REPORT

Issued by an FCC listed laboratory, Reg no. 93866
The test sites comply with RSS-Gen, IC-file no: 3482A

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Date	Reference	Page
2013-02-01	FX223719-F24	1 (2)

1002
ISO/IEC 17025

Ericsson AB
Klaes Holm
PDU HW
164 80 Stockholm

Class II permissive change on RRUS 11 B2 1900 MHz radio equipment with FCC ID: TA8AKRC161276-1 and IC: 287AB-AS1612761

(7 appendices)

Test object

RRUS 11 B2, product KRC 161 276/1, revision R1C

Summary

See appendix 1 for general information and appendix 7 for external photos.

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 Technical Research Institute of Sweden

Electronics – EMC

Prepared by

Reinhold Reul

Examined by

Christer Karlsson

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Appendix 1

Description of the test object

Equipment:	Radio equipment RRUS 11 B2
Operating bands:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
Antenna ports:	2 TX/RX ports, declared electrical idententical
Nominal RF output power:	1x 44.8 dBm (1x 30 W) per antenna port 2x 41.8 dBm (2x 15 W) per antenna port 4x 38.8 dBm (4x 7.5 W) per antenna port
LTE supports	
Modulations (payload):	QPSK, 16QAM and 64QAM
Channel bandwidths:	1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15 MHz, 20 MHz
Carrier constellations	Single carrier in conventional and MIMO mode
WCDMA supports	
Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidths:	4.2 to 5 MHz (configurable in steps of 100/200 kHz)
Channel spacings:	4.4 to 5 MHz (configurable in steps of 100/200 kHz)
Carrier constellations	Single & multi carrier in conventional and in MIMO mode
Nominal supply voltage:	-48VDC

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 MIMO for WCDMA single RAT (SR), MIMO for LTE single RAT (SR) and MSR for LTE & WCDMA access technologies, by verifying maintained compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-133 and RSS-Gen.

Operation modes

LTE single RAT

Measurements in MIMO single carrier configuration were performed with the test object transmitting test model E-TM1.1 defined in 3GPP TS 36.141.

WCDMA single RAT

Measurements in MIMO single carrier configuration were performed with the test object transmitting test model 5 with 30 DPCH:s at 30 ksps and 8 HS-PDSCH (SF=128) according 3GPP TS 25.141. MIMO multicarrier compliance was deemed to be covered by the margin demonstrated in the original filing, no additional multi carrier measurements were done.

LTE & WCDMA MSR

The EUT supports MSR in conventional (none-MIMO) mode. Measurements were performed with one WCDMA carrier transmitting TM1 with 16 DPCH:s at 30 ksps (SF=128) and one LTE carrier transmitting E-TM1.1, as proposed in 3GPP TS 37.141.

Conducted measurements were made on port RF A and partially repeated on port RF B to verify that the ports were electrical identical, as declared by the client.

For the purpose of this report the selected test configurations were deemed representative for a worst case based on the guidelines applied in above mentioned 3GPP standards and prior experience from comparative tests with different modulations on similar products.

The EUT was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings below. Measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

Appendix 1

Test frequencies used for radiated measurements

LTE single RAT MIMO Port A and B common configuration	Configuration 1	Configuration 2	Configuration 3
	EARFCN (Frequency)	EARFCN (Frequency)	EARFCN (Frequency)
Downlink	607 (1930.7 MHz)	900 (1960.0 MHz)	1193 (1989.3 MHz)
Uplink	18607 (1850.7 MHz)	18900 (1880.0 MHz)	19193 (1909.3 MHz)
BW configuration	1.4 MHz	1.4 MHz	1.4 MHz
Test model	E-TM1.1	E-TM1.1	E-TM1.1

WCDMA single RAT MIMO Port A and B common configuration	Configuration 4
	UARFCN (Frequency)
Downlink	9938 (1987.6 MHz)
Uplink	9538 (1907.6 MHz)
BW configuration	5 MHz
Test model	Test Model 5

WCDMA & LTE MSR Port A and B	Configuration 5	
	WCDMA UARFCN (Frequency)	LTE EARFCN (Frequency)
Downlink	9863 (1972.6 MHz)	1193 (1989.3 MHz)
Uplink	9463 (1892.6 MHz)	19193 (1909.3 MHz)
BW configuration	5 MHz	1.4 MHz
Test model	Test Model 1	E-TM1.1

Appendix 1

Test frequencies used for conducted measurements

LTE MIMO single RAT, single carrier TX test frequencies

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
607	1930.7	B	TX bottom frequency in 1.4 MHz BW configuration
615	1931.5	B	TX bottom frequency in 3 MHz BW configuration
625	1932.5	B	TX bottom frequency in 5 MHz BW configuration
900	1960.0	M	TX band mid frequency all BW configurations
1175	1987.5	T	TX top frequency in 5 MHz BW configuration
1185	1988.5	T	TX top frequency in 3 MHz BW configuration
1193	1989.3	T	TX top frequency in 1.4 MHz BW configuration

WCDMA MIMO single RATsingle carrier TX test frequencies

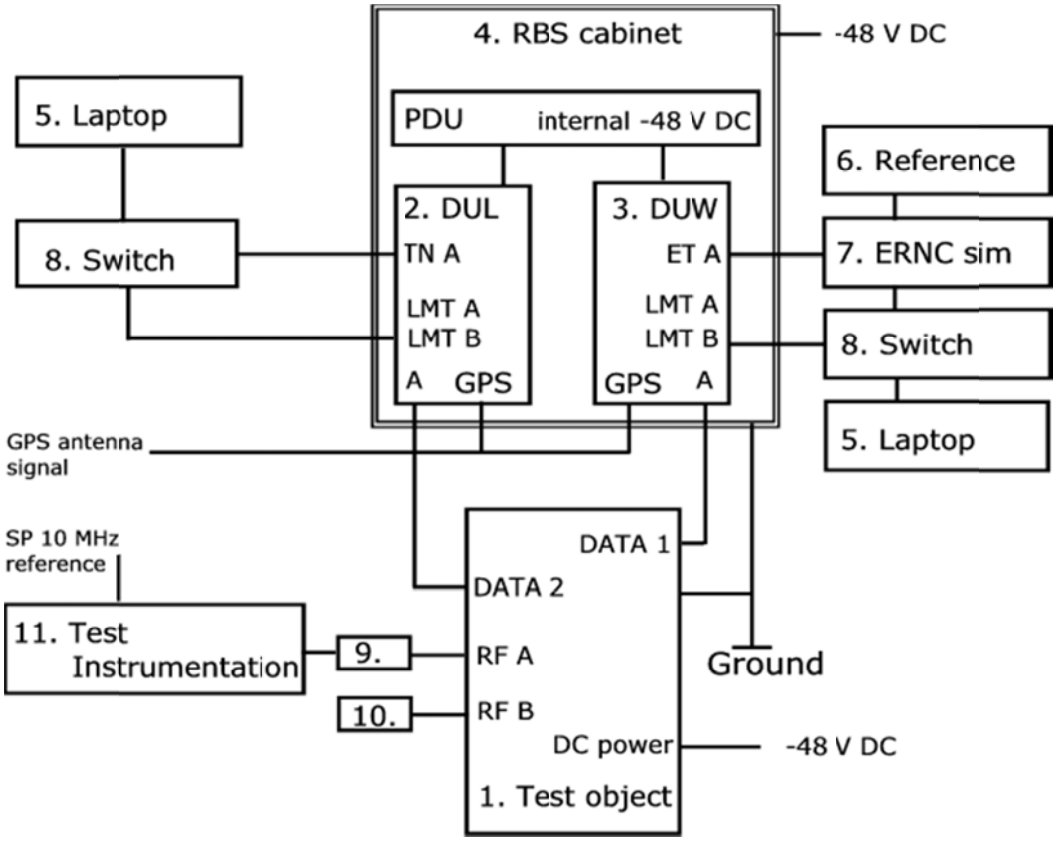
UARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
9662	1932.4	B	TX bottom frequency
9800	1960.0	M	TX band mid frequency
9938	1987.6	T	TX top frequency

WCDMA & LTE MSR TX test frequencies

WCDMA			LTE				
UARFCN Downlink	Frequency [MHz]	BW [MHz]	EARFCN Downlink	Frequency [MHz]	BW [MHz]	Symbolic name	Comment
9662	1932.4	5	774	1947.4	1.4	B	TX bottom constellation per LTE BW
9662	1932.4	5	784	1948.4	3	B	
9662	1932.4	5	774	1947.4	5	B	
9763	1952.6	5	993	1969.3	1.4	M	TX mid constellation per LTE BW
9763	1952.6	5	985	1968.5	3	M	
9763	1952.6	5	975	1967.5	5	M	
9863	1972.6	5	1193	1989.3	1.4	T	TX top constellation per LTE BW
9863	1972.6	5	1185	1988.5	3	T	
9863	1972.6	5	1175	1987.5	5	T	
9695	1939.0	5	797	1949.7	1.4	B_{IM}	TX constellation for bottom spurious IM per LTE BW
9693	1938.6	5	785	1948.5	3	B_{IM}	
9690	1938.0	5	775	1947.5	5	B_{IM}	
9862	1972.4	5	1120	1982.0	1.4	T_{IM}	TX constellation top for spurious IM per LTE BW
9862	1972.4	5	1120	1982.0	3	T_{IM}	
9862	1972.4	5	1120	1982.0	5	T_{IM}	

All RX frequencies were configured 80 MHz below the corresponding TX frequency according the appclicable duplex offset for the operating band.

Test set-up conducted measurements TX



Note: Above set-up shows connections for MSR mode. For single RAT, the data connection from DUW/DUL port A was connected to port DATA 1 only. Unconnected EUT interfaces were omitted in the picture for simplicity, but are listed in the interface table below.

Test object:

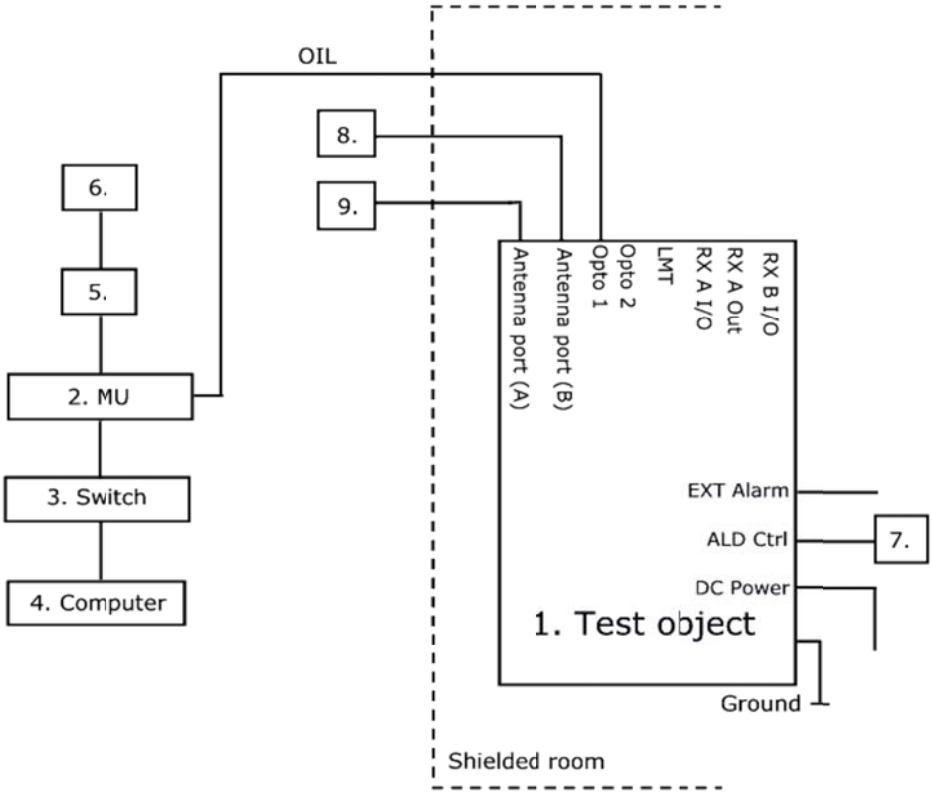
1. RRUS 11 B2, product KRC 161 276/1, revision R1C, s/n: C824682207
   with PIS software CXP 901 7316/1 rev. R32LS,
   unlocked working software CXP 901 3268/6 R49AY
   RBS software CXP 102 051/16 rev R26AD
   (FCC ID: TA8AKRC161276-1 and IC: 287AB-AS1612761)

Functional test equipment:

2. DUL 20 01, product KDU 137 533/4, revision R1F, s/n C825589657
3. DUW 30 01, product KDU 127 161/3, revision R4E, s/n: C825433814
4. RBS 6201 cabinet, BAMS 1000778792.
   PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316
5. Controlling laptop HP Elitebook 8740w, BAMS 1001052043
   running software MOSHELL V9.0c for LTE and channel builder SW for WCDMA
6. Symmetricon 8040, BAMS 1000714186 reference
7. ERNC Sim 127
8. Fast Ethernet switch, Netgear FS726G
9. Attenuator, filter, directional coupler according respective appendix
10. Termination 50 ohm
11. SP test instrument according measurement equipment list

Appendix 1

Test setup radiated measurements LTE SR SC MIMO



Test object:

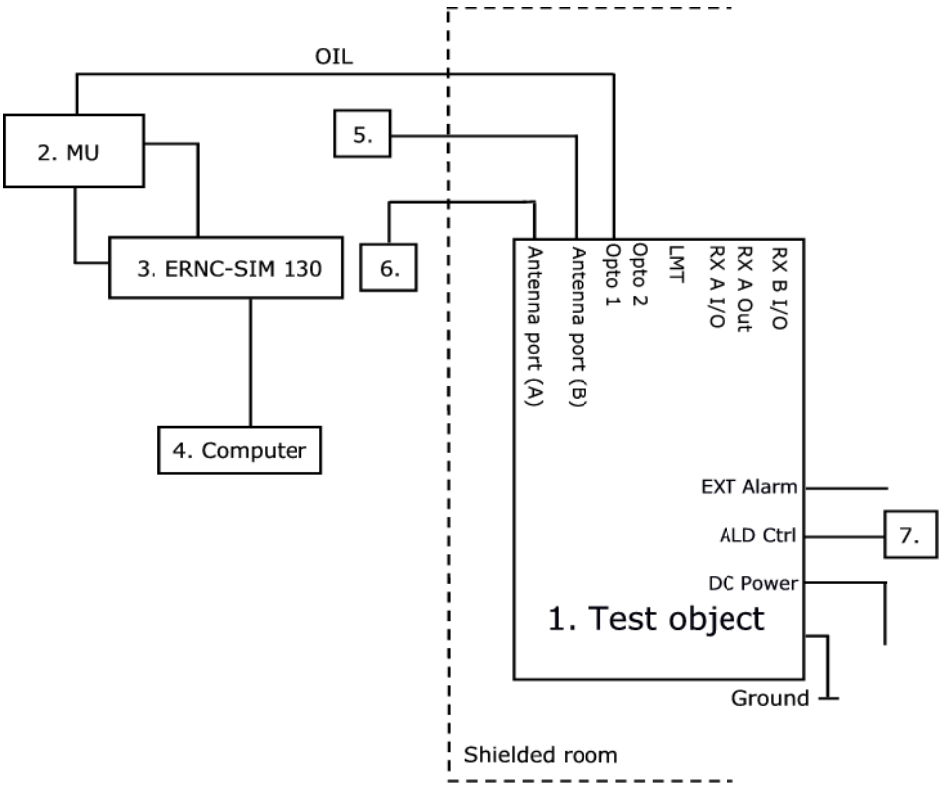
1. RRUS 11 B2, product KRC 161 276/1, revision R1C, s/n: C824447325
   with PIS software CXP 901 7316/1 revision R32LS,
   unlocked working software CXP 901 3268/6 revision R49AY,
   RBS software CXP 102 051/16 revision R26AD
   (FCC ID: TA8AKRC161276-1 and IC: 287AB-AS1612761)

Functional test equipment:

2. DUL 20 01, KDU 137 533/4, rev. R1F, s/n: C825589657,
   hosted in RBS 6202, BAMS – 1000961945
3. Fast Ethernet switch, Netgear FS108
4. Computer HP Elitebook 8540w, BAMS – 1001052032
5. GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356490
6. GPS Antenna
7. RET – Remote Electrical Tilt unit, KRY 121 67/2, rev. R1N
8. Termination 50 ohm
9. Termination 50 ohm

Appendix 1

Test setup radiated measurements WCDMA SR SC MIMO



Test object:

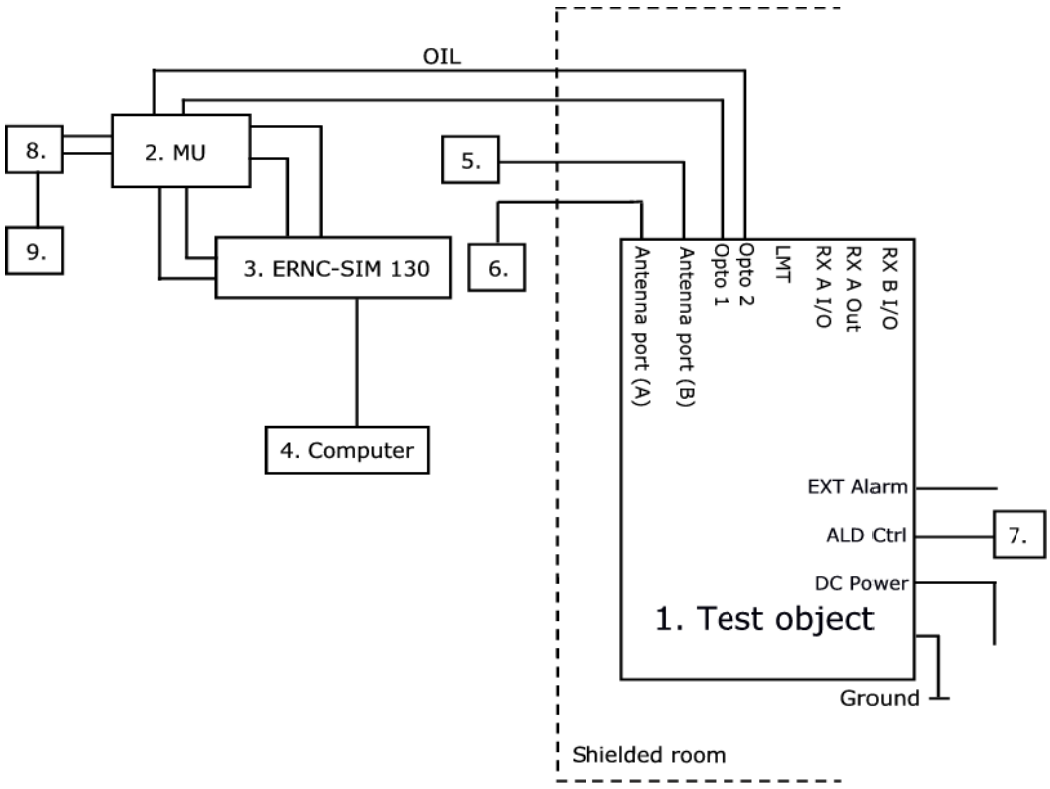
1. RRUS 11 B2, product KRC 161 276/1, revision R1C, s/n: C824447325
   with PIS software CXP 901 7316/1 revision R32LS,
   unlocked working software CXP 901 3268/6 revision R49AY,
   RBS software CXP 901 8350/1, revision R11D02
   (FCC ID: TA8AKRC161276-1 and IC: 287AB-AS1612761)

Functional test equipment:

2. DUW 30 01, product KDU 127 161/3, revision R4E, s/n: C826303721, hosted in RBS 6202, BAMS – 1000961945
3. ERNC-SIM 130, BAMS – 1000660991
4. Computer HP Elitebook 8540w, BAMS – 1001052032
5. Termination 50 ohm
6. Termination 50 ohm
7. RET – Remote Electrical Tilt unit, KRY 121 67/2, rev. R1N

Appendix 1

Test setup radiated measurements MSR WCDMA + LTE



Test object:

1. RRUS 11 B2, KRC 161 276/1, revision R1C, s/n: C824447325
   with PIS software CXP 901 7316/1 revision R32LS,
   unlocked working software CXP 901 3268/6 revision R49AY,
   RBS software CXP 901 8350/1 revision R11D02
   (FCC ID: TA8AKRC161276-1 and IC: 287AB-AS1612761)

Functional test equipment:

2. DUW 30 01, product KDU 127 161/3, revision R4E, s/n: C826303721,
   DUL 20 01, product KDU 137 533/4, revision R1F, s/n: C8255896557
   hosted in a RBS 6202 cabinet, BAMS – 1000961945
3. ERNC-SIM 130, BAMS – 1000660991
4. Computer HP Elitebook 8540w, BAMS – 1001052032
5. Termination 50 ohm
6. Termination 50 ohm
7. RET – Remote Electrical Tilt unit, KRY 121 67/2, rev. R1N
8. GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356490
9. GPS Antenna

Appendix 1

Interfaces:	**Type of port:**
Supply power -48 VDC	DC Power
Antenna port (A), 7/16 male connector, terminated	Antenna
Antenna port (B), 7/16 male connector, terminated	Antenna
Opto 1, Optical Interface Link, single mode opto fibre 1	Signal
Opto 2, for MSR Optical Interface Link, single mode opto fibre 2 for SR not connectetd	Signal
LMT, for maintenance use only	Signal
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

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 , 2012
CFR 47 part 24, October 1st, 2012
3GPP TS 25.141, version 8.9.0
3GPP TS 36.141, version 9.4.0
3GPP TS 37.141, version 10.8.0
RSS-Gen Issue 3
RSS-133 Issue 6

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	2013-05	504 143
R&S ESU 26	2013-09	901 553
Control computer with R&S EMC32 version 8.52.0	-	503 479
High pass filter	2013-07	901 502
High pass filter	2014-08	503 739
High pass filter	2013-07	503 740
RF attenuator	2013-07	504 159
RF attenuator	2013-09	900 233
RF attenuator	2013-08	901 384
Directional coupler	2013-08	901 496
Chase Bilog Antenna CBL 6111A	2014-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 1620-25	-	503 939
µComp Nordic, Low Noise Amplifier	2013-04	901 545
MITEQ Low Noise Amplifier	2013-08	503 285
Testo 635 Temperature and humidity meter	2013-06	504 203
Testo 625 Temperature and humidity meter	2013-06	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 2012-12-04.

Manufacturer’s representative

Christer Gustavsson, Ericsson AB

Test engineers

Andreas Johnson, Tomas Lennhager, Tomas Isbring, Hyder Khalaf, Reinhold Reul and Martin Theorin, SP

Test participant

Adam Skoglund, Ericsson AB (partially during radiated tests)

RF power output measurements according to CFR 47 §2.1046 / IC RSS-133 6.4

Date	Temperature	Humidity
2012-12-06	18 °C ± 3 °C	17 % ± 5 %
2012-12-12	23 °C ± 3 °C	18 % ± 5 %
2012-12-13	23 °C ± 3 °C	15 % ± 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
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	900 233
RF attenuator	901 384
Directional coupler	901 496
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

Single RAT, nominal output power 1x 44.77 dBm (30 W) per RF port:

Configuration	BW (MHz)	Measured RMS power (dBm)			Offset from nominal (dB)
		Port RFA	Port RFB	RFA+RFB[1]	
WCDMA single carrier per port, frequency M	5	44.60 (diagram 1)	44.54 (diagram 2)	**47.58**	-0.19
LTE, single carrier per port, frequency M	1.4	44.34 (diagram 3)	44.27 (diagram 4)	**47.32**	-0.45
	3	44.49 (diagram 5)	44.37 (diagram 6)	**47.44**	-0.33
	5	44.48 (diagram 7)	44.37 (diagram 8)	**47.44**	-0.33
	10	44.46 (diagram 9)	44.37 (diagram 10)	**47.43**	-0.34
	15	44.49 (diagram 11)	44.37 (diagram 12)	**47.44**	-0.33
	20	44.50 (diagram 13)	44.42 (diagram 14)	**47.47**	-0.30

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v01r02

Multi RAT (MSR), 1x WCDMA and 1x LTE carrier per RF port
nominal accumulated output power, 44.77 dBm (30 W a 15 W per carrier) per RF port

MSR frequency	LTE BW (MHz)	WCDMA BW (MHz)	Measured RMS power (dBm) Port RF A	Offset from nominal (dB)
B	5	5	44.44 (diagram 15)	-0.33
M	1.4	5	43.91 (diagram 16)	-0.86
M	3	5	44.15 (diagram 17)	-0.62
M	5	5	44.10 (diagram 18)	-0.67
T	5	5	44.51 (diagram 19)	-0.26

Note: The diagrams are shown on the following pages and provide Crest factor and PK power. The highest single carrier Crest factor measured was 7.63 dB. For multi-carrier constellations the measured "Crest factor" is informative only as to the definition of Crest factor per carrier.

Limits

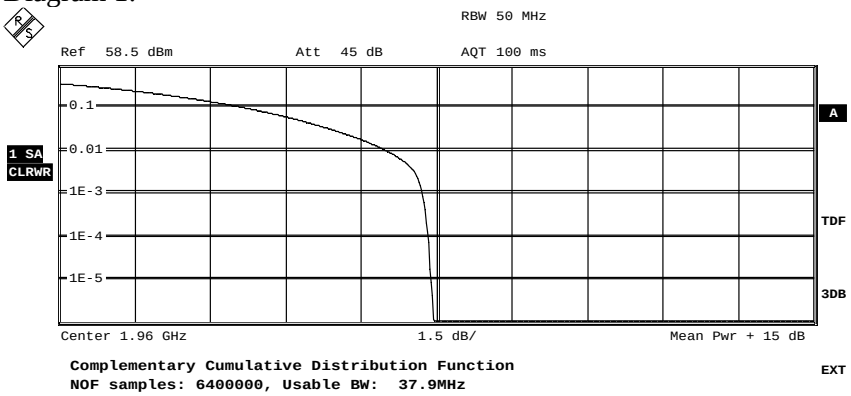
§24.232: The maximum equivalent isotropically radiated power (e.i.r.p.) may not exceed 3280 W (EIRP) / MHz.
The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-133 6.4: The average equivalent isotropically radiated power (e.i.r.p.) limits in SRSP-510 apply. Base station transmitters operating in the band 1930 – 1995 MHz shall not have output power exceeding 100 Watts.
The Peak to Average Ratio (PAR) may not exceed 13 dB.

