FCC RF Test Report

APPLICANT	:	Ring LLC
EQUIPMENT	:	Ring Car Cam
BRAND NAME	:	Ring
MODEL NAME	:	5B28S9
FCC ID	:	2AEUPBHACC001
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Nov. 01, 2021 ~ Mar. 01, 2022

We, Sporton International Inc. (Kunshan), 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. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1O0826G	Rev. 01	Initial issue of report	Mar. 01, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 5.16 dB at 408.300 MHz
3.5	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	Pass	-
-	15.207	AC Conducted Emission	15.207(a)	Not Required	-

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

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.

1 General Description

1.1 Applicant

Ring LLC
1523 26th Street, Santa Monica, CA 90404 USA

1.2 Manufacturer

Ring LLC
1523 26th Street, Santa Monica, CA 90404 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Ring Car Cam
Brand Name	Ring
Model Name	5B28S9
FCC ID	2AEUPBHACC001
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	**<5745 MHz ~ 5825 MHz>** 802.11a : 14.51 dBm / 0.0282 W 802.11n HT20 : 14.49 dBm / 0.0281 W
99% Occupied Bandwidth	802.11a : 16.83 MHz 802.11n HT20 : 18.28 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Type / Gain	IFA Antenna with gain 3.90 dBi

1.5 Modification of EUT

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

1.6 Testing Location

<FCC>-KS

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH06-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH06-KS	AUDIX	E3	6.2009-8-24al

1.8 Applicable Standards

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

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

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. 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: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	165	5825		

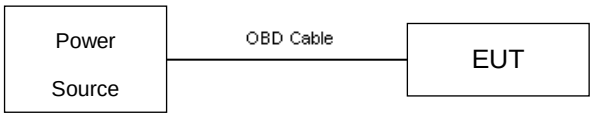
2.2 Test Mode

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**

Ch. #		U-NII-3：5745-5825 MHz	
		802.11a	802.11n HT20
L	Low	149	149
M	Middle	157	157
H	High	165	165

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	DC Power Supply	N/A	N/A	N/A	N/A	N/A
2.	OBD cable	Ring	5B29S1	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit/receive.

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 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.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 7.30 dB.

Offset(dB) = RF cable loss(dB).

= 7.30 (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.

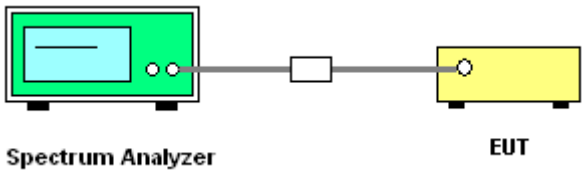
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 5.725-5.85GHz
2. For 6dB BW, Set RBW = 100kHz.
   For 26dB BW, Set RBW = approximately 1% of the emission bandwidth.
   For 99% OBW, Set RBW = 1% to 5% of the OBW.
3. For 26dB BW, Set the VBW > RBW.
   For 6dB BW & 99% OBW, 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.

