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FCC TEST REPORT (RFID)

REPORT NO.: RF130429E07

MODEL NO.: 8006L1-1CR

FCC ID: MQT-8006L11CR

RECEIVED: Apr. 29, 2013

TESTED: May 03 to 09, 2013

ISSUED: May 20, 2013

APPLICANT: XAC AUTOMATION CORP.

ADDRESS: 4F, No. 30, INDUSTRY E. RD. IX, SCIENCE-BASED
INDUSTRIAL PARK,HSINCHU,TAIWAN

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
Ltd., Taoyuan Branch Hsin Chu Laboratory

LAB ADDRESS : No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,
R.O.C.

TEST LOCATION (1): No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,
R.O.C.

TEST LOCATION (2): No. 49, Ln. 206, Wende Rd., Shangshan Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,
R.O.C.

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Table of Contents

RELEASE CONTROL RECORD.....	4
1 CERTIFICATION.....	5
2 SUMMARY OF TEST RESULTS.....	6
2.1 MEASUREMENT UNCERTAINTY	7
3 GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT.....	8
3.2 DESCRIPTION OF TEST MODES.....	9
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL	9
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	11
3.4 DESCRIPTION OF SUPPORT UNITS.....	12
3.5 CONFIGURATION OF SYSTEM UNDER TEST	13
4 TEST PROCEDURES AND RESULTS	14
4.1 CONDUCTED EMISSION MEASUREMENT	14
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	14
4.1.2 TEST INSTRUMENTS	14
4.1.3 TEST PROCEDURES.....	15
4.1.4 DEVIATION FROM TEST STANDARD	15
4.1.5 TEST SETUP	15
4.1.6 EUT OPERATING CONDITIONS.....	16
4.1.7 TEST RESULTS (MODE 1).....	17
4.1.8 TEST RESULTS (MODE 2).....	19
4.2 RADIATED EMISSION & OCCUPIED BANDWIDTH EASUREMENT	21
4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT.....	21
4.2.2 TEST INSTRUMENTS	22
4.2.3 TEST PROCEDURES.....	24
4.2.4 DEVIATION FROM TEST STANDARD	25
4.2.5 TEST SETUP	25
4.2.6 EUT OPERATING CONDITIONS.....	25
4.2.7 TEST RESULTS.....	26
4.3 20DB BANDWIDTH	30
4.3.1 LIMITS OF 20DB BANDWIDTH MEASUREMENT	30
4.3.2 TEST INSTRUMENTS	30
4.3.3 EUT OPERATING CONDITION	30
4.3.4 TEST RESULTS.....	31
4.4 FREQUENCY STABILITY	32
4.4.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT.....	32
4.4.2 TEST INSTRUMENTS	32
4.4.3 TEST PROCEDURE	32
4.4.4 DEVIATION FROM TEST STANDARD	33
4.4.5 TEST SETUP	33
4.4.6 EUT OPERATING CONDITION	33
4.4.7 TEST RESULTS.....	34
5 INFORMATION ON THE TESTING LABORATORIES	35



6 APPENDIX-A- MODIFICATIONS RECORDERS FOR ENGINEERING
CHANGES TO THE EUT BY THE LAB 36



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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130429E07	Original release	May 20, 2013



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1 CERTIFICATION

PRODUCT : PINPAD
BRAND NAME : XAC
MODEL NO. : 8006L1-1CR
TEST SAMPLE : ENGINEERING SAMPLE
APPLICANT : XAC AUTOMATION CORP.
TESTED : May 03 to 09, 2013
STANDARDS: FCC Part 15, Subpart C (Section 15.225)
FCC Part 15, Subpart C (Section 15.215)
ANSI C63.10-2009

The above equipment (Model: 8006L1-1CR) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : , **DATE:** May 20, 2013
(Lori Chung, Specialist)

APPROVED BY : , **DATE:** May 20, 2013
(May Chen, Manager)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.225, 15.215)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	Conducted emission test	PASS	Meet the requirement of limit. Minimum passing margin is -13.11dB at 0.49766MHz.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS	Meet the requirement of limit. Minimum passing margin is -55.85dB at 13.56MHz
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	PASS	Meet the requirement of limit. Minimum passing margin is -2.3dB at 0.72MHz
15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit.
15.225 (e)	The frequency tolerance	PASS	Meet the requirement of limit.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

Measurement	Value
Conducted Emission	2.98 dB
Radiated Emission-Chamber F	4.12 dB
Radiated Emission-Chamber G	5.59 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	PINPAD
MODEL NO.	8006L1-1CR
POWER SUPPLY	DC 12V from power adapter for RS232 connector DC 5V from host equipment for USB connector
MODULATION TYPE	ASK
OPERATING FREQUENCY	13.56MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Please see NOTE
DATA CABLE	USB cable (unshielded, 1.9m with 1 core) x 1 RS232 cable (unshielded, 1.9m) x 1
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	Adapter x 1

NOTE:

1. There is one antenna provided to this EUT, please refer to the following table:

Brand	Model	Antenna Type	Gain(dBi)	Frequency Range (MHz to MHz)	Antenna Connector	Cable Length
XAC	PCB ENIG ANT BOARD (W/KEY) 8006(ROHS)	PCB (2 Layer)	13	13.56	NA	NA

2. The EUT must be supplied with a power adapter as below:

Brand	Model No.	Spec.
HON-KWANG	HK-AX-120A200-US	Input: 100-240V, 50/60Hz, 0.8A Output: 12V, 2A DC output cable (unshielded, 1.5m)

3. The EUT is pre-tested under following test modes :

Pre-test Mode	Remark
Mode A	RS232 with adapter mode
Mode B	USB mode

For the above modes, the worse radiated emission was found in **Mode A**. Therefore only the test data of the mode were recorded in this report.

4. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF TEST MODES

The EUT only has 1 channel.

CHANNEL	FREQUENCY (MHz)
1	13.56

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE (Below 30MHz)	RE (Above 30MHz)	BW	FS	
MODE 1	√	√	√	√	√	RS232 with adapter mode
MODE 2	√	-	-	-	-	USB mode

Where RE: Radiated Emission

PLC: Power Line Conducted Emission

FS: Frequency Stability

BW: 20dB Bandwidth

NOTE: "-" means no effect.

POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1	1	ASK

RADIATED EMISSION TEST(BELOW 30MHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1	1	ASK

RADIATED EMISSION TEST(ABOVE 30MHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1	1	ASK

20dB BANDWIDTH:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1	1	ASK

FREQUENCY STABILITY:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	1	1	ASK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC (MODE 1)	25deg. C, 65%RH	120Vac, 60Hz	Anderson Chen
PLC (MODE 2)	25deg. C, 65%RH	120Vac, 60Hz (SYSTEM)	Anderson Chen
RE	23deg. C, 63%RH 24deg. C, 67%RH 25deg. C, 67%RH	120Vac, 60Hz	Robert Cheng Tim Ho
BW	25deg. C, 60%RH	120Vac, 60Hz	James Chan
FS	25deg. C, 60%RH	120Vac, 60Hz	James Chan



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.225)

FCC Part 15, Subpart C (15.215)

ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

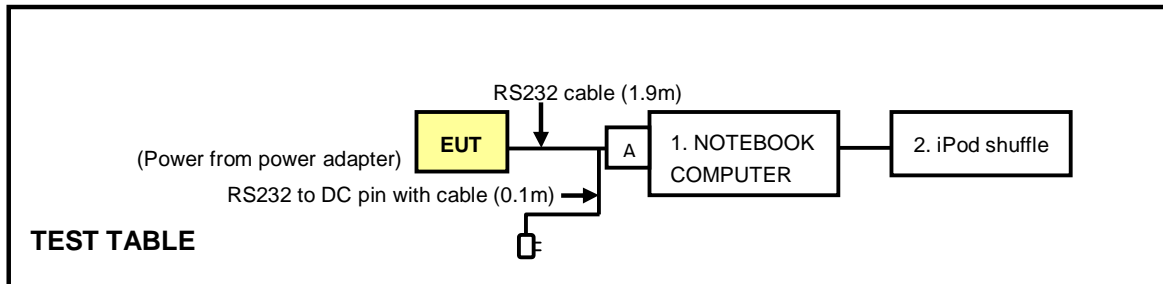
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER (for radiated emissions below 30MHz test)	DELL	PP32LA	GSLB32S	FCC DoC
	NOTEBOOK COMPUTER (for other test items)	DELL	E6420	482T3R1	FCC DoC
2	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFD M	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	iPod cable (0.1m)

NOTE: All power cords of the above support units are non shielded (1.8m).

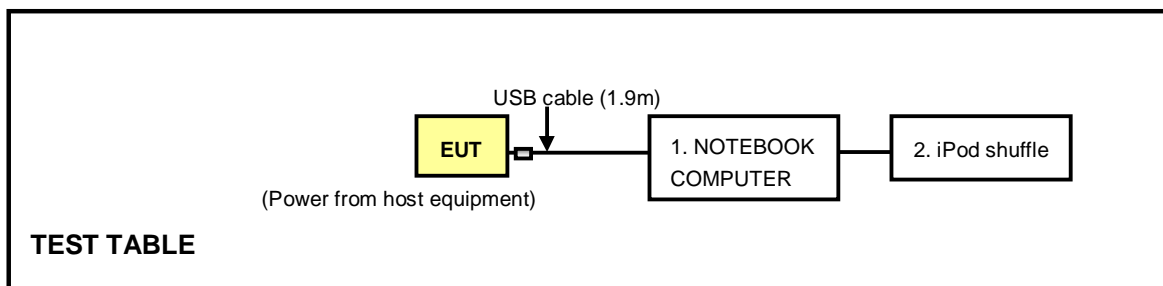
3.5 CONFIGURATION OF SYSTEM UNDER TEST

For MODE 1 test:



NOTE: The item A is USB to RS232 connector.

