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Radio measurements on RUS 02 B5 850 MHz radio equipment with FCC ID TA8AKRC161320-1 and IC 287AB-AS1613201 (8 appendices)

Test object

Product name: RUS 02 B5
Product number: KRC 161 320/1, R1C

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

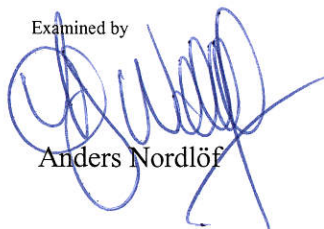
Electronics – EMC

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Appendix 1

Description of the test object

Equipment:	Product name: RUS 02 B5, supporting GSM Product number KRC 161 320/1 FCC ID TA8AKRC161320-1 IC: 287AB-AS1613201 IC MODEL NO: AS1613201
Frequency range:	TX: 869 - 894 MHz RX: 824 - 849 MHz
Antenna ports:	1 TX/RX port 1 RX port
RF configurations:	Single and multi carrier
Nominal RF output power per antenna port:	Single carrier: 1x 47.8 dBm (1 x 60.0W) Multi carrier: 2x 47 dBm (2 x 50W) 3x 45.2 dBm (3 x 33W) 4x 44 dBm (4 x 25W) 8x 41.0 dBm (8 x 12.5W)
Antenna:	No dedicated antenna, handled during licensing
Modulations :	GMSK, 8PSK, AQPSK, 16QAM and 32QAM,
Nominal power voltage:	-48VDC

Appendix 1

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. For AQPSK modulation the SCPIR is 0 dB

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 hosted in a RBS 6201 powered with -48 VDC. If not otherwise stated all measurements were performed on the RF A antenna port.

Radiated measurements

The test object was tested stand-alone. It was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmitter output power at port RF A.

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

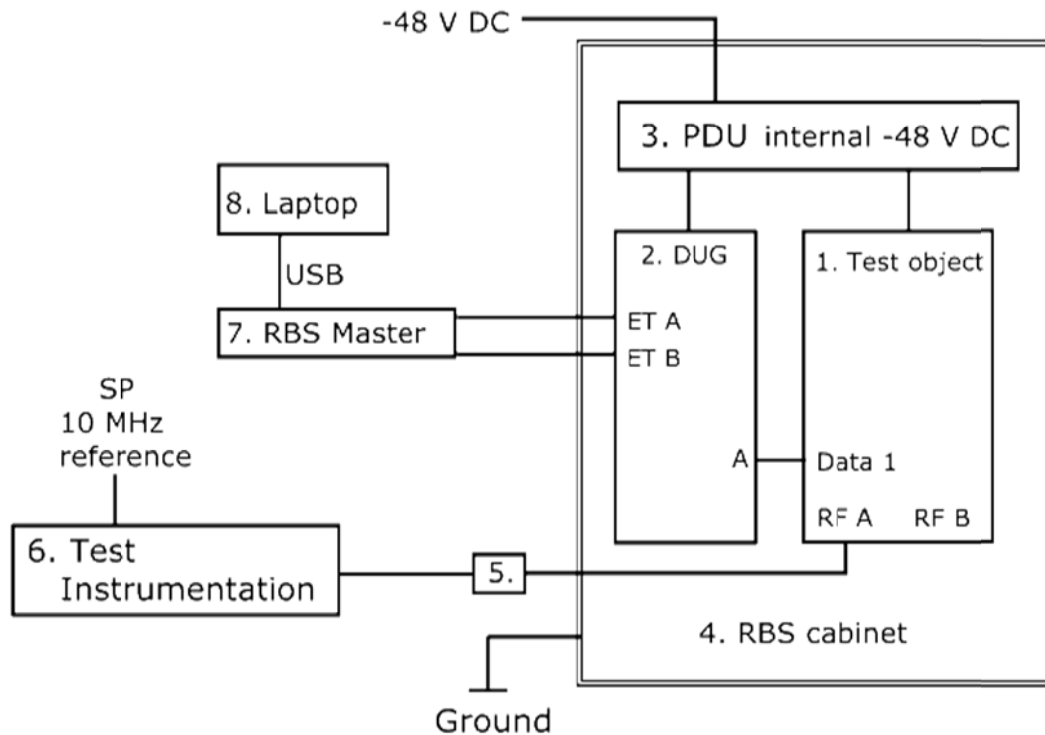
Test frequencies used for conducted and radiated measurements

TX test frequencies, conducted measurements

ARFCN Downlink Port A	Frequency Port A [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 bottom constellation
190	881.6	M	Single carrier TX mid frequency
190 193	881.6 882.2	M2	2 carrier TX band mid constellation
181 184 187 190 193 196 199 202	879.8 880.4 881.0 881.6 882.2 882.8 883.4 884.0	M8	8 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
129 137 153 182 197 226 242 250	869.4 871.0 874.2 880.0 883.0 888.8 892.0 893.6	BT8	8 carrier TX band bottom and top constellation

Appendix 1

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:

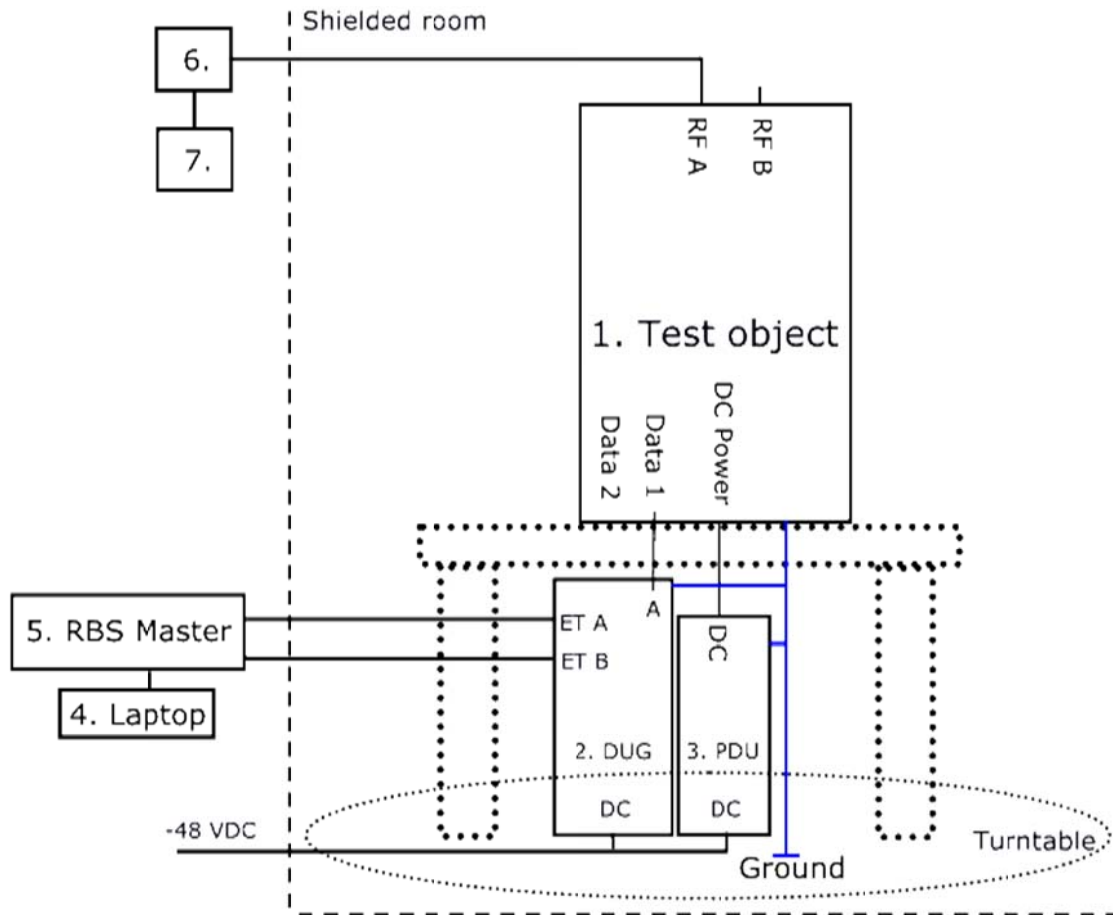
1.	RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827123129 working software PIS CXP 901 7316/2, rev. R51MT with FCC ID TA8AKRC161320-1 and IC: 287AB-AS1613201
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Functional test equipment:

2.	DUG 20 01 KDU 137 569/1, R3A, C825900510
3.	PDU 02 01, BMG 980336/4, R2A, s/n: BJ31528316
4.	RBS 6201 cabinet, BAMS – 1000778792
5.	Attenuator
6.	SP Test Instrumentation according to measurement equipment list
7.	RBS Master, 2E LPY 107 1007/3, BAMS – 1001195171
8.	Laptop HP EliteBook 8540 w, BAMS – 1001052044

Appendix 1

Test set-up radiated measurements GSM



Test object:

1.	RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827123103 working software PIS CXP 901 7316/2, rev. R51MT with FCC ID TA8AKRC161320-1 and IC: 287AB-AS1613201
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Functional test equipment:

2.	DUG 20 01 KDU 137 569/1, rev. R2B, s/n: C826250351, hosted in SUP 6601, 1/BFL 901 009/4, rev. R1E, s/n: BR88258668
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.	Laptop, EliteBook 8560w, BAMS – 1001236856
5.	RBS master 2E, LPY 107 1007/3, BAMS – 1000735211
6.	Attenuator
7.	ESI 26, SP number: 503 292, for supervision purpose only

Appendix 1

Interfaces:

Type of port:

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

RBS software:

Software	Revision
DXPR73FZ	R50L

Appendix 1

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2014-01	503 881
R&S ESU 26	2014-05	901 553
Control computer with R&S software EMC32 version 8.52.0	-	503 899
R&S FSQ 40	2014-03	504 143
Rohde & Schwarz signal analyzer FSW43	2014-03	902 073
High pass filter	2014-07	901 501
NRVS Power meter	2013-09	503 684
High pass filter	2014-07	901 502
High pass filter	2014-07	504 199
High pass filter	2013-09	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	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	--	503 360
Multimeter Fluke 87	2014-08	502 190

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 2013-08-19.

Manufacturer's representative

Christer Gustavsson

Test engineers

Tomas Lennhager, Tomas Isbring, Kexin Chen, Jörgen Wassholm and Hyder Khalaf, SP

Test participant

Gunnar Svensson, Ericsson AB (partially)

Appendix 2

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

Date	Temperature	Humidity
2013-08-20	22 °C ± 3 °C	46% ± 5 %
2013-08-21	23 °C ± 3 °C	46% ± 5 %
2013-08-22	24 °C ± 3 °C	47% ± 5 %
2013-08-23	23 °C ± 3 °C	47% ± 5 %
2013-08-26	23 °C ± 3 °C	48% ± 5 %

Test set-up and procedure

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

Measurement equipment	SP number
R&S FSQ	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.

Tested configuration BW and frequency	Port RF A [RMS dBm/ dB PAR]
GMSK, B	47.78/ 0.63
GMSK, M	47.80/ 0.63
GMSK, T	47.75/ 0.65
8PSK, M	47.76/ 3.49
AQPSK, M	47.73/ 3.70
16QAM, M	47.68/ 4.76
32QAM, M	47.63/ 4.81

Note: The highest single carrier PAR measured was 4.81 dB (0.1%).

Appendix 2

Multi carrier
2 carrier configuration.

Tested configuration Modulation and frequency	Port RF A [RMS dBm/ dB PAR]	Rated total nominal power RMS dBm
GMSK, B2	49.37/ 3.41	50.0
GMSK, M2	49.60/ 3.41	50.0
GMSK, T2	49.22/ 3.44	50.0
8PSK, M2	49.60/ 6.01	50.0
16QAM, M2	48.66/ 7.26	48.9
32QAM, M2	47.94/ 7.33	48.5
AQPSK, M2	49.56/ 6.44	50.0

Multi carrier
8 carrier configuration.

Tested configuration Modulation and frequency	Port RF A [RMS dBm/ dB PAR]	Rated total nominal power RMS dBm
GMSK, BT8	47.75/ 7.81	48.4
GMSK, M8	48.48/ 7.36	48.4
8PSK, M8	45.60/ 9.13	45.1
16QAM, M8	44.50/ 10.53	43.7
32QAM, M8	44.03/ 10.55	43.3
AQPSK, M8	45.22/ 9.01	45.0

Note: The highest single carrier PAR measured was 10.55 dB (0.1%). For multi-carrier constellations the measured “PAR” is informative only as to the definition of Peak to Average Ratio per carrier.

