



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

RFID 13.56MHz Wireless Module

**Model:
DWRFID1301**

Trade Name: DELL

Issued to

Dell Inc.

One Dell Way Round Rock Texas 78682 United States

Issued by

Compliance Certification Services Inc.

**No.11, Wugong 6th Rd., Wugu Dist.,
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Issued Date: March 6, 2013



**Testing Laboratory
1309**

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 6, 2013	Initial Issue	ALL	Angel Cheng



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1. TEST RESULT CERTIFICATION

Applicant: Dell Inc.
 One Dell Way Round Rock Texas 78682 United States

Equipment Under Test: RFID 13.56MHz Wireless Module

Trade Name: DELL

Model: DWRFID1301

Date of Test: February 25 ~ March 5, 2013

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: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.

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

Approved by:

Reviewed by:

Miller Lee
 Section Manager
 Compliance Certification Services Inc.

Gina Lo
 Section Manager
 Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	RFID 13.56MHz Wireless Module
Trade Name	DELL
Model Number	DWRFID1301
Model Difference	N/A
Received Date	February 19, 2013
Power Supply	Powered by host device
Frequency Range	13.56MHz
Modulation Technique	ASK
Number of Channels	1 Channel
Antenna Designation	Loop Antenna / Gain: 0 dBi
Note	The product DWRFID1301 will be installed in the following models of notebooks/laptops: Model: P40G, P22S Product name: Notebook Computer / Brand name: DELL / Model: P40G, P22S

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **E2K-DWRFID1301** filing to comply with Section 15.225 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: 2009 and FCC CFR 47 Part 15.207, 15.209 and 15.225.

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.

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: 2009. 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: 2009.



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: DWRFID1301) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

For Model: P40G

The EUT comes with three types of antennas (TE, WNC and SPEEDWIRE) have been pre-scanned during the test. The Antenna (TE) was selected as the worst case for final test, the detail information, please see as below.

Antenna Manufacture	Antenna Model No	Antenna Type	Antenna gain
TE	1556596-1	Loop Antenna	0 dBi
WNC	81EAAF15.G09		
SPEEDWIRE	F.0G.FN-0024-001		

Pre-test Data

Antenna for SPEEDWIRE

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5604	31.78	5.73	37.51	124	-86.49	100	199	peak

Antenna for WNC

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5607	33.68	5.73	39.41	124	-84.59	100	156	peak

Antenna for TE

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.56	34.56	5.73	40.29	124	-83.71	100	233	peak



For Model: P22S

The EUT comes with three types of antennas (TE, Yageo and WNC) have been pre-scanned during the test. The Antenna (WNC) was selected as the worst case for final test, the detail information, please see as below.

Antenna Manufacture	Antenna Model No	Antenna Type	Antenna gain
TE	1556597-1	Loop Antenna	0 dBi
Yageo	CAN4313DC0736RFA4		
WNC	81EAAF15.G04		

Pre-test Data

Antenna for Yageo

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5603	34.92	5.73	40.65	124	-83.35	100	332	peak

Antenna for WNC

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5604	35.07	5.73	40.8	124	-83.2	100	293	peak

Antenna for TE

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
13.5602	33.68	5.73	39.41	124	-84.59	186	301	peak



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.

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	11/06/2013
Power Meter	Anritsu	ML2495A	1012009	06/05/2013
Power Sensor	Anritsu	MA2411B	0917072	06/05/2013

Wugu 966 Chamber A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510268	11/06/2013
EMI Test Receiver	R&S	ESCI	100064	02/28/2014
Pre-Amplifier	Mini-Circuits	ZFL-1000LN	SF350700823	01/12/2014
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/19/2013
Bilog Antenna	Sunol Sciences	JB3	A030105	10/02/2013
Horn Antenna	EMCO	3117	00055165	02/13/2014
Horn Antenna	EMCO	3116	2487	10/10/2013
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	12/22/2013
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room # A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101203	09/13/2013
LISN	R&S	ESH3-Z5	848773/014	12/10/2013
ISN	FCC	FCC-TLISN-T8-02-09	101131	09/05/2013
Coaxial Cable	Commate	CFD300-NL	NA	12/06/2013
Test S/W	CCS-3A1-CE			