For MODE 2 test:





4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 08, 2013	Mar. 07, 2014
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK8127	8127-522	Sep. 06, 2012	Sep. 05, 2013
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 08, 2012	June 07, 2013
RF Cable (JYEBAO)	5DFB	COCCAB-003	Mar. 11, 2013	Mar. 10, 2014
50 ohms Terminator	50	EMC-3	Sep. 25, 2012	Sep. 24, 2013
Software ADT	BV ADT_Cond_V7.3.7.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: May 10, 2013

4.1.3 TEST PROCEDURES

- The EUT/HOST was placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN.
- The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT/HOST were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

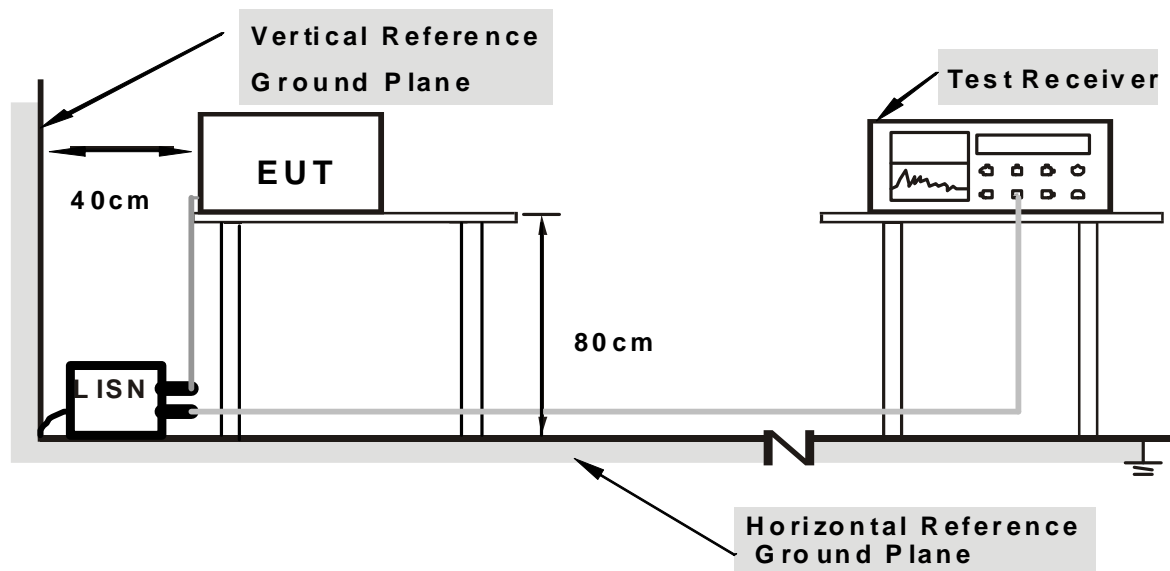
NOTE:

- The resolution bandwidth of test receiver is 9kHz for Quasi-peak detection (QP) & Average detection (AV).

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



4.1.6 EUT OPERATING CONDITIONS

1. Turn on the power of all equipment.
2. The support unit 1 (NB) runs a test program "Runin.exe" to link EUT under transmission condition continuously.

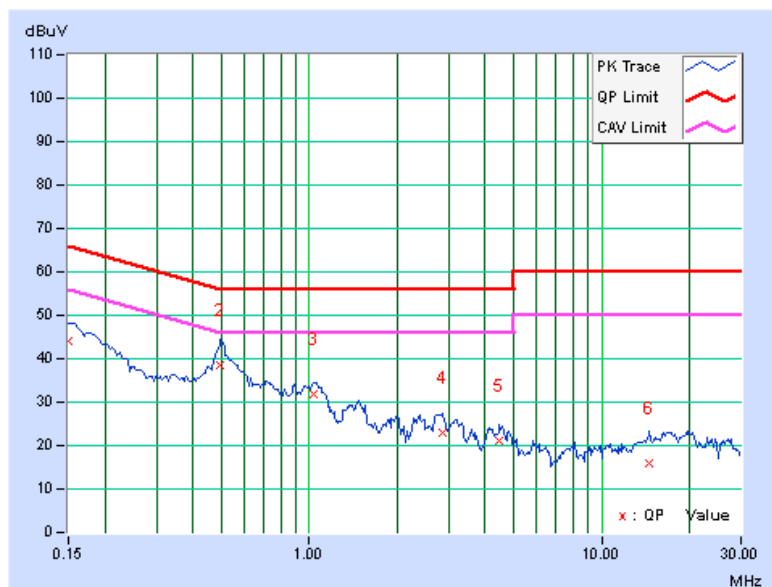
4.1.7 TEST RESULTS (MODE 1)

