REPORT

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

1002
ISO/IEC 17025

Date	Reference	Page
2009-05-08	F907629-F22	1 (2)

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Radio measurements on WCDMA 850 MHz Transceiver unit with FCC ID: TA8AKRC161134-51 and IC: 287AB-AW16113451

(9 appendices)

Test object

RRU22 0840 KRC 161 134/51 rev R2A

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-132 Issue 2			
2.1046 / RSS-132 4.4	RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1	Occupied bandwidth	Yes	3
2.1051 / RSS-132 4.5	Band edge	Yes	4
2.1051 / RSS-132 4.5	Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-132 4.5	Field strength of spurious radiation	Yes	6
2.1055 / RSS-132 4.3	Frequency stability	Yes	7
FCC CRF 47 / Industry Canada RSS-132 Issue 2			
15.111 / RSS-132 4.6	Receiver spurious emissions	Yes	8

Note: Above RSS-132 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

SP Technical Research Institute of Sweden
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Technical Manager

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Technical Officer

FCC ID: TA8AKRC161134-51
IC: 287AB-AW16113451

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FCC ID: TA8AKRC161134-51 Appendix 1
IC: 287AB-AW16113451

Description – Test object

Equipment:	WCDMA Radio equipment (RRU) 850 MHz, single and multi carrier.
Tx Frequency range:	Tx: 871.4 – 891.6 MHz Rx: 826.4 – 846.6 MHz
Modulations:	QPSK, 16QAM and 64QAM
Maximum output power:	Single carrier: 1x 46 dBm (1x 40W) Multi carrier: 2x 43 dBm (2x 20W)
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

UARFCN	Frequency
4357	871.4 MHz
4382	876.4 MHz
4407	881.4 MHz
4408	881.6 MHz
4433	886.6 MHz
4458	891.6 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 Ant 1 connector and the RX measurements were done on the Ant 2 connector.

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 RRU unit was allocated to the following UARFCN:

Single Carrier:

Downlink	4357 (871.4 MHz)	4407 (881.4 MHz)	4458 (891.6 MHz)
Uplink	4132 (826.4 MHz)	4182 (836.4 MHz)	4233 (846.6 MHz)

Multi Carrier:

Cell	1	2	1	2
Downlink	4357 (871.4 MHz)	4407 (881.4 MHz)	4408 (881.6 MHz)	4458 (891.6 MHz)
Uplink	4132 (826.4 MHz)	4182 (836.4 MHz)	4183 (836.6 MHz)	4233 (846.6 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-132.

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-132 Issue 2

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	2009-08	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	2009-06	503 285
Climate chamber 3	2009-05	503 546
Multimeter Fluke 87	2010-01	502 190
Testo 635, Temperature and humidity meter	2011-03	504 203
Testo 615, Temperature and humidity meter	2009-11	503 505

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: 2009-04-28

Manufacturer's representative

Xiaoying Jiang, Ericsson (China) Communications Company Ltd.

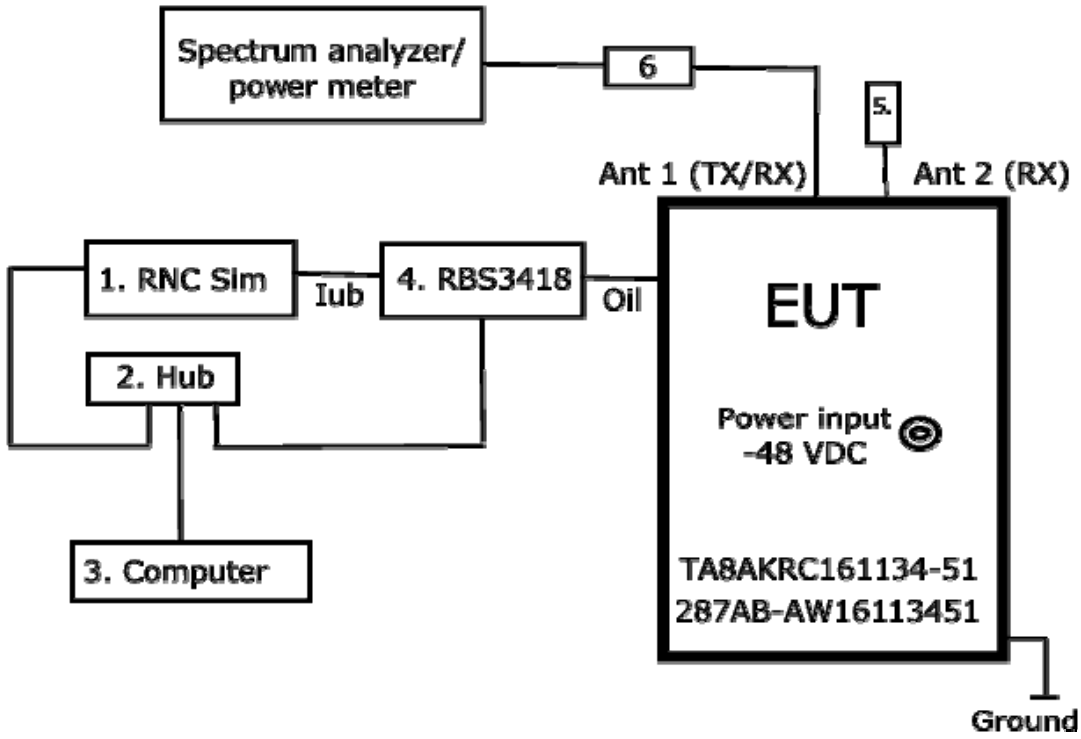
Test engineers

Andreas Johnson, Jonas Bremholt, Jörgen Wassholm and Reinhold Reul

Test witness

Xiaoying Jiang and Zheng Zhao, Ericsson (China) Communications Company Ltd.

Test set-up, conducted measurements TX



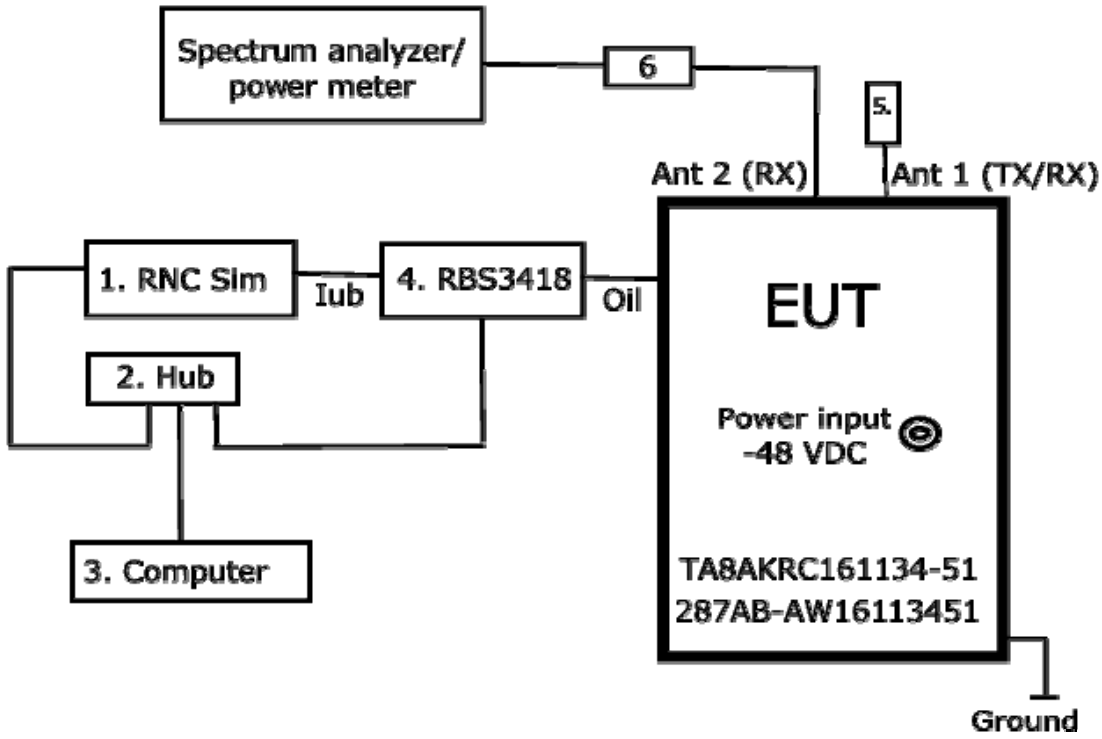
Test object

RRU22 0840 KRC 161 134/51 revision R2A, serial no: (s)CB48512587
(FCC ID: TA8AKRC161134-51/ IC: 287AB-AW16113451)

Functional test equipment

1. RNC Sim 4780 FA, Mini-sim #13, BAMS-1000351993
2. Ethernet switch, Tenda TEH108SK, serial no: S108SK01484801225
3. Computer, Sun Ultra 45, asset ID AP014388
4. RBS3418, product no. BFE 401 1019 Rev R1A, serial no. TA63705843 with software CXP 901 2959/1 rev. R9AA06
5. RF terminator
6. RF Antennuator

Test set-up, conducted measurements RX



Test object

RRU22 0840 KRC 161 134/51 revision R2A, serial no: (s)CB48512587
(FCC ID: TA8AKRC161134-51/ IC: 287AB-AW16113451)

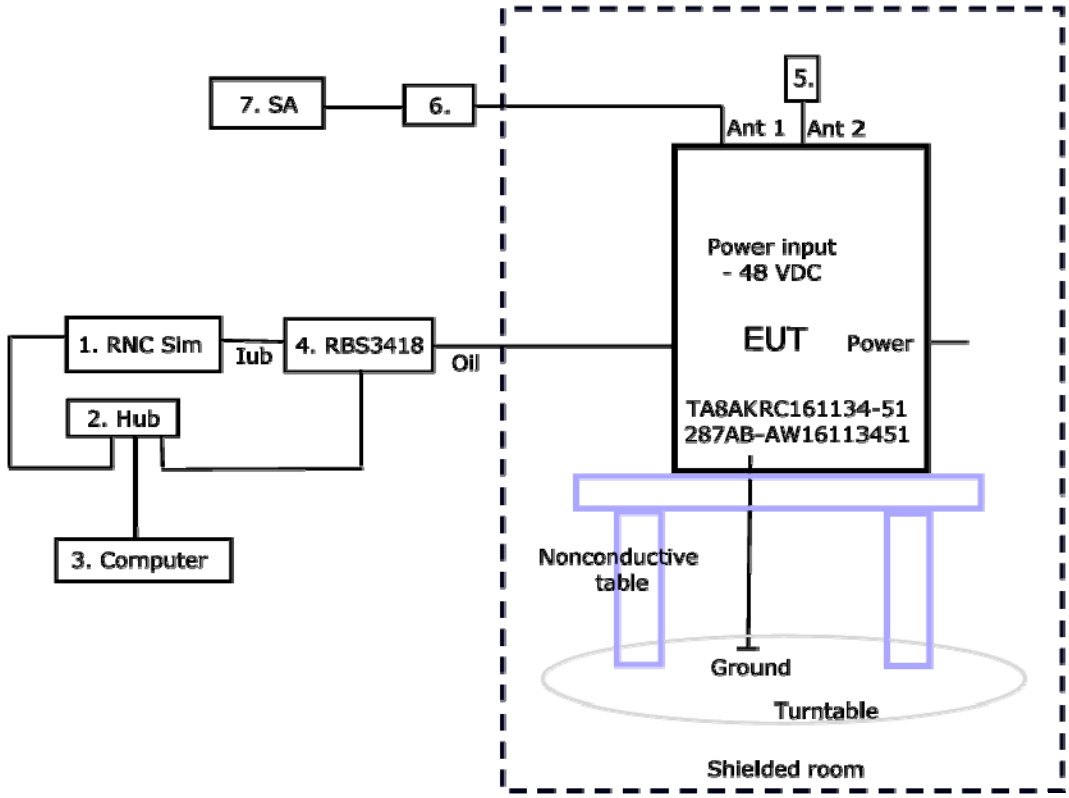
Functional test equipment

1. RNC Sim 4780 FA rev CDA, Mini-sim #13, BAMS-1000351993
2. Ethernet switch, Tenda TEH108SK, serial no: S108SK01484801225
3. Computer, Sun Ultra 45, asset ID AP014388
4. RBS3418, product no. BFE 401 1019 Rev R1A, serial no. TA63705843 with software CXP 901 2959/1 rev. R9AA06
5. RF terminator
6. RF Antennuator

FCC ID: TA8AKRC161134-51
IC: 287AB-AW16113451

Appendix 1

Test set-up, radiated measurements



Test object

RRU22 0840 KRC 161 134/51, Rev. R2A, (S)CB48512586
(FCC ID: TA8AKRC161134-51/ IC: 287AB-AW16113451)

Functional test equipment

1. RNC Sim 4780 FA, mini-SIM#27, s/n CH45000186 rev.BAA, BAMS 1000086811
2. Fast Ethernet switch, TENDA TEH500S, s/n S500S002085228528
3. Computer Sunblade 1500, s/n MT50610040
4. RBS3418, product no. BFE 401 1019 Rev R1A, serial no. TA634037772 with software CXP 901 2959/1 rev. R9AA06
5. Termination (50 Ω)
6. Attenuator 40 dB, model DTS100-40-3
7. FSQ 40, Signal analyzer, SP 504 143. Used for supervision only.

