REPORT
issued by an FCC listed laboratory Reg. no. 93866
The test site complies with RSS-Gen, IC file no. 3482A-1

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1002
ISO/IEC 17025

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Radio measurements on RRUS 12 B5 850 MHz radio equipment with FCC ID TA8AKRC161321-2 and IC 287AB-AS1613212

(8 appendices)

Test object

Product name: RRUS 12 B5
Product number: KRC 161 321/2, R1B

Summary

See appendix 1 for details.

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-132 ISSUE 3			
2.1046 / RSS-132 5.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-132 5.5	Band edge	Yes	4
2.1051 / RSS-132 5.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-132 5.5	Field strength of spurious radiation	Yes	6
2.1055 / RSS-132 5.3	Frequency stability	Yes	7

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

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Appendix 1

Description of the test object

Equipment:	Product name: RRUS 12 B5, supporting LTE Product number KRC 161 321/2 FCC ID TA8AKRC161321-2 IC: 287AB-AS1613212 IC MODEL NO: AS1613212
Frequency range:	TX: 869 - 894 MHz RX: 824 - 849 MHz
Antenna ports:	2 TX/RX ports
RF configurations:	Single carrier, multi carrier, TX diversity and MIMO 2x2
Nominal RF output power per antenna port:	Single carrier: 1x 47.8 dBm (1 x 60.0W) Multi carrier: 2x 44.8 dBm (2 x 30.0W)
Antenna:	No dedicated antenna, handled during licensing
Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidths:	1.4 MHz, 3 MHz, 5 MHz and 10 MHz
Nominal power voltage:	-48VDC

Operation mode during measurements

LTE Single RAT

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM and test model E-TM3.1 to represent 64QAM 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.The settings below were used for all measurements if not otherwise noted.

MIMO mode, single carrier: E-TM1.1

MIMO mode, multi carrier: 2 carriers E-TM1.1

All measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

Conducted measurements

The test object was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings below.
All measurements were made on RF A and additional measurements on RF B to verify that the ports were electrical identical, as declared by the client.

Radiated measurements

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

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-132 and RSS-Gen.

References

Measurements were done according to relevant parts of the following standards:
ANSI 63.4-2009
ANSI/TIA/EIA-603-C-2004
CFR 47 part 2, October 1st , 2012
CFR 47 part 22, October 1st, 2012
3GPP TS 36.141, version 11.4.0
RSS-Gen Issue 3
RSS-132 Issue 3

Appendix 1

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2014-01	503 881
R&S ESU 26	2013-07	901 553
R&S FSQ 40	2014-03	504 143
R&S FSW 43	2013-10	902 073
Control computer with R&S software EMC32 version 8.52.0	-	503 745
High pass filter	2013-07	901 501
High pass filter	2013-07	901 502
High pass filter	2013-07	504 199
High pass filter	2013-08	901 373
High pass filter	2014-08	503 739
High pass filter	2013-07	503 740
RF attenuator	2013-07	504 159
RF attenuator	2013-09	900 233
RF attenuator	2013-01	901 384
RF attenuator	2013-12	901 508
Chase Bilog Antenna CBL 6111A	2014-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
µComp Nordic, Low Noise Amplifier	2014-04	901 545
Temperature and humidity meter, Testo 635	2014-06	504 203
Temperature and humidity meter, Testo 625	2014-06	504 188
Temperature Chamber	2013-11	501 031
Datascan 7321	2013-11	502 698
Multimeter Fluke 87	2013-08	502 190

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 2013-05-22.

Manufacturer’s representative

Christer Gustavsson, Ericsson AB.

Test engineers

Andreas Johnson, Tomas Lennhager, Tomas Isbring, Kexin Chen, Jörgen Wassholm and Martin Theorin, SP

Test participant

Adam Skoglund, Ericsson AB (partially)

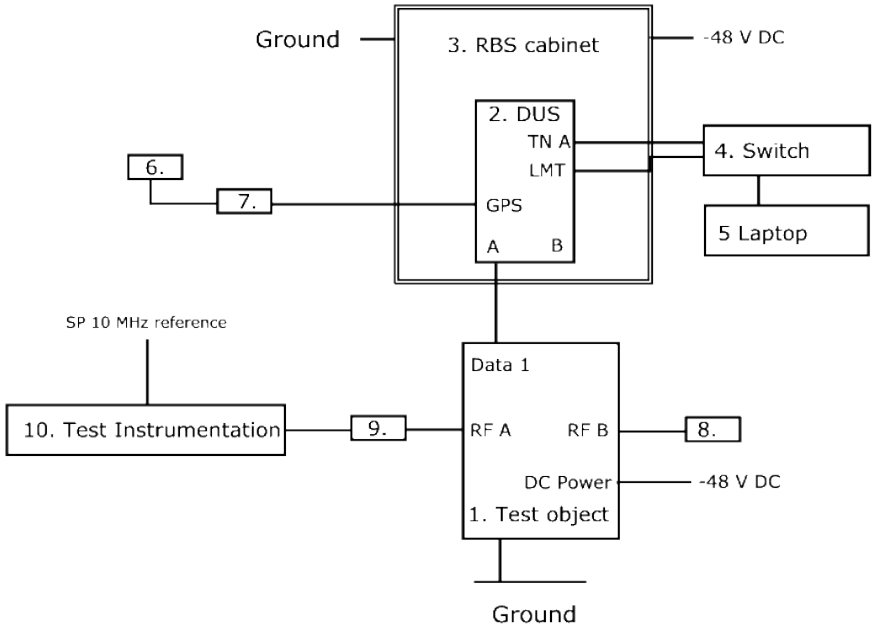
Appendix 1

Test frequencies during measurements

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
2407	869.7	B	TX bottom frequency in 1.4 MHz BW configuration
2415	870.5	B	TX bottom frequency in 3 MHz BW configuration
2425	871.5	B	TX bottom frequency in 5 MHz BW configuration
2450	874.0	B	TX bottom frequency in 10 MHz BW configuration
2407 2426	869.7 871.6	B2	2 carrier TX band bottom constellation 1.4 MHz BW configuration
2525	881.5	M	TX band mid frequency all BW configurations
2482 2575	877.2 886.5	M2	2 carrier TX band mid constellation 1.4 MHz BW configuration
2643	893.3	T	TX top frequency in 1.4 MHz BW configuration
2635	892.5	T	TX top frequency in 3 MHz BW configuration
2625	891.5	T	TX top frequency in 5 MHz BW configuration
2600	889.0	T	TX top frequency in 10 MHz BW configuration
2624 2643	891.4 893.3	T2	2 carrier TX band top constellation 1.4 MHz BW configuration

All RX frequencies were configured 45 MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.

Test set-up conducted measurements



Note: Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 8.

Test object:

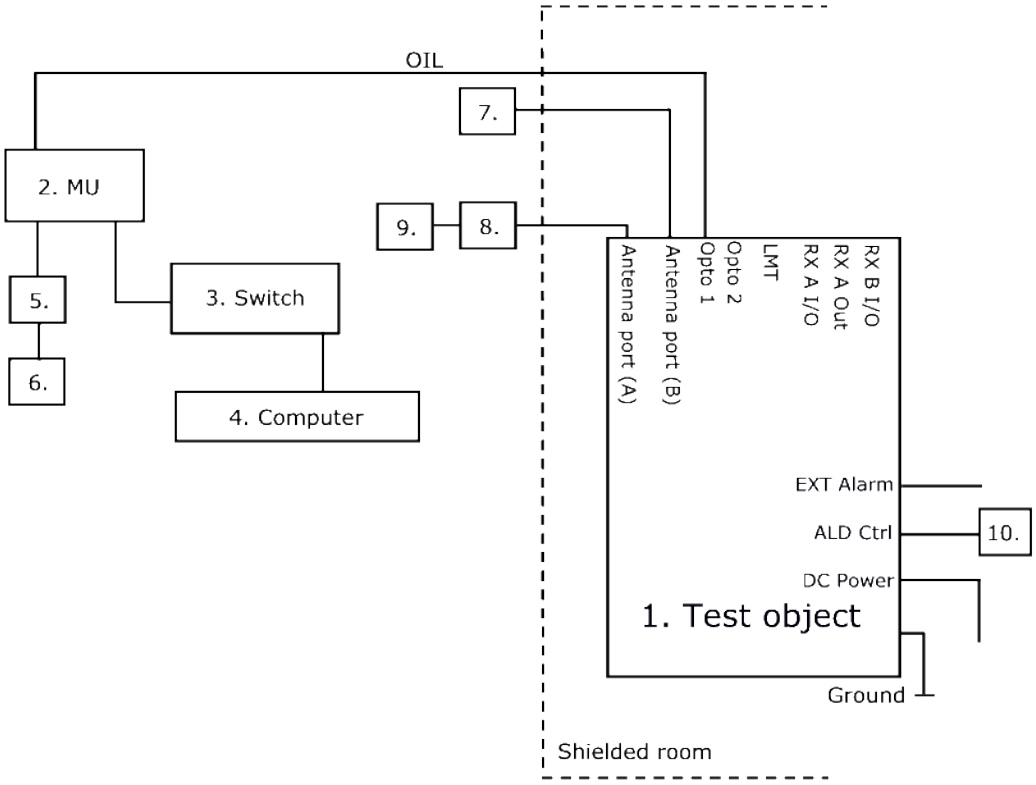
1.	RRUS 12 B5, KRC 161 321/2, rev. R1B, s/n: C827002288 working software PIS CXP 901 7316/2, rev. R49DU with FCC ID TA8AKRC161321-2 and IC: 287AB-AS1613212

Functional test equipment

2.	DUS 40 01, KDU 137 624/1, rev:R3C, s/n: C826152153
3.	RBS 6202 BAMS 1000961945
4.	Fast Ethernet switch, Netgear FS726T
5.	Controlling computer HP EliteBook 8560 w, BAMS 1001236850
6.	GPS Active Antenna, KRE 101 2082/1
7.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K474887
8.	Terminator, 50 ohm
9.	Attenuator
10.	SP Test Instrumentation according to measurement equipment list

Appendix 1

Test setup radiated measurements



Test object:

1.	RRUS 12 B5, KRC 161 321/2, rev. R1B, s/n: C827002289 working software: CXP 901 7316/2, rev. R49DU with FCC ID TA8AKRC161321-2 and IC: 287AB-AS1613212

Functional test equipment:

2.	Main Unit SUP 6601, 1/BFL 901 009/4, rev. R1E, s/n: BR82081105 DUS 41 01, KDU 137 624/1, rev. R3C, s/n: C826152153
3.	Switch Netgear FS726T
4.	Computer, EliteBook 8560w, BAMS – 1001236854
5.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356490
6.	GPS Active Antenna, KRE 101 2082/1
7.	Terminator
8.	Attenuator
9.	Signal Analyzer FSIQ 40 for supervision purpose only
10.	RET – Remote Electrical Tilt unit, KRY 121 67/2, rev. R1N

Appendix 1

Interfaces:	**Type of port:**
Power: -48 VDC	DC Power
Antenna port (A), 7/16 connector, terminated	Antenna
Antenna port (B), 7/16 connector, terminated	Antenna
Opto 1, Optical Interface Link, single mode opto fibre	Telecom
Opto 2, Optical Interface Link, single mode opto fibre, not in use	Telecom
LMT, for maintenance use only	Telecom
RX A Out, no cable attached	Antenna
RX A I/O, no cable attached	Antenna
RX B I/O, no cable attached	Antenna
EXT Alarm, shielded multi-wire	Signal
ALD Ctrl, shielded multi-wire	Signal
Ground wire	Ground

RBS software:

Software	**Revision**
CXP 102 051/18	R27X

Appendix 2

RF power output measurements according to CFR 47 2.1046 / IC RSS-132 5.4

Date	Temperature	Humidity
2013-05-28	20 °C ± 3 °C	42% ± 5 %
2013-05-30	22 °C ± 3 °C	40% ± 5 %
2013-06-12	23 °C ± 3 °C	35% ± 5 %
2013-06-20	23 °C ± 3 °C	55% ± 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 RBW of 50 MHz was used.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

Single carrier

Rated output power level at RF connector 1x 47.8 dBm. Total nominal RF power 50.8 dBm.

Tested configuration BW and frequency	Port RFA [RMS dBm/ dB PAR]	Port RFB [RMS dBm/ dB PAR]	Total power[1)] [RMS dBm]
1.4 MHz, B	47.37/ 6.90	47.56/ 6.92	50.48
10 MHz, B	47.45/ 6.85	47.50/ 6.88	50.49
1.4 MHz, M	47.50/ 6.90	47.47/ 6.92	50.50
3 MHz, M	47.56/ 6.80	47.54/ 6.80	50.56
5 MHz, M	47.57/ 6.80	47.56/ 6.80	50.58
10 MHz, M	47.54/ 6.78	47.52/ 6.78	50.54
1.4 MHz, T	47.44/ 6.92	47.49/ 6.92	50.48
10 MHz, T	47.43/ 7.00	47.41/ 7.00	50.43

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02

Multi Carrier

Rated output power 2 x 44.8 dBm per RF port.Total nominal RF power 50.8 dBm

Tested configuration BW and frequency	Port RFA [RMS dBm/ dB PAR]	Port RFB [RMS dBm/ dB PAR]	Total power[1)] [RMS dBm]
1.4 MHz, B2	47.26/ 7.12	47.50/ 7.12	50.39
1.4 MHz, M2	47.43/ 7.19	47.42/ 7.19	50.44
1.4 MHz, T2	47.32/ 7.14	47.43/ 7.14	50.39

[1)]: summed output power according to FCC KDB662911 Multiple transmitter output v02

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

CFR47 § 22.913: The effective radiated power ERP shall not exceed 1000 W.

RSS-132 5.4: The average equivalent isotropically radiated power (e.i.r.p.) limits in SRSP-503 apply, resulting in a maximum EIRP of 1640 W.
The PAR (0.1%) shall not exceed 13 dB.

Complies?	Yes

Occupied bandwidth measurements according to CFR47 2.1049 / RSS-Gen 4.6.1

Date	Temperature	Humidity
2013-05-29	23 °C ± 3 °C	51% ± 5 %
2013-06-20	23 °C ± 3 °C	55% ± 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 FSW 43	902 073
RF attenuator	504 159
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

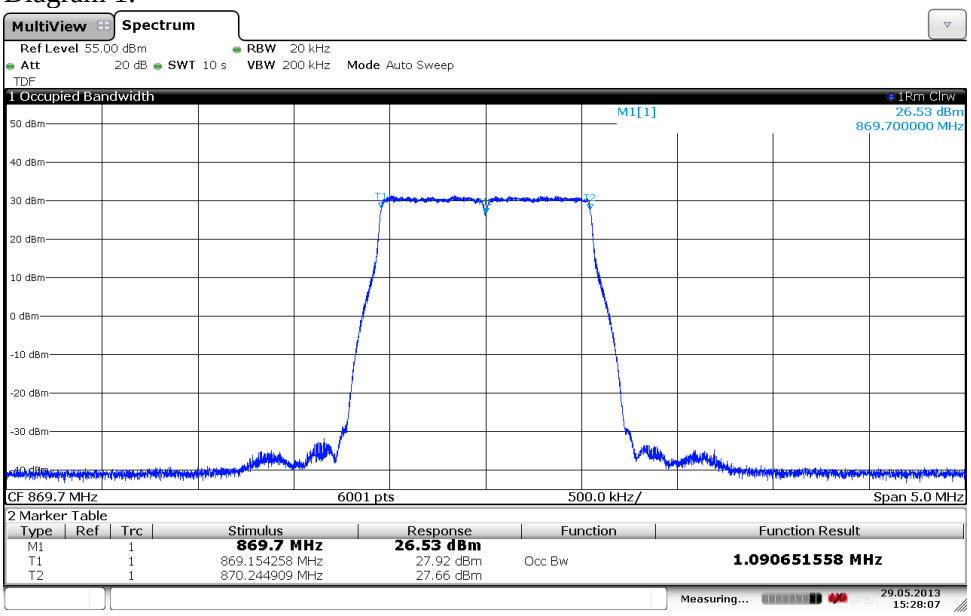
Single carrier

Diagram	BW configuration	Tested frequency	Tested Port	Occupied BW (99%) [MHz]
1	1.4 MHz	B	RF A	1.09
2	10 MHz	B	RF A	8.93
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	10 MHz	M	RF B	8.94
9	1.4 MHz	T	RF A	1.09
10	10 MHz	T	RF A	8.93

The diagrams are shown on the following pages.

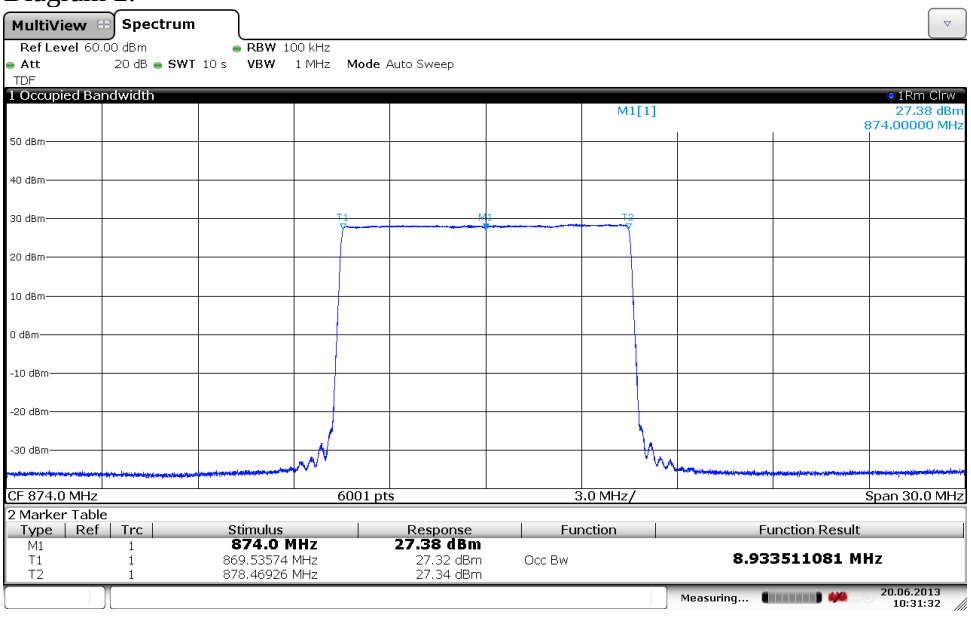
Appendix 3

Diagram 1:



Date: 29.MAY.2013 15:28:07

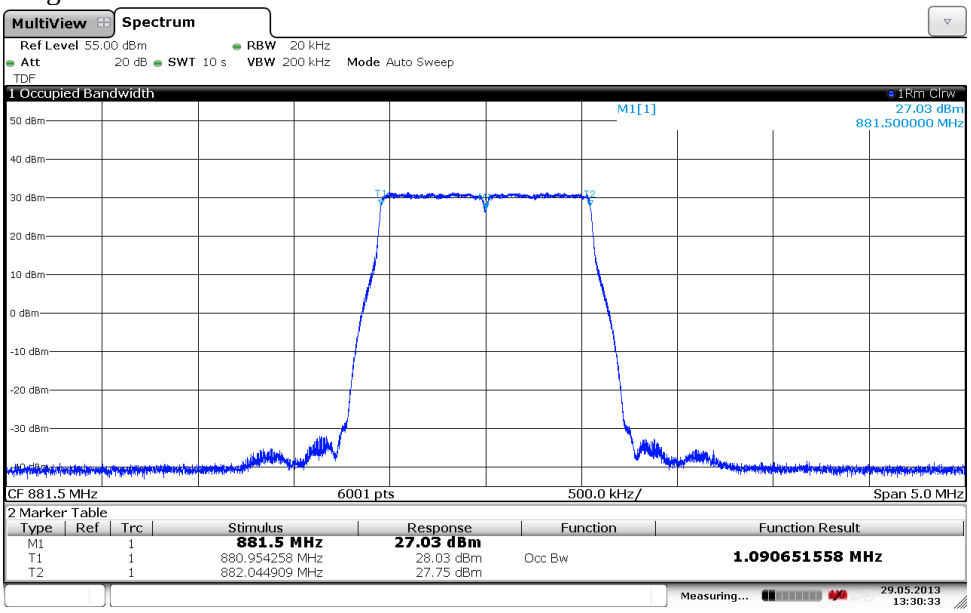
Diagram 2:



Date: 20.JUN.2013 10:31:32

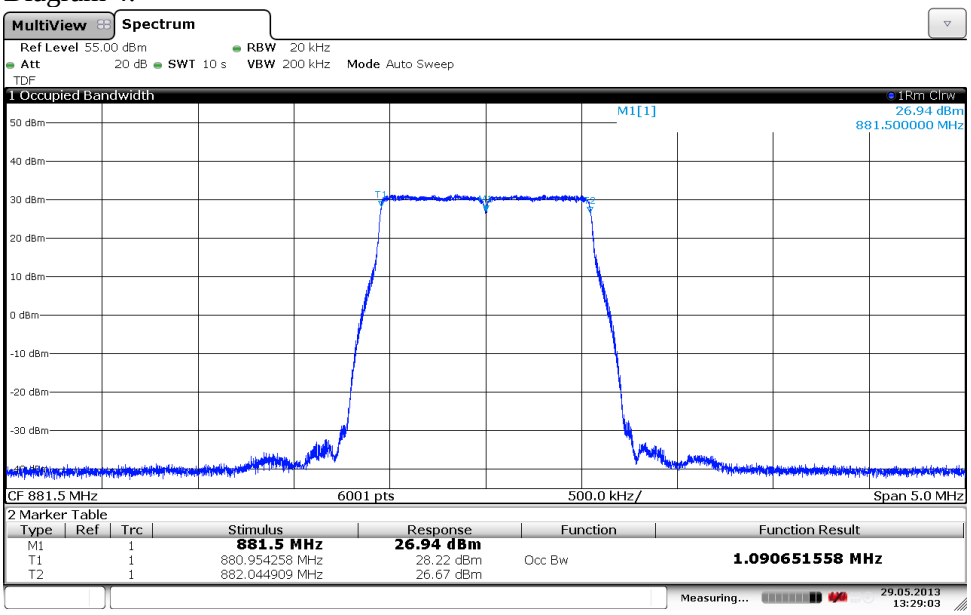
Appendix 3

Diagram 3:



Date: 29.MAY.2013 13:30:33

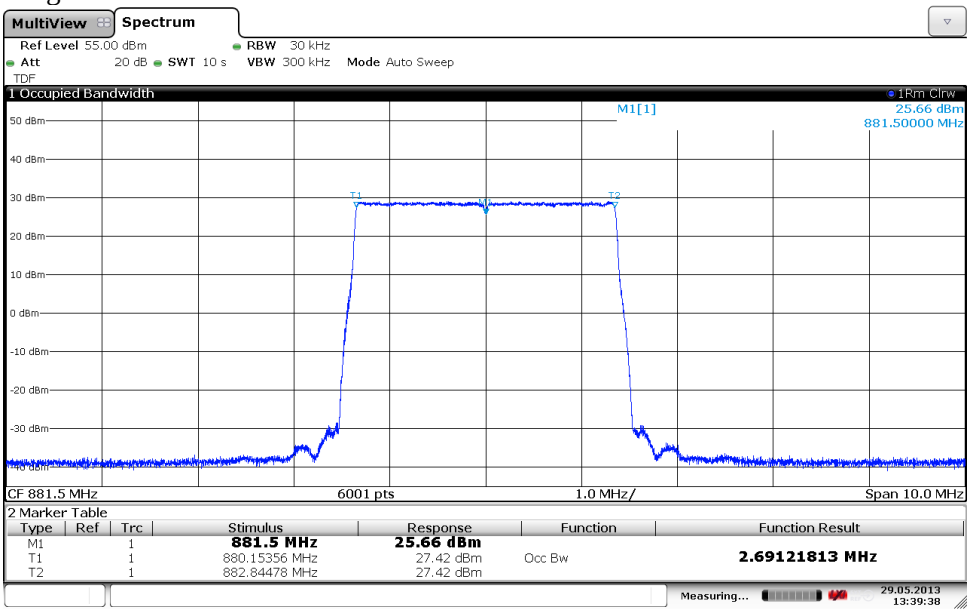
Diagram 4:



Date: 29.MAY.2013 13:29:03

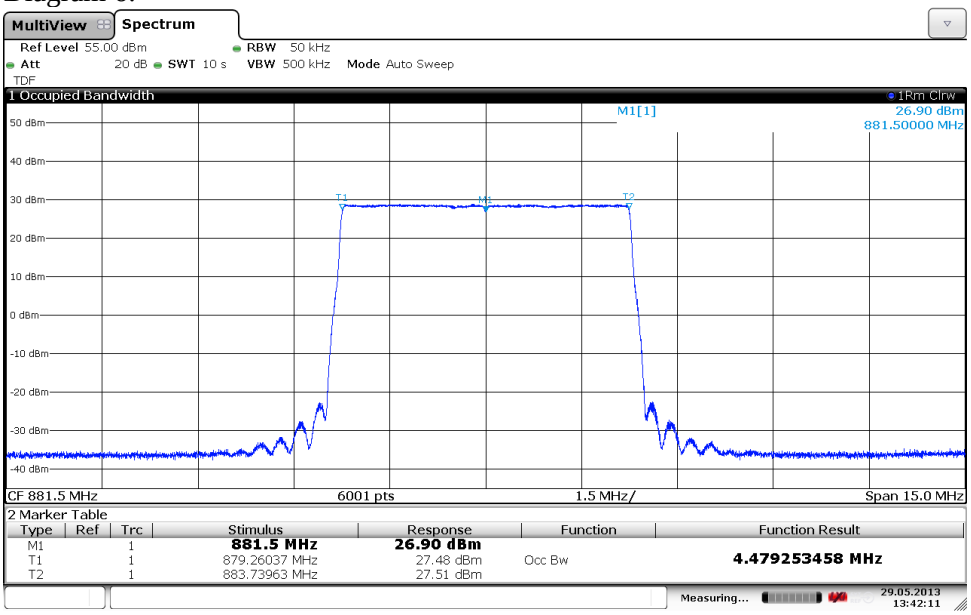
Appendix 3

Diagram 5:



Date: 29.MAY.2013 13:39:38

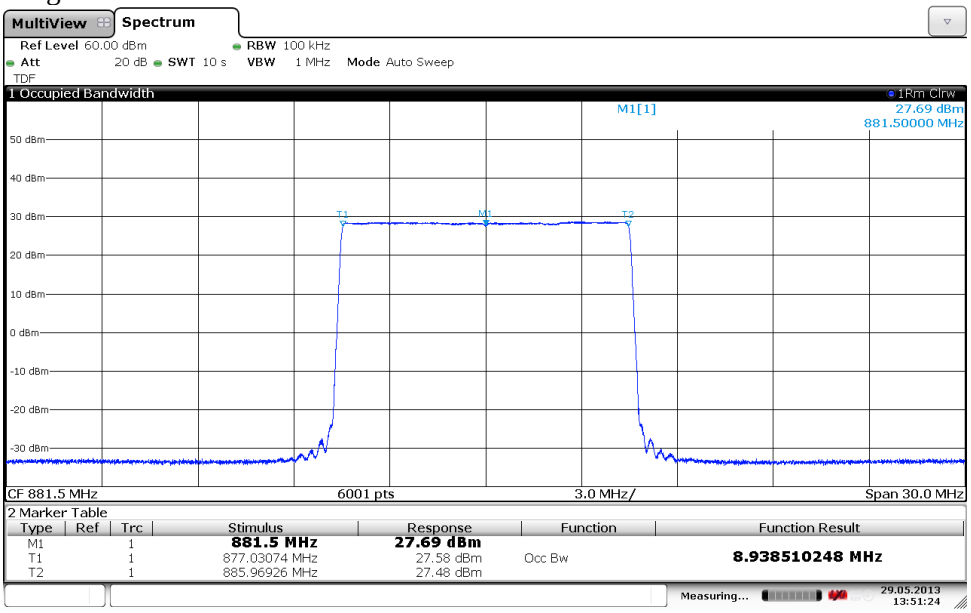
Diagram 6:



Date: 29.MAY.2013 13:42:11

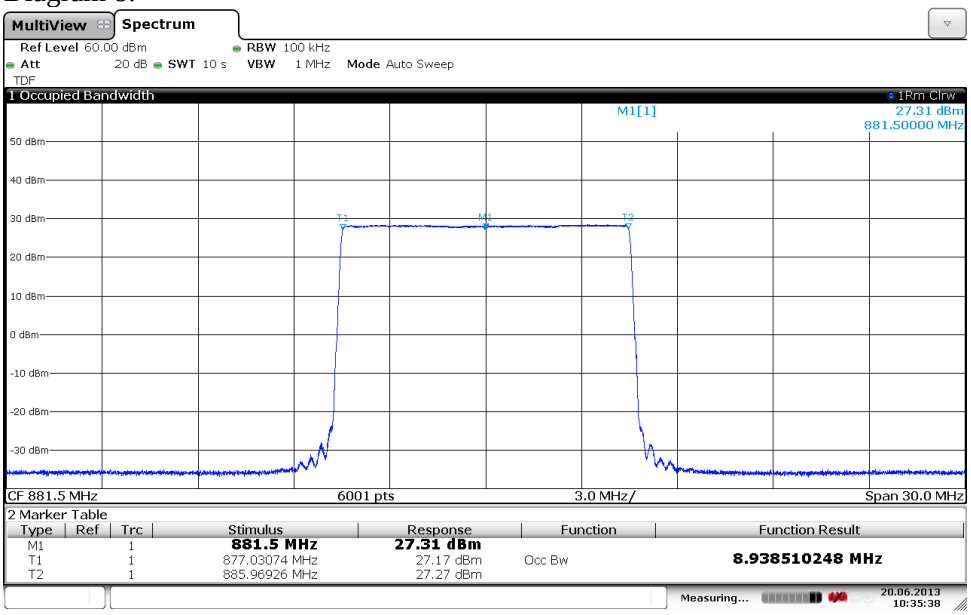
Appendix 3

Diagram 7:



Date: 29.MAY.2013 13:51:24

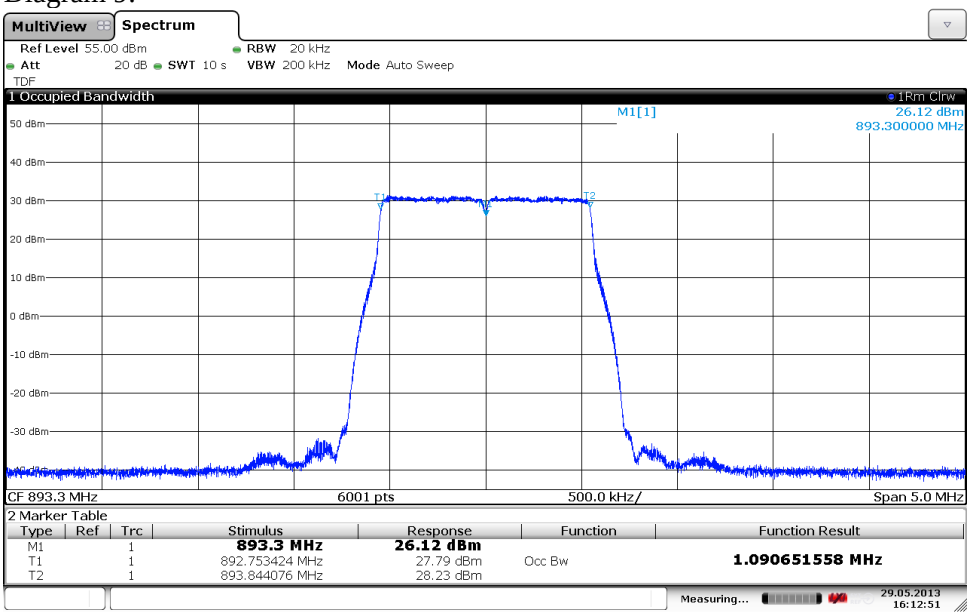
Diagram 8:



Date: 20.JUN.2013 10:35:38

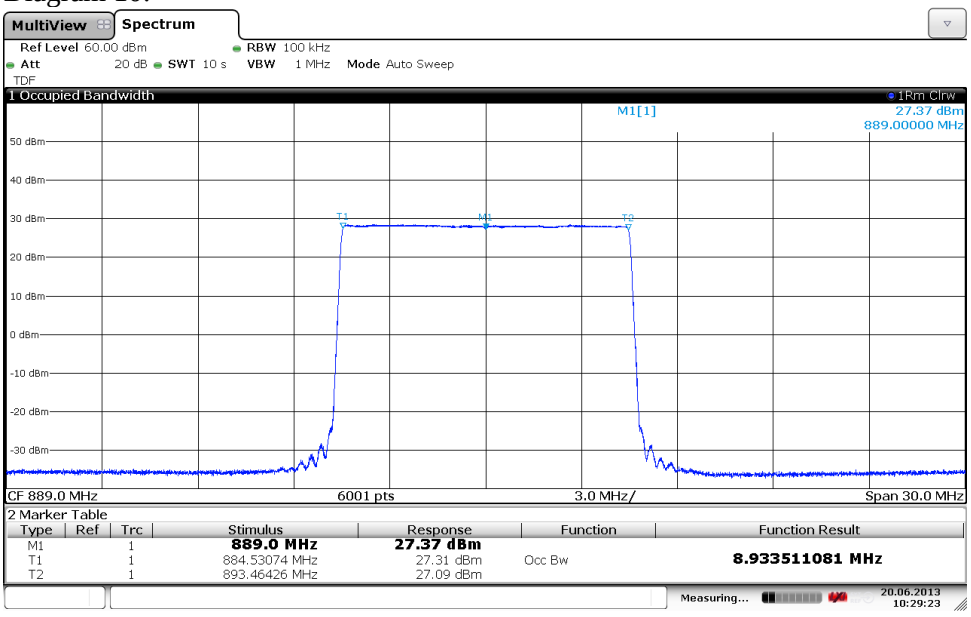
Appendix 3

Diagram 9:



Date: 29.MAY.2013 16:12:51

Diagram 10:



Date: 20.JUN.2013 10:29:23

Appendix 4

Band edge measurements according to CFR 47 §2.1051 / IC RSS-132 5.5

Date	Temperature	Humidity
2013-05-29	23 °C ± 3 °C	51% ± 5 %
2013-06-13	22 °C ± 3 °C	30% ± 5 %
2013-06-20	22 °C ± 3 °C	55% ± 5 %

Test set-up and procedure

The measurements were made per definition in § 22.917. 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.

FCC rules specify a RBW of at least 1% of the fundamental emission bandwidth (EBW) for offsets up to 1 MHz from the band edge and a RBW of 100 kHz 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(RBWused/RBW1%EBW) [dB].

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
1.4 MHz	1.12	10 kHz	-13.50
3 MHz	2.73	10 kHz	-17.40

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method c “measure and add 10 log(N_{ANT})” of FCC KDB662911 D01 Multiple Transmitter Output v02

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW 43	902 073
RF attenuator	504 159
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	BW configuration	Tested frequency	Tested Port
1 a-c	1.4 MHz	B	RF A
2 a-c	3 MHz	B	RF A
3 a-c	3 MHz	B	RF B
4 a-c	5 MHz	B	RF A
5 a-c	10 MHz	B	RF A
6 a-c	1.4 MHz	T	RF A
7 a-c	3 MHz	T	RF A
8 a-c	3 MHz	T	RF B
9 a-c	5 MHz	T	RF A
10 a-c	10 MHz	T	RF A

Multi carrier

Diagram	BW configuration	Tested frequency	Tested Port
11 a-c	3 MHz	B2	RF A
12 a-c	3 MHz	T2	RF A

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

The diagrams are shown on the following pages.

Remark

Where multiple requirements apply, the most stringent requirement is considered for compliance assessment.

Limits

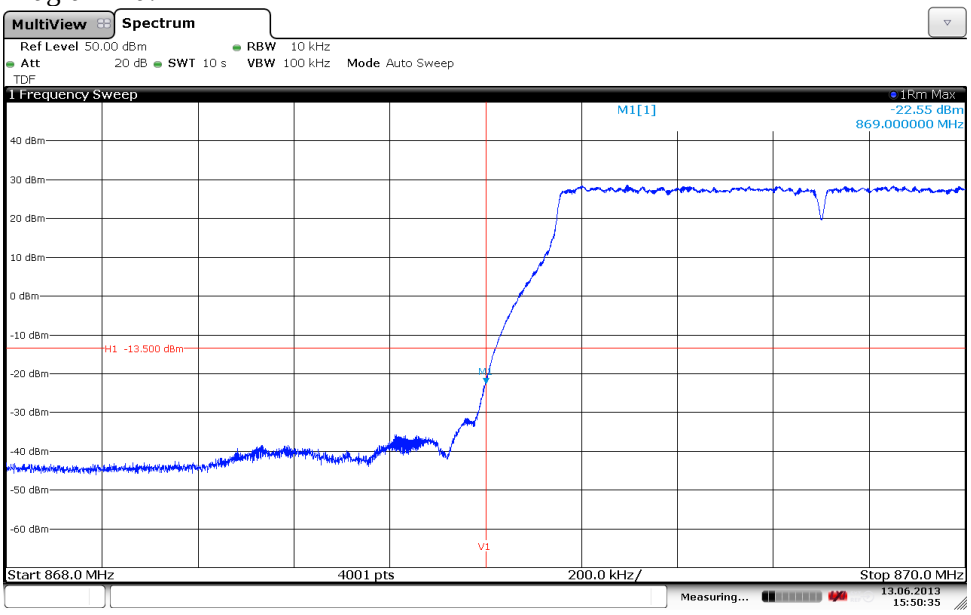
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm per 100 kHz RBW.

IC RSS-132 5.5.1.2: 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 per any 100 kHz RBW.

Complies?	Yes

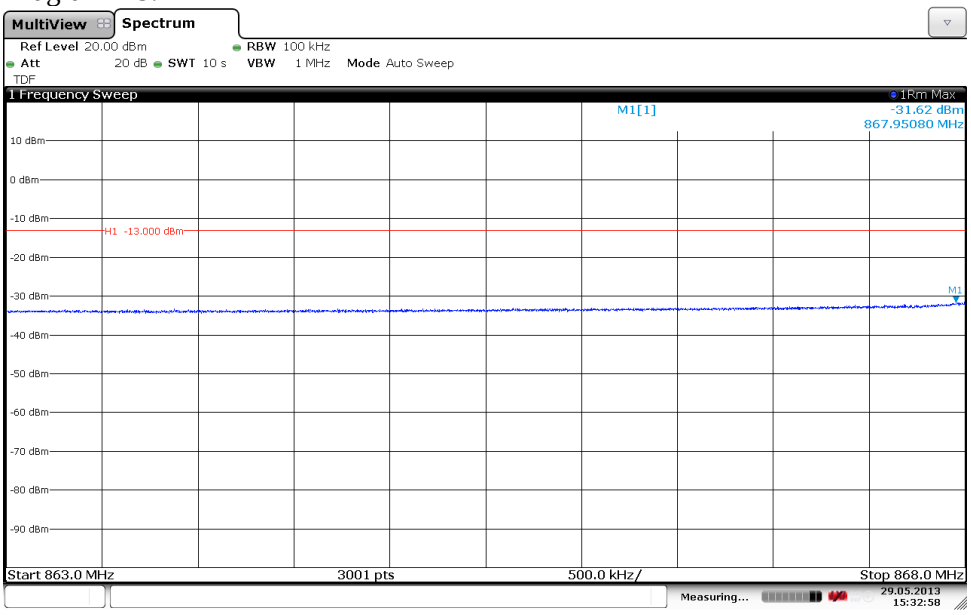
Appendix 4

Diagram 1 a:



Date: 13.JUN.2013 15:50:36

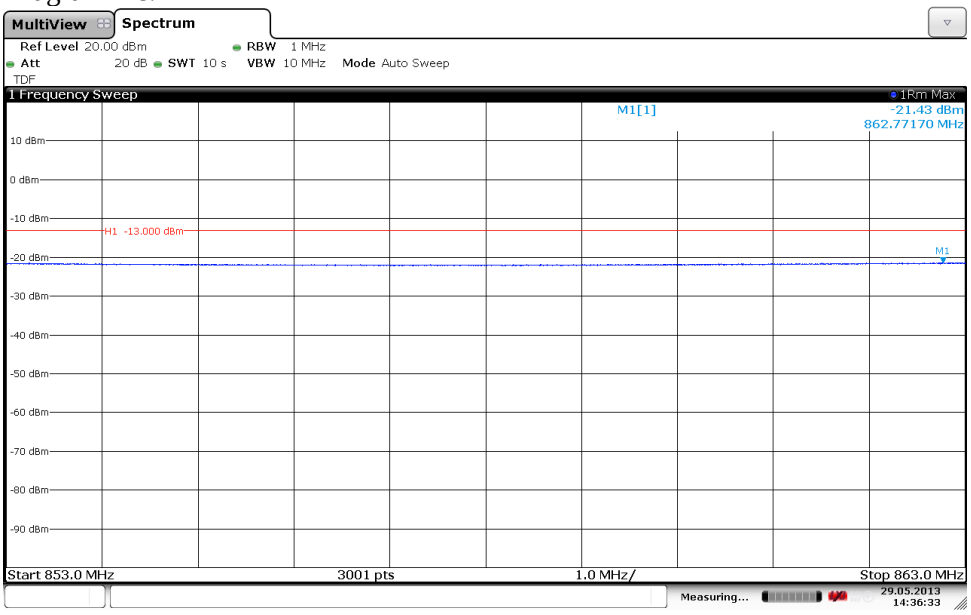
Diagram 1 b:



Date: 29.MAY.2013 15:32:58

Appendix 4

Diagram 1 c:



Date: 29.MAY.2013 14:36:33

Appendix 4

Diagram 2 a:

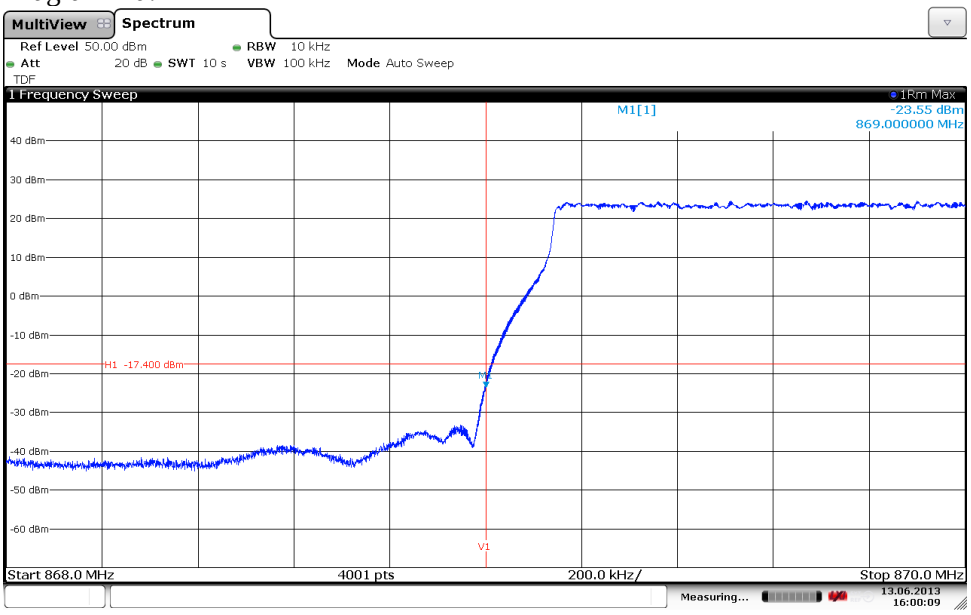


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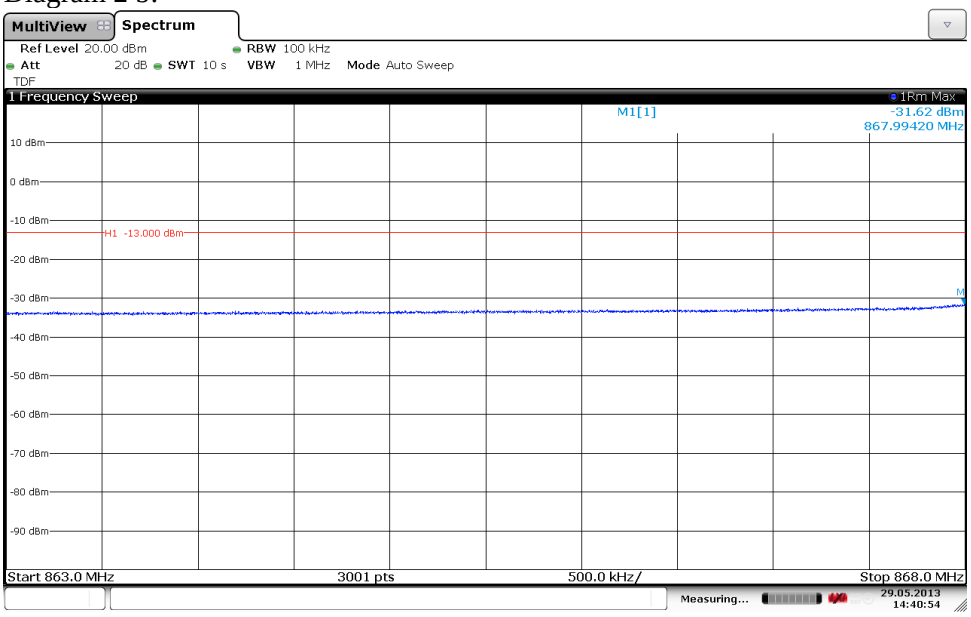
Diagram 2 b:



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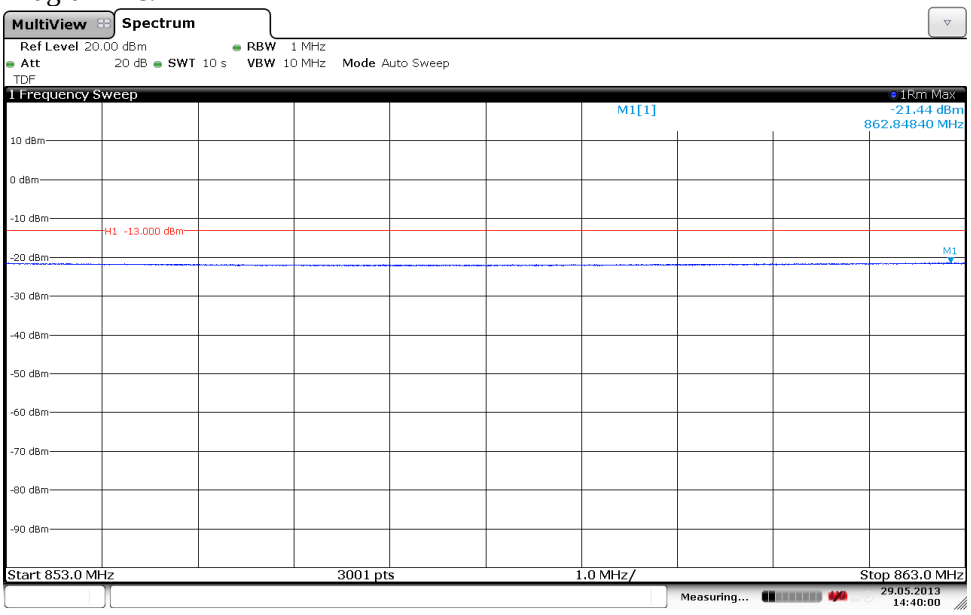
Appendix 4

Diagram 2 c:



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Appendix 4

Diagram 3 a:

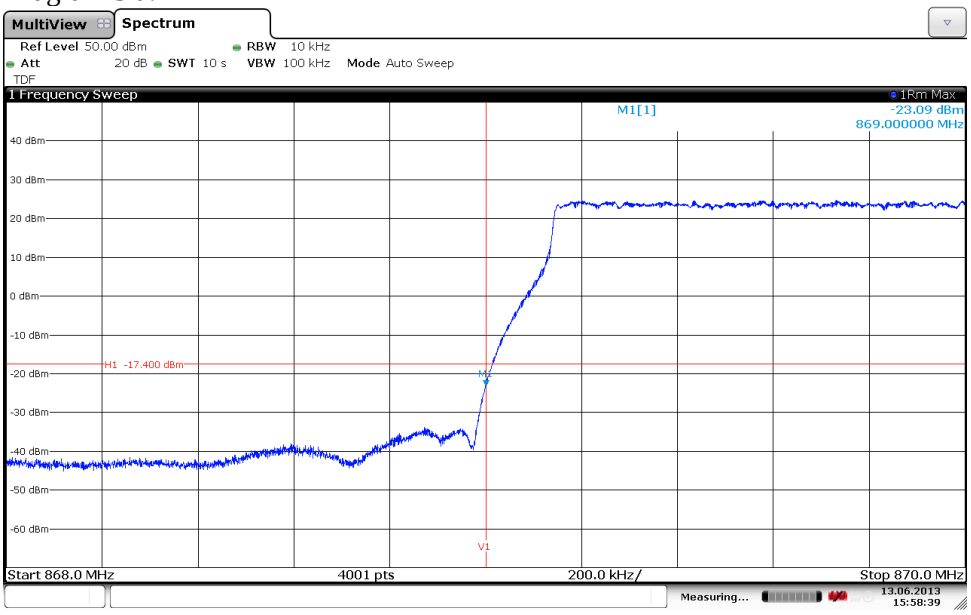

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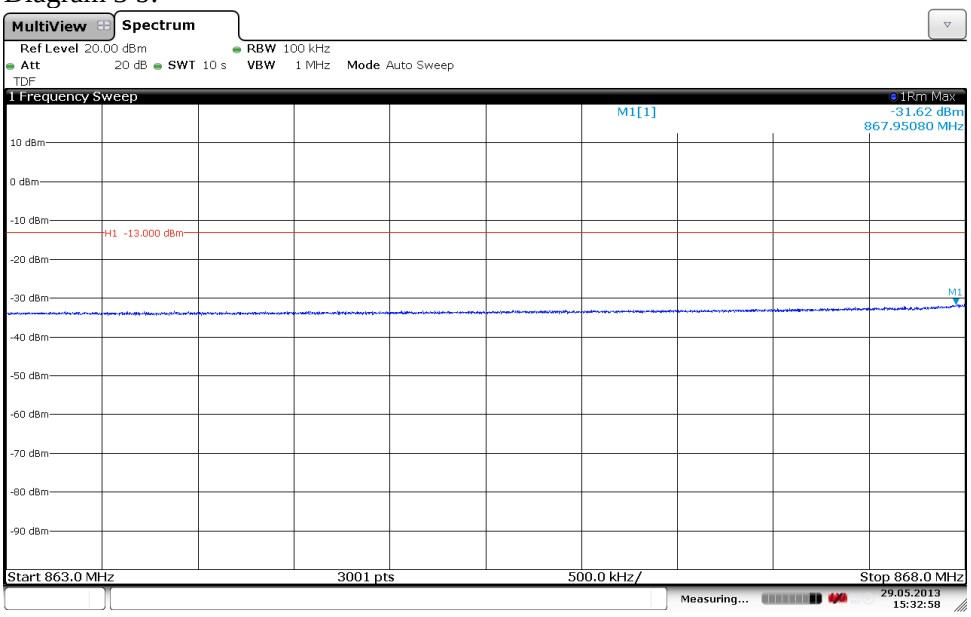
Diagram 3 b:



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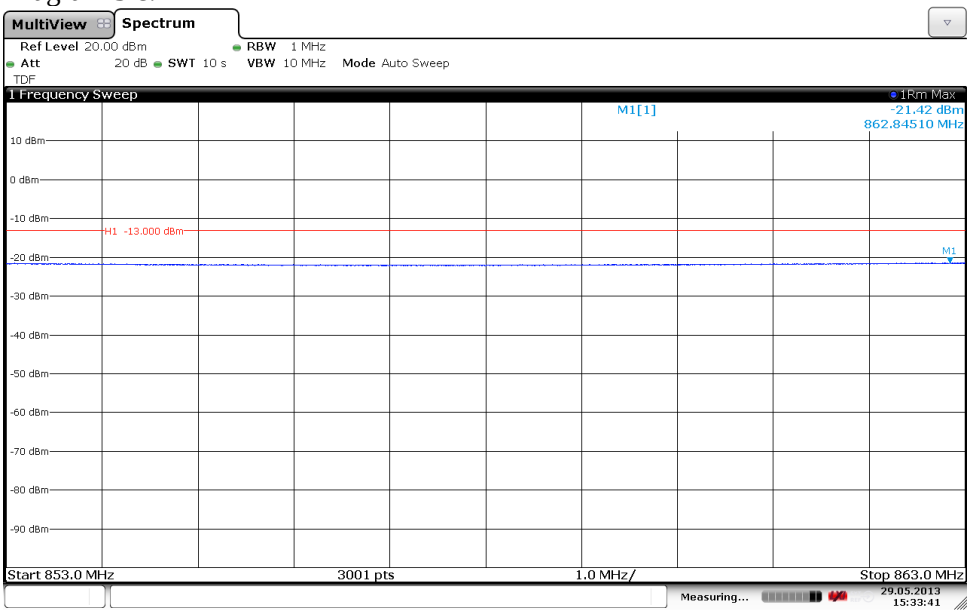
Appendix 4

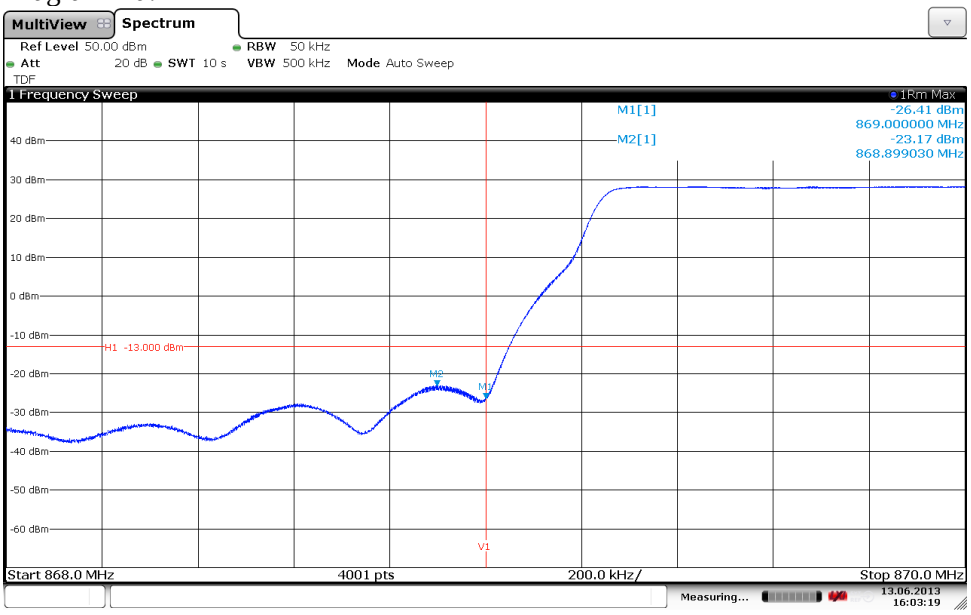
Diagram 3 c:



Date: 29.MAY.2013 15:33:40

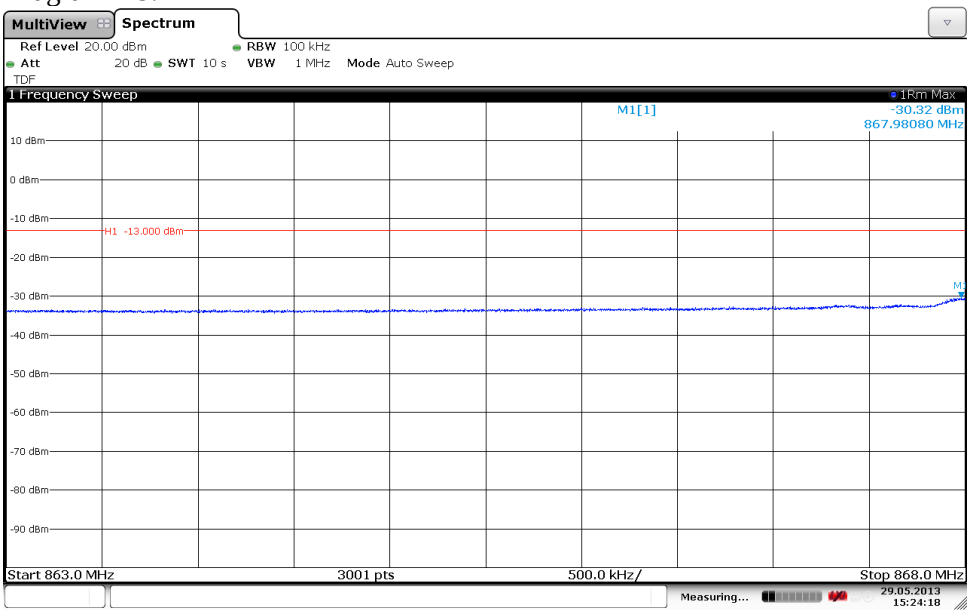
Appendix 4

Diagram 4 a:



Date: 13.JUN.2013 16:03:19

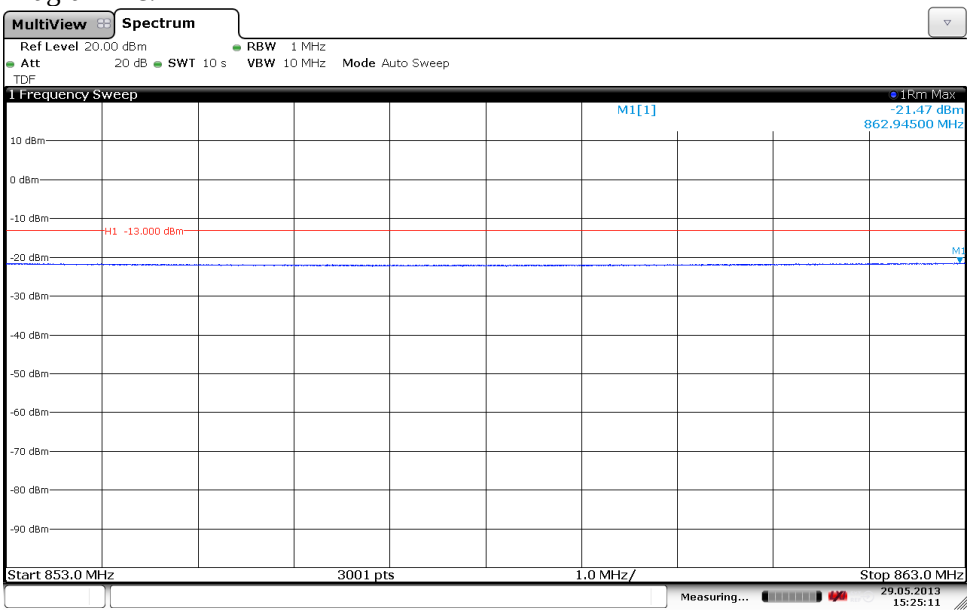
Diagram 4 b:



Date: 29.MAY.2013 15:24:17

Appendix 4

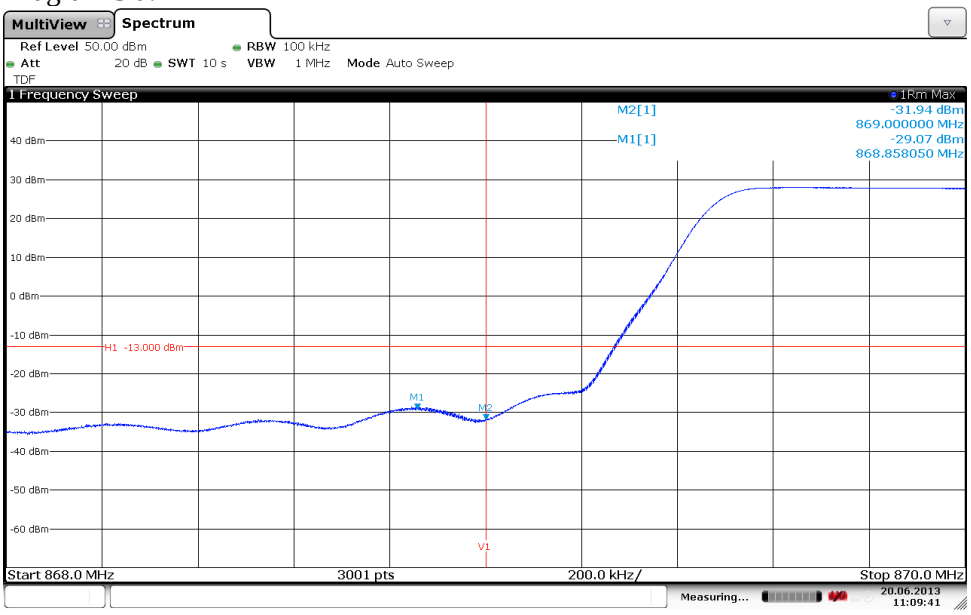
Diagram 4 c:



Date: 29.MAY.2013 15:25:10

Appendix 4

Diagram 5 a:



Date: 20.JUN.2013 11:09:41

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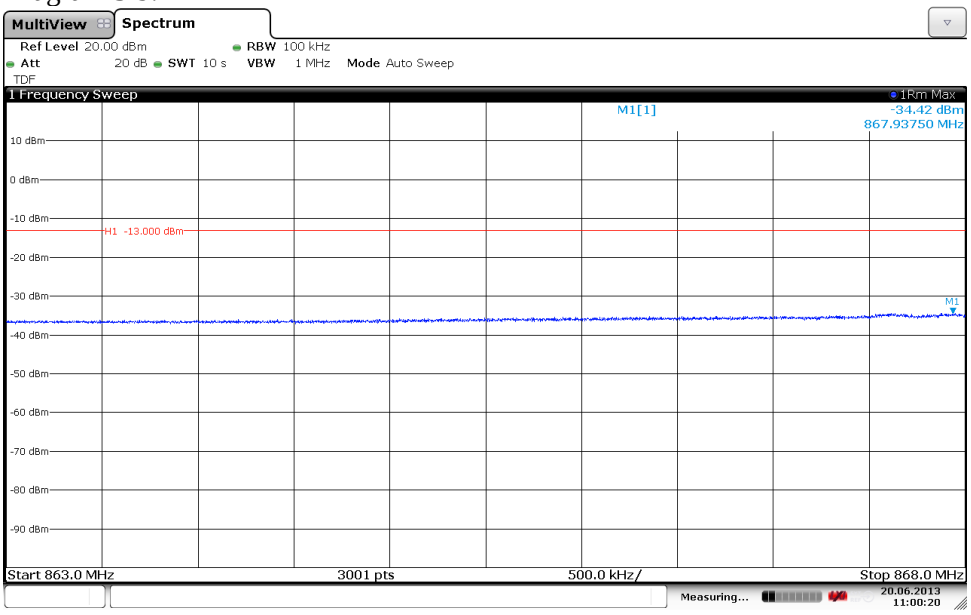
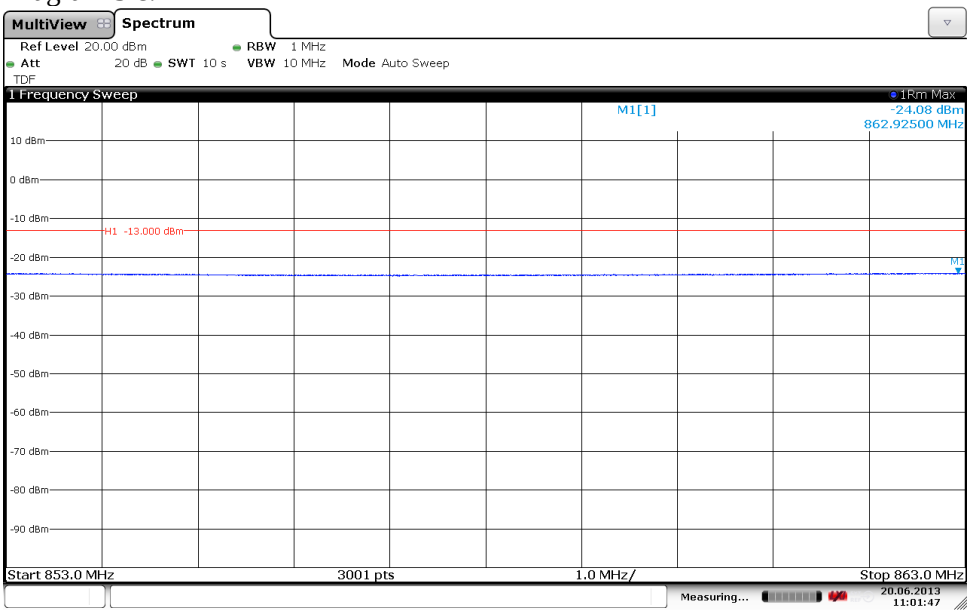


Date: 20.JUN.2013 11:00:20

Appendix 4

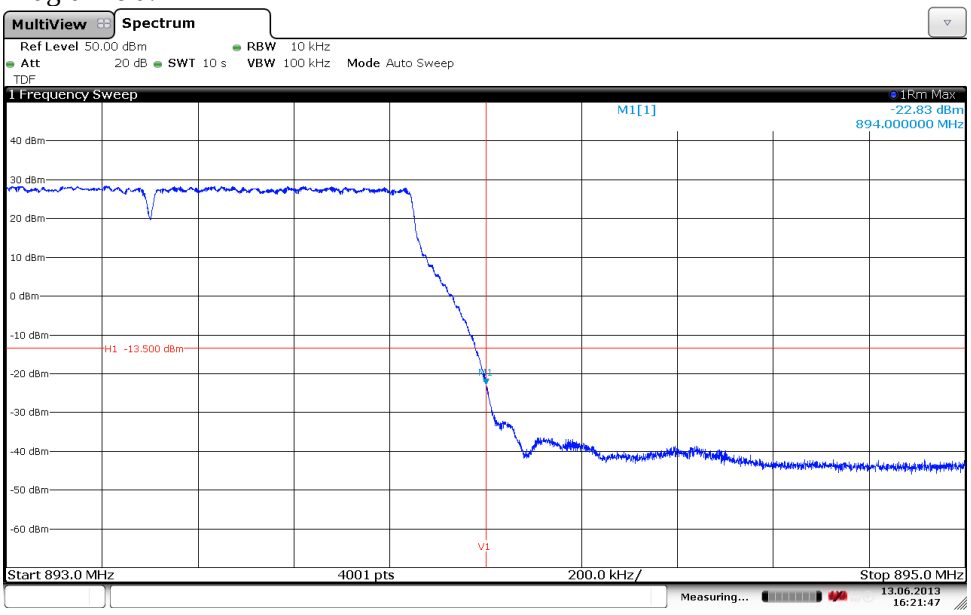
Diagram 5 c:



Date: 20.JUN.2013 11:01:47

Appendix 4

Diagram 6 a:



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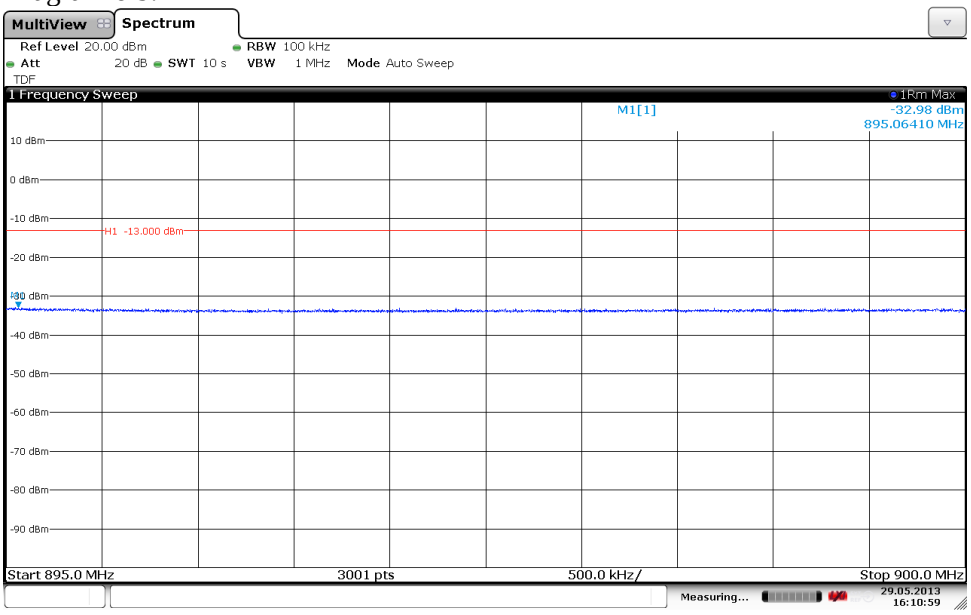
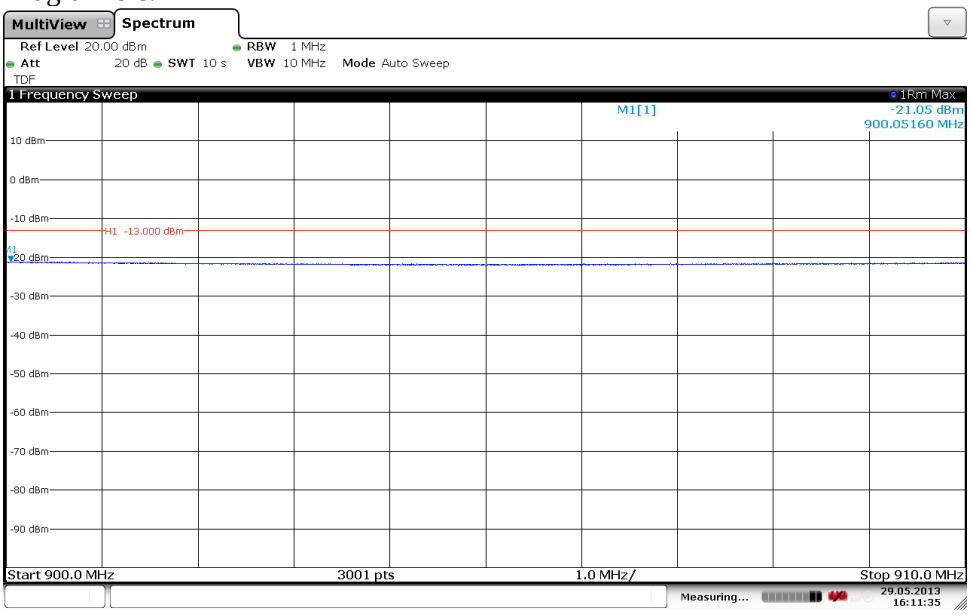


Date: 29.MAY.2013 16:10:58

Appendix 4

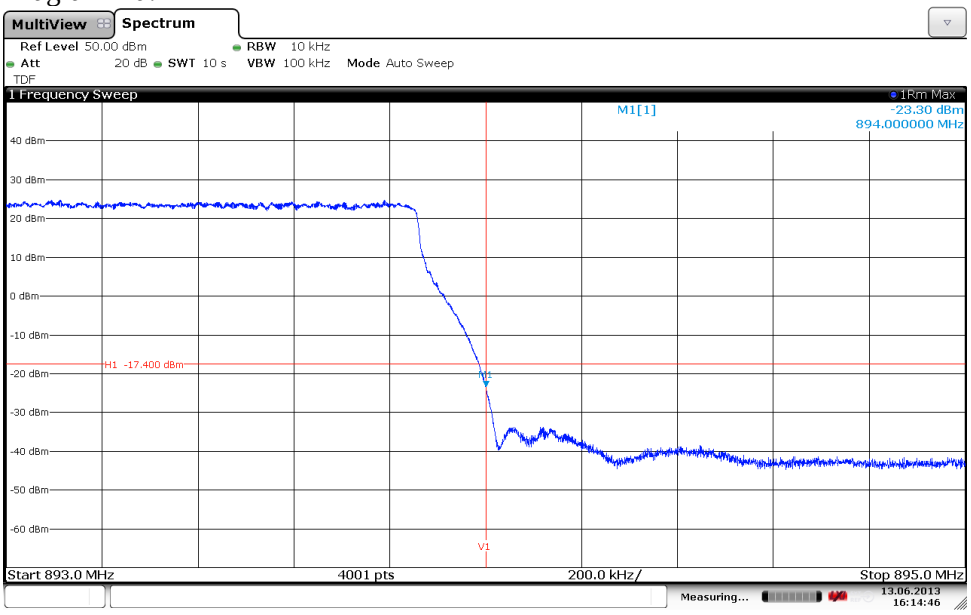
Diagram 6 c:



Date: 29.MAY.2013 16:11:35

Appendix 4

Diagram 7 a:



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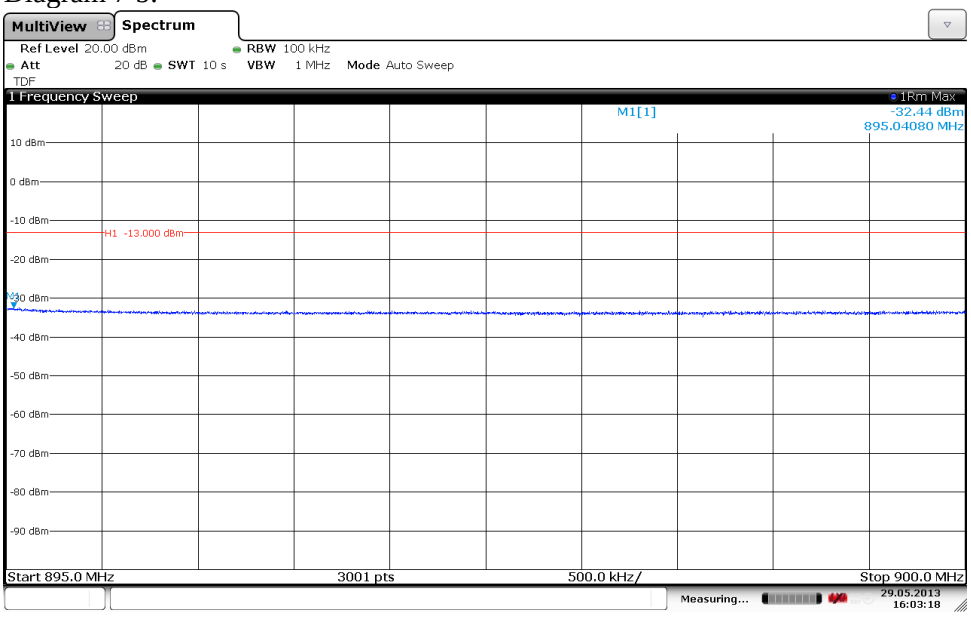

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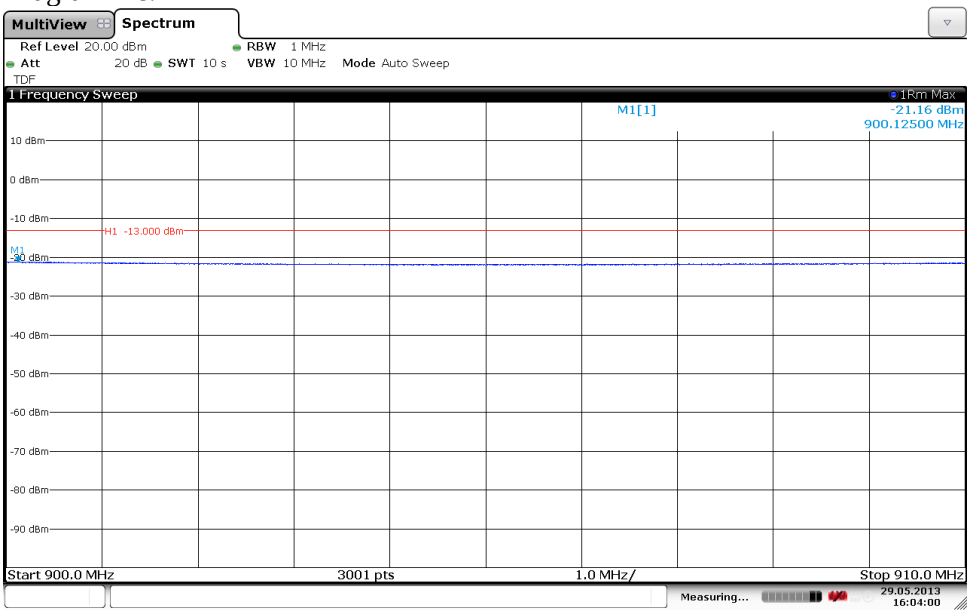
Appendix 4

Diagram 7 c:



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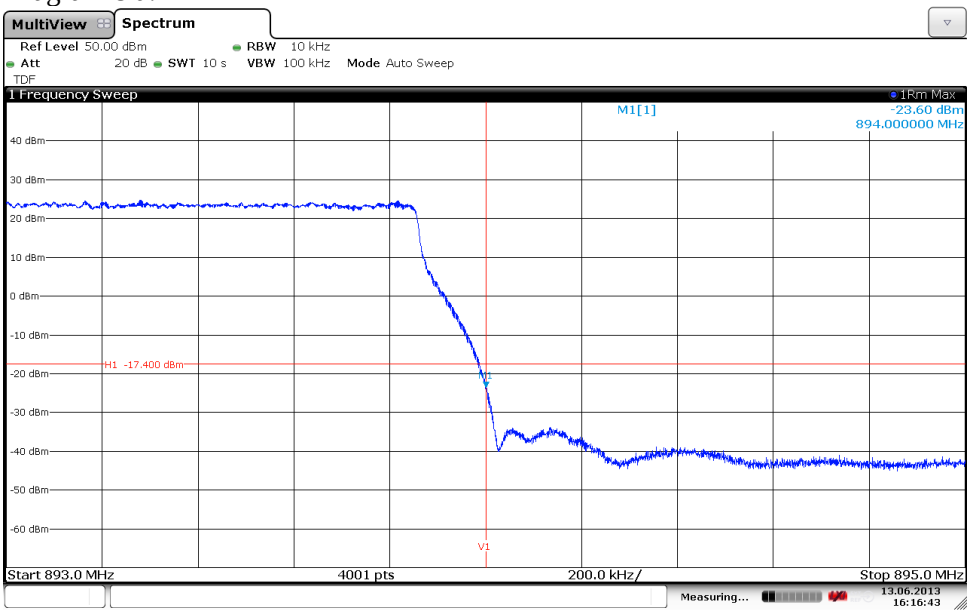
Appendix 4

Diagram 8 a:



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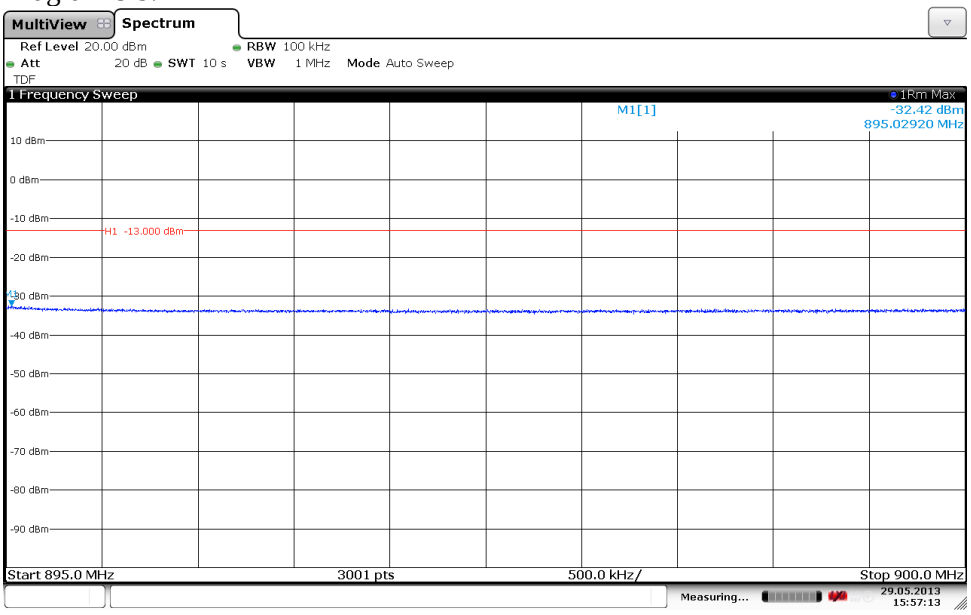
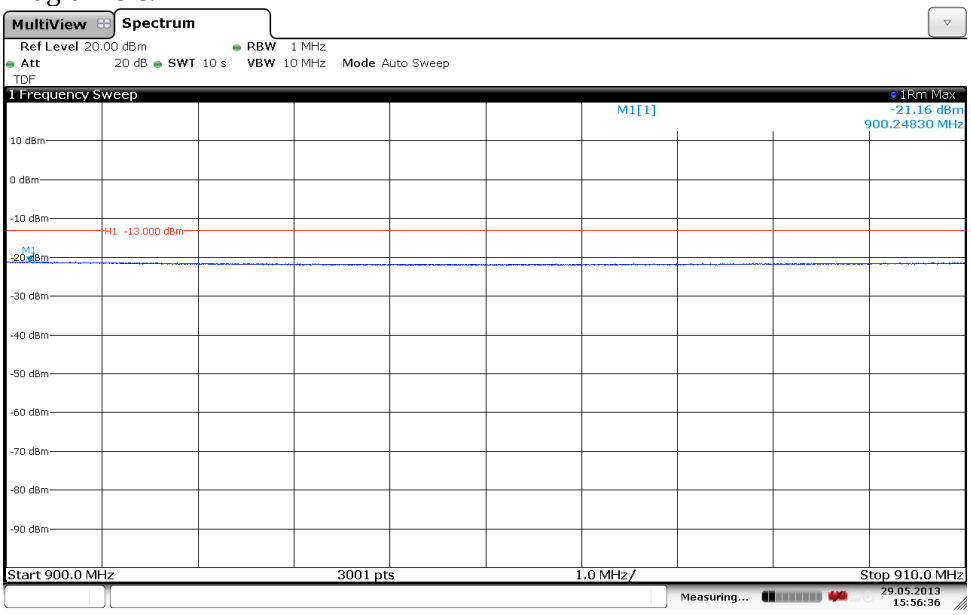


Date: 29.MAY.2013 15:57:13

Appendix 4

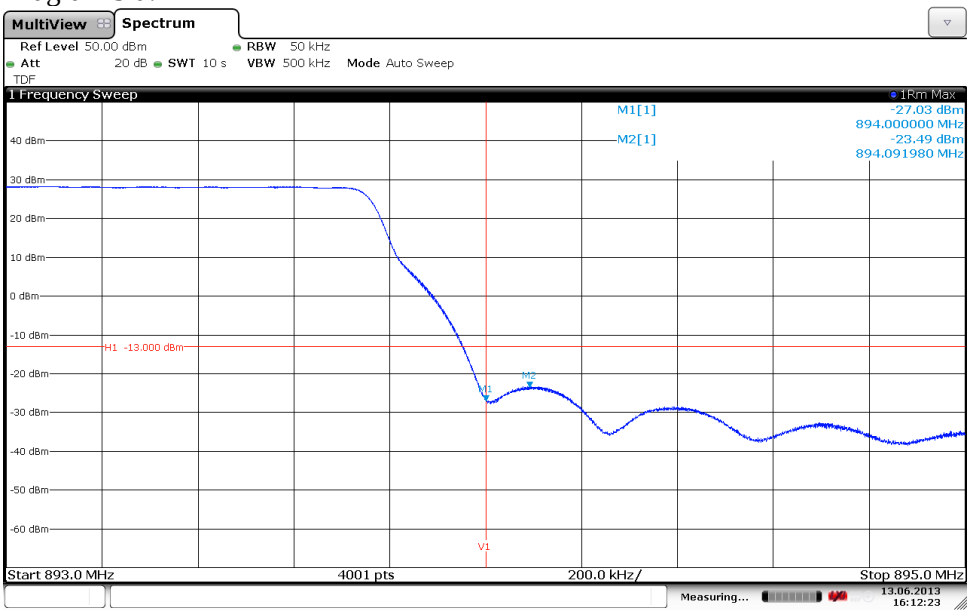
Diagram 8 c:



Date: 29.MAY.2013 15:56:36

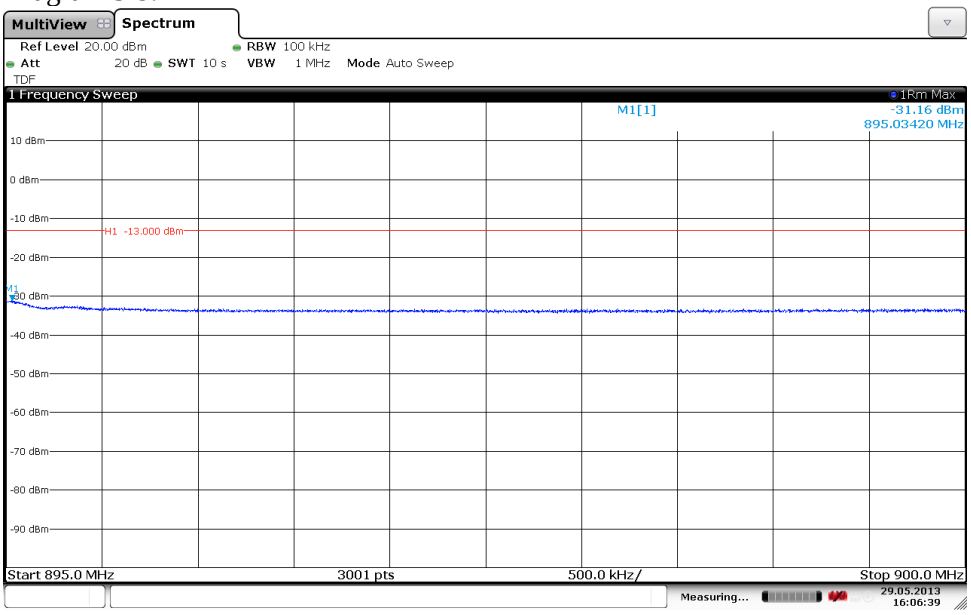
Appendix 4

Diagram 9 a:



Date: 13.JUN.2013 16:12:23

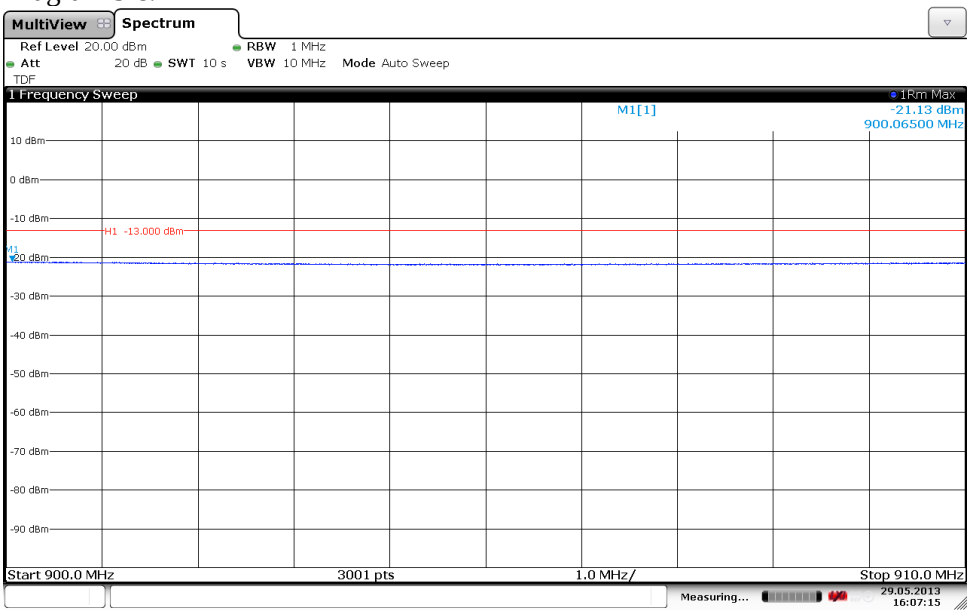
Diagram 9 b:



Date: 29.MAY.2013 16:06:39

Appendix 4

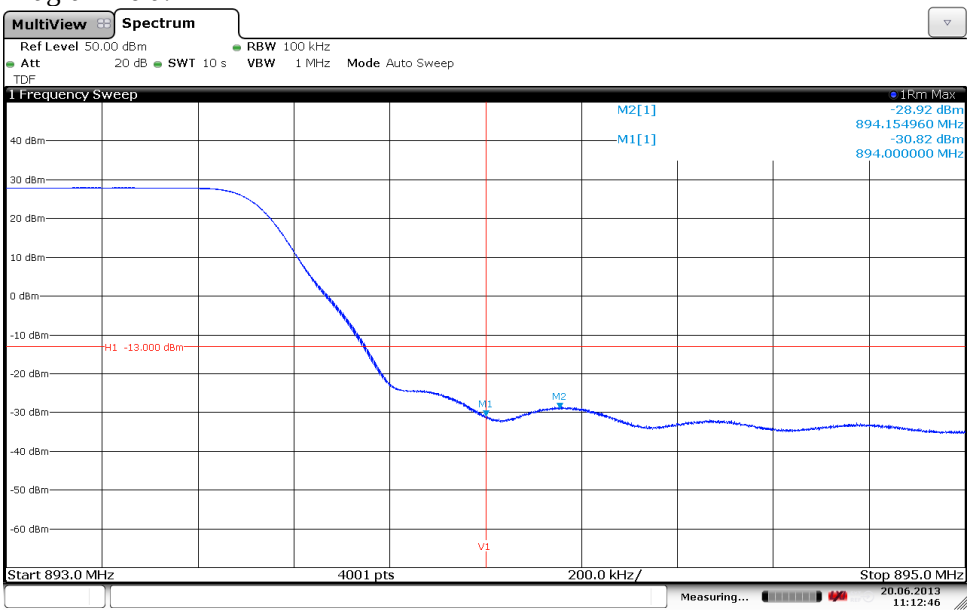
Diagram 9 c:



Date: 29.MAY.2013 16:07:15

Appendix 4

Diagram 10 a:



Date: 20.JUN.2013 11:12:45

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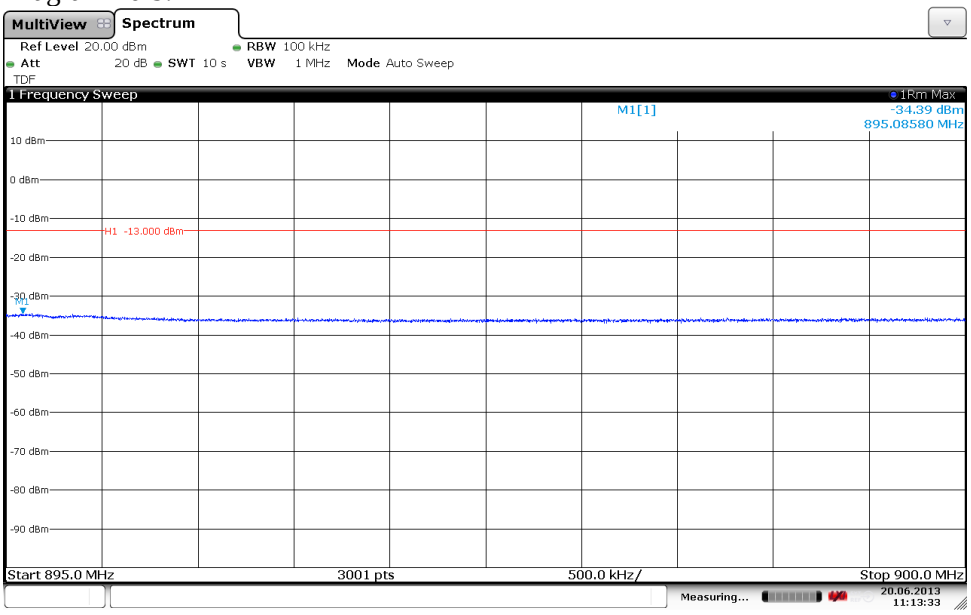

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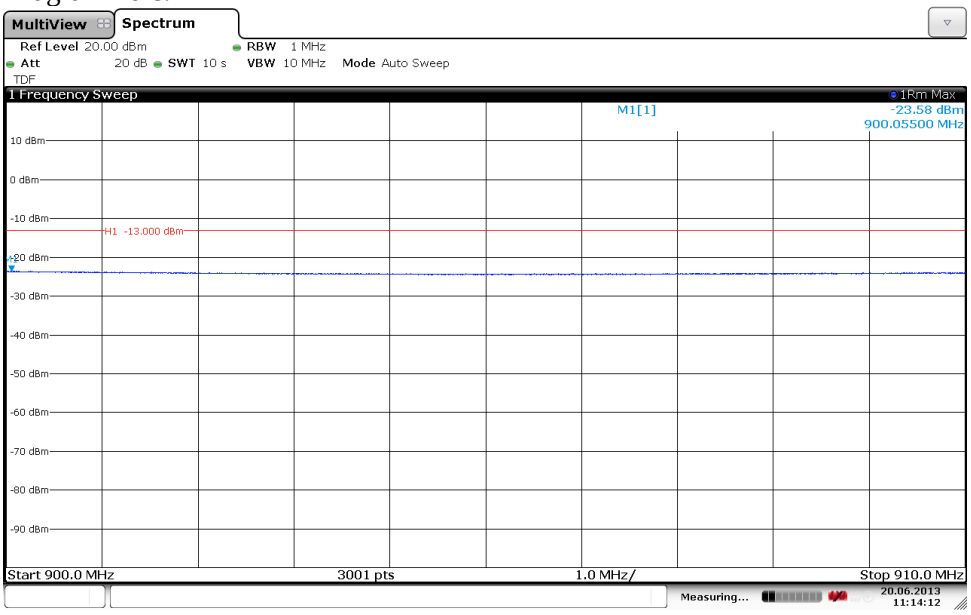
Appendix 4

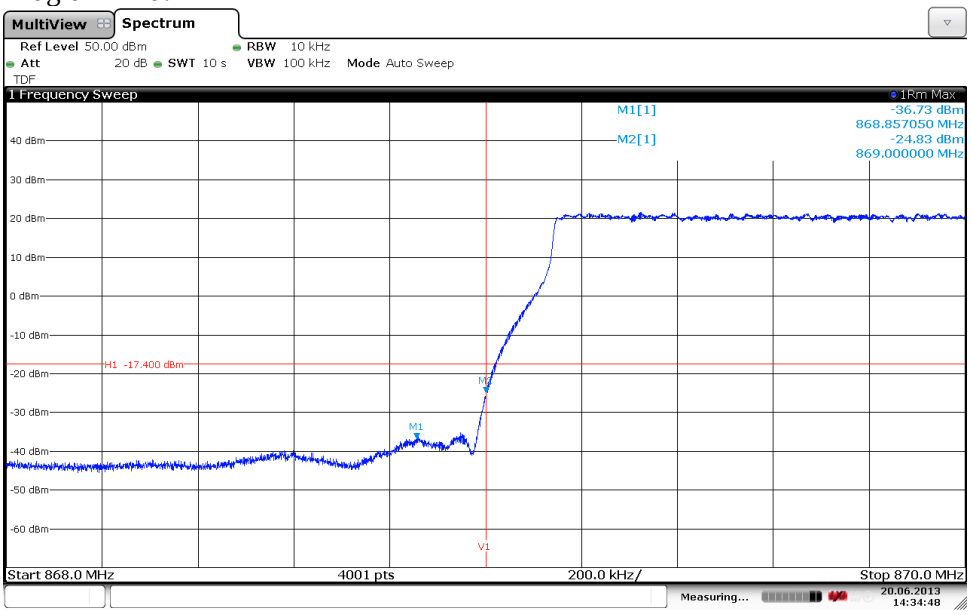
Diagram 10 c:



Date: 20.JUN.2013 11:14:12

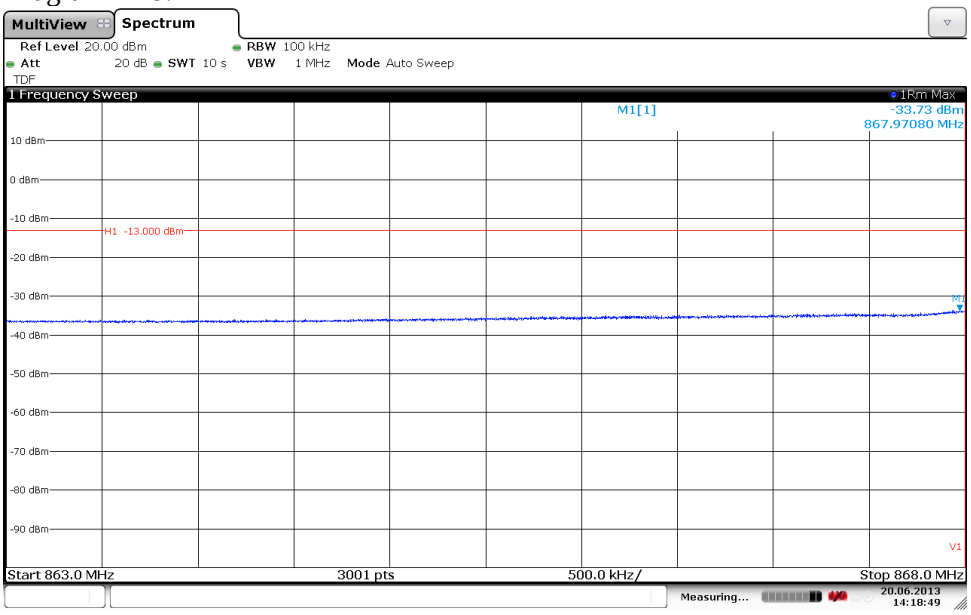
Appendix 4

Diagram 11 a:



Date: 20.JUN.2013 14:34:49

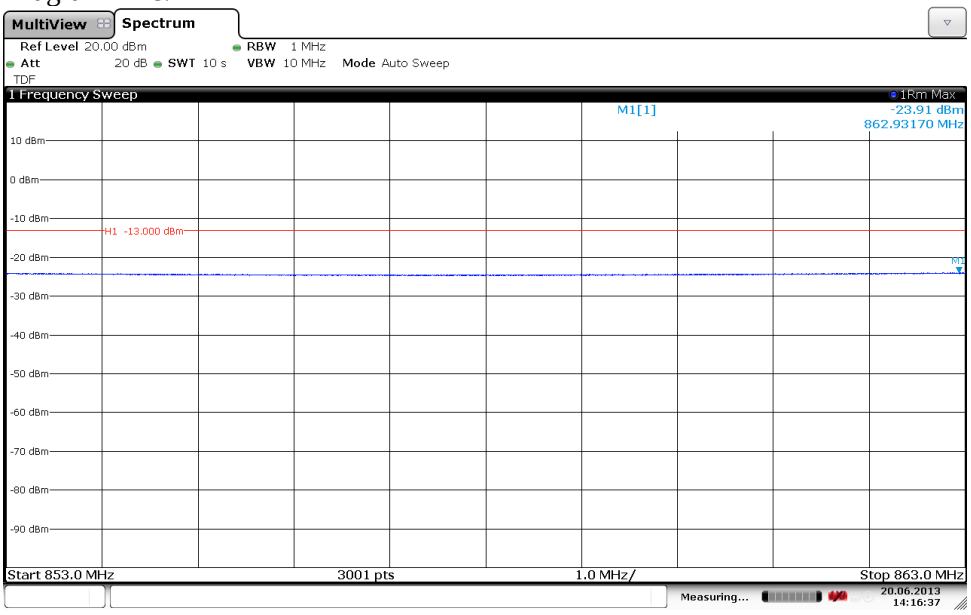
Diagram 11 b:



Date: 20.JUN.2013 14:18:49

Appendix 4

Diagram 11 c:



Date: 20.JUN.2013 14:16:37

Appendix 4

Diagram 12 a:

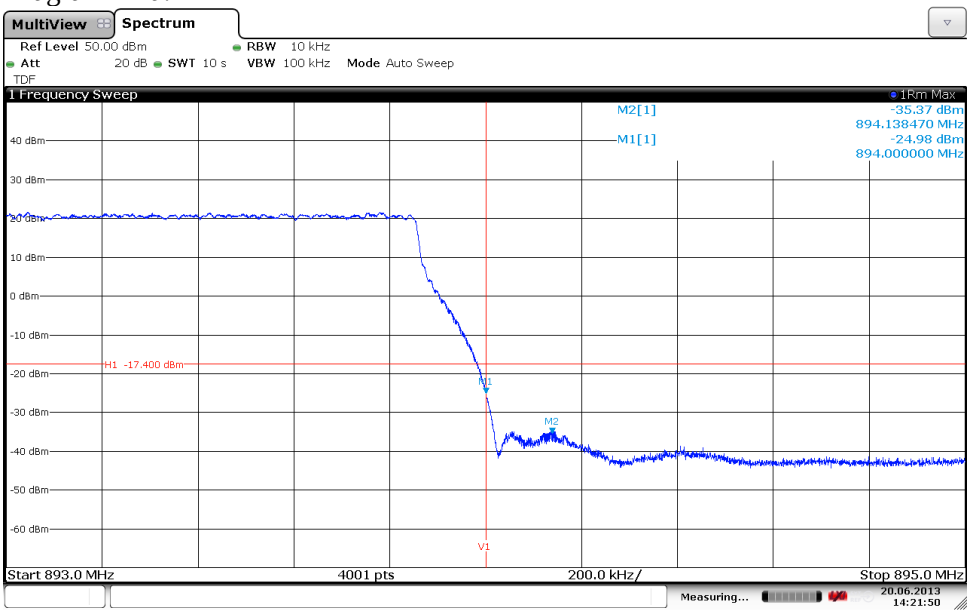


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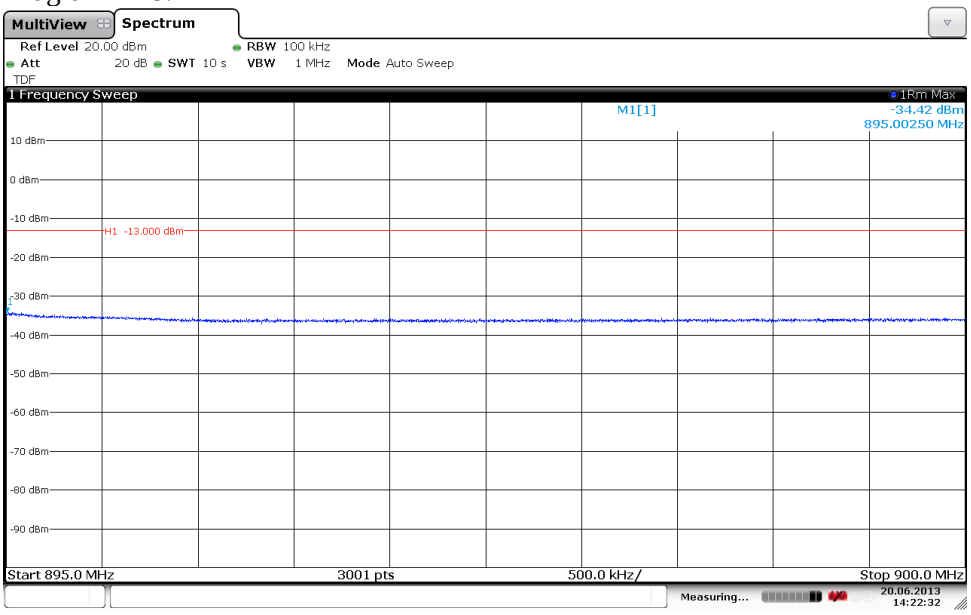
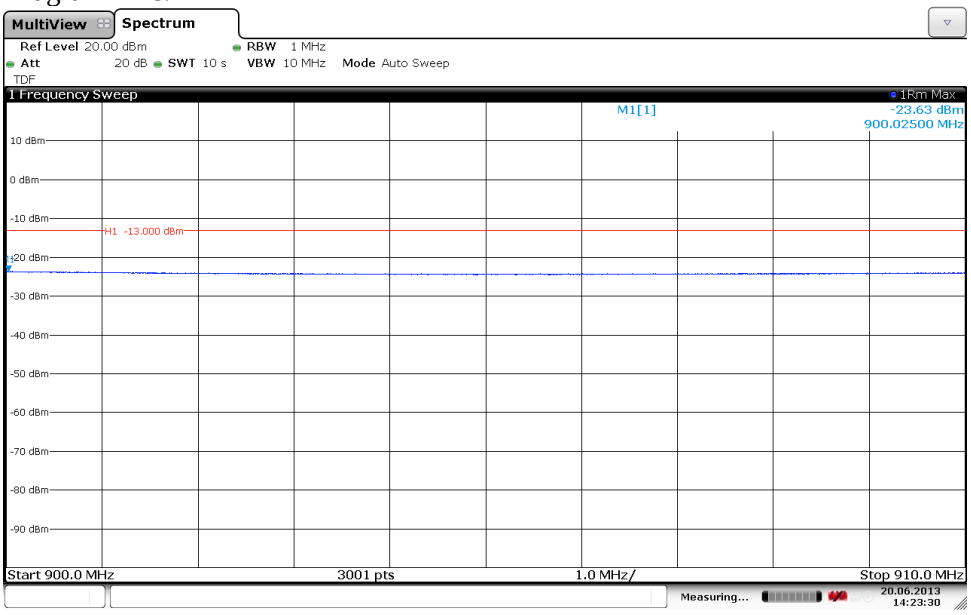
Diagram 12 b:



Date: 20.JUN.2013 14:22:32

Appendix 4

Diagram 12 c:



Date: 20.JUN.2013 14:23:30

Appendix 5

Conducted spurious emission measurements according to CFR 47 2.1051 / IC RSS-132 5.5

Date	Temperature	Humidity
2013-05-29	23 °C ± 3 °C	51% ± 5 %
2013-05-30	22 °C ± 3 °C	40% ± 5 %
2013-06-20	23 °C ± 3 °C	55% ± 5 %

Test set-up and procedure

The measurements were made per definition in § 22.917, but with a conservative 1 MHz RBW. 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.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method c “measure and add 10 log(N_{ANT})” of FCC KDB662911 D01 Multiple Transmitter Output v02

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW 43	902 073
RF attenuator	504 159
High pass filter	901 501
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	BW configuration	Tested frequency	Tested Port
1 a+b	1.4 MHz	B	RF A
2 a+b	10 MHz	B	RF A
3 a+b	1.4 MHz	M	RF A
4 a+b	1.4 MHz	M	RF B
5 a+b	10 MHz	M	RF A
6 a+b	10 MHz	M	RF B
7 a+b	1.4 MHz	T	RF A
8 a+b	10 MHz	T	RF A

Multi carrier

Diagram	BW configuration	Tested frequency	Tested Port
9 a+b+c	1.4 MHz	B2	RF A
10 a+b+c	1.4 MHz	M2	RF A
11 a+b+c	1.4 MHz	T2	RF A

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

Remarks

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 covers 10x the highest TX fundamental frequency.
The highest fundamental frequency is 894MHz. The measurements were made up to 9 GHz (10x894 MHz = 8.94 GHz).

Limits

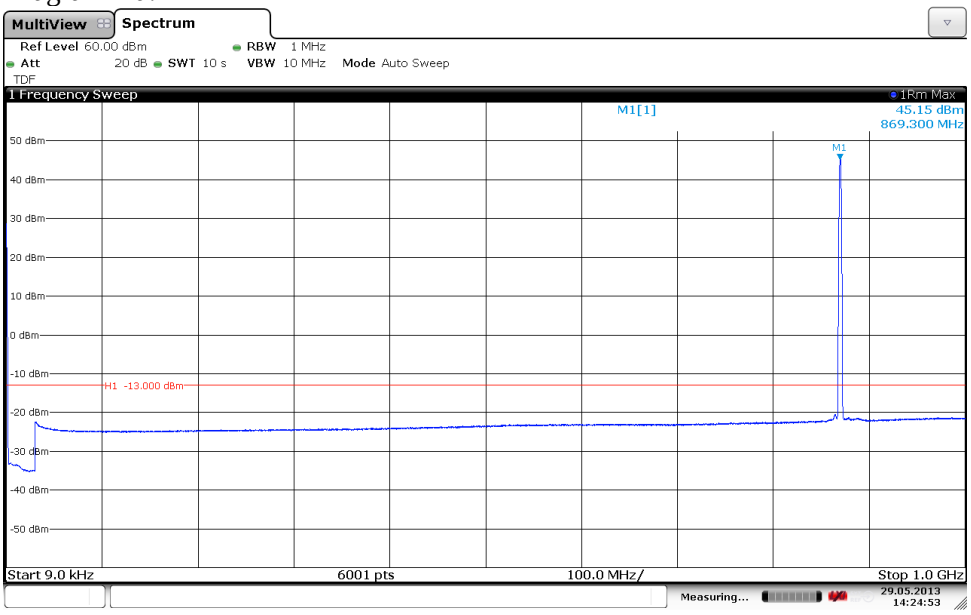
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm per 100 kHz RBW.

