SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**ASUSTeK COMPUTER INC.**
Applicant Address	4F, No. 150, Li-Te Rd., Peitou, Taipei 112, Taiwan
FCC ID	**MSQ-RTAC87U**
Manufacturer's company	**Compal Networking (KunShan) Co., LTD.**
Manufacturer Address	No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China

Product Name	Dual-band Wireless-AC Router
Brand Name	ASUS
Model No.	RT-AC87U, RT-AC87R
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	May 05, 2014
Final Test Date	Aug. 18, 2015
Submission Type	Class II Change

Statement

Test result included is only for the IEEE 802.11b/g, IEEE 802.11n/ac.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013, 47 CFR FCC Part 15 Subpart C, KDB558074 D01 v03r04, KDB 662911 D01 v02r01, KDB644545 D01 v01r02.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

Table of Contents

1. VERIFICATION OF COMPLIANCE 1
2. SUMMARY OF THE TEST RESULT 2
3. GENERAL INFORMATION 3
3.1. Product Details 3
3.2. Accessories 4
3.3. Table for Filed Antenna 5
3.4. Table for Carrier Frequencies 6
3.5. Table for Test Modes 6
3.6. Table for Testing Locations 7
3.7. Table for Multiple List 7
3.8. Table for Class II Change 8
3.9. Table for Supporting Units 10
3.10. Test Configurations 11
4. TEST RESULT 13
4.1. AC Power Line Conducted Emissions Measurement 13
4.2. Radiated Emissions Measurement 17
4.3. Antenna Requirements 23
5. LIST OF MEASURING EQUIPMENTS 24
6. MEASUREMENT UNCERTAINTY 25
APPENDIX A. TEST PHOTOS ..... A1 ~ A3

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR450542-07AA	Rev. 01	Initial issue of report	Apr. 29, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	Dual-band Wireless-AC Router
Brand Name	:	ASUS
Model No.	:	RT-AC87U, RT-AC87R
Applicant	:	ASUSTeK COMPUTER INC.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on May 05, 2014 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	16.96 dB
4.2	15.247(d)	Radiated Emissions	Complies	4.39 dB
4.3	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11b: DSSS (BPSK / QPSK / CCK) IEEE 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	IEEE 802.11b: DSSS (1/ 2/ 5.5/11) IEEE 802.11g: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Beamforming Function	☒ With beamforming	☐ Without beamforming

Note: The product has beamforming function for 802.11n/ac in 2.4GHz / 5GHz.

Antenna and Band width

Antenna	Three (TX)		
Band width Mode	20 MHz	40 MHz	80 MHz
IEEE 802.11b	V	X	X
IEEE 802.11g	V	X	X
IEEE 802.11n	V	V	X
IEEE 802.11ac	V	V	X

IEEE 802.11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3	MCS0-23
802.11n (HT40)	3	MCS0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT supports VHT20, VHT40 in 2.4GHz. Note 3: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac		

3.2. Accessories

Power	Brand	Model	Rating
Adapter 1	ASUS	AD883J20	Input: 100-240V~50-60Hz 1.0A Output: 19V, 2.37A
Adapter 2	ASUS	ADP-45BW B	Input: 100-240V~50-60Hz 1.2A Output: 19V, 2.37A
Others			
RJ-45 Cable: Shielded, 1.5m			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		
					2.4GHz	5GHz Band 1	5GHz Band 4
1	M.gear	C660-510310-A	Dipole Antenna	Reversed-SMA	3.66	3.24	3.29
	PSA	RFDPA171300SBLB803	Dipole Antenna	Reversed-SMA	2.85	2.75	3.26
2	M.gear	C660-510310-A	Dipole Antenna	Reversed-SMA	3.66	3.24	3.29
	PSA	RFDPA171300SBLB803	Dipole Antenna	Reversed-SMA	2.85	2.75	3.26
3	M.gear	C660-510310-A	Dipole Antenna	Reversed-SMA	3.66	3.24	3.29
	PSA	RFDPA171300SBLB803	Dipole Antenna	Reversed-SMA	2.85	2.75	3.26
4	M.gear	C660-510310-A	Dipole Antenna	Reversed-SMA	-	3.24	3.29
	PSA	RFDPA171300SBLB803	Dipole Antenna	Reversed-SMA	-	2.75	3.26

Note: M.gear antennas and PSA antennas are the same type antennas, only the higher gain antennas "M.gear" Antenna" was tested and recorded in the report.