Interfaces:	**Type of port:**
Power configuration: -48 VDC	DC Power
Antenna 1 (TX/RX): Coaxial cable with N connector	Antenna
Antenna 2 (RX): Terminated in 50 Ω	Antenna
Oil: Optical interface link via CPRI	Telecom

FCC ID: TA8AKRC161134-51 Appendix 2
IC: 287AB-AW16113451

RF power output measurements according to 47 CFR 2.1046/ RSS-132 4.4

Date	Temperature	Humidity
2009-05-04	22 °C ± 3 °C	36 % ± 5 %
2009-05-05	23 °C ± 3 °C	34 % ± 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 635, Temperature and humidity meter	504 203

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 871.4 MHz	Frequency 881.4 MHz	Frequency 891.6 MHz
45.8/ 6.2	45.5/ 6.1	45.7/ 6.5

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

Transmitter combined power (dBm/ dB) RMS/ PAR	
Frequencies 871.4 MHz 881.4 MHz	Frequencies 881.6 MHz 891.6 MHz
45.5/ 6.9	45.4/ 7.0

Limit

According to CFR 47/ RSS there are no conducted limits at the antenna connector.

CFR § 22.913/ SRSP-503 5.1: The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57 dBm).

RSS-132: The transmitter output power shall not exceed the limits given in SRSP-503

Complies?	Yes

FCC ID: TA8AKRC161134-51 Appendix 3
IC: 287AB-AW16113451

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

Date	Temperature	Humidity
2009-05-04	22 °C ± 3 °C	36 % ± 5 %
2009-05-05	23 °C ± 3 °C	34 % ± 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 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

Channel Bandwidth 5.0 MHz

	Frequency	OBW
Diagram 1	871.4 MHz	4.18 MHz
Diagram 2	881.4 MHz	4.18 MHz
Diagram 3	891.6 MHz	4.18 MHz

Channel Bandwidth 4.2 MHz

	Frequency	OBW
Diagram 4	871.4 MHz	3.86 MHz
Diagram 5	881.4 MHz	3.86 MHz
Diagram 6	891.6 MHz	3.86 MHz

