



REPORT

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The test sites comply with RSS-Gen, IC file no: 3482A

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Radio measurements on RUS 01 B5 850 MHz radio equipment with FCC ID:TA8AKRC11864-3 and IC:287AB-AS118643 (9 appendices)

Test object

RUS 01 B5, KRC 118 64/3, revision R1A, serial no: C824850036

Summary

Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-132		
2.1046 / RSS-132 4.4 RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	3
2.1051 / RSS-132 4.5 Band edge	Yes	4
2.1051 / RSS-132 4.5 Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-132 4.5 Field strength of spurious radiation	Yes	6
2.1055 / RSS-132 4.3 Frequency stability	Yes	7
FCC CFR 47/ Industry Canada RSS-132 Issue 2		
RSS-132 4.6 Receiver spurious emissions	Yes	8

Note: Above RSS-132 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

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Appendix 1

Description of test object

Equipment:	Radio equipment RUS 01 B5 running in LTE mode	
Frequency bands:	TX: 869– 894 MHz RX: 824 – 849 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 49.0 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	Frequency [MHz]	Comment
Downlink		
2407	869.7	TX bottom (B) frequency in 1.4 MHz BW configuration
2415	870.5	TX bottom (B) frequency in 3 MHz BW configuration
2425	871.5	TX bottom (B) frequency in 5 MHz BW configuration
2450	874.0	TX bottom (B) frequency in 10 MHz BW configuration
2475	876.5	TX bottom (B) frequency in 15 MHz BW configuration
2500	879.0	TX bottom (B) frequency in 20 MHz BW configuration
2525	881.5	TX band mid (M) frequency in all BW configurations
2550	884.0	TX top (T) frequency in 20 MHz BW configuration
2575	886.5	TX top (T) frequency in 15 MHz BW configuration
2600	889.0	TX top (T) frequency in 10 MHz BW configuration
2625	891.5	TX top (T) frequency in 5 MHz BW configuration
2635	892.5	TX top (T) frequency in 3 MHz BW configuration
2643	893.3	TX top (T) frequency in 1.4 MHz BW configuration

Appendix 1

Tested frequency and EARFCN for RX measurement

EARFCN	Frequency [MHz]	Comment
2407	869.7	RX bottom (B) frequency in 1.4 MHz BW configuration
2525	881.5	RX mid (M) frequency in 1.4 MHz BW configuration
2643	893.3	RX top(T) frequency in 1.4 MHz BW configuration

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

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

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 in channel BW configuration 1.4 MHz 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, IC RSS-132 and IC RSS-Gen.

Appendix 1

References

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

- ANSI C63.4-2009
- ANSI/TIA/EIA-603-C-2004
- 3GPP TS 36.141, version 8.5.0
- CFR 47 part 2, October 1st, 2010
- CFR 47 part 22 Subpart H, October 1st, 2010
- RSS-132 Issue 2
- RSS-Gen Issue 3

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2012-10	503 881
R&S FSIQ 40	2012-07	503 738
R&S FSQ 40	2012-07	504 143
R&S ESI 26	2012-07	503 292
Control computer with R&S software EMC32 version 8.20.1	-	503 479
High pass filter	2012-07	504 199
High pass filter	2012-07	504 200
High pass filter	2012-07	503 739
High pass filter	2012-07	503 740
RF attenuator	2012-07	504 159
RF attenuator	2012-07	900 233
Boonton RF Peak power meter/analyzer	2011-10	503 144
Boonton Power sensor 56518-S/4	2012-10	503 145
Chase Bilog Antenna CBL 6111A	2011-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 20240-20	-	503 674
µComp Nordic, Low Noise Amplifier	2012-07	504 160
MITEQ Low Noise Amplifier	2012-07	503 285
Temperature cabinet	-	503 360
Multimeter Fluke 87	2012-05	502 190
Testo 625, Temperature and humidity meter	2012-06	504 188
Testo 635 Temperature and humidity meter	2012-05	504 203

Uncertainties

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

Reservation

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

Delivery of test object

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

Appendix 1

Manufacturer's representative

Christer Gustavsson, Ericsson AB

Test engineers

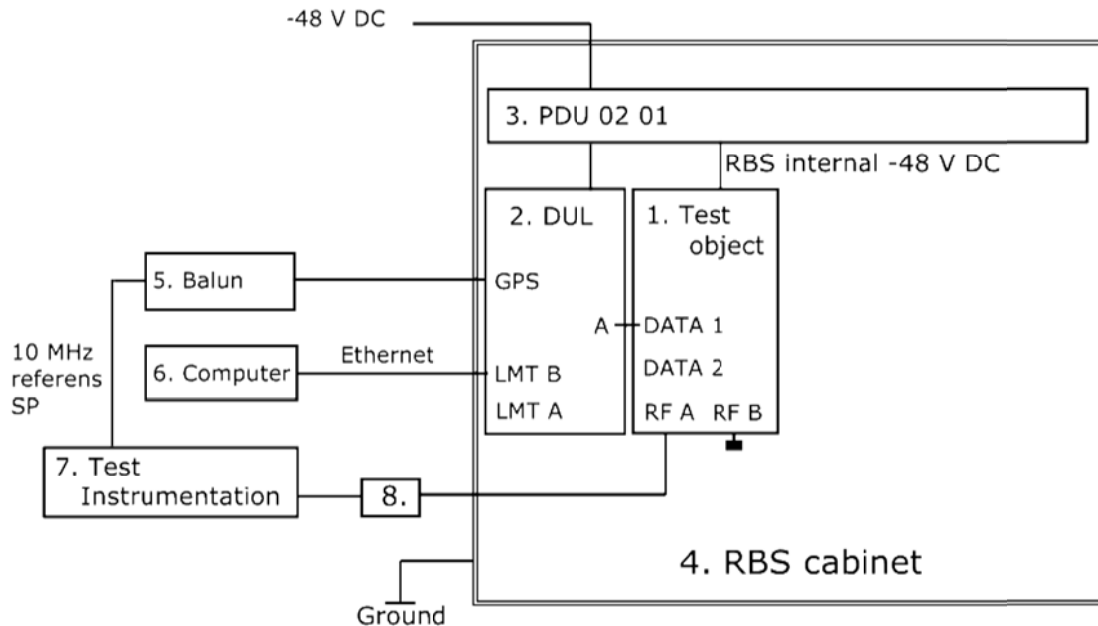
Jörgen Wassholm, Andreas Johnson, and Jonas Bremholt

Test participant(-s)

Xiang Yue, Ericsson CBC (Partly present)

Appendix 1

Test set-up conducted TX measurements at port RF A



Test object

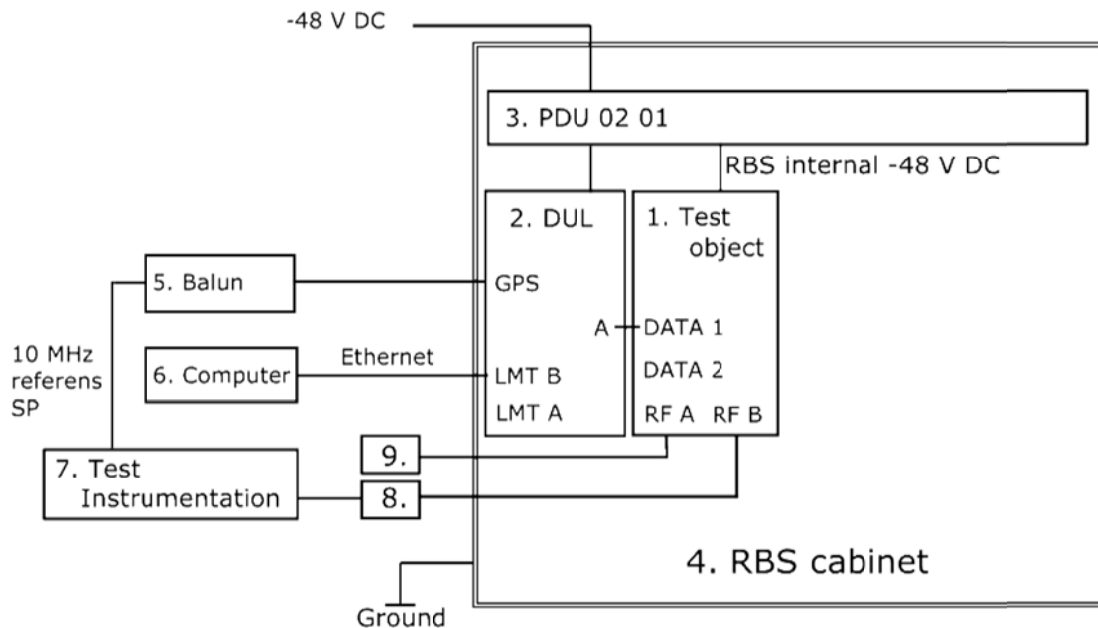
1. RUS 01 B5, KRC 118 64/3, revision R1A, S/N: C824850036 (FCC ID:TA8AKRC11864-3 and IC:287AB-AS118643)

Functional test equipment

2. DUL 20 01, KDU 137 533/4, revision R1C, S/N: CB4H274941
3. PDU 02 01, BMG 980 336/4, revision R2A, S/N: BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. Balun for 10 MHz reference, converting BNC to RJ-45 connector
6. Controlling laptop HP Elitebook 8730w, S/N CNU 942532V, BAMS 1000757967 running software MOSHELL V8.0k
7. SP test instrument according measurement equipment list
8. Attenuator and filter according measurement equipment list

Appendix 1

Test set-up conducted RX measurements at port RF B



Test object

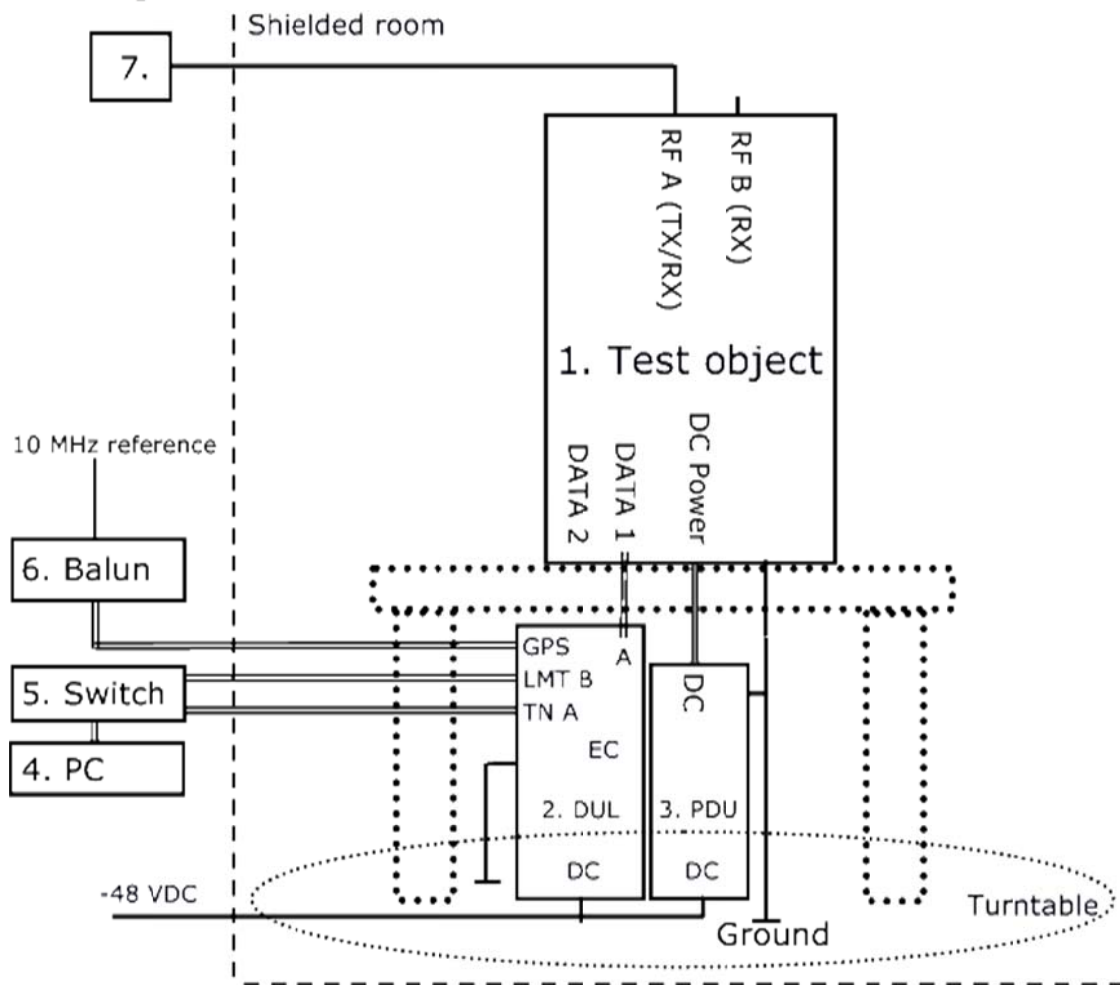
1. RUS 01 B5, KRC 118 64/3, revision R1A, S/N: C824850036 (FCC ID:TA8AKRC11864-3 and IC:287AB-AS118643)

Functional test equipment

2. DUL 20 01, KDU 137 533/4, revision R1C, S/N: CB4H274941
3. PDU 02 01, BMG 980 336/4, revision R2A, S/N: BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. Balun for 10 MHz reference, converting BNC to RJ-45 connector
6. Controlling laptop HP Elitebook 8730w, S/N CNU 942532V, BAMS 1000757967 running software MOSHELL V8.0k
7. SP test instrument according measurement equipment list
8. Attenuator and filter according measurement equipment list
9. Attenuator according measurement equipment list and 50 ohm termination

Appendix 1

Test set-up, radiated measurements



Test object

1. RUS 01 B5, KRC 118 64/3, revision R1A, S/N: C824850036 (FCC ID:TA8AKRC11864-3 and IC:287AB-AS118643)

Functional test equipment

2. DUL 20 01, KDU 137 533/4, revision R1C, S/N: CB4H274941, hosted in SUP 6601 1/BFL 901 009/1 Rev R3B, S/N: BR81262569
3. Power Distribution Unit PDU 02 01, BMG 980 336/4 Rev R2A, S/N: BJ31534775
4. Laptop computer: Mobile Workstation, HP Elite book BAMS – 1000757967 with MOSHELL Ver. 8.0k
5. Fast Ethernet Switch: NETGEAR 10/100 Mbps model: FS108
6. Balun for 10 MHz reference, converting BNC to RJ-45 connector
7. 50 ohm terminator

Appendix 1

Test object ports

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

RBS software

Software	Revision
CXP 102 051/14	R4BD

Appendix 2

RF power output measurements according to CFR 47 §22.913 / IC RSS-132 4.4

Date 2011-09-01 to 2011-09-05	Temperature 22 °C ± 3 °C	Humidity 49-55 % ± 5 %
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Test set-up and procedure

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

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
RF attenuator	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	48.3/ 7.0	48.5/ 7.1	48.1/ 7.1
BW configuration 3 MHz	48.5/ 6.9	48.5/ 6.7	48.3/ 7.0
BW configuration 5 MHz	48.4/ 6.9	48.4/ 6.7	48.2/ 7.1
BW configuration 10 MHz	48.4/ 7.3	48.3/ 6.7	48.2/ 7.1
BW configuration 15 MHz	48.2/ 7.5	48.2/ 6.9	48.0/ 7.1
BW configuration 20 MHz	48.1/ 7.3	48.1/ 7.0	47.9/ 7.2

Limits

CFR 47, 22.913/ SRSP-503 5.1: The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57 dBm).

RSS-132: The transmitter output power shall not exceed the limits given in SRSP-503

Complies?	Yes
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Appendix 3

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

Date 2011-09-01 to 2011-09-05	Temperature 22 °C ± 3 °C	Humidity 49-55 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	504 159
Testo 615 temperature and humidity meter	503 498

Measurement uncertainty: 3.7 dB

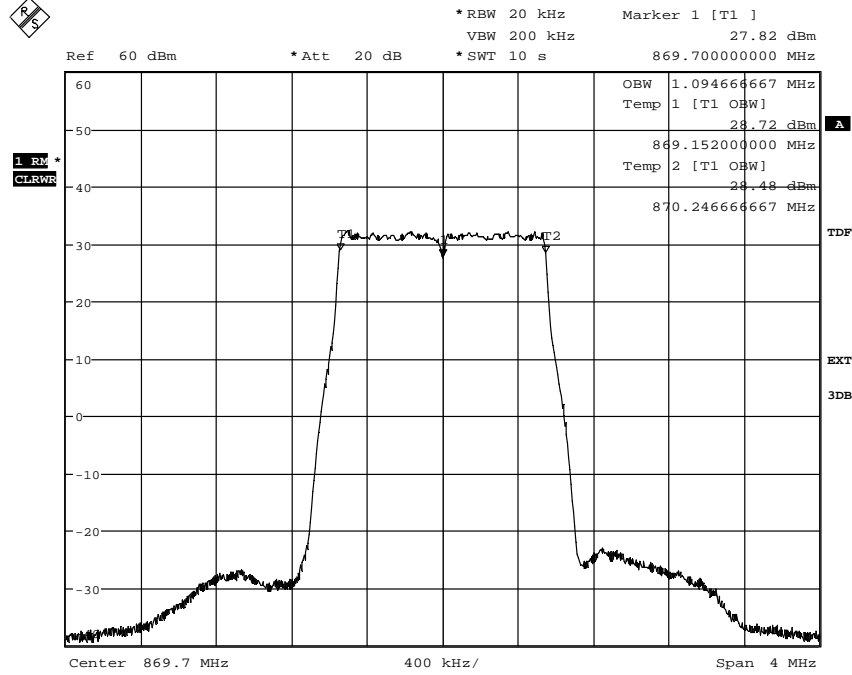
Results

The results are shown in appendix 3.1

Diagram	BW configuration	Tested frequency	Occupied BW (99%) [MHz]	Emission BW (99.75%) [MHz]
1	1.4 MHz	B	1.094	1.121
2	20 MHz	B	17.853	18.093
3	1.4 MHz	M	1.093	1.120
4	3 MHz	M	2.697	2.733
5	5 MHz	M	4.480	4.540
6	10 MHz	M	8.930	9.050
7	15 MHz	M	13.413	13.626
8	20 MHz	M	17.853	18.080
9	1.4 MHz	T	1.093	1.120
10	20 MHz	T	17.853	18.080

