



FCC 47 CFR PART 15 SUBPART C

ANSI C63.4: 2009

TEST REPORT

For

Industrial Radio Remote Controller

MODEL: SAGA1-V6

BRAND: SAGA

Issued to

GAIN ELECTRONIC CO., LTD

4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806), KAOHSIUNG,
TAIWAN, ROC

Issued by

Compliance Certification Services Inc.

Tainan Lab.

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Issued Date: August 16, 2013



**REVISION HISTORY**

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1. TEST RESULT CERTIFICATION

Product: Industrial Radio Remote Controller

Model: SAGA1-V6

Brand Name: SAGA

Applicant: GAIN ELECTRONIC CO., LTD

4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806),
KAOHSIUNG, TAIWAN, ROC

Manufacturer: GAIN ELECTRONIC CO., LTD

4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806),
KAOHSIUNG, TAIWAN, ROC

Tested: July 04, 2013 ~ July 23, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C: 2012 ANSI C63.4 : 2009	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 EUT tested as described in this report is in compliance with the requirements emission limits of FCC Rules Part 15.107, 15.109, 15.207, 15.209 and 15.249.

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

Approved by:

Jeter Wu
Assistant Manager

Reviewed by:

Eric Huang
Assistant Section Manager



2. EUT DESCRIPTION

Product	Industrial Radio Remote Controller
Model Number	SAGA1-V6
Brand Name	SAGA
Received Date	July 01, 2013
Frequency Range	904.000MHz to 926.138MHz
Transmit Peak Power	93.96 dB μ V/m
Data Rate	9.6kbps
Number of Channels	160 Channel
Type of Modulation	FSK
Power Supply	3Vdc (2 AA Size Battery)
Antenna Type	Planar inverted-F antenna (PIFA); Gain: 0 dBi
Temperature Range	-40°C ~ +80°C

Remark:

1. Client consigns only one model sample to test (Model Number: **SAGA1-V6**). Therefore, the testing Lab. just guarantees the unit, which has been tested.
2. This submittal(s) (test report) is intended for FCC ID: **NCT137V6T** filing to comply with Section 15.107 & 15.109 (FCC Part 15, Subpart B) and Section 15.207, 15.209, 15.249.
3. For more details, please refer to the User's manual of the EUT.



Frequency Listed											
Frequency Range : 904MHz ~ 926.138 MHz											
Number of Channels : 160 Channels											
Type of Modulation : FSK (Frequency Shift Key)											
No	MHz	No	MHz	No	MHz	No	MHz	No	MHz	No	MHz
1	904.000	41	908.007	50	912.014	90	916.021	130	920.028		924.035
2	904.100	42	908.107	51	912.114	91	916.121	131	920.128		924.135
3	904.200	43	908.207	52	912.214	92	916.221	132	920.228		924.235
4	904.300	44	908.307	53	912.314	93	916.321	133	920.328		924.335
5	904.401	45	908.408	54	912.414	94	916.421	134	920.428		924.435
6	904.501		908.508	55	912.515	95	916.522	135	920.529		924.536
7	904.601		908.608	56	912.615	96	916.622	136	920.629	145	924.636
8	904.701		908.708	57	912.715	97	916.722	137	920.729	146	924.736
9	904.801		908.808	58	912.815	98	916.822	138	920.829	147	924.836
10	904.901		908.908	59	912.915	99	916.922	139	920.929	148	924.936
11	905.002		909.009	60	913.016	100	917.022	140	921.029	149	925.036
12	905.102		909.109	61	913.116	101	917.123	141	921.130	150	925.137
13	905.202		909.209	62	913.216	102	917.223	142	921.230	151	925.237
14	905.302		909.309	63	913.316	103	917.323	143	921.330	152	925.337
15	905.402		909.409	64	913.416	104	917.423	144	921.430	153	925.437
16	905.502		909.509	65	913.516	105	917.523		921.530	154	925.537
17	905.603		909.610	66	913.617	106	917.624		921.630	155	925.637
18	905.703		909.710	67	913.717	107	917.724		921.731	156	925.738
19	905.803		909.810	68	913.817	108	917.824		921.831	157	925.838
20	905.903		909.910	69	913.917	109	917.924		921.931	158	925.938
21	906.003		910.010	70	914.017	110	918.024		922.031	159	926.038
22	906.104		910.110	71	914.117	111	918.124		922.131	160	926.138
23	906.204		910.211	72	914.218	112	918.225		922.232		
24	906.304		910.311	73	914.318	113	918.325		922.332		
25	906.404		910.411	74	914.418	114	918.425		922.432		
26	906.504		910.511	75	914.518	115	918.525		922.532		
27	906.604		910.611	76	914.618	116	918.625		922.632		
28	906.705		910.712	77	914.718	117	918.725		922.732		
29	906.805		910.812	78	914.819	118	918.826		922.833		
30	906.905		910.912	79	914.919	119	918.926		922.933		
31	907.005		911.012	80	915.019	120	919.026		923.033		
32	907.105		911.112	81	915.119	121	919.126		923.133		
33	907.205		911.212	82	915.219	122	919.226		923.233		
34	907.306		911.313	83	915.320	123	919.326		923.333		
35	907.406		911.413	84	915.420	124	919.427		923.434		
36	907.506		911.513	85	915.520	125	919.527		923.534		
37	907.606	46	911.613	86	915.620	126	919.627		923.634		
38	907.706	47	911.713	87	915.720	127	919.727		923.734		
39	907.806	48	911.813	88	915.820	128	919.827		923.834		
40	907.907	49	911.914	89	915.921	129	919.928		923.934		



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 15.249.

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, 15.249 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: SAGA1-V6**) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

The new batteries are used during the measurement.

Note :

The field strength of spurious emission was measured in the following position: EUT have three test modes(X, Y, Z axis). The worst emission was found in X axis and the worst case was recorded.



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

Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	DEC. 18, 2013
BI-LOG Antenna	Sunol	JB1	A070506-2	SEP. 26, 2013
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2014
Pre-Amplifier	HP	8447F	NCR	NCR
EMI Receiver	R&S	ESVS10	833206/012	JUN. 26, 2014
Horn Antenna	Com-Power	AH-118	071032	DEC. 05, 2013
3116 Double Ridge Antenna (40G)	ETS-LINDGREN	3116	00078900	DEC. 27, 2013
Turn Table	Yo Chen	001	-----	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	-----	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Power Meter	Anritsu	ML2487A	6K00003888	JUN. 24, 2014
Power Sensor	Anritsu	MA2491A	33265	JUN. 24, 2014
Temp./Humidity Chamber	K.SON	THS-M1	242	AUG. 08, 2013
DC Power Source	LOKO	DSP-5050	L1507009282	N.C.R
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 28, 2013

Remark: Each piece of equipment is scheduled for calibration once a year.



4.3 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Radiated Emission, 9 kHz to 30 MHz Test Site : OATS-6	±3.22dB
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.3456dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±2.6828dB
Radiated Emission, 1 to 8 GHz	± 2.6485dB
Radiated Emission, 8 to 18 GHz	± 2.6852dB
Radiated Emission, 18 to 26.5 GHz	± 2.6485dB
Radiated Emission, 26 to 40 GHz	± 3.0295dB
Power Line Conducted Emission	±1.91dB
Band Width	136.49kHz
Peak Output Power MU	±1.904dB
Band Edge MU	±0.302dBuV
Channel Separation MU	361.69Hz
Duty Cycle MU	0.064ms
Frequency Stability MU	0.223kHz

Uncertainty figures are valid to a confidence level of 95%, k=2



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7:1992, ANSI C63.4 : 2003 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 LABORATORY ACCREDITATIONS LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW-1037).



5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

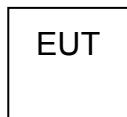
Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

RF Test



6.2 SUPPORT EQUIPMENT

RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1.	N/A	---	---	---	---

No.	Signal cable description
A	N/A ---

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.

6.3 EUT OPERATING CONDITION

RF Setup

1. Setup a whole system as the setup diagram.
2. Turn on power.
3. Press the button "start" and press the other button.

NOTE:

The transmission is modified to continuously transmission by software.



7. FCC PART 15.249 REQUIREMENTS

7.1 20 DB BANDWIDTH

LIMIT

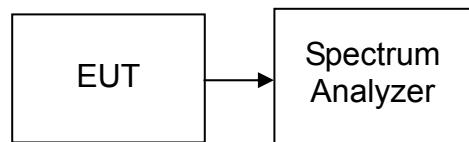
None; for reporting purposes only.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	R&S	FSU	200789	SEP. 29 , 2013

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

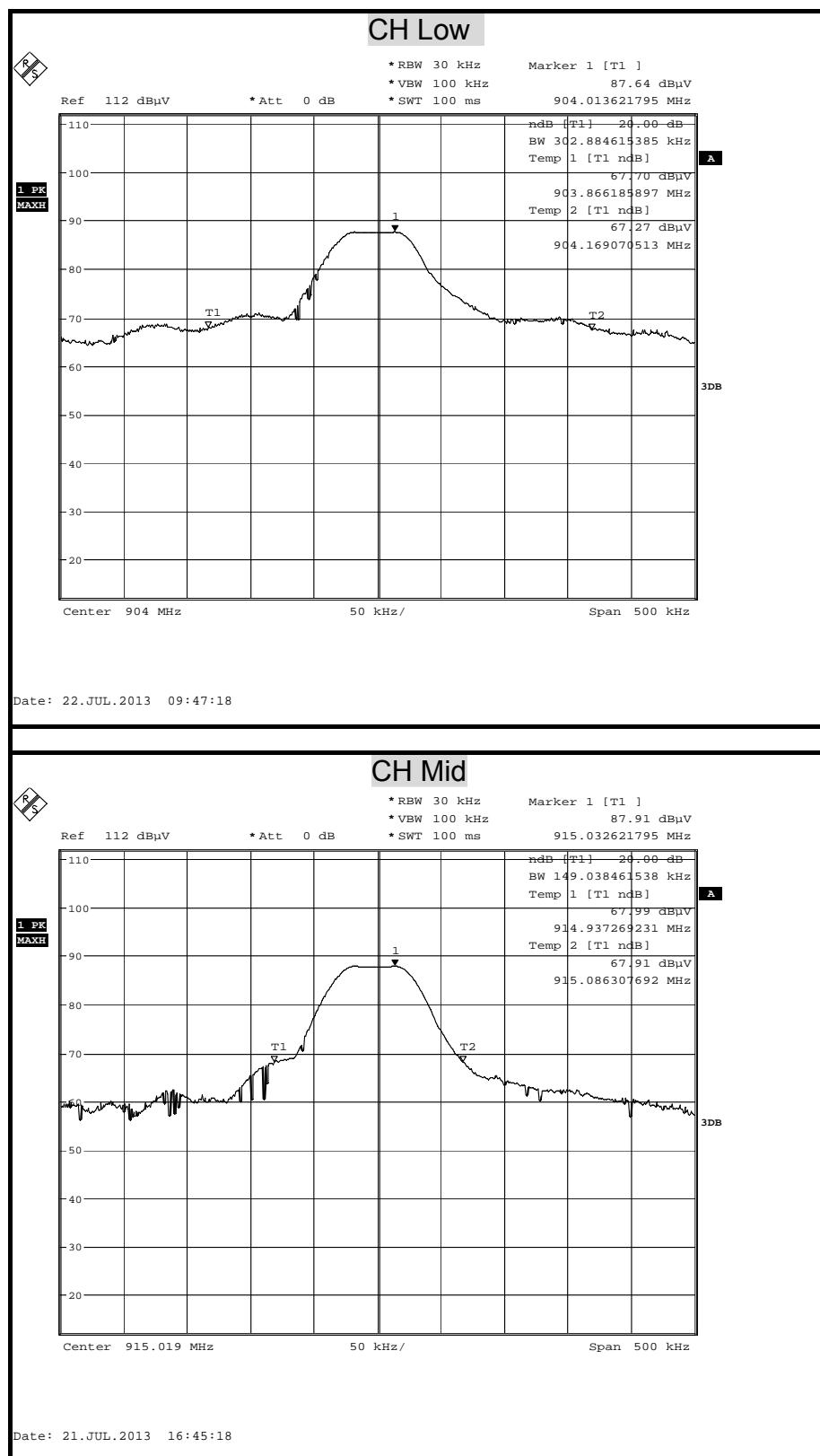
The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 30 kHz and VBW is set 100kHz..

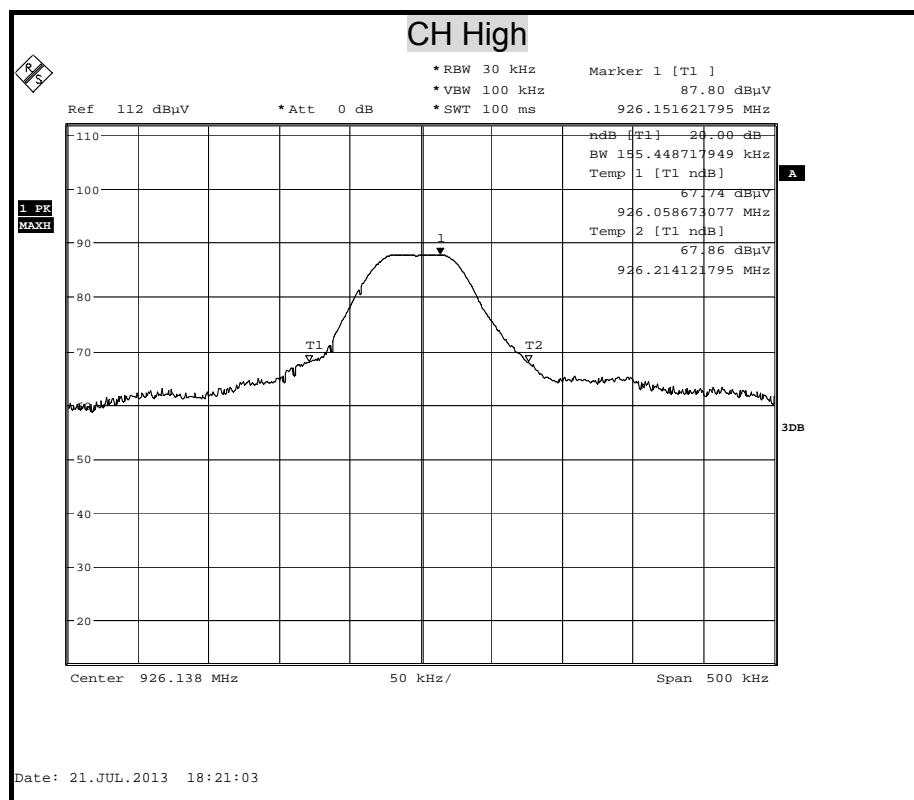
TEST RESULTS

No non-compliance noted.

Test Data

Channel	Frequency (MHz)	20dB Bandwidth (KHz)
Low	904.000	302.88
Middle	915.019	149.04
High	926.138	155.45

**Test Plot**



7.2 BAND EDGES MEASUREMENT

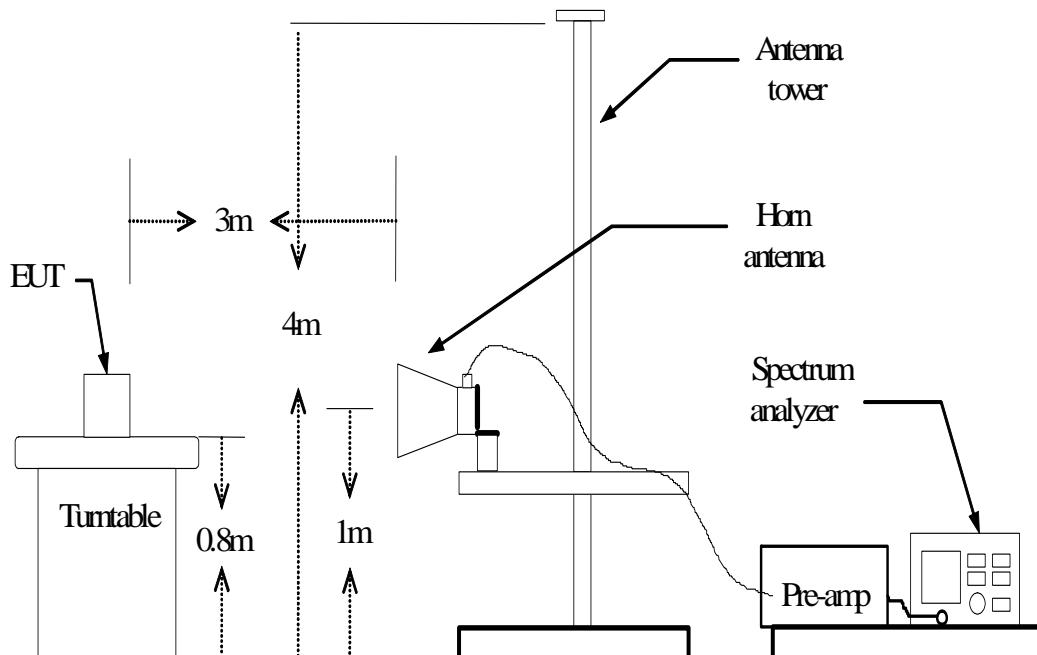
LIMIT

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

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength ($\text{dB}\mu\text{V/m}$ at 3-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

2. As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

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: Peak Level + Duty Factor
5. Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

TEST RESULTS

After estimate 20dB bandwidth of 1st and last channel ,the declared frequency will not invade restrict band. There is no requirement for this test.



7.3 DUTY CYCLE

LIMIT

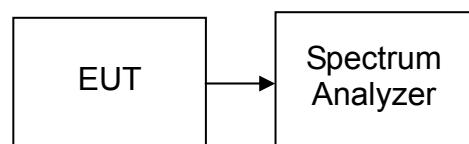
Nil (No dedicated limit specified in the Rules)

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	R&S	FSEK 30	835253/002	SEP, 29, 2013

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in 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 center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW=100kHz, VBW=300KHz, Span = 0Hz, a suitable Sweep Time.
5. Repeat above procedures until all frequency measured were complete.



TEST RESULTS

No non-compliance noted.

TEST DATA

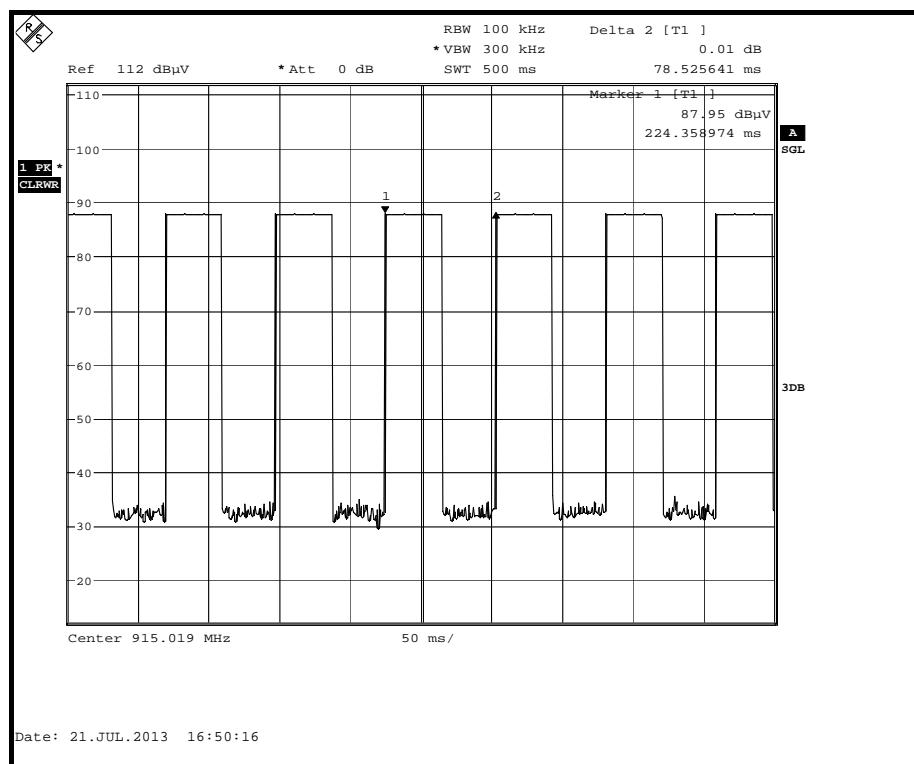
	us	Times	Ton	Total Ton time(ms)
Ton1	40544.872	1	40544.872	40.545
Ton2		0	0.000	
Ton3		0	0.000	
Tp				77.885

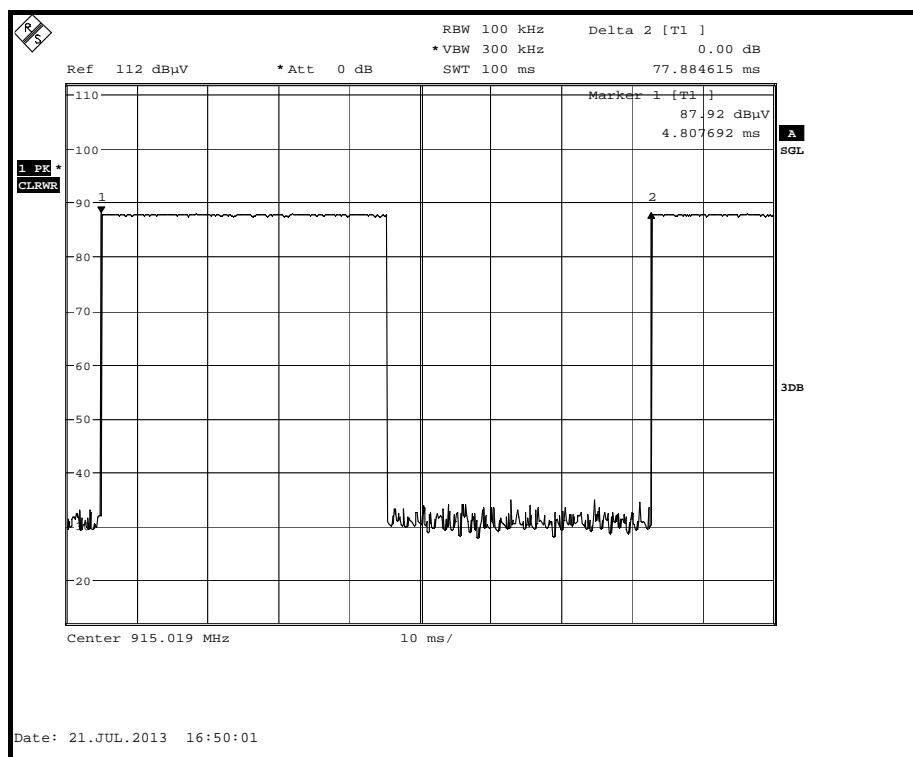
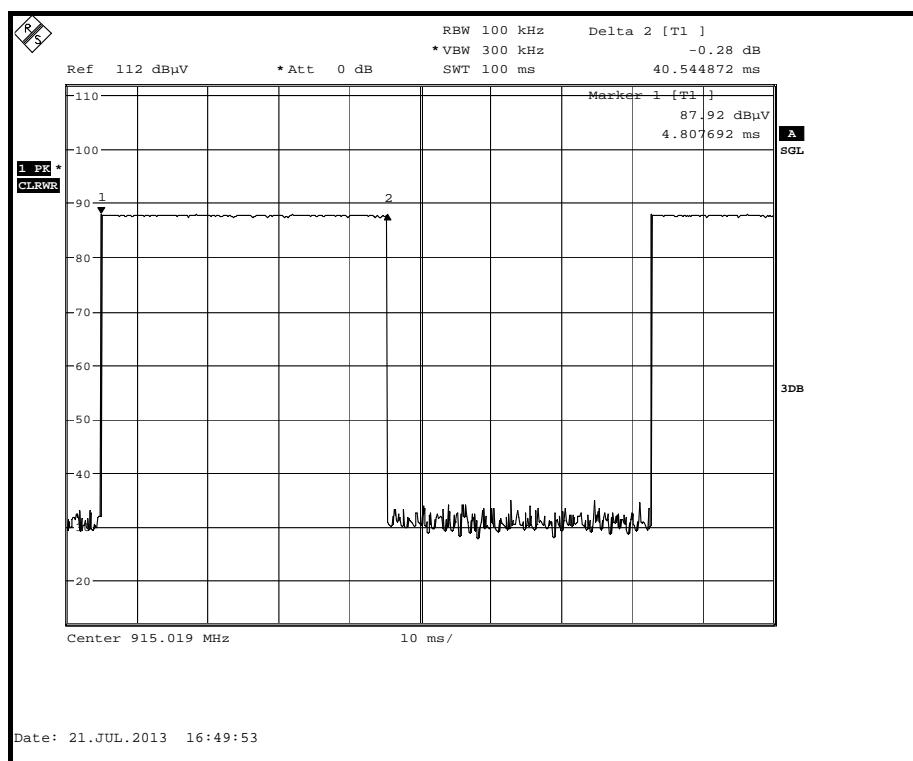
Ton	40.545
Tp(Ton+Toff)	77.885
Duty Cycle	0.521
Duty Factor	-5.670

52.05761369 %

Test Plot

TP1



**TP2****Ton**



7.4 SPURIOUS EMISSION

LIMIT

1. In the section 15.249(a):

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Field Strength (mV/m)	Field Strength of Harmonics (μ V/m)
902-928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

2. 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 3-meter)	Field Strength (dB μ V/m at 3-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

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.

3. In the above emission table, 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)
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

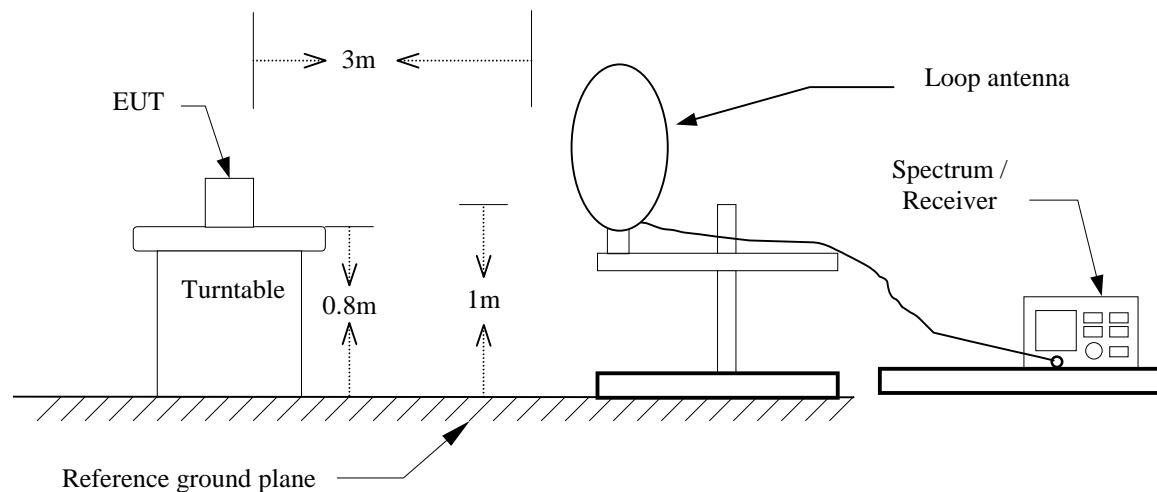
**MEASUREMENT EQUIPMENT USED**

Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	DEC. 18, 2013
BI-LOG Antenna	Sunol	JB1	A070506-2	SEP. 26, 2013
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2014
Pre-Amplifier	HP	8447F	NCR	NCR
EMI Receiver	R&S	ESVS10	833206/012	JUN. 26, 2014
Horn Antenna	Com-Power	AH-118	071032	DEC. 05, 2013
3116 Double Ridge Antenna (40G)	ETS-LINDGREN	3116	00078900	DEC. 27, 2013
Turn Table	Yo Chen	001	-----	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	-----	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Power Meter	Anritsu	ML2487A	6K00003888	JUN. 24, 2014
Power Sensor	Anritsu	MA2491A	33265	JUN. 24, 2014
Temp./Humidity Chamber	K.SON	THS-M1	242	AUG. 08, 2013
DC Power Source	LOKO	DSP-5050	L1507009282	N.C.R
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 28, 2013

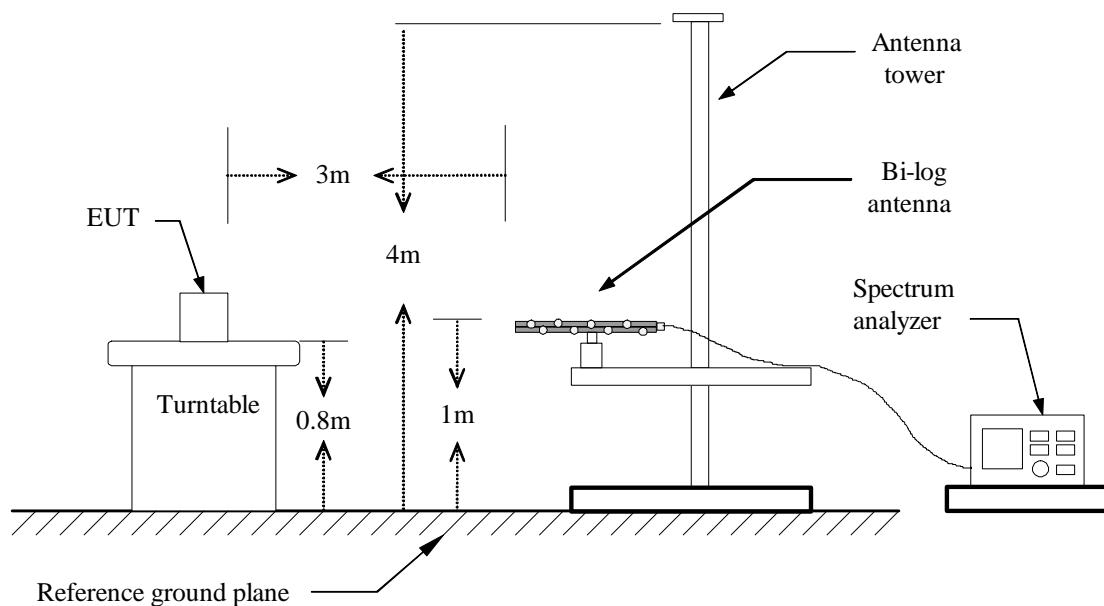
Remark: Each piece of equipment is scheduled for calibration once a year.

