FCC TEST REPORT
(RFID)

REPORT NO.:	RF131112E03
MODEL NO.:	xPED-8006L2-3CR
FCC ID:	MQT-8006L23CR
RECEIVED:	Nov. 12, 2013
TESTED:	Nov. 15 to 24, 2013
ISSUED:	Dec. 05, 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.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF131112E03	Original release	Dec. 05, 2013

1 CERTIFICATION

PRODUCT :	PINPAD
BRAND NAME :	XAC
MODEL NO. :	xPED-8006L2-3CR
TEST SAMPLE :	ENGINEERING SAMPLE
APPLICANT :	XAC AUTOMATION CORP.
TESTED :	Nov. 15 to 24, 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: xPED-8006L2-3CR) 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:** *Dec. 05, 2013*

(Claire Kuan, Specialist)

APPROVED BY : _____ , **DATE:** *Dec. 05, 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 -9.54dB at 4.69531MHz.
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 -58.1dB 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 -3.02dB at 40.670MHz
15.225 (e)	The frequency tolerance	PASS	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	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	5.46 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	PINPAD
MODEL NO.	xPED-8006L2-3CR
POWER SUPPLY	DC 5V from power adapter
MODULATION TYPE	ASK
OPERATING FREQUENCY	13.56MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Please see NOTE
DATA CABLE	USB cable (unshielded, 2.0m with one core) x 1 RS232 cable (unshielded, 2.0m with one core) x 1
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	Adapter x 1 QR Module (Option) x 1

NOTE:

1. The antennas provided to the EUT, please refer to the following table:

Brand	Model No.	Antenna Type	Antenna Connector	Gain(dBi)	Frequency range (MHz)
XAC	PCB ENIG ANT BOARD (W/KEY) 8006(ROHS)	PCB (2 Layer)	NA	13	13.56

2. The EUT could be supplied with power adapter as the following table:

Brand	Model No.	Spec.
HON-KWANG	HK-UA050A100-US	AC I/P: 100-240V, 50/60Hz, 0.2A DC O/P: 5V, 1A DC output cable: Unshielded, 1.25m

3. The EUT has two different types could be chosen and please refer the below table:

Type	Description	
Type 1	EUT with QR code module	With USB cable
		With RS232 cable
Type 2	EUT without QR code module	With USB cable
		With RS232 cable

From the above information, EUT with **QR code module** was selected as representative for test and it's data was 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	
1	√	√	√	√	√	USB mode
2	√	-	√	-	-	RS232 mode

Where **PLC:** Power Line Conducted Emission **RE:** Radiated Emission
BW: 20dB Bandwidth **FS:** Frequency Stability

NOTE: The EUT had been pre-tested two types. The worst case was found the **USB mode.**

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	24deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin
RE	24deg. C, 61%RH	120Vac, 60Hz	Robert Cheng
	25deg. C, 64%RH	120Vac, 60Hz	Robert Cheng
	23deg. C, 77%RH	120Vac, 60Hz	Nelson Teng
BW	25deg. C, 60%RH	120Vac, 60Hz	Chilin Lee
FS	25deg. C, 60%RH	120Vac, 60Hz	Chilin Lee

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.

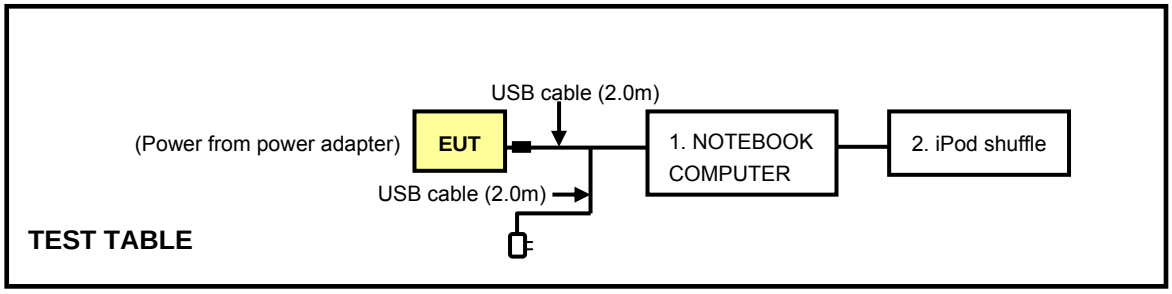
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER (for conducted emissions test)	DELL	PP11L	NA	E2K24BNHM
	NOTEBOOK COMPUTER (for other test items)	Apple	A1466	C02J2CN6DRVD	FCC DoC
2	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB cable, 2.0m, with one core / RS232 cable, 2.0m, with one core
2	USB cable, 0.1m

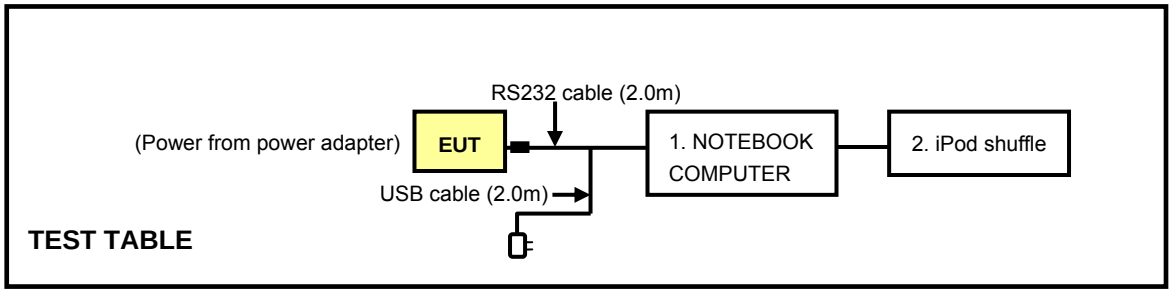
NOTE: All power cords of the above support units are non shielded (1.8m).

3.5 CONFIGURATION OF SYSTEM UNDER TEST

For test mode 1:



For test mode 2:



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100287	Feb. 28, 2013	Feb. 27, 2014
Line-Impedance Stabilization Network (for EUT) ROHDE & SCHWARZ	NSLK-8127	5127-523	Oct. 02, 2013	Oct. 01, 2014
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 13, 2013	Nov. 12, 2014
RF Cable (JYEBAO)	5DFB	COACAB-001	May 27, 2013	May 26, 2014
50 ohms Terminator	50	3	Oct. 17, 2013	Oct. 16, 2014
50 ohms Terminator	N/A	EMC-04	Oct. 17, 2013	Oct. 16, 2014
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. A.
3. The VCCI Con A Registration No. is C-817.
4. Tested Date: Nov. 18, 2013

4.1.3 TEST PROCEDURES

a. 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.
b. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
c. Both lines of the power mains connected to the EUT/HOST were checked for maximum conducted interference.
d. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

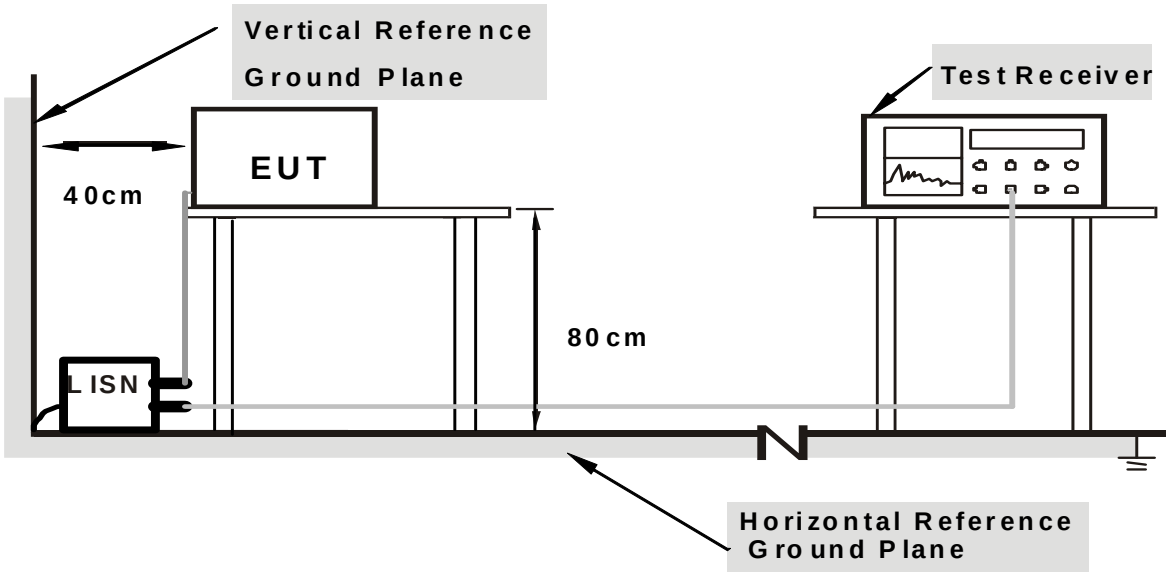
NOTE:

1. 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 EUT runs a test program “PTest.exe” to under transmission condition (RFID) continuously.

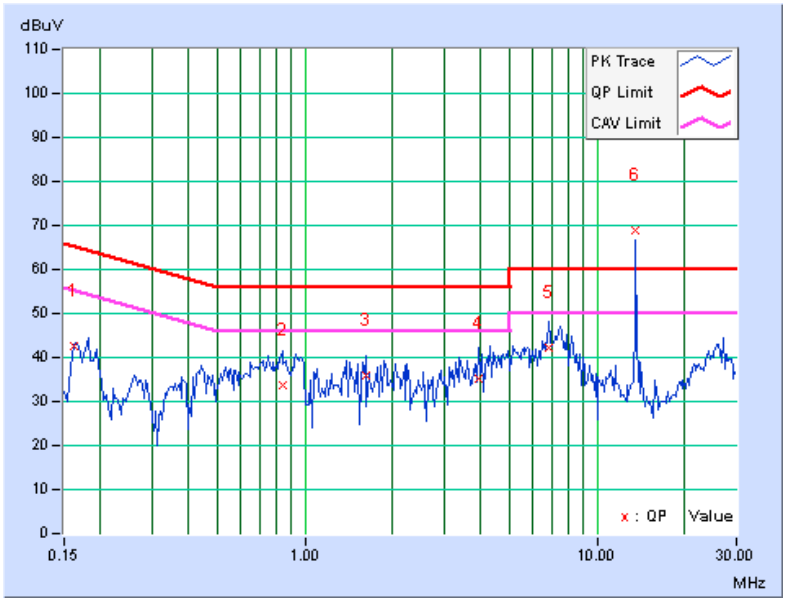
4.1.7 TEST RESULTS(MODE 1)

PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16300	0.07	42.38	40.64	42.45	40.71	65.31	55.31	-22.86	-14.60
2	0.83750	0.17	33.47	22.89	33.64	23.06	56.00	46.00	-22.36	-22.94
3	1.62109	0.22	35.63	27.19	35.85	27.41	56.00	46.00	-20.15	-18.59
4	3.91797	0.45	34.71	25.86	35.16	26.31	56.00	46.00	-20.84	-19.69
5	6.87500	0.57	41.72	33.72	42.29	34.29	60.00	50.00	-17.71	-15.71
6	*13.56000	0.89	68.08	64.93	68.97	65.82	60.00	50.00	8.97	15.82

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
6. " * ": Fundamental frequency.
7. Perform the AC line Conducted test with the permanent antenna.

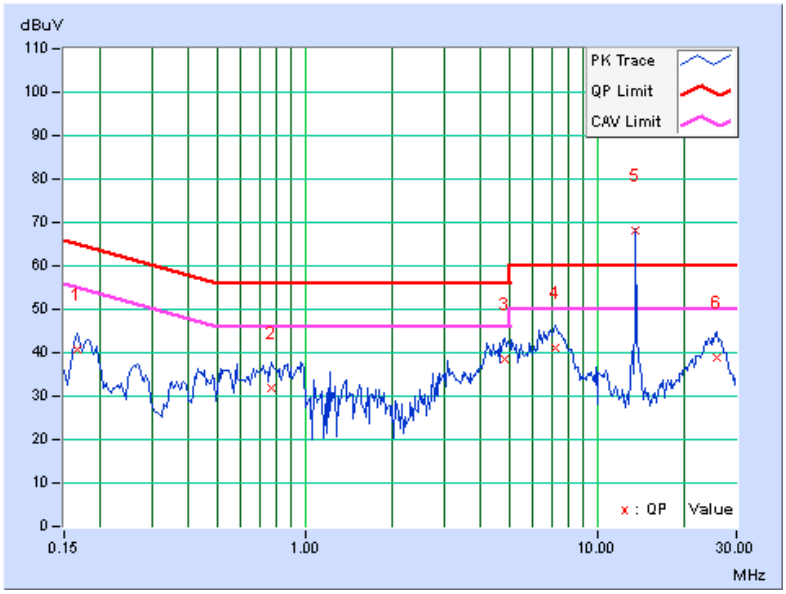


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.07	40.59	39.63	40.66	39.70	65.18	55.18	-24.52	-15.48
2	0.76719	0.16	31.78	21.04	31.94	21.20	56.00	46.00	-24.06	-24.80
3	4.85156	0.39	37.95	29.42	38.34	29.81	56.00	46.00	-17.66	-16.19
4	7.21875	0.51	40.58	31.76	41.09	32.27	60.00	50.00	-18.91	-17.73
5	*13.56000	0.84	67.40	64.71	68.24	65.55	60.00	50.00	8.24	15.55
6	25.67188	1.37	37.61	28.48	38.98	29.85	60.00	50.00	-21.02	-20.15

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
6. " * ": Fundamental frequency.
7. Perform the AC line Conducted test with the permanent antenna.

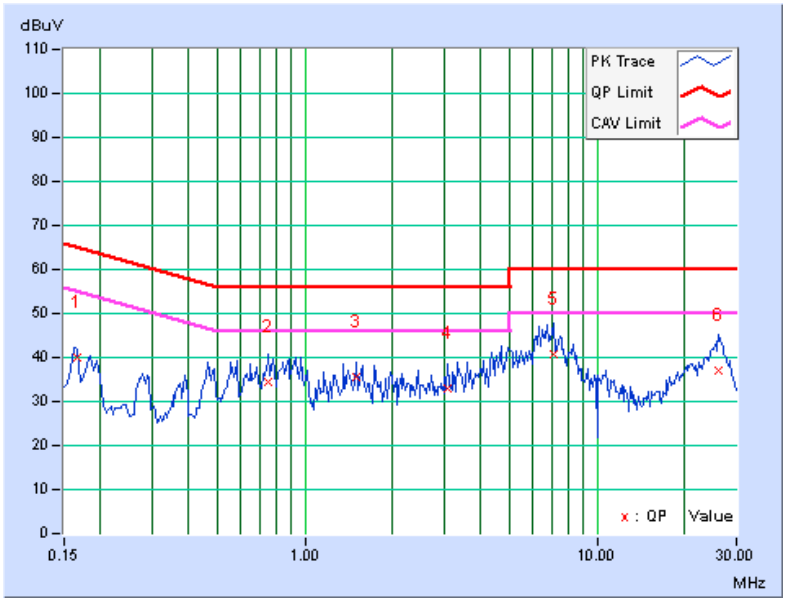


PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.07	39.90	39.43	39.97	39.50	65.18	55.18	-25.20	-15.67
2	0.74766	0.16	34.28	23.04	34.44	23.20	56.00	46.00	-21.56	-22.80
3	1.49609	0.21	35.28	26.32	35.49	26.53	56.00	46.00	-20.51	-19.47
4	3.09375	0.36	32.75	24.11	33.11	24.47	56.00	46.00	-22.89	-21.53
5	7.14063	0.58	40.21	31.10	40.79	31.68	60.00	50.00	-19.21	-18.32
6	26.09375	1.49	35.55	27.41	37.04	28.90	60.00	50.00	-22.96	-21.10

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
6. Perform the AC line Conducted test with the dummy load follow FCC KDB174176.

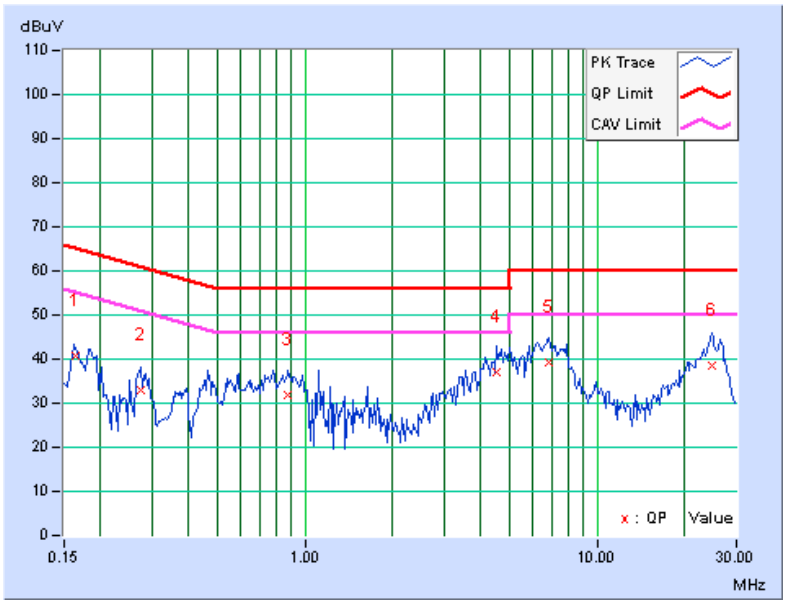


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16397	0.07	40.55	40.38	40.62	40.45	65.26	55.26	-24.64	-14.81
2	0.27500	0.10	33.00	21.49	33.10	21.59	60.97	50.97	-27.87	-29.38
3	0.87656	0.17	31.75	19.93	31.92	20.10	56.00	46.00	-24.08	-25.90
4	4.55859	0.37	36.80	27.17	37.17	27.54	56.00	46.00	-18.83	-18.46
5	6.86328	0.49	38.78	29.58	39.27	30.07	60.00	50.00	-20.73	-19.93
6	24.80859	1.34	37.15	27.50	38.49	28.84	60.00	50.00	-21.51	-21.16

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
6. Perform the AC line Conducted test with the dummy load follow FCC KDB174176.



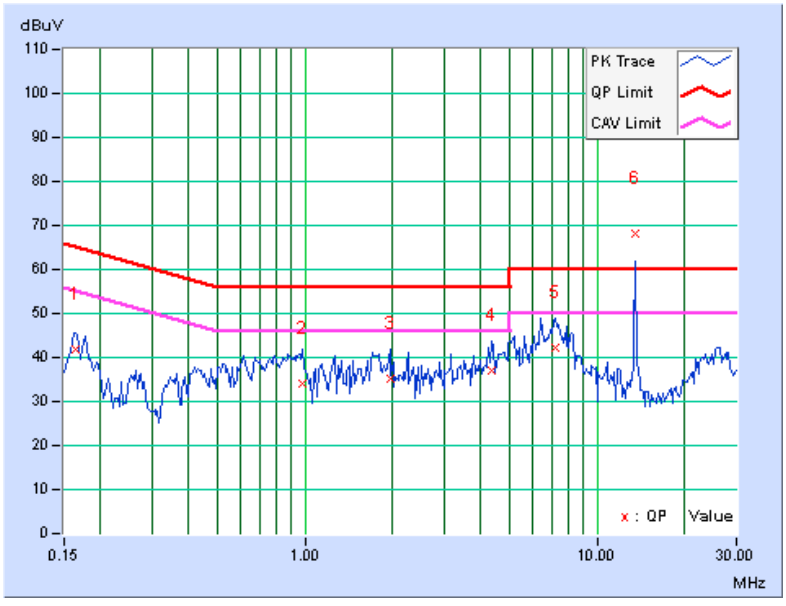
4.1.8 TEST RESULTS(MODE 2)

PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16422	0.07	41.77	40.75	41.84	40.82	65.25	55.25	-23.40	-14.42
2	0.98594	0.18	33.96	25.33	34.14	25.51	56.00	46.00	-21.86	-20.49
3	1.95313	0.24	35.13	26.25	35.37	26.49	56.00	46.00	-20.63	-19.51
4	4.37500	0.47	36.45	28.65	36.92	29.12	56.00	46.00	-19.08	-16.88
5	7.24219	0.58	41.64	33.31	42.22	33.89	60.00	50.00	-17.78	-16.11
6	*13.56000	0.89	67.22	64.13	68.11	65.02	60.00	50.00	8.11	15.02

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
6. " * ": Fundamental frequency.
7. Perform the AC line Conducted test with the permanent antenna.

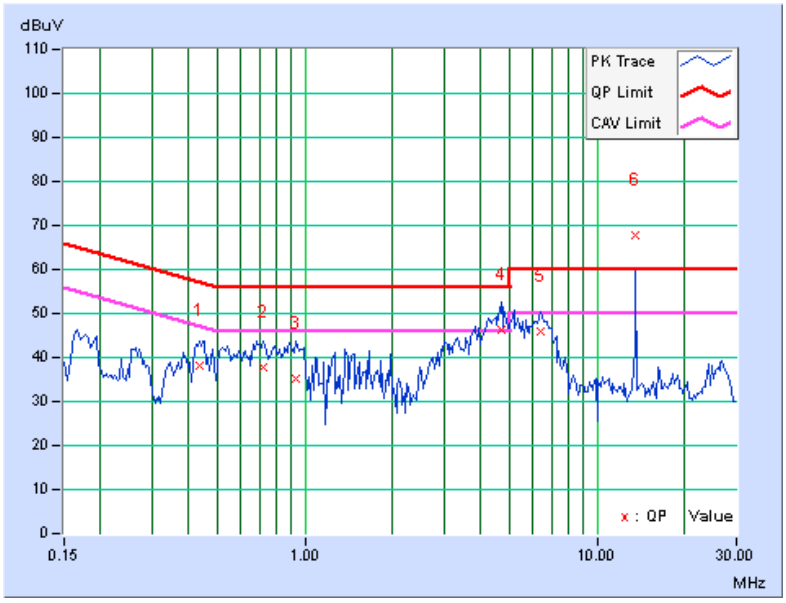


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.43516	0.14	38.12	27.97	38.26	28.11	57.15	47.15	-18.89	-19.04
2	0.72422	0.16	37.54	27.35	37.70	27.51	56.00	46.00	-18.30	-18.49
3	0.93125	0.18	34.96	26.25	35.14	26.43	56.00	46.00	-20.86	-19.57
4	**4.69531**	**0.38**	**46.08**	**36.07**	**46.46**	**36.45**	**56.00**	**46.00**	**-9.54**	**-9.55**
5	6.44922	0.47	45.61	37.02	46.08	37.49	60.00	50.00	-13.92	-12.51
6	*13.55859	0.84	66.98	64.07	67.82	64.91	60.00	50.00	7.82	14.91

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
6. " * ": Fundamental frequency.
7. Perform the AC line Conducted test with the permanent antenna.

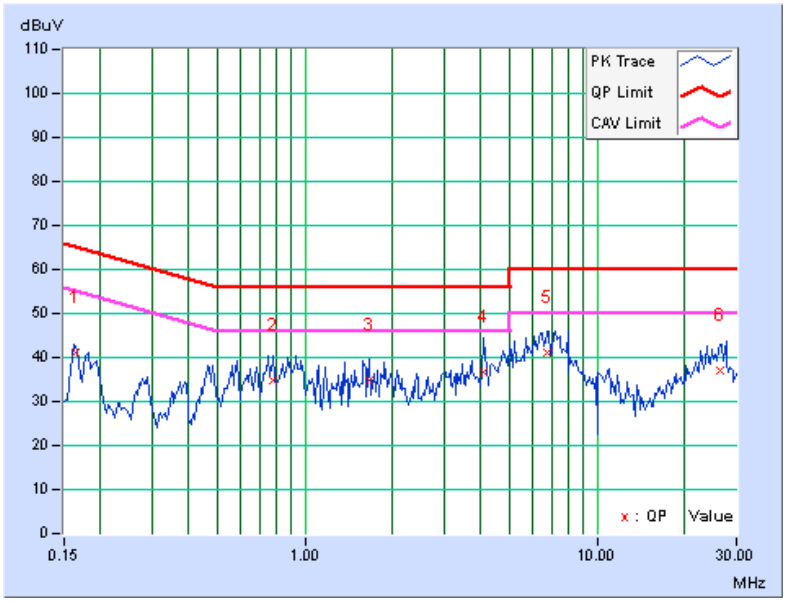


PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16397	0.07	41.00	40.66	41.07	40.73	65.26	55.26	-24.19	-14.53
2	0.77891	0.17	34.62	22.26	34.79	22.43	56.00	46.00	-21.21	-23.57
3	1.66016	0.22	34.70	25.83	34.92	26.05	56.00	46.00	-21.08	-19.95
4	4.11328	0.46	36.31	26.73	36.77	27.19	56.00	46.00	-19.23	-18.81
5	6.77734	0.57	40.47	31.55	41.04	32.12	60.00	50.00	-18.96	-17.88
6	26.28906	1.49	35.43	26.89	36.92	28.38	60.00	50.00	-23.08	-21.62

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
6. Perform the AC line Conducted test with the dummy load follow FCC KDB174176.

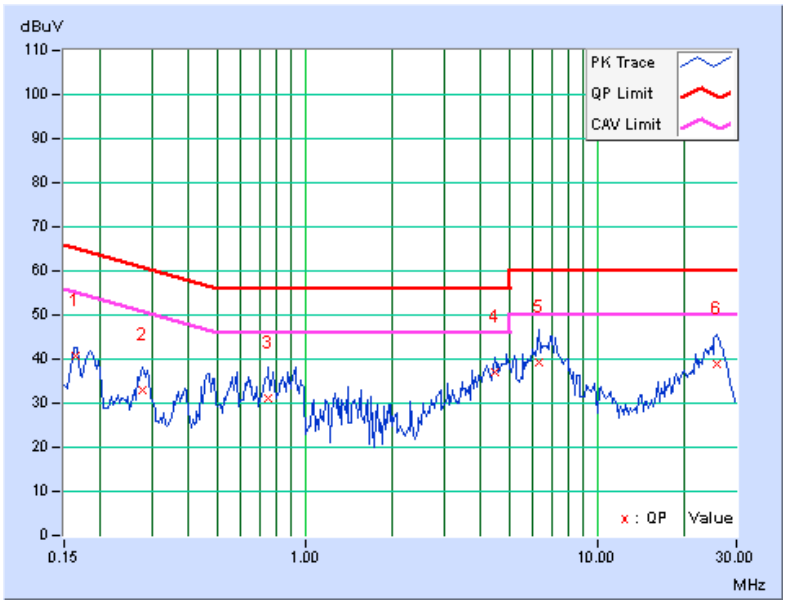


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16412	0.07	40.81	40.44	40.88	40.51	65.25	55.25	-24.37	-14.74
2	0.27891	0.10	33.03	22.19	33.13	22.29	60.85	50.85	-27.72	-28.56
3	0.74766	0.16	31.12	19.48	31.28	19.64	56.00	46.00	-24.72	-26.36
4	4.49609	0.37	36.53	28.16	36.90	28.53	56.00	46.00	-19.10	-17.47
5	6.28906	0.46	38.97	29.24	39.43	29.70	60.00	50.00	-20.57	-20.30
6	25.77344	1.38	37.36	27.67	38.74	29.05	60.00	50.00	-21.26	-20.95

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
6. Perform the AC line Conducted test with the dummy load follow FCC KDB174176.



