REPORT

Issued by an FCC listed Laboratory Reg. no. 93866.
The test site complies with RSS-Gen, IC file no. 3482A-2

1002
ISO/IEC 17025

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Date 2014-07-03 Reference 4P02676-02 Page 1 (2)

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Class II permissive change on RUS 01 B2 1900 MHz radio equipment with FCC ID: TA8BKRC11866-1 and IC: 287AB-BS118661

(7 appendices)

Test object

Product name:RUS 01 B2
Product number: KRC 118 66/1, R2G

Summary

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

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133 Issue 6			
2.1046 / RSS-133 6.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-133 6.5	Band edge	Yes	4
2.1051 / RSS-133 6.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-133 6.5	Field strength of spurious radiation	Yes	6

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

SP Technical Research Institute of Sweden

Electronics – EMC

Performed by

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Appendix 1

Description of the test object

Equipment:	Product name: RUS 01 B2 Product number KRC 118 66/1 FCC ID: TA8BKRC11866-1 IC: 287AB-BS118661 IC MODEL NO: BS118661
Tested configuration:	LTE single RAT
Frequency range:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
Antenna ports:	1 TX/RX port and 1 RX port
RF configurations:	Single carrier, multi carrier, TX diversity and MIMO 2x2
Nominal output power per antenna port:	Total power: 1x 47.8 dBm, (60 W), 2x 44.7 dBm (2x 30 W) Total number of carriers: 2
Antenna:	No dedicated antenna, handled during licensing
LTE Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidth:	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz
Nominal supply voltage:	-48VDC
RF configurations:	Single carrier, multi carrier, TX diversity and MIMO 2x2

Operation mode during measurements

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

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

LTE MIMO mode 1- carrier
E-TM1.1
Channel bandwidth 1.4 MHz.

LTE MIMO mode 2- carriers
E-TM1.1
Channel bandwidth 1.4 MHz.

Conducted measurements

The test object was hosted in a RBS 6201 powered with -48 VDC. Additional connections are documented in the set-up drawings below.
All measurements were performed on test object 1 (described in the Test setup diagram), running in primary mode.

Radiated measurements

The test object was tested stand-alone. It was powered with -48 VDC. RF A port was terminated into 50 ohm.

Purpose of test

The purpose of this test is to justify a Class II Permissive Change of the test object to include the use of MIMO and multi carrier with LTE access technology, by verifying compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-133 and RSS-Gen.

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 11.4.0
CFR 47 part 2, October 1st , 2013
CFR 47 part 24 Subpart E, October 1st, 2013
RSS-Gen Issue 3
RSS-133 Issue 6

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).
Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

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

Delivery of test object

The test object was delivered 2014-03-28.

Manufacturer’s representative

Christer Gustavsson, Ericsson AB.

Test engineers

Andreas Johnson, Kexin Chen, Rolf Kühn, Maulo Rivera-Avalos, Tomas Lennhager, Tomas Isbring and Jörgen Wassholm, SP.

Test participant

None.

Measurement equipment

	Calibration Due	SP number
Test site Edison	2015-03	504 114
R&S FSIQ 40	2014-07	503 738
R&S ESIB 26	2014-07	503 885
R&S FSQ 40	2014-07	504 143
Control computer with R&S software EMC32 version 8.52.0	-	503 899
High pass filter	2015-01	BX40074
High pass filter	2014-07	901 501
High pass filter	2014-07	901 502
High pass filter	2014-07	504 199
High pass filter	2014-09	901 373
High pass filter	2014-09	503 739
High pass filter	2014-07	503 740
RF attenuator	2014-07	504 159
RF attenuator	2014-07	900 233
RF attenuator	2014-07	900 691
RF attenuator	2014-07	901 384
RF attenuator	2014-11	901 508
Antenna Schaffner CBL 6143	2016-10	504 079
EMCO Horn Antenna 3115	2015-03	902 212
Std.gain horn FLANN model 20240-20	-	503 674
µComp Nordic, Low Noise Amplifier	2015-02	504 160
Miteq Low Noise Amplifier	2014-09	503 285
Schwartzbeck preamplifier BBV 9742	2015-01	504 085
Temperature and humidity meter, Testo 635	2015-03	504 203
Temperature and humidity meter, Testo 625	2014-06	504 117
Temperature Chamber	2015-03	501 031
Multimeter Fluke 87	2014-08	502 190

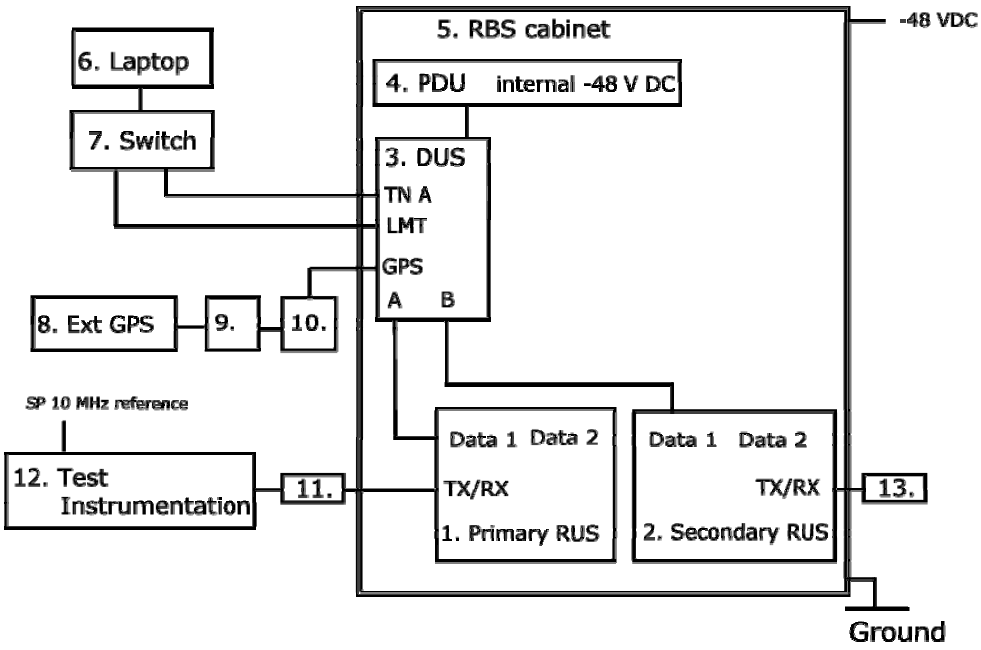
Appendix 1

Test frequencies used for conducted and radiated measurements

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
607	1930.7	B	TX bottom frequency in 1.4 MHz BW configuration.
607 657	1930.7 1935.7	B2	TX bottom frequency in 1.4 MHz BW configuration 2 carriers.
615 665	1931.5 1936.5	B3	TX bottom frequency in 3 MHz BW configuration 2 carriers.
607 626	1930.7 1932.6	B2im1	TX bottom frequency in 1.4 MHz BW configuration 2 carriers.
700 812	1940.0 1951.2	B2im2	TX bottom frequency in 1.4 MHz BW configuration 2 carriers.
615	1931.5	B	TX bottom frequency in 3 MHz BW configuration.
625	1932.5	B	TX bottom frequency in 5 MHz BW configuration.
650	1935.0	B	TX bottom frequency in 10 MHz BW configuration.
675	1937.5	B	TX bottom frequency in 15 MHz BW configuration.
700	1940.0	B	TX bottom frequency in 20 MHz BW configuration.
900	1960.0	M	TX band mid frequency in all BW configurations.
850 950	1955.0 1965.0	M2	TX band mid frequency in 5 MHz BW configuration 2 carriers.
875 925	1957.5 1962.5	M3	TX band mid frequency in 1.4 MHz BW configuration 2 carriers.
1100	1980.0	T	TX top frequency in 20 MHz BW configuration.
1125	1982.5	T	TX top frequency in 15 MHz BW configuration.
1150	1985.0	T	TX top frequency in 10 MHz BW configuration.
1175	1987.5	T	TX top frequency in 5 MHz BW configuration.
1185	1988.5	T	TX top frequency in 3 MHz BW configuration.
1193	1989.3	T	TX top frequency in 1.4 MHz BW configuration.
1193 1143	1989.3 1984.3	T2	TX top frequency in 1.4 MHz BW configuration 2 carriers.
1185 1135	1988.5 1983.5	T3	TX top frequency in 3 MHz BW configuration 2 carriers.
1193 1174	1989.3 1987.4	T2im1	TX top frequency in 1.4 MHz BW configuration 2 carriers.
1100 988	1980.0 1968.8	T2im2	TX top frequency in 1.4 MHz BW configuration 2 carriers.

All RX frequencies were configurated 80 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

Test set-up conducted measurements LTE



Note: Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 7.

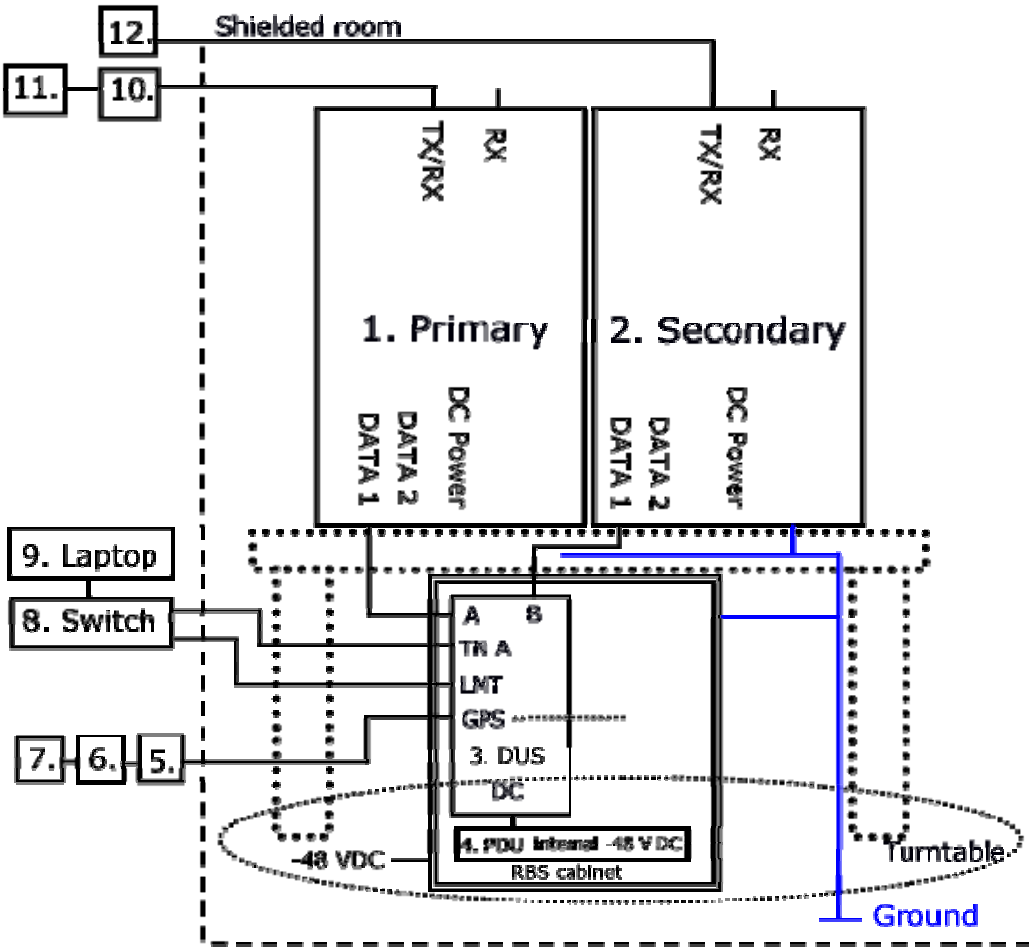
Test object:

1.	RUS 01 B2, KRC 118 66/1, revision R2G, s/n: CB4J995167, Test object: primary/ secondary
2.	RUS 01 B2, KRC 118 66/1, revision R2G, s/n: CB4J995078, Dummy (secondary/ primary) with software : CXP 901 3268/6 rev. R54XD FCC ID: TA8BKRC11866-1 and IC: 287AB-BS118661

Functional test equipment:

3.	DUS 41 01, KDU 137 624/1, rev:R6A, s/n: A401981869
4.	PDU 02 02, BMG 980 336/5, rev: R1F, s/n: X051445683
5.	RBS 6201 cabinet, BAMS – 1000778792
6.	Laptop, EliteBook 8540w, BAMS – 1001052032
7.	Fast Ethernet switch, Netgear GS108E
8.	GPS Active Antenna, KRE 101 2082/1
9.	1x4 GPS splitter, KRY 101 1946/1
10.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K475230
11.	Attenuator, filter, according respective appendix
12.	SP test instrument according measurement equipment list
13.	Terminator

Test setup radiated measurements



Test object:

1. 2.	RUS 01 B2, KRC 118 66/1, rev. R2G, s/n: CB4J995167, Test object: primary RUS 01 B2, KRC 118 66/1, rev. R2G, s/n: CB4J995078, Test object: secondary working software CXP 901 3268/6, rev. R54XD FCC ID: TA8CKRC11866-1 and IC: 287AB-CS118661

Functional test equipment:

3.	DUS 41 01, KDU 137 624/1, rev. R5A, s/n: D165724695
4.	RBS 6202: PDU 02 02, BMG 980 336/5, rev. R1F, s/n: X051445683
5.	Power supply, Mascot Type 719
6.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356428
7.	GPS Active Antenna, KRE 101 2082/1
8.	Switch Netgear FS726T
9.	Laptop, EliteBook 8560w, BAMS – 1001236856
10.	Attenuator
11.	ESI 26, SP number: 503 292, for supervision purpose only
12.	Terminator

Interfaces:	**Type of port:**
Power: -48 VDC	DC Power
Antenna port (A), 7/16 connector, combined TX/RX	Antenna
Antenna port (B), 7/16 connector, only RX	Antenna
Data 1, electrical interface	Signal
Data 2, electrical interface	Signal
RX A Out, no cable attached	RF
RX A I/O, no cable attached	RF
RX B I/O, no cable attached	RF
Ground wire	Ground

RBS software:

Software	**Revision**
CXP 102 051/18	R32AV

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

Date	Temperature	Humidity
2014-04-07	22 °C ± 3 °C	43 % ± 5 %
2014-04-08	22 °C ± 3 °C	43 % ± 5 %

Test set-up and procedure

The test object was connected to a signal analyzer measuring peak and RMS output power in CDF mode. A resolution bandwidth of 50 MHz was used.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

MIMO mode, single carrier

Rated output power level at RF connector 1x 47.8 dBm.

Carrier BW [MHz]	Symbolic name	[RMS dBm/ PAR dB]		
		Port RF A	Port RF B	Total power[1)]
1.4	B	48.24/ 7.12	48.19/ 7.12	51.23
20.0	B	48.12/ 7.43	48.11/ 7.45	51.13
1.4	M	48.15/ 7.12	48.09/ 7.12	51.13
3.0	M	48.20/ 7.24	48.09/ 7.26	51.16
5.0	M	48.18/ 7.33	48.20/ 7.26	51.20
10.0	M	48.16/ 7.24	48.13/ 7.26	51.16
15.0	M	48.18/ 7.26	48.16/ 7.26	51.18
20.0	M	48.20/ 7.26	48.17/ 7.26	51.20
1.4	T	48.26/ 7.12	48.06/ 7.12	51.17
20.0	T	48.11/ 7.31	48.08/ 7.31	51.11

[1)]: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, multicarrier

Rated output power level at RF connector 2x 41.8 dBm.

Carrier BW [MHz]	Symbolic name	[RMS dBm/ PAR dB]		
		Port RF A	Port RF B	Total power[1)]
1.4	B2	48.26/ 7.07	48.26/ 7.07	51.27
1.4	M3	48.17/ 7.04	48.18/ 7.07	51.19
1.4	T2	48.08/ 7.04	48.05/ 7.07	51.08

[1)]: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, single carrier

Measured output power per 1 MHz.

Carrier BW [MHz]	Symbolic name	[RMS dBm]		Total power[1)] [RMS dBm]
		Port RF A	Port RF B	
1.4	B	47.19	47.16	50.19
20	B	36.33	36.29	39.33
1.4	M	47.07	47.07	50.07
3.0	M	44.31	44.26	47.31
5.0	M	42.17	42.37	45.37
10.0	M	39.26	39.16	42.26
15.0	M	37.51	37.48	40.51
20.0	M	36.28	36.27	39.28
1.4	T	47.17	47.10	50.17
20	T	36.30	36.27	39.30

[1)]: Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). “Measure and add 10 log(N_{Ant})”.

Remark

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

Limits

§24.232 The maximum output power may not exceed 3280 W/MHz (EIRP).
The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-133 Base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts. When the transmitter power is measured in terms of average value, the peak-to-average ratio(PAR) of the power shall not exceed 13 dB

There is no EIRP limit specified for base station equipment in the RSS-133.

EIRP compliance is addressed at the time of licensing, as required by the responsible IC Bureau. Licensee's are required to take into account the antenna gain to get the maximum usable power settings to prevent the radiated output power to exceed the EIRP limits specified in SRSP-510

Complies?	Yes

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

Date	Temperature	Humidity
2014-04-08	22 °C ± 3 °C	43 % ± 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	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

MIMO mode, single carrier

Diagram	BW configuration	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1	1.4 MHz	B	RF A	1.09
2	20 MHz	B	RF A	17.85
3	1.4 MHz	M	RF A	1.09
4	1.4 MHz	M	RF B	1.09
5	3 MHz	M	RF A	2.69
6	5 MHz	M	RF A	4.48
7	10 MHz	M	RF A	8.94
8	15 MHz	M	RF A	13.42
9	20 MHz	M	RF A	17.86
10	20 MHz	M	RF B	17.86
11	1.4 MHz	T	RF A	1.09
12	20 MHz	T	RF A	17.86

Appendix 3

Diagram 1:

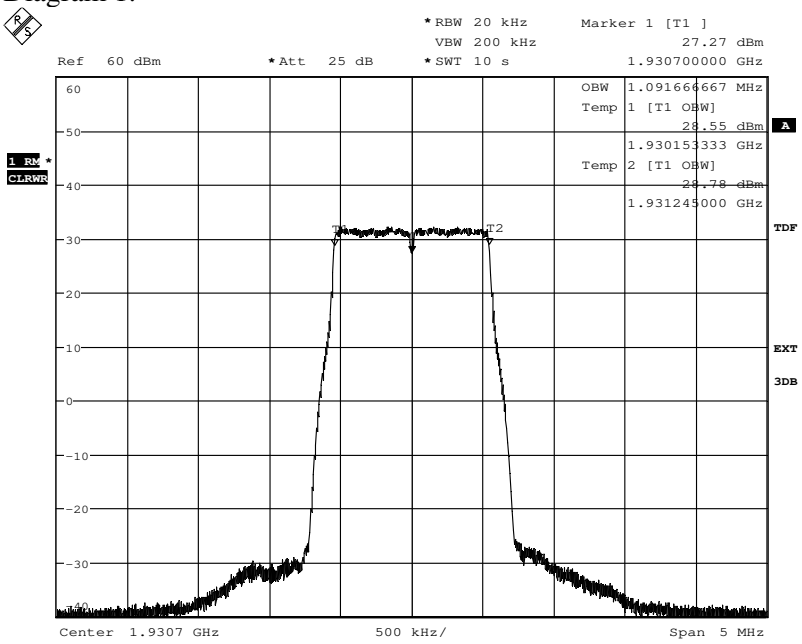


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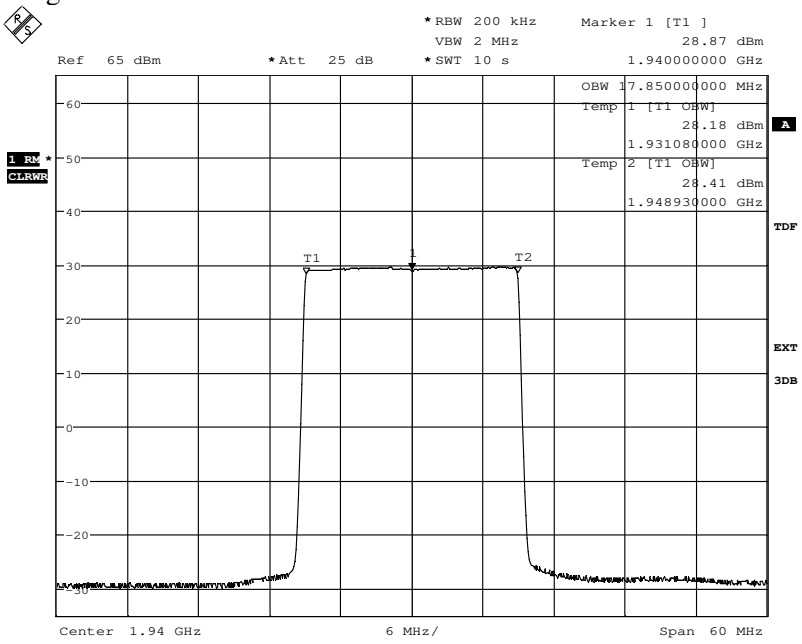
Diagram 2:



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Appendix 3

Diagram 3:

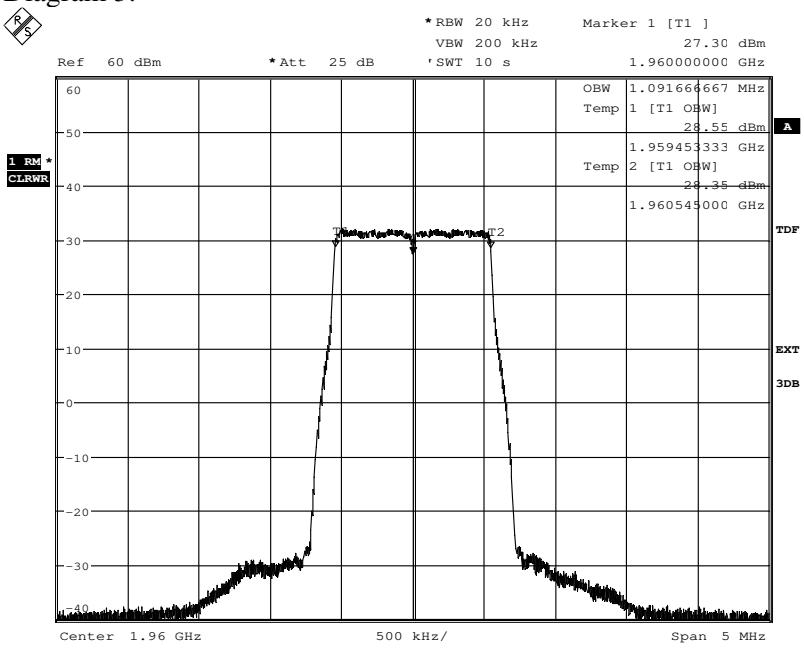

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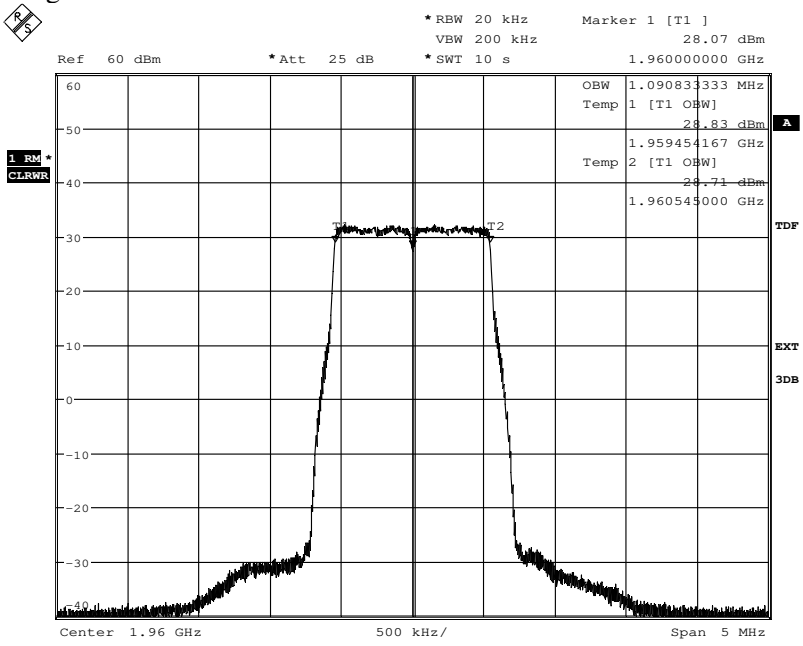
Diagram 4:



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Appendix 3

Diagram 5:

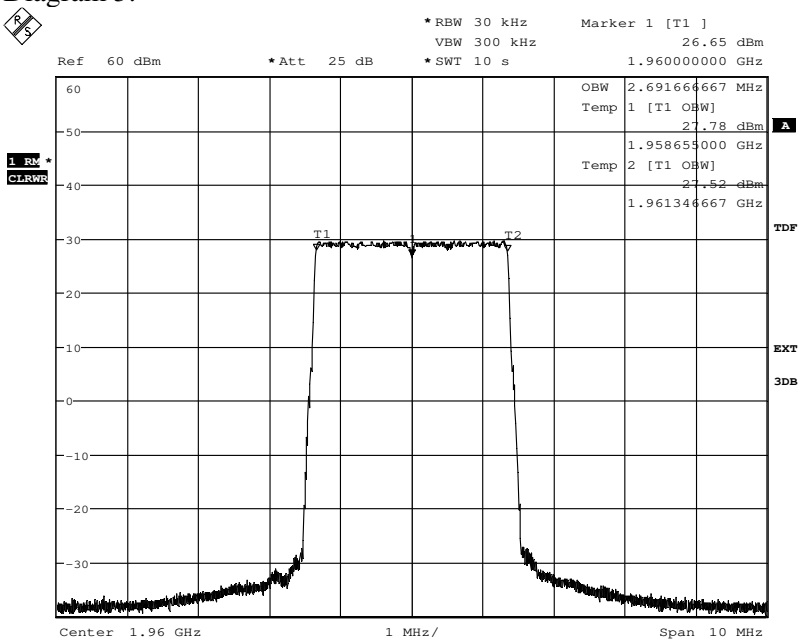

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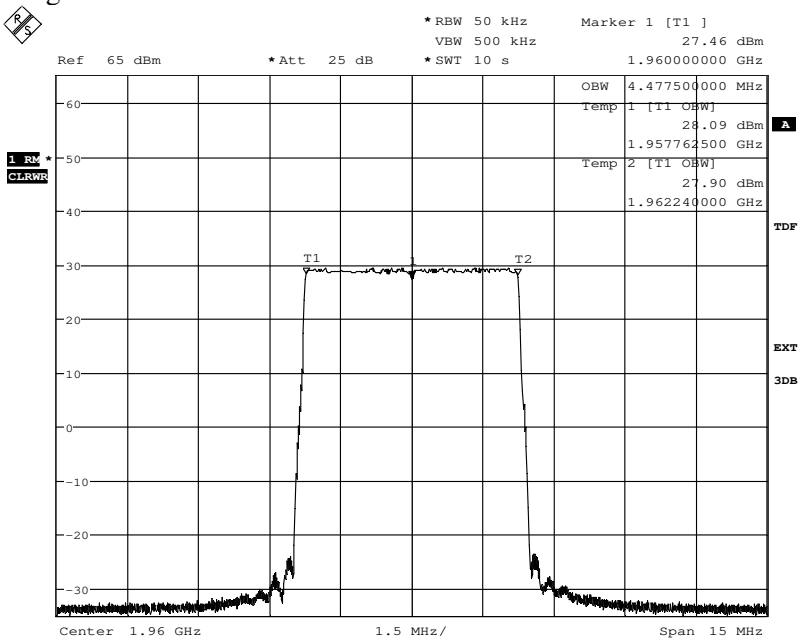
Diagram 6:



Date: 8.APR.2014 14:00:14

Appendix 3

Diagram 7:

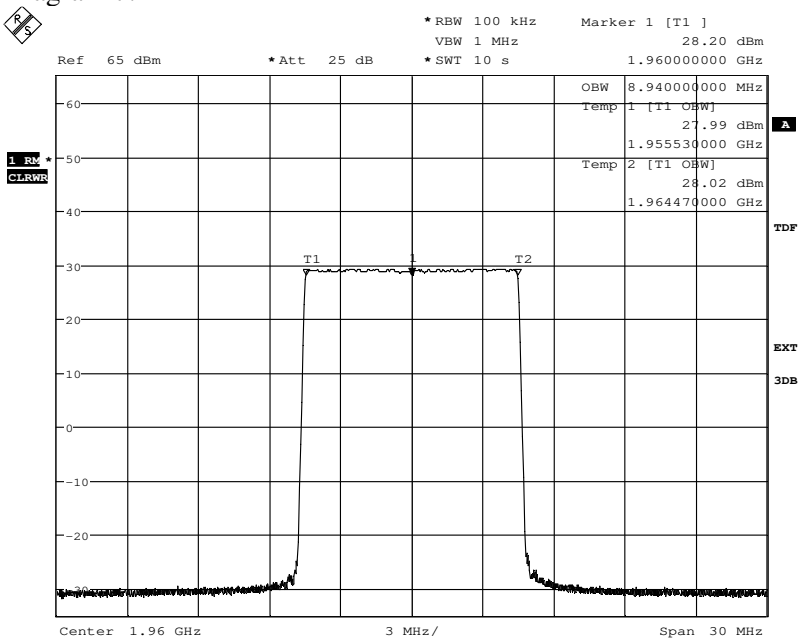


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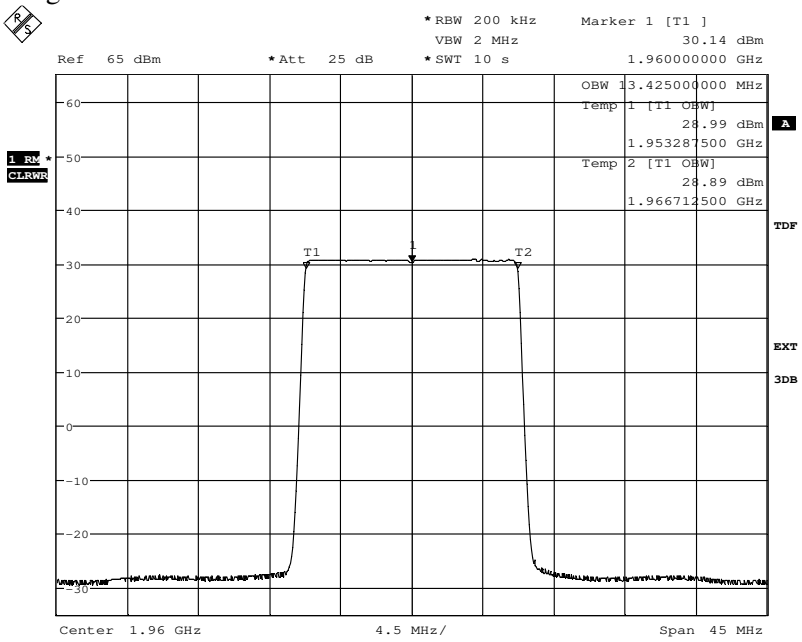
Diagram 8:



Date: 8.APR.2014 14:05:25

Appendix 3

Diagram 9:

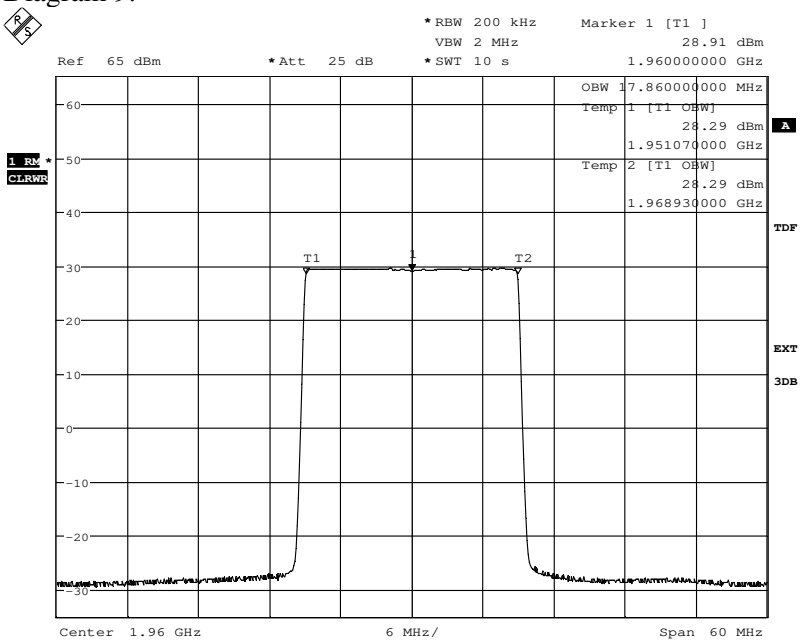


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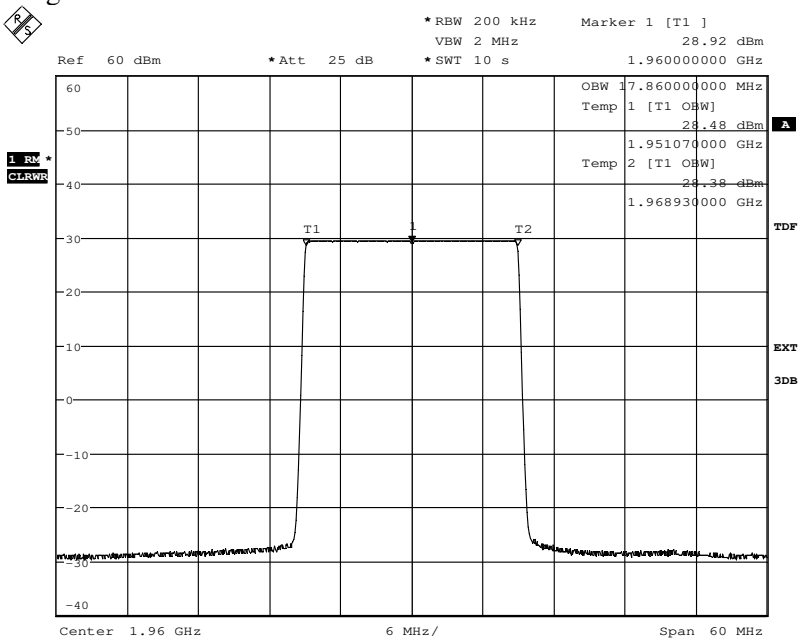
Diagram 10:



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Appendix 3

Diagram 11:

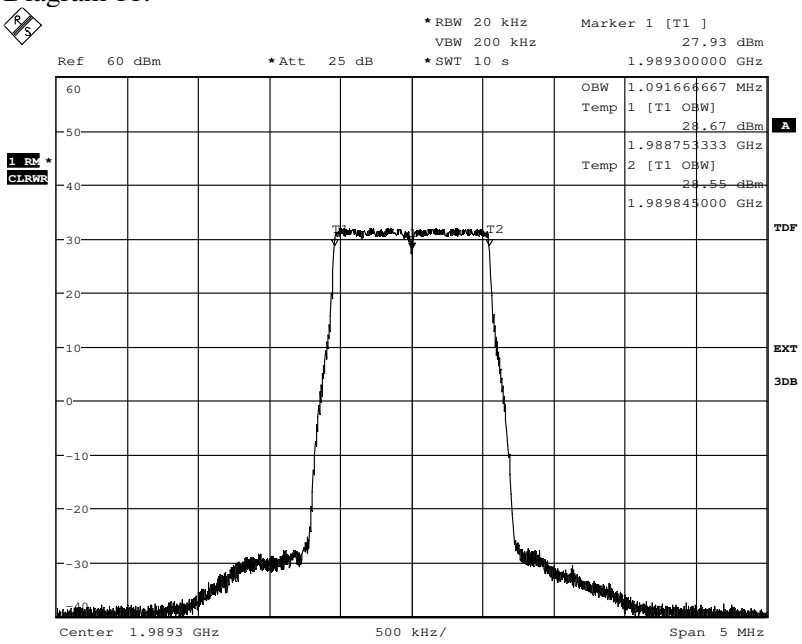

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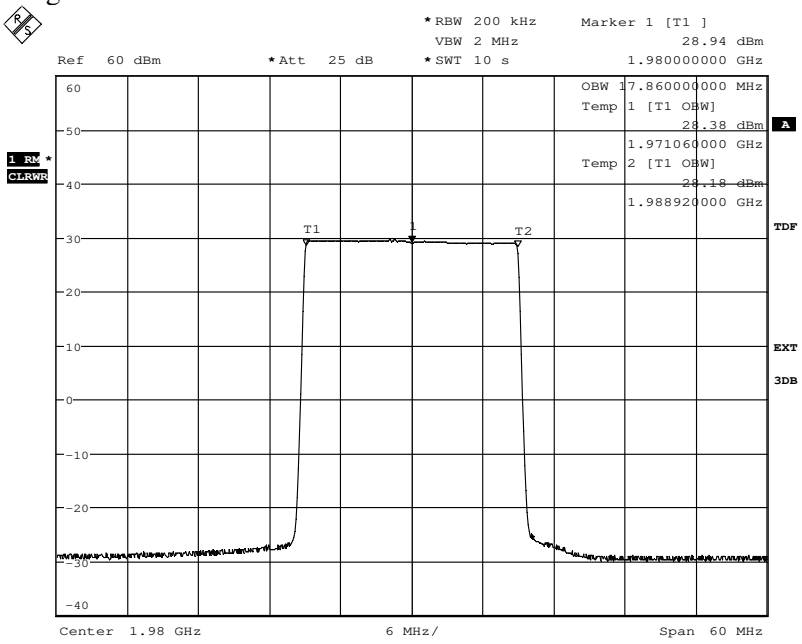
Diagram 12:



Date: 8.APR.2014 14:24:14

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

Date	Temperature	Humidity
2014-04-08	22 °C ± 3 °C	43 % ± 5 %
2014-04-09	23 °C ± 3 °C	28 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238 The test object was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Beyond the 1st MHz off the band edges the limit was adjusted to compensate for reduced measurement bandwidths pursuant to the FCC rules, specifying a RBW of at least 1% of the fundamental emission bandwidth up to 1 MHz away from the band edges and a RBW of 1 MHz for measurements of emissions more than 1 MHz away from the band edges.
Where a smaller RBW was used as compared to the rules, the limit in the plot is adjusted by 10 log ($RBW_{used}/RBW_{specified}$) [dB].

BW configuration [MHz]	Emission BW [MHz]	RBW_{used} [kHz]	Adjusted limit to [dBm]
1.4	1.12	10	-13.5
3.0	2.73	10	-17.4

A resolution bandwidth of 100 kHz was used 1 MHz to 6 MHz away from the band edges, to compensate for the reduced resolution bandwidth the limit was adjusted by 10 dB to -23 dBm.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), a), (iii) Measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

1-carrier, MIMO:

Diagram	BW configuration	Symbolic name	Tested mode
1 a-c	1.4 MHz	B	Primary
2 a-c	3 MHz	B	Primary
3 a-c	3 MHz	B	Secondary
4 a-c	5 MHz	B	Primary
5 a-c	10 MHz	B	Primary
6 a-c	15 MHz	B	Primary
7 a-c	20 MHz	B	Primary
8 a-c	1.4 MHz	T	Primary
9 a-c	3 MHz	T	Primary
10 a-c	3 MHz	T	Secondary
11 a-c	5 MHz	T	Primary
12 a-c	10 MHz	T	Primary
13 a-c	15 MHz	T	Primary
14 a-c	20 MHz	T	Primary

2- carrier, MIMO:

Diagram	BW configuration	Symbolic name	Tested Port
15 a-c	1.4 MHz	B2	RF A
16 a-c	3 MHz	B2	RF A
17 a-c	1.4 MHz	T2	RF A
18 a-c	3 MHz	T2	RF A

The diagrams are shown on the following pages.

Limits

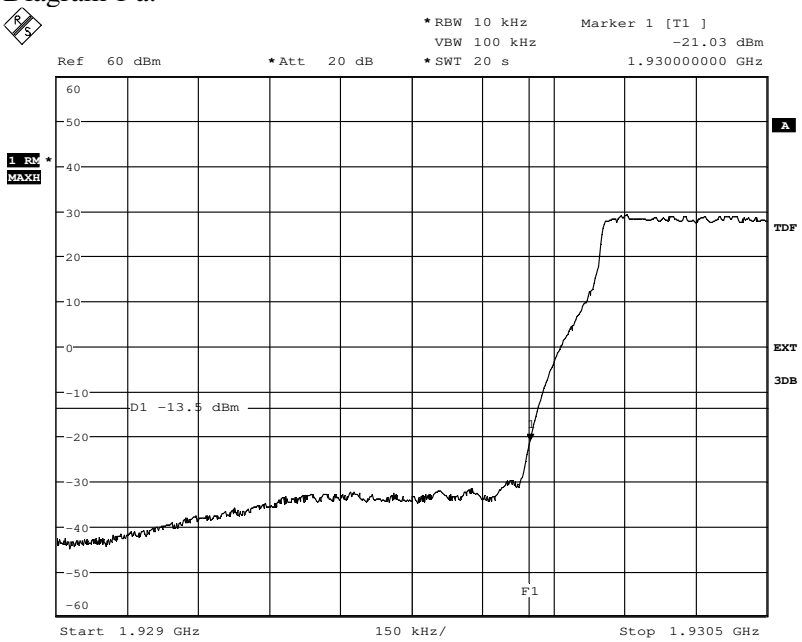
CFR 47 §24.238 and RSS-133 6.5

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

Complies?	Yes

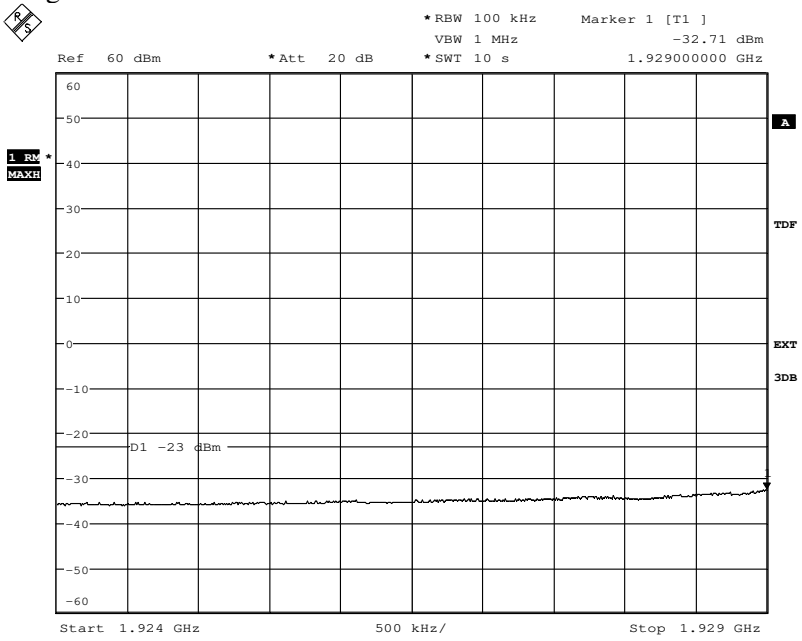
Appendix 4

Diagram 1 a:



Date: 8.APR.2014 10:02:43

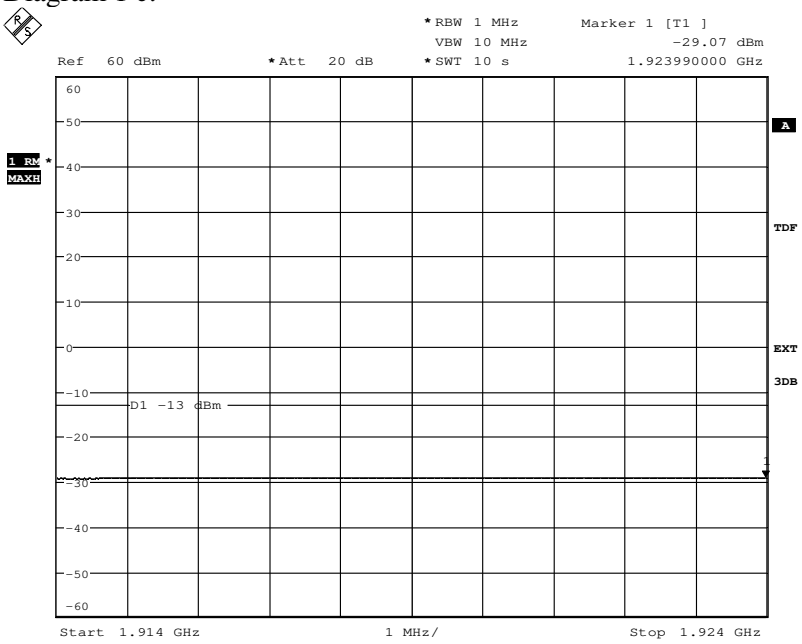
Diagram 1 b:



Date: 8.APR.2014 10:04:36

Appendix 4

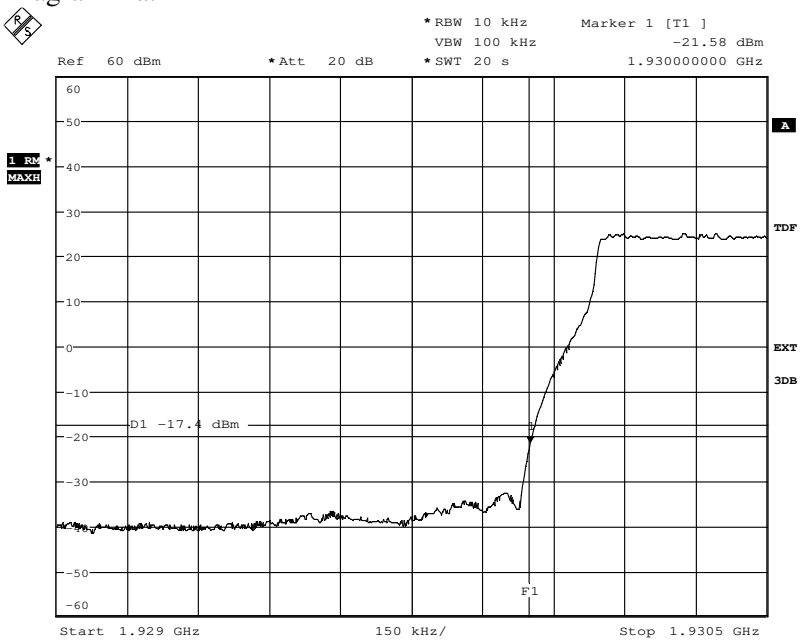
Diagram 1 c:



Date: 9.APR.2014 09:32:19

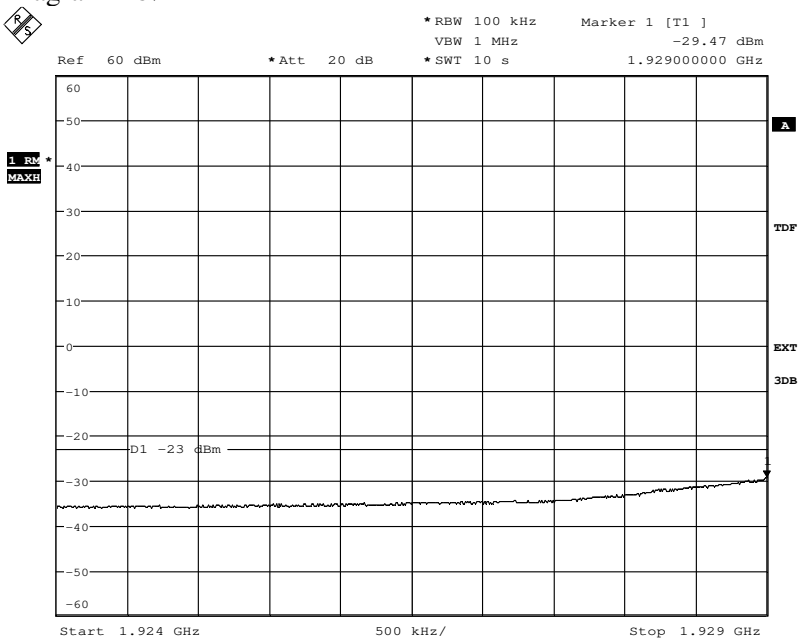
Appendix 4

Diagram 2 a:



Date: 8.APR.2014 10:17:29

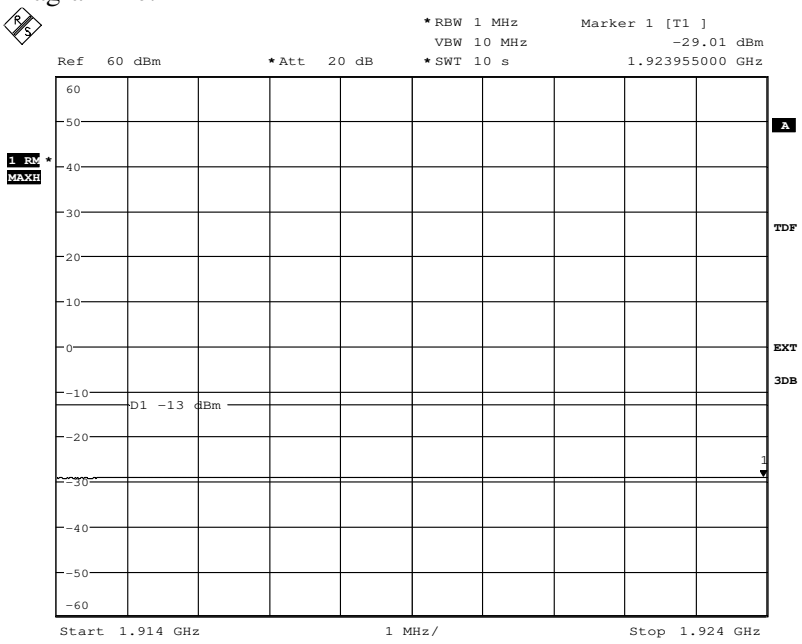
Diagram 2 b:



Date: 8.APR.2014 10:18:45

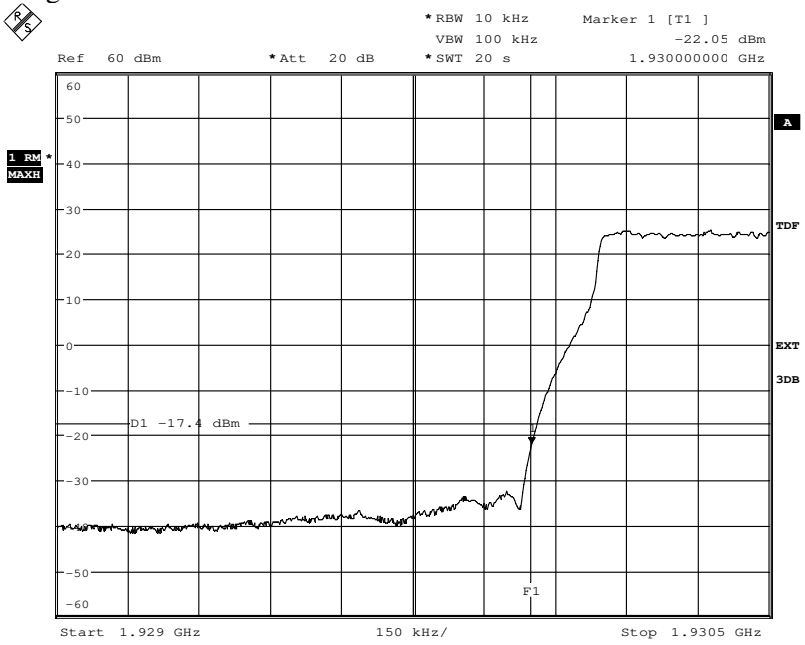
Appendix 4

Diagram 2 c:



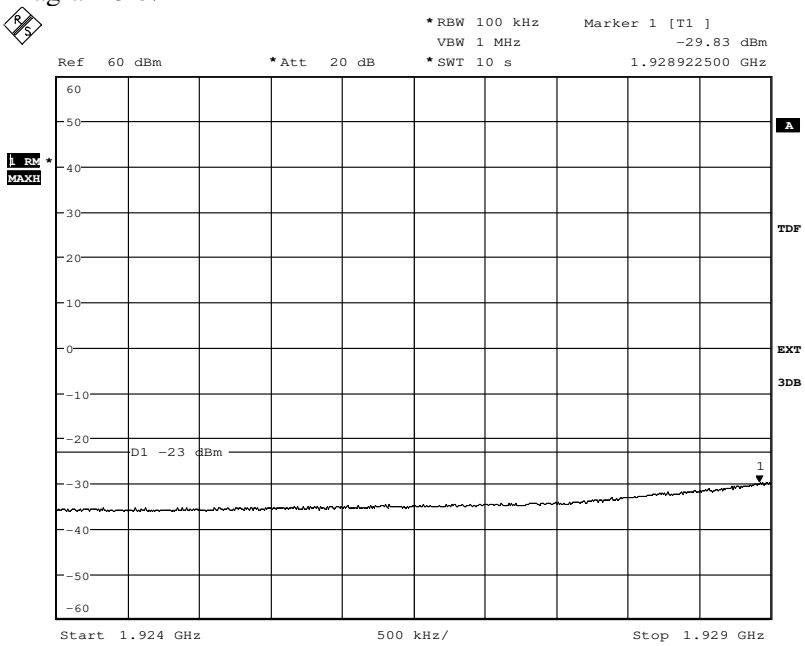
Appendix 4

Diagram 3 a:



Date: 8.APR.2014 09:41:22

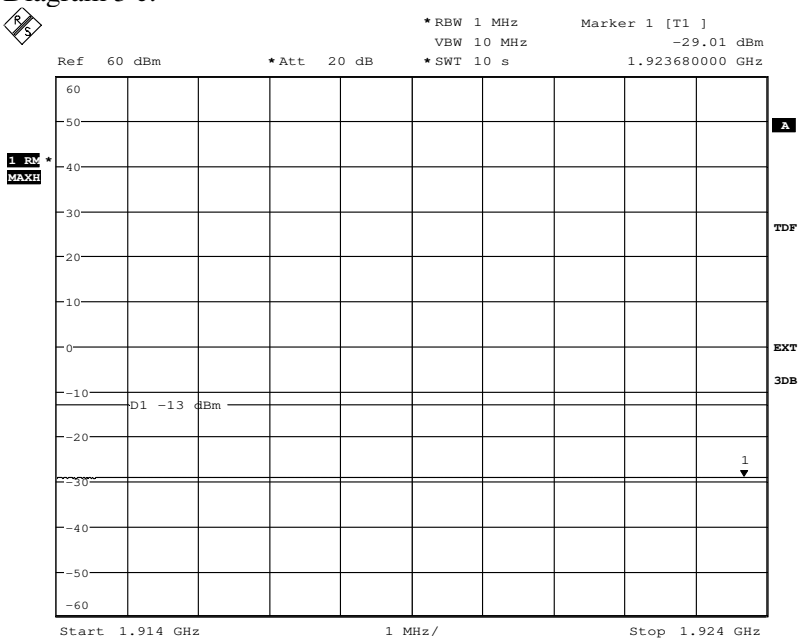
Diagram 3 b:



Date: 8.APR.2014 09:46:14

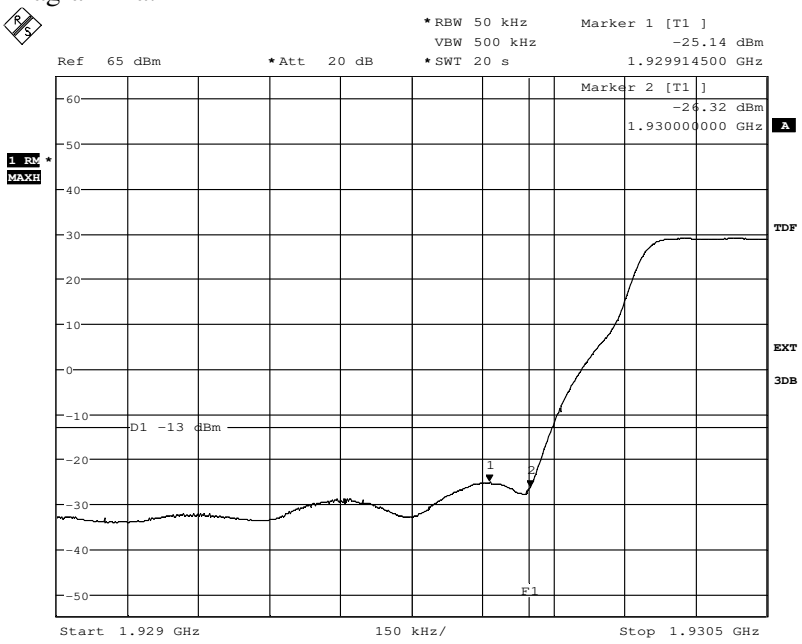
Appendix 4

Diagram 3 c:



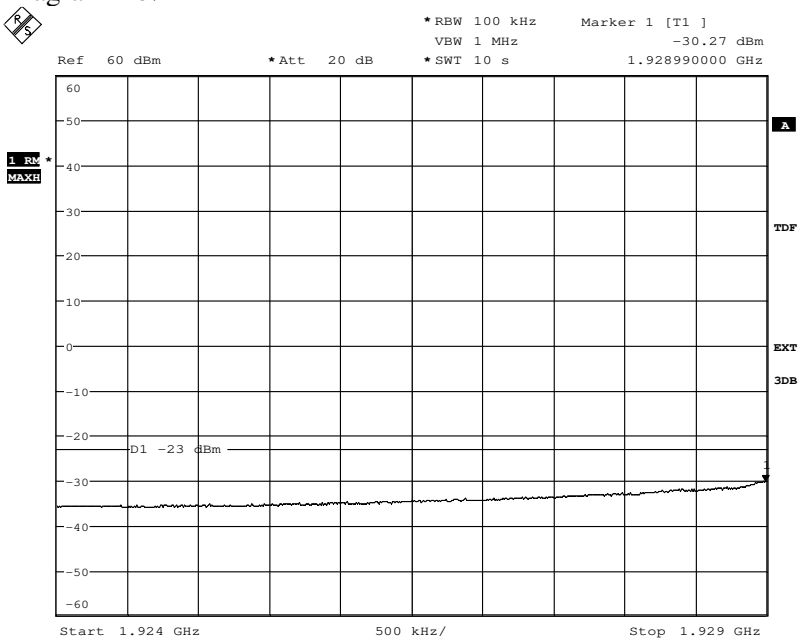
Appendix 4

Diagram 4 a:



Date: 8.APR.2014 10:48:57

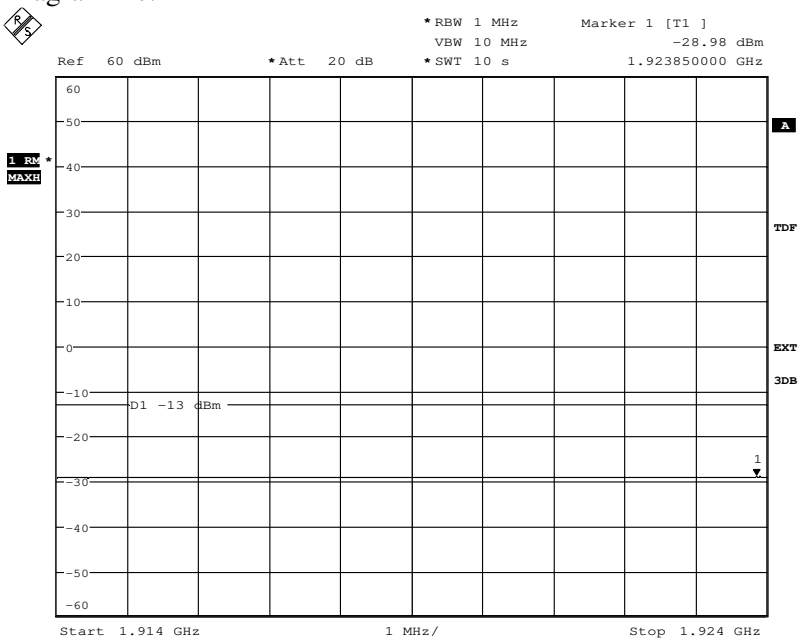
Diagram 4 b:



Date: 8.APR.2014 10:23:29

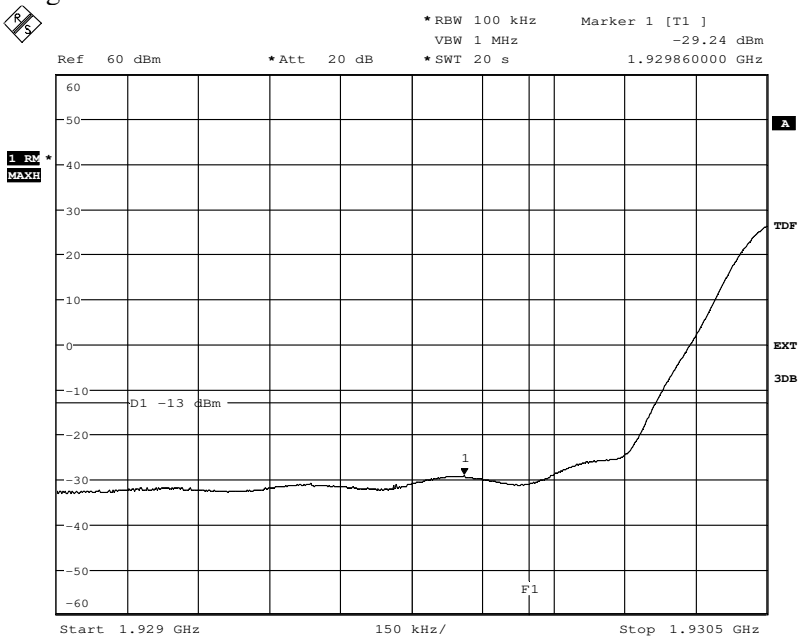
Appendix 4

Diagram 4 c:



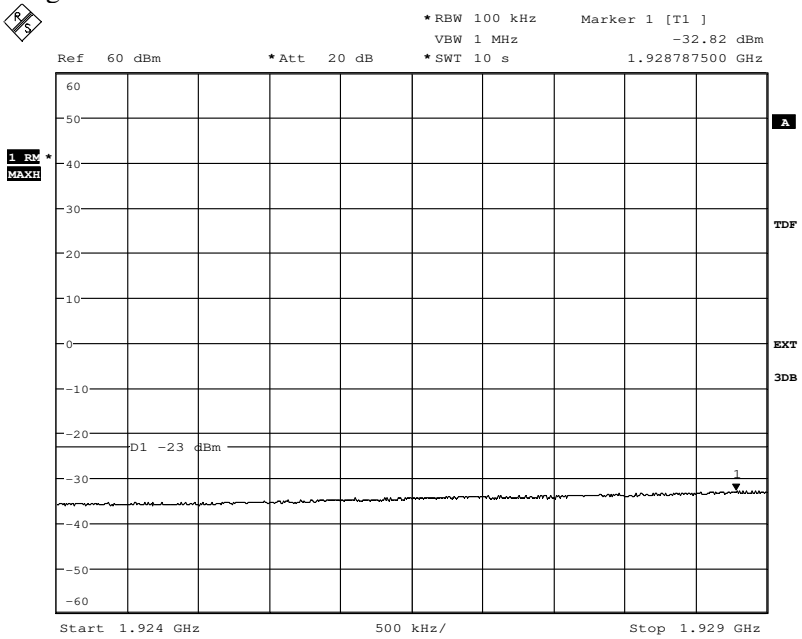
Appendix 4

Diagram 5 a:



Date: 8.APR.2014 11:49:03

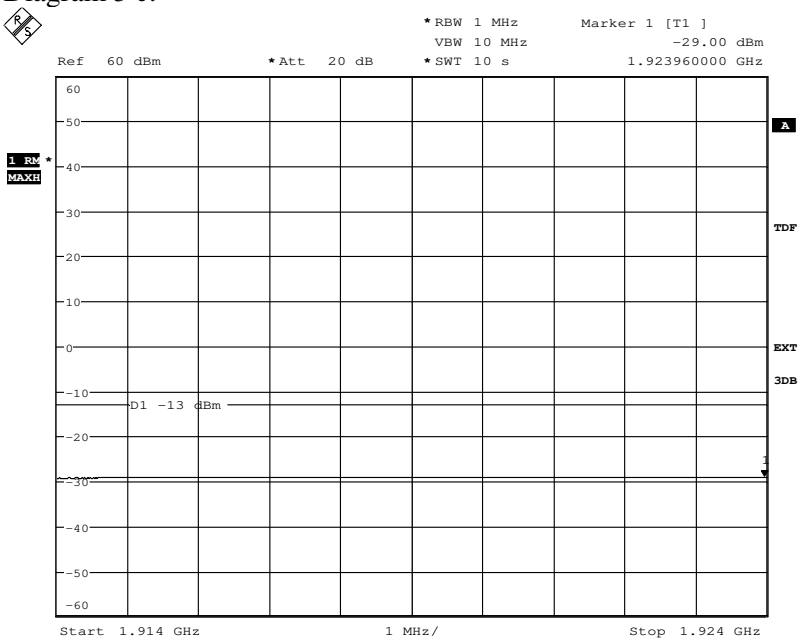
Diagram 5 b:



Date: 9.APR.2014 10:07:16

Appendix 4

Diagram 5 c:



Appendix 4

Diagram 6 a:

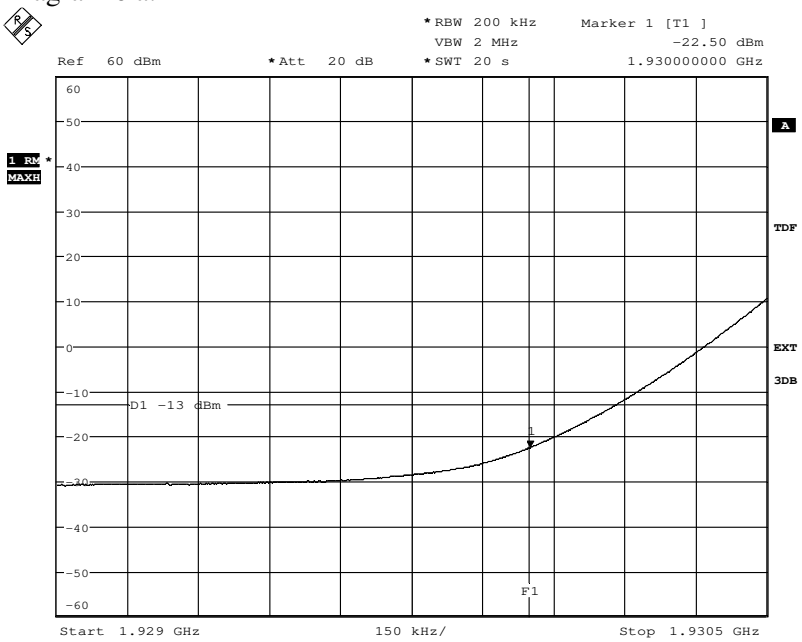


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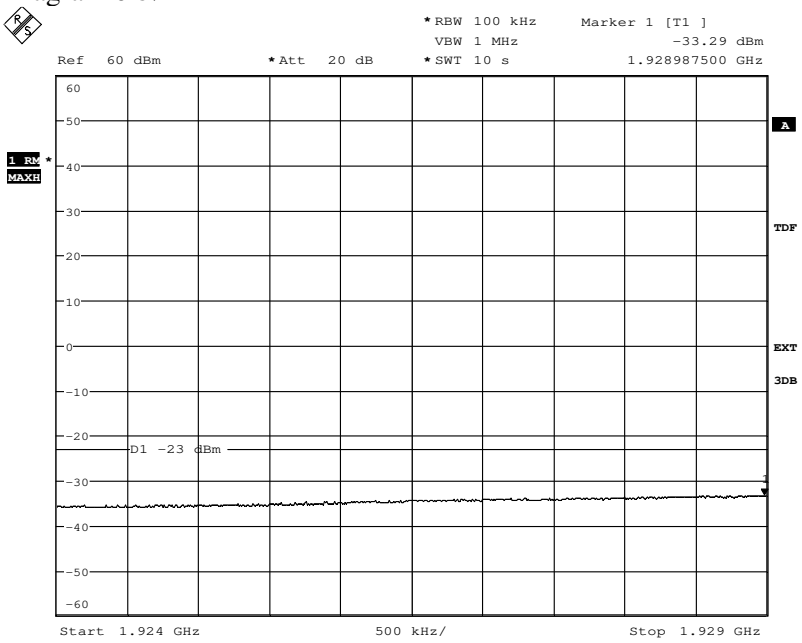
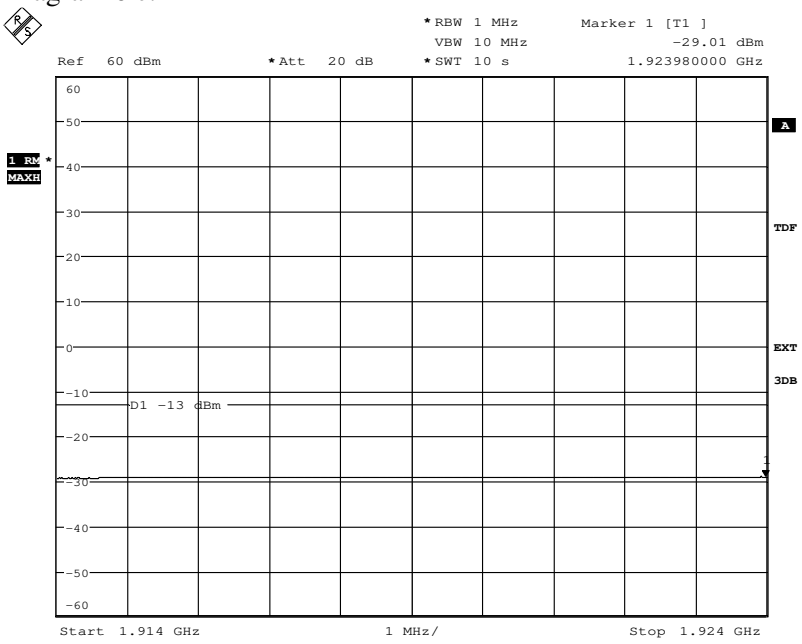
Diagram 6 b:



Date: 8.APR.2014 11:56:24

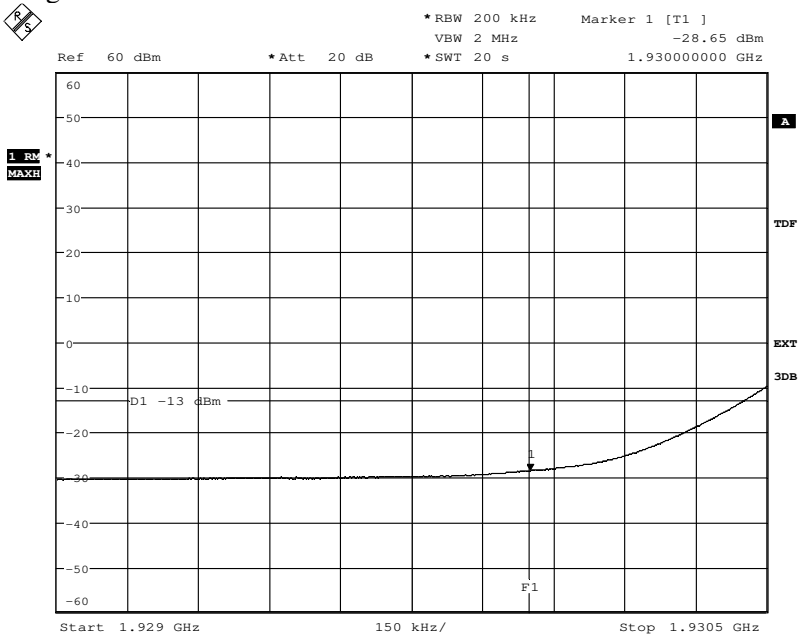
Appendix 4

Diagram 6 c:



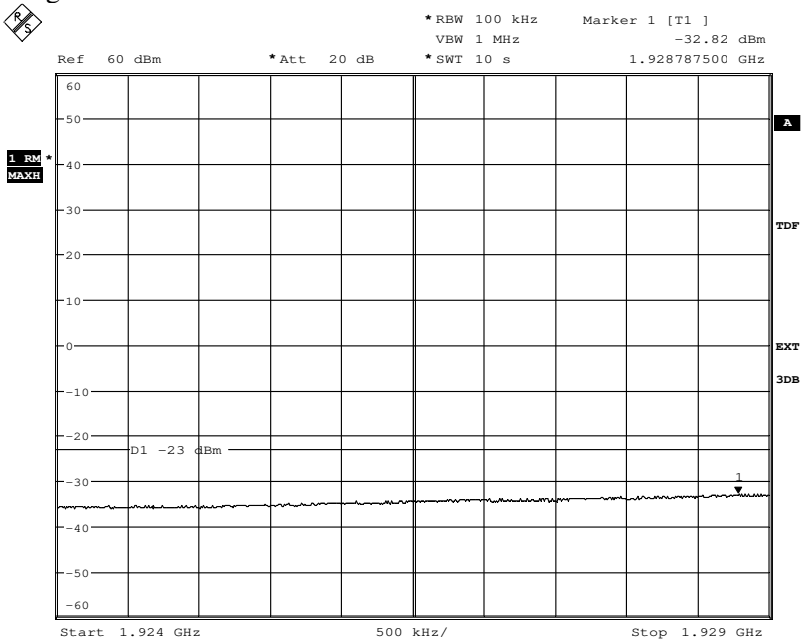
Appendix 4

Diagram 7 a:



Date: 8.APR.2014 12:00:37

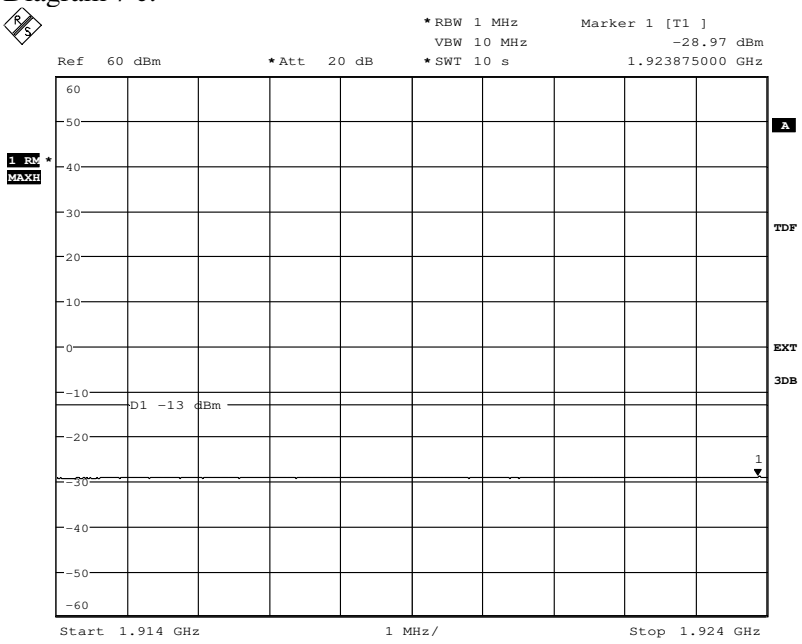
Diagram 7 b:



Date: 9.APR.2014 10:07:16

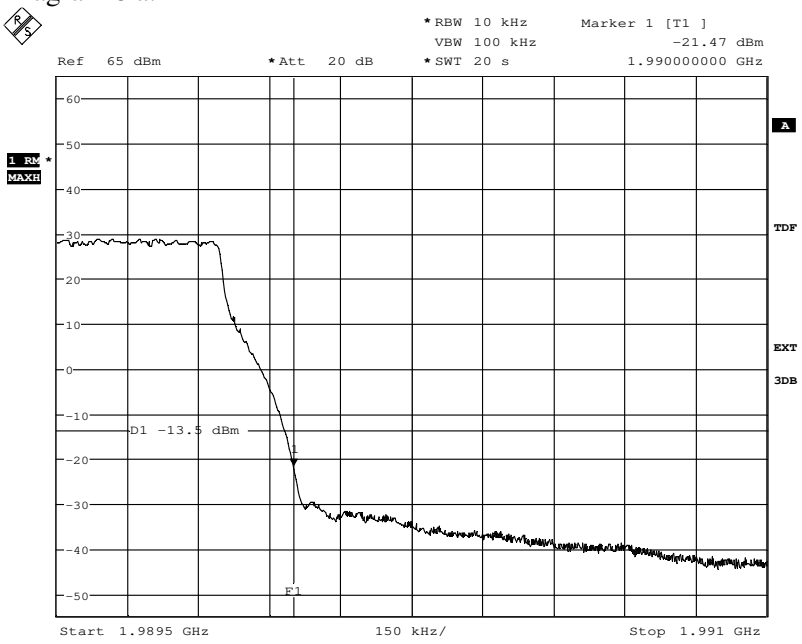
Appendix 4

Diagram 7 c:



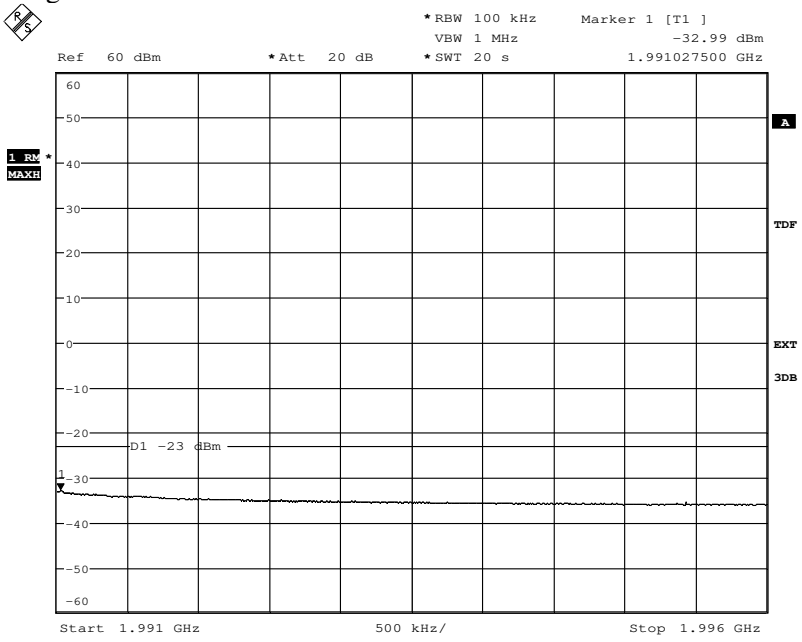
Appendix 4

Diagram 8 a:



Date: 8.APR.2014 12:06:20

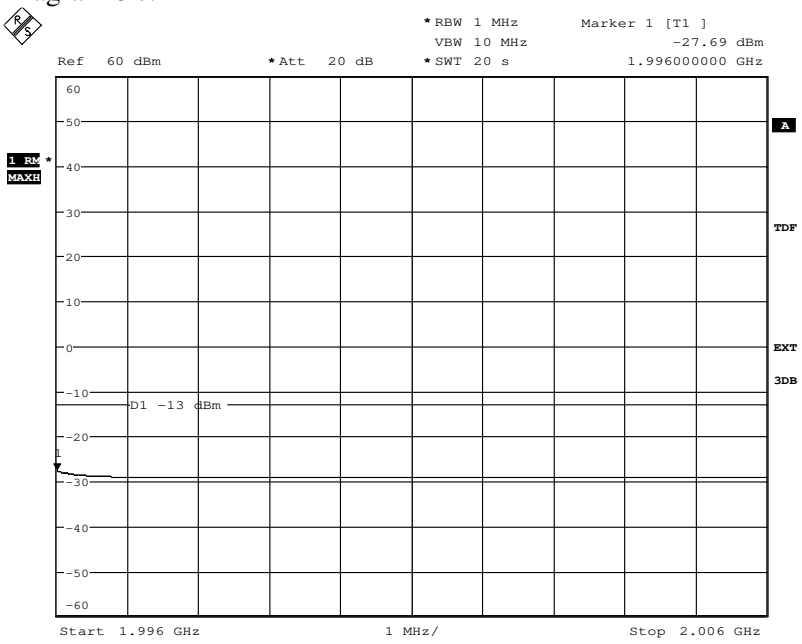
Diagram 8 b:



Date: 8.APR.2014 12:08:37

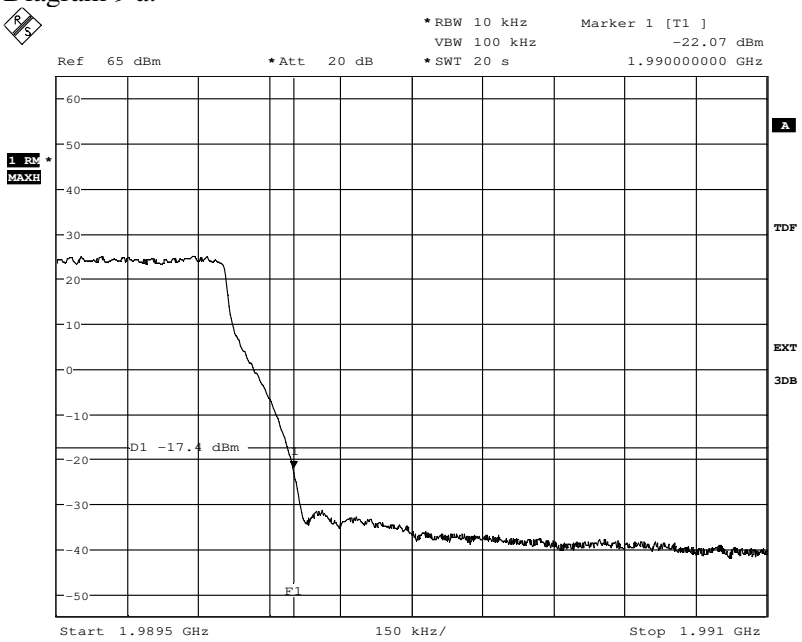
Appendix 4

Diagram 8 c:



Appendix 4

Diagram 9 a:



Date: 8.APR.2014 12:14:29

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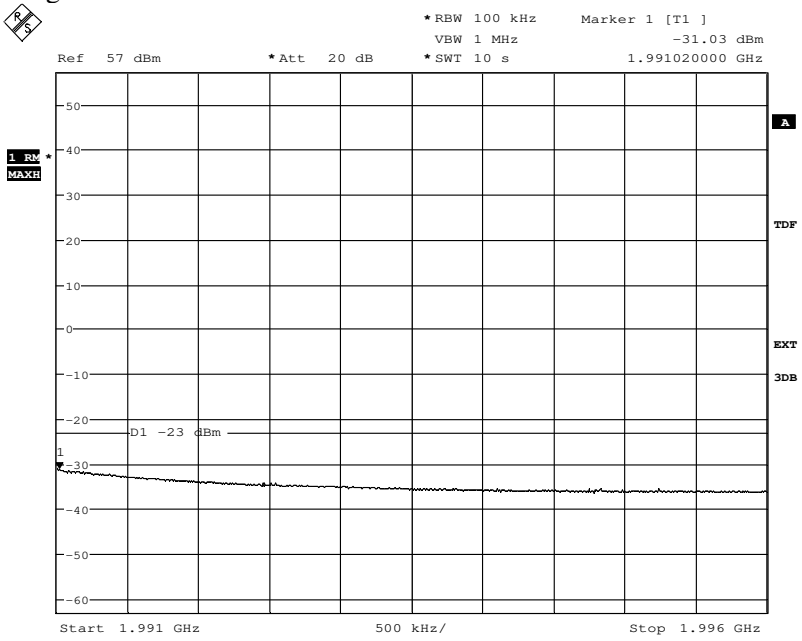
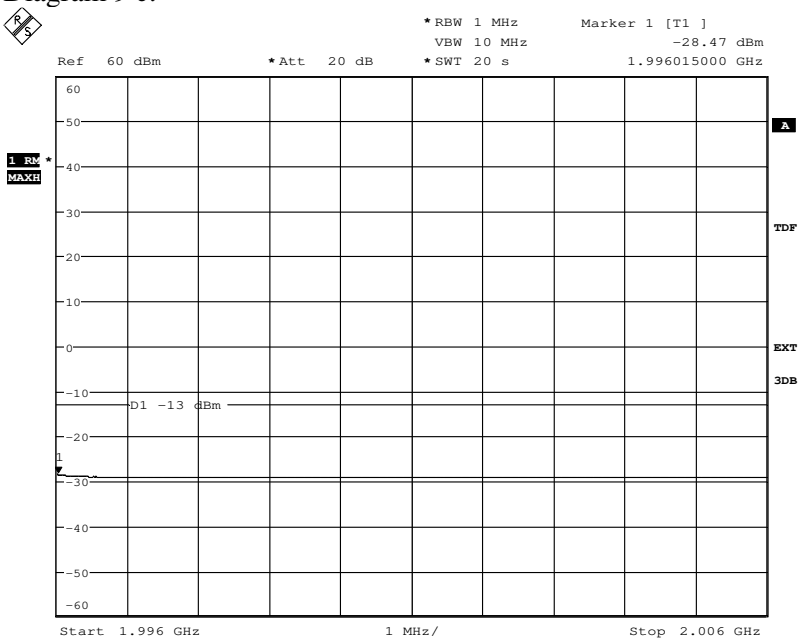


Date: 9.APR.2014 10:02:00

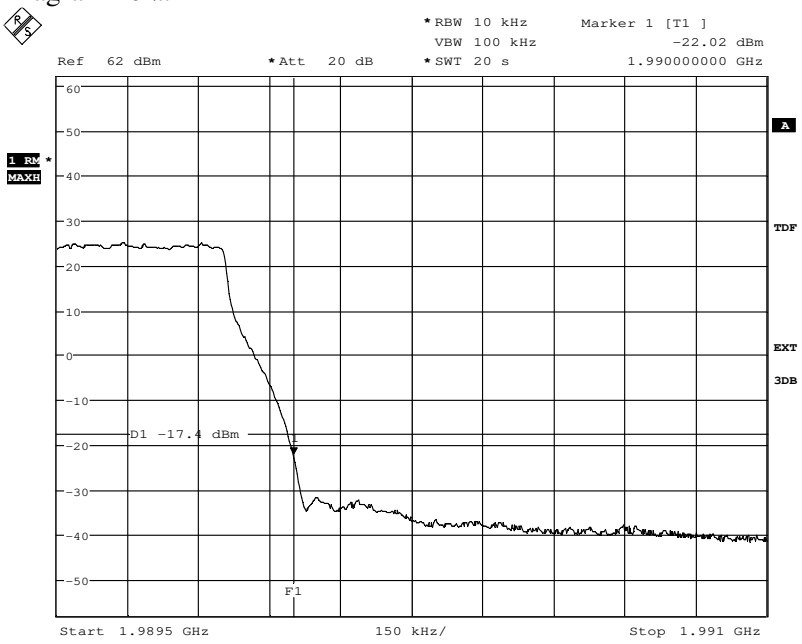
Appendix 4

Diagram 9 c:



Appendix 4

Diagram 10 a:



Date: 8.APR.2014 09:55:34

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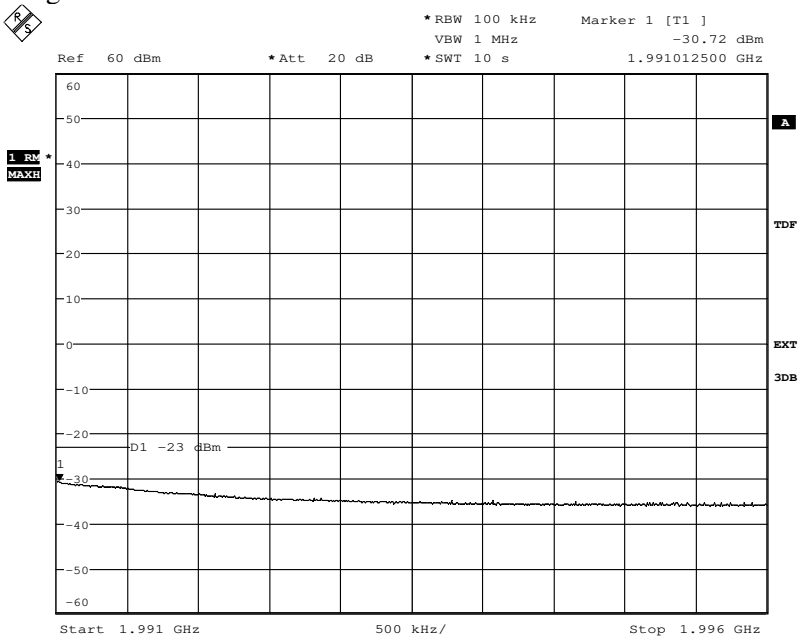

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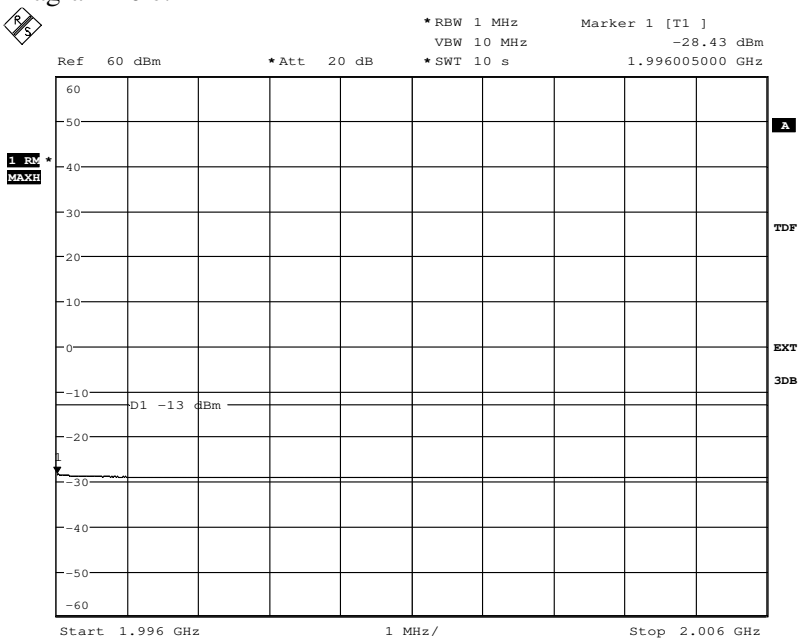
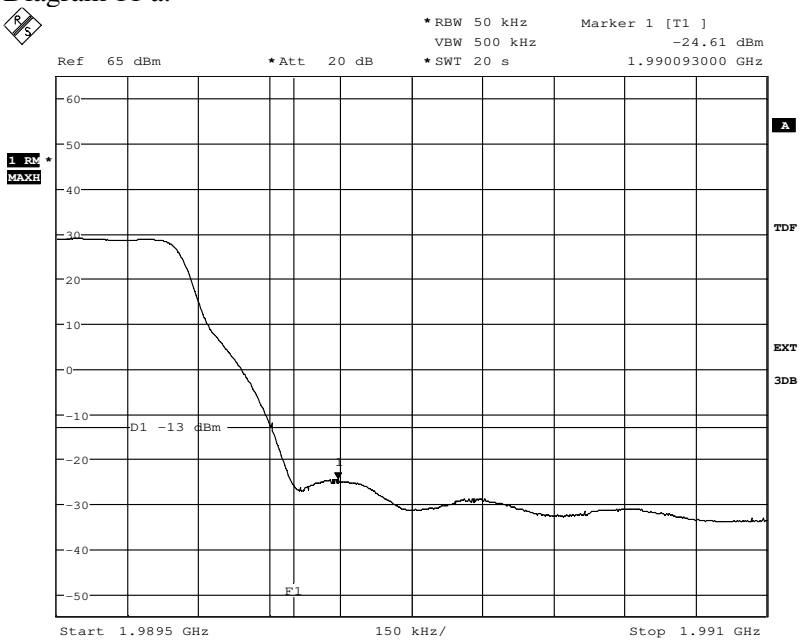
Appendix 4

Diagram 10 c:



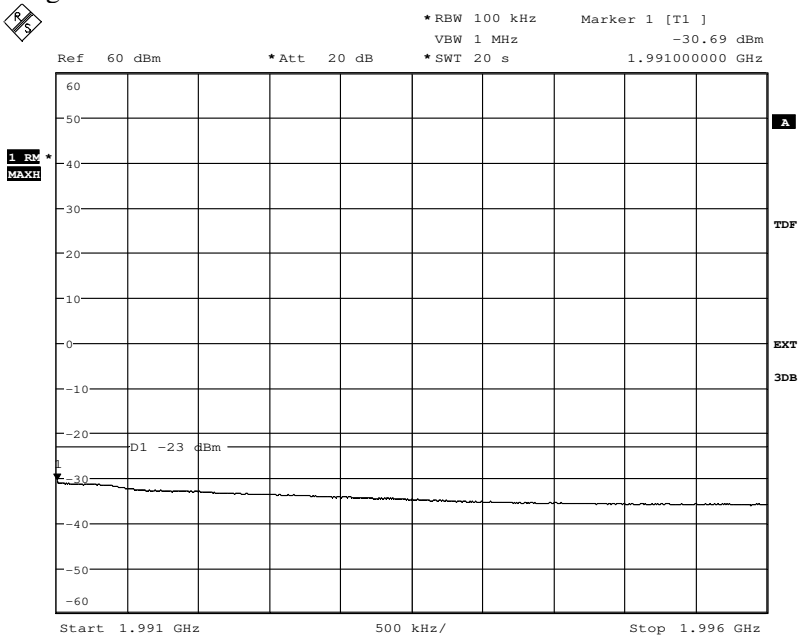
Appendix 4

Diagram 11 a:



Date: 8.APR.2014 12:17:42

Diagram11 b:



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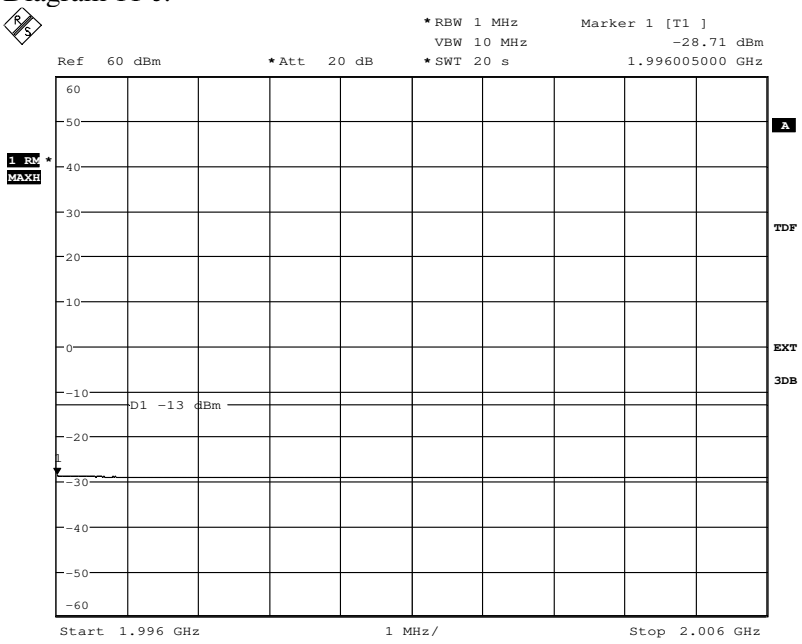
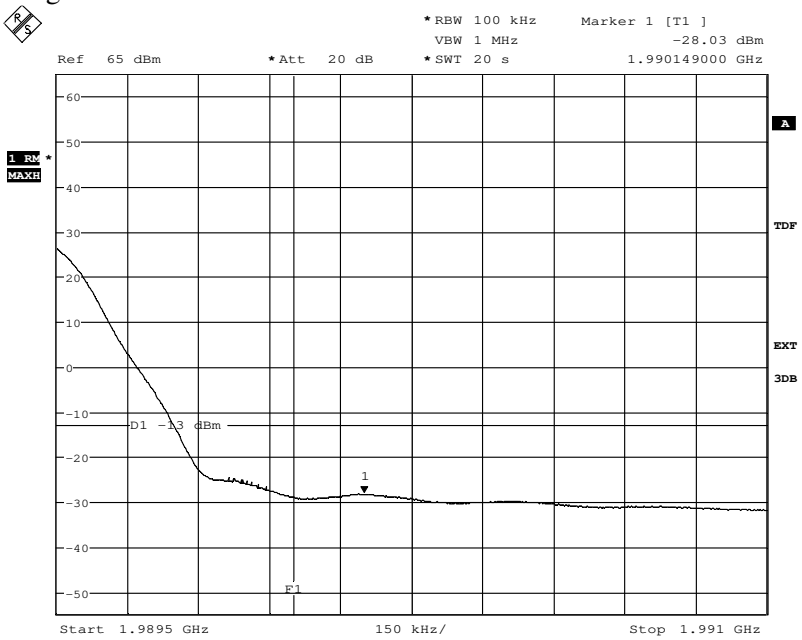
Appendix 4

Diagram 11 c:



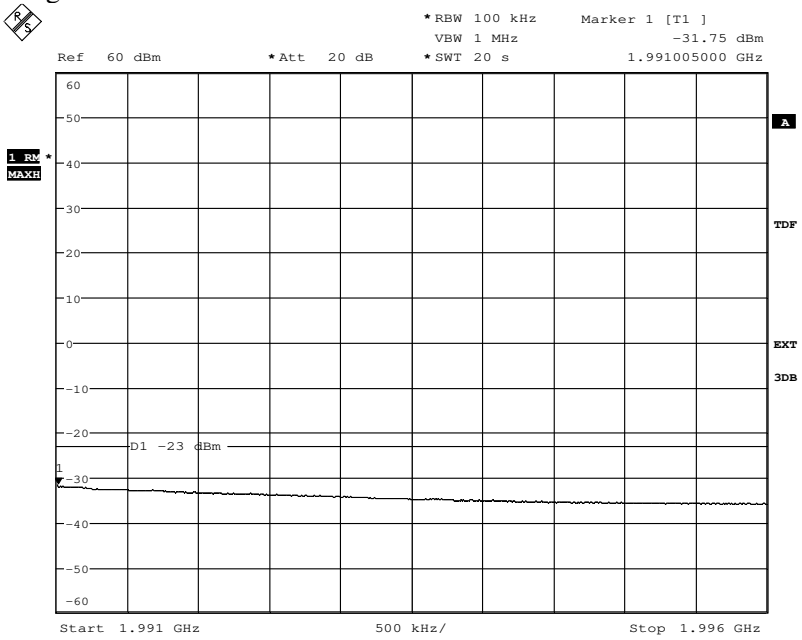
Appendix 4

Diagram 12 a:



Date: 8.APR.2014 12:25:33

Diagram 12 b:



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Appendix 4

Diagram 12 c:

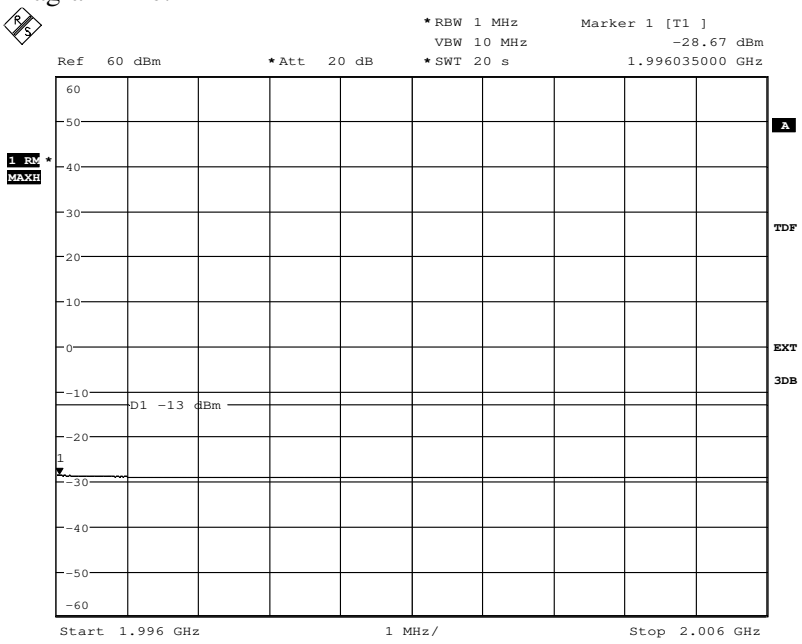

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Diagram 13 a:

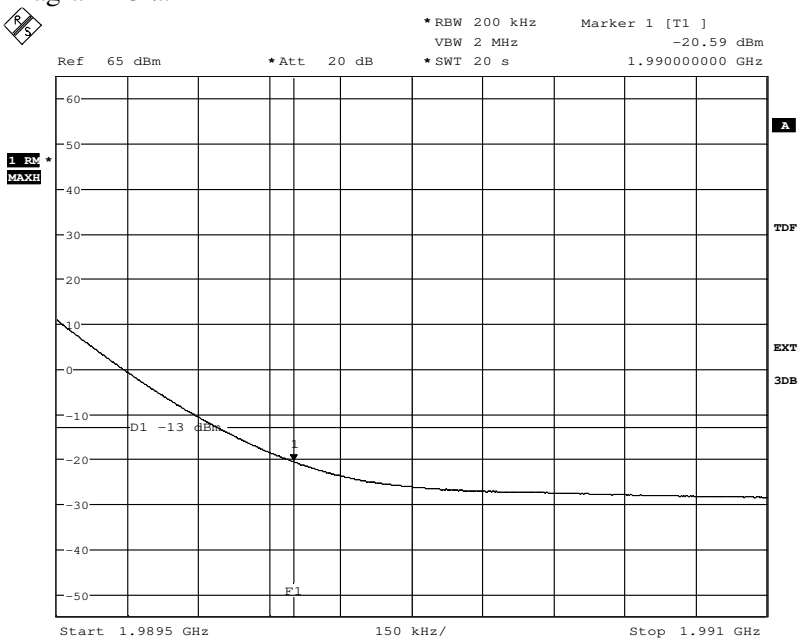

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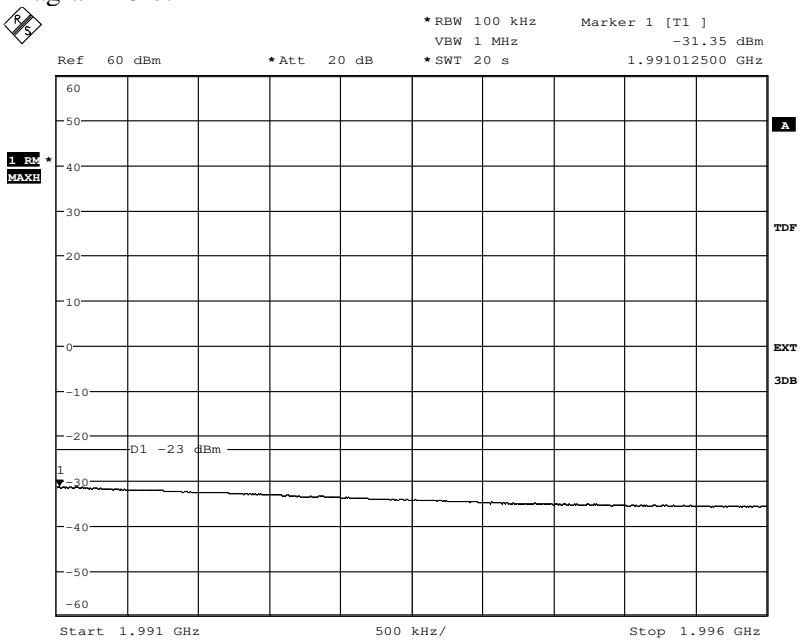
Diagram 13 b:



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Appendix 4

Diagram 13 c:

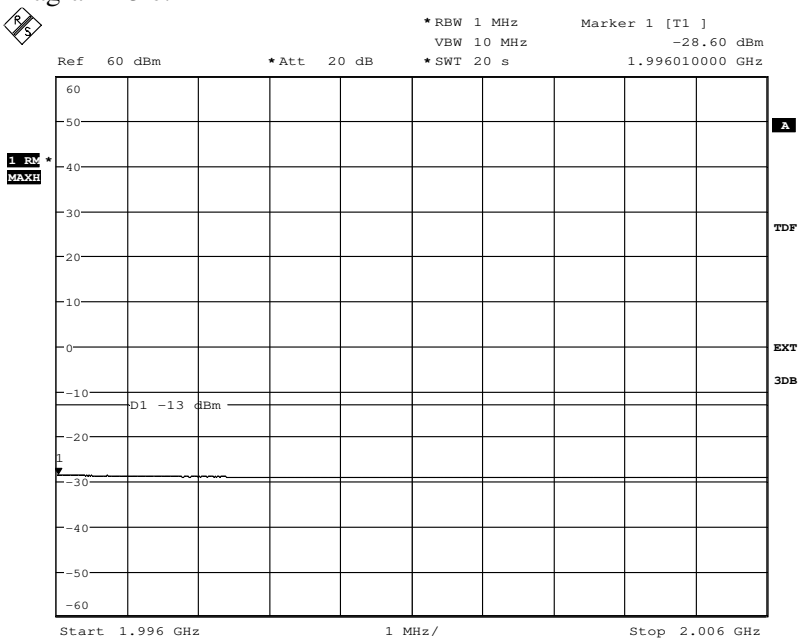

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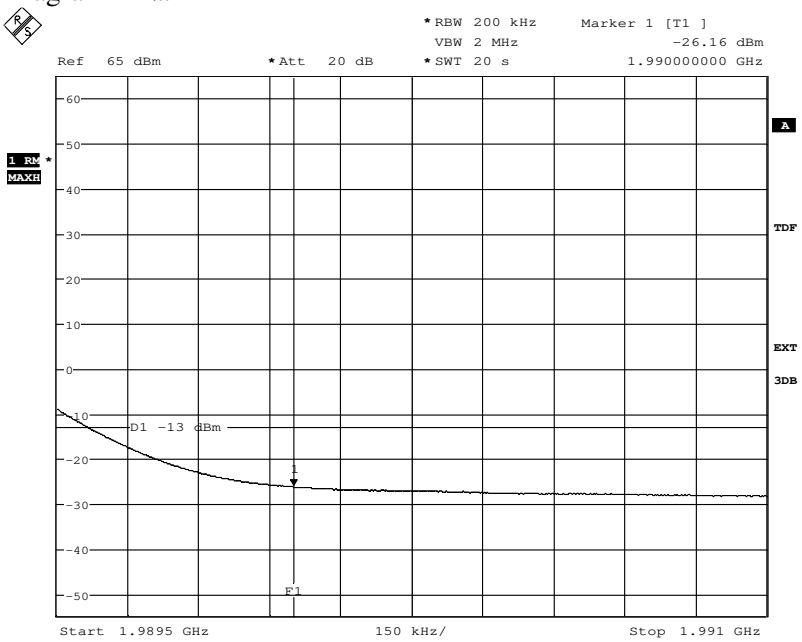
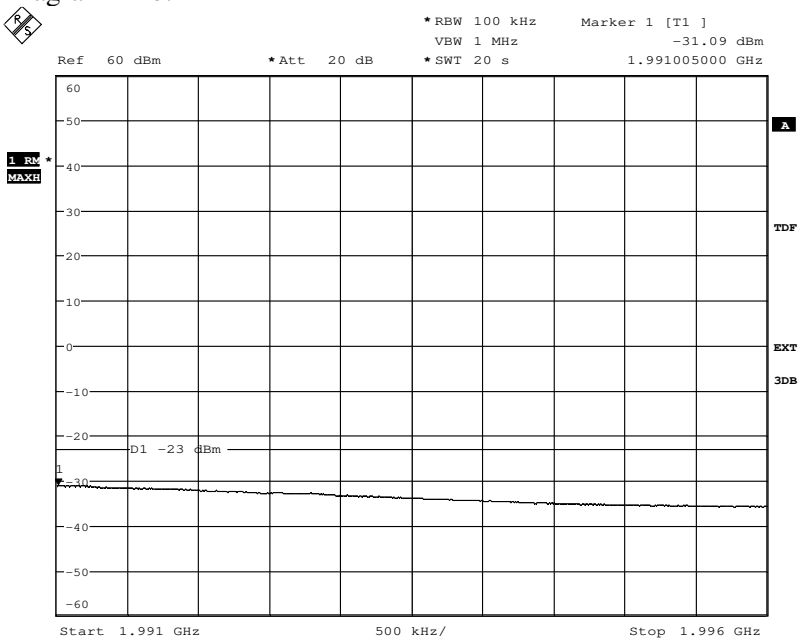
Diagram 14 a:



Date: 8.APR.2014 12:35:46

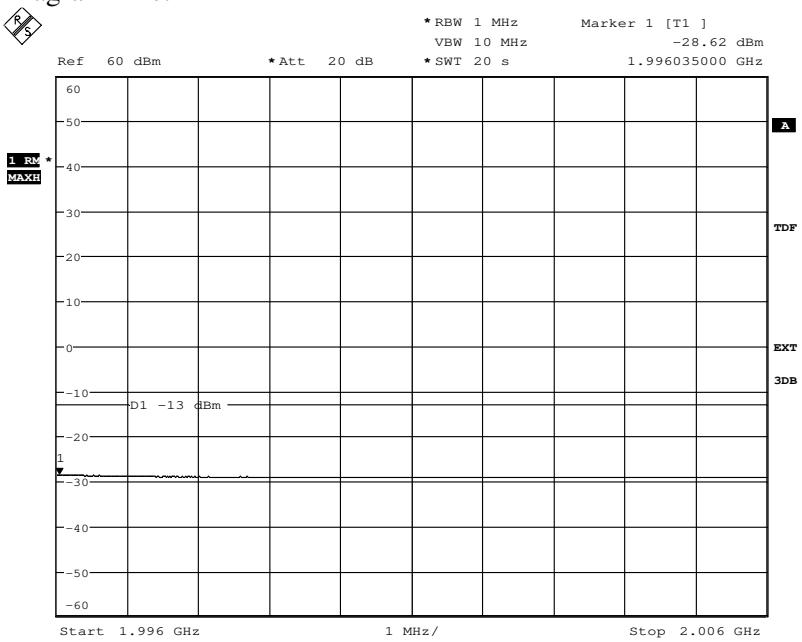
Diagram 14 b:



Date: 8.APR.2014 12:34:12

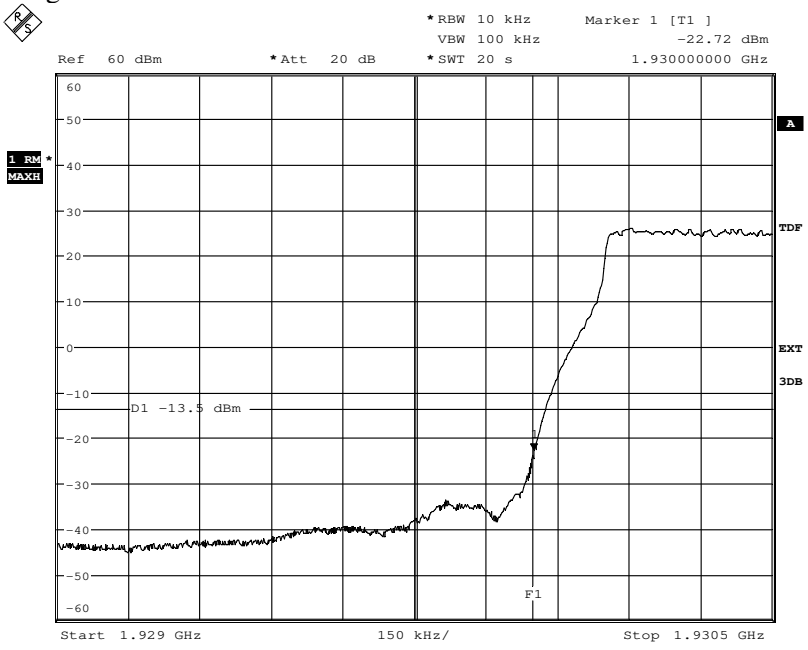
Appendix 4

Diagram 14 c:



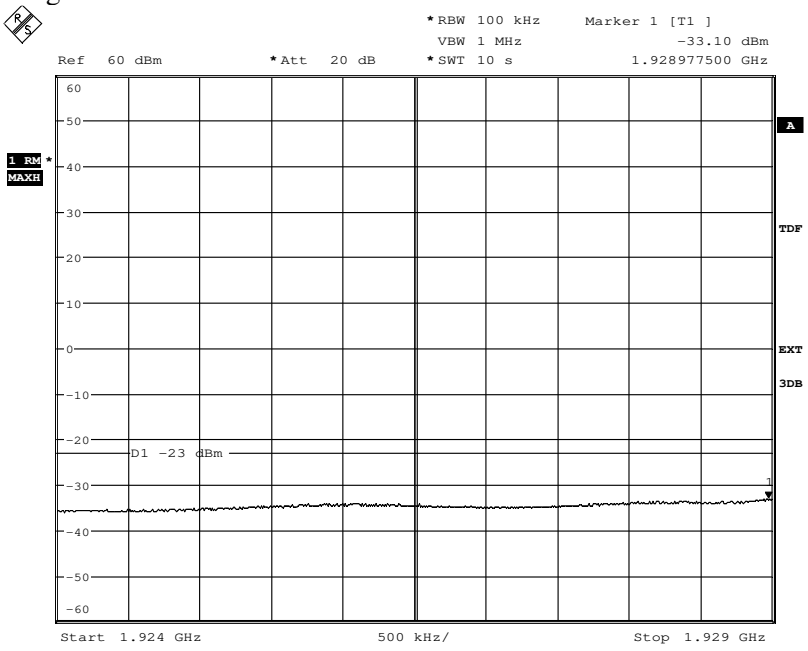
Appendix 4

Diagram 15 a:



Date: 8.APR.2014 19:31:18

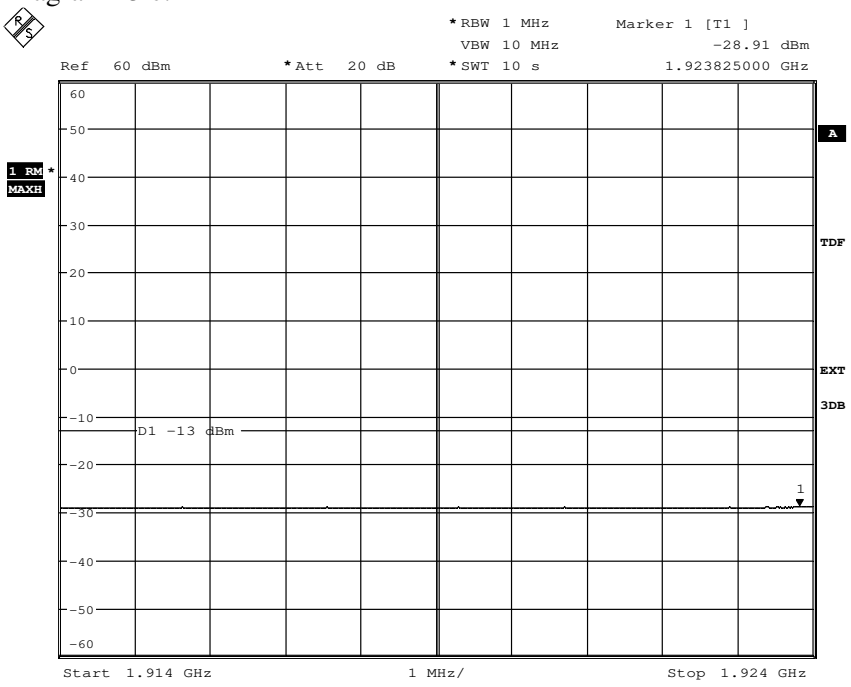
Diagram 15 b:



Date: 8.APR.2014 19:33:52

Appendix 4

Diagram 15 c:



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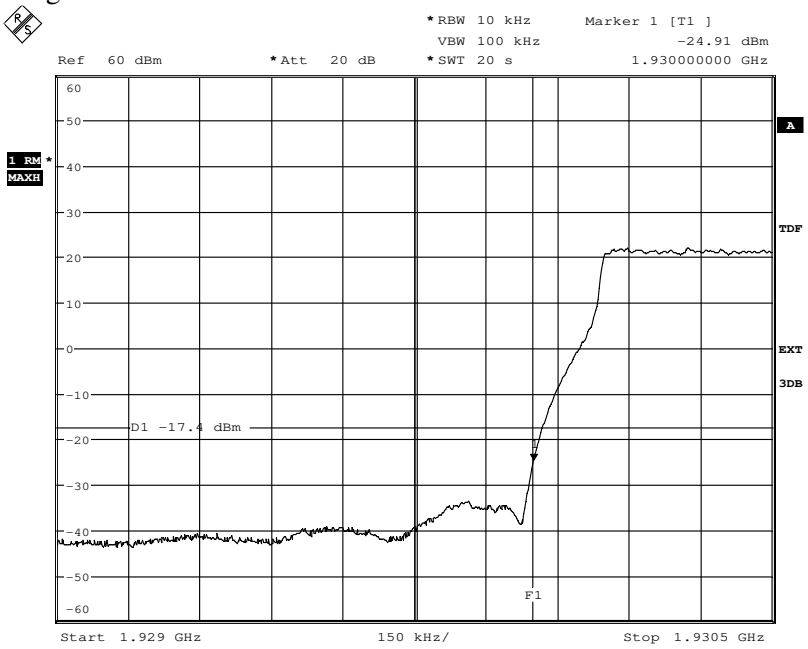
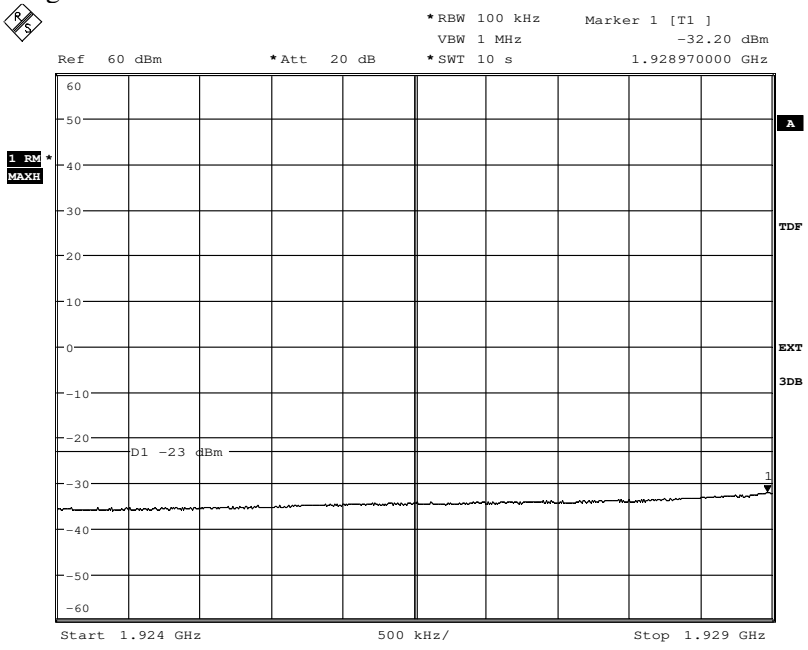
Appendix 4

Diagram 16 a:



Date: 8.APR.2014 20:08:11

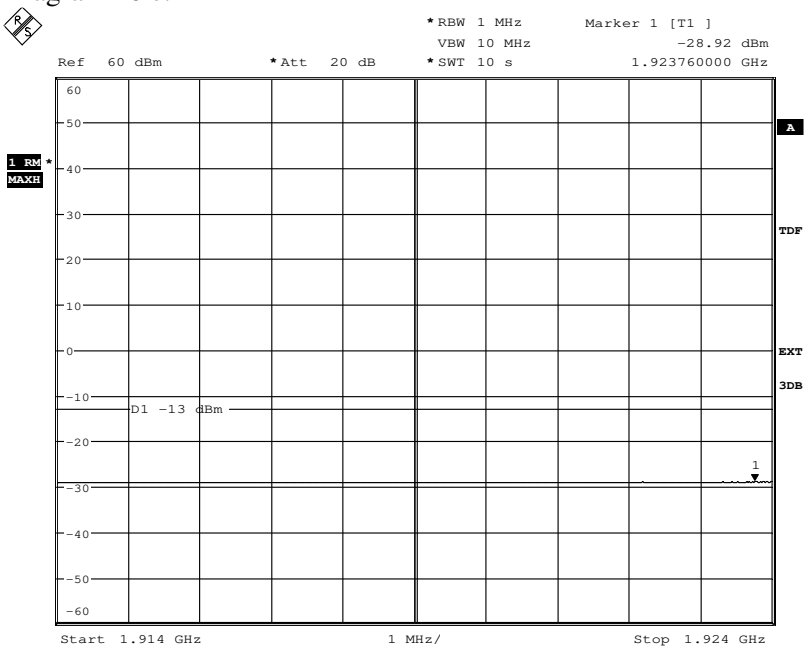
Diagram 16 b:



Date: 8.APR.2014 20:06:03

Appendix 4

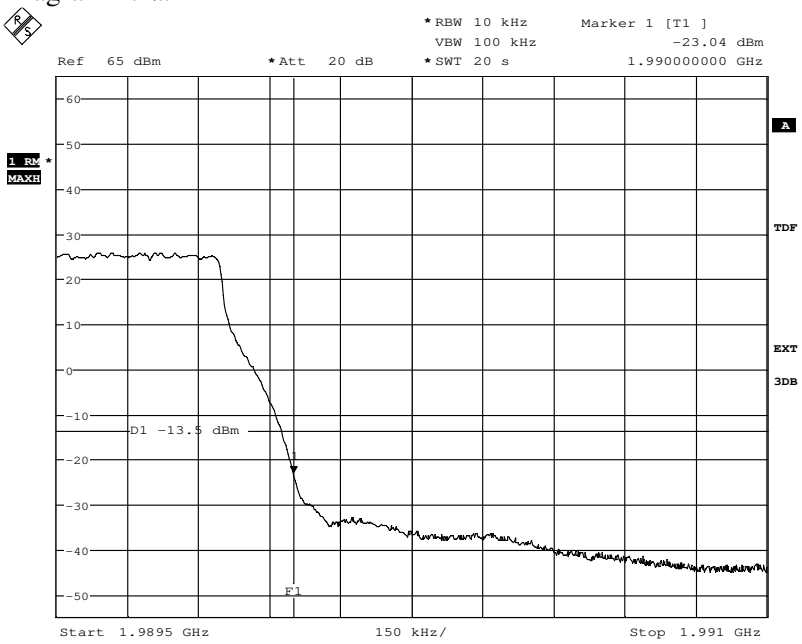
Diagram 16 c:



Date: 8.APR.2014 20:04:48

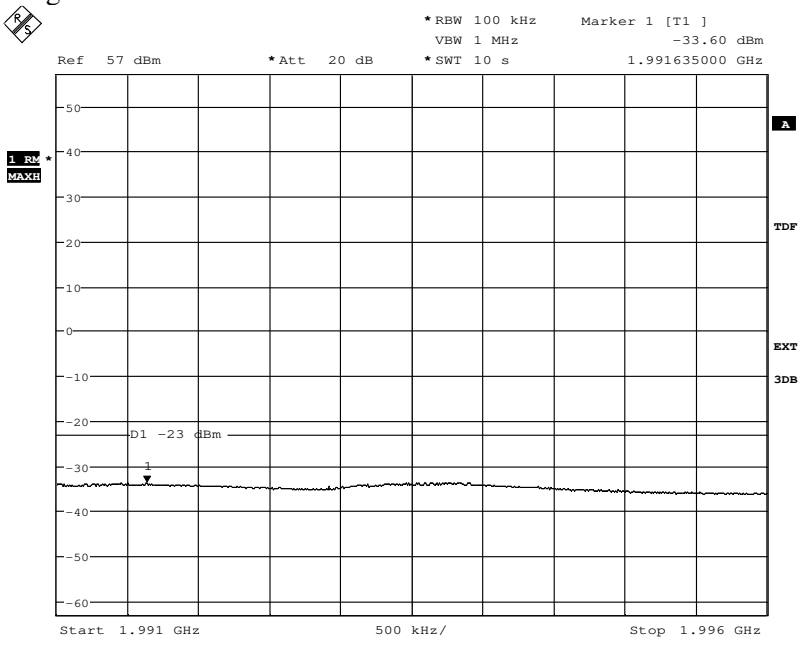
Appendix 4

Diagram 17 a:



Date: 9.APR.2014 14:40:04

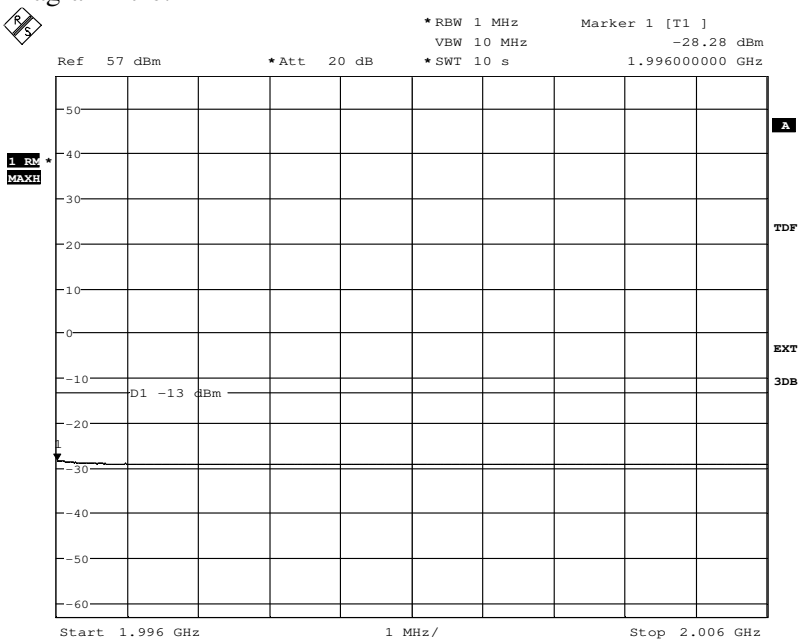
Diagram 17 b:



Date: 9.APR.2014 14:42:25

Appendix 4

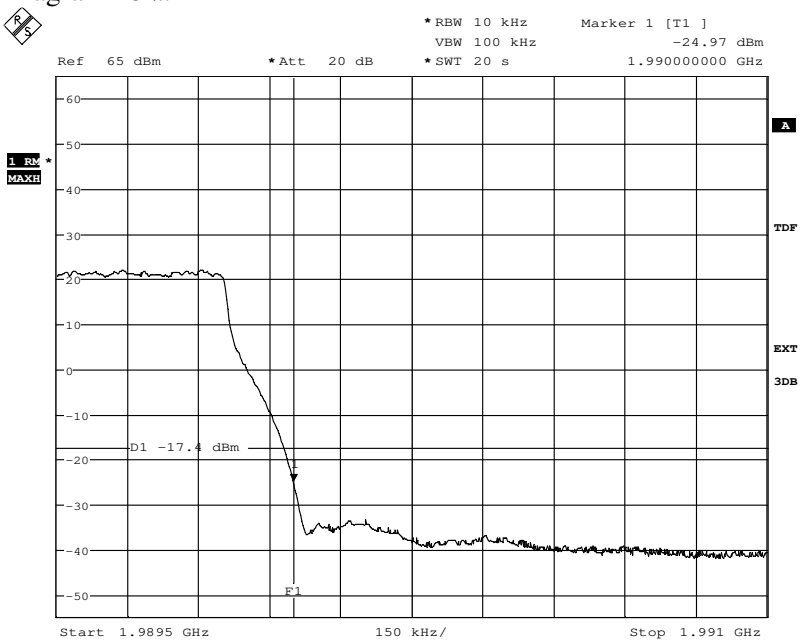
Diagram 17 c:



Date: 9.APR.2014 14:44:02

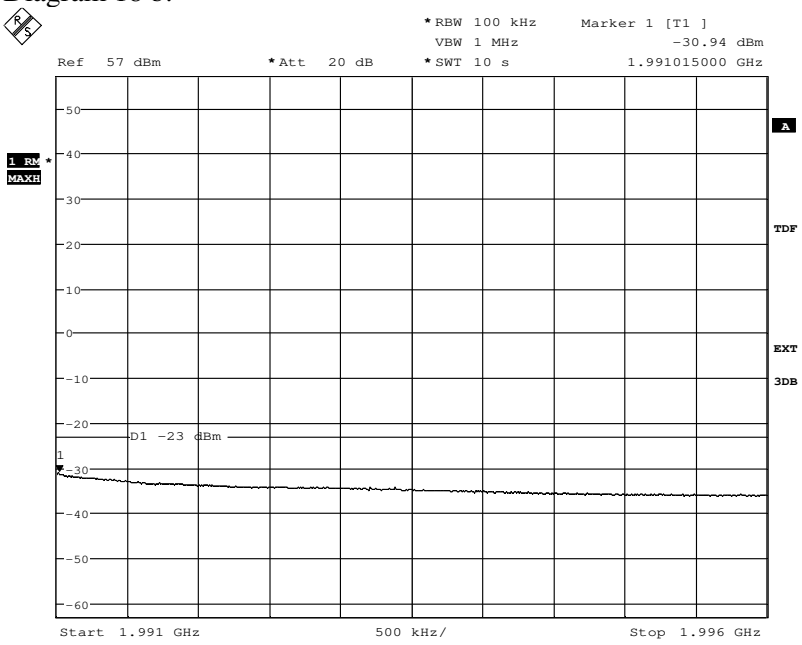
Appendix 4

Diagram 18 a:



Date: 9.APR.2014 15:08:00

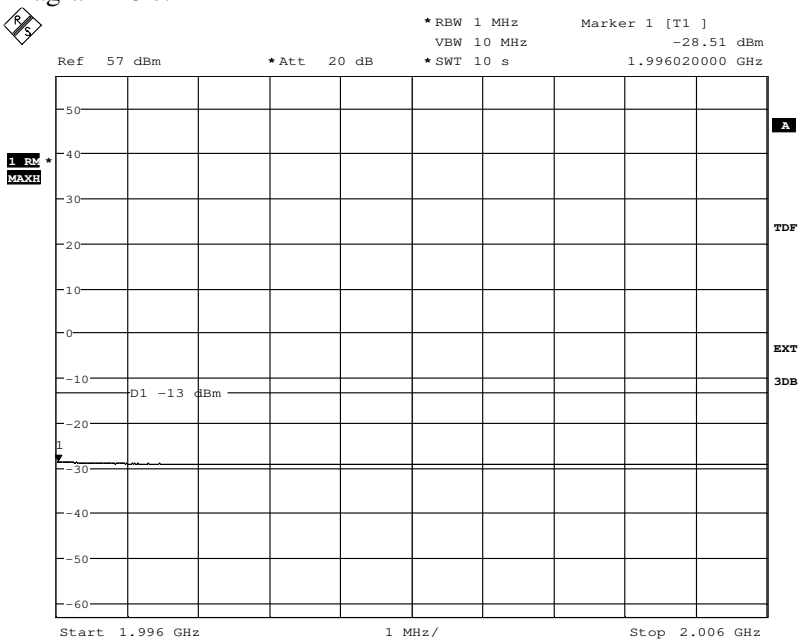
Diagram 18 b:



Date: 9.APR.2014 15:09:08

Appendix 4

Diagram 18 c:



Date: 9.APR.2014 15:10:11

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

Date	Temperature	Humidity
2014-04-08	22 °C ± 3 °C	43 % ± 5 %
2014-04-09	23 °C ± 3 °C	28 % ± 5 %

Test set-up and procedure

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

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), a), (iii) Measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	902 282
HP filter	BX40074
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

1- carrier MIMO

Diagram	BW configuration [MHz]	Symbolic name	Test mode
1 a+b+c+d	1.4	B	Primary
2 a+b+c+d	20	B	Primary
3 a+b+c+d	1.4	M	Primary
4 a+b+c+d	1.4	M	Secondary
5 a+b+c+d	3	M	Primary
6 a+b+c+d	5	M	Primary
7 a+b+c+d	10	M	Primary
8 a+b+c+d	15	M	Primary
9 a+b+c+d	20	M	Primary
10 a+b+c+d	20	M	Secondary
11 a+b+c+d	1.4	T	Primary
12 a+b+c+d	20	T	Primary

MIMO mode, multi carrier

Diagram	BW configuration [MHz]	Symbolic name	Test mode
13 a+b+c+d+e	1.4	B2im1	Primary
14 a+b+c+d+e	1.4	B2im2	Primary
15 a+b+c+d	1.4	M3	Primary
16 a+b+c+d+e	1.4	T2im1	Primary
17 a+b+c+d+e	1.4	T2im2	Primary

Note: Measurements were limited to port RF A due to the measurement result in single carrier mode that shows that the ports are electrical identical as declared by the client.