4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2159
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

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 Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841,
TAIWAN, R.O.C.
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	
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 I 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	2408WFPb	CN-OG293H-74261-9 5M-1KGS	FCC DoC	Shielded, 1.8m with 2 cores	Unshielded, 1.8m
2.	Printer	HP	C8952D	CN26R182GJ	FCC DoC	Shielded, 1.8m	Unshielded, 1.8m
3.	1TB 3.5" HDD	Buffalo	HD-HX1.0TU3-AP	15564891207204	FCC DoC	Shielded, 1m	N/A
4.	Multimedia Headset	Labtec	Axis-301	N/A	FCC DoC	Unshielded, 1.8m x 2	N/A
5.	USB Mouse	DELL	M-UV69a	323617-001	FCC DoC	Shielded, 1.8m	N/A

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.



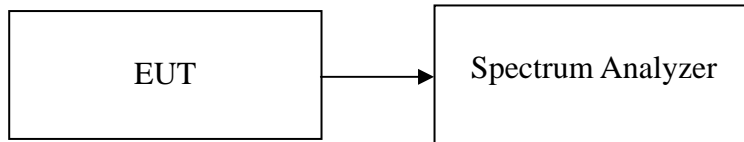
7. FCC PART 15.225 REQUIREMENTS

7.1 20 DB BANDWIDTH

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW= 5.1kHz, VBW = 10kHz, Span = 500kHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

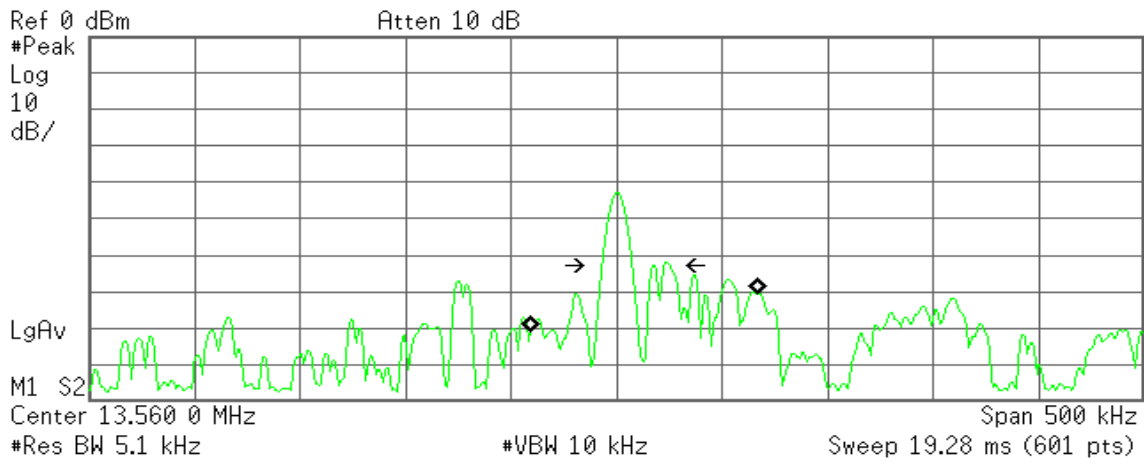
No non-compliance noted.



