



REPORT

Issued by an FCC listed Laboratory Reg. no93866
The test site complies with RSS-Gen, IC file no. 3482A-1
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Date

2014-05-21

Reference

4P02595-01-F24

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Radio measurements on RUS 01 B2 1900 MHz radio equipment with FCC ID: TA8CKRC11866-1 and IC: 287AB-CS118661 (8 appendices)

Test object

Product name: RUS 01 B2
Product number: KRC 118 66/1, R2H

Summary

See appendix 1 for general information and appendix 8 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
2.1055 / RSS-133 6.3 Frequency stability	Yes	7

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.

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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: TA8CKRC11866-1 IC: 287AB-CS118661 IC MODEL NO: CS118661
Tested configuration:	GSM single RAT
Frequency range:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
Antenna ports:	1 TX/RX port 1 RX port
RF configuration:	Single and multi carrier
Nominal RF output power at RF A:	Single carrier: 1x 47.8 dBm (1x 60W) Multi carrier: 2x 44.8 dBm (2x 30W) 4x 41.8 dBm (4x 15W)
Antenna type:	No dedicated antenna, handled during licensing
Modulations:	GMSK, 8-PSK, 16QAM, 32QAM and AQPSK.
Nominal supply voltage:	-48 VDC

Appendix 1

Operation mode during measurements

Measurements were performed with the test object transmitting following modulations: GMSK, AQPSK, 8-PSK, 16QAM and 32QAM.

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. For AQPSK modulation the SCPIR is 0 dB.

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

Single carrier GMSK modulation.
Multi carrier GMSK modulation.

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 TX parameters were measured at port RF A.

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 the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47, IC RSS-133 and IC 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

Appendix 1

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, Tomas Isbring, Maulo Rivera, Kexin Chen, Tomas Lennhager, Jörgen Wassholm and Rolf Kühn SP.

Test participant

None.

Appendix 1

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2017-01	503 881
R&S FSIQ 40	2014-07	503 738
R&S ESIB 26	2014-07	503 292
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
Chase Bilog Antenna CBL 6111A	2014-10	503 182
EMCO Horn Antenna 3115	2015-09	502 175
Std.gain horn FLANN model 20240-20	-	503 674
µComp Nordic, Low Noise Amplifier	2014-04	901 545
Miteq Low Noise Amplifier	2014-09	503 285
Schwartzbeck preamplifier BBV 9742	2014-04	504 085
Temperature and humidity meter, Testo 635	2015-03	504 203
Temperature and humidity meter, Testo 625	2014-06	504 188
Temperature Chamber	2015-03	503 360
Multimeter Fluke 87	2014-08	502 190

Appendix 1

Test frequencies used for radiated measurements

1 – Carrier:

Port A ARFCN (Frequency) Downlink	Symbolic Name
513 (1930.4 MHz)	B
661 (1960.0 MHz)	M
809 (1989.6 MHz)	T

2 – Carrier:

Port A ARFCN (Frequency) Downlink	Symbolic name
513 (1930.4 MHz)	B2
563 (1940.4 MHz)	

4 – Carrier:

Port A ARFCN (Frequency) Downlink	Symbolic name
513 (1930.4 MHz)	B4
538 (1935.4 MHz)	
563 (1940.4 MHz)	
588 (1945.4 MHz)	

Appendix 1

Test frequencies used for conducted measurements

1 – Carrier:

Port A + B ARFCN (Frequency) Downlink	Symbolic name
513 (1930.4 MHz)	B
661 (1960.0 MHz)	M
809 (1989.6 MHz)	T

2 – Carrier:

Port A + B ARFCN (Frequency) Downlink	Symbolic name
513 (1930.4 MHz)	B2im1
521 (1932.0 MHz)	
564 (1940.6 MHz)	B2im2
623 (1952.4 MHz)	
659 (1959.6 MHz)	M2
664 (1960.6 MHz)	
809 (1989.6 MHz)	T2im1
801 (1988.0 MHz)	
761 (1980.0 MHz)	T2im2
705 (1968.8 MHz)	

Appendix 1

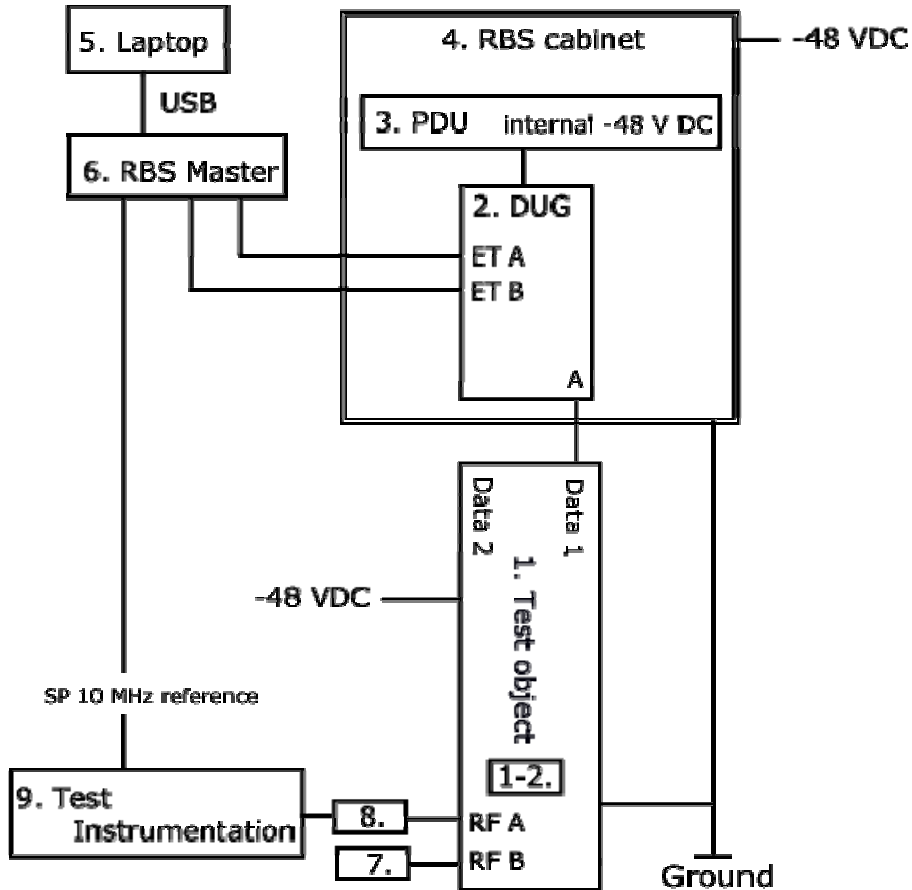
4 – Carrier:

Port A + B ARFCN (Frequency) Downlink	Symbolic name
513 (1930.4 MHz)	B4
522 (1932.2 MHz)	
531 (1934.0 MHz)	
540 (1935.8 MHz)	
650 (1957.8 MHz)	M4
659 (1959.6 MHz)	
664 (1960.6 MHz)	
673 (1962.4 MHz)	
809 (1989.6 MHz)	T4
800 (1987.8 MHz)	
791 (1986.0 MHz)	
782 (1984.2 MHz)	

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

Appendix 1

Test set-up conducted measurements GSM



Test object:

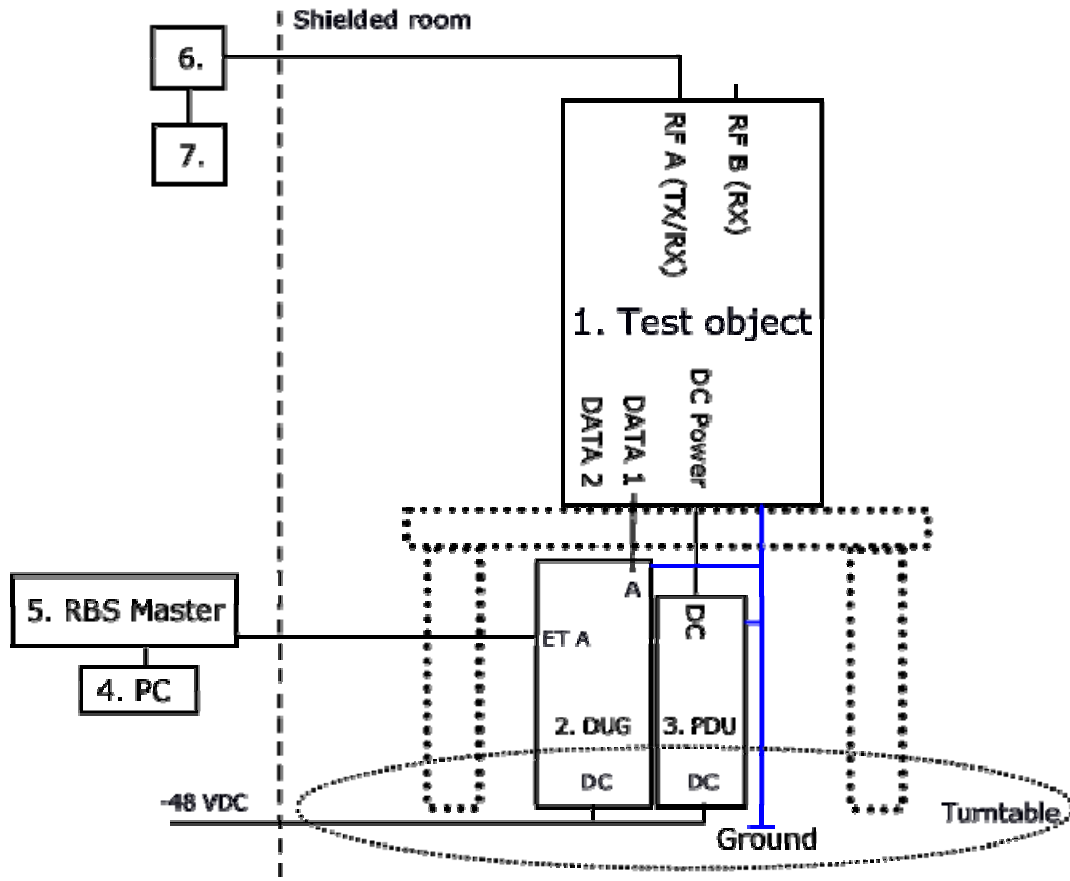
1.	RUS 01 B2, KRC 118 66/1, rev. R2H, s/n: : CB4J994518, software CXP 901 3268/6, rev. R49EG with FCC ID: TA8CKRC11866-1 and IC: 287AB-CS118661
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Functional test equipment

2.	DUG 20 01 KDU 137 569/1, R2B, s/n: C824442777
3.	PDU 02 02, BMG 980 336/5, rev. R1F, s/n: X051445683
4.	RBS 6201 cabinet, BAMS – 1000778792
5.	Controlling laptop HP EliteBook 8560 w, BAMS – 1001052060
6.	RBS master 2E, LPY 107 1007/3, BAMS – 1001195170
7.	Terminator, 50 ohm
8.	Attenuator, according respective appendix
9.	SP Test Instrumentation according to measurement equipment list

Appendix 1

Test setup radiated measurements GSM



Test object:

1.	RUS 01 B2, KRC 118 66/1, rev. R2H, s/n : CB4J994522 software CXP 901 3268/6, rev. R49EG with FCC ID: TA8CKRC11866-1 and IC: 287AB-CS118661
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Functional test equipment:

2.	Main Unit SUP 6601, 1/BFL 901 009/4, rev. R1E, s/n: BR88236818 DUG 20 01 KDU 137 569/1, R2B, s/n: C824442777
3.	Power Subrack: PDU 01 01, BMG 980 336/2, R4F, BJ31532384 PDU 01 01, BMG 980 336/2, R4F, BJ31532382 SHU 01 01, BGK 901 18/1, R3C, BJ31446269 PFU 01 01, KFE 101 1162/1, R1B, BR80910495 PCF 02 01, KFE 101 1157/1, R1C, BW95301450 DUMMY x3, SXK 109 8257/1, R1D DUMMY x1, SXK 109 8257/1, R1F
4.	RBS master 2E, LPY 107 1007/3, BAMS – 1001195170
5.	Laptop, EliteBook 8560w, BAMS – 1001052032
6.	Attenuator
7.	FSIQ 40, SP number: 503 738, for supervision purpose only

Appendix 1

Interfaces:
Type of port:

Supply 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, unused	RF
RX A I/O, unused	RF
RX B I/O, unused	RF
Ground wire	Ground

RBS software:

Software	Revision
DXP R73FZ	R52E

Appendix 2

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

Date	Temperature	Humidity
2014-04-03	22 °C ± 3 °C	24 % ± 5 %
2014-04-04	22 °C ± 3 °C	22 % ± 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
R&S FSQ 40	504 143
RF attenuator	902 280
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

Single carrier

Rated output power 1x 47.8 dBm at RF A.

Tested configuration	Transmitter power [RMS dBm/ PAR dB]
Modulation and symbolic name	Port RF A
GMSK, B	47.85/ 0.65
8PSK, B	47.78/3.86
GMSK, M	48.00/ 0.65
8PSK, M	48.05/ 3.44
16QAM, M	47.84/ 4.81
32QAM, M	47.66/ 5.00
AQPSK, M	48.01/ 3.65
GMSK, T	47.86/ 0.63
8PSK, T	47.81/ 3.56

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

Appendix 2

Multi Carrier

2-carrier

Rated output power 2x 44.8 dBm, i.e. total power 47.8dBm at RF A.

Tested configuration	Transmitter power [RMS dBm/ PAR dB]
Modulation and symbolic name	Port RF A
GMSK, B2im1	47.80/ 3.58
GMSK, B2im2	47.96/ 3.46
8 PSK, B2im1	47.93/ 6.03
GMSK M2	47.76/ 3.70
8 PSK, M2	47.89/ 6.23
GMSK, T2im1	47.76/ 3.63
GMSK, T2im2	48.01/ 3.56
8 PSK, T2im1	47.95/ 6.01

4-carrier

Rated output power 4 x 41.8 dBm, i.e. total power 47.8dBm at RF A.

Tested configuration	Transmitter power [RMS dBm/ PAR dB]
Modulation and symbolic name	Port RF A
GMSK, B4	47.99/ 6.23
8 PSK M4	46.31/ 7.57
GMSK, T4	47.95/ 6.15

Appendix 2

Single carrier

Measured output power per 1 MHz.

Tested configuration	Transmitter power [RMS (dBm)]
Modulation and symbolic name	Port RF A
GMSK, B	47.61
8PSK, B	47.72
GMSK, M	47.74
8PSK, M	48.00
16QAM, M	47.54
32QAM, M	47.64
AQPSK, M	47.98
GMSK, T	47.85
8PSK, T	48.02

Appendix 2

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
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Appendix 3

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

Date	Temperature	Humidity
2014-04-03	22 °C ± 3 °C	24 % ± 5 %
2014-04-04	22 °C ± 3 °C	22 % ± 5 %

Test set-up and procedure

The measurements were made per definition in RSS-Gen 4.6.1. 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
R&S FSQ	504 143
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

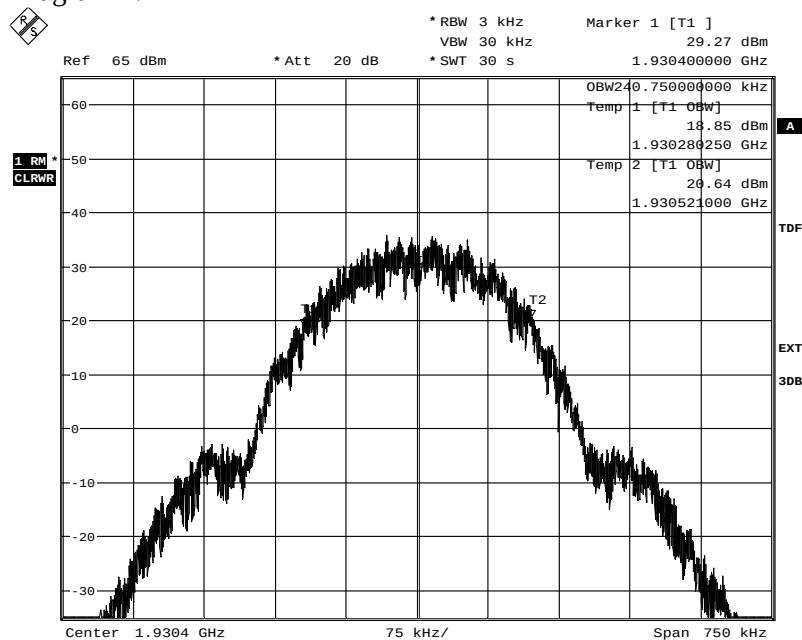
Results

Single carrier

Diagram	Modulation	Symbolic name	Tested Port	Occupied BW (99%) [kHz]
1	GMSK	B	RF A	241
2	GMSK	M	RF A	241
3	8PSK	M	RF A	238
4	16QAM	M	RF A	241
5	32QAM	M	RF A	240
6	AQPSK	M	RF A	238
7	GMSK	T	RF A	241

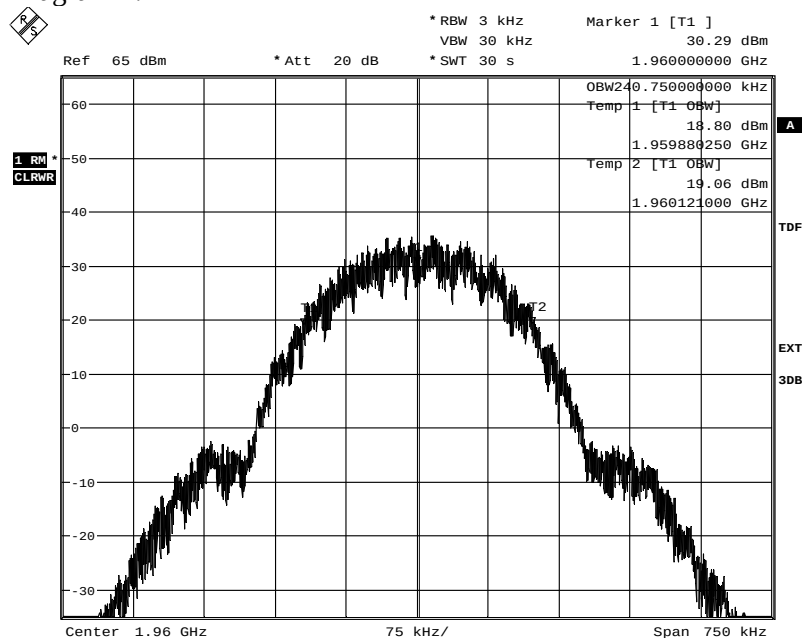
Appendix 3

Diagram 1:



Date: 3.APR.2014 10:12:05

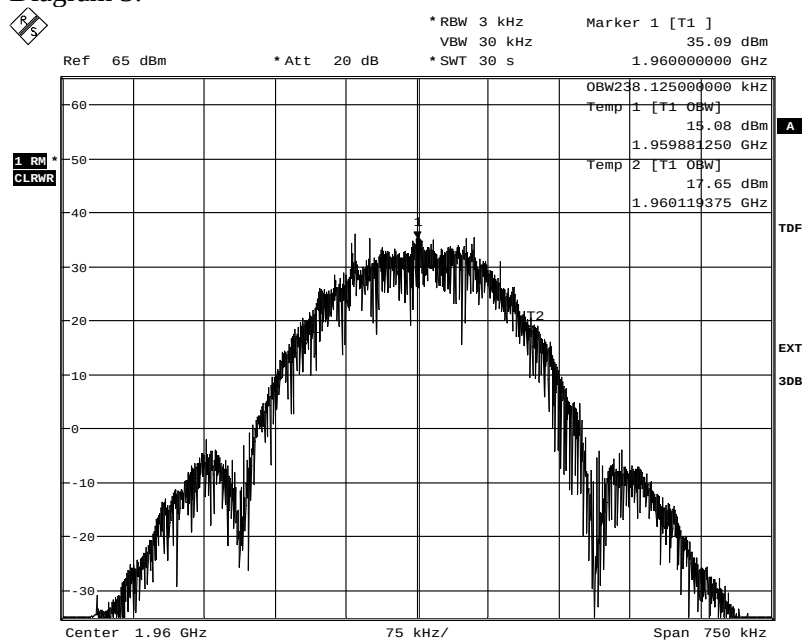
Diagram 2:



Date: 3.APR.2014 07:35:19

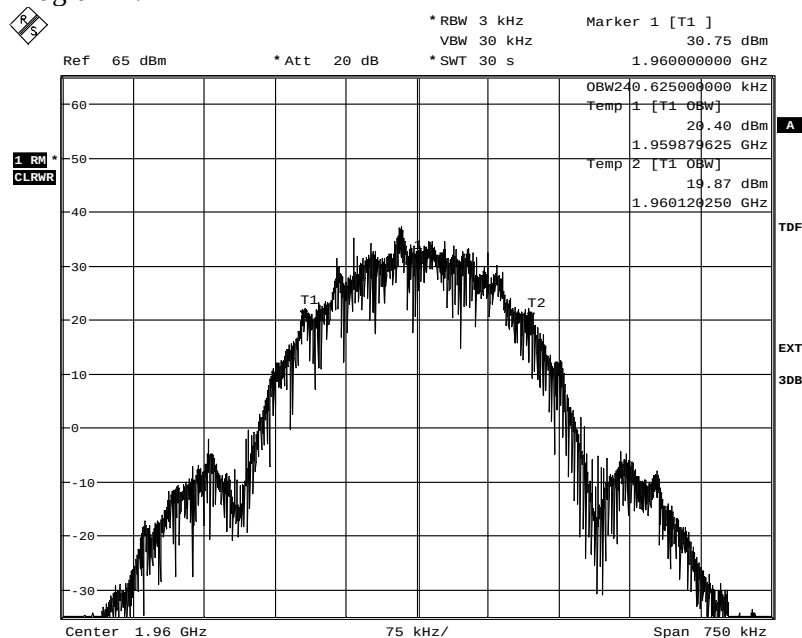
Appendix 3

Diagram 3:



Date: 3.APR.2014 07:55:30

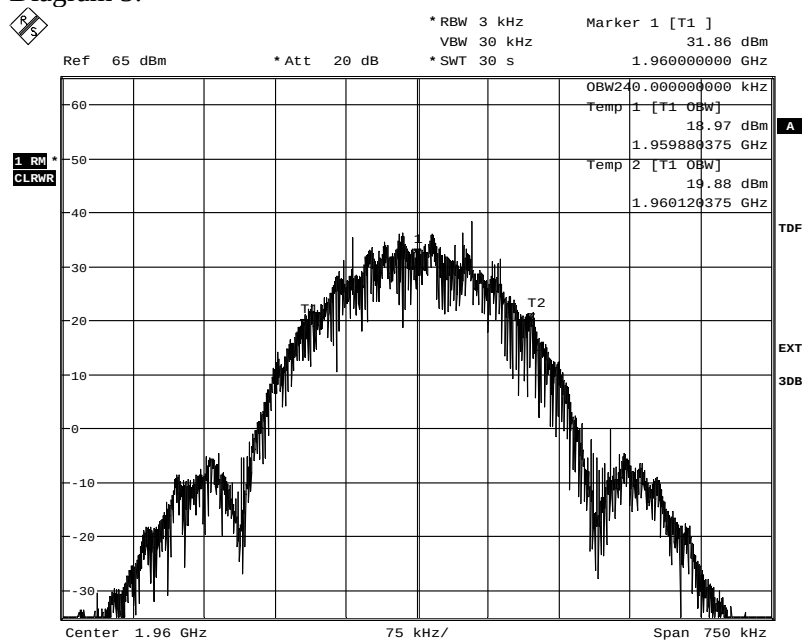
Diagram 4:



Date: 3.APR.2014 10:00:15

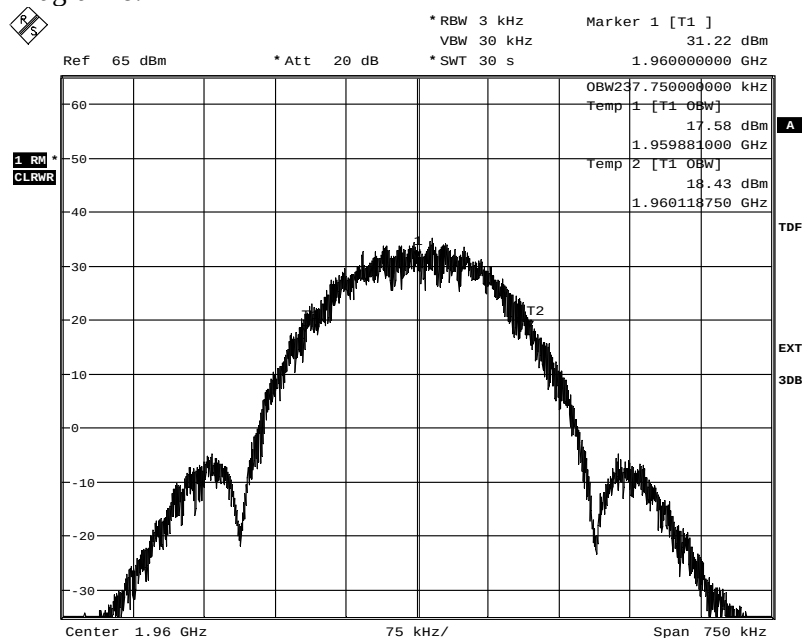
Appendix 3

Diagram 5:



Date: 3.APR.2014 08:53:29

Diagram 6:

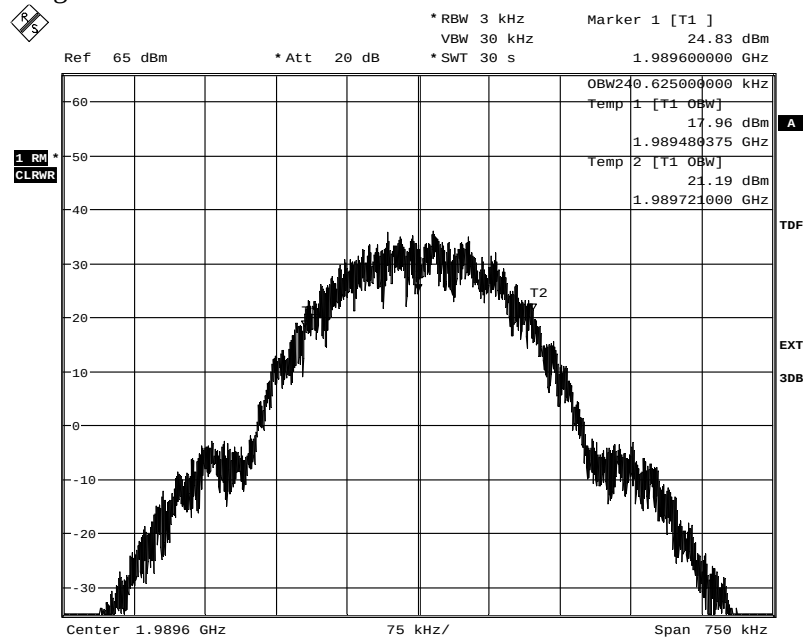


Date: 3.APR.2014 07:30:28



Appendix 3

Diagram 7:



Date: 3.APR.2014 11:36:43

Appendix 4

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

Date	Temperature	Humidity
2014-04-03	22 °C ± 3 °C	24 % ± 5 %
2014-04-04	22 °C ± 3 °C	22 % ± 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 100 kHz was used. To compensate for the reduced RBW the limit was adjusted by 13 dB to -23 dBm in this frequency range. A RBW of 1 MHz was used from 6 to 15 MHz away from the band edges.