4.2 RADIATED EMISSION EASUREMENT

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
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 29,2013	Jan. 28,2014
Pre-Amplifier EMCI	EMC001340	980142	Jan. 09, 2013	Jan. 08, 2014
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 10, 2012	Dec. 09, 2014
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 21, 2013	Jan. 20, 2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
RF Cable	NA	CHGCAB_001	Oct. 05, 2013	Oct. 04, 2014
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 19, 2012	Nov. 18, 2013
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 25, 2012	Dec. 24, 2013
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The test was performed in 966 Chamber No. G.
5. The FCC Site Registration No. is 966073.
6. The VCCI Site Registration No. is G-137.
7. The CANADA Site Registration No. is IC 7450H-2.
8. Tested Date: Nov. 15, 2013

For 30~1000MHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Jan. 16, 2013	Jan. 15, 2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Mar. 25, 2013	Mar. 24, 2014
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Horn_Antenna AISI	AIH.8018	0000220091110	Nov. 27, 2012	Nov. 26, 2013
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 26, 2012	Dec. 25, 2013
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Nov. 19 to 21, 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 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. 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:

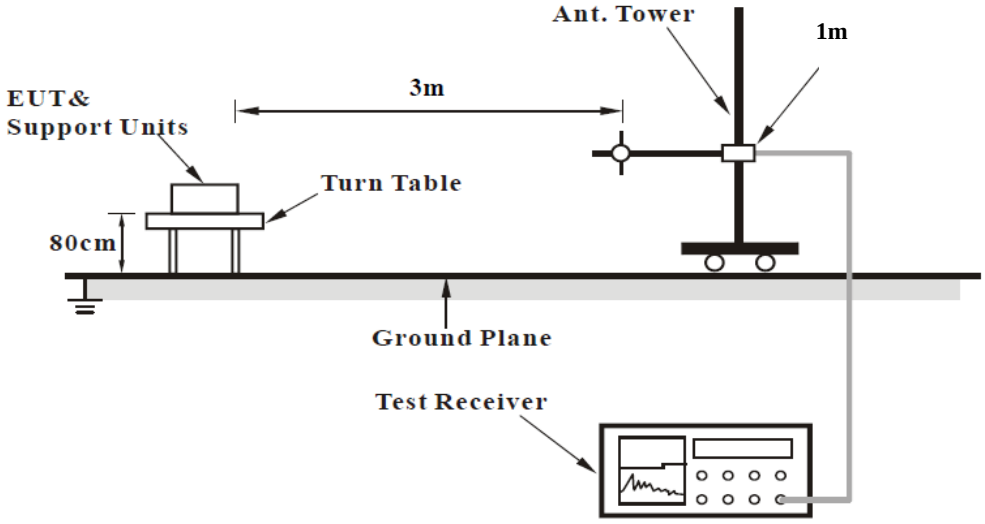
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency 30MHz ~ 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

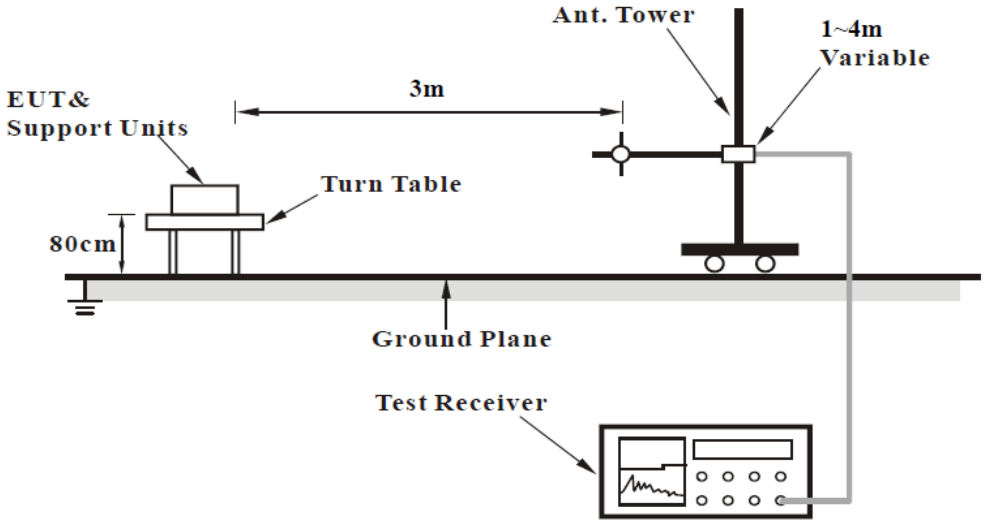
No deviation

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 (MODE 1)

EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	13.553 ~ 13.567MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 61%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Robert Cheng		

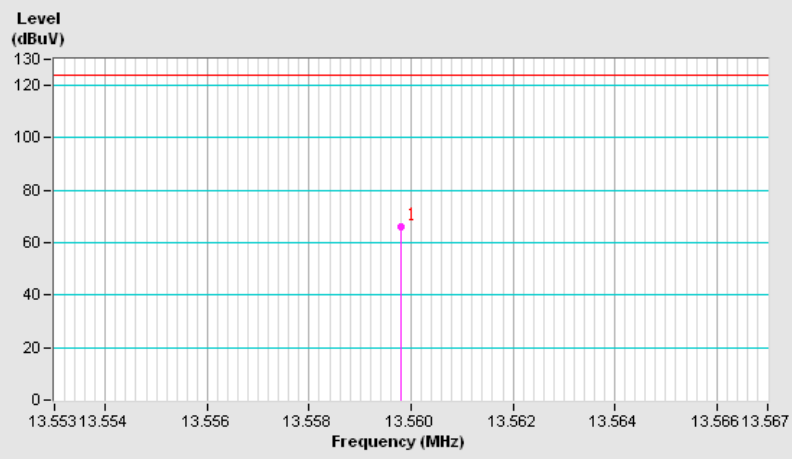
LOOP ANTENNA TEST DISTANCE: AT 3 M (X AXIS)								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.56	65.90 QP	124.00	-58.10	1.00	360	69.60	-3.70

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)
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:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	13.553 ~ 13.567MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 61%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Robert Cheng		

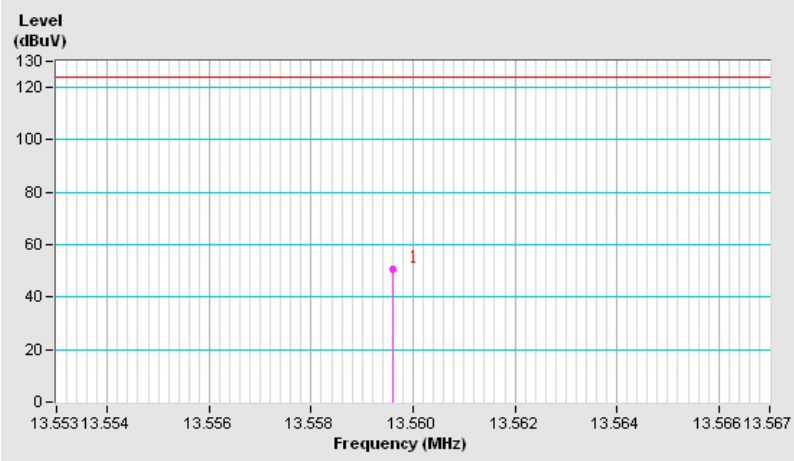
LOOP ANTENNA TEST DISTANCE: AT 3 M (Y AXIS)								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*13.56	50.70 QP	124.00	-73.30	1.00	261	54.40	-3.70

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)
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:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	Below 30MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 64%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Robert Cheng		

LOOP ANTENNA TEST DISTANCE: AT 3 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	0.012	64.0 QP	126.0	-62.0	1.00	29	-13.4	77.4
2	0.024	65.0 QP	120.0	-55.0	1.00	244	-6.5	71.5
3	1.326	33.8 QP	65.2	-31.4	1.00	156	-6.8	40.6
4	7.899	33.1 QP	69.5	-36.4	1.00	277	-4.9	38.0
5	25.301	36.1 QP	69.5	-33.4	1.00	235	2.2	33.9
6	29.856	38.5 QP	69.5	-31.0	1.00	192	-0.6	39.1
LOOP ANTENNA TEST DISTANCE: AT 3 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	0.012	64.4 QP	126.0	-61.6	1.00	259	-13.0	77.4
2	0.024	65.0 QP	120.0	-55.0	1.00	308	-6.5	71.5
3	1.425	36.4 QP	64.5	-28.1	1.00	6	-3.9	40.3
4	7.902	31.6 QP	69.5	-37.9	1.00	266	-6.4	38.0
5	25.300	36.1 QP	69.5	-33.4	1.00	254	2.2	33.9
6	29.954	39.3 QP	69.5	-30.2	1.00	1	0.1	39.2

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)
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	30deg. C, 70%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Chilin Lee		

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	176.28	37.33 QP	43.50	-6.17	2.00 H	318	51.44	-14.11
2	204.79	38.94 QP	43.50	-4.56	1.50 H	61	54.78	-15.84
3	340.74	40.55 QP	46.00	-5.45	1.00 H	324	50.95	-10.40
4	577.81	40.60 QP	46.00	-5.40	1.50 H	260	45.90	-5.30
5	666.71	39.99 QP	46.00	-6.01	2.00 H	92	43.66	-3.67
6	813.62	35.55 QP	46.00	-10.45	1.00 H	236	36.33	-0.78
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	**40.67**	**36.98 QP**	**40.00**	**-3.02**	**1.00 V**	**348**	**50.63**	**-13.65**
2	385.21	39.71 QP	46.00	-6.29	1.50 V	195	49.33	-9.62
3	474.07	41.97 QP	46.00	-4.03	1.00 V	316	49.50	-7.53
4	488.91	41.49 QP	46.00	-4.51	1.00 V	295	48.74	-7.25
5	518.54	41.07 QP	46.00	-4.93	1.00 V	297	47.53	-6.46
6	667.00	30.99 QP	46.00	-15.01	1.00 V	261	34.66	-3.67

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

4.2.8 TEST RESULTS (MODE 2)

EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER	120Vac, 60Hz	FREQUENCY RANGE	30~1000MHz
ENVIRONMENTAL CONDITIONS	21deg. C, 70%RH	DETECTOR FUNCTION	Quasi-Peak (QP)
TESTED BY	Chilin Lee		

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	176.28	40.03 QP	43.50	-3.47	1.50 H	301	54.14	-14.11
2	275.26	39.14 QP	46.00	-6.86	1.00 H	322	51.66	-12.52
3	340.74	41.12 QP	46.00	-4.88	1.00 H	322	51.52	-10.40
4	666.66	40.29 QP	46.00	-5.71	1.00 H	235	43.96	-3.67
5	813.62	35.68 QP	46.00	-10.32	1.00 H	238	36.46	-0.78
6	949.22	33.37 QP	46.00	-12.63	1.50 H	150	31.87	1.50
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	40.67	35.63 QP	40.00	-4.37	1.00 V	341	49.28	-13.65
2	385.21	39.95 QP	46.00	-6.05	1.00 V	191	49.57	-9.62
3	474.07	41.27 QP	46.00	-4.73	1.00 V	231	48.80	-7.53
4	488.91	40.31 QP	46.00	-5.69	1.00 V	236	47.56	-7.25
5	518.54	42.06 QP	46.00	-3.94	2.00 V	150	48.52	-6.46
6	666.71	37.34 QP	46.00	-8.66	1.00 V	314	41.01	-3.67

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)
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
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014

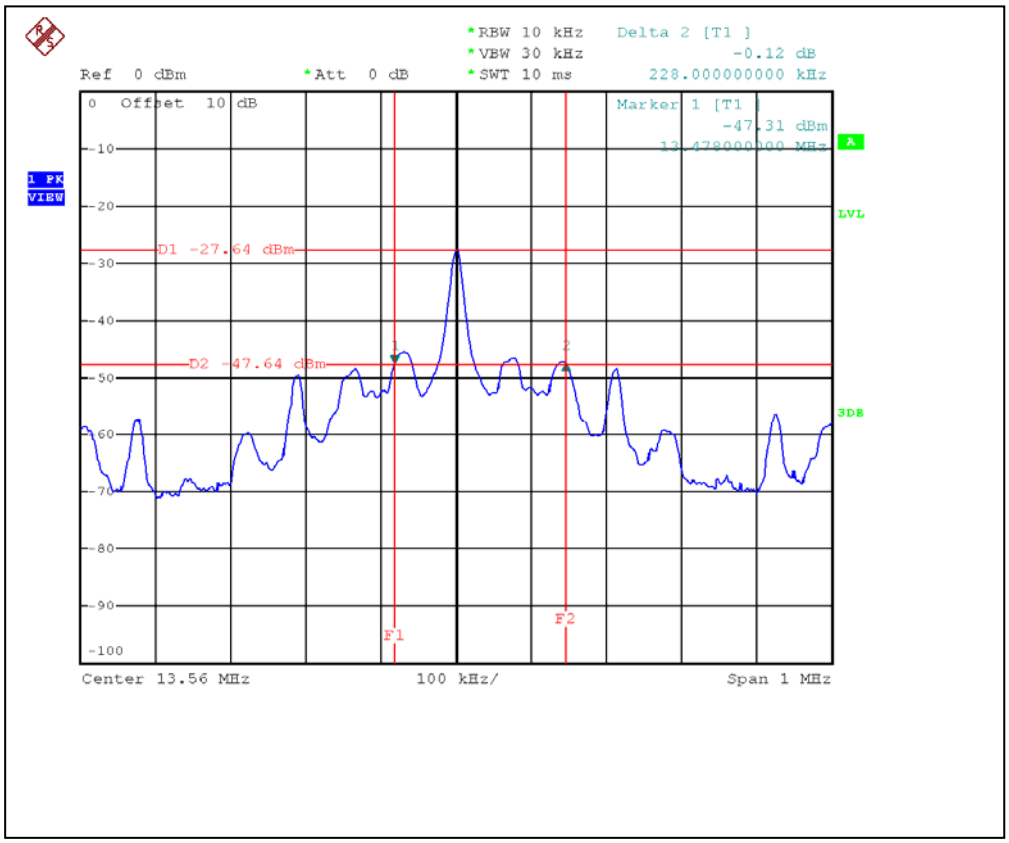
Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : Nov. 24, 2013

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	13.706 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 ±0.01%(± 100ppm) of the operating frequency over a temperature variation of –30 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
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-SP-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 : Nov. 24, 2013

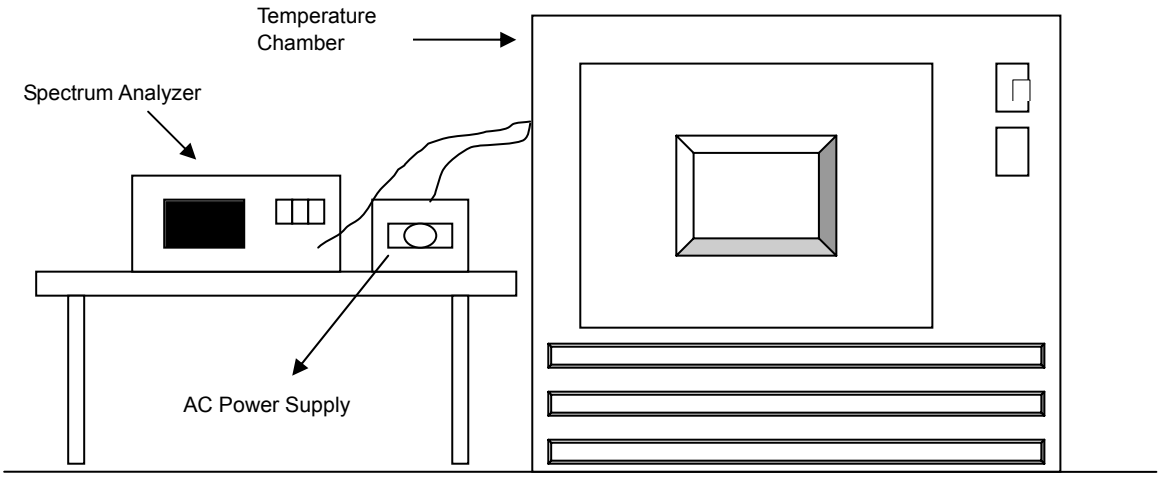
4.4.3 TEST PROCEDURE

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

FREQUEMCY STABILITY VERSUS TEMP.									
TEMP. (℃)	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	13.56004	0.00029	13.56005	0.00037	13.56005	0.00037	13.56004	0.00029
40	120	13.56	0.00000	13.56002	0.00015	13.56	0.00000	13.56	0.00000
30	120	13.56	0.00000	13.55999	-0.00007	13.56	0.00000	13.56	0.00000
20	120	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56	0.00000
10	120	13.56002	0.00015	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022
0	120	13.56003	0.00022	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029
-10	120	13.55997	-0.00022	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
-20	120	13.55994	-0.00044	13.55995	-0.00037	13.55994	-0.00044	13.55994	-0.00044
-30	120	13.55999	-0.00007	13.56	0.00000	13.55999	-0.00007	13.56001	0.00007

FREQUEMCY STABILITY VERSUS VOLTAGE									
TEMP. (℃)	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	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56	0.00000
	120	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56	0.00000
	102	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56	0.00000

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:

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

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.

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