REPORT

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The test site complies with RSS-Gen, file no: IC 3482

Date	Reference	Page
2007-11-12	F719719-F24	1 (2)

1002
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Handled by, department
Jonas Bremholt
Electronics
+46 (0)10 516 5438, jonas.bremholt@sp.se

ERICSSON AB
EAB/FJW/RGI Mats Falk
Lindholmspiren 11
417 56 Göteborg

Radio measurements on WCDMA 1900 MHz Transceiver unit with FCC ID: TA8AKRC11819-2 and IC: 287AB-AW118192

(9 appendices)

Test object

Radio Unit KRC 118 19/2 rev R1A

Appendix 1 provides information about the test object and the test set-up.
Appendix 9 provides external photos of the test object.

Summary

Standard		Compliant	Appendix
FCC CFR 47 / IC RSS-133			
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			
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.

SP Swedish National Testing and Research Institute
Electronics - EMC

Bengt Andersson
Deputy Technical Manager

Jonas Bremholt
Technical Officer

FCC ID: TA8AKRC11819-2
IC: 287AB-AW118192

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Description – Test object

Equipment: WCDMA Transceiver unit (RU) 1900 MHz, single and multi carrier.

Tx Frequency range: 1932.4-1987.6 MHz

Modulations: QPSK and 16QAM

Maximum output power: Single carrier: 1x 43 dBm (20W)
Multi carrier: 2x 40 dBm (10W)

Nominal power voltage: -48 VDC

Tested channels

UARFCN	Frequency
9662	1932.4 MHz
9712	1942.4 MHz
9763	1952.6 MHz
9788	1957.4 MHZ
9813	1962.6 MHz
9888	1977.6 MHz
9938	1987.6 MHZ

Operation mode during measurements

Test models

All measurements were performed with the test object transmitting the Test models 1 and 5 defined in 3GPP TS 25.141. Test model 1 uses the QPSK modulation only, and Test model 5 includes the 16QAM modulation.

Conducted measurements

All RF conducted measurements were performed with the test object installed in a RBS 3308 cabinet powered with -48 VDC. All measurements were done at the output connector (Ant A) of the Filter Unit (FU) KRC 118 20/1. The measurements were performed at maximum output power with both modulations.

The settings below was found to be representative for all traffic scenarios when several settings were tested to find the setting for worst case.

Single carrier
Test model 1: 64 DPCH:s at 30 ksps (SF=128)
Test model 5: 30 DPCH:s at 30 ksps (SF=128) and 8 HS-PDSCH:s at 240 ksps (SF=16)

Multi carrier
Test model 1: 32 DPCH:s at 30 ksps (SF=128)
Test model 5: 30 DPCH:s at 30 ksps (SF=128) and 8 HS-PDSCH:s at 240 ksps (SF=16)

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Radiated measurements

All radiated measurements were performed with the test object installed in a RBS 3308 cabinet powered with -48 VDC and 120 VAC/ 60 Hz.

The RU unit was activated for maximum transmit power. The RU unit was activated as Single Carrier (1x43dBm) and Multi Carrier (2x40 dBm). The RF output power port was terminated with 50 ohm loads.

The settings below were found to be representative for all traffic scenarios when several settings were tested to find the setting for worst case.

The RU unit were allocated to the following UARFCN:

Single Carrier:

Modulation	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Downlink UARFCN	9662 (1932.4 MHz)	9662 (1932.4 MHz)	9787 (1957.4 MHz)	9787 (1957.4 MHz)	9938 (1987.6 MHz)	9938 (1987.6 MHz)
Uplink UARFCN	9262 (1852.4 MHz)	9262 (1852.4 MHz)	9387 (1877.4 MHz)	9387 (1877.4 MHz)	9538 (1907.6 MHz)	9538 (1907.6 MHz)
Test model	1	5	1	5	1	5
Power configuration	DC	DC	DC	DC	AC	AC

Test model 1: 64 DPCH:s at 30 ksps (SF=128)
Test model 5: 30 DPCH:s at 30 ksps (SF=128) and 8 HS-PDSCH:s at 240 ksps (SF=16)

Multi Carrier:

Cell	1	2
Modulation	QPSK	16QAM
Downlink	9662 (1932.4 MHz)	9712 (1942.4 MHz)
Uplink	9262 (1852.4 MHz)	9312 (1862.4 MHz)
Test model	1	5
Power configuration	DC	

Test model 1: 32 DPCH:s at 30 ksps (SF=128)
Test model 5: 30 DPCH:s at 30 ksps (SF=128) and 8 HS-PDSCH:s at 240 ksps (SF=16)

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

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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: 2007-10-12

Manufacturer's representative

Mats Falk, Ericsson AB.

Test engineers

Jonas Bremholt and Jörgen Wassholm

Test witnesses

Christer Hjort and Magnus Gyllenhammar, Ericsson AB.

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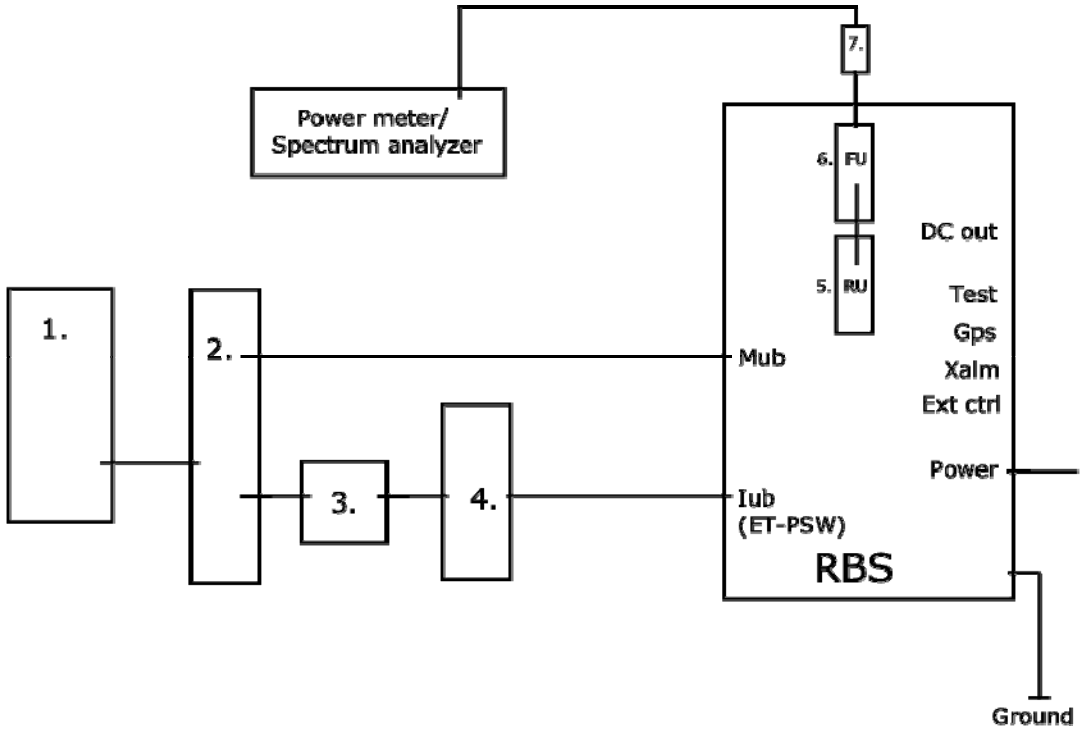
Test set-up, conducted measurements



RBS 3308: SEB 104 083/1 with software CXP 901 1610/1 Rev. R12C03. More information about the RBS hardware units are shown in SP document F719719-H

1. Computer Sunblade 1500, p/n 380-0961-02 s/n MT42210040
2. Fast ethernet switch, Netgear GS516T
3. RNC Sim 4780 BA, mini-SIM#23, s/n 0219 rev. CDA
4. Converter ATM/ IP, Axerra Networks, p/n AXN10-4H-UT-AS-EP Rev 2020 s/n 00022220
5. Test object, RU KRC 118 19/2 Rev. R1A (FCC ID: TA8AKRC11819-2)
6. FU KRC 118 20/1 Rev. R1H
7. Attenuator

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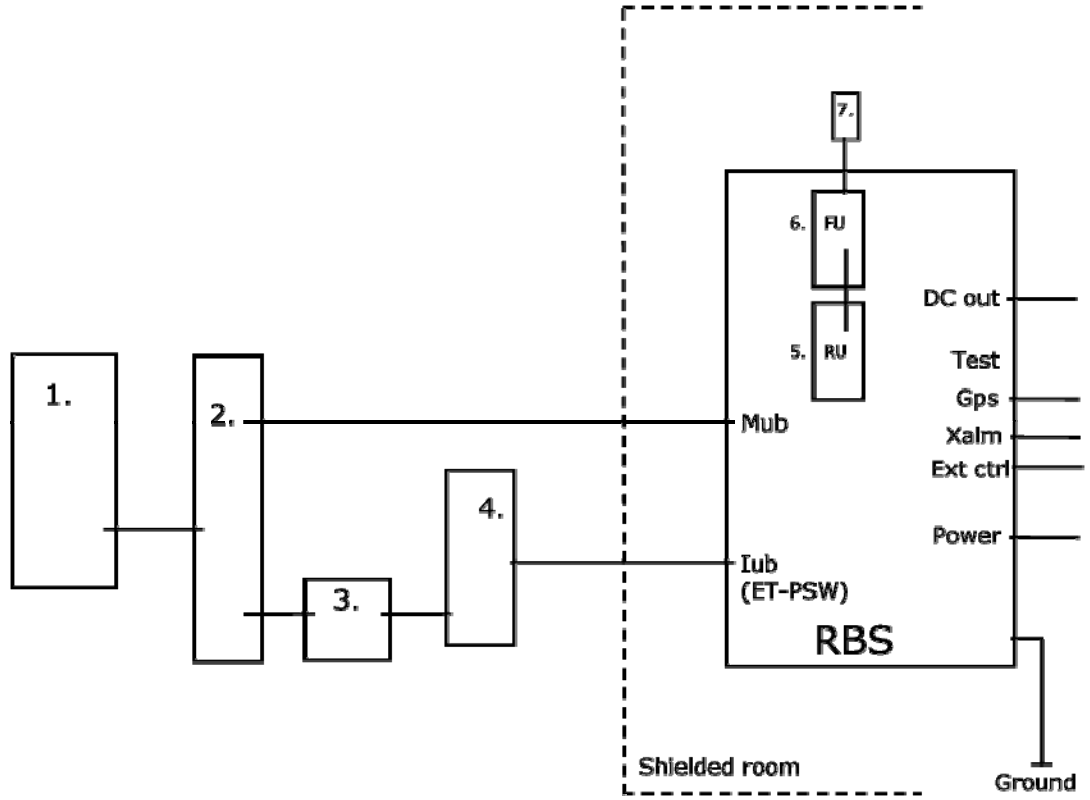
Test set-up, radiated measurements



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1. Computer Sunblade 1500, p/n 380-0961-02 s/n MT42210040
2. Fast ethernet switch, Netgear GS516T
3. RNC Sim 4780 BA, mini-SIM#23, s/n 0219 rev. CDA
4. Converter ATM/ IP, Axerra Networks, p/n AXN10-4H-UT-AS-EP Rev 2020 s/n 00022220
5. Test object, RU KRC 118 22/3 Rev. R1A (FCC ID: TA8AKRC11819-2)
6. FU KRC 118 20/1 Rev. R1H
7. Terminator, 50 ohm

Interfaces:	**Type of port:**
Power, 120 VAC, 60 Hz	AC Mains
Power, -48 VDC	DC power
Coaxial cable with N connector and adaptor to 7/16”	Antenna
DC out, terminated in a resistive load (100 W??)	DC Power
Test, serial interface, no cable attached	Test purpose
GPS, Shielded multiwire, unterminated	Signal
Xalm, shielded multi-wire with RJ-45 connector, unterminated	Signal
Ext ctrl: shielded multi-wire, un-terminated	Signal
Mub, shielded multi-wire with RJ-45 connector	Test purpose
Iub, configured as IP by ET-PSW, shielded multi-wire with RJ-45 connector	Telecom

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

Date	Temperature	Humidity
2007-10-19	22 °C ± 3 °C	20 % ± 5 %
2007-10-22	23 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The output was connected to a peak power analyzer. The transmitter was set up according to Test model 1 and Test model 5 during the measurements.

Measurement equipment	Calibration Due	SP number
Boonton RF Peak power meter/analyzer	2008-12	503 144
Boonton Power sensor 56518-S/4	2009-06	503 146
Multimeter Fluke 87	2007-12	502 190
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 0.5 dB

Results

Single carrier

Rated output power level at Ant 1 connector (maximum): 1x 43 dBm

Test conditions	Transmitter power (dBm) RMS		
T_{nom} 22 °C/ V_{nom} -48 V DC	Frequency 1932.4 MHz	Frequency 1957.4 MHz	Frequency 1987.6 MHz
QPSK	43.4	43.4	43.3
16QAM	43.4	43.5	43.4

Multi carrier

Rated output power level at Ant 1 connector (maximum): 2x 40 dBm

Test conditions	Transmitter combined power (dBm) RMS		
T_{nom} 22 °C/ V_{nom} -48 V DC	Frequencies 1932.4 MHz 1942.4 MHz	Frequencies 1952.4 MHz 1962.4 MHz	Frequencies 1977.6 MHz 1987.6 MHz
QPSK	43.5	43.5	43.4
16QAM	43.5	43.4	43.3

Limit

§24.232/RSS-133 6.4: Maximum conducted output power shall not exceed 100W (50 dBm).

Complies?	Yes

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Occupied bandwidth measurements according to 47 CFR 2.1049/ RSS-Gen 6.5.1

Date	Temperature	Humidity
2007-10-19	22 °C ± 3 °C	20 % ± 5 %
2007-10-22	23 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §2.1049. Measurements were performed on the combined TX/RX antenna terminal Ant 1. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. The transmitter was set up according to Test model 1 and Test model 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

QPSK

	Frequency	OBW
Diagram 1	1932.4 MHz	4.2 MHz
Diagram 2	1957.4 MHz	4.2 MHz
Diagram 3	1987.6 MHz	4.2 MHz

16QAM

	Frequency	OBW
Diagram 4	1932.4 MHz	4.2 MHz
Diagram 5	1957.4 MHz	4.2 MHz
Diagram 6	1987.6 MHz	4.2 MHz

FCC ID: TA8AKRC11819-2 Appendix 3.1

Diagram 1

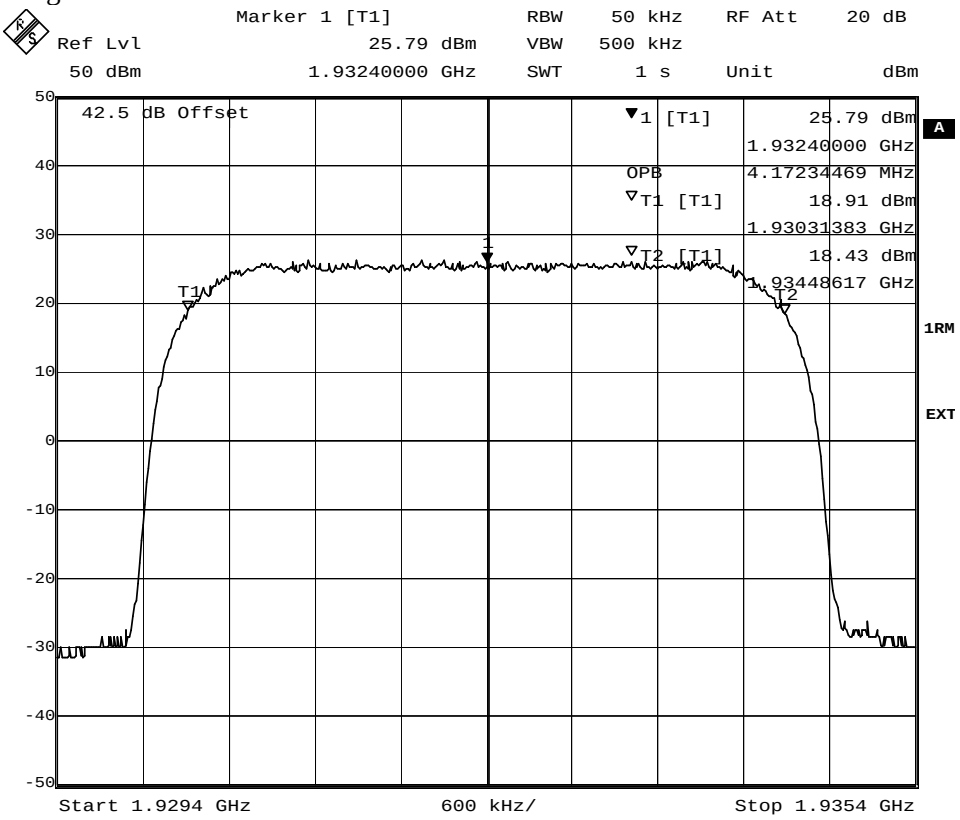

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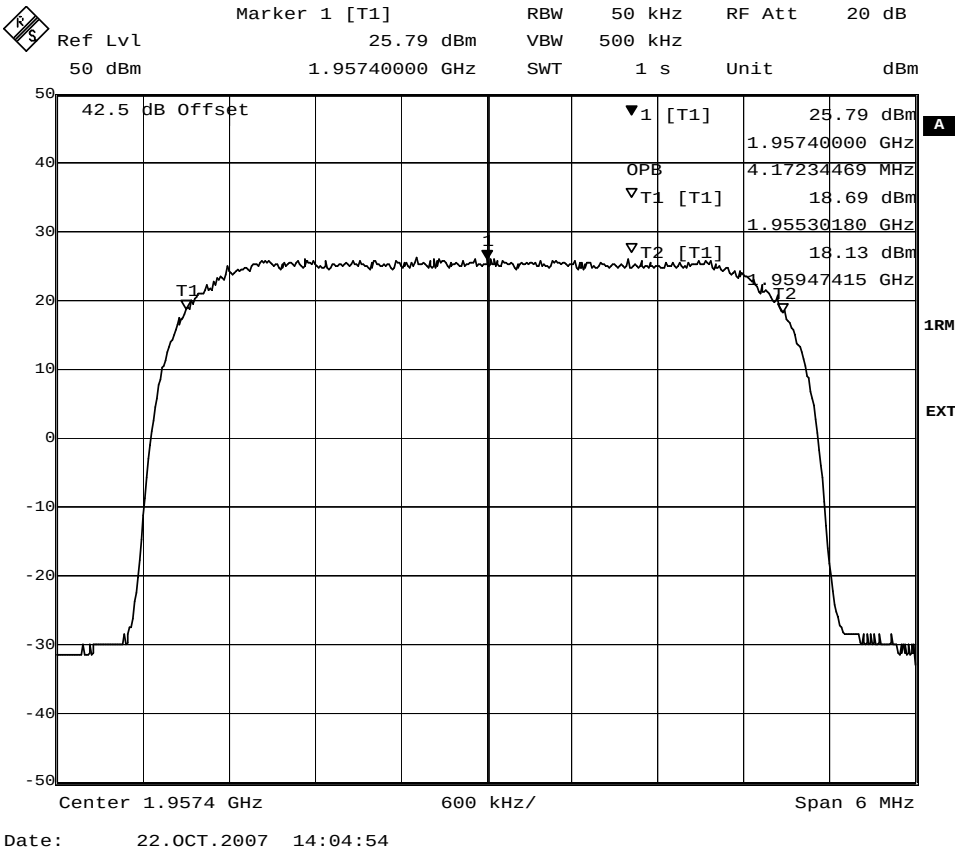
Diagram 2



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FCC ID: TA8AKRC11819-2 Appendix 3.1

