REPORT

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

Date	Reference	Page
2011-11-03	FX108944-F24G	1 (2)

1002
ISO/IEC 17025

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Radio measurements on RUS 01 B2 1900 MHz radio equipment with FCC ID:TA8AKRC11866-2 and IC:287AB-AS118662

(9 appendices)

Test object

RUS 01 B2, KRC 118 66/2 Rev R1A, serial no: CB4J462261

Summary

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133			
2.1046 / RSS-133 6.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-133 6.5	Band edge	Yes	4
2.1051 / RSS-133 6.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-133 6.5	Field strength of spurious radiation	Yes	6
2.1055 / RSS-133 6.3	Frequency stability	Yes	7
Industry Canada RSS-133			
RSS-133 6.6	Receiver spurious emissions	Yes	8

Note 1: Above RSS-133 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

Note 2: The channel adjacent to the lower and higher band edge cannot be used. The lowest usable channel is 513 (1930.4 MHz) and the highest usable channel is 809 (1989.6 MHz).

SP Technical Research Institute of Sweden
Electronics - EMC

Performed by

Jonas Bremholt

Examined by

Christer Karlsson

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Description – Test object

Equipment:	Radio equipment RUS 01 B2 running in GSM mode supporting single and multi carrier.
Antenna ports:	1 TX/RX port and 1 RX port
Frequency bands:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
Modulations:	GMSK, 8-PSK, AQPSK, 16QAM, and 32QAM
Nominal output power: (Maximum)	Single carrier: 1x 47.8 dBm (1x 60 W) Multi carrier: 2x 44.8 dBm (2x 30 W) 3x 44.3 dBm (3x 26.7 W) 4x 43.0 dBm (4x 20 W)
Nominal power voltage:	-48 VDC

Tested channels

Channel	ARFCN	Frequency (MHz) Downlink	Uplink
B	512	1930.2	1850.2
B+1	513	1930.4	1850.4
B+3	515	1930.8	1850.8
B+5	517	1931.2	1851.2
B+6	518	1931.4	1851.4
B+9	521	1932.0	1852.0
B+10	522	1932.2	1852.2
B+15	527	1933.2	1853.2
M-5	656	1959.0	1879.0
M	661	1960.0	1880.0
M+5	666	1961.0	1881.0
M+10	671	1962.0	1882.0
T-15	795	1986.8	1906.8
T-11	799	1987.6	1907.6
T-10	800	1987.8	1907.8
T-9	801	1988.0	1908.0
T-6	804	1988.6	1908.6
T-5	805	1988.8	1908.8
T-3	807	1989.2	1909.2
T-1	809	1989.6	1909.6
T	810	1989.8	1909.8

Used RF configurations

Unless noted otherwise, following configurations were used:

Single Carrier (One carrier configuration):

Cell	1	1	1
Channel	B	M	T

Multi Carrier 1x2 (Two carrier configuration):

Cell	1	2
Channels	B	B+10
Channels	M	M+10
Channels	T	T-10

Multi Carrier 1x3 (three carrier configuration):

Cell	1	2	3
Channels	B	B+5	B+10
Channels	M	M+5	M+10
Channels	T	T-5	T-10

Multi Carrier 1x4 (Four carrier configuration):

Cell	1	2	3	4
Channels	B	B+5	B+10	B+15
Channels	M	M-5	M+5	M+10
Channels	T	T-5	T-10	T-15

Operation mode during measurements

Unless otherwise stated, all measurements were performed with the test object transmitting pseudorandom data in all timeslots and settings for maximum transmitter output power applicable for each configuration. All supported modulations were tested to find worst case configuration. Occupied bandwidth and frequency error were only measured with single carrier configuration. For AQPSK modulation the SCPIR is 0 dB.

Conducted measurements

The test object was mounted into an RBS 6201 cabinet and powered by the cabinets internal -48 VDC. All RF conducted TX measurements were performed at antenna port RF A, with antenna port RF B terminated into 50 ohm. All RX measurements were performed at antenna port RF B, with the test object antenna port RF A transmitting at maximum output power into a 50 ohm termination.

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 FSIQ spectrum analyzer outside the shielded chamber for signal monitoring. Antenna port RF B was left unterminated. The modulation 8-PSK was found to be representative for worst case setting for the radiated spurious measurements.

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-133.

References

Measurements were done according to relevant parts of the following standards:
ANSI 63.4-2009
ANSI/TIA/EIA-603-C-2004
ANSI/TIA/EIA 136-280-D-2002
J-STD007A Vol 1
CFR 47 part 2, October 1st , 2010
CFR 47 part 24, October 1st, 2010
RSS-Gen Issue 3
RSS-133 Issue 5

Appendix 1

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 2011-05-26.

Manufacturer’s representative

Christer Gustavsson, Ericsson AB

Test engineers

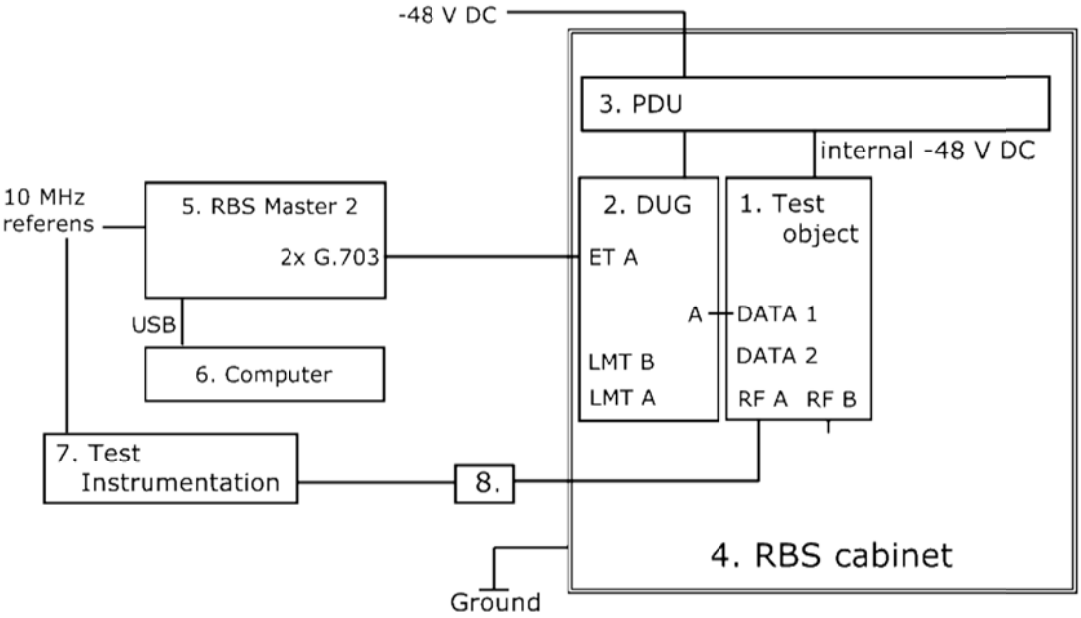
Andreas Johnson, Tomas Lennhager, Jörgen Wassholm, and Jonas Bremholt

Test participant

Xiang Yue, Ericsson CBC (Partly present)

Appendix 1

Test set-up conducted measurements TX



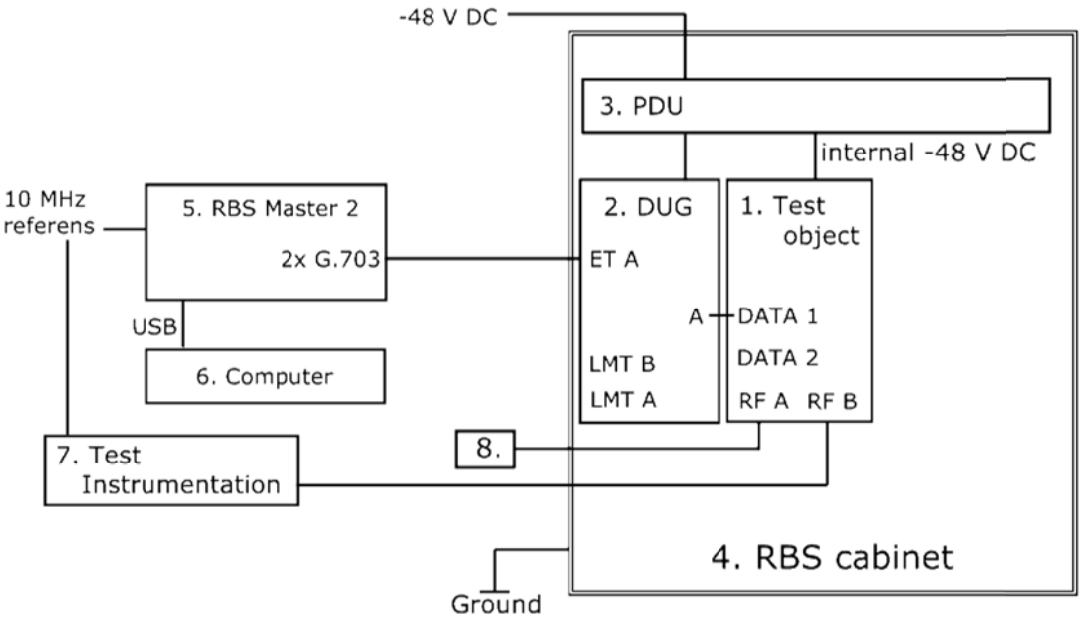
Test object

1. RUS 01 B2, KRC 118 66/2, revision R1A, S/N: CB4J462261
   (FCC ID: TA8AKRC11866-2 and IC: 287AB-AS118662)

Functional test equipment

2. DUG 20 01, KDU 137 569/1, revision R1D, C823497388
3. PDU 02 01, BMG 980 336/4, revision R2A, SN BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. RBS Master 2, LPY 107 1007/3, BAMS 1001086304
6. Computer, Compaq nc6220, BAMS – 1000208319
   running software RBS Master2, version R8B02
7. SP test instrument according measurement equipment list
8. Attenuator and filter according measurement equipment list

Test set-up conducted measurements RX



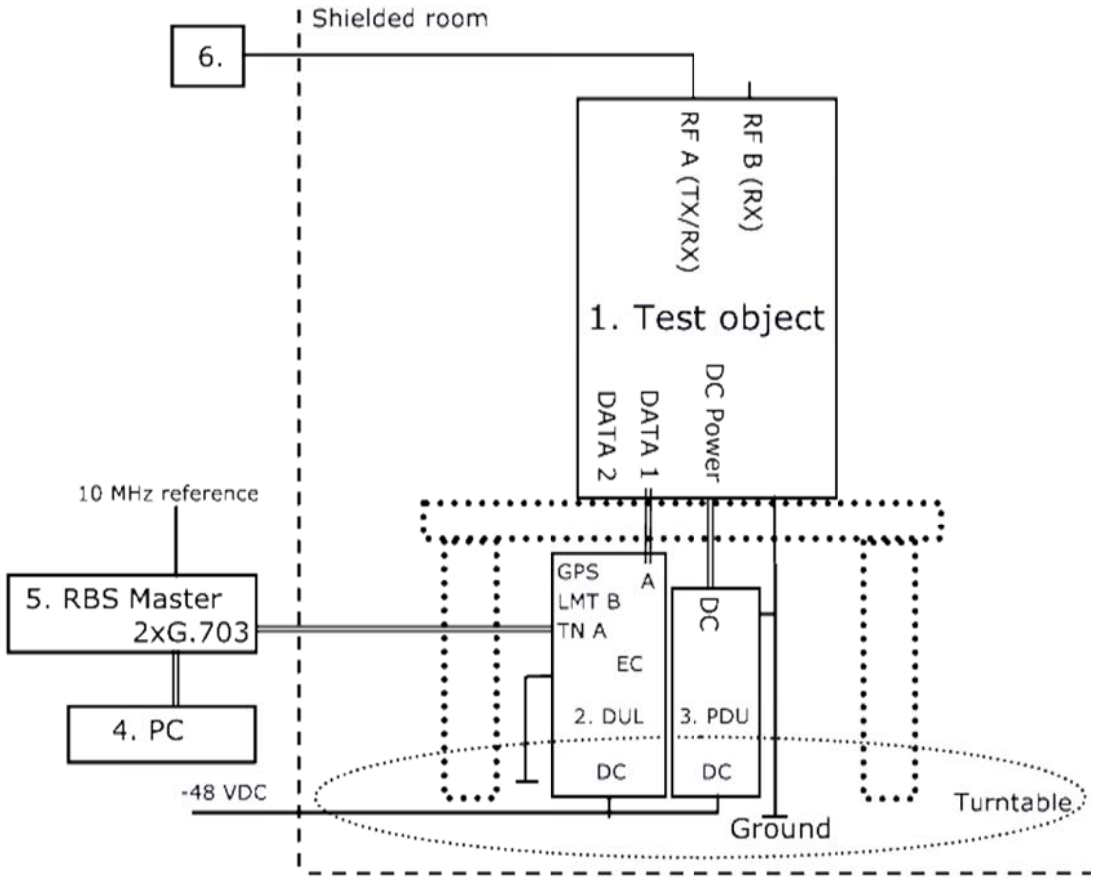
Test object

1. RUS 01 B2, KRC 118 66/2, revision R1A, S/N: CB4J462261
   (FCC ID: TA8AKRC11866-2 and IC: 287AB-AS118662)

Functional test equipment

2. DUG 20 01, KDU 137 569/1, revision R1D, C823497388
3. PDU 02 01, BMG 980 336/4, revision R2A, SN BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792
5. RBS Master 2, LPY 107 1007/3, BAMS 1001086304
6. Computer, Compaq nc6220, BAMS – 1000208319
   running software RBS Master2, version R8B02
7. SP test instrument according measurement equipment list
8. Attenuator and filter according to measurement equipment list
9. Attenuator and 50 ohm termination

Test set-up radiated measurements



Test object

1. RUS 01 B2, KRC 118 66/2, revision R1A, S/N: CB4J462261
   (FCC ID: TA8AKRC11866-2 and IC: 287AB-AS118662)

Functional test equipment

2. DUG 20 01, KDU 137 569/1, revision R1D, C823497388
3. PDU 02 01, BMG 980 336/4, Rev R2A, S/N: BJ31534775
4. Computer, Compaq nc6220, BAMS – 1000208319
   running software RBS Master2, version R8B02
5. RBS Master 2, LPY 107 1007/3, BAMS 1001086304
6. RF terminator

Appendix 1

Test object interfaces	Type of port:
Power configuration: -48 VDC	DC Power
Ground via RBS frame during conducted measurements, Ground via ground strap during radiated stand-alone measurements	Ground
Antenna port RF A, combined TX/RX, female 7/16 connector	Antenna
Antenna port RF B, RX only, female 7/16 connector	Antenna
Cross connect RX A, not supported, omitted in set-up drawings above	-
Cross connect RX B, not supported, omitted in set-up drawings above	-
RXA CO-site, not supported, omitted in set-up drawings above	-
Data 1, connected to DUG port A	Signal
Data 2, not supported	-

RBS software

Software	Revision
CXP 104 0013/06 (G12AG7)	P4BB

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

Date	Temperature	Humidity
2011-08-18 to 2011-08-26	23-24 °C ± 3 °C	38-53 % ± 5 %
2011-10-20 to 2011-10-21	23°C ± 3 °C	24-40 % ± 5 %

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	503 145
RF attenuator	504 159
Multimeter Fluke 87	502 190
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Results

Single carrier: Rated output power level at port RF A (maximum): 47.8 dBm

Transmitter power (dBm/ dB) RMS / PAR				
Channel	B	M	T	Nominal
GMSK	46.8/ 0.8	47.1/ 0.8	46.4/ 0.8	47.8
AQPSK	46.7/ 4.1	46.9/ 4.1	46.3/ 4.1	47.8
8-PSK	46.8/ 3.8	47.1/ 3.8	46.4/ 3.8	47.8
16QAM	46.7/ 5.1	47.0/ 5.1	46.3/ 5.1	47.8
32QAM	46.6/ 5.3	46.9/ 5.3	46.3/ 5.3	47.8

Multi carrier 1x2: Rated output power level at port RF A (maximum):

Transmitter power (dBm) per carrier RMS				
Channel	B	M	T	Nominal
GMSK	44.0	44.3	43.7	44.8
AQPSK	43.7	44.1	43.5	44.8
8-PSK	43.9	44.3	43.5	44.8
16QAM	43.5	43.0	43.2	44.5
32QAM	43.1	43.5	42.8	44.1

Appendix 2

Multi carrier 1x2: Rated output power level at port RF A (maximum):

Transmitter combined power (dBm) RMS				
Channel	B+(B+10)	M+(M+10)	T+(T-10)	Nominal
GMSK	47.0	47.3	46.7	47.8
AQPSK	46.7	47.1	46.5	47.8
8-PSK	46.9	47.3	46.5	47.8
16QAM	46.5	47.0	46.2	47.5
32QAM	46.1	46.5	45.8	47.1

Multi carrier 1x3: Rated output power level at port RF A (maximum):

Transmitter power (dBm) per carrier RMS				
Channel	B+(B+5)+ (B+10)	M+ (M+5)+ (M+10)	T+(T-5)+ (T-10)	Nominal
GMSK	43.4	43.9	43.2	44.3
AQPSK	42.5	42.8	42.3	43.6
8-PSK	42.5	43.2	42.6	43.7
16QAM	41.4	41.8	41.3	42.3
32QAM	41.1	41.4	40.9	41.9

Multi carrier 1x3: Rated output power level at port RF A (maximum):

Transmitter combined power (dBm) RMS				
Channel	B+(B+5)+ (B+10)	M+ (M+5)+ (M+10)	T+(T-5)+ (T-10)	Nominal
GMSK	48.2	48.7	48.0	49.0
AQPSK	47.3	47.6	47.1	48.4
8-PSK	47.3	48.0	47.4	48.5
16QAM	46.2	46.6	46.1	47.1
32QAM	45.9	46.2	45.7	46.7

Multi carrier 1x4: Rated output power level at port RF A (maximum):

Transmitter power (dBm) per carrier RMS				
Channel	B	M	T	Nominal
GMSK	41.7	42.1	41.7	43.0
AQPSK	39.7	40.6	39.7	41.0
8-PSK	40.1	40.5	40.1	41.1
16QAM	38.6	39.1	38.6	39.7
32QAM	38.2	38.7	38.3	39.3

Multi carrier 1x4: Rated output power level at port RF A (maximum):

Transmitter combined power (dBm) RMS				
Channel	B+(B+5)+ (B+10)+(B+15)	M+(M+5)+ (M+10)+(M+15)	T+(T-5)+ (T-10)+(T-15)	Nominal
GMSK	47.7	48.1	47.7	49.0
AQPSK	45.7	46.2	45.7	47.0
8-PSK	46.1	46.5	46.1	47.1
16QAM	44.6	45.1	44.6	45.7
32QAM	44.2	44.7	44.3	45.3

Limits

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

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

Complies?	Yes

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

Date	Temperature	Humidity
2011-08-18	22 °C ± 3 °C	60 % ± 5 %

Test set-up and procedure

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

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

Measurement uncertainty: 3.7 dB

Results

Diagram	Modulation	Tested frequency	Occupied BW (99%) [kHz]
1	GMSK	B	241
2	GMSK	M	241
3	AQPSK	M	233
4	8-PSK	M	239
5	16QAM	M	241
6	32QAM	M	241
7	GMSK	T	241

Appendix 3

Diagram 1

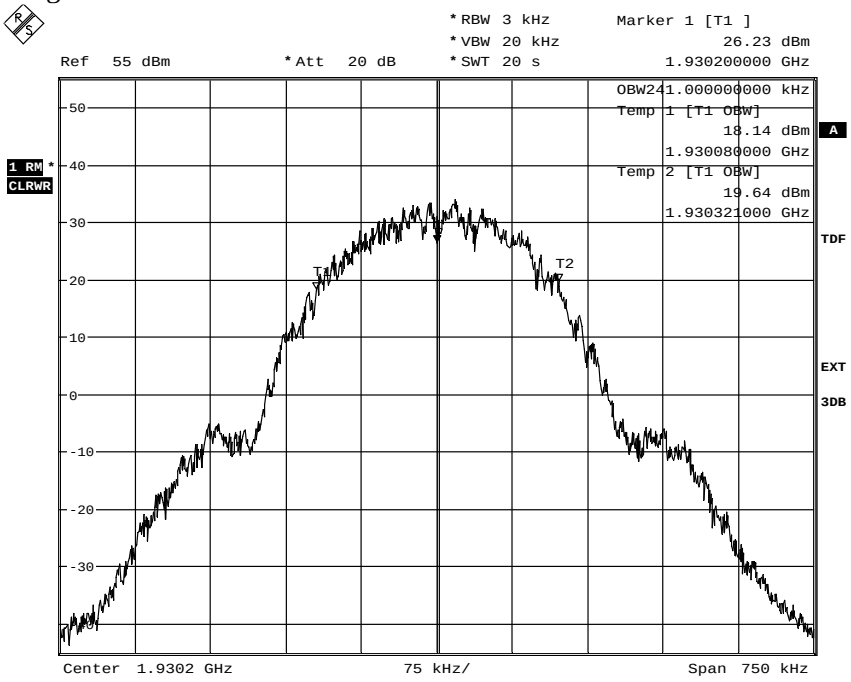


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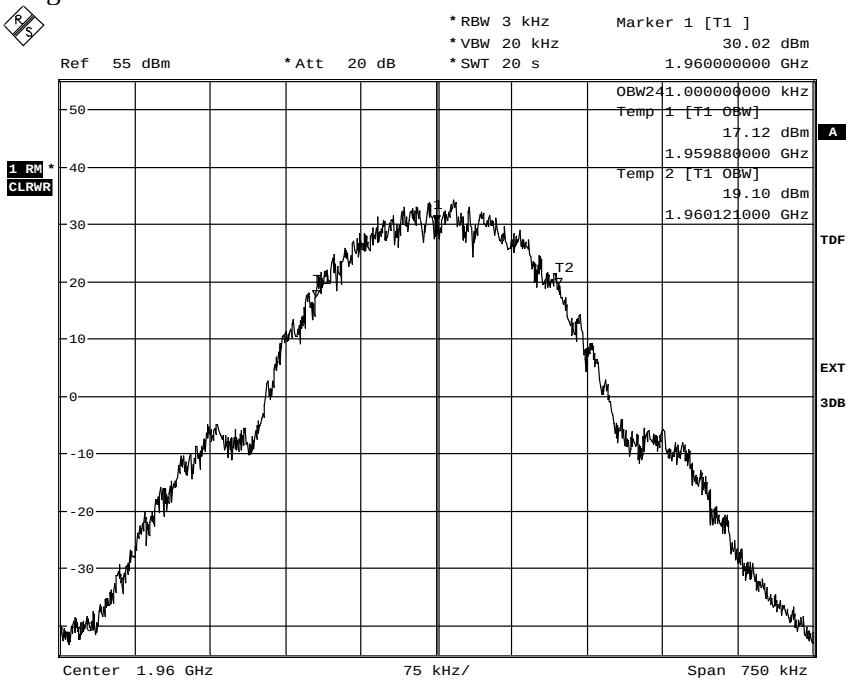
Diagram 2



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Appendix 3

Diagram 3

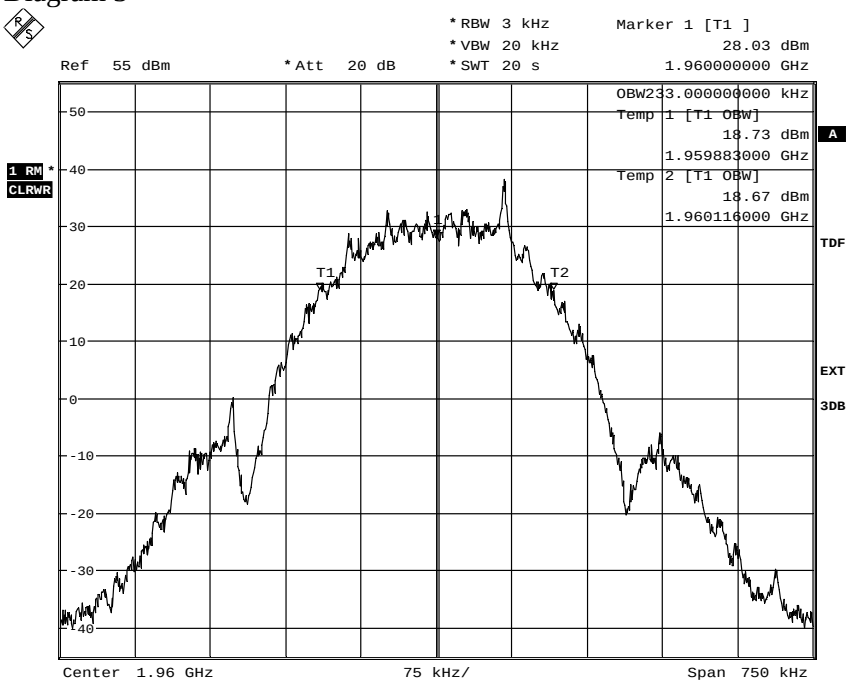

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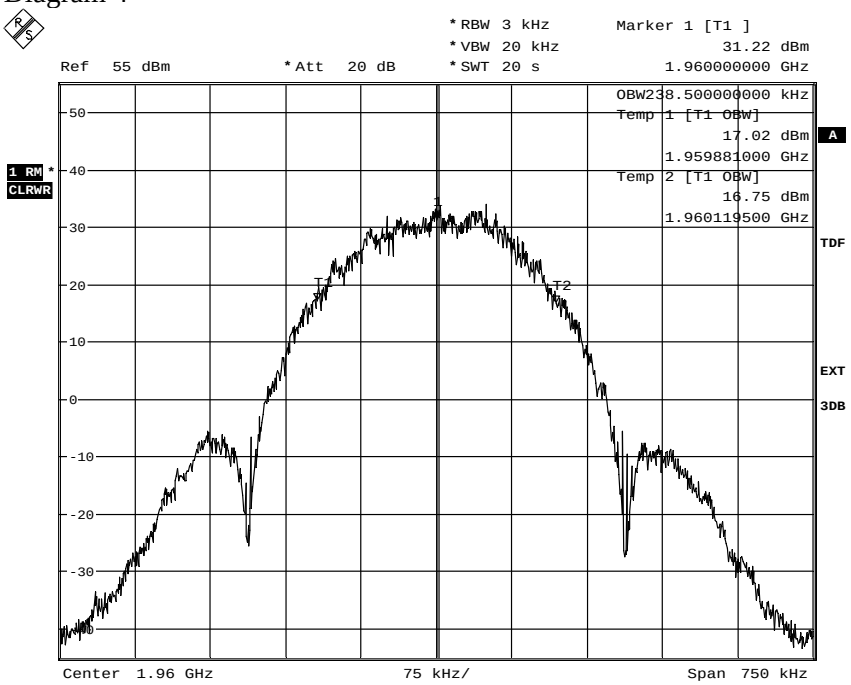
Diagram 4