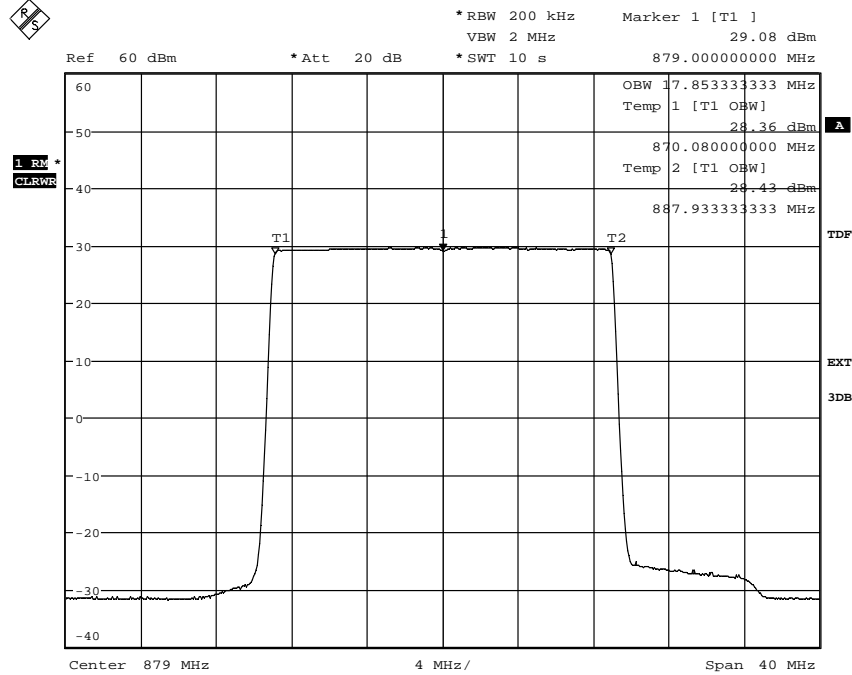
Appendix 3

Diagram 1



Date: 5.SEP.2011 09:42:11

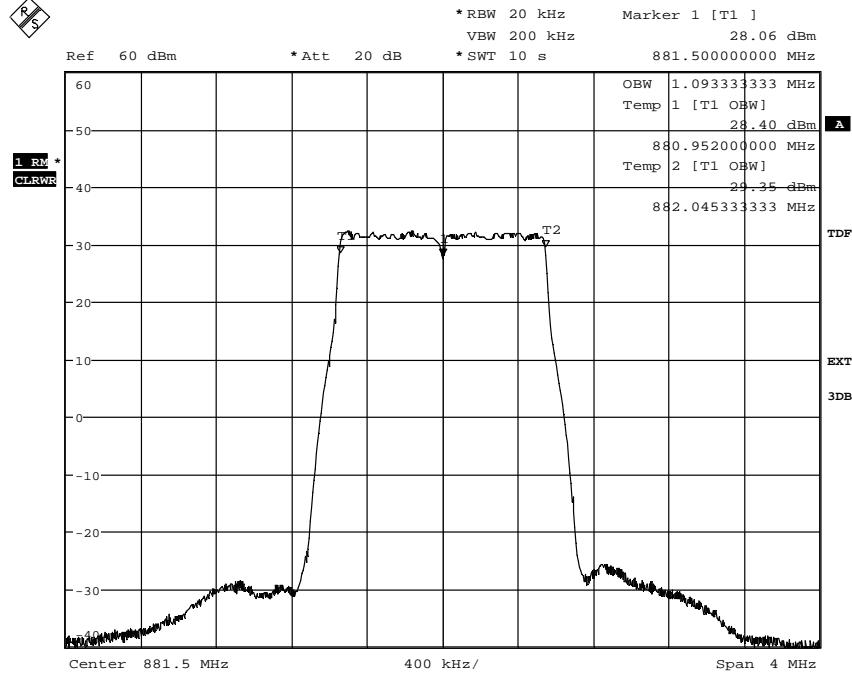
Diagram 2



Date: 5.SEP.2011 10:52:46

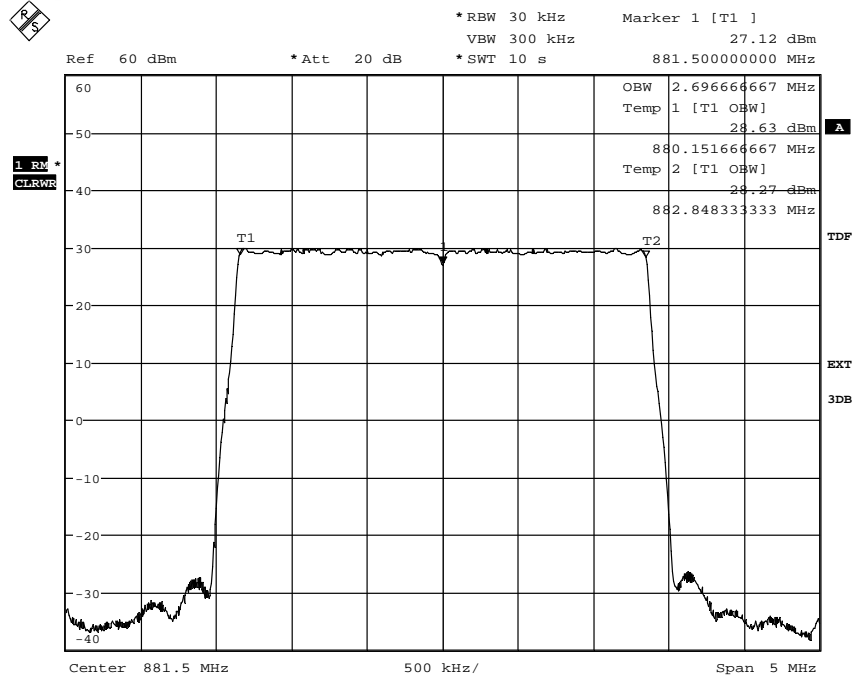
Appendix 3

Diagram 3



Date: 1.SEP.2011 12:50:41

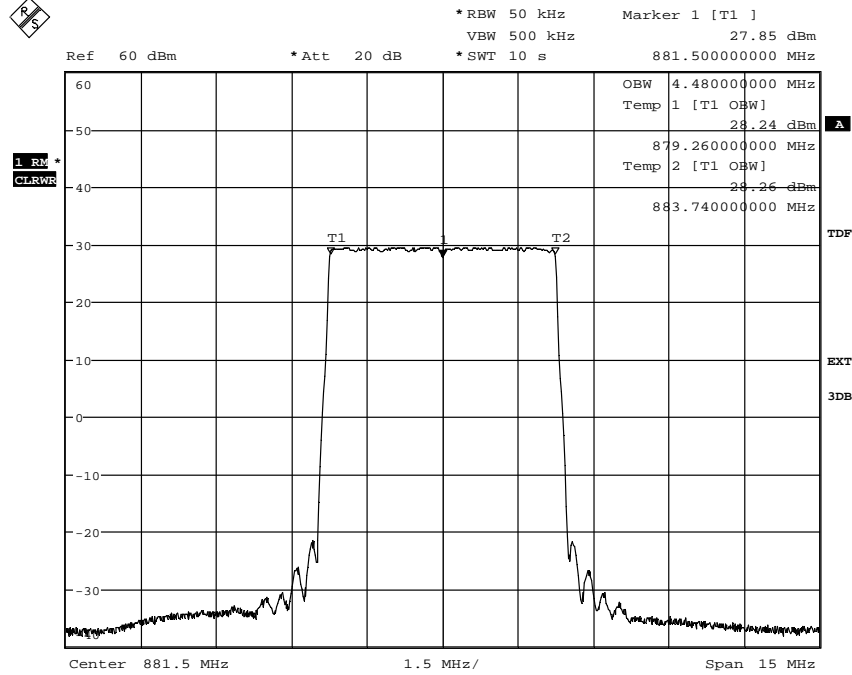
Diagram 4



Date: 1.SEP.2011 15:07:43

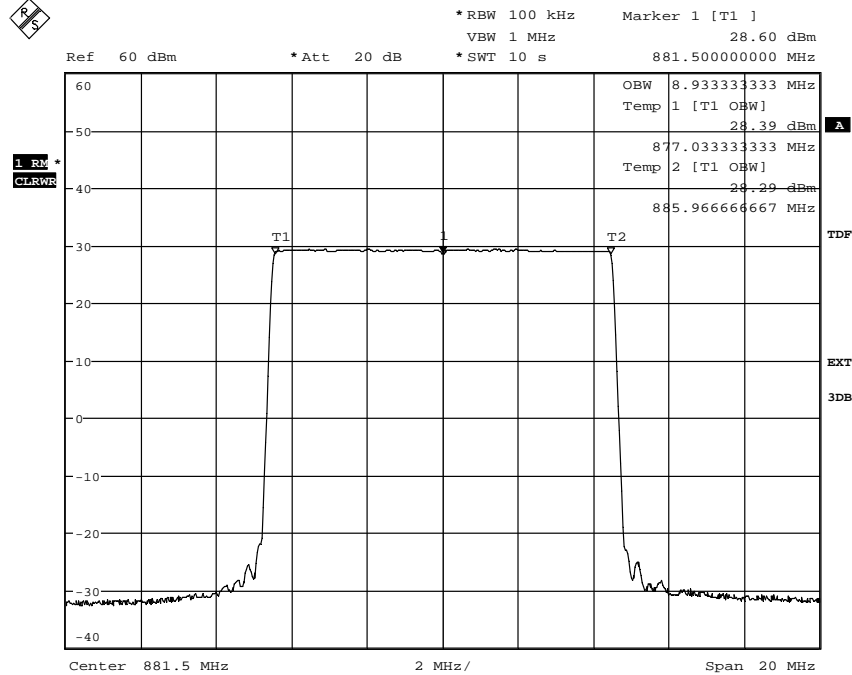
Appendix 3

Diagram 5



Date: 1.SEP.2011 14:49:16

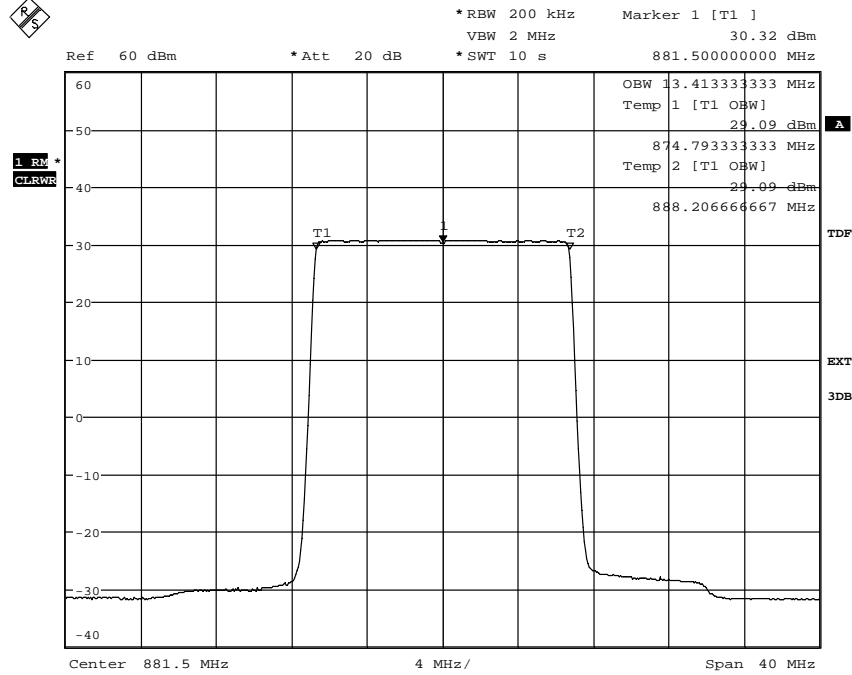
Diagram 6



Date: 1.SEP.2011 15:13:56

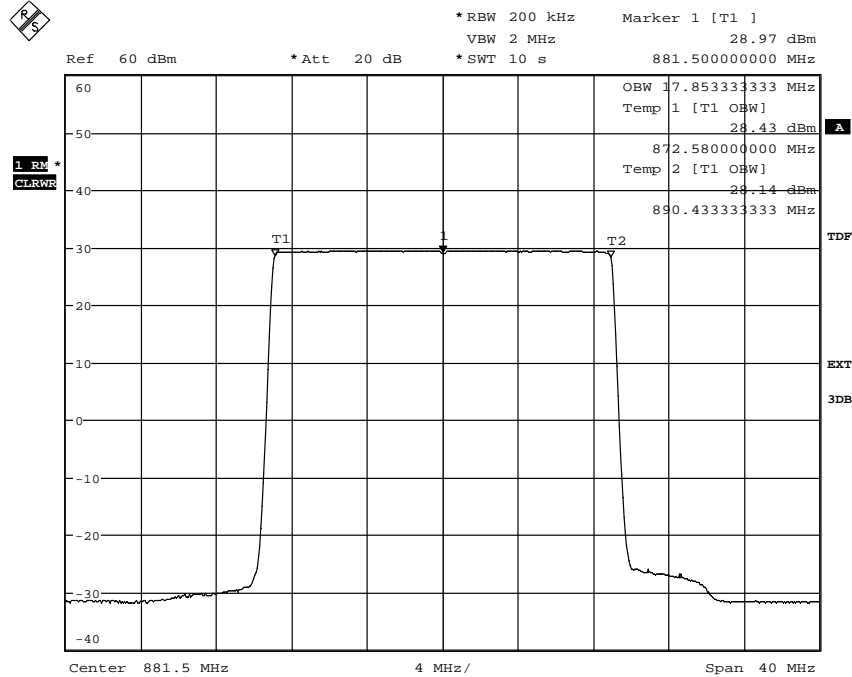
Appendix 3

Diagram 7



Date: 1.SEP.2011 15:42:18

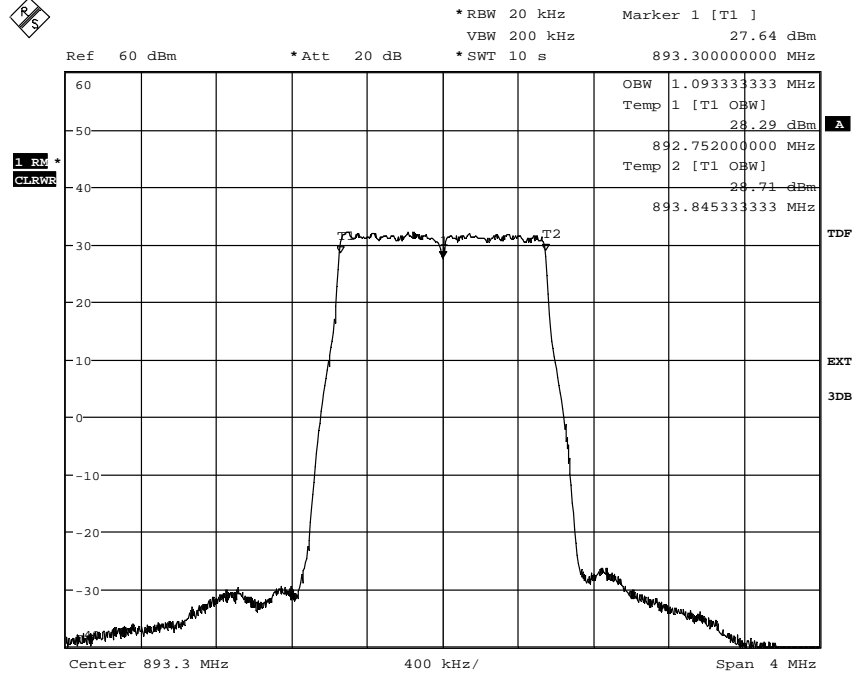
Diagram 8



Date: 1.SEP.2011 16:07:04

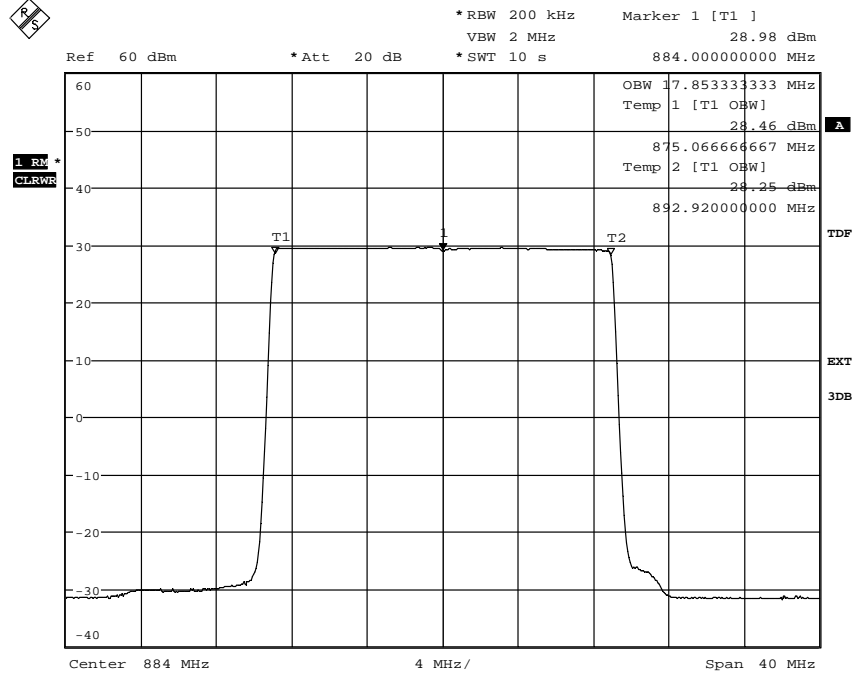
Appendix 3

Diagram 9



Date: 2.SEP.2011 08:20:47

Diagram 10



Date: 5.SEP.2011 15:14:15

Appendix 4

Band edge measurements according to 47 CFR 2.1051, 22.917 / IC RSS-132 4.5

Date 2011-09-01 to 2011-09-05	Temperature 22 °C ± 3 °C	Humidity 49-55 % ± 5 %
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Test set-up and procedure

The output 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. Both 22.917 and RSS-132 specifies a RBW of at least 1 % of the emission bandwidth up to 1 MHz away from the band edges. 22.917 specifies a RBW of at least 100 kHz for measurements of emission >1 MHz away from the band edges and RSS-132 specifies a RBW of at least 1 MHz for measurements of emission >1MHz away from the band edges for equipment having an emission bandwidth of ≥4 MHz.

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 in Appendix 3 were used for the calculation of the limit.

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

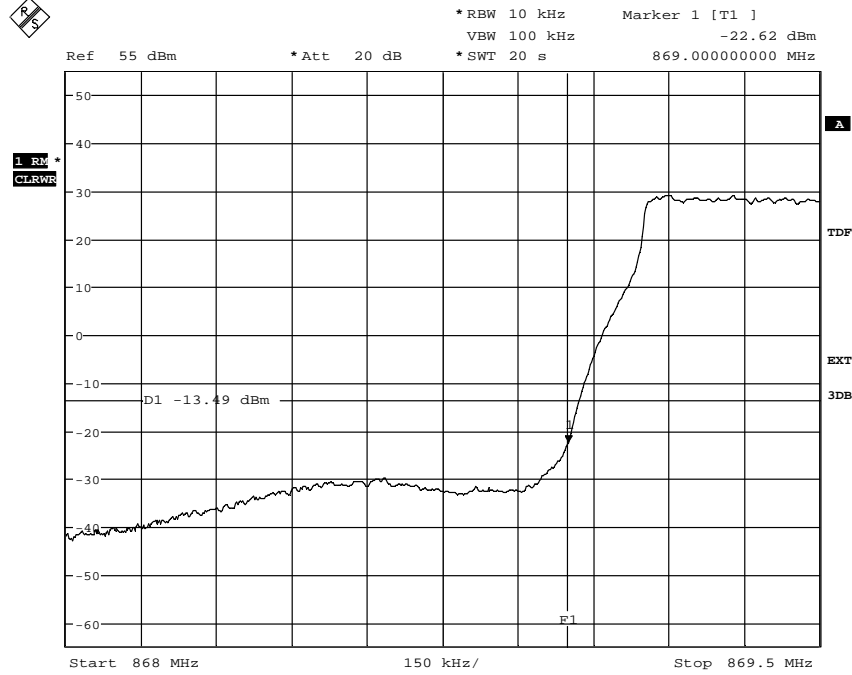
CFR 47, §22.917 / RSS-132 4.5:

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

Complies?	Yes
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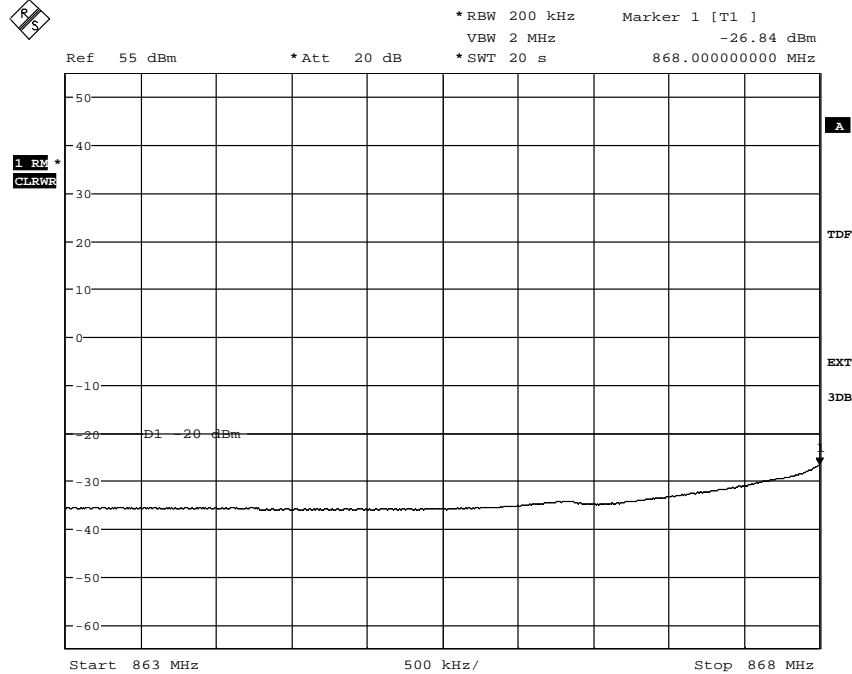
Appendix 4

Diagram 1 a



Date: 5.SEP.2011 09:54:54

Diagram 1 b



Date: 5.SEP.2011 09:56:36

Appendix 4

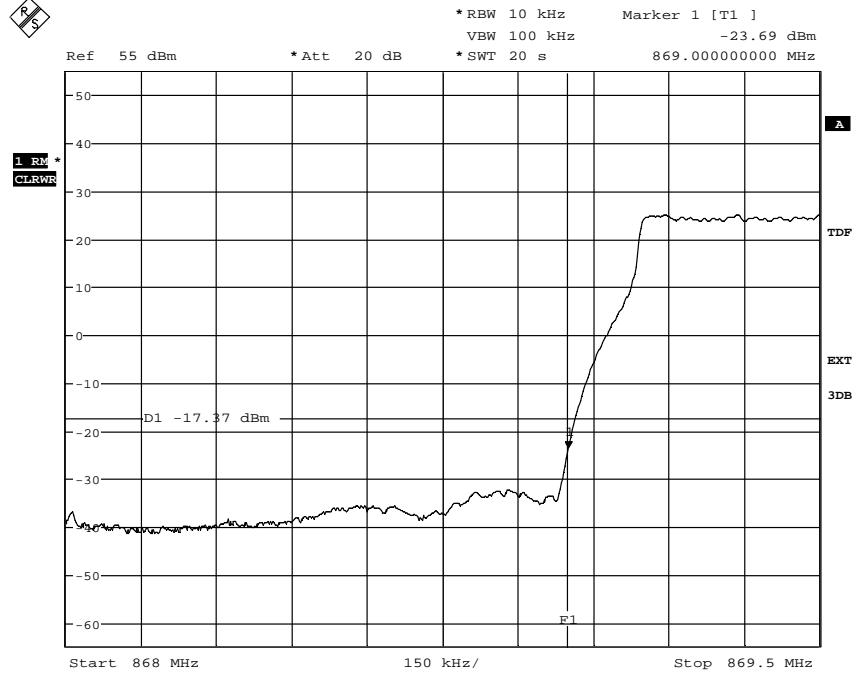
Diagram 1 c



Date: 5.SEP.2011 09:58:18

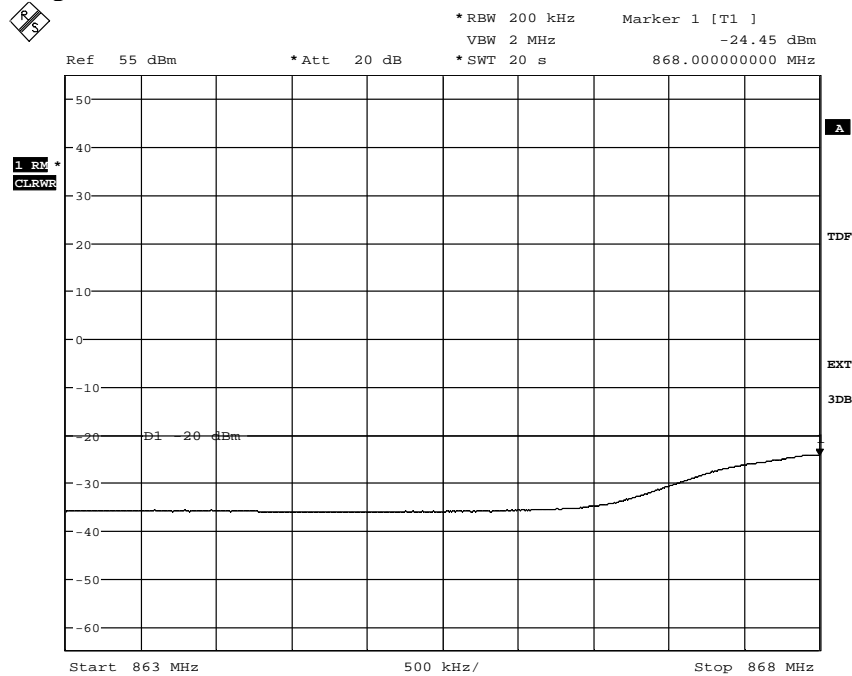
Appendix 4

Diagram 2 a



Date: 5.SEP.2011 14:00:43

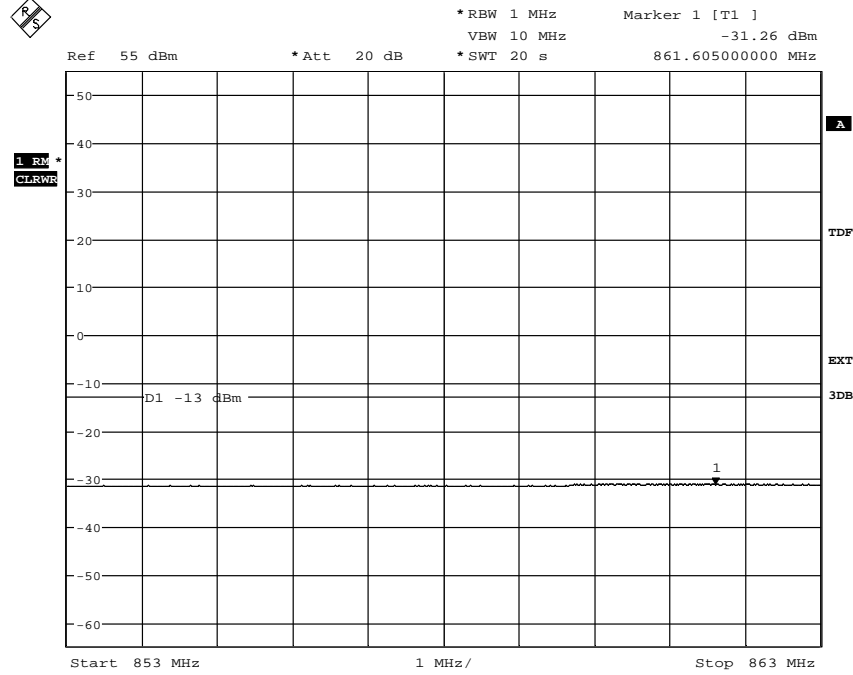
Diagram 2 b



Date: 5.SEP.2011 14:03:02

Appendix 4

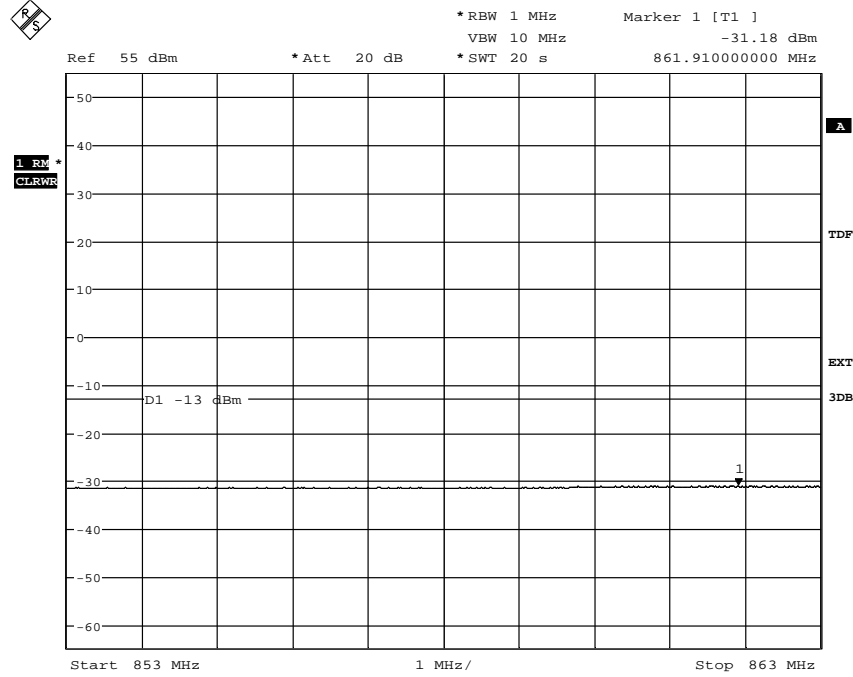
Diagram 2 c



Date: 5.SEP.2011 14:04:46

Appendix 4

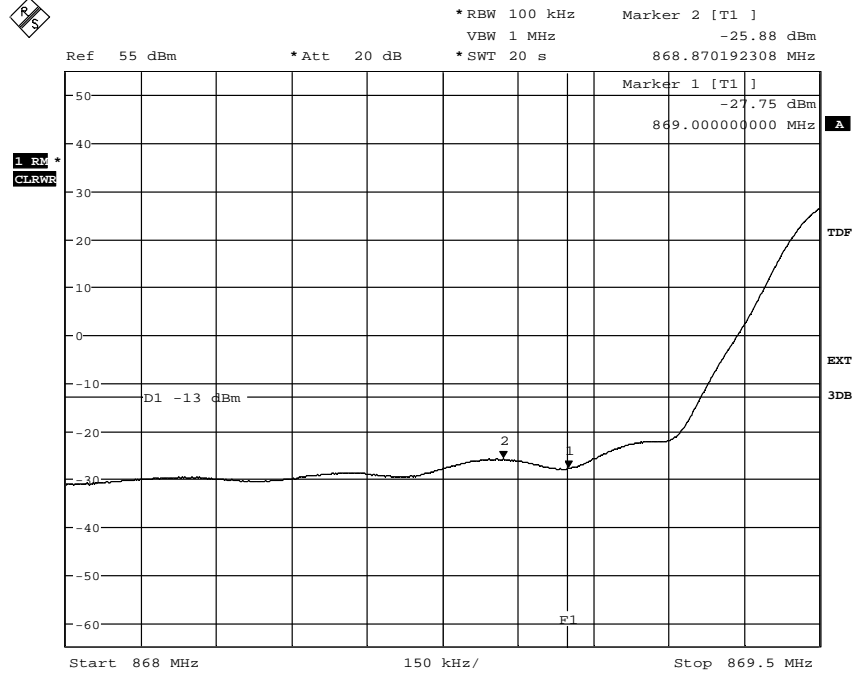
Diagram 3 c



Date: 5.SEP.2011 14:09:09

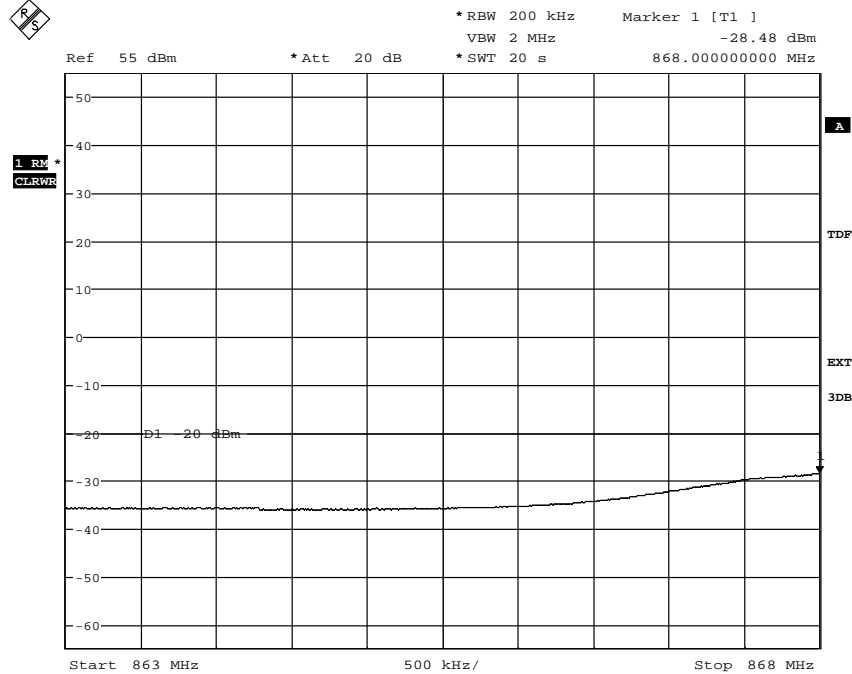
Appendix 4

Diagram 4 a



Date: 5.SEP.2011 14:28:47

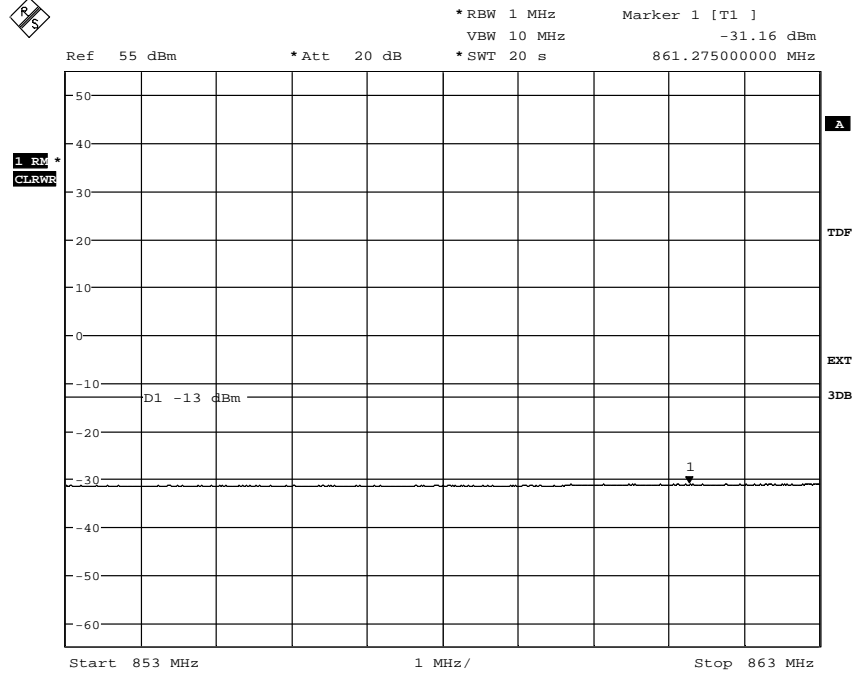
Diagram 4 b



Date: 5.SEP.2011 14:36:46

Appendix 4

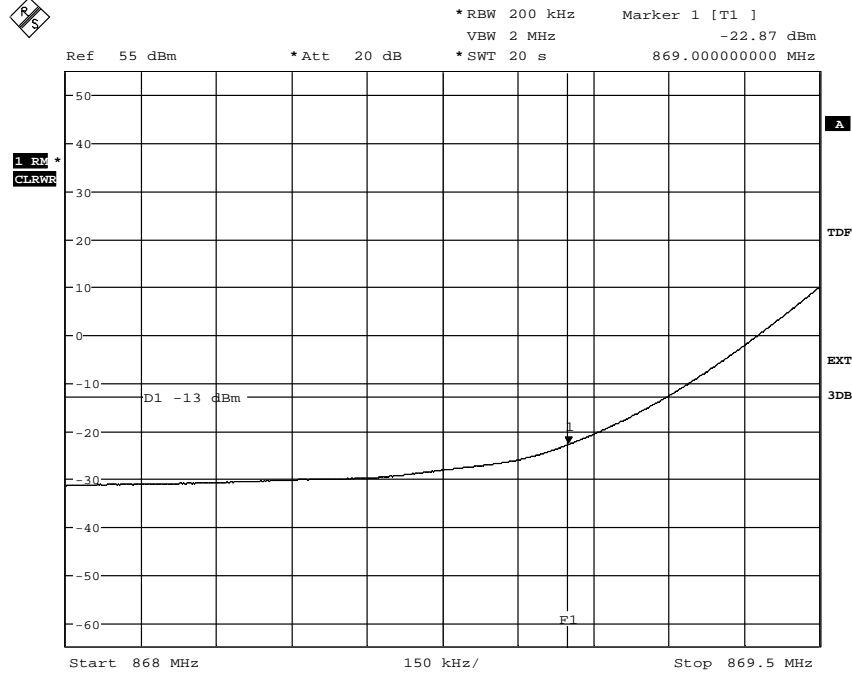
Diagram 4 c



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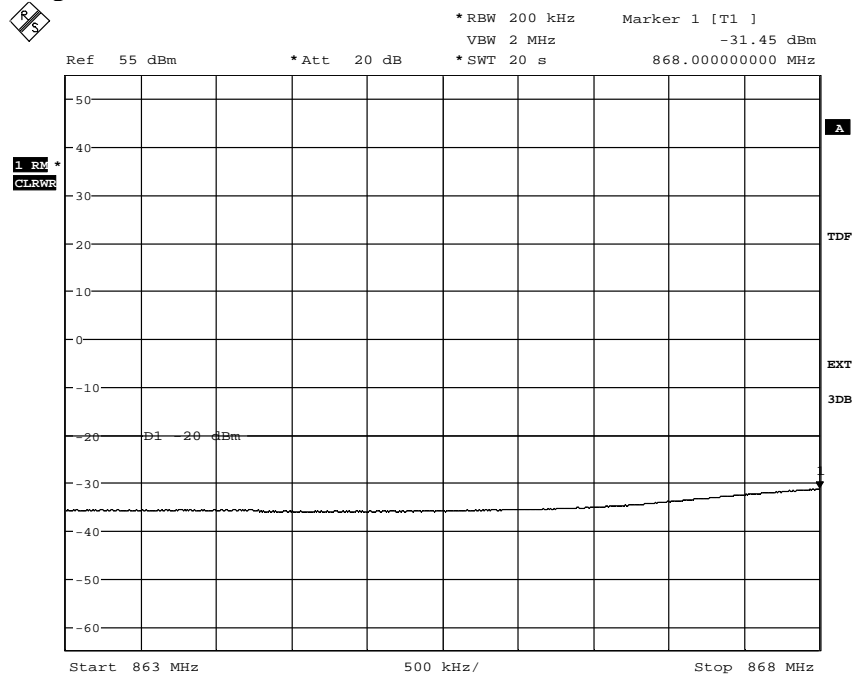
Appendix 4

