REPORT

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The test site complies with RSS-Gen, IC file no: 3482A

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Date	Reference	Page
2013-10-09	P305639-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: TA8AKRC161276-2 and IC: 287AB-AS1612762

(7 appendices)

Test object

RRUS 11 B2, product KRC 161 276/2, revision R2A

Summary

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

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133 Issue 6			
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

Jörgen Wassholm

Examined by

Anders Nordlöf

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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
Antenna:	No dedicated antenna, handled during licensing
LTE supports	
Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidths:	1.4 MHz, 3 MHz, 5 MHz, 10 MHz,15 MHz and 20 MHz
Channel bandwidths supported in MSR mode	5 MHz, 10 MHz and 15 MHz
RF configurations	Single & multi carrier and MIMO mode
Nominal RF output power:	1x 46 dBm (1x 40 W) per antenna port 2x 43 dBm (2x 20W) per antenna port
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)
RF configurations	Single & multi carrier and MIMO mode
Nominal RF output power:	1x 46 dBm (1x 40.0 W) per antenna port 2x 43 dBm (2x 20.0W) per antenna port 3x 41.1 dBm (3x 13.3W) per antenna port 4x 40 dBm (4x 10.0W) per antenna port
Nominal supply voltage:	-48VDC

Purpose of test

The purpose of this test is to justify a Class II Permissive Change due to hardware update, 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 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 modulation.

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting.The settings below were used for all measurements if not otherwise noted.

MIMO mode single carrier: E-TM1.1

MIMO mode multi carrier: 2 carriers E-TM1.1

Channel bandwidth 1.4 MHz

All measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

WCDMA single RAT

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 25.141. Test model 1 (TM1) was used to represent QPSK. Test model 5 (TM5) to represent 16QAM modulation and Test model 6 (TM6) to represent 64QAM modulation.

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting.The settings below were used for all measurements if not otherwise noted.

MIMO mode Single carrier
TM5: 8 HS-PDSCH at 240 ksps + 30 DPCH:s at 30 ksps (SF=128)

Channel bandwidth 5 MHz

All measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

Appendix 1

LTE & WCDMA MSR

WCDMA measurements were performed with the test object transmitting test models as defined in 3GPP TS 25.141. Test model 1 (TM1) was used to represent QPSK. Test model 5 (TM5) to represent 16QAM modulation and Test model 6 (TM6) to represent 64QAM modulation.

LTE 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 modulation.

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting.The settings below were used for all measurements if not otherwise noted.

WCDMA MIMO mode
TM5: 8 HS-PDSCH at 240ksps + 30 DPCH:s at 30 ksps (SF=128)

Channel bandwidth 5 MHz

LTE MIMO mode
E-TM1.1

Channel bandwidth 5 MHz.

Measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

Appendix 1

Test frequencies used for conducted and radiated measurements

LTE MIMO, single carrier TX test frequencies

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
607	1930.7	B_{LTE}	TX bottom frequency in 1.4 MHz BW configuration
615	1931.5	B_{LTE}	TX bottom frequency in 3 MHz BW configuration
625	1932.5	B_{LTE}	TX bottom frequency in 5 MHz BW configuration
650	1935.0	B_{LTE}	TX bottom frequency in 10 MHz BW configuration
675	1937.5	B_{LTE}	TX bottom frequency in 15 MHz BW configuration
700	1940.0	B_{LTE}	TX bottom frequency in 20 MHz BW configuration
900	1960.0	M_{LTE}	TX band mid frequency all BW configurations
1100	1980.0	T_{LTE}	TX top frequency in 20 MHz BW configuration
1125	1982.5	T_{LTE}	TX top frequency in 15 MHz BW configuration
1150	1985.0	T_{LTE}	TX top frequency in 10 MHz BW configuration
1175	1987.5	T_{LTE}	TX top frequency in 5 MHz BW configuration
1185	1988.5	T_{LTE}	TX top frequency in 3 MHz BW configuration
1193	1989.3	T_{LTE}	TX top frequency in 1.4 MHz BW configuration

LTE MIMO, multi carrier TX test frequencies

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
615 645	1931.5 1934.5	$B+(B+3)_{LTE}$	TX bottom frequencies in 3 MHz BW configuration
900 930	1960.0 1963.0	$M+(M+3)_{LTE}$	TX mid frequencies in 3 MHz BW configuration
1155 1185	1985.5 1988.5	$T+(T-3)_{LTE}$	TX top frequencies in 3 MHz BW configuration
688 788	1938.8 1948.8	B_{IM-LTE}	TX bottom frequencies in 1.4 MHz BW configuration
1012 1112	1971.2 1981.2	T_{IM-LTE}	TX top frequencies in 1.4 MHz BW configuration

WCDMA MIMO, single carrier TX test frequencies

UARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
9662	1932.4	B_{WCDMA}	TX bottom frequency
9800	1960.0	M_{WCDMA}	TX band mid frequency
9938	1987.6	T_{WCDMA}	TX top frequency

WCDMA MIMO, multi carrier TX test frequencies

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
9662 9737	1932.4 1947.4	$B+(B+15)_{WCDMA}$	TX bottom frequencies
9662 9687	1932.4 1937.4	$B+(B+5)_{WCDMA}$	TX bottom frequencies
9800 9825	1960.0 1965.0	$M+(M+5)_{WCDMA}$	TX band mid frequencies
9938 9913	1987.6 1882.6	$T+(T-5)_{WCDMA}$	TX top frequencies

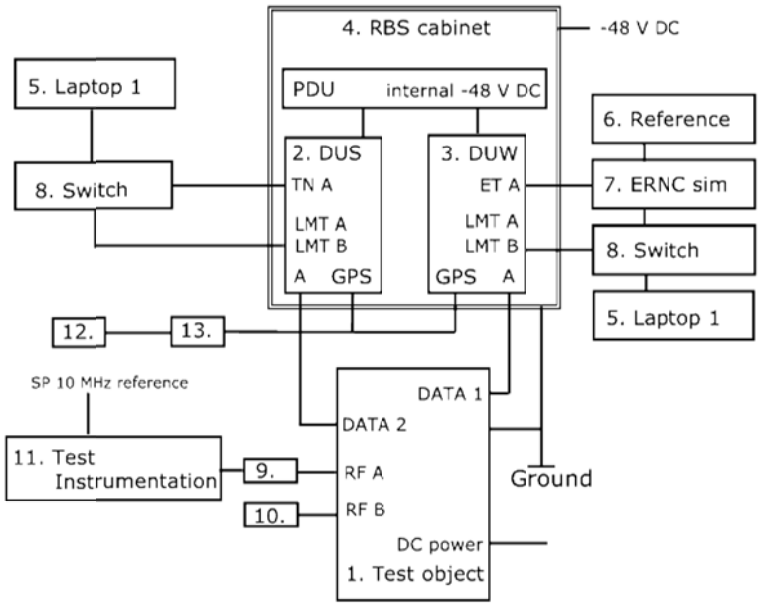
Appendix 1

WCDMA and LTE MIMO multi RAT, TX test frequencies

WCDMA			LTE				
UARFCN Downlink	Frequency [MHz]	BW [MHz]	EARFCN Downlink	Frequency [MHz]	BW [MHz]	Symbolic name	Comment
9662	1932.4	5	775	1947.5	5	B_{L+W}	TX **b**ottom constellation per LTE BW
9763	1952.6	5	975	1967.5	5	M_{L+W}	TX **m**id constellation per LTE BW
9763	1952.6	5	925	1962.5	15	M_{L+W}	
9863	1972.6	5	1175	1987.5	5	T_{L+W}	TX **t**op constellation per **L**TE BW
9690	1938.0	5	775	1947.5	5	B_{IM-L+W}	TX **c**onstellation for bottom spurious IM
9862	1972.8	5	1120	1982.0	5	T_{IM-L+W}	TX **c**onstellation top for spurious 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/DUS 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.

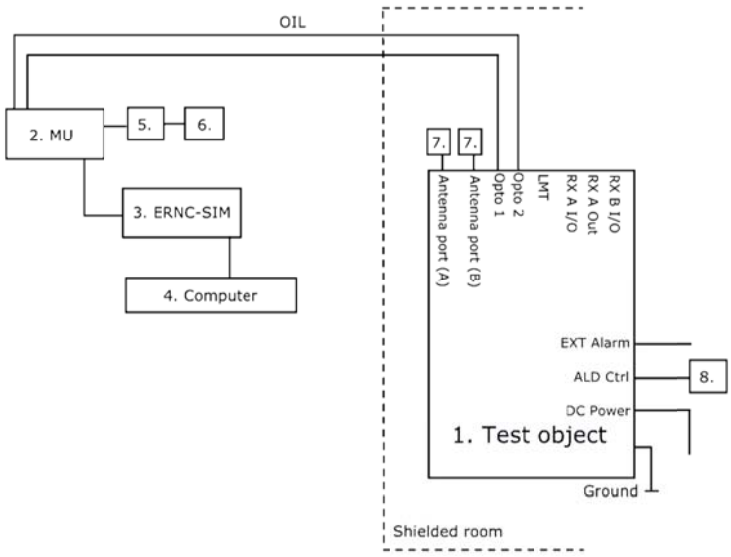
Test object:

1. RRUS 11 B2, product KRC 161 276/2, rev. R2A, S/N: CF81323607
   with PIS software CXP 901 7316/1 rev. R39UL,
   unlocked working software CXP 901 3268/6 R49EG
   (FCC ID: TA8AKRC161276-2 and IC: 287AB-AS1612762)

Functional test equipment:

2. DUS 41 01, product KDU 137 624/1, rev. R3C, S/N C826121052
3. DUW 30 01, product KDU 127 161/3, rev. R4F, S/N: TU8XB20731
4. RBS 6202 cabinet, BAMS 1000961945
   PFU 0202, KFE 101 1162/3, rev. R1B, S/N: R80954554
   SCU 0301, BGM 136 1006/3, rev. R1A, S/N: C823563230
5. Controlling laptop HP Elitebook 8560w, BAMS 1001236858
   running software MOSHELL V10.0bc for LTE and channel builder SW for WCDMA
6. Symmetricon 8040, BAMS 1000714189, reference
7. ERNC Sim 130, BAMS 1000660991
8. Fast Ethernet switch, Netgear FS726T
9. Attenuator, filter, directional coupler according to respective appendix
10. Termination 50 ohm
11. SP test instrument according to measurement equipment list
12. GPS Active Antenna, KRE 101 2082/1
13. GPS 02 01, NCD 901 41/1, rev. R1D, S/N: TU8K47887

Test setup radiated measurements MSR WCDMA + LTE



Note: Above set-up shows connections for MSR mode. For single RAT, the data connection from DUW/DUS 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.

Test object:

1. RRUS 11 B2, KRC 161 276/2, rev. R2A, S/N: CF81323607
   with PIS software CXP 901 7316/1 rev. R39UL,
   unlocked working software CXP 901 3268/6 R49EG
   (FCC ID: TA8AKRC161276-2 and IC: 287AB-AS1612762)

Functional test equipment:

2. Main Unit:
   Hosted in a RBS 6202
   DUS 41 01, KDU 137 624/1, rev. R3C, S/N: C826121052
   DUW 30 01, KDU 127 161/3,rev. R4F, S/N: TU8XB20731
3. ERNC-SIM 130:
   Symmetricom SyncServer, BAMS – 1000532027
   Switch Netgear FS726T
   Switch Netgear GSM 7212
   10 MHz reference Symmetricom 8040, BAMS – 1000714189
4. Computer, EliteBook 8540w, BAMS – 1001052042
5. GPS 02 01, NCD 901 41/1, rev. R1D, S/N: TU8K356428
6. GPS Active Antenna, KRE 101 2082/1
7. Attenuator/ Termination 50 ohm
8. RET – Remote Electrical Tilt unit, KRY 121 67/2, rev. R1N

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, no cable attached	Signal
RX A Out, no cable attached	RF
RX A I/O, no cable attached	RF
RX B I/O, no cable attached	RF
EXT Alarm, shielded multi-wire	Signal
ALD Ctrl, shielded multi-wire	Signal
Ground wire	Ground

RBS software:

RAT	**Software**	**Revision**
LTE	CXP 102 151/16	R38AD
WCDMA	CXP 901 8350/1	R12L09

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 11.4.0
3GPP TS 36.141, version 11.4.0
3GPP TS 37.141, version 11.3.0
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	2014-07	503 738
R&S ESU 26	2014-05	901 553
R&S FSQ 40	2014-03	504 143
R&S FSW 43	2013-10	902 073
Control computer with R&S software EMC32 version 8.52.0	-	503 899
High pass filter	2014-07	504 199
High pass filter	2014-07	503 740
RF attenuator	2014-07	902 282
Chase Bilog Antenna CBL 6111A	2014-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 20240-20	2014-03	503 674
µComp Nordic, Low Noise Amplifier	2014-04	901 545
Schwarzbeck preamplifier BBV 9742	2014-03	504 085
Temperature and humidity meter, Testo 635	2014-06	504 203
Temperature and humidity meter, Testo 625	2014-06	504 188
Temperature Chamber	--	503 360
Multimeter Fluke 87	2014-08	502 190

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 2013-08-01.

Appendix 1

Manufacturer’s representative

Christer Gustavsson, Ericsson AB

Test engineers

Jörgen Wassholm, Kexin Chen, Hyder Kahlaf and Tomas Lennhager, SP

Test participants

None

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

Date	Temperature	Humidity
2013-08-14	22 °C ± 3 °C	44 % ± 5 %
2013-08-15	23 °C ± 3 °C	45 % ± 5 %
2013-08-19	23 °C ± 3 °C	45 % ± 5 %
2013-08-20	23 °C ± 3 °C	46 % ± 5 %
2013-08-22	23 °C ± 3 °C	45 % ± 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	902 282
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

WCDMA MIMO, single carrier, nominal output power
1x 46.0 dBm (1x40 W) per RF port:

Configuration	BW (MHz)	Transmitter power RMS (dBm) / PAR (dB)			
		Port RFA	Port RFB	(RFA+RFB)[1)]	Result RMS (dBm/ MHz)[2)]
B_{WCDMA}	5	46.06 / 6.37	46.03 / 6.37	49.06	42.86
M_{WCDMA}	5	45.96 / 6.35	45.84 / 6.35	48.91	42.71
T_{WCDMA}	5	45.97 / 6.35	45.98 / 6.35	48.99	42.79

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02
[2)]: Power density (dBm/MHz) is calculated. Measured Output power = -10log(OBW/1MHz)

WCDMA MIMO, multicarrier, nominal output power 2x 43.0 dBm (2x20 W) per RF port:

Configuration	BW (MHz)	Transmitter power RMS (dBm) / PAR (dB)		
		Port RFA	Port RFB	RFA+RFB[1]
$B + (B + 5)_{WCDMA}$	5	45.97 / 6.44	45.98 / 6.39	48.99
$M + (M + 5)_{WCDMA}$	5	45.95 / 6.35	45.90 / 6.35	48.94
$T + (T - 5)_{WCDMA}$	5	45.91 / 6.37	45.96 / 6.37	48.95

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02

LTE MIMO, single carrier, nominal output power 1x 46.0 dBm (1x40 W) per RF port.

Configuration	BW (MHz)	Transmitter power RMS (dBm) / PAR (dB)			
		Port RFA	Port RFB	RFA+RFB[1)]	Result RMS (dBm/ MHz)[2)]
B_{LTE}	1.4	46.00 / 6.44	45.92 / 6.44	48.97	48.60
B_{LTE}	20	46.04 / 6.78	46.04 / 6.73	49.05	36.53
M_{LTE}	1.4	45.99 / 6.44	45.94 / 6.44	48.98	48.60
M_{LTE}	3	46.04 /6.44	46.03 / 6.44	49.05	44.75
M_{LTE}	5	46.07 / 6.44	46.01 / 6.44	49.05	42.54
M_{LTE}	10	46.02 / 6.47	46.00 / 6.47	49.02	39.51
M_{LTE}	15	46.07 / 6.47	45.99 / 6.47	49.04	37.77
M_{LTE}	20	46.07 / 6.49	46.01 / 6.49	49.05	36.53
T_{LTE}	1.4	45.92 / 6.44	45.92 / 6.44	48.93	48.56
T_{LTE}	20	46.01 / 6.54	46.05 / 6.59	49.04	35.52

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02
[2)]: Power density (dBm/MHz) is calculated. Measured Output power = -10log(OBW/1MHz)

LTE MIMO, multi carrier, nominal output power 2 x 43 dBm per RF port.

Configuration	BW (MHz)	Transmitter power RMS (dBm) / PAR (dB)		
		Port RFA	Port RFB	RFA+RFB[1)]
B + (B +3)$_{LTE}$	3	45.44 / 6.83	45.50 / 6.83	48.48
M + (M + 3)$_{LTE}$	3	45.83 / 6.44	45.89 / 6.44	48.87
T + (T - 3)$_{LTE}$	3	45.48 / 6.83	45.50 / 6.83	48.50

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02

MSR MIMO, 1x WCDMA and 1x LTE carrier (5 MHz BW) per RF port.
nominal output power 2 x 43 dBm per RF port

Configuration	Transmitter power RMS (dBm) / PAR (dB)		
	Port RF A	Port RF B	Total power[1)]
B_{L+W}	45.54 / 6.80	45.60 / 6.73	48.58
M_{L+W}	45.70 / 6.59	45.60 / 6.59	48.66
T_{L+W}	45.59 / 6.63	45.57 / 6.63	48.59
B_{IM-L+W}	45.63 / 6.59	45.56 / 6.59	48.61
T_{IM-L+W}	45.57 /6.54	45.55 / 6.56	48.57

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02

Remark

This unit is tested without antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/IC Bureau(s). Licensee's are required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

Limits

§24.232: The maximum equivalent isotropically radiated power (e.i.r.p.) may not exceed 3280 W/ 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

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

Date	Temperature	Humidity
2013-08-14	22 °C ± 3 °C	44 % ± 5 %
2013-08-15	23 °C ± 3 °C	45 % ± 5 %
2013-08-16	23 °C ± 3 °C	45 % ± 5 %
2013-08-21	23 °C ± 3 °C	45 % ± 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 FSW 43	902 073
RF attenuator	902 282
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA, MIMO mode:

Diagram	BW / [MHz]	TX frequency	Tested Port	OBW (99%) / [MHz]
1	5 MHz	B_{WCDMA}	RF A	4.17
2	5 MHz	M_{WCDMA}	RF A	4.17
3	5 MHz	M_{WCDMA}	RF B	4.18
4	5 MHz	T_{WCDMA}	RF A	4.17

Appendix 3

LTE, MIMO mode:

Diagram	BW / [MHz]	TX frequency	Tested Port	OBW (99%) / [MHz]
5	1.4	B_{LTE}	RF A	1.09
6	20	B_{LTE}	RF A	17.85
7	1.4	M_{LTE}	RF A	1.09
8	1.4	M_{LTE}	RF B	1.09
9	3	M_{LTE}	RF A	2.69
10	5	M_{LTE}	RF A	4.48
11	10	M_{LTE}	RF A	8.93
12	15	M_{LTE}	RF A	13.40
13	20	M_{LTE}	RF A	17.86
14	20	M_{LTE}	RF B	17.86
15	1.4	T_{LTE}	RF A	1.09
16	20	T_{LTE}	RF A	17.85

Appendix 3

Diagram 1:

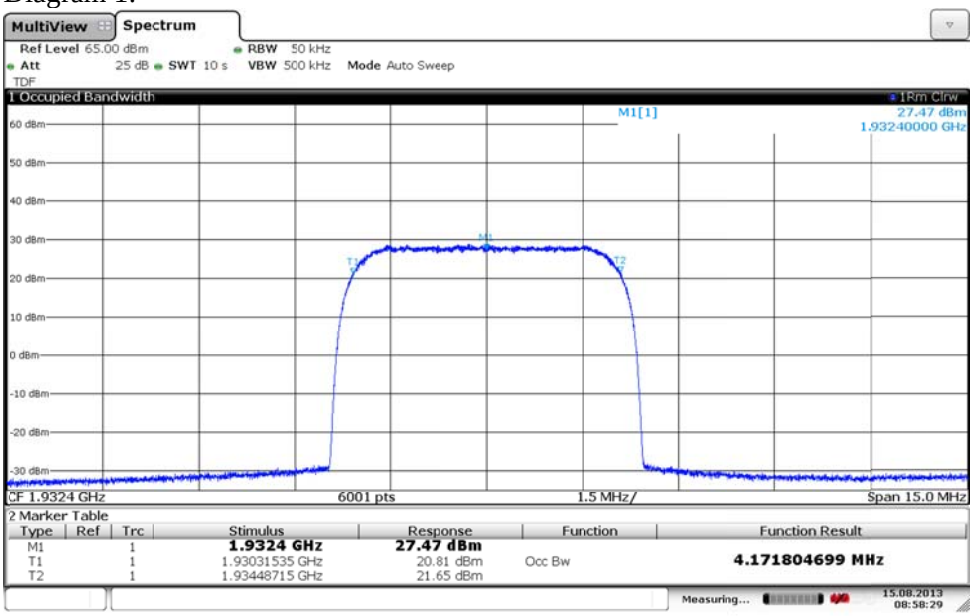


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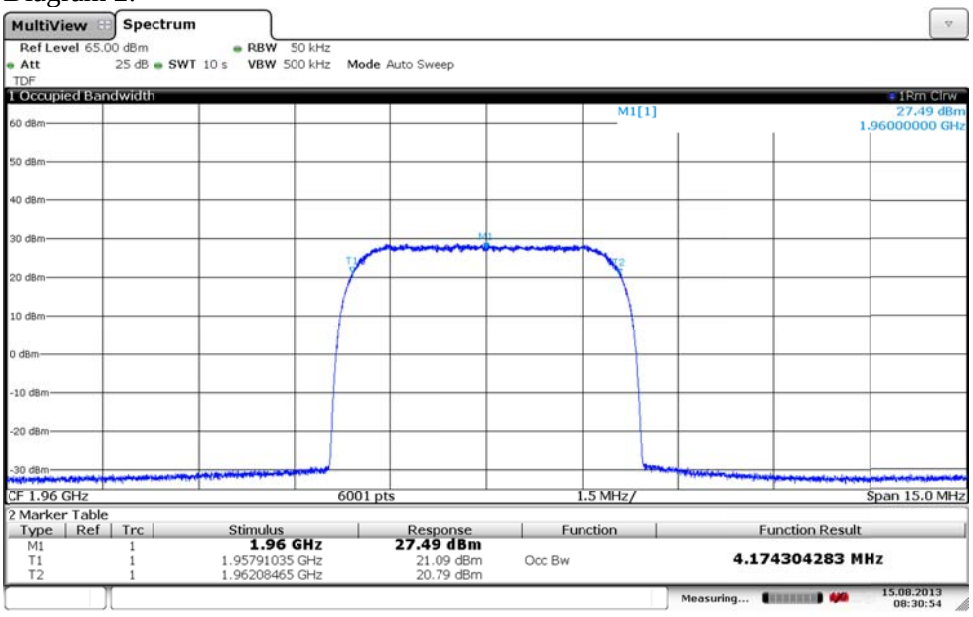
Diagram 2:



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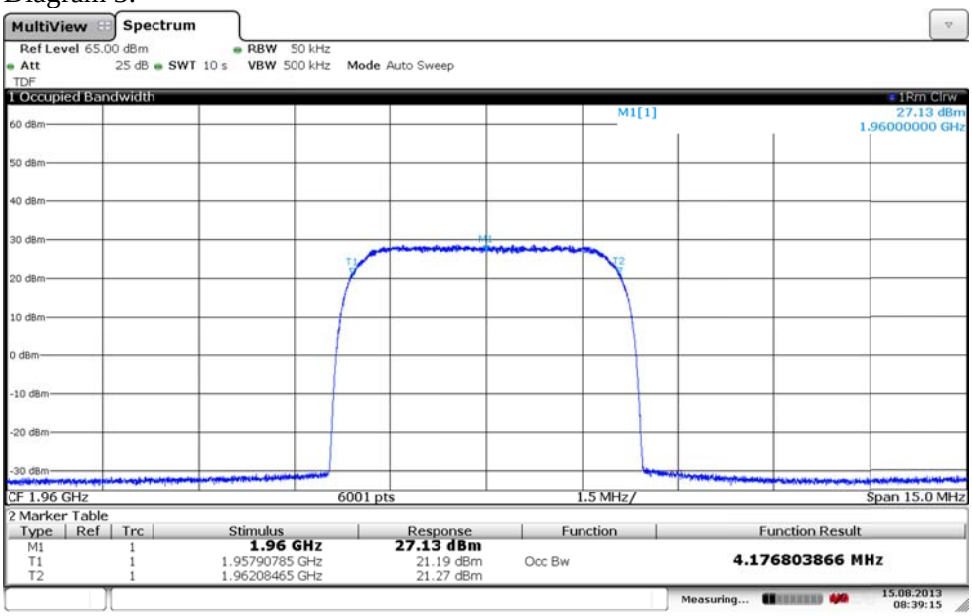
Appendix 3

Diagram 3:



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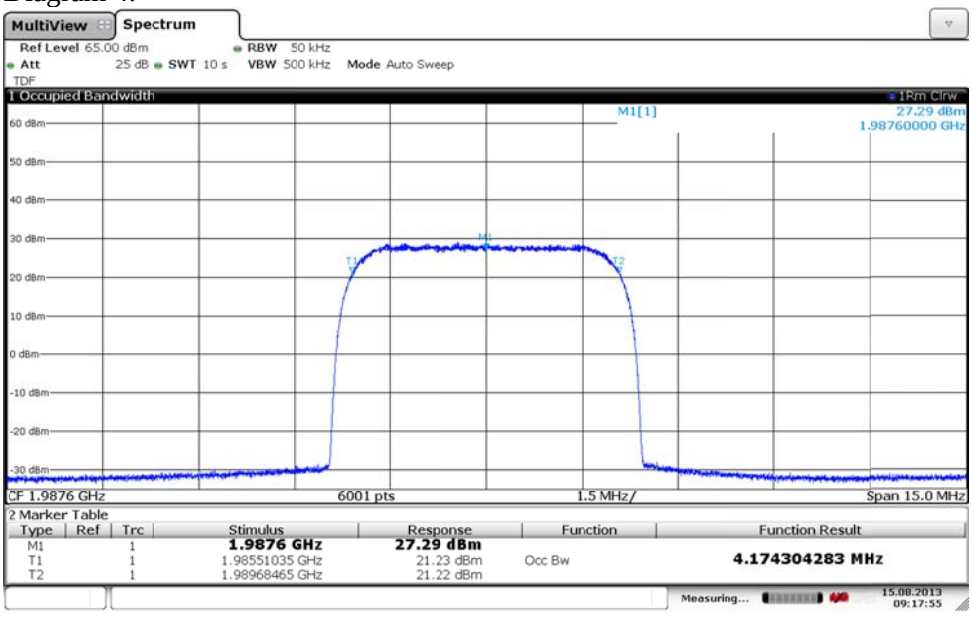

