REPORT
issued by an FCC listed Laboratory Reg. no93866
The test site complies with RSS-Gen, IC file no. 3482A-a
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Date	Reference	Page
2013-09-04	3P04068-03-F22	1 (2)

1002
ISO/IEC 17025

Ericsson AB
Klaes Holm
PDU HW
164 80 Stockholm

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.

SP Technical Research Institute of Sweden

Electronics – EMC

Prepared by

Jörgen Wassholm

Examined by

Bengt Andersson

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Appendix 1

Description of the test object

Equipment:	Product name: RRUS 12 B5, supporting GSM 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 and multi carrier	
Maximum nominal 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) 3x 43.0 dBm (3 x 20W) 4x 41.8 dBm (4 x 15W)
Antenna:	No dedicated antenna, handled during licensing	
Modulations :	GMSK, 8PSK, AQPSK, 16QAM and 32QAM,	
Nominal power voltage:	-48VDC	

Operation modes 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.

The settings below were deemed representative for all traffic scenarios when settings with different modulations and number of carriers 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 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
ANSI/TIA/EIA 136-280-D-2002
J-STD007A Vol 1
CFR 47 part 2, October 1st , 2012
CFR 47 part 22, October 1st, 2012
RSS-Gen Issue 3
RSS-132 Issue 3

Appendix 1

Test frequencies used for conducted and radiated measurements

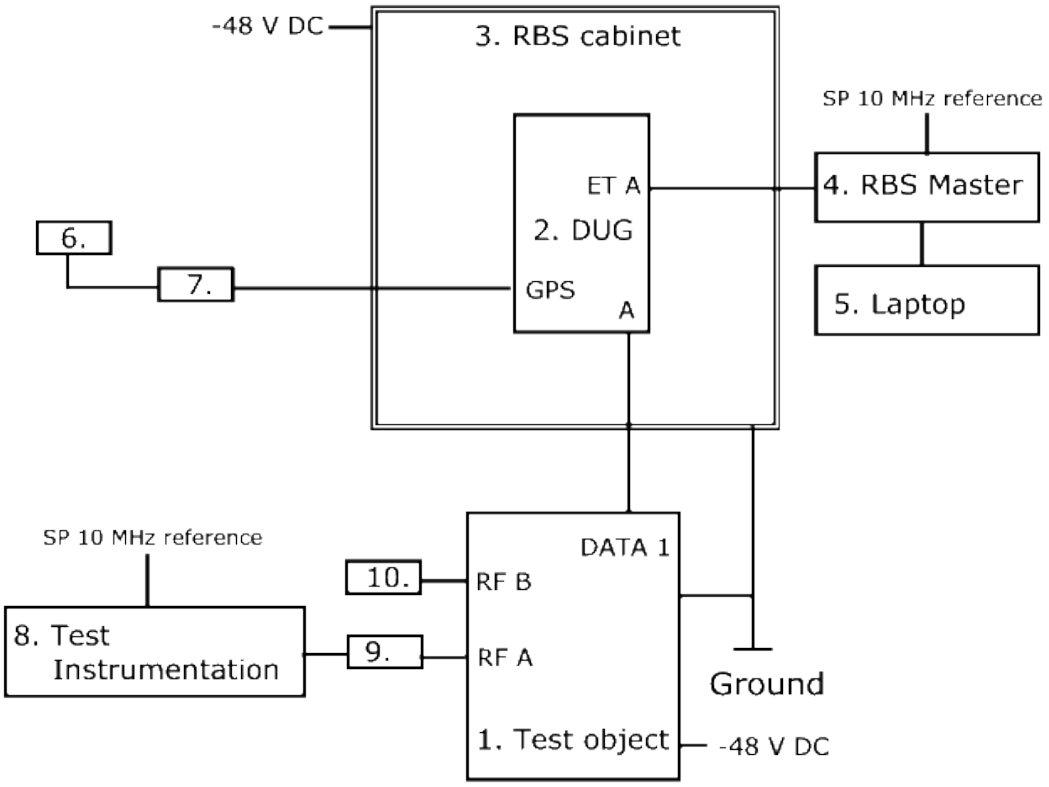
TX test frequencies, conducted measurements

ARFCN Downlink Port A and B	Frequency Port A and B [MHz]	Symbolic name	Comment
129	869.4	B	Single carrier TX bottom frequency
129 132	869.4 870.0	B2	2 carrier TX band bottom constellation
129 132 136 139	869.4 870.0 870.8 871.4	B4	4 carrier TX band botttom constellation
190	881.6	M	Single carrier TX mid frequency
190 193	881.6 882.2	M2	2 carrier TX band mid constellation
250	893.6	T	Single carrier TX top frequency
247 250	893.0 893.6	T2	2 carrier TX band top constellation
185 250	880.6 893.6	$B_{im\ 1}$	2 carrier TX band configuration
153 185	874.2 880.6	$B_{im\ 2}$	2 carrier TX band configuration
129 137	869.4 871.0	$B_{im\ 3}$	2 carrier TX band configuration
129 194	869.4 882.4	$T_{im\ 1}$	2 carrier TX band configuration
194 226	882.4 888.8	$T_{im\ 2}$	2 carrier TX band configuration
242 250	892.0 893.6	$T_{im\ 3}$	2 carrier TX band configuration

TX test frequencies, radiated measurements

ARFCN Downlink Port A	ARFCN Downlink Port B	Frequency Port A [MHz]	Frequency Port B [MHz]	Symbolic name	Comment
129	137	869.4	871.0	B	Single carrier TX bottom frequency
165	215	876.6	886.6	M	Single carrier TX mid frequency
242	250	892.0	893.6	T	Single carrier TX top frequency
247 250	241 244	893.0 893.6	891.8 892.4	T2	2 carrier TX band top constellation
144 175 220 250	129 160 205 235	872.4 878.6 887.6 890.6	869.4 875.6 884.6 890.6	T4	4 carrier TX band mid constellation

Test set-up conducted measurements GSM



Note: Unconnected test object interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 6.

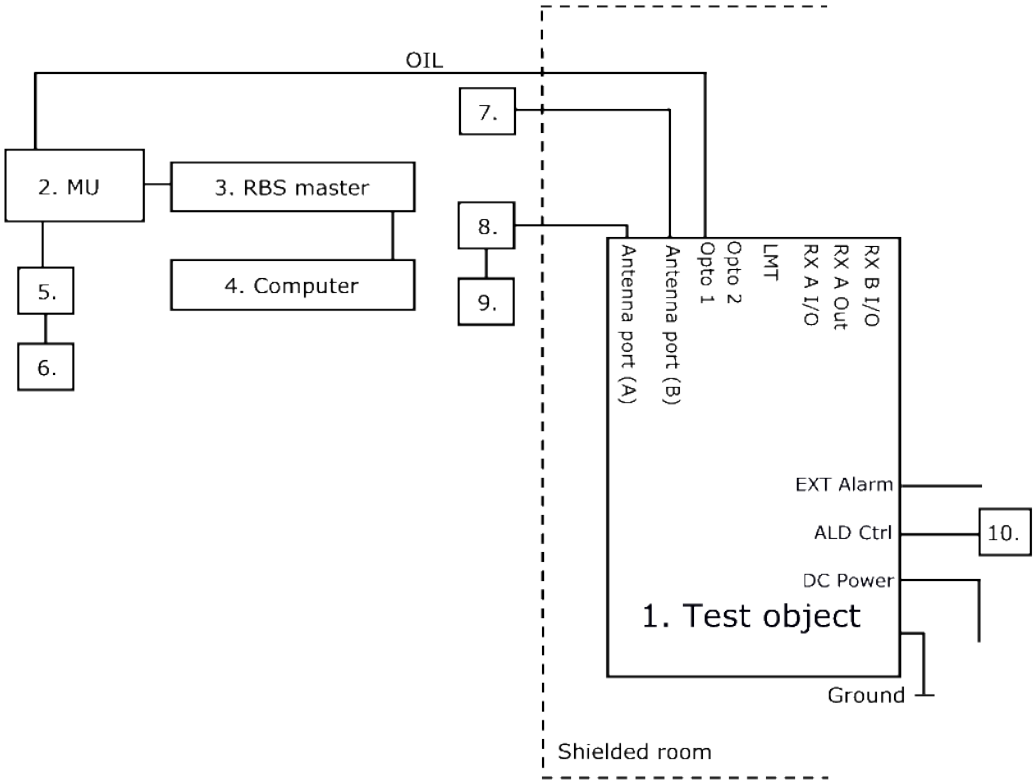
Test object:

1.	RRUS 12 B5, KRC 161321/2, 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.	DUG 2001 KDU 137 569/1, R3D, A402019156
3.	RBS 6202 BAMS 1000961945
4.	RBS Master LPY 107 1007/3 rev. R1C. BAMS 1001195170
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.	SP Test Instrumentation according to measurement equipment list
9.	Attenuator
10.	Terminator, 50 ohm

Test set-up 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: BR82691785 DUG 20 01, KDU 137 569/1, rev. R3D, s/n: A402019155
3.	RBS master 2E, LPY 107 1007/3, BAMS-1001195172
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

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, no cable attached	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**
G13AG7	R71L

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2014-01	503 881
R&S ESU 26	2013-07	901 553
Control computer with R&S software EMC32 version 8.52.0	-	503 745
R&S FSQ 40	2014-03	504 143
Rohde & Schwarz signal analyzer FSW43	2013-10	902 073
High pass filter	2013-07	901 501
Boonton 4500A	2013-11	503 144
Peak Power Sensor	2013-11	503 258
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

Test engineers

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

Test participant

Adam Skoglund, Ericsson AB (partially)

Appendix 2

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

Date	Temperature	Humidity
2013-05-24	20 °C ± 3 °C	30% ± 5 %

Test set-up and procedure

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

Measurement equipment	SP number
Boonton 4500A	503 144
Peak Power Sensor	503 258
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Results

Single carrier

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

Tested configuration BW and frequency	Port RF A [RMS dBm/ dB PAR]	Port RF B [RMS dBm/ dB PAR]
GMSK, B	47.32 / 0.81	47.58 / 0.82
GMSK, M	47.37 / 0.83	47.33 / 0.83
GMSK, T	47.35 / 0.80	47.42 / 0.83
8PSK, M	47.37 / 3.80	47.35 / 3.72
AQPSK, M	47.27 / 4.01	47.25 / 4.00
16QAM, M	47.33 / 5.01	47.21 / 5.07
32QAM, M	47.23 / 5.33	47.13 / 5.22

Multi carrier
Rated output power 2x 44.8 dBm.

Tested configuration Modulation and frequency	Port RF A [RMS dBm/ dB PAR]	Total nominal power RMS dBm
GMSK, B2	47.21 / 3.70	47.8
GMSK, M2	47.35 / 3.71	47.8
GMSK, T2	47.30 / 3.70	47.8
16QAM, M2	46.26 / 7.91	46.7

Multi carrier
Rated output power 4x 41.8 dBm. Total nominal power 47.8dBm.

Tested configuration Modulation and frequency	Port RF A [RMS dBm/ dB PAR]
GMSK, B4	47.43 / 6.49

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
2013-06-27	21 °C ± 3 °C	50% ± 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 FSW43	902 073
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	Modulation	Tested frequency	Tested Port	Occupied BW (99%) [KHz]
1	GMSK	B	RFA	241
2	GMSK	B	RFB	241
3	GMSK	M	RFA	241
4	GMSK	M	RFB	241
5	8 PSK	M	RFA	237
6	8 PSK	M	RFB	237
7	AQPSK	M	RFA	242
8	AQPSK	M	RFB	241
9	16 QAM	M	RFA	241
10	16 QAM	M	RFB	240
11	32 QAM	M	RFA	241
12	32 QAM	M	RFB	241
13	GMSK	T	RFA	241
14	GMSK	T	RFB	241

The diagrams are shown on the following pages.

Appendix 3

Diagram 1:

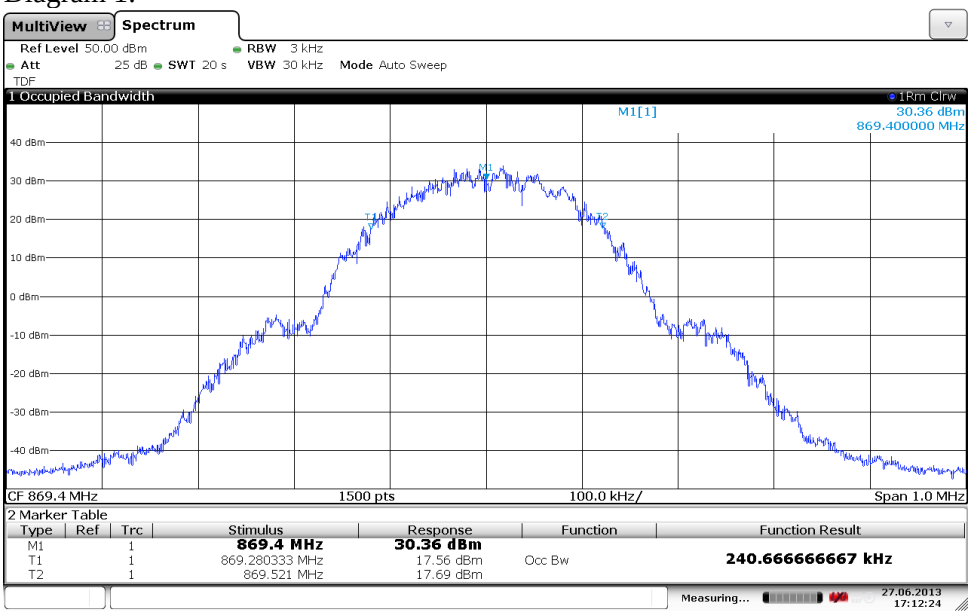


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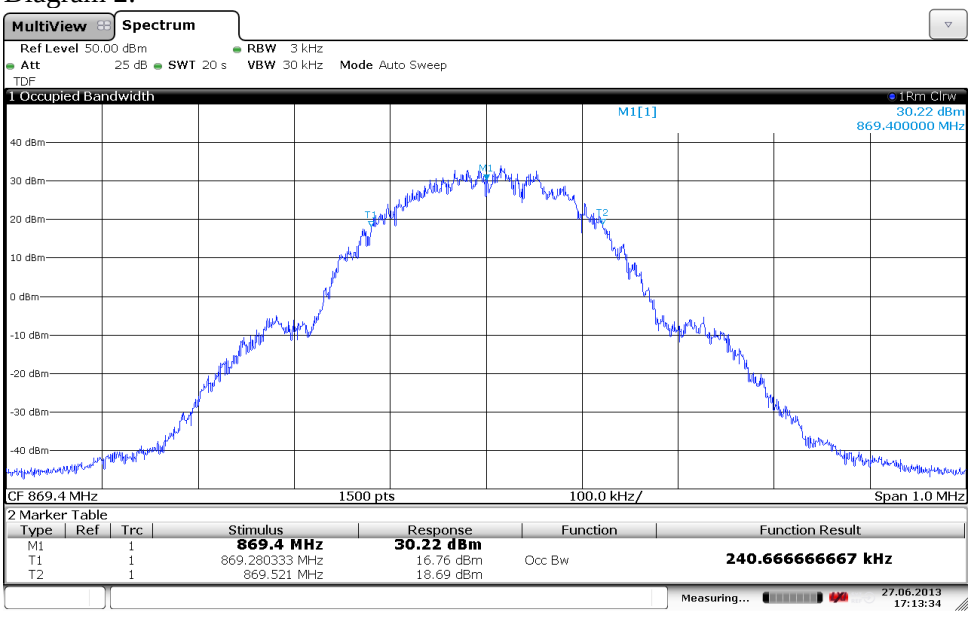
Diagram 2:



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Appendix 3

Diagram 3:

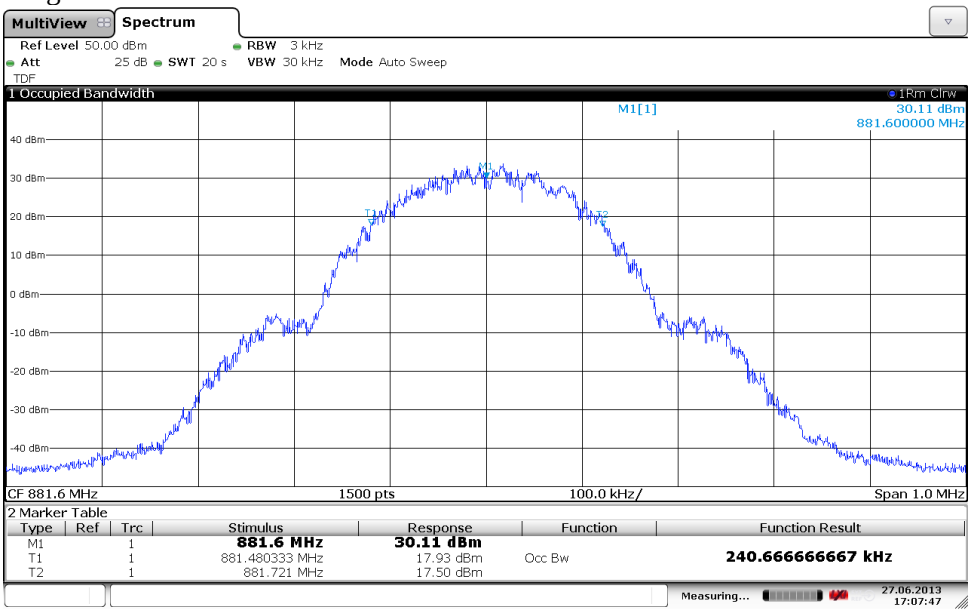

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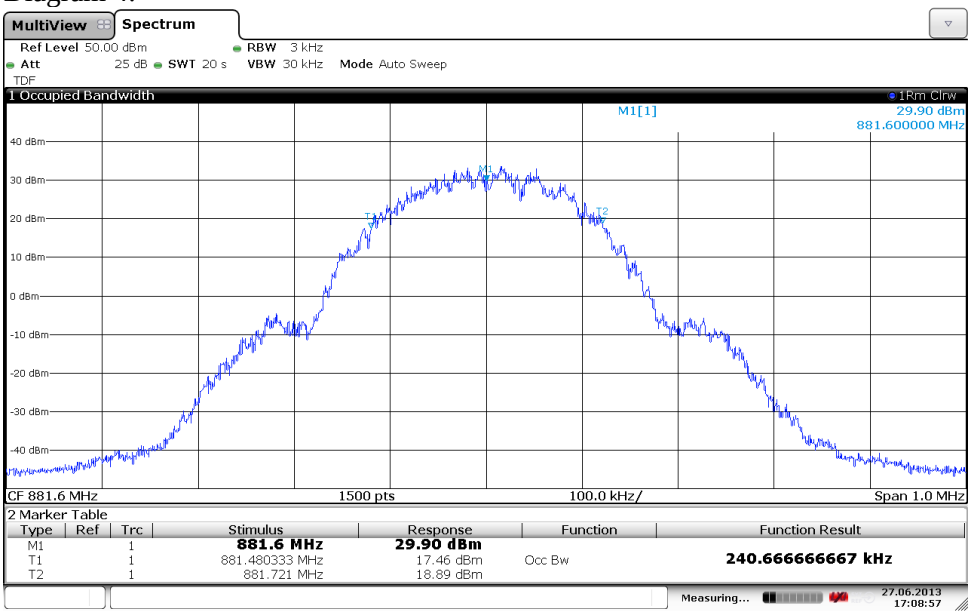
Diagram 4:



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Appendix 3

Diagram 5:

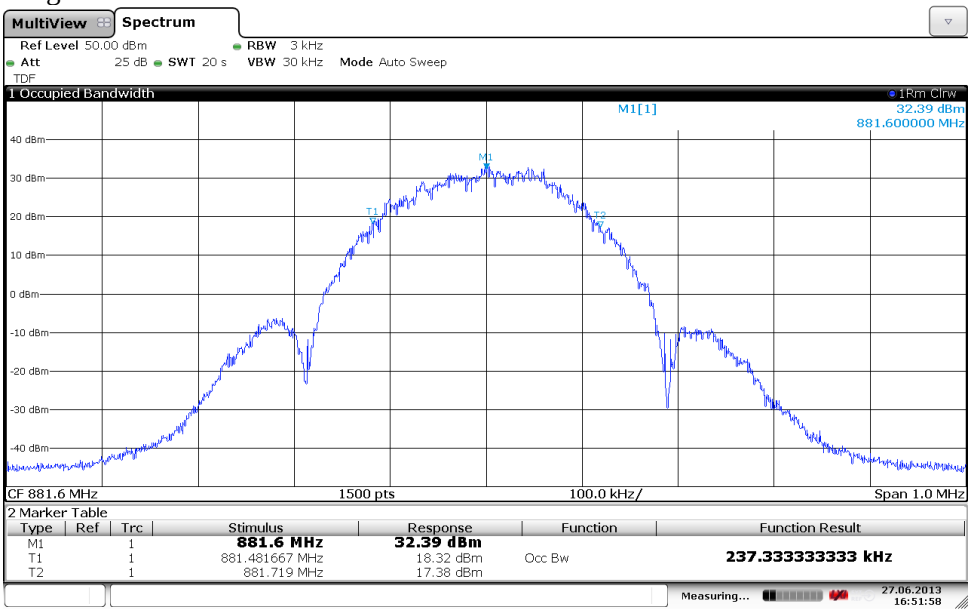

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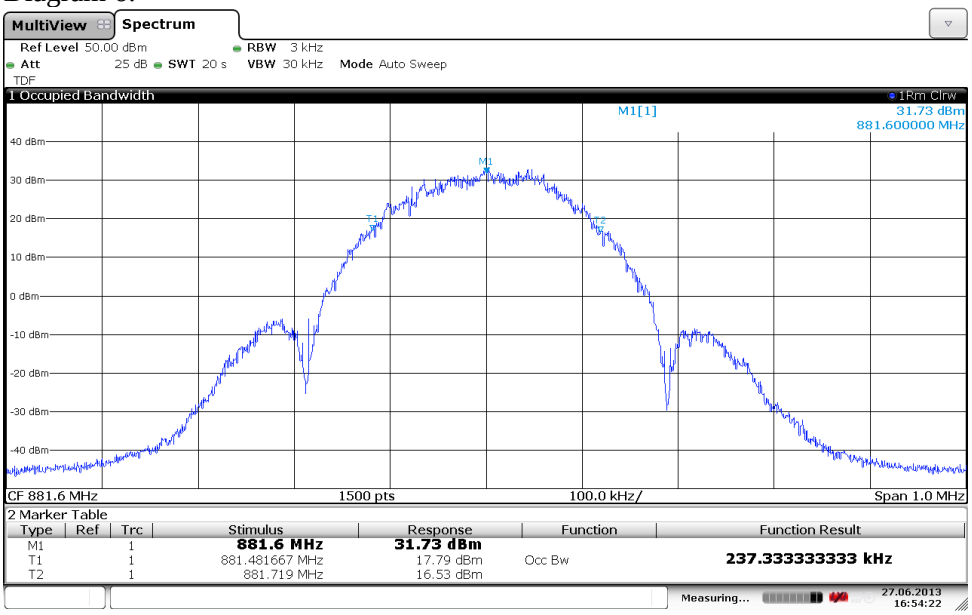
Diagram 6:



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Appendix 3

Diagram 7:

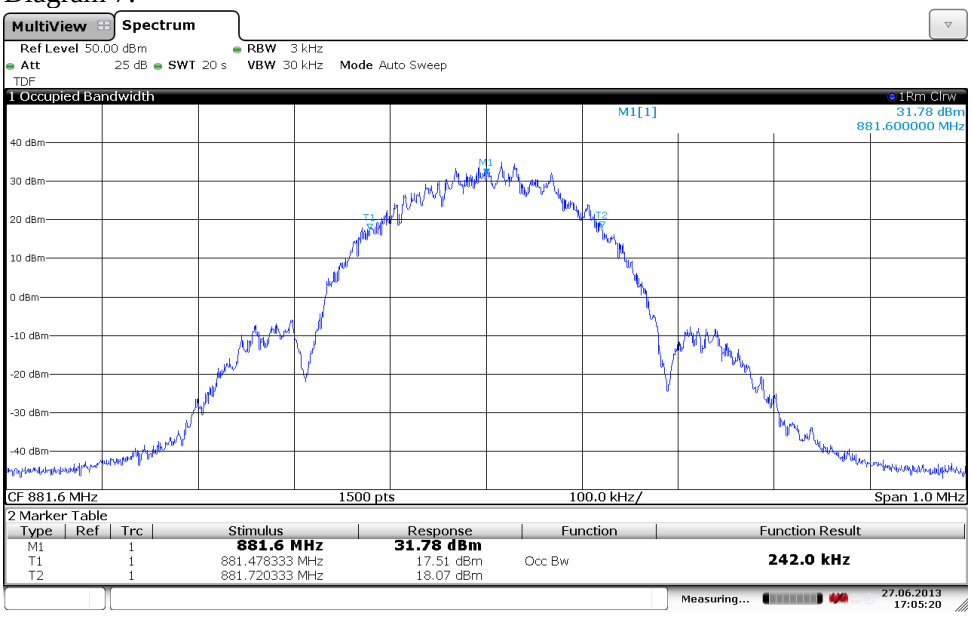

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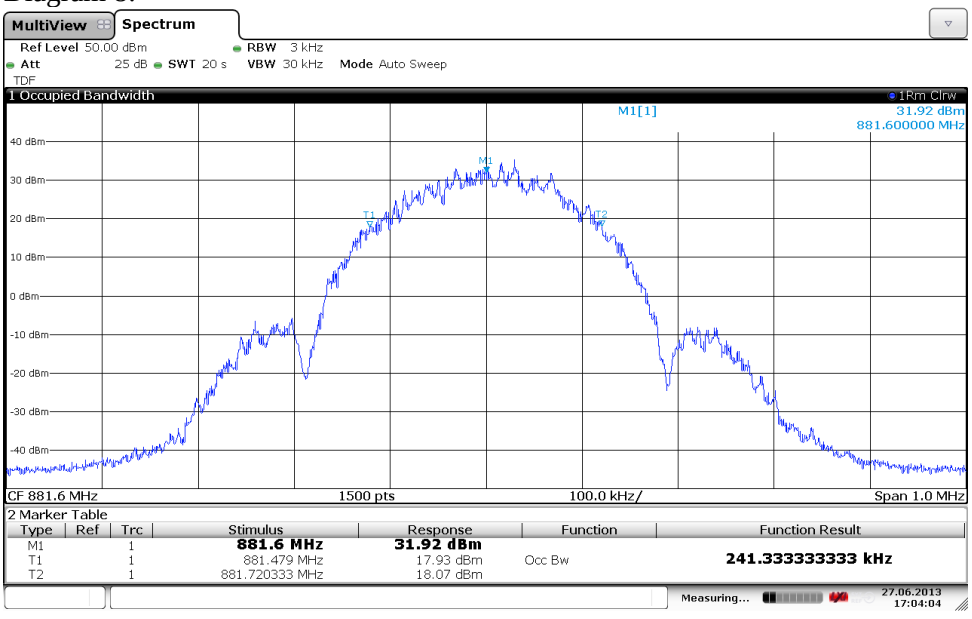
Diagram 8:



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Appendix 3

Diagram 9:

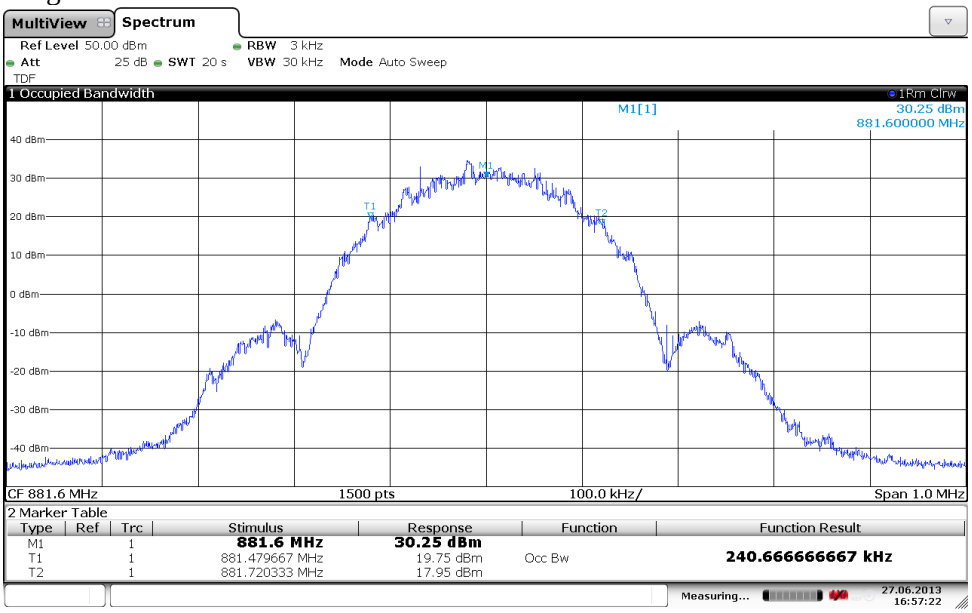

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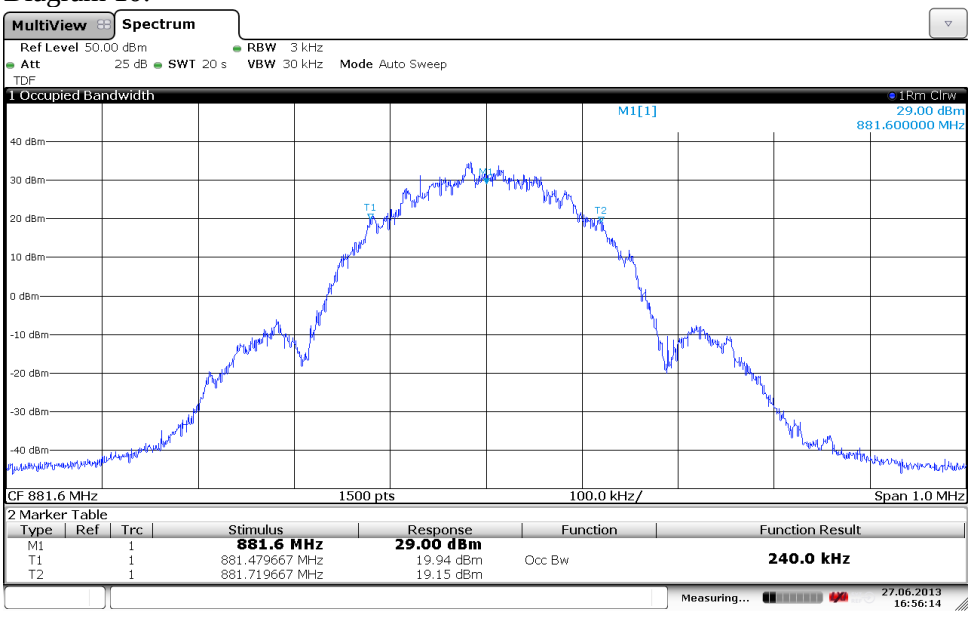
Diagram 10:



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Appendix 3

Diagram 11:

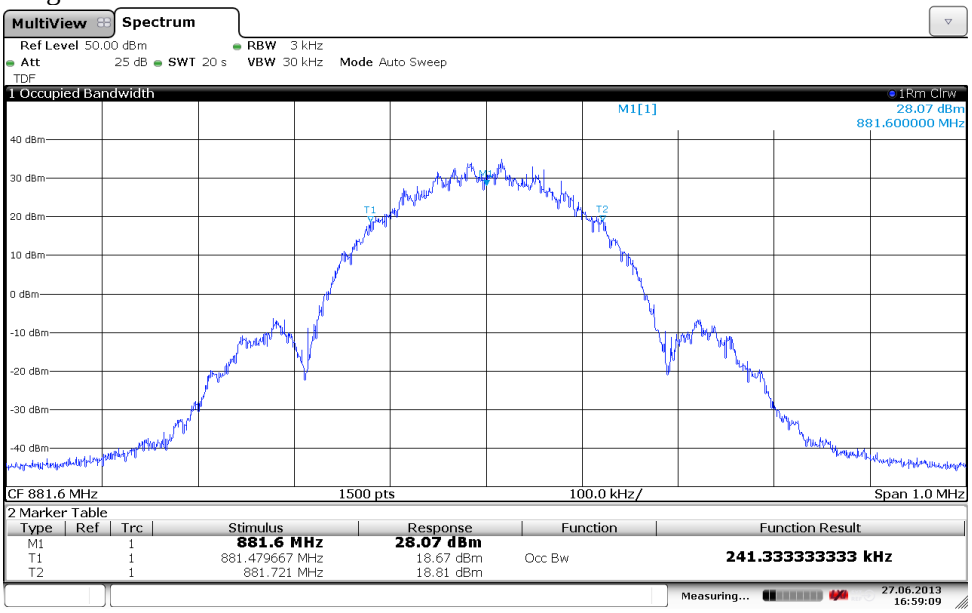

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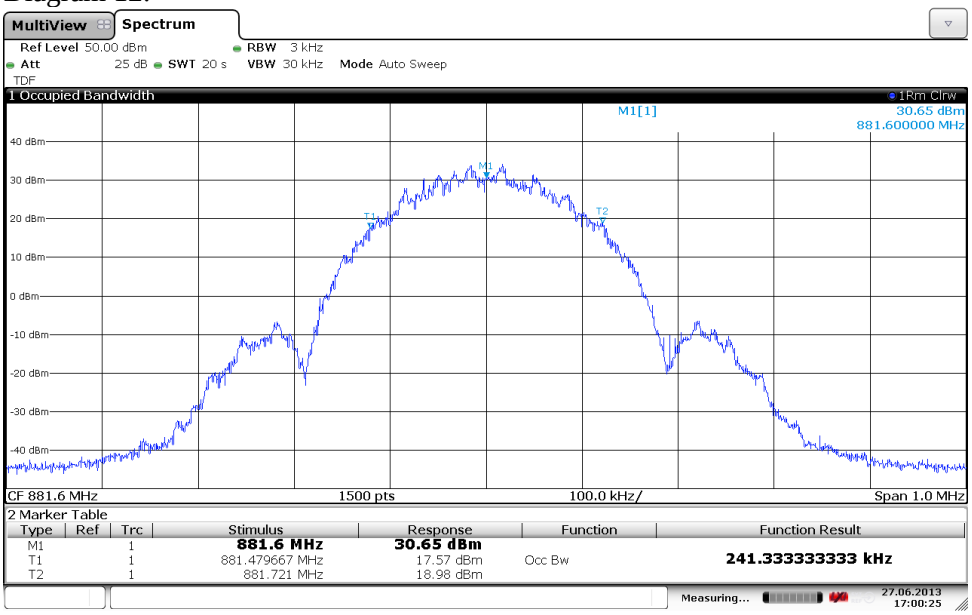
Diagram 12:



Date: 27.JUN.2013 17:00:25

Appendix 3

Diagram 13:

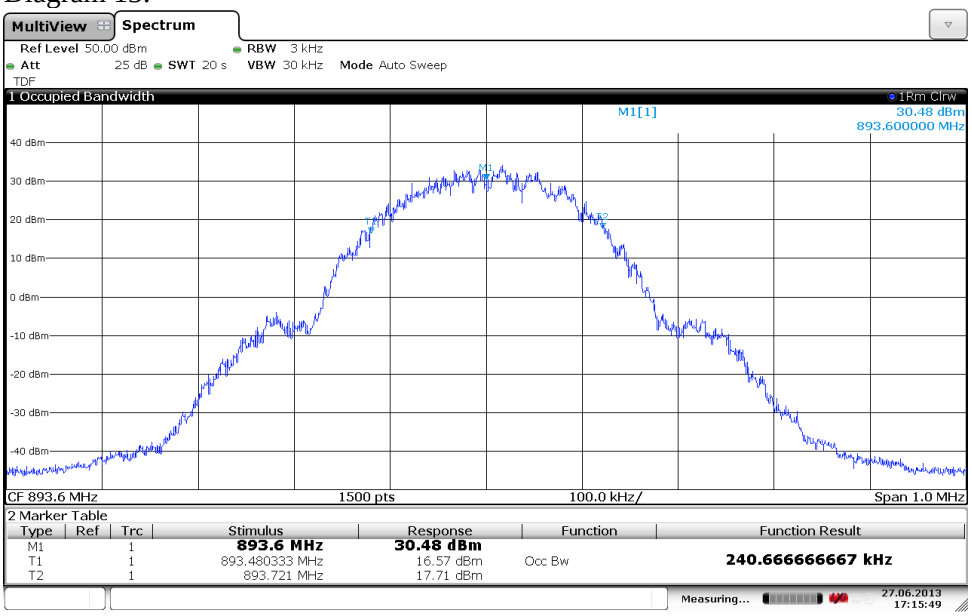


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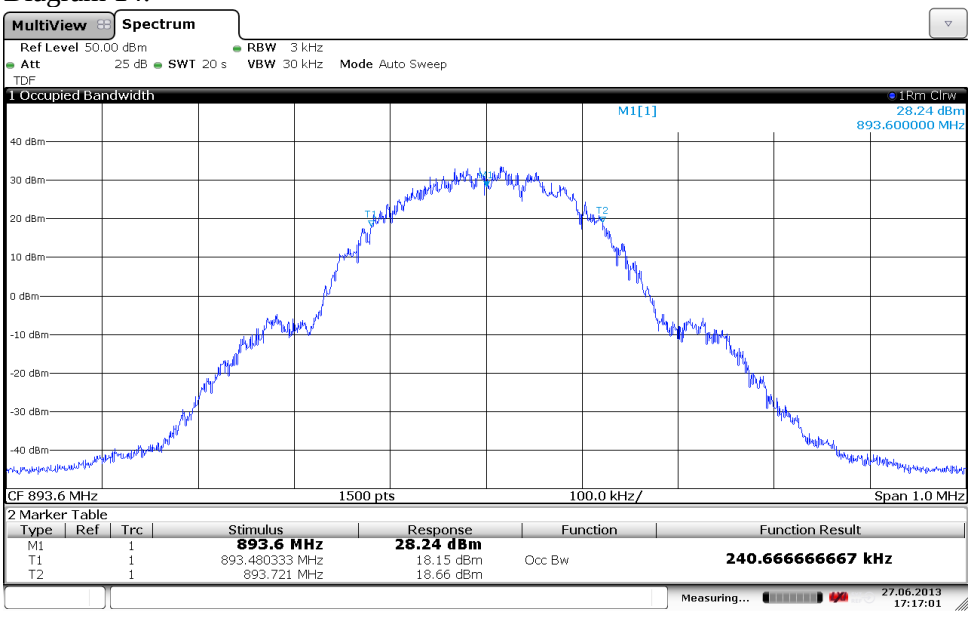
Diagram 14:



Date: 27.JUN.2013 17:17:00

Appendix 4

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

Date	Temperature	Humidity
2013-05-24	20 °C ± 3 °C	30% ± 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.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW43	902 073
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	Modulation	Tested frequency	Tested Port
1 a-b	GMSK	B	RFA
2 a-b	16 QAM	B	RFA
3 a-b	GMSK	T	RFA
4 a-b	16QAM	T	RFA

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:

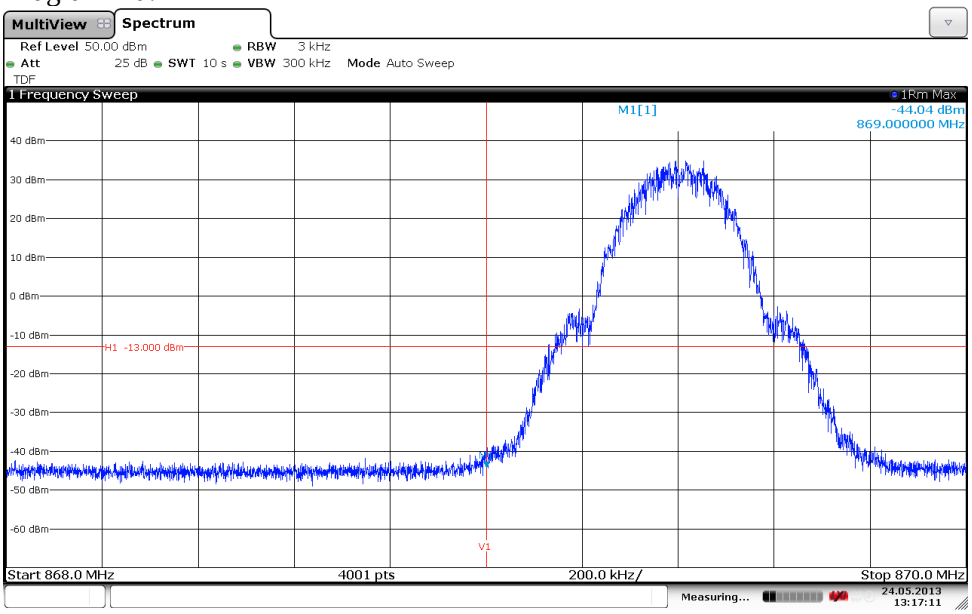


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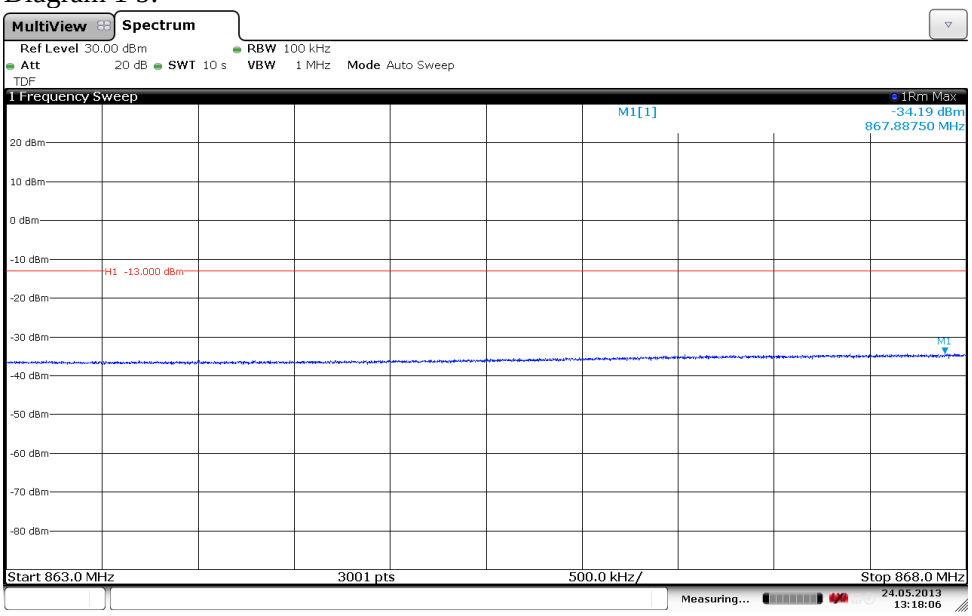
Diagram 1 b:



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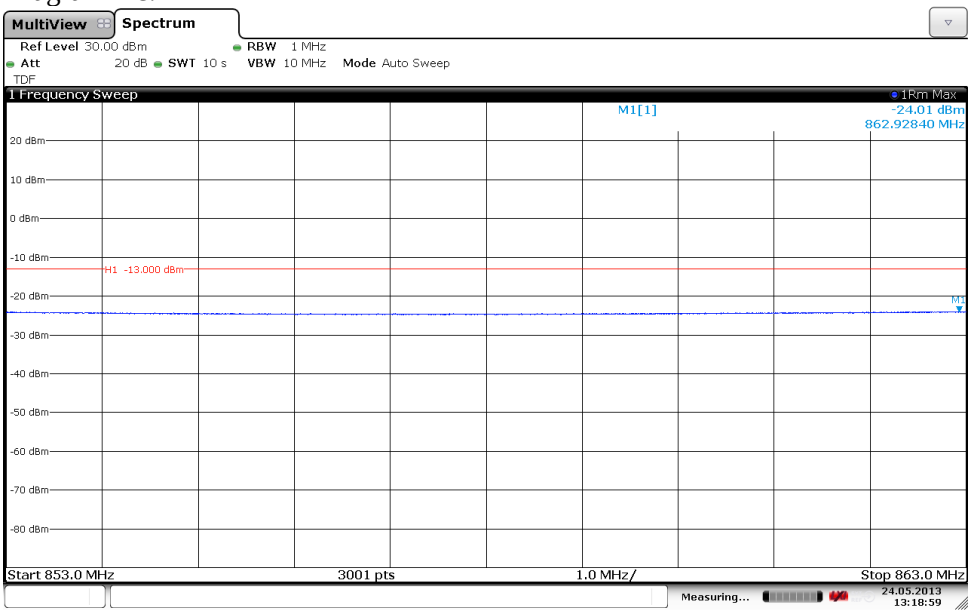
Appendix 4

Diagram 1 c:



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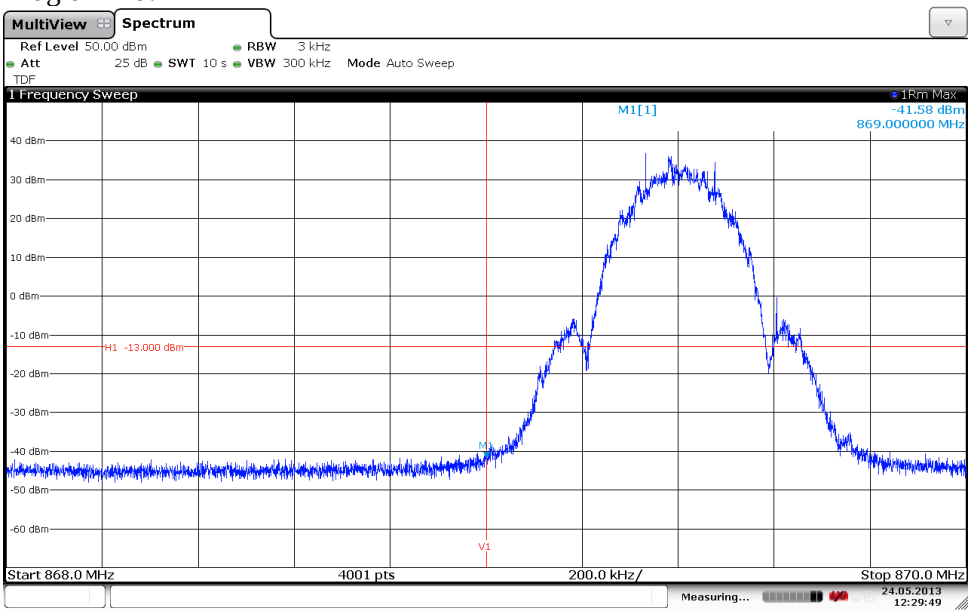
Appendix 4

Diagram 2 a:



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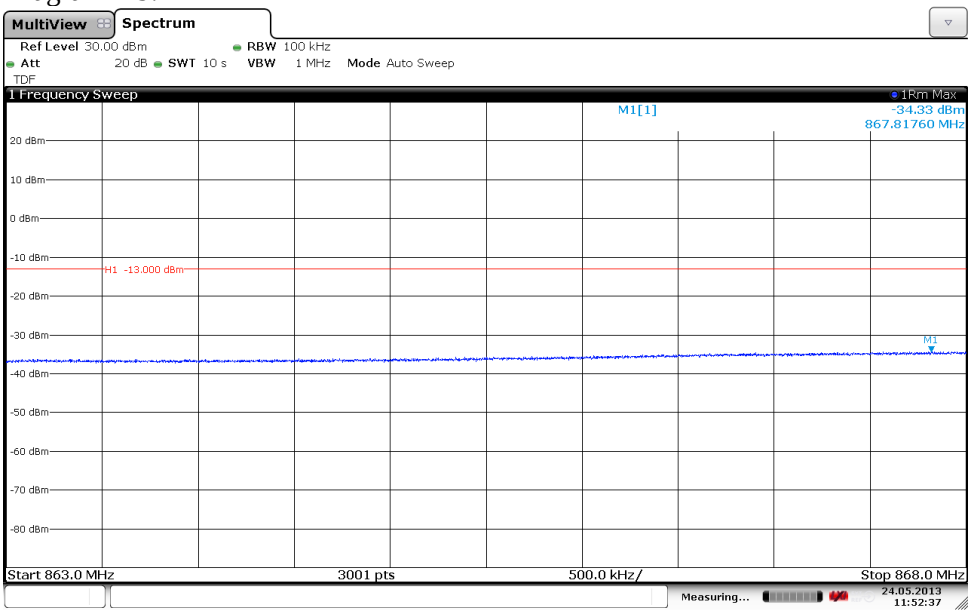

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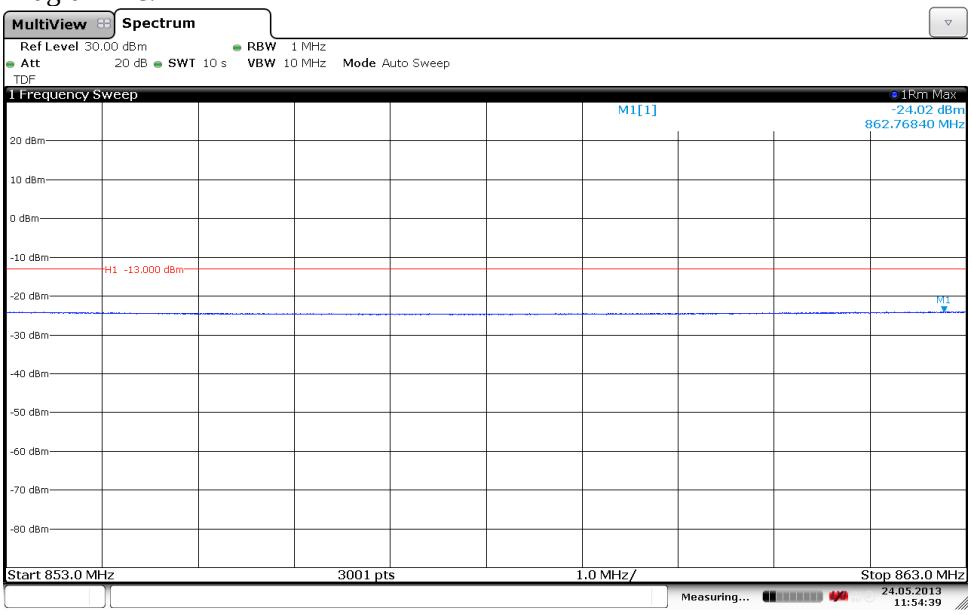
Appendix 4

Diagram 2 c:



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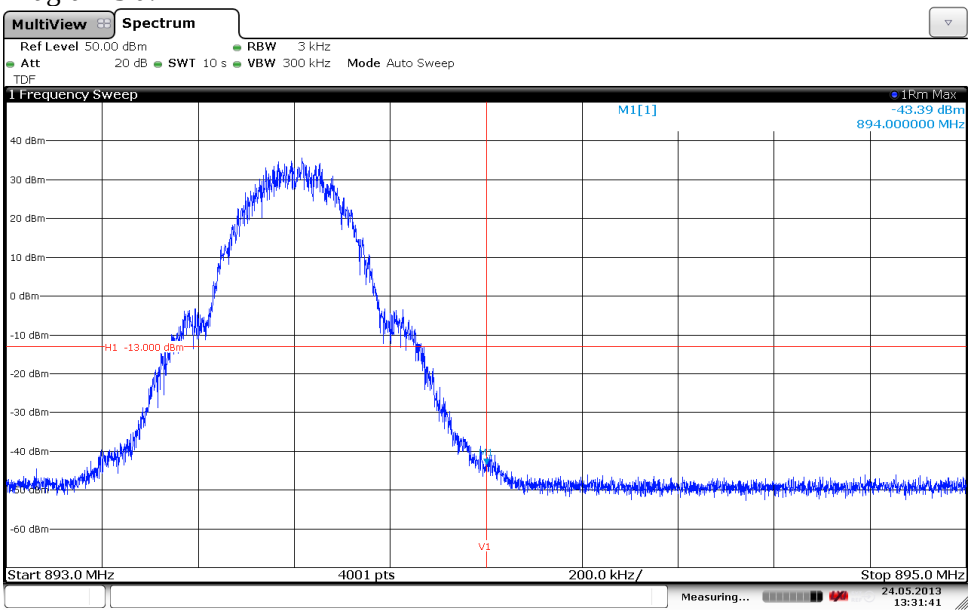
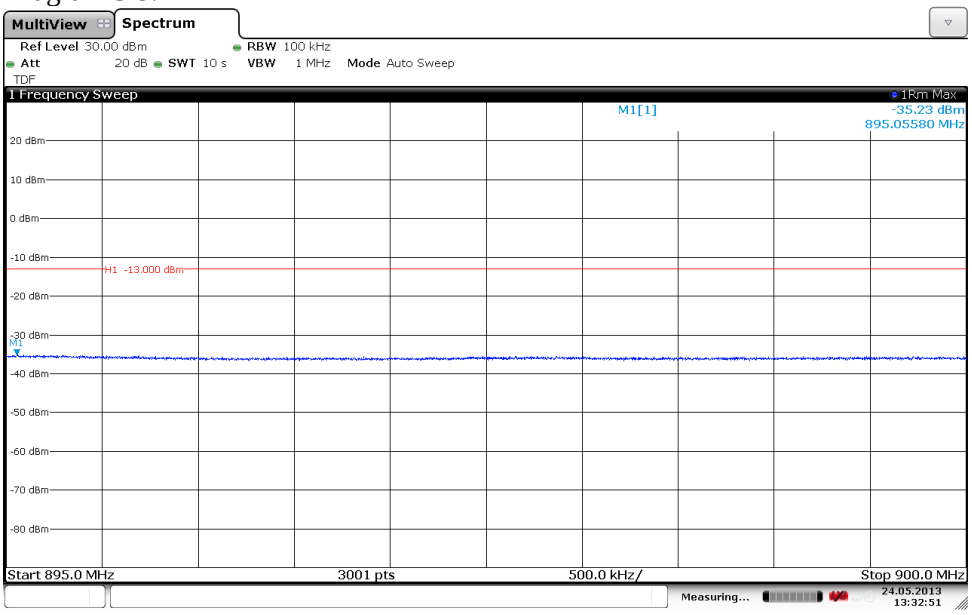
Appendix 4

Diagram 3 a:



Date: 24.MAY.2013 13:31:41

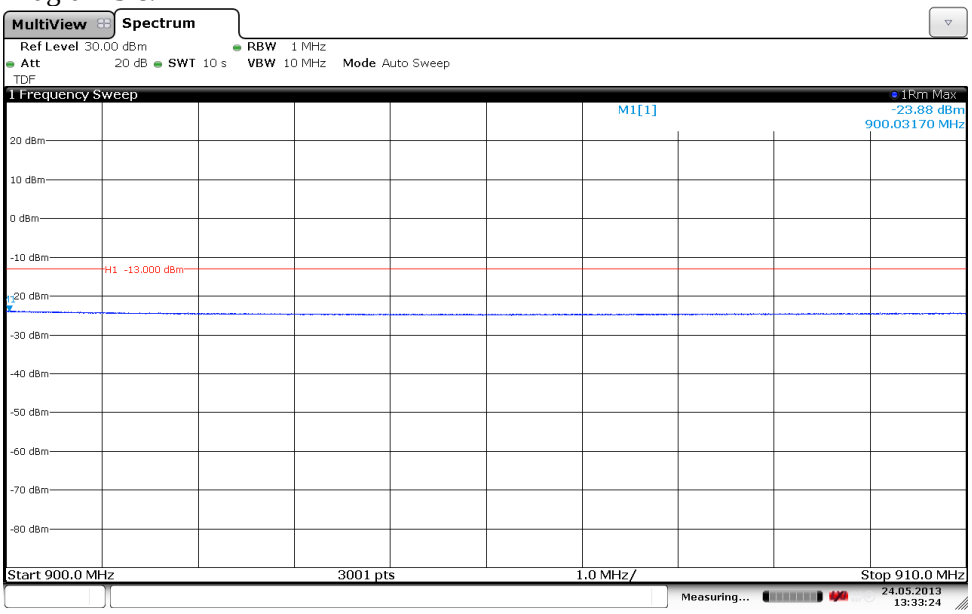
Diagram 3 b:



Date: 24.MAY.2013 13:32:51

Appendix 4

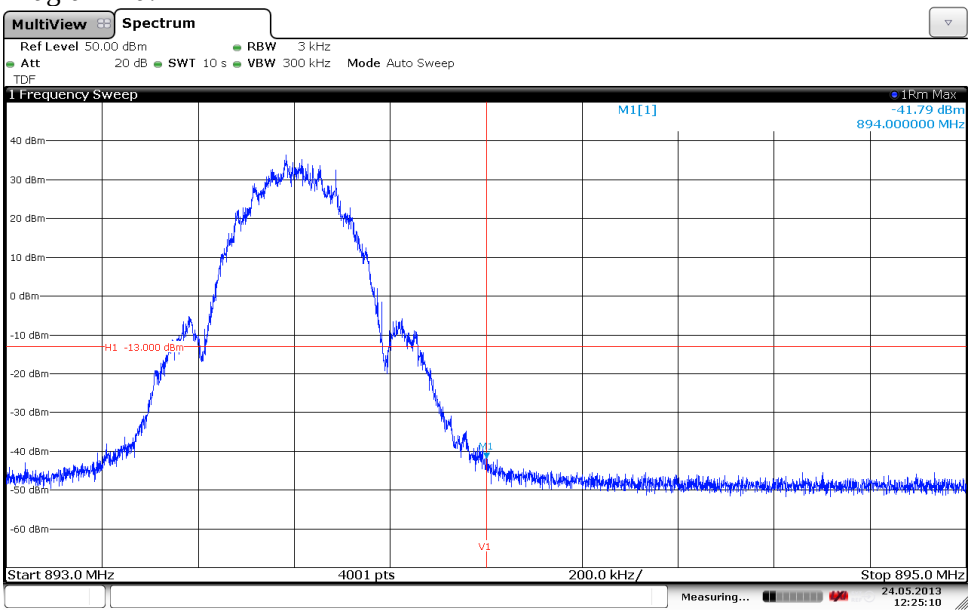
Diagram 3 c:



Date: 24.MAY.2013 13:33:24

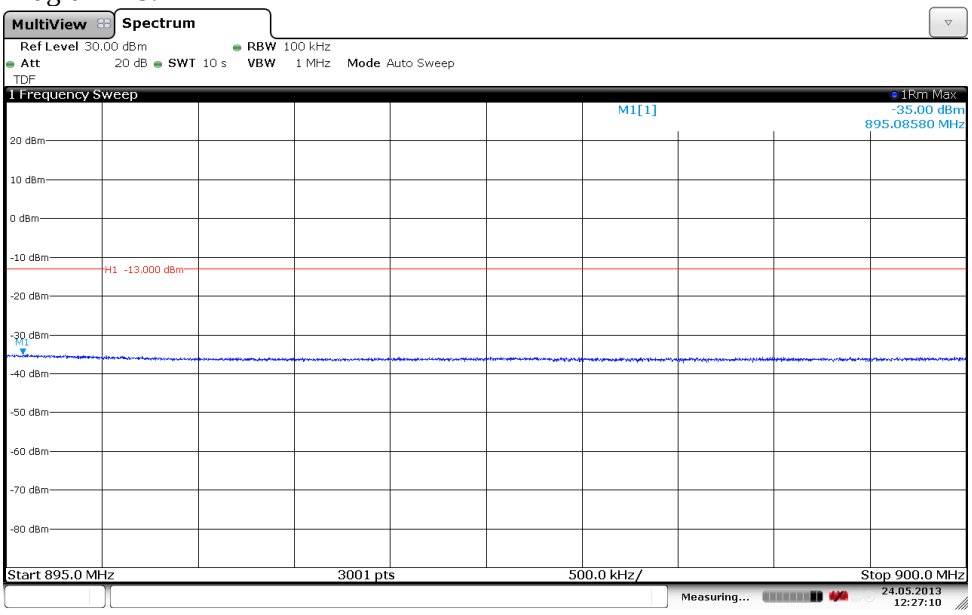
Appendix 4

Diagram 4 a:



Date: 24.MAY.2013 12:25:10

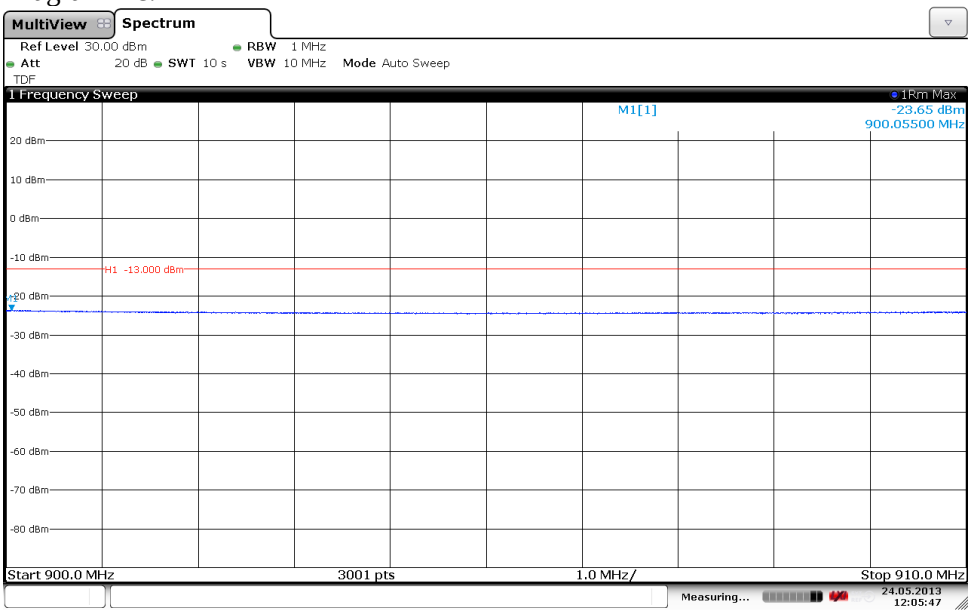
Diagram 4 b:



Date: 24.MAY.2013 12:27:10

Appendix 4

Diagram 4 c:



Date: 24.MAY.2013 12:05:47

Appendix 5

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

Date	Temperature	Humidity
2013-05-24	20 °C ± 3 °C	30% ± 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.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSW43	902 073
RF attenuator	901 508
High pass filter	901 501
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	Modulation	Tested frequency	Tested Port
1 a+b	GMSK	B	RFA
2 a+b	GMSK	M	RFA
3 a+b	16QAM	M	RFA
4 a+b	GMSK	T	RFA

Multi carrier

Diagram	Modulation	Tested frequency	Tested Port
5 a+b	GMSK	M2	RFA
6 a+b	16QAM	M2	RFA
7 a+b+c	GMSK	$B_{im\ 1}$	RFA
8 a+b+c	GMSK	$B_{im\ 2}$	RFA
9 a+b+c	GMSK	$B_{im\ 3}$	RFA
10 a+b+c	16QAM	$B_{im\ 3}$	RFA
11 a+b+c	GMSK	$T_{im\ 1}$	RFA
12 a+b+c	GMSK	$T_{im\ 2}$	RFA
13 a+b+c	GMSK	$T_{im\ 3}$	RFA
14 a+b+c	16QAM	$T_{im\ 3}$	RFA

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.

Limits

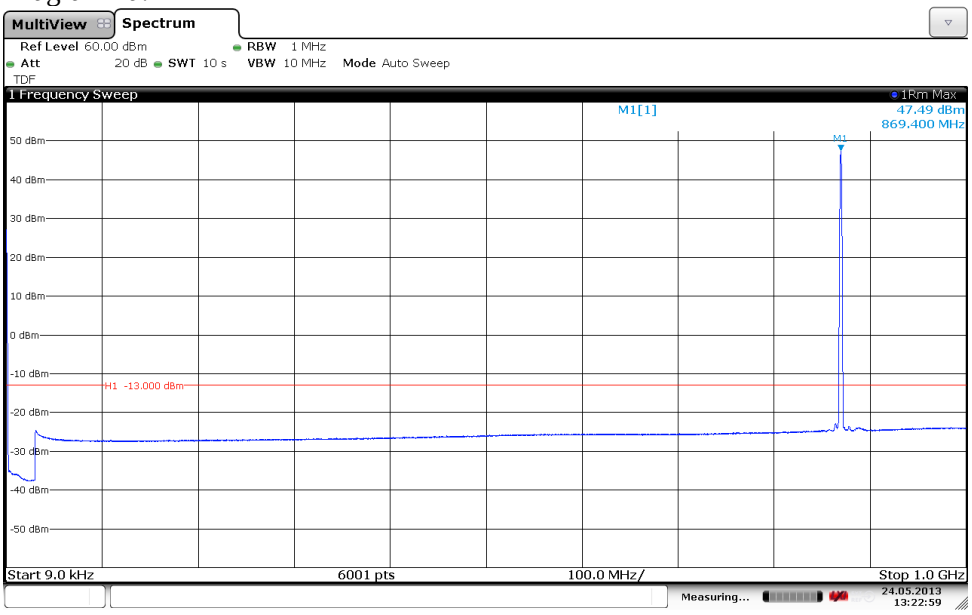
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm per 100 kHz RBW.

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

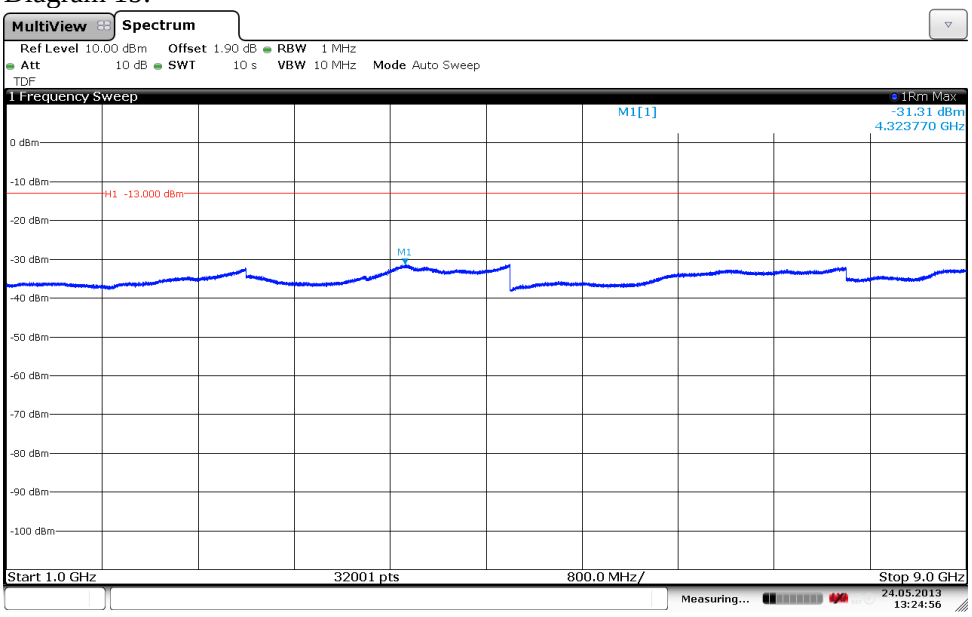
Appendix 5

Diagram 1a:



Date: 24.MAY.2013 13:22:59

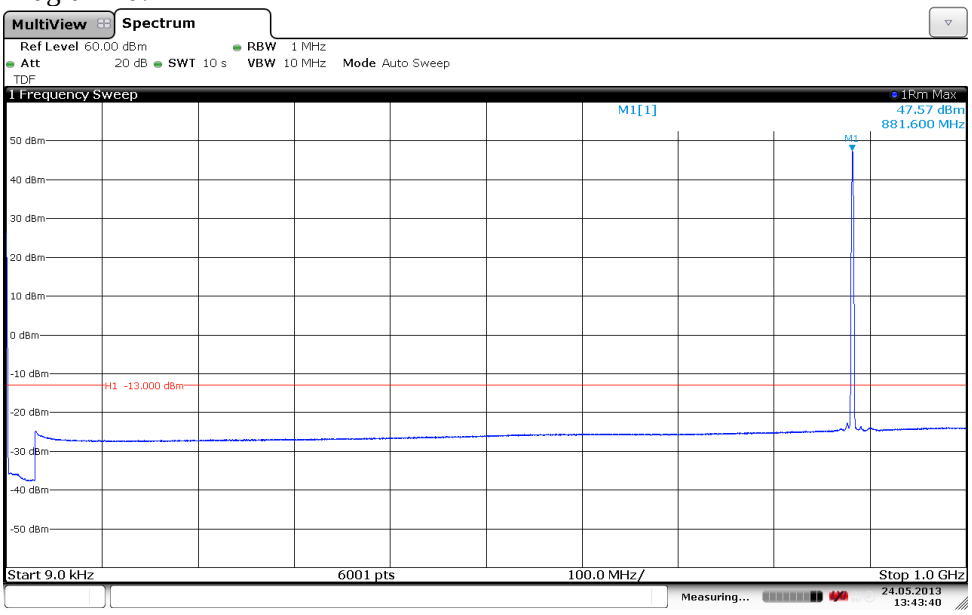
Diagram 1b:



Date: 24.MAY.2013 13:24:56

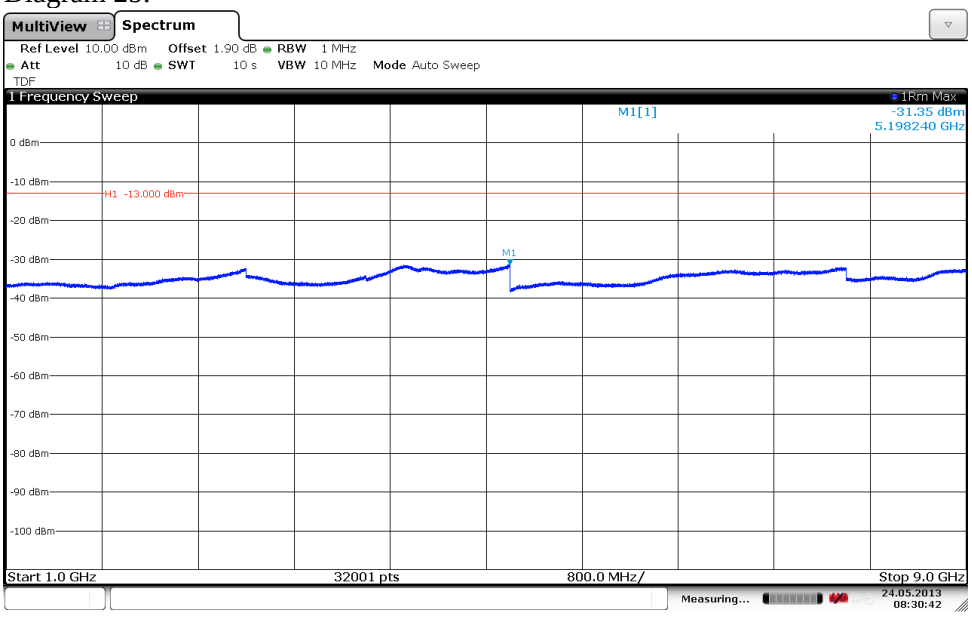
Appendix 5

Diagram 2a:



Date: 24.MAY.2013 13:43:40

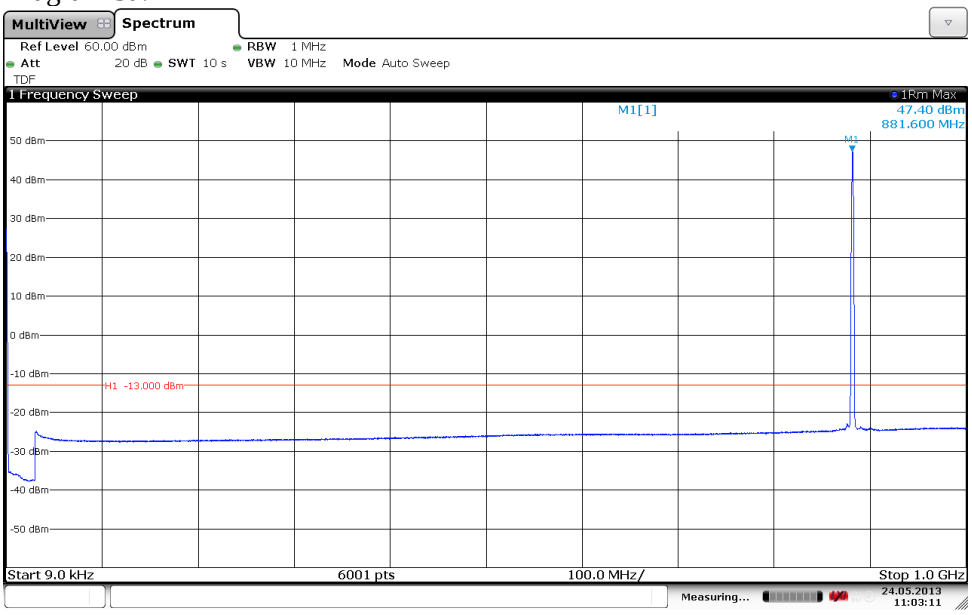
Diagram 2b:



Date: 24.MAY.2013 08:30:42

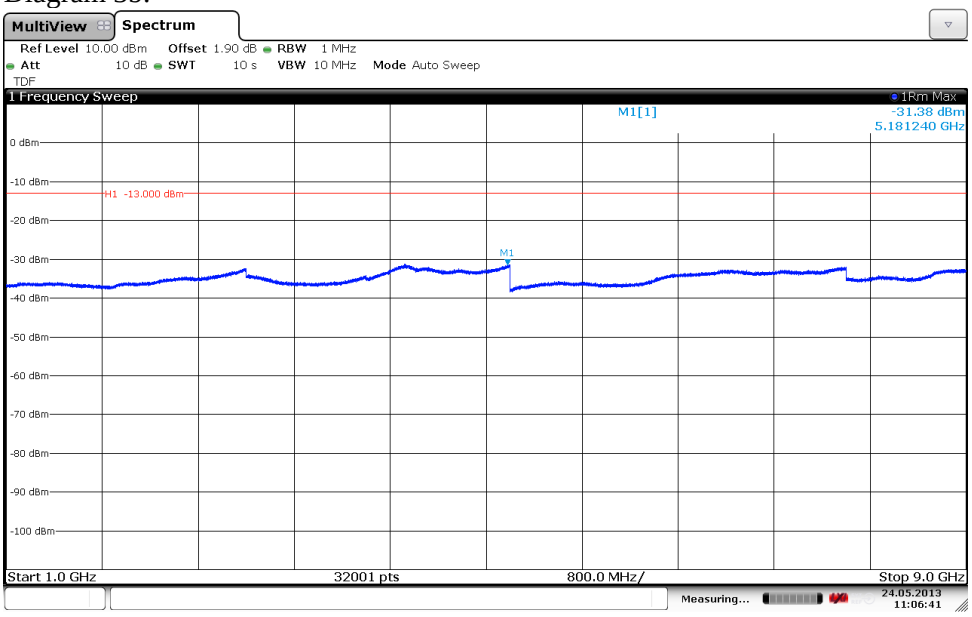
Appendix 5

Diagram 3a:



Date: 24.MAY.2013 11:03:11

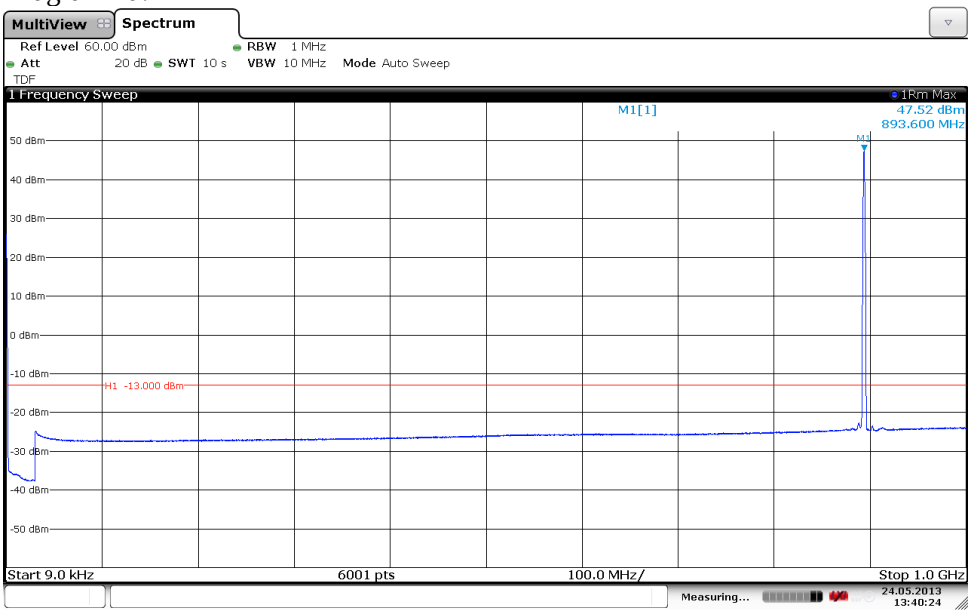
Diagram 3b:



Date: 24.MAY.2013 11:06:41

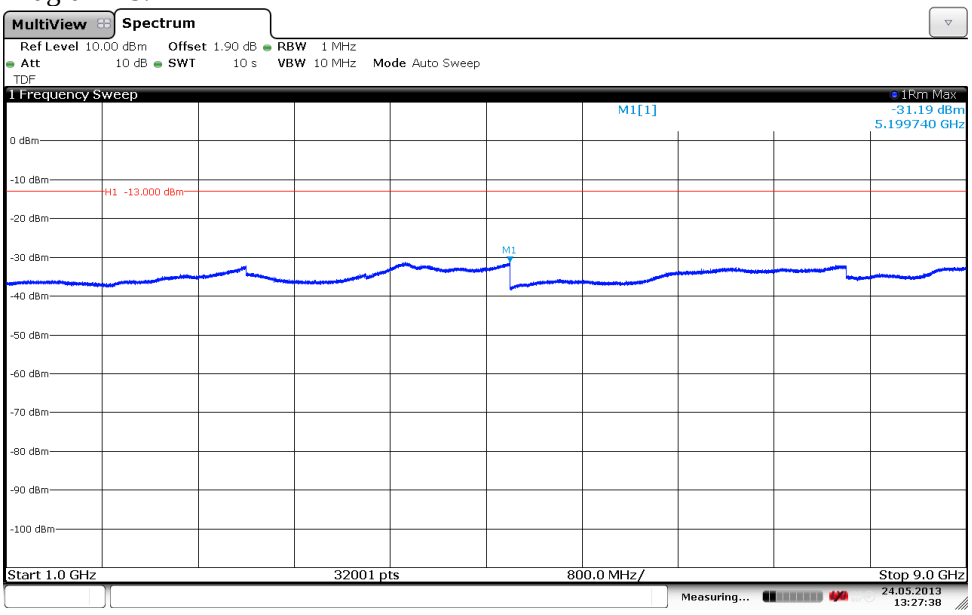
Appendix 5

Diagram 4a:



Date: 24.MAY.2013 13:40:23

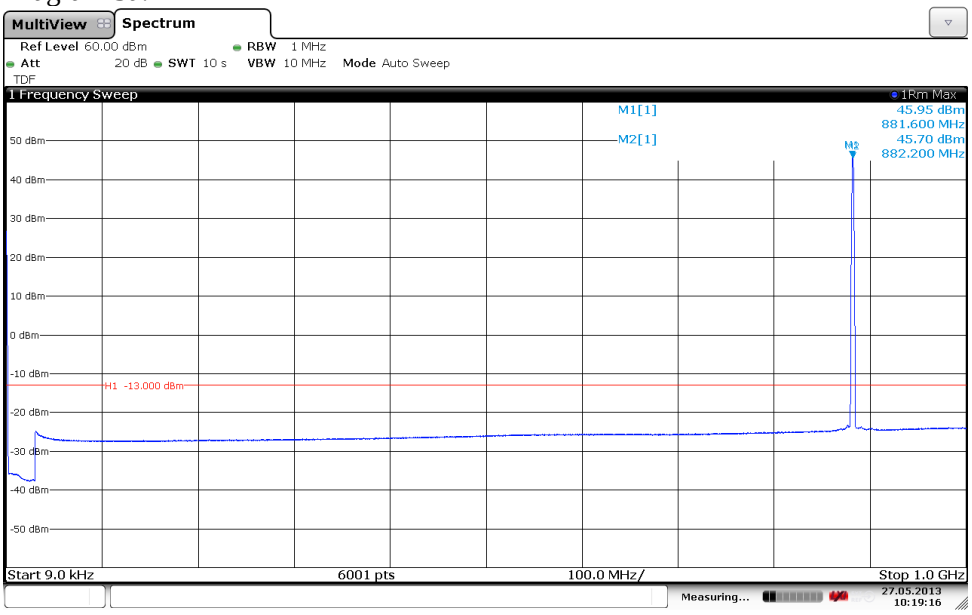
Diagram 4b:



Date: 24.MAY.2013 13:27:38

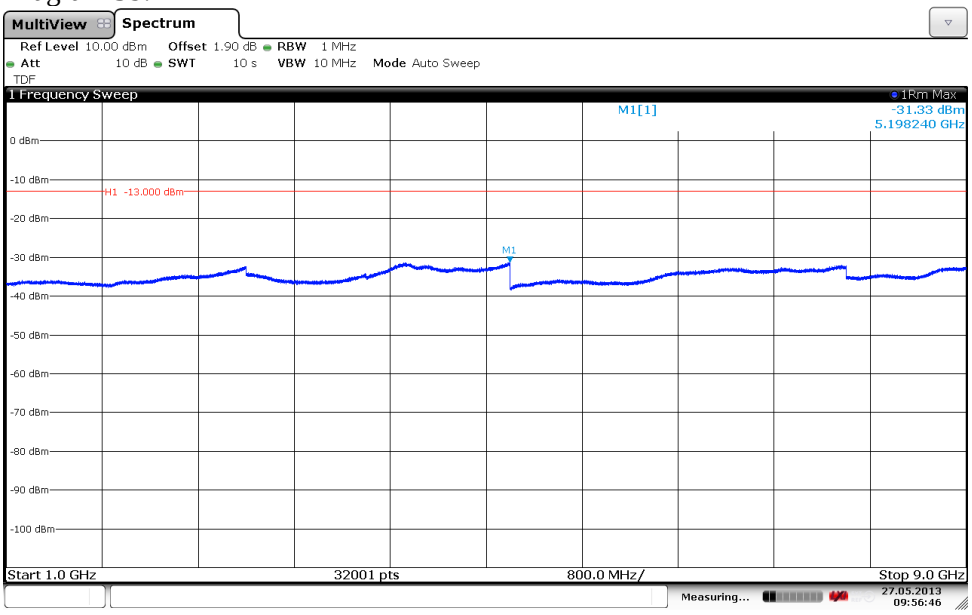
Appendix 5

Diagram 5a:



Date: 27.MAY.2013 10:19:16

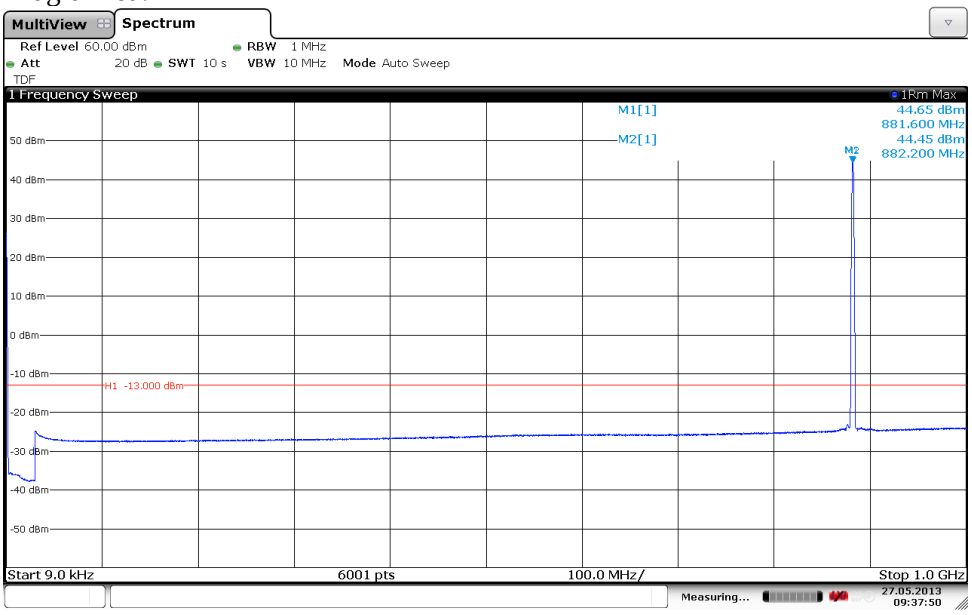
Diagram 5b:



Date: 27.MAY.2013 09:56:46

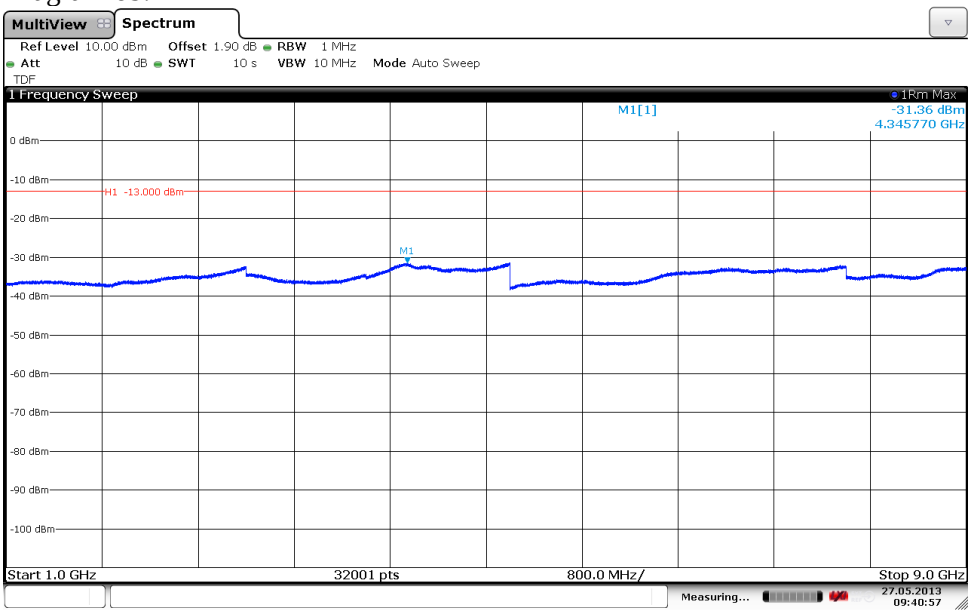
Appendix 5

Diagram 6a:



Date: 27.MAY.2013 09:37:49

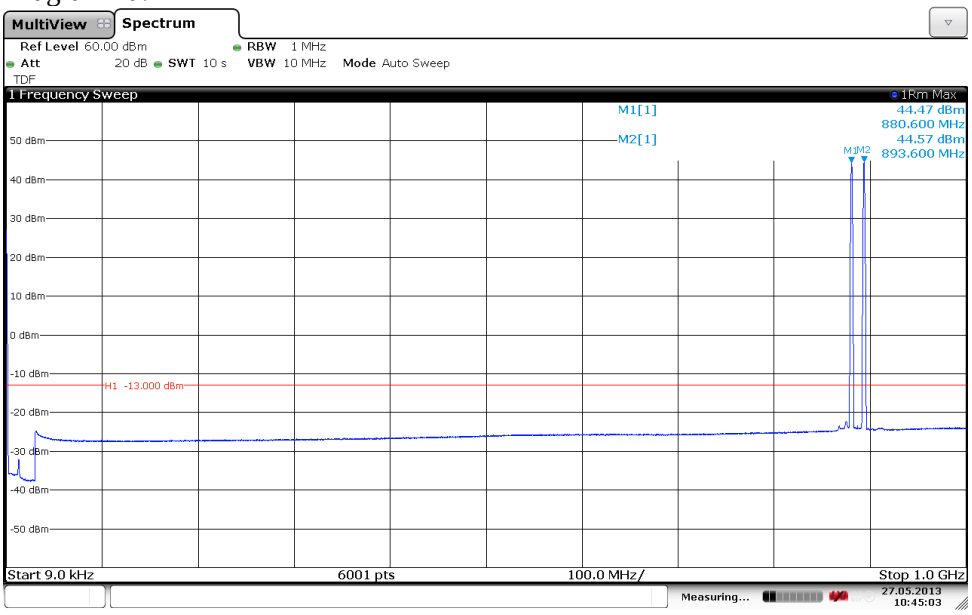
Diagram 6b:



Date: 27.MAY.2013 09:40:57

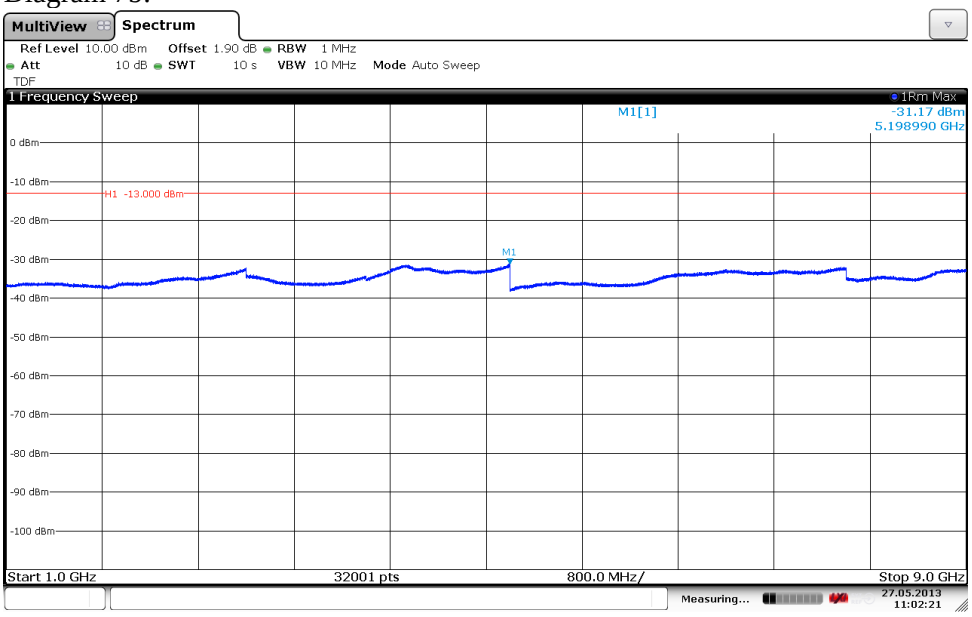
Appendix 5

Diagram 7a:



Date: 27.MAY.2013 10:45:02

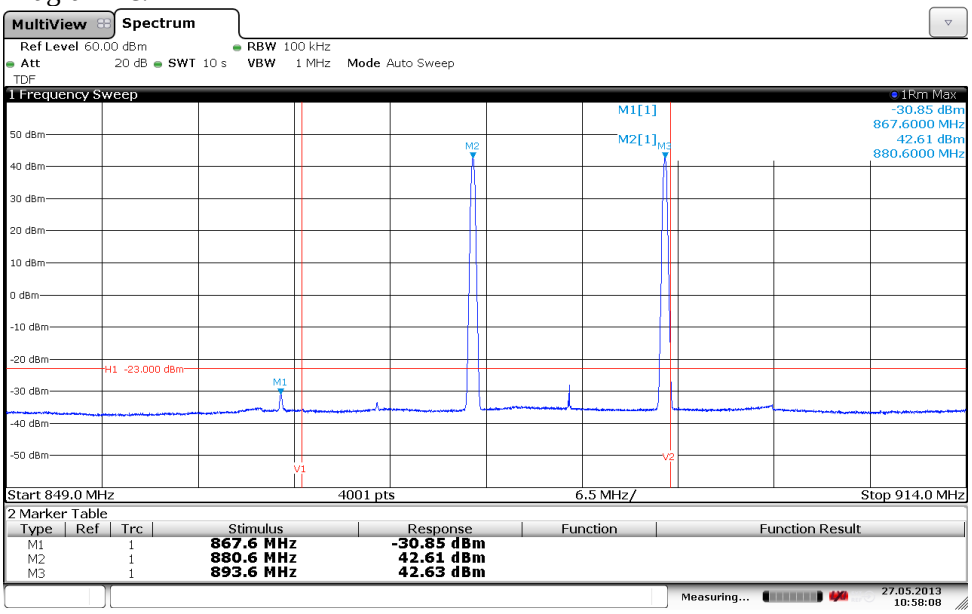
Diagram 7b:



Date: 27.MAY.2013 11:02:21

Appendix 5

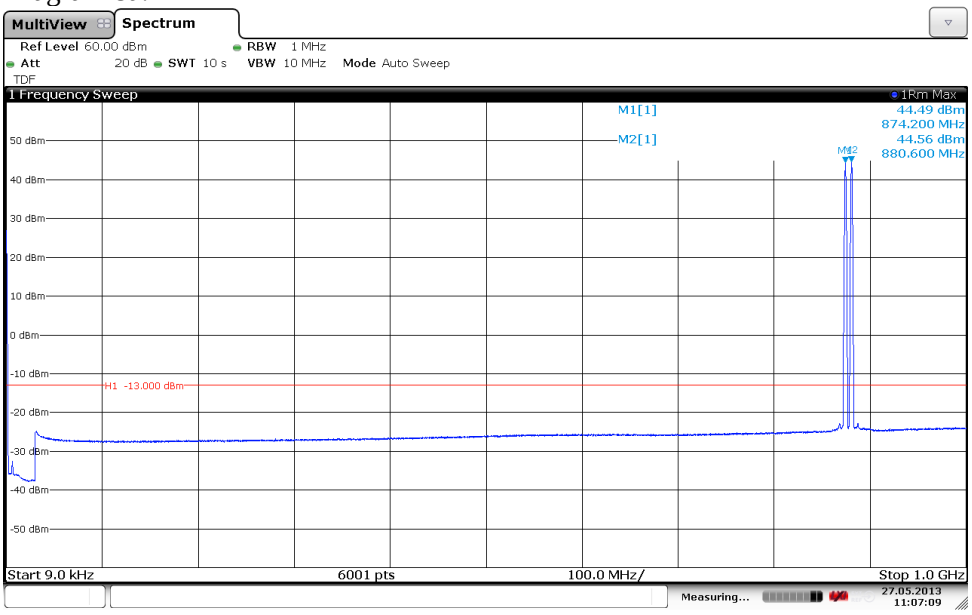
Diagram 7c:



Date: 27.MAY.2013 10:58:08

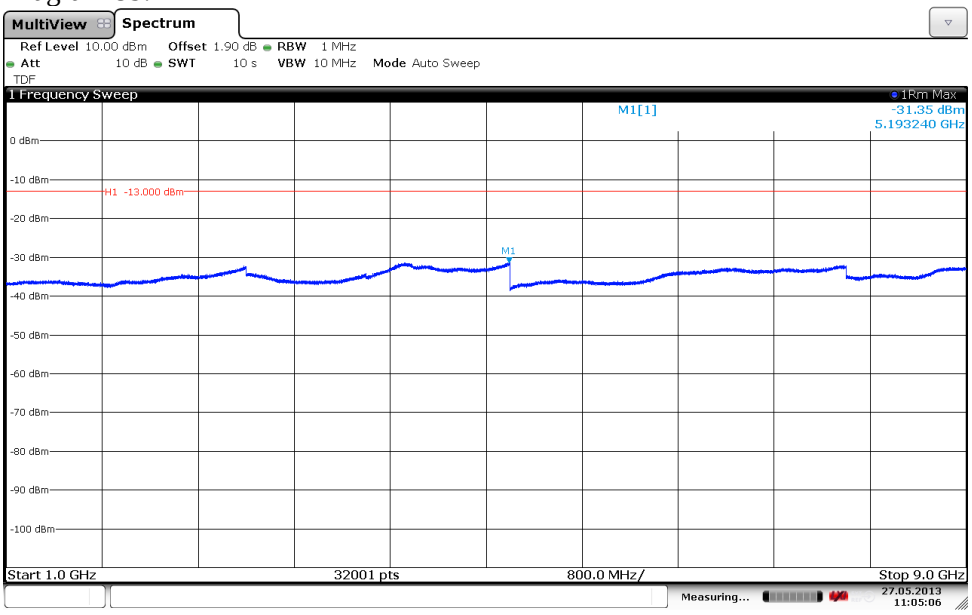
Appendix 5

Diagram 8a:



Date: 27.MAY.2013 11:07:09

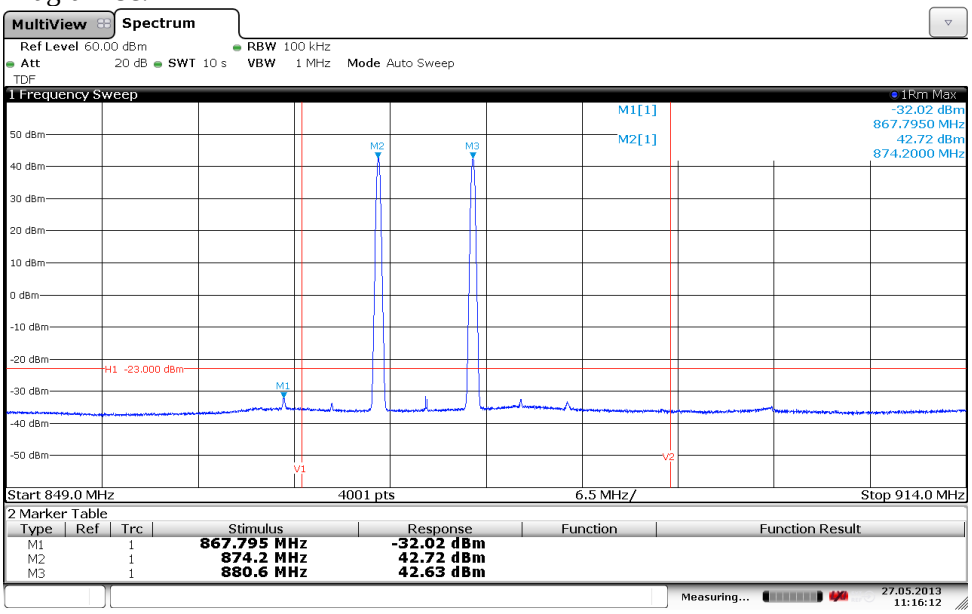
Diagram 8b:



Date: 27.MAY.2013 11:05:06

Appendix 5

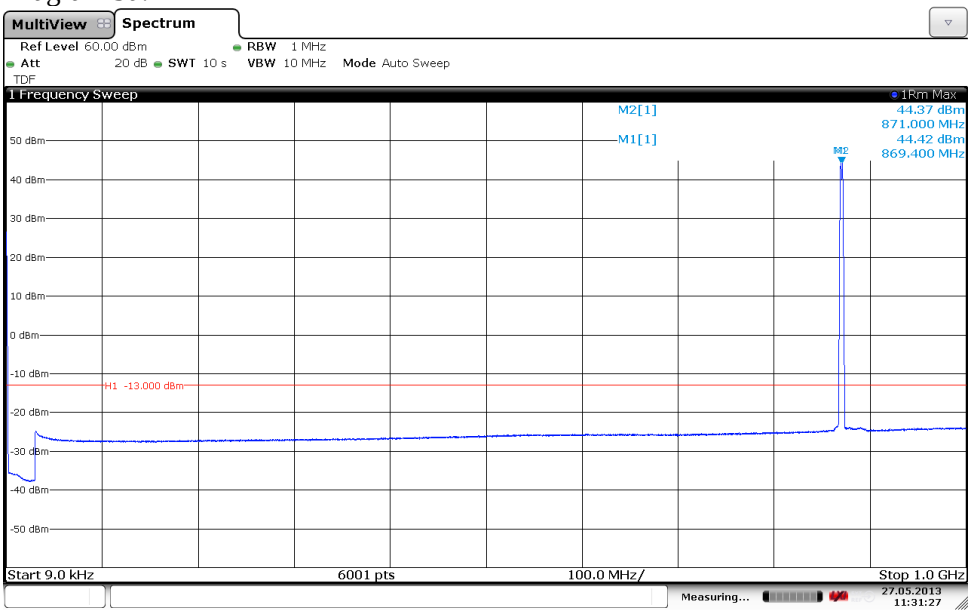
Diagram 8c:



Date: 27.MAY.2013 11:16:13

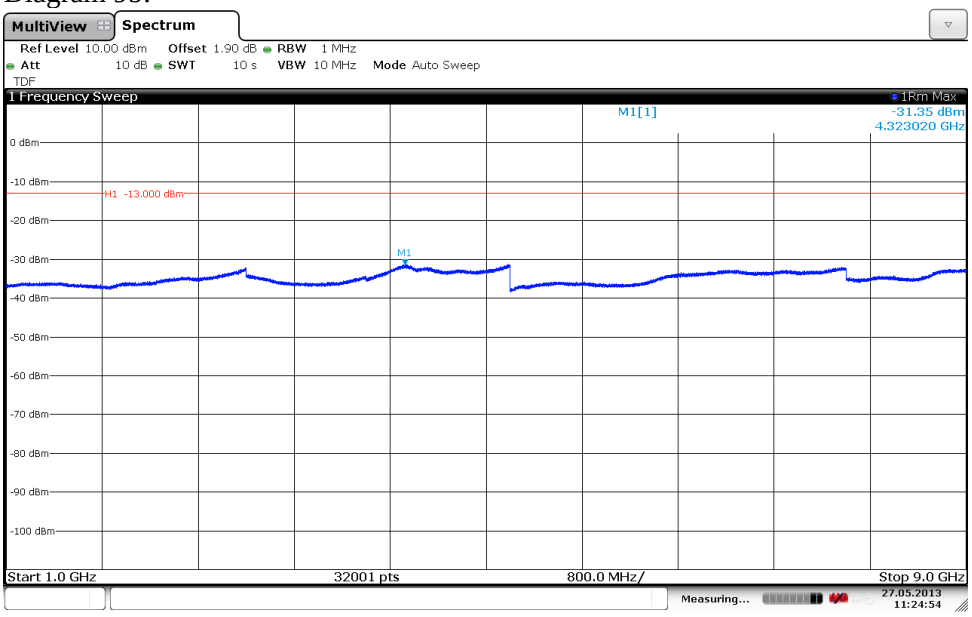
Appendix 5

Diagram 9a:



Date: 27.MAY.2013 11:31:27

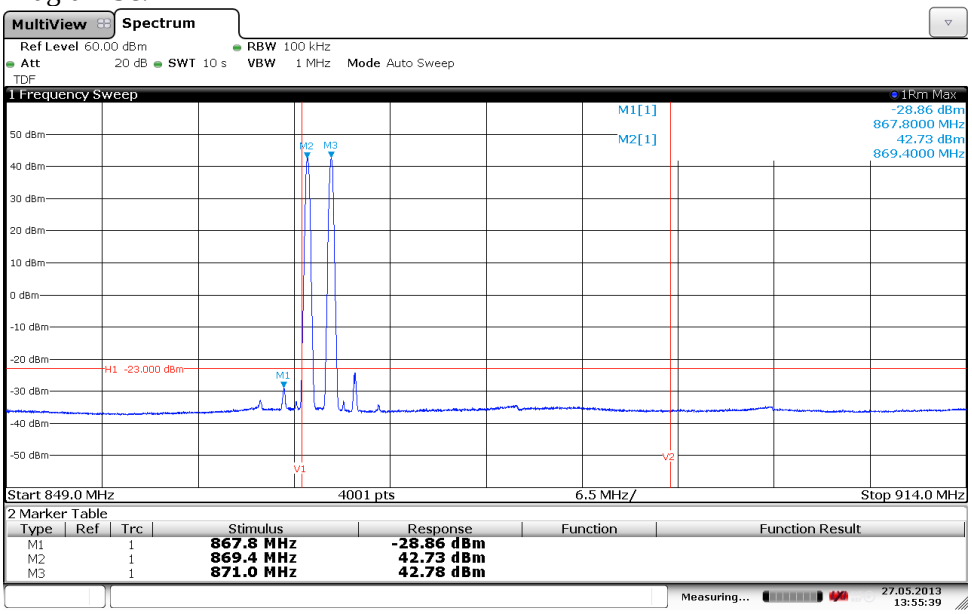
Diagram 9b:



Date: 27.MAY.2013 11:24:54

Appendix 5

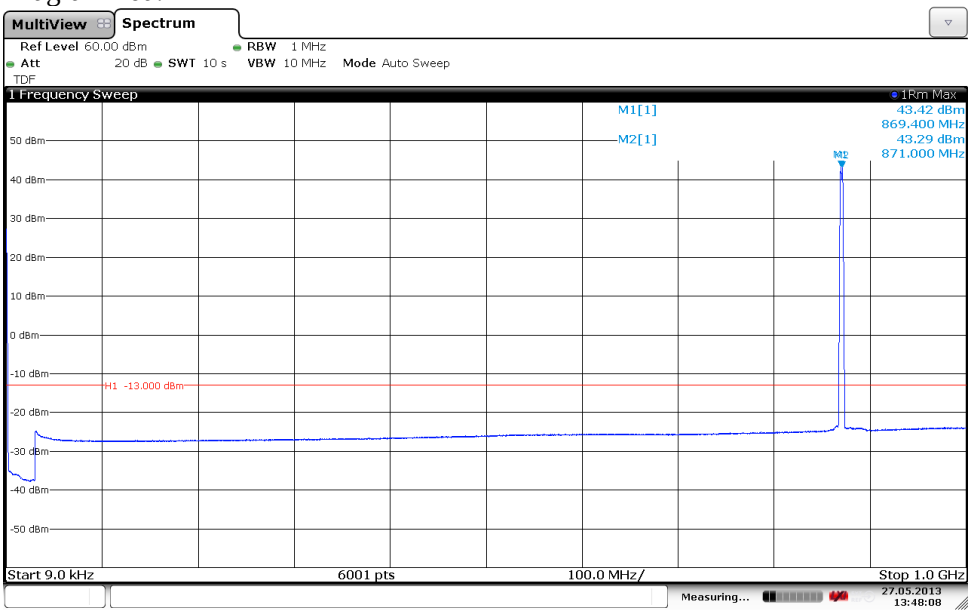
Diagram 9c:



Date: 27.MAY.2013 13:55:38

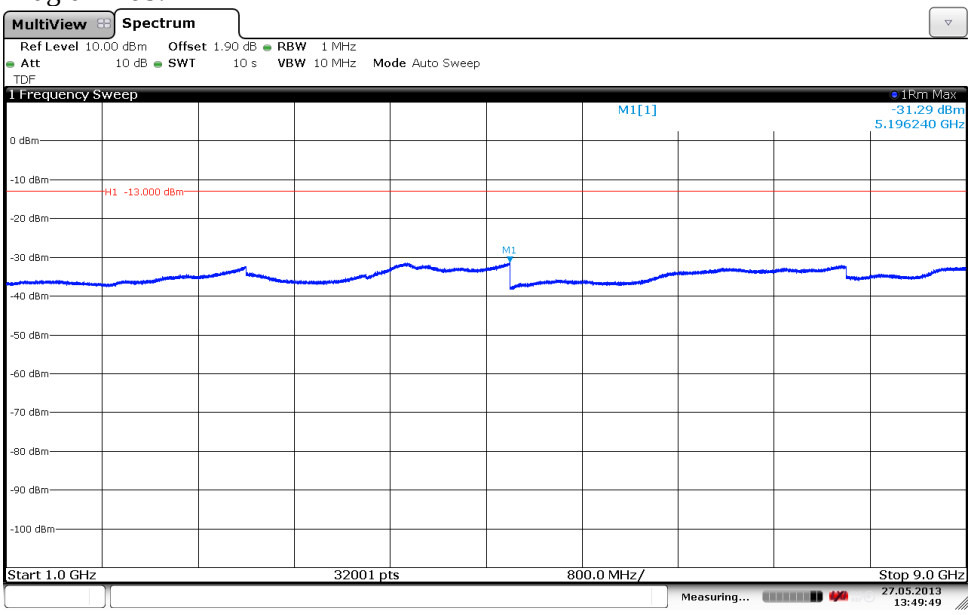
Appendix 5

Diagram 10a:



Date: 27.MAY.2013 13:48:08

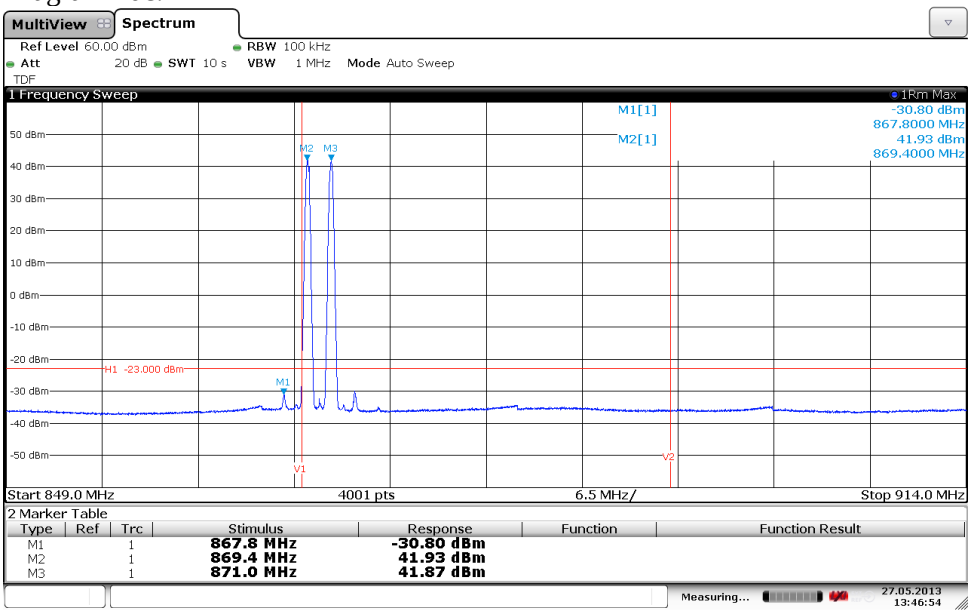
Diagram 10b:



Date: 27.MAY.2013 13:49:49

Appendix 5

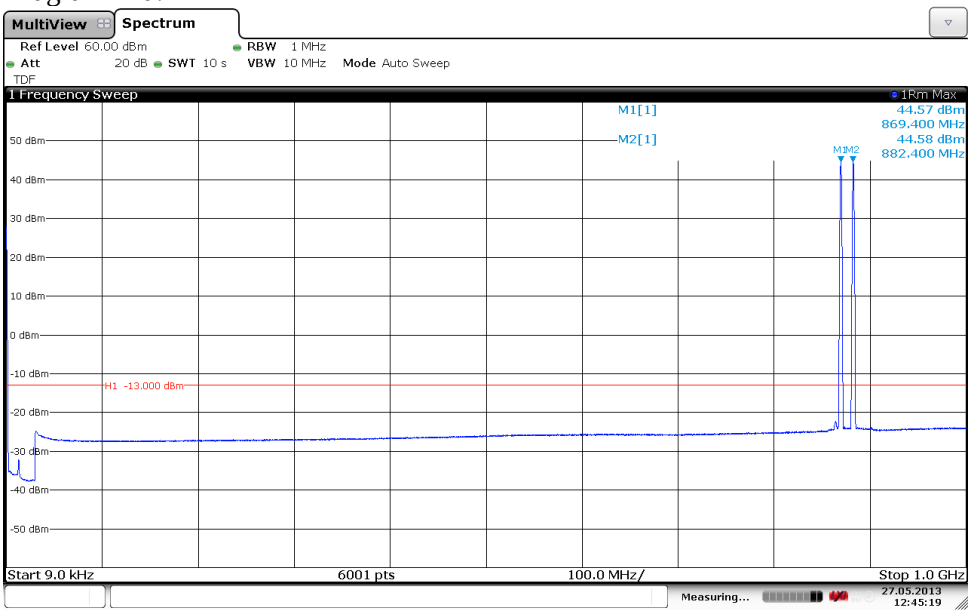
Diagram 10c:



Date: 27.MAY.2013 13:46:54

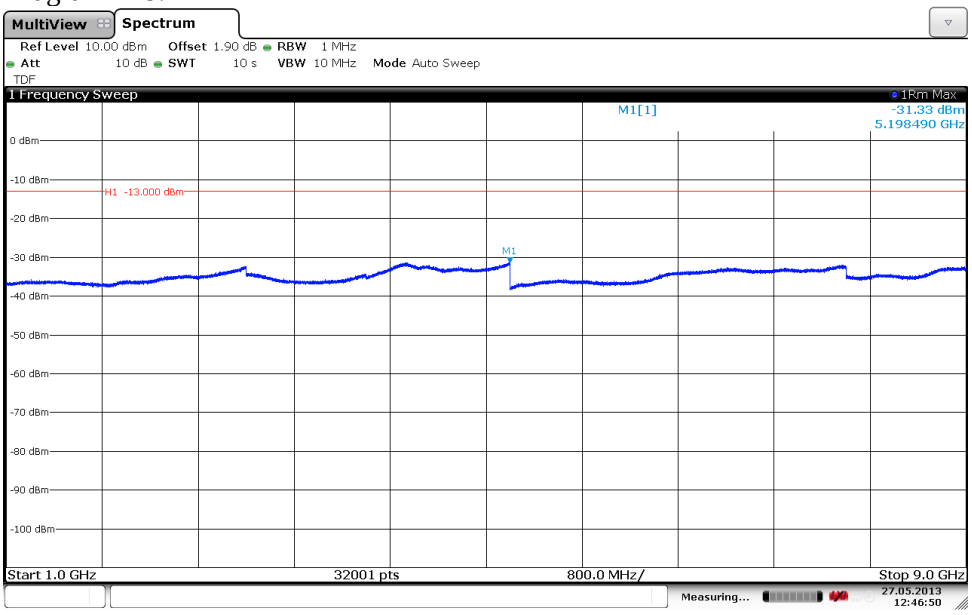
Appendix 5

Diagram 11a:



Date: 27.MAY.2013 12:45:20

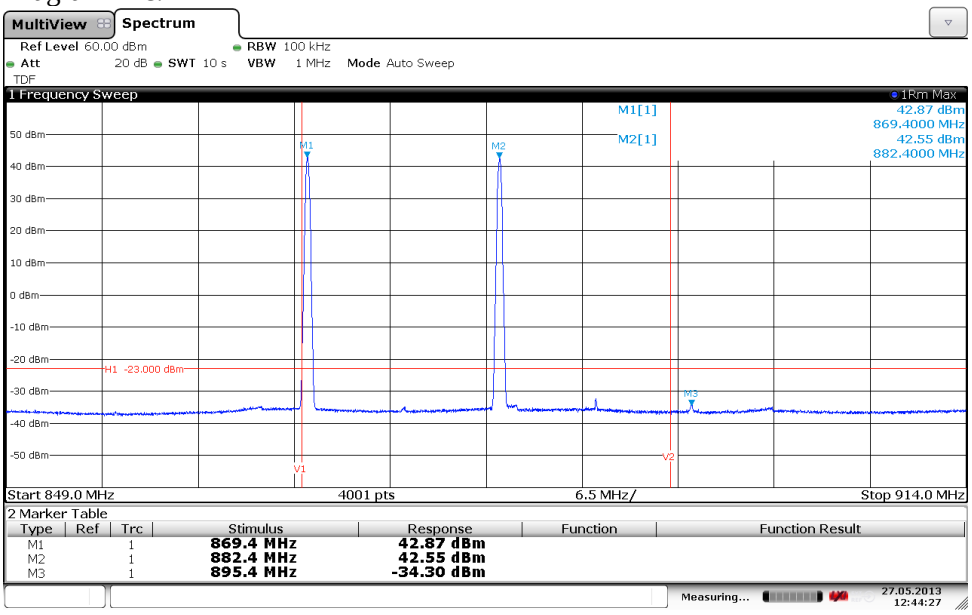
Diagram 11b:



Date: 27.MAY.2013 12:46:51

Appendix 5

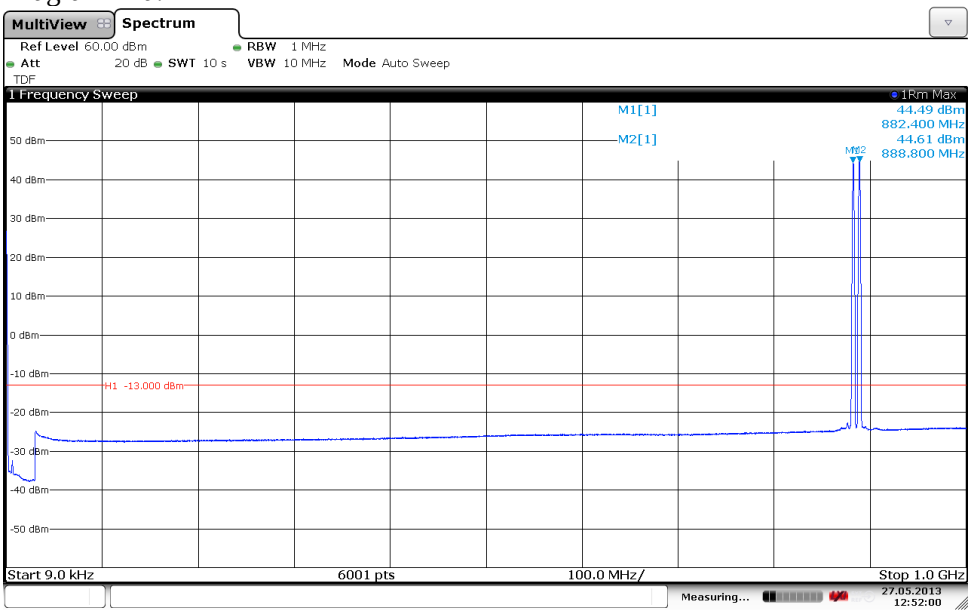
Diagram 11c:



Date: 27.MAY.2013 12:44:27

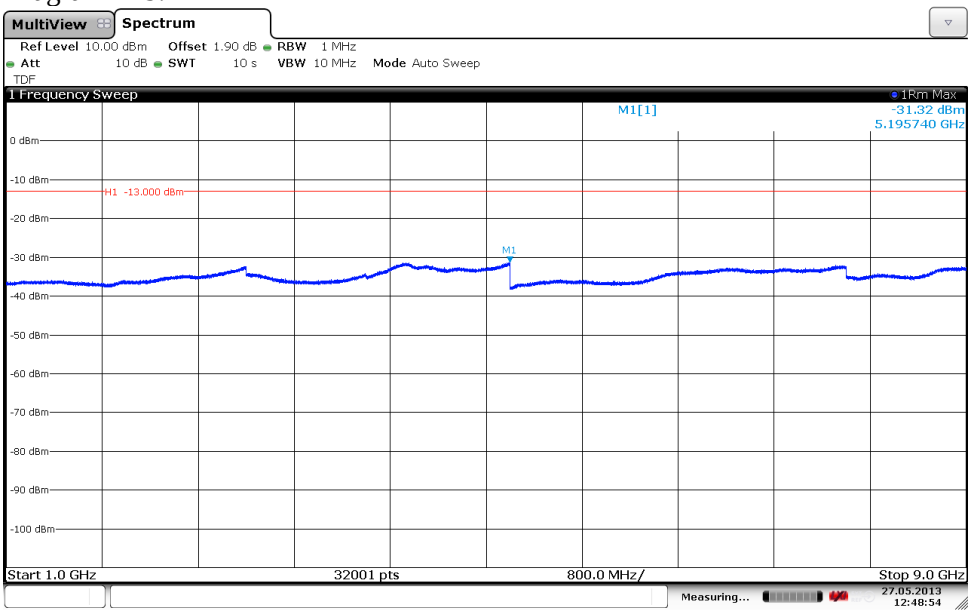
Appendix 5

Diagram 12a:



Date: 27.MAY.2013 12:52:00

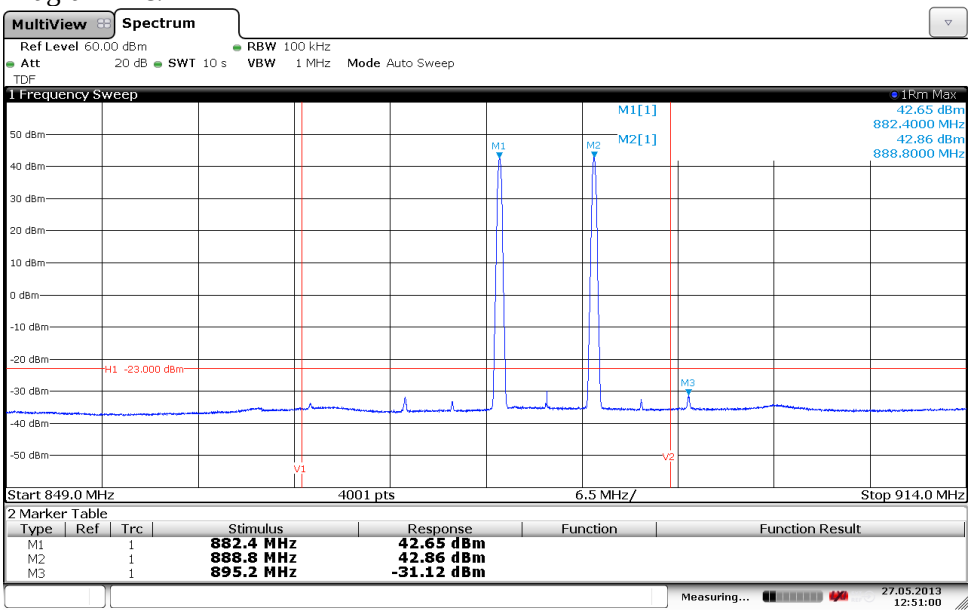
Diagram 12b:



Date: 27.MAY.2013 12:48:54

Appendix 5

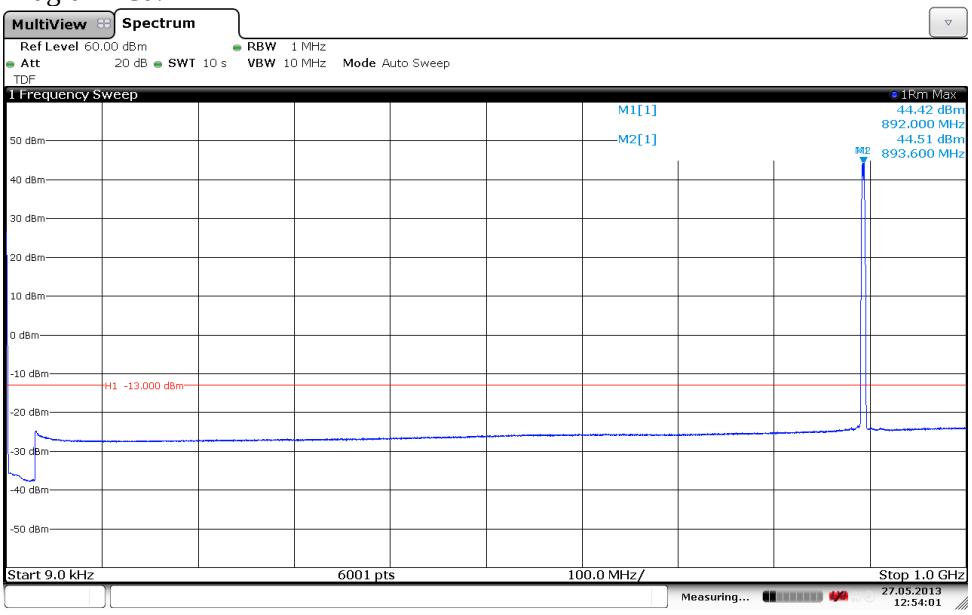
Diagram 12c:



Date: 27.MAY.2013 12:51:00

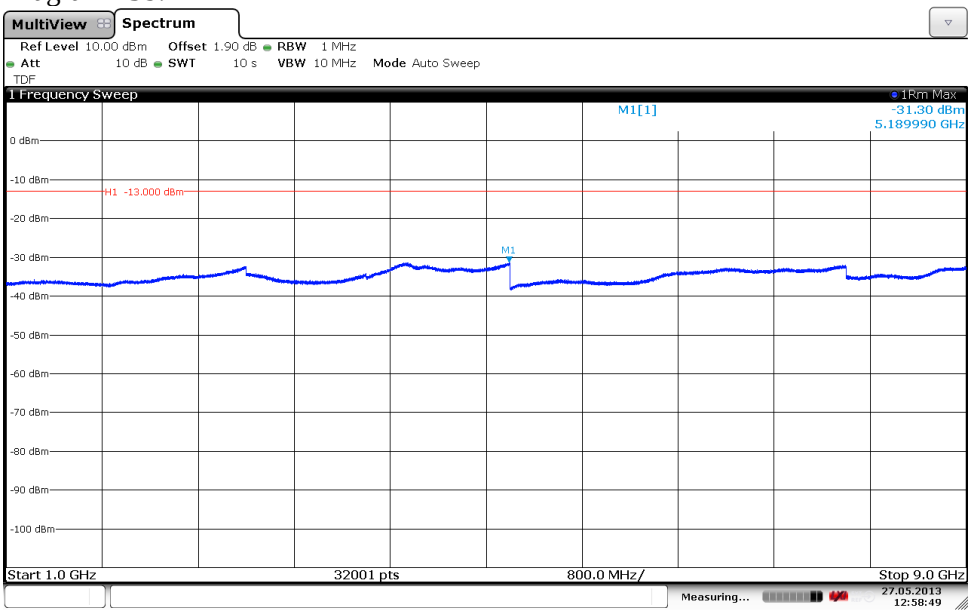
Appendix 5

Diagram 13a:



Date: 27.MAY.2013 12:54:00

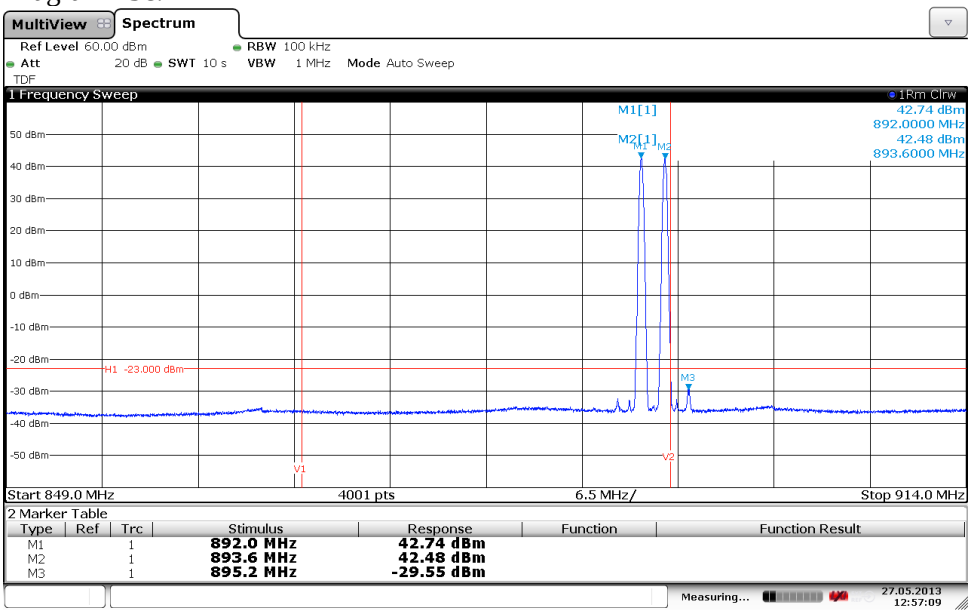
Diagram 13b:



Date: 27.MAY.2013 12:58:49

Appendix 5

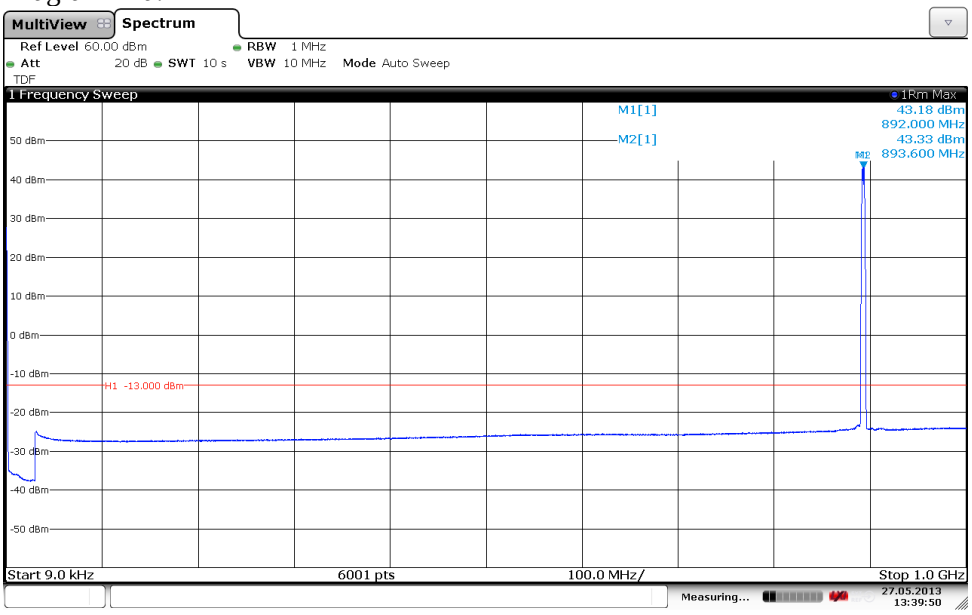
Diagram 13c:



Date: 27.MAY.2013 12:57:09

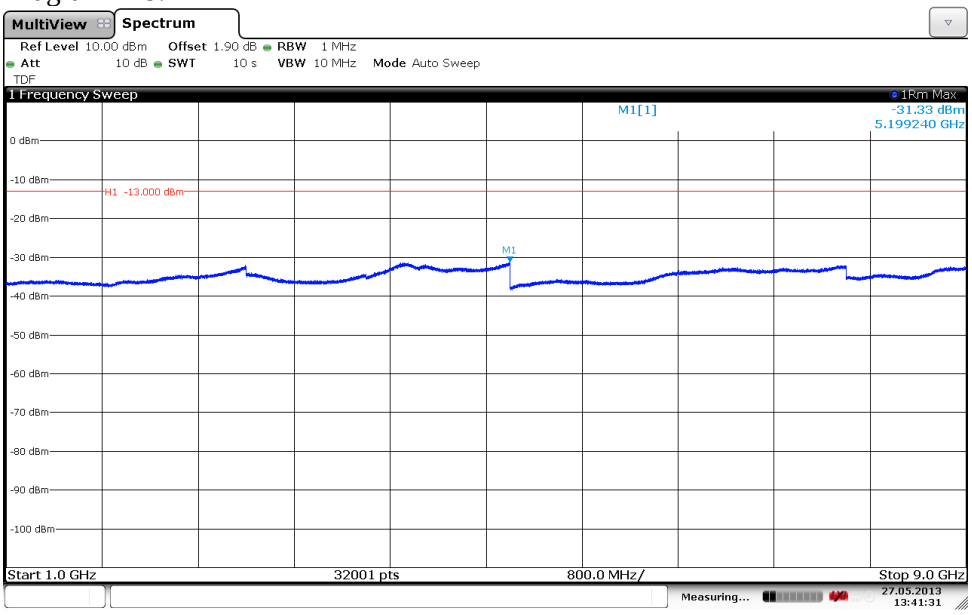
Appendix 5

Diagram 14a:



Date: 27.MAY.2013 13:39:50

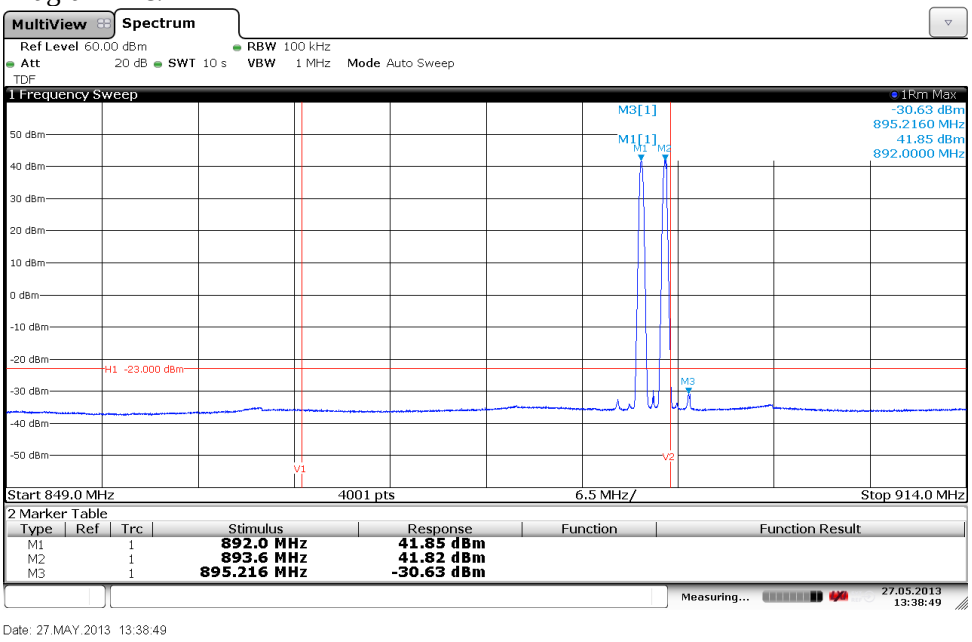
Diagram 14b:



Date: 27.MAY.2013 13:41:31

Appendix 5

Diagram 14c:



Date: 27.MAY.2013 13:38:49

Appendix 6

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

Date	Temperature	Humidity
2013-05-27	23°C ± 3°C	38 % ± 5 %
2013-05-28	23°C ± 3°C	38 % ± 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.

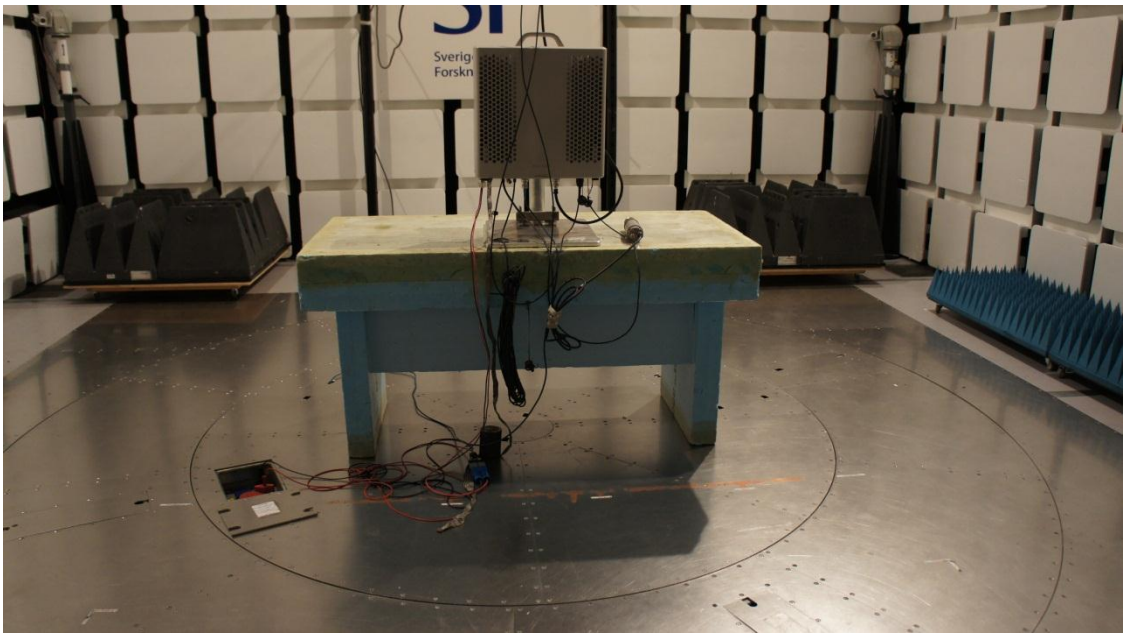
In the frequency range 30 MHz - 9 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

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
3. 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	502 181
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
T
T2
T4

Results

Multi carrier

Diagram	Modulation	Tested frequency
1 a+b	GMSK	T4

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.

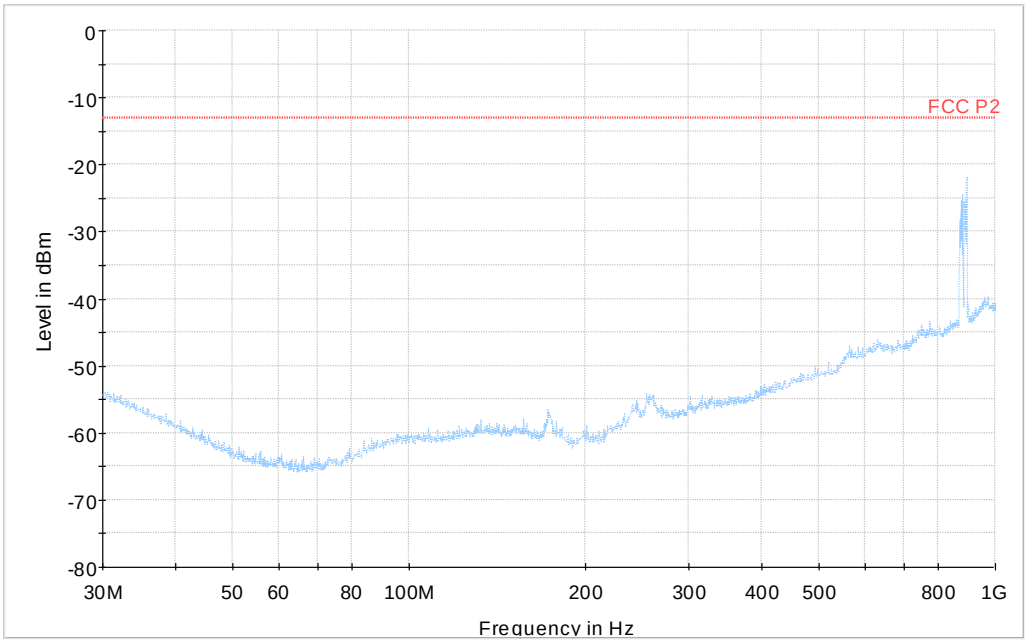
Limits

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.

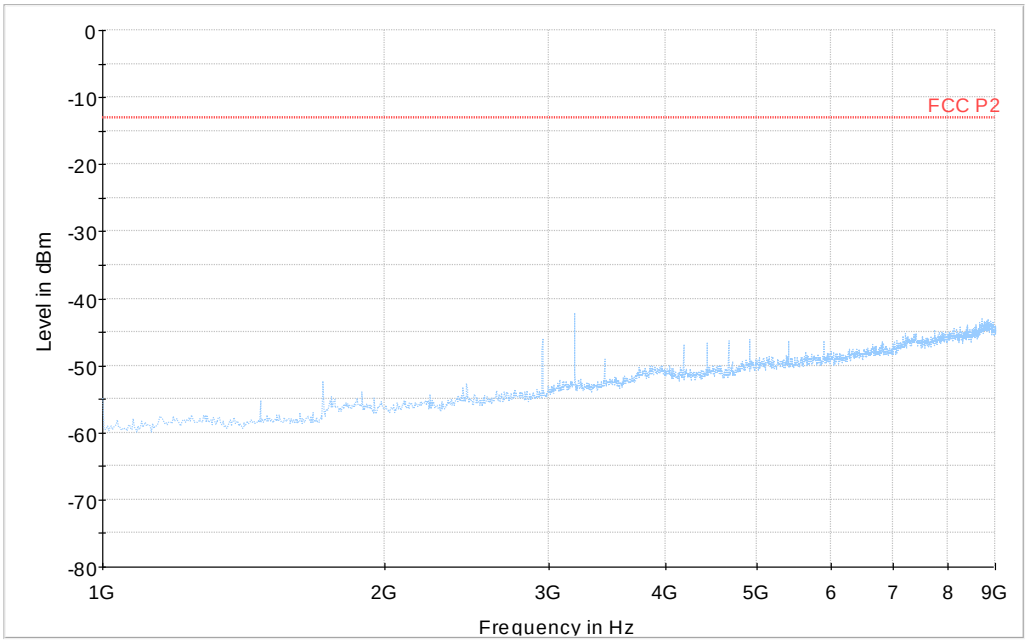
Complies?	Yes

Diagram 1 a:



Note: The emission between 869 MHz and 894 MHz are the carrier frequencies 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 measurements were made per J-STD-007A Vol 1 (GMSK)

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, 881.6 MHz)

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	-4
-55.2	+20	+4
-40.8	+20	-5
-48.0	+30	+4
-48.0	+40	0
-48.0	+50	-4
-48.0	+10	+4
-48.0	0	-3
-48.0	-10	+4
-48.0	-20	+4
-48.0	-30	+4
Maximum freq. error (Hz)		5
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:

§22.355
The frequency stability shall be within ± 1.5 ppm (± 1322.4 Hz).

RSS-132 5.3 Frequency:
The carrier frequency shall not depart from the reference frequency in excess of ± 1.5 ppm (± 1322.4 Hz) for base stations when tested to the temperature and supply voltage variations specified in RSS-Gen.

Complies?	Yes

Appendix 8

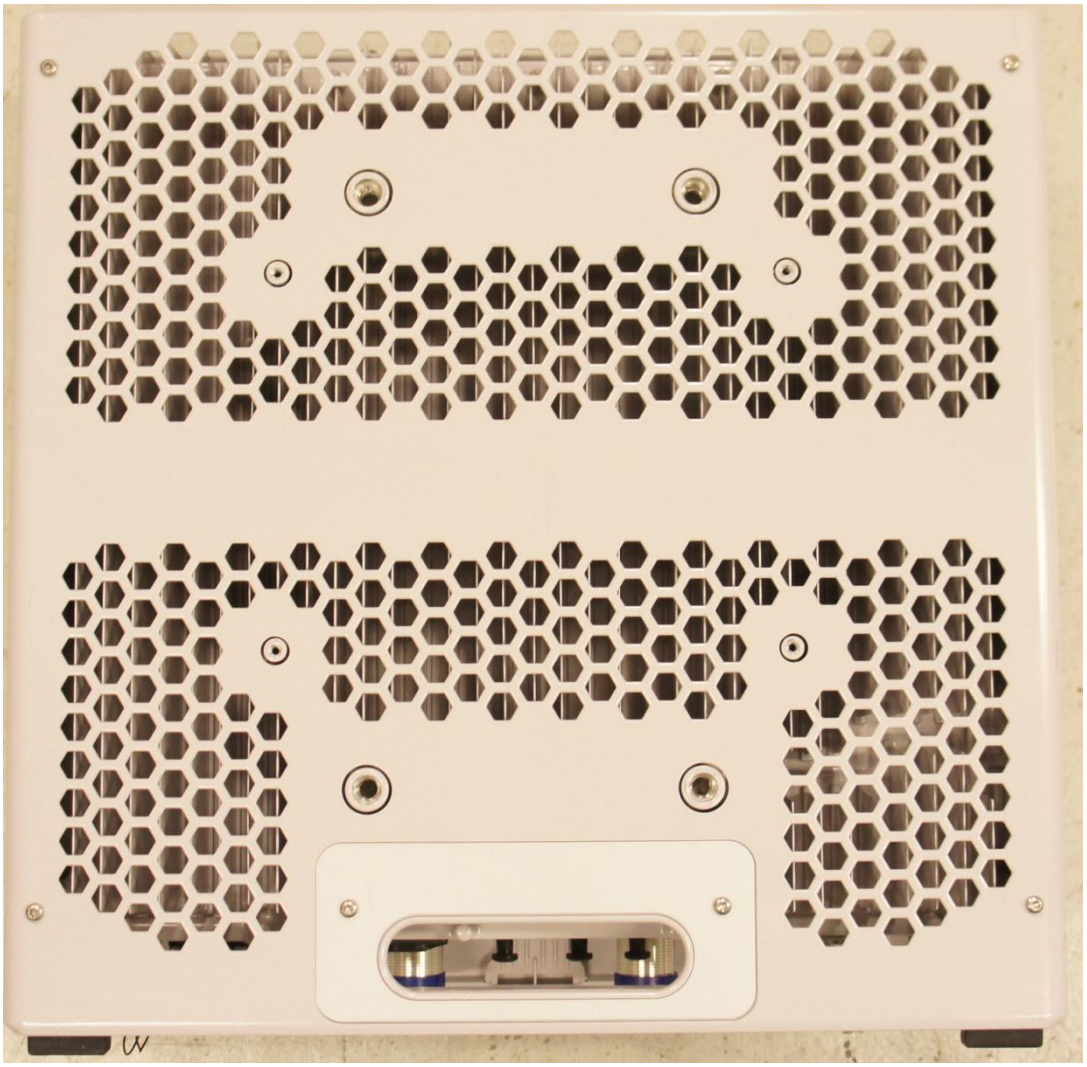
External photos

Front side:

Product label

Appendix 8

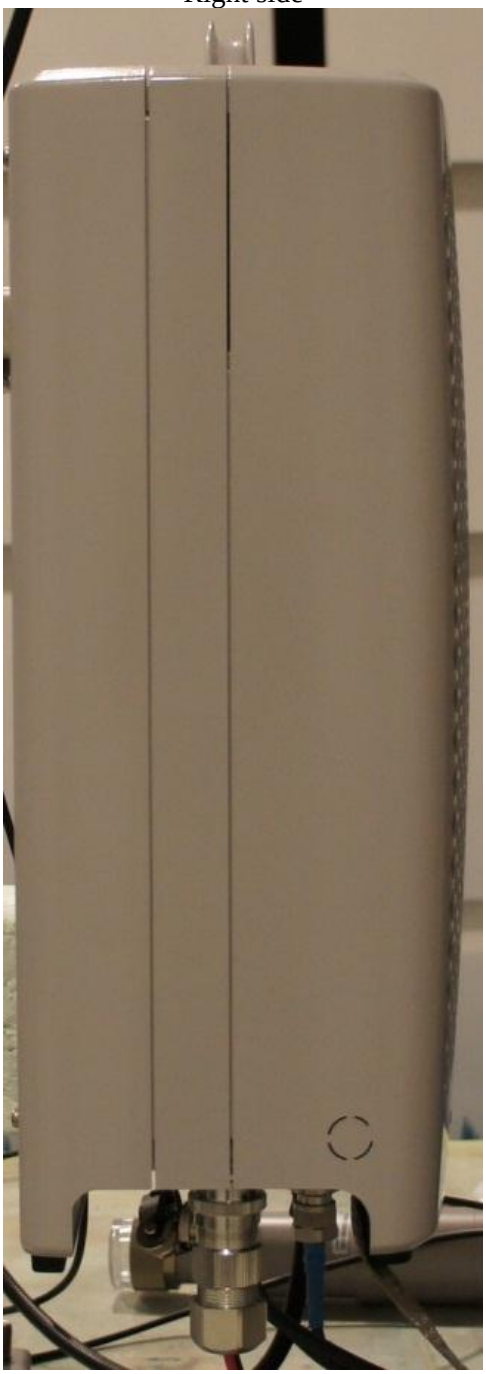
Rear side



Appendix 8

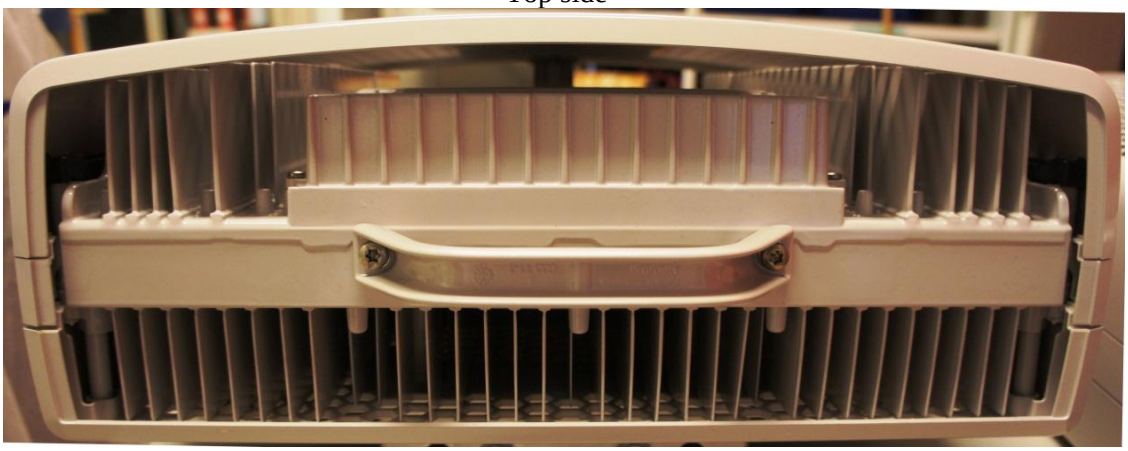
Left side

Right side



Appendix 8

Top side



Bottom side