Remark

The emission at 9 kHz on some of the plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through. The upper frequency boundary was chosen to cover 10x the highest TX fundamental frequency.

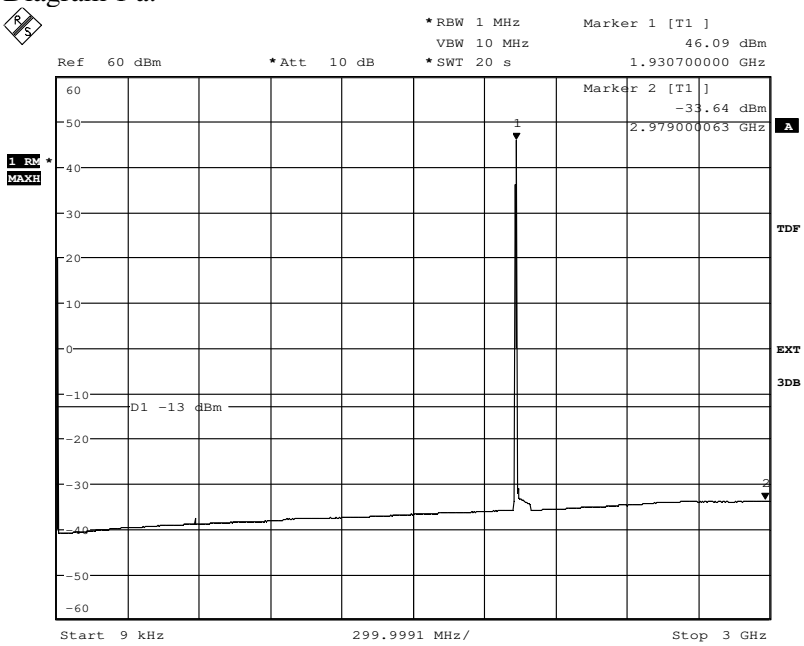
Limits

CFR 47 §24.238 and IC RSS-133 6.5
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm.

Complies?	Yes

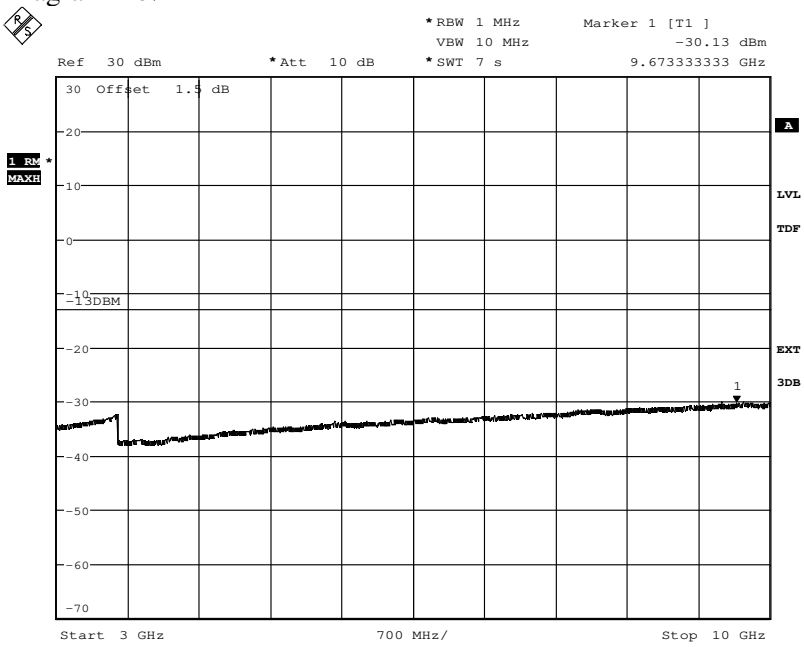
Appendix 5

Diagram 1 a:



Date: 9.APR.2014 09:39:31

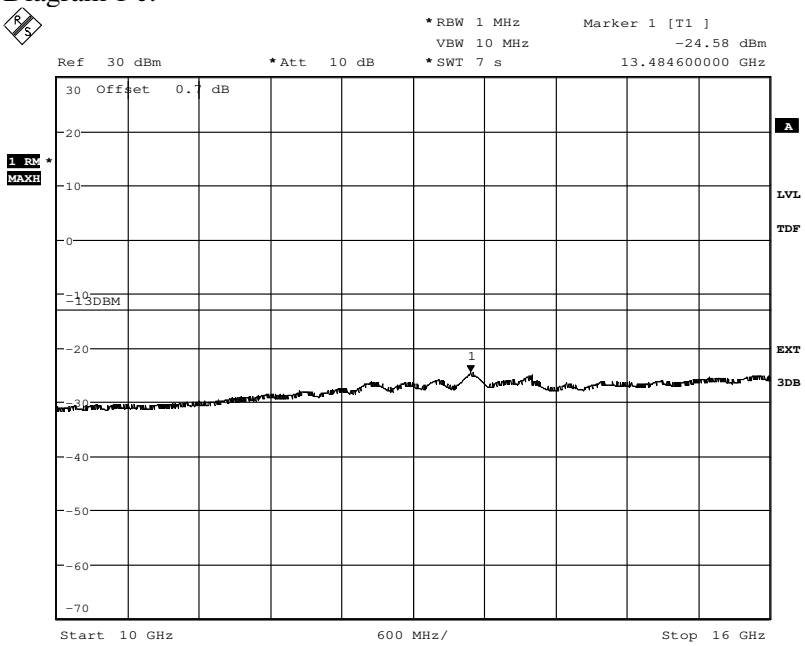
Diagram 1 b:



Date: 9.APR.2014 09:42:33

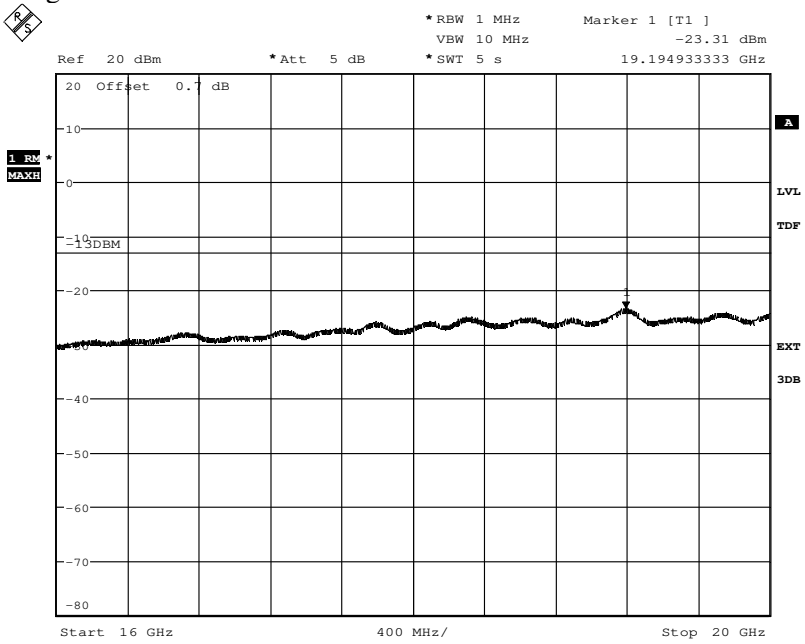
Appendix 5

Diagram 1 c:



Date: 9.APR.2014 09:46:46

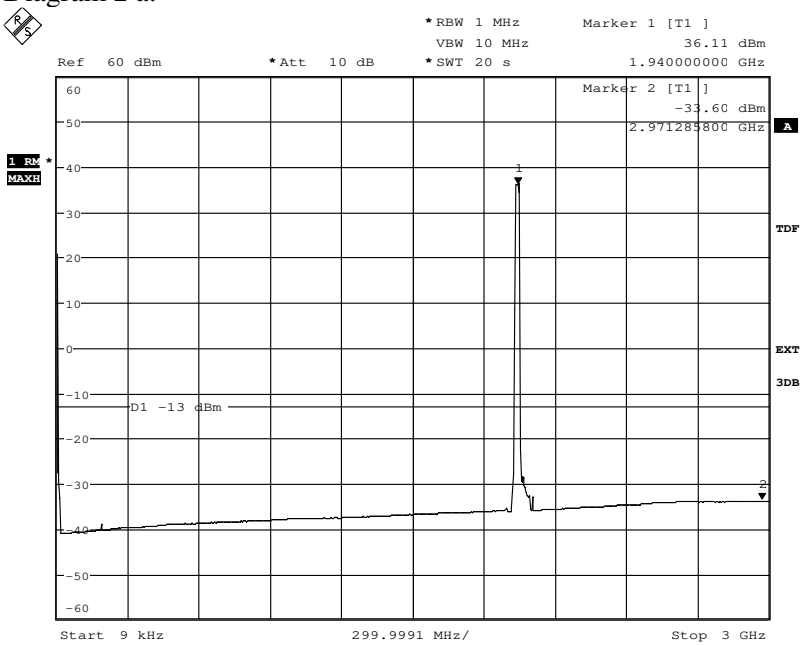
Diagram 1 d:



Date: 9.APR.2014 09:48:25

Appendix 5

Diagram 2 a:



Date: 9.APR.2014 09:58:56

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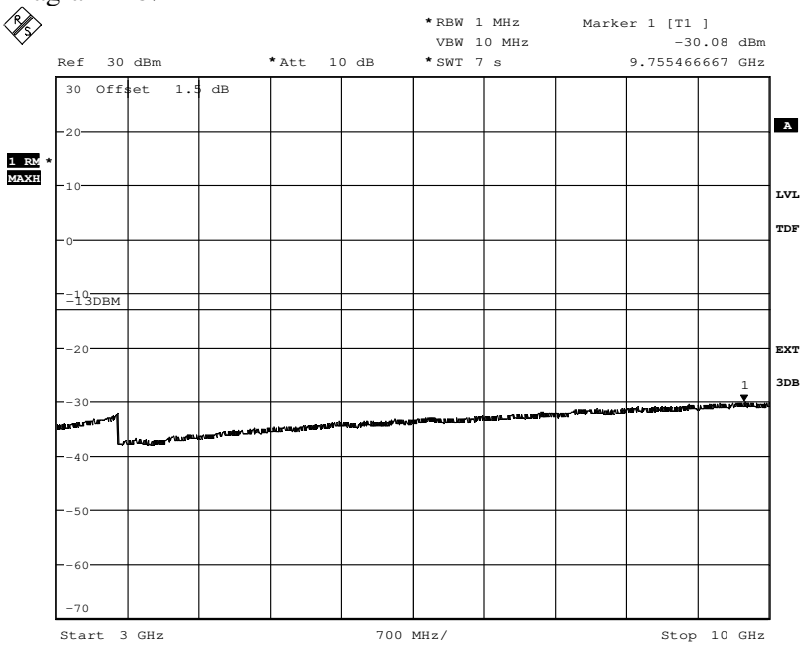
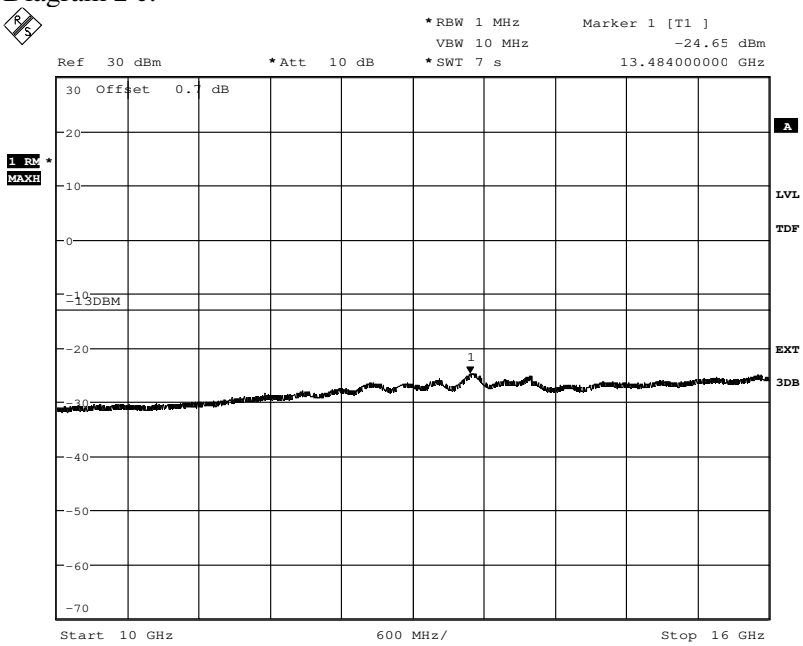


Date: 9.APR.2014 09:54:59

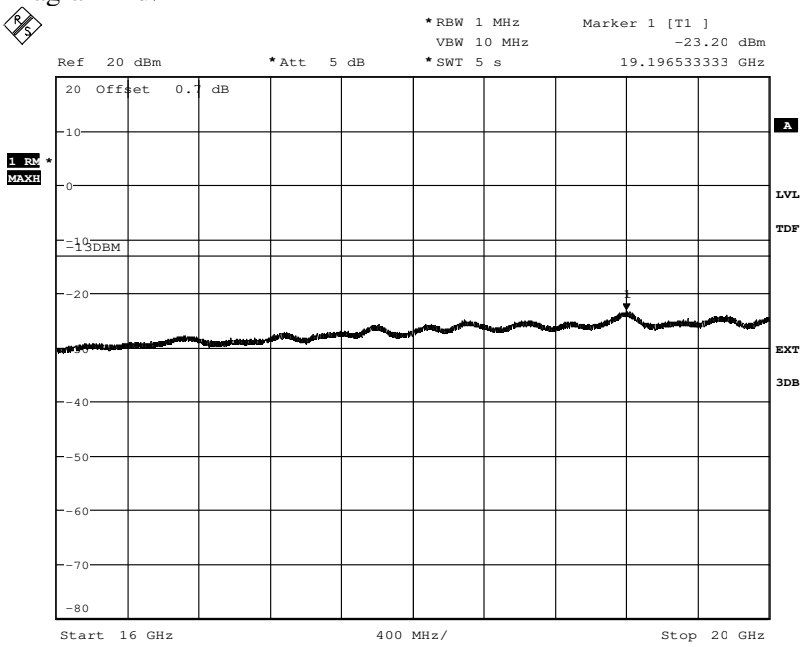
Appendix 5

Diagram 2 c:



Date: 9.APR.2014 09:53:32

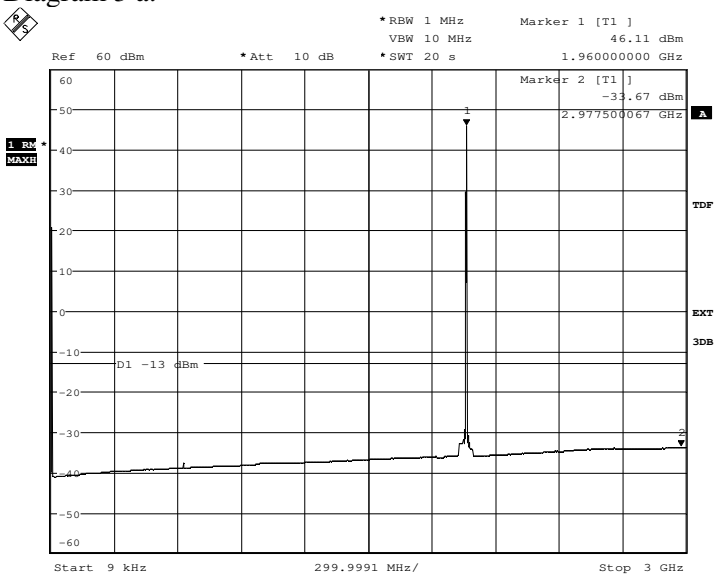
Diagram 2 d:



Date: 9.APR.2014 09:52:19

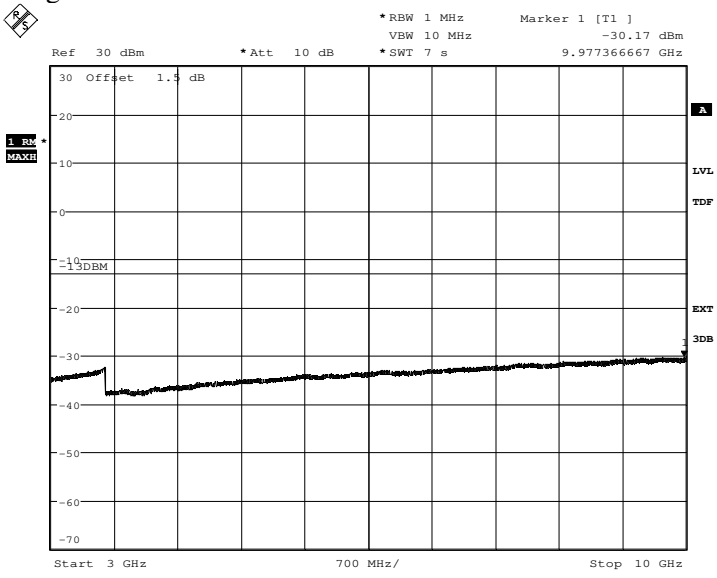
Appendix 5

Diagram 3 a:



Date: 8.APR.2014 15:21:28

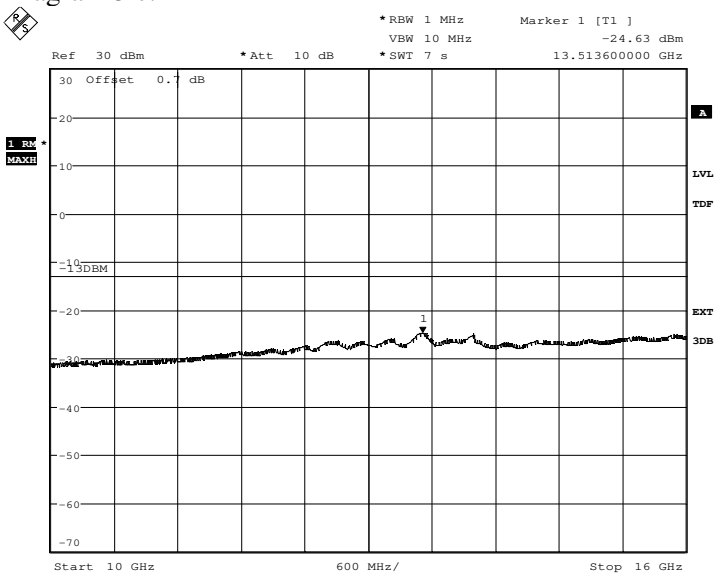
Diagram 3 b:



Date: 8.APR.2014 15:28:15

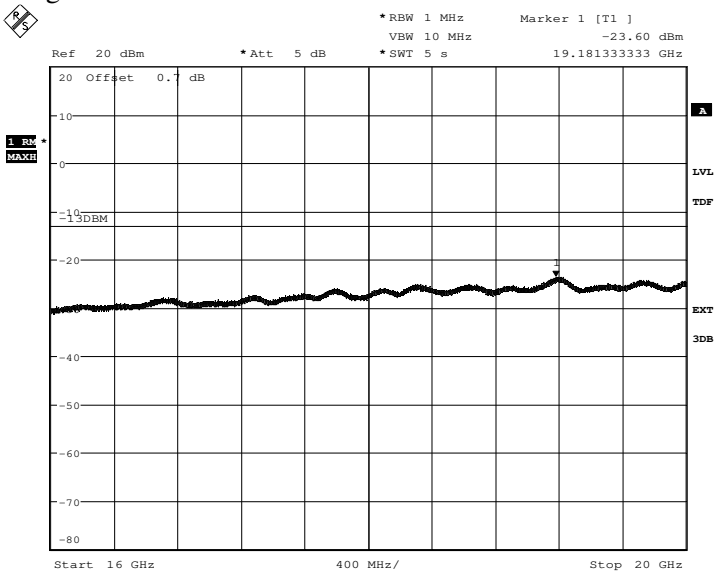
Appendix 5

Diagram 3 c:



Date: 8.APR.2014 15:31:07

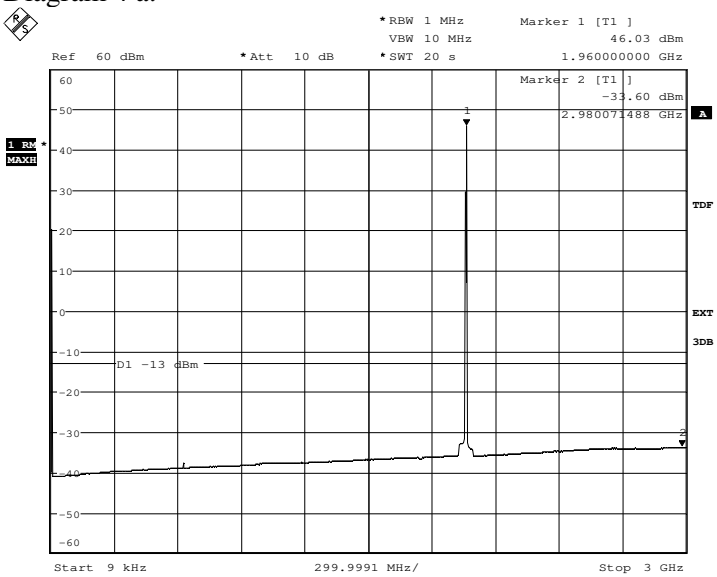
Diagram 3 d:



Date: 8.APR.2014 15:32:20

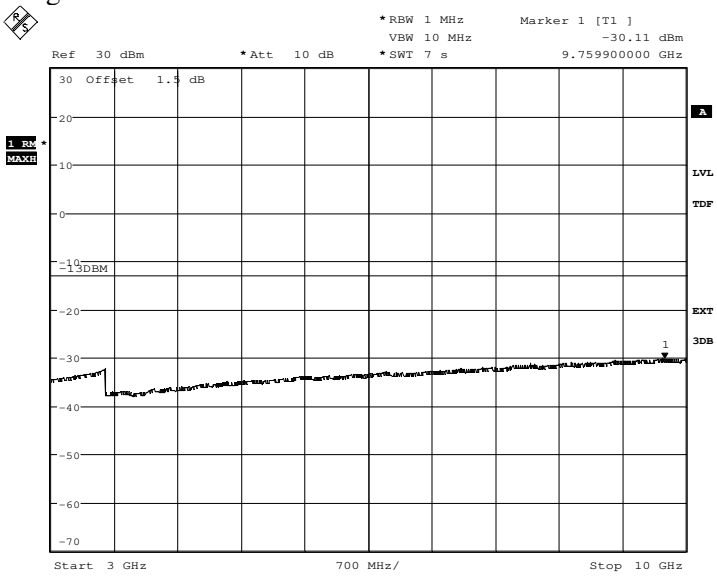
Appendix 5

Diagram 4 a:



Date: 8.APR.2014 14:53:22

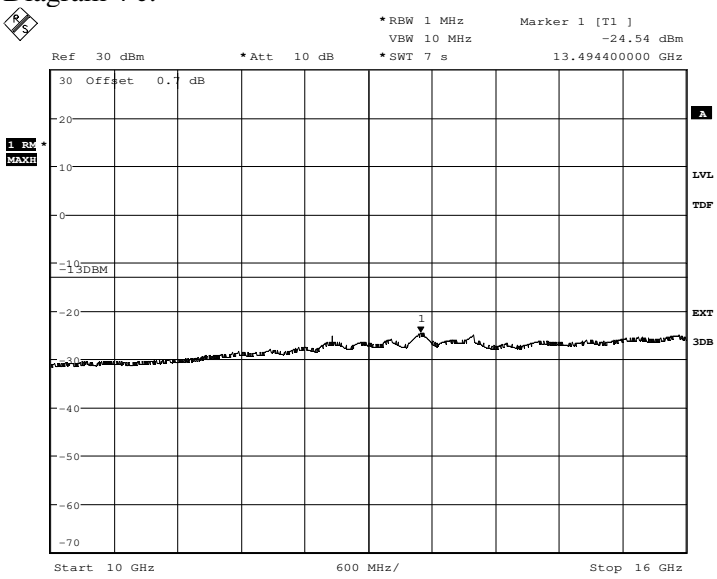
Diagram 4 b:



Date: 8.APR.2014 15:00:44

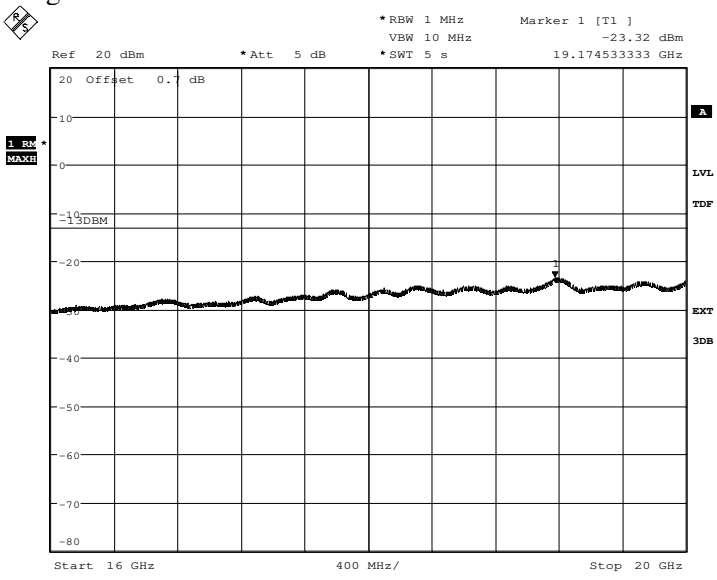
Appendix 5

Diagram 4 c:



Date: 8.APR.2014 15:03:27

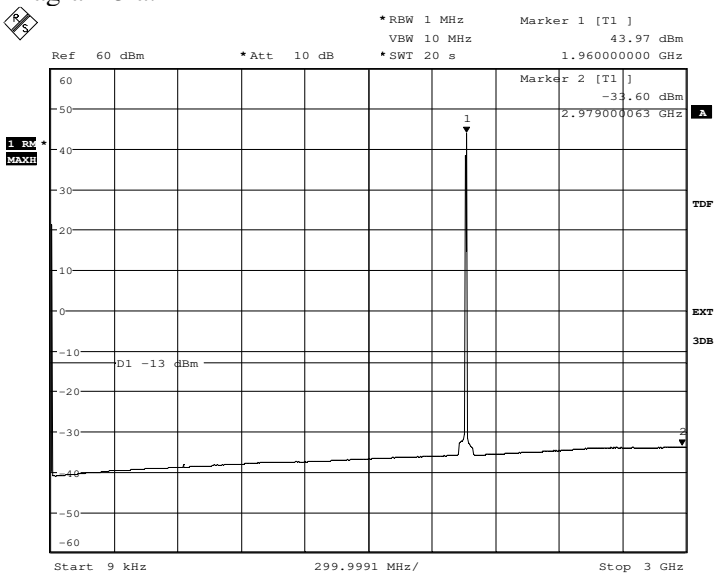
Diagram 4 d:



Date: 8.APR.2014 15:06:41

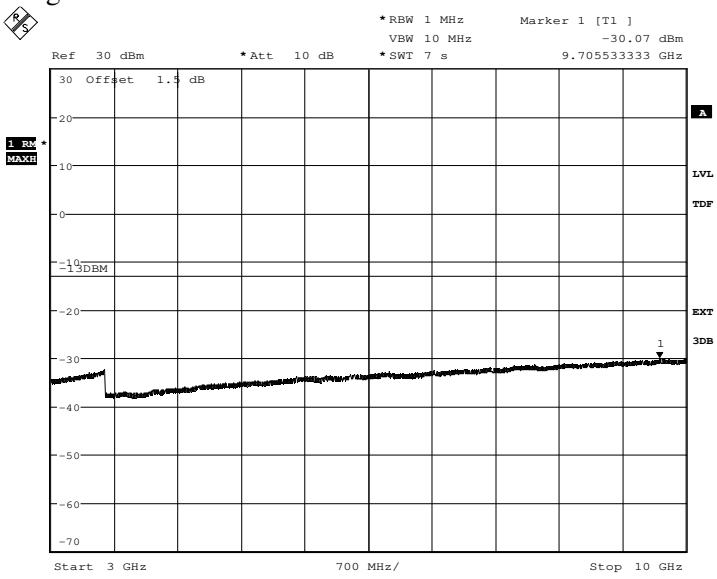
Appendix 5

Diagram 5 a:



Date: 8.APR.2014 15:40:59

Diagram 5 b:



Date: 8.APR.2014 15:37:28

Appendix 5

Diagram 5 c:

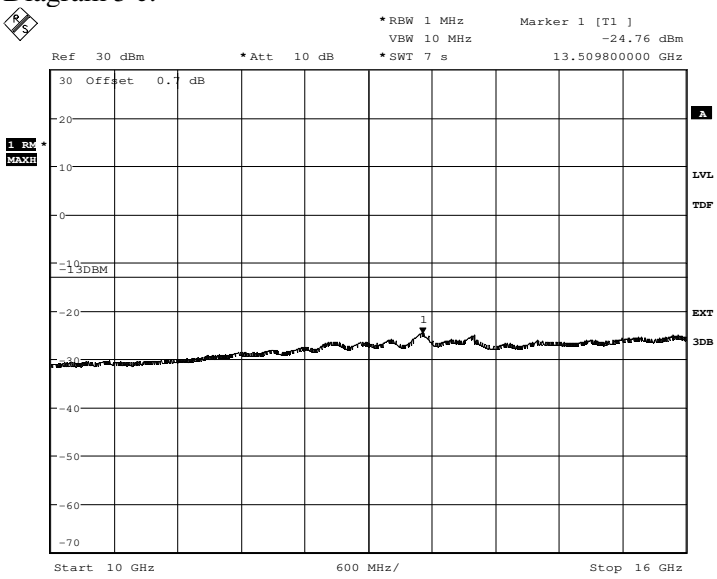


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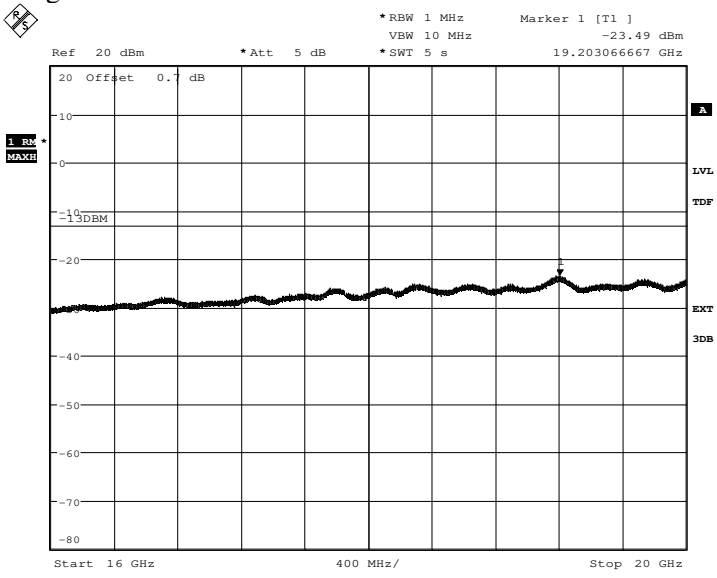
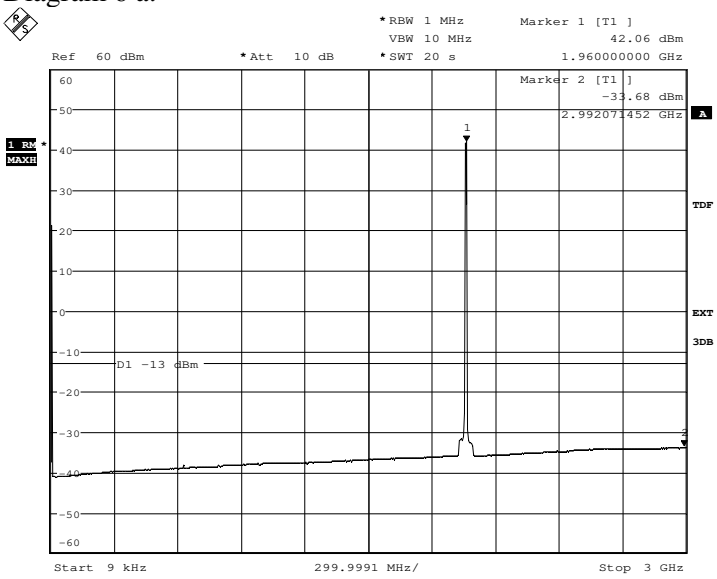
Diagram 5 d:



Date: 8.APR.2014 15:33:43

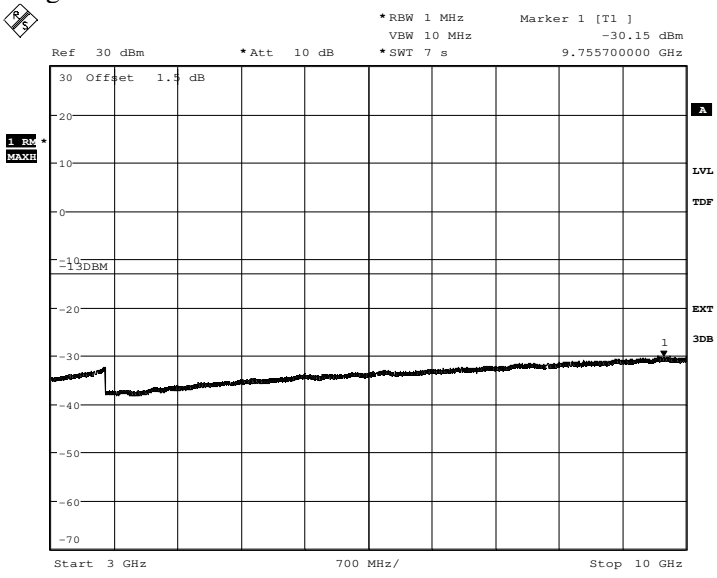
Appendix 5

Diagram 6 a:



Date: 8.APR.2014 15:43:01

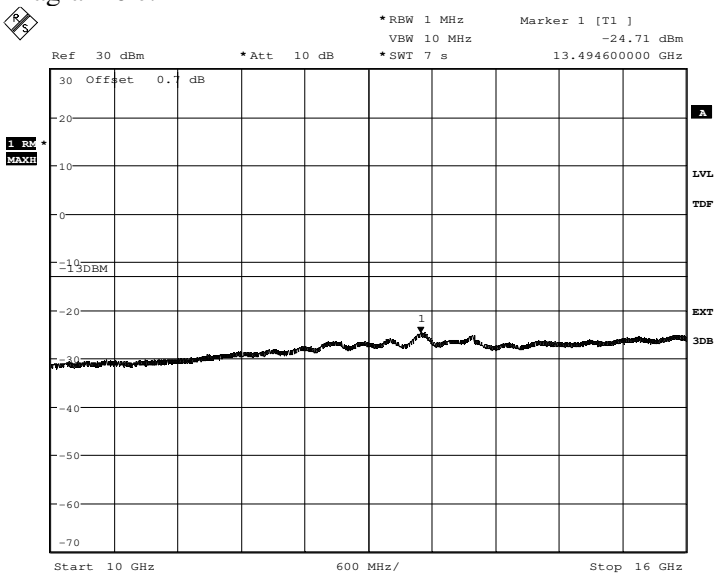
Diagram 6 b:



Date: 8.APR.2014 15:48:49

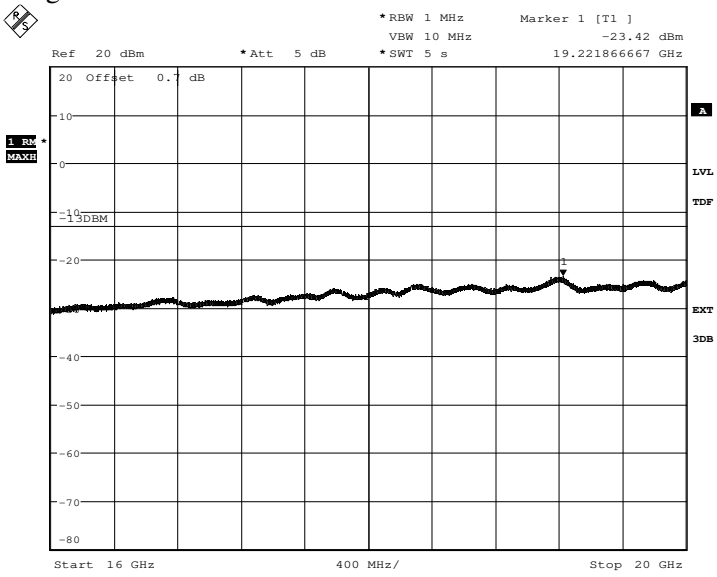
Appendix 5

Diagram 6 c:



Date: 8.APR.2014 15:50:32

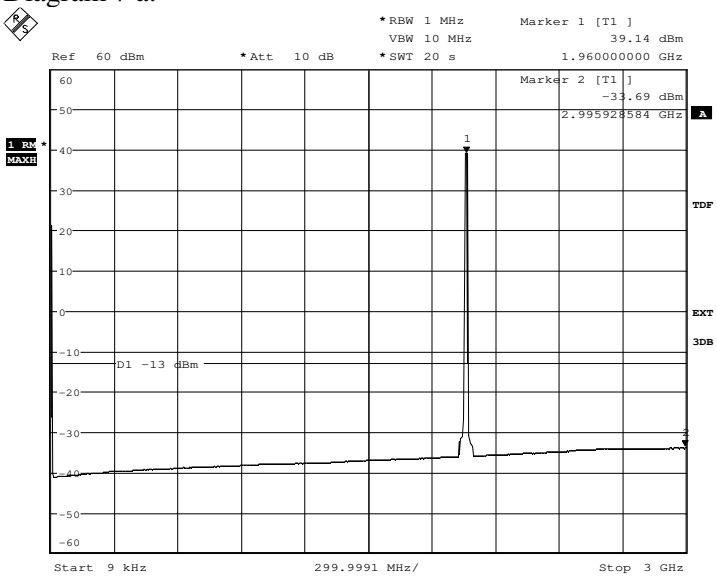
Diagram 6 d:



Date: 8.APR.2014 15:51:54

Appendix 5

Diagram 7 a:



Date: 8.APR.2014 15:59:27

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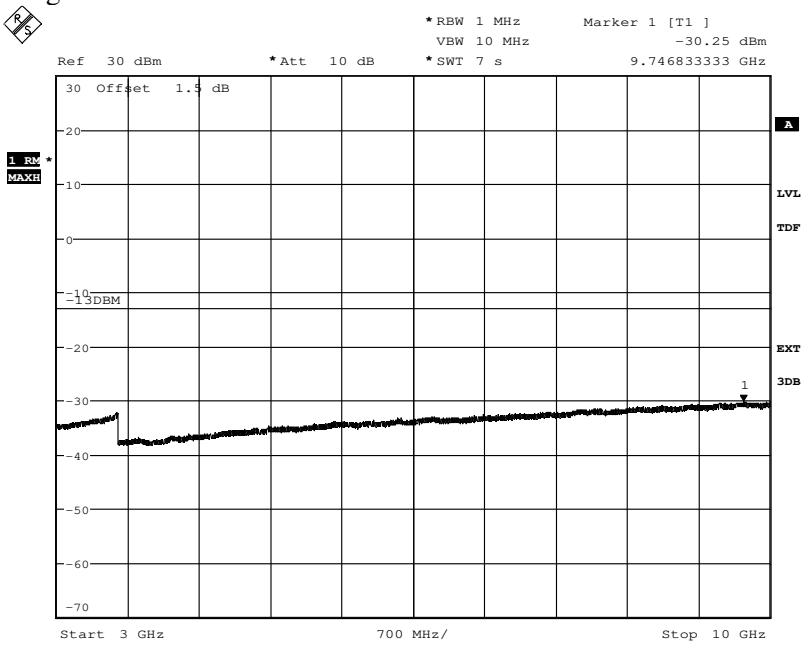
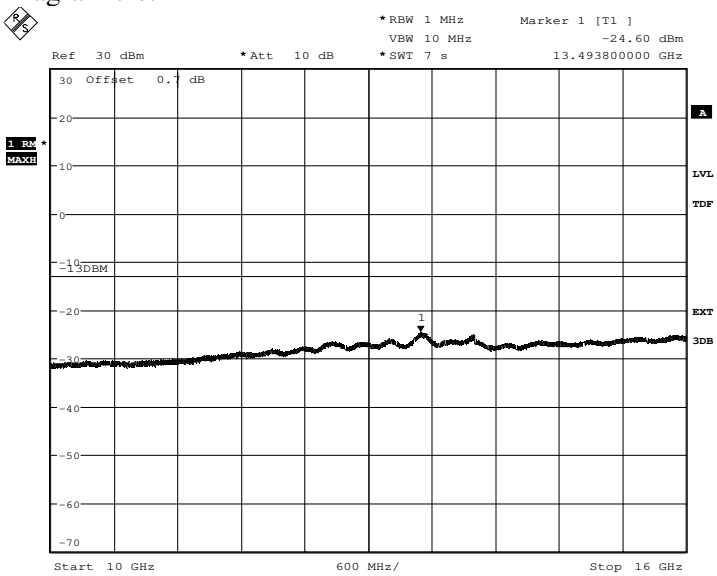


Date: 11.APR.2014 09:35:16

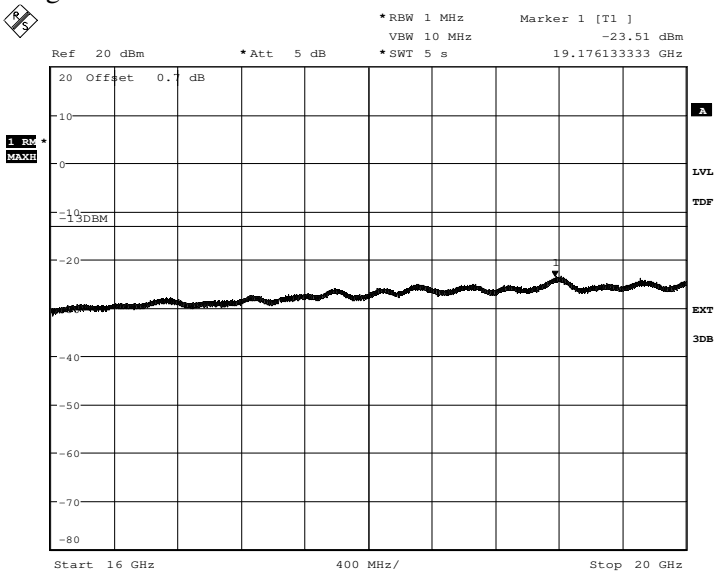
Appendix 5

Diagram 7 c:



Date: 8.APR.2014 15:55:25

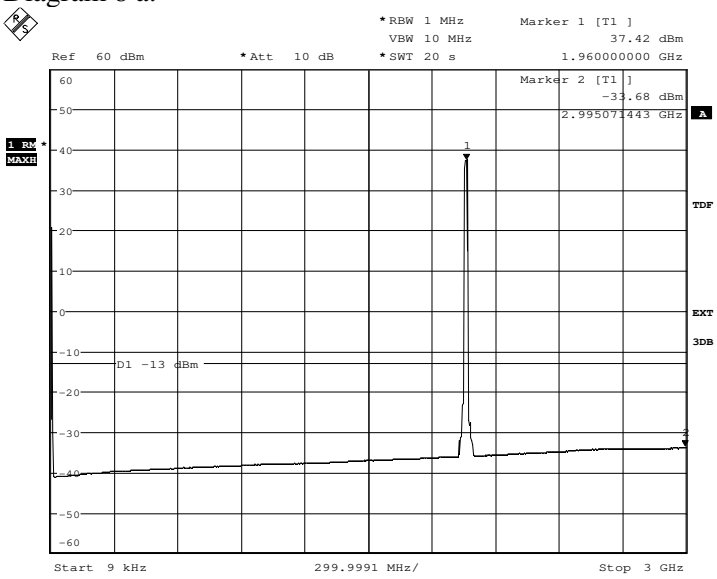
Diagram 7 d:



Date: 8.APR.2014 15:54:06

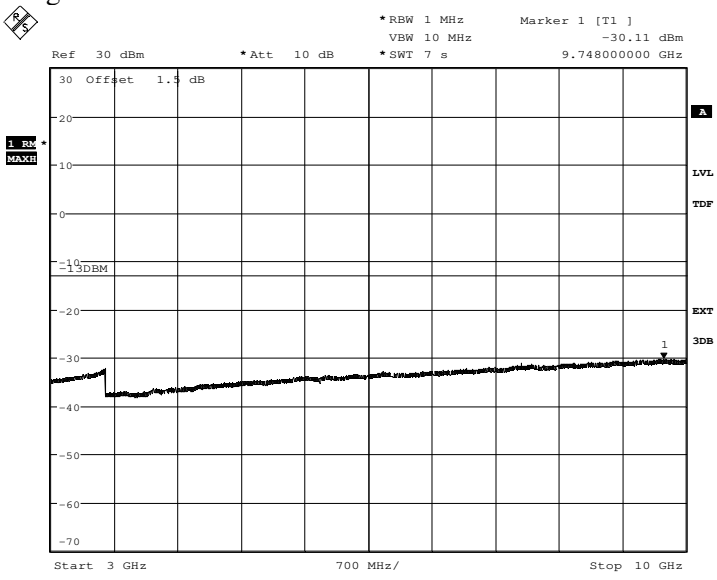
Appendix 5

Diagram 8 a:



Date: 8.APR.2014 16:02:08

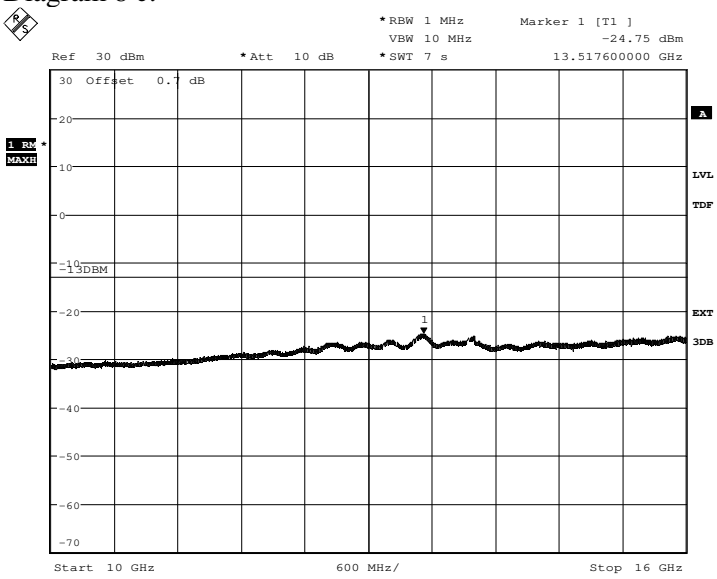
Diagram 8 b:



Date: 8.APR.2014 16:04:10

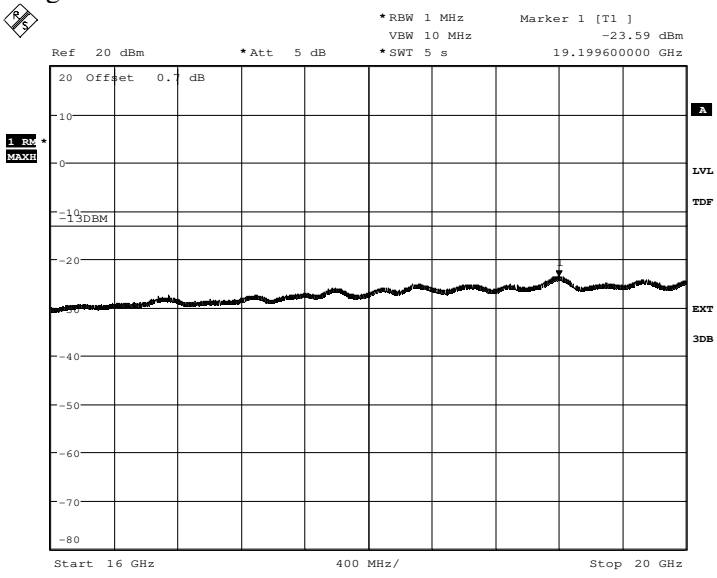
Appendix 5

Diagram 8 c:



Date: 8.APR.2014 16:05:28

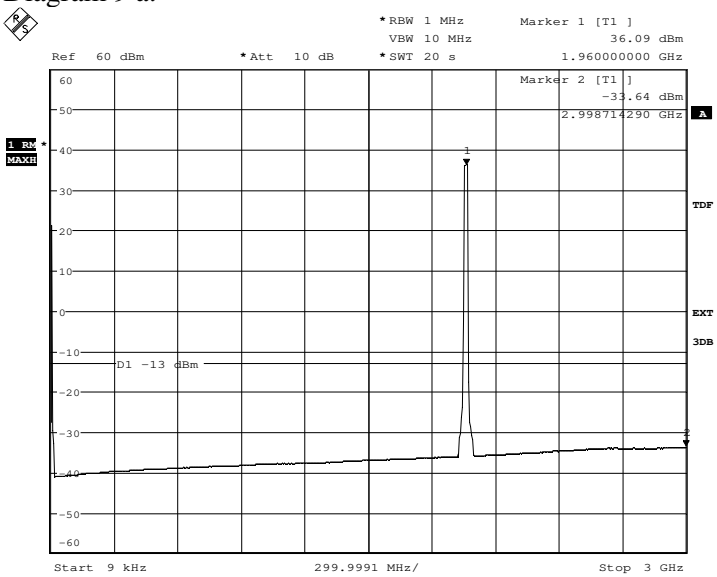
Diagram 8 d:



Date: 8.APR.2014 16:07:12

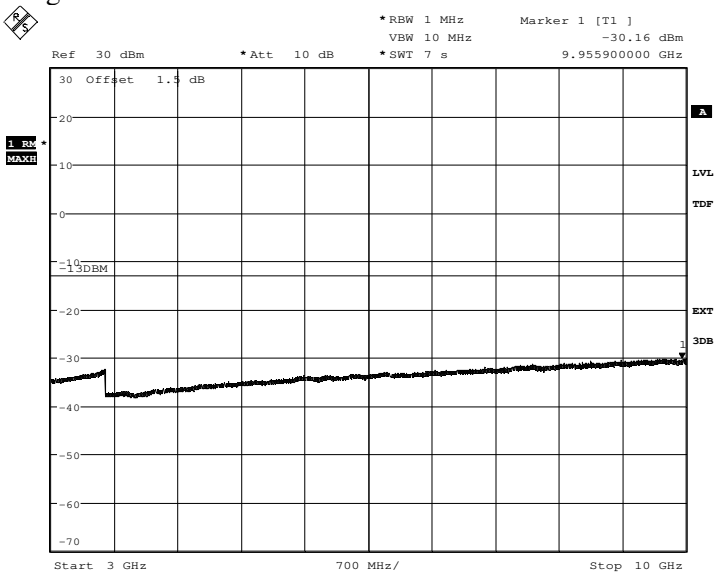
Appendix 5

Diagram 9 a:



Date: 8.APR.2014 16:13:02

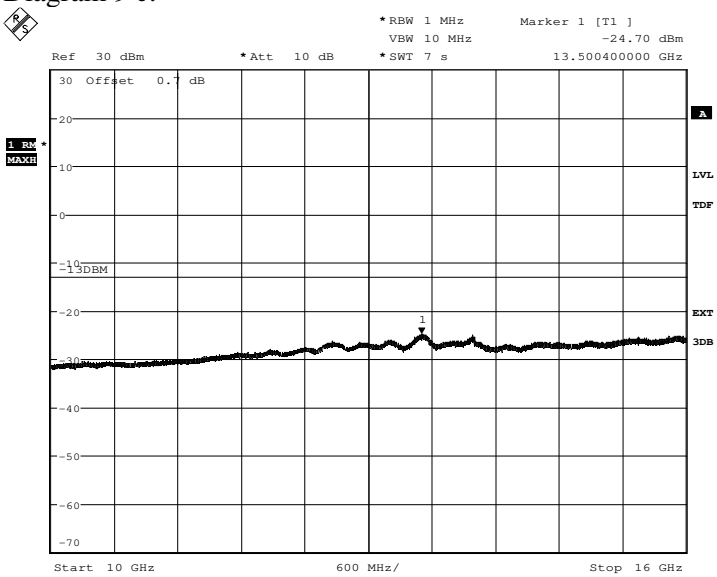
Diagram 9 b:



Date: 8.APR.2014 16:11:00

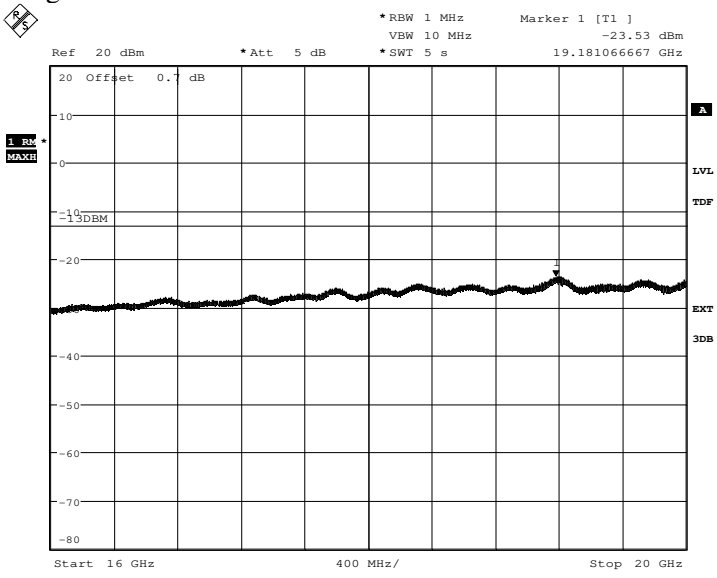
Appendix 5

Diagram 9 c:



Date: 8.APR.2014 16:09:47

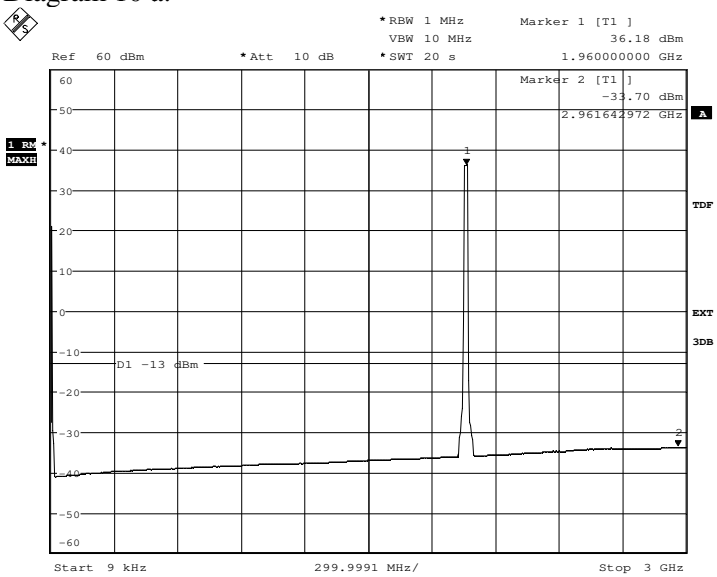
Diagram 9 d:



Date: 8.APR.2014 16:08:46

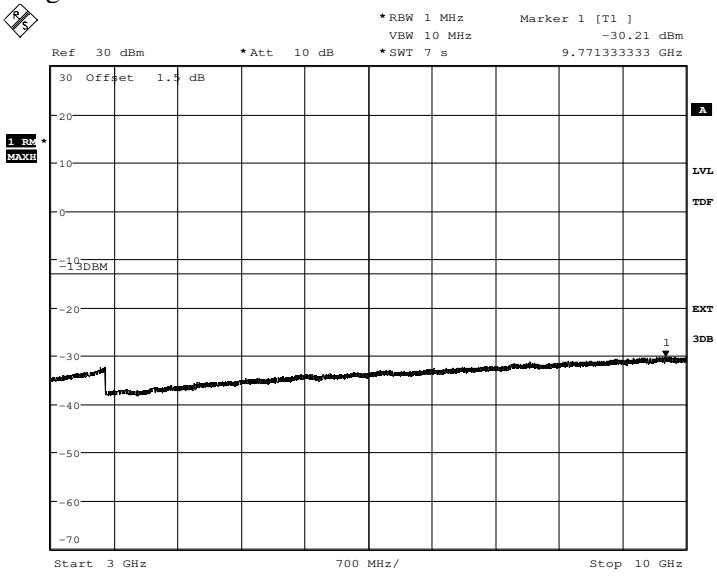
Appendix 5

Diagram 10 a:



Date: 8.APR.2014 15:23:49

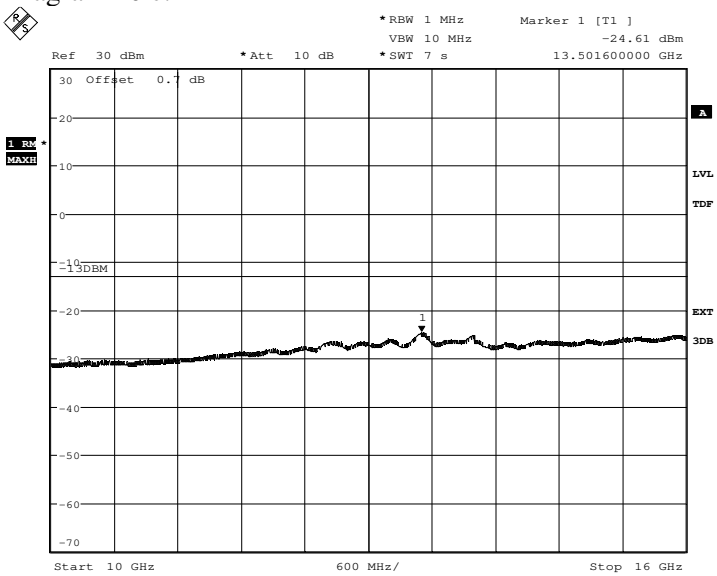
Diagram 10 b:



Date: 8.APR.2014 15:12:43

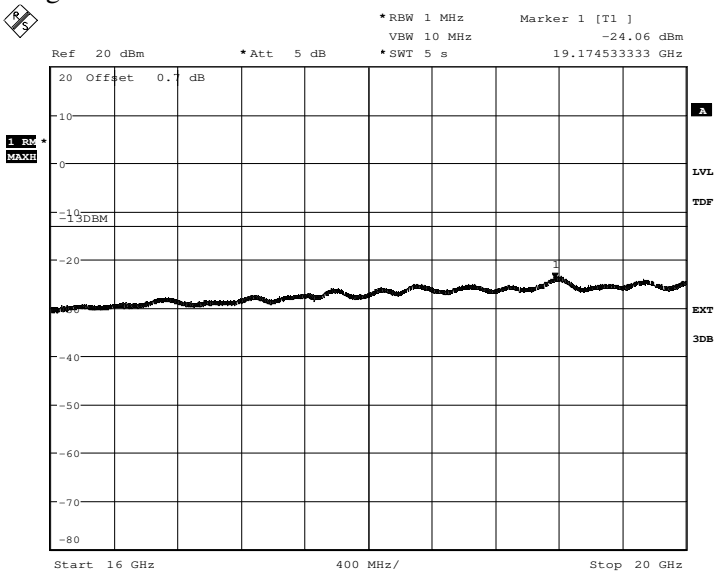
Appendix 5

Diagram 10 c:



Date: 8.APR.2014 15:11:32

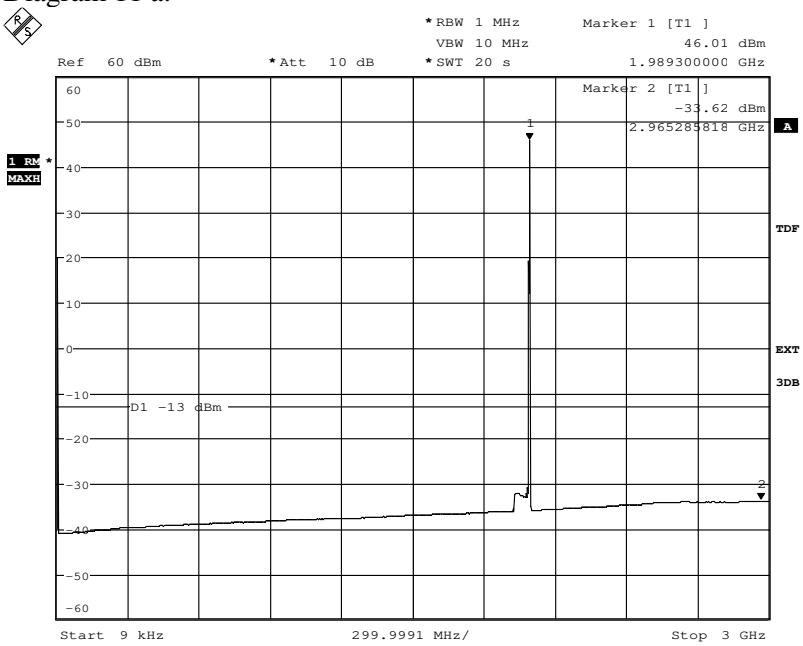
Diagram 10 d:



Date: 8.APR.2014 15:10:08

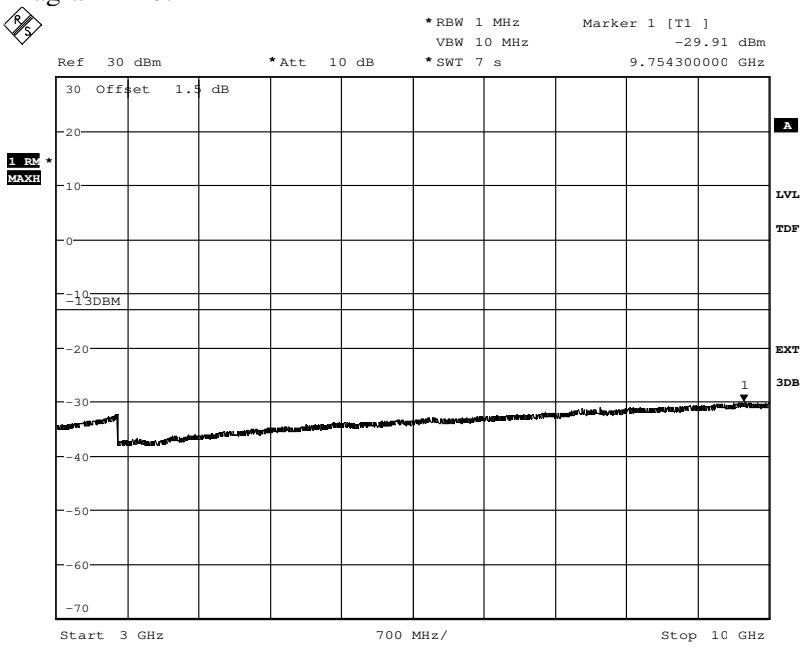
Appendix 5

Diagram 11 a:



Date: 9.APR.2014 10:10:51

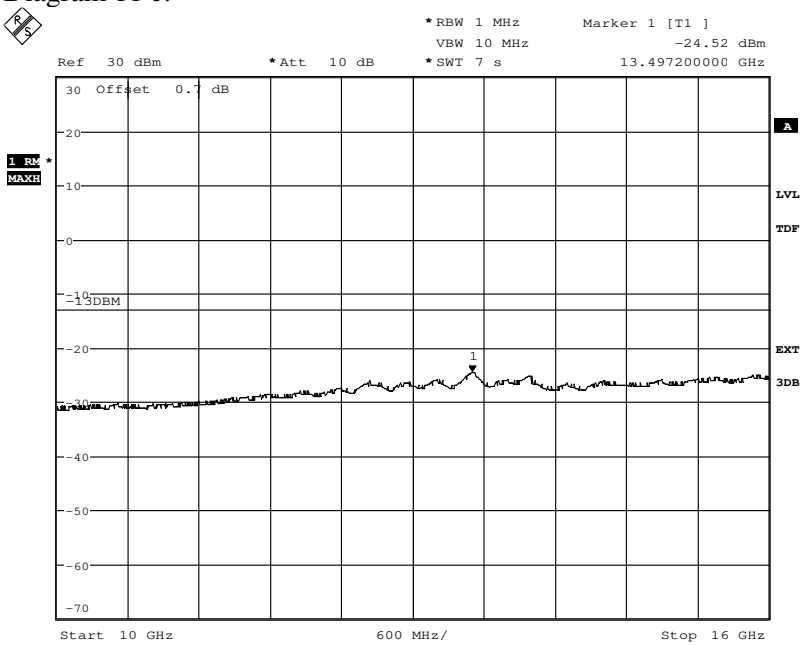
Diagram 11 b:



Date: 9.APR.2014 10:13:50

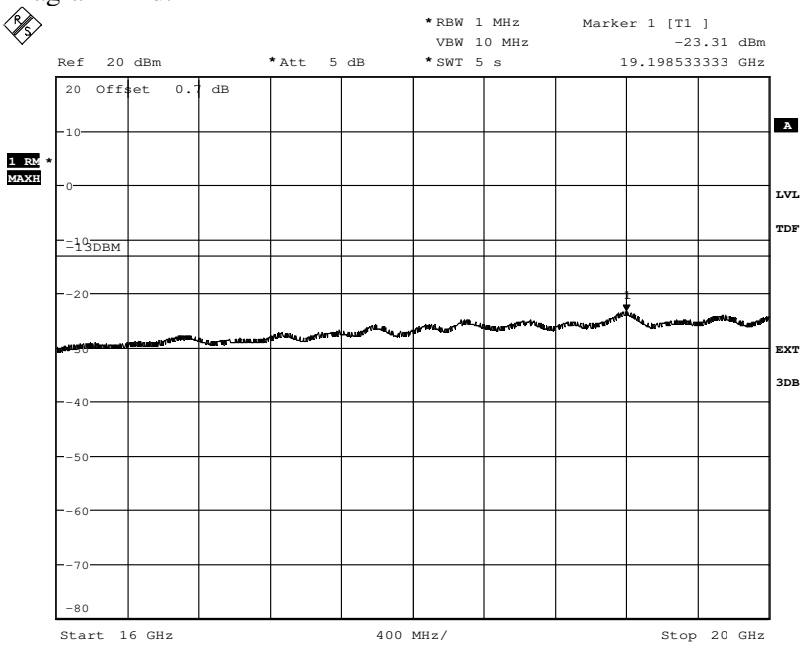
Appendix 5

Diagram 11 c:



Date: 9.APR.2014 10:18:22

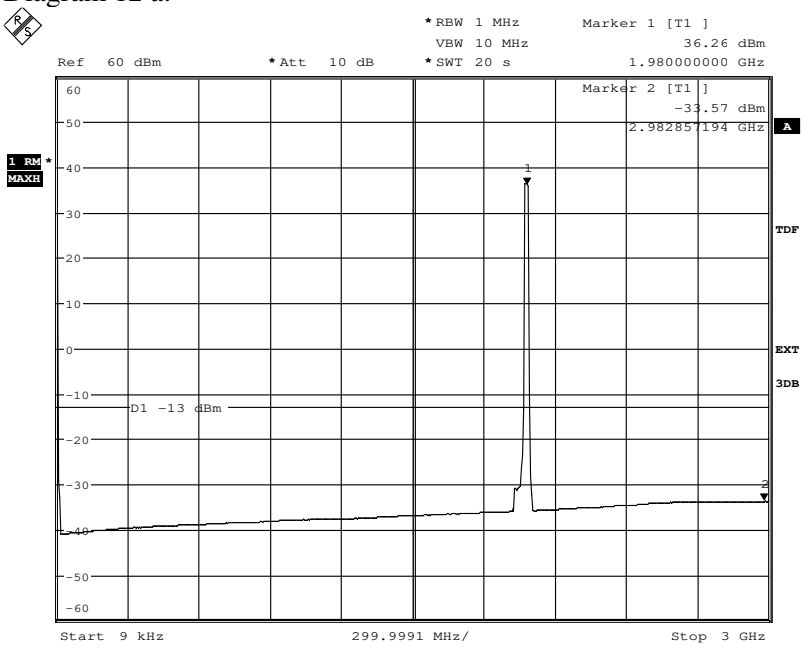
Diagram 11 d:



Date: 9.APR.2014 10:22:32

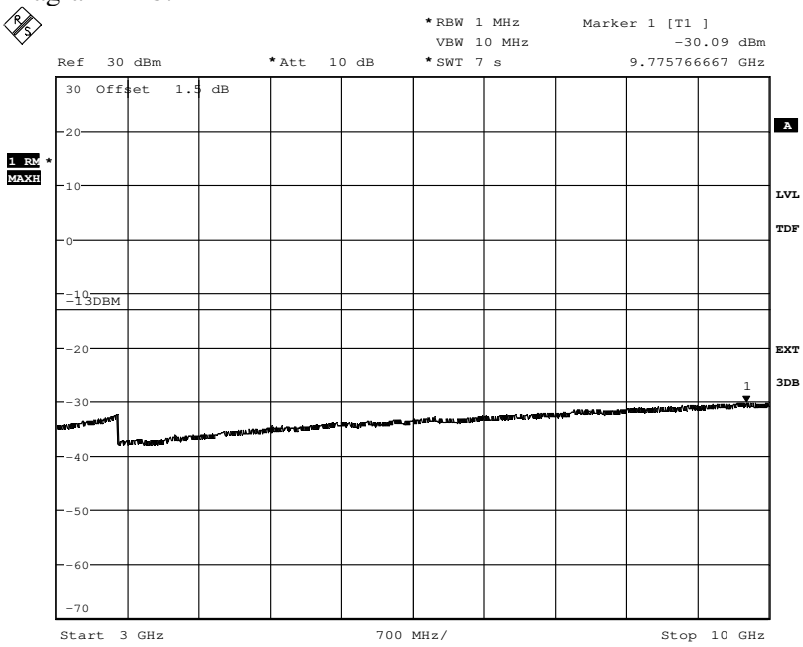
Appendix 5

Diagram 12 a:



Date: 9.APR.2014 10:33:41

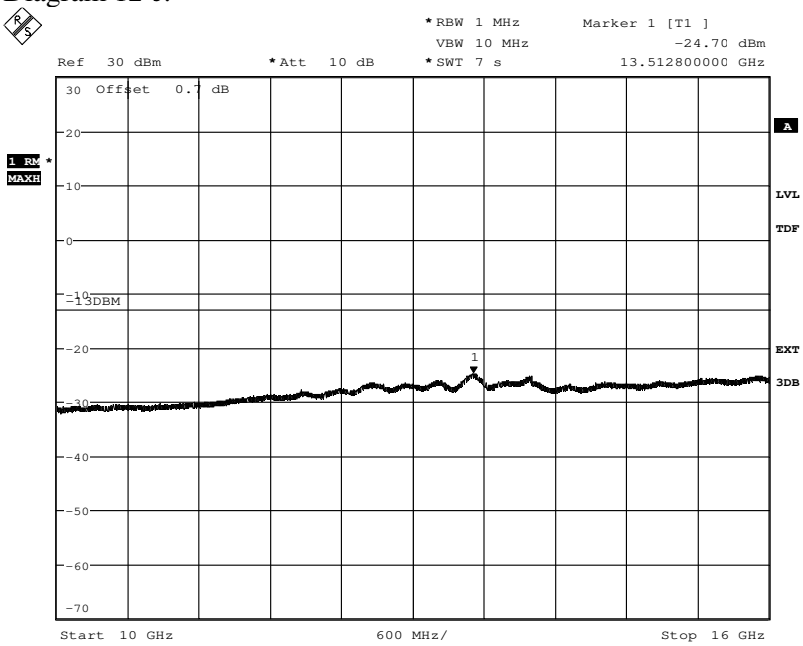
Diagram 12 b:



Date: 9.APR.2014 10:28:47

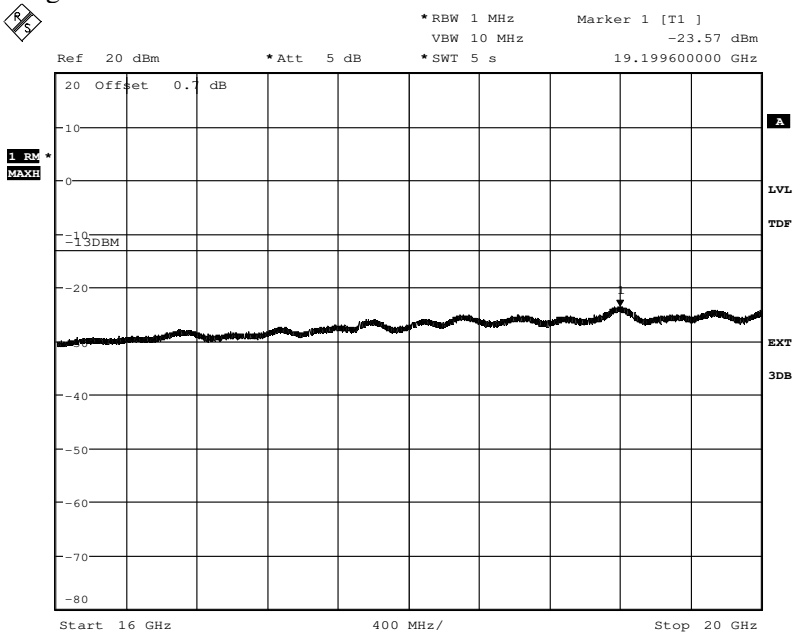
Appendix 5

Diagram 12 c:



Date: 9.APR.2014 10:27:21

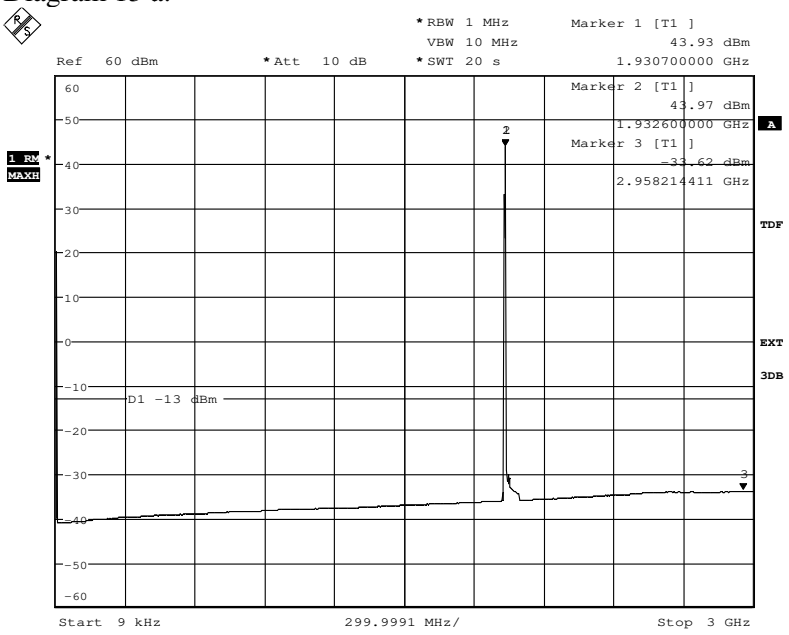
Diagram 12 d:



Date: 9.APR.2014 10:26:06

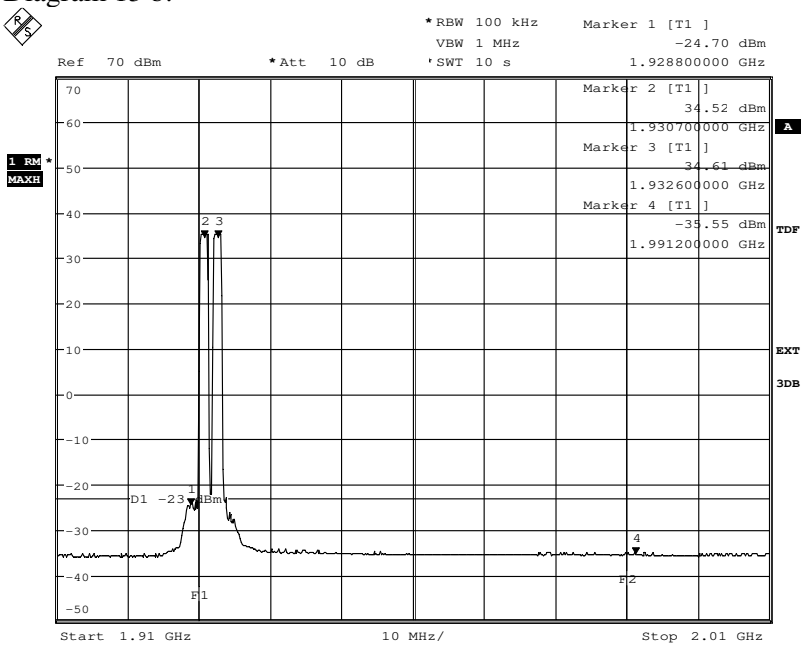
Appendix 5

Diagram 13 a:



Date: 9.APR.2014 12:55:26

Diagram 13 b:

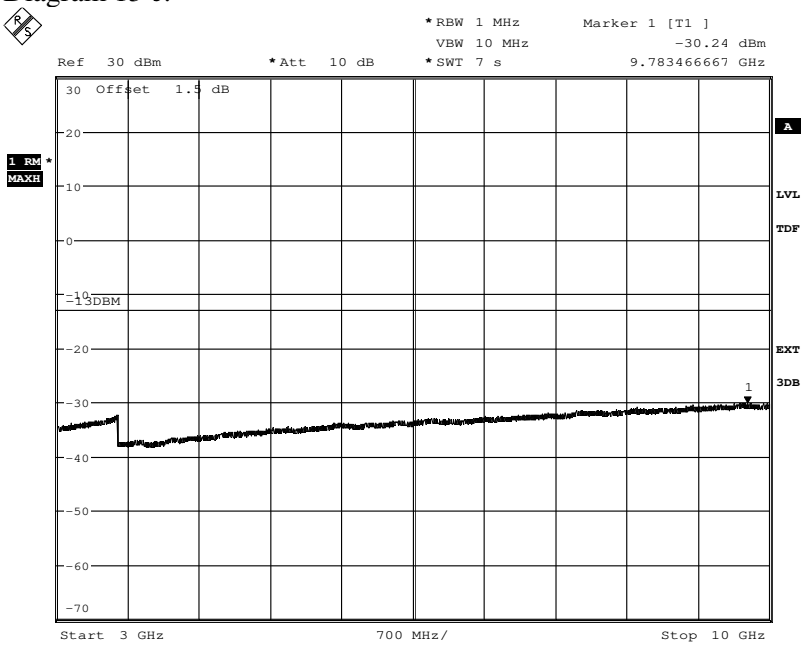


Date: 9.APR.2014 13:03:55

The emission at 1928.8 MHz was –21.42 dBm, measured with the channel power method with 1 MHz channel bandwidth.

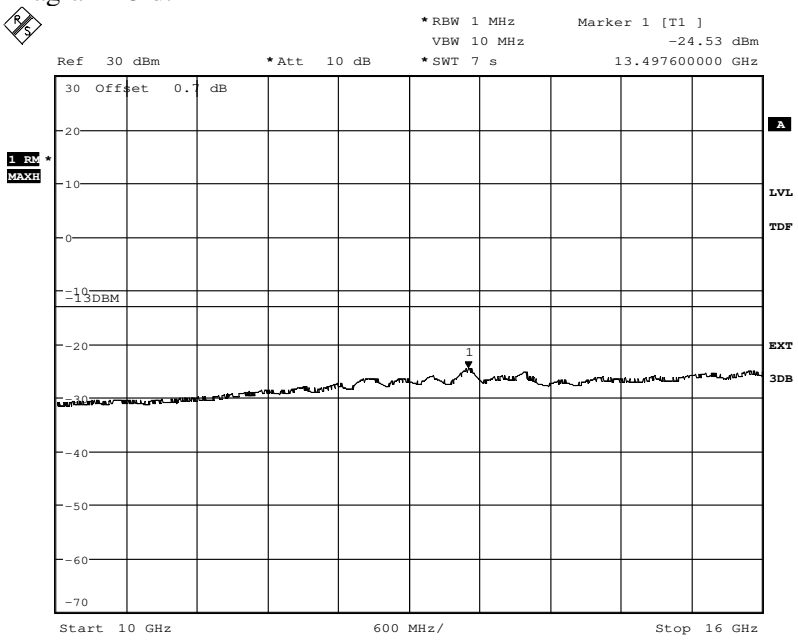
Appendix 5

Diagram 13 c:



Date: 9.APR.2014 13:13:04

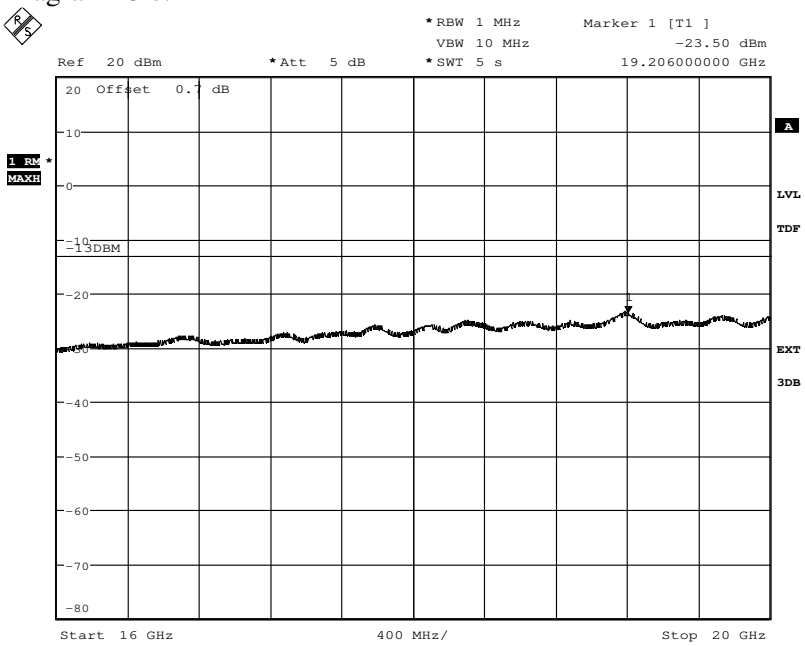
Diagram 13 d:



Date: 9.APR.2014 13:20:21

Appendix 5

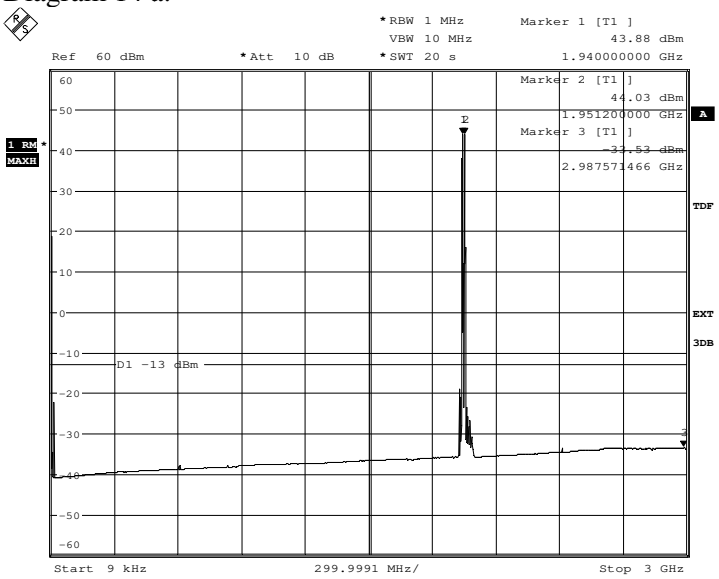
Diagram 13 e:



Date: 9.APR.2014 13:23:15

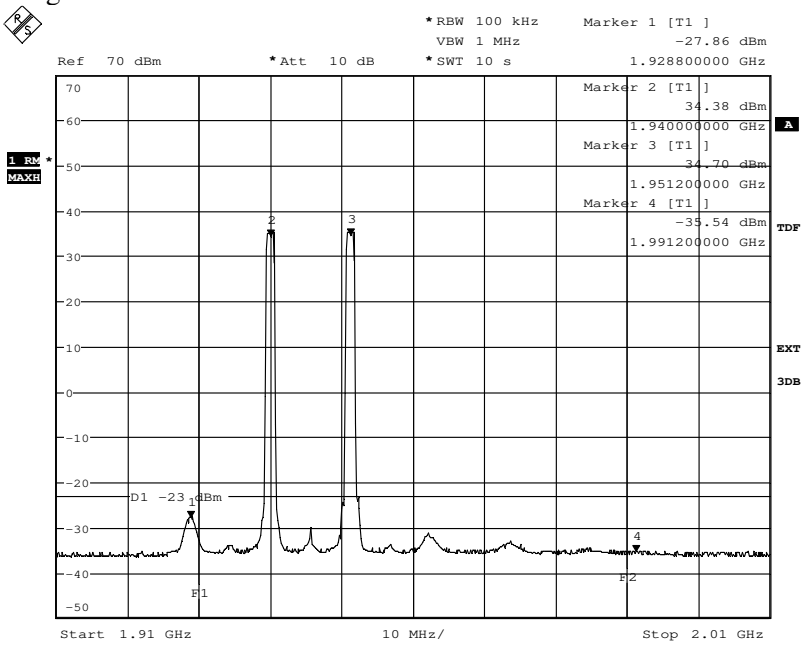
Appendix 5

Diagram 14 a:



Date: 8.APR.2014 20:54:43

Diagram 14 b:

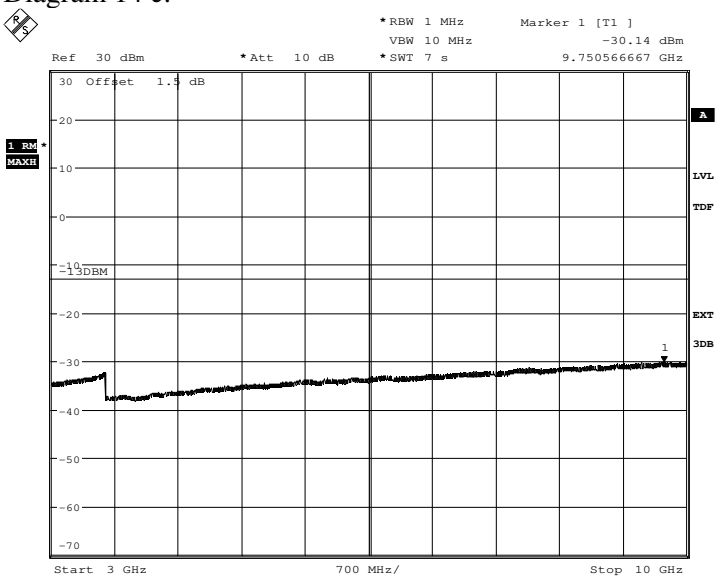


Date: 9.APR.2014 14:24:09

The emission at 1928.8 MHz was –22.47 dBm, measured with the channel power method with 1 MHz channel bandwidth.

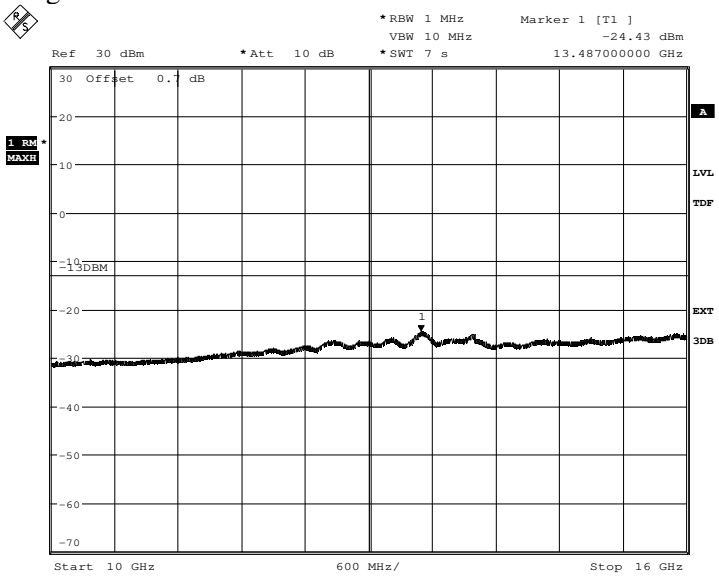
Appendix 5

Diagram 14 c:



Date: 8.APR.2014 20:52:52

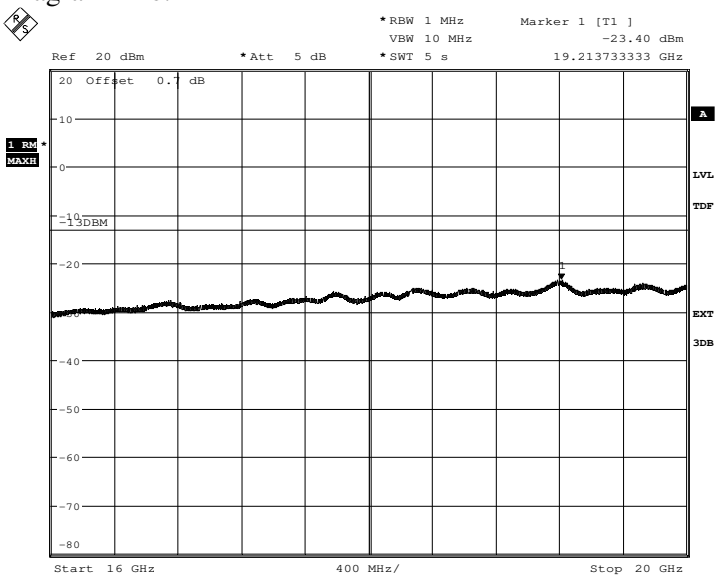
Diagram 14 d:



Date: 8.APR.2014 20:52:01

Appendix 5

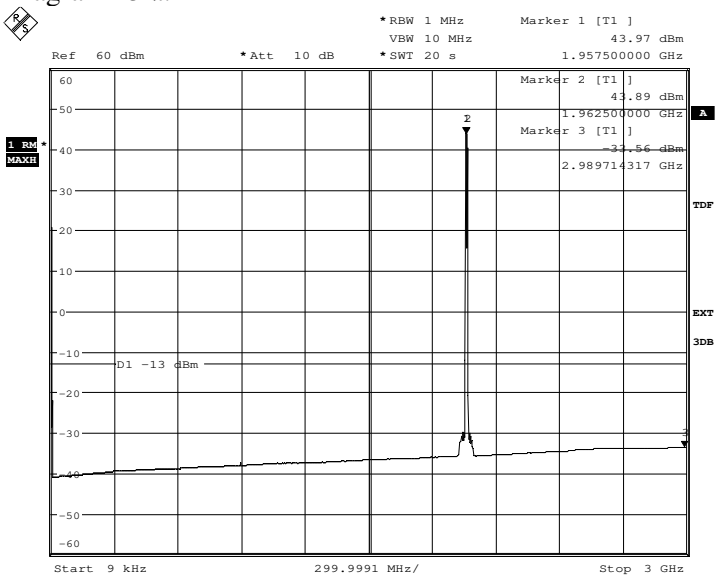
Diagram 14 e:



Date: 8.APR.2014 20:51:11

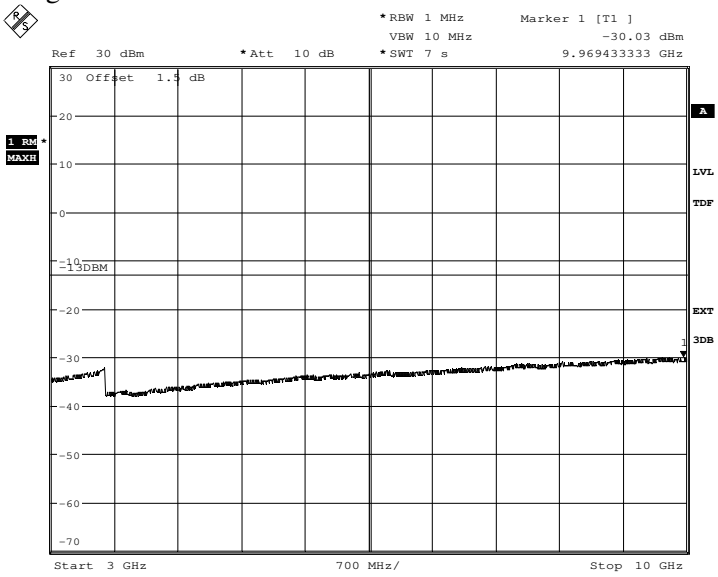
Appendix 5

Diagram 15 a:



Date: 8.APR.2014 17:04:51

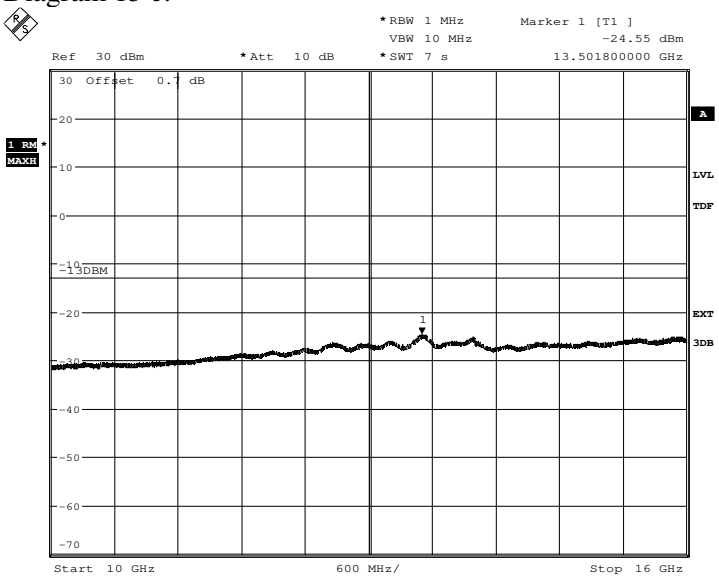
Diagram 15 b:



Date: 8.APR.2014 19:05:47

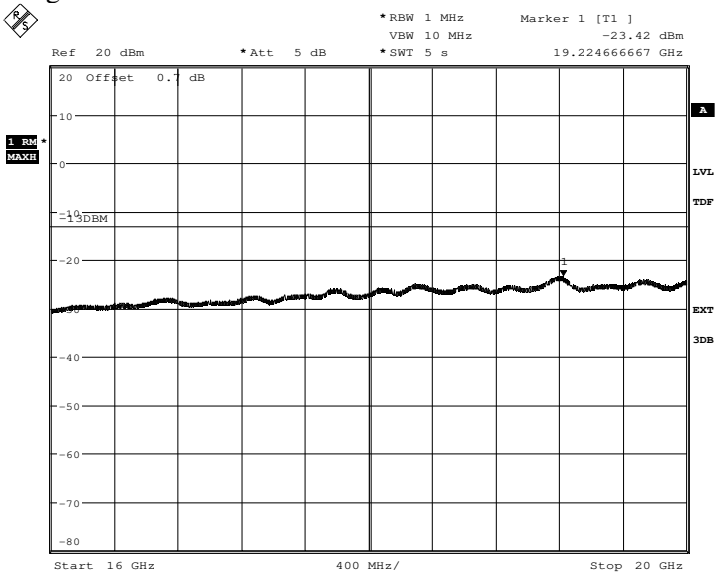
Appendix 5

Diagram 15 c:



Date: 8.APR.2014 19:07:56

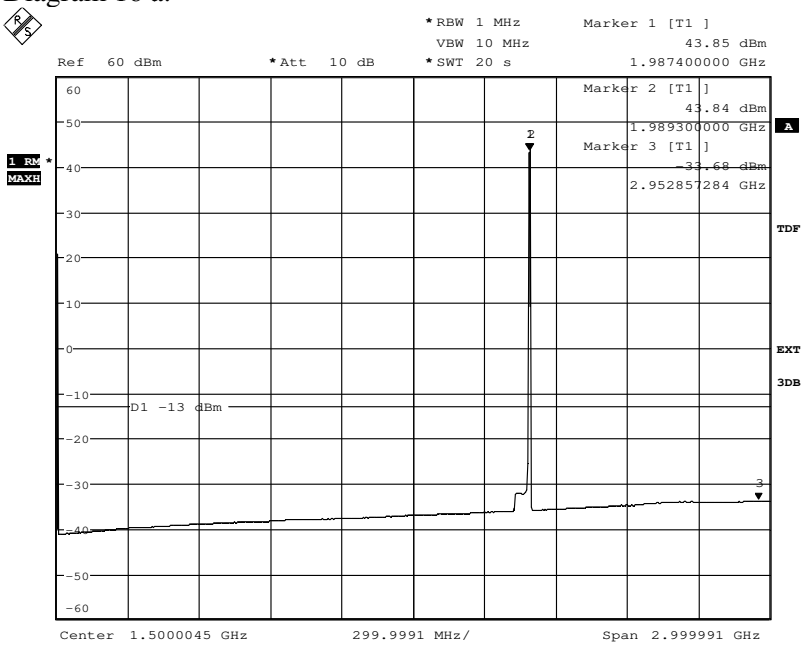
Diagram 15 d:



Date: 8.APR.2014 19:09:43

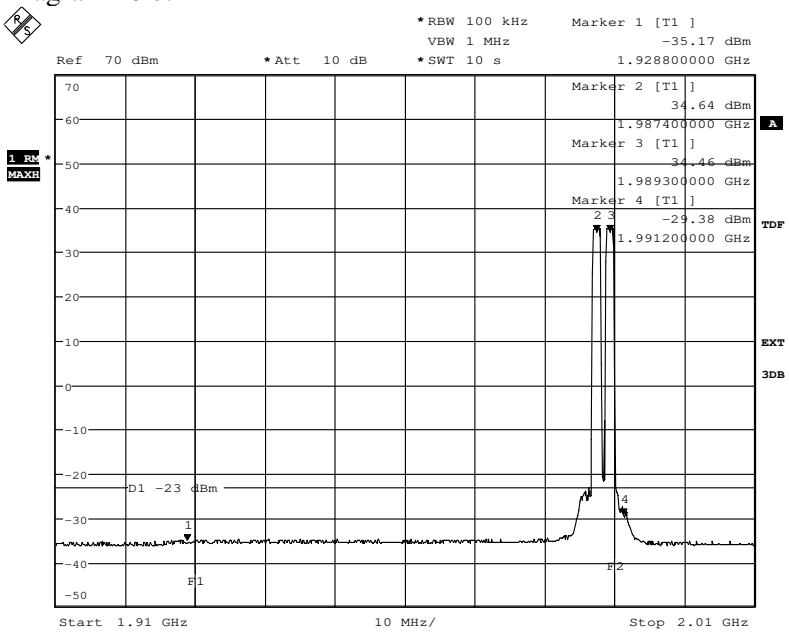
Appendix 5

Diagram 16 a:



Date: 11.APR.2014 09:26:08

Diagram 16 b:

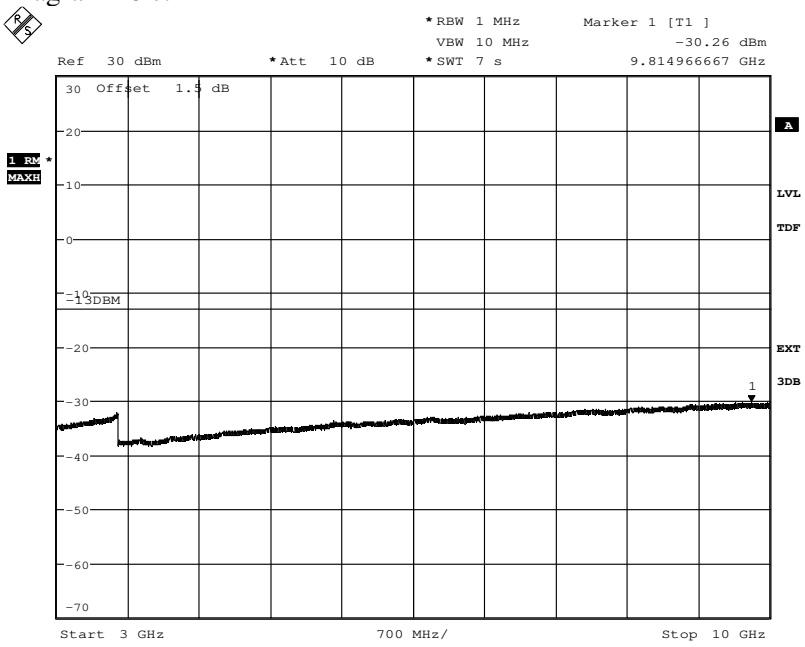


Date: 9.APR.2014 13:56:42

The emission at 1991.2 MHz was –22.44 dBm, measured with the channel power method with 1 MHz channel bandwidth.

