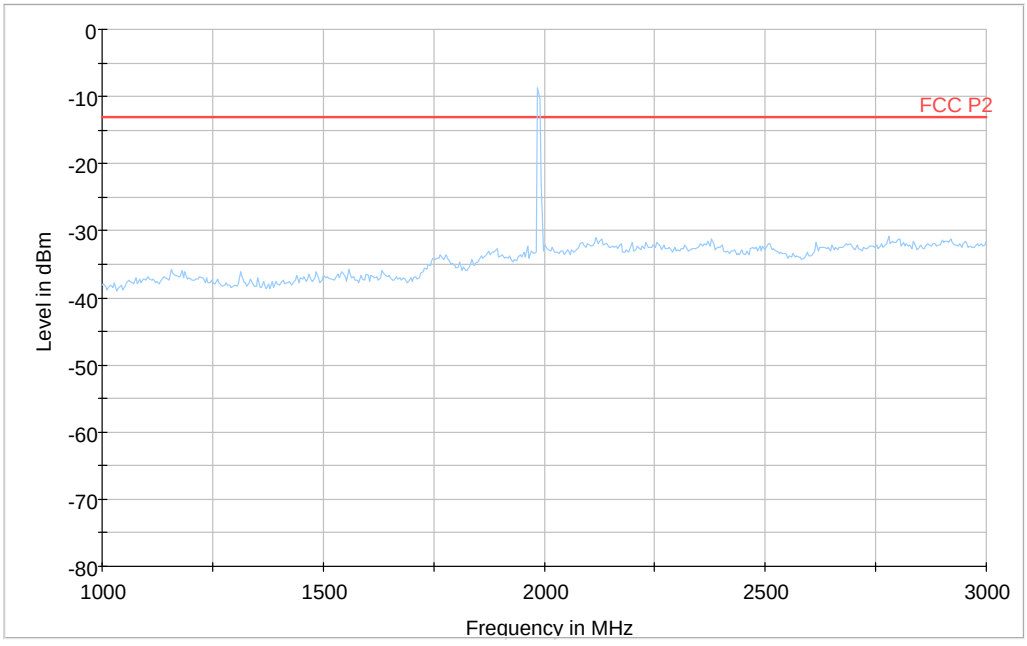
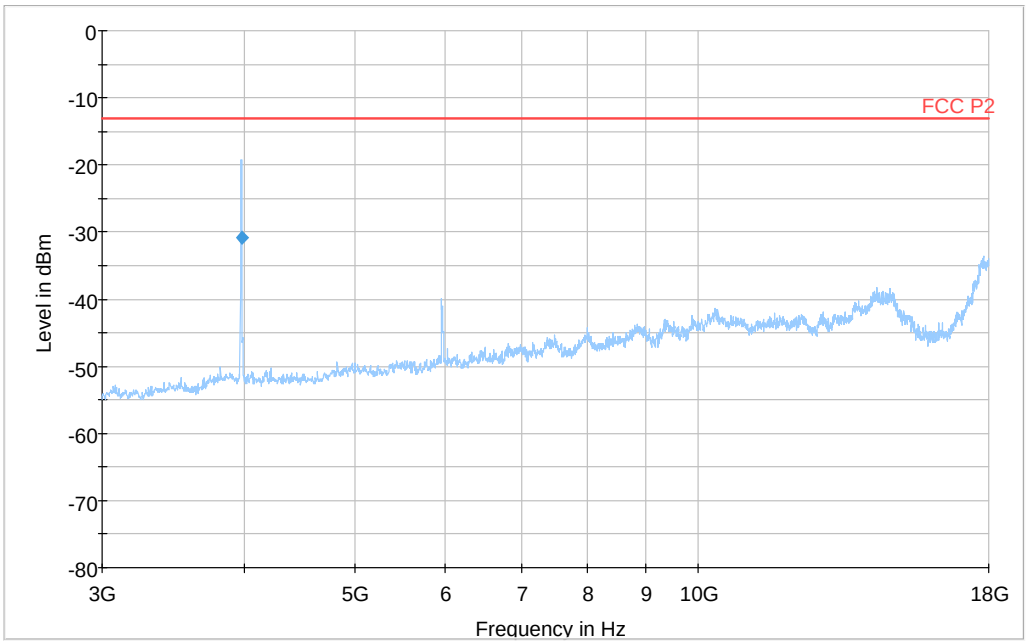


Diagram 1b:



Note: The emission between 1986.25 MHz and 1993.5 MHz are the carrier frequencies and shall be ignored in the context.