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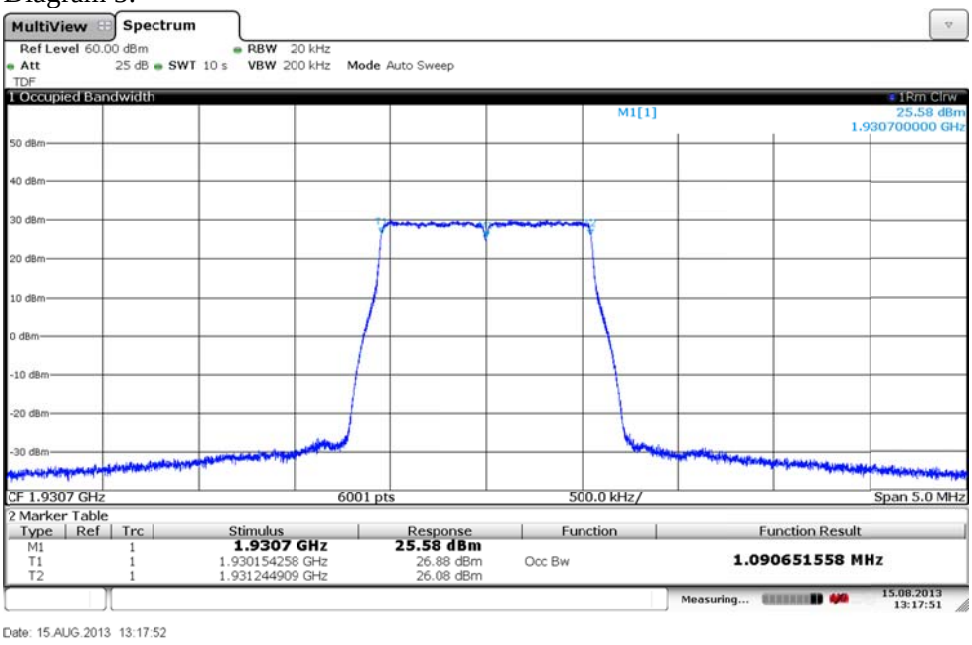

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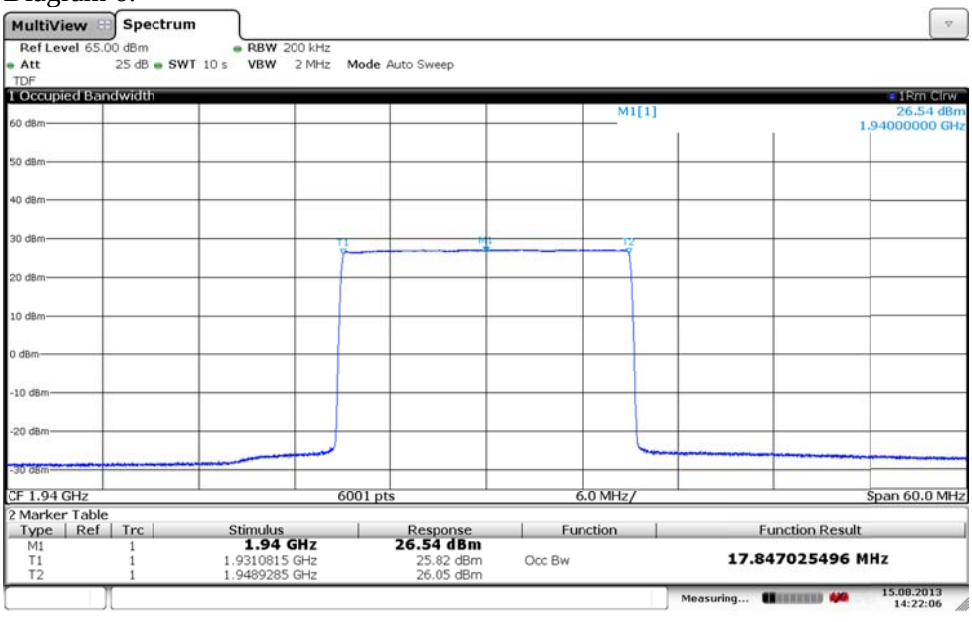

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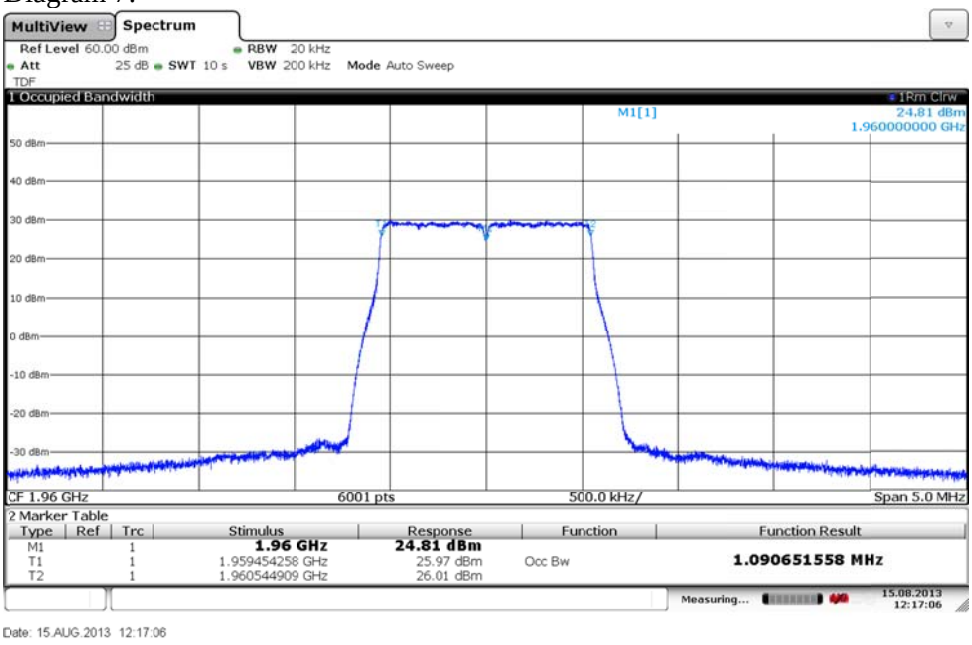
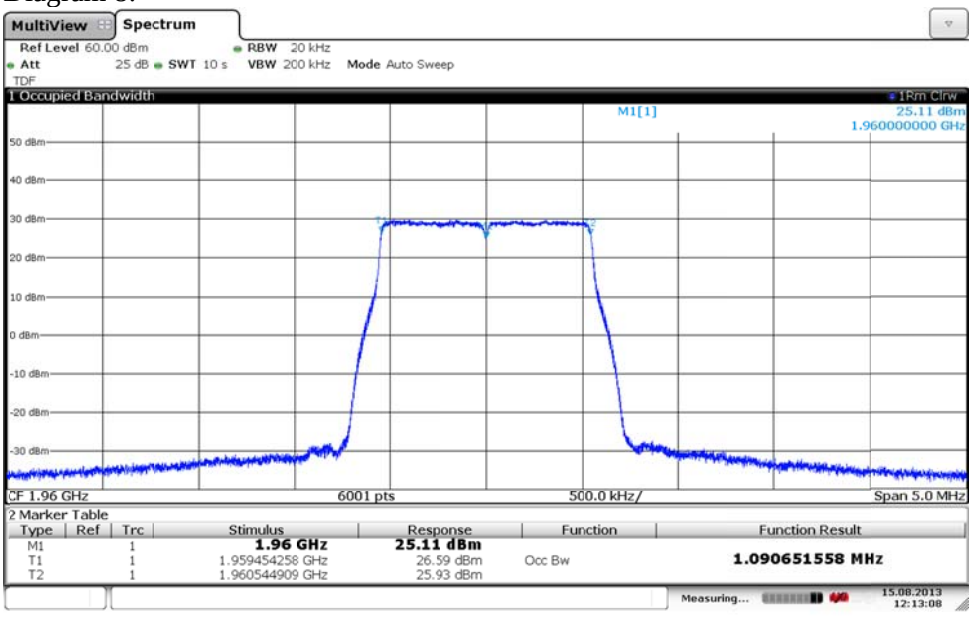
Appendix 3

Diagram 7:



Date: 15.AUG.2013 12:17:06

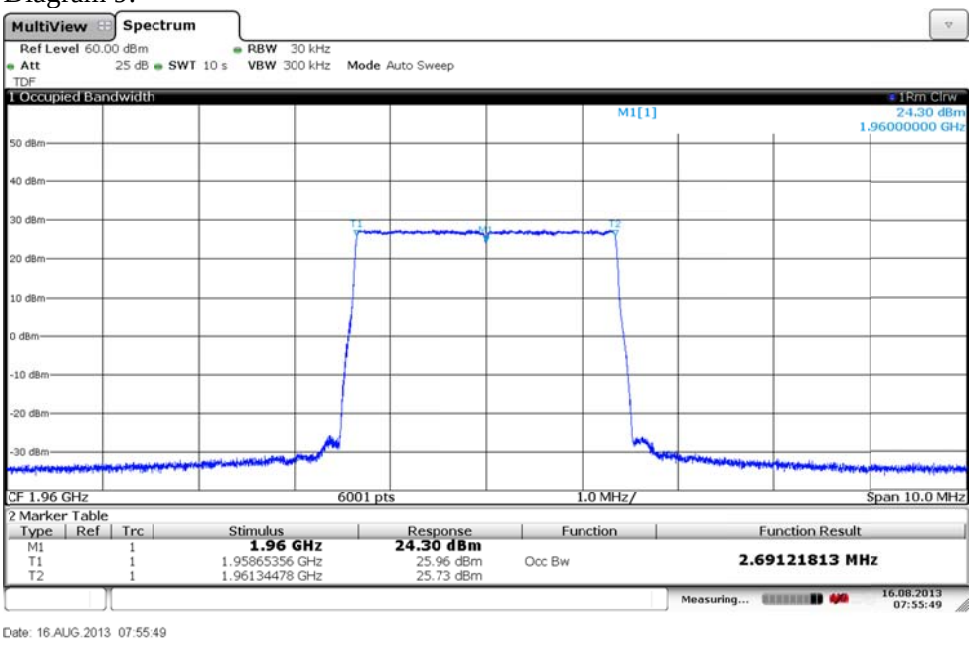
Diagram 8:



Date: 15.AUG.2013 12:13:07

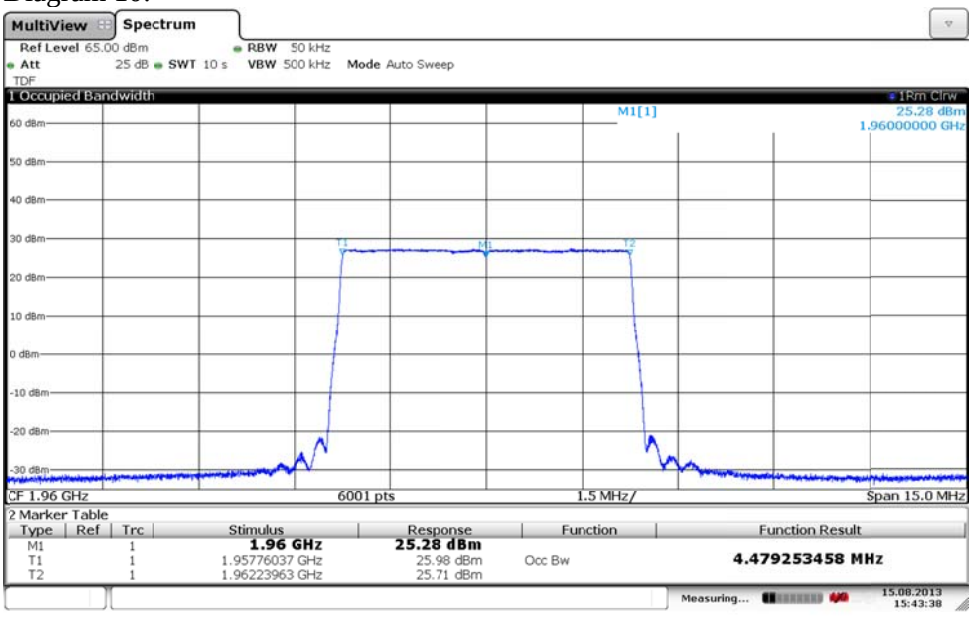
Appendix 3

Diagram 9:



Date: 16.AUG.2013 07:55:49

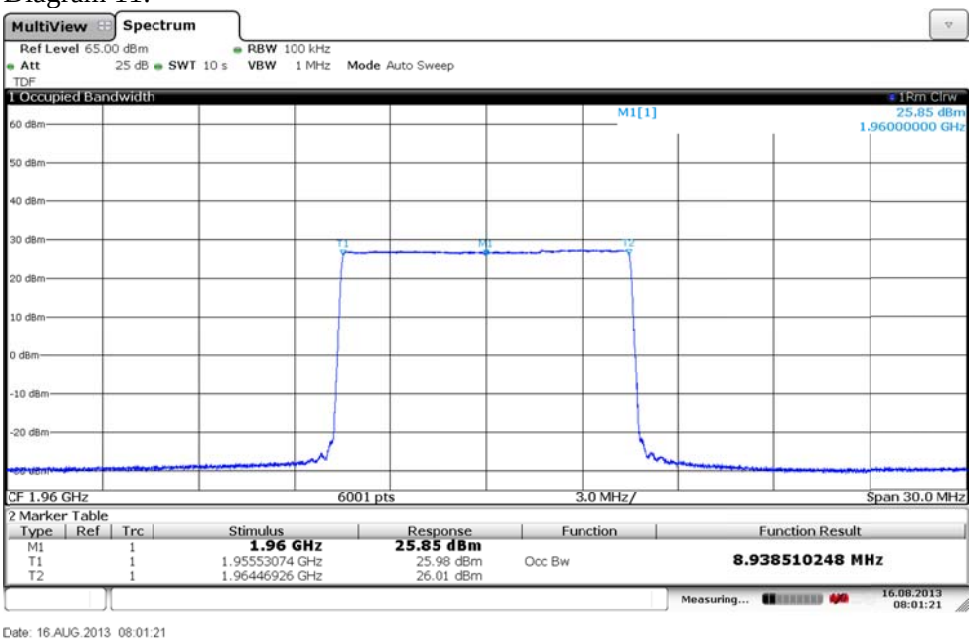
Diagram 10:



Date: 15.AUG.2013 15:43:38

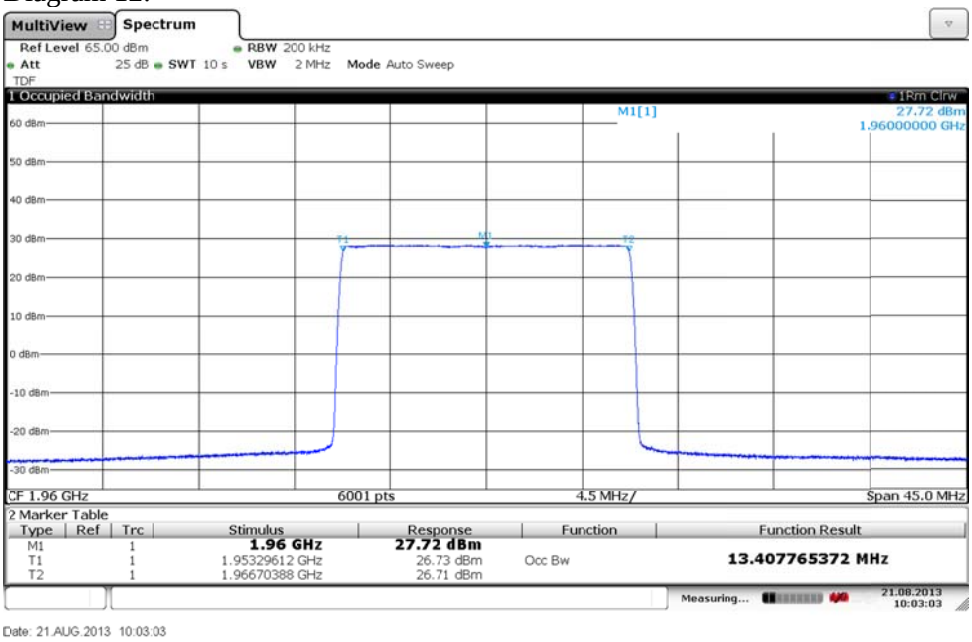
Appendix 3

Diagram 11:



Date: 16.AUG.2013 08:01:21

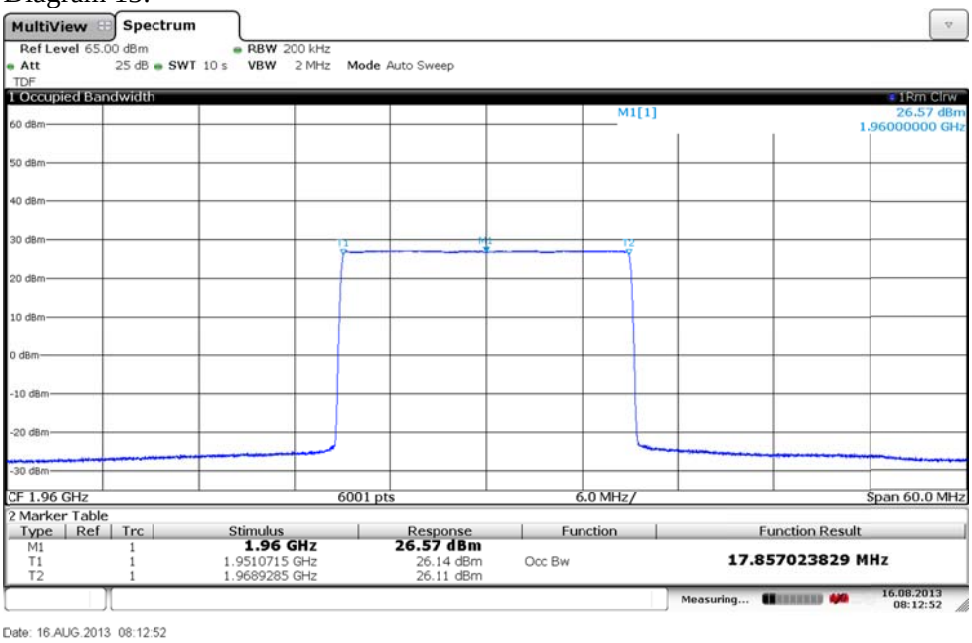
Diagram 12:



Date: 21.AUG.2013 10:03:03

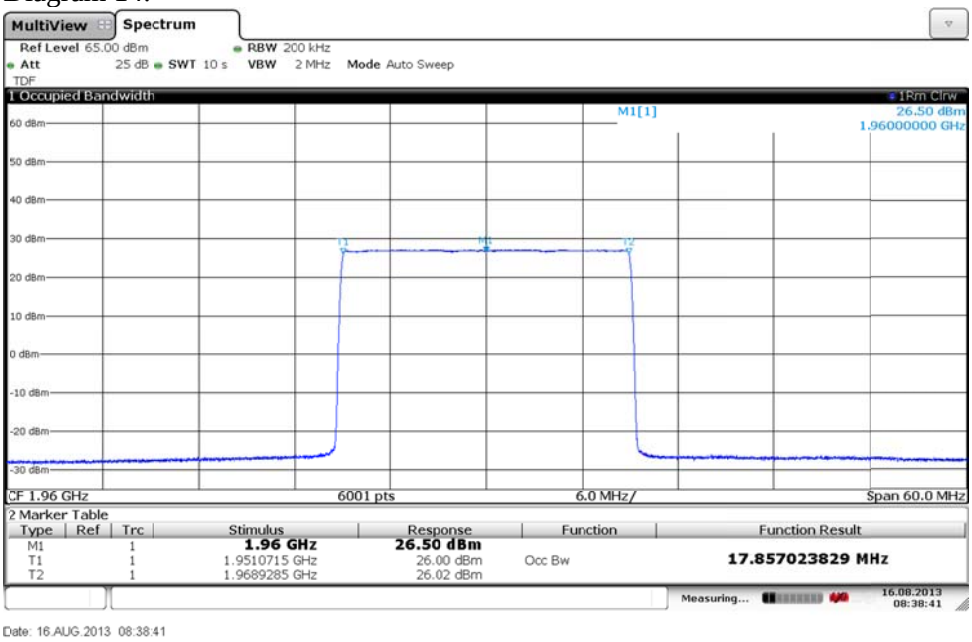
Appendix 3

Diagram 13:



Date: 16.AUG.2013 08:12:52

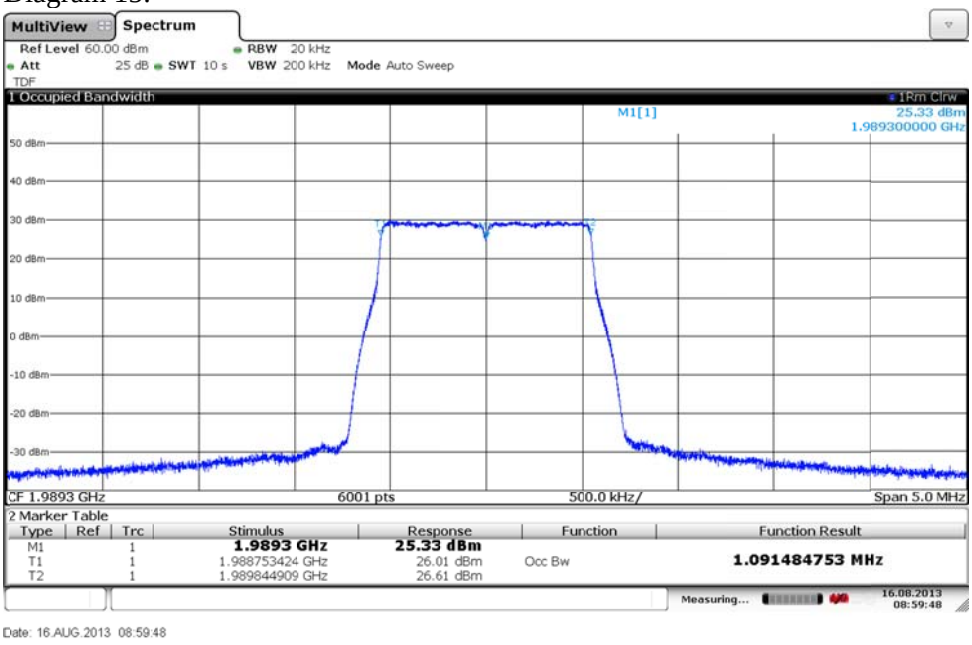
Diagram 14:



Date: 16.AUG.2013 08:38:41

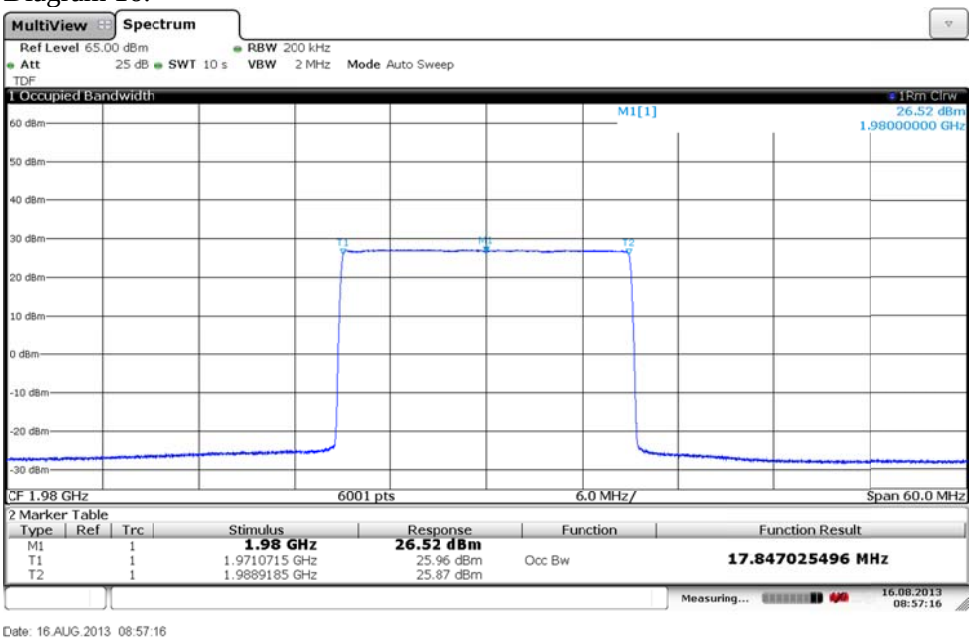
Appendix 3

Diagram 15:



Date: 16.AUG.2013 08:59:48

Diagram 16:



Date: 16.AUG.2013 08:57:16

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

Date	Temperature	Humidity
2013-08-14	22 °C ± 3 °C	44 % ± 5 %
2013-08-15	23 °C ± 3 °C	45 % ± 5 %
2013-08-16	23 °C ± 3 °C	45 % ± 5 %
2013-08-19	23 °C ± 3 °C	45 % ± 5 %
2013-08-22	23 °C ± 3 °C	45 % ± 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.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), (iii) "measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v02

WCDMA MIMO mode:

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
5 MHz	4.39	20 kHz	-16.40

LTE, MIMO mode:

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
1.4 MHz	1.12	10 kHz	-13.50
3 MHz	2.73	10 kHz	-17.40

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW 43	902 073
RF attenuator	902 282
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA MIMO, Single carrier:

Diagram	BW configuration	Tested frequency	Tested Port
1 a-c	5 MHz	B_{WCDMA}	RF A
2 a-c	5 MHz	B_{WCDMA}	RF B
3 a-c	5 MHz	T_{WCDMA}	RF A
4 a-c	5 MHz	T_{WCDMA}	RF B

LTE MIMO, Single carrier:

Diagram	BW configuration	Tested frequency	Tested Port
5 a-c	1.4 MHz	B_{LTE}	RF A
6 a-c	3 MHz	B_{LTE}	RF A
7 a-c	5 MHz	B_{LTE}	RF A
8 a-c	3 MHz	B_{LTE}	RF B
9 a+c	1.4 MHz	T_{LTE}	RF A
10 a+c	3 MHz	T_{LTE}	RF A
11 a+c	5 MHz	T_{LTE}	RF A
12 a+c	3 MHz	T_{LTE}	RF B

Limits

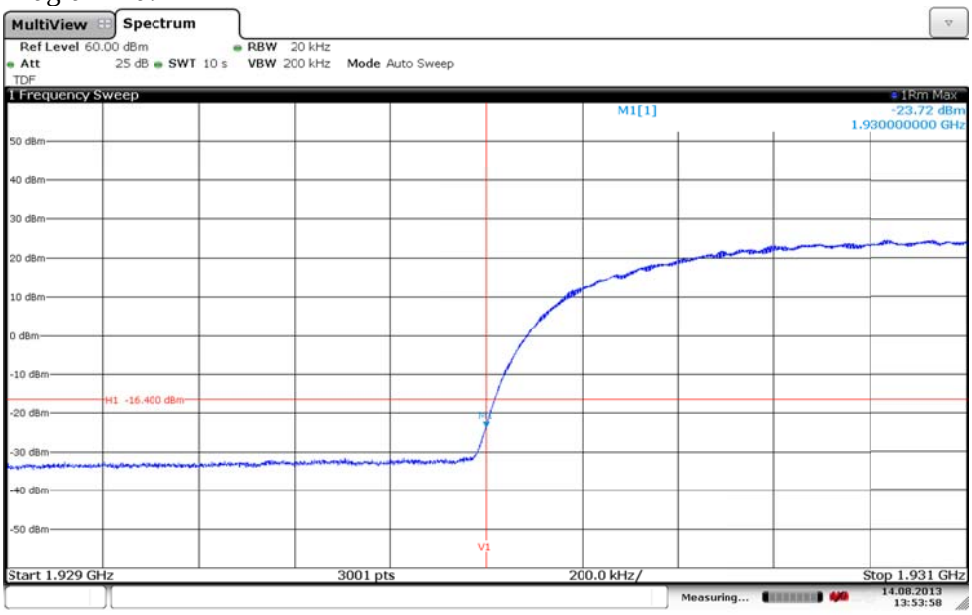
CFR 47 §24.238 and RSS-133 6.5

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

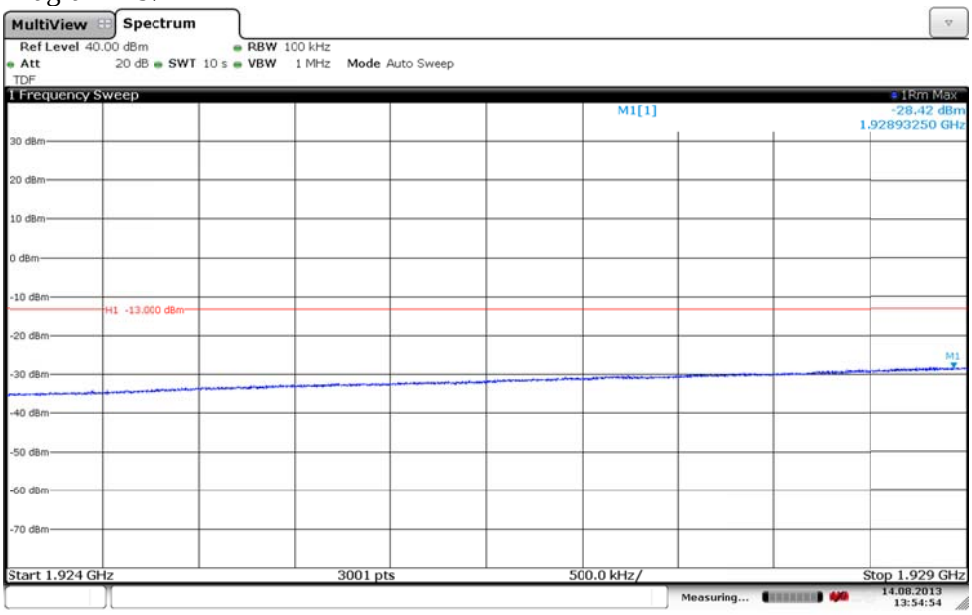
Appendix 4

Diagram 1 a:



Date: 14.AUG.2013 13:53:57

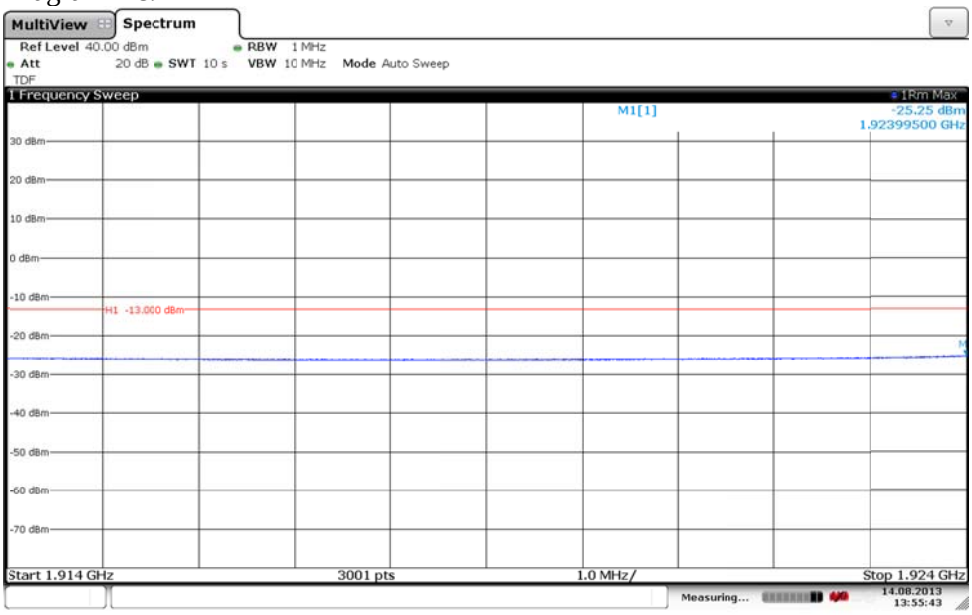
Diagram 1 b:



Date: 14.AUG.2013 13:54:54

Appendix 4

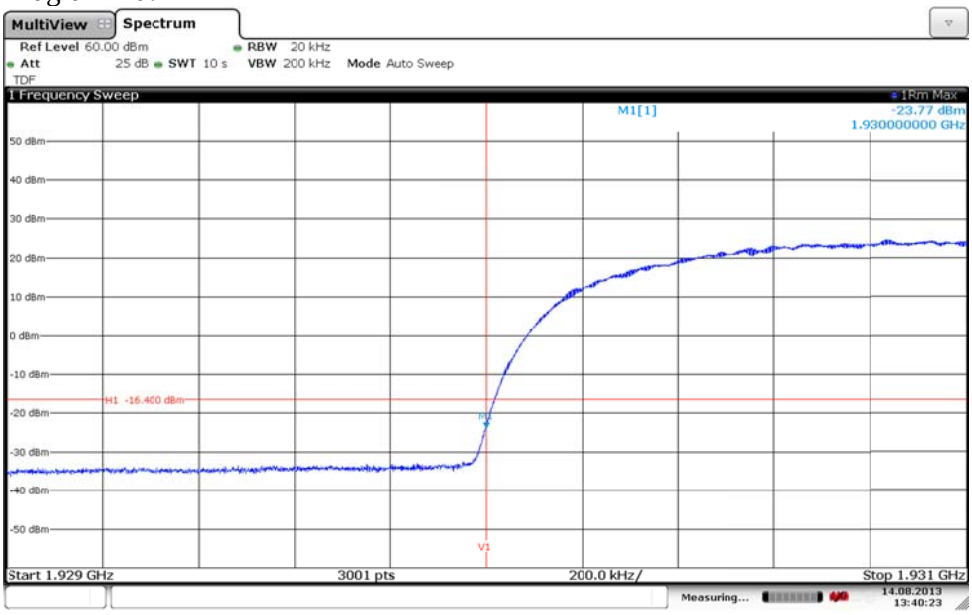
Diagram 1 c:



Date: 14.AUG.2013 13:55:43

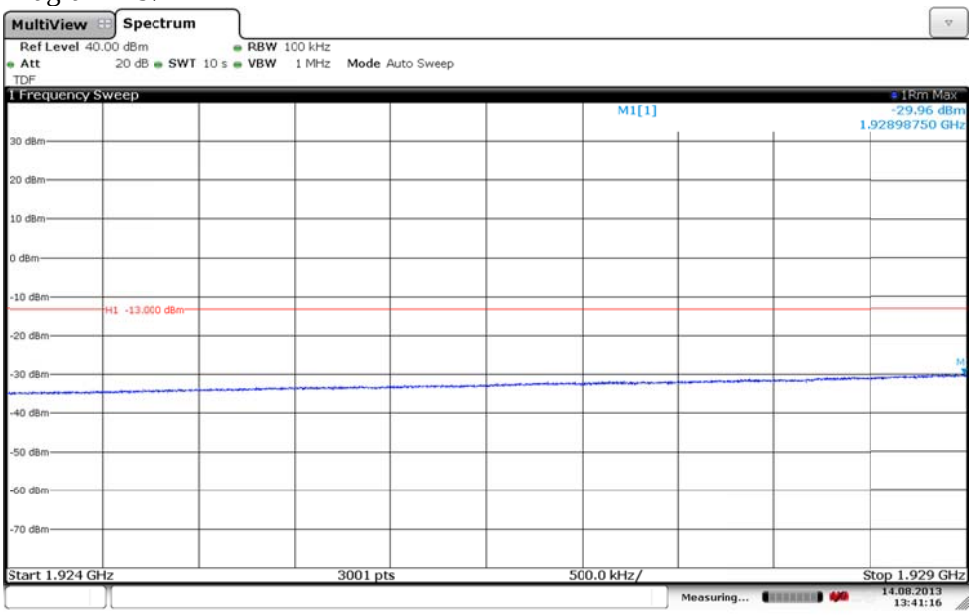
Appendix 4

Diagram 2 a:



Date: 14.AUG.2013 13:40:22

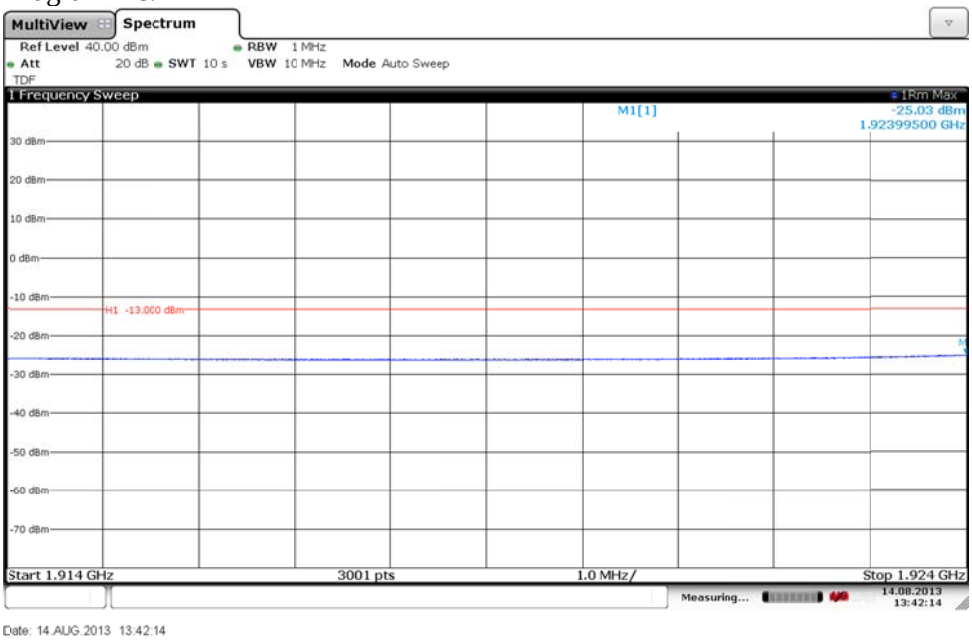
Diagram 2 b:



Date: 14.AUG.2013 13:41:16

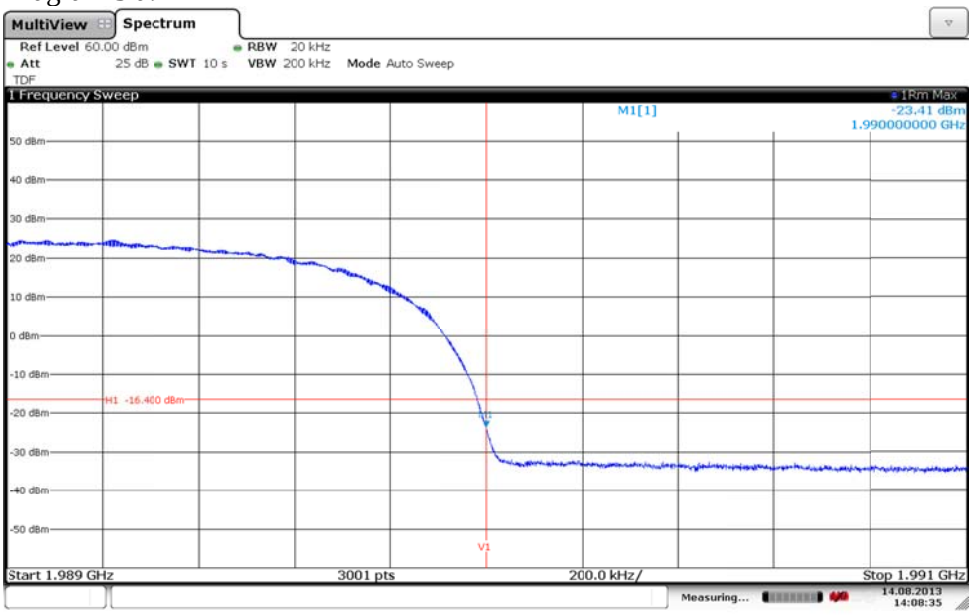
Appendix 4

Diagram 2 c:



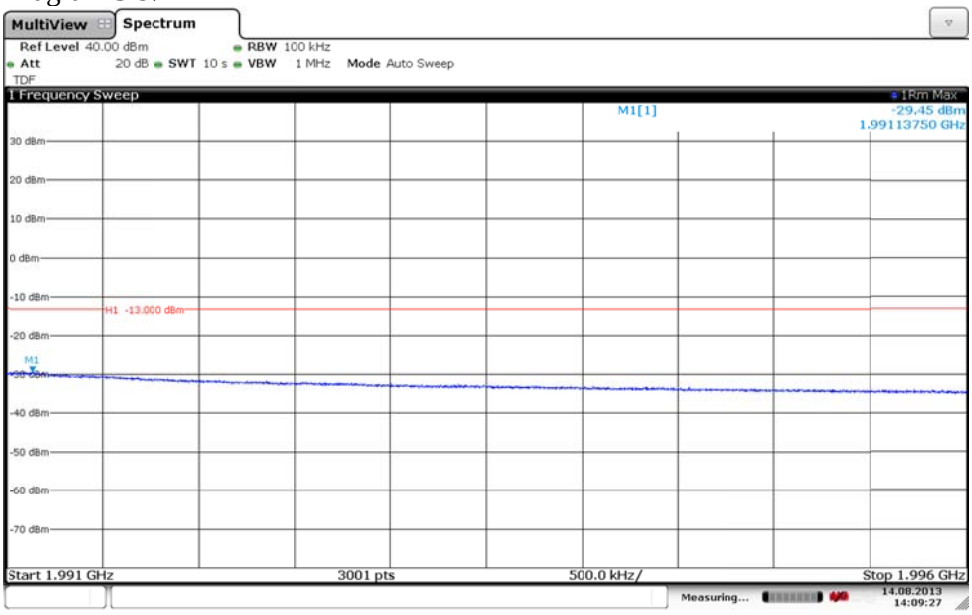
Appendix 4

Diagram 3 a:



Date: 14.AUG.2013 14:08:35

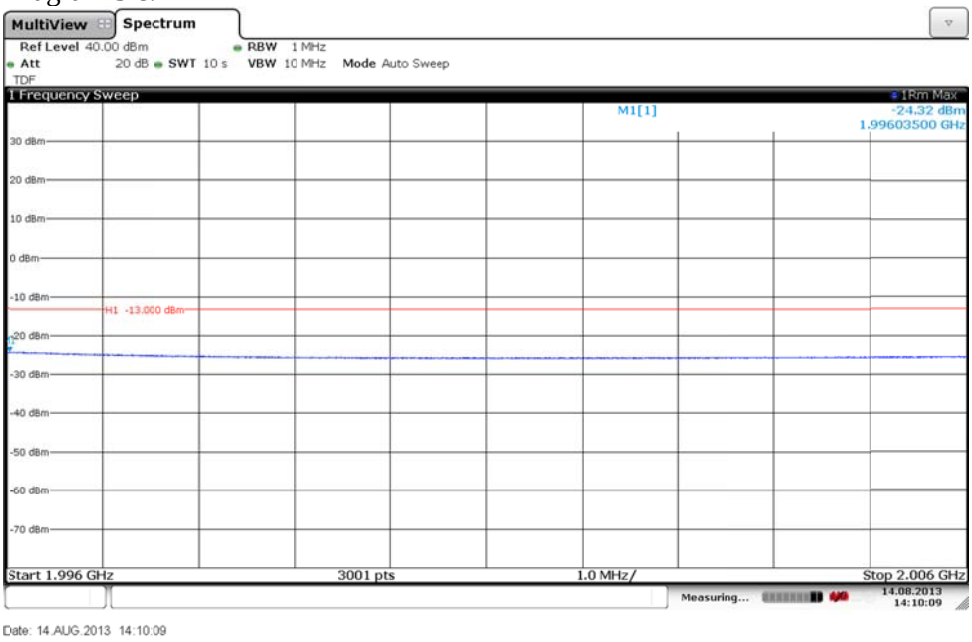
Diagram 3 b:



Date: 14.AUG.2013 14:09:26

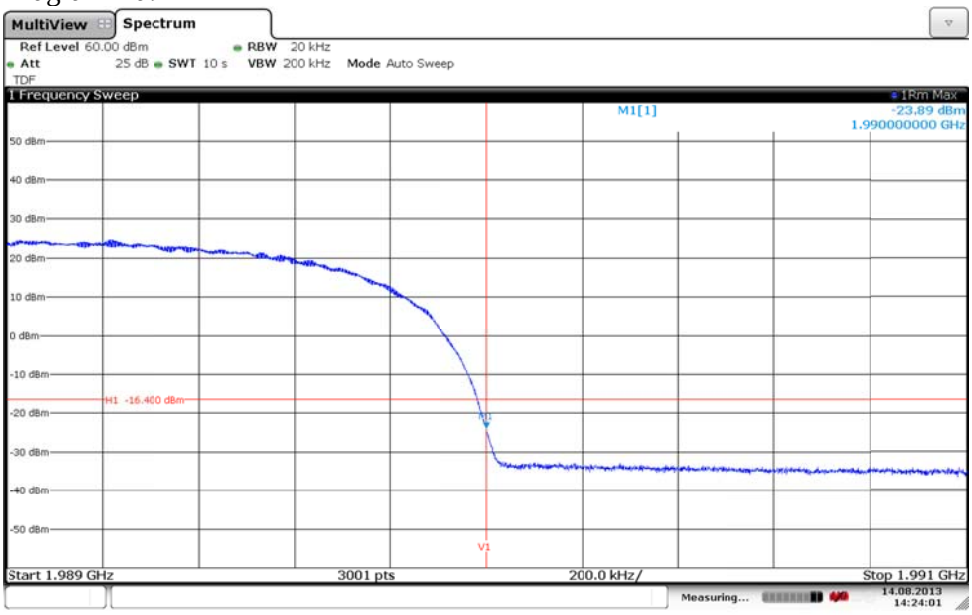
Appendix 4

Diagram 3 c:



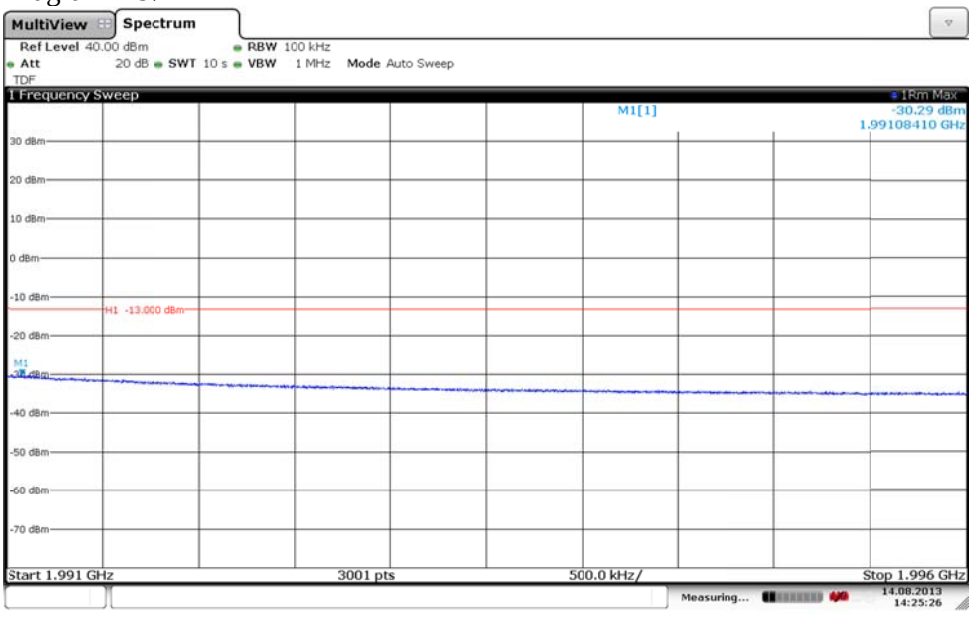
Appendix 4

Diagram 4 a:



Date: 14.AUG.2013 14:24:01

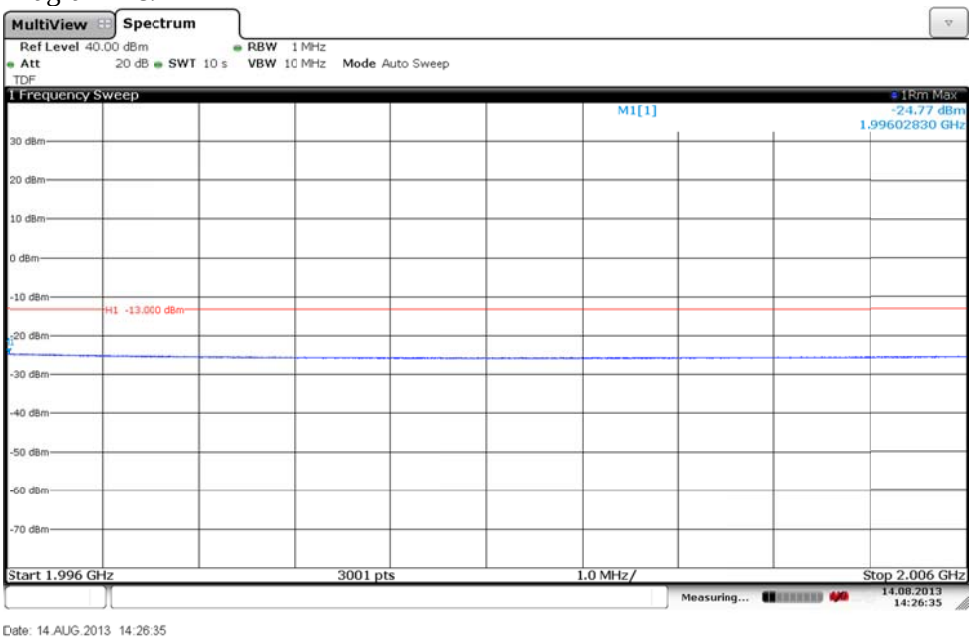
Diagram 4 b:



Date: 14.AUG.2013 14:25:26

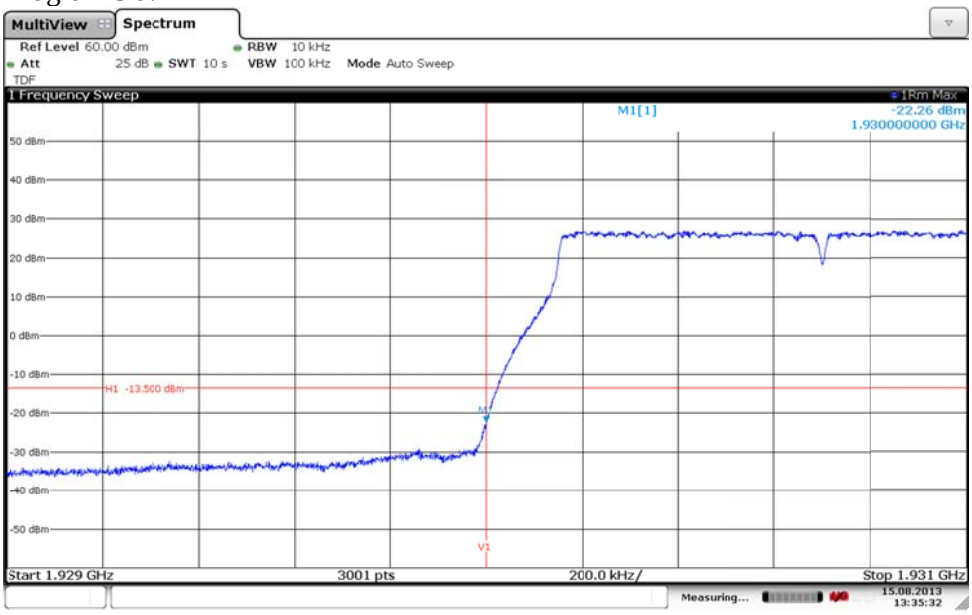
Appendix 4

Diagram 4 c:



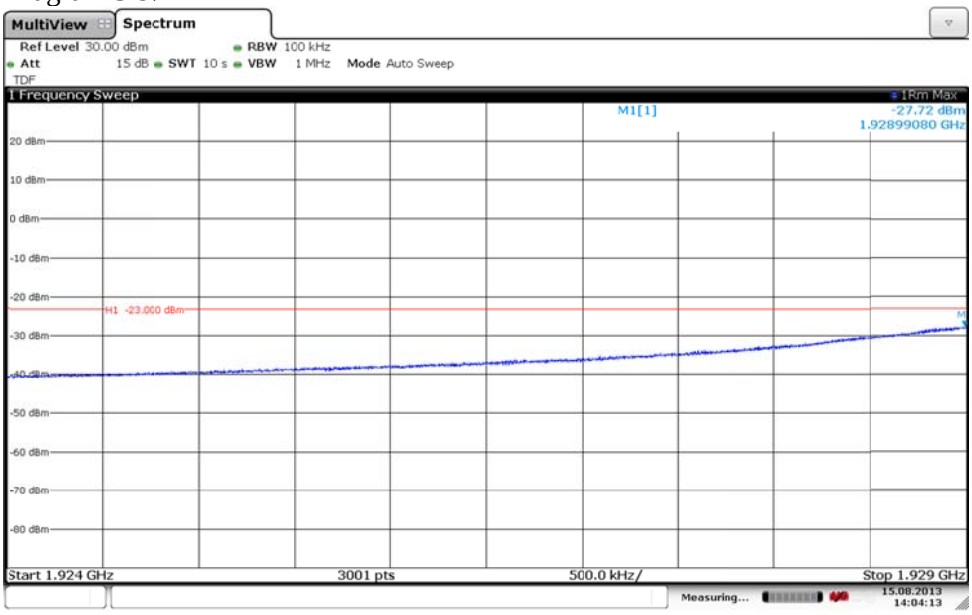
Appendix 4

Diagram 5 a:



Date: 15.AUG.2013 13:35:32

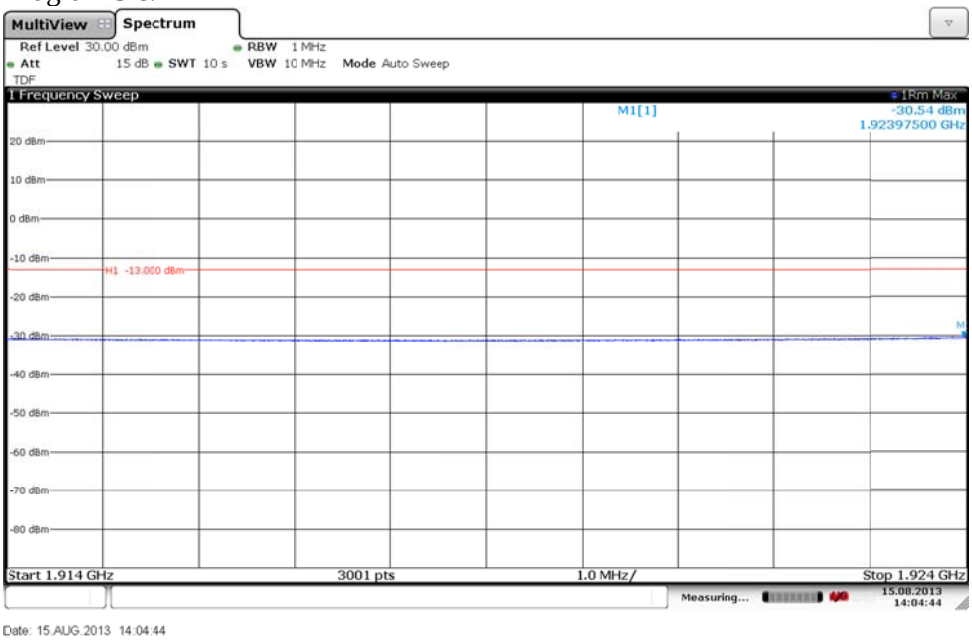
Diagram 5 b:



Date: 15.AUG.2013 14:04:12

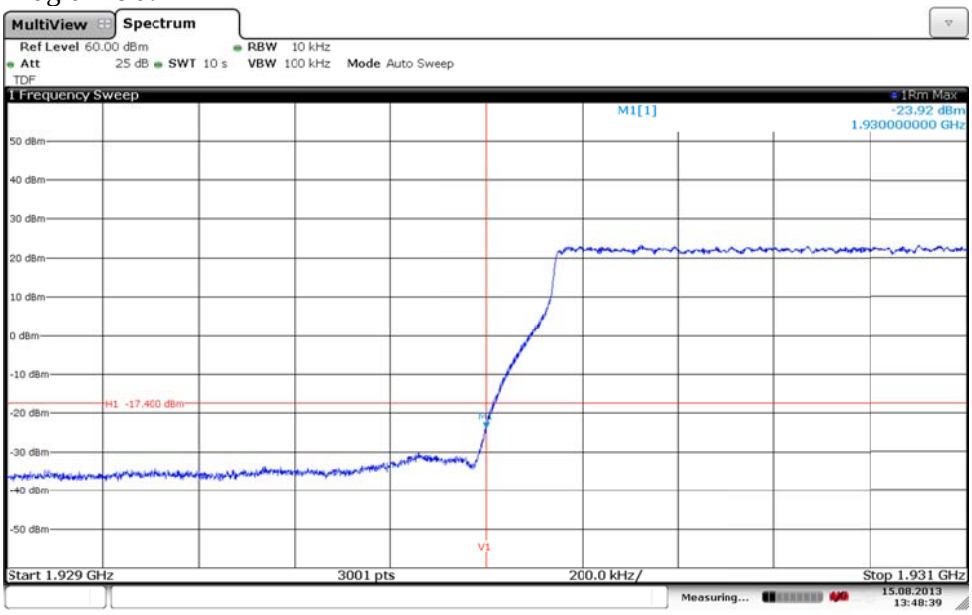
Appendix 4

Diagram 5 c:



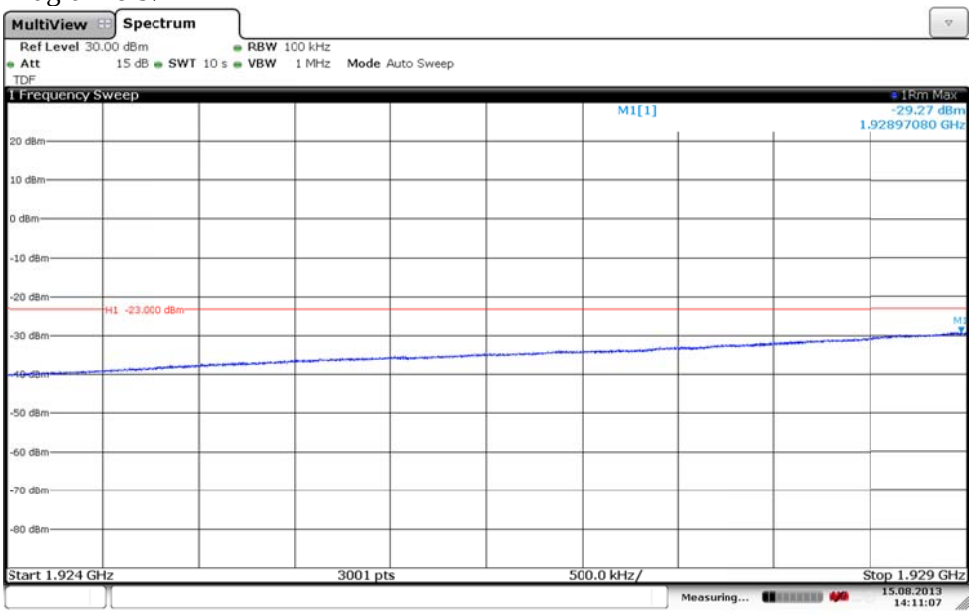
Appendix 4

Diagram 6 a:



Date: 15.AUG.2013 13:48:39

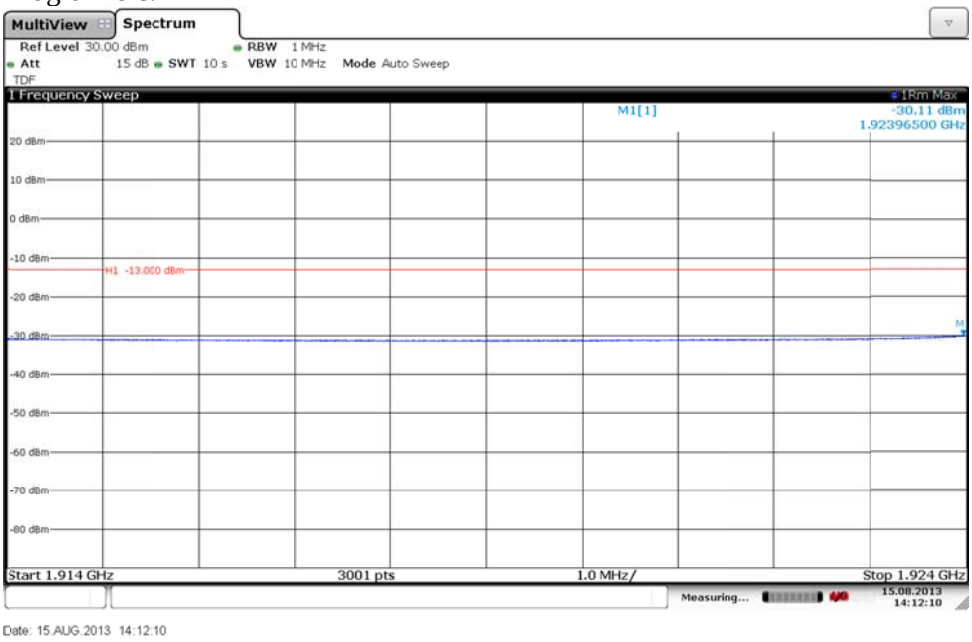
Diagram 6 b:



Date: 15.AUG.2013 14:11:07

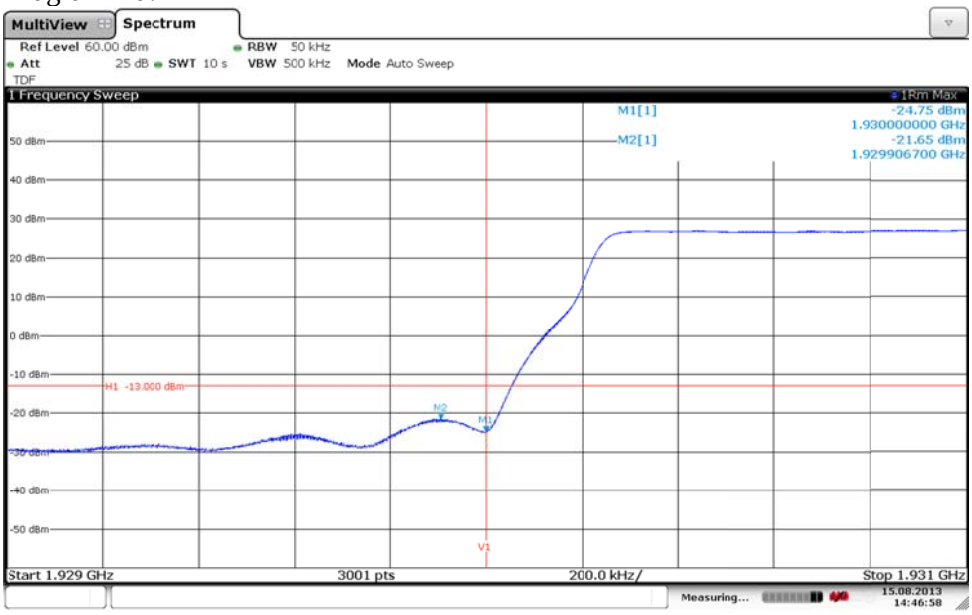
Appendix 4

Diagram 6 c:



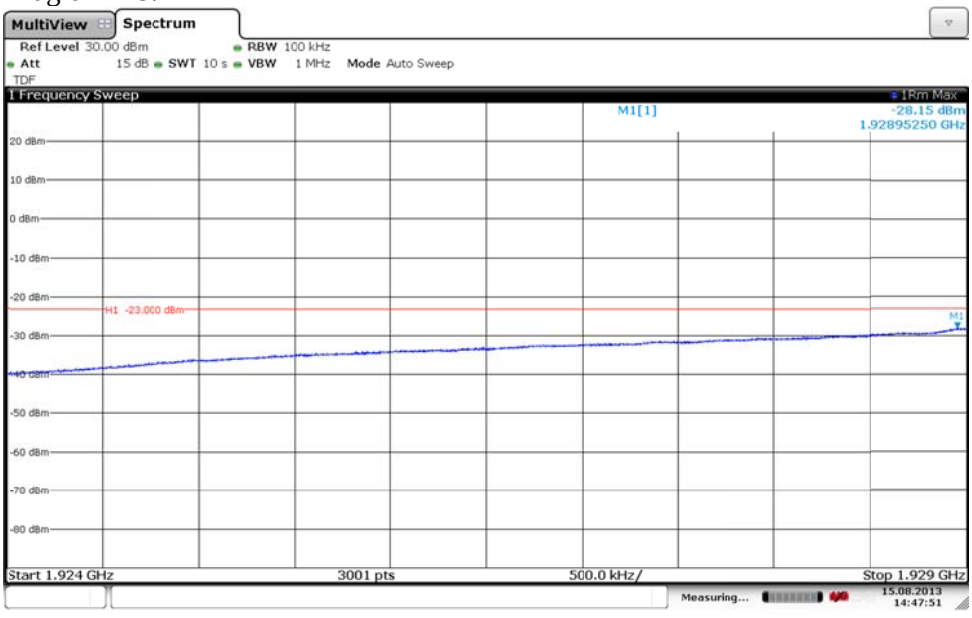
Appendix 4

Diagram 7 a:



Date: 15.AUG.2013 14:46:58

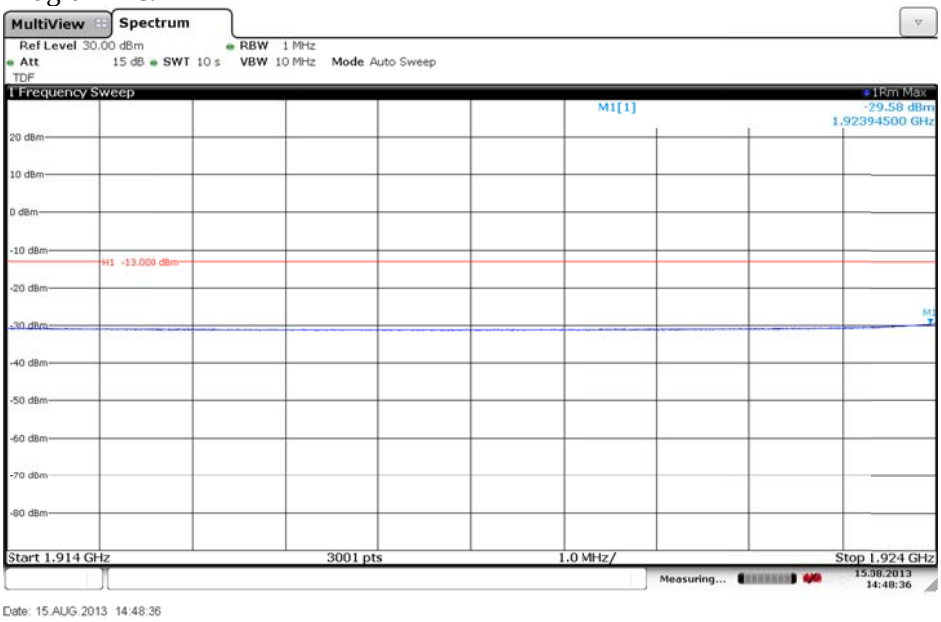
Diagram 7 b:



Date: 15.AUG.2013 14:47:50

Appendix 4

Diagram 7 c:



Appendix 4

Diagram 8 a:

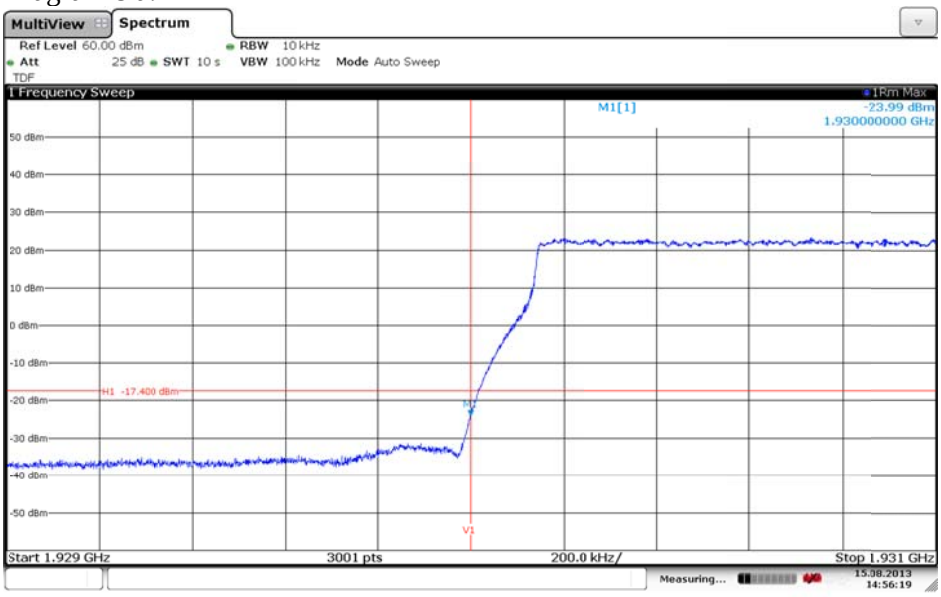


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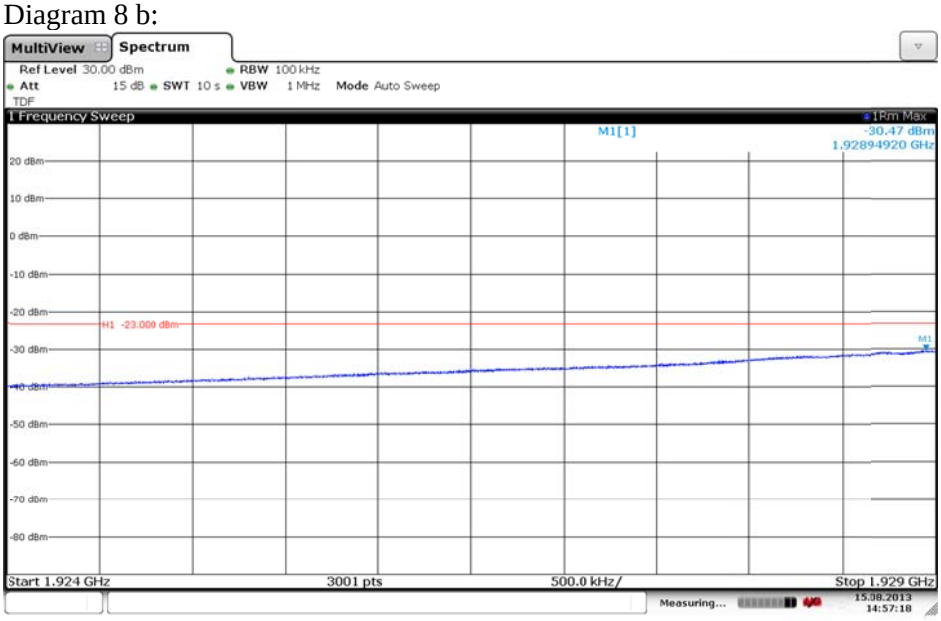
Diagram 8 b:



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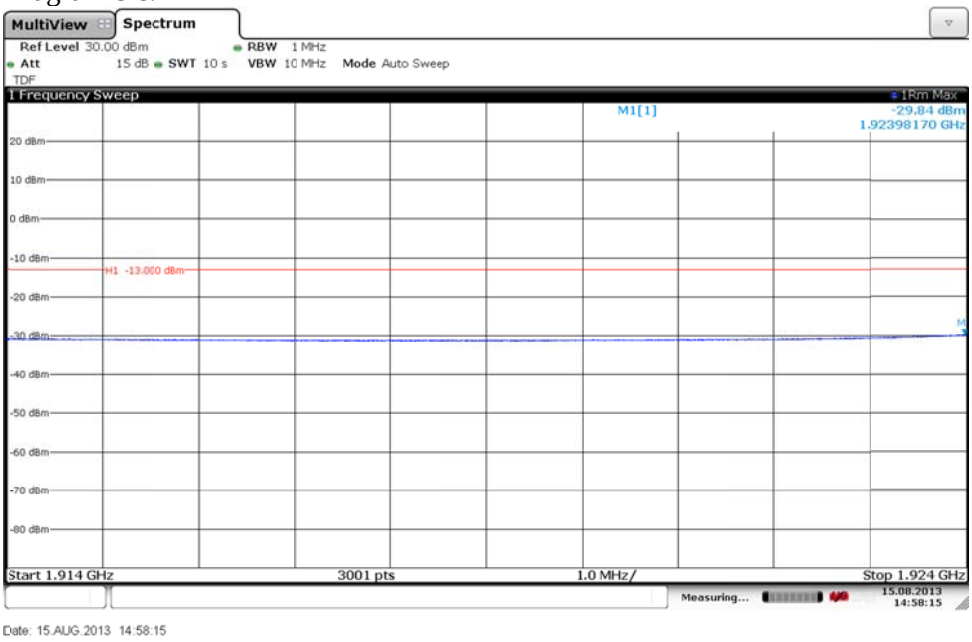
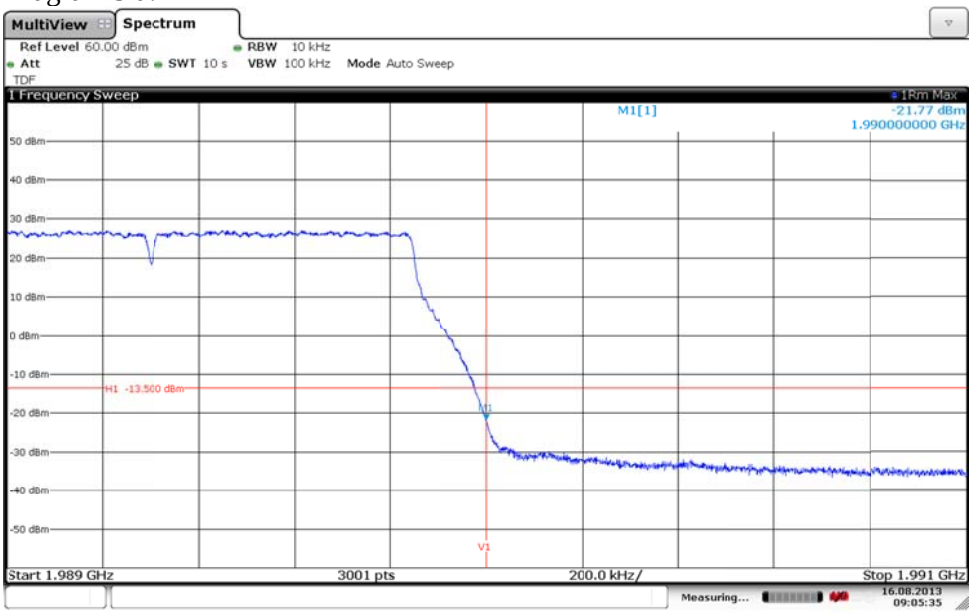
Appendix 4

Diagram 8 c:



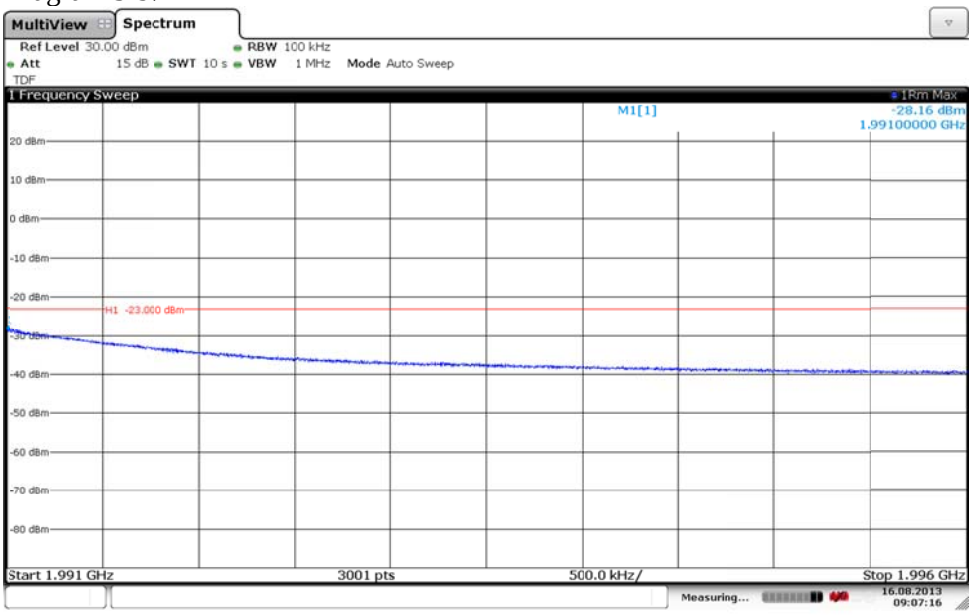
Appendix 4

Diagram 9 a:



Date: 16.AUG.2013 09:05:34

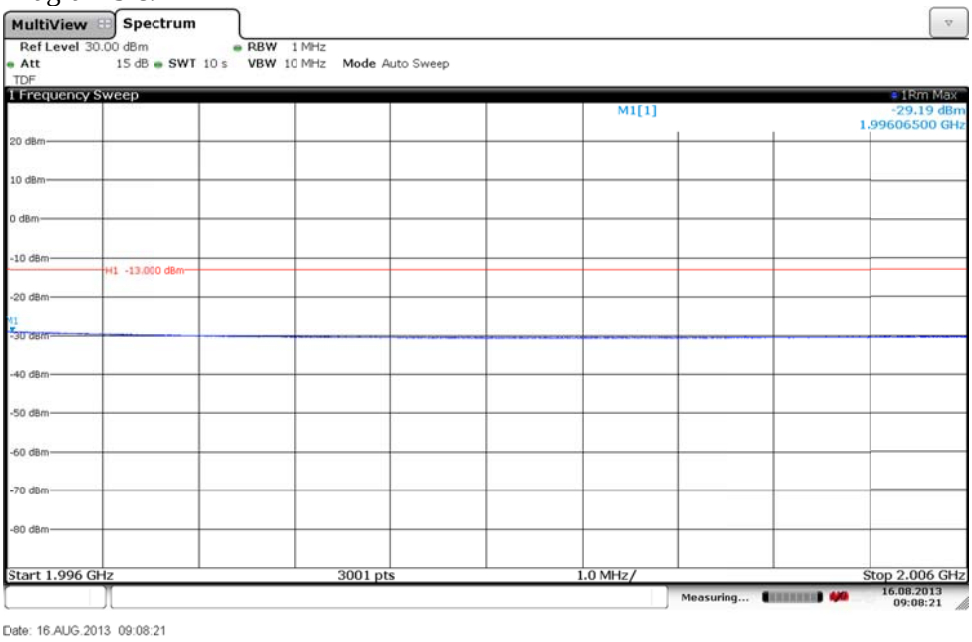
Diagram 9 b:



Date: 16.AUG.2013 09:07:16

Appendix 4

Diagram 9 c:



Appendix 4

Diagram 10 a:

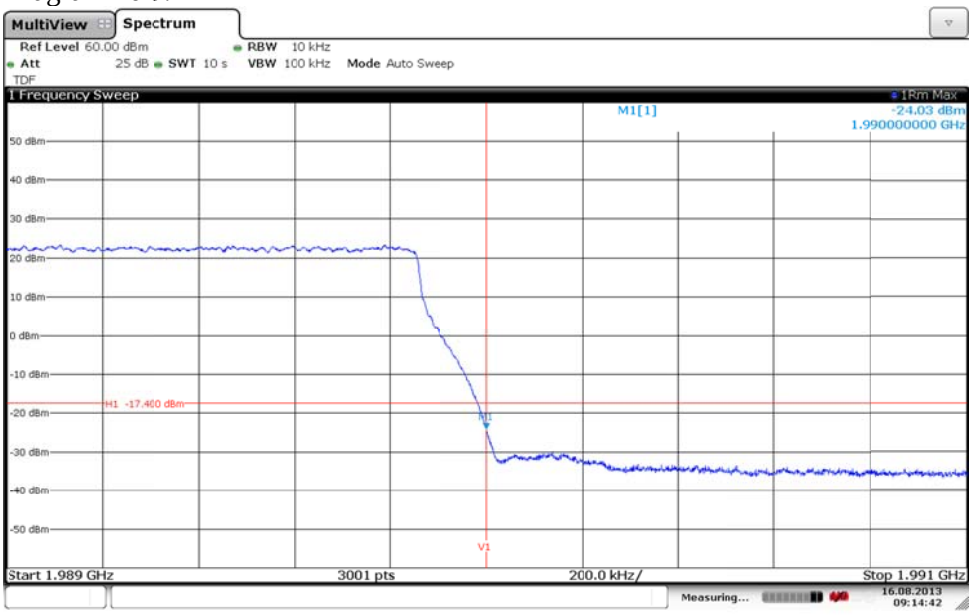


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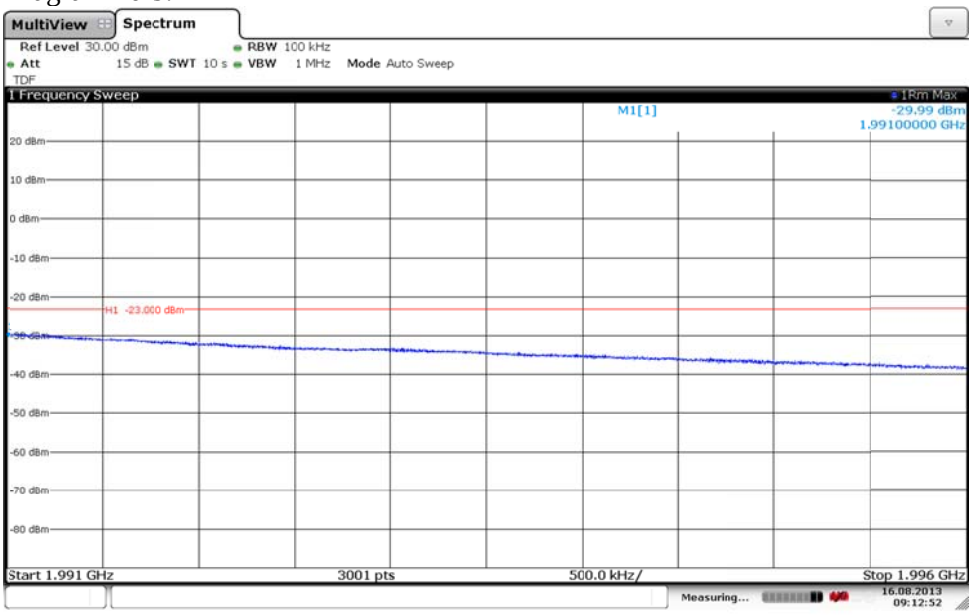
Diagram 10 b:



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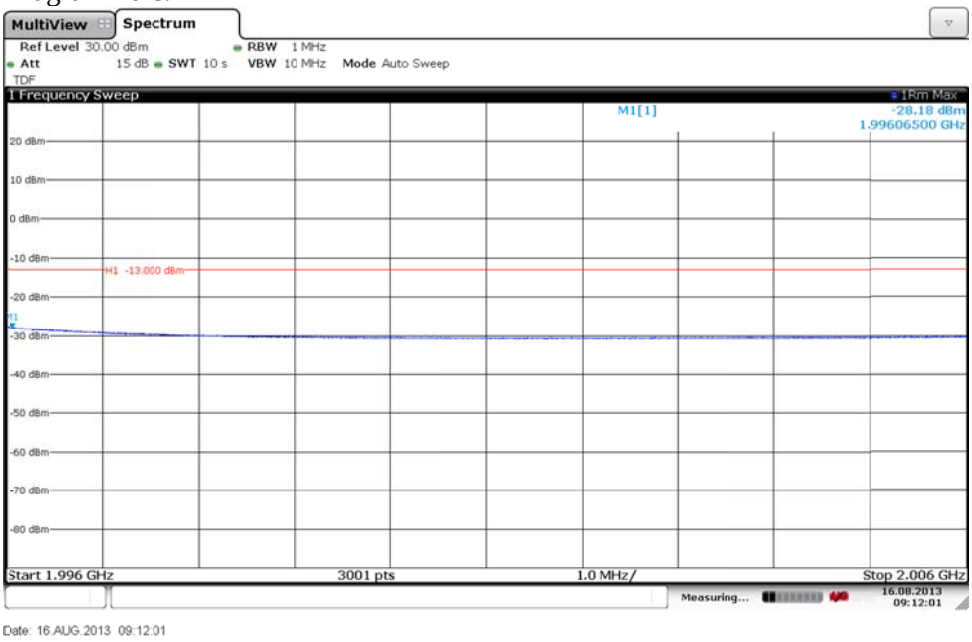
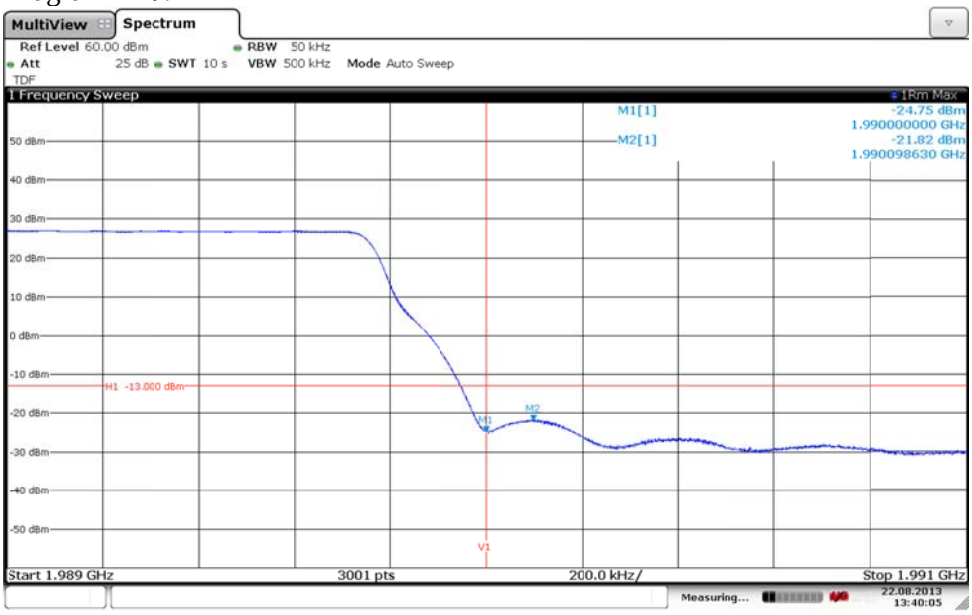
Appendix 4

Diagram 10 c:



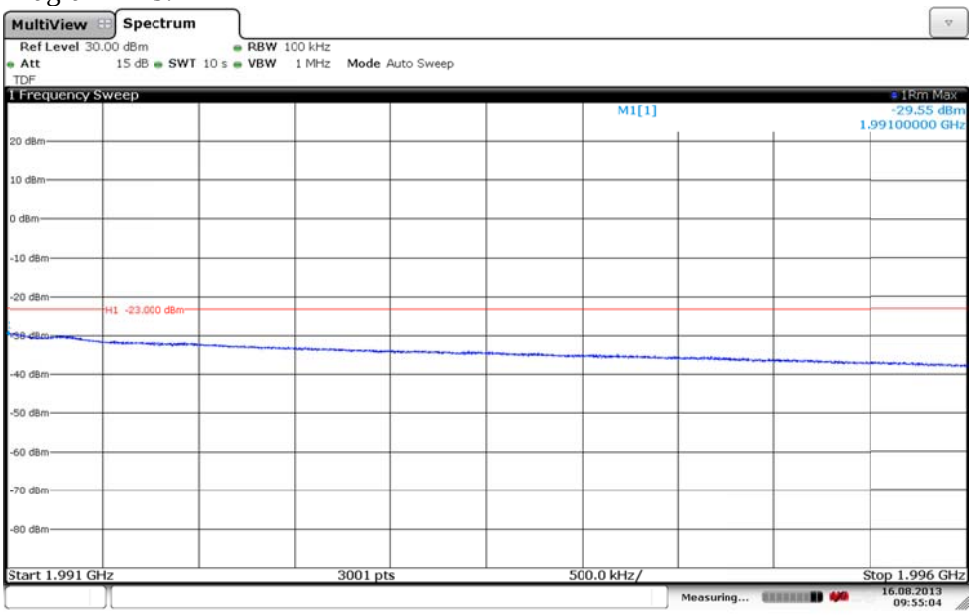
Appendix 4

Diagram 11 a:



Date: 22.AUG.2013 13:40:05

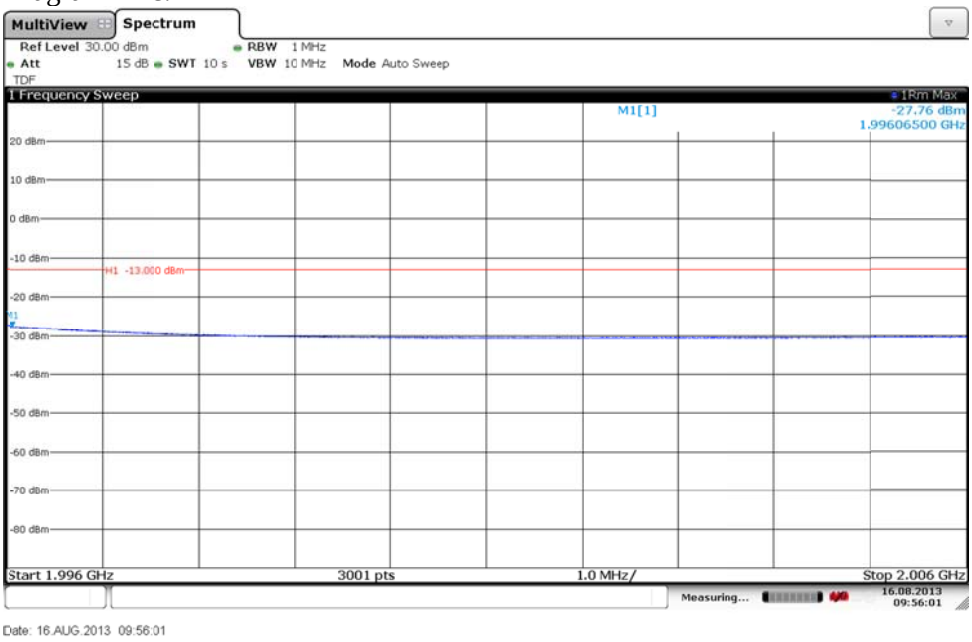
Diagram 11 b:



Date: 16.AUG.2013 09:55:04

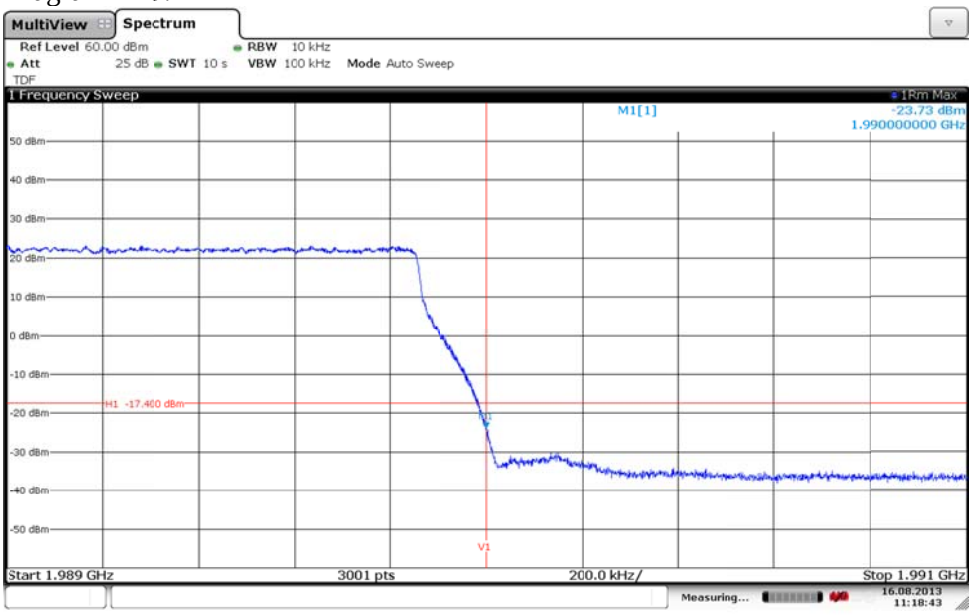
Appendix 4

Diagram 11 c:



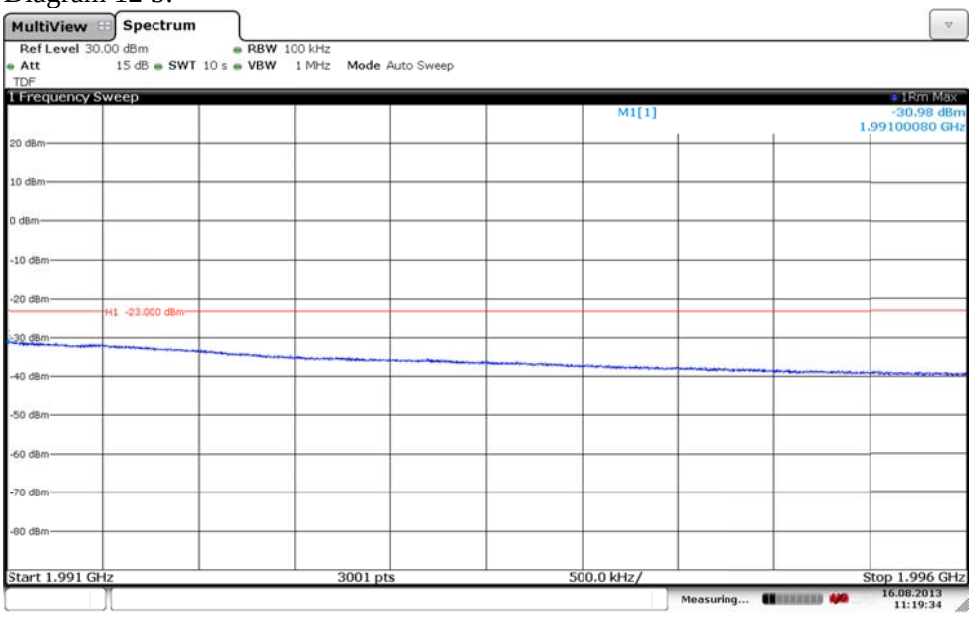
Appendix 4

Diagram 12 a:



Date: 16.AUG.2013 11:18:43

Diagram 12 b:



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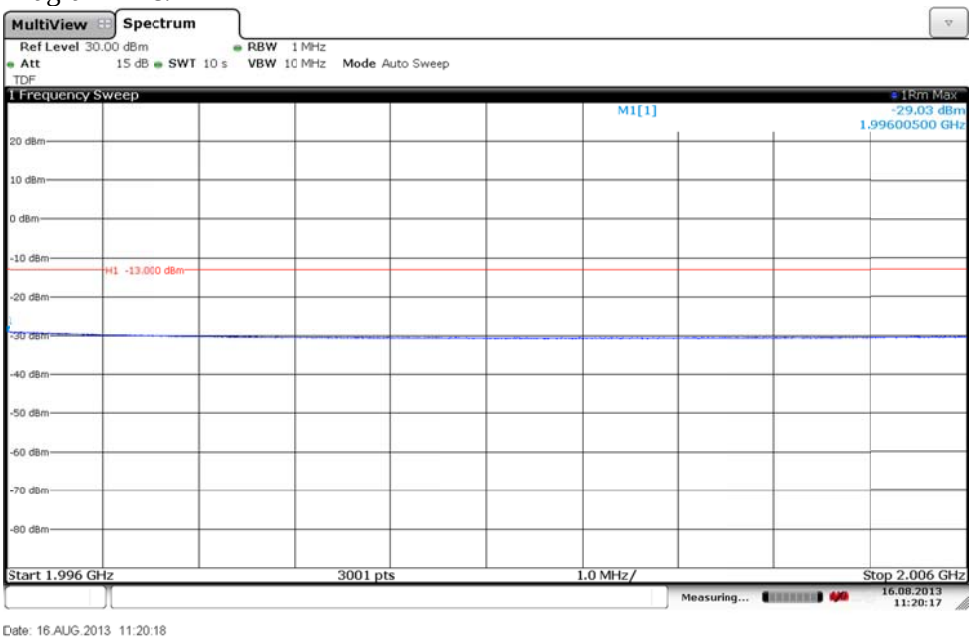
Appendix 4

Diagram 12 c:



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

Date	Temperature	Humidity
2013-08-14	22 °C ± 3 °C	44 % ± 5 %
2013-08-15	23 °C ± 3 °C	45 % ± 5 %
2013-08-16	23 °C ± 3 °C	45 % ± 5 %
2013-08-19	23 °C ± 3 °C	45 % ± 5 %
2013-08-20	23 °C ± 3 °C	46 % ± 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.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), (iii) “measure and add 10 log(N_{ANT})” of FCC KDB662911 D01 Multiple Transmitter Output v02

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW 43	902 073
RF attenuator	902 282
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

WCDMA MIMO, single carrier:

Diagrams	BW / [MHz]	TX frequency	Tested Port
1 a-b	5 MHz	B_{WCDMA}	RF A
2 a-b	5 MHz	M_{WCDMA}	RF A
3 a-b	5 MHz	M_{WCDMA}	RF B
4 a-b	5 MHz	T_{WCDMA}	RF A

LTE single, MIMO single carrier:

Diagrams	BW / [MHz]	TX frequency	Tested Port
5 a-b	1.4	B_{LTE}	RF A
6 a-b	1.4	M_{LTE}	RF A
7 a-b	20	M_{LTE}	RF A
8 a-b	1.4	M_{LTE}	RF B
9 a-b	20	M_{LTE}	RF B
10 a-b	1.4	T_{LTE}	RF A

LTE MIMO, multi carrier:

Diagrams	BW / [MHz]	Symbolic frequency	Tested Port
11	1.4	B_{IM-LTE}	RF A
12	1.4	T_{IM-LTE}	RF A

MSR MIMO, WCDMA + LTE

Diagrams	WCDMA BW/[MHz]	LTE BW/[MHz]	Symbolic frequency	Tested Port
13 a-b	5	5	B_{L+W}	RF A
14 a-b	5	5	M_{L+W}	RF A
15 a-b	5	5	T_{L+W}	RF A
16 a-c	5	5	B_{IM-LTE}	RF A
17 a-c	5	5	T_{IM-LTE}	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.

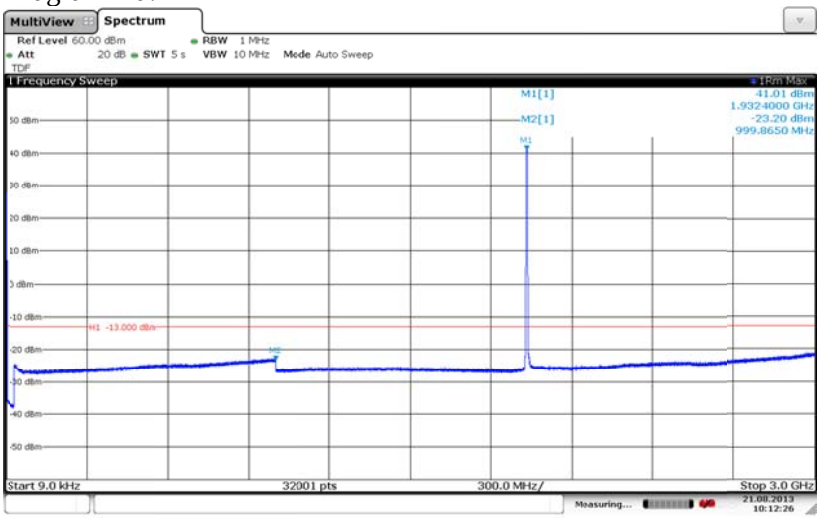
Limits

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

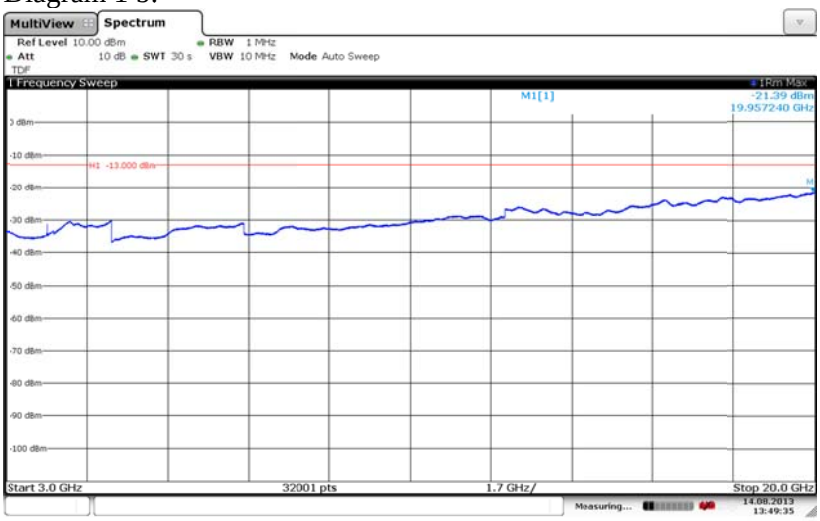
Appendix 5

Diagram 1 a:



Date: 21.AUG.2013 10:12:26

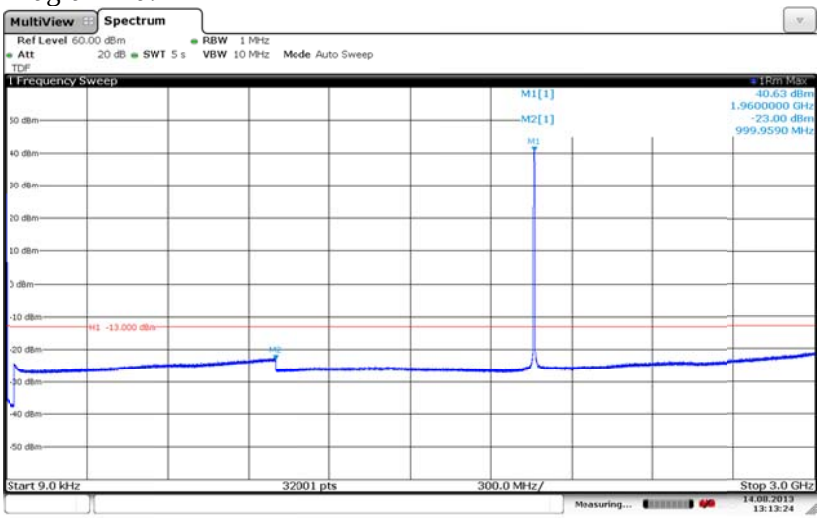
Diagram 1 b:



Date: 14.AUG.2013 13:49:35

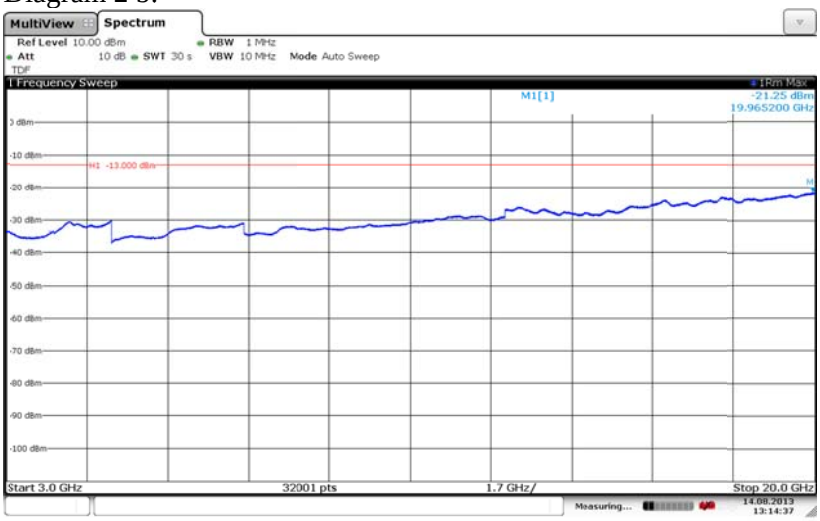
Appendix 5

Diagram 2 a:



Date: 14.AUG.2013 13:13:24

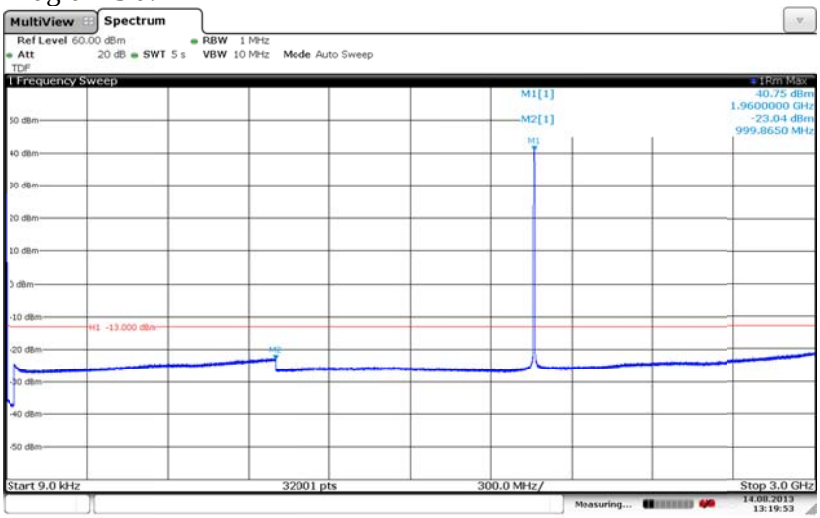
Diagram 2 b:



Date: 14.AUG.2013 13:14:37

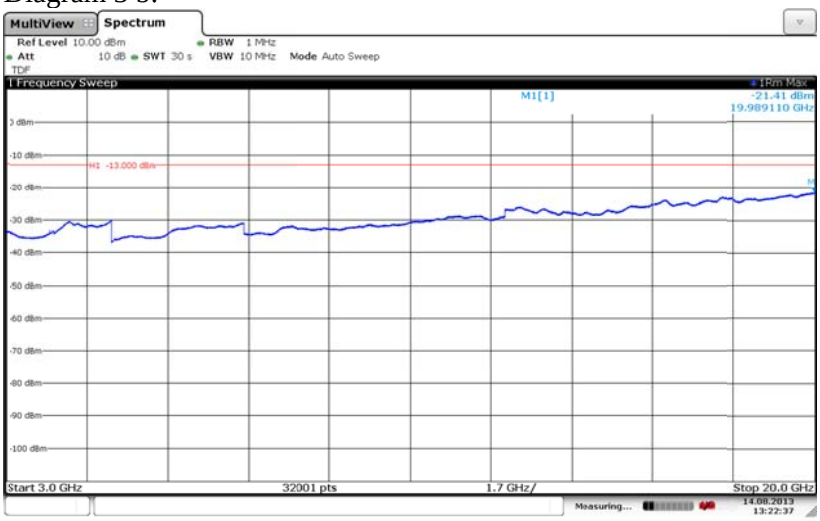
Appendix 5

Diagram 3 a:



Date: 14.AUG.2013 13:19:53

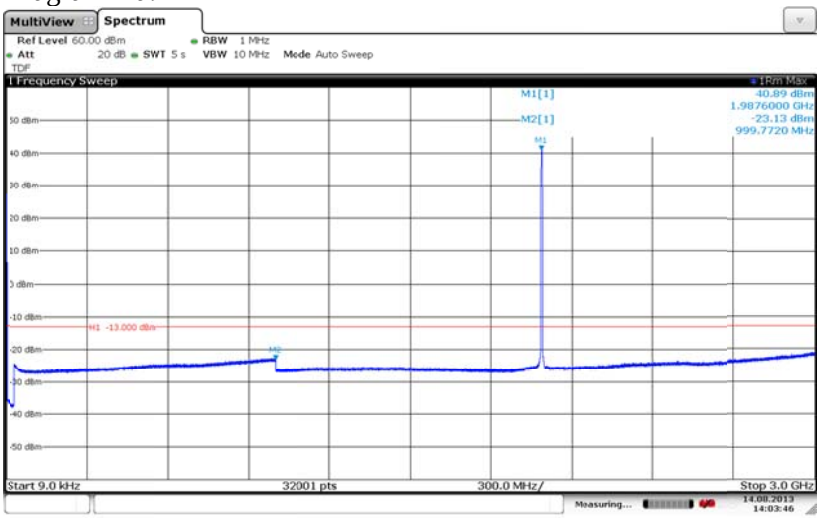
Diagram 3 b:



Date: 14.AUG.2013 13:22:36

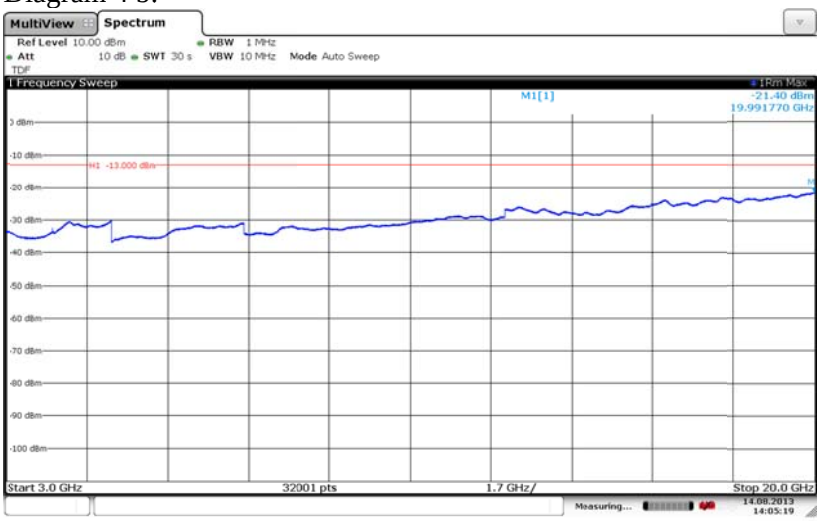
Appendix 5

Diagram 4 a:



Date: 14.AUG.2013 14:03:46

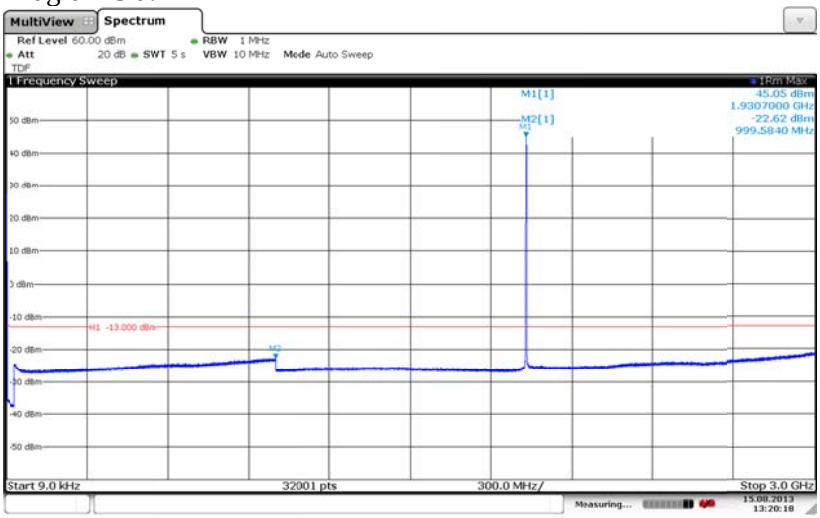
Diagram 4 b:



Date: 14.AUG.2013 14:05:19

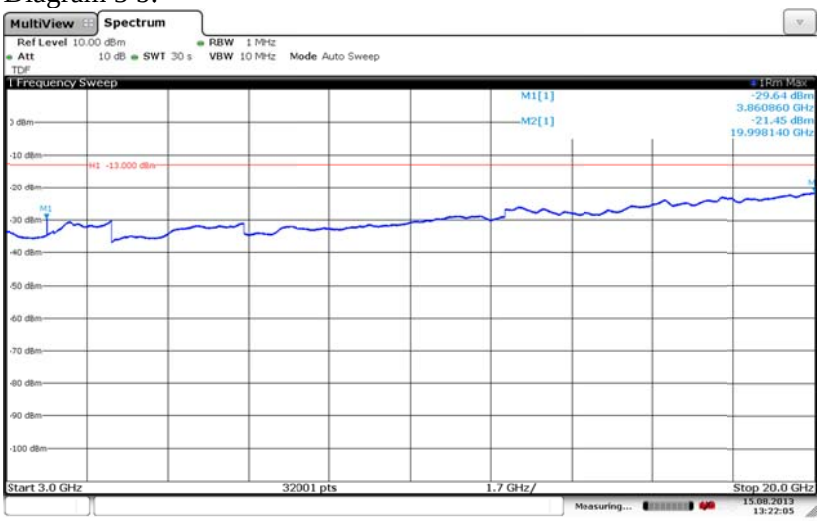
Appendix 5

Diagram 5 a:



Date: 15.AUG.2013 13:20:18

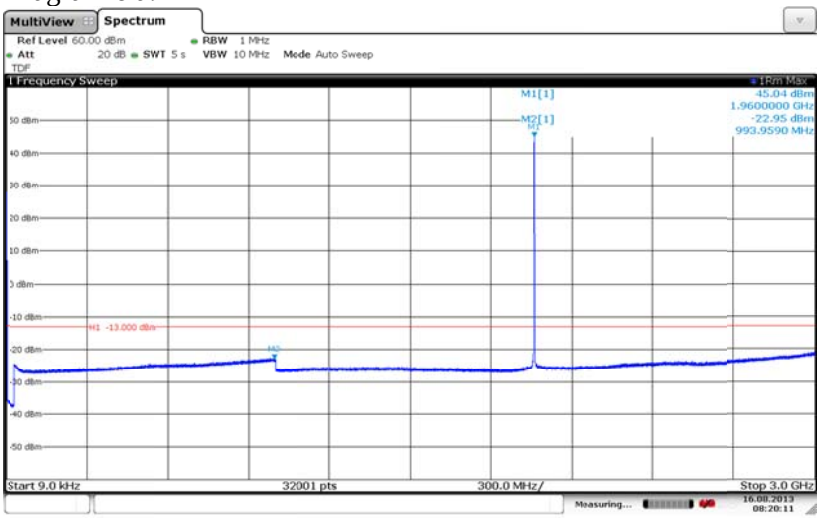
Diagram 5 b:



Date: 15.AUG.2013 13:22:05

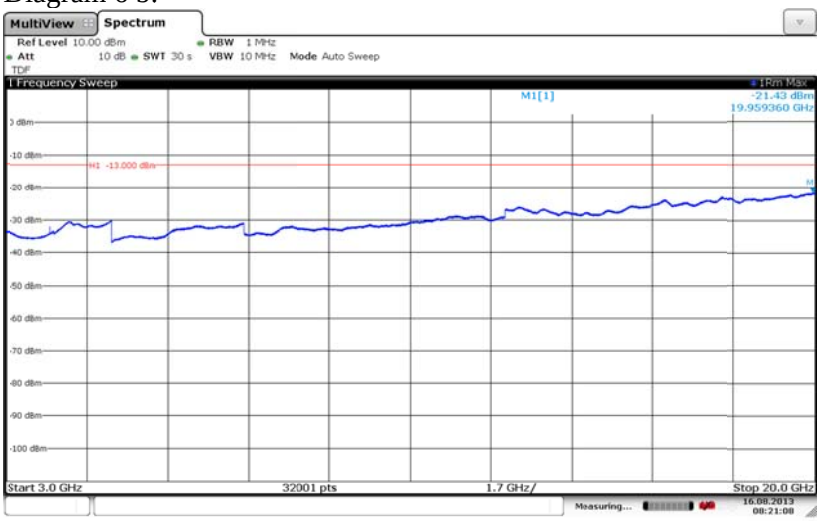
Appendix 5

Diagram 6 a:



Date: 16.AUG.2013 08:20:11

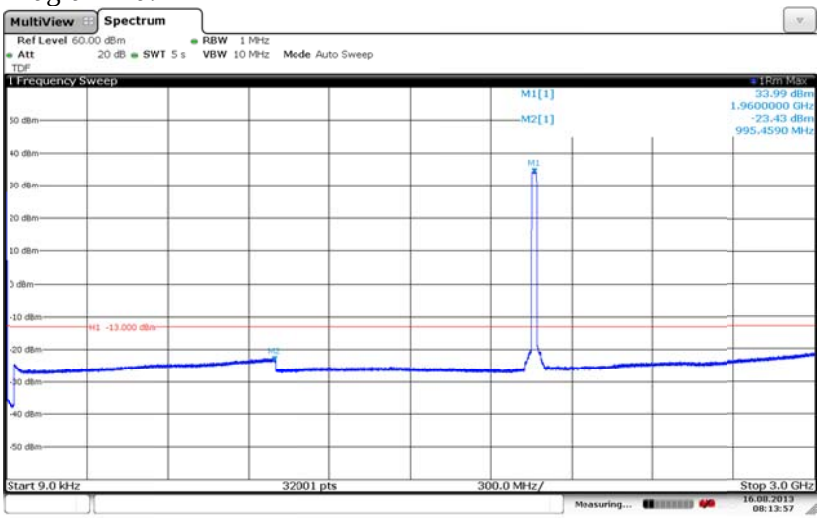
Diagram 6 b:



Date: 16.AUG.2013 08:21:08

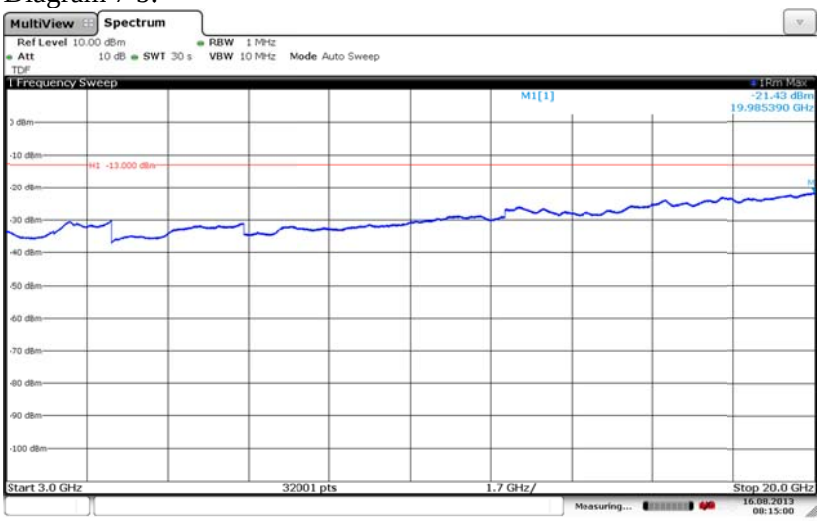
Appendix 5

Diagram 7 a:



Date: 16.AUG.2013 08:13:57

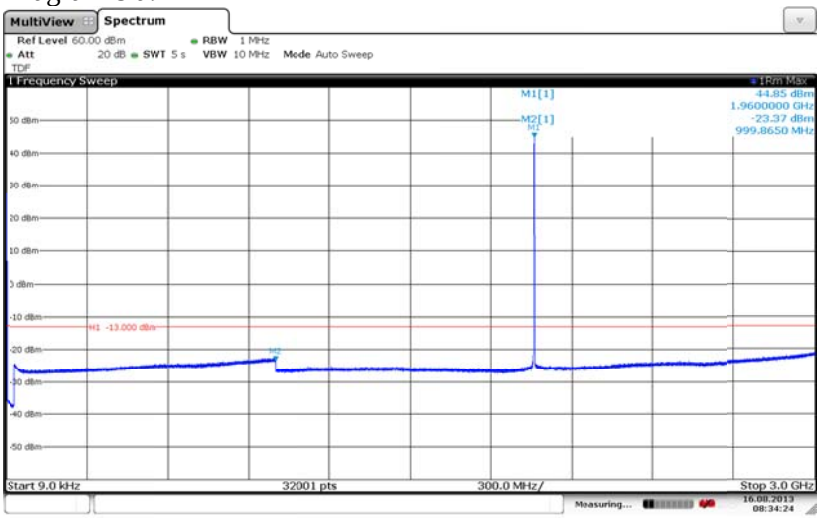
Diagram 7 b:



Date: 16.AUG.2013 08:15:00

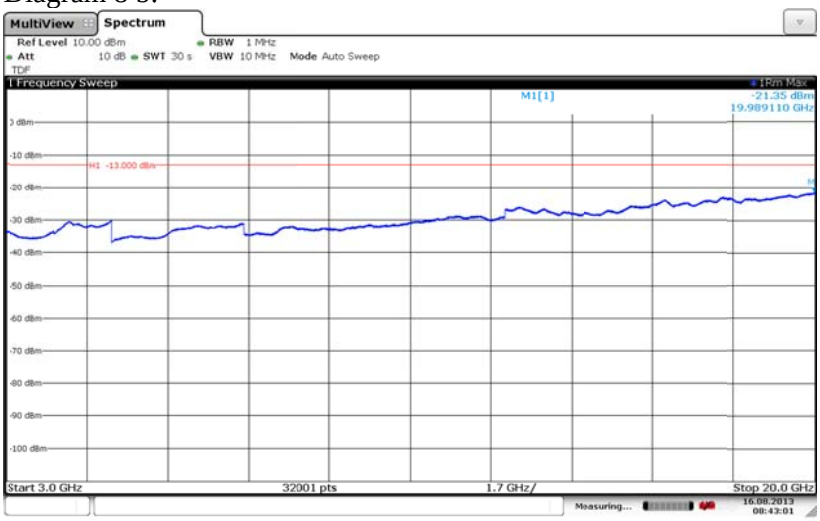
Appendix 5

Diagram 8 a:



Date: 16.AUG.2013 08:34:24

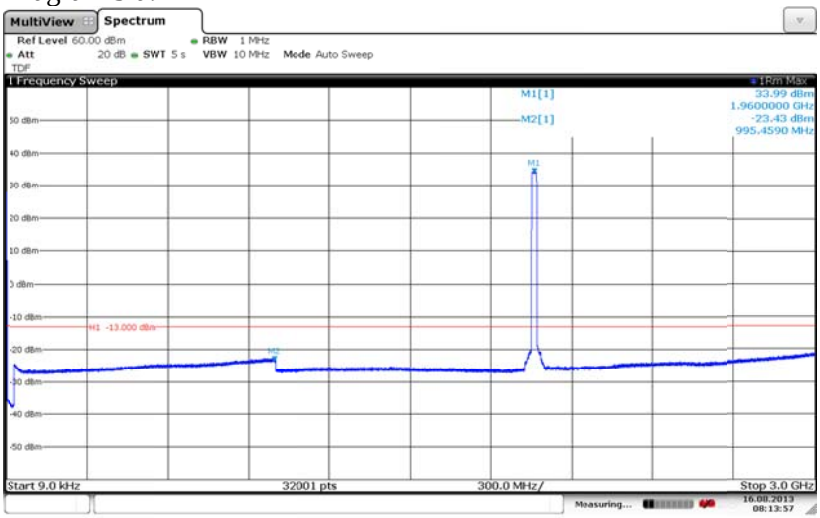
Diagram 8 b:



Date: 16.AUG.2013 08:43:01

Appendix 5

Diagram 9 a:



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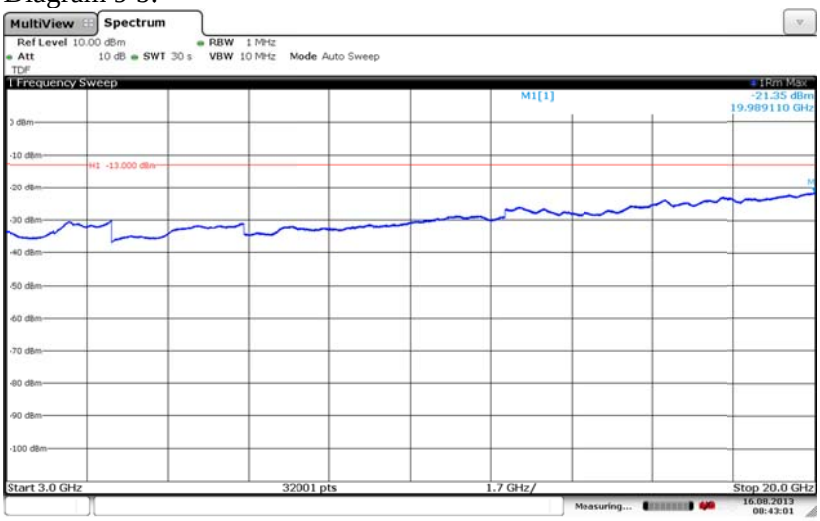
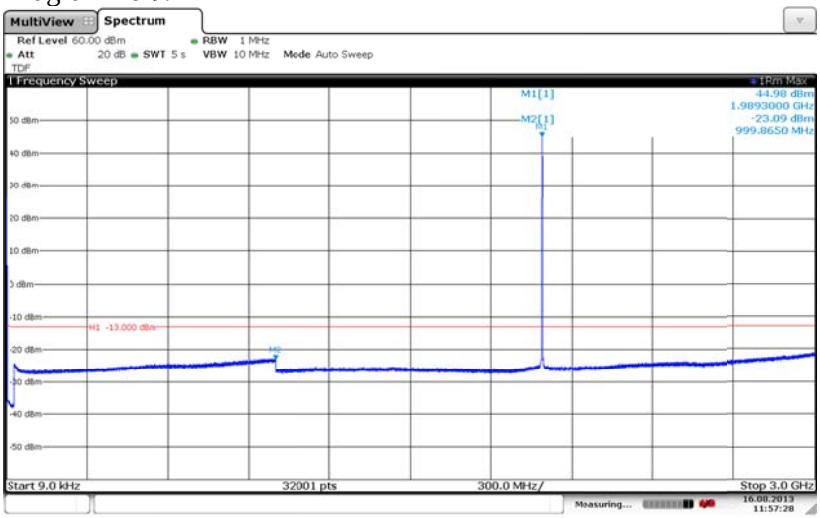


Date: 16.AUG.2013 08:43:01

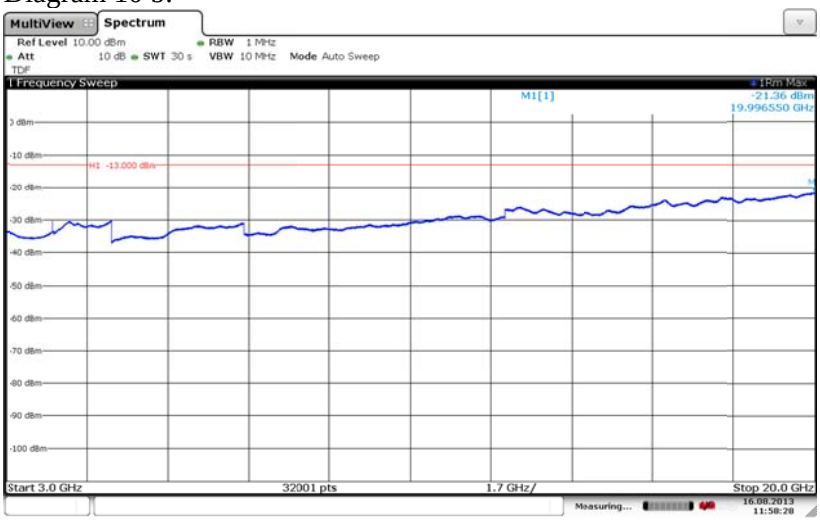
Appendix 5

Diagram 10 a:



Date: 16.AUG.2013 11:57:28

Diagram 10 b:



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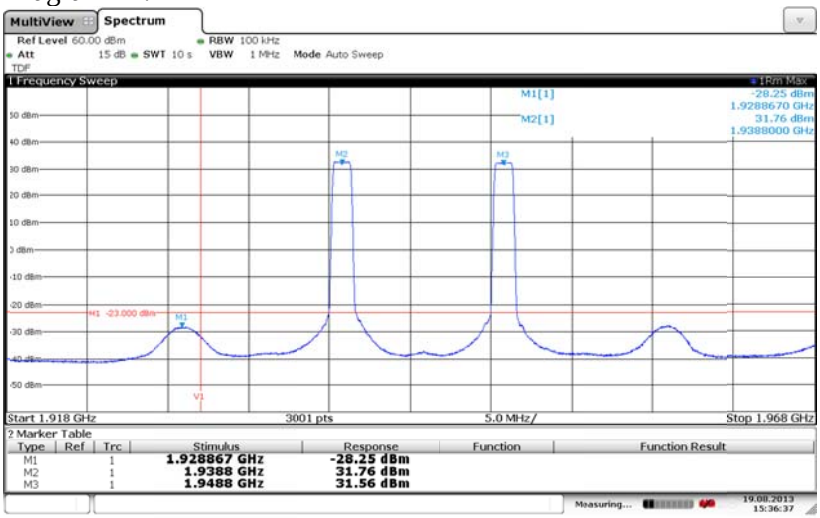
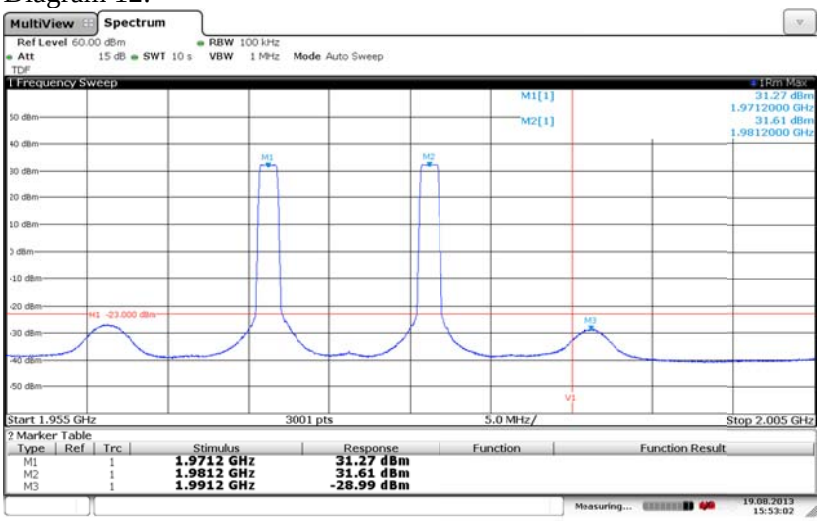
Appendix 5

Diagram 11:



Date: 19.AUG.2013 15:36:37

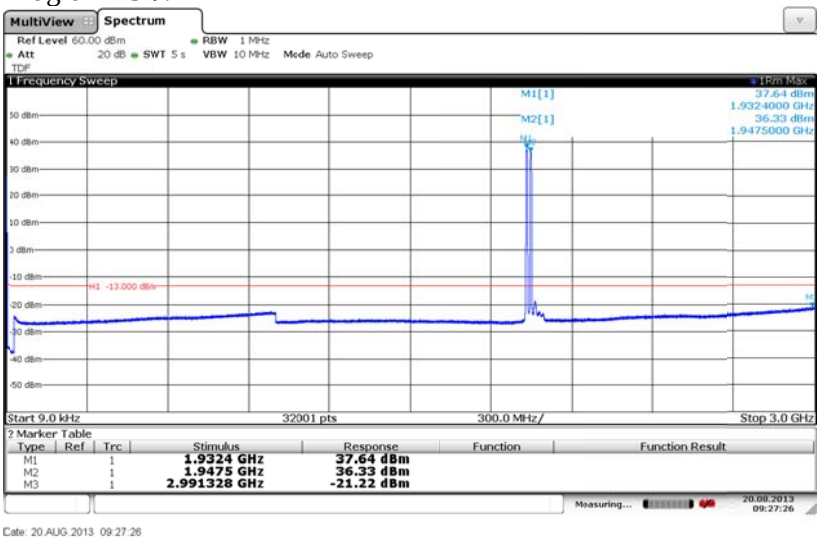
Diagram 12:



Date: 19.AUG.2013 15:53:02

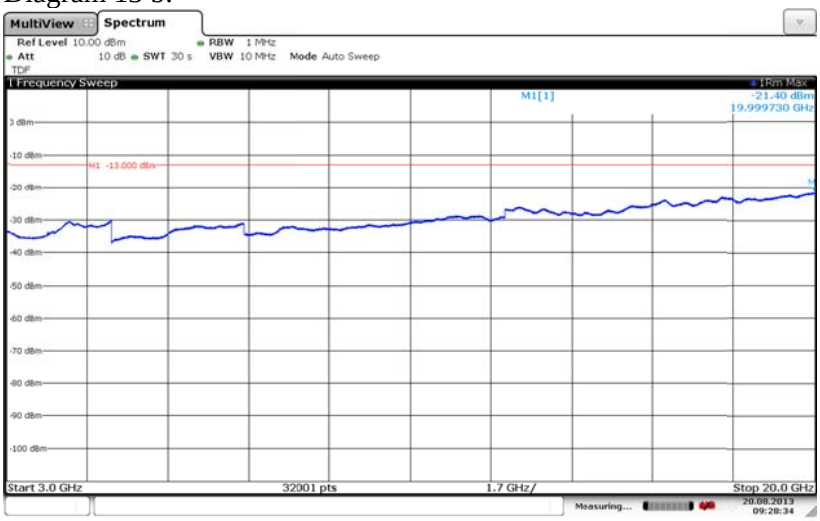
Appendix 5

Diagram 13 a:



Date: 20.AUG.2013 09:27:26

Diagram 13 b:



Date: 20.AUG.2013 09:28:35

Appendix 5

Diagram 14 a:

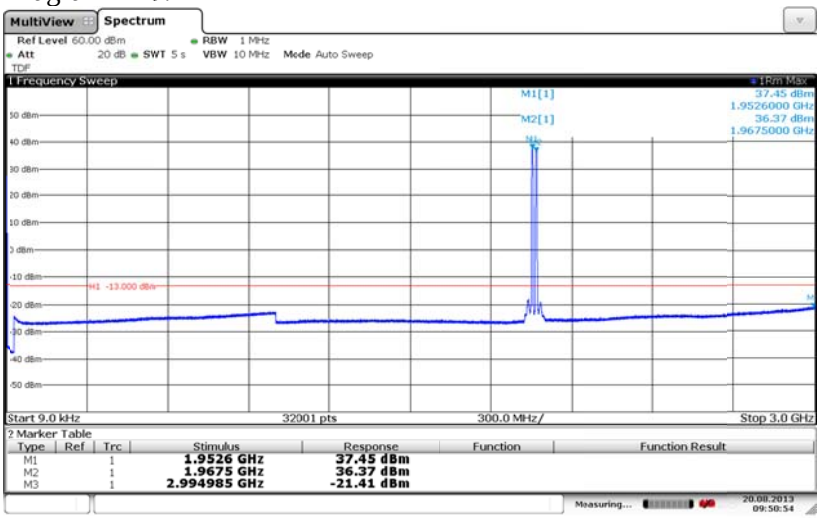


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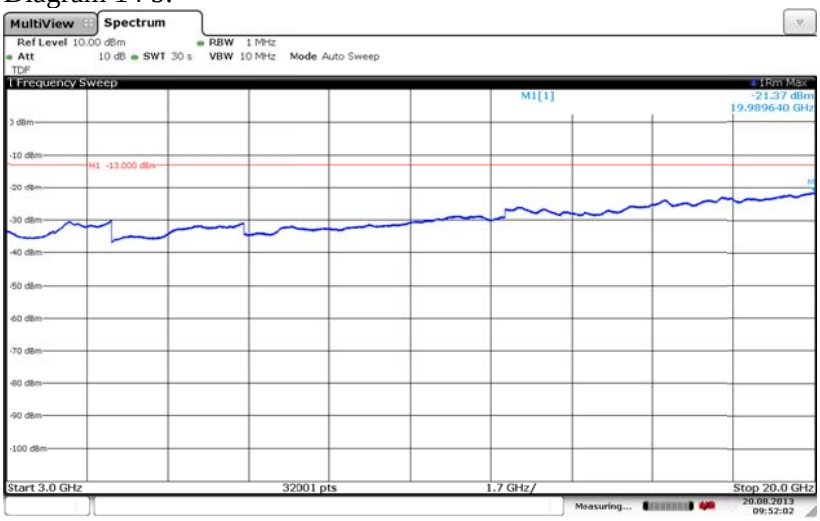
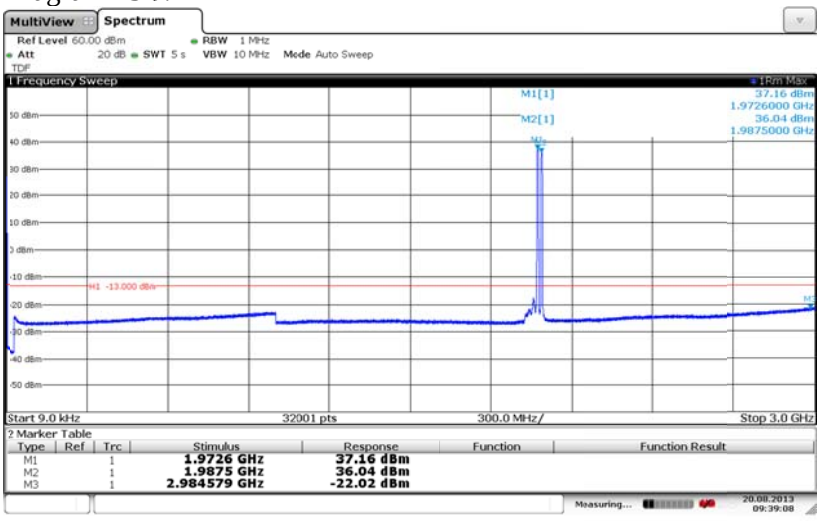
Diagram 14 b:



Date: 20.AUG.2013 09:52:01

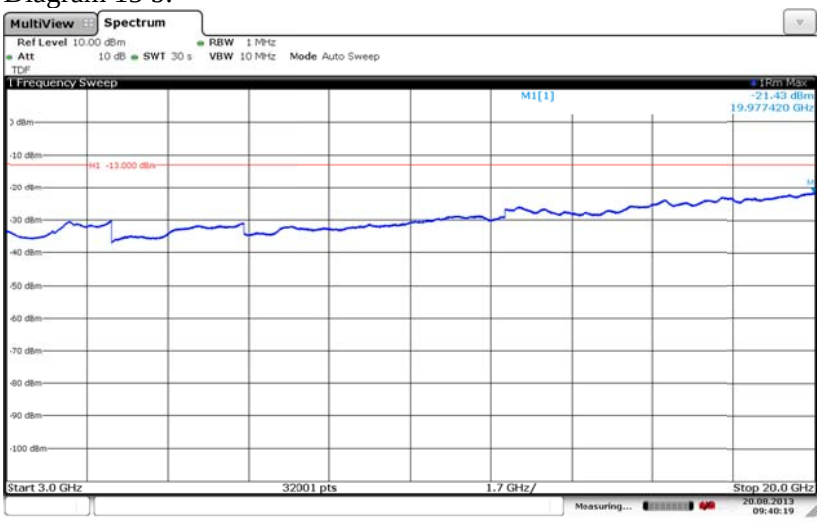
Appendix 5

Diagram 15 a:



Date: 20.AUG.2013 09:39:08

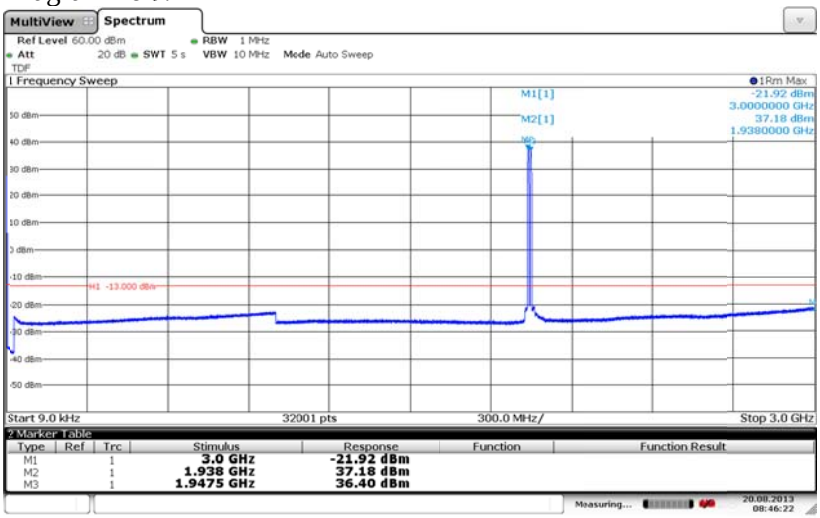
Diagram 15 b:



Date: 20.AUG.2013 09:40:19

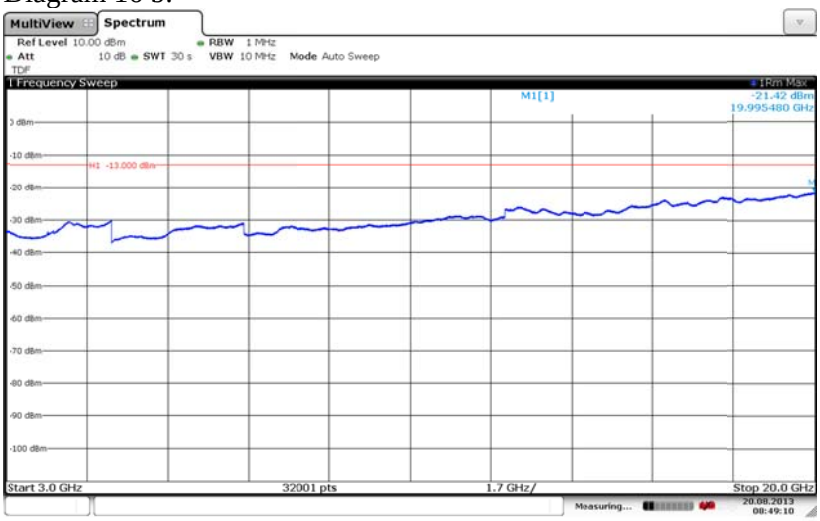
Appendix 5

Diagram 16 a:



Date: 20.AUG.2013 08:46:21

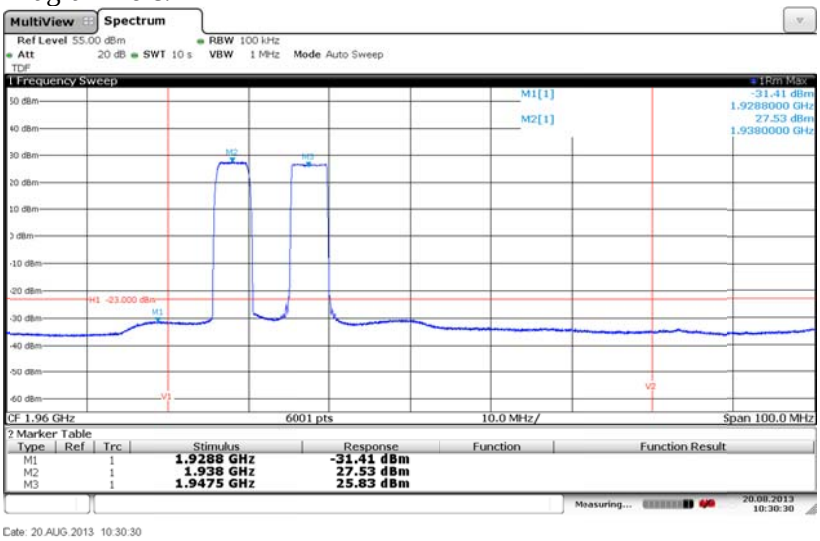
Diagram 16 b:



Date: 20.AUG.2013 08:49:09

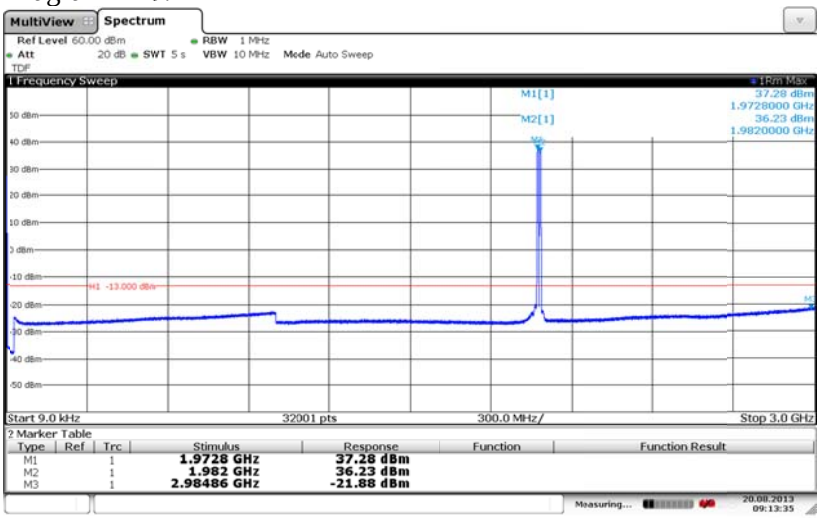
Appendix 5

Diagram 16 c:



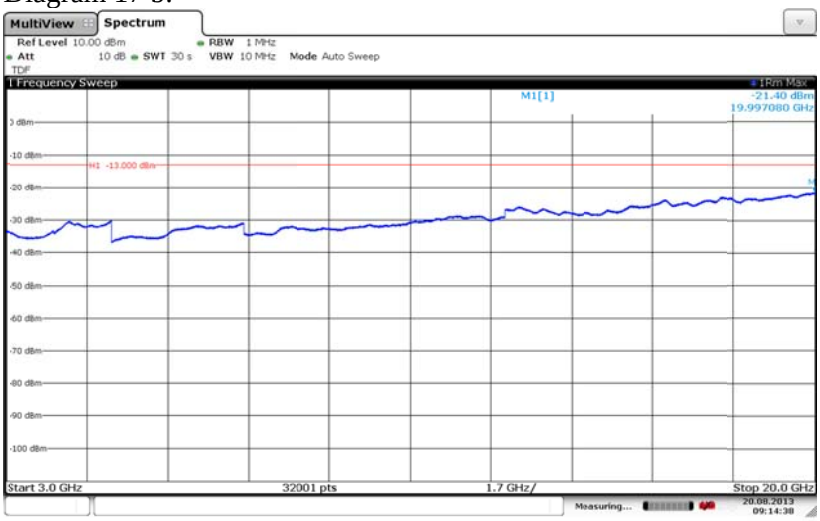
Appendix 5

Diagram 17 a:



Date: 20.AUG.2013 09:13:35

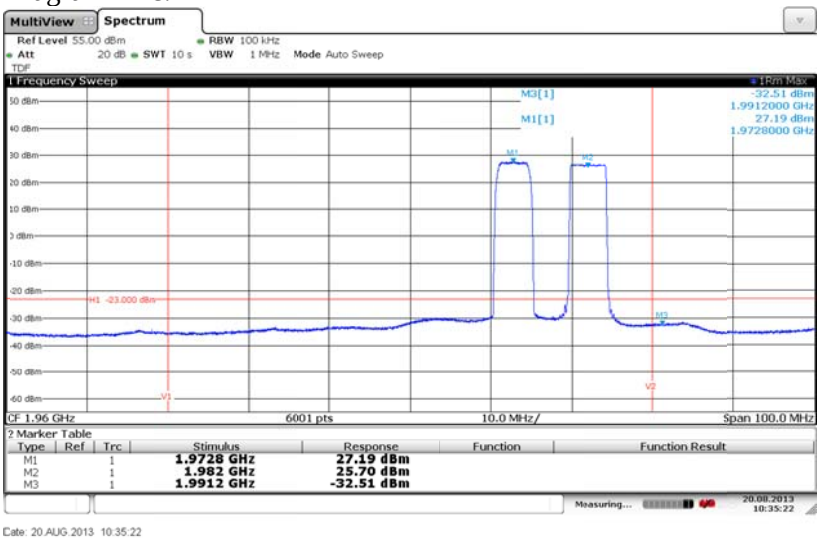
Diagram 17 b:



Date: 20.AUG.2013 09:14:38

Appendix 5

Diagram 17 c:



Appendix 6

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

Date	Temperature	Humidity
2013-08-05	23°C ± 3°C	56 % ± 5 %
2013-08-06	23°C ± 3°C	52 % ± 5 %
2013-08-07	23°C ± 3°C	55 % ± 5 %
2013-08-08	23°C ± 3°C	59 % ± 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.

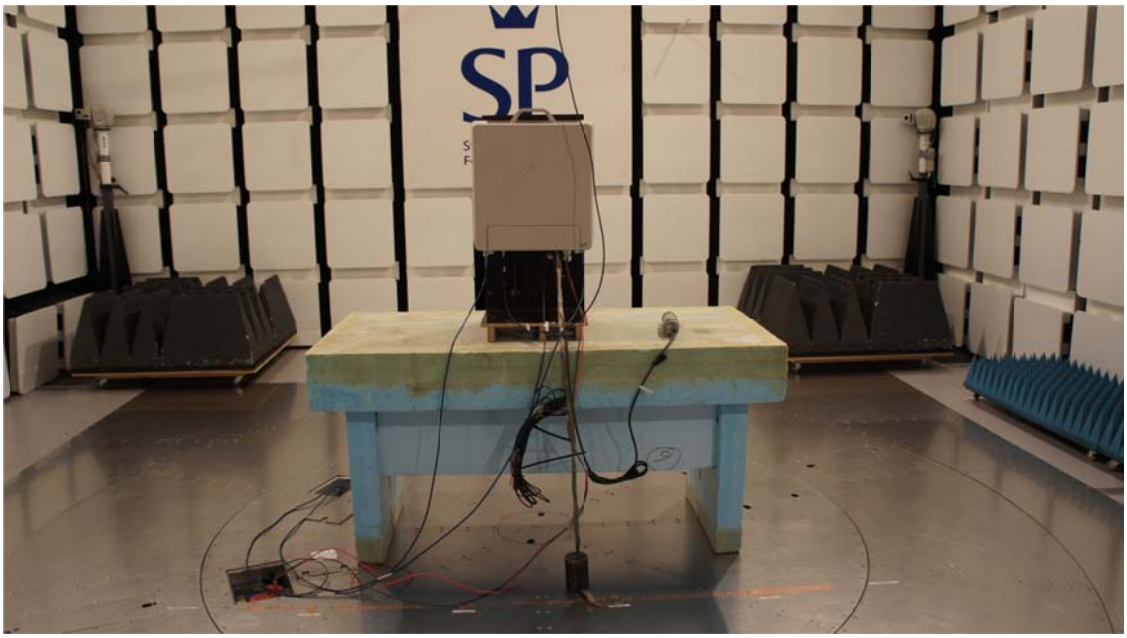
In the frequency range 30 MHz - 20 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

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
R&S FSIQ 40	503 738
EMC 32 ver. 8.52.0	503 899
Chase Bilog Antenna CBL 6111A	502 182
EMCO Horn Antenna 3115	502 175
Flann STD Gain Horn Antenna 20240-20	503 674
High pass filter, RLC Electronics	503 739
Schwarzbeck preamplifier BBV 9742	504 085
Miteq, Low Noise Amplifier	503 285
µComp Nordic, Low Noise Amplifier	901 545
Temperature and humidity meter, Testo 625	504 188

Tested configurations

LTE MIMO, single carrier (all BW configurations)

B_{LTE}, M_{LTE}, T_{LTE}

LTE MIMO, multi carrier

B_{IM-LTE}; T_{IM-LTE}

WCDMA MIMO, single carrier

B_{WCDMA}, M_{WCDMA}, T_{WCDMA}

WCDMA MIMO, multi carrier

$B+(B+15)_{WCDMA}$

MSR MIMO WCDMA and LTE (5 MHz BW configuration)

T_{L+W}

Results for worst emissions found

Diagram 1 a-d: LTE MIMO, multi carrier, T_{IM-LTE}
Diagram 2 a-d: WCDMA MIMO, multi carrier, $B+(B+15)_{WCDMA}$
Diagram 3 a-d: MSR MIMO WCDMA and LTE, T_{L+W}

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-20000	All emission > 20 dB below limit	All emission > 20 dB below limit

Measurement uncertainty:

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

Limits

CFR 47 §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:

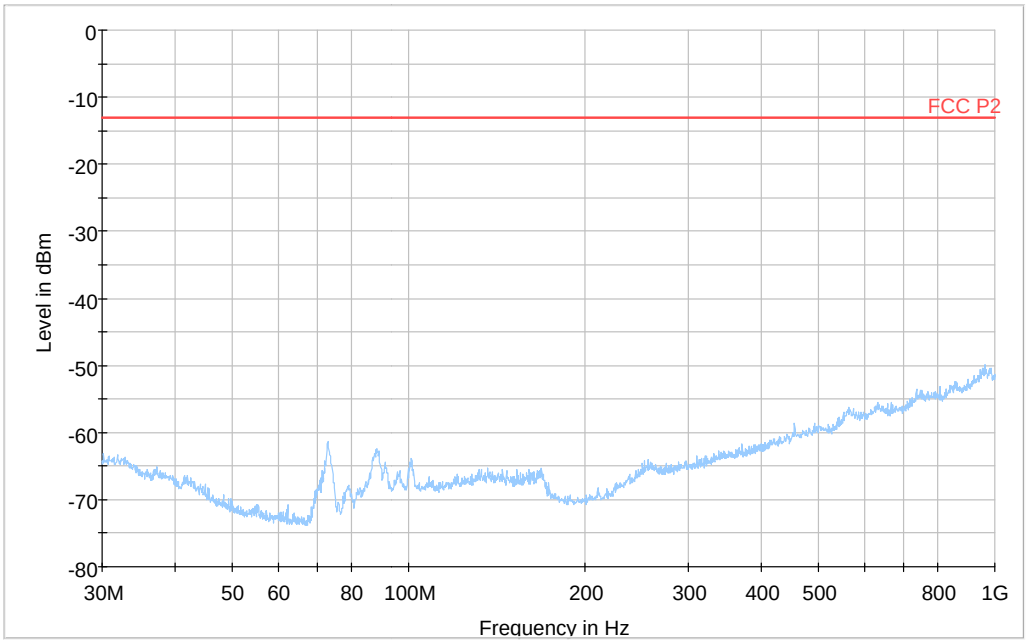
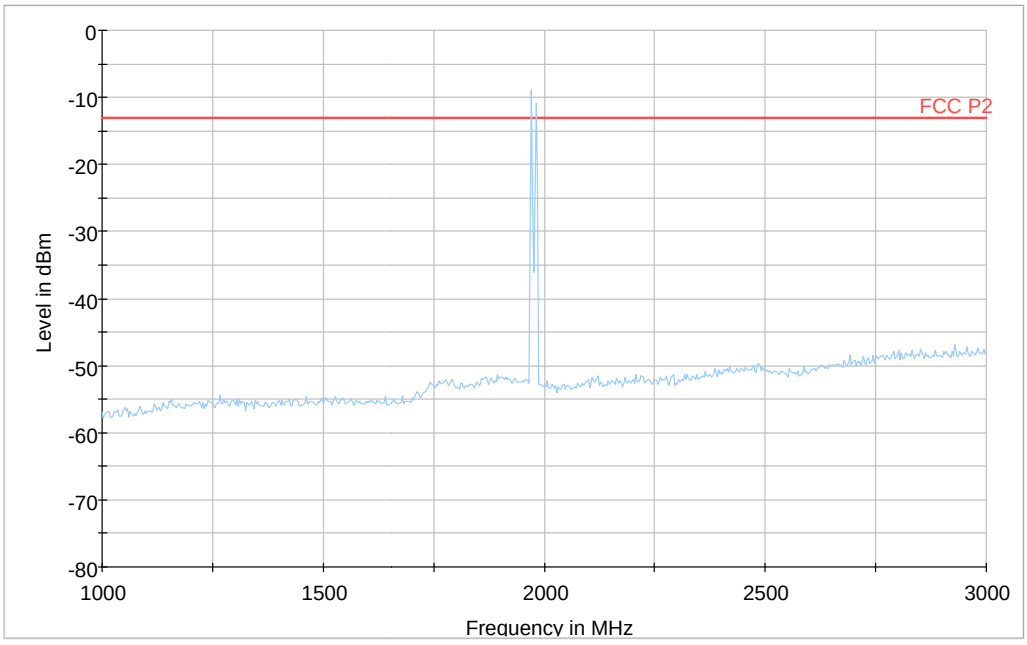


Diagram 1 b:



Note: The emission between 1930 MHz to 1990 MHz is the carrier frequencies and shall be ignored in the context.

Appendix 6

Diagram 1 c:

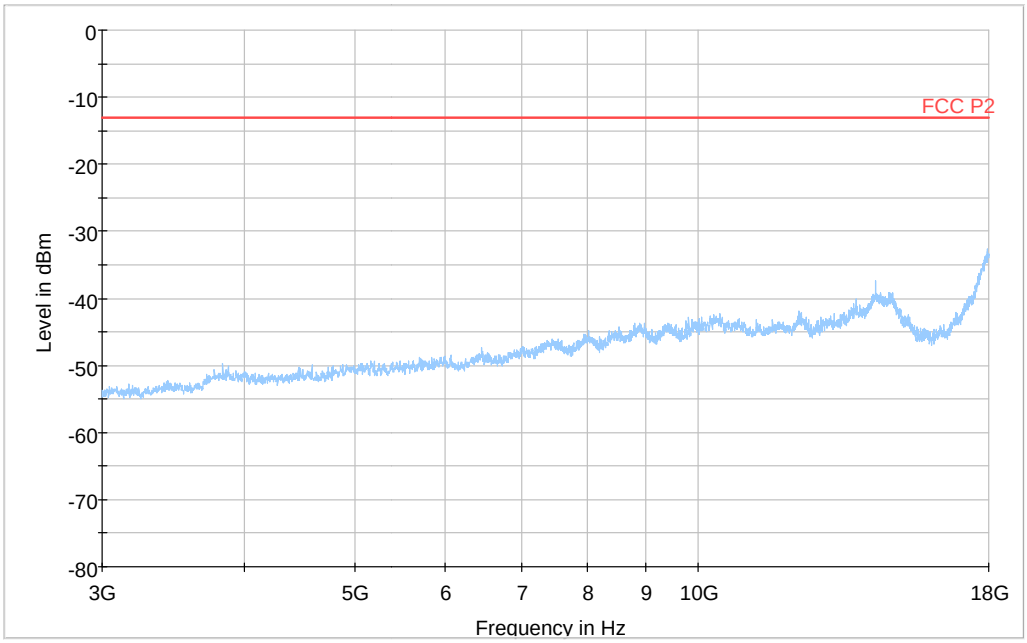
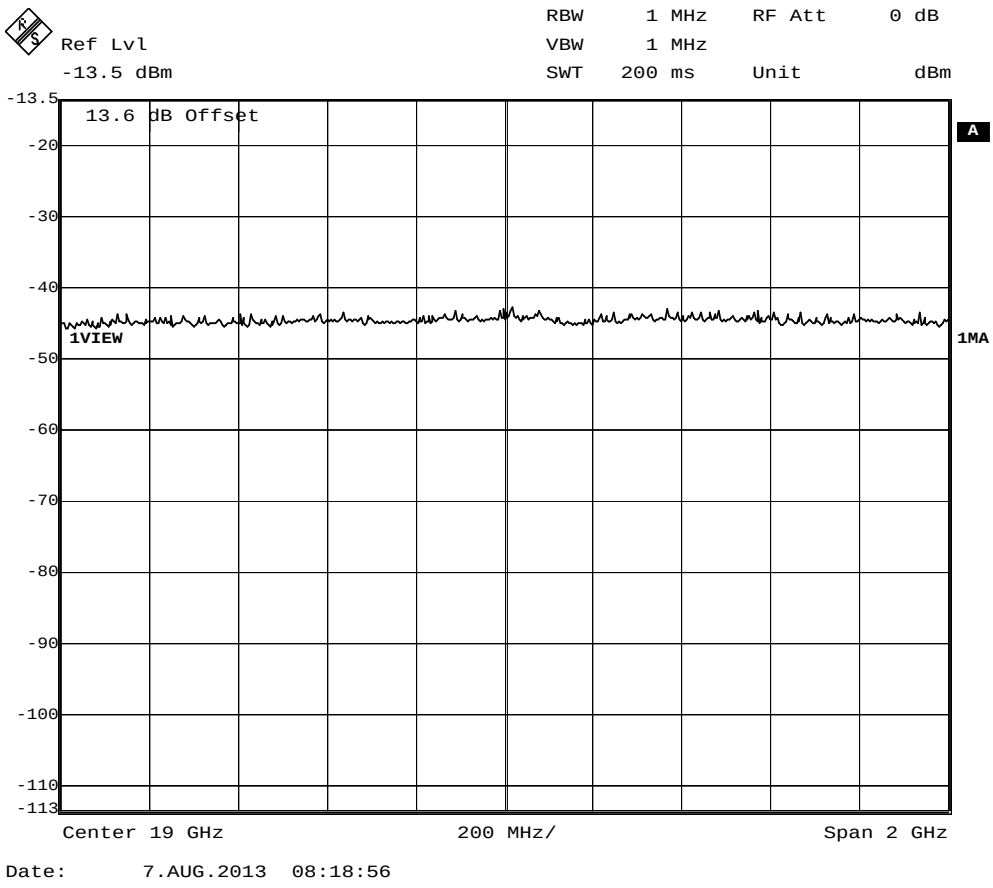


Diagram 1 d:



Appendix 6

Diagram 2 a:

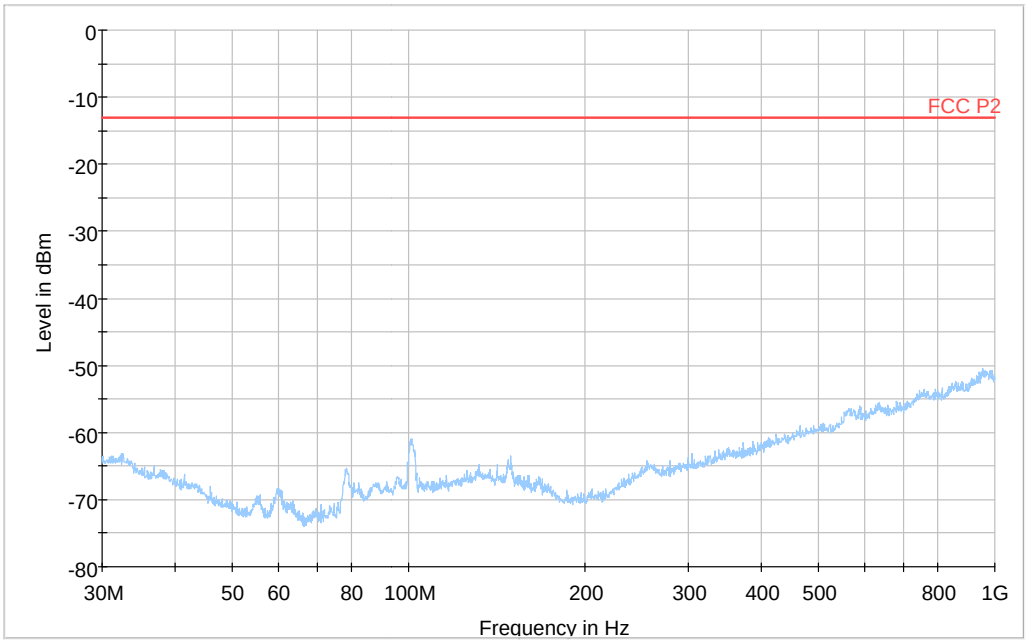
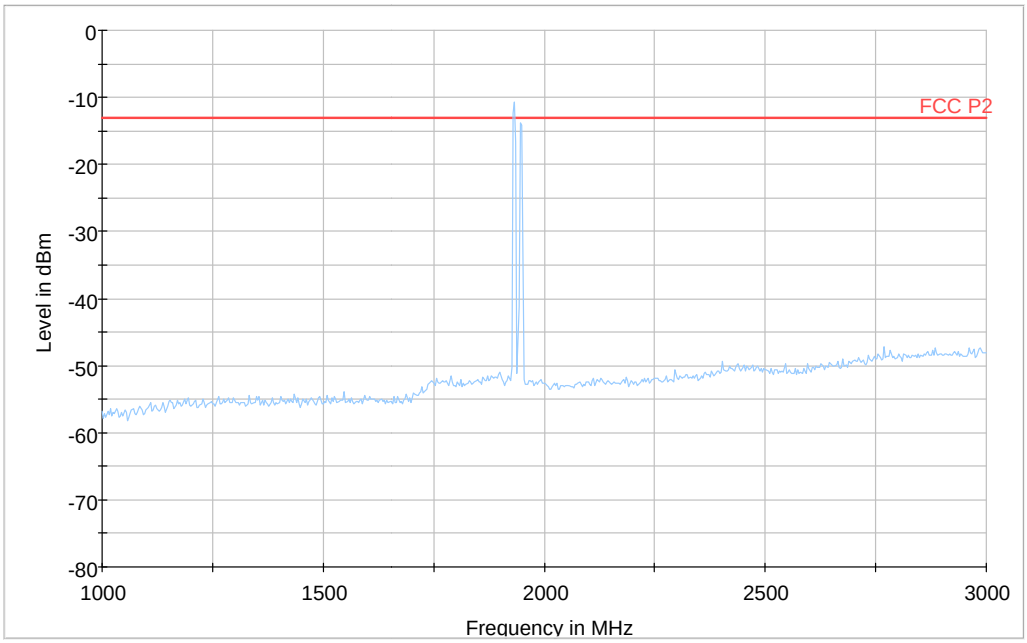


Diagram 2 b:



Note: The emission between 1930 MHz and 1990 MHz are the carrier frequencies and shall be ignored in the context.

Appendix 6

Diagram 2 c:

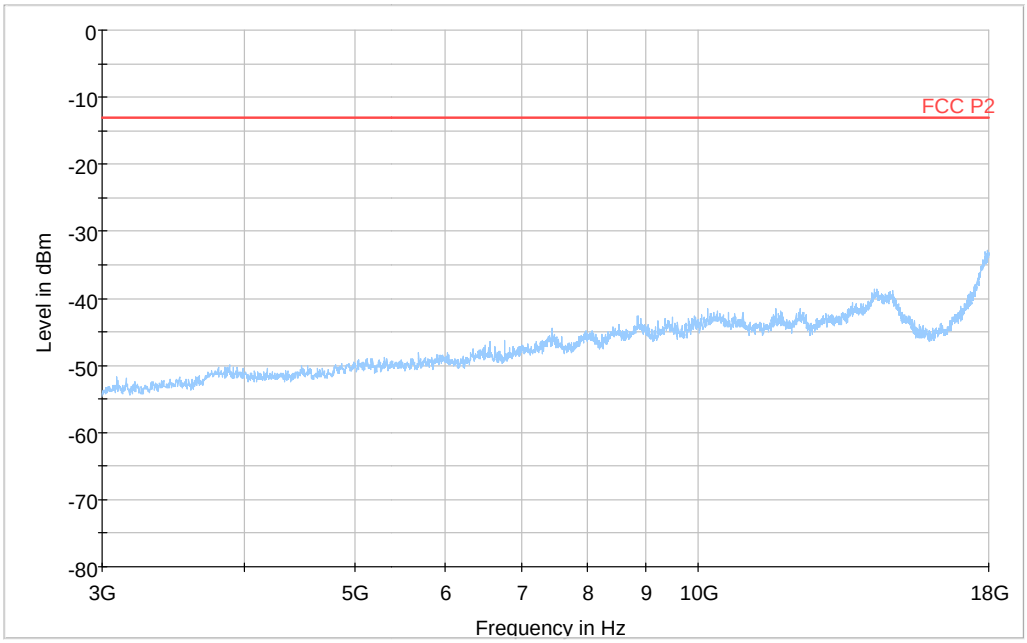
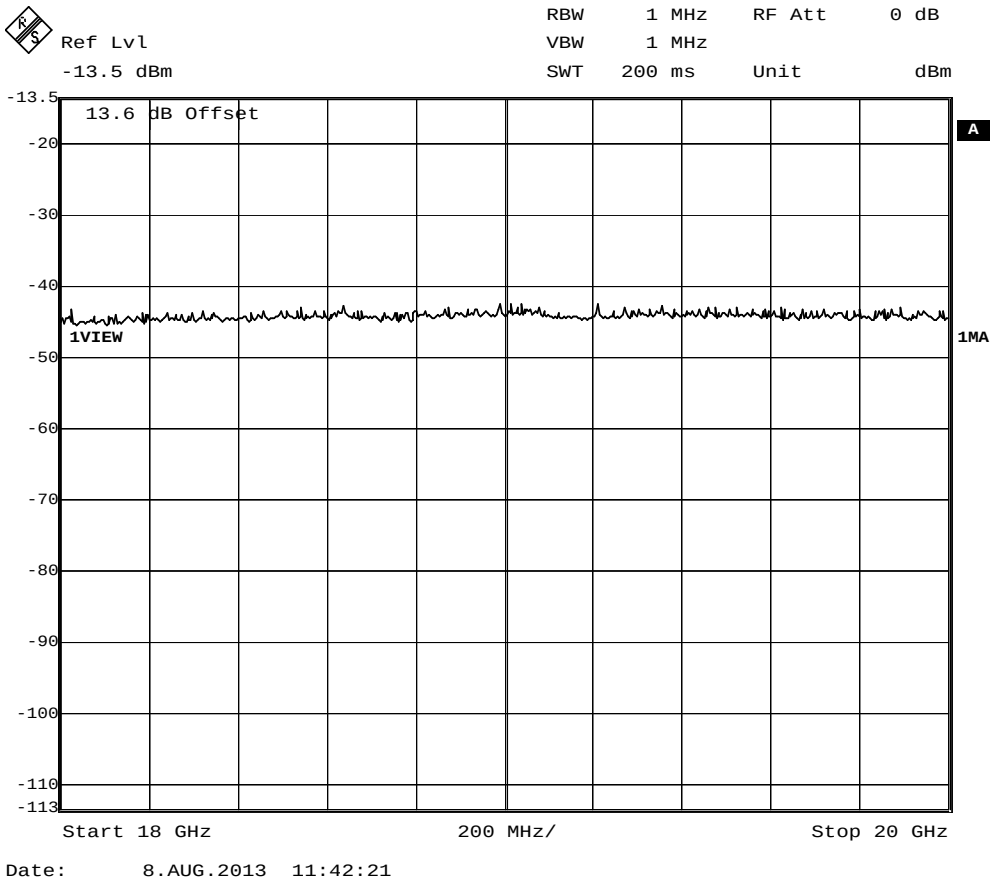


Diagram 2 d:



Appendix 6

Diagram 3 a:

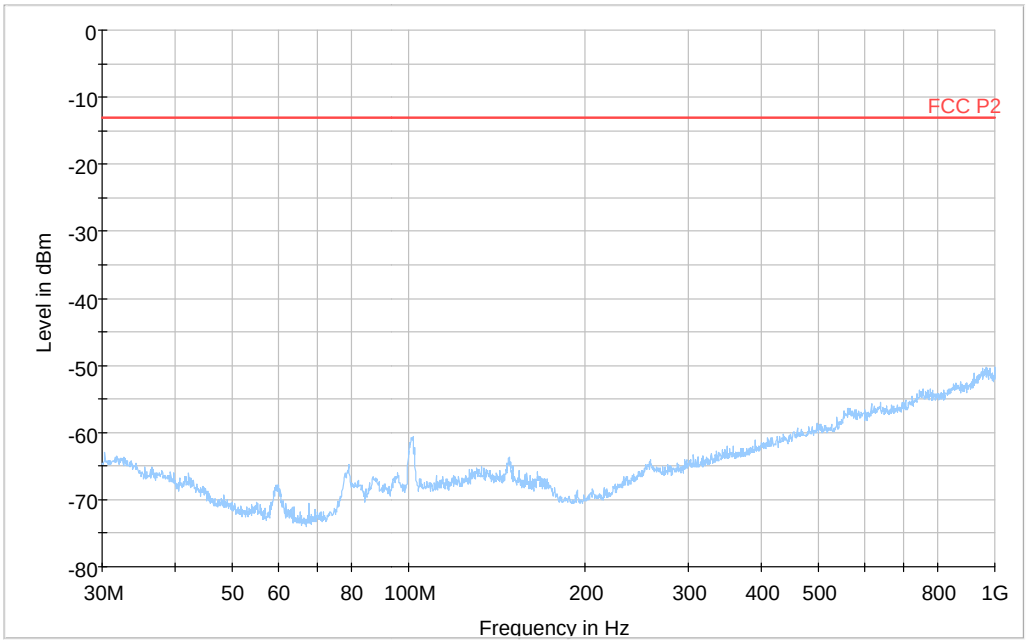
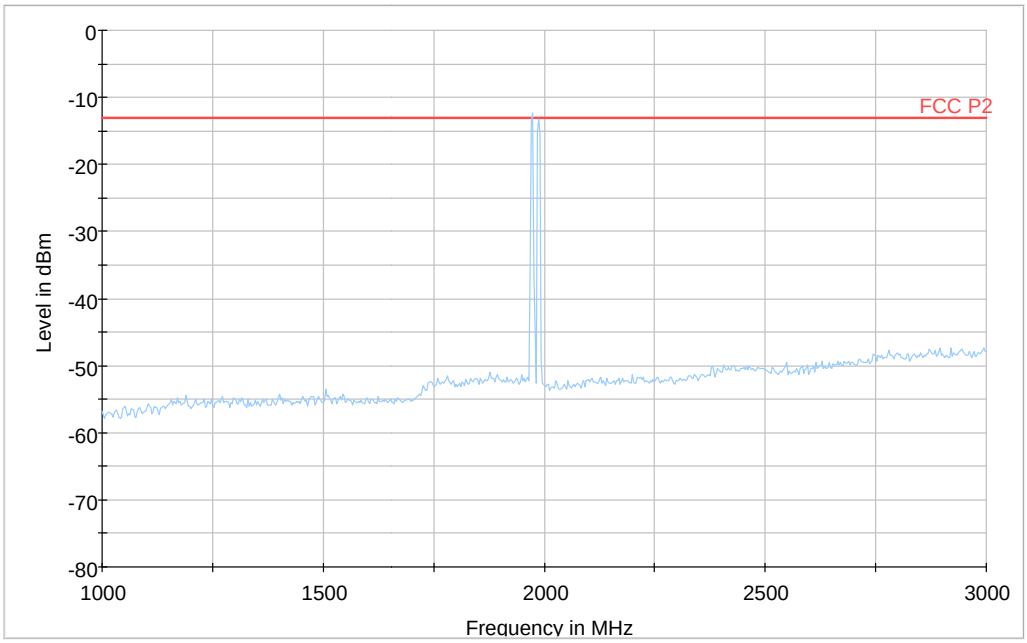


Diagram 3 b:



Note: The emission between 1930 MHz and 1990 MHz are the carrier frequencies and shall be ignored in the context.

Appendix 6

Diagram 3 c:

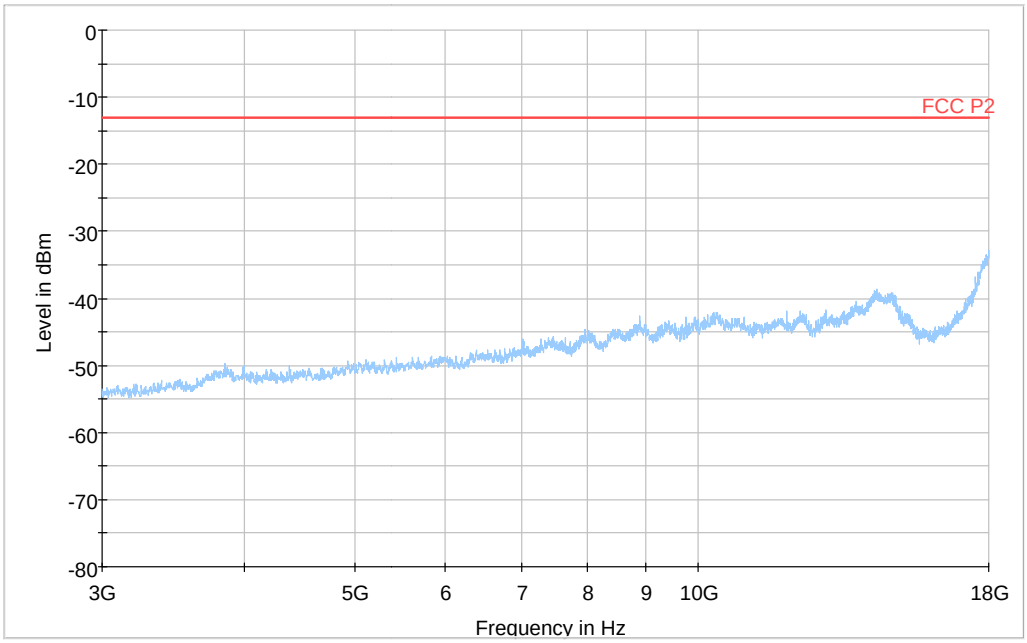
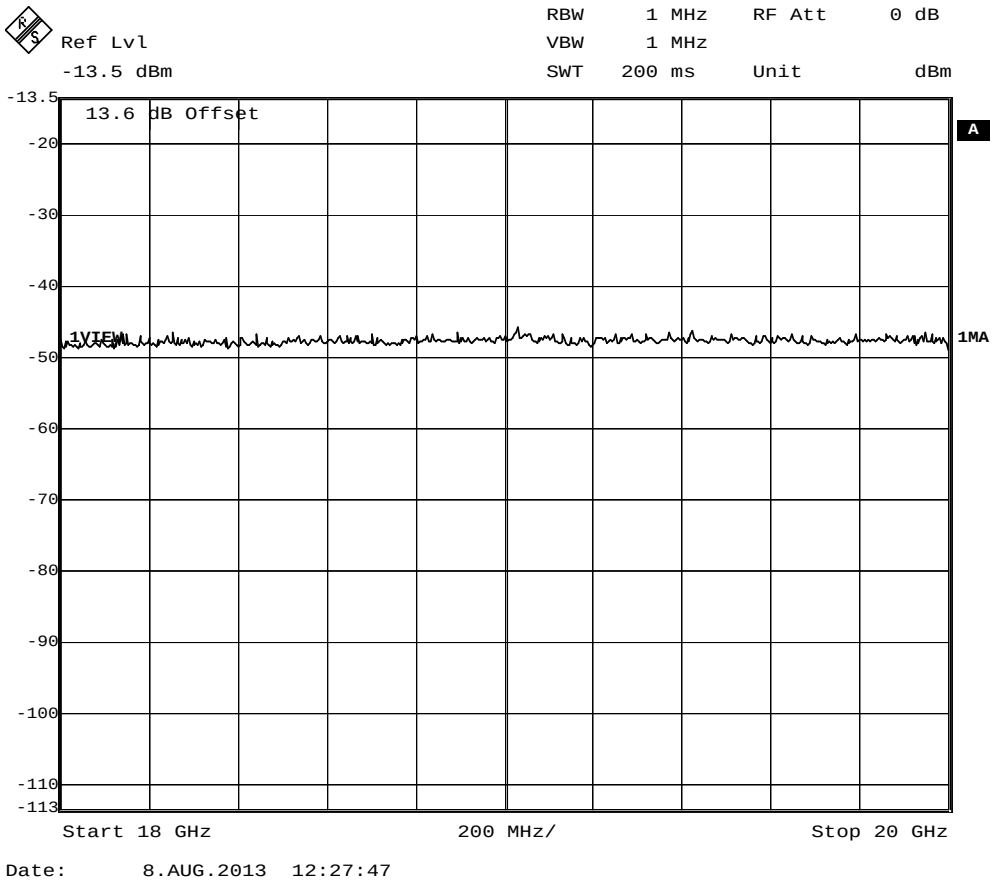


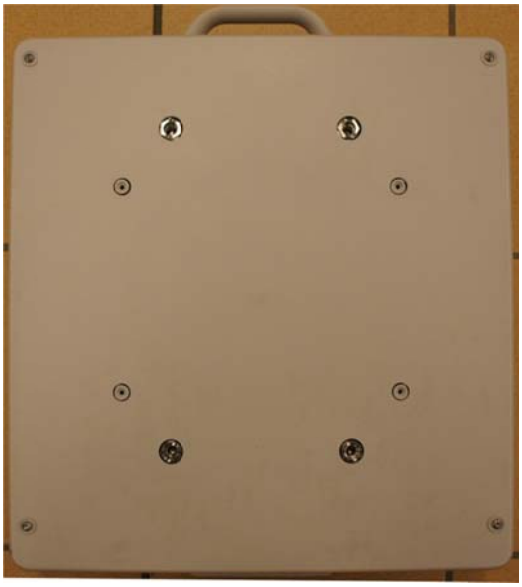
Diagram 3 d:



External photos

Front side

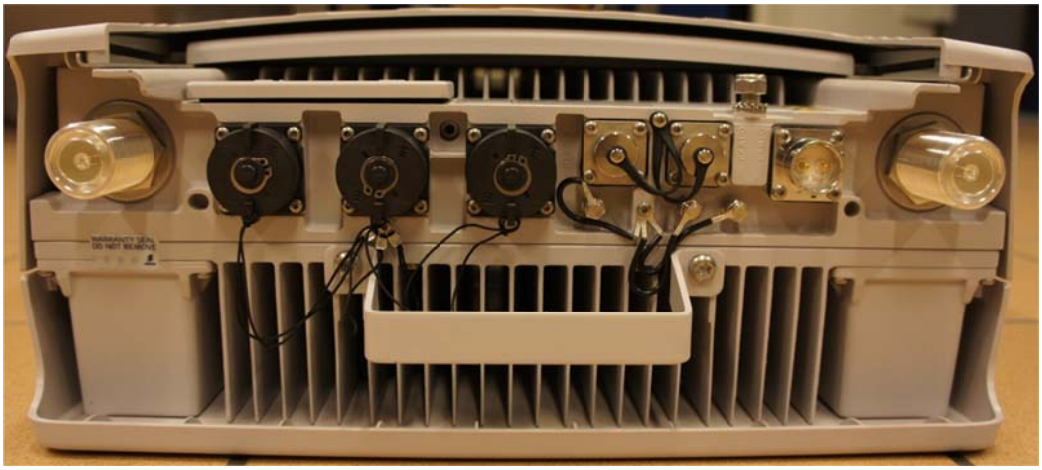
Rear side



Appendix 7

Top side

Bottom side



Appendix 7

Left side

Rigth side