FCC/ISED - TEST REPORT

Report Number	:	**709502405028-00C**	Date of Issue:	September 18, 2024

Model	:	FreeScan UE Pro2
Product Type	:	Laser 3D Scanner
Applicant	:	SHINING 3D Tech Co., Ltd.
Address	:	No.1398 Xiangbin Rd., Wenyan St.,Xiaoshan District,Hangzhou,China
Manufacturer	:	SHINING 3D Tech Co., Ltd.
Address	:	No.1398 Xiangbin Rd., Wenyan St.,Xiaoshan District,Hangzhou,China
Test Result	:	■ Positive ☐ Negative
Total pages including Appendices	:	45

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1 Table of Contents

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2 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
709502405028-00C	First Issue	09/18/2024

3 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China
Telephone:	+86 21 6141 0123
Fax:	+86 21 6140 8600
FCC Registration No.:	820234
FCC Designation Number:	CN1183
ISED CAB identifier	CN0101
IC Registration No.:	31668

4 Description of the Equipment under Test

Product: Laser 3D Scanner

PMN / HVIN / Model no.: FreeScan UE Pro2

FCC ID: 2AMG4-FSUEP2

IC: 24652-FSUEP2

Options and accessories: NA

Rating: DC24V 3.75A for Laser 3D Scanner
Input AC 100-240V~, 50/60Hz, Output DC 24V for adapter

RF Transmission Frequency: For 2.4GHz Wi-Fi:802.11b/g/n-HT20/ax(HE20):2412~2462 MHz (Full RU)
For 5GHz Wi-Fi:5180~5240 MHz (U-NII-1)
5745~5825 MHz (U-NII-3)

No. of Operated Channel: 2.4GHz WIFI:
11 for 802.11b/802.11g/802.11(H20)/ax(HE20)

Ch	Fre(MHz)	Ch	Fre(MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

5180~5240 MHz (U-NII-1):
4 channels for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax(HE20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

2 channels are for 802.11n (HT40), 802.11ac (VHT40), 802.11ax(HE40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1 channel is provided for 802.11ac (VHT80) and 802.11ax(HE80):

Channel	Frequency (MHz)
42	5210

5745~5825 MHz (U-NII-3): Channel 149 – 165
5 channels for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax(HE20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

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2 channels for 802.11n (HT40), 802.11ac (VHT40), 802.11ax(HE40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

1 channel is provided for 802.11ac (VHT80) and 802.11ax(HE80):

Channel	Frequency (MHz)
155	5755

Modulation:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11a/g/n/ac; Orthogonal Frequency Division Multiple Access (OFDMA) for 802.11ax
Hardware Version:	1.0
Software Version:	2.1.0.4
Data speed:	2.4G Wi-Fi SISO:11b 1-11Mbps, 11g 6-54Mbps MIMO:11n HT20 13~144.4Mbps, 11ax HE20 17.2 ~ 286.8Mbps 5G Wi-Fi SISO: 11a 6 ~ 54Mbps, 11n HT20 6.5 ~ 72.2Mbps, 11n HT 40 13.5 ~ 150Mbps, 11ac VHT20 6.5 ~ 86.7Mbps, 11ac VHT40 13.5 ~ 200Mbps, 11ac VHT80 29.3 ~ 433.3Mbps 11ax HE20 8.6 ~ 143.4Mbps, 11ax HE40 17.2 ~ 286.8Mbps, 11ax HE80 36 ~ 600.5Mbps MIMO: 11n HT20 13 ~ 144.4Mbps, 11n HT 40 27 ~ 300Mbps, 11ac VHT20 13 ~ 173.3Mbps, 11ac VHT40 27 ~ 400Mbps, 11ac VHT80 58.5 ~ 866.7Mbps 11ax HE20 17.2 ~ 286.8Mbps, 11ax HE40 34.4 ~ 573.5Mbps, 11ac HE80 72.1 ~ 1201Mbps
Antenna Type:	PCB Antenna 1 and PCB Antenna 2
Antenna Gain:	Antenna 1: 2.2dBi, Antenna 2: 2.2dBi
Directional Gain:	GAN+ 10 log(N_{Ant}) dBi=2.2+3.01=5.01dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Laser 3D Scanner with 2.4GHz and 5GHz Wi-Fi. This report is only 5GHz Wi-Fi included.
Test sample no.:	SHA-828049-1(RF Radiated); SHA-828049-1(RF conducted)

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.

