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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

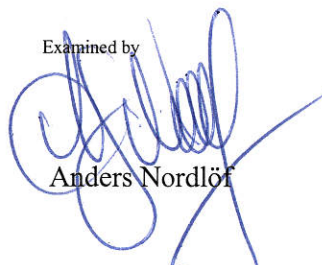
Electronics – EMC

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Appendix 1

Description of the test object

Equipment:	Product name: RUS 02 B5, supporting WCDMA 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 carrier, multi carrier and MIMO 2x2
Nominal RF output power per antenna port:	Single carrier: 1x 50.0 dBm (1x 100W) Multi carrier: 2x 47dBm (2x 50W) 3x 45.2 dBm (3x 33.3W) 4x 44 dBm (4x 25W) In WCDMA MIMO configuration the maximum nominal output power is limited to 47 dBm (50W) per carrier and port.
Antenna:	No dedicated antenna, handled during licensing
Modulations:	QPSK, 16QAM and 64QAM
Channel bandwidths:	4.2 to 5 MHz (configurable in steps of 100/200 kHz)
Channel spacings:	4.4 to 5 MHz (configurable in steps of 100/200 kHz)
Nominal supply voltage:	-48VDC

Appendix 1

Operation mode during measurements**WCDMA**

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 25.141. Test model 1 (TM1) was used to represent QPSK. Test model 5 (TM5) to represent 16QAM modulation and Test model 6 (TM6) 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.

Single carrier, none MIMO mode

TM1: 64 DPCH:s at 30 ksps (SF=128)

single carrier, MIMO mode

TM5: 8 HS-PDSCH at 240 ksps + 30 DPCH:s at 30 ksps (SF=128)

multi carrier(2 carriers), MIMO mode

TM5: 8 HS-PDSCH at 240 ksps +30 DPCH:s at 30 ksps (SF=128)

Channel bandwidth 5 MHz

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

Appendix 1

Conducted measurements

The test object was hosted in a RBS 6201 powered with -48 VDC. Additional connections are documented in the setup drawings below.

All measurements were performed on test object 1(described in the Test set-up diagram), running in primary and secondary mode. Test object 2 has been used as dummy for MIMO configuration.

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

CFR 47 part 2, October 1st, 2012

CFR 47 part 22, October 1st, 2012

3GPP TS 25.141, 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	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, Ericsson AB.

Test engineers

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

Test participant

Gunnar Svensson, Ericsson AB (partially).

Appendix 1

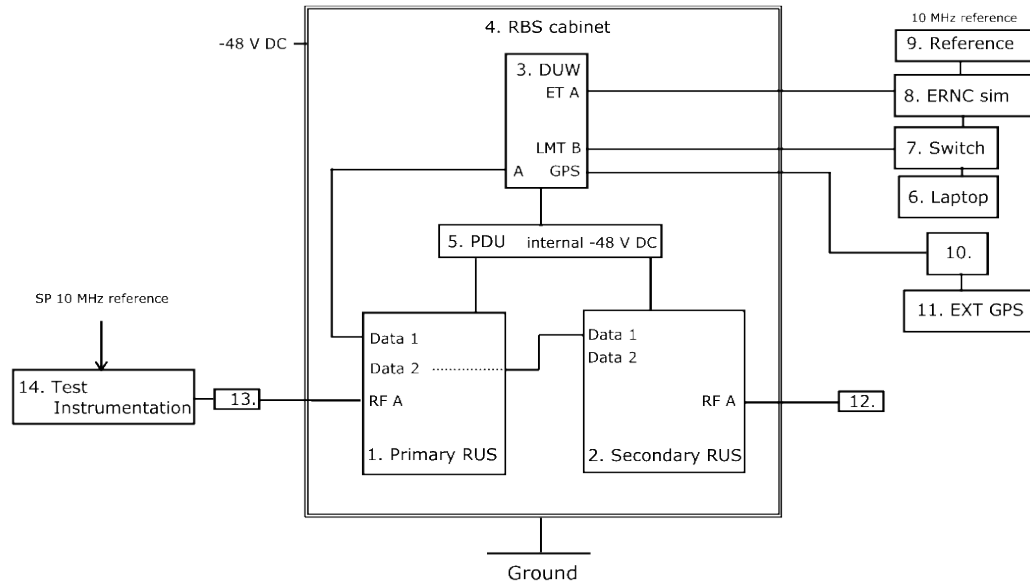
TX test frequencies used for conducted and radiated measurements

UARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
4357	871.4	B	Single carrier TX bottom frequency
4357	871.4	B2	2 carrier TX band bottom constellation
4382	876.4		
4357	871.4	B3	2 carrier TX band bottom constellation
4407	881.4		
4408	881.6	M	Single carrier TX band mid frequency
4382	876.4	M2	2 carrier TX band mid constellation
4433	886.6		
4458	891.6	T	Single carrier TX top frequency
4433	886.6	T2	2 carrier TX band top constellation
4458	891.6		
4408	881.6	T3	2 carrier TX band top constellation
4458	891.6		
4458	891.6	T4	4 carrier TX band top constellation
4433	886.6		
4408	881.6		
4383	876.6		

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

Appendix 1

Test set-up conducted measurements, WCDMA MIMO mode



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

Test object:

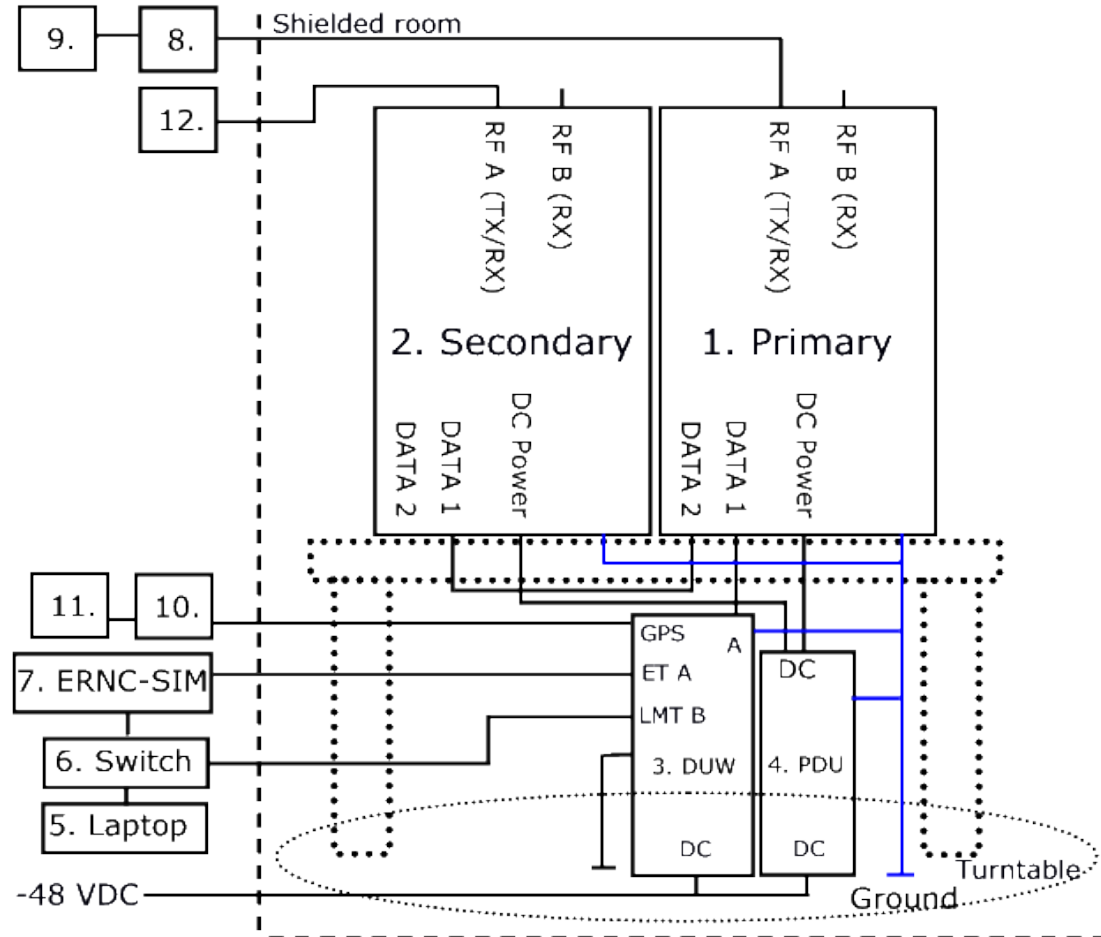
1.	RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827123129, primary/ secondary
2.	RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827123115, Dummy: secondary/ primaty working software PIS CXP 901 7316/2, rev. R51MT with FCC ID TA8AKRC161320-1 and IC: 287AB-AS1613201

Functional test equipment

3.	DUW 30 01, KDU 127 161/3, rev: R4F, s/n: TU8XB20908 DUW 30 01, KDU 127 161/3, rev: R4F, s/n: TU8XB20706
4.	RBS 6201 cabinet, BAMS – 1000778792
5.	PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316
6.	Controlling laptop HP EliteBook 8560 w, BAMS – 1001236858
7.	Fast Ethernet switch, Netgear FS726T
8.	ERNC sim 130, BAMS – 1000660991
9.	Symmetricon 8040 reference, BAMS – 1000714189
10.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K474887
11.	GPS Active Antenna, KRE 101 2082/1
12.	Terminator, 50 ohm
13.	Attenuator, filter, according respective appendix
14.	SP test instrument according measurement equipment list

Appendix 1

Test setup radiated measurements single RAT WCDMA, MIMO mode



Test object:

1. RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827123103 primary
2. RUS 02 B5, KRC 161 320/1, rev. R1C, s/n: C827159515 secondary
working software: CXP 901 7316/2, rev. R51MT with
FCC ID TA8AKRC161320-1 and IC: 287AB-AS1613201

Appendix 1

Functional test equipment:

3.	DUW 30 01 KDU 127 16/3, rev. R4F, s/n: TU8XB21900, hosted in SUP 6601, 1/BFL 901 009/4, rev. R1E, s/n: BR88258668
4.	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
5.	Laptop, EliteBook 8560w, BAMS – 1001236856
6.	Switch Netgear FS726T
7.	ERNC-SIM 131, BAMS – 1000660992
8.	Attenuator
9.	ESI 26, SP number: 503 292, for supervision purpose only
10.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356428
11.	GPS Active Antenna, KRE 101 2082/1
12.	Terminator

Interfaces:

Type of port:

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

RBS software:

Software	Revision
CXP 902 1719	R1DC14

Appendix 2

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

Date	Temperature	Humidity
2013-09-03	23 °C ± 3 °C	34% ± 5 %
2013-09-04	23 °C ± 3 °C	48% ± 5 %
2013-09-05	22 °C ± 3 °C	54% ± 5 %
2013-09-09	22 °C ± 3 °C	47% ± 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 1 x 50 dBm.

Tested configuration BW and frequency	[RMS dBm/ dB PAR]
5 MHz, B	49.54/ 6.73
5 MHz, M	49.73/ 6.71
5 MHz, T	49.41/ 6.80

Note: (PAR). The highest single carrier PAR measured was 6.80 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

Single carrier, MIMO mode

Rated output power level at RF connector 1 x 47 dBm.

Tested configuration BW and frequency	Primary mode [RMS dBm/ dB PAR]	Secondary mode [RMS dBm/ dB PAR]	Total power ¹⁾ [RMS dBm]
5 MHz, B	47.06/ 7.40	47.03/ 7.38	50.06
5 MHz, M	47.02/ 7.38	47.00/ 7.40	50.02
5 MHz, T	47.02/ 7.40	47.02/ 7.40	50.03

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

Multi carrier 2 carriers, MIMO mode

Rated output power level at RF connector 2x 47dBm.

Tested configuration BW and frequency	Primary mode [RMS dBm/ dB PAR]	Secondary mode [RMS dBm/ dB PAR]	Total power ¹⁾ [RMS dBm]
5 MHz, B2	49.42/ 7.43	49.47/ 7.43	52.46
5 MHz, M2	49.49/ 7.57	49.47/ 7.57	52.49
5 MHz, T2	49.36/ 7.64	49.47/ 7.60	52.43

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

MIMO mode 4 carriers, multi carrier

Rated output power level at RF connector 4x 44dBm.

