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

Date 2011-12-12 | Reference FX115752-F2L | Page 1 (2)

1002
ISO/IEC 17025

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164 80 Stockholm

Radio measurements on RUS 01 B4 1700/ 2100 MHz radio equipment with FCC ID:TA8AKRC11859-2 and IC:287AB-AS118592

(9 appendices)

Test object

RUS 01 B4, KRC 118 59/2 Rev R1D

Summary

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-139			
2.1046 / RSS-139 6.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-139 6.5	Band edge	Yes	4
2.1051 / RSS-139 6.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-139 6.5	Field strength of spurious radiation	Yes	6
2.1055 / RSS-139 6.3	Frequency stability	Yes	7
Industry Canada RSS-139			
RSS-139 6.6	Receiver spurious emissions	Yes	8

Note: Above RSS-139 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

SP Technical Research Institute of Sweden
Electronics - EMC

Performed by

Jörgen Wassholm

Examined by

Bengt Andersson

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Description of test object

Equipment:	Radio equipment RUS 01 B4 running in LTE mode
Frequency bands:	TX: 2110 – 2155 MHz RX: 1710 – 1755 MHz The highest and lowest EARFCNs and the corresponding frequencies for each supported channel BW configuration are listed below and are pursuant to 3GPP TS 36.141 section 5.7 Channel arrangement
Supported channel bandwidth configurations	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz
Modulation and access scheme	OFDMA in FDD
OFDM subcarrier modulation	System information and pilots use BPSK and QPSK. For payload data QPSK, 16QAM and 64QAM can be used.
Maximum rated output power:	Single carrier 1x 49 dBm (1x80 W)
Number of antenna ports:	TX/RX: 1 RX only: 1
Nominal supply voltage:	-48 VDC

Tested frequencies and EARFCNs for TX measurements

EARFCN Downlink	Frequency [MHz]	Comment
1957	2110.7	TX bottom (B) frequency in 1.4 MHz BW configuration
1965	2111.5	TX bottom (B) frequency in 3 MHz BW configuration
1975	2112.5	TX bottom (B) frequency in 5 MHz BW configuration
2000	2115.0	TX bottom (B) frequency in 10 MHz BW configuration
2025	2117.5	TX bottom (B) frequency in 15 MHz BW configuration
2050	2120.0	TX bottom (B) frequency in 20 MHz BW configuration
2175	2132.5	TX band mid (M) frequency in all BW configurations
2300	2145.0	TX top (T) frequency in 20 MHz BW configuration
2325	2147.5	TX top (T) frequency in 15 MHz BW configuration
2350	2150.0	TX top (T) frequency in 10 MHz BW configuration
2375	2152.5	TX top (T) frequency in 5 MHz BW configuration
2385	2153.5	TX top (T) frequency in 3 MHz BW configuration
2393	2154.3	TX top (T) frequency in 1.4 MHz BW configuration

Tested frequency and EARFCN for RX measurement

EARFCN	Frequency [MHz]	Comment
20175	1732.5	RX band mid (M) frequency in all BW configurations

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

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

Appendix 1

Operation modes during measurements

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM and test model E-TM3.1 to represent 64QAM payload modulation.

The setting TX single carrier with test model E-TM1.1 in channel bandwidth configuration 1.4 MHz was found to be representative for all traffic scenarios when several settings with different modulations and channel bandwidth configurations were compared to find a worst case setting. This setting was used for all measurements unless noted otherwise.

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

Conducted measurements

The EUT was mounted into a RBS 6201 cabinet and supplied by the cabinet's internal -48 V DC. TX parameters were measured at port RF A with port RF B terminated into 50 ohm. RX spurious emission conducted was measured at port RF B with port RF A activated with E-TM1.1 on the TX band center frequency (M). Port RF A was terminated into 50 ohm.

Radiated measurements

The test object was tested stand-alone. It was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmitter output power at port RF A. The port RF A was via a RF attenuator connected to a spectrum analyzer outside the shielded chamber for signal monitoring. Antenna port RF B was unterminated.

Purpose of test

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

References

Measurements were done according to relevant parts of the following standards:
ANSI C63.4-2009
ANSI/TIA/EIA-603-C-2009
3GPP TS 36.141, version 8.5.0
CFR 47 part 2, October 1st , 2010
CFR 47 part 27 Subpart L, October 1st, 2010
RSS-139 Issue 2
RSS-Gen Issue

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2012-10	503 881
R&S FSIQ 40	2012-07	503 738
R&S FSQ 40	2012-07	504 143
R&S ESI 26	2012-07	503 292
Control computer with R&S software EMC32 version 8.20.1	-	503 479
High pass filter	2012-07	504 200
High pass filter	2012-07	503 739
High pass filter	2012-07	503 740
RF attenuator	2012-07	503 248
RF attenuator	2012-07	504 159
RF attenuator	2012-07	900 229
RF attenuator	2012-07	900 260
RF attenuator	2012-07	900 261
Boonton RF Peak power meter/analyzer	2012-11	503 144
Boonton Power sensor 56518-S/4	2012-11	503 146
Chase Bilog Antenna CBL 6111A	2011-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 20240-20	-	503 674
µComp Nordic, Low Noise Amplifier	2012-07	504 160
MITEQ Low Noise Amplifier	2012-07	503 285
Temperature cabinet	-	503 360
Multimeter Fluke 87	2012-05	502 190
Testo 625, Temperature and humidity meter	2012-06	504 188
Testo 635 Temperature and humidity meter	2012-05	504 203

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Modification of test object

To fulfil the requirements of TX spurious emission at band edge and RX spurious emission the test object PIS software was upgraded from R39SF (Rev state R1A) to R39UL (Rev state R1D) to improve performance. Based on an analysis and justification measurements, it is deemed that this software upgrade do not affect previous measured RF parameters.

Delivery of test object

The test object was delivered: 2011-08-10.

Manufacturer’s representative

Christer Gustavsson, Ericsson AB

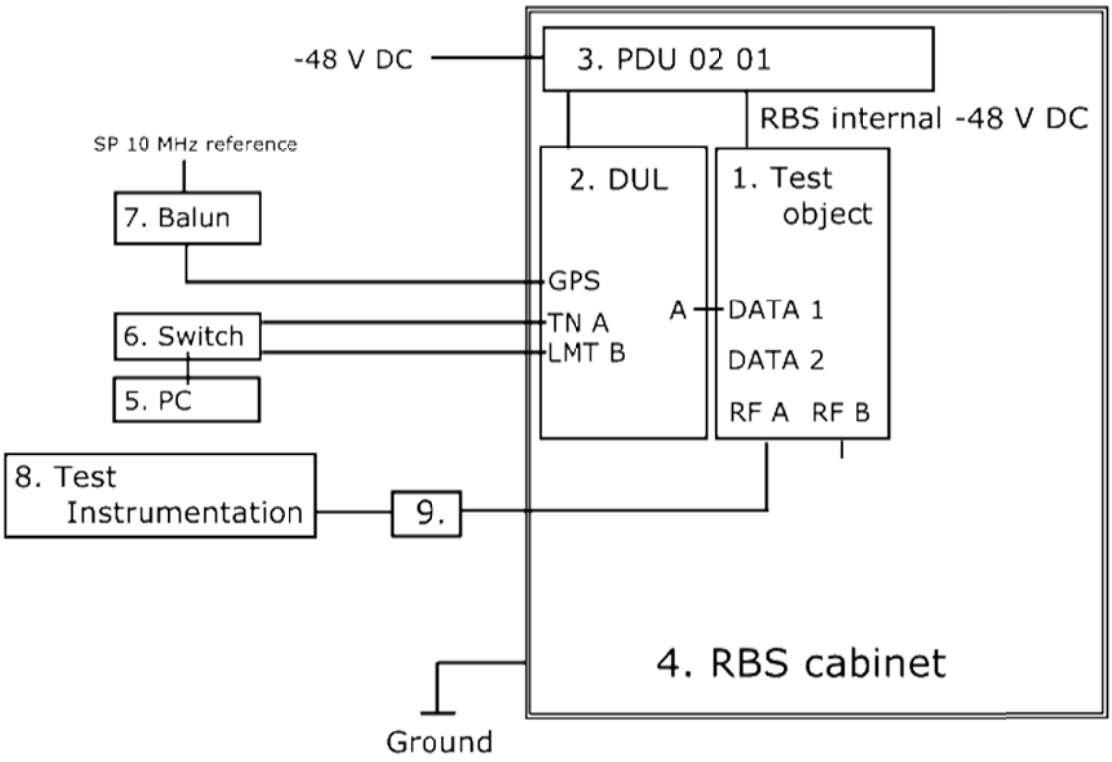
Test engineers

Andreas Johnson, Tomas Lennhager and Jörgen Wassholm

Test participant

Xiang Yue, Ericsson CBC (Partly present)

Test set-up conducted TX measurements at port RF A



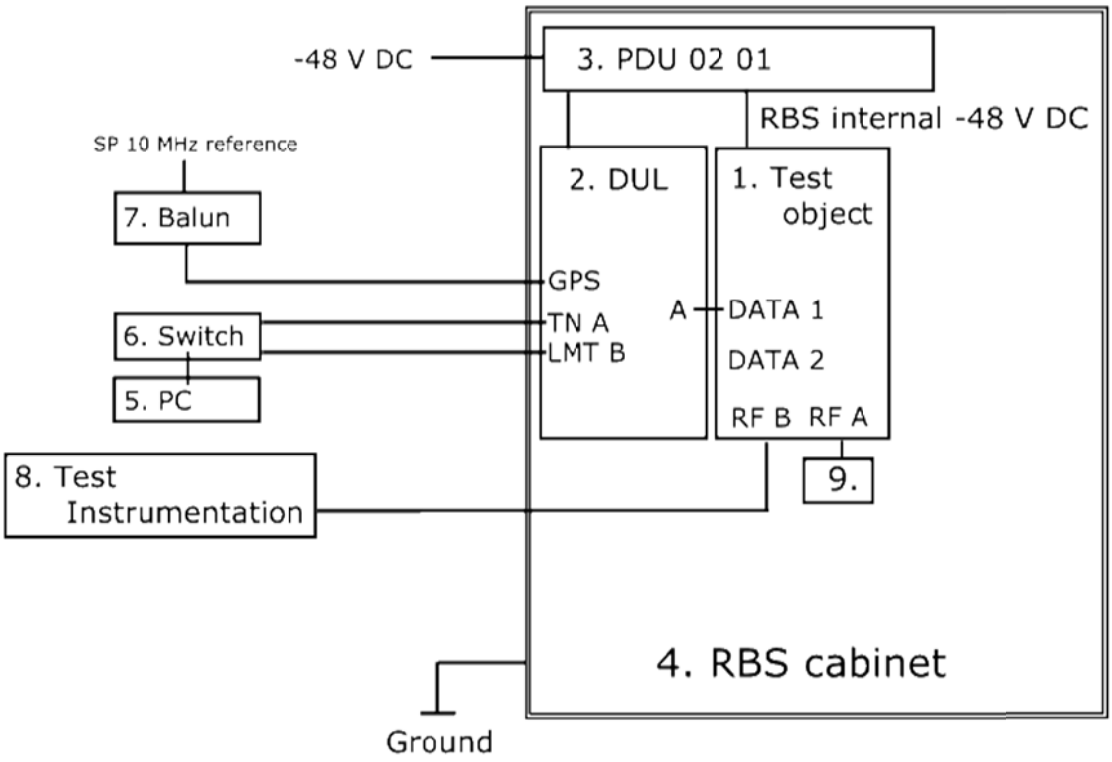
Test object

1. RUS 01 B4, KRC 118 59/2 revision R1A/R1D S/N: C824815960
   FCC ID:TA8AKRC11859-2 and IC:287AB-AS118592

Functional test equipment

2. DUL 20 01 KDU 137 533/4 R1C, CB4H274941
3. PDU 02 01, BMG 980336/4, R2A, (S)BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. Controlling laptop HP Elitebook 8730w, BAMS 1000757967
   running software MOSHELL V8.0k
6. Fast Ethernet Switch: NETGEAR 10/100 Mbps model: FS108
7. Balun for 10 MHz reference, converting BNC to RJ-45 connector
8. SP test instrument according measurement equipment list
9. Attenuator and filter according measurement equipment list

Test set-up conducted RX measurements at port RF B



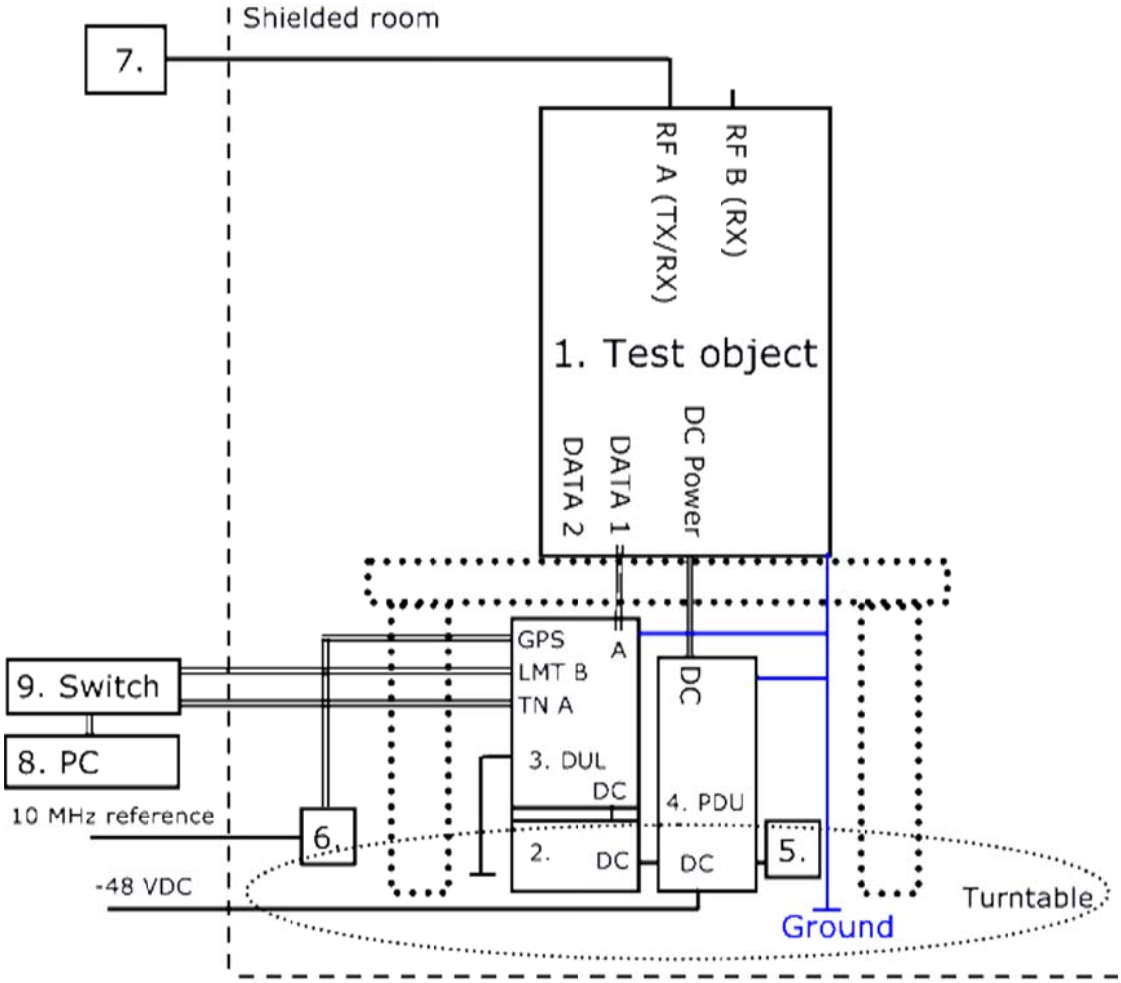
Test object

1. RUS 01 B4, KRC 118 59/2, revision R1D S/N: C824815960
   FCC ID:TA8AKRC11859-2 and IC:287AB-AS118592

Functional test equipment

2. DUL 20 01 KDU 137 533/4 R1C, CB4H274941
3. PDU 02 01, BMG 980336/4, R2A, (S)BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. Controlling laptop HP Elitebook 8730w, BAMS 1000757967
   running software MOSHELL V8.0k
6. Fast Ethernet Switch: NETGEAR 10/100 Mbps model: FS108
7. Balun for 10 MHz reference, converting BNC to RJ-45 connector
8. SP test instrument according measurement equipment list
9. 50 ohm termination

Test set-up, radiated measurements



Test object:

1.	RUS 01 B4, KRC 118 59/2, revision R1A, S/N: C824815980 FCC ID:TA8AKRC11859-2 and IC:287AB-AS118592

Functional test equipment:

2.	SUP 6601, 1/BFL 901 009/1 R3B, BR81262561
3.	DUL 20 01 KDU 137 533/4 R1C, CB4H274941
4.	PDU 02 01, BMG 980 336/4, Rev R2A, S/N: BJ31534775
5.	SCU 02 01, BGM 136 1006/2, Rev R2A, S/N: CD31343358
6.	Jointing Box, NCD 901 40/1, Rev R1A, S/N: A401222764
7.	Terminator
8.	Computer, HP EliteBook 8730w, BAMS - 1000757967
9.	Switch, Netgear FS 105

Test object ports

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

RBS software

Software	Revision
CXP 102 051/14	R4BD

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

Date	Temperature	Humidity
2011-12-09	23 °C ± 3 °C	23 % ± 5 %
2011-12-10	23 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

Tested revision state R1D.

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

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
RF attenuator	504 159
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Results

Measured output power level at connector RF A

Test conditions	Transmitter power RMS (dBm) / PAR (dB)		
	Frequency B	Frequency M	Frequency T
BW configuration 1.4 MHz	48.6/ 6.6	48.6/ 6.6	48.5/ 6.5
BW configuration 3 MHz	48.6/ 6.6	48.7/ 6.5	48.6/ 6.5
BW configuration 5 MHz	48.5/ 6.5	48.6/ 6.5	48.5/ 6.5
BW configuration 10 MHz	48.5/ 6.5	48.5/ 6.4	48.5/ 6.5
BW configuration 15 MHz	48.4/ 6.5	48.4/ 6.5	48.4/ 6.5
BW configuration 20 MHz	48.4/ 6.5	48.4/ 6.4	48.4/ 6.5

Limits

§27.50: The maximum output power may not exceed 1640 W (EIRP) / MHz. The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-139 6.4: The average equivalent isotropically radiated power (e.i.r.p.) limits in SRSP-513 apply, resulting in a maximum EIRP of 1640 W / MHz for the scope of this report. The peak-to-average ratio of the power shall not exceed 13 dB.

Complies?	Yes

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

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

Test set-up and procedure

Tested revision state R1A.

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	900 229
Testo 615 temperature and humidity meter	504 203

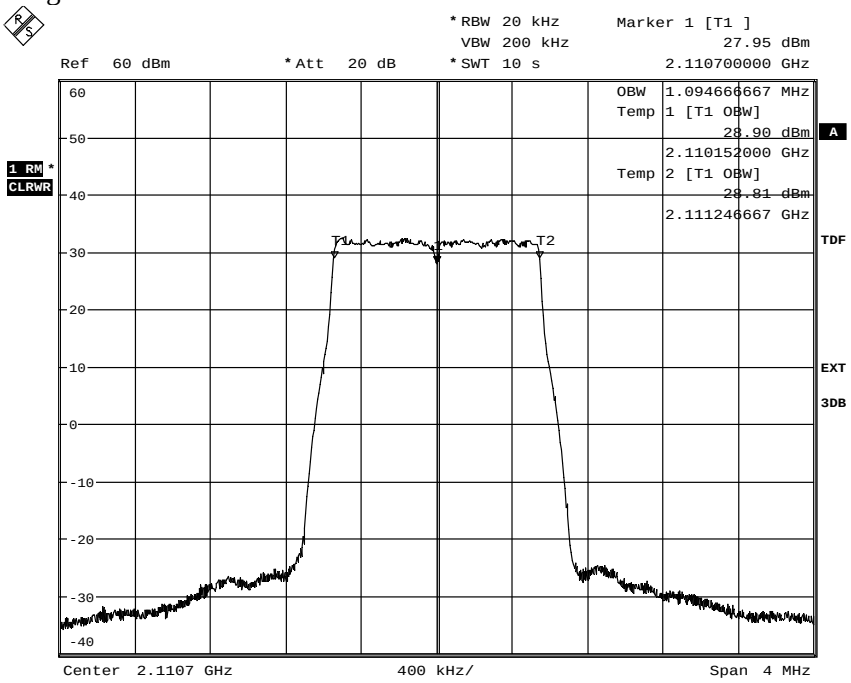
Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration	Tested frequency	OBW / [MHz]
1	1.4 MHz	B	1.095
2	20 MHz	B	17.867
3	1.4 MHz	M	1.095
4	3 MHz	M	2.697
5	5 MHz	M	4.480
6	10 MHz	M	8.940
7	15 MHz	M	13.427
8	20 MHz	M	17.867
9	1.4 MHz	T	1.095
10	20 MHz	T	17.867