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5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart E, 2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart E - Unlicensed National Information Infrastructure Devices
RSS-Gen Issue 5 Amendment 2 February 2021	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 3 August 2023	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

Test Method:
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices

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6 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart E & RSS-247 Issue 3/RSS-Gen Issue 5						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	13-17	Site 1	☒	☐	☐
§15.407(a)(2), (e) & RSS-247 6.2.1.2, RSS-247 6.2.2.1, RSS-247 6.2.3.1, RSS-247 6.2.4.2, RSS-Gen 6.7	Emission bandwidth	18	Site 1	☒	☐	☐
15.407407(a)(1)(2)(3) & RSS-247 6.2	Maximum Conducted Output Power and EIRP	19	Site 1	☒	☐	☐
15.407(a)(1)(2)(3) & RSS-247 6.2	Maximum Power Spectral Density	20	Site 1	☒	☐	☐
§15.407(g) & RSS-GEN 6.11	Frequencies Stability	21	Site 1	☒	☐	☐
§15.407(b)(1), 15.407(b)(2), 15.407(b)(3), 15.407(b)(4), 15.407(b)(8), 15.407(b)(9),15.209 & RSS-247 6.2 RSS-GEN 8.9	Unwanted Emissions	22-41	Site 1	☒	☐	☐
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1		☒	☐	☐

Remark 1: The EUT only operation at 5G Wi-Fi UNII Band (5180MHz-5240MHz, 5745MHz-5825MHz).

Note 1: The EUT uses two PCB antenna, which gain is Antenna1: 2.2 dBi, Antenna2: 2.2 dBi.
In accordance to §15.203 and RSS-Gen 6.8, It is considered sufficiently to comply with the provisions of this section.

15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

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7 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AMG4-FSUEP2, IC: 24652-FSUEP2 complies with Section 15.207, 15.209, 15.205, 15.407 of the FCC Part 15, Subpart C rules, Subpart E Rules and RSS-247, RSS-GEN.

SUMMARY:

All tests according to the regulations cited on page 8 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	July 1, 2024
Testing Start Date:	July 2, 2024
Testing End Date:	September 12, 2024

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:	Prepared by:	Tested by:
Hui TONG	Jiaxi XU	Chengjie GUO
Review Engineer	Project Engineer	Test Engineer