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

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
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Appendix 3

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

Date	Temperature	Humidity
2013-08-20	22 °C ± 3 °C	46% ± 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 FSQ 40	504 143
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

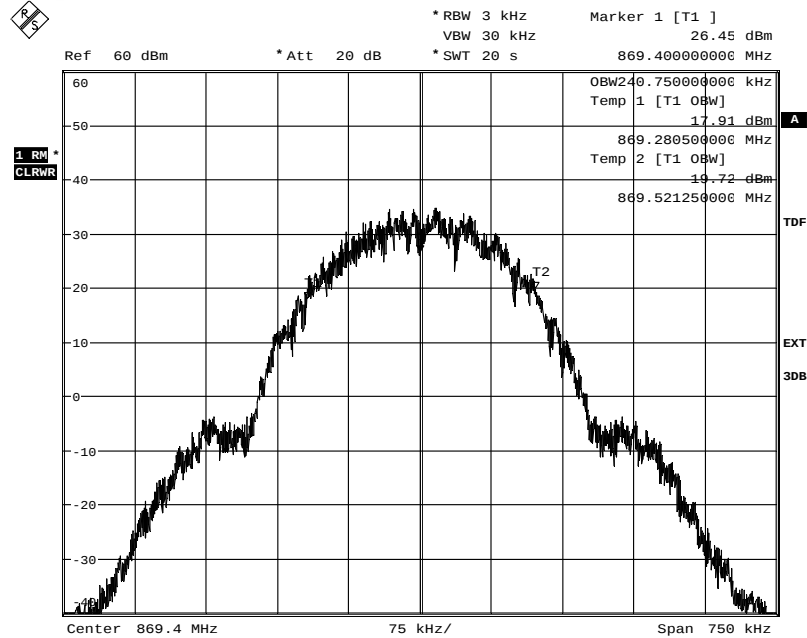
Results

Single carrier

Diagram	Modulation	Tested frequency	Occupied BW (99%) [KHz]
1	GMSK	B	241
2	GMSK	M	241
3	AQPSK	M	238
4	8 PSK	M	238
5	16 QAM	M	241
6	32 QAM	M	240
7	GMSK	T	241

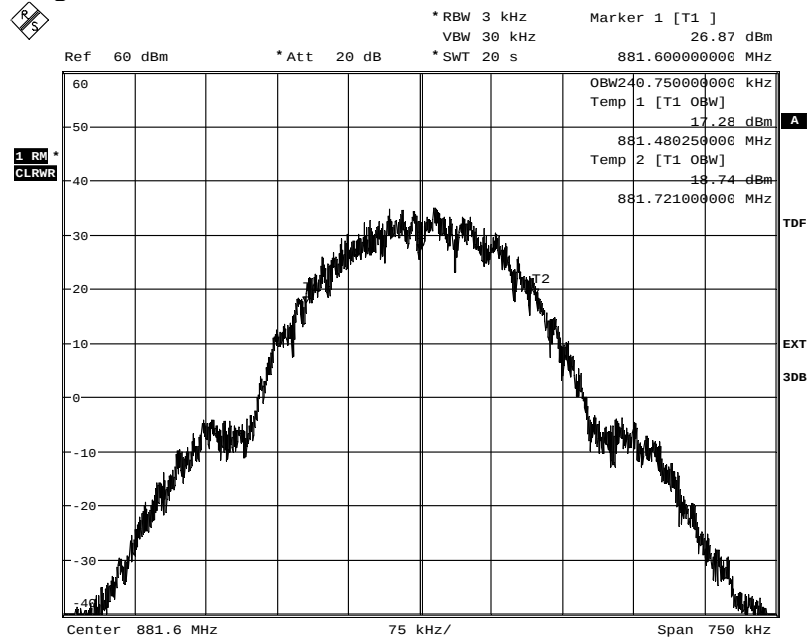
Appendix 3

Diagram 1:



Date: 20.AUG.2013 10:40:34

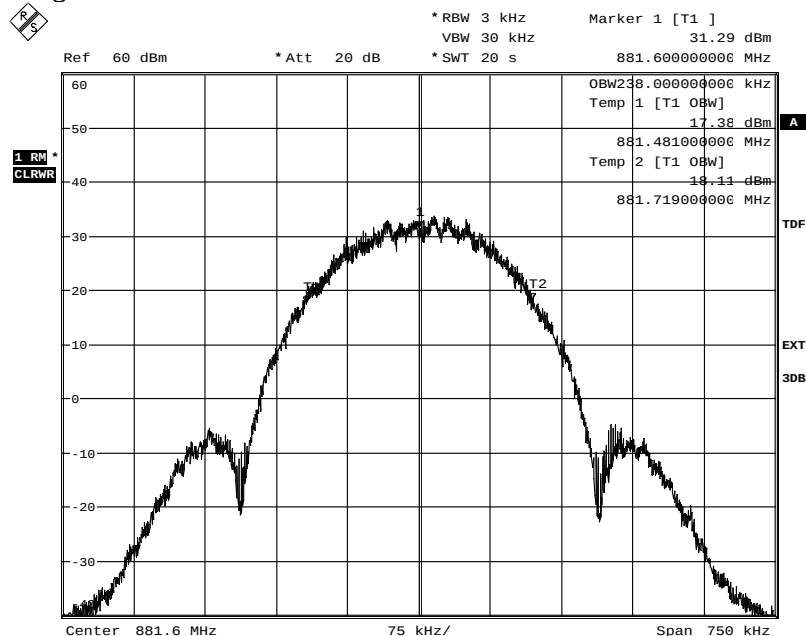
Diagram 2:



Date: 20.AUG.2013 13:28:05

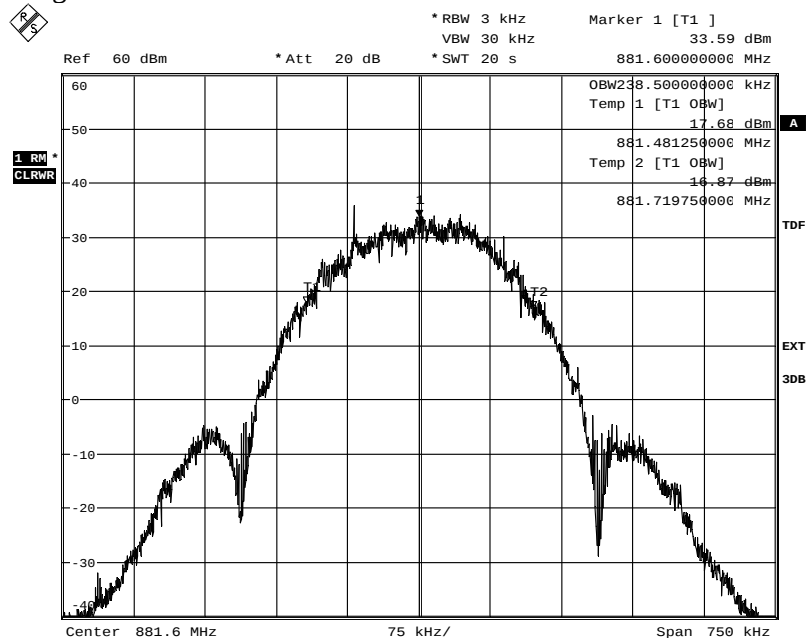
Appendix 3

Diagram 3:



Date: 20.AUG.2013 14:01:15

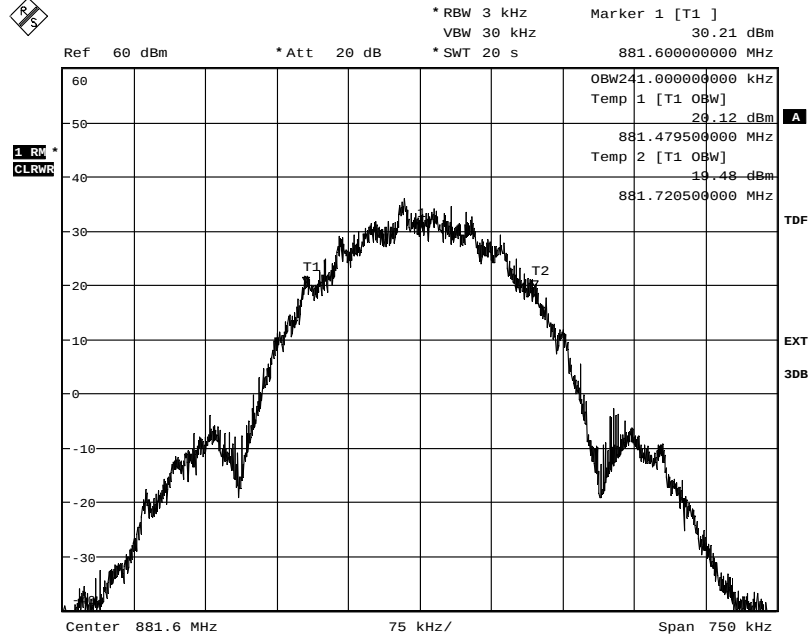
Diagram 4:



Date: 20.AUG.2013 14:07:18

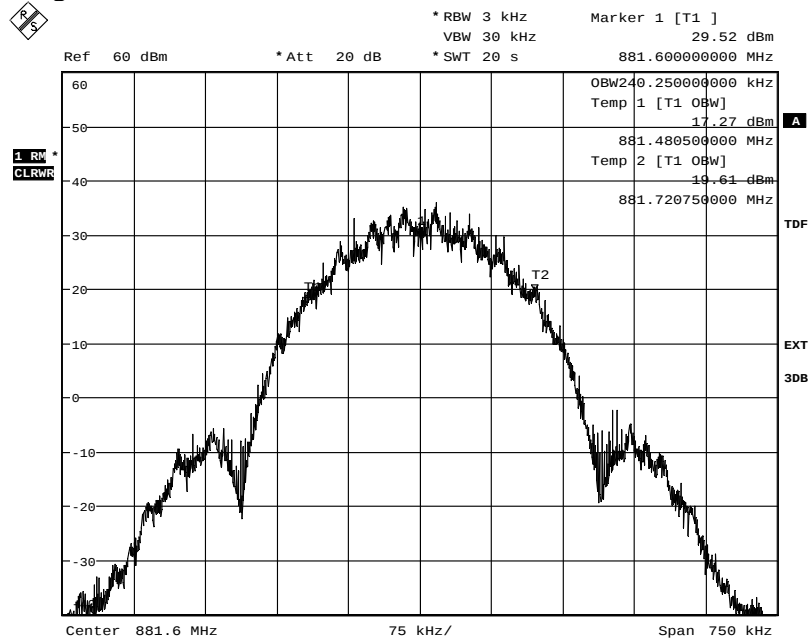
Appendix 3

Diagram 5:



Date: 20.AUG.2013 14:31:00

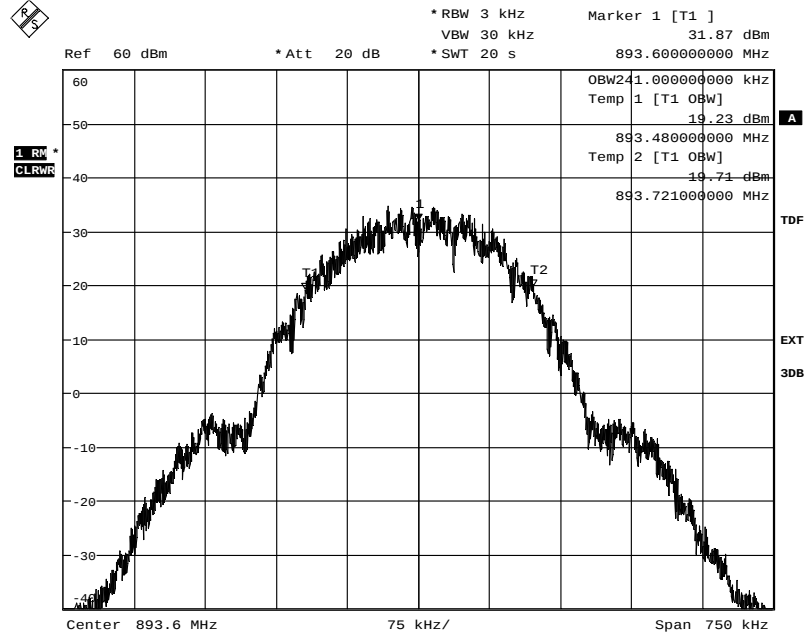
Diagram 6:



Date: 20.AUG.2013 14:37:58

Appendix 3

Diagram 7:



Date: 20.AUG.2013 16:02:04

Appendix 4

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

Date	Temperature	Humidity
2013-08-20	23 °C ± 3 °C	46% ± 5 %
2013-08-27	23 °C ± 3 °C	48% ± 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 FSQ 40	504 143
RF attenuator	901 508
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Appendix 4

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

Multi carrier

Diagram	Modulation	Tested frequency	Tested Port
5 a-b	GMSK	B2	RFA
6 a-b	GMSK	T2	RFA

The diagrams are shown on the following pages.

Limits

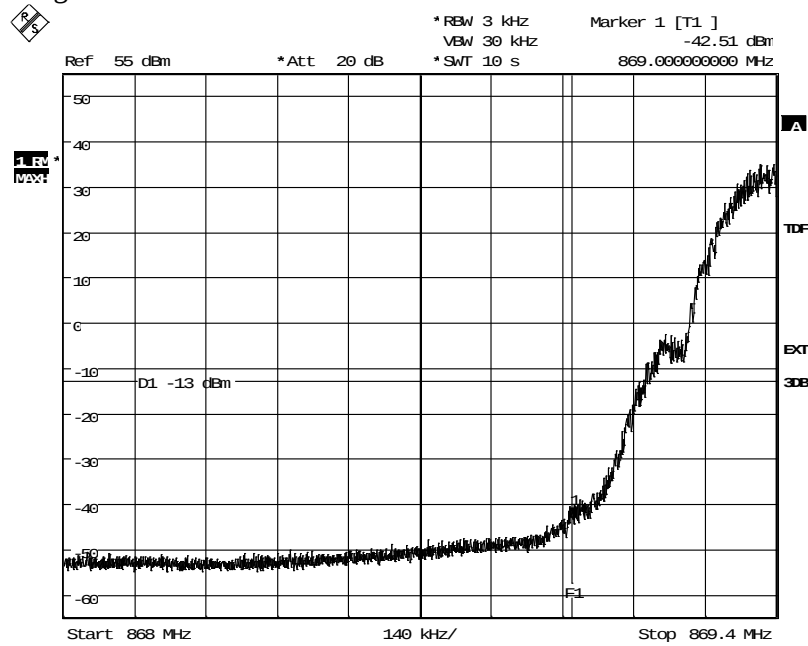
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 100 kHz RBW.

