FCC RADIO TEST REPORT

FCC ID	:	ACJFZA3A
Equipment	:	Tablet Computer
Brand Name	:	Panasonic
Model Name	:	FZ-A3
Marketing Name	:	FZ-A3
Applicant	:	Panasonic Corporation of North America Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490
Manufacturer	:	Panasonic Mobile Communications Co., Ltd. 600 Saedo-cho, Tsuzuki-ku, Yokohama City 224-8539, Japan
Standard	:	FCC Part 15 Subpart E §15.407

The product was received on May 19, 2020 and testing was started from May 28, 2020 and completed on Jun. 19, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, 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.

Louis Wu

Approved by: Louis Wu

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
FR992410-06B	01	Initial issue of report	Jun. 17, 2020
FR992410-06B	02	Remove sample list	Jun. 18, 2020
FR992410-06B	03	Add conducted power	Jun. 23, 2020
FR992410-06B	04	Revising antenna information.	Jun. 30, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403(i)	26dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.407(a)	Maximum Conducted Output Power	Pass	-
-	15.407(a)	Power Spectral Density	Not Required	-
3.2	15.407(b)	Unwanted Emissions	Pass	Under limit 3.08 dB at 5727.800 MHz
3.3	15.207	AC Conducted Emission	Pass	Under limit 4.41 dB at 13.560 MHz
-	15.407(c)	Automatically Discontinue Transmission	Not Required	-
3.1	15.203 15.407(a)	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.

2. This is a variant report by adding Vehicle Dock and External Antenna. All the test cases were performed on original report which can be referred to Sporton Report Number FR992410-01E. Based on the original report, the test cases were verified.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Cindy Liu

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/ac, NFC, and GNSS.

Product Specification subjective to this standard	
Antenna Type	WLAN: **<Ant. 0>** Monopole Antenna **<Ant. 1>** Monopole Antenna Bluetooth: **<Ant. 0>** Monopole Antenna GNSS: Monopole Antenna NFC: Loop Antenna

Accessories Information		
AC Adapter	**Brand Name**	Panasonic
	Model Name	CF-AA6413A
Battery 1 (Small)	**Brand Name**	Panasonic
	Model Name	FZ-VZSUT10U
Battery 2 (Large)	**Brand Name**	Panasonic
	Model Name	FZ-VZSUT11U
USB Cable 1	**Brand Name**	Panasonic
	Model Name	K1HY24YY0021
USB Cable 2	**Brand Name**	ELECOM
	Model Name	USB3-AC10BK
Gadget 1 (2nd USB)	**Brand Name**	Panasonic
	Model Name	N/A
Gadget 2 (BCR)	**Brand Name**	Panasonic
	Model Name	N/A
Cradle	**Brand Name**	Panasonic
	Model Name	FZ-VEBA21U
Shoulder Strap	**Brand Name**	Panasonic
	Model Name	CF-VNS331U
Stylus Pen	**Brand Name**	Panasonic
	Model Name	CF-VNP025U
Vehicle Dock	**Brand Name**	Havis
	Model Name	DS-PAN-1401-2
External antenna (Cellular+2.4G)	**Brand Name**	Airgain
	Model Name	AP-PAN-MMF-C-Q-BL

Remark: The WLAN external antenna can only be connected to the WLAN ant 1 external antenna port of EUT.

1.2 Modification of EUT

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

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
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. EMC & Wireless Communications Laboratory
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.**
	03CH11-HY

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

FCC designation No.: TW1190 and TW0007

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:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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 (X 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)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122#	5610	128	5640

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138#	5690	144	5720
	142*	5710		

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

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

<Ant. 1>

Modulation	Data Rate
802.11a	**6 Mbps**
802.11n HT20	**MCS0**
802.11n HT40	**MCS0**
802.11ac VHT80	**MCS0**

Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Link + WALN (5GHz) Link + Battery 1 + Earphone + Adapter connect to Docking + MPEG4 (Color bar) + NFC On + USB 2.0 data link with USB Flash Drive (USB Flash Drive to SD Card) + WLAN External Antenna connect to Docking + GPS External Antenna connect to Docking + SD Card + Stylus Pen + Docking (USB link with USB Flash Drive (SD Card to USB Flash Drive) + RJ45 (Load)
Remark: For Radiated Test Cases, the tests were performed with Battery 1.	

Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz
		802.11ac VHT80	802.11n HT40
L	Low	-	-
M	Middle	42	-
H	High	-	62

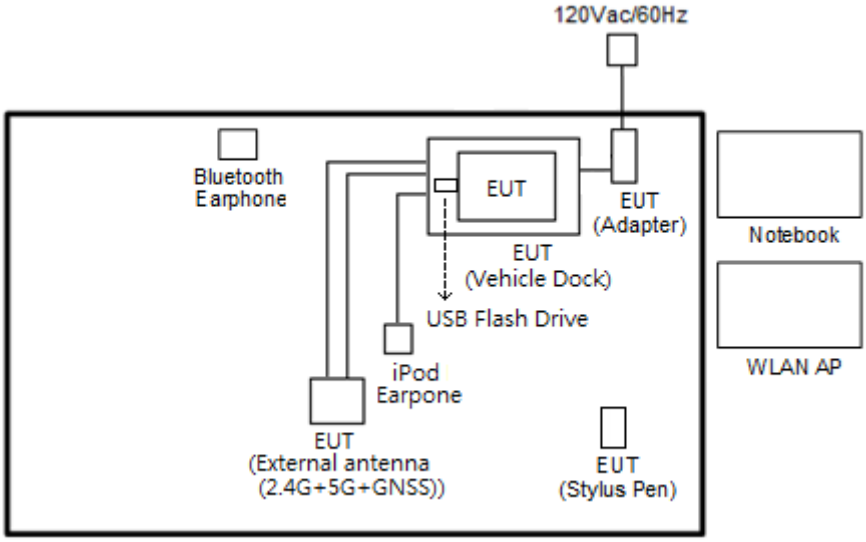
Ch. #		Band III：5470-5725MHz	Band III：5470-5725MHz
		802.11a	802.11n HT20
L	Low	-	-
M	Middle	-	-
H	High	140	140

Remark:

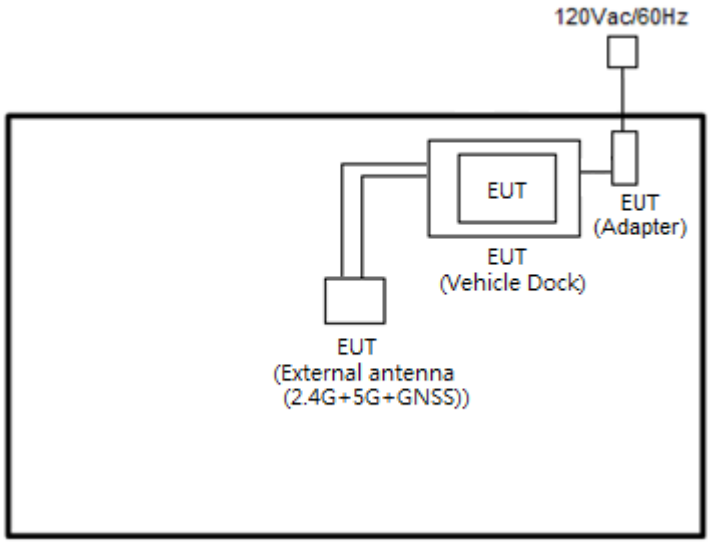
1. For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.
2. 2X2 MIMO with 2 internal antennas documented in original report is considered as the worst case because they have higher antenna gain than the configuration of Ant0 internal antenna + Ant 1 external antenna reported in this C2PC filing. Therefore, this C2PC test was performed with SISO mode with the added external antenna against the worst case raised in original report.

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<WLAN Tx Mode>



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.	Notebook	DELL	Latitude E5480	FCC DoC	N/A	AC I/P： Unshielded, 1.2m DC O/P： Shielded, 1.8m
4.	USB Flash Drive	Kingston	DTDUO3C/32G	FCC DoC	N/A	N/A
5.	USB Flash Drive	ADATA	C906	FCC DoC	N/A	N/A
6.	USB Flash Drive	Transcend	C21002	FCC DoC	N/A	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
8.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT v4.0-00156” 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

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

■ For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For the 5.25–5.725 GHz bands:

■ The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

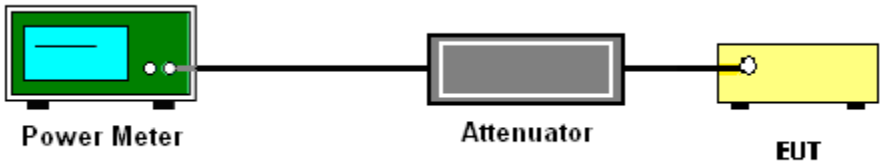
The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(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.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/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) Sections 15.407(b)(1-3) specifies the unwanted emissions limit 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.

(ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

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 Peak Unwanted Emissions Measurements Above 1000 MHz

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

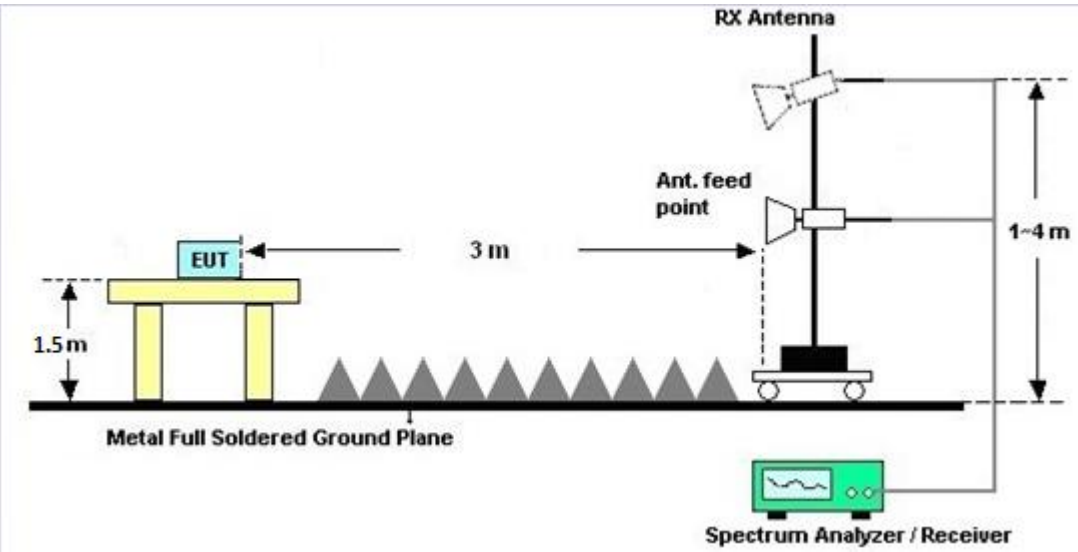
(2) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW ≥ 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 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 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 above 1GHz



3.2.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.6 Duty Cycle

Please refer to Appendix E.

3.2.7 Test Result of Radiated Spurious Emissions

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.

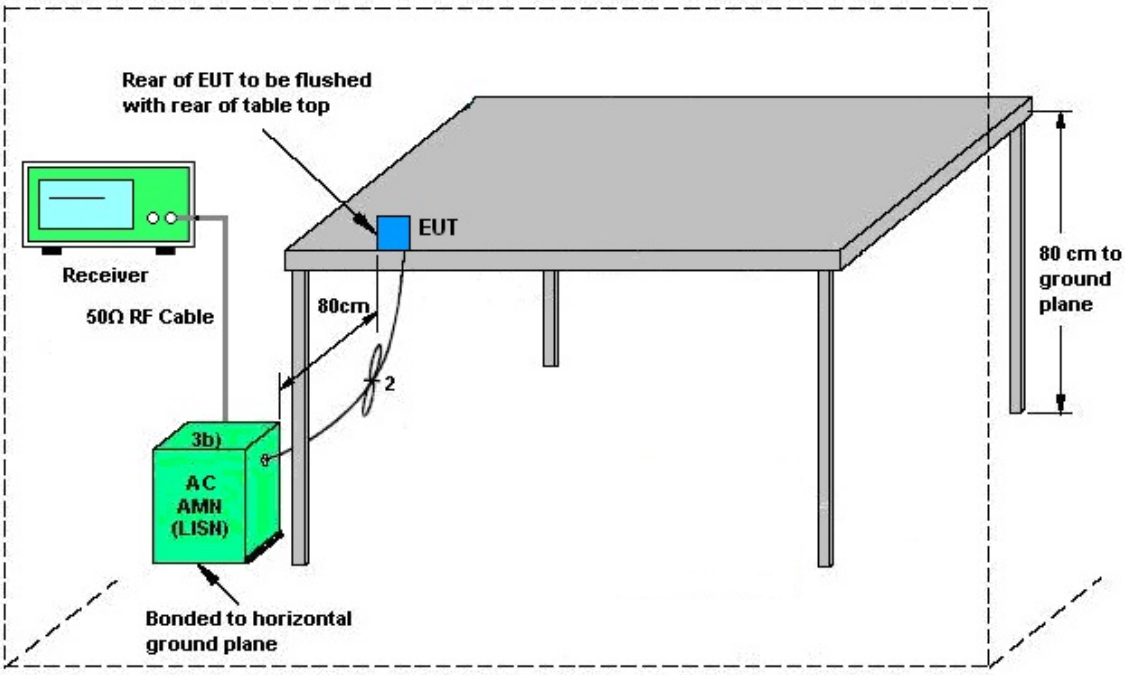
3.3.2 Measuring Instruments

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



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.4 Antenna Requirements

3.4.1 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.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 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
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	May 28, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	May 28, 2020	Nov. 14, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	May 28, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	May 28, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	May 28, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	May 28, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Preamplifier	EMCE	EM18G40G	060715	18GHz ~ 40GHz	Dec. 13, 2019	Jun. 05, 2020 ~ Jun. 12, 2020	Dec. 12, 2020	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 13, 2019	Jun. 05, 2020 ~ Jun. 12, 2020	Nov. 12, 2020	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55303K	1710001800054002	1GHz~18GHz	Feb. 07, 2020	Jun. 05, 2020 ~ Jun. 12, 2020	Feb. 06, 2021	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz- 40GHz	May 22, 2020	Jun. 05, 2020 ~ Jun. 12, 2020	May 21, 2021	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Nov. 04, 2019	Jun. 05, 2020 ~ Jun. 12, 2020	Nov. 03, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 28, 2019	Jun. 05, 2020 ~ Jun. 12, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Jun. 05, 2020 ~ Jun. 12, 2020	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Jun. 05, 2020 ~ Jun. 12, 2020	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jun. 05, 2020 ~ Jun. 12, 2020	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Jun. 05, 2020 ~ Jun. 12, 2020	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 12, 2020	Jun. 05, 2020 ~ Jun. 12, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 12, 2020	Jun. 05, 2020 ~ Jun. 12, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 12, 2020	Jun. 05, 2020 ~ Jun. 12, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40SS	SN3	6.75GHz High Pass Filter	Sep. 16, 2019	Jun. 05, 2020 ~ Jun. 12, 2020	Sep. 15, 2020	Radiation (03CH11-HY)
Hygrometer	Testo	608-H2	34893241	N/A	Mar. 02, 2020	Jun. 19, 2020	Mar. 01, 2021	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	13I00030SNO31	10MHz~6GHz	Jan. 22, 2020	Jun. 19, 2020	Jan. 21, 2021	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Jun. 19, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Aug. 14, 2019	Jun. 19, 2020	Aug. 13, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1208382	N/A	Aug. 15, 2019	Jun. 19, 2020	Aug. 14, 2020	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.3**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.3**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Owen Yang	Temperature:	22~25	°C
Test Date:	2020/6/19	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

FCC Band I single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 0	Ant 1	SUM	Ant 0	Ant 1	Ant 0	Ant 1		
VHT80	MCS0	1	42	5210	9.60	9.60		24.00	24.00	2.00	0.70		Pass

TEST RESULTS DATA
Average Power Table

FCC Band II single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 0	Ant 1	SUM	Ant 0	Ant 1	Ant 0	Ant 1		
HT40	MCS0	1	62	5310	9.20	9.30		23.98	23.98	2.00	0.70	26.99	Pass

TEST RESULTS DATA
Average Power Table

FCC Band III single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 0	Ant 1	SUM	Ant 0	Ant 1	Ant 0	Ant 1		
11a	6Mbps	1	100	5500	12.00	11.90		23.98	23.98	2.00	0.70	26.99	Pass
11a	6Mbps	1	140	5700	11.20	11.00		23.98	23.98	2.00	0.70	26.99	Pass
HT20	MCS0	1	140	5700	9.20	9.10		23.98	23.98	2.00	0.70	26.99	Pass
HT40	MCS0	1	102	5510	12.60	13.00		23.98	23.98	2.00	0.70	26.99	Pass

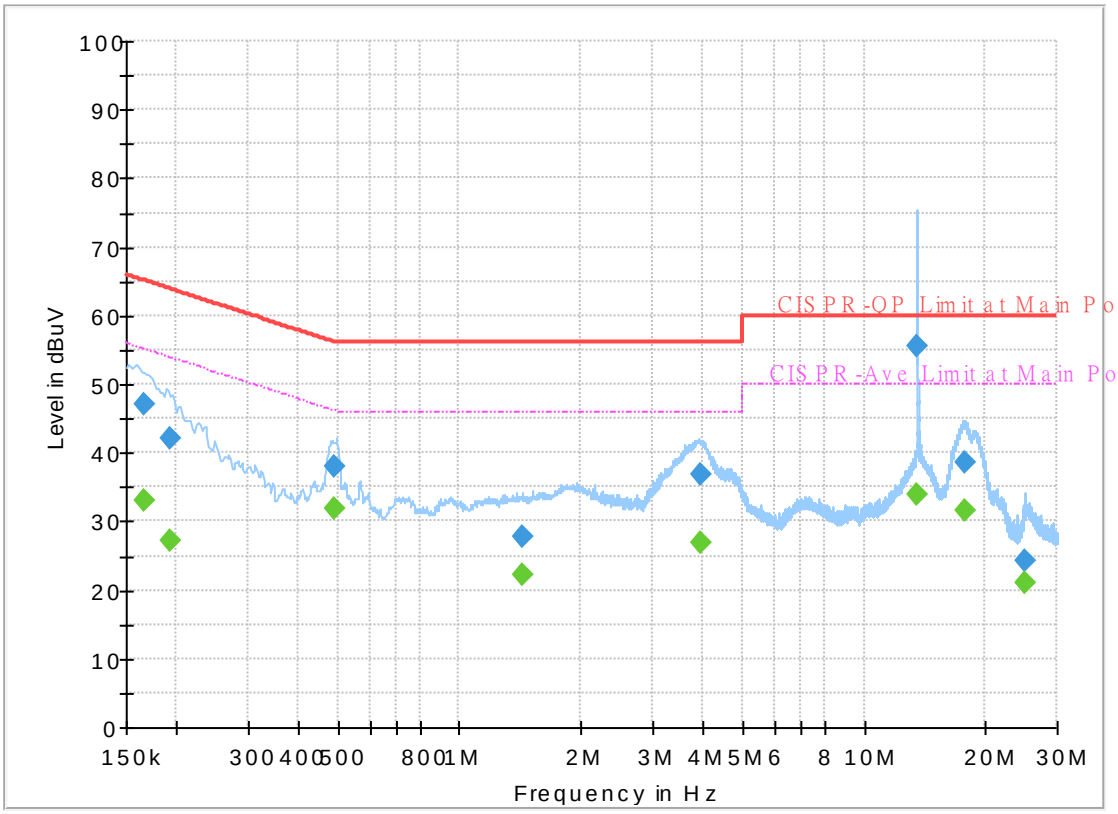
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Howard Huang	**Temperature :**	21~25℃
		Relative Humidity :	40~45%

EUT Information

Report NO :	992410-06
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



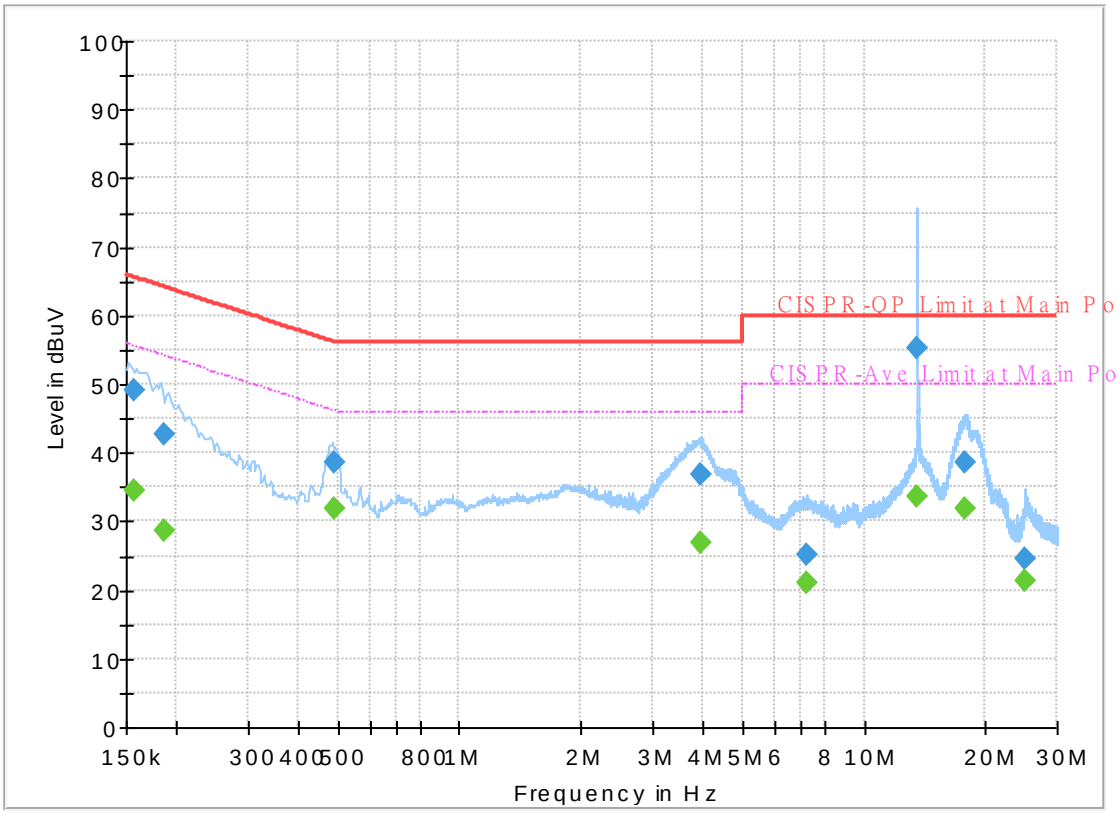
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.165750	---	33.01	55.17	22.16	L1	OFF	19.5
0.165750	46.98	---	65.17	18.19	L1	OFF	19.5
0.192750	---	27.20	53.92	26.72	L1	OFF	19.5
0.192750	42.16	---	63.92	21.76	L1	OFF	19.5
0.492000	---	31.75	46.13	14.38	L1	OFF	19.5
0.492000	38.02	---	56.13	18.11	L1	OFF	19.5
1.430250	---	22.25	46.00	23.75	L1	OFF	19.6
1.430250	27.69	---	56.00	28.31	L1	OFF	19.6
3.945750	---	26.76	46.00	19.24	L1	OFF	19.6
3.945750	36.93	---	56.00	19.07	L1	OFF	19.6
13.560000	---	33.88	50.00	16.12	L1	OFF	19.8
13.560000	55.59	---	60.00	4.41	L1	OFF	19.8
17.696400	---	31.61	50.00	18.39	L1	OFF	19.8
17.696400	38.55	---	60.00	21.45	L1	OFF	19.8
24.990720	---	21.13	50.00	28.87	L1	OFF	19.8
24.990720	24.23	---	60.00	35.77	L1	OFF	19.8

EUT Information

Report NO :	992410-06
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.156750	---	34.39	55.63	21.24	N	OFF	19.5
0.156750	49.07	---	65.63	16.56	N	OFF	19.5
0.186000	---	28.69	54.21	25.52	N	OFF	19.5
0.186000	42.82	---	64.21	21.39	N	OFF	19.5
0.489750	---	31.99	46.17	14.18	N	OFF	19.5
0.489750	38.46	---	56.17	17.71	N	OFF	19.5
3.930000	---	26.95	46.00	19.05	N	OFF	19.6
3.930000	36.92	---	56.00	19.08	N	OFF	19.6
7.219320	---	21.13	50.00	28.87	N	OFF	19.8
7.219320	25.22	---	60.00	34.78	N	OFF	19.8
13.560000	---	33.56	50.00	16.44	N	OFF	19.9
13.560000	55.34	---	60.00	4.66	N	OFF	19.9
17.711700	---	31.81	50.00	18.19	N	OFF	19.9
17.711700	38.66	---	60.00	21.34	N	OFF	19.9
24.987570	---	21.49	50.00	28.51	N	OFF	20.0
24.987570	24.61	---	60.00	35.39	N	OFF	20.0

Appendix C. Radiated Spurious Emission

Test Engineer :	Cookie Ku, Fu Chen and Troye Hsieh	**Temperature :**	19.1 ~ 24.9°C
		Relative Humidity :	56.7 ~ 68.9%

Band 1 - 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac VHT80 CH 42 5210MHz		5147.9	58.01	-15.99	74	49.07	31.8	9.96	32.82	150	298	P	H
		5149.94	50.53	-3.47	54	41.57	31.8	9.97	32.81	150	298	A	H
	*	5210	95.25	-	-	86.5	31.48	10.05	32.78	150	298	P	H
	*	5210	87.97	-	-	79.22	31.48	10.05	32.78	150	298	A	H
		5406.96	49.63	-24.37	74	40.47	31.61	10.2	32.65	150	298	P	H
		5452.72	42.4	-11.6	54	33.08	31.71	10.23	32.62	150	298	A	H
		5140.42	51.86	-22.14	74	42.93	31.8	9.95	32.82	100	299	P	V
		5145.18	44.08	-9.92	54	35.14	31.8	9.96	32.82	100	299	A	V
	*	5210	88.11	-	-	79.36	31.48	10.05	32.78	100	299	P	V
	*	5210	80.56	-	-	71.81	31.48	10.05	32.78	100	299	A	V
		5451.42	48.64	-25.36	74	39.32	31.71	10.23	32.62	100	299	P	V
		5452.72	40.99	-13.01	54	31.67	31.71	10.23	32.62	100	299	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT80 (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)
		10420	47.12	-21.08	68.2	51.96	39.98	17.44	62.26	100	0	P	H
		15630	43.7	-30.3	74	45.08	37.51	21.6	60.49	100	0	P	H
802.11ac													H
VHT80													H
CH 42		10420	46.54	-21.66	68.2	51.38	39.98	17.44	62.26	100	0	P	V
5210MHz		15630	43.27	-30.73	74	44.65	37.51	21.6	60.49	100	0	P	V
													V
													V

Remark	
	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.

Band 2 - 5250~5350MHz

WIFI 802.11n HT40 (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 HT40 CH 62 5310MHz		5045.22	51.77	-22.23	74	43.35	31.48	9.82	32.88	144	301	P	H
		5137.02	42.64	-11.36	54	33.71	31.8	9.95	32.82	144	301	A	H
	*	5310	109.2	-	-	100.41	31.38	10.12	32.71	144	301	P	H
	*	5310	101.39	-	-	92.6	31.38	10.12	32.71	144	301	A	H
		5361.36	61.57	-12.43	74	52.72	31.37	10.16	32.68	144	301	P	H
		5350.56	50.43	-3.57	54	41.67	31.3	10.15	32.69	144	301	A	H
		5133.28	51.43	-22.57	74	42.51	31.8	9.94	32.82	100	300	P	V
		5095.88	41.97	-12.03	54	33.15	31.78	9.89	32.85	100	300	A	V
	*	5310	100.94	-	-	92.15	31.38	10.12	32.71	100	300	P	V
	*	5310	93.38	-	-	84.59	31.38	10.12	32.71	100	300	A	V
		5356.32	52.38	-21.62	74	43.56	31.34	10.16	32.68	100	300	P	V
		5352.96	43.41	-10.59	54	34.62	31.32	10.15	32.68	100	300	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 5250~5350MHz

WIFI 802.11n HT40 (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)
		10620	45.74	-28.26	74	50.87	39.86	17.46	62.45	100	0	P	H
		15930	42.18	-31.82	74	43.83	36.84	21.52	60.01	100	0	P	H
802.11n													H
HT40													H
CH 62		10620	46.42	-27.58	74	51.55	39.86	17.46	62.45	100	0	P	V
5310MHz		15930	42.83	-31.17	74	44.48	36.84	21.52	60.01	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11a (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)
802.11a CH 140 5700MHz	*	5700	112.18	-	-	102.16	32.1	10.45	32.53	208	306	P	H
	*	5700	104.44	-	-	94.42	32.1	10.45	32.53	208	306	A	H
		5727.8	65.12	-3.08	68.2	55.01	32.16	10.48	32.53	208	306	P	H
													H
													H
													H
	*	5700	104.52	-	-	94.5	32.1	10.45	32.53	100	347	P	V
	*	5700	96.57	-	-	86.55	32.1	10.45	32.53	100	347	A	V
		5739.96	58.97	-9.23	68.2	48.82	32.18	10.49	32.52	100	347	P	V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11a (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)
802.11a CH 140 5700MHz		11440	49.29	-24.71	74	53.99	39.66	17.98	62.34	100	0	P	H
		17100	48.23	-19.97	68.2	44.58	39.7	22.67	58.72	100	0	P	H
													H
													H
		11400	49.66	-24.34	74	54.39	39.7	17.93	62.36	100	0	P	V
		17100	48.89	-19.31	68.2	45.24	39.7	22.67	58.72	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11n20 (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)
802.11n20 CH 140 5700MHz	*	5700	111.77	-	-	101.75	32.1	10.45	32.53	156	305	P	H
	*	5700	104.36	-	-	94.34	32.1	10.45	32.53	156	305	A	H
		5737	65.06	-3.14	68.2	54.92	32.17	10.49	32.52	156	305	P	H
													H
													H
													H
	*	5700	100.29	-	-	90.27	32.1	10.45	32.53	100	280	P	V
	*	5700	92.93	-	-	82.91	32.1	10.45	32.53	100	280	A	V
		5729.56	55.04	-13.16	68.2	44.93	32.16	10.48	32.53	100	280	P	V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11n20 (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)
802.11n20 CH 140 5700MHz		11400	49.09	-24.91	74	53.82	39.7	17.93	62.36	100	0	P	H
		17100	48.56	-19.64	68.2	44.91	39.7	22.67	58.72	100	0	P	H
													H
													H
		11400	48.39	-25.61	74	53.12	39.7	17.93	62.36	100	0	P	V
		17100	49.51	-18.69	68.2	45.86	39.7	22.67	58.72	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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

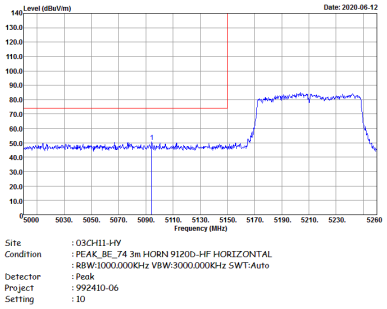
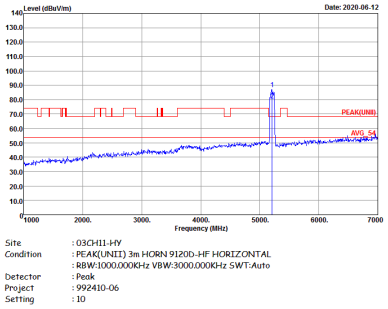
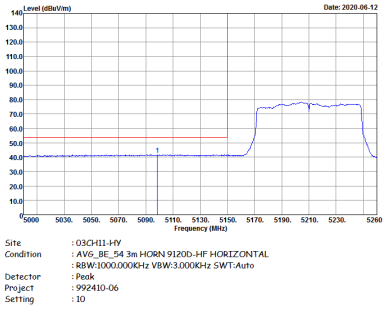
Test Engineer :	Cookie Ku, Fu Chen and Troye Hsieh	**Temperature :**	19.1 ~ 24.9°C
		Relative Humidity :	56.7 ~ 68.9%

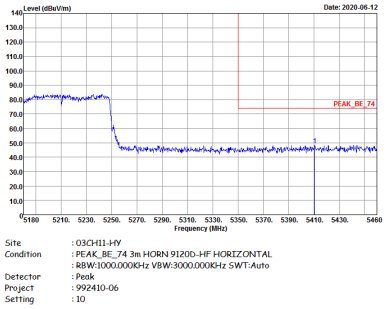
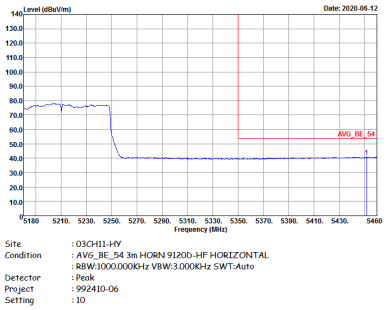
Note symbol

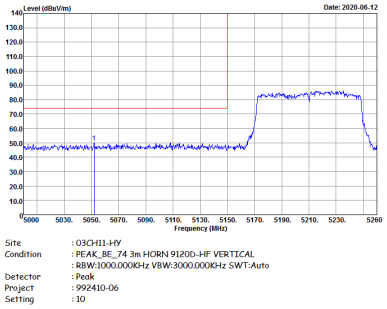
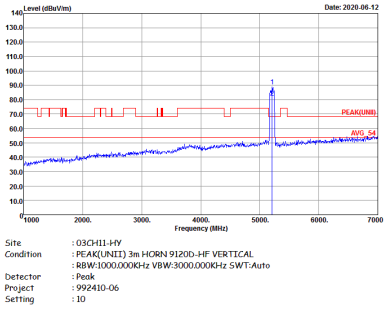
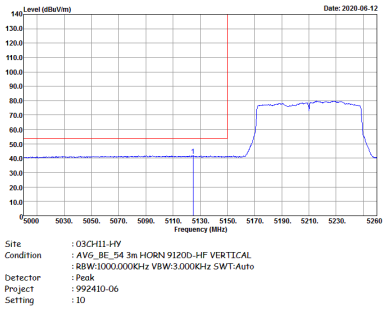
-L	**Low channel location**
-R	**High channel location**

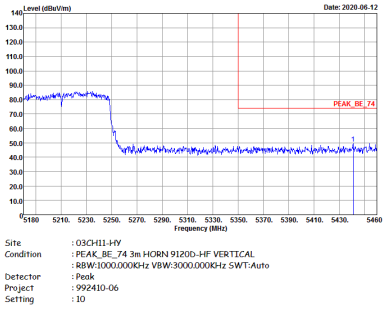
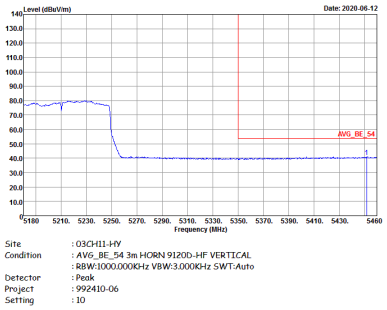
Band 1 - 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
1	Horizontal	Fundamental
Peak		
Avg.		Left blank

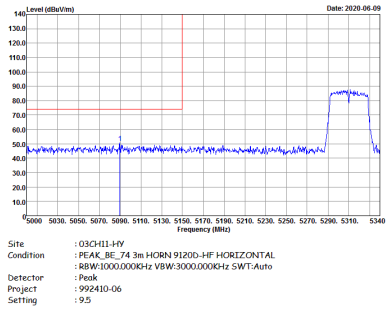
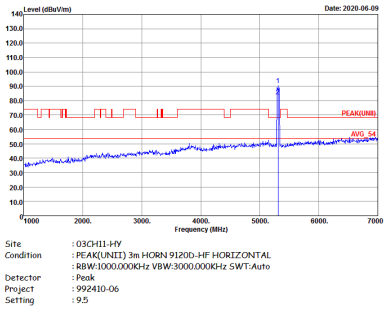
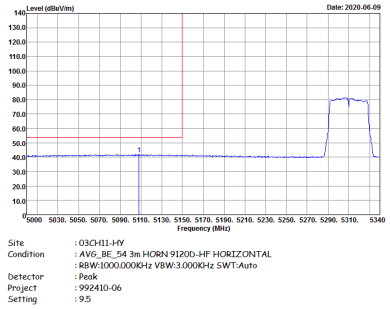
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
1	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

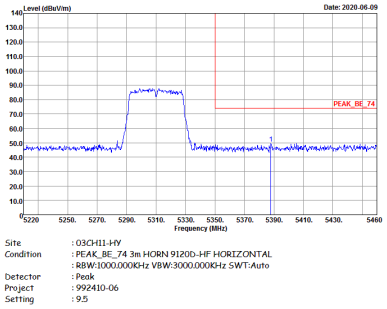
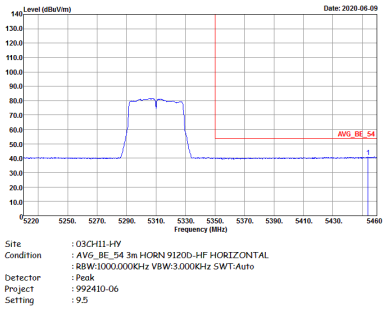
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
1	Vertical	Fundamental
Peak		
Avg.		Left blank

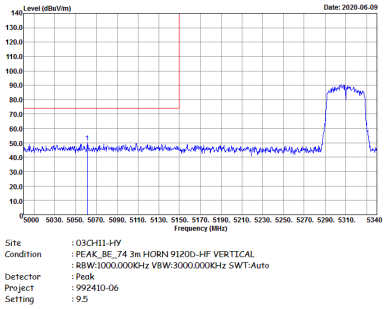
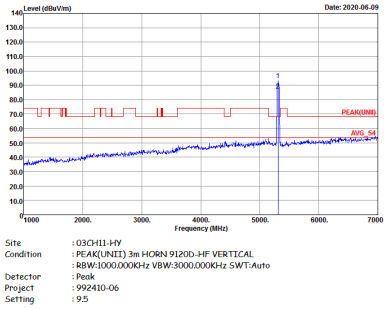
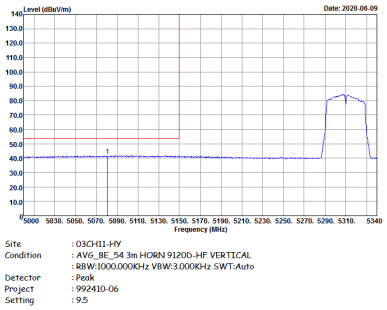
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
1	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

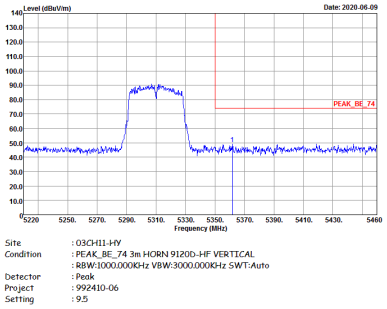
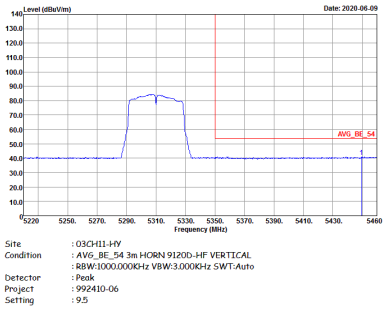
Band 2 - 5250~5350MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - L	
1	Horizontal	Fundamental
Peak		
Avg.		Left blank

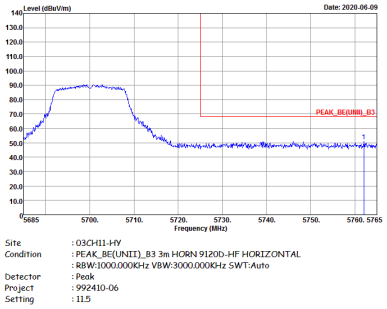
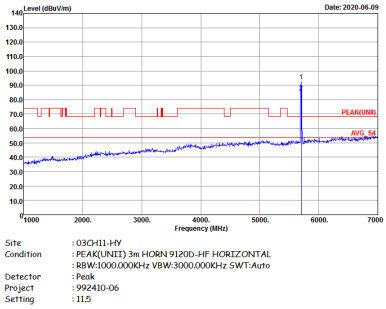
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - R	
1	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

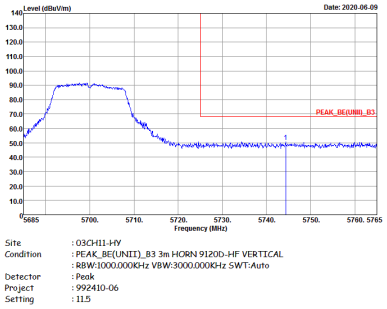
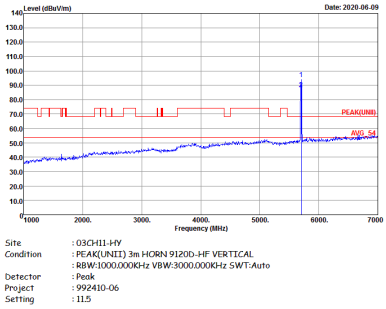
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - L	
1	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - R	
1	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

Band 3 - 5470~5725MHz

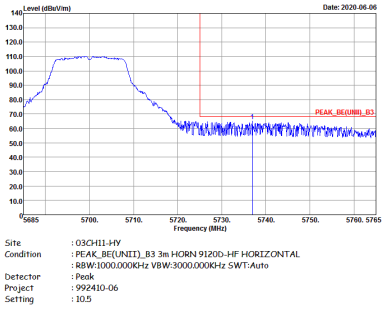
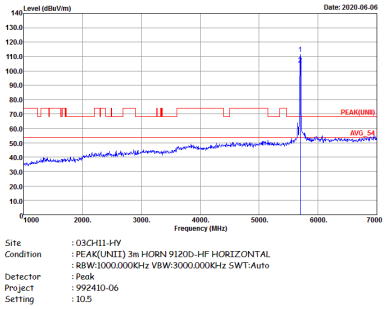
WIFI 802.11a (Band Edge @ 3m)

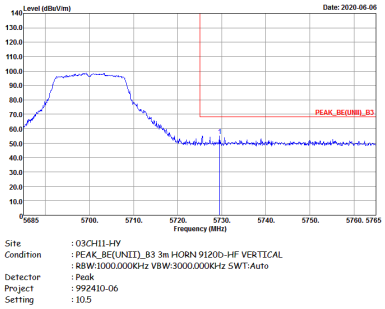
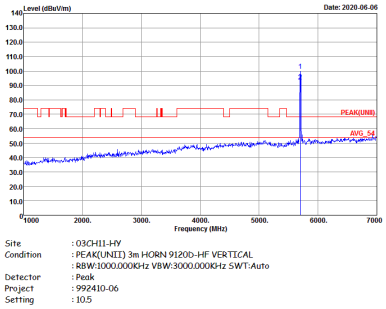
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11a CH140 5700MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11a CH140 5700MHz	
1	Vertical	Fundamental
Peak.		

Band 3 - 5470~5725MHz

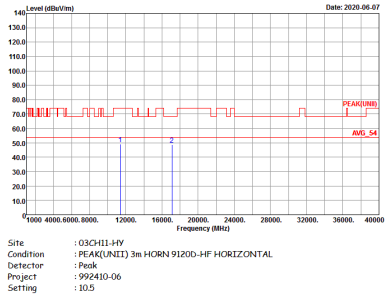
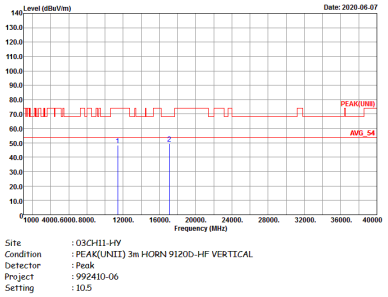
WIFI 802.11n20 (Band Edge @ 3m)

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n20 CH140 5700MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n20 CH140 5700MHz	
1	Vertical	Fundamental
Peak		

Band 3 - 5470~5725MHz

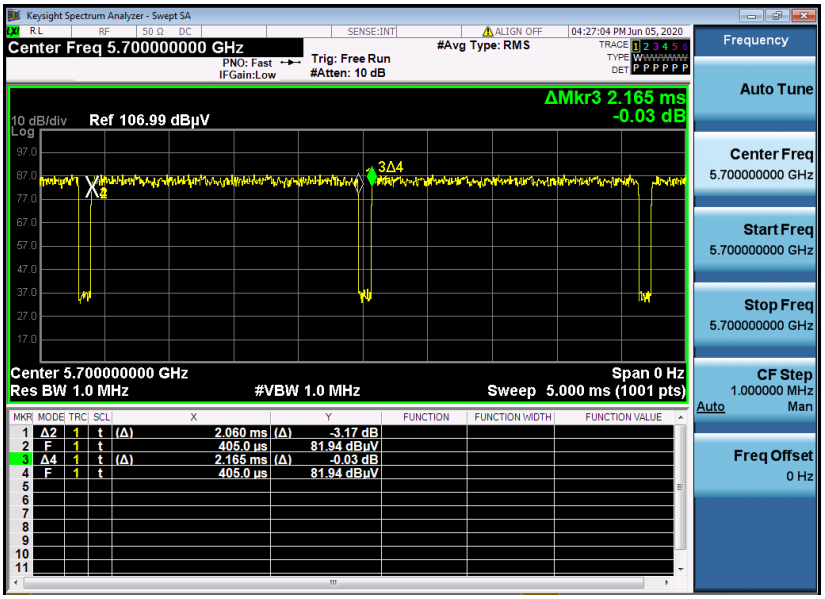
WIFI 802.11n20 (Harmonic @ 3m)

WIFI	Band 3 5470~5725MHz Harmonic @ 3m	
ANT	802.11n20 CH140 5700MHz	
1	Horizontal	Vertical
Peak Avg.		

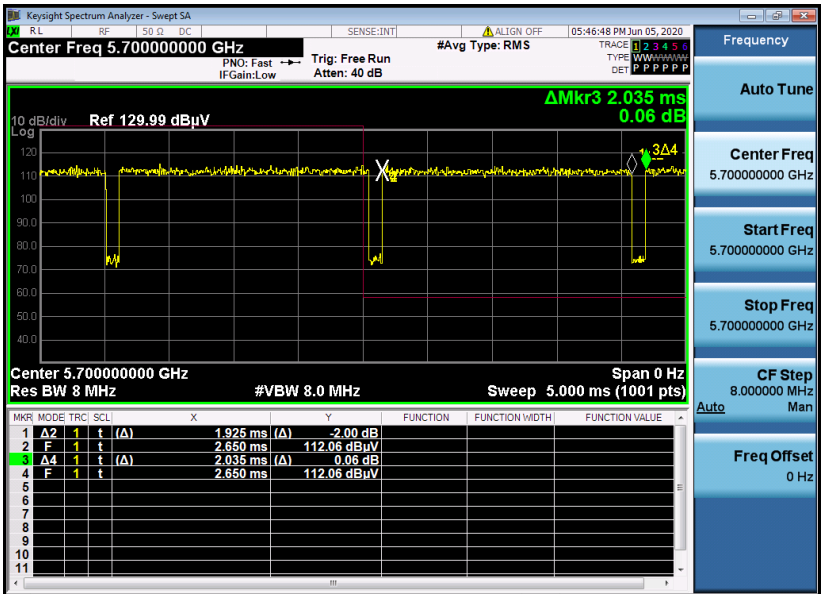
Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1	802.11a	95.15	2060	0.49	1kHz	0.22
1	5GHz 802.11n HT20	94.59	1925	0.52	1kHz	0.24
1	5GHz 802.11n HT40	91.33	948	1.05	3kHz	0.39
1	5GHz 802.11ac VHT80	84.12	463	2.16	3kHz	0.75

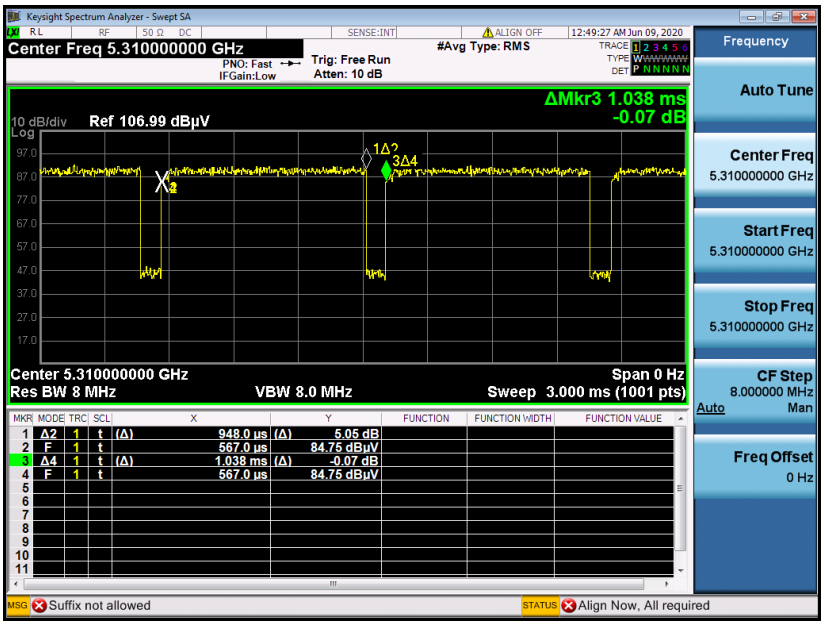
802.11a



802.11n HT20



802.11n HT40



802.11ac VHT80