Tested configuration BW and frequency	Primary mode [RMS dBm/ dB PAR]	Secondary mode [RMS dBm/ dB PAR]	Total power ¹⁾ [RMS dBm]
5 MHz, T4	49.63/ 7.60	49.60/ 7.62	52.63

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

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
2013-09-03	23 °C ± 3 °C	34% ± 5 %
2013-09-04	23 °C ± 3 °C	48% ± 5 %
2013-09-05	22 °C ± 3 °C	54% ± 5 %

Test set-up and procedure

The measurements were made per definition in § 2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

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

Measurement uncertainty: 3.7 dB

Results

Single carrier

Diagram	BW configuration	Tested frequency	Occupied BW (99%) [MHz]
1	5 MHz	B	4.18
2	5 MHz	M	4.18
3	5 MHz	T	4.18

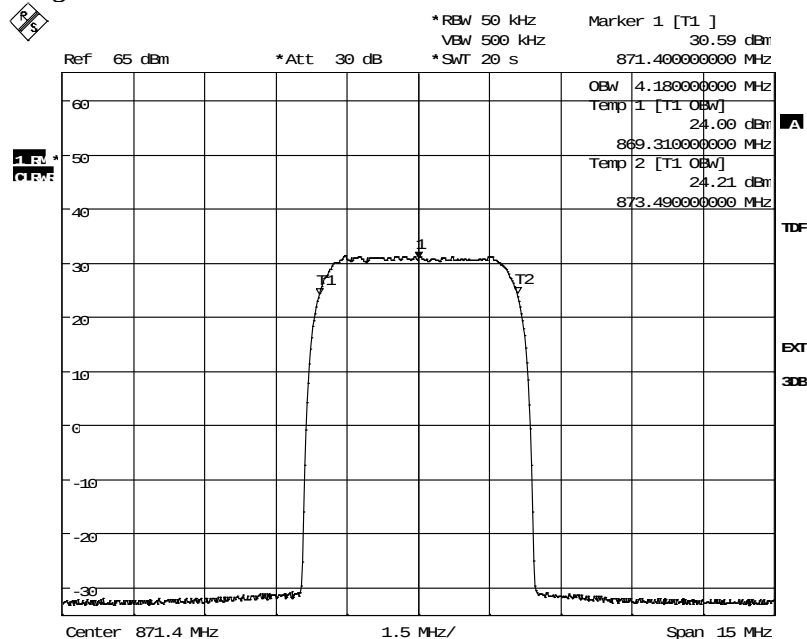
Single carrier, MIMO mode

Diagram	BW configuration	Tested frequency	Test mode	Occupied BW (99%) [MHz]
4	5 MHz	B	Primary	4.17
5	5 MHz	M	Primary	4.17
6	5 MHz	M	Secondary	4.18
7	5 MHz	T	Primary	4.17

The diagrams are shown on the following pages.

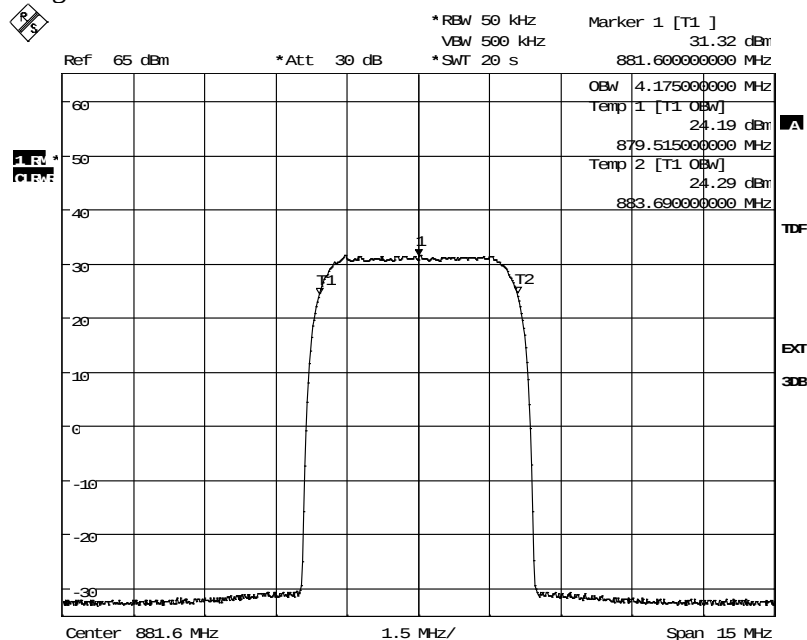
Appendix 3

Diagram 1:



Date: 3.SEP.2013 13:05:44

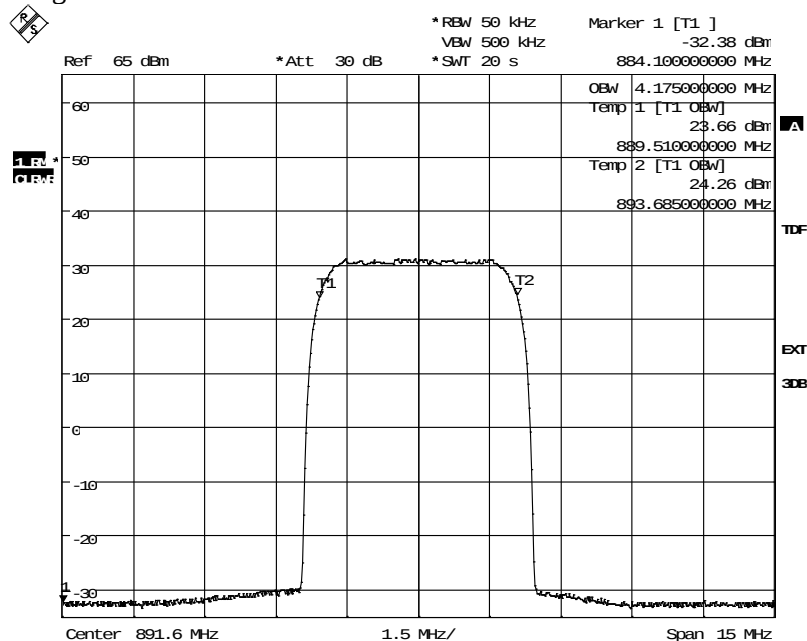
Diagram 2:



Date: 3.SEP.2013 13:42:09

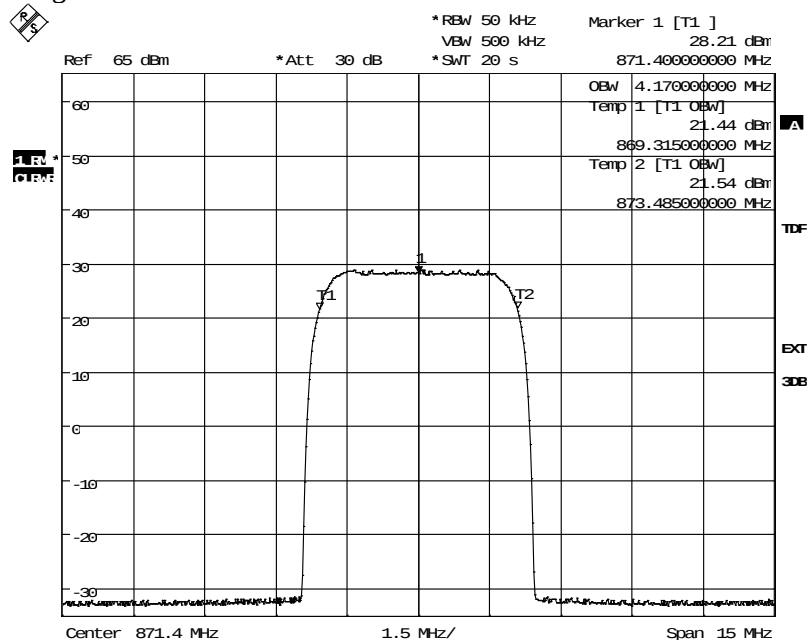
Appendix 3

Diagram 3:



Date: 3.SEP.2013 13:59:57

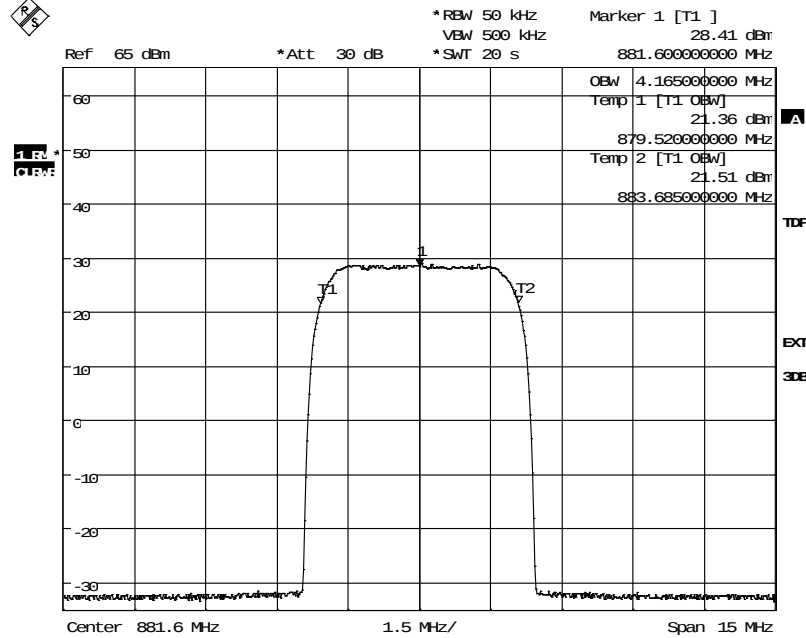
Diagram 4:



Date: 3.SEP.2013 15:36:01

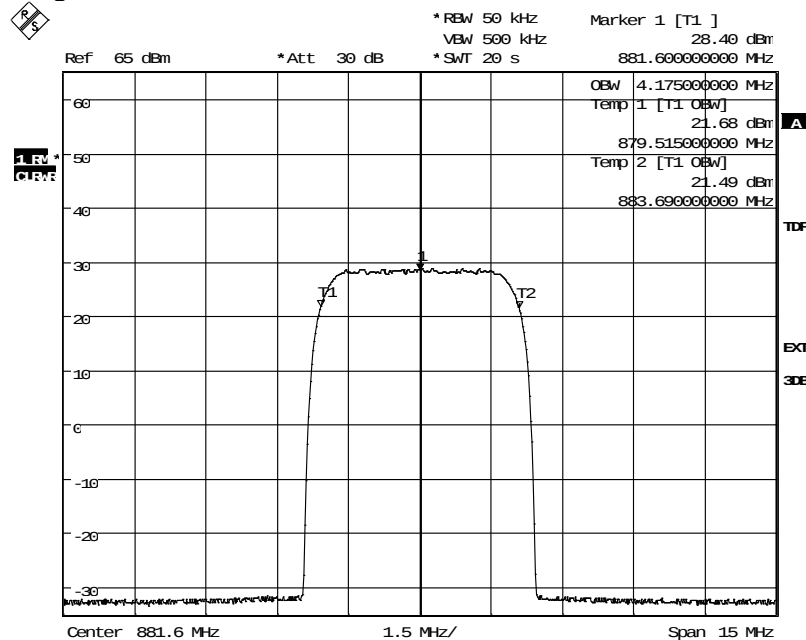
Appendix 3

Diagram 5:



Date: 4.SEP.2013 11:02:11

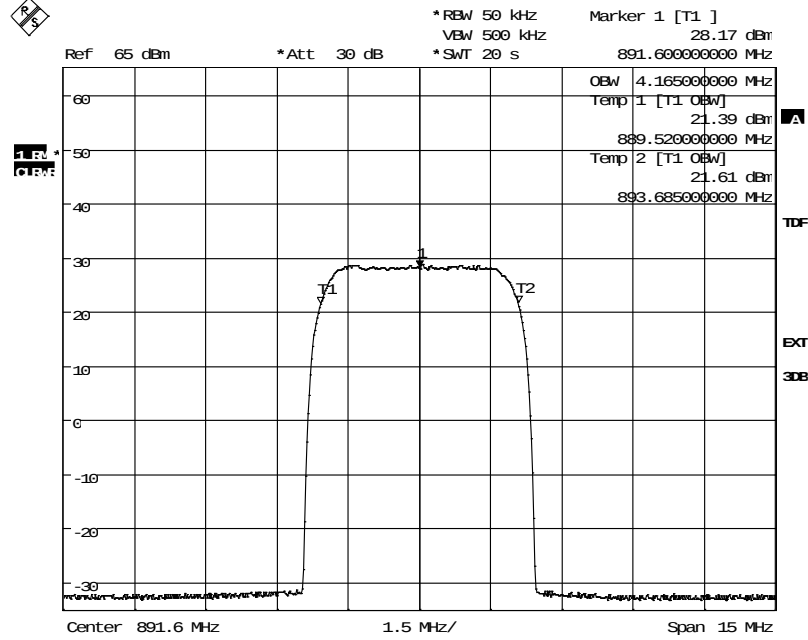
Diagram 6:



Date: 4.SEP.2013 09:13:16

Appendix 3

Diagram 7:



Date: 4.SEP.2013 11:49:33

Appendix 4

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

Date	Temperature	Humidity
2013-09-03	23 °C ± 3 °C	34% ± 5 %
2013-09-04	23 °C ± 3 °C	48% ± 5 %
2013-09-05	22 °C ± 3 °C	54% ± 5 %
2013-09-09	22 °C ± 3 °C	47% ± 5 %
2013-09-16	23 °C ± 3 °C	44% ± 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 $10 \cdot \log(\text{RBW}_{\text{used}}/\text{RBW}_{1\% \text{EBW}})$ [dB].