Diagram 3

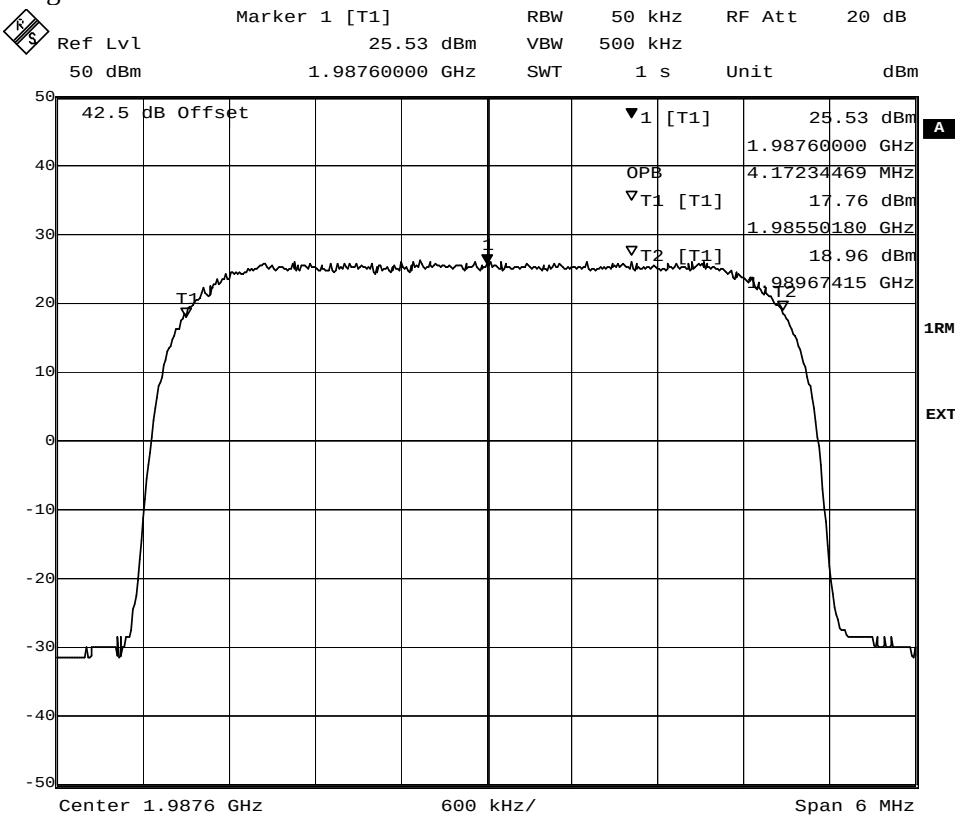

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Diagram 4

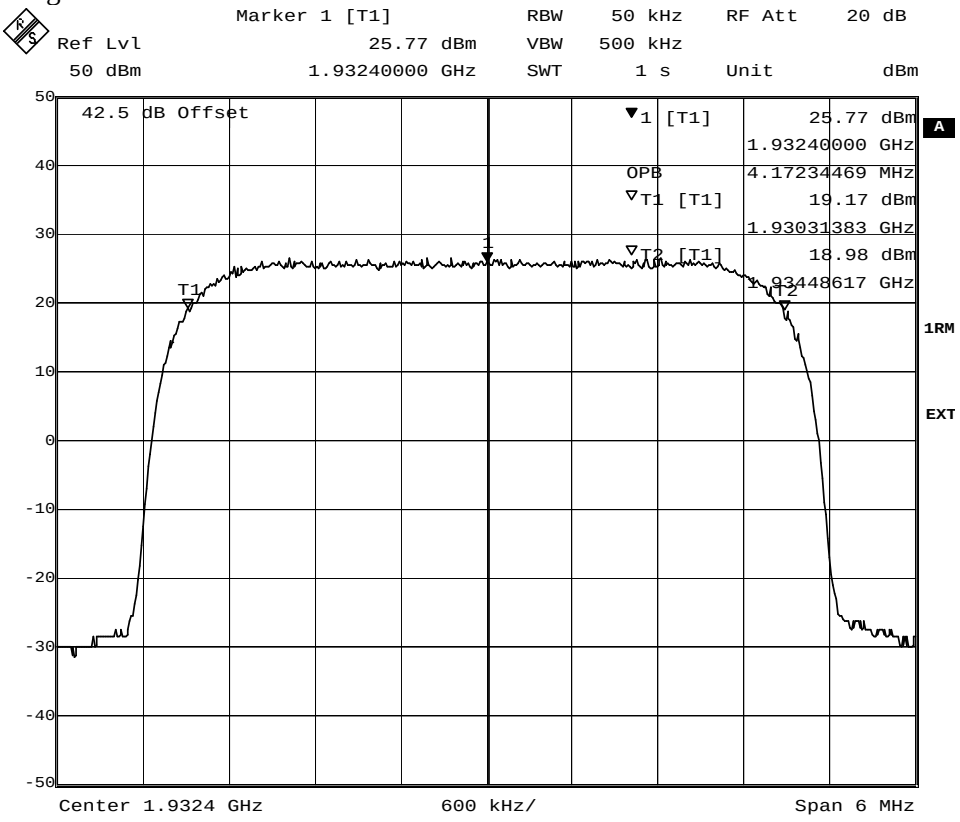

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Diagram 5

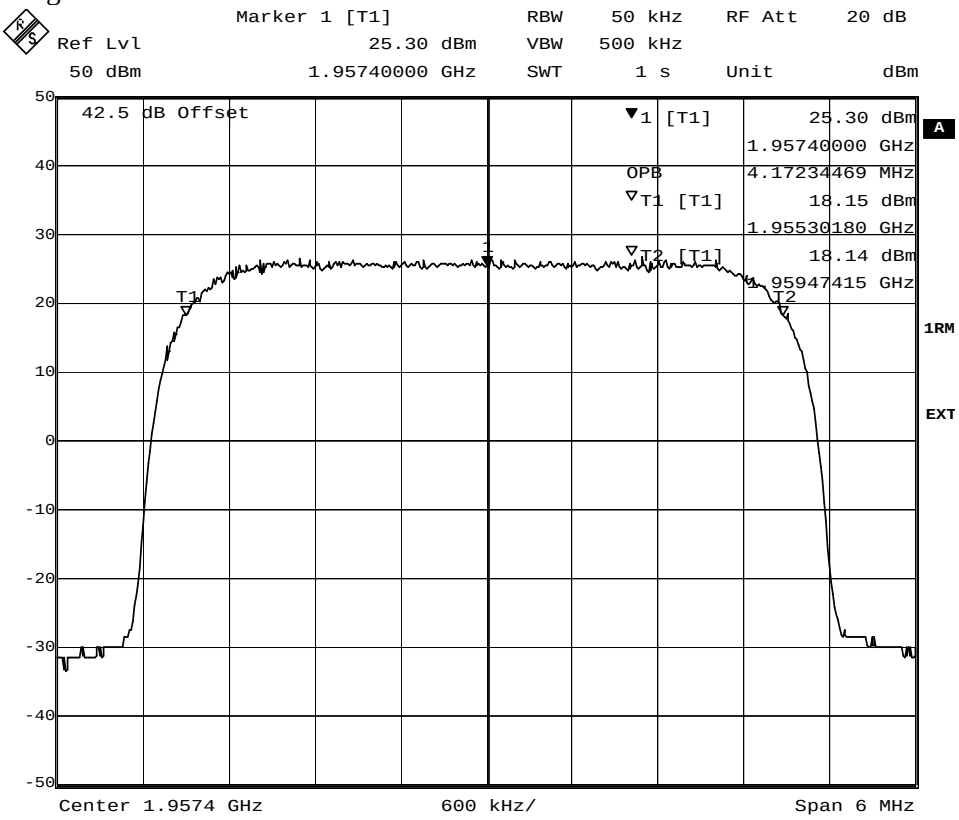

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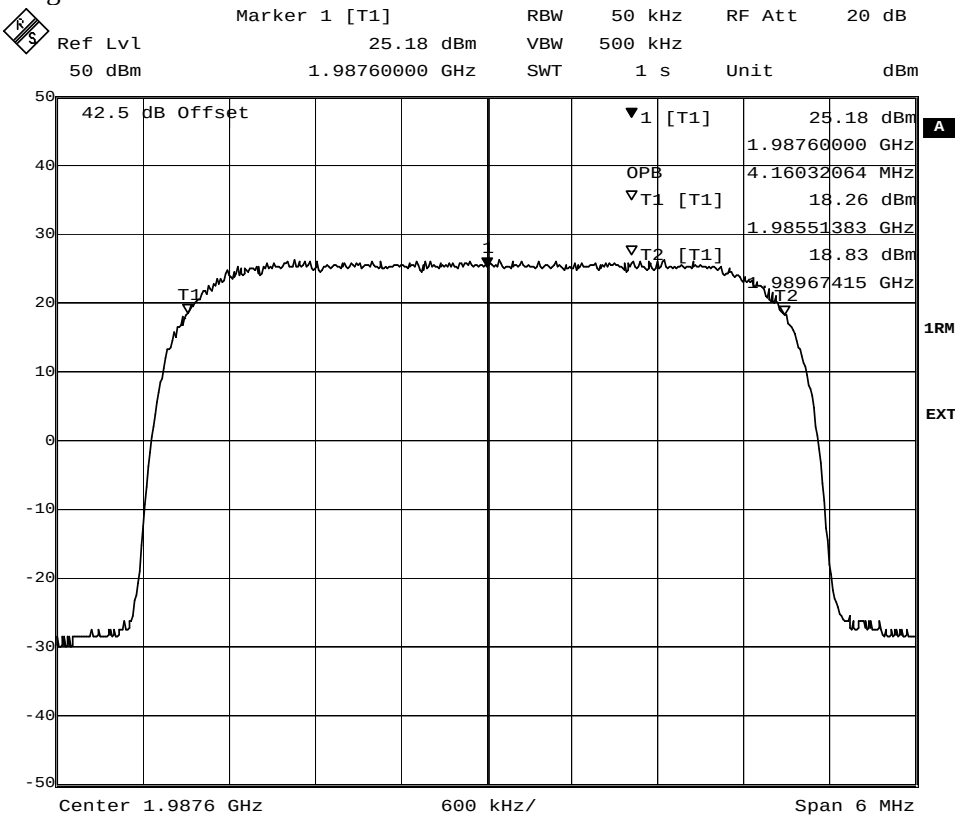
Diagram 6



Date: 19.OCT.2007 15:43:04

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

Date	Temperature	Humidity
2007-10-19	22 °C ± 3 °C	20 % ± 5 %
2007-10-22	23 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. Measurements were performed on the combined TX/RX antenna terminal Ant 1. 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. The transmitter was set up according to Test model 1 and Test model 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Single carrier

QPSK		16QAM	
Diagram 1:	1932.4 MHz	Diagram 3:	1932.4 MHz
Diagram 2:	1987.6 MHz	Diagram 4:	1987.6 MHz

Multi carrier

QPSK		16QAM	
Diagram 5:	1932.4+1942.4 MHz	Diagram 7:	1932.4+1942.4 MHz
Diagram 6:	1977.6+1987.6 MHz	Diagram 8:	1977.6+1987.6 MHz

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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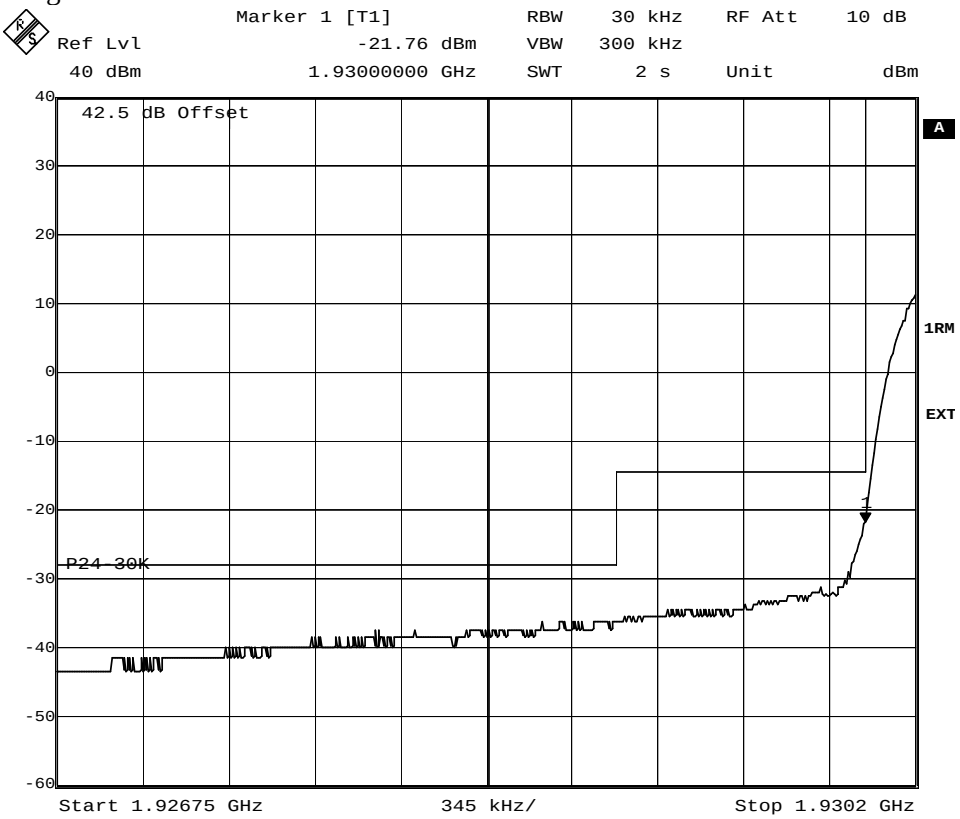
IC: 287AB-AW118192

Diagram 1



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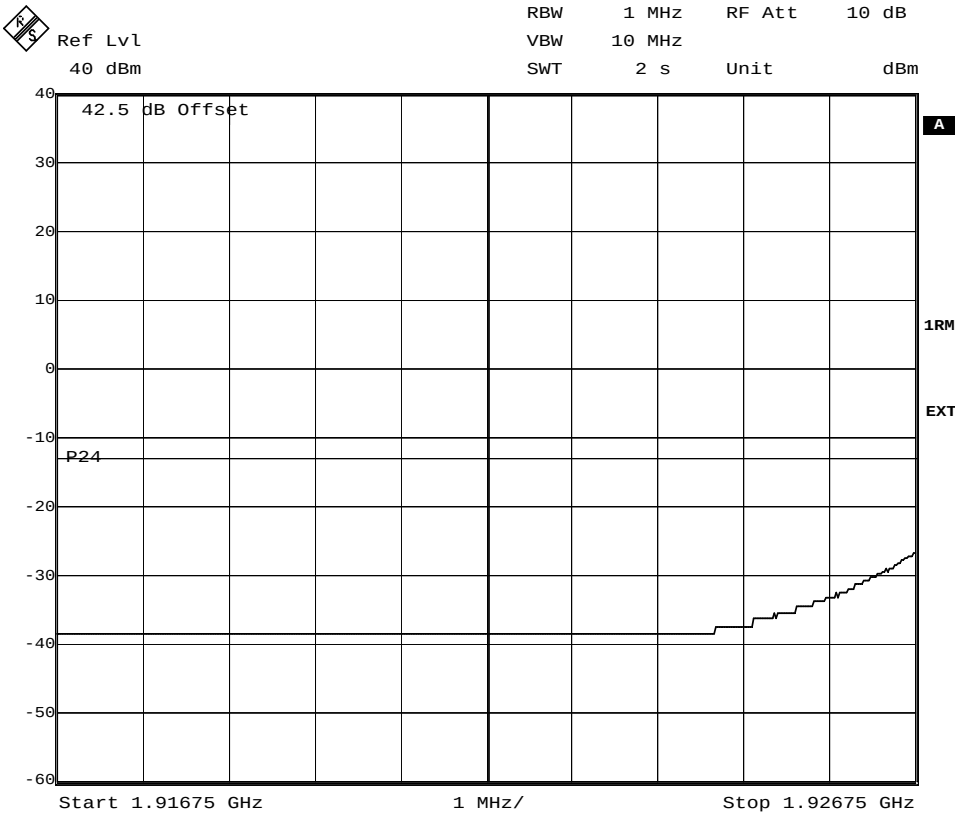

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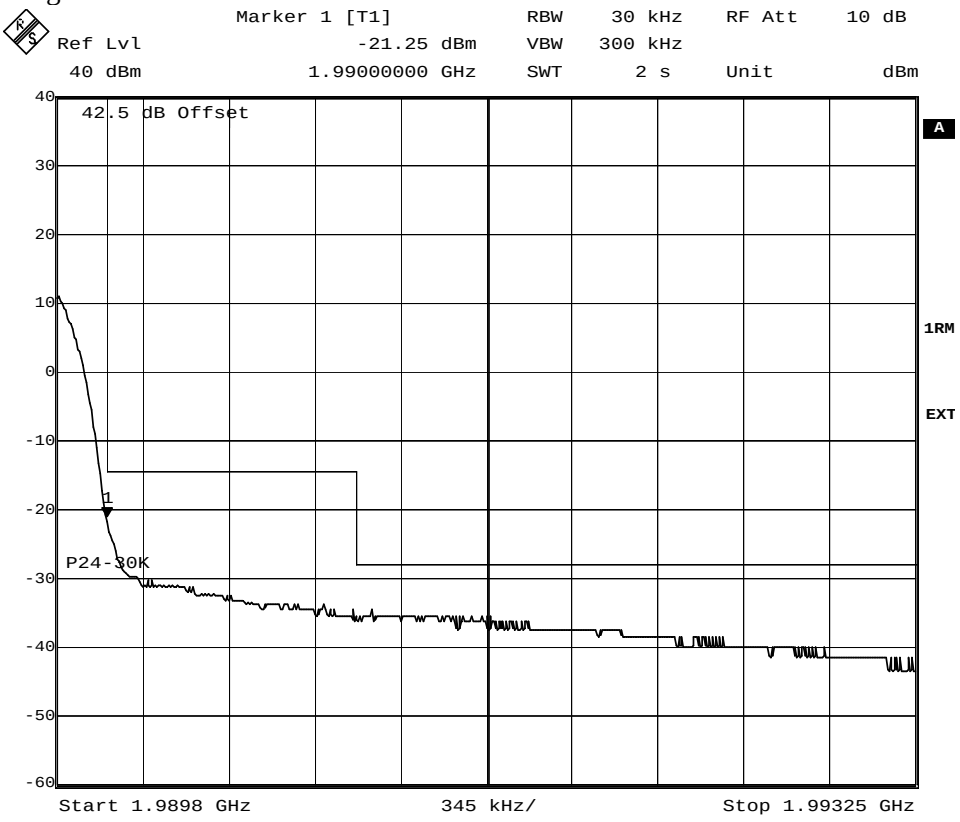
Diagram 2



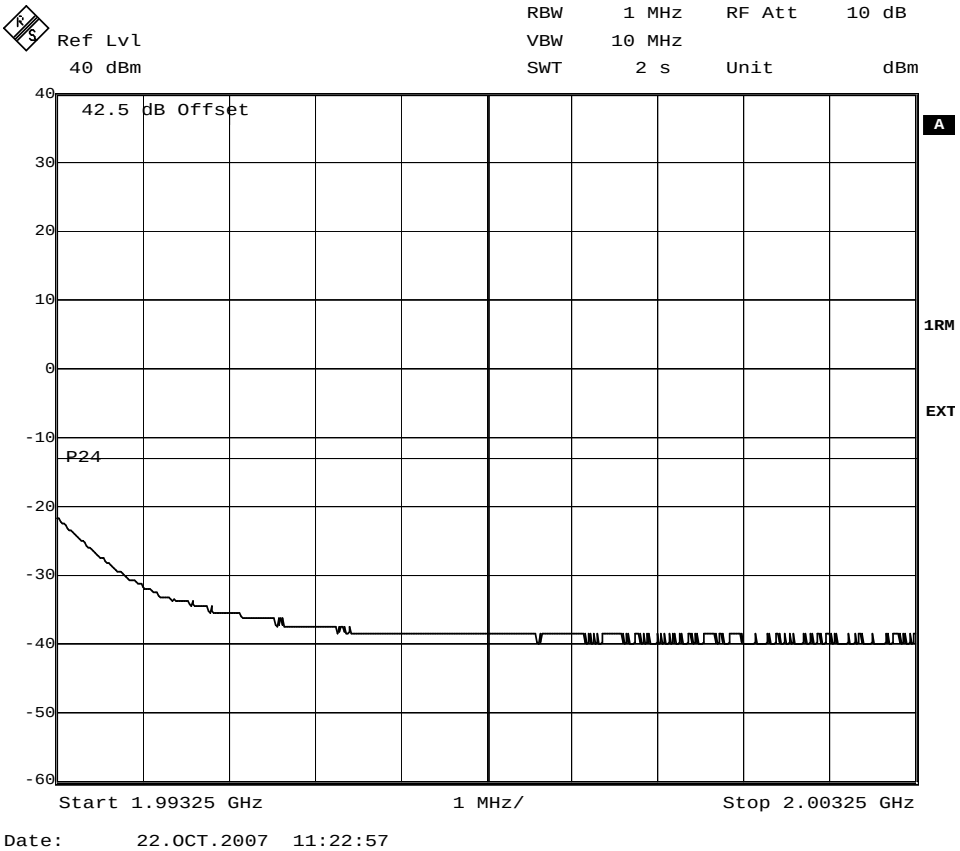


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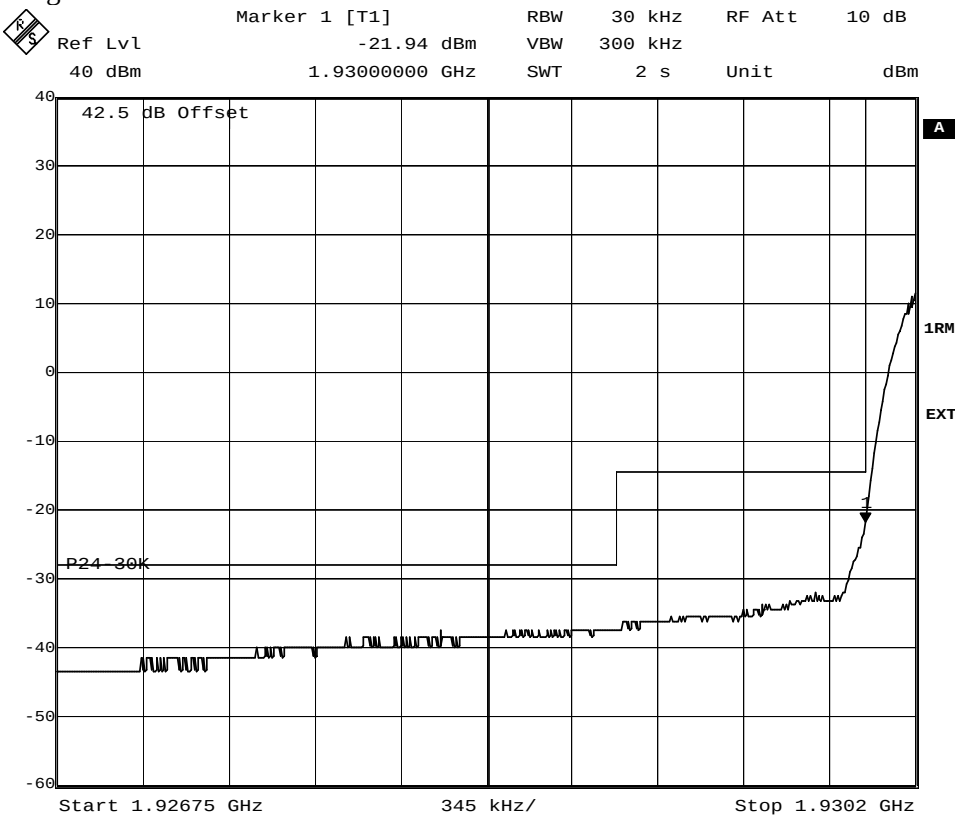
Diagram 3



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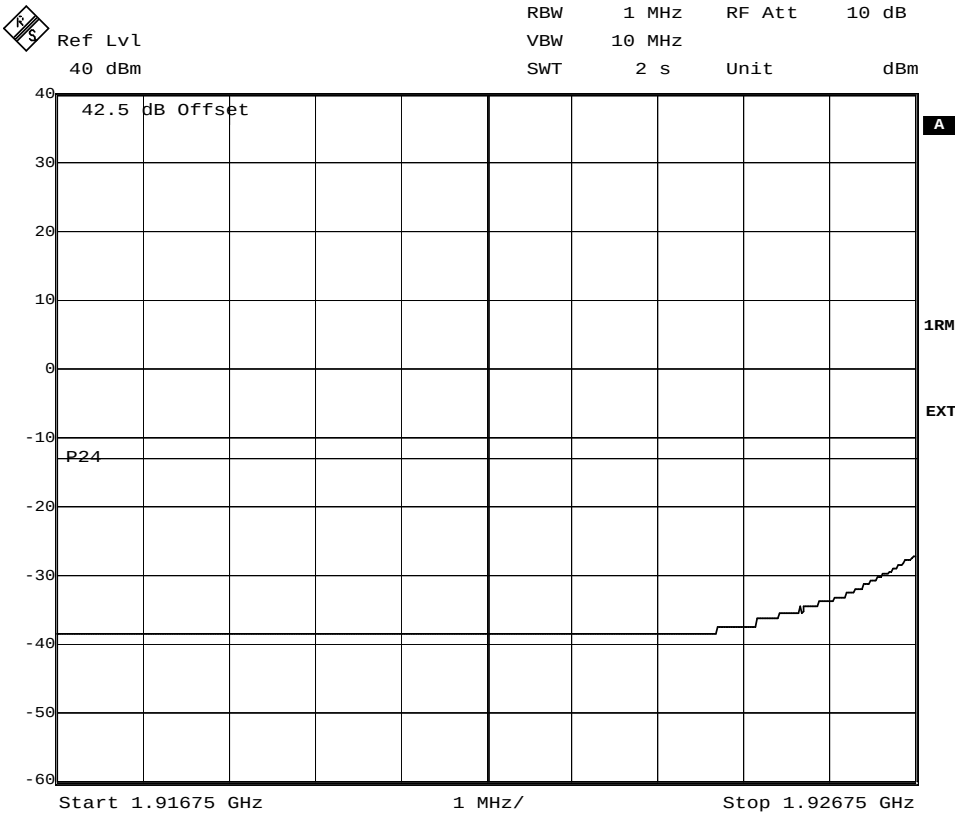

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FCC ID: TA8AKRC11819-2 Appendix 4.1
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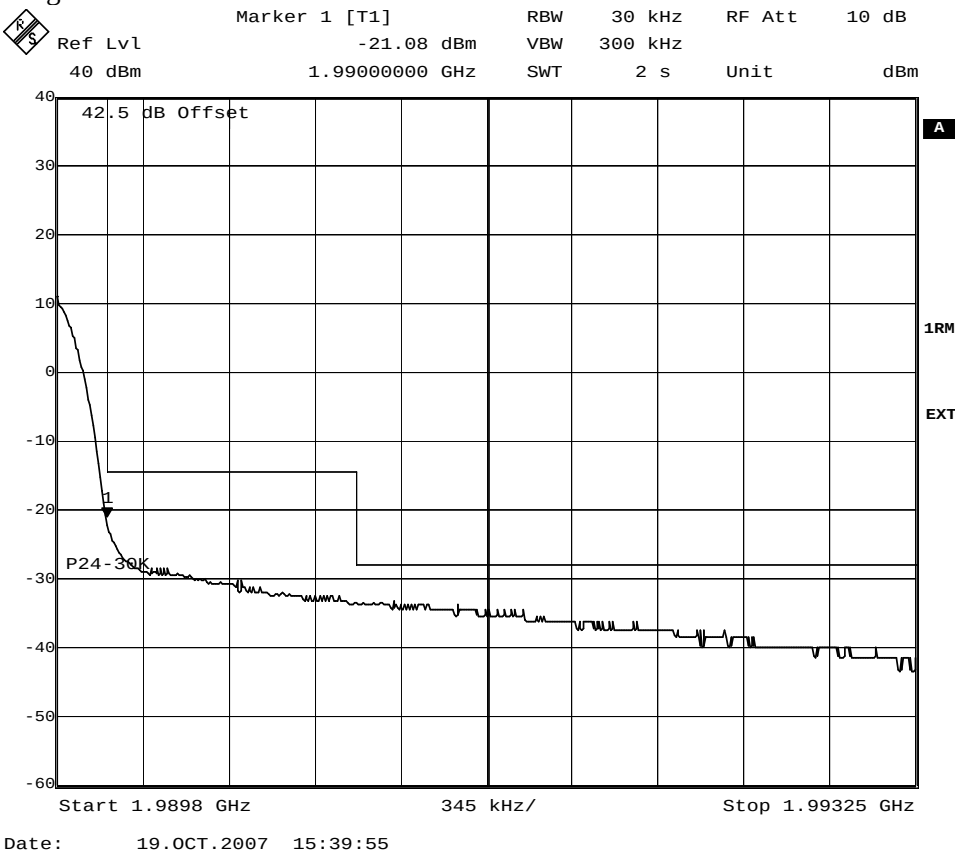
Diagram 4



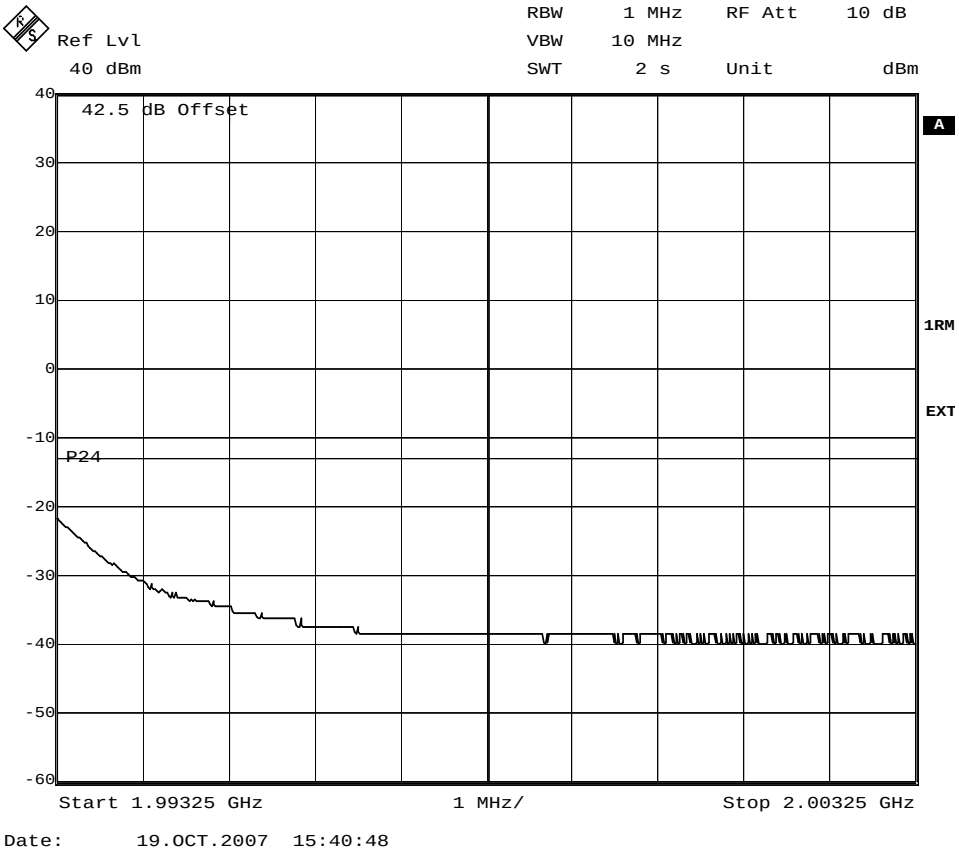


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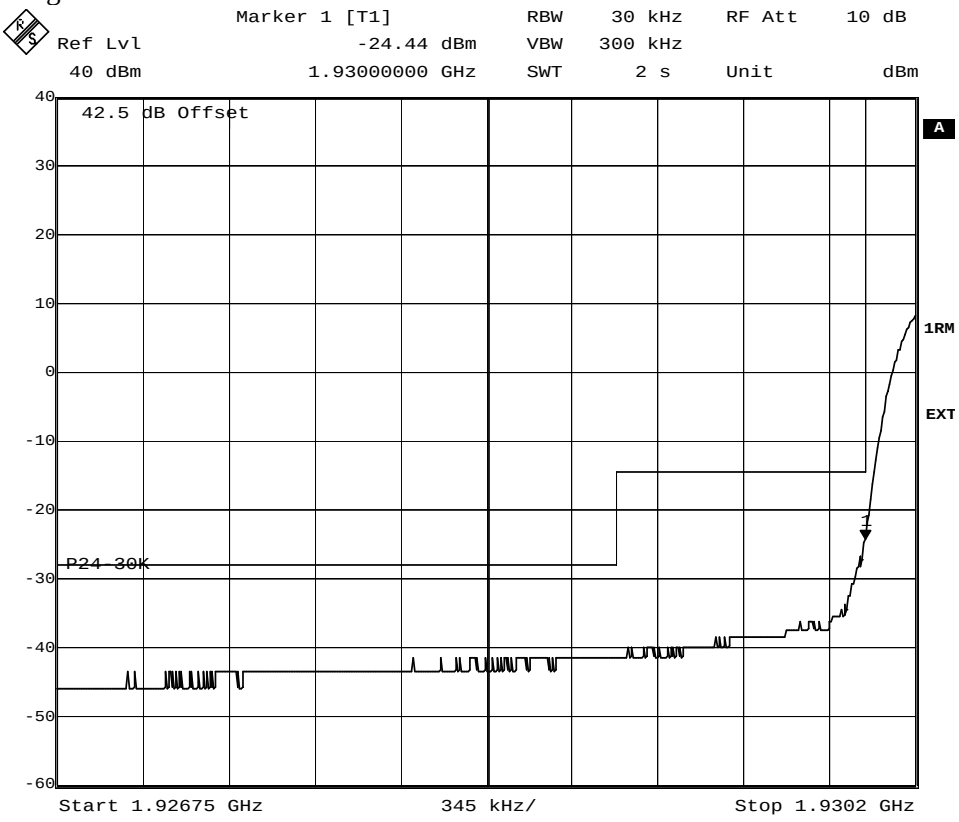
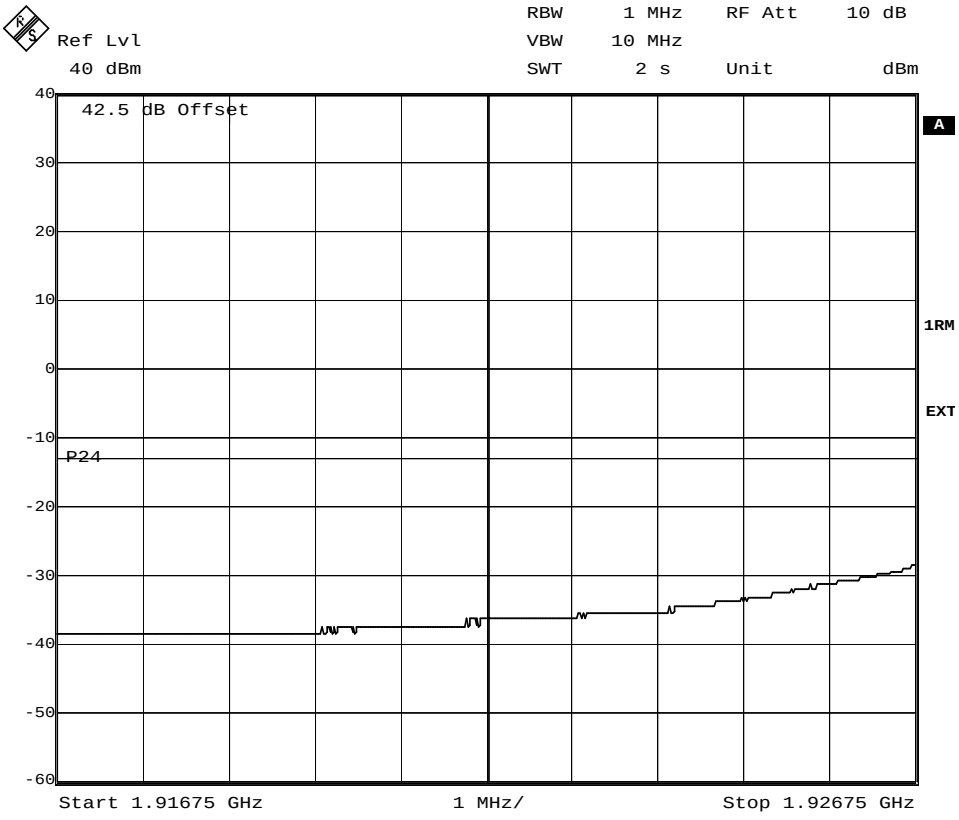
Diagram 5





FCC ID: TA8AKRC11819-2 Appendix 4.1
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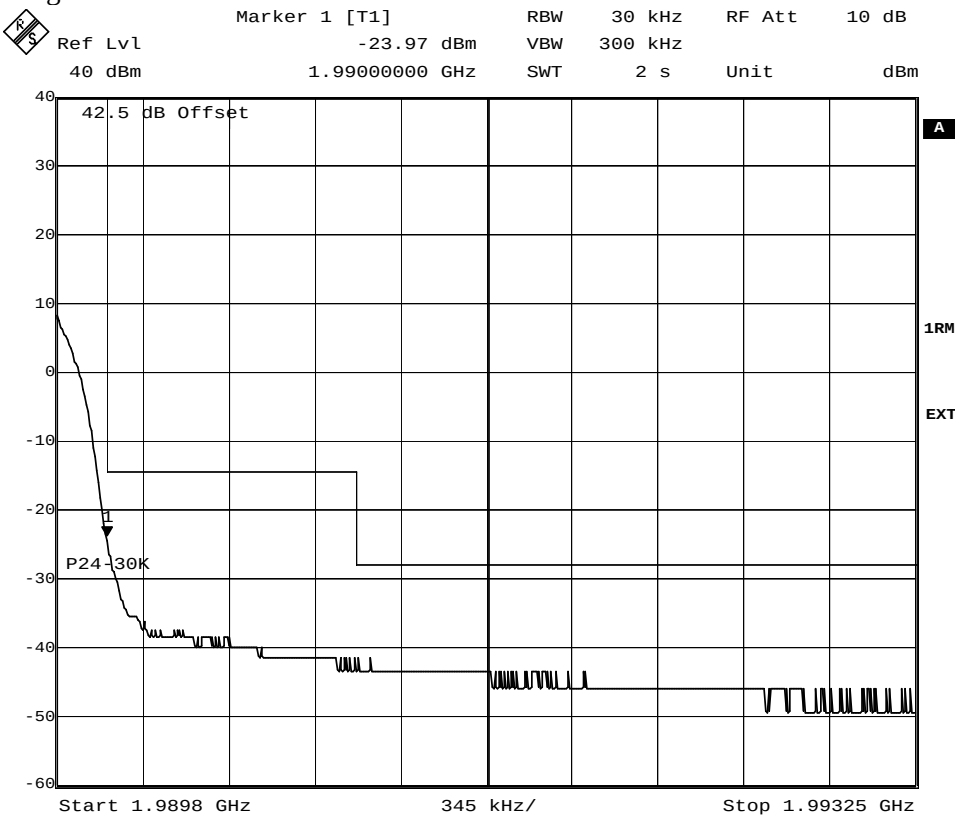
Diagram 6



