



**FCC 47 CFR PART 15 SUBPART C
(Class II Permissive Change)**

TEST REPORT

For

802.11b/g/n 1T1R combo card

Model: RT3090BC4

Trade Name: Ralink

Issued to

**Ralink Technology Corporation
5F., No.36, Taiyuan St., Jhubei City, Hsin-Chu 302, Taiwan**

Issued by

**Compliance Certification Services Inc.
No. 11, Wu-Gong 6th Rd., Wugu Industrial Park,
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1. TEST RESULT CERTIFICATION

Applicant: Ralink Technology Corporation
5F., No.36, Taiyuan St., Jhubei City, Hsin-Chu 302, Taiwan

Equipment Under Test: 802.11b/g/n 1T1R combo card

Trade Name: Ralink

Model: RT3090BC4

Date of Test: September 17 ~ 27, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Reviewed by:

Rex Lai
Section Manager
Compliance Certification Services Inc.

Gina Lo
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	802.11b/g/n 1T1R combo card
Trade Name	Ralink
Model Number	RT3090BC4
Model Discrepancy	N/A
Power Supply	Powered from host device
Frequency Range	2402 ~ 2480 MHz
Transmit Power	0.0029W
Modulation Technique	GFSK for 1Mbps; $\pi/4$ -DQPSK for 2Mbps; 8DPSK for 3Mbps
Transmit Data Rate	1, 2, 3Mbps
Number of Channels	79 Channels
Antenna Specification	Gain: -1.7 dBi
Antenna Designation	PIFA Antenna
Class II Permissive Change	Add portable Condition compliance to the grant so that the module may be used in qualified host PC(s) and implementation of module-notebook authentication. Product name: Notebook Computer / Brand name: Quanta, QCI Model: UW3* (* can be 0-9, A-Z or blank)

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **VQF-RT3090BC4** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



3.5 DESCRIPTION OF TEST MODES

The EUT (model: RT3090BC4) had been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode was programmed.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

The worst case data rate is determined as the data rate with highest output power.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

During the preliminary test, GFSK, $\pi/4$ -QPSK & 8DPSK with DH1 were pre-tested and found that 8DPSK emits the highest output power. Then the tests were carried on with DH1 compare to DH3 & DH5 and found that 8DPSK with DH5 emit the highest output power, and therefore had been tested under operating condition.

Following channels were selected for the radiated emission testing only as listed below:

Tested Channel	Modulation Type	Packet Type	Data Rate
Low, Mid, High	GFSK	DH 5	1
Low, Mid, High	8DPSK	DH 5	3



4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	10/26/2010
EMI Test Receiver	R&S	ESCI	100064	02/04/2011
Pre-Amplifier	Mini-Circuits	ZFL-1000LN	SF350700823	01/13/2011
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/20/2010
Bilog Antenna	Sunol Sciences	JB3	A030105	09/10/2011
Horn Antenna	EMCO	3117	00055165	12/07/2010
Loop Antenna	EMCO	6502	8905/2356	06/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/31/2010
Test S/W	EZ-EMC (CCS-3A1RE)			

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESHS30	828144/003	12/06/2010
LISN	EMCO	3825/2	9106-1809	05/02/2011
LISN	SCHAFFNER	NNB 41	03/10013	12/03/2010



4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Overline Conducted Emission	+/- 1.6202
Semi Anechoic Chamber / 30M~200M	+/- 4.0606
Semi Anechoic Chamber / 200M~1000M	+/- 3.9979
Semi Anechoic Chamber / 1G~8G	+/- 2.5790
Semi Anechoic Chamber / 8G~18G	+/- 2.5928
Semi Anechoic Chamber / 18G~26G	+/- 2.7212
Semi Anechoic Chamber / 26G~40G	+/- 2.9520

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.




Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	 Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	LCD Monitor	DELL	2407WFPb	CN-0FC255-46633-675-22TJS	FCC DoC	Shielded, 1.8m with 2 cores	Unshielded, 1.8m
2	USB Mouse	DELL	MO56UO	408031121	FCC DoC	Shielded, 1.8m	N/A
3	1TB 3.5" HDD	Buffalo	HD-HX1.0TU3-AP	15564891207204	FCC DoC	Shielded, 1m	N/A
4	1TB 3.5" HDD	Buffalo	HD-HX1.0TU3-AP	15564891208089	FCC DoC	Shielded, 1m	N/A
5	Multimedia Headset	Labtec	Axis-301	N/A	FCC DoC	Unshielded, 1.8m x 2	N/A
6	SD Card	SANDISK	N/A	N/A	N/A	N/A	N/A
7	Wireless Pre-N Router (Remote)	BELKIN	F5D8230-4	N/A	SA3-AGN0901AP0100	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



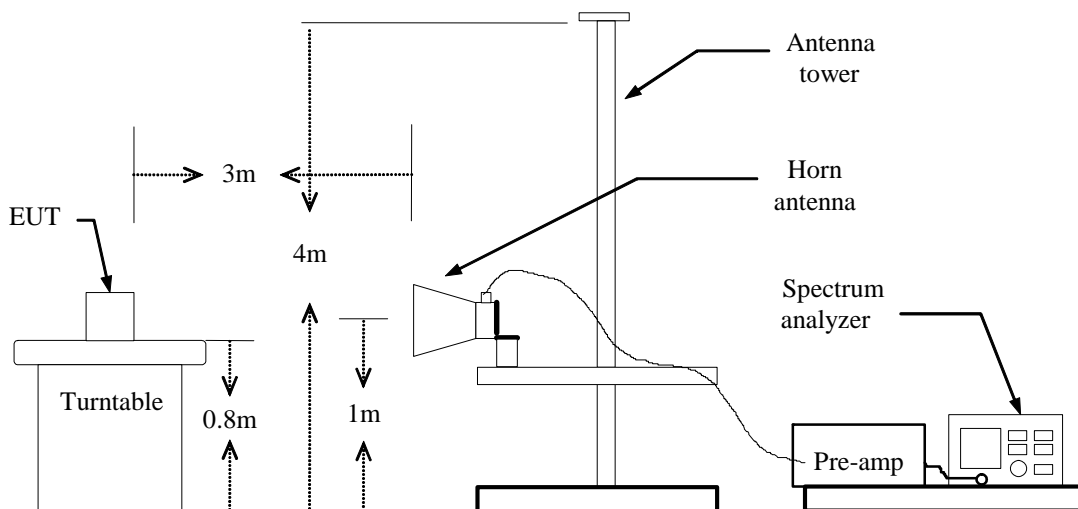
7. FCC PART 15.247 REQUIREMENTS

7.1 BAND EDGES MEASUREMENT

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

Refer to attach spectrum analyzer data chart.