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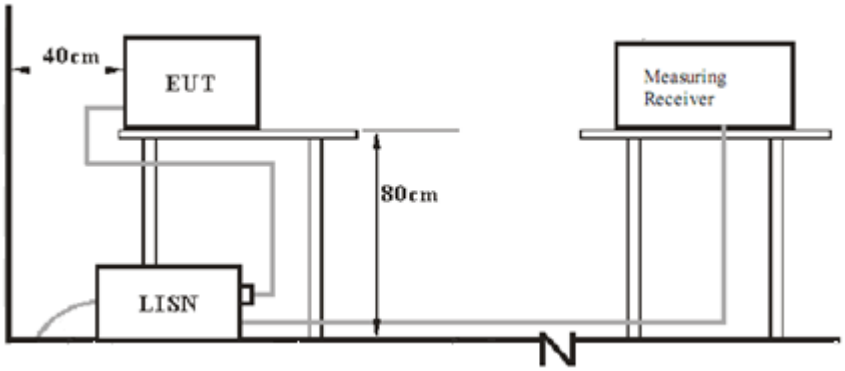
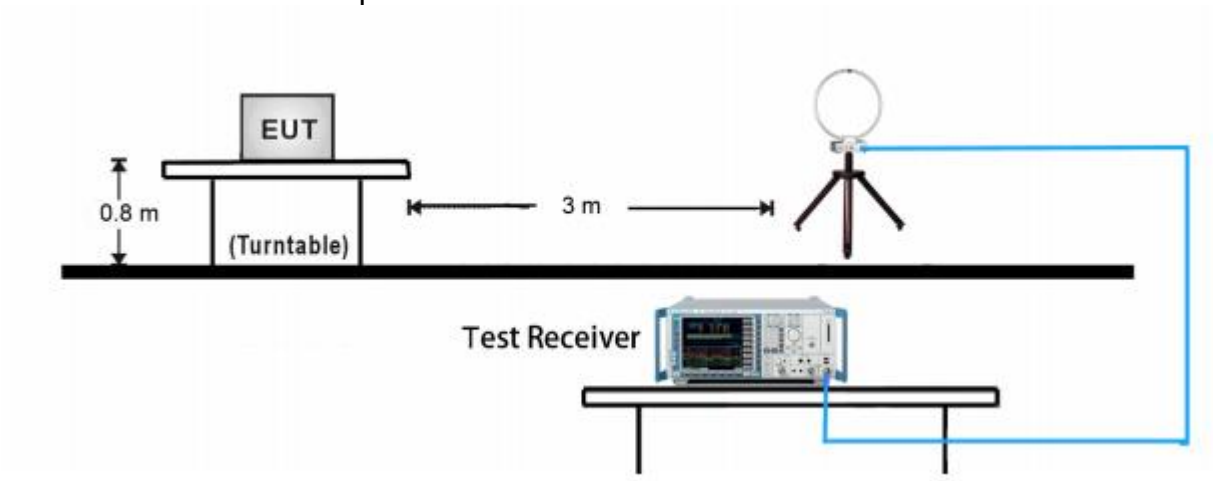
8 Test Setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

9kHz ~ 30MHz Test Setup:



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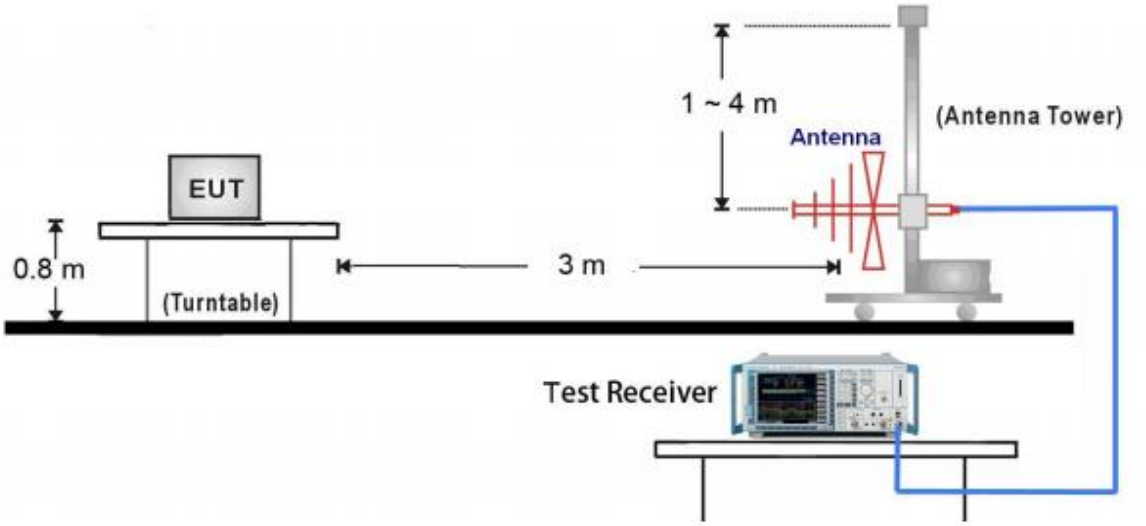
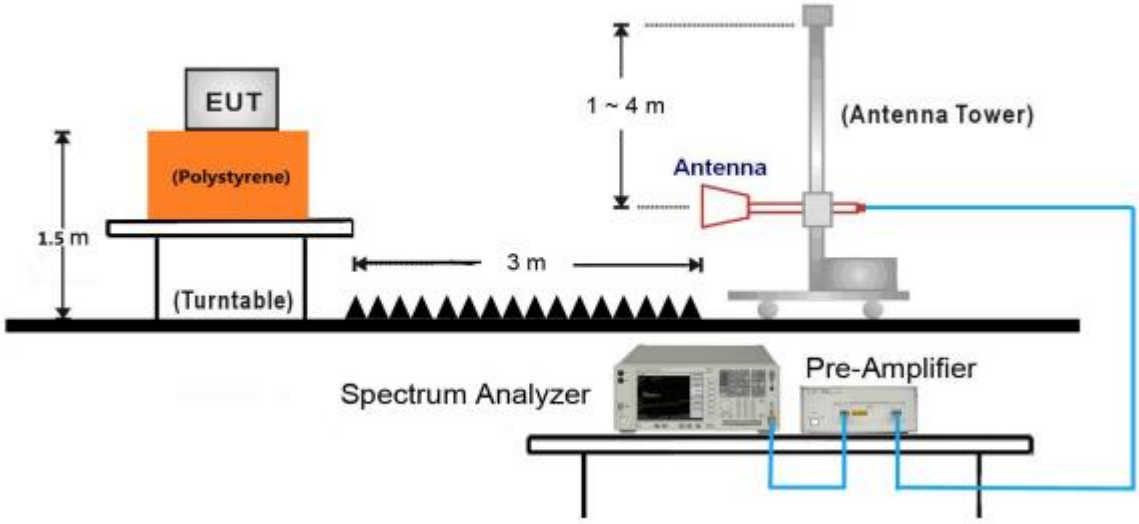
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



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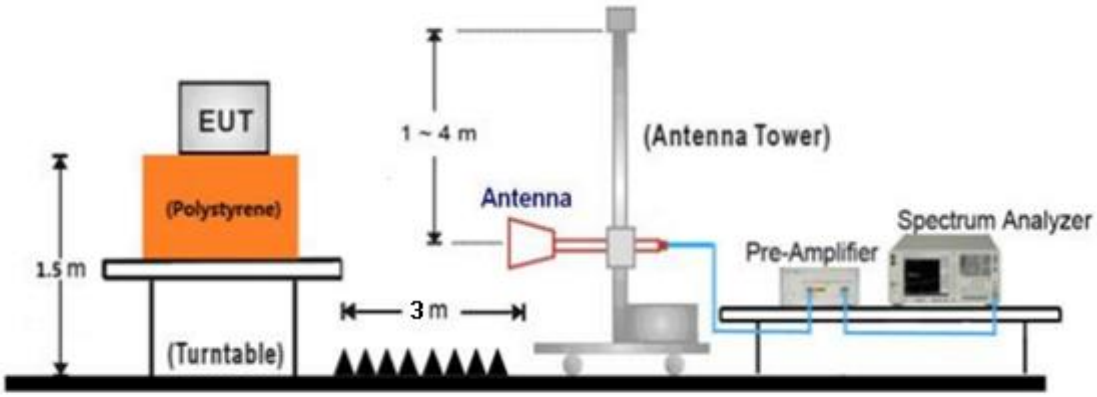
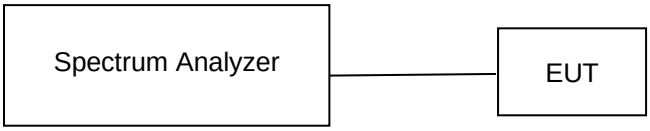
18GHz ~ 40GHz Test Setup:



7.3 Conducted RF test setups



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9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Laptop	MSI	Crosshair 15 R6E B12UEZ	---

Test software: adb command, which used to control the EUT in continues transmitting mode.
The system was configured to channel:

Test Mode	Channel	Index Value (Power level setting)	Frequency (MHz)
802.11a, 802.11n HT20 802.11ac20 802.11 ax20	36	15	5180
	40	15	5200
	48	15	5240
	149	15	5745
	157	15	5785
	165	15	5825
802.11n HT40 802.11ac40 802.11 ax 40	38	10	5190
	46	10	5230
	151	10	5755
	159	10	5795
802.11ac80 802.11ax 80	42	9	5210
	155	9	5755

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

	Modulation Type	Data Rate	Index Value (Power level setting)
SISO	802.11a OFDM	6Mbps	15
	802.11n (HT20): OFDM	MCS0 (6.5Mbps)	15
	802.11n (HT40): OFDM	MCS0 (13.5Mbps)	10
	802.11ac (VHT20): OFDM	11ac 6.5Mbps	13
	802.11ac (VHT40): OFDM	11ac 13.5Mbps	10
	802.11ac (VHT80): OFDM	11ac 29.3Mbps	9
	802.11ax (HE20): OFDM	11ax 8.6Mbps	15
	802.11ax (HE40): OFDM	11ax 17.2Mbps	10
	802.11ax (HE80): OFDM	11ax 36Mbps	9

	Modulation Type	Data Rate	
MIMO	802.11n (HT20): OFDM	MCS0 (13Mbps)	10
	802.11n (HT40): OFDM	MCS0 (27Mbps)	10
	802.11ac (VHT20): OFDM	11ac 13Mbps	11
	802.11ac (VHT40): OFDM	11ac 27Mbps	10
	802.11ac (VHT80): OFDM	11ac 58.5Mbps	9
	802.11ax (HE20): OFDM	11ax 17.2Mbps	12
	802.11ax (HE40): OFDM	11ax 34.4Mbps	10
	802.11ax (HE80): OFDM	11ax 72.1Mbps	9

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10 Technical Requirement

10.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. An EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency

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Conducted Emission

150k-30MHz Conducted Emission Test

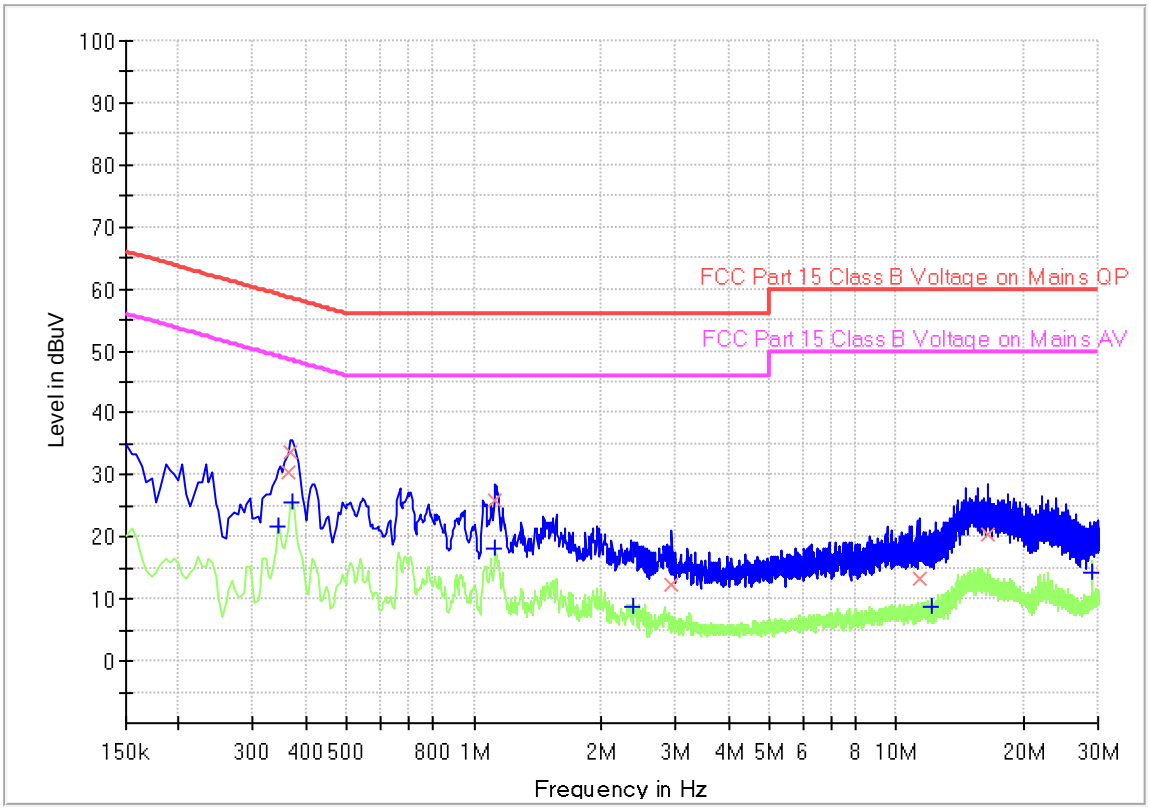
EUT Information

EUT Name:	Laser 3D Scanner
Model	FreeScan UE Pro2
Client:	Shining 3D Tech Co.,Ltd
Op Cond	TX MIMO 802.11ac 5240MHz,120V,60Hz
Operator:	Chengjie GUO
Standard	FCC part 15.207(a)
Sample No.:	SHA-828049-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup:	Voltage with 2-Line-LISN
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.343500	---	21.80	49.12	27.32	1000.0	9.000	L1	19.5
0.361500	30.46	---	58.69	28.23	1000.0	9.000	L1	19.5
0.366000	33.83	---	58.59	24.76	1000.0	9.000	L1	19.5
0.370500	---	25.45	48.49	23.04	1000.0	9.000	L1	19.5
1.122000	25.97	---	56.00	30.03	1000.0	9.000	L1	19.5
1.122000	---	18.14	46.00	27.86	1000.0	9.000	L1	19.5
2.377500	---	8.81	46.00	37.19	1000.0	9.000	L1	19.5
2.940000	12.33	---	56.00	43.67	1000.0	9.000	L1	19.5
11.377500	13.28	---	60.00	46.72	1000.0	9.000	L1	19.9
12.111000	---	8.73	50.00	41.27	1000.0	9.000	L1	19.9
16.485000	20.31	---	60.00	39.69	1000.0	9.000	L1	20.1
28.990500	---	14.27	50.00	35.73	1000.0	9.000	L1	21.2

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150k-30MHz Conducted Emission Test