Measurement equipment	SP number
R&S FSQ 40	504 143
RF attenuator	902 282
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	Modulation	Symbolic name	Tested Port
1 a-c	GMSK	B	RF A
2 a-c	16QAM	B	RF A
3 a-c	GMSK	T	RF A
4 a-c	16QAM	T	RF A

Appendix 4

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

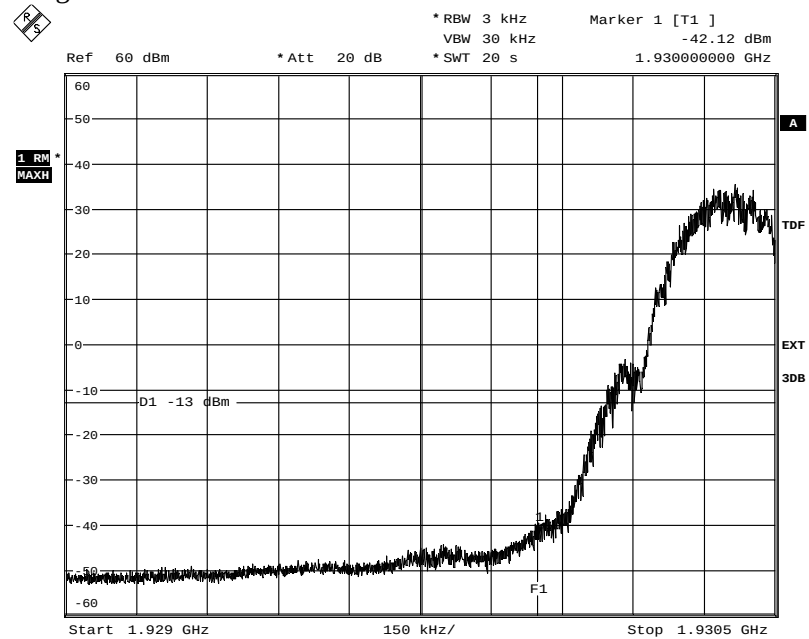
CFR 47 §24.238 and RSS-133 6.5

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
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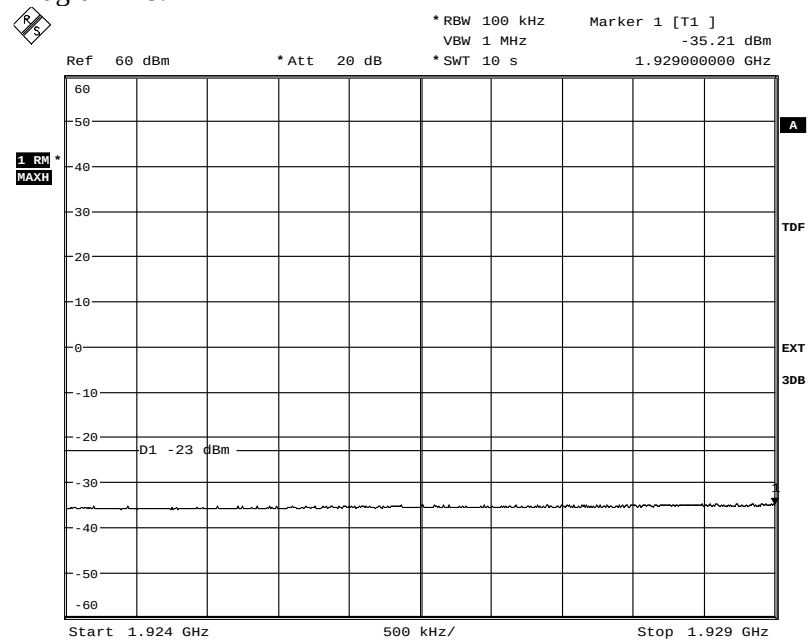
Appendix 4

Diagram 1 a:



Date: 3.APR.2014 10:14:57

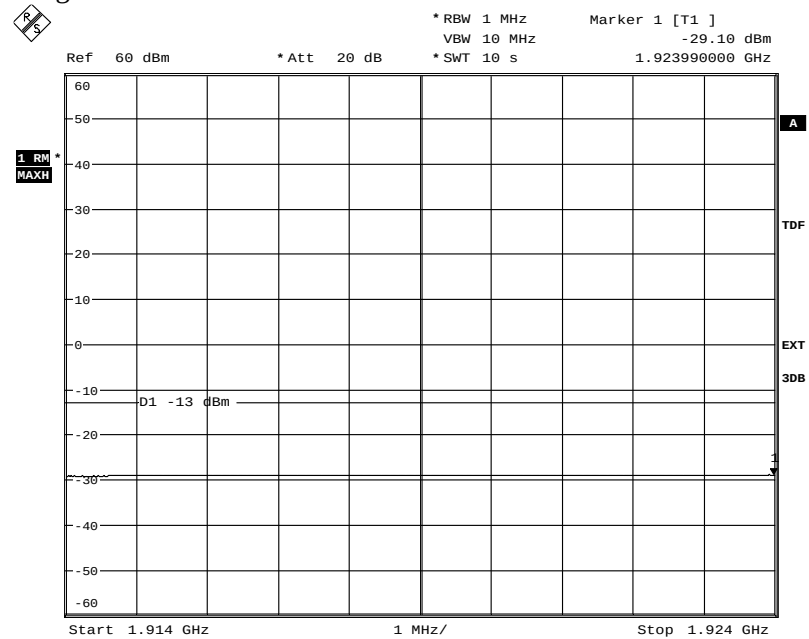
Diagram 1 b:



Date: 3.APR.2014 10:18:43

Appendix 4

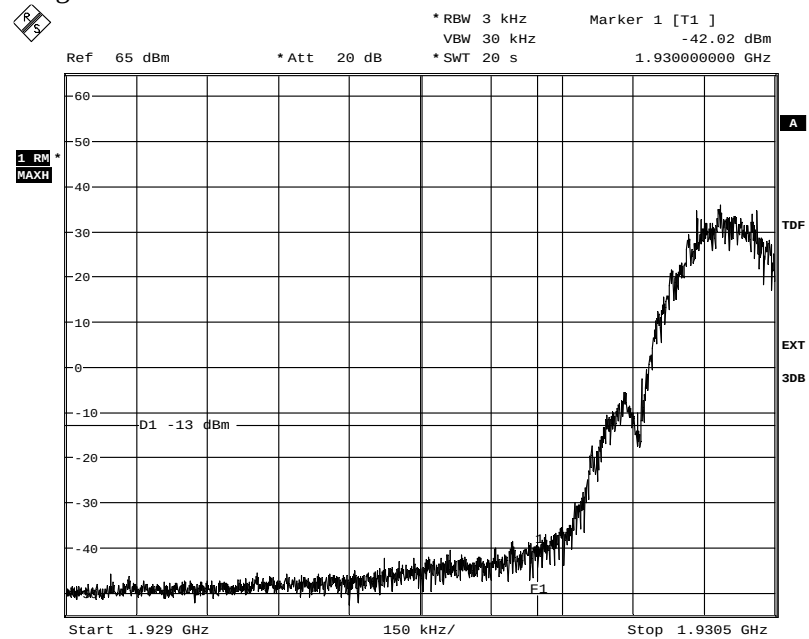
Diagram 1 c:



Date: 3.APR.2014 10:22:56

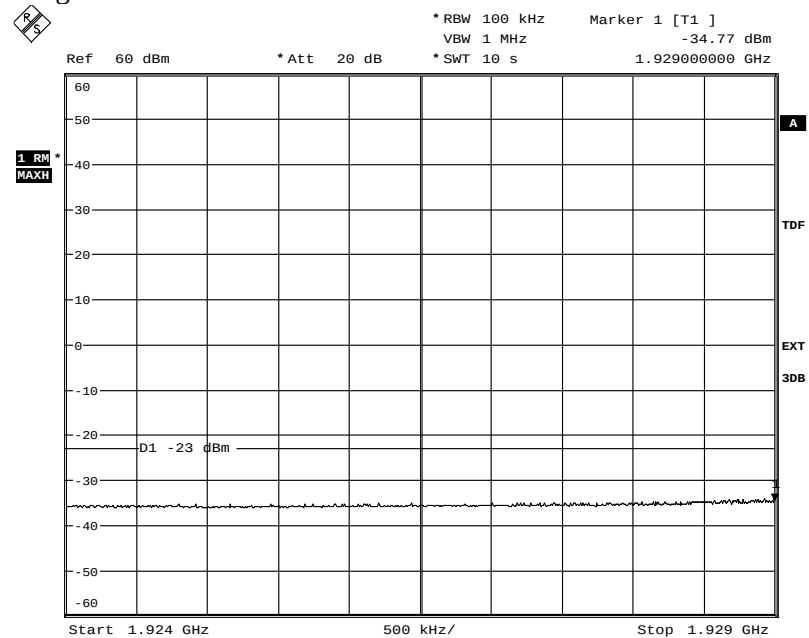
Appendix 4

Diagram 2 a:



Date: 3.APR.2014 10:42:48

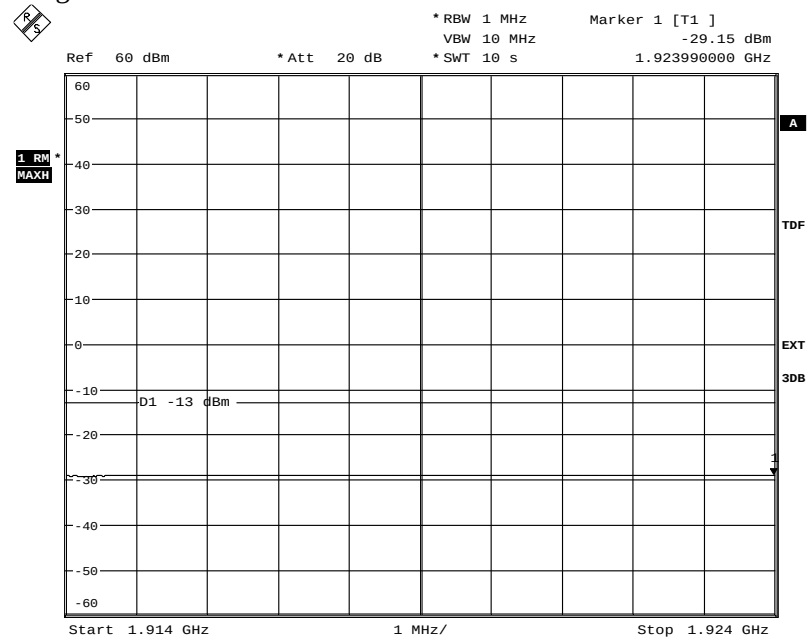
Diagram 2 b:



Date: 3.APR.2014 10:44:25

Appendix 4

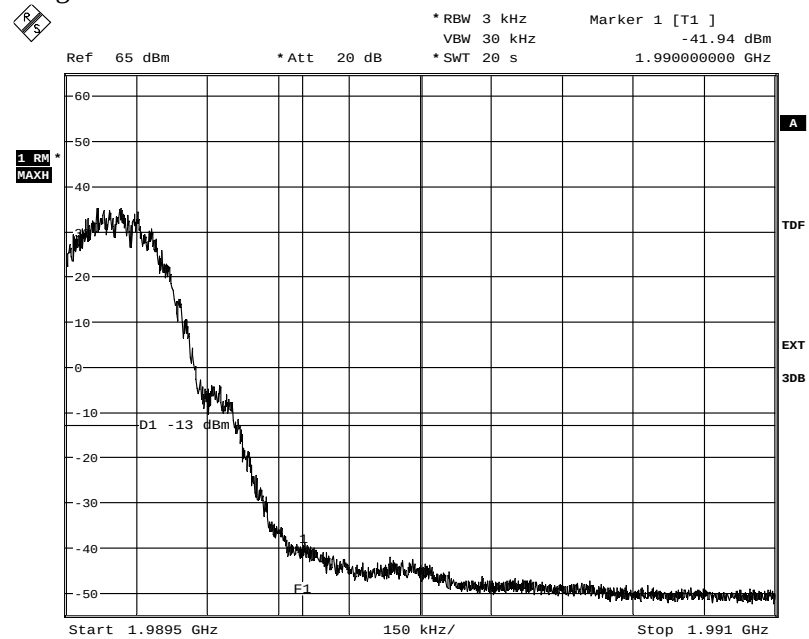
Diagram 2 c:



Date: 3.APR.2014 10:46:02

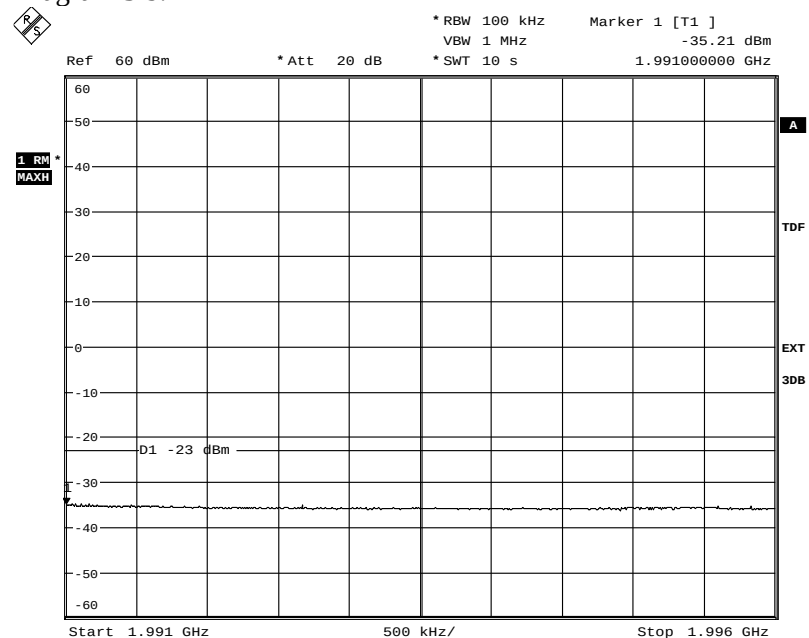
Appendix 4

Diagram 3 a:



Date: 3.APR.2014 11:31:11

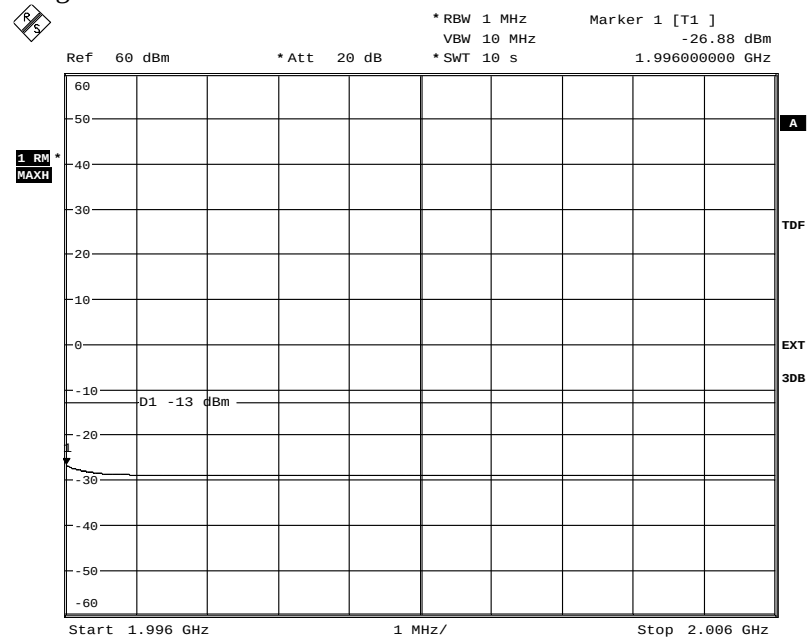
Diagram 3 b:



Date: 3.APR.2014 11:30:05

Appendix 4

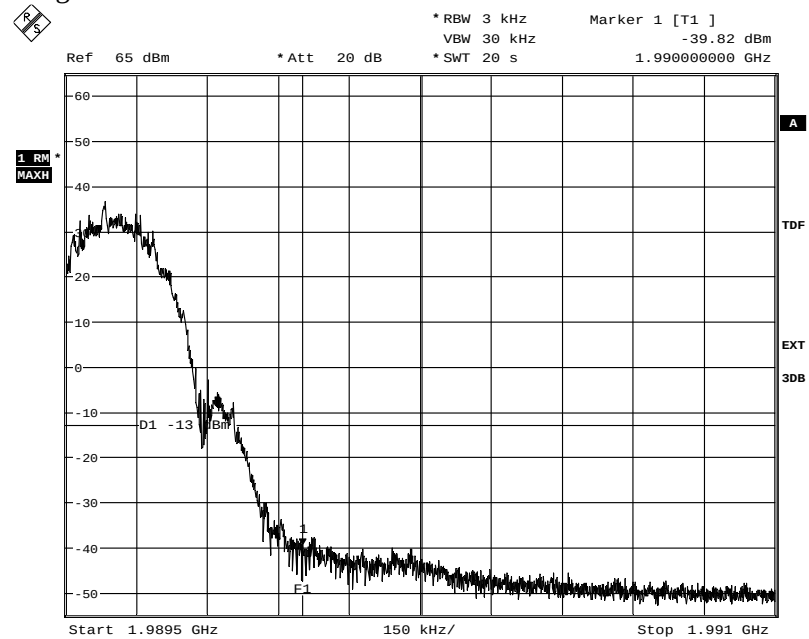
Diagram 3 c:



Date: 3.APR.2014 11:28:46

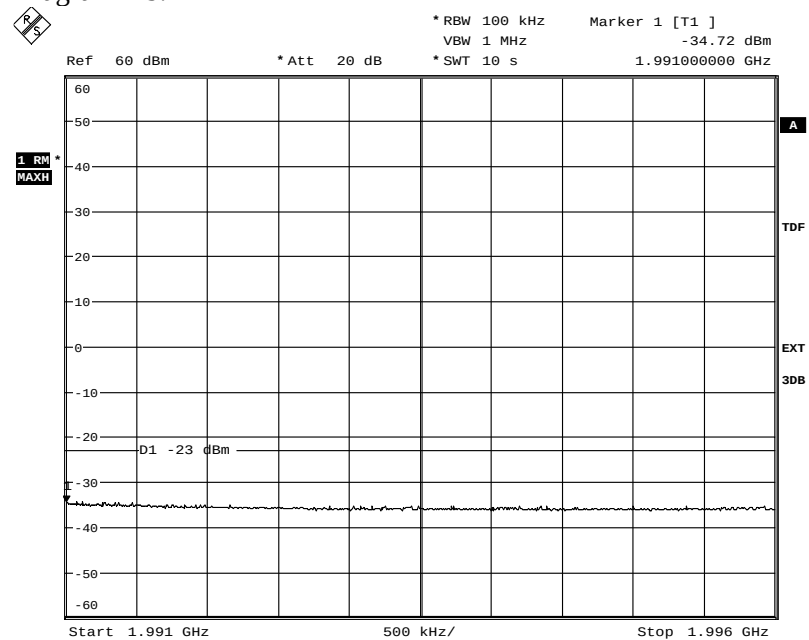
Appendix 4

Diagram 4 a:



Date: 3.APR.2014 11:23:45

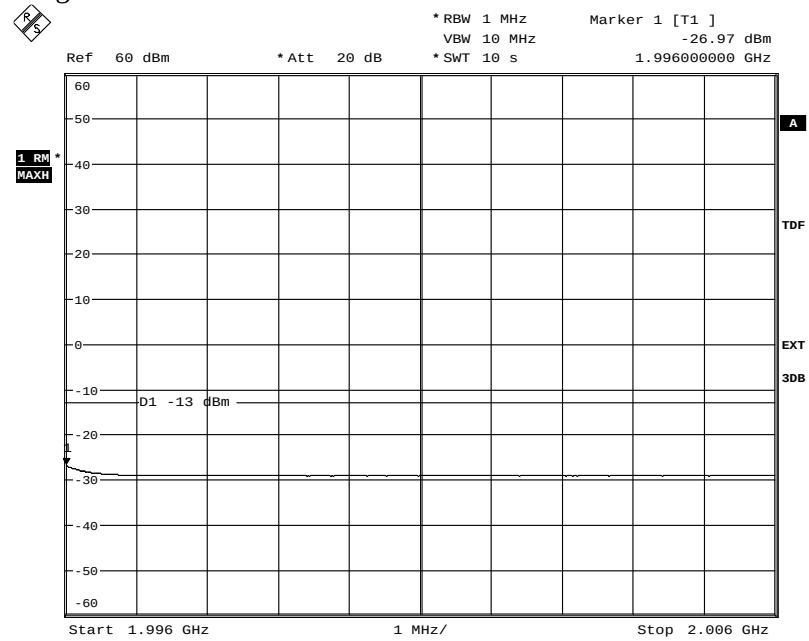
Diagram 4 b:



Date: 3.APR.2014 11:25:22

Appendix 4

Diagram 4 c:



Date: 3.APR.2014 11:26:59

Appendix 4

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

Date	Temperature	Humidity
2014-04-03	22 °C ± 3 °C	24 % ± 5 %
2014-04-04	22 °C ± 3 °C	22 % ± 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 40	504 143
RF attenuator	902 282
HP filter	BX40074
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	Modulation	Symbolic name	Tested Port
1 a+b+c+d	GMSK	B	RF A
2 a+b+c+d	GMSK	M	RF A
3 a+b+c+d	8PSK	M	RF A
4 a+b+c+d	16QAM	M	RF A
5 a+b+c+d	32QAM	M	RF A
6 a+b+c+d	AQPSK	M	RF A
7 a+b+c+d	GMSK	T	RF A

Appendix 4

2- carrier

Diagram	Modulation	Symbolic name	Tested Port
8 a+b+c+d+e	GMSK	B2im1	RF A
9 a+b+c+d+e	GMSK	B2im2	RF A
10 a+b+c+d+e	16QAM	B2im1	RF A
11 a+b+c+d+e	16QAM	B2im2	RF A
12 a+b+c+d	GMSK	M2	RF A
13 a+b+c+d+e	GMSK	T2im1	RF A
14 a+b+c+d+e	GMSK	T2im2	RF A
15 a+b+c+d+e	16QAM	T2im1	RF A
16 a+b+c+d+e	16QAM	T2im2	RF A

4- carrier

Diagram	Modulation	Symbolic name	Tested Port
17 a+b+c+d+e	GMSK	B4	RF A
18 a+b+c+d+e	16QAM	B4	RF A
19 a+b+c+d	GMSK	M4	RF A
20 a+b+c+d+e	GMSK	T4	RF A
21 a+b+c+d+e	16QAM	T4	RF A

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 1990 GHz, thus the choice of the upper frequency boundary was set to $10 \times 2 \text{ GHz} = 20 \text{ GHz}$ for emission measurements.

Limits

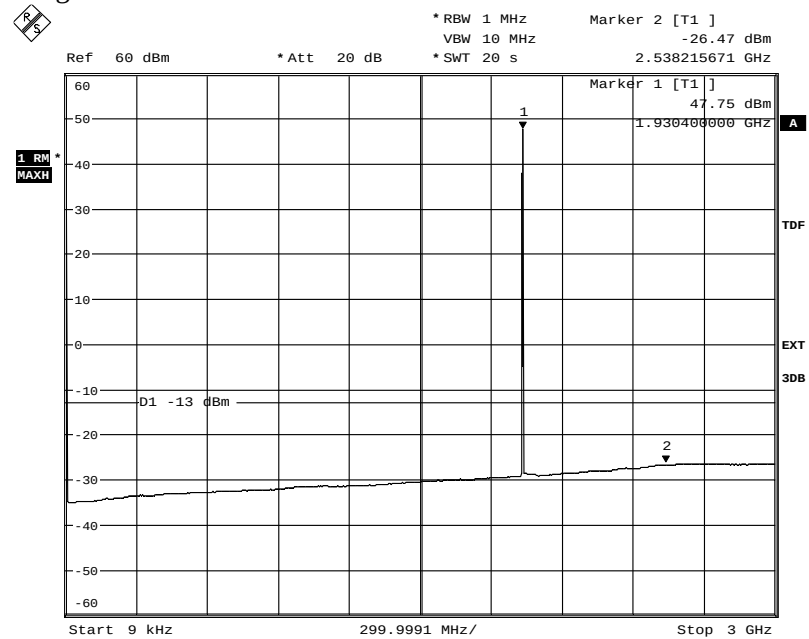
§24.238 and RSS-133 6.5

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 $43 + 10 \log (P) \text{ dB}$, resulting in a limit of -13 dBm per 1 MHz RBW.

Complies?	Yes
-----------	-----

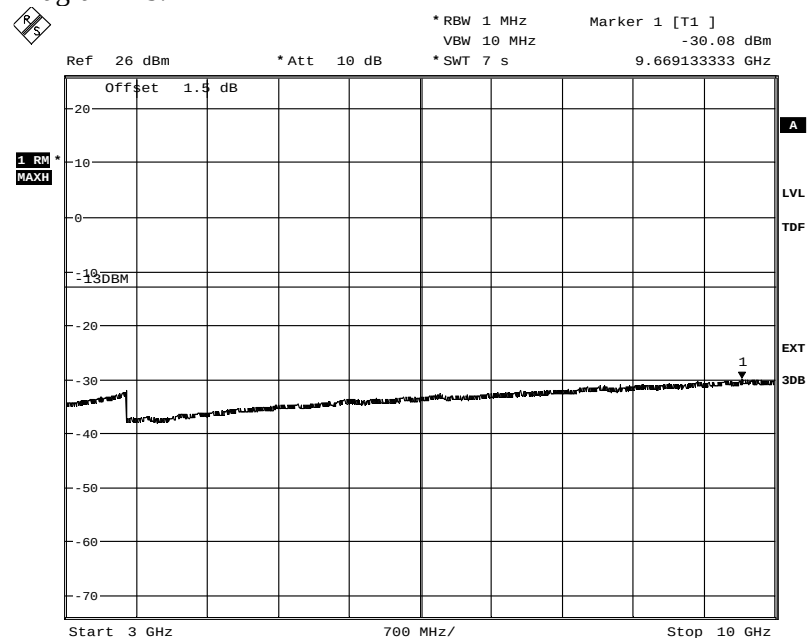
Appendix 4

Diagram 1 a:



Date: 3.APR.2014 10:24:34

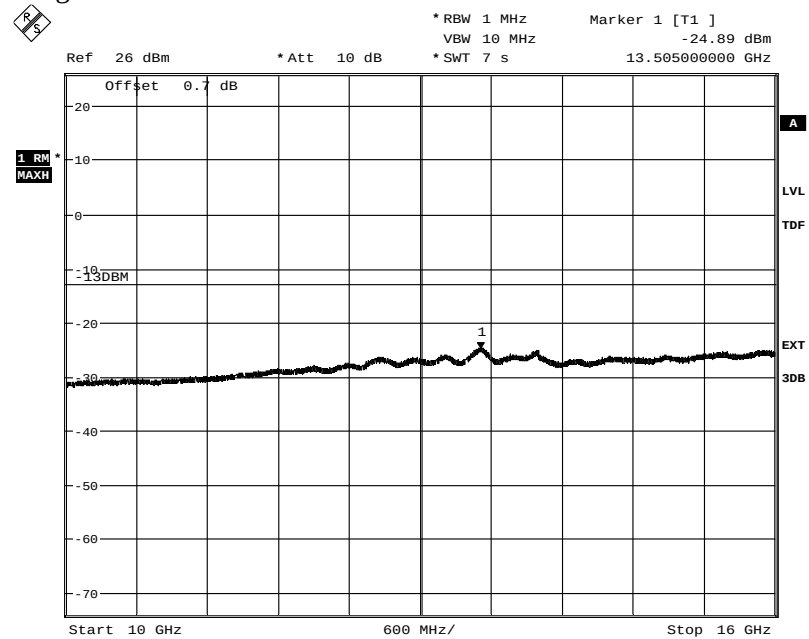
Diagram 1 b:



Date: 3.APR.2014 10:26:21

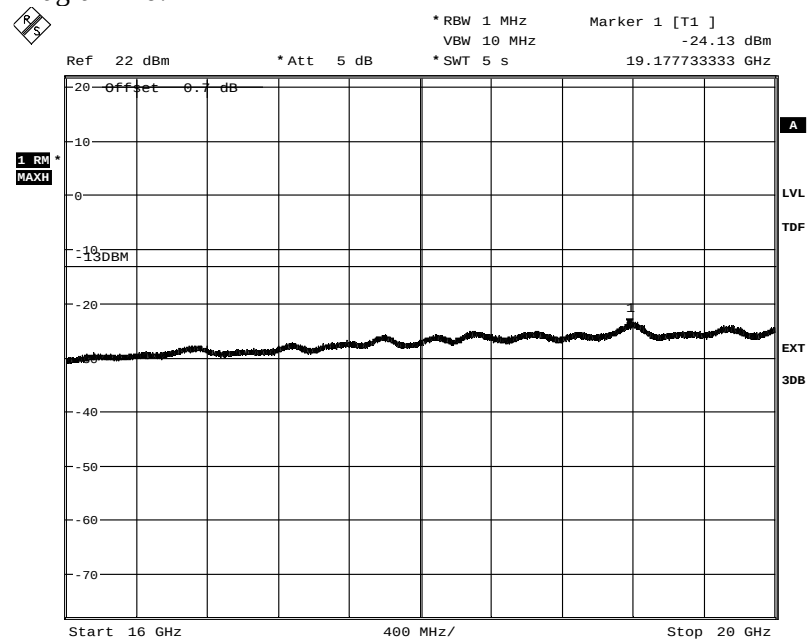
Appendix 4

Diagram 1 c:



Date: 3.APR.2014 10:27:08

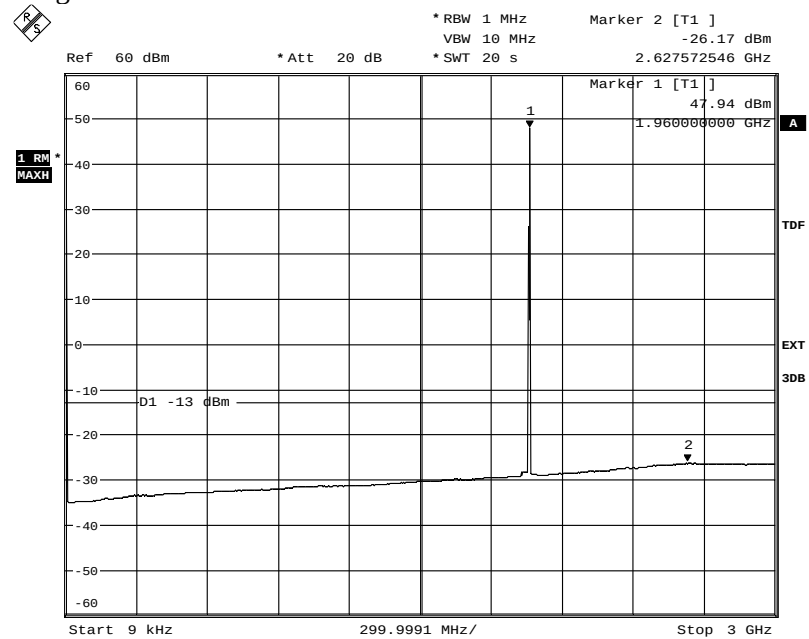
Diagram 1 d:



Date: 3.APR.2014 10:27:51

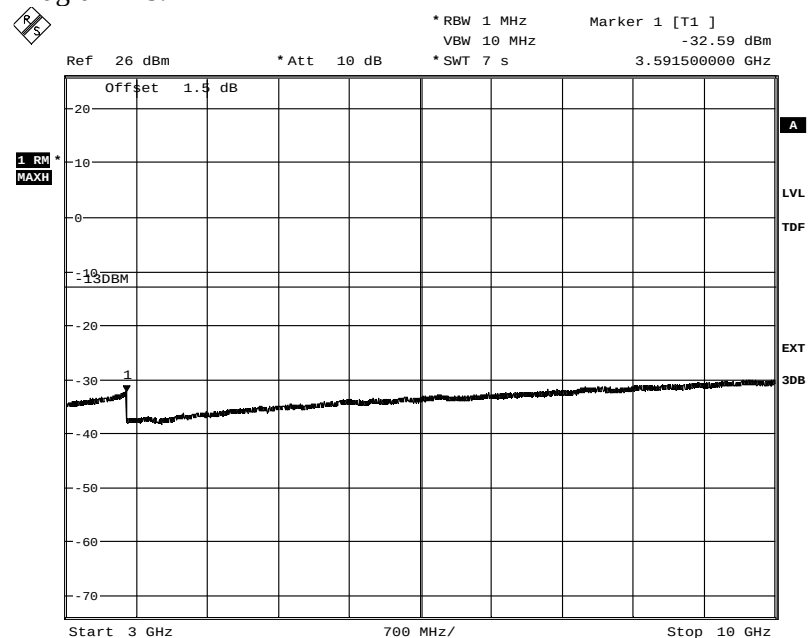
Appendix 4

Diagram 2 a:



Date: 3.APR.2014 07:38:56

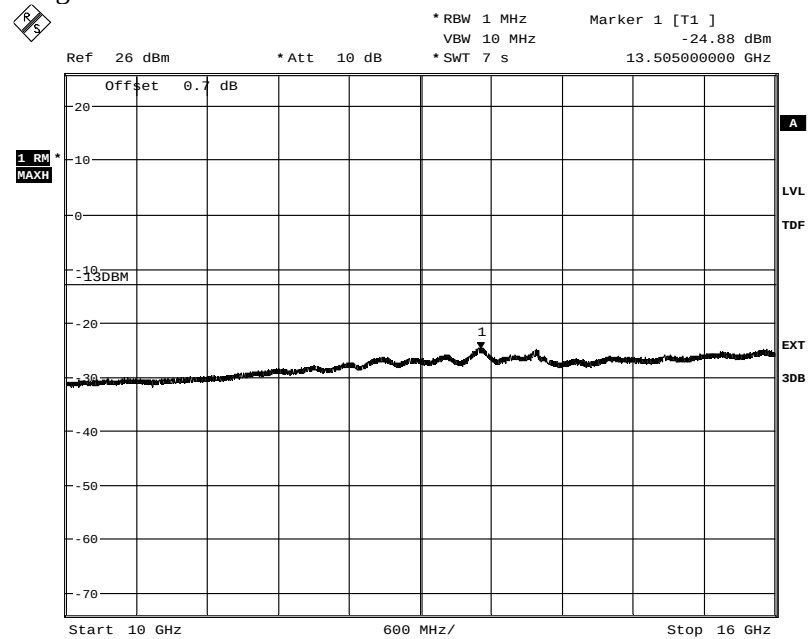
Diagram 2 b:



Date: 3.APR.2014 07:40:24

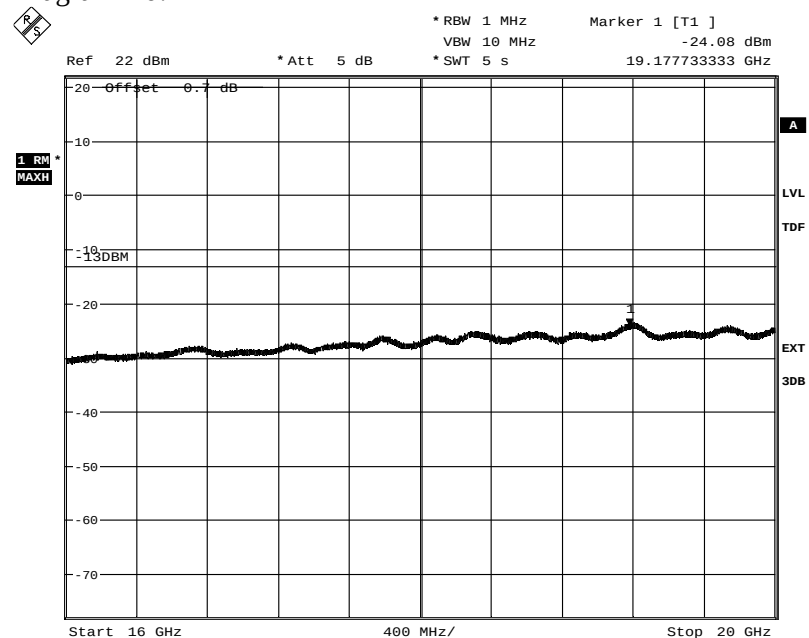
Appendix 4

Diagram 2 c:



Date: 3.APR.2014 07:41:34

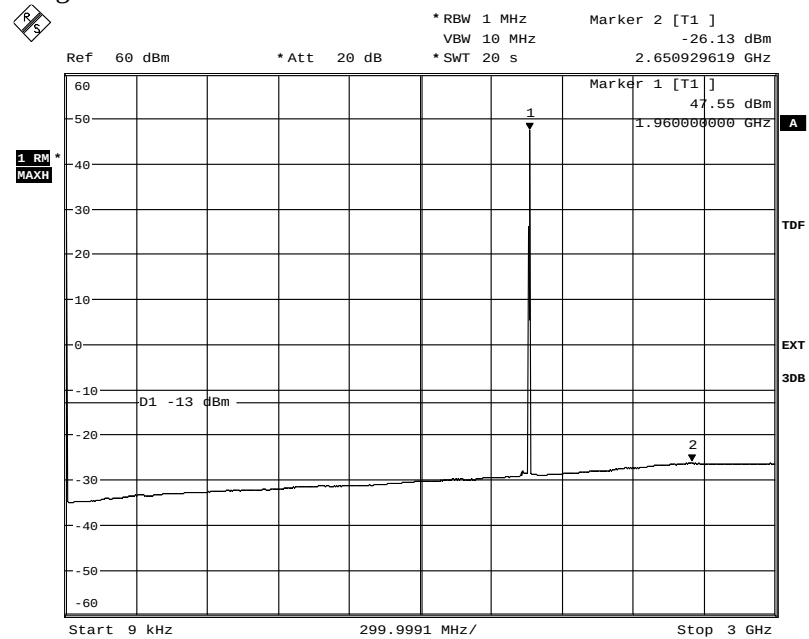
Diagram 2 d:



Date: 3.APR.2014 07:42:16

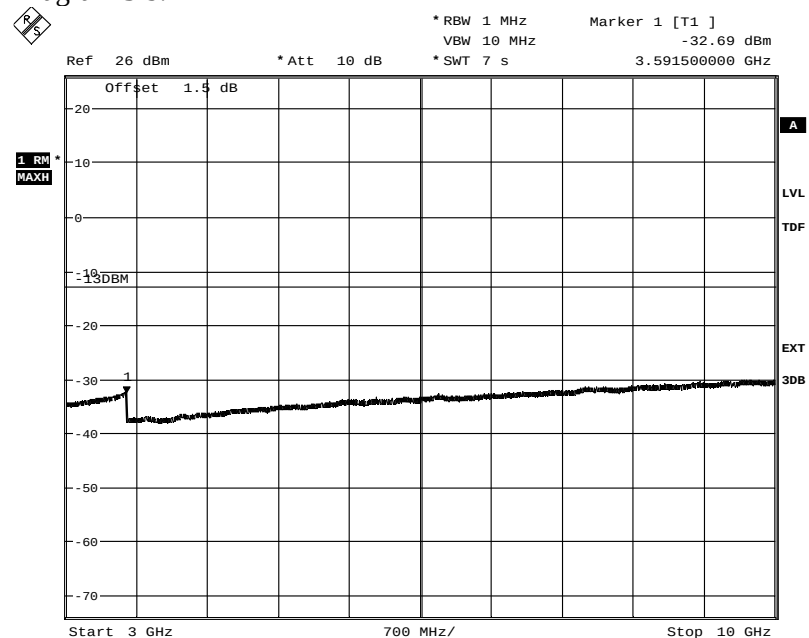
Appendix 4

Diagram 3 a



Date: 3.APR.2014 07:48:56

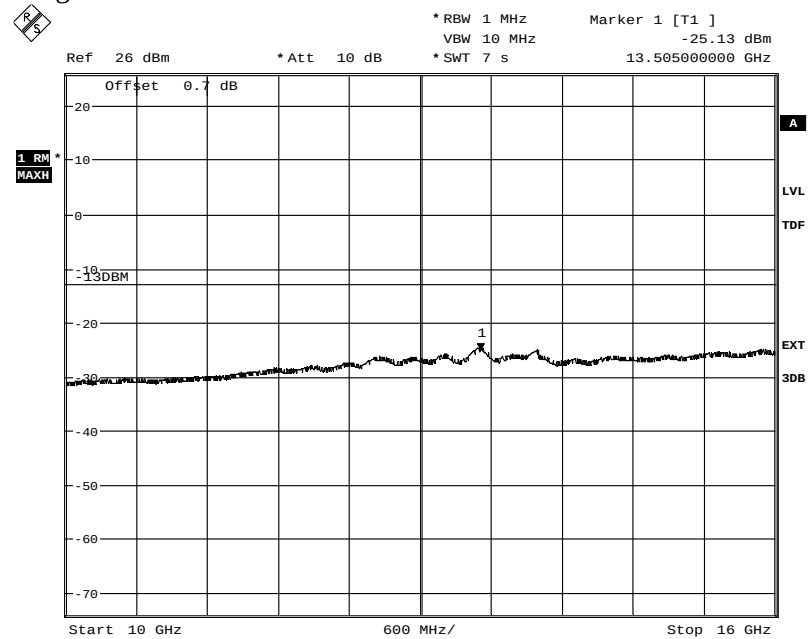
Diagram 3 b:



Date: 3.APR.2014 07:47:10

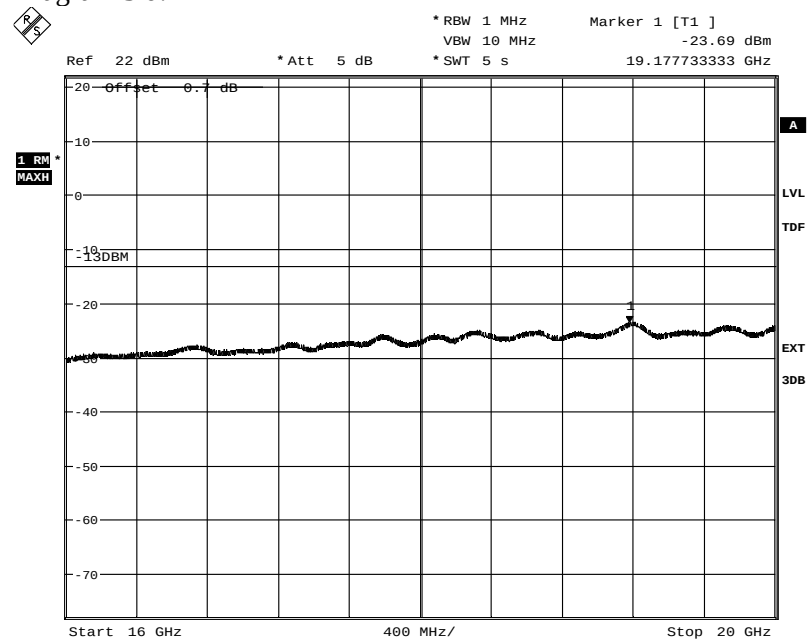
Appendix 4

Diagram 3 c:



Date: 3.APR.2014 07:46:14

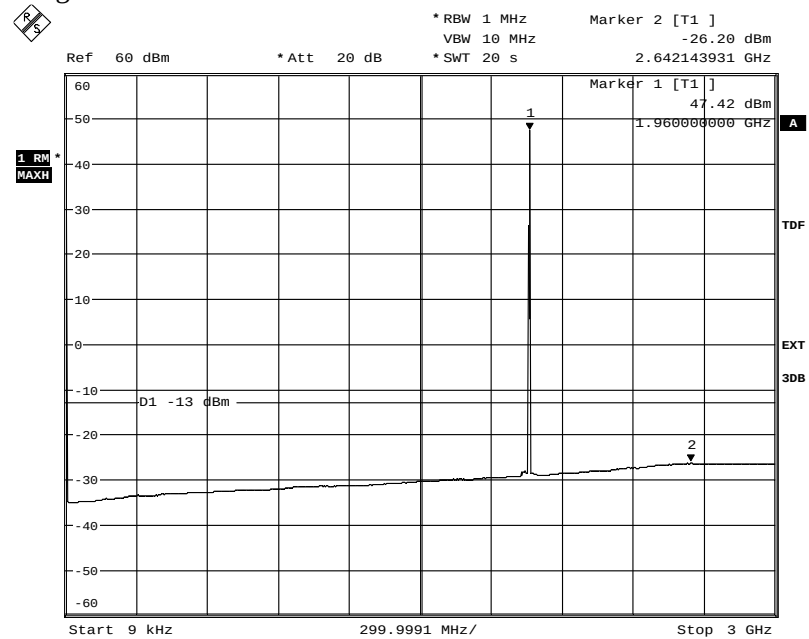
Diagram 3 d:



Date: 3.APR.2014 07:44:24

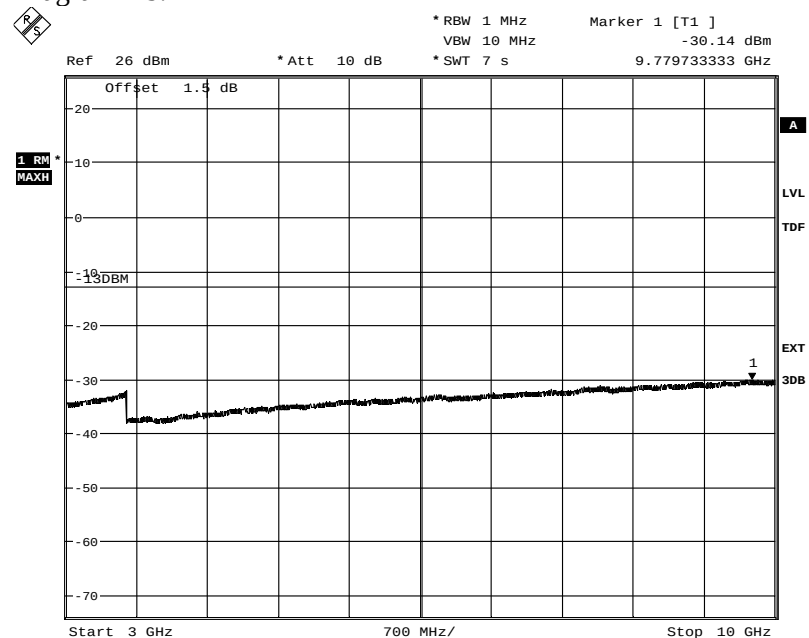
Appendix 4

Diagram 4 a:



Date: 3.APR.2014 08:36:39

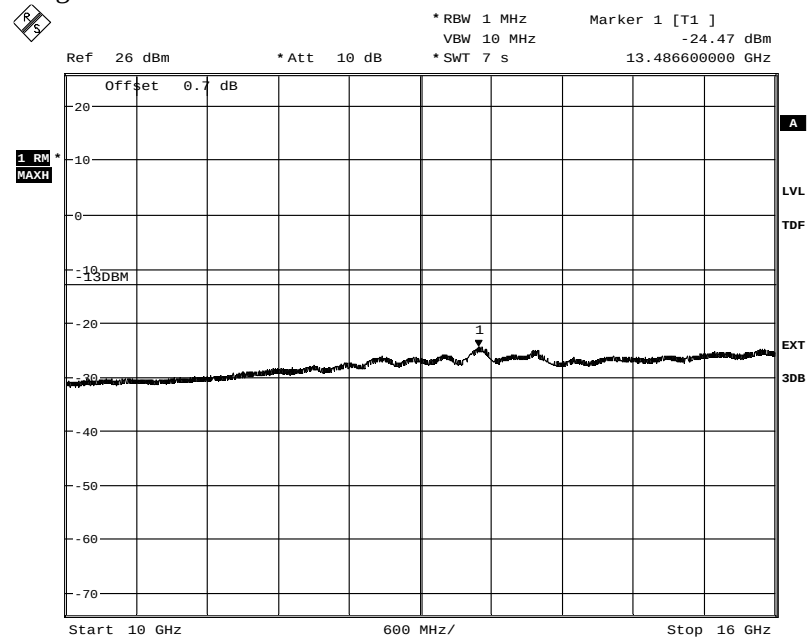
Diagram 4 b:



Date: 3.APR.2014 08:41:12

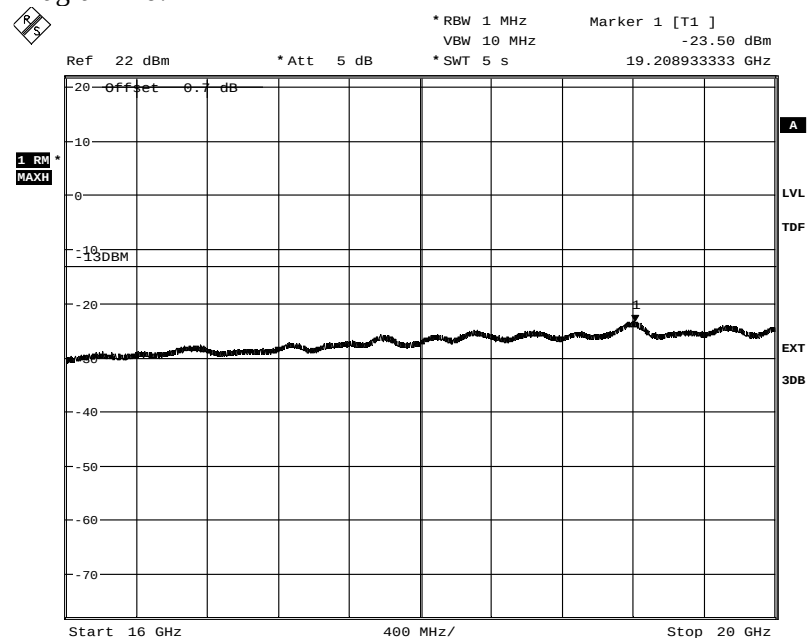
Appendix 4

Diagram 4 c:



Date: 3.APR.2014 08:42:32

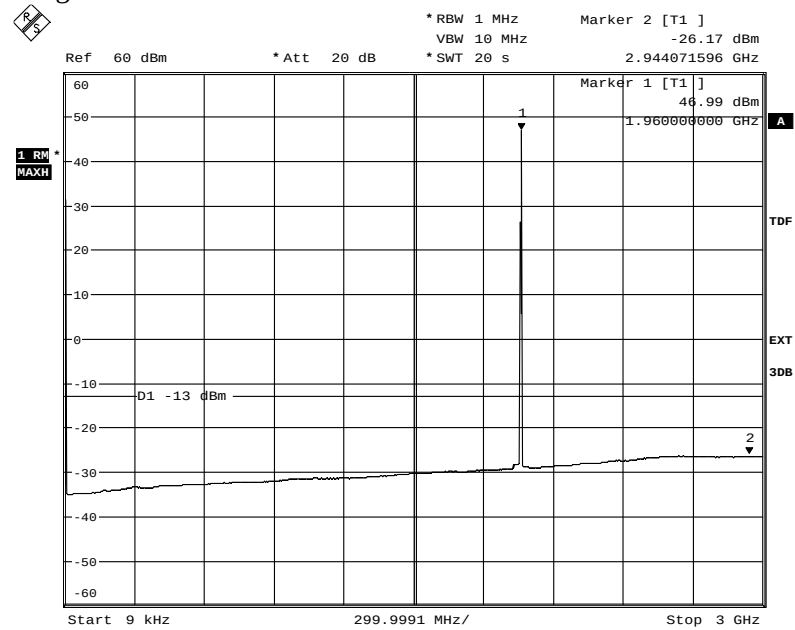
Diagram 4 d:



Date: 3.APR.2014 08:43:49

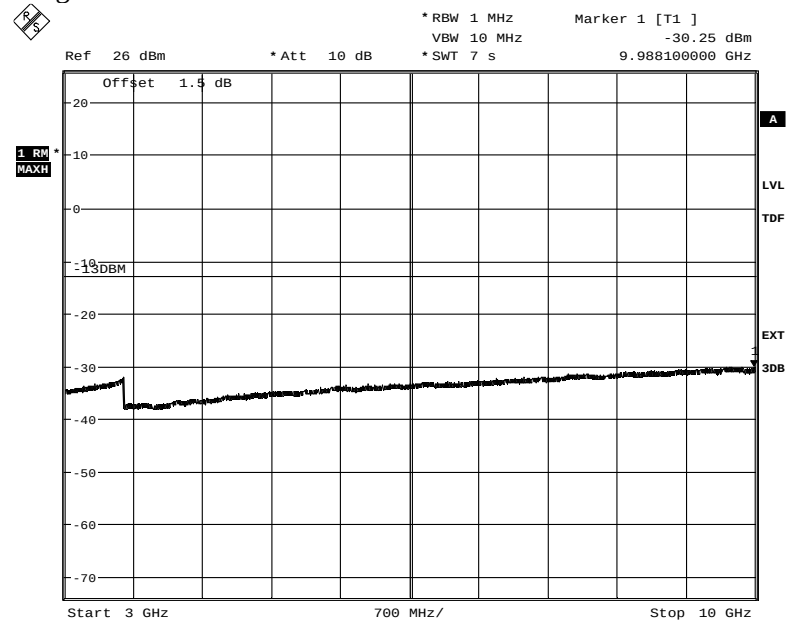
Appendix 4

Diagram 5 a:



Date: 3.APR.2014 08:51:19

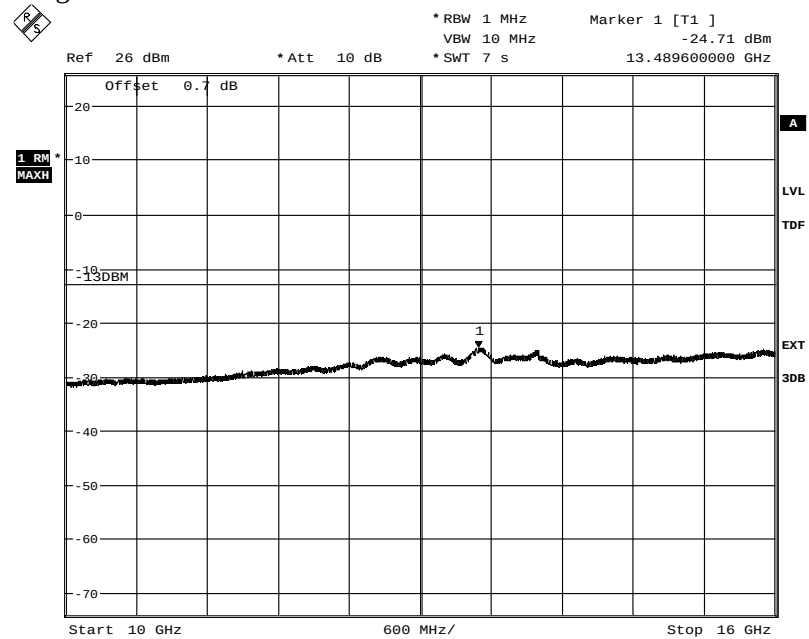
Diagram 5 b:



Date: 3.APR.2014 08:48:56

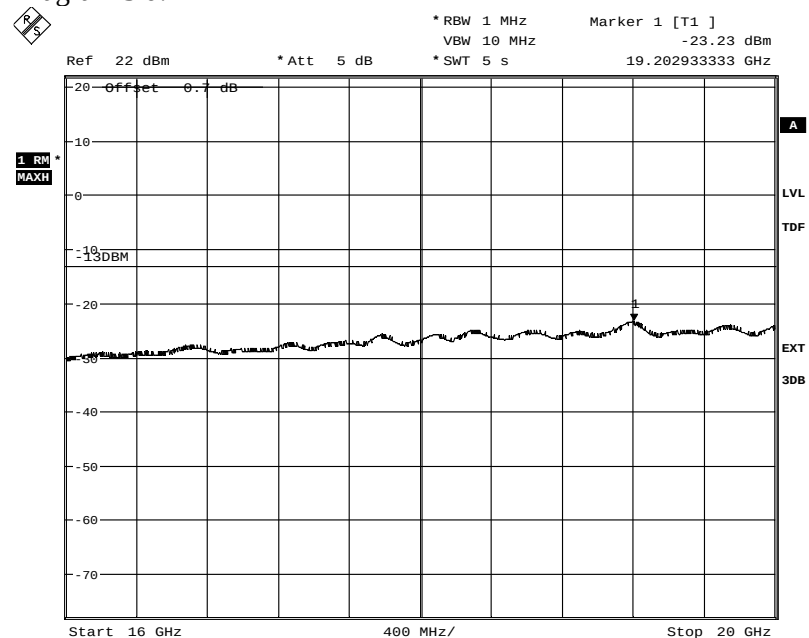
Appendix 4

Diagram 5 c:



Date: 3.APR.2014 08:47:40

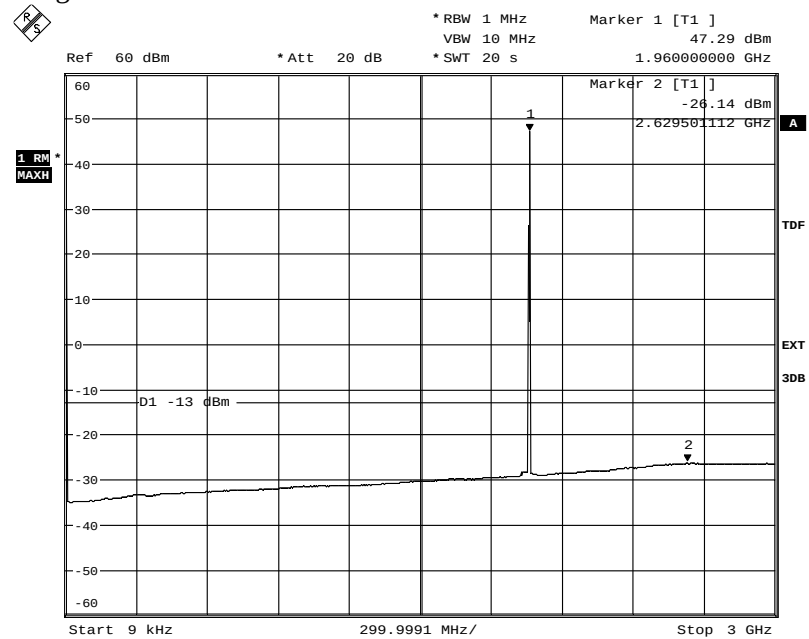
Diagram 5 d:



Date: 3.APR.2014 08:46:23

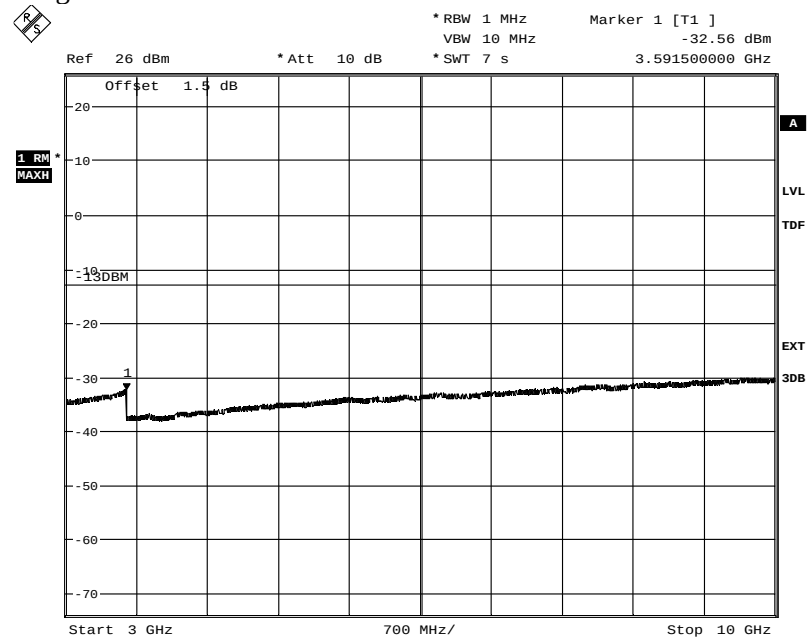
Appendix 4

Diagram 6 a:



Date: 3.APR.2014 07:23:05

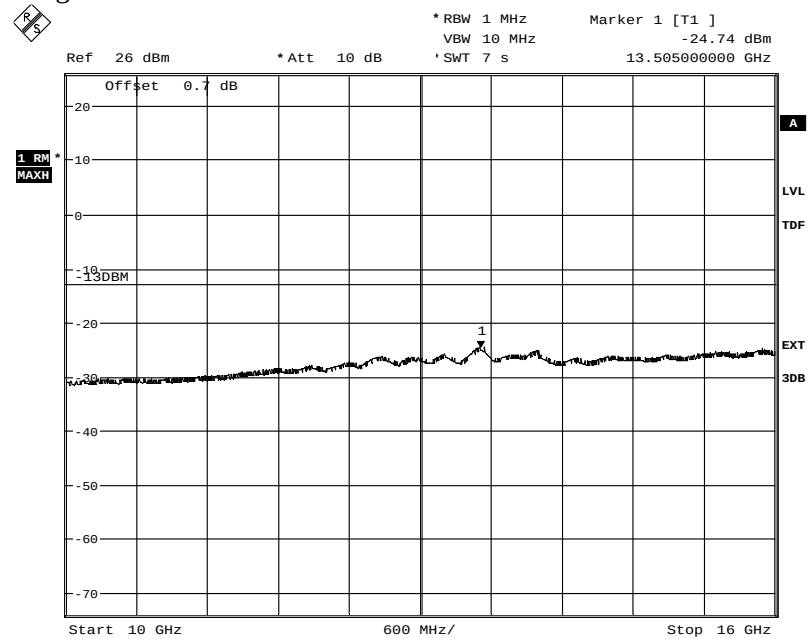
Diagram 6 b:



Date: 3.APR.2014 07:16:52

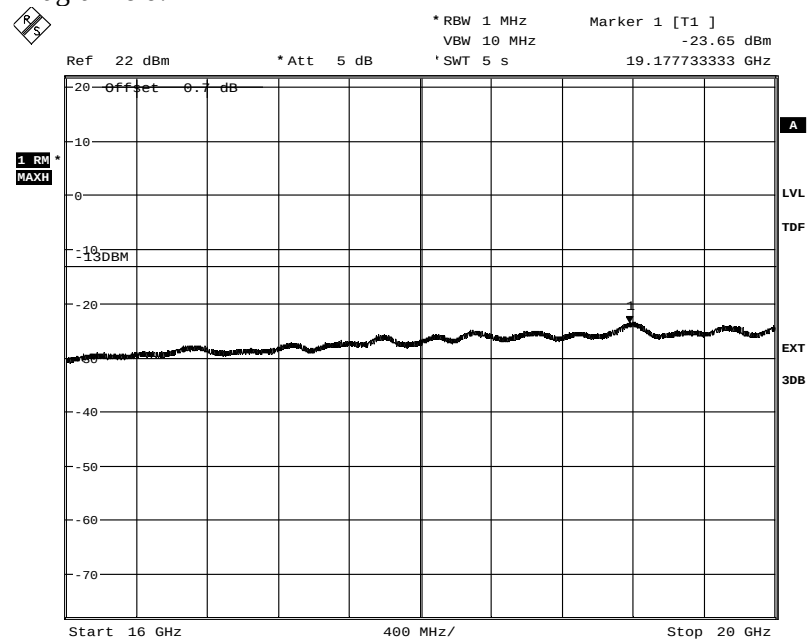
Appendix 4

Diagram 6 c:



Date: 3.APR.2014 07:19:33

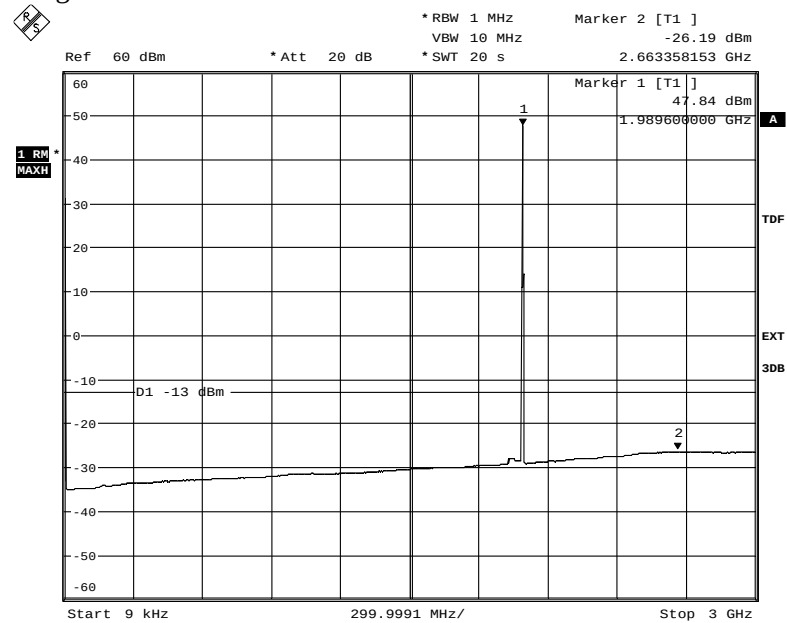
Diagram 6 d:



Date: 3.APR.2014 07:21:06

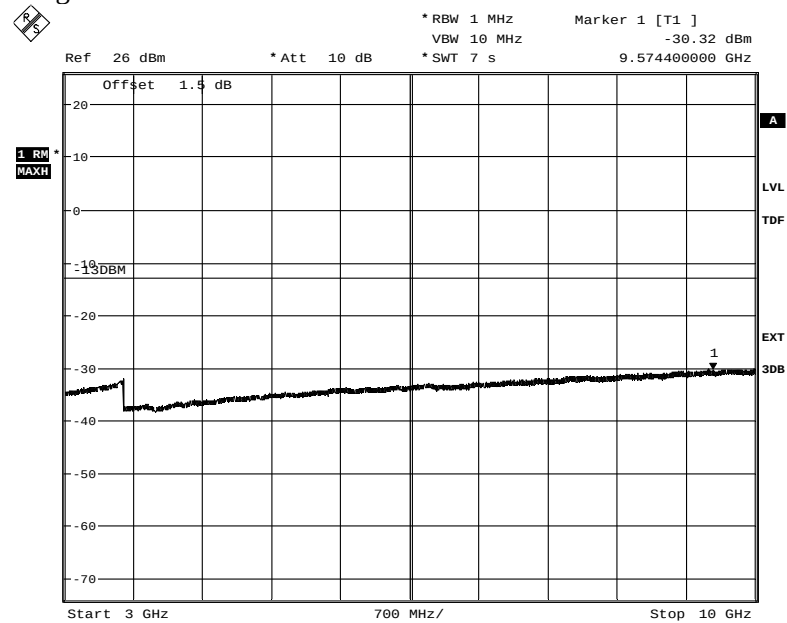
Appendix 4

Diagram 7 a:



Date: 3.APR.2014 11:39:11

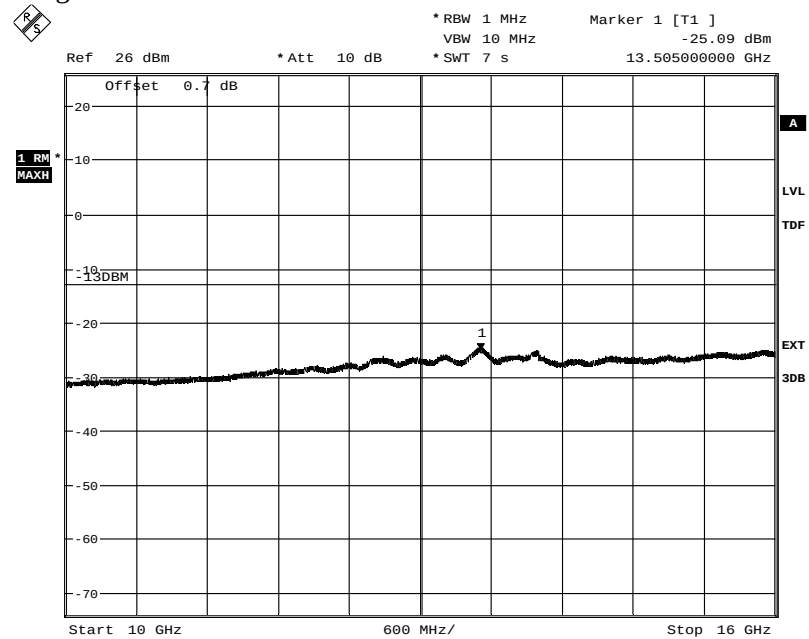
Diagram 7 b:



Date: 3.APR.2014 11:43:30

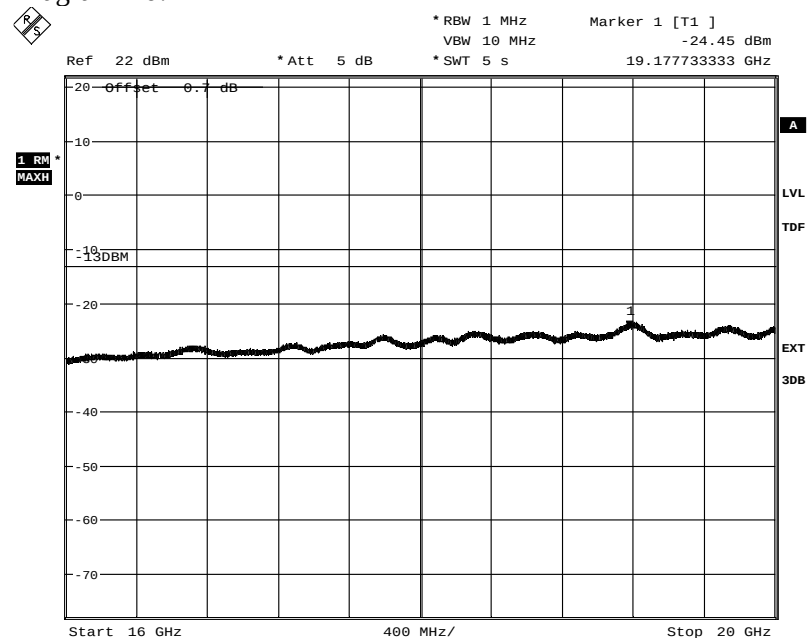
Appendix 4

Diagram 7 c:



Date: 3.APR.2014 11:44:16

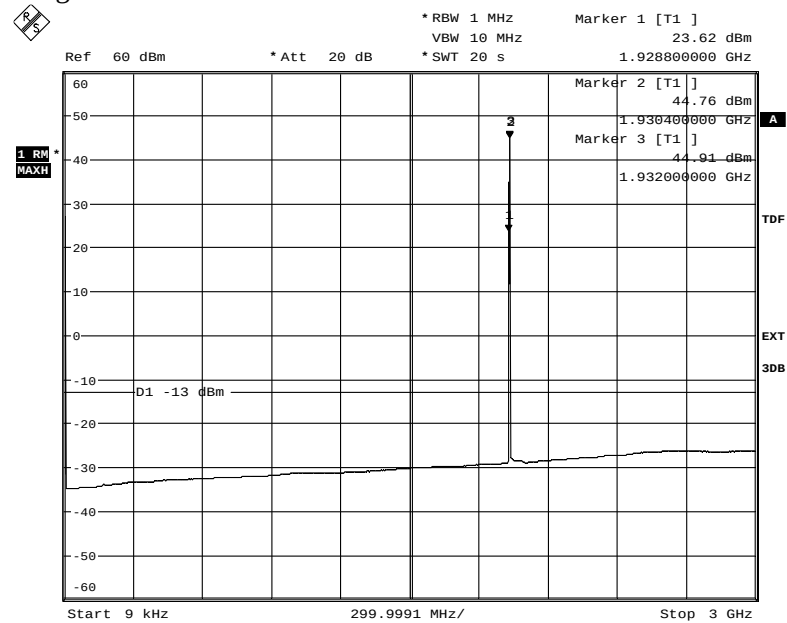
Diagram 7 d:



Date: 3.APR.2014 11:45:00

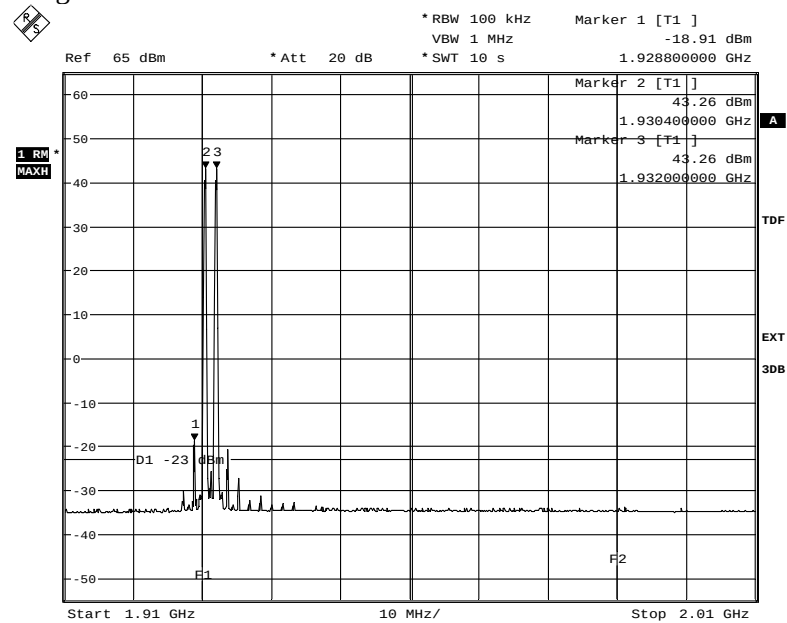
Appendix 4

Diagram 8 a:



Date: 3.APR.2014 20:10:08

Diagram 8 b:

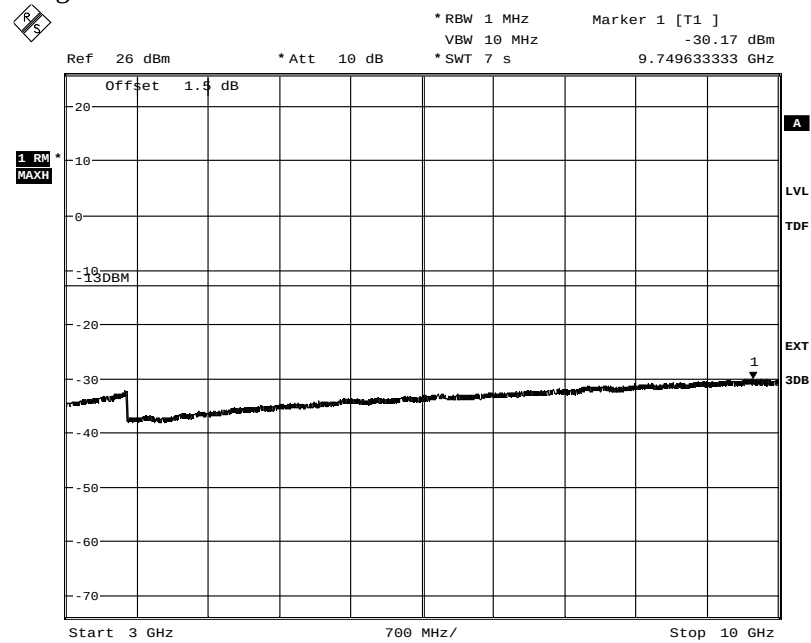


Date: 3.APR.2014 20:13:33

The emission at 1928.8 MHz was -18.82 dBm, measured with the channel power method with 1 MHz channel bandwidth.

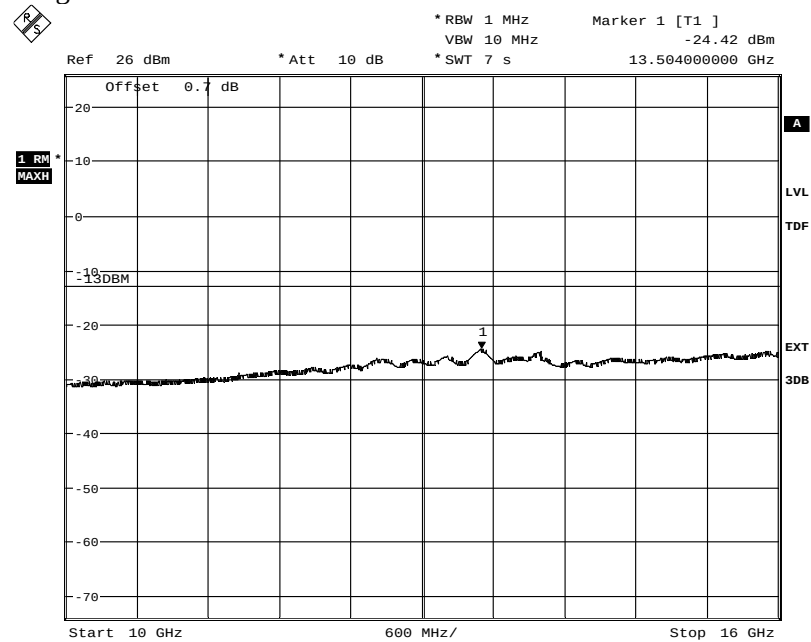
Appendix 4

Diagram 8 c:



Date: 3.APR.2014 20:21:16

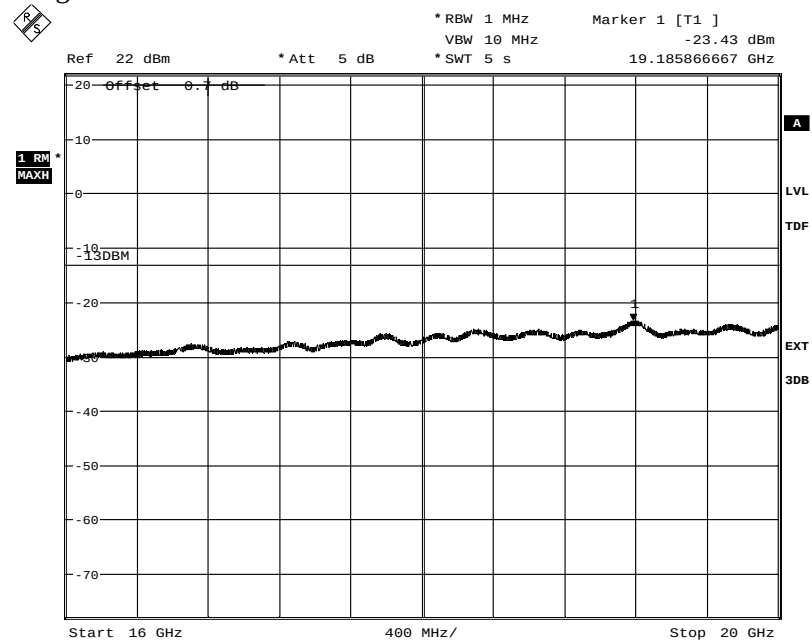
Diagram 8 d:



Date: 3.APR.2014 20:23:23

Appendix 4

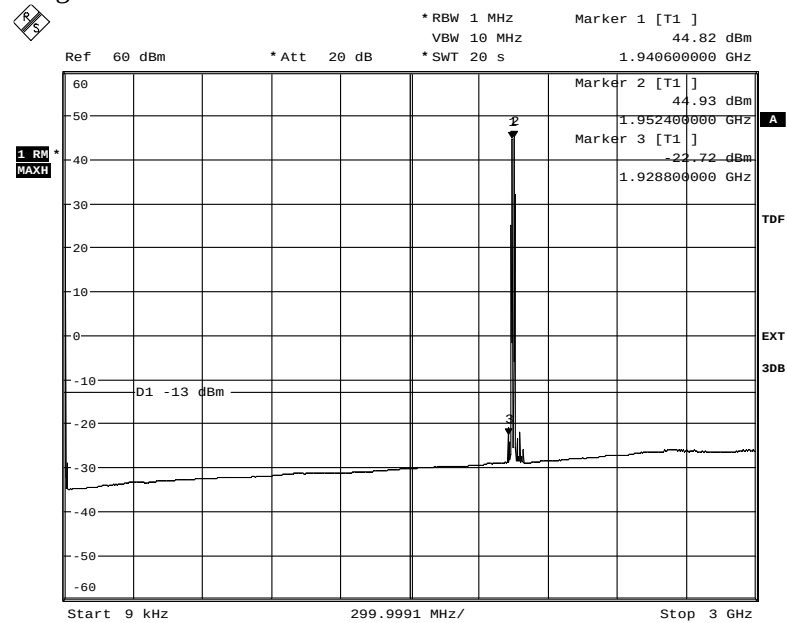
Diagram 8 e:



Date: 3.APR.2014 20:25:08

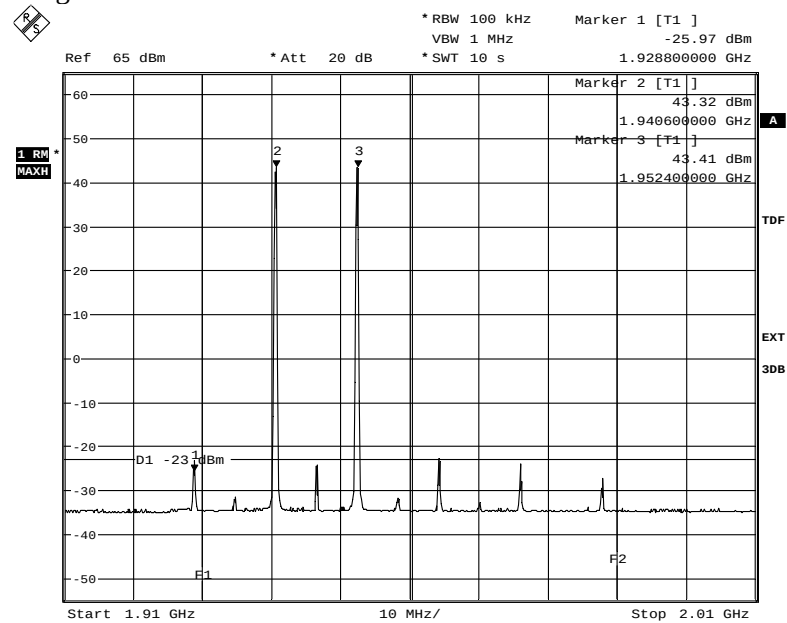
Appendix 4

Diagram 9 a:



Date: 3.APR.2014 15:16:21

Diagram 9 b:

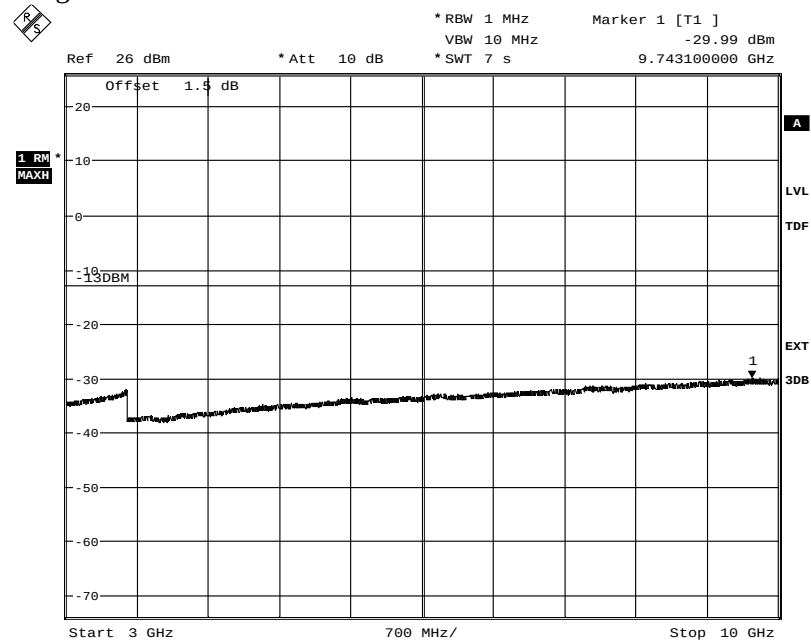


Date: 3.APR.2014 15:19:49

The emission at 1928.8 MHz was -21.39 dBm measured with the channel power method with 1 MHz channel bandwidth.

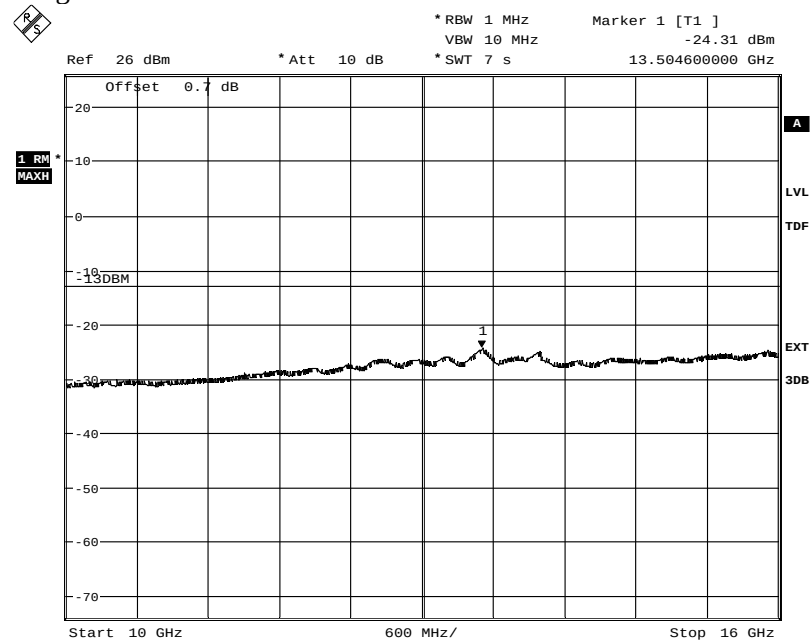
Appendix 4

Diagram 9 c



Date: 3.APR.2014 15:26:10

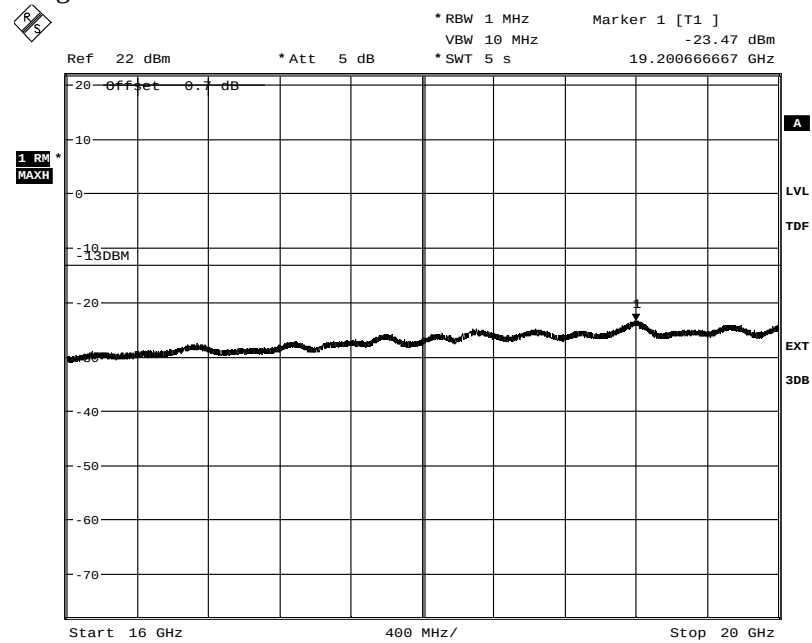
Diagram 9 d:



Date: 3.APR.2014 15:28:11

Appendix 4

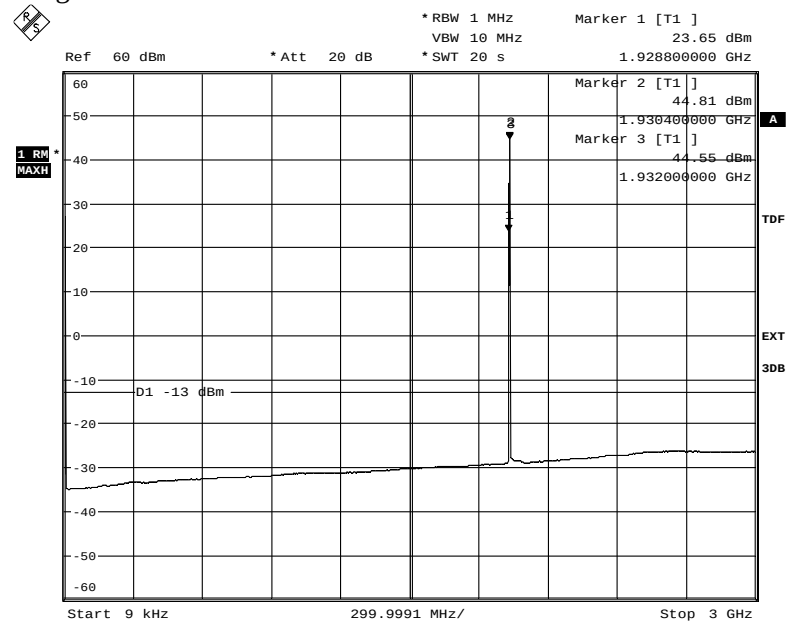
Diagram 9 e:



Date: 3.APR.2014 15:29:06

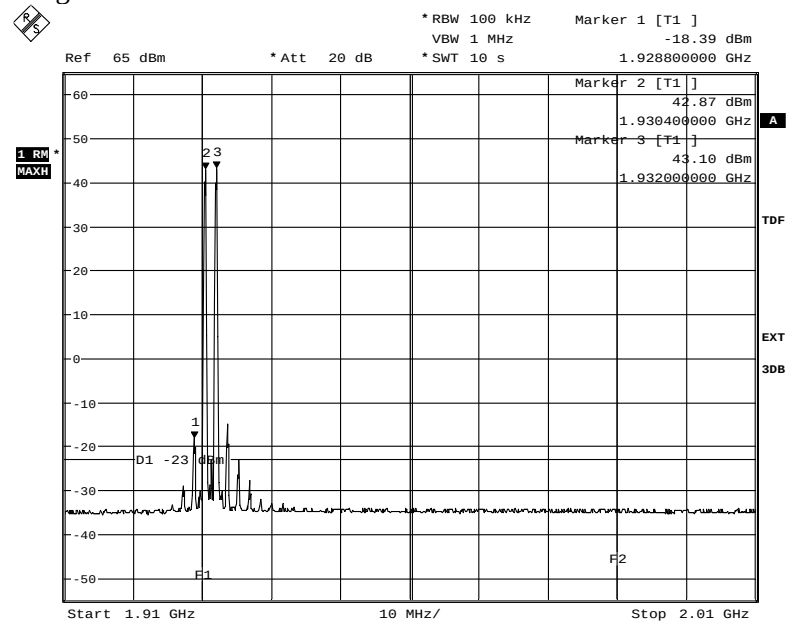
Appendix 4

Diagram 10 a:



Date: 3.APR.2014 20:50:23

Diagram 10 b:

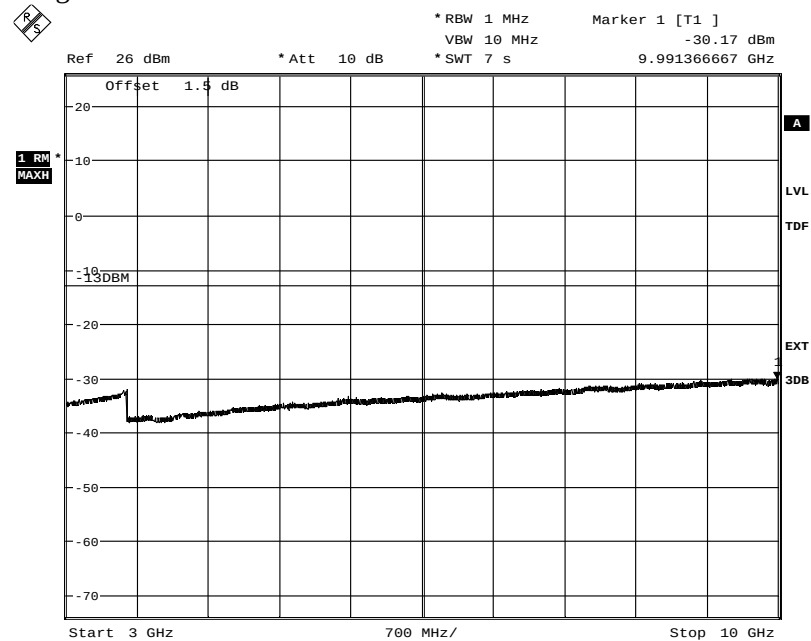


Date: 3.APR.2014 20:51:52

The emission at 1928.8 MHz was -16.56 dBm measured with the channel power method with 1 MHz channel bandwidth.

