FCC 47 CFR PART 15 SUBPART C
ANSI C63.4: 2003

TEST REPORT

For

Industrial Radio Remote Controller

MODEL: SAGA1-P10

DATA APPLIES TO: SAGA1-P10-1; SAGA1-P8; SAGA1-P8-1; SAGA1-P6; SAGA1-P6-1; SAGA1-P4; SAGA1-P4-1

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.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
TEL: (06) 580-2201
FAX: (06) 580-2202
Issued Date: December 18, 2012

REVISION HISTORY

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 3, 2012	Initial Issue	ALL	Eva Lin
01	December 14, 2012	Update test data	Page 28-30	Eva Lin
02	December 18, 2012	Revised data	Page 26-27	Eva Lin

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Product:	Industrial Radio Remote Controller
Model:	SAGA1-P10
Data Applies To:	SAGA1-P10-1; SAGA1-P8; SAGA1-P8-1; SAGA1-P6; SAGA1-P6-1; SAGA1-P4; SAGA1-P4-1
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:	November 19, 2012 – November 23, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C ANSI C63.4 : 2003	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 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: ***Reviewed by:***

Jeter Wu
Assistant Manager

Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

Product	Industrial Radio Remote Controller
Model Number	SAGA1-P10
Data Applies To	SAGA1-P10-1; SAGA1-P8; SAGA1-P8-1; SAGA1-P6; SAGA1-P6-1; SAGA1-P4; SAGA1-P4-1
Brand Name	SAGA
Received Date	November 14, 2012
Frequency Range	910.146 MHz to 925.906 MHz
Transmit Peak Power	87.94 dBμV/m
Data Rate	4.8 kbps
Number of Channels	160 Channels
Type of Modulation	FSK
Power Supply	6Vdc
Antenna Type	Whip antenna Gain: ≦0 dBi
Temperature Range	-15°C ~ +60°C

Remark:

1. Client consigns only one model sample to test (Model Number: **SAGA1-P10**). Therefore, the testing Lab. just guarantees the unit, which has been tested.
2. This submittal(s) (test report) is intended for FCC ID: **NCT12BP10** filing to comply with Section 15.107 & 15.109 (FCC Part 15, Subpart B) and Section 15.207, 15.209, 15.249.
3. The different of the each model is shown as below:

The difference of the series (SAGA1-P10)

Model / Different Item	SAGA1-P10	SAGA1-P10-1	SAGA1-P8	SAGA1-P8-1
Brand	SAGA	SAGA	SAGA	SAGA
Transmitter PCB	Same	Same	Same	Same
Transmitter Power Supply	Same	Same	Same	Same
Transmitter RF Circuit Design	Same	Same	Same	Same
Transmitter Key Numbers & Spec.	Eight units of double-speed push-button	Eight units of Single-speed push-button	Six units of double-speed push-button	Six units of Single-speed push-button

Model / Different Item	SAGA1-P6	SAGA1-P6-1	SAGA1-P4	SAGA1-P4-1
Brand	SAGA	SAGA	SAGA	SAGA
Transmitter PCB	Same	Same	Same	Same
Transmitter Power Supply	Same	Same	Same	Same
Transmitter RF Circuit Design	Same	Same	Same	Same
Transmitter Key Numbers & Spec.	Four units of double-speed push-button	Four units of Single-speed push-button	Two units of double-speed push-button	Two units of Single-speed push-button

To add a series model for business necessary. (Double-speed push-button: 3003.0451; Single-speed push-button:B3W-4050)
The Products between these models are all the same except for Transmitter Key number.

SAGA1-P10 Frequency Listed									
Frequency Range : 910.146MHz～ 925.906 MHz									
Number of Channels : 160 Channels									
Type of Modulation : FSK (Frequency Shift Key)									
No	MHz	No	MHz	No	MHz	No	MHz	No	MHz
1	910.146	41	913.346	72	916.546	103	919.746	123	922.946
2	910.226	42	913.426	73	916.626	104	919.826	124	923.026
3	910.306	43	913.506	74	916.706	105	919.906	125	923.106
4	910.386	44	913.586	75	916.786	106	919.986	126	923.186
5	910.466	45	913.666	76	916.866	107	920.066	127	923.266
6	910.546	46	913.746	77	916.946	108	920.146	128	923.346
7	910.626	47	913.826	78	917.026	109	920.226	129	923.426
8	910.706		913.906	79	917.106	110	920.306	130	923.506
9	910.786		913.986	80	917.186	111	920.386	131	923.586
10	910.866		914.066	81	917.266	112	920.466	132	923.666
11	910.946		914.146	82	917.346	113	920.546	133	923.746
12	911.026		914.226	83	917.426	114	920.626	134	923.826
13	911.106		914.306	84	917.506	115	920.706	135	923.906
14	911.186		914.386	85	917.586	116	920.786	136	923.986
15	911.266		914.466	86	917.666		920.866	137	924.066
16	911.346		914.546	87	917.746		920.946	138	924.146
17	911.426	48	914.626	88	917.826		921.026	139	924.226
18	911.506	49	914.706	89	917.906		921.106	140	924.306
19	911.586	50	914.786	90	917.986		921.186	141	924.386
20	911.666	51	914.866	91	918.066		921.266	142	924.466
21	911.746	52	914.946	92	918.146		921.346	143	924.546
22	911.826	53	915.026	93	918.226		921.426	144	924.626
23	911.906	54	915.106	94	918.306		921.506	145	924.706
24	911.986	55	915.186	95	918.386		921.586	146	924.786
25	912.066	56	915.266		918.466		921.666	147	924.866
26	912.146	57	915.346		918.546		921.746	148	924.946
27	912.226	58	915.426		918.626		921.826	149	925.026
28	912.306	59	915.506		918.706		921.906	150	925.106
29	912.386	60	915.586		918.786		921.986	151	925.186
30	912.466	61	915.666		918.866		922.066	152	925.266
31	912.546	62	915.746		918.946		922.146	153	925.346
32	912.626	63	915.826		919.026		922.226	154	925.426
33	912.706	64	915.906		919.106		922.306	155	925.506
34	912.786	65	915.986	96	919.186		922.386	156	925.586
35	912.866	66	916.066	97	919.266	117	922.466	157	925.666
36	912.946	67	916.146	98	919.346	118	922.546	158	925.746
37	913.026	68	916.226	99	919.426	119	922.626	159	925.826
38	913.106	69	916.306	100	919.506	120	922.706	160	925.906
39	913.186	70	916.386	101	919.586	121	922.786		
40	913.266	71	916.466	102	919.666	122	922.866		

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 15.107 and 15.109 under the FCC Rules Part 15 Subpart B and 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-P10**) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

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	NOV. 15, 2013
BI-LOG Antenna	Sunol	JB1	A070506-2	OCT. 03, 2013
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2013
Pre-Amplifier	HP	8447F	2944A03817	NOV. 23, 2013
EMI Receiver	R&S	ESVS10	833206/012	JUN. 26, 2013
Horn Antenna	Com-Power	AH-118	071032	DEC. 04, 2012
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 29, 2013
Spectrum Analyzer	R&S	FSU	200789	SEP. 29, 2013
3116 Double Ridge Antenna (40G)	ETS-LINDGREN	EMCO-003	00078	NOV. 14, 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
Test S/W	e-3 (5.04303e)			

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

4.3 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.38dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±3.04dB
Radiated Emission, 1 to 26.5 GHz	± 2.38 dB
Power Line Conducted Emission	±2.01dB
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.

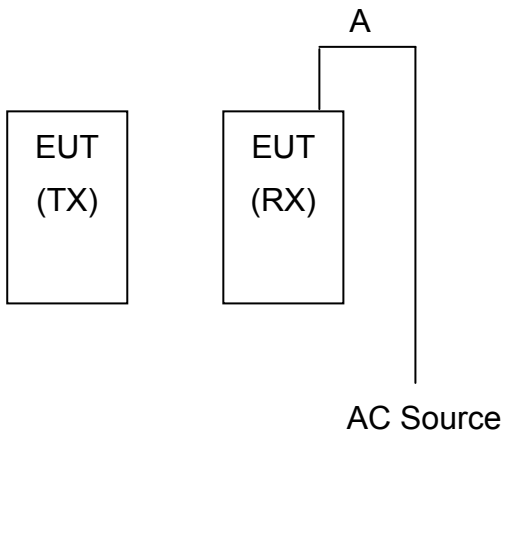
Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

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

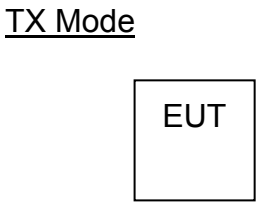
6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

EMI Test



RF Test



6.2 SUPPORT EQUIPMENT

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

No.	Signal cable description	
A	AC Power	Unshielded, 1.8m, 1pcs.

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.

6.3 EUT OPERATING CONDITION

RF Setup

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

7. FCC PART 15.249 REQUIREMENTS

7.1 20 DB BANDWIDTH

LIMIT

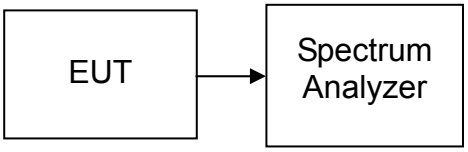
None; for reporting purposes only.

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

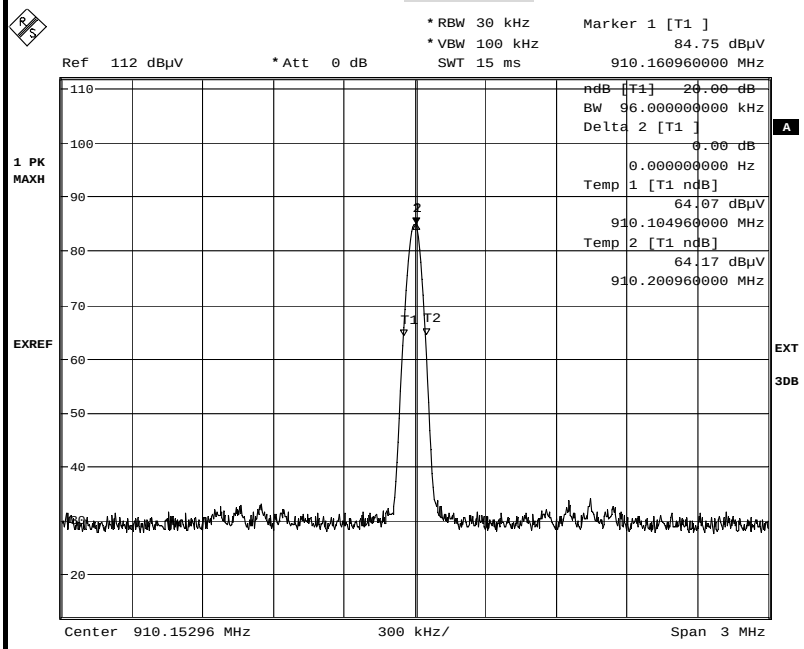
No non-compliance noted.

Test Data

Channel	Frequency (MHz)	20dB Bandwidth (KHz)
Low	910.16	96.000
Middle	918.32	93.600
High	925.92	96.000

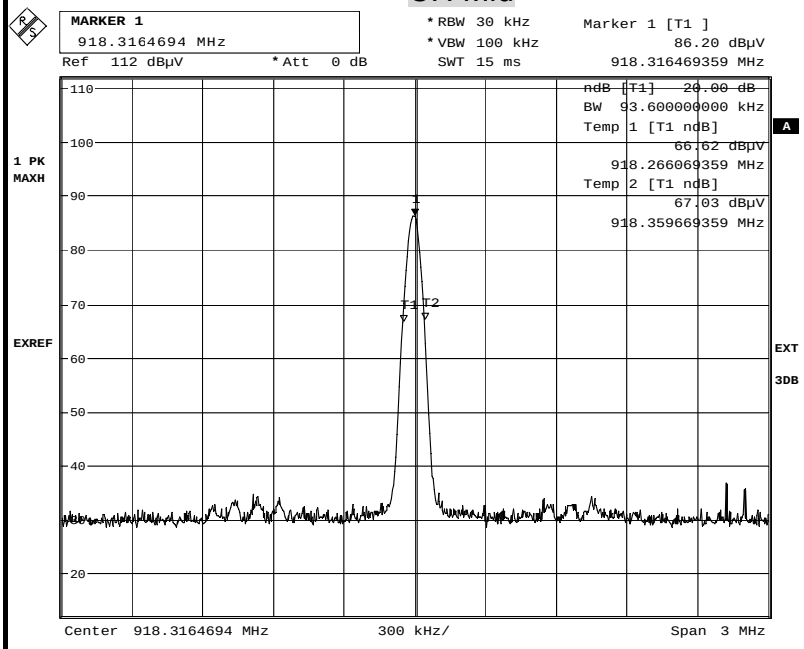
Test Plot

CH Low



Date: 19.NOV.2012 11:26:15

CH Mid



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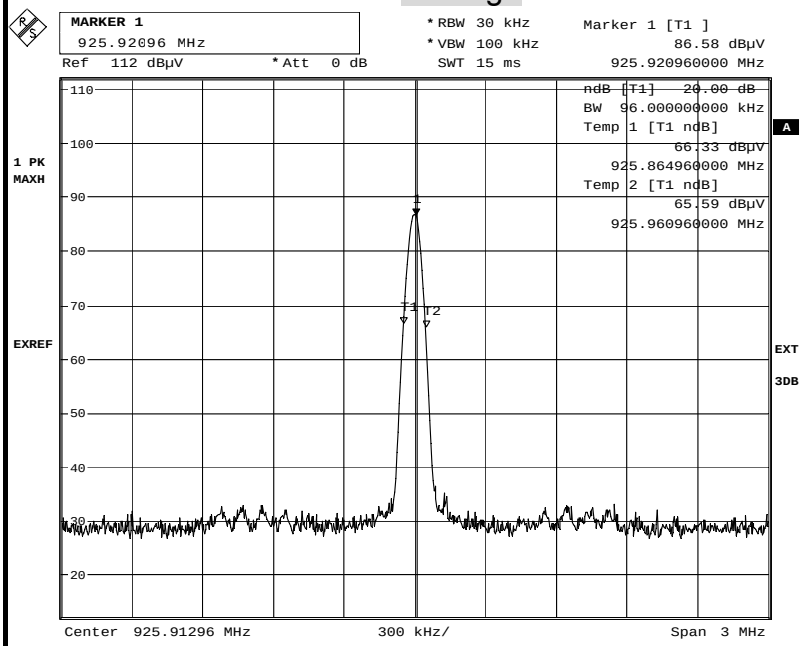
CH High


MARKER 1
925.92096 MHz
*RBW 30 kHz
*VBW 100 kHz
SWT 15 ms
Marker 1 [T1]
86.58 dBµV
925.920960000 MHz
Ref 112 dBµV
*Att 0 dB
ndB [T1] 20.00 dB
BW 96.000000000 kHz
Temp 1 [T1 ndB]
66.33 dBµV
925.864960000 MHz
Temp 2 [T1 ndB]
65.59 dBµV
925.960960000 MHz
1 PK
MAXH
EXREF
A
EXT
3DB
110
100
90
80
70
60
50
40
30
20
T1
T2
Center 925.91296 MHz
300 kHz/
Span 3 MHz
Date: 19.NOV.2012 14:21:59

7.2 BAND EDGES MEASUREMENT

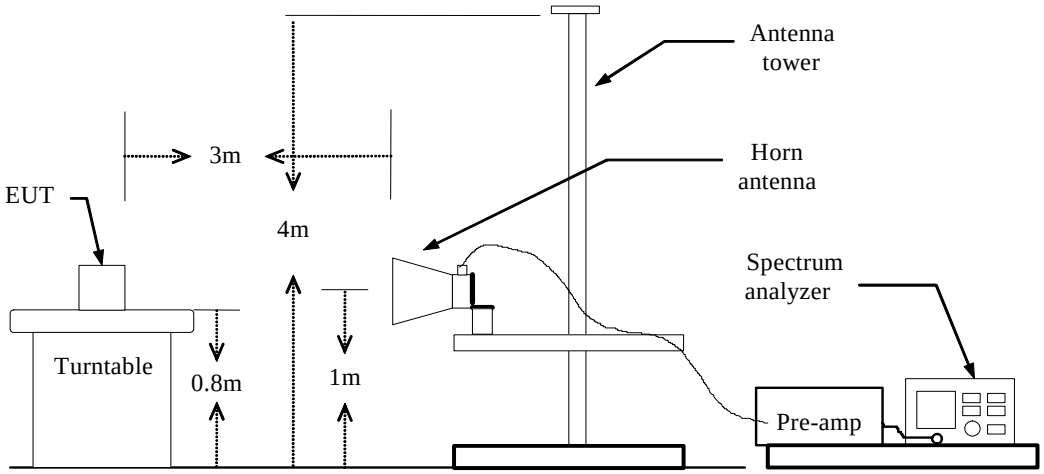
LIMIT

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

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

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

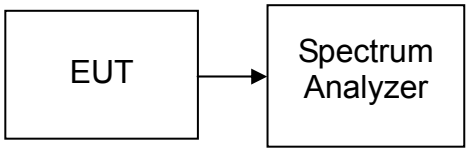
Nil (No dedicated limit specified in the Rules)

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, VBW=100KHz, Span = 0Hz, a suitable Sweep Time.
5. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

No non-compliance noted.

TEST DATA

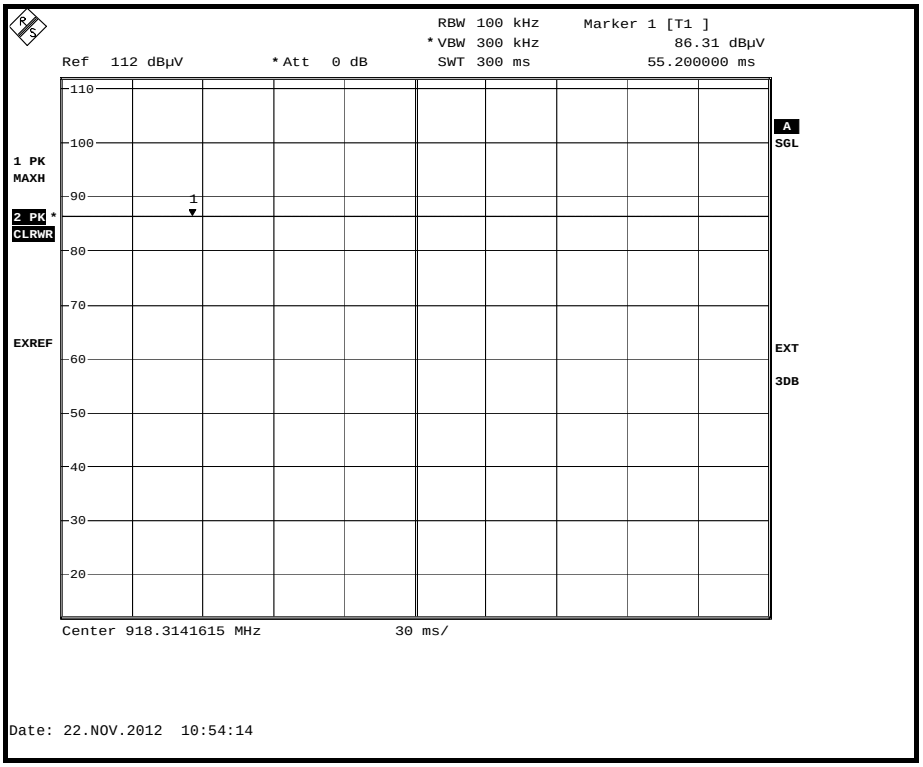
	us	Times	Ton	Total Ton time(ms)
Ton1	100000	1	100000	100.00
Ton2		0	0.000	
Ton3		0	0.000	
Tp				100.00

Ton	100.000
Tp(Ton+Toff)	100.000
Duty Cycle	1.000
Duty Factor	0.000

100 %

Test Plot

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 (μV/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 (μV/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.

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

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

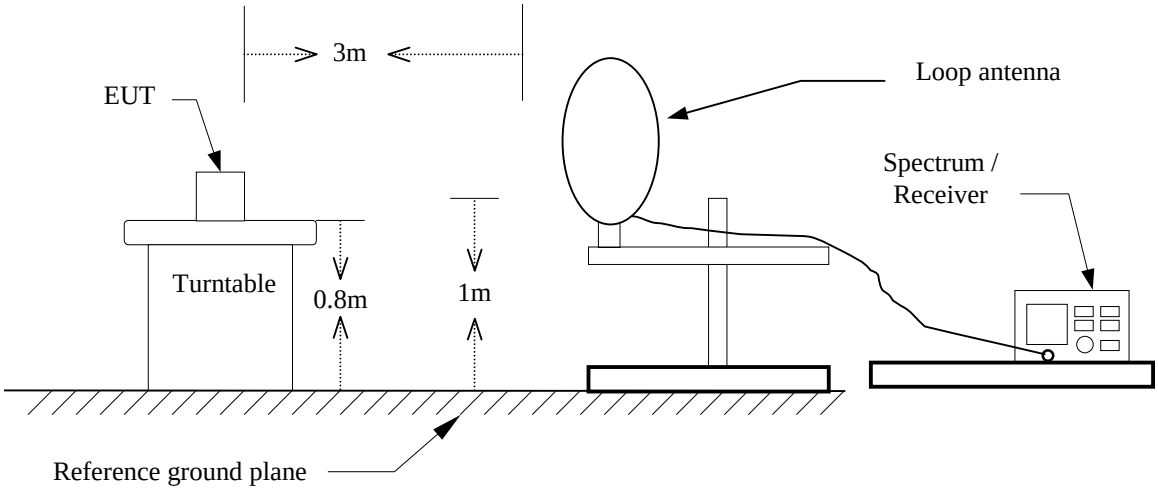
MEASUREMENT EQUIPMENT USED

Open Area Test Site # 6				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	NOV. 15, 2013
BI-LOG Antenna	Sunol	JB1	A070506-2	OCT. 03, 2013
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2013
Pre-Amplifier	HP	8447F	2944A03817	NCR
EMI Receiver	R&S	ESVS10	833206/012	JAN. 29, 2013
Horn Antenna	Com-Power	AH-118	071032	DEC. 04, 2012
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 29, 2013
3116 Double Ridge Antenna (40G)	ETS-LINDGREN	EMCO-003	00078	NOV. 14, 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
Test S/W	e-3 (5.04303e)			

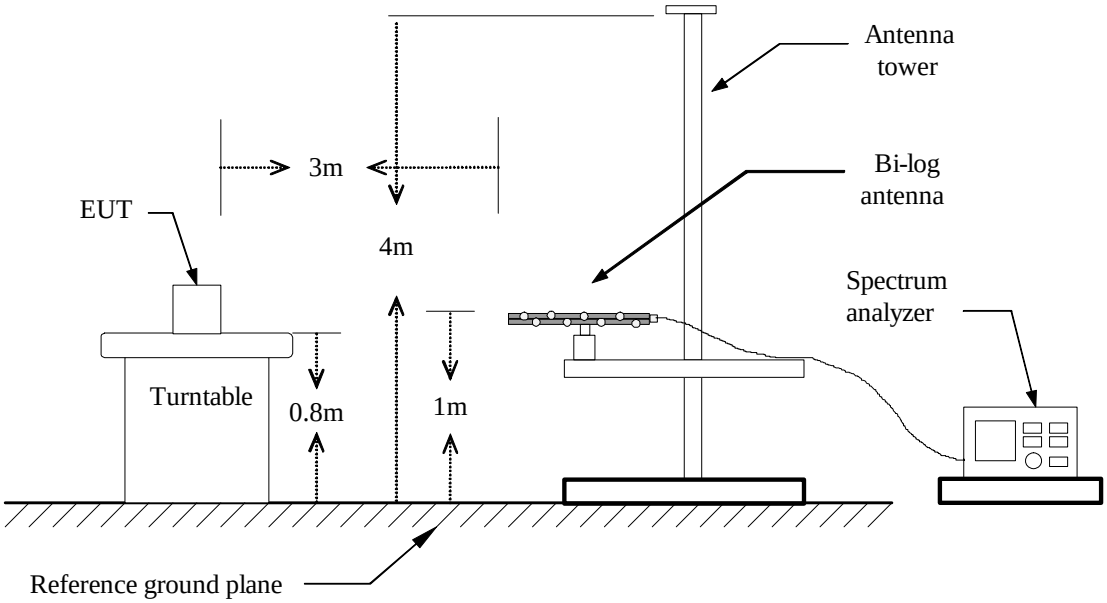
Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration

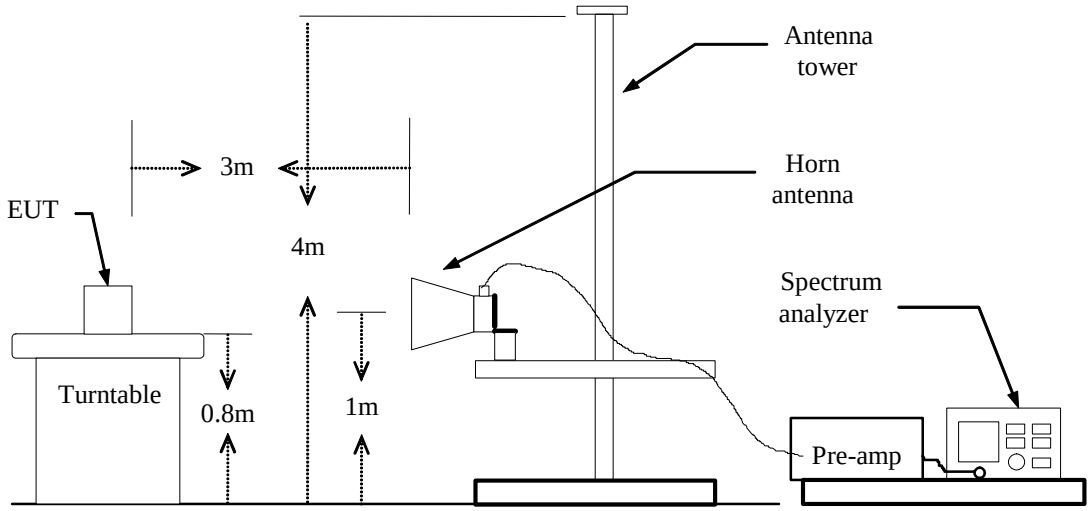
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz


Antenna
tower
3m
Horn
antenna
EUT
4m
Spectrum
analyzer
Turntable
0.8m
1m
Pre-amp

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:

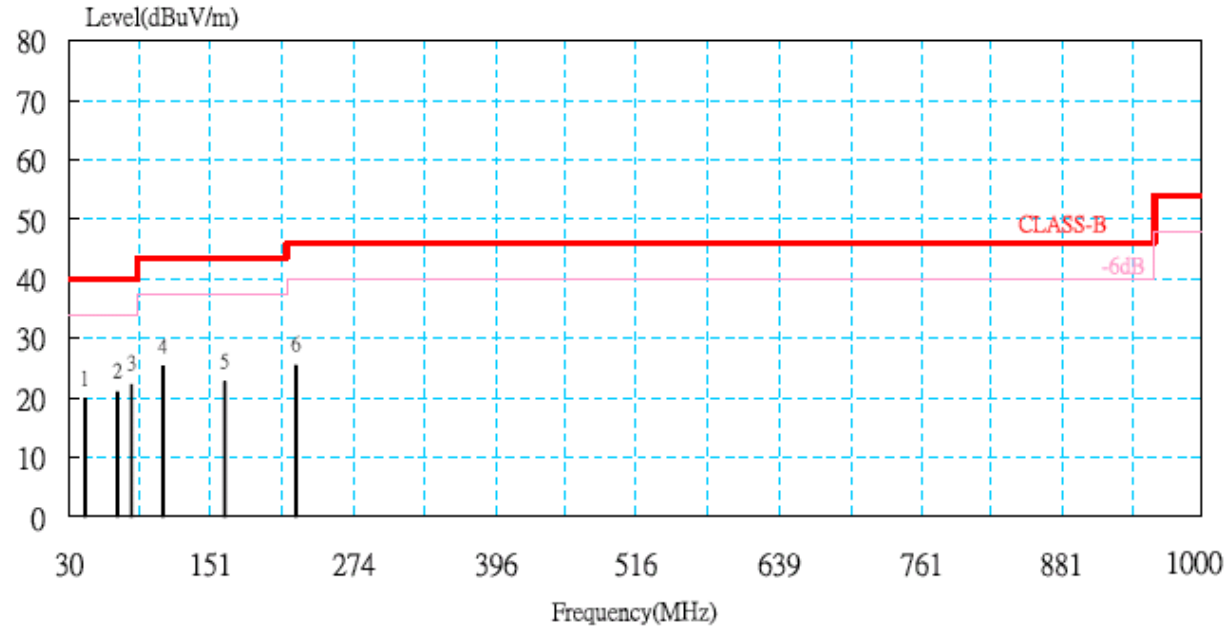
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

   (b) AVERAGE: Peak Level + Duty Factor
7. Repeat above procedures until the measurements for all frequencies are complete.

Below 1 GHz

Operation Mode:	TX CH MIDDLE (WORST CASE)	**Test Date:**	2012/11/23
Temperature:	26.3°C	**Tested by:**	John Chen
Humidity:	60% RH	**Polarity:**	Ver. / Hor.