IC RSS-132 5.5.1.2: 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 per any 100 kHz RBW.

Complies?	Yes

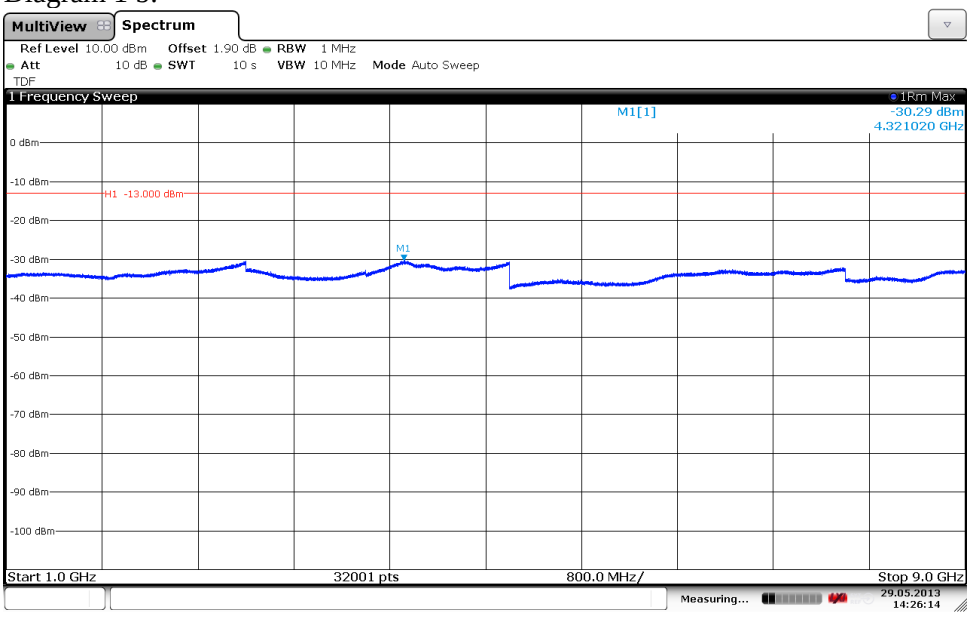
Appendix 5

Diagram 1 a:



Date: 29.MAY.2013 14:24:53

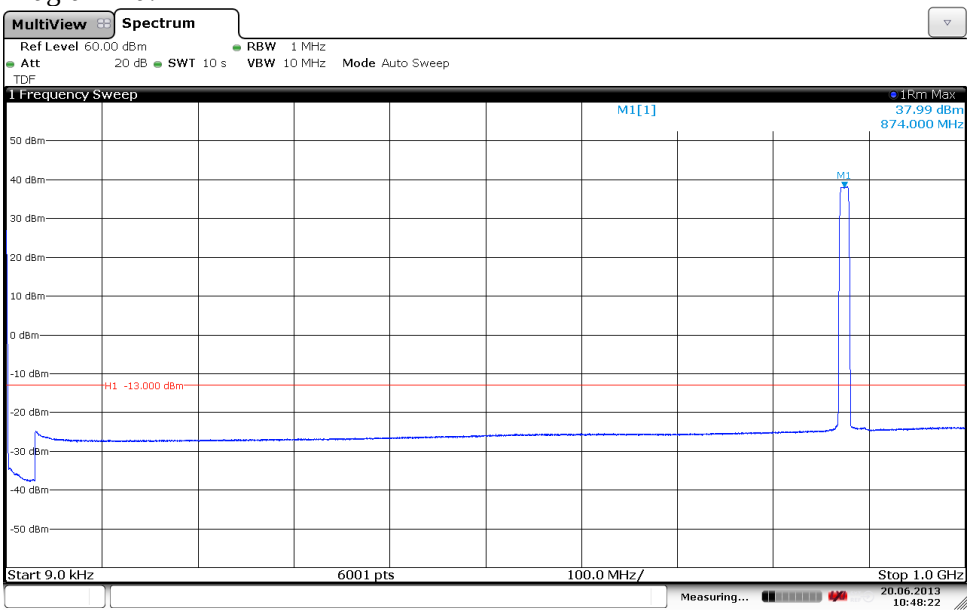
Diagram 1 b:



Date: 29.MAY.2013 14:26:14

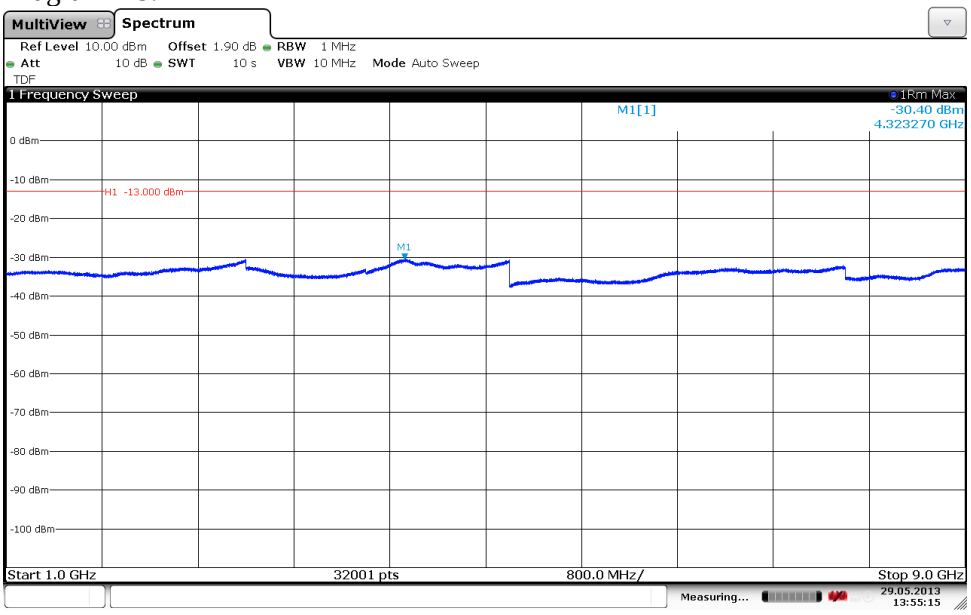
Appendix 5

Diagram 2 a:



Date: 20.JUN.2013 10:48:21

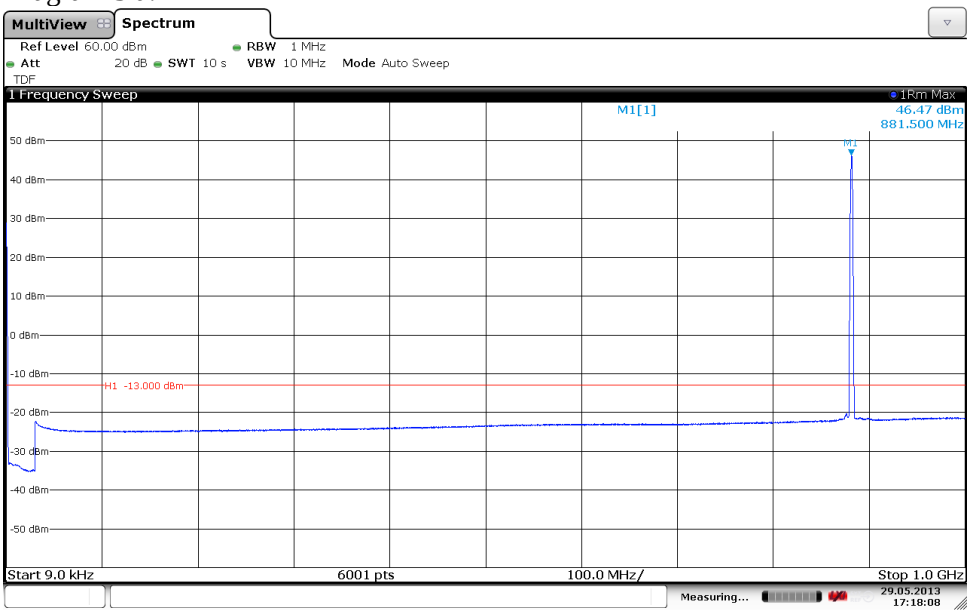
Diagram 2 b:



Date: 29.MAY.2013 13:55:15

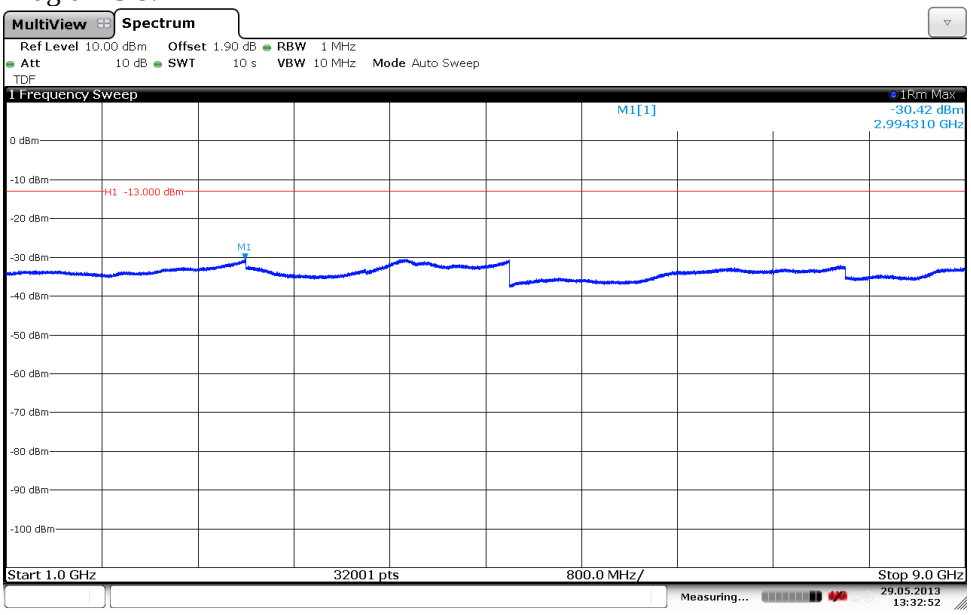
Appendix 5

Diagram 3 a:



Date: 29.MAY.2013 17:18:08

Diagram 3 b:



Date: 29.MAY.2013 13:32:52

Appendix 5

Diagram 4 a:

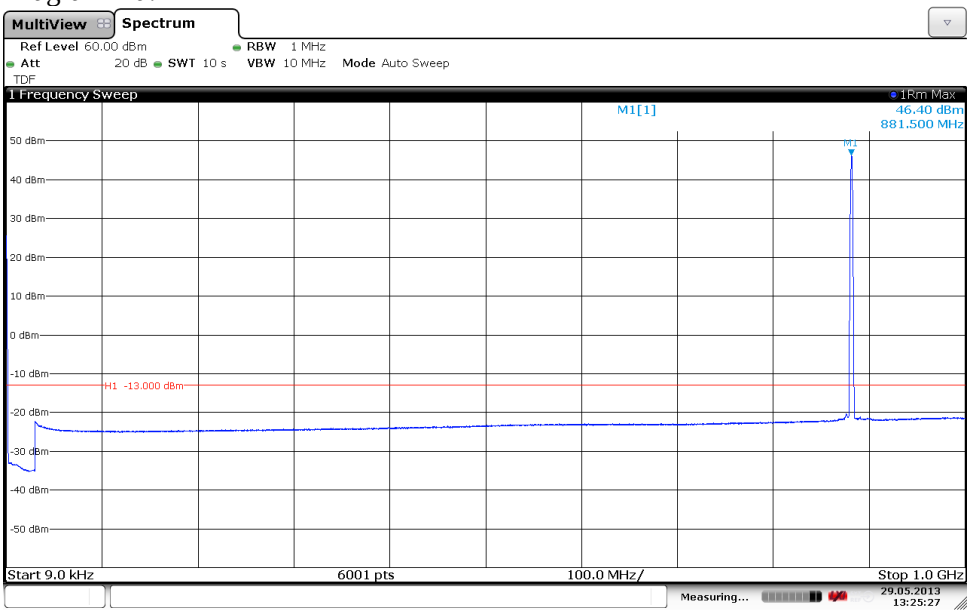


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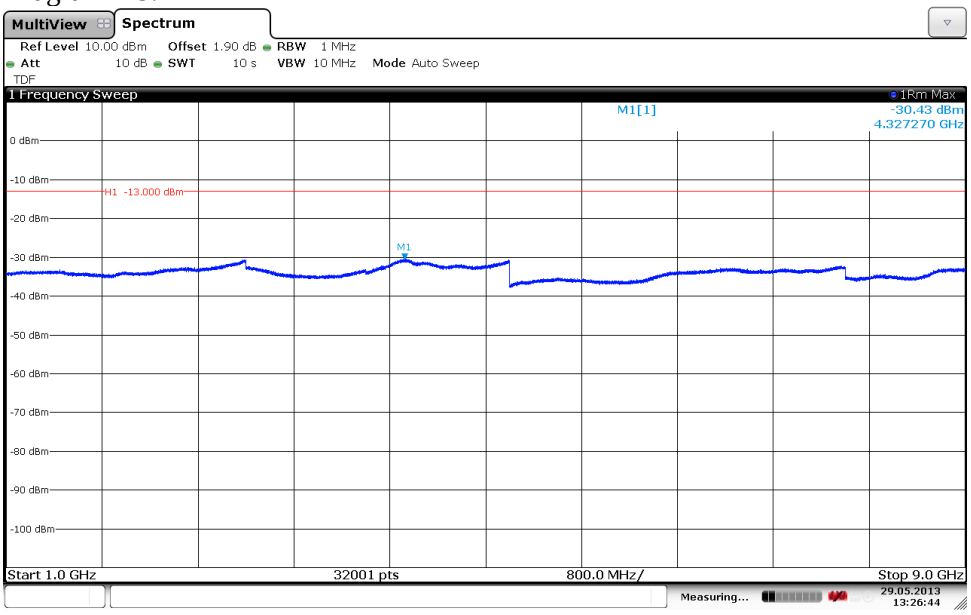
Diagram 4 b:



Date: 29.MAY.2013 13:26:45

Appendix 5

Diagram 5 a:

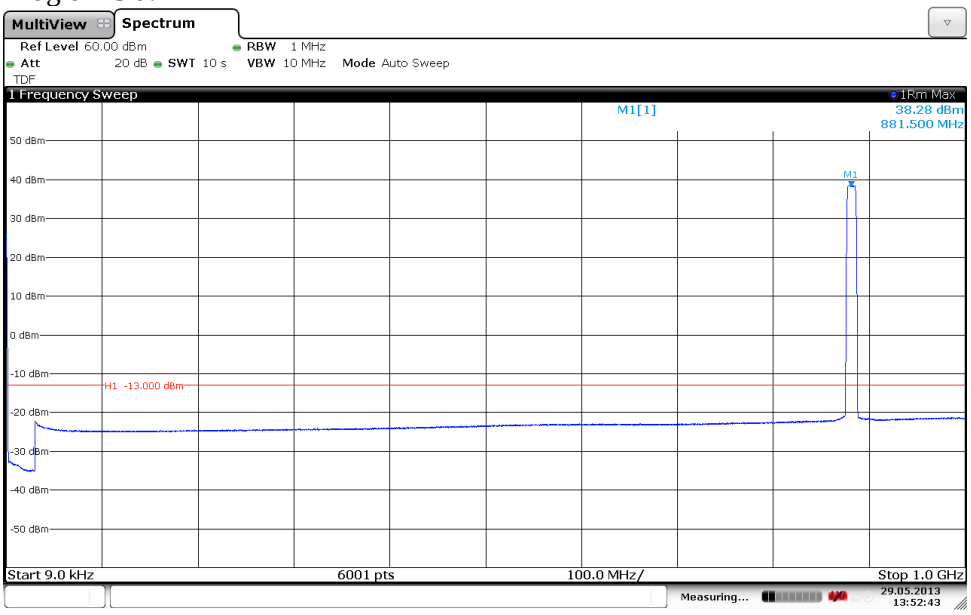


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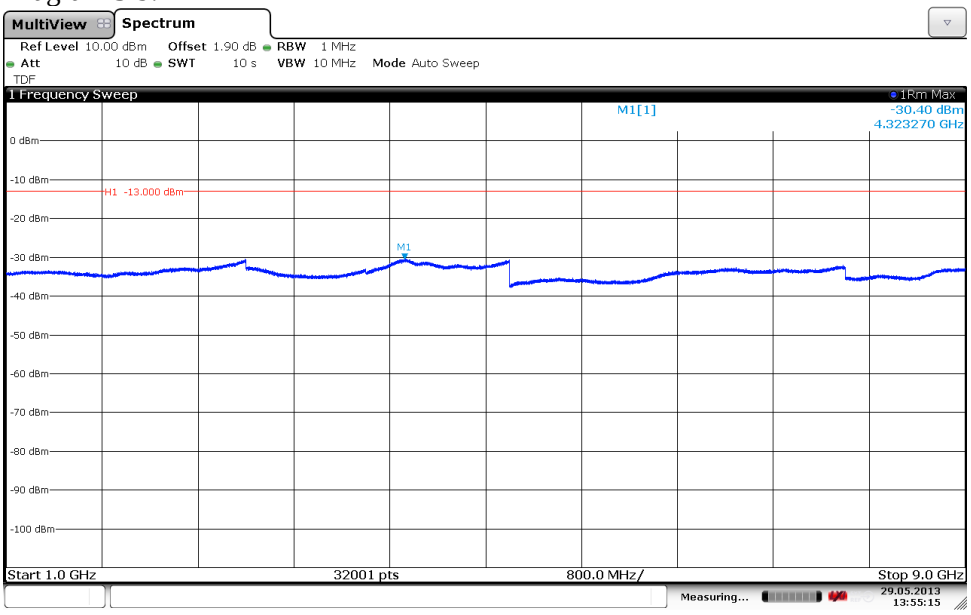
Diagram 5 b:



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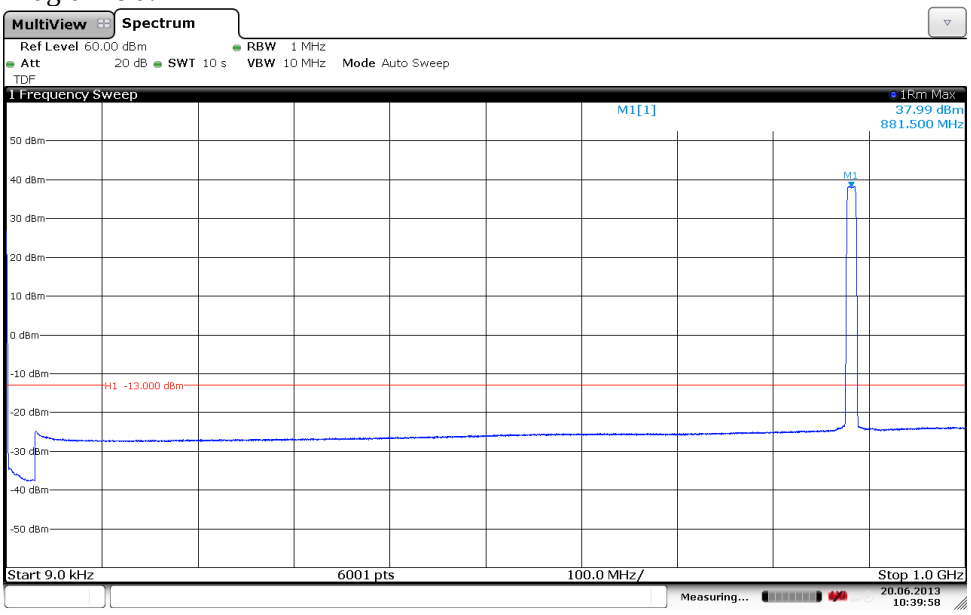
Appendix 5

Diagram 6 a:



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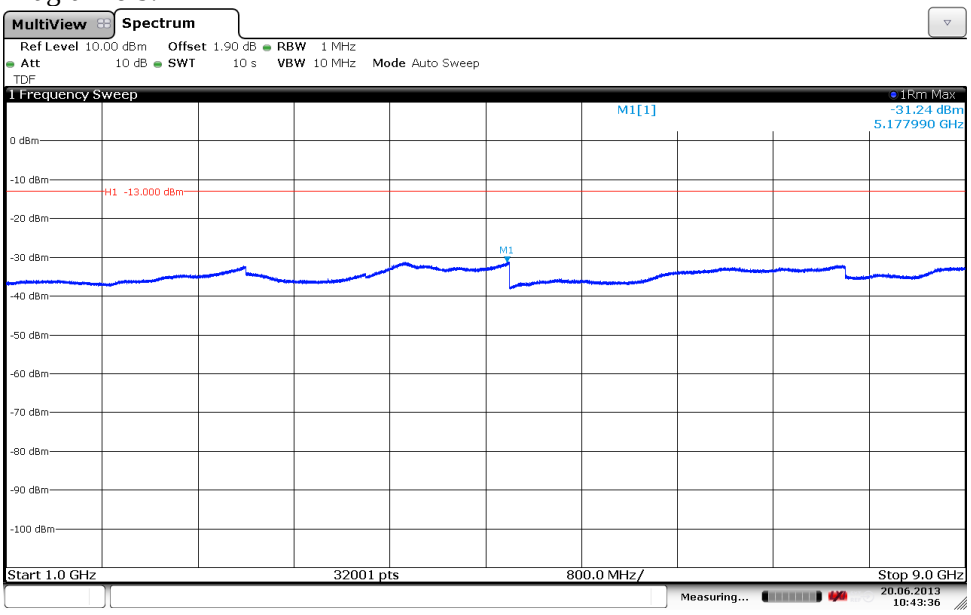

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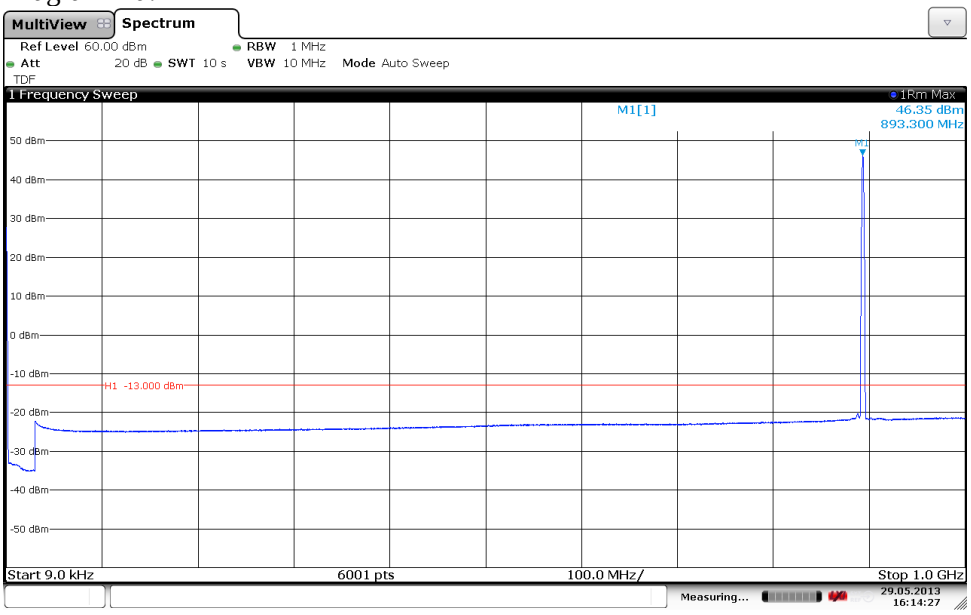
Appendix 5

Diagram 7 a:



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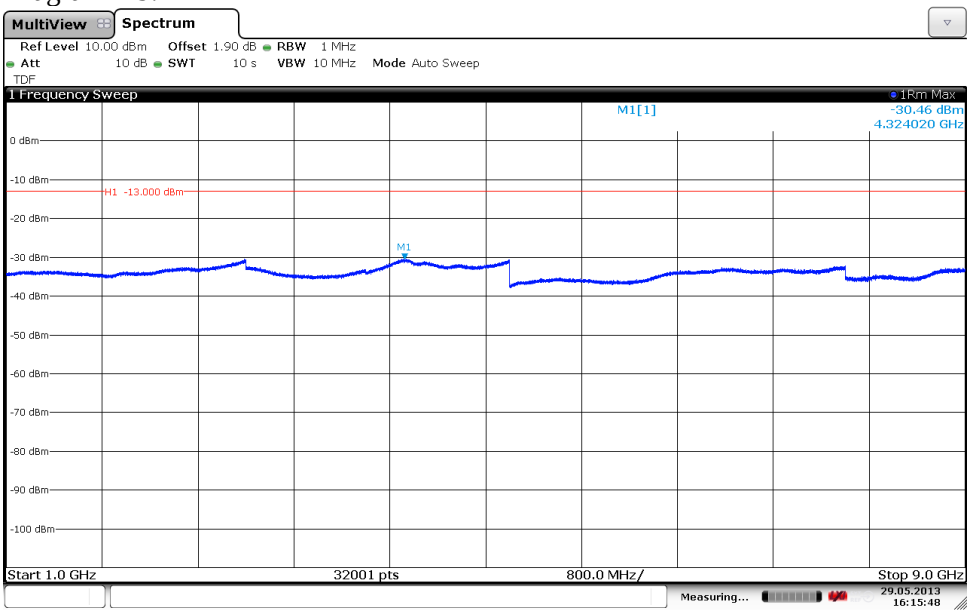

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Appendix 5

Diagram 8 a:

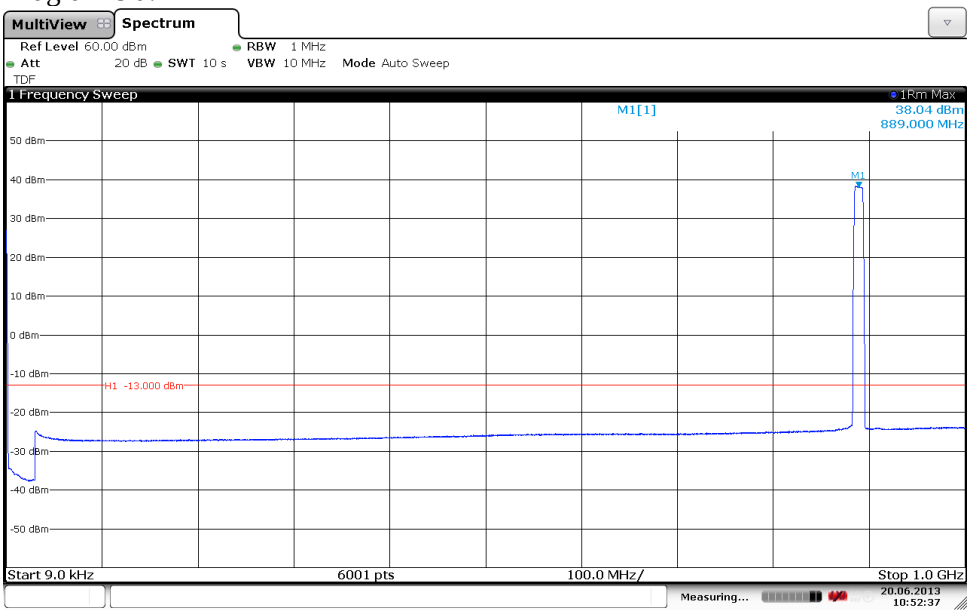

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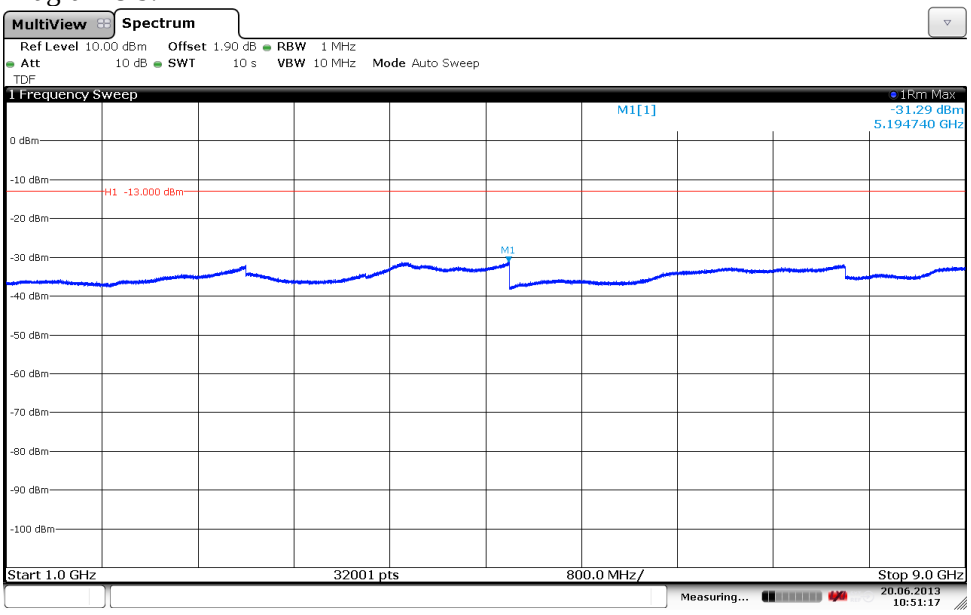
Diagram 8 b:



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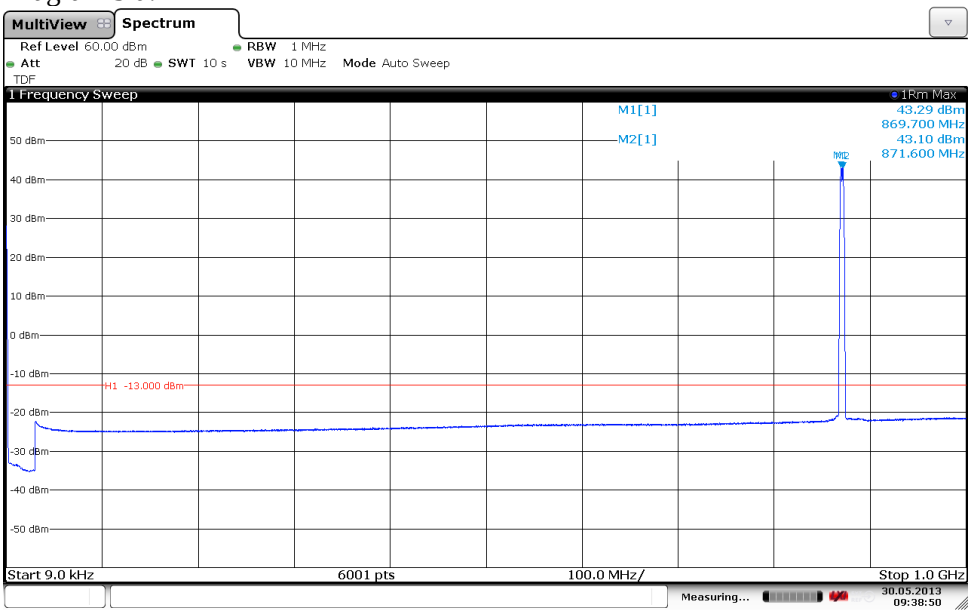
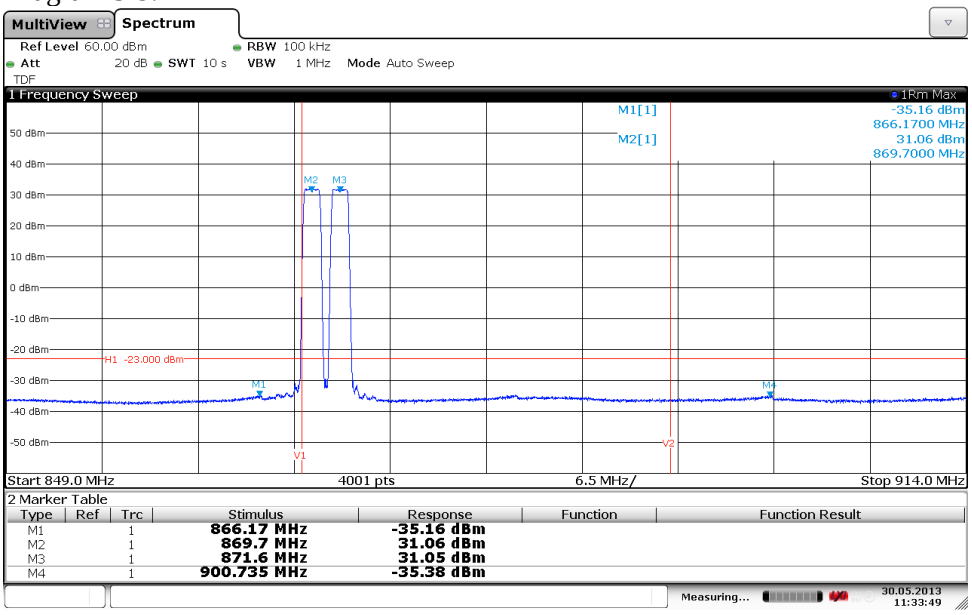
Appendix 5

Diagram 9 a:



Date: 30.MAY.2013 09:38:50

Diagram 9 b:



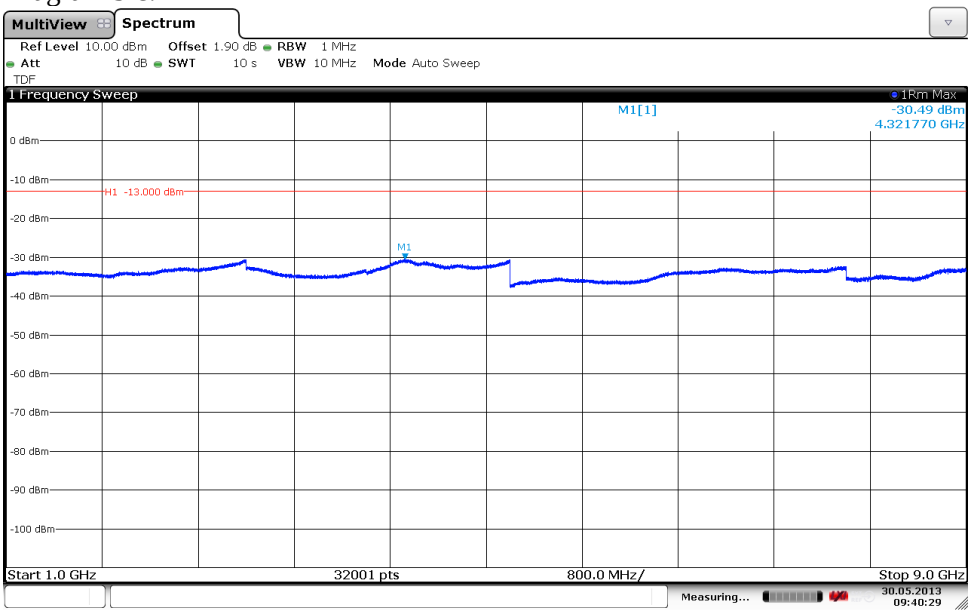
2 Marker Table

Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	866.17 MHz	-35.16 dBm		
M2		1	869.7 MHz	31.06 dBm		
M3		1	871.6 MHz	31.05 dBm		
M4		1	900.735 MHz	-35.38 dBm		

Date: 30.MAY.2013 11:33:50

Appendix 5

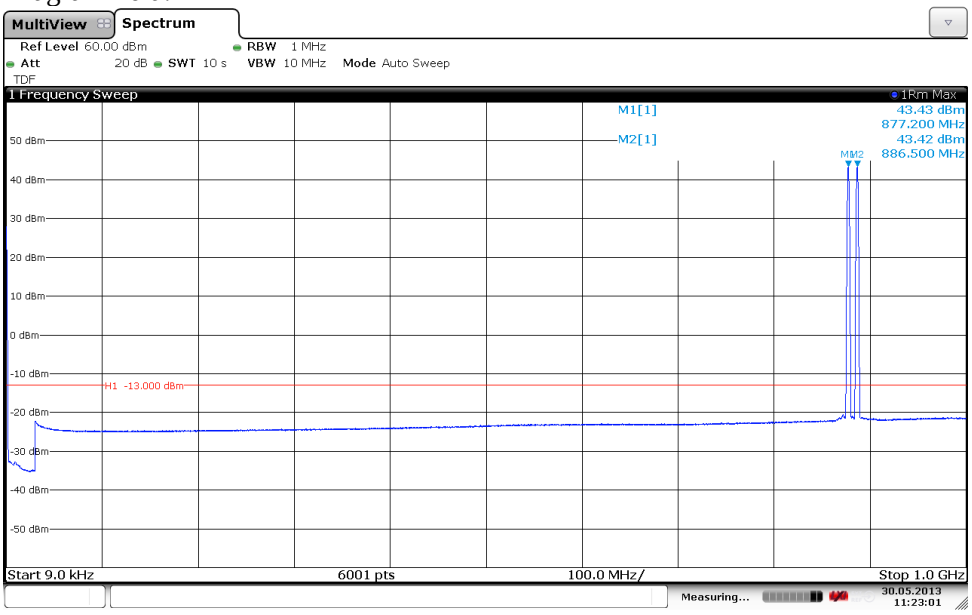
Diagram 9 c:



Date: 30.MAY.2013 09:40:29

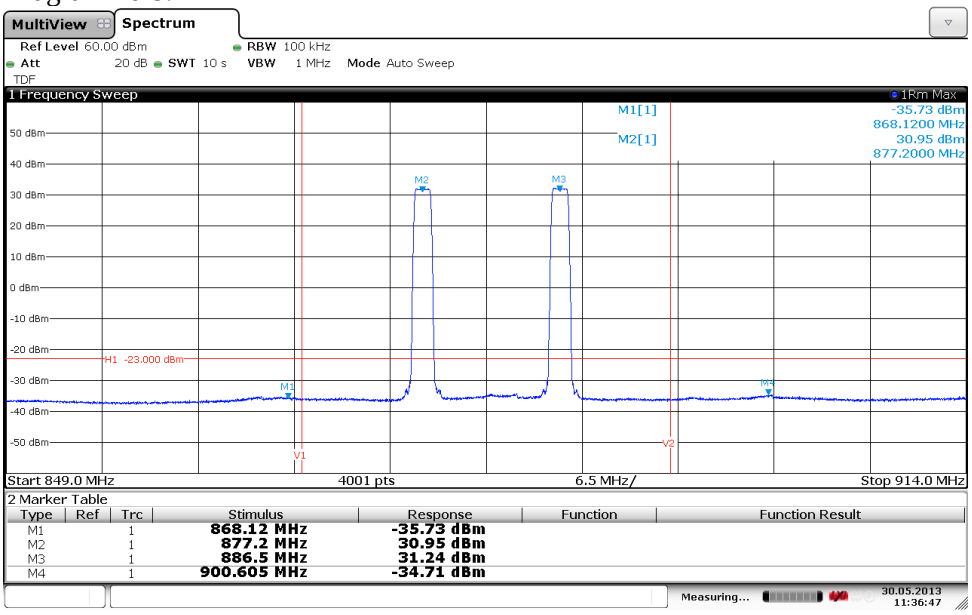
Appendix 5

Diagram 10 a:



Date: 30.MAY.2013 11:23:02

Diagram 10 b:



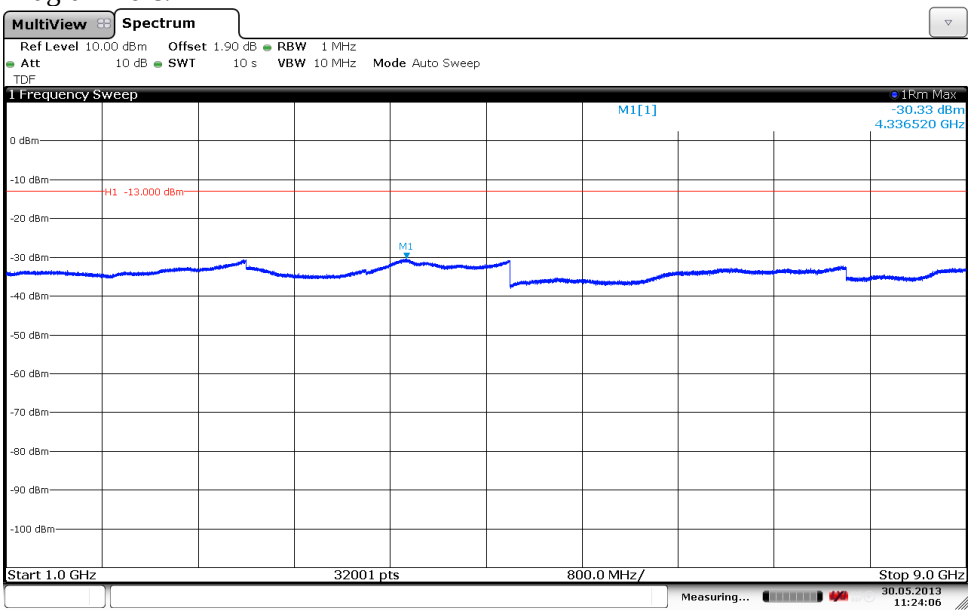
2 Marker Table

Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	868.12 MHz	-35.73 dBm		
M2		1	877.2 MHz	30.95 dBm		
M3		1	886.5 MHz	31.24 dBm		
M4		1	900.605 MHz	-34.71 dBm		

Date: 30.MAY.2013 11:36:47

Appendix 5

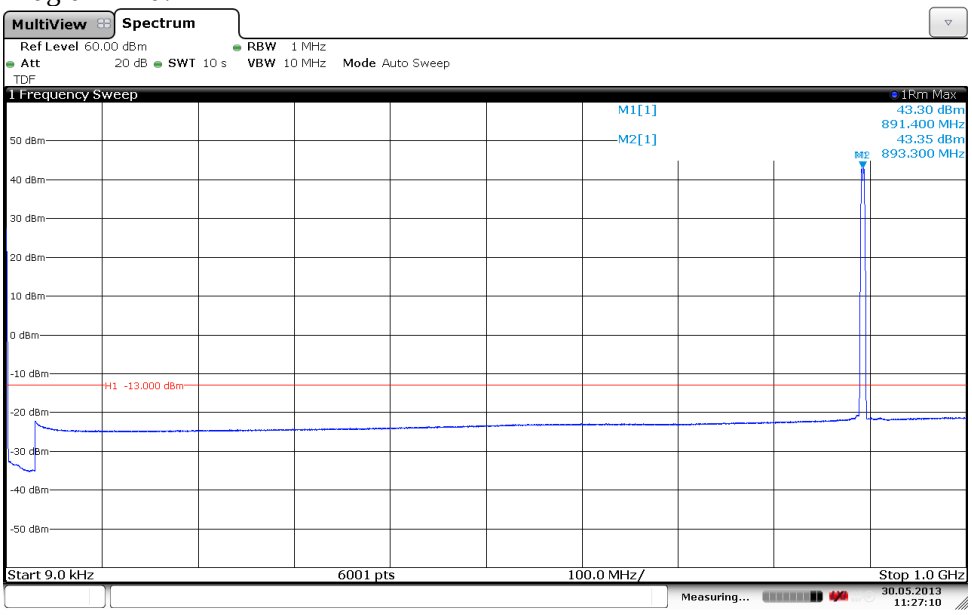
Diagram 10 c:



Date: 30.MAY.2013 11:24:06

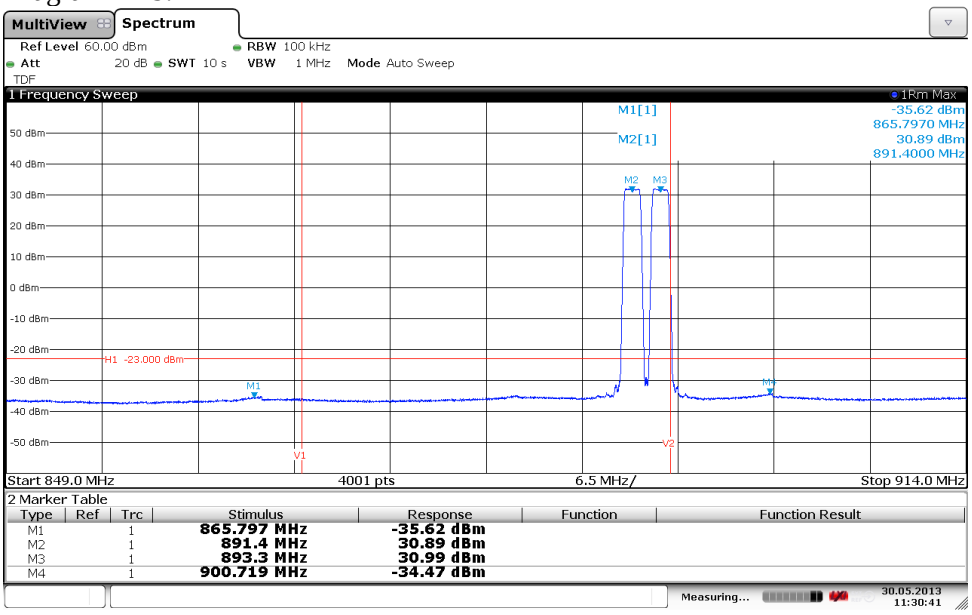
Appendix 5

Diagram 11 a:



Date: 30.MAY.2013 11:27:10

Diagram 11 b:



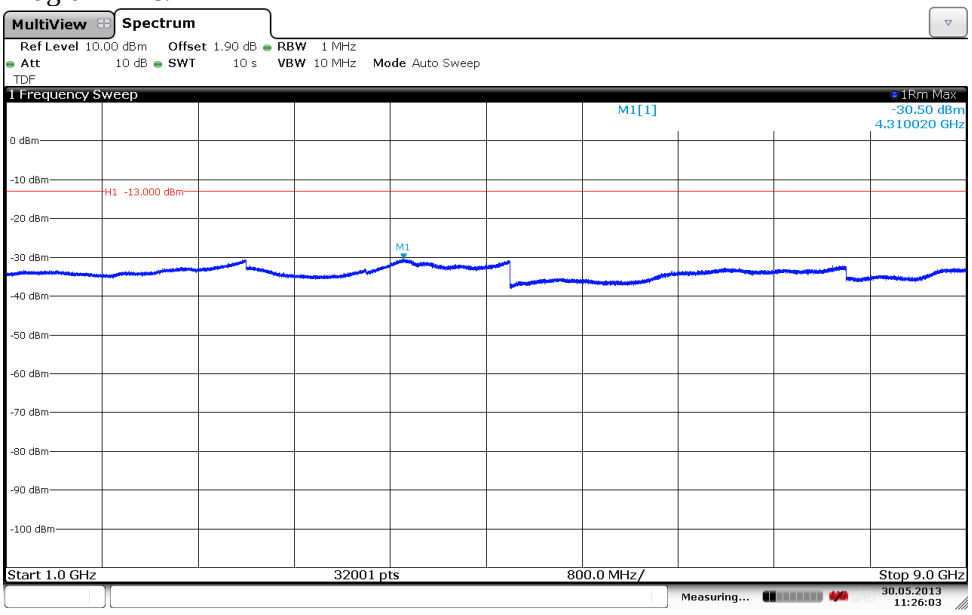
2 Marker Table

Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	865.797 MHz	-35.62 dBm		
M2		1	891.4 MHz	30.89 dBm		
M3		1	893.3 MHz	30.99 dBm		
M4		1	900.719 MHz	-34.47 dBm		

Date: 30.MAY.2013 11:30:40

Appendix 5

Diagram 11 c:



Date: 30.MAY.2013 11:26:03

Appendix 6

Field strength of spurious radiation measurements according to 47 CFR 2.1053 / IC RSS-132 5.5

Date	Temperature	Humidity
2013-05-30	23°C ± 3°C	41 % ± 5 %
2013-05-31	23°C ± 3°C	46 % ± 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 – 9 GHz. The upper frequency boundary was chosen to comprise 10x the highest fundamental TX frequency.

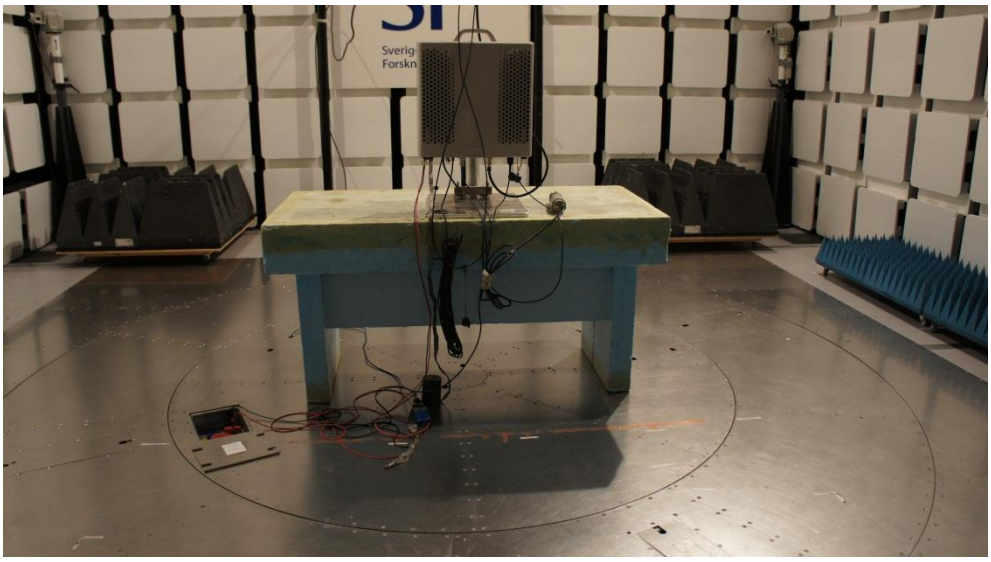
In the frequency range 30 MHz - 9 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

The measurement procedure was as the following:

1. A pre-measurement was first performed with peak detector. The Test object was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.

2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were with the substitution method according to the standard.

Representative 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 ESU 26	901 553
EMC 32 ver. 8.52.0	503 745
Chase Bilog Antenna CBL 6111A	502 182
EMCO Horn Antenna 3115	502 175
µComp Nordic, Low Noise Amplifier	901 545
High pass filter	901 373
Temperature and humidity meter, Testo 625	504 188

Tested configurations

B
M
M2
T

Results, representing worst case

Diagram	BW configuration	Tested configurations
1 a+b	1.4 MHz	M

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30 - 9 000	All emissions > 20 dB below limit	All emissions > 20 dB below limit

Measurement uncertainty: 3.2 dB

Remarks

The upper frequency bound for verification was chosen as 9 GHz in order to cover 10 x the maximum fundamental TX frequency.

Limits

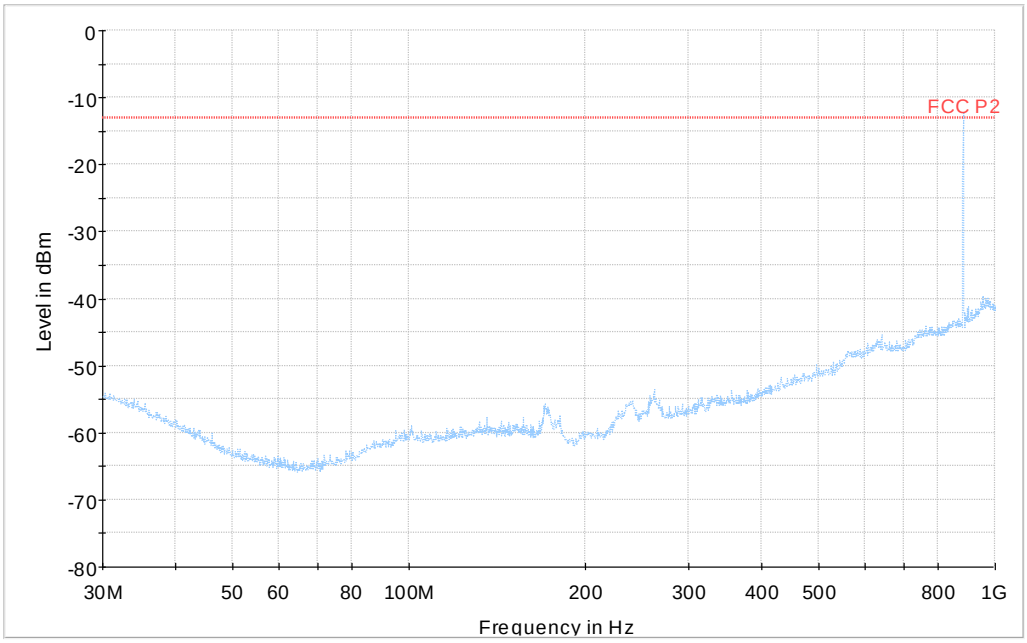
CFR 47 § 22.917 and IC RSS-132 5.5

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 any 100 kHz bandwidth.

Complies?	Yes

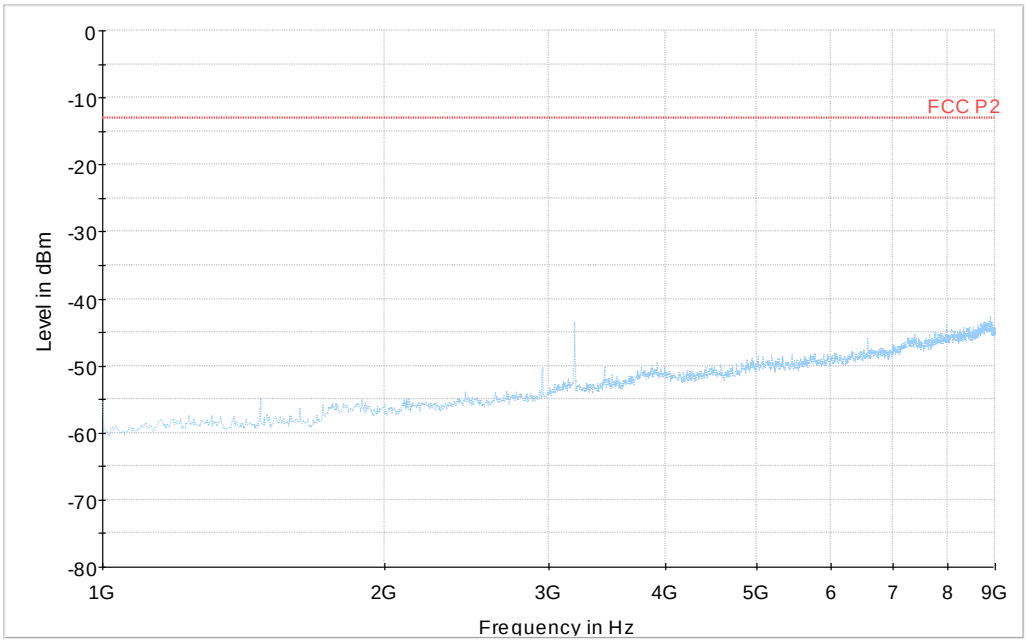
Appendix 6

Diagram 1 a:



Note: The emission between 869 MHz and 894 MHz is the carrier frequency and shall be ignored in this context.

Diagram 1 b:



Appendix 7

Frequency stability measurements according to CFR 47 §22.355 , 2.1055 / IC RSS 132 5.3

Date	Temperature (test equipment)	Humidity (test equipment)
2013-05-16	23 °C ± 3 °C	37% ± 5 %
2013-05-17	22 °C ± 3 °C	45% ± 5 %
2013-05-21	22 °C ± 3 °C	43% ± 5 %

Test set-up and procedure

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

Measurement equipment	SP number
R&S FSQ	504 143
EAB RF attenuator	-
Temperature Chamber	501 031
Datascan 7321	502 698
Testo 635, temperature and humidity meter	504 203
Multimeter Fluke 87	502 190

Results

Nominal Voltage -48 V DC

Maximum output power at mid channel (M, 881.5 MHz)

Channel Bandwidth 1.4MHz

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	Test model E-TM1.1
-48.0	+20	-2
-55.2	+20	-2
-40.8	+20	-2
-48.0	+30	+4
-48.0	+40	+3
-48.0	+50	-6
-48.0	+10	-2
-48.0	0	-2
-48.0	-10	-2
-48.0	-20	+3
-48.0	-30	+4
Maximum freq. error (Hz)		6
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Remark

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

Limits

Limit according to:

3GPP TS 36.141:
The frequency error shall be within ± 0.05 PPM ± 12 Hz (± 44.075Hz).

§22.355
The frequency stability shall be within ± 1.5 ppm (± 1322.25 Hz).

RSS-132 5.3 Frequency:
The carrier frequency shall not depart from the reference frequency in excess of ± 1.5 ppm (± 1322.25 Hz) for base stations when tested to the temperature and supply voltage variations specified in RSS-Gen.

Complies?	Yes

Appendix 8

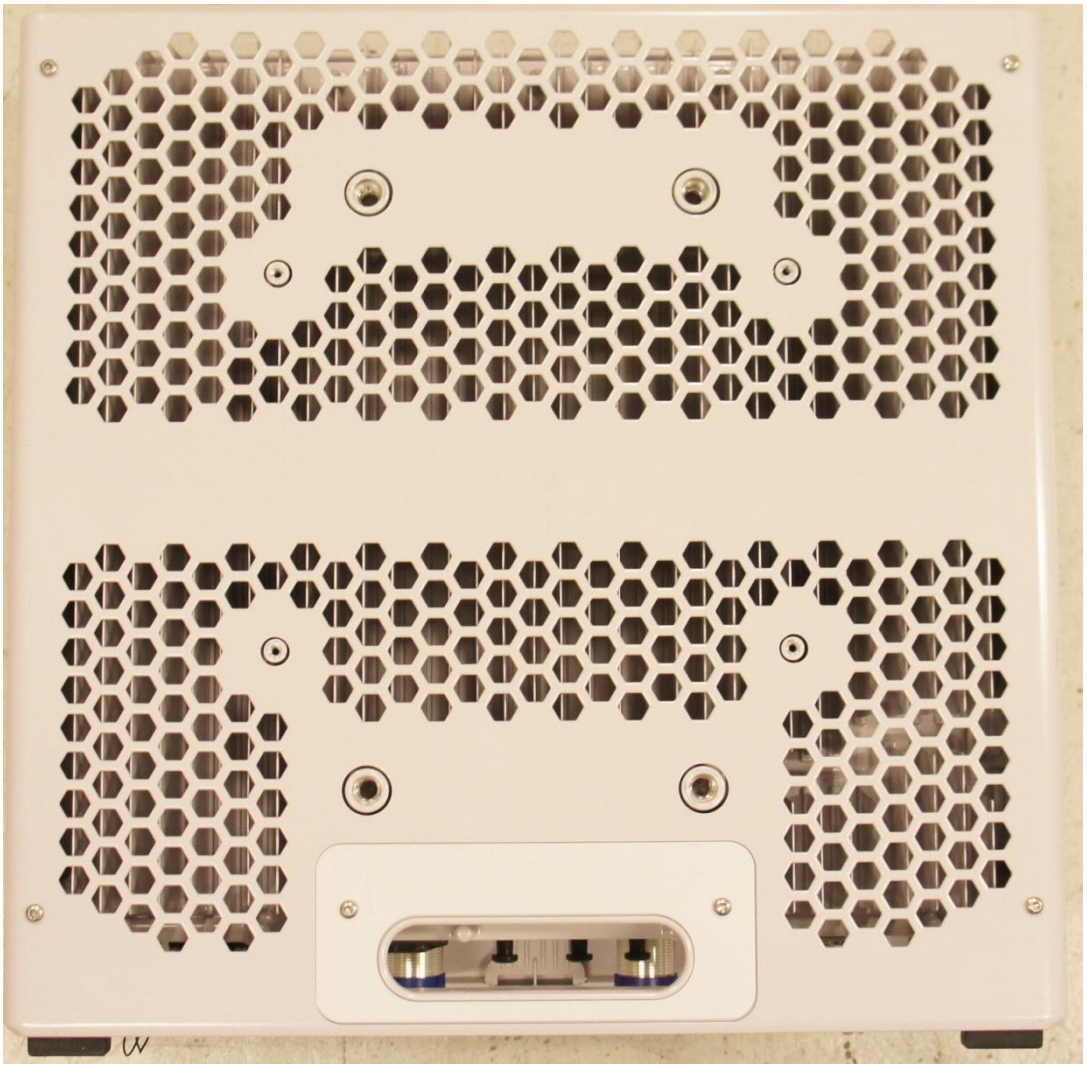
External photos

Front side:

Product label

Appendix 8

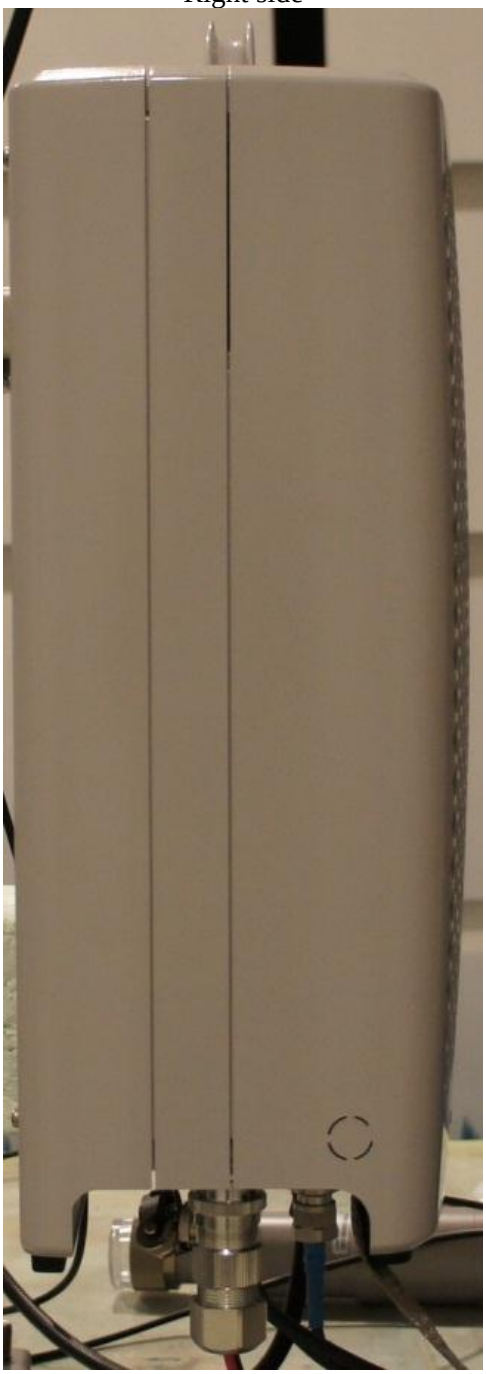
Rear side



Appendix 8

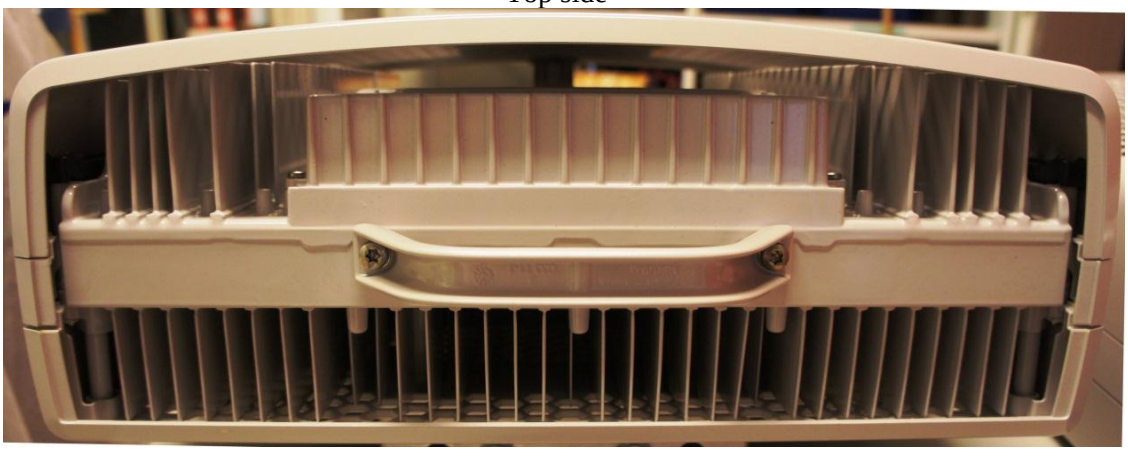
Left side

Right side



Appendix 8

Top side



Bottom side