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Radio measurements on WCDMA 1900 MHz Transceiver unit with FCC ID: TA8BKRC11819-3 and IC: 287AB-BW118193 (9 appendices)

Test object

Radio Unit KRC 118 19/3 rev R2C

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.

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FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

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Appendix 1

Description – Test object

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

Tx Frequency range: 1932.4-1987.6 MHz

Modulations: QPSK, 16QAM and 64QAM

Maximum output power: Single carrier: 1x 46 dBm (40W)
Multi carrier: 2x 43 dBm (20W)

Nominal power voltage: -48 VDC

Tested channels

UARFCN	Frequency
9662	1932.4 MHz
9712	1942.4 MHz
9762	1952.4 MHz
9812	1962.4 MHz
9888	1977.6 MHz
9938	1987.6 MHz

Operation mode during measurements

Measurements were performed with the test object transmitting the Test models 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 were tested to find the setting for worst case.

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

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 measurements were done at the output connector (Ant A) of the Filter Unit (FU) KRC 118 20/1.



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Appendix 1

Radiated measurements

The test object was powered with -48 VDC. All radiated measurements were performed with the test object installed in a wooden rack without EMC shielding. This 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 RU unit were allocated to the following UARFCN:

Single Carrier:

Downlink	9662 (1932.4 MHz)	9762 (1952.4 MHz)	9938 (1987.6 MHz)
Uplink	9262 (1852.4 MHz)	9362 (1872.4 MHz)	9538 (1907.6 MHz)

Multi Carrier:

Cell	1	2
Downlink	9662 (1932.4 MHz)	9712 (1942.4 MHz)
Uplink	9262 (1852.4 MHz)	9312 (1862.4 MHz)

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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Appendix 1

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2010-10	503 881
R&S FSIQ	2009-08	503 738
R&S ESI 26	2009-07	503 292
High pass filter	2010-06	503 739
Boonton RF Peak power meter/analyzer	2008-12	503 144
Boonton Power sensor 56518-S/4	2009-06	503 146
Chase Bilog antenna CBL 6111A	2011-11	502 181
EMCO Horn Antenna 3115	2011-01	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	2009-06	503 285
Temperature chamber 2	2010-11	501 031
Climate chamber 3	2009-05	503 546
Multimeter Fluke 87	2009-04	502 190
Testo 610, Temperature and humidity meter	2009-04	502 658

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: 2008-10-21

Manufacturer's representative

Christer Gustavsson, Ericsson AB.

Test engineers

Andreas Johnson, Jonas Bremholt and Jörgen Wassholm

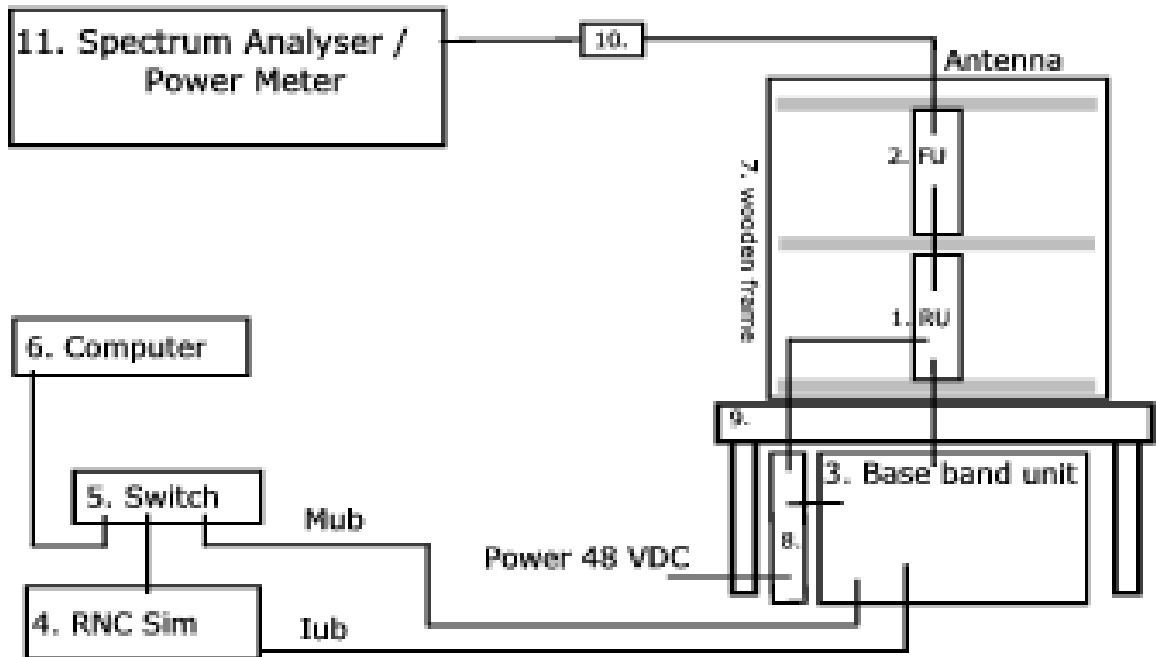
Test witness

Samir Catic, Ericsson AB.

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Appendix 1

Test set-up, conducted measurements



Test object

1. RU KRC 118 19/3, Rev. R2C, S/N C820264086 (Frequency error C820264084) (FCC ID: TA8BKRC11819-3)

Functional test equipment

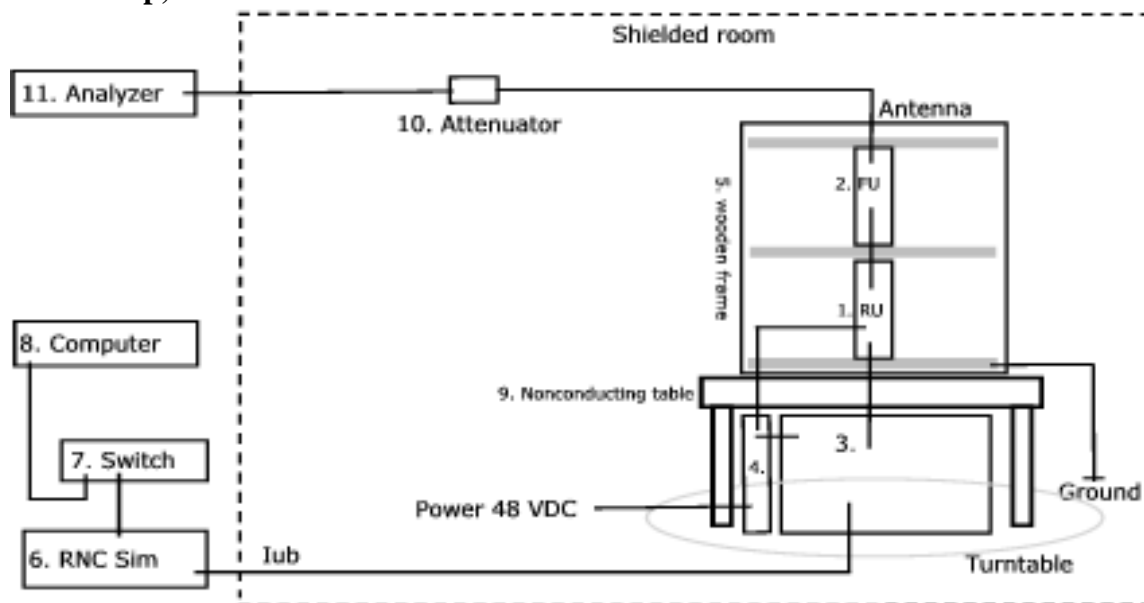
2. FU KRC 118 20/1, Rev. R1H, S/N: A400578717 (Frequency error A400576510)
3. Base band sub rack:
 S/N AB20199733 with SW CXP 901 2959, rev. R6T/9 (TM1 and TM6)
 S/N AB20008811 with SW CXP 901 2073, revR10AV01 (TM5)
4. RNC: Mini-sim #51 4780 DA S/N 0205 REV BAA
5. Switch: HP ProCurve 2810-24G, BAMS 1000552539
6. Computer: SunBlade 2500 BAMS 0000015231
7. Wooden frame
8. PDU 02, product BMG 980 33/02, Rev. R1A, S/N (s)T671498775
9. Non conductive table
10. RF attenuator
11. Measurement equipment

Note The serial number of the test object during the measurement of frequency error was C820264084 and it was installed in a RBS 3206.

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Appendix 1

Test set-up, radiated measurements



Test object

1. RU KRC 118 19/3, Rev. R2C, S/N C820264086
(FCC ID: TA8BKRC11819-3)

Functional test equipment

2. FU KRC 118 20/1, Rev. R1H, S/N: A400578717
3. Base band sub rack:
S/N AB20199733 with SW CXP 901 2959, rev. R6T/9 (TM1 and TM6)
S/N AB20008811 with SW CXP 901 2073, revR10AV01 (TM5)
4. PDU 02, product BMG 980 33/02, Rev. R1A, S/N (S)T671498775
5. Wooden frame
6. RNC Sim 4780 DA, mini-SIM#53, BAMS 1000134363
7. Ethernet switch, 3Com, SP-equipment
8. Computer Sunblade 2500 BAMS 0000015232
9. Non conductive table
10. Attenuator, Weinschel model 49-40-33
11. Anritsu Signal Analyzer, MS2691A, SN 6200750255



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Appendix 2

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

Date 2008-11-05	Temperature 23 °C ± 3 °C	Humidity 23 % ± 5 %
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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 610, Temperature and humidity meter	502 658

Measurement uncertainty: 0.5 dB

Results

Single carrier: Rated output power level at Ant 1 connector (maximum): 1x 46 dBm

Transmitter power (dBm/ dB) RMS/ PAR		
Frequency 1932.4 MHz	Frequency 1952.4 MHz	Frequency 1987.6 MHz
45.8/ 6.4	45.8/ 6.5	45.8/ 6.5

Multi carrier: Rated output power level at Ant 1 connector (maximum): 2x 43 dBm

Transmitter combined power (dBm/ dB) RMS/ PAR		
Frequencies 1932.4 MHz 1942.4 MHz	Frequencies 1952.4 MHz 1962.4 MHz	Frequencies 1977.6 MHz 1987.6 MHz
45.6/ 6.7	45.6/ 6.5	45.6/ 6.5

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 Maximum conducted output power shall not exceed 100W (50 dBm).

Complies?	Yes
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Appendix 3

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

Date 2008-11-05	Temperature 23 °C ± 3 °C	Humidity 23 % ± 5 %
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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 610, Temperature and humidity meter	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

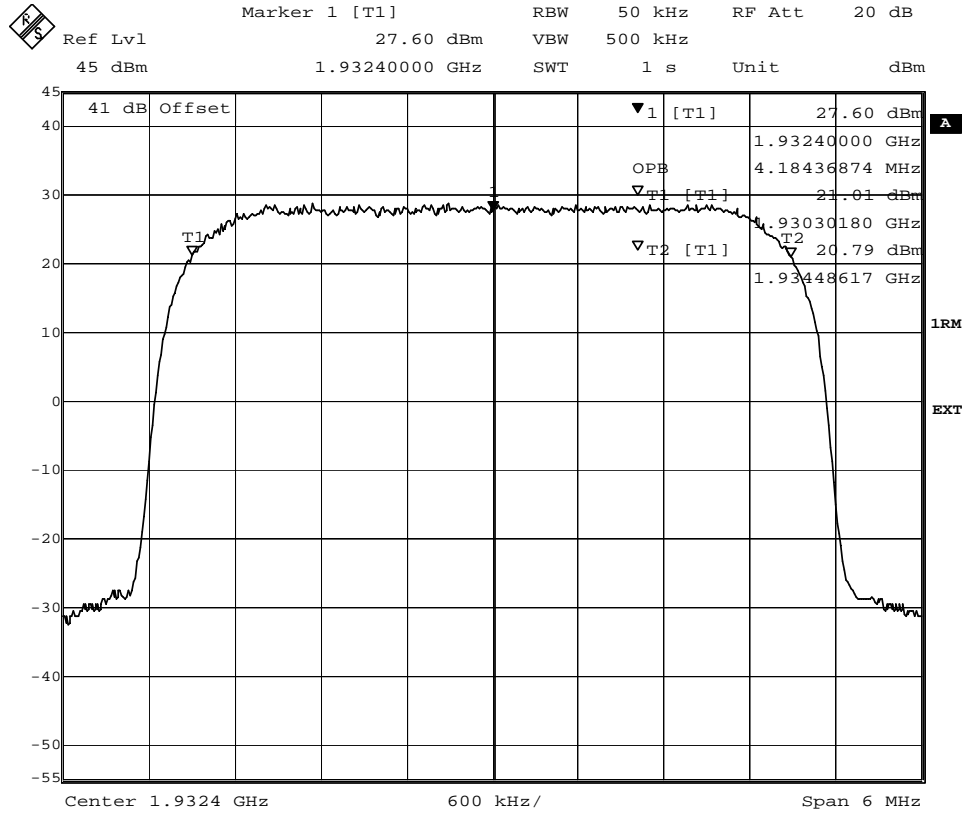
	Frequency	OBW
Diagram 1	1932.4 MHz	4.2
Diagram 2	1952.4 MHz	4.2
Diagram 3	1987.6 MHz	4.2



FCC ID: TA8BKRC11819-3

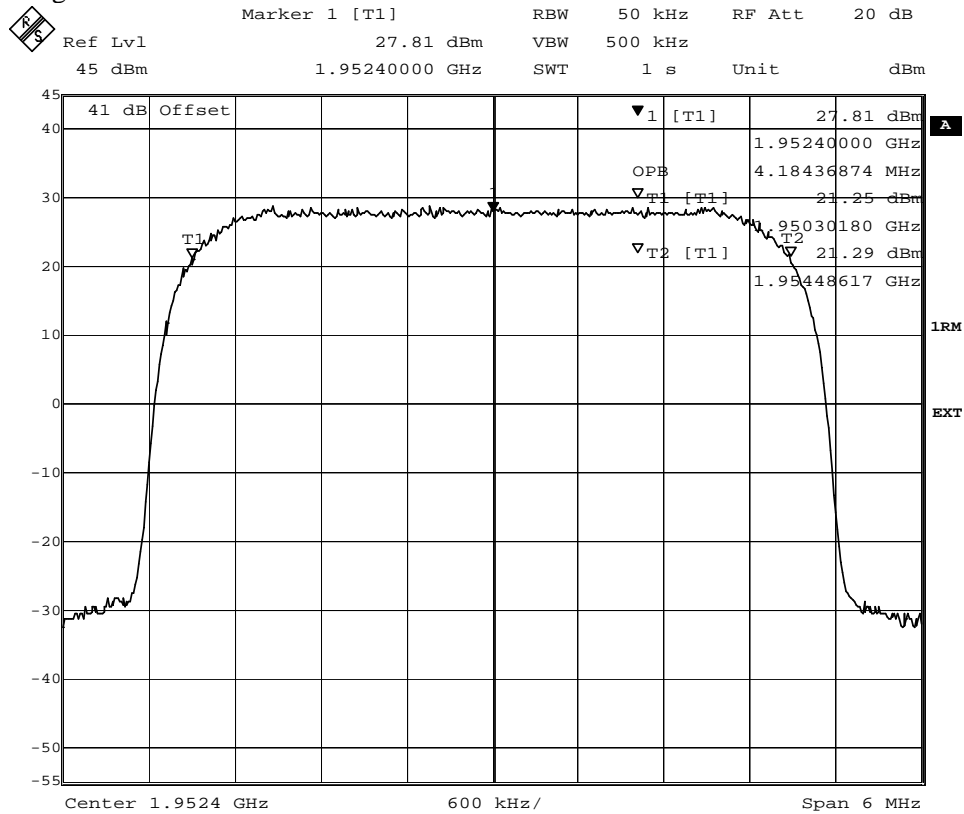
Appendix 3.1

Diagram 1



Date: 5.NOV.2008 13:42:35

Diagram 2



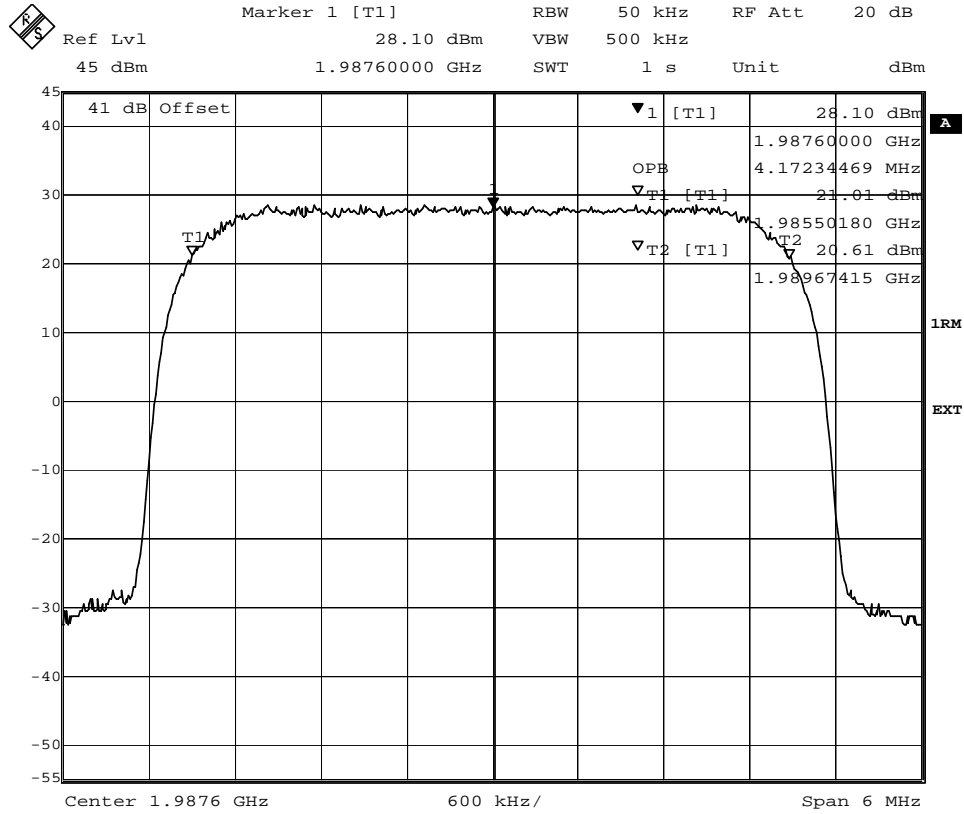
Date: 5.NOV.2008 17:16:29



FCC ID: TA8BKRC11819-3

Appendix 3.1

Diagram 3



Date: 5.NOV.2008 17:32:17



FCC ID: TA8BKRC11819-3
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Appendix 4

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

Date	Temperature	Humidity
2008-11-05	24 °C ± 3 °C	23 % ± 5 %
2008-11-06	24 °C ± 3 °C	25 % ± 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 610, Temperature and humidity meter	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Single carrier:

Diagram 1: 1932.4 MHz

Diagram 2: 1987.6 MHz

Multi carrier:

Diagram 3: 1932.4+1942.4 MHz

Diagram 4: 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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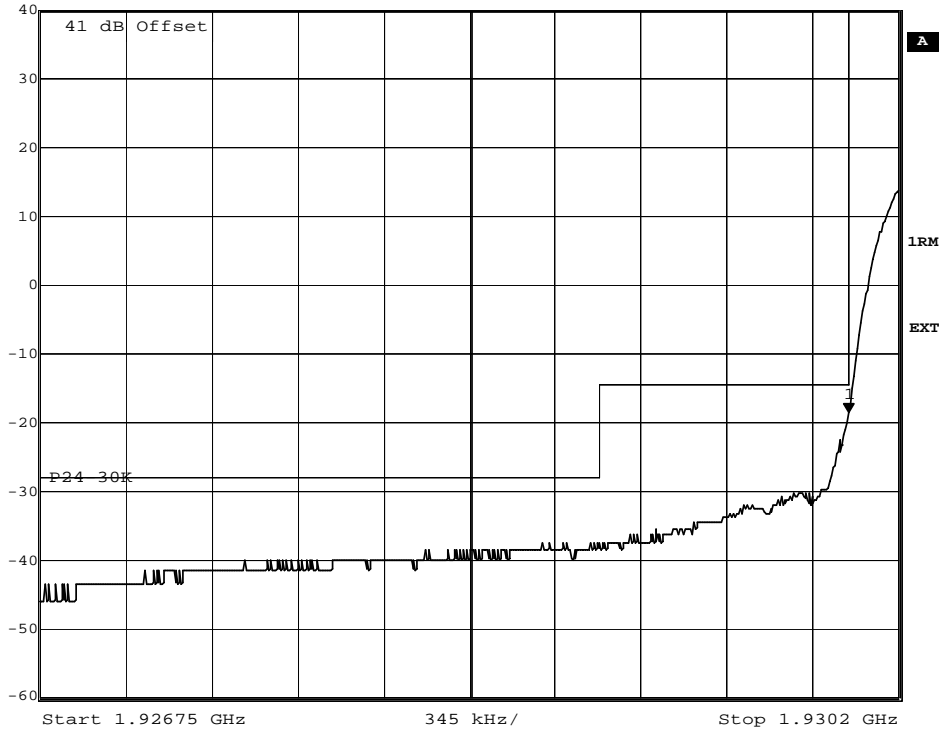


FCC ID: TA8BKRC11819-3
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Appendix 4.1

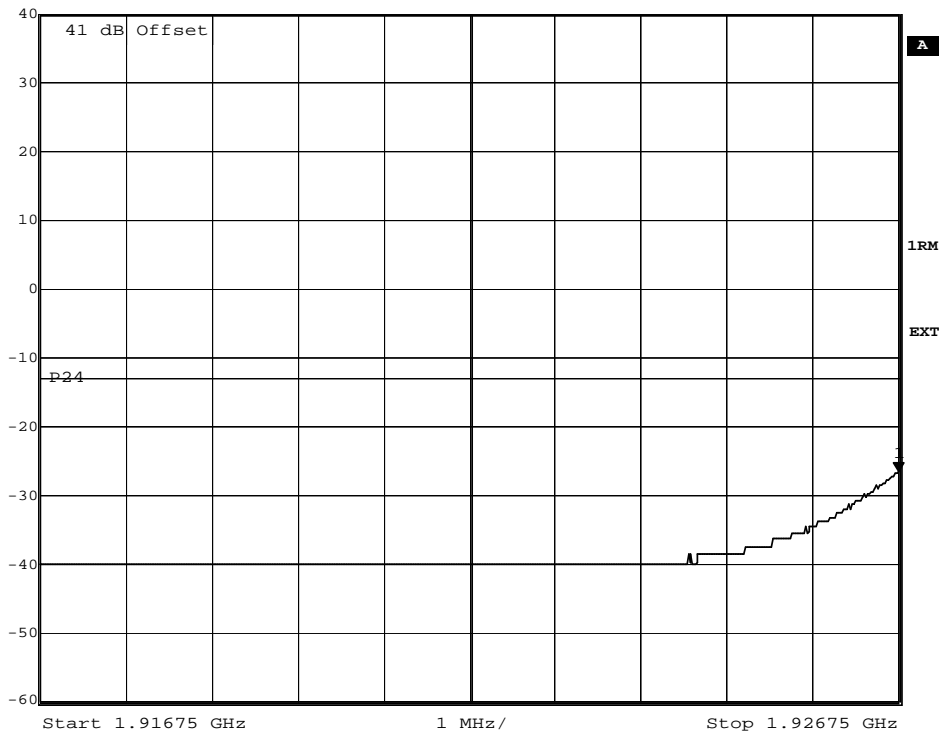
Diagram 1

Marker 1 [T1] RBW 30 kHz RF Att 10 dB
Ref Lvl -18.54 dBm VBW 300 kHz
40 dBm 1.9300000 GHz SWT 2 s Unit dBm



Date: 5.NOV.2008 13:46:19

Marker 1 [T1] RBW 1 MHz RF Att 10 dB
Ref Lvl -26.62 dBm VBW 10 MHz
40 dBm 1.9267500 GHz SWT 2 s Unit dBm



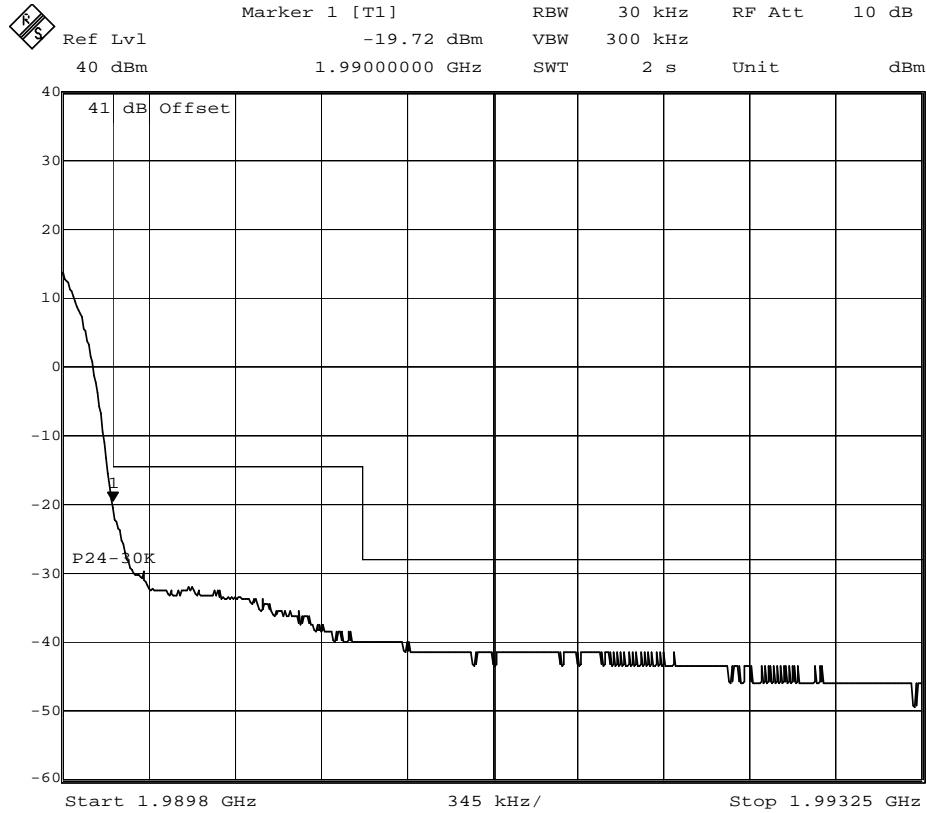
Date: 5.NOV.2008 13:47:36



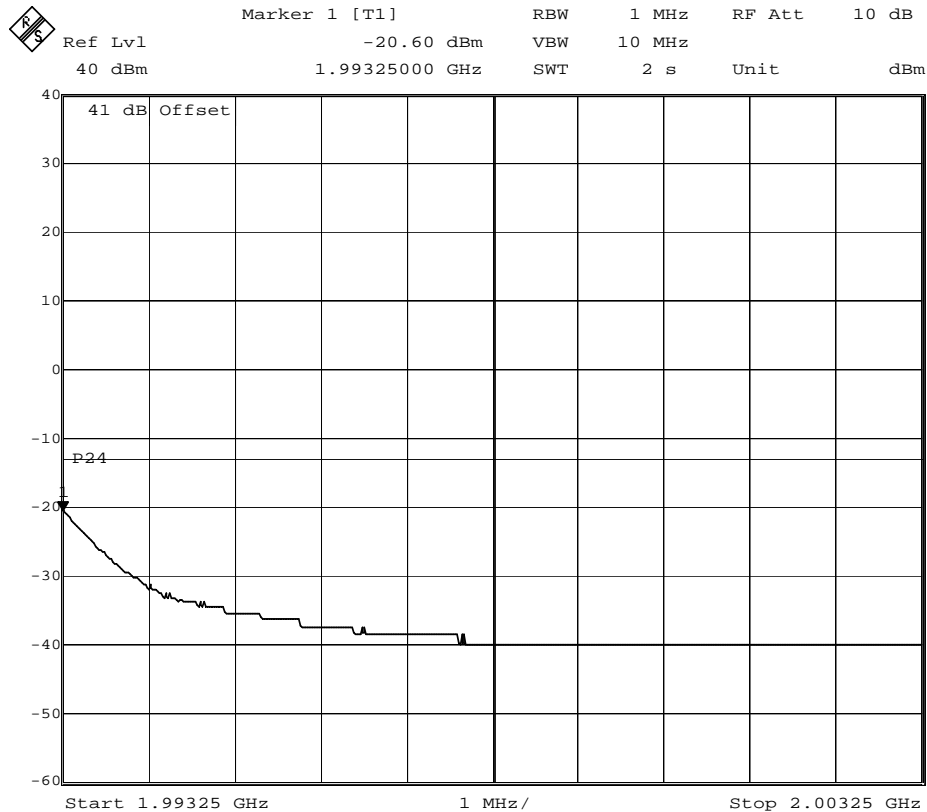
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 4.1

Diagram 2



Date: 5.NOV.2008 17:33:45



Date: 5.NOV.2008 17:34:24

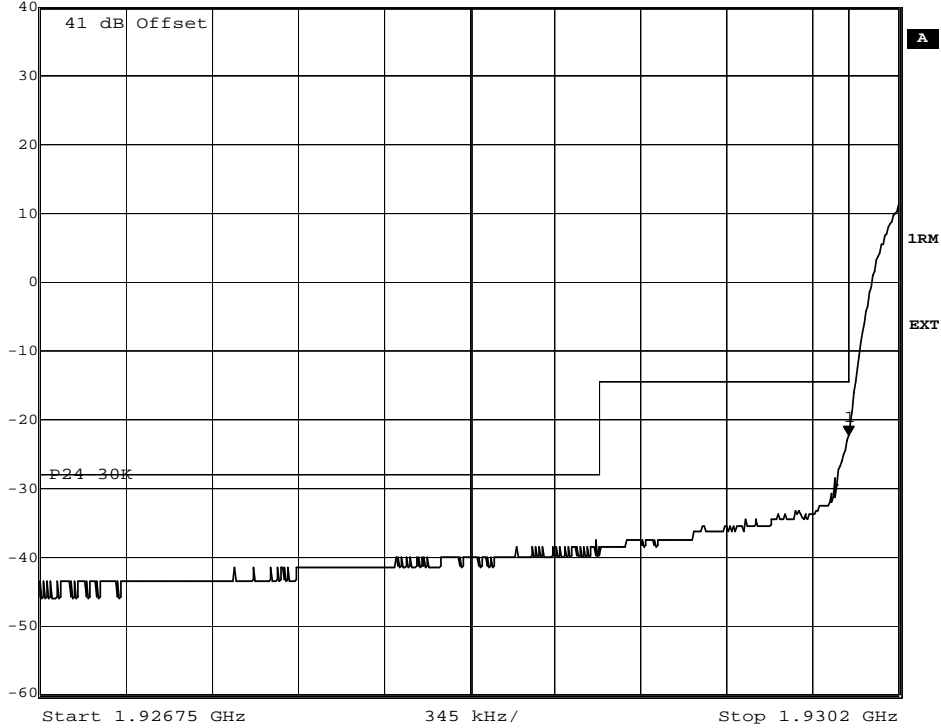


FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 4.1

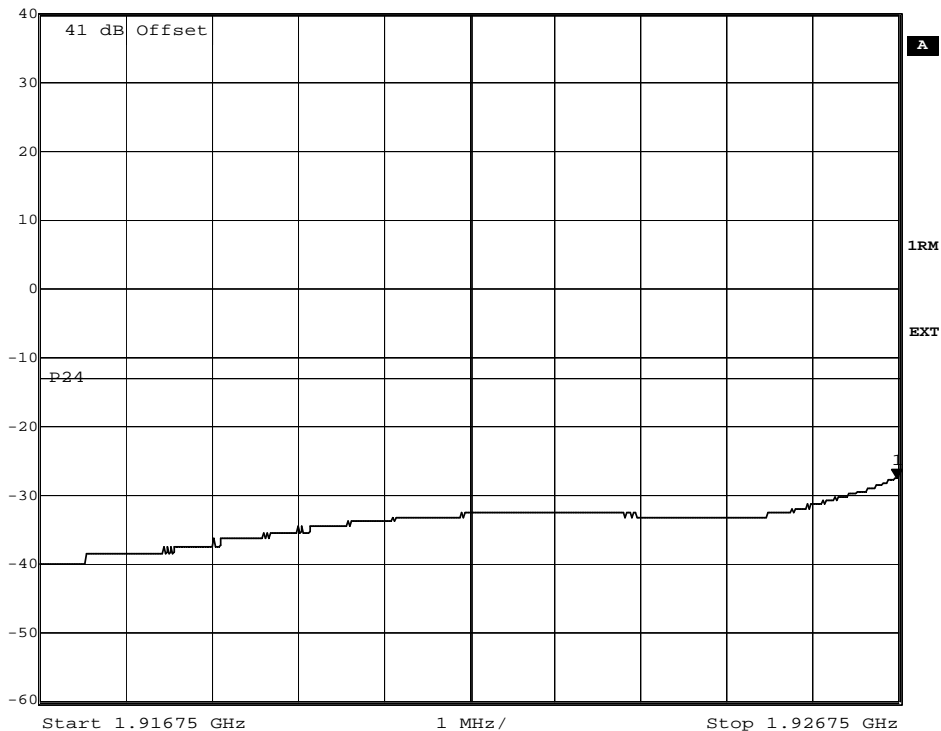
Diagram 3

Marker 1 [T1] RBW 30 kHz RF Att 10 dB
Ref Lvl -22.31 dBm VBW 300 kHz
40 dBm 1.9300000 GHz SWT 2 s Unit dBm



Date: 6.NOV.2008 10:23:38

Marker 1 [T1] RBW 1 MHz RF Att 10 dB
Ref Lvl -27.61 dBm VBW 10 MHz
40 dBm 1.92672996 GHz SWT 2 s Unit dBm



Date: 6.NOV.2008 10:24:34

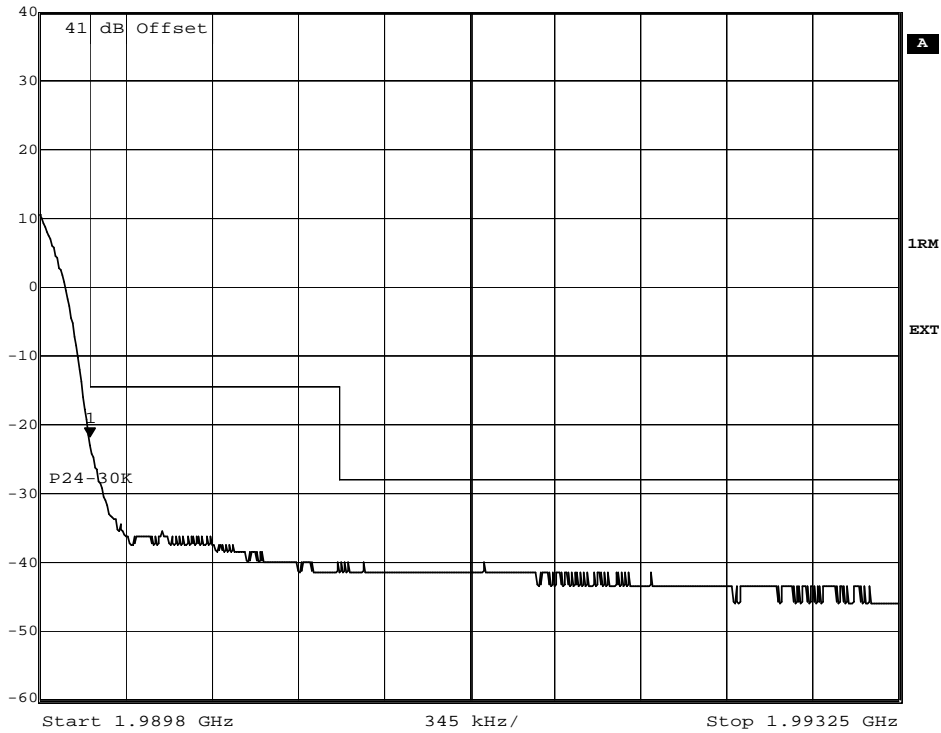


FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 4.1

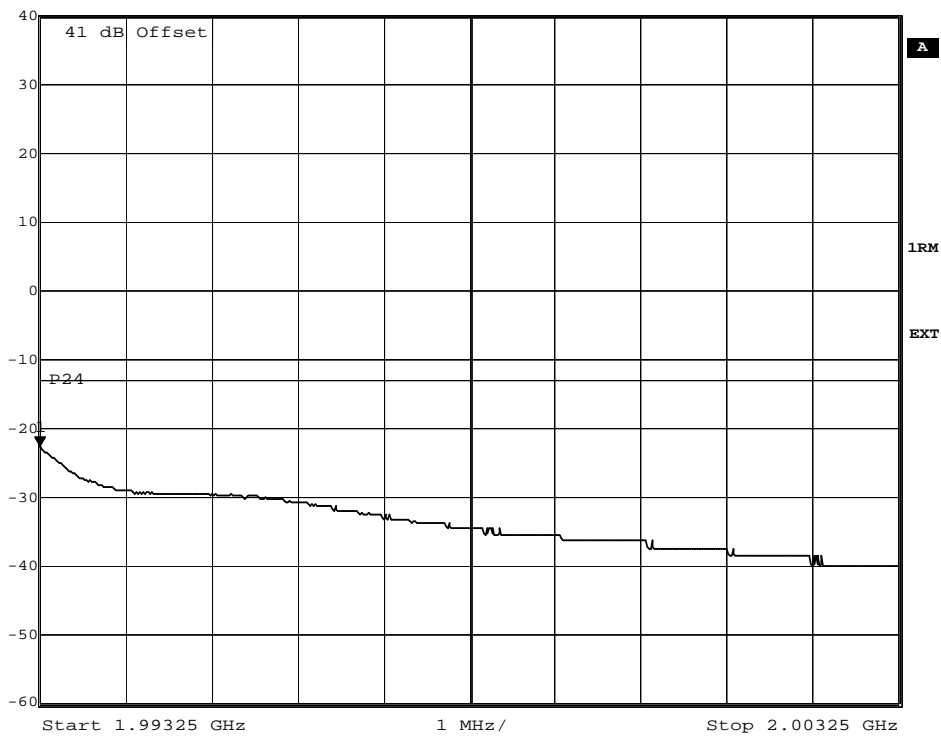
Diagram 4

Marker 1 [T1] RBW 30 kHz RF Att 10 dB
Ref Lvl -21.94 dBm VBW 300 kHz
40 dBm 1.99000000 GHz SWT 2 s Unit dBm



Date: 6.NOV.2008 11:18:22

Marker 1 [T1] RBW 1 MHz RF Att 10 dB
Ref Lvl -22.70 dBm VBW 10 MHz
40 dBm 1.99325000 GHz SWT 2 s Unit dBm



Date: 6.NOV.2008 11:19:38



FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5

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

Date	Temperature	Humidity
2008-11-05	24 °C ± 3 °C	23 % ± 5 %
2008-11-06	24 °C ± 3 °C	26 % ± 5 %

Test set-up and procedure

The measurements were made as defined in §24.238. 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 610, Temperature and humidity meter	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier:

- Diagram 1: 1932.4 MHz
- Diagram 2: 1952.4 MHz
- Diagram 3: 1987.6 MHz

Multi carrier:

- Diagram 4: 1932.4+1942.4 MHz
- Diagram 5: 1952.4+1962.4 MHz
- Diagram 6: 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.

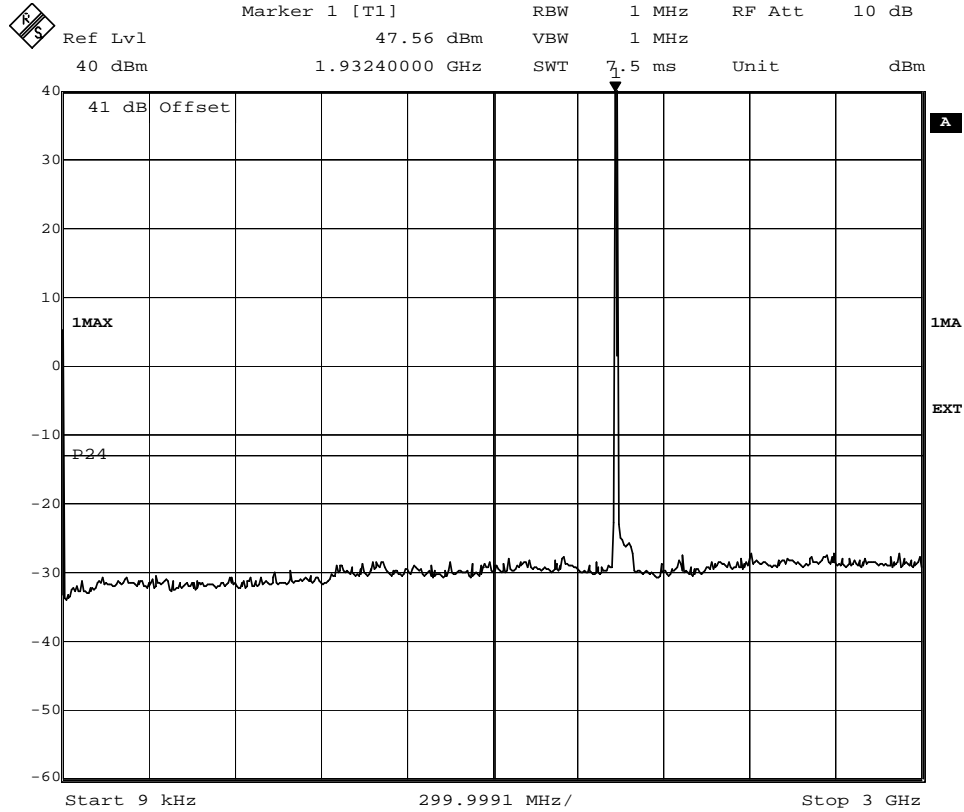
Complies?	Yes
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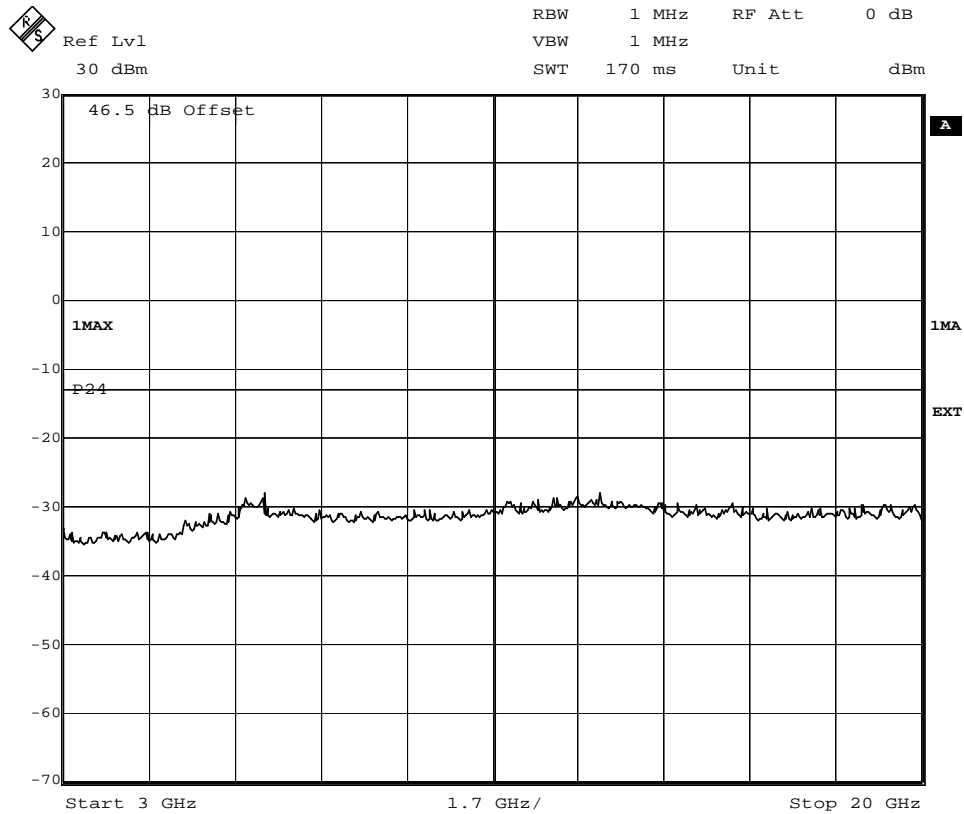
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 1



Date: 5.NOV.2008 13:49:51



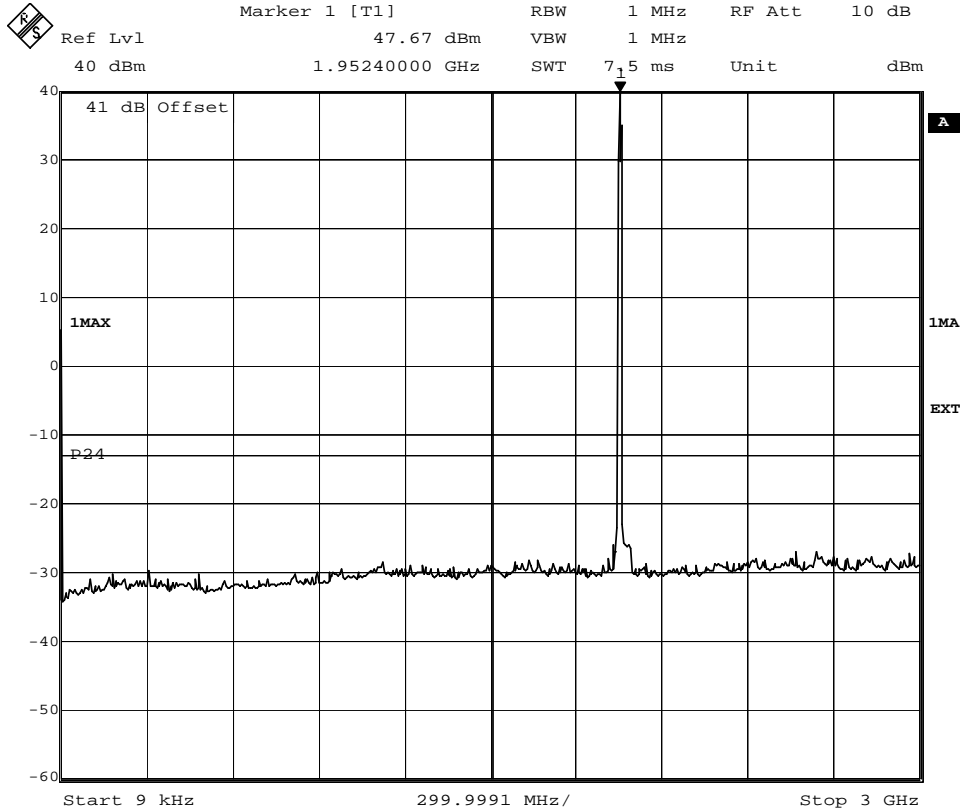
Date: 5.NOV.2008 13:52:30



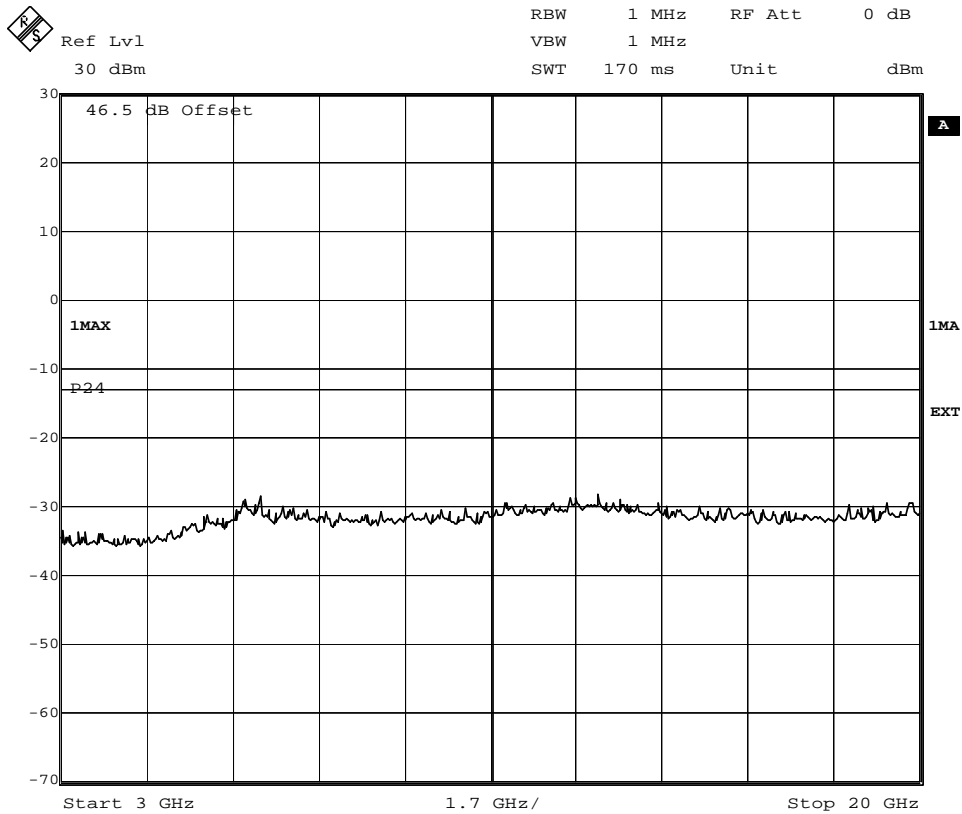
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 2



Date: 5.NOV.2008 17:12:14



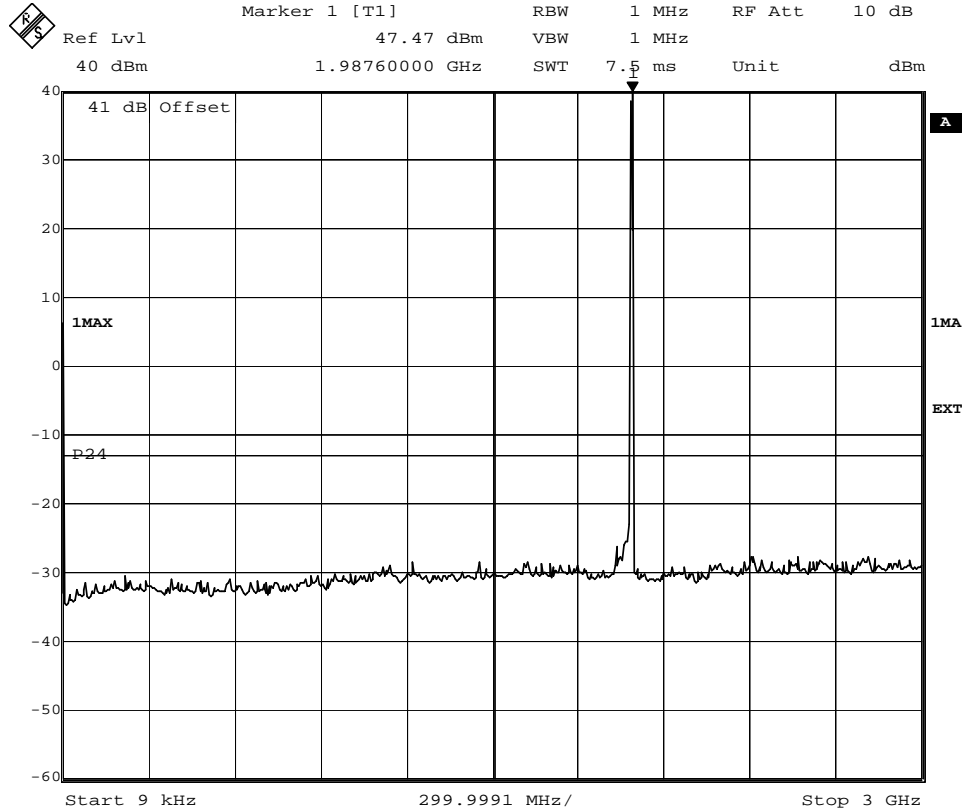
Date: 5.NOV.2008 17:15:04



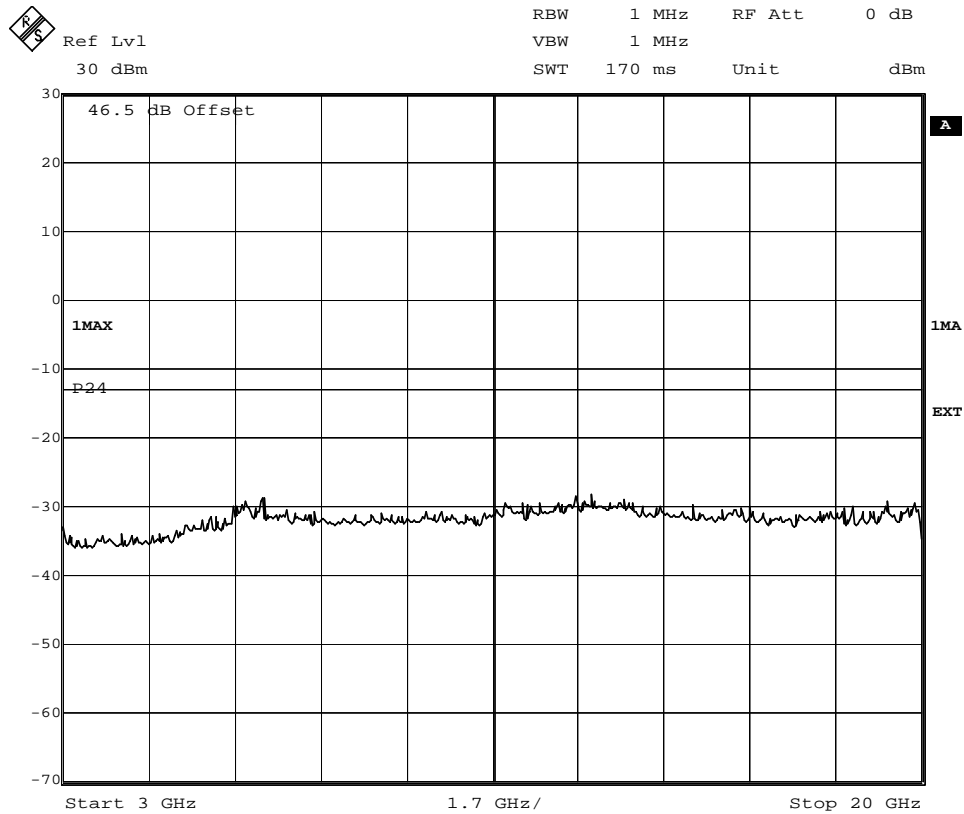
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 3



Date: 5.NOV.2008 17:35:52



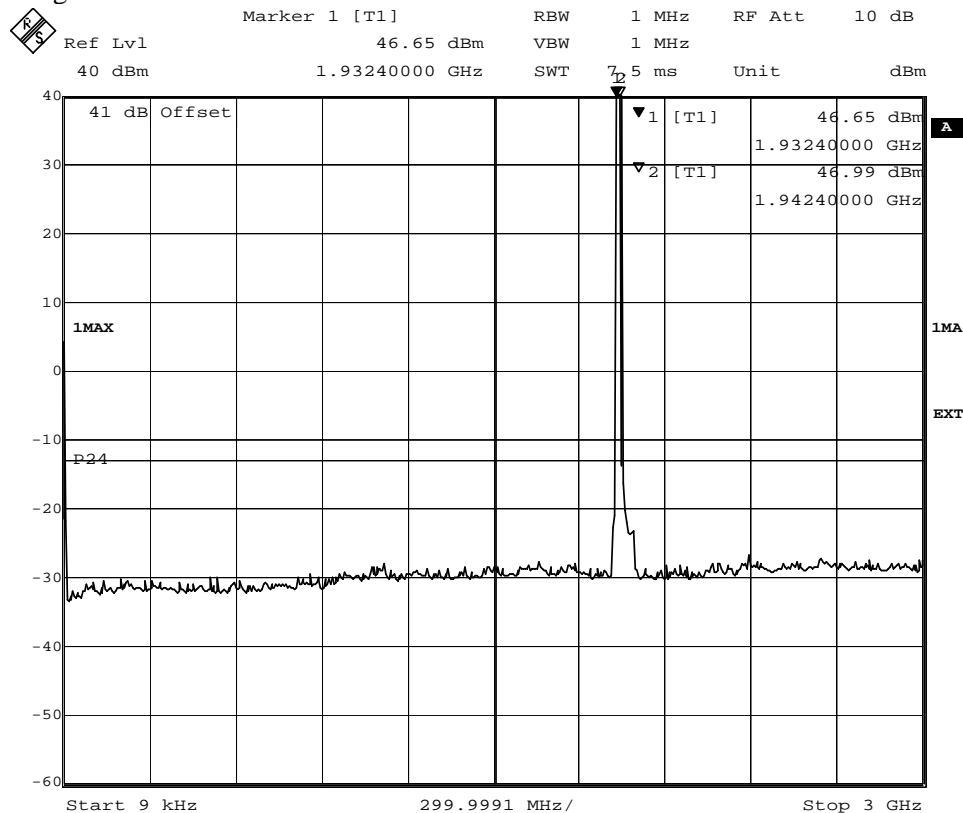
Date: 5.NOV.2008 17:36:54



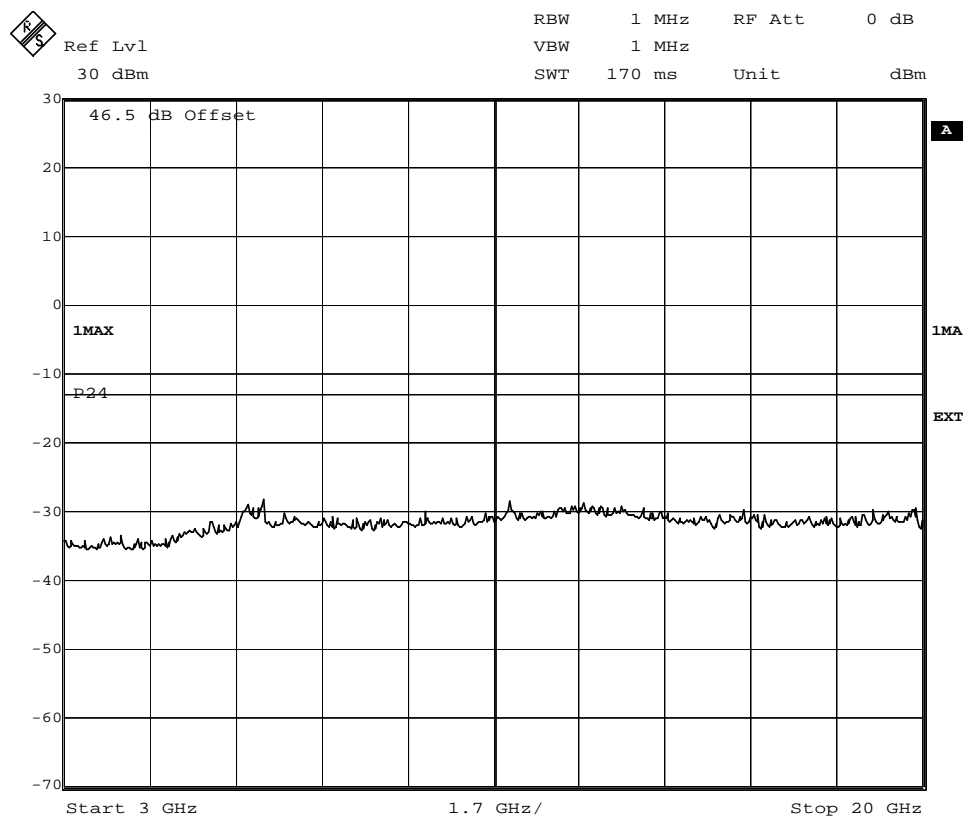
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 4



Date: 6.NOV.2008 10:29:36



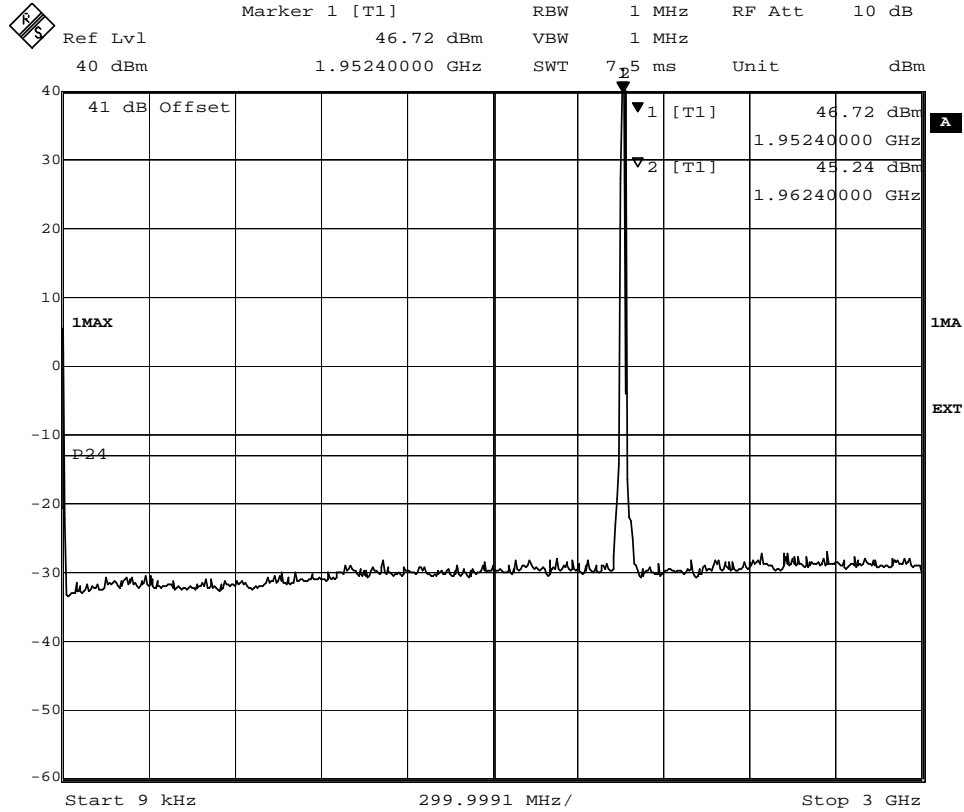
Date: 6.NOV.2008 10:35:16



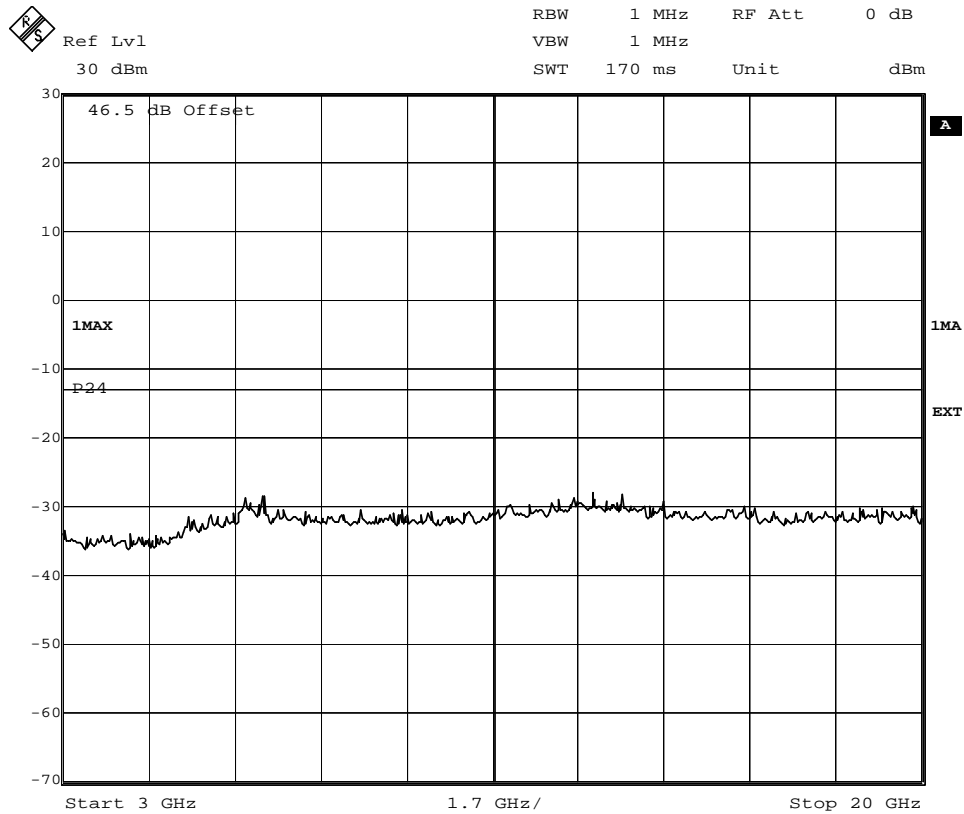
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 5



Date: 6.NOV.2008 10:55:33



Date: 6.NOV.2008 10:57:20

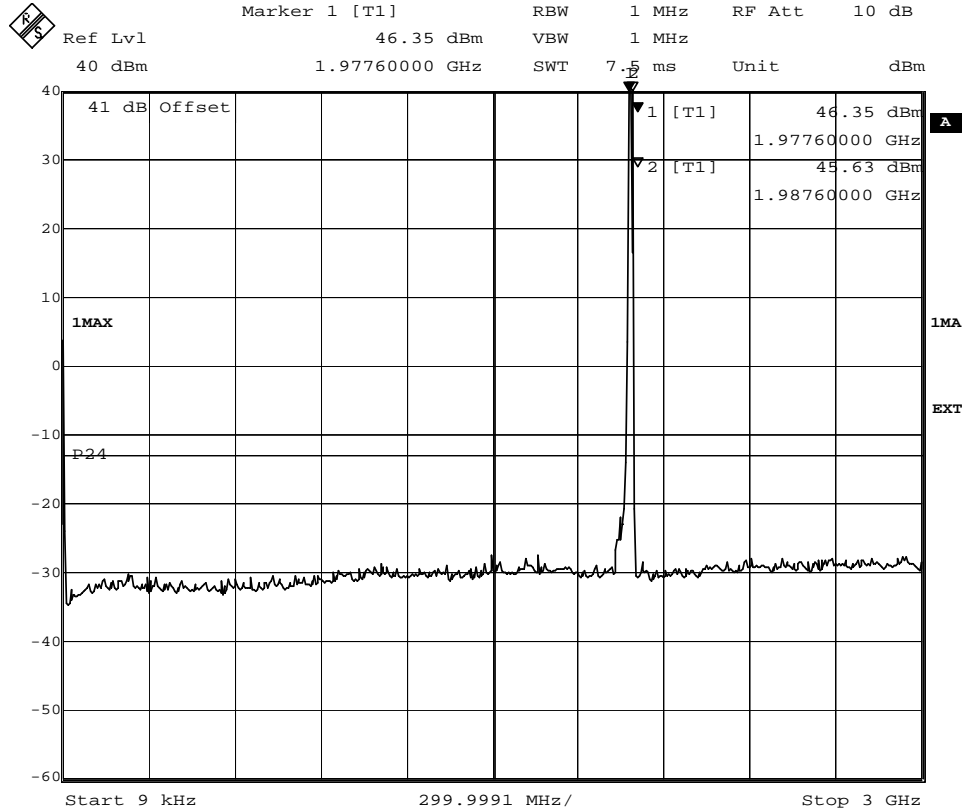


REPORT

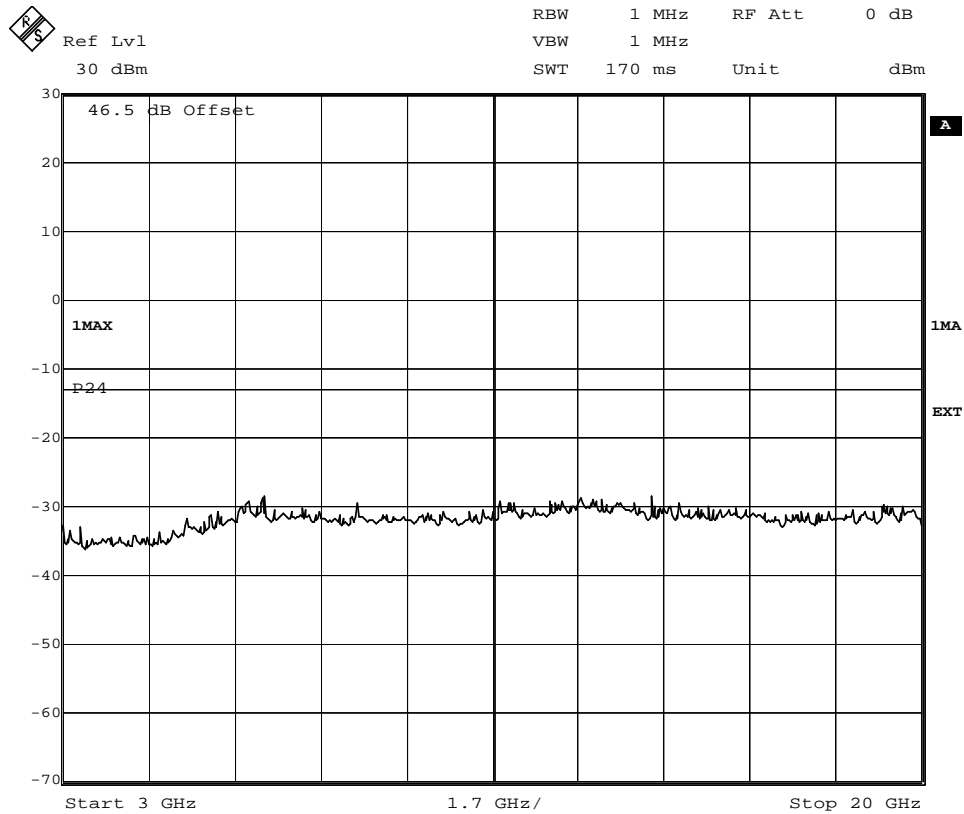
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 5.1

Diagram 6



Date: 6.NOV.2008 11:21:01



Date: 6.NOV.2008 11:46:32

FCC ID: TA8BKRC11819-3
 IC: 287AB-BW118193

Appendix 6

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

Date 2008-10-31 to 2008-11-04	Temperature 21-22 °C ± 3 °C	Humidity 28-44 % ± 5 %
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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.

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,

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

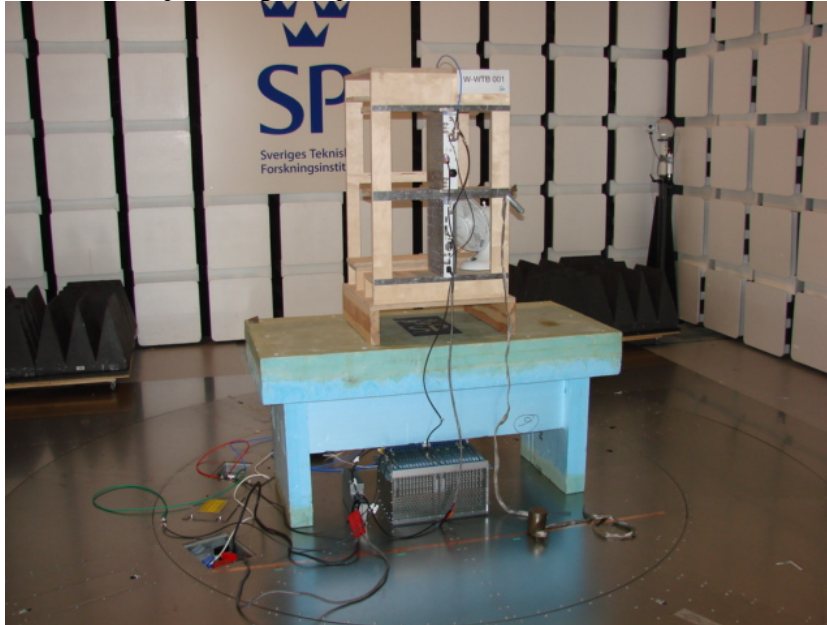
3. The measurement procedure was as the following:
4. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
5. Spurious radiation on frequencies closer than 20 dB to the limit is scanned 0-360 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
High pass filter	503 739
Testo 610, Temperature and humidity meter	502 658

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Appendix 6

The test set-ups during the spurious radiation measurements are 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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Appendix 7

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

Date 2008-11-03 to 2008-11-05	Temperature (test equipment) 22-23 °C ± 3 °C	Humidity (test equipment) 24-33 % ± 5 %
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Test set-up and procedure

The measurement was made per 3GPP TS 25.141 with the test object installed on a RBS 3206E. 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 610, Temperature and humidity meter	502 658
Climate chamber 3	503 546

Results

Nominal Voltage -48 V DC
Maximum output power at 1952.4 MHz

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	+22
-55.2	+20	+18
-40.8	+20	+21
-48.0	+30	-20
-48.0	+40	+27
-48.0	+50	-35
-48.0	+10	+23
-48.0	0	-28
Maximum freq. error (Hz)		-35
Measurement uncertainty		< ± 1 x 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 (109.62 Hz).

Complies?	Yes
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Appendix 8

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

Date 2008-11-06	Temperature 24 °C ± 3 °C	Humidity 26 % ± 5 %
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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	SP number
R&S FSIQ 40	503 738
Testo 610, Temperature and humidity meter	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 transmitting TM1.

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.

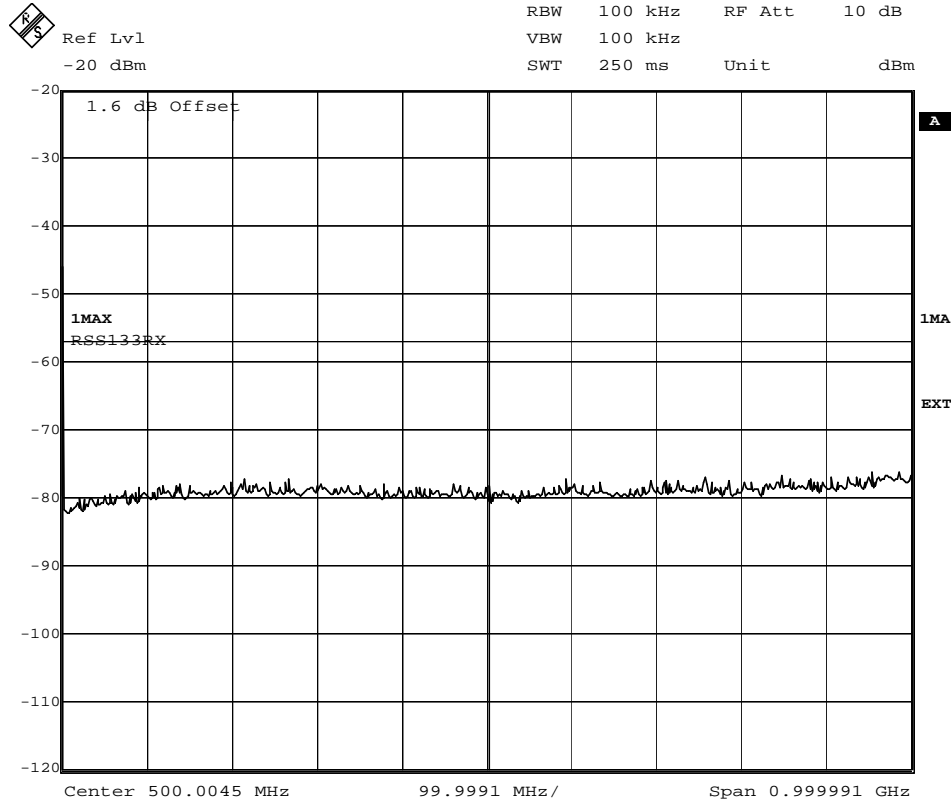
Emission below limit?	Yes
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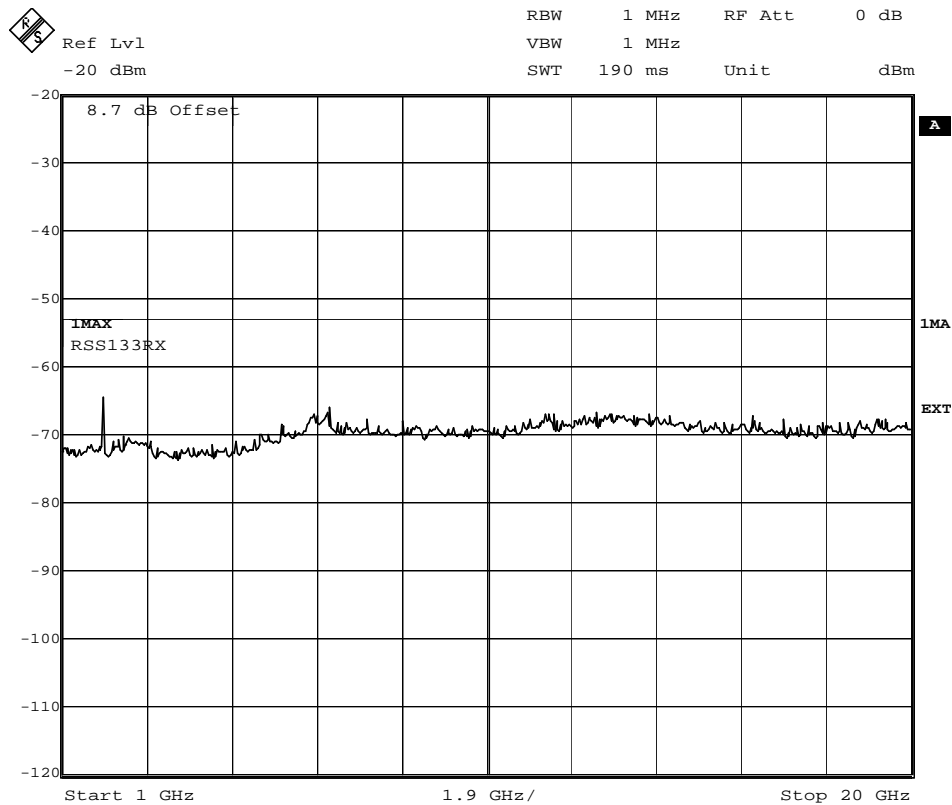
FCC ID: TA8BKRC11819-3
IC: 287AB-BW118193

Appendix 8.1

Diagram 1



Date: 6.NOV.2008 09:27:38



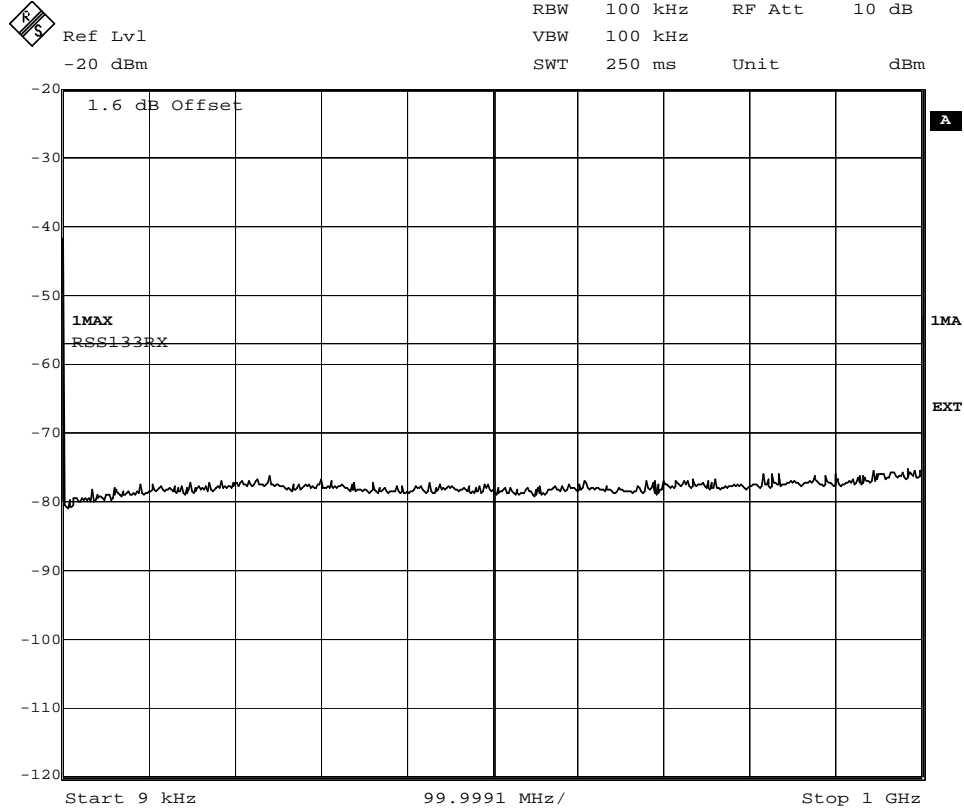
Date: 6.NOV.2008 09:25:52



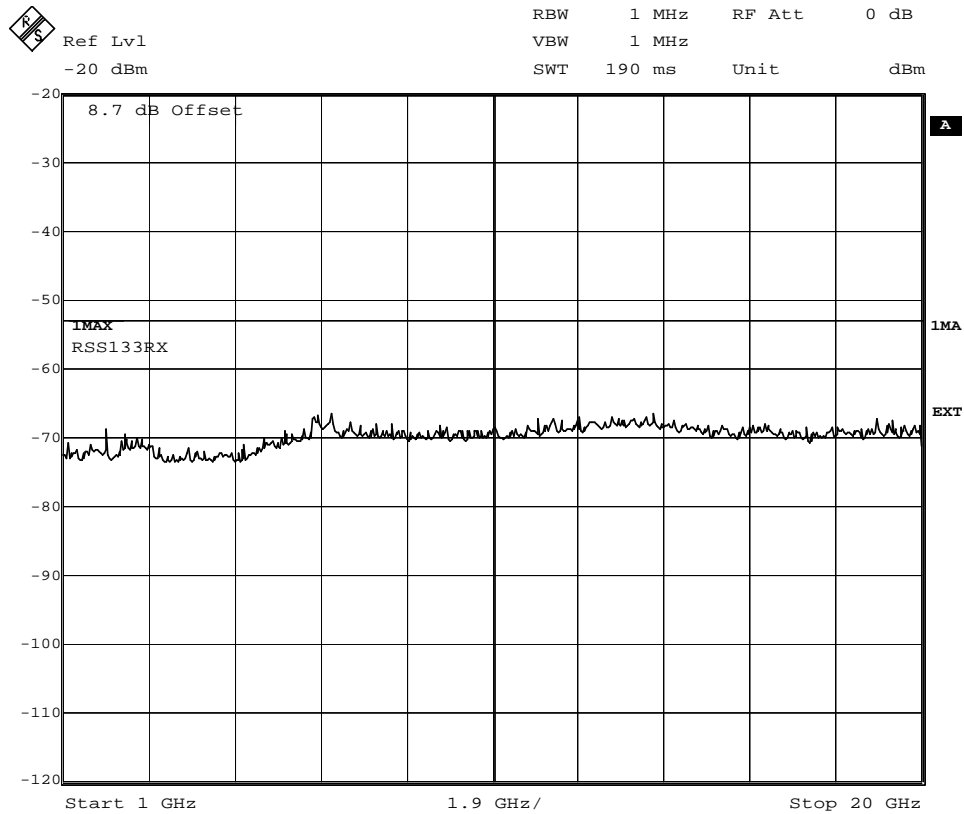
FCC ID: TA8BKRC11819-3
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Appendix 8.1

Diagram 2



Date: 6.NOV.2008 09:12:28



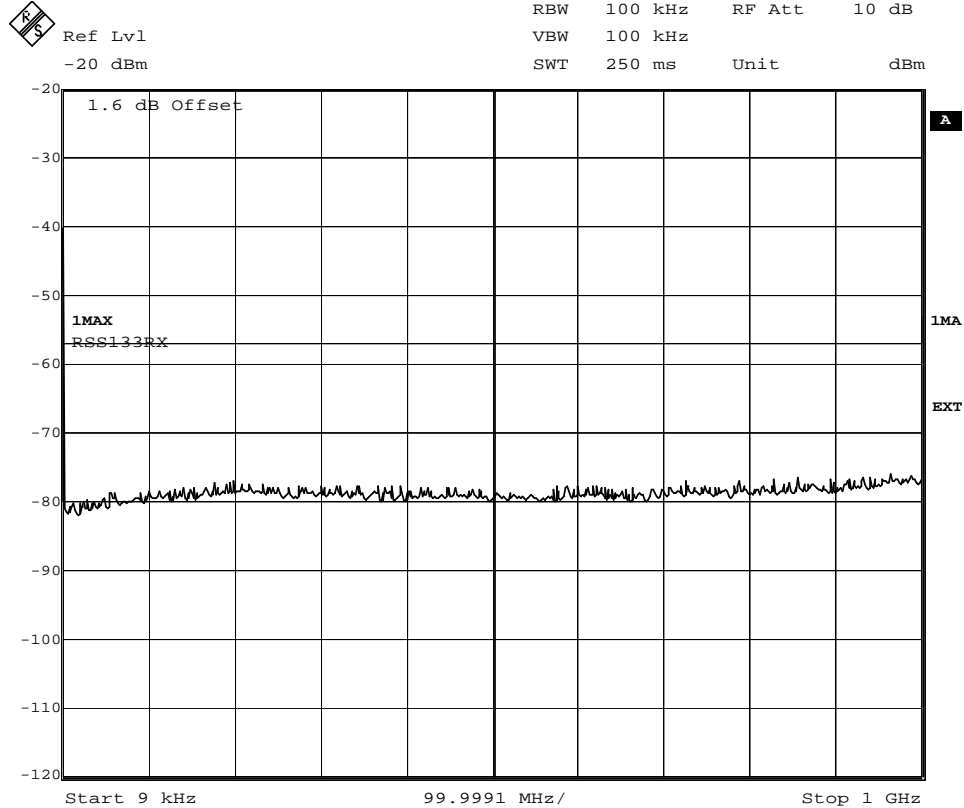
Date: 6.NOV.2008 09:13:22



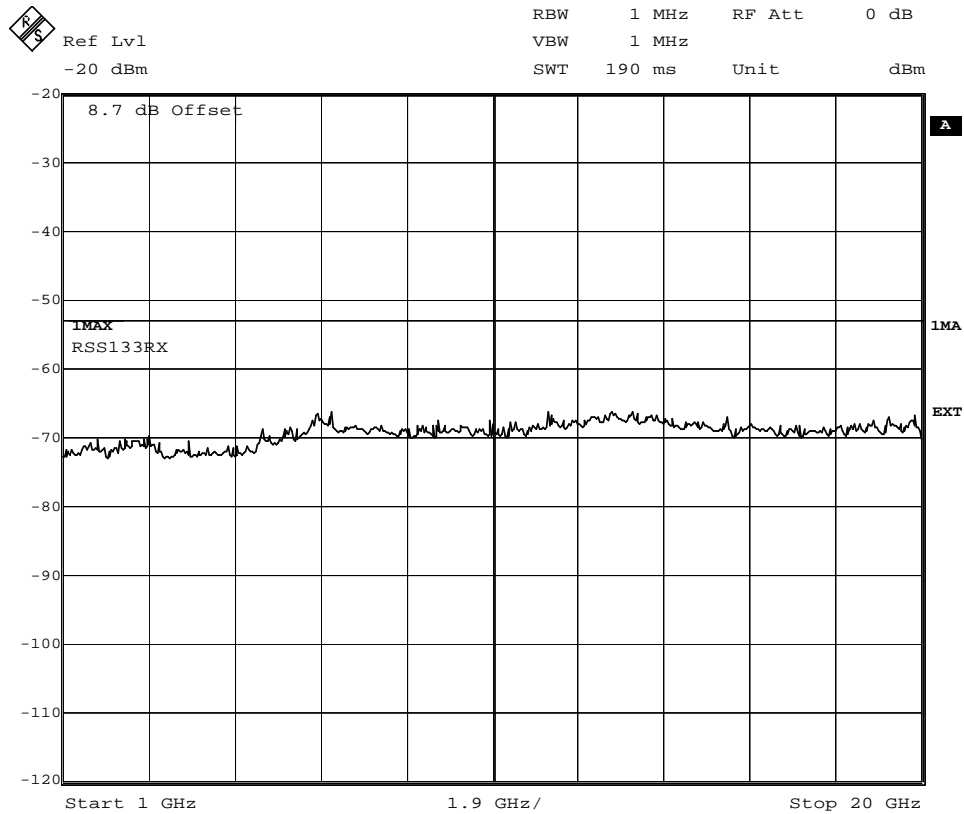
FCC ID: TA8BKRC11819-3 IC: 287AB-BW118193

Appendix 8.1

Diagram 3



Date: 6.NOV.2008 08:37:04



Date: 6.NOV.2008 08:35:48

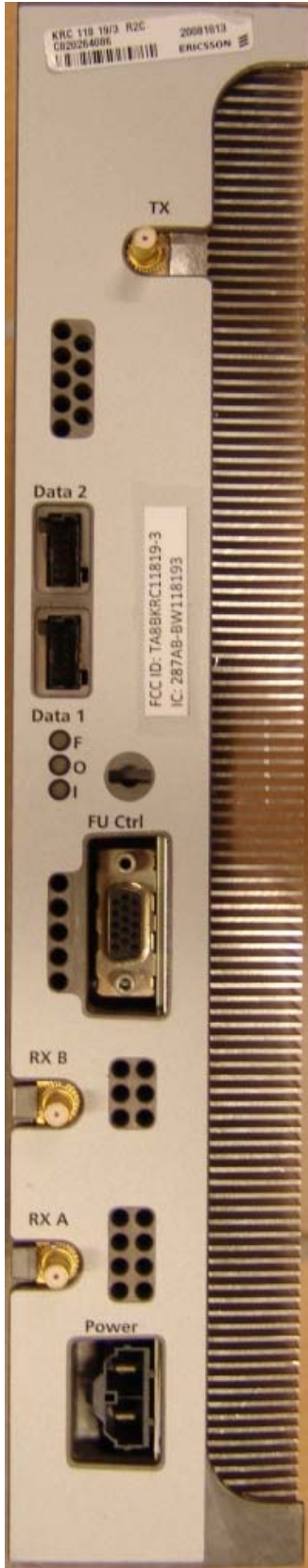
FCC ID: TA8BKRC11819-3
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Appendix 9

Photos

Radio Unit KRC 118 19/3

Front side



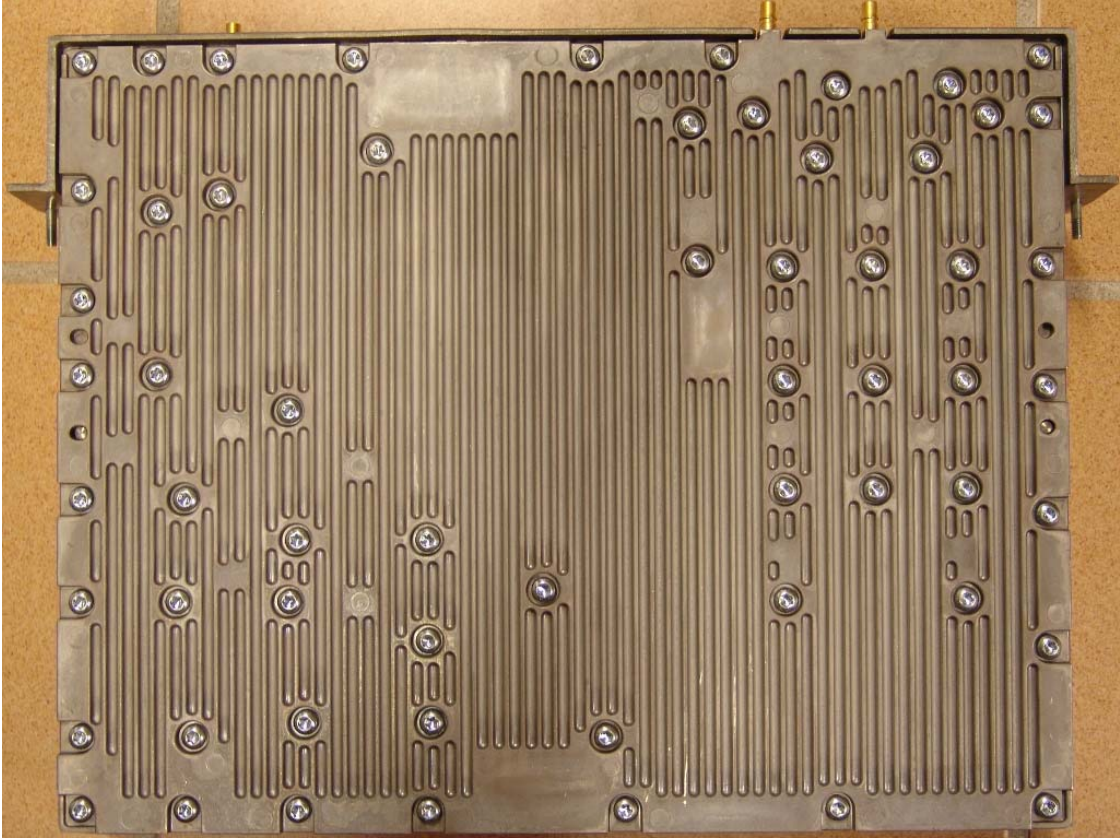
Rear side



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Appendix 9

Left side



Right side