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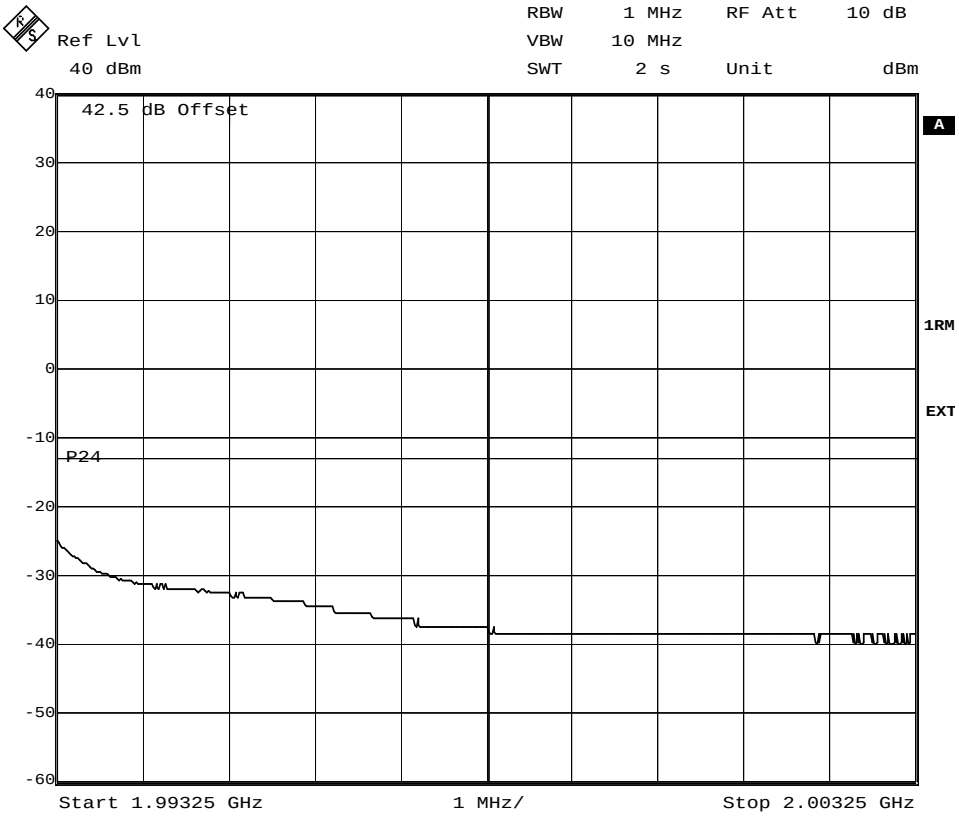

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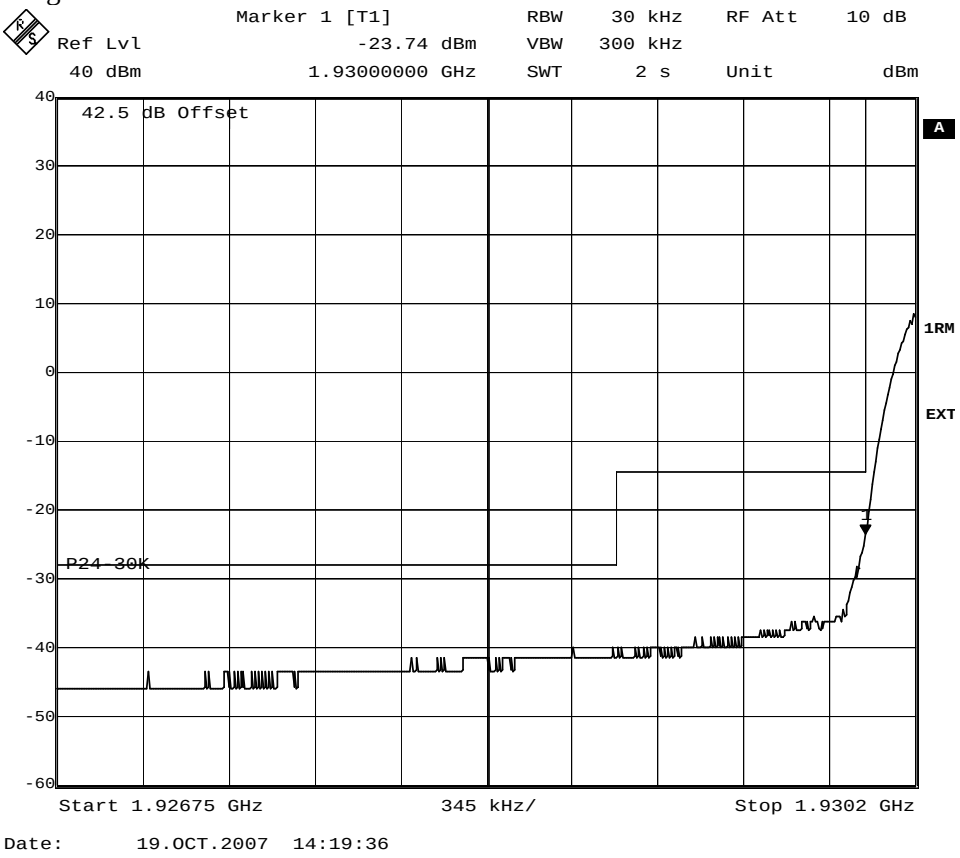
Diagram 7



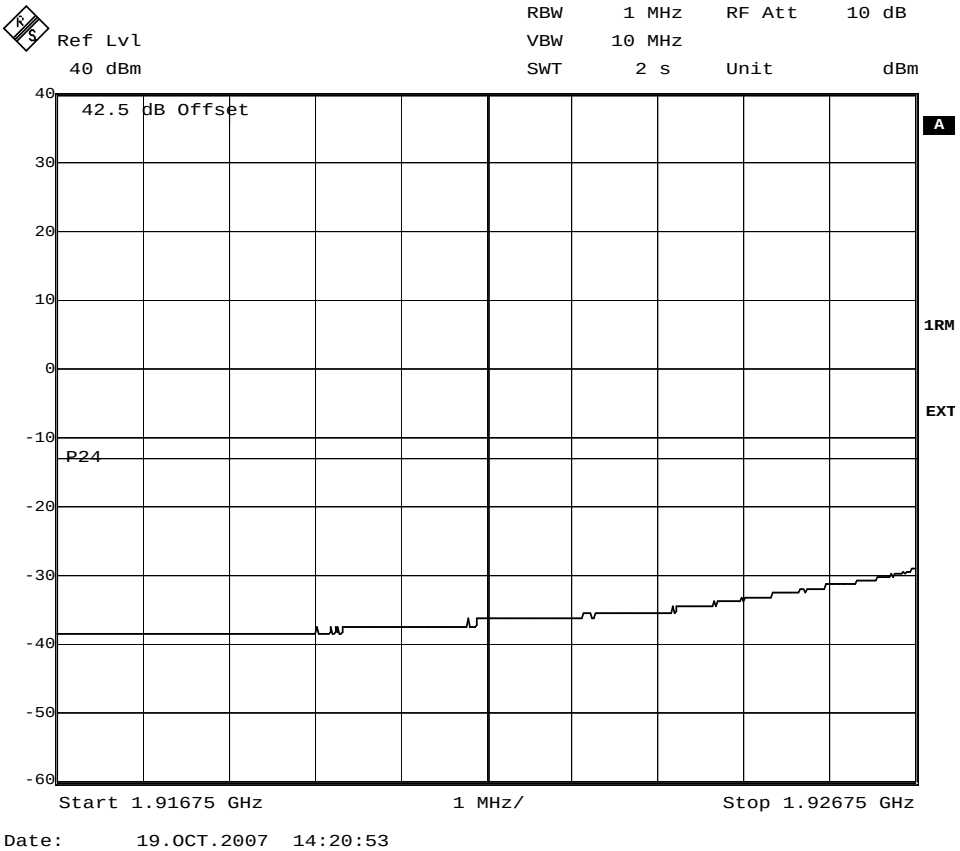


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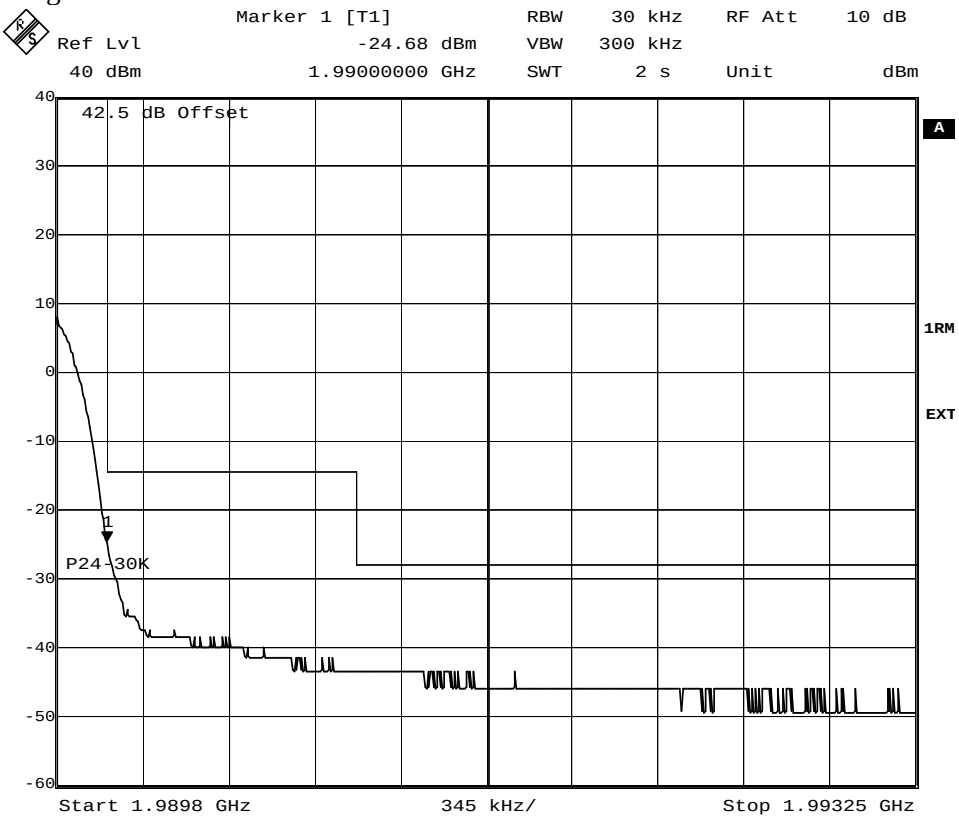
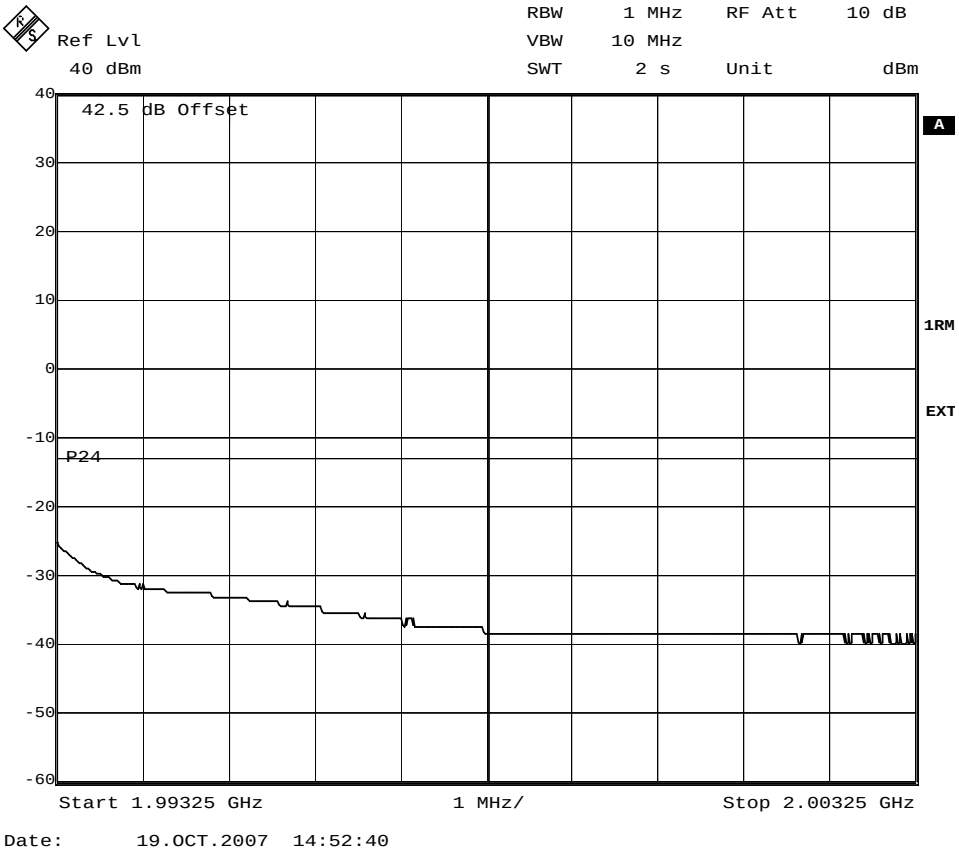
Diagram 8





FCC ID: TA8AKRC11819-2 Appendix 5
IC: 287AB-AW118192

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

Date	Temperature	Humidity
2007-10-19	22 °C ± 3 °C	20 % ± 5 %
2007-10-25	23 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. Measurements were performed on Ant A connector of the FU unit. 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. The transmitter was set up according to Test model 1 and Test model 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	503 738
High pass filter	2008-07	503 739
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier

	QPSK		**16QAM**
Diagram 1:	1932.4 MHz	Diagram 4:	1932.4 MHz
Diagram 2:	1957.4 MHz	Diagram 5:	1957.4 MHz
Diagram 3:	1987.6 MHz	Diagram 6:	1987.6 MHz

Multi carrier

	QPSK		**16QAM**
Diagram 7:	1932.4+1942.4 MHz	Diagram 10:	1932.4+1942.4 MHz
Diagram 8:	1952.4+1962.4 MHz	Diagram 11:	1952.4+1962.4 MHz
Diagram 9:	1977.6+1987.6 MHz	Diagram 12:	1977.6+1987.6 MHz

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 feedthrough.

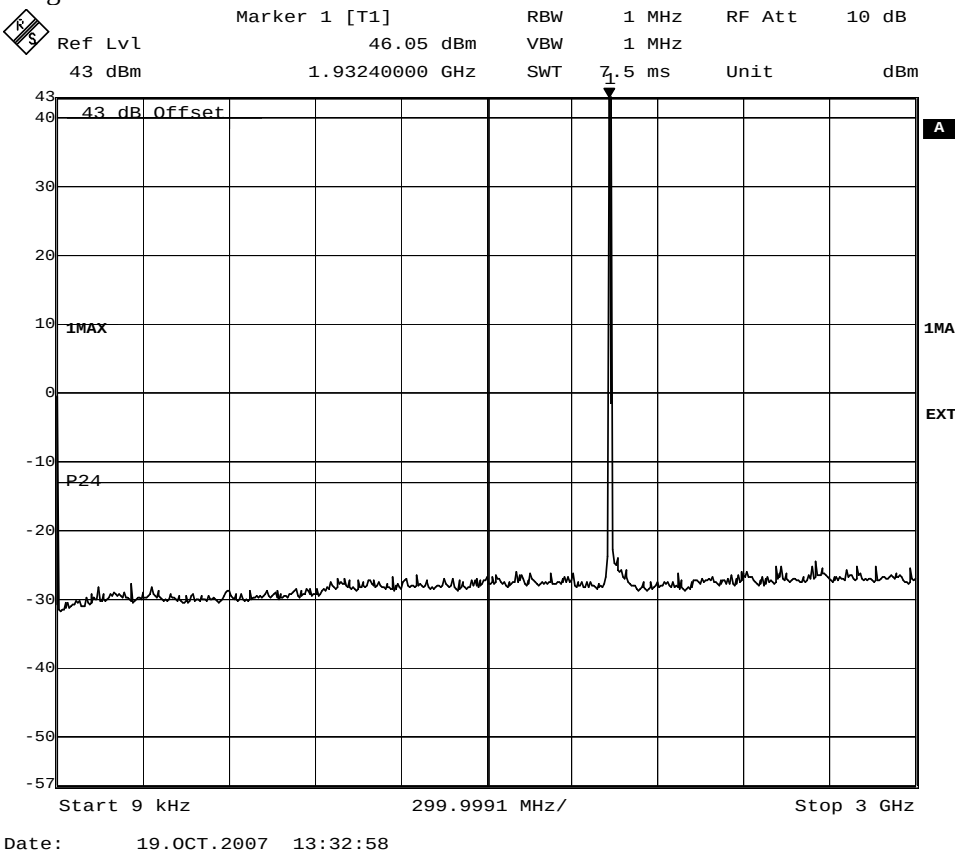
Limits

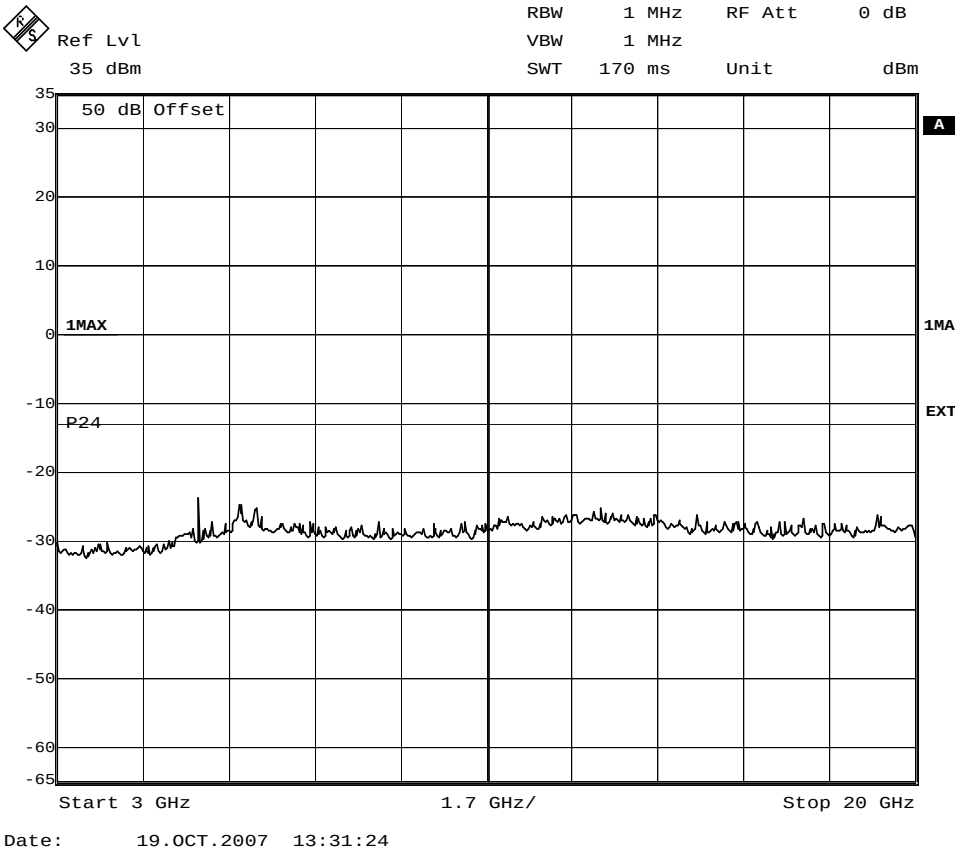
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