Diagram 5 a



Date: 5.SEP.2011 14:59:11

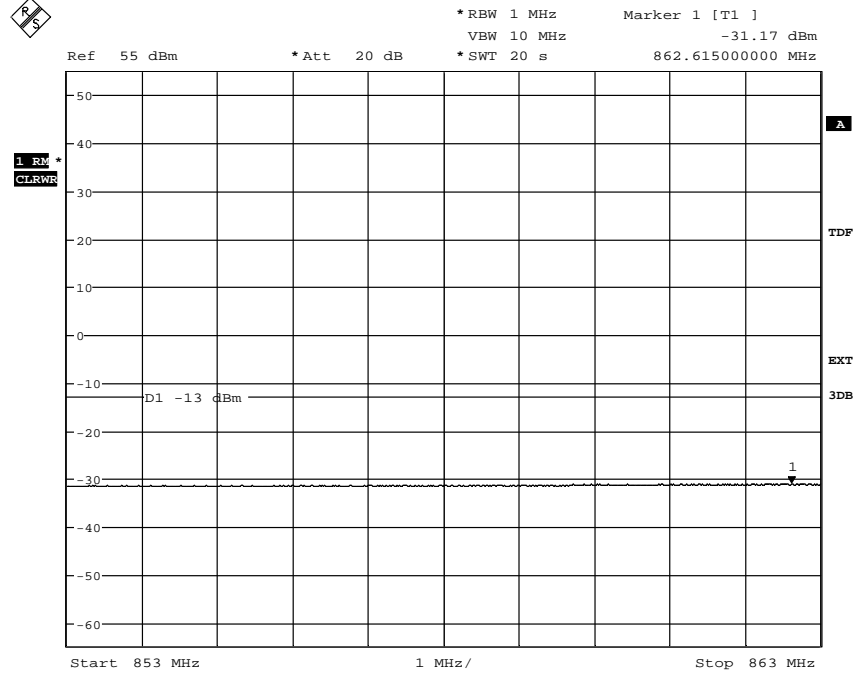
Diagram 5 b



Date: 5.SEP.2011 15:00:57

Appendix 4

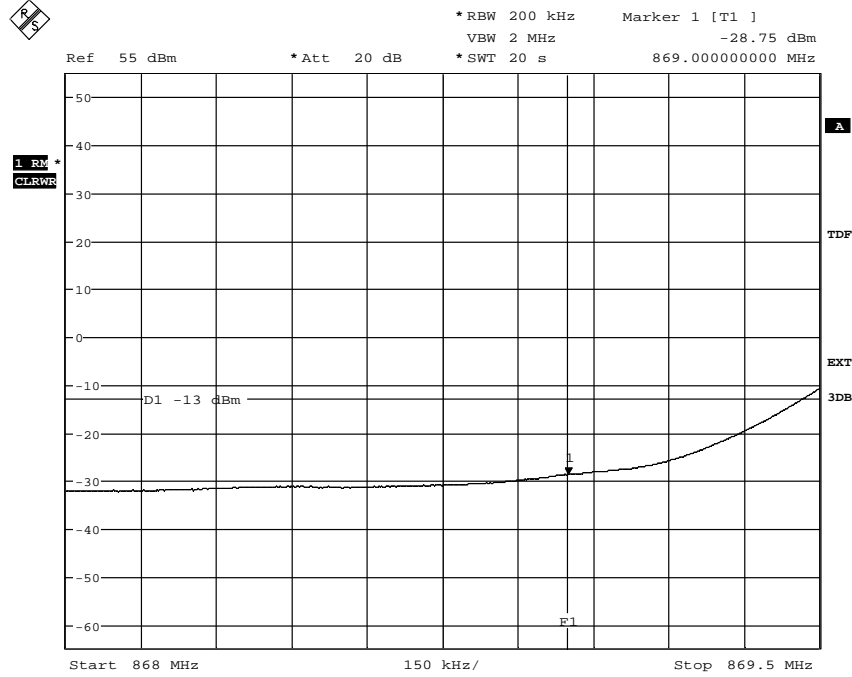
Diagram 5 c



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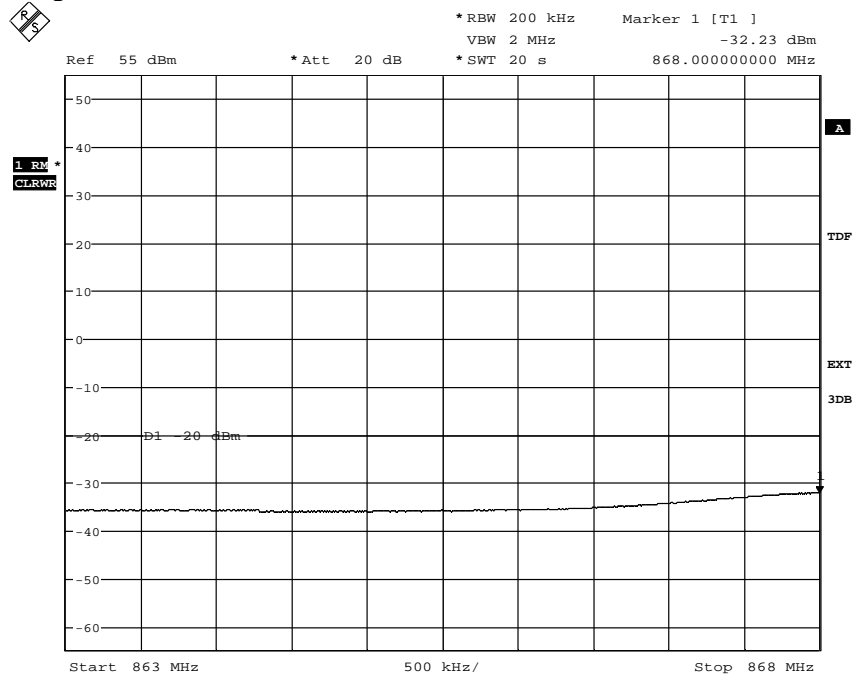
Appendix 4

Diagram 6 a



Date: 5.SEP.2011 10:57:44

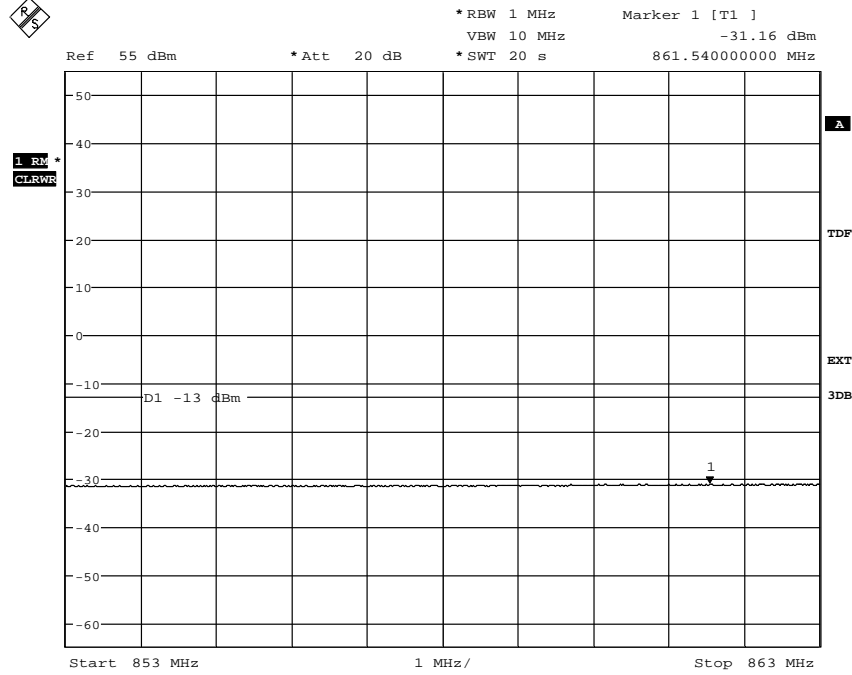
Diagram 6 b



Date: 5.SEP.2011 10:59:42

Appendix 4

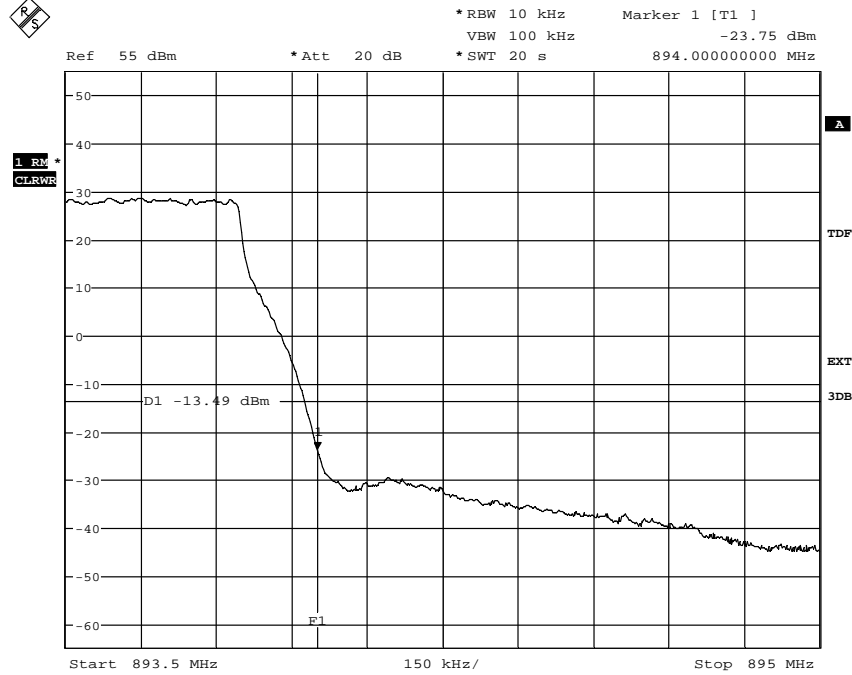
Diagram 6 c



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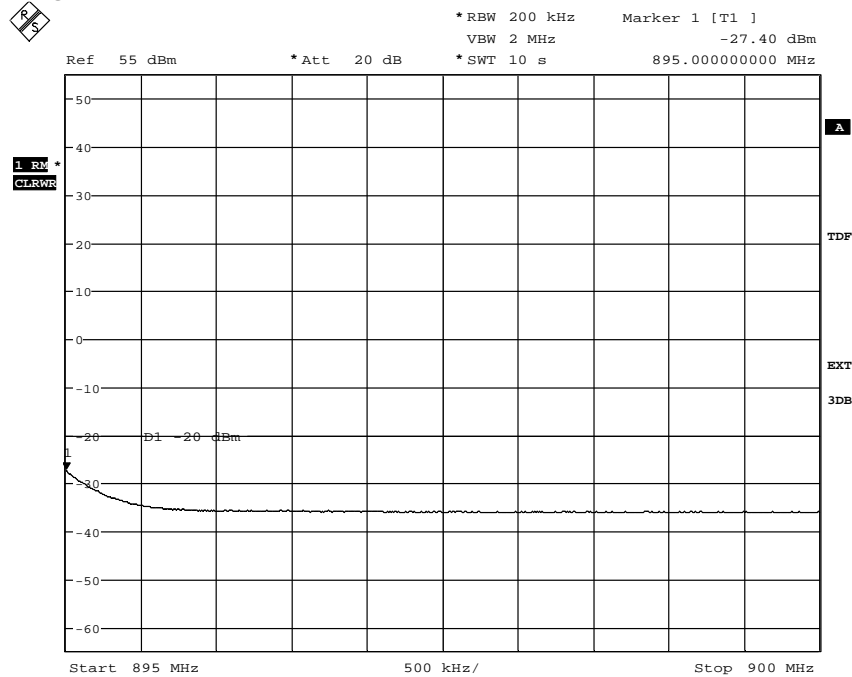
Appendix 4