Date: 18.AUG.2011 20:33:00

Appendix 3

Diagram 5

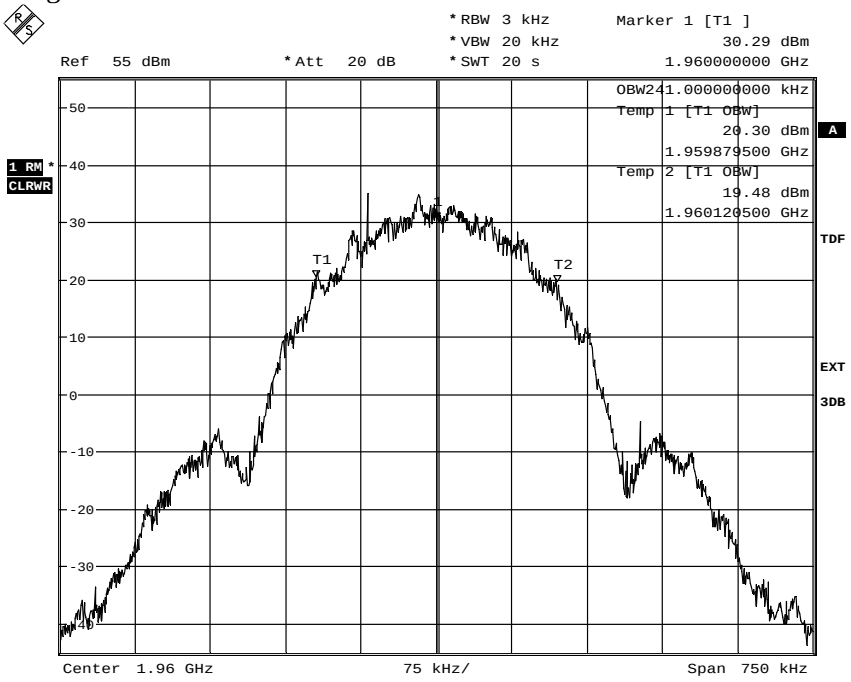


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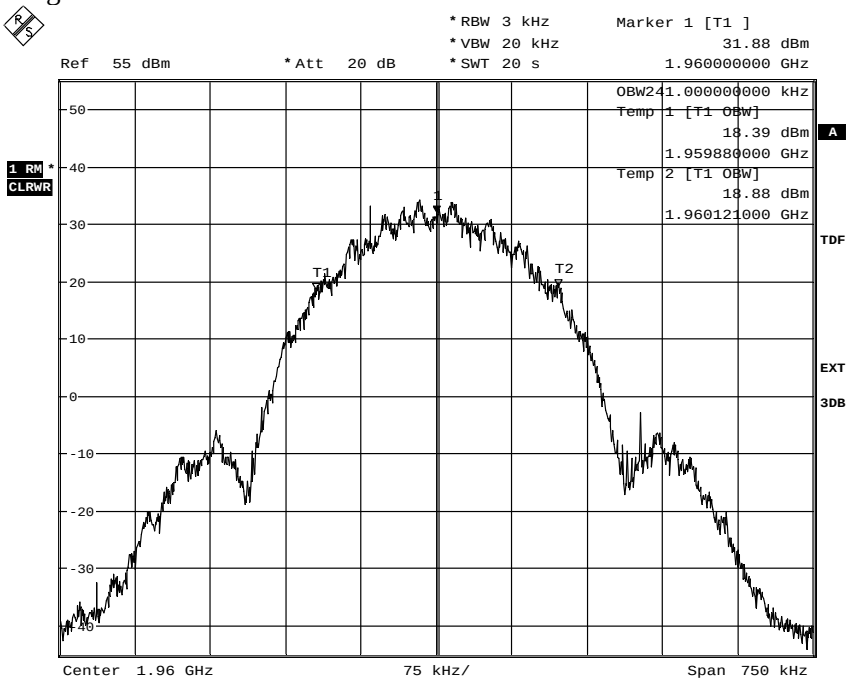
Diagram 6



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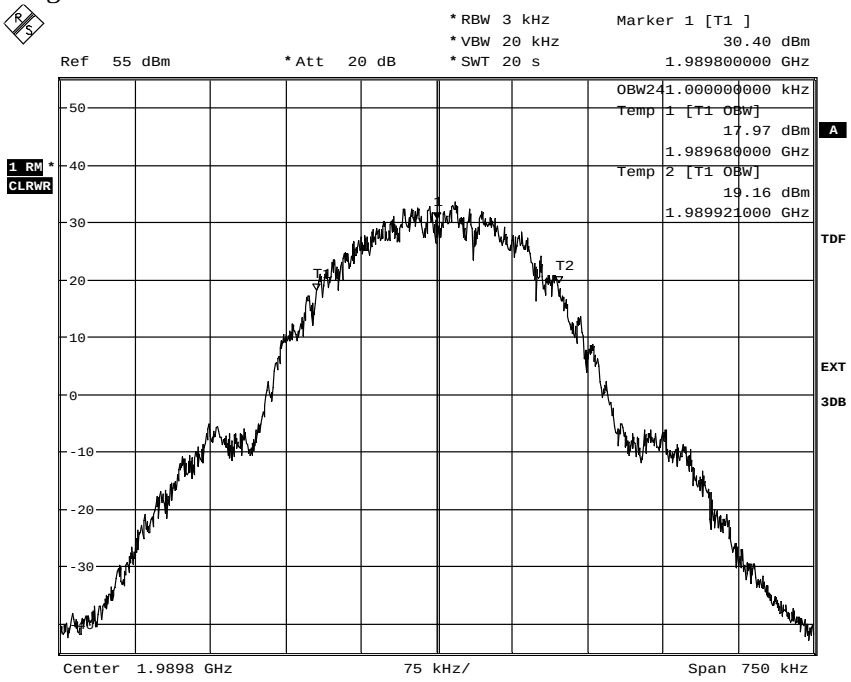
Appendix 3

Diagram 7



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

Date	Temperature	Humidity
2011-08-18 to 2011-08-19 2011-10-19 2011-10-31	23-24 °C ± 3 °C	24-53% ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. 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. A RBW of 3 kHz (>1% of EBW) was used up to 1 MHz away from the band edges, from 1 MHz to 6 MHz away from the band edges a RBW of 200 kHz was used. To compensate for the reduced RBW the limit was adjusted by 7 dB to -20 dBm in this frequency range. A RBW of 1 MHz was used from 6 to 15 MHz away from the band edges. In Multi carrier mode a RBW of 100 kHz was used with the limit adjusted to -23 dBm, those measurements was complemented with a channel power measurement with 1 MHz channel bandwidth and those results should be compliant with -13 dBm.

Measurement equipment	SP number
Rohde & Schwarz FSIQ	503 738
RF attenuator	504 159
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier:

		Channel	Modulation
Diagram	1 a,b,c:	B+1	GMSK
Diagram	2 a,b,c:	B+1	AQPSK
Diagram	3 a,b,c:	B+1	8-PSK
Diagram	4 a,b,c:	B+1	16QAM
Diagram	5 a,b,c:	B+1	32QAM
Diagram	6 a,b,c:	T-1	GMSK
Diagram	7 a,b,c:	T-1	AQPSK
Diagram	8 a,b,c:	T-1	8-PSK
Diagram	9 a,b,c:	T-1	16QAM
Diagram	10 a,b,c:	T-1	32QAM

Multi carrier 1x2:

Diagram	11 :	(B+1)+(B+9)	GMSK
Diagram	12 :	(T-1)+(T-9)	16QAM

Multi carrier 1x3:

Diagram	13	(B+1)+(B+3)+(B+9)	16QAM
Diagram	14	(T-1)+(T-3)+(T-11)	GMSK

Remark

The channel adjacent to the lower and higher band edge cannot be used. The lowest usable channel is 513 (1930.4 MHz) and the highest usable channel is 809 (1989.6 MHz).

Limits

CFR 47 §24.238 and RSS-133 6.5

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

Complies?	Yes

Appendix 4

Diagram 1a:

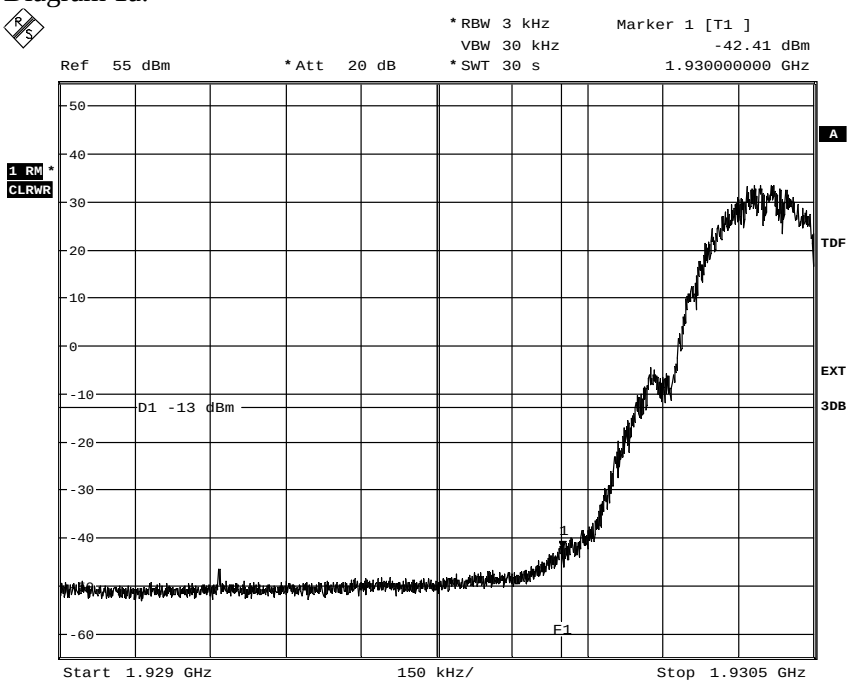


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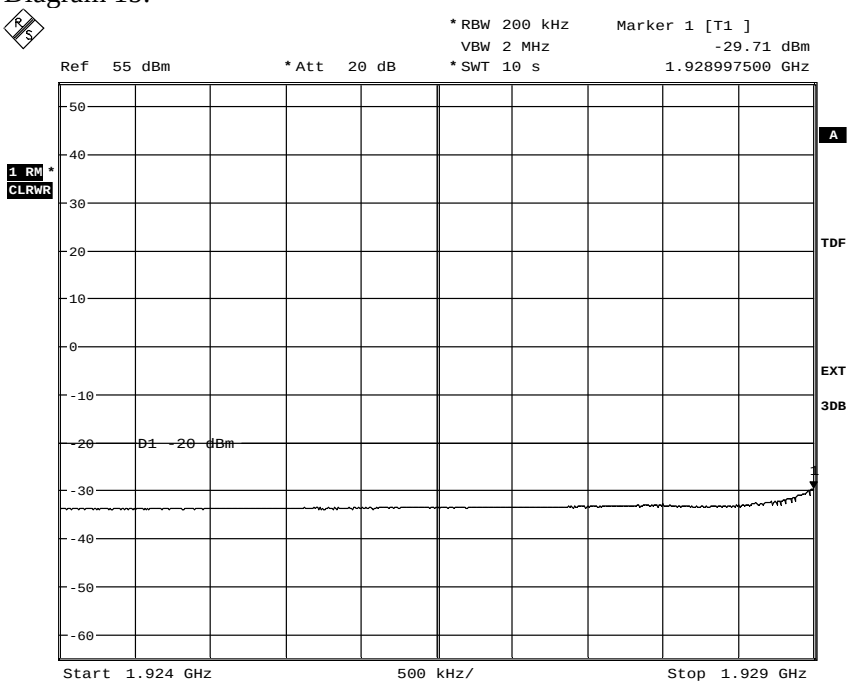
Diagram 1b:



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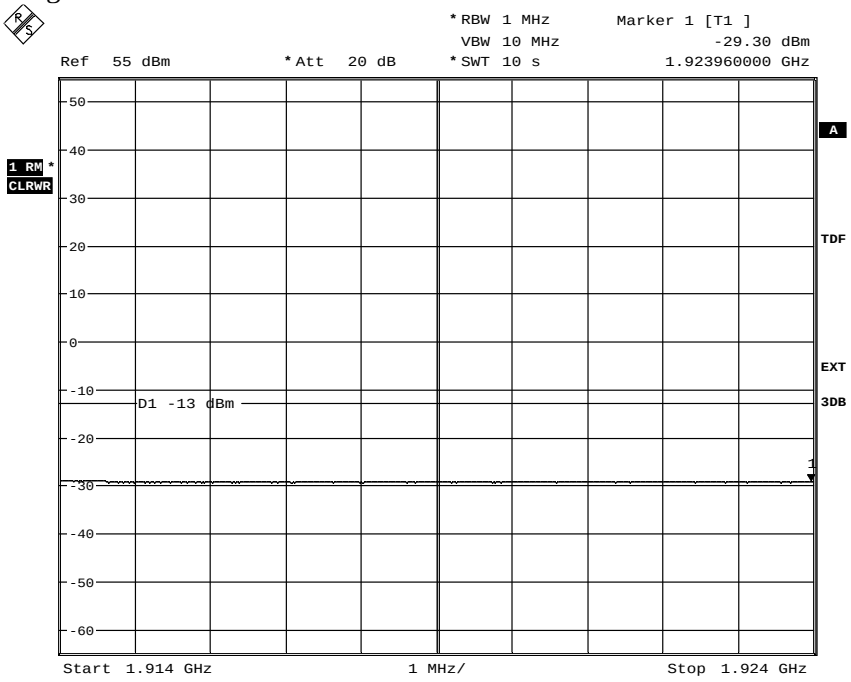
Appendix 4

Diagram 1c:



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Appendix 4

Diagram 2a:

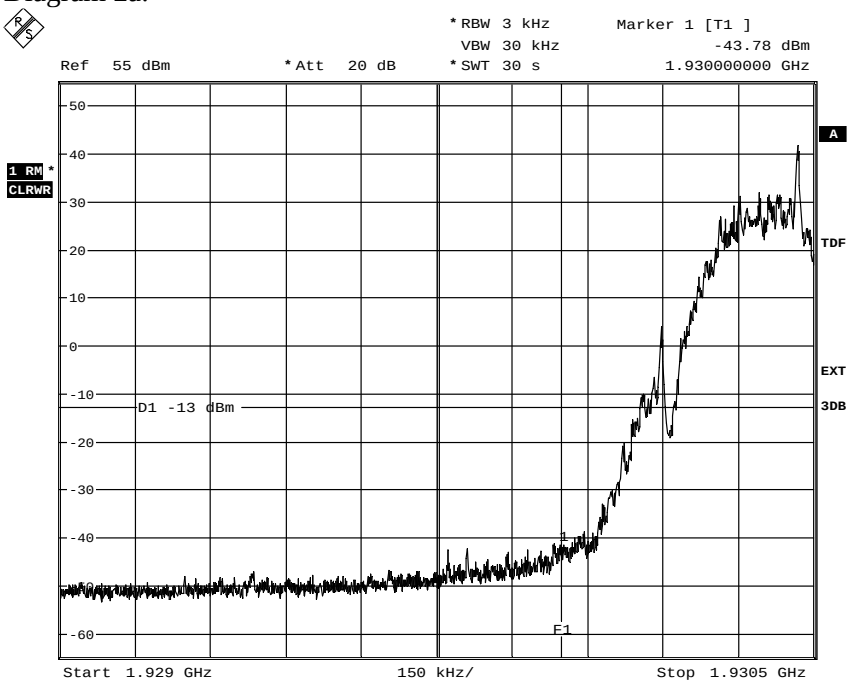

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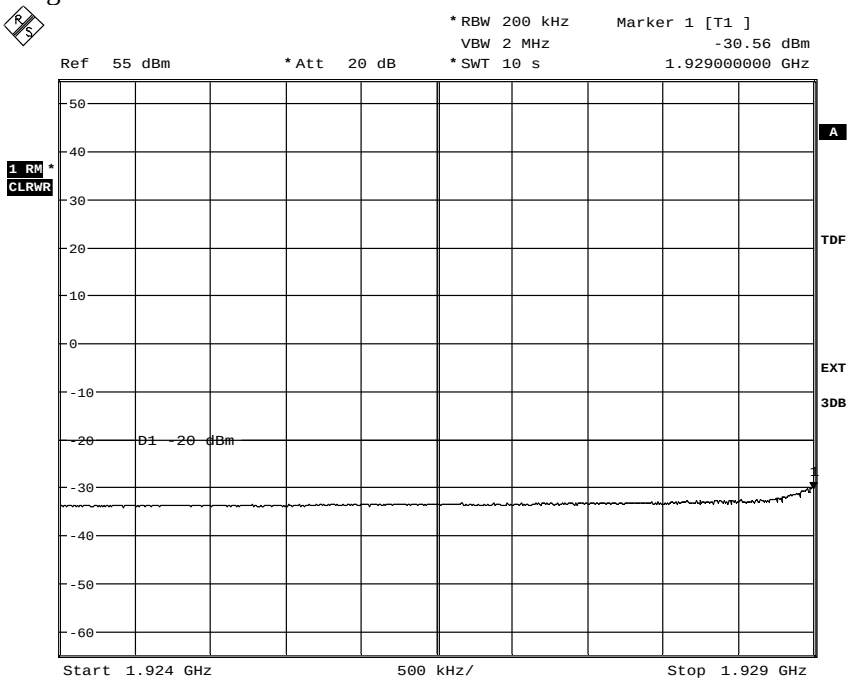
Diagram 2b:



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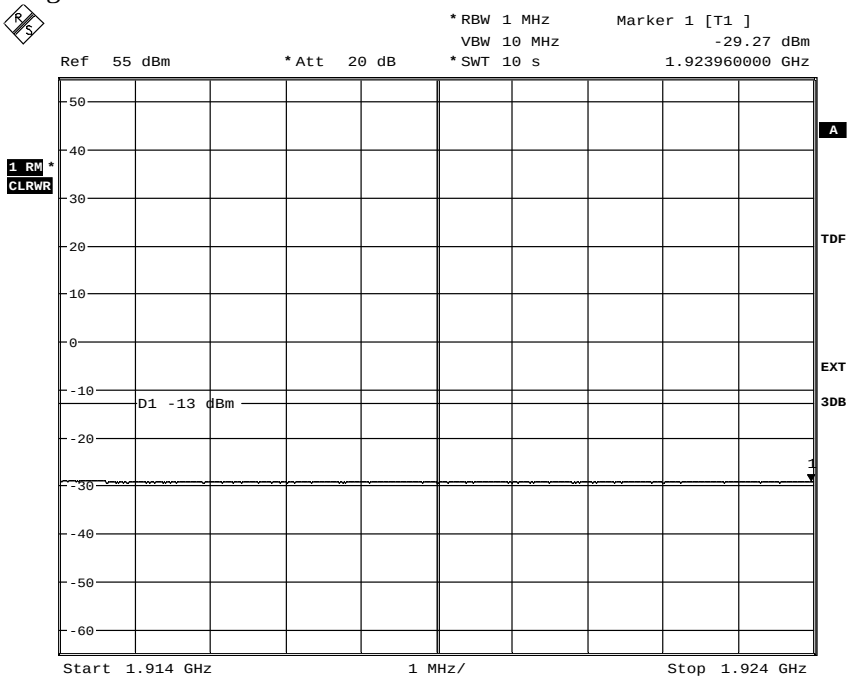
Appendix 4

Diagram 2c:



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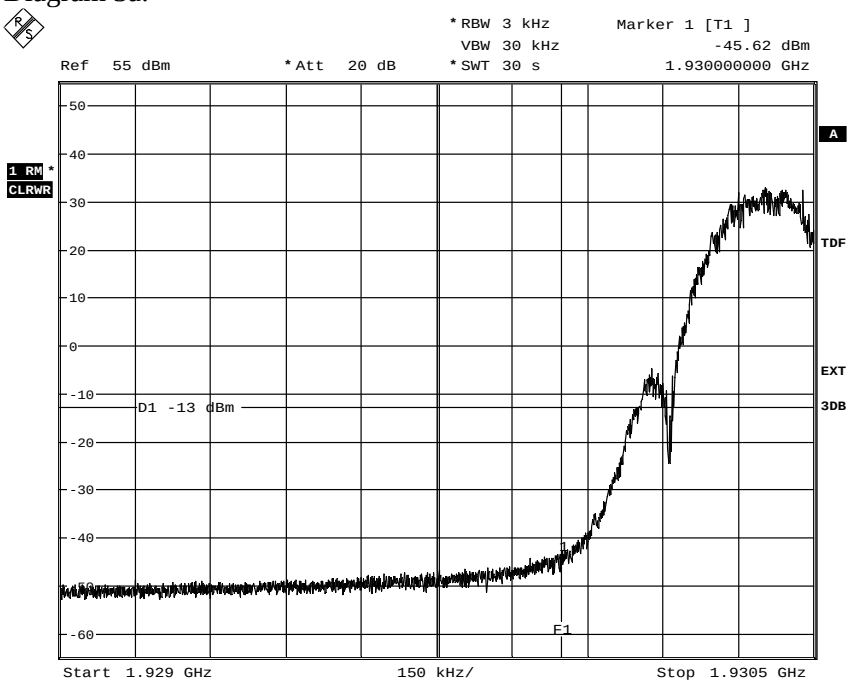
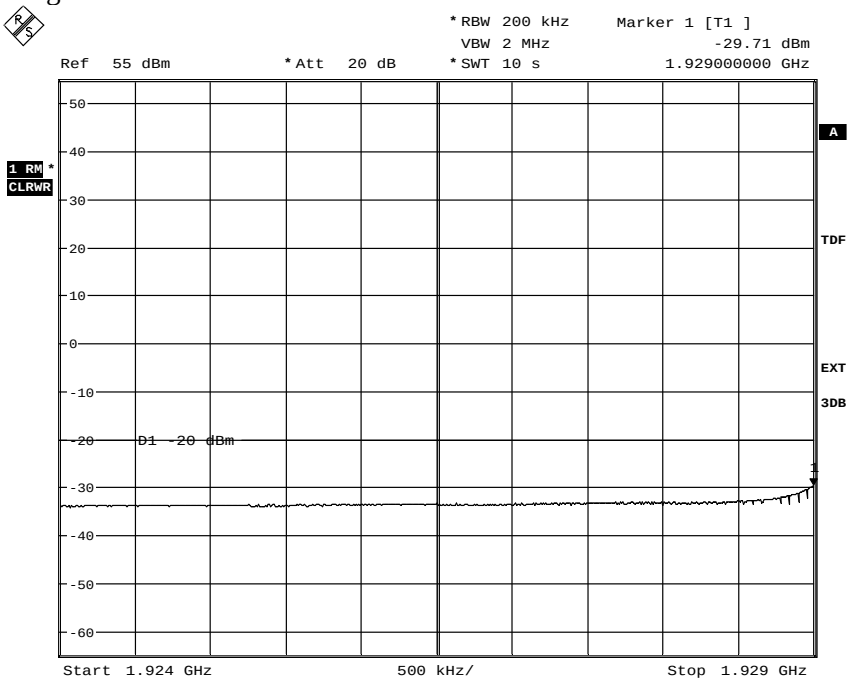
Appendix 4

Diagram 3a:



Date: 18.AUG.2011 18:47:49

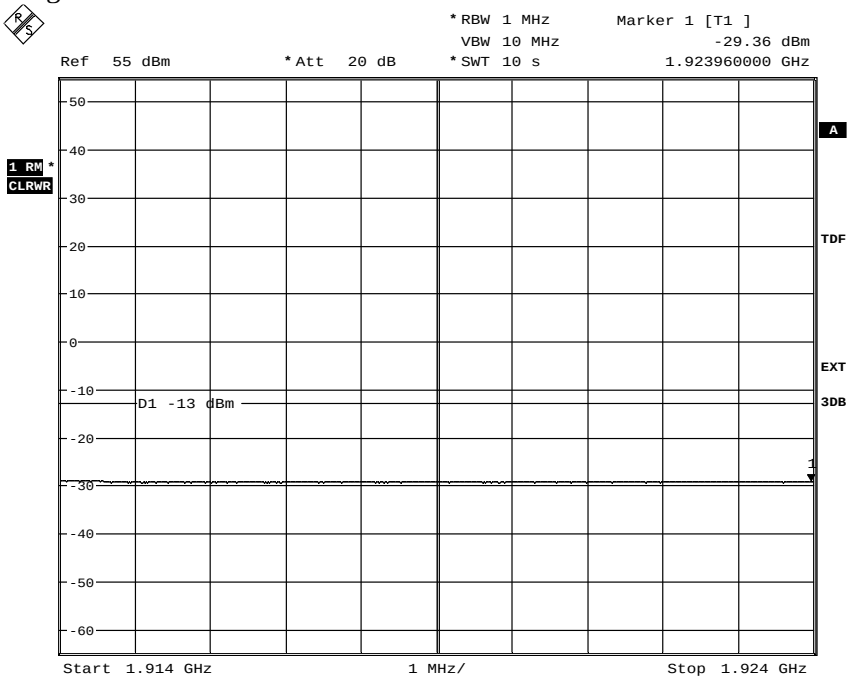
Diagram 3b:



Date: 19.AUG.2011 10:53:20

Appendix 4

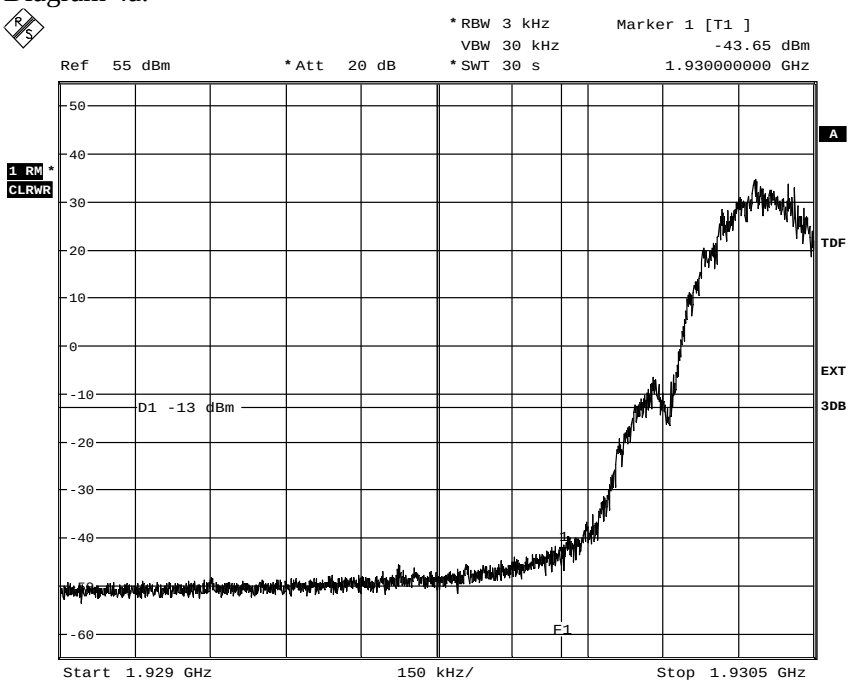
Diagram 3c:



Date: 19.AUG.2011 11:05:11

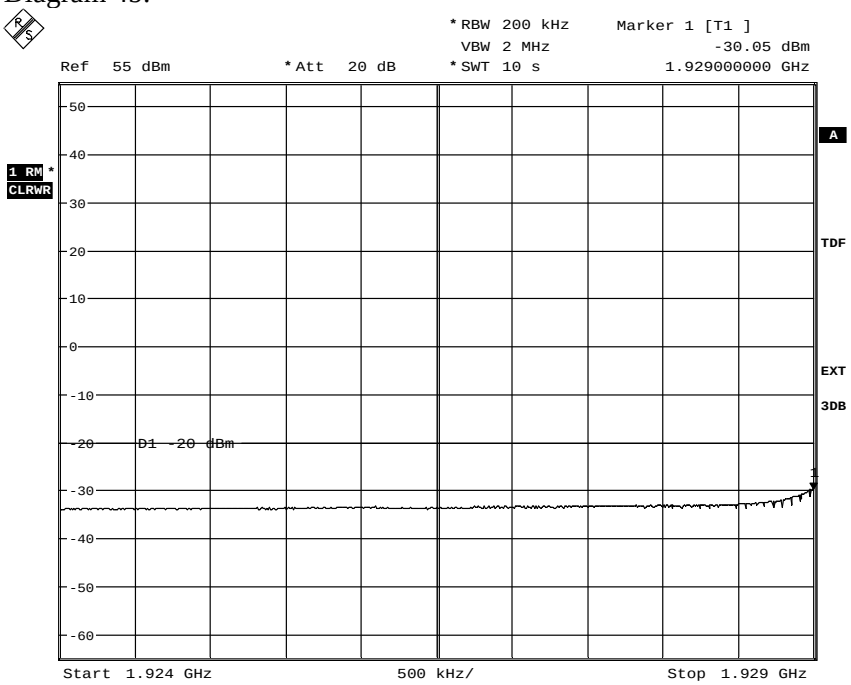
Appendix 4

Diagram 4a:



Date: 18.AUG.2011 18:40:43

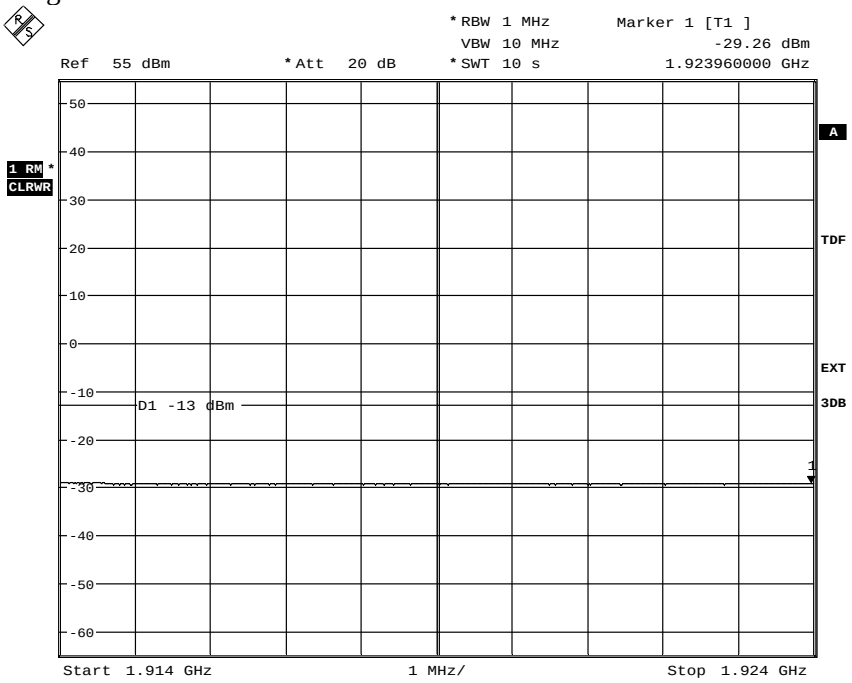
Diagram 4b:



Date: 19.AUG.2011 10:55:33

Appendix 4

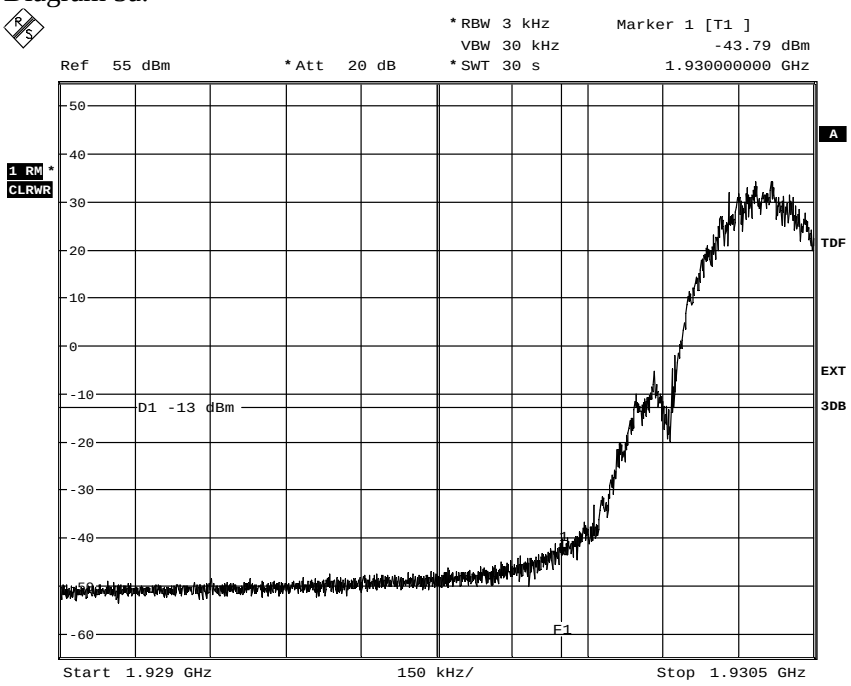
Diagram 4c:



Date: 19.AUG.2011 10:59:53

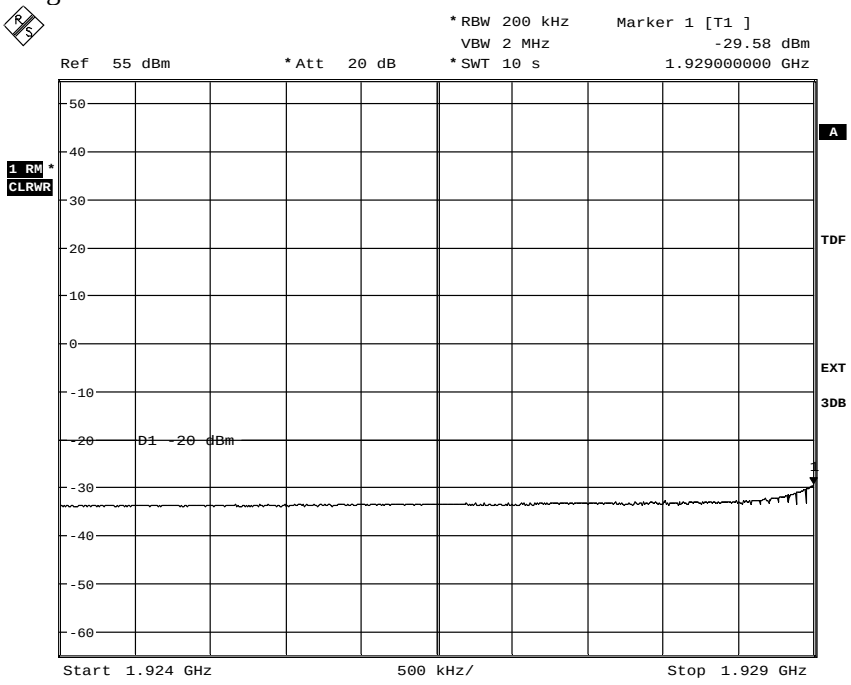
Appendix 4

Diagram 5a:



Date: 18.AUG.2011 18:42:22

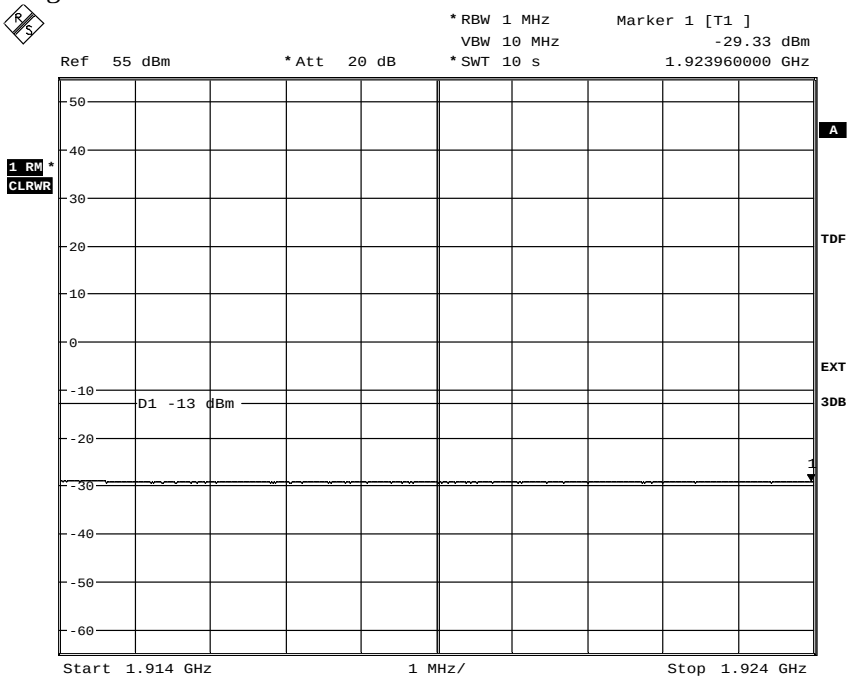
Diagram 5b:



Date: 19.AUG.2011 11:02:01

Appendix 4

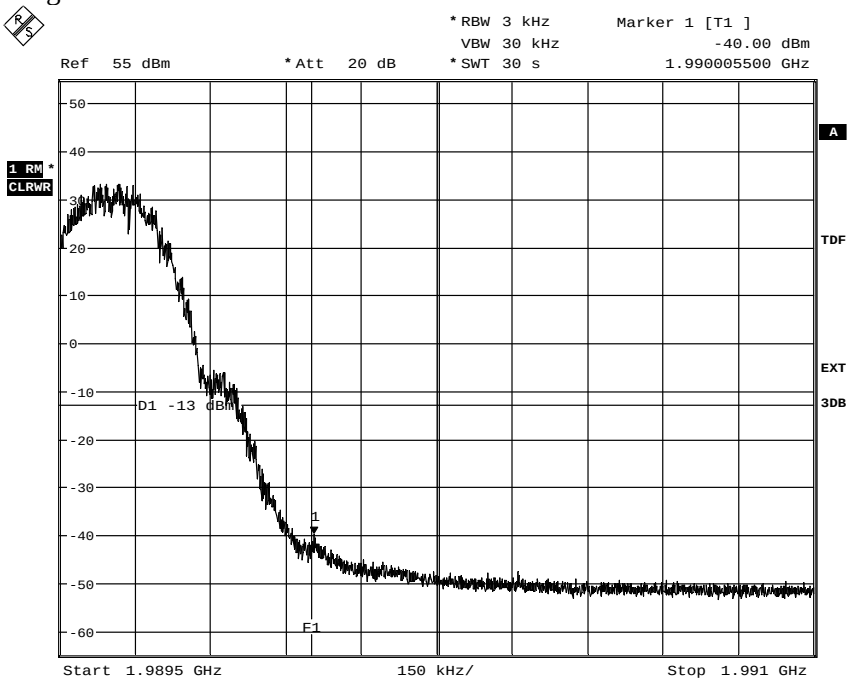
Diagram 5c:



Date: 19.AUG.2011 11:01:07

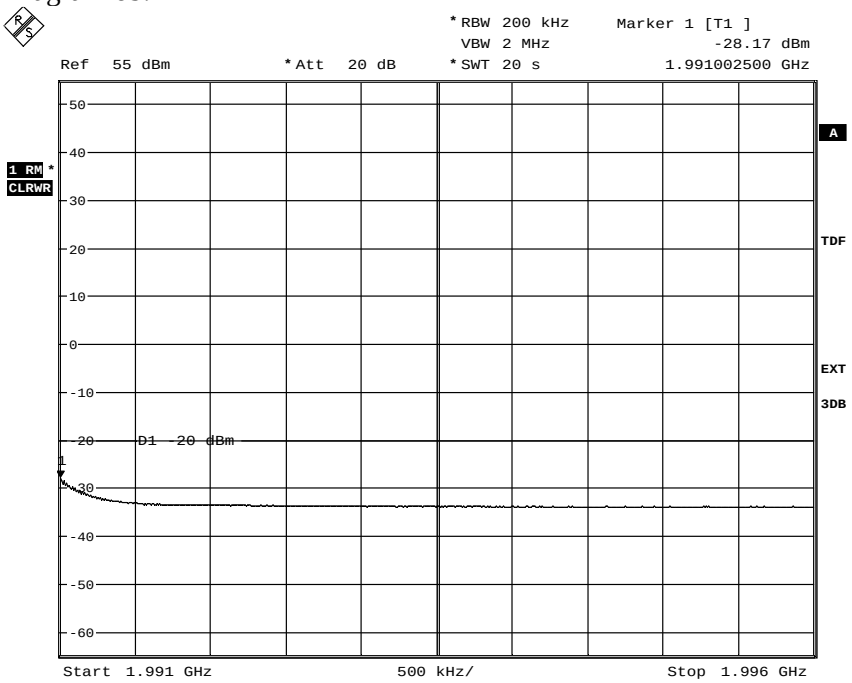
Appendix 4

Diagram 6a:



Date: 19.AUG.2011 14:38:37

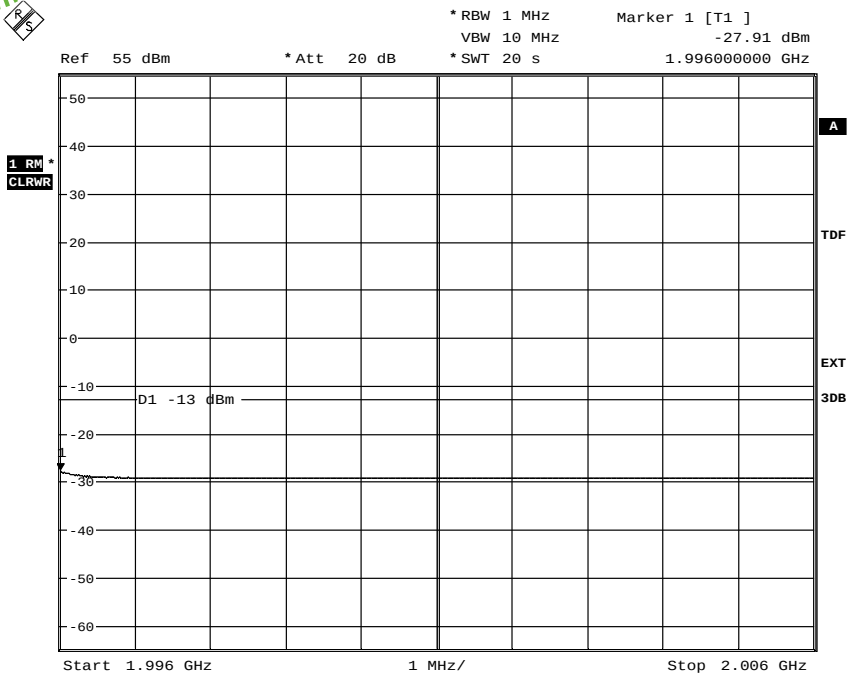
Diagram 6b:



Date: 19.AUG.2011 14:47:34

Diagram 6c:

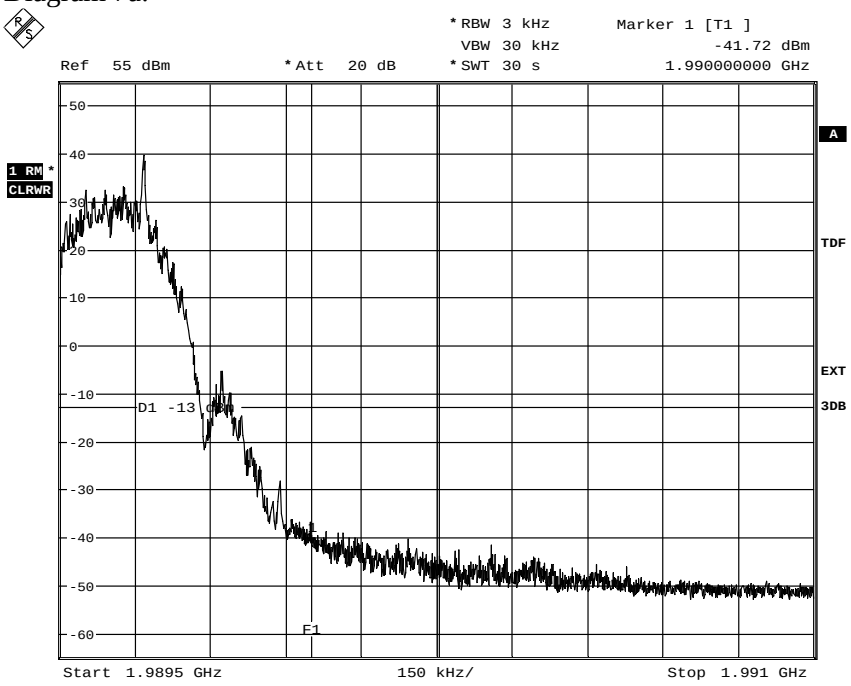
Appendix 4



Date: 19.AUG.2011 14:49:18

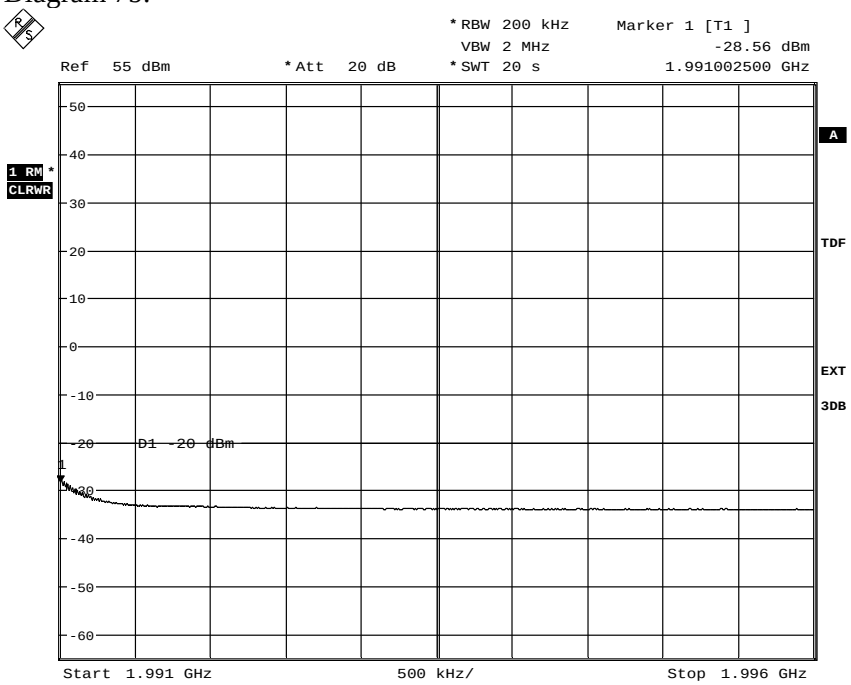
Appendix 4

Diagram 7a:



Date: 19.AUG.2011 15:14:06

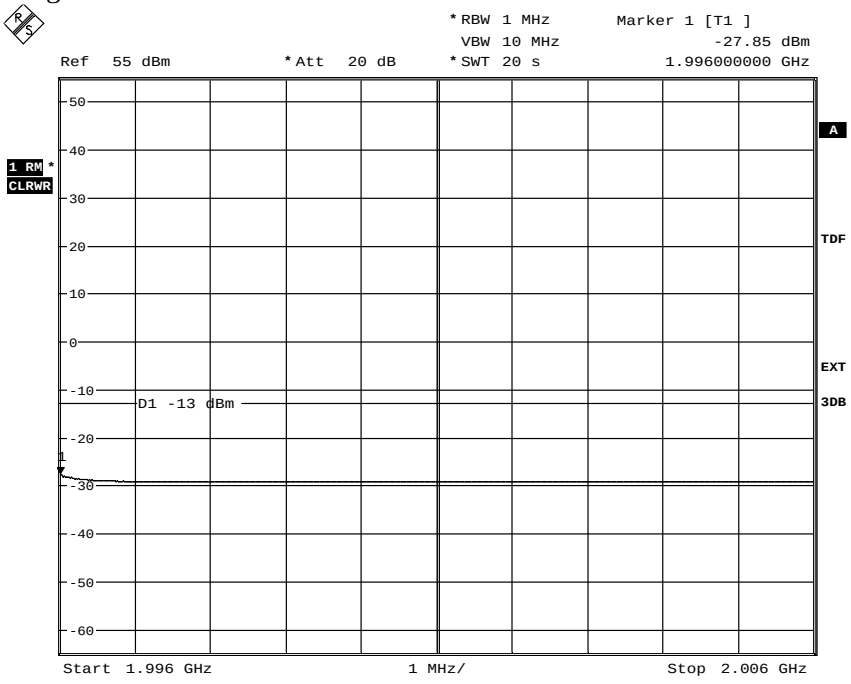
Diagram 7b:



Date: 19.AUG.2011 15:12:09

Appendix 4

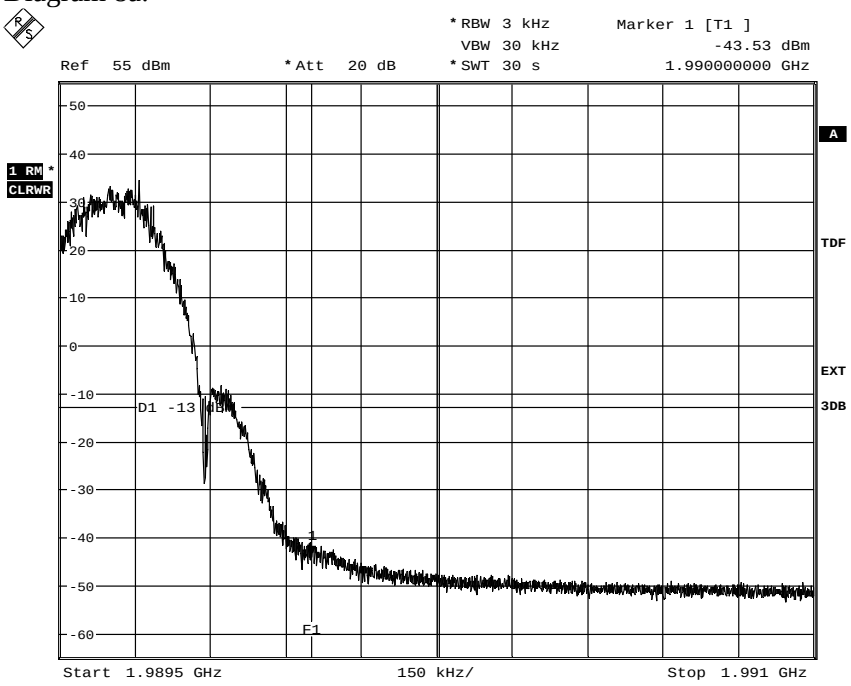
Diagram 7c:



Date: 19.AUG.2011 15:10:50

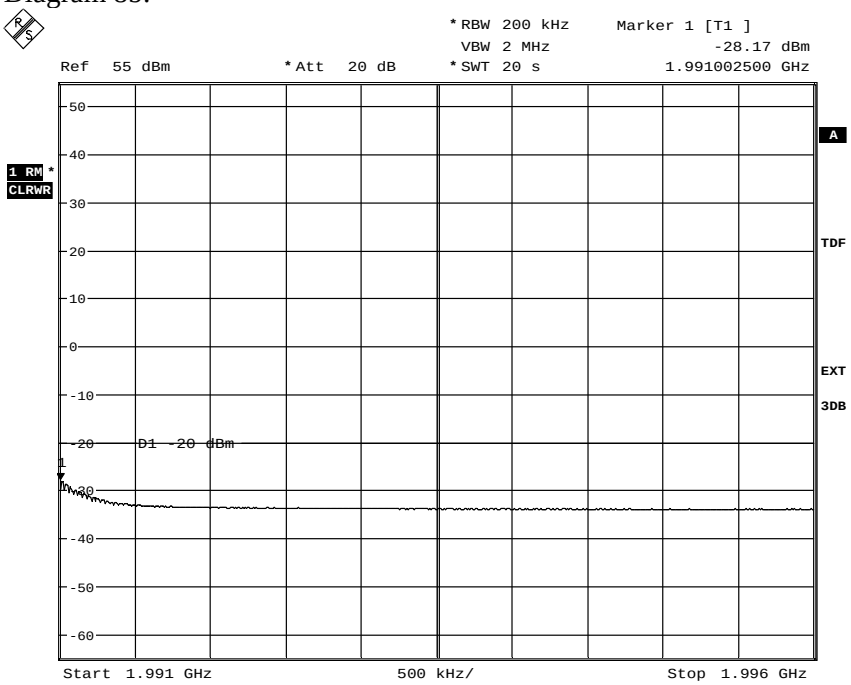
Appendix 4

Diagram 8a:



Date: 19.AUG.2011 15:24:55

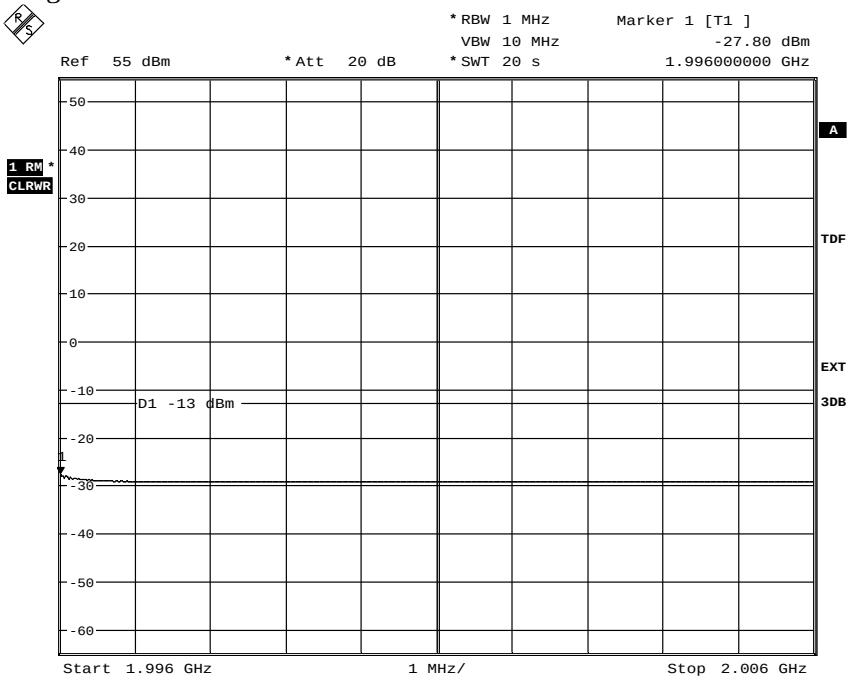
Diagram 8b:



Date: 19.AUG.2011 15:28:27

Appendix 4

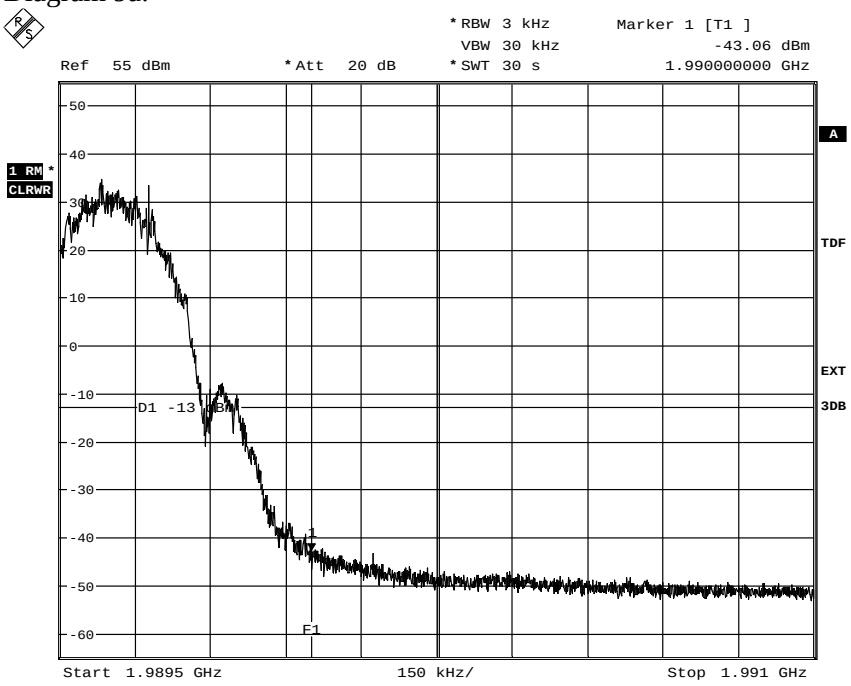
Diagram 8c:



Date: 19.AUG.2011 15:29:49

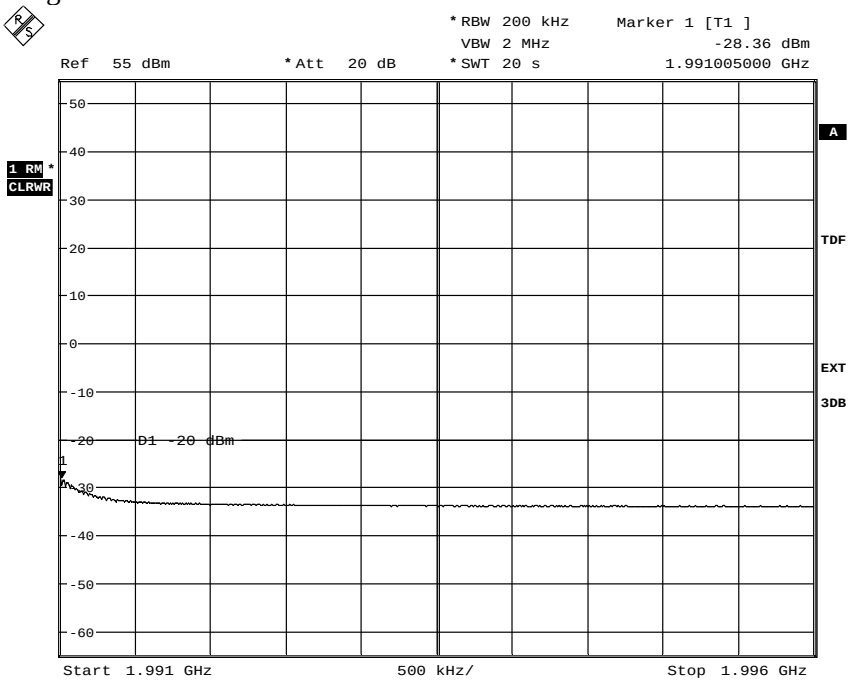
Appendix 4

Diagram 9a:



Date: 19.AUG.2011 15:35:42

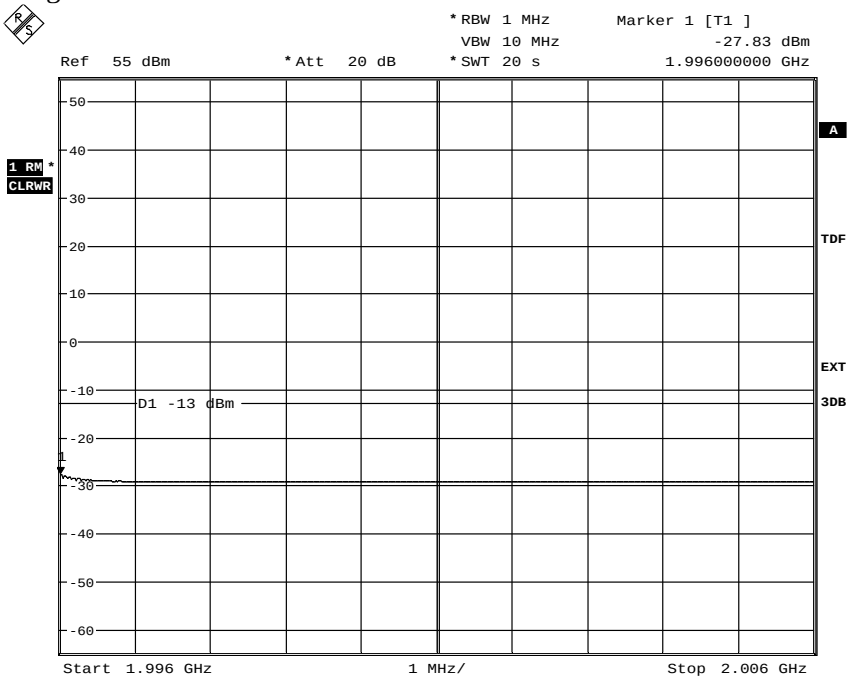
Diagram 9b:



Date: 19.AUG.2011 15:33:13

Appendix 4

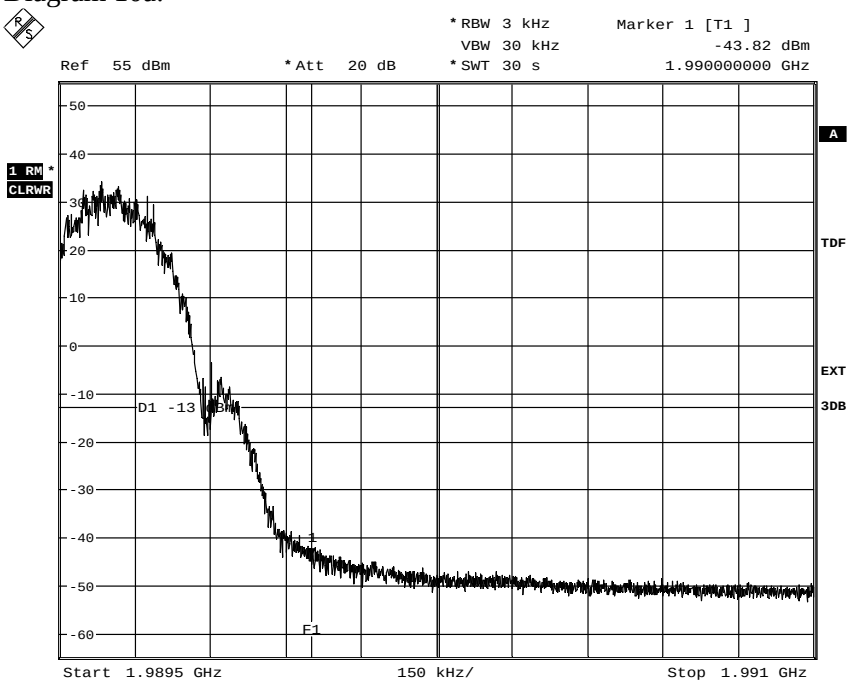
Diagram 9c:



Date: 19.AUG.2011 15:31:10

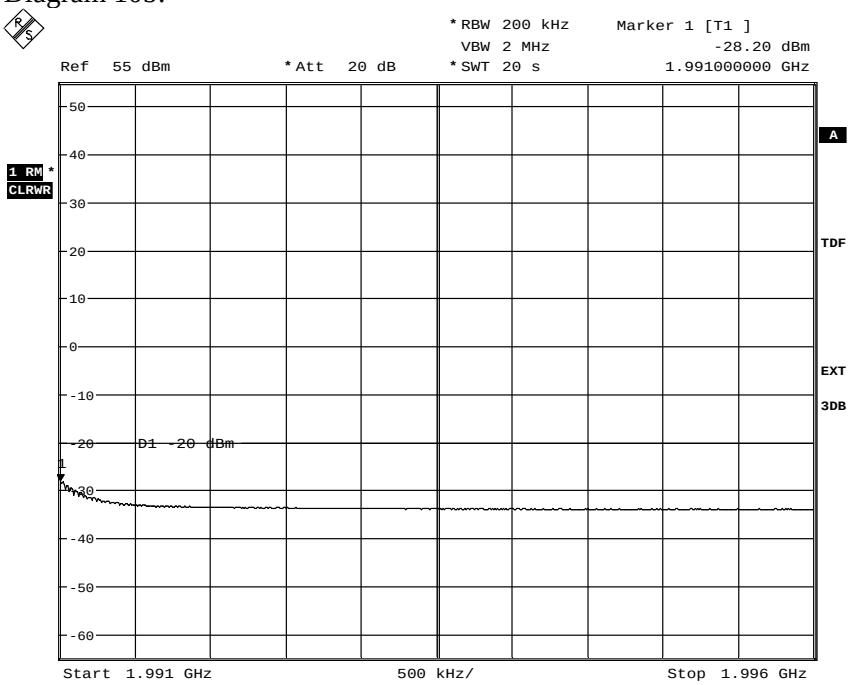
Appendix 4

Diagram 10a:



Date: 19.AUG.2011 15:37:47

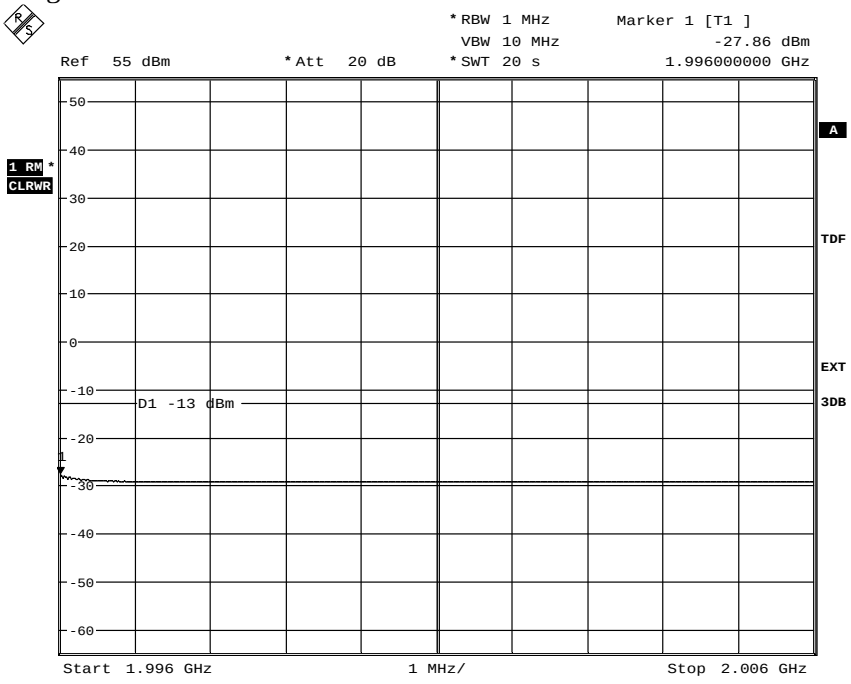
Diagram 10b:



Date: 19.AUG.2011 15:40:10

Appendix 4

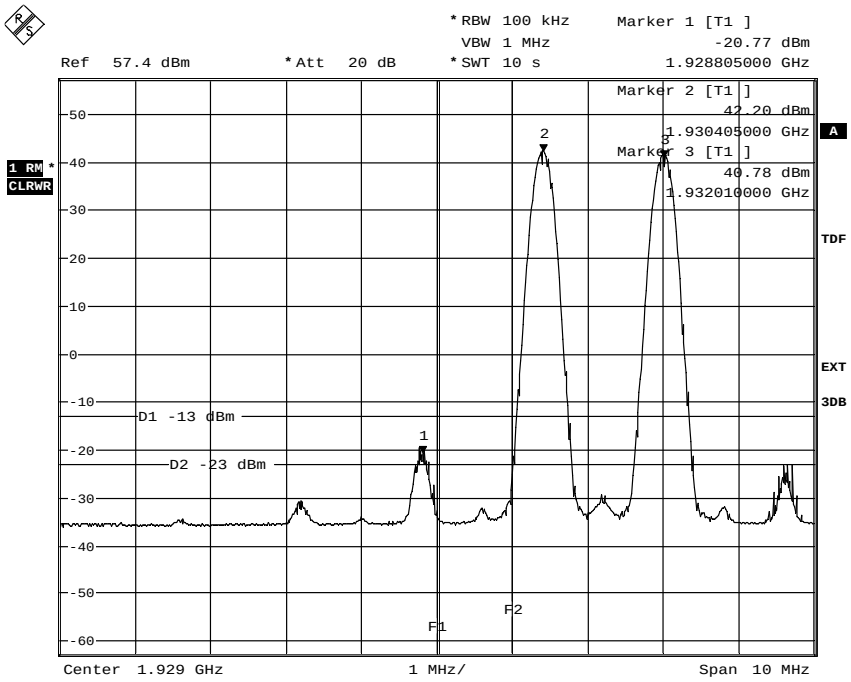
Diagram 10c:



Date: 19.AUG.2011 15:52:38

Appendix 4

Diagram 11:

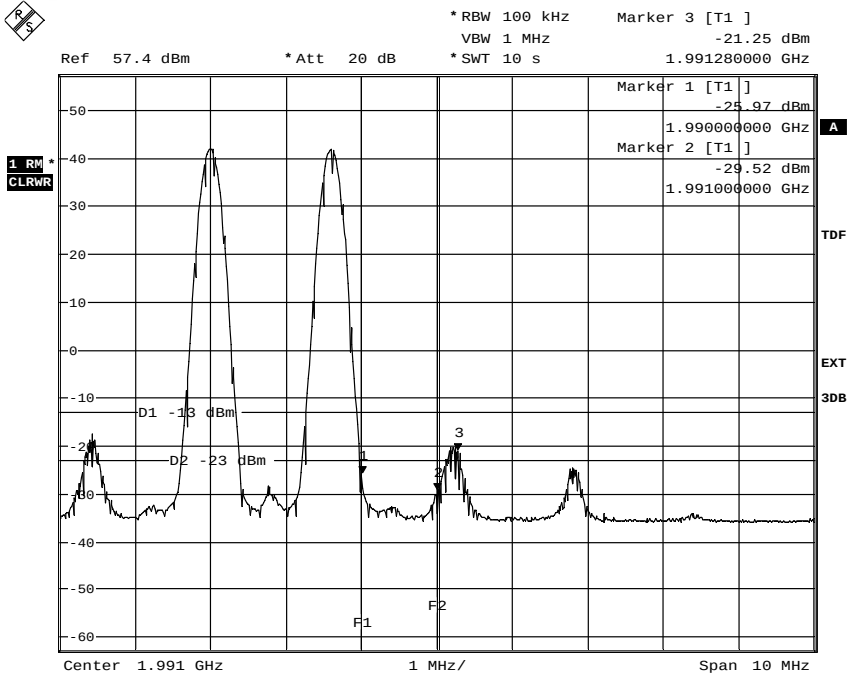


Date: 19.OCT.2011 15:12:22

The emission at 1928.8 MHz was -17.90 dBm measured with the channel power method with 1 MHz channel bandwidth

Appendix 4

Diagram 12:

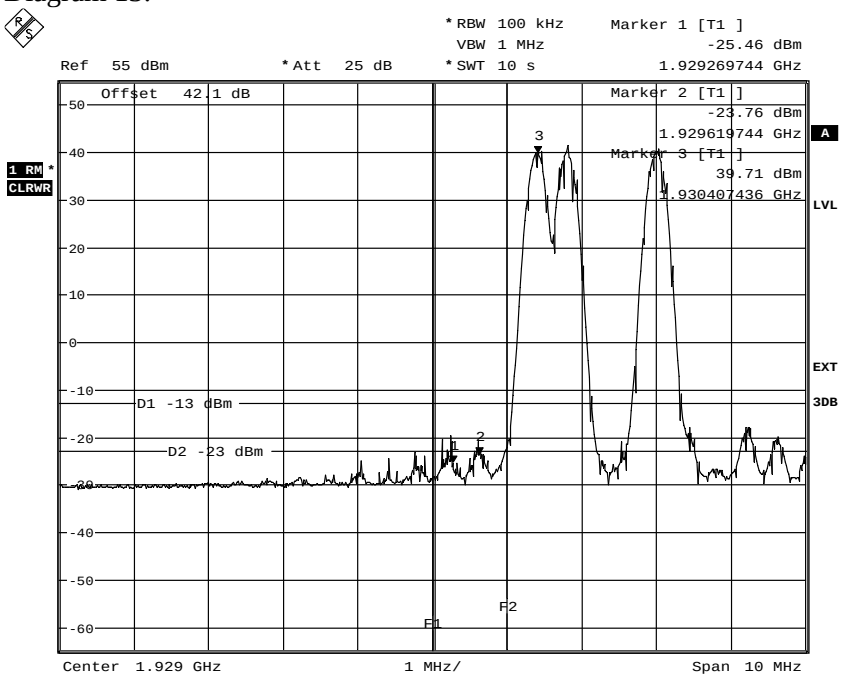


Date: 19.OCT.2011 13:28:23

The emission at 1991.2 MHz was -17.31 dBm measured with the channel power method with 1 MHz channel bandwidth

Appendix 4

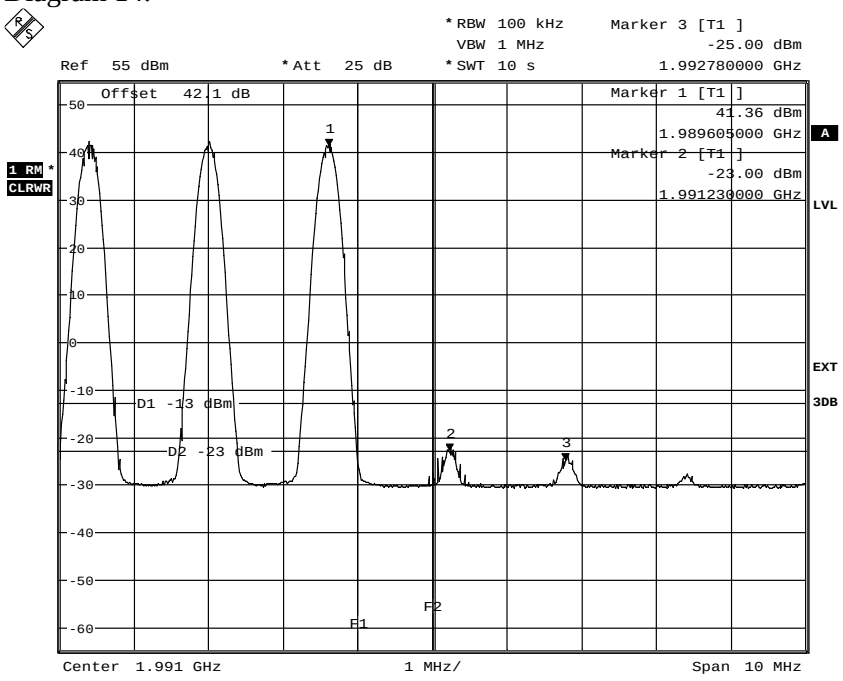
Diagram 13:



The emission at 1928.8 MHz was -17.34 dBm measured with the channel power method with 1 MHz channel bandwidth.

Appendix 4

Diagram 14:



The emission at 1991.2 MHz was -15.34 dBm measured with the channel power method with 1 MHz channel bandwidth.