Test Plot

Agilent 09:37:56 Mar 5, 2013

R T



Occupied Bandwidth
108.4686 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error 13.132 kHz
x dB Bandwidth 32.861 kHz



7.2 RADIATED EMISSIONS

LIMIT

According to §15.225,

- (a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts / meter at 30 meters.
- (b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts / meter at 30 meters.
- (c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts / meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

According to §15.225, 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:

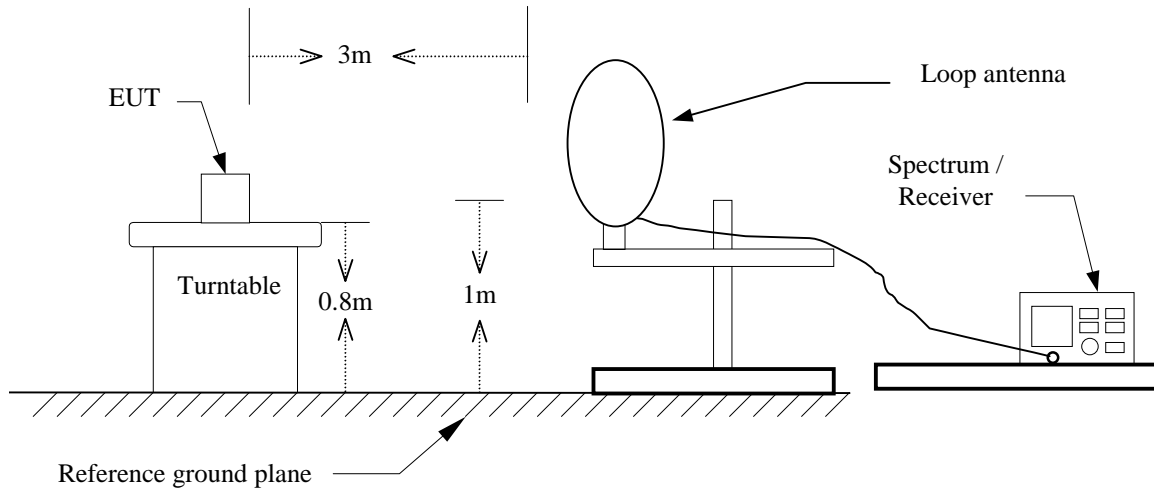
Frequency (MHz)	Field Strength (μ V/m at meter)	Measurement Distance (meter)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** 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.