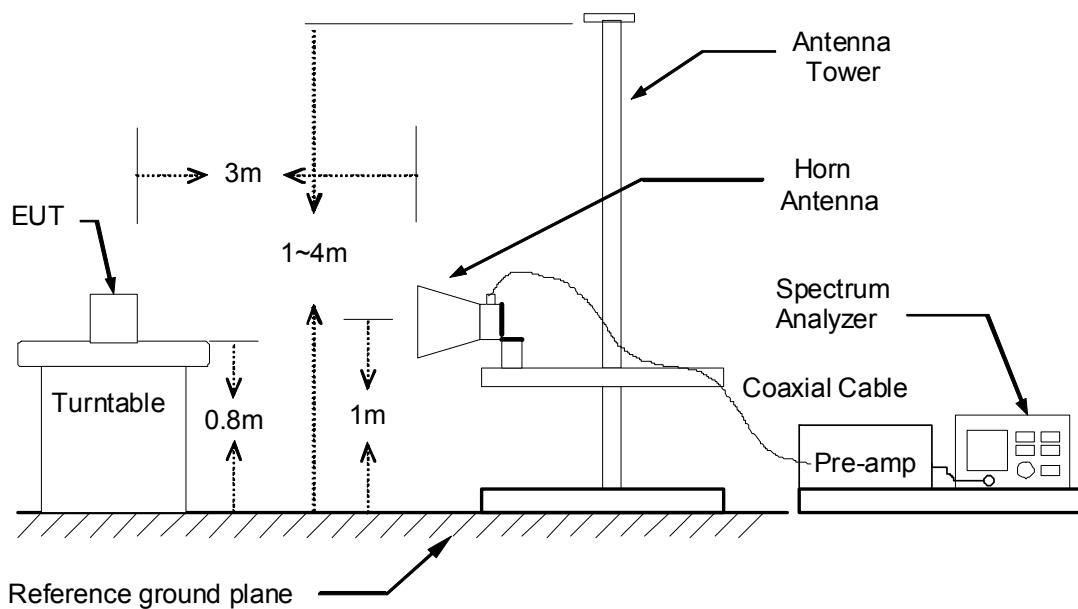
TEST CONFIGURATION

9kHz ~ 30MHz



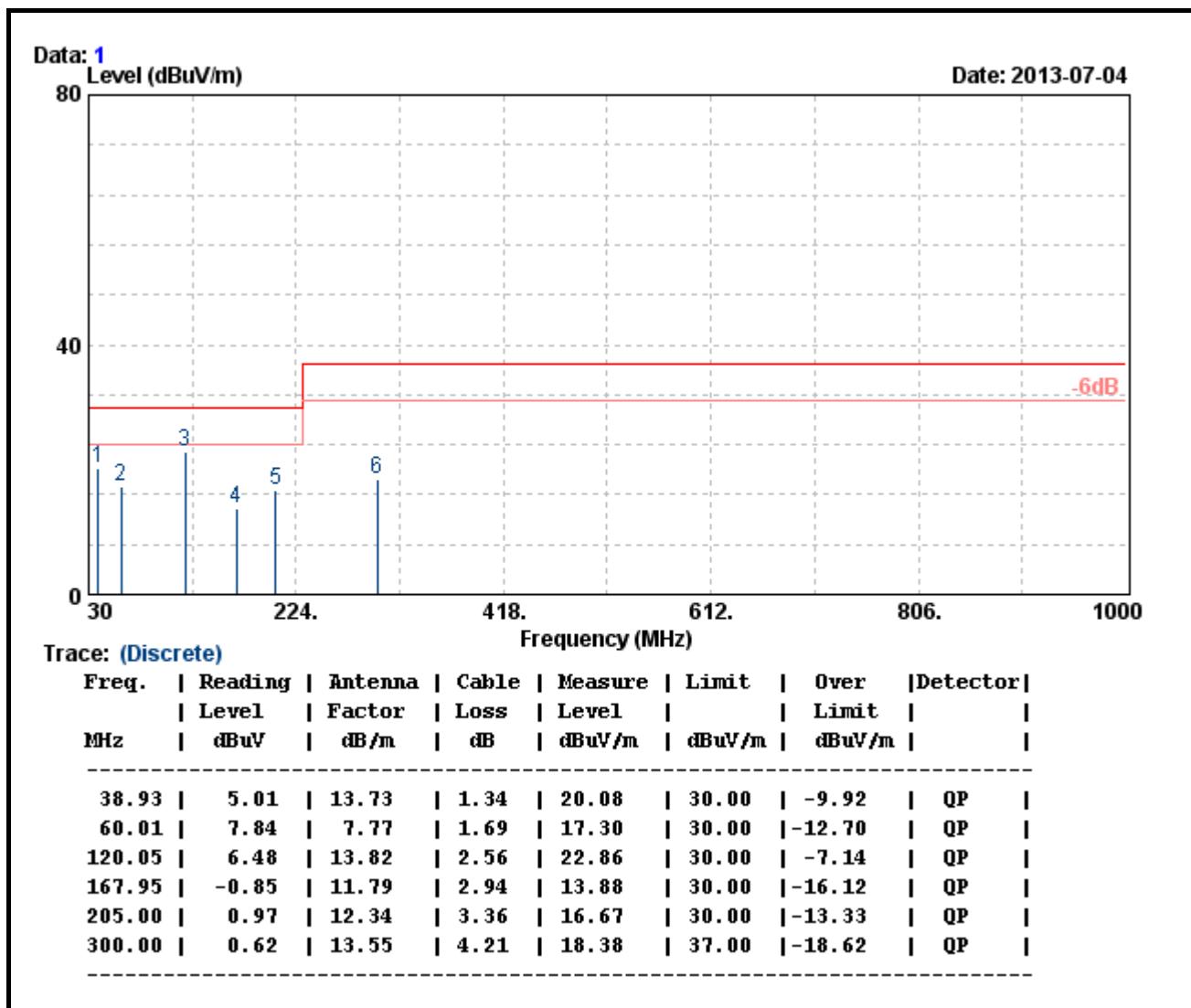
30MHz ~ 1GHz



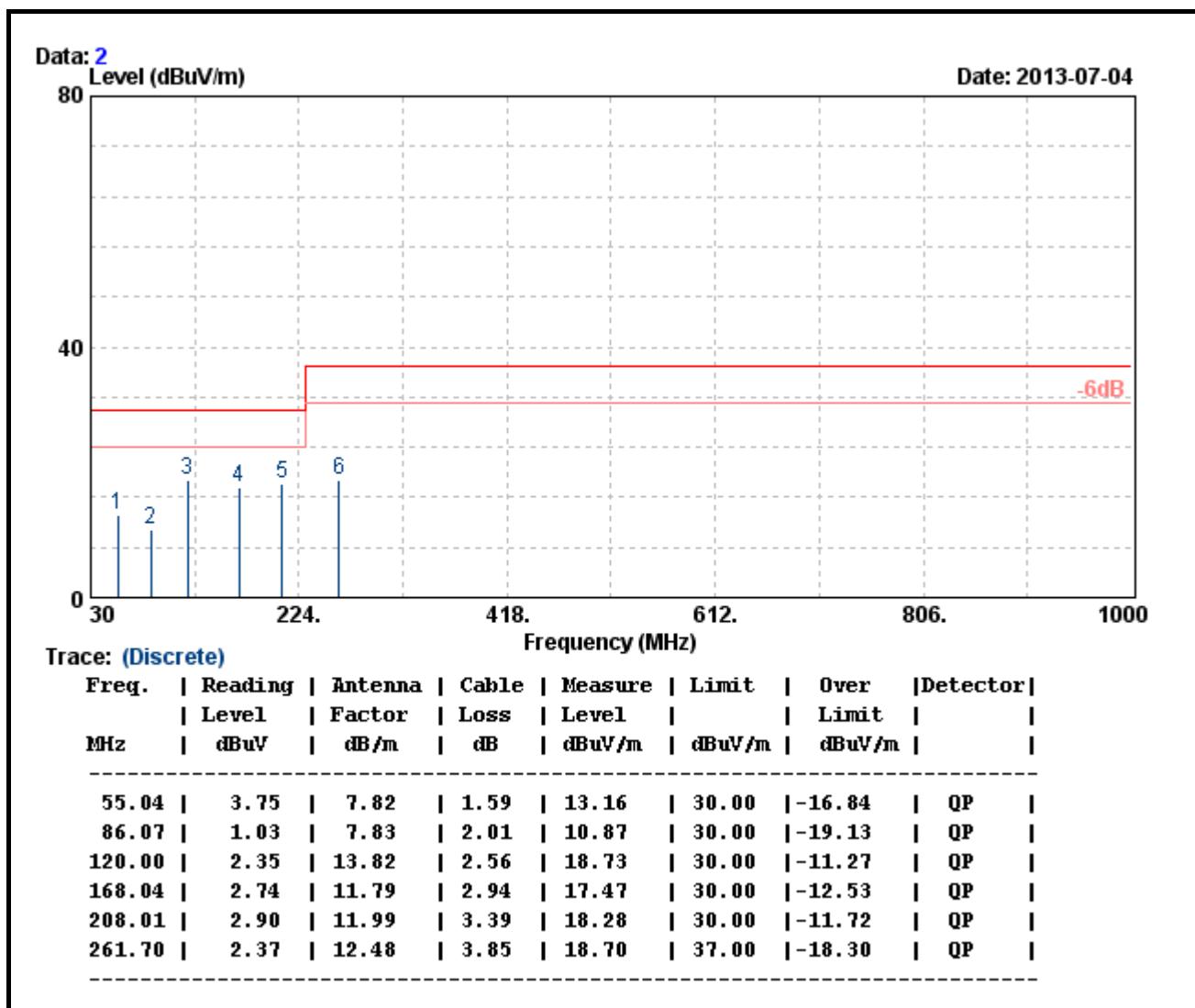
**Above 1 GHz**

**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: Peak Level + Duty Factor
7. Repeat above procedures until the measurements for all frequencies are complete.

**Below 1GHz****Operation Mode:** Link Mode**Test Date:** 2013/07/04**Temperature:** 25°C**Tested by:** Ted Huang**Humidity:** 54% RH**Polarity:** Ver. / Hor.**Vertical****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) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).
6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.
7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 – 1000 MHz scan.

**Operation Mode:** Link Mode**Test Date:** 2013/07/04**Temperature:** 25°C**Tested by:** Ted Huang**Humidity:** 54% RH**Polarity:** Ver. / Hor.**Horizontal****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) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).
6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.
7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 – 1000 MHz scan.

**The fundamental signal****Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.**Horizontal**

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
904.000	87.85	23.25	6.60	24.14	0.00	93.56	114.00	-20.44	P
904.000	86.71	23.25	6.60	24.14	0.00	92.42	94.00	-1.58	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
904.000	77.81	23.25	6.60	24.14	0.00	83.52	114.00	-30.48	P
904.000	76.59	23.25	6.60	24.14	0.00	82.30	94.00	-11.70	Q

Remark:*Margin (dB) = Remark result (dB μ V/m) – Quasi-peak limit (dB μ V/m).*

**The fundamental signal****Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.**Horizontal**

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