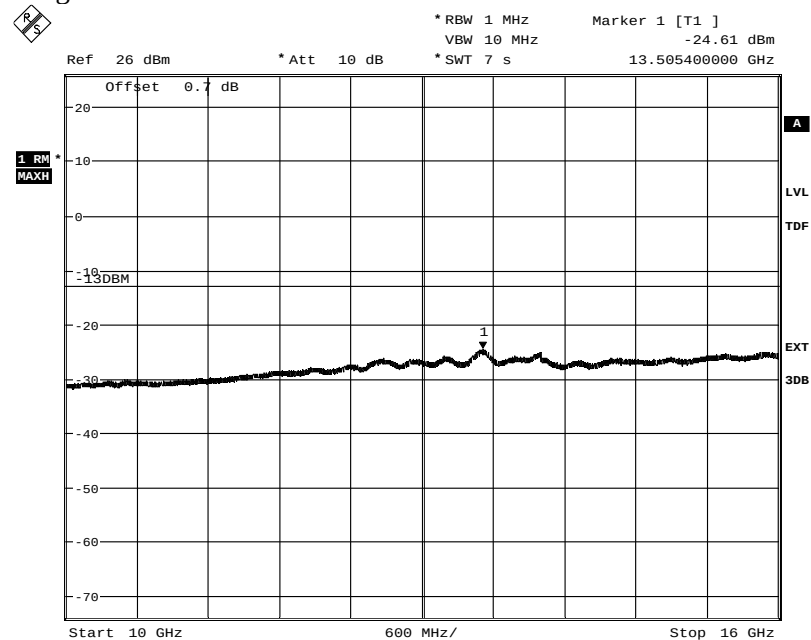
Appendix 4

Diagram 10 c:



Date: 3.APR.2014 20:55:24

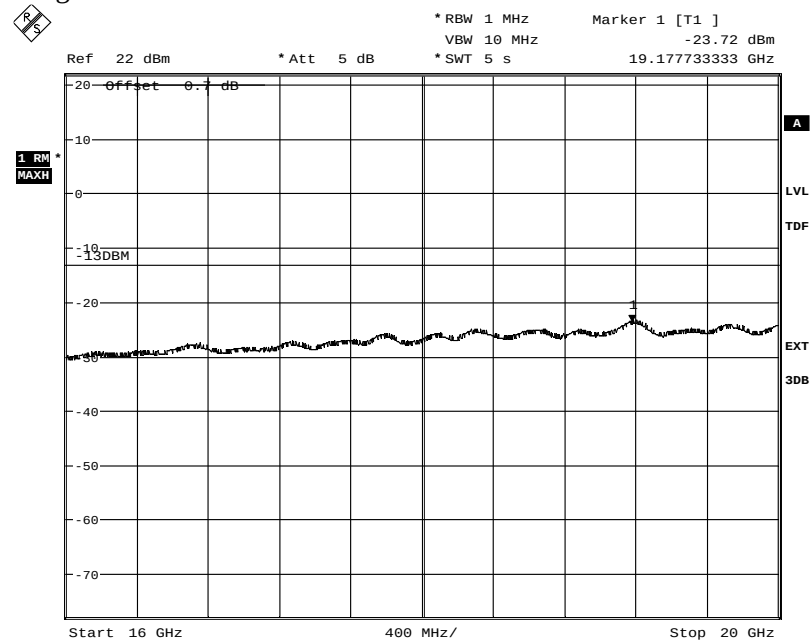
Diagram 10 d:



Date: 3.APR.2014 20:56:23

Appendix 4

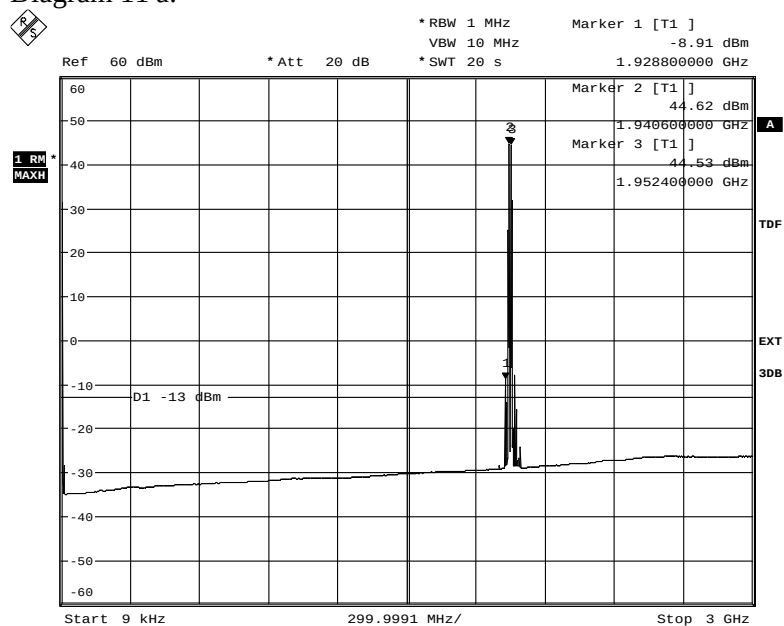
Diagram 10 e:



Date: 3.APR.2014 14:17:40

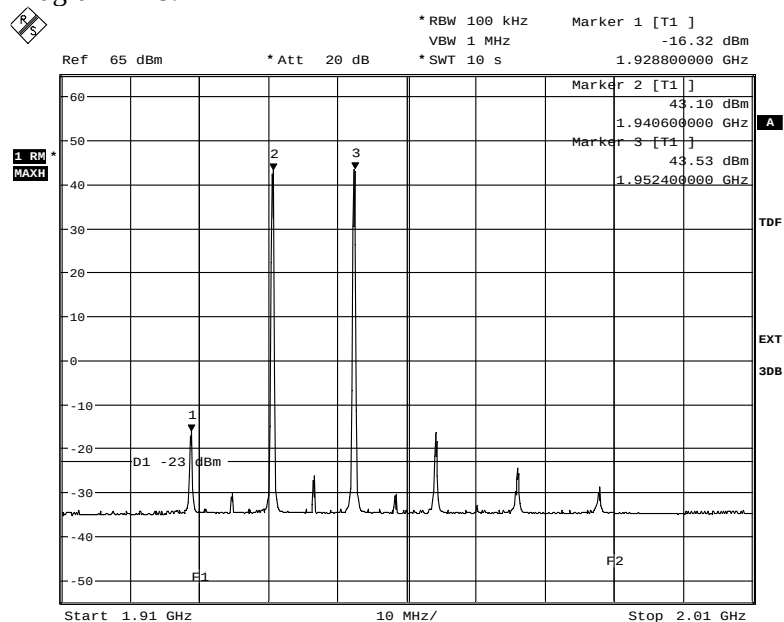
Appendix 4

Diagram 11 a:



Date: 3.APR.2014 15:39:49

Diagram 11 b:

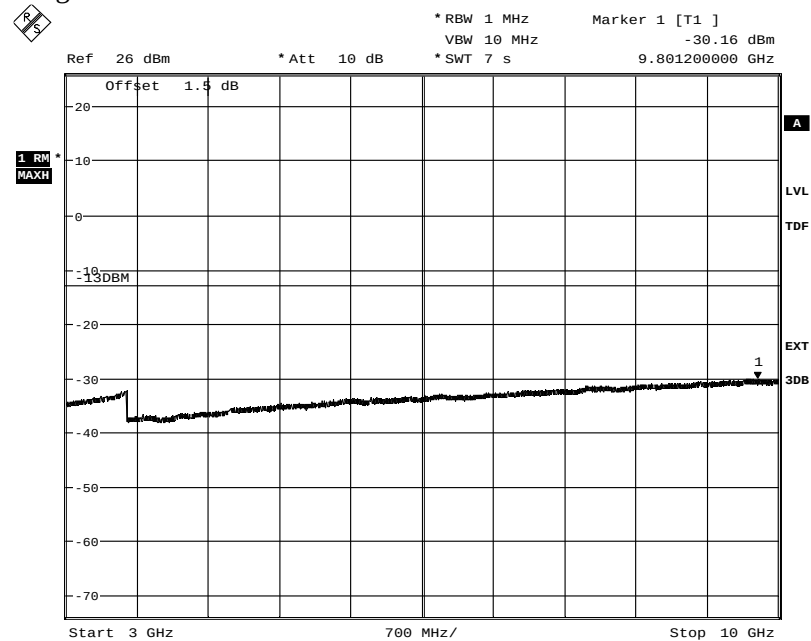


Date: 3.APR.2014 15:58:13

The emission at 1928.8 MHz was -13.94 dBm measured with the channel power method with 1 MHz channel bandwidth.

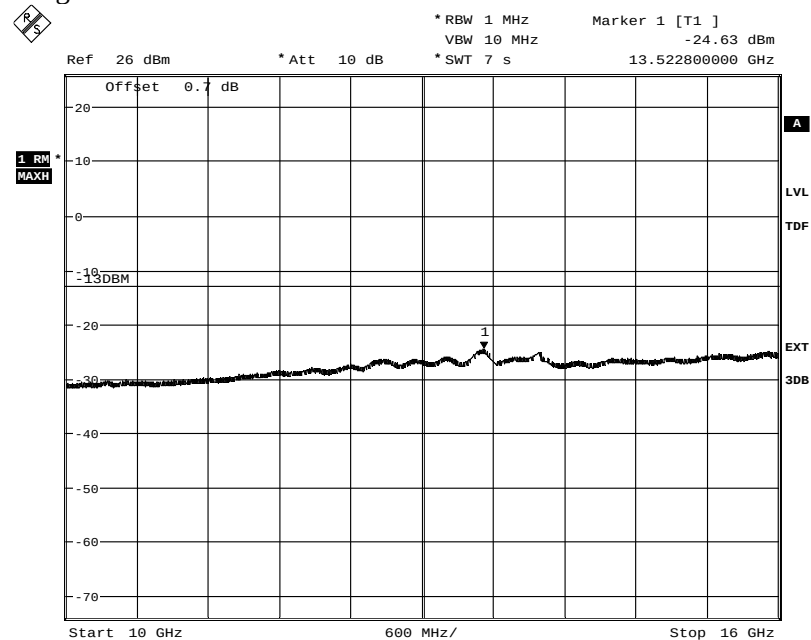
Appendix 4

Diagram 11 c



Date: 3.APR.2014 15:37:16

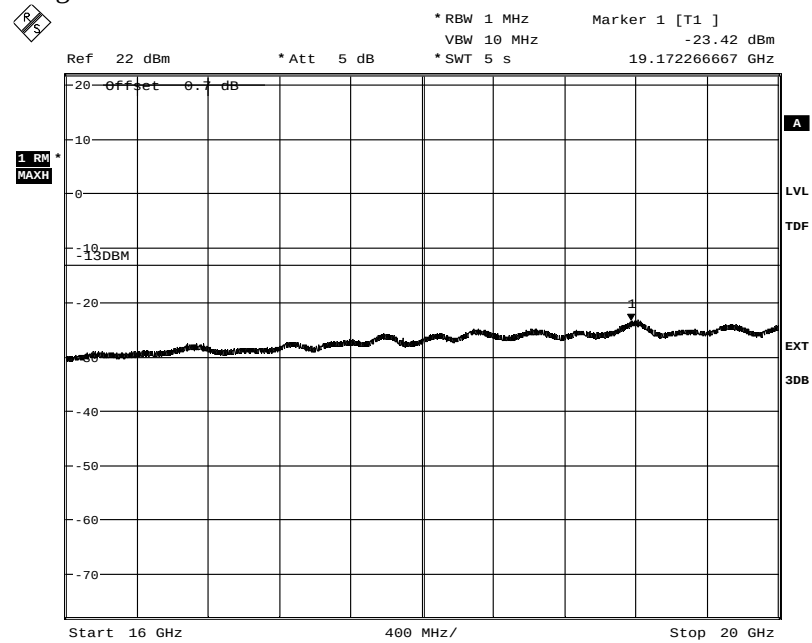
Diagram 11 d:



Date: 3.APR.2014 15:36:19

Appendix 4

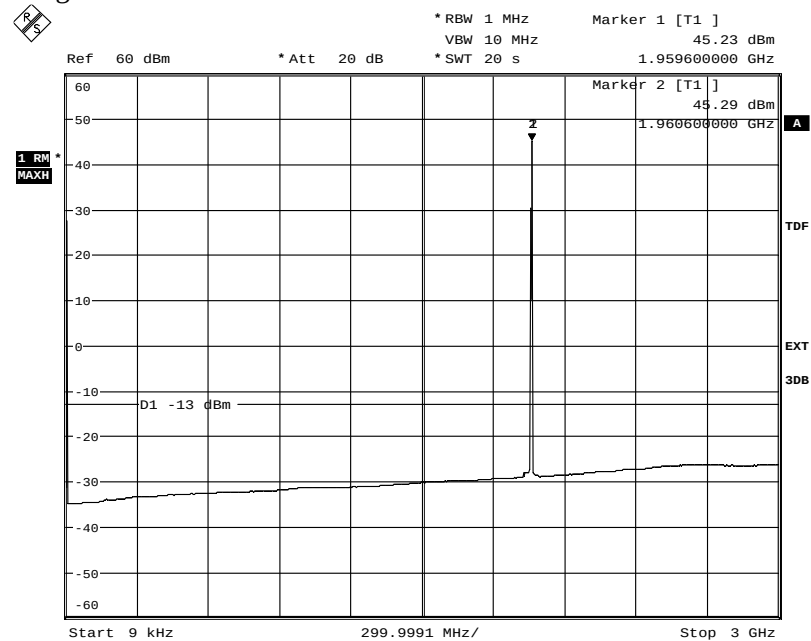
Diagram 11 e:



Date: 3.APR.2014 15:34:48

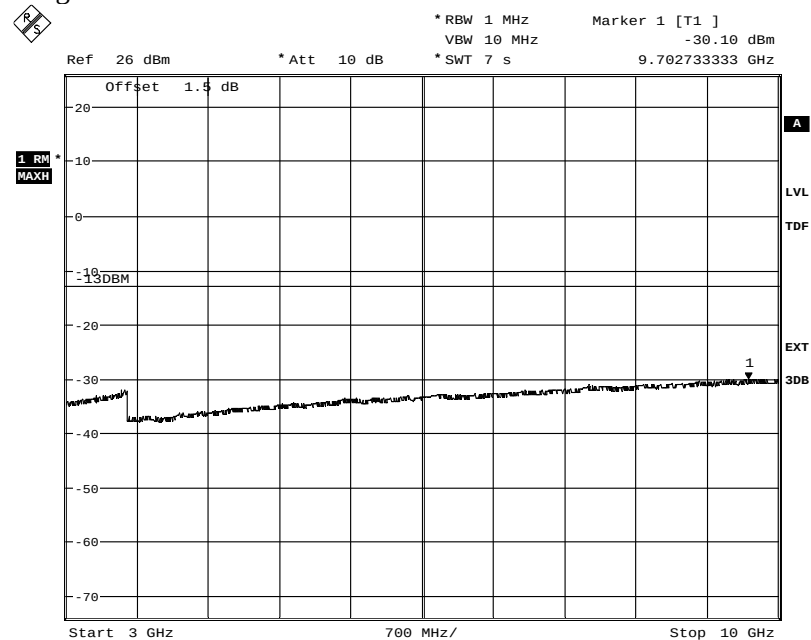
Appendix 4

Diagram 12 a:



Date: 3.APR.2014 19:09:48

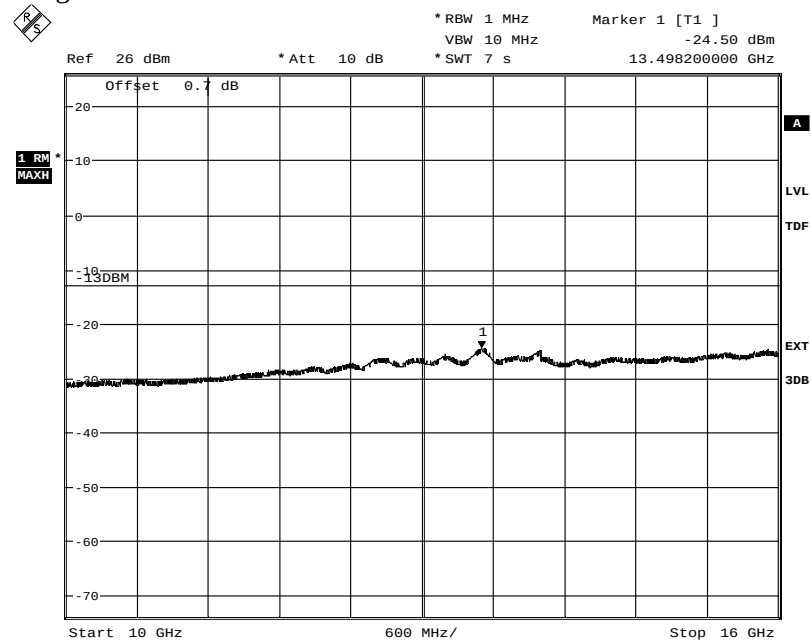
Diagram 12 b:



Date: 3.APR.2014 19:14:16

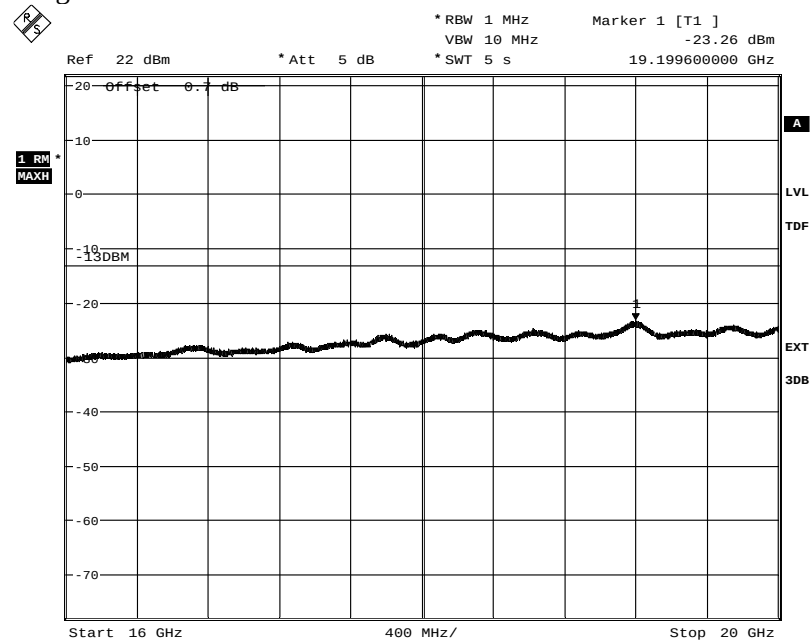
Appendix 4

Diagram 12 c:



Date: 3.APR.2014 19:16:44

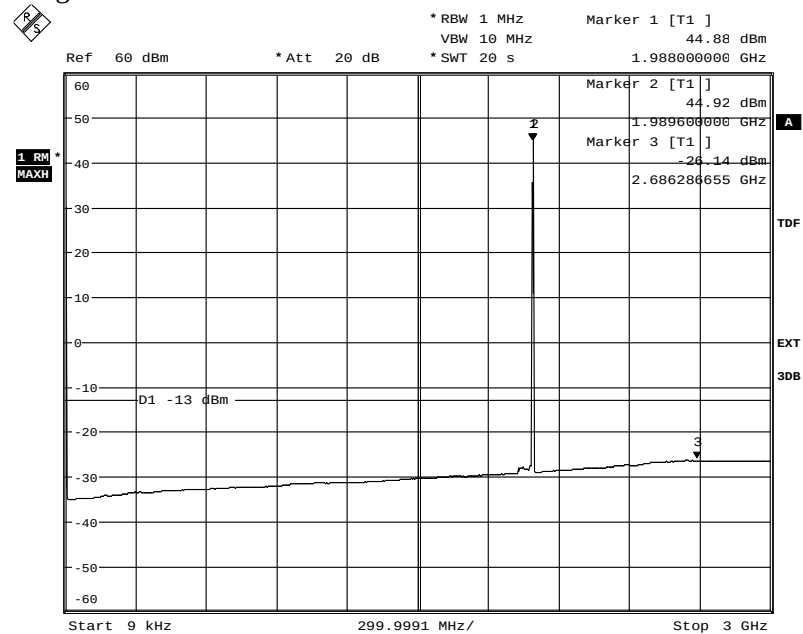
Diagram 12 d:



Date: 3.APR.2014 19:17:42

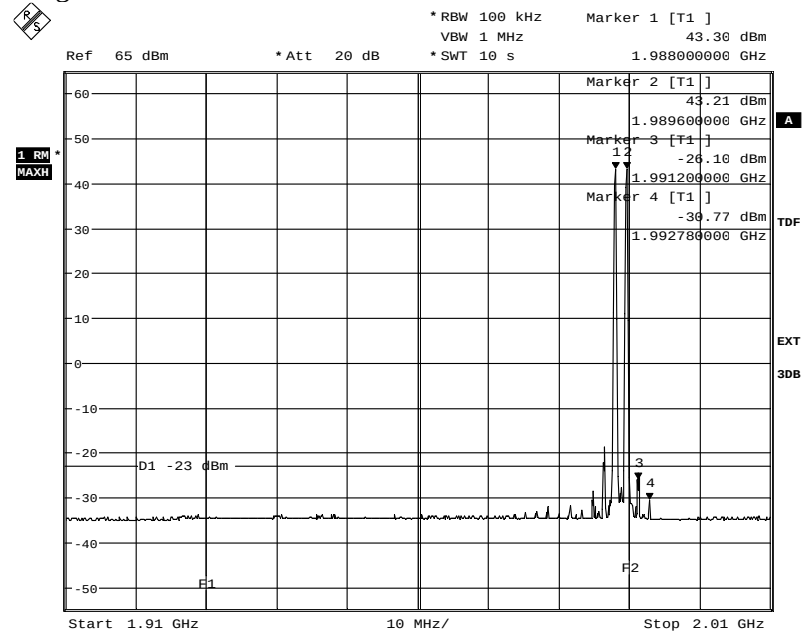
Appendix 4

Diagram 13 a:



Date: 3.APR.2014 12:36:58

Diagram 13 b:

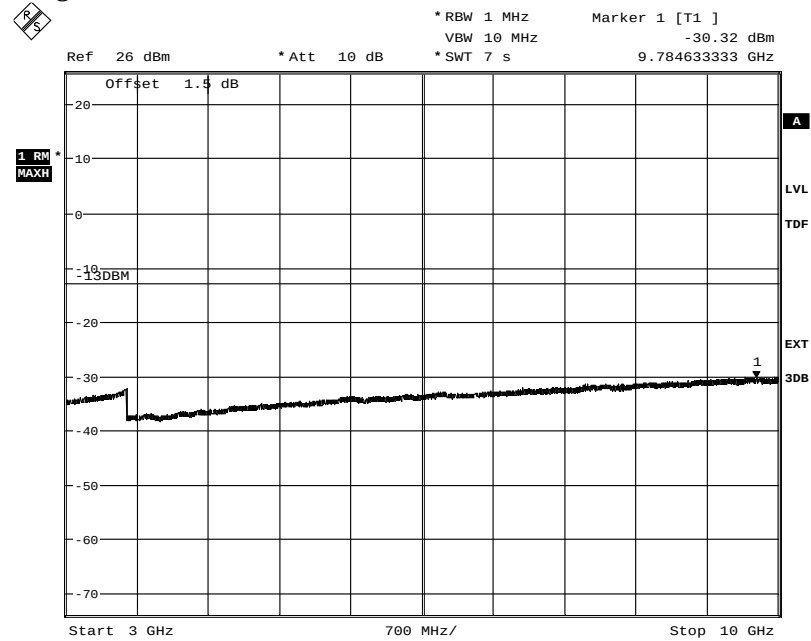


Date: 3.APR.2014 12:54:59

The emission at 1991.2 MHz was -25.66 dBm, and at 1992.78 MHz was -29.75 dBm, measured with the channel power method with 1 MHz channel bandwidth.