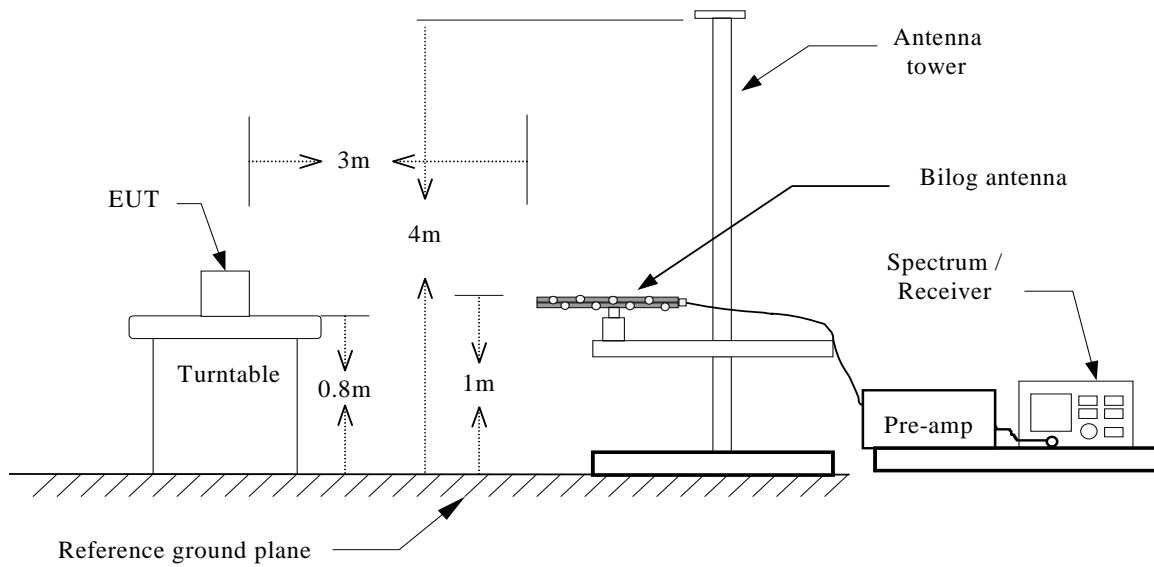


Test Configuration

9kHz ~ 30MHz



30MHz ~ 1GHz





TEST PROCEDURE

For 9kHz ~ 30MHz

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, The center of the loop shall be 1 m above the ground then to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Set the spectrum analyzer in the following setting as:
RBW=10kHz / VBW=30kHz / Sweep=AUTO
6. Repeat above procedures until the measurements for all frequencies are complete.

For 30MHz ~ 1GHz

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 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:
RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.



For P40G

Operation Mode: TX mode **Test Date:** February 25, 2013
Temperature: 27°C **Tested by:** Shawn Wu
Humidity: 53 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Detector Mode (PK/QP/AVG)
13.5604	35.54	5.73	41.27	124.00	-82.73	QP

Remark:

1. *Measuring frequencies from 9kHz to the 1GHz.*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.*
3. *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.*
4. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

**9kHz ~ 30MHz**

Operation Mode: TX mode **Test Date:** February 25, 2013
Temperature: 27°C **Tested by:** Shawn Wu
Humidity: 53 % RH

Frequency (MHz)	Reading (dBUV)	Correction Factor (dB/m)	Result (dBUV/m)	Limit 3m (dBUV/m)	Margin (dB)	Detector Mode (PK/QP/AVG)
0.1958	44.60	32.03	76.63	115.03	-38.40	Peak
0.2295	43.36	30.88	74.24	112.60	-38.36	Peak
0.2872	41.60	29.51	71.11	108.43	-37.32	Peak
0.3329	41.41	28.68	70.09	105.14	-35.05	Peak
0.3665	39.50	28.07	67.57	102.71	-35.14	Peak
0.3858	39.53	27.72	67.25	101.32	-34.07	Peak
0.4900	35.54	25.83	61.37	73.80	-12.43	Peak
0.9818	33.37	19.11	52.48	69.41	-16.93	Peak
4.5230	21.67	7.95	29.62	69.50	-39.88	Peak
7.1789	25.34	6.84	32.18	69.50	-37.32	Peak
14.8515	20.08	5.57	25.65	69.50	-43.85	Peak
20.9503	27.06	5.41	32.47	69.50	-37.03	Peak

Remark:

1. *Measuring frequencies from 9kHz to the 1GHz.*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.*
3. *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.*
4. *Margin (dB) = Result (dBUV/m) – Limit (dBUV/m).*

**30MHz ~ 1GHz**

Operation Mode: TX mode **Test Date:** February 25, 2013
Temperature: 27°C **Tested by:** Shawn Wu
Humidity: 53 % RH

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Ant.Pol. (H/V)	Detector Mode (PK/QP/AVG)
34.8500	55.08	-24.02	31.06	40.00	-8.94	V	Peak
249.8667	58.56	-29.65	28.91	46.00	-17.09	V	Peak
432.5500	50.24	-24.67	25.57	46.00	-20.43	V	Peak
531.1667	49.12	-23.03	26.09	46.00	-19.91	V	Peak
642.7167	53.03	-20.96	32.07	46.00	-13.93	V	Peak
799.5333	51.22	-19.04	32.18	46.00	-13.82	V	Peak
31.6167	44.28	-21.64	22.64	40.00	-17.36	H	Peak
214.3000	57.92	-29.72	28.20	43.50	-15.30	H	Peak
249.8667	58.57	-29.65	28.92	46.00	-17.08	H	Peak
316.1500	52.09	-27.35	24.74	46.00	-21.26	H	Peak
713.8500	46.44	-20.15	26.29	46.00	-19.71	H	Peak
799.5333	53.06	-19.04	34.02	46.00	-11.98	H	Peak

Remark:

1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
3. 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.
4. $Margin (dB) = Result (dBuV/m) - Limit (dBuV/m)$.



For P22S

Operation Mode: TX mode **Test Date:** February 25, 2013
Temperature: 27°C **Tested by:** Shawn Wu
Humidity: 53 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Detector Mode (PK/QP/AVG)
13.5602	36.28	5.73	42.01	124.00	-81.99	QP

Remark:

1. *Measuring frequencies from 9kHz to the 1GHz.*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.*
3. *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.*
4. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*



9kHz ~ 30MHz

Operation Mode: TX mode **Test Date:** February 25, 2013
Temperature: 27°C **Tested by:** Shawn Wu
Humidity: 53 % RH

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Detector Mode (PK/QP/AVG)
0.2078	43.98	31.62	75.60	114.16	-38.56	Peak
0.2559	41.69	30.08	71.77	110.69	-38.92	Peak
0.2864	40.35	29.53	69.88	108.49	-38.61	Peak
0.3433	39.75	28.49	68.24	104.39	-36.15	Peak
0.3738	38.78	27.94	66.72	102.19	-35.47	Peak
0.4034	39.52	27.40	66.92	100.05	-33.13	Peak
0.6867	37.24	22.25	59.49	72.05	-12.56	Peak
0.9326	36.39	19.53	55.92	69.85	-13.93	Peak
3.8345	21.45	8.90	30.35	69.50	-39.15	Peak
7.3265	26.45	6.81	33.26	69.50	-36.24	Peak
14.7532	20.28	5.58	25.86	69.50	-43.64	Peak
20.9503	24.99	5.41	30.40	69.50	-39.10	Peak

Remark:

1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
3. 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.
4. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).

**30MHz ~ 1GHz****Operation Mode:** TX mode**Test Date:** February 25, 2013**Temperature:** 27°C**Tested by:** Shawn Wu**Humidity:** 53 % RH

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Ant.Pol. (H/V)	Detector Mode (PK/QP/AVG)
33.2333	53.38	-22.83	30.55	40.00	-9.45	V	Peak
102.7500	52.16	-31.23	20.93	43.50	-22.57	V	Peak
531.1667	53.25	-23.03	30.22	46.00	-15.78	V	Peak
566.7333	51.40	-22.68	28.72	46.00	-17.28	V	Peak
763.9667	50.56	-19.39	31.17	46.00	-14.83	V	Peak
796.3000	53.90	-19.08	34.82	46.00	-11.18	V	Peak
31.6167	44.63	-21.64	22.99	40.00	-17.01	H	Peak
261.1833	54.26	-28.84	25.42	46.00	-20.58	H	Peak
311.3000	51.89	-27.47	24.42	46.00	-21.58	H	Peak
600.6833	45.82	-22.47	23.35	46.00	-22.65	H	Peak
762.3500	51.78	-19.40	32.38	46.00	-13.62	H	Peak
799.5333	56.78	-19.04	37.74	46.00	-8.26	H	Peak

Remark:

1. *Measuring frequencies from 9kHz to the 1GHz.*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.*
3. *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.*
4. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*



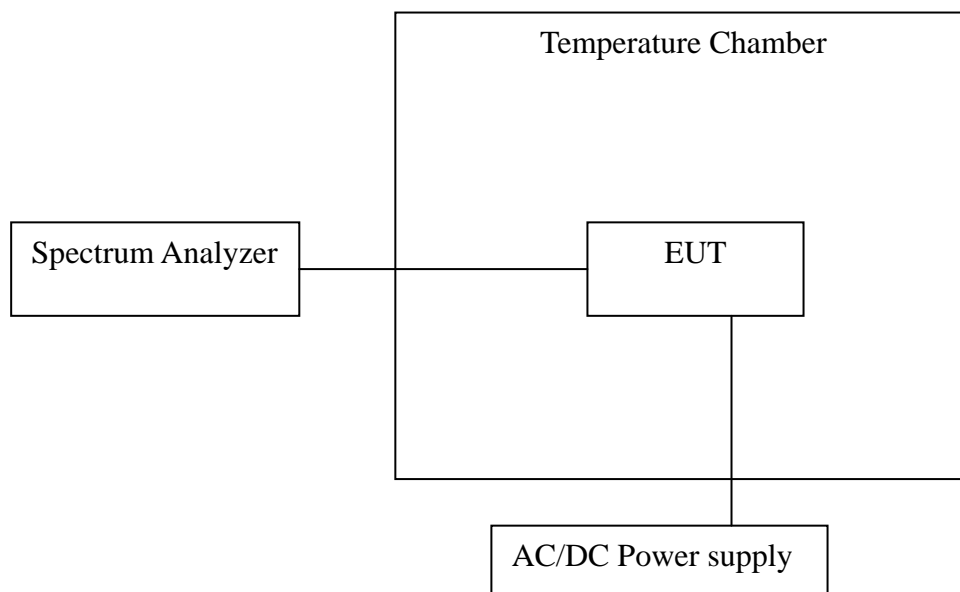
7.3 FREQUENCY STABILITY

LIMIT

According to §15.225(e), the frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the environment into appropriate environment.
4. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
5. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
6. Repeat until all the results are investigated.



TEST RESULTS

No non-compliance noted.

Temperature Variations

Temp. (°C)	Voltage (V)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (%)	Limit (±%)	Margin (%)	Result (Pass/Fail)
-20	120	13.56120	1200	0.00885	0.01	-0.00115	Pass
-10		13.56123	1228	0.00906	0.01	-0.00094	Pass
0		13.56121	1210	0.00892	0.01	-0.00108	Pass
10		13.56131	1310	0.00966	0.01	-0.00034	Pass
20		13.56124	1240	0.00914	0.01	-0.00086	Pass
30		13.56125	1250	0.00922	0.01	-0.00078	Pass
40		13.56129	1290	0.00951	0.01	-0.00049	Pass
50		13.56128	1280	0.00944	0.01	-0.00056	Pass

Voltage Variations

Temp. (°C)	Voltage (V)	Measured Frequency (MHz)	Delta Frequency (Hz)	Tolerance (%)	Limit (±%)	Margin (%)	Result (Pass/Fail)
20	102	13.56123	1230	0.00907	0.01	-0.00093	Pass
	120	13.56125	1250	0.00922	0.01	-0.00078	Pass
	138	13.56126	1260	0.00929	0.01	-0.00071	Pass



7.4 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 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.

Operation Mode:	Normal Link	Test Date:	March 5, 2013
Temperature:	26°C	Tested by:	Wayne Tsai
Humidity:	60% RH		

Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1632	45.04	34.71	0.09	45.13	34.80	65.30	55.30	-20.17	-20.50	L1
0.1872	49.60	42.76	0.09	49.69	42.85	64.16	54.16	-14.47	-11.31	L1
0.2311	43.65	31.64	0.09	43.74	31.73	62.41	52.41	-18.67	-20.68	L1
0.2584	39.51	28.15	0.09	39.60	28.24	61.48	51.48	-21.88	-23.24	L1
0.4103	45.04	31.29	0.10	45.14	31.39	57.64	47.64	-12.50	-16.25	L1
0.4779	41.51	31.40	0.10	41.61	31.50	56.38	46.38	-14.77	-14.88	L1
0.1847	51.36	46.56	0.09	51.45	46.65	64.27	54.27	-12.82	-7.62	L2
0.1923	48.79	40.47	0.09	48.88	40.56	63.94	53.94	-15.06	-13.38	L2
0.2477	45.28	38.24	0.09	45.37	38.33	61.83	51.83	-16.46	-13.50	L2
0.3365	36.62	22.43	0.09	36.71	22.52	59.29	49.29	-22.58	-26.77	L2
0.3950	42.98	24.52	0.09	43.07	24.61	57.96	47.96	-14.89	-23.35	L2
0.4879	42.85	34.83	0.09	42.94	34.92	56.20	46.20	-13.26	-11.28	L2