915.019	88.06	23.37	6.65	24.15	0.00	93.93	114.00	-20.07	P
915.019	86.93	23.37	6.65	24.15	0.00	92.80	94.00	-1.20	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
915.019	78.73	23.37	6.65	24.15	0.00	84.60	114.00	-29.40	P
915.019	77.49	23.37	6.65	24.15	0.00	83.36	94.00	-10.64	Q

Remark:*Margin (dB) = Remark result (dB μ V/m) – Quasi-peak limit (dB μ V/m).*

**The fundamental signal****Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.**Horizontal**

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
926.138	87.93	23.49	6.69	24.15	0.00	93.96	114.00	-20.04	P
926.138	86.75	23.49	6.69	24.15	0.00	92.78	94.00	-1.22	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)
926.138	78.30	23.49	6.69	24.15	0.00	84.33	114.00	-29.67	P
926.138	77.09	23.49	6.69	24.15	0.00	83.12	94.00	-10.88	Q

Remark:*Margin (dB) = Remark result (dB μ V/m) – Quasi-peak limit (dB μ V/m).*

**Above 1GHz****Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.

Horizontal

Freq. (MHz)	Reading (dB μ V)	AF (dB/m)	Cable Loss (dB)	Pre-amp (dB)	Filter (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Mark	
1808.03	67.52	28.98	2.51	44.78	0.30	54.53	74.00	-19.47	P	
1808.03	61.85	28.98	2.51	44.78	0.30	48.86	54.00	-5.14	A	
*	2712.18	56.15	30.28	3.02	44.84	0.30	44.92	74.00	-29.08	P
*	2712.18	50.48	30.28	3.02	44.84	0.30	39.25	54.00	-14.75	A
*	3616.03	59.85	30.69	3.38	44.42	0.30	49.79	74.00	-24.21	P
*	3616.03	54.18	30.69	3.38	44.42	0.30	44.12	54.00	-9.88	A
*	4520.00	56.41	32.37	3.76	44.75	0.40	48.20	74.00	-25.80	P
*	4520.00	50.74	32.37	3.76	44.75	0.40	42.53	54.00	-11.47	A
*	5423.99	56.92	34.27	4.03	45.01	0.40	50.62	74.00	-23.38	P
*	5423.99	51.25	34.27	4.03	45.01	0.40	44.95	54.00	-9.05	A
	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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.