FCC ID: TA8AKRC161134-51 Appendix 3.1
IC: 287AB-AW16113451

Diagram 1

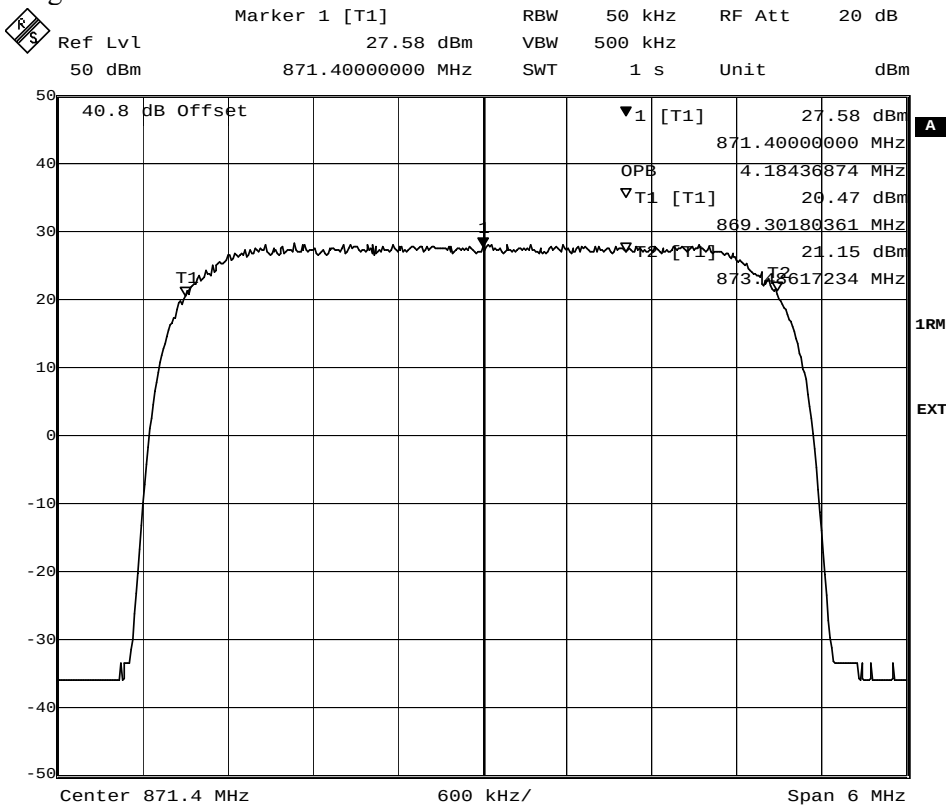


Diagram 2

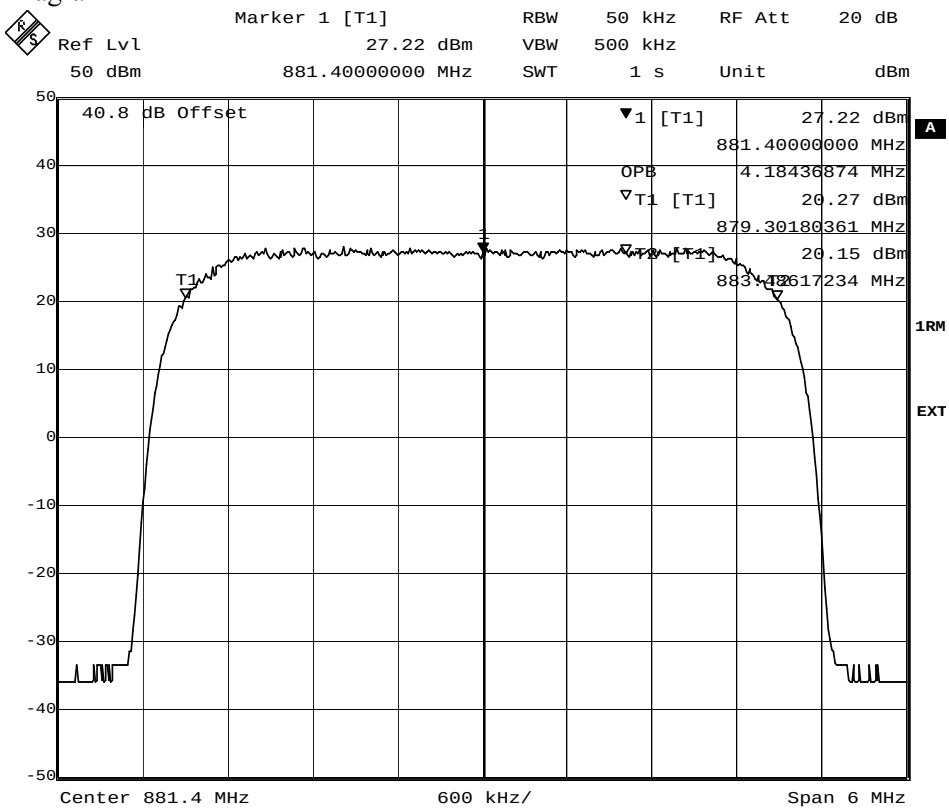


Diagram 3

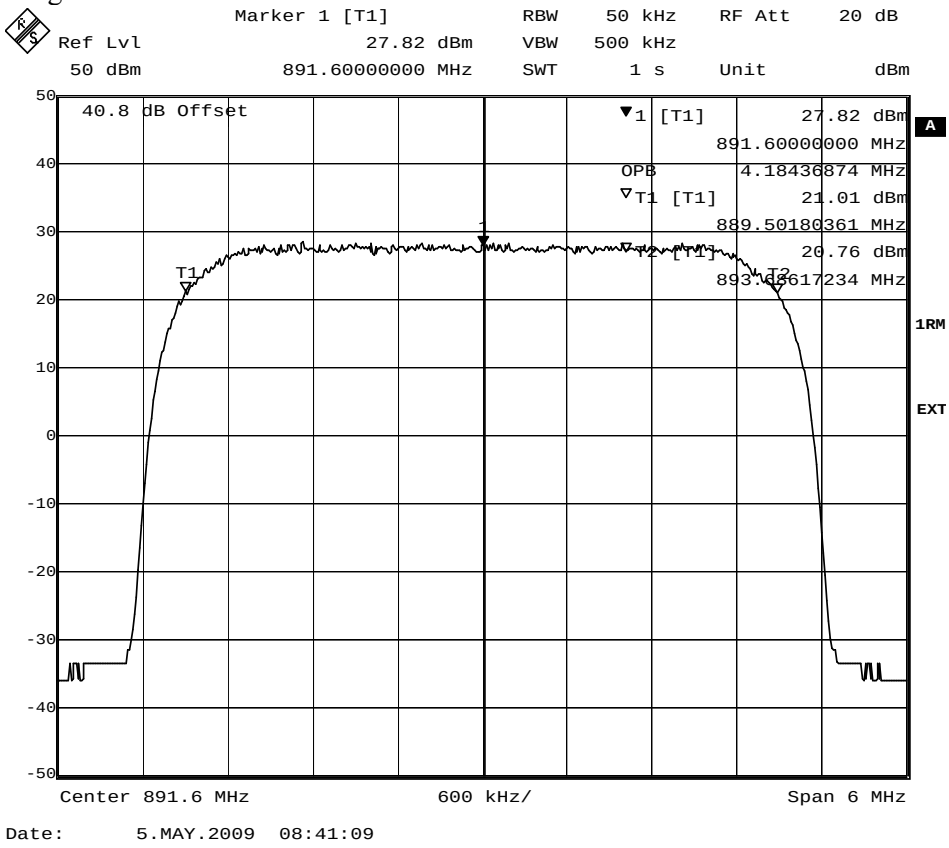


Diagram 4

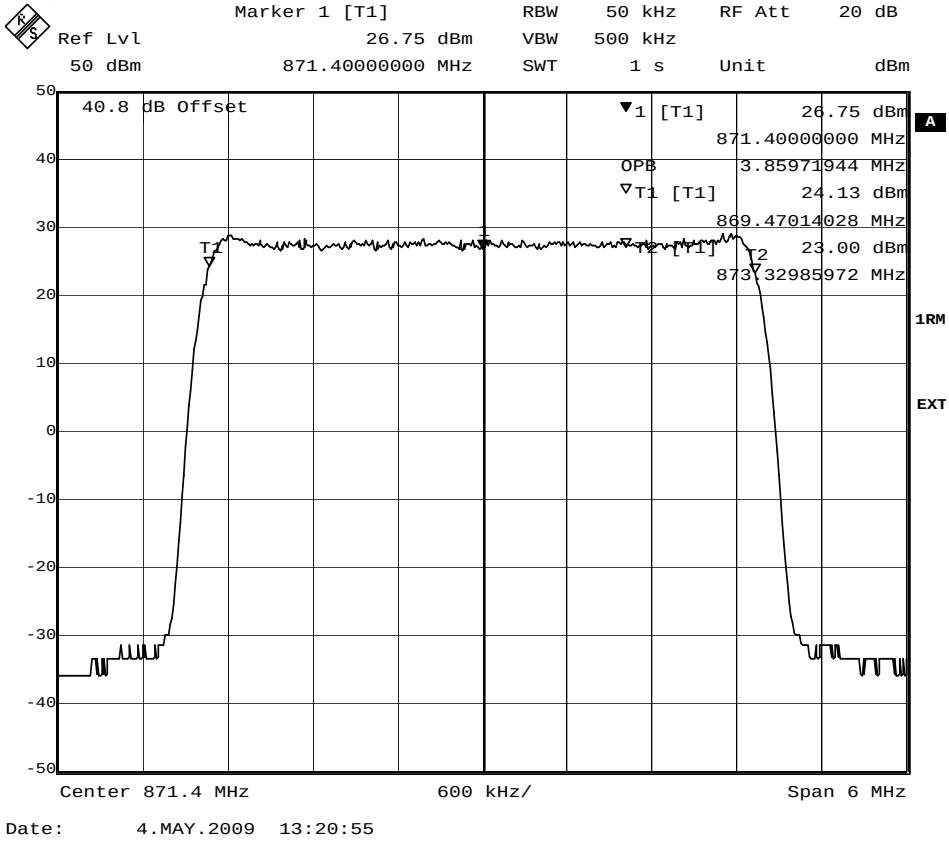


Diagram 5

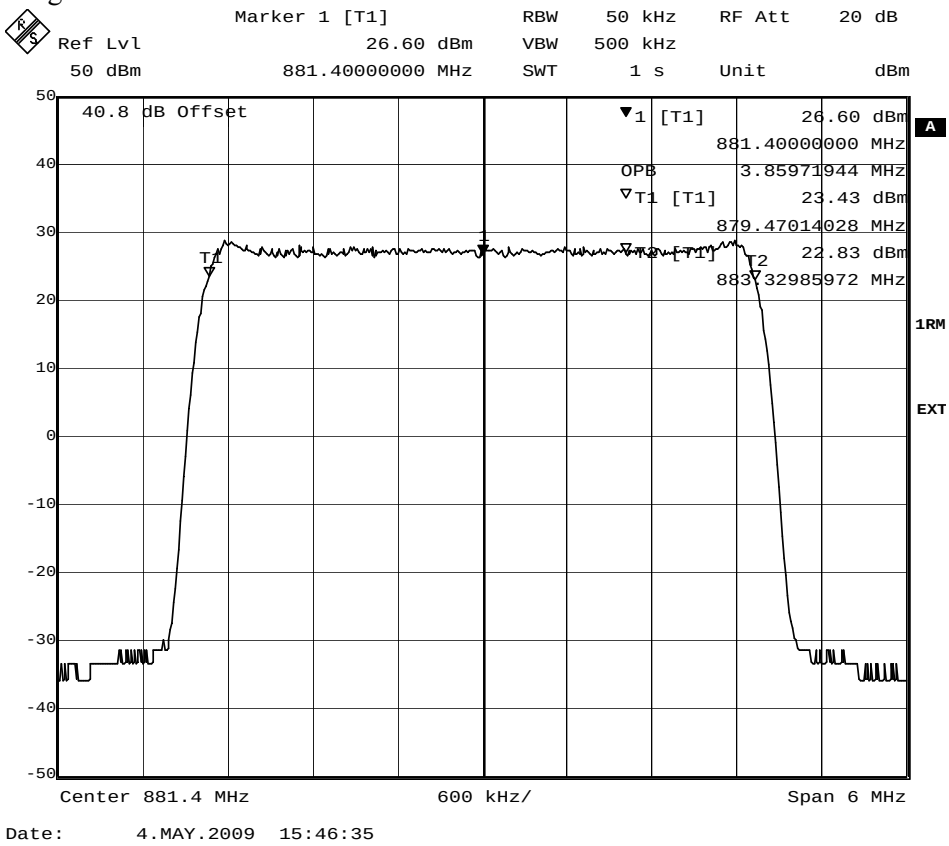


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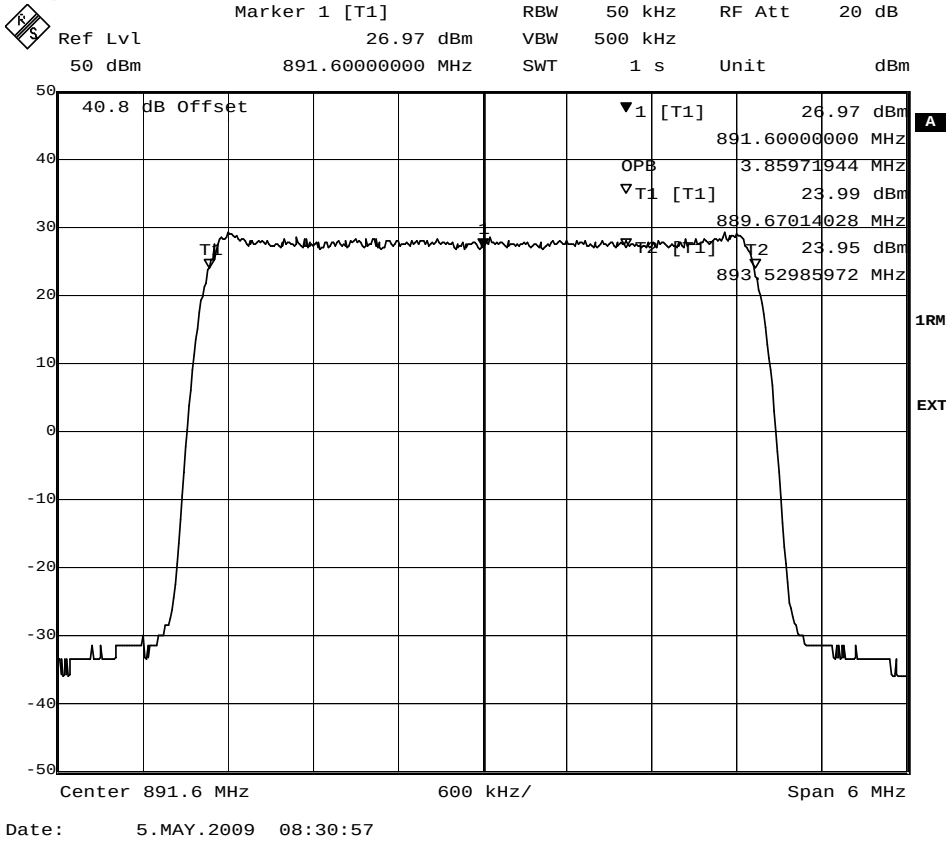
Diagram 6



Date: 5.MAY.2009 08:30:57

FCC ID: TA8AKRC161134-51 Appendix 4
IC: 287AB-AW16113451

Band edge measurements according to 47 CFR 2.1051/ RSS-132 4.5

Date	Temperature	Humidity
2009-05-04	22 °C ± 3 °C	36 % ± 5 %
2009-05-05	23 °C ± 3 °C	34 % ± 5 %

Test set-up and procedure

The measurements were made as defined in §22.917. 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 bandwidth, 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 from 1 MHz to 3.25 MHz away from the band edges.

Measurement equipment	SP number
R&S FSIQ	503 738
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Single carrier:
Diagram 1: 871.4 MHz
Diagram 2: 891.6 MHz