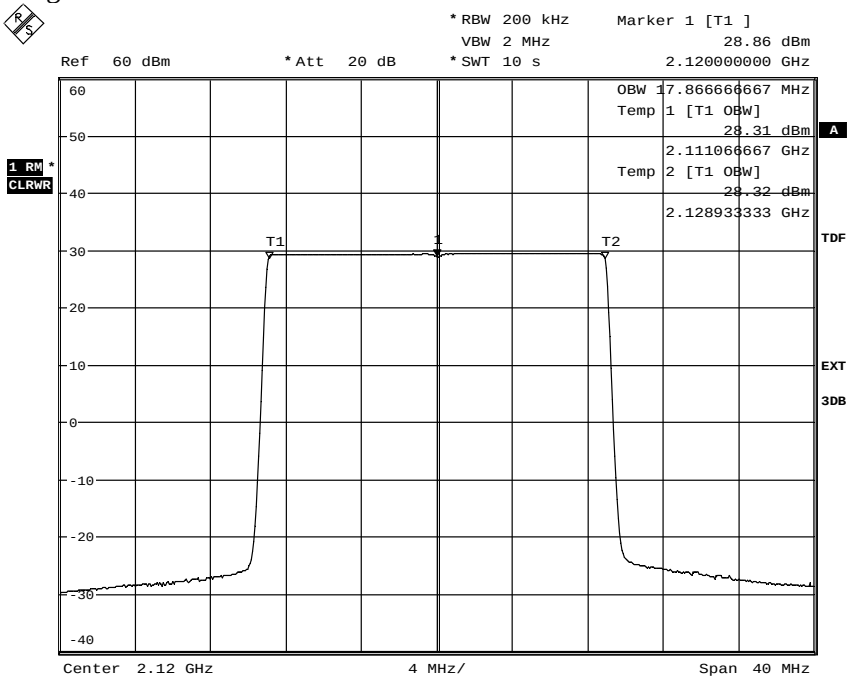
Appendix 3

Diagram 1



Date: 30.SEP.2011 09:58:03

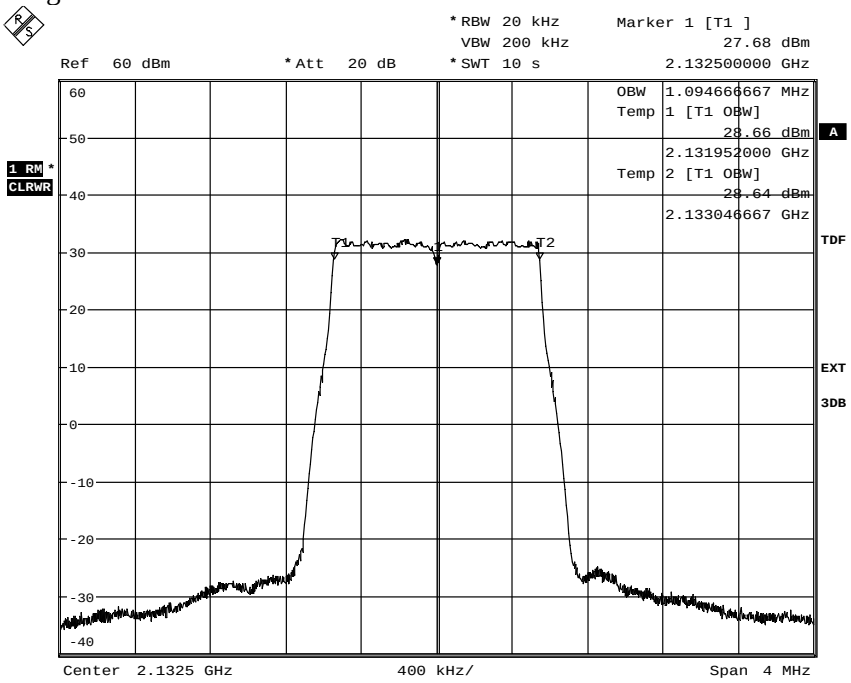
Diagram 2



Date: 30.SEP.2011 10:35:10

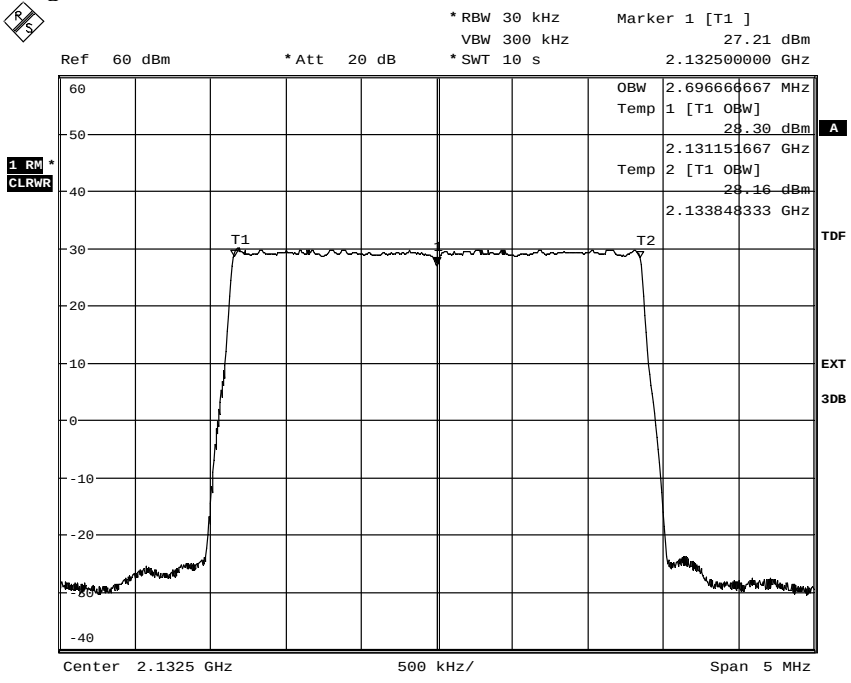
Appendix 3

Diagram 3



Date: 30.SEP.2011 10:06:42

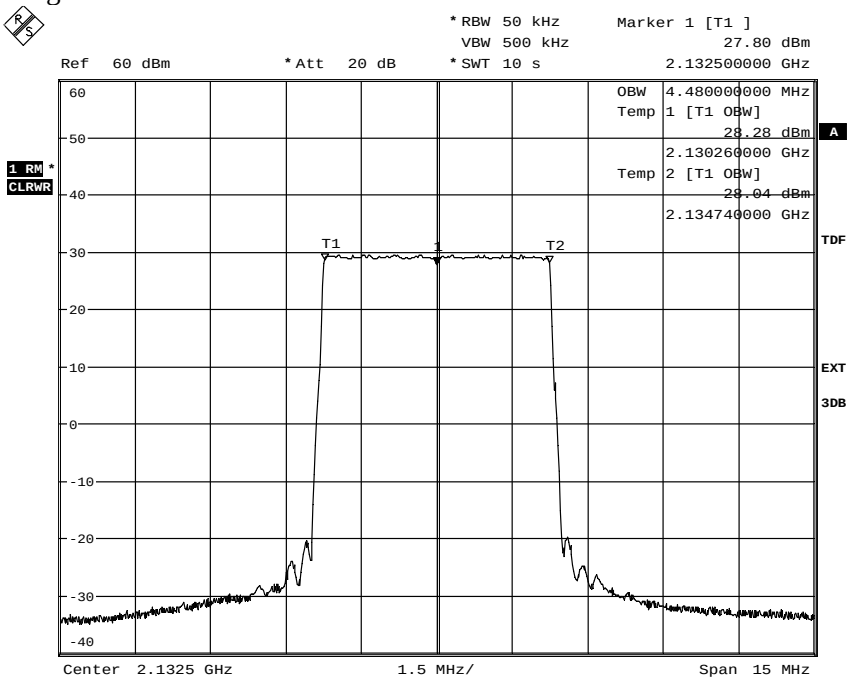
Diagram 4



Date: 30.SEP.2011 11:01:39

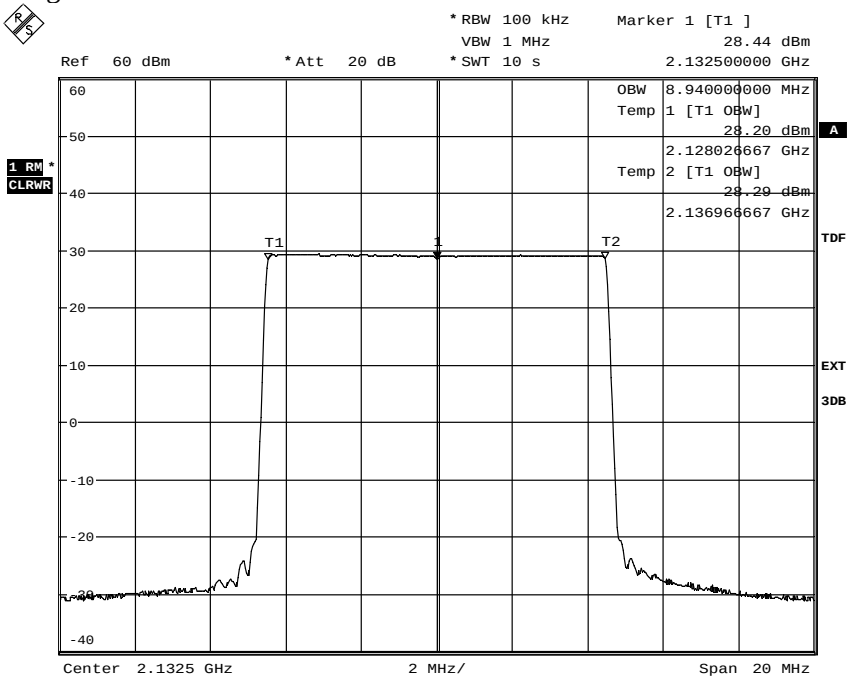
Appendix 3

Diagram 5



Date: 30.SEP.2011 10:57:24

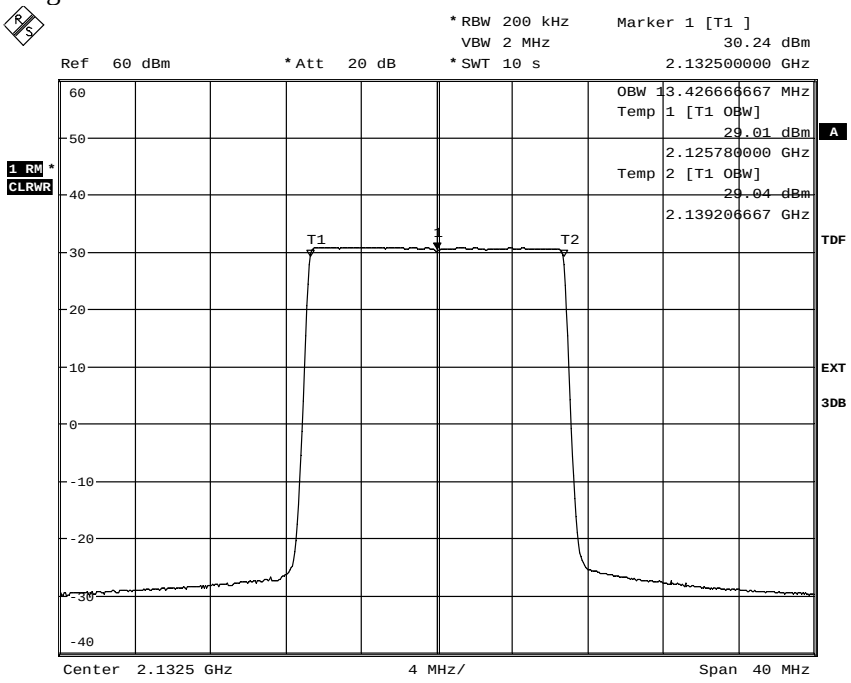
Diagram 6



Date: 30.SEP.2011 10:53:15

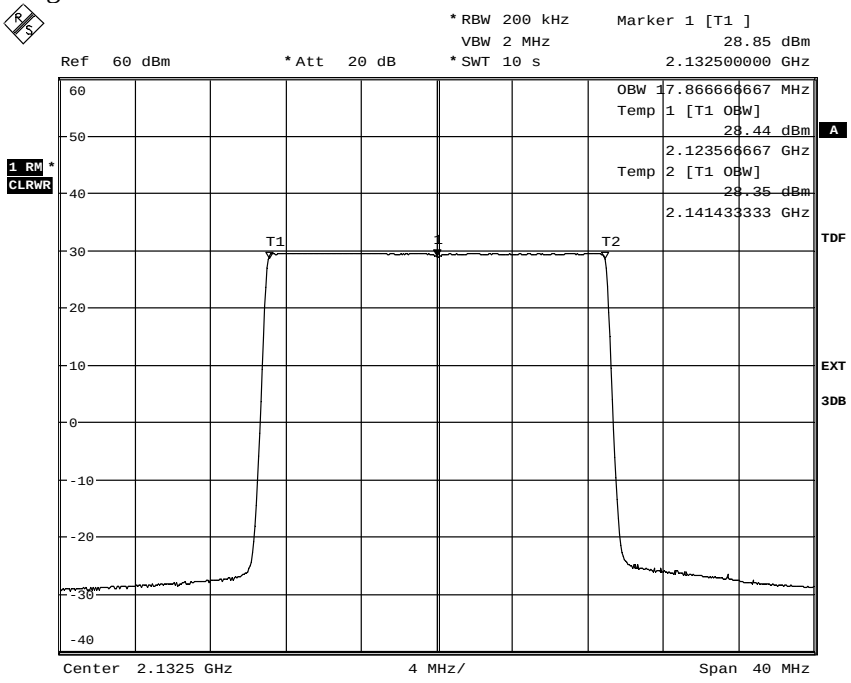
Appendix 3

Diagram 7



Date: 30.SEP.2011 10:47:17

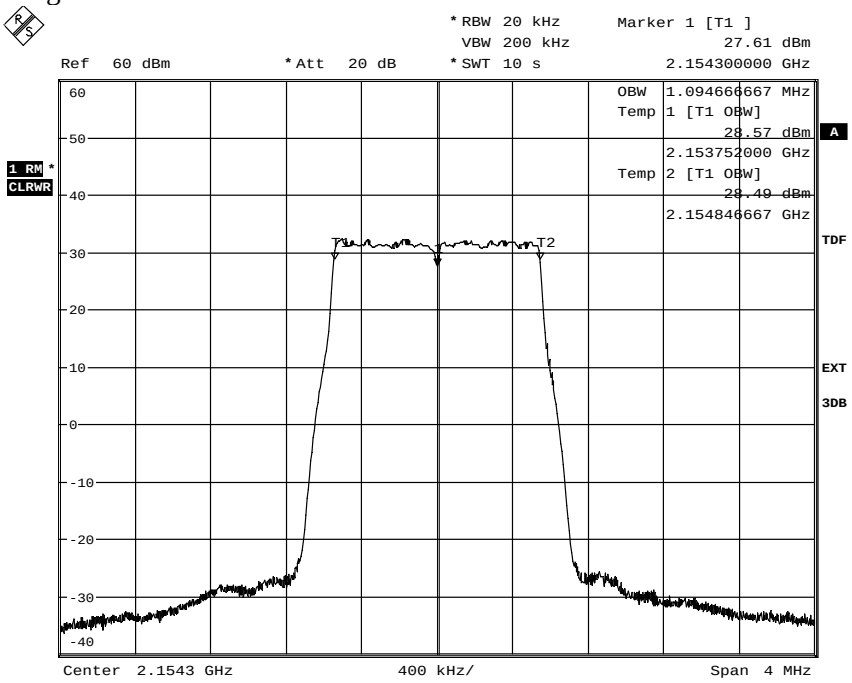
Diagram 8



Date: 30.SEP.2011 10:41:10

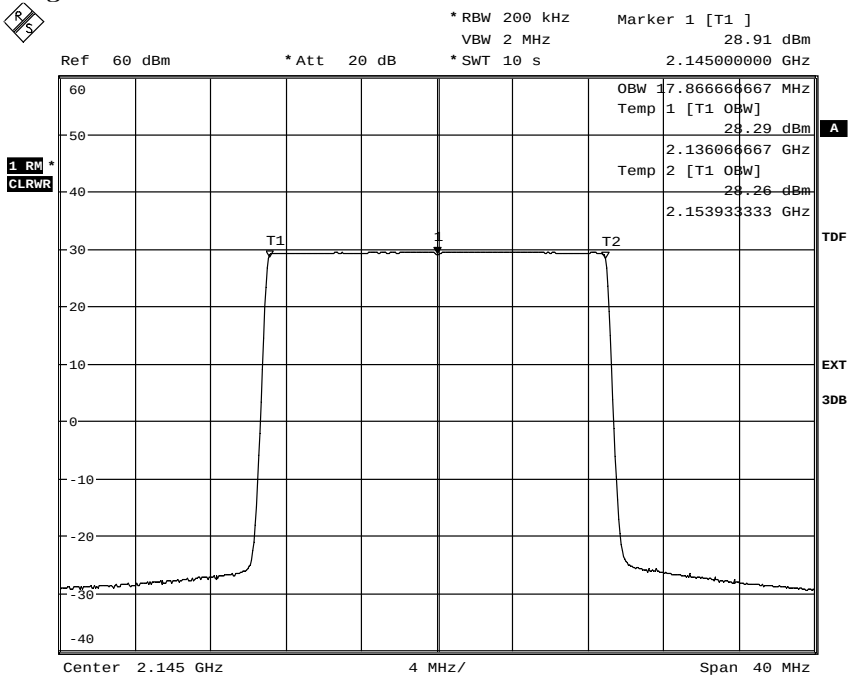
Appendix 3

Diagram 9



Date: 30.SEP.2011 10:21:39

Diagram 10



Date: 30.SEP.2011 10:28:34

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

Date	Temperature	Humidity
2011-12-09	23 °C ± 3 °C	23 % ± 5 %
2011-12-10	23 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

Tested revision state R1D.

The measurements were made per definition in §27.53(h). The test object was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

The FCC rules, specifying a RBW of at least 1% of the fundamental emission bandwidth up to 1 MHz away from the band edges and a RBW of 1 MHz for measurements of emissions more than 1 MHz away from the band edges.

In cases where a smaller RBW was used than that specified by the rules, the limit was adjusted to compensate for the reduced RBW. In the frequency range up to 1 MHz away from the band edges the measured values of the emission bandwidth reported below were used for the calculation of the limit.

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
1.4 MHz	1.120	10 kHz	-13.49
3 MHz	2.733	10 kHz	-17.37
5 MHz	4.540	30 kHz	-14.80
10 MHz	9.053	100 kHz	-
15 MHz	13.627	200 kHz	-
20 MHz	18.093	200 kHz	-

In the frequency ranges 2104 to 2109 and 2156-2161 MHz a RBW of 200 kHz were used instead of 1 MHz, in this case the limit has been adjusted to -20 dBm. In cases when a complementary channel power measurement has been made, -13 dBm limit apply for those results.

Measurement equipment	SP number
R&S FSQ	504 143
RF attenuator	504 159
Testo 615 temperature and humidity meter	503 498

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration	Tested frequency
1 a+b+c	1.4 MHz	B
2 a+b+c	3 MHz	B
3 a+b+c	5 MHz	B
4 a+b+c	10 MHz	B
5 a+b+c	15 MHz	B
6 a+b+c	20 MHz	B
7 a+b+c	1.4 MHz	T
8 a+b+c	3 MHz	T
9 a+b+c	5 MHz	T
10 a+b+c	10 MHz	T
11 a+b+c	15 MHz	T
12 a+b+c	20 MHz	T

Limits

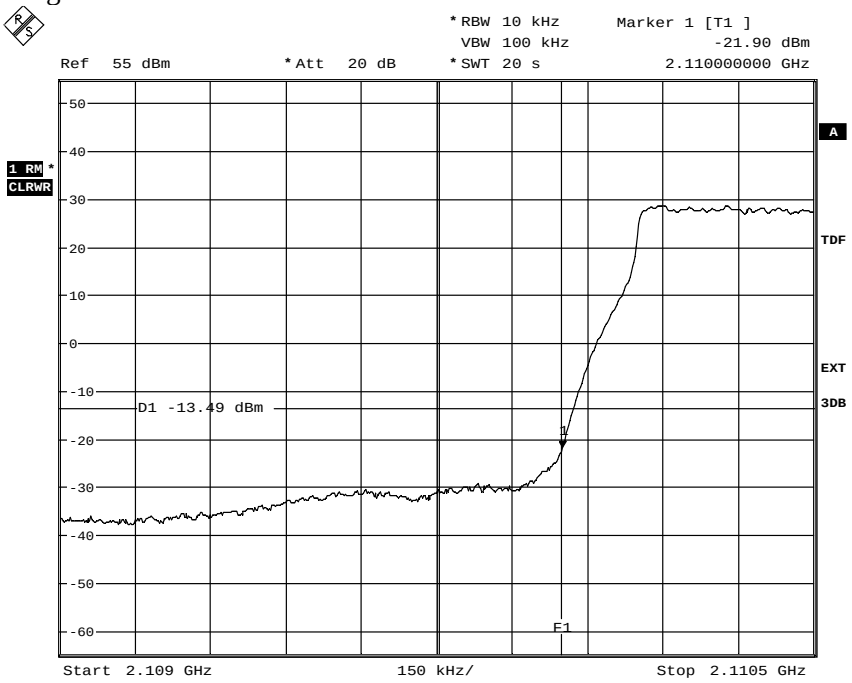
CFR 47 §27.53(h) and RSS-139 6.5

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

Complies?	Yes

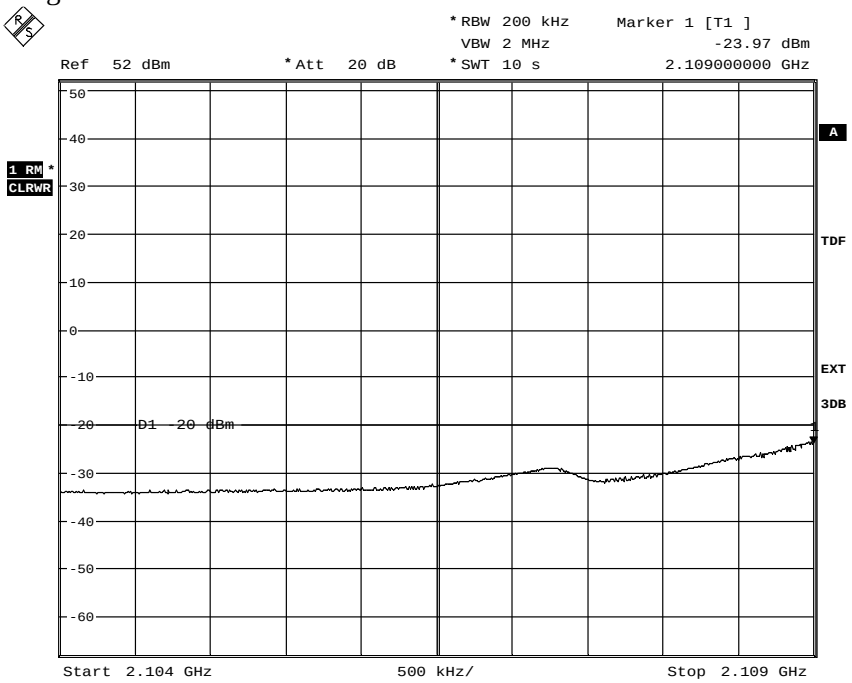
Appendix 4

Diagram 1 a



Date: 9.DEC.2011 14:13:04

Diagram 1 b

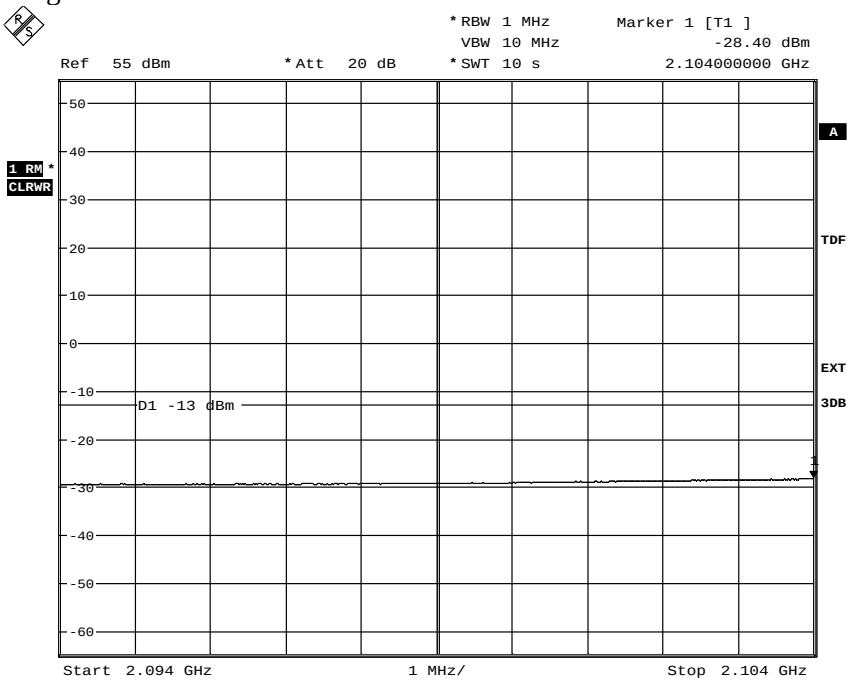


Date: 9.DEC.2011 14:40:34

The emission at 2109 MHz was -17.34 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

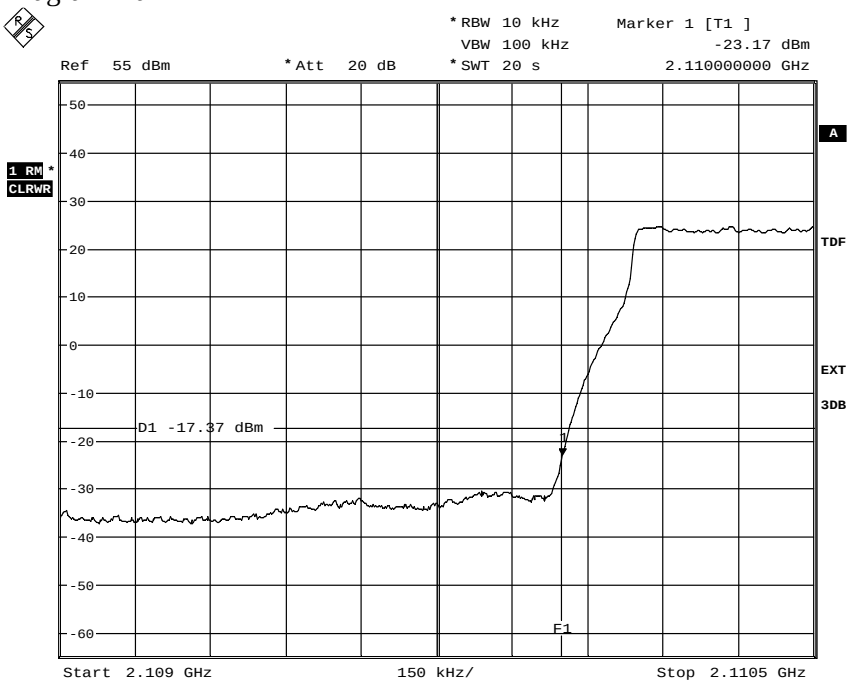
Diagram 1 c



Date: 9.DEC.2011 15:28:20

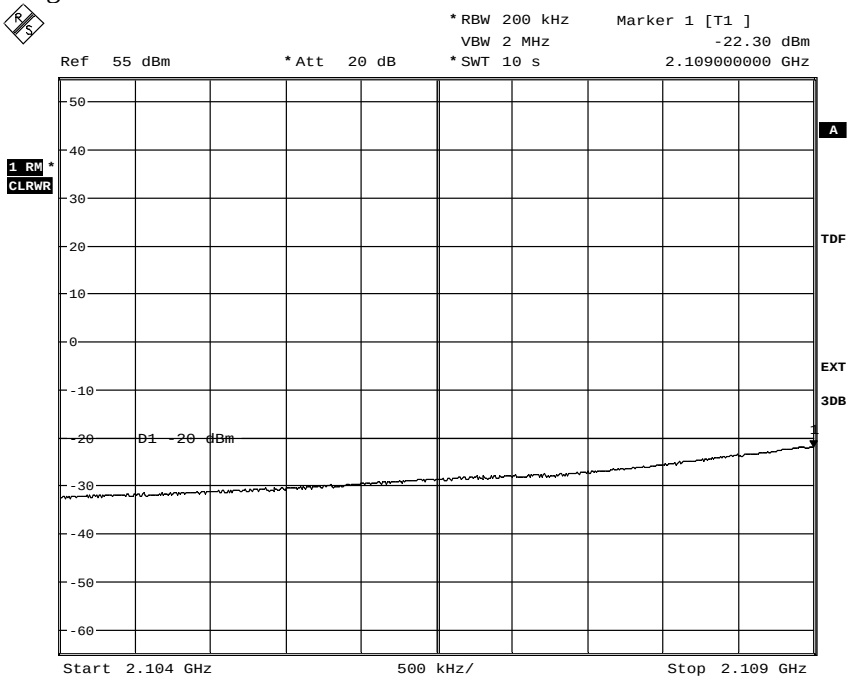
Appendix 4

Diagram 2 a



Date: 9.DEC.2011 13:40:29

Diagram 2 b

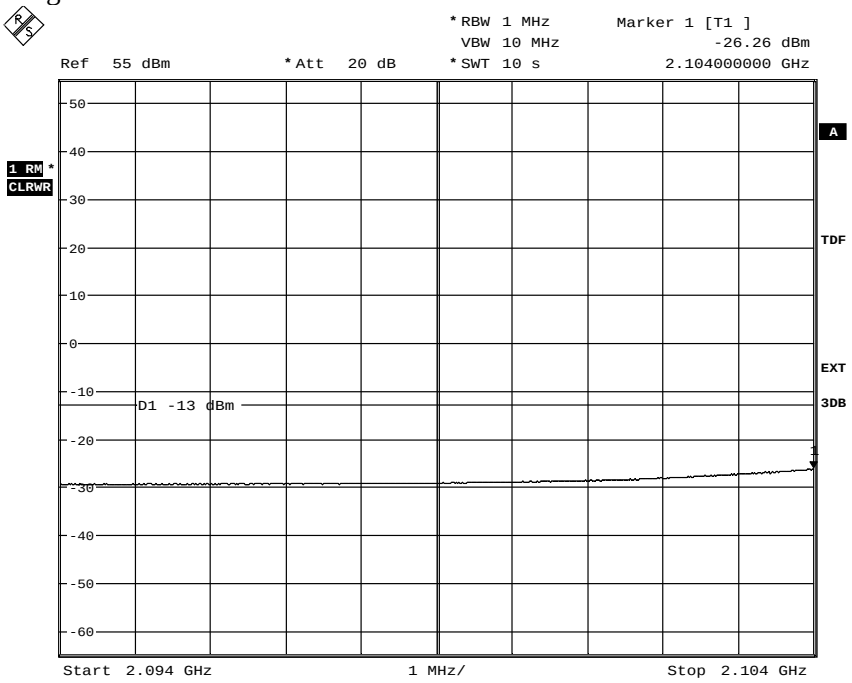


Date: 9.DEC.2011 13:27:56

The emission at 2109 MHz was -16.30 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