Complies?	Yes

FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

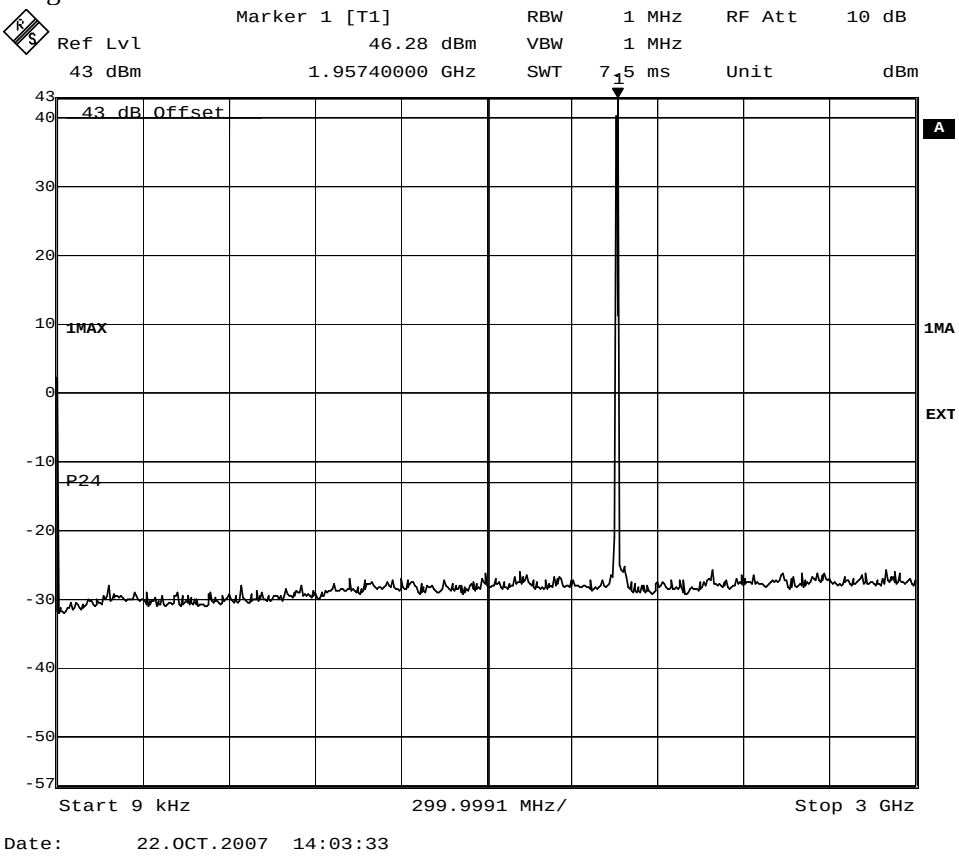
Diagram 1





FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 2



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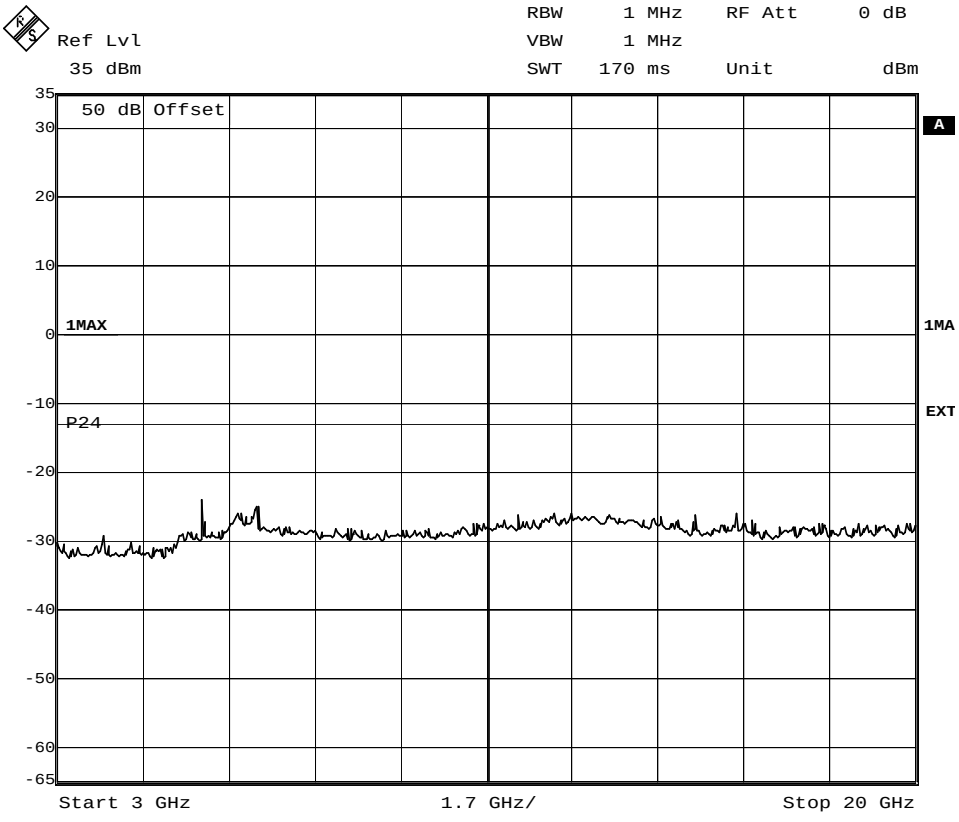

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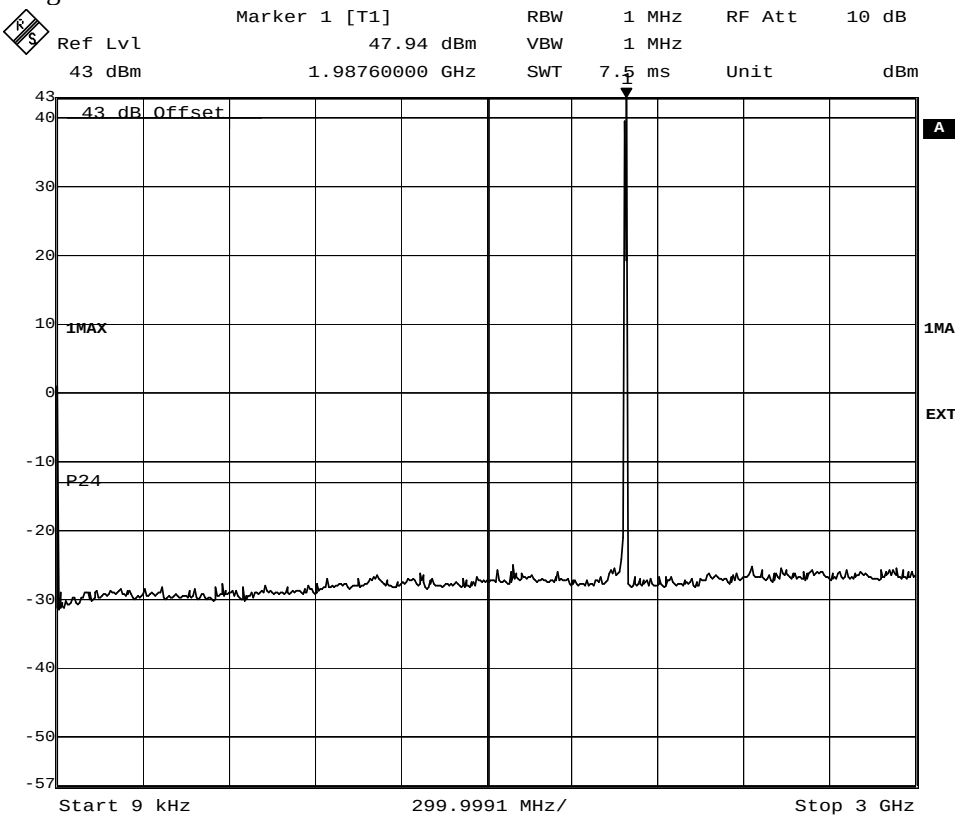
FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 3



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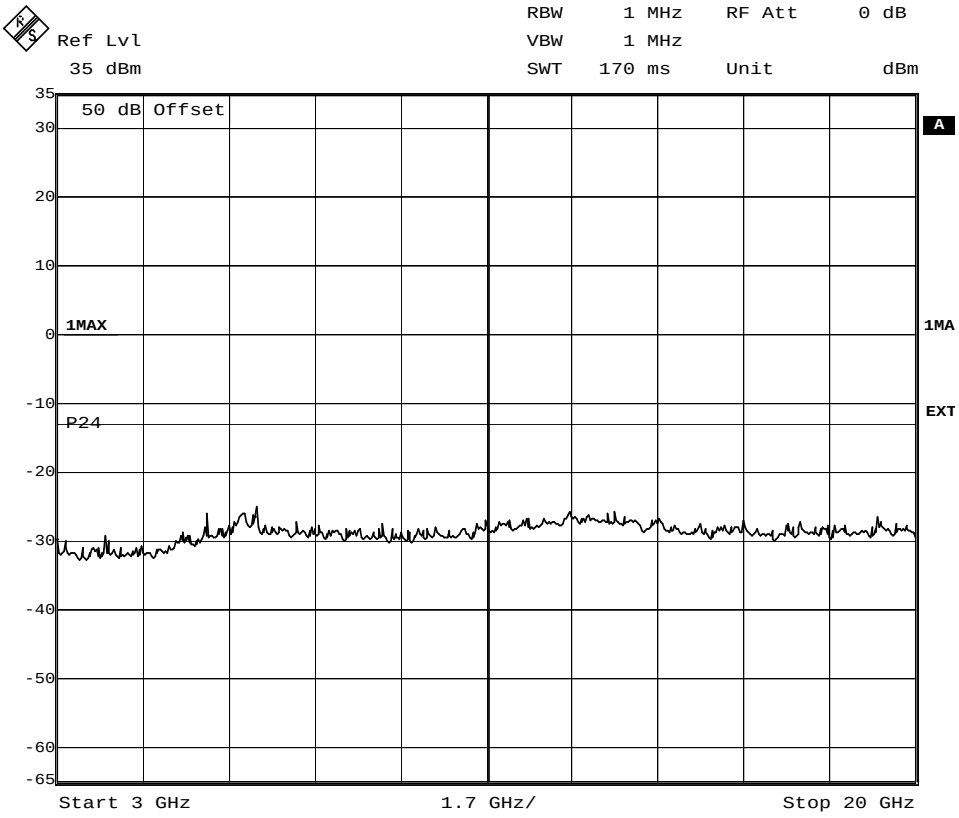

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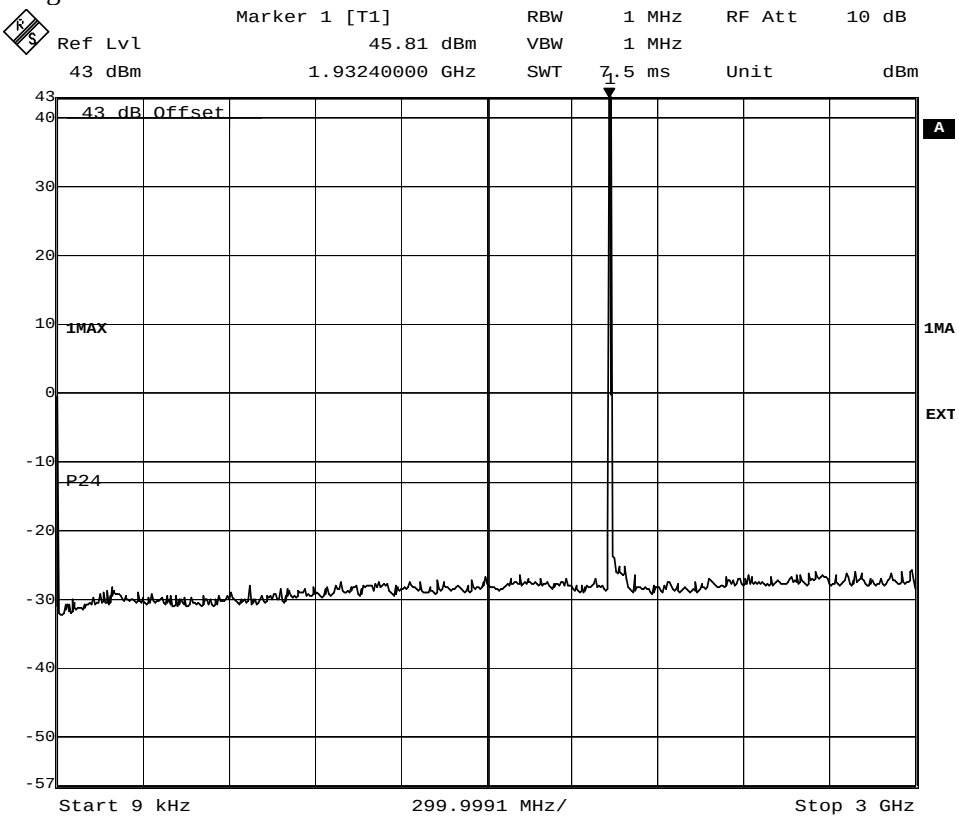
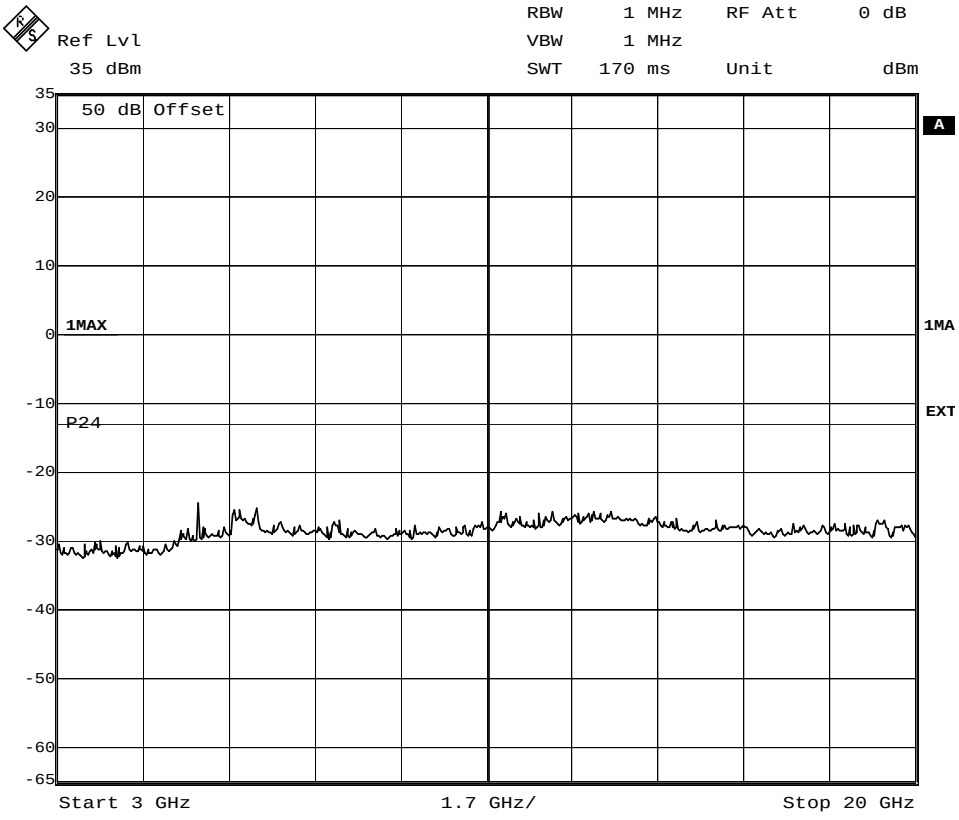
FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

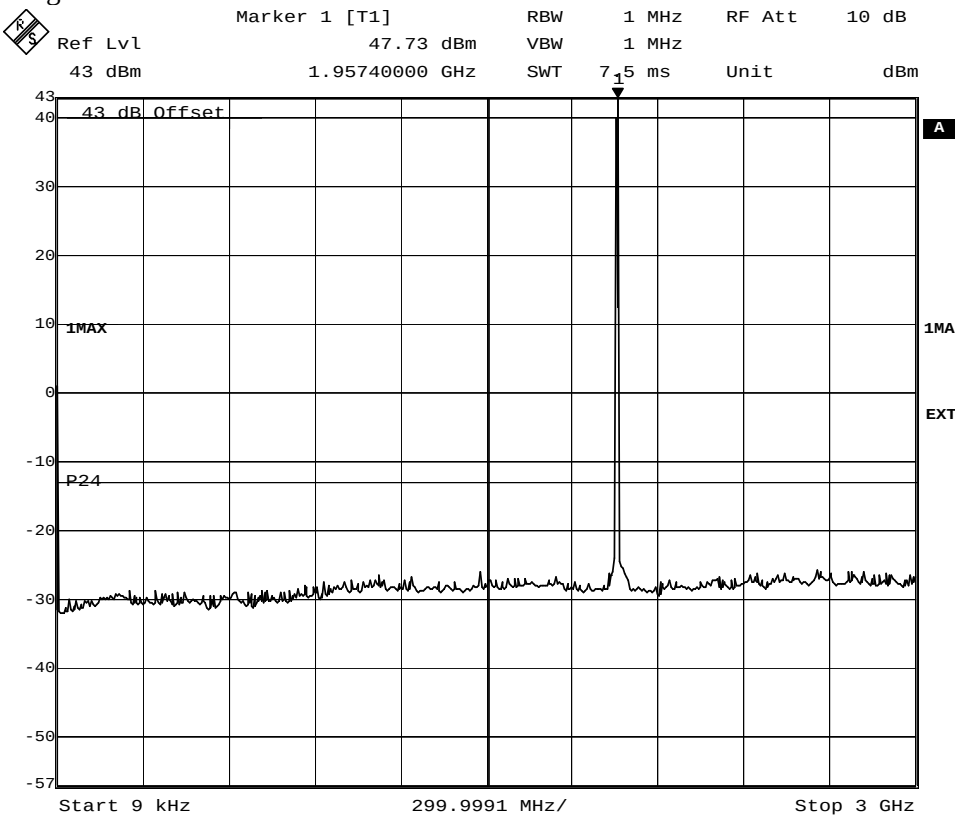
Diagram 4





FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 5



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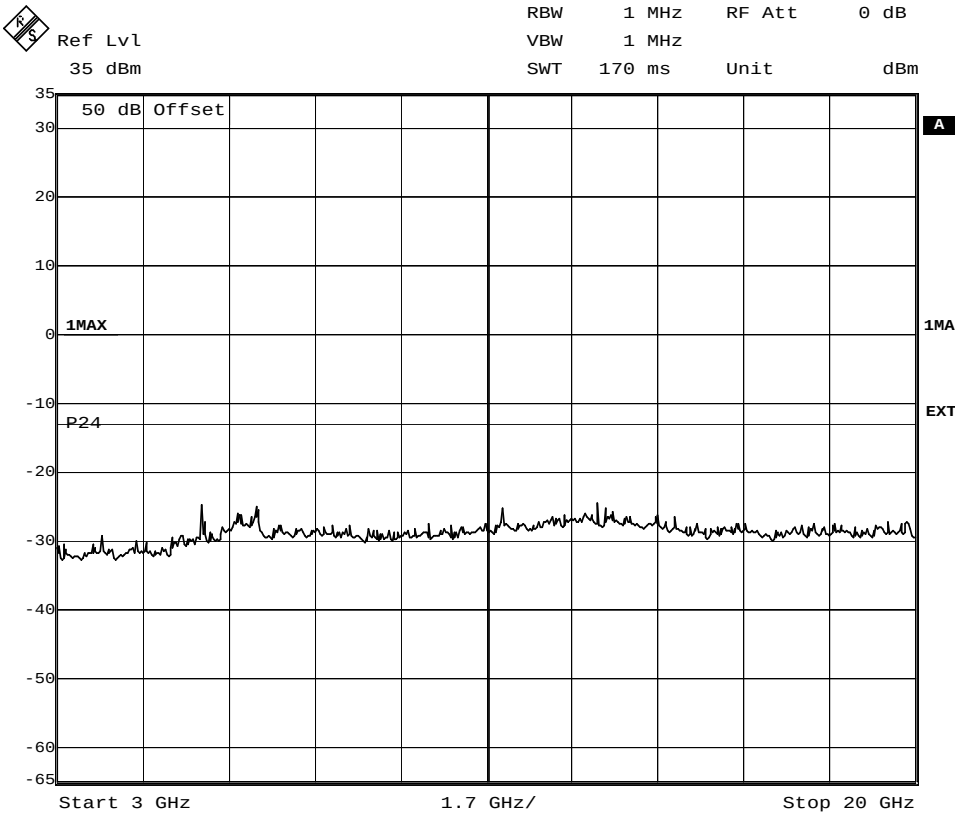