PHASE	Line (L)	6dB BANDWIDTH	Quasi-Peak (QP) / Average (AV)
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	44.12	33.24	44.22	33.34	66.00	56.00	-21.78	-22.66
2	0.49766	0.14	38.43	32.79	38.57	32.93	56.04	46.04	-17.47	-13.11
3	1.03516	0.17	31.85	25.29	32.02	25.46	56.00	46.00	-23.98	-20.54
4	2.87109	0.26	22.73	16.71	22.99	16.97	56.00	46.00	-33.01	-29.03
5	4.48047	0.35	20.76	13.97	21.11	14.32	56.00	46.00	-34.89	-31.68
6	14.48047	0.77	15.04	9.83	15.81	10.60	60.00	50.00	-44.19	-39.40

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

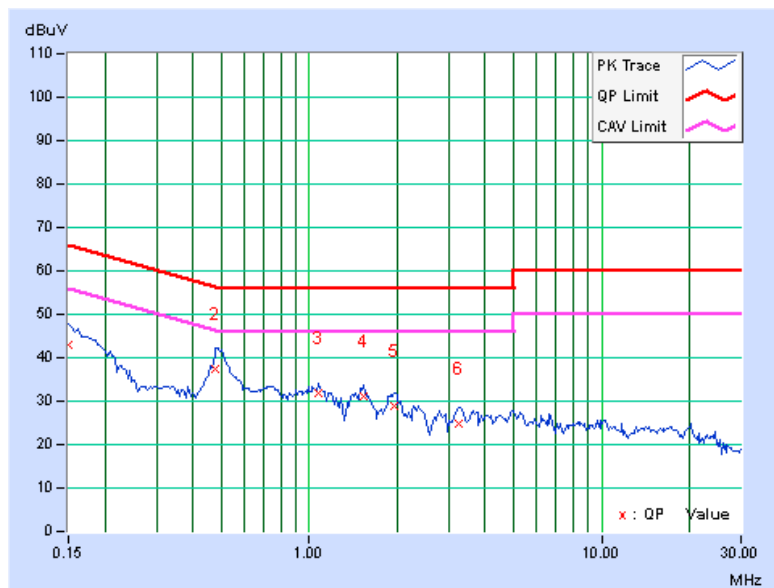


PHASE	Neutral (N)	6dB BANDWIDTH	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	0.08	43.02	31.20	43.10	31.28	66.00
2	0.47813	0.12	37.25	32.28	37.37	32.40	56.37	46.37	-19.00	-13.97
3	1.07031	0.15	31.61	25.39	31.76	25.54	56.00	46.00	-24.24	-20.46
4	1.53125	0.17	30.79	24.28	30.96	24.45	56.00	46.00	-25.04	-21.55
5	1.96484	0.19	28.75	22.58	28.94	22.77	56.00	46.00	-27.06	-23.23
6	3.23047	0.26	24.70	18.77	24.96	19.03	56.00	46.00	-31.04	-26.97

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



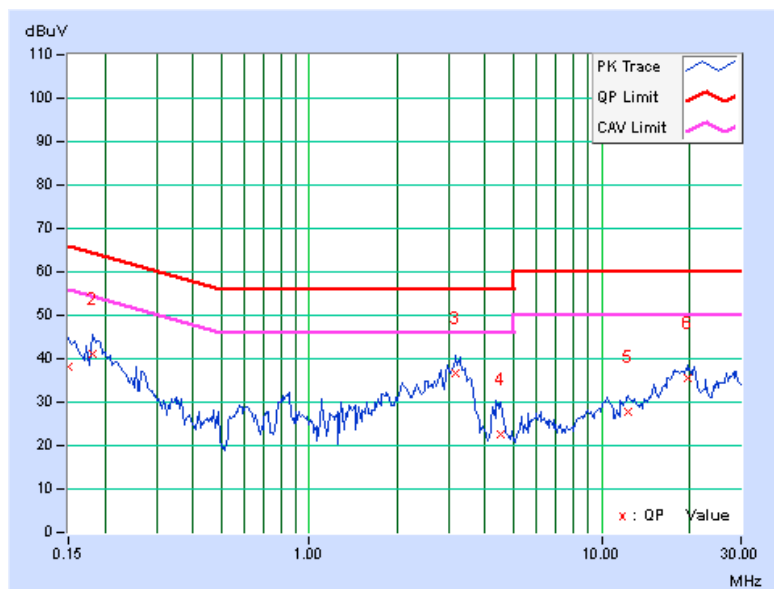
4.1.8 TEST RESULTS (MODE 2)

PHASE	Line (L)	6dB BANDWIDTH	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	38.22	23.27	38.32	23.37	66.00	56.00	-27.68	-32.63
2	0.18125	0.11	40.86	28.38	40.97	28.49	64.43	54.43	-23.46	-25.94
3	3.17969	0.28	36.30	30.93	36.58	31.21	56.00	46.00	-19.42	-14.79
4	4.53125	0.35	22.12	15.54	22.47	15.89	56.00	46.00	-33.53	-30.11
5	12.40234	0.69	27.02	22.24	27.71	22.93	60.00	50.00	-32.29	-27.07
6	19.60156	0.97	34.42	29.55	35.39	30.52	60.00	50.00	-24.61	-19.48

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

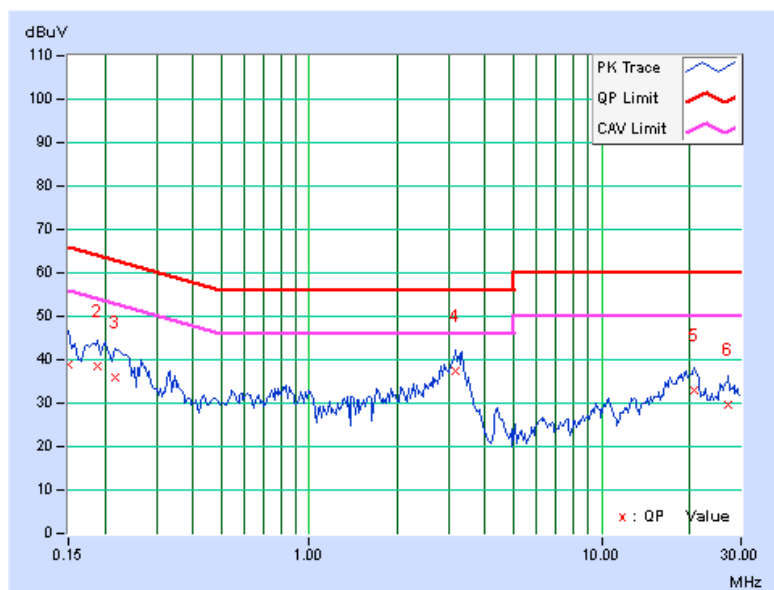


PHASE	Neutral (N)	6dB BANDWIDTH	Quasi-Peak (QP) / Average (AV)
--------------	-------------	----------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	0.08	38.97	25.37	39.05	25.45	66.00
2	0.18906	0.09	38.35	30.17	38.44	30.26	64.08	54.08	-25.64	-23.82
3	0.21641	0.09	36.00	24.31	36.09	24.40	62.96	52.96	-26.86	-28.55
4	3.18359	0.26	37.18	31.68	37.44	31.94	56.00	46.00	-18.56	-14.06
5	20.87891	0.70	32.26	27.62	32.96	28.32	60.00	50.00	-27.04	-21.68
6	27.05469	0.84	28.95	23.30	29.79	24.14	60.00	50.00	-30.21	-25.86

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.2 RADIATED EMISSION & OCCUPIED BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB.



4.2.2 TEST INSTRUMENTS

For below 30MHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E9038A	MY50010125	Feb. 01, 2013	Jan. 31, 2014
	E9038A	MY50010132	Dec. 27, 2012	Dec. 26, 2013
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 14, 2012	Nov. 13, 2013
	ZFL-1000VH2B	AMP-ZFL-02	Nov. 14, 2012	Nov. 13, 2013
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2012	Aug. 27, 2013
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Jan. 08, 2013	Jan. 07, 2015
RF Cable	NA	RF104-110 RF104-206 RF104-209	Dec. 21, 2012	Dec.20, 2013
RF Cable	8DFB	CHFCAB-001 CHFCAB-002 CHFCAB-003	Nov. 14, 2012	Nov. 13, 2013
Software	ADT_Radiated_ V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. * = The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 10m Chamber No. F.
4. The FCC Site Registration No. is 928149.
5. The VCCI Site Registration No. is R-3252 & G-136.
6. The CANADA Site Registration No. is IC 7450H-1.
7. Loop antenna was used for all emissions below 30MHz.
8. Tested Date: May 03 and 09, 2013



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For above 30MHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Sep. 03, 2012	Sep. 02, 2013
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 29,2013	Jan. 28,2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 25, 2012	Dec. 24, 2013
RF Cable	NA	CHGCAB_001	Oct. 06, 2012	Oct. 05, 2013
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- 2 The test was performed in 966 Chamber No. G.
- 3 The FCC Site Registration No. is 966073.
- 4 The VCCI Site Registration No. is G-137.
- 5 The CANADA Site Registration No. is IC 7450H-2.
- 6 Tested Date: May 03, 2013

4.2.3 TEST PROCEDURES

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission 30~1000MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

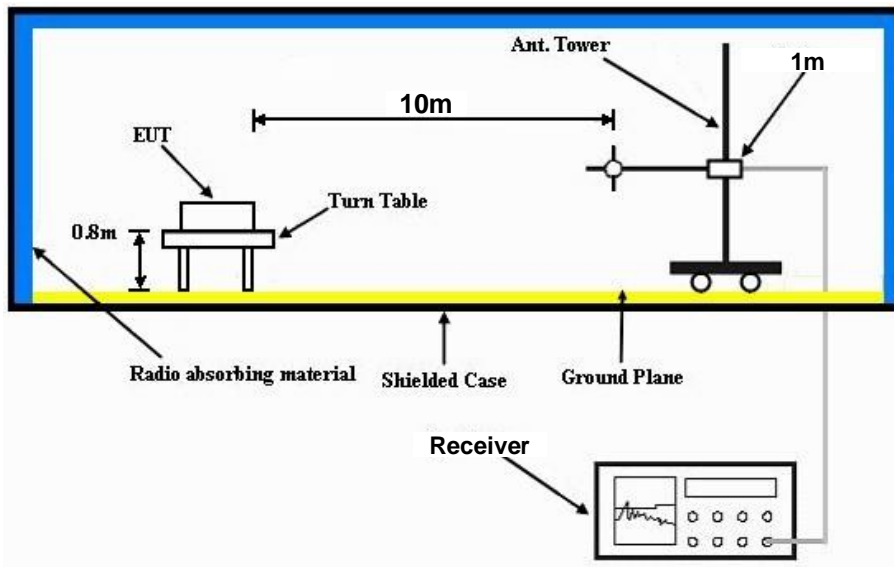
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency 30MHz ~ 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

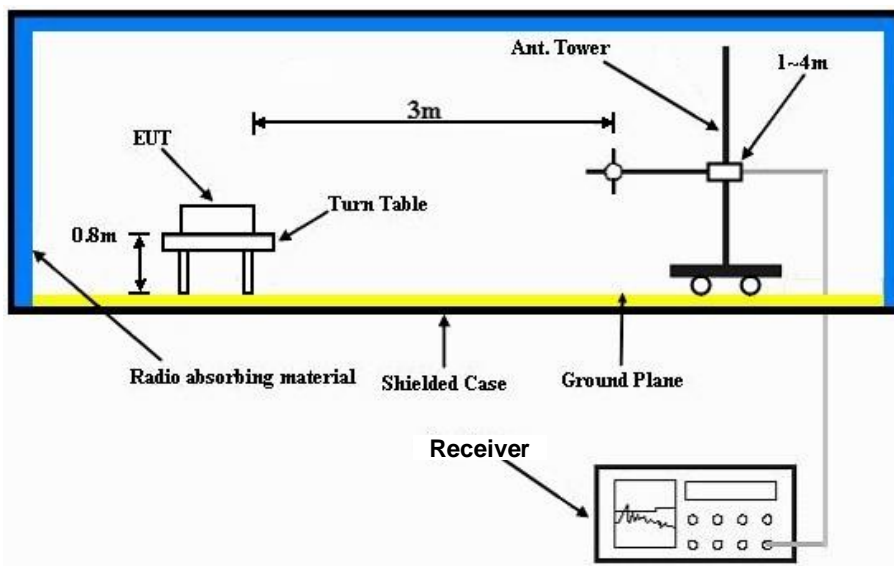
No deviation

4.2.5 TEST SETUP

For Radiated emission below 30MHz



For Radiated emission 30~1000MHz



For the actual test configuration, please refer to the related item in this test report - Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

4.2.7 TEST RESULTS

EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	13.553 ~ 13.567MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 63%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Robert Cheng		

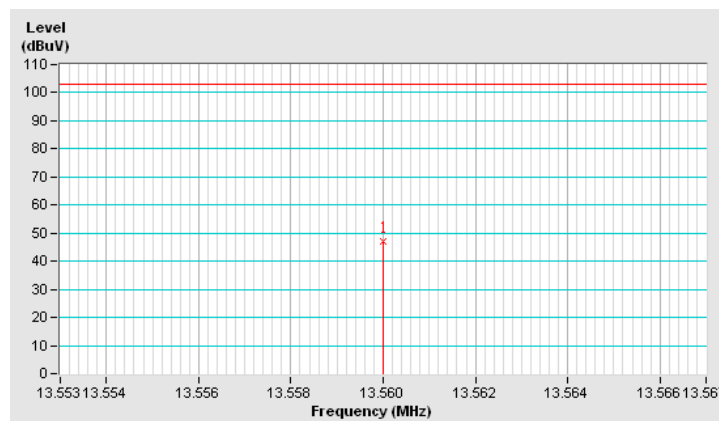
LOOP ANTENNA TEST DISTANCE: AT 10 M (X AXIS)								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.56	47.25 QP	103.10	-55.85	1.00	131	50.89	-3.64

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB) if use
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value
 5. “ * “: Fundamental frequency.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\mu\text{V/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/10)^2 && 10\text{m} \\
 &= 103.1\text{dBuV/m}
 \end{aligned}$$





EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	13.553 ~ 13.567MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 63%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Robert Cheng		

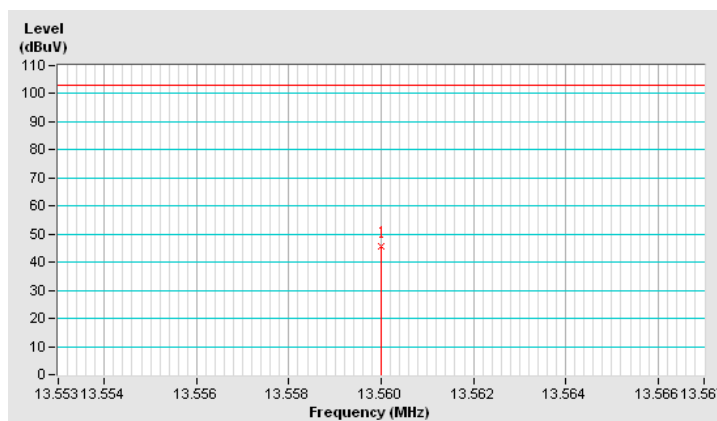
LOOP ANTENNA TEST DISTANCE: AT 10 M (Y AXIS)								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*13.56	45.68 QP	103.10	-57.42	1.00	269	49.32	-3.64

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB) if use
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value
 5. “ * “: Fundamental frequency.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\text{uV/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/10)^2 && 10\text{m} \\
 &= 103.1\text{dBuV/m}
 \end{aligned}$$





EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	Below 30MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Tim Ho		

LOOP ANTENNA TEST DISTANCE: AT 10 M (X AXIS)								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.02	44.4 QP	100.7	-56.2	1.00	316	13.04	31.40
2	0.08	39.4 QP	88.6	-49.2	1.00	335	20.30	19.13
3	0.72	47.2 QP	49.6	-2.3	1.00	257	45.07	2.16
4	11.69	27.9 QP	48.6	-20.7	1.00	359	31.36	-3.49
5	22.03	33.4 QP	48.6	-15.2	1.00	50	39.58	-6.14
6	25.40	25.1 QP	48.6	-23.5	1.00	169	32.56	-7.44
LOOP ANTENNA TEST DISTANCE: AT 10 M (Y AXIS)								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	0.01	44.7 QP	106.7	-62.0	1.00	304	6.84	37.90
2	0.11	32.3 QP	85.9	-53.5	1.00	15	16.00	16.34
3	0.72	40.6 QP	49.6	-8.9	1.00	213	38.47	2.16
4	9.11	23.4 QP	48.6	-25.2	1.00	271	27.04	-3.60
5	26.11	33.2 QP	48.6	-15.5	1.00	289	39.78	-6.63
6	27.25	31.4 QP	48.6	-17.2	1.00	268	36.80	-5.36

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB) if use
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	30~1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 67%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Tom Ho		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	107.60	35.4 QP	43.5	-8.2	1.50 H	99	52.16	-16.81
2	135.58	38.6 QP	43.5	-4.9	1.50 H	65	52.69	-14.06
3	203.39	34.9 QP	43.5	-8.6	1.50 H	339	51.60	-16.67
4	252.03	34.8 QP	46.0	-11.2	1.00 H	328	49.40	-14.61
5	275.80	34.9 QP	46.0	-11.1	1.00 H	319	48.52	-13.63
6	308.00	36.0 QP	46.0	-10.0	1.00 H	360	48.58	-12.54
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	45.86	32.8 QP	40.0	-7.2	1.00 V	259	46.04	-13.22
2	102.17	32.1 QP	43.5	-11.4	1.50 V	360	49.85	-17.77
3	135.58	34.6 QP	43.5	-8.9	1.00 V	307	48.63	-14.06
4	203.39	32.5 QP	43.5	-11.0	1.00 V	221	49.16	-16.67
5	243.98	29.9 QP	46.0	-16.2	2.00 V	1	44.78	-14.93
6	275.99	29.8 QP	46.0	-16.2	1.50 V	10	43.46	-13.63

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB) if use
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



4.3 20dB BANDWIDTH

4.3.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

The 20dB bandwidth shall be specified in operating frequency band.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013

Note:

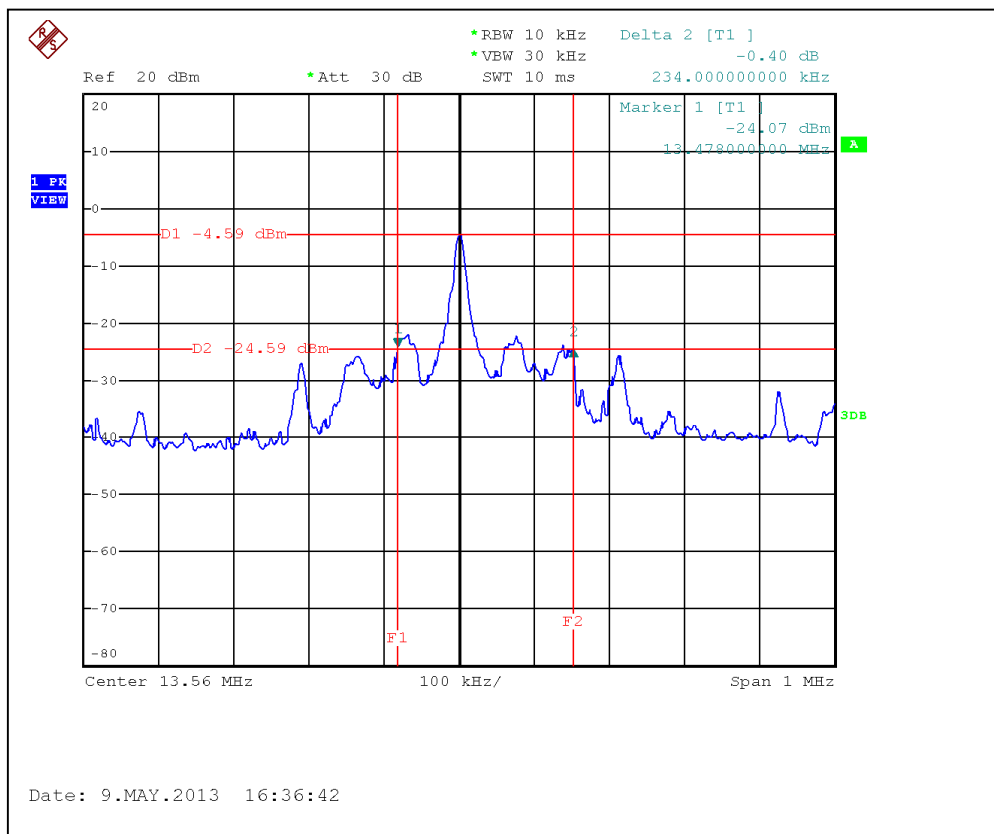
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : May 09, 2013

4.3.3 EUT OPERATING CONDITION

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 10kHz RBW and 30kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3.4 TEST RESULTS

20dBc point (Low)	20dBc point (High)	Operating frequency band (MHz)	PASS/FAIL
13.478 MHz	13.712 MHz	13.11 – 14.01	PASS





4.4 FREQUENCY STABILITY

4.4.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ ($\pm 100\text{ppm}$) 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.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-S P-AR	MAA0812-008	Jan. 17, 2013	Jan. 16, 2014

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : May 09, 2013

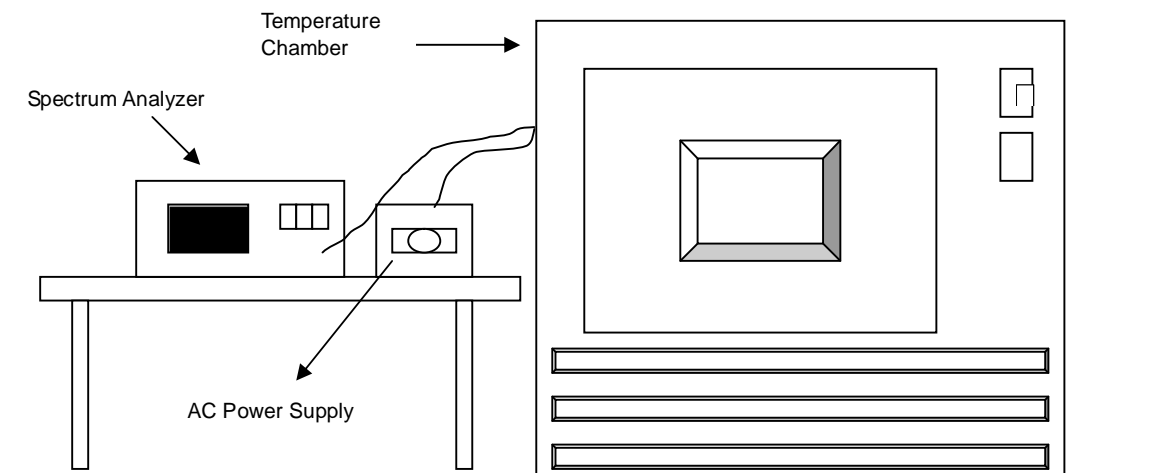
4.4.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at $+20$ degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



4.4.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	120	13.55994	-0.00044	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
40	120	13.55996	-0.00029	13.55998	-0.00015	13.55996	-0.00029	13.55997	-0.00022
30	120	13.56	0.00000	13.56001	0.00007	13.56	0.00000	13.56	0.00000
20	120	13.55999	-0.00007	13.55999	-0.00007	13.55998	-0.00015	13.56	0.00000
10	120	13.56004	0.00029	13.56005	0.00037	13.56003	0.00022	13.56003	0.00022
0	120	13.56006	0.00044	13.56007	0.00052	13.56007	0.00052	13.56005	0.00037
-10	120	13.56001	0.00007	13.56003	0.00022	13.56003	0.00022	13.56002	0.00015
-20	120	13.55997	-0.00022	13.55997	-0.00022	13.55999	-0.00007	13.55999	-0.00007
-30	120	13.55994	-0.00044	13.55994	-0.00044	13.55995	-0.00037	13.55993	-0.00052

FREQUENCY STABILITY VERSUS VOLTAGE									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	138	13.55999	-0.00007	13.55999	-0.00007	13.55998	-0.00015	13.56	0.00000
	120	13.55999	-0.00007	13.55999	-0.00007	13.55998	-0.00015	13.56	0.00000
	102	13.55999	-0.00007	13.55999	-0.00007	13.55998	-0.00015	13.56	0.00000



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5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.



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6 APPENDIX-A- MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---