For GFSK / DH5

Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

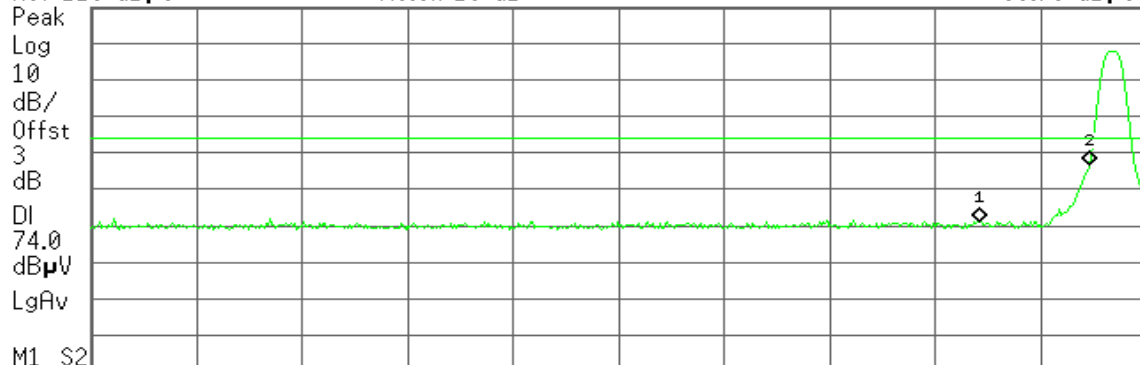
Agilent 14:22:01 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
66.79 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	50.96 dB μ V
2	(1)	Freq	2.400 00 GHz	66.79 dB μ V

Detector mode: Average

Polarity: Vertical

Agilent 14:22:35 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
55.09 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 7.408 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	38.70 dB μ V
2	(1)	Freq	2.400 00 GHz	55.09 dB μ V



Detector mode: Peak

Polarity: Horizontal

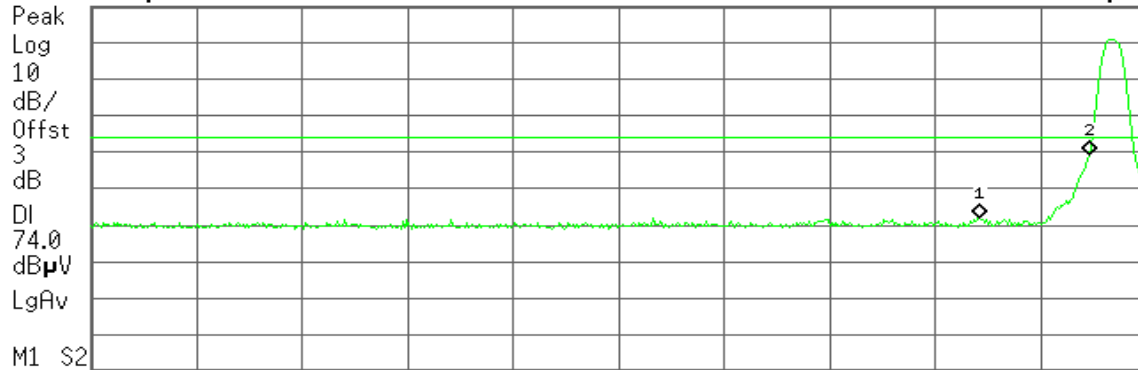
Agilent 14:31:21 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
69.28 dBμV

Ref 110 dBμV

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.398 00 GHz	51.87 dBμV
2	(1)	Freq	2.400 00 GHz	69.28 dBμV

Detector mode: Average

Polarity: Horizontal

Agilent 14:31:54 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
57.29 dBμV

Ref 110 dBμV

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 7.408 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.398 00 GHz	39.57 dBμV
2	(1)	Freq	2.400 00 GHz	57.29 dBμV



Band Edges (CH High)

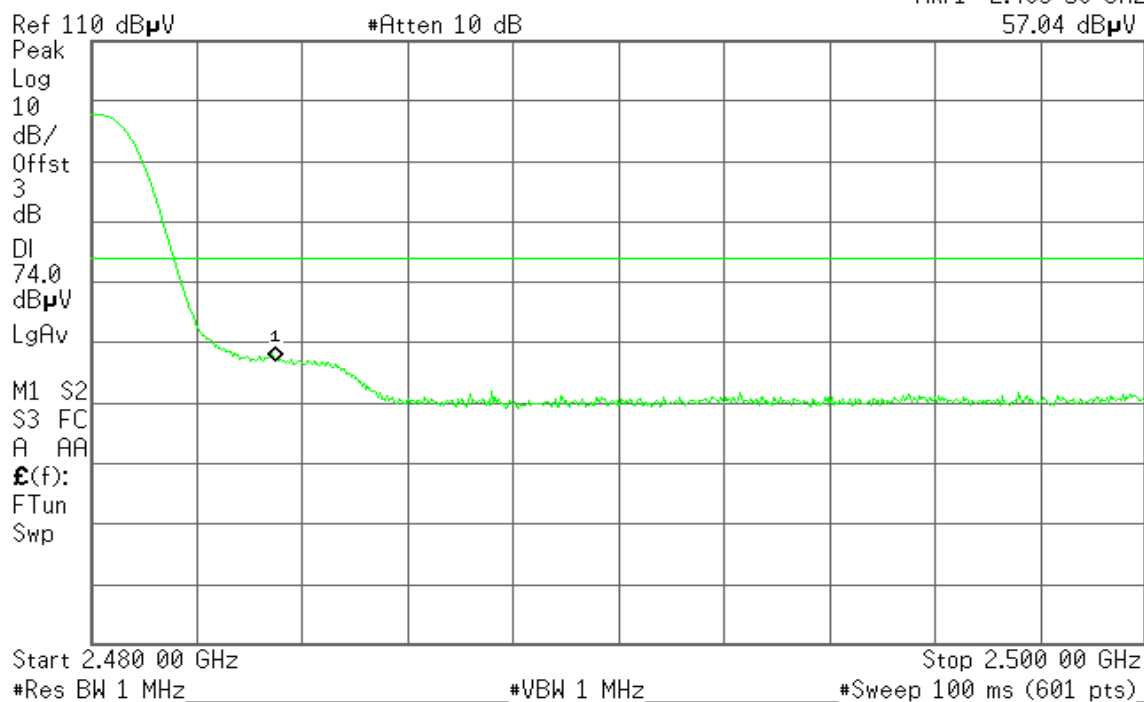
Detector mode: Peak

Polarity: Vertical

Agilent 14:40:49 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
57.04 dBμV



