FCC RADIO TEST REPORT

FCC ID	:	B32P630
Equipment	:	Point of Sales Terminal
Brand Name	:	Verifone
Model Name	:	P630
Applicant	:	Verifone, Inc. 1400 West Stanford Ranch Road, Suite 200, Rocklin CA 95765 USA
Manufacturer	:	Verifone, Inc.
Standard	:	FCC Part 15 Subpart E §15.407

The product was received on May 18, 2021 and testing was started from Jun. 01, 2021 and completed on Jul. 06, 2021. 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 test results in this 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 333, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR0O2036-01F	01	Initial issue of report	Jul. 16, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403(i)	6dB & 26dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.407(a)	Maximum Conducted Output Power	Pass	-
3.3	15.407(a)	Power Spectral Density	Pass	-
3.4	15.407(b)	Unwanted Emissions	Pass	Under limit 3.24 dB at 18000.000 MHz
3.5	15.207	AC Conducted Emission	Pass	Under limit 12.99 dB at 0.499 MHz
3.6	15.203 15.407(a)	Antenna Requirement	Pass	-

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: Yun Huang

Report Producer: Tina Chuang

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	
Antenna Type	WLAN: FPC Antenna Bluetooth: FPC Antenna NFC: Loop Antenna

Antenna information		
5725 MHz ~ 5850 MHz	Peak Gain (dBi)	3.98

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

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 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH02-HY, CO05-HY

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

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH15-HY (TAF Code: 3786)
Remark:	The Radiated Spurious Emission test item subcontracted to Sporton International Inc. Wensan Laboratory

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

FCC designation No.: TW1190 and TW3786

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.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- 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). The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane as worst plane.

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	-	-

Note: The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40

2.2 Test Mode

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

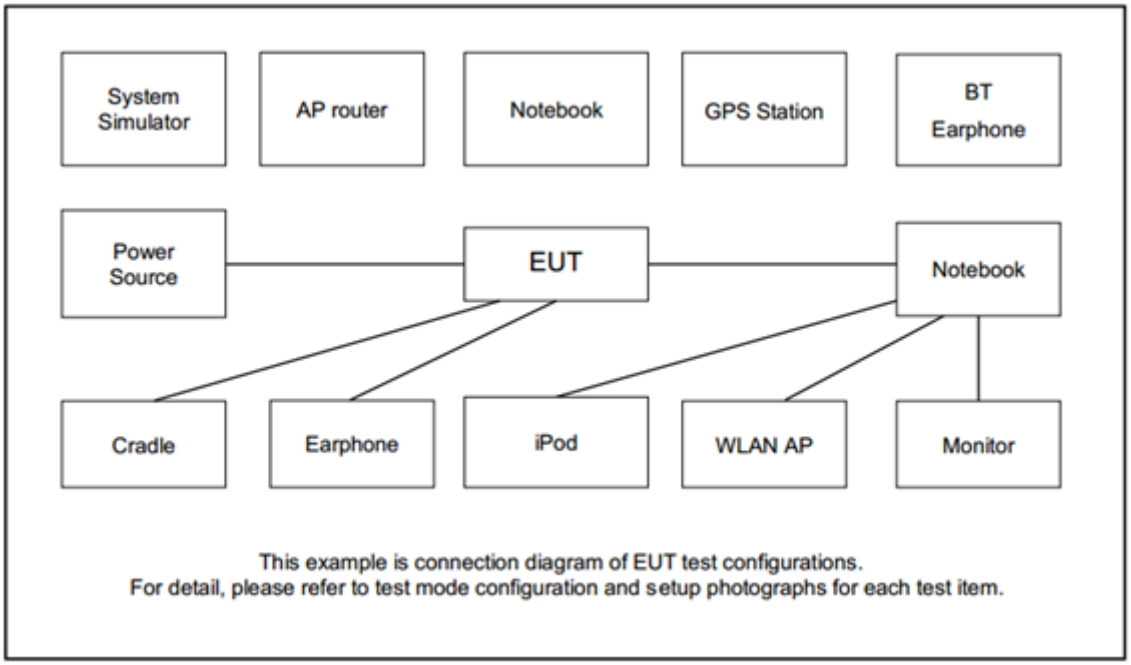
Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Test Cases	
AC Conducted Emission	Mode 1: WLAN (5GHz) Link + Bluetooth Link + NFC On + TC 1 + Adapter
Remark: TC 1 stands for test configuration, and consists of *EUT*: TF Card, SAM-1 Card and SAM-2 Card Link. *Dongle 1*: RJ45 (Load), USB 2.0 (Load), Mini USB (Load) and RS232 (Load).	

Ch. #		Band IV：5725-5850 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	149	149	151
M	Middle	157	157	-
H	High	161	161	159

Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand 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, 1.8 m
3.	Notebook	Dell	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	SAM Card	N/A	N/A	N/A	N/A	N/A
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
6.	RJ45 Cable	N/A	N/A	N/A	Unshielded, 1.2m	N/A
7.	USB Cable	N/A	N/A	N/A	Unshielded, 1.0m	N/A
8.	Mini USB Cable	N/A	N/A	N/A	Unshielded, 1.0m	N/A
9.	RS232 Cable	N/A	N/A	N/A	Unshielded, 1.2m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT 3.0.246.0” 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.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

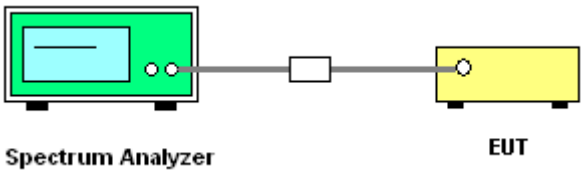
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth for the band 5.725-5.85 GHz
2. Set RBW = 100 kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

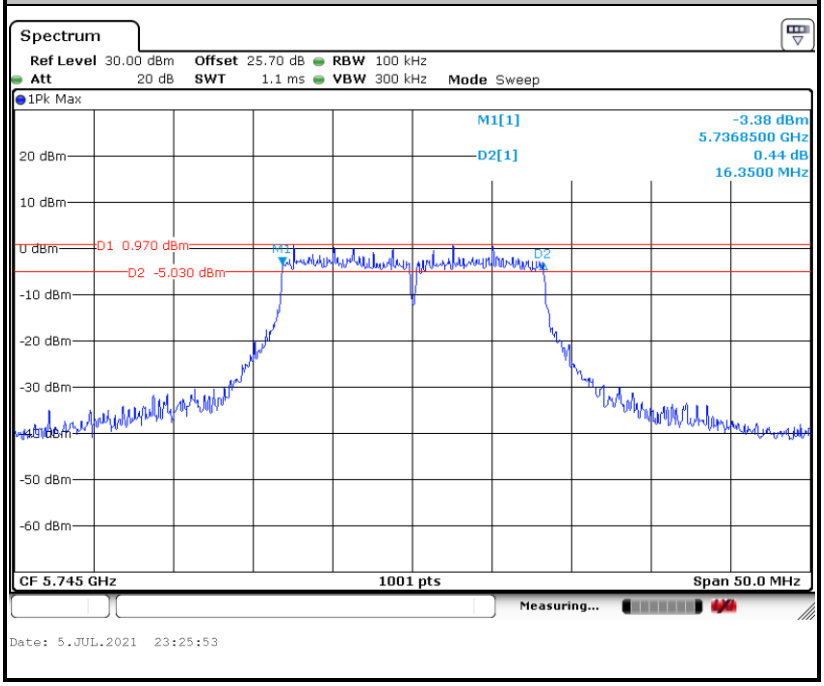
3.1.4 Test Setup



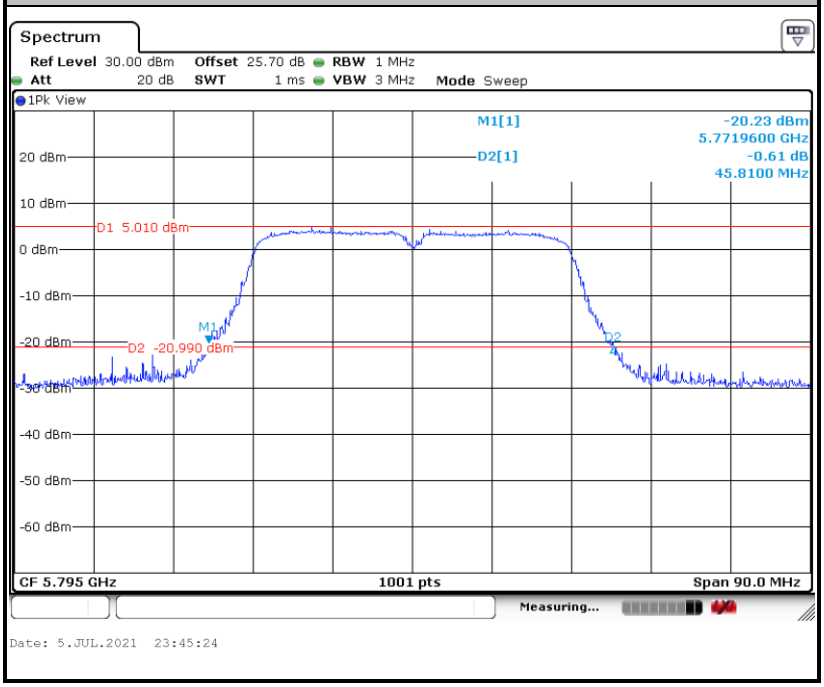
3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

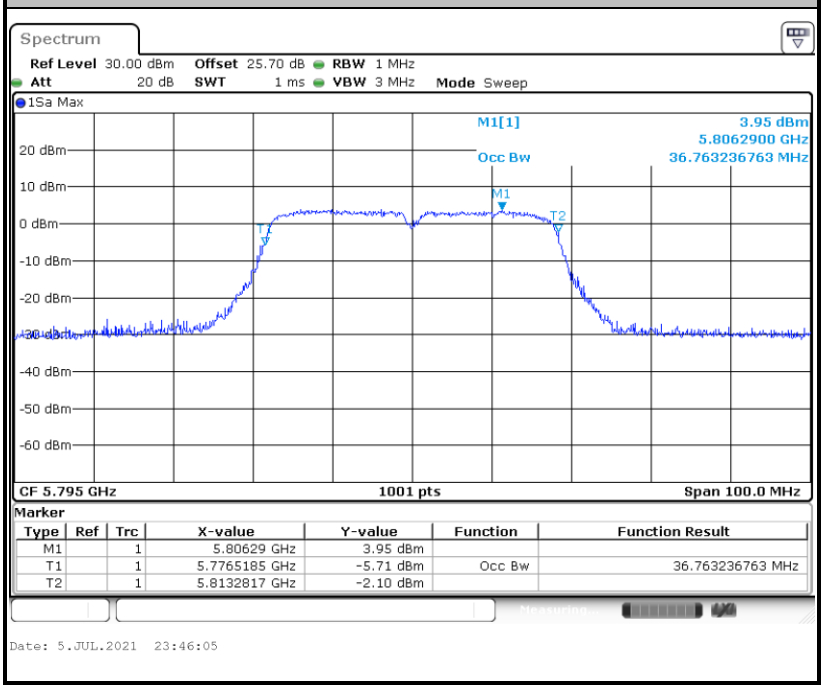
Minimum 6dB Bandwidth



Maximum 26dB Bandwidth



Maximum 99% Occupied Bandwidth



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Maximum Conducted Output Power Measurement

3.2.1 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.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

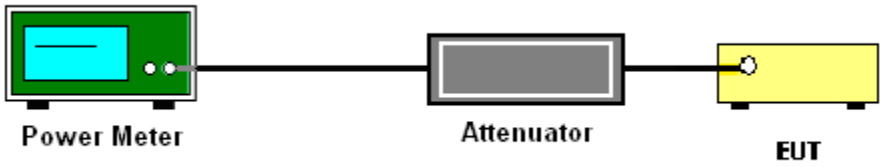
3.2.3 Test Procedures

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

Method PM-G (Measurement using a gated 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.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

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.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section F) Maximum power spectral density.

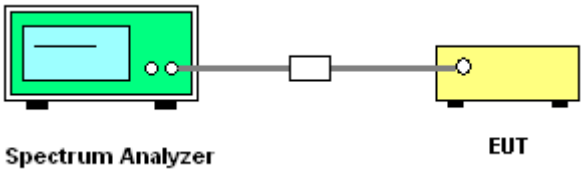
 # Method SA-3 #

(power averaging (rms) detection with max hold):

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time ≤ (number of points in sweep) × 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.
  Detector = power averaging (rms).
- Trace mode = max hold.
- Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

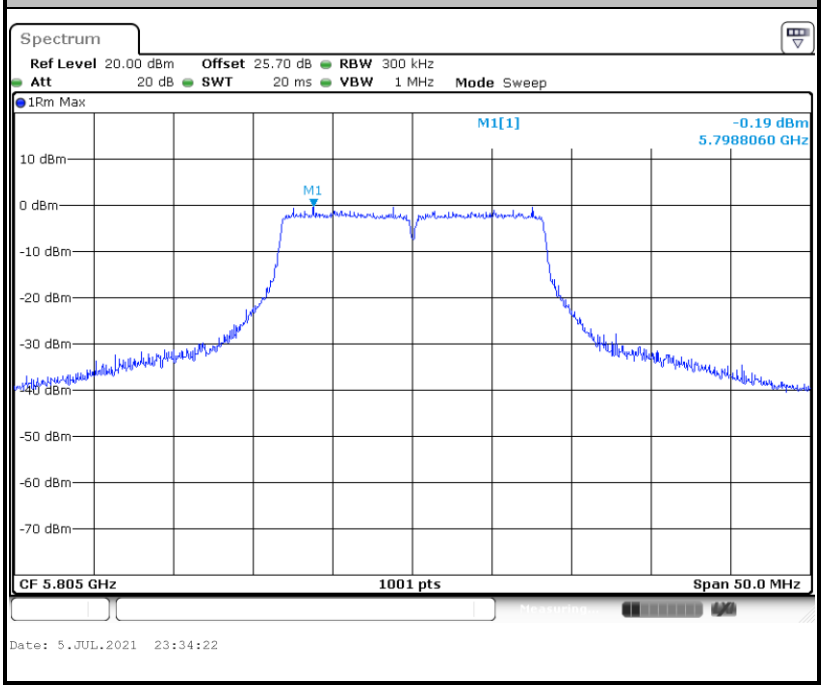
3.3.4 Test Setup



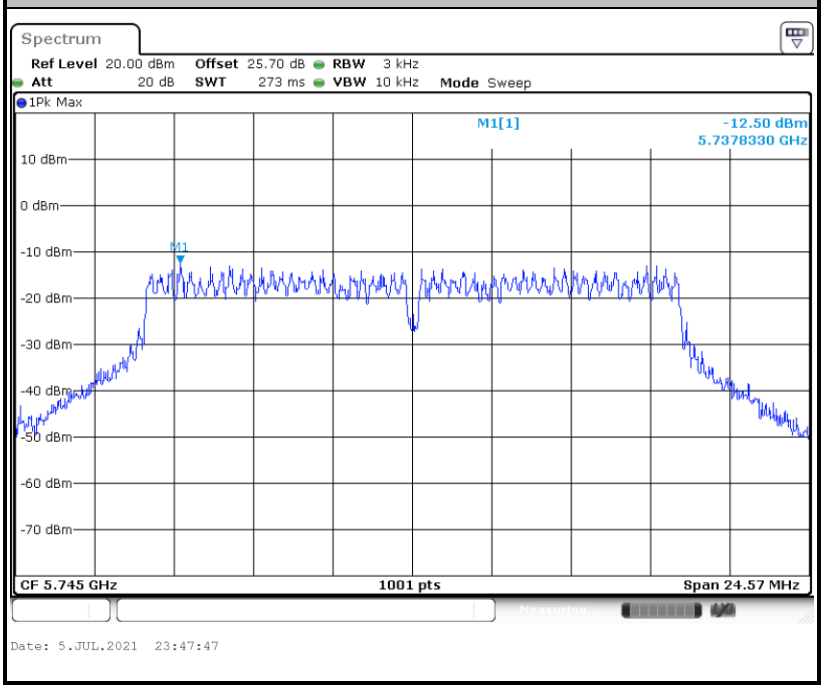
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/MHz)



Worst Case Power Density (dBm/3kHz)



3.4 Unwanted Emissions Measurement

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

3.4.1 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.

$$E=\frac{1000000\sqrt{30P}}{3}$$ 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.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 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 1000 MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

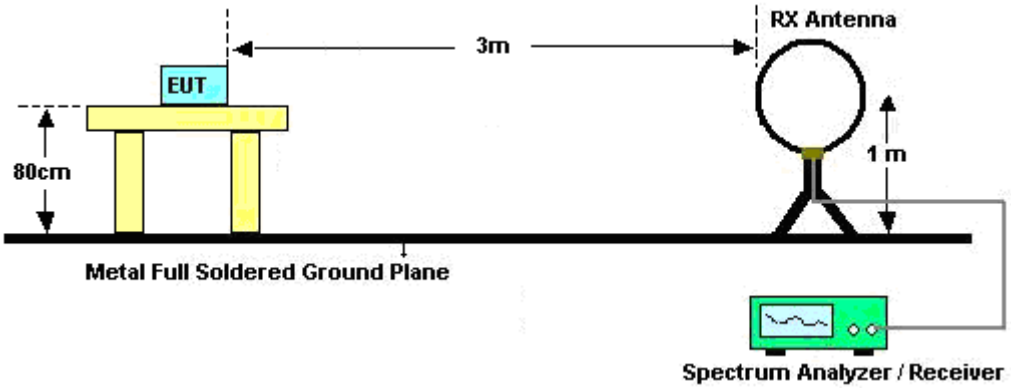
   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz
   - 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 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz 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 1 GHz, 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.

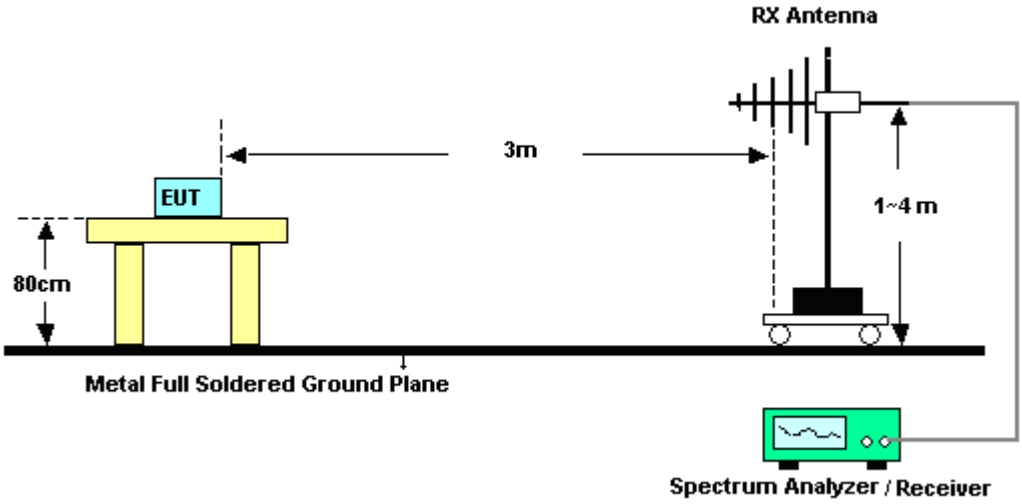
7. For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

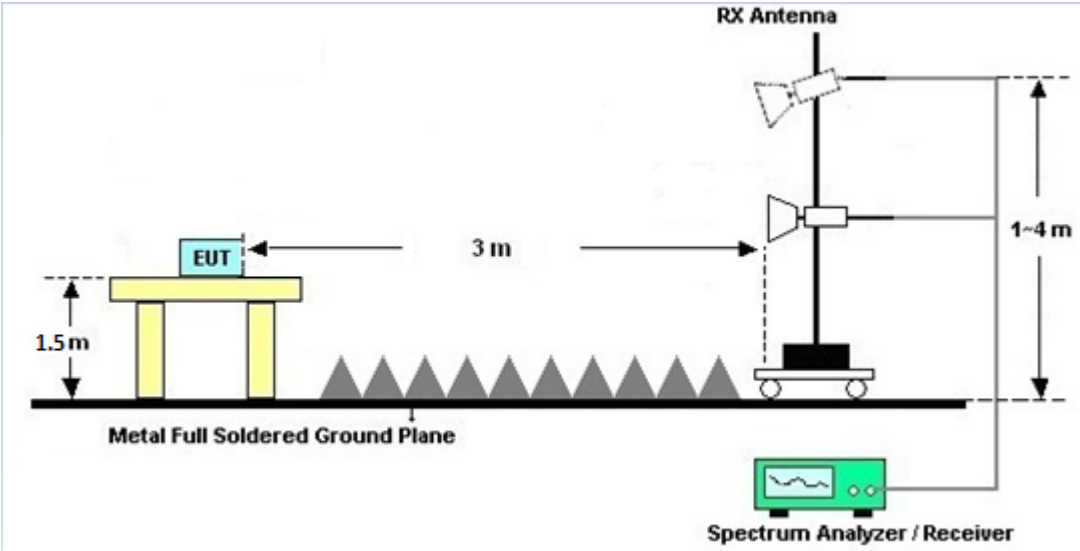
For radiated emissions below 30MHz



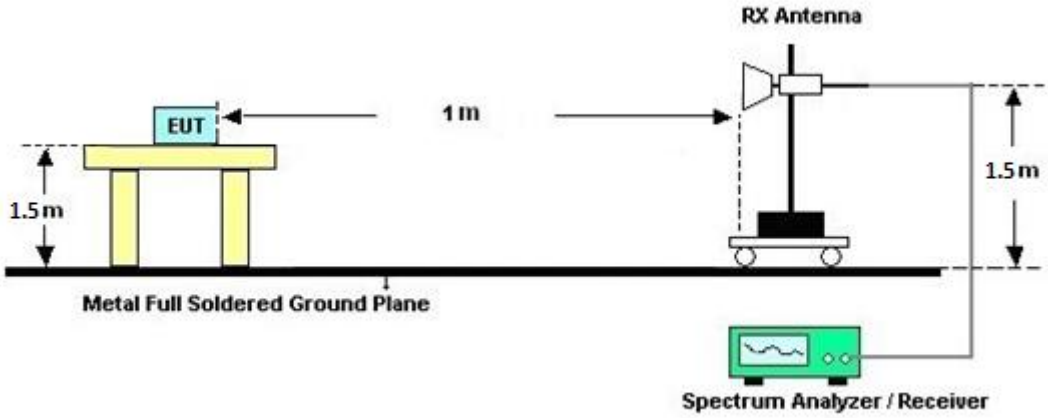
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.4.5 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 adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C and D.

3.4.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.5 AC Conducted Emission Measurement

3.5.1 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.

For terminal test result, the testing follows FCC KDB 174176.

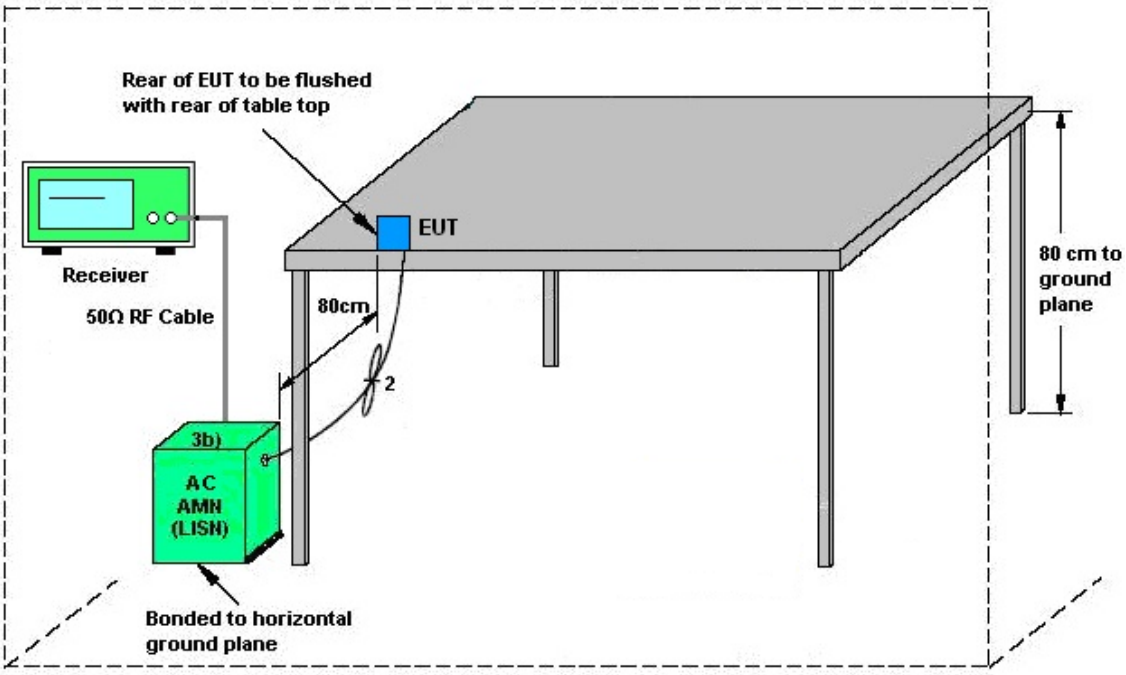
3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 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 shall 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.

3.5.4 Test Setup



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

3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 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.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 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	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Sensor	DARE	RPR3006W	17100015SNO37	10MHz~6GHz	Dec. 02, 2020	Jun. 01, 2021 ~ Jul. 06, 2021	Dec. 01, 2021	Conducted (TH02-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz ~ 40GHz	Jul. 22, 2020	Jun. 01, 2021 ~ Jul. 06, 2021	Jul. 21, 2021	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSQ	200578/026	20Hz-26.5GHz	Jul. 17, 2020	Jun. 01, 2021 ~ Jul. 06, 2021	Jul. 16, 2021	Conducted (TH02-HY)
Switch Box & RF Cable	EM Electronics	EMSW18SE	SW200302	N/A	Mar. 17, 2021	Jun. 01, 2021 ~ Jul. 06, 2021	Mar. 16, 2022	Conducted (TH02-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jul. 14, 2020	Jun. 17, 2021~ Jul. 06, 2021	Jul. 13, 2021	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	41912 & 05	30MHz~1GHz	Feb. 08, 2021	Jun. 17, 2021~ Jul. 06, 2021	Feb. 07, 2022	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2020	Jun. 17, 2021~ Jul. 06, 2021	Dec. 27, 2021	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Nov. 03, 2020	Jun. 17, 2021~ Jul. 06, 2021	Nov. 02, 2021	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Dec. 02, 2020	Jun. 17, 2021~ Jul. 06, 2021	Dec. 01, 2021	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055006	1GHz~18GHz	May 06, 2021	Jun. 17, 2021~ Jul. 06, 2021	May 05, 2022	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 21, 2020	Jun. 17, 2021~ Jul. 06, 2021	Aug. 20, 2021	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Oct. 27, 2020	Jun. 17, 2021~ Jul. 06, 2021	Oct. 26, 2021	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Nov. 02, 2020	Jun. 17, 2021~ Jul. 06, 2021	Nov. 01, 2021	Radiation (03CH15-HY
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	May 07, 2021	Jun. 17, 2021~ Jul. 06, 2021	May 06, 2022	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jun. 17, 2021~ Jul. 06, 2021	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jun. 17, 2021~ Jul. 06, 2021	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Jun. 17, 2021~ Jul. 06, 2021	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY36980/4, MY9838/4PE, 508405/2E	30MHz~18G	Nov. 16, 2020	Jun. 17, 2021~ Jul. 06, 2021	Nov. 15, 2021	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 22, 2021	Jun. 17, 2021~ Jul. 06, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 22, 2021	Jun. 17, 2021~ Jul. 06, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 11, 2021	Jun. 17, 2021~ Jul. 06, 2021	Mar. 10, 2022	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-1530-6000-40ST	SN4	1.53GHz Low Pass Filter	Jul. 03, 2020	Jun. 17, 2021~ Jun. 23, 2021	Jul. 02, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN12	1.53GHz Low Pass Filter	Sep. 15, 2020	Jun. 24, 2021~ Jul. 06, 2021	Sep. 14, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN6	6.75GHz High Pass Filter	Jul. 01, 2020	Jun. 17, 2021~ Jun. 23, 2021	Jun. 30, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN5	6.75GHz High Pass Filter	Mar. 11, 2021	Jun. 24, 2021~ Jul. 06, 2021	Mar. 10, 2022	Radiation (03CH15-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 18, 2021~ Jun. 23, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Jun. 18, 2021~ Jun. 23, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	Jun. 18, 2021~ Jun. 23, 2021	Nov. 17, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 16, 2020	Jun. 18, 2021~ Jun. 23, 2021	Nov. 15, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jun. 18, 2021~ Jun. 23, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Feb. 25, 2021	Jun. 18, 2021~ Jun. 23, 2021	Feb. 24, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Jun. 18, 2021~ Jun. 23, 2021	Dec. 30, 2021	Conduction (CO05-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 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7 dB

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.9 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Ching Chen/Junyu Jhou	Temperature:	24.2~25.2	°C
Test Date:	2021/6/1-2021/7/6	Relative Humidity:	52.9~54.5	%

TEST RESULTS DATA
6dB and 26dB EBW and 99% OBW

Band IV single antenna												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	149	5745	18.68	-	36.85	-	16.35	-	0.5	Pass
11a	6Mbps	1	157	5785	18.73	-	33.25	-	16.35	-	0.5	Pass
11a	6Mbps	1	161	5805	18.83	-	33.55	-	16.35	-	0.5	Pass
HT20	MCS0	1	149	5745	19.33	-	27.50	-	17.60	-	0.5	Pass
HT20	MCS0	1	157	5785	19.43	-	31.80	-	17.55	-	0.5	Pass
HT20	MCS0	1	161	5805	19.28	-	28.20	-	17.55	-	0.5	Pass
HT40	MCS0	1	151	5755	36.76	-	45.36	-	35.37	-	0.5	Pass
HT40	MCS0	1	159	5795	36.76	-	45.81	-	35.37	-	0.5	Pass

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	149	5745	14.20	-		30.00	-	3.98	-	Pass
11a	6Mbps	1	157	5785	14.10	-		30.00	-	3.98	-	Pass
11a	6Mbps	1	161	5805	14.30	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	149	5745	13.70	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	157	5785	13.80	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	161	5805	13.20	-		30.00	-	3.98	-	Pass
HT40	MCS0	1	151	5755	11.90	-		30.00	-	3.98	-	Pass
HT40	MCS0	1	159	5795	11.80	-		30.00	-	3.98	-	Pass

Report Number : FR0O2036-01F

TEST RESULTS DATA
Power Spectral Density

Band IV single antenna														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	10log (500kHz /RBW) Factor (dB)		Average Power Density (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		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	2.22	-	1.32	-		30.00	-	3.98	-	Pass
11a	6Mbps	1	157	5785	2.22	-	1.34	-		30.00	-	3.98	-	Pass
11a	6Mbps	1	161	5805	2.22	-	2.03	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	149	5745	2.22	-	0.94	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	157	5785	2.22	-	1.06	-		30.00	-	3.98	-	Pass
HT20	MCS0	1	161	5805	2.22	-	1.03	-		30.00	-	3.98	-	Pass
HT40	MCS0	1	151	5755	2.22	-	-2.90	-		30.00	-	3.98	-	Pass
HT40	MCS0	1	159	5795	2.22	-	-4.01	-		30.00	-	3.98	-	Pass

Report Number : FR0O2036-01F

TEST RESULTS DATA
Power Spectral Density

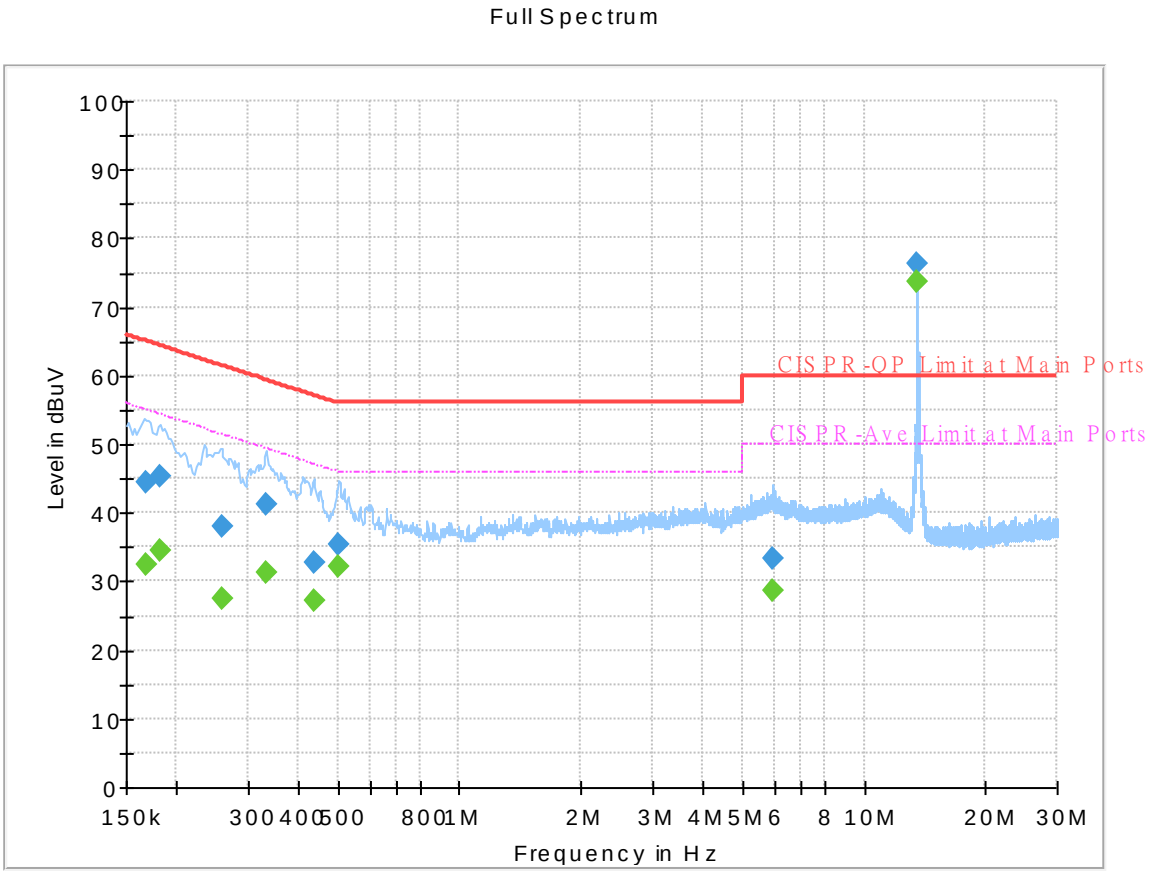
Band IV single antenna												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Power Density (dBm/3kHz)			Average PSD Limit (dBm/3kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	-12.50	-		14.00	-	3.98	-	Pass
11a	6Mbps	1	157	5785	-13.16	-		14.00	-	3.98	-	Pass
11a	6Mbps	1	161	5805	-12.84	-		14.00	-	3.98	-	Pass
HT20	MCS0	1	149	5745	-13.61	-		14.00	-	3.98	-	Pass
HT20	MCS0	1	157	5785	-13.55	-		14.00	-	3.98	-	Pass
HT20	MCS0	1	161	5805	-13.88	-		14.00	-	3.98	-	Pass
HT40	MCS0	1	151	5755	-18.43	-		14.00	-	3.98	-	Pass
HT40	MCS0	1	159	5795	-18.74	-		14.00	-	3.98	-	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	**Temperature :**	23~26℃
		Relative Humidity :	40~50%

Original

Report NO :	0O2036-01
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

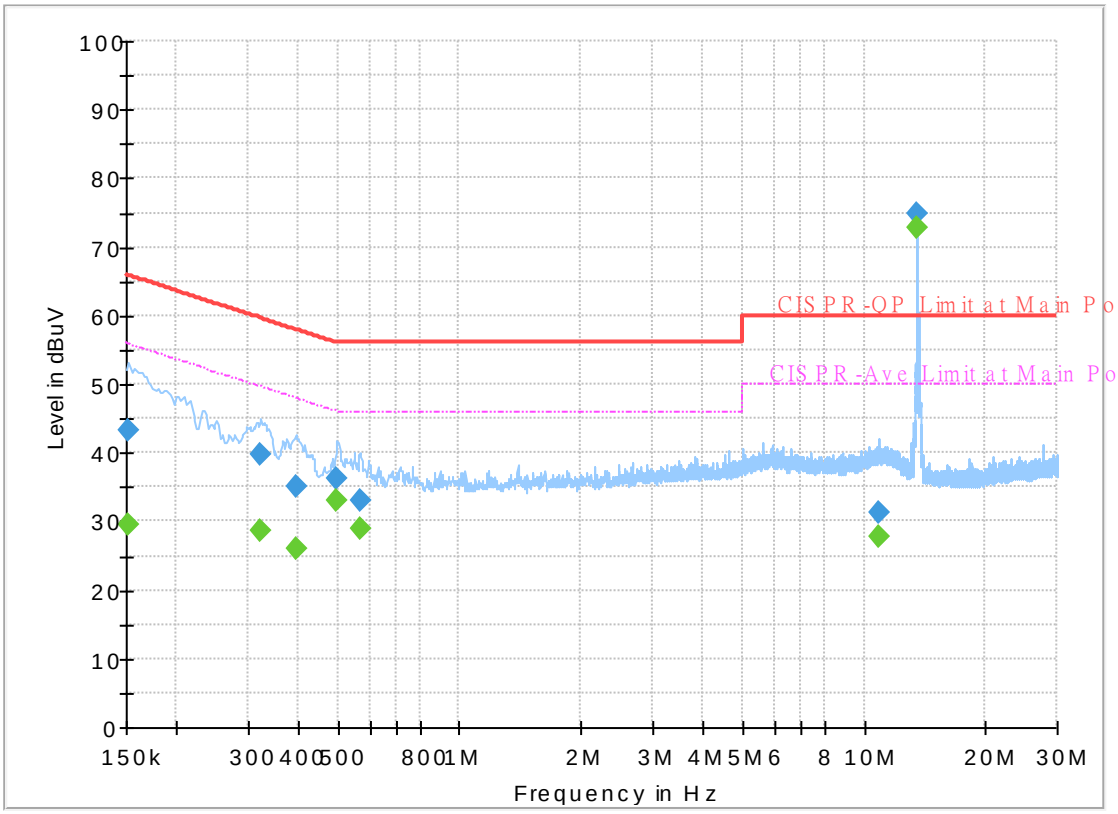


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.168000	44.32	---	65.06	20.74	L1	OFF	19.5
0.168000	---	32.41	55.06	22.65	L1	OFF	19.5
0.181500	45.46	---	64.42	18.96	L1	OFF	19.5
0.181500	---	34.37	54.42	20.05	L1	OFF	19.5
0.258000	37.87	---	61.50	23.63	L1	OFF	19.5
0.258000	---	27.39	51.50	24.11	L1	OFF	19.5
0.332250	41.12	---	59.40	18.28	L1	OFF	19.5
0.332250	---	31.33	49.40	18.07	L1	OFF	19.5
0.435750	32.62	---	57.14	24.52	L1	OFF	19.6
0.435750	---	27.24	47.14	19.90	L1	OFF	19.6
0.503250	35.32	---	56.00	20.68	L1	OFF	19.7
0.503250	---	32.07	46.00	13.93	L1	OFF	19.7
5.923500	33.26	---	60.00	26.74	L1	OFF	19.9
5.923500	---	28.67	50.00	21.33	L1	OFF	19.9
13.560000	76.28	---	60.00	-16.28	L1	OFF	20.1
13.560000	---	73.81	50.00	-23.81	L1	OFF	20.1

Report NO : 0O2036-01
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

Full Spectrum

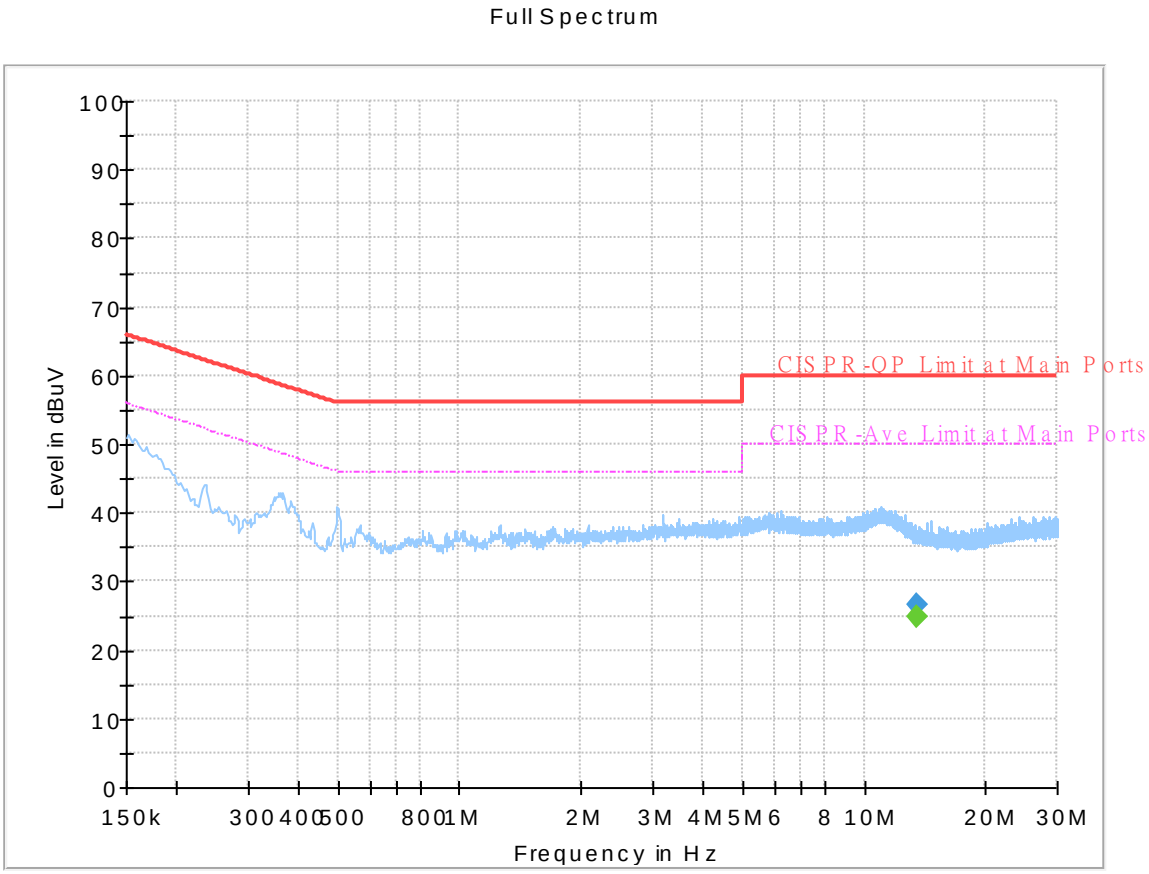


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	29.62	55.88	26.26	N	OFF	19.5
0.152250	43.39	---	65.88	22.49	N	OFF	19.5
0.323250	---	28.77	49.62	20.85	N	OFF	19.6
0.323250	39.84	---	59.62	19.78	N	OFF	19.6
0.393000	---	25.93	48.00	22.07	N	OFF	19.6
0.393000	35.22	---	58.00	22.78	N	OFF	19.6
0.498750	---	33.03	46.02	12.99	N	OFF	19.7
0.498750	36.30	---	56.02	19.72	N	OFF	19.7
0.566250	---	29.07	46.00	16.93	N	OFF	19.8
0.566250	32.91	---	56.00	23.09	N	OFF	19.8
10.905000	---	27.76	50.00	22.24	N	OFF	20.1
10.905000	31.27	---	60.00	28.73	N	OFF	20.1
13.560000	---	72.67	50.00	-22.67	N	OFF	20.2
13.560000	74.88	---	60.00	-14.88	N	OFF	20.2

Terminal

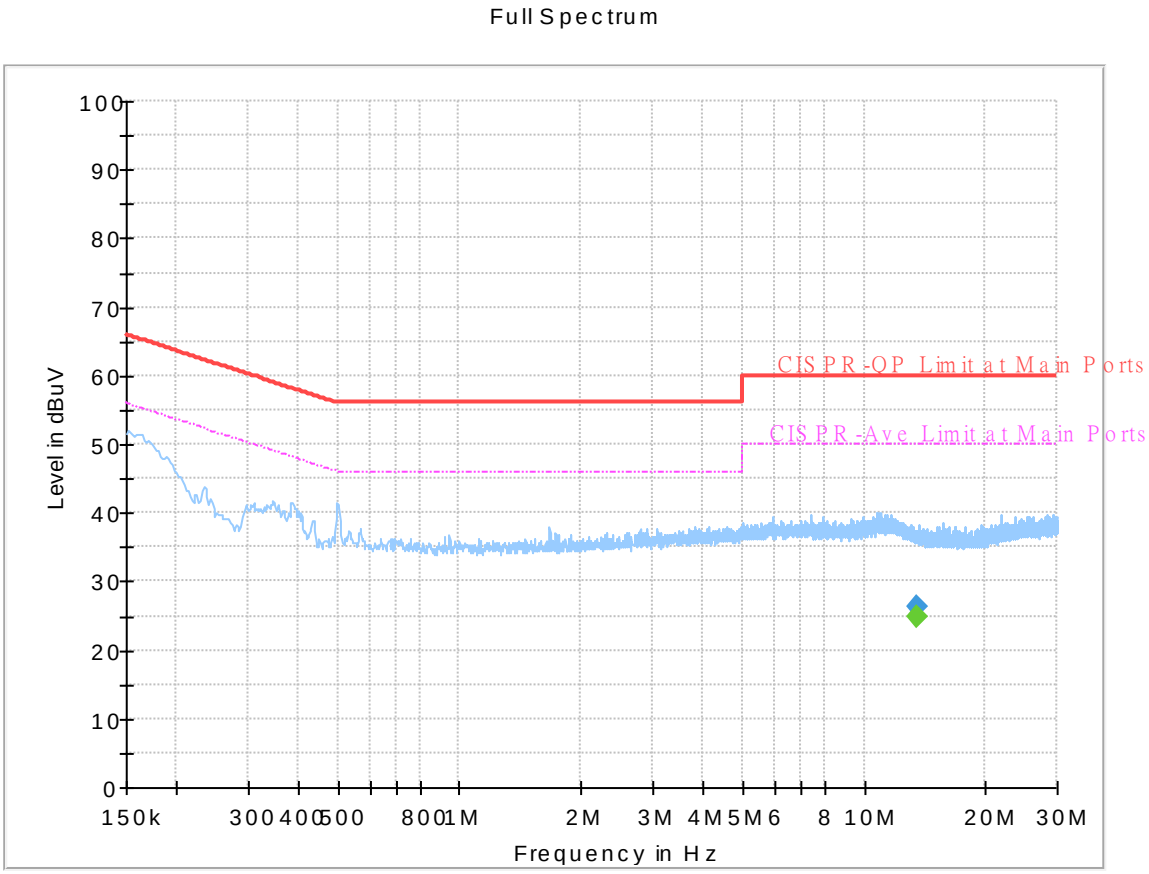
Report NO :	0O2036-01
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.560000	---	24.96	50.00	25.04	L1	OFF	20.1
13.560000	26.63	---	60.00	33.37	L1	OFF	20.1

Report NO :	0O2036-01
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.560000	---	24.94	50.00	25.06	N	OFF	20.2
13.560000	26.26	---	60.00	33.74	N	OFF	20.2

Appendix C. Radiated Spurious Emission

Test Engineer :	Leo Lee, Mancy Chou, and Bigshow Wang	Temperature :	22.1~23.1°C
		Relative Humidity :	55.0~60.0%

Band 4 - 5725~5850MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	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 149 5745MHz		5647.6	52.08	-16.12	68.2	40.05	31.7	10.43	30.1	100	41	P	H
		5692.4	55.18	-44.42	99.6	43.13	31.7	10.48	30.13	100	41	P	H
		5714.6	68.12	-41.17	109.29	56.02	31.73	10.51	30.14	100	41	P	H
		5724.6	73.57	-47.72	121.29	61.45	31.75	10.52	30.15	100	41	P	H
	*	5745	108.79	-	-	96.63	31.79	10.54	30.17	100	41	P	H
	*	5745	101.69	-	-	89.53	31.79	10.54	30.17	100	41	A	H
													H
													H
		5648.4	51.38	-16.82	68.2	39.35	31.7	10.43	30.1	100	346	P	V
		5692.6	54.02	-45.72	99.74	41.97	31.7	10.48	30.13	100	346	P	V
		5720	65.68	-45.12	110.8	53.58	31.74	10.51	30.15	100	346	P	V
		5724.4	71.47	-49.36	120.83	59.35	31.75	10.52	30.15	100	346	P	V
	*	5745	108.39	-	-	96.23	31.79	10.54	30.17	100	346	P	V
	*	5745	100.19	-	-	88.03	31.79	10.54	30.17	100	346	A	V
													V
													V

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 157 5785MHz		5640.8	51.54	-16.66	68.2	39.53	31.68	10.42	30.09	100	42	P	H
		5681.8	51.33	-40.44	91.77	39.28	31.7	10.47	30.12	100	42	P	H
		5717.8	52.28	-57.9	110.18	40.18	31.74	10.51	30.15	100	42	P	H
		5721.4	51.76	-62.23	113.99	39.66	31.74	10.51	30.15	100	42	P	H
	*	5785	108.12	-	-	95.94	31.8	10.58	30.2	100	42	P	H
	*	5785	100.22	-	-	88.04	31.8	10.58	30.2	100	42	A	H
		5851.805	51.72	-66.36	118.08	39.32	32	10.64	30.24	100	42	P	H
		5873.945	51.54	-53.95	105.49	39.1	32.05	10.65	30.26	100	42	P	H
		5885.425	52.42	-45.04	97.46	39.96	32.07	10.66	30.27	100	42	P	H
		5941.39	51.77	-16.43	68.2	39.2	32.18	10.7	30.31	100	42	P	H
													H
													H
		5603	52.27	-15.93	68.2	40.34	31.61	10.38	30.06	100	358	P	V
		5659.8	51.59	-23.89	75.48	39.55	31.7	10.45	30.11	100	358	P	V
		5719.8	51.39	-59.35	110.74	39.29	31.74	10.51	30.15	100	358	P	V
		5720	50.59	-60.21	110.8	38.49	31.74	10.51	30.15	100	358	P	V
	*	5785	106.63	-	-	94.45	31.8	10.58	30.2	100	358	P	V
	*	5785	98.35	-	-	86.17	31.8	10.58	30.2	100	358	A	V
		5854.47	51.85	-60.16	112.01	39.45	32.01	10.64	30.25	100	358	P	V
		5869.64	51.17	-55.53	106.7	38.74	32.04	10.65	30.26	100	358	P	V
		5891.37	51.85	-41.2	93.05	39.38	32.08	10.66	30.27	100	358	P	V
		5927.86	51.94	-16.26	68.2	39.39	32.16	10.69	30.3	100	358	P	V
													V
													V

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)
	*	5805	108.83	-	-	96.62	31.82	10.6	30.21	100	41	P	H
	*	5805	100.45	-	-	88.24	31.82	10.6	30.21	100	41	A	H
		5850.2	52.64	-69.1	121.74	40.24	32	10.64	30.24	100	41	P	H
		5857.2	53.79	-56.39	110.18	41.39	32.01	10.64	30.25	100	41	P	H
		5888.6	51.82	-43.28	95.1	39.35	32.08	10.66	30.27	100	41	P	H
		5932.4	50.95	-17.25	68.2	38.4	32.16	10.69	30.3	100	41	P	H
													H
802.11a													H
CH 161	*	5805	107.19	-	-	94.98	31.82	10.6	30.21	100	346	P	V
5805MHz	*	5805	99.09	-	-	86.88	31.82	10.6	30.21	100	346	A	V
		5852.8	52.21	-63.61	115.82	39.8	32.01	10.64	30.24	100	346	P	V
		5857.4	52.61	-57.52	110.13	40.21	32.01	10.64	30.25	100	346	P	V
		5887.8	52.81	-42.89	95.7	40.34	32.08	10.66	30.27	100	346	P	V
		5940.4	51.72	-16.48	68.2	39.15	32.18	10.7	30.31	100	346	P	V
													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 802.11a (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 149 5745MHz		11490	48.37	-25.63	74	54.12	40.09	15.03	60.87	100	0	P	H
		17235	49.8	-18.4	68.2	49	40.87	18.48	58.55	100	0	P	H
		17988.9	59.85	-14.15	74	49.29	48.8	19.03	57.27	300	269	P	H
		17988.9	49.96	-4.04	54	39.4	48.8	19.03	57.27	300	269	A	H
		11490	48.48	-25.52	74	54.23	40.09	15.03	60.87	100	0	P	V
		17235	50.41	-17.79	68.2	49.61	40.87	18.48	58.55	100	0	P	V
		18000	60.48	-13.52	74	49.68	49	19.04	57.24	100	159	P	V
		18000	50.56	-3.24	54	39.76	49	19.04	57.24	100	159	A	V
802.11a CH 157 5785MHz		11570	47.86	-26.14	74	53.7	40.03	15.07	60.94	100	0	P	H
		17355	51.2	-17	68.2	49.51	41.6	18.57	58.48	100	0	P	H
		17988.9	59.15	-14.85	74	48.59	48.8	19.03	57.27	300	247	P	H
		17988.9	49.26	-4.74	54	38.7	48.8	19.03	57.27	300	247	A	H
		11570	48.67	-25.33	74	54.51	40.03	15.07	60.94	100	0	P	V
		17355	51.54	-16.66	68.2	49.85	41.6	18.57	58.48	100	0	P	V
		17977.8	60.17	-13.83	74	49.83	48.6	19.03	57.29	100	126	P	V
		17977.8	49.83	-4.17	54	39.49	48.6	19.03	57.29	100	126	A	V
802.11a CH 161 5805MHz		11610	48.89	-25.11	74	54.85	39.94	15.09	60.99	100	0	P	H
		17415	51.32	-16.88	68.2	48.91	42.24	18.61	58.44	100	0	P	H
		18000	60.37	-13.63	74	49.57	49	19.04	57.24	300	247	P	H
		18000	50.52	-3.48	54	39.72	49	19.04	57.24	300	247	A	H
		11610	49.28	-24.72	74	55.24	39.94	15.09	60.99	100	0	P	V
		17415	52.27	-15.93	68.2	49.86	42.24	18.61	58.44	100	0	P	V
		17988.9	59.41	-14.59	74	48.85	48.8	19.03	57.27	100	125	P	V
		17988.9	49.32	-4.68	54	38.76	48.8	19.03	57.27	100	125	A	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. 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)
		5649.6	50.6	-17.6	68.2	38.57	31.7	10.43	30.1	100	43	P	H
		5693.2	58.06	-42.13	100.19	46.01	31.7	10.48	30.13	100	43	P	H
		5717.6	65.94	-44.19	110.13	53.84	31.74	10.51	30.15	100	43	P	H
		5725	72.97	-49.23	122.2	60.85	31.75	10.52	30.15	100	43	P	H
	*	5745	108	-	-	95.84	31.79	10.54	30.17	100	43	P	H
	*	5745	100.79	-	-	88.63	31.79	10.54	30.17	100	43	A	H
802.11n													H
HT20													H
CH 149		5630	52.19	-16.01	68.2	40.2	31.66	10.41	30.08	100	346	P	V
5745MHz		5693	54.38	-45.66	100.04	42.33	31.7	10.48	30.13	100	346	P	V
		5719.6	66.99	-43.7	110.69	54.89	31.74	10.51	30.15	100	346	P	V
		5725	72.61	-49.59	122.2	60.49	31.75	10.52	30.15	100	346	P	V
	*	5745	107.13	-	-	94.97	31.79	10.54	30.17	100	346	P	V
	*	5745	99.43	-	-	87.27	31.79	10.54	30.17	100	346	A	V
													V
													V

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)
		5601.4	50.93	-17.27	68.2	39.01	31.6	10.38	30.06	100	40	P	H
		5688.8	52.12	-44.82	96.94	40.07	31.7	10.48	30.13	100	40	P	H
		5718.2	52.22	-58.08	110.3	40.12	31.74	10.51	30.15	100	40	P	H
		5723.8	49.99	-69.47	119.46	37.87	31.75	10.52	30.15	100	40	P	H
	*	5785	106.92	-	-	94.74	31.8	10.58	30.2	100	40	P	H
	*	5785	99.32	-	-	87.14	31.8	10.58	30.2	100	40	A	H
		5852.625	50.66	-65.55	116.21	38.25	32.01	10.64	30.24	100	40	P	H
		5860.005	51.11	-58.29	109.4	38.7	32.02	10.64	30.25	100	40	P	H
		5881.53	51.05	-49.3	100.35	38.59	32.06	10.66	30.26	100	40	P	H
		5932.37	51.6	-16.6	68.2	39.05	32.16	10.69	30.3	100	40	P	H
802.11n													H
HT20													H
CH 157		5630.2	51.01	-17.19	68.2	39.02	31.66	10.41	30.08	100	358	P	V
5785MHz		5685	51.6	-42.53	94.13	39.55	31.7	10.47	30.12	100	358	P	V
		5713.6	50.95	-58.06	109.01	38.86	31.73	10.5	30.14	100	358	P	V
		5721	49.41	-63.67	113.08	37.31	31.74	10.51	30.15	100	358	P	V
	*	5785	106.08	-	-	93.9	31.8	10.58	30.2	100	358	P	V
	*	5785	97.82	-	-	85.64	31.8	10.58	30.2	100	358	A	V
		5853.035	50.21	-65.07	115.28	37.8	32.01	10.64	30.24	100	358	P	V
		5867.59	50.29	-56.98	107.27	37.85	32.04	10.65	30.25	100	358	P	V
		5875.995	51.6	-52.86	104.46	39.16	32.05	10.65	30.26	100	358	P	V
		5934.83	51.66	-16.54	68.2	39.1	32.17	10.69	30.3	100	358	P	V
													V
													V

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)
	*	5805	107.86	-	-	95.65	31.82	10.6	30.21	100	40	P	H
	*	5805	99.99	-	-	87.78	31.82	10.6	30.21	100	40	A	H
		5852.2	51.02	-66.16	117.18	38.62	32	10.64	30.24	100	40	P	H
		5857.8	53.18	-56.83	110.01	40.77	32.02	10.64	30.25	100	40	P	H
		5900.6	51.48	-34.74	86.22	38.99	32.1	10.67	30.28	100	40	P	H
		5928.4	51.55	-16.65	68.2	39	32.16	10.69	30.3	100	40	P	H
802.11n													H
HT20													H
CH 161	*	5805	106.22	-	-	94.01	31.82	10.6	30.21	100	347	P	V
5805MHz	*	5805	98.27	-	-	86.06	31.82	10.6	30.21	100	347	A	V
		5854	52.89	-60.19	113.08	40.48	32.01	10.64	30.24	100	347	P	V
		5857.6	53.13	-56.94	110.07	40.72	32.02	10.64	30.25	100	347	P	V
		5894.8	52.26	-38.25	90.51	39.77	32.09	10.67	30.27	100	347	P	V
		5937.4	51.31	-16.89	68.2	38.74	32.17	10.7	30.3	100	347	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 149 5745MHz		11490	48.25	-25.75	74	54	40.09	15.03	60.87	100	0	P	H
		17235	50.45	-17.75	68.2	49.65	40.87	18.48	58.55	100	0	P	H
		18000	59.55	-14.45	74	48.75	49	19.04	57.24	300	248	P	H
		18000	49.45	-4.55	54	38.65	49	19.04	57.24	300	248	A	H
		11490	47.81	-26.19	74	53.56	40.09	15.03	60.87	100	0	P	V
		17235	50.88	-17.32	68.2	50.08	40.87	18.48	58.55	100	0	P	V
		18000	59.72	-14.28	74	48.92	49	19.04	57.24	100	129	P	V
		18000	49.27	-4.73	54	38.47	49	19.04	57.24	100	129	A	V
802.11n HT20 CH 157 5785MHz		11570	48.68	-25.32	74	54.52	40.03	15.07	60.94	100	0	P	H
		17355	51.67	-16.53	68.2	49.98	41.6	18.57	58.48	100	0	P	H
		18000	60.65	-13.35	74	49.85	49	19.04	57.24	300	236	P	H
		18000	50.75	-3.25	54	39.95	49	19.04	57.24	300	236	A	H
		11570	49.33	-24.67	74	55.17	40.03	15.07	60.94	100	0	P	V
		17355	51.46	-16.74	68.2	49.77	41.6	18.57	58.48	100	0	P	V
		18000	59.72	-14.28	74	48.92	49	19.04	57.24	100	145	P	V
		18000	49.56	-4.44	54	38.76	49	19.04	57.24	100	145	A	V
802.11n HT20 CH 161 5805MHz		11610	49.37	-24.63	74	55.33	39.94	15.09	60.99	100	0	P	H
		17415	52.03	-16.17	68.2	49.62	42.24	18.61	58.44	100	0	P	H
		17977.8	59.55	-14.45	74	49.21	48.6	19.03	57.29	300	214	P	H
		17977.8	50.09	-3.91	54	39.75	48.6	19.03	57.29	300	214	A	H
		11610	48.75	-25.25	74	54.71	39.94	15.09	60.99	100	0	P	V
		17415	51.34	-16.86	68.2	48.93	42.24	18.61	58.44	100	0	P	V
		17977.8	59.88	-14.12	74	49.54	48.6	19.03	57.29	100	120	P	V
		17977.8	50.09	-3.91	54	39.75	48.6	19.03	57.29	100	120	A	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 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)
		5618.6	51.87	-16.33	68.2	39.91	31.64	10.4	30.08	100	44	P	H
		5698	57.63	-46.1	103.73	45.57	31.7	10.49	30.13	100	44	P	H
		5716	66.95	-42.73	109.68	54.86	31.73	10.51	30.15	100	44	P	H
		5722	69.61	-45.75	115.36	57.51	31.74	10.51	30.15	100	44	P	H
	*	5755	104.24	-	-	92.06	31.8	10.55	30.17	100	44	P	H
	*	5755	96.52	-	-	84.34	31.8	10.55	30.17	100	44	A	H
		5850.575	49.97	-70.92	120.89	37.57	32	10.64	30.24	100	44	P	H
		5861.44	50.98	-58.01	108.99	38.57	32.02	10.64	30.25	100	44	P	H
		5877.635	50.94	-52.3	103.24	38.49	32.06	10.65	30.26	100	44	P	H
		5928.065	51.01	-17.19	68.2	38.46	32.16	10.69	30.3	100	44	P	H
802.11n													H
HT40													H
CH 151		5646.6	51.65	-16.55	68.2	39.63	31.69	10.43	30.1	100	346	P	V
5755MHz		5692.6	55.95	-43.79	99.74	43.9	31.7	10.48	30.13	100	346	P	V
		5720	66.73	-44.07	110.8	54.63	31.74	10.51	30.15	100	346	P	V
		5724	68.21	-51.71	119.92	56.09	31.75	10.52	30.15	100	346	P	V
	*	5755	102.95	-	-	90.77	31.8	10.55	30.17	100	346	P	V
	*	5755	95.18	-	-	83	31.8	10.55	30.17	100	346	A	V
		5853.035	50.81	-64.47	115.28	38.4	32.01	10.64	30.24	100	346	P	V
		5860.21	51.58	-57.76	109.34	39.17	32.02	10.64	30.25	100	346	P	V
		5880.095	51.3	-50.12	101.42	38.84	32.06	10.66	30.26	100	346	P	V
		5946.72	52.09	-16.11	68.2	39.51	32.19	10.7	30.31	100	346	P	V
													V
													V

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)
		5636.8	51.65	-16.55	68.2	39.65	31.67	10.42	30.09	100	42	P	H
		5692.6	52.17	-47.57	99.74	40.12	31.7	10.48	30.13	100	42	P	H
		5718	51.13	-59.11	110.24	39.03	31.74	10.51	30.15	100	42	P	H
		5722.2	51.59	-64.23	115.82	39.49	31.74	10.51	30.15	100	42	P	H
	*	5795	103.09	-	-	90.9	31.8	10.59	30.2	100	42	P	H
	*	5795	95.21	-	-	83.02	31.8	10.59	30.2	100	42	A	H
		5852.01	55.52	-62.1	117.62	43.12	32	10.64	30.24	100	42	P	H
		5855.495	53.43	-57.23	110.66	41.03	32.01	10.64	30.25	100	42	P	H
		5890.755	51.21	-42.3	93.51	38.74	32.08	10.66	30.27	100	42	P	H
		5942.415	51.65	-16.55	68.2	39.08	32.18	10.7	30.31	100	42	P	H
802.11n													H
HT40													H
CH 159		5648	51.88	-16.32	68.2	39.85	31.7	10.43	30.1	100	359	P	V
5795MHz		5667.8	52.96	-28.45	81.41	40.92	31.7	10.45	30.11	100	359	P	V
		5713.8	50.39	-58.68	109.07	38.29	31.73	10.51	30.14	100	359	P	V
		5722	50.45	-64.91	115.36	38.35	31.74	10.51	30.15	100	359	P	V
	*	5795	101.05	-	-	88.86	31.8	10.59	30.2	100	359	P	V
	*	5795	93.59	-	-	81.4	31.8	10.59	30.2	100	359	A	V
		5849.96	52.76	-81.44	134.2	40.37	32	10.63	30.24	100	359	P	V
		5855.7	52.19	-58.41	110.6	39.79	32.01	10.64	30.25	100	359	P	V
		5904.695	51.8	-31.39	83.19	39.3	32.11	10.67	30.28	100	359	P	V
		5949.795	51.59	-16.61	68.2	39	32.2	10.7	30.31	100	359	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 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)
802.11n HT40 CH 151 5755MHz		11510	48.21	-25.79	74	53.96	40.09	15.04	60.88	100	0	P	H
		17265	50.02	-18.18	68.2	49.13	40.93	18.5	58.54	100	0	P	H
		17988.9	60.53	-13.47	74	49.97	48.8	19.03	57.27	300	257	P	H
		17988.9	50.33	-3.67	54	39.77	48.8	19.03	57.27	300	257	A	H
		11510	49	-25	74	54.75	40.09	15.04	60.88	100	0	P	V
		17265	50.36	-17.84	68.2	49.47	40.93	18.5	58.54	100	0	P	V
		17977.8	59.65	-14.35	74	49.31	48.6	19.03	57.29	100	148	P	V
		17977.8	49.79	-4.21	54	39.45	48.6	19.03	57.29	100	148	A	V
802.11n HT40 CH 159 5795MHz		11590	48.44	-25.56	74	54.32	40.01	15.08	60.97	100	0	P	H
		17385	51.96	-16.24	68.2	49.9	41.93	18.59	58.46	100	0	P	H
		18000	59.38	-14.62	74	48.58	49	19.04	57.24	300	236	P	H
		18000	49.26	-4.74	54	38.46	49	19.04	57.24	300	236	A	H
		11590	48.5	-25.5	74	54.38	40.01	15.08	60.97	100	0	P	V
		17385	51.69	-16.51	68.2	49.63	41.93	18.59	58.46	100	0	P	V
		18000	59.95	-14.05	74	49.15	49	19.04	57.24	100	124	P	V
		18000	50.47	-3.53	54	39.67	49	19.04	57.24	100	124	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission above 18GHz

WIFI 802.11a (SHF @ 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)
		22378	38.24	-35.76	74	41.59	38.93	12.27	54.55	150	0	P	H
		34236	40.7	-33.3	74	39.2	41.56	18.08	58.14	150	0	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
802.11a													H
SHF		22906	40.04	-33.96	74	43.11	38.69	12.42	54.18	150	0	P	V
		36524	45	-29	74	41.31	43.3	18.77	58.38	150	0	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Emission below 1GHz

WIFI 802.11a (LF @ 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 LF		77.53	24.31	-15.69	40	42.54	13.03	1.24	32.5	-	-	P	H
		102.75	24.36	-19.14	43.5	39.25	16.16	1.46	32.51	-	-	P	H
		277.35	27.48	-18.52	46	38.77	18.81	2.35	32.45	-	-	P	H
		365.62	32.62	-13.38	46	41.65	20.86	2.61	32.5	-	-	P	H
		394.72	33.99	-12.01	46	41.97	21.74	2.7	32.42	100	0	P	H
		490.75	30.64	-15.36	46	36.32	23.84	3.03	32.55	-	-	P	H
													H
													H
													H
													H
													H
													H
		67.83	28.67	-11.33	40	48.04	12.04	1.13	32.54	-	-	P	V
		158.04	25.76	-17.74	43.5	39.84	16.62	1.8	32.5	-	-	P	V
		307.42	26.53	-19.47	46	37.3	19.3	2.43	32.5	-	-	P	V
		336.52	30.71	-15.29	46	40.71	20.01	2.52	32.53	-	-	P	V
		365.62	34.72	-11.28	46	43.75	20.86	2.61	32.5	100	0	P	V
		394.72	33.12	-12.88	46	41.1	21.74	2.7	32.42	-	-	P	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	**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.	
1		(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)

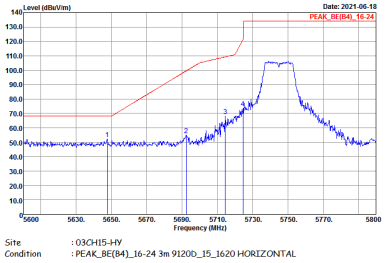
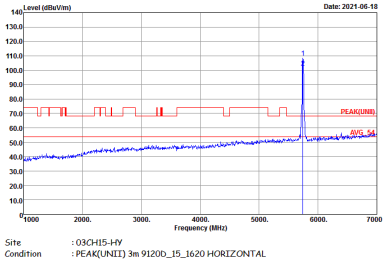
Both peak and average measured complies with the limit line, so test result is “PASS”.

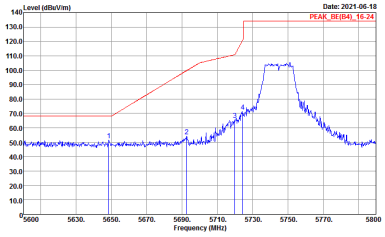
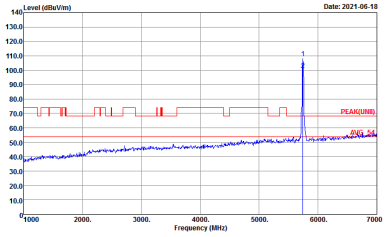
Appendix D. Radiated Spurious Emission Plots

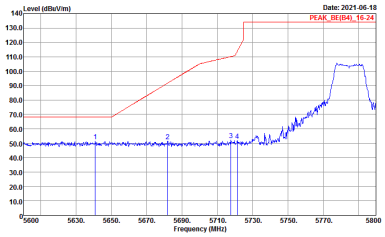
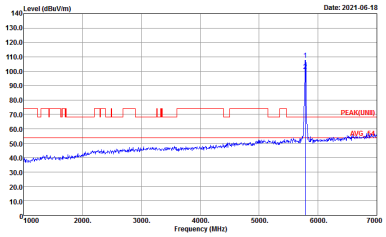
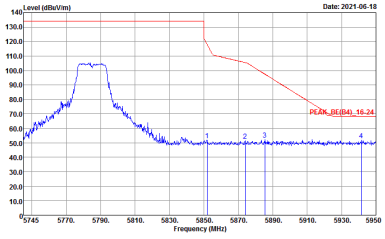
Test Engineer :	Leo Lee, Mancy Chou, and Bigshow Wang	Temperature :	22.1~23.1°C
		Relative Humidity :	55.0~60.0%

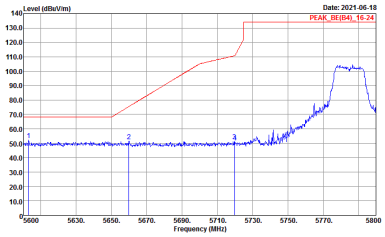
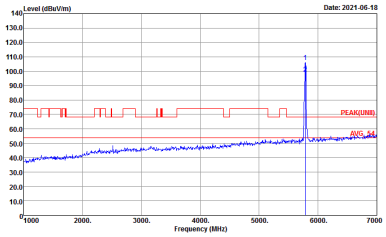
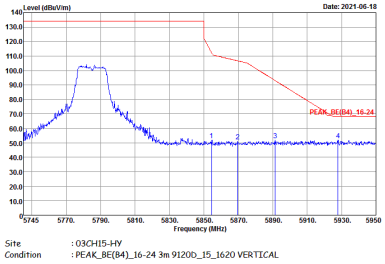
Band 4 - 5725~5850MHz

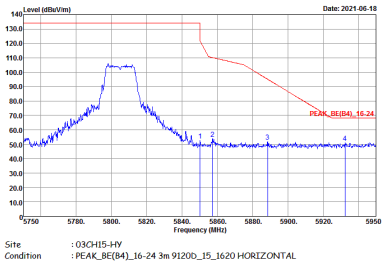
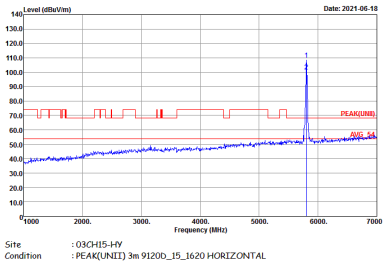
WIFI 802.11a (Band Edge @ 3m)

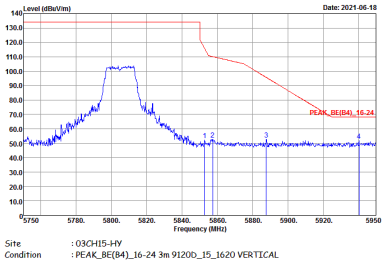
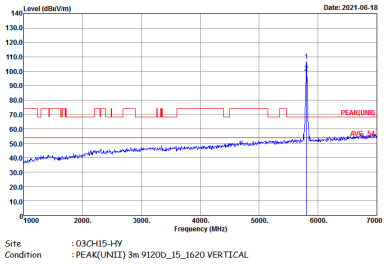
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Vertical	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Fundamental
Peak		
Peak		Left blank

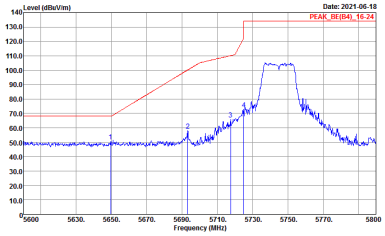
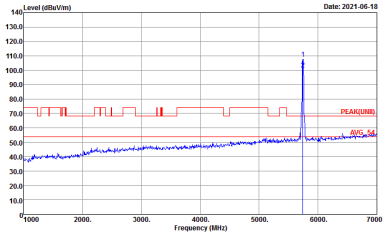
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

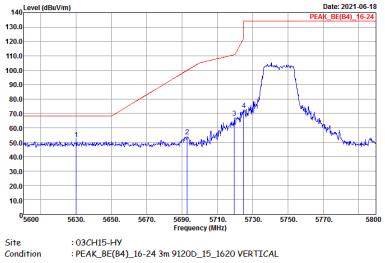
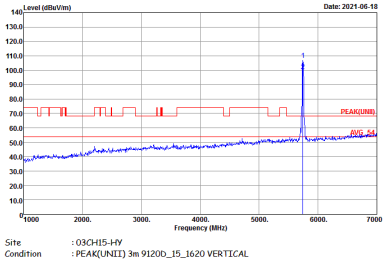
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH161 5805MHz	
1	Horizontal	Fundamental
Peak		

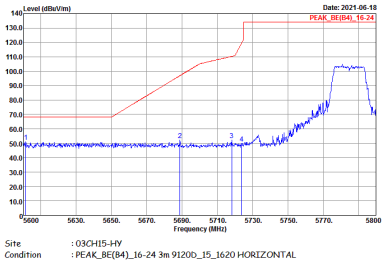
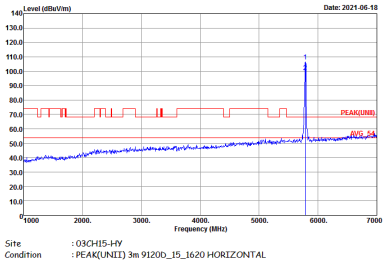
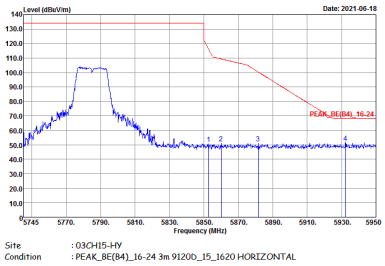
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH161 5805MHz	
1	Vertical	Fundamental
Peak		

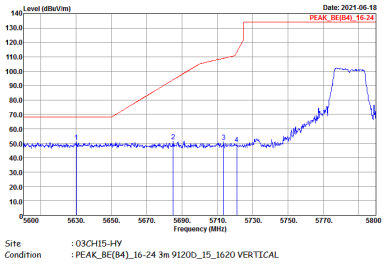
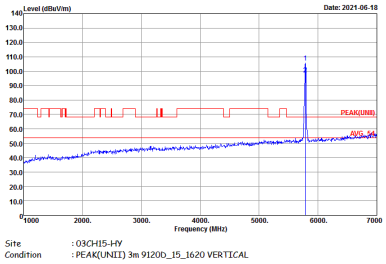
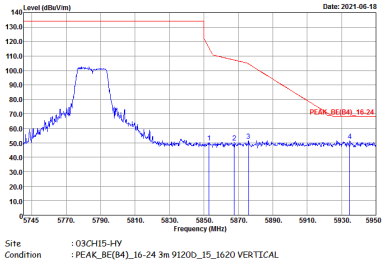
Band 4 5725~5850MHz

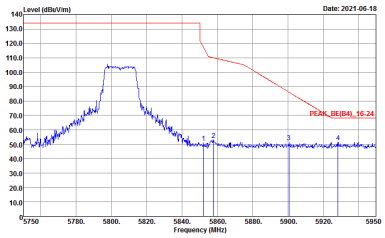
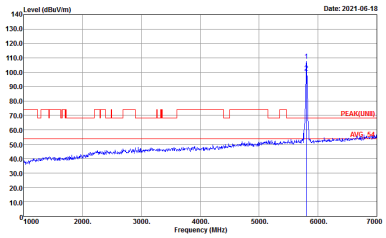
WIFI 802.11n HT20 (Band Edge @ 3m)

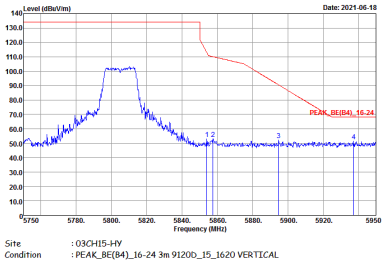
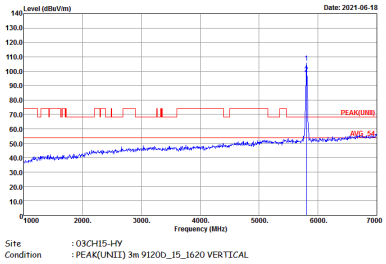
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Vertical	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Fundamental
Peak		
Peak		Left blank

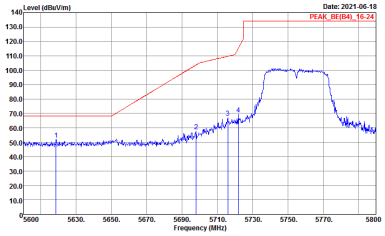
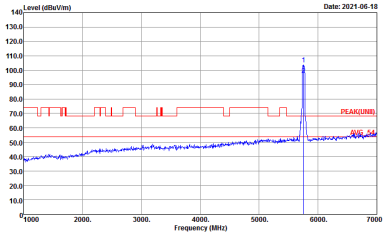
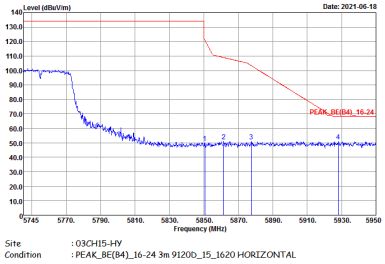
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

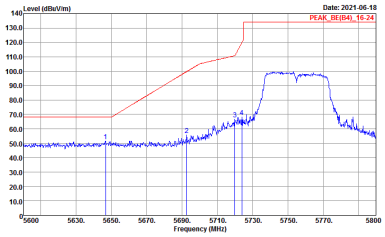
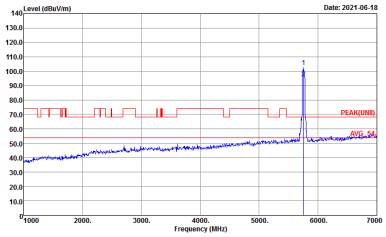
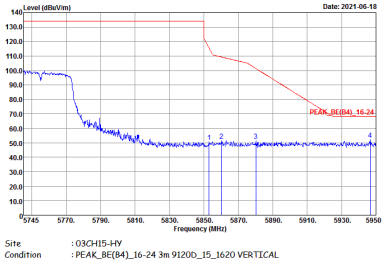
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH161 5805MHz	
1	Horizontal	Fundamental
Peak		

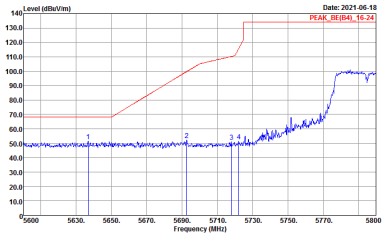
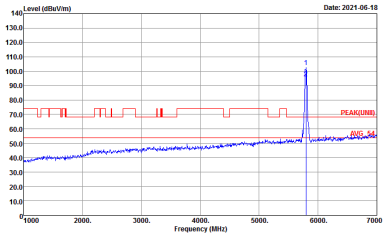
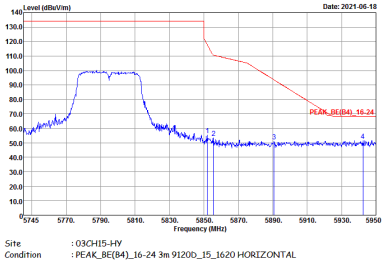
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH161 5805MHz	
1	Vertical	Fundamental
Peak		

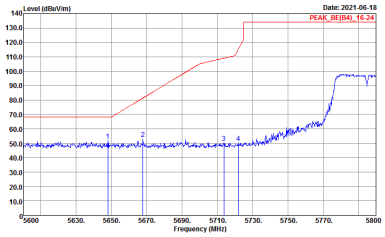
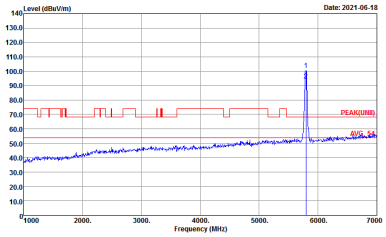
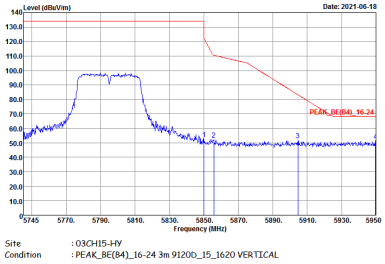
Band 4 5725~5850MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Fundamental
Peak		
Peak		Left blank

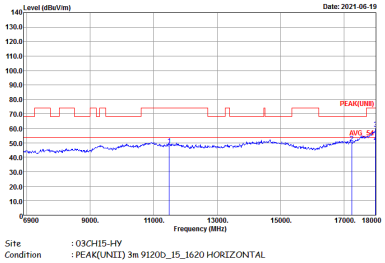
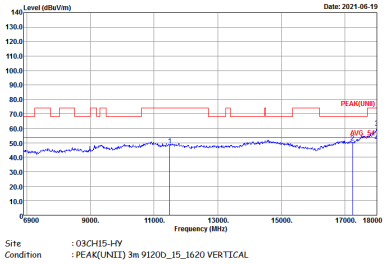
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

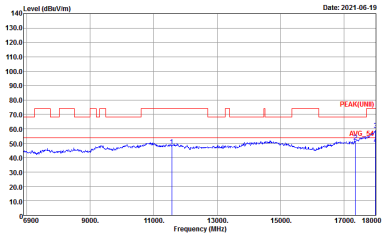
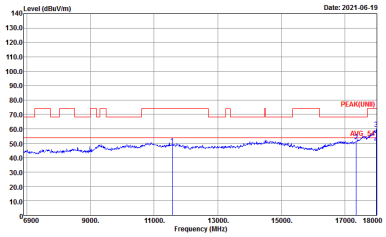
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Fundamental
Peak		
Peak		Left blank

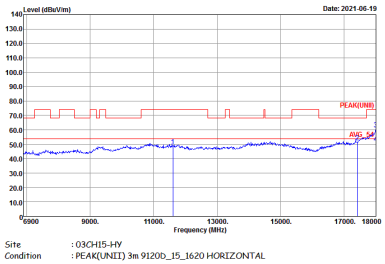
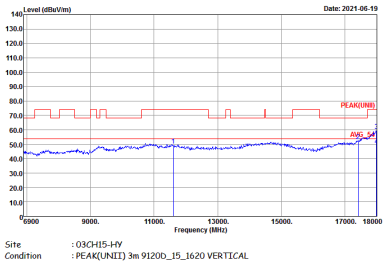
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

Band 4 - 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

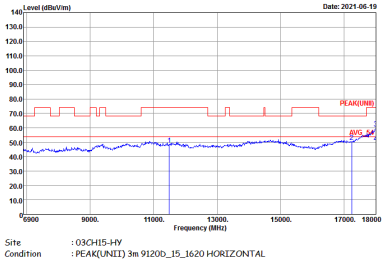
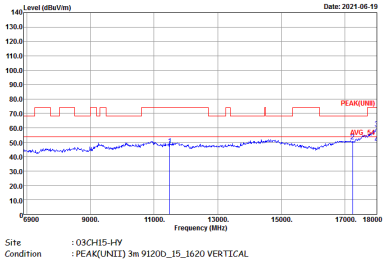
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

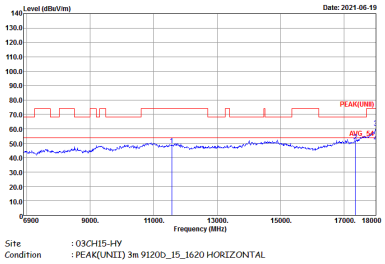
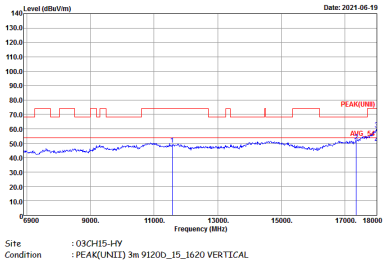
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

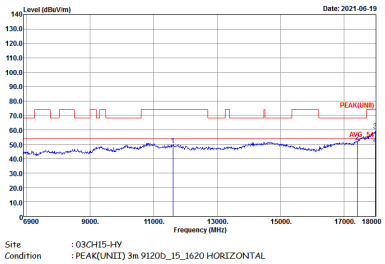
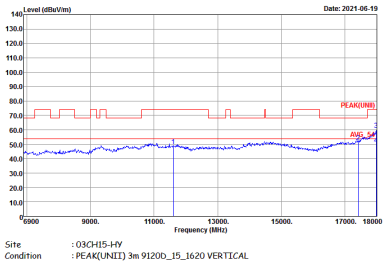
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH161 5805MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

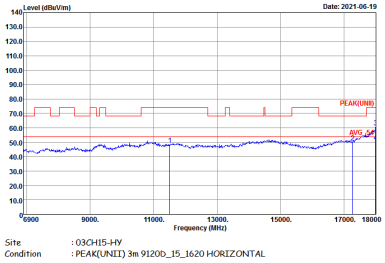
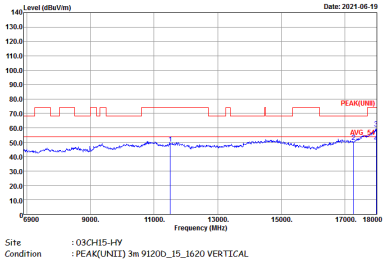
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

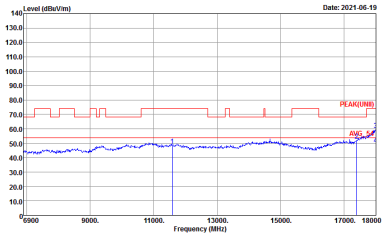
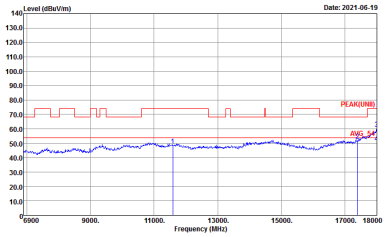
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH161 5805MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5725~5850MHz

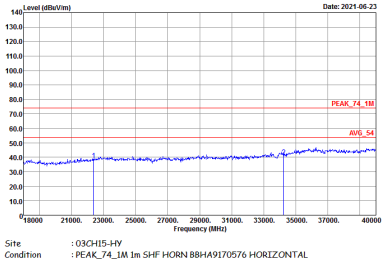
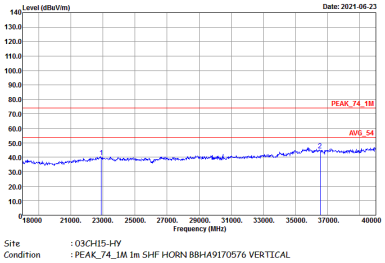
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Vertical
Peak Avg.		

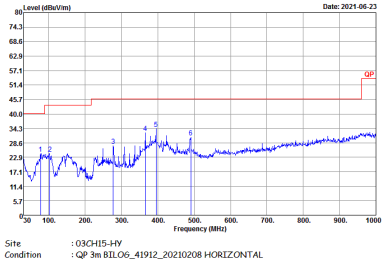
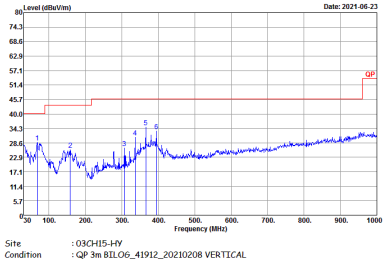
Emission above 18GHz

5GHz WIFI 802.11a (SHF)

WIFI	5GHz WIFI	
ANT	802.11a SHF	
1	Horizontal	Vertical
QP / Peak		

Emission below 1GHz

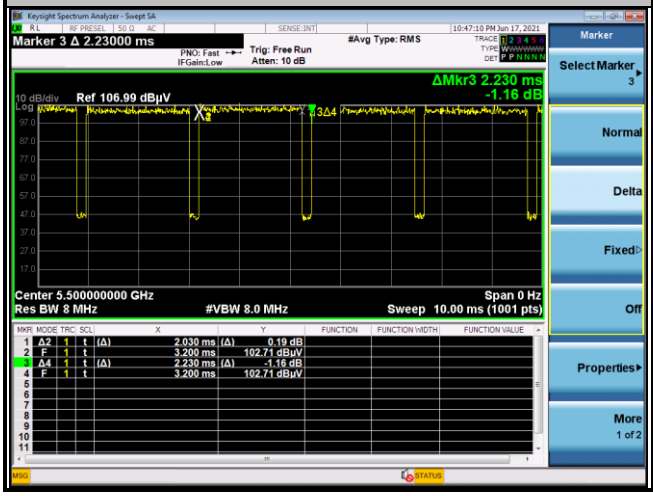
5GHz WIFI 802.11a (LF)

WIFI	5GHz WIFI	
ANT	802.11a LF	
1	Horizontal	Vertical
QP / Peak		

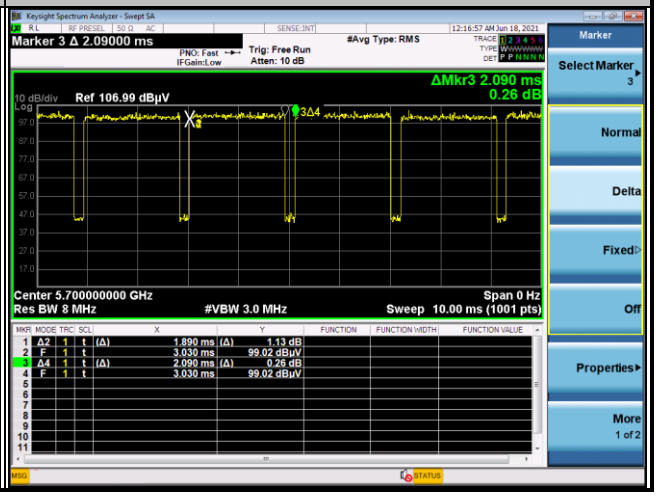
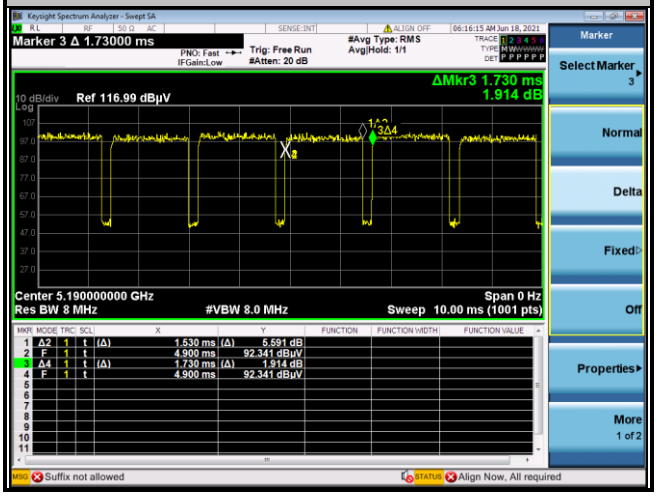
Appendix E. Duty Cycle Plots

Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting
802.11a	91.03	2030	0.49	1kHz
5GHz 802.11n HT20	90.43	1890	0.53	1kHz
5GHz 802.11n HT40	88.44	1530	0.65	1kHz

802.11a



802.11n HT20



802.11n HT40