Diagram 7 a



Date: 2.SEP.2011 08:45:07

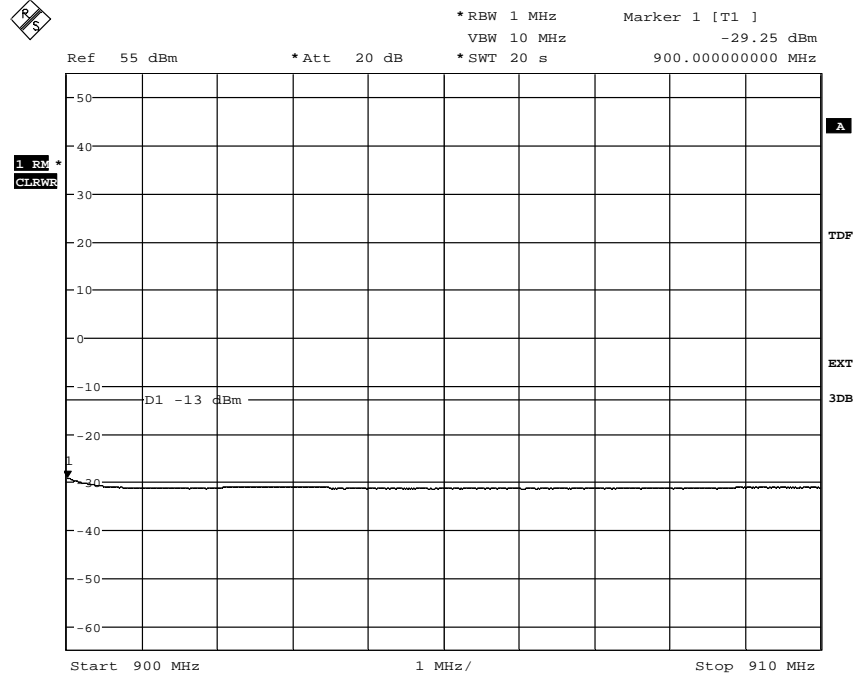
Diagram 7 b



Date: 2.SEP.2011 09:29:32

Appendix 4

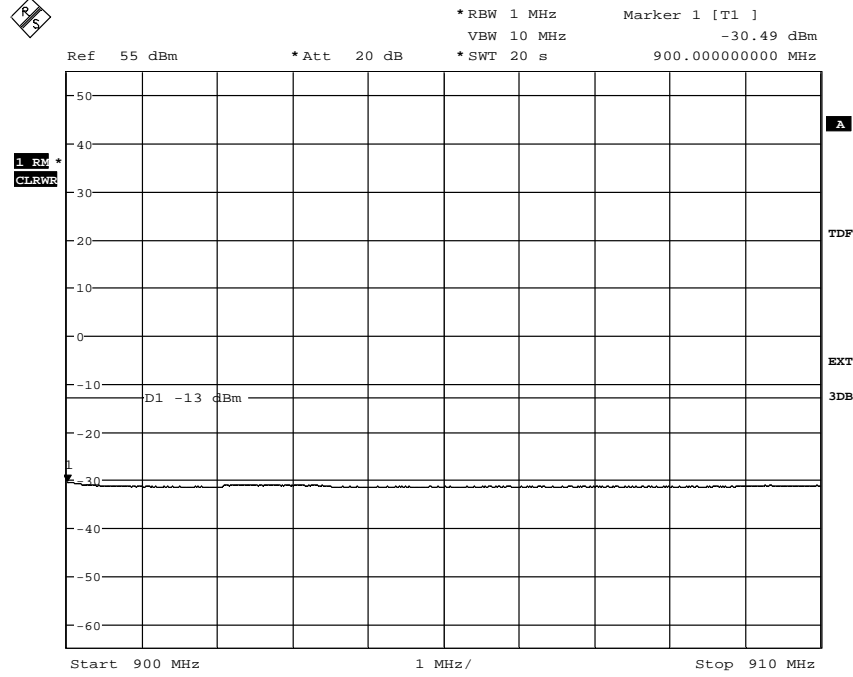
Diagram 7 c



Date: 2.SEP.2011 09:31:26

Appendix 4

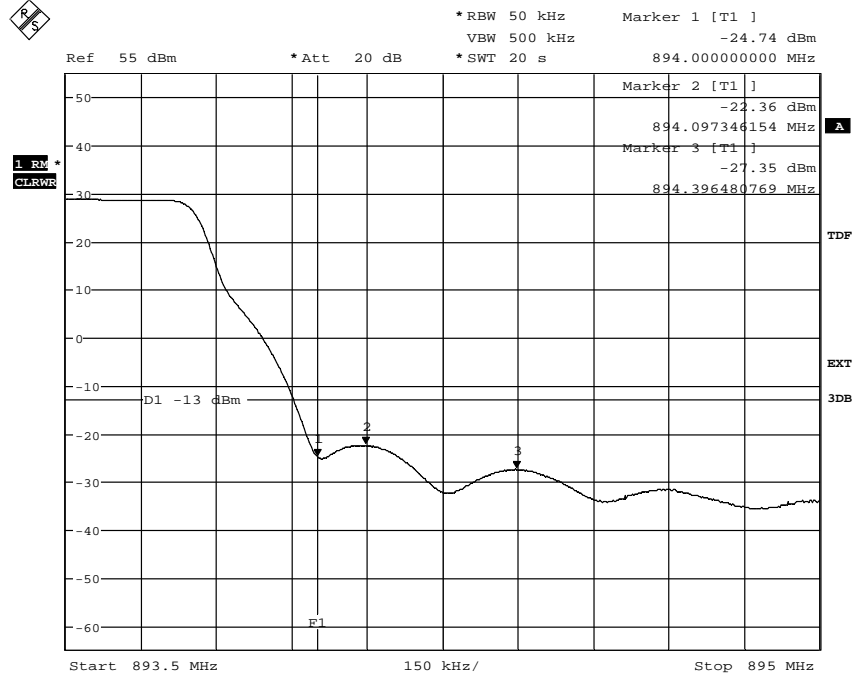
Diagram 8 c



Date: 2.SEP.2011 14:56:38

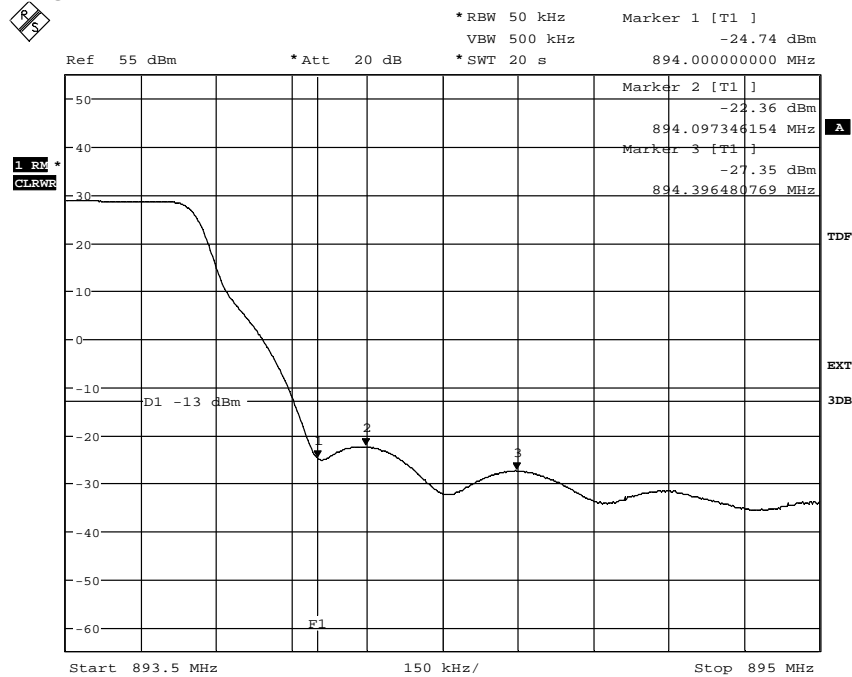
Appendix 4

Diagram 9 a



Date: 2.SEP.2011 14:45:43

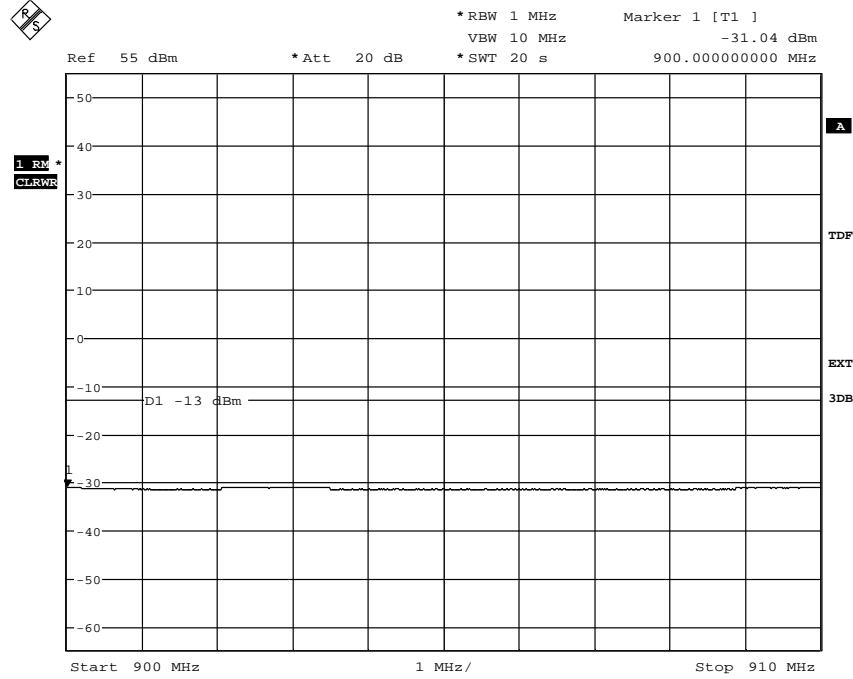
Diagram 9 b



Date: 2.SEP.2011 14:45:43

Appendix 4

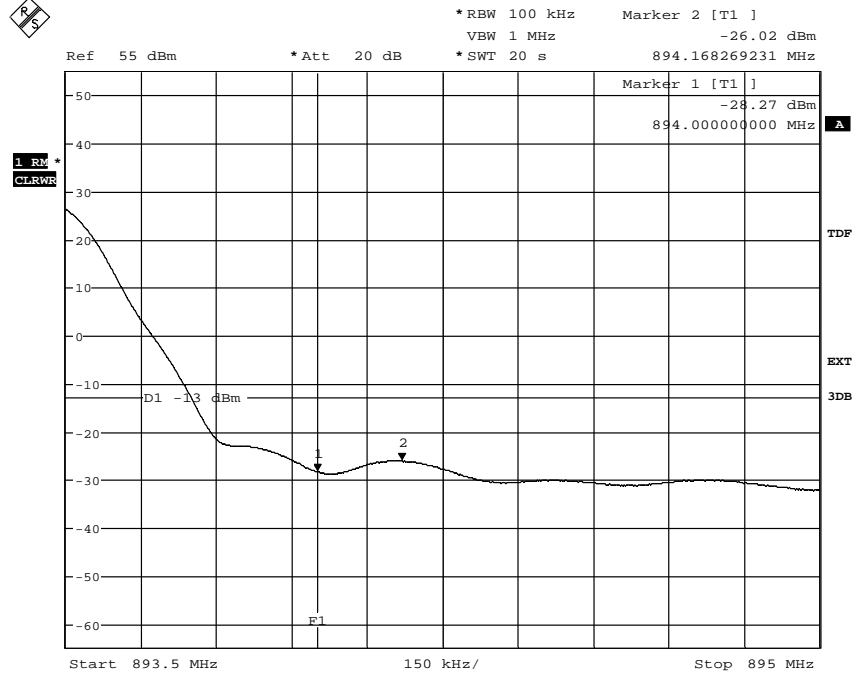
Diagram 9 c



Date: 2.SEP.2011 14:48:48

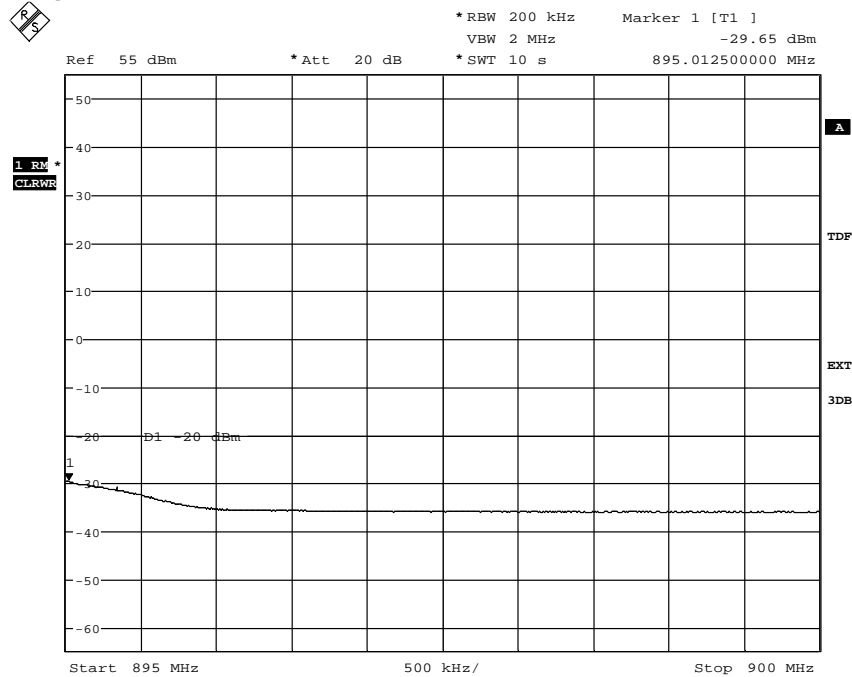
Appendix 4

Diagram 10 a



Date: 2.SEP.2011 13:36:19

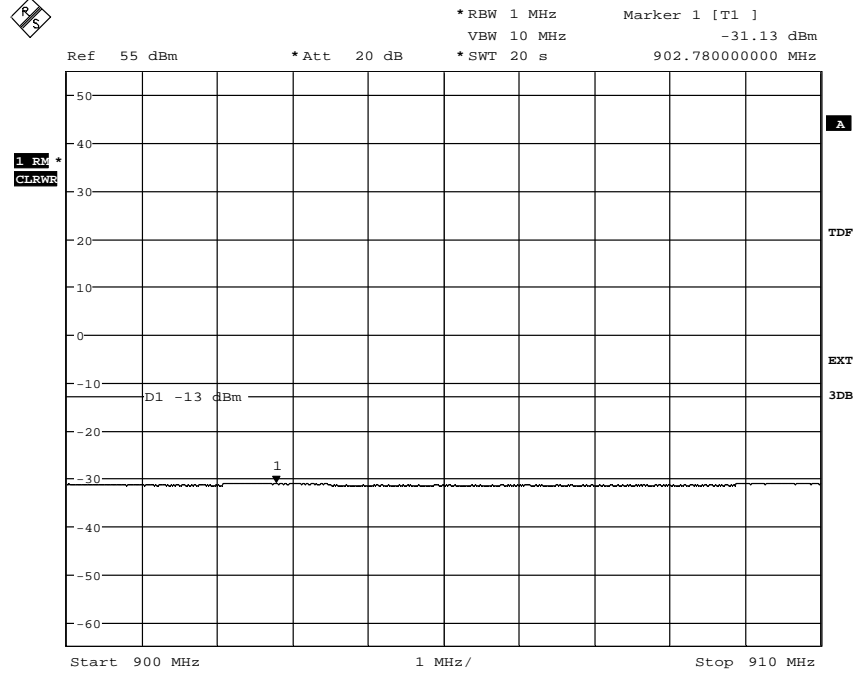
Diagram 10 b



Date: 2.SEP.2011 13:37:20

Appendix 4

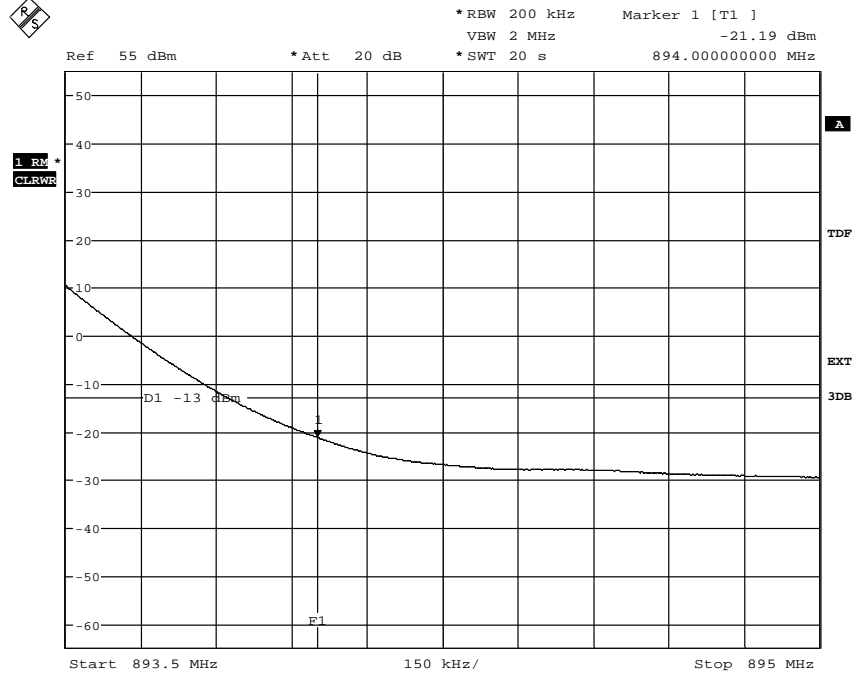
Diagram 10 c



Date: 2.SEP.2011 13:38:58

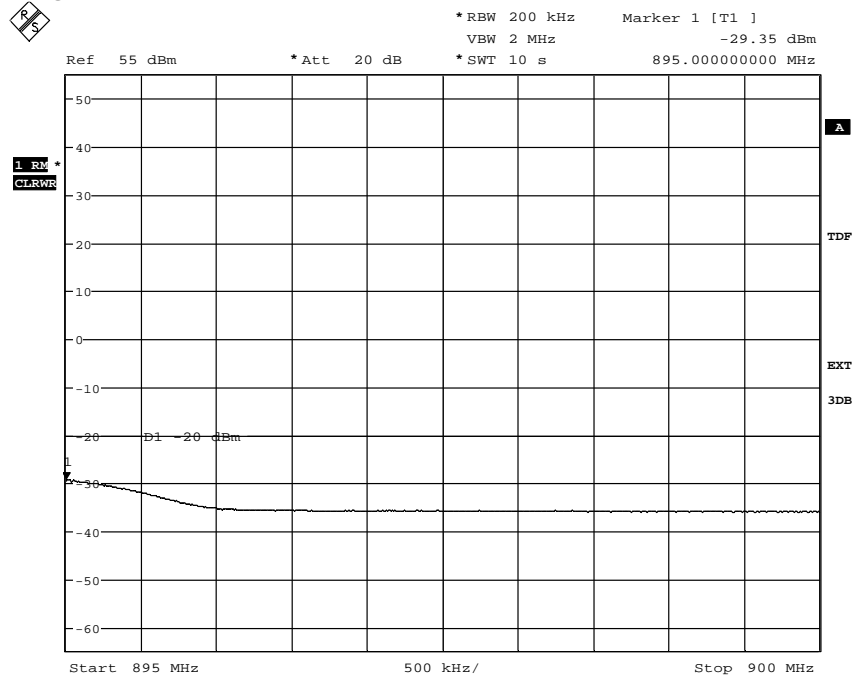
Appendix 4

Diagram 11 a



Date: 2.SEP.2011 13:14:39

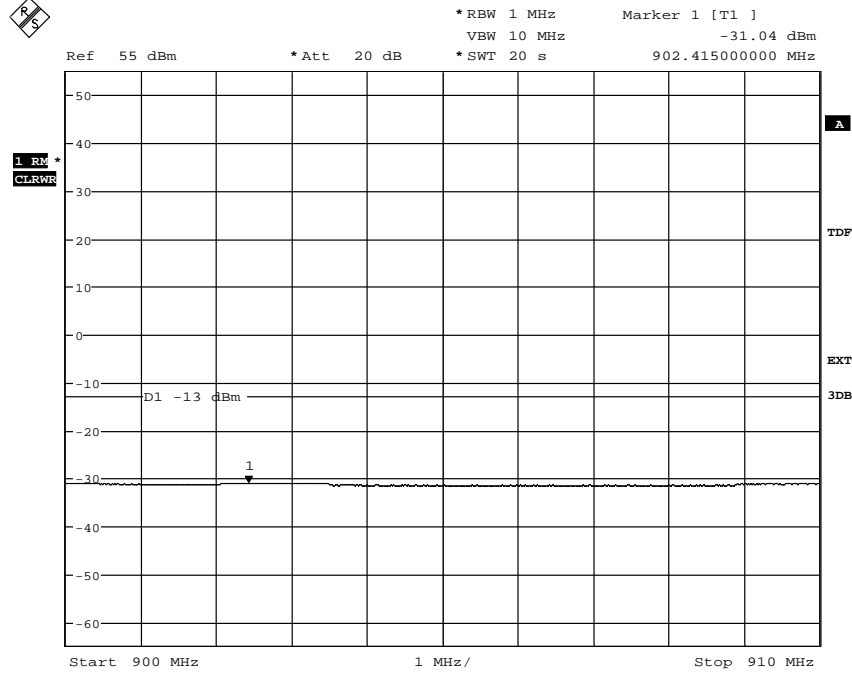
Diagram 11 b



Date: 2.SEP.2011 13:15:46

Appendix 4

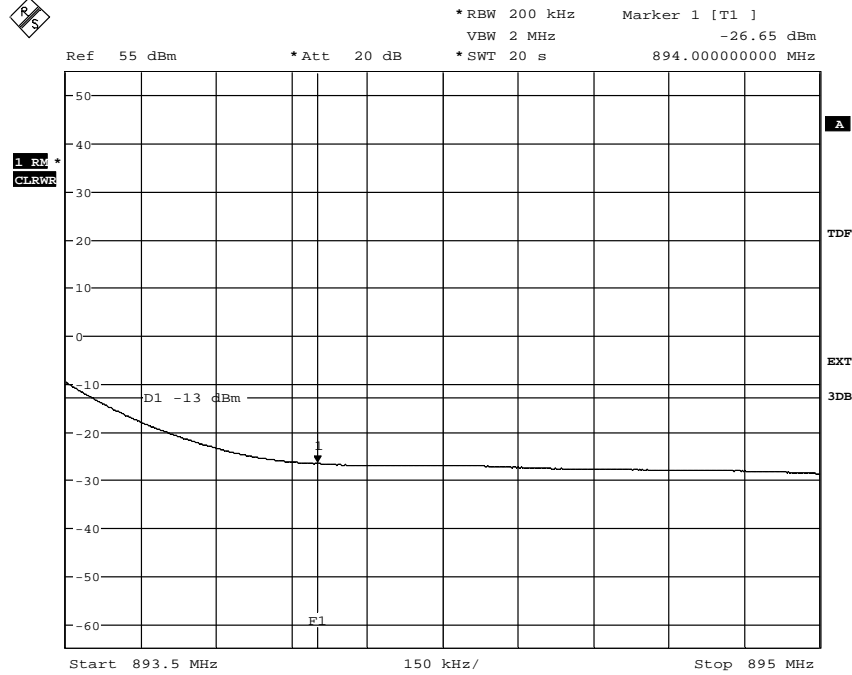
Diagram 11 c



Date: 2.SEP.2011 13:16:57

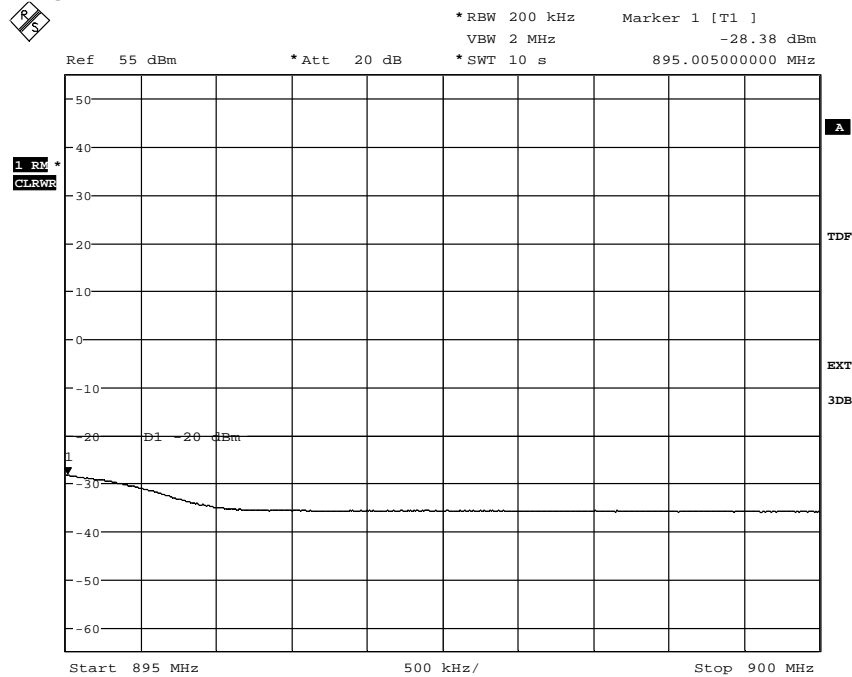
Appendix 4

Diagram 12 a



Date: 2.SEP.2011 11:26:50

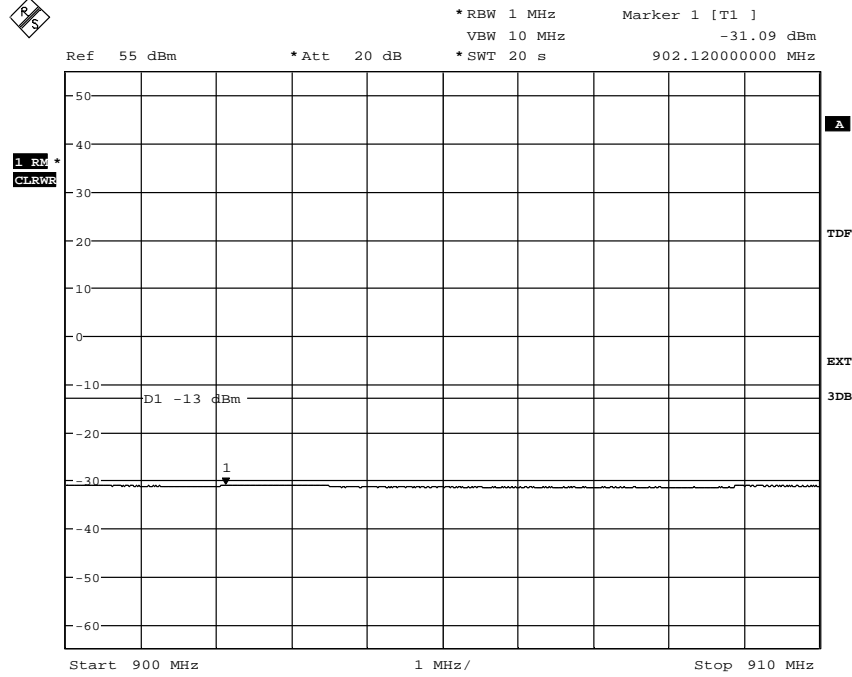
Diagram 12 b



Date: 2.SEP.2011 12:46:30

Appendix 4

Diagram 12 c



Date: 2.SEP.2011 12:48:00

Appendix 5

Conducted spurious emission measurements according to 47 CFR 2.1051, 22.917 / IC RSS-132 4.5

Date 2011-09-01 to 2011-09-05	Temperature 22 °C ± 3 °C	Humidity 49-55 % ± 5 %
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Test set-up and procedure

The measurements were made with a resolution bandwidth of 1 MHz instead of 100 kHz as RSS-132 specifies a resolution bandwidth of 1 MHz for equipment with an emission bandwidth of ≥4 MHz. The output was connected to a spectrum analyzer with the RMS detector activated.

Measurement equipment	SP number
Rohde & Schwarz FSQ40	504 143
RF attenuator	504 159
RF attenuator	900 233
High pass filter used within 1-15 GHz	504 199
High pass filter used within 15-18 GHz	504 200
High pass filter used within 18-25 GHz	503 740
Testo 615 temperature and humidity meter	503 498

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.

Appendix 5

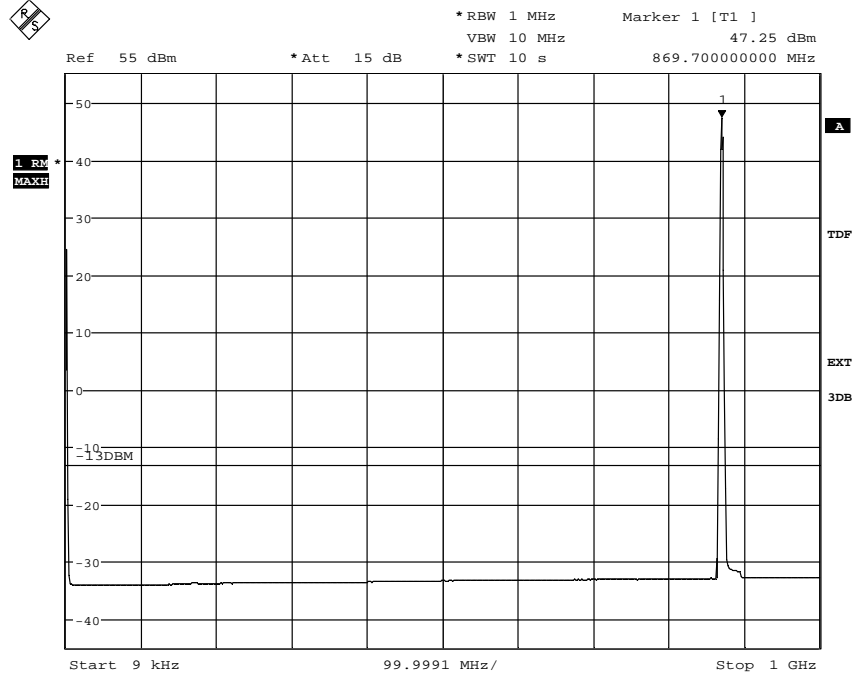
Limits

CFR 47, 22.917 / RSS-132 4.5: The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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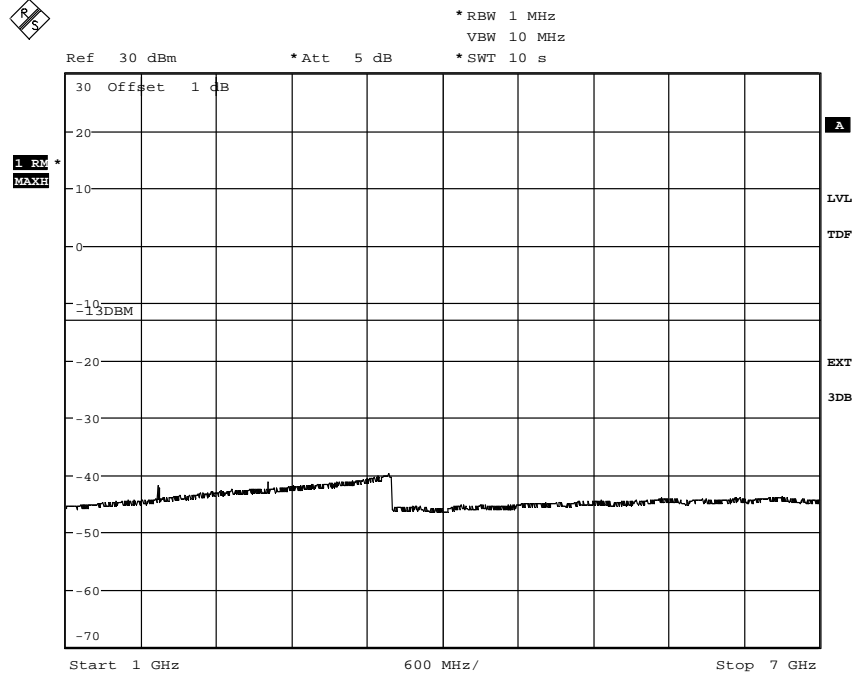
Appendix 5

Diagram 1a:



Date: 5.SEP.2011 09:35:20

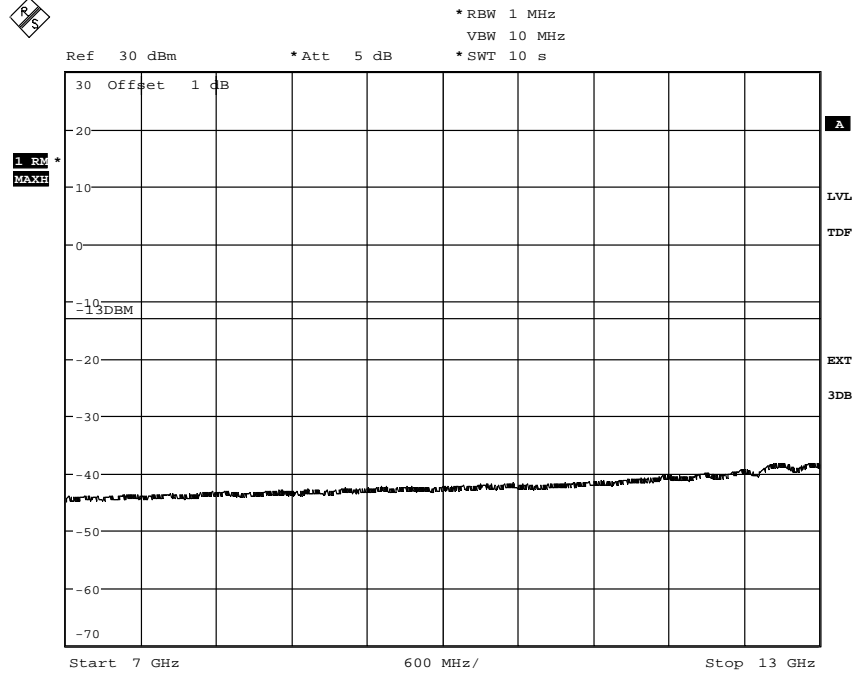
Diagram 1b:



Date: 5.SEP.2011 10:11:03

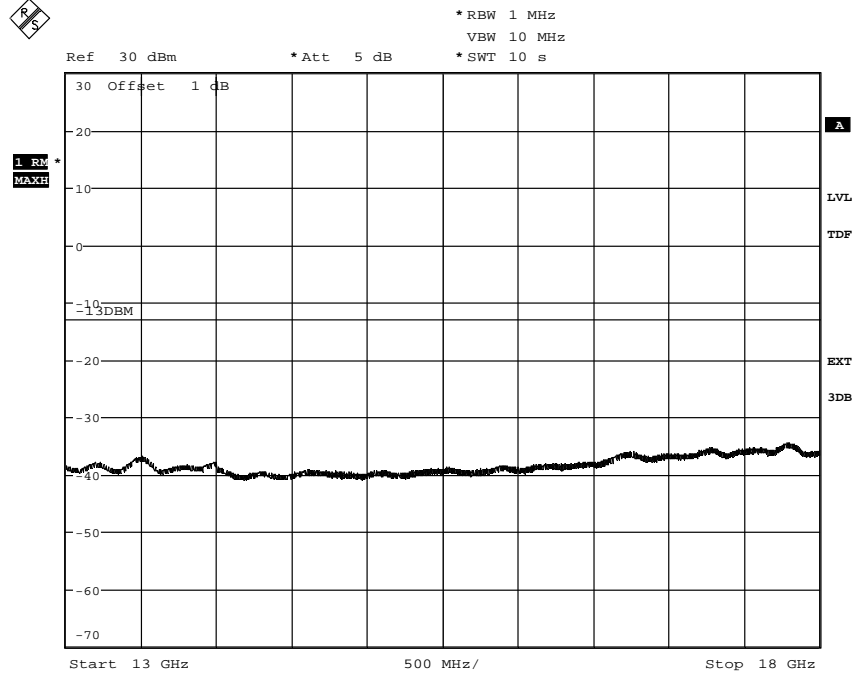
Appendix 5

Diagram 1c:



Date: 5.SEP.2011 10:13:12

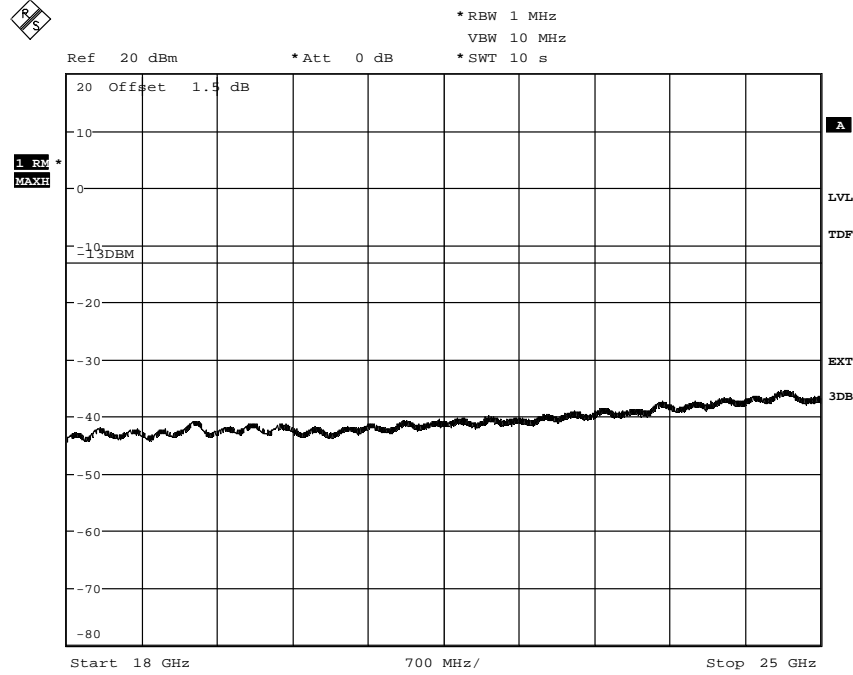
Diagram 1d:



Date: 5.SEP.2011 10:15:55

Appendix 5

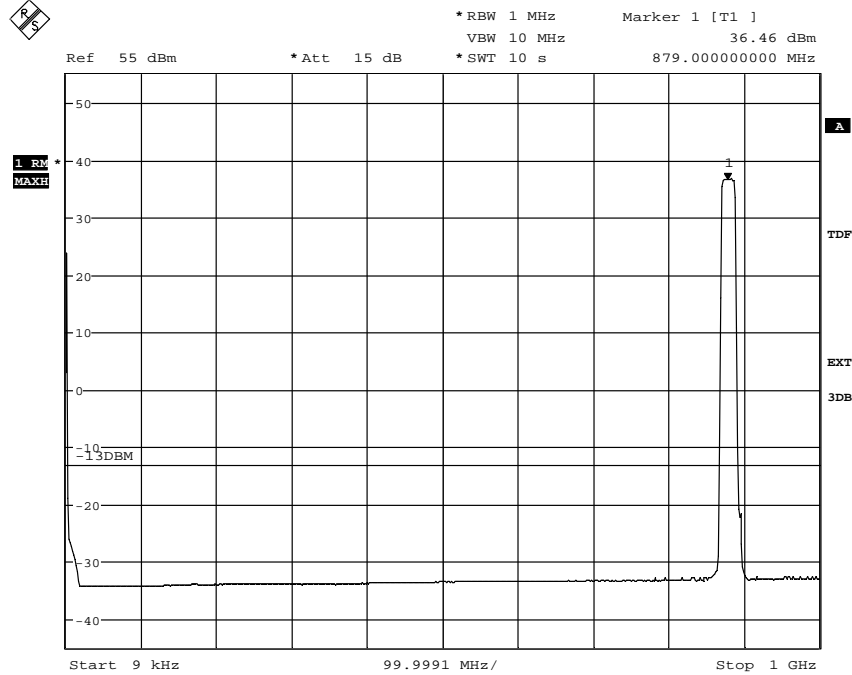
Diagram 1e:



Date: 5.SEP.2011 16:19:59

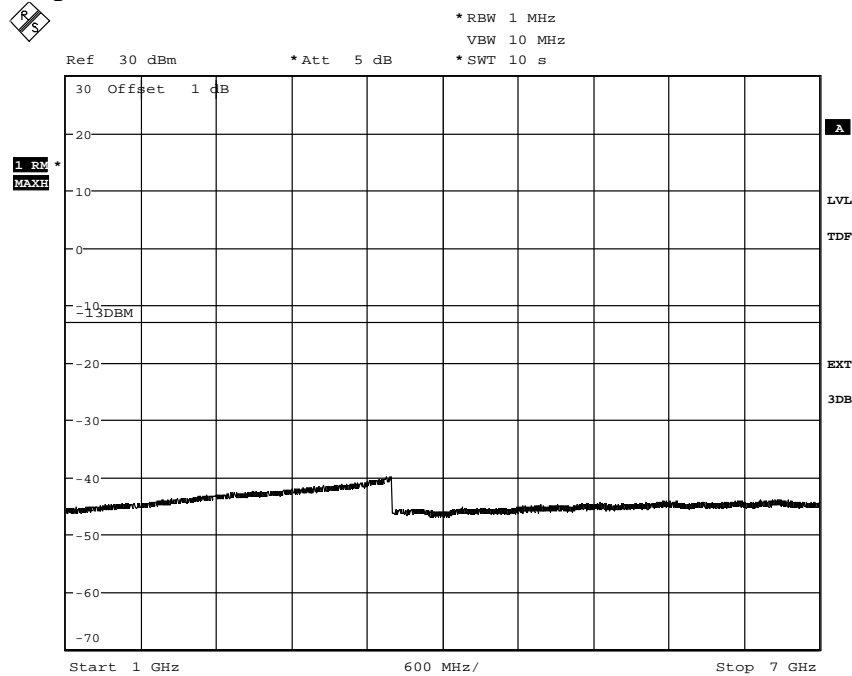
Appendix 5

Diagram 2a:



Date: 5.SEP.2011 11:06:16

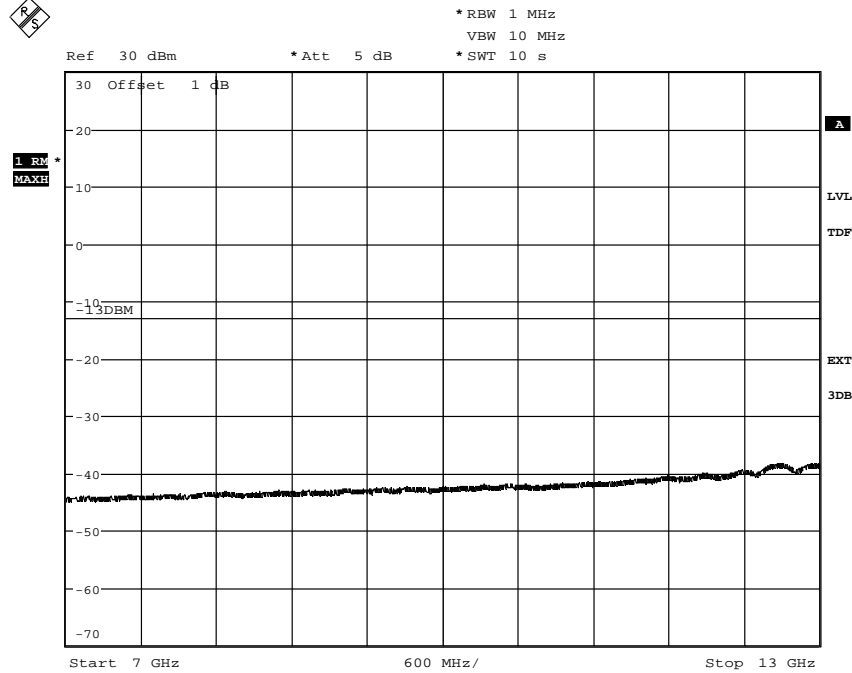
Diagram 2b:



Date: 5.SEP.2011 11:15:24

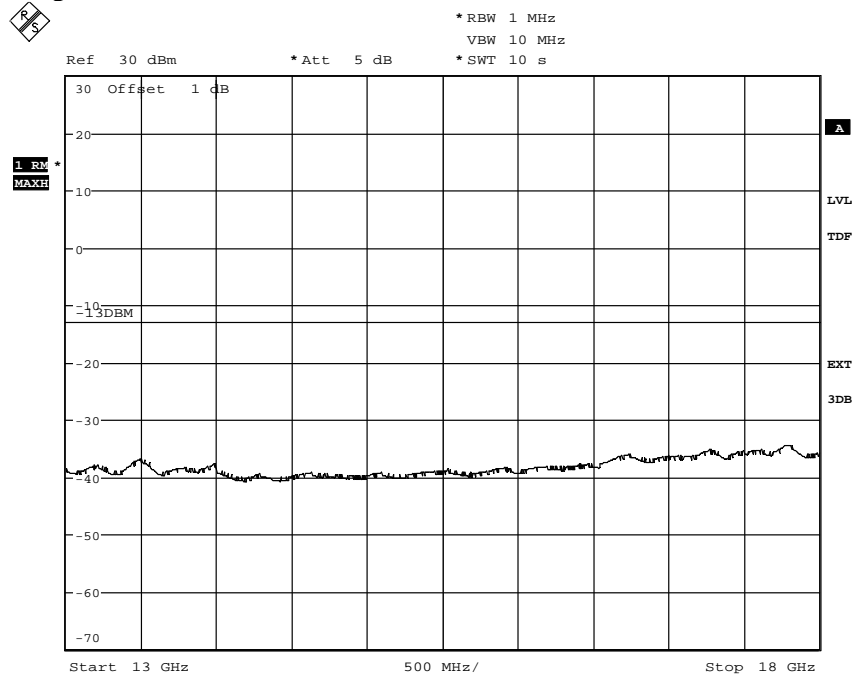
Appendix 5

Diagram 2c:



Date: 5.SEP.2011 11:09:42

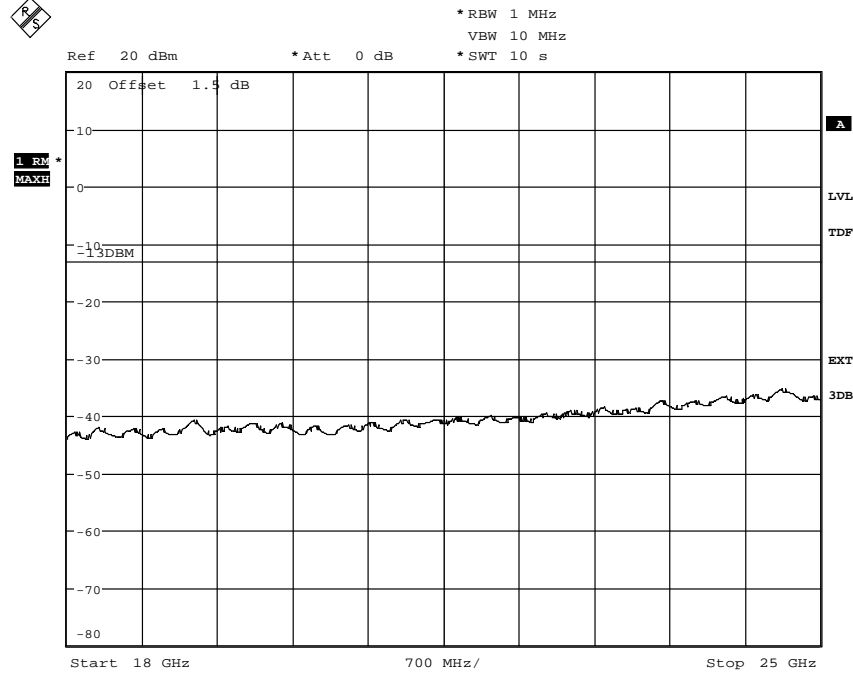
Diagram 2d:



Date: 5.SEP.2011 11:12:43

Appendix 5

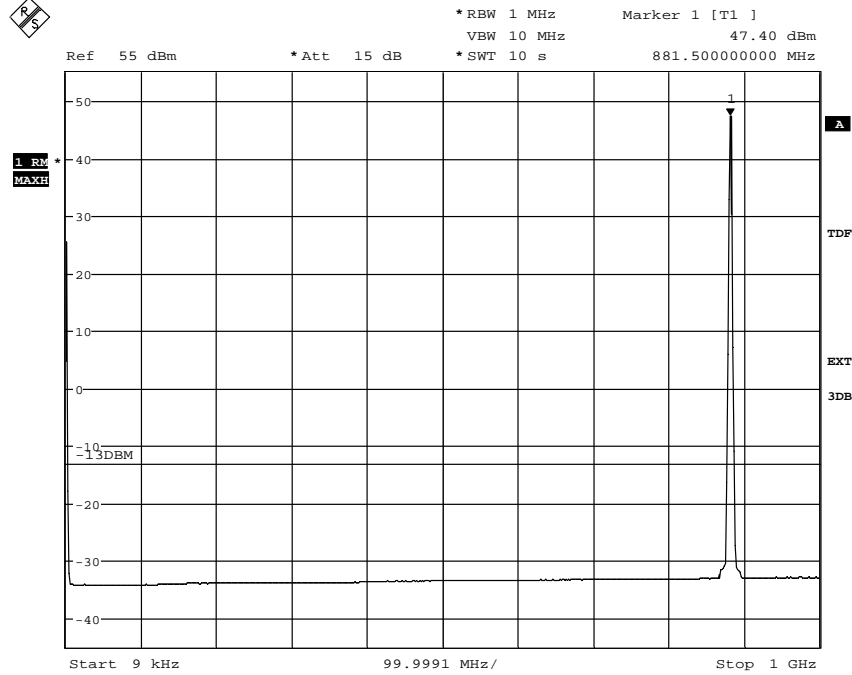
Diagram 2e:



Date: 5.SEP.2011 15:36:17

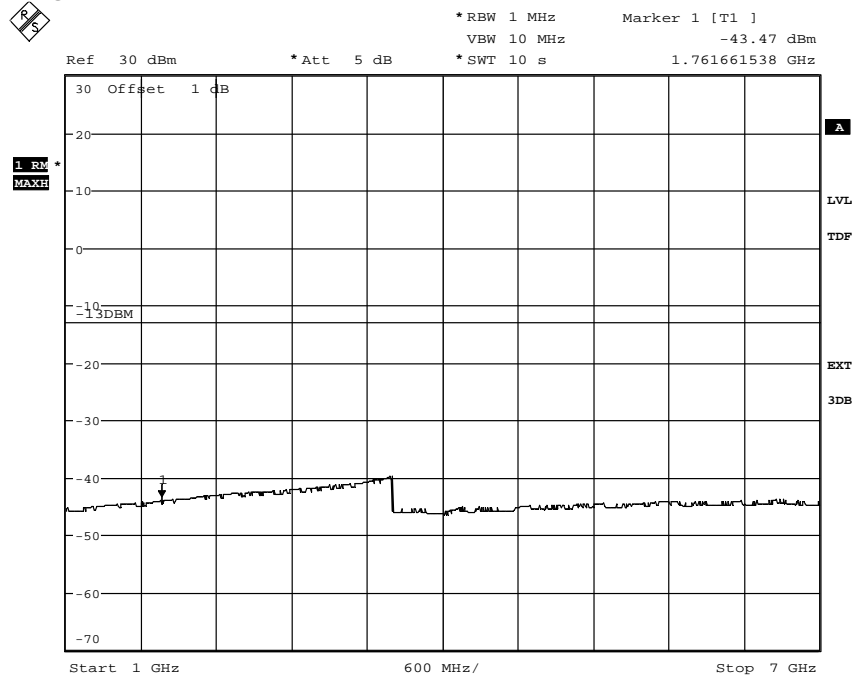
Appendix 5

Diagram 3a:



Date: 1.SEP.2011 12:32:31

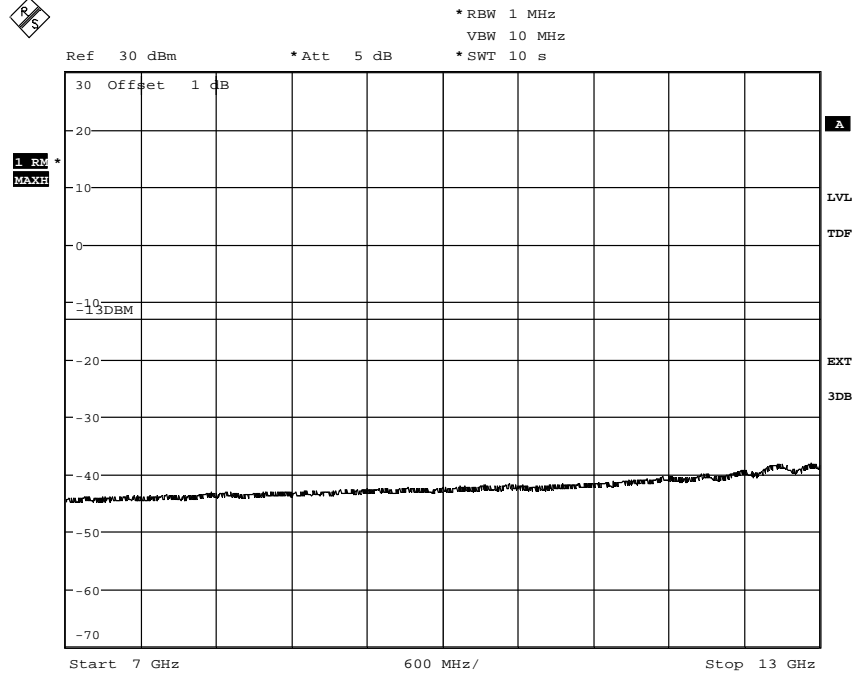
Diagram 3b:



Date: 1.SEP.2011 12:54:45

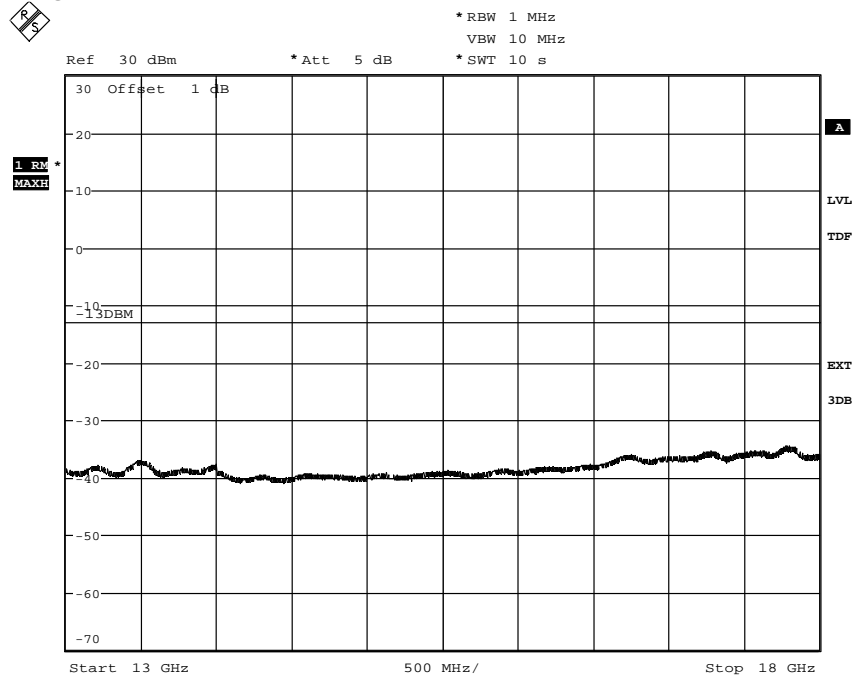
Appendix 5

Diagram 3c:



Date: 1.SEP.2011 12:45:28

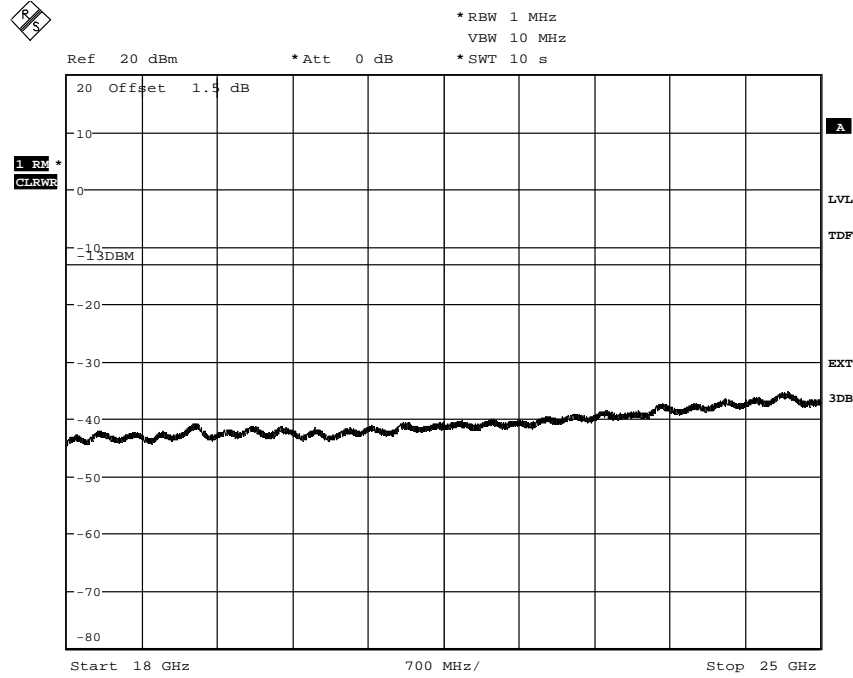
Diagram 3d:



Date: 1.SEP.2011 12:47:50

Appendix 5

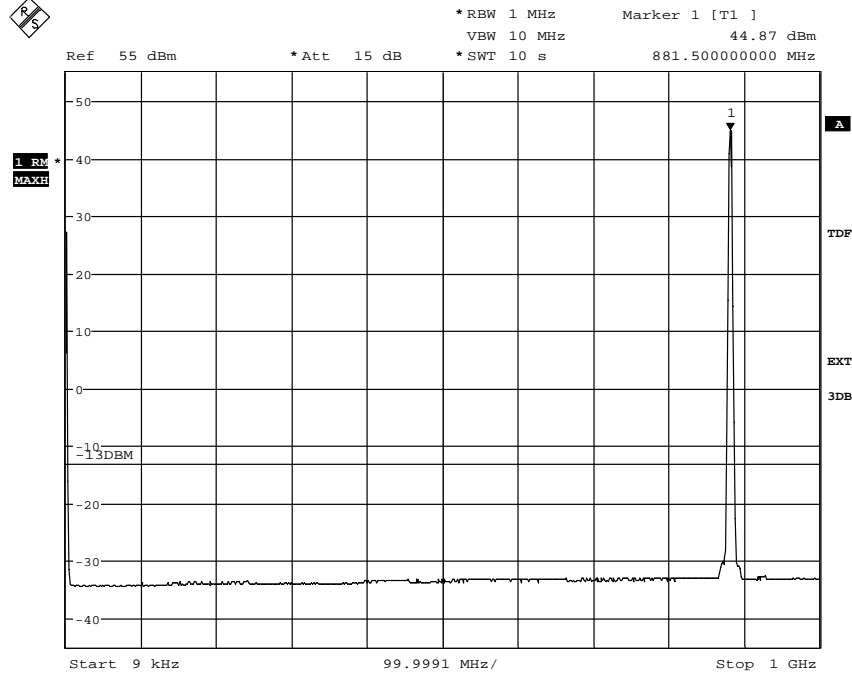
Diagram 3e:



Date: 5.SEP.2011 16:08:20

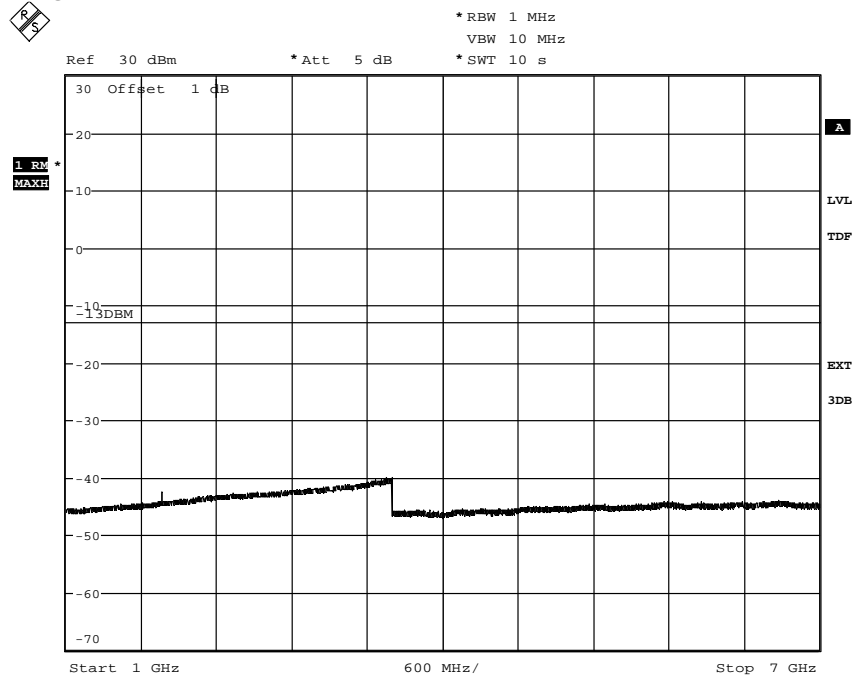
Appendix 5

Diagram 4a:



Date: 1.SEP.2011 14:20:03

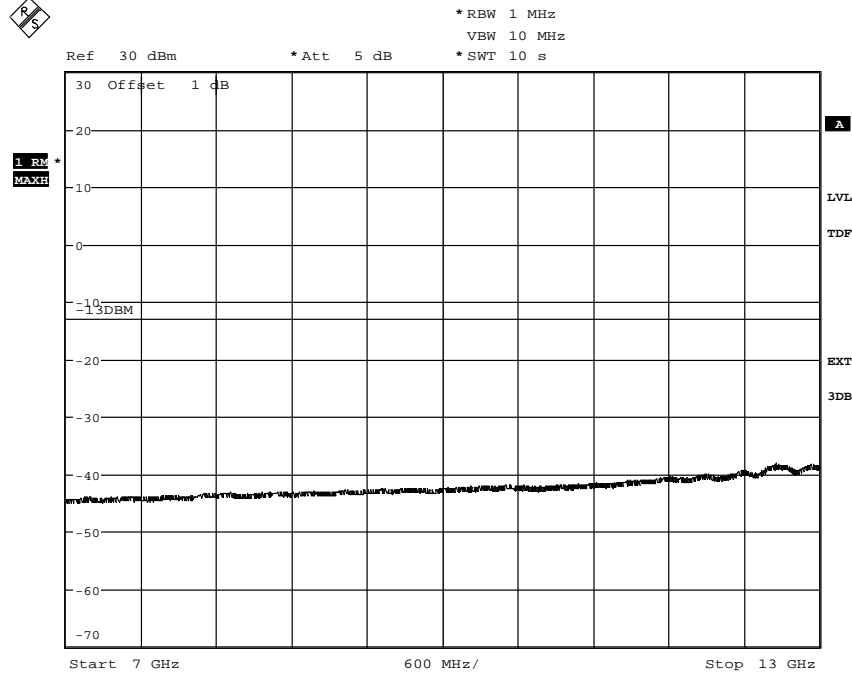
Diagram 4b:



Date: 1.SEP.2011 14:25:52

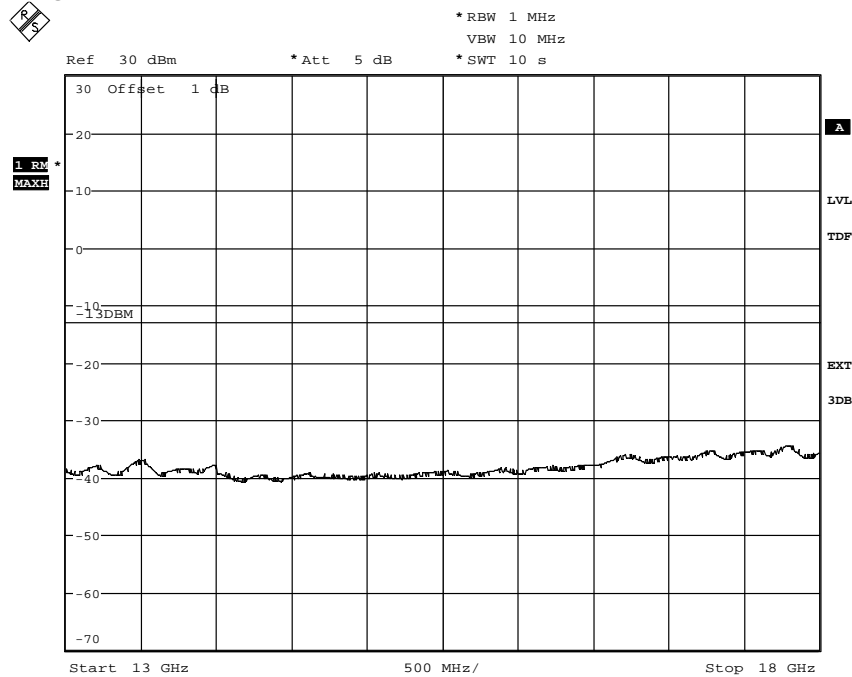
Appendix 5

Diagram 4c:



Date: 1.SEP.2011 14:28:23

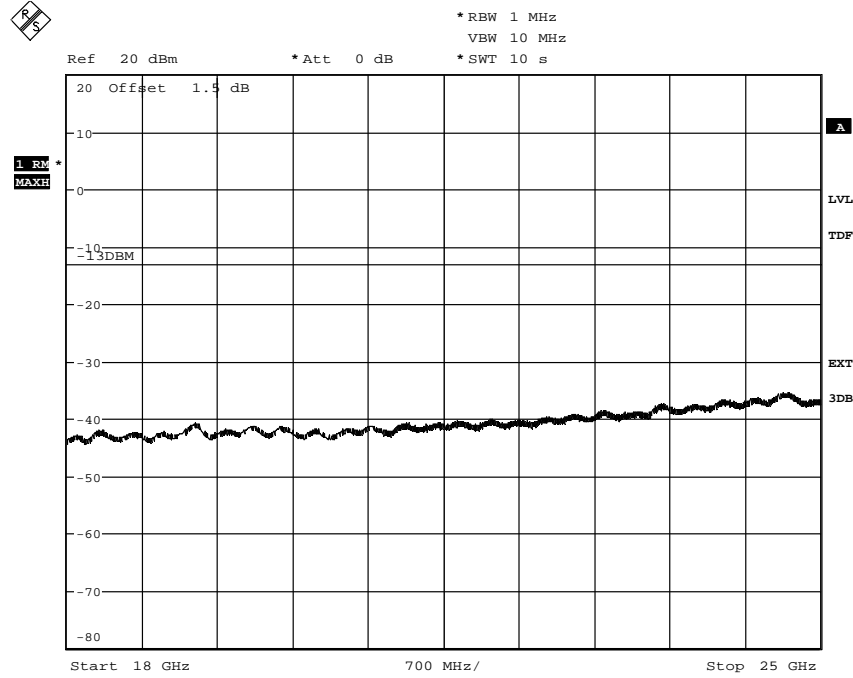
Diagram 4d:



Date: 1.SEP.2011 14:30:57

Appendix 5

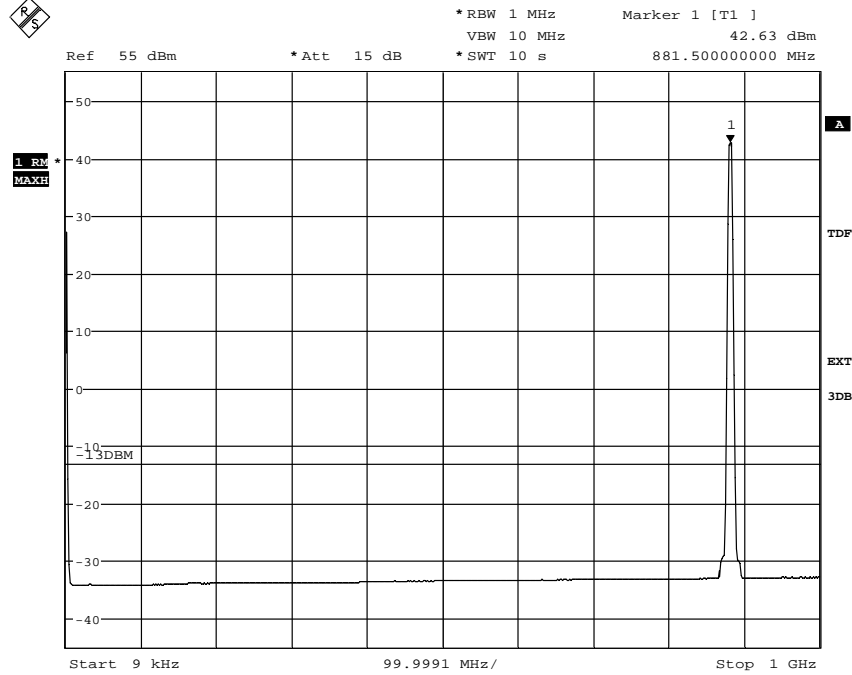
Diagram 4e:



Date: 5.SEP.2011 16:04:57

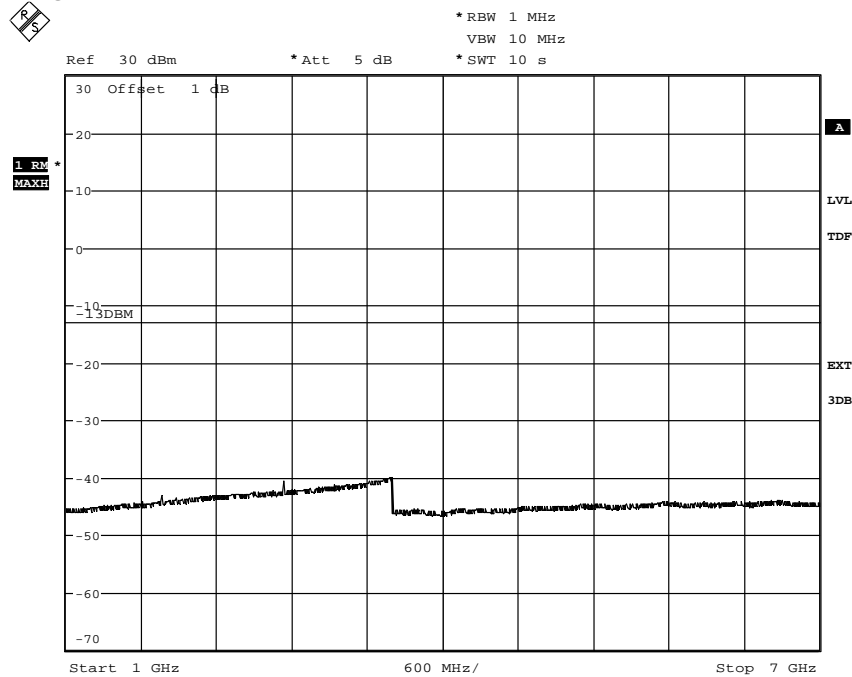
Appendix 5

Diagram 5a:



Date: 1.SEP.2011 14:52:50

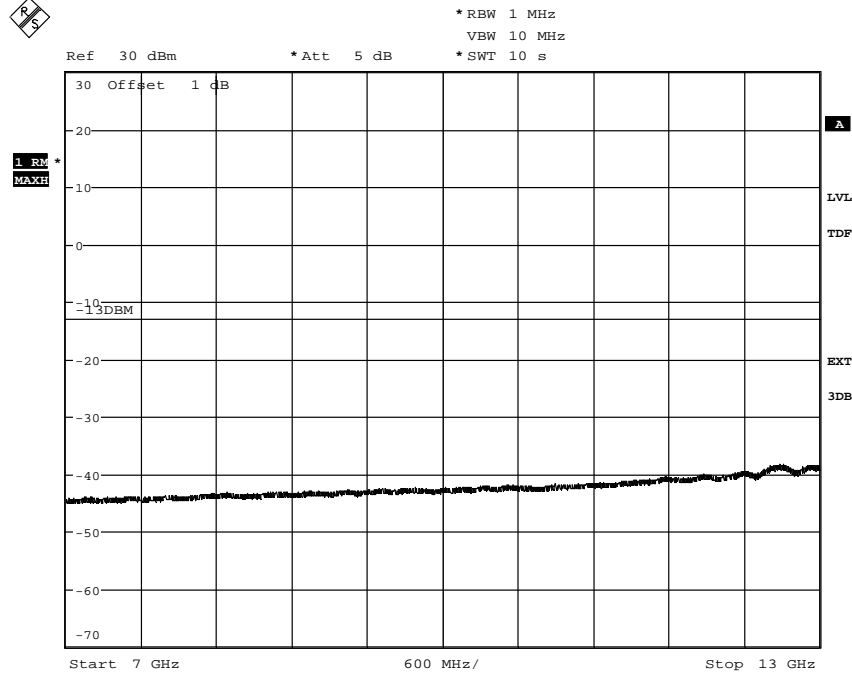
Diagram 5b:



Date: 1.SEP.2011 14:58:41

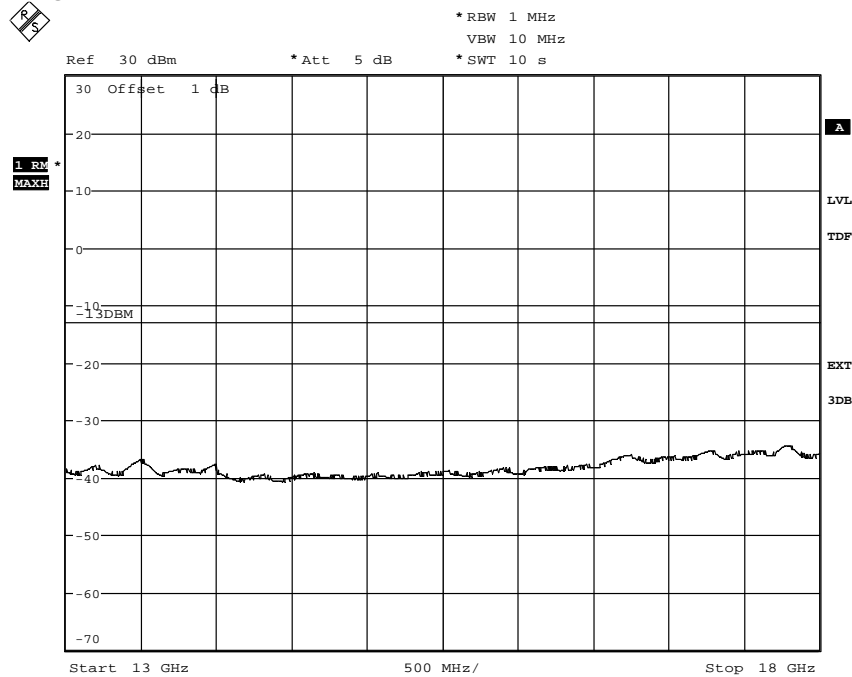
Appendix 5

Diagram 5c:



Date: 1.SEP.2011 14:54:27

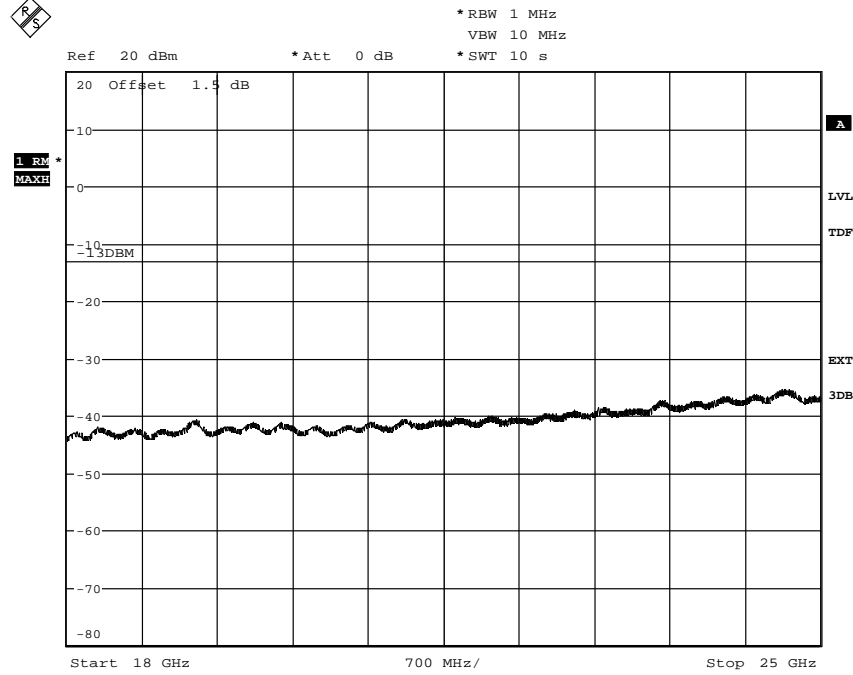
Diagram 5d:



Date: 1.SEP.2011 14:56:42

Appendix 5

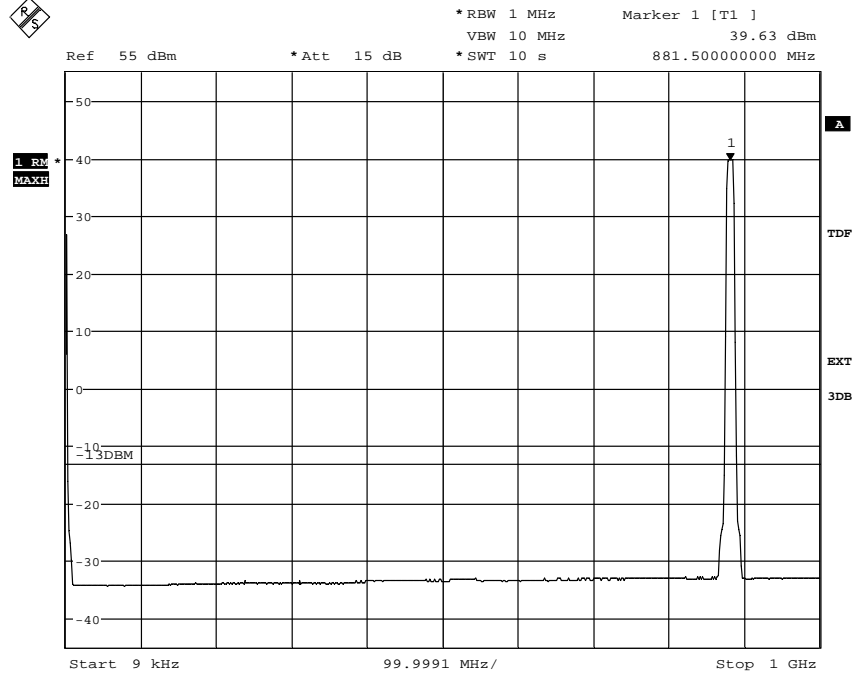
Diagram 5e:



Date: 5.SEP.2011 16:01:21

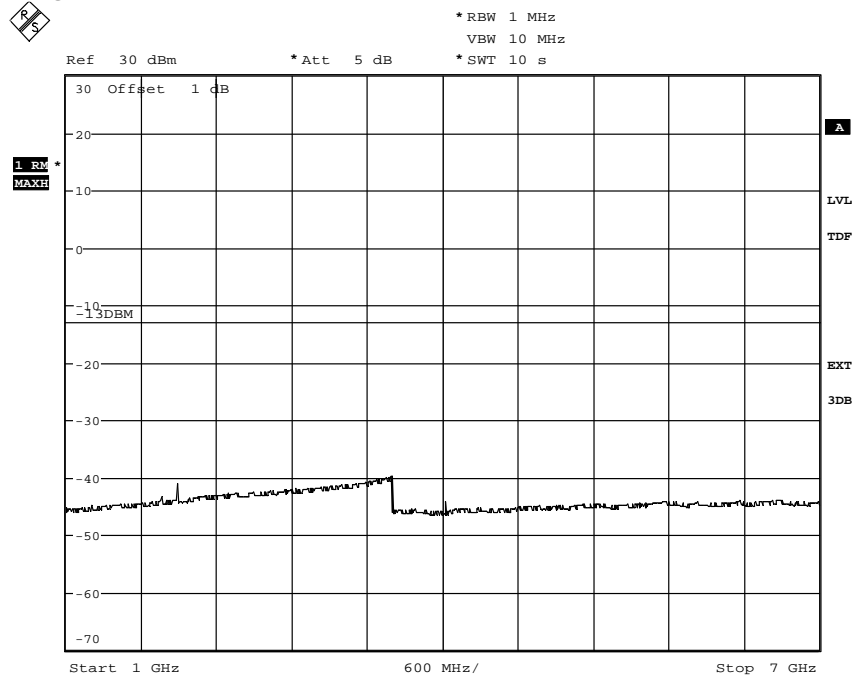
Appendix 5

Diagram 6a:



Date: 1.SEP.2011 15:16:23

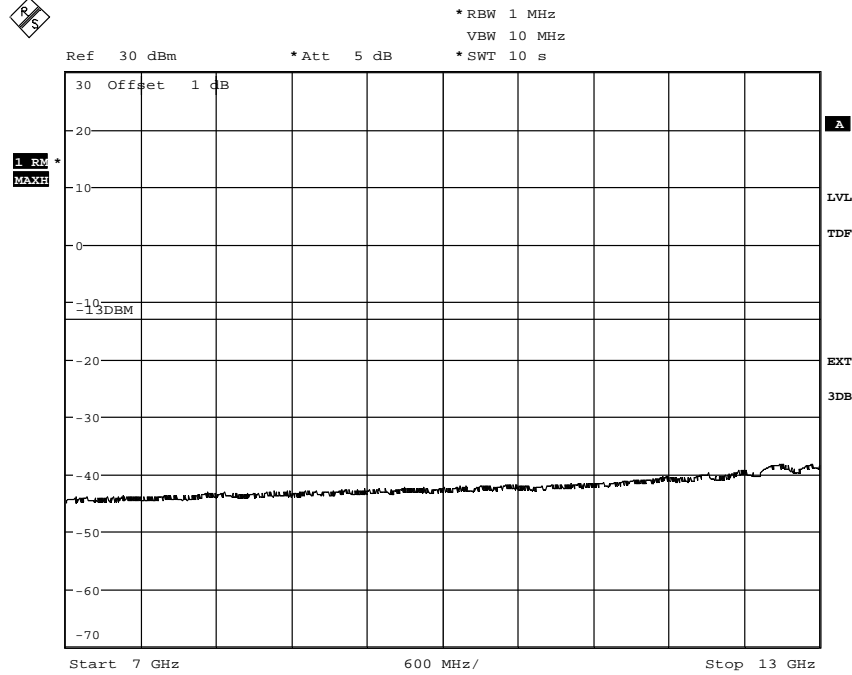
Diagram 6b:



Date: 1.SEP.2011 15:21:17

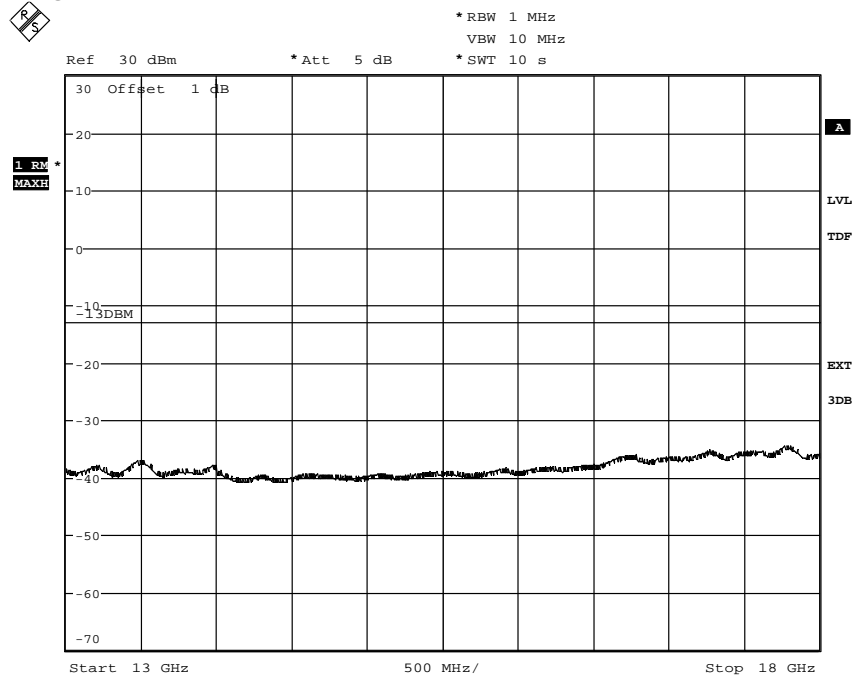
Appendix 5

Diagram 6c:



Date: 1.SEP.2011 15:23:38

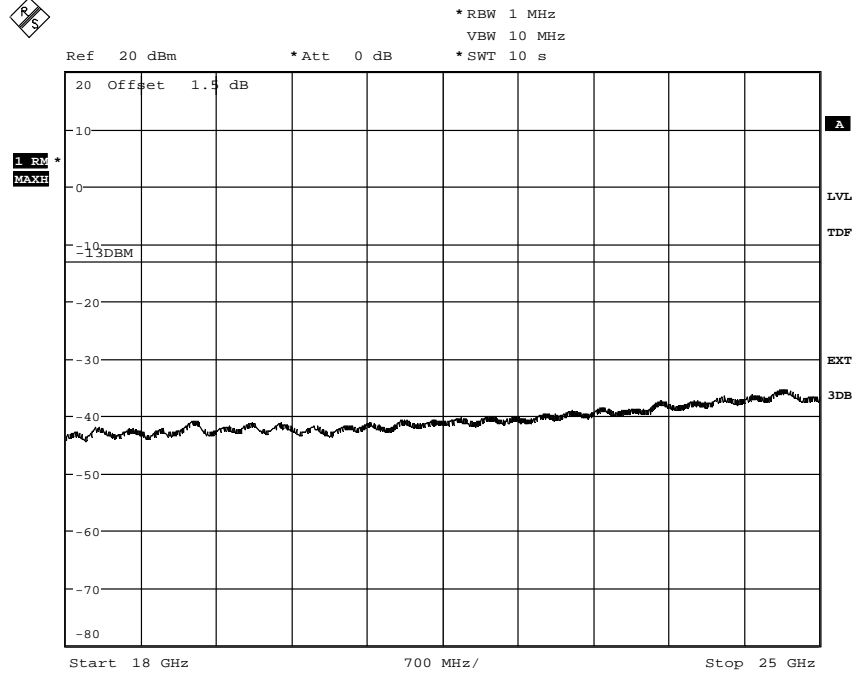
Diagram 6d:



Date: 1.SEP.2011 15:24:59

Appendix 5

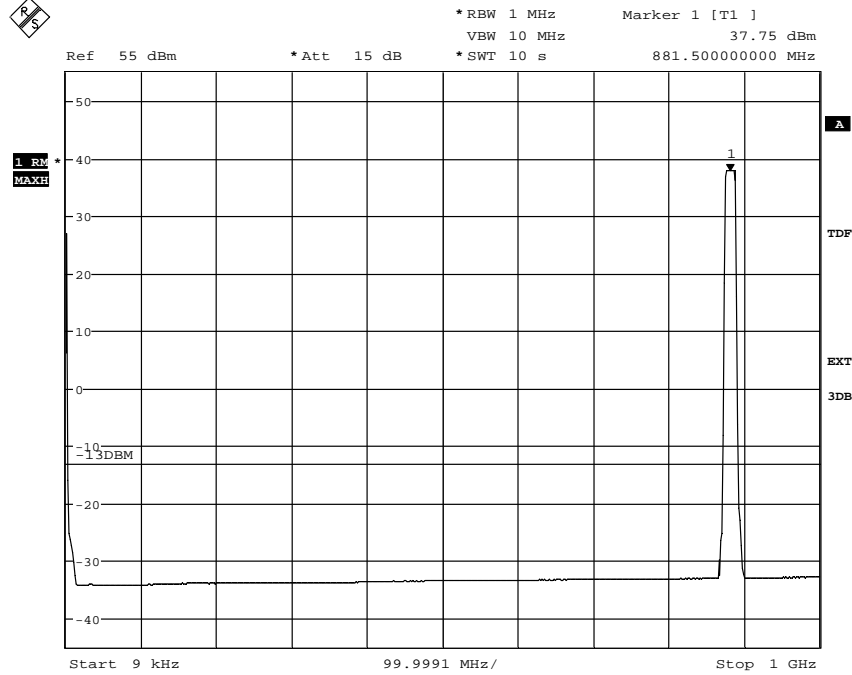
Diagram 6e:



Date: 5.SEP.2011 15:57:52

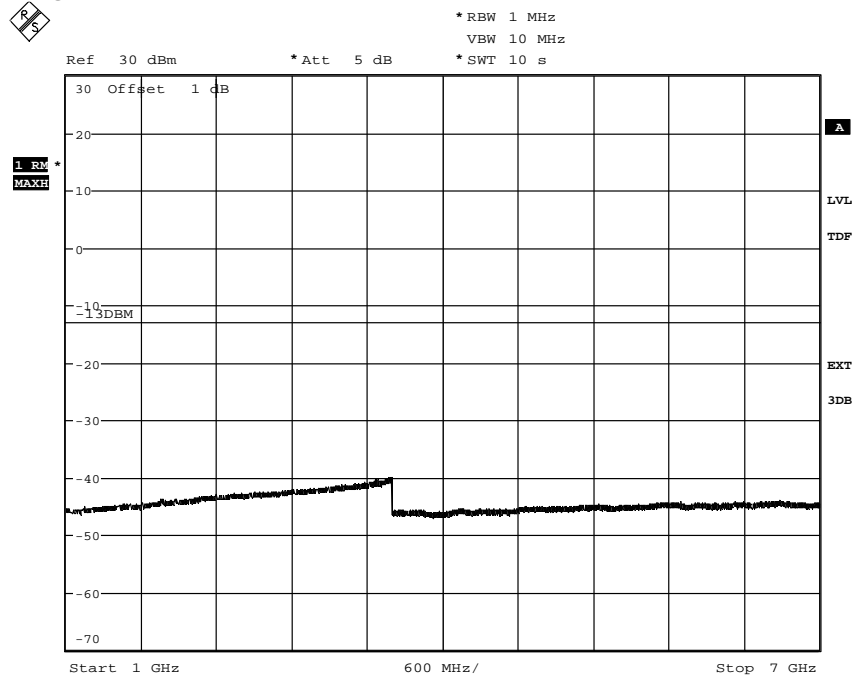
Appendix 5

Diagram 7a:



Date: 1.SEP.2011 15:37:34

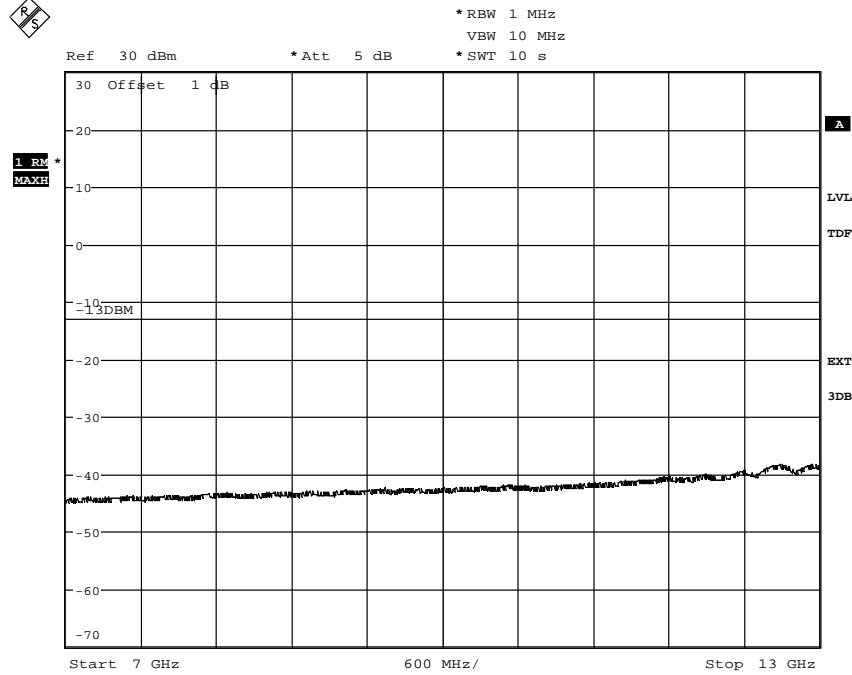
Diagram 7b:



Date: 1.SEP.2011 15:49:23

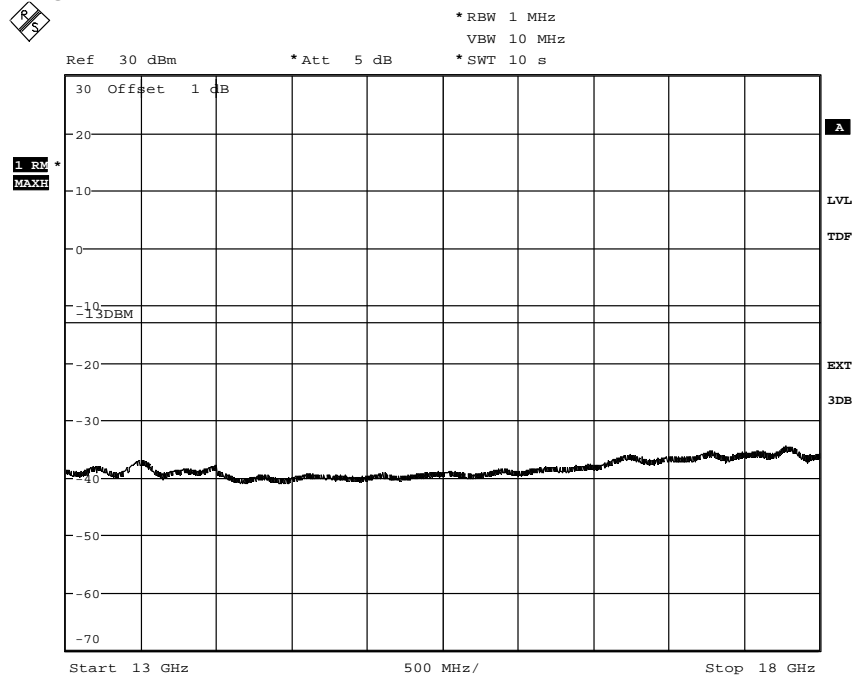
Appendix 5

Diagram 7c:



Date: 1.SEP.2011 15:45:17

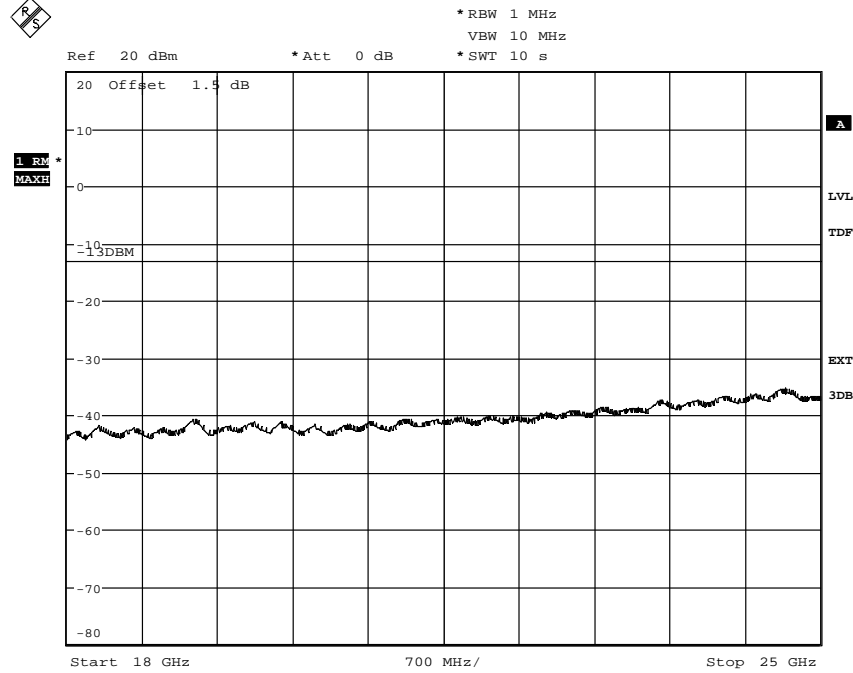
Diagram 7d:



Date: 1.SEP.2011 15:47:07

Appendix 5

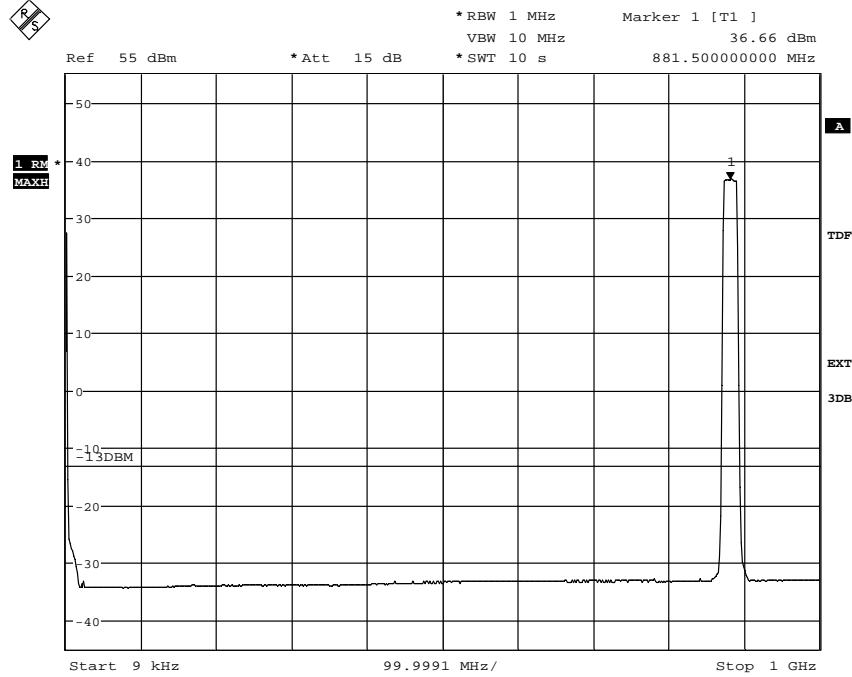
Diagram 7e:



Date: 5.SEP.2011 15:53:33

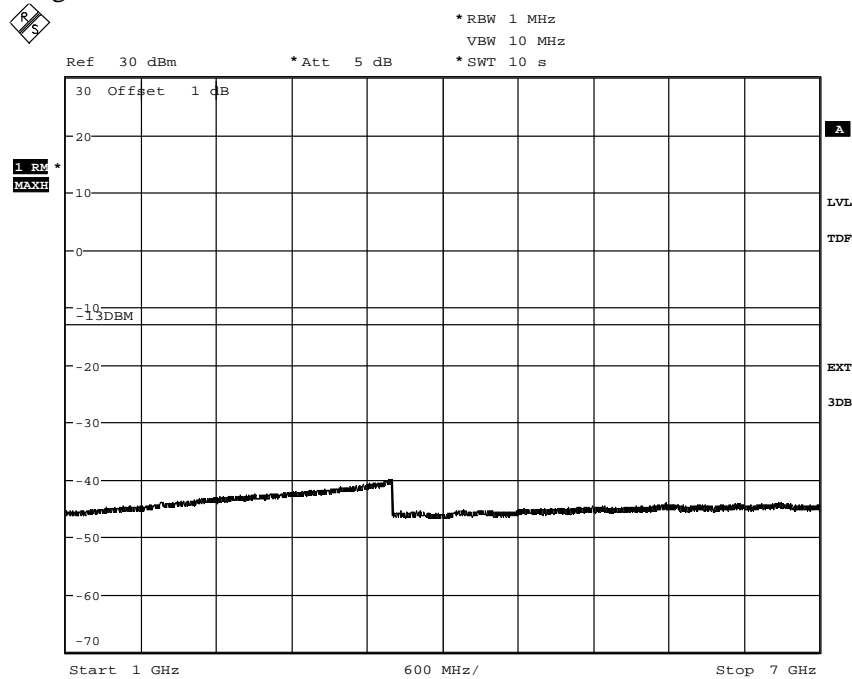
Appendix 5

Diagram 8a:



Date: 1.SEP.2011 16:01:28

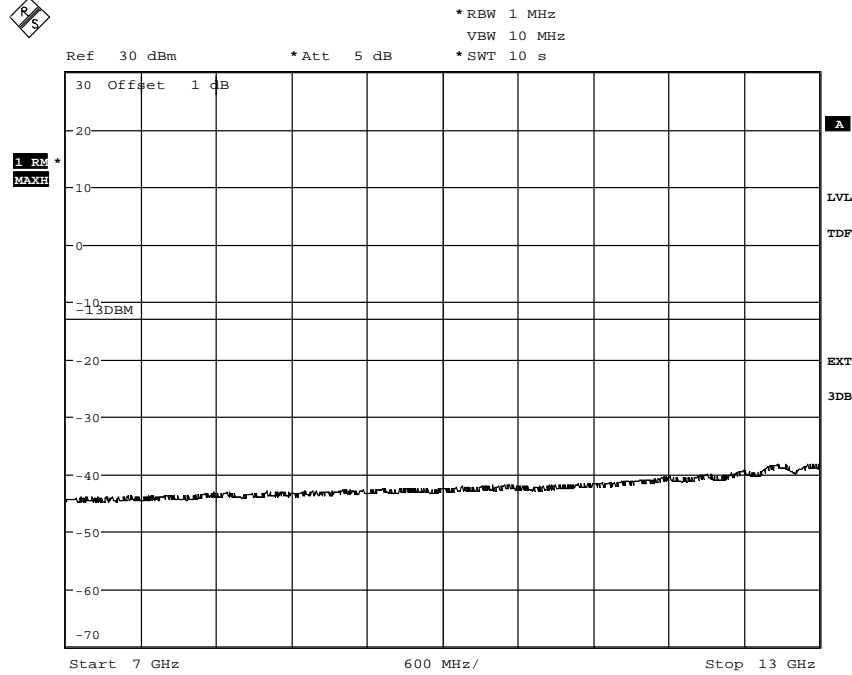
Diagram 8b:



Date: 1.SEP.2011 15:55:36

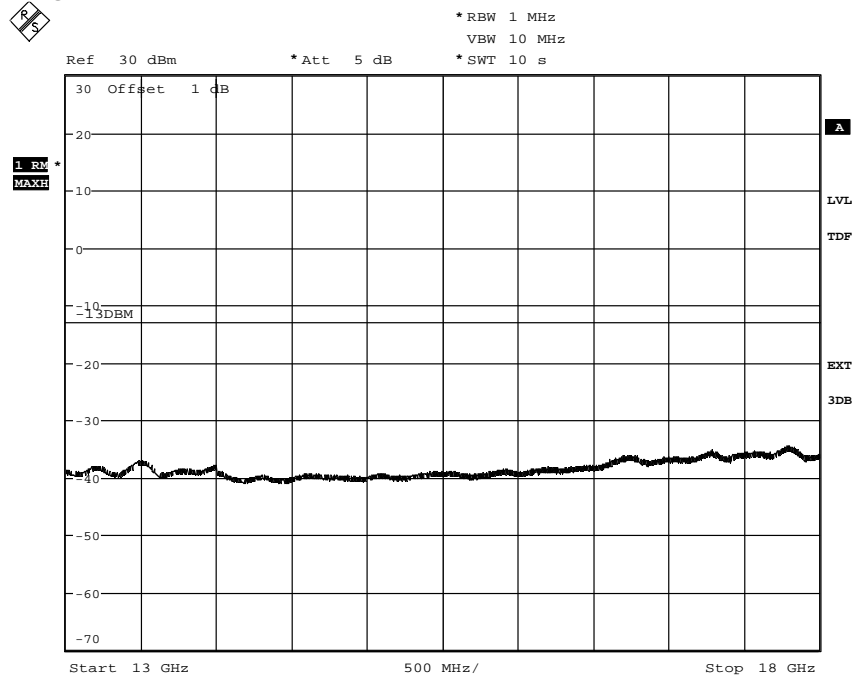
Appendix 5

Diagram 8c:



Date: 1.SEP.2011 15:57:53

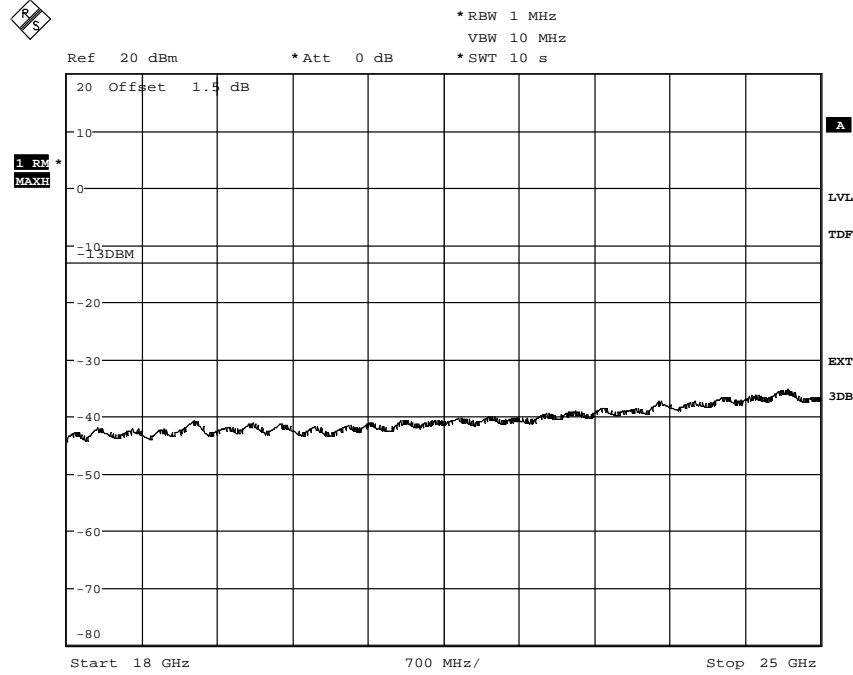
Diagram 8d:



Date: 1.SEP.2011 15:59:50

Appendix 5

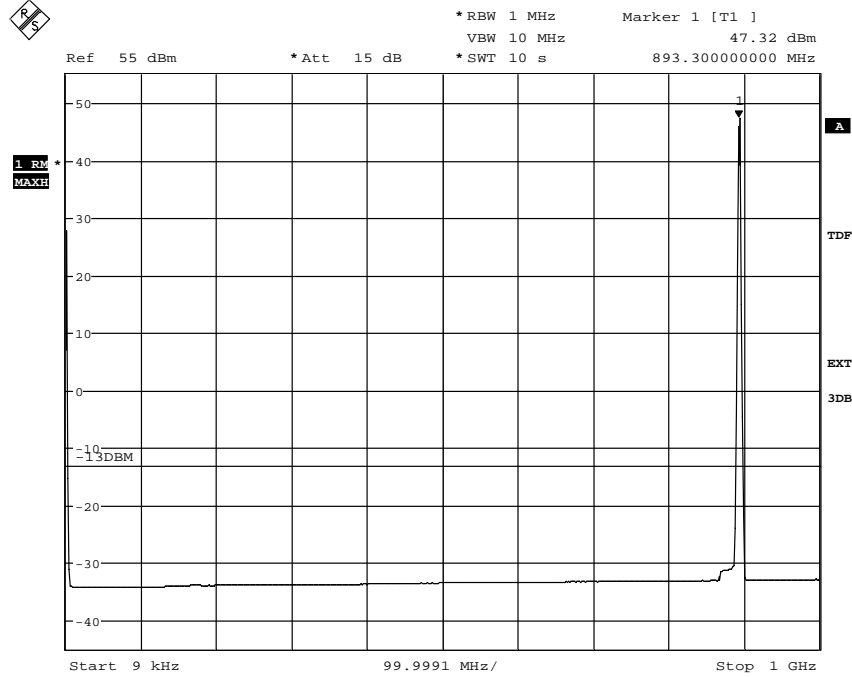
Diagram 8e:



Date: 5.SEP.2011 15:42:44

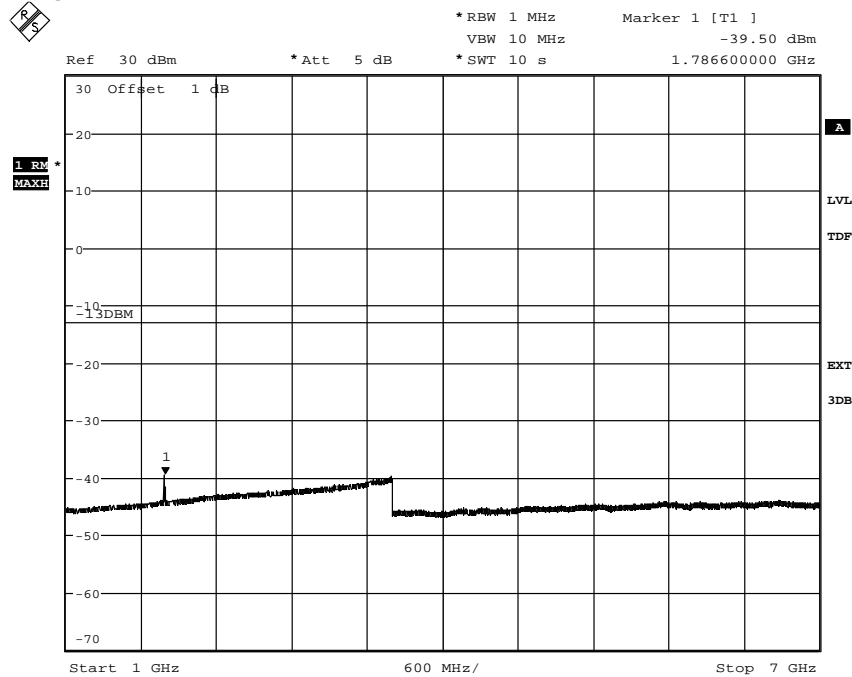
Appendix 5

Diagram 9a:



Date: 2.SEP.2011 08:14:41

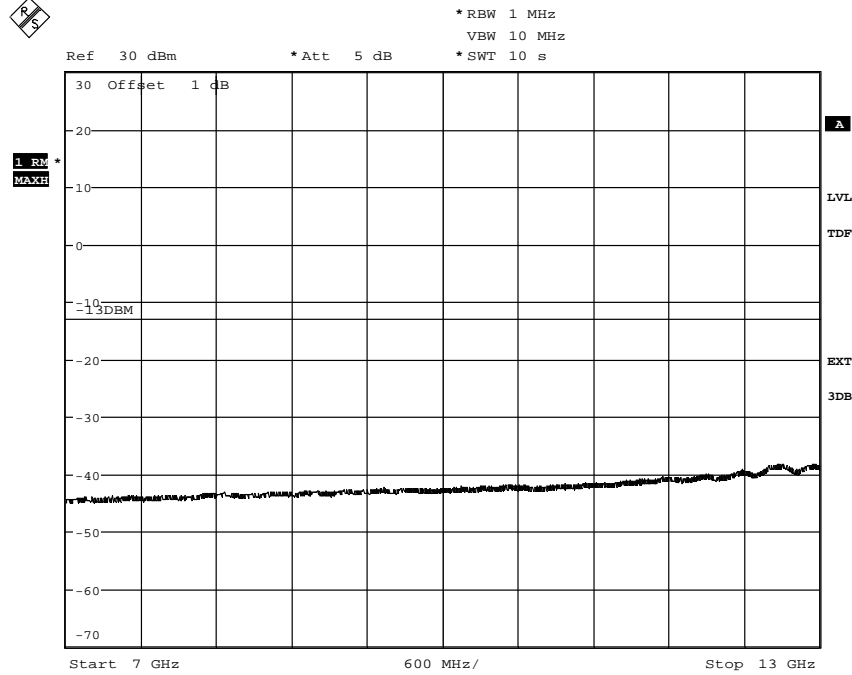
Diagram 9b:



Date: 2.SEP.2011 09:39:24

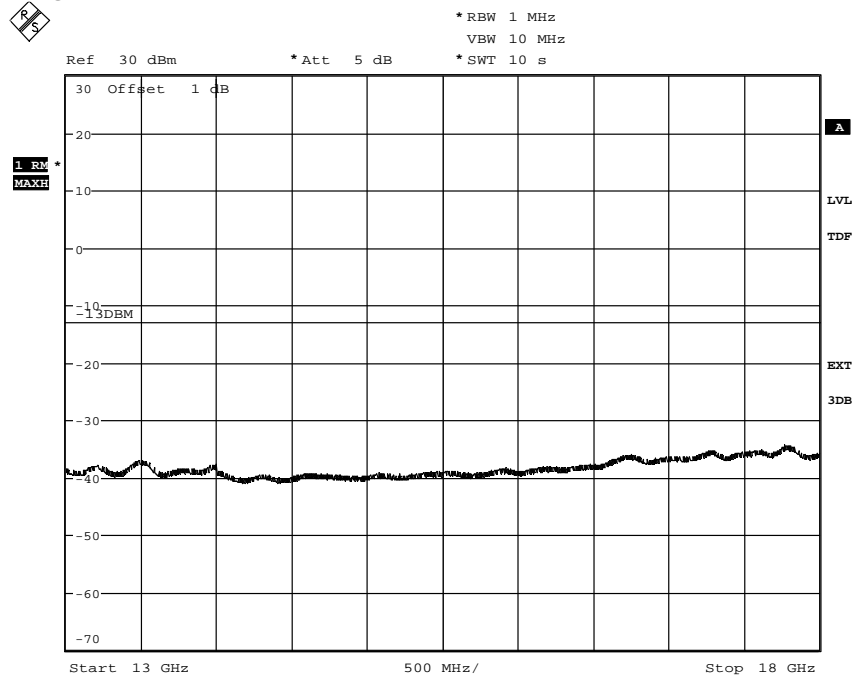
Appendix 5

Diagram 9c:



Date: 2.SEP.2011 09:33:33

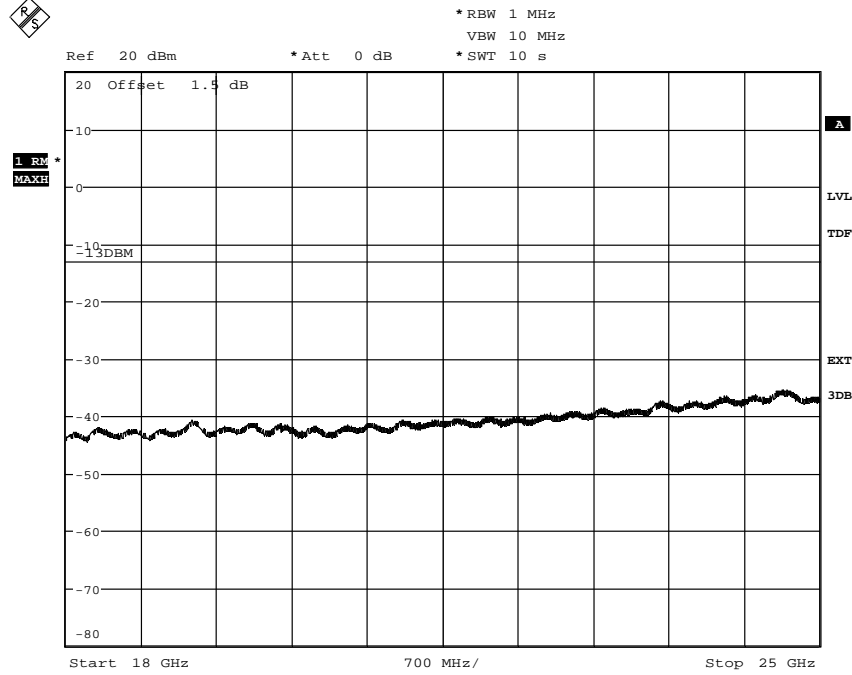
Diagram 9d:



Date: 2.SEP.2011 09:36:49

Appendix 5

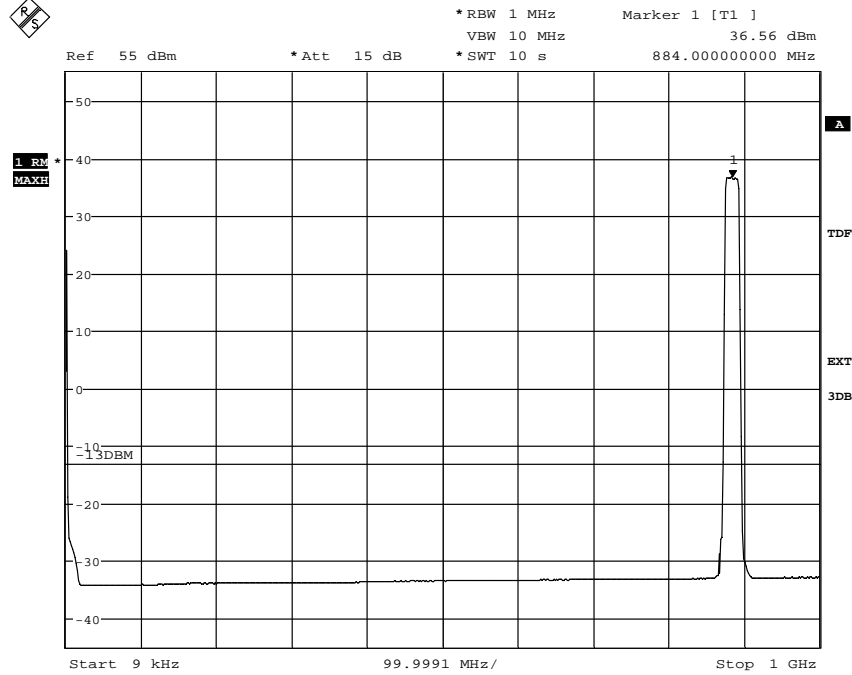
Diagram 9e:



Date: 5.SEP.2011 16:16:36

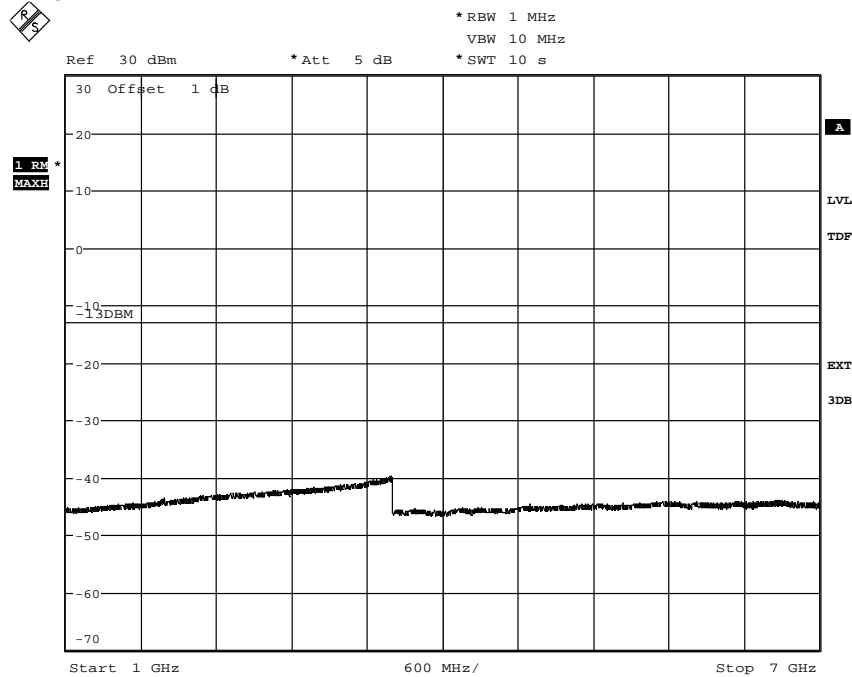
Appendix 5

Diagram 10a:



Date: 2.SEP.2011 10:52:17

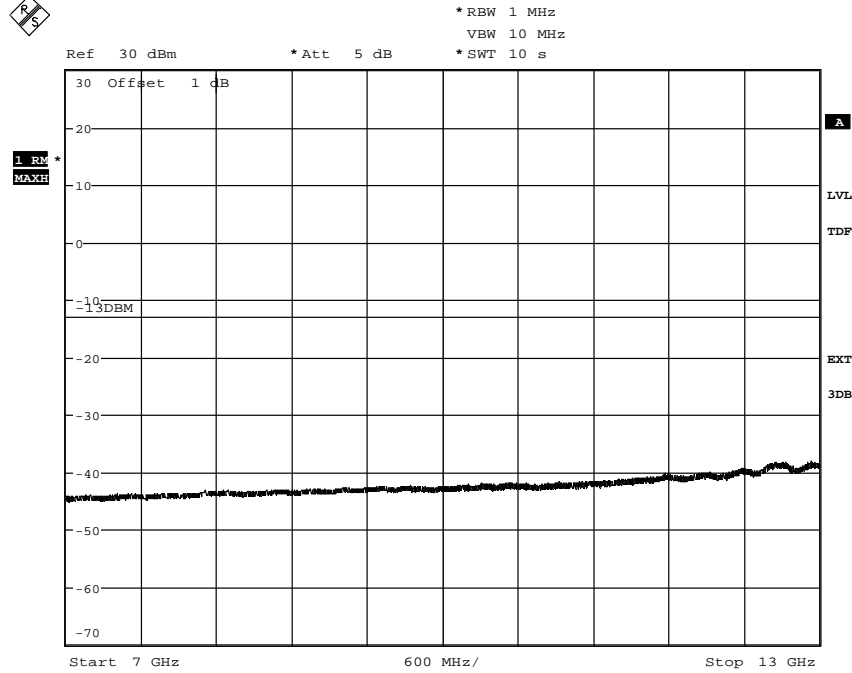
Diagram 10b:



Date: 2.SEP.2011 10:43:23

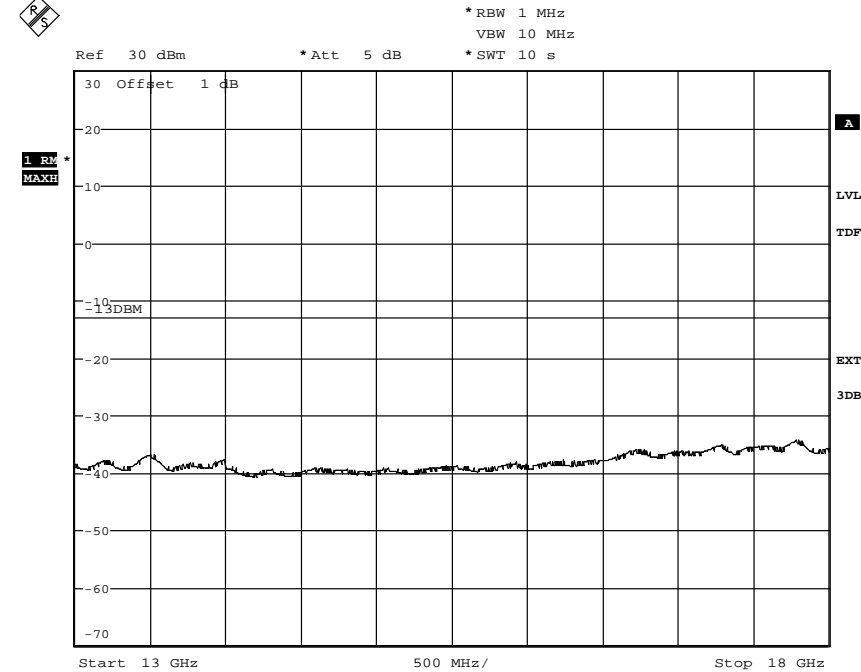
Appendix 5

Diagram 10c:



Date: 2.SEP.2011 10:46:31

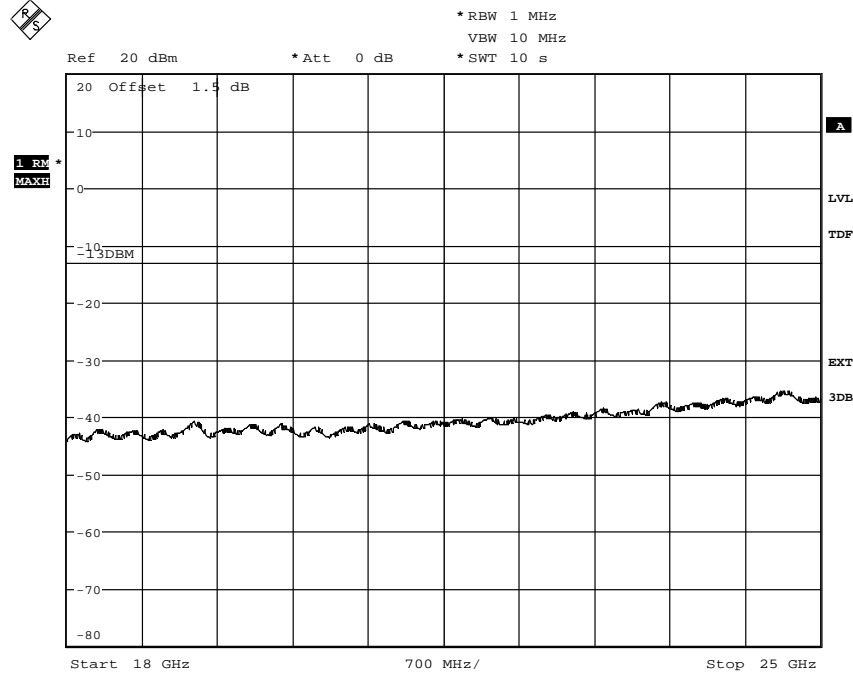
Diagram 10d:



Date: 2.SEP.2011 10:50:30

Appendix 5

Diagram 10e:



Date: 5.SEP.2011 15:25:23

Appendix 6

Field strength of spurious radiation measurements according to 47 CFR 2.1053, 22.917 / IC RSS-132 4.5

Date 2011-08-22 to 2011-08-25	Temperature 22-24°C ± 3°C	Humidity 47-70 % ± 5 %
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Test set-up and procedure

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

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

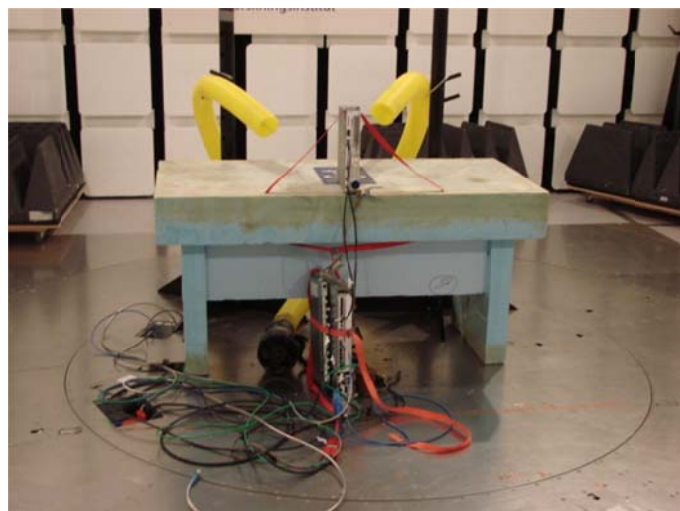
In the frequency range 30 MHz - 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

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

The measurement procedure was as the following:

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

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



Appendix 6

Measurement equipment

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

Results

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

Measurement uncertainty:

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

Limits

CFR 47, 22.917 / RSS-132 4.5:

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

Complies?	Yes
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Appendix 7

Frequency stability measurements according to CFR 47 §22.355 / IC RSS 132 4.5

Date 2011-09-02 to 2011-09-04	Temperature (test equipment) 22-24°C ± 3 °C	Humidity (test equipment) 41-52% ± 5 %
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Test set-up and procedure

The measurement was made per 3GPP TS 36.141. The output was connected to a spectrum 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
Testo 635, Temperature and humidity meter	504 203
Temperature cabinet	503 360
Multimeter Fluke 87	502 190

Results

Nominal transmitter frequency was 881.5 MHz 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	-3
-55.2	+20	-4
-40.8	+20	-3
-48.0	+30	-3
-48.0	+40	-3
-48.0	+50	-4
-48.0	+10	-3
-48.0	0	-3
-48.0	-10	-5
-48.0	-20	-3
-48.0	-30	-4
Maximum freq. error (Hz)		4
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Appendix 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

§ 22.355 Frequency tolerance

The carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances of ± 1.5 ppm for base stations.