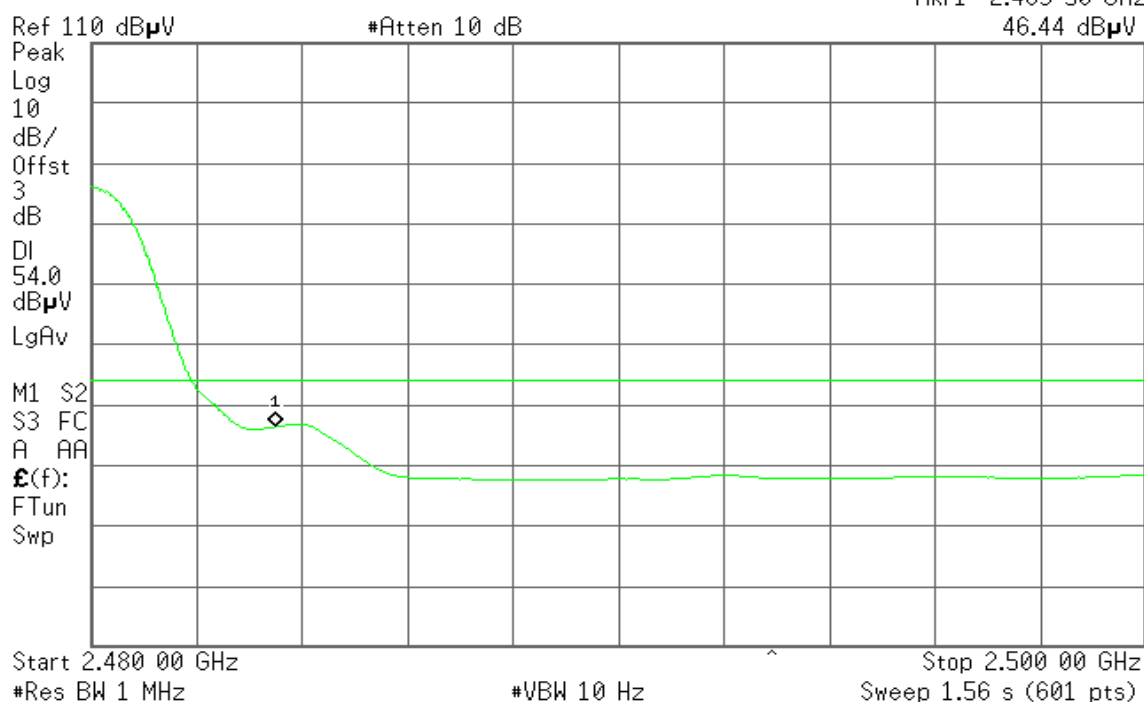
Detector mode: Average

Polarity: Vertical

Agilent 14:41:12 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
46.44 dBμV





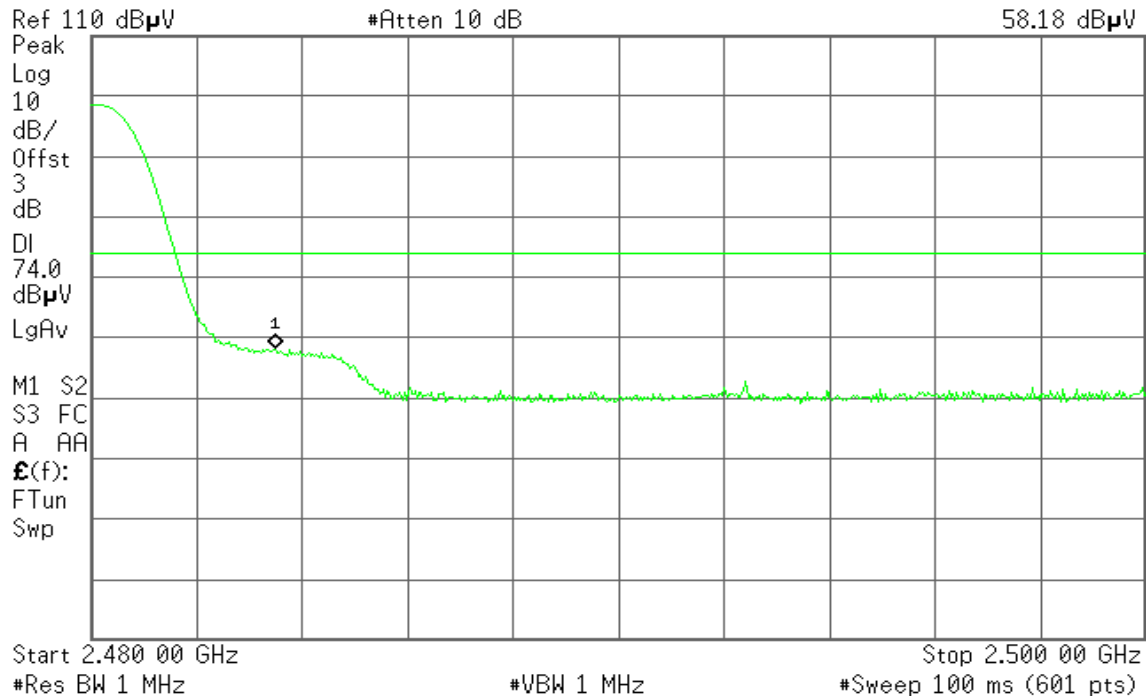
Detector mode: Peak

Polarity: Horizontal

Agilent 14:47:07 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
58.18 dB μ V