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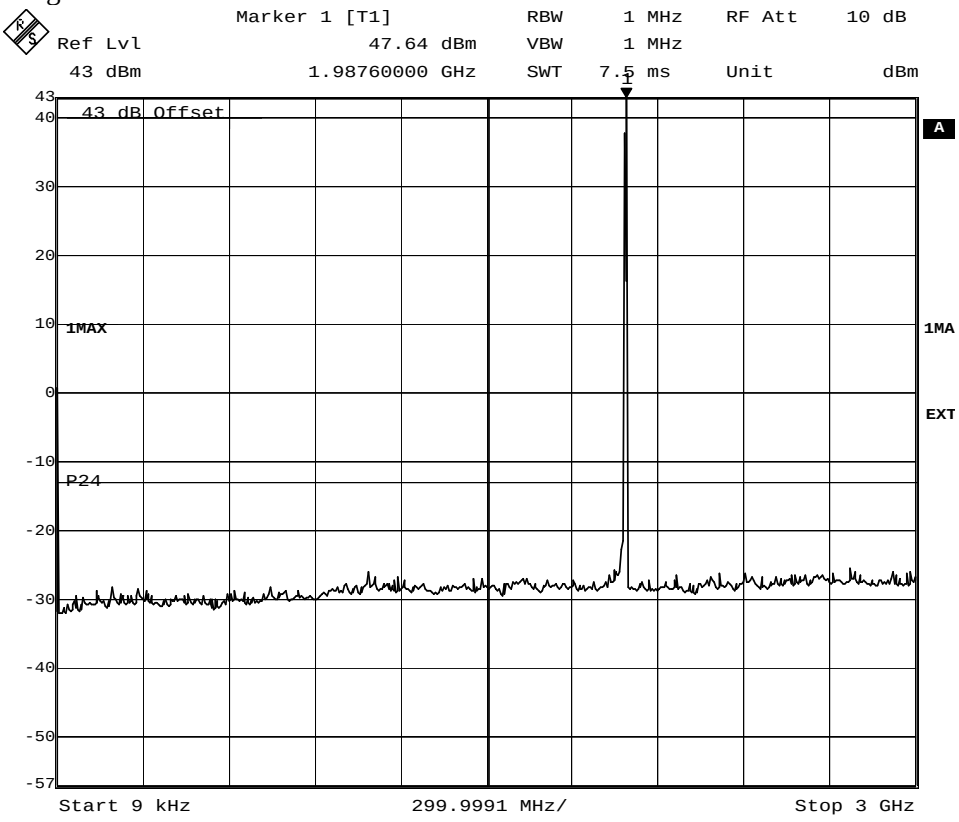
FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 6



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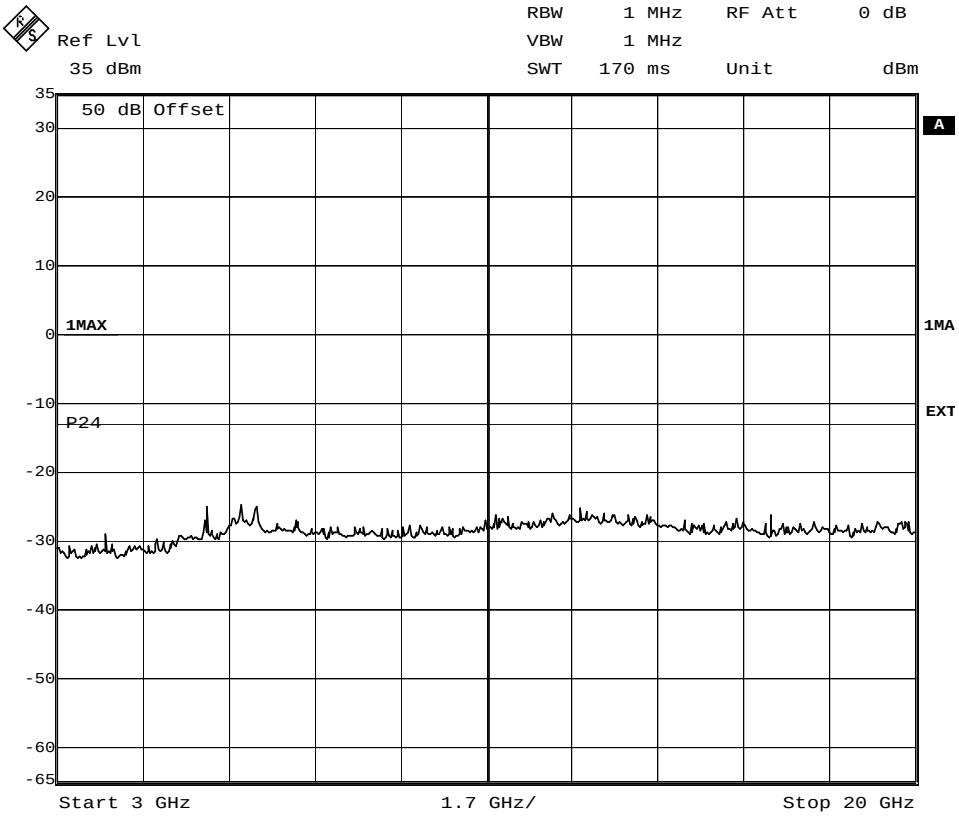
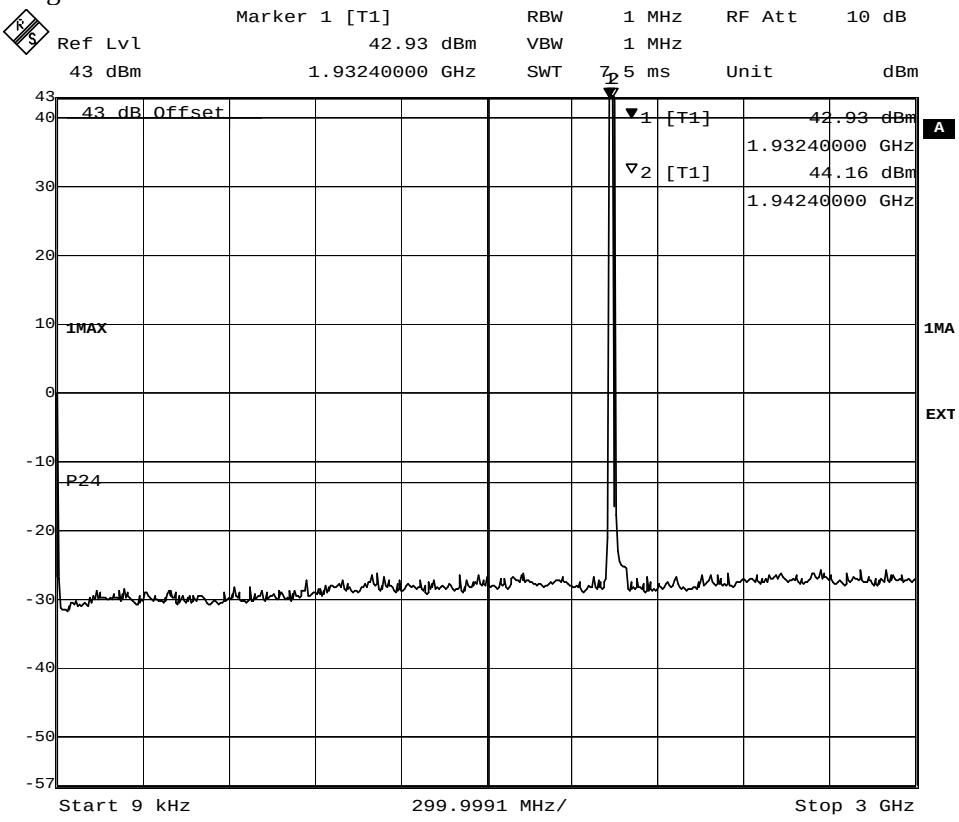
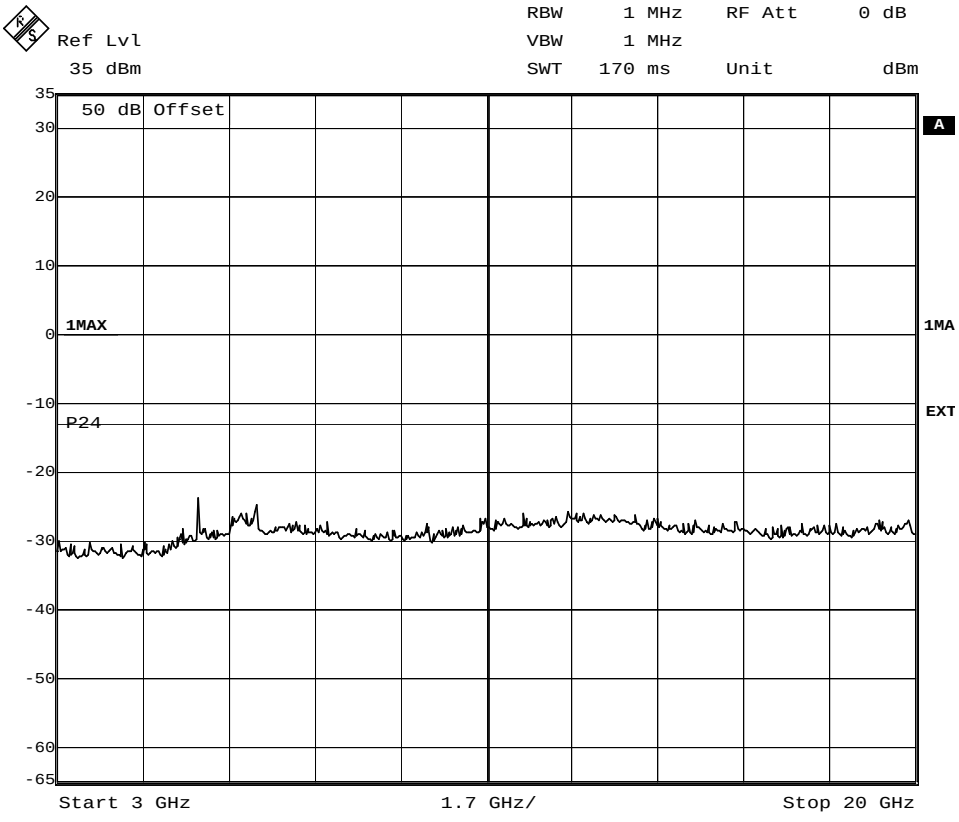


