



FCC RADIO TEST REPORT

FCC ID : 2ATUQ-6698
Equipment : Tablet
Model name : K72LL4
Applicant : Mangled Horses LLC
225 Wilmington-West Chester Pike,
Suite 202 Chadds Ford, PA 19317
Standard : FCC Part 15 Subpart E §15.407

The product was received on Nov. 12, 2019 and testing was started from Nov. 12, 2019 and completed on Jan. 16, 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
FR982217-02E	01	Initial issue of report	Jan. 15, 2020
FR982217-02E	02	Add the description of worst mode in section 2.2	Jan. 17, 2020
FR982217-02E	03	Adding conducted output power	Jan. 21, 2020
FR982217-02E	04	Add the near view of Radiated Emission in setup photo	Jan. 23, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
-	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	Not Required
3.2	15.407(b)	Unwanted Emissions	Pass
3.3	15.207	AC Conducted Emission	Pass
-	15.407 (c)	Automatically Discontinue Transmission	Not Required
3.4	15.203 & 15.407 (a)	Antenna Requirement	Pass

Remark:

1. Not required means after assessing, test items are not necessary to carry out, which is covered by previous report..
2. This is a variant report by removing WPC function. All the test cases were performed on original report which can be referred to Sporton Report Number FR982217-01E. 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: Ching Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Model Name	K72LL4
FCC ID	2ATUQ-6698
EUT supports Radios application	WLAN b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

Standards-related Product Specification	
Tx/Rx Frequency Range	5745 MHz ~ 5825 MHz
Antenna Type / Gain	Ant. 1 : IFA Antenna with gain 2.50 dBi Ant. 2 : Monopole Antenna with gain 2.80 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

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.
	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.
	03CH13-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: 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 (1 GHz 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)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 [#]	5775	165	5825

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

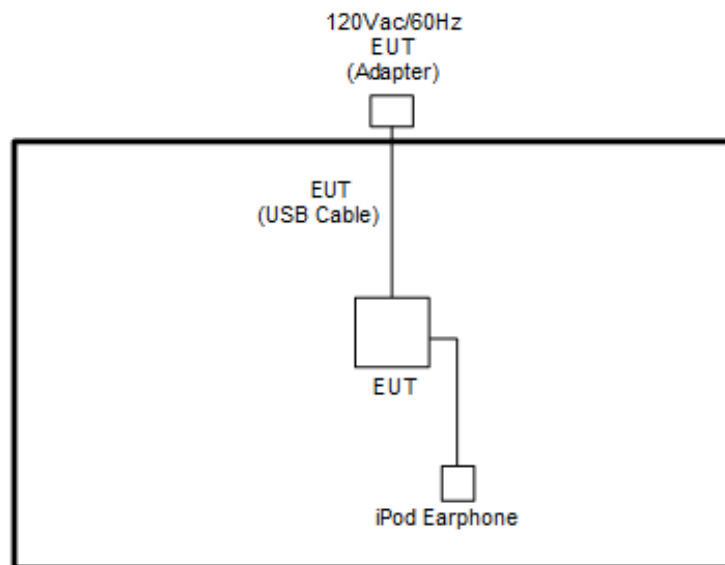
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0

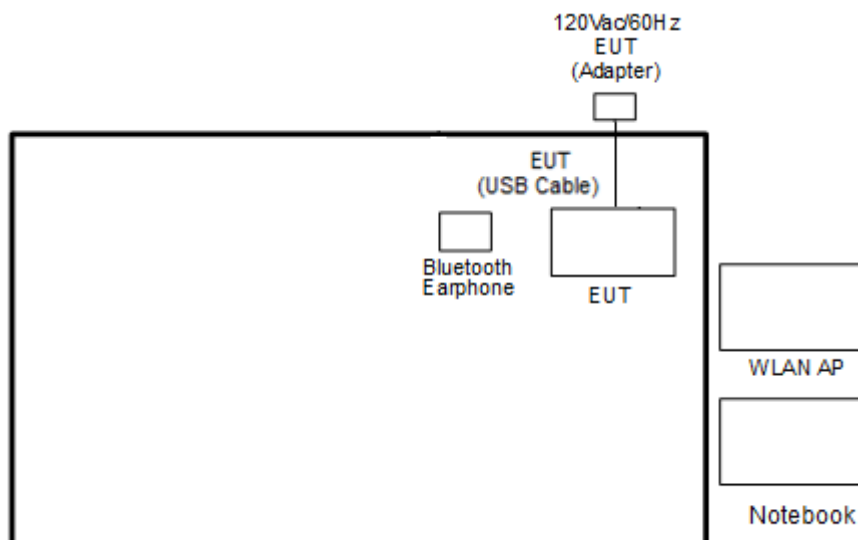
Test Cases	
AC Conducted Emission	Mode 1 : WLAN (5GHz) Link + Bluetooth Link + Play MPEG4 from SD Card + USB Cable (Charging from Adapter (AP16)) + Micro SD Card
Remark: 1. For Radiated Test Cases, the tests were performed with Adapter 1 2. The AC Conducted Emission test case has leveraged from the worst mode of Part 15B AC Conducted Emission.	