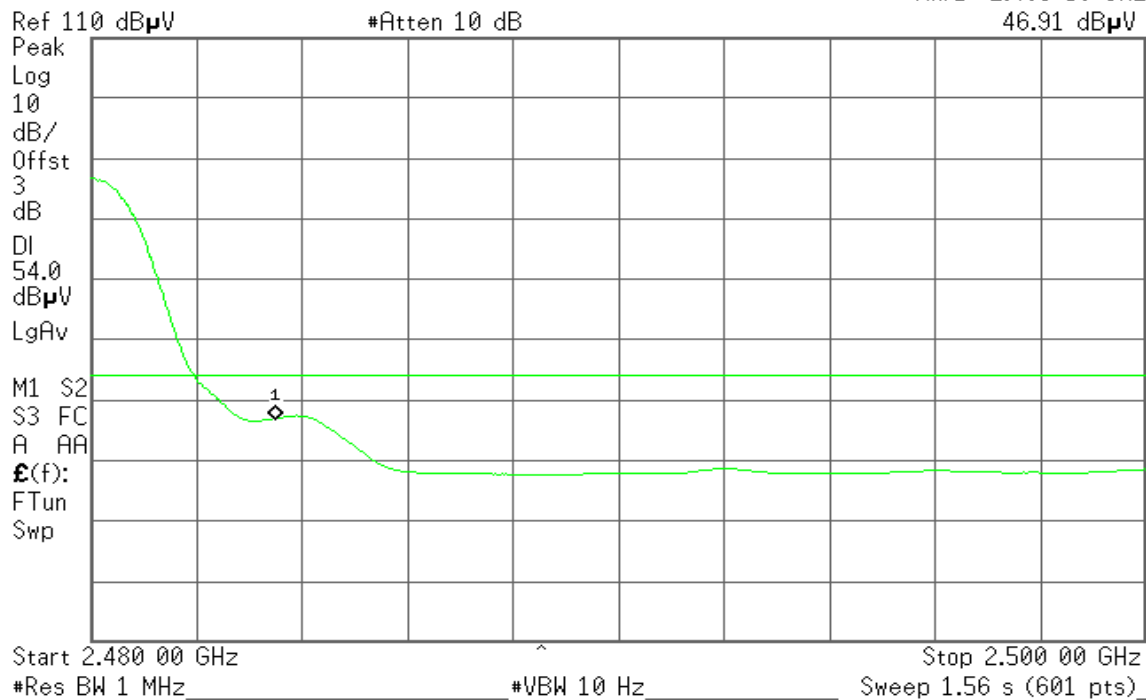
Detector mode: Average

Polarity: Horizontal

Agilent 14:47:31 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
46.91 dB μ V





For 8DPSK / DH5

Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

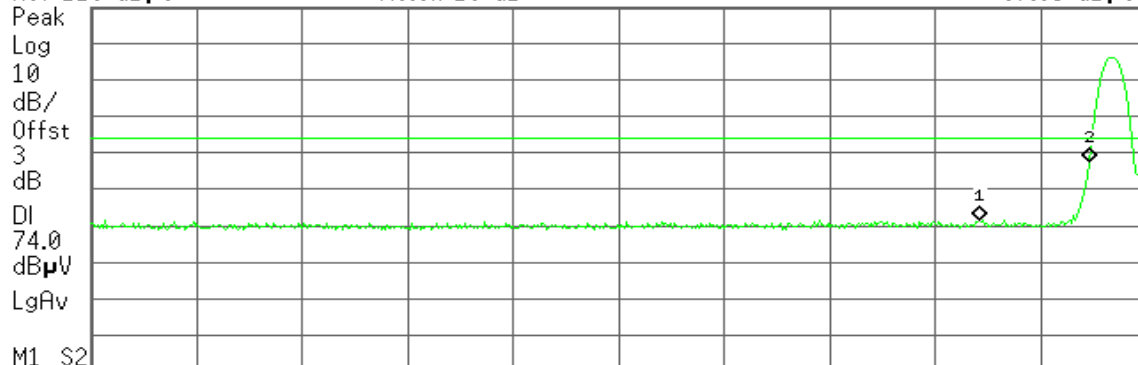
Agilent 15:22:47 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
67.63 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	51.55 dB μ V
2	(1)	Freq	2.400 00 GHz	67.63 dB μ V

Detector mode: Average

Polarity: Vertical

Agilent 15:23:15 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
52.01 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Start 2.310 00 GHz

Stop 2.405 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 7.408 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	38.34 dB μ V
2	(1)	Freq	2.400 00 GHz	52.01 dB μ V



Detector mode: Peak

Polarity: Horizontal

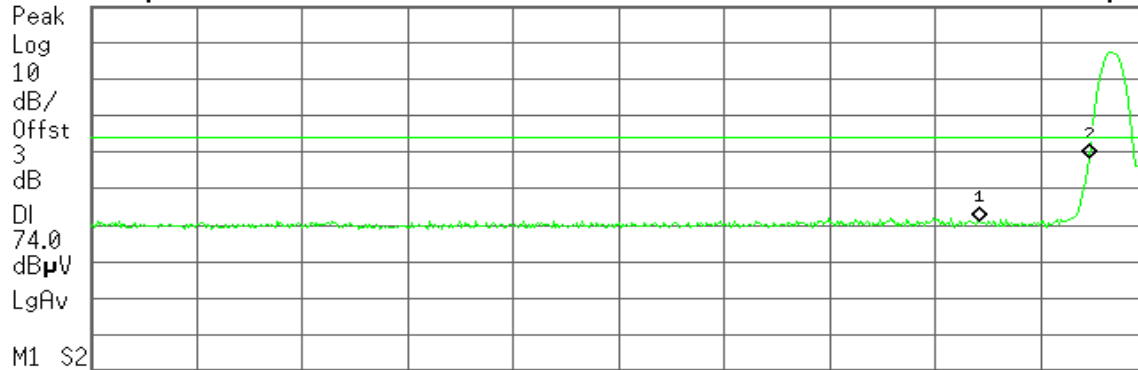
Agilent 15:17:06 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
68.28 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	51.29 dB μ V
2	(1)	Freq	2.400 00 GHz	68.28 dB μ V

Detector mode: Average

Polarity: Horizontal

Agilent 15:17:34 Sep 27, 2010

R T

Mkr2 2.400 00 GHz
53.01 dB μ V

Ref 110 dB μ V

#Atten 10 dB



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	38.50 dB μ V
2	(1)	Freq	2.400 00 GHz	53.01 dB μ V



Band Edges (CH High)