RSS-132, 4.3 Frequency stability

The carrier frequency shall not depart from the reference frequency in excess of ± 1.5 ppm for base stations

Complies?	Yes
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Appendix 8

Receiver spurious emissions measurements according to §15.111 / IC RSS-Gen 6.2

Date 2011-09-20	Temperature 23 °C ± 3 °C	Humidity 48 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4.

Measurements were performed on the receiver antenna terminal (RF B). In the frequency range 9kHz -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 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)	900 229
Testo 635, Temperature and humidity meter	504 203

Result

	Channel
Diagram 1a-c	B
Diagram 2a-c	M
Diagram 3a-c	T

A frequency component at 482.15 kHz was measured to -57.5 dBm with Quasi-peak detector activated.

Remark

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

Limit

§15.111 Antenna power conduction limits for receivers

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

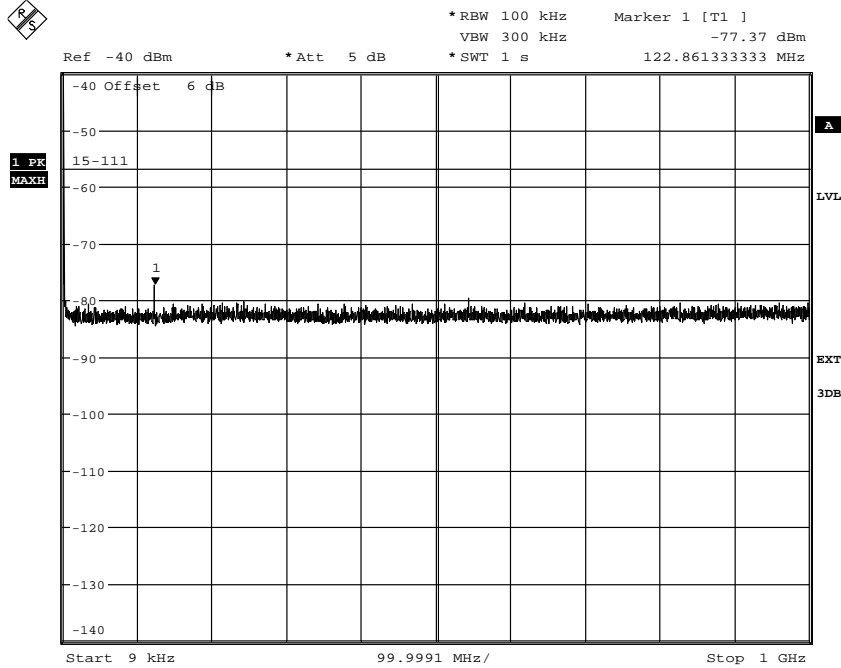
RSS-Gen 6.2 Antenna Conducted limits

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
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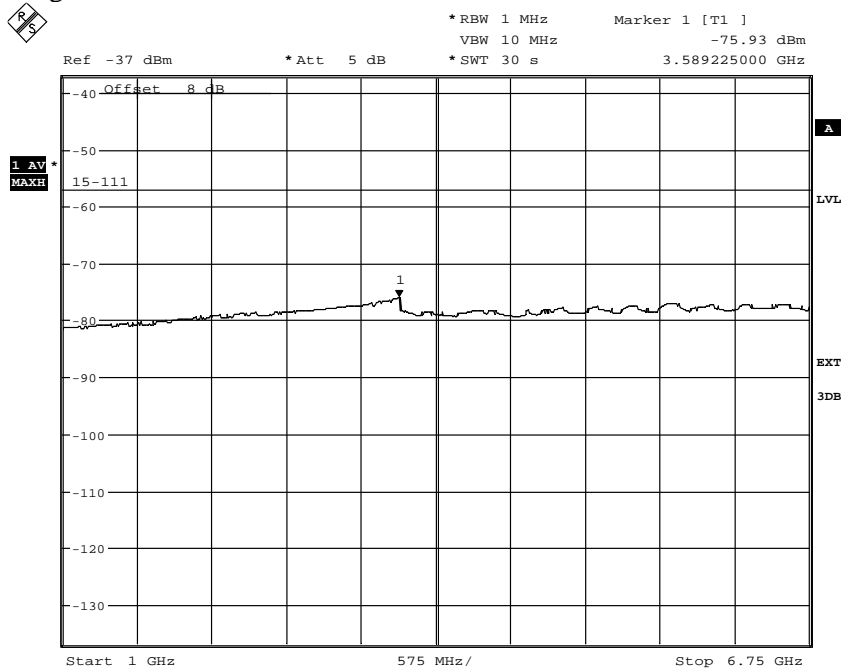
Appendix 8

Diagram 1a



Date: 28.SEP.2011 19:25:56

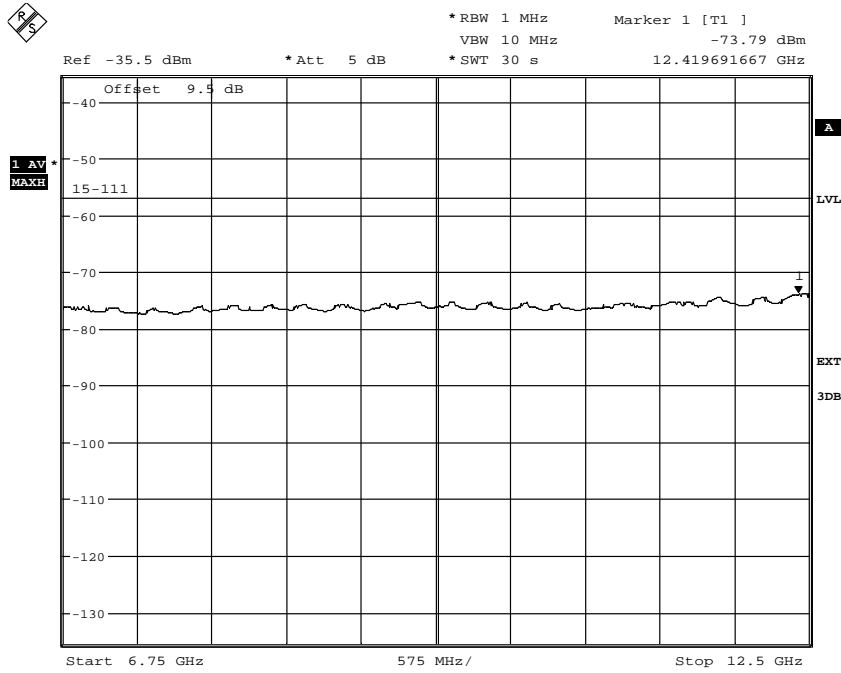
Diagram 1b



Date: 28.SEP.2011 19:24:08

Appendix 8

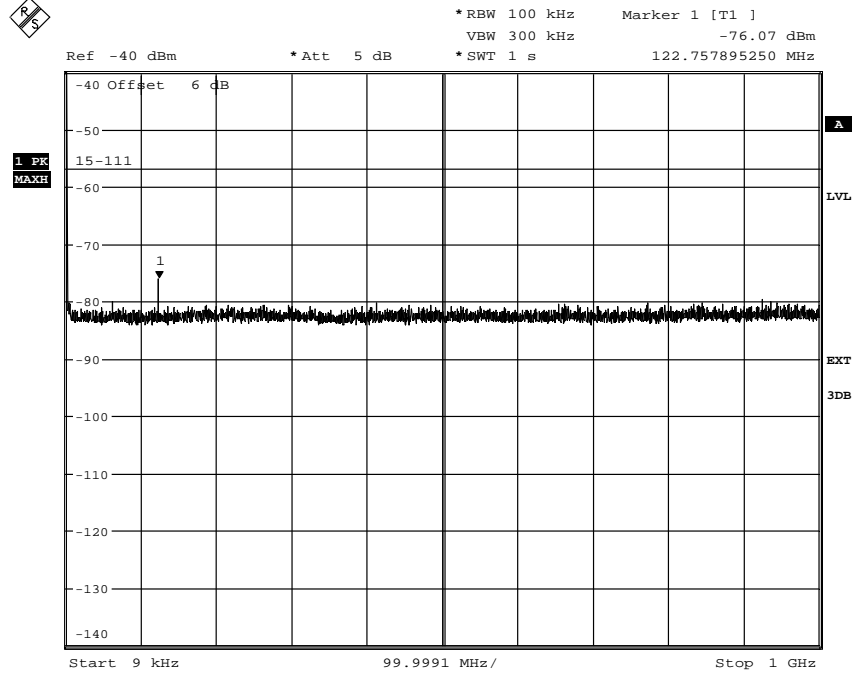
Diagram 1c



Date: 28.SEP.2011 19:21:48

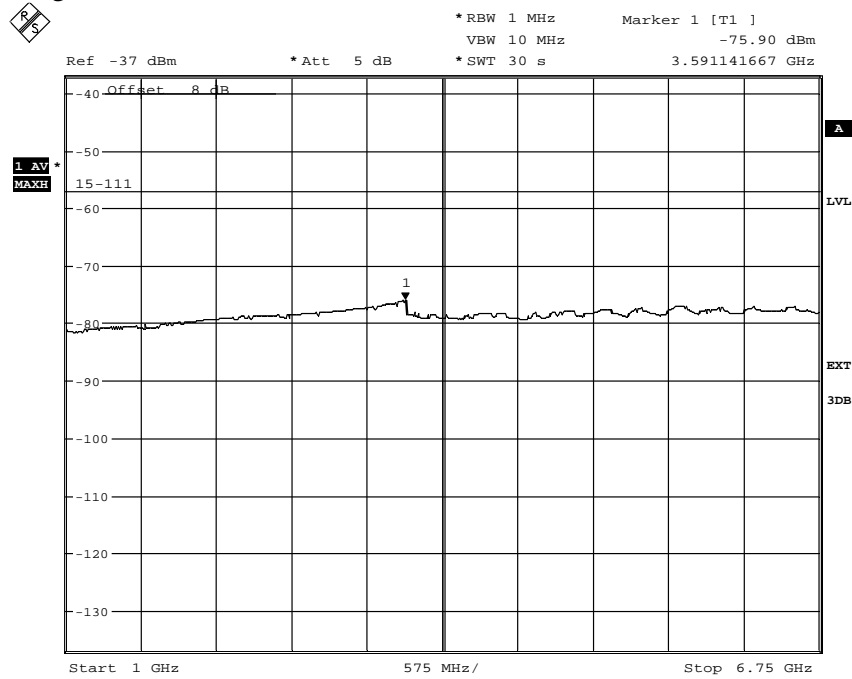
Appendix 8

Diagram 2a



Date: 28.SEP.2011 19:07:46

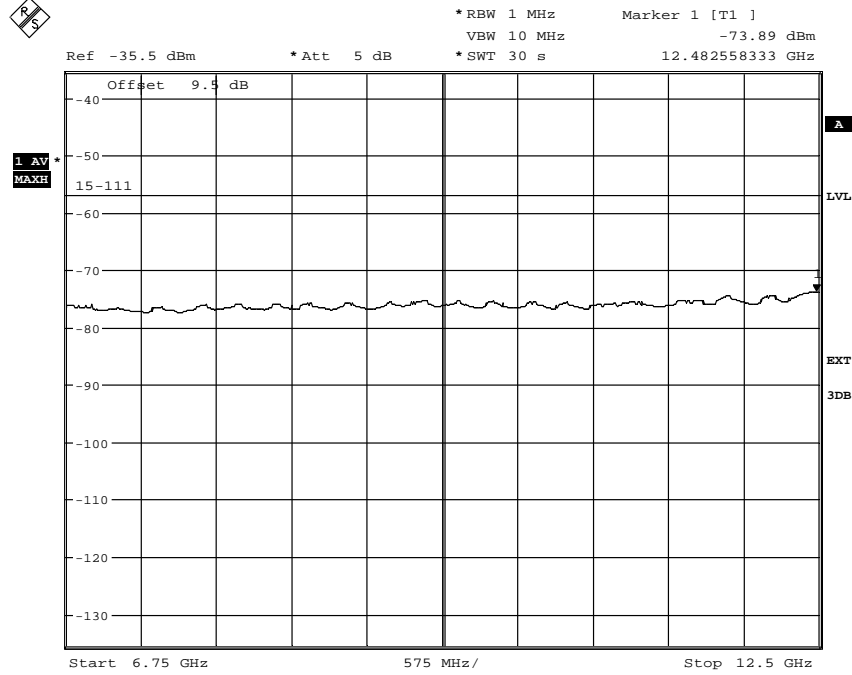
Diagram 2b



Date: 28.SEP.2011 19:09:59

Appendix 8

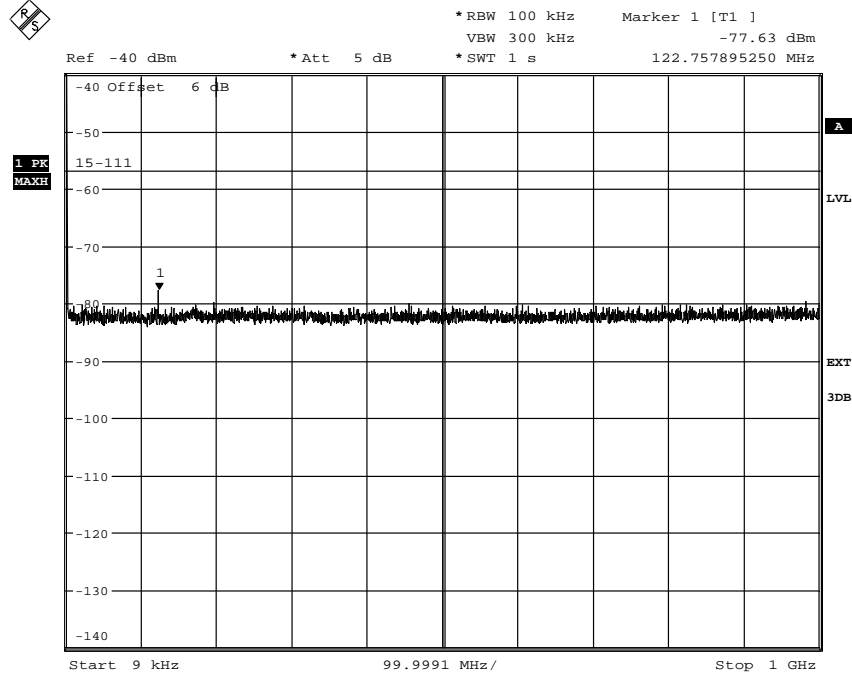
Diagram 2c



Date: 28.SEP.2011 19:12:51

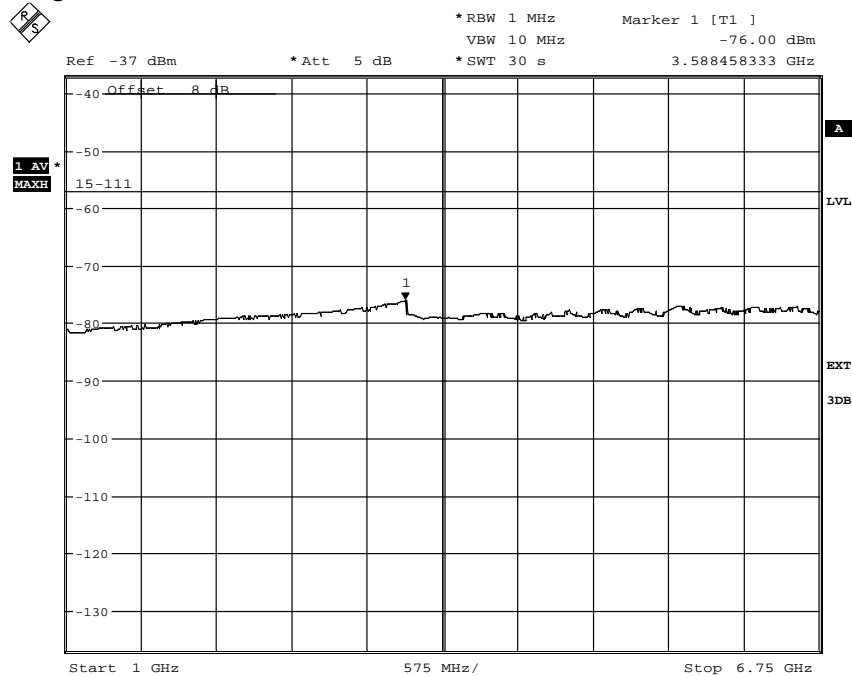
Appendix 8

Diagram 3a



Date: 28.SEP.2011 19:31:16

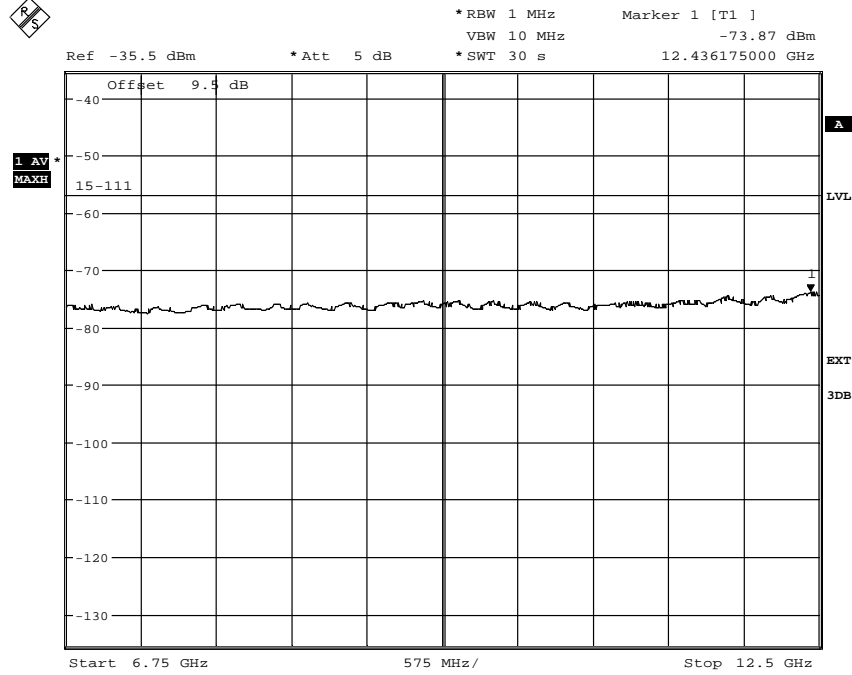
Diagram 3b



Date: 28.SEP.2011 19:32:39

Appendix 8

Diagram 3c



Date: 28.SEP.2011 19:33:51

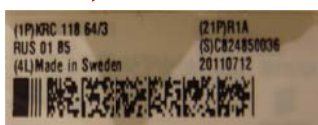
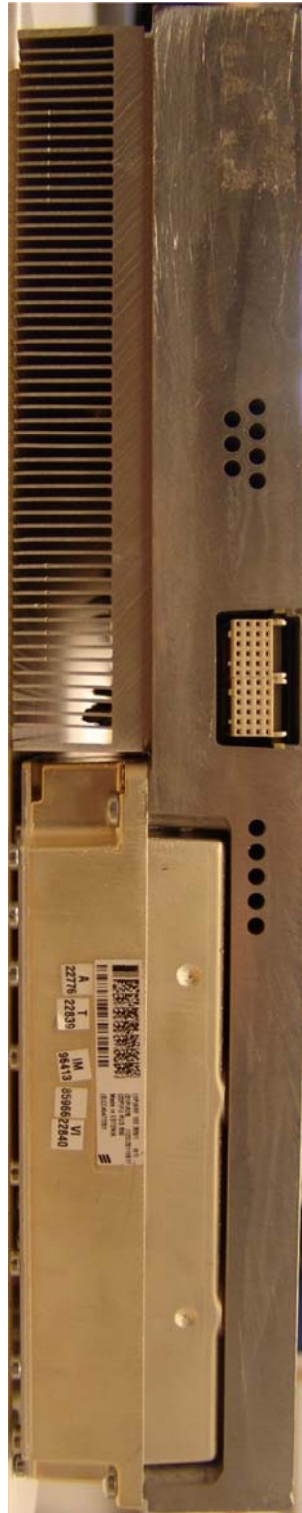
Appendix 9

External photos

Front side

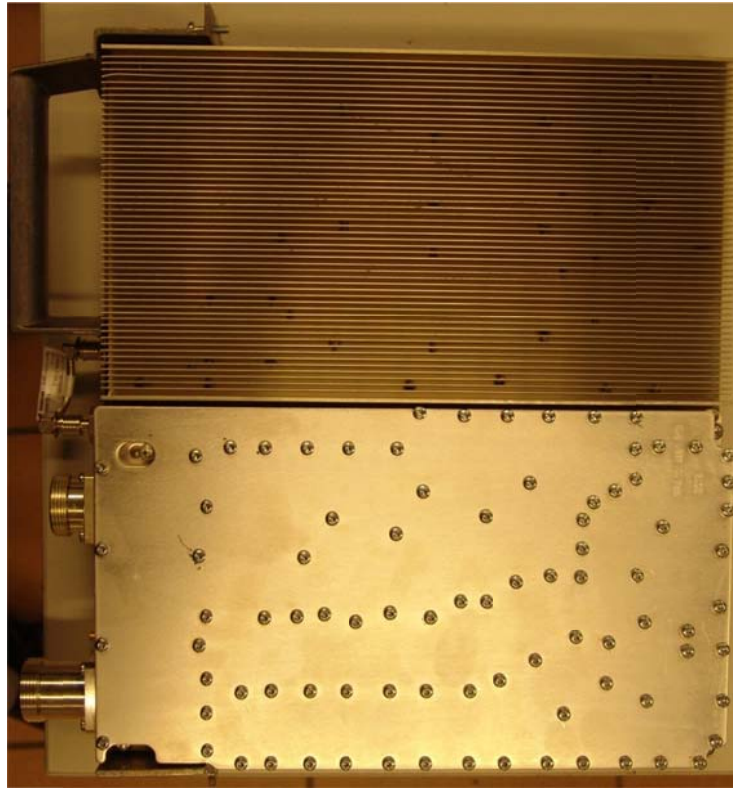


Rear side

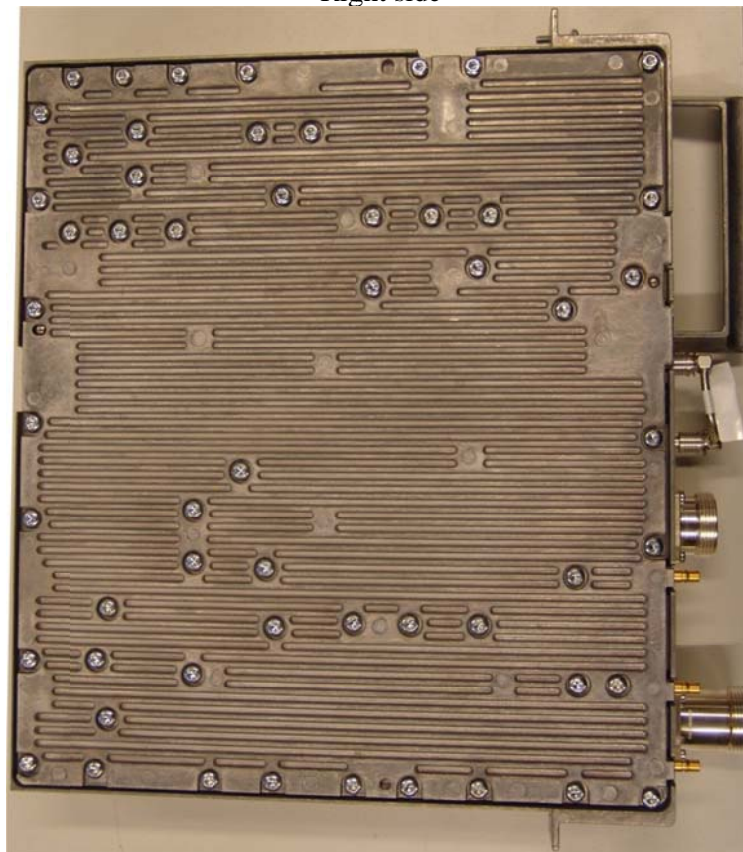


Appendix 9

Left side



Right side



Appendix 9

Bottom side



Top side