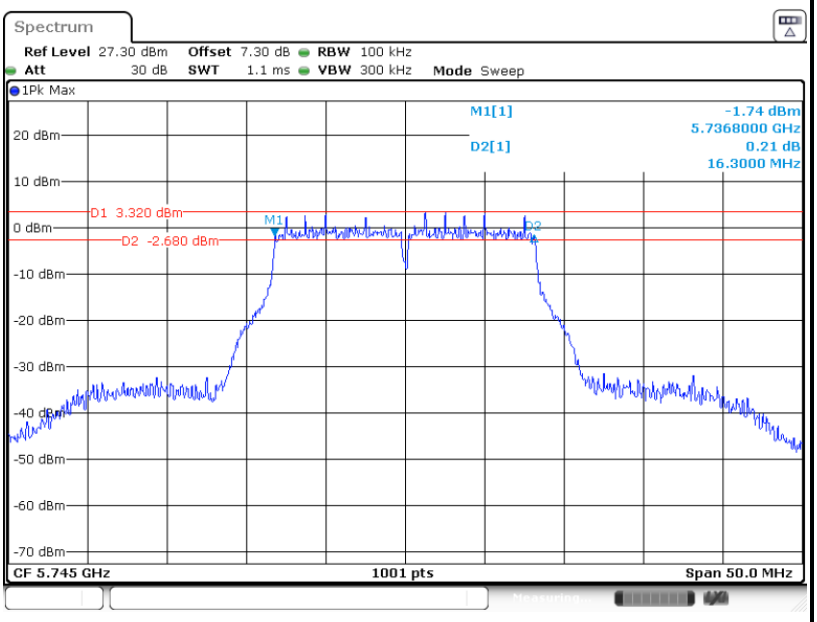
3.1.4 Test Setup



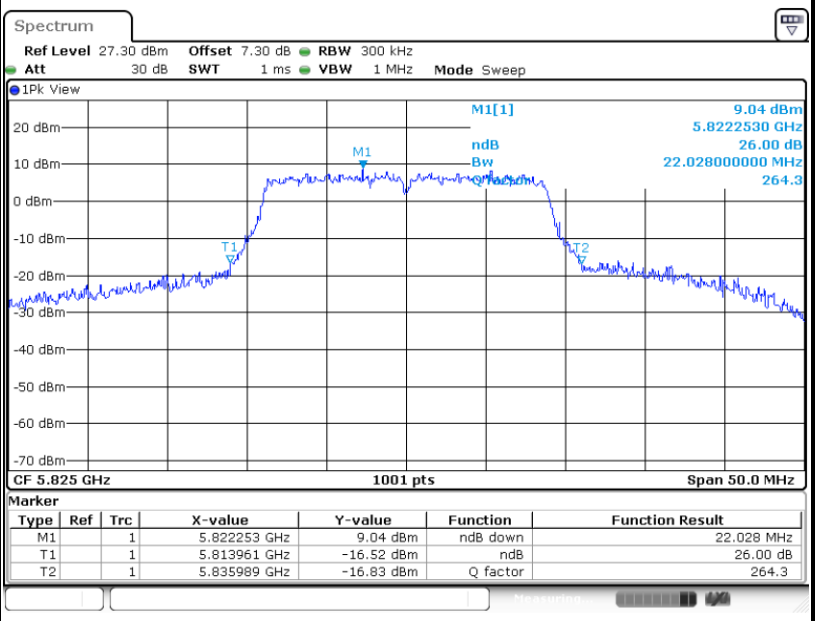
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

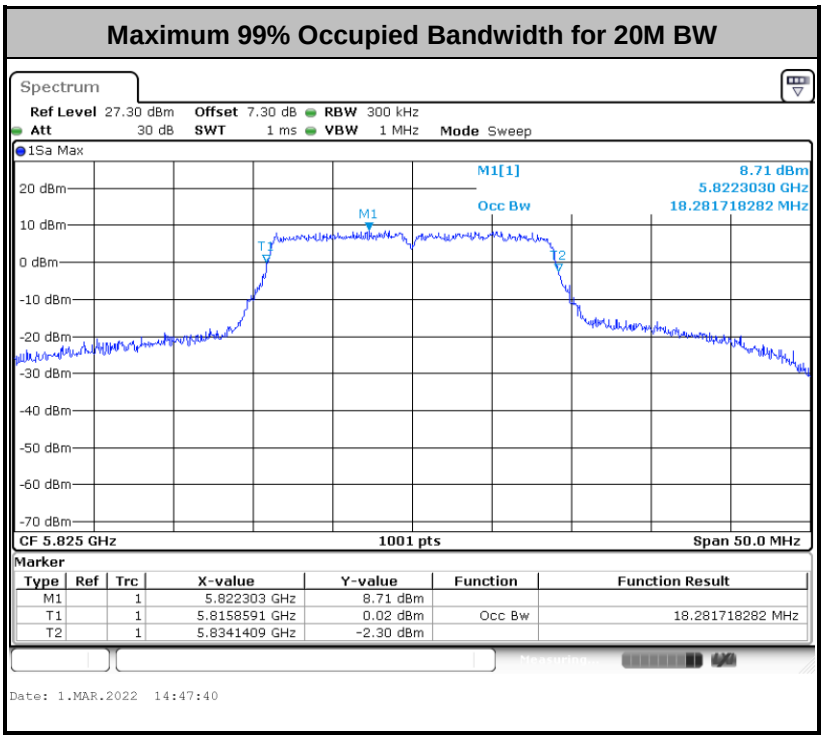
Minimum 6dB Bandwidth



Maximum 26dB Bandwidth for 20M BW



Maximum 99% Occupied Bandwidth for 20M BW



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

The measuring equipment is listed in the section 4 of this test report.

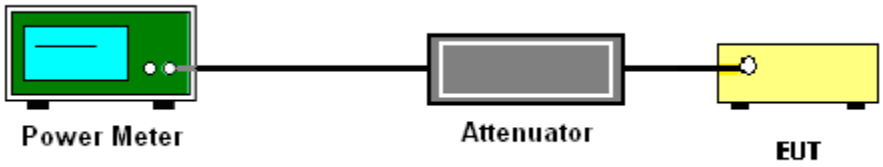
3.2.3 Test Procedures

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.

3.2.4 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

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

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

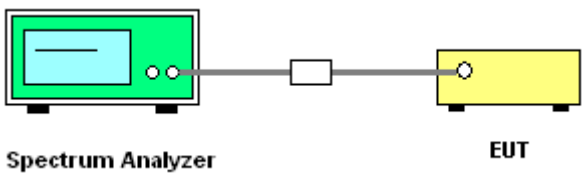
Section F) Maximum power spectral density.

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(500kHz/RBW) to the test result.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

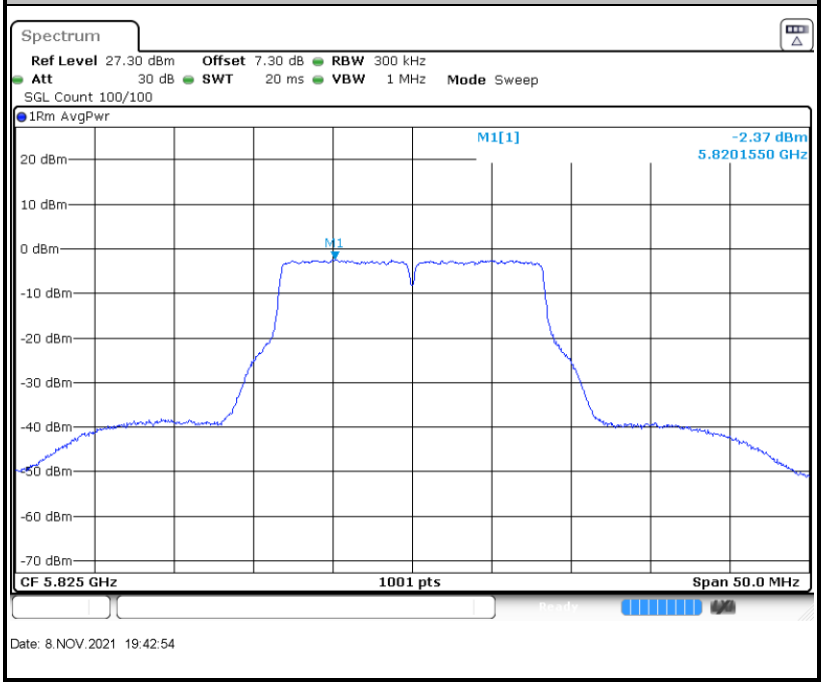
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/MHz)



Note: Average Power Density (dB) = Measured value+ Duty Factor

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

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

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

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.77$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

(3) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 1000MHz

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

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

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

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

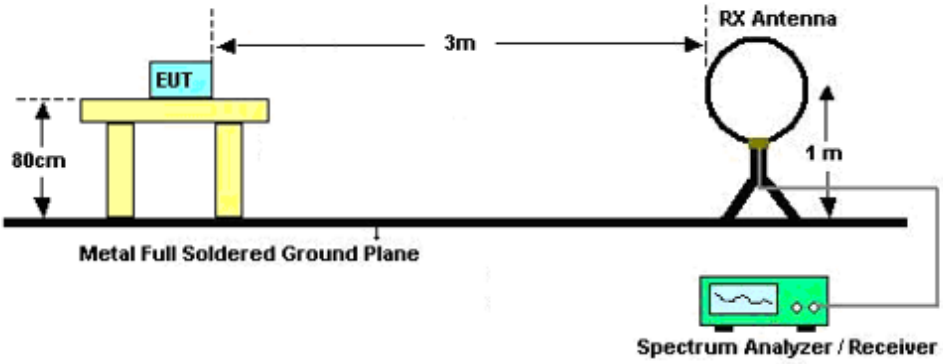
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.

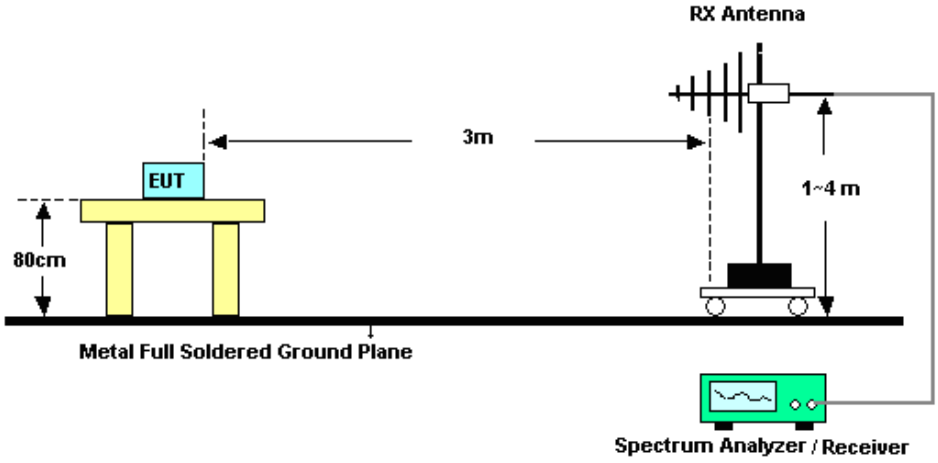
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak 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

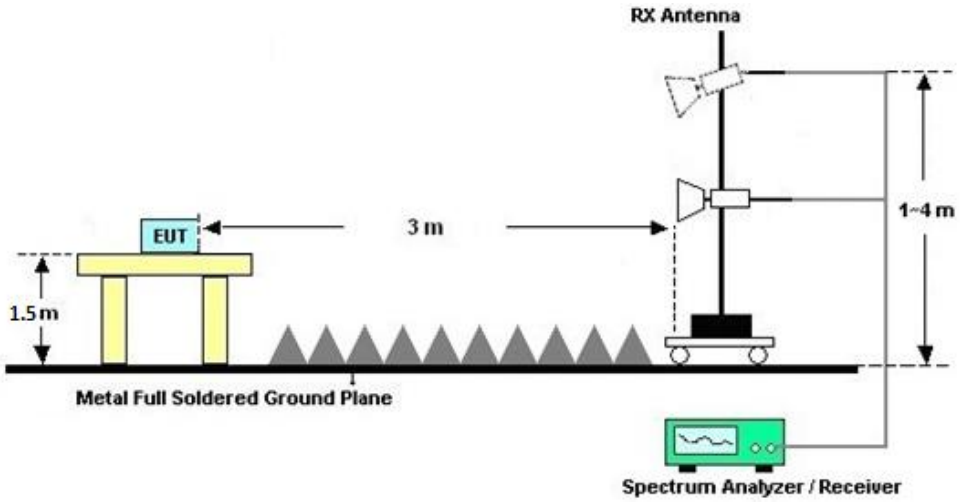
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix B.

3.4.7 Duty Cycle

Please refer to Appendix C.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix B.

3.5 Antenna Requirements

3.5.1 Standard Applicable

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

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 14, 2021	Nov. 01, 2021~ Mar. 01, 2021	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 08, 2021	Nov. 01, 2021~ Nov. 08, 2021	Jan. 07, 2022	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Mar. 01, 2021	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 08, 2021	Nov. 01, 2021~ Nov. 08, 2021	Jan. 07, 2022	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Mar. 01, 2021	Jan. 04, 2023	Conducted (TH01-KS)
Temperature &humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	Nov. 01, 2021~ Mar. 01, 2021	Jul. 11, 2022	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 16, 2021	Feb. 21, 2022	Oct. 15, 2022	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44GHz	Apr. 12, 2021	Feb. 21, 2022	Apr. 11, 2022	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Feb. 21, 2022	Oct. 29, 2022	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	May 27, 2021	Feb. 21, 2022	May 26, 2022	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 25, 2021	Feb. 21, 2022	Apr. 24, 2022	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2022	Feb. 21, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Apr. 12, 2021	Feb. 21, 2022	Apr. 11, 2022	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Feb. 21, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	Feb. 21, 2022	Jul. 29, 2022	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Apr. 13, 2021	Feb. 21, 2022	Apr. 12, 2022	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Feb. 21, 2022	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Feb. 21, 2022	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Feb. 21, 2022	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

---------- THE END ----------

Appendix A. Conducted Test Results

Report Number : FR1O0826G

Test Engineer:	Albert shi	Temperature:	21~25	°C
Test Date:	2021/11/1~2022/3/1	Relative Humidity:	51~54	%

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

U-NII-3									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)	6 dB Bandwidth (MHz)	6dB Bandwidth min. Limit (MHz)	Pass/Fail
11a	6M bps	1	149	5745	16.73	21.33	16.30	0.5	Pass
11a	6Mbps	1	157	5785	16.73	21.33	16.35	0.5	Pass
11a	6Mbps	1	165	5825	16.83	21.93	16.35	0.5	Pass
HT20	MCS 0	1	149	5745	18.08	21.93	17.55	0.5	Pass
HT20	MCS 0	1	157	5785	18.03	22.03	17.55	0.5	Pass
HT20	MCS 0	1	165	5825	18.28	22.03	17.55	0.5	Pass

TEST RESULTS DATA
Average Power Table

U-NII-3										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail
11a	6M bps	1	149	5745	0.30	14.42	30.00	3.90		Pass
11a	6Mbps	1	157	5785	0.30	14.51	30.00	3.90		Pass
11a	6Mbps	1	165	5825	0.30	14.32	30.00	3.90		Pass
HT20	MCS 0	1	149	5745	0.34	14.49	30.00	3.90		Pass
HT20	MCS 0	1	157	5785	0.34	14.41	30.00	3.90		Pass
HT20	MCS 0	1	165	5825	0.34	14.36	30.00	3.90		Pass

TEST RESULTS DATA
Power Spectral Density

U-NII-3										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	10log (500kHz /RBW) Factor (dB)	Average Power Density (dBm/500kHz)	Average PSD Limit (dBm/500kHz)	DG (dBi)	Pass/Fail
11a	6M bps	1	149	5745	0.30	2.22	0.04	30.00	3.90	Pass
11a	6Mbps	1	157	5785	0.30	2.22	0.14	30.00	3.90	Pass
11a	6Mbps	1	165	5825	0.30	2.22	0.15	30.00	3.90	Pass
HT20	MCS 0	1	149	5745	0.34	2.22	-0.32	30.00	3.90	Pass
HT20	MCS 0	1	157	5785	0.34	2.22	-0.09	30.00	3.90	Pass
HT20	MCS 0	1	165	5825	0.34	2.22	-0.28	30.00	3.90	Pass

Appendix B. Radiated Spurious Emission

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 149 5745MHz		5649.2	55.28	-13.02	68.3	40.72	35.5	11.16	32.1	364	10	P	H
		5694.8	59.2	-42.27	101.47	44.46	35.58	11.22	32.06	364	10	P	H
		5719.8	70.51	-40.33	110.84	55.7	35.6	11.25	32.04	364	10	P	H
		5724	76.99	-43.03	120.02	62.16	35.62	11.25	32.04	364	10	P	H
		5740	112.42	------	------	97.51	35.65	11.27	32.01	364	10	P	H
		5740	104.32	------	------	89.41	35.65	11.27	32.01	364	10	A	H
		5648.8	55.44	-12.86	68.3	40.88	35.5	11.16	32.1	292	345	P	V
		5688.8	56.18	-40.86	97.04	41.44	35.58	11.22	32.06	292	345	P	V
		5714.8	65.5	-43.95	109.45	50.71	35.6	11.23	32.04	292	345	P	V
		5724.8	72.88	-48.96	121.84	58.05	35.62	11.25	32.04	292	345	P	V
		5740	105.73	------	------	90.82	35.65	11.27	32.01	292	345	P	V
		5740	98.81	------	------	83.9	35.65	11.27	32.01	292	345	A	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		5647.6	55.45	-12.85	68.3	40.89	35.5	11.16	32.1	310	7	P	H
		5699.2	55.81	-48.9	104.71	41.07	35.58	11.22	32.06	310	7	P	H
		5715.6	56.24	-53.43	109.67	41.45	35.6	11.23	32.04	310	7	P	H
		5723.6	58.05	-61.06	119.11	43.22	35.62	11.25	32.04	310	7	P	H
		5780	111.54	------	------	96.53	35.7	11.3	31.99	310	7	P	H
		5780	103.52	------	------	88.51	35.7	11.3	31.99	310	7	A	H
		5850.4	56.96	-64.43	121.39	41.73	35.8	11.36	31.93	310	7	P	H
		5855.2	56.43	-54.41	110.84	41.18	35.8	11.38	31.93	310	7	P	H
		5887.6	57.94	-38.01	95.95	42.71	35.79	11.41	31.97	310	7	P	H
		5945.2	55.88	-12.42	68.3	40.68	35.76	11.45	32.01	310	7	P	H
		5644.8	54.69	-13.61	68.3	40.13	35.5	11.16	32.1	303	345	P	V
		5673.2	56.4	-29.11	85.51	41.73	35.55	11.2	32.08	303	345	P	V
		5711.6	55.4	-53.15	108.55	40.61	35.6	11.23	32.04	303	345	P	V
		5722.8	54.97	-62.31	117.28	40.14	35.62	11.25	32.04	303	345	P	V
		5784	104.81	------	------	89.78	35.7	11.3	31.97	303	345	P	V
		5784	96.49	------	------	81.46	35.7	11.3	31.97	303	345	A	V
		5850.8	55.93	-64.55	120.48	40.7	35.8	11.36	31.93	303	345	P	V
		5868.4	57.22	-49.93	107.15	42	35.79	11.38	31.95	303	345	P	V
		5910.8	56.19	-22.59	78.78	40.97	35.78	11.43	31.99	303	345	P	V
		5972.4	56.1	-12.2	68.3	40.9	35.76	11.47	32.03	303	345	P	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 165 5825MHz		5824	112.12	------	------	96.97	35.75	11.35	31.95	395	6	P	H
		5824	103.69	------	------	88.54	35.75	11.35	31.95	395	6	A	H
		5852	63.56	-54.18	117.74	48.33	35.8	11.36	31.93	395	6	P	H
		5865.6	60.89	-47.04	107.93	45.67	35.79	11.38	31.95	395	6	P	H
		5876.4	57.38	-46.88	104.26	42.15	35.79	11.39	31.95	395	6	P	H
		5941.2	56.68	-11.62	68.3	41.47	35.77	11.45	32.01	395	6	P	H
		5820	103.91	------	------	88.76	35.75	11.35	31.95	300	344	P	V
		5820	95.69	------	------	80.54	35.75	11.35	31.95	300	344	A	V
		5852.8	58.53	-57.39	115.92	43.3	35.8	11.36	31.93	300	344	P	V
		5867.6	57.33	-50.04	107.37	42.11	35.79	11.38	31.95	300	344	P	V
		5900.4	56.41	-30.05	86.46	41.19	35.78	11.41	31.97	300	344	P	V
		5956.4	56.05	-12.25	68.3	40.83	35.76	11.47	32.01	300	344	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

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	48.47	-25.53	74	53.9	38.69	16.31	60.43	300	0	P	H
		11490	49.58	-24.42	74	55.01	38.69	16.31	60.43	100	0	P	V
802.11a CH 157 5785MHz		11570	48.42	-25.58	74	53.7	38.71	16.39	60.38	300	0	P	H
		11570	49.7	-24.3	74	54.98	38.71	16.39	60.38	100	0	P	V
802.11a CH 165 5825MHz		11650	48.59	-25.41	74	53.73	38.73	16.46	60.33	300	0	P	H
		11650	50.98	-23.02	74	56.12	38.73	16.46	60.33	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