Diagram 2 c



Date: 9.DEC.2011 13:48:56

Appendix 4

Diagram 3 a

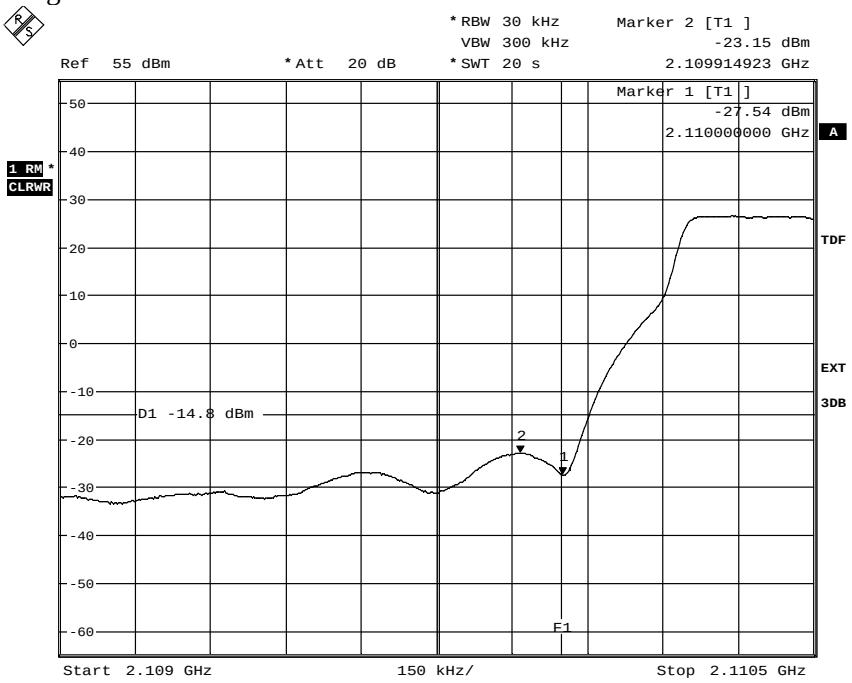


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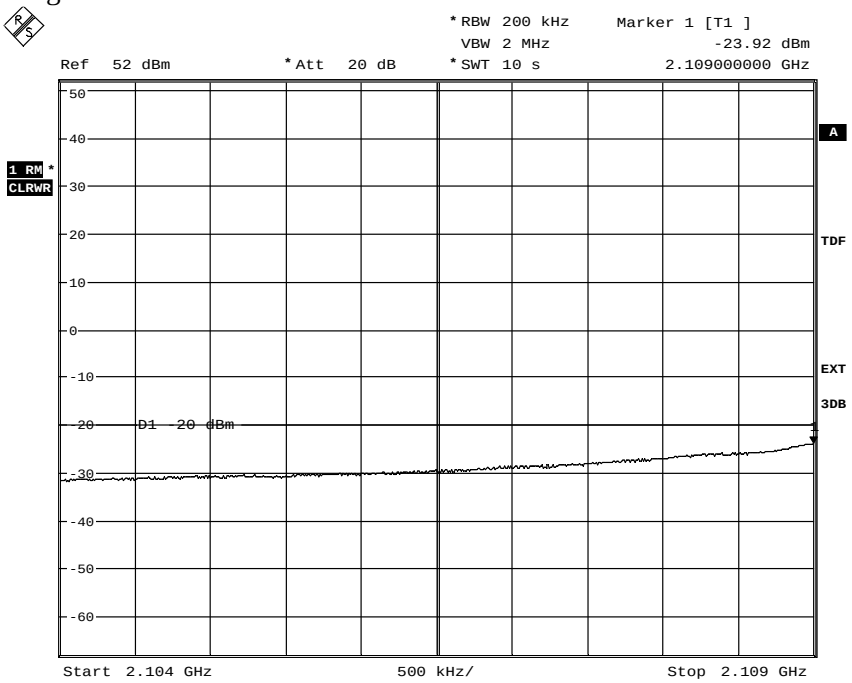
Diagram 3 b

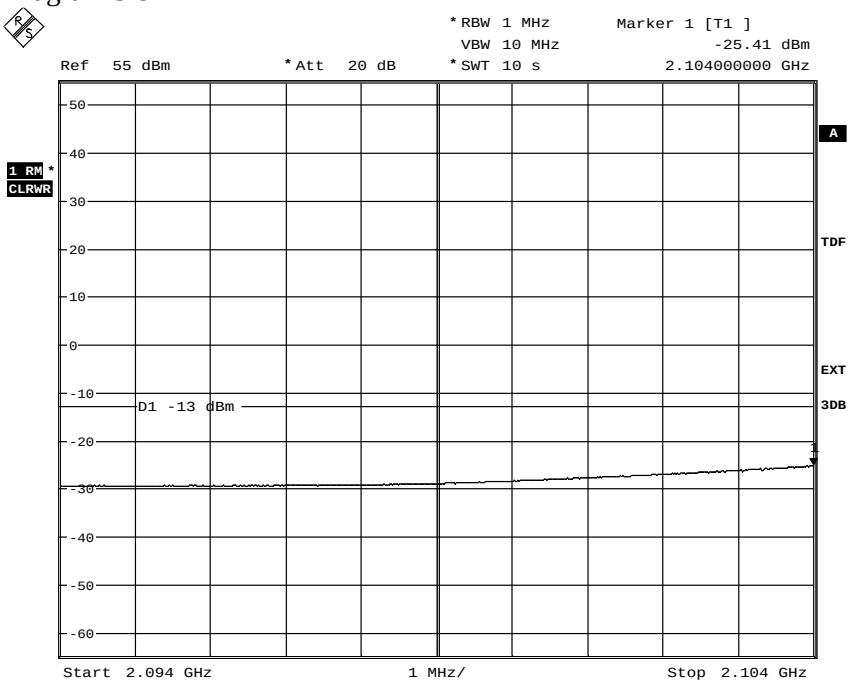


Date: 9.DEC.2011 15:59:24

The emission at 2109 MHz was -18.02 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

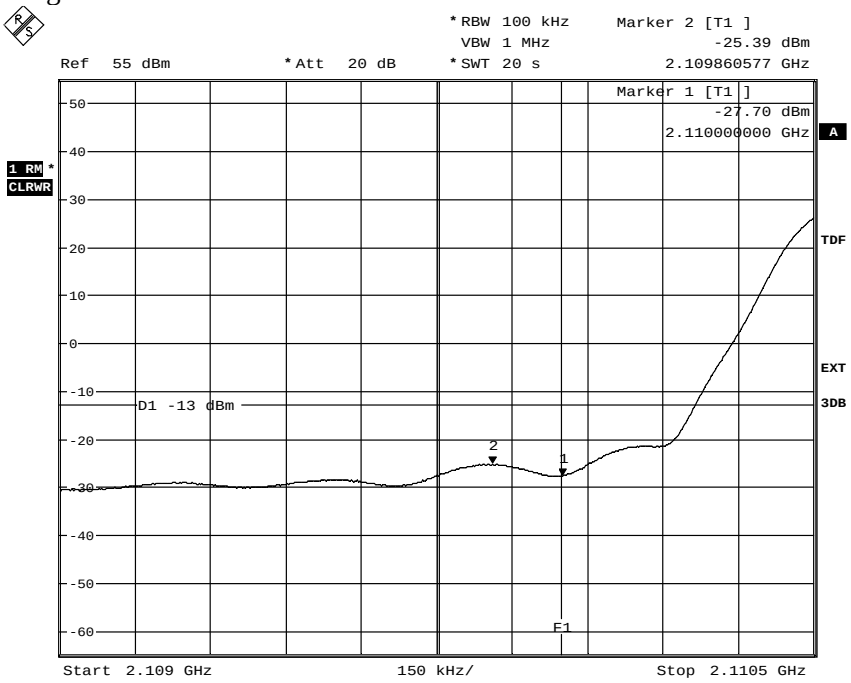
Diagram 3 c



Date: 9.DEC.2011 15:58:02

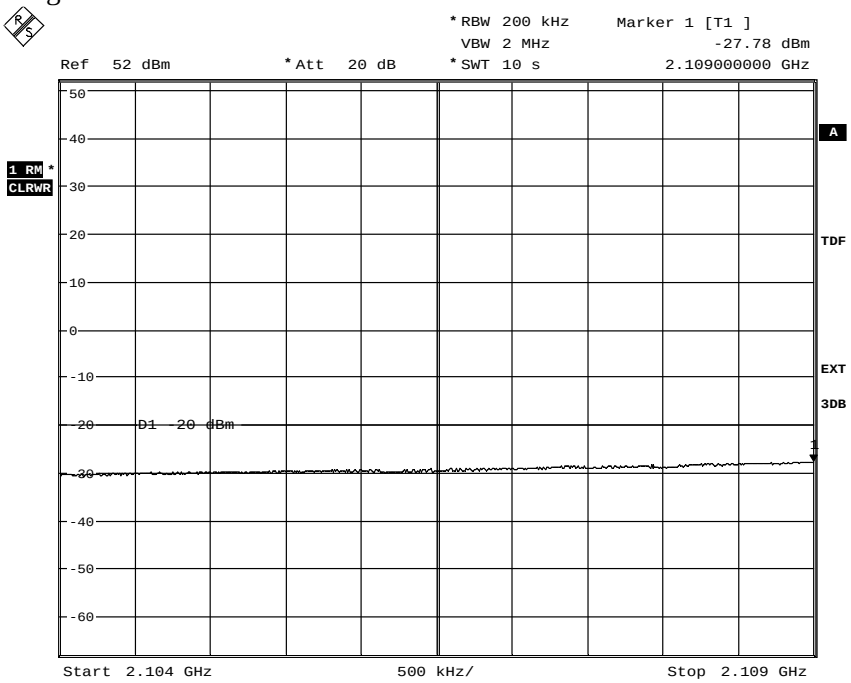
Appendix 4

Diagram 4 a



Date: 9.DEC.2011 17:19:06

Diagram 4 b

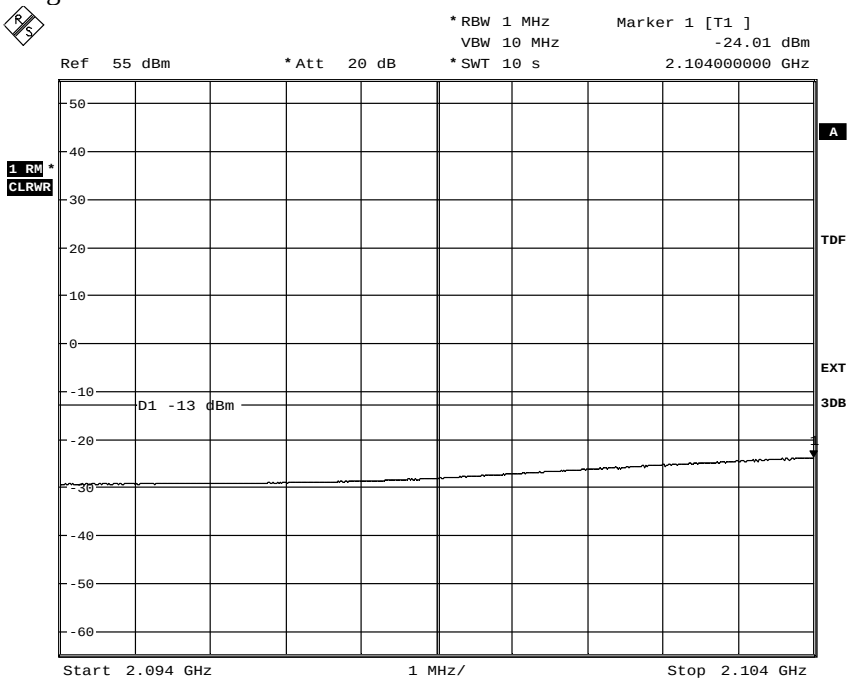


Date: 9.DEC.2011 17:21:48

The emission at 2109 MHz was -21.37 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

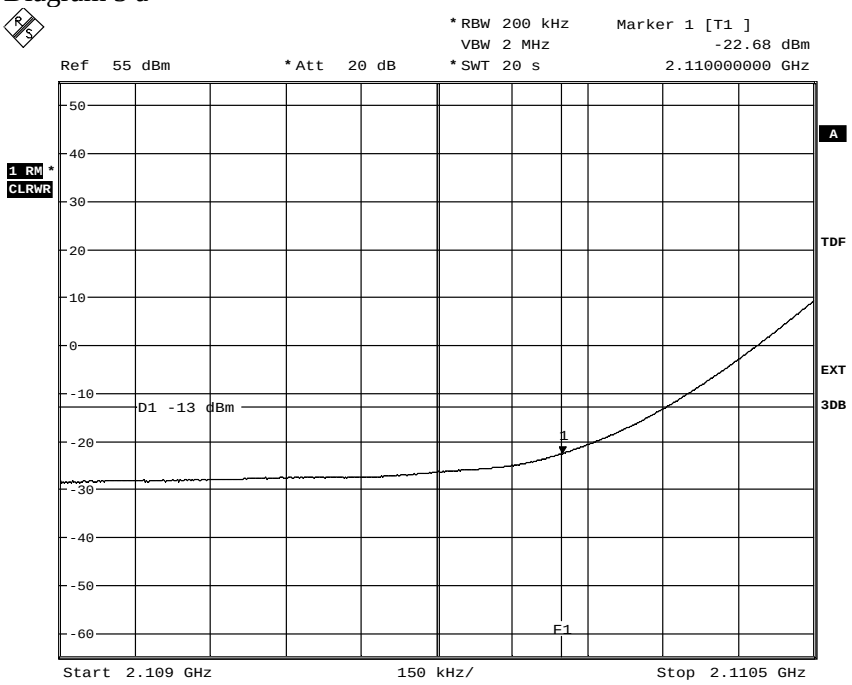
Diagram 4 c



Date: 9.DEC.2011 17:22:56

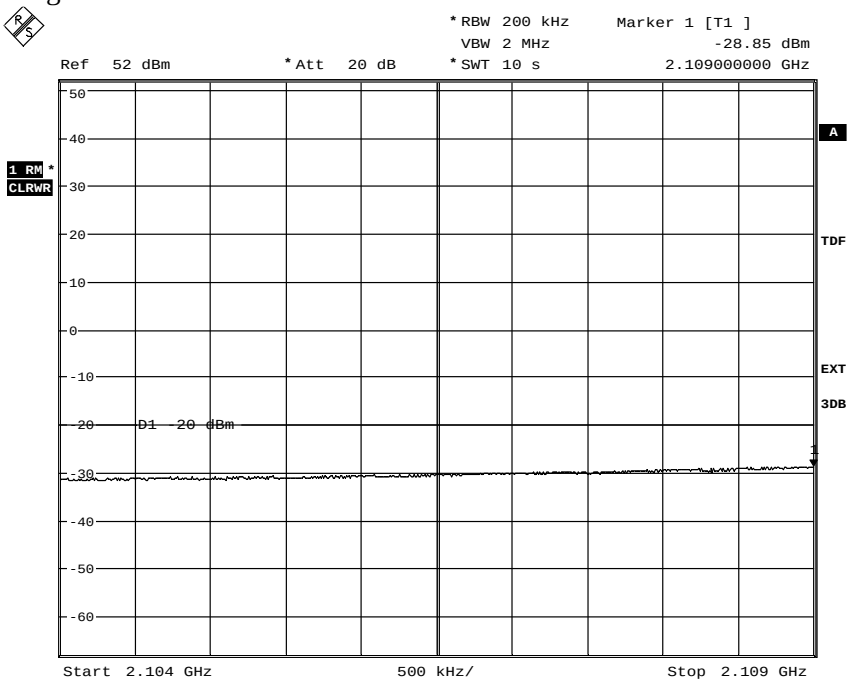
Appendix 4

Diagram 5 a



Date: 10.DEC.2011 10:31:00

Diagram 5 b

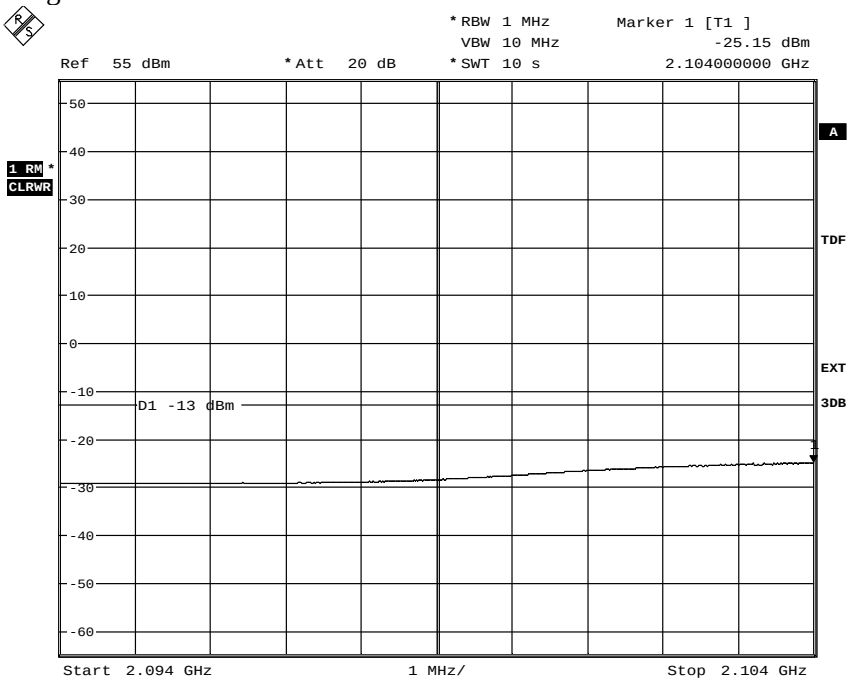


Date: 10.DEC.2011 10:34:57

The emission at 2109 MHz was -22.65 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

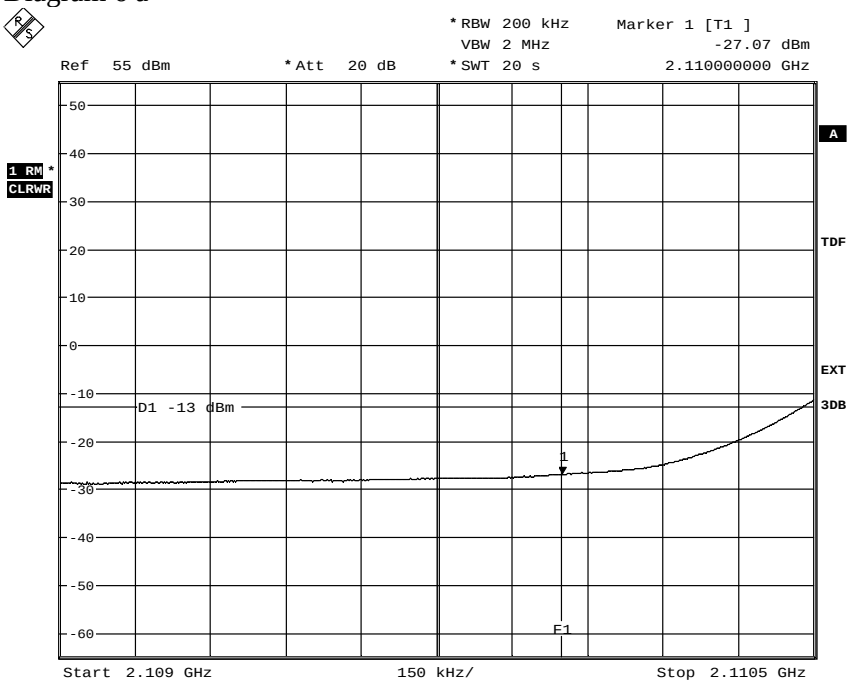
Diagram 5 c



Date: 10.DEC.2011 10:36:34

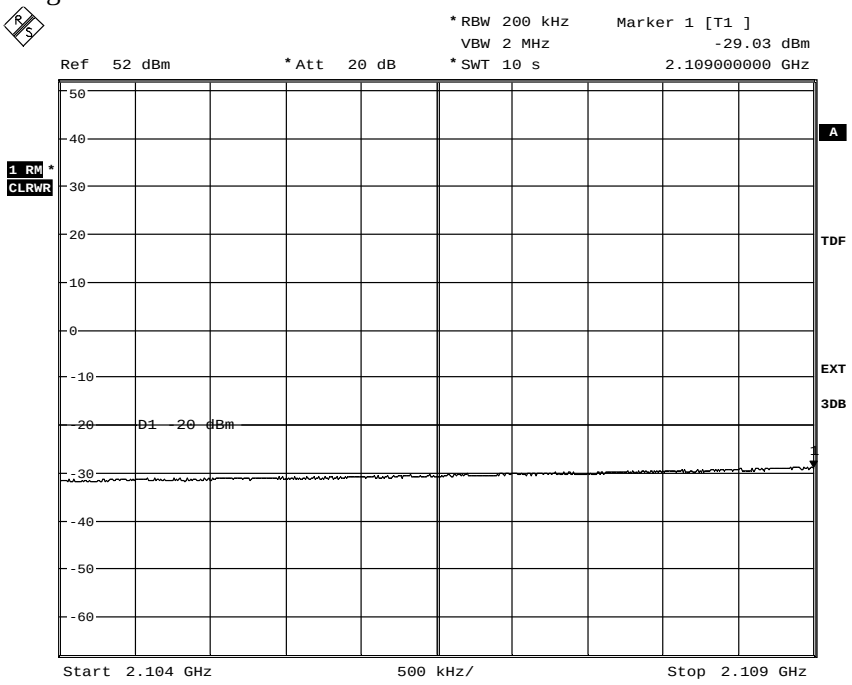
Appendix 4

Diagram 6 a



Date: 10.DEC.2011 10:50:47

Diagram 6 b

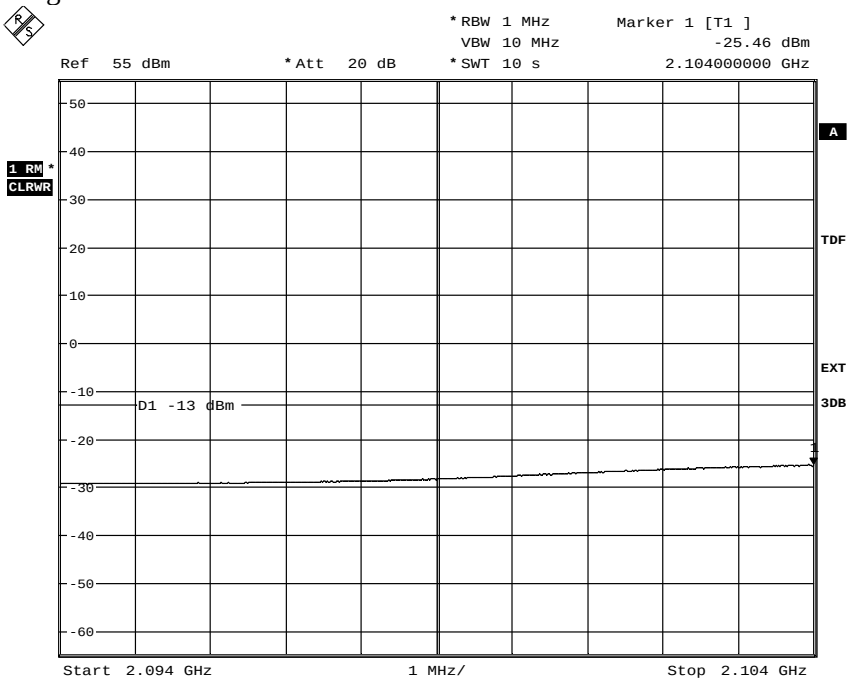


Date: 10.DEC.2011 10:52:39

The emission at 2109 MHz was -22.54 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