Date: 19.OCT.2007 15:48:26

FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

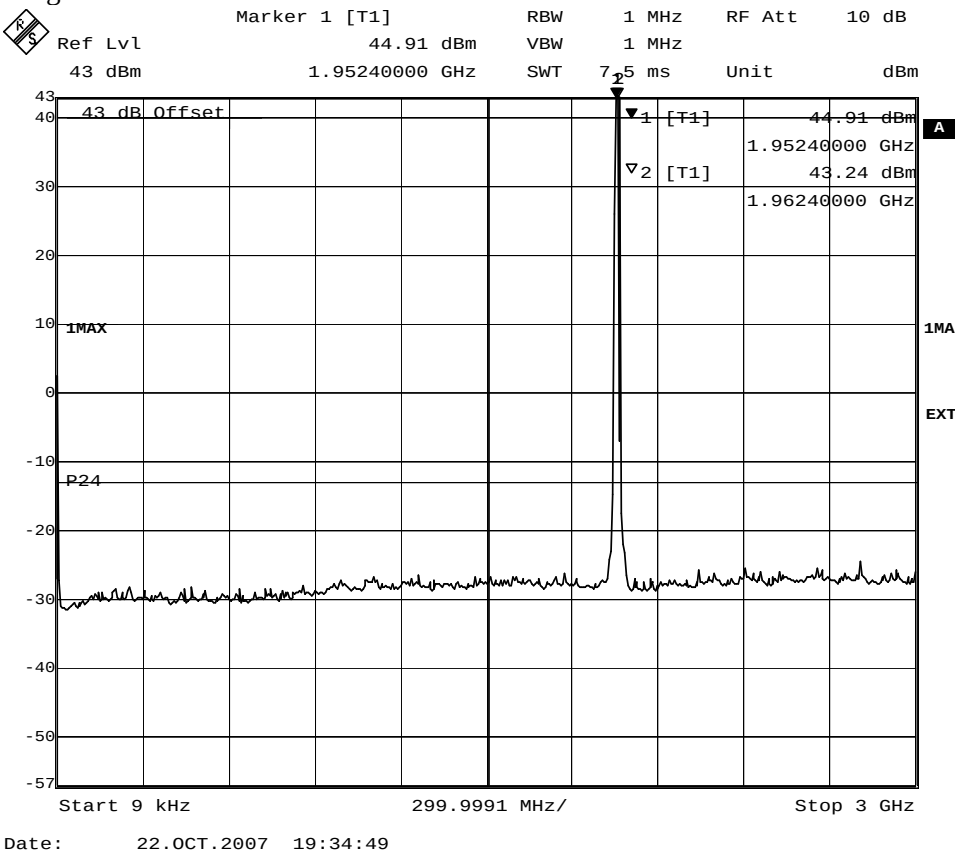
Diagram 7

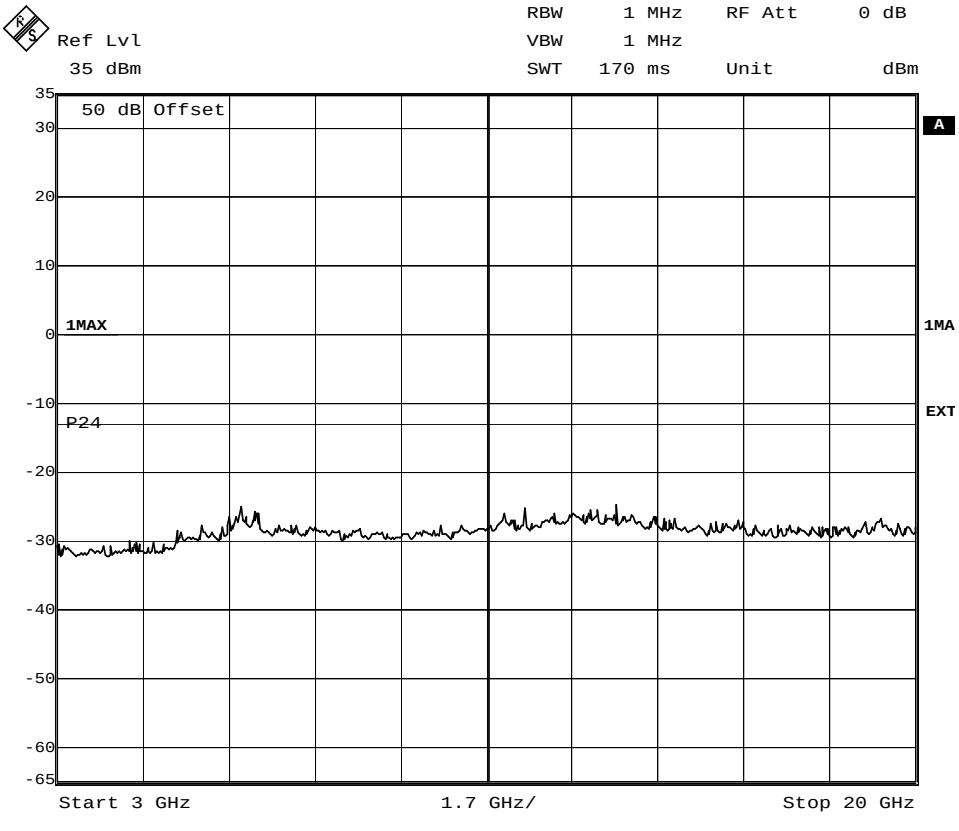




FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

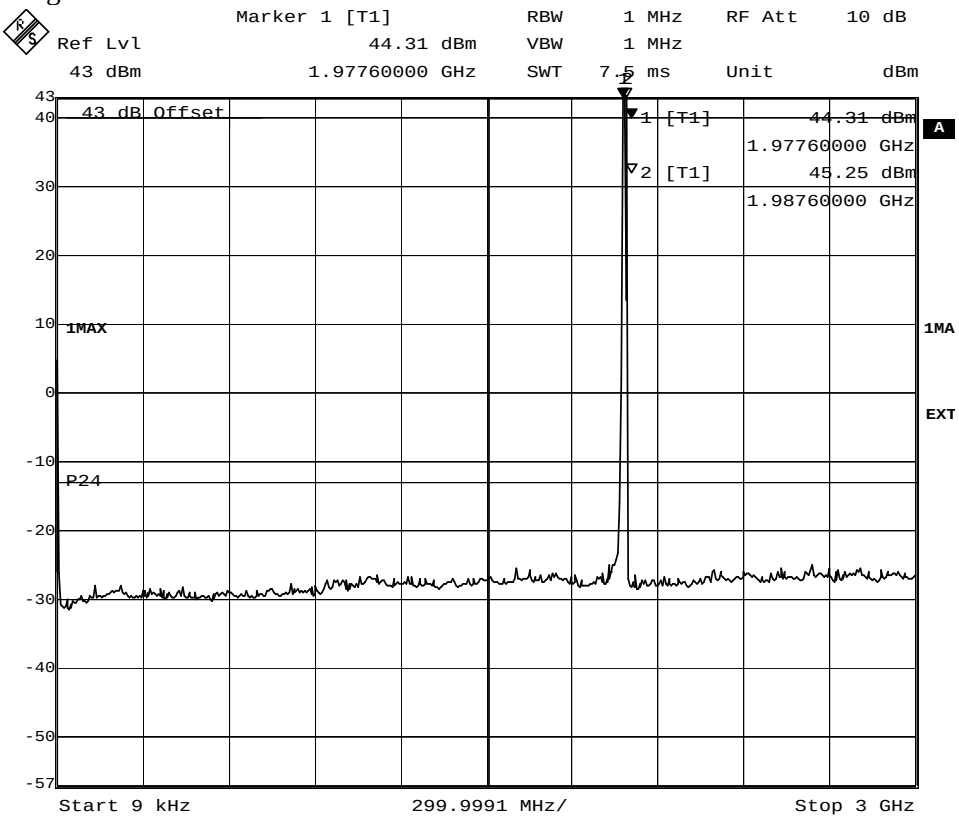
Diagram 8





FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 9



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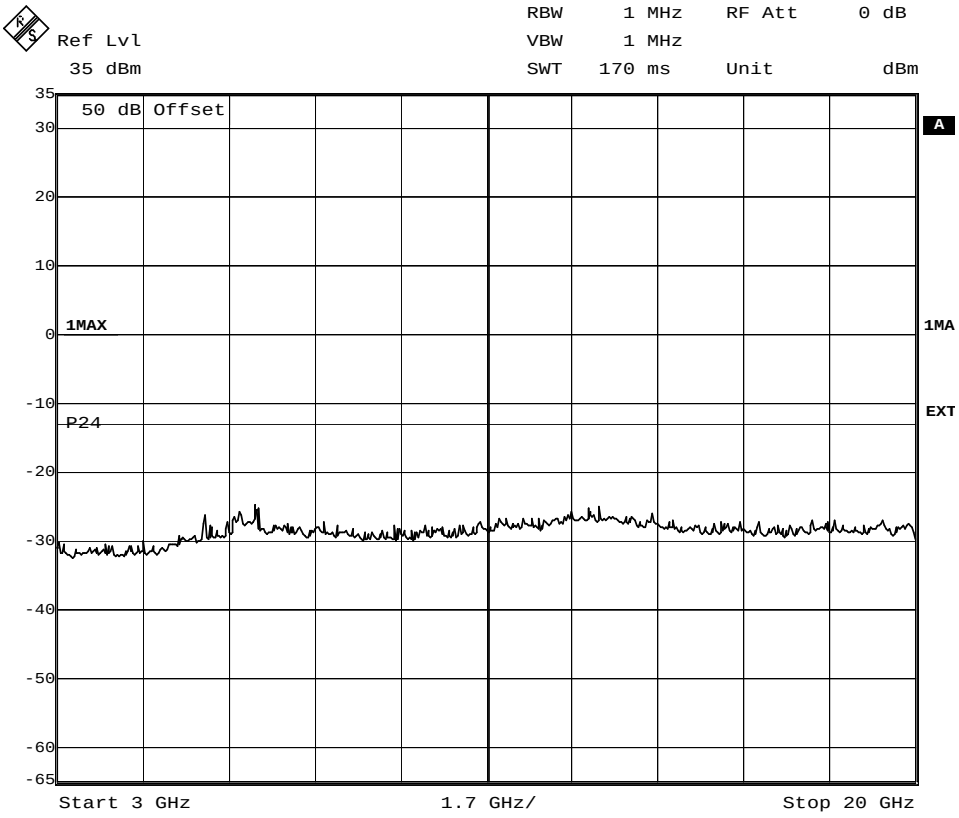
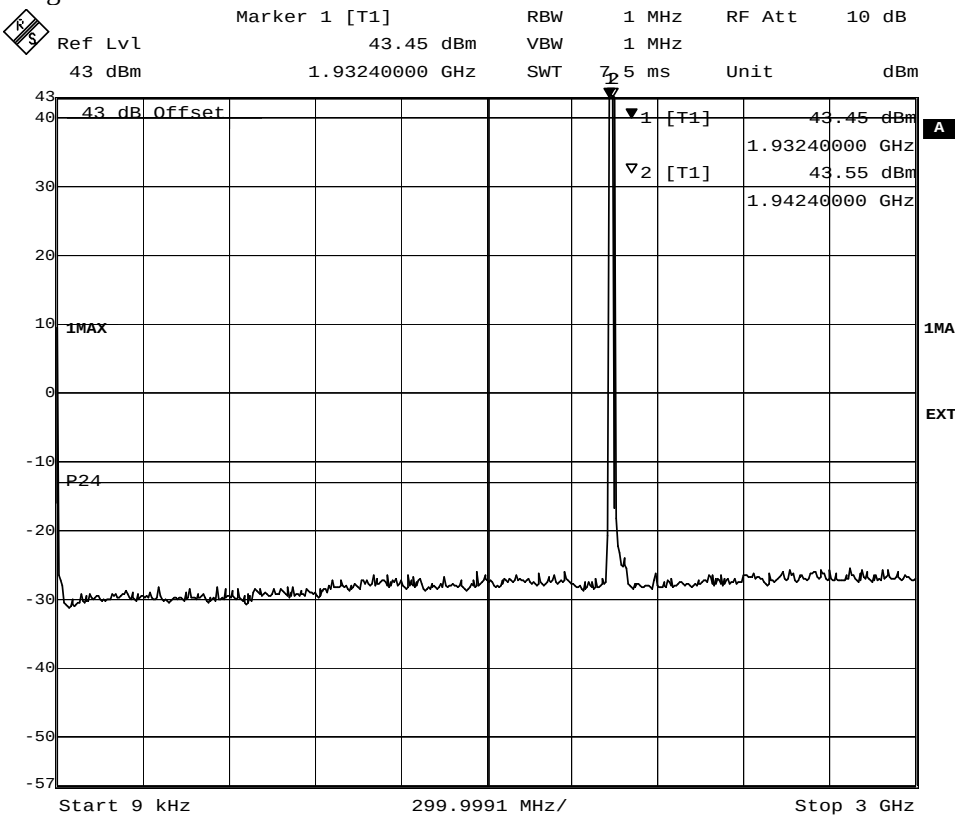
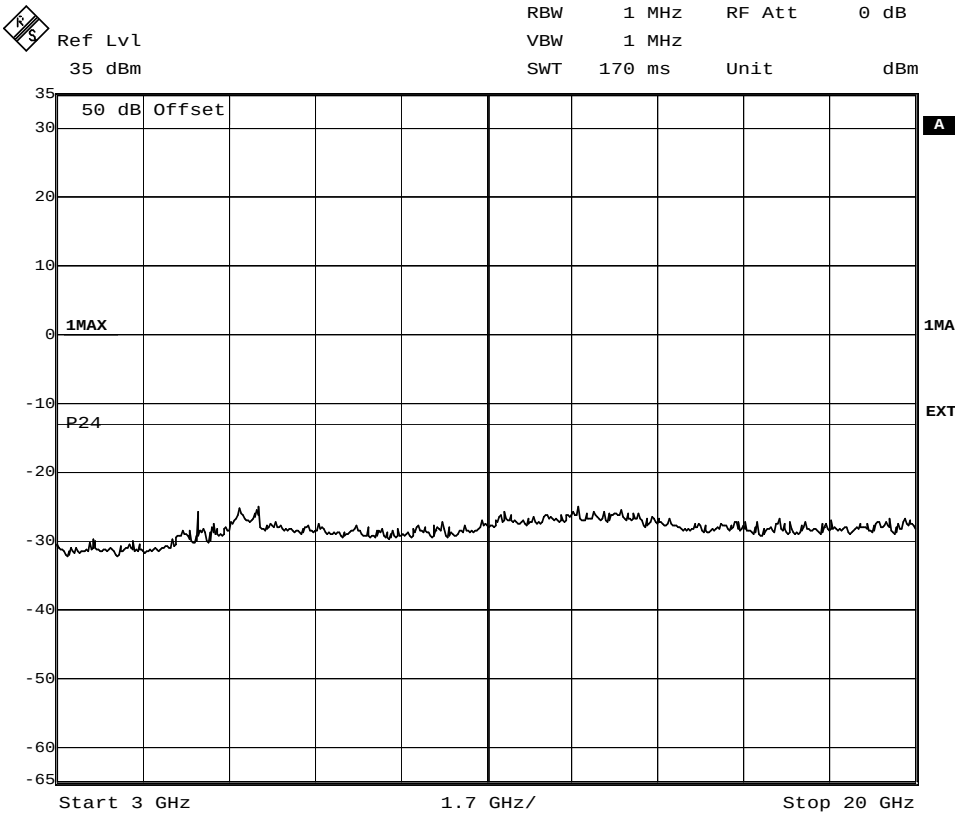


Date: 19.OCT.2007 15:17:49

FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

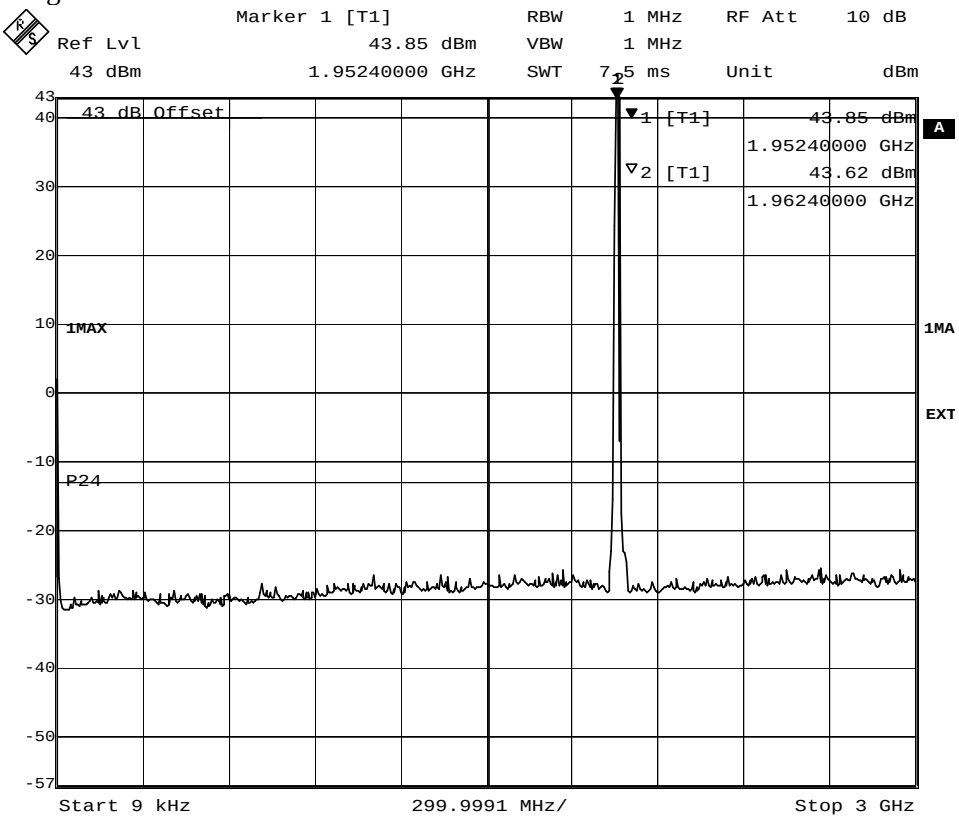
Diagram 10

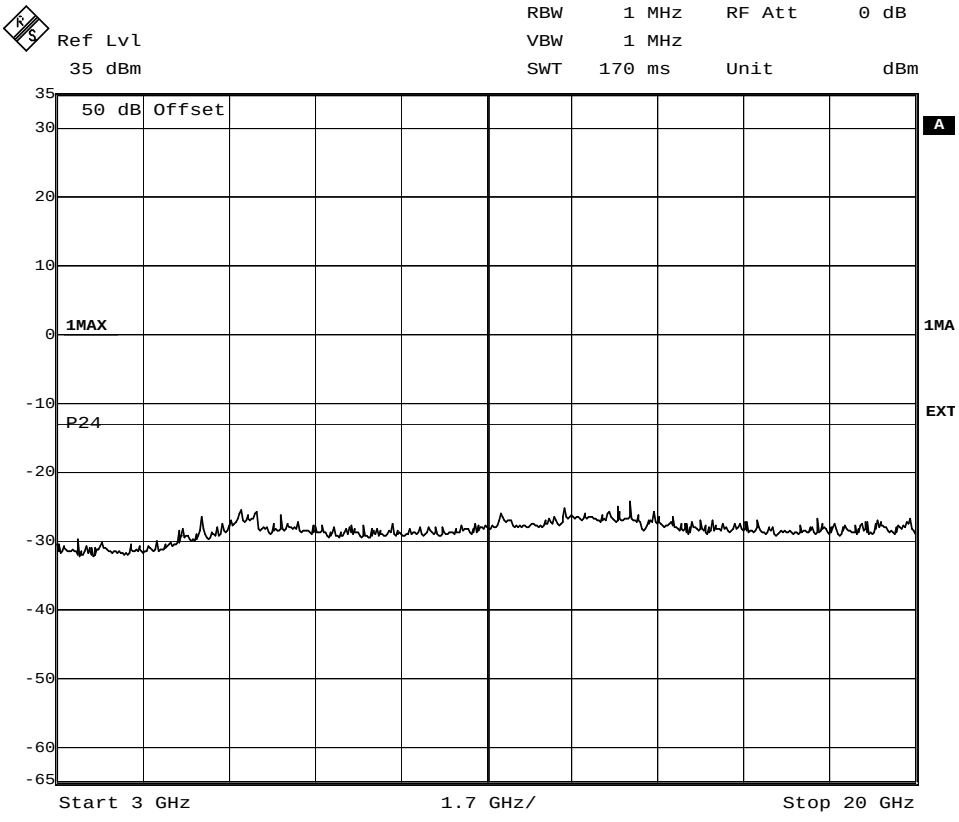




FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

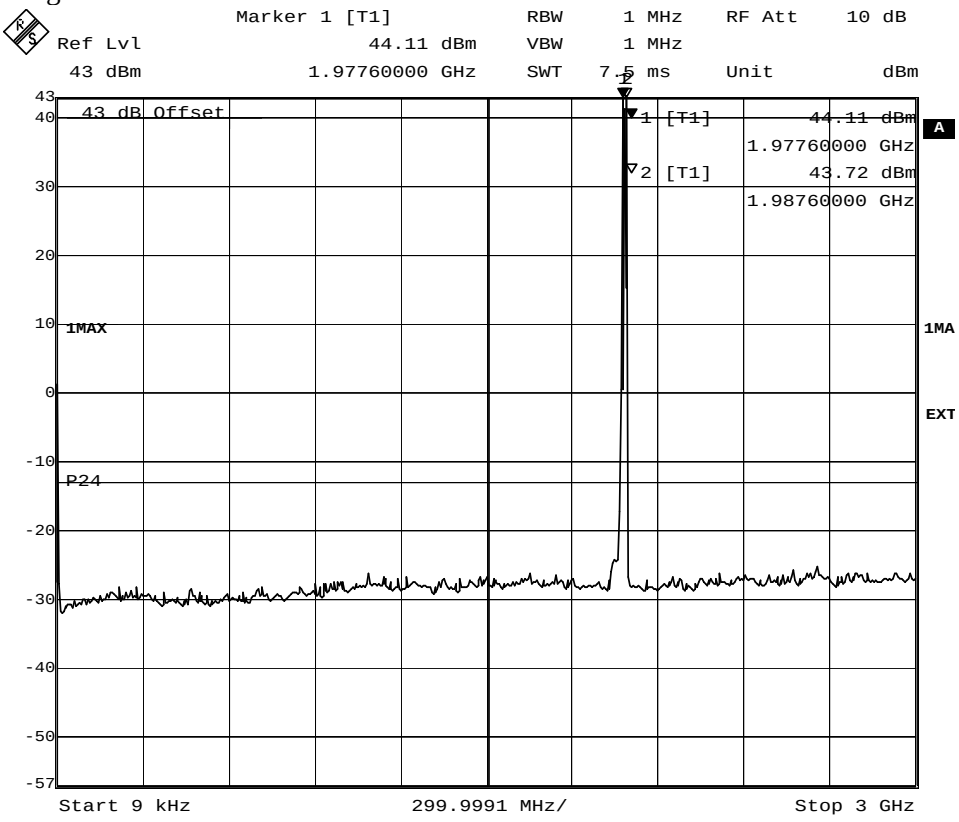
Diagram 11





FCC ID: TA8AKRC11819-2 Appendix 5.1
IC: 287AB-AW118192

Diagram 12



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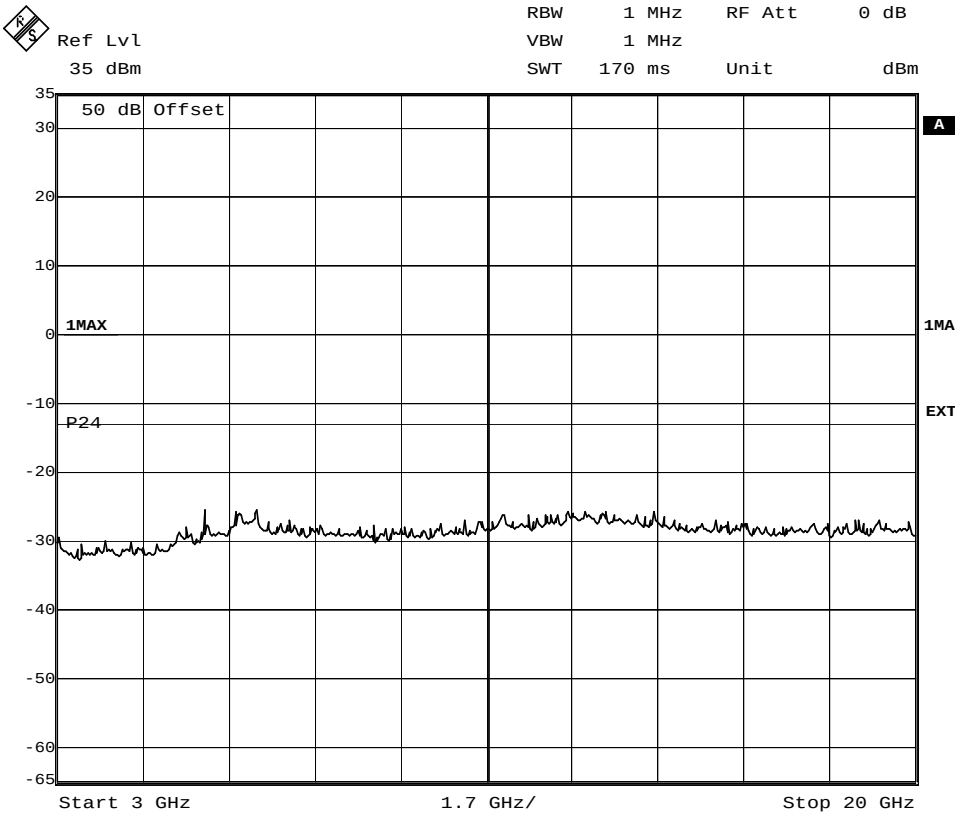

Date: 19.OCT.2007 15:02:17

FCC ID: TA8AKRC11819-2 Appendix 6
IC: 287AB-AW118192

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

Date	Temperature	Humidity
2007-10-15 to 2007-10-18	21-22 °C ± 3 °C	28-44 % ± 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 ports were terminated with 50 ohm loads.

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.

A pre-measurement was first performed:
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.
The measurement procedure was as the following:

1. 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.
2. 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	Calibration Due	SP number
Test site	2008-11	503 881
R&S ESI 26	2008-07	503 292
R&S FSIQ	2008-10	503 738
Control computer	-	503 479
Software: R&S ES-K1, ver. 1.60	-	-
Chase Bilog antenna CBL 6111A	2008-11	503 182
EMCO Horn Antenna 3115	2007-11	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	2008-08	503 285
High pass filter	2008-07	503 739
Testo 610, Temperature and humidity meter	2009-04	502 658

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The test set-ups during the spurious radiation measurements are shown in the pictures below:

RBS 3308 AC Powered (120 VAC, 60 Hz)

RBS 3308 DC Powered (-48 VDC)

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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IC: 287AB-AW118192

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

Date	Temperature (test equipment)	Humidity (test equipment)
2007-10-29 to 2007-11-01	21-23 °C ± 3 °C	28-40 % ± 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. The transmitter was set up according to Test model 1 and Test model 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658
Rotronic, Temperature and humitity meter	2008-04	502 946
Temperature chamber	2009-12	501 031

Results

Nominal Voltage -48 V DC
43 dBm output power at 1957.4 MHz

Test conditions		Frequency error (Hz)	
Supply voltage DC (V)	T (°C)	QPSK	16QAM
-48.0	+20	-60	-50
-55.2	+20	-47	-56
-40.8	+20	-57	-49
-48.0	+30	-46	-56
-48.0	+40	-52	-45
-48.0	+50	-63	-49
-48.0	+10	-52	-45
-48.0	0	-48	-55
Maximum freq. error (Hz)		63	
Measurement uncertainty		$< \pm 1 \times 10^{-7}$	

Note: At -10°C it was not possible to enable the transmitter, the cell was not available.

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (109.87 Hz).

Complies?	Yes

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Receiver conducted spurious according to Industry Canada RSS-133, section 6.7.

Date	Temperature	Humidity
2007-10-22	23 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.4.

Measurements were performed on the receiver antenna terminal (Ant 2). 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	Calibration Due	SP number
R&S FSIQ 40	2008-10	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Result

The results are shown in appendix 8.1:

	Rx frequency
Diagram 1	1852.4 MHz
Diagram 2	1877.4 MHz
Diagram 3	1907.6 MHz

Note: During the measurement on the RX port Ant 2 the combined TX/RX port Ant 1 was terminated with 50 ohm, the TX was active in single carrier mode with test model 1.