Ch. #		Band IV : 5725-5850 MHz	
		802.11a	802.11n HT20
L	Low	-	149
M	Middle	-	157
H	High	165	-

2.3 Connection Diagram of Test System



<AC Conducted Emission Mode>





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPhone Earphone	Apple	N/A	Verification	Unshielded, 1.0m	N/A
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	DELL	Latitude E3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “CMD” 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.

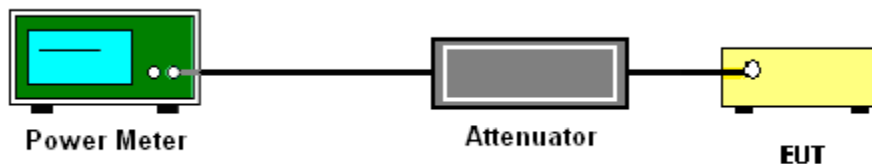
3.1.3 Test Procedures

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) 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.

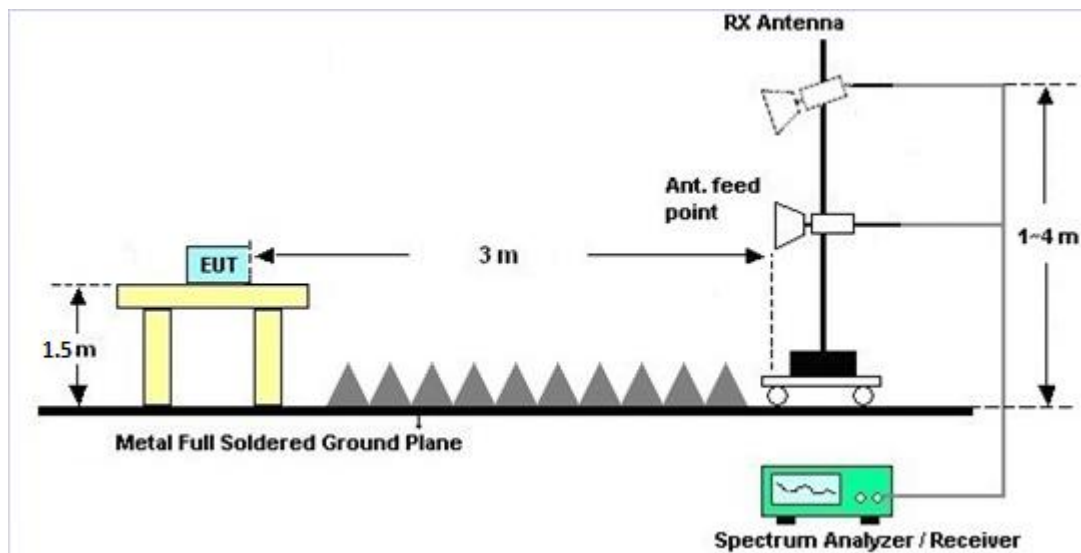
3.2.3 Test Procedures

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 $\geq$ 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 $\geq$ 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 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 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 Unwanted Radiated Emission

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 (dB μ V)	
	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.