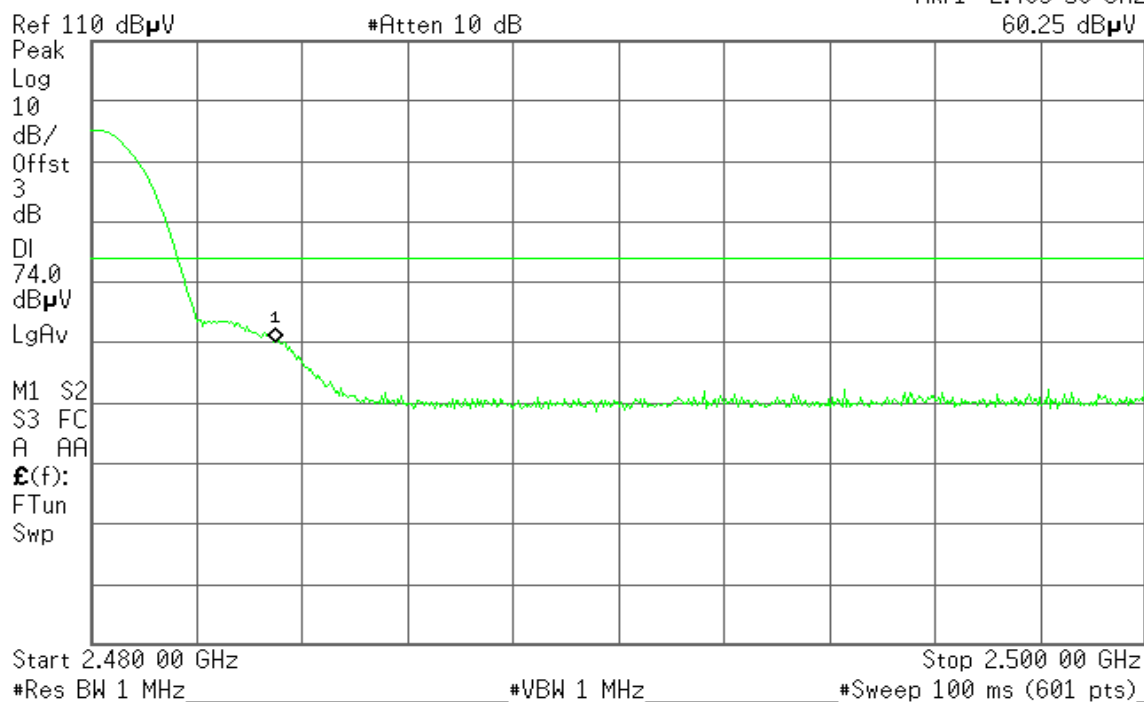
Detector mode: Peak

Polarity: Vertical

Agilent 15:34:43 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
60.25 dB μ V



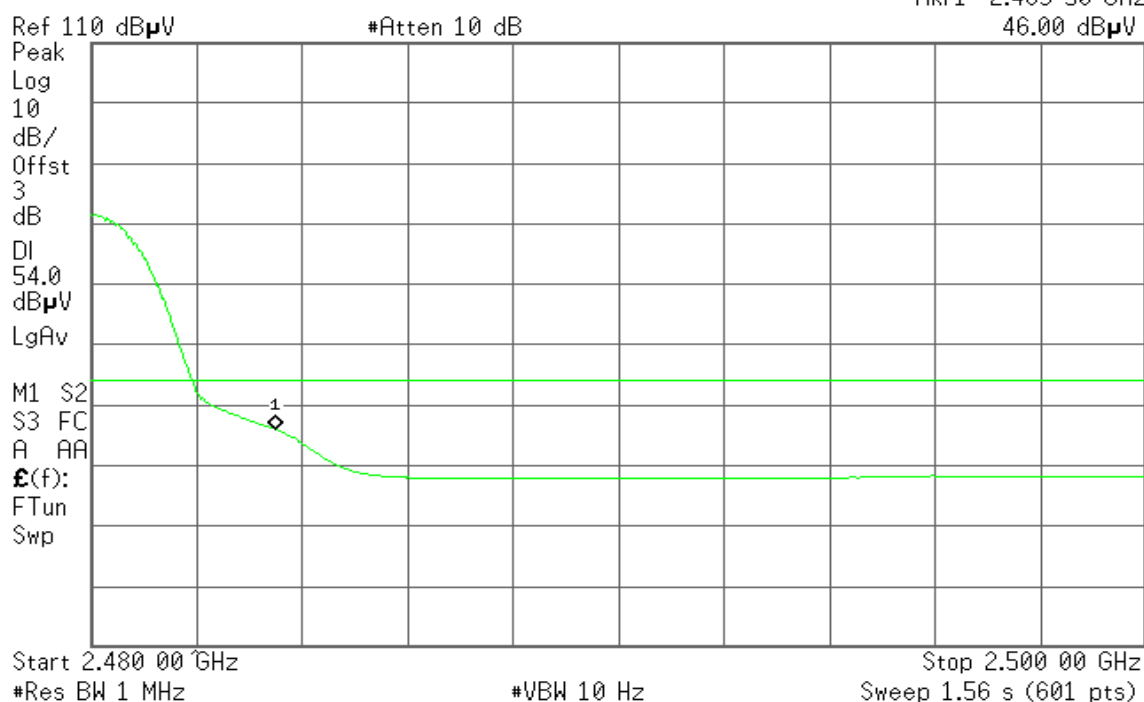
Detector mode: Average

Polarity: Vertical

Agilent 15:35:00 Sep 27, 2010

R L

Mkr1 2.483 50 GHz
46.00 dB μ V





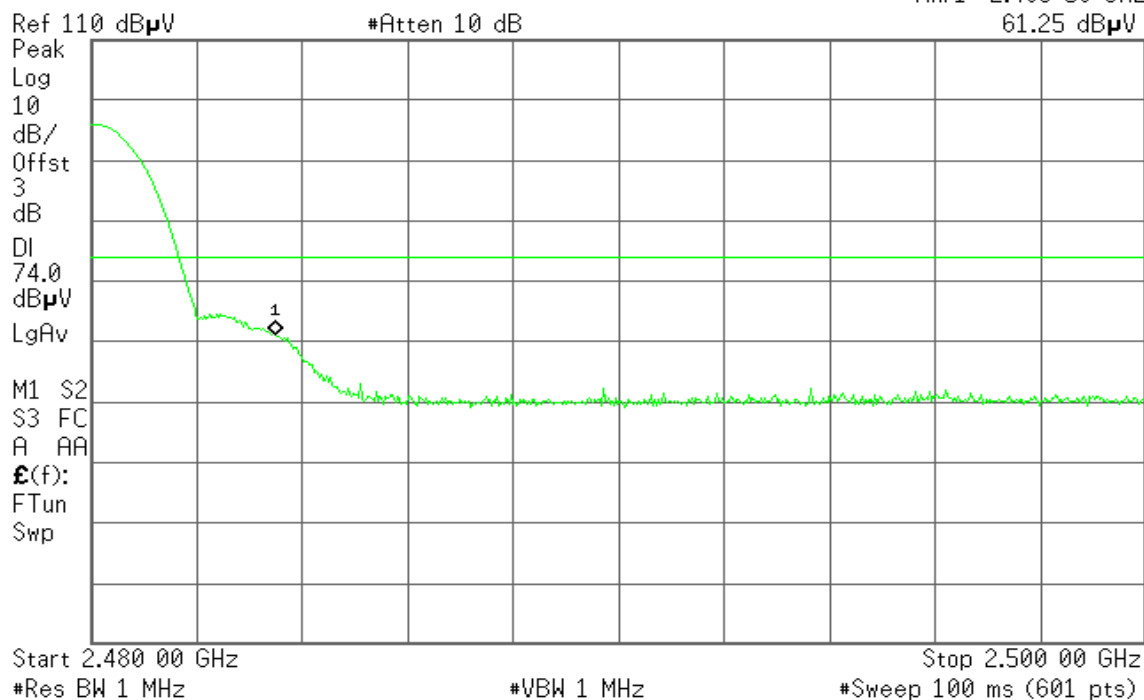
Detector mode: Peak

Polarity: Horizontal

Agilent 15:38:57 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
61.25 dBμV



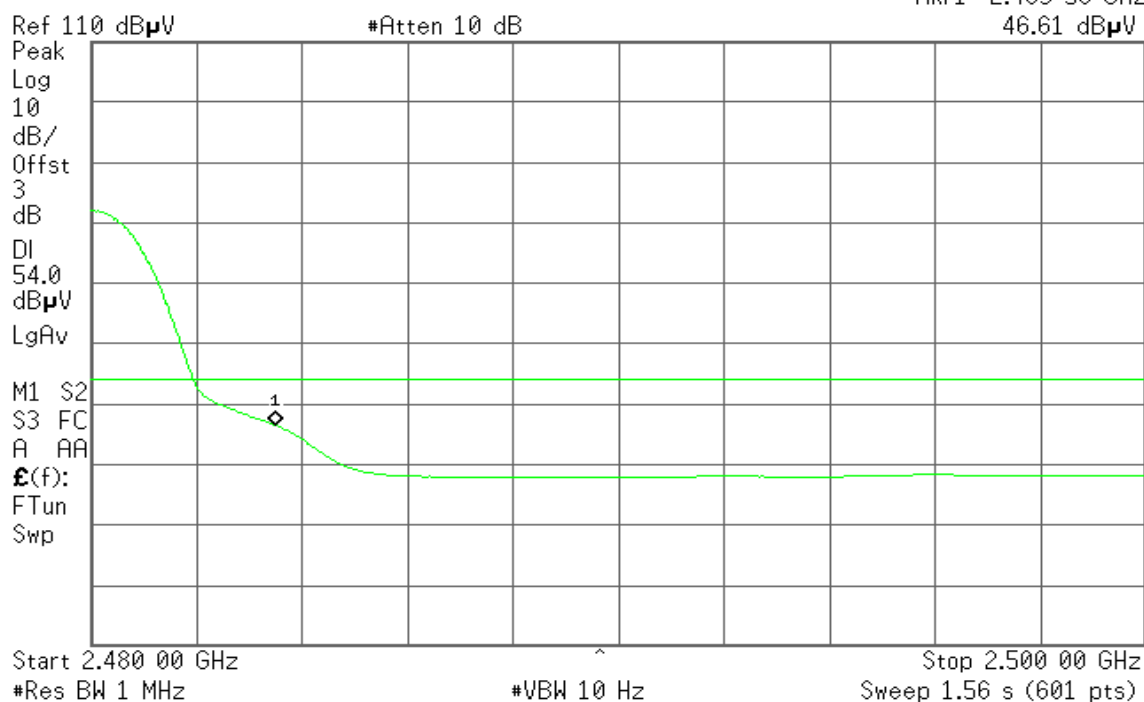
Detector mode: Average

Polarity: Horizontal

Agilent 15:39:20 Sep 27, 2010

R T

Mkr1 2.483 50 GHz
46.61 dBμV





7.2 SPURIOUS EMISSIONS

LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

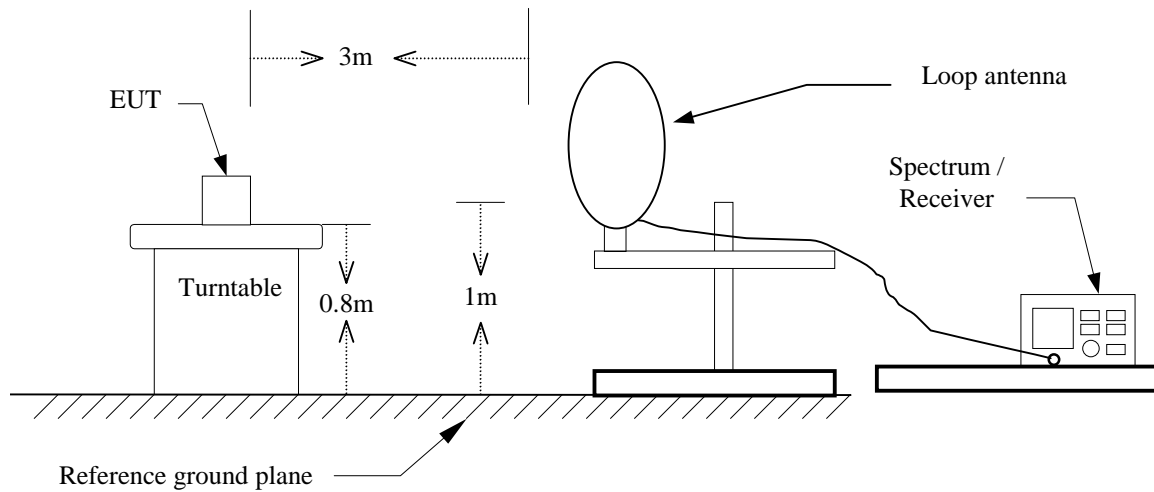
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

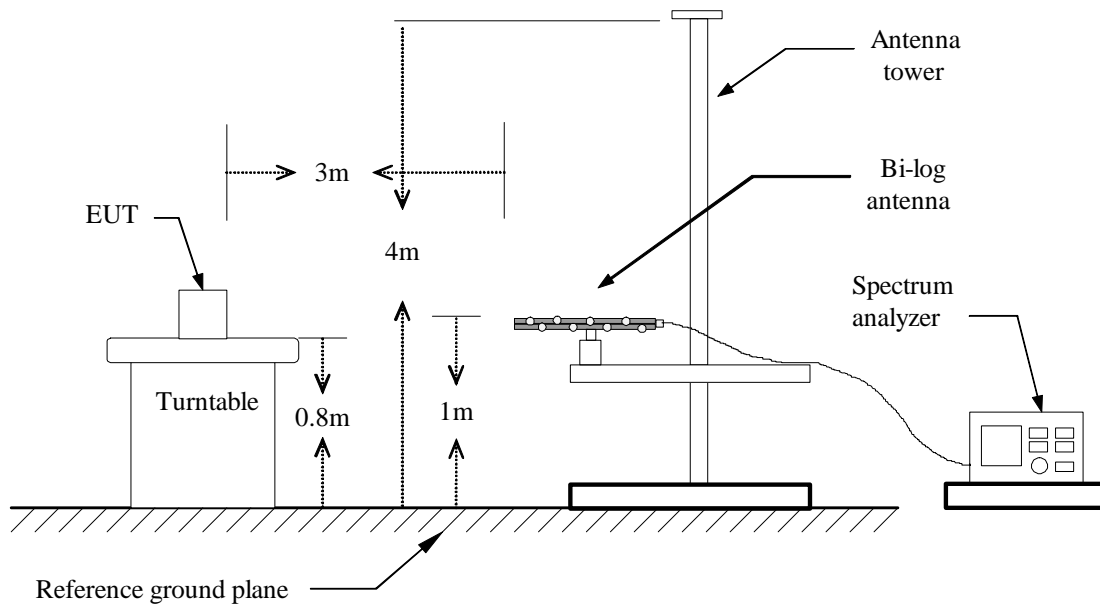


Test Configuration

9kHz ~ 30MHz

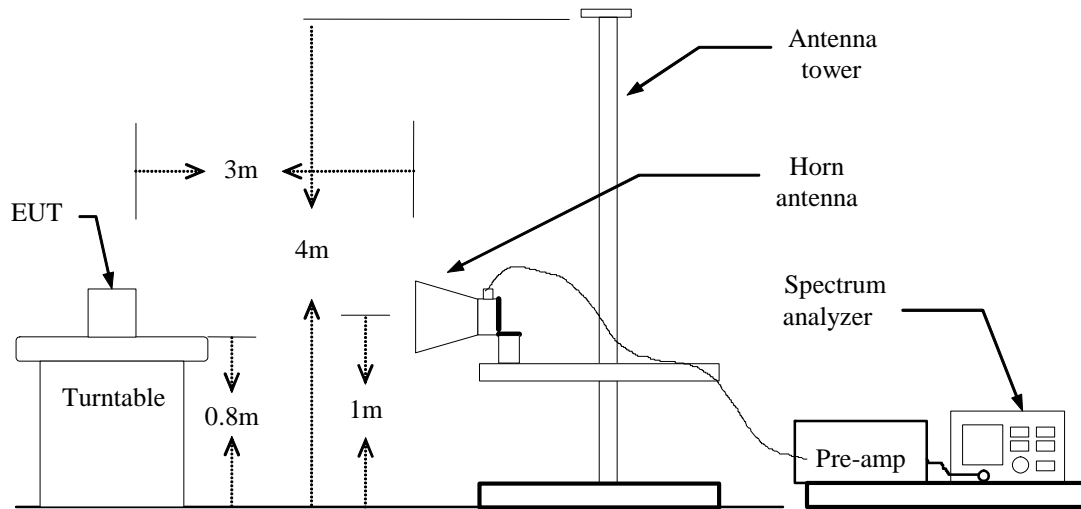


30MHz ~ 1GHz





Above 1 GHz





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
Below 1GHz:
RBW=100kHz / VBW=300kHz / Sweep=AUTO
Above 1GHz:
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

**TEST RESULTS***No non-compliance noted***Below 1GHz****Operation Mode:** Normal Link**Test Date:** September 17, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
42.93	V	44.06	-11.14	32.92	40.00	-7.08	Peak
466.50	V	37.50	-5.63	31.87	46.00	-14.13	Peak
590.98	V	36.92	-4.13	32.79	46.00	-13.21	Peak
890.07	V	31.93	-0.68	31.25	46.00	-14.75	Peak
936.95	V	31.98	0.07	32.05	46.00	-13.95	Peak
980.60	V	41.06	0.72	41.78	54.00	-12.22	Peak
468.12	H	33.95	-5.60	28.34	46.00	-17.66	Peak
513.38	H	32.93	-4.97	27.97	46.00	-18.03	Peak
590.98	H	32.50	-4.13	28.36	46.00	-17.64	Peak
654.03	H	36.85	-2.86	33.99	46.00	-12.01	Peak
899.77	H	30.47	-0.64	29.83	46.00	-16.17	Peak
983.83	H	36.17	0.76	36.93	54.00	-17.07	Peak

Remark:

- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)*
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
- 5. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

**Above 1 GHz****Operation Mode:** TX / GFSK / DH5 / CH Low**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1076.67	V	58.22	---	-9.46	48.76	---	74.00	54.00	-5.24	Peak
1170.00	V	57.80	---	-9.31	48.49	---	74.00	54.00	-5.51	Peak
4808.33	V	60.77	52.30	1.18	61.95	53.48	74.00	54.00	-0.52	AVG
N/A										
1950.00	H	54.14	---	-4.61	49.53	---	74.00	54.00	-4.47	Peak
4808.33	H	53.55	47.96	1.18	54.73	49.14	74.00	54.00	-4.86	AVG
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / GFSK / DH5 / CH Mid**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1170.00	V	58.14	---	-9.31	48.83	---	74.00	54.00	-5.17	Peak
1216.67	V	59.23	---	-9.23	50.00	---	74.00	54.00	-4.00	Peak
1310.00	V	56.60	---	-9.08	47.52	---	74.00	54.00	-6.48	Peak
4883.33	V	54.03	48.17	1.16	55.19	49.33	74.00	54.00	-4.67	AVG
N/A										
1876.67	H	54.80	---	-5.29	49.51	---	74.00	54.00	-4.49	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Operation Mode:** TX / GFSK / DH5 / CH High**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1170.00	V	57.95	---	-9.31	48.64	---	74.00	54.00	-5.36	Peak
1216.67	V	57.50	---	-9.23	48.27	---	74.00	54.00	-5.73	Peak
1310.00	V	57.86	---	-9.08	48.78	---	74.00	54.00	-5.22	Peak
4958.33	V	54.03	45.63	1.13	55.16	46.76	74.00	54.00	-7.24	AVG
N/A										
1086.67	H	56.75	---	-9.45	47.30	---	74.00	54.00	-6.70	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Operation Mode:** TX / 8DPSK / DH5 / CH Low**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1170.00	V	58.67	---	-9.31	49.36	---	74.00	54.00	-4.64	Peak
1310.00	V	57.07	---	-9.08	47.99	---	74.00	54.00	-6.01	Peak
4800.00	V	53.18	44.04	1.18	54.37	45.22	74.00	54.00	-8.78	AVG
N/A										
1340.00	H	56.02	---	-9.03	46.99	---	74.00	54.00	-7.01	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Operation Mode:** TX / 8DPSK / DH5 / CH Mid**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1170.00	V	57.78	---	-9.31	48.48	---	74.00	54.00	-5.52	Peak
1216.67	V	56.85	---	-9.23	47.62	---	74.00	54.00	-6.38	Peak
1313.33	V	58.64	---	-9.07	49.57	---	74.00	54.00	-4.43	Peak
N/A										
1253.33	H	55.85	---	-9.17	46.68	---	74.00	54.00	-7.32	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Operation Mode:** TX / 8DPSK / DH5 / CH High**Test Date:** September 27, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1123.33	V	57.49	---	-9.39	48.10	---	74.00	54.00	-5.90	Peak
1170.00	V	59.07	---	-9.31	49.76	---	74.00	54.00	-4.24	Peak
1220.00	V	58.07	---	-9.22	48.85	---	74.00	54.00	-5.15	Peak
1306.67	V	56.99	---	-9.08	47.91	---	74.00	54.00	-6.09	Peak
N/A										
1543.33	H	55.44	---	-8.36	47.08	---	74.00	54.00	-6.92	Peak
N/A										

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.



7.3 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.



TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Operation Mode: Normal Link **Test Date:** September 23, 2010
Temperature: 26°C **Tested by:** Edward Lin
Humidity: 60% RH

Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1500	38.66	15.06	0.14	38.80	15.20	66.00	56.00	-27.20	-40.80	L1
0.2100	45.47	29.17	0.13	45.60	29.30	63.21	53.21	-17.61	-23.91	L1
0.2700	40.07	26.87	0.13	40.20	27.00	61.12	51.12	-20.92	-24.12	L1
0.3300	39.76	29.36	0.14	39.90	29.50	59.45	49.45	-19.55	-19.95	L1
0.4500	38.86	25.86	0.14	39.00	26.00	56.88	46.88	-17.88	-20.88	L1
22.6800	35.58	26.98	0.52	36.10	27.50	60.00	50.00	-23.90	-22.50	L1
0.1500	41.00	16.80	0.10	41.10	16.90	66.00	56.00	-24.90	-39.10	L2
0.2100	50.00	31.40	0.10	50.10	31.50	63.21	53.21	-13.11	-21.71	L2
0.2700	44.10	29.40	0.10	44.20	29.50	61.12	51.12	-16.92	-21.62	L2
0.3300	41.80	29.10	0.10	41.90	29.20	59.45	49.45	-17.55	-20.25	L2
3.5700	31.00	18.10	0.00	31.00	18.10	56.00	46.00	-25.00	-27.90	L2
23.0700	37.74	29.14	0.16	37.90	29.30	60.00	50.00	-22.10	-20.70	L2

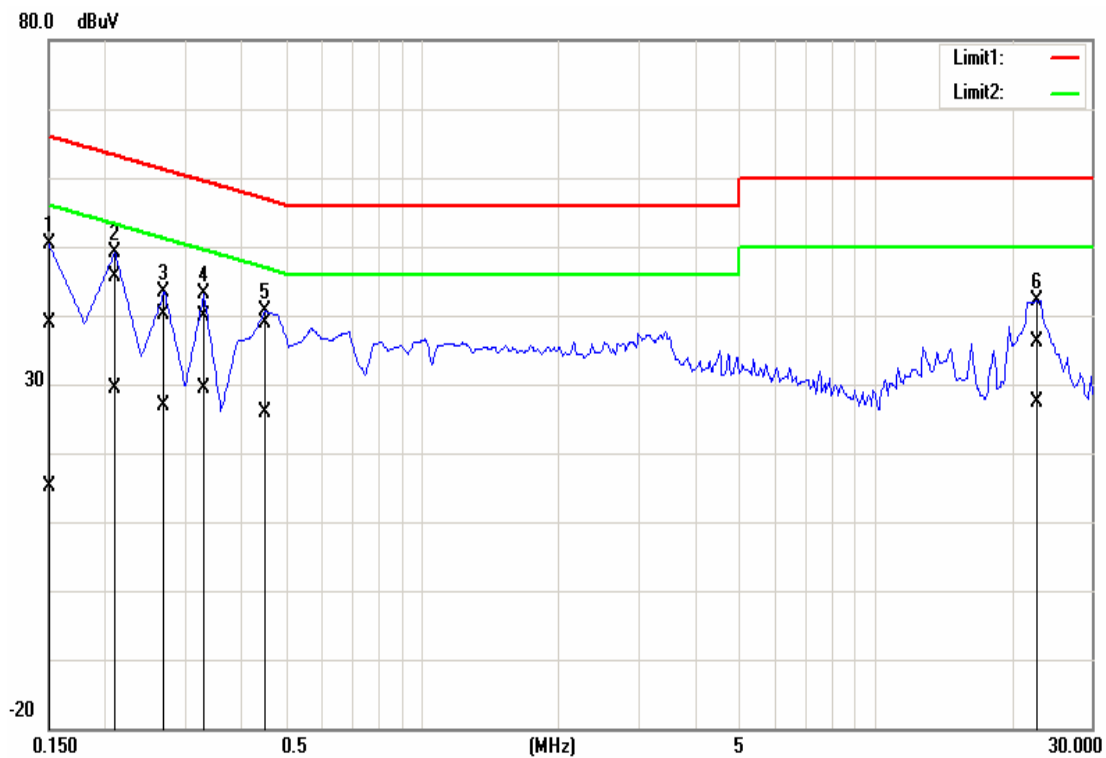
Remark:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