Multi carrier:
Diagram 3: 871.4+876.4 MHz
Diagram 4: 891.6+886.6 MHz

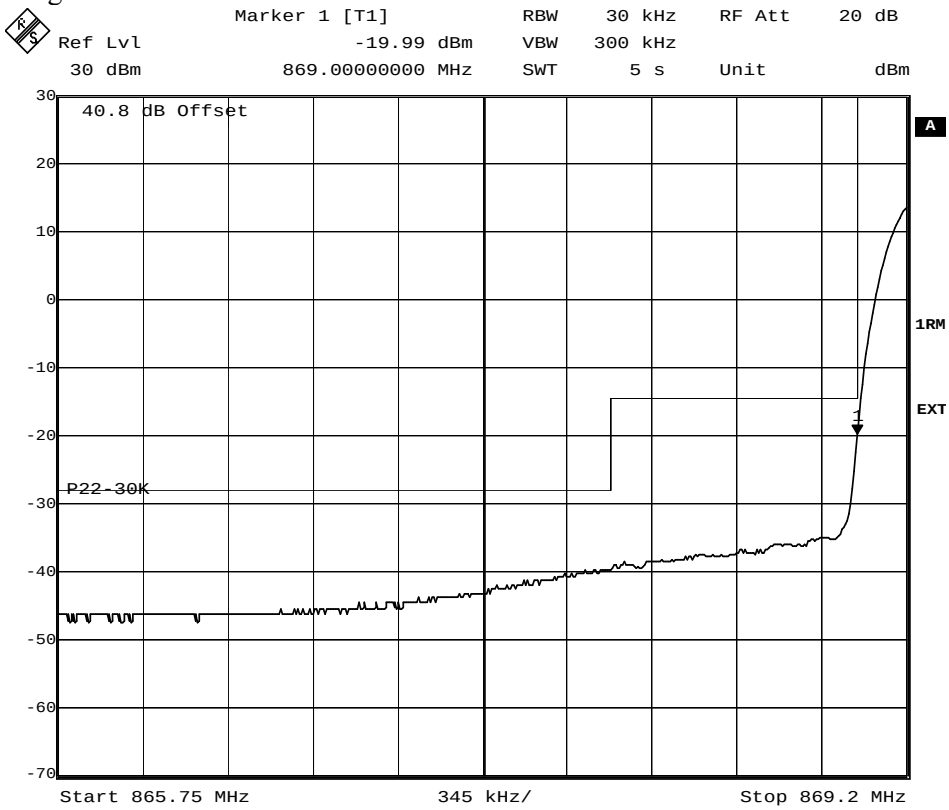
Limits

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

FCC ID: TA8AKRC161134-51 Appendix 4.1
IC: 287AB-AW16113451

Diagram 1



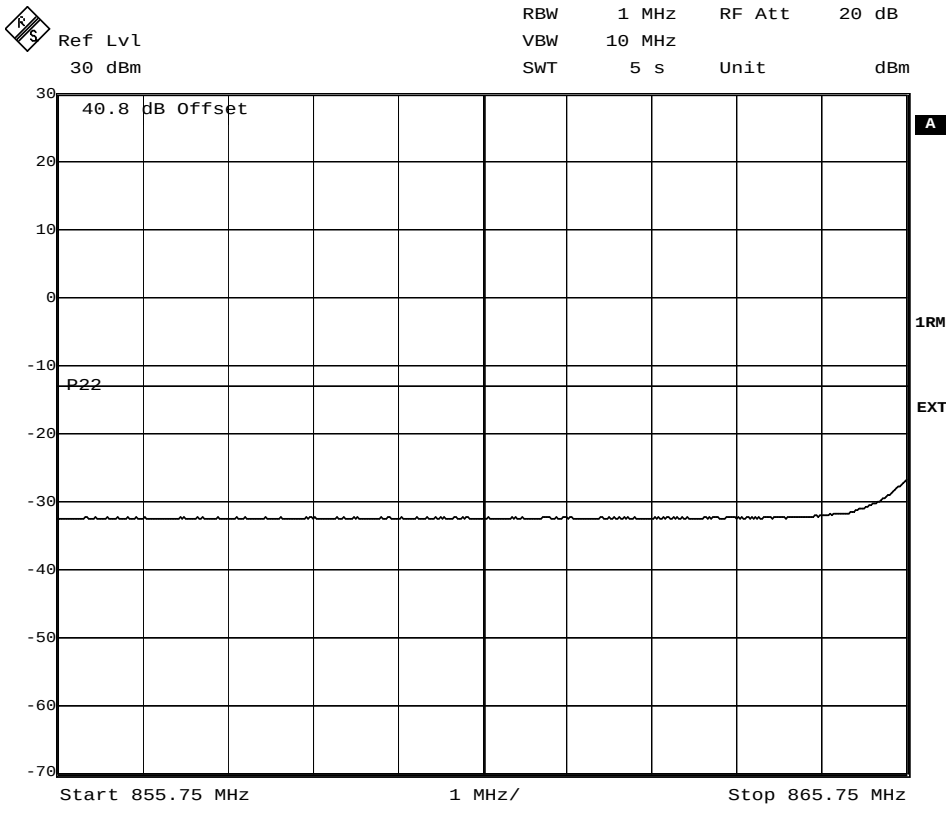
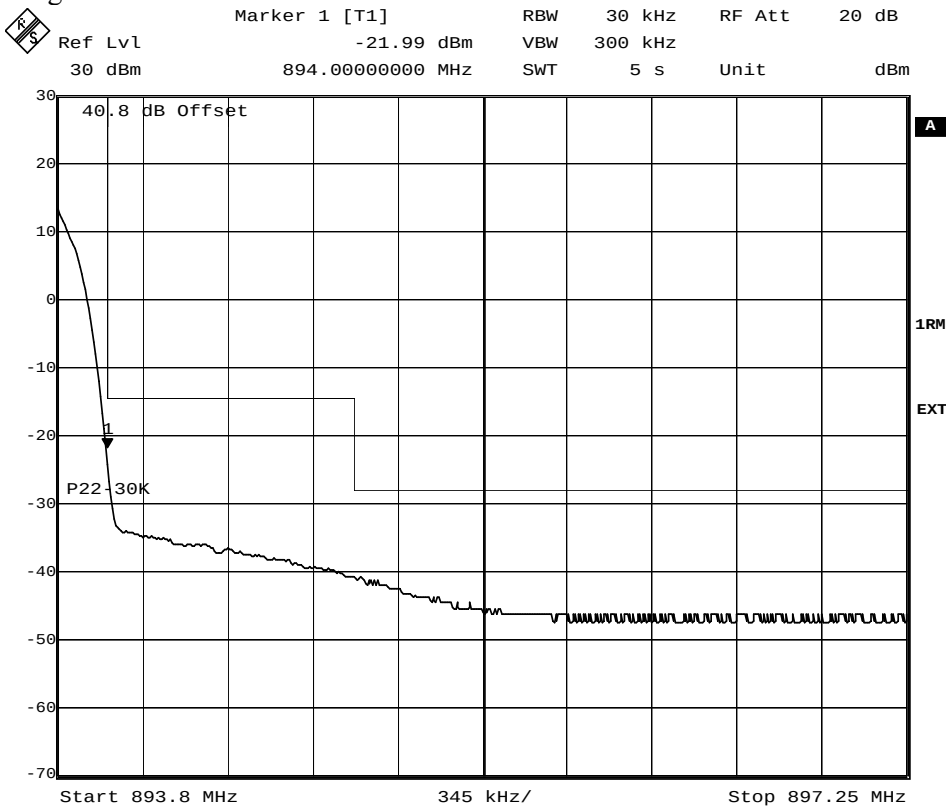


Diagram 2


Marker 1 [T1]
Ref Lvl
30 dBm
-21.99 dBm
894.00000000 MHz
RBW 30 kHz
VBW 300 kHz
SWT 5 s
RF Att 20 dB
Unit dBm
40.8 dB Offset
A
1RM
EXT
P22-30K
Start 893.8 MHz
345 kHz/
Stop 897.25 MHz
Date: 5.MAY.2009 08:47:50

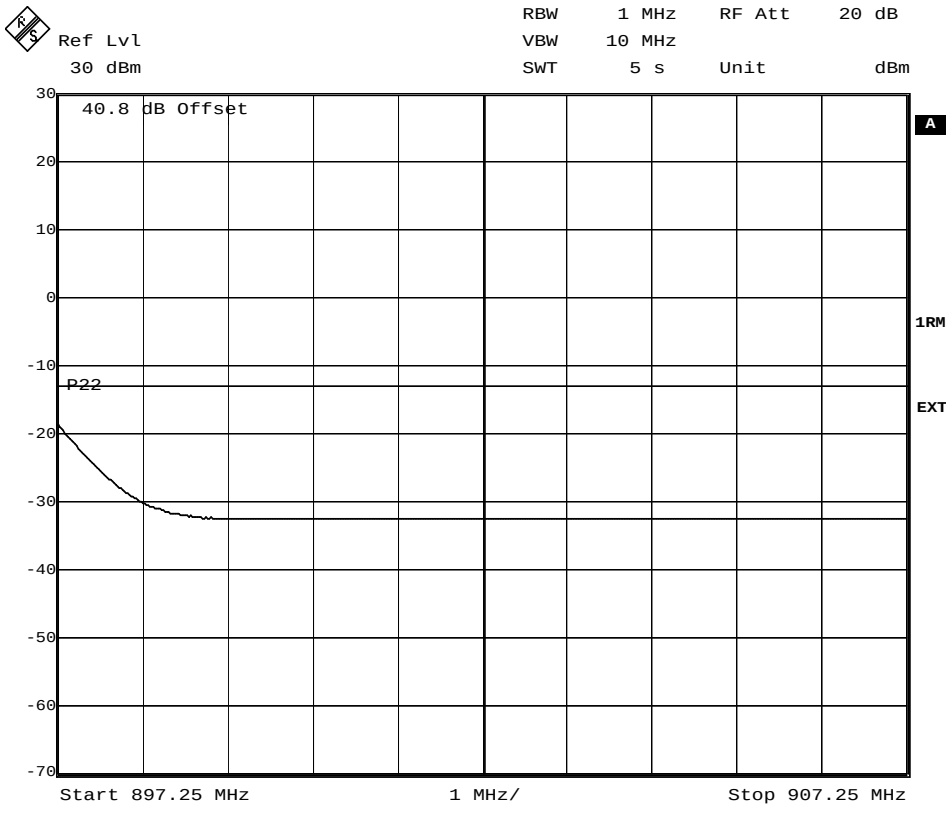
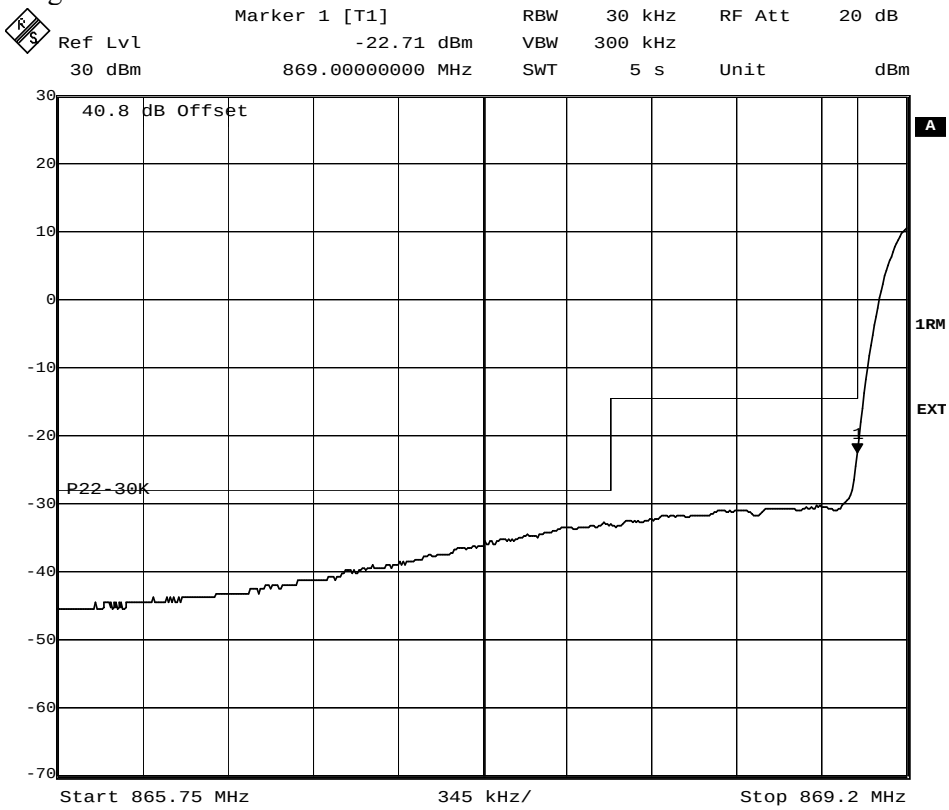

Ref Lvl
30 dBm
RBW 1 MHz
VBW 10 MHz
SWT 5 s
RF Att 20 dB
Unit dBm
40.8 dB Offset
A
1RM
EXT
P22
Start 897.25 MHz
1 MHz/
Stop 907.25 MHz
Date: 5.MAY.2009 08:51:11

Diagram 3



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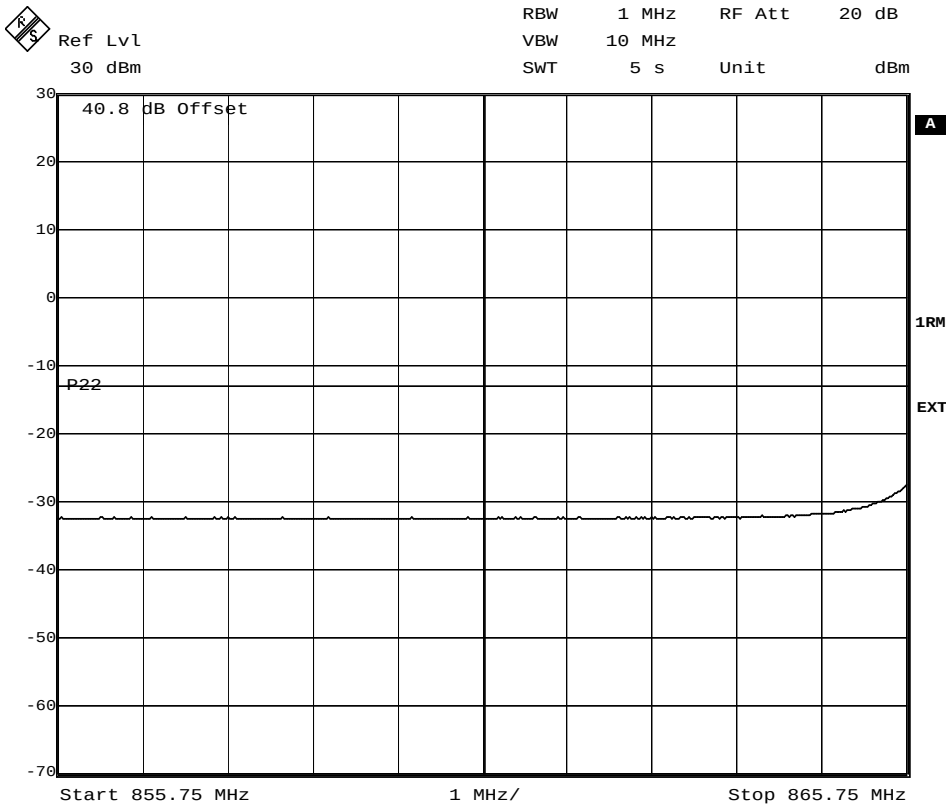