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
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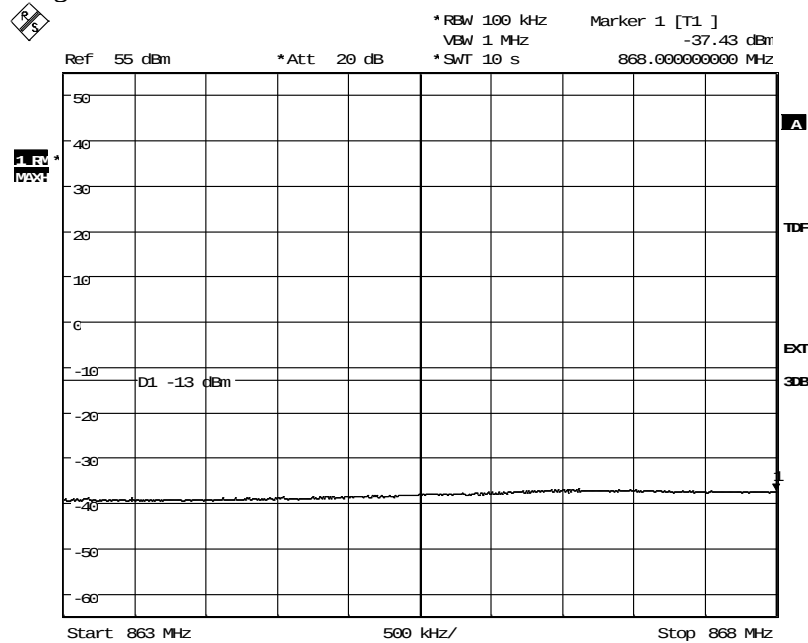
Appendix 4

Diagram 1 a:



Date: 20.AUG.2013 11:05:55

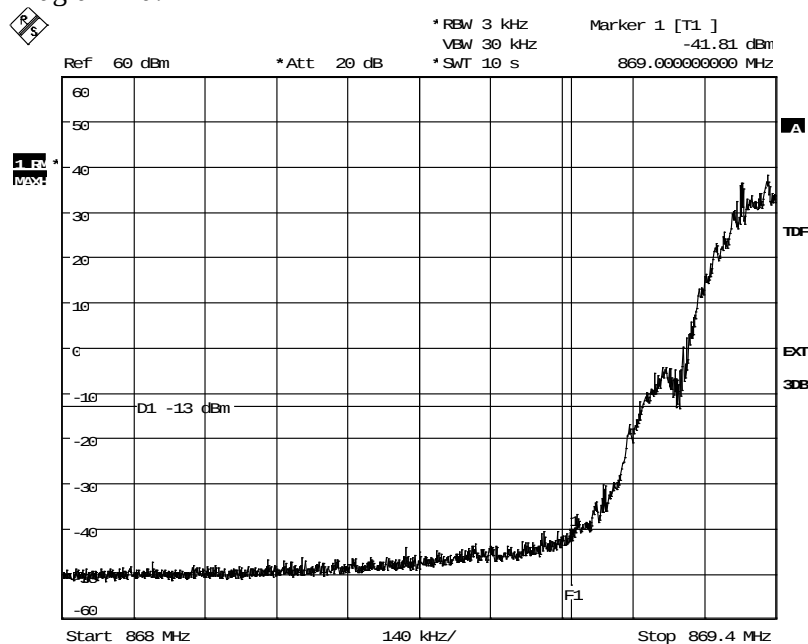
Diagram 1 b:



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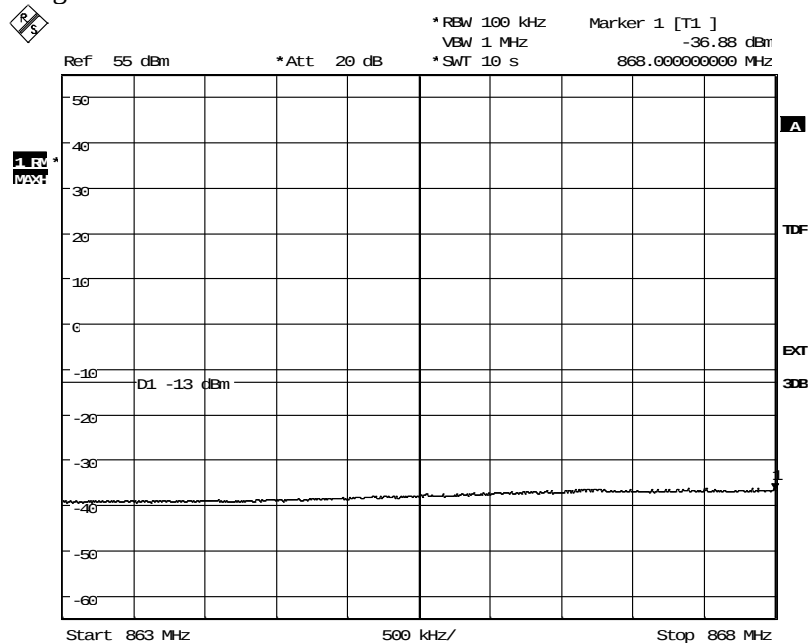
Appendix 4

Diagram 2 a:



Date: 20.AUG.2013 12:30:05

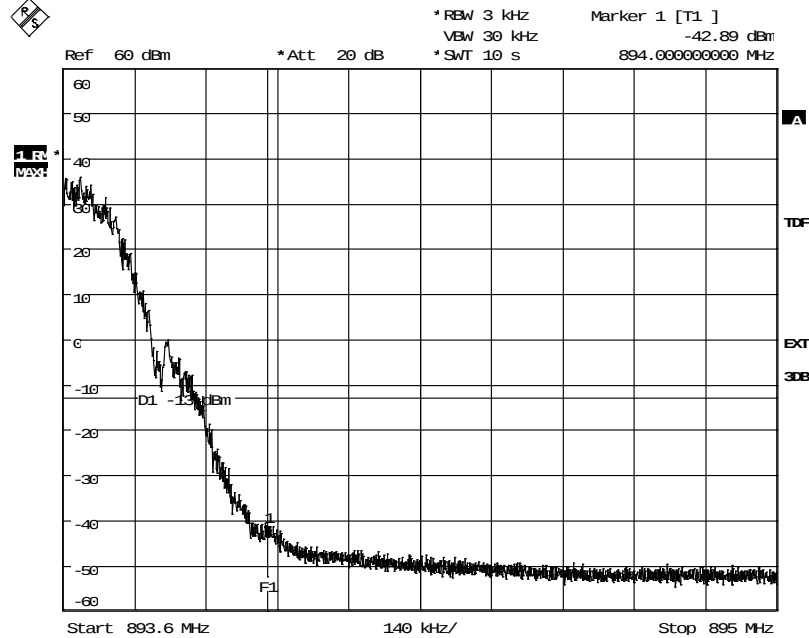
Diagram 2 b:



Date: 20.AUG.2013 12:32:24

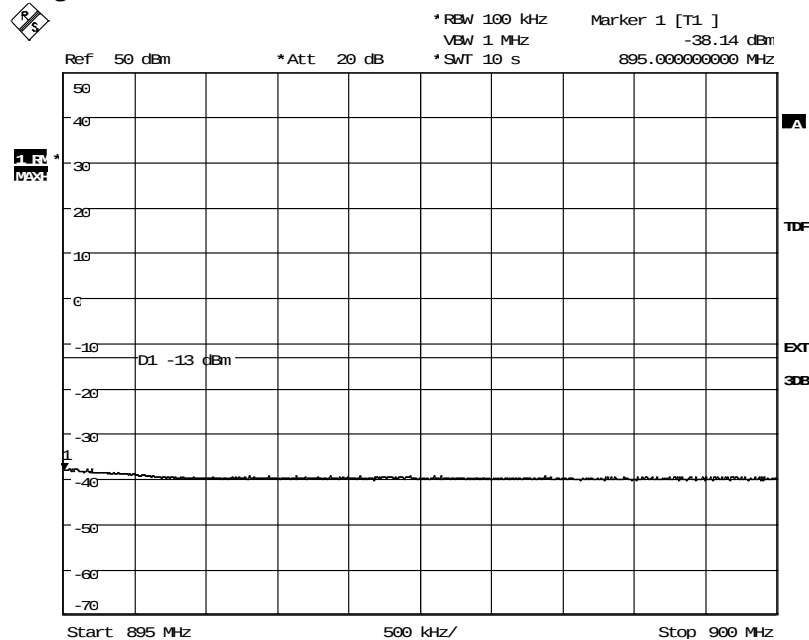
Appendix 4

Diagram 3 a:



Date: 20.AUG.2013 16:20:29

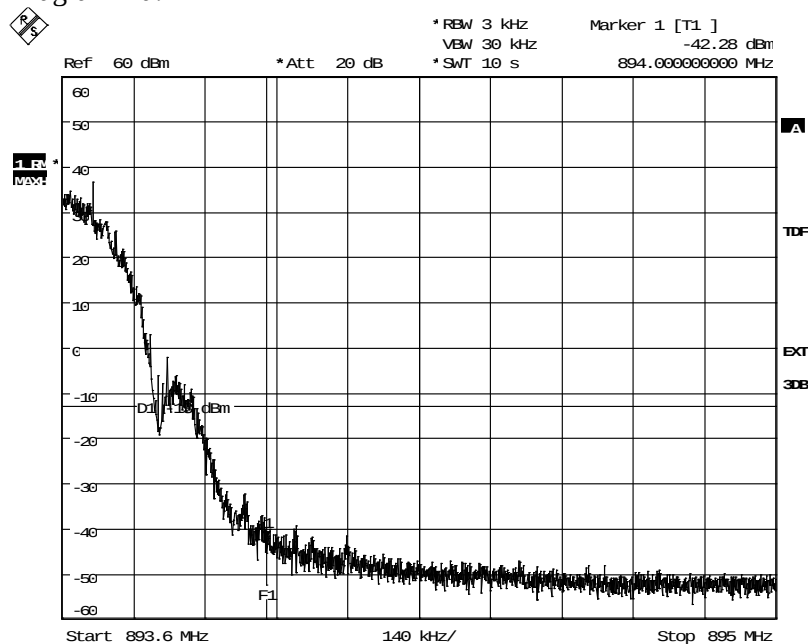
Diagram 3 b:



Date: 20.AUG.2013 15:56:00

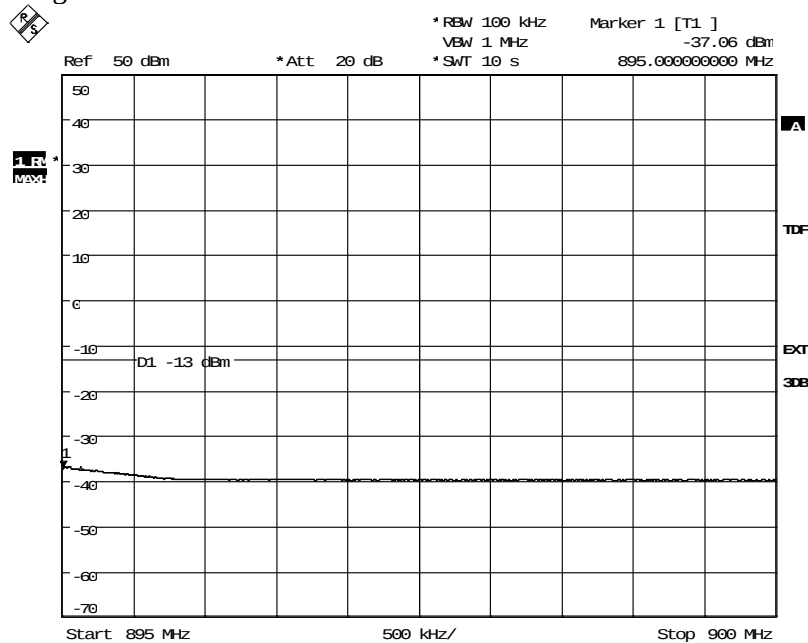
Appendix 4

Diagram 4 a:



Date: 20.AUG.2013 16:13:34

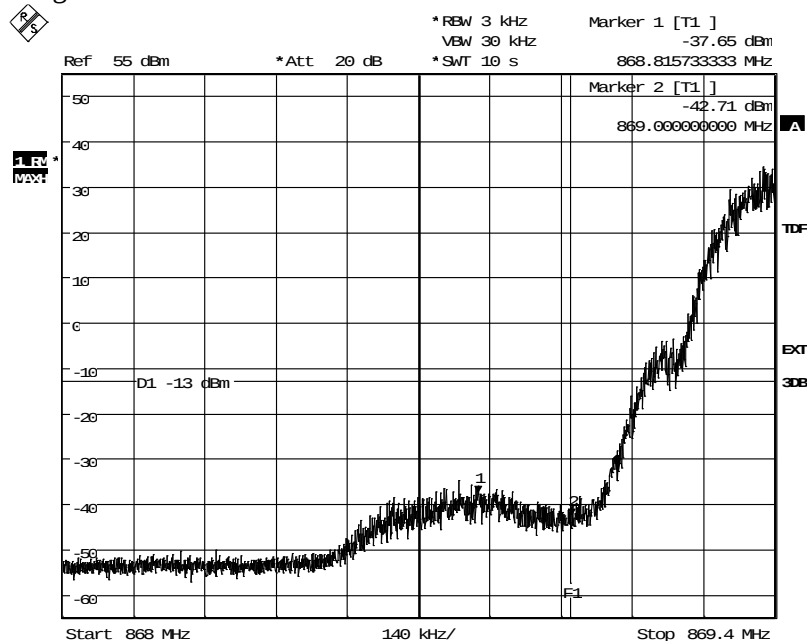
Diagram 4 b:



Date: 20.AUG.2013 16:17:22

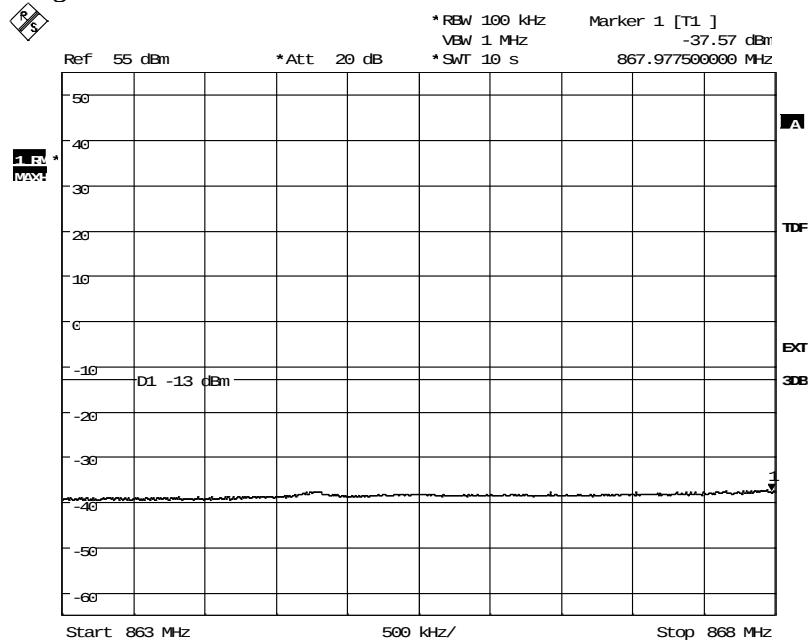
Appendix 4

Diagram 5 a:



Date: 27.AUG.2013 10:49:06

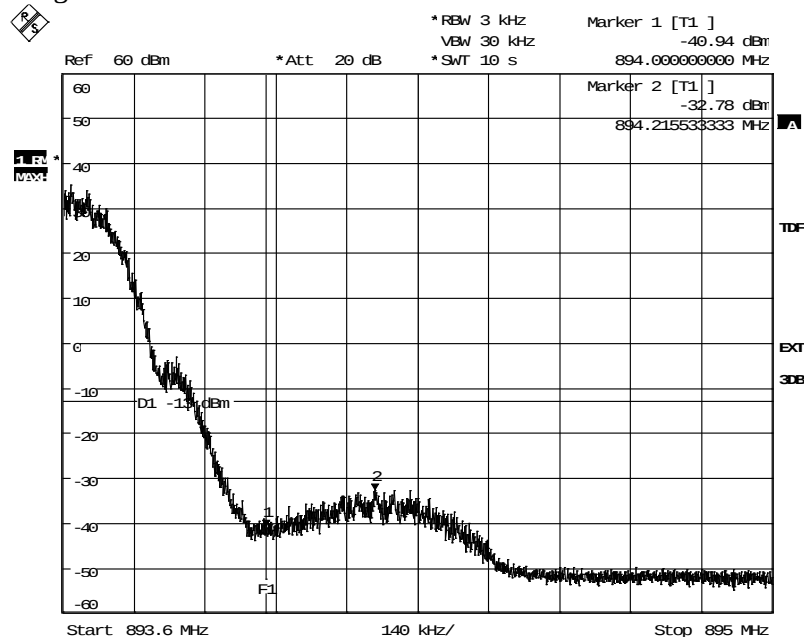
Diagram 5 b:



Date: 27.AUG.2013 10:53:21

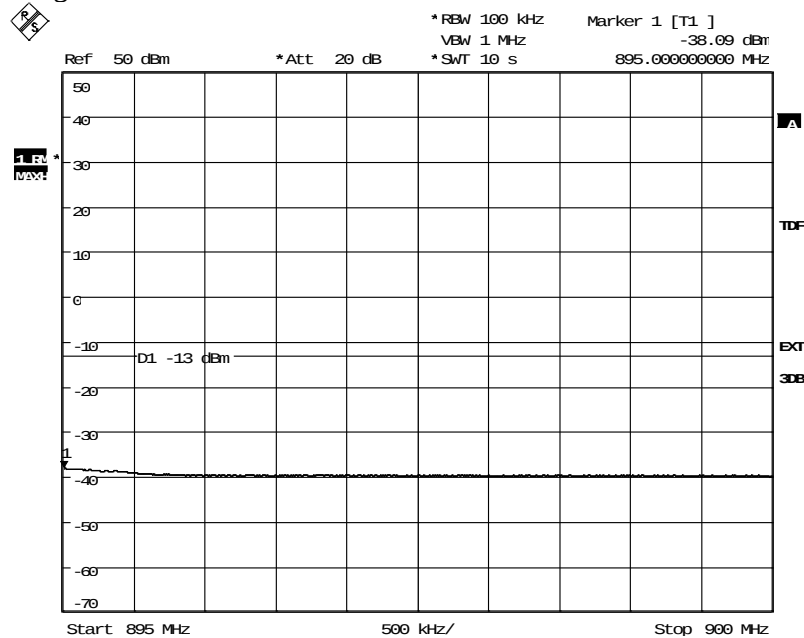
Appendix 4

Diagram 6 a:



Date: 27.AUG.2013 10:57:12

Diagram 6 b:



Date: 27.AUG.2013 10:59:19

Appendix 5

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

Date	Temperature	Humidity
2013-08-20	22 °C ± 3 °C	46% ± 5 %
2013-08-21	24 °C ± 3 °C	49% ± 5 %
2013-08-22	23 °C ± 3 °C	46% ± 5 %
2013-08-23	24 °C ± 3 °C	47% ± 5 %
2013-08-26	23 °C ± 3 °C	47% ± 5 %
2013-08-27	23 °C ± 3 °C	48% ± 5 %
2013-09-11	23 °C ± 3 °C	52% ± 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 FSQ 40	504 143
RF attenuator	901 508
High pass filter	901 501
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Appendix 5

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+c	GMSK	$B_{im\ 1}$	RFA
6 a+b+c	GMSK	$B_{im\ 2}$	RFA
7 a+b+c	GMSK	$B_{im\ 3}$	RFA
8 a+b+c	GMSK	$T_{im\ 1}$	RFA
9 a+b+c	GMSK	$T_{im\ 2}$	RFA
10 a+b+c	GMSK	$T_{im\ 3}$	RFA
11 a+b+c	GMSK	BT8	RFA

Appendix 5

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

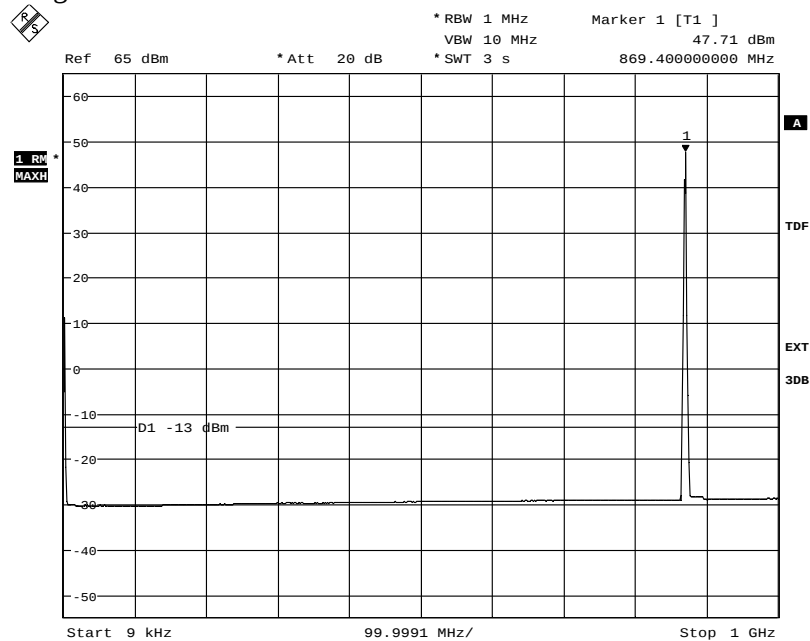
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 100 kHz RBW.

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
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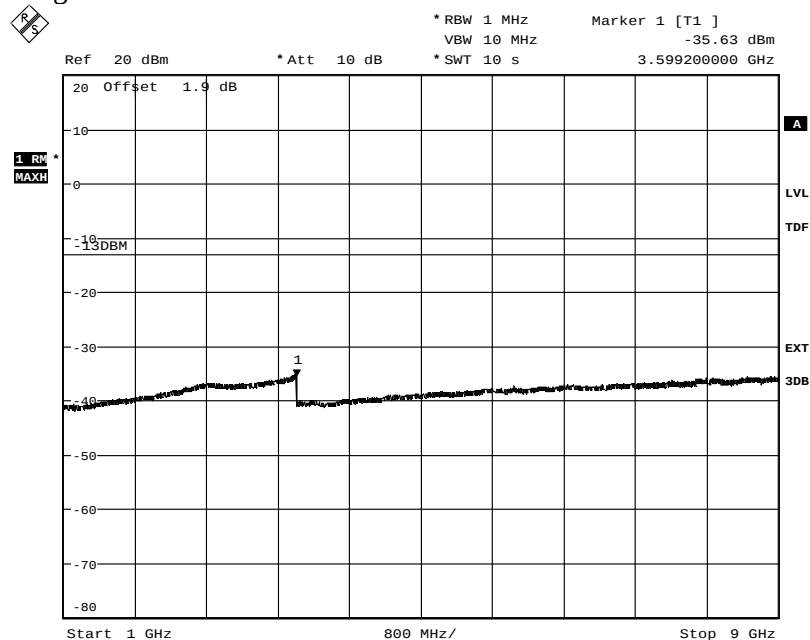
Appendix 5

Diagram 1a:



Date: 20.AUG.2013 12:16:43

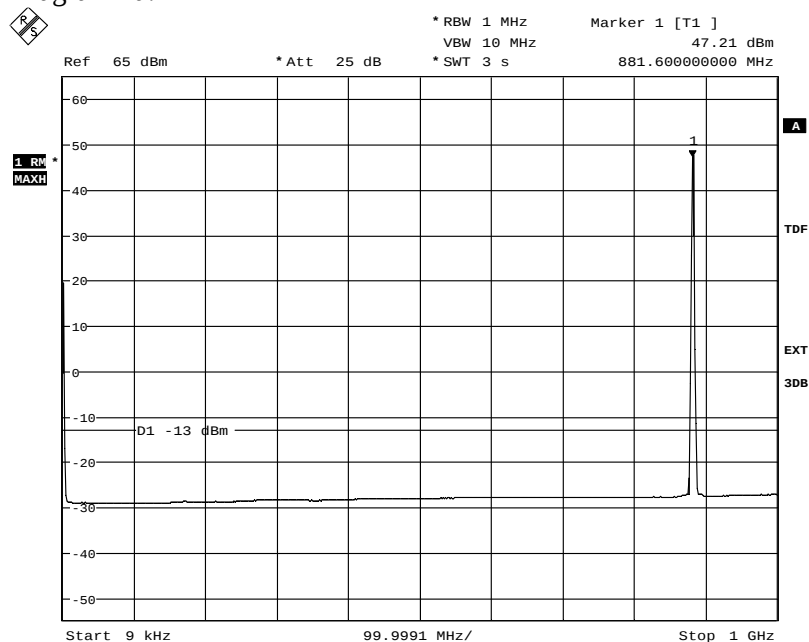
Diagram 1b:



Date: 20.AUG.2013 12:21:10

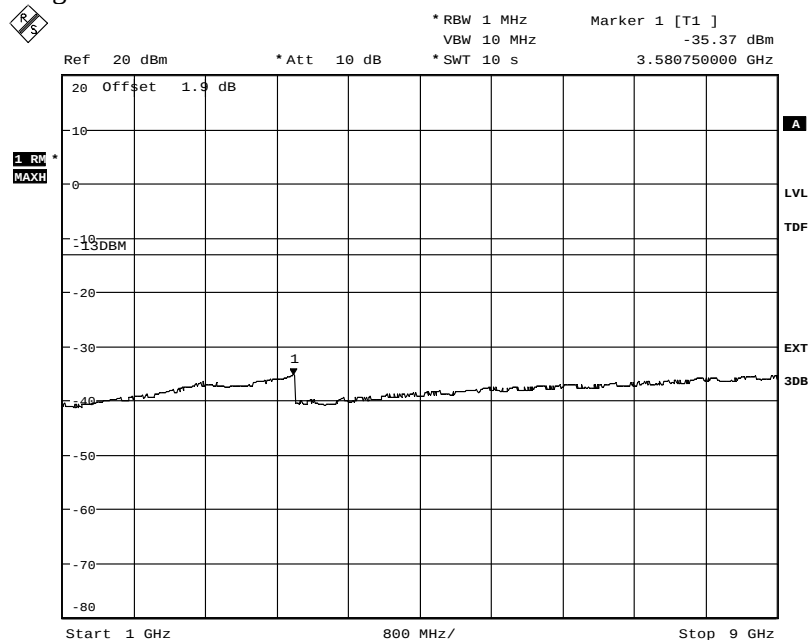
Appendix 5

Diagram 2a:



Date: 20.AUG.2013 13:04:01

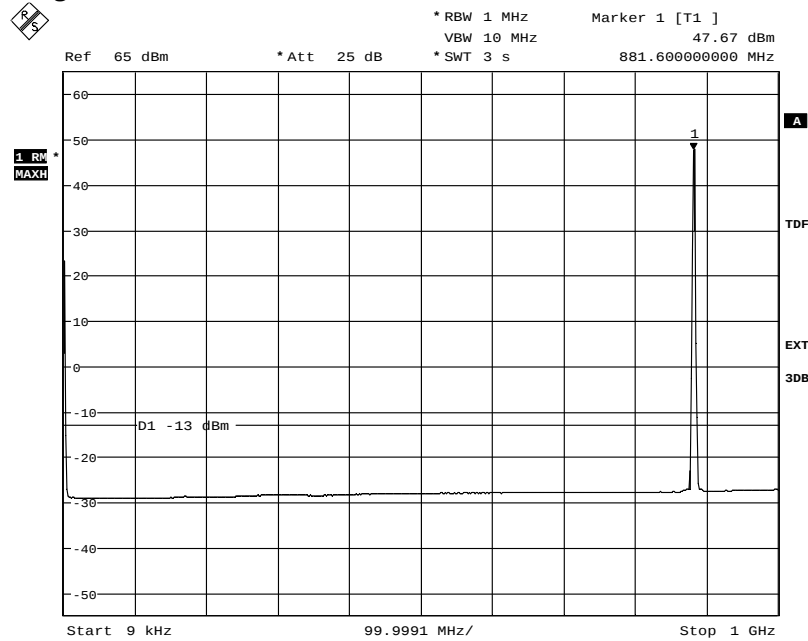
Diagram 2b:



Date: 20.AUG.2013 13:24:32

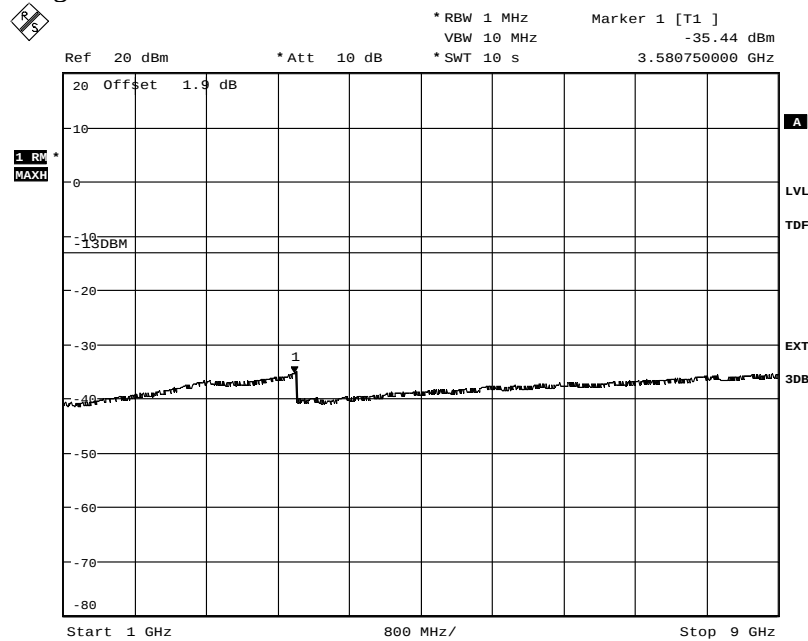
Appendix 5

Diagram 3a:



Date: 20.AUG.2013 14:54:56

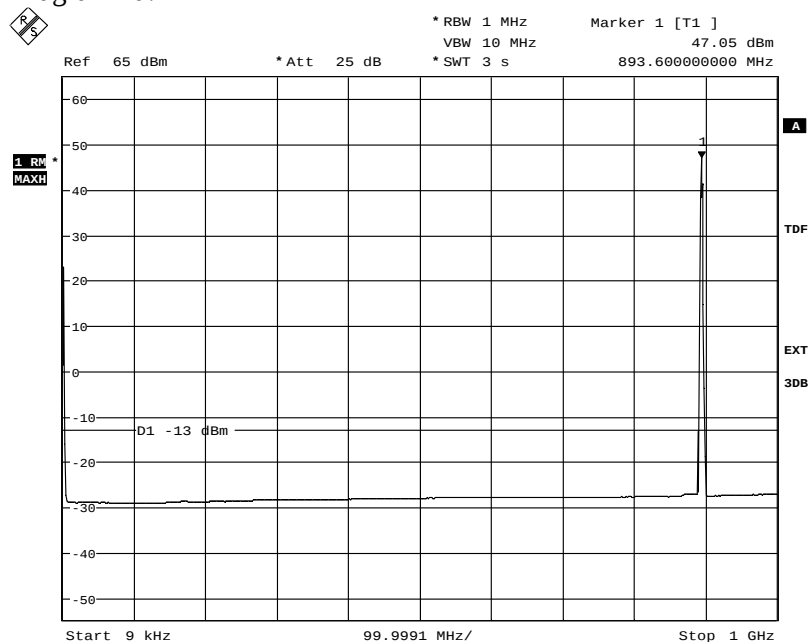
Diagram 3b:



Date: 20.AUG.2013 14:57:23

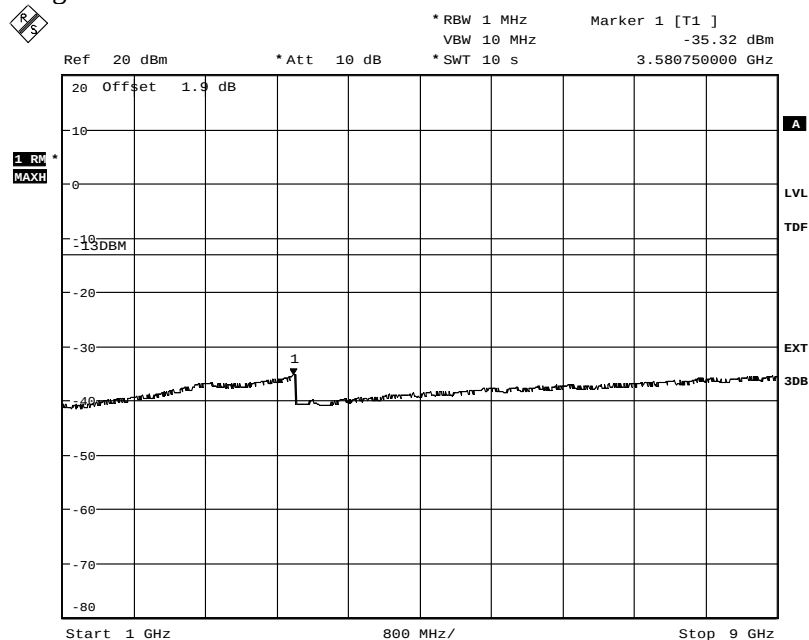
Appendix 5

Diagram 4a:



Date: 20.AUG.2013 15:09:08

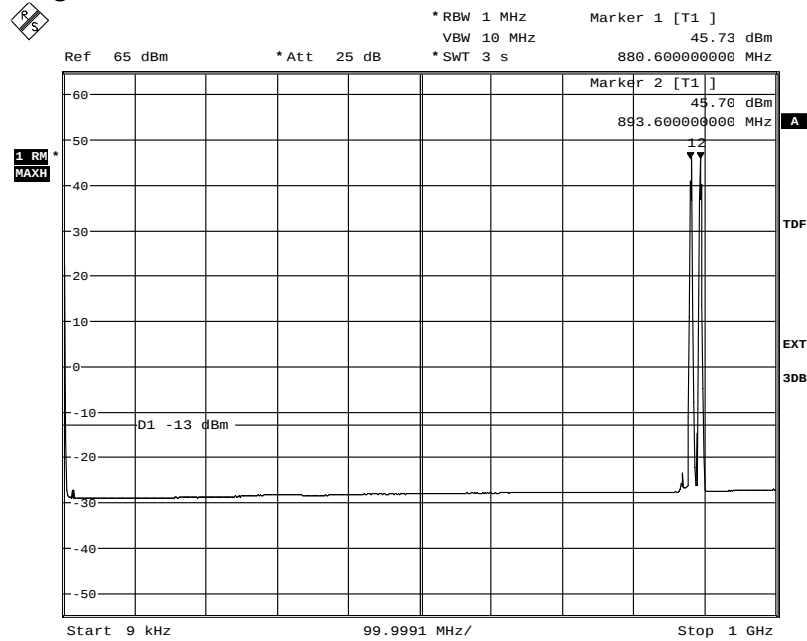
Diagram 4b:



Date: 20.AUG.2013 15:01:32

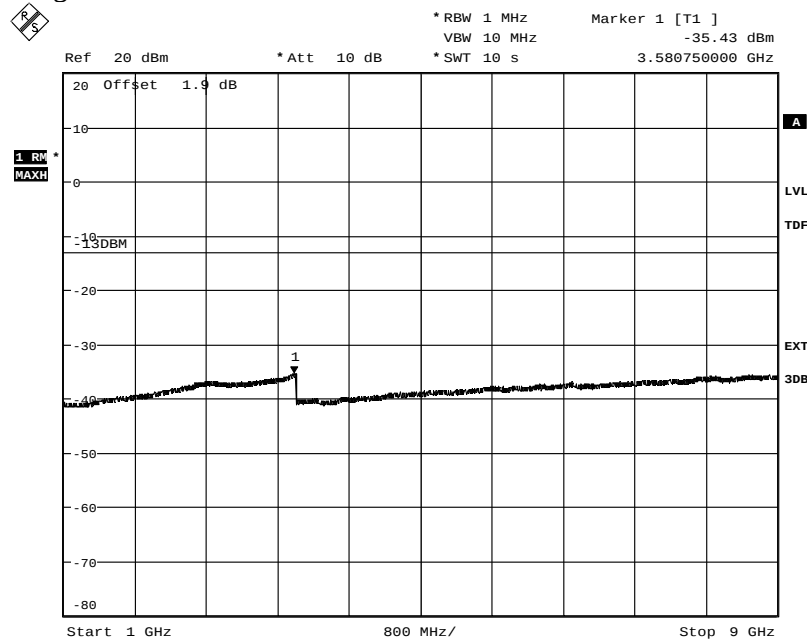
Appendix 5

Diagram 5a:



Date: 21.AUG.2013 12:46:10

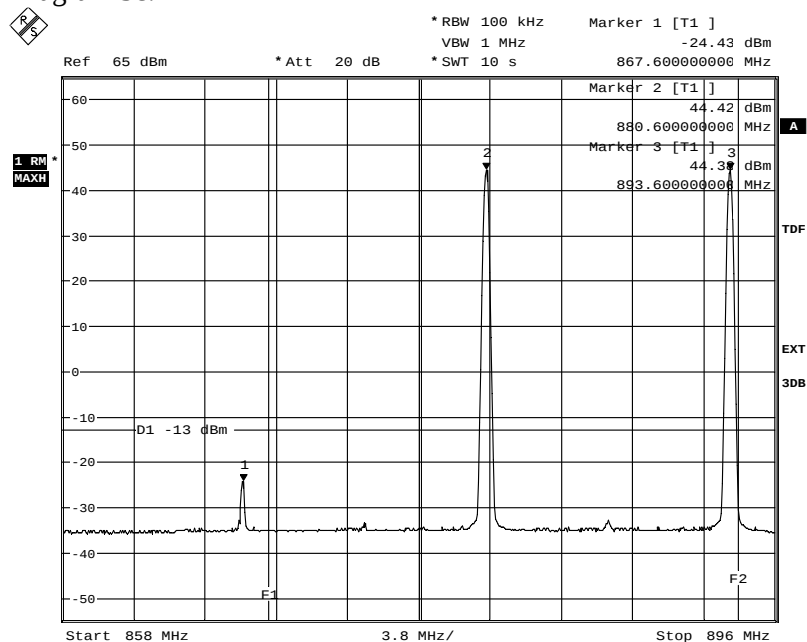
Diagram 5b:



Date: 27.AUG.2013 12:40:36

Appendix 5

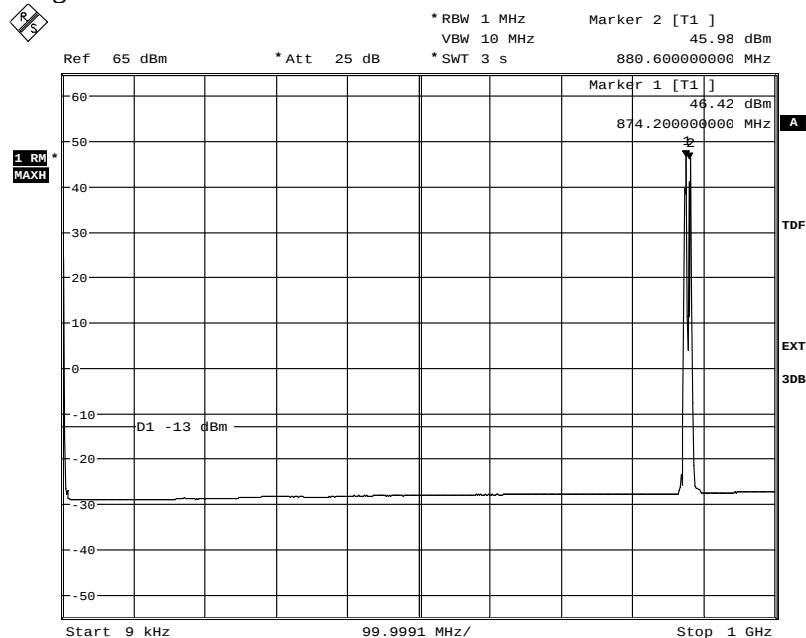
Diagram 5c:



Date: 21.AUG.2013 12:41:54

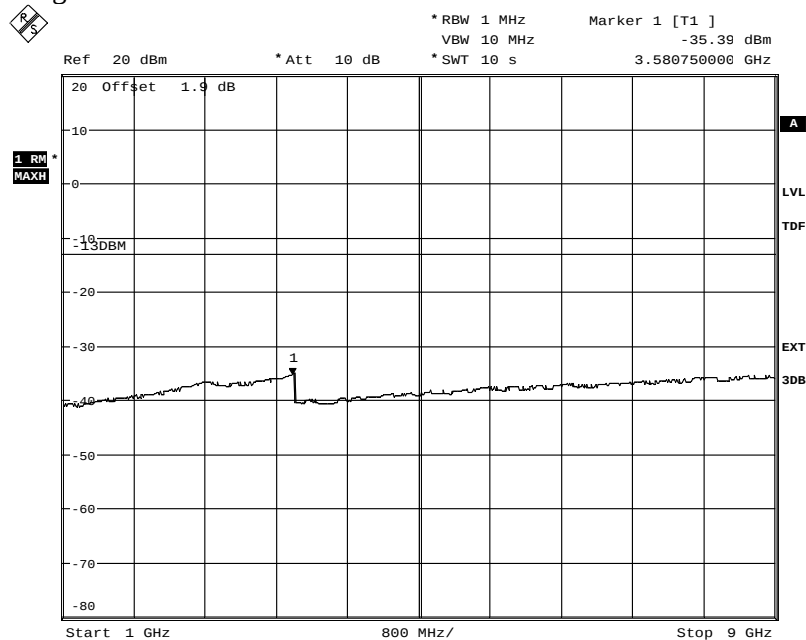
Appendix 5

Diagram 6a:



Date: 21.AUG.2013 13:59:39

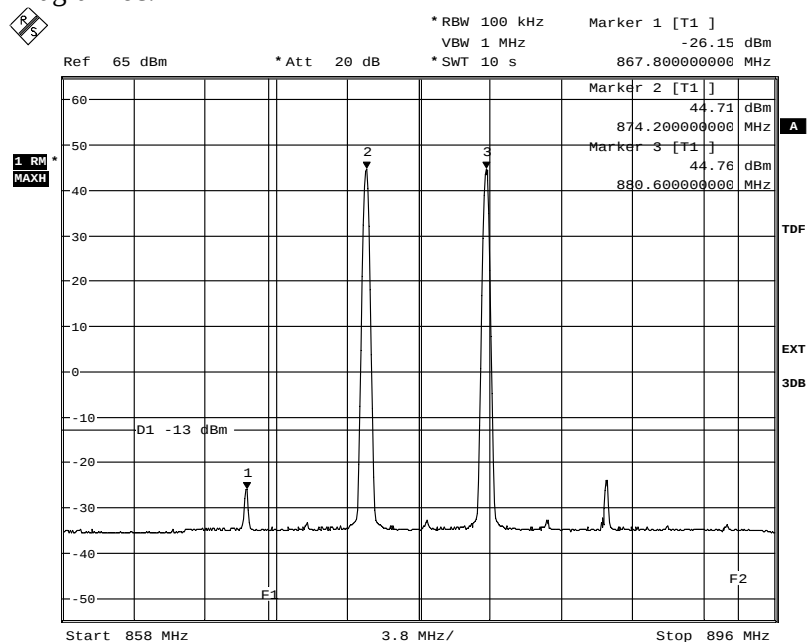
Diagram 6b:



Date: 21.AUG.2013 13:56:53

Appendix 5

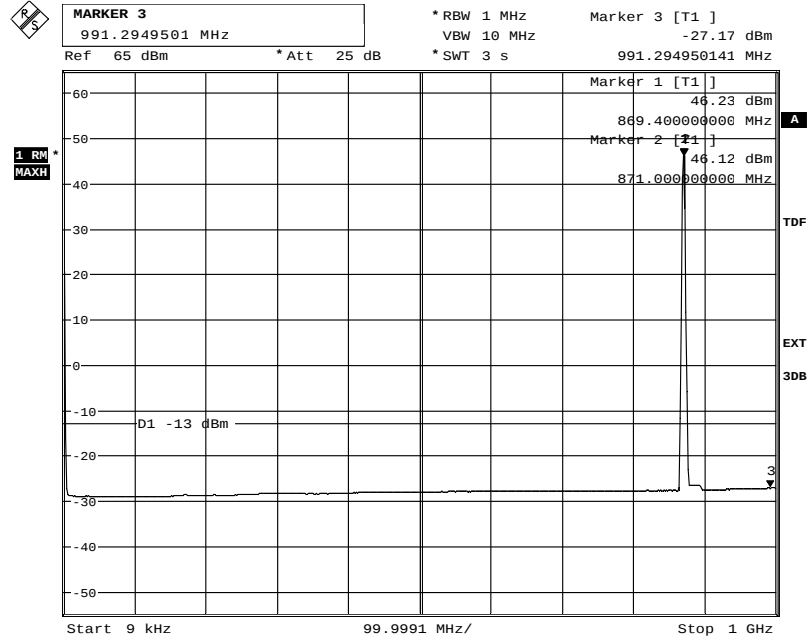
Diagram 6c:



Date: 21.AUG.2013 14:02:13

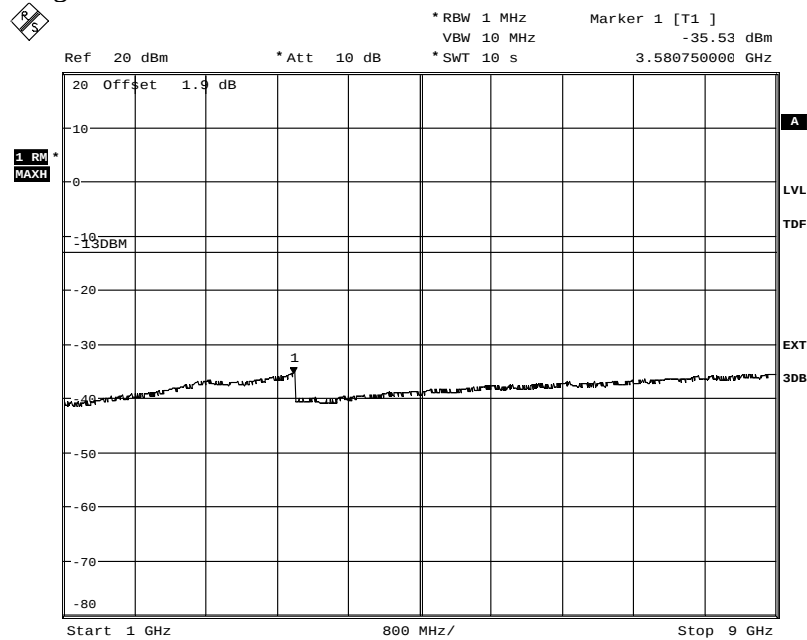
Appendix 5

Diagram 7a:



Date: 21.AUG.2013 14:13:58

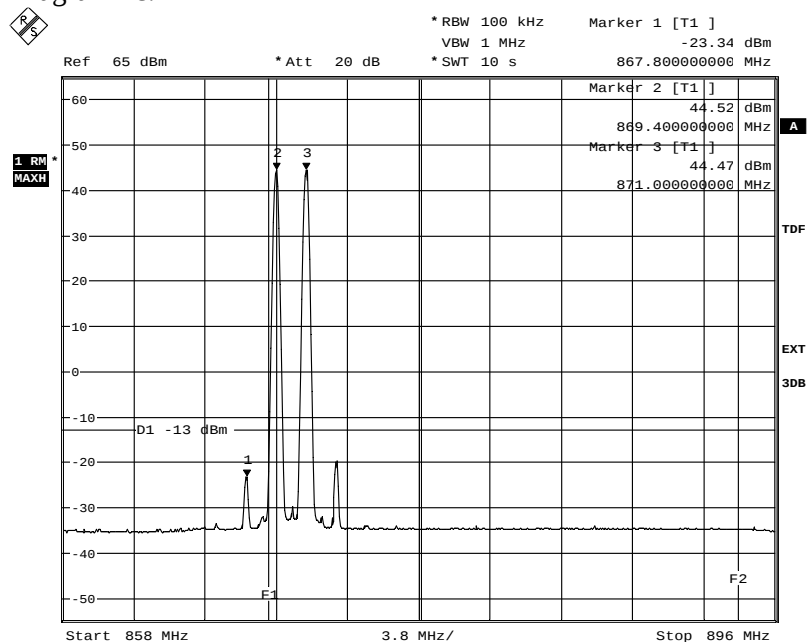
Diagram 7b:



Date: 21.AUG.2013 14:20:26

Appendix 5

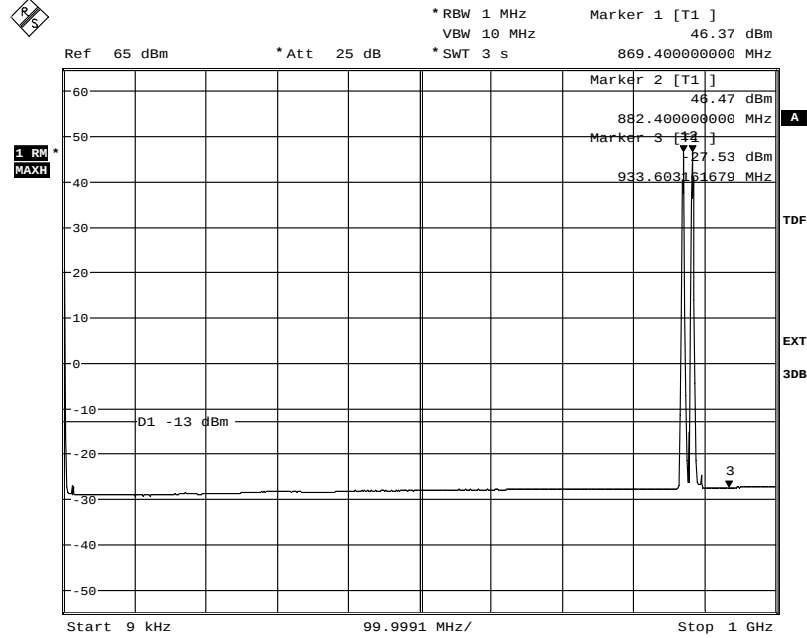
Diagram 7c:



Date: 21.AUG.2013 14:10:29

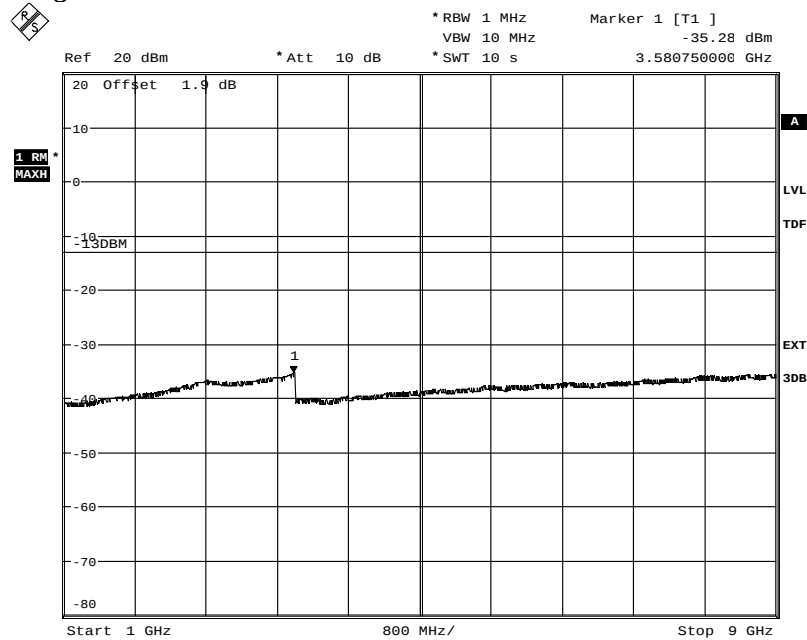
Appendix 5

Diagram 8a:



Date: 23.AUG.2013 09:14:50

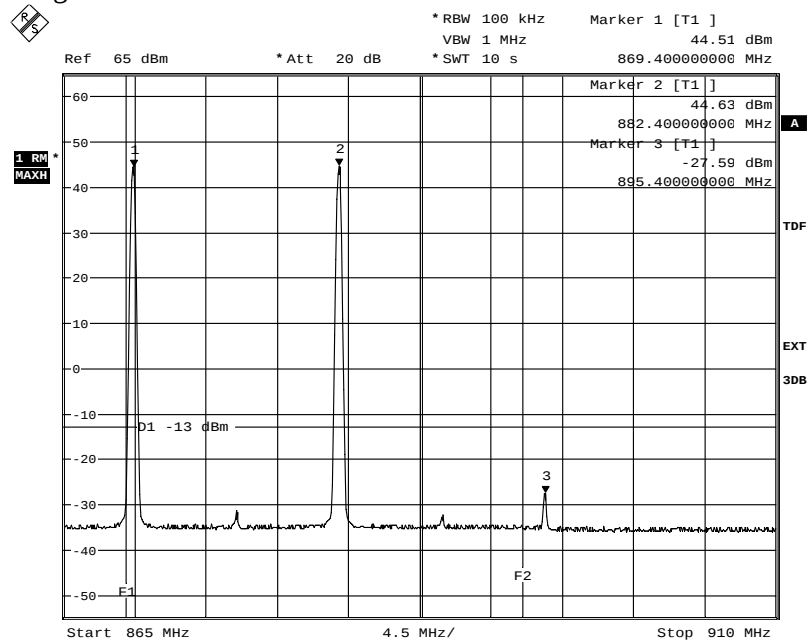
Diagram 8b:



Date: 23.AUG.2013 09:17:17

Appendix 5

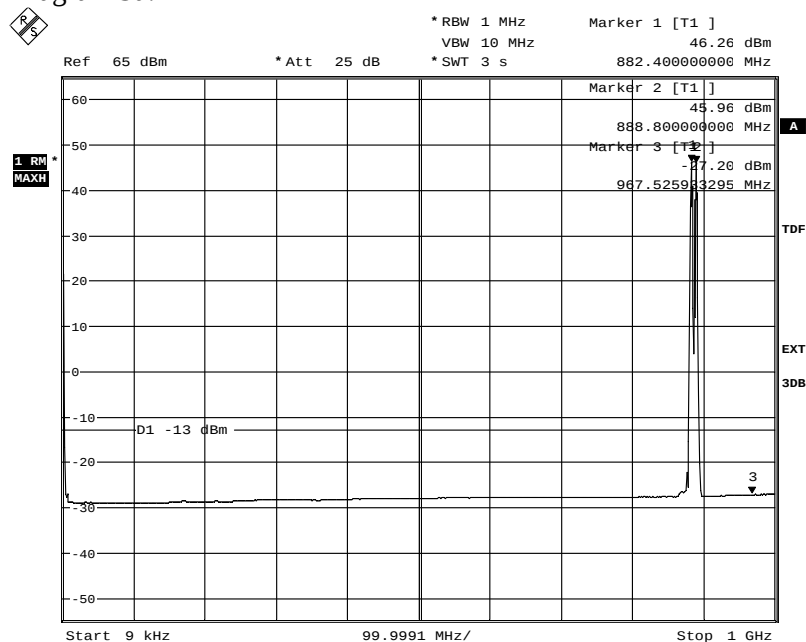
Diagram 8c:



Date: 23.AUG.2013 09:03:48

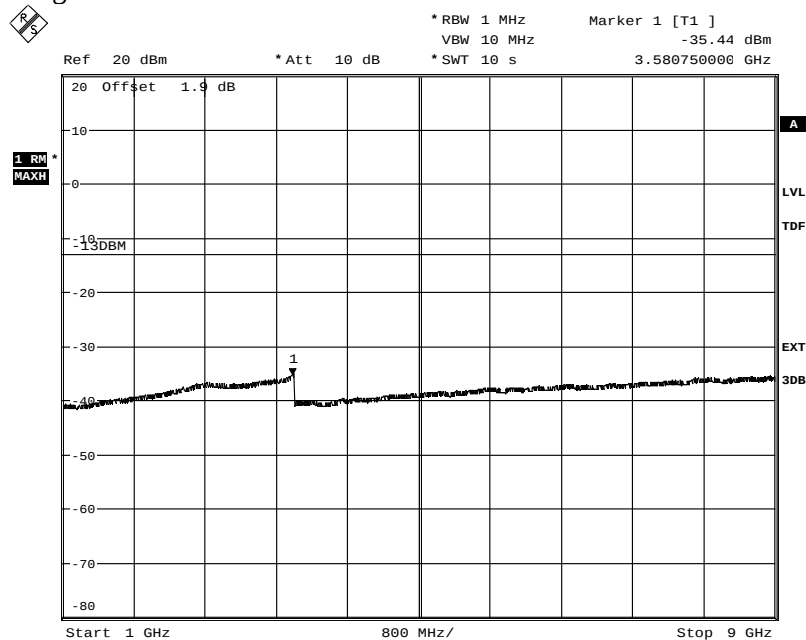
Appendix 5

Diagram 9a:



Date: 23.AUG.2013 13:58:12

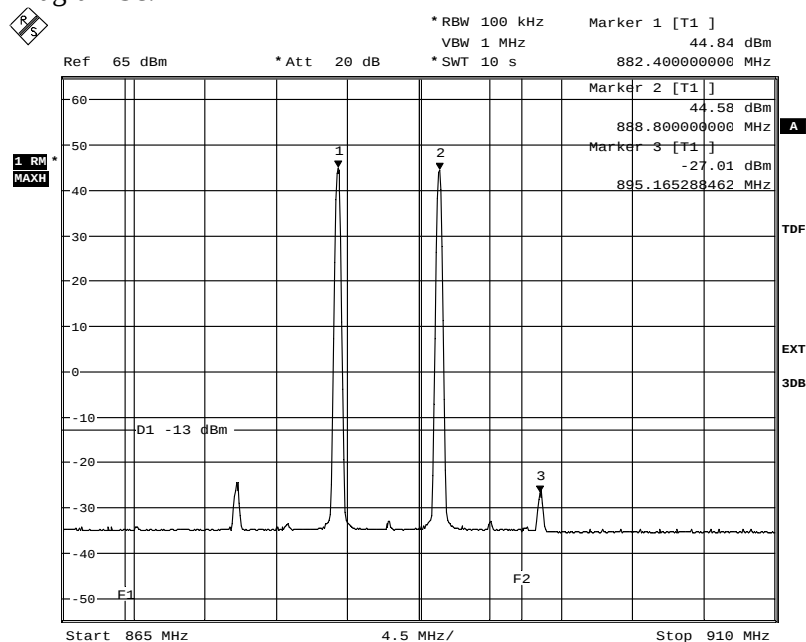
Diagram 9b:



Date: 23.AUG.2013 14:01:55

Appendix 5

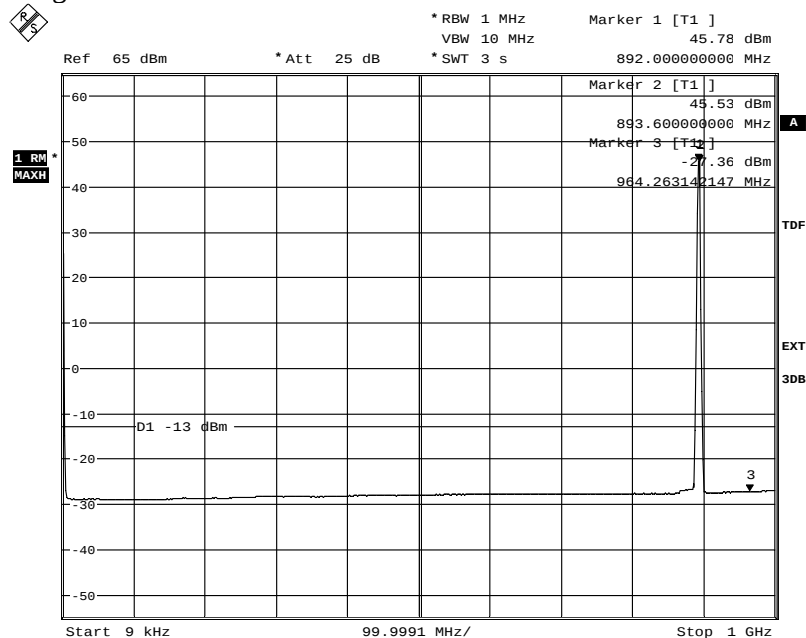
Diagram 9c:



Date: 23.AUG.2013 13:54:37

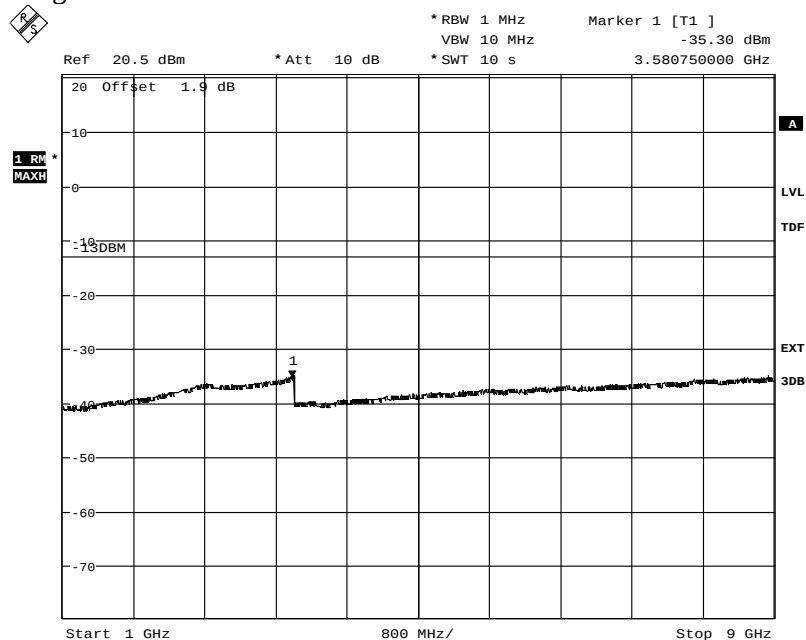
Appendix 5

Diagram 10a:



Date: 23.AUG.2013 15:33:20

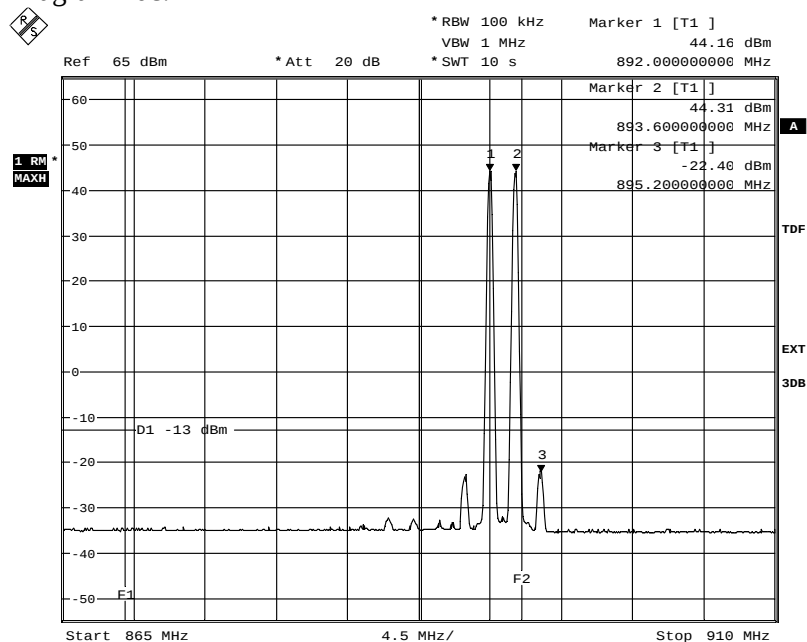
Diagram 10b:



Date: 11.SEP.2013 09:43:16

Appendix 5

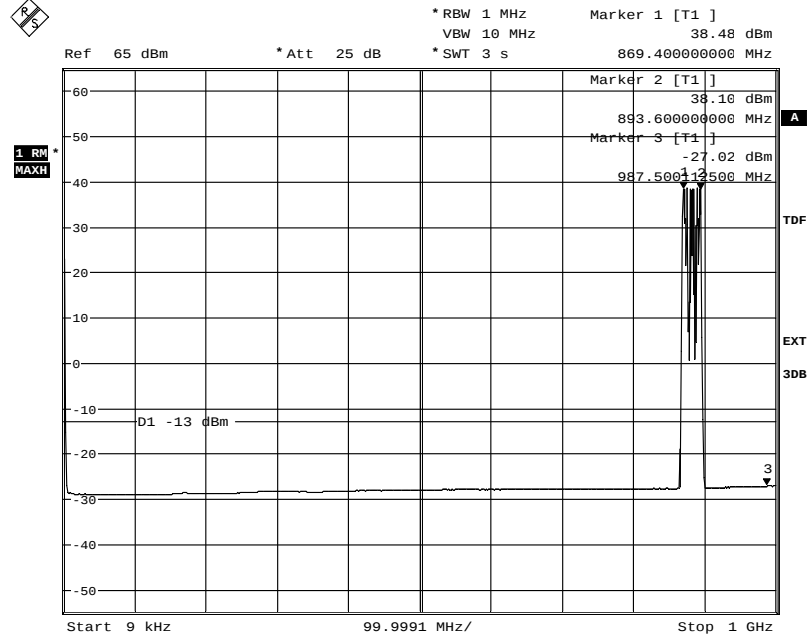
Diagram 10c:



Date: 23.AUG.2013 15:35:27

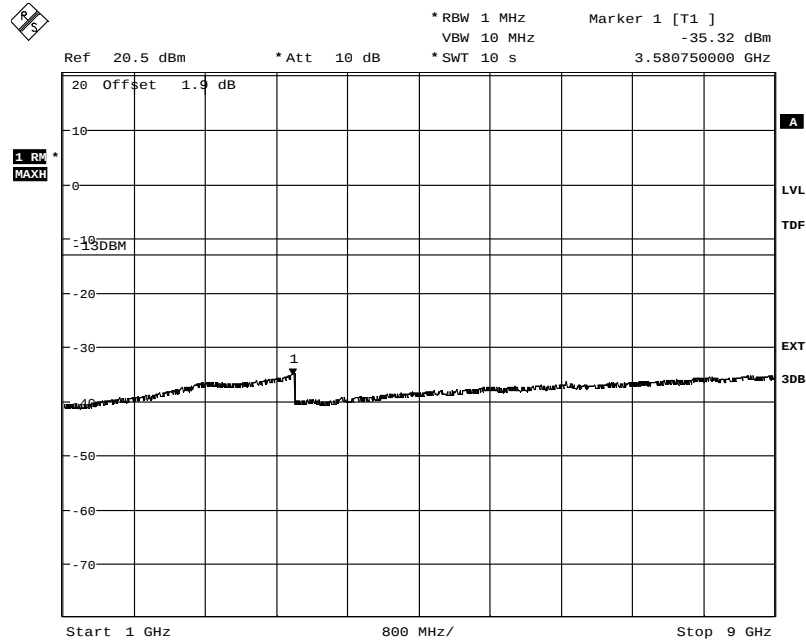
Appendix 5

Diagram 11a:



Date: 26.AUG.2013 13:19:03

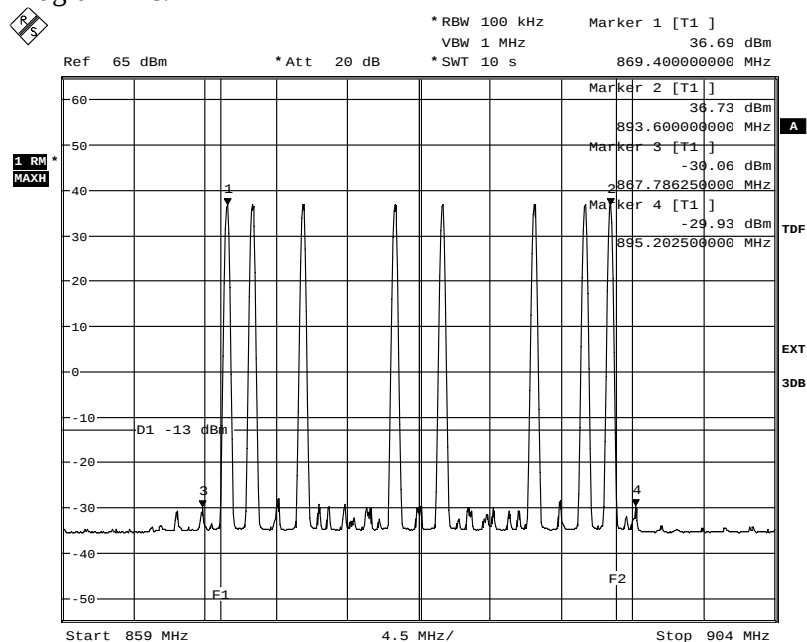
Diagram 11b:



Date: 11.SEP.2013 09:54:15

Appendix 5

Diagram 11c:



Date: 26.AUG.2013 13:22:04

Appendix 6

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

Date	Temperature	Humidity
2013-08-27	23°C ± 3°C	48 % ± 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

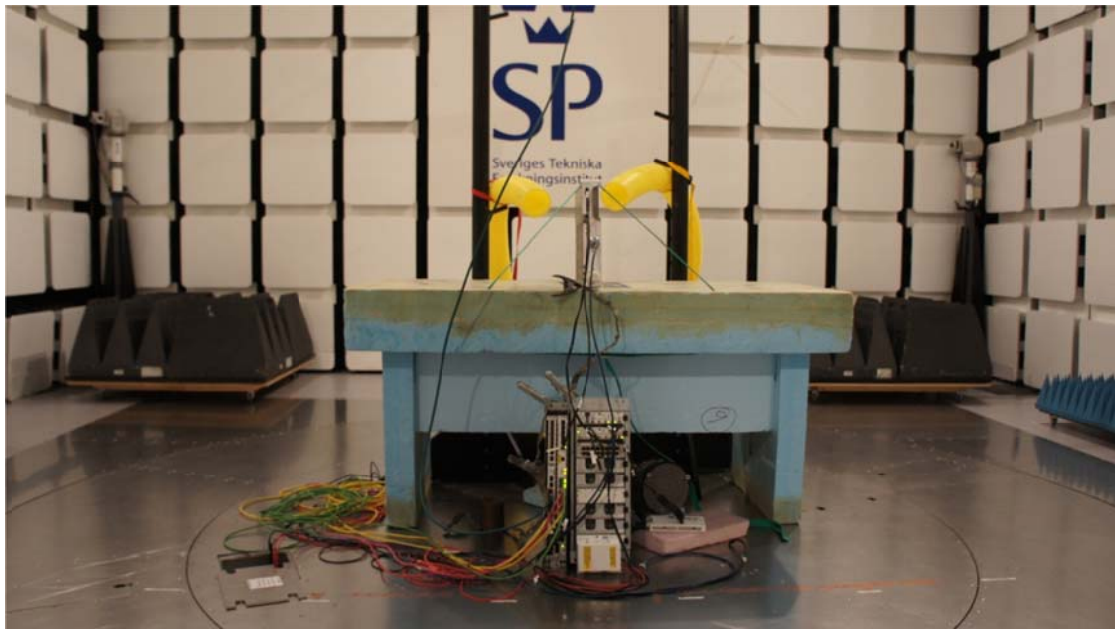
$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

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.

Appendix 6

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	503 899
Chase Bilog Antenna CBL 6111A	503 182
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
B2
M
M2
T
T2
BT8

Appendix 6

Results, representing worst case

Multi carrier

Diagram	Modulation	Tested frequency
1 a+b	GMSK	B2

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

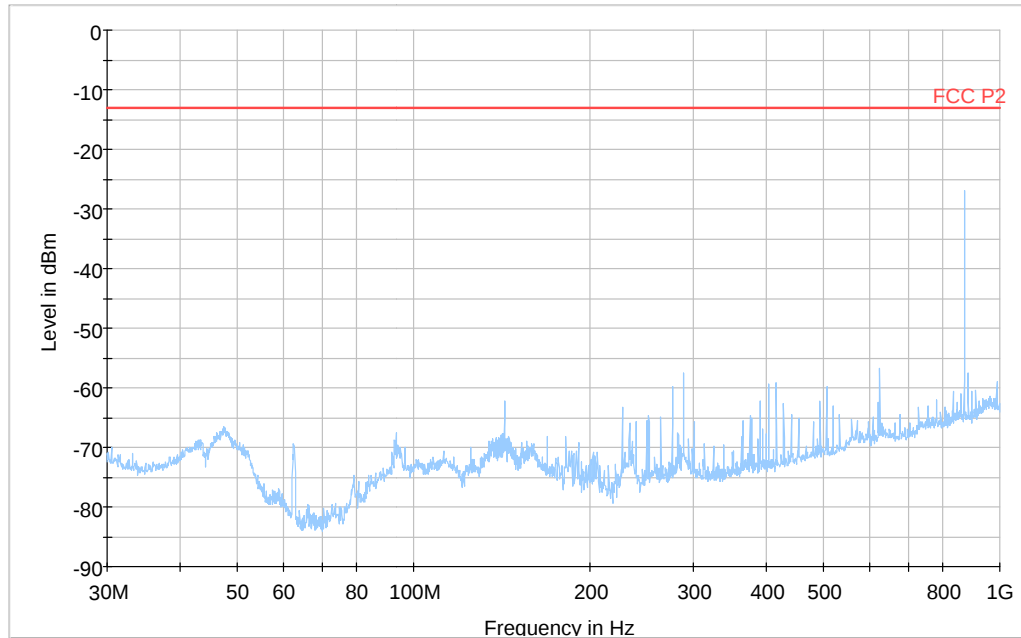
CFR 47 § 22.917 and IC RSS-132 5.5

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
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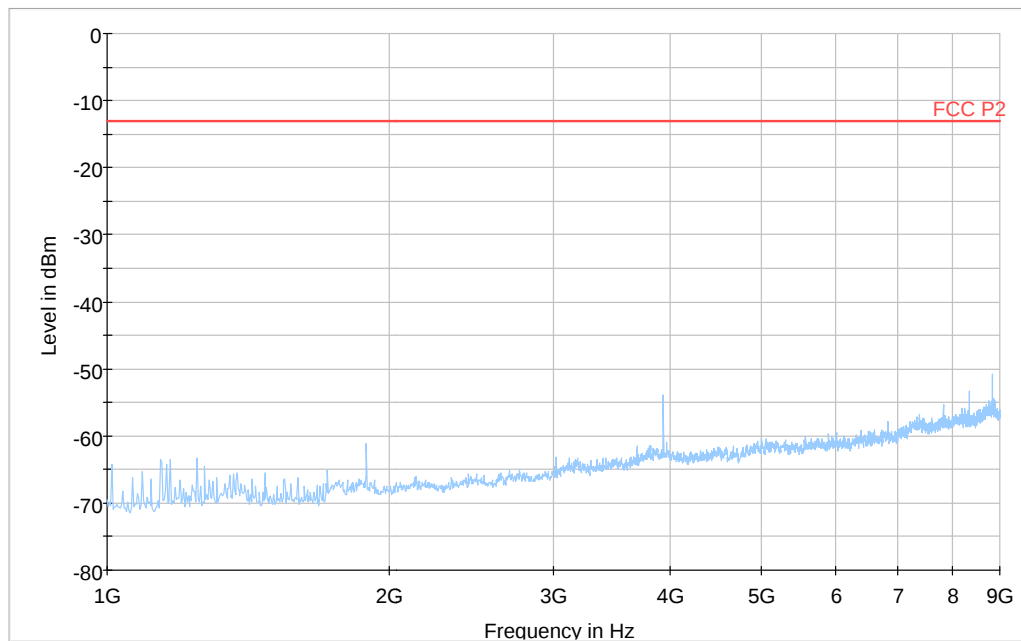
Appendix 6

Diagram 1 a:



Note: The emission between 869 MHz and 870 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)
2013-09-06	23 °C ± 3 °C	29% ± 5 %
2013-09-07	22 °C ± 3 °C	31% ± 5 %
2013-09-09	23 °C ± 3 °C	38% ± 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 40	504 143
RF attenuator	-
Temperature Chamber	503 360
Datascan 7321	502 698
Testo 635, temperature and humidity meter	504 203
Multimeter Fluke 87	502 190

Appendix 7

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	+8
-55.2	+20	+6
-40.8	+20	+5
-48.0	+30	+5
-48.0	+40	+8
-48.0	+50	+8
-48.0	+10	-4
-48.0	0	-5
-48.0	-10	-6
-48.0	-20	-7
-48.0	-30	-6
Maximum freq. error (Hz)		8
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Appendix 7

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
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Appendix 8

External photos

Front side:



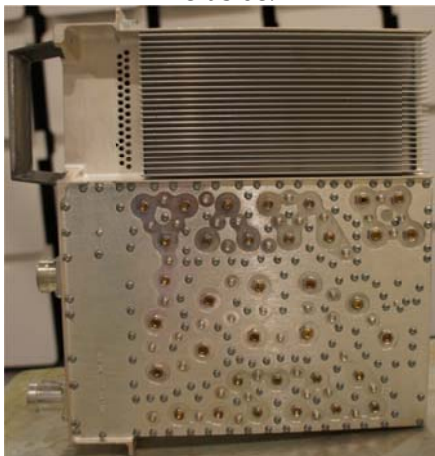
Back side:



Product Label:



Left side:



Right side:



Appendix 8

Top side:



Bottom side:

