

# FCC TEST REPORT

REPORT NO.: RF130617E08

MODEL NO.: XRAG-P1, XRAG-P2, XRAG-P4

FCC ID: NKR-XRAGP1

RECEIVED: June 17, 2013

TESTED: June 26 to 28, 2013

**TESTEFFD:** July 09, 2013

APPLICANT: Wistron NeWeb Corp.

- ADDRESS: 20 Park Avenue II, Hsinchu Science Park,Hsinchu 308, Taiwan, R.O.C.
- **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.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification

Report No.: RF130617E08



# TABLE OF CONTENTS

RELEAS	SE 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	
3.3	TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:	. 11
3.4	GENERAL DESCRIPTION OF APPLIED STANDARDS	.13
3.5	DESCRIPTION OF SUPPORT UNITS	.14
3.6	CONFIGURATION OF SYSTEM UNDER TEST	.15
4	TEST PROCEDURES AND RESULTS	.18
4.1	CONDUCTED EMISSION MEASUREMENT	
4.1.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT	.18
4.1.2	TEST INSTRUMENTS	.18
4.1.3	TEST PROCEDURES	.19
4.1.4	DEVIATION FROM TEST STANDARD	.19
4.1.5	TEST SETUP	.20
4.1.6	EUT OPERATING CONDITIONS	.20
4.1.7	TEST RESULTS(MODE 1)	.21
4.1.8	TEST RESULTS(MODE 2)	.23
4.2	NUMBER OF HOPPING FREQUENCY USED	
4.2.1	LIMIT OF HOPPING FREQUENCY USED	.25
4.2.2	TEST INSTRUMENTS	
4.2.3	TEST PROCEDURES	.25
4.2.4	DEVIATION FROM TEST STANDARD	
4.2.5	TEST SETUP	.26
4.2.6	TEST RESULTS	.26
4.3	DWELL TIME ON EACH CHANNEL	.27
4.3.1	LIMIT OF DWELL TIME USED	.27
4.3.2	TEST INSTRUMENTS	.27
4.3.3	TEST PROCEDURES	-
4.3.4	DEVIATION FROM TEST STANDARD	.28
4.3.5	TEST SETUP	.28
4.3.6	TEST RESULTS	.29
4.4	CHANNEL BANDWIDTH	. 30
4.4.1	TEST INSTRUMENTS	. 30
4.4.2	TEST PROCEDURE	.30
4.4.3	DEVIATION FROM TEST STANDARD	.30
4.4.4	TEST SETUP	
4.4.5	EUT OPERATING CONDITION	.31
4.4.6	TEST RESULTS	.32



4.5	HOPPING CHANNEL SEPARATION	33
4.5.1	LIMIT OF HOPPING CHANNEL SEPARATION	33
4.5.2	TEST INSTRUMENTS	33
4.5.3	TEST PROCEDURES	33
4.5.4	DEVIATION FROM TEST STANDARD	33
4.5.5	TEST SETUP	33
4.5.6	TEST RESULTS	34
4.6	MAXIMUM PEAK OUTPUT POWER	35
4.6.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT	35
4.6.2	INSTRUMENTS	35
4.6.3	TEST PROCEDURES	35
4.6.4	DEVIATION FROM TEST STANDARD	36
4.6.5	TEST SETUP	36
4.6.6	EUT OPERATING CONDITION	36
4.6.7	TEST RESULTS	36
4.7	RADIATED EMISSION AND BANDEDGE MEASUREMENT	37
4.7.1	LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	37
4.7.2	TEST INSTRUMENTS	38
4.7.3	TEST PROCEDURES	39
4.7.4	DEVIATION FROM TEST STANDARD	39
4.7.5	TEST SETUP	40
4.7.6	EUT OPERATING CONDITION	40
4.7.7	TEST RESULTS	41
4.8	CONDUCTED OUT-BAND EMISSION MEASUREMENT	47
4.8.1	LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT	47
4.8.2	TEST INSTRUMENTS	47
4.8.3	TEST PROCEDURE	47
4.8.4	DEVIATION FROM TEST STANDARD	47
4.8.5	TEST SETUP	47
4.8.6	EUT OPERATING CONDITION	47
4.8.7	TEST RESULTS	48
5	INFORMATION ON THE TESTING LABORATORIES	49
6	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANC TO THE EUT BY THE LAB	



# **RELEASE CONTROL RECORD**

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130617E08	Original release	July 09, 2013



# **1** CERTIFICATION

PRODUCT :	Second Generation RFID Smart Reader
BRAND NAME :	WNC
MODEL NO. :	XRAG-P1, XRAG-P2, XRAG-P4
APPLICANT :	Wistron NeWeb Corp.
TESTED DATE:	June 26 to 28, 2013
TEST SAMPLE :	ENGINEERING SAMPLE
STANDARDS :	FCC Part 15, Subpart C (Section 15.247)
	ANSI C63.10-2009

The above equipment (Model: XRAG-P1) 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 : _	(Midoli Peng, Specialist)
APPROVED BY : _	(May Chen, Manager)



# **2** SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C					
Standard Section	Test Type and Limit	Result	REMARK		
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit Minimum passing margin is -3.01dB at 0.23984 MHz		
15.247(a)(1) (i)	Number of Hopping Frequency Used Spec.:	PASS	Meet the requirement of limit		
15.247(a)(1) (i)	Dwell Time on Each Channel Spec. : Max. 0.4 second	PASS	Meet the requirement of limit		
15.247(a)(1)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit		
15.247(a)(1)(i)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System Spec.: Max. 0.5 MHz	PASS	Meet the requirement of limit		
15.247(b)(2)	Maximum Peak Output Power	PASS	Meet the requirement of limit		
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -0.6dB at 4573.75MHz		
15.247(d)	Conducted Out-Band Emission Measurement	PASS	Meet the requirement of limit		
15.203	Antenna Requirement	-	Antenna connector is a Reverse TNC standard connector.		



#### 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 emissions	2.98 dB
Radiated emissions (30MHz-1GHz)	5.63 dB
Radiated emissions (1GHz -6GHz)	3.73 dB
Radiated emissions (1GHz ~18GHz)	3.90 dB



# **3 GENERAL INFORMATION**

# **3.1 GENERAL DESCRIPTION OF EUT**

PRODUCT	Second Generation RFID Smart Reader			
MODEL NO.	XRAG-P1, XRAG-P2, XRAG-P4			
POWER SUPPLY	DC 12V from power adapter or DC 56V from POE			
MODULATION TYPE	ASK			
MODULATION TECHNOLOGY	FHSS			
FREQUENCY RANGE	902.75MHz ~ 927.25MHz			
NUMBER OF CHANNEL	50			
OUTPUT POWER	977.237mW			
ANTENNA TYPE	Please see NOTE			
DATA CABLE	NA			
I/O PORTS	NA			
ASSOCIATED DEVICES	Adapter x 1			

#### NOTE:

1. The EUT has three model names which are identical to each other in all aspects except for the following table:

Brand	Model	Different
WNC	XRAG-P1	Plastic housing with POE
WNC	XRAG-P2	Stamping housing with POE
WNC	XRAG-P4	Stamping housing w/o POE

#### 2. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Type	Gain (dBi) Include cable loss	Cable Loss (dB)	Antenna Connector	Cable Length
WNC	XRAB-N1	Omni- DirectionalShelf	5.5	1	Reverse TNC	3m



3. The EUT must be supplied with a power adapter or POE adapter and following as table:

Brand	Model	Spec.			
CHANNEL WELL KPL-040F		Input: 100-240V, 1.7A, 50-60Hz AC input cable (unshielded, 1.8m) Output:12V, 3.33A DC output cable (unshielded, 1.6m with one core)			
POE(only for test not for sale)					
Brand	Model	Spec.			
PHIHONG	POE36U-1AT-R	Input: 100-240V, 1.0A, 50-60Hz Output:56V, 0.643A			

4. For Radiated test : The EUT was pre-tested under following test modes:

Below 1GHz test					
Pre-test Mode Description Power					
Mode A	XRAG-P1(Plastic housing with POE)	POE			
Mode B	XRAG-P1(Plastic housing with POE)	Adapter			
Mode C	XRAG-P2 (Stamping housing with POE)	POE			
Mode D	XRAG-P4 (Stamping housing w/o POE)	Adapter			
Above 1GHz test					
Pre-test Mode	Description	BNC Port	Power		
Mode E	XRAG-P1(Plastic housing with POE)	Y 1	POE		
Mode F	XRAG-P1(Plastic housing with POE)	Y 2	POE		
Mode G	XRAG-P1(Plastic housing with POE)	Y 3	POE		
Mode H	XRAG-P1(Plastic housing with POE)	Y 4	POE		
Mode I	XRAG-P2 (Stamping housing with POE)	Y 1	POE		
Mode J	XRAG-P4 (Stamping housing w/o POE)	Y 1	Adapter		

From the above modes, the Radiated (below 1GHz) test worst case was found in **Mode A** and the Radiated (above 1GHz) test worst case was found in **Mode H** Therefore only the test data of the modes were recorded in this report individually.

5. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



# 3.2 DESCRIPTION OF TEST MODES

50 channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.75	21	913.25	42	923.75
1	903.25	22	913.75	43	924.25
2	903.75	23	914.25	44	924.75
3	904.25	24	914.75	45	925.25
4	904.75	25	915.25	46	925.75
5	905.25	26	915.75	47	926.25
6	905.75	27	916.25	48	926.75
7	906.25	28	916.75	49	927.25
8	906.75	29	917.25		
9	907.25	30	917.75		
10	907.75	31	918.25		
11	908.25	32	918.75		
12	908.75	33	919.25		
13	909.25	34	919.75		
14	909.75	35	920.25		
15	910.25	36	920.75		
16	910.75	37	921.25		
17	911.25	38	921.75		
18	911.75	39	922.25		
19	912.25	40	922.75		
20	912.75	41	923.25		



# 3.3 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

CONFIGURE		APP									
MODE	PLC	RE < 1G	RE <sup>3</sup> 1G	APCM	ОВ	DESCRIPTION					
1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	With POE					
2	$\checkmark$	-	-	-	-	With Adapter					
Vhere PLC	: Power Line	Conducted E	mission	RE <	<b>1G:</b> Radiat	ted Emission below 1GHz					
		ed Emission a Dut-Band Emi			M: Antenna	Port Conducted Measurement					
modulat Followir	n to deterr ions and p ng channe	mine the wo backet type I(s) was (wo	orst-case r s. ere) select	ed for th	e final tes	sible combinations between available					
Δvail	Available Tested Modulation Modulation										
	anol	Channal	I Tochn		Type						
Char 0 to adiated Em Pre-Sca betweer	149 hission Te In has bee In available	en conducte	d to deter	SS							
Char 0 to adiated Em Pre-Sca betweer architec Followir	149 hission Te In has bee n available ture). ng channe	49 est (Below en conducte e modulation I(s) was (we	FHS 1 GHz): d to deter ns, data ra ere) select	mine the ates and a ted for th	ASK worst-cas antenna p e final tes	se mode from all possible combinatio ports (if EUT with antenna diversity					
Char 0 to adiated Em Pre-Sca betweer architec Followir Ava	149 nission Te in has bee n available ture). ng channe ilable	49 est (Below en conducte e modulation I(s) was (we Tested	FHS 1 GHz): d to deter ns, data ra ere) select Modu	mine the ates and a red for th lation	ASK worst-cas antenna p e final tes Modulat	se mode from all possible combinatio ports (if EUT with antenna diversity at as listed below. tion					
Char 0 to adiated Em Pre-Sca betweer architec Followir Ava Char	149 hission Te In has bee n available ture). ng channe	49 est (Below en conducte e modulation I(s) was (we	FHS 1 GHz): d to deter ns, data ra ere) select	mine the ates and a aed for th lation ology	ASK worst-cas antenna p e final tes	se mode from all possible combination ports (if EUT with antenna diversity at as listed below.					
<ul> <li>Charlen 0 to 10 t</li></ul>	hission Te n has bee n available ture). ng channe ilable annel o 49 hission Te n has bee n available ture).	49 est (Below en conducte e modulation I(s) was (we Tested Channel 0, 24, 49 est (Above en conducte e modulation	FHS         1 GHz):         d to deterns, data rate         ere) select         Modu         Techn         FH         1 GHz):         d to deterns, data rate         sere) select         Modu         Techn         FH         1 GHz):         d to deterns, data rate	mine the ates and a ted for the <b>lation ology</b> SS mine the ates and a ted for the ates and a ted for the <b>lation</b>	ASK worst-cas antenna p e final tes <b>Modulat</b> <b>Type</b> ASK worst-cas antenna p	se mode from all possible combination borts (if EUT with antenna diversity at as listed below. tion se mode from all possible combination borts (if EUT with antenna diversity at as listed below.					



#### Antenna Port Conducted Measurement:

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

Available	Tested	Modulation	Modulation
Channel	Channel	Technology	Type
0 to 49	0, 24, 49	FHSS	ASK

#### Conducted Out-Band Emission Measurement:

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

Available	Tested	Modulation	Modulation
Channel	Channel	Technology	Type
0 to 49	0, 49	FHSS	

#### **<u>\* TEST CONDITION:</u>**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY		
PLC	25deg. C, 65%RH	120Vac, 60Hz	Anderson Chen		
RE <sup>3</sup> 1G	21deg. C, 65%RH	120Vac, 60Hz	Robert Cheng		
RE<1G	23deg. C, 65%RH	120Vac, 60Hz	Tim Ho		
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng		
ОВ	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng		



### 3.4 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. (15.247)

#### ANSI C63.10-2009

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

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



### 3.5 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	DELL	DELL	PP32LA	FCC DoC
2	iPod shuffle	Apple	Apple	MC749TA/A	NA
3	RF SWITCH	WNC	NA	NA	NA
4	Fan out	WNC	NA	NA	NA
5	RFID Reader	WNC	NA	NA	NA
6	SD CARD	Transcend	NA	NA	NA

1 UTP cable (10m) 2 iPod cable (0.1m)

3 RF cable (1.5m) / RS232 cable (10m)

4 RS232 cable (1.8m)

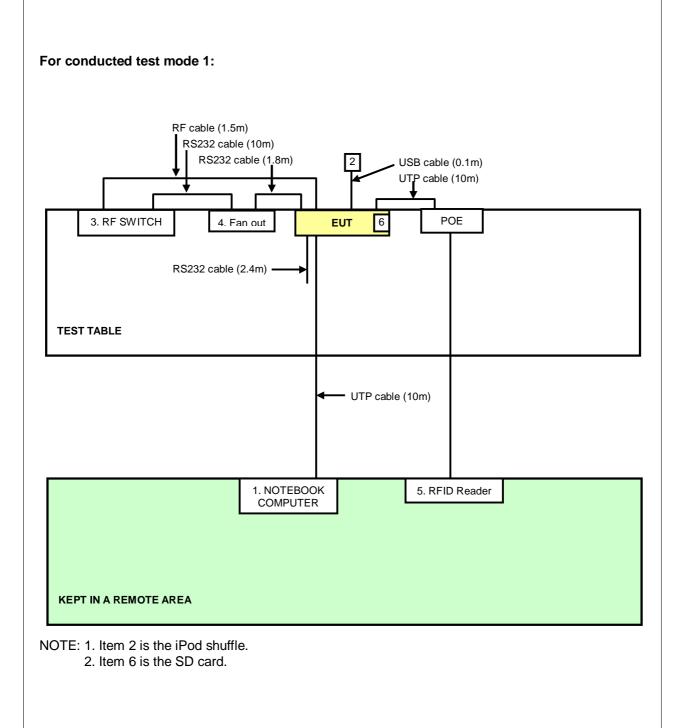
5 UTP cable (3m)

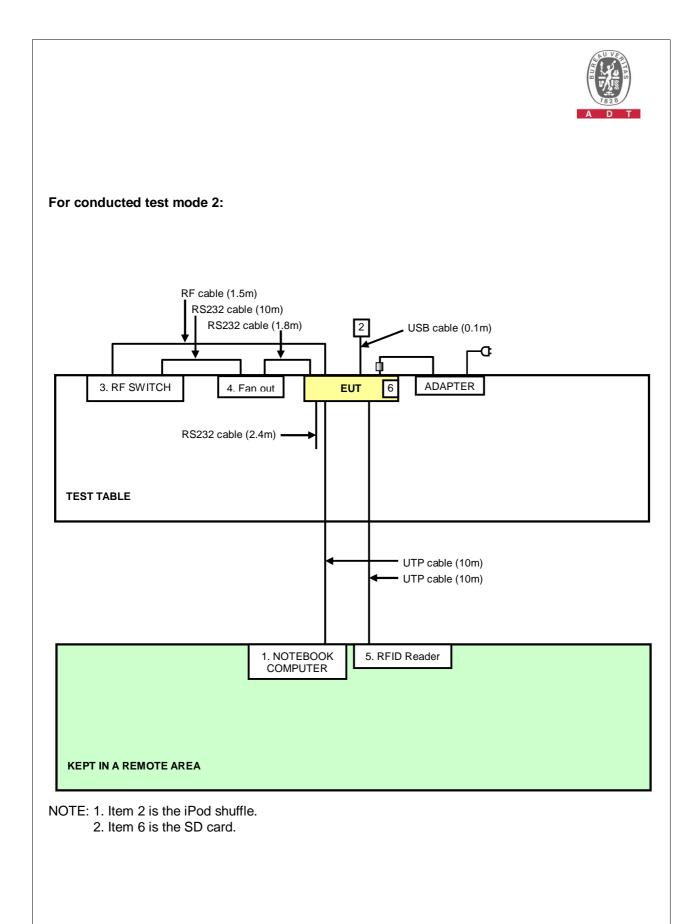
6 NA

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



# 3.6 CONFIGURATION OF SYSTEM UNDER TEST







# For other test items: RF cable (1.5m) RS232 cable (10m) RS232 cable (1.8m) 2 USB cable (0.1m) 3. RF SWITCH 6 EUT 4. Fan out RS232 cable (2.4m) -TEST TABLE UTP cable (10m) UTP cable (10m) 1. NOTEBOOK COMPUTER POE 5. RFID Reader **KEPT IN A REMOTE AREA** NOTE: 1. Item 2 is the iPod shuffle. 2. Item 6 is the SD card.



# 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	66 to 56 56	56 to 46 46		
5-30	60	40 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	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 07,2013	June 06,2014
RF Cable (JYEBAO)	5DFB	COCCAB-001	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: June 28, 2013



#### 4.1.3 TEST PROCEDURES

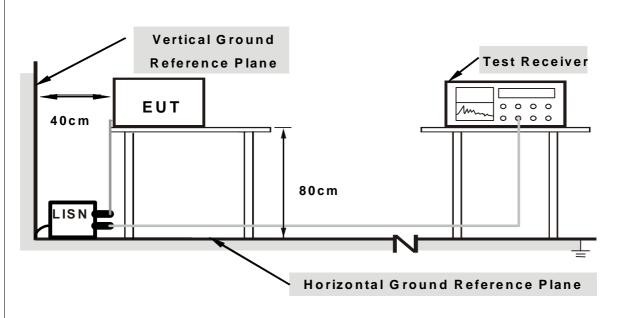
- a. The EUT/HOST placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit 20dB) were 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

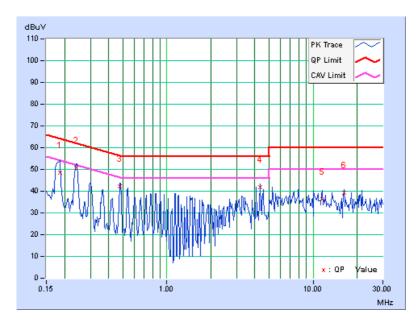
- 1. Placed the EUT on the testing table.
- 2. The support unit 1 (NB) ran test program "RFID\_FCC\_Utility.exe & DemoProgramConsoleMultiple.exe" to enable EUT under transmission condition continuously at specific channel frequency.



#### 4.1.7 TEST RESULTS(MODE 1)

PHA	SE		ne (L)			ECTOR		Quasi-Peak (QP) / Average (AV)		
	Freq. Corr. Reading Value Emission Level Limit				nit	Mai	rgin			
No		Factor	[dB	(uV)]	[dB	(uV)]	[dB (	(uV)]	(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18516	0.13	48.45	44.09	48.58	44.22	64.25	54.25	-15.67	-10.03
2	0.23984	0.15	50.63	48.94	50.78	49.09	62.10	52.10	-11.32	-3.01
3	0.47813	0.19	42.17	41.19	42.36	41.38	56.37	46.37	-14.02	-5.00
4	4.32813	0.38	41.62	40.67	42.00	41.05	56.00	46.00	-14.00	-4.95
5	11.58984	0.73	35.45	32.18	36.18	32.91	60.00	50.00	-23.82	-17.09
6	16.23047	0.91	38.47	35.13	39.38	36.04	60.00	50.00	-20.62	-13.96

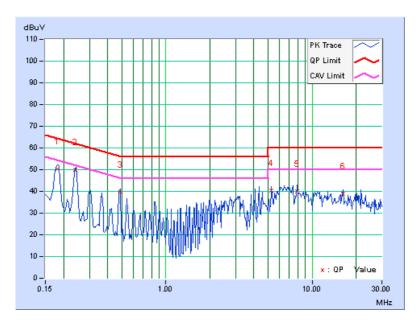
- 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
- 2. The emission levels of other frequencies were very low against the limit.
- 3. Margin value = Emission Level Limit value
- 4. Correction Factor = Insertion loss + Cable loss
- 5. Emission Level = Correction Factor + Reading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





PHA	ASE		utral (N)			ECTOR		Quasi-Peak (QP) / Average (AV)		
	Freq.	Freq. Corr. Reading Value Emission Level			Lir	nit	Mai	gin		
No		Factor	[dB	(uV)]	[dB	(uV)]	[dB(	(uV)]	(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18125	0.11	50.32	49.06	50.43	49.17	64.43	54.43	-14.00	-5.26
2	0.23984	0.13	49.81	48.93	49.94	49.06	62.10	52.10	-12.16	-3.04
3	0.48594	0.17	39.37	33.98	39.54	34.15	56.24	46.24	-16.69	-12.08
4	5.29297	0.37	40.06	38.50	40.43	38.87	60.00	50.00	-19.57	-11.13
5	7.92188	0.45	39.62	39.62 35.71		36.16	60.00	50.00	-19.93	-13.84
6	16.22656	0.67	38.14	35.24	38.81	35.91	60.00	50.00	-21.19	-14.09

- 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

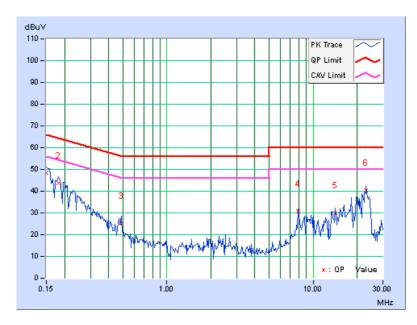




#### 4.1.8 TEST RESULTS(MODE 2)

PHA	SE		Line (L)			ECTOR		Quasi-Peak (QP) / Average (AV)		
	Freq.	Corr.	Readin	g Value	Emissio	on Level	Lir	nit	Mai	rgin
No		Facto	r [dB (	(uV)]	[dB	(uV)]	[dB (	(uV)]	(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.12	48.25	33.46	48.37	33.58	66.00	56.00	-17.63	-22.42
2	0.18125	0.13	43.70	26.87	43.83	27.00	64.43	54.43	-20.60	-27.43
3	0.48594	0.19	24.94	11.17	25.13	11.36	56.24	46.24	-31.11	-34.88
4	7.92188	0.56	30.15	27.07	30.71	27.63	60.00	50.00	-29.29	-22.37
5	14.21484	0.84	29.29	27.39	30.13	28.23	60.00	50.00	-29.87	-21.77
6	23.06641	1.13	39.17	36.60	40.30	37.73	60.00	50.00	-19.70	-12.27

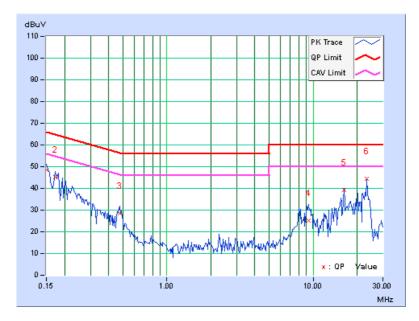
- 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
- 2. The emission levels of other frequencies were very low against the limit.
- 3. Margin value = Emission Level Limit value
- 4. Correction Factor = Insertion loss + Cable loss
- 5. Emission Level = Correction Factor + Reading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





PHA	HASE Neutral (N)						Quasi-Peak (QP) / Average (AV)			
	Freq.	Corr.	Reading Value Emission Level		Lir	nit	Mai	rgin		
No		Factor	[dB	(uV)]	[dB	(uV)]	[dB(	(uV)]	(d	B)
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	48.57	33.66	48.67	33.76	66.00	56.00	-17.33	-22.24
2	0.17344	0.11	45.12	29.34	45.23	29.45	64.79	54.79	-19.56	-25.34
3	0.47422	0.17	28.31	15.92	28.48	16.09	56.44	46.44	-27.96	-30.35
4	9.30469	0.50	24.52	18.38	25.02	18.88	60.00	50.00	-34.98	-31.12
5	16.23047	0.67	38.45	34.95	39.12	35.62	60.00	50.00	-20.88	-14.38
6	23.12891	0.80	43.46	38.65	44.26	39.45	60.00	50.00	-15.74	-10.55

- 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 NUMBER OF HOPPING FREQUENCY USED

#### 4.2.1 LIMIT OF HOPPING FREQUENCY USED

CONDITION	HOPPING FREQUENCY USED	APPLICATION
20dB Bandwidth <250kHz	hopping channels $\ge$ 50	V
20dB Bandwidth >250kHz	hopping channels $\ge$ 25	X

#### 4.2.2 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 : June 26, 2013

#### 4.2.3 TEST PROCEDURES

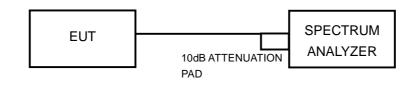
- 1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- 3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- 4. Set the SA on View mode and then plot the result on SA screen.
- 5. Repeat above procedures until all frequencies measured were complete.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

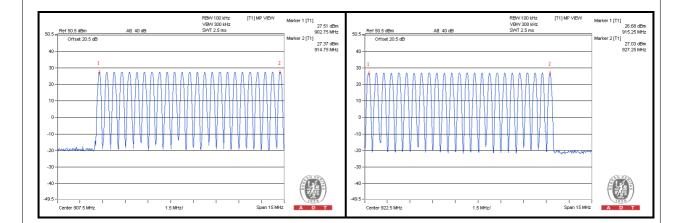


## 4.2.5 TEST SETUP



#### 4.2.6 TEST RESULTS

There are 50 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.





#### 4.3 DWELL TIME ON EACH CHANNEL

#### 4.3.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than as below:

CONDITION	DWELL TIME	APPLICATION
20dB Bandwidth <250kHz	0.4 seconds within a 20 second	N.
(hopping channels $\ge$ 50)	period	V
20dB Bandwidth >250kHz	0.4 seconds within a 10 second	
(hopping channels $\ge$ 25)	period	X

#### 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 : June 26, 2013



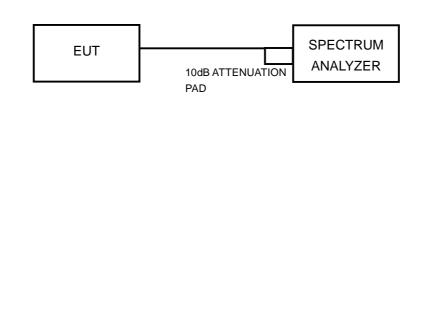
#### 4.3.3 TEST PROCEDURES

- 1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- 4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- 5. Repeat above procedures until all frequencies measured were complete.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP





# 4.3.6 TEST RESULTS

Number of transmission in a 20 s	Length of transmission time (msec)	Result (msec)	Limit (msec)
3 time	133	399	400
5 - Ref 40.5 dBm Att 30 dB Offset 20.5 dB 	RBW 100 Hrz V9W 100 Hrz SWT 20 s         [T1] MP CLRWR	40.5 Ref 40.5 dBm Att 30 dB Offset 20.5 dB 0 0 0 0 	RBW 100 kHz         [T1] MP VEW         Marker 1 [T1]         -3.3.1 df           VBW 100 kHz         97.00000



### 4.4 CHANNEL BANDWIDTH

For frequency hopping system operating in the 902-928MHz, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

## 4.4.1 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 : June 26, 2013

#### 4.4.2 TEST PROCEDURE

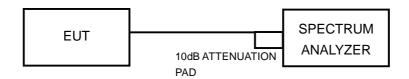
- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

#### 4.4.3 DEVIATION FROM TEST STANDARD

No deviation



#### 4.4.4 TEST SETUP



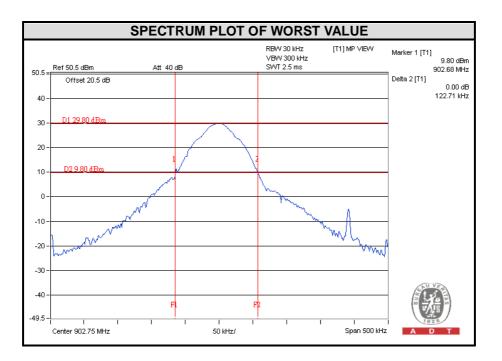
#### 4.4.5 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



## 4.4.6 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	902.75	0.12
24	914.75	0.11
49	927.25	0.11





### 4.5 HOPPING CHANNEL SEPARATION

#### 4.5.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25 kHz or 20dB hopping channel bandwidth (whichever is greater).

## 4.5.2 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 : June 26, 2013

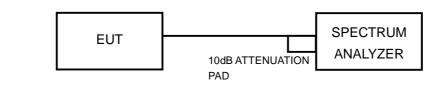
#### 4.5.3 TEST PROCEDURES

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- 3. By using the MaxHold function record the separation of two adjacent channels.
- 4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- 5. Repeat above procedures until all frequencies measured were complete.

#### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.5.5 TEST SETUP

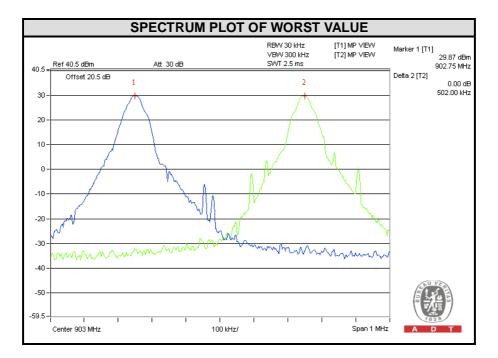




# 4.5.6 TEST RESULTS

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.75	0.50	0.12	PASS
24	914.75	0.51	0.11	PASS
49	927.25	0.51	0.11	PASS

The minimum limit is 20dB bandwidth.





#### 4.6 MAXIMUM PEAK OUTPUT POWER

#### 4.6.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement as below:

CONDITION	OUTPUT POWER	APPLICATION
hopping channels $\geq$ 50	1 W	V
hopping channels $\geq$ 25 & $\leq$ 50	0.25W	Х

#### 4.6.2 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 : June 26, 2013

#### 4.6.3 TEST PROCEDURES

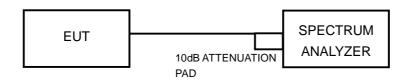
- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
- 4. Measure the captured power within the band and recording the plot.
- 5. Repeat above procedures until all frequencies measured were complete.



#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 TEST SETUP



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

#### 4.6.6 EUT OPERATING CONDITION

The software (RFID\_FCC\_Utility.exe) provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

#### 4.6.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	902.75	977.237	29.90	1000	PASS
24	914.75	970.510	29.87	1000	PASS
49	927.25	977.237	29.90	1000	PASS



## 4.7 RADIATED EMISSION AND BANDEDGE MEASUREMENT

### 4.7.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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. 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.



### 4.7.2 TEST INSTRUMENTS

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
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 19, 2012	Nov. 18, 2013
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
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 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. G.
- 4. The FCC Site Registration No. is 966073.
- 5 The VCCI Site Registration No. is G-137.
- 6 The CANADA Site Registration No. is IC 7450H-2.
- 7 Tested Date: June 26, 2013



### 4.7.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### NOTE:

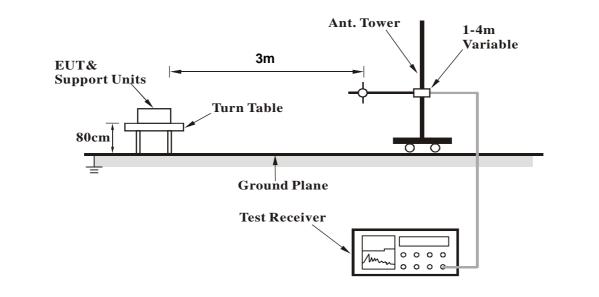
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.

### 4.7.4 DEVIATION FROM TEST STANDARD

No deviation



### 4.7.5 TEST SETUP



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

### 4.7.6 EUT OPERATING CONDITION

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



## 4.7.7 TEST RESULTS

#### **BELOW 1GHz**

CHANNEL	TX Channel 0		Quasi-Peak (QP)
	Delaw 4011-	DETECTOR FUNCTION	Peak(PK)
FREQUENCY RANGE	Below 1GHZ		Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	98.43	32.4 QP	43.5	-11.1	2.00 H	44	51.19	-18.81
2	106.68	31.8 QP	43.5	-11.7	1.50 H	99	48.73	-16.91
3	265.90	38.9 QP	46.0	-7.1	1.50 H	124	53.00	-14.06
4	400.01	35.3 QP	46.0	-10.7	1.00 H	228	45.51	-10.25
5	528.73	30.8 QP	46.0	-15.2	2.00 H	37	38.12	-7.33
6	797.56	30.8 QP	46.0	-15.2	1.50 H	360	32.73	-1.93
7	902.00	80.2 PK	110.5	-30.3	1.76 H	352	80.49	-0.29
8	902.00	49.1 AV	108.1	-59.0	1.76 H	352	49.39	-0.29
9	*902.75	130.5 PK			1.76 H	351	130.79	-0.29
10	*902.75	128.1 AV			1.76 H	351	128.39	-0.29
		ANTENNA		( & TEST DI	STANCE: V	ERTICAL A	T 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	37.53	39.0 QP	40.0	-1.0	1.00 V	132	53.02	-14.00
2	97.17	35.9 QP	43.5	-7.6	1.50 V	314	54.80	-18.93
3	179.53	37.5 QP	43.5	-6.0	1.00 V	7	52.27	-14.80
4	265.81	34.6 QP	46.0	-11.4	1.50 V	261	48.64	-14.06
5	400.01	32.7 QP	46.0	-13.3	1.50 V	67	42.95	-10.25
6	633.15	31.5 QP	46.0	-14.5	1.50 V	360	36.20	-4.66
7	902.00	80.1 PK	105.3	-25.2	1.00 V	235	80.39	-0.29
8	902.00	41.4 AV	103.1	-61.7	1.00 V	235	41.69	-0.29
9	*902.75	125.3 PK			1.00 V	235	125.59	-0.29
10	*902.75	123.1 AV			1.00 V	235	123.39	-0.29

**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.



#### ABOVE 1GHz

CHANNEL	TX Channel 0	DETECTOR	Peak(PK)
FREQUENCY RANGE	1GHz ~ 10GHz	FUNCTION	Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	2708.25	66.3 PK	74.0	-7.7	1.94 H	4	67.55	-1.25
2	2708.25	49.7 AV	54.0	-4.3	1.94 H	4	50.95	-1.25
3	3611.00	59.4 PK	74.0	-14.6	2.20 H	184	57.88	1.52
4	3611.00	45.7 AV	54.0	-8.3	2.20 H	184	44.18	1.52
5	4513.75	72.1 PK	74.0	-1.9	2.23 H	170	66.92	5.18
6	4513.75	53.3 AV	54.0	-0.7	2.23 H	170	48.12	5.18
		ANTENNA		/ & TEST DI	STANCE: V	ERTICAL A	Т 3 М	
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	2708.25	57.5 PK	74.0	-16.5	1.24 V	264	58.75	-1.25
2	2708.25	48.8 AV	54.0	-5.2	1.24 V	264	50.05	-1.25
3	3611.00	58.7 PK	74.0	-15.3	2.41 V	213	57.18	1.52
4	3611.00	51.5 AV	54.0	-2.5	2.41 V	213	49.98	1.52
5	4513.75	68.0 PK	74.0	-6.0	3.17 V	317	62.82	5.18
6	4513.75	41.2 AV	54.0	-12.8	3.17 V	317	36.02	5.18

**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



#### **BELOW 1GHz**

CHANNEL	TX Channel 24		Quasi-Peak (QP)
	Below 4011-	DETECTOR FUNCTION	Peak(PK)
FREQUENCY RANGE	Below IGHZ		Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	98.43	32.2 QP	43.5	-11.3	2.00 H	44	51.00	-18.81
2	106.68	31.6 QP	43.5	-11.9	1.50 H	99	48.49	-16.91
3	265.90	38.7 QP	46.0	-7.3	1.50 H	124	52.79	-14.06
4	400.01	35.1 QP	46.0	-10.9	1.00 H	228	45.36	-10.25
5	528.73	30.6 QP	46.0	-15.4	2.00 H	37	37.93	-7.33
6	797.56	30.6 QP	46.0	-15.4	1.50 H	360	32.50	-1.93
7	*914.75	130.1 PK			2.06 H	342	130.06	0.04
8	*914.75	127.8 AV			2.06 H	342	127.76	0.04
		ANTENNA		/ & TEST DI	STANCE: V	ERTICAL A	Т 3 М	
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	37.53	37.0 QP	40.0	-3.0	1.00 V	132	51.02	-14.00
2	97.17	35.7 QP	43.5	-7.8	1.50 V	314	54.60	-18.93
3	179.53	37.3 QP	43.5	-6.3	1.00 V	7	52.05	-14.80
4	265.81	34.3 QP	46.0	-11.7	1.50 V	261	48.36	-14.06
5	400.01	32.4 QP	46.0	-13.6	1.50 V	67	42.66	-10.25
6	633.15	31.2 QP	46.0	-14.8	1.50 V	360	35.90	-4.66
7	*914.75	124.8 PK			1.00 V	234	124.76	0.04
8	*914.75	122.6 AV			1.00 V	234	122.56	0.04