BW configuration	Emission BW [MHz]	RBW used	Adjusted limit [dBm]
5 MHz	4.37	20 kHz	-16.39

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

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: 3.7 dB

Appendix 4

Results

Single carrier

Diagram	BW configuration	Tested frequency
1 a-b	5 MHz	B
2 a-b	5 MHz	T

Single carrier, MIMO mode

Diagram	BW configuration	Tested frequency	Test mode
3 a-b	5 MHz	B	Primary
4 a-b	5 MHz	B	Secondary
5 a-b	5 MHz	T	Primary
6 a-b	5 MHz	T	Secondary

Multi carrier, MIMO mode

Diagram	BW configuration	Tested frequency	Test mode
7 a-b	5 MHz	B2	Primary
8 a-b	5 MHz	T2	Primary
9 a-b	5 MHz	T4	Primary

The diagrams are shown on the following pages.

Remark

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

Limits

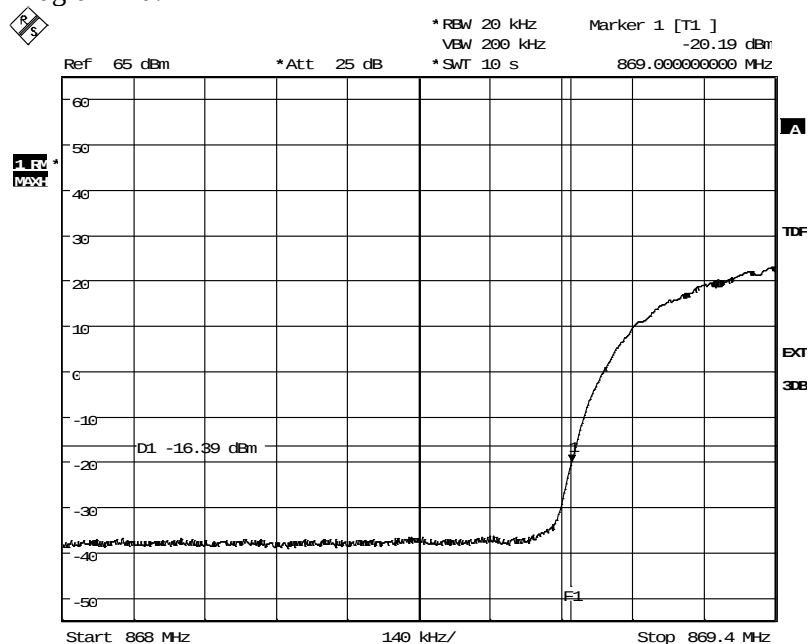
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 100 kHz RBW.

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
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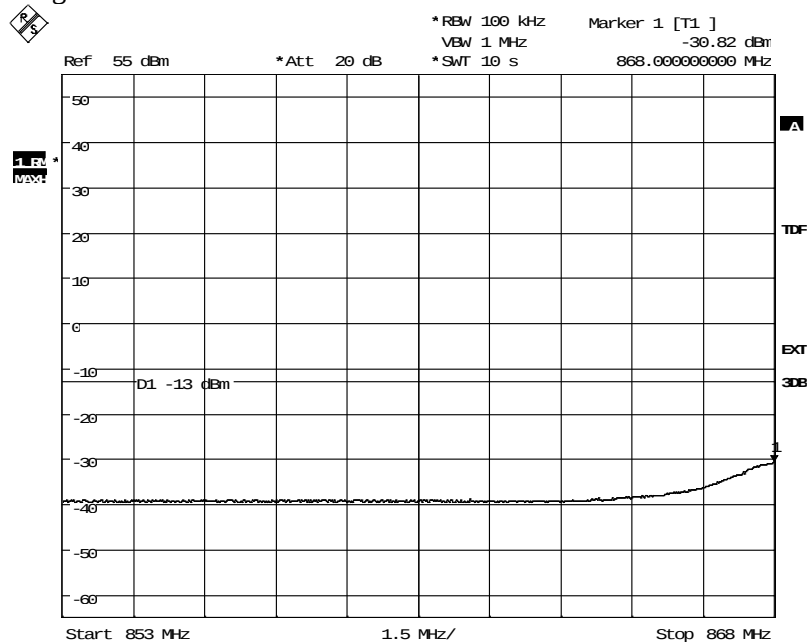
Appendix 4

Diagram 1 a:



Date: 3.SEP.2013 13:16:12

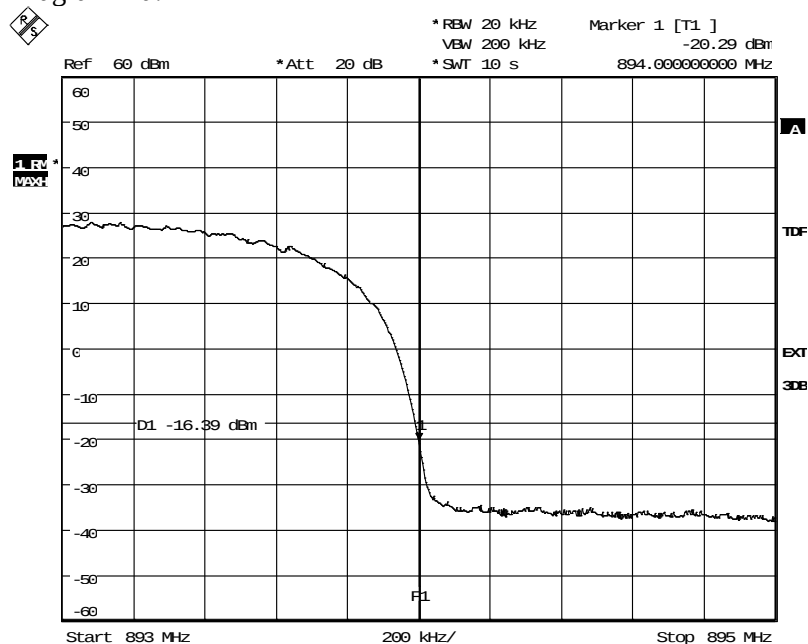
Diagram 1 b:



Date: 3.SEP.2013 13:21:30

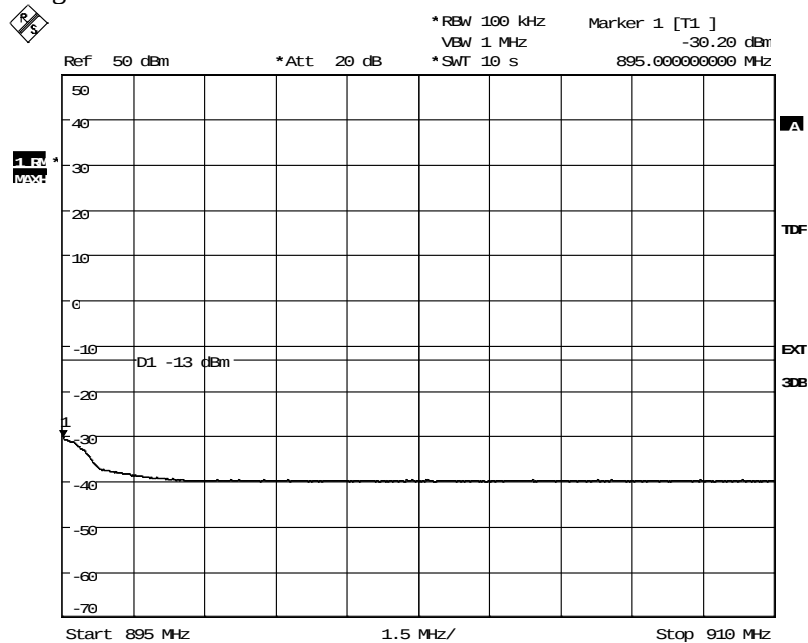
Appendix 4

Diagram 2 a:



Date: 3.SEP.2013 14:05:06

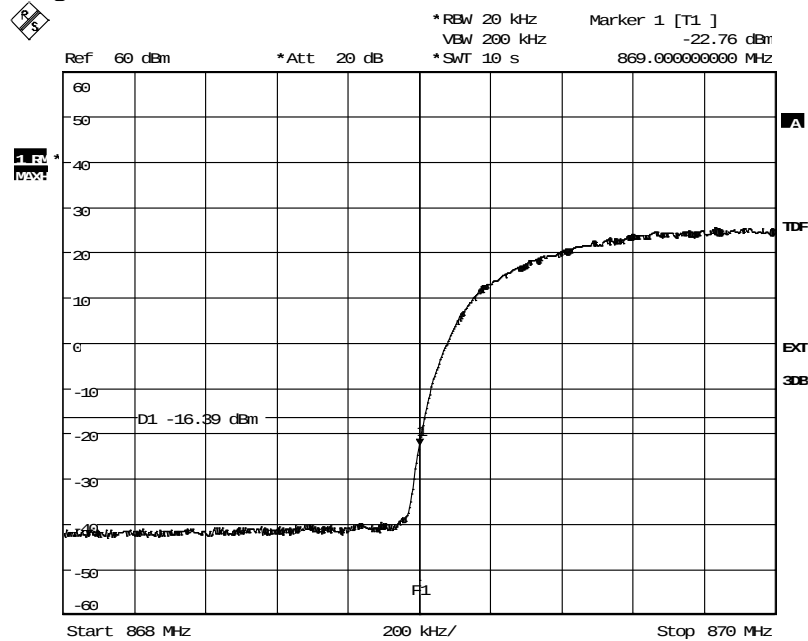
Diagram 2 b:



Date: 3.SEP.2013 14:03:55

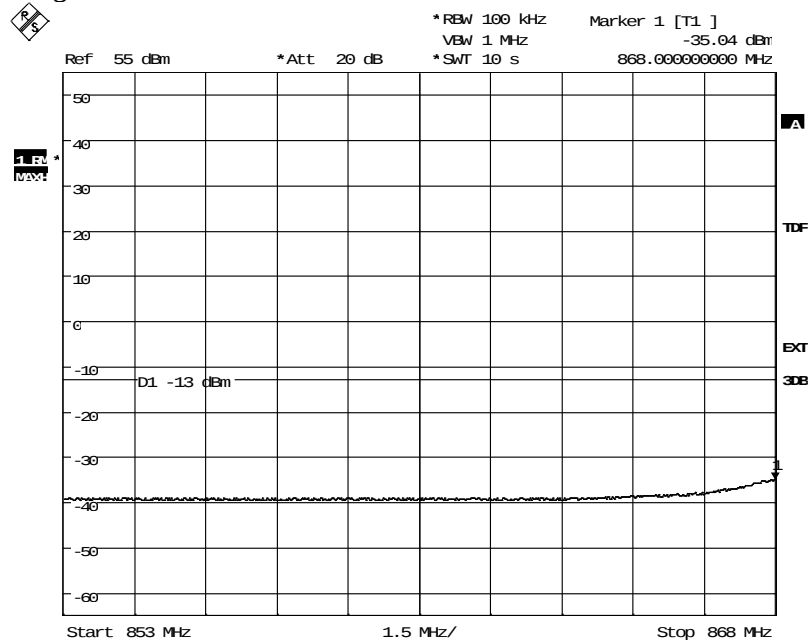
Appendix 4

Diagram 3 a:



Date: 3.SEP.2013 15:42:32

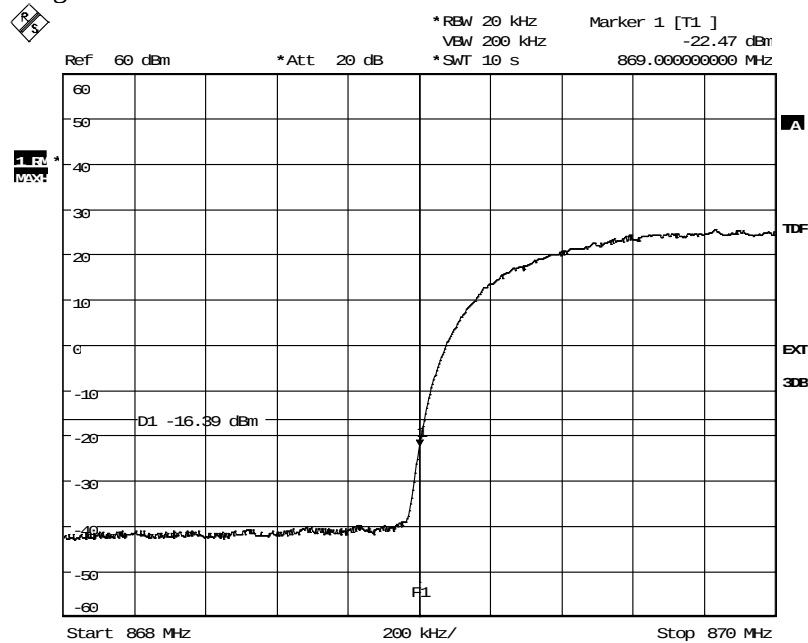
Diagram 3 b:



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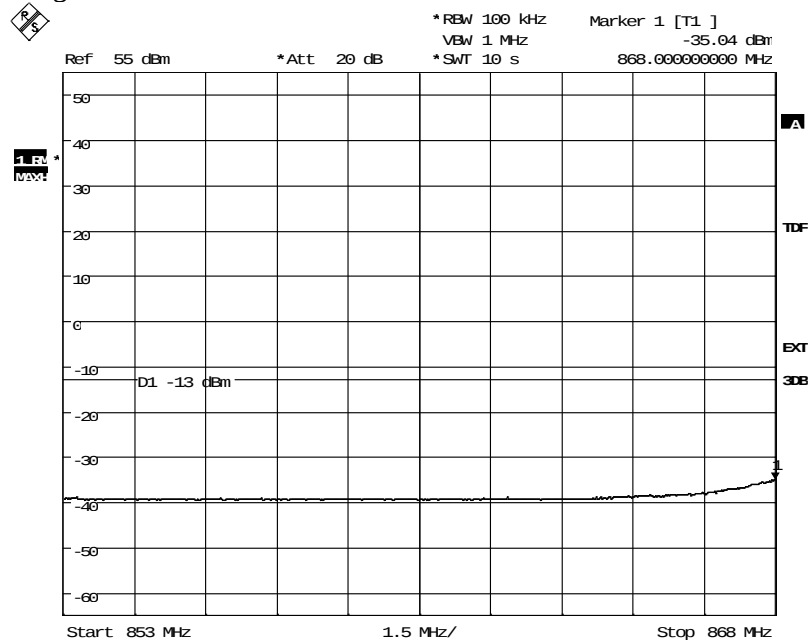
Appendix 4

Diagram 4 a:



Date: 3.SEP.2013 15:58:24

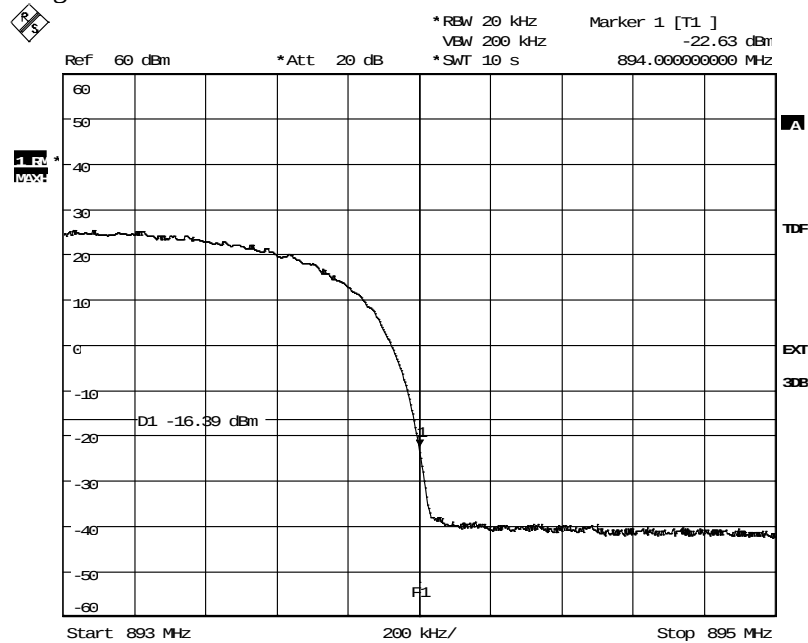
Diagram 4 b:



Date: 3.SEP.2013 15:56:49

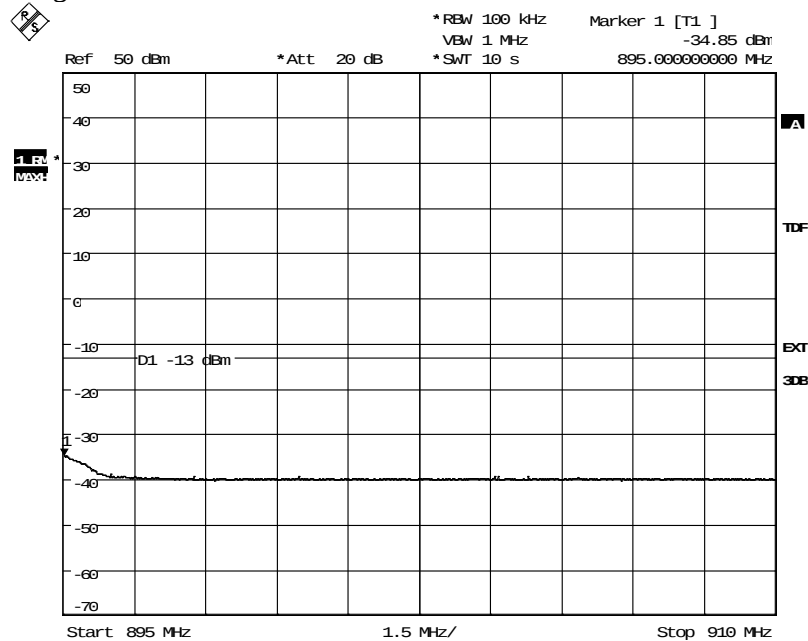
Appendix 4

Diagram 5 a:



Date: 4.SEP.2013 11:51:07

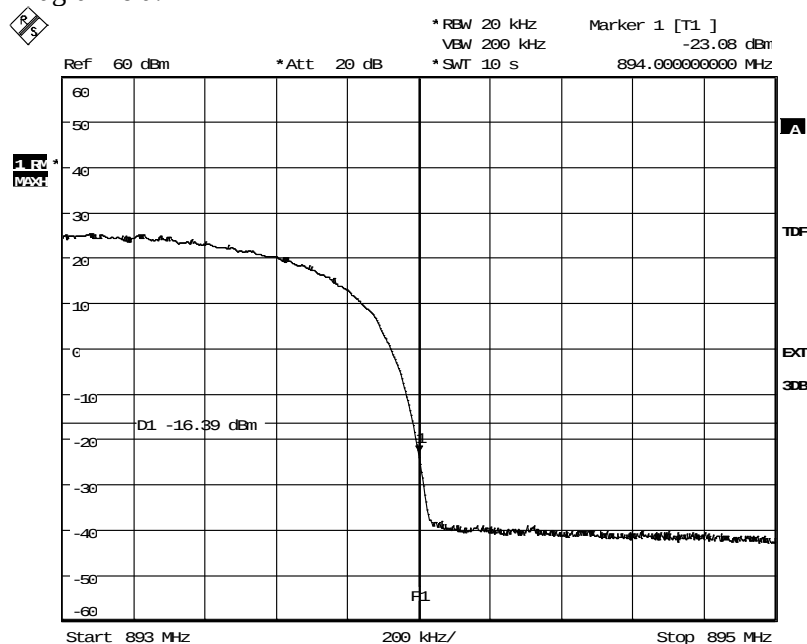
Diagram 5 b:



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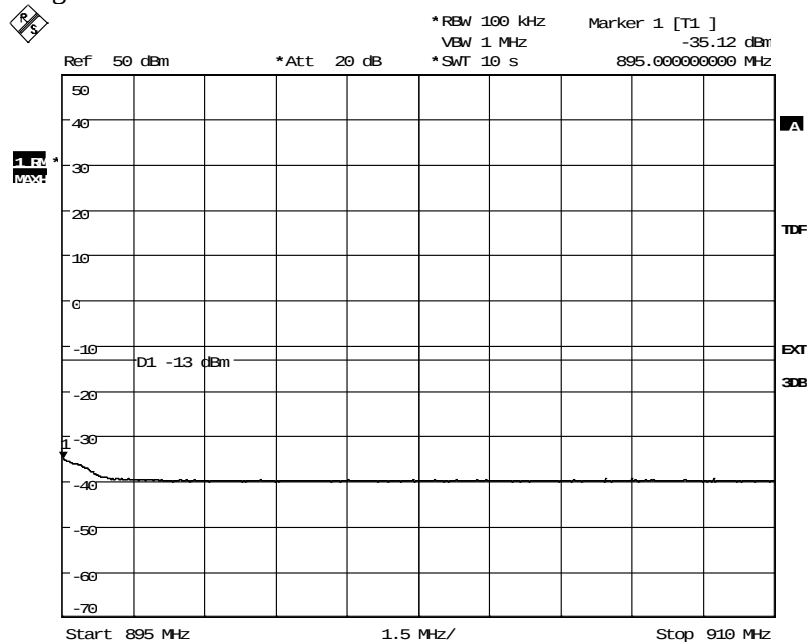
Appendix 4

Diagram 6 a:



Date: 4.SEP.2013 09:01:31

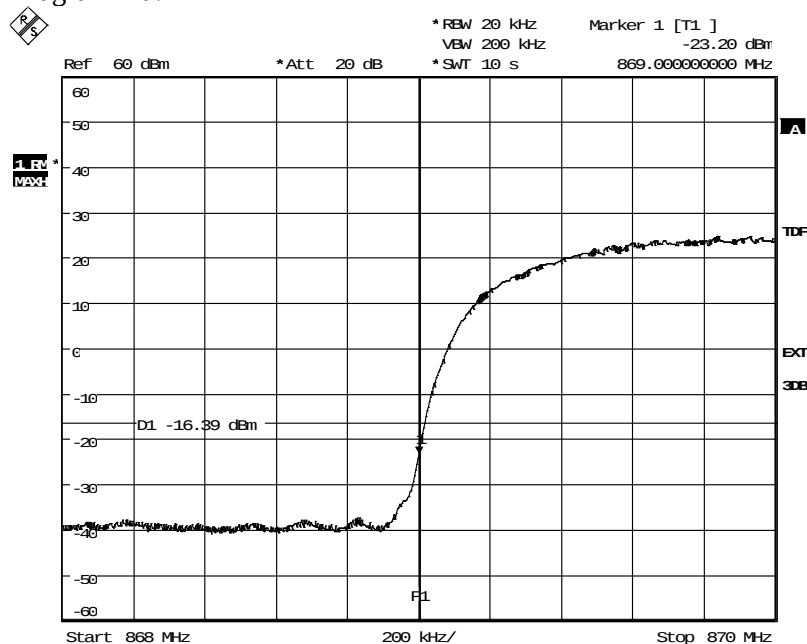
Diagram 6 b:



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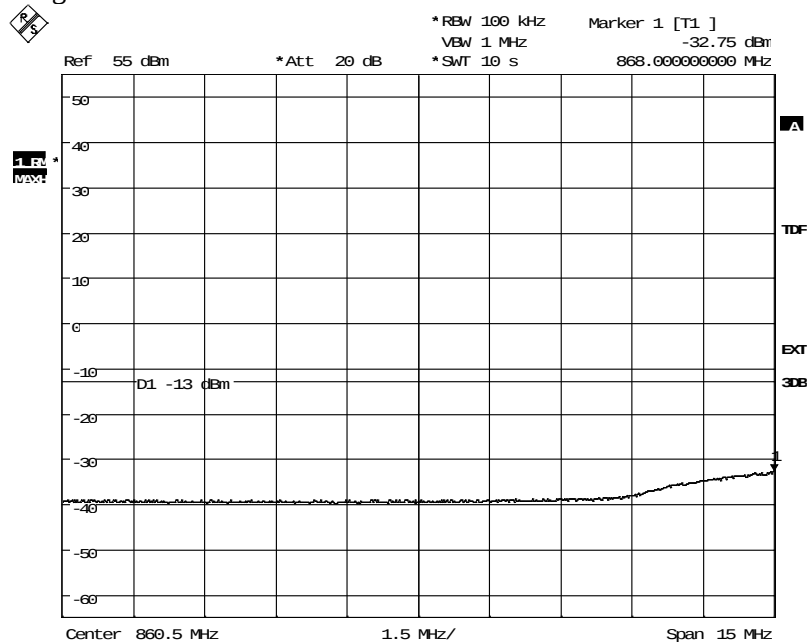
Appendix 4

Diagram 7 a:



Date: 4.SEP.2013 13:15:31

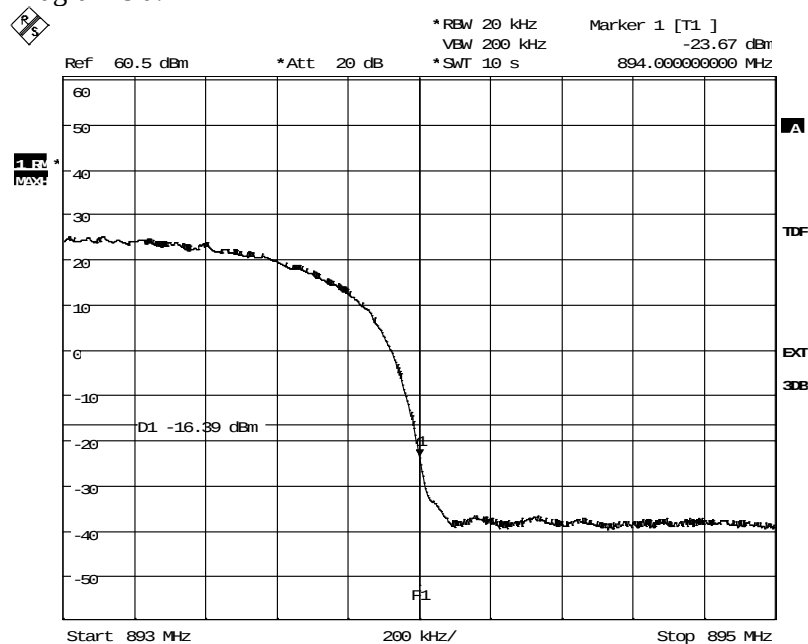
Diagram 7 b:



Date: 4.SEP.2013 13:17:12

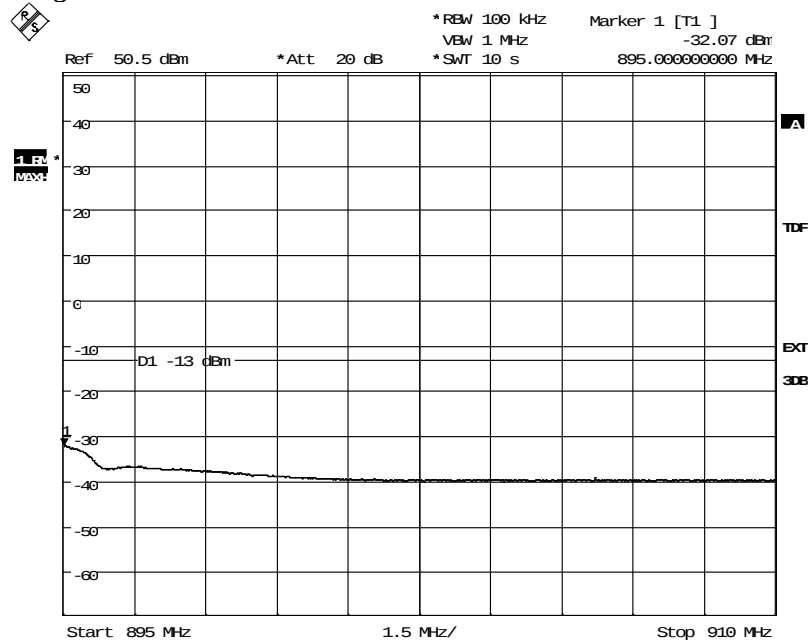
Appendix 4

Diagram 8 a:



Date: 9.SEP.2013 11:01:30

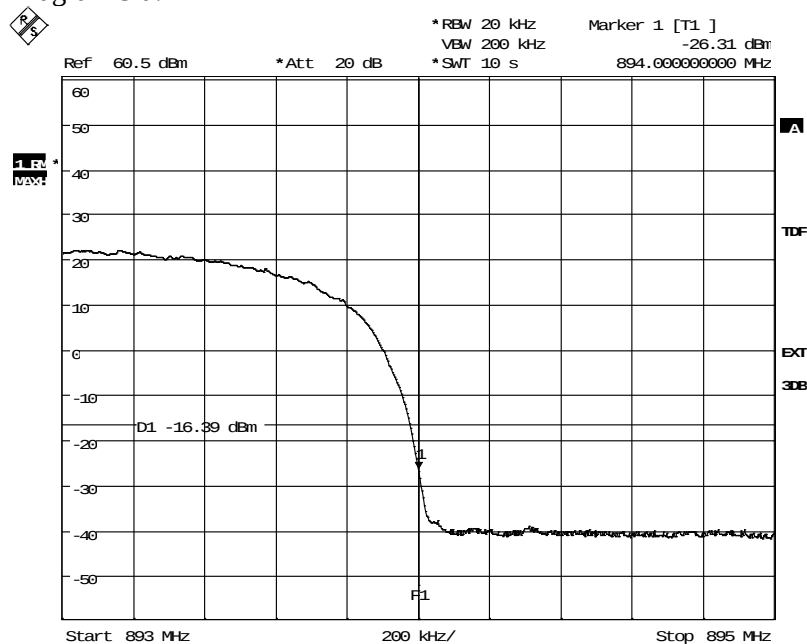
Diagram 8 b:



Date: 5.SEP.2013 11:58:13

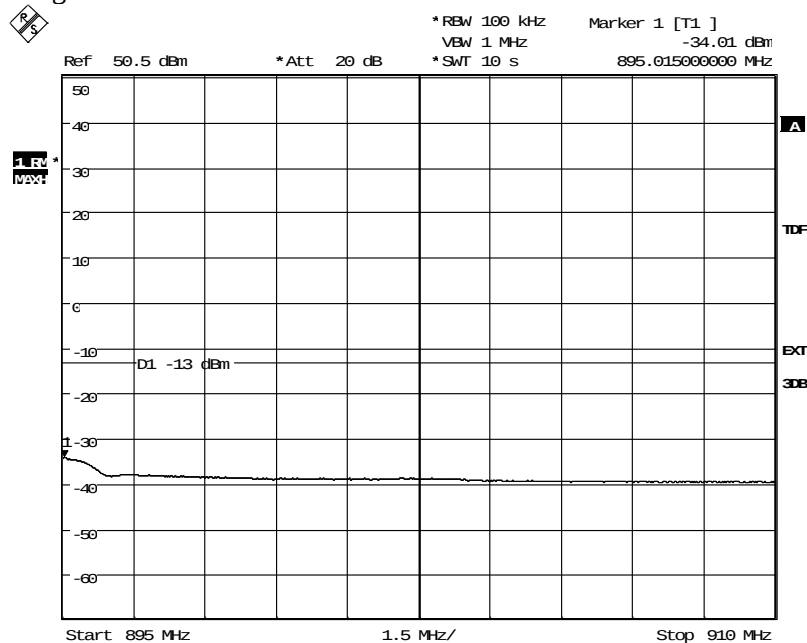
Appendix 4

Diagram 9 a:



Date: 5.SEP.2013 12:41:55

Diagram 9 b:



Date: 16.SEP.2013 12:58:33

Appendix 5

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

Date	Temperature	Humidity
2013-09-03	23 °C ± 3 °C	34% ± 5 %
2013-09-04	23 °C ± 3 °C	48% ± 5 %
2013-09-05	22 °C ± 3 °C	54% ± 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 E), 3, (iii) measure and add 10 log(N_{ANT})” of FCC KDB662911 D01 Multiple Transmitter Output v02

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	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	BW configuration[MHz]	Tested frequency
1a+b	5 MHz	B
2 a+b	5 MHz	M
3 a+b	5 MHz	T

Single carrier, MIMO mode

Diagram	BW configuration[MHz]	Tested frequency	Test mode
4 a+b	5 MHz	B	Primary
5 a+b	5 MHz	M	Primary
6 a+b	5 MHz	M	Secondary
7 a+b	5 MHz	T	Primary

Multi carrier, MIMO mode

Diagram	BW configuration[MHz]	Tested frequency	Test mode
8 a+b	5 MHz	B3	Primary
9 a+b	5 MHz	T3	Primary

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.

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

Limits

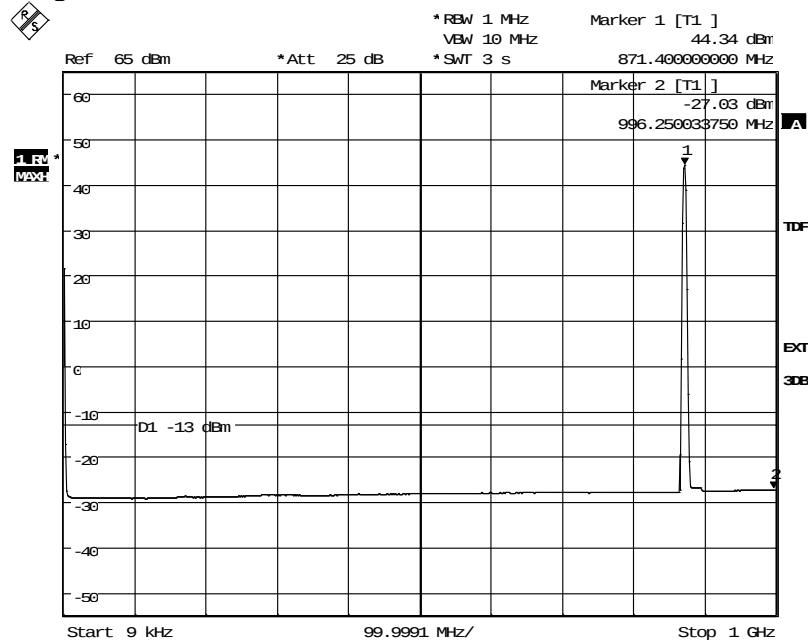
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 100 kHz RBW.