Vertical



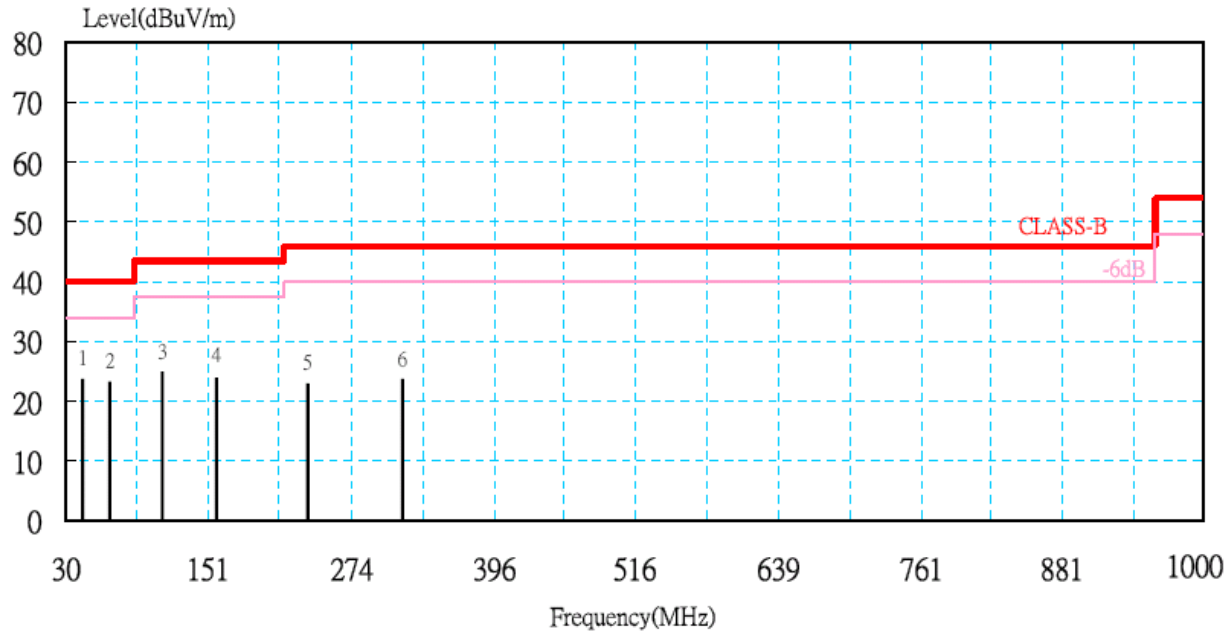
No.	Freq-Uency (MHz)	Meter Reading at 3 m Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission at 3 m Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Mode PK/QP
1	43.62	5.40	12.52	1.93	19.85	40.00	-20.15	QP
2	71.62	10.22	8.45	2.29	20.97	40.00	-19.03	QP
3	83.88	11.68	8.03	2.48	22.19	40.00	-17.81	QP
4	110.65	9.73	12.53	2.97	25.23	43.50	-18.27	QP
5	163.28	6.58	12.62	3.38	22.58	43.50	-20.92	QP
6	224.92	8.37	13.27	3.76	25.40	46.00	-20.60	QP

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:	TX CH MIDDLE (WORST CASE)	**Test Date:**	2012/11/23
Temperature:	26.3°C	**Tested by:**	John Chen
Humidity:	60% RH	**Polarity:**	Ver. / Hor.

Horizontal



No.	Freq-Uency (MHz)	Meter Reading at 3 m Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission at 3 m Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Mode PK/QP
1	44.62	9.77	11.92	1.95	23.64	40.00	**-16.36**	QP
2	67.62	12.65	8.27	2.23	23.16	40.00	**-16.84**	QP
3	112.62	8.90	12.90	3.00	24.80	43.50	**-18.70**	QP
4	158.62	7.62	12.80	3.36	23.79	43.50	**-19.71**	QP
5	236.62	5.98	13.05	3.85	22.88	46.00	**-23.12**	QP
6	317.62	4.62	14.67	4.30	23.59	46.00	**-22.41**	QP

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:** 2012/11/21

Temperature: 26.4°C **Tested by:** John Chen

Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
910.15	84.89	23.05	4.52	26.93	0.00	85.54	94.00	-8.46	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
910.15	77.72	23.05	4.52	26.93	0.00	78.37	94.00	-15.63	Q

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

Operation Mode: TX / X Mode Mid **Test Date:** 2012/11/21

Temperature: 26.4°C **Tested by:** John Chen

Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
918.31	86.29	23.18	4.53	26.78	0.00	87.23	94.00	-6.77	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
918.31	78.30	23.18	4.53	26.78	0.00	79.24	94.00	-14.76	Q

Remark:

Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Operation Mode: TX / X Mode High **Test Date:** 2012/11/21

Temperature: 26.4°C **Tested by:** John Chen

Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
925.88	86.73	23.31	4.54	26.64	0.00	87.94	94.00	-6.06	Q

Vertical

Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
925.88	77.79	23.31	4.54	26.64	0.00	79.00	94.00	-15.00	Q

Remark:

Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Above 1 GHz

Operation Mode: TX / X Mode Low **Test Date:** 2012/11/21
Temperature: 26.6°C **Tested by:** John Chen
Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1820.30	58.40	29.03	2.34	41.29	0.95	49.43	74.00	-24.57	P
	1820.30	58.40	29.03	2.34	41.29	0.95	49.43	54.00	-4.57	A
*	2730.49	50.70	29.88	2.74	41.11	1.41	43.62	74.00	-30.38	P
*	2730.49	50.70	29.88	2.74	41.11	1.41	43.62	54.00	-10.38	A
*	3640.63	50.87	30.43	3.28	41.36	0.81	44.03	74.00	-29.97	P
*	3640.63	50.87	30.43	3.28	41.36	0.81	44.03	54.00	-9.97	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 (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

Operation Mode: TX / X Mode Low **Test Date:** 2012/11/21

Temperature: 26.6°C **Tested by:** John Chen

Humidity: 64% RH **Polarity:** Ver. / Hor.

Vertical

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	1820.31	57.87	29.03	2.34	41.29	0.95	48.90	74.00	-25.10	P
	1820.31	57.87	29.03	2.34	41.29	0.95	48.90	54.00	-5.10	A
*	2730.48	51.46	29.88	2.74	41.11	1.41	44.38	74.00	-29.62	P
*	2730.48	51.46	29.88	2.74	41.11	1.41	44.38	54.00	-9.62	A
*	3640.63	51.09	30.43	3.28	41.36	0.81	44.25	74.00	-29.75	P
*	3640.63	51.09	30.43	3.28	41.36	0.81	44.25	54.00	-9.75	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 (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

Operation Mode: TX / X Mode Mid **Test Date:** 2012/11/21
Temperature: 26.6°C **Tested by:** John Chen
Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	1836.61	58.89	29.16	2.35	41.27	0.96	50.09	74.00	-23.91	P
	1836.61	58.89	29.16	2.35	41.27	0.96	50.09	54.00	-3.91	A
*	2754.97	51.29	29.90	2.75	41.11	1.42	44.25	74.00	-29.75	P
*	2754.97	51.29	29.90	2.75	41.11	1.42	44.25	54.00	-9.75	A
*	3673.34	50.51	30.48	3.29	41.37	0.79	43.70	74.00	-30.30	P
*	3673.34	50.51	30.48	3.29	41.37	0.79	43.70	54.00	-10.30	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 (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

Operation Mode: TX / X Mode Mid **Test Date:** 2012/11/21
Temperature: 26.6°C **Tested by:** John Chen
Humidity: 64% RH **Polarity:** Ver. / Hor.

Vertical

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	1836.63	58.88	29.16	2.35	41.27	0.96	50.08	74.00	-23.92	P
	1836.63	58.88	29.16	2.35	41.27	0.96	50.08	54.00	-3.92	A
*	2754.96	50.84	29.90	2.75	41.11	1.42	43.80	74.00	-30.20	P
*	2754.96	50.84	29.90	2.75	41.11	1.42	43.80	54.00	-10.20	A
*	3673.23	50.94	30.48	3.29	41.37	0.79	44.13	74.00	-29.87	P
*	3673.23	50.94	30.48	3.29	41.37	0.79	44.13	54.00	-9.87	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 (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

Operation Mode: TX / X Mode High **Test Date:** 2012/11/21
Temperature: 26.6°C **Tested by:** John Chen
Humidity: 64% RH **Polarity:** Ver. / Hor.

Horizontal

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	1851.84	58.83	29.27	2.35	41.25	0.97	50.18	74.00	-23.82	P
	1851.84	58.83	29.27	2.35	41.25	0.97	50.18	54.00	-3.82	A
*	2777.78	52.03	29.92	2.75	41.11	1.43	45.03	74.00	-28.97	P
*	2777.78	52.03	29.92	2.75	41.11	1.43	45.03	54.00	-8.97	A
*	3703.64	51.08	30.53	3.30	41.39	0.78	44.30	74.00	-29.70	P
*	3703.64	51.08	30.53	3.30	41.39	0.78	44.30	54.00	-9.70	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 (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

Operation Mode: TX / X Mode High **Test Date:** 2012/11/21
Temperature: 26.6°C **Tested by:** John Chen
Humidity: 64% RH **Polarity:** Ver. / Hor.

Vertical

	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	1851.81	58.39	29.27	2.35	41.25	0.97	49.74	74.00	-24.26	P
	1851.81	58.39	29.27	2.35	41.25	0.97	49.74	54.00	-4.26	A
*	2777.73	52.07	29.92	2.75	41.11	1.43	45.07	74.00	-28.93	P
*	2777.73	52.07	29.92	2.75	41.11	1.43	45.07	54.00	-8.93	A
*	3703.67	52.64	30.53	3.30	41.39	0.78	45.86	74.00	-28.14	P
*	3703.67	52.64	30.53	3.30	41.39	0.78	45.86	54.00	-8.14	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 (dBuV/m) – Average limit (dBuV/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 μH/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 (dBμV)	
	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, 2013
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 do not connect to AC Source directly. Not applicability for this test.