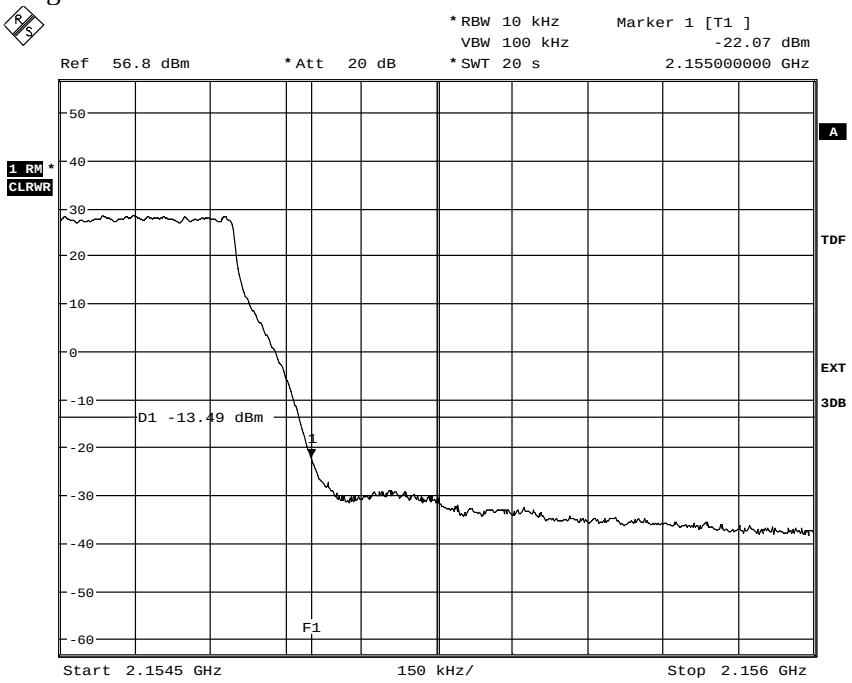
Diagram 6 c



Date: 10.DEC.2011 10:54:45

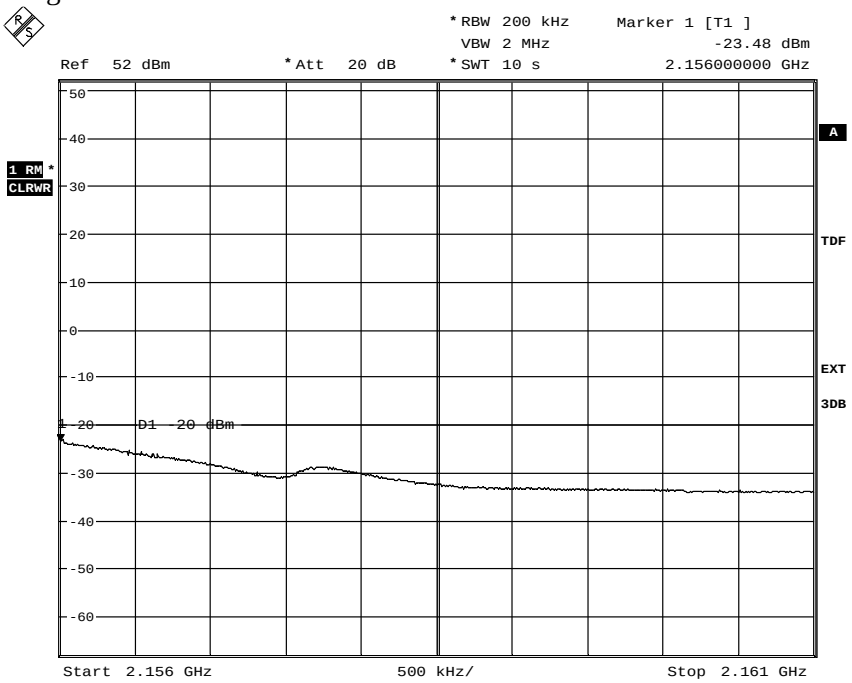
Appendix 4

Diagram 7 a



Date: 9.DEC.2011 17:02:26

Diagram 7 b

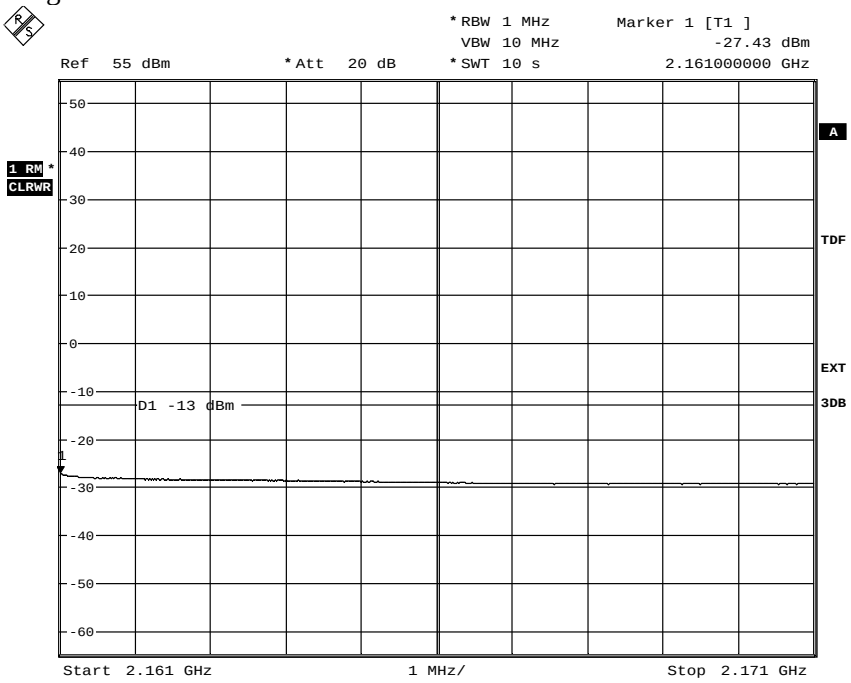


Date: 9.DEC.2011 17:04:15

The emission at 2156 MHz was -17.4 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

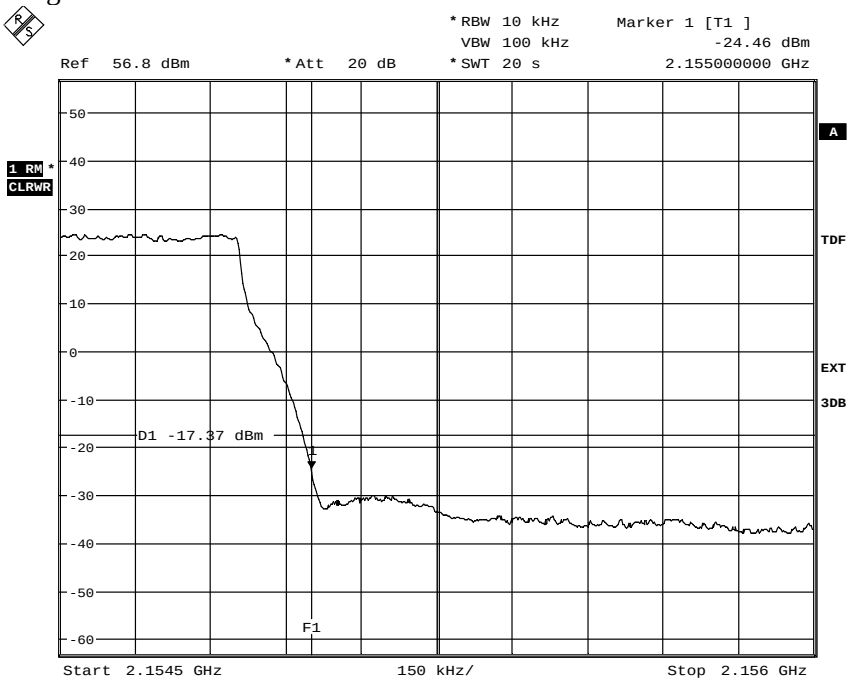
Diagram 7 c



Date: 9.DEC.2011 17:05:29

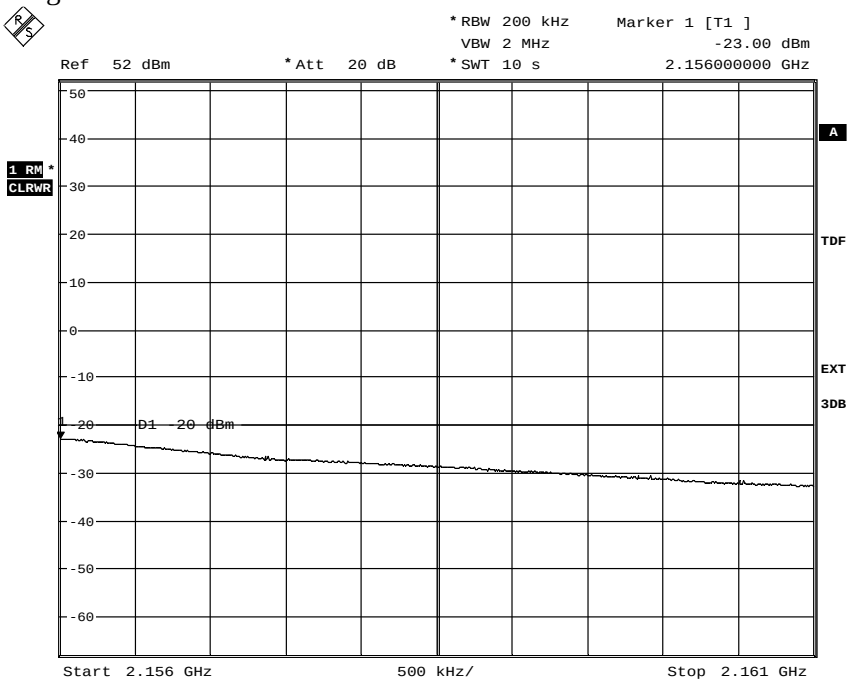
Appendix 4

Diagram 8 a



Date: 9.DEC.2011 16:52:39

Diagram 8 b

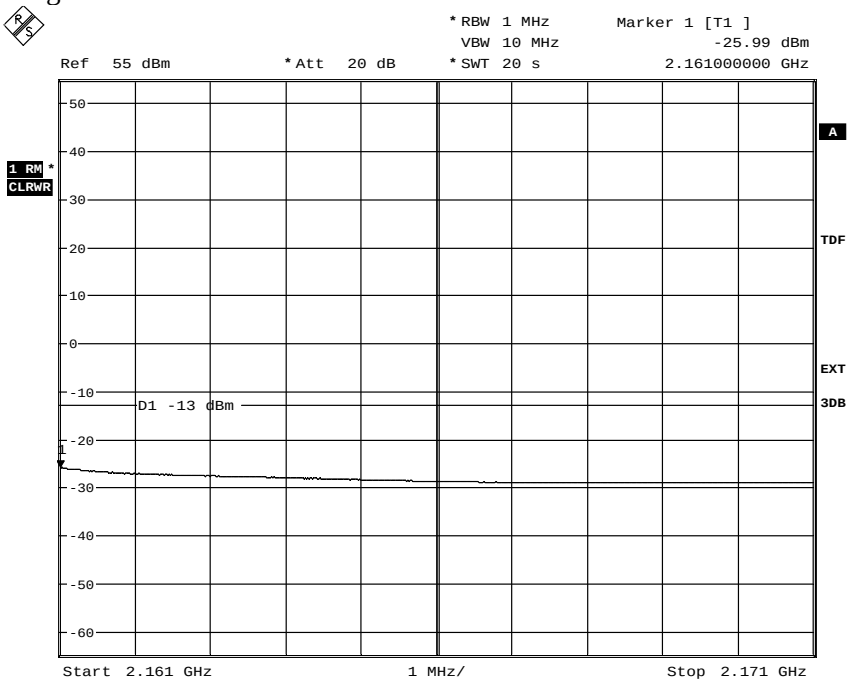


Date: 9.DEC.2011 16:47:53

The emission at 2156 MHz was -16.89 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

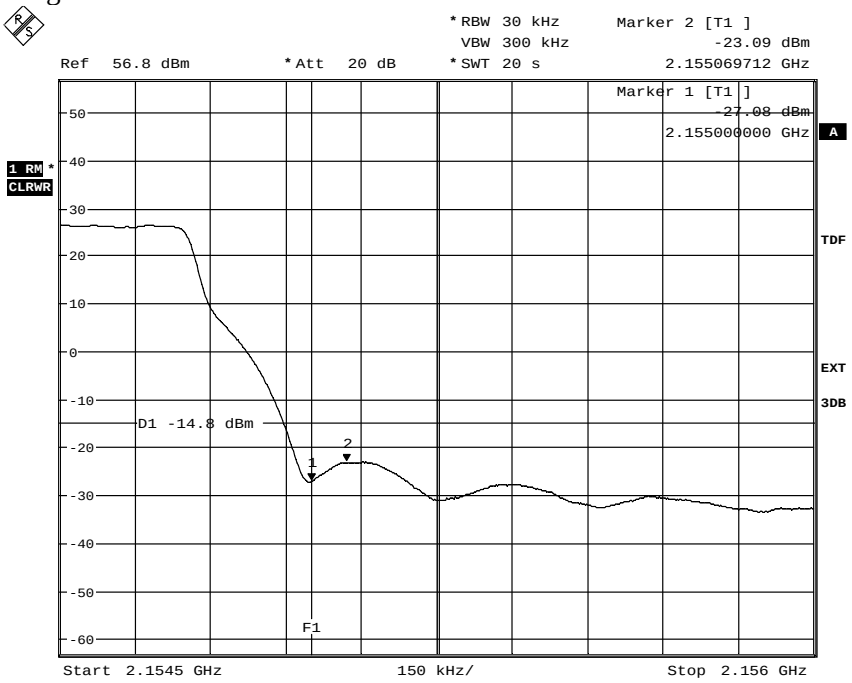
Diagram 8 c



Date: 3.OCT.2011 14:27:47

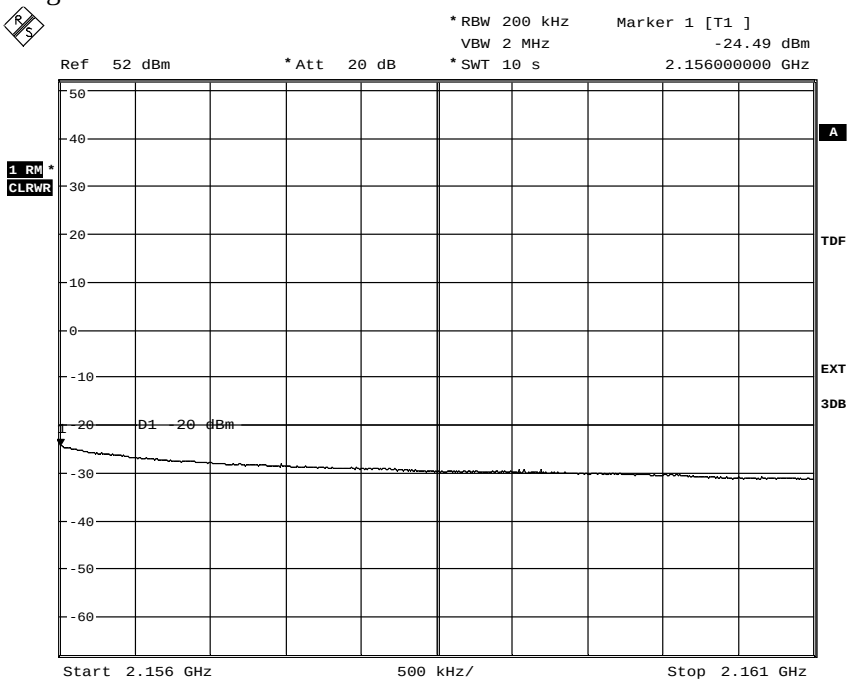
Appendix 4

Diagram 9 a



Date: 9.DEC.2011 16:32:40

Diagram 9 b

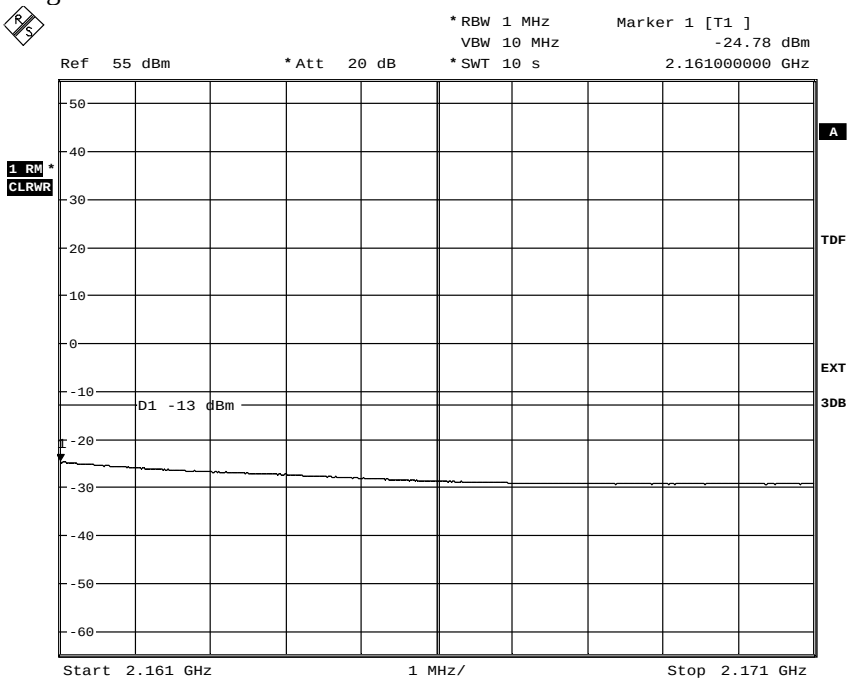


Date: 9.DEC.2011 16:34:41

The emission at 2156 MHz was -17.98 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

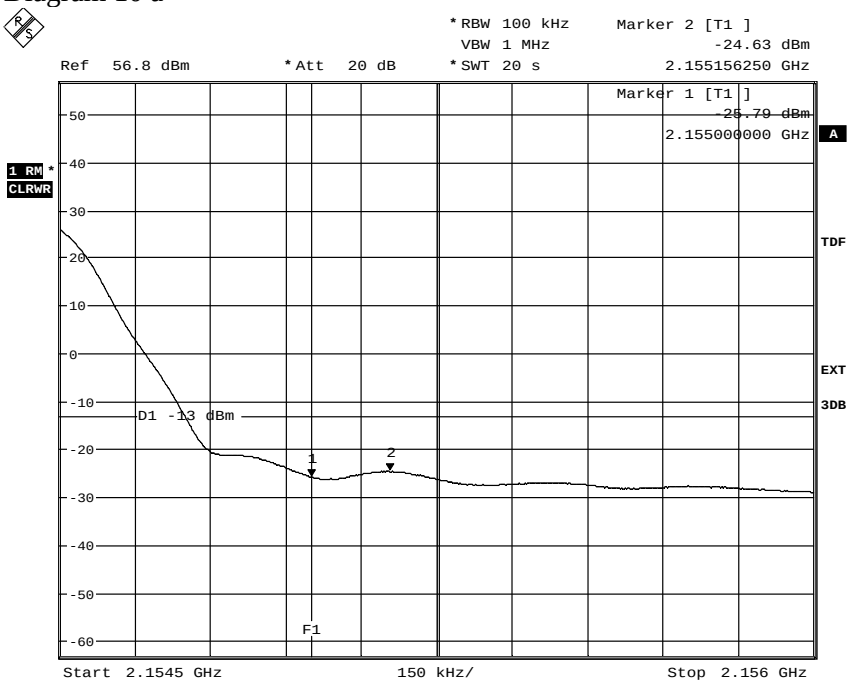
Diagram 9 c



Date: 9.DEC.2011 16:36:04

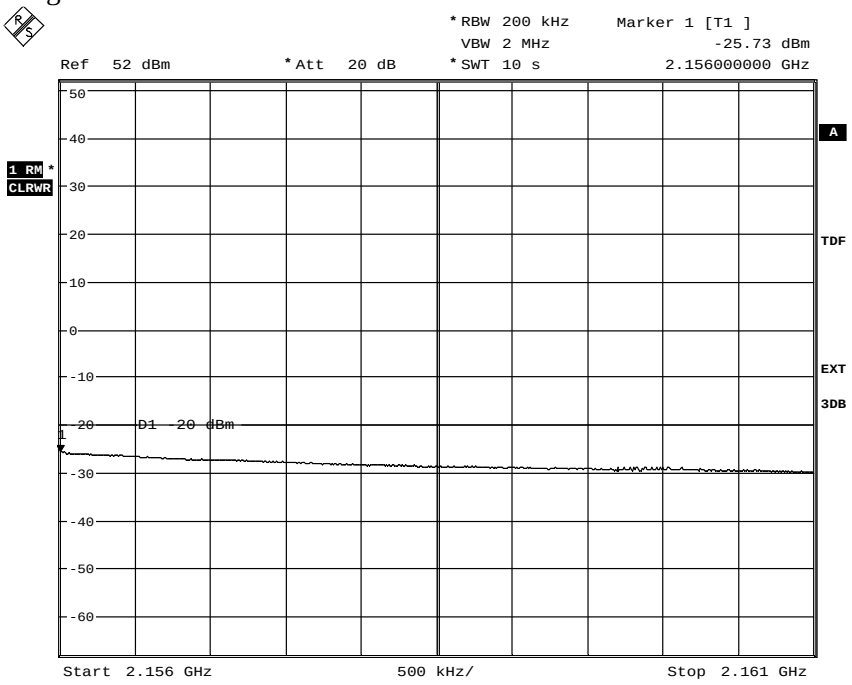
Appendix 4

Diagram 10 a



Date: 10.DEC.2011 09:58:25

Diagram 10 b

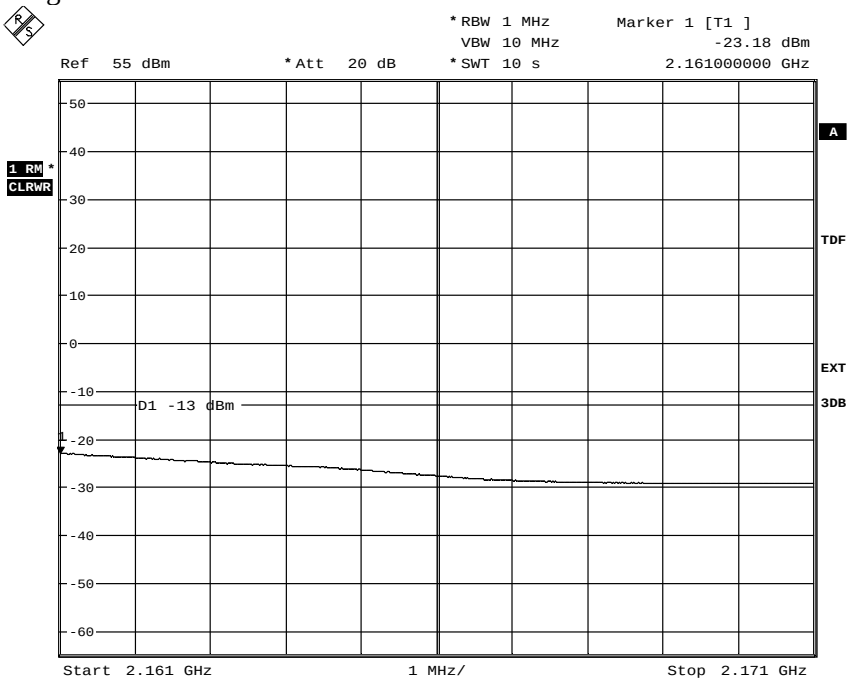


Date: 10.DEC.2011 10:01:13

The emission at 2156 MHz was -19.21 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

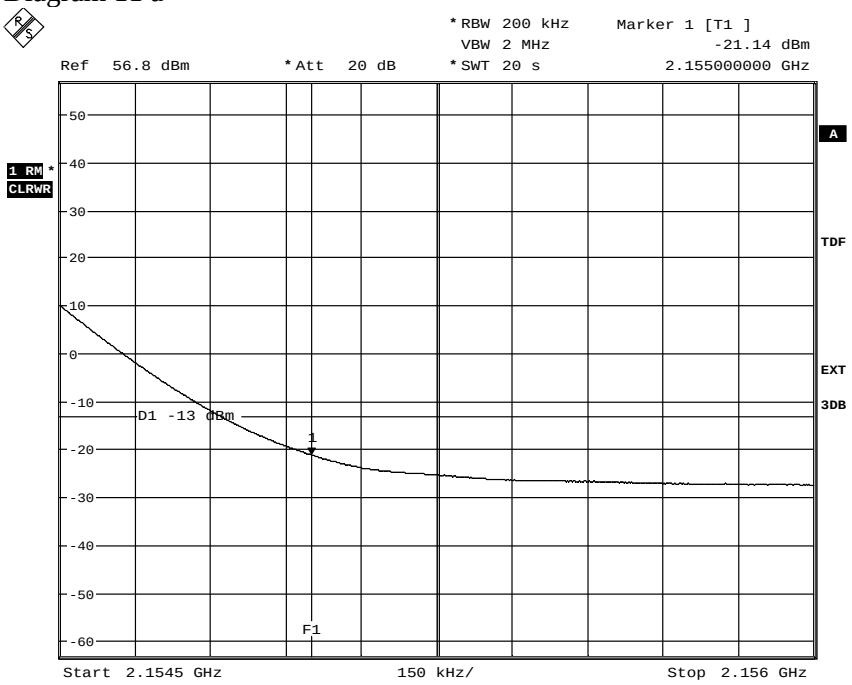
Diagram 10 c



Date: 10.DEC.2011 10:03:11

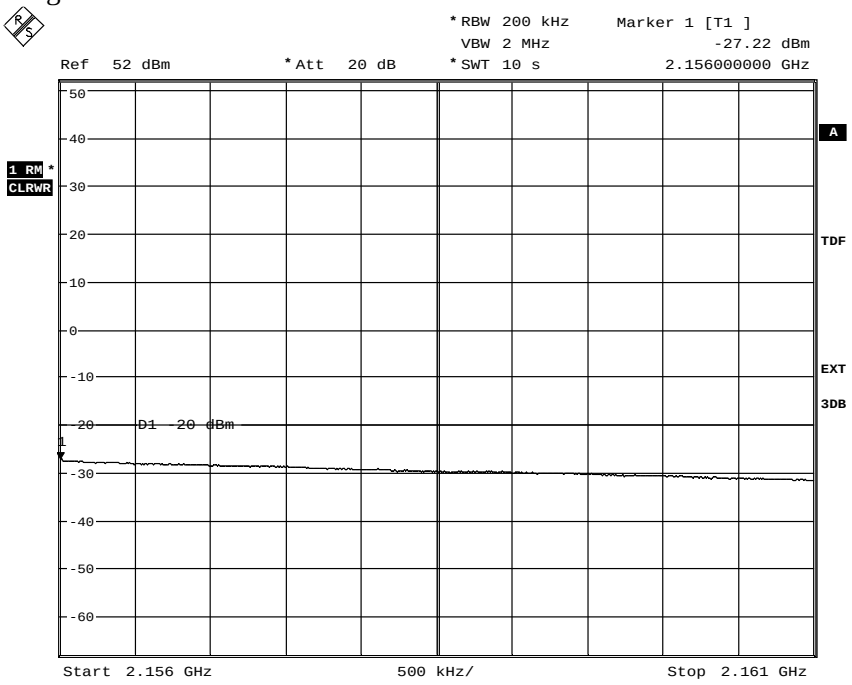
Appendix 4

Diagram 11 a



Date: 10.DEC.2011 10:21:36

Diagram 11 b

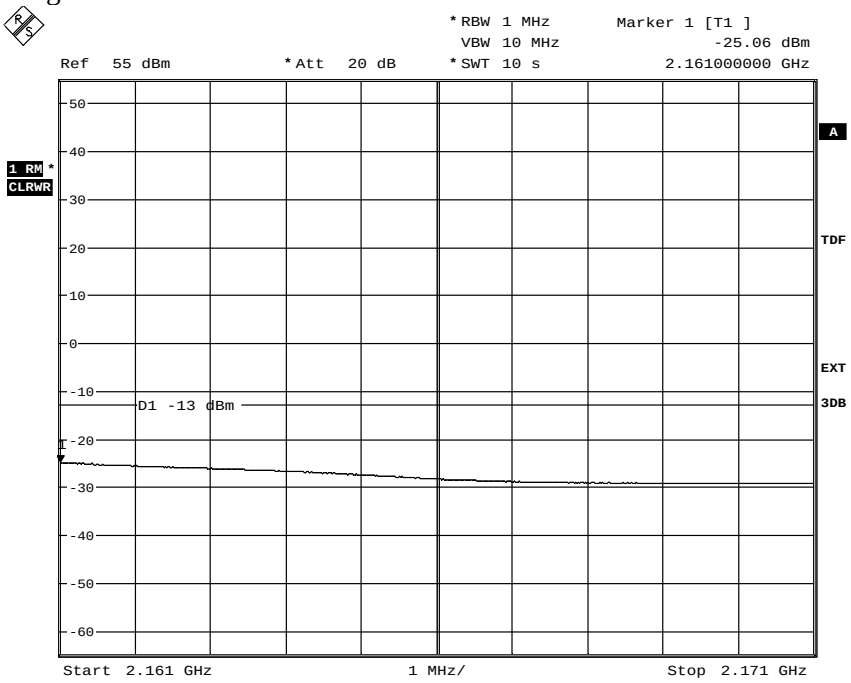


Date: 10.DEC.2011 10:19:18

The emission at 2156 MHz was -21.19 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