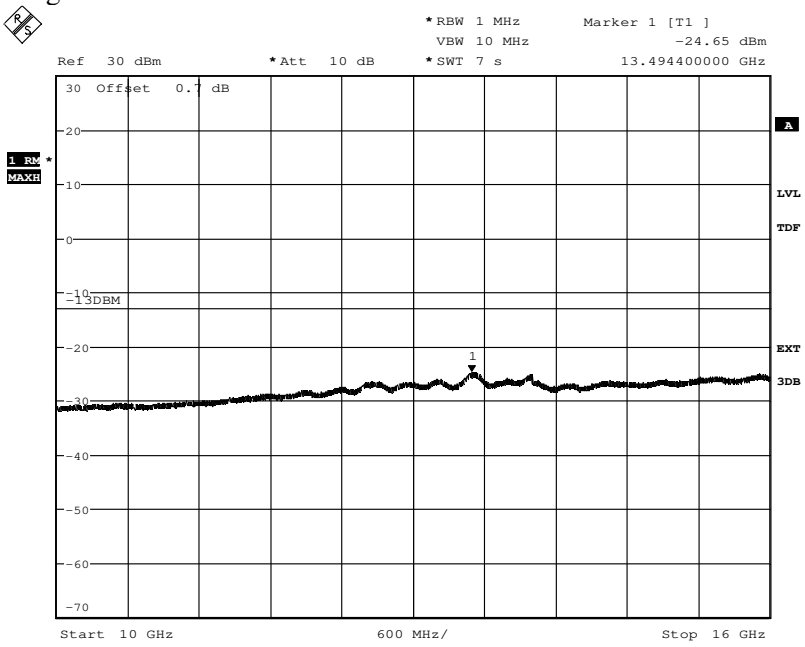
Appendix 5

Diagram 16 c:



Date: 9.APR.2014 14:06:48

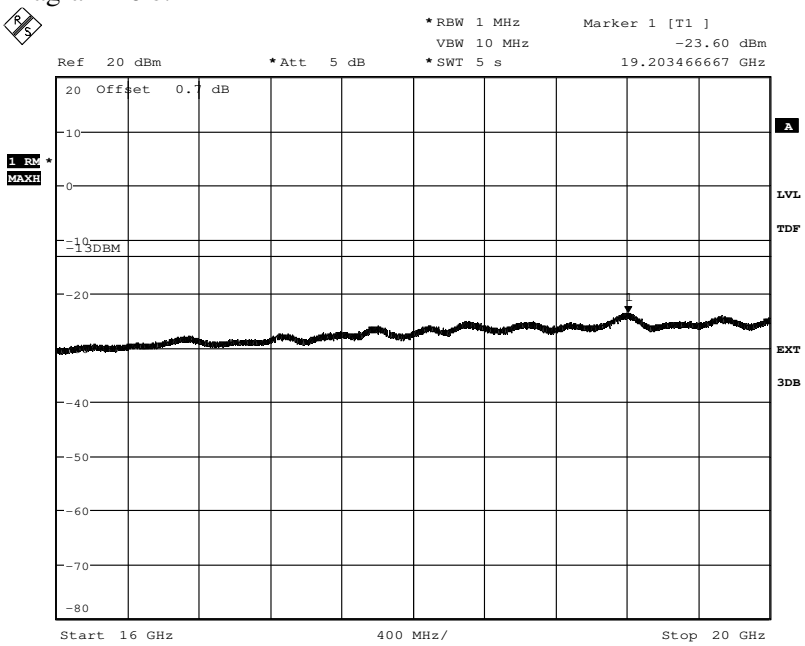
Diagram 16 d:



Date: 9.APR.2014 14:07:59

Appendix 5

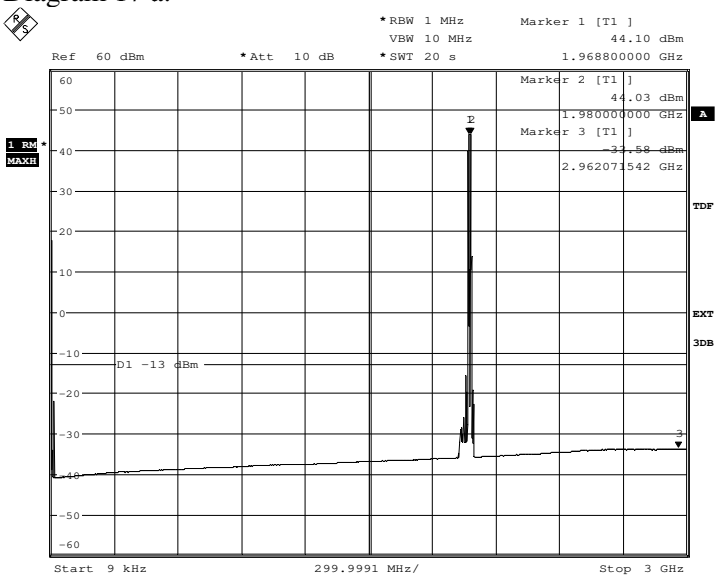
Diagram 16 e:



Date: 9.APR.2014 14:09:15

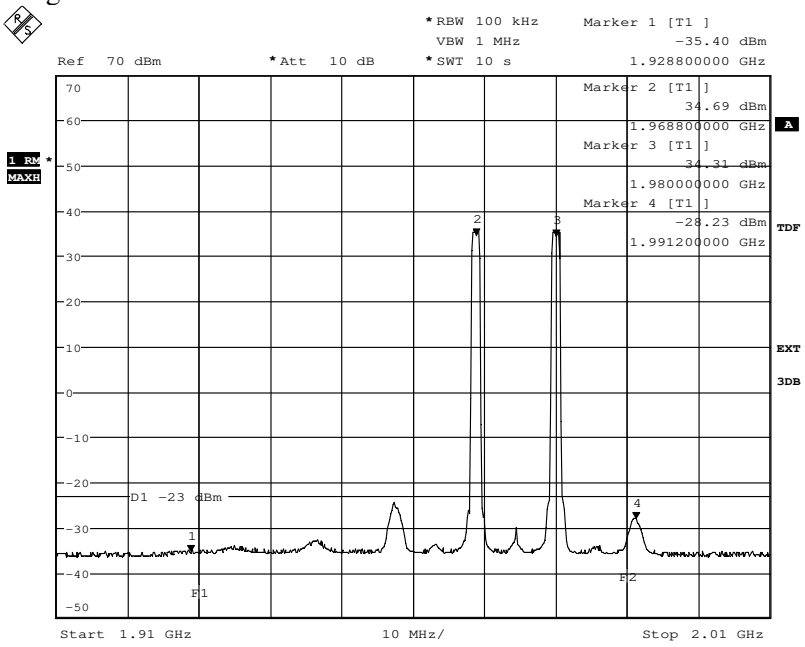
Appendix 5

Diagram 17 a:



Date: 8.APR.2014 21:47:27

Diagram 17 b:

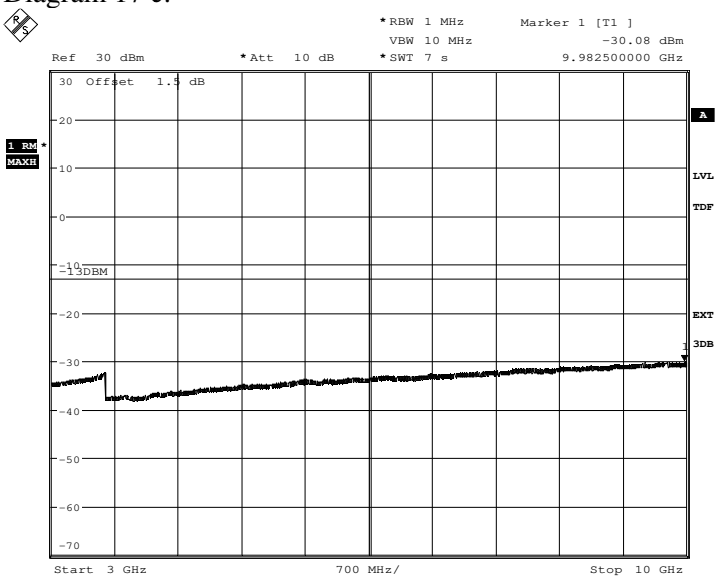


Date: 9.APR.2014 14:33:32

The emission at 1991.2 MHz was –22.50 dBm, measured with the channel power method with 1 MHz channel bandwidth.

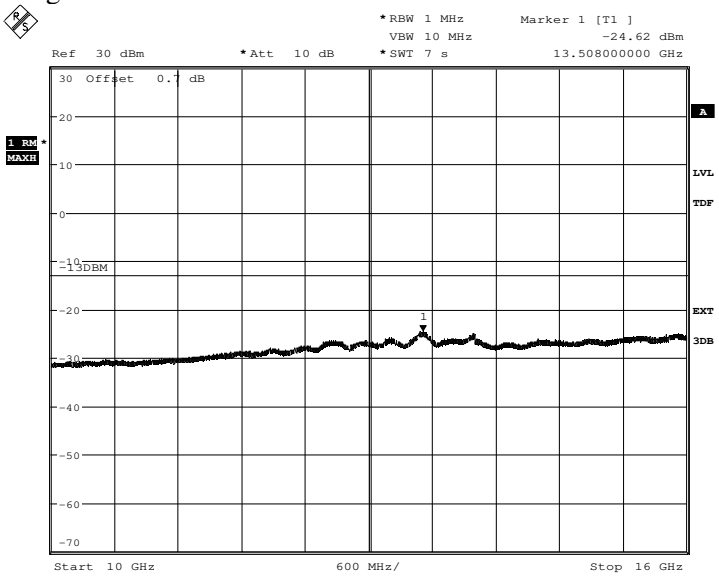
Appendix 5

Diagram 17 c:



Date: 8.APR.2014 21:45:24

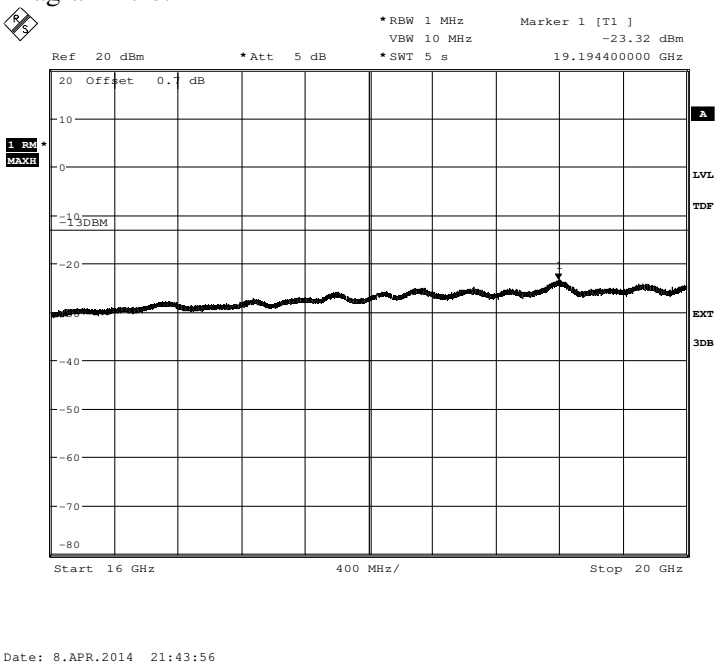
Diagram 17 d:



Date: 8.APR.2014 21:44:35

Appendix 5

Diagram 17 e:



Appendix 6

Field strength of spurious radiation measurements according to CFR 47 §2.1053 / IC RSS-133 6.5

Date	Temperature	Humidity
2014-05-23	23 °C ± 3°C	40 % ± 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-2.

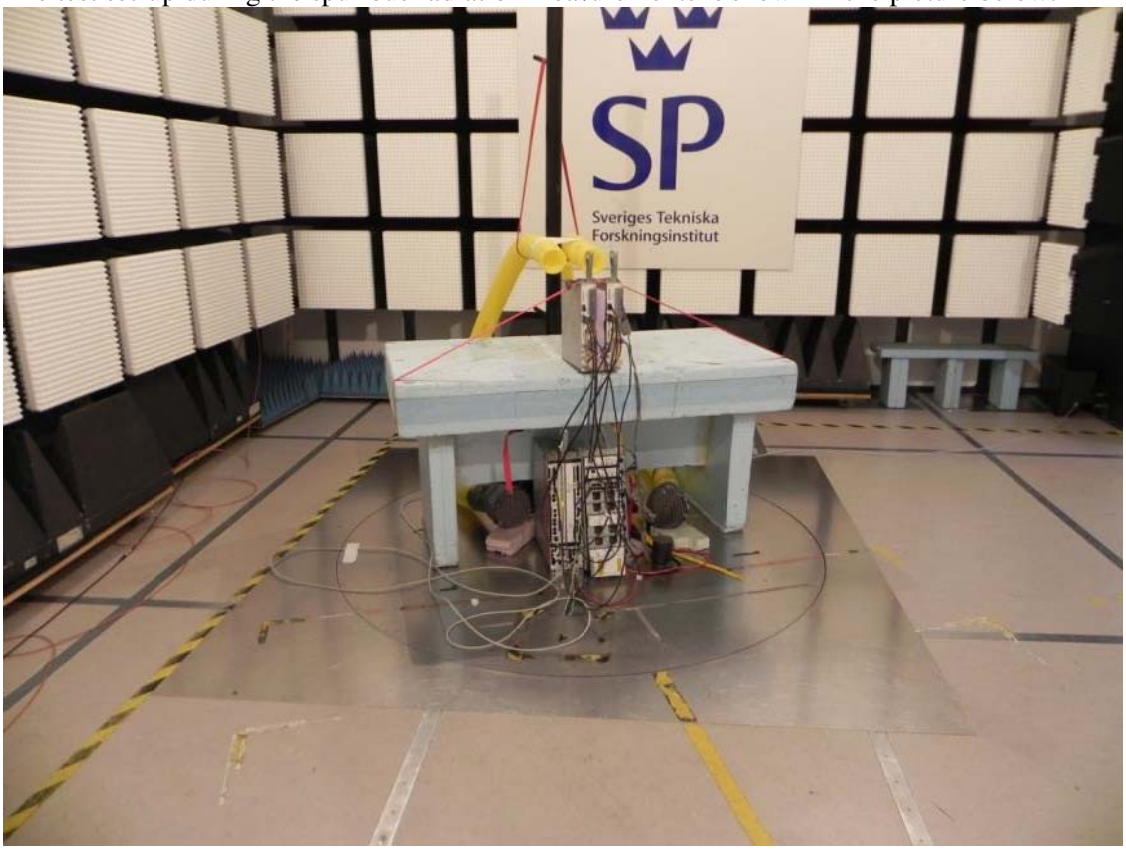
The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1 m in the frequency range 18 - 20 GHz.

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

The measurement procedure was as the following:

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

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



Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber	504 114
R&S ESIB 26	503 885
R&S FSIQ 40	503 738
EMC 32 ver. 8.52.0	503 899
Antenna Schaffner CBL 6143	504 079
EMCO Horn Antenna 3115	902 212
Flann STD Gain Horn Antenna 20240-20	503 674
High pass filter, RLC Electronics	503 739
Miteq, Low Noise Amplifier	503 285
Schwarzbeck preamplifier BBV 9742	504 085
µComp Nordic, Low Noise Amplifier	504 160
Temperature and humidity meter, Testo 625	504 188

Tested configurations

Symbolic name
B
M
B2
T

Results, representing worst case

Diagram	BW [MHz]	Symbolic name
1 a-d	1.4 MHz	B

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-20 000	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 §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 6

Diagram 1a:

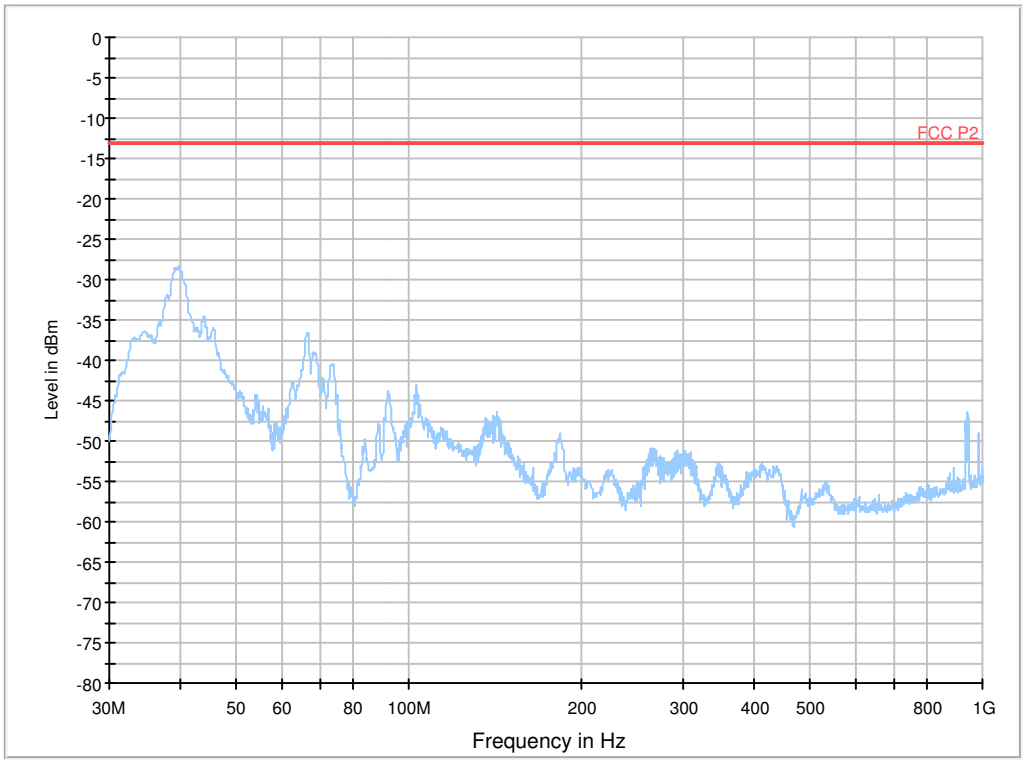
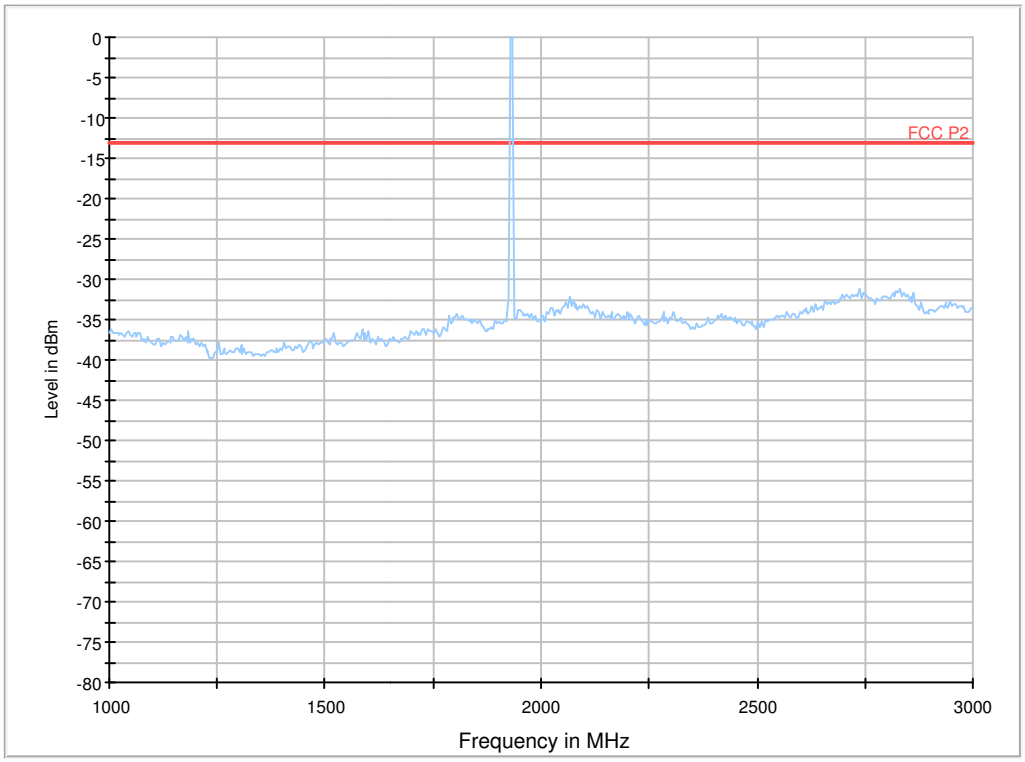
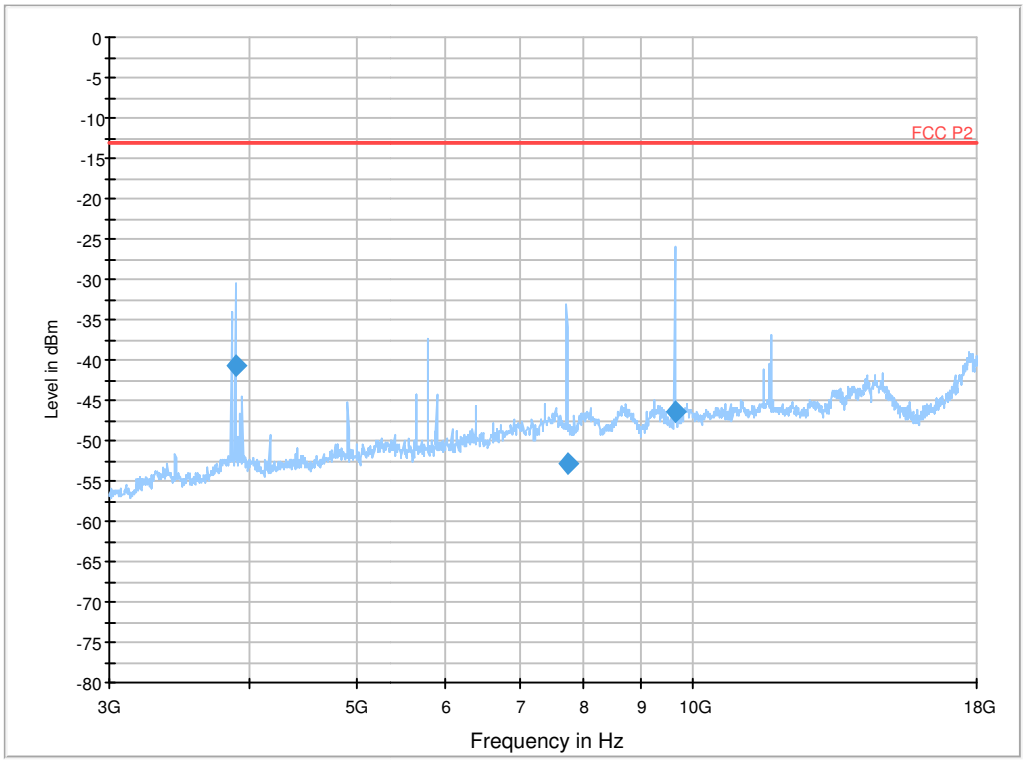


Diagram 1b:



Note: The emission at 1930.7 MHz is the carrier frequencies and shall be ignored in the context.

Diagram 1c:

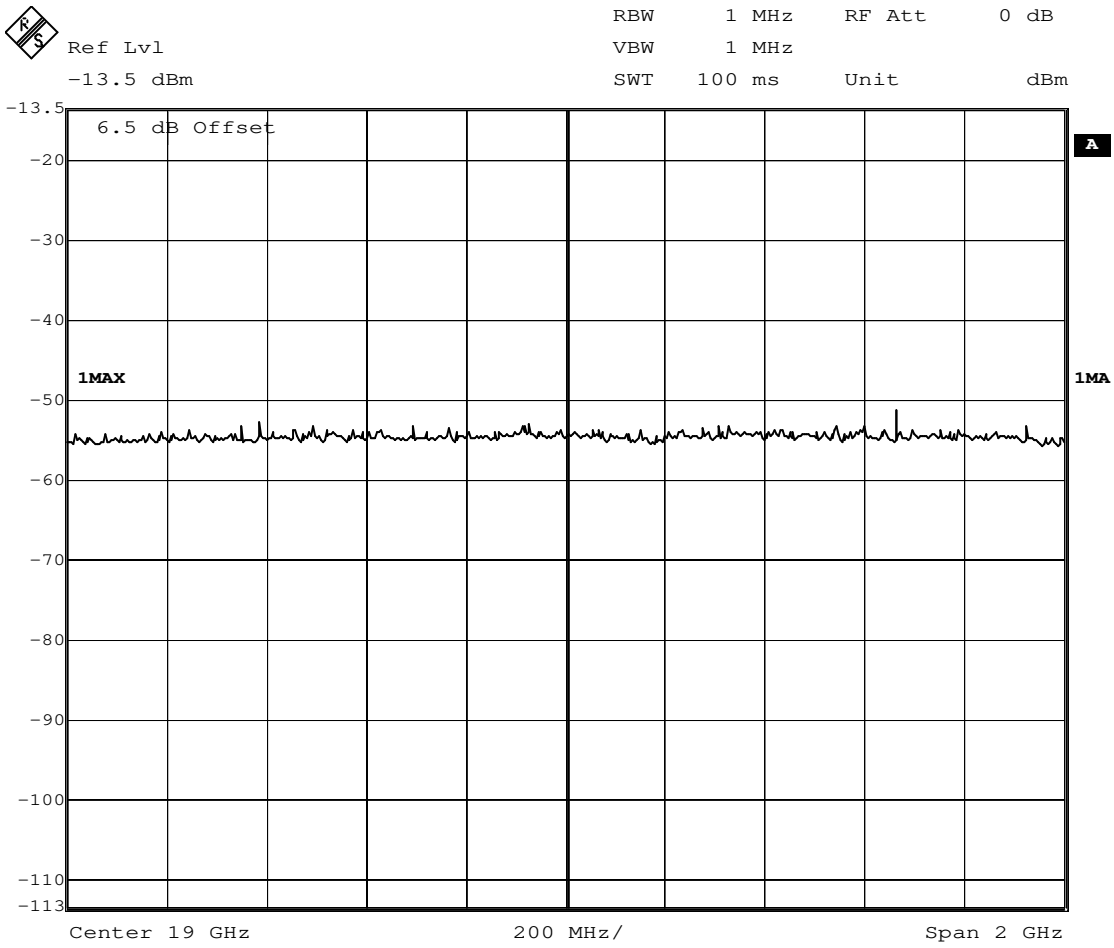


Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3890.831	-40.3	3000.0	1000.000	100.0	V	45.0	-103.7	27.3	-13.0
7722.374	-51.8	3000.0	1000.000	100.0	V	86.0	-96.1	38.8	-13.0
9654.242	-46.5	3000.0	1000.000	100.0	V	302.0	-96.1	33.5	-13.0

Appendix 6

Diagram 1d:



Appendix 7

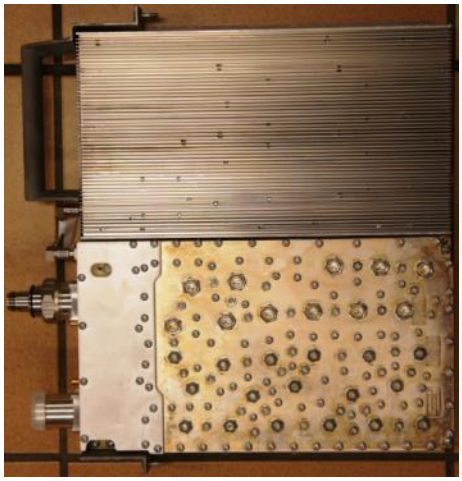
External photos

Front side:

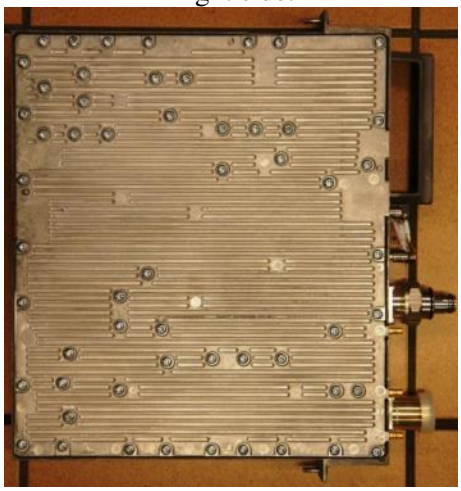
Back side:

Product Label:

Left side:



Right side:



Appendix 7

Top side:

Bottom side: