REPORT

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

Date	Reference	Page
2009-10-27	F917797-F24	1 (2)

1002
ISO/IEC 17025

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Radio measurements on RRUW 02 B2 WCDMA 1900 MHz radio equipment with FCC ID: TA8AKRC11847-2 and IC: 287AB-AW118472

(9 appendices)

Test object

RRUW 02 B2, KRC 118 47/2 Rev. R1A, S/N C822835225

Summary

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133 Issue 5			
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
2.1055 / RSS-133 6.3	Frequency stability	Yes	7
Industry Canada RSS-133 Issue 5			
Section 6.7 Receiver spurious emissions		Yes	8

Note: 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.

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FCC ID: TA8AKRC11847-2
IC: 287AB-AW118472

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IC: 287AB-AW118472

Description – Test object

Equipment:	WCDMA radio equipment (RRUW) 1900 MHz single and multi carrier.
Frequency range:	TX: 1932.4 – 1987.6 MHz (Downlink) RX: 1852.4 – 1907.6 MHz (Uplink)
Modulations:	QPSK, 16QAM and 64QAM
Maximum output power:	Single carrier: 1x 47.8 dBm (1x 60W) Multi carrier: 2x 44.8 dBm (2x 30W)
Channel bandwidth:	4.2 to 5 MHz (configurable in steps of 100/200 kHz)
Channel spacing:	4.4 to 5 MHz (configurable in steps of 100/200 kHz)
Nominal power voltage:	-48 VDC

Tested channels

	Downlink		Uplink	
Channel	Frequency*	UARFCN	Frequency*	UARFCN
B	1932.4	9662	1852.4	9262
B+5	1937.4	9687	1857.4	9287
B+10	1942.4	9712	1862.4	9312
M	1957.6	9788	1877.6	9388
M+10	1967.6	9813	1887.6	9413
T-10	1977.6	9888	1897.6	9488
T-5	1982.6	9913	1902.6	9513
T	1987.6	9938	1907.6	9538

* Frequency in MHz

Operation mode during measurements

Measurements were performed with the test object transmitting the Test models which are defined in 3GPP TS 25.141. Test model 1 (TM1) uses the QPSK modulation only, Test model 5 (TM5) includes the 16QAM modulation and Test model 6 (TM6) includes the 64QAM modulation.

The settings below were found to be representative for all traffic scenarios when several settings with the different modulations and channel bandwidths were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted.

Single carrier TM1: 64 DPCH:s at 30 ksps (SF=128)
Multi carrier TM1: 32 DPCH:s at 30 ksps (SF=128) in each carrier
Channel bandwidth 5 MHz

Conducted measurements

The test object was powered with -48 VDC. All RF conducted measurements were performed with the test object configured for maximum transmit power. All TX measurements were done at the RF A connector and the RX measurements were done at the RF B connector.

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Radiated measurements

The test object was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmit power. The configuration represents worst case for radiated spurious emission measurements.

The RF output power port was via a RF attenuator connected to functional test equipment for supervision.

The RRUW unit was allocated to the following channels during radiated spurious emission measurements:

Single Carrier:

Cell	1	1	1
Channel	B	M	T

Multi Carrier:

Cell	1	2	1	2
Channel	B	B+10	T-10	T

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-133.

References

Measurements were done according to relevant parts of the following standards:
ANSI 63.4-2003
ANSI/TIA/EIA-603-B-2002
3GPP TS 25.141
RSS-Gen Issue 2
RSS-133 Issue 5

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2010-10	503 881
R&S FSIQ 40	2010-07	503 738
R&S FSQ 40	2010-07	504 143
R&S ESI 26	2010-07	503 292
High pass filter	2010-06	503 739
RF attenuator	2010-06	504 159
RF step attenuator	2010-06	503 096
Boonton RF Peak power meter/analyzer	2010-09	503 144
Boonton Power sensor 56518-S/4	2010-02	503 146
Chase Bilog antenna CBL 6111A	2011-11	502 181
EMCO Horn Antenna 3115	2011-01	502 175
MITEQ Low Noise Amplifier	2010-08	503 285
Climate chamber 2	2010-11	501 031
Multimeter Fluke 87	2010-01	502 190
Testo 625, Temperature and humidity meter	2010-05	504 188

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: 2009-10-02

Test engineers

Jörgen Wassholm and Jonas Bremholt

Test participants

Christer Hjorth and Ove Nilsson, Ericsson AB

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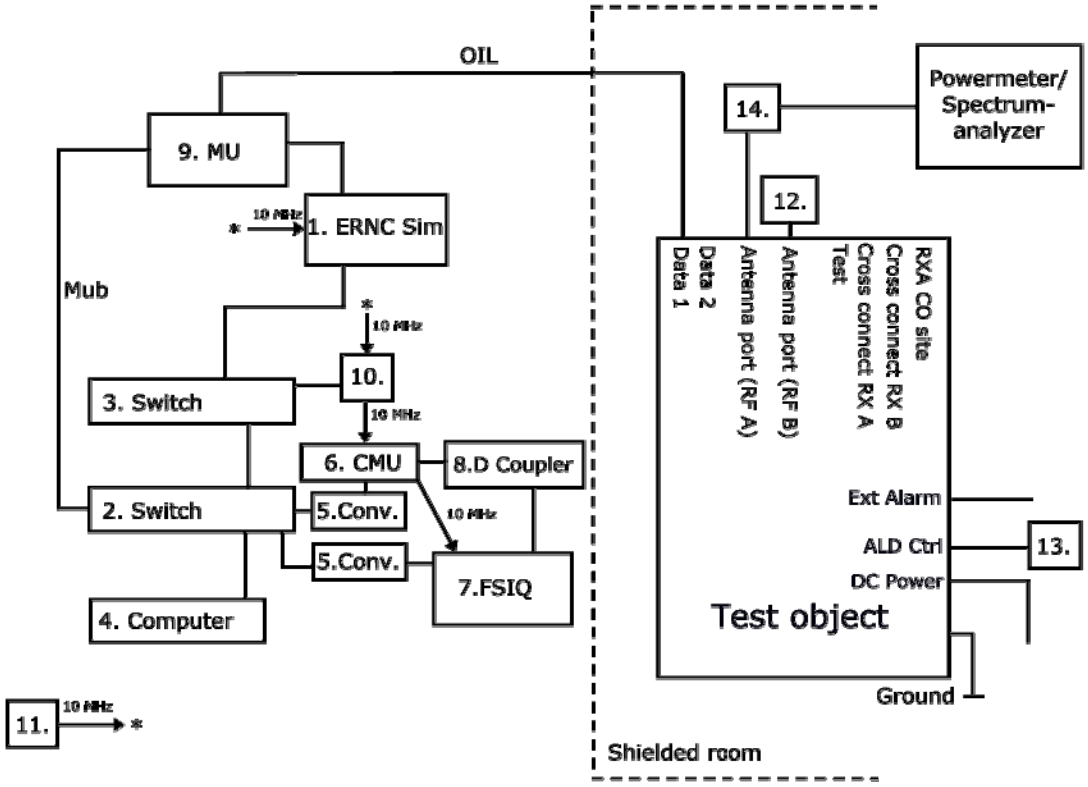
Test set-up conducted measurements TX



Test object

RRUW 02 B2, KRC 118 47/2 with software CXP 901 4350 Rev R2J05
(FCC ID: TA8AKRC11847-2 / IC: 287AB-AW118472)

Functional test equipment

1. ERNC SIM 072, 2/BFD 7422018 R1A, BAMS – 1000579045
2. Fast ethernet switch, Netgear FS726
3. Fast ethernet switch, Netgear FS726
4. Computer Sunblade Ultra 45 BAMS 1000655789
5. Ethernet/GPIB converter, National Instrument
6. CMU 300, R & S, BAMS 1000452891
7. Spectrum analyzer, R & S, FSIQ 26, BAMS 1000452890
8. Directional coupler
9. Main Unit: RBS 3418, BFE 401 1019, Software CXP 901 4350 Rev R2J05
10. NTP-server, Symmetricom, BAMS 1000562217
11. Symmetricom model 8040 BAMS 1000645314
12. Terminator
13. RET – Remote Electrical Tilt unit
14. RF Attenuator (40 dB)

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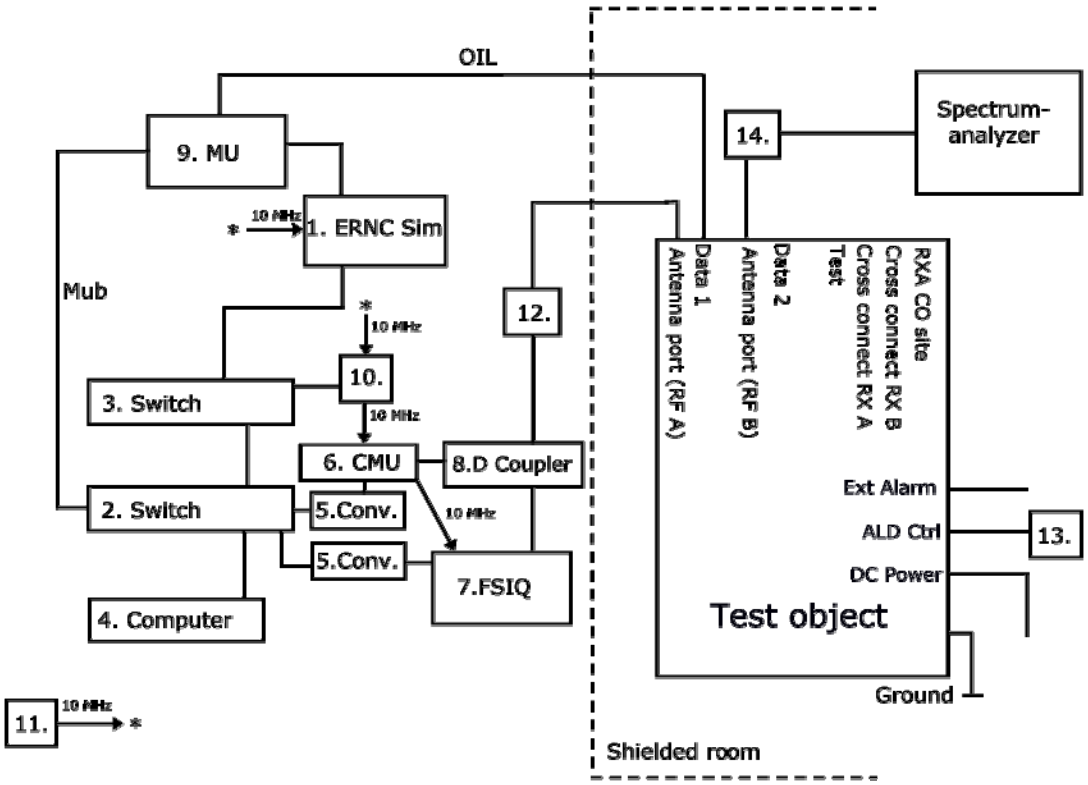
Test set-up conducted measurements RX



Test object

RRUW 02 B2, KRC 118 47/2 with software CXP 901 4350 Rev R2J05
(FCC ID: TA8AKRC11847-2 / IC: 287AB-AW118472)

Functional test equipment

1. ERNC SIM 072, 2/BFD 7422018 R1A, BAMS – 1000579045
2. Fast ethernet switch, Netgear FS726
3. Fast ethernet switch, Netgear FS726
4. Computer Sunblade Ultra 45 BAMS 1000655789
5. Ethernet/GPIB converter, National Instrument
6. CMU 300, R & S, BAMS 1000452891
7. Spectrum analyzer, R & S, FSIQ 26, BAMS 1000452890
8. Directional coupler
9. Main Unit: RBS 3418, BFE 401 1019, Software CXP 901 4350 Rev R2J05
10. NTP-server, Symmetricom, BAMS 1000562217
11. Symmetricom model 8040 BAMS 1000645314
12. RF Attenuator
13. RET – Remote Electrical Tilt unit
14. RF Attenuator (10 dB)

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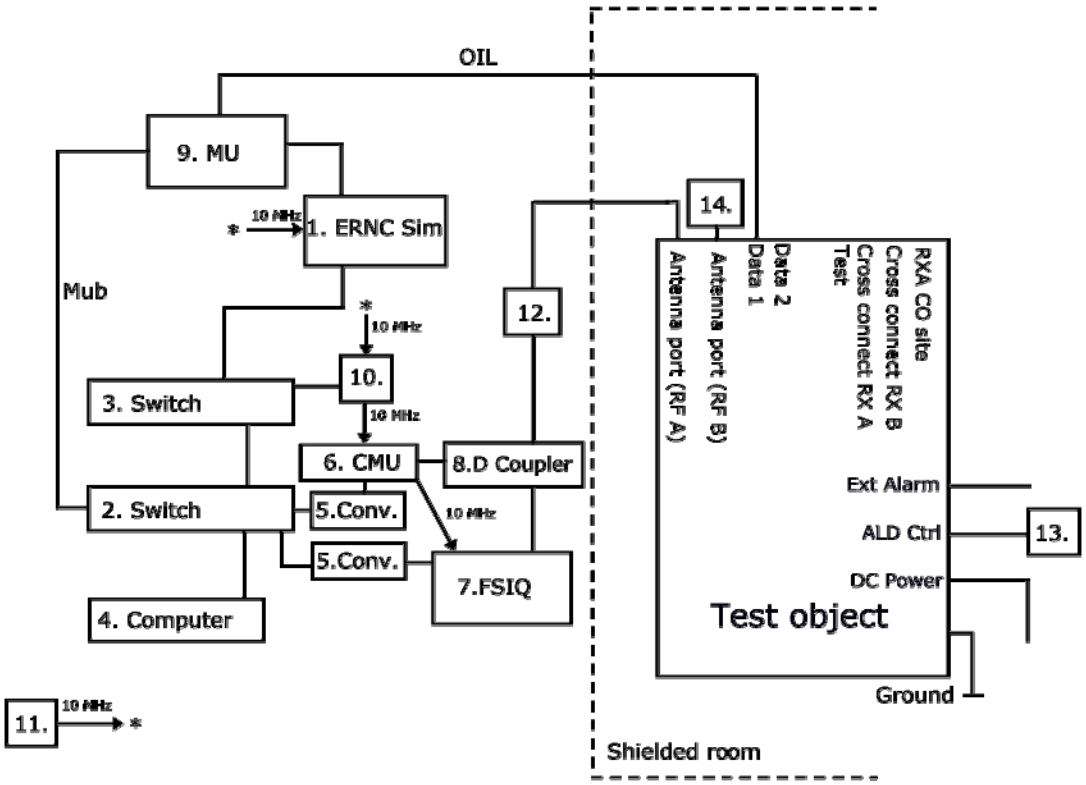
Test set-up radiated measurements



Test object

RRUW 02 B2, KRC 118 47/2 with software CXP 901 4350 Rev R2J05
(FCC ID: TA8AKRC11847-2 / IC: 287AB-AW118472)

Functional test equipment

1. RNC Sim 4780 DA, mini-SIM#65, s/n 0210 rev. BAMS 1000544673
2. Fast ethernet switch, Netgear FS726
3. Fast ethernet switch, Netgear FS726
4. Computer Sunblade Ultra 45 BAMS 1000655789
5. Ethernet/GPIB converter, National Instrument
6. CMU 300, R & S, BAMS 1000452891
7. Spectrum analyzer, R & S, FSIQ 26, BAMS 1000452890
8. Directional coupler
9. Main Unit: RBS 3418, BFE 401 1019, Software CXP 901 4350 Rev R2J05
10. NTP-server, Symmetricom, BAMS 1000562217
11. Symmetricom model 8040 BAMS 1000645314
12. RF Attenuator
13. RET – Remote Electrical Tilt unit
14. Terminator

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Interfaces:	**Type of port:**
Power configuration: -48 VDC	DC Power
Antenna port 1 “RF A”, 7/16 connector, female to coaxial cable	Antenna
Antenna port 2 “RF B”, terminated	Antenna
Test, No cable attached	Test purposes
Ext Alarm, Shielded multi-wire	Signal
Cross connect RX A, Not supported	Signal
Cross connect RX B, Not supported	Signal
RXA CO-site, Not supported	Signal
ALD Ctrl, Shielded multi-wire connected to RET unit	Signal
Data 1: Optical Interface Link, Single mode opto fibre	Signal
Data 2: Not supported	Signal

FCC ID: TA8AKRC11847-2 Appendix 2
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RF power output measurements according to 47 CFR 2.1046/ RSS-133 6.4

Date	Temperature	Humidity
2009-10-13 to 2009-10-14	22 °C ± 3 °C	20-25 % ± 5 %

Test set-up and procedure

The output was connected to a peak power analyzer with the CDF mode activated.

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
Multimeter Fluke 87	502 190
Testo 625, Temperature and humidity meter	504 188

Measurement uncertainty: 0.5 dB

Results

Single carrier: Output power level at RF A connector (maximum):

Transmitter power (dBm / dB) RMS / PAR		
B	M	T
47.6/ 6.5	47.9/ 6.5	47.6/ 6.5

Multi carrier: Output power level at RF A connector (maximum):

Transmitter combined power (dBm / dB) RMS / PAR		
B and (B+10)	M and (M+10)	T and (T-10)
47.4/ 6.3	47.4/ 6.2	47.7/ 6.3

Limit

§24.232 **Federal Register** / Vol. 73, No. 86
The maximum output power may not exceed 1640 W (EIRP)
The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-133: The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

Complies?	Yes

FCC ID: TA8AKRC11847-2 Appendix 3
IC: 287AB-AW118472

Occupied bandwidth measurements according to 47 CFR 2.1049/ RSS-Gen 4.6.1

Date	Temperature	Humidity
2009-10-13 to 2009-10-14	22 °C ± 3 °C	20-25 % ± 5 %

Test set-up and procedure

The measurements were made as defined in §2.1049. 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 FSIQ	503 738
Testo 625, Temperature and humidity meter	504 188

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

Channel Bandwidth 5.0 MHz

	Channel	OBW
Diagram 1	B	4.17 MHz
Diagram 2	M	4.18 MHz
Diagram 3	T	4.18 MHz

Channel Bandwidth 4.2 MHz

	Channel	OBW
Diagram 4	B	3.86 MHz
Diagram 5	M	3.86 MHz
Diagram 6	T	3.86 MHz

FCC ID: TA8AKRC11847-2 Appendix 3.1
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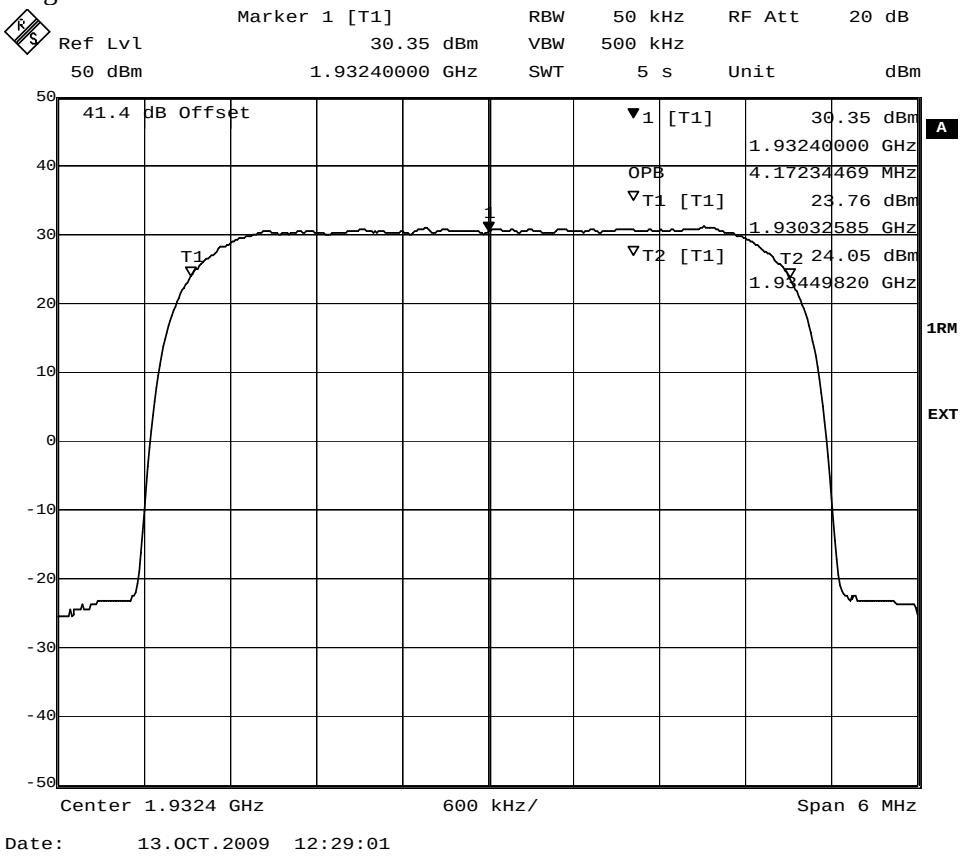
Diagram 1



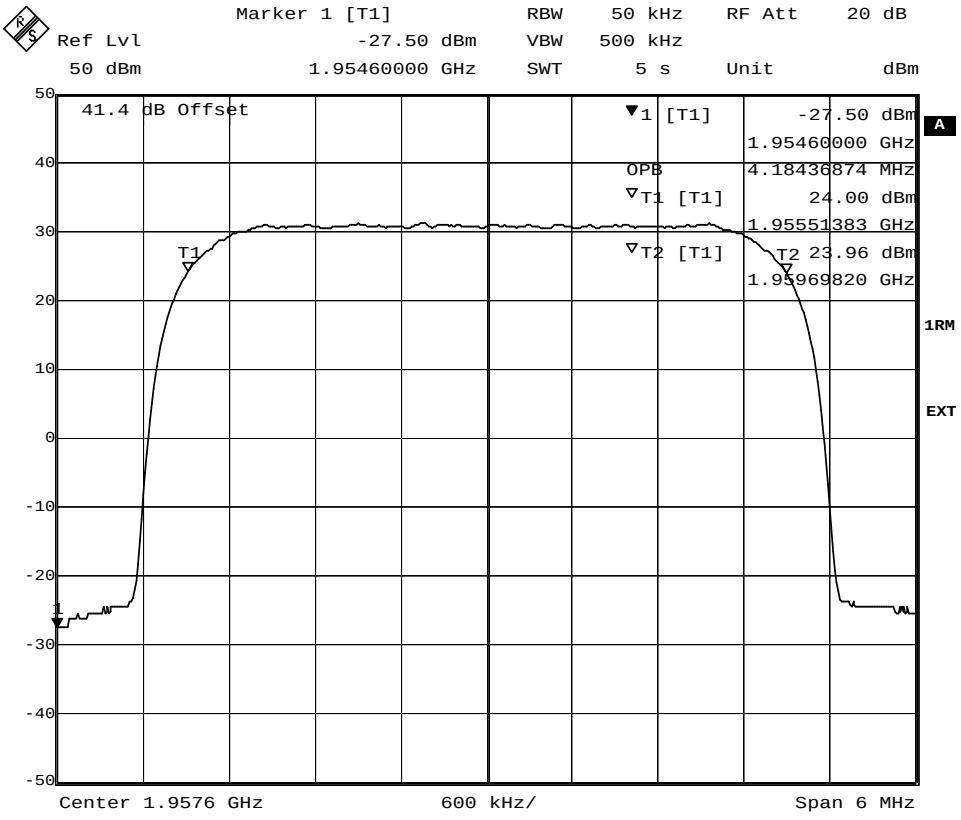
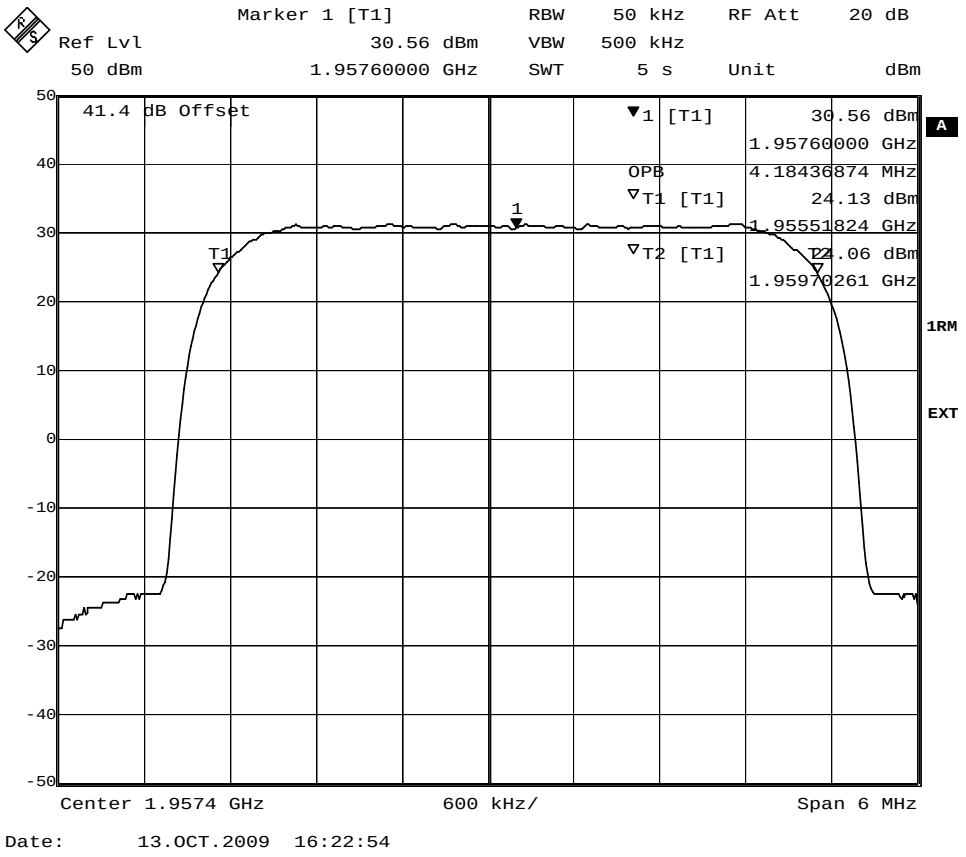


Diagram 2

FCC ID: TA8AKRC11847-2 Appendix 3.1
IC: 287AB-AW118472



FCC ID: TA8AKRC11847-2 Appendix 3.1
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Diagram 3

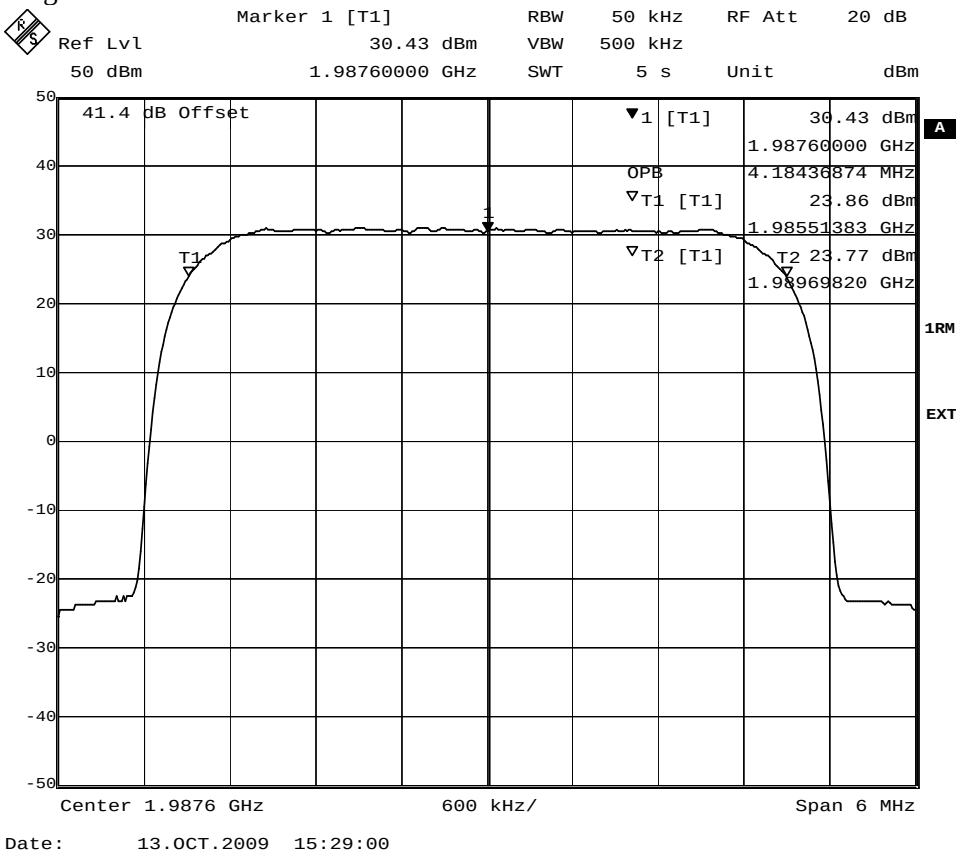

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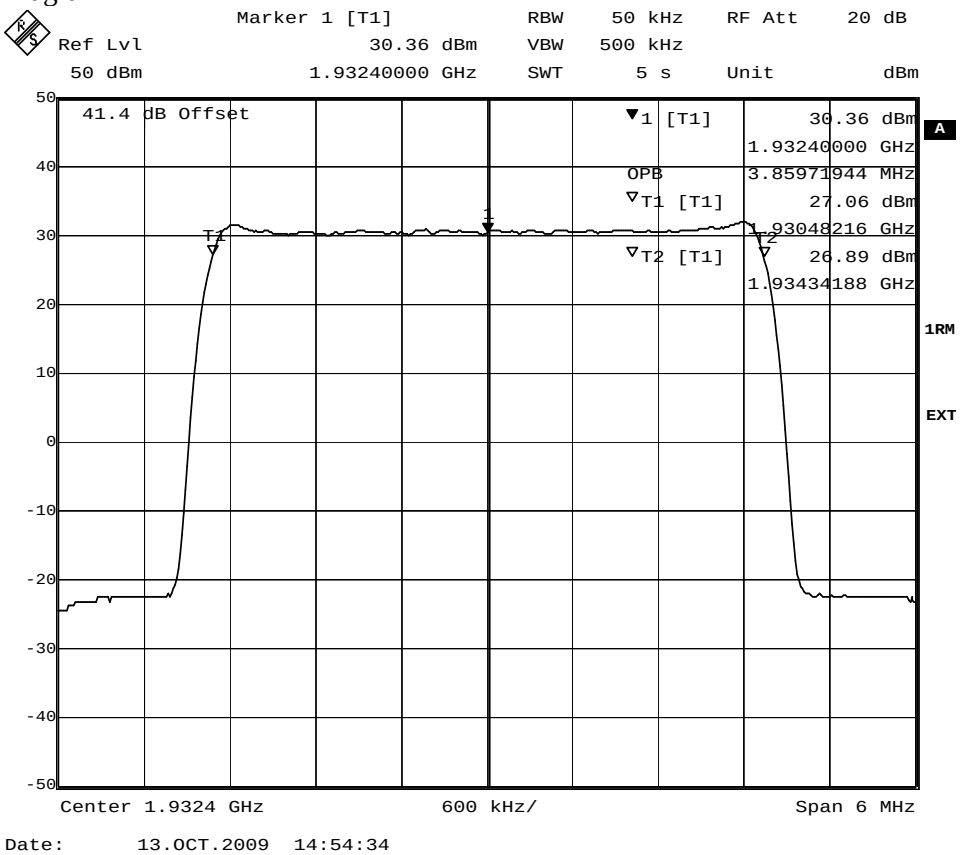
Diagram 4



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FCC ID: TA8AKRC11847-2 Appendix 3.1
IC: 287AB-AW118472

Diagram 5

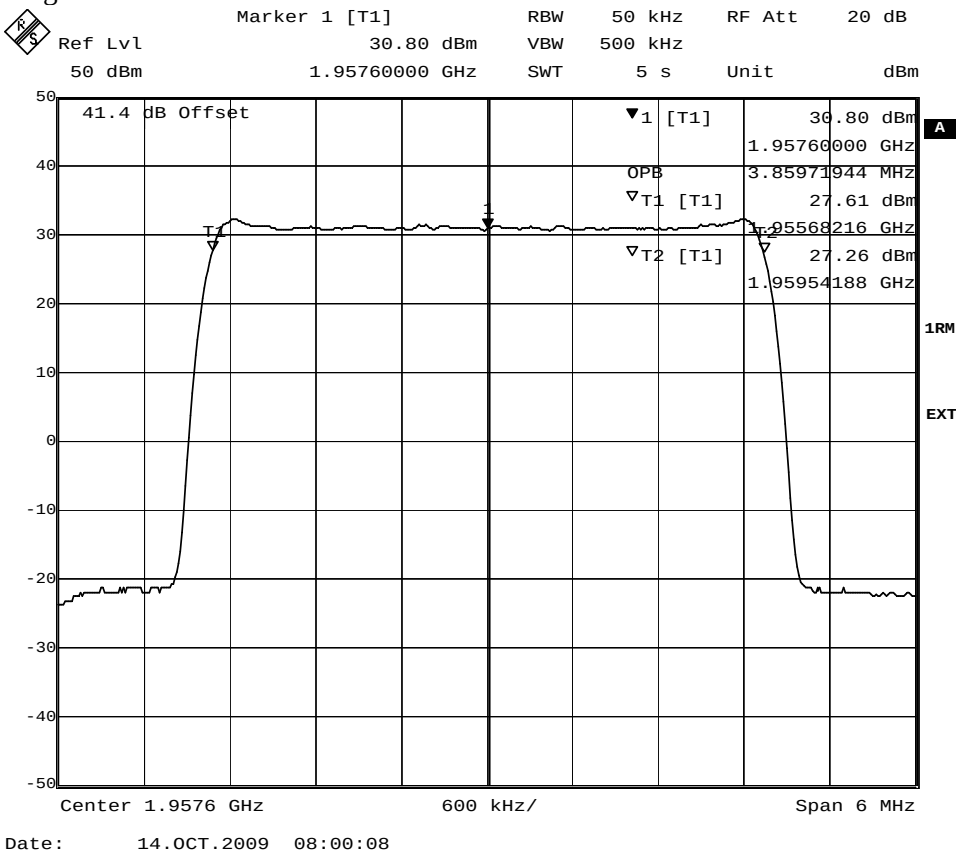

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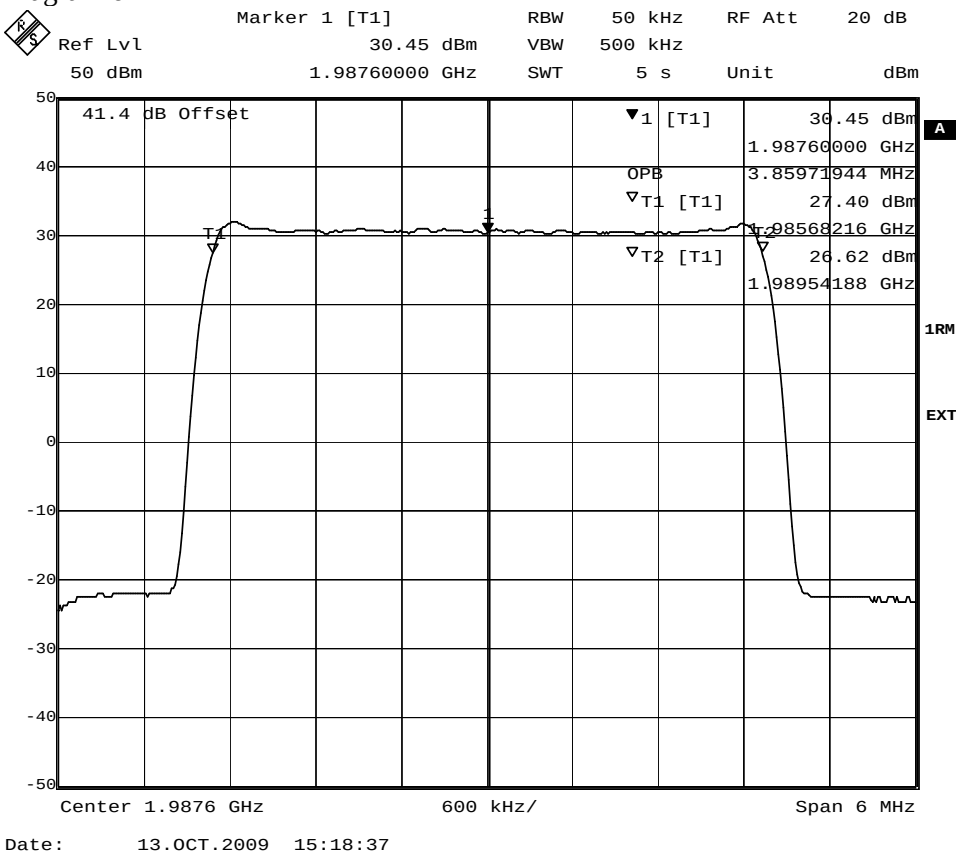
Diagram 6



Date: 13.OCT.2009 15:18:37

FCC ID: TA8AKRC11847-2 Appendix 4
IC: 287AB-AW118472

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

Date	Temperature	Humidity
2009-10-13	22 °C ± 3 °C	23% ± 5 %

Test set-up and procedure

The measurements were made as defined in §24.238. 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. A resolution bandwidth of 30 kHz was used up to 3.25 MHz away from the band edges. 30 kHz is <1% of the Emission BW(4.25 MHz between the 26 dB points). To compensate for the reduced measurement band width, the limit was adjusted with 1.5 dB to -14.5 dBm up to 1 MHz away from the band edges and with 15.2 dB to -28.2 dBm between 1 MHz to 3.25 MHz away from the band edges.

Measurement equipment	SP number
R&S FSIQ	503 738
Testo 625, Temperature and humidity meter	504 188

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Single carrier:
Diagram 1: B
Diagram 2: T

Multi carrier:
Diagram 3: B and (B+10)
Diagram 4: T and (T-10)

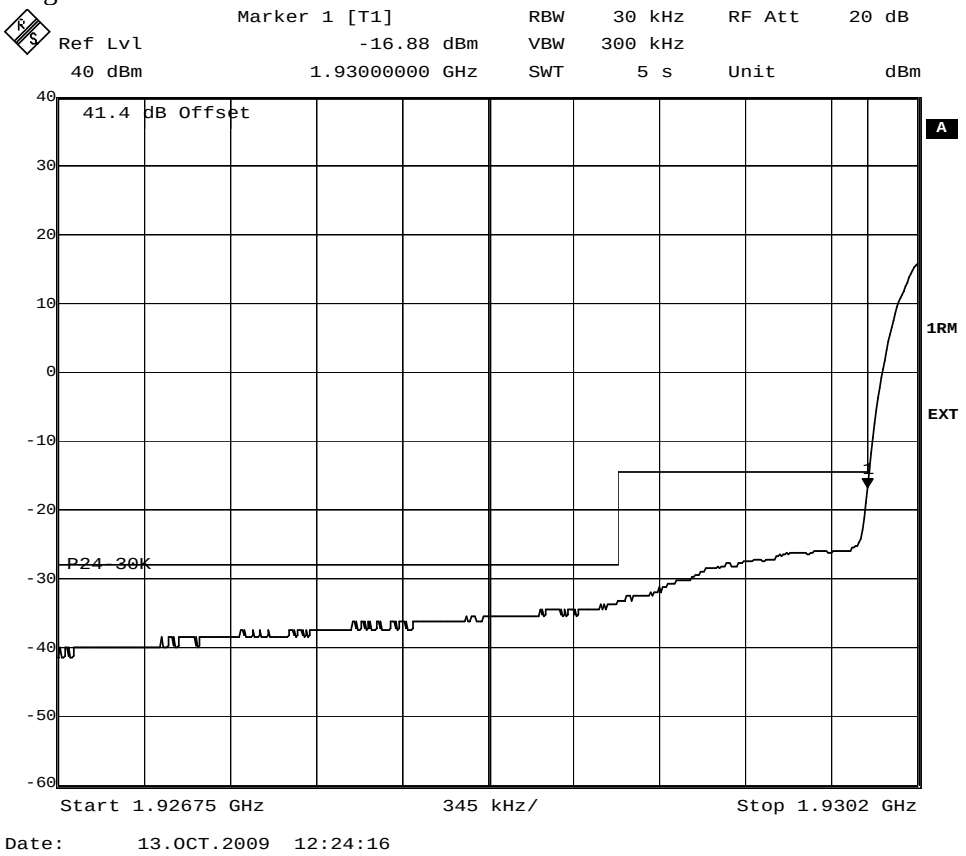
Limits

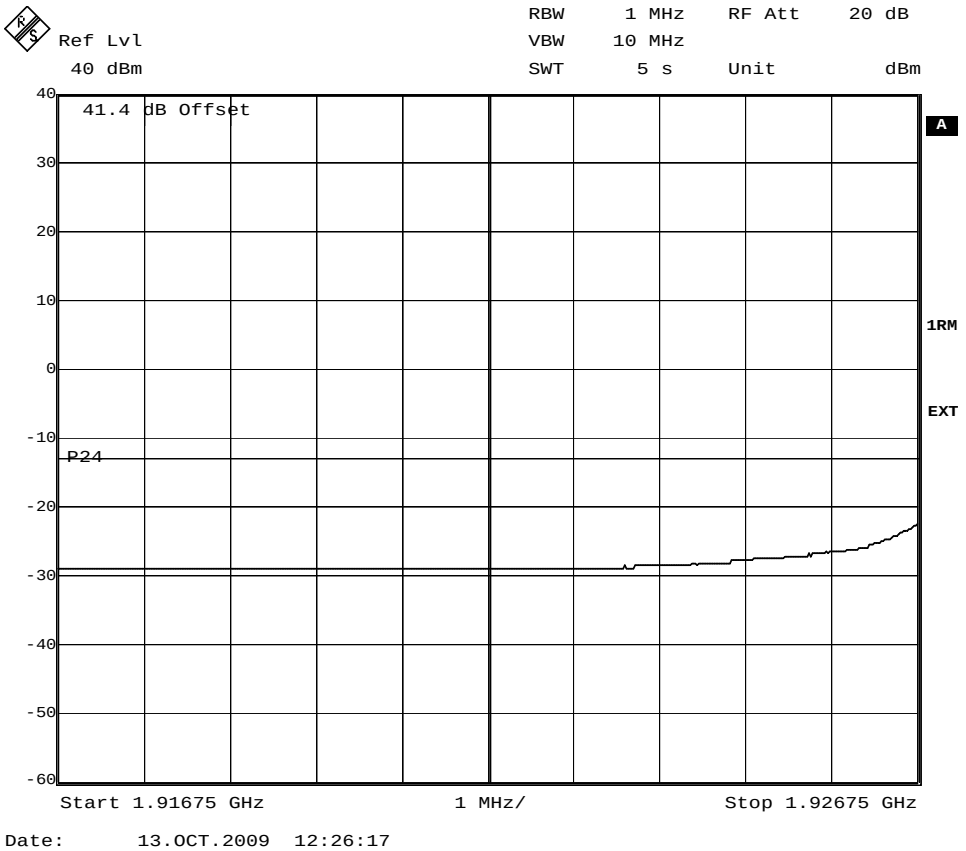
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

Complies?	Yes

FCC ID: TA8AKRC11847-2 Appendix 4.1
IC: 287AB-AW118472

Diagram 1





FCC ID: TA8AKRC11847-2 Appendix 4.1
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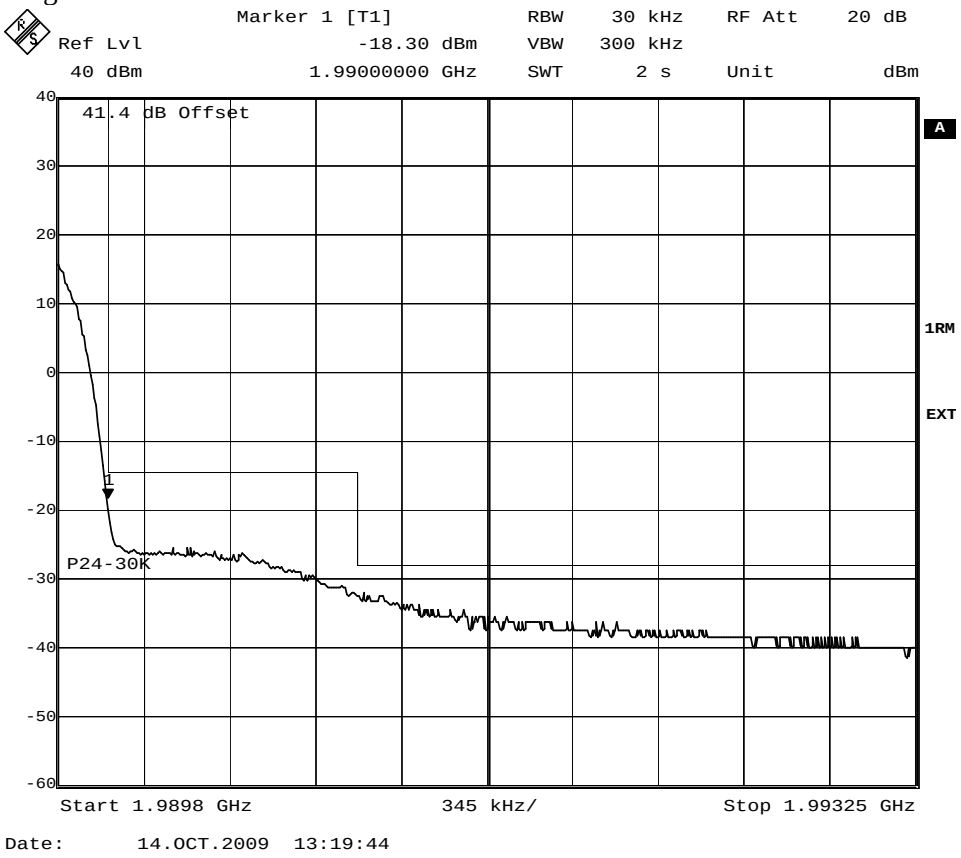
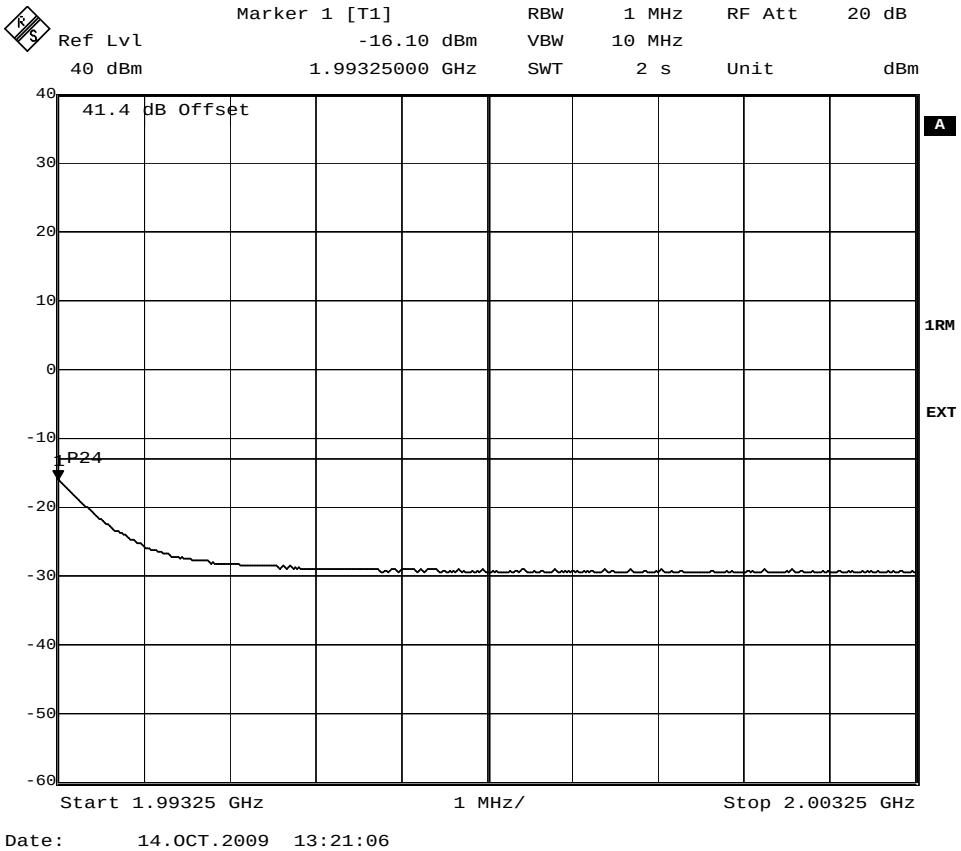
Diagram 2





FCC ID: TA8AKRC11847-2 Appendix 4.1
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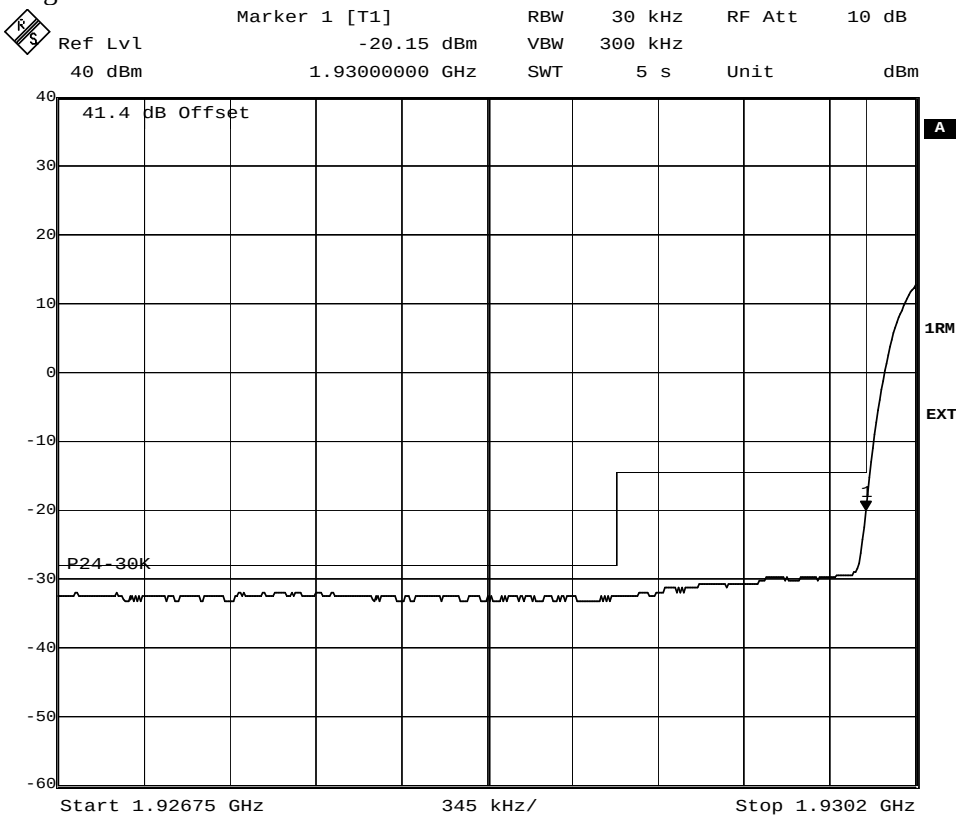
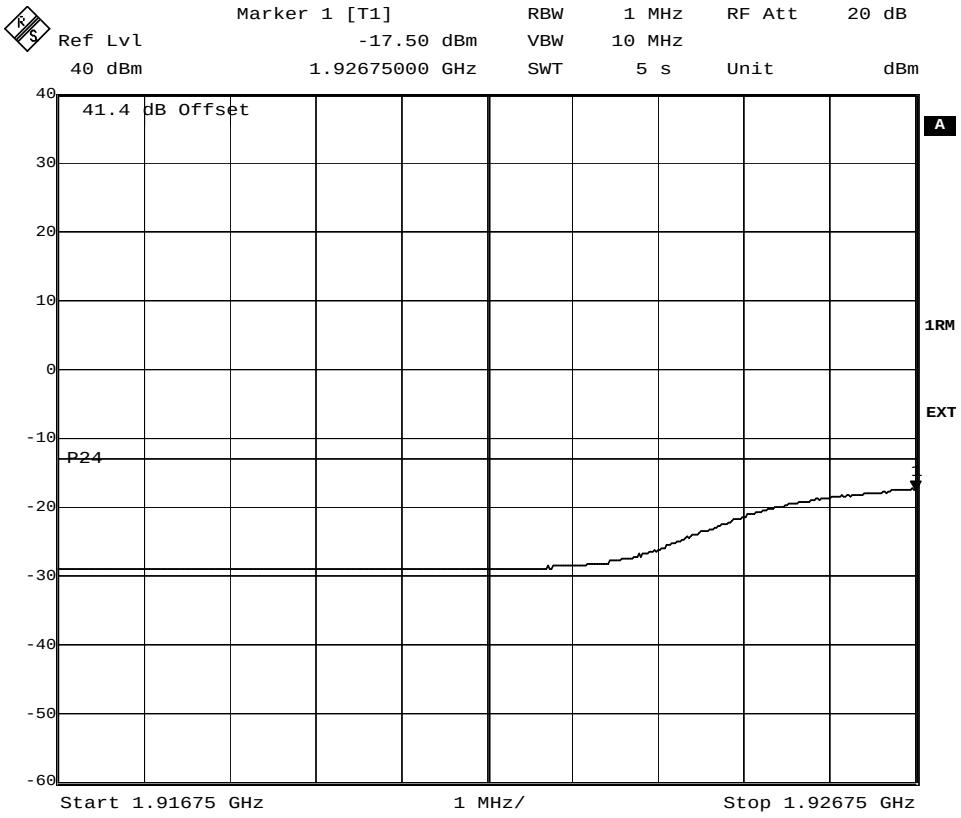
Diagram 3





FCC ID: TA8AKRC11847-2 Appendix 4.1
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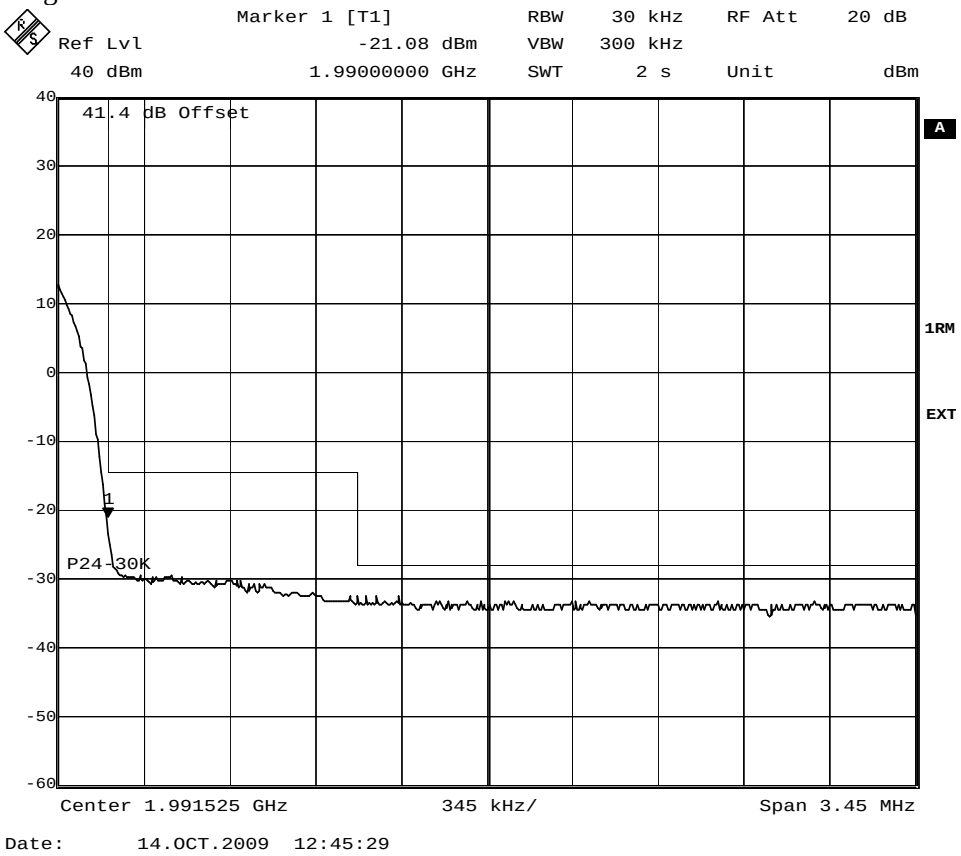
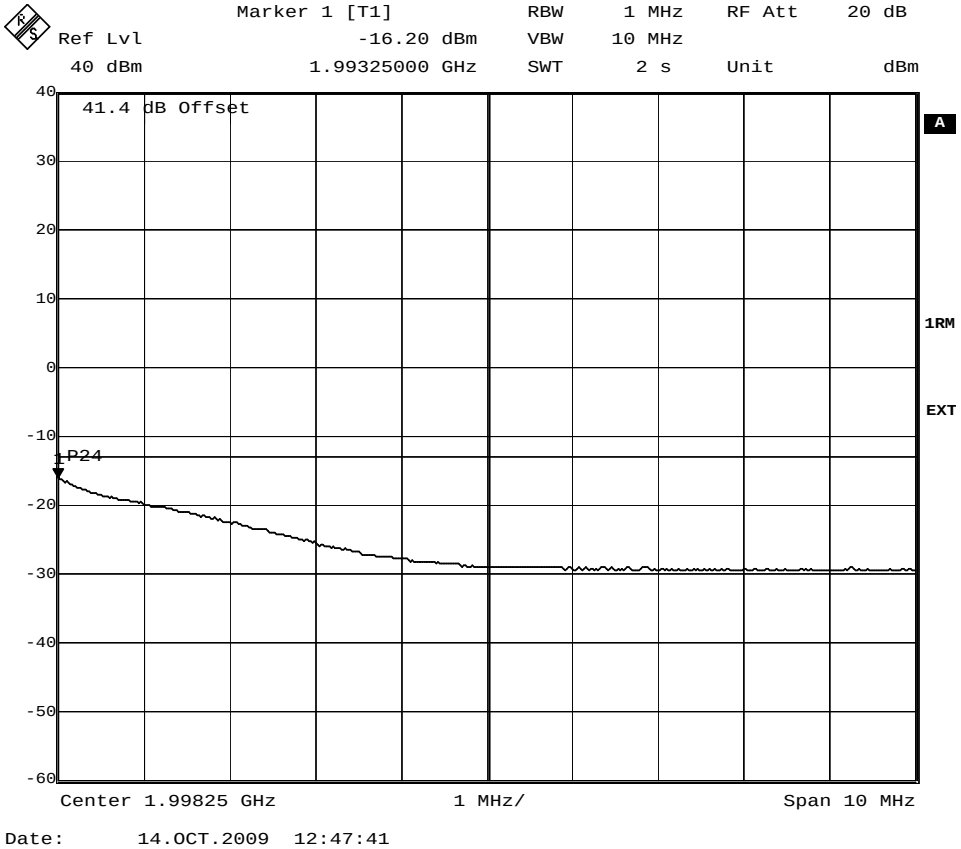
Diagram 4





FCC ID: TA8AKRC11847-2 Appendix 5
IC: 287AB-AW118472

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

Date	Temperature	Humidity
2009-10-13 to 2009-10-14	22 °C ± 3 °C	20-25 % ± 5 %

Test set-up and procedure

The output was connected to a spectrum analyzer. First a pre-measurement with activated peak detector was performed. Emissions close to or above the limit is measured with activated RMS detector and the RMS measurement result is noted. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSIQ	503 738
High pass filter	503 739
Testo 625, Temperature and humidity meter	504 188

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier:
Diagram 1: B
Diagram 2: M
Diagram 3: T

Multi carrier:
Diagram 4: B and (B+10)
Diagram 5: M and (M+10)
Diagram 6: T and (T-10)

Remark

The emission at 9 kHz on 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.

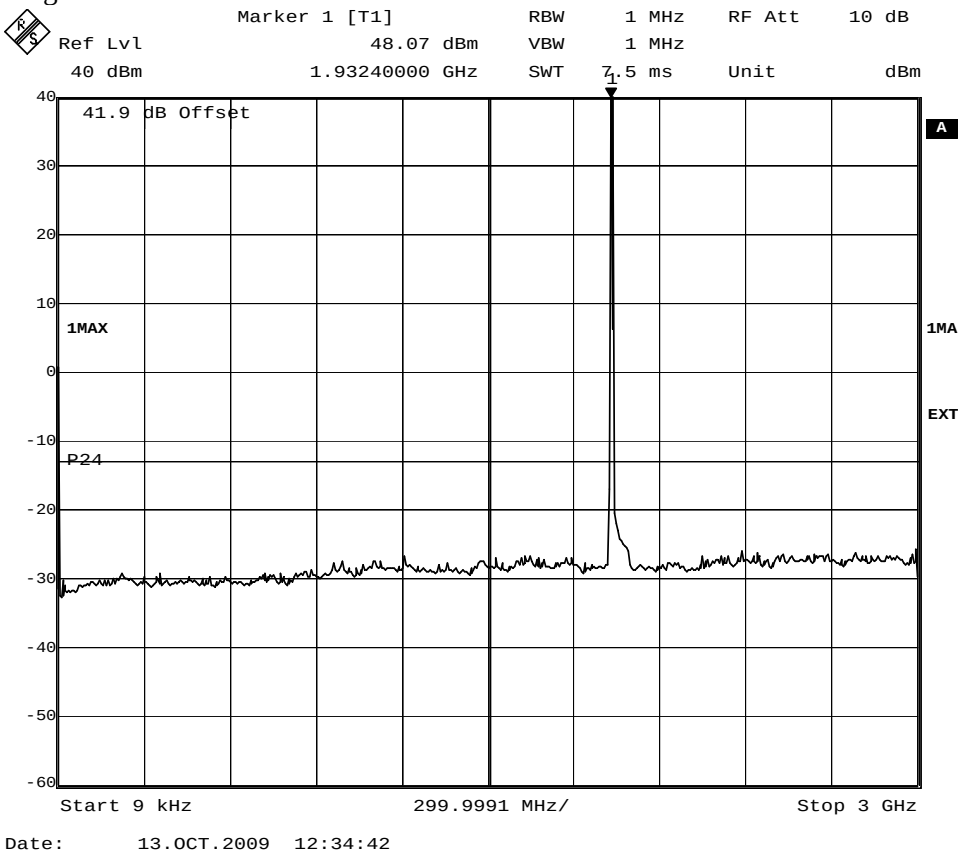
Limits

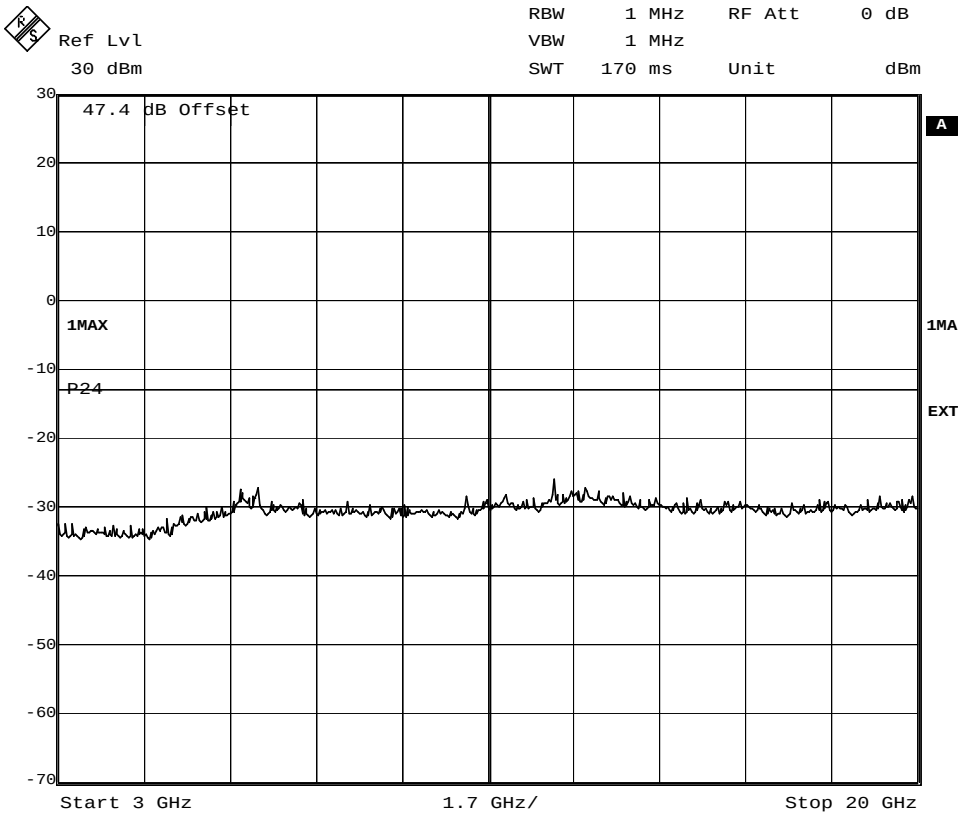
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

Complies?	Yes

FCC ID: TA8AKRC11847-2 Appendix 5.1
IC: 287AB-AW118472

Diagram 1





FCC ID: TA8AKRC11847-2 Appendix 5.1
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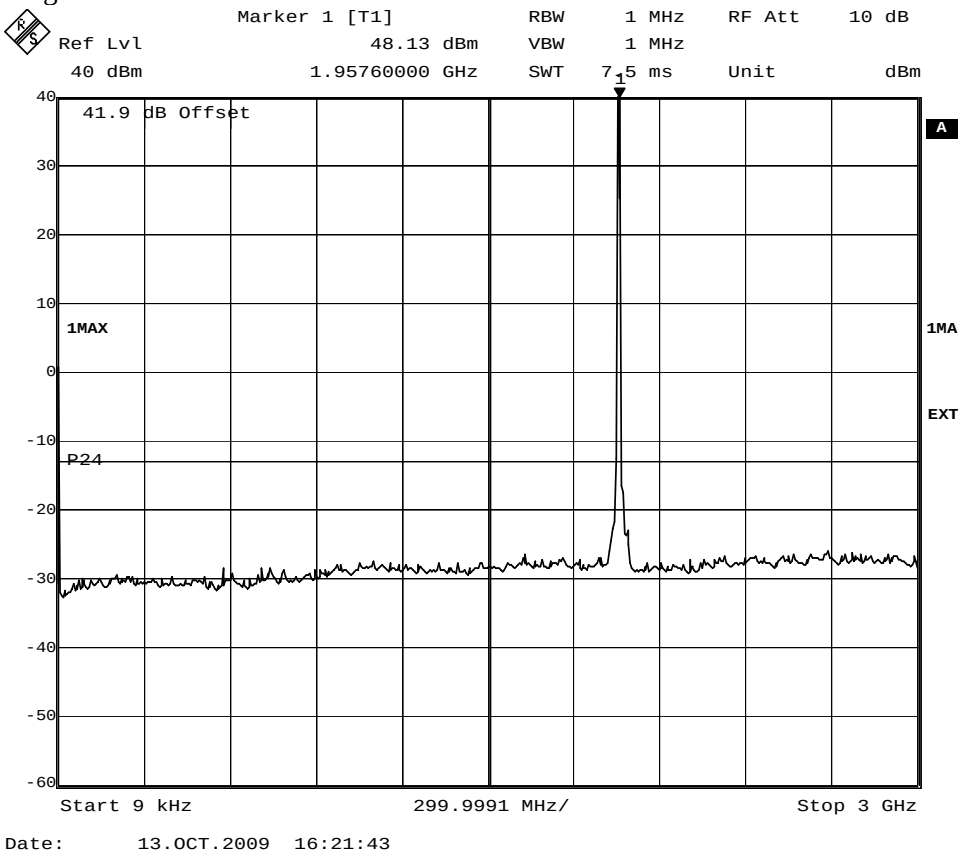
Diagram 2



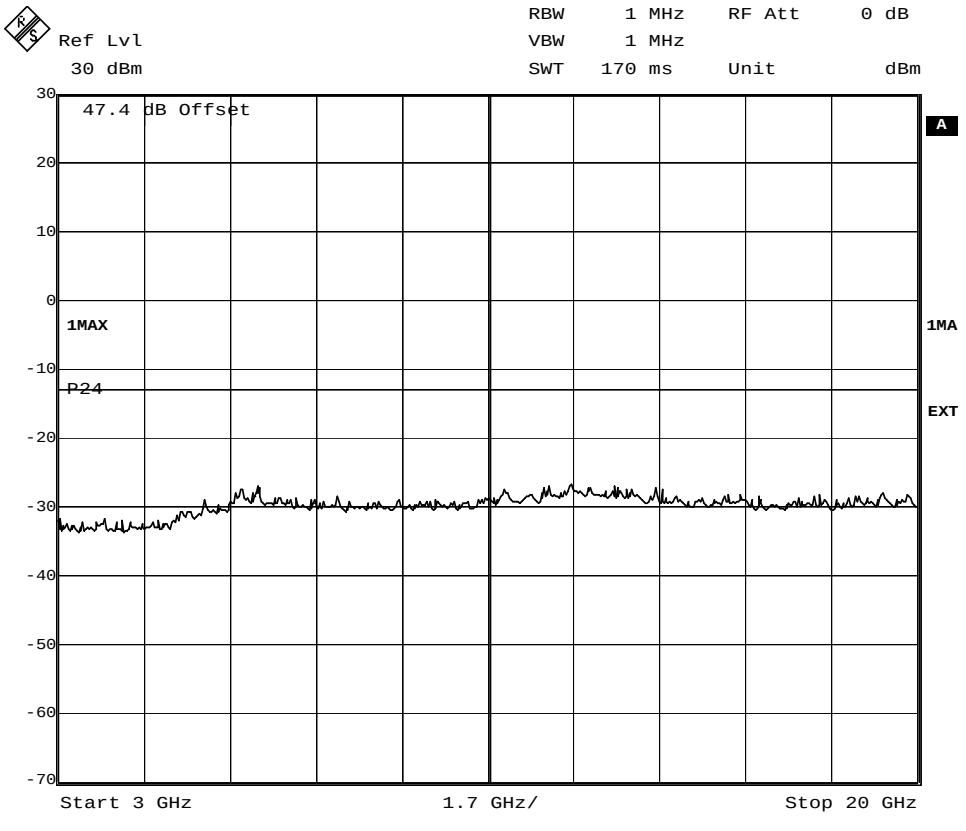


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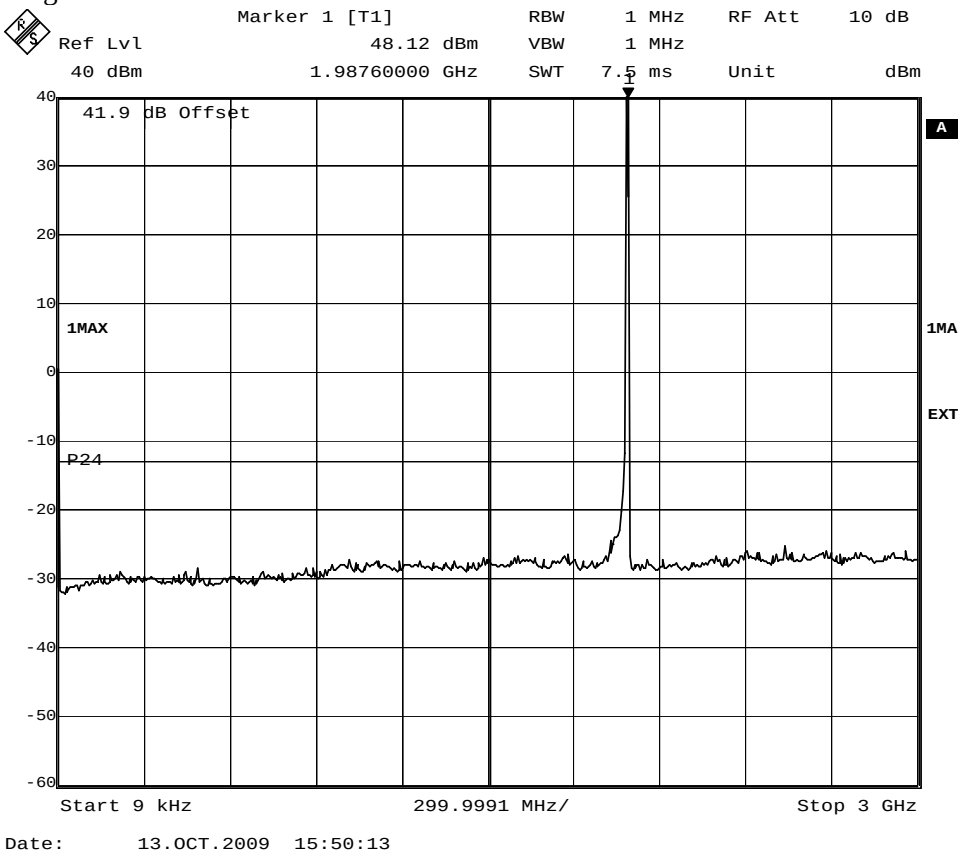
Diagram 3



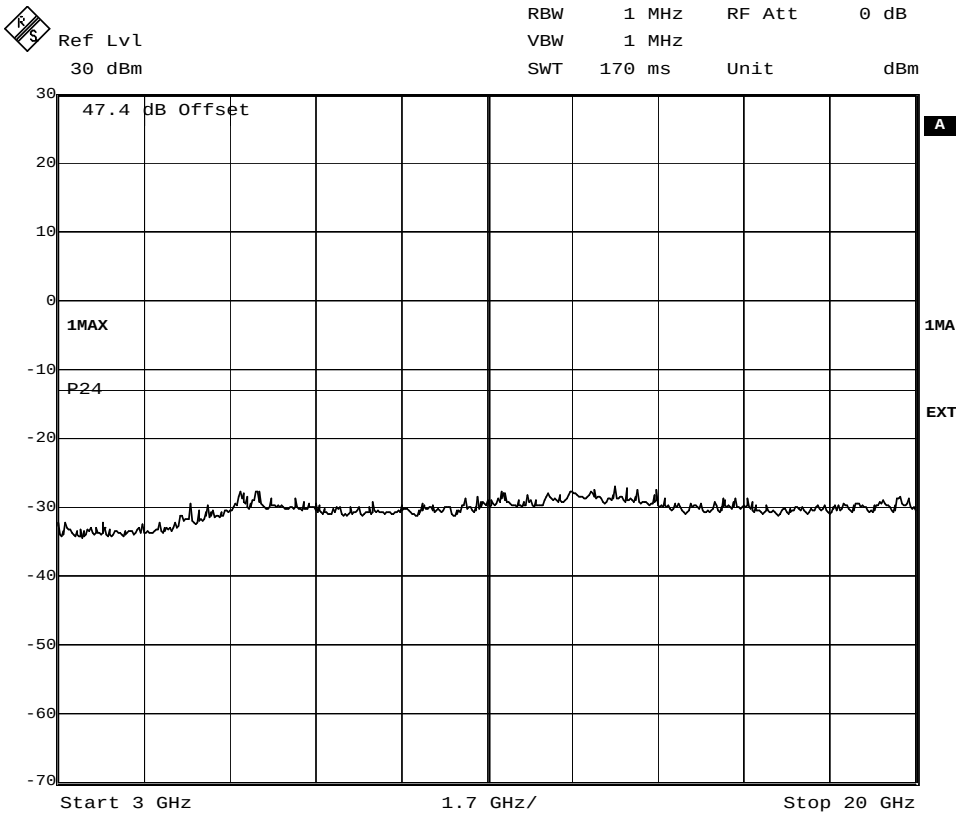


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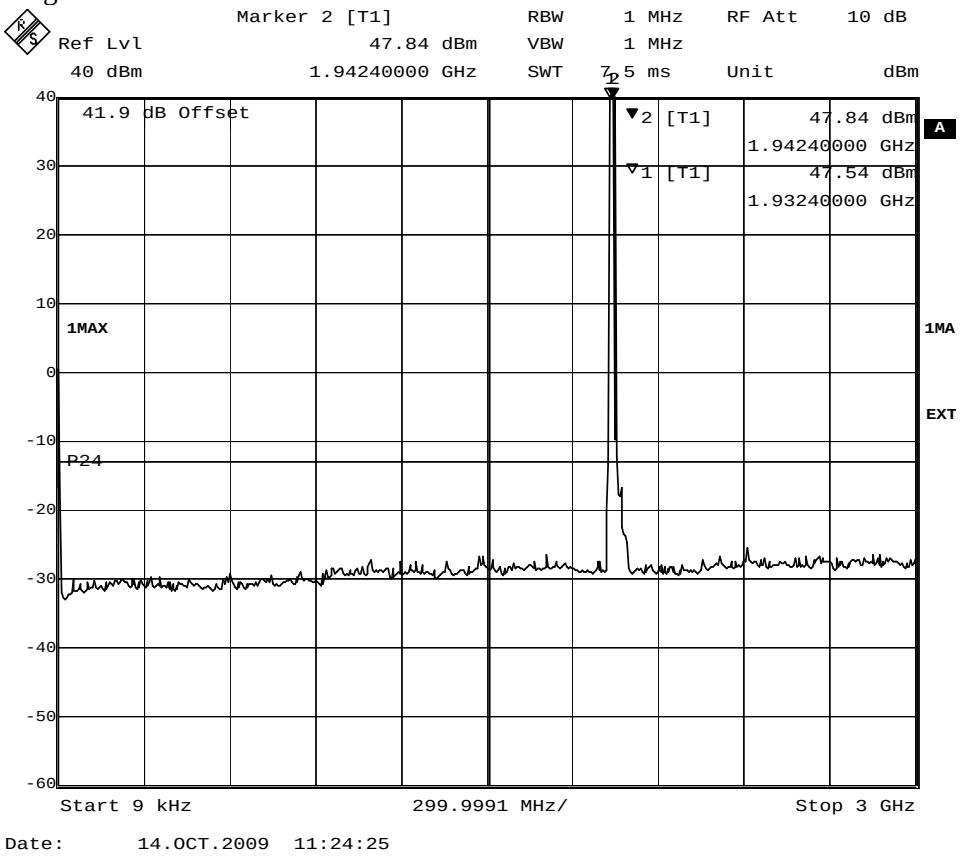
Diagram 4



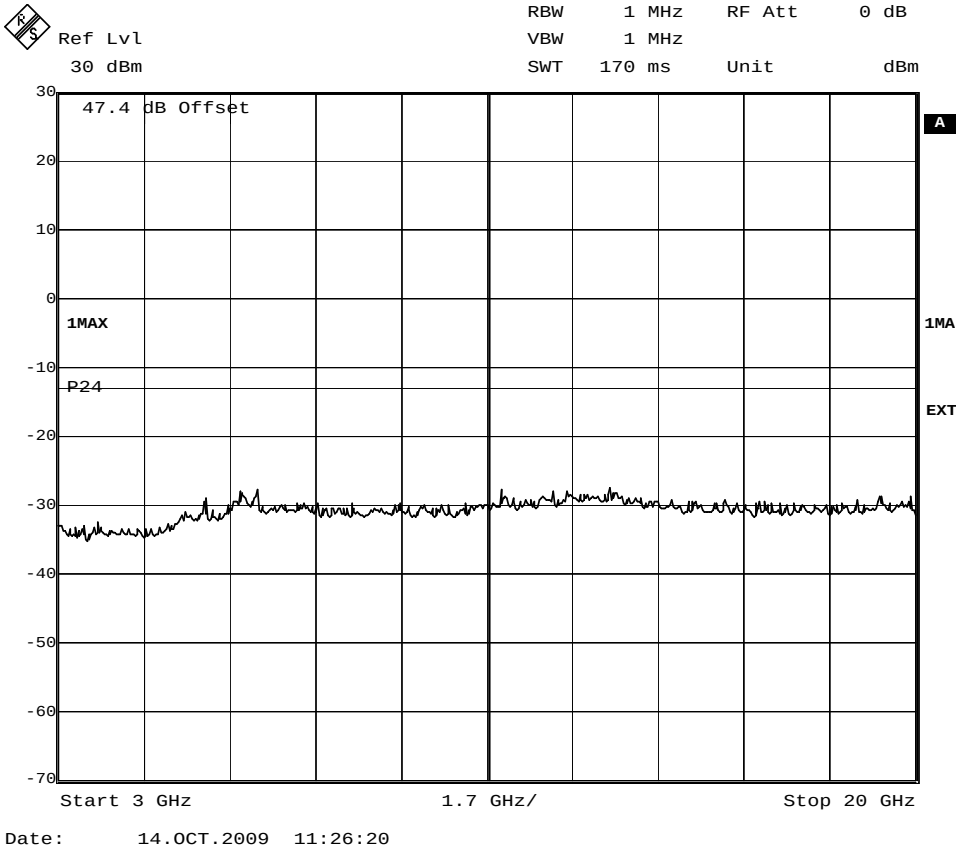


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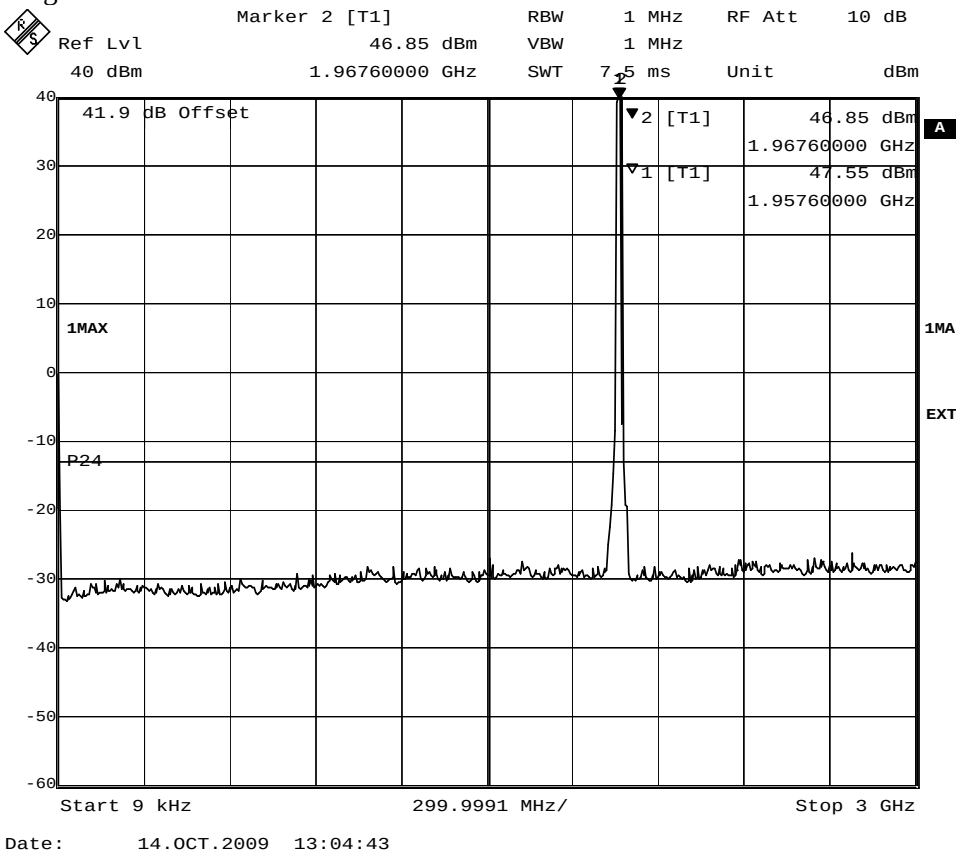
Diagram 5



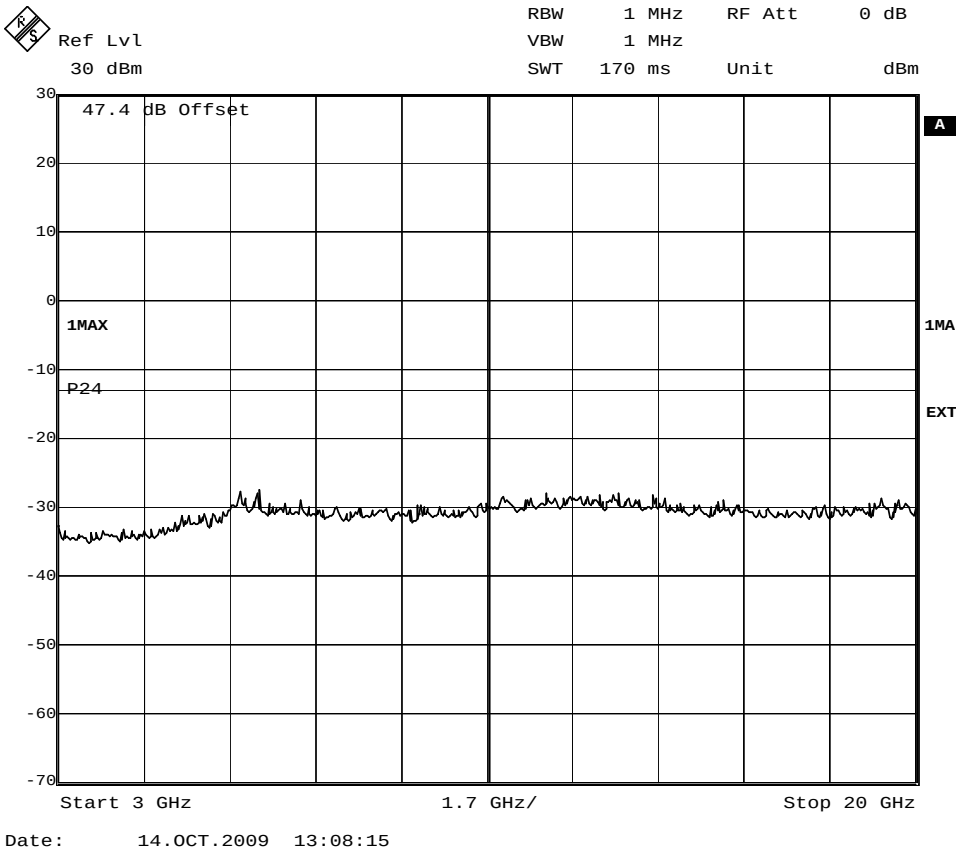


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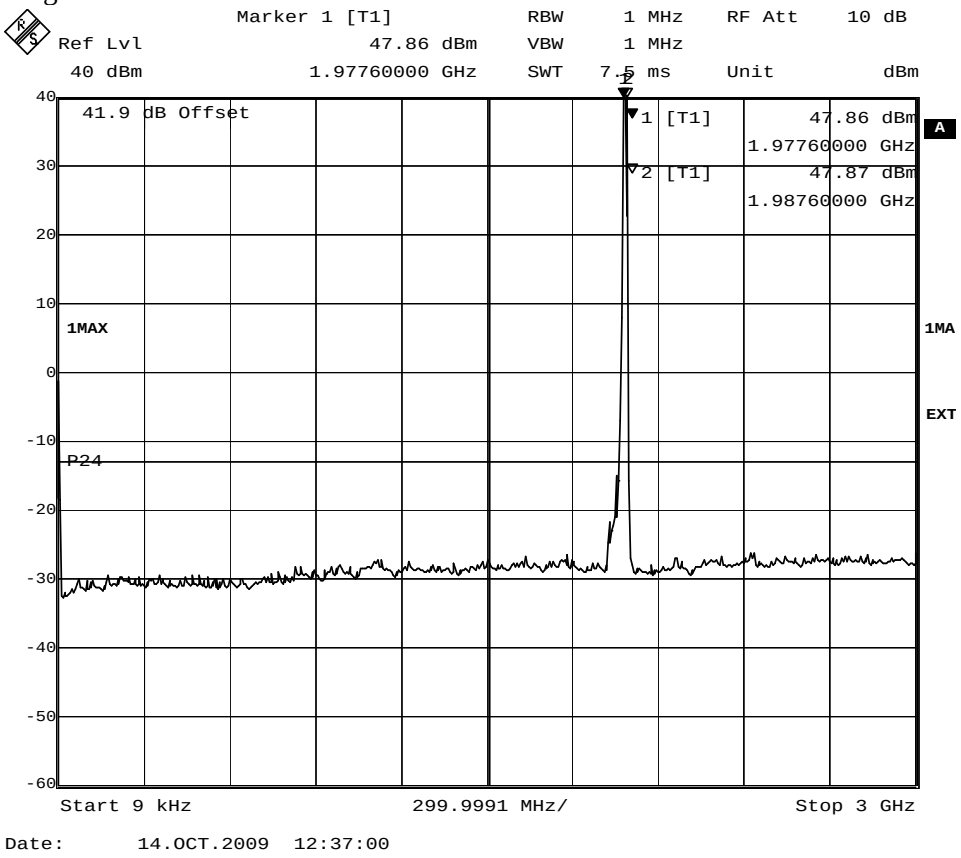
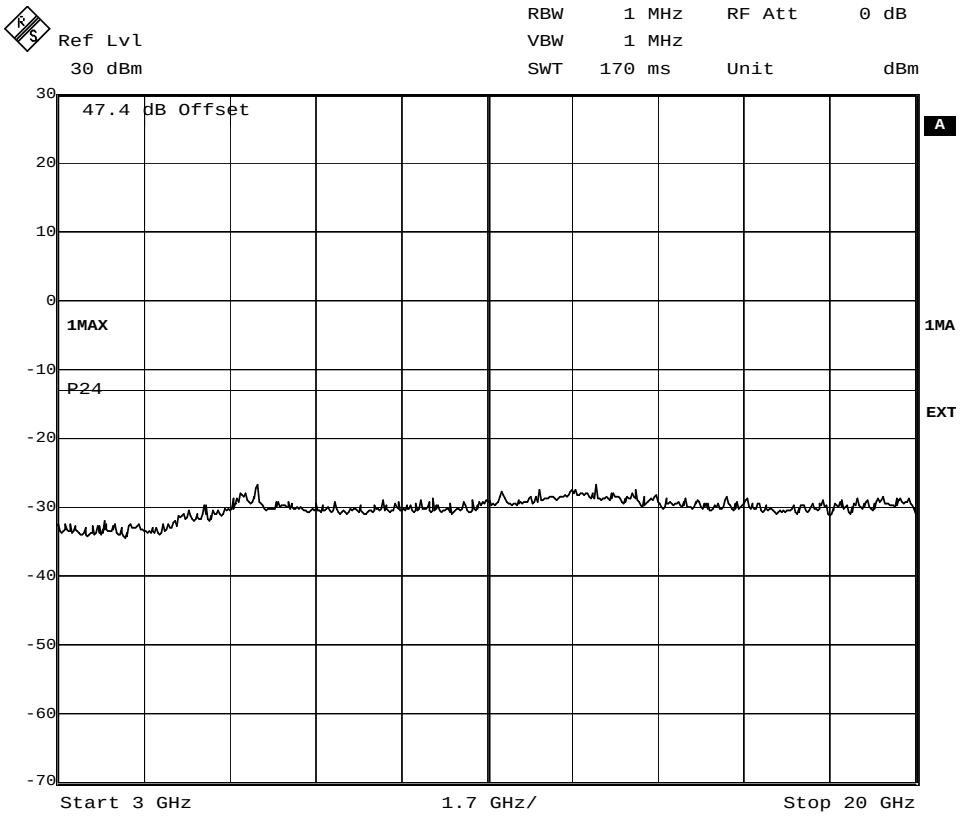
Diagram 6





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

Date	Temperature	Humidity
2009-10-06 to 2009-10-12	22-23 °C ± 3 °C	27-37 % ± 5 %

Test set-up and procedure

The test site is listed at FCC, Columbia with registration number: 93866. The test site also complies with RSS-Gen, Industry Canada file no.:IC 3482.
The transmitter was modulated with pseudorandom data during the measurements. The antenna port 1 “RF A” was connected to functional test equipment outside the test chamber for signal monitoring. Antenna port 2 “RF B” was terminated with a 50 ohm load.

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.

1. A pre-measurement was first performed:
2. In the frequency range 30 MHz-20 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was,
   $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.
3. The measurement procedure was as the following:
4. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
5. Spurious radiation on frequencies closer than 20 dB to the limit 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 measured with the RMS detector were measured with the substitution method according to the standard.

Measurement equipment	SP number
Test site Tesla	503 881
R&S ESI 26	503 292
R&S FSIQ	503 738
Control computer	503 479
Software: R&S EMC32, ver. 6.30.10	-
Chase Bilog antenna CBL 6111A	502 182
EMCO Horn Antenna 3115	502 175
Flann Standard gain horn 16240-25	503 939
Flann Standard gain horn 18240-25	503 900
Flann Standard gain horn 20240-20	503 674
MITEQ Low Noise Amplifier	503 285
Testo 625, Temperature and humidity meter	504 188

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The test set-up during the spurious radiation measurements is shown in the picture below:

Results

Single carrier

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 4.7 dB		

Multi carrier

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 4.7 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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Frequency stability according to 47 CFR 2.1055/ RSS-133 6.3

Date	Temperature (test equipment)	Humidity (test equipment)
2009-10-20 to 2009-10-23	23 to 24 °C ± 3 °C	28 to 35 % ± 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 FSIQ 40	503 738
Testo 625, Temperature and humidity meter	504 188
Climate chamber 2	501 031

Results

Nominal Voltage -48 V DC
Maximum output power at M channel:

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	Temperature (°C)	
-48.0	+20	-13
-55.2	+20	12
-40.8	+20	-8
-48.0	+30	17
-48.0	+40	15
-48.0	+50	14
-48.0	+10	-12
-48.0	0	15
-48.0	-10	-16
-48.0	-20	15
-48.0	-30	12
Maximum frequency error (Hz)		17
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (109.9 Hz).

Complies?	Yes

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Receiver spurious emissions measurements according to IC RSS-133, section 6.7

Date	Temperature	Humidity
2009-10-14	22°C ± 3 °C	20 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.4.

Measurements were performed on the receiver antenna port “RF B”. The measurement is first performed with peak detector. Emission on frequencies close to or above the limit is re-measured with quasi-peak detector (average detector above 1000 MHz).

Measurement equipment	SP number
R&S FSIQ 40	503 738
Testo 625, Temperature and humidity meter	504 188

Result

The results are shown in appendix 8.1:

	Channel
Diagram 1	B
Diagram 2	M
Diagram 3	T

Note: During the measurement at the RX port the combined TX/RX port “RF A” was terminated into 50 ohm, the TX was active in single carrier mode transmitting TM1.

Remark

The emission at 9 kHz on 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.

Limit

The power of any spurious output signals appearing at the antenna terminals must not exceed -57 dBm (2 nanowatt).

Emission below limit?	Yes

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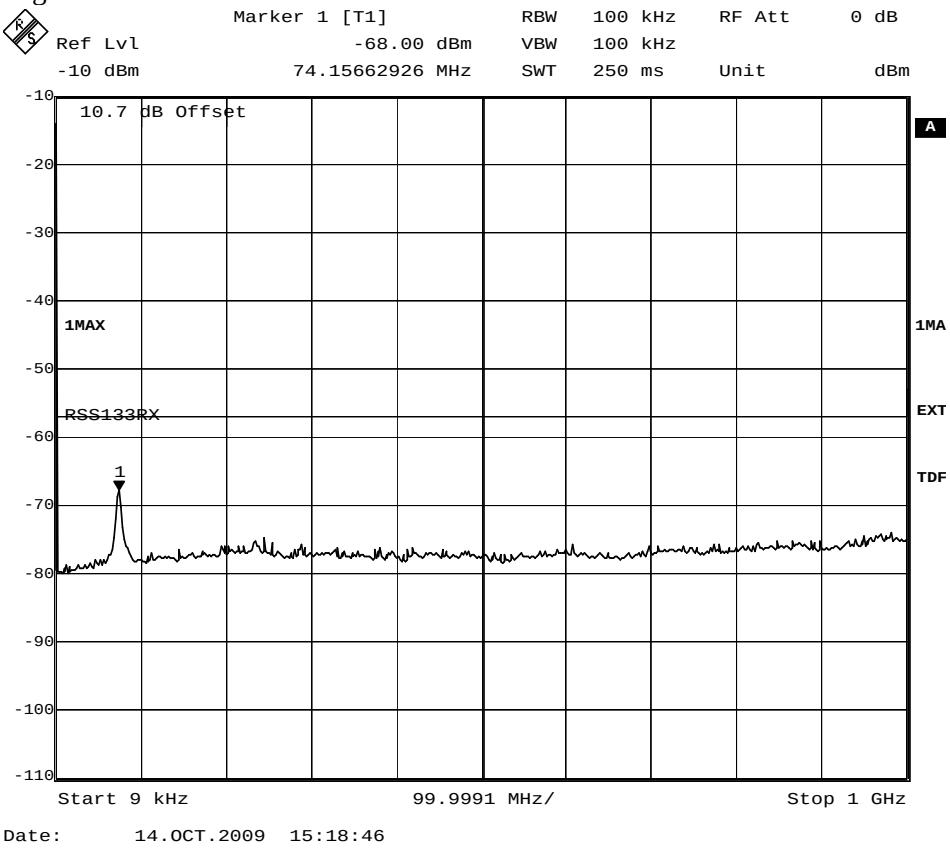
Diagram 1



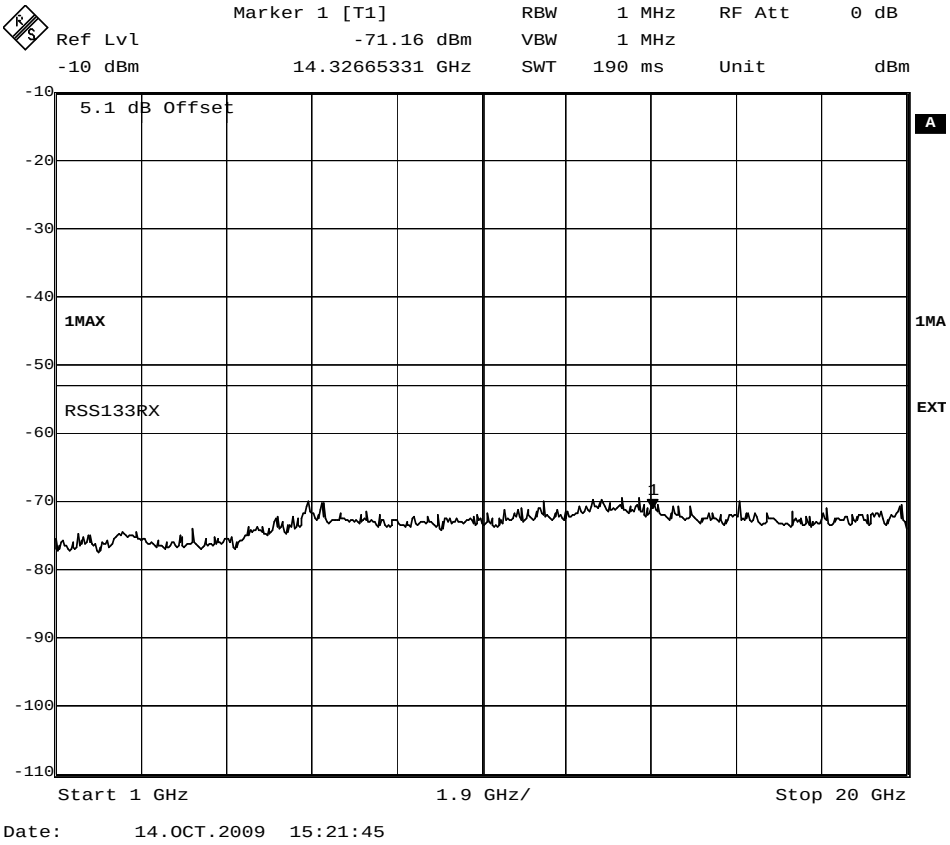


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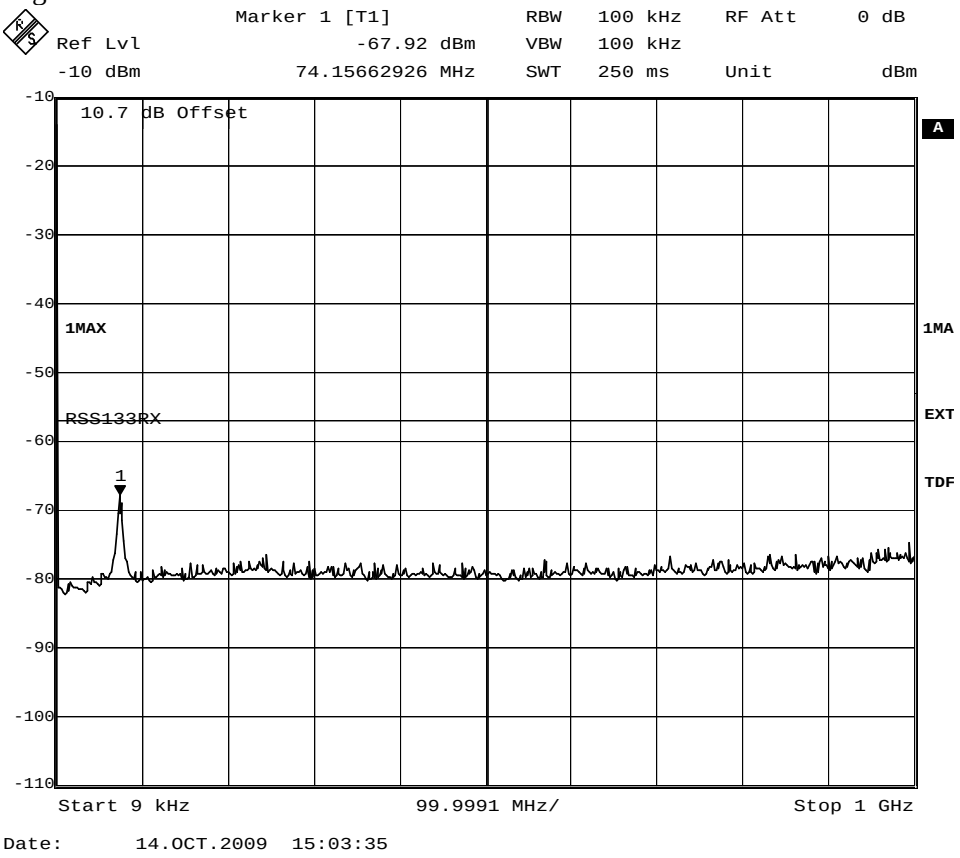
Diagram 2



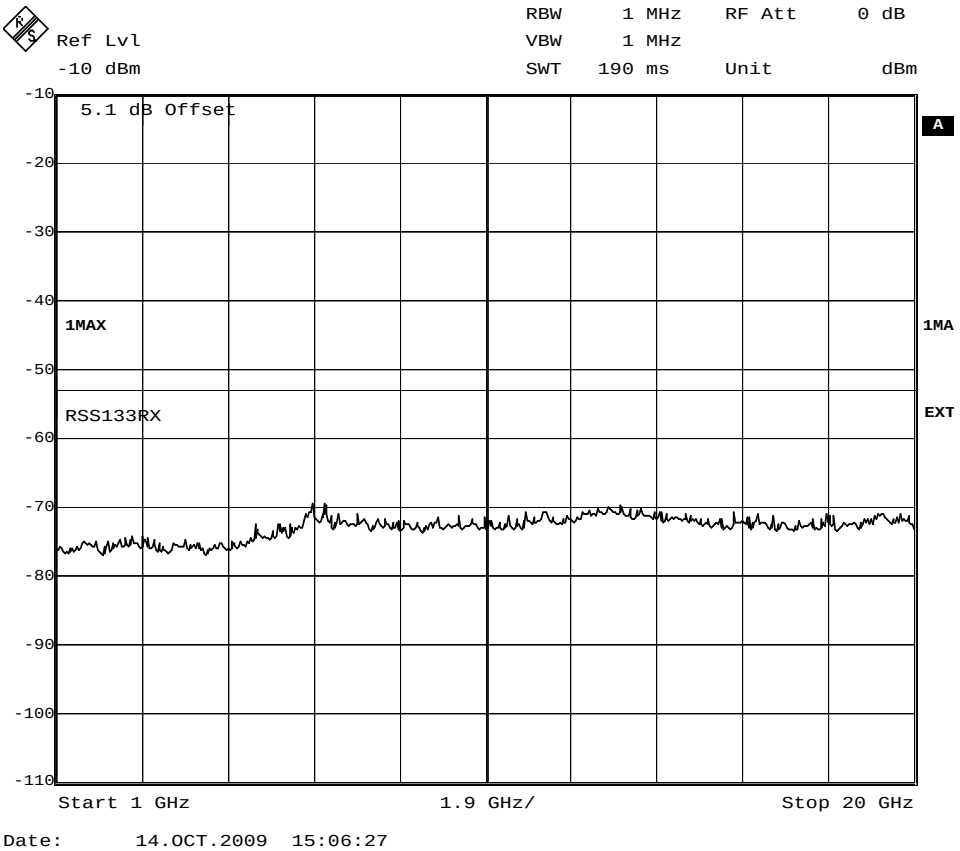


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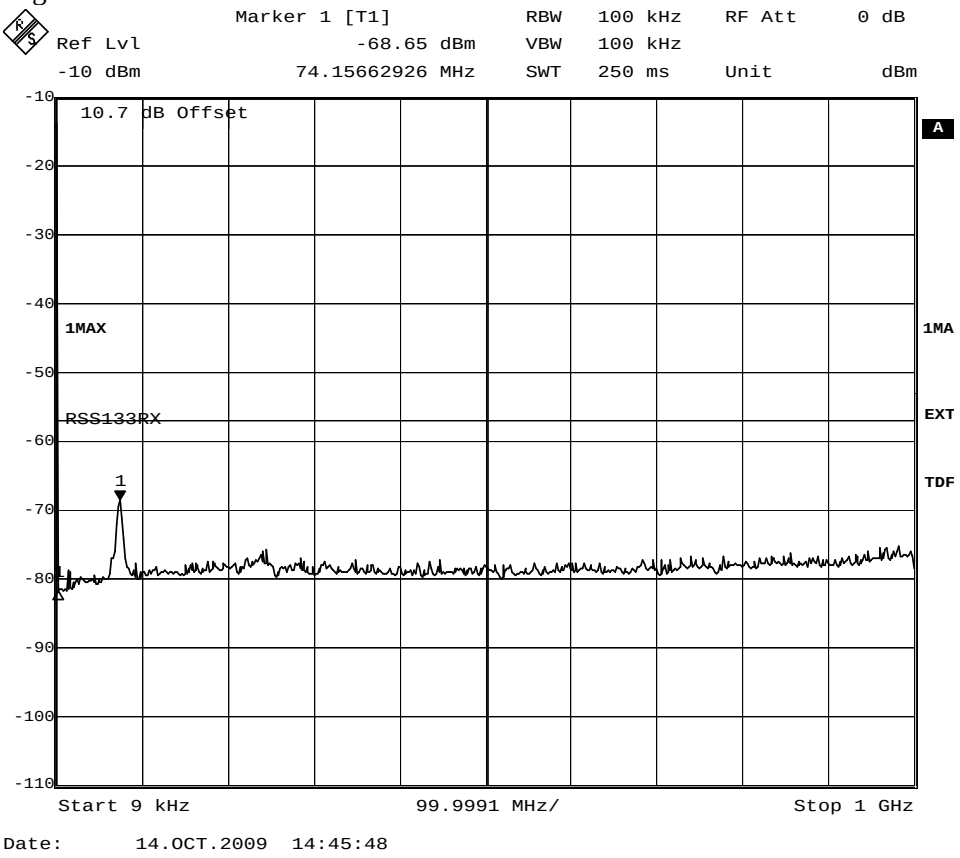
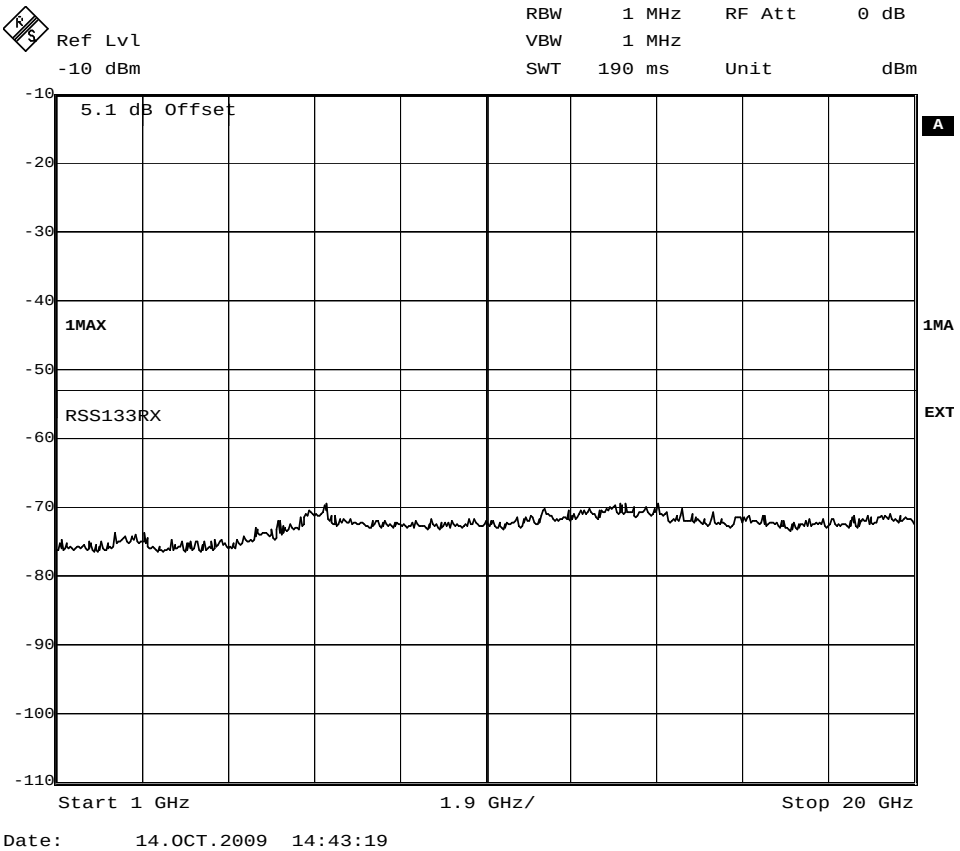
Diagram 3





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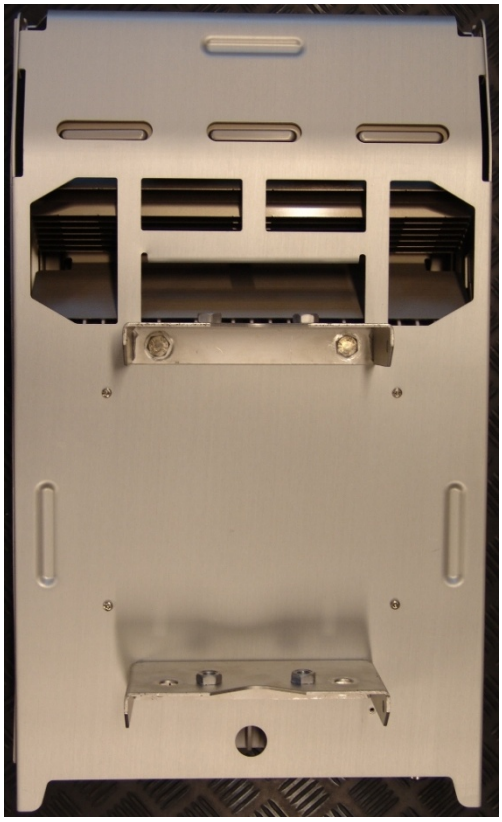
Appendix 9

External photos of EUT

Front side

Rear side



Right side

Left side

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Bottom side

Top side