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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-RTGZ00**
Manufacturer's company (1)	**ASKEY TECHNOLOGY (JIANG SU) LTD**
Manufacturer Address	NO1388, Jiao Tong Road, Wujiang Economic Technological Development Area Jiangsu Province 215200 China
Manufacturer's company (2)	**Compal Networking (KunShan) Co., LTD.**
Manufacturer Address	No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China

Product Name	Wireless-AC5300 Tri-band Gigabit Router
Brand Name	ASUS
Model No.	RT-AC5300, RT-AC5300R, RT-AC5300W, RT-AC5300P, RT-AC95U, RT-AC96U
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Apr. 28, 2015
Final Test Date	Sep. 10, 2015
Submission Type	Class II Change

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11a/ac of the product.

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 E, KDB789033 D02 v01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR532637-04AB	Rev. 01	Initial issue of report	Nov. 06, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	Wireless-AC5300 Tri-band Gigabit Router
Brand Name	:	ASUS
Model No.	:	RT-AC5300, RT-AC5300R, RT-AC5300W, RT-AC5300P, RT-AC95U, RT-AC96U
Applicant	:	ASUSTeK COMPUTER INC.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Apr. 28, 2015 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

For adding a heat sink (2mm) and resistance (0201) – EUT 1 test record

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.2	15.407(b)	Radiated Emissions	Complies	7.50 dB
4.3	15.407(b)	Band Edge Emissions	Complies	2.59 dB
4.4	15.203	Antenna Requirements	Complies	-

For adding adapter 4 ~ 6 – EUT 2 test record

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	10.01 dB
4.5	15.247(d)	Radiated Emissions (Below 1GHz)	Complies	6.71 dB
4.4	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (3TX/3RX, 4TX/4RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM, 1024QAM)
Data Rate (Mbps)	IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	**EUT: Version 1** For non-beamforming function: IEEE 802.11a: 17.89 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 17.97 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.32 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 74.96 MHz For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT20): 17.97 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.61 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.41 MHz

	EUT: Version 2 For non-beamforming function: IEEE 802.11a: 18.92 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 18.23 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.90 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 74.67 MHz IEEE 802.11ac MCS0/Nss4 (VHT20): 18.06 MHz IEEE 802.11ac MCS0/Nss4 (VHT40): 36.76 MHz IEEE 802.11ac MCS0/Nss4 (VHT80): 76.12 MHz For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT20): 18.23 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 37.04 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz
Maximum Conducted Output Power	**EUT: Version 1** For non-beamforming function: IEEE 802.11a: 26.90 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 26.82 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 28.33 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 24.94 dBm For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT20): 26.47 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 26.39 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 24.47 dBm
	EUT: Version 2 For non-beamforming function: IEEE 802.11a: 26.89 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 26.91 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 28.22 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 22.48 dBm IEEE 802.11ac MCS0/Nss4 (VHT20): 26.05 dBm IEEE 802.11ac MCS0/Nss4 (VHT40): 24.47 dBm IEEE 802.11ac MCS0/Nss4 (VHT80): 24.50 dBm For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT20): 26.46 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 26.38 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 24.43 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
Beamforming Function	☐ With beamforming	☒ Without beamforming
Operating Mode	☐ Outdoor access point	
	☒ Indoor access point	
	☐ Fixed point-to-point access points	
	☐ Mobile and portable client devices	

Note: The product has beamforming function for 802.11n and 802.11ac.

Antenna and Band width

Antenna		Three (TX)			Four (TX)		
Band width Mode		20 MHz	40 MHz	80 MHz	20 MHz	40 MHz	80 MHz
5G	IEEE 802.11a	V	X	X	V	X	X
	IEEE 802.11n	V	V	X	V	V	X
	IEEE 802.11ac	V	V	V	V	V	V

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3, 4	MCS0-23, MCS0-31
802.11n (HT40)	3, 4	MCS0-23, MCS0-31
802.11ac (VHT20)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4
802.11ac (VHT40)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4
802.11ac (VHT80)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT supports 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 and VHT80.

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 No.	Rating
Adapter 1	ASUS	ADP-65DW B	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 2	ASUS	AD887320	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 3	ASUS	PA-1650-93	Input: 100-240Vac, 50-60Hz, 1.7A Output: 19Vdc, 3.42A
Adapter 4	ASUS	ADP-65DW B	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 5	ASUS	PA-1650-63	Input: 100-240Vac, 50-60Hz, 1.7A Output: 19Vdc, 3.42A
Adapter 6	ASUS	AD887320	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Other			
RJ-45 cable*1: Shielded, 1.5m			

3.3. Table for Filed Antenna

Set	Brand	Part No.	Antenna Type	Connector
1	PSA	RFDPA131000SBLB805	Dipole Antenna	Reversed-SMA
2	PSA	RFDPA151000SBLB802	Dipole Antenna	Reversed-SMA
3	M.gear	C660-510368-A	Dipole Antenna	Reversed-SMA
4	M.gear	C660-510369-A	Dipole Antenna	Reversed-SMA
5	M.gear	C660-510370-A	Dipole Antenna	Reversed-SMA

Set	Gain (dBi)		Cable Loss		True Gain (dBi)	
	2.4GHz	5GHz	2.4GHz	5GHz	2.4GHz	5GHz
1	2.32	3.47	-	-	2.32	3.47
2	1.98	3.37	-	-	1.98	3.37
3	1.50	3.30	0.39	0.61	1.11	2.69
4	2.00	3.20	0.35	0.55	1.65	2.65
5	2.20	3.20	0.33	0.51	1.87	2.69

Note: 1. The EUT has five set of antenna, and each set contains eight antennas.

2. Both antennas above are the same type. Besides, only set 1 antenna was selected to perform the test and written in this report due to the highest gain.

For IEEE 802.11a/b/g/n/ac mode:

For 2.4GHz and 5GHz (3TX/3RX) function:

Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antenna.

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

For 2.4GHz and 5GHz (4TX/4RX) function:

Chain 1, Chain 2, Chain 3 and Chain 4 can be used as transmitting/receiving antenna.

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

3. The EUT has two versions theirs measure information as below:


Version 1:
5GHz Band 1: Chain 2
Version 2:
5GHz Band4: Chain 3
Version 1:
5GHz Band 1: Chain 3
Version 2:
5GHz Band4: Chain 2
Version 1:
5GHz Band 1: Chain 1
Version 2:
5GHz Band4: Chain 4
Version 1:
5GHz Band 1: Chain 4
Version 2:
5GHz Band4: Chain 1
Version 1:
2.4GHz Band and 5GHz Band 4: Chain 4
Version 2:
2.4GHz Band: Chain 1
5GHz Band 1: Chain 4
Version 1:
2.4GHz Band and 5GHz Band 4: Chain 1
Version 2:
2.4GHz Band: Chain 4
5GHz Band 1: Chain 1
Version 1:
2.4GHz Band and 5GHz Band 4: Chain 3
Version 2:
2.4GHz Band: Chain 2
5GHz Band 1: Chain 3
Version 1:
2.4GHz Band and 5GHz Band 4: Chain 2
Version 2:
2.4GHz Band: Chain 3
5GHz Band 1: Chain 2

3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48.

For 40MHz bandwidth systems, use Channel 38, 46.

For 80MHz bandwidth systems, use Channel 42.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 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.

Verify below items for adding a heat sink (2mm) – EUT 1

Test Items	Mode		Data Rate	Channel	Chain
Radiated Emission Above 1GHz	11a/BPSK	Band 1	6Mbps	36	1+2+3+4

Verify below items for adding a resistance (0201) – EUT 1

Test Items	Mode		Data Rate	Channel	Chain
Radiated Emission Above 1GHz	11a/BPSK	Band 1	6Mbps	36	1+2+3+4
Band Edge Emission	11a/BPSK	Band 1	6Mbps	36	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss1	36	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4

Note: VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.

The following test modes were performed for all tests:

For Radiated Emissions Above 1GHz test:

Verify for adding a heat sink (2mm) – EUT 1

EUT 1 (Version 2) - 11a (5180MHz)

Verify for adding a resistance (0201) – EUT 1

EUT 1 (Version 2) - 11a (5180MHz)

For Band Edge Emissions test:

Verify for adding a resistance (0201) – EUT 1

EUT 1 (Version 2) - 11a (5180MHz)

EUT 1 (Version 2) - 11ac VHT20 (5180MHz) - Non beamforming mode

EUT 1 (Version 2) - 11ac VHT40 (5190MHz) - Non beamforming mode

EUT 1 (Version 2) - 11ac VHT80 (5210MHz) - Non beamforming mode

Verify below items for adding adapter 4 ~ 6 – EUT 2

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

Note: The EUT is used for laying only.

The following test modes were performed for all tests:

For AC Power Line Conducted Emissions test:

SKU A generated the worst test results in Conducted Emissions of Original Report; thus, additional report (Rev. 1.31) will follow this same configuration.

Mode 1. EUT 2 (Rev. 1.31) + Adapter 4 + SKU A with 2.4GHz WLAN function

Mode 2. EUT 2 (Rev. 1.31) + Adapter 4 + SKU A with 5GHz Band 1 WLAN function

Mode 3. EUT 2 SKU A (Rev. 1.31) + Adapter 4 + with 5GHz Band 4 WLAN function

Mode 3 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4~5 will follow this same test mode.

Mode 4. EUT 2 (Rev. 1.31) + Adapter 5 + SKU A with 5GHz Band 4 WLAN function

Mode 5. EUT 2 (Rev. 1.31) + Adapter 6 + SKU Awith 5GHz Band 4 WLAN function

Mode 4 is the worst case, so it was selected to record in this test report.

For Radiated Emissions <Below 1GHz> test:

SKU A generated the worst test results in Radiated Emissions Below 1GHz of Original Report; thus, additional report (Rev. 1.31) will follow this same configuration.

Mode 1. EUT 2 (Rev. 1.31) + Adapter 4 + SKU A with 2.4GHz WLAN function

Mode 2. EUT 2 (Rev. 1.31) + Adapter 4 + SKU A with 5GHz Band 1 WLAN function

Mode 3. EUT 2 (Rev. 1.31) + Adapter 4 + SKU A with 5GHz Band 4 WLAN function

Mode 1 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4~5 will follow this same test mode.

Mode 4. EUT 2 (Rev. 1.31) + Adapter 5 + SKU A with 2.4GHz WLAN function

Mode 5. EUT 2 (Rev. 1.31) + Adapter 6 + SKU A with 2.4GHz WLAN function

Mode 5 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 Reg. No.**	**IC File No.**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D
TH01-CB	OVEN Room	Hsin Chu	-	-

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

3.7. Table for Multiple Listing

1. The model numbers in the following table are all refer to the identical product.

Model No.	Description
RT-AC5300	The models are identical except for the model numbers as marketing strategy.
RT-AC5300R	
RT-AC5300W	
RT-AC5300P	
RT-AC95U	
RT-AC96U	

2. The EUT has two types, which are identical to each other in all aspects except for the following table:

EUT	LAN Port	EUT Version	Transformer	Resistance (Size)	Thickness of Heat sink (mm)	Pad (mm)	Fan
EUT 1	8	Version 1, 2 (Rev 1.30)	SKU A	0402/0201	4.2mm/2mm	1mm/5mm	V
EUT 2	4	Version 1,2 (Rev 1.30)	SKU A	0402/0201	4.2mm/2mm	1mm/5mm	V / X
		Version 2 (Rev 1.30, Rev 1.31)	SKU A ~ SKU C	0402/0201	4.2mm/2mm	1mm/5mm	V / X

Note 1: All the specification of test configurations and test modes were based on customer's request.

Note 2: V : With X :Without

The transformer information as below:

Transformer	Brand	LAN	LAN	WAN
SKU A	Mingtek	HN8011VG	HN8011VG	HN18101CG
SKU B	Mingtek	HN8014VG	HN8015VG	HN18101CG
SKU C	FCE	NS777207	NS777208	NS771802

3.8. Table for Class II Change

This product is an extension of original report under Sporton project number: FR532637AA
Below is the table for the change of the product with respect to the original one.

Modification	Performance Checking
1. Adding four set same type of Dipole antenna (set 2~ set 5) with lower gains than the original. (Please refer to the table of filed antenna for detail) 2. Adding a pad (5mm).	After evaluating, it is not necessary to verify.
3. Adding a heat sink (2mm).	1. Radiated Emissions Below 1GHz test 2. Radiated Emissions Above 1GHz test 11b (2412MHz) 11a (5745MHz)
4. Adding a resistance (0201).	1. Radiated Emissions Below 1GHz test 2. Radiated Emissions Above 1GHz test 11b (2412MHz、2462MHz) 11a (5745MHz) 3. Band Edge Emissions test 11b (2412MHz、2462MHz) 11ac VHT20 (2412MHz、2462MHz) 11ac VHT40 (2422MHz、2452MHz) 4. Emission not in Restricted Band 11ac VHT80 (5775MHz)
5. Adding two SKU B and SKU C for the EUT with 4 ports (EUT 2).	1. AC Power Line Conducted Emissions test 2. Radiated Emissions Below 1GHz test Note: The test result of SKU B and SKU C was recorded in FR532637-04AA test report.
6. Only EUT 2 updating EUT version to "Rev 1.31" from "Rev 1.30" The version of EUT difference between item, Please refer to below and photographs of EUT (1) Adding the EUT without the fan. (2) Adding Capacitance. (3) Changing all the push buttons to DIP.	After evaluating, it is not necessary to verify.

7. Adding three adapters: (1) Adapter 4 (Model No.: ADP-65DW B) (2) Adapter 5 (Model No.: PA-1650-63) (3) Adapter 6 (Model No.: AD887320) (Please refer to below table for adapter detail)	1. AC Power Line Conducted Emissions 2. Radiated Emissions Below 1GHz test
8. For version 2 adding 3TX/3RX	After evaluating, it is not necessary to re-test. Note: The 3TX powers of the rest of the test modes were based on the 3TX powers out of 4TX.
9. Removing 5GHz Band Pass Filter	After evaluating, it is not necessary to re-test.

a. The difference between adapter 1(model: ADP-65DW B) and adapter 4 (model: ADP-65DW B) as below:

Adapter 1			
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
Adapter 4			
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

b. The difference between adapter 3 (model: PA-1650-93) and adapter 5 (model: PA-1650-63) as below:

Adapter 3	Adapter 5
Model: PA-1650-93	Model: PA-1650-63

c. The difference between adapter 2 (model: AD887320) and new adapter 6 (model: AD887320) as below:

Adapter 2	Adapter 6
Type: 010KLF BAH	Type: 010K-3LF

3.9. Table for Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC

3.10. Table for Parameters of Test Software Setting

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

EUT: Version 1

For non-beamforming function:

Test Software Version	MTOOL 2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	86	87	86
802.11ac MCS0/Nss1 VHT20	83	86	86
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	74	92	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	77		

For beamforming function:

Test Software Version	MTOOL 2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11ac MCS0/Nss1 VHT20	84	84	84
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	74	83	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	76		

EUT: Version 2

For non-beamforming function:

Test Software Version	MTOOL 2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	87	86	86
802.11ac MCS0/Nss1 VHT20	81	87	87
802.11ac MCS0/Nss4 VHT20	83	-	-
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	70	92	
802.11ac MCS0/Nss4 VHT40	77	-	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	69		
802.11ac MCS0/Nss4 VHT80	76		

For beamforming function:

Test Software Version	MTOOL 2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11ac MCS0/Nss1 VHT20	83	85	84
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	74	83	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	76		

3.11. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.12. Maximum Conducted Output Power for original report

EUT: Version 1 / Non-beamforming function

Mode	Frequency	Conducted Power (dBm)				
		Chain 1	Chain 2	Chain 3	Chain 4	Total
802.11a	5180 MHz	20.91	20.54	20.33	20.66	26.64
	5200 MHz	20.88	20.48	20.55	21.04	26.76
	5240 MHz	21.23	20.73	21.23	20.25	26.90
802.11ac MCS0/Nss1 VHT20	5180 MHz	20.41	20.11	20.21	20.45	26.32
	5200 MHz	20.54	20.34	20.38	20.45	26.45
	5240 MHz	20.89	20.66	21.33	20.24	26.82
802.11ac MCS0/Nss1 VHT40	5190 MHz	17.88	17.78	17.31	17.64	23.68
	5230 MHz	22.48	22.18	22.58	21.97	28.33
802.11ac MCS0/Nss1 VHT80	5210 MHz	18.92	18.76	18.91	19.08	24.94

EUT: Version 1 / Beamforming function

Mode	Frequency	Conducted Power (dBm)				
		Chain 1	Chain 2	Chain 3	Chain 4	Total
802.11ac MCS0/Nss1 VHT20	5180 MHz	20.59	20.25	20.34	20.39	26.41
	5200 MHz	20.45	20.24	20.36	20.42	26.39
	5240 MHz	20.58	20.18	20.54	20.48	26.47
802.11ac MCS0/Nss1 VHT40	5190 MHz	18.11	17.92	17.98	18.02	24.03
	5230 MHz	20.38	20.19	20.34	20.56	26.39
802.11ac MCS0/Nss1 VHT80	5210 MHz	18.81	18.43	18.48	18.06	24.47

EUT: Version 2 / Non-beamforming function

Mode	Frequency	Conducted Power (dBm)				
		Chain 1	Chain 2	Chain 3	Chain 4	Total
802.11a	5180 MHz	20.94	20.95	20.72	20.87	26.89
	5200 MHz	20.93	20.72	20.63	20.35	26.68
	5240 MHz	20.89	20.63	20.57	20.86	26.76
802.11ac MCS0/Nss1 VHT20	5180 MHz	19.45	19.51	19.24	19.21	25.38
	5200 MHz	21.09	20.76	20.73	20.41	26.77
	5240 MHz	21.11	20.82	20.53	21.06	26.91
802.11ac MCS0/Nss1 VHT40	5190 MHz	16.79	16.82	16.68	16.42	22.70
	5230 MHz	22.56	22.13	21.85	22.24	28.22
802.11ac MCS0/Nss1 VHT80	5210 MHz	16.63	16.73	16.14	16.31	22.48
802.11ac MCS0/Nss4 VHT20	5180 MHz	19.92	20.15	19.95	20.09	26.05
802.11ac MCS0/Nss4 VHT40	5190 MHz	18.39	18.59	18.28	18.55	24.47
802.11ac MCS0/Nss4 VHT80	5210 MHz	18.53	18.51	18.21	18.66	24.50

EUT: Version 2 / Beamforming function

Mode	Frequency	Conducted Power (dBm)				
		Chain 1	Chain 2	Chain 3	Chain 4	Total
802.11ac MCS0/Nss1 VHT20	5180 MHz	19.43	20.11	19.84	19.82	25.83
	5200 MHz	20.22	20.47	20.52	20.55	26.46
	5240 MHz	20.19	20.52	20.07	20.81	26.43
802.11ac MCS0/Nss1 VHT40	5190 MHz	17.53	17.76	18.01	17.89	23.82
	5230 MHz	20.29	20.37	20.31	20.47	26.38
802.11ac MCS0/Nss1 VHT80	5210 MHz	18.12	18.79	18.12	18.58	24.43

3.13. Duty Cycle

EUT: Version 1

For non-beamforming function:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	0.420	0.488	86.07	0.65	2.38
802.11ac MCS0/Nss1 VHT20	2.040	2.080	98.08	0.08	0.01
802.11ac MCS0/Nss1 VHT40	1.910	1.940	98.45	0.07	0.01
802.11ac MCS0/Nss1 VHT80	0.922	0.992	92.94	0.32	1.08

For beamforming function:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.820	4.240	90.09	0.45	0.26
802.11ac MCS0/Nss1 VHT40	4.560	5.300	86.04	0.65	0.22
802.11ac MCS0/Nss1 VHT80	5.600	7.000	80.00	0.97	0.18

EUT: Version 2

For non-beamforming function:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.059	2.083	98.84	0.05	0.01
802.11ac MCS0/Nss1 VHT20	1.923	1.939	99.17	0.04	0.01
802.11ac MCS0/Nss1 VHT40	0.914	1.045	87.46	0.58	1.09
802.11ac MCS0/Nss1 VHT80	0.425	0.489	86.91	0.61	2.35
802.11ac MCS0/Nss4 VHT20	0.496	0.552	89.86	0.46	2.02
802.11ac MCS0/Nss4 VHT40	0.252	0.308	81.82	0.87	3.97
802.11ac MCS0/Nss4 VHT80	0.160	0.188	85.12	0.70	6.24

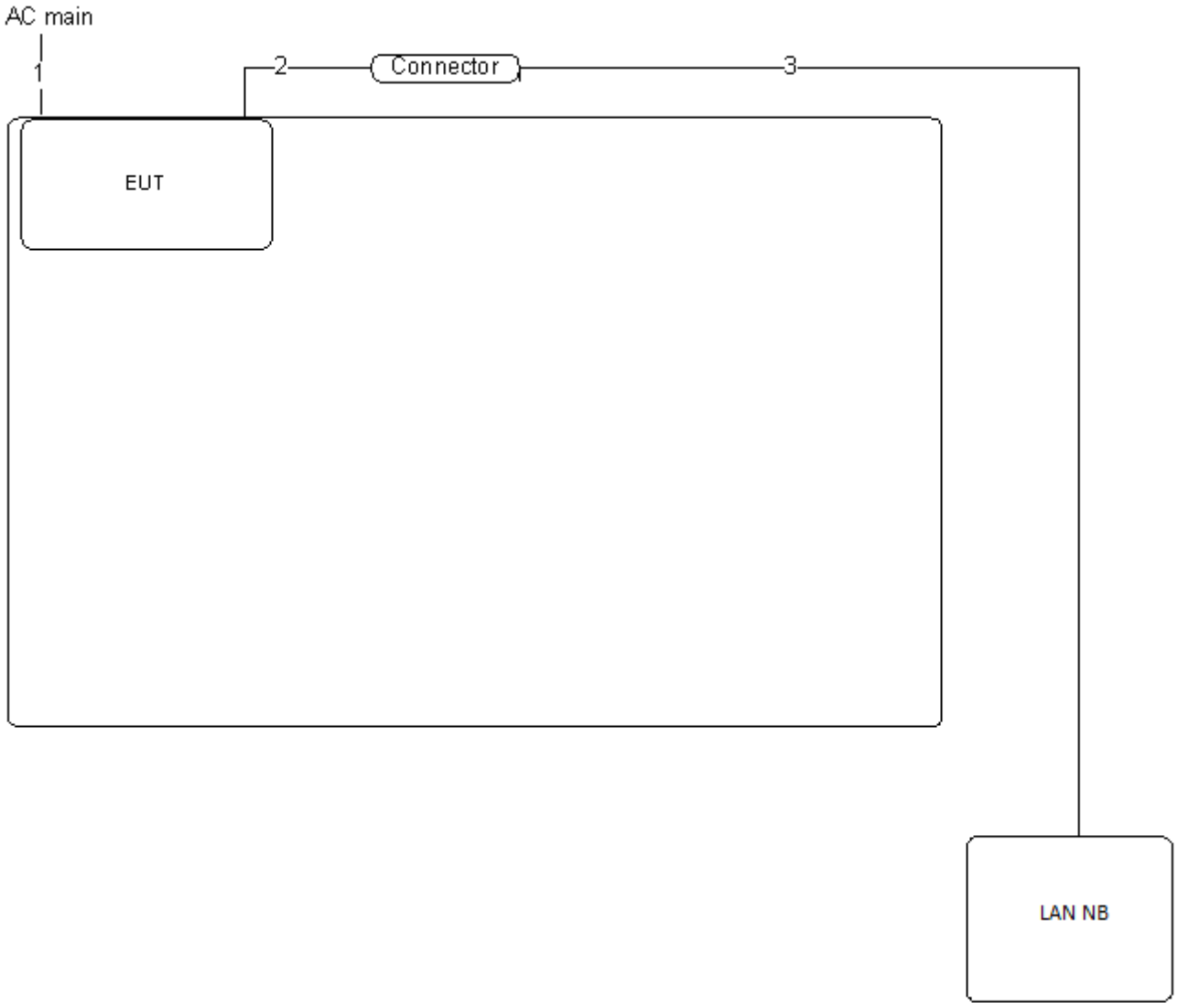
For beamforming function:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.846	4.191	91.78	0.37	0.26
802.11ac MCS0/Nss1 VHT40	4.585	5.012	91.48	0.39	0.22
802.11ac MCS0/Nss1 VHT80	5.090	5.446	93.47	0.29	0.20

3.14. Test Configurations

3.14.1. AC Power Line Conduction Emissions Test Configuration

Verify for adding adapter 4 ~ 6 – EUT 2

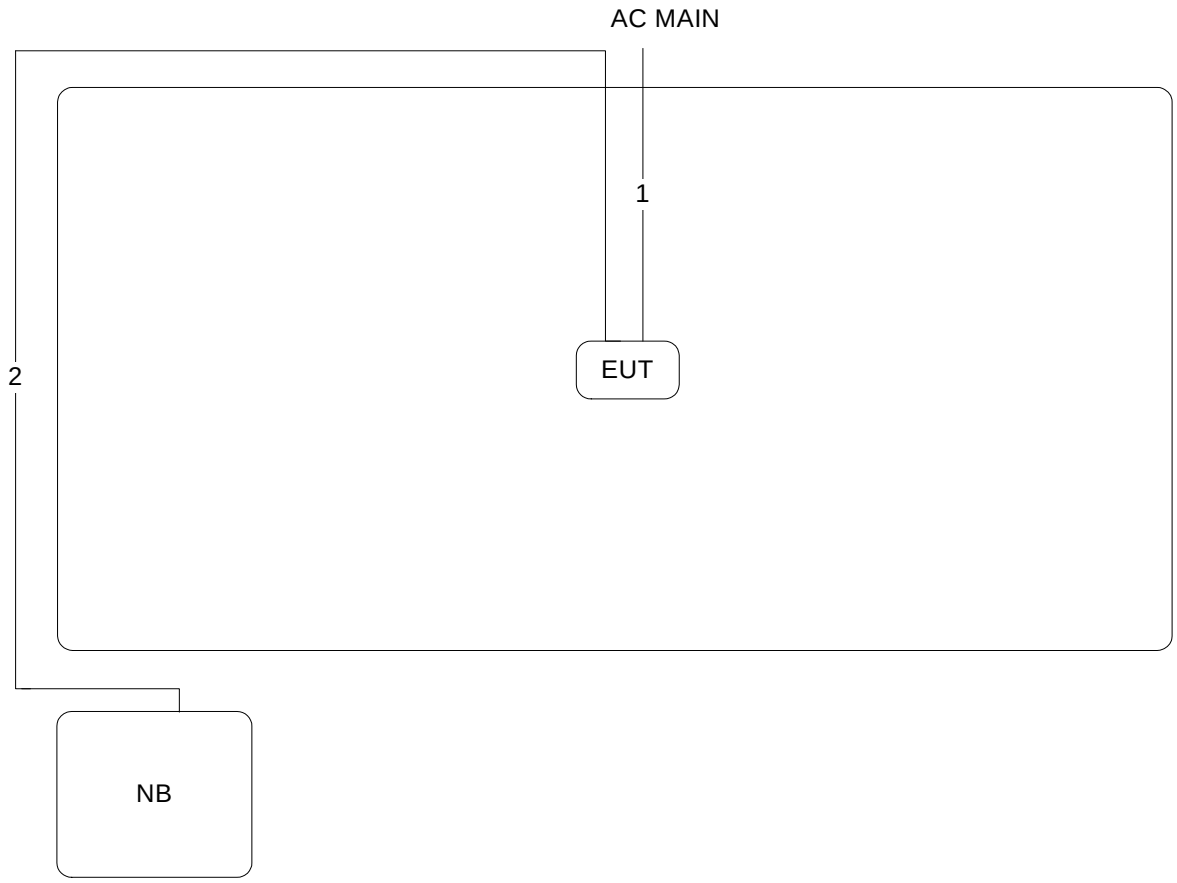


Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable	Yes	1.5m
3	RJ-45 cable	Yes	10m

3.14.2. Radiation Emissions Test Configuration

Verify for adding a heat sink (2mm) and resistance (0201) – EUT 1

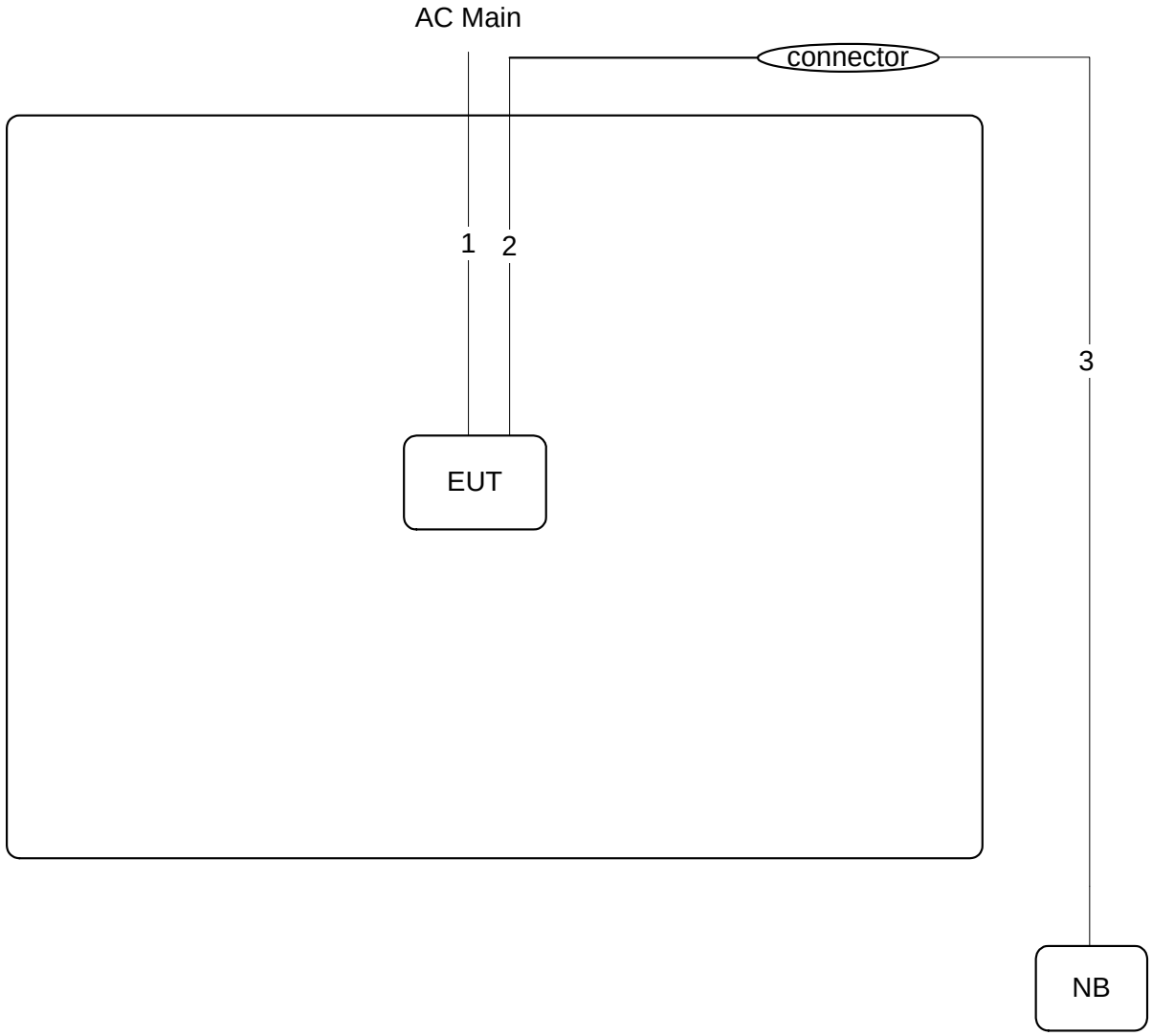
Test Configuration: above 1GHz



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

Verify below items for adding adapter 4 ~ 6 and two SKU B and SKU C – EUT 2

Test Configuration: 30MHz ~1GHz



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

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product that is designed to connect 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

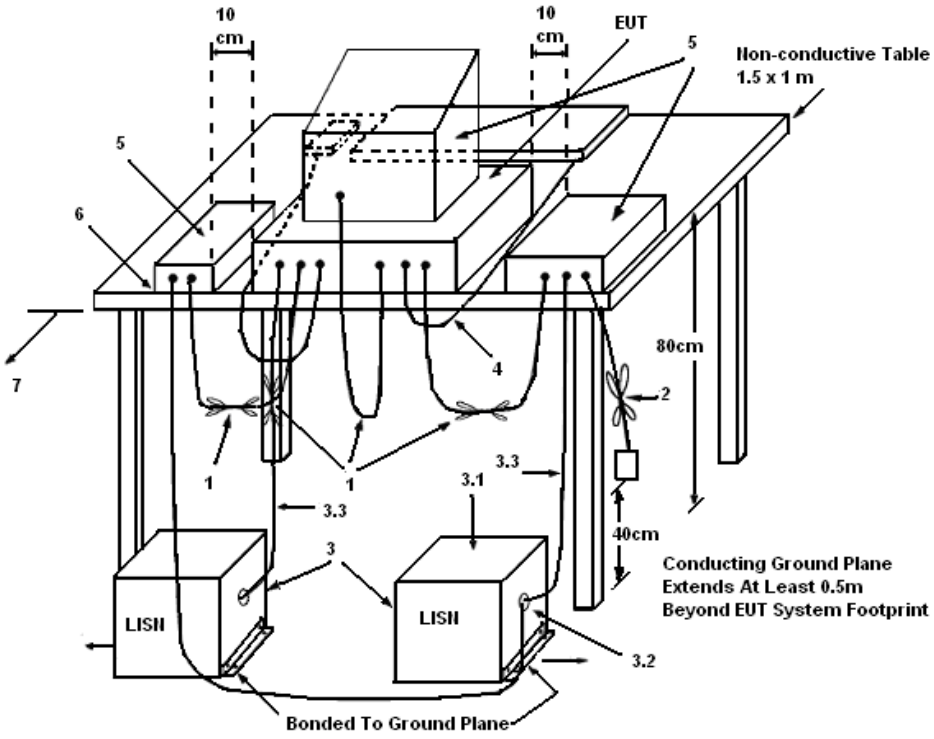
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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.

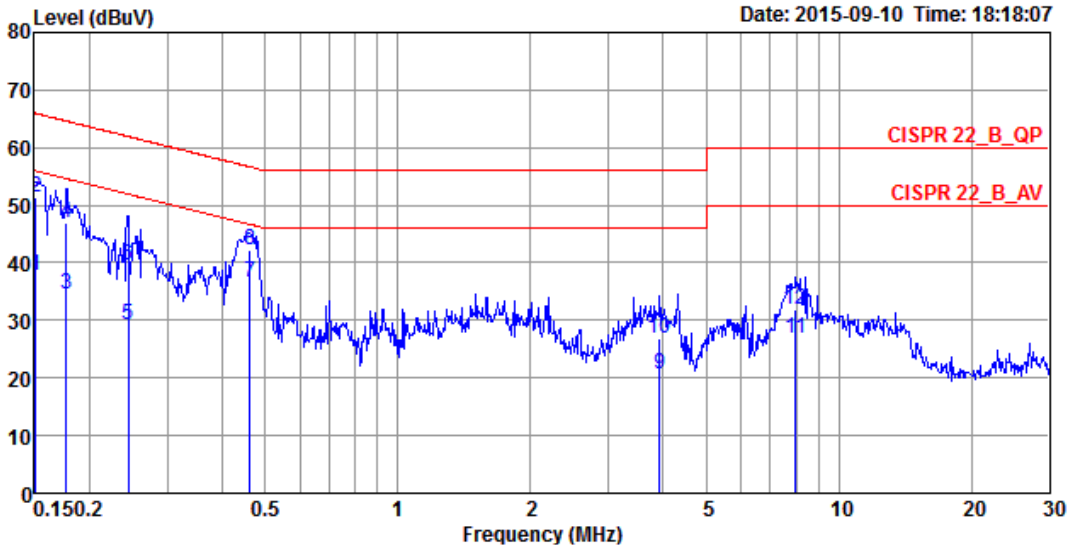
4.1.6. EUT Operation during Test

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

4.1.7. Results of AC Power Line Conducted Emissions Measurement

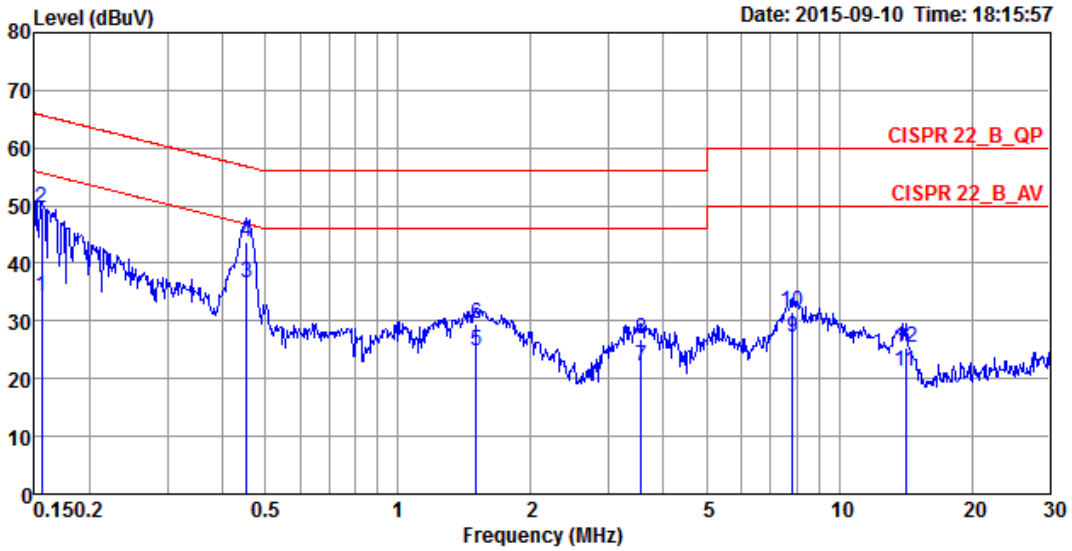
For adding adapter 4 ~ 6 – EUT 2 test record

Temperature	24°C	Humidity	56%
Test Engineer	Hank Yang	Phase	Line
Configuration	CTX	Test Mode	Mode 4



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1508	37.75	-18.21	55.96	27.80	9.93	0.02	LINE	Average
2	0.1508	51.36	-14.60	65.96	41.41	9.93	0.02	LINE	QP
3	0.1768	34.51	-20.13	54.64	24.56	9.93	0.02	LINE	Average
4	0.1768	46.93	-17.71	64.64	36.98	9.93	0.02	LINE	QP
5	0.2442	29.37	-22.58	51.95	19.41	9.93	0.03	LINE	Average
6	0.2442	39.63	-22.32	61.95	29.67	9.93	0.03	LINE	QP
7	0.4612	36.66	-10.01	46.67	26.69	9.93	0.04	LINE	Average
8	0.4612	42.32	-14.35	56.67	32.35	9.93	0.04	LINE	QP
9	3.9222	20.70	-25.30	46.00	10.61	10.02	0.07	LINE	Average
10	3.9222	26.96	-29.04	56.00	16.87	10.02	0.07	LINE	QP
11	7.9774	26.96	-23.04	50.00	16.65	10.14	0.17	LINE	Average
12	7.9774	31.74	-28.26	60.00	21.43	10.14	0.17	LINE	QP

Temperature	24°C	Humidity	56%
Test Engineer	Hank Yang	Phase	Neutral
Configuration	CTX	Test Mode	Mode 4



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1557	34.11	-21.58	55.69	24.31	9.78	0.02	NEUTRAL	Average
2	0.1557	49.65	-16.04	65.69	39.85	9.78	0.02	NEUTRAL	QP
3	0.4539	36.58	-10.22	46.80	26.75	9.79	0.04	NEUTRAL	Average
4	0.4539	43.70	-13.10	56.80	33.87	9.79	0.04	NEUTRAL	QP
5	1.5033	24.67	-21.33	46.00	14.78	9.83	0.06	NEUTRAL	Average
6	1.5033	29.37	-26.63	56.00	19.48	9.83	0.06	NEUTRAL	QP
7	3.5654	22.05	-23.95	46.00	12.13	9.86	0.06	NEUTRAL	Average
8	3.5654	26.90	-29.10	56.00	16.98	9.86	0.06	NEUTRAL	QP
9	7.8516	27.14	-22.86	50.00	17.00	9.97	0.17	NEUTRAL	Average
10	7.8516	31.65	-28.35	60.00	21.51	9.97	0.17	NEUTRAL	QP
11	14.1376	21.18	-28.82	50.00	10.84	10.09	0.25	NEUTRAL	Average
12	14.1376	25.37	-34.63	60.00	15.03	10.09	0.25	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Radiated Emissions Measurement

4.2.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

In addition, 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	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

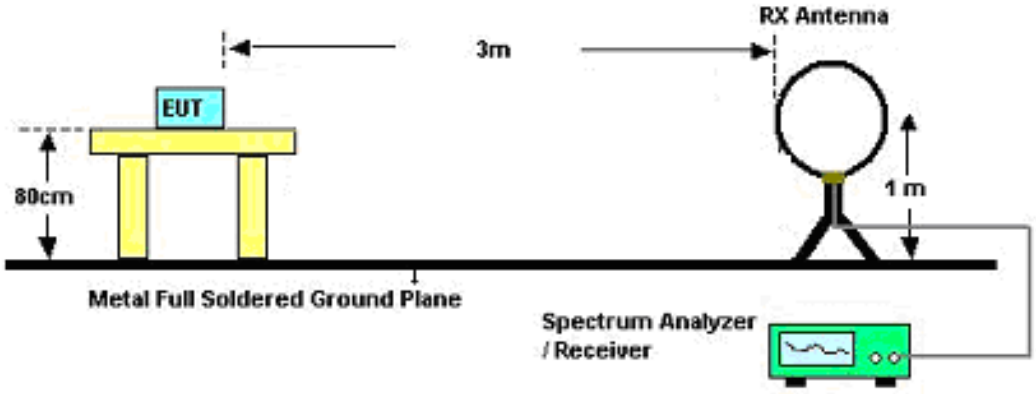
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.2.3. Test Procedures

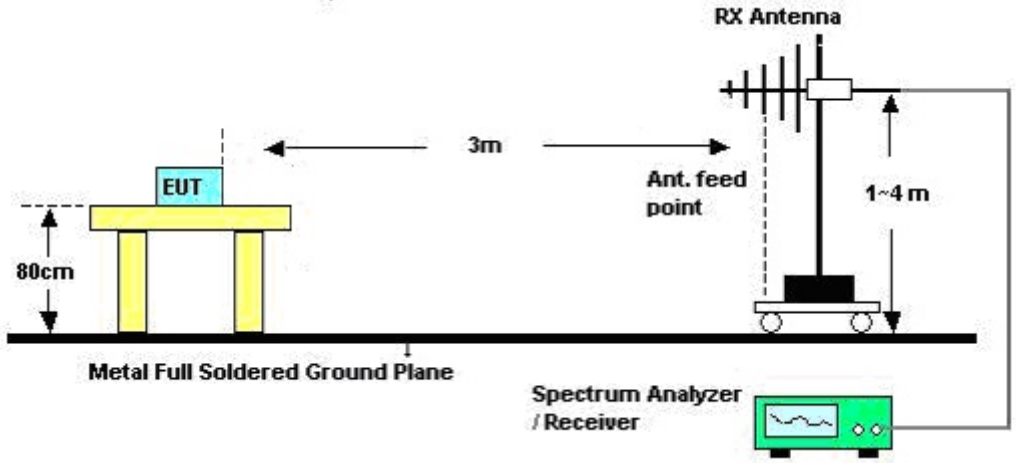
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting 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

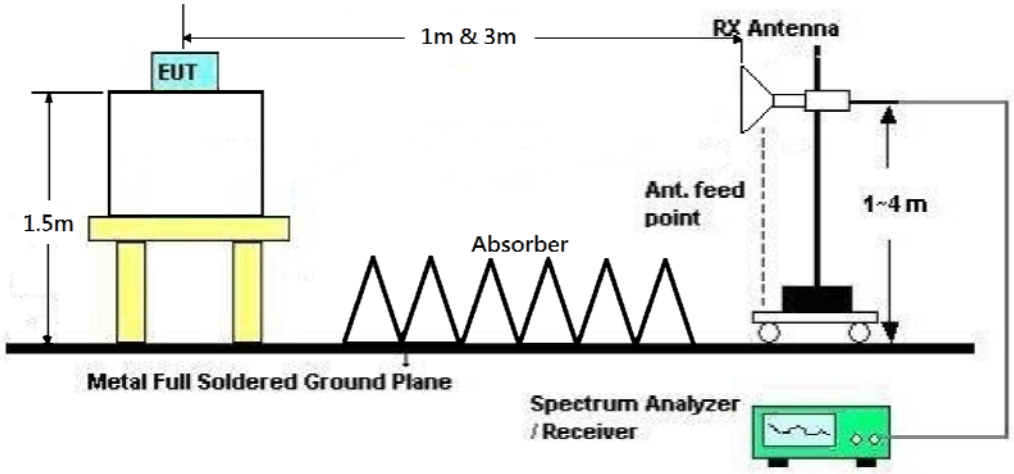
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

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

For adding adapter 4 ~ 6 – EUT 2 test record

Temperature	24℃	**Humidity**	55%
Test Engineer	Gary Chu	**Configurations**	CTX
Test Date	Aug. 26, 2015	**Test Mode**	Mode 5

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);

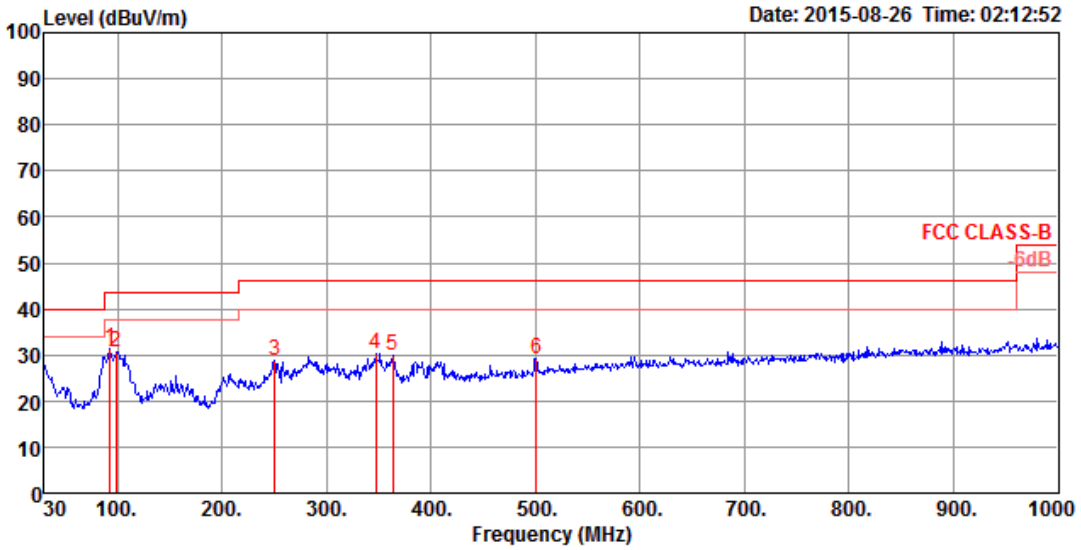
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

For adding adapter 4 ~ 6 – EUT 2 test record

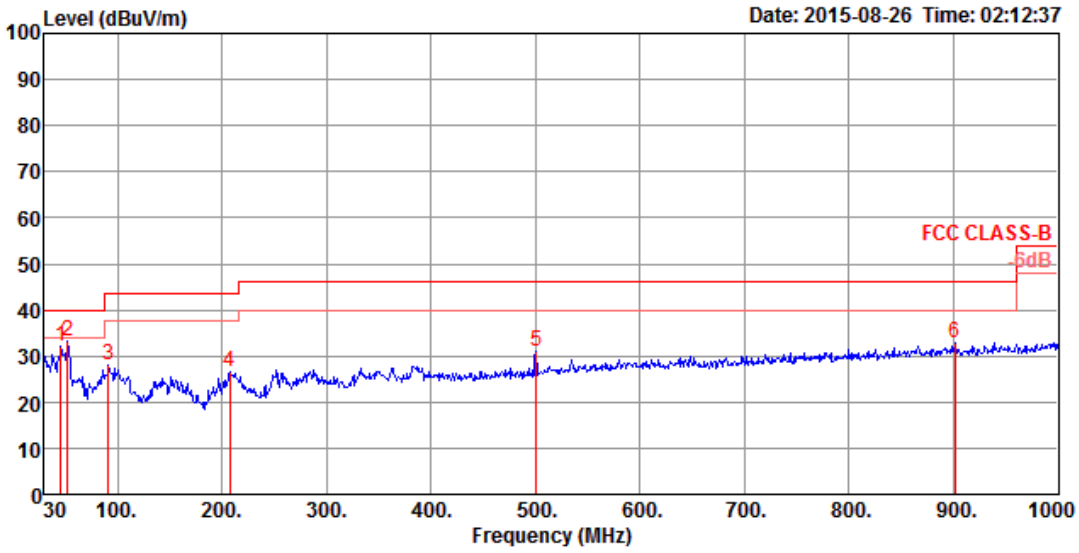
Temperature	24℃	Humidity	55%
Test Engineer	Gary Chu	Configurations	CTX
Test Mode	Mode 5		

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	93.05	31.20	43.50	-12.30	52.84	0.92	9.83	32.39	200	93	Peak	HORIZONTAL
2	98.87	30.66	43.50	-12.84	51.21	0.93	10.91	32.39	200	258	Peak	HORIZONTAL
3	250.19	28.91	46.00	-17.09	46.93	1.38	12.90	32.30	100	128	Peak	HORIZONTAL
4	347.19	30.39	46.00	-15.61	45.89	1.61	15.20	32.31	100	23	Peak	HORIZONTAL
5	363.68	29.91	46.00	-16.09	44.92	1.65	15.65	32.31	100	298	Peak	HORIZONTAL
6	500.45	29.17	46.00	-16.83	41.79	1.90	17.83	32.35	150	244	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	45.52	31.97	40.00	-8.03	52.63	0.68	11.07	32.41	100	249	Peak	VERTICAL
2	52.31	33.29	40.00	-6.71	56.49	0.73	8.48	32.41	100	0	Peak	VERTICAL
3	91.11	28.15	43.50	-15.35	50.17	0.92	9.45	32.39	100	280	Peak	VERTICAL
4	207.51	26.75	43.50	-16.75	47.09	1.28	10.71	32.33	100	194	Peak	VERTICAL
5	500.45	30.82	46.00	-15.18	43.44	1.90	17.83	32.35	100	226	Peak	VERTICAL
6	901.06	32.73	46.00	-13.27	40.34	2.43	21.70	31.74	150	296	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.

4.2.9. Results for Radiated Emissions (1GHz~40GHz)

For adding a heat sink (2mm) – EUT 1 test record

Temperature	22℃	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 22, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11485.10	42.41	54.00	-11.59	31.80	6.53	38.70	34.62	282	110	Average	HORIZONTAL
2	11492.06	55.34	74.00	-18.66	44.73	6.53	38.70	34.62	282	110	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11488.10	46.50	54.00	-7.50	35.89	6.53	38.70	34.62	20	117	Average	VERTICAL
2	11488.80	60.87	74.00	-13.13	50.26	6.53	38.70	34.62	20	117	Peak	VERTICAL

For adding a resistance (0201) – EUT 1 test record

Temperature	22°C	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 22, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15542.12	56.77	74.00	-17.23	44.23	10.04	38.22	35.72	200	171	HORIZONTAL	Peak
2	15542.29	44.01	54.00	-9.99	31.47	10.04	38.22	35.72	200	171	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15542.48	44.12	54.00	-9.88	31.58	10.04	38.22	35.72	200	214	VERTICAL	Average
2	15542.58	56.78	74.00	-17.22	44.24	10.04	38.22	35.72	200	214	VERTICAL	Peak

4.3. Band Edge Emissions Measurement

4.3.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

In addition, 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

4.3.2. Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.3.3. Test Procedures

1. The test procedure is the same as section 4.2.3, only the frequency range investigated is limited to 100MHz around bandedges.

4.3.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.2.4.

4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

4.3.7. Test Result of Band Edge and Fundamental Emissions

For adding a resistance (0201) – EUT 1 test record

Temperature	22°C	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 19, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5134.81	50.68	54.00	-3.32	46.38	5.50	33.15	34.35	205	23	VERTICAL	Average
2	5149.71	66.46	74.00	-7.54	62.12	5.51	33.17	34.34	205	23	VERTICAL	Peak
3	5174.23	108.24			103.83	5.52	33.23	34.34	205	23	VERTICAL	Average
4	5174.39	119.01			114.60	5.52	33.23	34.34	205	23	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5180 MHz.

Temperature	22°C	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36/ Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 19, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.43	51.25	54.00	-2.75	46.91	5.51	33.17	34.34	200	338	VERTICAL	Average
2	5148.59	63.86	74.00	-10.14	59.52	5.51	33.17	34.34	200	338	VERTICAL	Peak
3	5173.43	105.01			100.60	5.52	33.23	34.34	200	338	VERTICAL	Average
4	5186.25	116.49			112.08	5.52	33.23	34.34	200	338	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5180 MHz.

Temperature	22°C	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 19, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5141.60	63.67	74.00	-10.33	59.35	5.51	33.15	34.34	201	24	VERTICAL	Peak
2	5146.73	51.41	54.00	-2.59	47.07	5.51	33.17	34.34	201	24	VERTICAL	Average
3	5196.73	101.02			96.58	5.53	33.25	34.34	201	24	VERTICAL	Average
4	5196.73	111.11			106.67	5.53	33.25	34.34	201	24	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5190 MHz.

Temperature	22°C	Humidity	60%
Test Engineer	Akina Chiu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Jul. 19, 2015	Test EUT / Function	EUT: Version 2 / Non-beamforming function

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5142.05	51.32	54.00	-2.68	46.98	5.51	33.17	34.34	192	100	VERTICAL	Average
2	5142.05	61.67	74.00	-12.33	57.33	5.51	33.17	34.34	192	100	VERTICAL	Peak
3	5220.26	99.83			95.32	5.54	33.31	34.34	192	100	VERTICAL	Average
4	5220.26	109.62			105.11	5.54	33.31	34.34	192	100	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5210 MHz.

4.4. Antenna Requirements

4.4.1. 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.

4.4.2. Antenna Connector Construction

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

5. LIST OF MEASURING EQUIPMENTS

For adding a heat sink (2mm) and resistance (0201) – EUT 1 test record

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 25, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 06, 2014	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO 2000	N/A	1 m ~ 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Thermometer	HTC-1	HTC-1	TP-1	-50℃~70℃	Mar. 11, 2015	Radiation (03CH01-CB)

Note: Calibration Interval of instruments listed above is one year.
N.C.R. means Non-Calibration required.

For adding adapter 4 ~ 6 – EUT 2 test record

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)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 12, 2015*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 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)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)

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

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

N.C.R. 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%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%