#### **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.



#### ABOVE 1GHz

1				
	CHANNEL	TX Channel 24	DETECTOR	Peak(PK)
	FREQUENCY RANGE	1GHz ~ 10GHz	FUNCTION	Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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)
3	2744.25	66.2 PK	74.0	-7.8	1.84 H	17	67.35	-1.15
4	2744.25	48.8 AV	54.0	-5.2	1.84 H	17	49.95	-1.15
5	3659.00	59.6 PK	74.0	-14.4	2.19 H	183	57.92	1.68
6	3659.00	45.6 AV	54.0	-8.4	2.19 H	183	43.92	1.68
7	4573.75	72.8 PK	74.0	-1.2	2.32 H	175	67.46	5.34
8	4573.75	53.4 AV	54.0	-0.6	2.32 H	175	48.06	5.34
		ANTENNA		/ & TEST DI	STANCE: V	ERTICAL A	T 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)
3	2744.25	57.9 PK	74.0	-16.1	1.24 V	279	59.05	-1.15
4	2744.25	48.9 AV	54.0	-5.1	1.24 V	279	50.05	-1.15
5	3659.00	58.6 PK	74.0	-15.4	2.37 V	219	56.92	1.68
6	3659.00	51.7 AV	54.0	-2.3	2.37 V	219	50.02	1.68
7	4573.75	67.3 PK	74.0	-6.7	3.20 V	329	61.96	5.34
8	4573.75	41.6 AV	54.0	-12.4	3.20 V	329	36.26	5.34

**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



#### **BELOW 1GHz**

CHANNEL	TX Channel 49		Quasi-Peak (QP)
		DETECTOR FUNCTION	Peak(PK)
FREQUENCY RANGE	Below IGHZ		Average (AV)

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	98.43	32.1 QP	43.5	-11.4	2.00 H	44	50.90	-18.81
2	106.68	31.4 QP	43.5	-12.1	1.50 H	99	48.27	-16.91
3	265.90	38.5 QP	46.0	-7.5	1.50 H	124	52.60	-14.06
4	400.01	34.9 QP	46.0	-11.1	1.00 H	228	45.18	-10.25
5	528.73	30.4 QP	46.0	-15.6	2.00 H	37	37.69	-7.33
6	797.56	30.3 QP	46.0	-15.7	1.50 H	360	32.27	-1.93
7	*927.25	131.0 PK			2.03 H	357	130.71	0.29
8	*927.25	128.5 AV			2.03 H	357	128.21	0.29
9	928.00	80.9 PK	111.0	-30.1	2.03 H	357	80.59	0.31
10	928.00	49.2 AV	108.5	-59.3	2.03 H	357	48.89	0.31
		ANTENNA	POLARIT	( & TEST DI	STANCE: V	ERTICAL A	ТЗМ	
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)
<b>NO.</b>		EMISSION LEVEL			HEIGHT	ANGLE	VALUE	FACTOR
	(MHz)	EMISSION LEVEL (dBuV/m)	(dBuV/m)	(dB)	HEIGHT (m)	ANGLE (Degree)	VALUE (dBuV)	FACTOR (dB/m)
1	(MHz) 37.53	EMISSION LEVEL (dBuV/m) 36.9 QP	(dBuV/m) 40.0	(dB) -3.1	HEIGHT (m) 1.00 V	ANGLE (Degree) 132	VALUE (dBuV) 50.88	FACTOR (dB/m) -14.00
1 2	(MHz) 37.53 97.17	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP	(dBuV/m) 40.0 43.5	(dB) -3.1 -8.0	HEIGHT (m) 1.00 V 1.50 V	ANGLE (Degree) 132 314	VALUE (dBuV) 50.88 54.39	FACTOR (dB/m) -14.00 -18.93
1 2 3	(MHz) 37.53 97.17 179.53	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP 37.0 QP	(dBuV/m) 40.0 43.5 43.5	(dB) -3.1 -8.0 -6.5	HEIGHT (m) 1.00 V 1.50 V 1.00 V	ANGLE (Degree) 132 314 7	VALUE (dBuV) 50.88 54.39 51.84	FACTOR (dB/m) -14.00 -18.93 -14.80
1 2 3 4	(MHz) 37.53 97.17 179.53 265.81	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP 37.0 QP 34.0 QP	(dBuV/m) 40.0 43.5 43.5 46.0	(dB) -3.1 -8.0 -6.5 -12.0	HEIGHT (m) 1.00 V 1.50 V 1.00 V 1.50 V	ANGLE (Degree) 132 314 7 261	VALUE (dBuV) 50.88 54.39 51.84 48.09	FACTOR (dB/m) -14.00 -18.93 -14.80 -14.06
1 2 3 4 5	(MHz) 37.53 97.17 179.53 265.81 400.01	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP 37.0 QP 34.0 QP 32.1 QP	(dBuV/m) 40.0 43.5 43.5 43.5 46.0 46.0	(dB) -3.1 -8.0 -6.5 -12.0 -13.9	HEIGHT (m) 1.00 V 1.50 V 1.00 V 1.50 V 1.50 V	ANGLE (Degree) 132 314 7 261 67	VALUE (dBuV) 50.88 54.39 51.84 48.09 42.38	FACTOR (dB/m) -14.00 -18.93 -14.80 -14.06 -10.25
1 2 3 4 5 6	(MHz) 37.53 97.17 179.53 265.81 400.01 633.15	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP 37.0 QP 34.0 QP 32.1 QP 31.0 QP	(dBuV/m) 40.0 43.5 43.5 43.5 46.0 46.0	(dB) -3.1 -8.0 -6.5 -12.0 -13.9	HEIGHT (m) 1.00 V 1.50 V 1.00 V 1.50 V 1.50 V 1.50 V	ANGLE (Degree) 132 314 7 261 67 360	VALUE (dBuV) 50.88 54.39 51.84 48.09 42.38 35.62	FACTOR (dB/m)           -14.00           -18.93           -14.80           -14.06           -10.25           -4.66
1 2 3 4 5 6 7	(MHz) 37.53 97.17 179.53 265.81 400.01 633.15 *927.25	EMISSION LEVEL (dBuV/m) 36.9 QP 35.5 QP 37.0 QP 34.0 QP 32.1 QP 31.0 QP 125.7 PK	(dBuV/m) 40.0 43.5 43.5 43.5 46.0 46.0	(dB) -3.1 -8.0 -6.5 -12.0 -13.9	HEIGHT (m) 1.00 V 1.50 V 1.00 V 1.50 V 1.50 V 1.50 V 1.50 V 1.00 V	ANGLE (Degree) 132 314 7 261 67 360 235	VALUE (dBuV) 50.88 54.39 51.84 48.09 42.38 35.62 125.41	FACTOR (dB/m)           -14.00           -18.93           -14.80           -14.06           -10.25           -4.66           0.29

#### **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.



#### ABOVE 1GHz

CHANNEL	TX Channel 49	DETECTOR	Peak(PK)
FREQUENCY RANGE	1GHz ~ 10GHz	FUNCTION	Average (AV)

		ANTENNA I	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	2781.75	66.0 PK	74.0	-8.0	1.85 H	7	67.03	-1.03
2	2781.75	48.9 AV	54.0	-5.1	1.85 H	7	49.93	-1.03
3	3709.00	59.8 PK	74.0	-14.2	2.14 H	147	57.94	1.86
4	3709.00	46.3 AV	54.0	-7.7	2.14 H	147	44.44	1.86
5	4636.25	73.1 PK	74.0	-0.9	2.90 H	168	67.57	5.53
6	4636.25	53.3 AV	54.0	-0.7	2.90 H	168	47.77	5.53
		ANTENNA		( & TEST DI	STANCE: V	ERTICAL A	Т 3 М	
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	2781.75	58.4 PK	74.0	-15.6	1.27 V	272	59.43	-1.03
2	2781.75	48.7 AV	54.0	-5.3	1.27 V	272	49.73	-1.03
3	3709.00	59.1 PK	74.0	-14.9	2.36 V	217	57.24	1.86
4	3709.00	51.4 AV	54.0	-2.6	2.36 V	217	49.54	1.86
5	4636.25	67.2 PK	74.0	-6.8	3.19 V	326	61.67	5.53
6	4636.25	41.9 AV	54.0	-12.1	3.19 V	326	36.37	5.53

**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



## 4.8 CONDUCTED OUT-BAND EMISSION MEASUREMENT

## 4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz RBW).

## 4.8.2 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 : June 26, 2013

### 4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW of spectrum analyzer to 100kHz and VBW of spectrum analyzer to 300kHz with suitable frequency span including 20 MHz bandwidth from band edge. The band edges was measured and recorded.

## 4.8.4 DEVIATION FROM TEST STANDARD

No deviation

## 4.8.5 TEST SETUP



### 4.8.6 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



## 4.8.7 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

		RBW 100 kHz VBW 300 kHz	[T1] MP VIEW	Marker 1 [T1] 29.83 dBm			RBW 100 kHz VBW 300 kHz	[T1] MP VIEW	Marker 1 [T1] 2
f 35.5 dBm	Att 30 dB	SWT 20 ms		902.75 MHz	35.5 - Ref 35.5 dBm	Att 30 dB	SWT1s		90
0915919398.5.4P				Marker 2 [T1] -33.36 dBm	30 DP12003985.4B				Marker 2 [T1] 403
				902.00 MHz					-3
				Marker 3 [T1] -31.55 dBm	20-				Marker 3 [T1] 909
D2 9.83 dBm				901.97 MHz	D2 9 B3 dBm				-3 Marker 4 [T1]
0000000000				1	10-02983dBm				948 -3
				_	0-				
				-	-10-				-
					30				
			11		-20 -				]
					-30 -				-
أحاجا وارتبقاء فيريقع وأطرحهم وال	lift (see a literated) (lana) a far na dynamical synamical provident	وجاء فبالمقتورين أأسراق معتقدتهما	1 Internation	1	and an interaction of the state of the second	ومانته ومصرفا فأنفأ فالتقاه وأقل مستر	i felologica da la felologica y principa da la conte na confesione e constitución de la conte	ويرتاعيه للمراجعة ورا	
	na na anna anna anna anna anna anna	and the second	4 47 C	-	-40 -	the second se	And a set of a set of a set of a set	a sub-sub-sub-sub-sub-sub-sub-sub-sub-sub-	1
					-50 -				_
									63
			F		-60 -				
1 1	- I I I	<u> </u>		1028	-64.5 - 1 1	I I I	1 I	1 1	1828
nter 893.5 MHz	2 MHz/	/	Span 20 MH	Z A D T	Start 30 MHz	997 M	Hz/	Stop 10 GH	A D
-		RBW 100 kHz VBW 300 kHz	[T1] MP VIEW	Marker 1 [T1] 29.83 dBm			RBW 100 kHz VBW 300 kHz	[T1] MP VIEW	Marker 1 [T1] 2
19 135.5 dBm 0759983786.48 029.83 dBm	Att 30 dB	R9W 100 HHz V9W 300 HHz SWT 20 ms	[T1] MP VIEW	Marker 1 [T1] 29.83 dBn 19.22 Mitz Marker 2 [T1] 350 dBm 920.00 Mitz Marker 3 [T1] 928.00 Mitz	35.5 30 19 10 0 10 0 10 0 10 0 10 10 10	AH 30 dB	R9W100 HHz VBW 300 HHz SWT1s	[T1] MP VIEW	Marker 1 [T1] 92 92 Marker 2 [T1] 302 -3-3 Marker 3 [T1] 36- 36- 37- 36- 36- 36- 36- 36- 36- 36- 36
1 35.5 dBm DP15995936.#B	Att 30 dB	VBVV 300 kHz	[T1] MP VIEW	29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5 0 <b>1197898 37 6.4</b> P	Att 30 of9	VEW 300 kHz	[T1] MP VIEW	2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 317 316 316 316 316 316 317 316 317 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm DP15995936.#B	Att 30 dB	VBVV 300 kHz	[T1] MP VIEW	29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	30.5 - 07(\$\$\$\$\$\$\$\$\$\$\$#B 20 - 02.9.83 dBm	Att 30 dB	VEW 300 kHz	[T1] MP VIEW	2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 317 316 316 316 316 316 317 316 317 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm DP15995936.#B	Att 30 dB	VBVV 300 kHz	[T1] MP VIEW	29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5 0 <b>1197898 37 6.4</b> P	Att 30 oB	VEW 300 kHz	[T1] MP VIEW	2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm DP15995936.#B	Att 30.68	VBVV 300 kHz	[T1] MP VIEW	29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5	Att 30 dB	VEW 300 kHz	[T1] MP VIEW	2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 20 5 gB D2 9 83 4Bm 		VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5		VBW 300 kHz SWT1 s		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 20 5 gB D2 9 83 4Bm 	Att 30 oB	VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5		VEW 300 kHz		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 208,gP D2 9 83 4Bm - 02 9 83 4Bm		VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5		VBW 300 kHz SWT1 s		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 208,gP D2 9 83 4Bm - 02 9 83 4Bm		VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5		VBW 300 kHz SWT1 s		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 208,gP D2 9 83 4Bm - 02 9 83 4Bm		VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	30.5 - 197499396,49 30 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -		VBW 300 kHz SWT1 s		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316
1 35.5 dBm - 0416m5 208,gP D2 9 83 4Bm - 02 9 83 4Bm		VBW 300 Htz SWT 20 ms		29.83 dBm 927.25 MHz Marker 2 [T1] -33.50 dBm 928.00 MHz Marker 3 [T1] -31.89 dBm	35.5 - 19995396,49 20- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0		VBW 300 kHz SWT1 s		2 92 302 302 33 302 302 302 302 302 316 316 316 316 316 316 316 316 316 316



# **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: <u>service.adt@tw.bureauveritas.com</u> Web Site: <u>www.bureauveritas-adt.com</u>

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 modifications were made to the EUT by the lab during the test.

---- END ----