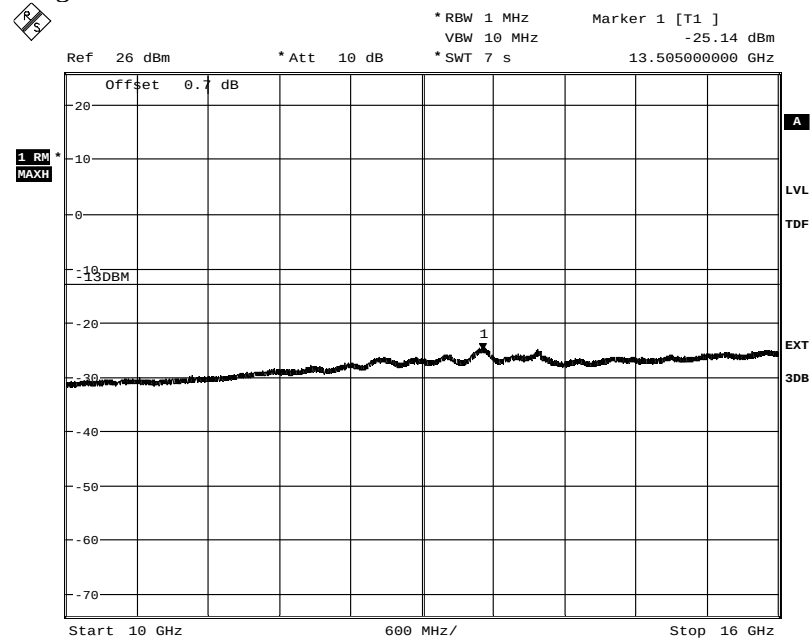
Appendix 4

Diagram 13 c



Date: 3.APR.2014 12:58:45

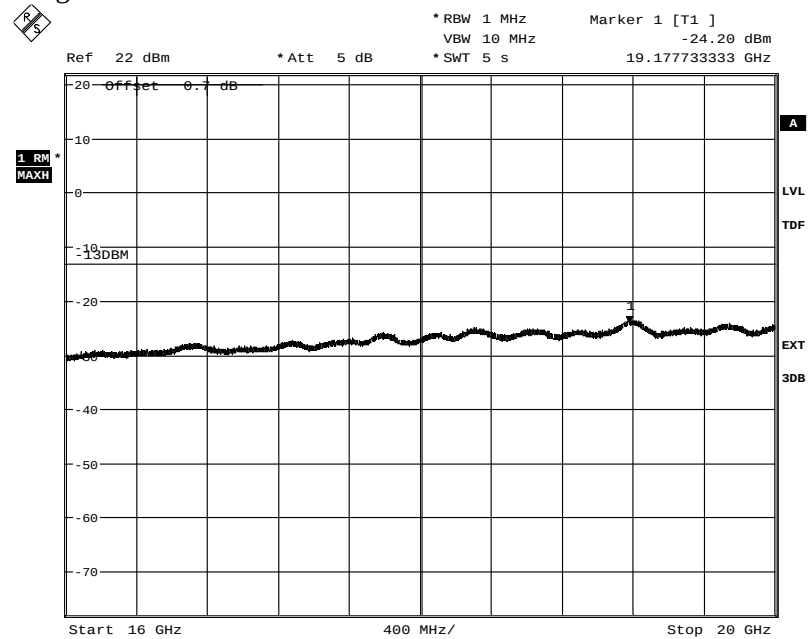
Diagram 13 d:



Date: 3.APR.2014 12:59:37

Appendix 4

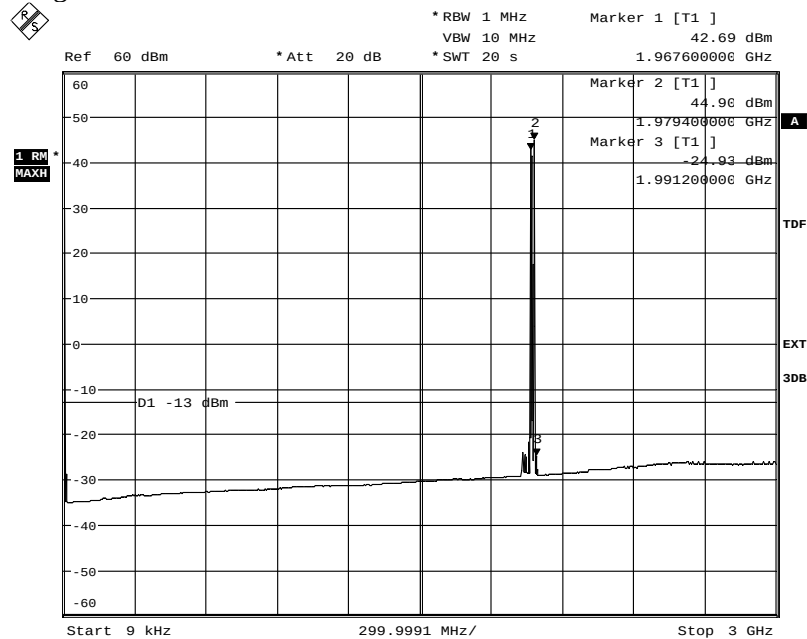
Diagram 13 e:



Date: 3.APR.2014 13:00:24

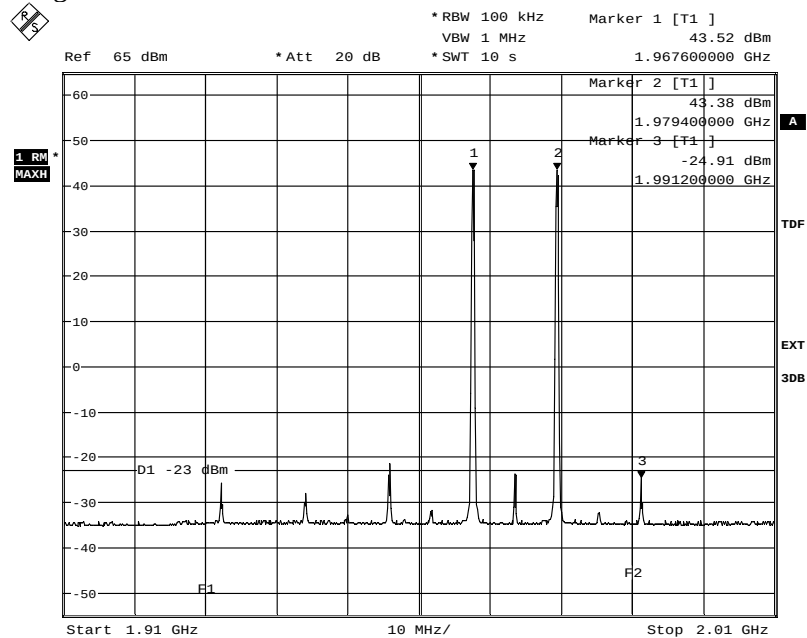
Appendix 6

Diagram 14 a:



Date: 3.APR.2014 13:49:53

Diagram 14 b:

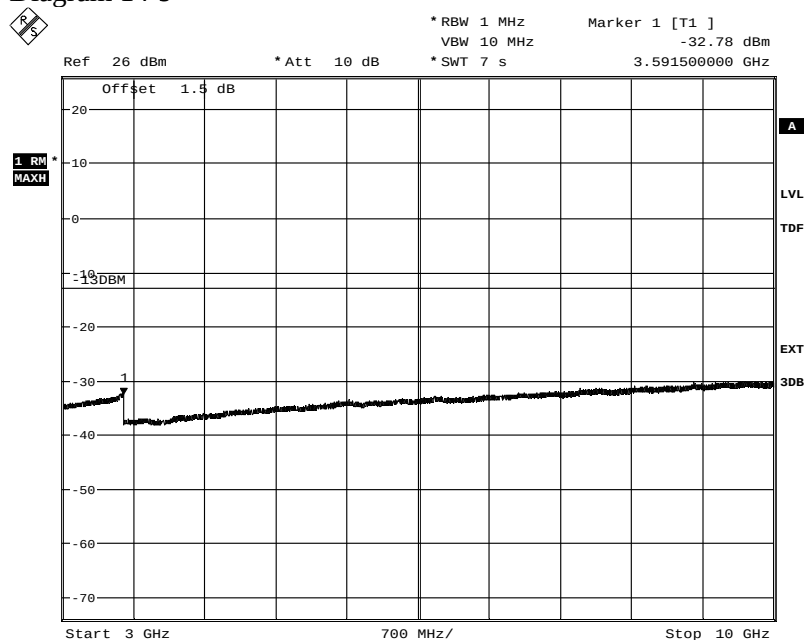


Date: 3.APR.2014 13:55:41

The emission at 1991.2 MHz was -24.38 dBm measured with the channel power method with 1 MHz channel bandwidth.

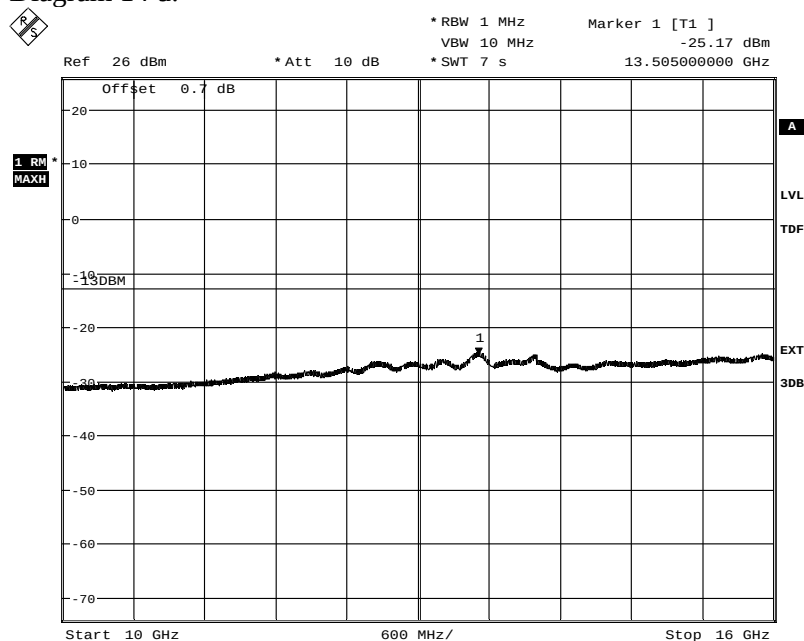
Appendix 6

Diagram 14 c



Date: 3.APR.2014 14:10:44

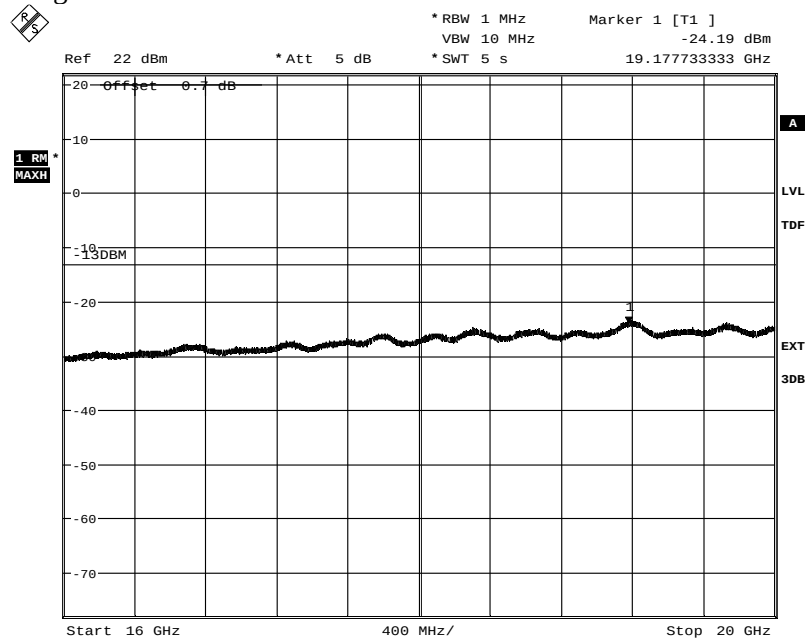
Diagram 14 d:



Date: 3.APR.2014 14:11:43

Appendix 6

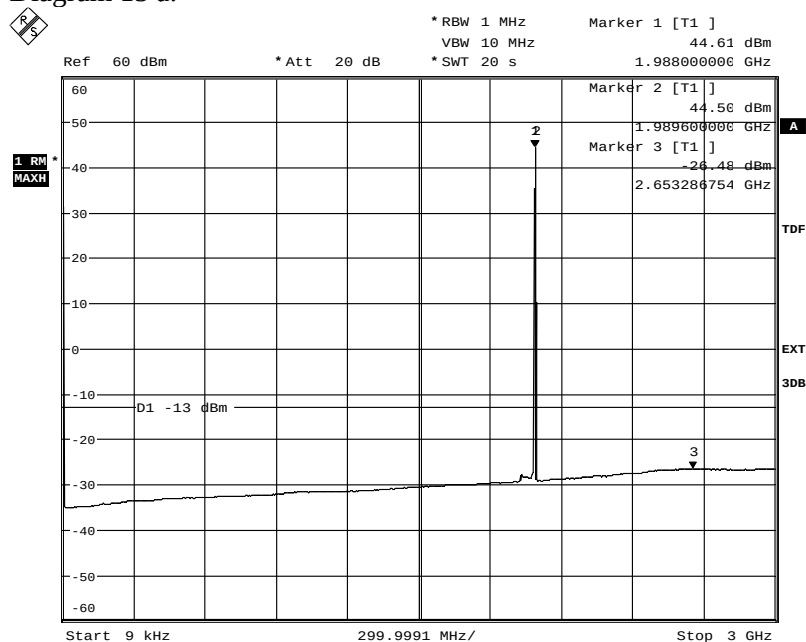
Diagram 14 e:



Date: 3.APR.2014 14:12:30

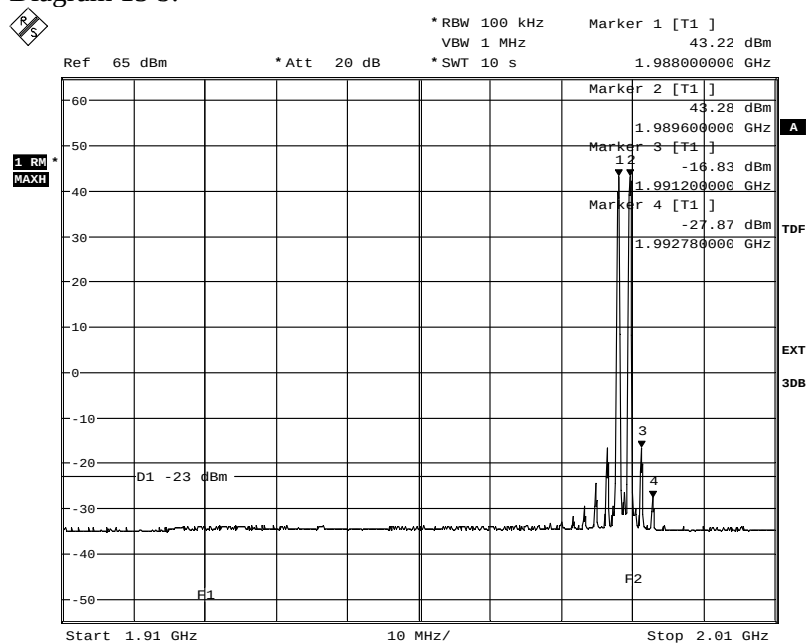
Appendix 6

Diagram 15 a:



Date: 3.APR.2014 13:10:14

Diagram 15 b:

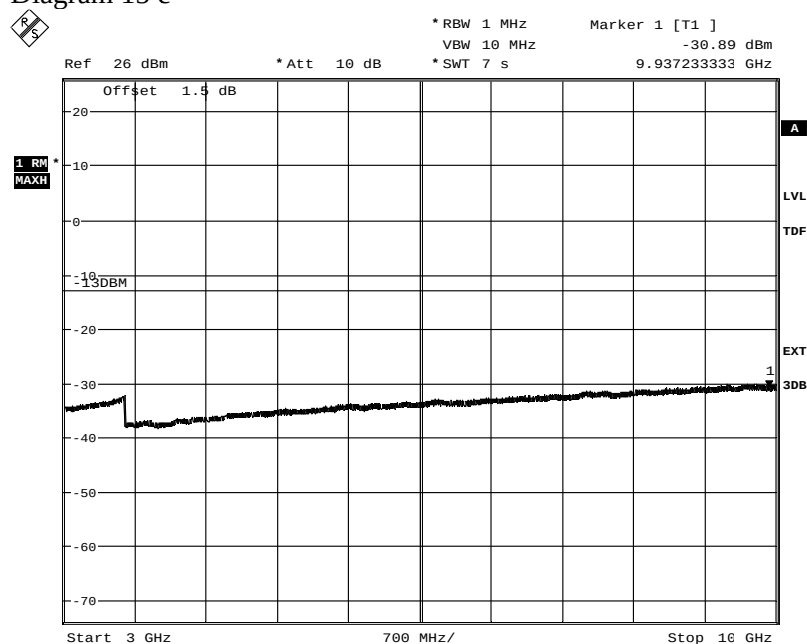


Date: 3.APR.2014 13:12:29

The emission at 1991.2 MHz was -17.59 dBm, and at 1999.3 MHz was -26.81 dBm, measured with the channel power method with 1 MHz channel bandwidth.

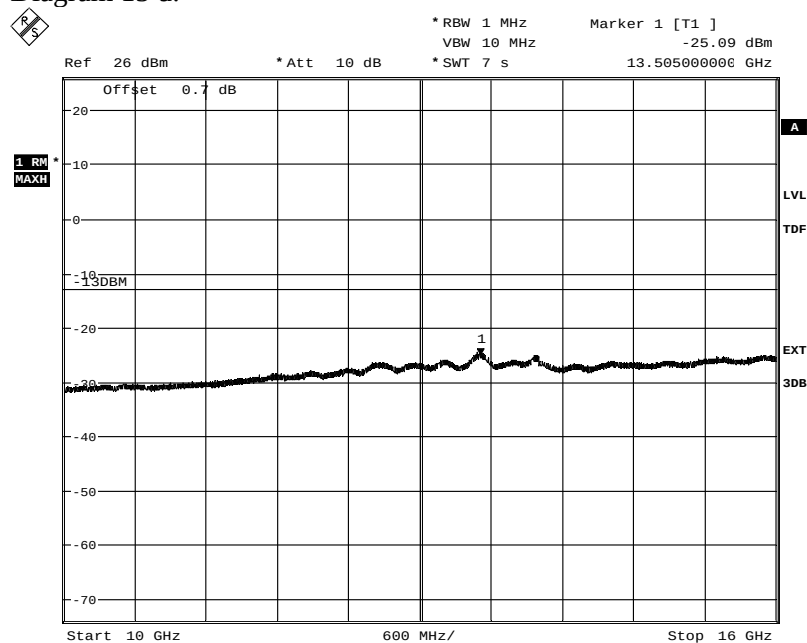
Appendix 6

Diagram 15 c



Date: 3.APR.2014 13:07:49

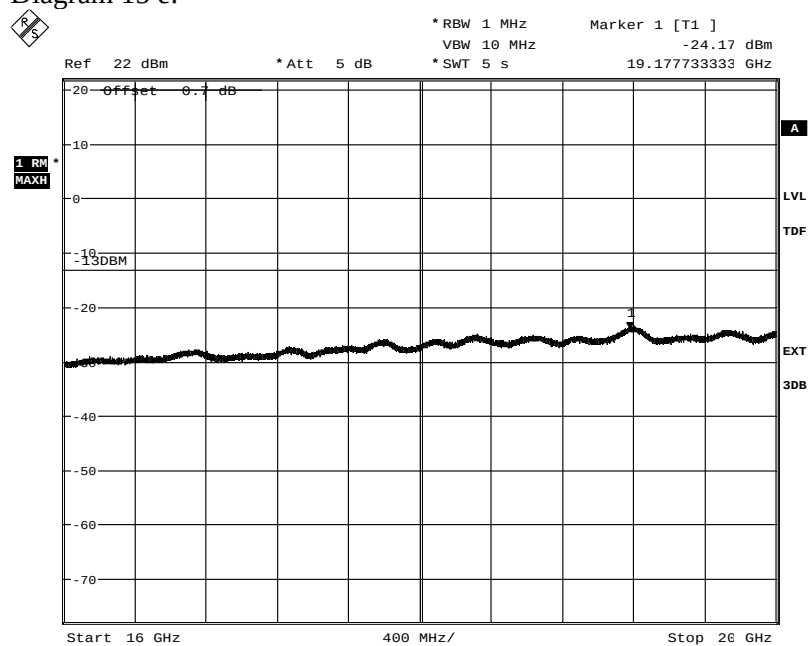
Diagram 15 d:



Date: 3.APR.2014 13:04:53

Appendix 6

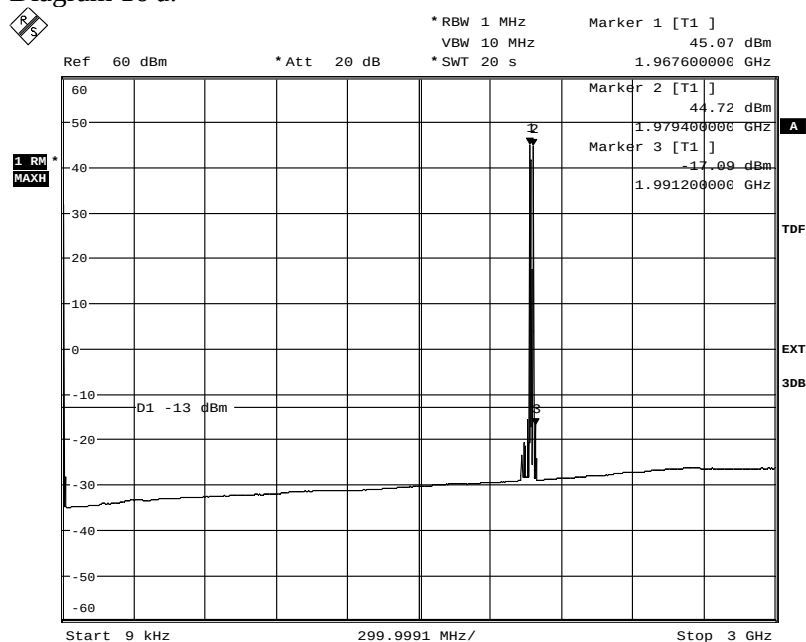
Diagram 15 e:



Date: 3.APR.2014 13:03:51

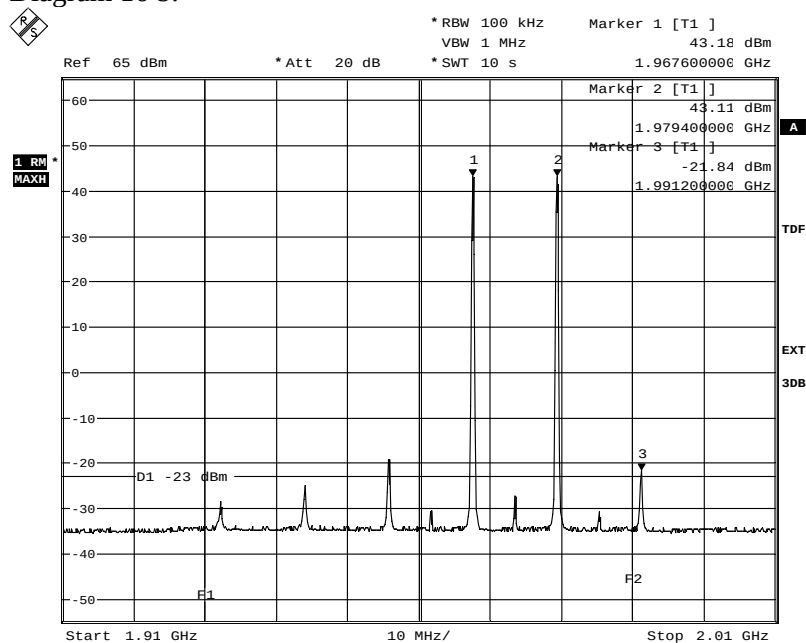
Appendix 6

Diagram 16 a:



Date: 3.APR.2014 14:24:32

Diagram 16 b:

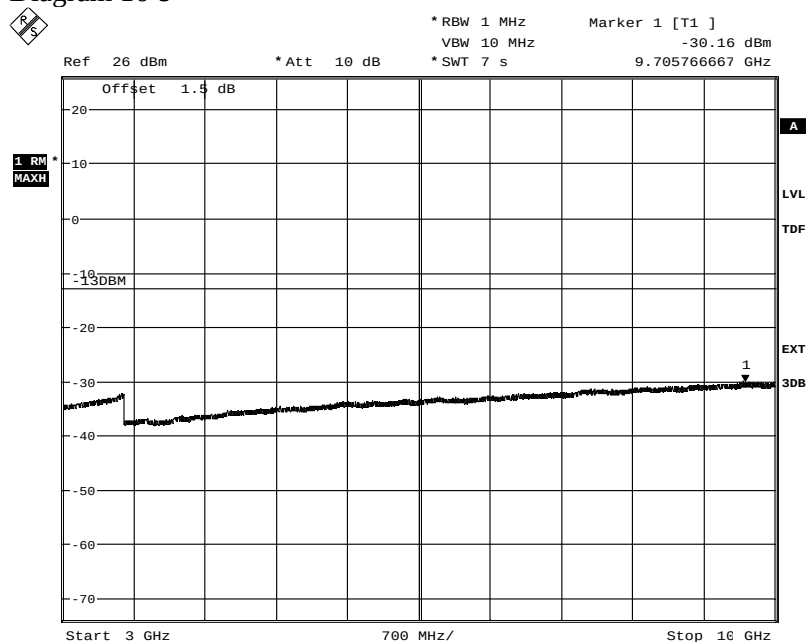


Date: 3.APR.2014 14:25:53

The emission at 1991.2 MHz was -18.11 dBm measured with the channel power method with 1 MHz channel bandwidth.

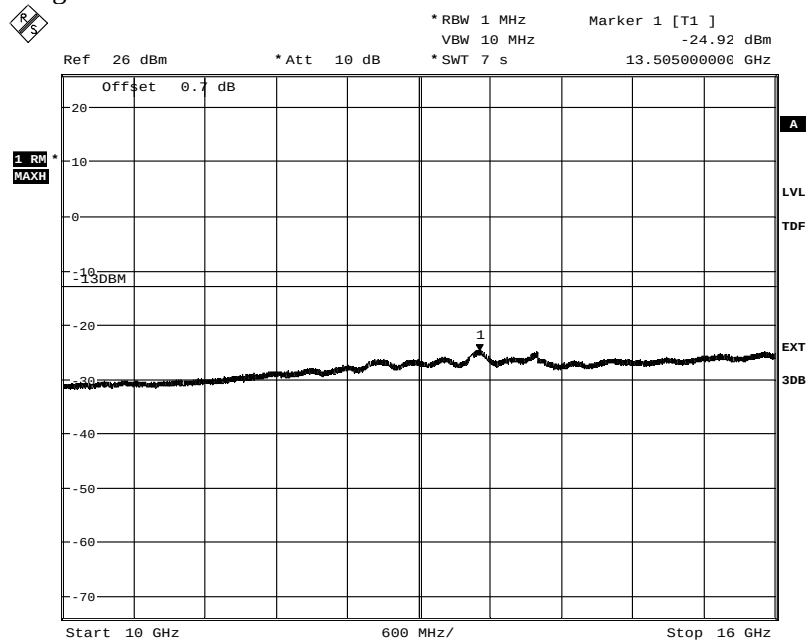
Appendix 6

Diagram 16 c



Date: 3.APR.2014 14:21:24

Diagram 16 d:

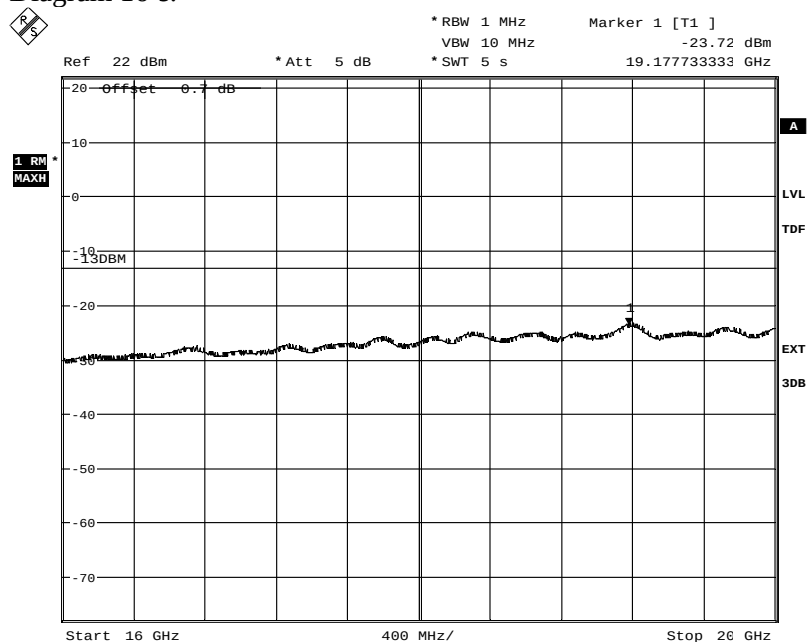


Date: 3.APR.2014 14:18:34



Appendix 6

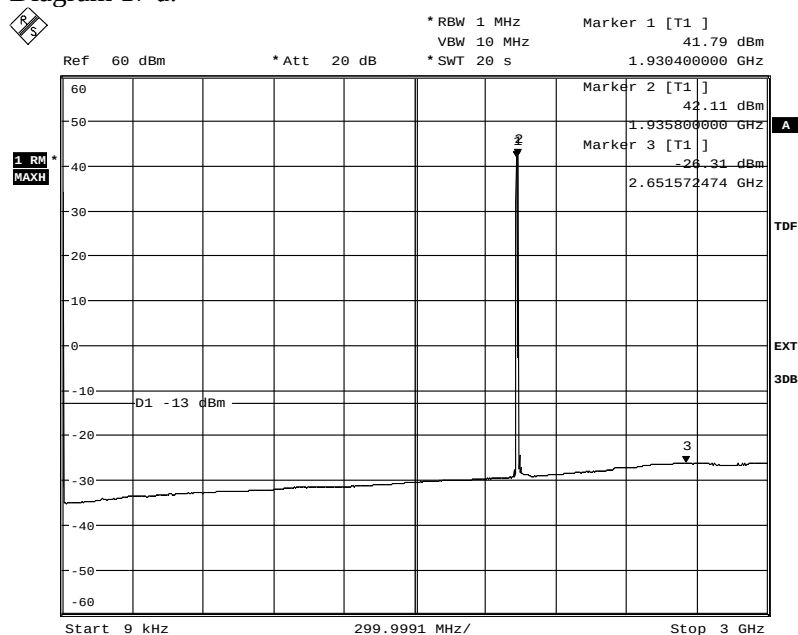
Diagram 16 e:



Date: 3.APR.2014 14:17:40

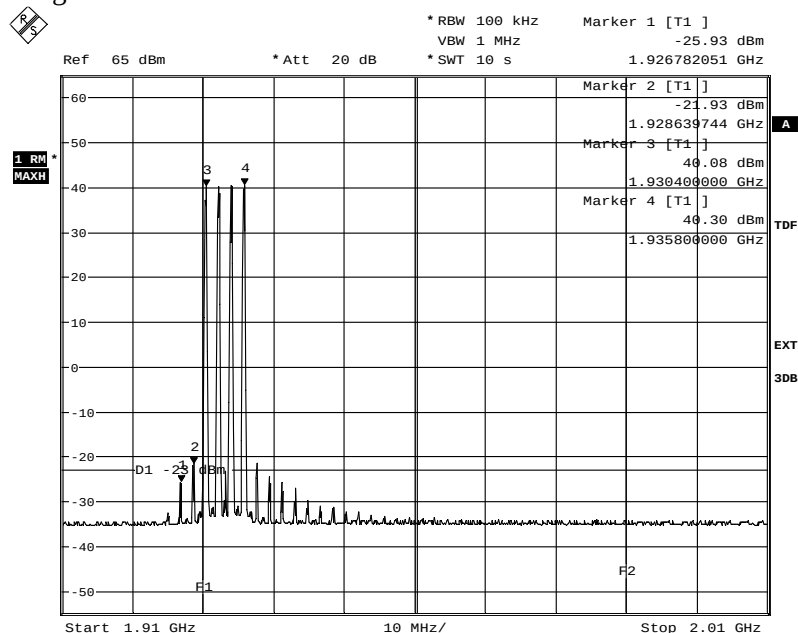
Appendix 6

Diagram 17 a:



Date: 4.APR.2014 08:57:39

Diagram 17 b:

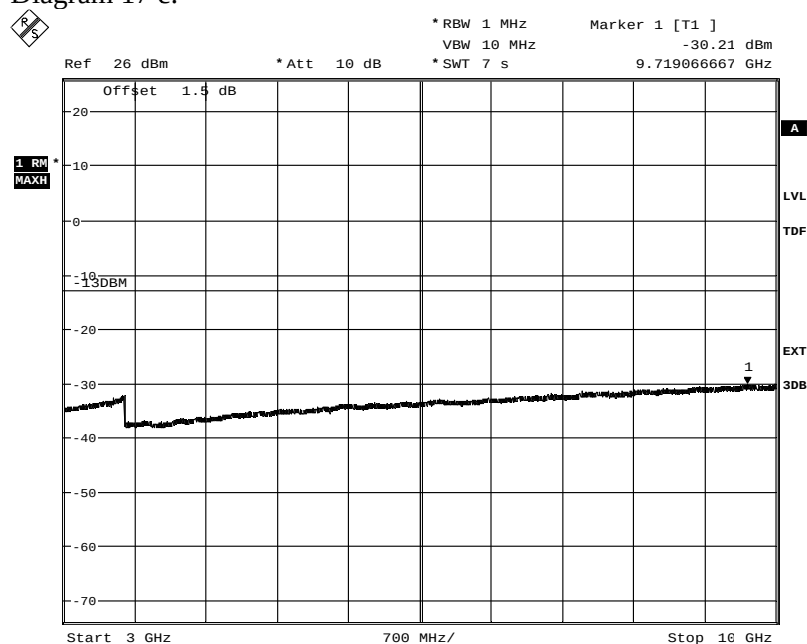


Date: 4.APR.2014 08:41:48

The emission at 1926.78 MHz was -24.25 dBm, and at 1928.64 it was -21.17 dBm, measured with the channel power method with 1 MHz channel bandwidth.