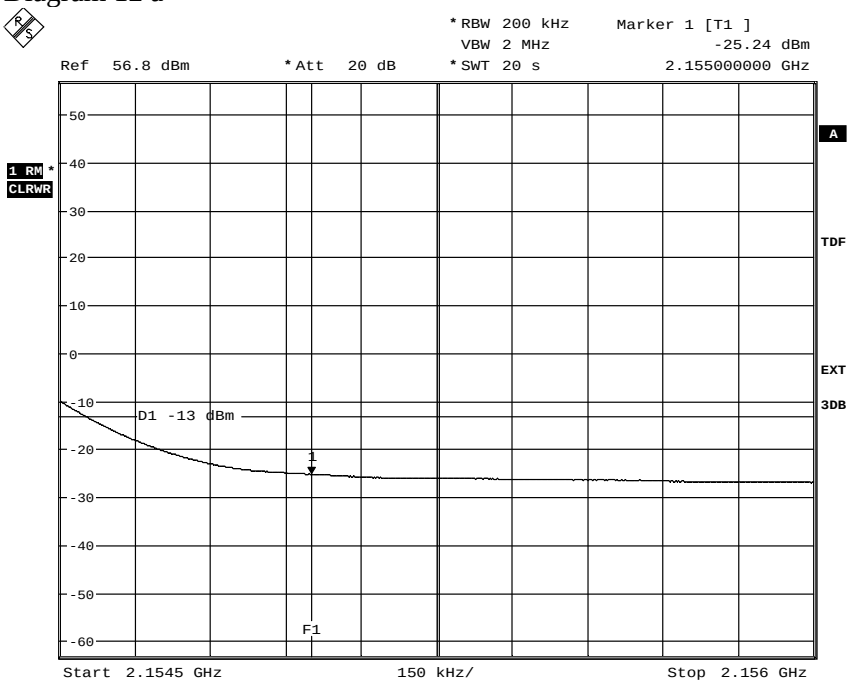
Diagram 11 c



Date: 10.DEC.2011 10:18:00

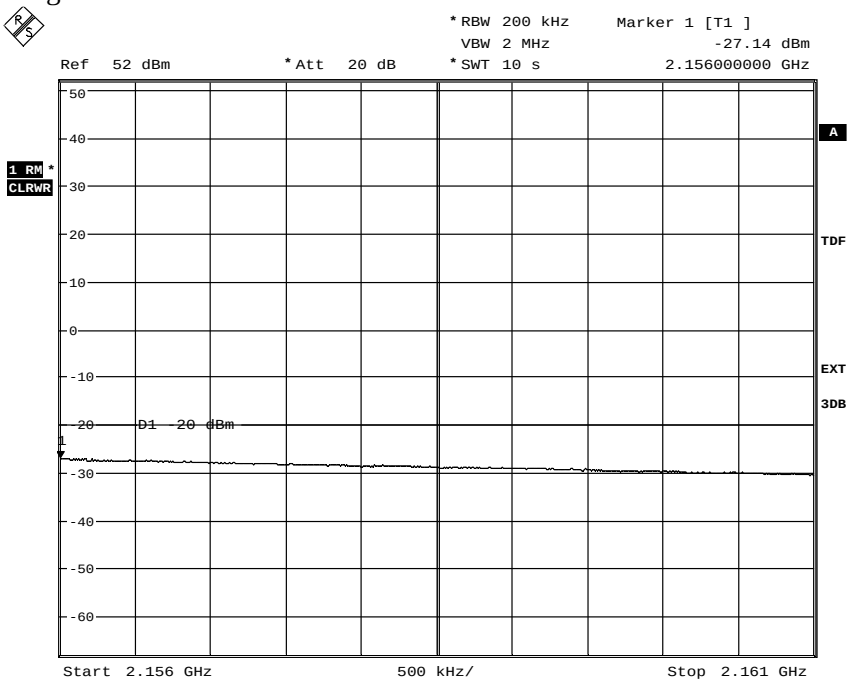
Appendix 4

Diagram 12 a



Date: 10.DEC.2011 11:35:42

Diagram 12 b

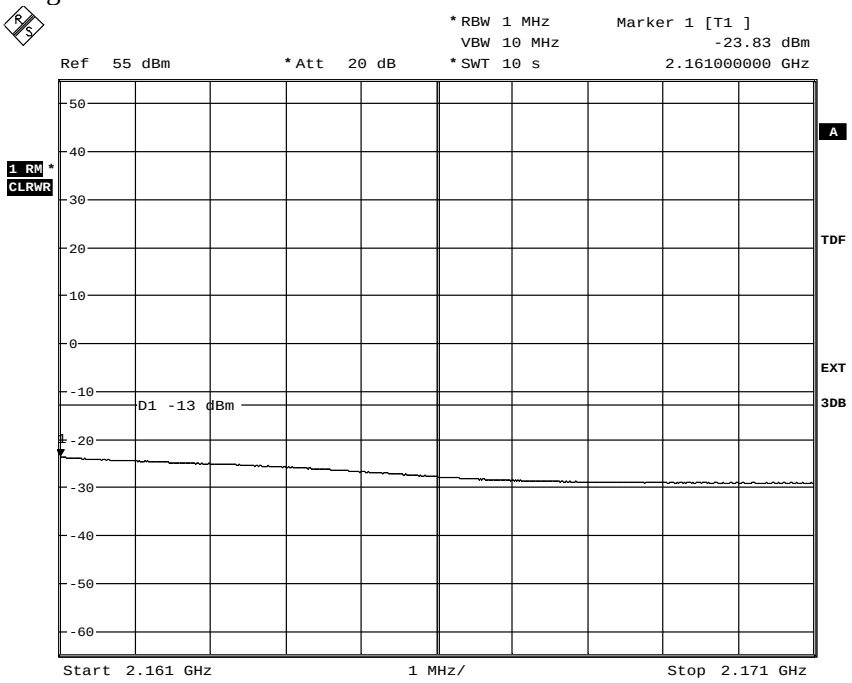


Date: 10.DEC.2011 11:42:42

The emission at 2156 MHz was -20.93 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

Diagram 12 c



Date: 10.DEC.2011 11:44:01

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

Date	Temperature	Humidity
2011-09-30 to 2011-10-04	21-22 °C ± 3 °C	56-59 % ± 5 %

Test set-up and procedure

Tested revision state R1A.

The measurements were made as defined in §27.53 (h). The output was connected to a spectrum analyzer. First a pre-measurement with activated peak detector was performed. Emissions close to or above the limit is measured with activated RMS detector and the RMS measurement result is noted. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSQ	504 143
High pass filter	504 200
RF attenuator	900 229
RF attenuator	900 260
RF attenuator	900 261
High pass filter	503 740
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Diagram	BW configuration / [MHz]	Tested frequency
1	1.4	B
2	20	B
3	1.4	M
4	3	M
5	5	M
6	10	M
7	15	M
8	20	M
9	1.4	T
10	20	T

Remark

The emission at 9 kHz on some plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through.

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to 10x2.5 GHz = 25 GHz for emission measurements.

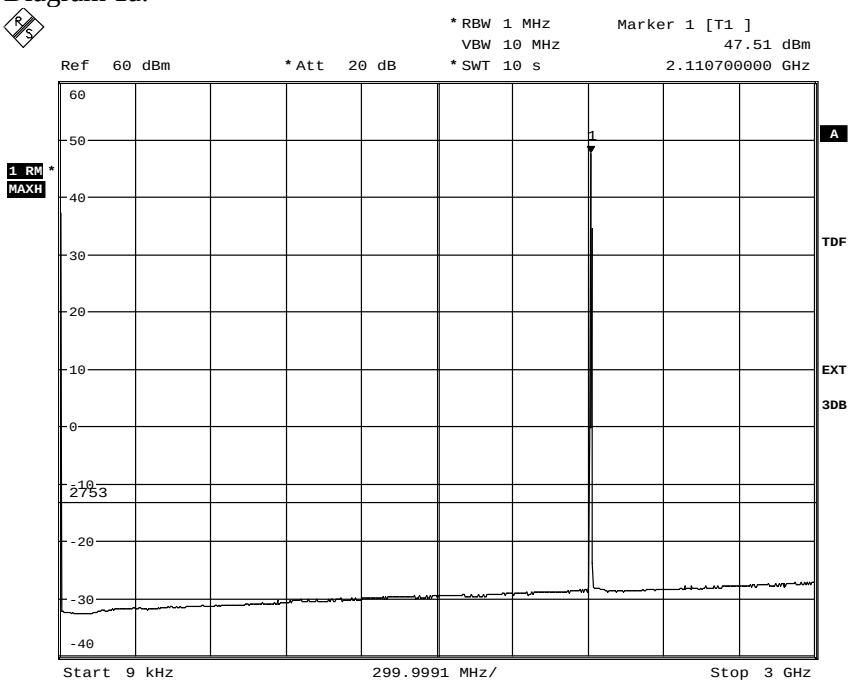
Limits

CFR 47 § 27.53 (h) and RSS-139 6.5:
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm per 1 MHz RBW.

Complies?	Yes

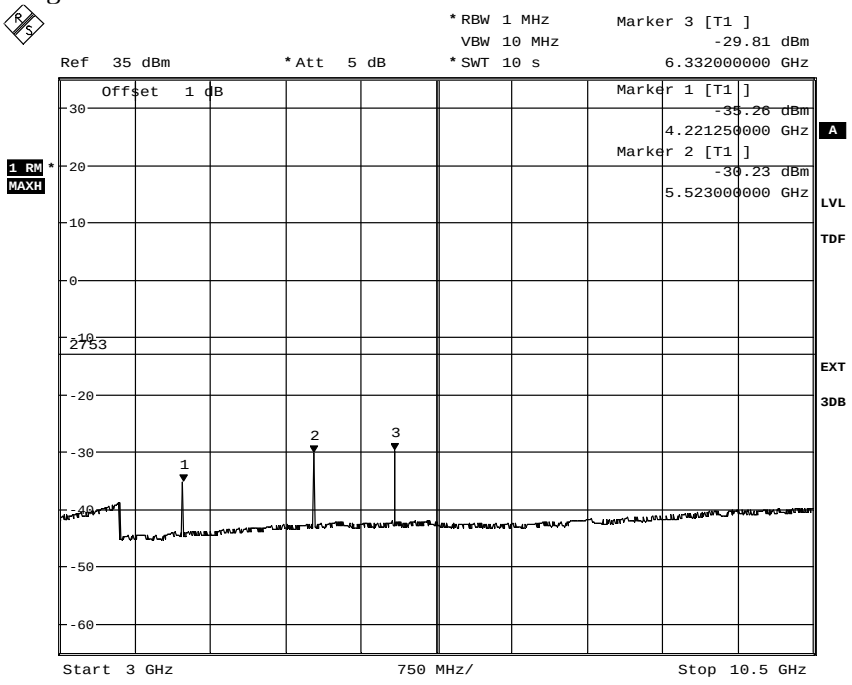
Appendix 5

Diagram 1a:



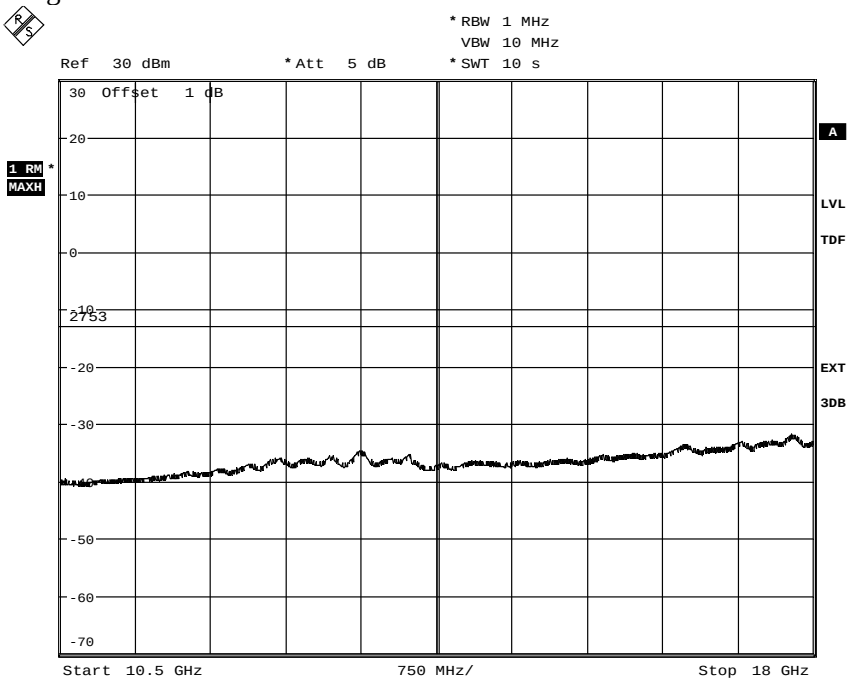
Date: 30.SEP.2011 12:48:06

Diagram 1b:



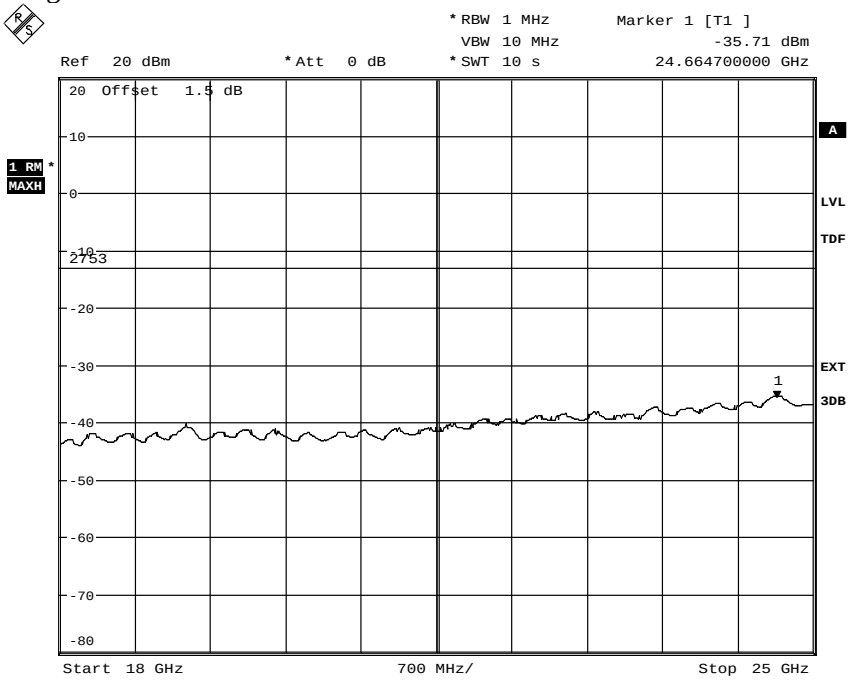
Date: 30.SEP.2011 13:20:26

Diagram 1c:



Date: 30.SEP.2011 13:21:40

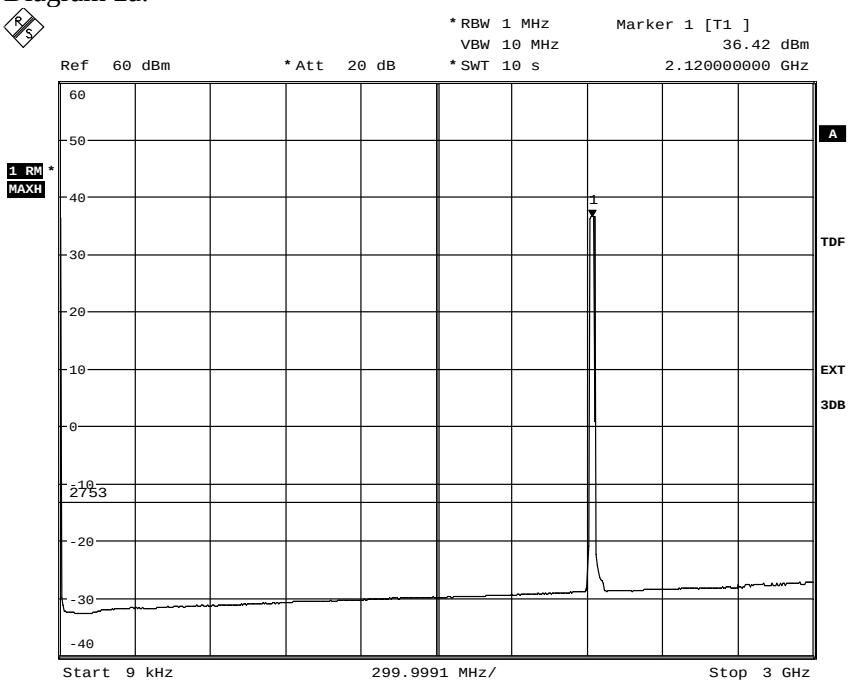
Diagram 1d:



Date: 4.OCT.2011 07:13:43

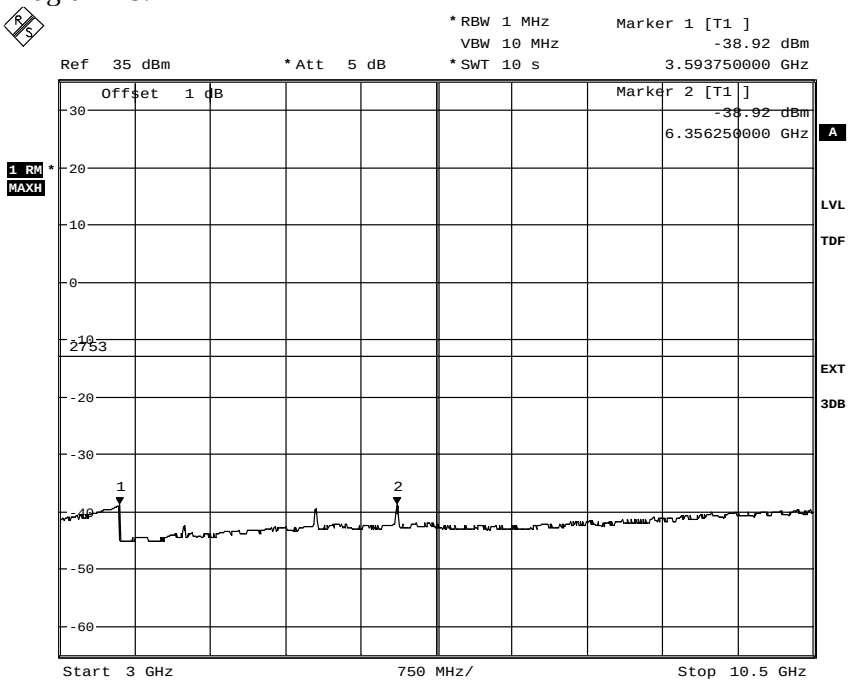
Appendix 5

Diagram 2a:



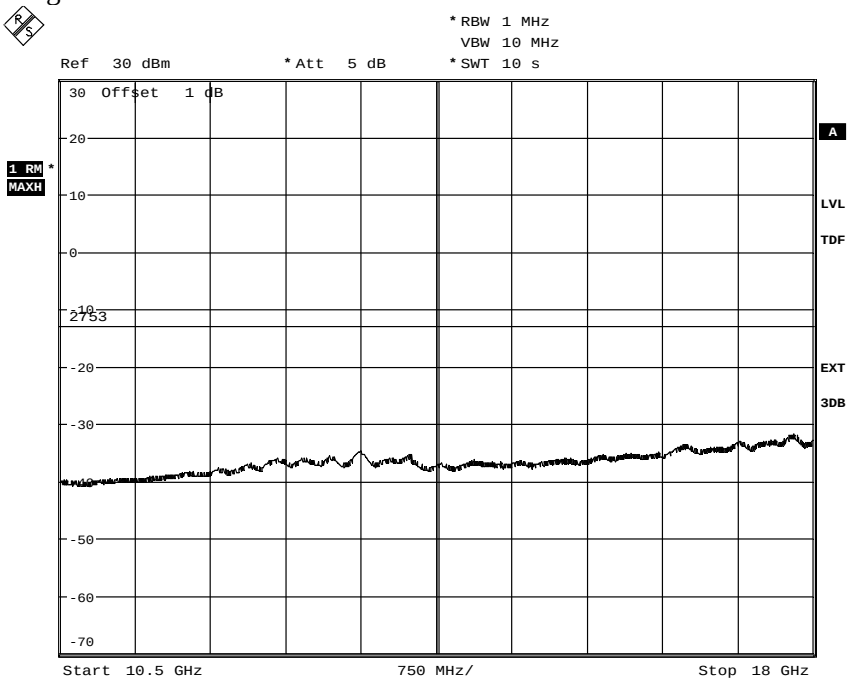
Date: 3.OCT.2011 11:58:26

Diagram 2b:



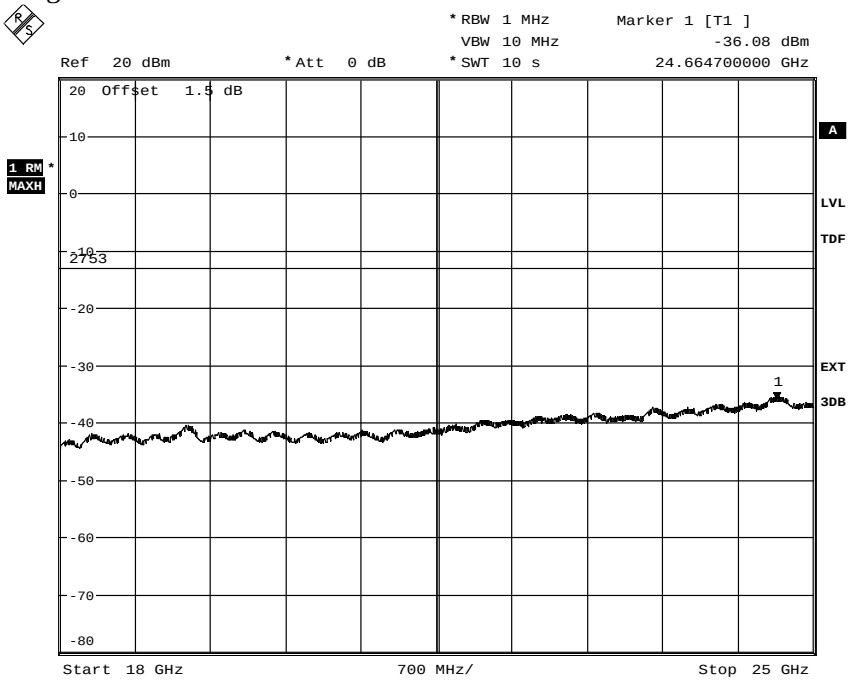
Date: 3.OCT.2011 12:09:19

Diagram 2c:



Date: 3.OCT.2011 12:10:26

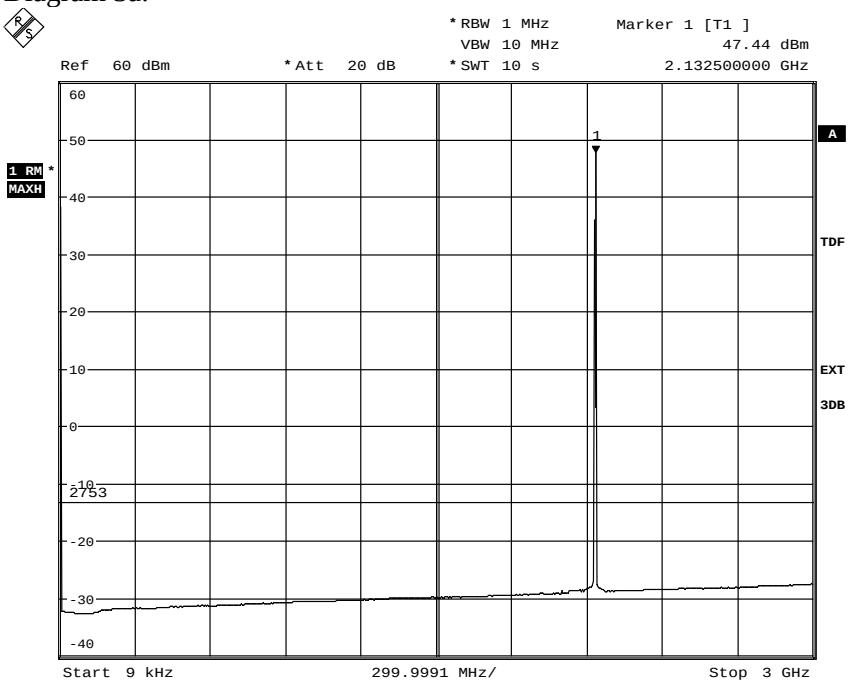
Diagram 2d:



Date: 4.OCT.2011 07:39:41

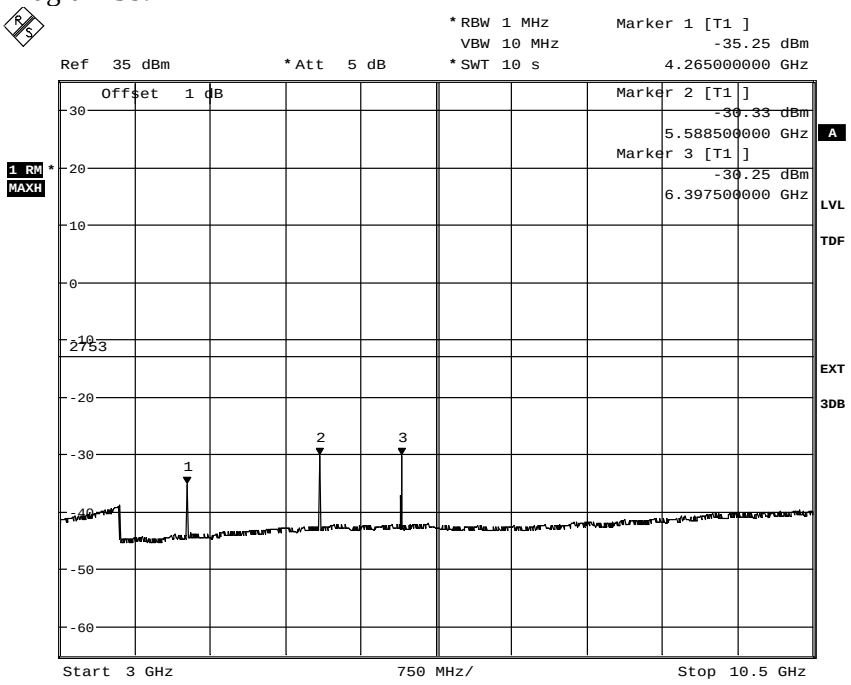
Appendix 5

Diagram 3a:



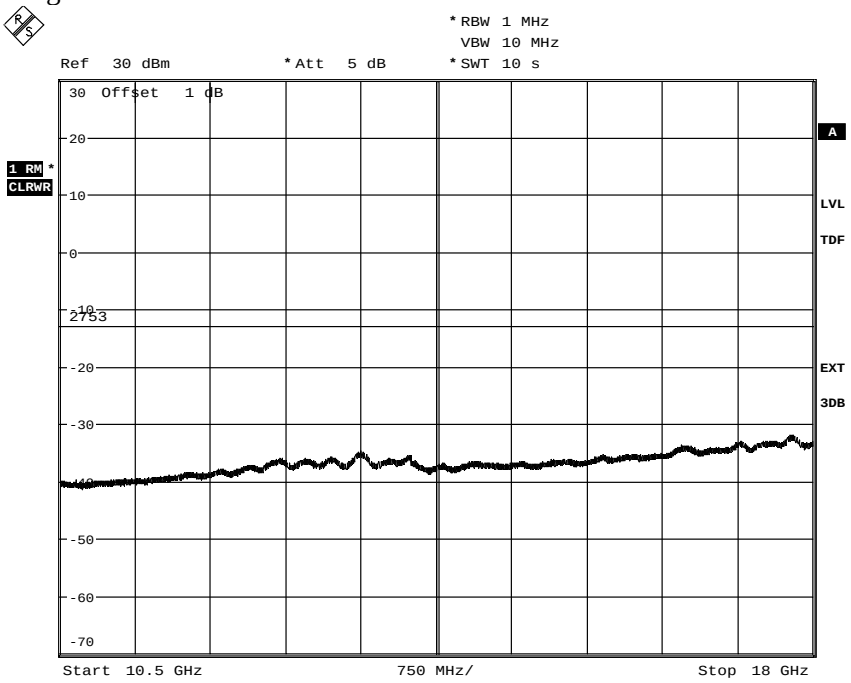
Date: 3.OCT.2011 15:12:54

Diagram 3b:



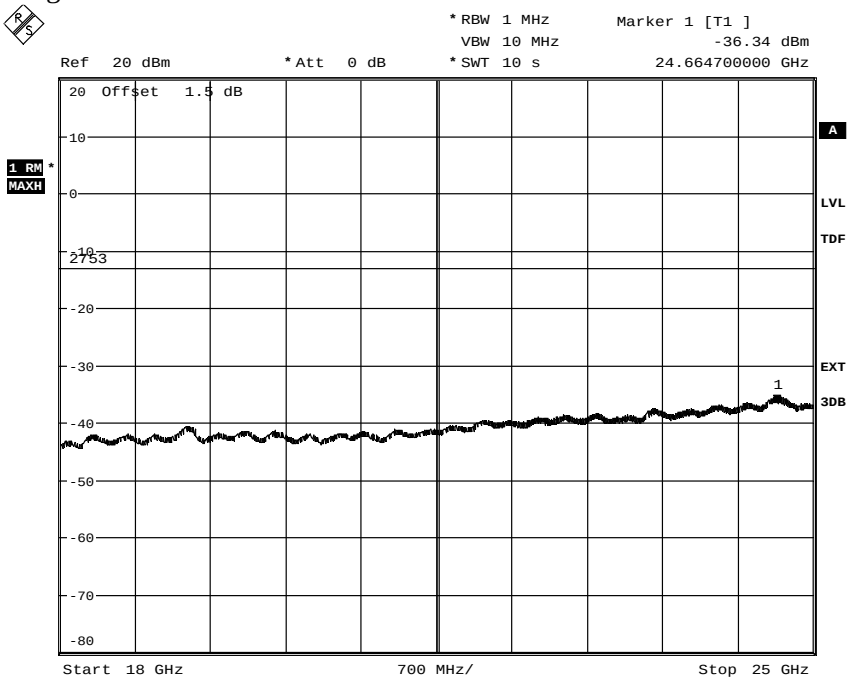
Date: 3.OCT.2011 15:10:33

Diagram 3c:



Date: 3.OCT.2011 15:08:55

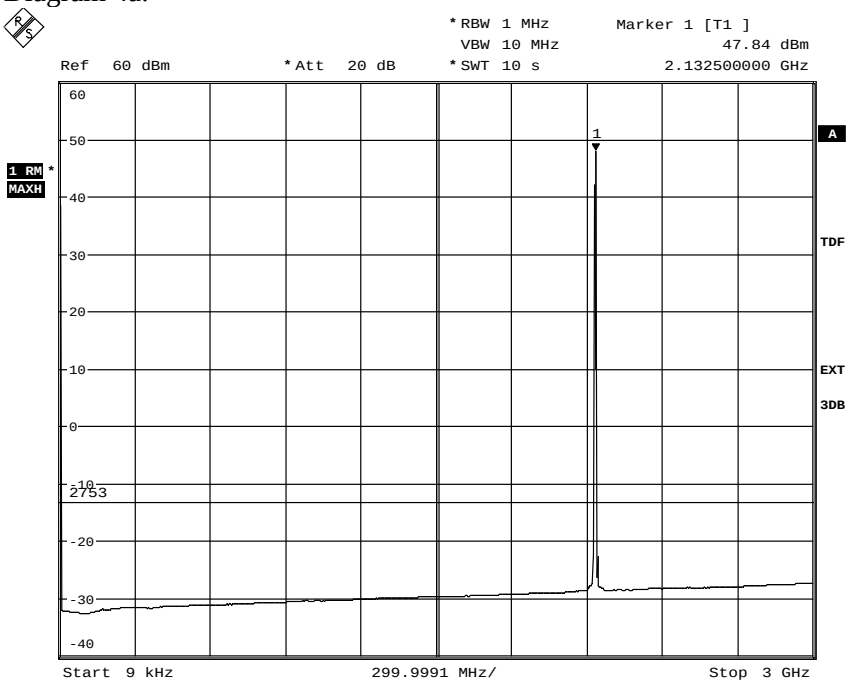
Diagram 3d:



Date: 4.OCT.2011 07:17:59

Appendix 5

Diagram 4a:



Date: 3.OCT.2011 15:46:47

Diagram 4b:

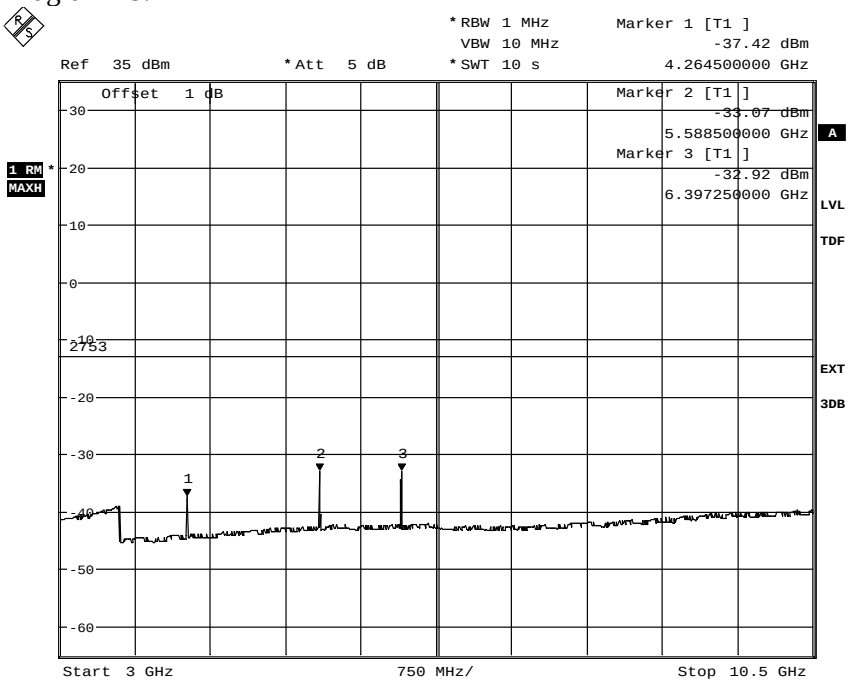


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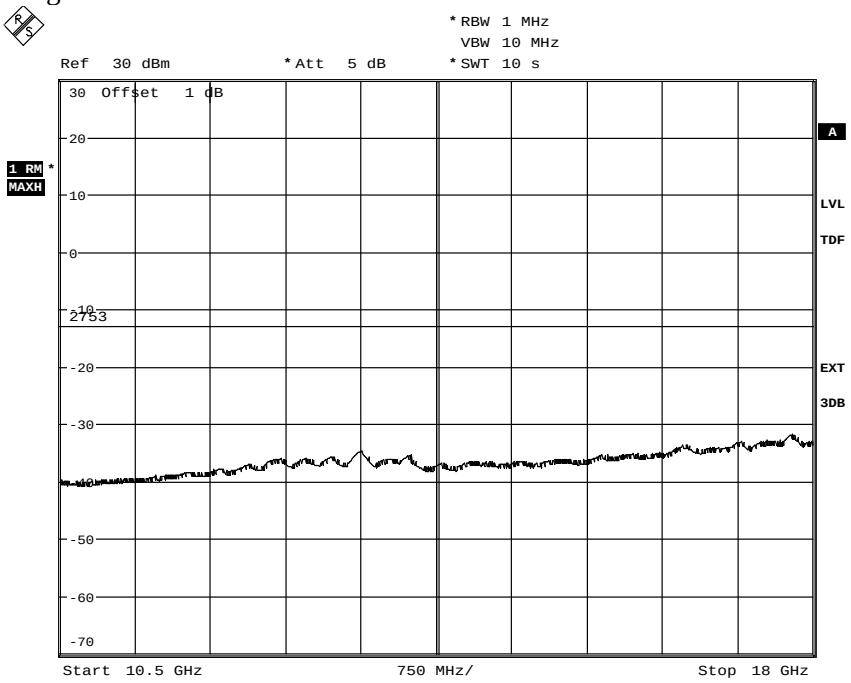
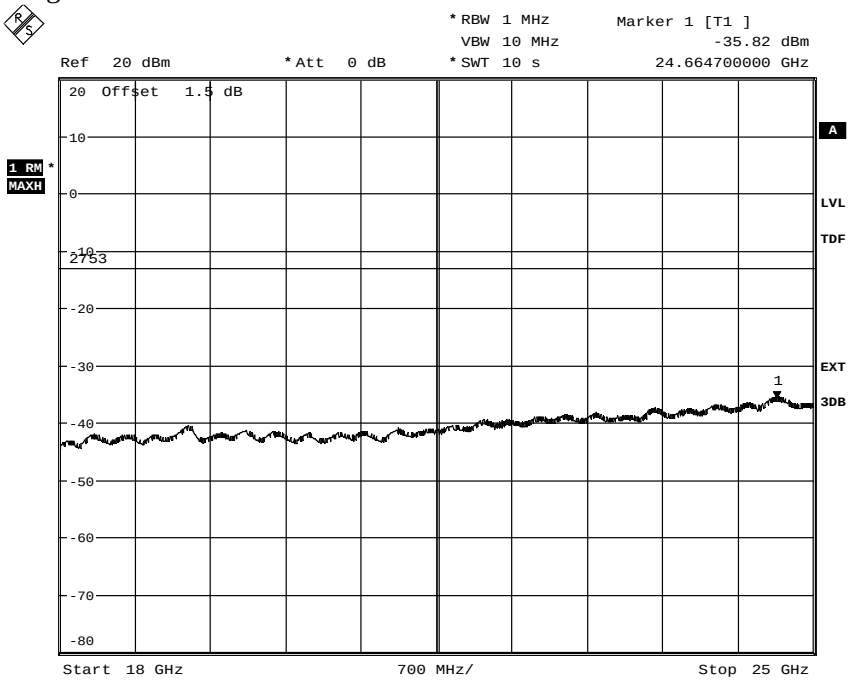
Diagram 4c:



Date: 3.OCT.2011 15:50:09

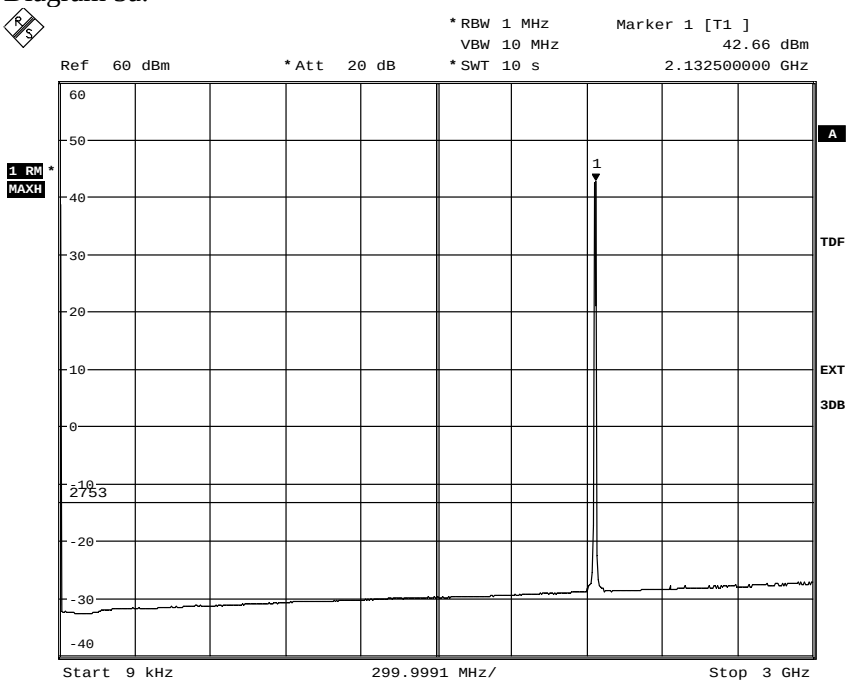
Diagram 4d:



Date: 4.OCT.2011 08:07:27

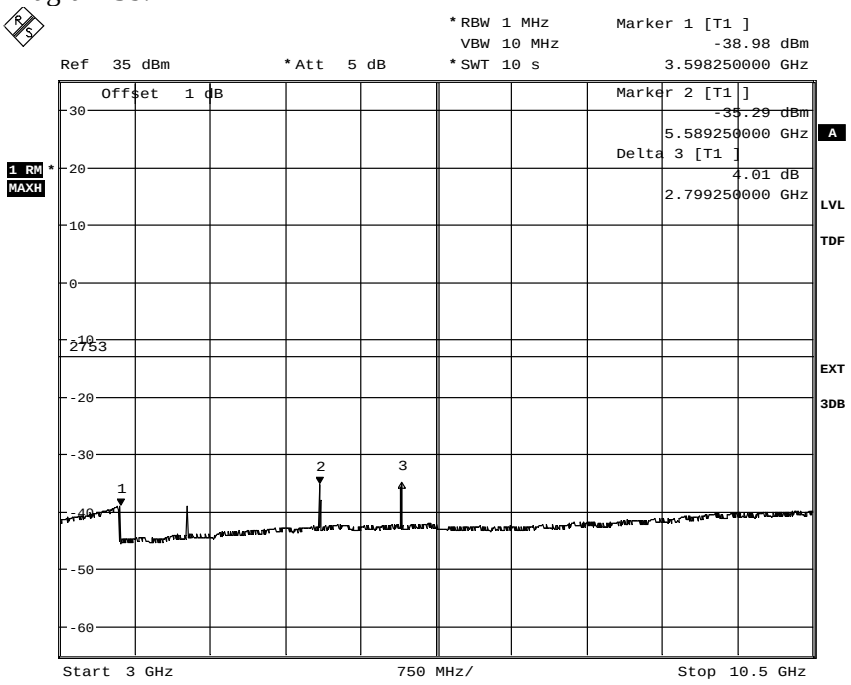
Appendix 5

Diagram 5a:



Date: 3.OCT.2011 15:59:02

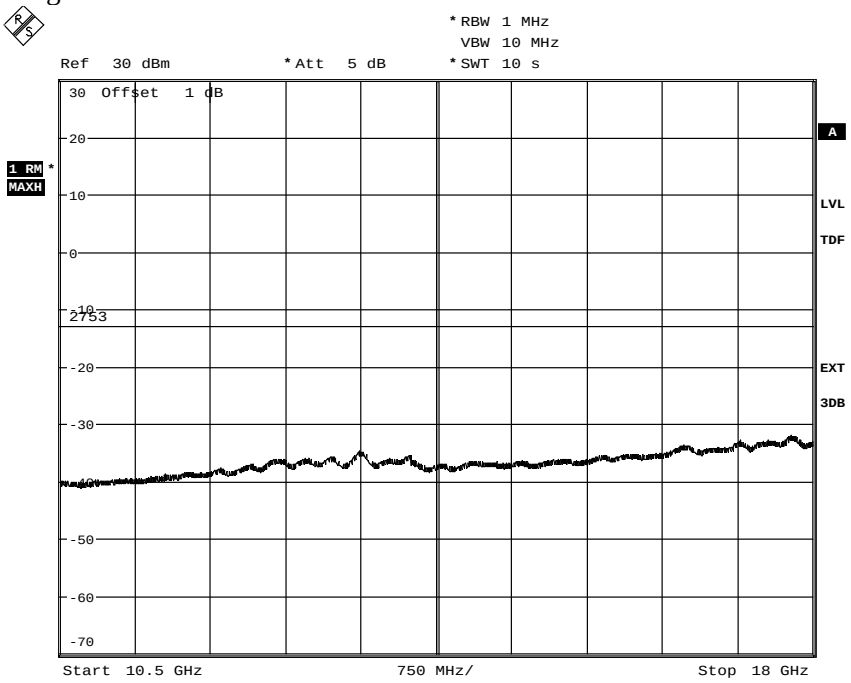
Diagram 5b:



Date: 3.OCT.2011 15:55:44

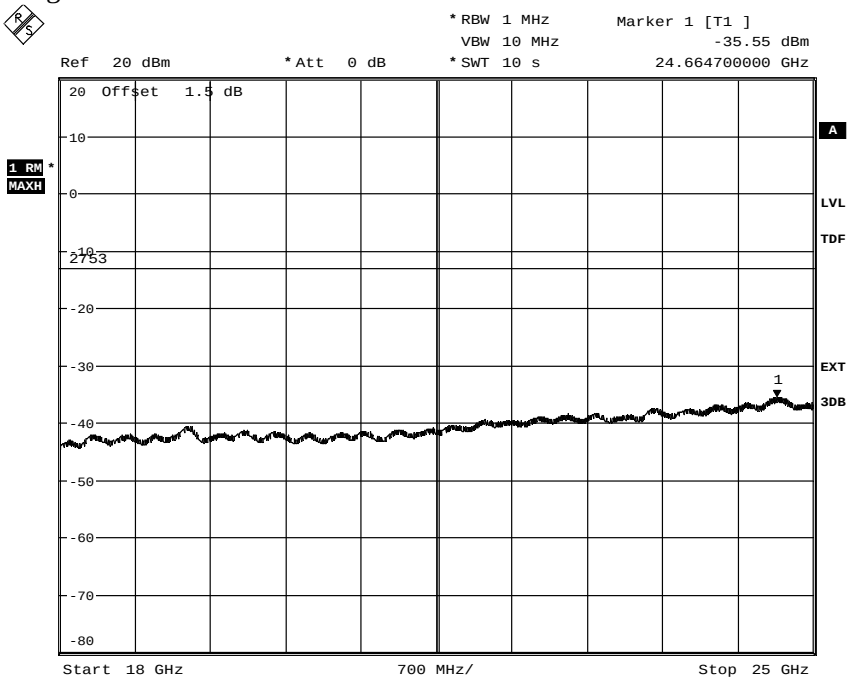
Appendix 5

Diagram 5c:



Date: 3.OCT.2011 15:54:05

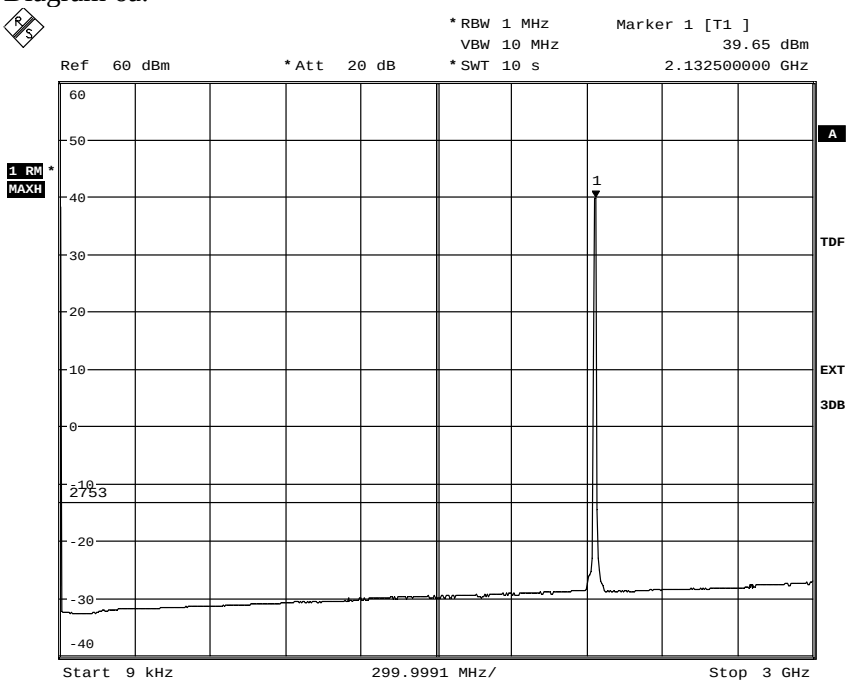
Diagram 5d:



Date: 4.OCT.2011 08:04:19

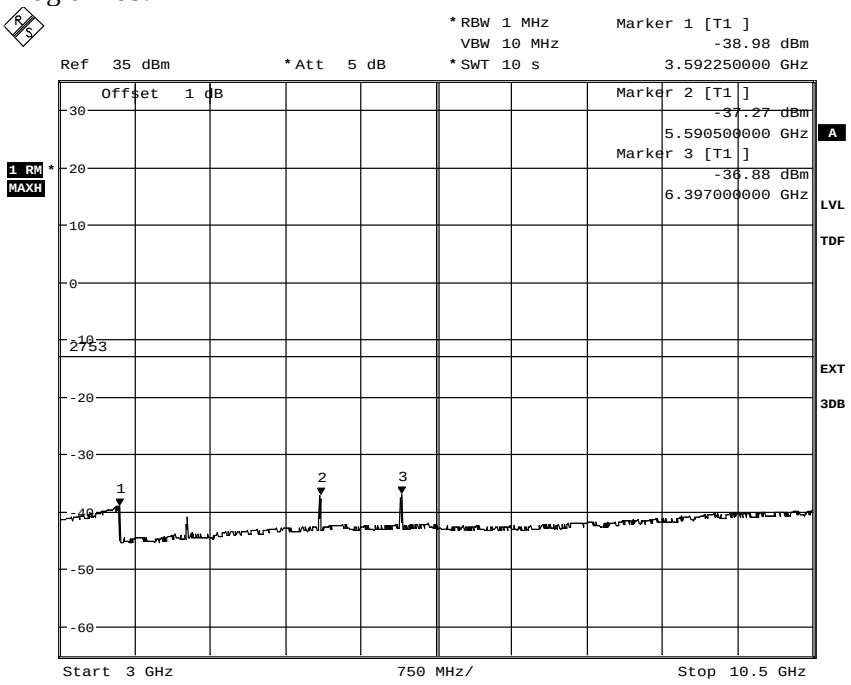
Appendix 5

Diagram 6a:



Date: 3.OCT.2011 16:03:03

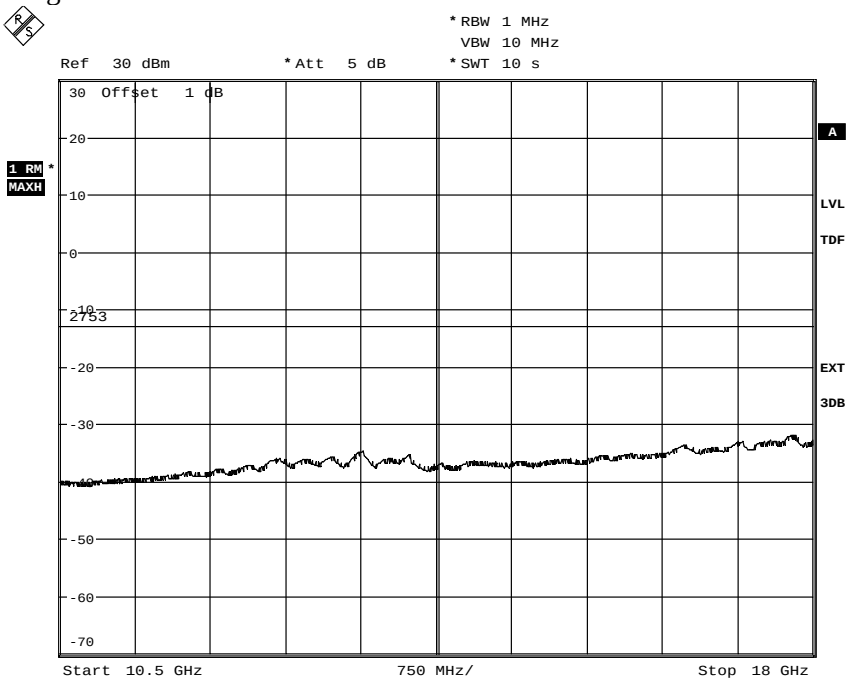
Diagram 6b:



Date: 3.OCT.2011 16:05:35

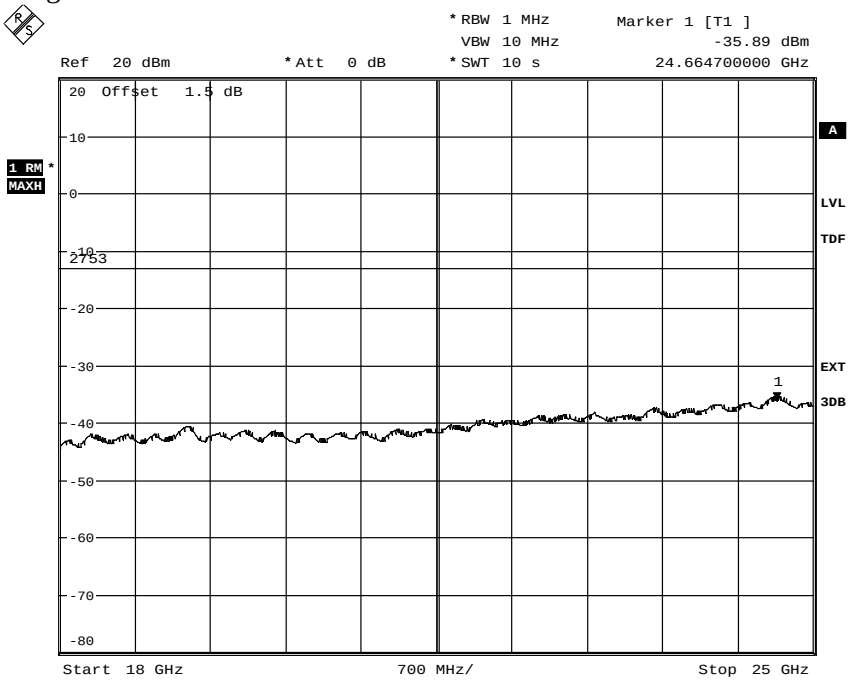
Appendix 5

Diagram 6c:



Date: 3.OCT.2011 16:06:55

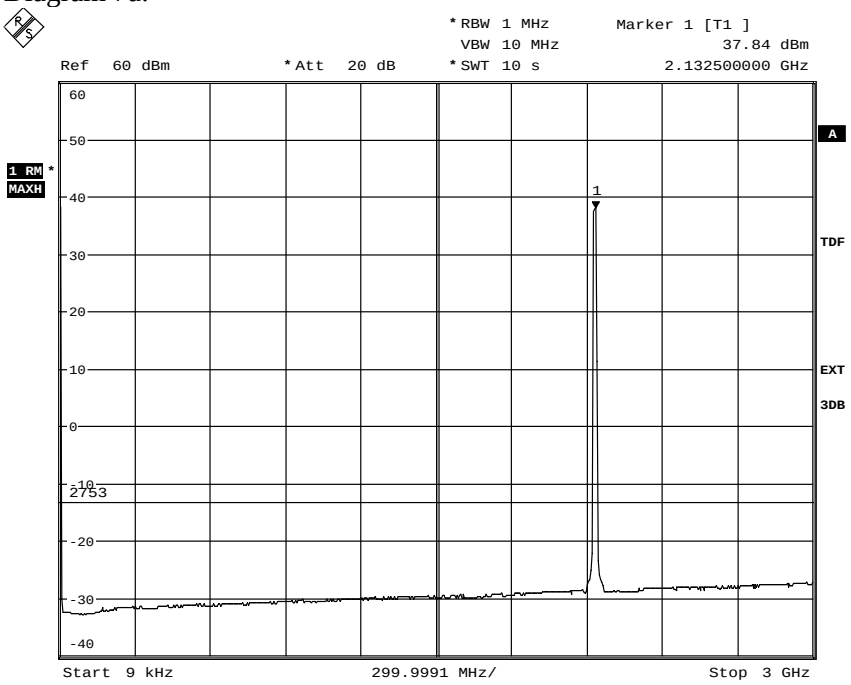
Diagram 6d:



Date: 4.OCT.2011 08:01:34

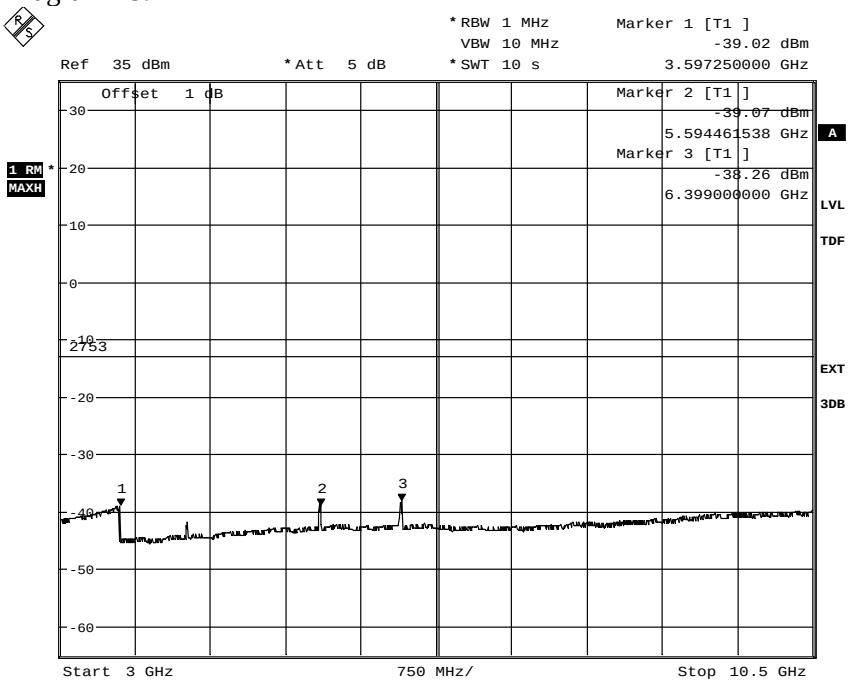
Appendix 5

Diagram 7a:



Date: 3.OCT.2011 16:16:28

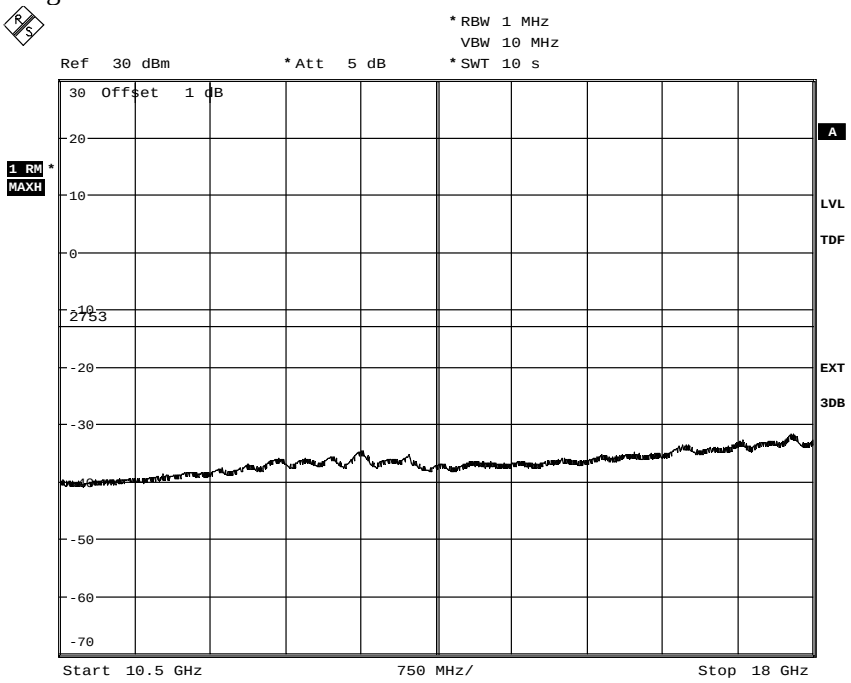
Diagram 7b:



Date: 3.OCT.2011 16:14:16

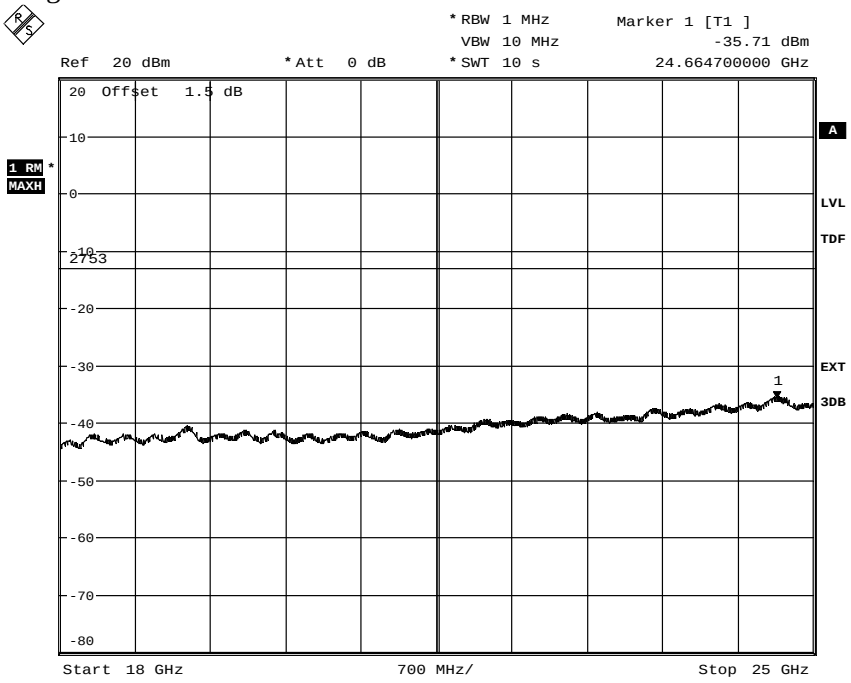
Appendix 5

Diagram 7c:



Date: 3.OCT.2011 16:12:56

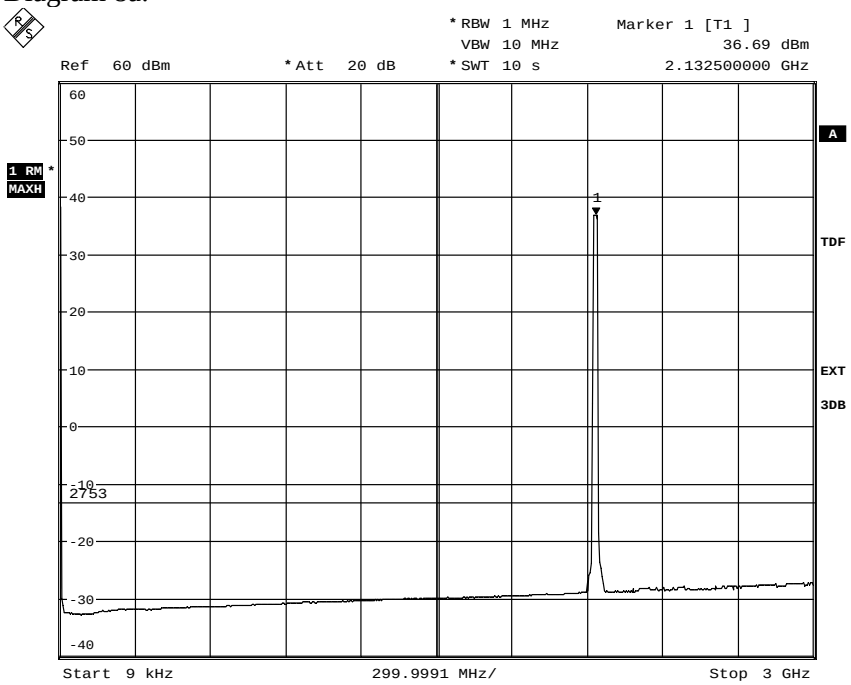
Diagram 7d:



Date: 4.OCT.2011 07:54:25

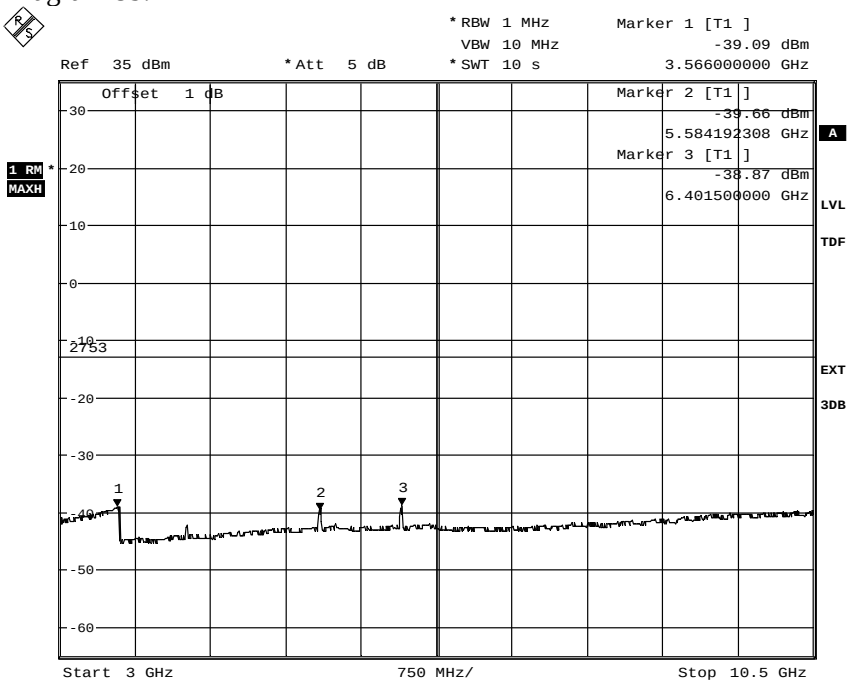
Appendix 5

Diagram 8a:



Date: 3.OCT.2011 16:22:21

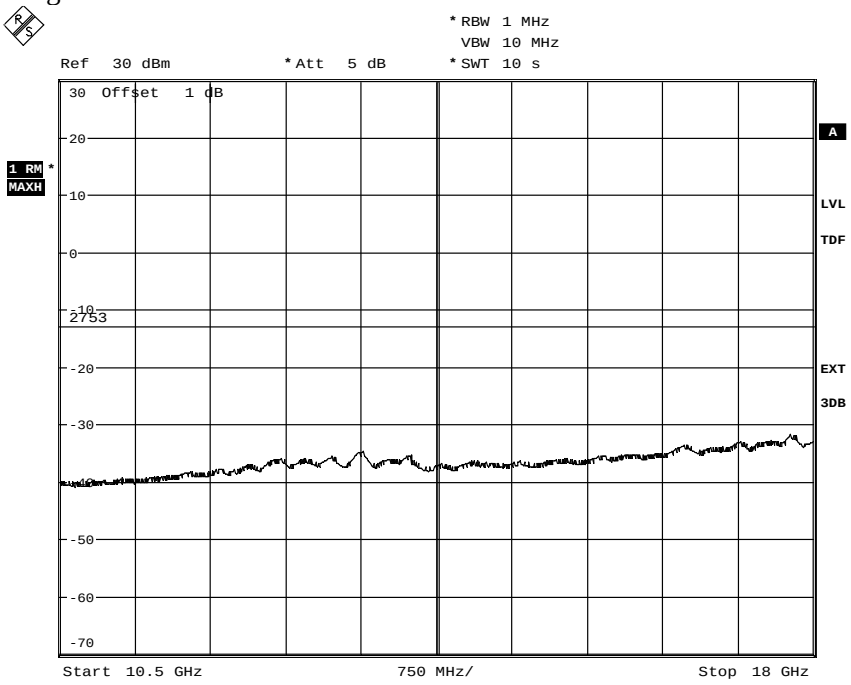
Diagram 8b:



Date: 3.OCT.2011 16:24:27

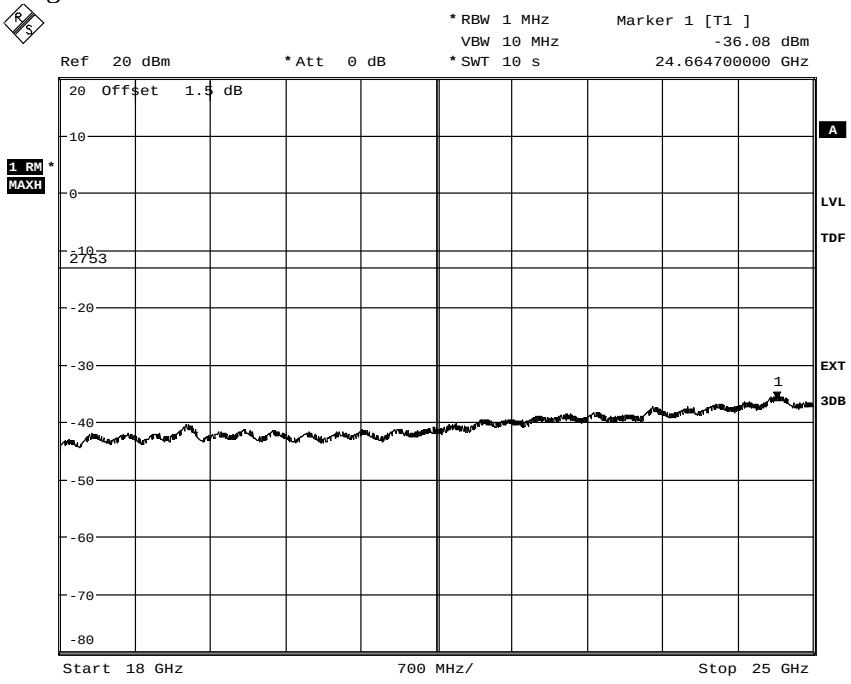
Appendix 5

Diagram 8c:



Date: 3.OCT.2011 16:25:46

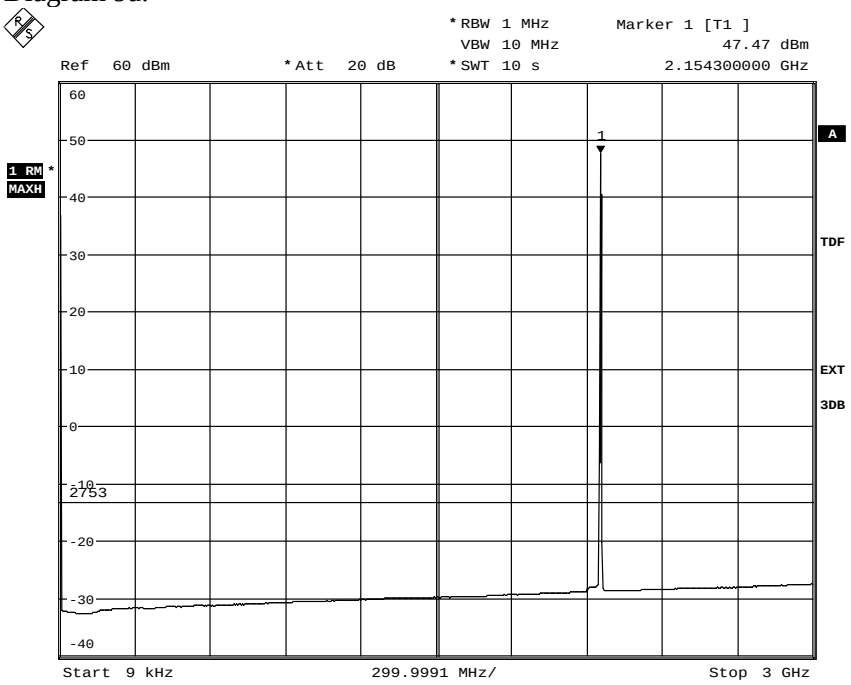
Diagram 8d:



Date: 4.OCT.2011 07:39:41

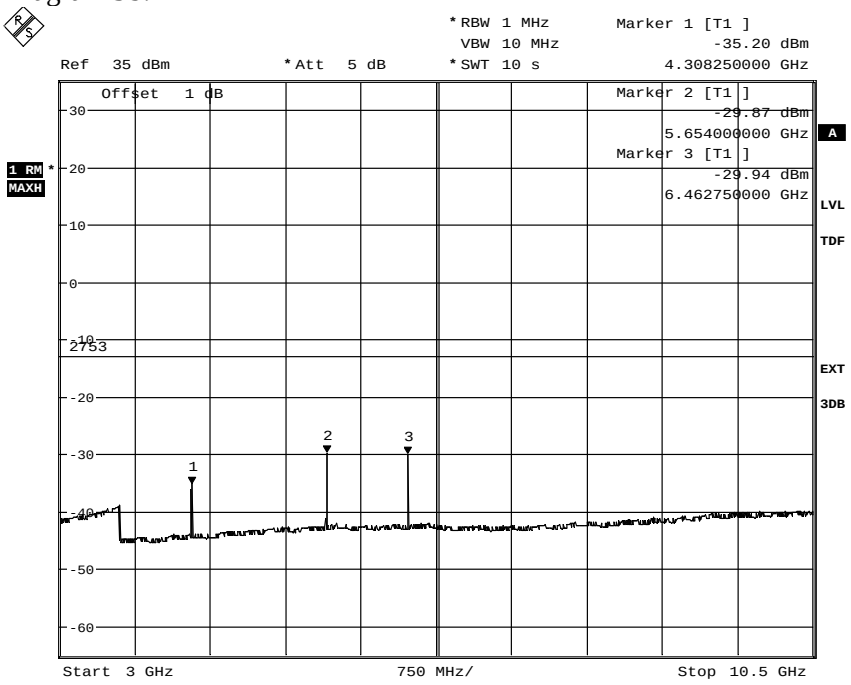
Appendix 5

Diagram 9a:



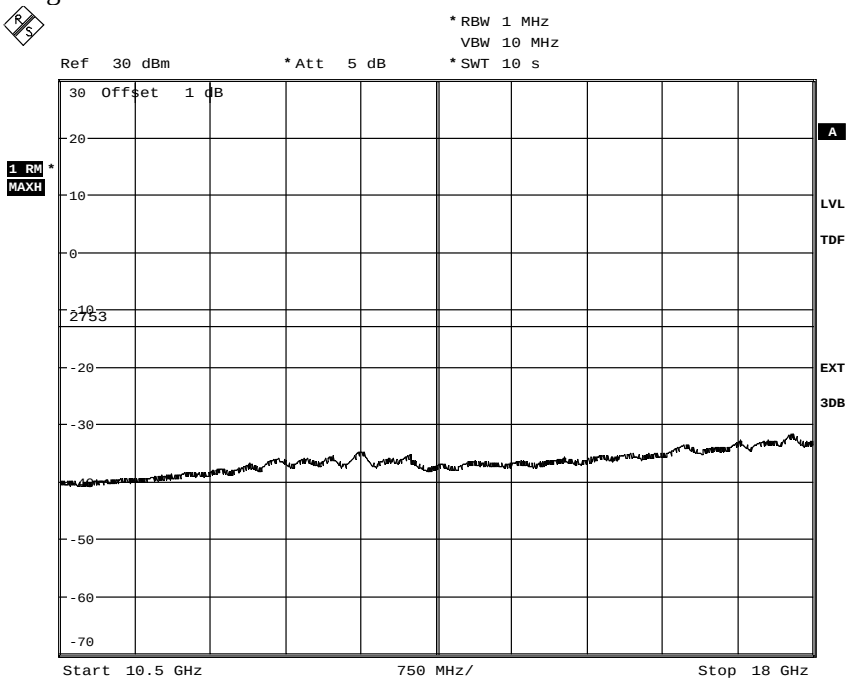
Date: 3.OCT.2011 14:51:38

Diagram 9b:



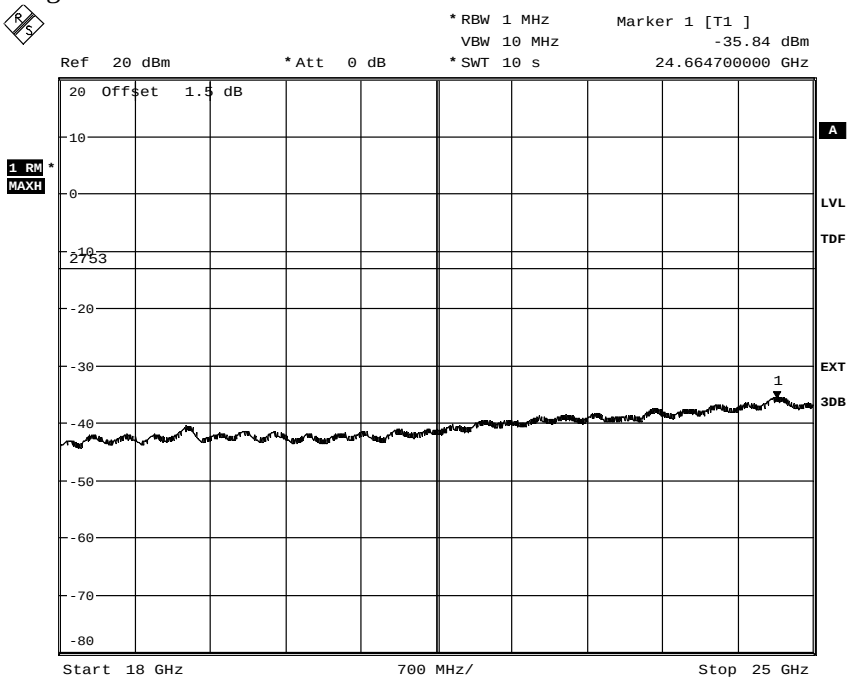
Date: 3.OCT.2011 15:02:56

Diagram 9c:



Date: 3.OCT.2011 15:04:13

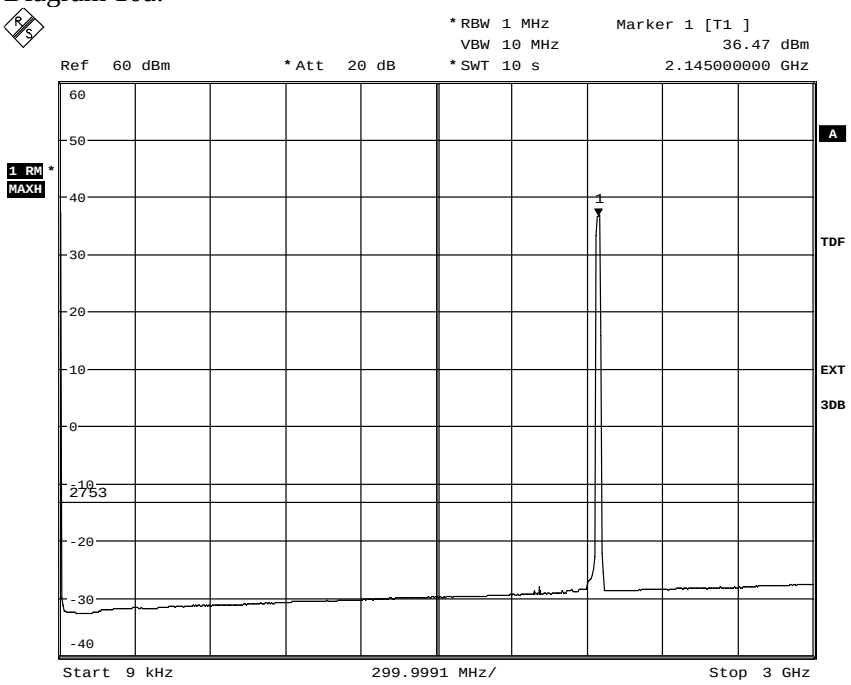
Diagram 9d:



Date: 4.OCT.2011 07:27:16

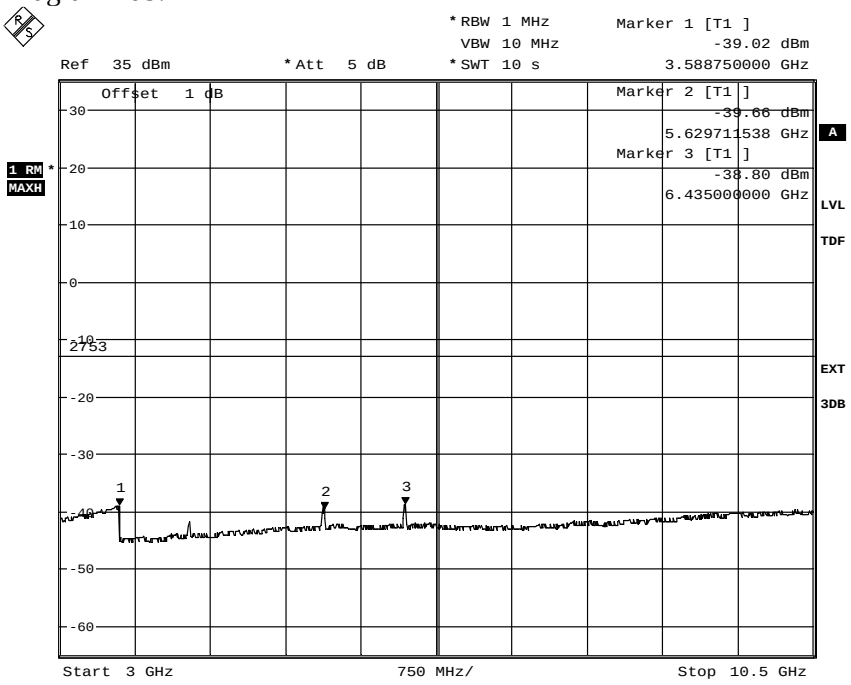
Appendix 5

Diagram 10a:



Date: 3.OCT.2011 12:21:44

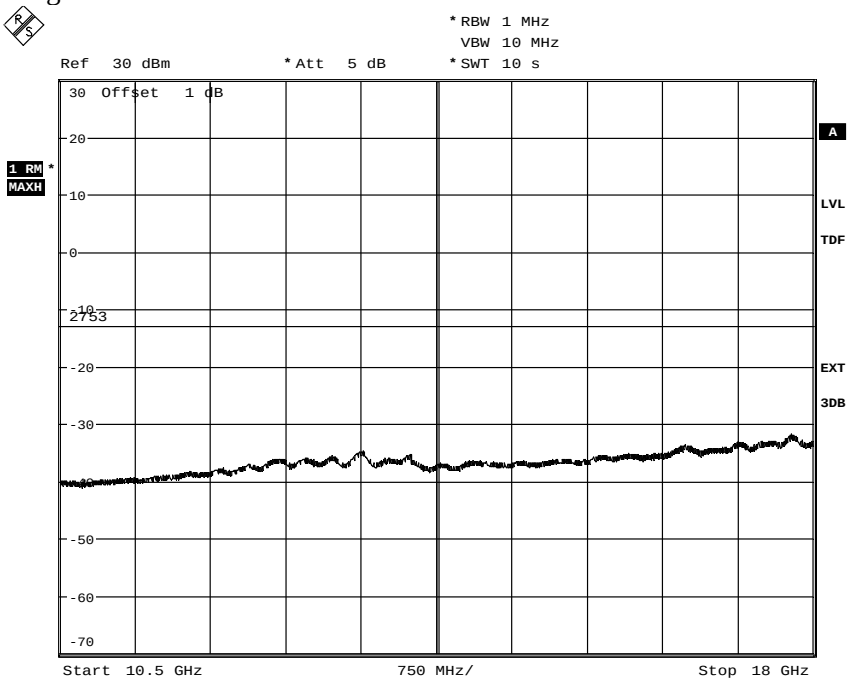
Diagram 10b:



Date: 3.OCT.2011 12:19:48

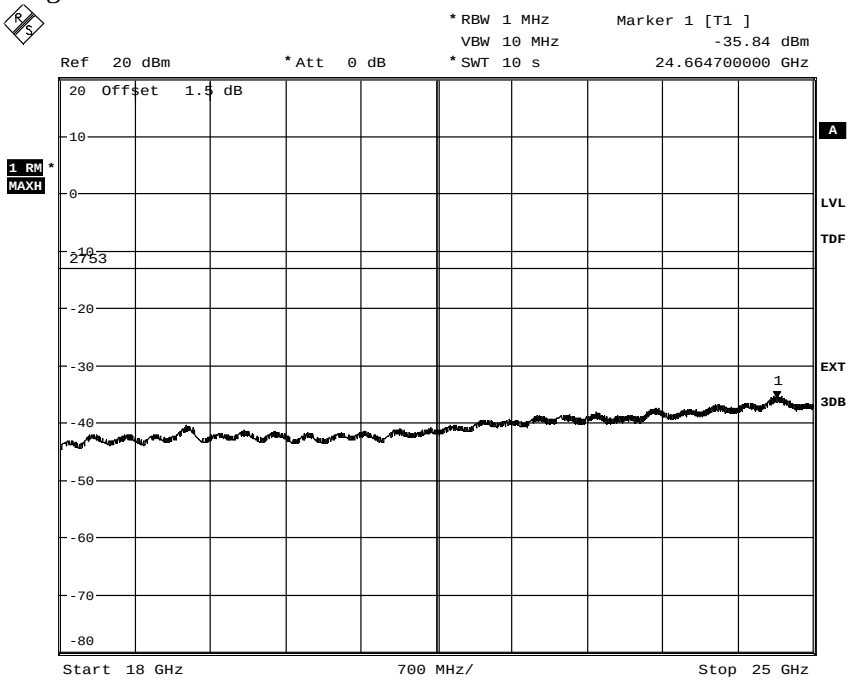
Appendix 5

Diagram 10c:



Date: 3.OCT.2011 12:18:08

Diagram 10d:



Date: 4.OCT.2011 07:34:26

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

Date	Temperature	Humidity
2011-09-21 to 2011-09-27	21-22°C ± 3°C	47-61 % ± 5 %

Test set-up and procedure

Tested revision state R1A.

The test sites are listed at FCC, Columbia with registration number: 93866. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

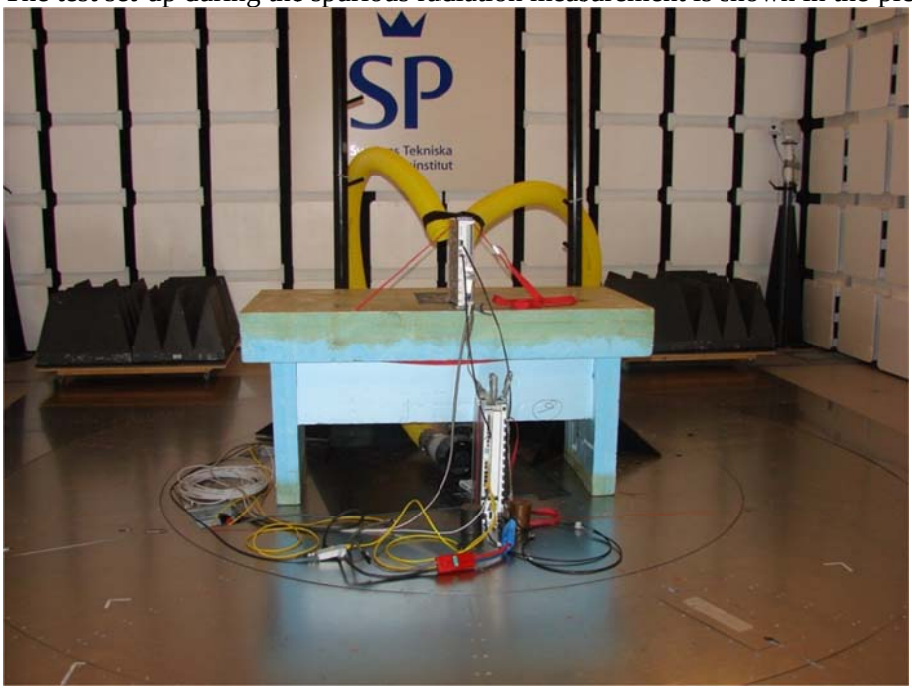
The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18 - 25 GHz.

In the frequency range 30 MHz - 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

The measurement procedure was as the following:

1. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to the standard.

The test set-up during the spurious radiation measurement is shown in the picture below:



Measurement equipment

Measurement equipment	SP number
Test site Tesla	503 881
R&S ESI 26	503 292
R&S FSIQ 40	503 738
Control computer	503 479
Software: R&S EMC32, ver. 8.20.1	503 745
Chase Bilog antenna CBL 6111A	503 182
Miteq, Low Noise Amplifier	503 285
EMCO Horn Antenna 3115	502 175
Standard gain antenna 20240-20	503 674
High pass filter, RLC Electronics	503 739
Testo 625 temperature and humidity meter	504 188

Results

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-25 000	All emission > 20 dB below limit	All emission > 20 dB below limit

Measurement uncertainty:

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

Limits

CFR 47 § 27.53 (h) and RSS-139 6.5:

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

Complies?	Yes

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

Date	Temperature (test equipment)	Humidity (test equipment)
2011-10-04 to 2011-10-05	22-24°C ± 3 °C	43-58% ± 5 %

Test set-up and procedure

Tested revision state R1A.

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

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

Results

Nominal transmitter frequency at mid channel (M) in channel bandwidth configuration 5 MHz.
Rated output power level at connector RF A (maximum): 49 dBm (80 W).

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	Test model E-TM1.1
-48.0	+20	-4
-55.2	+20	+4
-40.8	+20	+5
-48.0	+30	+3
-48.0	+40	+3
-48.0	+50	-5
-48.0	+10	+4
-48.0	0	-4
-48.0	-10	-4
-48.0	-20	-4
-48.0	-30	-6
Maximum freq. error (Hz)		6
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Remark

It was deemed sufficient to test one combination of TX frequency, channel bandwidth configuration and test model (modulation), as all combinations share a common internal reference to derive the TX frequency from.

Limits

Limit according to 3GPP TS 36.141:
The frequency error shall be within ± 0.05 PPM ± 12 Hz (±118.63).

§27.54
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-139 6.3 Frequency:
The frequency stability shall be sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

Complies?	Yes

Receiver spurious emissions measurements according to RSS-139 6.6

Date	Temperature	Humidity
2011-12-10	23 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

Tested revision state R1D.

The measurements were performed according to ANSI C63.4.

Measurements were performed on the receiver antenna terminal (RF B). In the frequency range 30MHz -1000 MHz the measurement is first performed with peak detector. Emission on frequencies close to or above the limit is re-measured with quasi-peak detector. The average detector was used in the frequency range 1-12.5 GHz.

During the measurement at the receiver port “RF B” the combined TX/RX port “RF A” was terminated into 50 ohm. The TX was active at maximum power at the TX band center frequency(M) with test model E-TM1.1 in channel bandwidth configuration 1.4 MHz.

Measurement equipment	SP number
R&S FSQ40	504 143
RF attenuator (RF A)	504 159
RF attenuator (RF B)	503 248
Testo 635, Temperature and humidity meter	504 203

Result

	Tested port, frequency range
Diagram 1a, b, c	RX B, 30 MHz – 12.5 GHz

Remark

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to 5x2.5 GHz = 12.5 GHz for emission measurements.

Limit

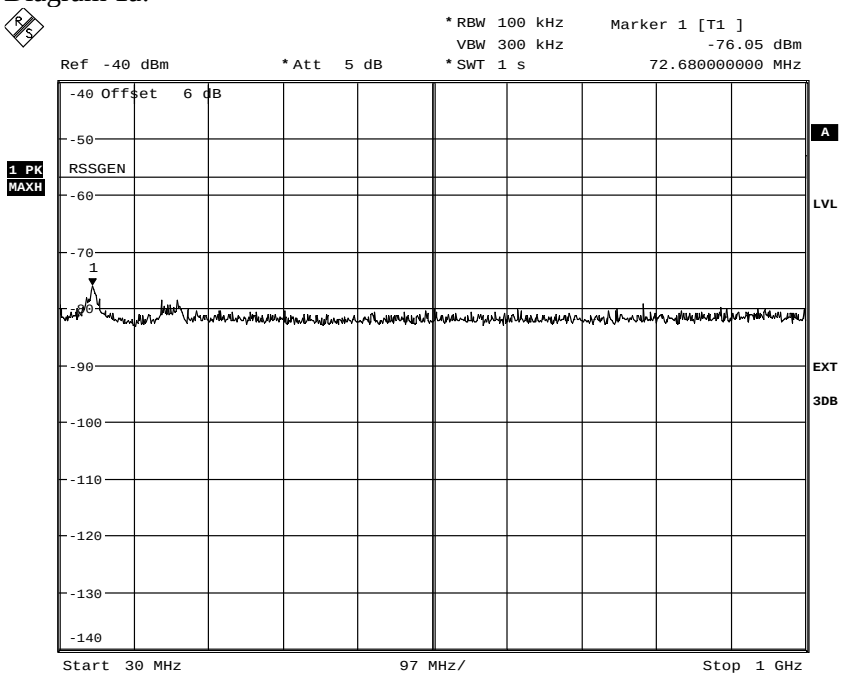
RSS-Gen 6.2 Antenna Conducted limits

Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, and 5 nanowatts (-53 dBm) above 1000 MHz.

Emission below limit?	Yes

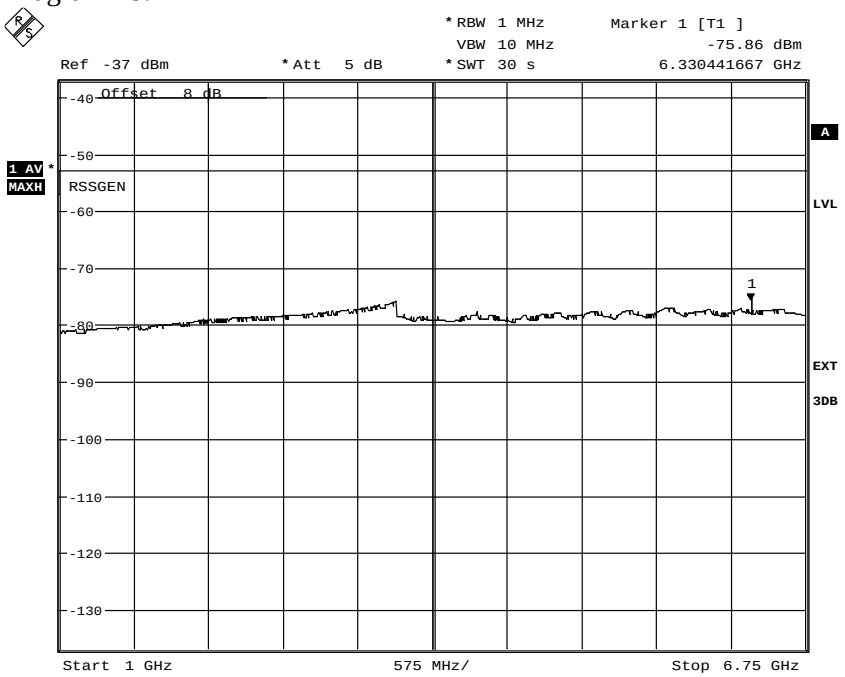
Appendix 8

Diagram 1a:



Date: 10.DEC.2011 13:41:16

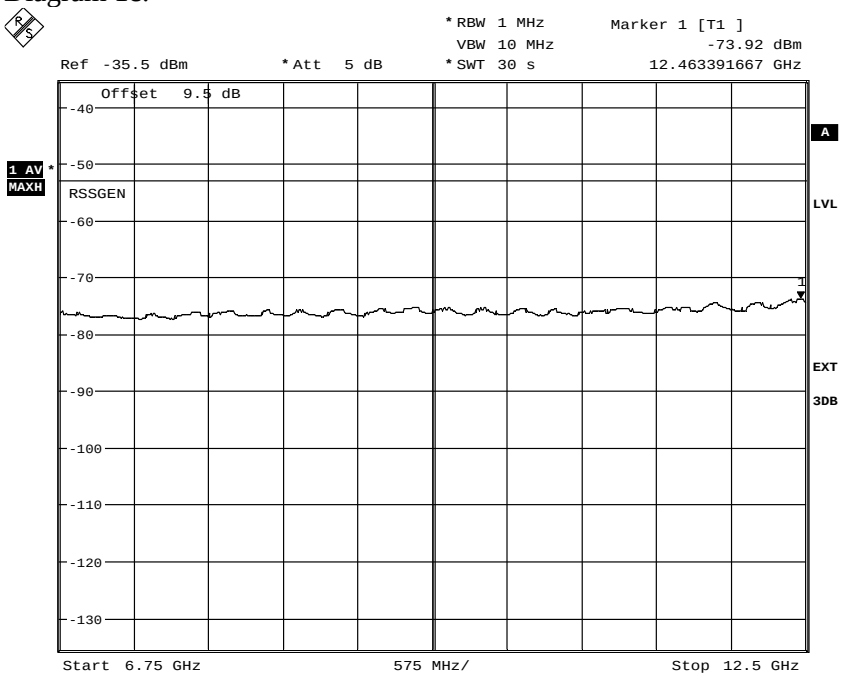
Diagram 1b:



Date: 10.DEC.2011 13:46:33

Appendix 8

Diagram 1c:

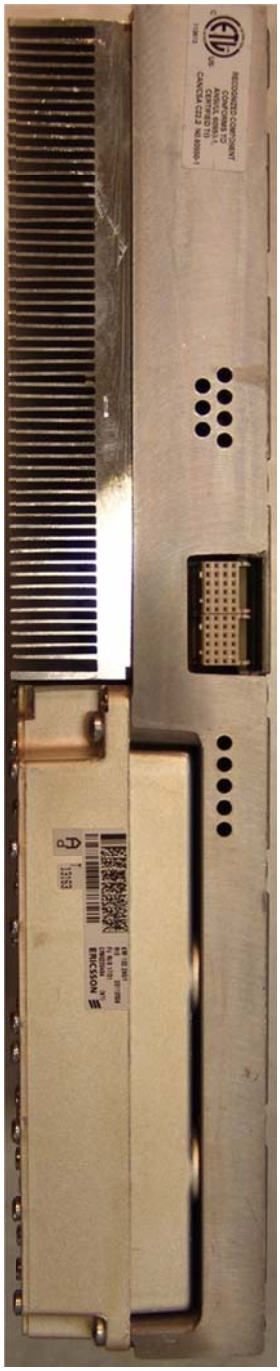


Date: 10.DEC.2011 13:48:52

External photos

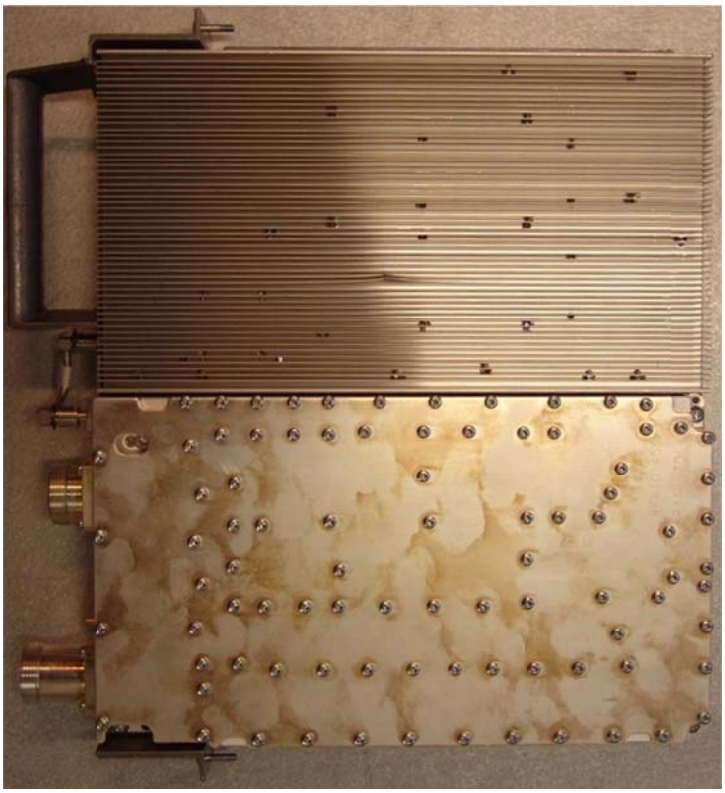
Front side

Rear side

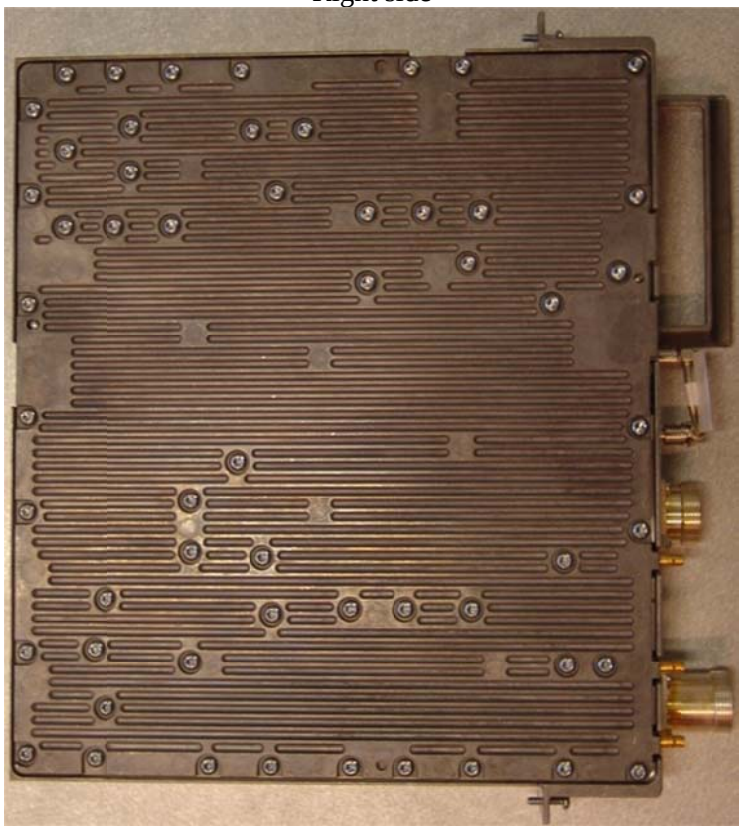


Appendix 9

Left side



Right side



Appendix 9

Bottom side

Top side