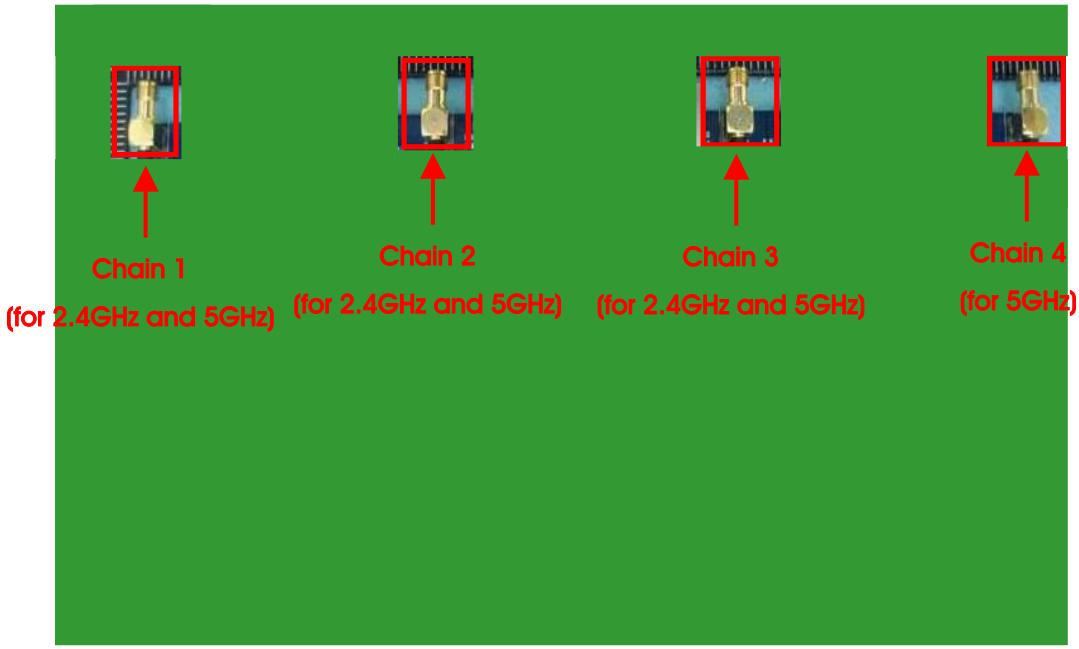
Chain 1: Connect to Ant. 1, Chain 2: Connect to Ant. 2, Chain 3: Connect to Ant. 3 and Chain 4: Connect to Ant. 4.

For 2.4GHz WLAN function (3TX/3RX):

Chain 1, Chain 2 and Chain 3 could transmit/receive simultaneously.

For 5GHz WLAN function (4TX/4RX):

Chain 1, Chain 2, Chain 3 and Chain 4 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems, use Channel 1~Channel 11.

For 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	CTX	-	-	-
Radiated Emissions Below 1GHz	CTX	-	-	-

The following test modes were performed for all tests:

There are two version of EUT, one is EUT "Rev1.50", the other one is EUT "Rev1.60".

EUT "Rev1.50" has been evaluated to be the worst case after evaluating.

Consequently, measurement for all test will follow this same test mode.

For Conducted Emission test:

Mode 1. 2.4GHz CTX - EUT "Rev1.50" + Adapter 2

Mode 2. 5GHz CTX - EUT "Rev1.50" + Adapter 2

Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.

Mode 3. 5GHz CTX - EUT "Rev1.50" + Adapter 1

Mode 3 is the worst case, so it was selected to record in this test report.

For Radiated Emissions Below 1GHz test:

Mode 1. 2.4GHz CTX - EUT "Rev1.50" + Adapter 1

Mode 2. 5GHz CTX - EUT "Rev1.50" + Adapter 1

Mode 1 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.

Mode 3. 2.4GHz CTX - EUT "Rev1.50" + Adapter 2

Mode 1 is the worst case, so it was selected to record in this test report.

3.6. Table for Testing Locations

Test Site Location				
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.			
TEL:	886-3-656-9065			
FAX:	886-3-656-9085			
Test Site No.	**Site Category**	**Location**	**FCC Designation No.**	**IC File No.**
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D
CO01-CB	Conduction	Hsin Chu	TW0006	IC 4086D

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

3.7. Table for Multiple List

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

Model No.	Description
RT-AC87U	All the models are identical, the difference model served as marketing strategy.
RT-AC87R	

From the above models, model: RT-AC87U was selected as representative model for the test and its data was recorded in this report.

3.8. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR450542

Below is the table for the change of the product with respect to the original one.

Modifications:

A. Adding EUT version Rev1.60. The difference between original EUT "Rev1.50" and new EUT "Rev1.60" as below:

EUT version	Description
Original EUT "Rev1.50"	Original
New EUT "Rev1.60"	1. Adding a TVS (D1). 2. Adding a snubber circuit (C267, R266, R267). 3. Adding a snubber circuit (C266, R264, R265).

B. Changing the adapter 1 (model: AD883J20). The difference between original adapter 1 and new adapter 1 as below:

Original adapter 1	New adapter 1
Type: 010KLF BAH	Type: 010K-3LF

C. Changing the adapter 2 (model: ADP-45BW B). The difference between original adapter 2 and new adapter 2 as below:

Original adapter 2			
Design No	MFG TITLE	MFG PART	DESCRIPTION
Q1	AUK	SMK0760F	FET 600V 7A 1.2ohm TO-220F-3P
Q1	ST	STP6NK60ZFP	FET 600V 6A 1.2ohm TO-220FP-3P
Q1	TOSHIBA	TK10A60DR(STA4,X)	FET 600V 10A 750mohm TO-220SIS-3P
D101	ST	STPS20S100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS20SM100ST	DIO SBD 20A 100V TO-220AB-3P
D101	ST	STPS30SM100ST	DIO SBD 30A 100V TO-220AB-3P
IC31	ON	DAP022ASN65T1G	IC ASIC PWM CURRENT MODE TSOP-6P SMD
IC131	TI	TL432BIDBZR	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	NXP	TL431BMFDT	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	DIODES	AS431ANTR-G1	IC VOL REF ADJ 2.5V 100mA 0.5% SOT-23-3P
IC32	EVERLIGHT	EL816M(Y)(D)-VG	PHOTO TR 50mA 80V DIP-4P 150%-300%
IC32	SHARP	PC123Y92FZ0F	PHOTO TR 50mA 70V DIP-4P 160%-300%
IC32	Renesas	PS2561DL1-1Y-V-A(G)	EOL PHOTO TR 40mA 80V DIP-4P 150%-300%
CX1	EUROPTRONIC	MPX2224K30B15LXD20	CAP X2 MP PC 305VAC 0.22uF K S15
CX1	OKAYA	LE224-MX-30-C3.2	CAP X2 MP PC 300VAC 0.22uF K S15
CX1	HUA	MKP-224K0275AB115S-G	CAP X2 MP PC 275VAC 0.22uF K S15
FL1	DELTA	HFV-MP13202	LINE FILTER T14 14mH MIN
FL101	DELTA	LFV-MP13303	LINE FILTER T10 17uH MIN

T1	DELTA	MV-MP13167	TRANSFORMER MAIN RM10 1mH +/-5%
C1	NICHICON	UPT2G680MHD3	CAP AL 400V 68uF M 16*25 P7.5
C1	NCC	EKMG401ELL680ML25S	CAP AL 400V 68uF M 16*25 P7.5
C1	L-Tec	TYJ2GM680K25O	CAP AL 400V 68uF M 16*25 P7.5
CY1	MURATA	DE1B3KX221KNHAN99F	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	TDK	CD70-B2GA221KYVK	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	WALSIN	YP0AH221K061DASDAB	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
New adapter 2			
Design No	**MFG TITLE**	**MFG PART**	**DESCRIPTION**
Q1	TOSHIBA	TK10A60DR(STA4,X)	FET 600V 10A 750mohm TO-220SIS-3P
Q1	FUJI	FMV11N60ES	FET 600V 11A 750mohm TO-220F-3P
D101	ST	STPS20S100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS20H100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS30H100CT	DIO SBD 30A 100V TO-220AB-3P C.C.
IC31	NeoEnergy	DAP022AT	IC ASIC PWM CURRENT MODE SOT-26-6P SMD
IC131	LITE-ON	LA431OCRPA	IC REGU ADJ 2.495V 100mA 0.4% SOT-23R-3P
IC131	TI	TL432BIDBZR	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	NXP	TL431BMFDT	IC VOL REF ADJ 2.495V 100mA 0.5%
IC32	EVERLIGHT	EL816M(Y)(D)-VG	PHOTO TR 50mA 80V DIP-4P 150%-300%
IC32	SHARP	PC123Y92FZ0F	PHOTO TR 50mA 70V DIP-4P 160%-300%
IC32	TOSHIBA	TLP785F(D4-GRH,F	PHOTO TR 60mA 80V DIP-4P 150%-300%
CX1	HUA	MKP-334K0275AB115S-G	CAP X2 MP PC 275VAC 0.33uF K S15
CX1	HUA	MKP-334K0275AB115S-P	CAP X2 MP PC 275VAC 0.33uF K S15
CX1	EUROPTRONIC	MPX2334K30B15LXD31	CAP X2 MP PC 305VAC 0.33uF K S15
FL1	DELTA	HFV-MP15027	LINE FILTER T16 12.7mH MIN
FL101	DELTA	LFV-MP13171	LINE FILTER T6 1.55uH MIN
T1	DELTA	MV-MP15037	TRANSFORMER MAIN RM10 1000uH +/-5%
C1	NCC	EKMG401ELL680ML25S	CAP AL 400V 68uF M 16*25 P7.5
CY1	MURATA	DE1B3KX221KNHAN99F	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	WALSIN	YP0AH221K061DASDAB	CAP Y1/X1 CD 250VAC 220pF K B TP VI10

Performance Checking for above change:

a. AC Power Line Conducted Emissions.

b. Radiated Emissions Below 1GHz.