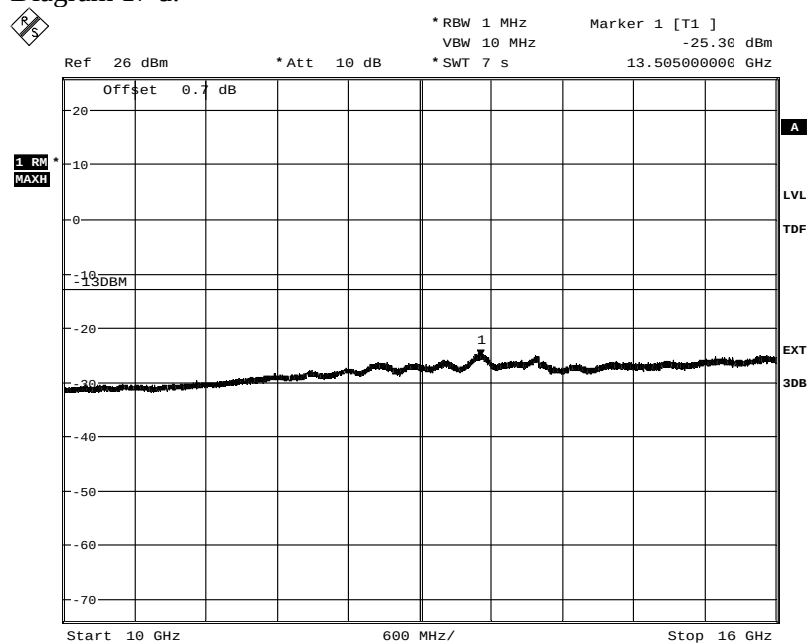
Appendix 6

Diagram 17 c:



Date: 4.APR.2014 08:54:24

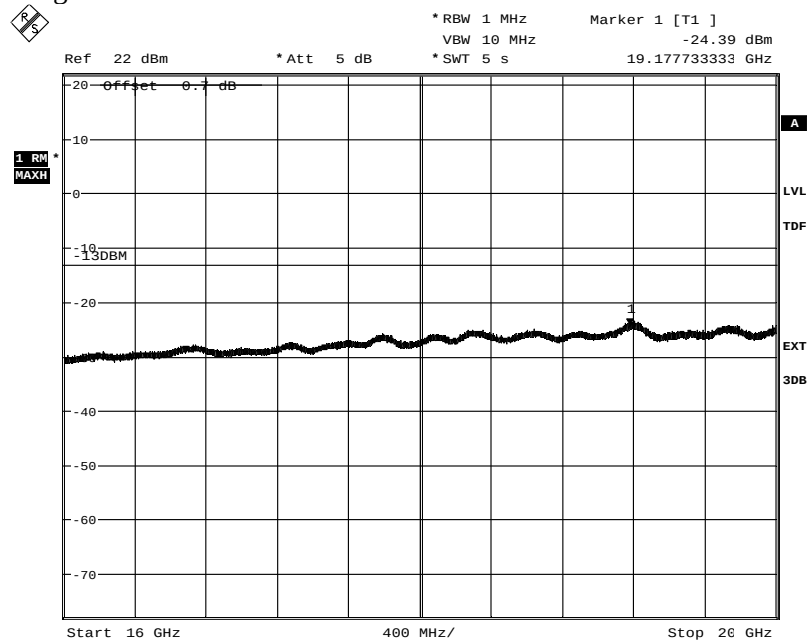
Diagram 17 d:



Date: 4.APR.2014 08:55:06

Appendix 6

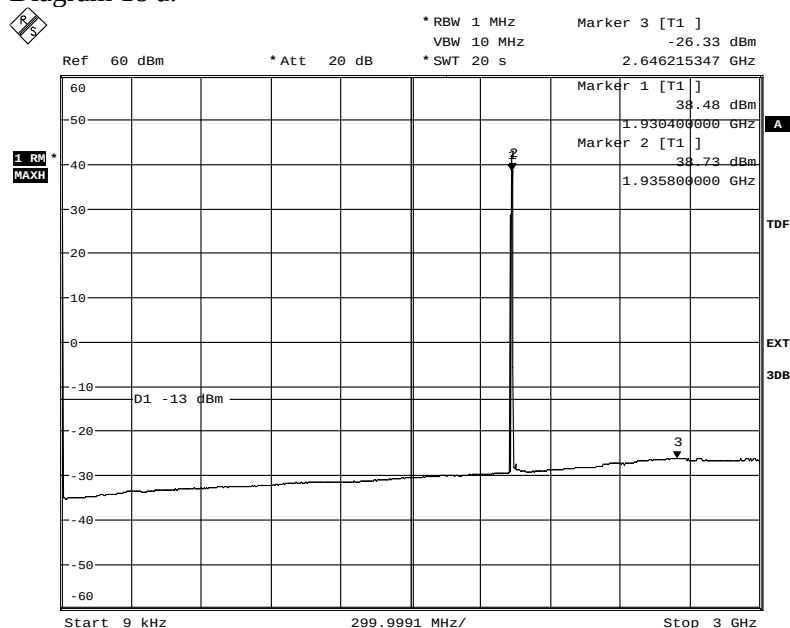
Diagram 17 e:



Date: 4.APR.2014 08:55:48

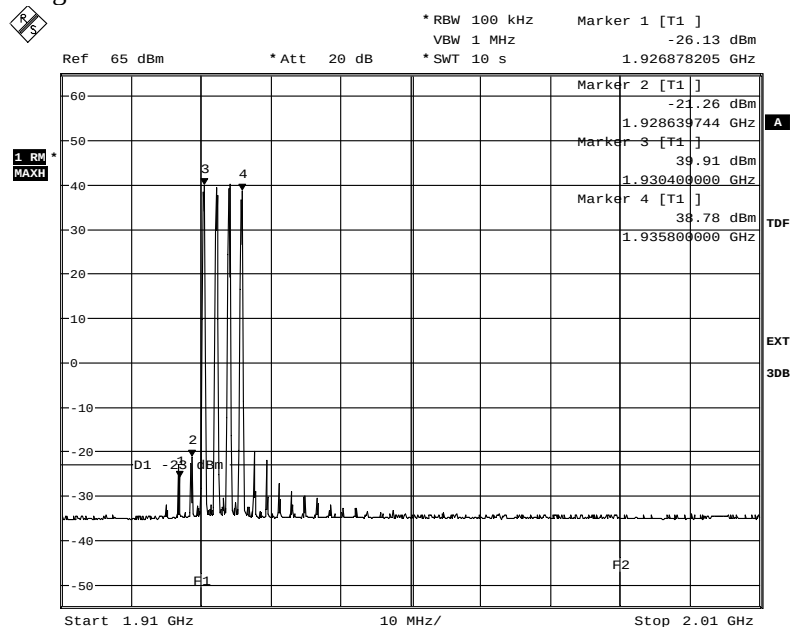
Appendix 6

Diagram 18 a:



Date: 4.APR.2014 12:39:25

Diagram 18 b:

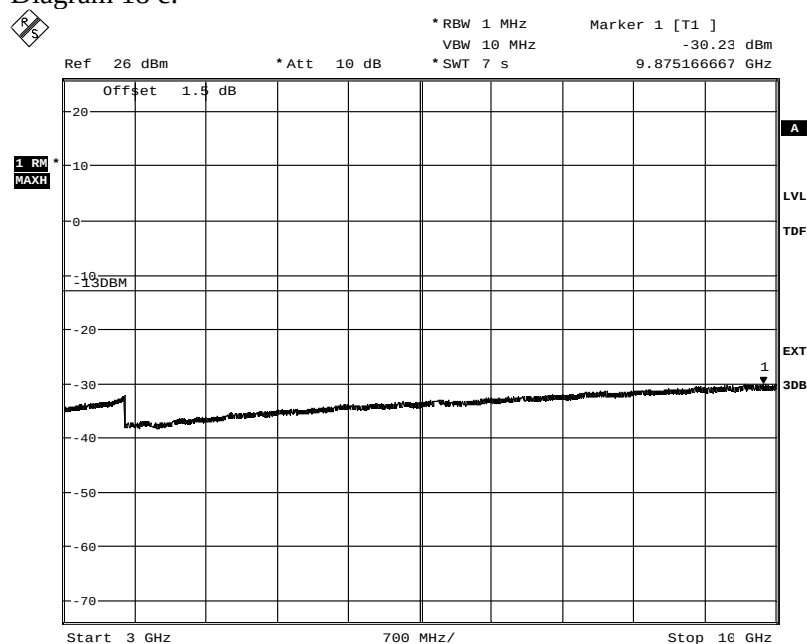


Date: 4.APR.2014 12:31:47

The emission at 1926.9 MHz was -27.12 dBm, and at 1928.64 -24.41 dBm, measured with the channel power method with 1 MHz channel bandwidth.

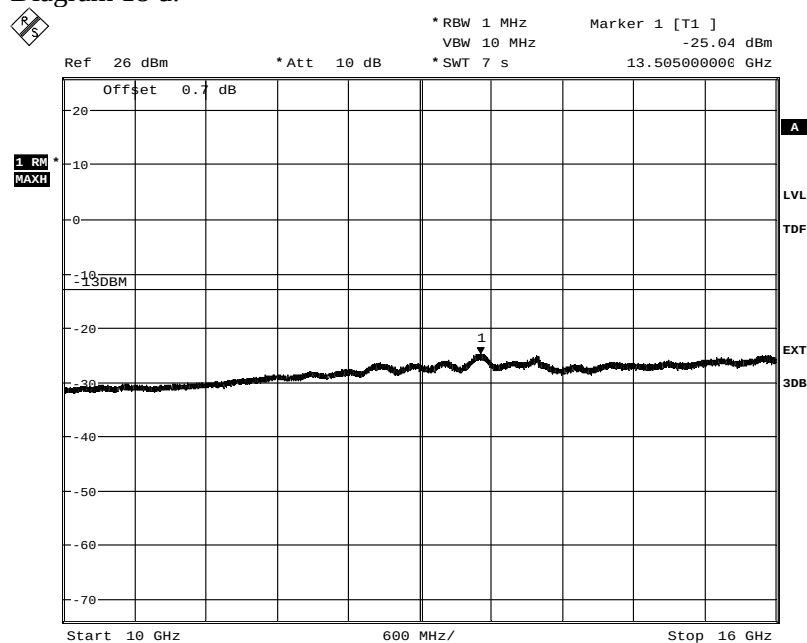
Appendix 6

Diagram 18 c:



Date: 4.APR.2014 12:40:37

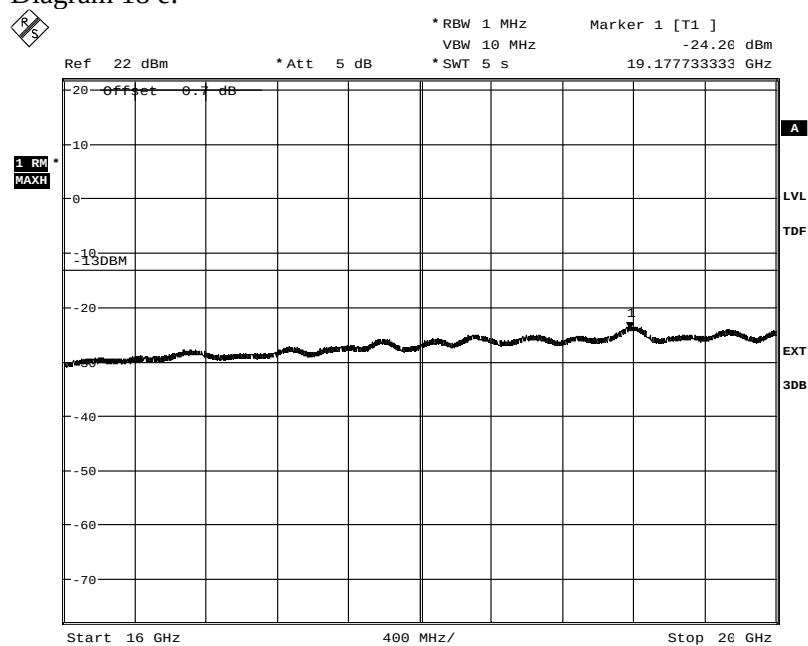
Diagram 18 d:



Date: 4.APR.2014 12:47:30

Appendix 6

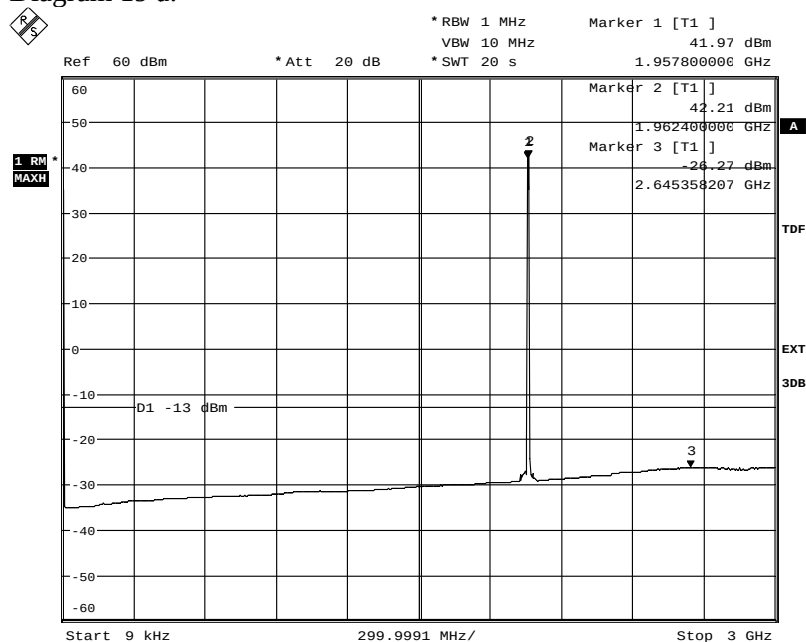
Diagram 18 e:



Date: 4.APR.2014 12:48:40

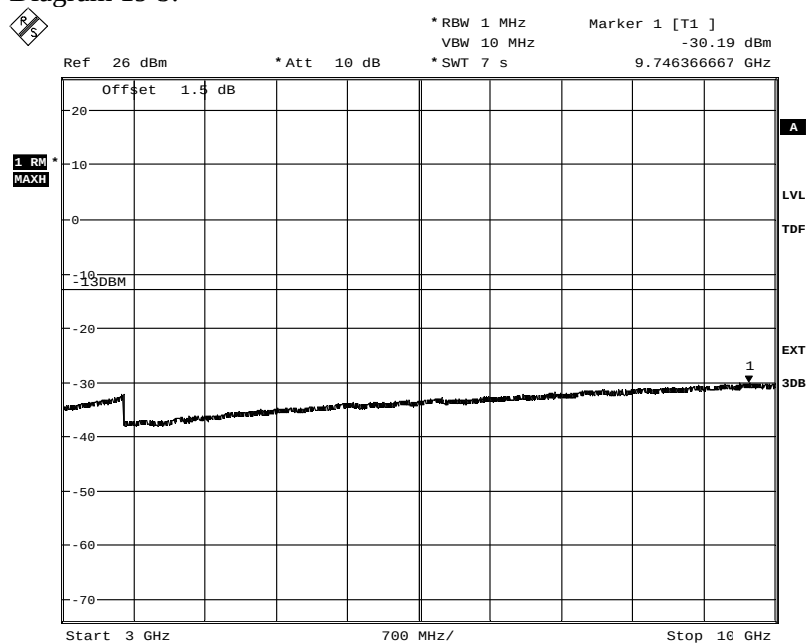
Appendix 6

Diagram 19 a:



Date: 4.APR.2014 13:17:35

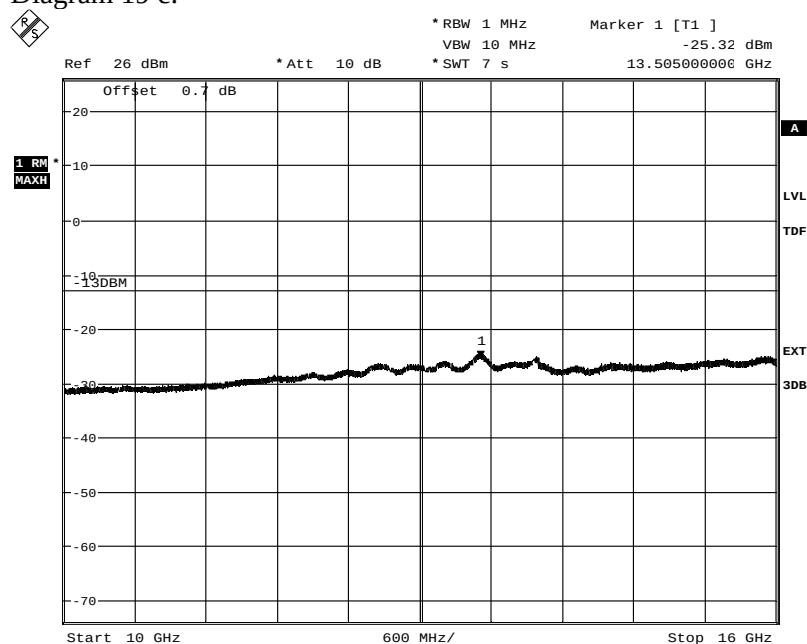
Diagram 19 b:



Date: 4.APR.2014 13:13:45

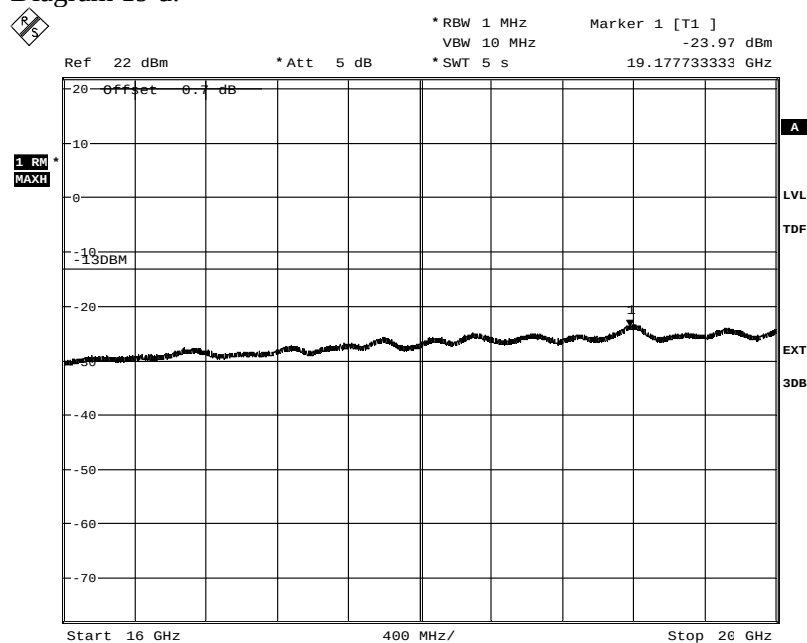
Appendix 6

Diagram 19 c:



Date: 4.APR.2014 13:11:59

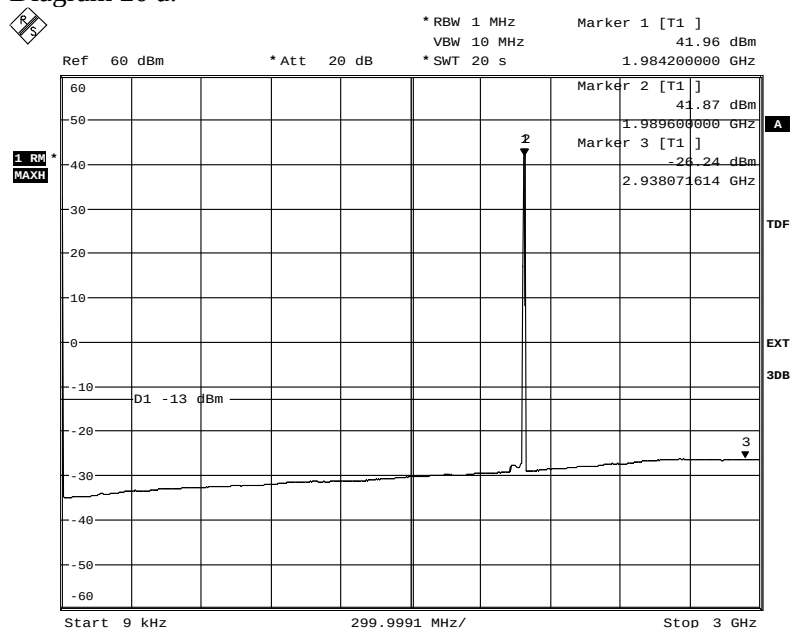
Diagram 19 d:



Date: 4.APR.2014 13:10:31

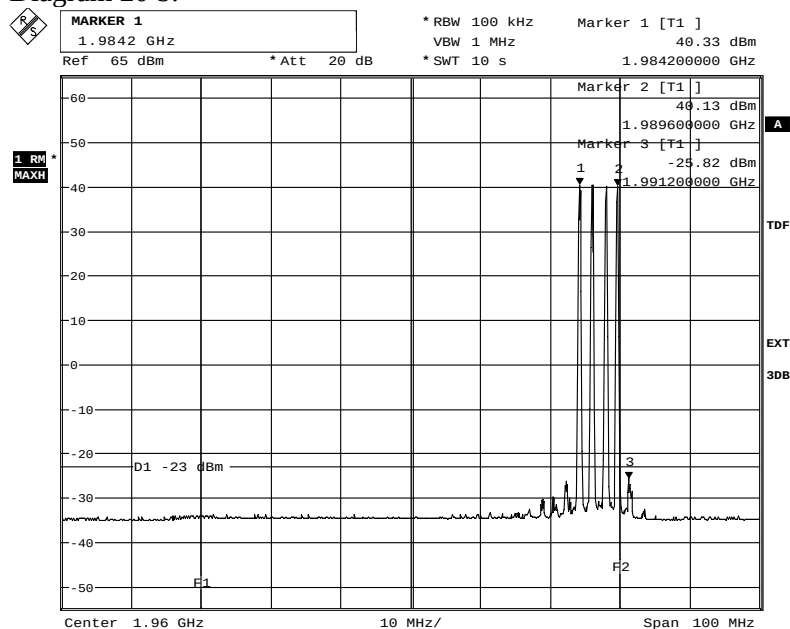
Appendix 6

Diagram 20 a:



Date: 4.APR.2014 14:42:54

Diagram 20 b:

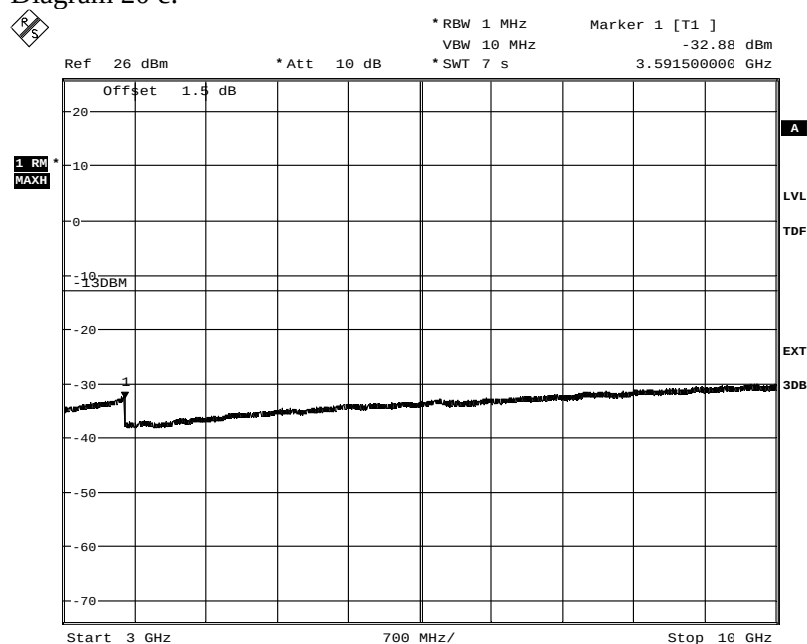


Date: 4.APR.2014 14:38:12

The emission at 1991.2 MHz was -21.38 dBm, measured with the channel power method with 1 MHz channel bandwidth.