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)
		5607.6	56.93	-11.37	68.3	42.41	35.47	11.13	32.08	308	48	P	H
		5697.6	60.55	-42.98	103.53	45.81	35.58	11.22	32.06	308	48	P	H
		5720	73.33	-37.57	110.9	58.52	35.6	11.25	32.04	308	48	P	H
		5723.6	80.65	-38.46	119.11	65.82	35.62	11.25	32.04	308	48	P	H
802.11n		5740	111.93	------	------	97.02	35.65	11.27	32.01	308	48	P	H
HT20		5740	104.26	------	------	89.35	35.65	11.27	32.01	308	48	A	H
CH 149		5643.6	55.84	-12.46	68.3	41.28	35.5	11.16	32.1	300	32	P	V
5745MHz		5700	58.85	-46.45	105.3	44.11	35.58	11.22	32.06	300	32	P	V
		5719.6	68.64	-42.15	110.79	53.83	35.6	11.25	32.04	300	32	P	V
		5724	77.26	-42.76	120.02	62.43	35.62	11.25	32.04	300	32	P	V
		5740	107.25	------	------	92.34	35.65	11.27	32.01	300	32	P	V
		5740	99.65	------	------	84.74	35.65	11.27	32.01	300	32	A	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)
		5646.8	56.94	-11.36	68.3	42.38	35.5	11.16	32.1	347	107	P	H
		5699.2	55.39	-49.32	104.71	40.65	35.58	11.22	32.06	347	107	P	H
		5718	57.58	-52.76	110.34	42.77	35.6	11.25	32.04	347	107	P	H
		5724	58.04	-61.98	120.02	43.21	35.62	11.25	32.04	347	107	P	H
		5782	112.59	------	------	97.56	35.7	11.3	31.97	347	107	P	H
		5782	104.34	------	------	89.31	35.7	11.3	31.97	347	107	A	H
		5852	58.69	-59.05	117.74	43.46	35.8	11.36	31.93	347	107	P	H
		5863.2	56.74	-51.86	108.6	41.52	35.79	11.38	31.95	347	107	P	H
802.11n		5908	57.31	-23.53	80.84	42.07	35.78	11.43	31.97	347	107	P	H
HT20		5929.2	56.36	-11.94	68.3	41.14	35.77	11.44	31.99	347	107	P	H
CH 157		5613.2	55.37	-12.93	68.3	40.85	35.47	11.13	32.08	300	65	P	V
5785MHz		5699.6	55.83	-49.18	105.01	41.09	35.58	11.22	32.06	300	65	P	V
		5701.2	56.51	-49.13	105.64	41.76	35.58	11.23	32.06	300	65	P	V
		5724.8	54.98	-66.86	121.84	40.15	35.62	11.25	32.04	300	65	P	V
		5782	108.42	------	------	93.39	35.7	11.3	31.97	300	65	P	V
		5782	99.75	------	------	84.72	35.7	11.3	31.97	300	65	A	V
		5850.8	57.4	-63.08	120.48	42.17	35.8	11.36	31.93	300	65	P	V
		5855.2	57.2	-53.64	110.84	41.95	35.8	11.38	31.93	300	65	P	V
		5900.8	56.33	-29.84	86.17	41.11	35.78	11.41	31.97	300	65	P	V
		5970	57.18	-11.12	68.3	41.98	35.76	11.47	32.03	300	65	P	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)
802.11n HT20 CH 165 5825MHz		5830	112.16	------	------	96.99	35.77	11.35	31.95	330	91	P	H
		5830	103.83	------	------	88.66	35.77	11.35	31.95	330	91	A	H
		5850	69.19	-53.11	122.3	53.96	35.8	11.36	31.93	330	91	P	H
		5859.6	65.11	-44.5	109.61	49.89	35.79	11.38	31.95	330	91	P	H
		5875.2	59.44	-45.71	105.15	44.21	35.79	11.39	31.95	330	91	P	H
		5928.4	57	-11.3	68.3	41.78	35.77	11.44	31.99	330	91	P	H
		5818	107.33	------	------	92.19	35.75	11.34	31.95	314	64	P	V
		5818	99.35	------	------	84.21	35.75	11.34	31.95	314	64	A	V
		5850	62.83	-59.47	122.3	47.6	35.8	11.36	31.93	314	64	P	V
		5856.8	58.75	-51.65	110.4	43.5	35.8	11.38	31.93	314	64	P	V
		5890	56.4	-37.77	94.17	41.17	35.79	11.41	31.97	314	64	P	V
		5932.8	56.74	-11.56	68.3	41.52	35.77	11.44	31.99	314	64	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

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	48.23	-25.77	74	53.66	38.69	16.31	60.43	300	0	P	H
		11490	49.56	-24.44	74	54.99	38.69	16.31	60.43	100	0	P	V
802.11n HT20 CH 157 5785MHz		11570	47.91	-26.09	74	53.19	38.71	16.39	60.38	300	0	P	H
		11570	48.53	-25.47	74	53.81	38.71	16.39	60.38	100	0	P	V
802.11n HT20 CH 165 5825MHz		11650	49.87	-24.13	74	55.01	38.73	16.46	60.33	300	0	P	H
		11650	49.66	-24.34	74	54.8	38.73	16.46	60.33	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

5725~5850MHz

Emission below 1GHz

WIFI 802.11n HT20 (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)
802.11n HT20 LF		84.32	26.86	-13.14	40	42.94	14.24	1.39	31.71	------	------	P	H
		263.77	29.93	-16.07	46	40	18.75	2.62	31.44	------	------	P	H
		312.27	34.55	-11.45	46	43.83	19.5	2.86	31.64	------	------	P	H
		349.13	38.47	-7.53	46	46.7	20.39	3.03	31.65	------	------	P	H
		408.3	40.84	-5.16	46	46.93	21.86	3.29	31.24	151	255	P	H
		827.34	32.94	-13.06	46	33.12	26.42	4.68	31.28	------	------	P	H
		39.7	29.26	-10.74	40	40.29	19.9	0.72	31.65	------	------	P	V
		59.1	33.7	-6.3	40	50.71	13.56	1.01	31.58	------	------	P	V
		121.18	30.49	-13.01	43.5	42.48	17.85	1.79	31.63	------	------	P	V
		344.28	34.87	-11.13	46	42.25	21.26	3.01	31.65	------	------	P	V
		408.3	34.85	-11.15	46	39.94	22.86	3.29	31.24	------	------	P	V
		518.88	29.24	-16.76	46	31.96	25.02	3.7	31.44	------	------	P	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)

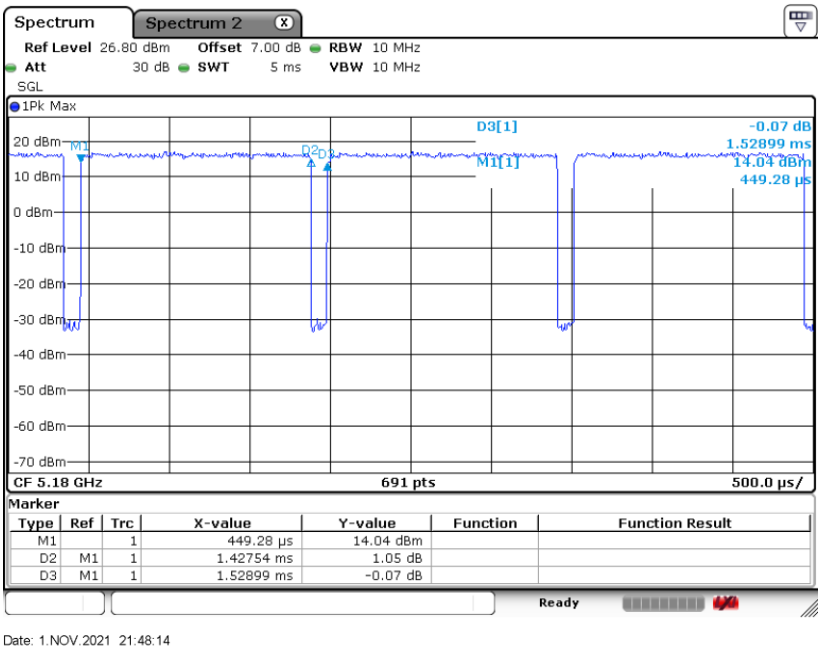
= -10.46(dB)

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

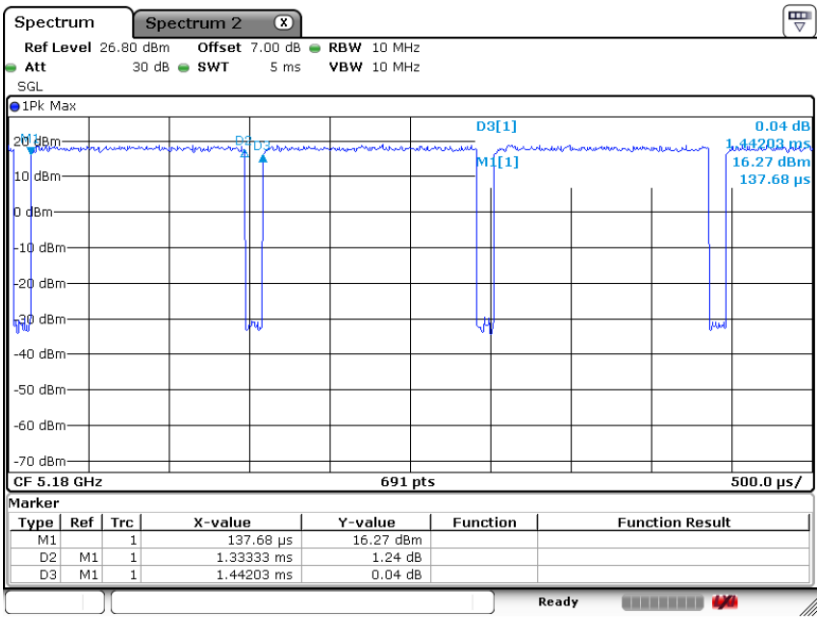
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	93.36	1.428	0.701	0.75KHz
802.11n HT20	92.46	1.333	0.750	0.82KHz

802.11a



802.11n HT20



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