D. Updating test rule of 5GHz band 4 to "15.407 (b)(4)(ii) of New Rules (ET Docket No. 13–49; FCC 16–24)" from "Old Rules".

Performance Checking

No test case need redo for this test report.

3.9. Table for Supporting Units

For Test Site No: 03CH01-CB

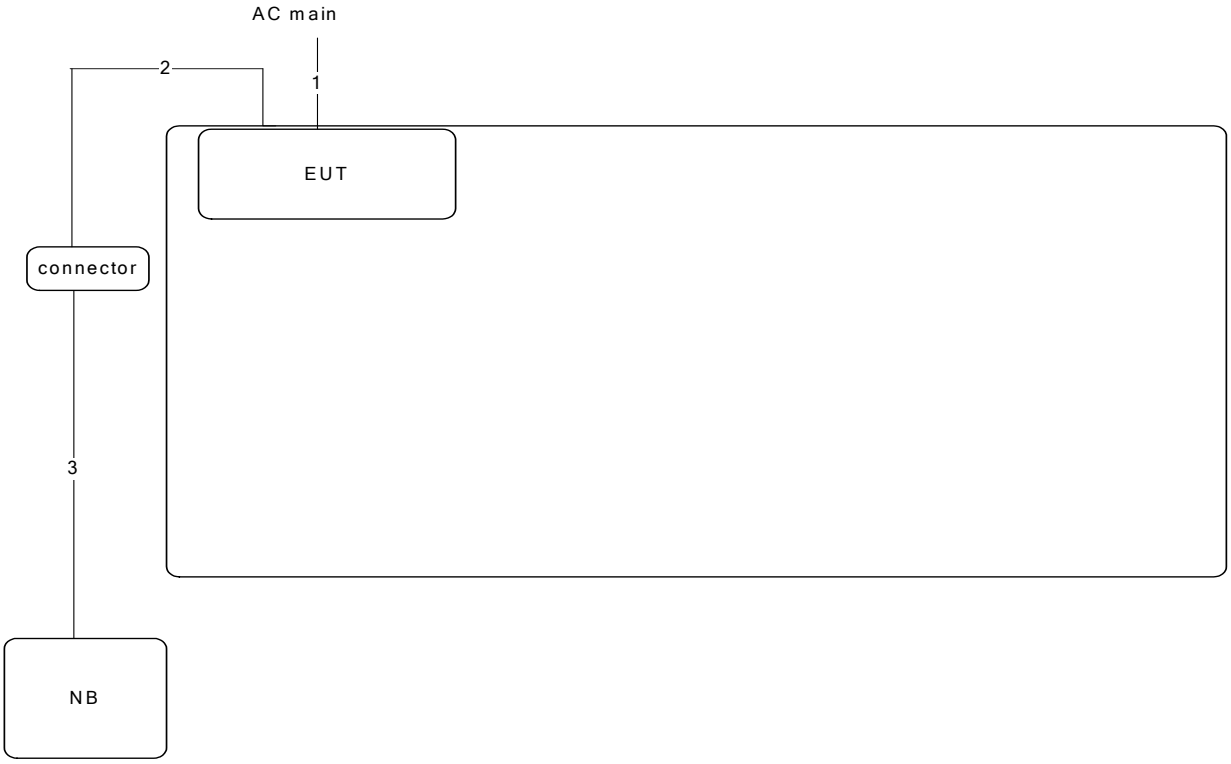
Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

3.10. Test Configurations

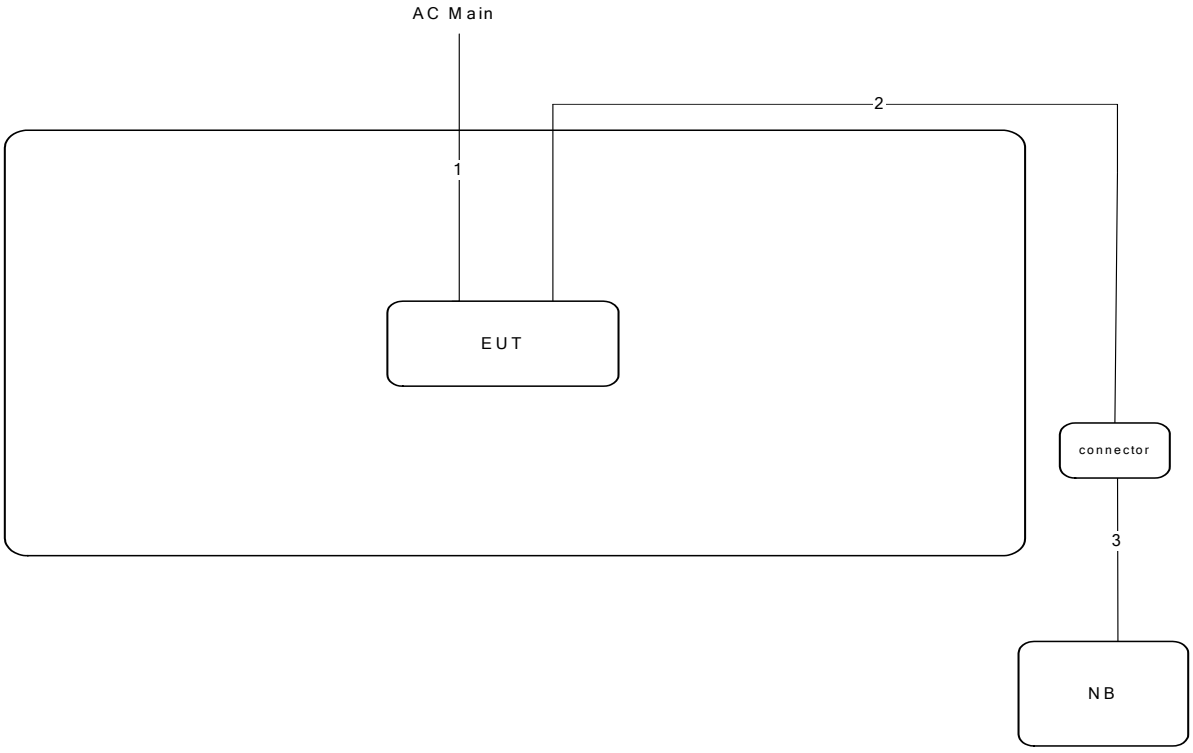
3.10.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable	Yes	1.5m
3	RJ-45 cable	No	10m

3.10.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable	No	10m
3	RJ-45 cable	Yes	1.5m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

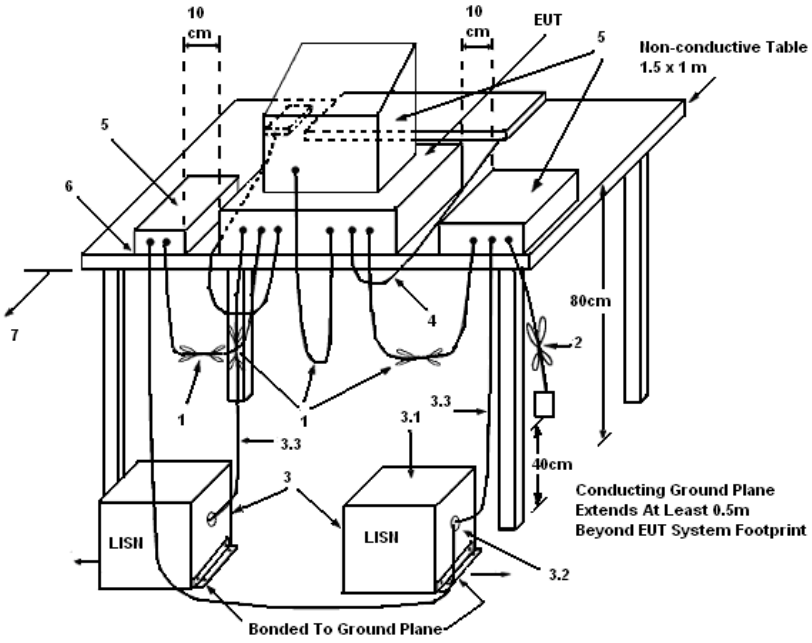
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