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

Date	Temperature	Humidity
2011-10-24 to 2011-10-26	23 °C ± 3 °C	30-40 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with a RBW setting of 1 MHz and RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements

Measurement equipment	SP number
R&S FSQ	504 143
RF attenuator	504 159
High pass filter	504 200
RF attenuator	900 229
High pass filter	503 740
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier, modulation GMSK:
Diagram 1a-d: B
Diagram 2a-d: M
Diagram 3a-d: T

Multi carrier: 1x2
Diagram 4a-d: B+(B+10)
Diagram 5a-d: M+(M+10)
Diagram 6a-d: T+(T-10)

Multi carrier: 1x3
Diagram 7a-d: B+(B+5)+(B+10)
Diagram 8a-d: M+(M+5)+(M+10)
Diagram 9a-d: T+(T-5)+(T-10)

Multi carrier: 1x4
Diagram 10a-d: B+(B+5)+(B+10)+(B+15)
Diagram 11a-d: M+(M-5)+(M+5)+(M+10)
Diagram 12a-d: T+(T-5)+(T-10)+(T-15)

Remark

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

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

Limits

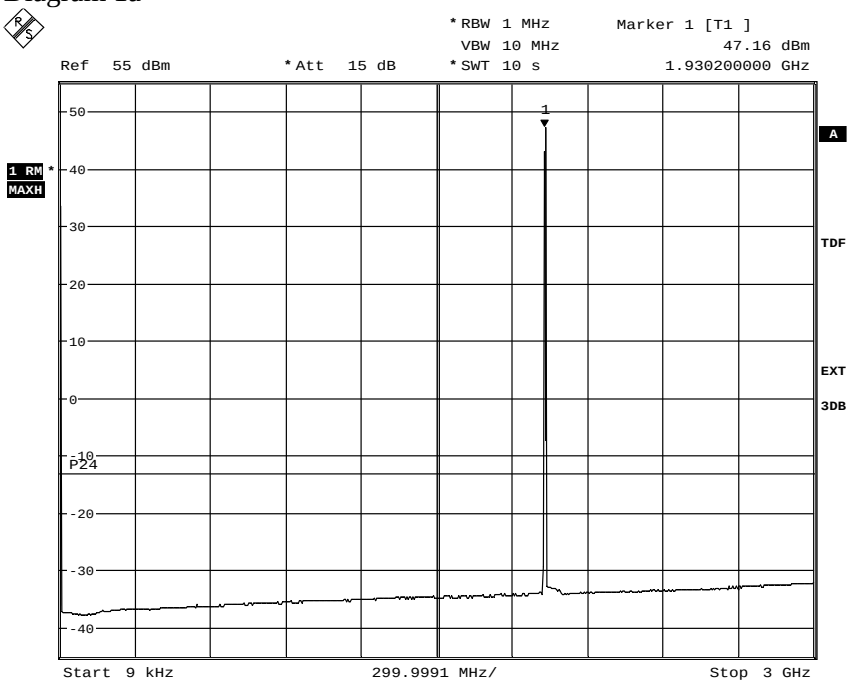
§24.238 and RSS-133 6.5

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

Complies?	Yes

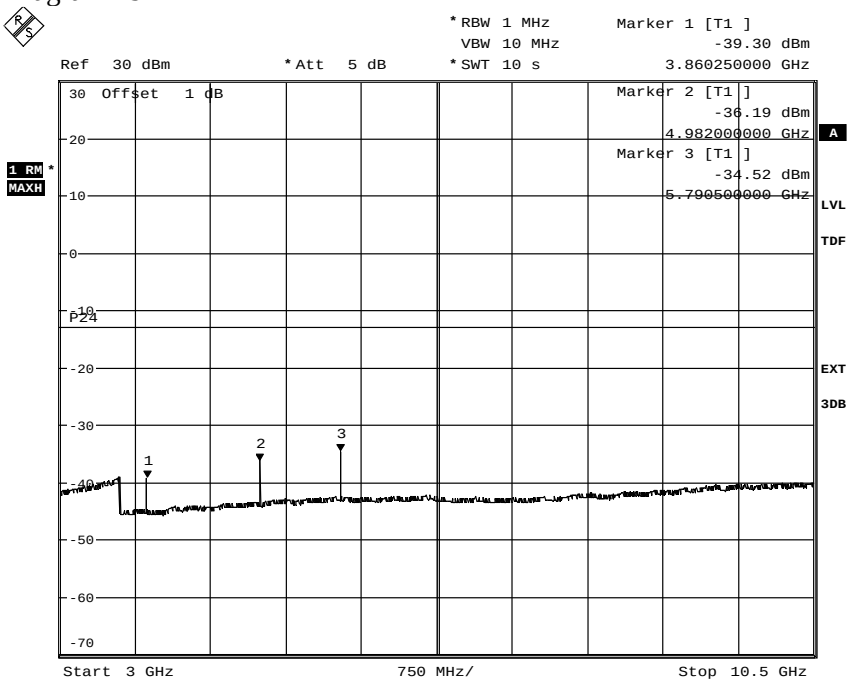
Appendix 5

Diagram 1a



Date: 25.OCT.2011 09:25:33

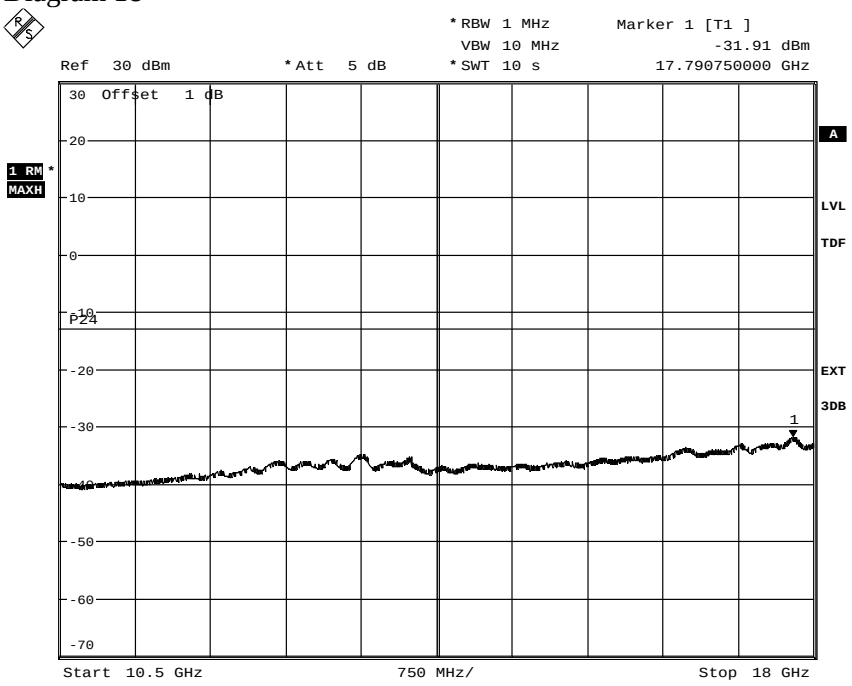
Diagram 1b



Date: 25.OCT.2011 09:22:14

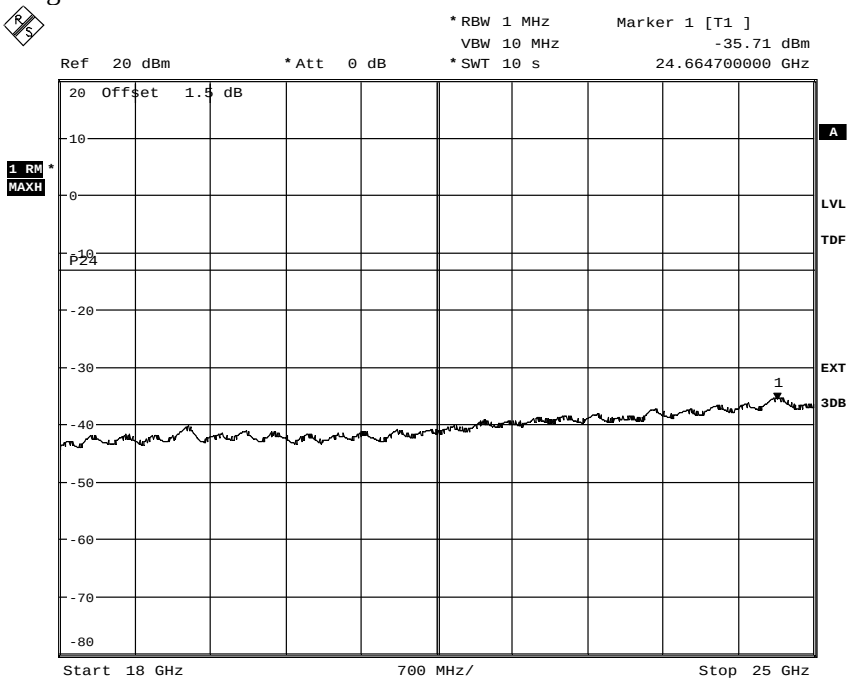
Appendix 5

Diagram 1c



Date: 25.OCT.2011 09:23:18

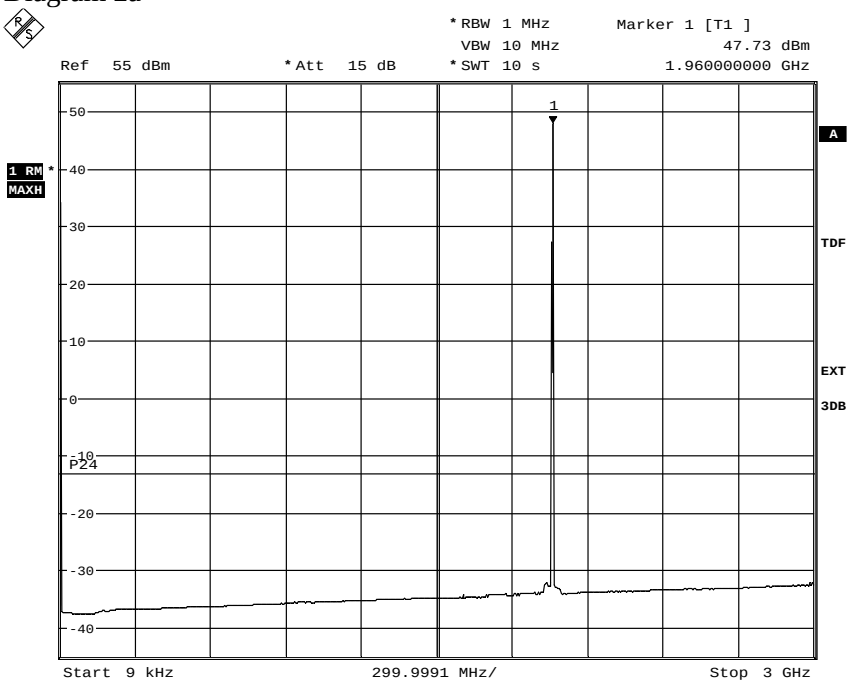
Diagram 1d