Complies?	Yes

Appendix 2

Diagram 1:

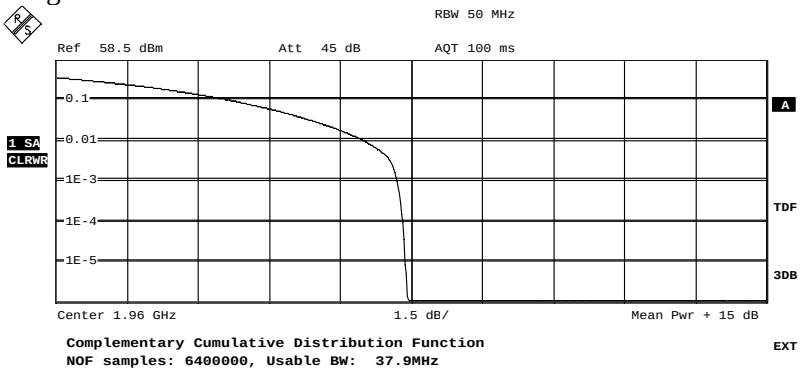


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.60 dBm
Peak	52.11 dBm
Crest	7.51 dB
10 %	3.73 dB
1 %	6.51 dB
.1 %	7.21 dB
.01 %	7.33 dB

Date: 6.DEC.2012 13:35:48

Diagram 2:



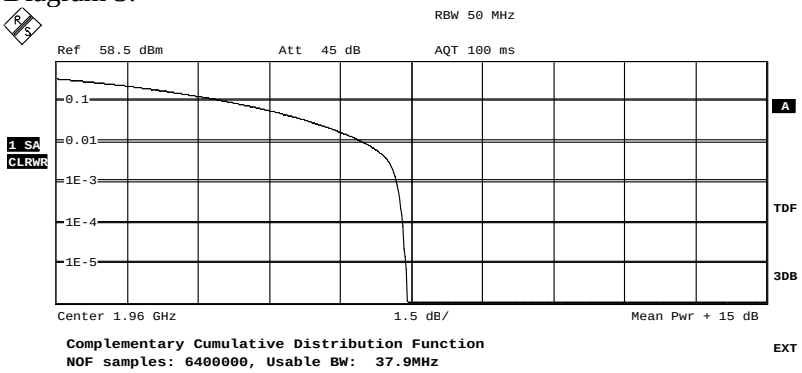
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.54 dBm
Peak	51.97 dBm
Crest	7.42 dB
10 %	3.73 dB
1 %	6.49 dB
.1 %	7.21 dB
.01 %	7.33 dB

Date: 6.DEC.2012 15:29:18

Appendix 2

Diagram 3:

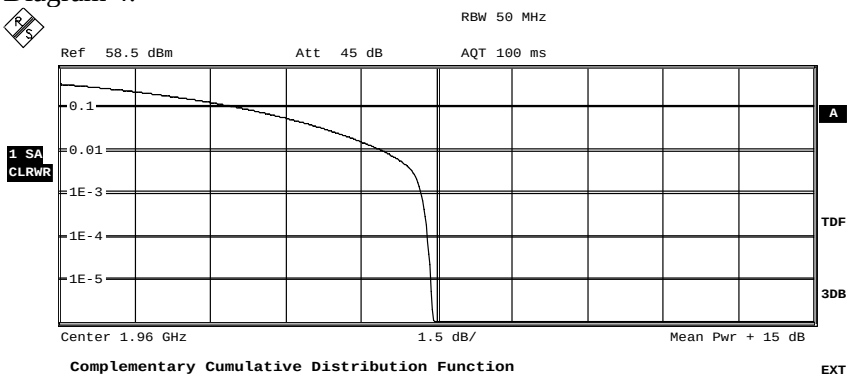


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.34 dBm
Peak	51.82 dBm
Crest	7.48 dB
10 %	3.65 dB
1 %	6.49 dB
.1 %	7.19 dB
.01 %	7.33 dB

Date: 10.DEC.2012 11:07:14

Diagram 4:



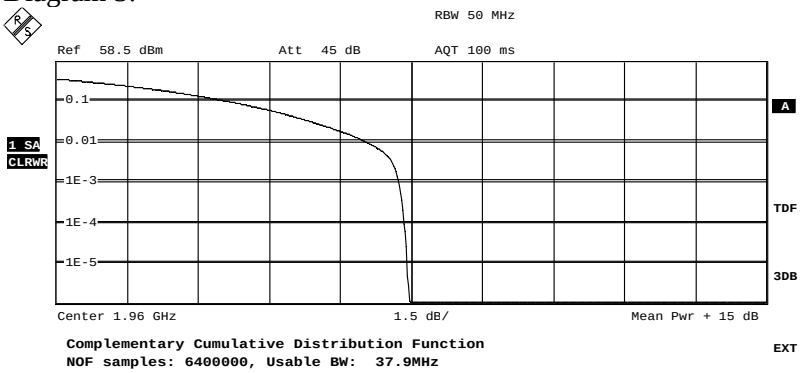
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.27 dBm
Peak	51.74 dBm
Crest	7.47 dB
10 %	3.68 dB
1 %	6.44 dB
.1 %	7.21 dB
.01 %	7.33 dB

Date: 7.DEC.2012 15:31:38

Appendix 2

Diagram 5:

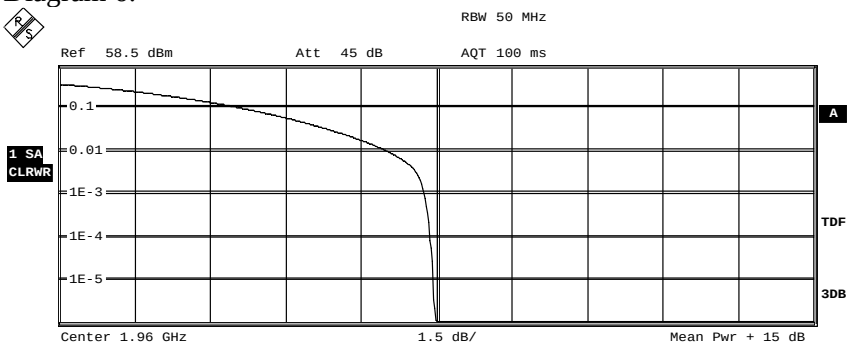


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.49 dBm
Peak	52.04 dBm
Crest	7.55 dB
10 %	3.70 dB
1 %	6.56 dB
.1 %	7.24 dB
.01 %	7.36 dB

Date: 10.DEC.2012 12:03:17

Diagram 6:



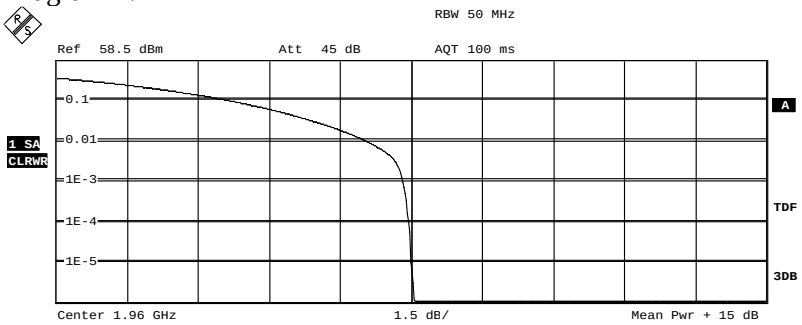
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.37 dBm
Peak	51.88 dBm
Crest	7.51 dB
10 %	3.68 dB
1 %	6.54 dB
.1 %	7.26 dB
.01 %	7.38 dB

Date: 7.DEC.2012 15:35:21

Appendix 2

Diagram 7:

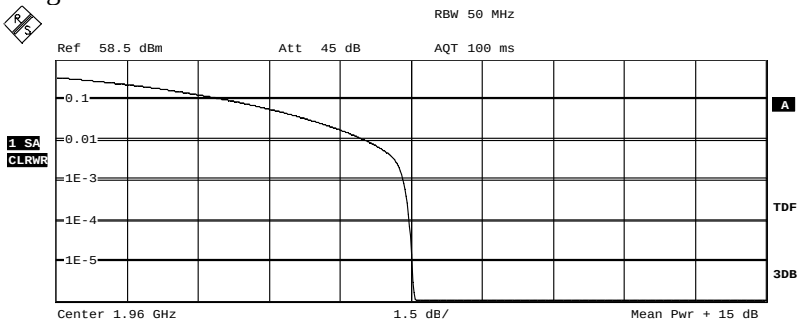


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.48 dBm
Peak	52.11 dBm
Crest	7.63 dB
10 %	3.70 dB
1 %	6.56 dB
.1 %	7.33 dB
.01 %	7.45 dB

Date: 10.DEC.2012 12:16:31

Diagram 8:



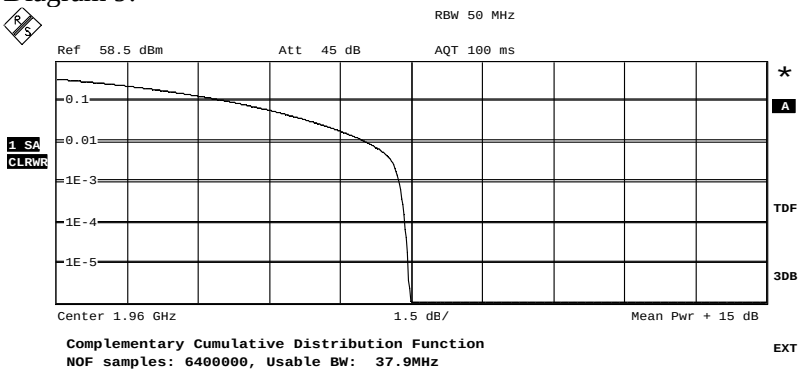
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.37 dBm
Peak	51.97 dBm
Crest	7.59 dB
10 %	3.68 dB
1 %	6.54 dB
.1 %	7.33 dB
.01 %	7.48 dB

Date: 10.DEC.2012 13:04:04

Appendix 2

Diagram 9:

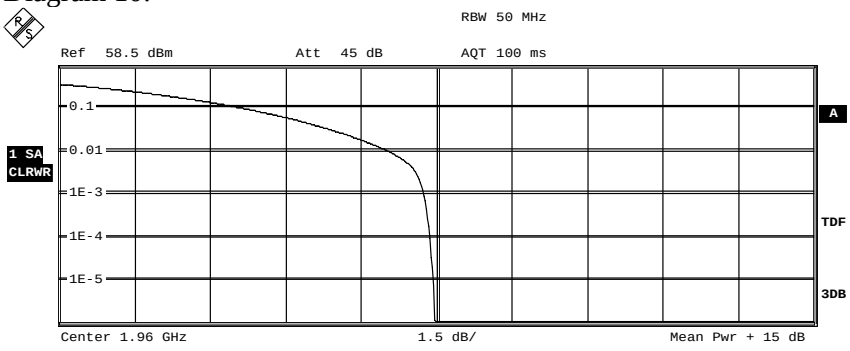


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.46 dBm
Peak	52.04 dBm
Crest	7.57 dB
10 %	3.70 dB
1 %	6.56 dB
.1 %	7.26 dB
.01 %	7.38 dB

Date: 10.DEC.2012 12:27:07

Diagram 10:



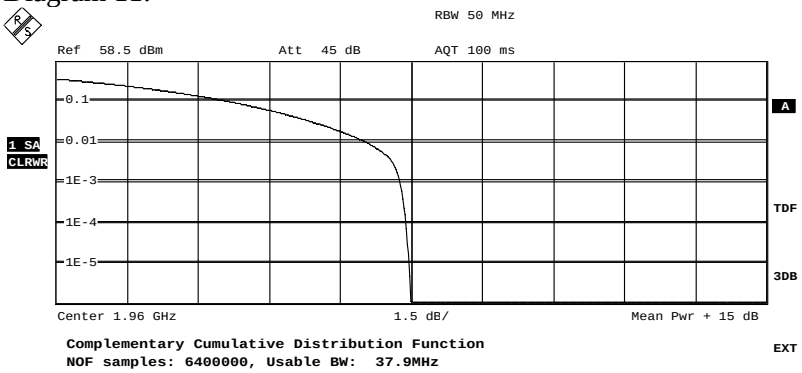
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.37 dBm
Peak	51.89 dBm
Crest	7.52 dB
10 %	3.70 dB
1 %	6.54 dB
.1 %	7.26 dB
.01 %	7.38 dB

Date: 10.DEC.2012 13:08:32

Appendix 2

Diagram 11:

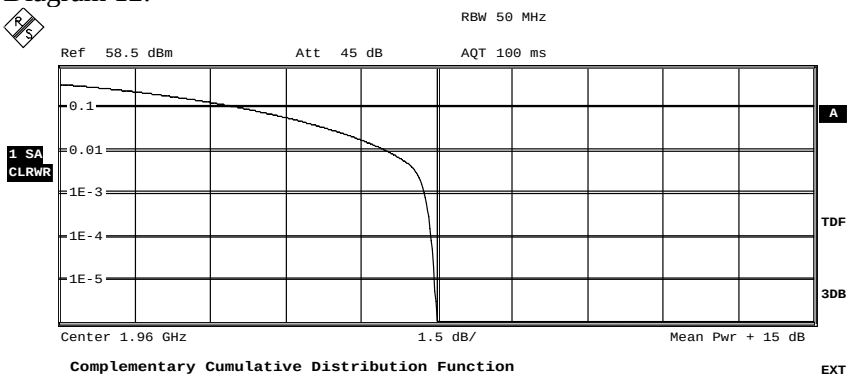


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.49 dBm
Peak	52.04 dBm
Crest	7.54 dB
10 %	3.70 dB
1 %	6.54 dB
.1 %	7.26 dB
.01 %	7.40 dB

Date: 10.DEC.2012 12:29:54

Diagram 12:



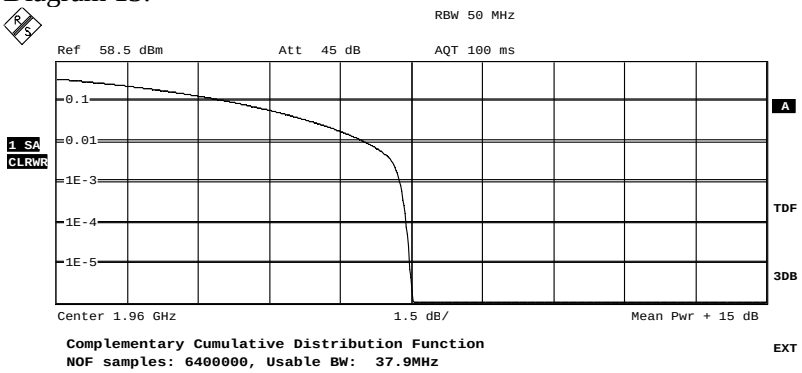
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.37 dBm
Peak	51.97 dBm
Crest	7.59 dB
10 %	3.70 dB
1 %	6.51 dB
.1 %	7.26 dB
.01 %	7.40 dB

Date: 10.DEC.2012 13:14:00

Appendix 2

Diagram 13:

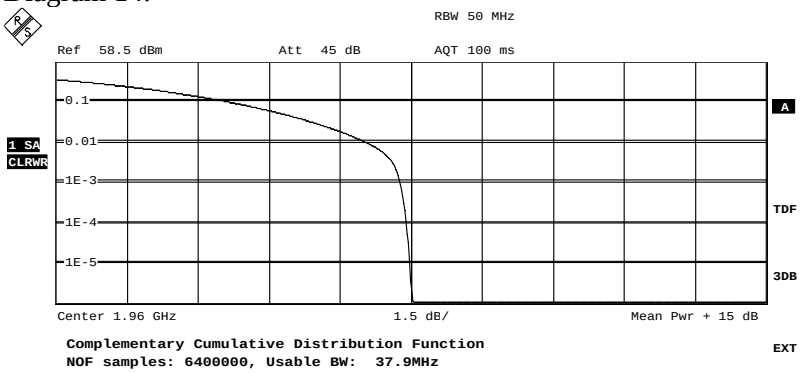


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.50 dBm
Peak	52.11 dBm
Crest	7.60 dB
10 %	3.70 dB
1 %	6.54 dB
.1 %	7.26 dB
.01 %	7.40 dB

Date: 10.DEC.2012 12:37:28

Diagram 14:



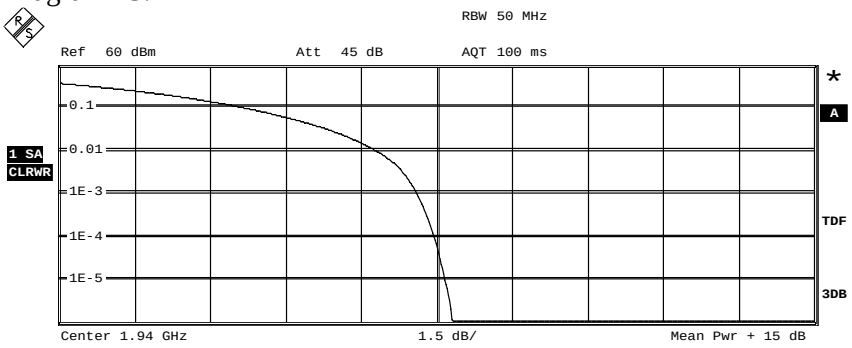
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.42 dBm
Peak	52.04 dBm
Crest	7.61 dB
10 %	3.70 dB
1 %	6.56 dB
.1 %	7.26 dB
.01 %	7.40 dB

Date: 10.DEC.2012 13:16:05

Appendix 2

Diagram 15:

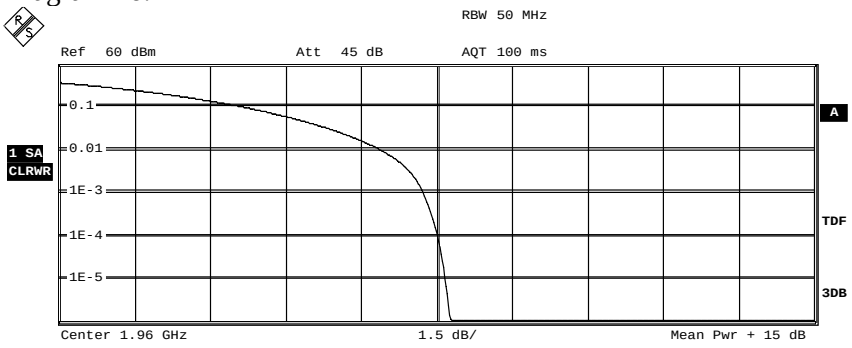


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.44 dBm
Peak	52.45 dBm
Crest	8.01 dB
10 %	3.70 dB
1 %	6.30 dB
.1 %	7.12 dB
.01 %	7.45 dB

Date: 12.DEC.2012 14:45:39

Diagram 16:



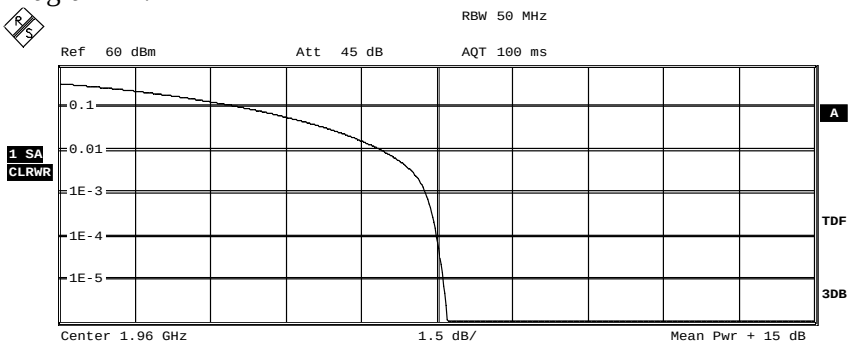
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	43.91 dBm
Peak	51.78 dBm
Crest	7.88 dB
10 %	3.70 dB
1 %	6.39 dB
.1 %	7.24 dB
.01 %	7.52 dB

Date: 12.DEC.2012 12:12:18

Appendix 2

Diagram 17:

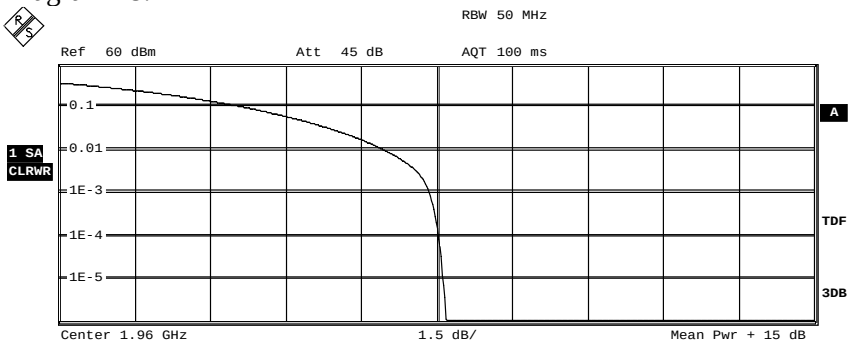


Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.15 dBm
Peak	51.92 dBm
Crest	7.77 dB
10 %	3.70 dB
1 %	6.42 dB
.1 %	7.28 dB
.01 %	7.50 dB

Date: 12.DEC.2012 13:15:00

Diagram 18:



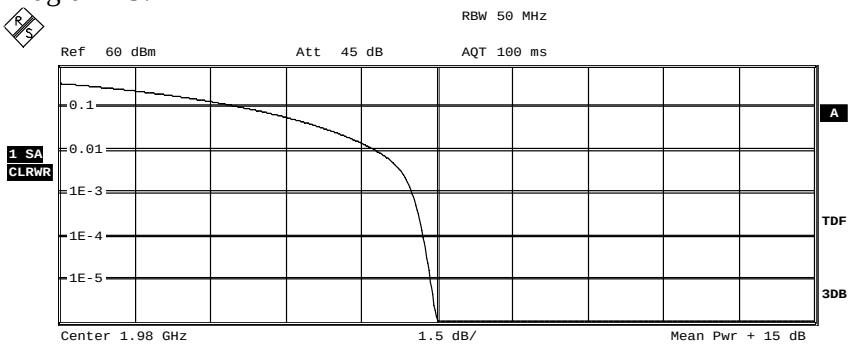
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

	Trace 1
Mean	44.10 dBm
Peak	51.85 dBm
Crest	7.75 dB
10 %	3.70 dB
1 %	6.47 dB
.1 %	7.36 dB
.01 %	7.55 dB

Date: 12.DEC.2012 12:58:17

Appendix 2

Diagram 19:



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

	Trace 1
Mean	44.51 dBm
Peak	52.09 dBm
Crest	7.58 dB
10 %	3.70 dB
1 %	6.30 dB
.1 %	7.02 dB
.01 %	7.24 dB

Date: 13.DEC.2012 11:55:26

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

Date	Temperature	Humidity
2012-12-06	18 °C ± 3 °C	17 % ± 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
RF attenuator	901 384
Directional coupler	901 496
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA:

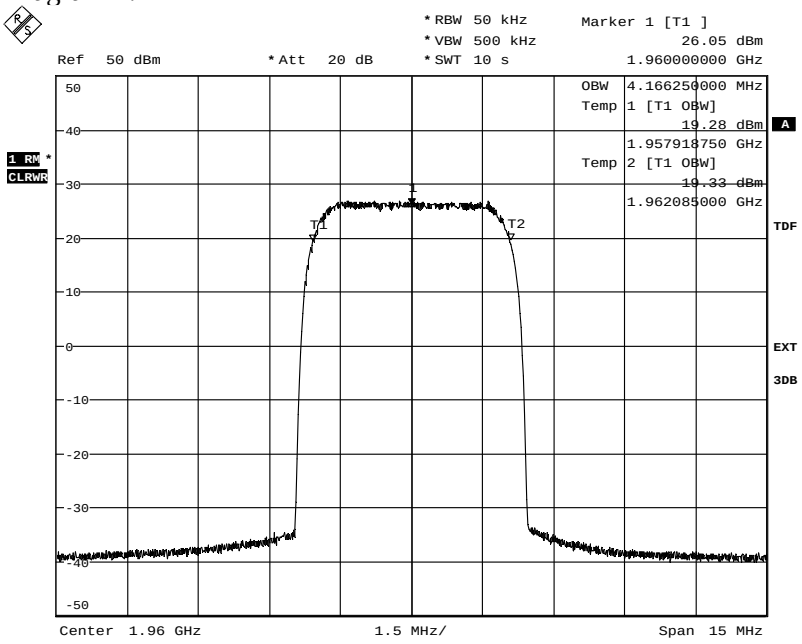
Diagram	BW / [MHz]	TX frequency	Tested Port	OBW (99%) / [MHz]
1	5 MHz	M	RF A	4.17
2	5 MHz	M	RF B	4.17

LTE:

Diagram	BW / [MHz]	TX frequency	Tested Port	OBW (99%) / [MHz]
3	1.4	M	RF A	1.09
4	3	M	RF A	2.69
5	5	M	RF A	4.48
6	10	M	RF A	8.94
7	15	M	RF A	13.43
8	20	M	RF A	17.86
9	1.4	M	RF B	1.09
10	20 MHz	M	RF B	17.86

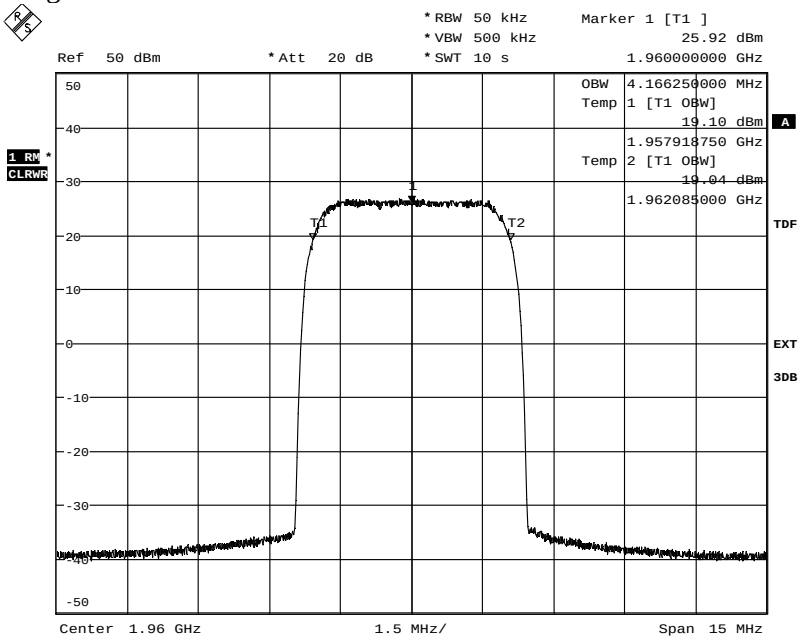
Appendix 3

Diagram 1:



Date: 6.DEC.2012 13:50:56

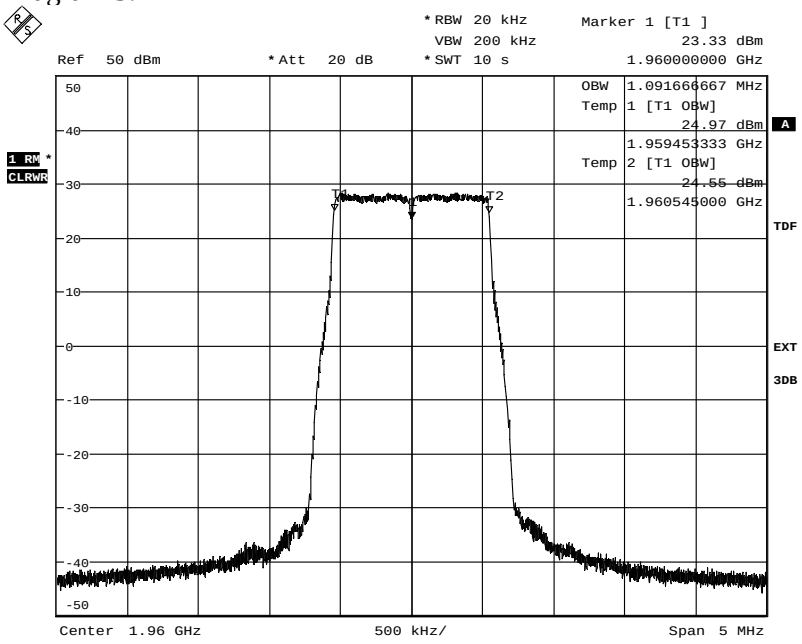
Diagram 2:



Date: 6.DEC.2012 15:51:05

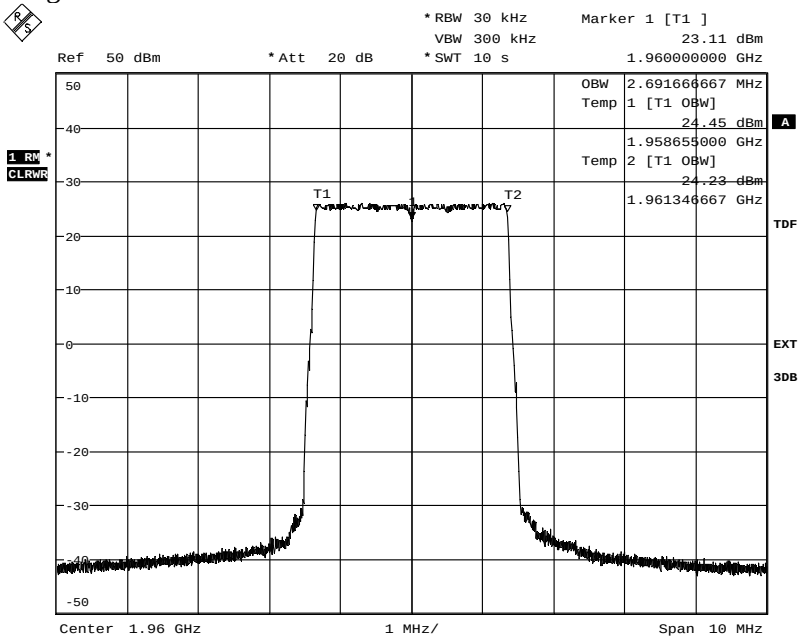
Appendix 3

Diagram 3:



Date: 10.DEC.2012 11:05:17

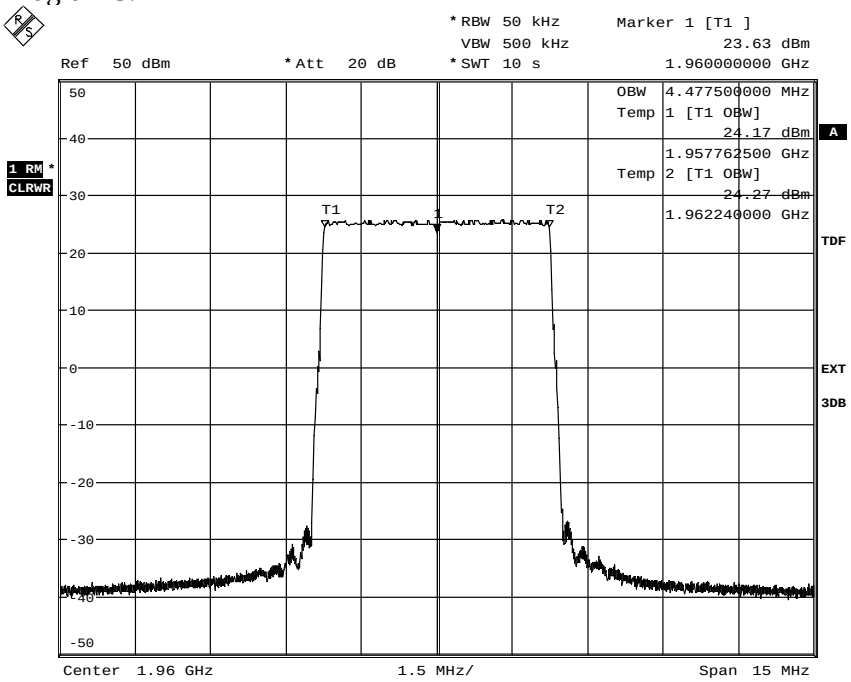
Diagram 4:



Date: 10.DEC.2012 12:06:27

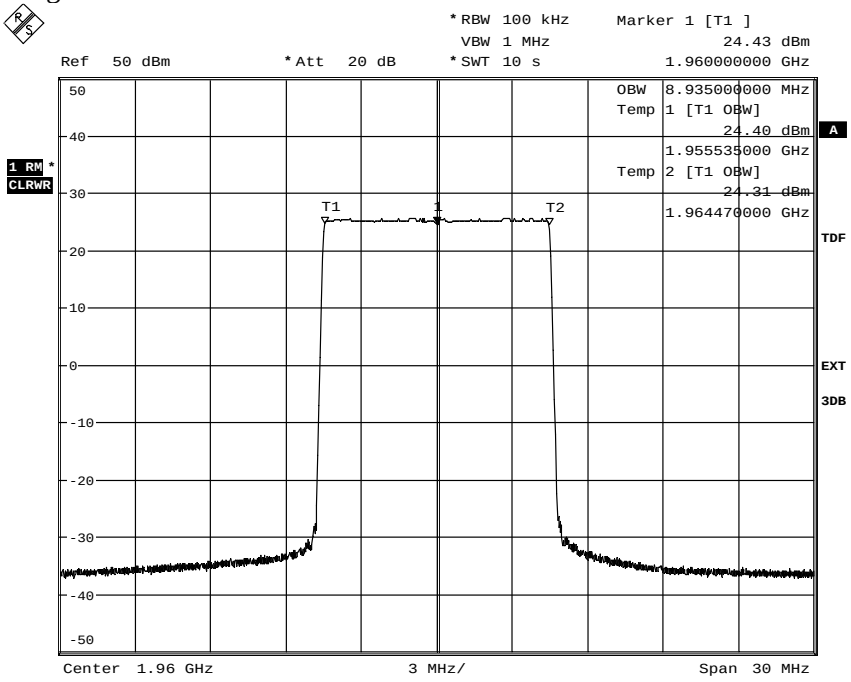
Appendix 3

Diagram 5:



Date: 10.DEC.2012 12:13:13

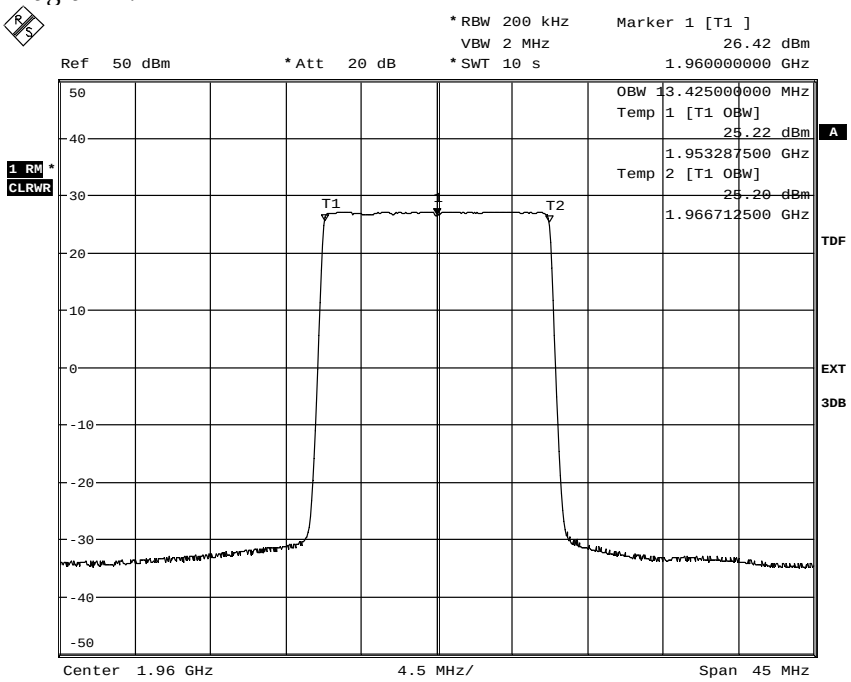
Diagram 6:



Date: 10.DEC.2012 12:24:10

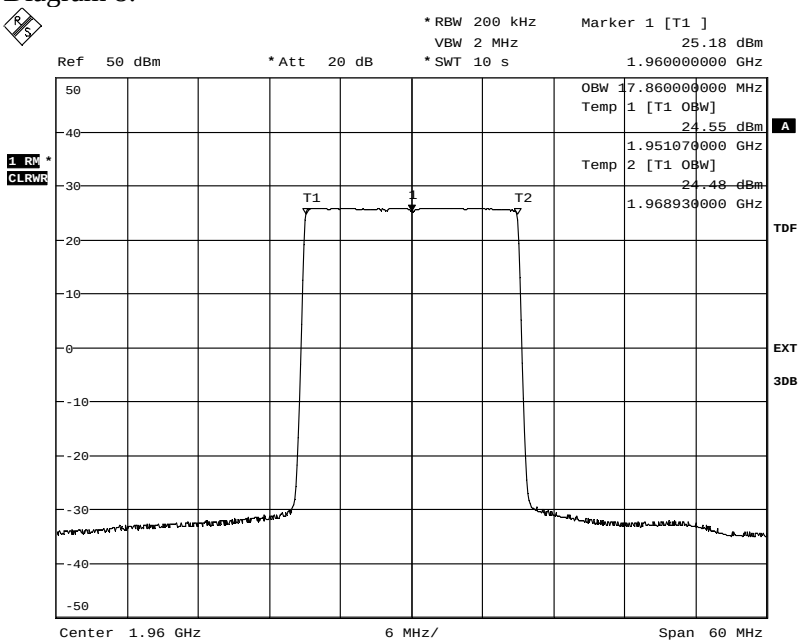
Appendix 3

Diagram 7:



Date: 10.DEC.2012 12:33:11

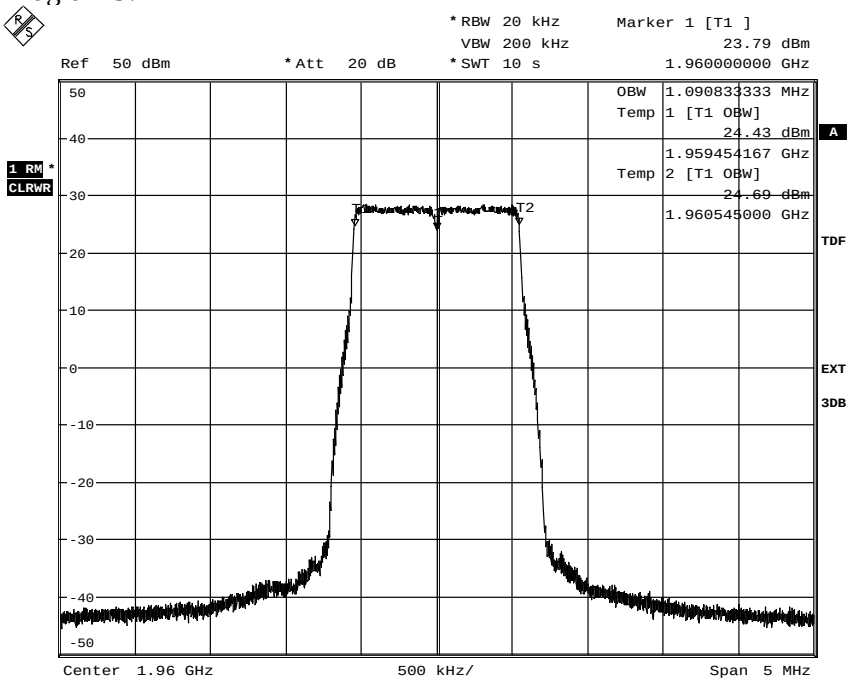
Diagram 8:



Date: 10.DEC.2012 12:38:57

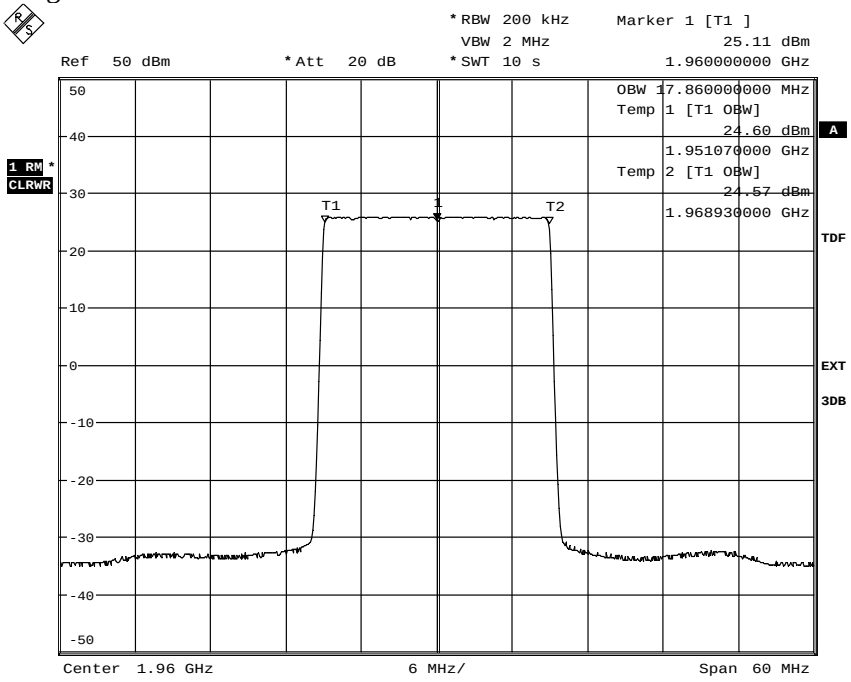
Appendix 3

Diagram 9:



Date: 10.DEC.2012 10:51:27

Diagram 10:



Date: 10.DEC.2012 10:39:09

Band edge measurements according to CFR 47 §2.1051 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-12-07	22 °C ± 3 °C	11 % ± 5 %
2012-12-11	22 °C ± 3 °C	14 % ± 5 %
2012-12-12	23 °C ± 3 °C	18 % ± 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.

FCC rules specify a RBW of at least 1% of the fundamental emission bandwidth (EBW) for offsets up to 1 MHz from the band edge and a RBW of 1 MHz for bigger offsets.

Before comparing results to the limit, two mathematical adjustments need to be applied: Where a smaller RBW was used as compared to FCC rules the limit in the plot is to be adjusted by 10*log(RBWused/RBW1%EBW) [dB]. For diagrams denoted 'b:' this correction was applied using RBW 100 kHz instead of 1 MHz and limit -23 dBm instead of -13 dBm.

To address the MIMO aspect of the EUT with 2 RF ports, additional 3 dB [10 log (2)] margin shall be added to the trace values shown prior to comparing to the limit, according to method 2 "measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v01r02.

LTE:

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
1.4 MHz	1.10	20 kHz	-13.00
3 MHz	2.71	30 kHz	-13.00
5 MHz	4.51	50 kHz	-13.00

WCDMA:

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
5 MHz	4.28	30 kHz	-14.54

Measurement equipment	SP number
R&S FSQ 40	504 143
RF attenuator	900 233
RF attenuator	901 384
Directional coupler	901 496
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA SR, SC:

Diagram	Configuration BW, TX power	Frequency	Tested Port
1 a - c	5 MHz, 1x 44.8 dBm	B	RF A
2 a - c	5 MHz, 1x 44.8 dBm	T	RF A
3 a – c	5 MHz, 1x 44.8 dBm	B	RF B
4 a – c	5 MHz, 1x 44.8 dBm	T	RF B

LTE SR, SC:

Diagram	Configuration BW, TX power	Frequency	Tested Port
5 a-c	1.4 MHz, 1x 44.8 dBm	B	RF A
6 a-c	3 MHz, 1x 44.8 dBm	B	RF A
7 a-c	5 MHz, 1x 44.8 dBm	B	RF A
8 a-c	3 MHz, 1x 44.8 dBm	B	RF B
9 a+c	1.4 MHz, 1x 44.8 dBm	T	RF A
10 a+c	3 MHz, 1x 44.8 dBm	T	RF A
11 a+c	5 MHz, 1x 44.8 dBm	T	RF A
12 a+c	3 MHz, 1x 44.8 dBm	T	RF B

Limits

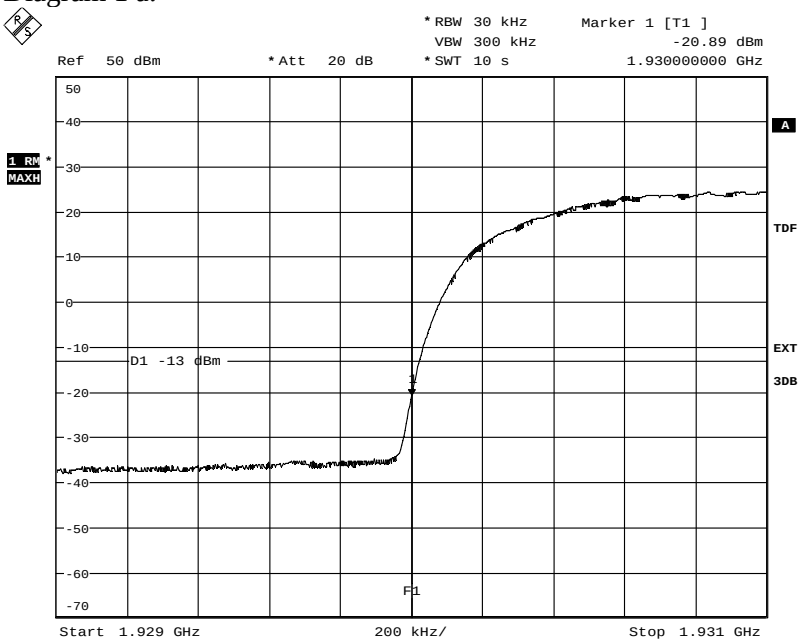
CFR 47 §24.238 and RSS-133 6.5

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

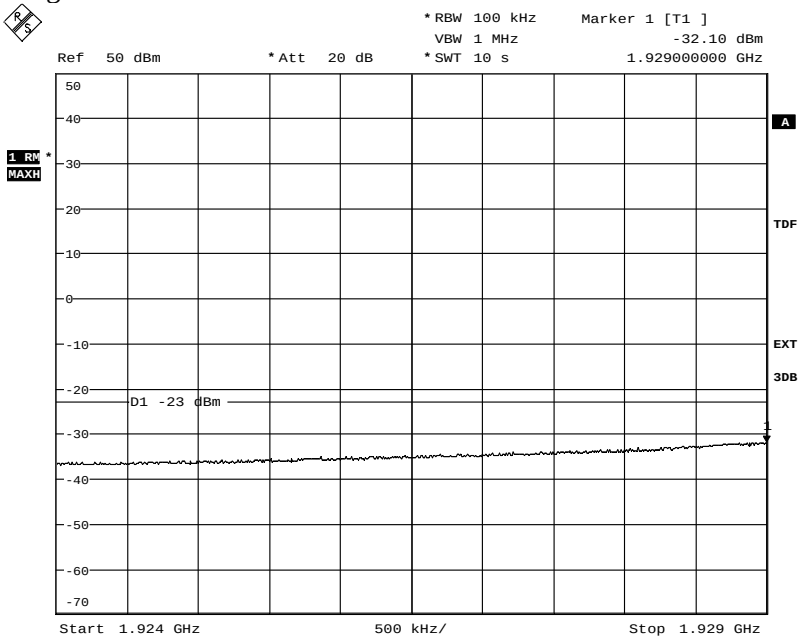
Appendix 4

Diagram 1 a:



Date: 7.DEC.2012 11:23:14

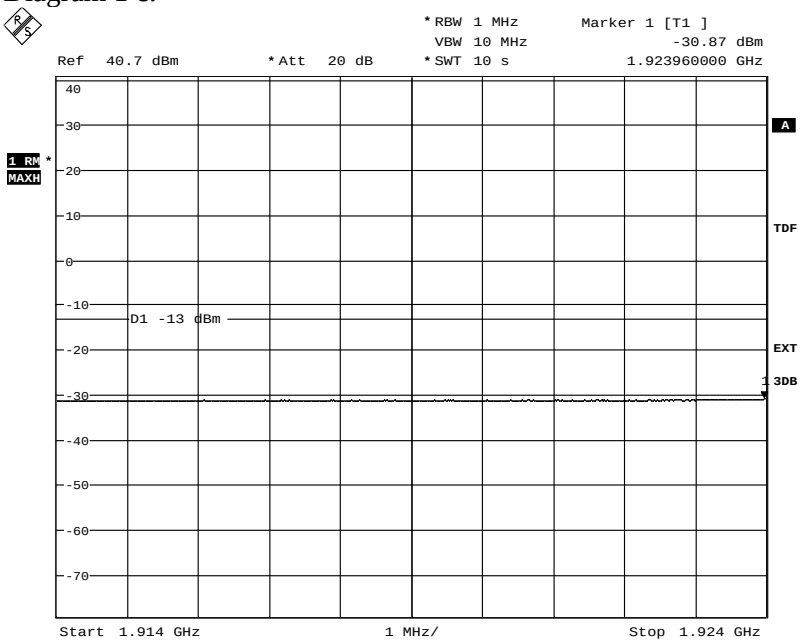
Diagram 1 b:



Date: 7.DEC.2012 11:24:58

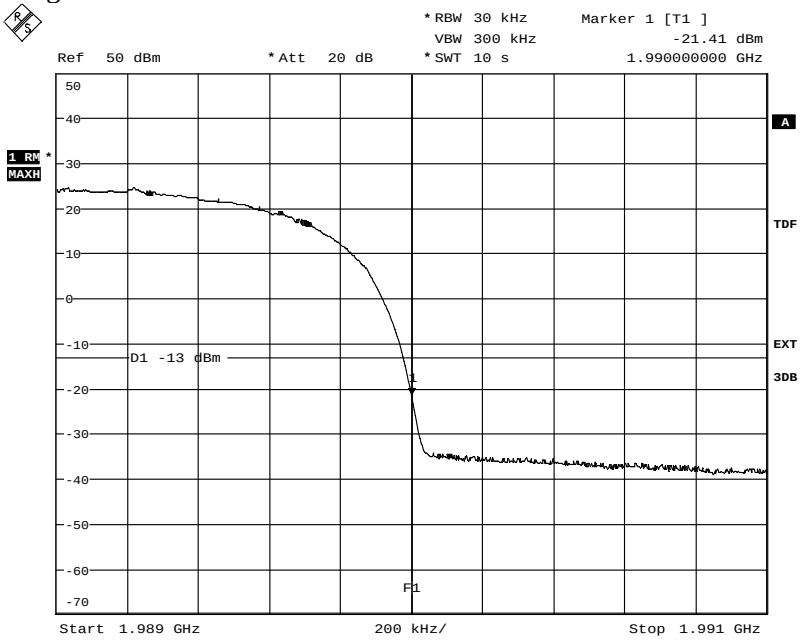
Appendix 4

Diagram 1 c:



Date: 7.DEC.2012 14:03:02

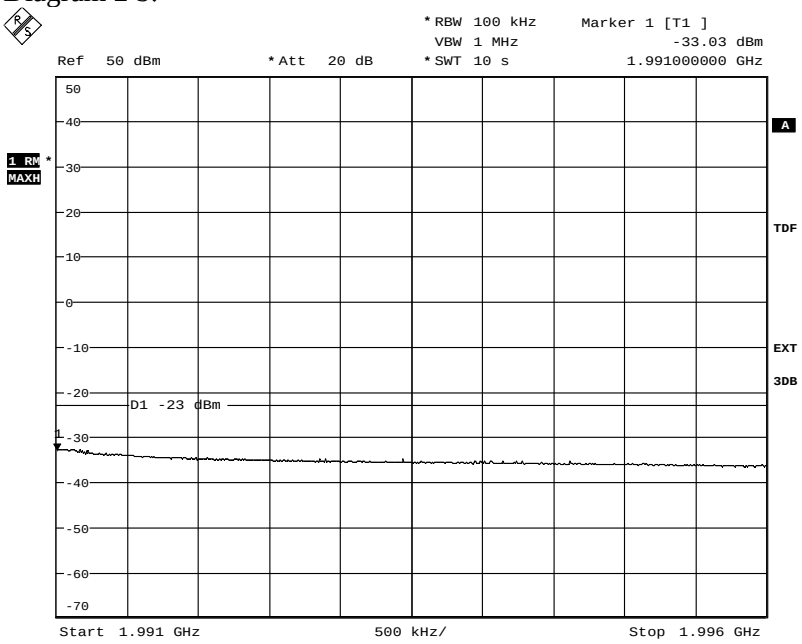
Diagram 2 a:



Date: 7.DEC.2012 14:54:03

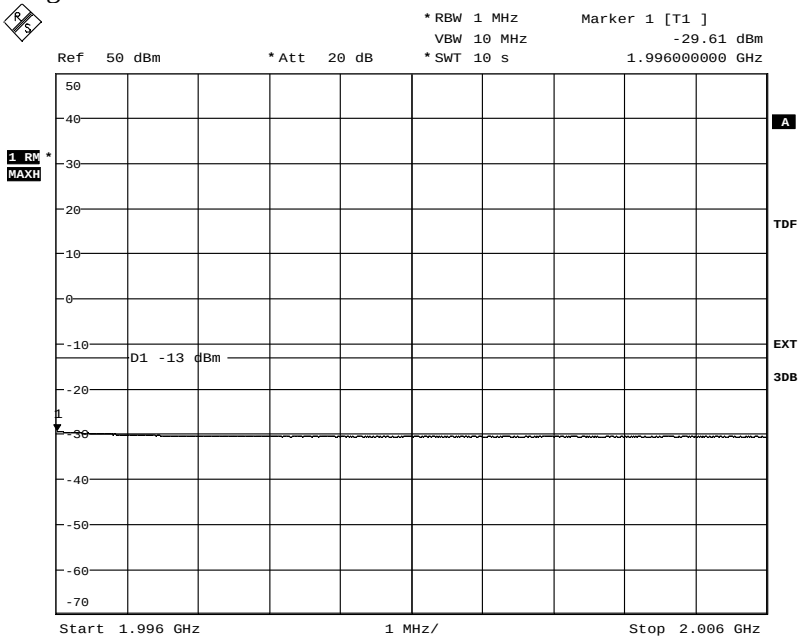
Appendix 4

Diagram 2 b:



Date: 7.DEC.2012 14:56:52

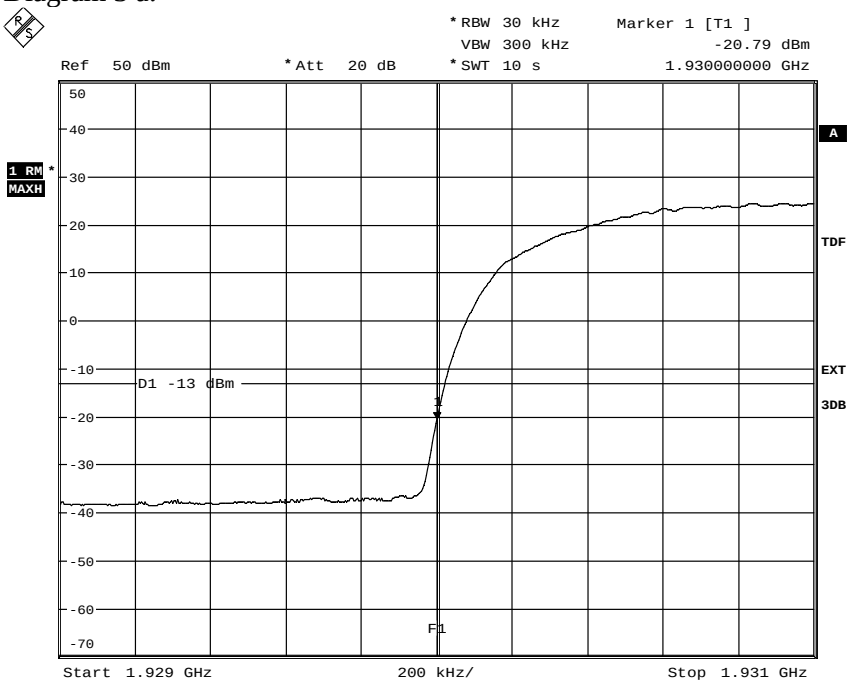
Diagram 2 c:



Date: 7.DEC.2012 14:59:02

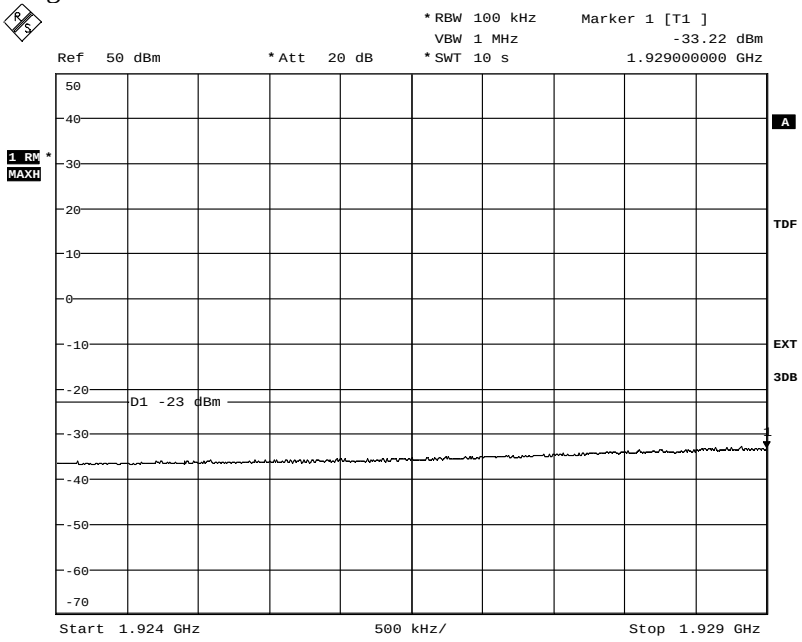
Appendix 4

Diagram 3 a:



Date: 7.DEC.2012 10:43:28

Diagram 3 b:

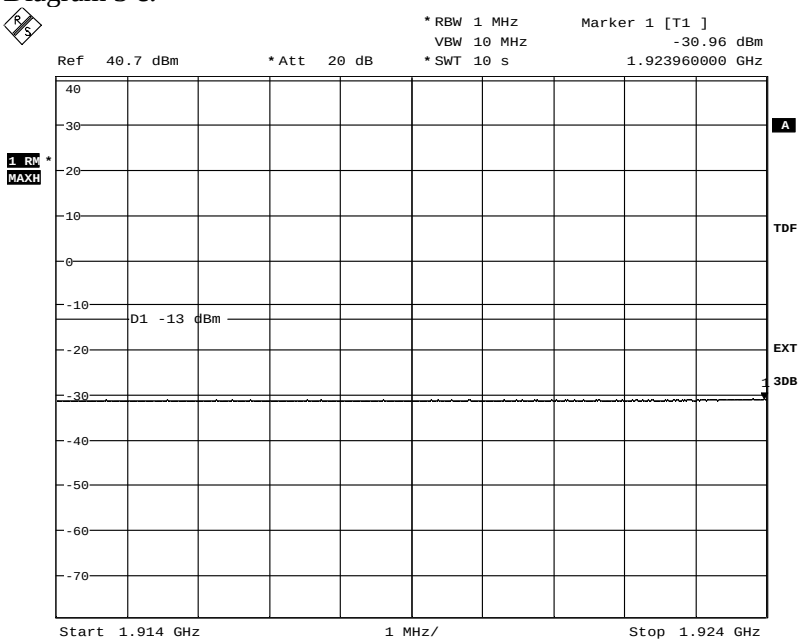


Date: 7.DEC.2012 11:09:33

Note: The limit was adjusted to match the used RBW

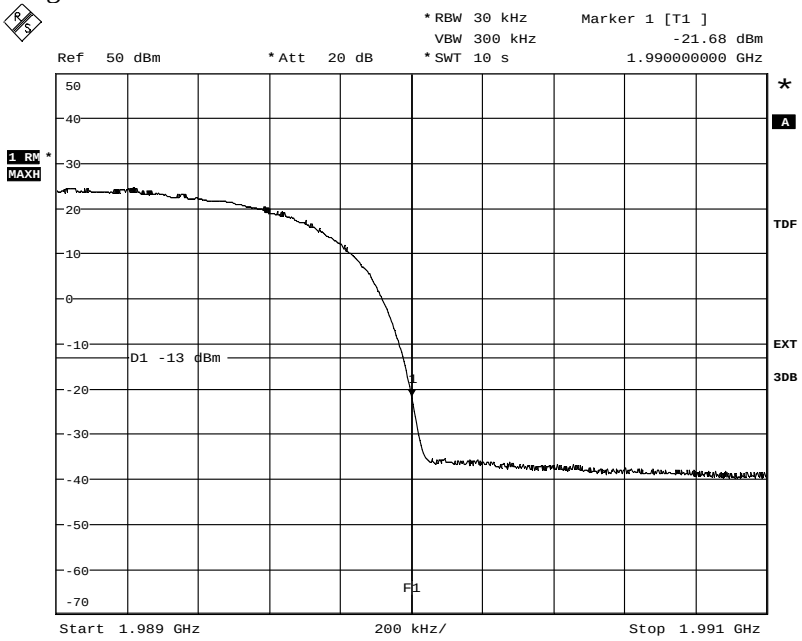
Appendix 4

Diagram 3 c:



Date: 7.DEC.2012 14:07:59

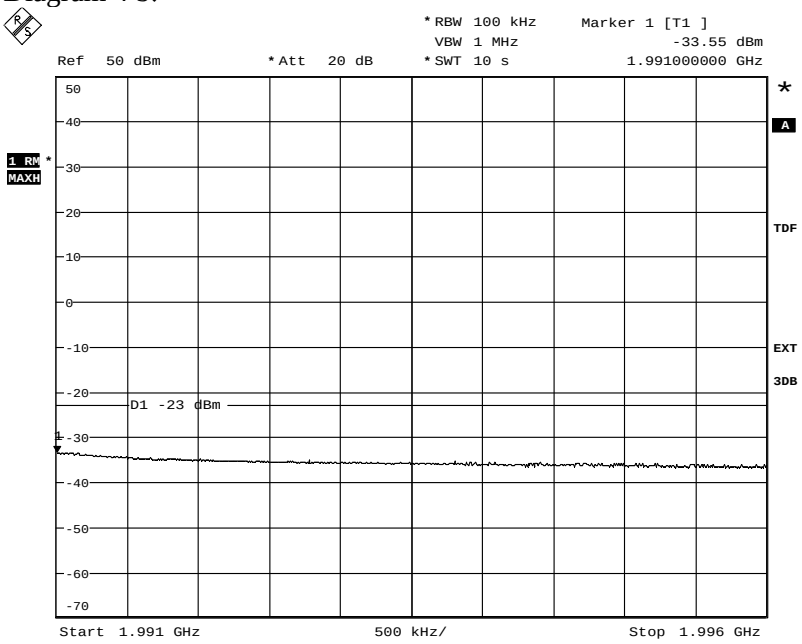
Diagram 4 a:



Date: 7.DEC.2012 15:11:37

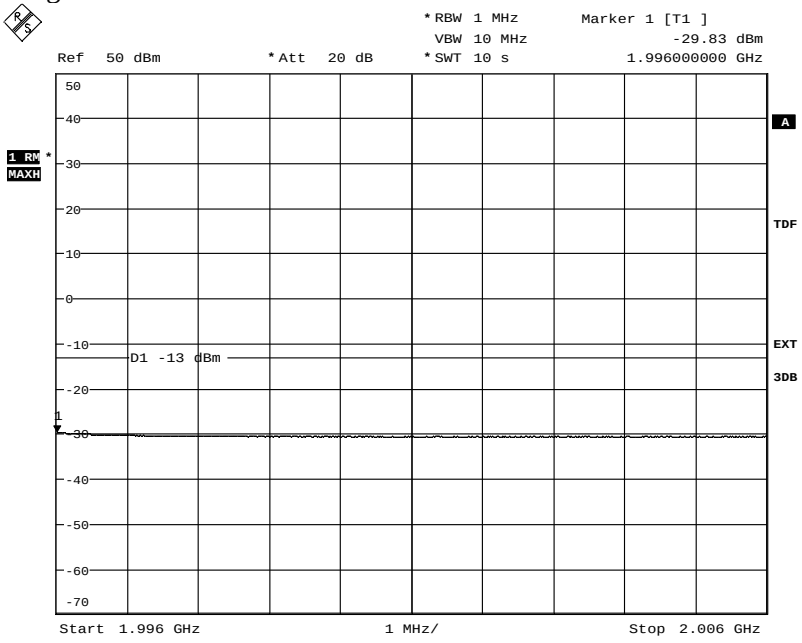
Appendix 4

Diagram 4 b:



Date: 7.DEC.2012 15:12:58

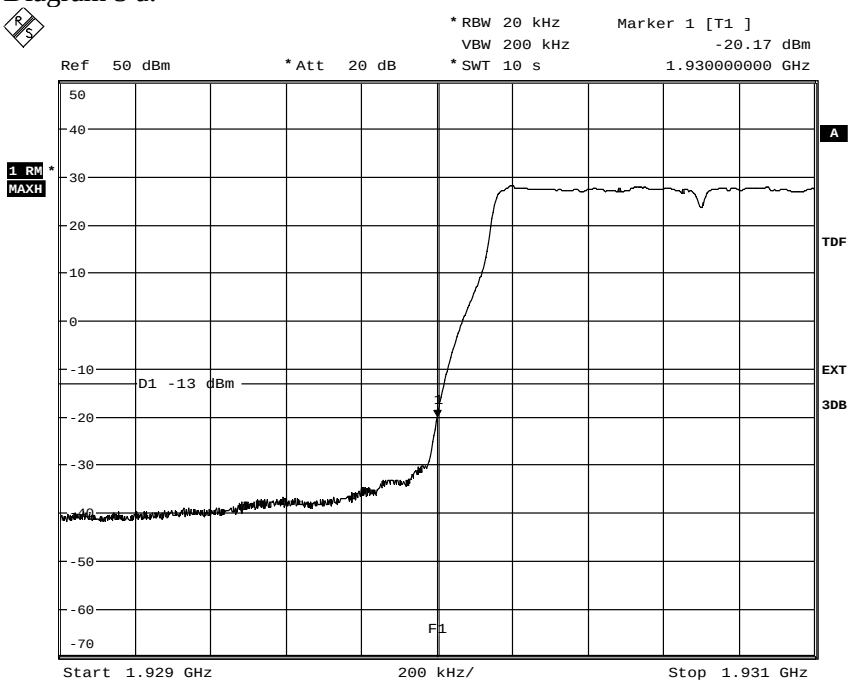
Diagram 4 c:



Date: 7.DEC.2012 15:14:21

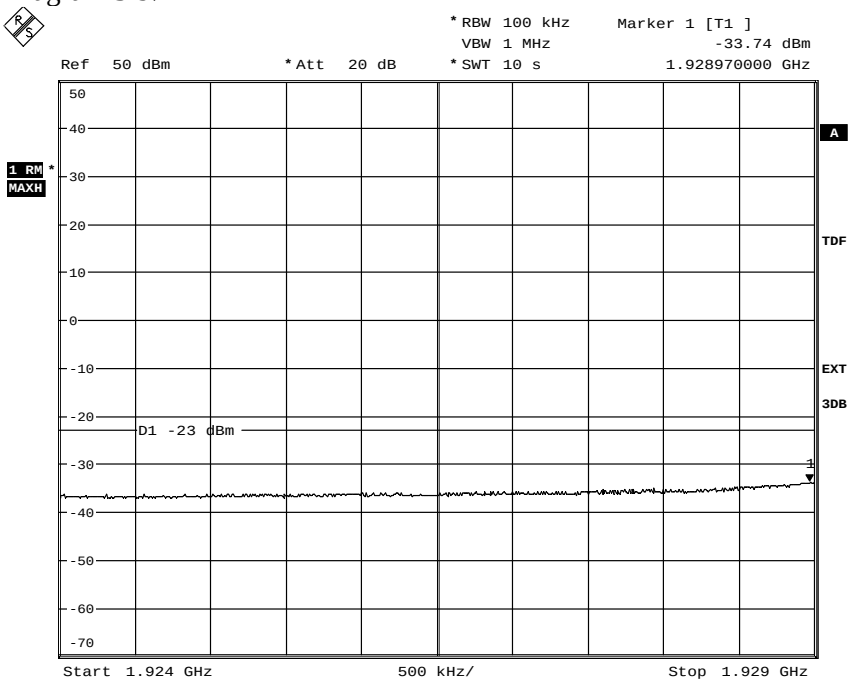
Appendix 4

Diagram 5 a:



Date: 11.DEC.2012 11:45:55

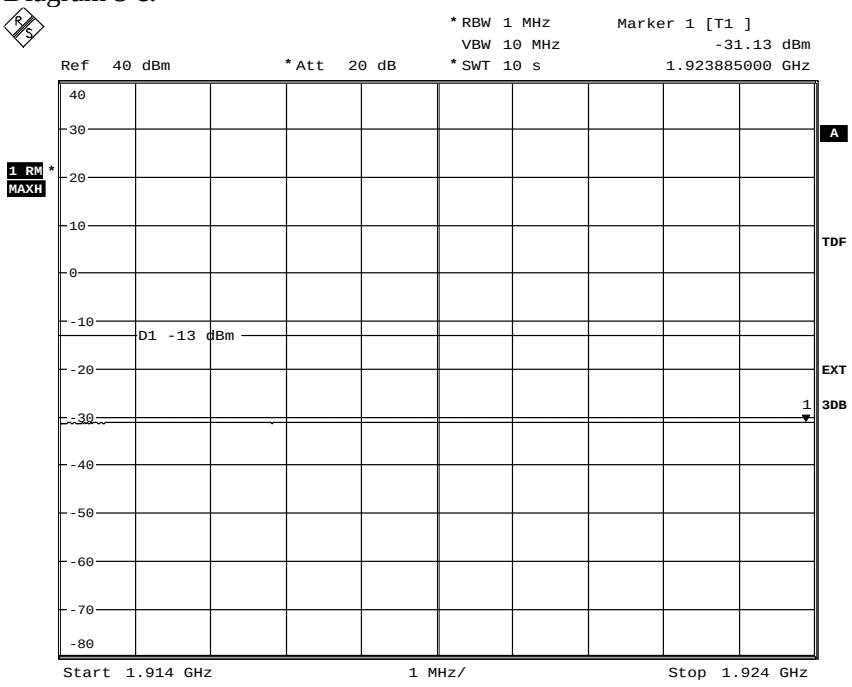
Diagram 5 b:



Date: 11.DEC.2012 11:46:56

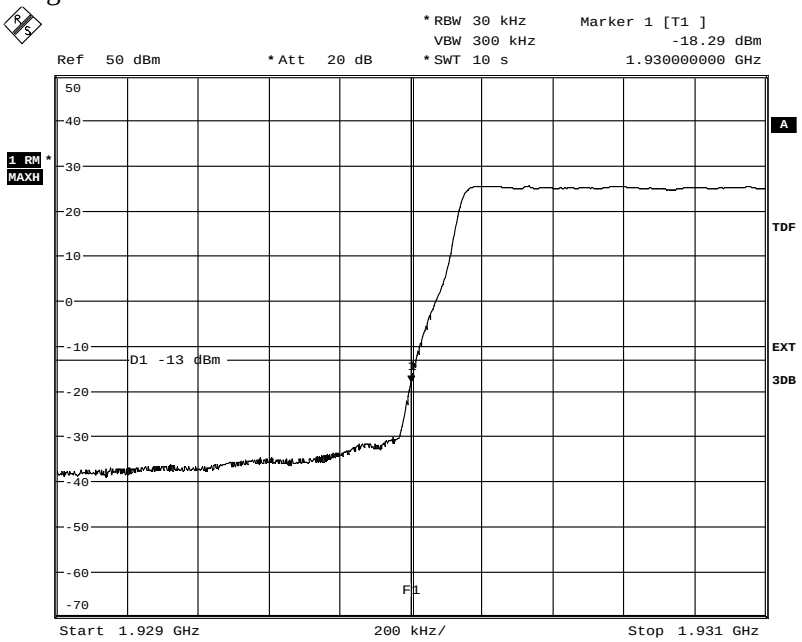
Appendix 4

Diagram 5 c:



Date: 11.DEC.2012 11:48:18

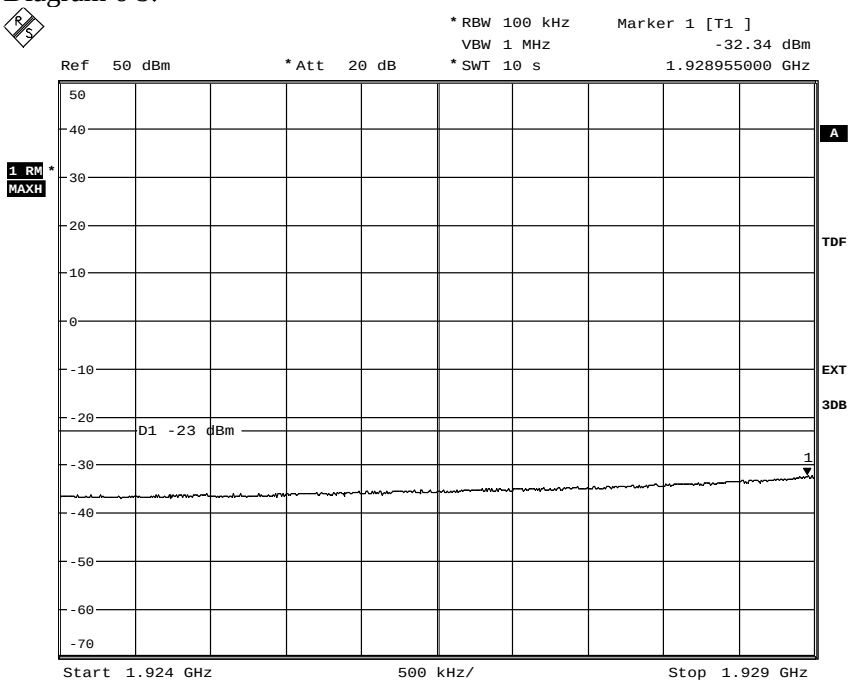
Diagram 6 a:



Date: 11.DEC.2012 11:21:57

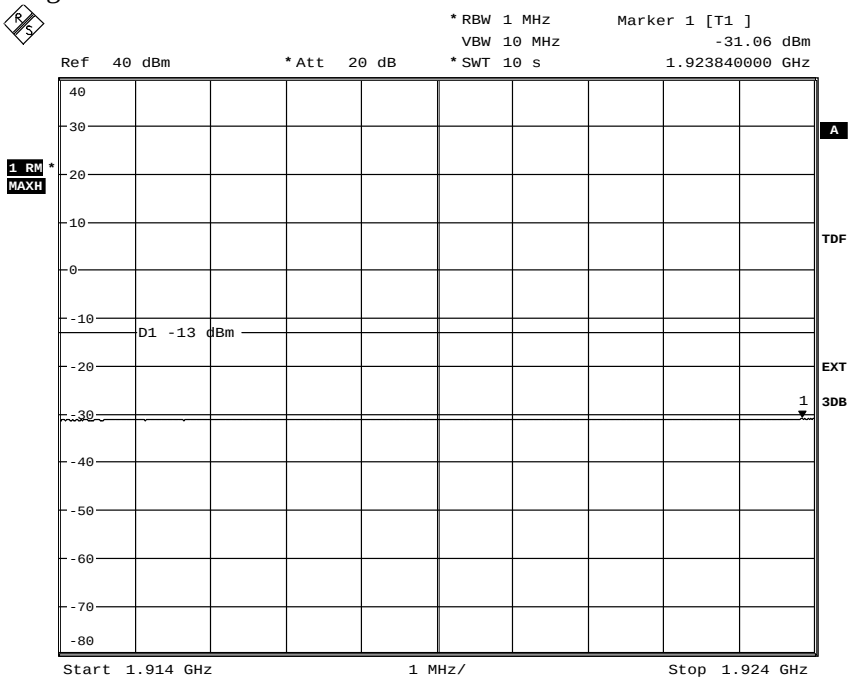
Appendix 4

Diagram 6 b:



Date: 11.DEC.2012 11:23:26

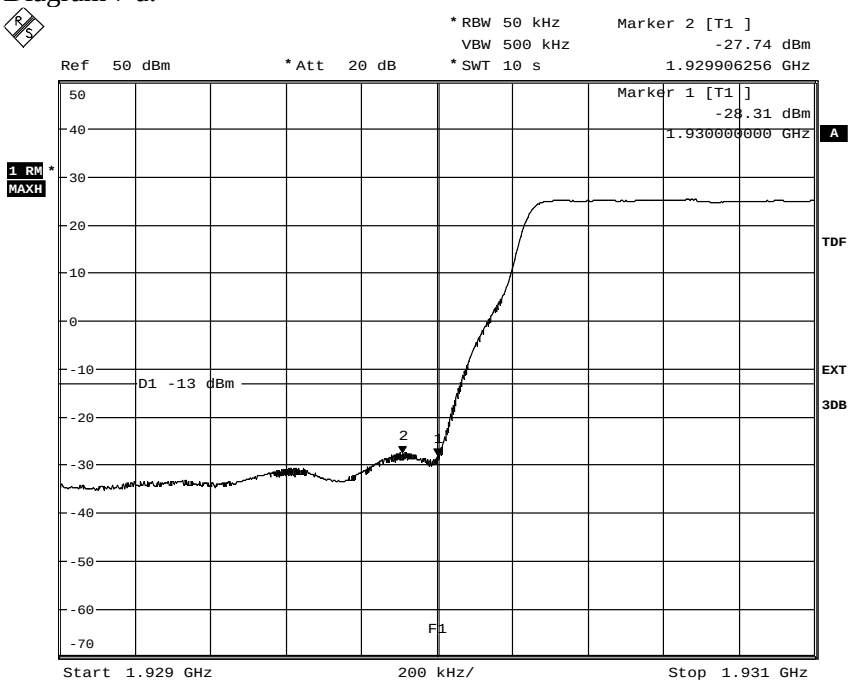
Diagram 6 c:



Date: 11.DEC.2012 11:25:09

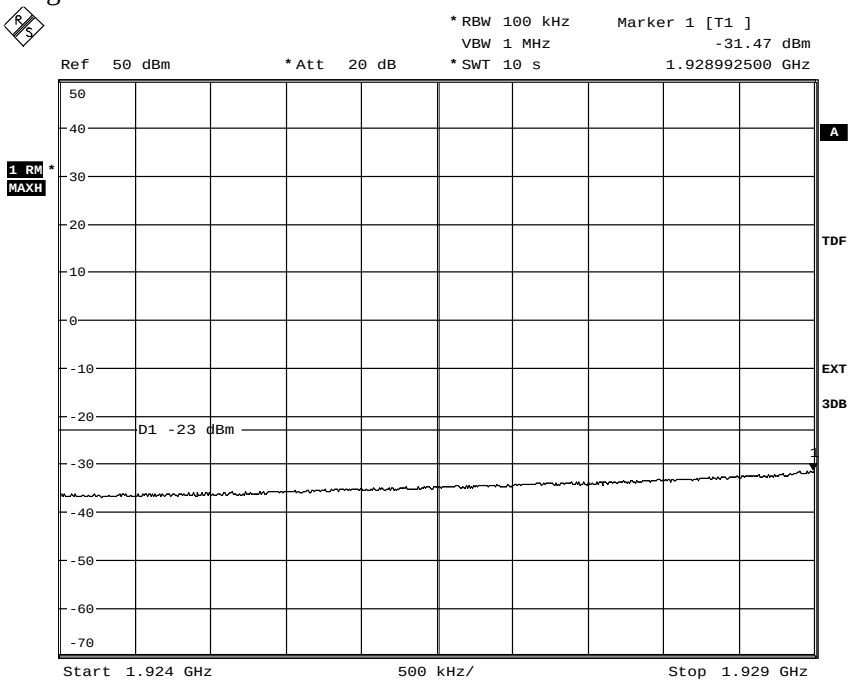
Appendix 4

Diagram 7 a:



Date: 11.DEC.2012 11:11:45

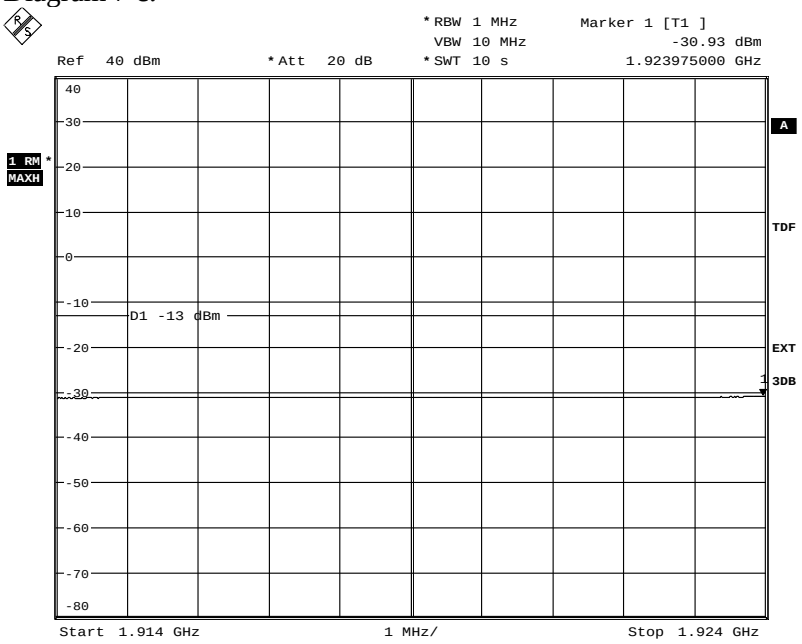
Diagram 7 b:



Date: 11.DEC.2012 11:13:26

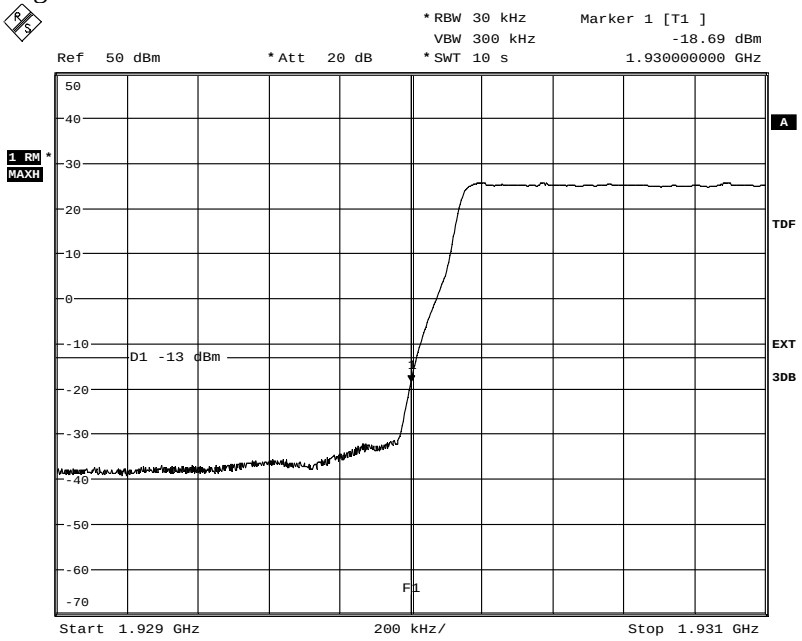
Appendix 4

Diagram 7 c:



Date: 11.DEC.2012 11:15:43

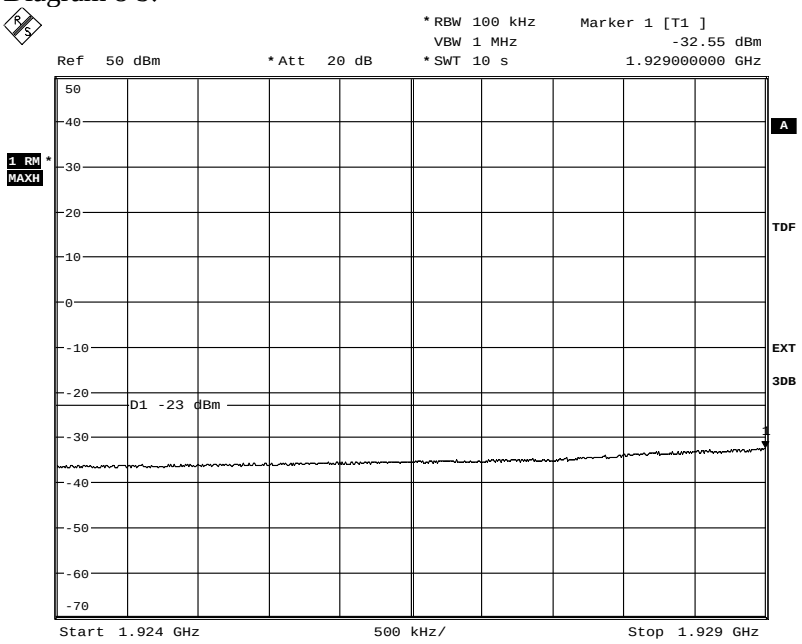
Digram 8 a:



Date: 11.DEC.2012 10:42:13

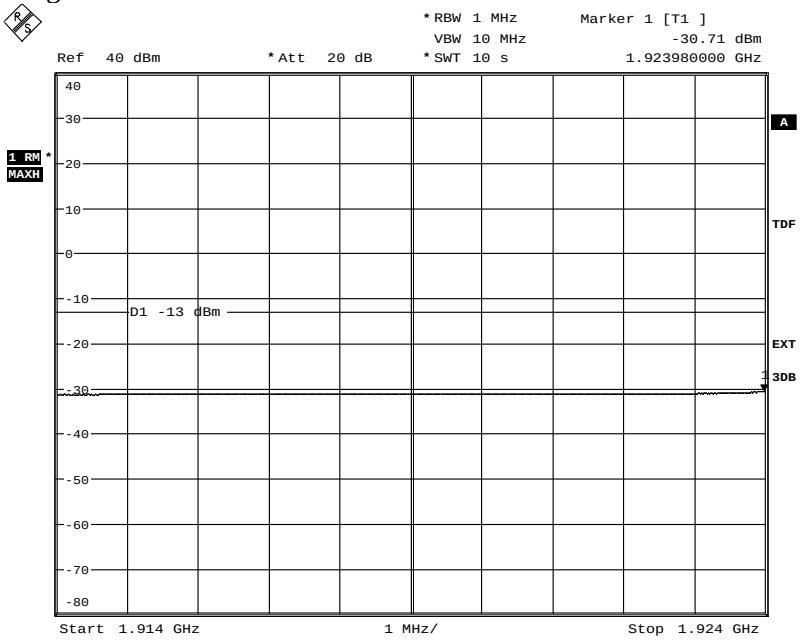
Appendix 4

Diagram 8 b:



Date: 11.DEC.2012 10:45:25

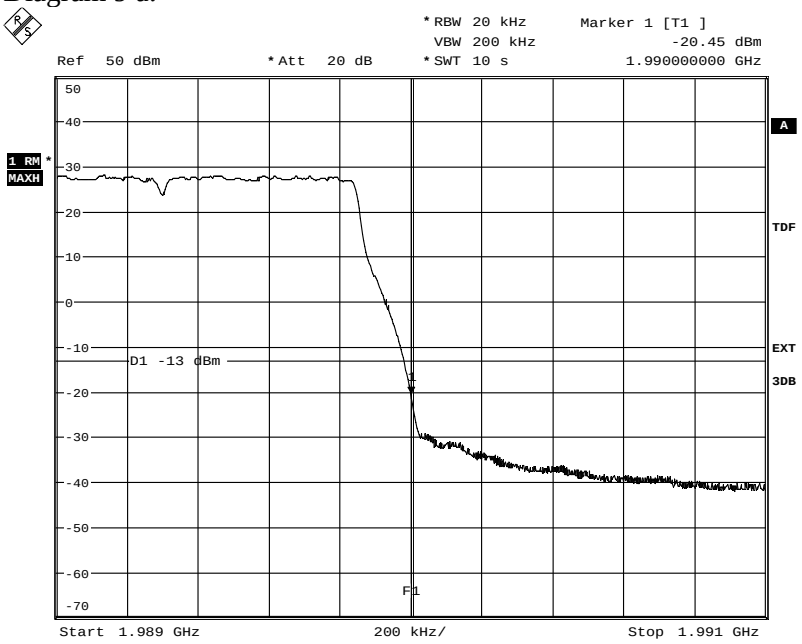
Diagram 8 c:



Date: 11.DEC.2012 11:54:52

Appendix 4

Diagram 9 a:



Date: 12.DEC.2012 06:41:55

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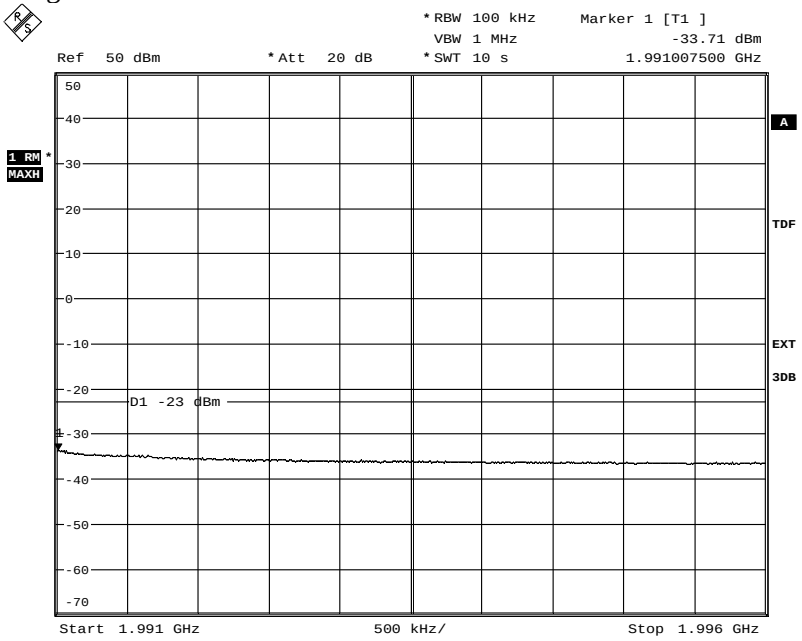
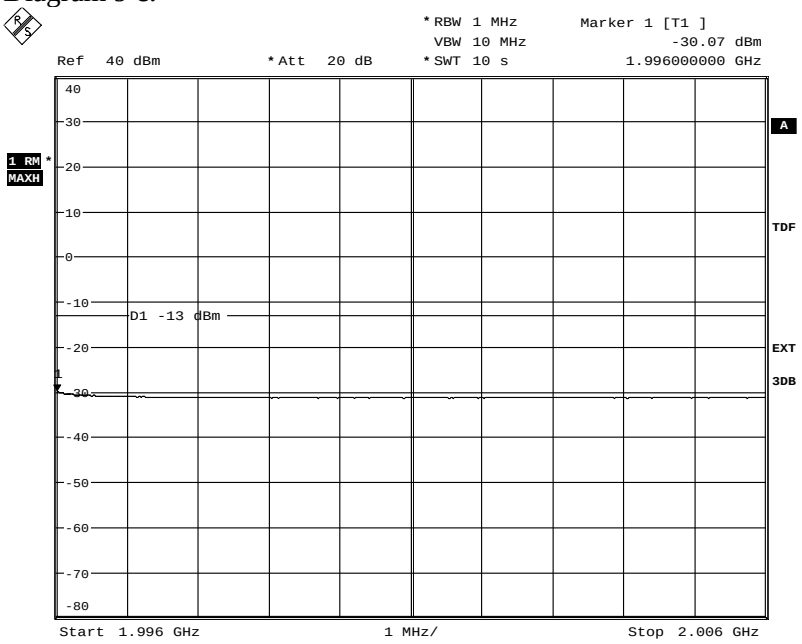


Date: 12.DEC.2012 06:43:31

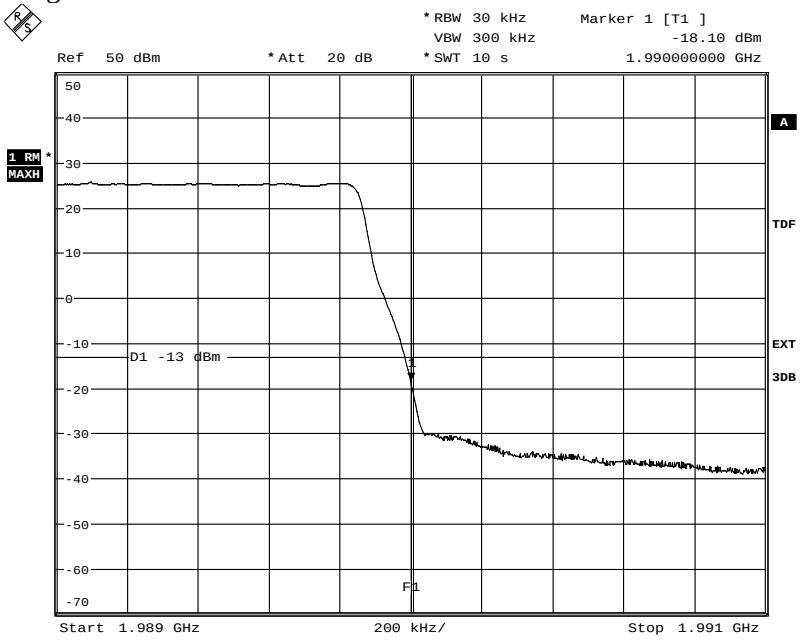
Appendix 4

Diagram 9 c:



Date: 12.DEC.2012 09:36:22

Diagram 10 a:



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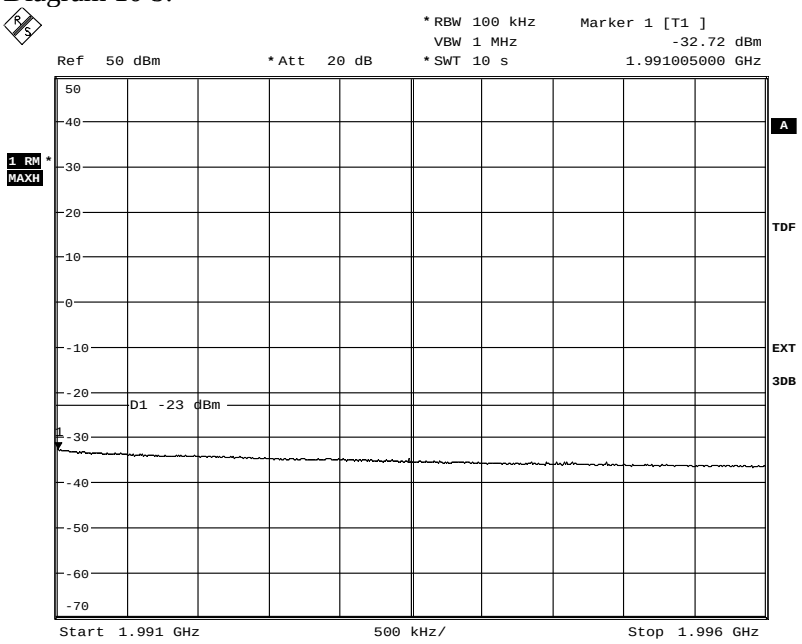
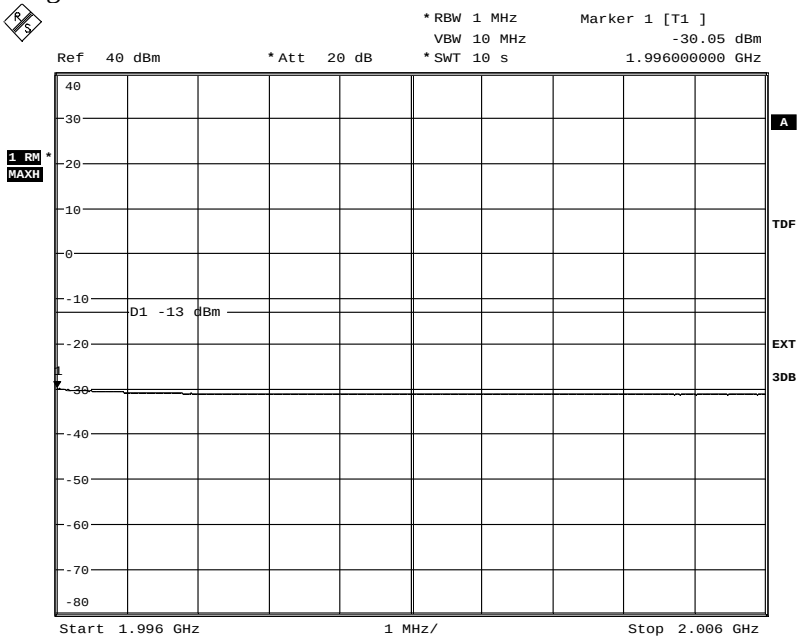
Appendix 4

Diagram 10 b:



Date: 12.DEC.2012 06:34:57

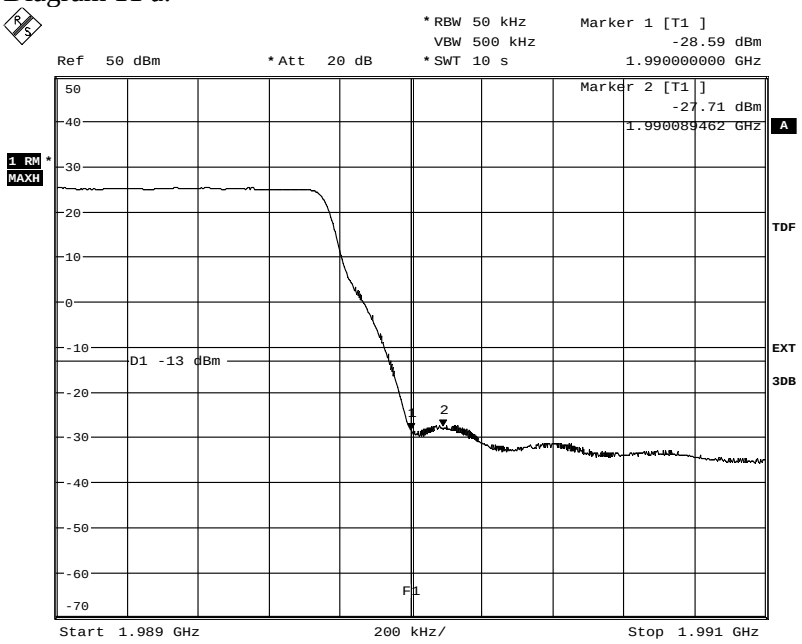
Diagram 10 c:



Date: 12.DEC.2012 09:31:00

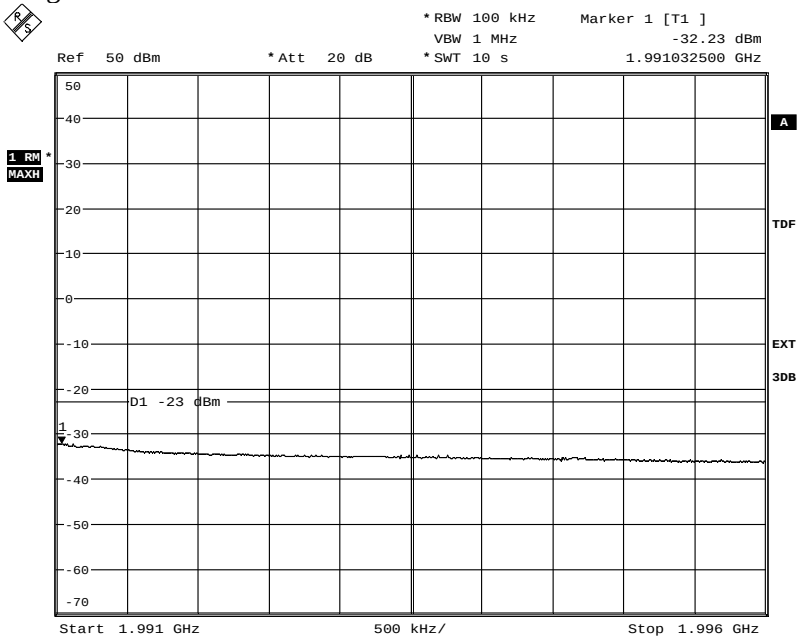
Appendix 4

Diagram 11 a:



Date: 12.DEC.2012 06:50:02

Diagram11 b:



Date: 12.DEC.2012 06:51:25

Appendix 4

Diagram 11 c:

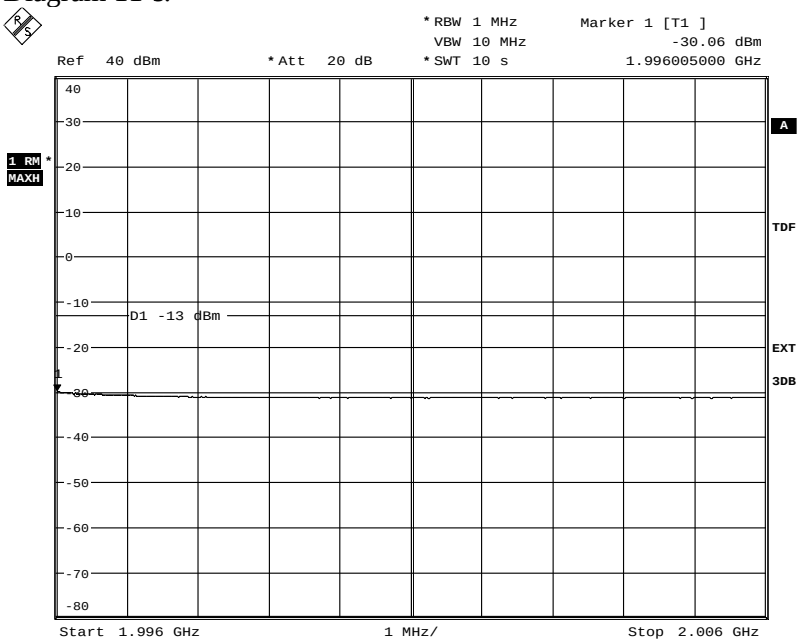


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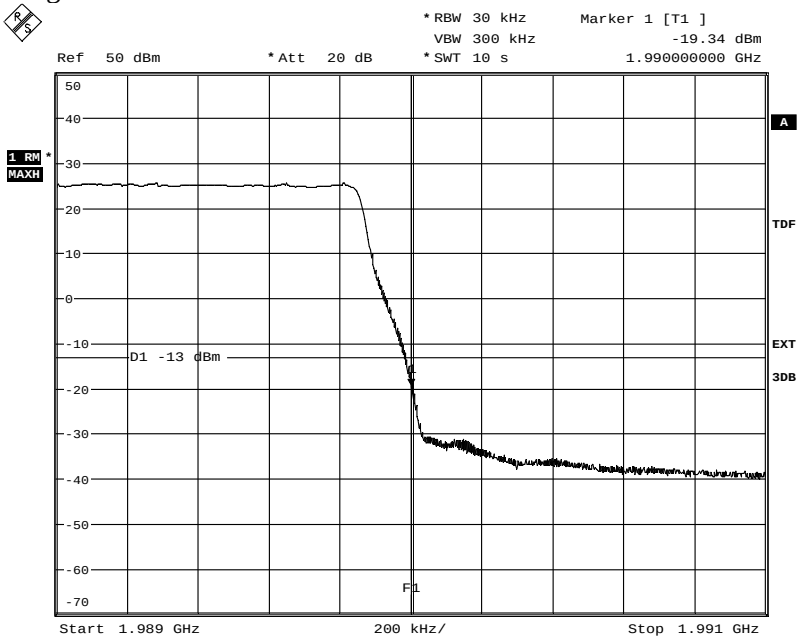
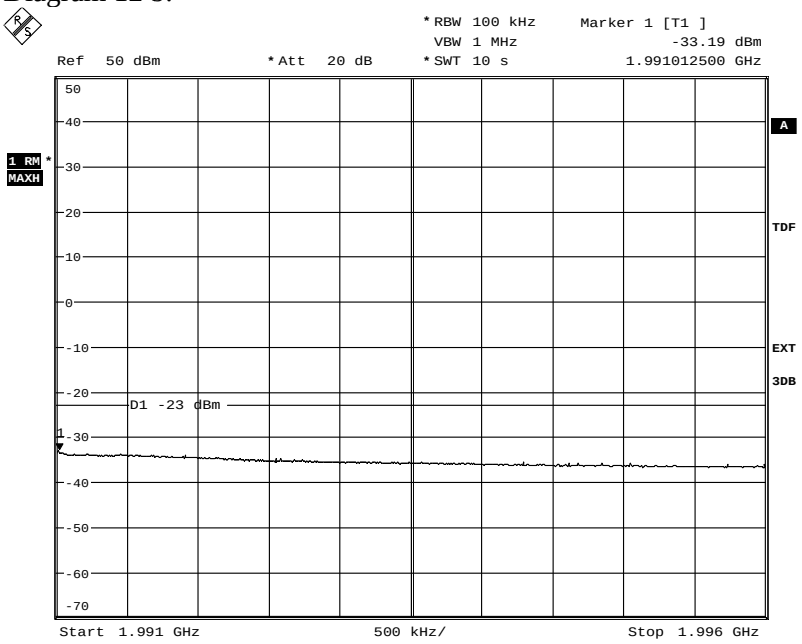
Diagram 12 a:



Date: 11.DEC.2012 11:59:17

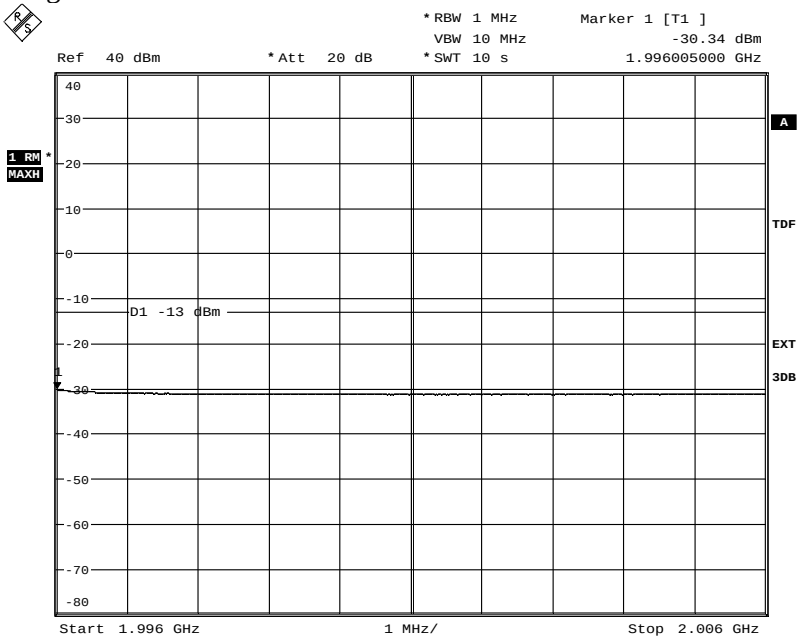
Appendix 4

Diagram 12 b:



Date: 11.DEC.2012 12:00:50

Diagram 12 c:



Date: 12.DEC.2012 09:42:20

Appendix 5

Conducted spurious emission measurements according to CFR 47 §2.1051 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-12-06	22 °C ± 3 °C	17 % ± 5 %
2012-12-12	23 °C ± 3 °C	18 % ± 5 %
2012-12-13	23 °C ± 3 °C	15 % ± 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.

To address the MIMO aspect of the present EUT with 2 antenna ports, additional 3 dB [10 log (2)] margin shall be added to trace values shown according to method 2 “measure and add 10 log(N_{ANT})” of FCC KDB662911 D01 Multiple Transmitter Output v01r02 before comparing the results to the limit.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	900 233
RF attenuator	901 384
Directional coupler	901 496
High pass filter	901 502
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA single RAT MIMO

Diagrams	BW / [MHz]	TX frequency	Tested Port
1 a, b	5 MHz	M	RF A
2 a, b	5 MHz	M	RF B

LTE single RAT MIMO

Diagrams	BW / [MHz]	TX frequency	Tested Port
3 a, b	1.4	M	RF A
4 a, b	20	M	RF A
5 a, b	1.4	M	RF A
6 a, b	20	M	RF A

WCDMA + LTE MSR

Diagrams	WCDMA BW/[MHz]	LTE BW/[MHz]	Symbolic frequency	Tested Port
7 a, b	5	1.4	B	RF A
8 a, b	5	3	B	RF A
9 a, b	5	5	B	RF A
10 a, b	5	1.4	M	RF A
11 a, b	5	3	M	RF A
12 a, b	5	5	M	RF A
13 a, b	5	1.4	T	RF A
14 a, b	5	3	T	RF A
15 a, b	5	5	T	RF A
16	5	1.4	B_{IM}	RF A
17	5	3	B_{IM}	RF A
18	5	5	B_{IM}	RF A
19	5	1.4	T_{IM}	RF A
20	5	3	T_{IM}	RF A
21	5	5	T_{IM}	RF A

The diagrams are shown on the following pages.

Remarks

The emission at 9 kHz on some of 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 upper frequency boundary was chosen to cover 10x the highest TX fundamental frequency.

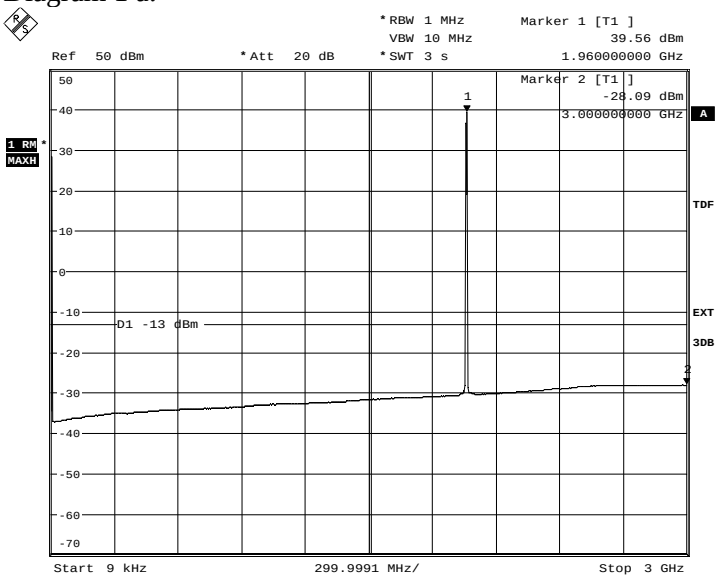
Limits

CFR 47 §24.238 and IC 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

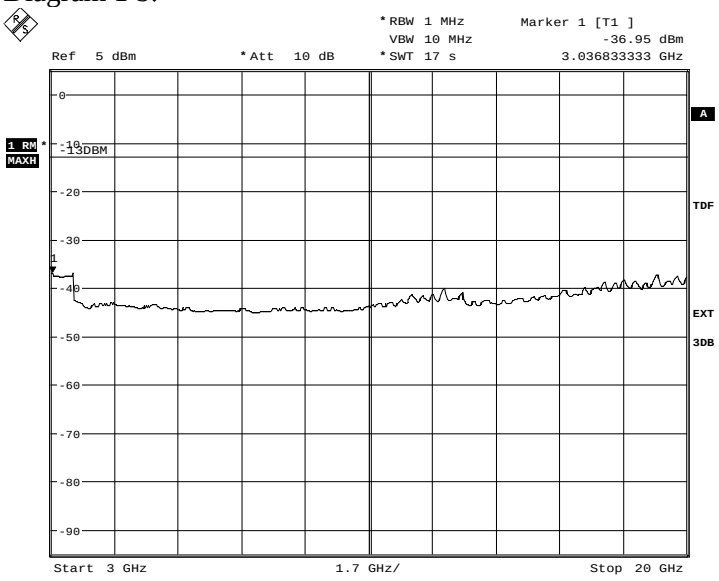
Appendix 5

Diagram 1 a:



Date: 6.DEC.2012 14:16:04

Diagram 1 b:



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Appendix 5

Diagram 2 a:

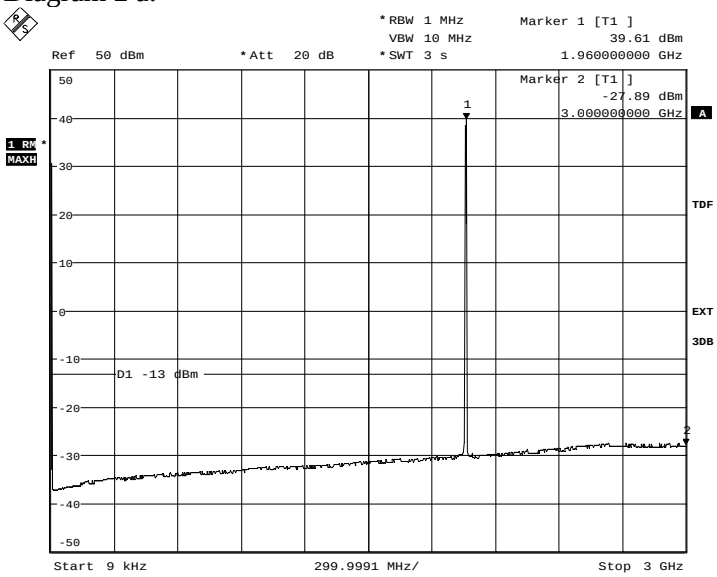

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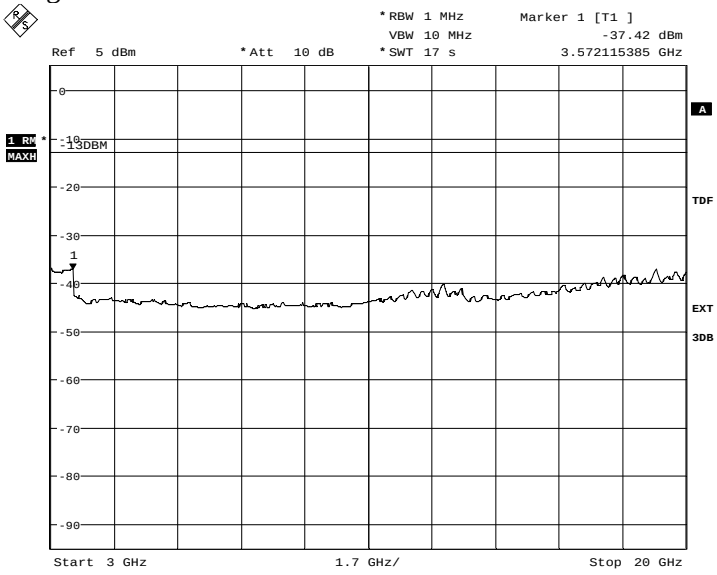
Diagram 2 b:



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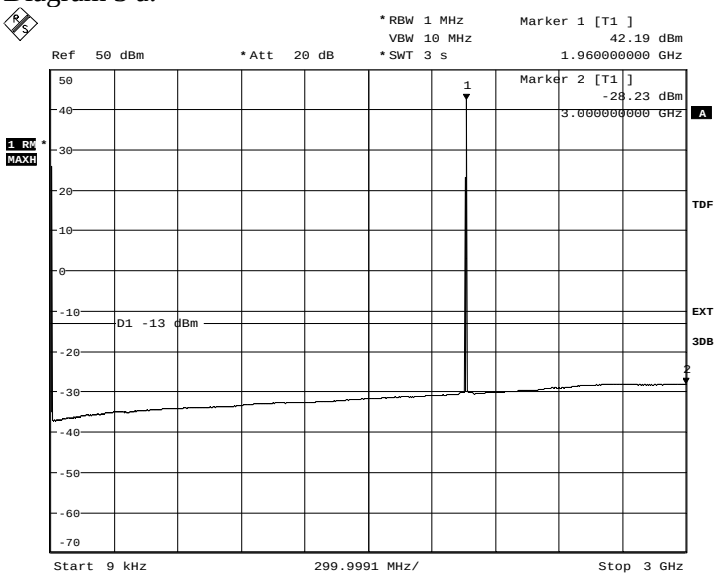
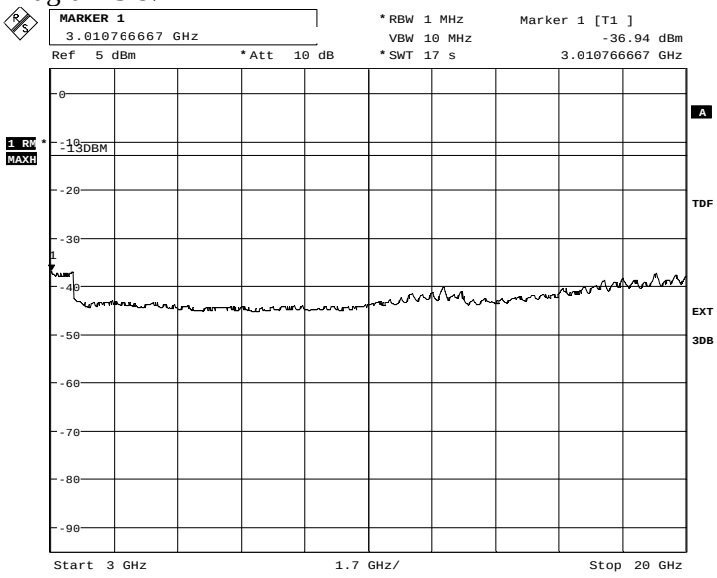
Appendix 5

Diagram 3 a:



Date: 10.DEC.2012 11:54:42

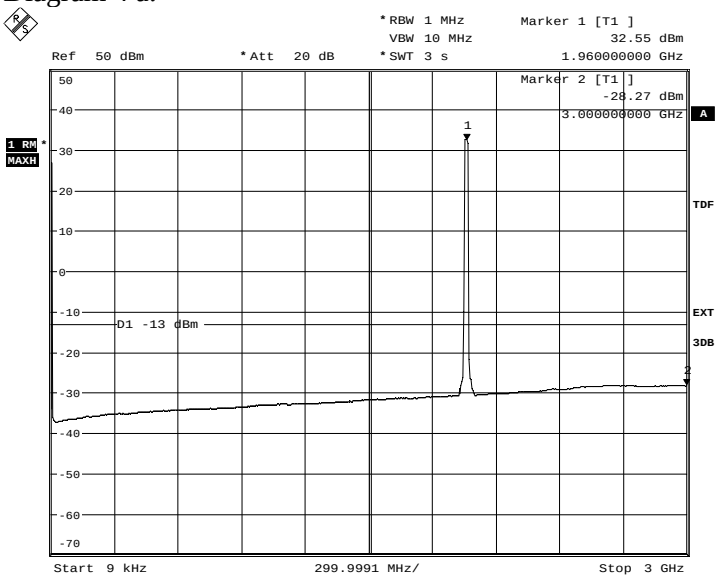
Diagram 3 b:



Date: 10.DEC.2012 11:57:25

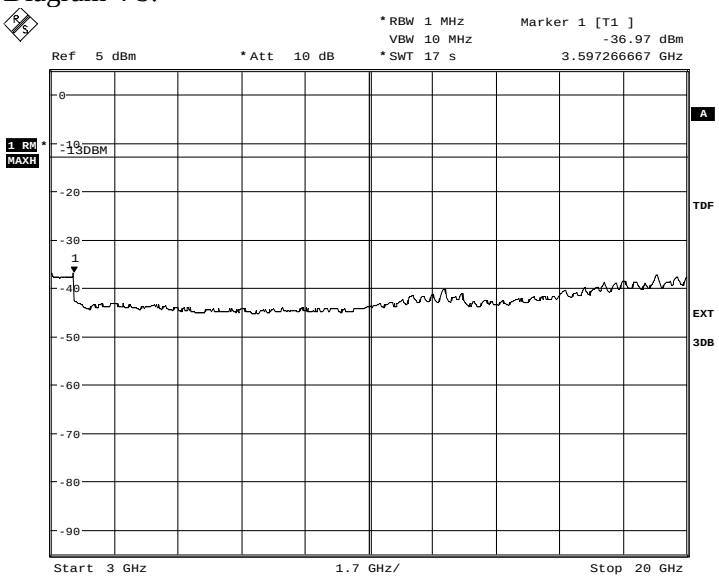
Appendix 5

Diagram 4 a:



Date: 10.DEC.2012 12:42:45

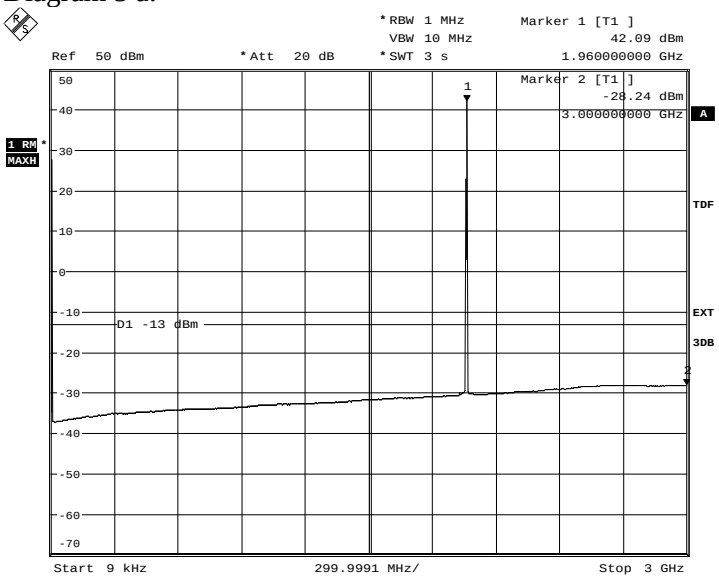
Diagram 4 b:



Date: 10.DEC.2012 12:50:19

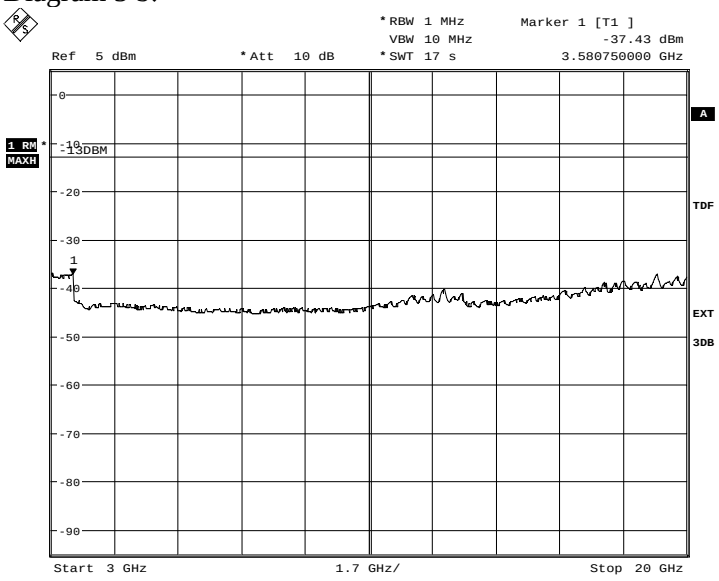
Appendix 5

Diagram 5 a:



Date: 7.DEC.2012 15:49:11

Diagram 5 b:



Date: 7.DEC.2012 15:51:09

Appendix 5

Diagram 6 a:

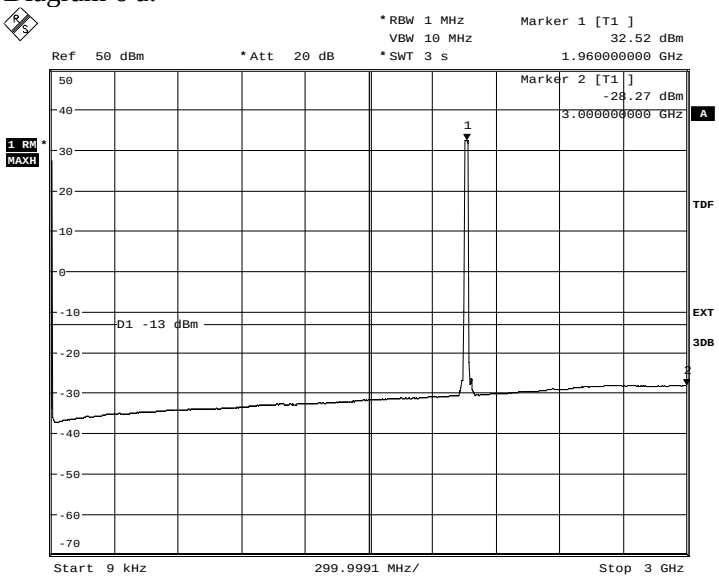


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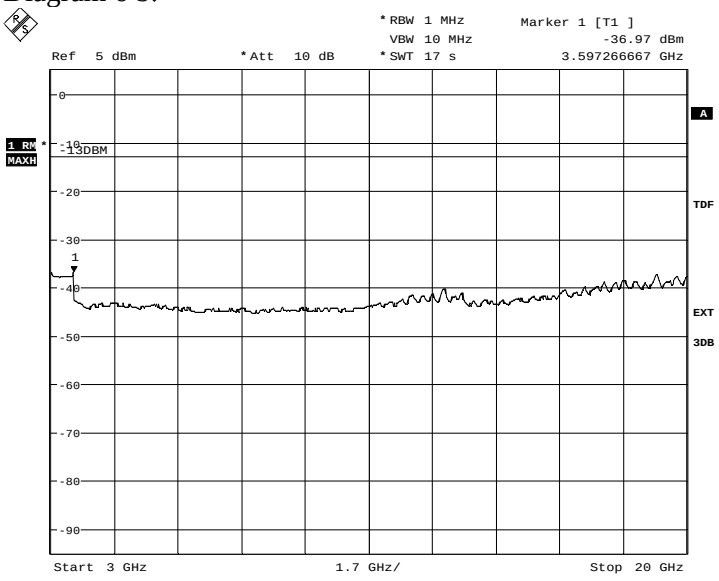
Diagram 6 b:



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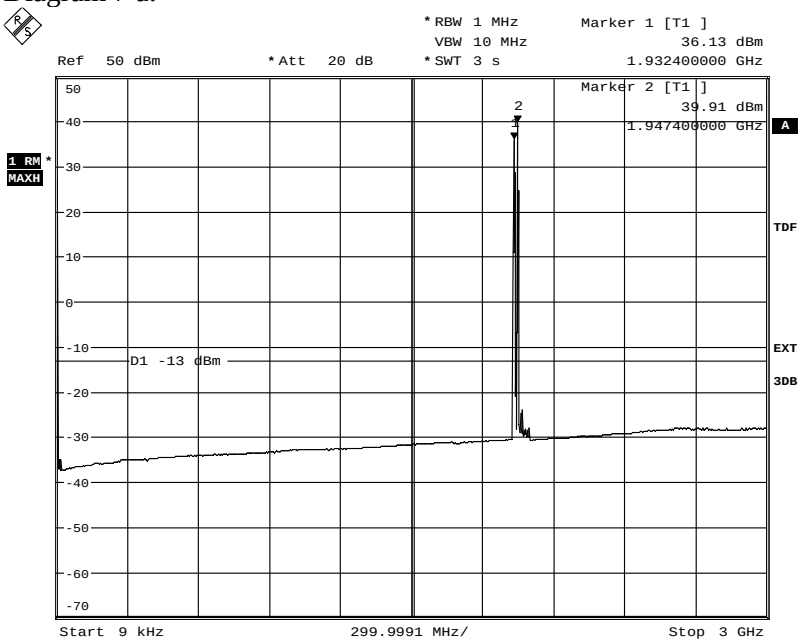
Appendix 5

Diagram 7 a:



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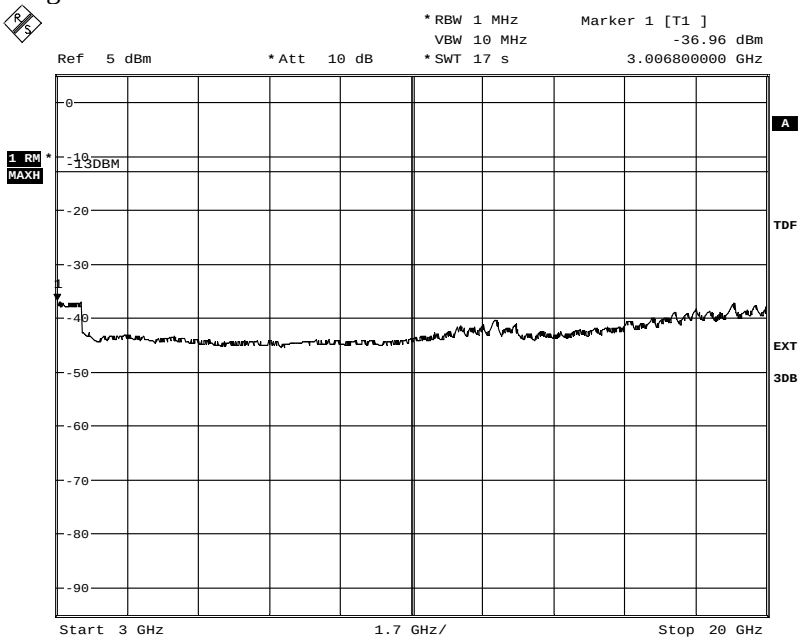

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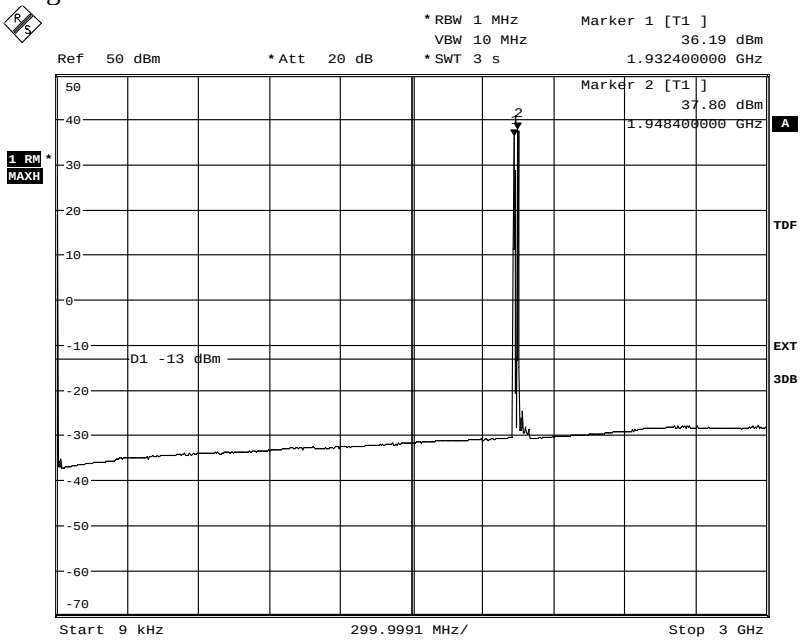
Appendix 5

Diagram 8 a:



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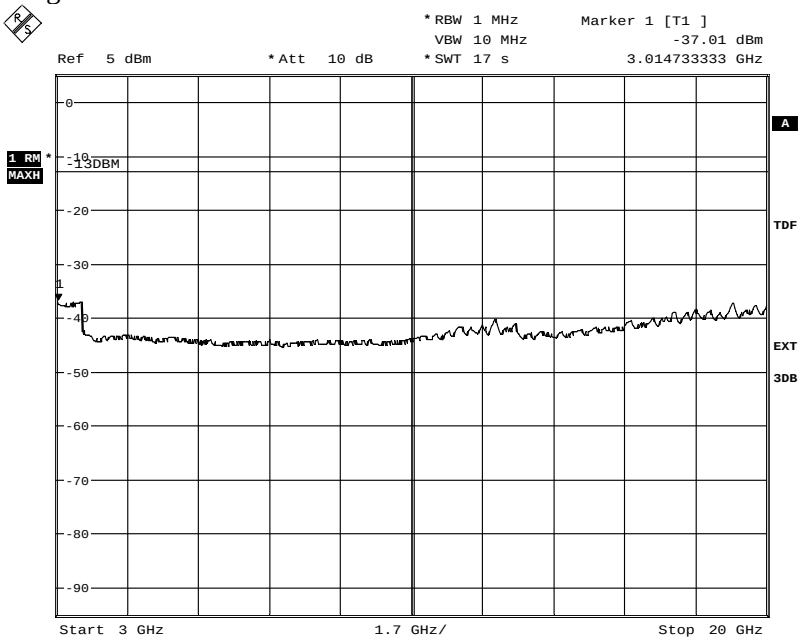

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Appendix 5

Diagram 9 a:

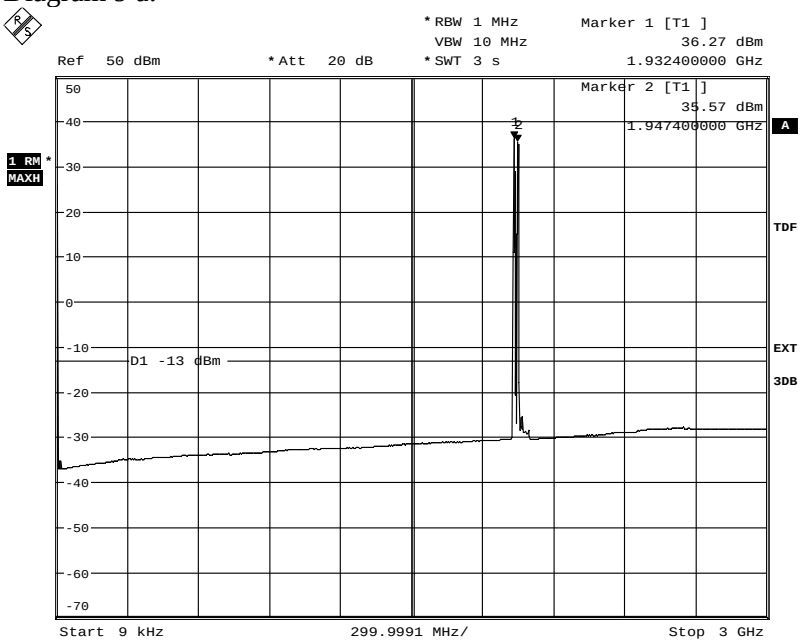

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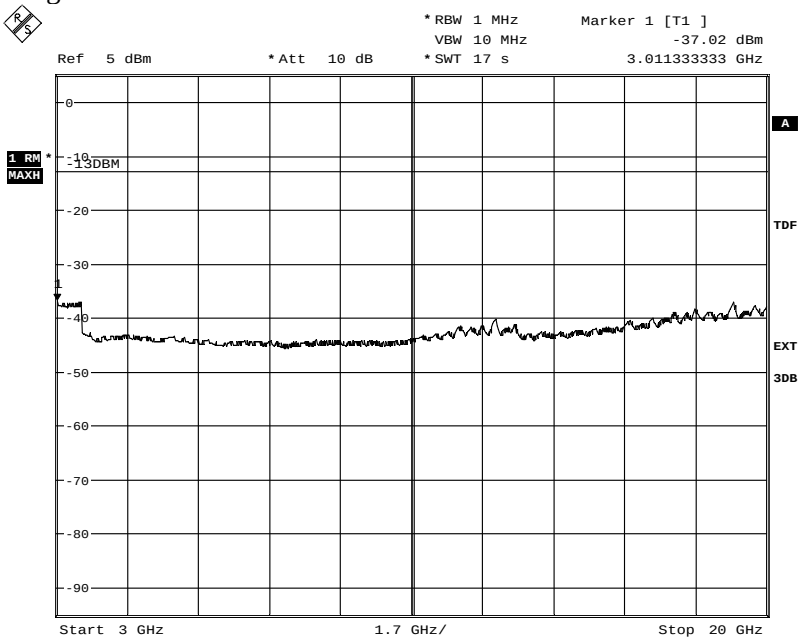
Diagram 9 b:



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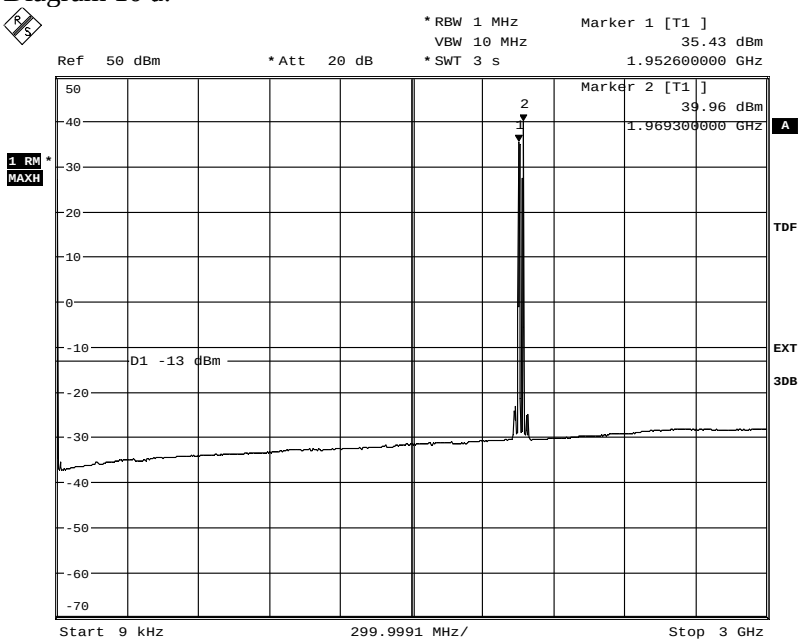
Appendix 5

Diagram 10 a:



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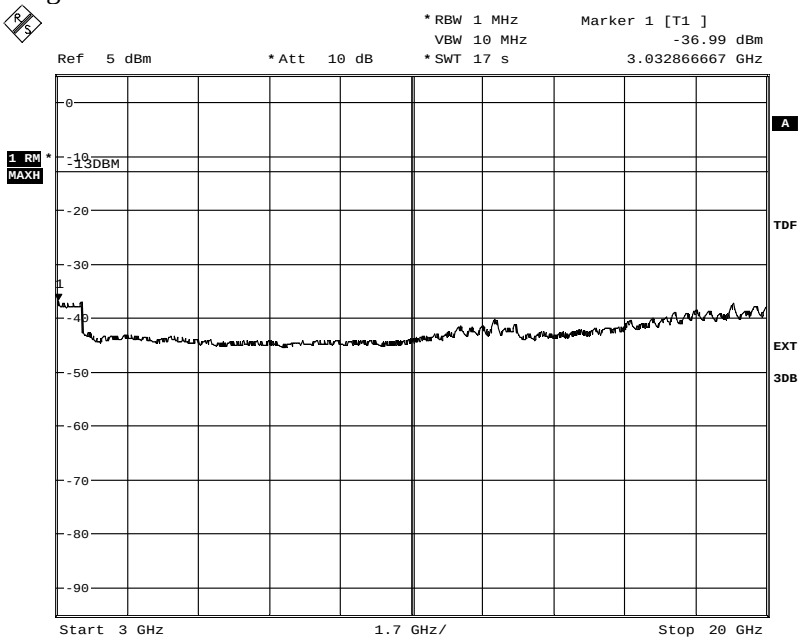

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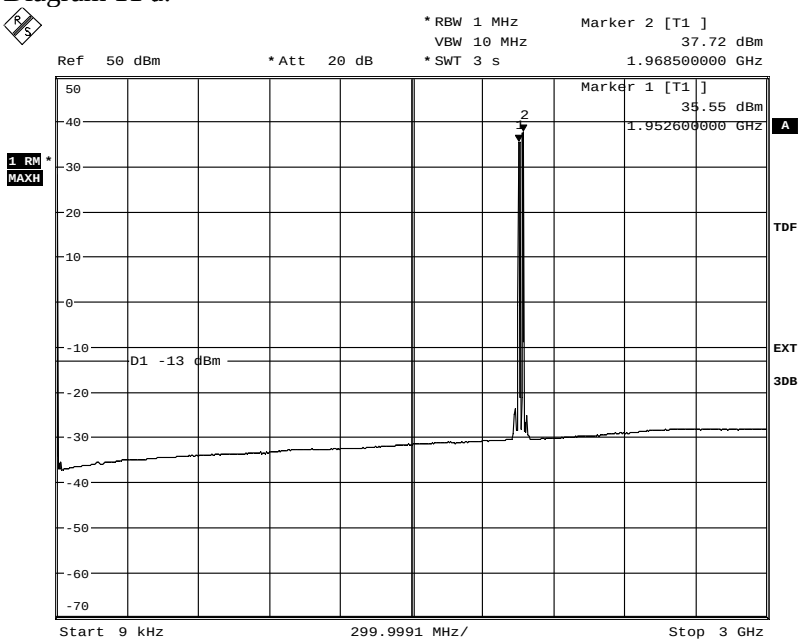
Appendix 5

Diagram 11 a:



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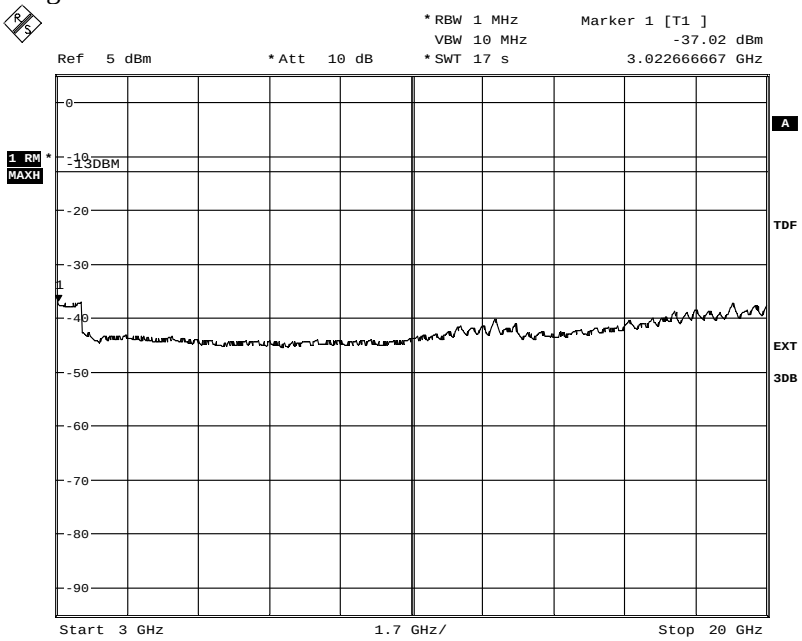

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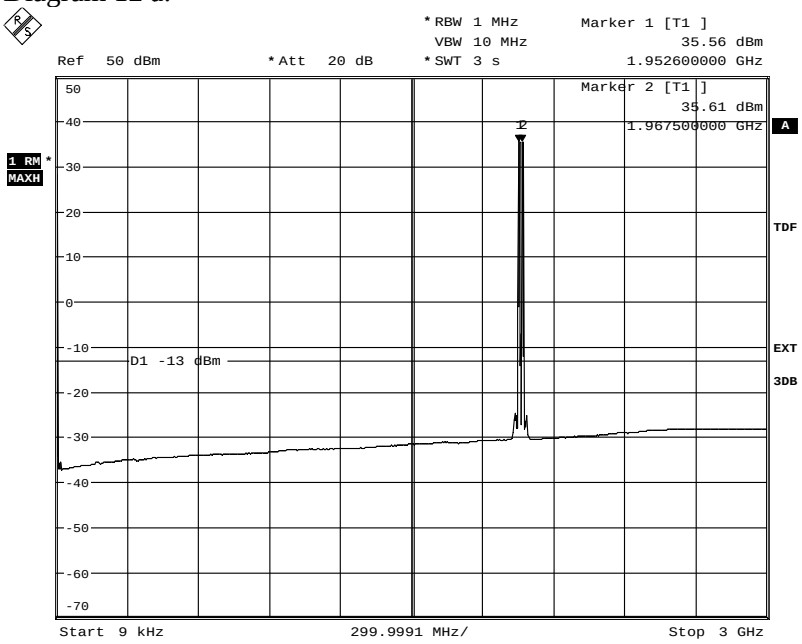
Appendix 5

Diagram 12 a:



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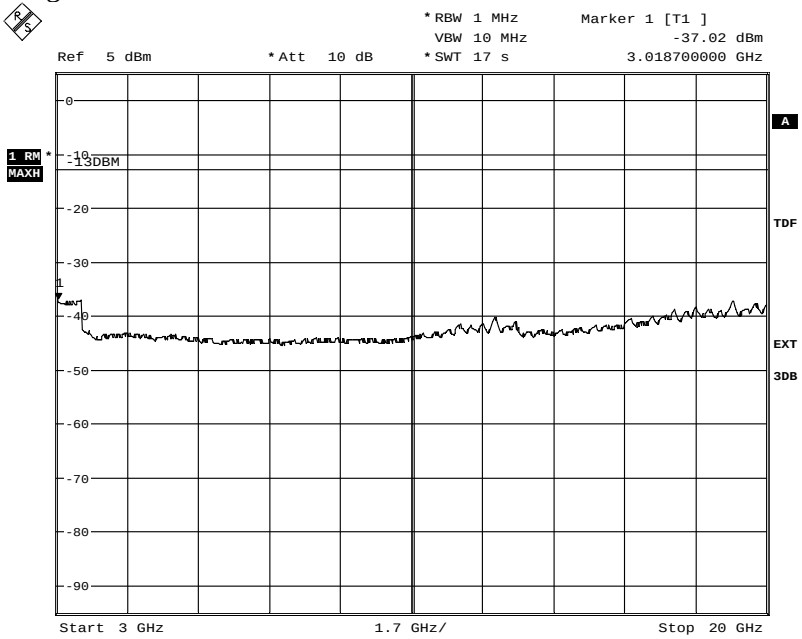

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Appendix 5

Diagram 13 a:

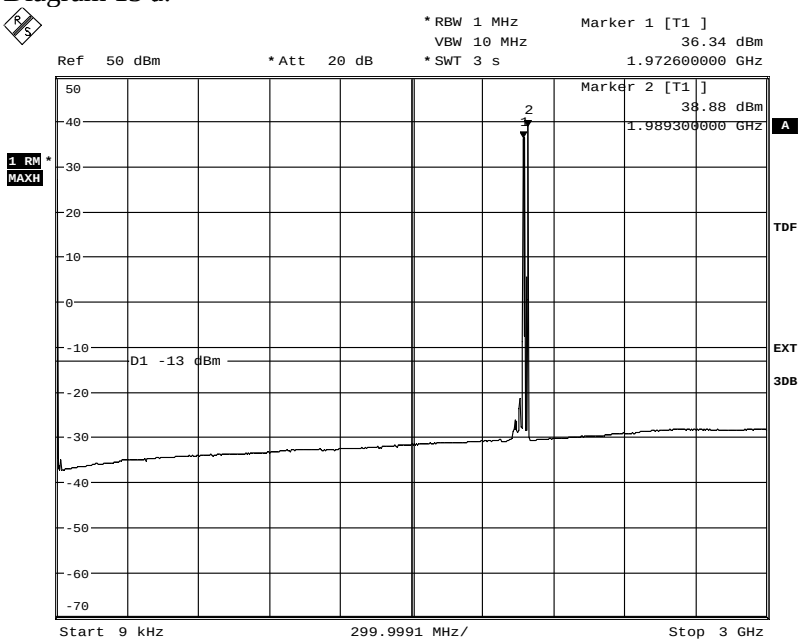

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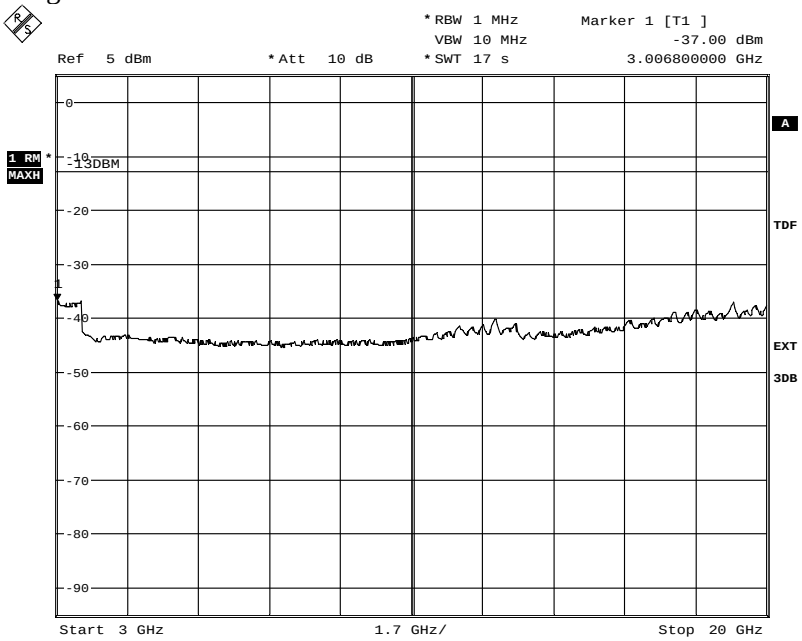
Diagram 13 b:



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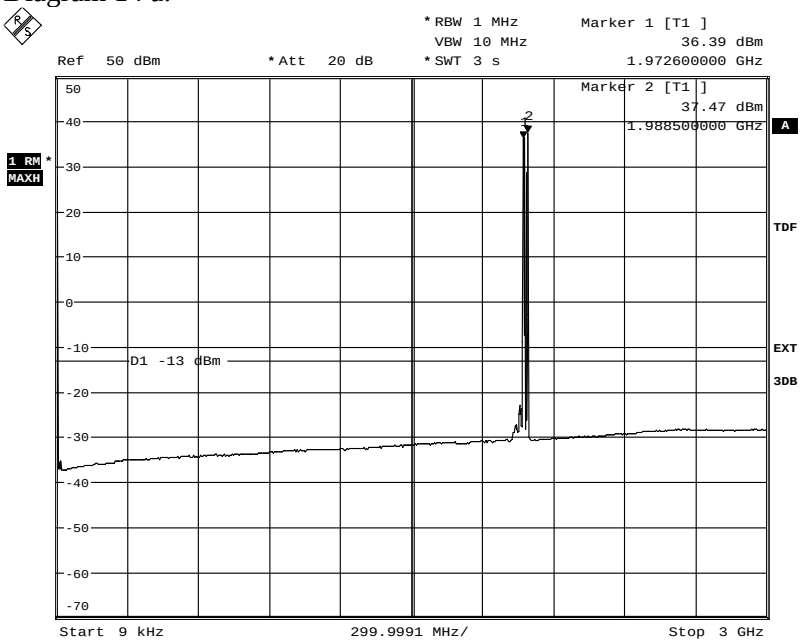
Appendix 5

Diagram 14 a:



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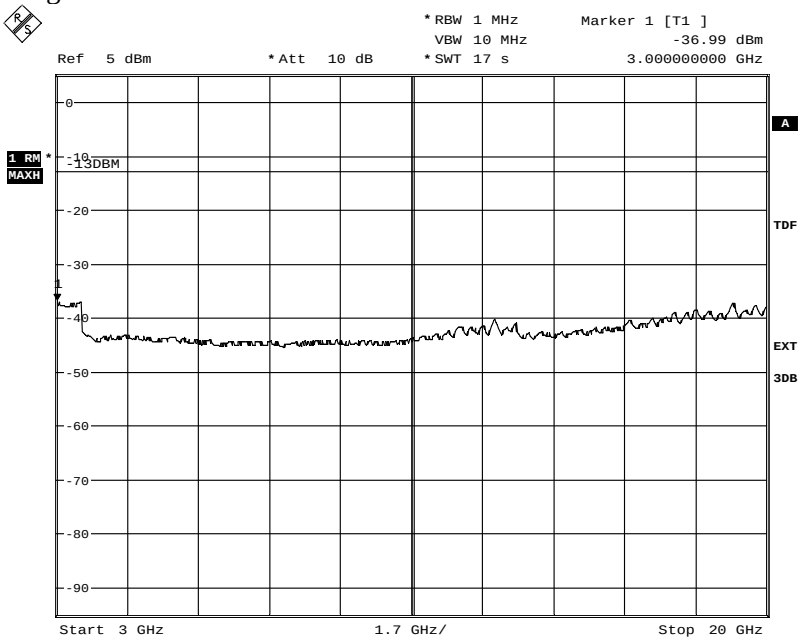

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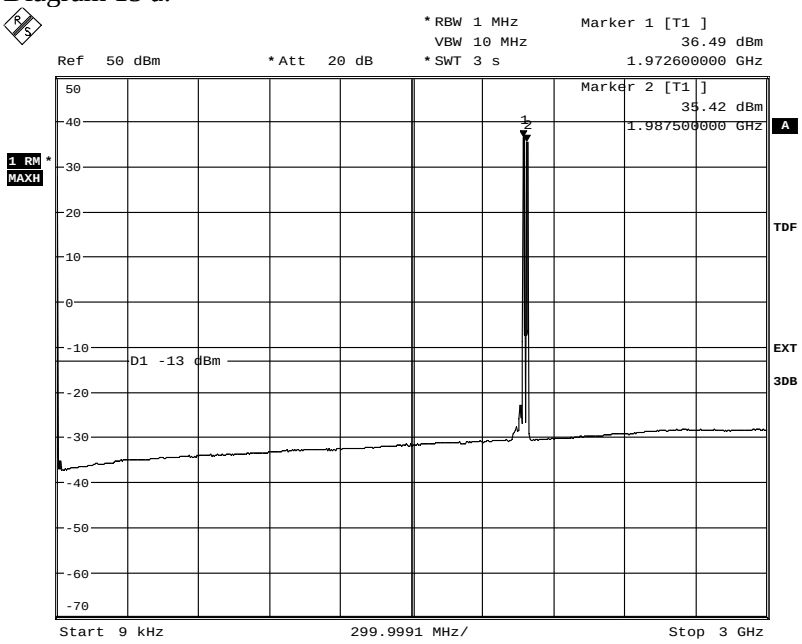
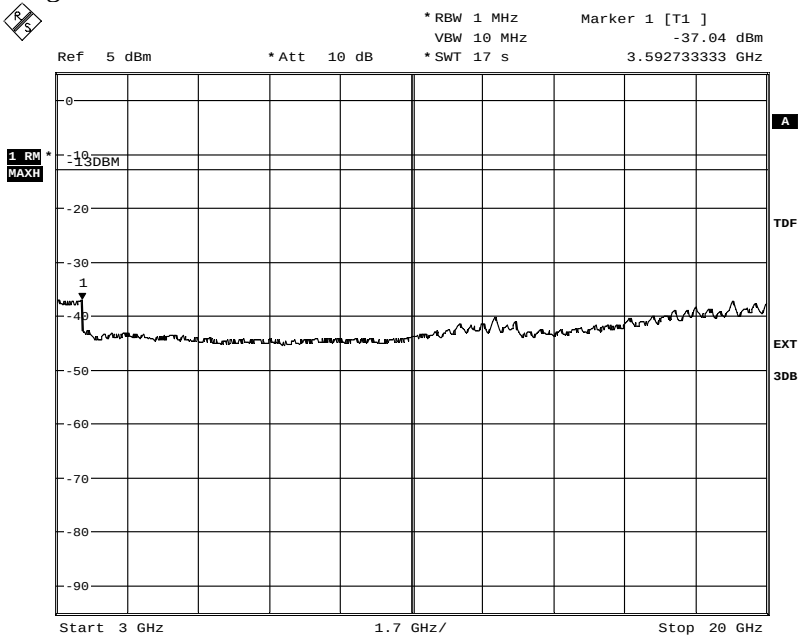
Appendix 5

Diagram 15 a:



Date: 13.DEC.2012 11:51:04

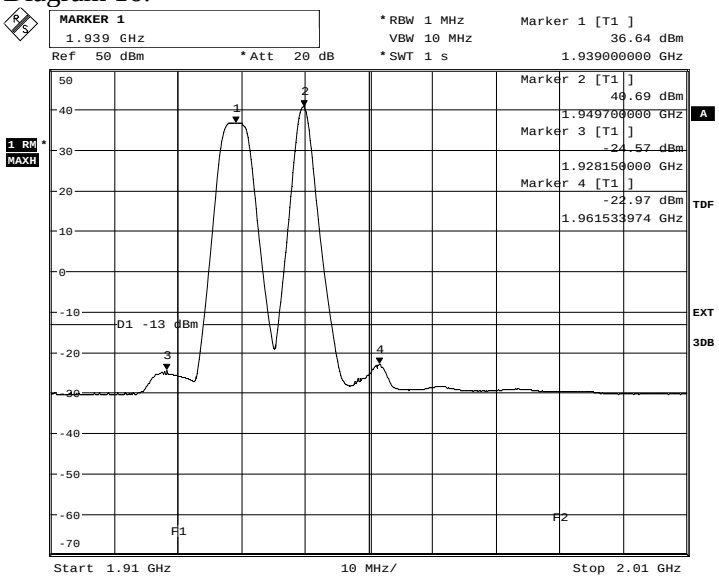
Diagram 15 b:



Date: 13.DEC.2012 11:49:35

Appendix 5

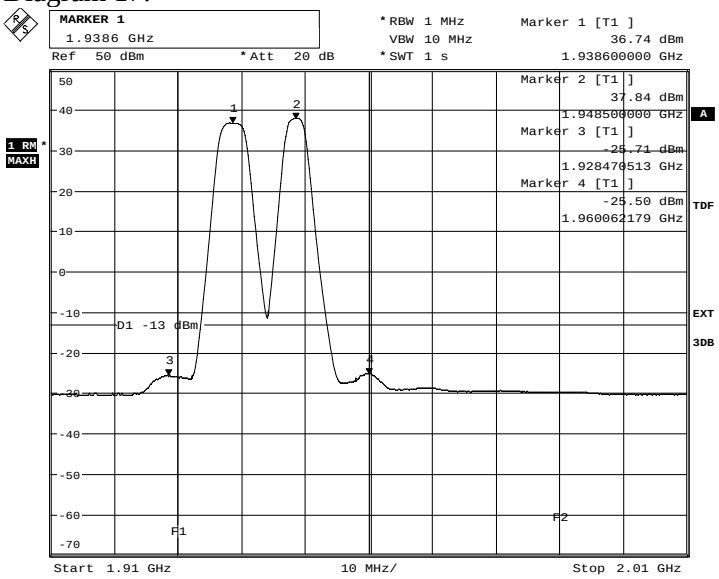
Diagram 16:



Date: 13.DEC.2012 13:38:03

Marker 3 is placed on the out-of-band spurious product of interest.

Diagram 17:

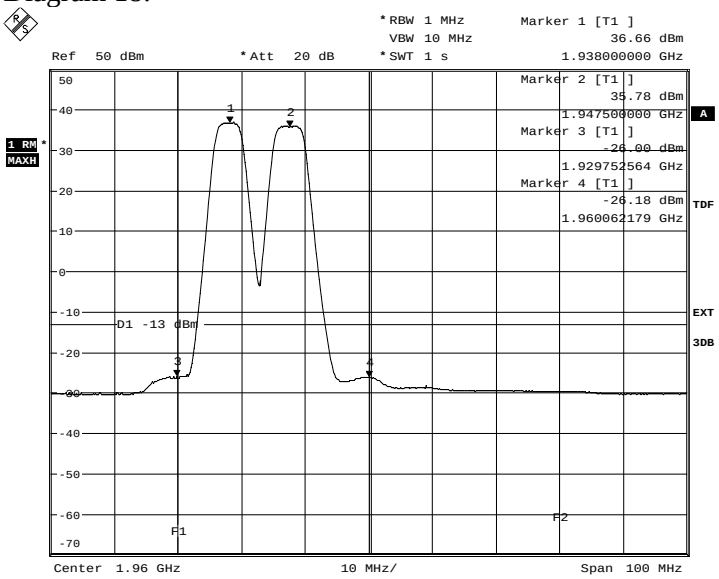


Date: 13.DEC.2012 14:06:12

Marker 3 is placed on the out-of-band spurious product of interest.

Appendix 5

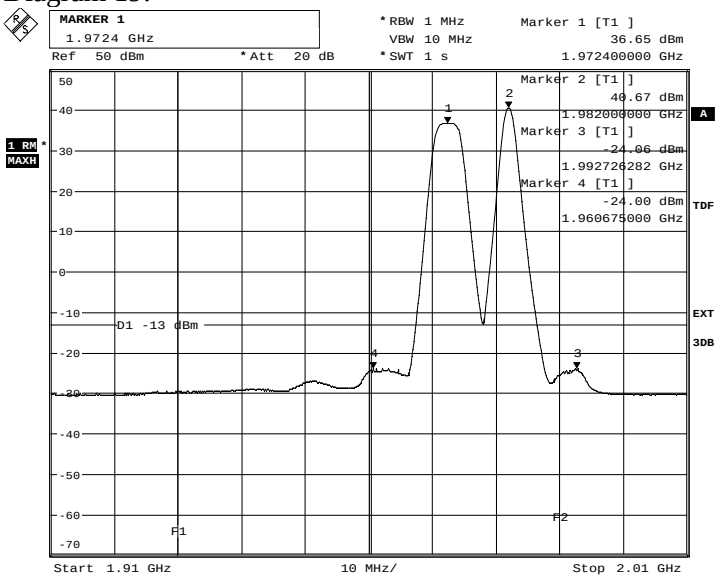
Diagram 18:



Date: 13.DEC.2012 14:13:42

Marker 3 is placed on the out-of-band spurious product of interest.

Diagram 19:

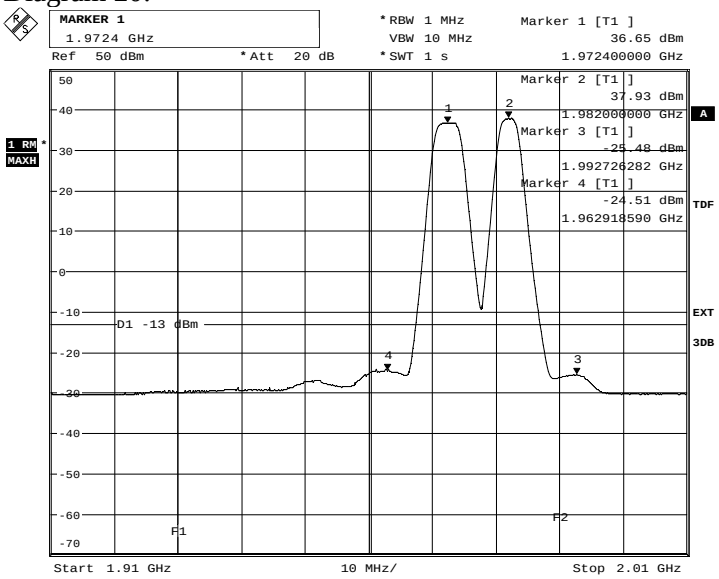


Date: 13.DEC.2012 14:30:13

Marker 3 is placed on the out-of-band spurious product of interest.

Appendix 5

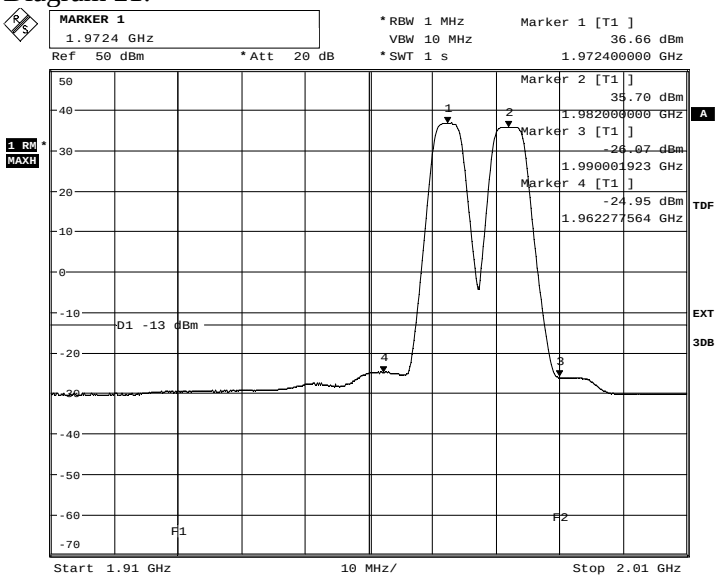
Diagram 20:



Date: 13.DEC.2012 14:28:09

Marker 3 is placed on the out-of-band spurious product of interest.

Diagram 21:



Date: 13.DEC.2012 14:26:08

Marker 3 is placed on the out-of-band spurious product of interest.

Appendix 6

Field strength of spurious radiation measurements according to 47 CFR 2.1053 / IC RSS-139 6.5

Date	Temperature	Humidity
2012-12-04	22°C ± 3°C	17 % ± 5 %
2012-12-05	22°C ± 3°C	17 % ± 5 %
2012-12-06	22°C ± 3°C	17 % ± 5 %
2012-12-07	23°C ± 3°C	15 % ± 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 - 20 GHz.

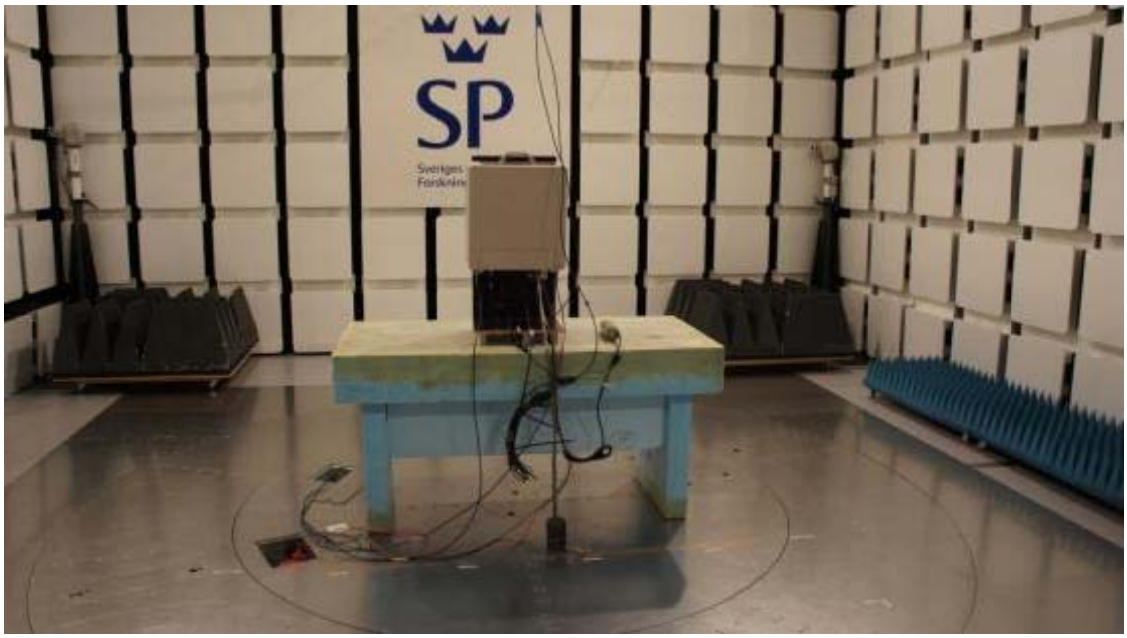
In the frequency range 30 MHz - 20 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

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 measurements is shown in the picture below:



Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber	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
Flann STD Gain Horn Antenna 20240-20	503 674
High pass filter, RLC Electronics	503 739
Miteq, Low Noise Amplifier	503 285
µComp Nordic, Low Noise Amplifier	901 545
Temperature and humidity meter, Testo 625	504 188

Results for worst emissions found

Diagram 1 a-d: LTE SR, SC, BW configuration 1.4 MHz with E-TM1.1 on frequency T
Diagram 2 a-d: WCDMA SR, SC, BW configuration 5 MHz with TM1, on frequency T
Diagram 3 a-d: MSR WCDMA and LTE on frequency T

Note: The LTE SR, SC measurement was repeated for frequencies B and M with lower emission levels compared to frequency T.

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
3977.982	-	-26.6 dBm
3974.130	-	-29.2 dBm
3962.019	-	-27.4 dBm
3978.437	-	-32.7 dBm
30-20 000	All other emissions > 20 dB below limit	

Measurement uncertainty:

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

Limits

CFR 47 §24.238 and IC 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

Appendix 6

Diagram 1 a:

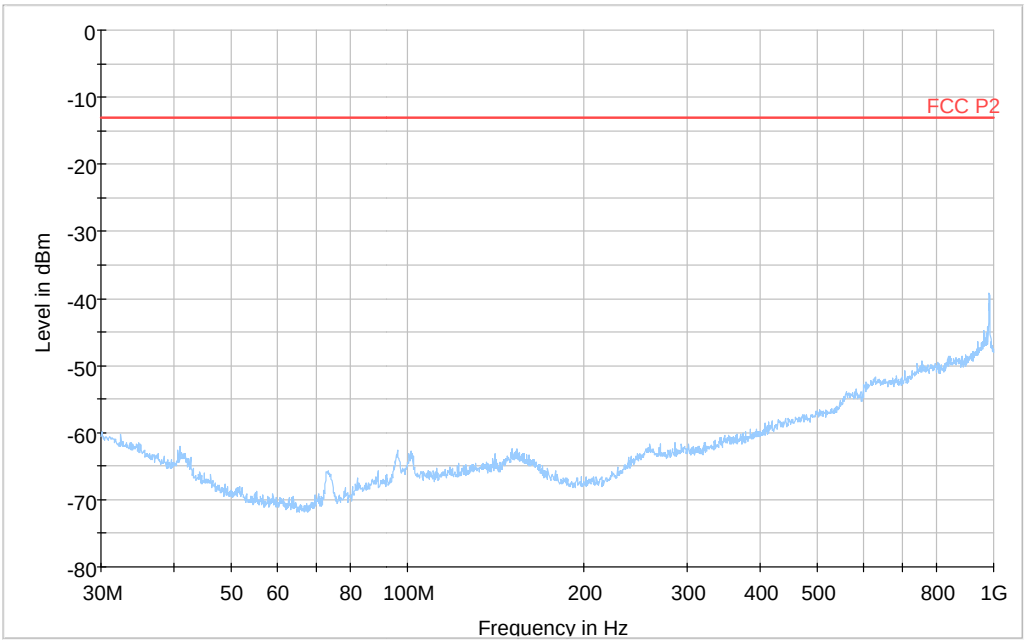
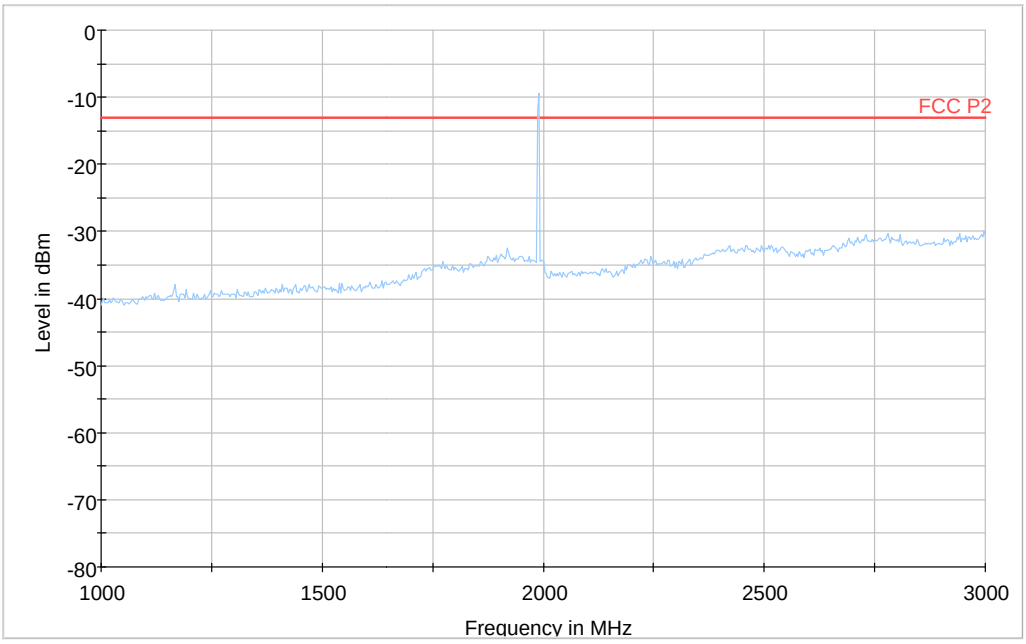
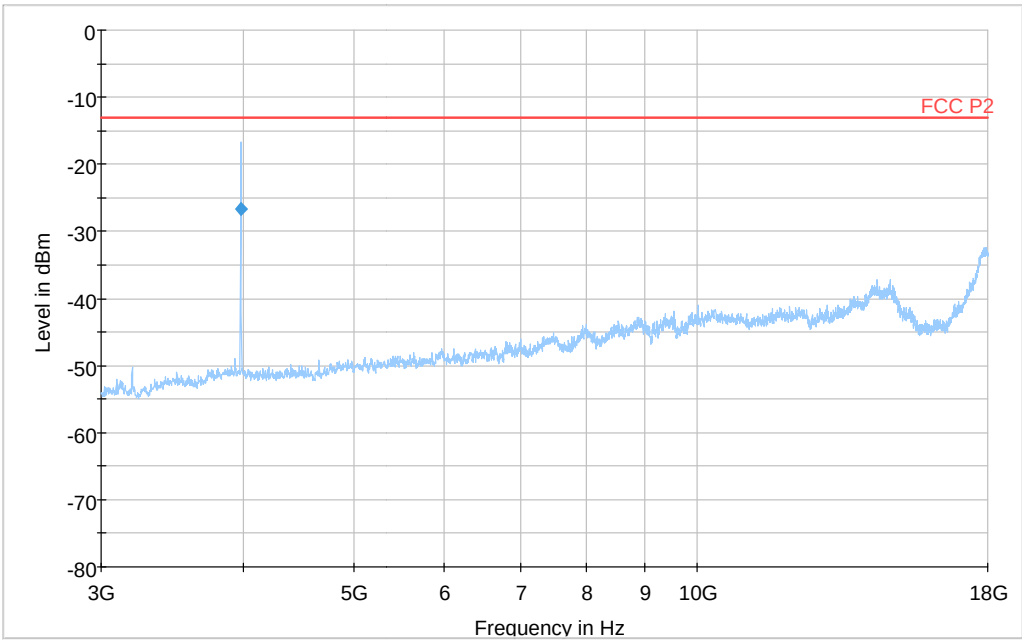


Diagram 1 b:



Note: The emission at 1989.3 MHz is the EUT LTE TX carrier frequency T and shall be ignored for the scope of the measurement.

Diagram 1 c:



Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3977.982	-26.6	5000.0	1000.000	100.0	H	99.0	-103.1	13.6	-13.0

Appendix 6

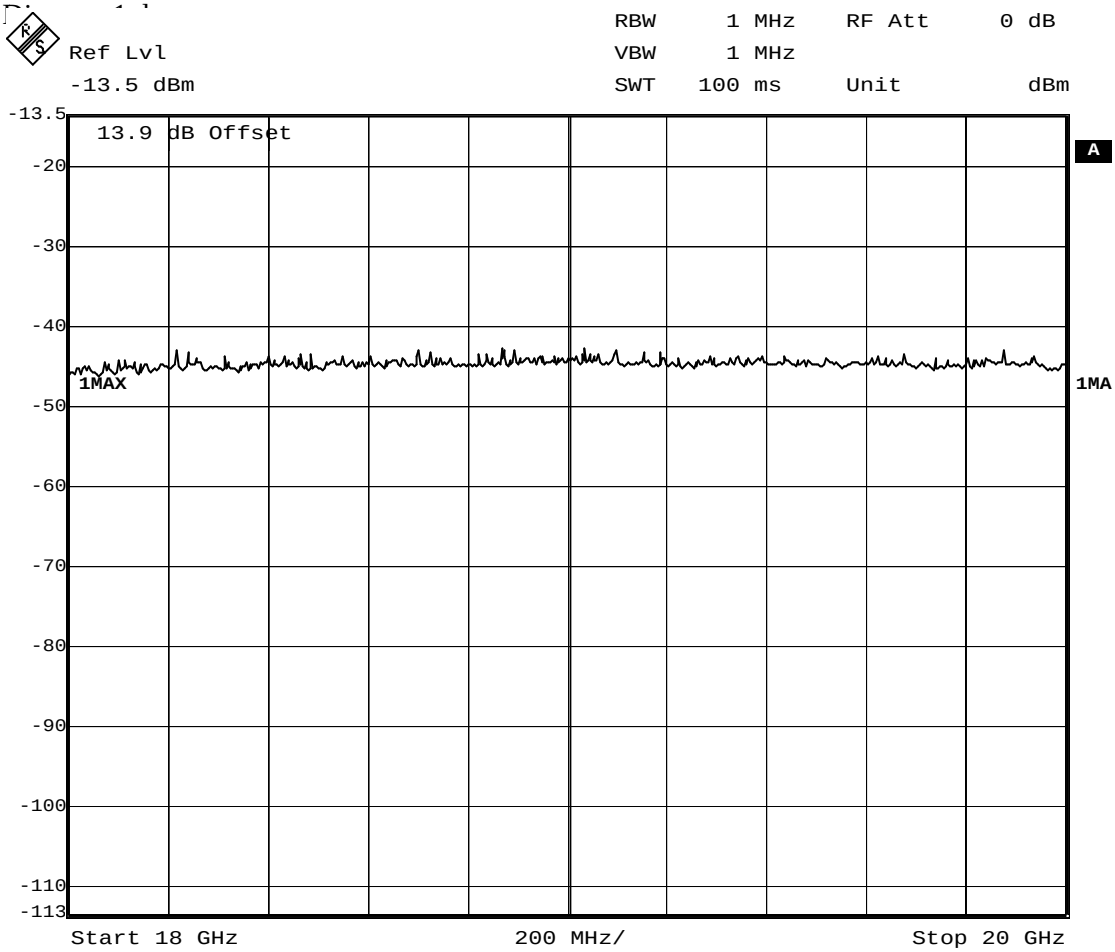

RBW 1 MHz
RF Att 0 dB
Ref Lvl
VBW 1 MHz
-13.5 dBm
SWT 100 ms
Unit dBm
13.9 dB Offset
A
1MAX
1MA
-13.5
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-113
Start 18 GHz
200 MHz/
Stop 20 GHz
Date: 5.DEC.2012 09:28:21

Diagram 2 a:

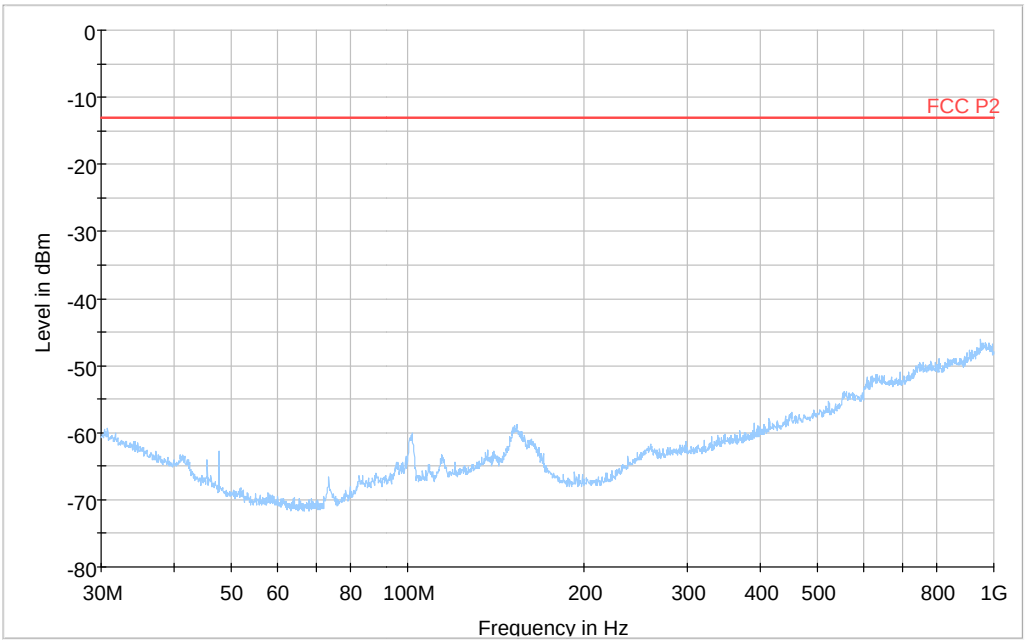
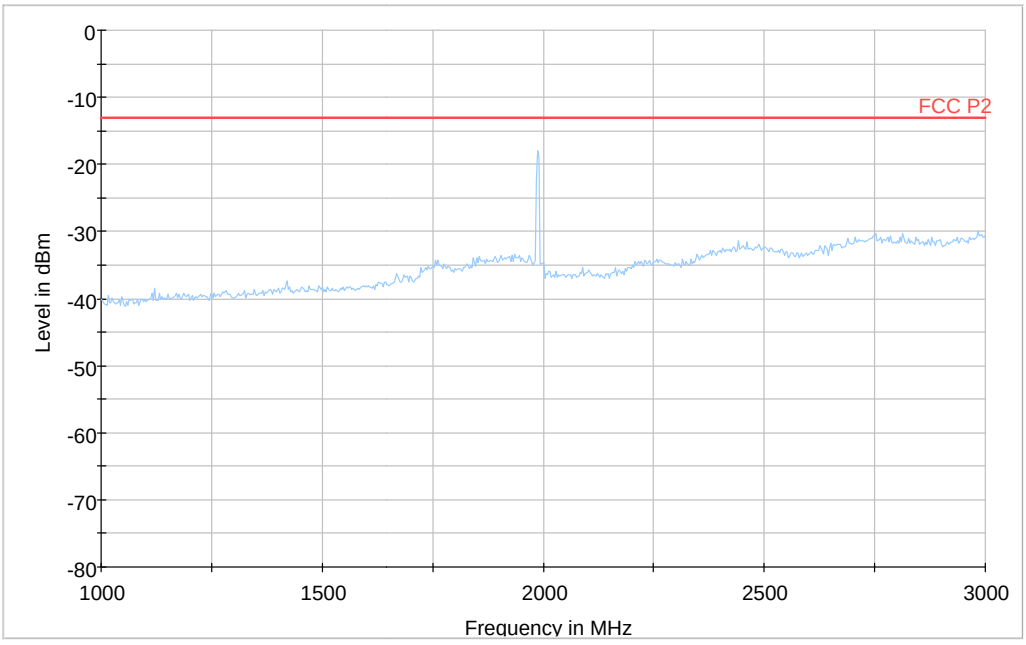
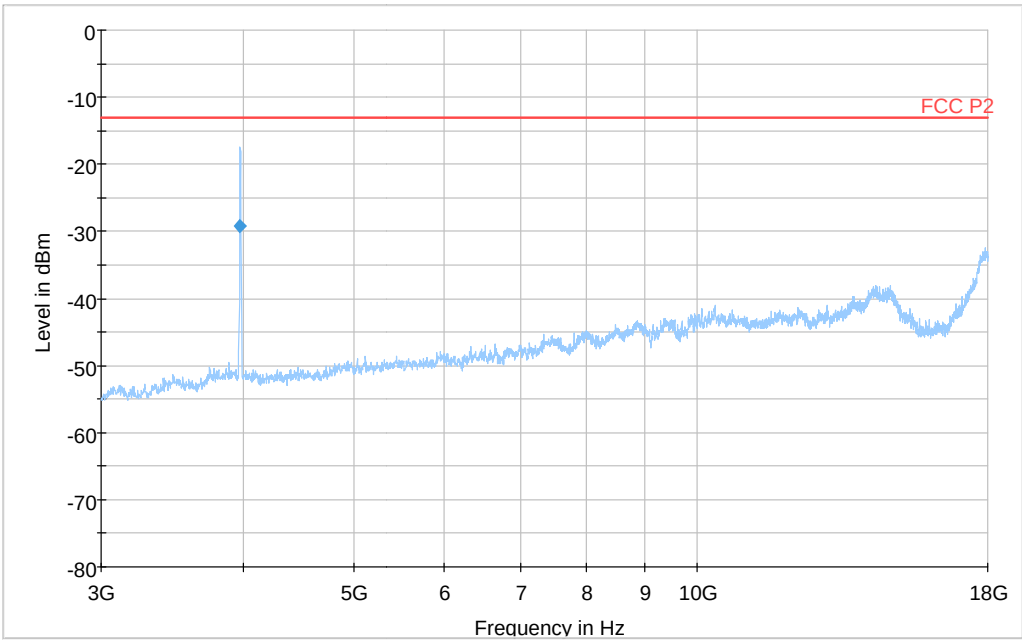


Diagram 2 b:



Note: The emission at 1987.6 MHz is the EUT WCDMA TX carrier frequency T and shall be ignored for the scope of the measurement.

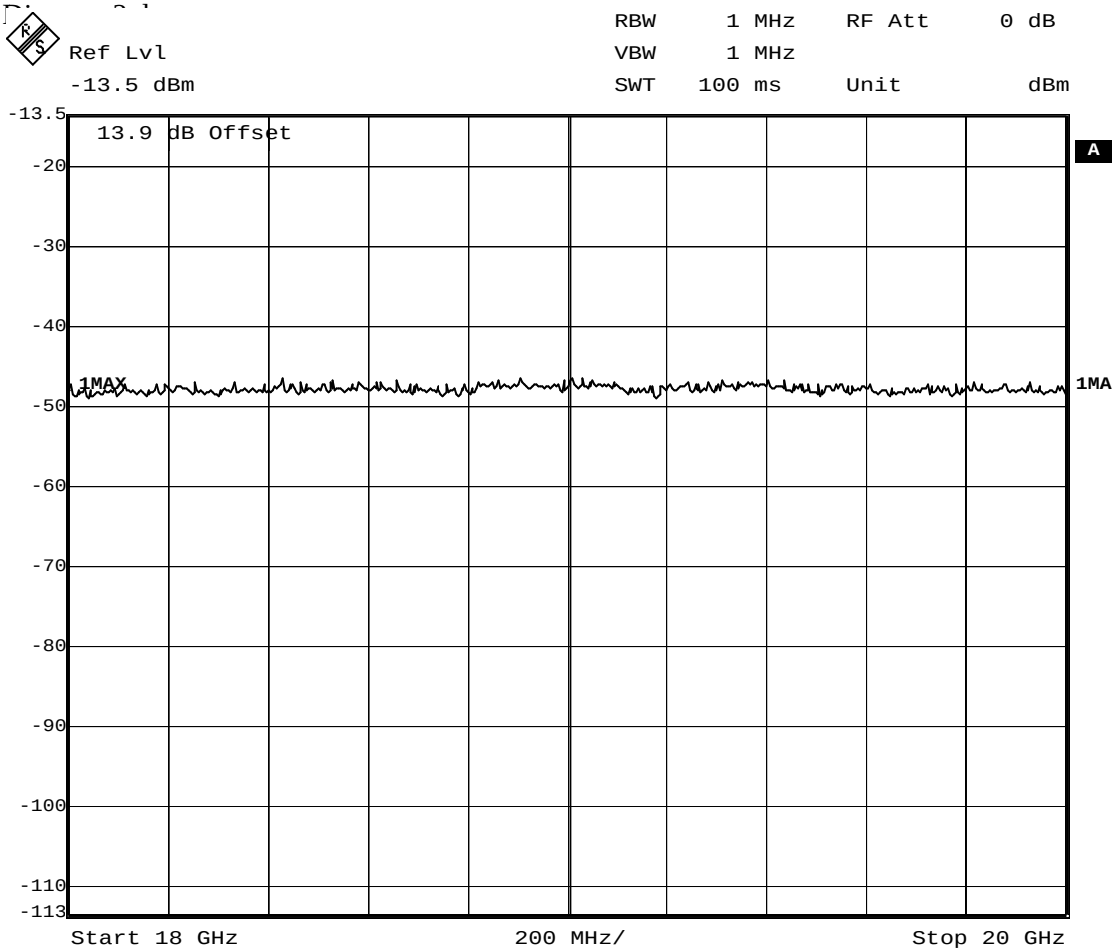
Diagram 2 c:



Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3974.130	-29.2	5000.0	1000.000	100.0	H	78.0	-103.1	16.2	-13.0

Appendix 6


RBW 1 MHz
RF Att 0 dB
Ref Lvl
VBW 1 MHz
-13.5 dBm
SWT 100 ms
Unit dBm
13.9 dB Offset
A
1MAX
1MA
-13.5
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-113
Start 18 GHz
200 MHz/
Stop 20 GHz
Date: 5.DEC.2012 11:38:00

Appendix 6

Diagram 3 a:

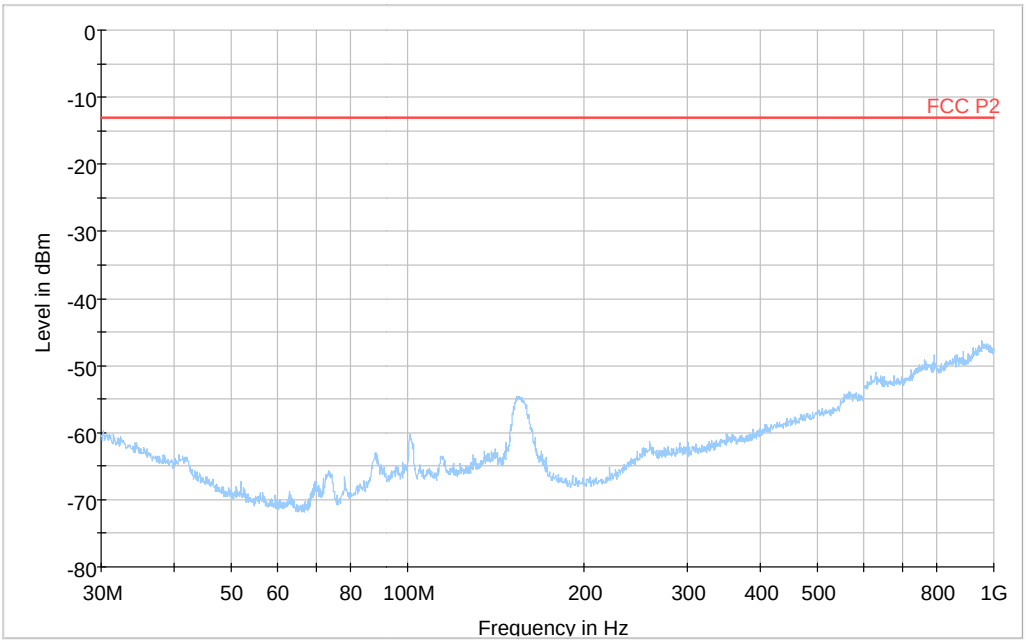
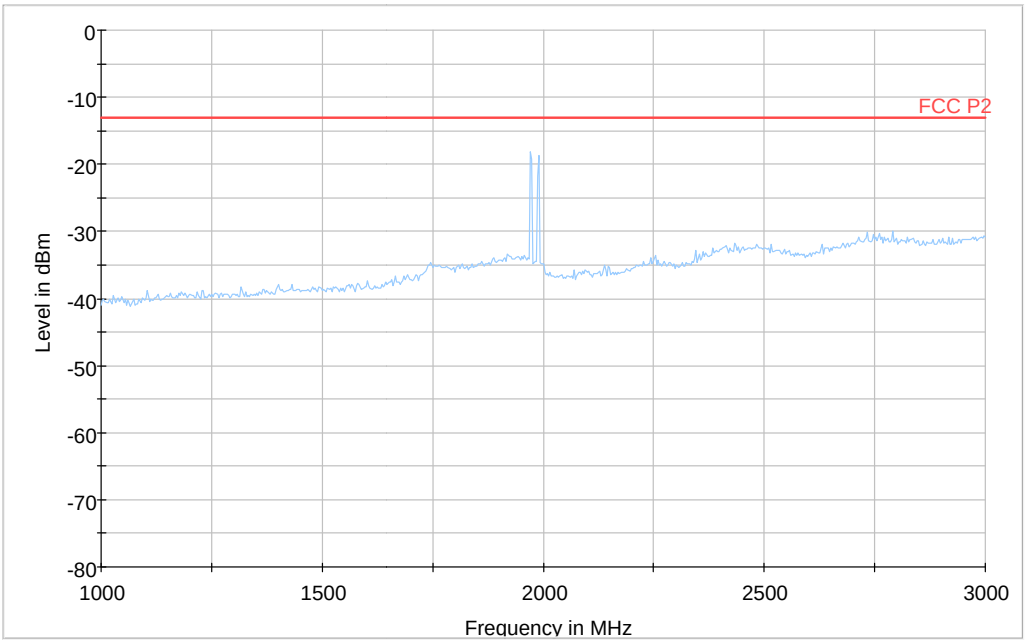
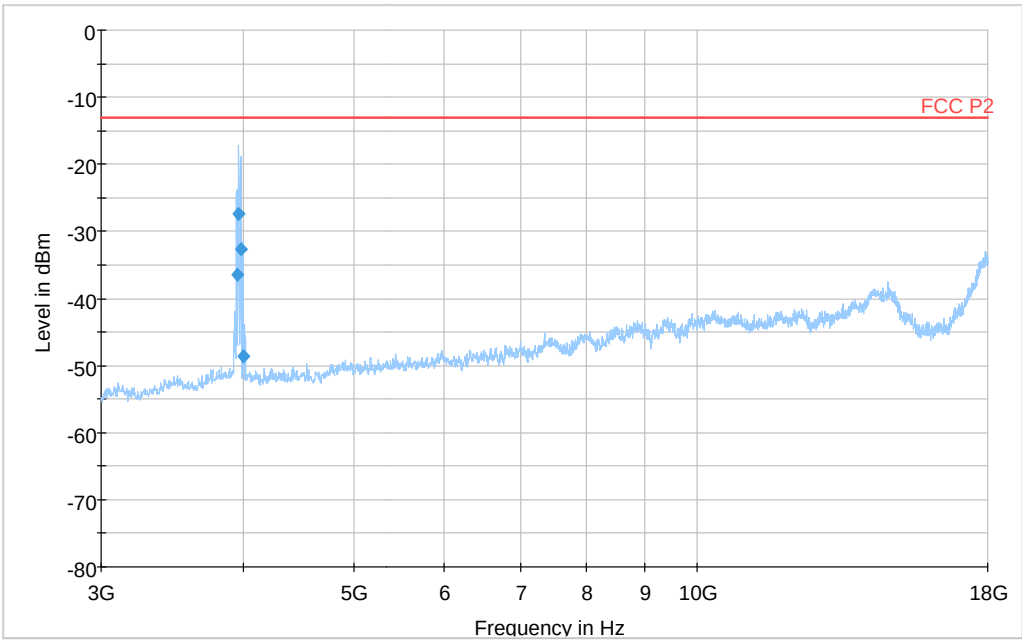


Diagram 3 b:



Note: The emissions at 1972.6 MHz and 1989.3 MHz are the EUT TX carrier frequencies and shall be ignored for the scope of this measurement.

Diagram 3 c:

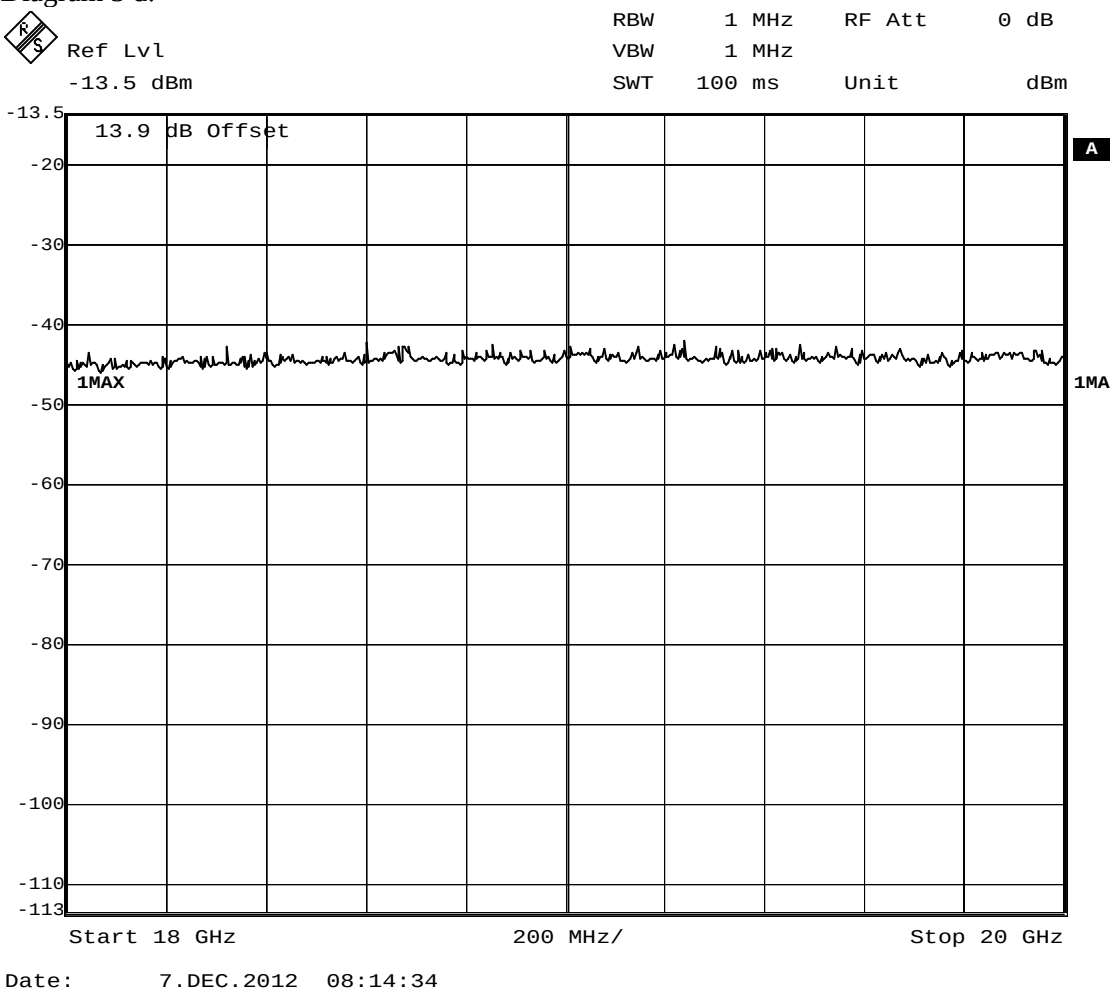


Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3946.274	-36.5	5000.0	1000.000	106.0	H	133.0	-103.1	23.5	-13.0
3962.019	-27.4	5000.0	1000.000	104.0	H	100.0	-103.1	14.4	-13.0
3978.437	-32.7	5000.0	1000.000	100.0	H	89.0	-103.1	19.7	-13.0
3995.168	-48.7	5000.0	1000.000	100.0	H	88.0	-103.1	35.7	-13.0

Appendix 6

Diagram 3 d:



External photos

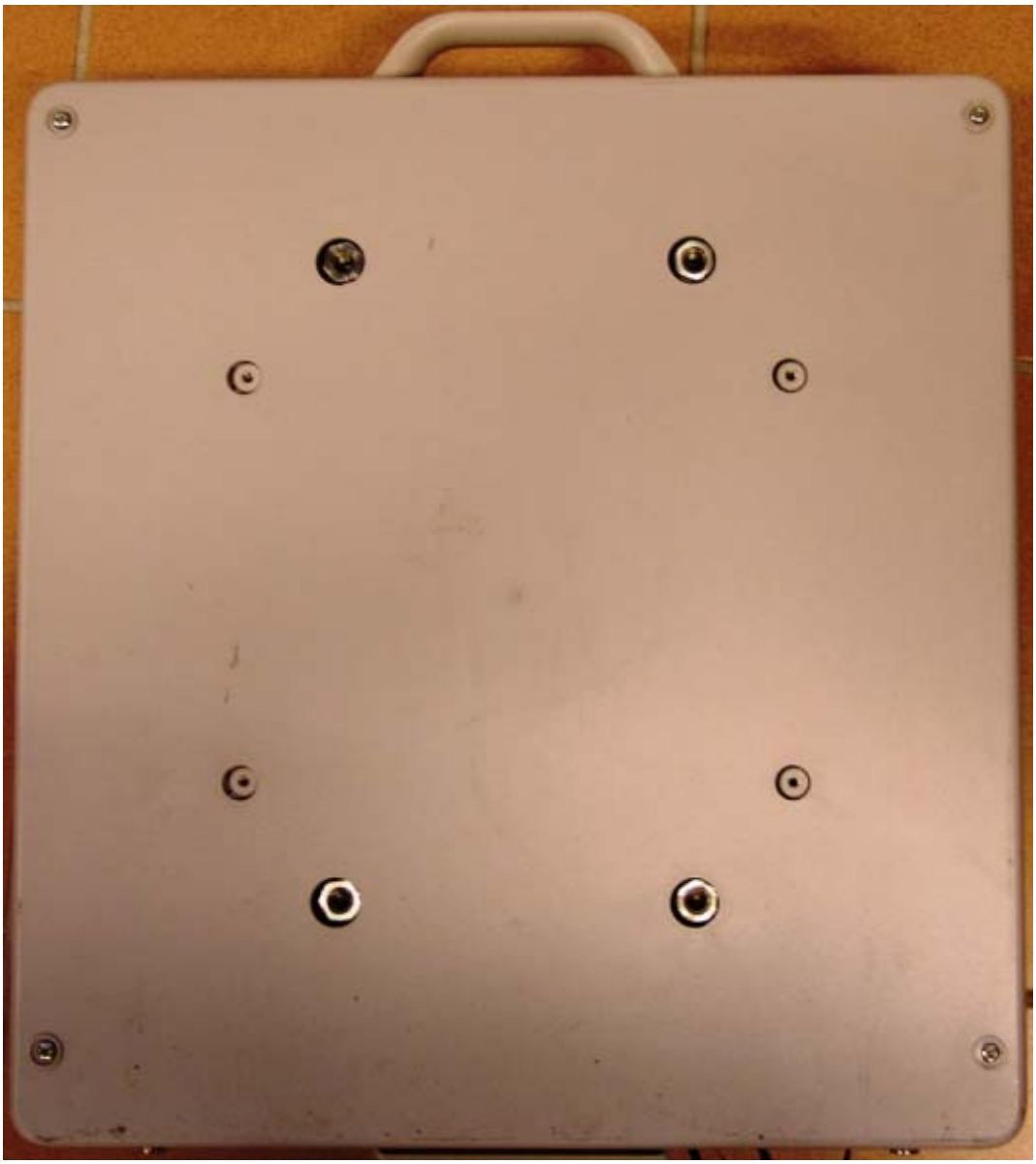
Note: The pictures show the sample used for radiated measurements.

Front side

FCC/IC ID label and product label mounted beneath cover.

Appendix 7

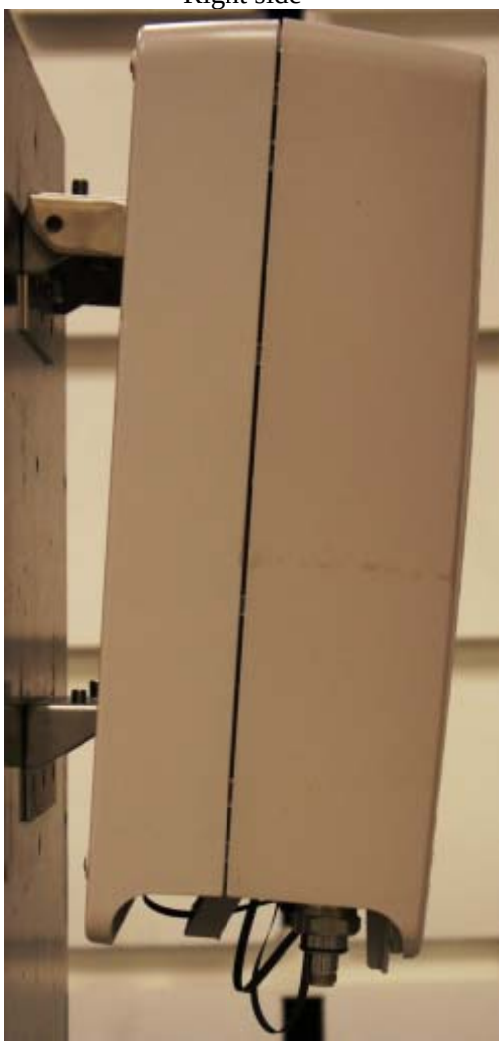
Rear side



Appendix 7

Left side

Right side



Appendix 7

Bottom side

Top side