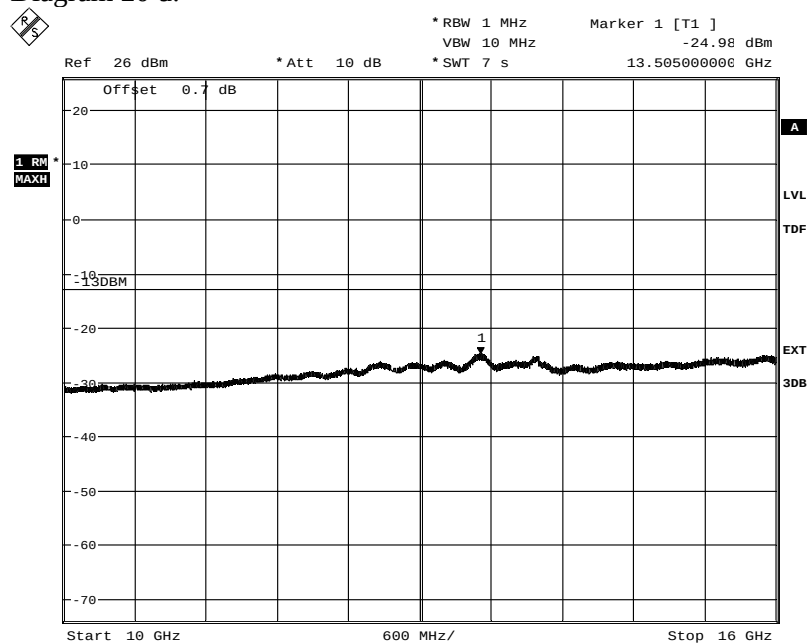
Appendix 6

Diagram 20 c:



Date: 4.APR.2014 14:44:18

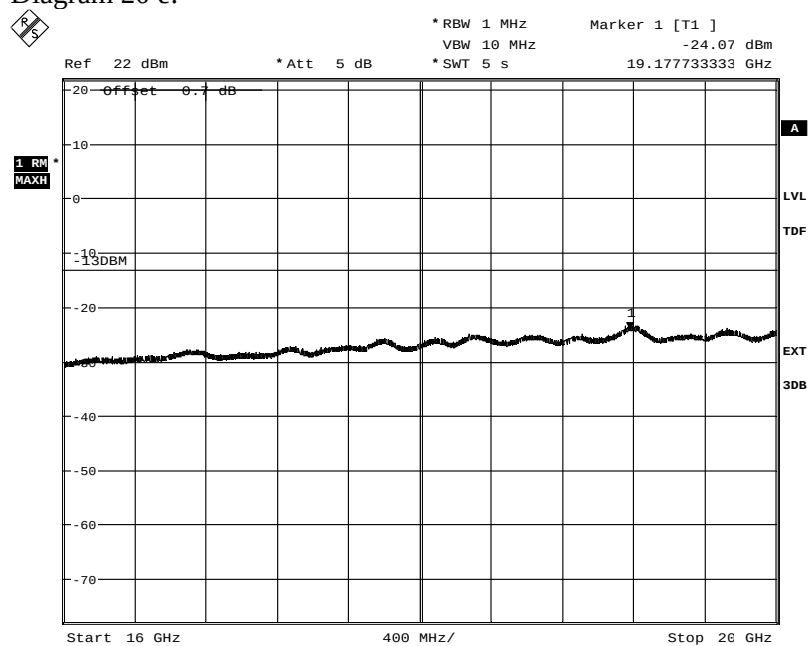
Diagram 20 d:



Date: 4.APR.2014 14:45:01

Appendix 6

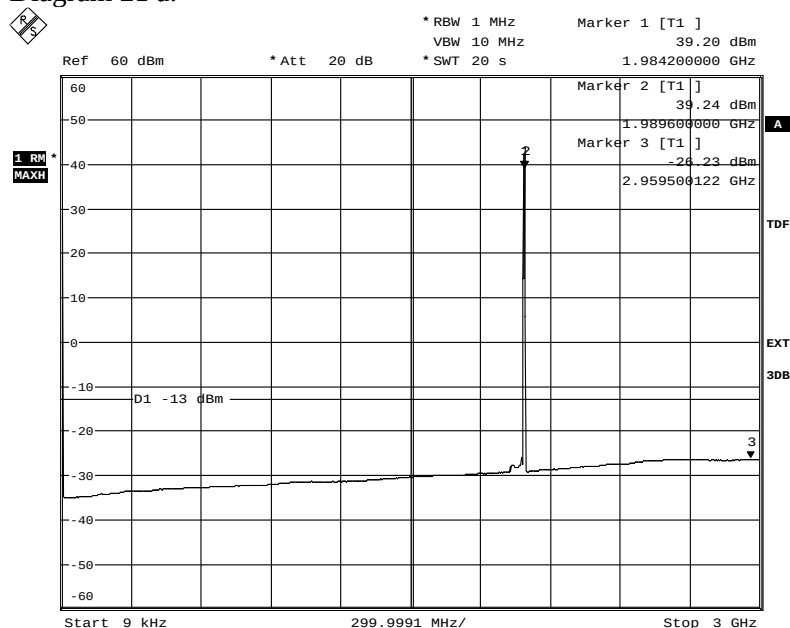
Diagram 20 e:



Date: 4.APR.2014 14:46:02

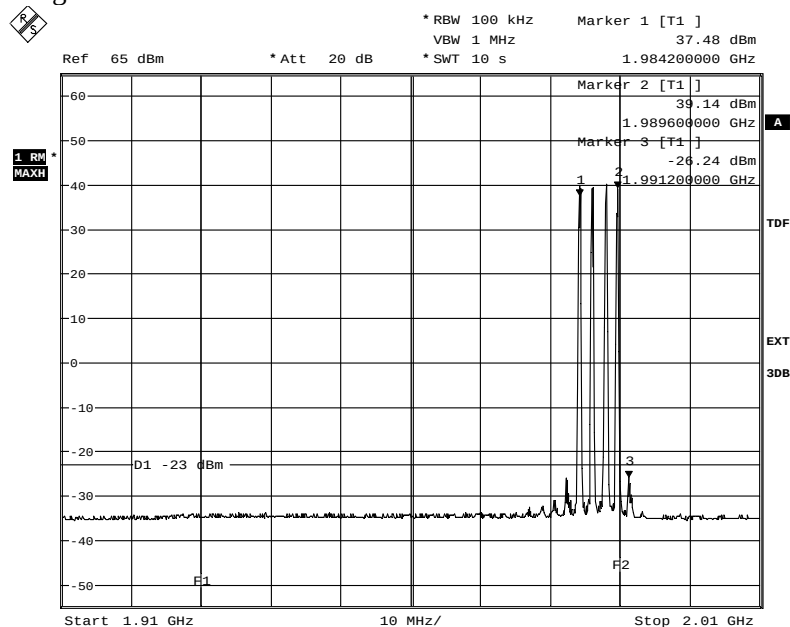
Appendix 6

Diagram 21 a:



Date: 4.APR.2014 15:06:38

Diagram 21 b:

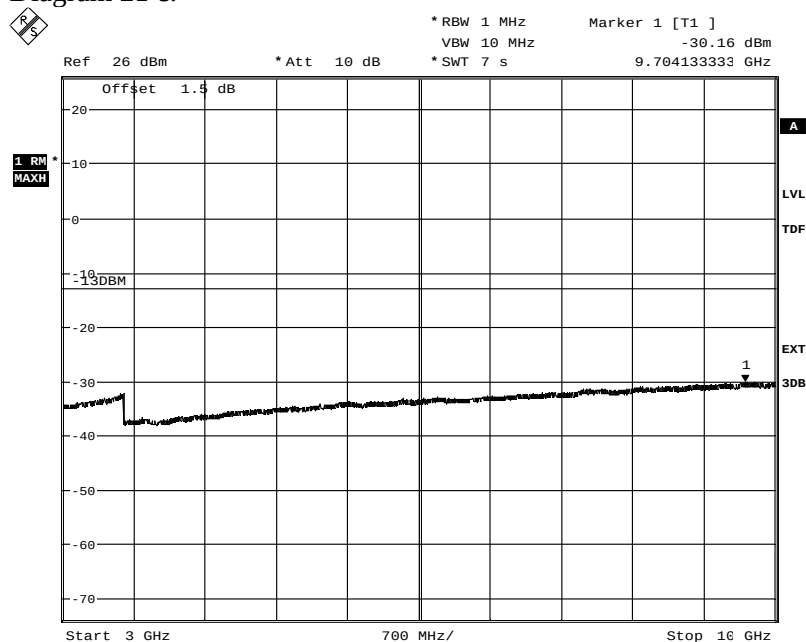


Date: 4.APR.2014 15:08:11

The emission at 1991.2 MHz was -23.47 dBm, measured with the channel power method with 1 MHz channel bandwidth.

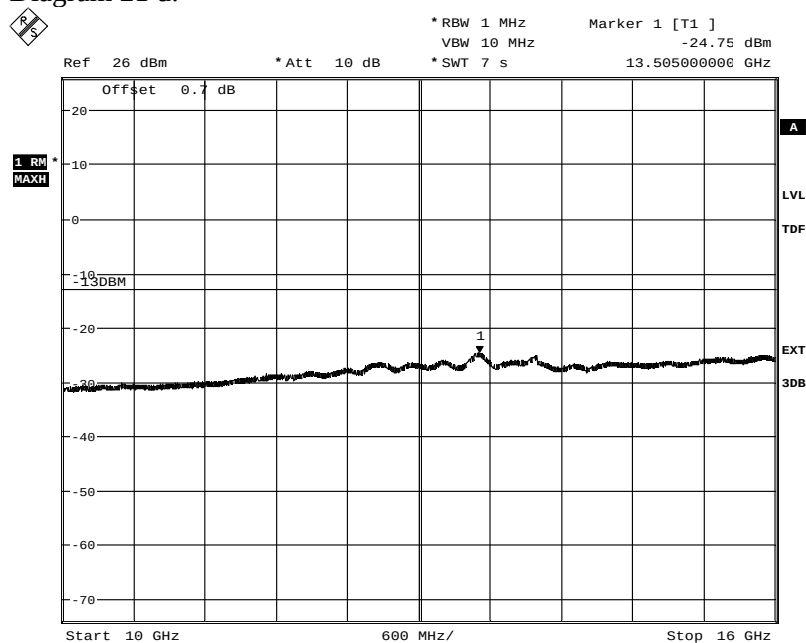
Appendix 6

Diagram 21 c:



Date: 4.APR.2014 15:02:22

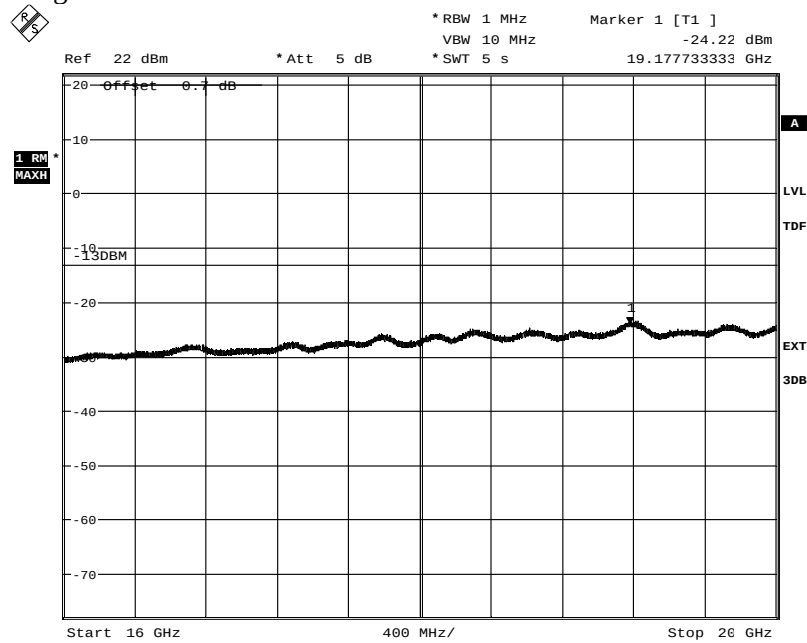
Diagram 21 d:



Date: 4.APR.2014 15:01:07

Appendix 6

Diagram 21 e:



Date: 4.APR.2014 14:59:56

Appendix 6

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

Date	Temperature	Humidity
2014-04-08	22 °C ± 3°C	33 % ± 5 %
2014-04-09	23 °C ± 3°C	35 % ± 5 %
2014-04-10	23 °C ± 3°C	30 % ± 5 %
2014-05-21	23 °C ± 3°C	42 % ± 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 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

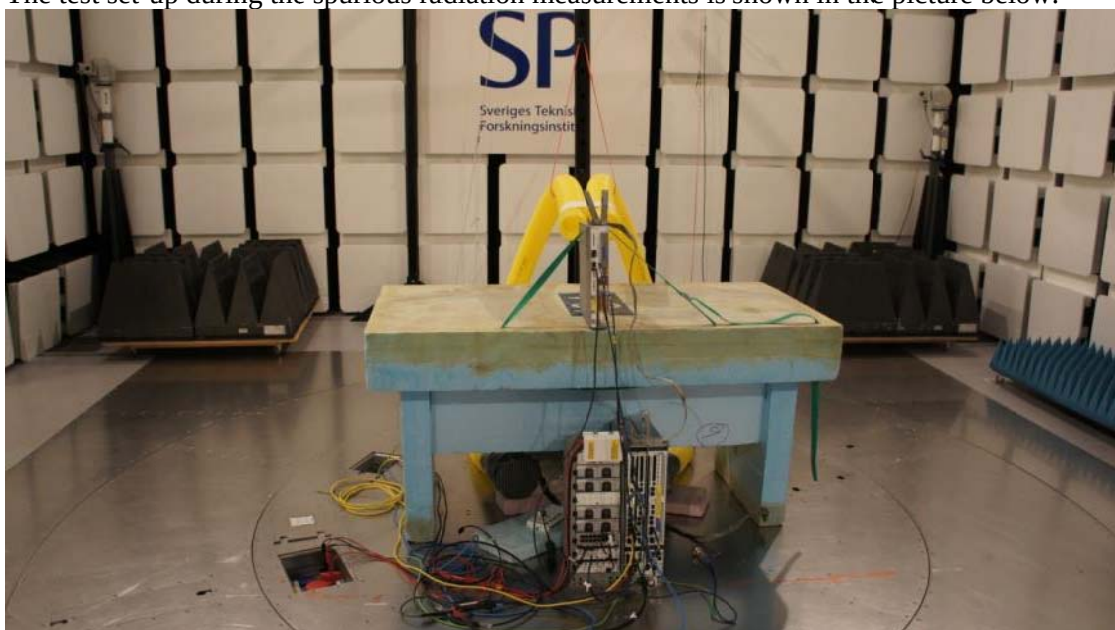
$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

The measurement procedure was as the following:

1. The pre-measurement is performed with peak detector. For measurement < 1 GHz the test object is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0. For measurements > 1 GHz the test object is measured in sixteen directions with the antenna at 1.0 m in height.
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.

Appendix 6

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



Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber	503 881
R&S ESI 26	503 292
R&S FSIQ 40	503 738
EMC 32 ver. 8.52.0	503 899
Chase Bilog Antenna CBL 6111A	502 182
EMCO Horn Antenna 3115	502 175
Flann STD Gain Horn Antenna 20240-20	503 674
High pass filter, RLC Electronics, 3-18 GHz	503 739
Miteq, Low Noise Amplifier	503 285
Schwartzbeck preamplifier BBV 9742	504 085
µComp Nordic, Low Noise Amplifier	901 545
Temperature and humidity meter, Testo 625	504 188

Appendix 6

Tested configurations

Symbolic name
B
M
T
B2
B4

Results, representing worst case

Diagram	Configuration	Symbolic name
1 a-d	1 - Carrier	B

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
3860.906	-31.9 dBm	-
30-20 000	All other 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
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Appendix 6

Diagram 1a:

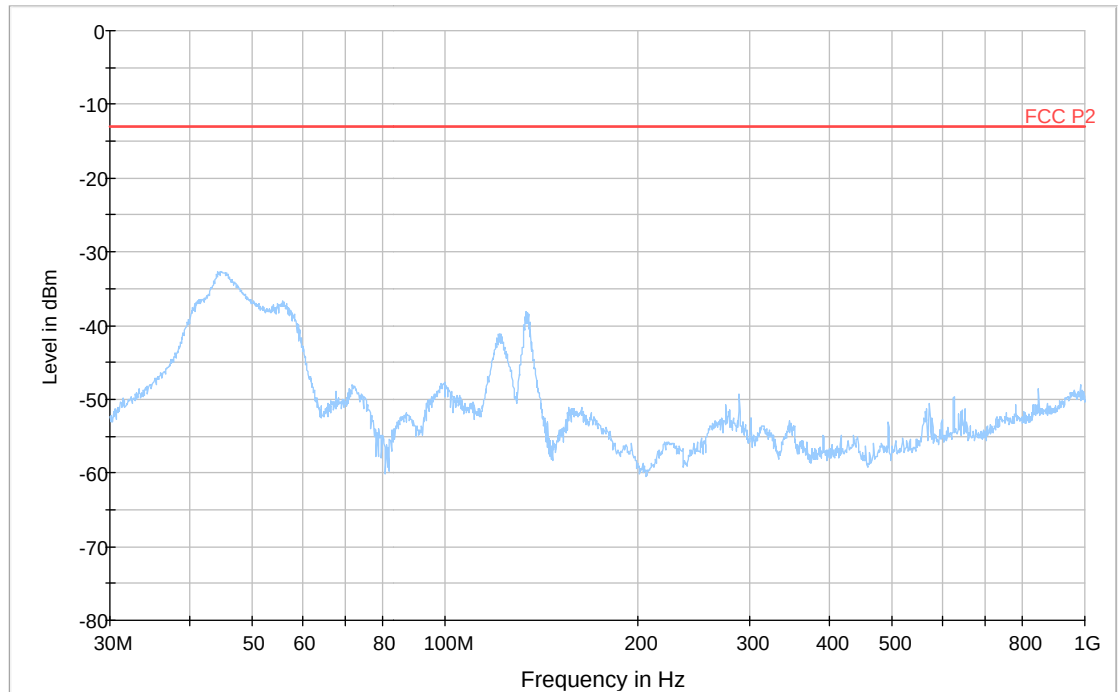
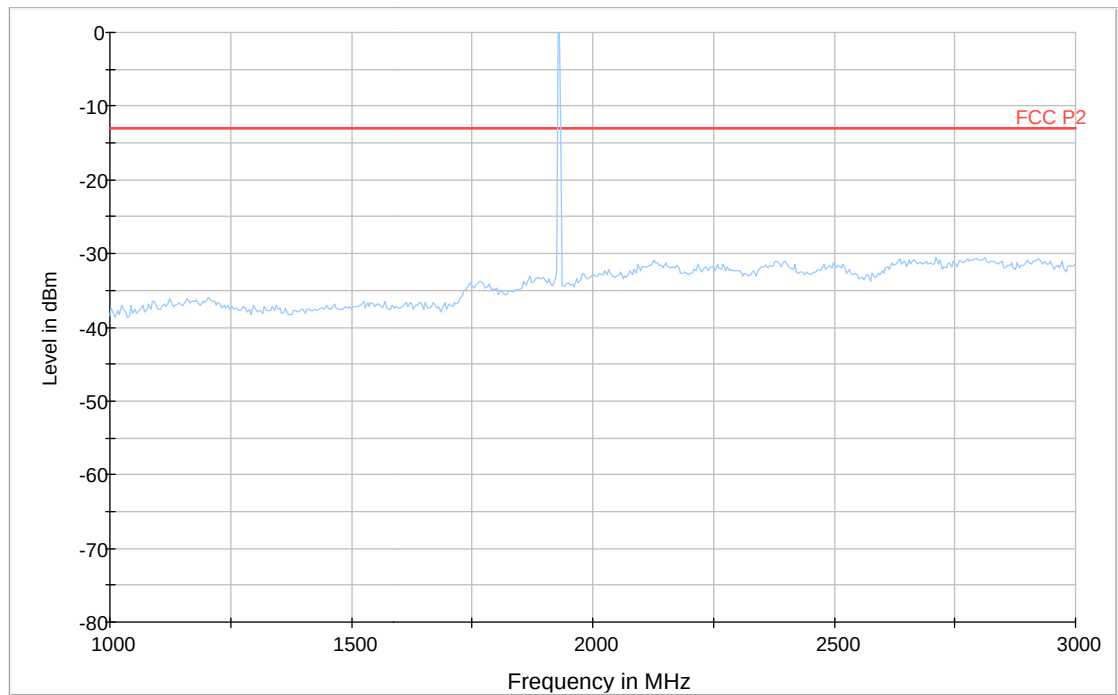


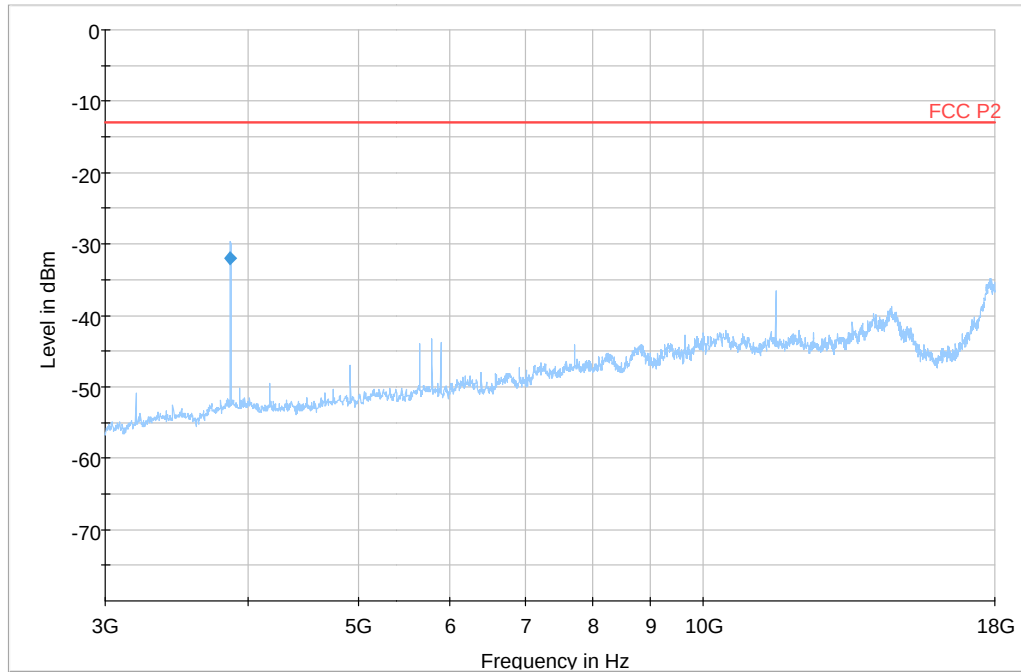
Diagram 1b:



Note: The emission at 1930.4 MHz is the carrier frequency and shall be ignored in the context.

Appendix 6

Diagram 1c:

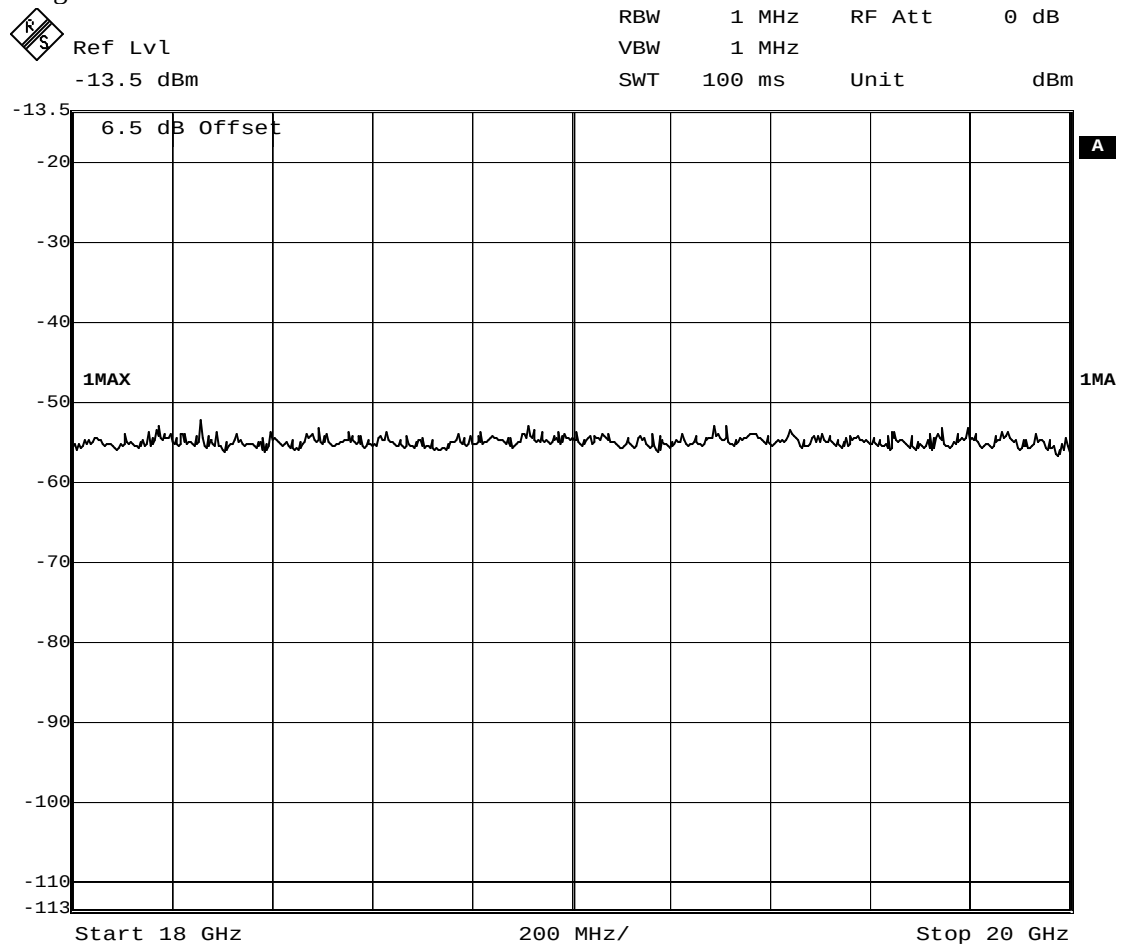


Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3860.906814	-31.9	5000.0	1000.000	100.0	V	84.0	-104.3	18.9	-13.0

Appendix 6

Diagram 1d:



Date: 21.MAY.2014 10:04:08

Appendix 7

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

Date 2014-04 -17 to 2014-04-24	Temperature (test equipment) 22-24 °C ± 3 °C	Humidity (test equipment) 24-27 % ± 5 %
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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	502 282
Testo 635, Temperature and humidity meter	504 203
Temperature cabinet	503 360

Results

Nominal Voltage -48 V DC

Maximum output power at mid channel (M). Rated output power level at connector RF A (maximum): 47.8 dBm (60 W)

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	Temp. (°C)	
-48.0	+20	20
-55.2	+20	21
-40.8	+20	20
-48.0	+30	18
-48.0	+40	18
-48.0	+50	22
-48.0	+10	23
-48.0	0	21
-48.0	-10	22
-48.0	-20	25
-48.0	-30	21
Maximum freq. error (Hz)		25
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Appendix 7

Remark

It was deemed sufficient to test one combination of TX frequency modulation, as all combinations share a common internal reference to derive the TX frequency from.

Limit according to:

§24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-133 6.3 Frequency stability:

The carrier frequency shall not depart from the reference frequency in excess of ± 1.0 ppm (± 1960 Hz) for base stations when tested to the temperature and supply voltage variations specified in RSS-Gen.

Complies?	Yes
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Appendix 6

External photos

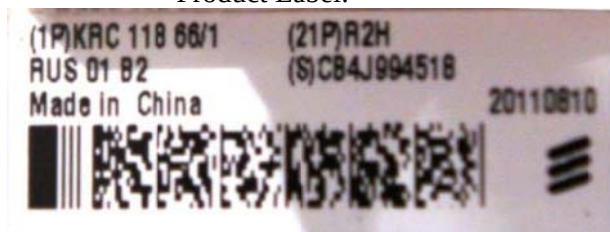
Front side:



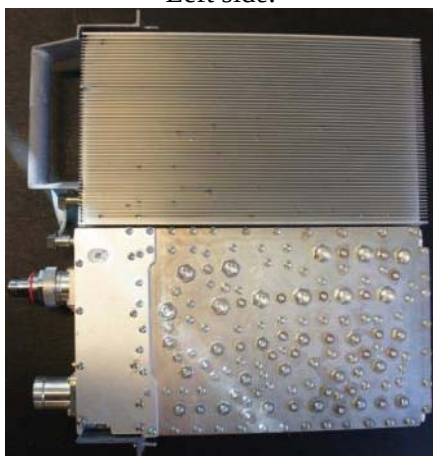
Back side:



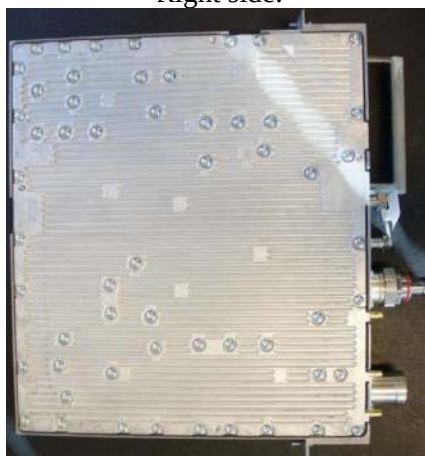
Product Label:



Left side:



Right side:



Appendix 6

Top side:



Bottom side:

