



LABCODE: 500069-0



FCC PART 15B, CLASS B

TEST REPORT

For

SHENZHEN TENDA TECHNOLOGY CO.,'LTD.

Tenda Industrial Park, No. 34-1, Shilong Rd., Shiyan Town, Bao'an District, Shenzhen, China

FCC ID: V7TW311E

Report Type: Original Report	Product Type: Wireless N150 PCI Express Adapter
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Report Number: <u>R2DG130826003-00B</u>	
Report Date: <u>2013-09-12</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *SHENZHEN TENDA TECHNOLOGY CO., LTD.*'s product, model number: *W311E (FCC ID: V7TW311E)* (the "EUT") in this report was a *Wireless N150 PCI Express Adapter*, which was measured approximately: 16.0 cm (L) x 12.0 cm (W) x 2.0 cm (H).

** All measurement and test data in this report was gathered from production sample serial number: 130826003 (Assigned by BACL.Dongguan). The EUT was received on 2013-08-28.*

Objective

This report is prepared on behalf of *SHENZHEN TENDA TECHNOLOGY CO., LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC Part 15B, Class B.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: *V7TW311E*.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).



The current scope of accreditations can be found at <http://ts.nist.gov/standards/scopes/5000690.htm>

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

“Ping.exe” was used for testing.

Equipment Modifications

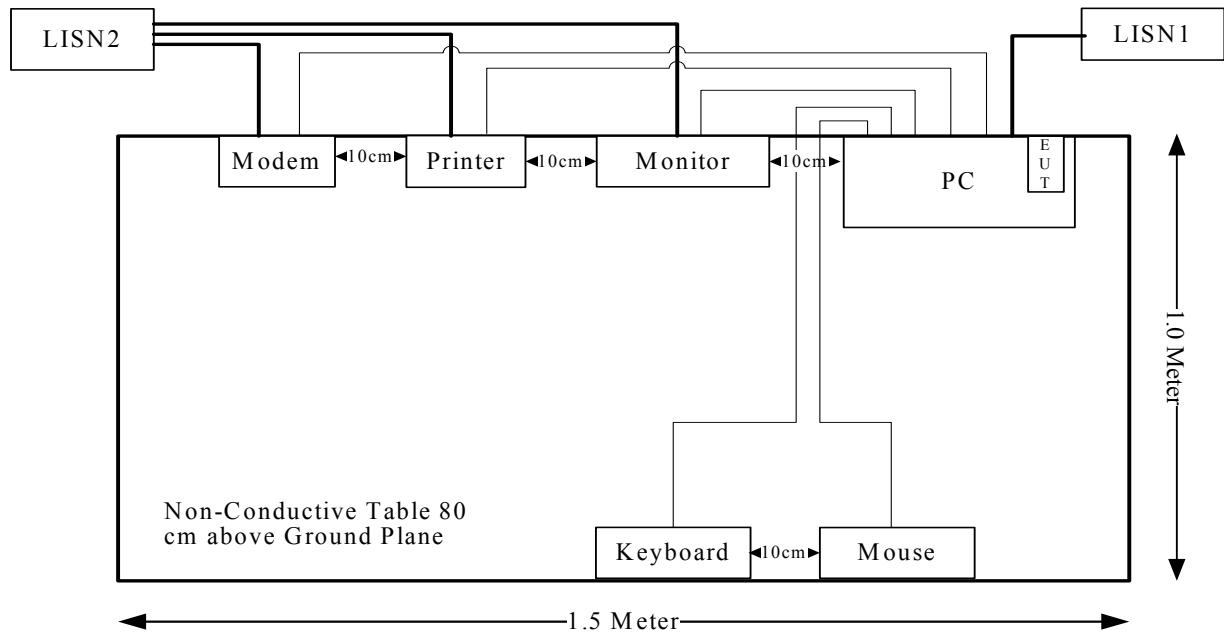
No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HP	Printer	C3941A	JPTVOB2337
DELL	Keyboard	L100	CNORH656658907BL05DC
SAST	Modem	AEM-2100	0293
DELL	PC	GX620	/
DELL	MONITOR	1706FPVT	CN-0T9401-71618-588-AJ9X
DELL	MOUSE	MO56UOA	F0Y02P7Y

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Parallel Cable	yes	No	1.2	Parallel Port of PC	Printer
Serial Cable	yes	No	1.2	Serial Port of PC	Modem
VGA Cable	yes	No	1.2	VGA Port of PC	monitor
USB Cable	yes	No	1.8	USB Port of PC	Mouse
USB Cable	yes	No	2.0	USB Port of PC	Keyboard

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to $U_{\text{cisp}}_{\text{r}}$ of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than $U_{\text{cisp}}_{\text{r}}$ of Table 1, then:

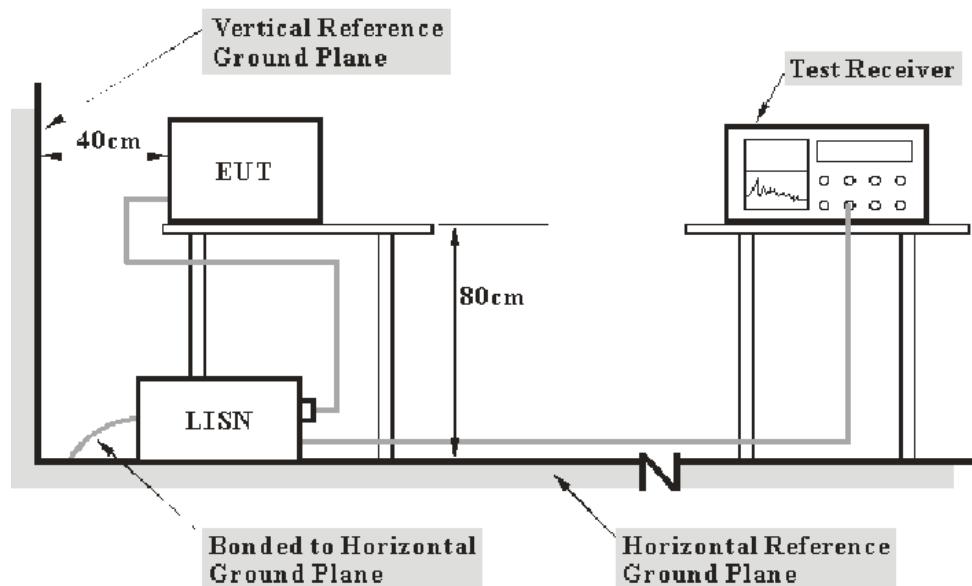
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cisp}}_{\text{r}})$, exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cisp}}_{\text{r}})$, exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of $U_{\text{cisp}}_{\text{r}}$

Measurement	$U_{\text{cisp}}_{\text{r}}$
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

EUT Setup



Note:

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.107 Class B limits.

The PC was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the PC was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$
$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2012-11-29	2013-11-28
R&S	LISN1	ESH3-Z5	843331/015	2012-09-17	2013-09-16
R&S	LISN2	ESH3-Z5	100113	2012-11-29	2013-11-28
BACL	Test Software	BACL-EMC	V1.0-2010	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107, with the worst margin reading of:

12.37 dB at 0.210MHz in the **Neutral** conducted mode.

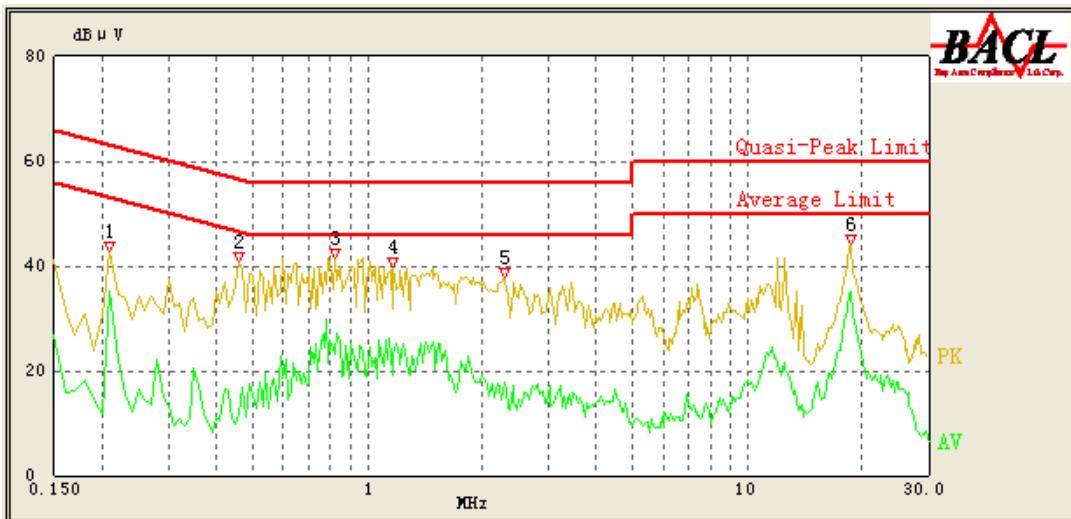
Test Data**Environmental Conditions**

Temperature:	27.5° C
Relative Humidity:	63 %
ATM Pressure:	100.7kPa

The testing was performed by Leon Chen on 2013-09-06.

Test mode: Normal Link

120 V, 60 Hz, Line:



Frequency (MHz)	Cord. Reading (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/AV/QP)
0.210	44.57	0.42	63.21	18.64	QP
0.210	35.09	0.42	53.21	18.12	AV
0.460	30.92	0.32	56.69	25.77	QP
0.460	11.79	0.32	46.69	34.90	AV
0.820	32.32	0.32	56.00	23.68	QP
0.820	23.09	0.32	46.00	22.91	AV
1.170	32.01	0.33	56.00	23.99	QP
1.170	23.13	0.33	46.00	22.87	AV
2.290	29.93	0.37	56.00	26.07	QP
2.290	17.74	0.37	46.00	28.26	AV
18.650	41.38	2.38	60.00	18.62	QP
18.650	35.27	2.38	50.00	14.73	AV

120 V, 60 Hz, Neutral:

Frequency (MHz)	Cord. Reading (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Detector (PK/AV/QP)
0.210	43.33	0.25	63.21	19.88	QP
0.210	40.84	0.25	53.21	12.37	AV
0.640	32.48	0.22	56.00	23.52	QP
0.640	23.50	0.22	46.00	22.50	AV
1.060	32.51	0.23	56.00	23.49	QP
1.060	20.06	0.23	46.00	25.94	AV
1.820	30.95	0.26	56.00	25.05	QP
1.820	21.80	0.26	46.00	24.20	AV
11.880	29.01	0.90	60.00	30.99	QP
11.880	28.93	0.90	50.00	21.07	AV
18.580	36.99	1.37	60.00	23.01	QP
18.510	34.85	1.37	50.00	15.15	AV

FCC §15.109 - RADIATED EMISSIONS

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cispr}})$, exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

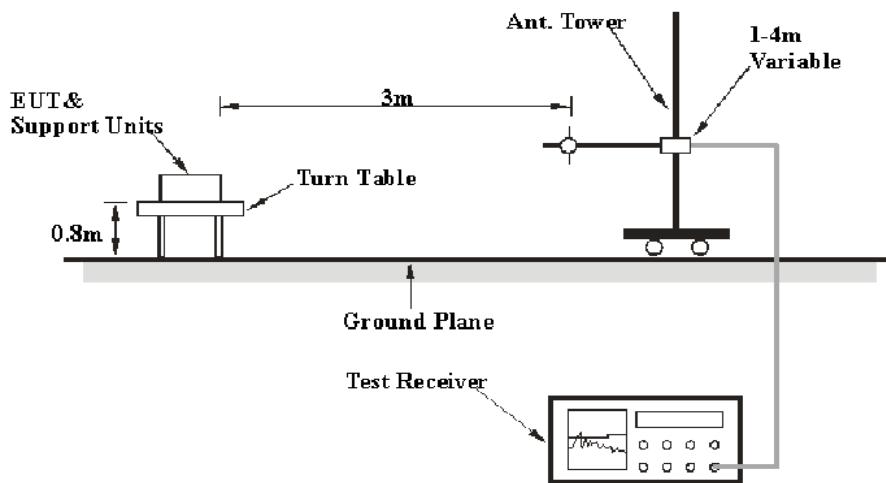
6G~18GHz: 5.23 dB

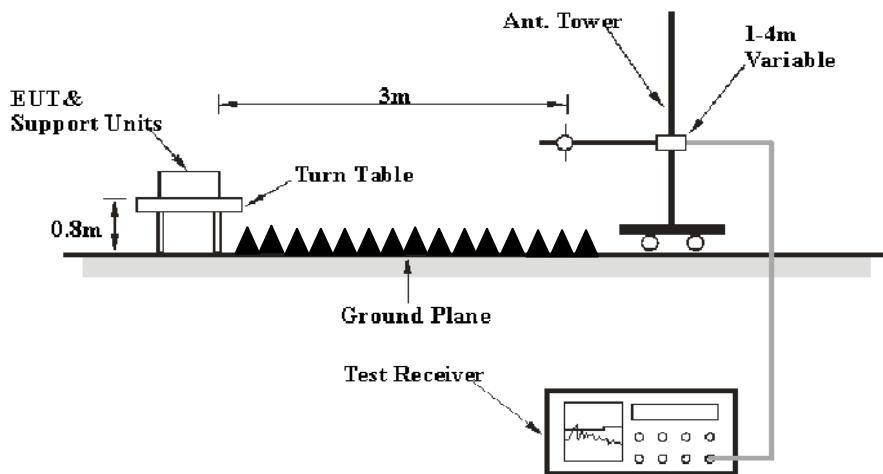
Table 2 – Values of U_{cispr}

Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 G:

The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part 15.109, Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The PC connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

According to FCC 15.33 requirements, the system was measured from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

For the radiated emissions test, the PC was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The data was recorded in Quasi-peak detection mode for 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESCI	100224	2013-5-6	2014-5-5
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A
R&S	Spectrum analyzer	FSEM 30	849016/001	2013-9-4	2014-9-3
ETS LINDGREN	horn antenna	3115	000 527 35	2012-9-6	2015-9-5
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	N/A	N/A
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109, Class B, with the worst margin reading of:

12.70 dB at 30.0600 MHz in the Vertical polarization

Test Data

Environmental Conditions

Temperature:	26.3°C
Relative Humidity:	62 %
ATM Pressure:	100.7 kPa

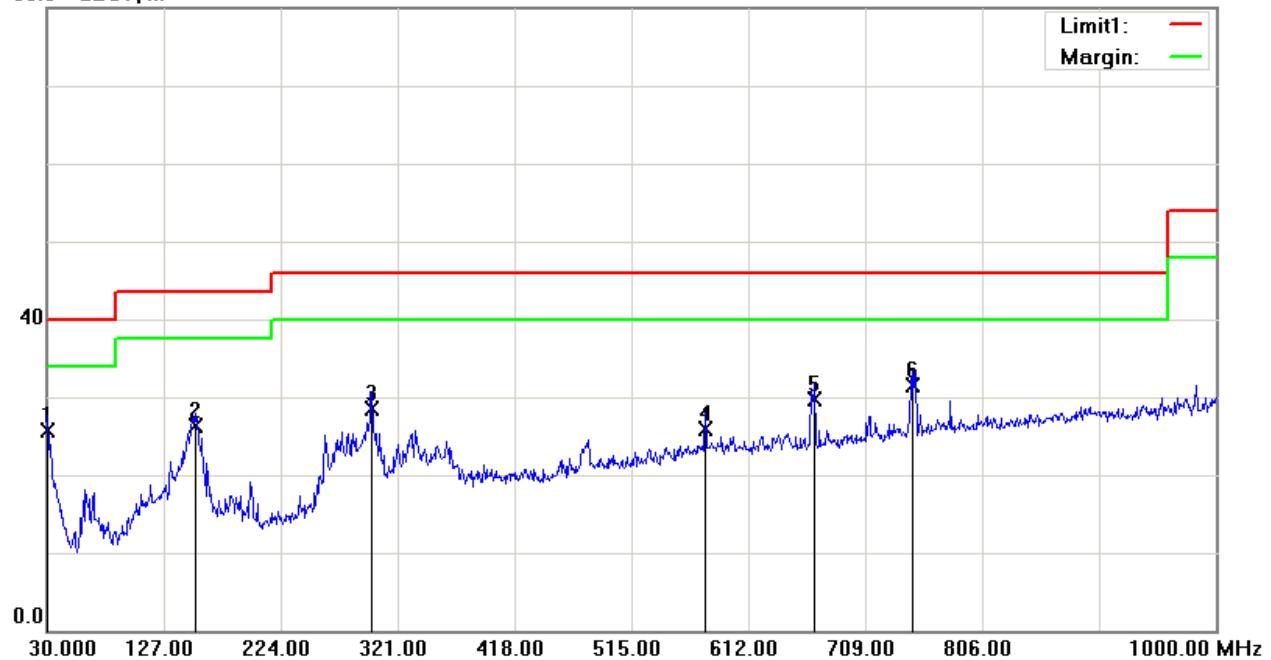
The testing was performed by Leon Chen on 2013-09-06.

Test mode: Normal Link

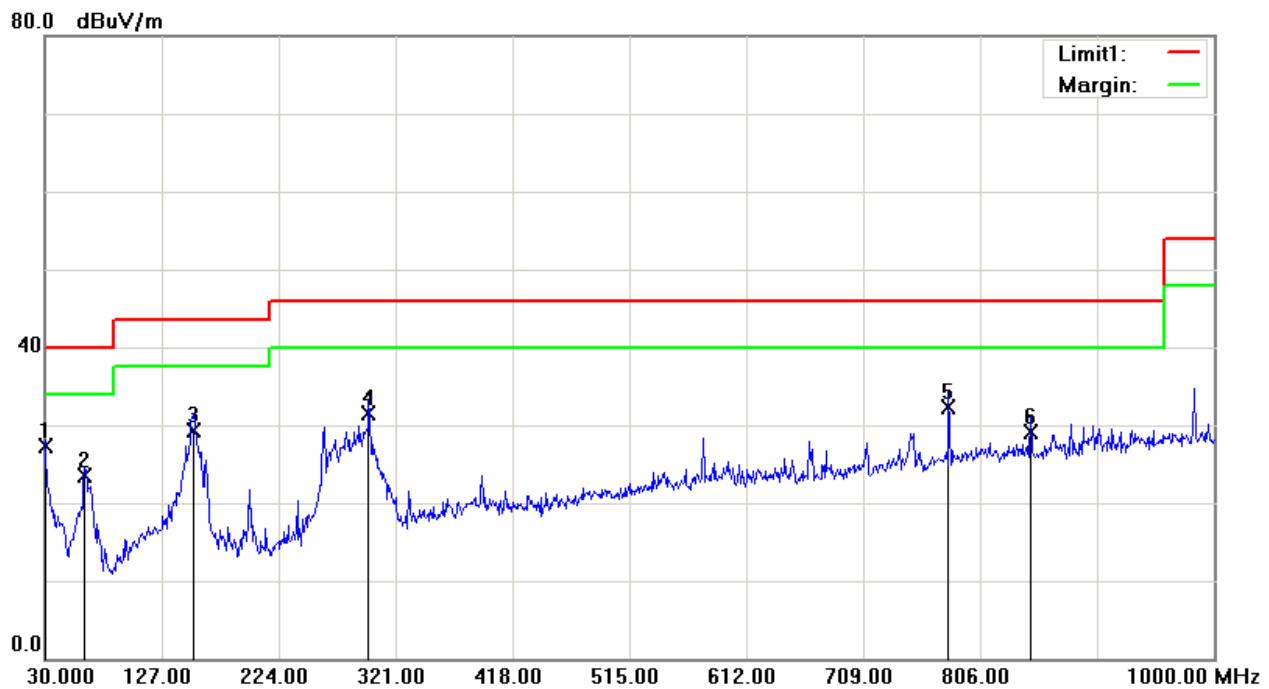
Below 1'GJ | :

Horizontal:

80.0 dBuV/m



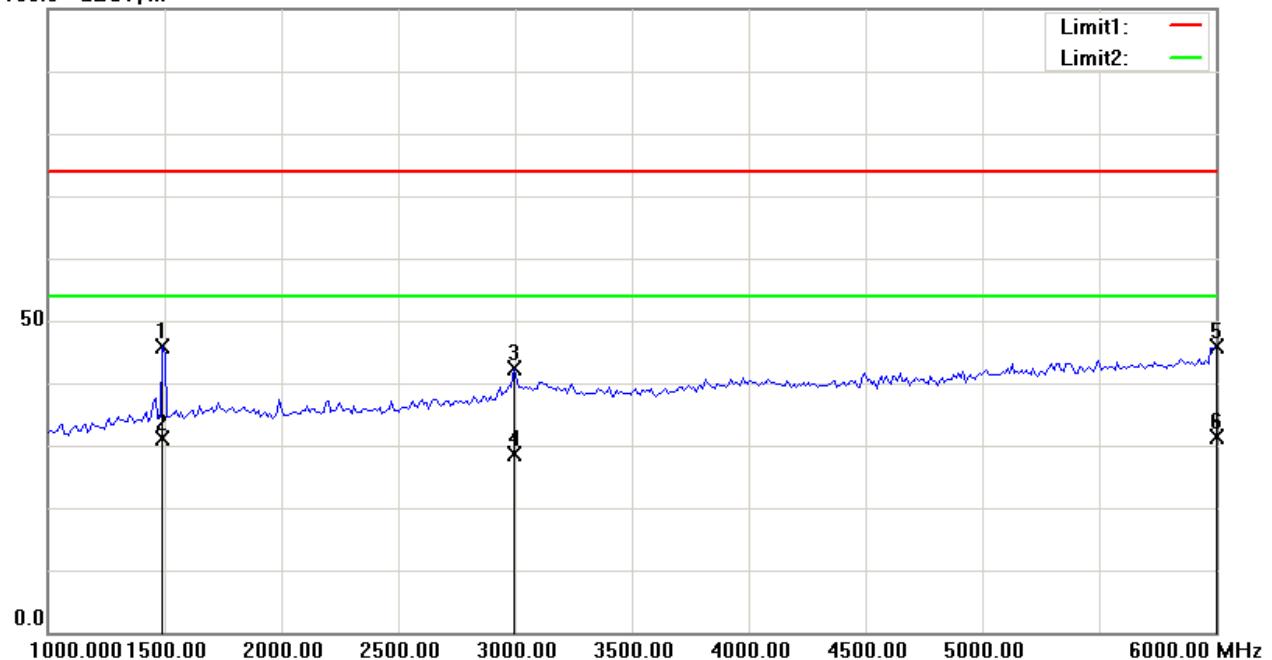
Frequency (MHz)	Receiver Reading (dBuV/m)	Detector (PK/QP/Ave+)	Correction Factor (dB)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	24.85	QP	0.85	25.70	40.00	14.30
153.1900	33.59	QP	-7.19	26.40	43.50	17.10
299.6600	34.26	QP	-5.66	28.60	46.00	17.40
576.1100	26.03	QP	-0.03	26.00	46.00	20.00
667.2900	29.15	QP	0.65	29.80	46.00	16.20
747.8000	29.33	QP	2.17	31.50	46.00	14.50

Vertical:

Frequency (MHz)	Receiver Reading (dBuV/m)	Detector (PK/QP/Ave)	Correction Factor (dB)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0600	25.80	QP	1.50	27.30	40.00	12.70
62.9800	36.16	QP	-12.56	23.60	40.00	16.40
153.1900	36.59	QP	-7.19	29.40	43.50	14.10
298.6900	37.15	QP	-5.65	31.50	46.00	14.50
779.8100	29.90	QP	2.50	32.40	46.00	13.60
847.7100	25.94	QP	3.26	29.20	46.00	16.80

Above 1 GHz:**Horizontal:**

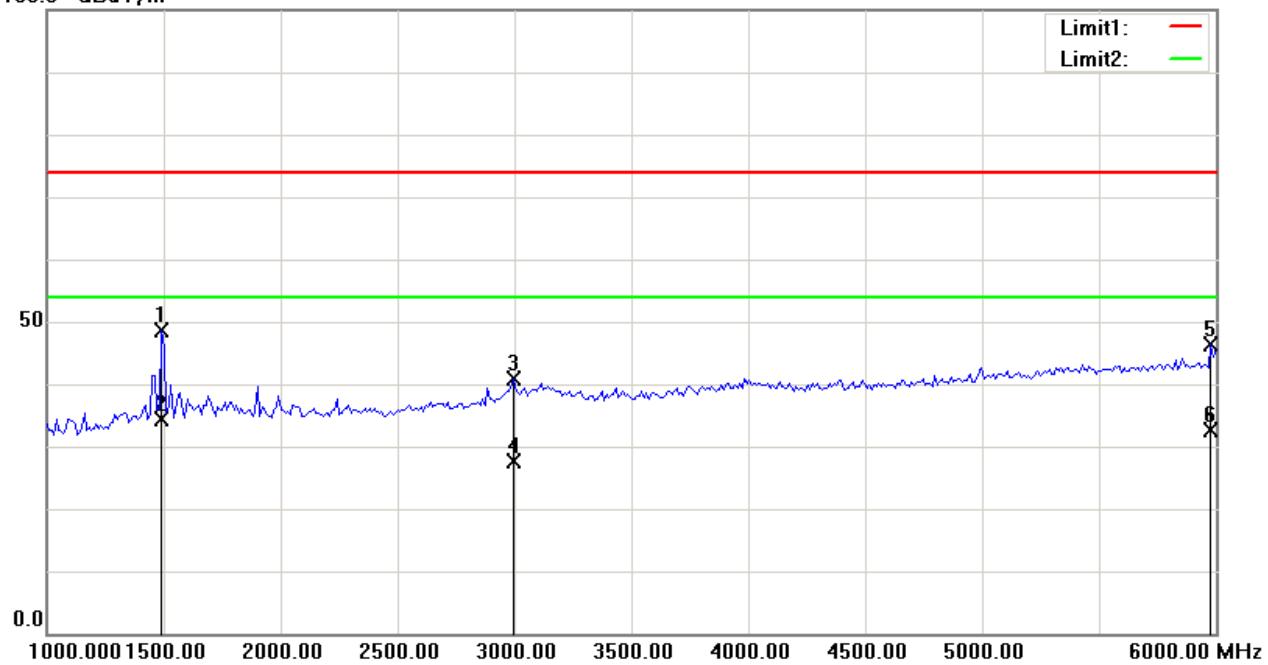
100.0 dBuV/m



Frequency (MHz)	Receiver Reading (dBuV/m)	Detector (PK/QP/Ave)	Correction Factor (dB)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1490.982	46.34	peak	-0.40	45.94	74.00	28.06
1490.982	31.65	AVG	-0.40	31.25	54.00	22.75
2993.988	35.39	peak	7.07	42.46	74.00	31.54
2993.988	21.56	AVG	7.07	28.63	54.00	25.37
6000.000	34.04	peak	11.74	45.78	74.00	28.22
6000.000	19.60	AVG	11.74	31.34	54.00	22.66

Vertical:

100.0 dBuV/m



Frequency (MHz)	Receiver Reading (dBuV/m)	Detector (PK/QP/Ave)	Correction Factor (dB)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1490.982	49.06	peak	-0.40	48.66	74.00	25.34
1490.982	34.77	AVG	-0.40	34.37	54.00	19.63
2993.988	33.93	peak	7.07	41.00	74.00	33.00
2993.988	20.68	AVG	7.07	27.75	54.00	26.25
5979.960	34.69	peak	11.78	46.47	74.00	27.53
5979.960	20.75	AVG	11.78	32.53	54.00	21.47

******* END OF REPORT *******