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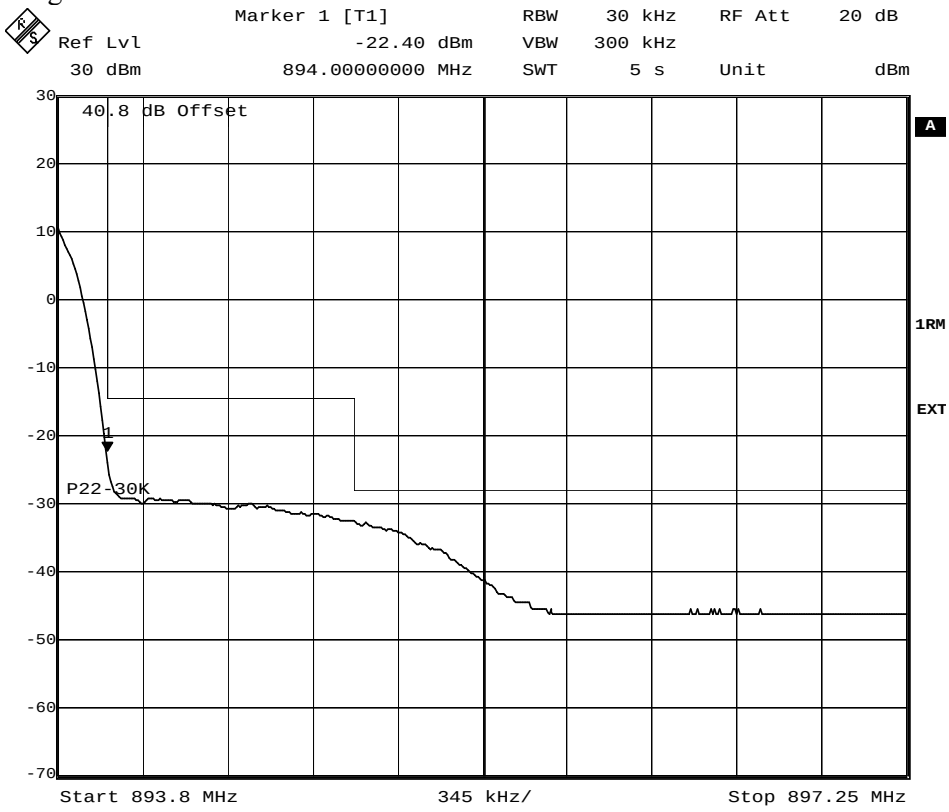
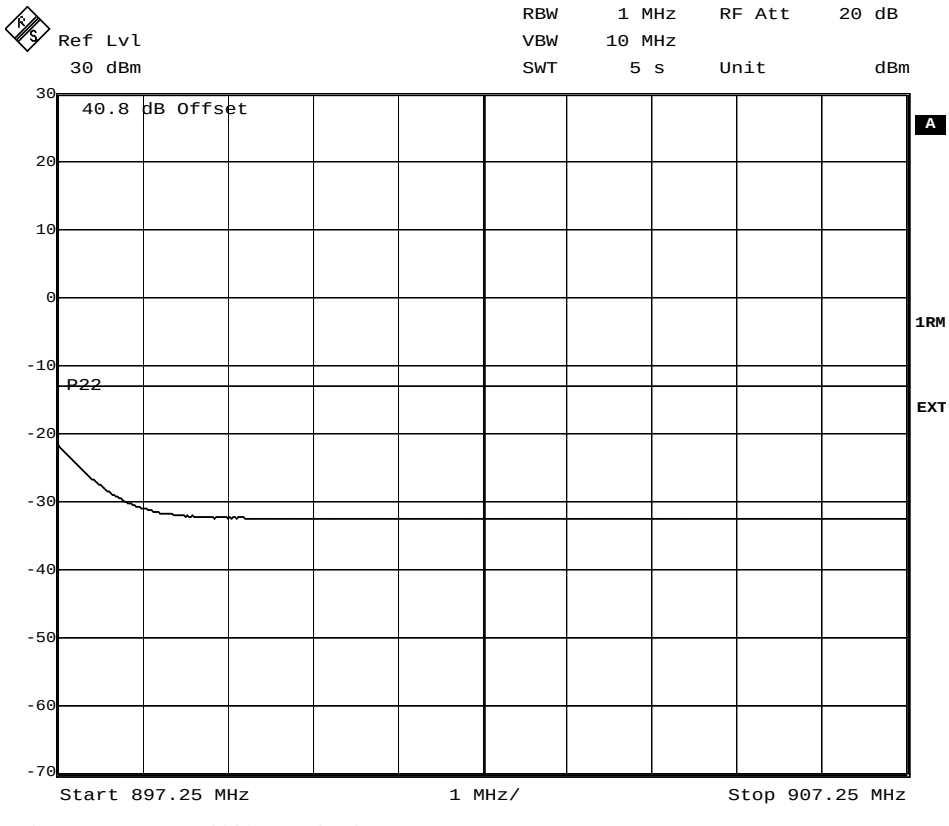
FCC ID: TA8AKRC161134-51 Appendix 4.1
IC: 287AB-AW16113451

Diagram 4





FCC ID: TA8AKRC161134-51 Appendix 5
IC: 287AB-AW16113451

Conducted spurious emission measurements according to 47 CFR 2.1051/ RSS-132 4.5

Date	Temperature	Humidity
2009-05-04	22 °C ± 3 °C	36 % ± 5 %
2009-05-05	23 °C ± 3 °C	34 % ± 5 %

Test set-up and procedure

The measurements were made with a resolution bandwidth of 1 MHz instead of 100 kHz as RSS-132 specify 1 MHz for equipment with an emission bandwidth of ≥4 MHz. 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 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier:
Diagram 1: 871.4 MHz
Diagram 2: 881.4 MHz
Diagram 3: 891.6 MHz

Multi carrier:
Diagram 4: 871.4+881.4 MHz
Diagram 5: 881.6+891.6 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.

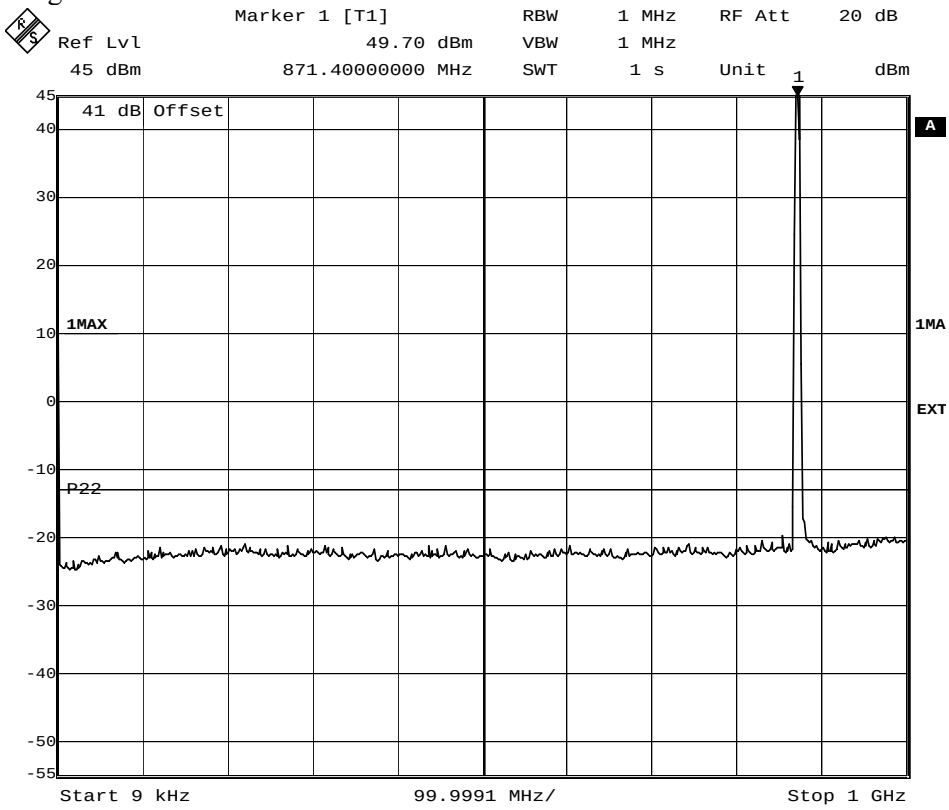
Limits

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: TA8AKRC161134-51 Appendix 5.1
IC: 287AB-AW16113451

Diagram 1



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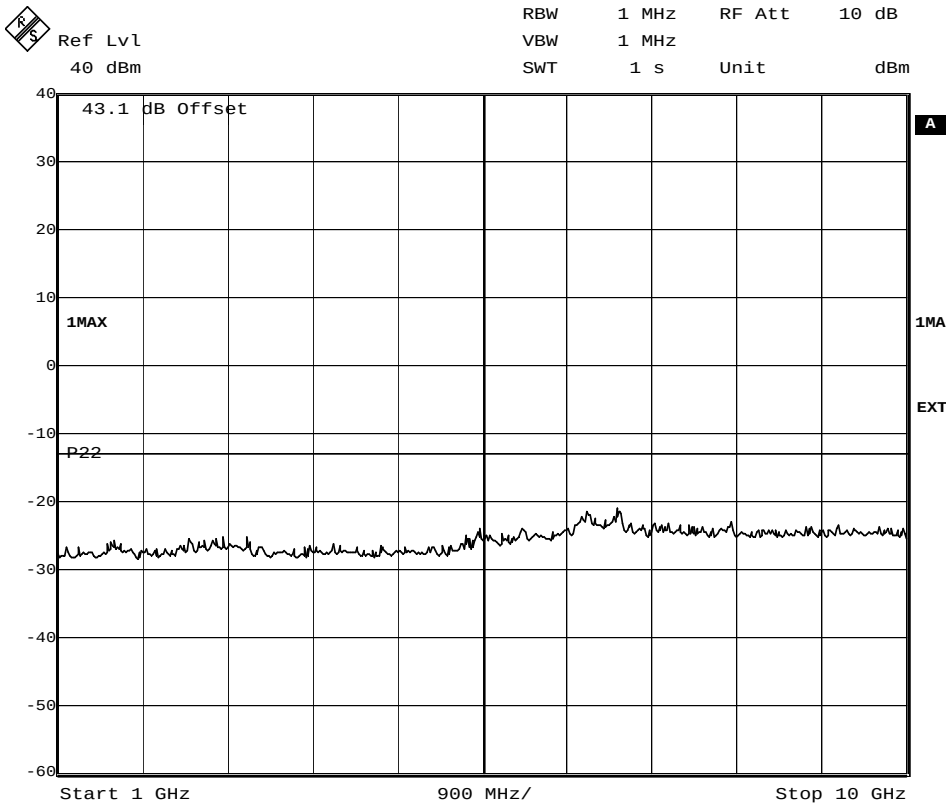

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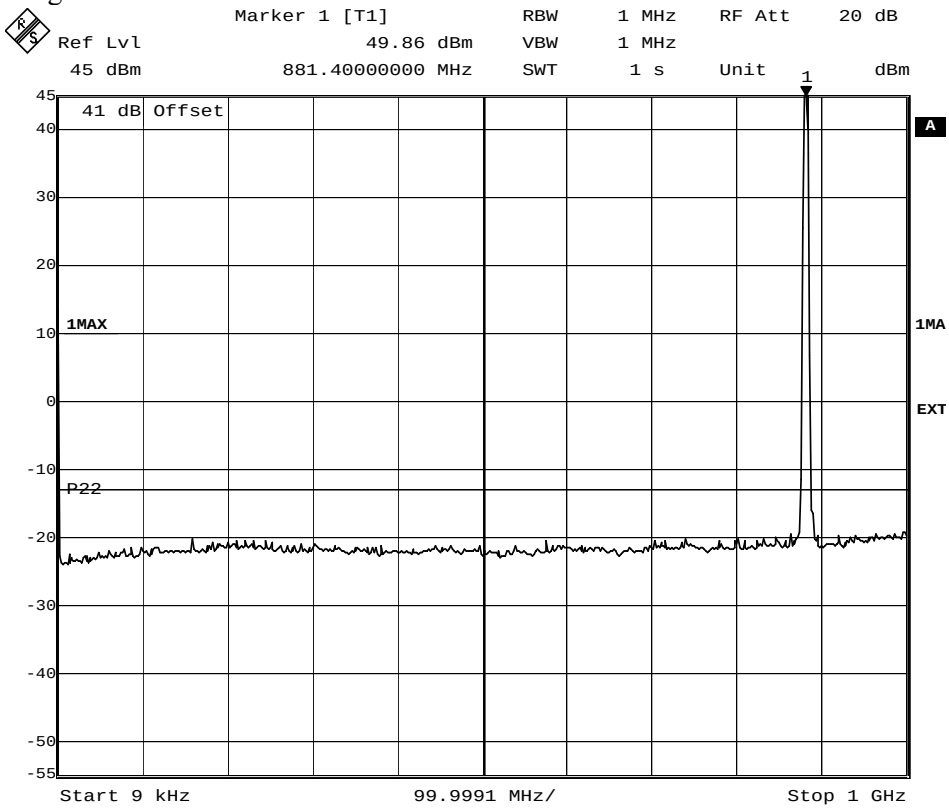
Diagram 2



