



FCC RADIO TEST REPORT

FCC ID : P4Q-N536A
Equipment : Tablet
Brand Name : Mitac, Magellan
Model name : N536A
Applicant : MiTAC Digital Technology Corporation
No.200, Wen Hua 2nd Rd., Guishan Dist., Taoyuan
City 333, Taiwan (R.O.C.)
Manufacturer : MITAC COMPUTER (KUSHAN) CO. LTD
No. 269, 2nd Rd, Export Processing Zone
Changjiang South Road Kushan, Jiangsu China
Standard : FCC Part 15 Subpart E §15.407

The product was received on Mar. 23, 2018 and testing was started from Apr. 24, 2018 and completed on Jul. 15, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR720610-11F	01	Initial issue of report	Jul. 30, 2018
FR720610-11F	02	Add the power level for WWAN+WLAN SKU applied in WLAN is 3dB lower than WLAN SKU power in appendix A	Aug. 03, 2018

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403 (i)	6dB & 26dB Bandwidth	Pass	-
-	2.1049	99% Occupied Bandwidth	Reporting only	-
3.1	15.407 (a)	Maximum Conducted Output Power	Pass	-
-	15.407 (a)	Power Spectral Density	Pass	-
3.2	15.407(b)	Unwanted Emissions	Pass	Under limit 4.55 dB at 200.370 MHz
3.3	15.207	AC Conducted Emission	Pass	Under limit 4.72 dB at 3.579 MHz
3.4	15.407 (c)	Automatically Discontinue Transmission	Pass	-
3.5	15.203 & 15.407 (a)	Antenna Requirement	Pass	-
Remark: 1. Not required means after assessing, test items are not necessary to carry out. 2. This is a variant report which can be referred change list. All the test cases were performed on original report which can be referred to Sporton Report Number FR720610-10F (FCC ID: P4Q-N536B). 3. The WWAN+WLAN SKU(Model name: N536B) refers the WLAN test data from the WLAN SKU(Model name: N536A) according to KDB 484596 D01. We have spot check the WWAN+WLAN SKU for WLAN at the same power level as WLAN SKU, and the result is similar with the result of WLAN SKU. The WWAN+WLAN SKU reduces its WLAN power by 3dB for SAR compliance, we measured the power with 3dB reduction setting for the report purpose.				

Reviewed by: Joseph Lin

Report Producer: Nancy Yang

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n, and NFC

Product Specification subjective to this standard	
Sample 1	EUT with SKU 5
Sample 2	EUT with SKU 6
Sample 3	EUT with SKU 7
Integrated WLAN Module	Brand Name: Qualcomm Model Name: WCN3660B
Antenna Type	WLAN: Holder with FPC Antenna Bluetooth: Holder with FPC Antenna NFC : Loop Antenna

Remark: All the tests were performed with Sample 1.

<Sample Information>

Sample List			
SKU	SKU 5	SKU 6	SKU 7
Model name	N536A	N536A	N536A
WLAN	Support	Support	Support
WWAN	Not Support	Not Support	Not Support
RFID(13.56MHz)	Support	Not Support	Support
Barcode	Support(MR)	Not Support	Support(SR)
GPS	Not Support	Not Support	Not Support

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH12-HY	

Note: The test site complies with ANSI C63.4 2014 requirement.

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	-	-	165	5825

Note: The above Frequency and Channel in "*" were 802.11n HT40.

2.2 Test Mode

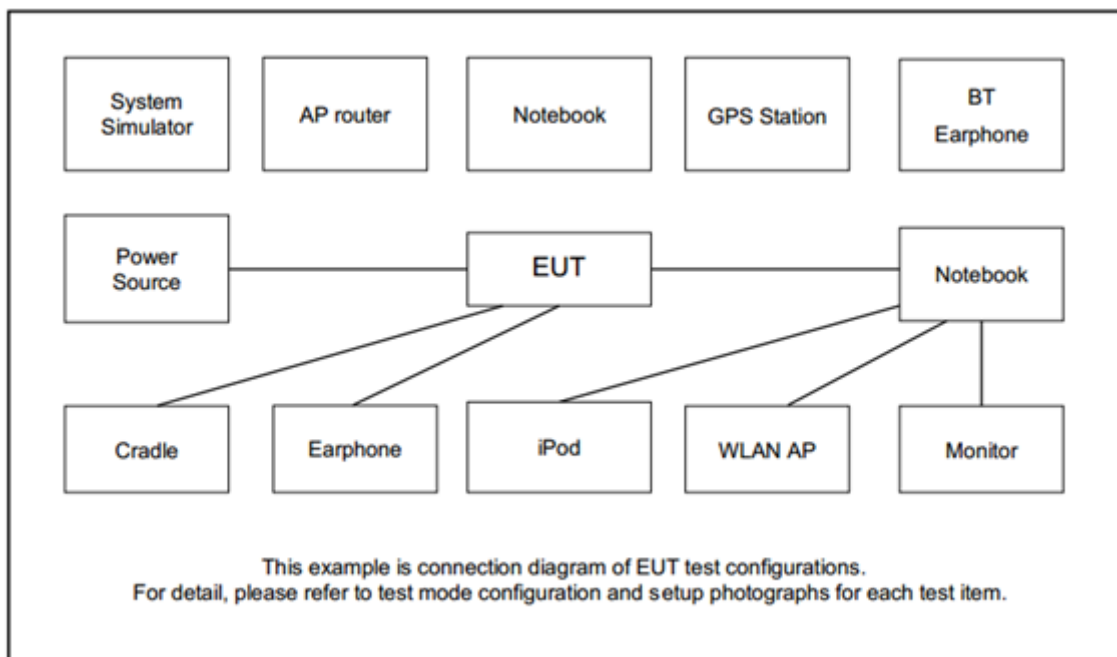
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11n HT20	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN (5GHz) Link + NFC Link + Earphone + USB Cable (Charging from AC Adapter)

Ch. #		Band IV : 5725-5850 MHz
		802.11n HT20
L	Low	-
M	Middle	157
H	High	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
3.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

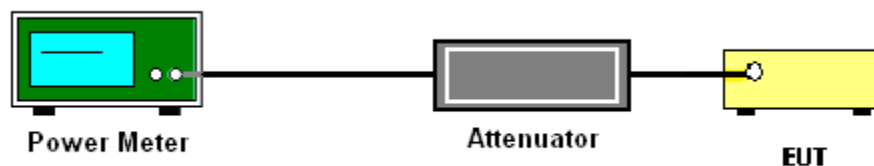
3.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, $10 \log(1/x)$, where x is the duty cycle.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.2 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.2.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

- (2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (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: The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \quad \mu\text{V/m, where P is the eirp (Watts)}$$



EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

(3) KDB789033 D02 v02r01 G)2)c)

- (i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.³
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.⁴

Note 3: An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

Note 4: Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.



3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Section G) Unwanted emissions measurement.

(1) Procedure for Unwanted Emissions Measurements Below 1000MHz

- RBW = 120 kHz
- VBW = 300 kHz
- Detector = Peak
- Trace mode = max hold

(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW $\geq$ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

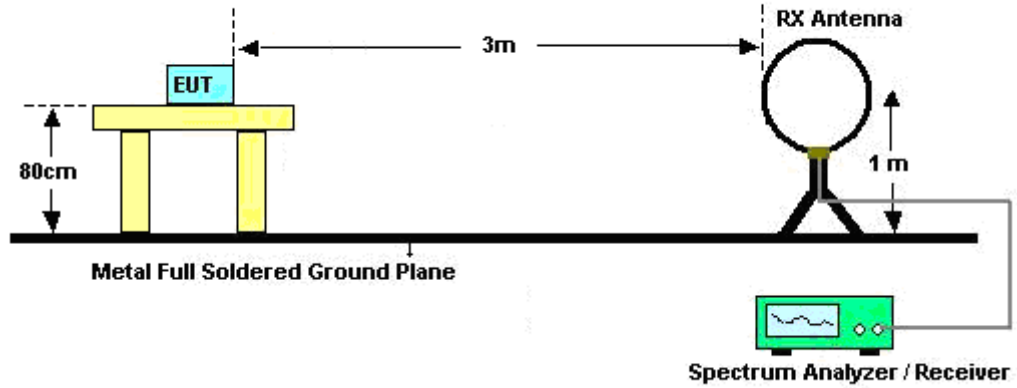
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



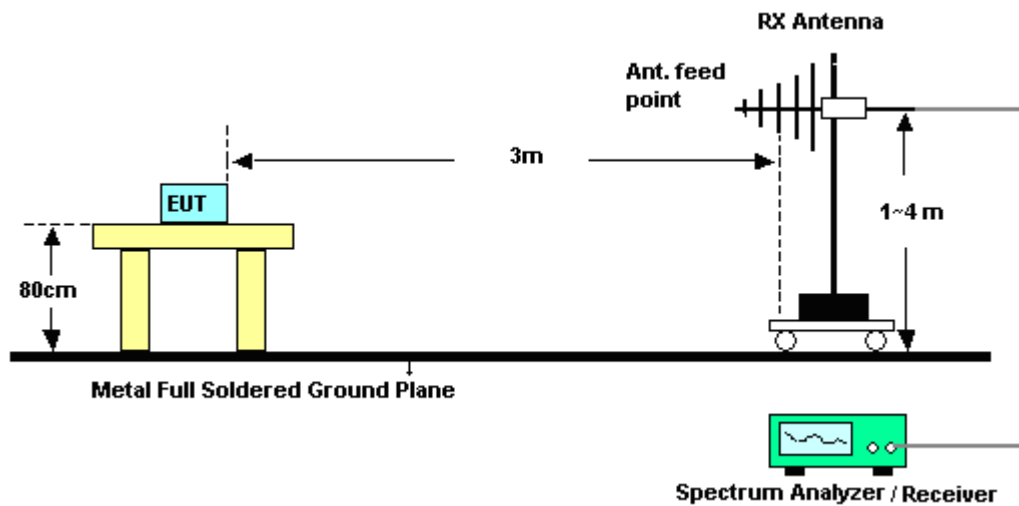
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

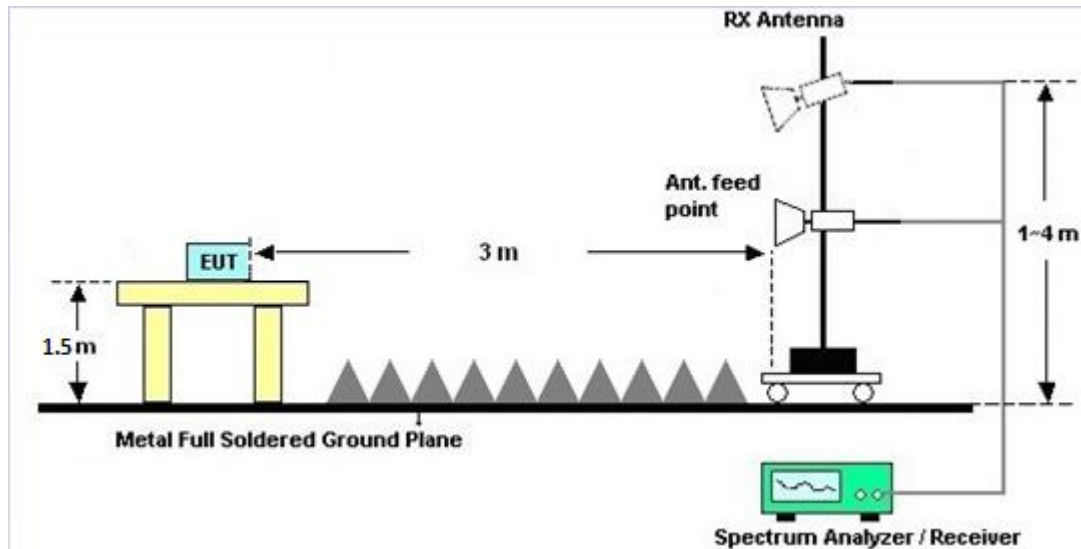
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.2.6 Test Result of Radiated Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

3.2.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (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 the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

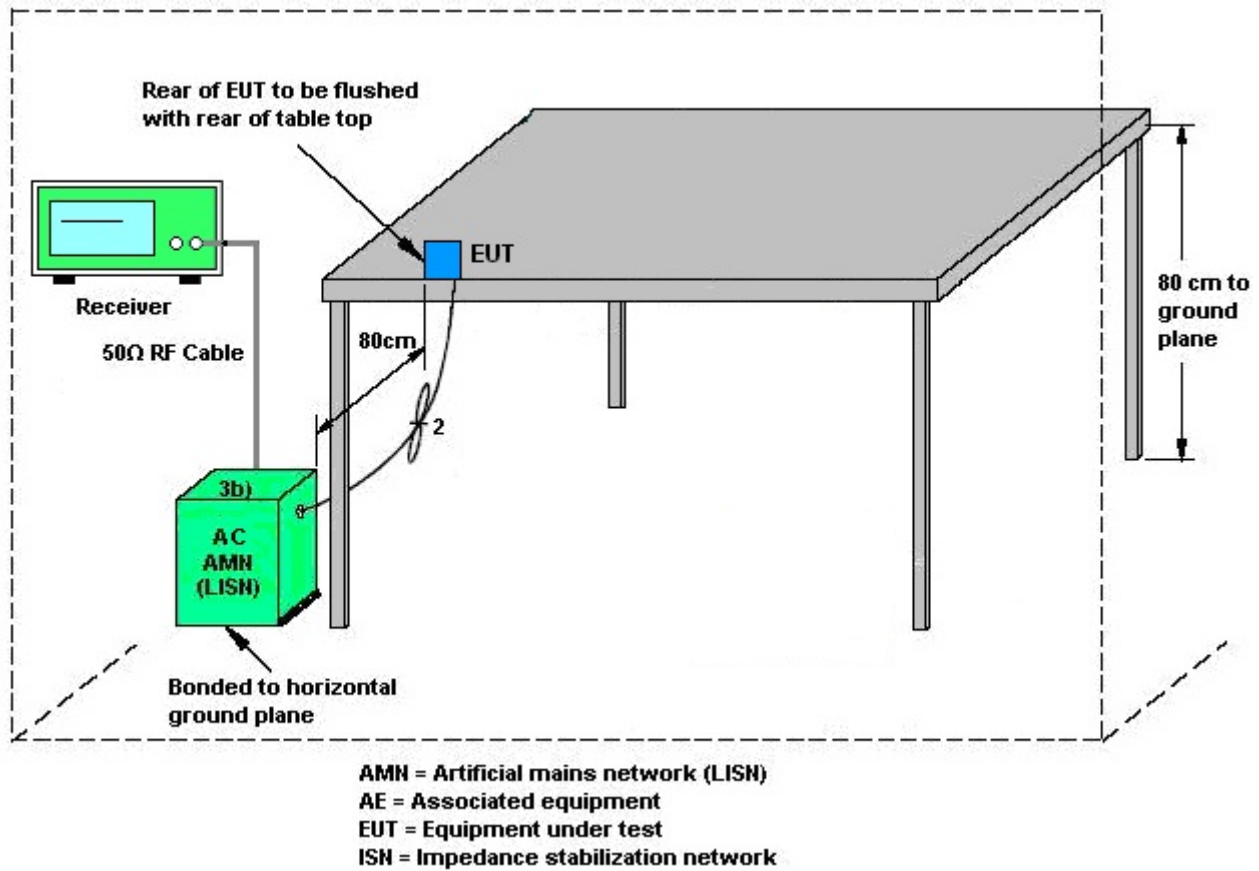
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.3.4 Test Setup



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.4 Automatically Discontinue Transmission

3.4.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.



3.5 Antenna Requirements

3.5.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1218006	N/A	Oct. 06, 2017	Apr. 28, 2018 ~ Jun. 06, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207363	300MHz~40GHz	Oct. 06, 2017	Apr. 28, 2018 ~ Jun. 06, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz~40GHz	Nov. 21, 2017	Apr. 28, 2018 ~ Jun. 06, 2018	Nov. 20, 2018	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC130048 4	N/A	Mar. 01, 2018	Apr. 28, 2018 ~ Jun. 06, 2018	Feb. 28, 2019	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 24, 2018~ Apr. 25, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	Apr. 24, 2018~ Apr. 25, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Apr. 24, 2018~ Apr. 25, 2018	Nov. 29, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 08, 2017	Apr. 24, 2018~ Apr. 25, 2018	Dec. 07, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Apr. 24, 2018~ Apr. 25, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Apr. 24, 2018~ Apr. 25, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Apr. 24, 2018~ Apr. 25, 2018	Jan. 02, 2019	Conduction (CO05-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	May 15, 2018 ~ Jul. 15, 2018	Jul. 17, 2018	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY542004 85	10Hz ~ 44GHz	Oct. 31, 2017	May 15, 2018 ~ Jul. 15, 2018	Oct. 30, 2018	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-0 6	35414&AT- N0602	30MHz~1GHz	Oct. 14, 2017	May 15, 2018 ~ Jul. 15, 2018	Oct. 13, 2018	Radiation (03CH12-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	May 15, 2018 ~ Jul. 15, 2018	Nov. 22, 2018	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 25, 2017	May 15, 2018 ~ Jul. 15, 2018	Dec. 24, 2018	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-132 8	1GHz ~ 18GHz	Oct. 20, 2017	May 15, 2018 ~ Jul. 15, 2018	Oct. 19, 2018	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 26, 2018	May 15, 2018 ~ Jul. 15, 2018	Mar. 25, 2019	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY532701 48	1GHz~26.5GHz	Jan. 15, 2018	May 15, 2018 ~ Jul. 15, 2018	Jan. 14, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WLKS1200-1 2SS	SN2	1.2G Low Pass	Jul. 17, 2017	May 15, 2018 ~ Jul. 15, 2018	Jul. 16, 2018	Radiation (03CH12-HY)
Filter	Woken	WHKX8-5272. 5-6750-18000 -40ST	SN2	6.75G High pass	Jul. 17, 2017	May 15, 2018 ~ Jul. 15, 2018	Jul. 16, 2018	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500- B	N/A	1m~4m	N/A	May 15, 2018 ~ Jul. 15, 2018	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	May 15, 2018 ~ Jul. 15, 2018	N/A	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 584	18GHz ~ 40GHz	Nov. 27, 2017	May 15, 2018 ~ Jul. 15, 2018	Nov. 26, 2018	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03K	171000180 0054002	1GHz~18GHz	Apr. 17, 2018	May 15, 2018 ~ Jul. 15, 2018	Apr. 16, 2019	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-00098 9	N/A	N/A	May 15, 2018 ~ Jul. 15, 2018	N/A	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30M-18G	Mar. 14, 2018	May 15, 2018 ~ Jul. 15, 2018	Mar. 13, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15539/ 4	30M-18G	Mar. 14, 2018	May 15, 2018 ~ Jul. 15, 2018	Mar. 13, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY36979/ 4	30M-18G	Mar. 14, 2018	May 15, 2018 ~ Jul. 15, 2018	Mar. 13, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30M~40GHz	Oct. 17, 2017	May 15, 2018 ~ Jul. 15, 2018	Oct. 16, 2018	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30M~40GHz	Oct. 17, 2017	May 15, 2018 ~ Jul. 15, 2018	Oct. 16, 2018	Radiation (03CH12-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.70
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.10
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.20
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.70
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Appendix A. Test Result of Conducted Test Items

<WWAN+WLAN SKU for WLAN at the same power level as WLAN SKU>

Test Engineer:	Tommy Lee	Temperature:	21~25	°C
Test Date:	2018/4/28~2018/05/11	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

Band IV														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	0.62	-	15.78	-		30.00	-	2.12	-	Pass
11a	6Mbps	1	157	5785	0.62	-	21.20	-		30.00	-	2.12	-	Pass
11a	6Mbps	1	165	5825	0.62	-	18.13	-		30.00	-	2.12	-	Pass
HT20	MCS0	1	149	5745	0.66	-	15.16	-		30.00	-	2.12	-	Pass
HT20	MCS0	1	157	5785	0.66	-	21.30	-		30.00	-	2.12	-	Pass
HT20	MCS0	1	165	5825	0.66	-	17.70	-		30.00	-	2.12	-	Pass
HT40	MCS0	1	151	5755	0.69	-	14.23	-		30.00	-	2.12	-	Pass
HT40	MCS0	1	159	5795	0.69	-	17.96	-		30.00	-	2.12	-	Pass

<The power level for WWAN+WLAN SKU applied in WLAN is 3dB lower than WLAN SKU>

Test Engineer:	Tommy Lee	Temperature:	21~25	°C
Test Date:	2018/4/28~2018/06/06	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

Band IV														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	0.62		15.78			30.00	30.00	2.12	0.00	Pass
11a	6Mbps	1	157	5785	0.62		18.27			30.00	30.00	2.12	0.00	Pass
11a	6Mbps	1	165	5825	0.62		18.13			30.00	30.00	2.12	0.00	Pass
HT20	MCS0	1	149	5745	0.66		15.16			30.00	30.00	2.12	0.00	Pass
HT20	MCS0	1	157	5785	0.66		18.29			30.00	30.00	2.12	0.00	Pass
HT20	MCS0	1	165	5825	0.66		17.70			30.00	30.00	2.12	0.00	Pass
HT40	MCS0	1	151	5755	0.69		14.23			30.00	30.00	2.12	0.00	Pass
HT40	MCS0	1	159	5795	0.69		17.96			30.00	30.00	2.12	0.00	Pass



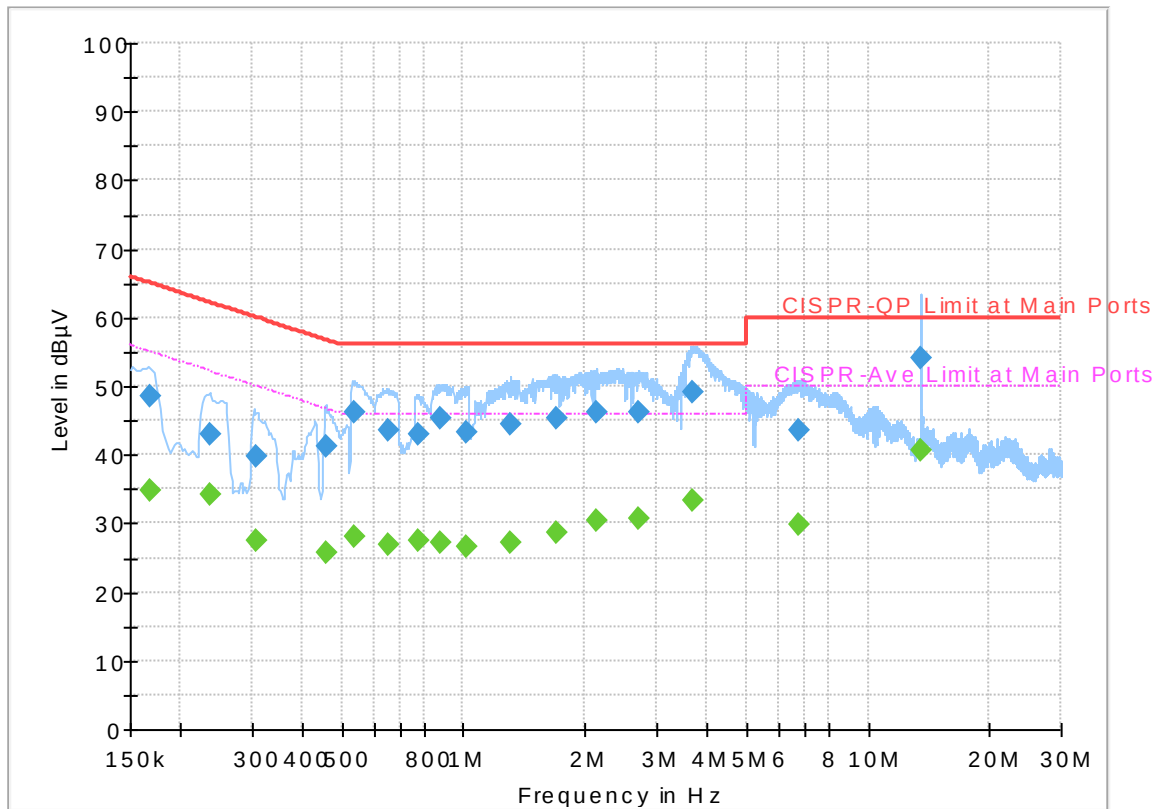
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Shareef Yu	Temperature :	23~24℃
		Relative Humidity :	58~63%

EUT Information

Report NO : 720610-11
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



Final_Result

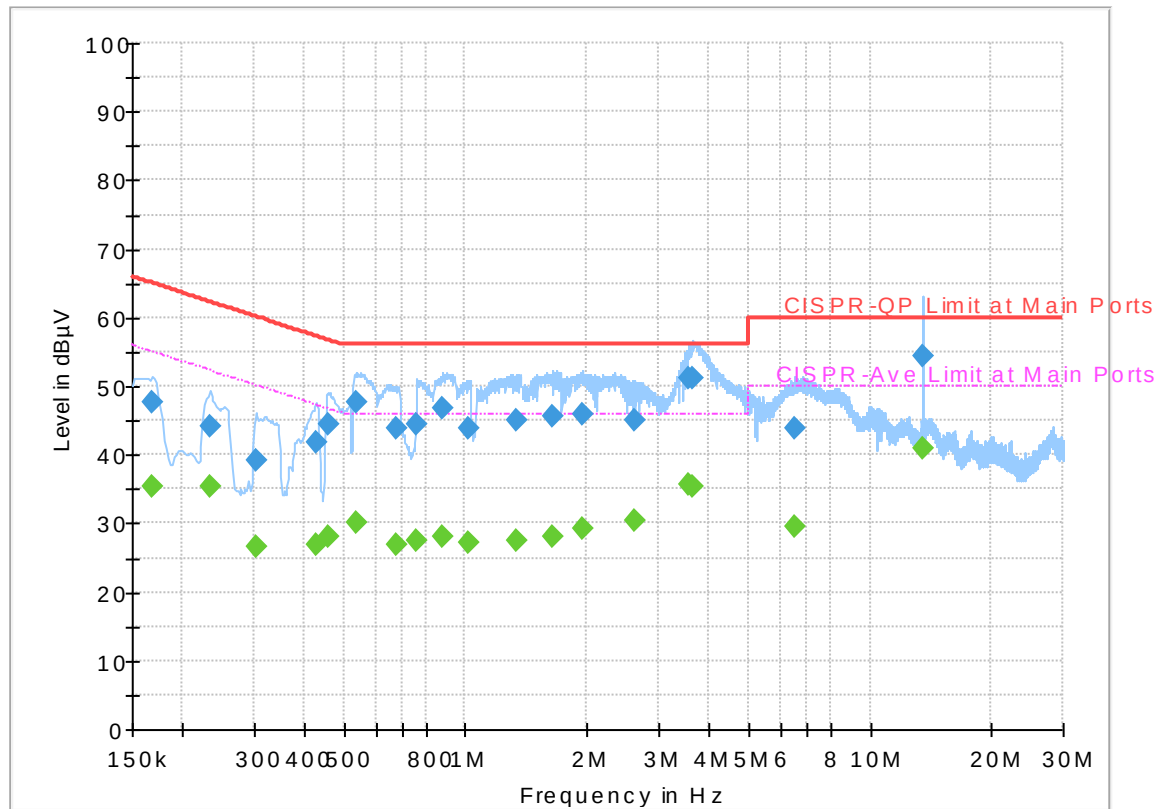
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.168000	---	34.66	55.06	20.40	L1	OFF	19.5
0.168000	48.43	---	65.06	16.63	L1	OFF	19.5
0.235500	---	34.26	52.25	17.99	L1	OFF	19.5
0.235500	43.04	---	62.25	19.21	L1	OFF	19.5
0.307500	---	27.39	50.04	22.65	L1	OFF	19.5
0.307500	39.68	---	60.04	20.36	L1	OFF	19.5
0.456000	---	25.78	46.77	20.99	L1	OFF	19.5
0.456000	41.25	---	56.77	15.52	L1	OFF	19.5
0.534750	---	28.16	46.00	17.84	L1	OFF	19.5
0.534750	46.05	---	56.00	9.95	L1	OFF	19.5
0.651750	---	26.90	46.00	19.10	L1	OFF	19.5
0.651750	43.59	---	56.00	12.41	L1	OFF	19.5
0.771000	---	27.63	46.00	18.37	L1	OFF	19.5
0.771000	43.06	---	56.00	12.94	L1	OFF	19.5
0.881250	---	27.08	46.00	18.92	L1	OFF	19.5
0.881250	45.22	---	56.00	10.78	L1	OFF	19.5
1.014000	---	26.73	46.00	19.27	L1	OFF	19.5
1.014000	43.39	---	56.00	12.61	L1	OFF	19.5
1.311000	---	27.26	46.00	18.74	L1	OFF	19.6
1.311000	44.56	---	56.00	11.44	L1	OFF	19.6
1.691250	---	28.72	46.00	17.28	L1	OFF	19.6

1.691250	45.42	---	56.00	10.58	L1	OFF	19.6
2.130000	---	30.28	46.00	15.72	L1	OFF	19.4
2.130000	46.26	---	56.00	9.74	L1	OFF	19.4
2.706000	---	30.78	46.00	15.22	L1	OFF	19.5
2.706000	46.11	---	56.00	9.89	L1	OFF	19.5
3.687000	---	33.41	46.00	12.59	L1	OFF	19.6
3.687000	49.23	---	56.00	6.77	L1	OFF	19.6
6.749250	---	29.95	50.00	20.05	L1	OFF	19.6
6.749250	43.70	---	60.00	16.30	L1	OFF	19.6
13.560000	---	40.73	50.00	9.27	L1	OFF	19.7
13.560000	53.97	---	60.00	6.03	L1	OFF	19.7

EUT Information

Report NO : 720610-11
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.168000	---	35.41	55.06	19.65	N	OFF	19.5
0.168000	47.67	---	65.06	17.39	N	OFF	19.5
0.233250	---	35.52	52.33	16.81	N	OFF	19.5
0.233250	44.03	---	62.33	18.30	N	OFF	19.5
0.303000	---	26.61	50.16	23.55	N	OFF	19.5
0.303000	39.26	---	60.16	20.90	N	OFF	19.5
0.426750	---	27.02	47.32	20.30	N	OFF	19.5
0.426750	41.87	---	57.32	15.45	N	OFF	19.5
0.458250	---	28.05	46.72	18.67	N	OFF	19.5
0.458250	44.55	---	56.72	12.17	N	OFF	19.5
0.539250	---	30.08	46.00	15.92	N	OFF	19.5
0.539250	47.58	---	56.00	8.42	N	OFF	19.5
0.676500	---	26.94	46.00	19.06	N	OFF	19.5
0.676500	43.73	---	56.00	12.27	N	OFF	19.5
0.759750	---	27.58	46.00	18.42	N	OFF	19.5
0.759750	44.54	---	56.00	11.46	N	OFF	19.5
0.874500	---	28.07	46.00	17.93	N	OFF	19.5
0.874500	46.78	---	56.00	9.22	N	OFF	19.5
1.020750	---	27.23	46.00	18.77	N	OFF	19.5
1.020750	43.90	---	56.00	12.10	N	OFF	19.5
1.331250	---	27.38	46.00	18.62	N	OFF	19.5

1.331250	44.91	---	56.00	11.09	N	OFF	19.5
1.639500	---	28.01	46.00	17.99	N	OFF	19.6
1.639500	45.74	---	56.00	10.26	N	OFF	19.6
1.952250	---	29.24	46.00	16.76	N	OFF	19.6
1.952250	45.86	---	56.00	10.14	N	OFF	19.6
2.604750	---	30.42	46.00	15.58	N	OFF	19.5
2.604750	45.03	---	56.00	10.97	N	OFF	19.5
3.579000	---	35.71	46.00	10.29	N	OFF	19.6
3.579000	51.28	---	56.00	4.72	N	OFF	19.6
3.662250	---	35.33	46.00	10.67	N	OFF	19.6
3.662250	51.12	---	56.00	4.88	N	OFF	19.6
6.488250	---	29.62	50.00	20.38	N	OFF	19.6
6.488250	43.72	---	60.00	16.28	N	OFF	19.6
13.560000	---	41.07	50.00	8.93	N	OFF	19.8
13.560000	54.32	---	60.00	5.68	N	OFF	19.8



Appendix C. Radiated Spurious Emission

Test Engineer :	Watt Tseng, Karl Hou, and Nick Yu	Temperature :	23~25°C
		Relative Humidity :	61~65%



Band 4 - 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 157 5785MHz		5610.4	59	-9.2	68.2	47.64	32.14	10.43	31.21	218	64	P	H
		5670.2	55.84	-27.35	83.19	44.35	32.24	10.48	31.23	218	64	P	H
		5715.8	57.7	-51.93	109.63	46.16	32.29	10.51	31.26	218	64	P	H
		5721.8	60.08	-54.82	114.9	48.51	32.31	10.52	31.26	218	64	P	H
	*	5788	115.04	-	-	103.35	32.41	10.57	31.29	218	64	P	H
	*	5788	103.9	-	-	92.21	32.41	10.57	31.29	218	64	A	H
		5850.2	58.61	-63.13	121.74	46.83	32.48	10.62	31.32	218	64	P	H
		5859.2	60.49	-49.13	109.62	48.69	32.51	10.62	31.33	218	64	P	H
		5887.2	58.32	-37.82	96.14	46.48	32.53	10.65	31.34	218	64	P	H
		5933	56.26	-11.94	68.2	44.33	32.6	10.68	31.35	218	64	P	H
													H
													H
		5610.8	57.17	-11.03	68.2	45.81	32.14	10.43	31.21	101	2	P	V
		5684.8	56.63	-37.36	93.99	45.12	32.27	10.49	31.25	101	2	P	V
		5714.4	55.77	-53.46	109.23	44.23	32.29	10.51	31.26	101	2	P	V
		5722.4	54.27	-62	116.27	42.7	32.31	10.52	31.26	101	2	P	V
	*	5785	112.04	-	-	100.37	32.39	10.57	31.29	101	2	P	V
	*	5785	100.97	-	-	89.3	32.39	10.57	31.29	101	2	A	V
		5851.2	57.29	-62.17	119.46	45.51	32.48	10.62	31.32	101	2	P	V
		5863.4	56.3	-52.15	108.45	44.49	32.51	10.63	31.33	101	2	P	V
		5883.2	54.34	-44.77	99.11	42.5	32.53	10.64	31.33	101	2	P	V
		5947.2	54.57	-13.63	68.2	42.62	32.63	10.69	31.37	101	2	P	V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 157 5785MHz		11570	49.41	-24.59	74	49.23	39.93	16.55	56.3	100	0	P	H
		17355	54.58	-13.62	68.2	48.55	41.96	20.88	56.81	100	0	P	H
													H
													H
		11570	48.62	-25.38	74	48.44	39.93	16.55	56.3	100	0	P	V
		17355	51.09	-17.11	68.2	45.06	41.96	20.88	56.81	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

5GHz WIFI 802.11n HT20 (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11n HT20 LF		63.21	27.09	-12.91	40	44.65	12.18	0.72	30.46	-	-	P	H
		200.37	38.95	-4.55	43.5	51.88	16.12	1.27	30.32	100	0	P	H
		250.32	32.6	-13.4	46	42.59	18.8	1.44	30.23	-	-	P	H
		550.6	28.31	-17.69	46	31.17	24.82	2.02	29.7	-	-	P	H
		801.2	38.77	-7.23	46	37.53	28.11	2.42	29.29	-	-	P	H
		934.9	33.34	-12.66	46	29.91	29.78	2.69	29.04	-	-	P	H
													H
													H
													H
													H
													H
													H
		31.89	33.32	-6.68	40	38.05	25.04	0.44	30.21	100	0	P	V
		88.59	29.61	-13.89	43.5	44.53	14.7	0.82	30.44	-	-	P	V
		200.37	31.79	-11.71	43.5	44.72	16.12	1.27	30.32	-	-	P	V
		650.7	30.69	-15.31	46	31.98	26.11	2.17	29.57	-	-	P	V
		801.2	36.56	-9.44	46	35.32	28.11	2.42	29.29	-	-	P	V
		981.8	33.72	-20.28	54	29.89	29.97	2.76	28.9	-	-	P	V
													V
													V
												V	
												V	
												V	
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
 = 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
 = 55.45 (dBμV/m)
2. Over Limit(dB)
 = Level(dBμV/m) – Limit Line(dBμV/m)
 = 55.45(dBμV/m) – 74(dBμV/m)
 = -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
 = 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
 = 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)
 = 43.54(dBμV/m) – 54(dBμV/m)
 = -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



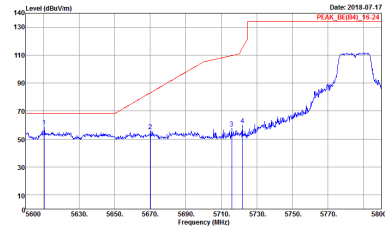
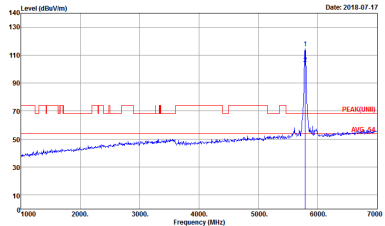
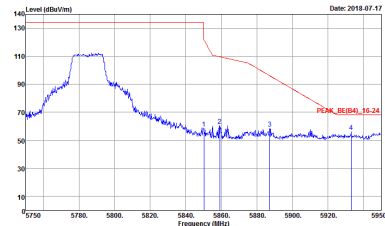
Appendix D. Radiated Spurious Emission Plots

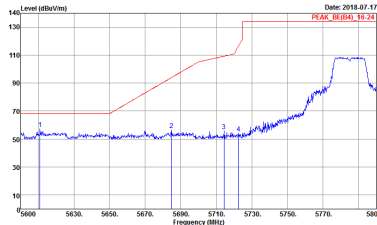
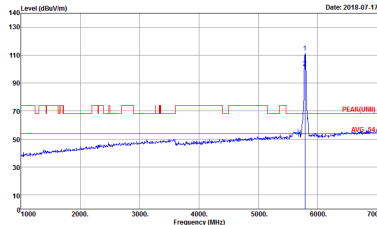
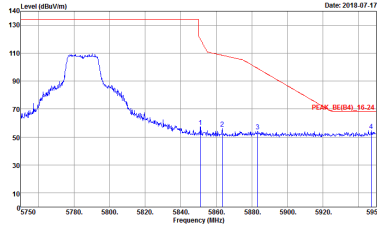
Test Engineer :	Watt Tseng, Karl Hou, and Nick Yu	Temperature :	23~25°C
		Relative Humidity :	61~65%

Note symbol

-L	Low channel location
-R	High channel location

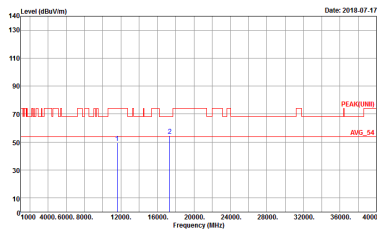
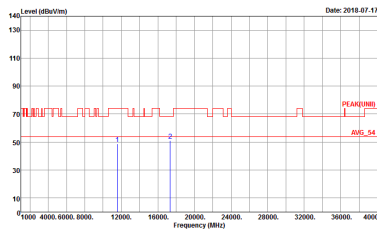
Band 4 - 5725~5850MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 720610-11 Mode : 30 Setting : 20.5	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 720610-11 Mode : 30 Setting : 20.5
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 720610-11 Mode : 30 Setting : 20.5	Left blank

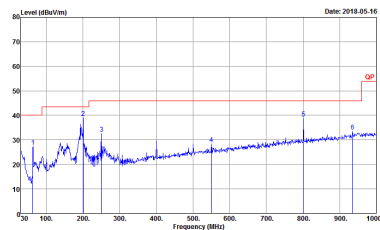
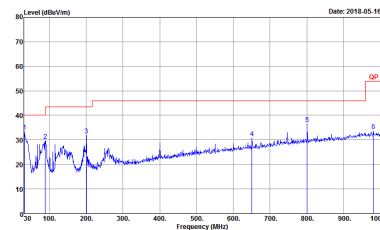
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Project : 720610-11 Mode : 30 Setting : 20.5	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Project : 720610-11 Mode : 30 Setting : 20.5
	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Project : 720610-11 Mode : 30 Setting : 20.5	Left blank



Band 4 - 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 720610-11 Mode : 30 Setting : 20.5	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 720610-11 Mode : 30 Setting : 20.5

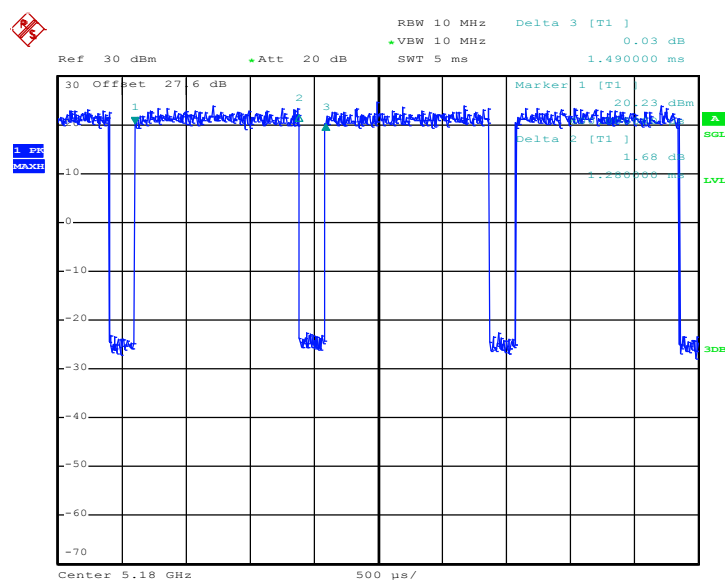
Emission below 1GHz
5GHz WIFI 802.11n HT20 (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak	 Site : 03CH12-HY Condition : QP 3m BIL06_6110_47020606 HORIZONTAL Detector : Peak Project : 720610-11 Mode : 35	 Site : 03CH12-HY Condition : QP 3m BIL06_6110_47020606 VERTICAL Detector : Peak Project : 720610-11 Mode : 35

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
5GHz 802.11n HT20	85.91	1280	0.78	1kHz	0.66

802.11n HT20



Date: 28.APR.2018 18:29:21