Date: 25.OCT.2011 09:37:10

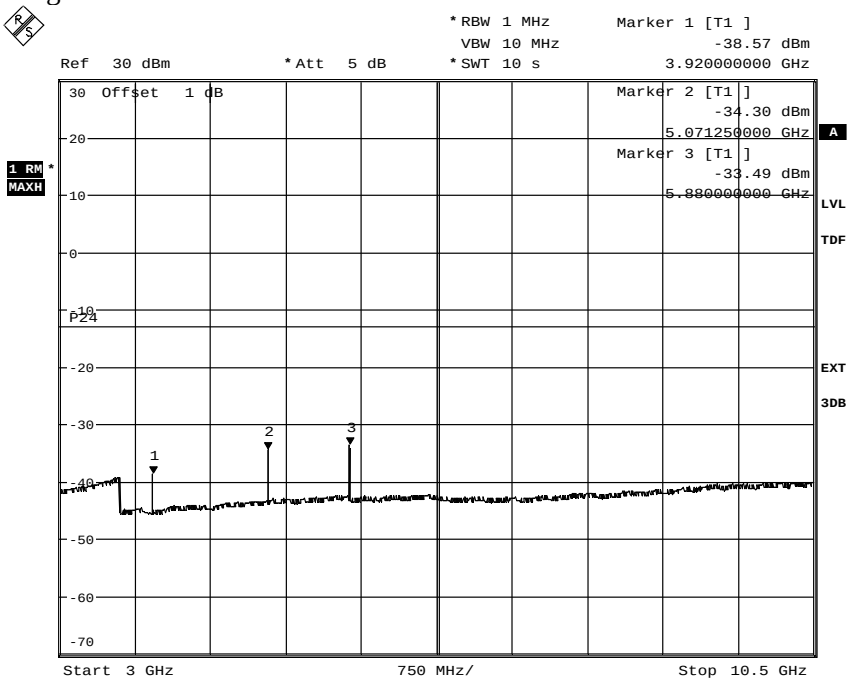
Appendix 5

Diagram 2a



Date: 24.OCT.2011 14:29:41

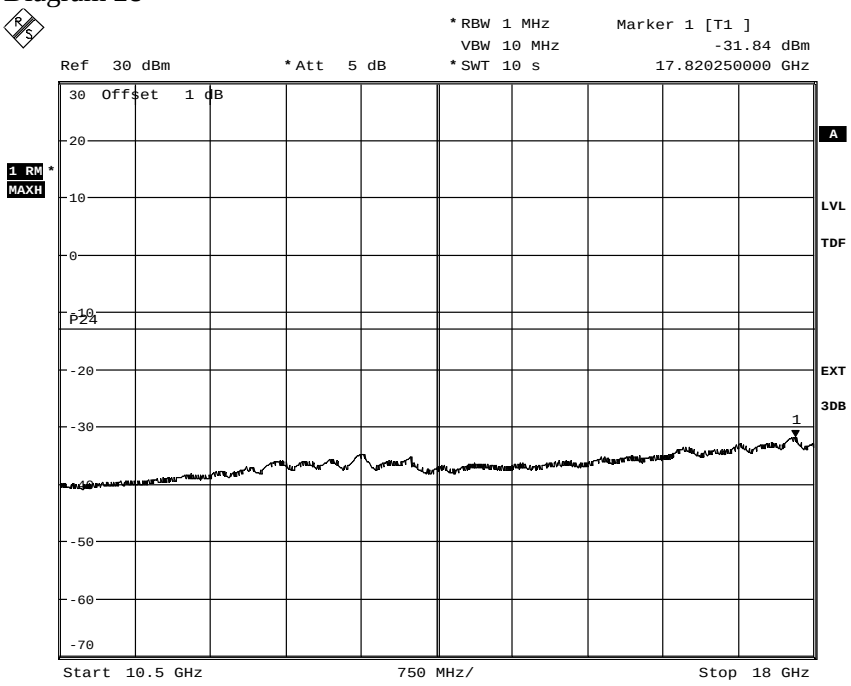
Diagram 2b



Date: 24.OCT.2011 14:32:27

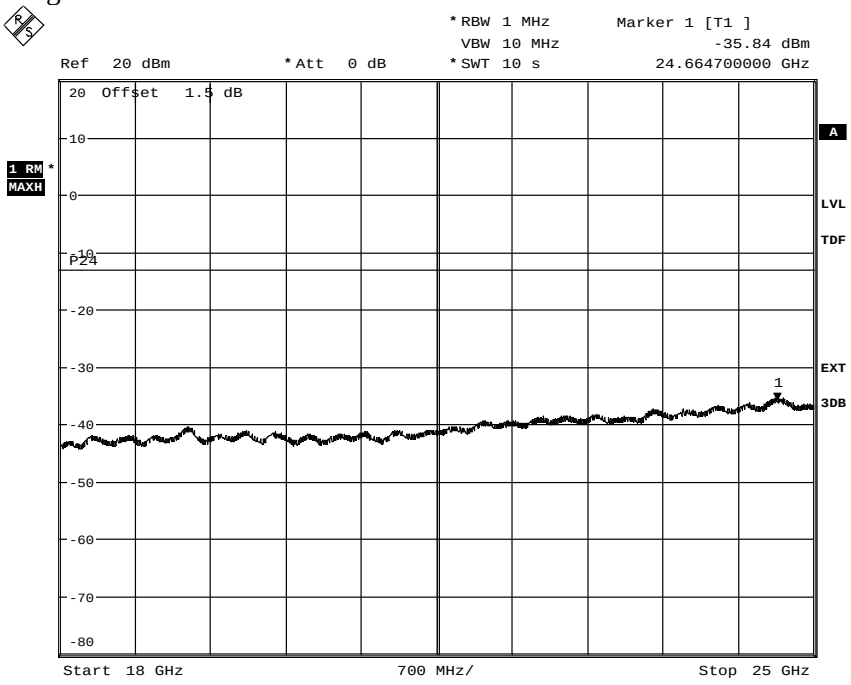
Appendix 5

Diagram 2c



Date: 24.OCT.2011 14:33:43

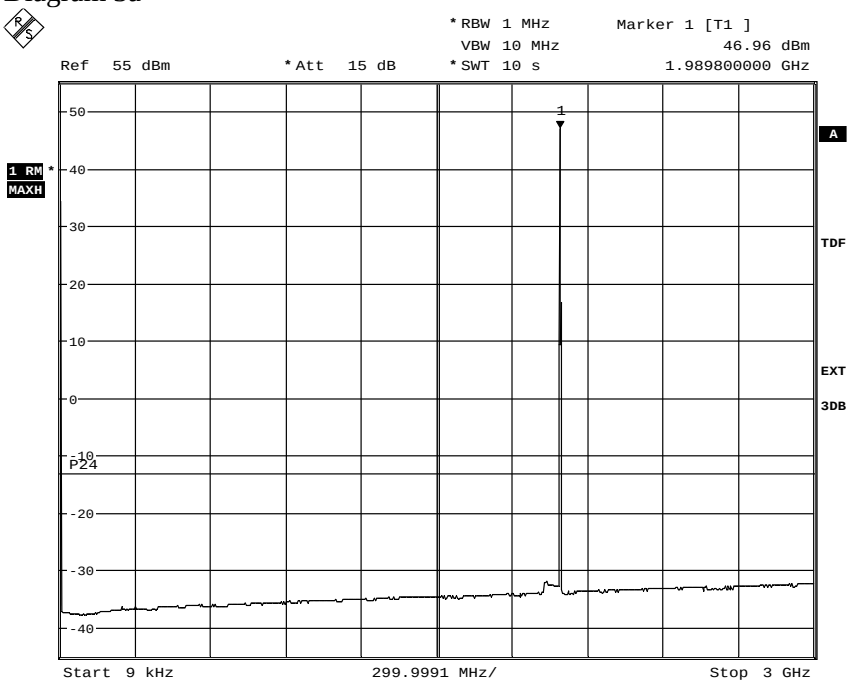
Diagram 2d



Date: 24.OCT.2011 15:51:09

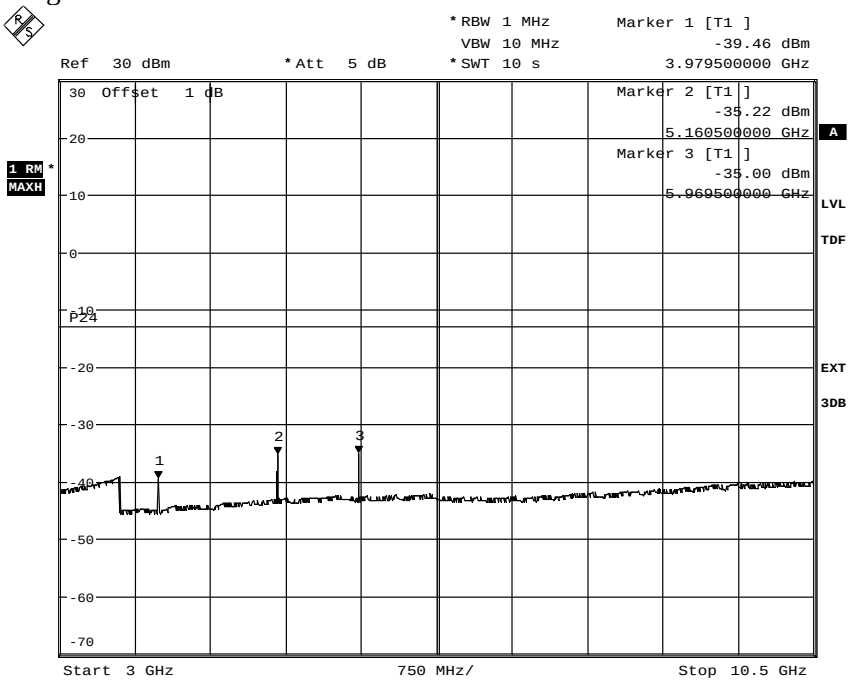
Appendix 5

Diagram 3a



Date: 25.OCT.2011 09:59:44

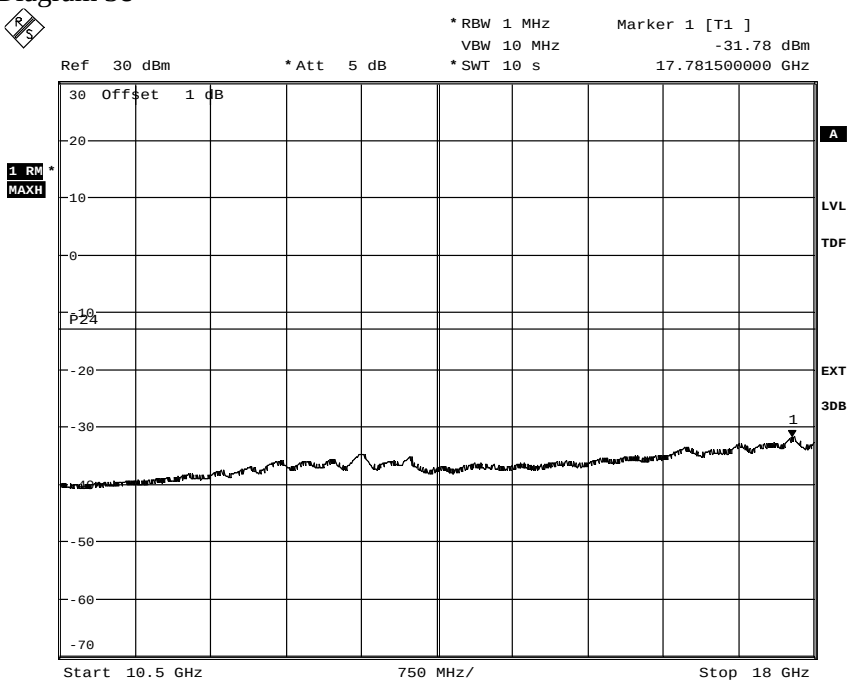
Diagram 3b



Date: 25.OCT.2011 10:02:04

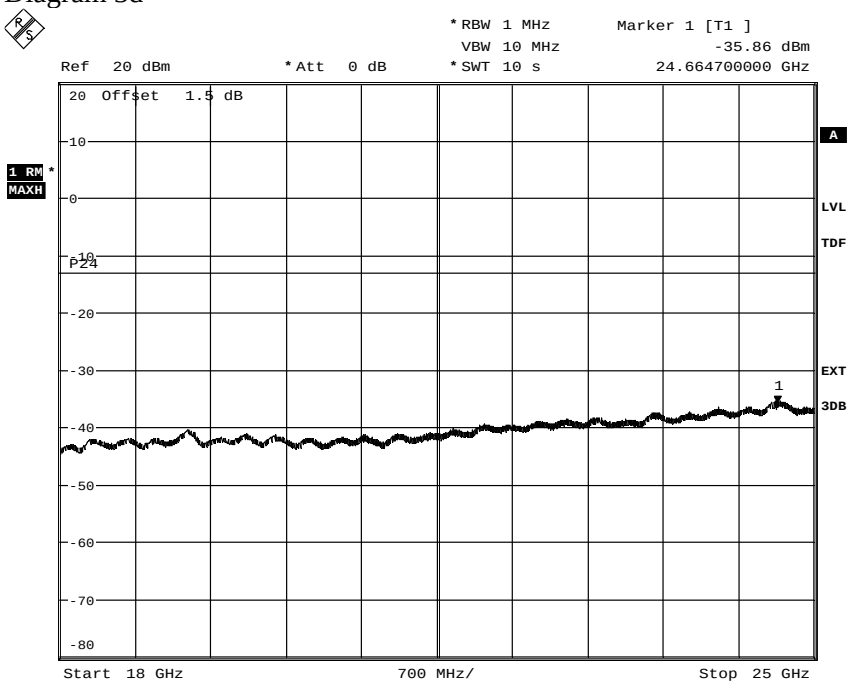
Appendix 5

Diagram 3c



Date: 25.OCT.2011 10:03:14

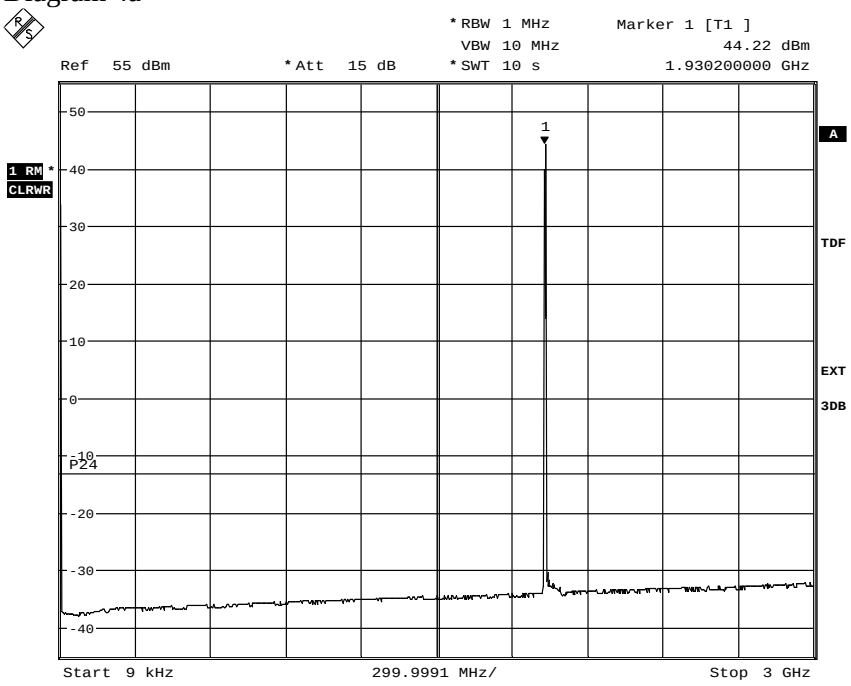
Diagram 3d



Date: 25.OCT.2011 09:50:02

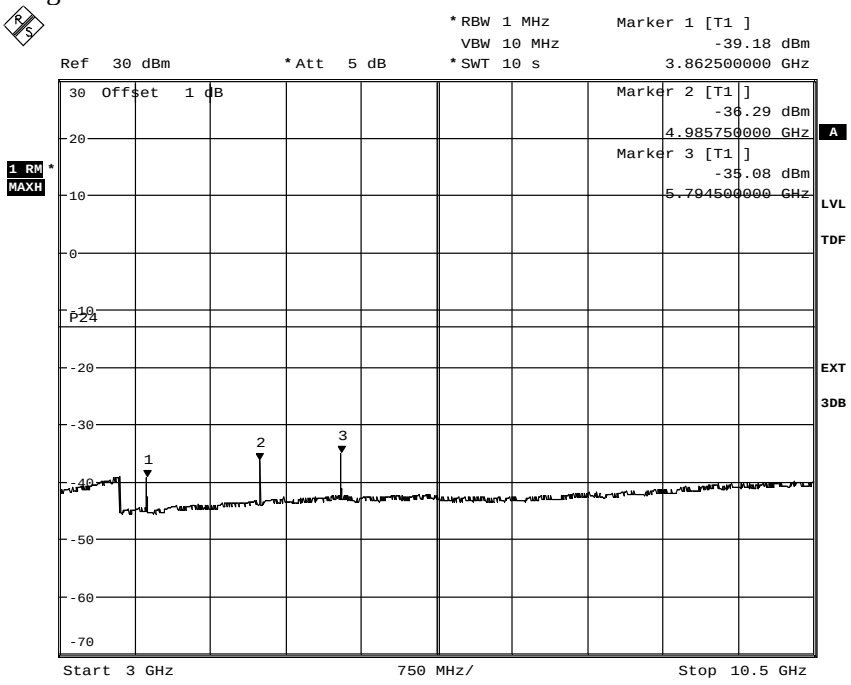
Appendix 5

Diagram 4a



Date: 25.OCT.2011 12:33:50

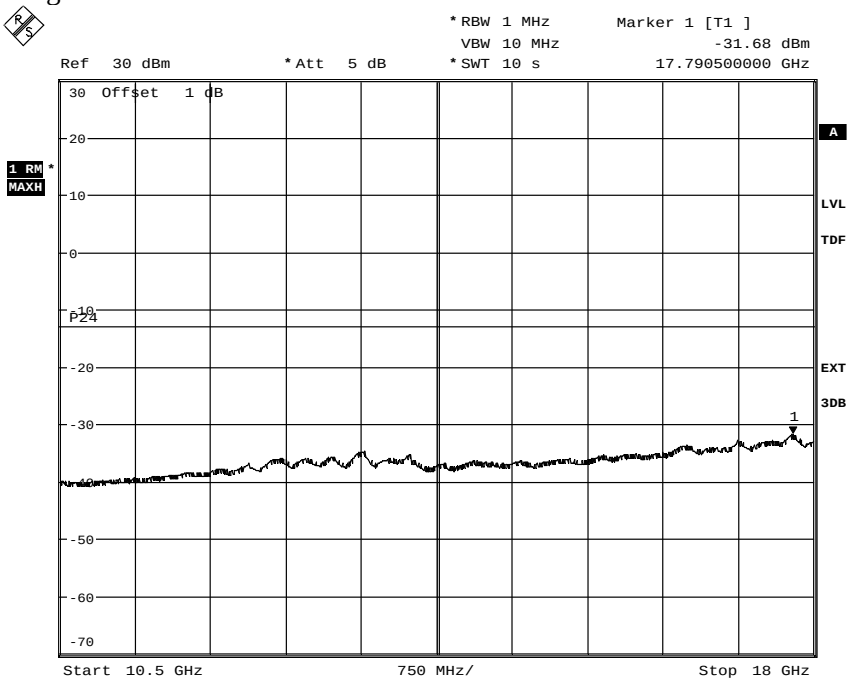
Diagram 4b



Date: 25.OCT.2011 12:37:23

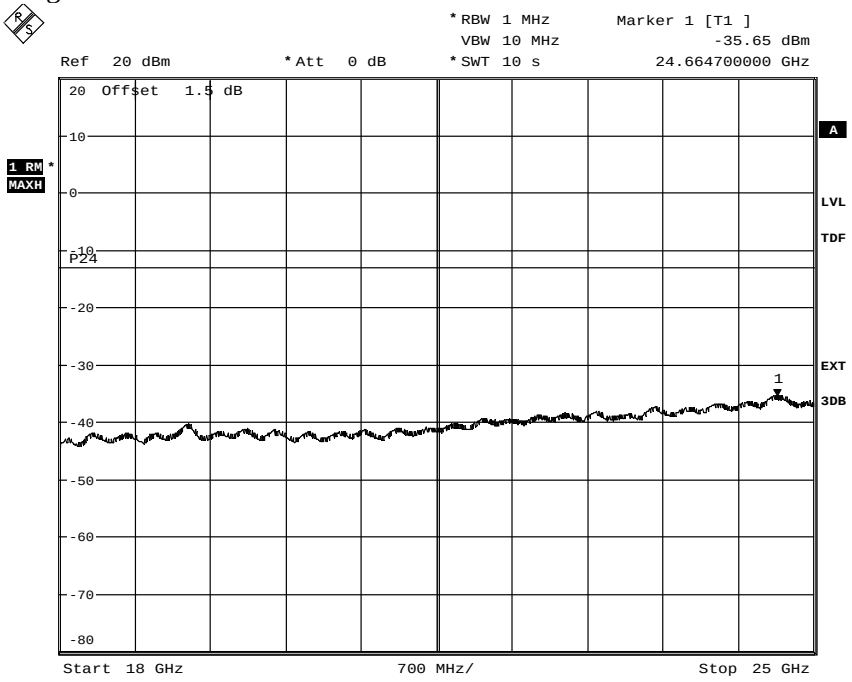
Appendix 5

Diagram 4c



Date: 25.OCT.2011 12:39:08

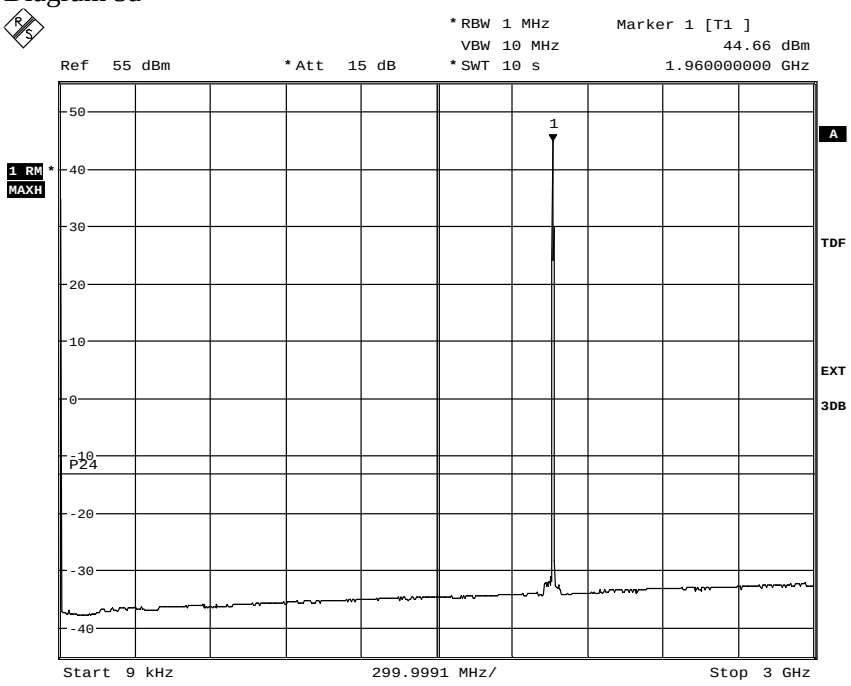
Diagram 4d



Date: 25.OCT.2011 12:53:06

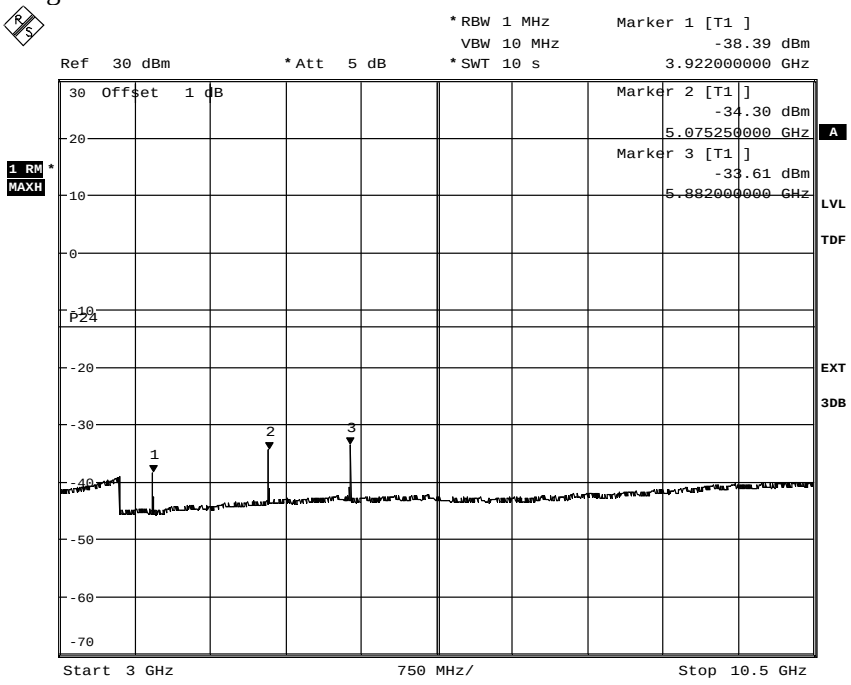
Appendix 5

Diagram 5a



Date: 25.OCT.2011 14:34:44

Diagram 5b



Date: 25.OCT.2011 14:33:17

Appendix 5

Diagram 5c

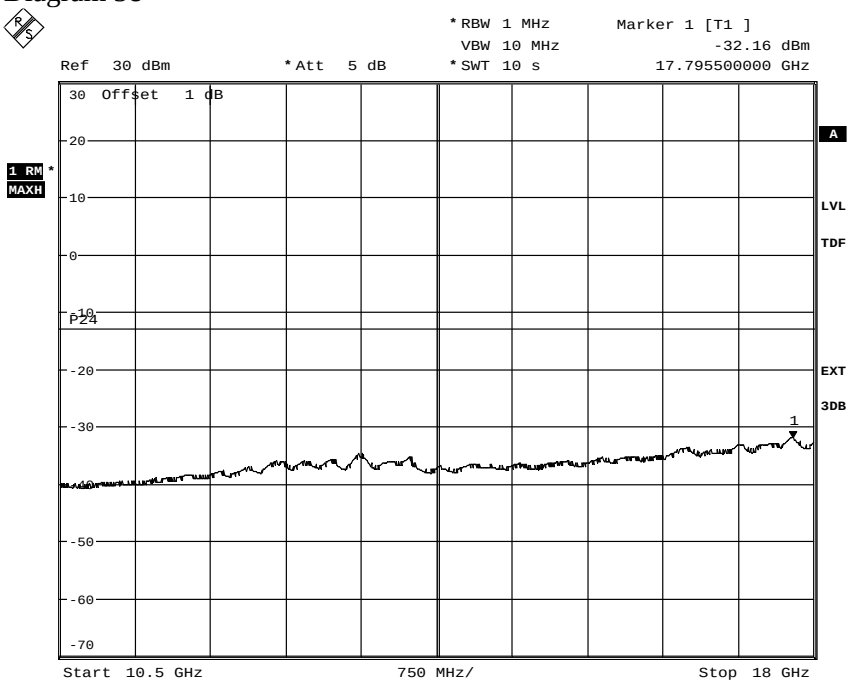


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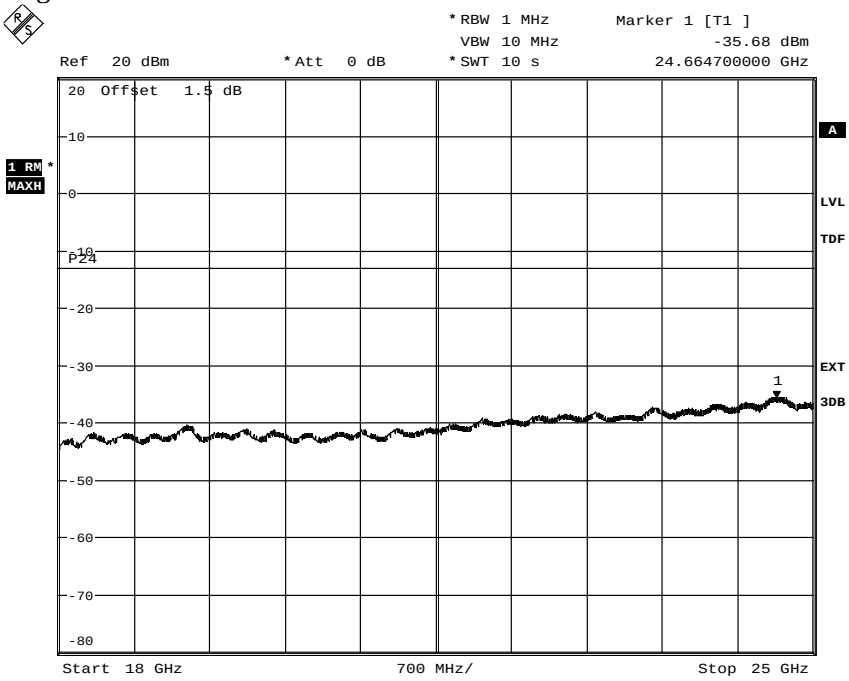
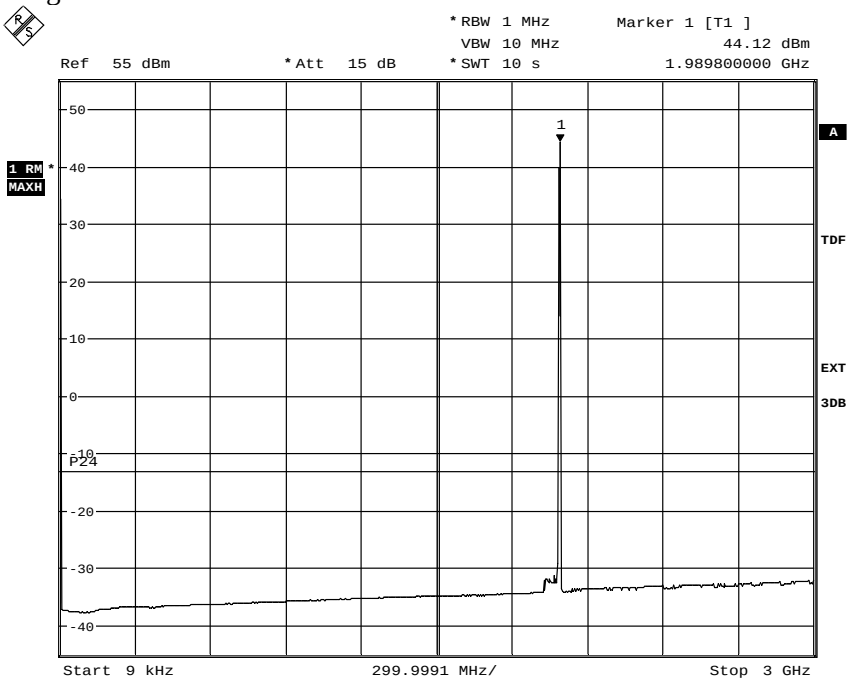
Diagram 5d