Vertical

Freq. (MHz)	Reading (dB μ V)	AF (dB/m)	Cable Loss (dB)	Pre-amp (dB)	Filter (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Mark (P/Q/A)	
1807.95	60.70	28.98	2.51	44.78	0.30	47.71	74.00	-26.29	P	
1807.95	55.03	28.98	2.51	44.78	0.30	42.04	54.00	-11.96	A	
*	2711.78	55.72	30.28	3.02	44.84	0.30	44.49	74.00	-29.51	P
*	2711.78	50.05	30.28	3.02	44.84	0.30	38.82	54.00	-15.18	A
*	3615.91	61.80	30.69	3.38	44.42	0.30	51.74	74.00	-22.26	P
*	3615.91	56.13	30.69	3.38	44.42	0.30	46.07	54.00	-7.93	A
*	4519.85	55.95	32.37	3.76	44.75	0.40	47.74	74.00	-26.26	P
*	4519.85	50.28	32.37	3.76	44.75	0.40	42.06	54.00	-11.94	A
*	5424.01	58.70	34.27	4.03	45.01	0.40	52.40	74.00	-21.60	P
*	5424.01	53.03	34.27	4.03	45.01	0.40	46.73	54.00	-7.27	A
	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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.**Horizontal**

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)	
1830.23	66.36	29.14	2.52	44.79	0.30	53.54	74.00	-20.46	P	
1830.23	60.69	29.14	2.52	44.79	0.30	47.87	54.00	-6.13	A	
*	2745.04	56.19	30.30	3.04	44.76	0.30	45.06	74.00	-28.94	P
*	2745.04	50.52	30.30	3.04	44.76	0.30	39.39	54.00	-14.61	A
*	3659.99	62.55	30.76	3.40	44.42	0.30	52.58	74.00	-21.42	P
*	3659.99	56.88	30.76	3.40	44.42	0.30	46.91	54.00	-7.09	A
*	4574.79	57.41	32.57	3.78	44.81	0.40	49.35	74.00	-24.65	P
*	4574.79	51.74	32.57	3.78	44.81	0.40	43.68	54.00	-10.32	A
	5490.30	56.86	34.30	4.06	44.97	0.40	50.65	74.00	-23.35	P
	5490.30	51.19	34.30	4.06	44.97	0.40	44.98	54.00	-9.02	A
	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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.

Vertical

Freq. (MHz)	Reading (dB μ V)	AF (dB/m)	Cable Loss (dB)	Pre-amp (dB)	Filter (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Mark	
(P/Q/A)										
1830.07	59.55	29.14	2.52	44.79	0.30	46.73	74.00	-27.27	P	
1830.07	53.88	29.14	2.52	44.79	0.30	41.06	54.00	-12.94	A	
*	2744.83	56.08	30.30	3.04	44.76	0.30	44.95	74.00	-29.05	P
*	2744.83	50.41	30.30	3.04	44.76	0.30	39.28	54.00	-14.72	A
*	3659.98	62.48	30.76	3.40	44.42	0.30	52.51	74.00	-21.49	P
*	3659.98	56.81	30.76	3.40	44.42	0.30	46.84	54.00	-7.16	A
*	4575.03	57.39	32.57	3.78	44.81	0.40	49.33	74.00	-24.67	P
*	4575.03	51.72	32.57	3.78	44.81	0.40	43.66	54.00	-10.34	A
	5490.06	57.39	34.30	4.06	44.97	0.40	51.18	74.00	-22.82	P
	5490.06	51.72	34.30	4.06	44.97	0.40	45.51	54.00	-8.49	A
	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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.**Horizontal**

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
(MHz)	(dB μ V)	(dB/m)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(P/Q/A)	
1852.29	65.92	29.31	2.54	44.79	0.30	53.27	74.00	-20.73	P	
1852.29	60.25	29.31	2.54	44.79	0.30	47.60	54.00	-6.40	A	
*	2778.01	55.56	30.31	3.05	44.69	0.30	44.54	74.00	-29.46	P
*	2778.01	49.89	30.31	3.05	44.69	0.30	38.87	54.00	-15.13	A
*	3704.60	61.69	30.83	3.41	44.42	0.30	51.81	74.00	-22.19	P
*	3704.60	56.02	30.83	3.41	44.42	0.30	46.14	54.00	-7.86	A
*	4630.11	55.73	32.77	3.79	44.87	0.40	47.82	74.00	-26.18	P
*	4630.11	50.06	32.77	3.79	44.87	0.40	42.15	54.00	-11.85	A
	5556.96	56.78	34.36	4.08	45.00	0.40	50.62	74.00	-23.38	P
	5556.96	51.11	34.36	4.08	45.00	0.40	44.95	54.00	-9.05	A
	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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 31.4°C**Tested by:** John Chen**Humidity:** 60% RH**Polarity:** Ver. / Hor.

Vertical

Freq. (MHz)	Reading (dB μ V)	AF (dB/m)	Cable Loss (dB)	Pre-amp (dB)	Filter (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Mark	
1852.18	61.33	29.31	2.54	44.79	0.30	48.68	74.00	-25.32	P	
1852.18	55.66	29.31	2.54	44.79	0.30	43.01	54.00	-10.99	A	
*	2778.45	55.86	30.31	3.05	44.68	0.30	44.84	74.00	-29.16	P
*	2778.45	50.19	30.31	3.05	44.68	0.30	39.17	54.00	-14.83	A
*	3704.36	58.56	30.83	3.41	44.42	0.30	48.68	74.00	-25.32	P
*	3704.36	52.89	30.83	3.41	44.42	0.30	43.01	54.00	-10.99	A
*	4630.81	57.24	32.77	3.79	44.87	0.40	49.33	74.00	-24.67	P
*	4630.81	51.57	32.77	3.79	44.87	0.40	43.66	54.00	-10.34	A
5556.95	58.72	34.36	4.08	45.00	0.40	52.56	74.00	-21.44	P	
5556.95	53.05	34.36	4.08	45.00	0.40	46.89	54.00	-7.11	A	
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 (dB μ V/m) – Average limit (dB μ V/m). Peak detector mode and average detector mode of the emission shown in Result column



7.5 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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

MEASUREMENT EQUIPMENT USED

Conducted Emission room #1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N.	SCHWARZBECK	NNLK 8130	8130124	SEP. 30, 2013
	Rohde & Schwarz	ESH 3-Z5	840062/021	JUL. 31, 2013
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL. 23, 2014
BNC COAXIAL CABLE	CCS	BNC50	11	OCT. 30, 2013
Test S/W	e-3 (5.04211c) R&S (2.27)			

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST RESULTS

This EUT is powered by the battery only, so this test item is not applicable.