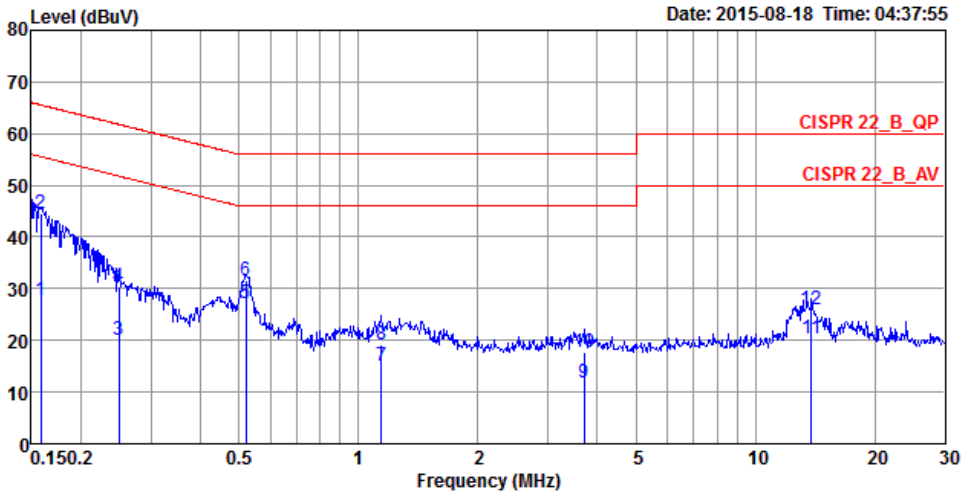
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

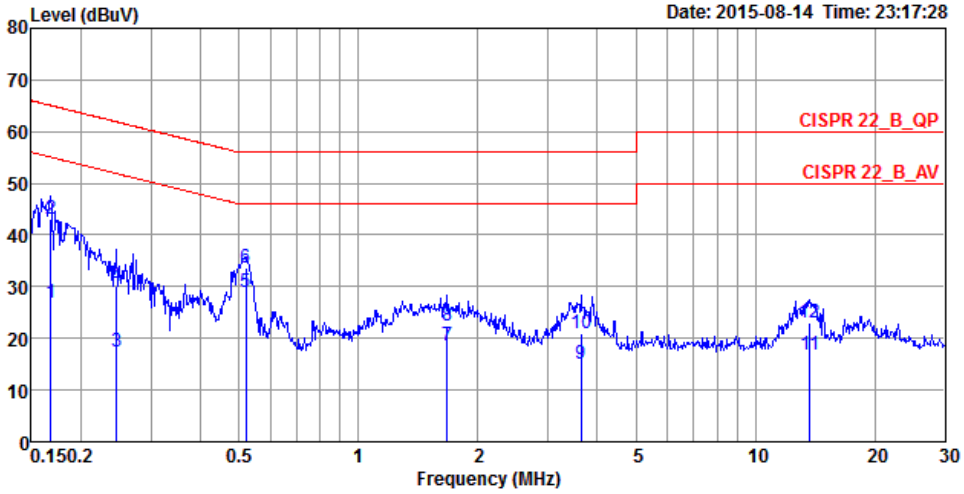
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	56%
Test Engineer	Edison Lin	Phase	Line
Configuration	CTX	Test Mode	Mode 3



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1582	27.68	-27.88	55.56	17.73	9.93	0.02	LINE	Average
2	0.1582	44.53	-21.03	65.56	34.58	9.93	0.02	LINE	QP
3	0.2495	20.05	-31.73	51.78	10.09	9.93	0.03	LINE	Average
4	0.2495	30.54	-31.24	61.78	20.58	9.93	0.03	LINE	QP
5	0.5210	27.03	-18.97	46.00	17.05	9.94	0.04	LINE	Average
6	0.5210	31.62	-24.38	56.00	21.64	9.94	0.04	LINE	QP
7	1.1413	14.95	-31.05	46.00	4.93	9.97	0.05	LINE	Average
8	1.1413	19.06	-36.94	56.00	9.04	9.97	0.05	LINE	QP
9	3.7001	11.88	-34.12	46.00	1.80	10.02	0.06	LINE	Average
10	3.7001	17.66	-38.34	56.00	7.58	10.02	0.06	LINE	QP
11	13.8411	20.32	-29.68	50.00	9.77	10.30	0.25	LINE	Average
12	13.8411	25.90	-34.10	60.00	15.35	10.30	0.25	LINE	QP

Temperature	25°C	Humidity	56%
Test Engineer	Edison Lin	Phase	Neutral
Configuration	CTX	Test Mode	Mode 3



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1677	27.00	-28.08	55.08	17.20	9.78	0.02	NEUTRAL	Average
2	0.1677	43.00	-22.08	65.08	33.20	9.78	0.02	NEUTRAL	QP
3	0.2455	17.41	-34.50	51.91	7.59	9.79	0.03	NEUTRAL	Average
4	0.2455	30.06	-31.85	61.91	20.24	9.79	0.03	NEUTRAL	QP
5	0.5210	29.04	-16.96	46.00	19.20	9.80	0.04	NEUTRAL	Average
6	0.5210	33.60	-22.40	56.00	23.76	9.80	0.04	NEUTRAL	QP
7	1.6713	18.47	-27.53	46.00	8.58	9.83	0.06	NEUTRAL	Average
8	1.6713	22.55	-33.45	56.00	12.66	9.83	0.06	NEUTRAL	QP
9	3.6418	15.17	-30.83	46.00	5.24	9.87	0.06	NEUTRAL	Average
10	3.6418	21.03	-34.97	56.00	11.10	9.87	0.06	NEUTRAL	QP
11	13.6952	16.80	-33.20	50.00	6.46	10.09	0.25	NEUTRAL	Average
12	13.6952	23.16	-36.84	60.00	12.82	10.09	0.25	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Radiated Emissions Measurement

4.2.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

4.2.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

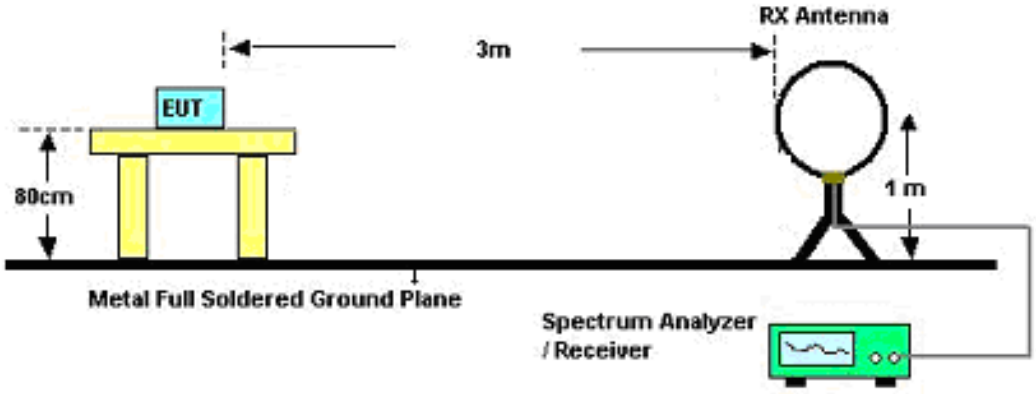
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RBW 120kHz for QP

4.2.3. Test Procedures

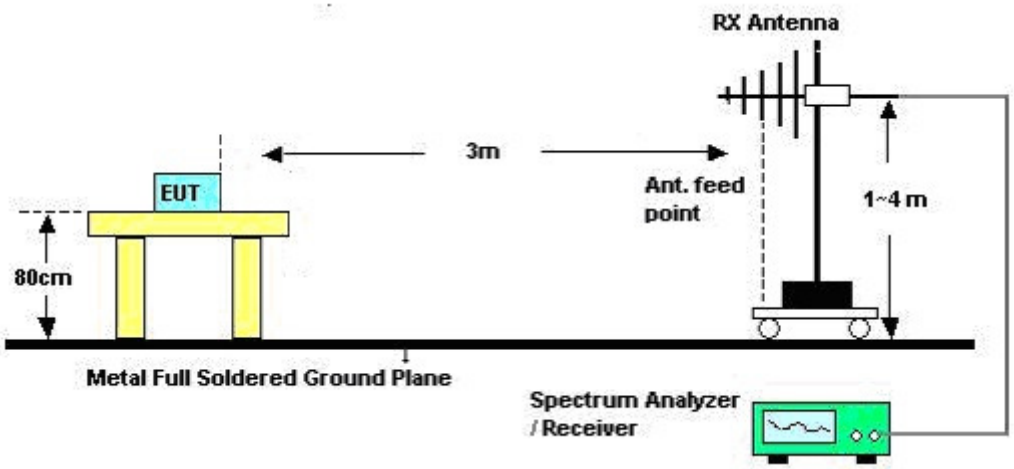
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.2.4. Test Setup Layout

For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

4.2.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	24°C	Humidity	55%
Test Engineer	Lucke Hsieh	Configurations	CTX
Test Date	Aug. 13, 2015	Test Mode	Mode 1

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

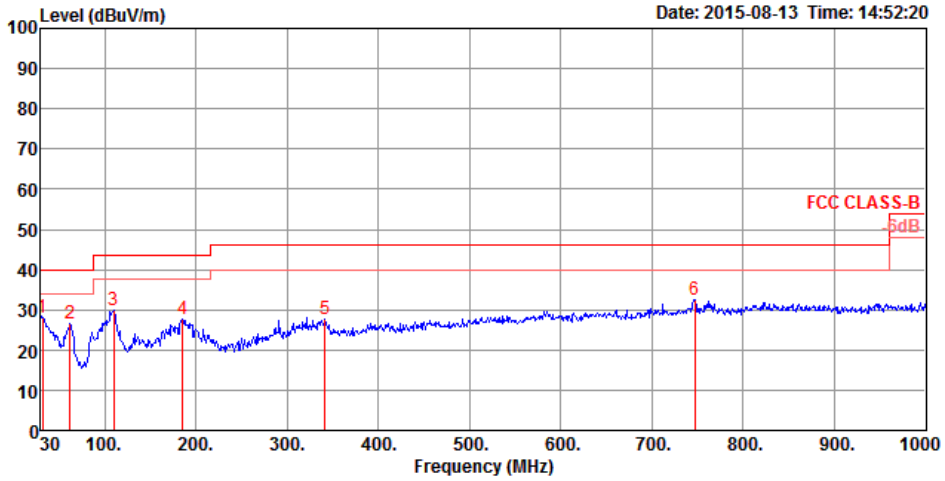
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8. Results of Radiated Emissions (30MHz~1GHz)

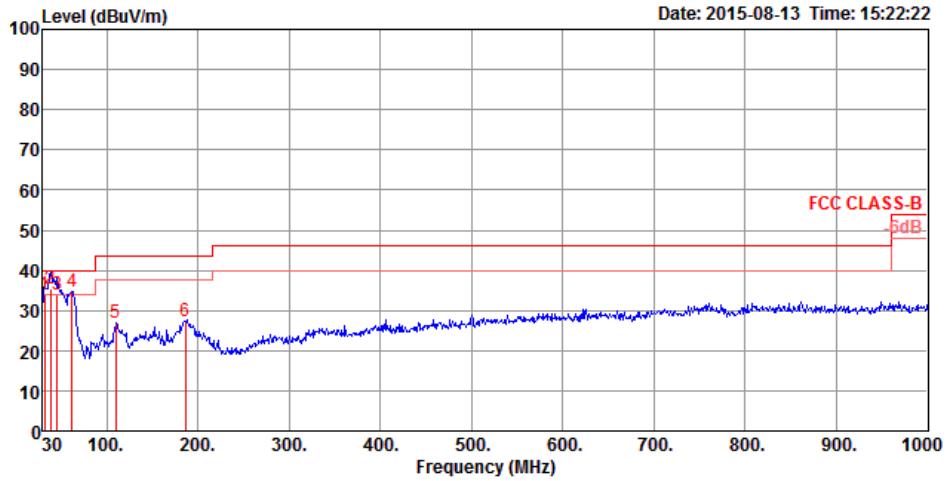
Temperature	24°C	Humidity	55%
Test Engineer	Lucke Hsieh	Configurations	CTX
Test Mode	Mode 1		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	31.94	27.91	40.00	-12.09	40.80	0.64	18.87	32.40	200	355	Peak	HORIZONTAL
2	62.01	26.40	40.00	-13.60	51.14	0.78	6.88	32.40	200	270	Peak	HORIZONTAL
3	109.54	29.95	43.50	-13.55	49.14	0.98	12.21	32.38	200	242	Peak	HORIZONTAL
4	185.20	27.82	43.50	-15.68	49.30	1.21	9.65	32.34	200	93	Peak	HORIZONTAL
5	341.37	27.75	46.00	-18.25	43.40	1.60	15.05	32.30	100	121	Peak	HORIZONTAL
6	746.83	32.56	46.00	-13.44	42.28	2.22	20.36	32.30	200	276	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	31.94	33.82	40.00	-6.18	46.71	0.64	18.87	32.40	100	328	QP	VERTICAL
2	38.73	35.61	40.00	-4.39	52.55	0.66	14.81	32.41	100	64	QP	VERTICAL
3	45.52	34.00	40.00	-6.00	54.66	0.68	11.07	32.41	100	272	QP	VERTICAL
4	62.01	34.82	40.00	-5.18	59.56	0.78	6.88	32.40	100	307	Peak	VERTICAL
5	109.54	26.77	43.50	-16.73	45.96	0.98	12.21	32.38	100	151	Peak	VERTICAL
6	186.17	27.42	43.50	-16.08	48.92	1.21	9.63	32.34	100	214	Peak	VERTICAL

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.3. Antenna Requirements

4.3.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.3.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 22, 2015	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 02, 2014	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 02, 2014	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 03, 2014	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 06, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 06, 2014	Radiation (03CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 21, 2015	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 12, 2015*	Radiation (03CH01-CB)

Note: Calibration Interval of instruments listed above is one year.

"*" Calibration Interval of instruments listed above is two years.

NCR means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%