Date: 25.OCT.2011 13:00:09

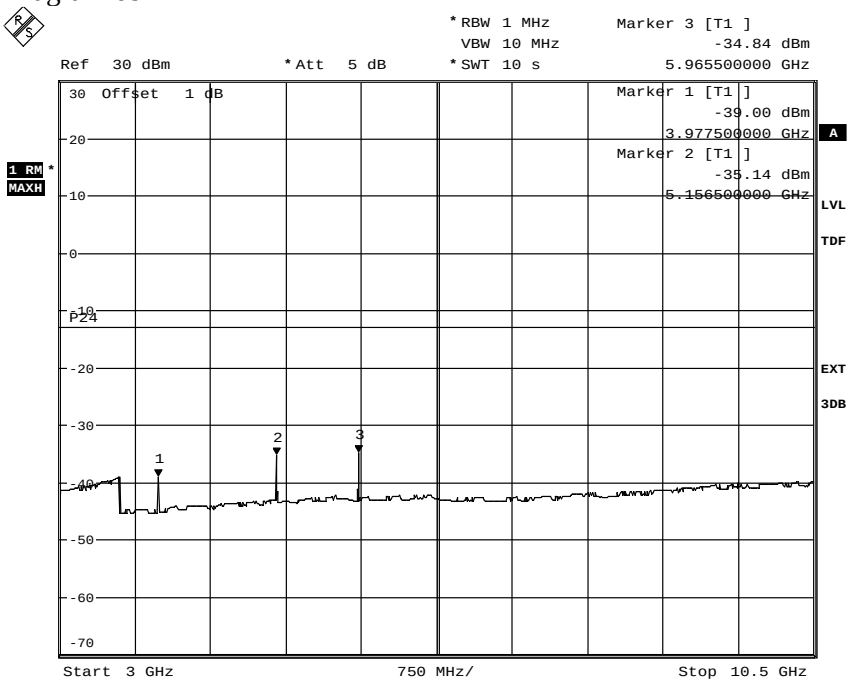
Appendix 5

Diagram 6a



Date: 25.OCT.2011 14:53:57

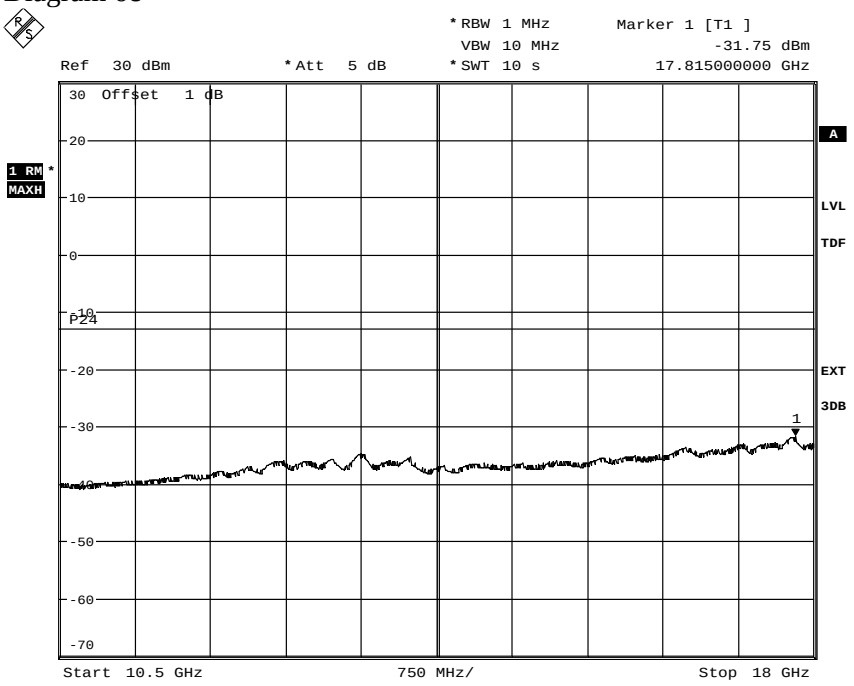
Diagram 6b



Date: 25.OCT.2011 14:59:44

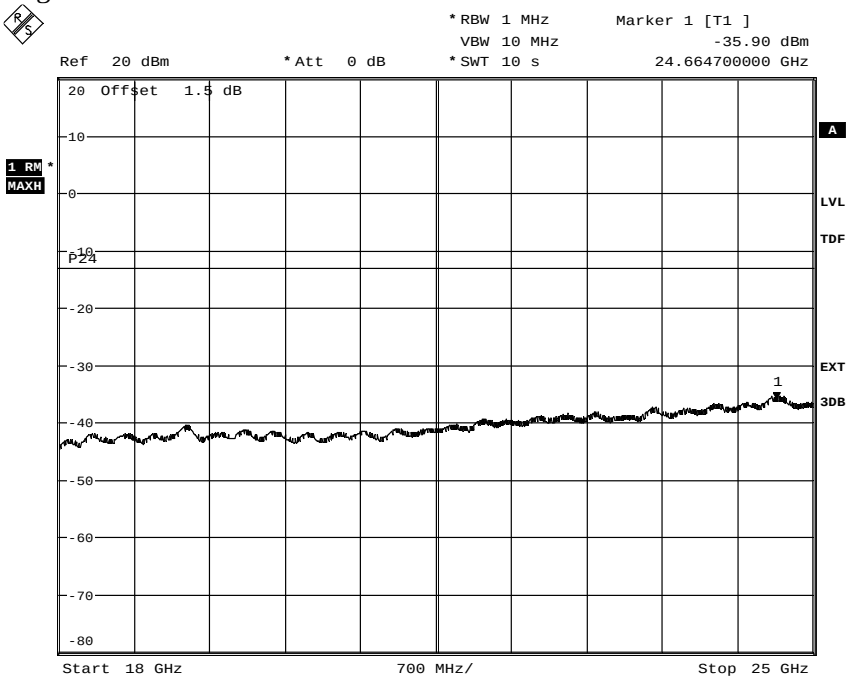
Appendix 5

Diagram 6c



Date: 25.OCT.2011 15:00:58

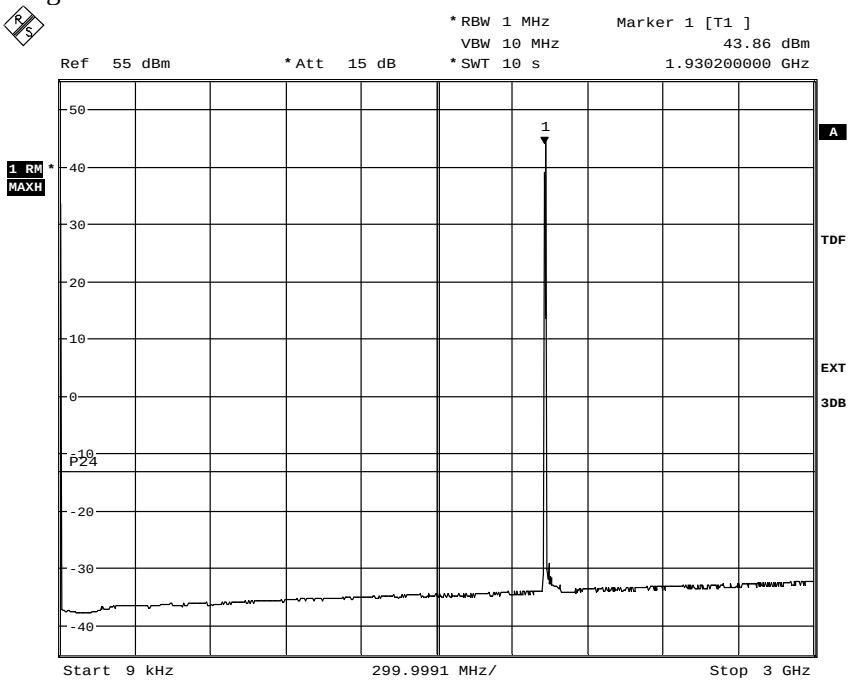
Diagram 6d



Date: 25.OCT.2011 15:10:14

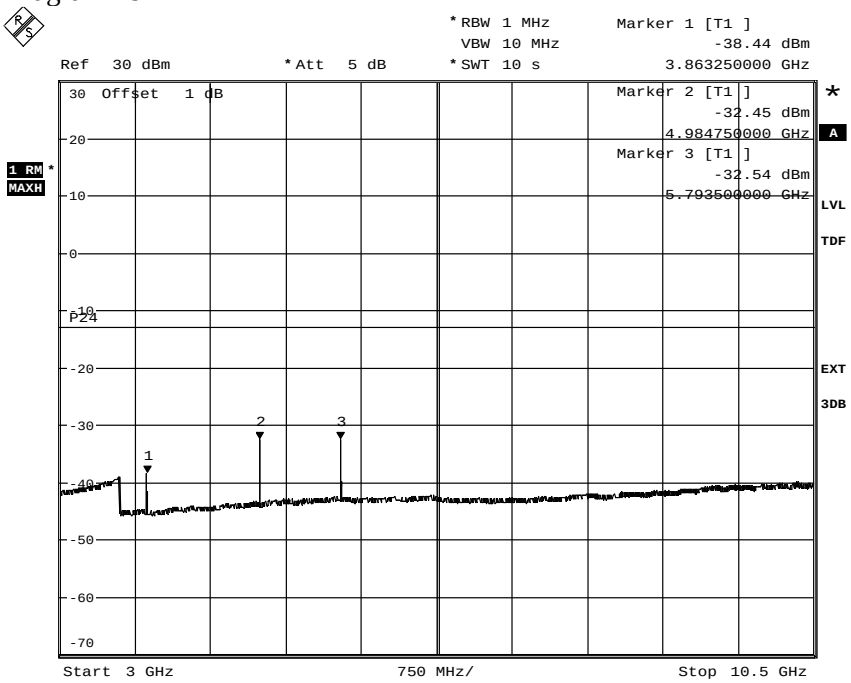
Appendix 5

Diagram 7a



Date: 21.OCT.2011 10:43:28

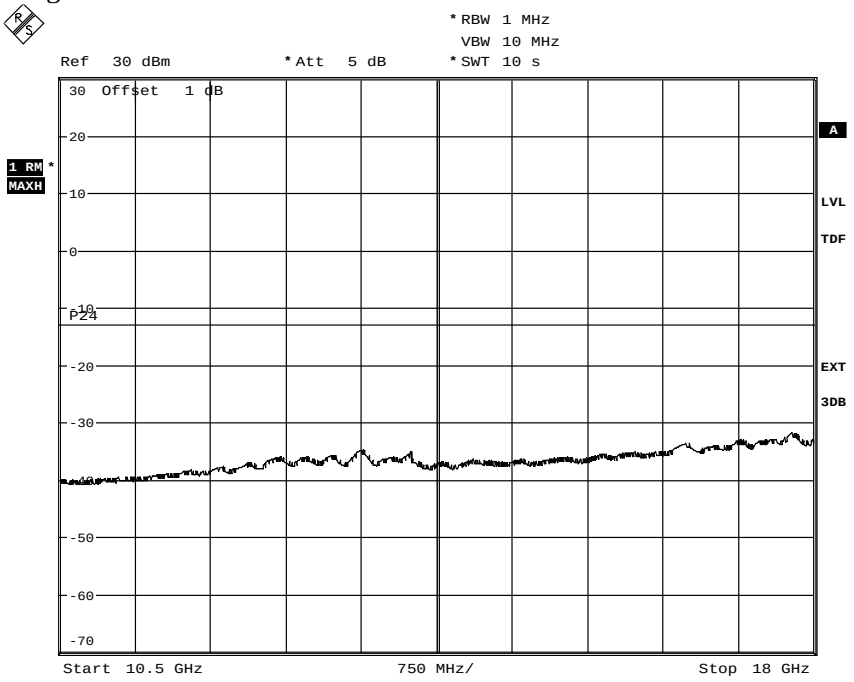
Diagram 7b



Date: 21.OCT.2011 10:41:41

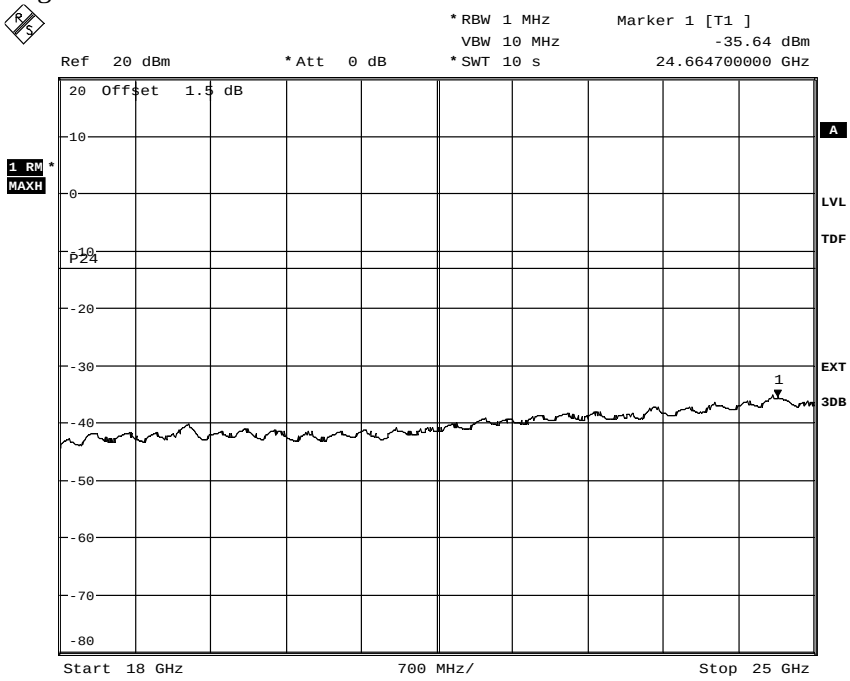
Appendix 5

Diagram 7c



Date: 21.OCT.2011 14:03:13

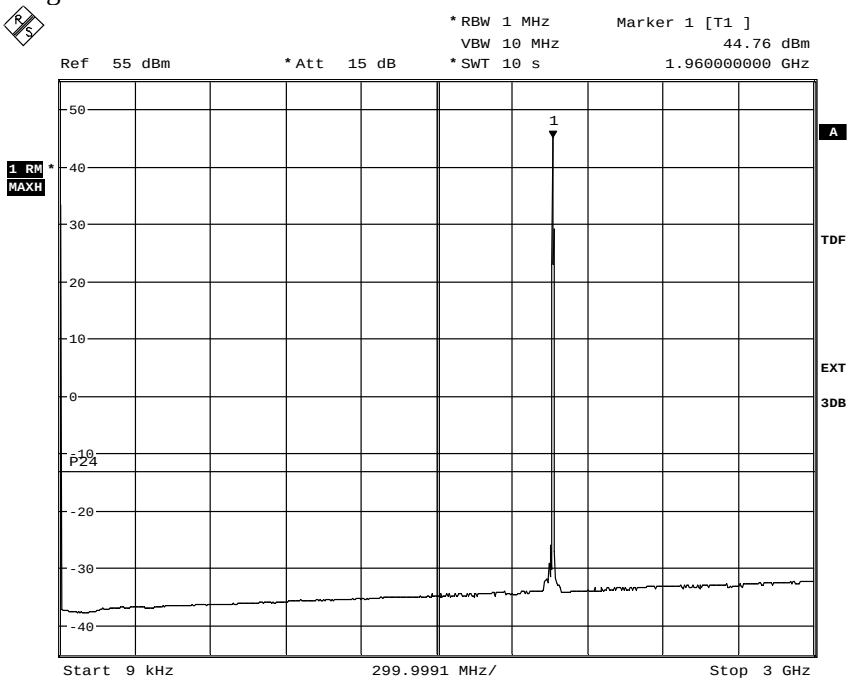
Diagram 7d



Date: 21.OCT.2011 13:55:06

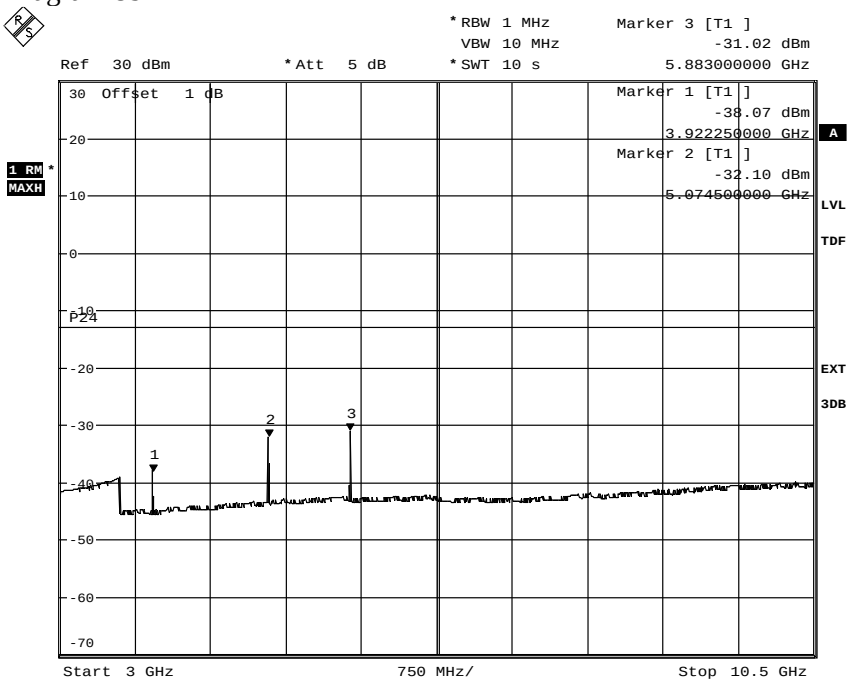
Appendix 5

Diagram 8a



Date: 21.OCT.2011 09:47:23

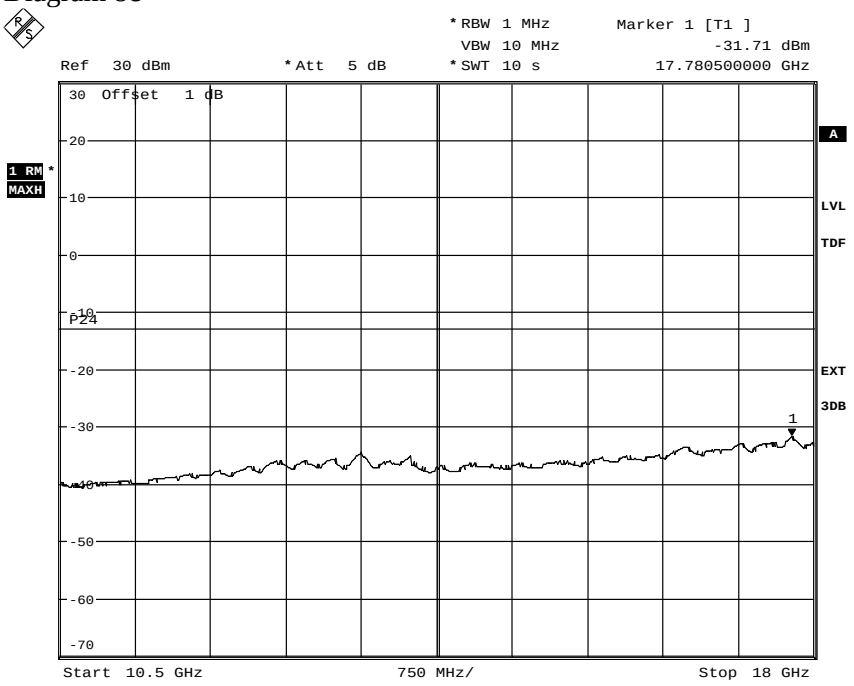
Diagram 8b



Date: 21.OCT.2011 10:05:43

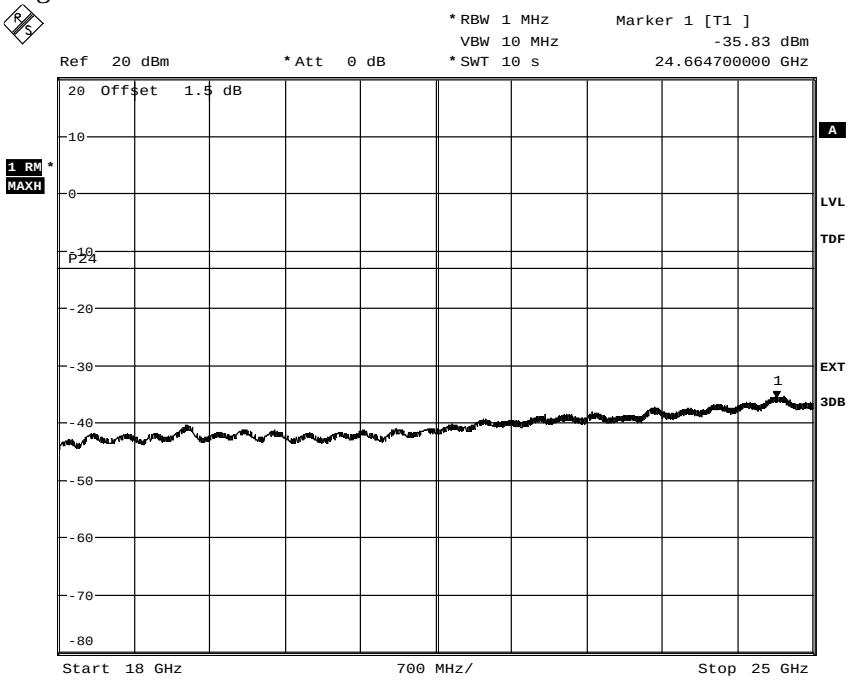
Appendix 5

Diagram 8c



Date: 21.OCT.2011 09:38:31

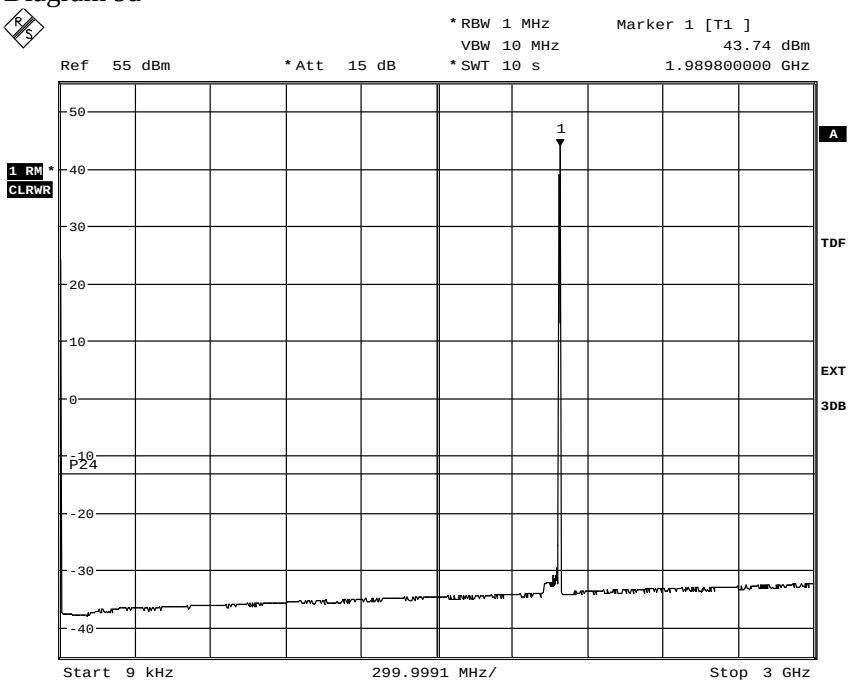
Diagram 8d



Date: 21.OCT.2011 13:37:13

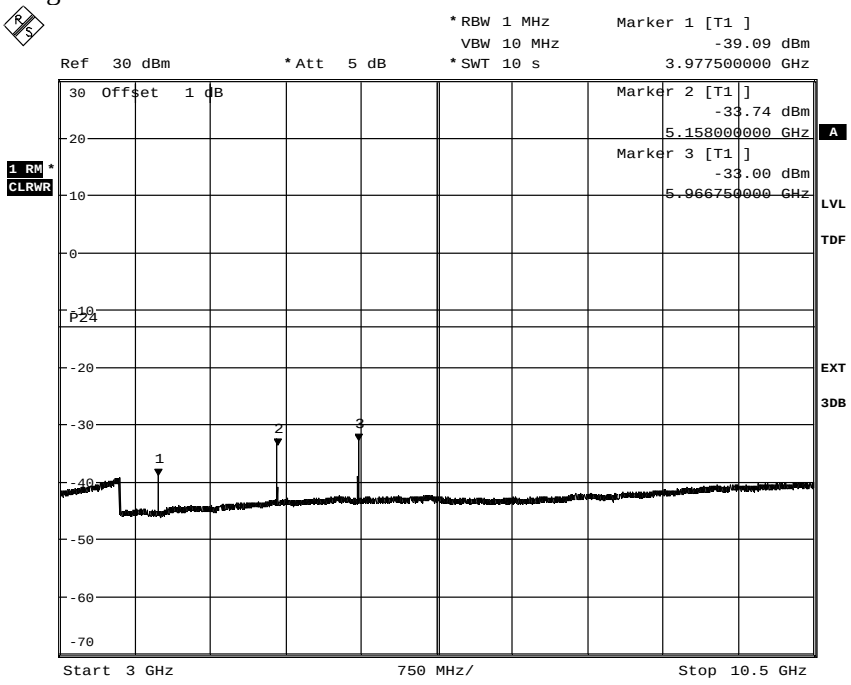
Appendix 5

Diagram 9a



Date: 21.OCT.2011 11:04:53

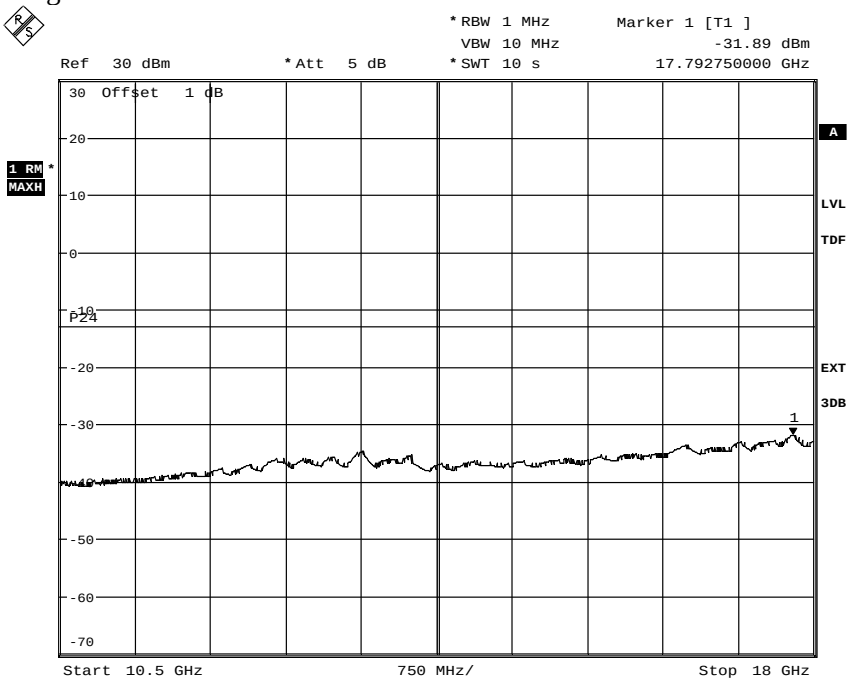
Diagram 9b



Date: 21.OCT.2011 11:06:39

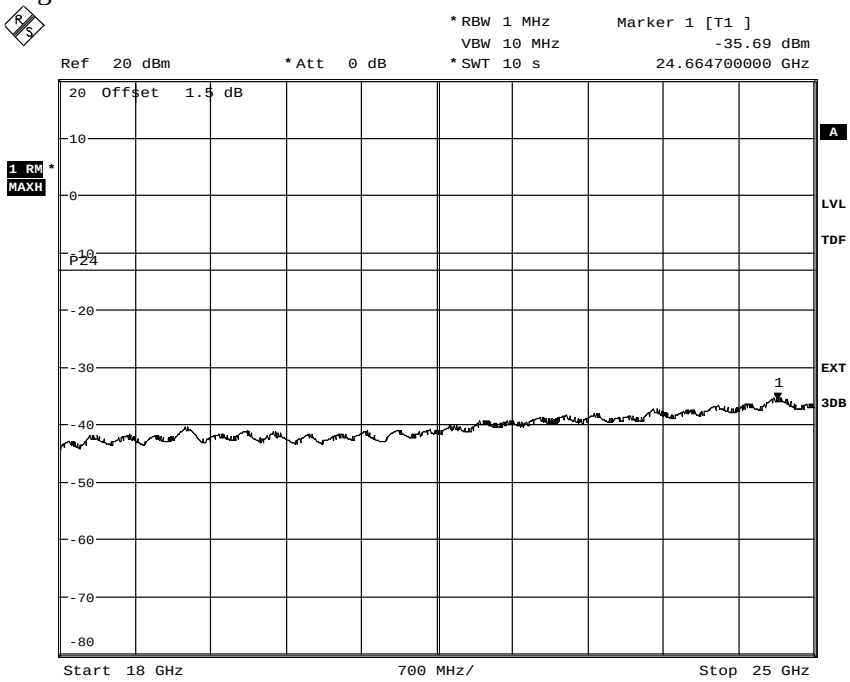
Appendix 5

Diagram 9c



Date: 21.OCT.2011 11:08:22

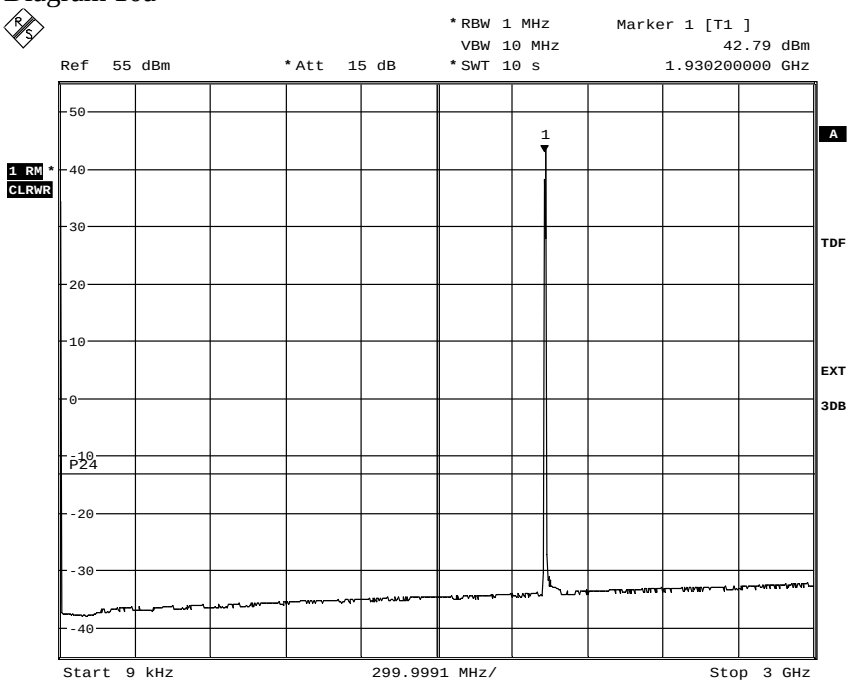
Diagram 9d



Date: 21.OCT.2011 13:28:57

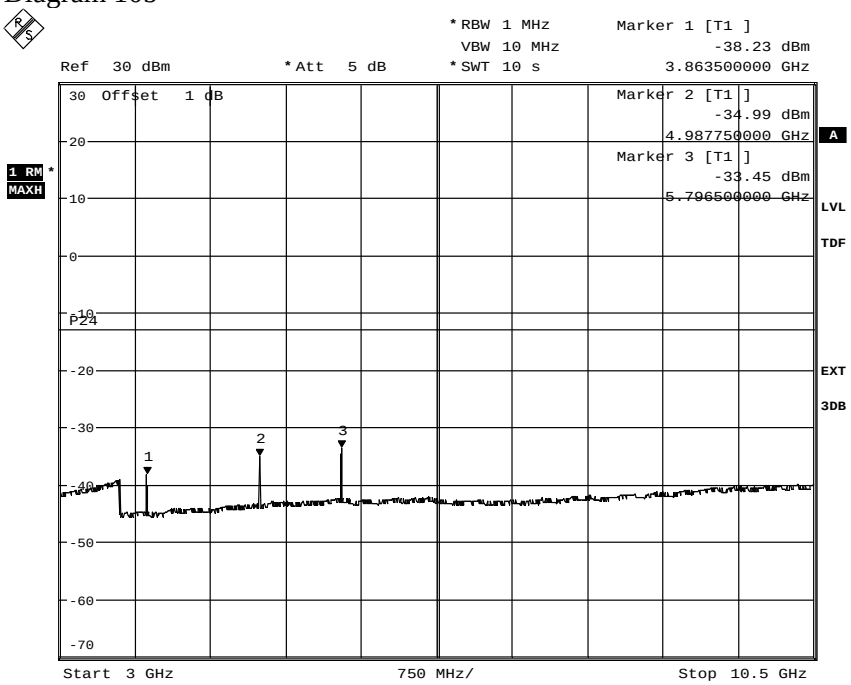
Appendix 5

Diagram 10a



Date: 25.OCT.2011 16:06:18

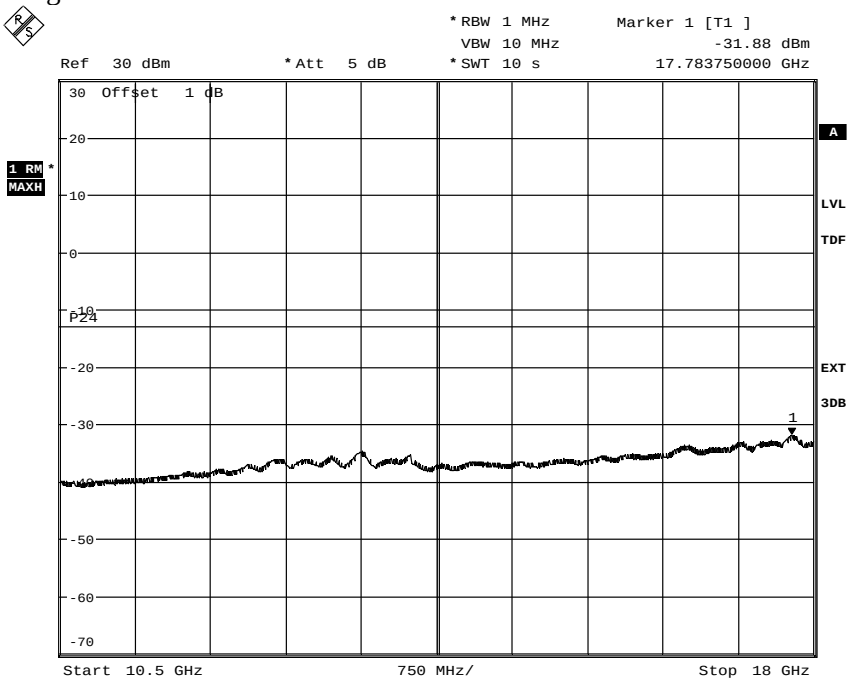
Diagram 10b



Date: 25.OCT.2011 16:08:51

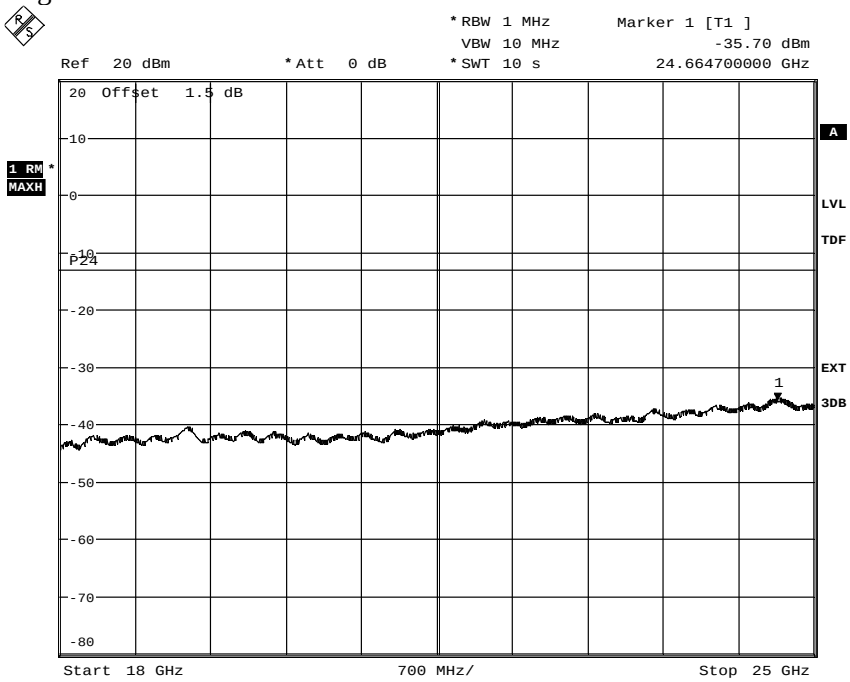
Appendix 5

Diagram 10c



Date: 25.OCT.2011 16:09:54

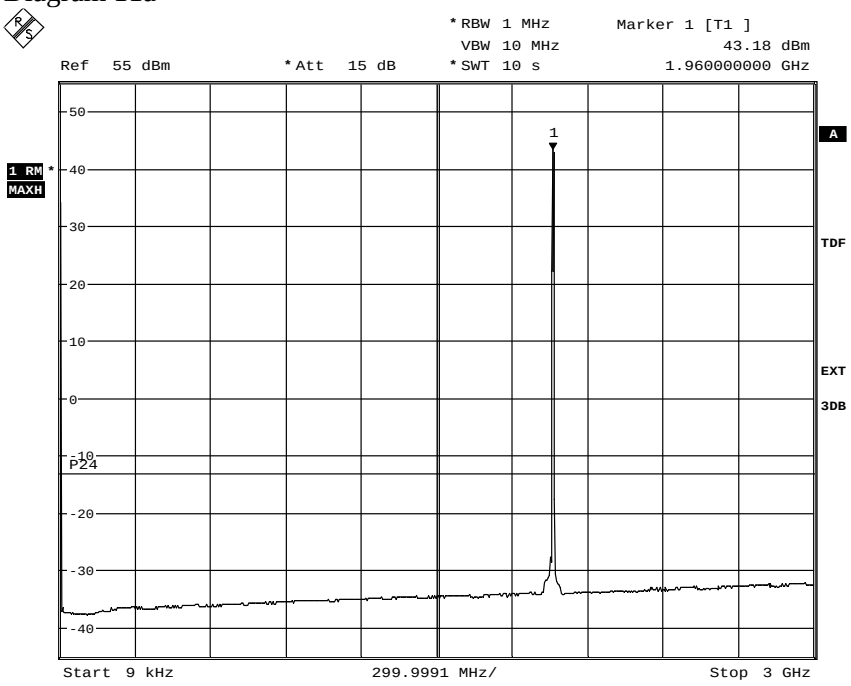
Diagram 10d



Date: 25.OCT.2011 16:12:36

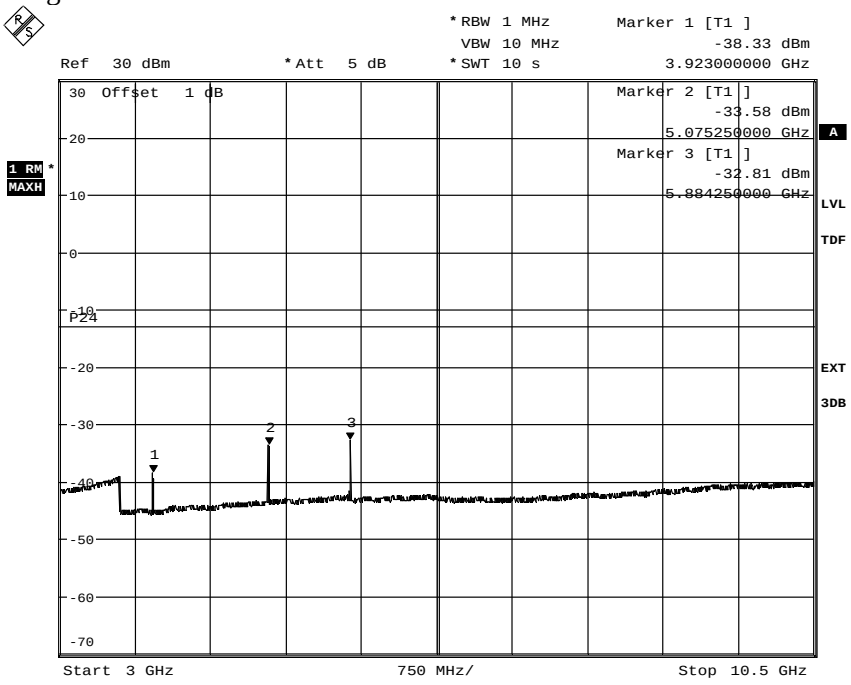
Appendix 5

Diagram 11a



Date: 26.OCT.2011 08:46:05

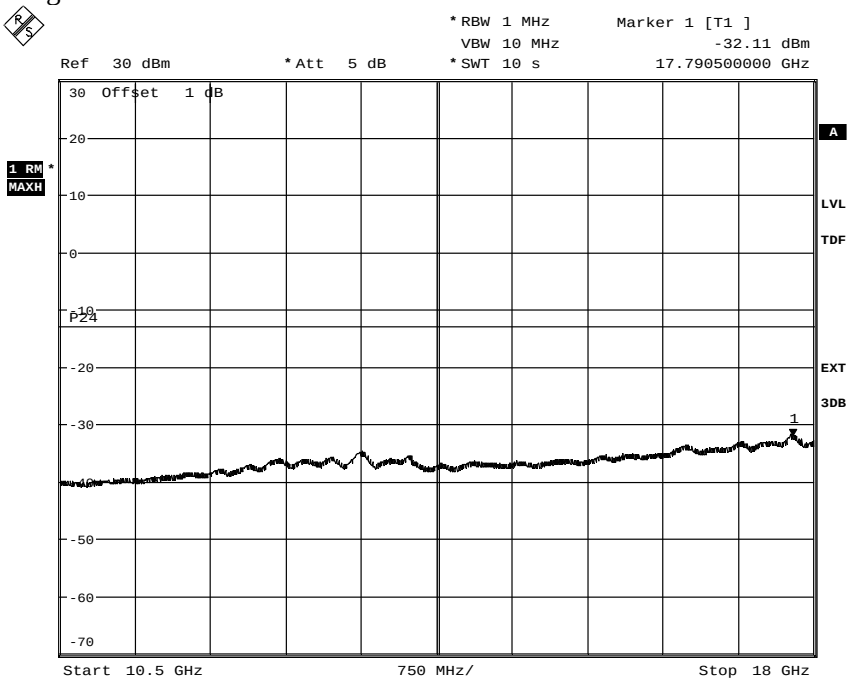
Diagram 11b



Date: 26.OCT.2011 08:44:32

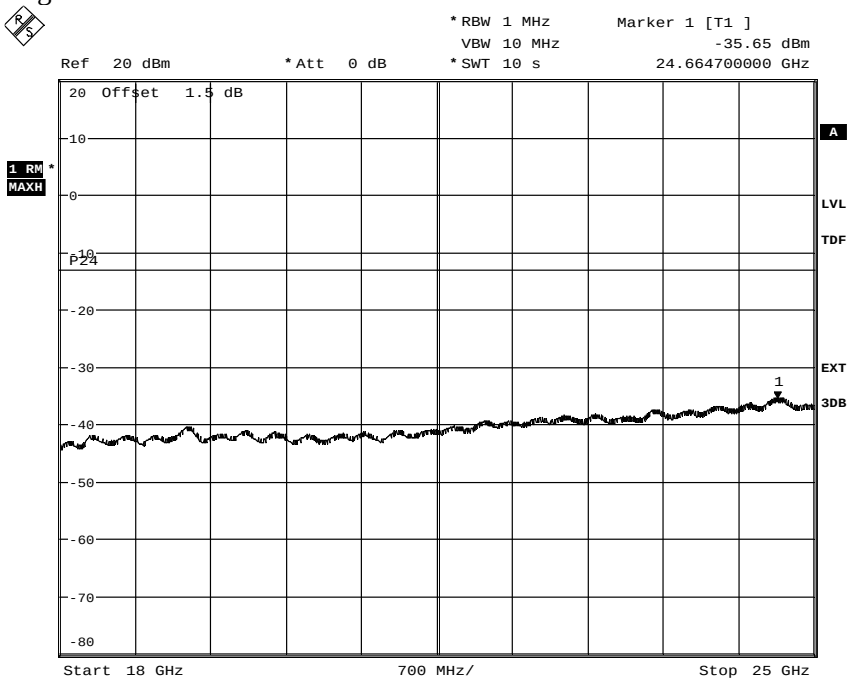
Appendix 5

Diagram 11c



Date: 26.OCT.2011 08:43:09

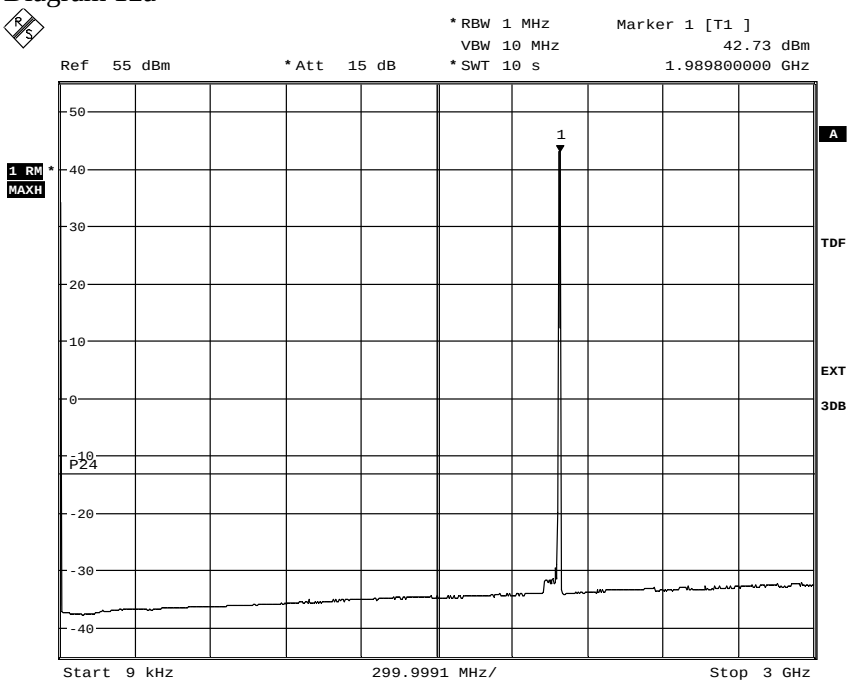
Diagram 11d



Date: 26.OCT.2011 09:36:21

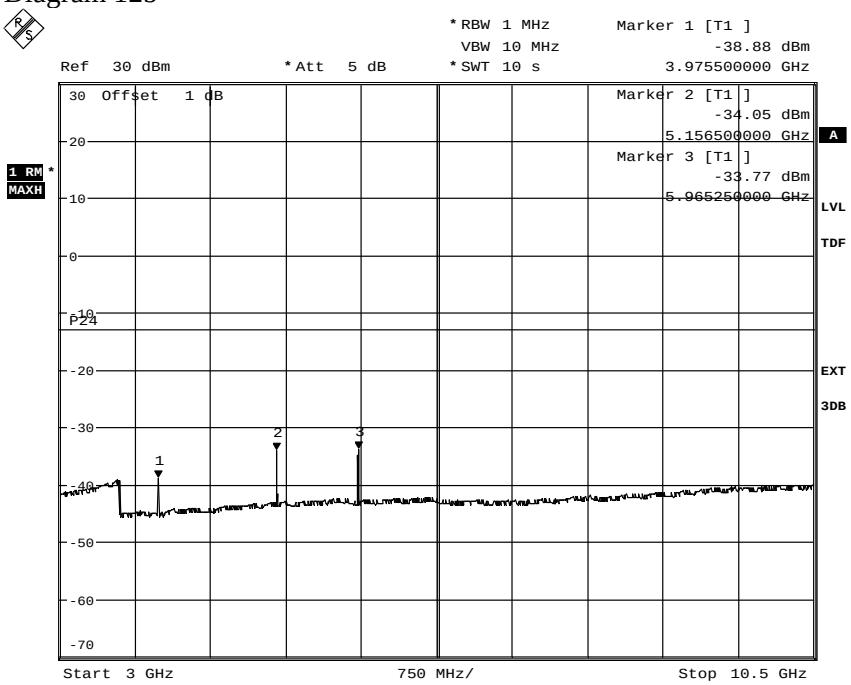
Appendix 5

Diagram 12a



Date: 26.OCT.2011 10:40:28

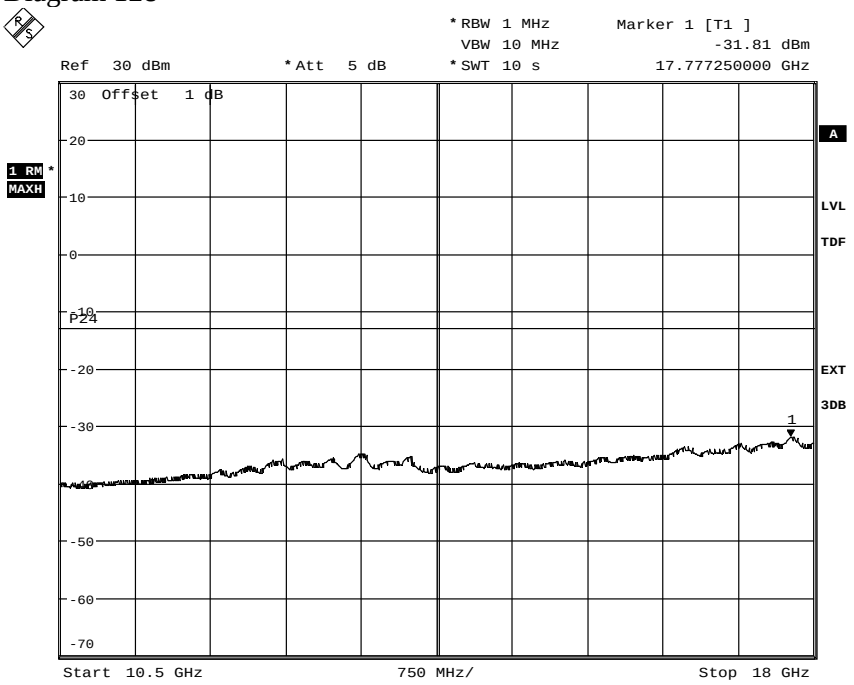
Diagram 12b



Date: 26.OCT.2011 10:42:13

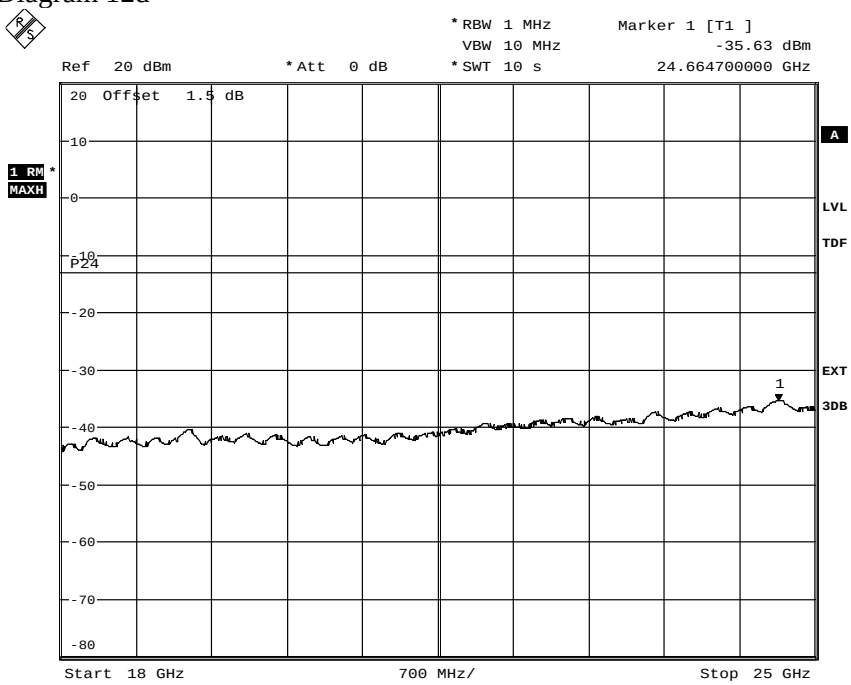
Appendix 5

Diagram 12c



Date: 26.OCT.2011 10:43:35

Diagram 12d



Date: 26.OCT.2011 10:46:47

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

Date	Temperature	Humidity
2011-07-26 to 2011-08-11	22-24°C ± 3 °C	43-65 % ± 5 %

Test set-up and procedure

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

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

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

The measurement procedure was as the following:

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

The test set-up during the spurious radiation measurements 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	-
R&S FSIQ 40	503 738
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

Tested configurations

Single Carrier (One carrier configuration):

Cell	1	1	1
Channel	B	M	T

Multi Carrier 1x2 (Two carrier configuration):

Cell	1	2
Channels	B	B+10
Channels	T	T-10

Multi Carrier 1x4 (Four carrier configuration):

Cell	1	2	3	4
Channels	B	B+5	B+10	B+15
Channels	T	T-5	T-10	T-15

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

§24.238 and RSS-133 6.5

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

Complies?	Yes

Frequency stability measurements according to CFR 47 §24.235 / IC RSS 133 6.3

Date	Temperature (test equipment)	Humidity (test equipment)
2011-08-17 to 2011-08-19	22-23 °C ± 3 °C	43-52 % ± 5 %

Test set-up and procedure

The measurement was made per 3GPP TS 25.141. 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 Voltage -48 V DC
Maximum output power at mid channel (M), GMSK modulation

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+50	-14
-48.0	+40	-15
-48.0	+30	-14
-48.0	+20	-15
-48.0	+10	-14
-48.0	0	-15
-48.0	-10	-12
-48.0	-20	-14
-48.0	-30	-12
-55.2	+20	-13
-40.8	+20	-14
Maximum freq. error (Hz)		15
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (109.9 Hz).

Complies?	Yes

Receiver spurious emissions measurements according to IC RSS-133 6.6

Date	Temperature	Humidity
2011-09-04	23 °C ± 3 °C	57 % ± 5 %

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 30-1000 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.

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	M

Note: During the measurement on the RX port RF B the combined TX/RX port RF A was terminated into 50 ohm, the TX was active with GMSK modulation in single carrier mode at setting for maximum output power.

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

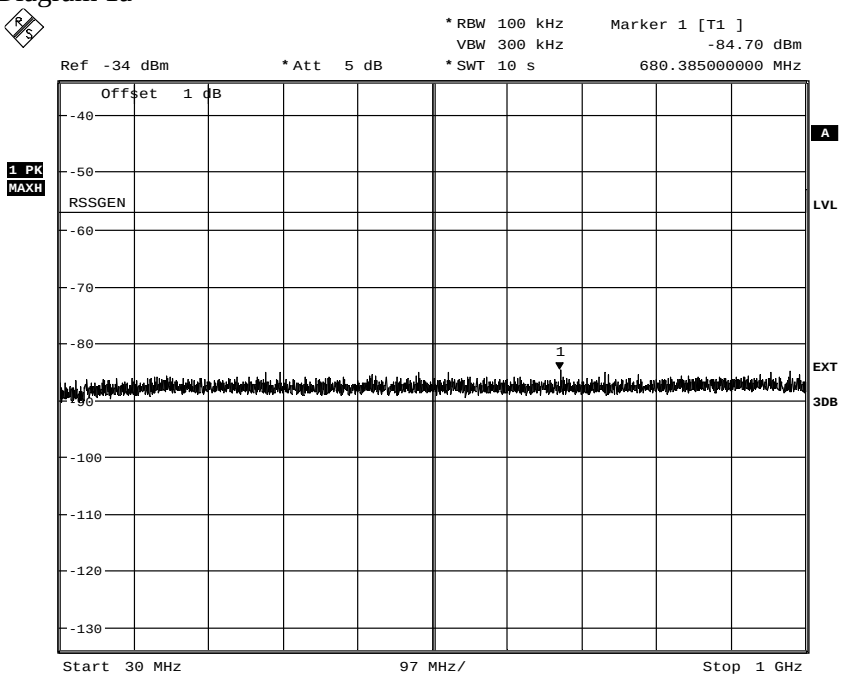
RSS-Gen 6.2 Antenna Conducted limits

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

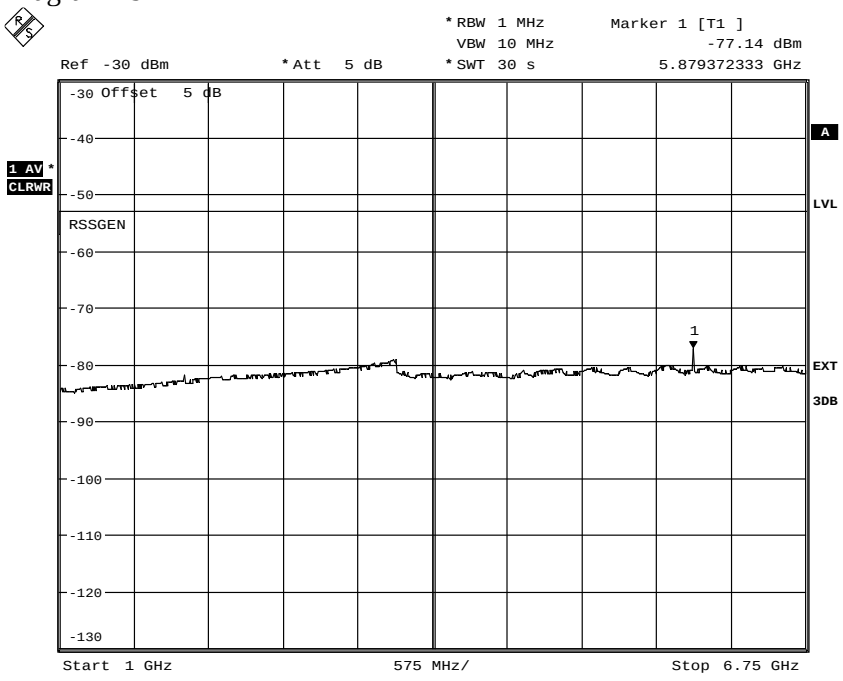
Appendix 8

Diagram 1a



Date: 4.SEP.2011 09:43:24

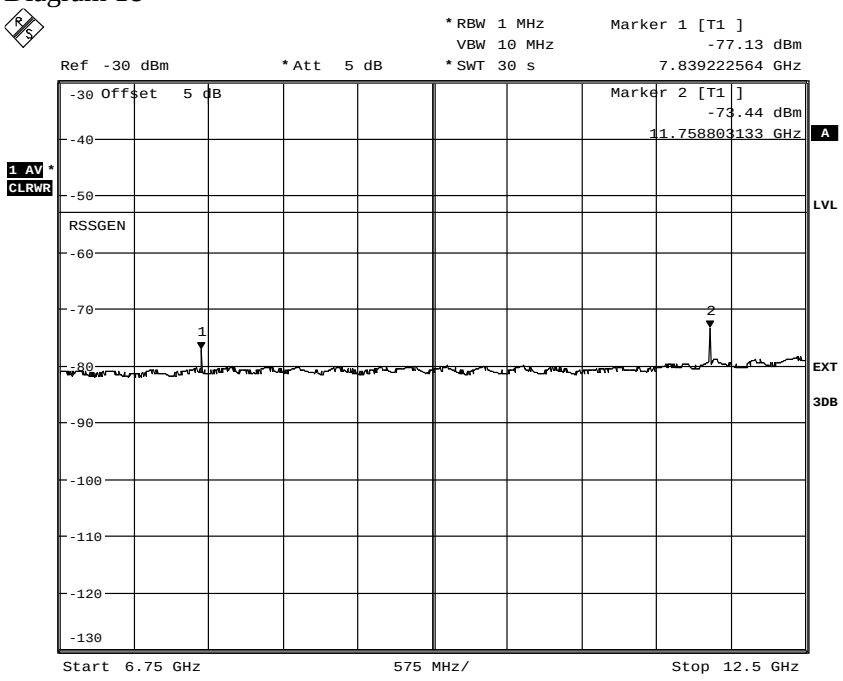
Diagram 1b



Date: 4.SEP.2011 09:34:02

Appendix 8

Diagram 1c

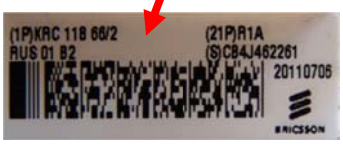


Date: 4.SEP.2011 09:38:25

Appendix 9

External photos

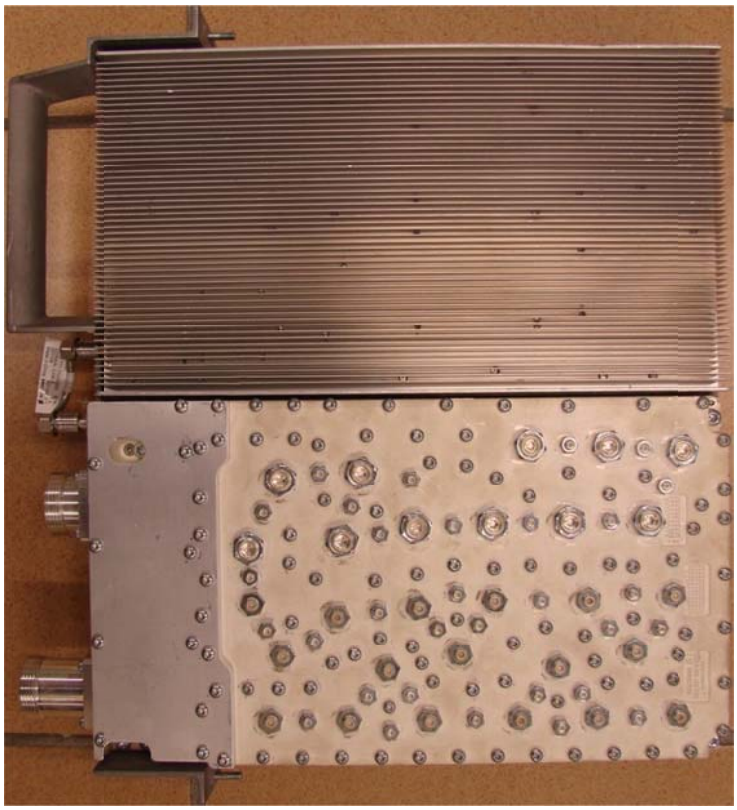
Front side



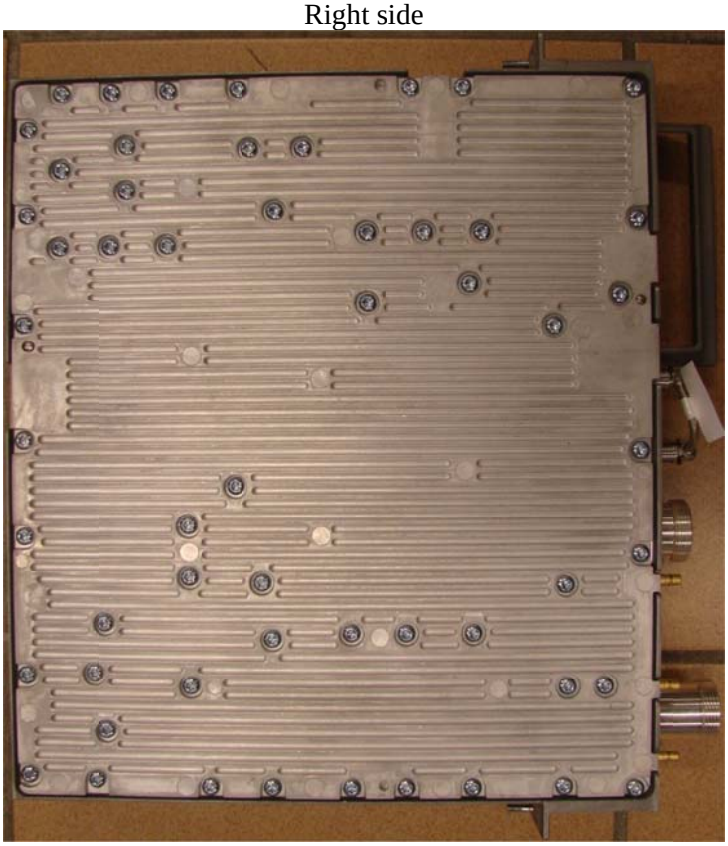
Rear side

Appendix 9

Left side



Right side



Appendix 9

Bottom side

Top side