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
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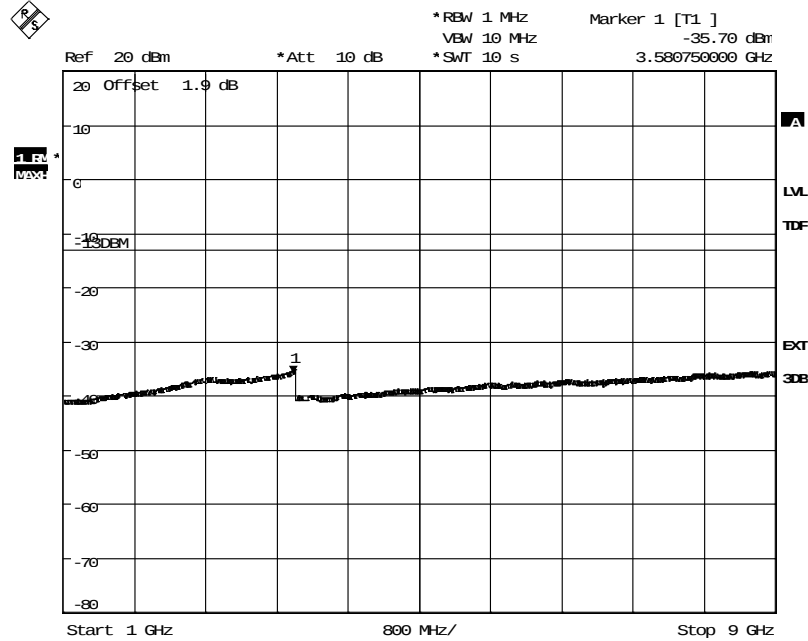
Appendix 5

Diagram 1 a:



Date: 3.SEP.2013 13:23:50

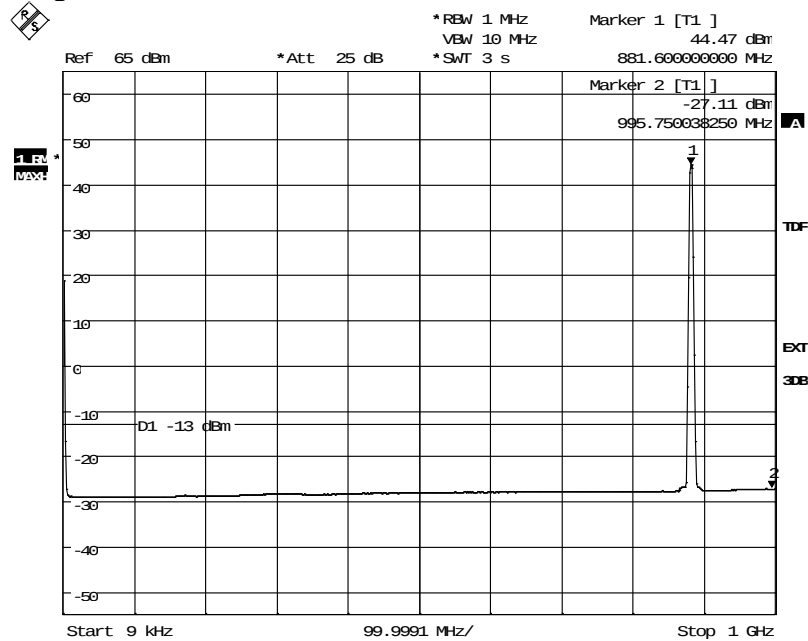
Diagram 1 b:



Date: 3.SEP.2013 13:28:16

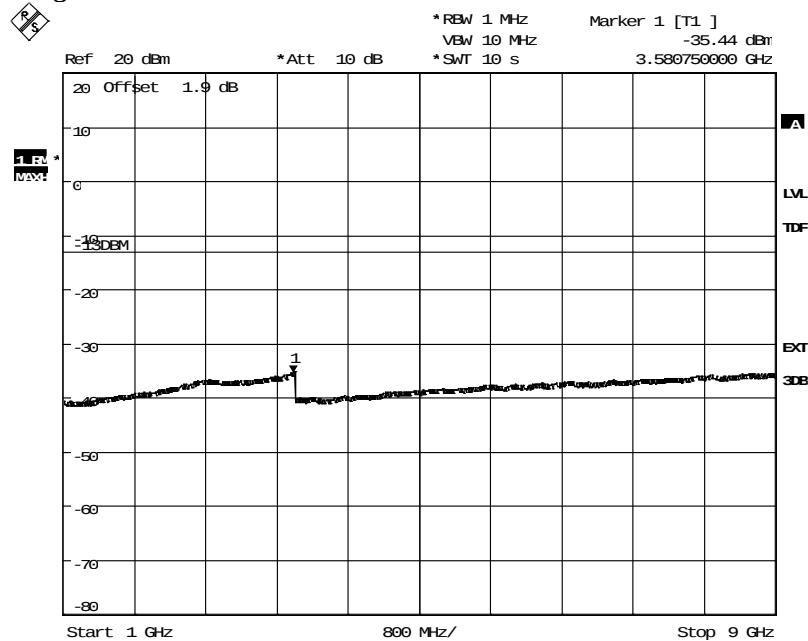
Appendix 5

Diagram 2 a:



Date: 3.SEP.2013 13:36:10

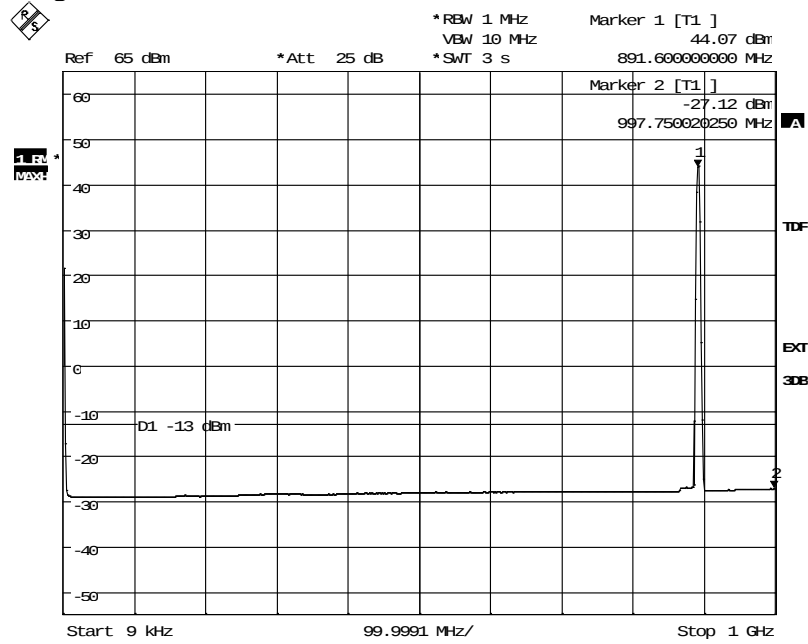
Diagram 2 b:



Date: 3.SEP.2013 13:34:25

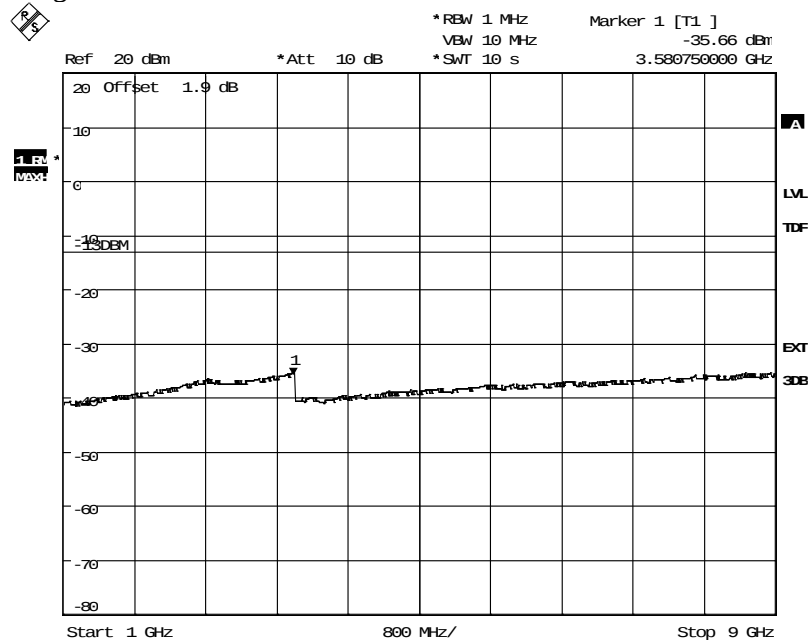
Appendix 5

Diagram 3 a:



Date: 3.SEP.2013 14:07:31

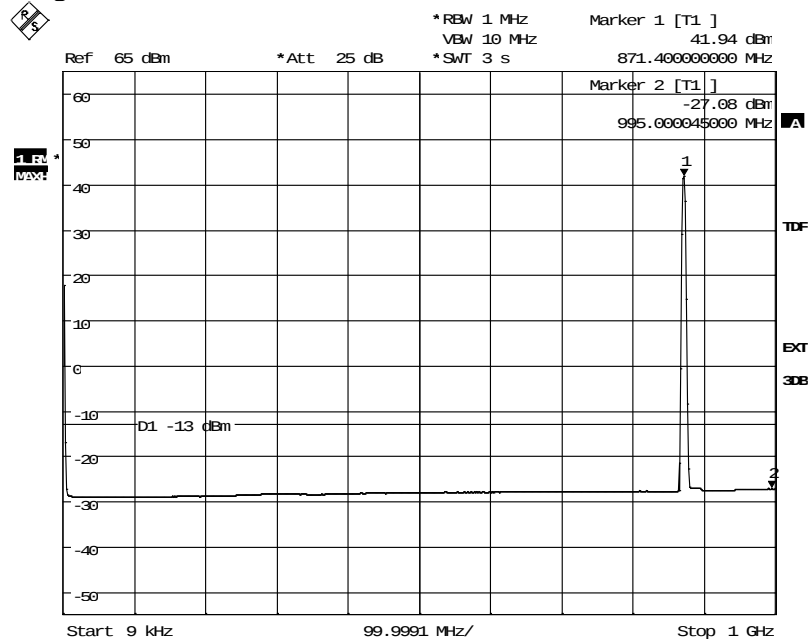
Diagram 3 b:



Date: 3.SEP.2013 14:10:43

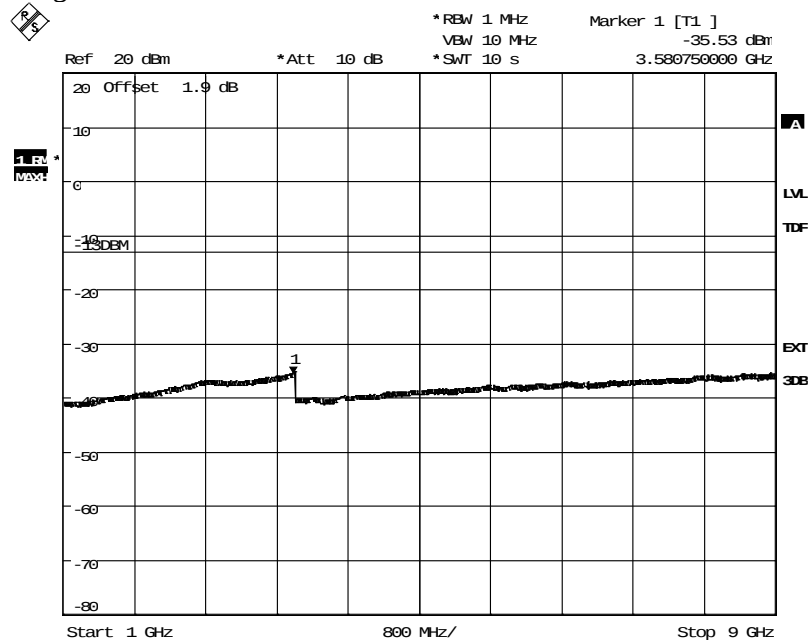
Appendix 5

Diagram 4 a:



Date: 3.SEP.2013 15:44:16

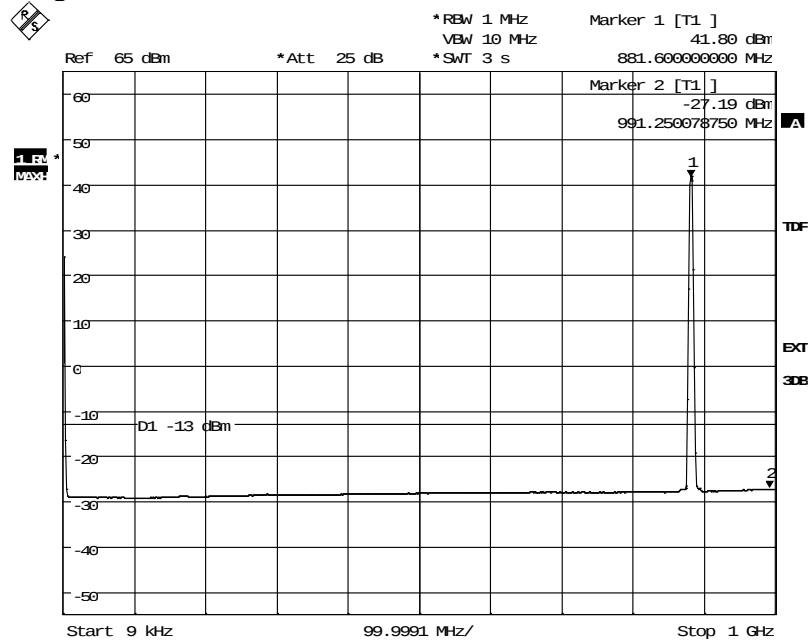
Diagram 4 b:



Date: 3.SEP.2013 15:45:52

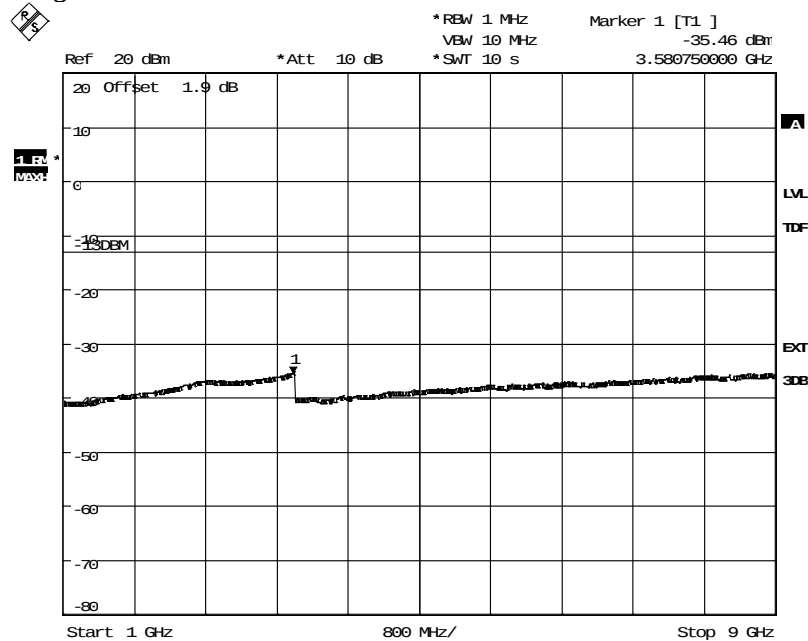
Appendix 5

Diagram 5 a:



Date: 4.SEP.2013 11:03:51

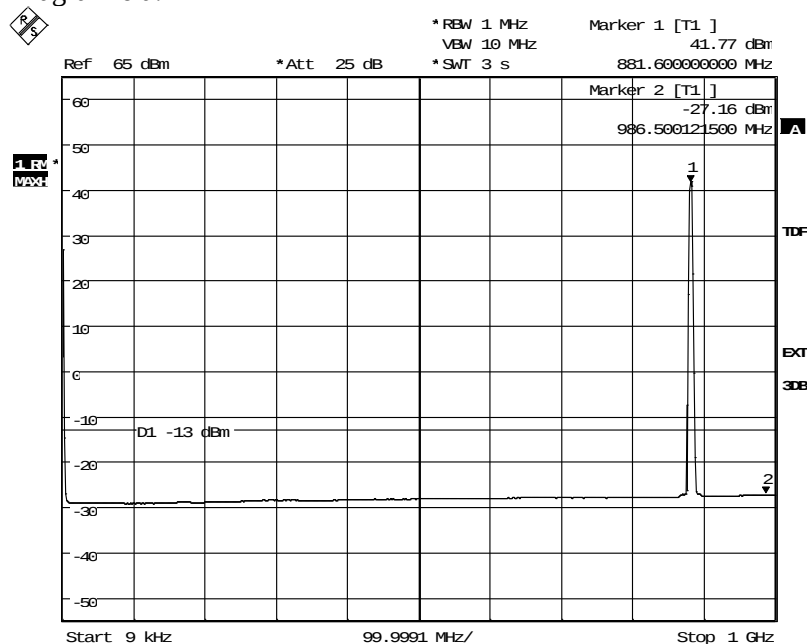
Diagram 5 b:



Date: 4.SEP.2013 11:06:03

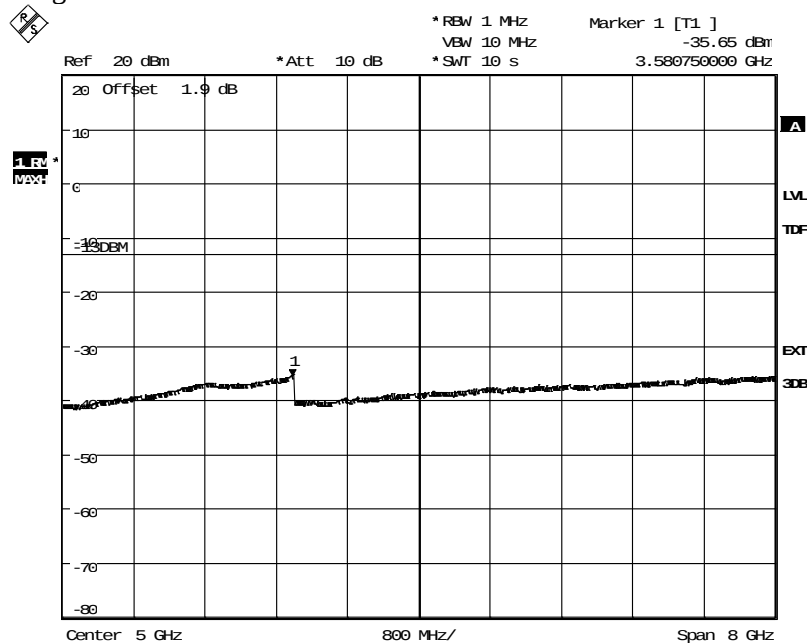
Appendix 5

Diagram 6 a:



Date: 4.SEP.2013 09:16:23

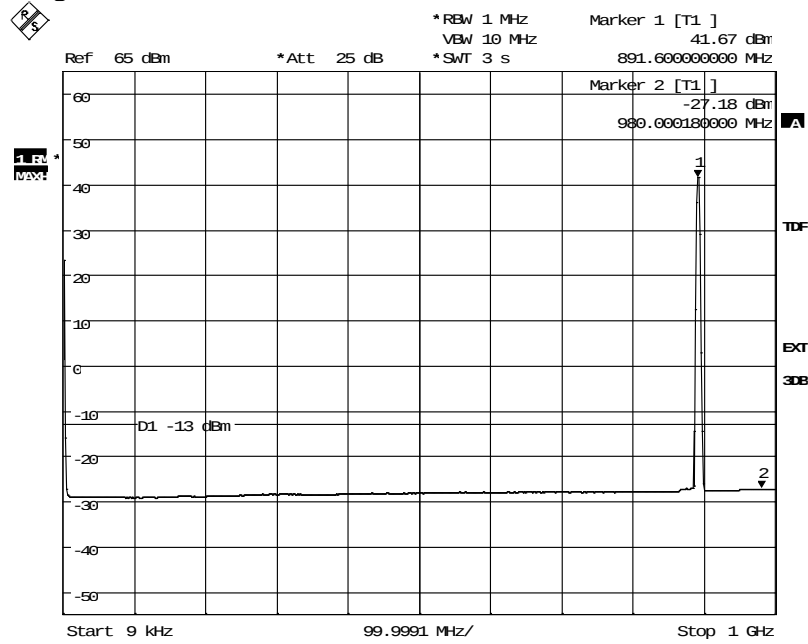
Diagram 6 b:



Date: 4.SEP.2013 09:18:49

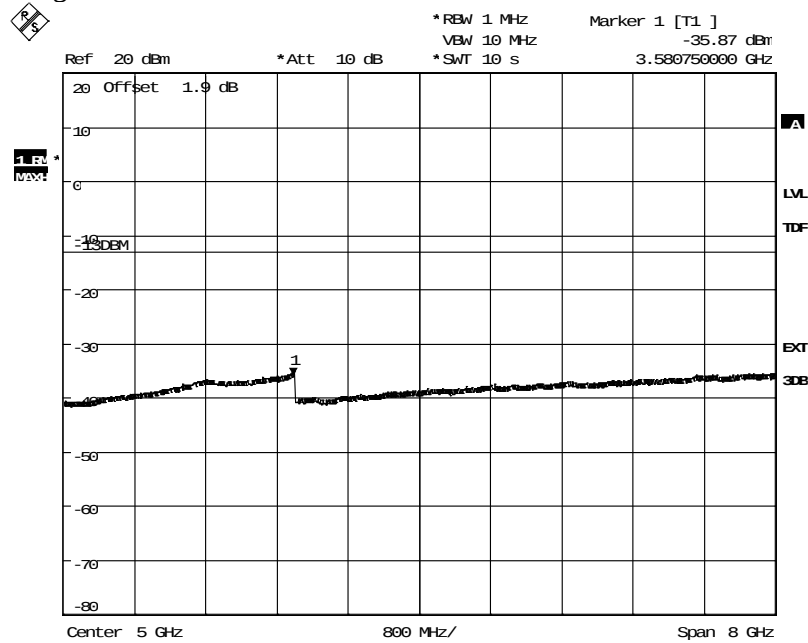
Appendix 5

Diagram 7 a:



Date: 4.SEP.2013 11:53:21

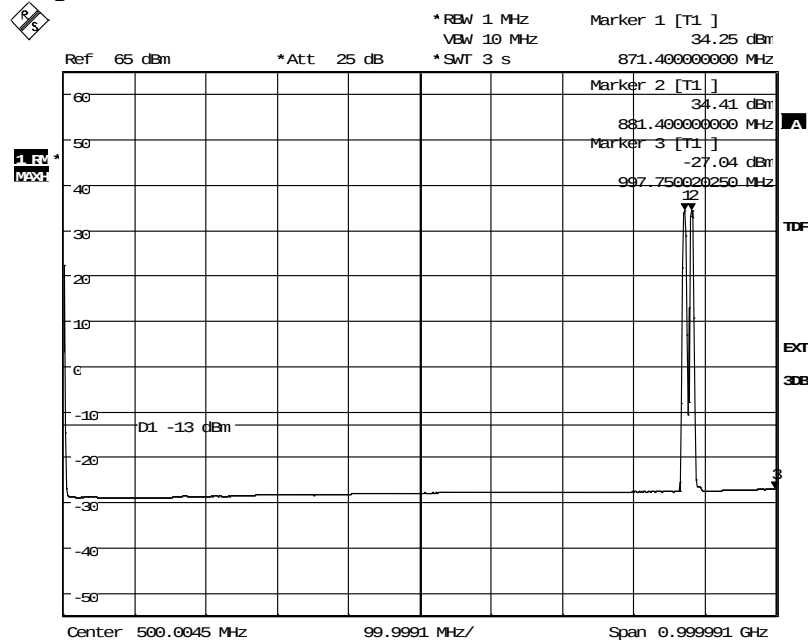
Diagram 7 b:



Date: 4.SEP.2013 11:55:17

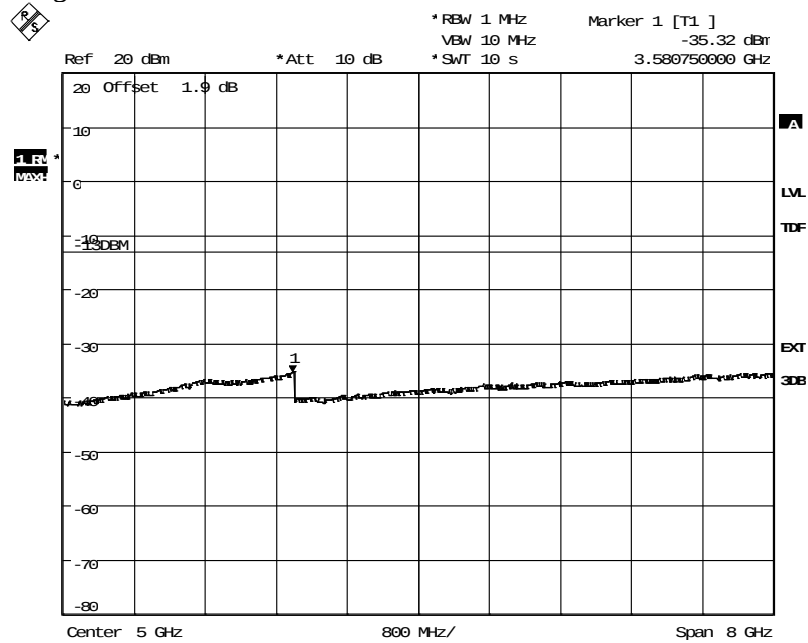
Appendix 5

Diagram 8 a:



Date: 4.SEP.2013 17:43:54

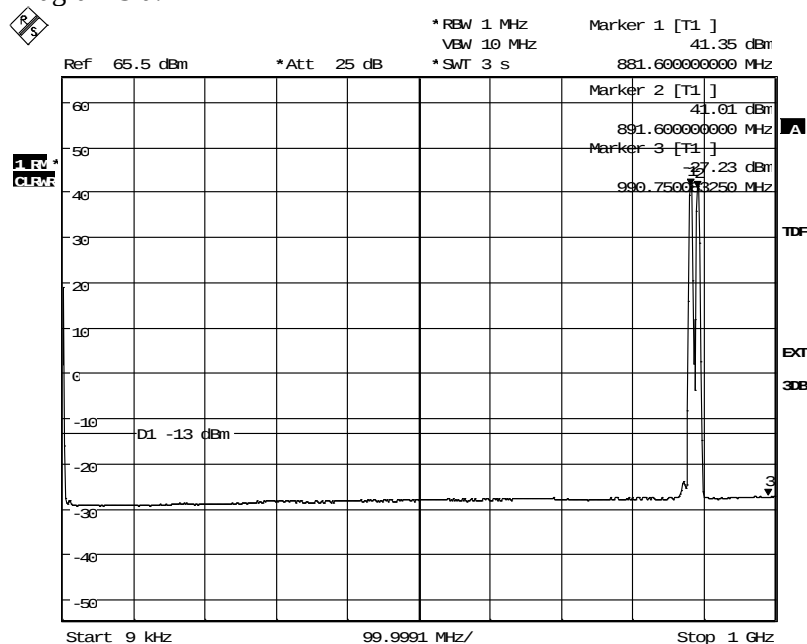
Diagram 8 b:



Date: 4.SEP.2013 17:47:58

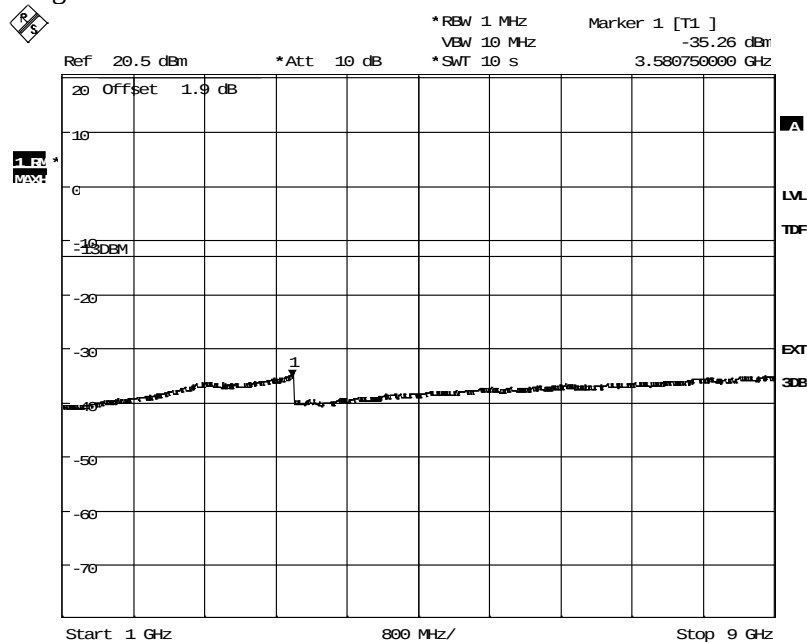
Appendix 5

Diagram 9 a:



Date: 5.SEP.2013 12:04:53

Diagram 9 b:



Date: 5.SEP.2013 12:07:25

Appendix 6

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

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

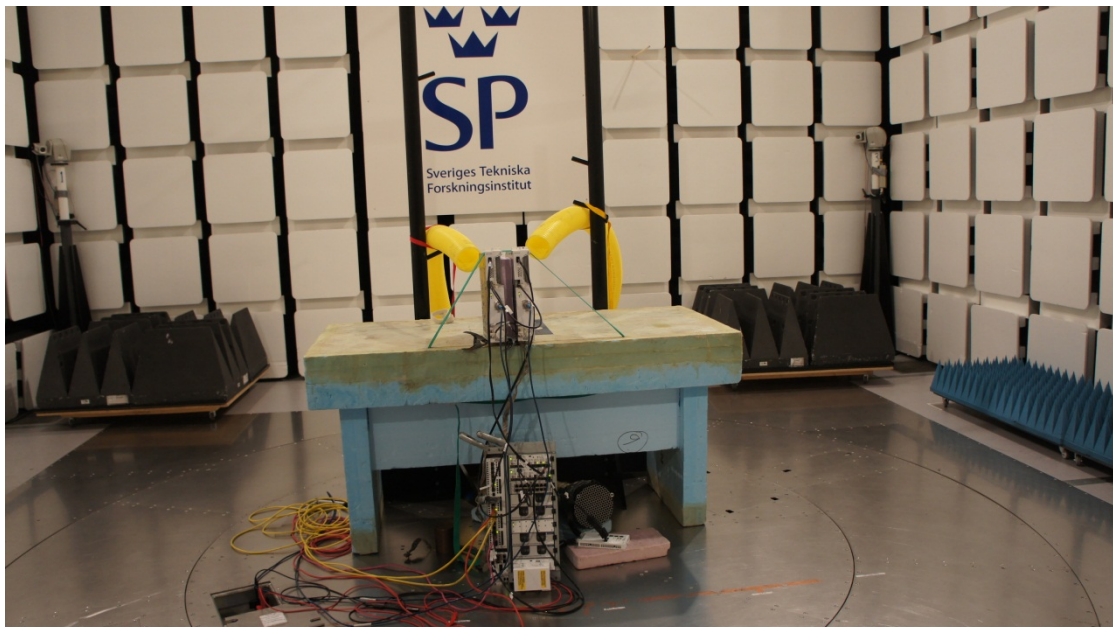
$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

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	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

Appendix 6

Results, representing worst case

Single carrier, MIMO mode,

Diagram	BW configuration[MHz]	Tested frequency
1 a+b	5 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

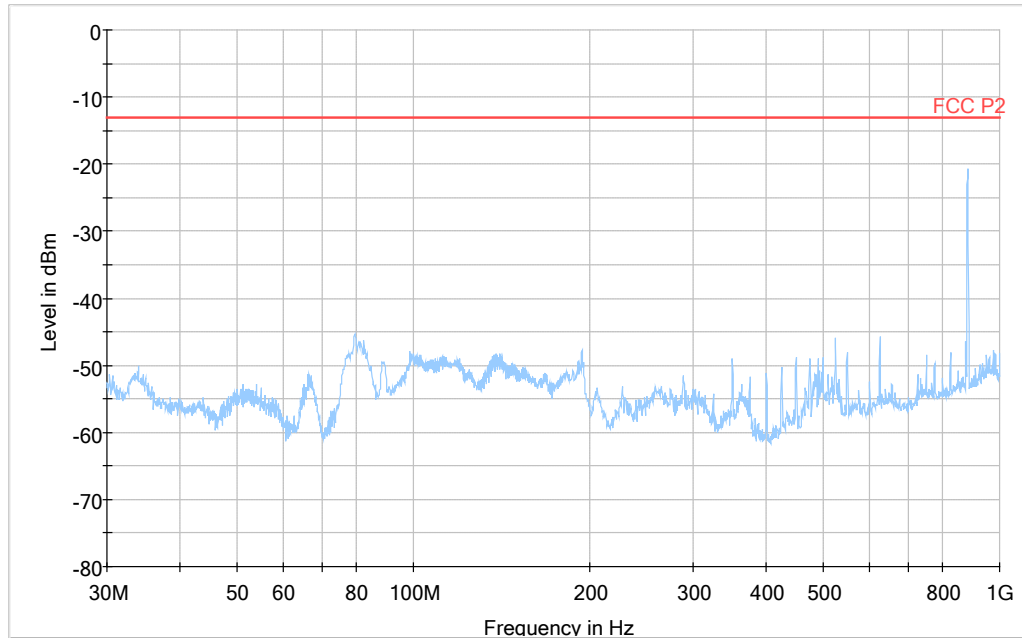
CFR 47 § 22.917 and IC RSS-132 5.5

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
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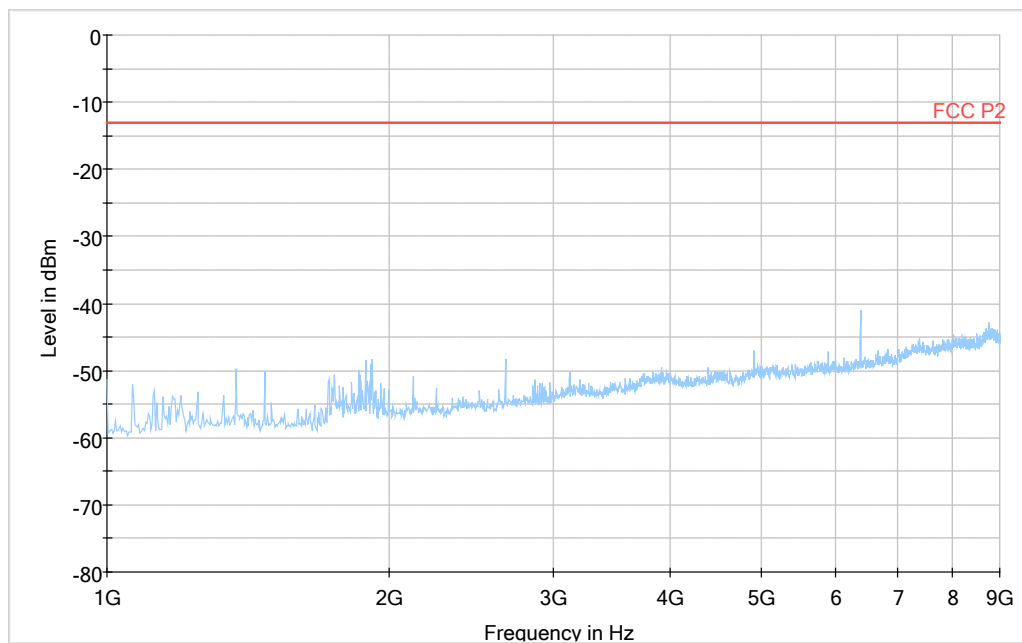
Appendix 6

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)
2013-09-06	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 measurement was made per 3GPP TS 25.141. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSQ 40	504 143
RF attenuator	-
Temperature Chamber	503 360
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)

Channel Bandwidth 5MHz

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

Appendix 7

Limits

Limit according to:

3GPP TS 25.141:

The frequency error shall be within $\pm 0.05 \text{ PPM} \pm 12 \text{ Hz}$ ($\pm 44.08 \text{ Hz}$).

§22.355

The frequency stability shall be within $\pm 1.5 \text{ ppm}$ ($\pm 1322.4 \text{ Hz}$).

RSS-132 5.3 Frequency:

The carrier frequency shall not depart from the reference frequency in excess of $\pm 1.5 \text{ ppm}$ ($\pm 1322.4 \text{ Hz}$) 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:



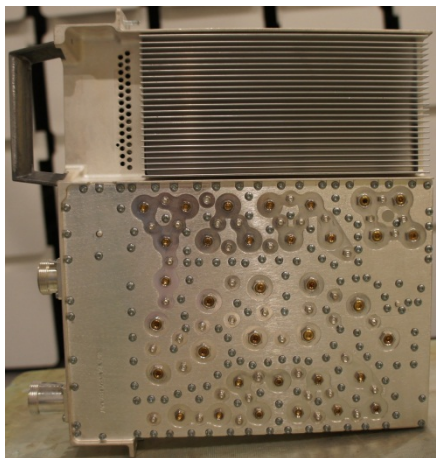
Back side:



Product Label:



Left side:



Right side:



Appendix 8

Top side:



Bottom side:

