

Ericsson (China) Communications Company Ltd
Att. Hua Yang
Ericsson Tower
No. 5 Lize East Street
Chaoyang District, Beijing 100102
P. R. China

Class II permissive change measurements on RRUS 01 B2 1900 MHz cellular equipment with FCC ID: TA8AKRC11874-1 and IC: 287AB-AS118741

(7 appendices)

Test object

RRUS 01 B2, product KRC 118 74/1, revision R1C

Summary

Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-132		
2.1046 / RSS-133 6.4 RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	3
2.1051 / RSS-133 6.5 Band edge	Yes	4
2.1051 / RSS-133 6.5 Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-133 6.5 Field strength of spurious radiation	Yes	6

Note 1: Above RSS-133 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

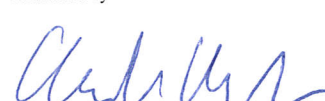
SP Technical Research Institute of Sweden Electronics - EMC

Performed by



Reinhold Reul

Examined by



Christer Karlsson

SP Technical Research Institute of Sweden

Postal address

SP
Box 857
SE-501 15 BORÅS
Sweden

Office location

Västerås
Brinellgatan 4
SE-504 62 BORÅS

Phone / Fax / E-mail

+46 10 516 50 00
+46 33 13 55 02
info@sp.se

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Appendix 1

Description - Equipment Under Test (EUT)

Equipment:	RRUS 01 B2 radio equipment 1900 MHz single and multi-carrier, operating in GSM mode.				
TX frequency band:	1930 - 1990 MHz				
Modulations:	GMSK, 8PSK, 16QAM, 32QAM and AQPSK				
Nominal maximum output power:	Per configuration and modulation, RMS value in [dBm]				
	GMSK	8PSK	16QAM	32QAM	AQPSK
Mode: Single carrier, 1 x	47.8	47.8	47.8	47.8	47.8
Mode: Multi carrier, 2 x	44.8	44.8	44.5	44.1	44.8
Mode: Multi carrier, 3 x	43.0	42.4	41.0	40.6	42.3
Mode: Multi carrier, 4 x	41.8	39.9	38.5	38.1	39.8
Nominal supply voltage:	-48 V DC				

Purpose of test

The purpose of this test is to justify a Class II Permissive Change of the test object to include the use of the modulations 16QAM, 32QAM and AQPSK in SCPIR 0 dB. This report verifies maintained performance characteristics of affected items by re-testing the updated equipment and comparing results for GMSK modulation with results for the new modulations.

Tested configurations and set-ups

Single and multi-carrier modes were used as documented in the respective appendix. The EUT was activated at the maximum nominal RF output power per activated carrier and random data was transmitted in all time slots, with the various modulations being tested one at a time. Connections and reference points for measurements are shown in the set-ups below.

Test frequencies used

In single carrier mode:

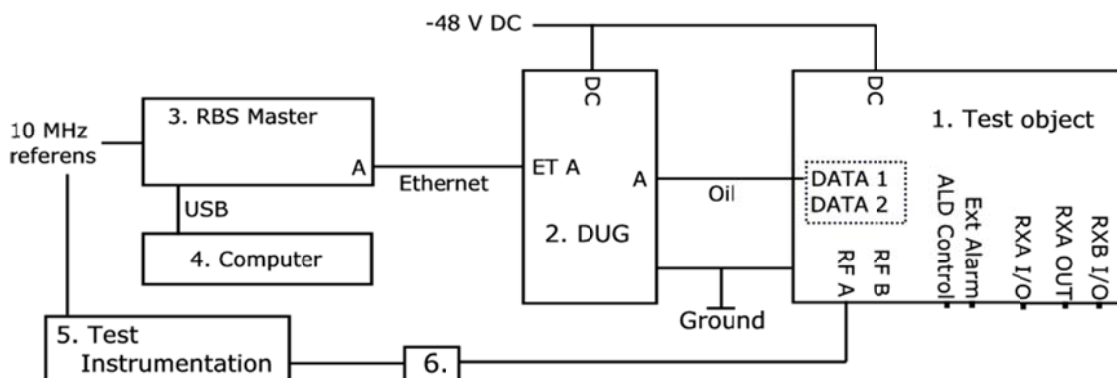
Channel	ARFCN	Frequency	Comment
B+1	513	1930.4 MHz	TX lowest frequency
M	661	1960.0 MHz	TX band center frequency
T-1	809	1989.6 MHz	TX highest frequency

In multi-carrier mode:

Channel	ARFCN	Frequency	Comment
B+1	513	1930.4 MHz	TX low multi-carrier bottom frequency used
B+9	521	1932.0 MHz	TX high multi-carrier bottom frequency used
M-4	657	1959.2 MHz	TX low multi-carrier mid frequency used
M+4	665	1960.8 MHz	TX high multi-carrier mid frequency used
T-9	801	1988.0 MHz	TX low multi-carrier top frequency used
T-1	809	1989.6 MHz	TX high multi-carrier top frequency used

Appendix 1

Test set-up, conducted measurements



Test object

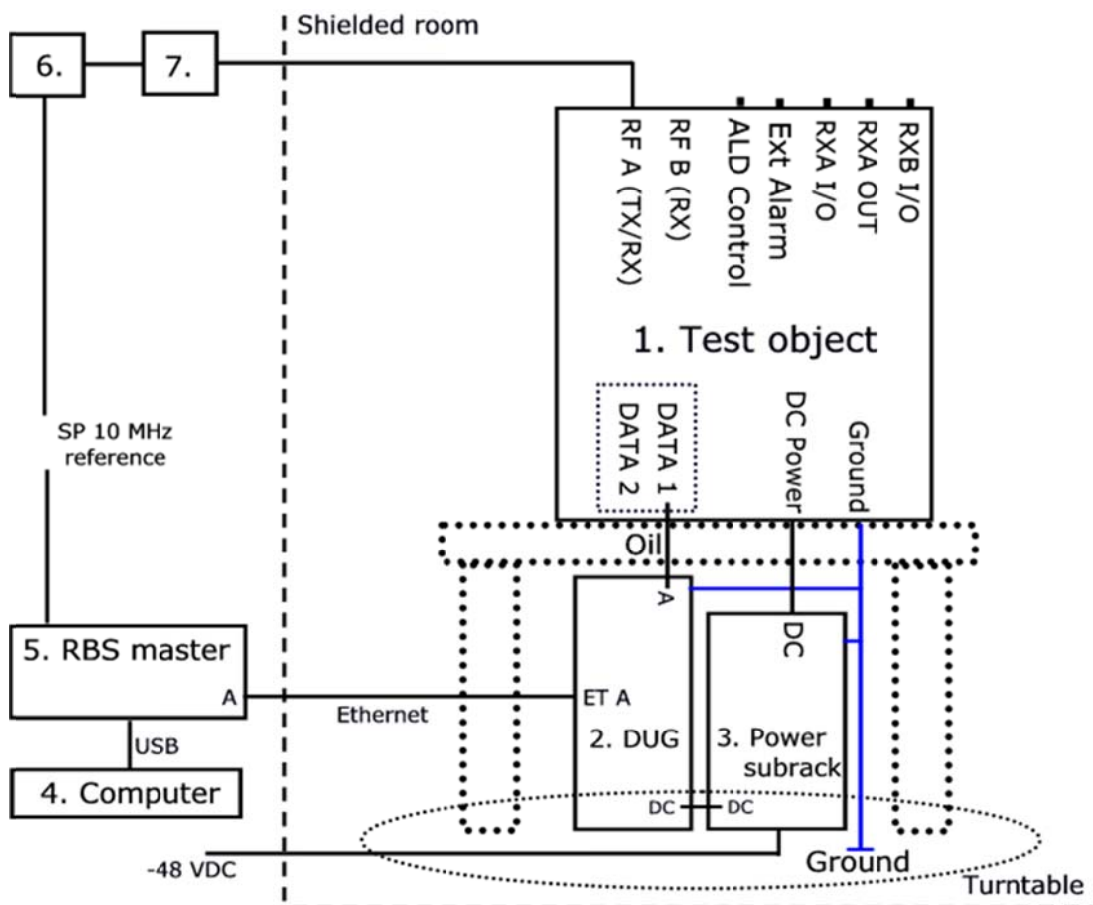
1. RRUS 01 B2, product KRC 118 74/1, revision R1C, SN CB4G624463 with FCC ID: TA8AKRC11874-1 and IC: 287AB-AS118741

Functional test equipment

2. Digital unit DUG 20 01, product KDU 137 569/1, revision R2A, SN C823667528
3. RBS Master 2E hardware, product LPY 107 1007/3, revision R1C/A, SN T01E6555543, BAMS 1000878432, using shielded Ethernet multi-wire with RJ-45 connectors and transmission mode E1 to DUG port ET A
4. Laptop Compaq nc6220, S/N: CNU54722NZ, BAMS 1000208319, with RBS Master 2E control software
5. Measurement equipment specified in respective appendix or client supplied Agilent MXA Signal Analyser model N9020A 20 Hz – 3.6 GHz, BAMS 1000785533 used to verify the modulation schemes
6. Attenuator / filter listed under test equipment in respective appendix

Appendix 1

Test set-up, radiated emission



Test object

1. RRUS 01 B2, product KRC 118 74/1, revision R1C, SN CB4G624463 with FCC ID: TA8AKRC11874-1 and IC: 287AB-AS118741

Functional test equipment

2. Digital unit DUG 20 01, product KDU 137 569/1, revision R2A, SN C823667528
3. Power sub-rack, details see below
4. Laptop Compaq nc6220, S/N: CNU54722NZ, BAMS 1000208319, with software RBS Master 2E control software
5. RBS Master 2E hardware, product LPY 107 1007/3, revision R1C/A, SN T01E6555543, BAMS 1000878432, using shielded Ethernet multi-wire with RJ-45 connectors and transmission mode E1 to DUG port ET A
6. Rohde & Schwarz ESI40 (SP 503 125) for signal monitoring or 50 ohm termination
7. Attenuator 30 dB, SP 900229

Appendix 1

Test object connections

Interface	Type of port
-48.0 V DC	DC power
Ground strap connected to grounding screw on bottom side	Ground
RF A, 7/16" female, RF connector	RF/Antenna
RF B, 7/16" female RF connector, unconnected	RF/Antenna
3 x feed-through for optical fibre connections,	
1x fibre connected to internal Data 1 port,	Signal
remaining unconnected, covered by rubber plugs	
RXA I/O, SMA female, unconnected, covered by metal protection cap	Signal
RXA OUT, SMA female, unconnected, covered by metal protection cap	Signal
RXB I/O, SMA female, unconnected, covered by metal protection cap	Signal
ALD control, unconnected, covered by metal protection cap	Signal
Ext Alarm, unconnected, covered by metal protection cap	Signal

Note: A bottom view photo of the EUT ports is included in appendix 7.

Power sub-rack used during radiated test:

Pos.	Unit	Product Number	Revision	Serial Number
	Power subrack	SXK 109 8115/1	R2A	-
1	PDU 01 01	BMG 980 336/2	R4F	BJ31532384
2	PDU 01 01	BMG 980 336/2	R4F	BJ31532382
3	SHU 01 01	BGK 901 18/1	R3C	BJ31446269
4	DUMMY	SXK 109 8257/1	R1F	-
5	DUMMY	SXK 109 8257/1	R1F	-
6	PFU	KFE 101 11621	R1B	BR80910495
7	DUMMY	SXK 109 8257/1	R1F	-
8	DUMMY	SXK 109 8257/1	R1F	-
9	PCF 02 01	KFE 101 1157/1	R1C	BW95301450

Test object software

Software	Revision
CXP 104 0013/07	R65F

References

Measurements were done according to relevant parts of the following standards:

ANSI C63.4-2009
ANSI/TIA/EIA-603-C-2004
ANSI/TIA/EIA 136-280-D-2002
CFR 47 part 2, October 1st, 2010
CFR 47 part 22, October 1st, 2010
RSS-Gen, Issue 3
RSS-133, Issue 5

Appendix 1

Reservation

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in the report.

Delivery of test object

The test object was delivered: 2011-12-07

Test equipment

Measurement equipment	Calibration Due	SP number
Anechoic chamber, Hertz	2013-10	15:116
Boonton 4500A RF Peak power meter/analyser	2012-11	503 144
Boonton Power sensor 56518-S/4	2012-11	503 146
Rohde & Schwarz FSQ40	2012-07	504 143
Rohde & Schwarz FSIQ40	2012-07	503 738
Rohde & Schwarz ESI40	2012-07	503 125
Rohde & Schwarz Vector Network Analyser	2012-07	503 687
Chase bilog antenna CBL 6121A	2014-10	502 460
Schaffner Reference Dipole BSRD6500	2012-03	502 181
EMCO Horn Antenna 3115	2014-01	502 175
EMCO Horn Antenna 3115	2014-01	501 548
MITEQ Low Noise Amplifier	2012-08	503 277
Flann Std gain horn 20240-20	2014-03	503 674
Attenuator 40 dB	2012-08	504 159
Attenuator 30 dB	2012-08	900 229
Attenuator 30 dB	2012-05	503 870
Attenuator 10 dB	2012-08	900 118
High pass filter	2012-08	504 199
High pass filter	2012-08	504 200
High pass filter	2012-08	502 758
High pass filter	2012-08	503 739
High pass filter	2012-10	503 740
Multimeter Fluke 87	2012-05	502 190
Testo 615 temperature and humidity meter	2012-03	503 498
Testo 635 temperature and humidity meter	2013-05	504 203

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).



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2012-02-29

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Appendix 1

Test engineers

Jörgen Wassholm, Martin Nilsson, Martin Forsberg and Reinhold Reul, SP

Manufacturer's representative

Hua Yang, Ericsson (China) Communications Company Ltd

Appendix 2

RF Power output measurements according to CFR 47 2.1046 / RSS-133 6.4

Date	Temperature	Humidity
2012-01-04	23 °C ± 3 °C	25 % ± 5 %
2012-01-05	23 °C ± 3 °C	23 % ± 5 %

Test set-up and procedure

Measurements were made at connector RF A. The output was connected to a peak power analyser via a 50 ohm attenuator.

Measurement equipment	SP number
Boonton 4500A RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
Attenuator	503 870
Attenuator	900 118
Multimeter Fluke 87	502 190
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Appendix 2

Results

Single carrier, 1 x 47.8 dBm, RBS master 2E setting 48

Transmitter power (dBm) Peak / RMS	
Channel:	M
Modulation:	
GMSK	48.2 / 47.4
16QAM	52.3 / 47.1
32QAM	52.4 / 47.0
AQPSK	51.3 / 47.2

The highest measured PAR for above configuration was 5.4 dB.

Multi carrier, 2 x 44.8 dBm, RBS master 2E setting 45 per carrier, channels M-4 and M+4

Aggregated transmitter power (dBm) Peak / RMS	
Channel:	(M-4) & (M+4)
Modulation:	
GMSK	51.1 / 47.3
16QAM	54.9 / 47.0
32QAM	54.4 / 46.5
AQPSK	54.1 / 47.3

The theoretical RMS power per carrier is 3 dB below the aggregated measured RMS values.
The highest measured PAR for above configuration was 7.9 dB.

Appendix 2

Limits

According to CFR § 24 there are no conducted limits at the antenna connector.

§ 24.232: The peak-to-average (PAR) ratio shall not exceed 13 dB. Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP).

RSS-133: Base station transmitters operating within the frequency range 1930 – 1995 MHz shall not exceed 100 W output power. The peak-to-average (PAR) ratio shall not exceed 13 dB. 1640 W EIRP shall not be exceeded (according SRSP-510).

Complies?	Yes
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Appendix 3

Occupied bandwidth measurements according to 47CFR 2.1049 / RSS-133 6.5

Date	Temperature	Humidity
2012-01-04	23 °C ± 3 °C	25 % ± 5 %
2012-01-05	23 °C ± 3 °C	23 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. Measurements were made with connector RF A connected to a spectrum analyser with activated RMS detector. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz FSIQ40	503 738
Attenuator	503 870
Attenuator	900 118
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

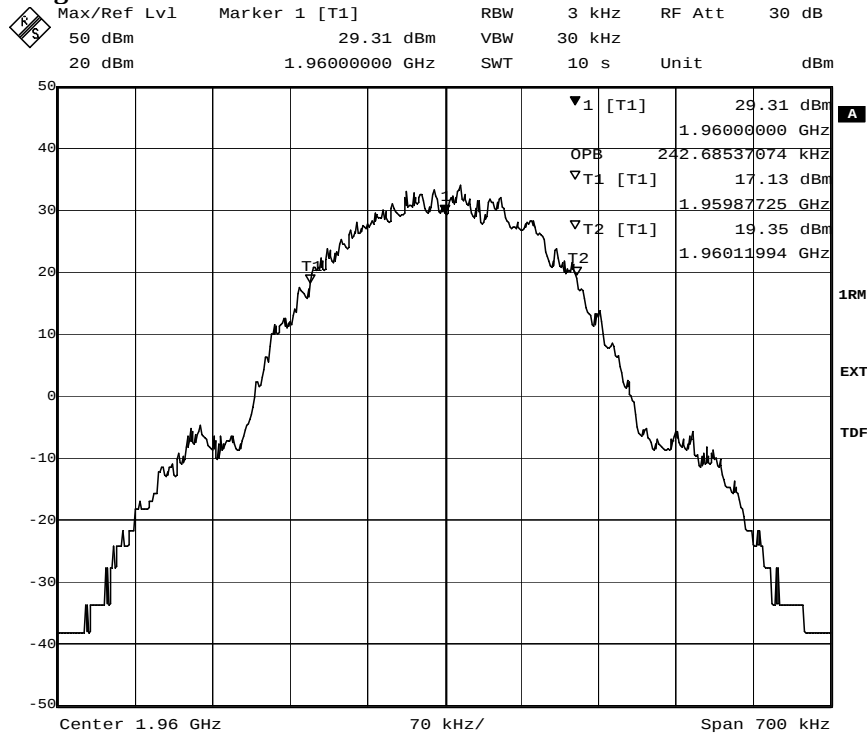
Results

Single carrier 1x47.8 dBm, RBS master 2E setting 48

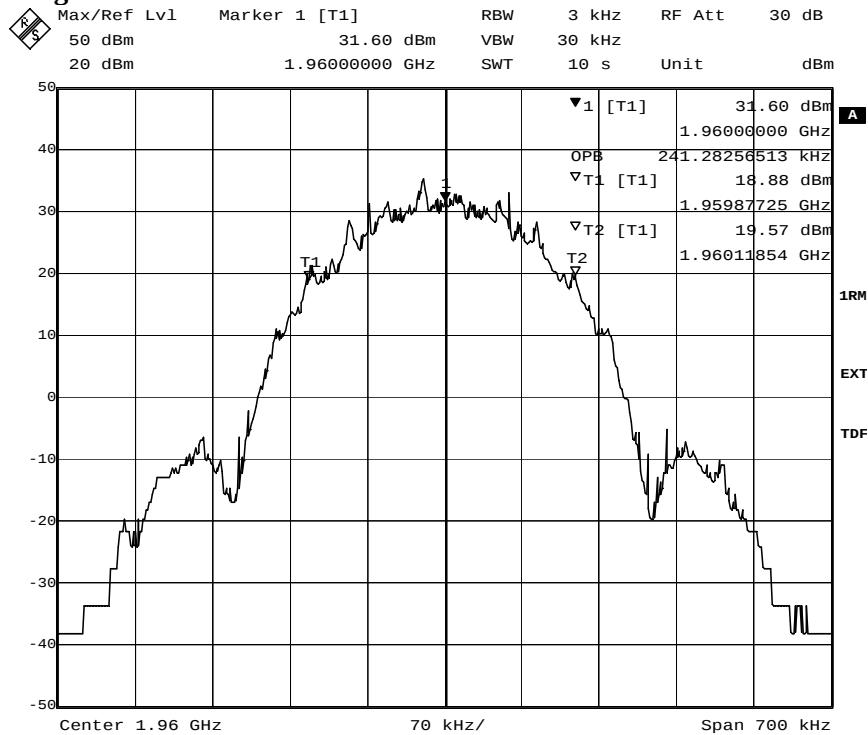
Diagram	Channel	Frequency	Modulation	OBW
1.	M	1960.0 MHz	GMSK	243 kHz
2.	M	1960.0 MHz	16QAM	241 kHz
3.	M	1960.0 MHz	32QAM	240 kHz
4.	M	1960.0 MHz	AQPSK	238 kHz

Complies?	Yes
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Appendix 3

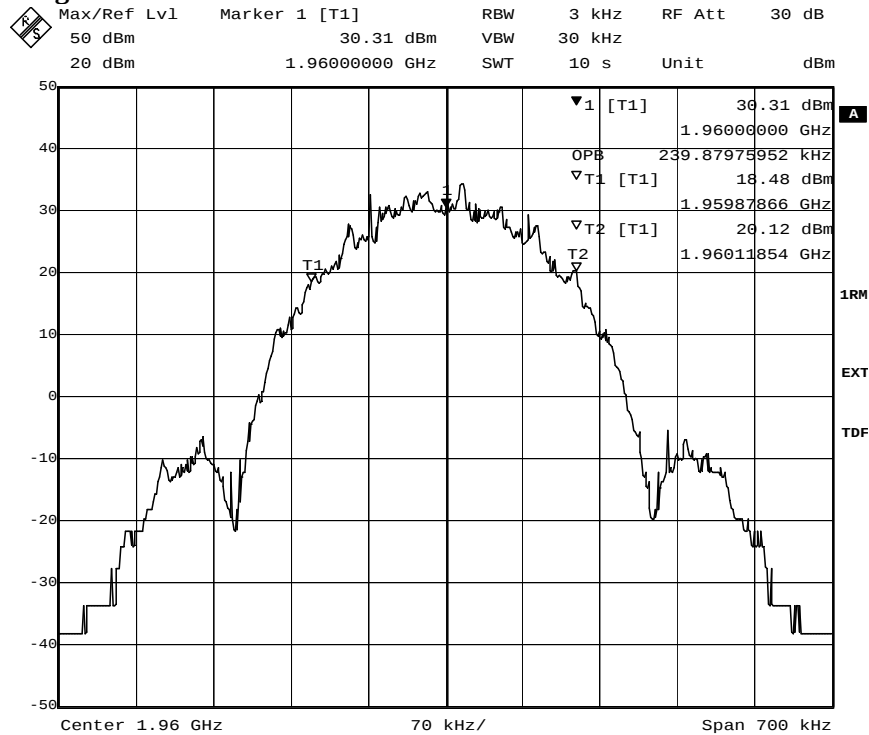
Diagram 1


Date: 4.JAN.2012 15:56:53

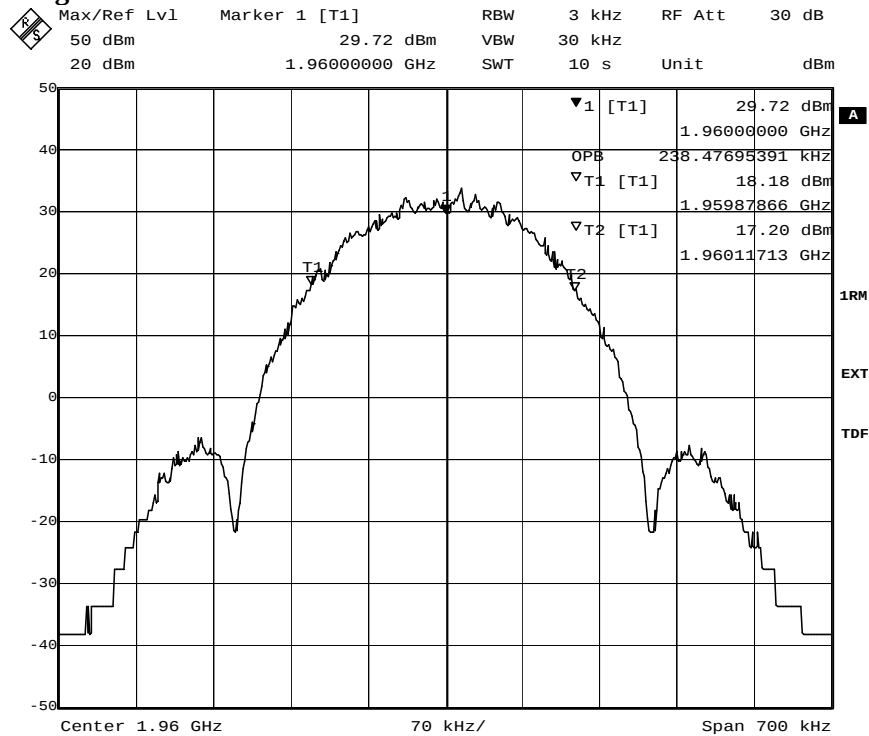
Diagram 2:


Date: 5.JAN.2012 09:04:37

Appendix 3

Diagram 3:


Date: 5. JAN. 2012 09:08:03

Diagram 4:


Date: 5. JAN. 2012 08:43:52

Appendix 4

Band edge measurements according to 47CFR 2.1051 / RSS-133 6.5

Date	Temperature	Humidity
2012-01-05	23 °C ± 3 °C	23 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. The EUT 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.

The standard defines a RBW of 1% of the EBW within the 1st MHz off the band-edge and a RBW of 1 MHz beyond. Where a reduced RBW was used the limit line was adapted by $(10 \cdot \log(\text{RBW}/1 \text{ MHz})) \text{ dB}$.

Measurement equipment	SP number
Rohde & Schwarz FSIQ40	503 738
Attenuator	900 229
Attenuator	900 118
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier 1x47.8 dBm, RBS master 2E setting 48

Modulation 16QAM:

Diagram	Channel	Power setting	RMS power measured
1 a, b, c	B+1	48	47.1 dBm
2 a, b, c	T-1	48	47.0 dBm

Modulation 32QAM:

Diagram	Channel	Power setting	RMS power measured
3 a, b, c	B+1	48	47.0 dBm
4 a, b, c	T-1	48	46.8 dBm

Modulation AQPSK:

Diagram	Channel	Power setting	RMS power measured
5 a, b, c	B+1	48	47.1 dBm
6 a, b, c	T-1	48	46.9 dBm

The diagrams are shown on the following pages.

Remarks

The channels adjacent to the TX band edges, ARFCN 512 and 810, must not be used.



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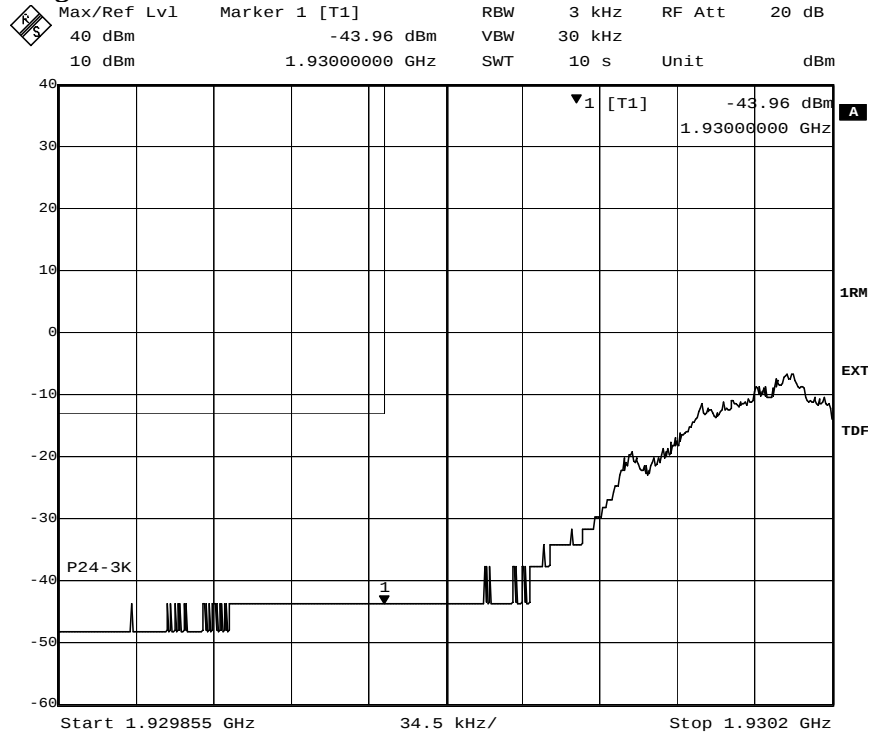
Appendix 4

Limits

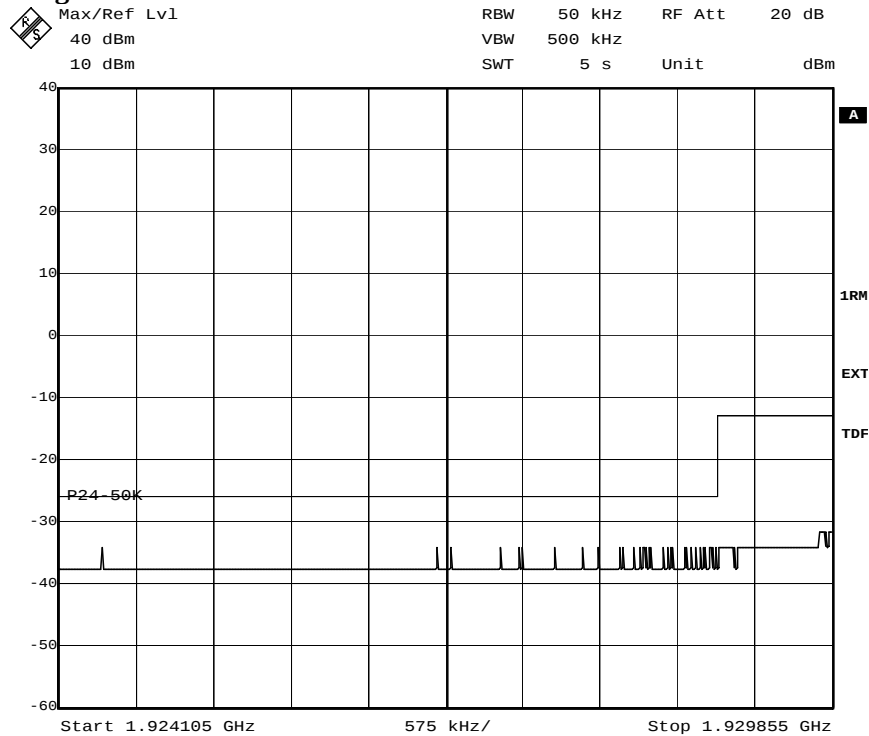
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 4

Diagram 1 a:


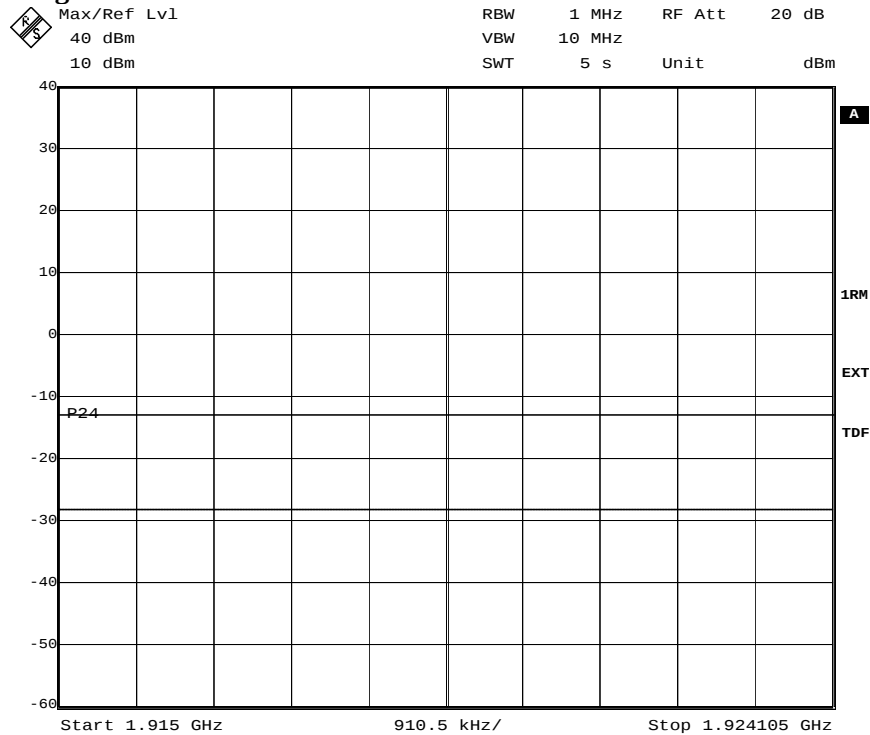
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Diagram 1 b:


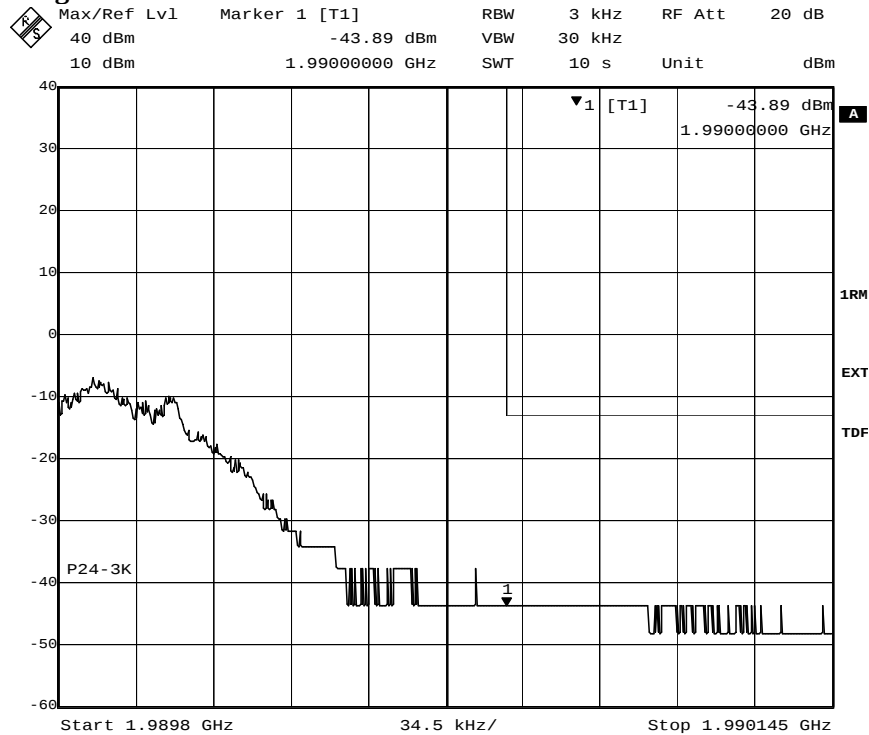
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Appendix 4

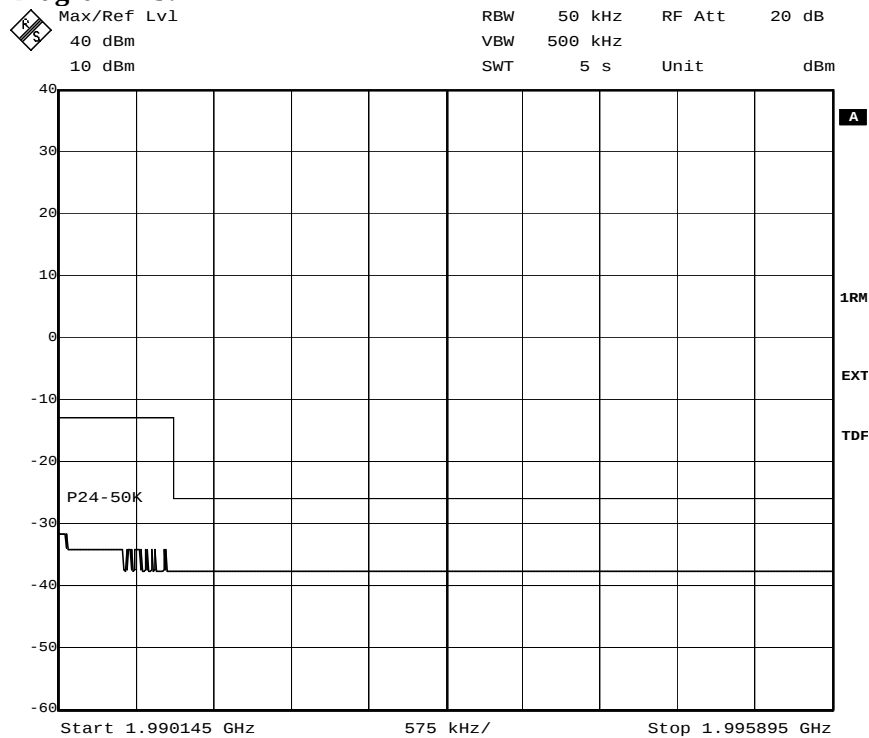
Diagram 1 c:



Appendix 4

Diagram 2 a:


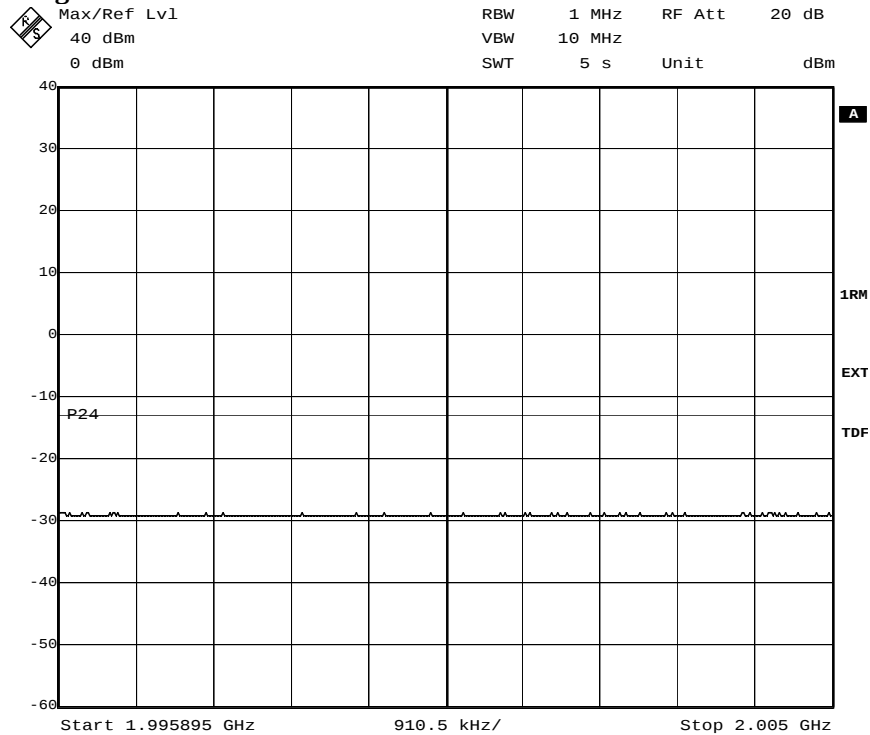
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Diagram 2 b:


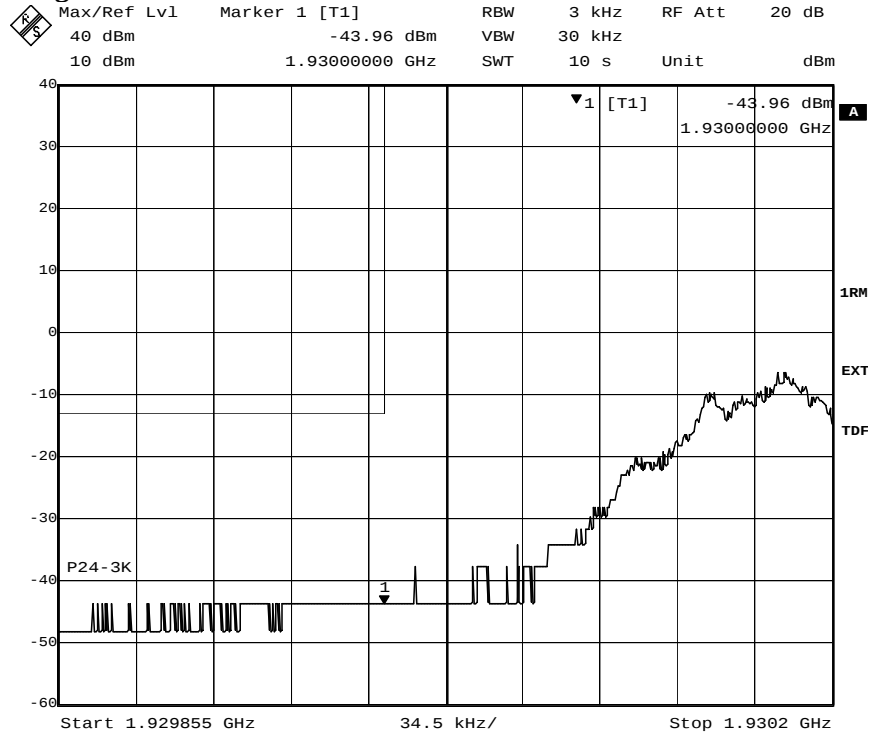
Date: 5. JAN. 2012 10:30:37

Appendix 4

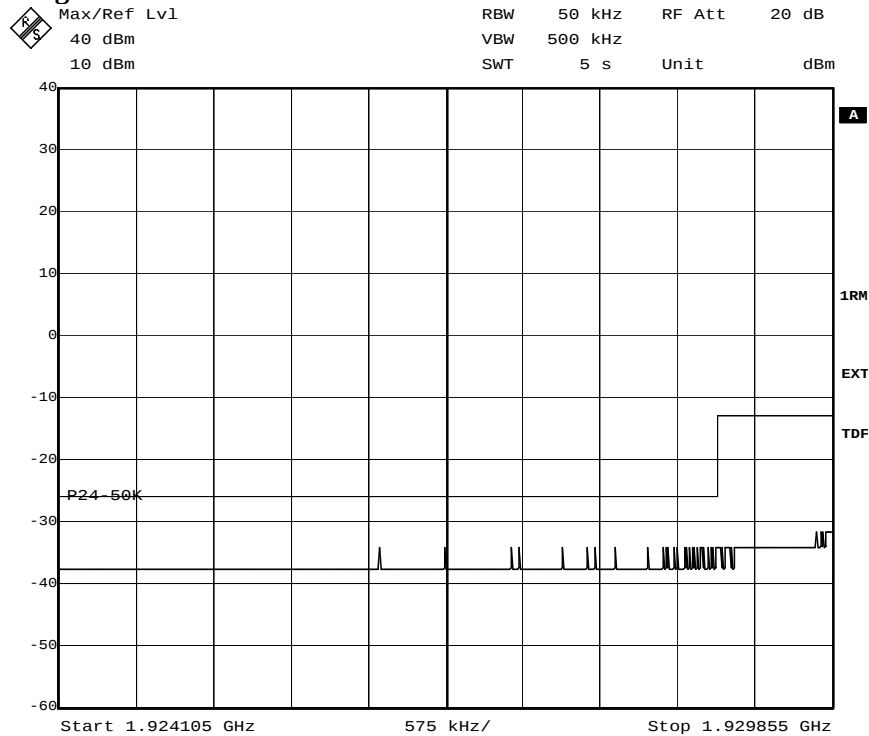
Diagram 2 c:



Appendix 4

Diagram 3 a:


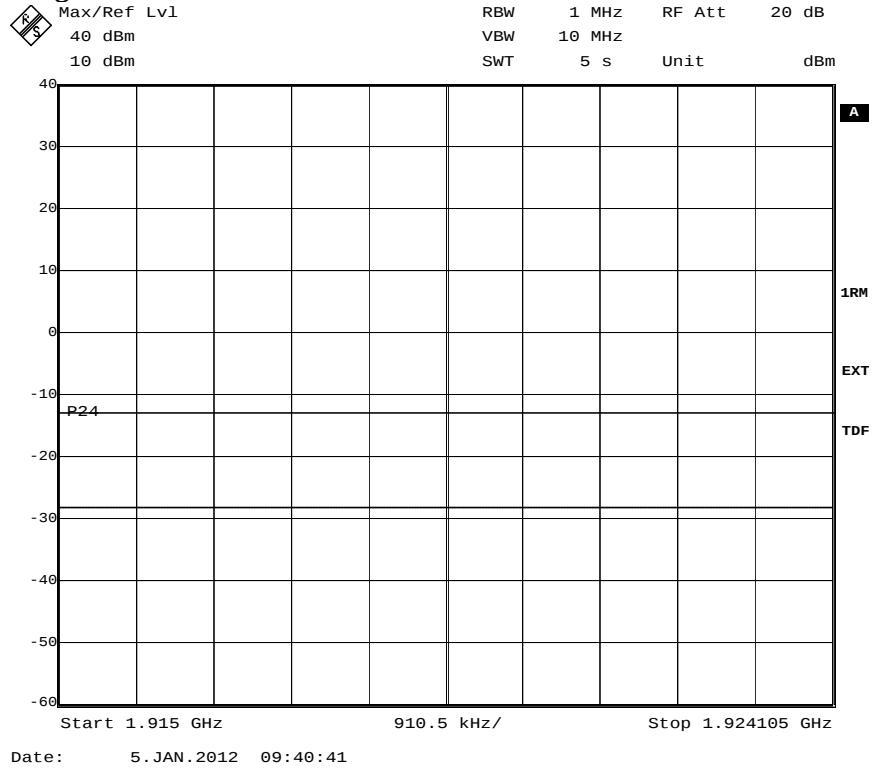
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Diagram 3 b:


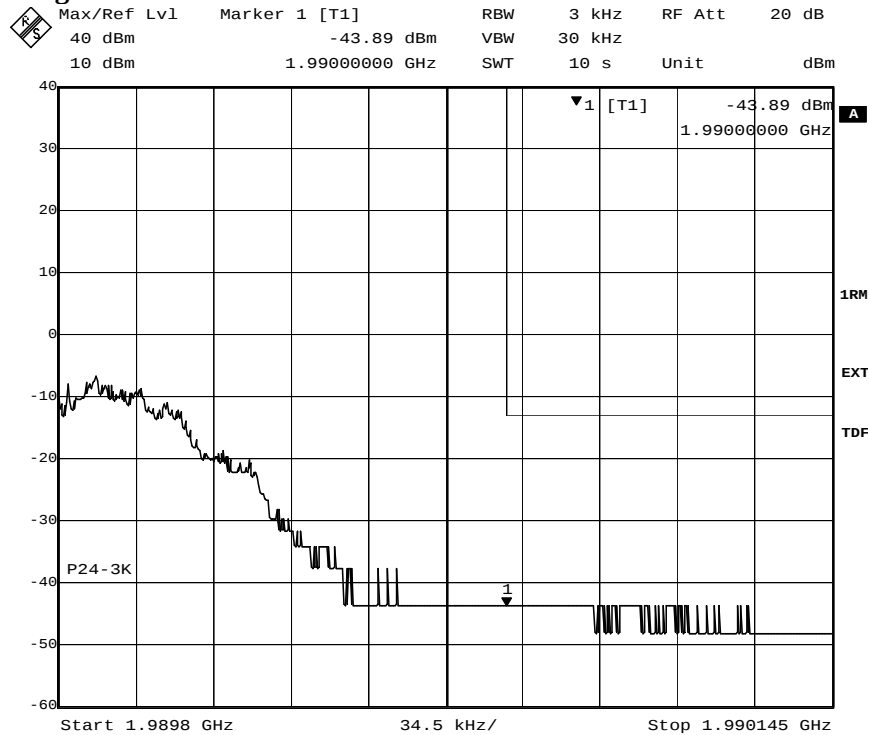
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Appendix 4

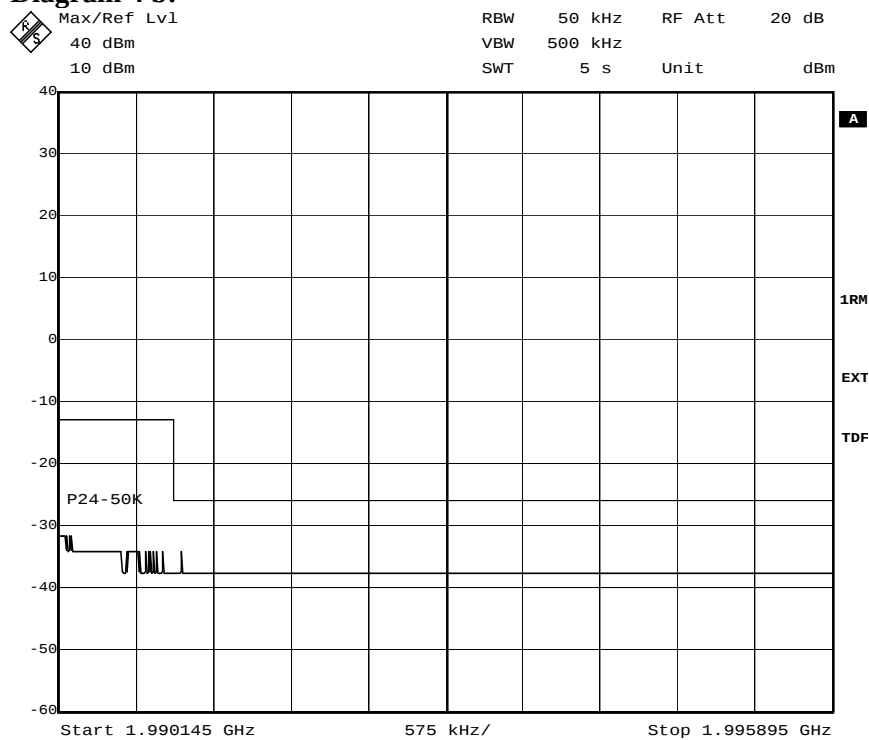
Diagram 3 c:



Appendix 4

Diagram 4 a:


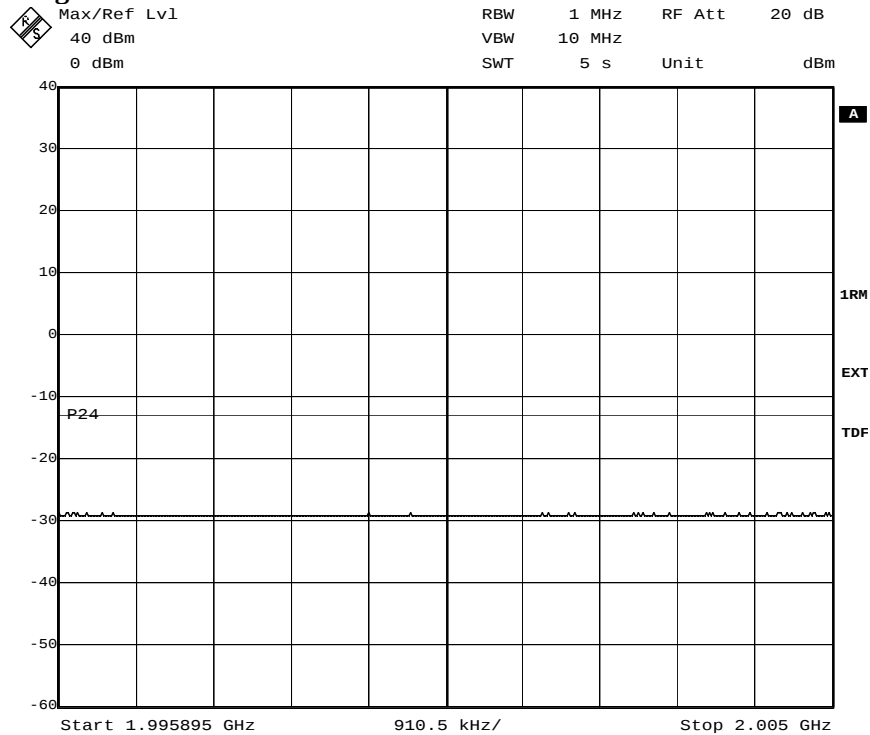
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Diagram 4 b:


Date: 5. JAN. 2012 10:39:00

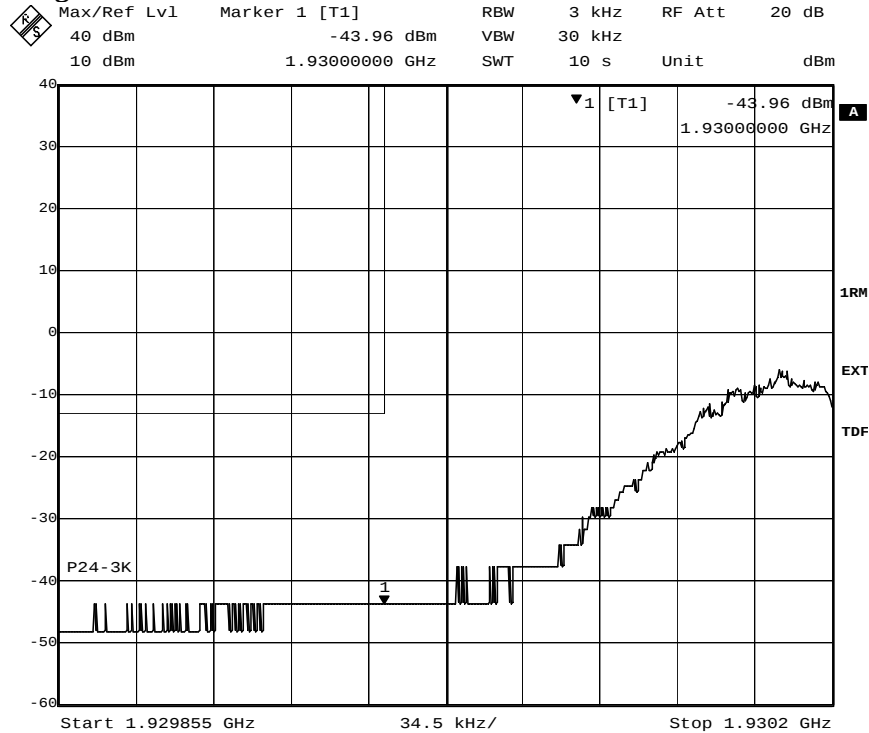
Appendix 4

Diagram 4 c:

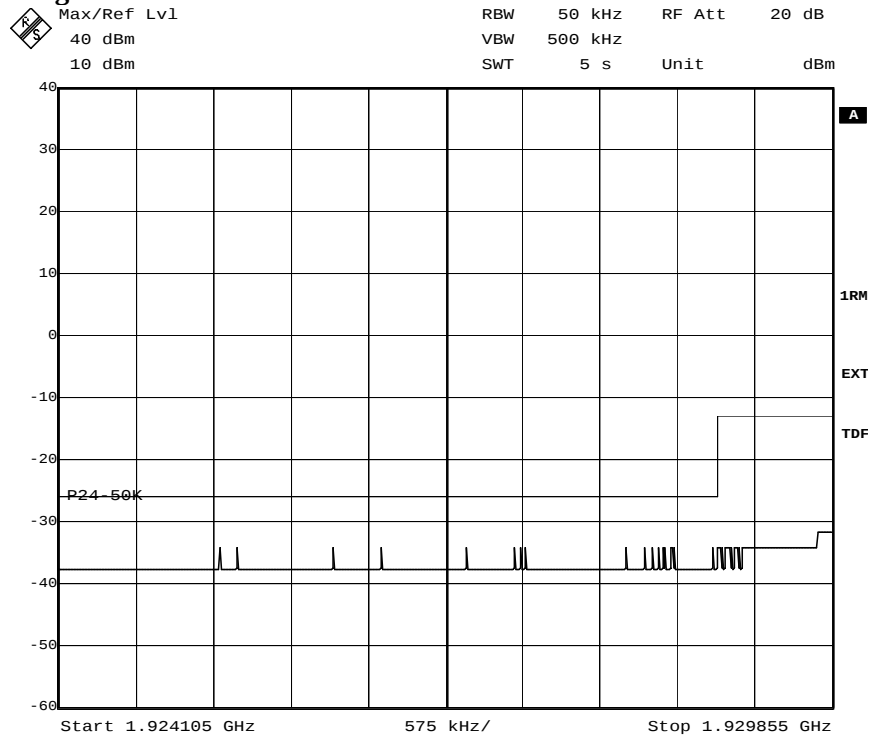


Date: 5. JAN. 2012 10:39:38

Appendix 4

Diagram 5 a:


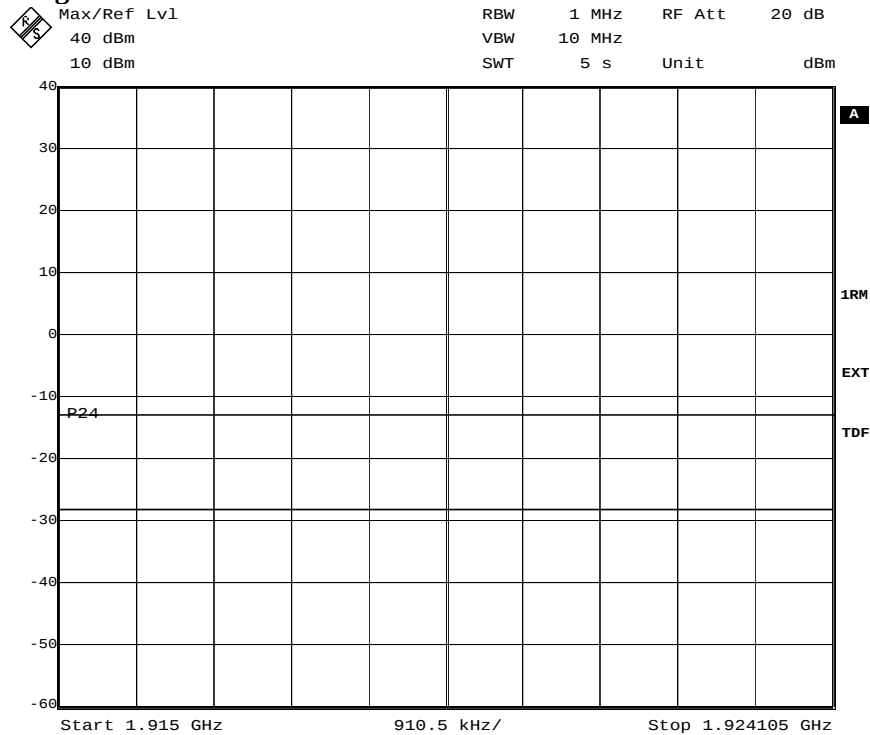
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Diagram 5 b:


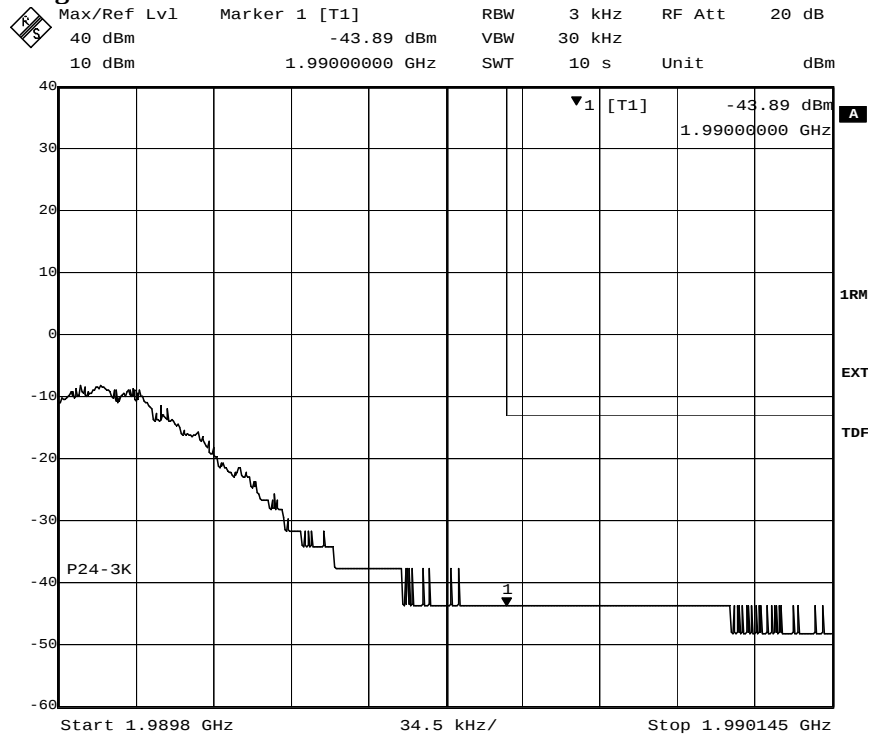
Date: 5. JAN. 2012 09:35:14

Appendix 4

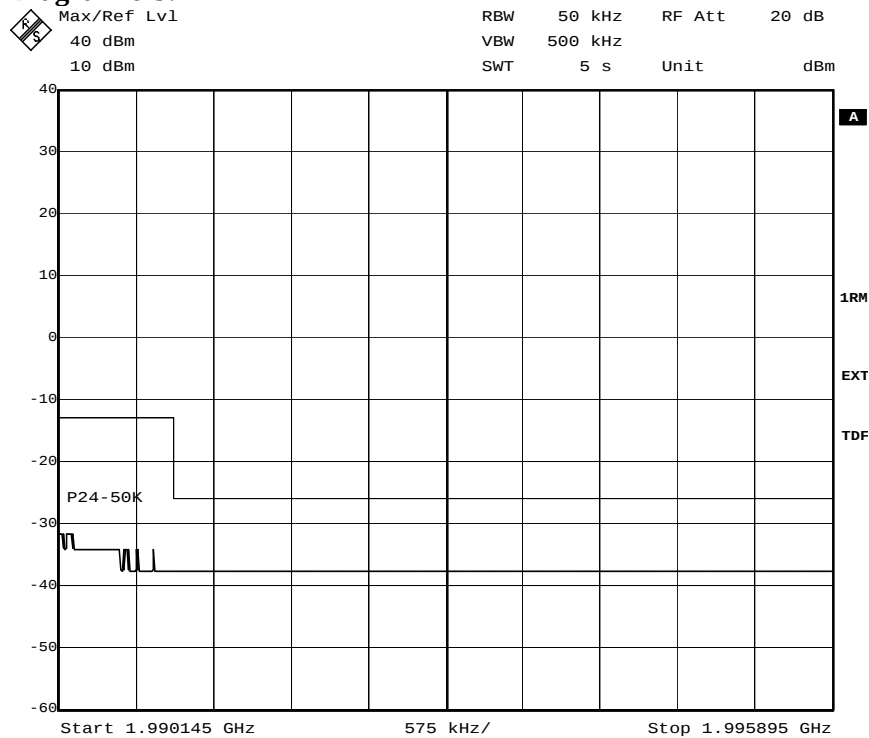
Diagram 5 c:



Appendix 4

Diagram 6 a:


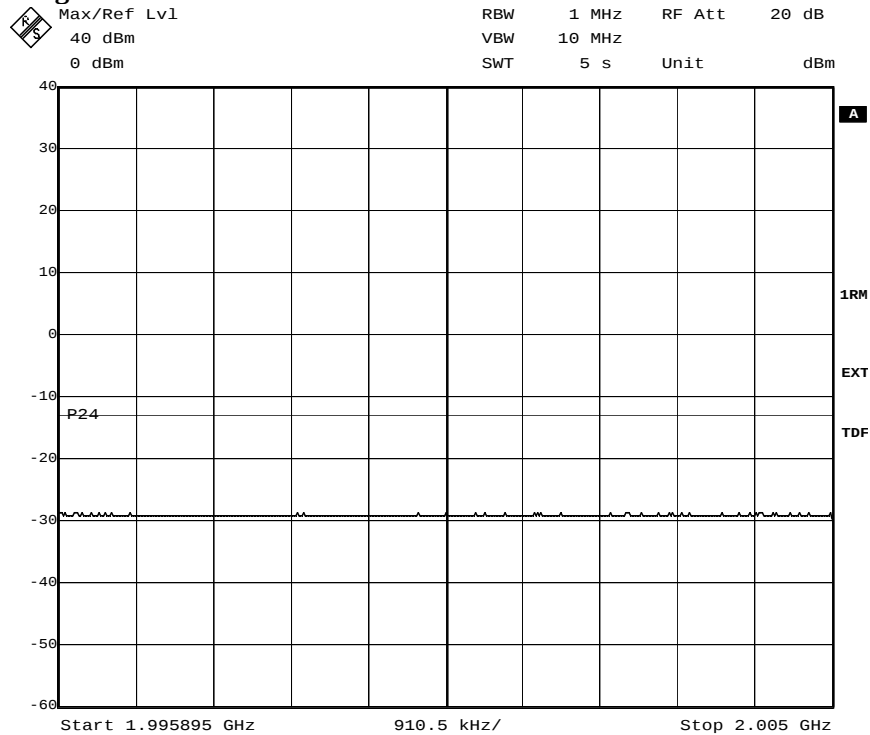
Date: 5. JAN. 2012 10:24:42

Diagram 6 b:


Date: 5. JAN. 2012 10:25:29

Appendix 4

Diagram 6 c:



Date: 5. JAN. 2012 10:26:32

Appendix 5

Conducted spurious emission measurements according to 47CFR 2.1051 / RSS-133 6.5

Date	Temperature	Humidity
2012-01-04	23 °C ± 3 °C	25 % ± 5 %
2012-01-05	23 °C ± 3 °C	23 % ± 5 %

Test set-up and procedure

The measurements were made at connector RF A. The output was via attenuators connected to a spectrum analyser. A pre-measurement was performed with the PEAK detector activated. Emission close to or above the limit with the PEAK detector is measured with the RMS detector activated. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz FSIQ40	503 738
Rohde & Schwarz FSQ40	504 143
Attenuator	900 229
Attenuator	900 118
Attenuator	504 159
High pass filter	504 200
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier 1 x 47.8 dBm, RBS master 2E setting 48

Diagram	Channel	Modulation	Measured range
1 a, b	M	GMSK	9 kHz – 20 GHz
2 a, b	M	16QAM	9 kHz – 20 GHz
3 a, b	M	32QAM	9 kHz – 20 GHz
4 a, b	M	AQPSK	9 kHz – 20 GHz

Multi carrier 2 x 44.8 dBm, RBS master 2E setting 45 per carrier

Diagram	Channels	Modulation	Measured range
7 a - c	(B+1) & (B+9)	16QAM	9 kHz – 20 GHz
8 a, b	(M-4) & (M+4)	GMSK	9 kHz – 20 GHz
9 a, b	(M-4) & (M+4)	16QAM	9 kHz – 20 GHz
10 a, b	(M-4) & (M+4)	32QAM	9 kHz – 20 GHz
11 a, b	(M-4) & (M+4)	AQPSK	9 kHz – 20 GHz
12 a - c	(T-1) & (T-9)	16QAM	9 kHz – 20 GHz

The diagrams are shown on the following pages.



Appendix 5

Remarks

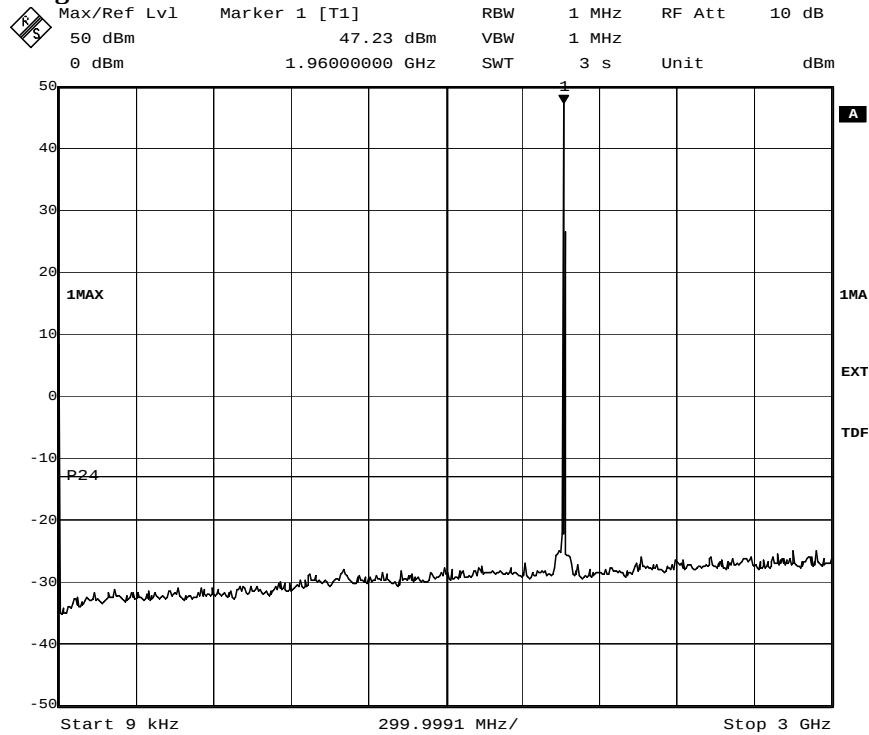
The emission at 9 kHz on some plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through. 16QAM modulation had the highest RMS level of TX IM when comparing 16QAM, 32QAM and AQPSK modulation. Results for 16QAM modulation are shown in diagrams 7 c and 12 c.

Limits

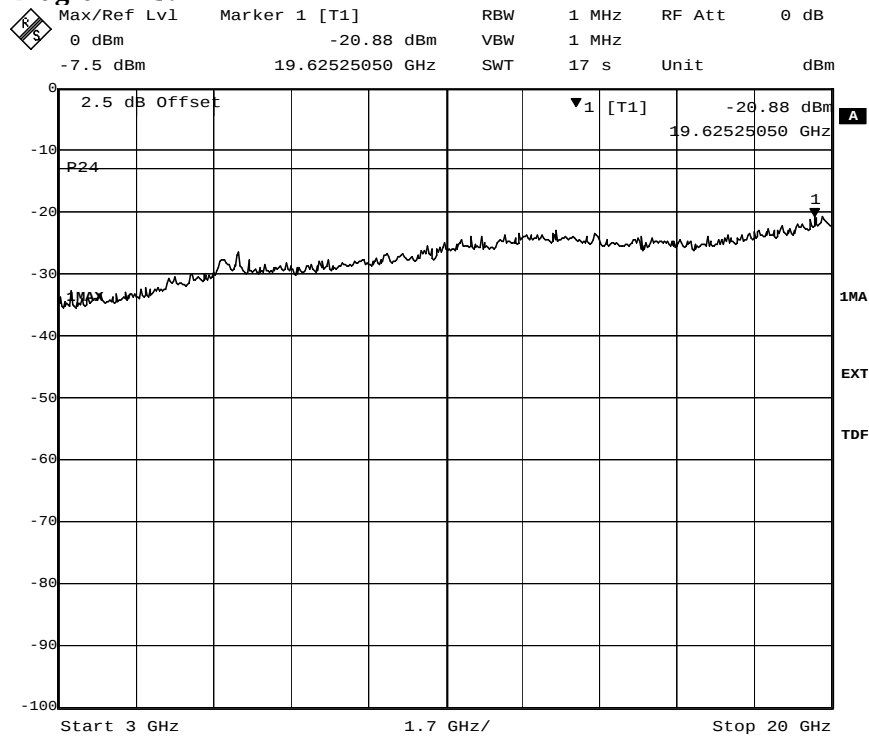
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 5

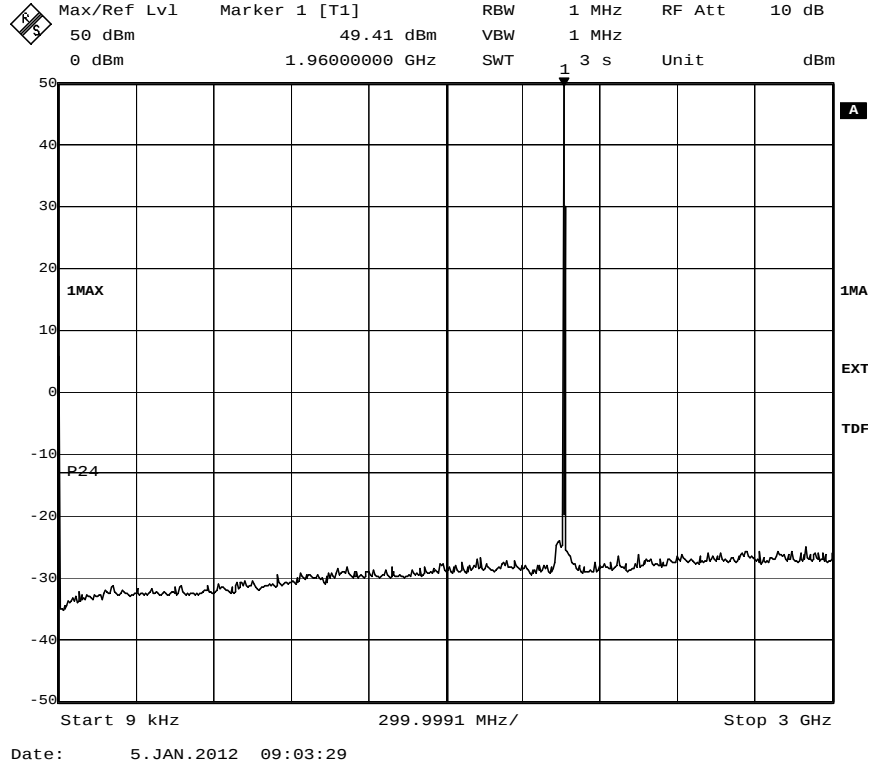
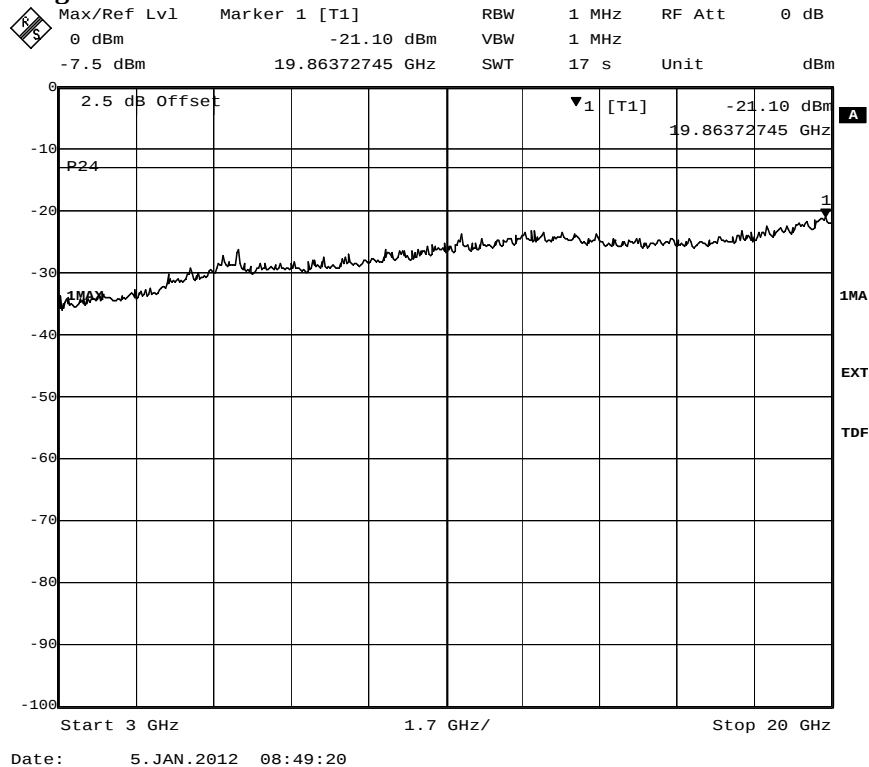
Diagram 1 a:


Date: 4. JAN. 2012 16:01:50

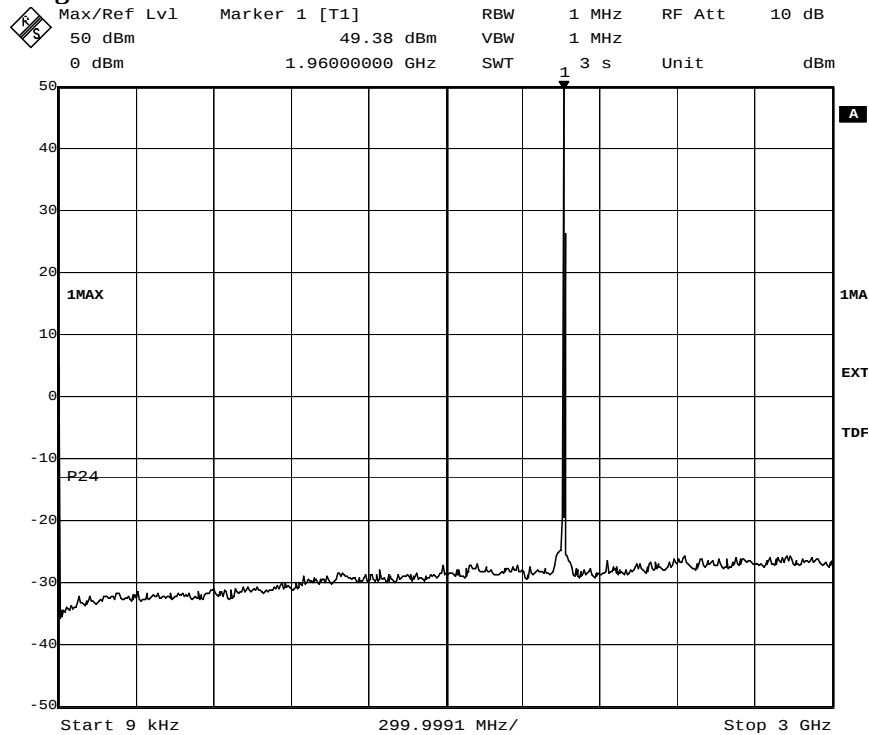
Diagram 1 b:


Date: 4. JAN. 2012 16:03:19

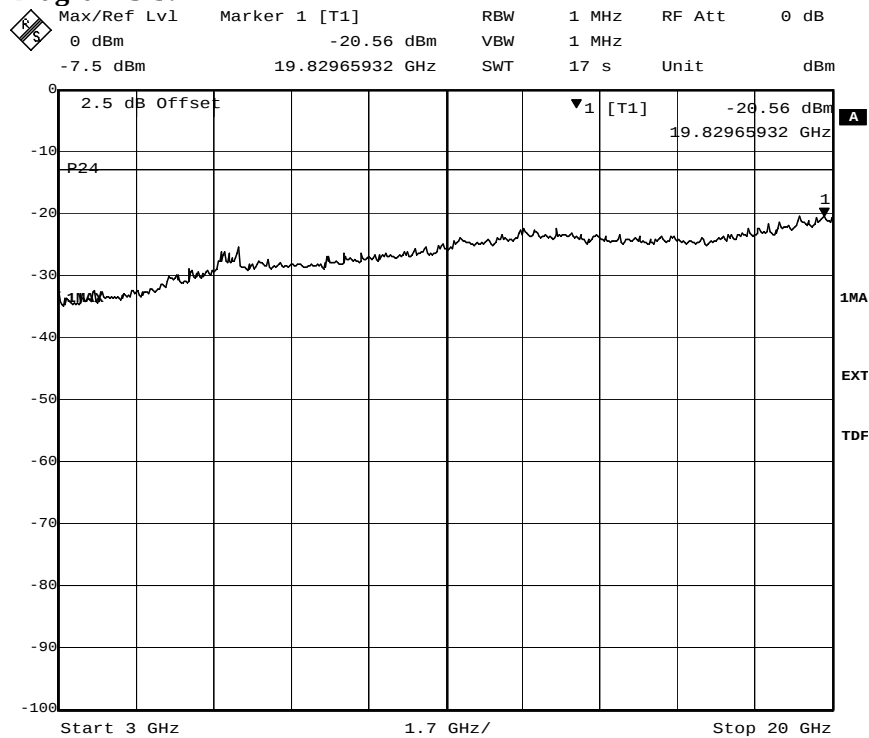
Appendix 5

Diagram 2 a:

Diagram 2 b:


Appendix 5

Diagram 3 a:


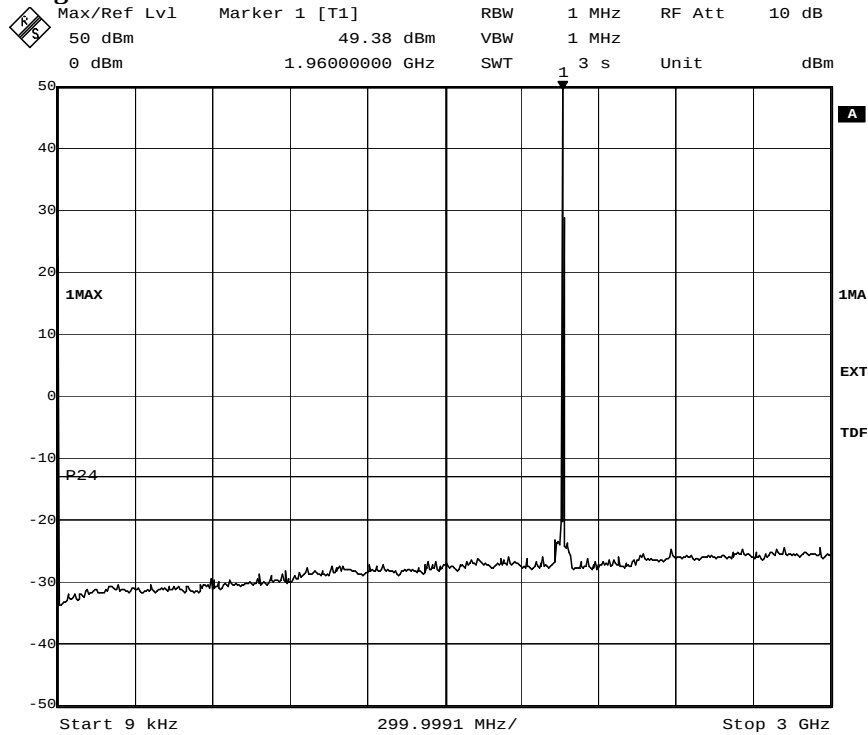
Date: 5. JAN. 2012 09:09:10

Diagram 3 b:


Date: 5. JAN. 2012 09:13:59

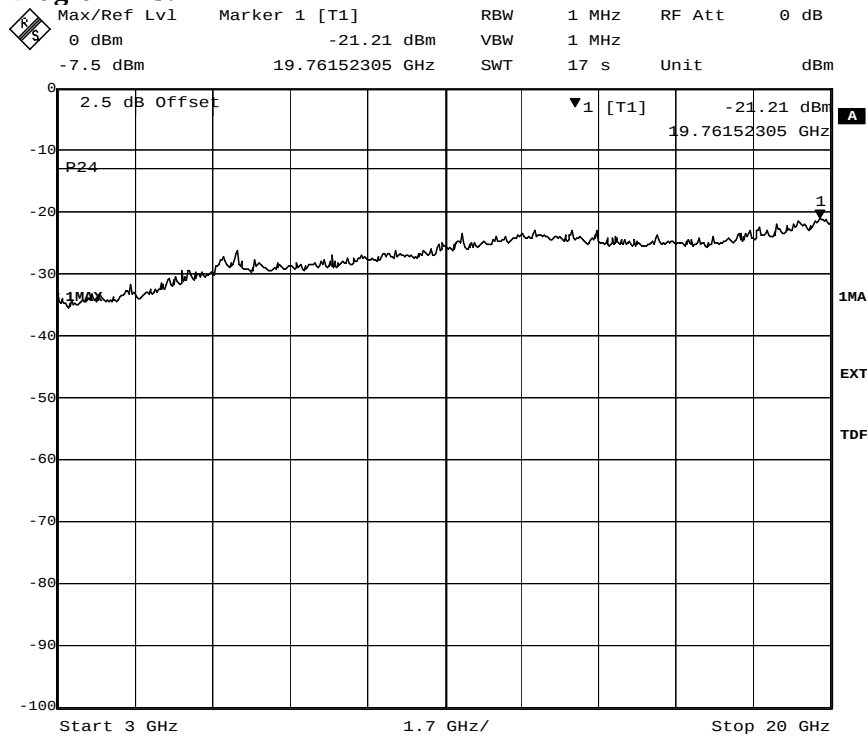
Appendix 5

Diagram 4 a:



Date: 5. JAN. 2012 08:42:36

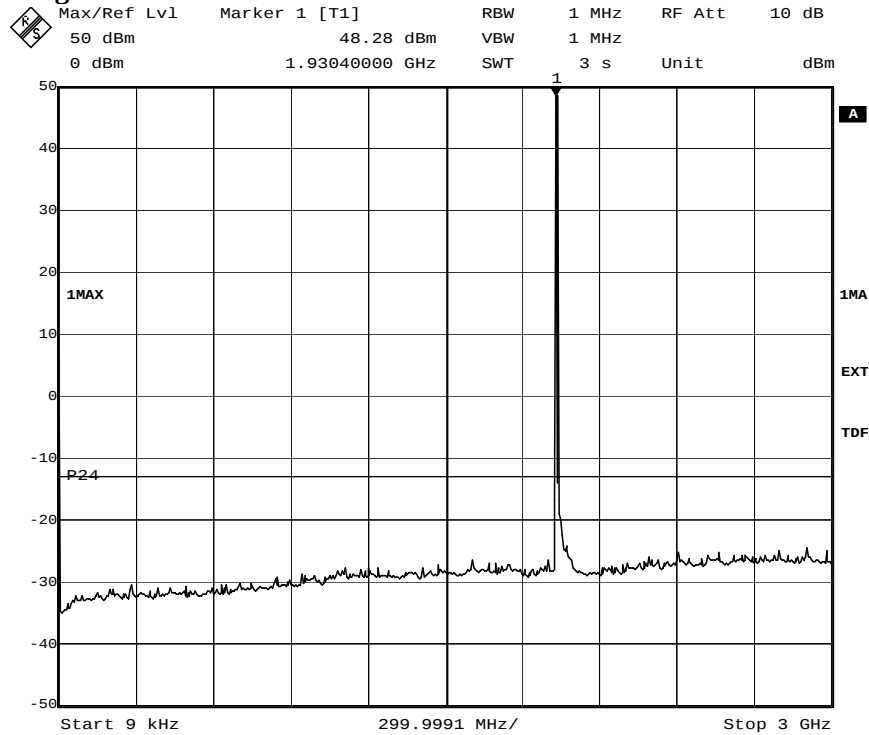
Diagram 4 b:



Date: 5. JAN. 2012 08:46:08

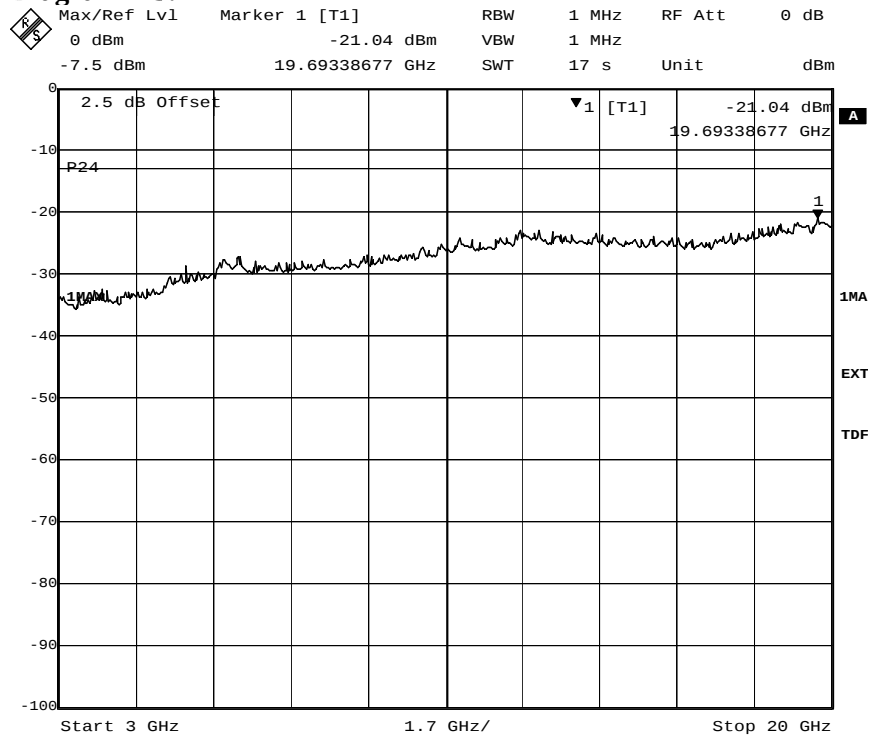
Appendix 5

Diagram 7 a:



Date: 4. JAN. 2012 14:04:47

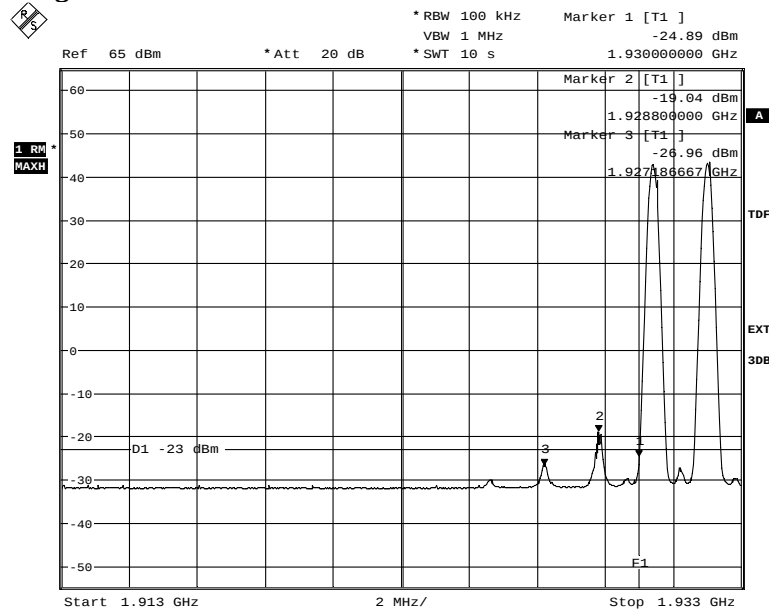
Diagram 7 b:



Date: 4. JAN. 2012 14:02:27

Appendix 5

Diagram 7 c:

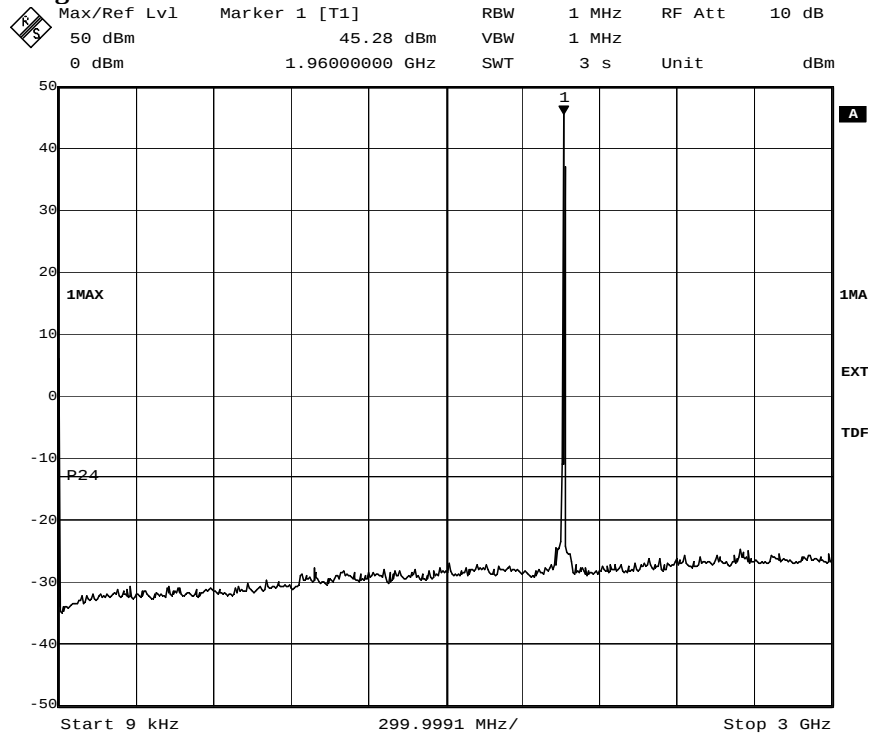


Date: 20.DEC.2011 10:14:48

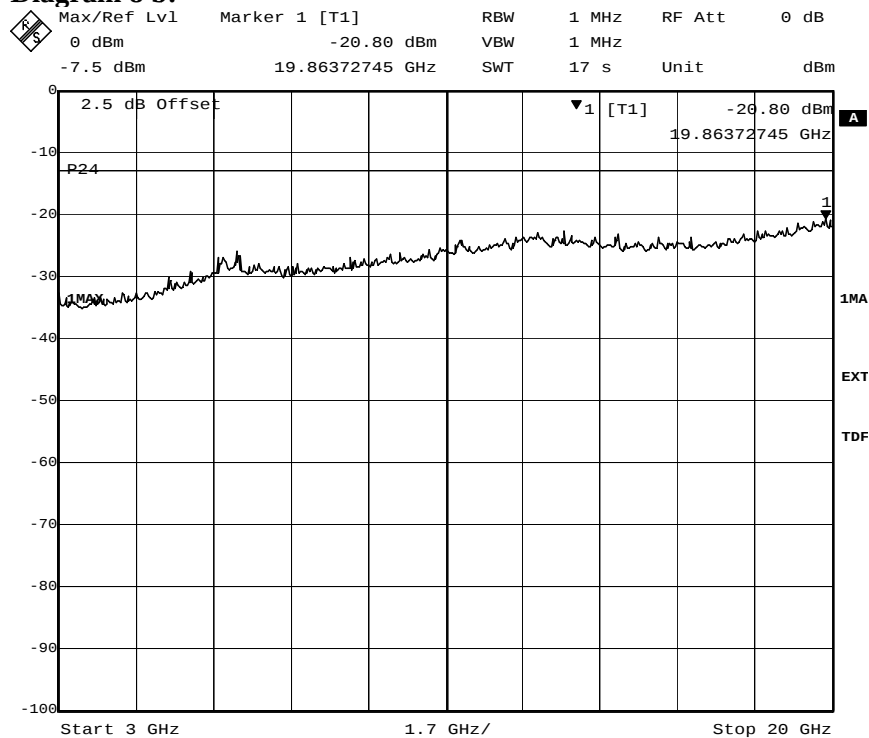
Note: Above plot is not intended to verify band-edge performance but shall provide an overview picture for out of band emission at the lower TX band edge. RBW 100 kHz was used to achieve reasonable visual resolution and a corresponding limit line of -23 dBm (-13 dBm – 10 dB) is shown in the plot.

The highest out-of-band RMS level was measured as -16.68 dBm at 1928.8 MHz, using power integration over a bandwidth of 1 MHz, as required by the standard. The applicable limit of -13 dBm per 1 MHz RBW was not exceeded.

Appendix 5

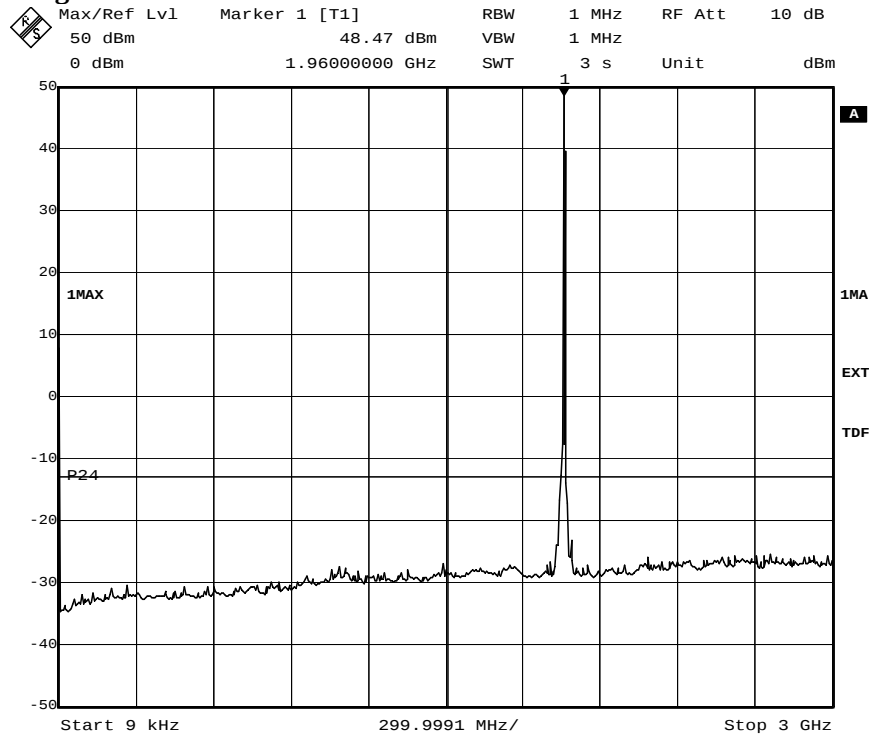
Diagram 8 a:


Date: 4. JAN. 2012 12:25:56

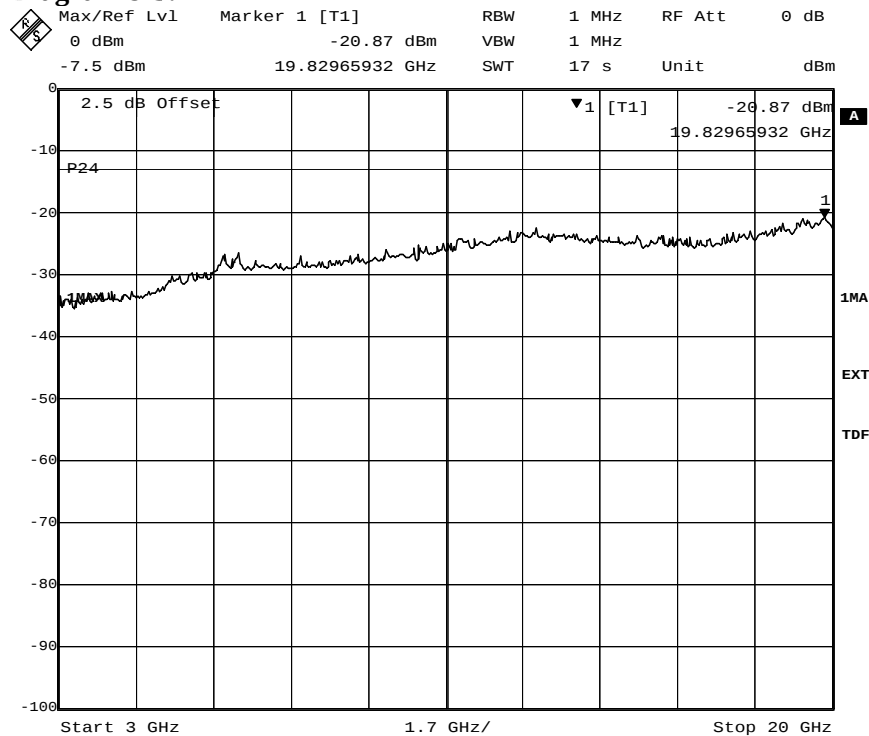
Diagram 8 b:


Date: 4. JAN. 2012 12:34:53

Appendix 5

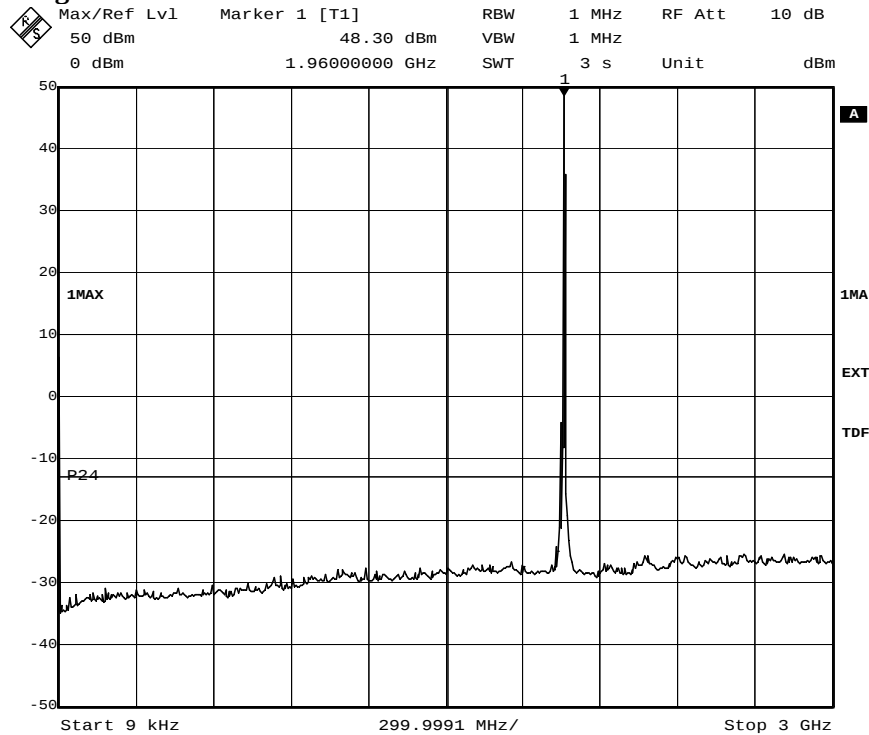
Diagram 9 a:


Date: 4.JAN.2012 13:00:28

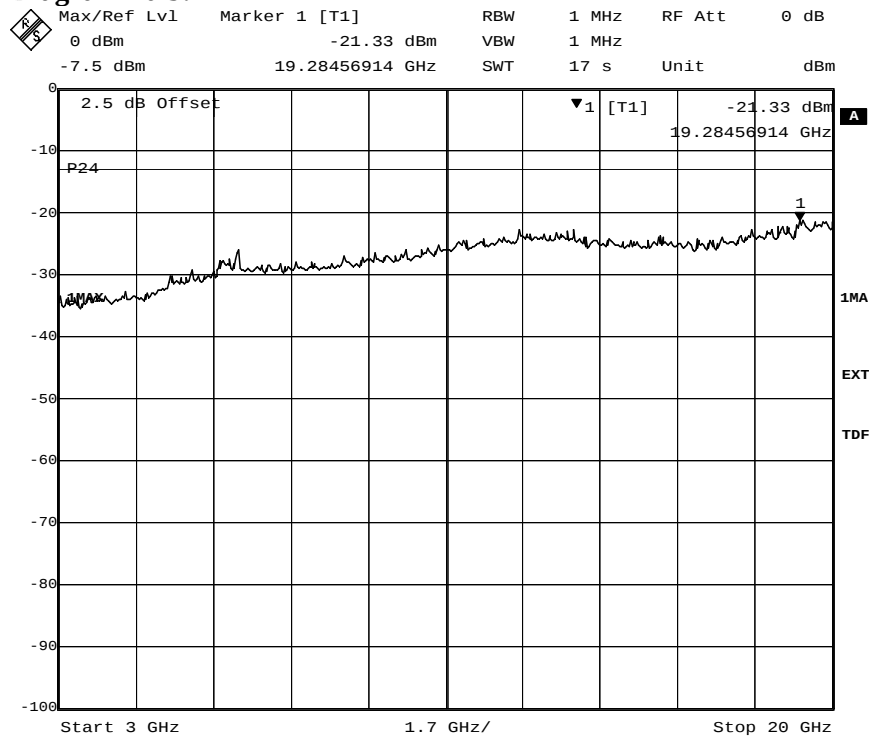
Diagram 9 b:


Date: 4.JAN.2012 13:02:35

Appendix 5

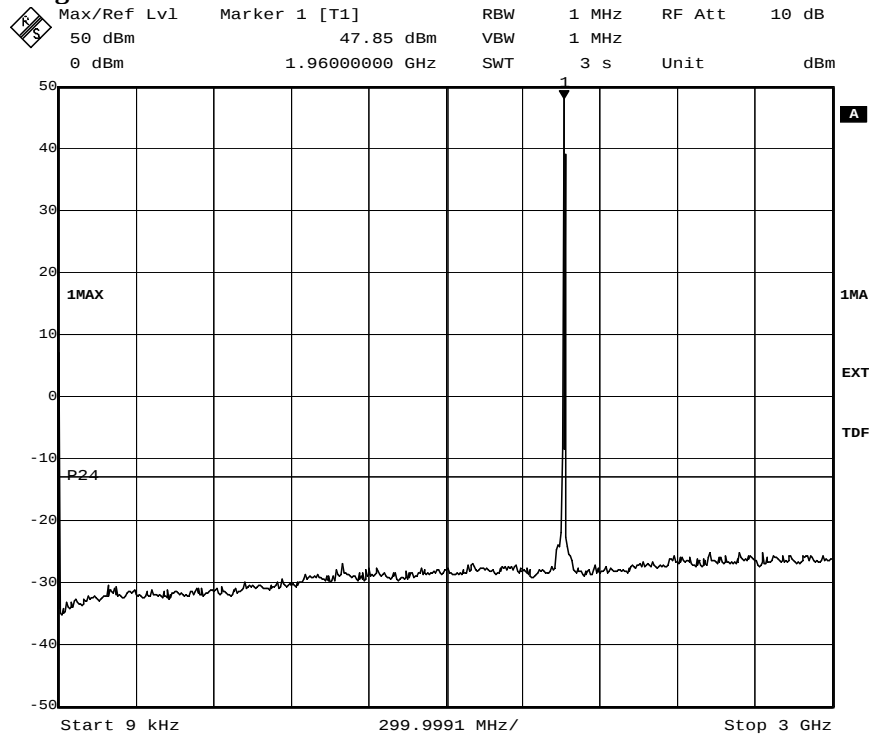
Diagram 10 a:


Date: 4.JAN.2012 12:55:00

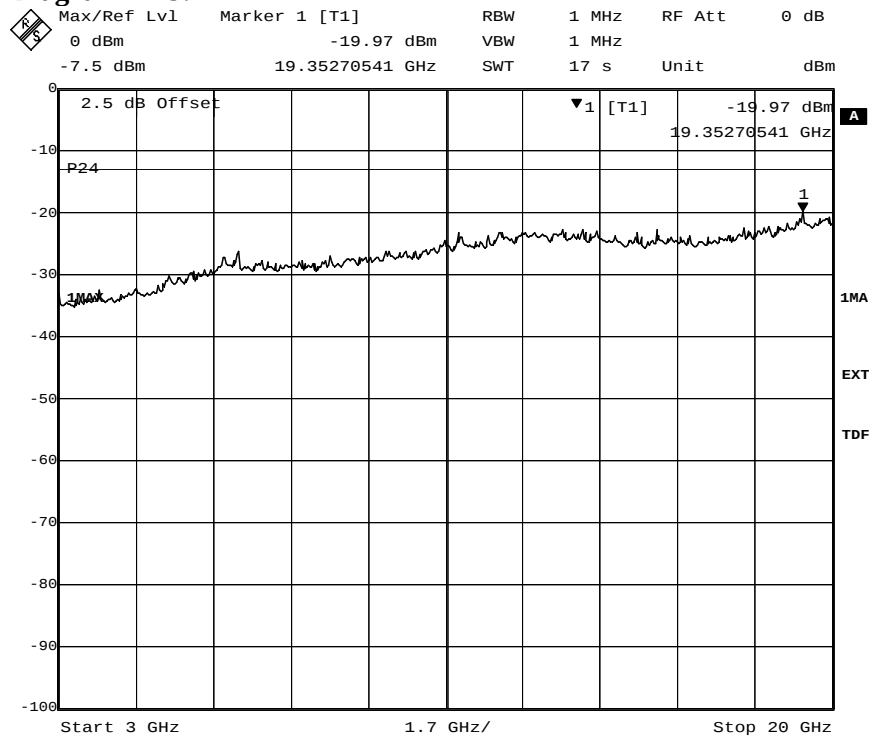
Diagram 10 b:


Date: 4.JAN.2012 12:56:56

Appendix 5

Diagram 11 a:


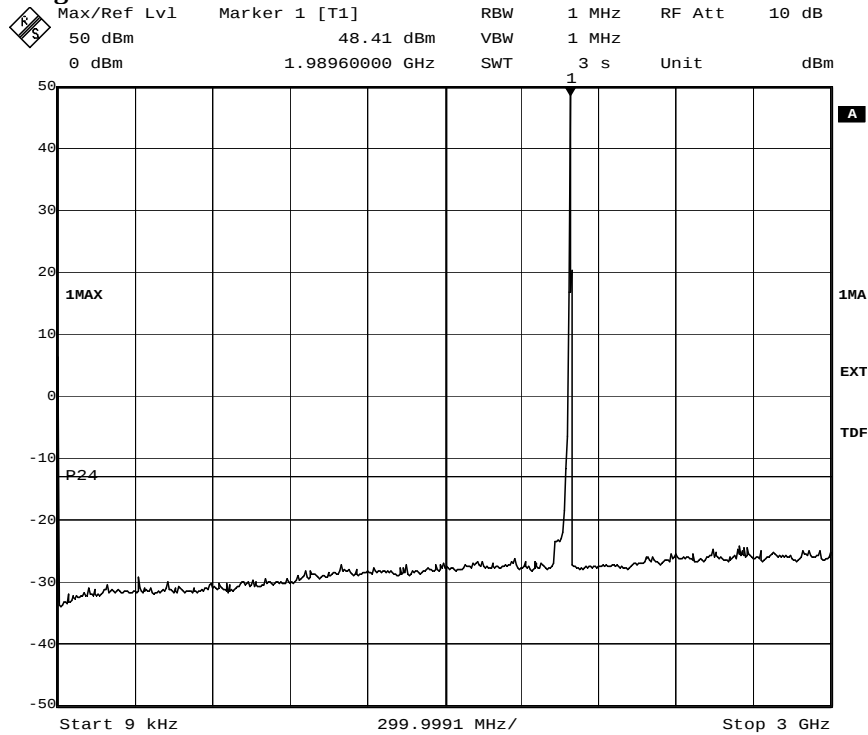
Date: 4.JAN.2012 12:41:07

Diagram 11 b:


Date: 4.JAN.2012 12:39:12

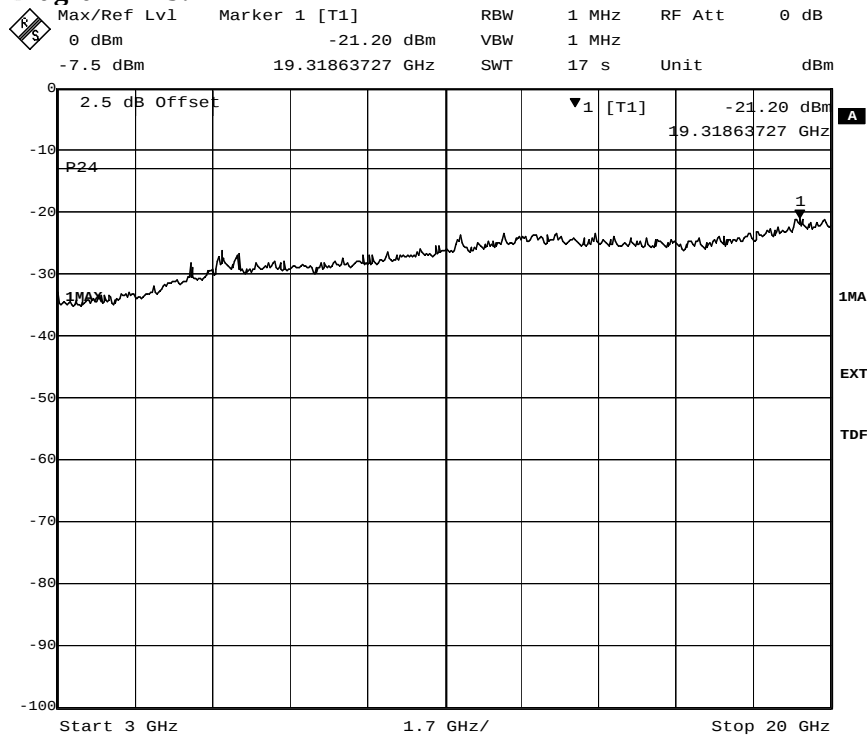
Appendix 5

Diagram 12 a:



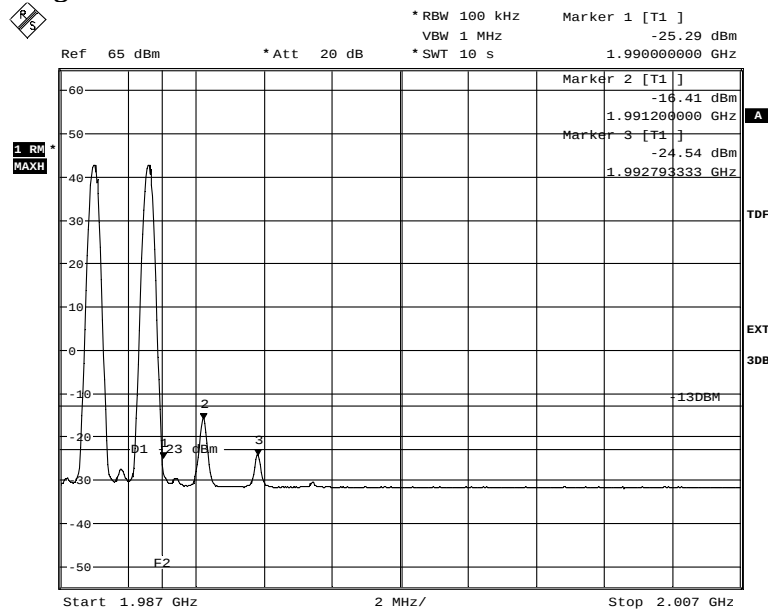
Date: 4. JAN. 2012 14:12:01

Diagram 12 b:



Date: 4. JAN. 2012 14:14:19

Appendix 5

Diagram 12 c:


Date: 20.DEC.2011 13:39:43

Note: Above plot is not intended to verify band-edge performance but shall provide an overview picture for out of band emission at the higher TX band edge. RBW 100 kHz was used to achieve sufficient visual resolution.

The highest out-of-band RMS level was measured as -13.98 dBm at 1991.2 MHz, using power integration over a bandwidth of 1 MHz, as required by the standard. The applicable limit of -13 dBm per 1 MHz RBW was not exceeded.

Appendix 6

Field strength of spurious radiation measurements according to 47CFR 2.1053 / RSS 133 6.5

Date	Temperature	Humidity
2012-01-10	23 °C ± 3 °C	20 % ± 5 %
2012-01-11	23 °C ± 3 °C	27 % ± 5 %

Test set-up and procedure

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18-20 GHz.

The measurements were performed in Effective Radiated Power (ERP). A fully anechoic chamber was used during the measurements. The chamber is regularly calibrated with the substitution method and from that calibration an ERP correction factor is derived. The correction factor was used as a transducer to get the readings in ERP.

The measurement procedure was as the following:

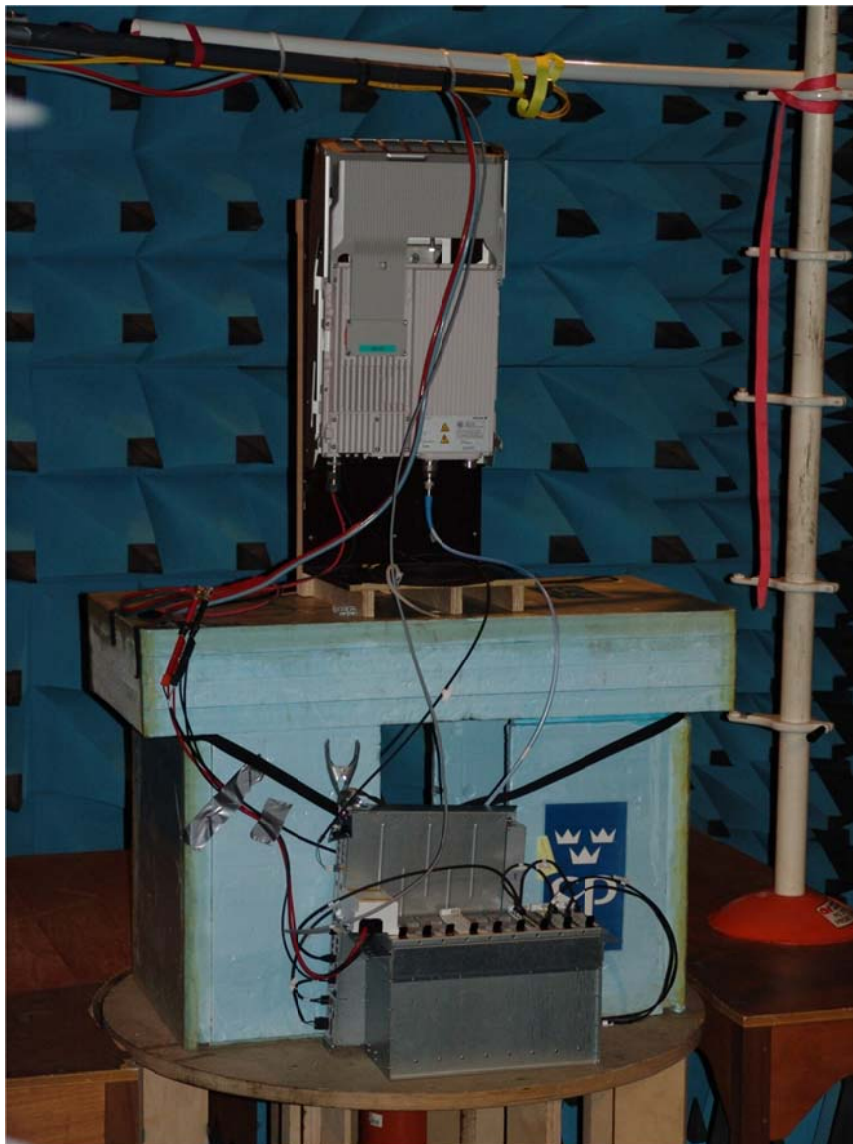
1. A pre-measurement was first performed with peak detector. The EUT was continuously measured in 360 degrees.
2. Spurious radiation on frequencies closer than 6 dB to the limit was re-measured with RMS detector and with the substitution method according to the standard.

The test object was configured in single carrier with RBS master 2E power setting 48. When comparing different modulations for radiated emission performance, 16QAM was found to represent worst case and measurements were performed on channels B+1, M and T-1.

Measurement equipment	SP number
Anechoic chamber, Hertz	15:116
Rohde & Schwarz EMI Test Receiver ESI40	503 125
Chase bilog antenna CBL 6121A	502 460
Schaffner Reference Dipole BSRD6500	503 649
EMCO Horn Antenna 3115	502 175
EMCO Horn Antenna 3115	501 548
Flann Std gain horn 20240-20	503 674
MITEQ Low Noise Amplifier	503 277
Rohde & Schwarz Vector Network Analyser	503 687
Attenuator	900 229
High pass filter	503 739
High pass filter	503 740
Testo 615 temperature and humidity meter	503 498

Appendix 6

The test set-up is shown in the picture below:



Appendix 6

Results

Channel B+1, modulation 16QAM

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

Channel M, modulation 16QAM

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

Channel T-1, modulation 16QAM

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

Measurement uncertainty: 3.1 dB

Limits

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 7

Photos of the test object

Front side



Appendix 7

Rear side



Appendix 7

Left side

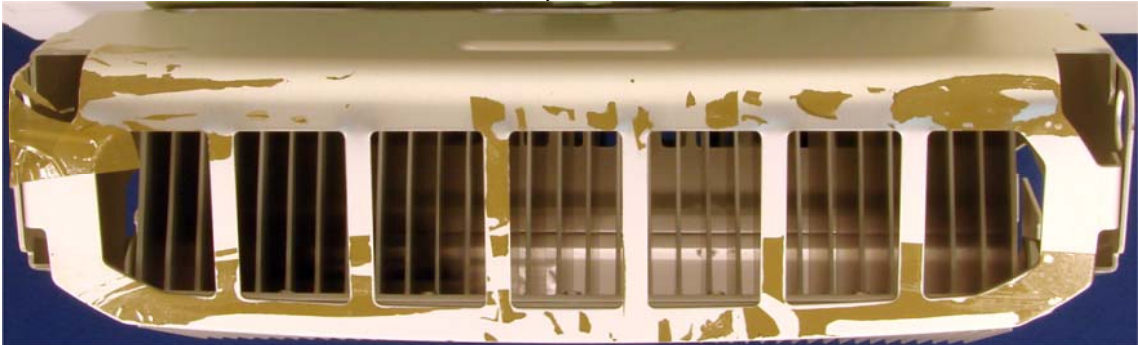


Right side



Appendix 7

Top side



Bottom side