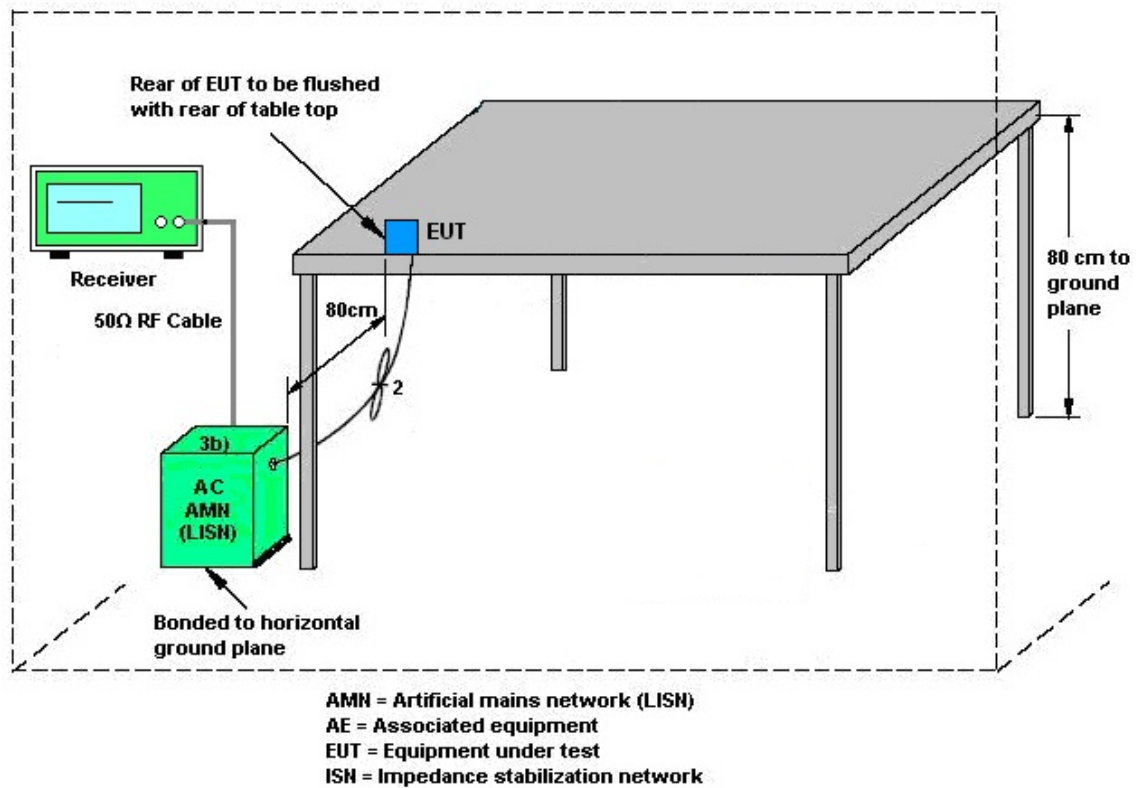
3.3.2 Measuring Instruments

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 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
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Jul. 02, 2019	Nov. 12, 2019~ Nov. 24, 2019	Jul. 01, 2020	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Dec. 05, 2018	Nov. 12, 2019~ Nov. 24, 2019	Dec. 04, 2019	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Mar. 15, 2019	Nov. 12, 2019~ Nov. 24, 2019	Mar. 14, 2020	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 20, 2019	Nov. 12, 2019~ Nov. 24, 2019	May 19, 2020	Radiation (03CH13-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 06, 2018	Nov. 12, 2019~ Nov. 24, 2019	Dec. 05, 2019	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303B	TP150115	N/A	Nov. 11, 2019	Nov. 12, 2019~ Nov. 24, 2019	Nov. 10, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30M-18G	Feb. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30M-18G	Feb. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30M-18G	Feb. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30M~40GHz	Mar. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Mar. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30M~40GHz	Mar. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Mar. 12, 2020	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 19, 2019	Nov. 12, 2019~ Nov. 24, 2019	Mar. 18, 2020	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 12, 2019~ Nov. 24, 2019	N/A	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 12, 2019~ Nov. 24, 2019	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 12, 2019~ Nov. 24, 2019	N/A	Radiation (03CH13-HY)
Software	AUDIX	E3 6.2009-8-24c	RK-001124	N/A	N/A	Nov. 12, 2019~ Nov. 24, 2019	N/A	Radiation (03CH13-HY)
Filter	Woken	WHKX8-5272. 5-6750-18000-40ST	SN5	6.75G Highpass	Mar. 13, 2019	Nov. 12, 2019~ Nov. 24, 2019	Mar. 12, 2020	Radiation (03CH13-HY)
Filter	Wainwright	WLK4-1000-1 530-8000-40S S	SN12	1.53GHz Low Pass Filter	Sep. 16, 2019	Nov. 12, 2019~ Nov. 24, 2019	Sep. 15, 2020	Radiation (03CH13-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 07, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Jan. 07, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 19, 2019	Jan. 07, 2020	Mar. 18, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Jan. 07, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jan. 07, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Jan. 07, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Jan. 07, 2020	Jan. 01, 2021	Conduction (CO05-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Jan. 16, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054S NO10	10MHz~6GHz	Dec. 23, 2019	Jan. 16, 2020	Dec. 22 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Jan. 16, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC120838 2	N/A	Mar. 27, 2019	Jan. 16, 2020	Mar. 26, 2020	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.0
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.8
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Appendix A. Test Result of Conducted Test Items

Test Engineer:	Luffy Lin	Temperature:	21~25	°C
Test Date:	2020/1/16	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

Band IV single antenna												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	165	5825	13.20	13.00		30.00	30.00	2.50	2.80	Pass
HT20	MCS0	1	157	5785	13.30	13.10		30.00	30.00	2.50	2.80	Pass



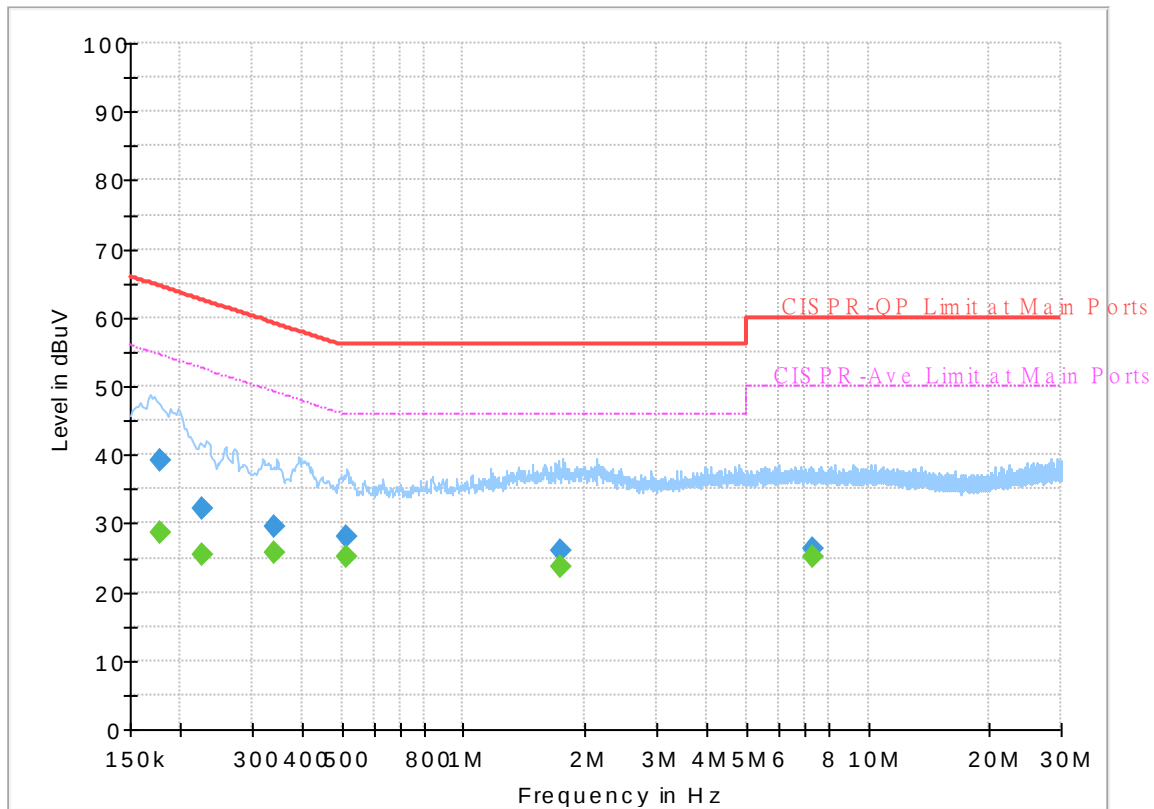
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee and Howard Huang	Temperature :	22~25℃
		Relative Humidity :	45~53%

EUT Information

Report NO : 982217-02
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



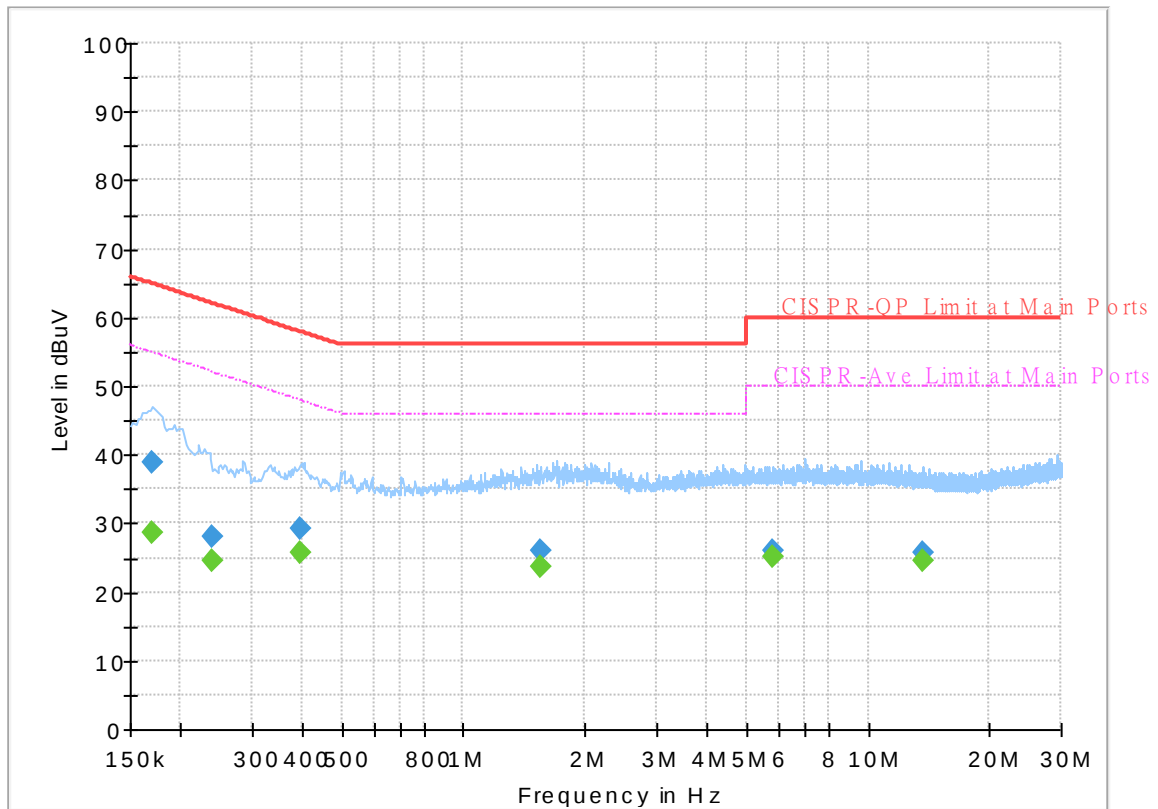
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.177000	---	28.77	54.63	25.86	L1	OFF	19.5
0.177000	39.18	---	64.63	25.45	L1	OFF	19.5
0.226500	---	25.42	52.58	27.16	L1	OFF	19.5
0.226500	32.15	---	62.58	30.43	L1	OFF	19.5
0.341250	---	25.68	49.17	23.49	L1	OFF	19.5
0.341250	29.41	---	59.17	29.76	L1	OFF	19.5
0.512250	---	25.29	46.00	20.71	L1	OFF	19.5
0.512250	28.17	---	56.00	27.83	L1	OFF	19.5
1.729500	---	23.80	46.00	22.20	L1	OFF	19.6
1.729500	26.12	---	56.00	29.88	L1	OFF	19.6
7.273500	---	25.27	50.00	24.73	L1	OFF	19.9
7.273500	26.18	---	60.00	33.82	L1	OFF	19.9

EUT Information

Report NO : 982217-02
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)
0.170430	---	28.72	54.94	26.22	N	OFF	19.6
0.170430	38.84	---	64.94	26.10	N	OFF	19.6
0.240000	---	24.65	52.10	27.45	N	OFF	19.6
0.240000	28.20	---	62.10	33.90	N	OFF	19.6
0.393630	---	25.67	47.99	22.32	N	OFF	19.6
0.393630	29.33	---	57.99	28.66	N	OFF	19.6
1.547250	---	23.76	46.00	22.24	N	OFF	19.6
1.547250	26.01	---	56.00	29.99	N	OFF	19.6
5.792100	---	25.16	50.00	24.84	N	OFF	19.8
5.792100	26.13	---	60.00	33.87	N	OFF	19.8
13.682310	---	24.60	50.00	25.40	N	OFF	20.1
13.682310	25.78	---	60.00	34.22	N	OFF	20.1



Appendix C. Radiated Spurious Emission

Test Engineer :	JC Liang	Temperature :	24.2~24.8°C
		Relative Humidity :	55~64%

Band 4 - 5725~5850MHz

WIFI 802.11a (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)
802.11a CH 165 5825MHz	*	5825	106.32	-	-	94.53	32.35	6.42	26.98	100	225	P	H
	*	5825	97.63	-	-	85.84	32.35	6.42	26.98	100	225	A	H
		5850.2	53.59	-68.15	121.74	41.75	32.4	6.44	27	100	225	P	H
		5860	53.21	-56.19	109.4	41.33	32.44	6.45	27.01	100	225	P	H
		5895	53.39	-36.97	90.36	41.37	32.58	6.48	27.04	100	225	P	H
		5936.4	52.15	-16.05	68.2	40.04	32.67	6.51	27.07	100	225	P	H
	*	5825	100.68	-	-	88.89	32.35	6.42	26.98	104	350	P	V
	*	5825	91.81	-	-	80.02	32.35	6.42	26.98	104	350	A	V
		5854.4	50.55	-61.62	112.17	38.69	32.42	6.44	27	104	350	P	V
		5856.2	52.53	-57.93	110.46	40.67	32.42	6.44	27	104	350	P	V
		5885	52.37	-45.4	97.77	40.39	32.54	6.47	27.03	104	350	P	V
		5940.4	51.93	-16.27	68.2	39.82	32.68	6.51	27.08	104	350	P	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	46.33	-27.67	74	52.3	39.83	10.5	56.3	100	0	P	H
		17355	48.05	-20.15	68.2	51.45	40.33	13.08	56.81	100	0	P	H
		11570	45.95	-28.05	74	51.92	39.83	10.5	56.3	100	0	P	V
		17355	48.07	-20.13	68.2	51.47	40.33	13.08	56.81	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

**Band 4 5725~5850MHz****WIFI 802.11a (Harmonic @ 3m)**

WIFI Ant. 2	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 165 5825MHz		11650	46.16	-27.84	74	52.37	39.55	10.54	56.3	100	0	P	H
		17475	49.05	-19.15	68.2	52.06	40.83	13.21	57.05	100	0	P	H
		11650	47.44	-26.56	74	53.65	39.55	10.54	56.3	100	0	P	V
		17475	49.33	-18.87	68.2	52.34	40.83	13.21	57.05	100	0	P	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 (Band Edge @ 3m)

WIFI Ant. 2	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		5608.4	51.75	-16.45	68.2	40.42	31.8	6.32	26.79	100	78	P	H
		5661.6	53.37	-23.44	76.81	42.01	31.85	6.34	26.83	100	78	P	H
		5715.8	51.94	-57.69	109.63	40.39	32.06	6.37	26.88	100	78	P	H
		5723.8	53.64	-65.82	119.46	42.06	32.1	6.37	26.89	100	78	P	H
	*	5785	105.46	-	-	93.74	32.27	6.39	26.94	100	78	P	H
	*	5785	97.43	-	-	85.71	32.27	6.39	26.94	100	78	A	H
		5854.6	51.93	-59.78	111.71	40.07	32.42	6.44	27	100	78	P	H
		5858.4	52.97	-56.88	109.85	41.1	32.43	6.45	27.01	100	78	P	H
		5907.8	52.46	-28.43	80.89	40.4	32.62	6.49	27.05	100	78	P	H
		5949.6	52.5	-15.7	68.2	40.37	32.7	6.52	27.09	100	78	P	H
		5641.4	52.87	-15.33	68.2	41.54	31.8	6.34	26.81	395	184	P	V
		5673.8	52.17	-33.68	85.85	40.76	31.9	6.35	26.84	395	184	P	V
		5719.6	52.23	-58.46	110.69	40.66	32.08	6.37	26.88	395	184	P	V
		5725	50.59	-71.61	122.2	39.01	32.1	6.37	26.89	395	184	P	V
	*	5785	102.85	-	-	91.13	32.27	6.39	26.94	395	184	P	V
	*	5785	92.78	-	-	81.06	32.27	6.39	26.94	395	184	A	V
		5851	51.18	-68.74	119.92	39.34	32.4	6.44	27	395	184	P	V
		5870.4	52.15	-54.34	106.49	40.23	32.48	6.46	27.02	395	184	P	V
		5876.4	52.18	-51.98	104.16	40.23	32.51	6.46	27.02	395	184	P	V
		5949.6	51.31	-16.89	68.2	39.18	32.7	6.52	27.09	395	184	P	V



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.	
2		(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

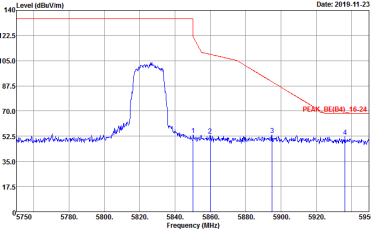
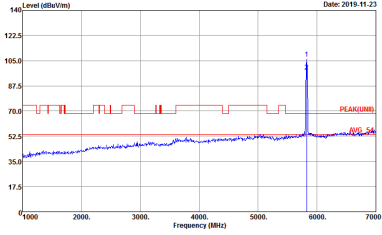
Test Engineer :	JC Liang	Temperature :	24.2~24.8°C
		Relative Humidity :	55~64%

Note symbol

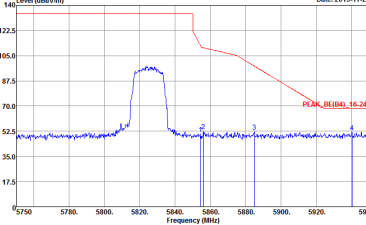
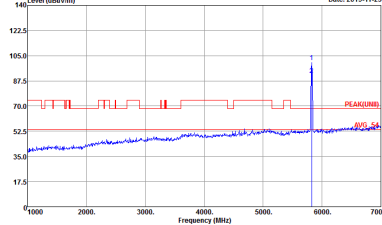
-L	Low channel location
-R	High channel location



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

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_B4_16-24 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 14 Setting : 16	 Site : 03CH13-HY Condition : PEAK_LNB 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 14 Setting : 16



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-49Y Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 14 Setting : 16	 Site : 03CH13-49Y Condition : PEAK(UNIT) 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 14 Setting : 16

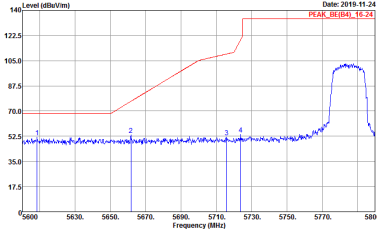
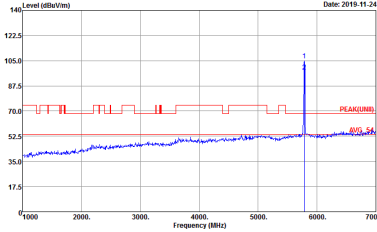
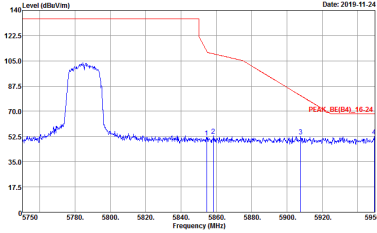


Band 4 - 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

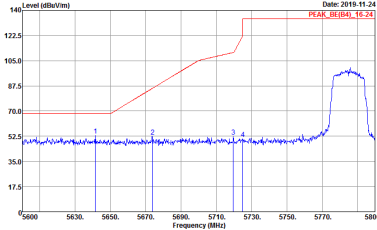
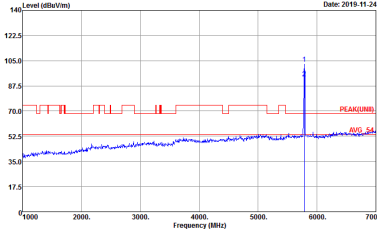
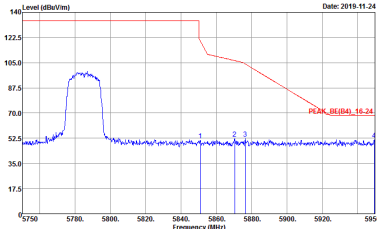
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.	Site : 03CH13-HY Condition : PEAK(UNIT) 3m HORN_91200_1241 HORIZONTAL Detector : Peak Project : 982217-02 Mode : 13 Setting : 16	Site : 03CH13-HY Condition : PEAK(UNIT) 3m HORN_91200_1241 VERTICAL Detector : Peak Project : 982217-02 Mode : 13 Setting : 16



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

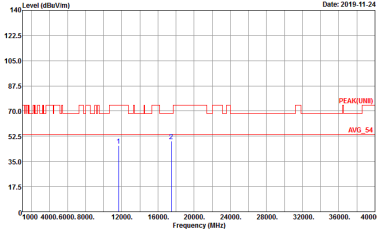
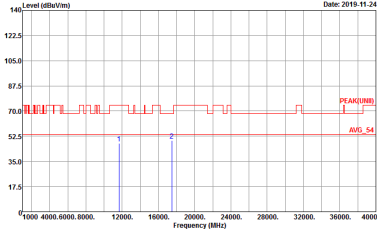
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
2	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16	 Site : 03CH13-HY Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16
Peak	 Site : 03CH13-HY Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16	Left blank



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
2	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE(84)_16-24 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16	 Site : 03CH13-HY Condition : PEAK(UNIT) 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16
	 Site : 03CH13-HY Condition : PEAK_BE(84)_16-24 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02 Mode : 16 Setting : 16	Left blank



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

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
2	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK(UNIT) 3m HORN_91200_1241 HORIZONTAL Detector : Peak Project : 982217-02 Mode : 15 Setting : 16	 Site : 03CH13-HY Condition : PEAK(UNIT) 3m HORN_91200_1241 VERTICAL Detector : Peak Project : 982217-02 Mode : 15 Setting : 16



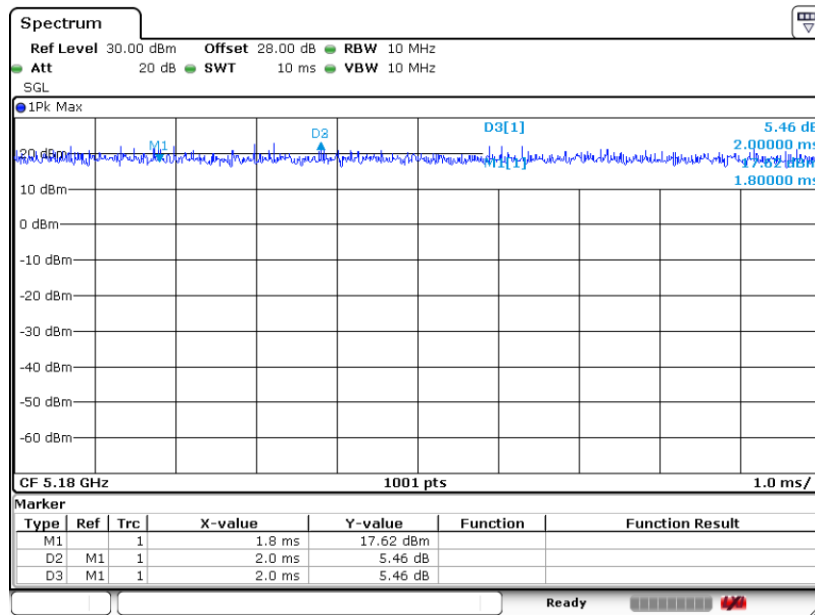
Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1	802.11a	100.00	-	-	10Hz	0.00
2	802.11a	100.00	-	-	10Hz	0.00
1	5GHz 802.11n HT20	100.00	-	-	10Hz	0.00
2	5GHz 802.11n HT20	100.00	-	-	10Hz	0.00



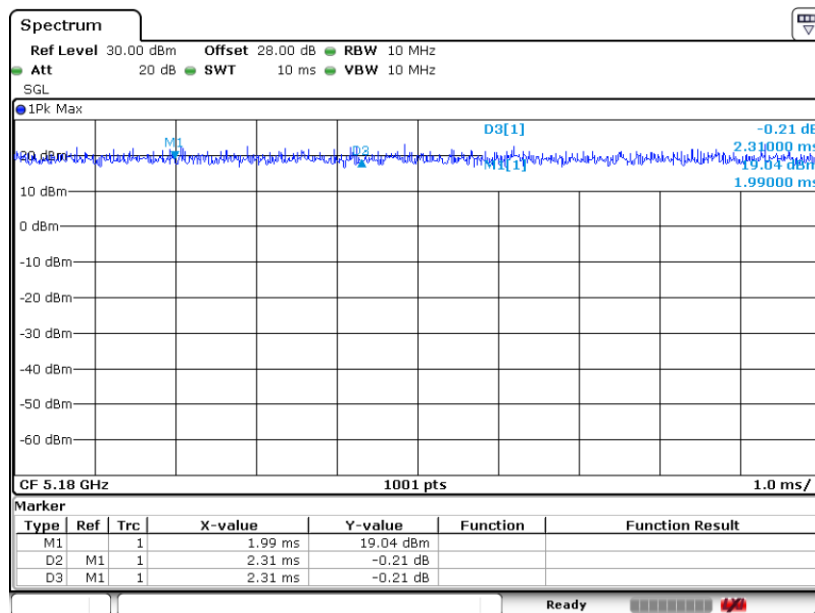
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802.11a



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802.11n HT20

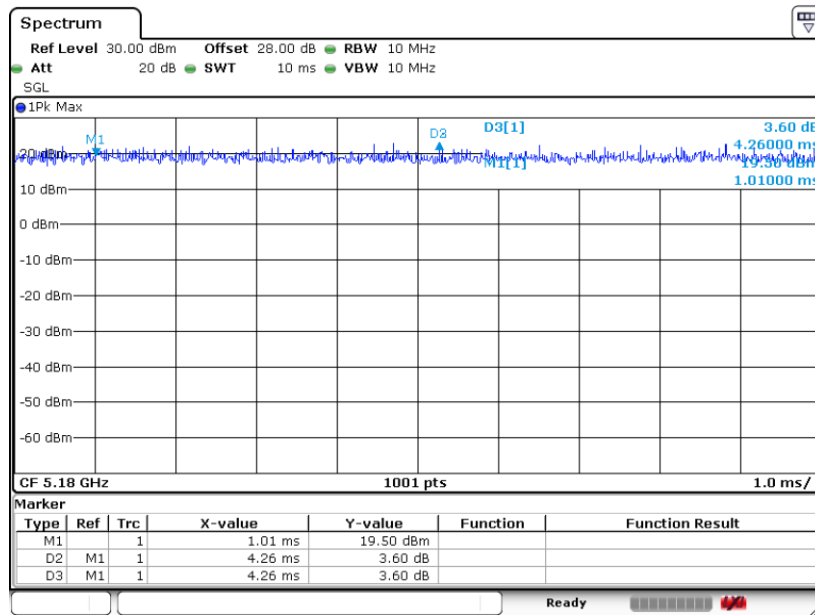


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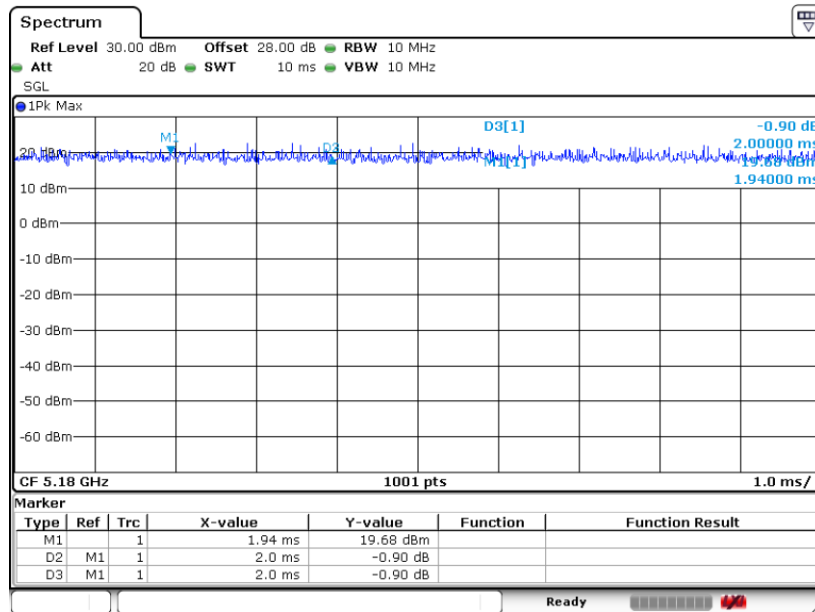
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802.11a



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802.11n HT20



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—THE END—