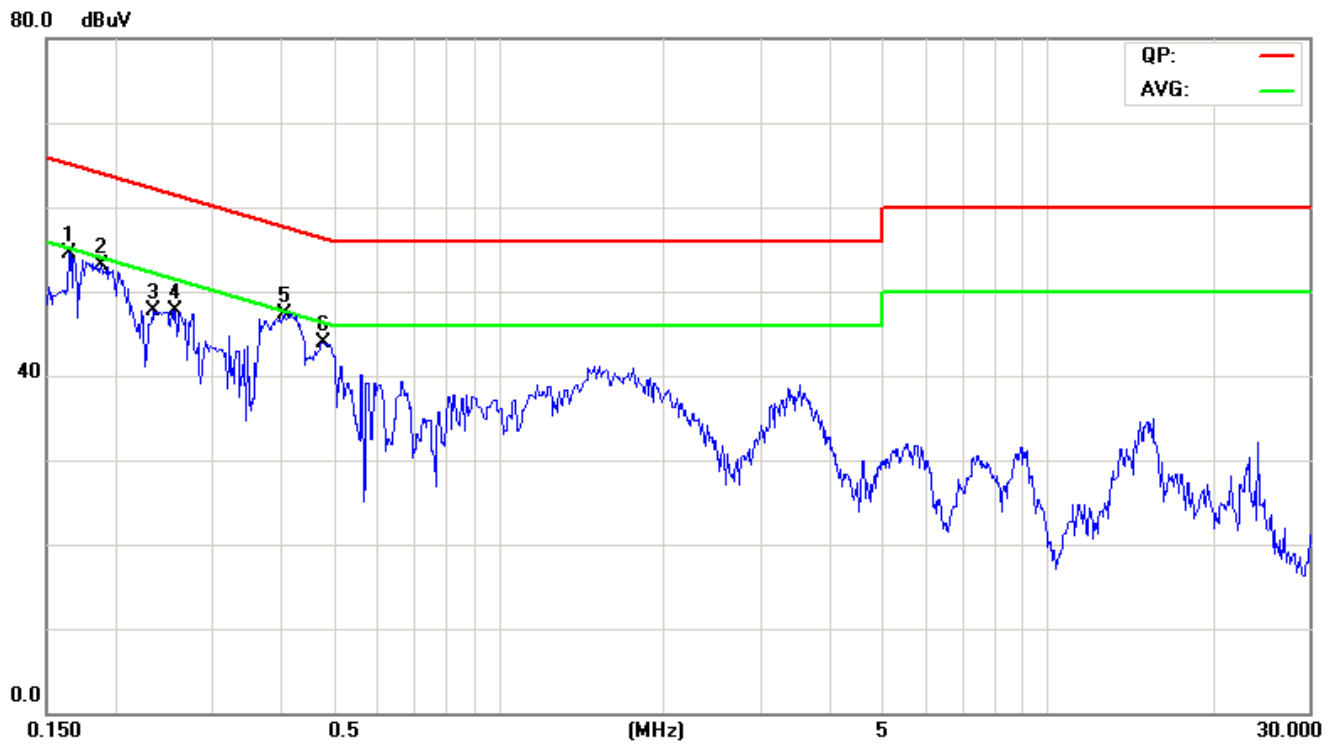
Remark:

1. The measuring frequencies range between 0.15 MHz and 30 MHz.
2. The emissions measured in the frequency range between 0.15 MHz and 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 10kHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)
5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.



Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