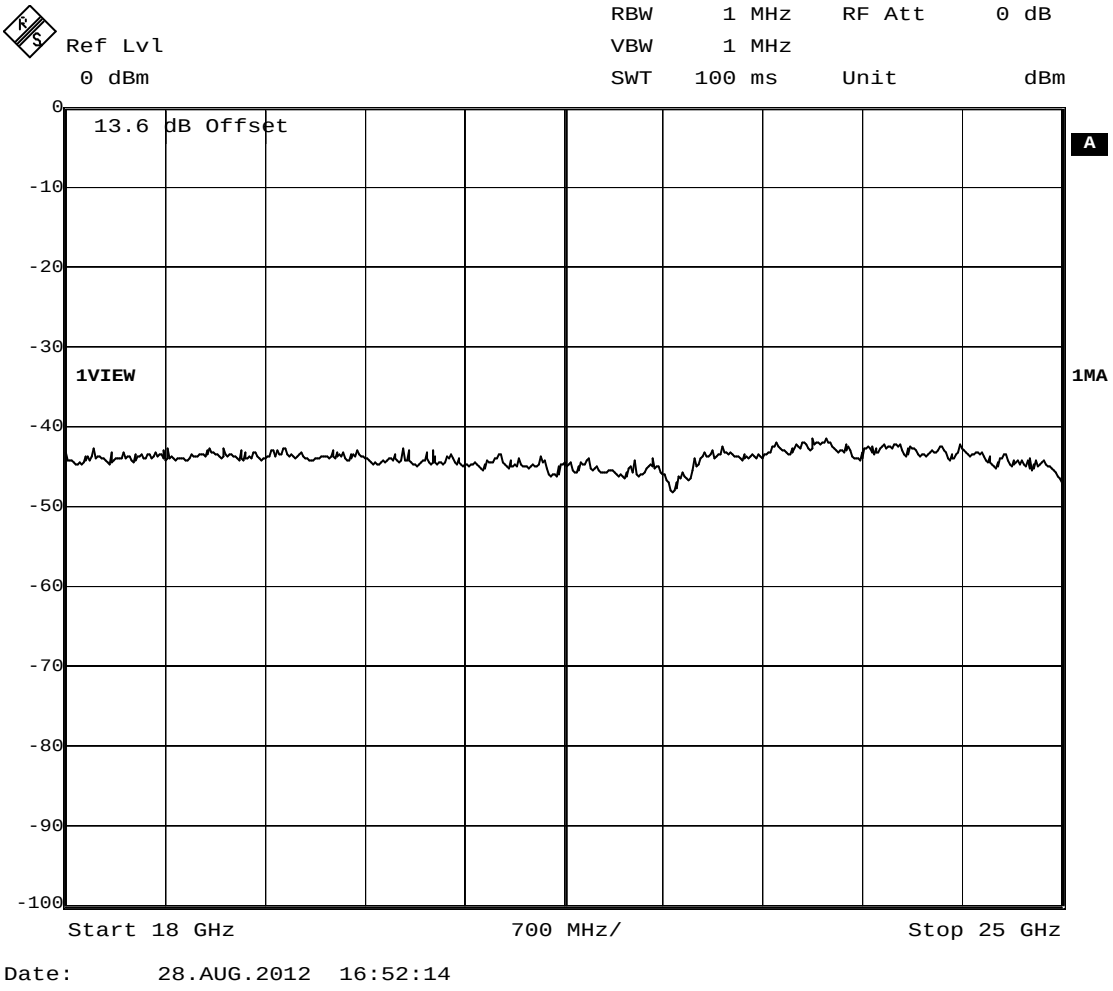
Diagram 1c:



Final RMS Result

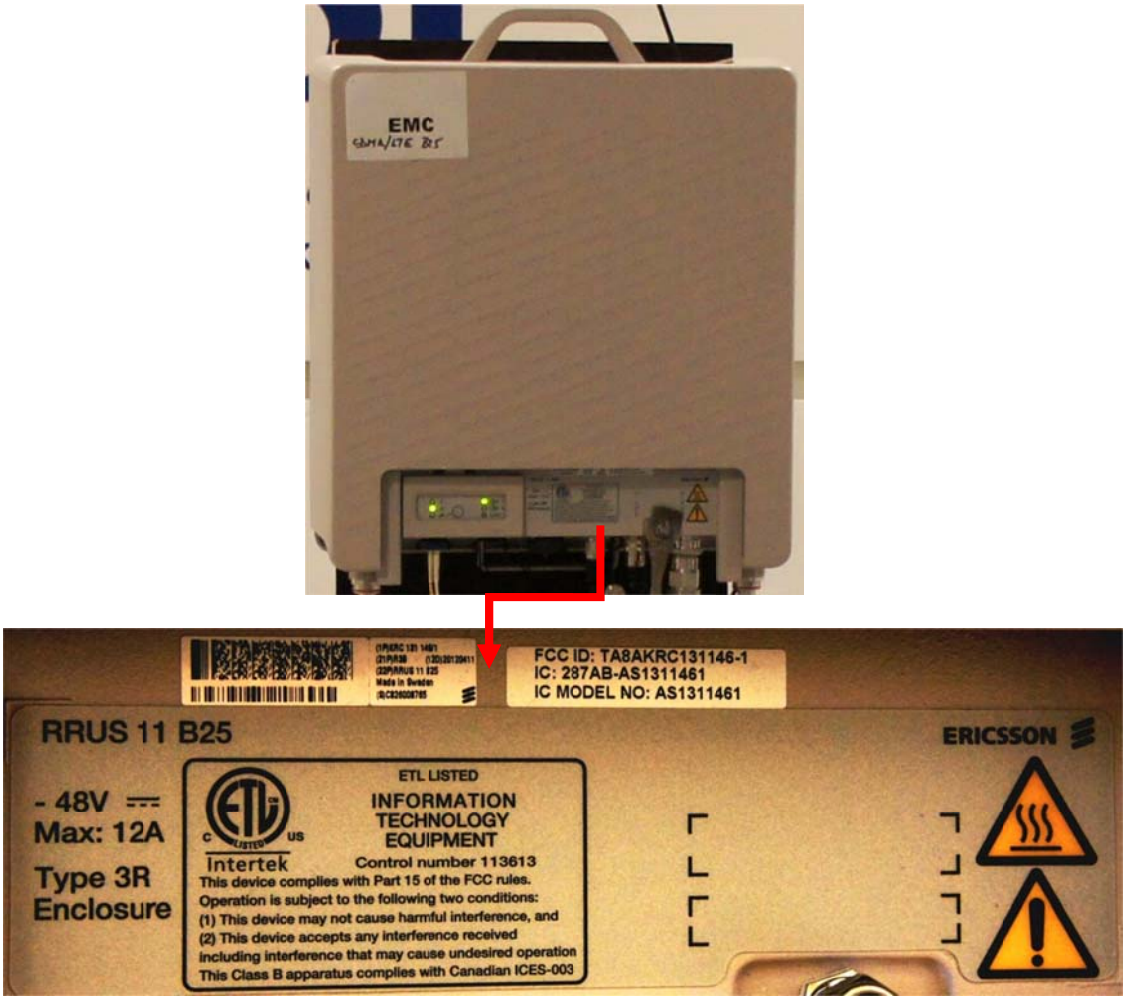
Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3975.479	-30.9	5000.0	1000.000	130.0	V	129.0	-103.2	17.9	-13.0

Diagram 1d:

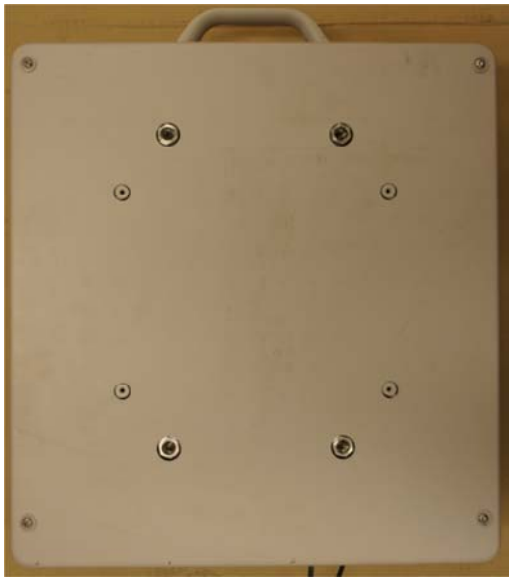

Ref Lvl
0 dBm
RBW 1 MHz
VBW 1 MHz
SWT 100 ms
RF Att 0 dB
Unit dBm
13.6 dB Offset
1VIEW
A
1MA
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 28.AUG.2012 16:52:14

External photos

Front side



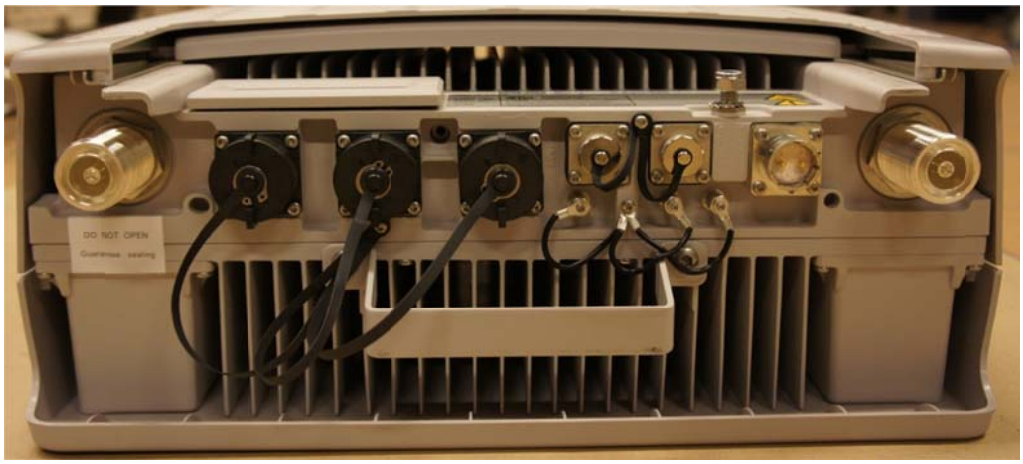
Rear side



Left side

Right side

Bottom Side



Top Side