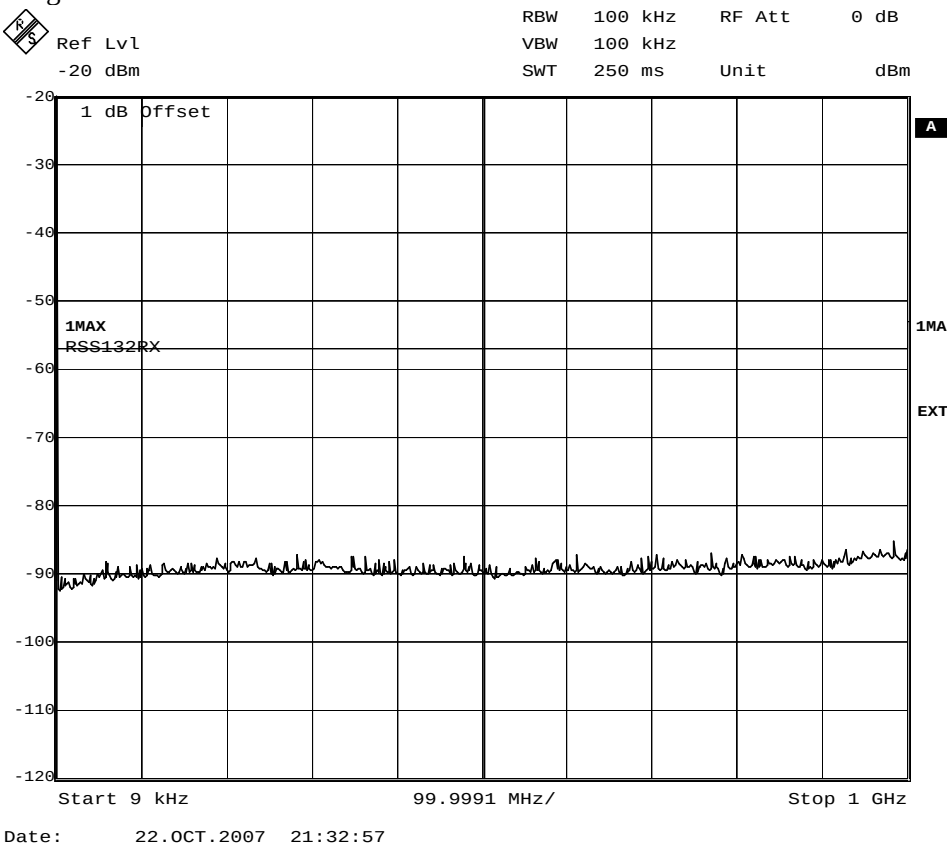
Limit

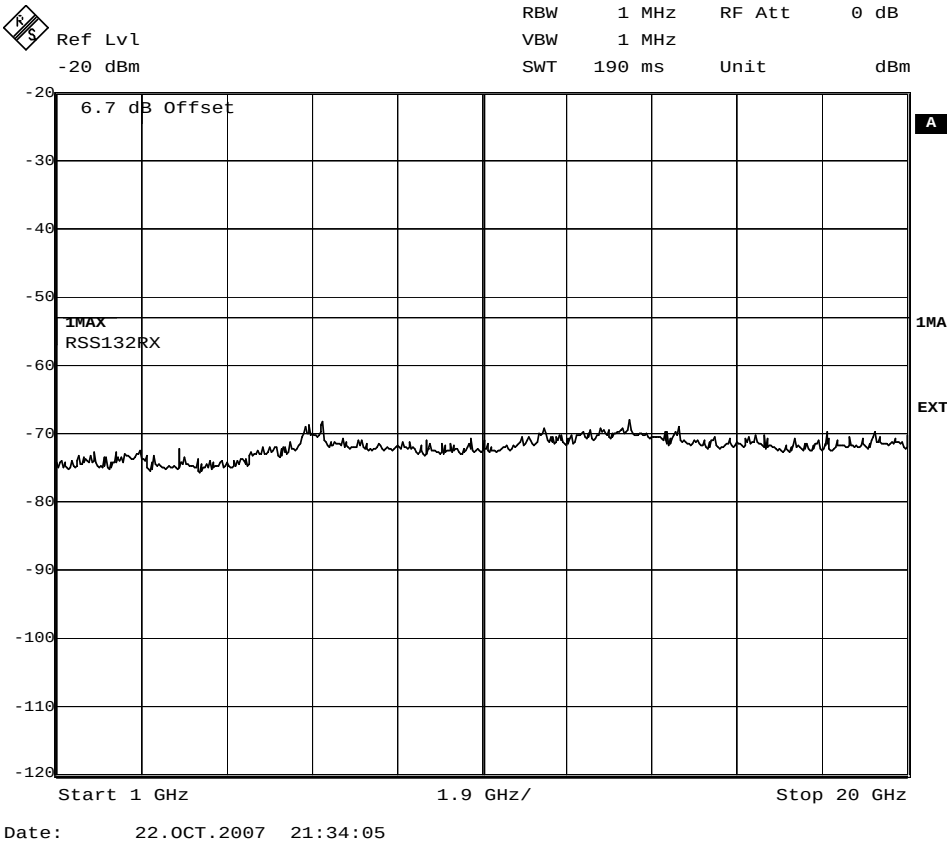
The power of any spurious output signals appearing at the antenna terminals must not exceed -57 dBm (2 nanowatts) per any 4 kHz in the band 30 MHz to 1 GHz, or -53 dBm (5 nanowatts) above 1 GHz.

Emission below limit?	Yes

FCC ID: TA8AKRC11819-2 Appendix 8.1
IC: 287AB-AW118192

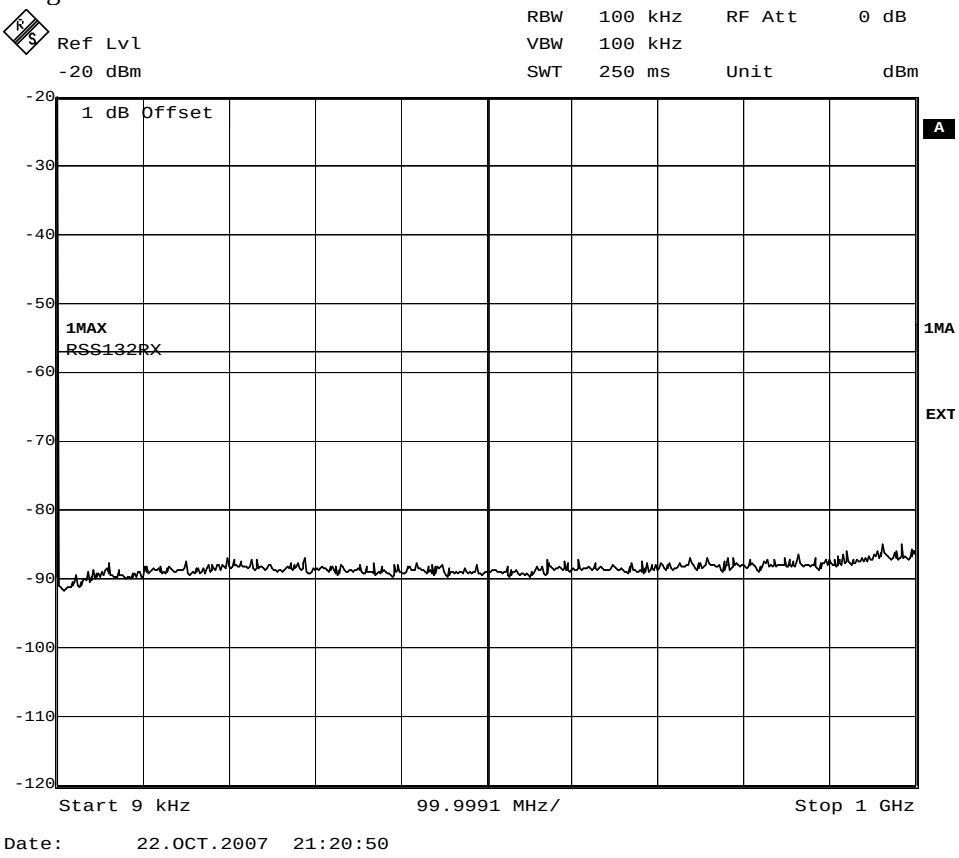
Diagram 1

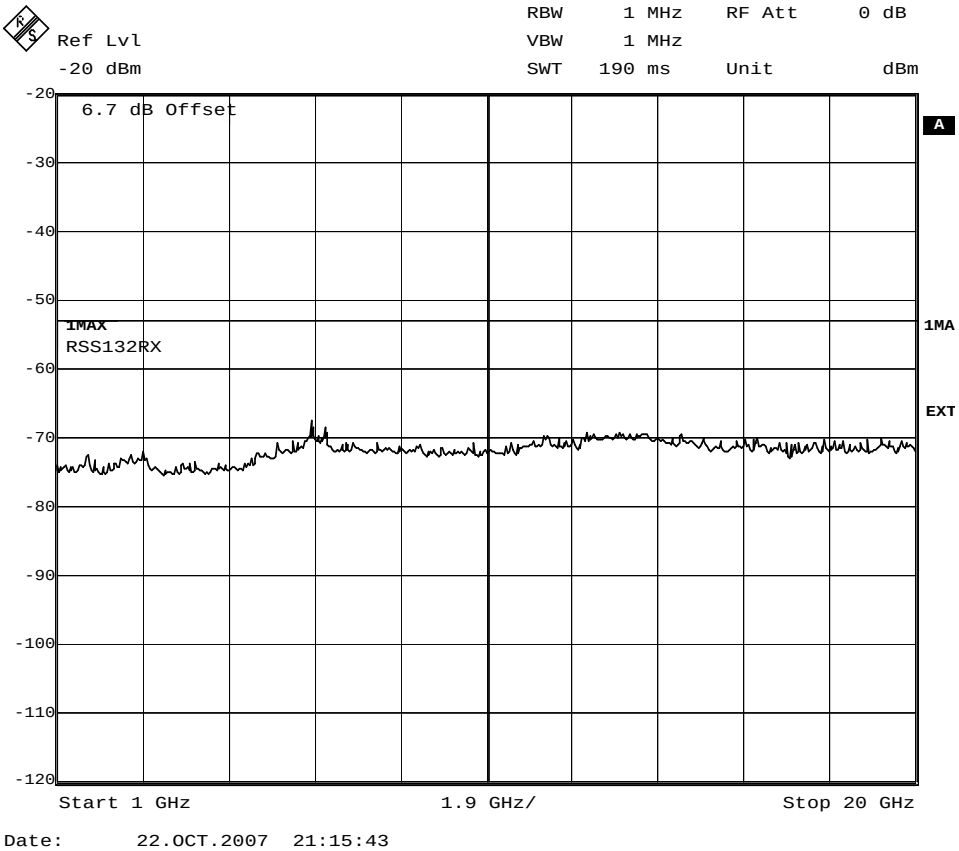




FCC ID: TA8AKRC11819-2 Appendix 8.1
IC: 287AB-AW118192

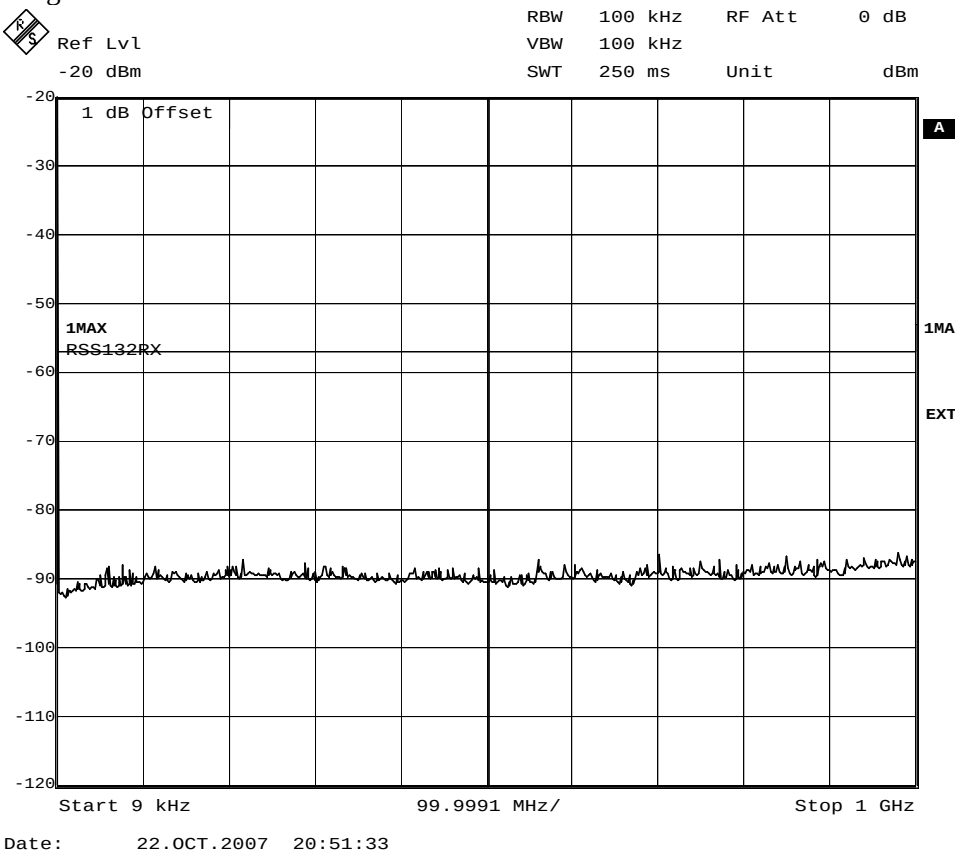
Diagram 2





FCC ID: TA8AKRC11819-2 Appendix 8.1
IC: 287AB-AW118192

Diagram 3



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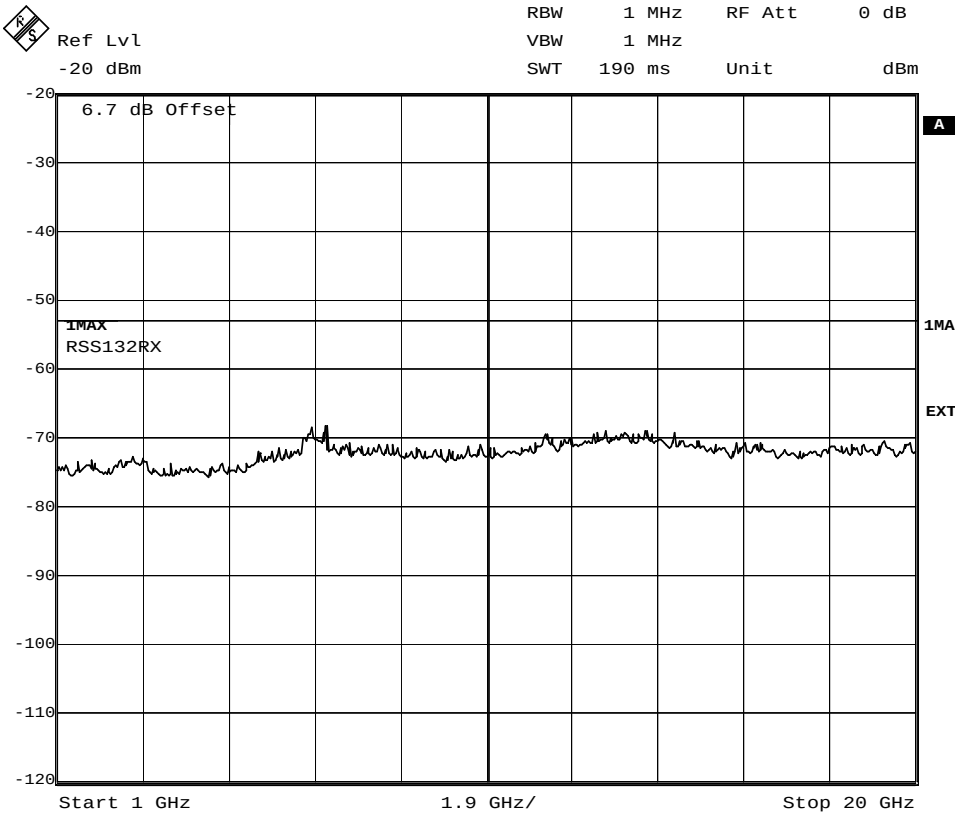

Date: 22.OCT.2007 21:18:47

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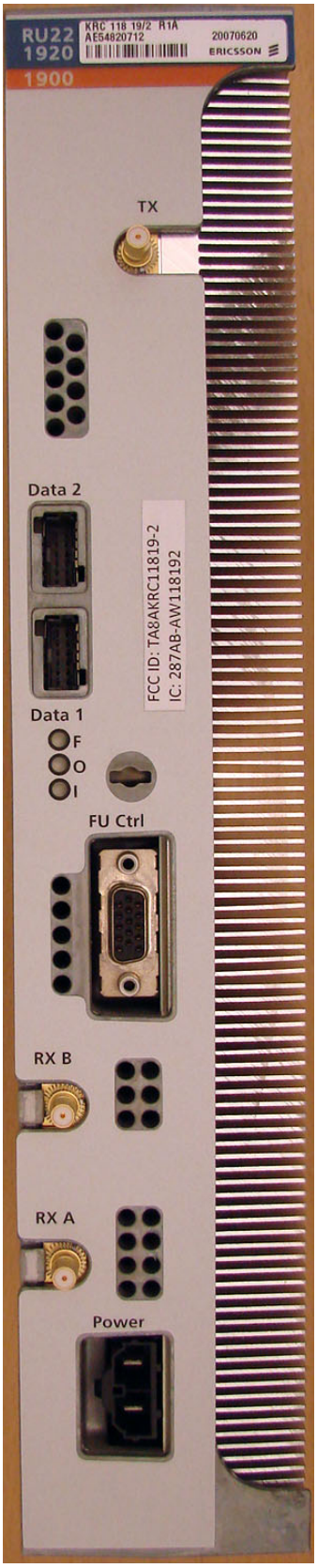
Appendix 9

Photos
Radio Unit KRC 118 19/2

Front side



Rear side

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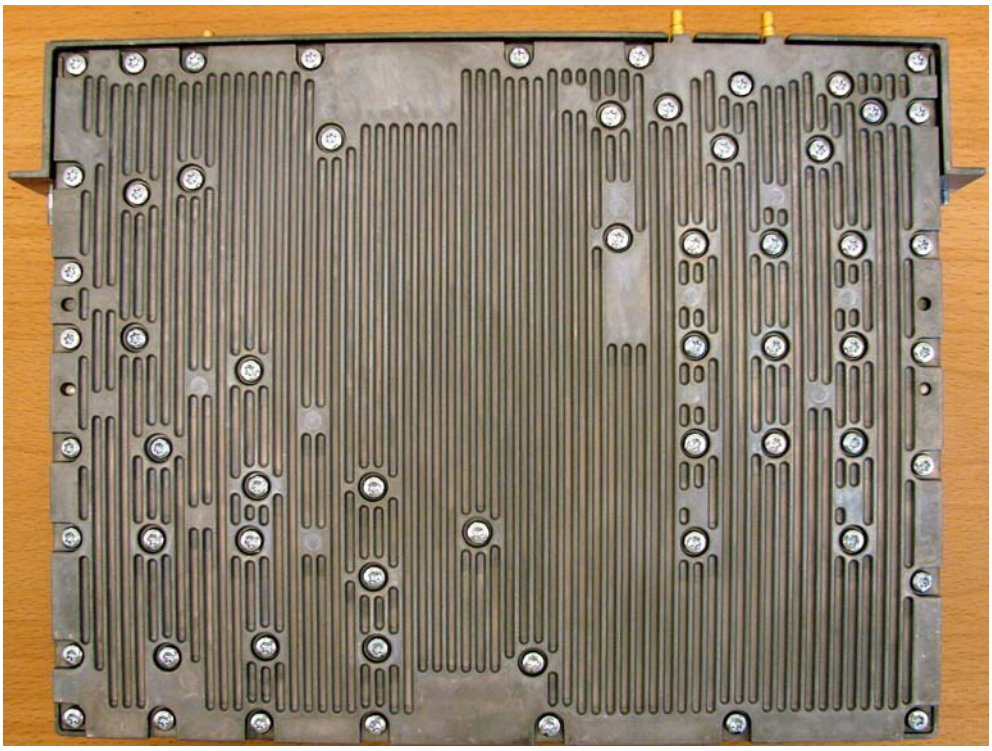
IC: 287AB-AW118192

Left side



Right side