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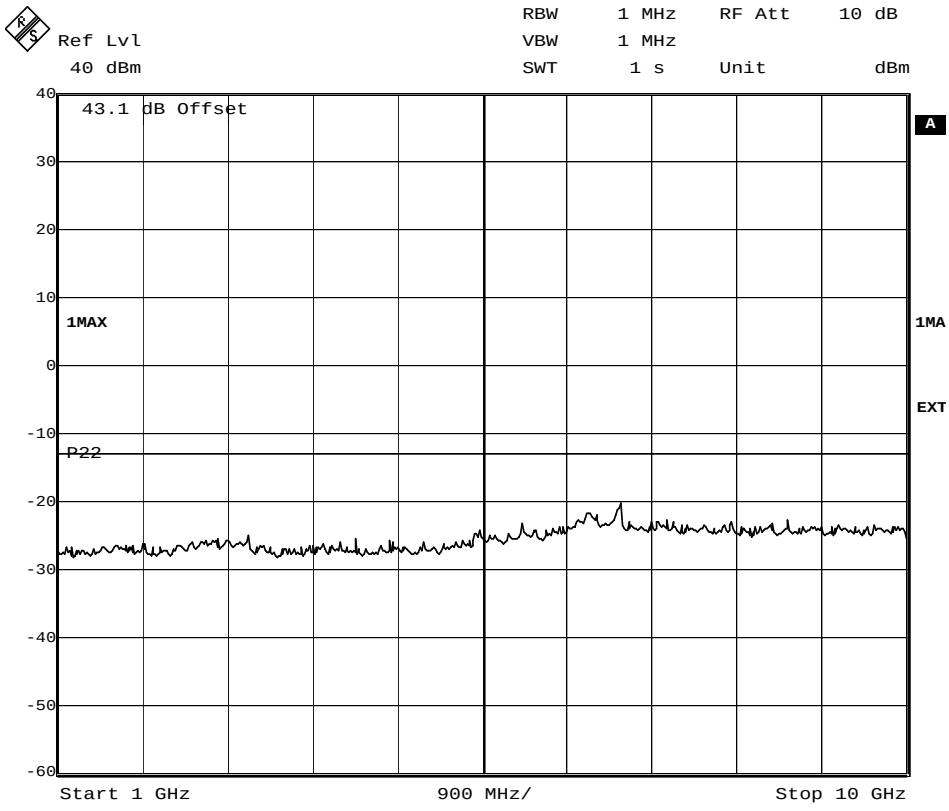

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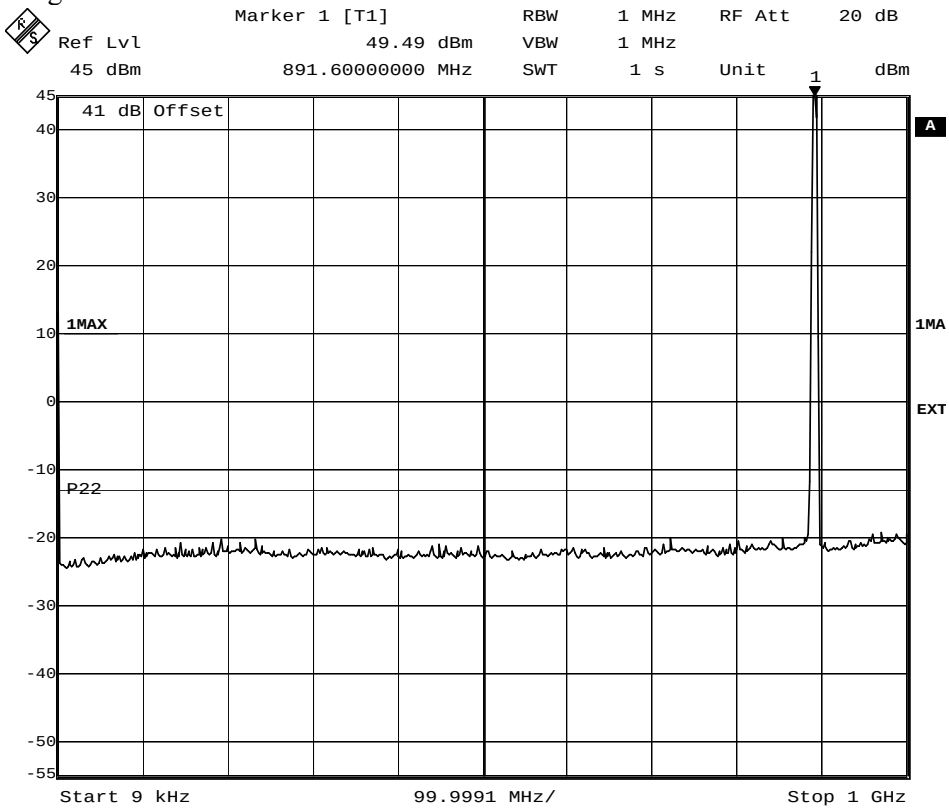
Diagram 3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Ref Lvl
45 dBm
49.49 dBm
891.60000000 MHz
RBW 1 MHz
VBW 1 MHz
SWT 1 s
RF Att 20 dB
Unit dBm
41 dB Offset
1MAX
P22
A
1MA
EXT
Start 9 kHz
99.9991 MHz/
Stop 1 GHz
Date: 5.MAY.2009 08:52:48

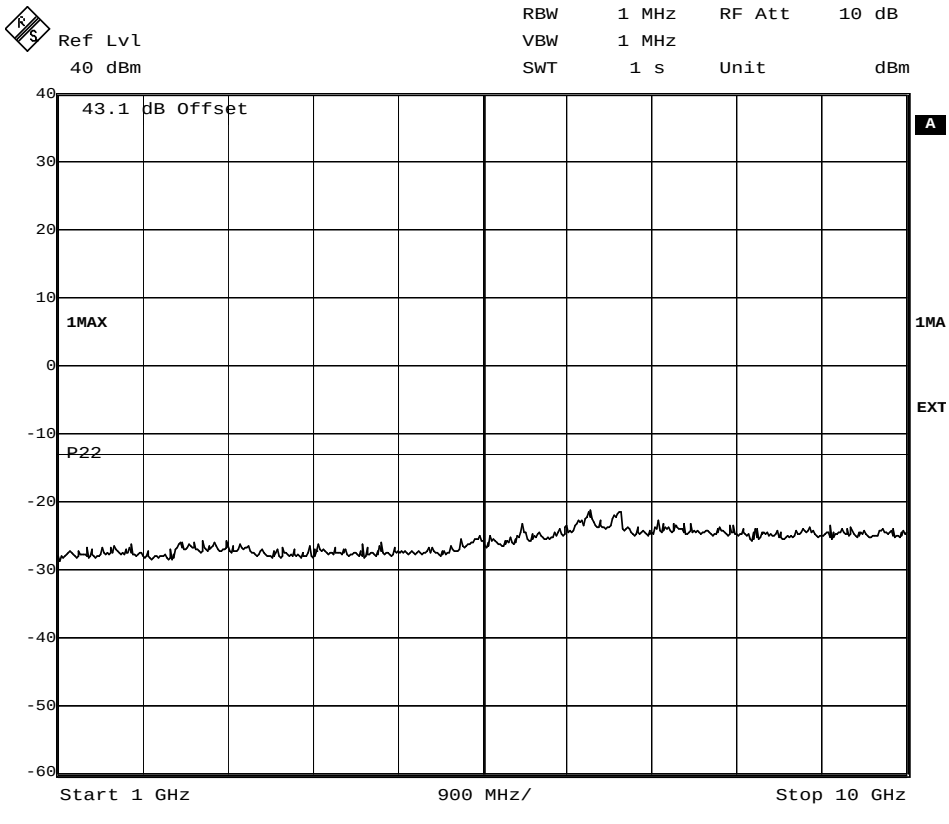
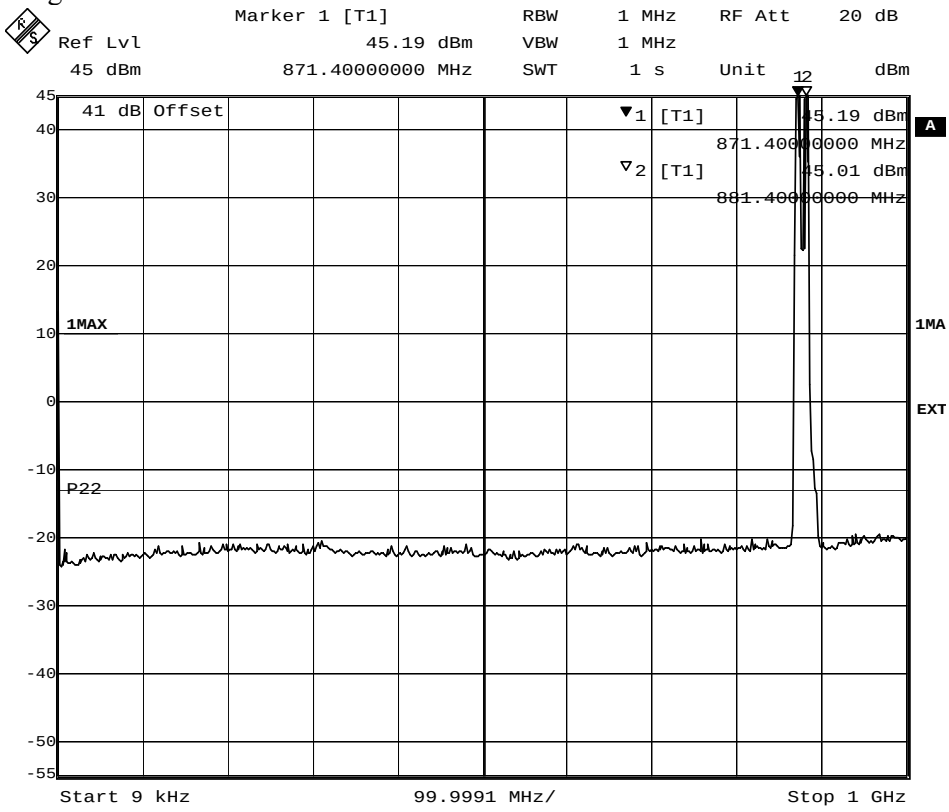

Ref Lvl
40 dBm
RBW 1 MHz
VBW 1 MHz
SWT 1 s
RF Att 10 dB
Unit dBm
43.1 dB Offset
1MAX
P22
A
1MA
EXT
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 5.MAY.2009 08:55:20

Diagram 4



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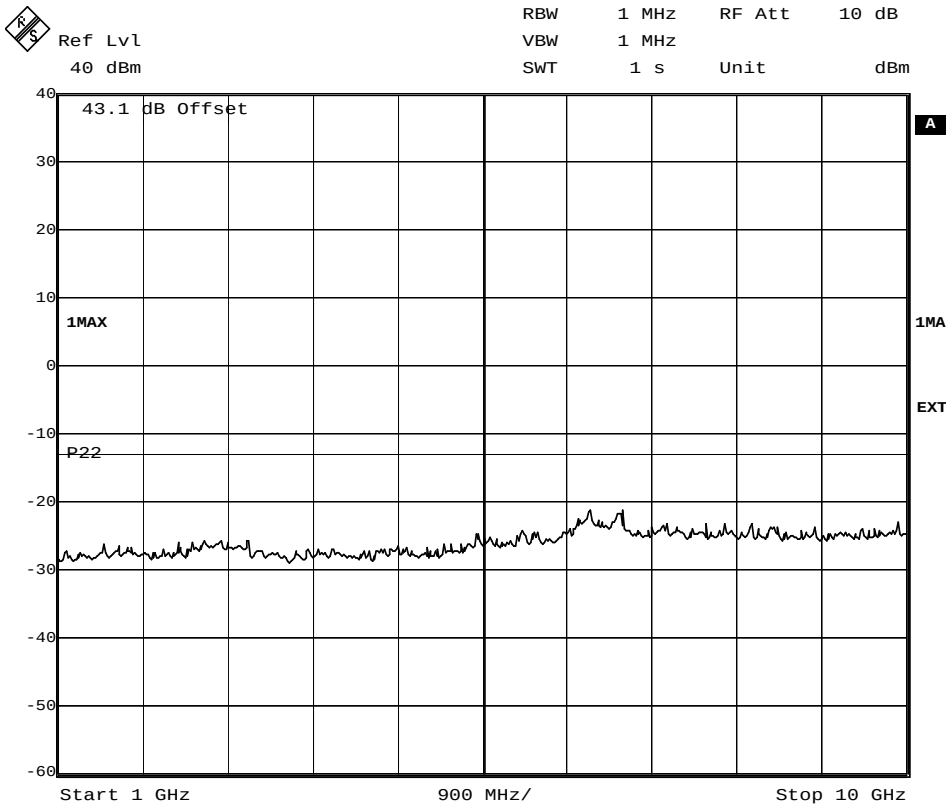
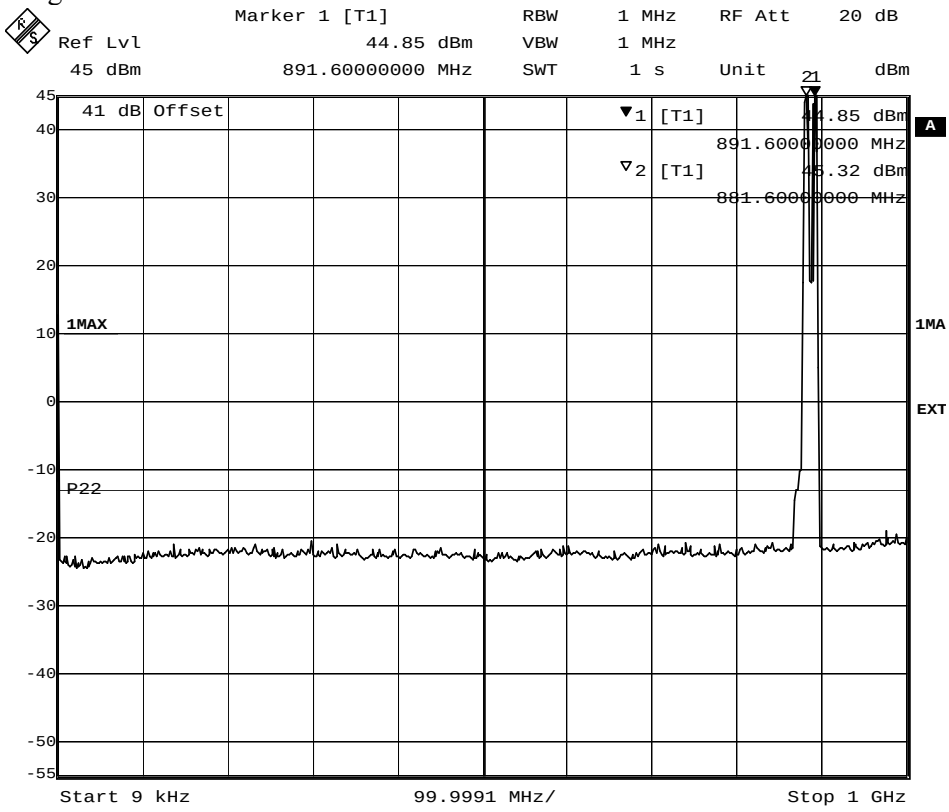
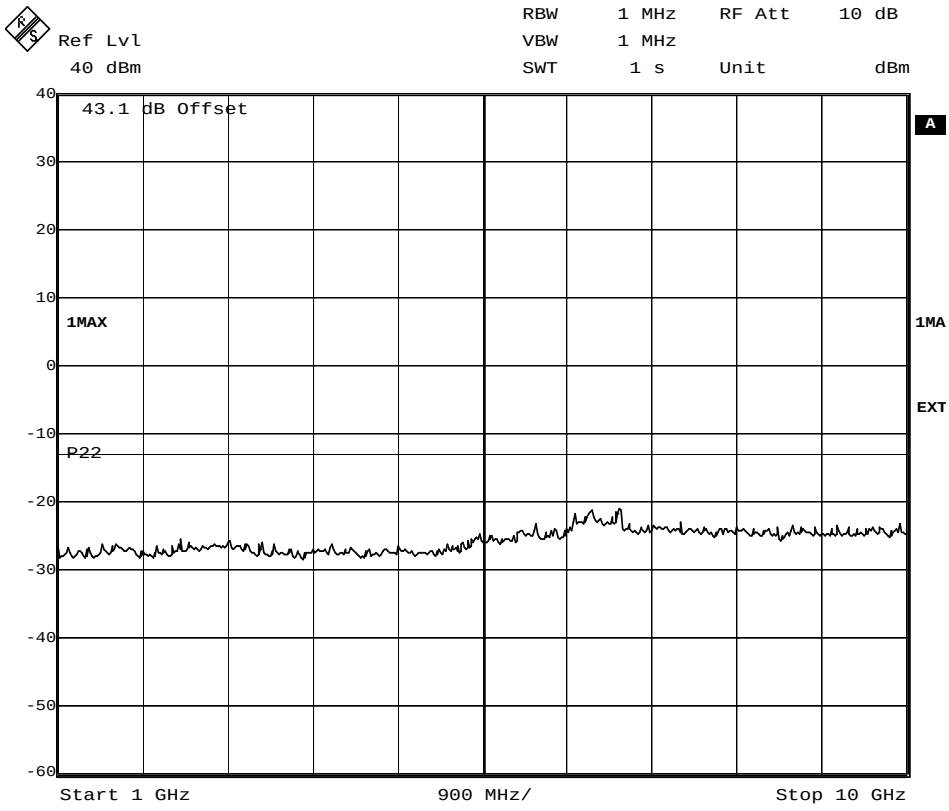


Date: 5.MAY.2009 10:45:06

Diagram 5



Date: 5.MAY.2009 11:04:17



Date: 5.MAY.2009 11:07:07

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Field strength of spurious radiation measurements according to 47 CFR 2.1053/ RSS-132 4.5

Date	Temperature	Humidity
2009-05-04 to 2009-05-06	22-23 °C ± 3 °C	28-32 % ± 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. Antenna port 1 was connected to functional test equipment outside the test chamber for signal monitoring. Antenna port 2 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.

1. A pre-measurement was first performed:
2. In the frequency range 30 MHz-10 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
MITEQ Low Noise Amplifier	503 285
Testo 615, Temperature and humidity meter	503 505

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

Results

Single carrier

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-10 000	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
30-10 000	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-132 4.3

Date	Temperature (test equipment)	Humidity (test equipment)
2009-05-06 to 2009-05-08	23°C ± 3 °C	31-35 % ± 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	503 738
Testo 635, Temperature and humidity meter	504 203
Climate chamber 3	503 546

Results

Nominal Voltage -48 V DC
Maximum output power at 881.4 MHz

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	-30
-55.2	+20	-35
-40.8	+20	+31
-48.0	+30	-48
-48.0	+40	+26
-48.0	+50	+36
-48.0	+10	-33
-48.0	0	-36
-48.0	-10	-37
-48.0	-20	+30
-48.0	-30	-25
Maximum freq. error (Hz)		48
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 (56.1 Hz).

Complies?	Yes

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Receiver spurious emissions measurements according to 47 CFR 15.111/ IC RSS-132, section 4.6.

Date	Temperature	Humidity
2009-05-05	23°C ± 3 °C	34 % ± 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	SP number
R&S FSIQ 40	503 738
Testo 635, Temperature and humidity meter	504 203

Result

The results are shown in appendix 8.1:

	Rx frequency
Diagram 1	826.4 MHz
Diagram 2	836.4 MHz
Diagram 3	846.6 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.

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.

Limit

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

Emission below limit?	Yes

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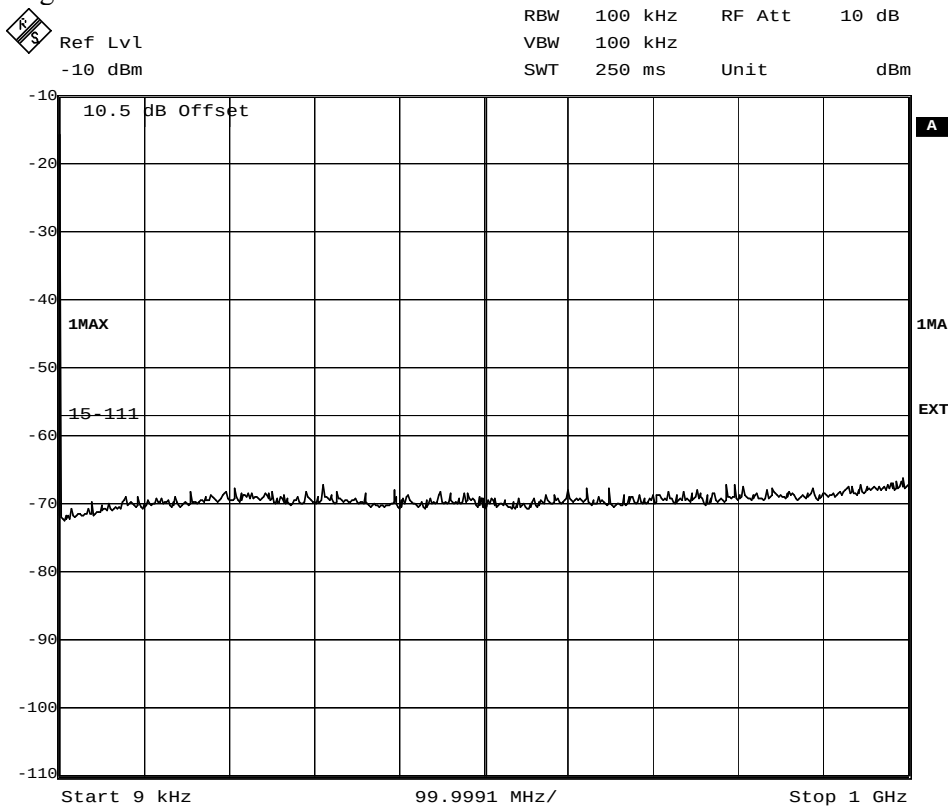
IC: 287AB-AW16113451

Diagram 1



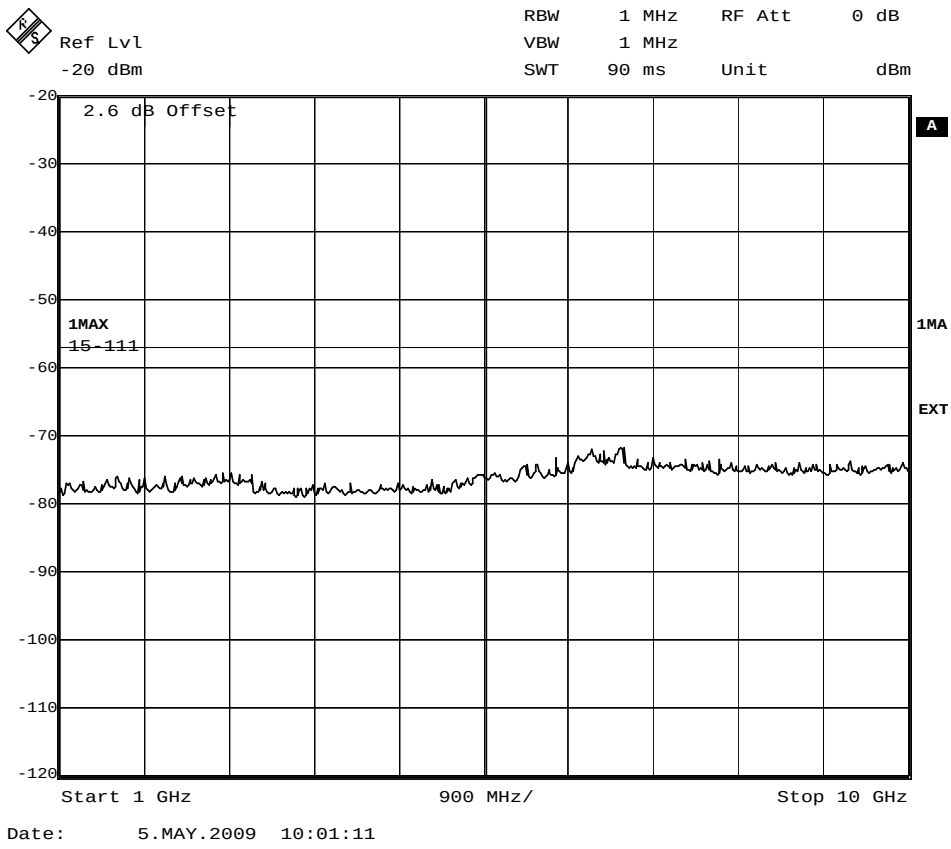


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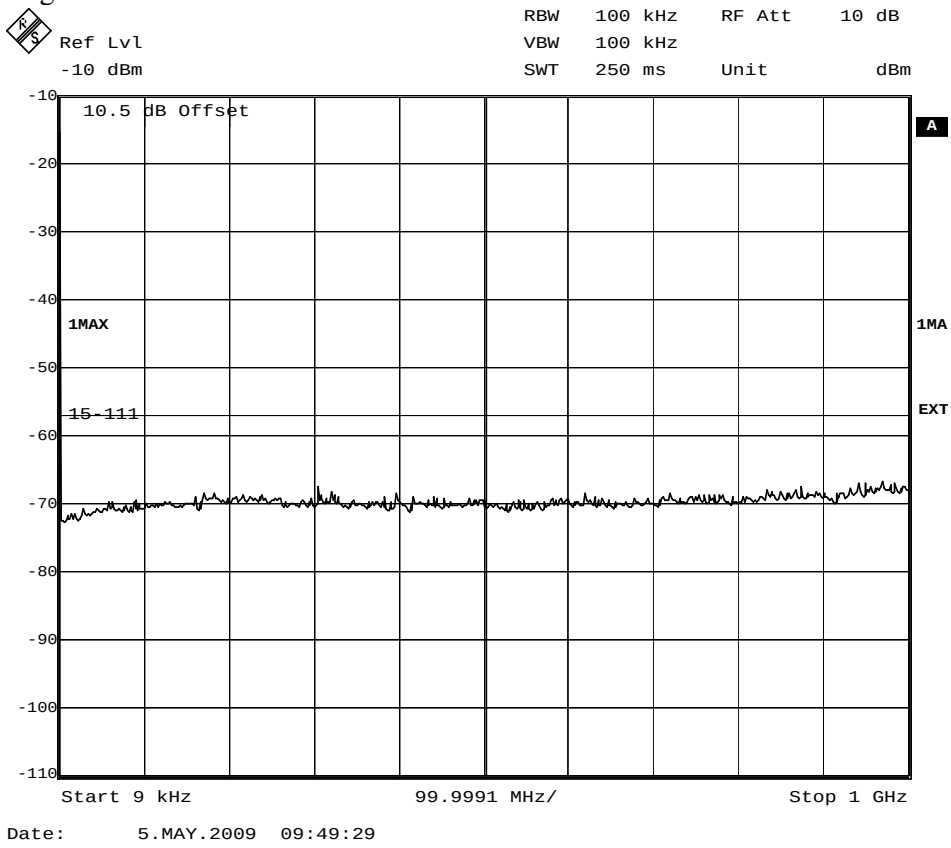
Diagram 2



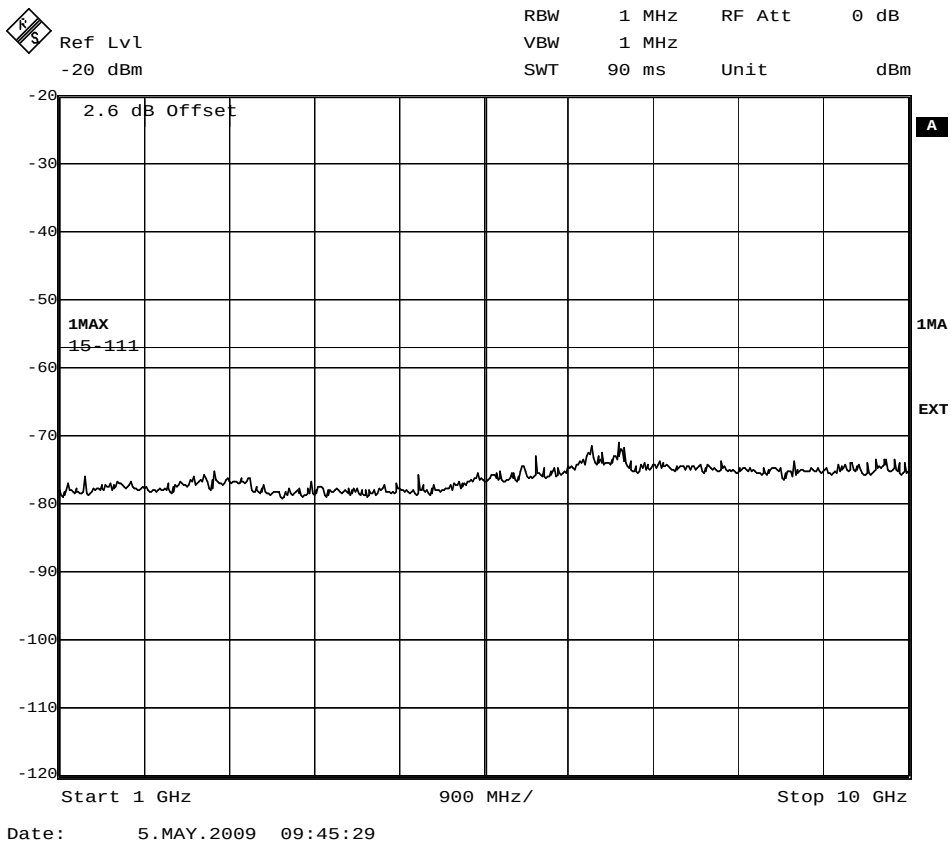


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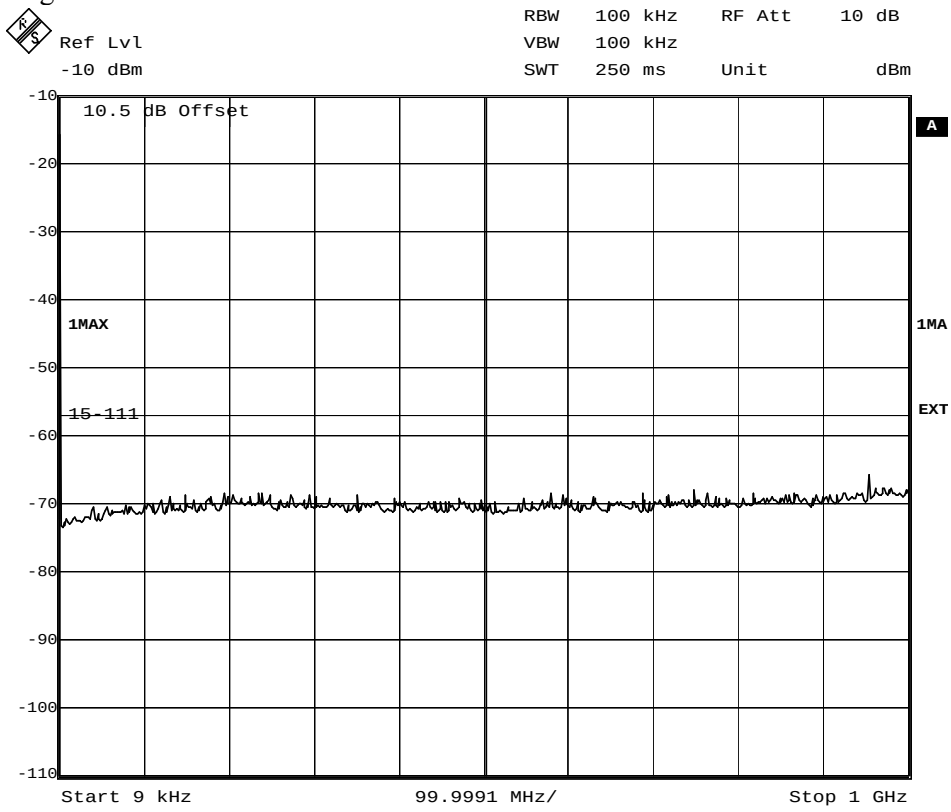
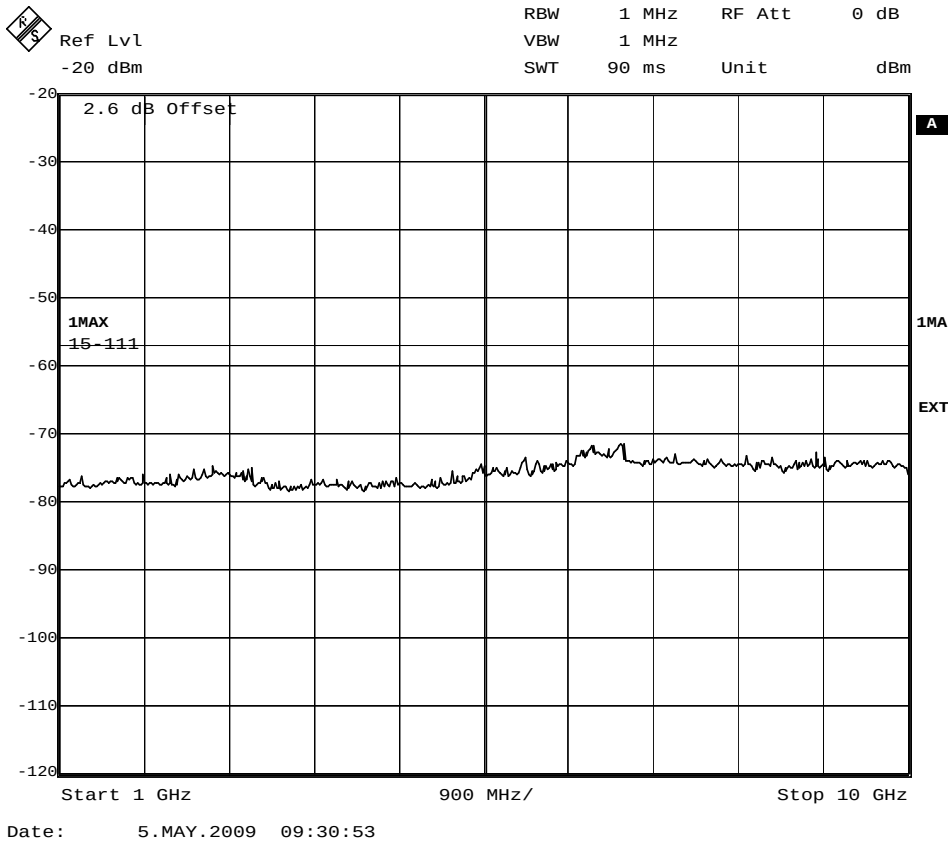
Diagram 3





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Appendix 9

Photos

Front side

Rear side

Right side

Left side

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Bottom side