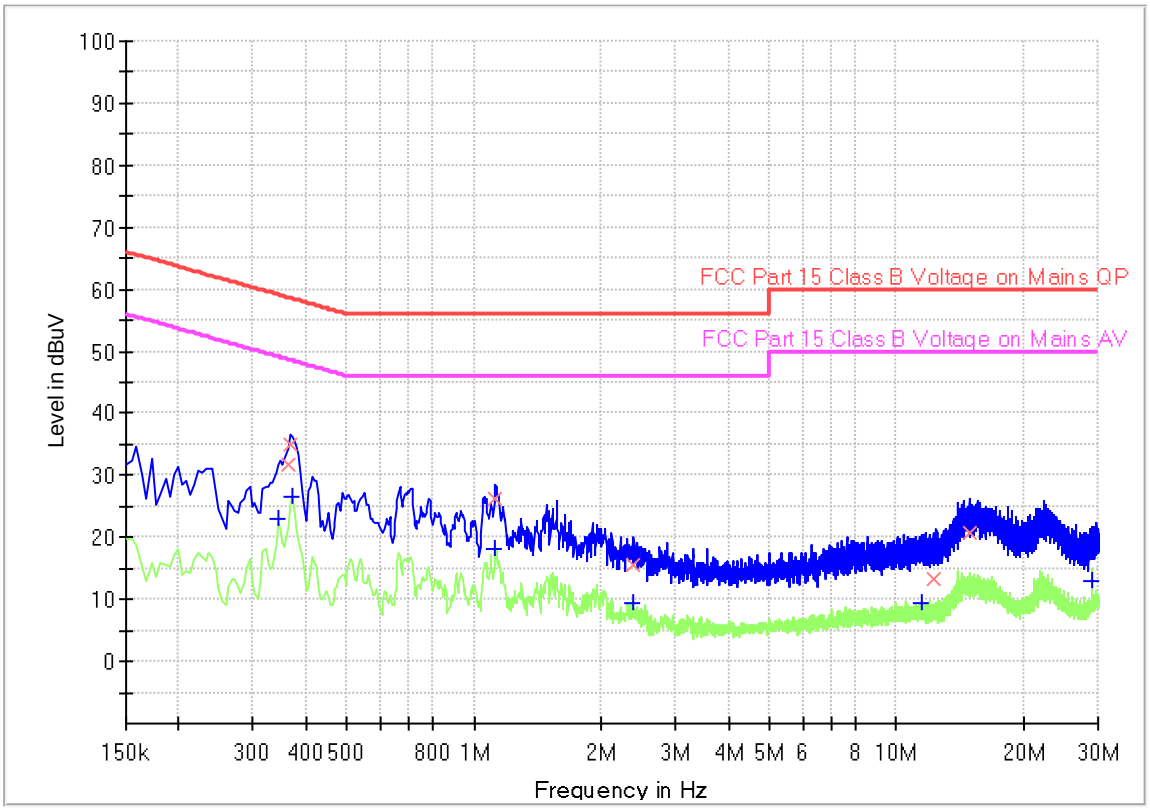
EUT Information

EUT Name:	Laser 3D Scanner
Model	FreeScan UE Pro2
Client:	Shining 3D Tech Co.,Ltd
Op Cond	TX MIMO 802.11ac 5240MHz,120V,60Hz
Operator:	Chengjie GUO
Standard	FCC part 15.207(a)
Sample No.:	SHA-828049-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup:	Voltage with 2-Line-LISN
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.343500	---	23.01	49.12	26.11	1000.0	9.000	N	19.5
0.361500	31.66	---	58.69	27.03	1000.0	9.000	N	19.5
0.366000	34.84	---	58.59	23.75	1000.0	9.000	N	19.5
0.370500	---	26.51	48.49	21.98	1000.0	9.000	N	19.5
1.122000	26.39	---	56.00	29.61	1000.0	9.000	N	19.5
1.122000	---	18.25	46.00	27.75	1000.0	9.000	N	19.5
2.377500	---	9.40	46.00	36.60	1000.0	9.000	N	19.5
2.391000	15.64	---	56.00	40.36	1000.0	9.000	N	19.5
11.485500	---	9.34	50.00	40.66	1000.0	9.000	N	19.8
12.183000	13.24	---	60.00	46.76	1000.0	9.000	N	19.8
14.887500	20.66	---	60.00	39.34	1000.0	9.000	N	19.9
28.990500	---	13.08	50.00	36.92	1000.0	9.000	N	20.7

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

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10.2 Emission bandwidth

1、Test Method of 26dB Bandwidth

According to KDB789033 D02
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Limit: No limit

2、Test Method of 6dB Bandwidth

According to KDB789033 D02
a) Set RBW = 100KHz
b) Set the video bandwidth (VBW) ≥ 3 × RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Limit: ≥500KHz

3、Test Method of 99% Bandwidth

According to KDB789033 D02
a) Set center frequency to the nominal EUT channel center frequency
b) Set span = 1.5 times to 5.0 times the OBW.
c) Set RBW = 1 % to 5 % of the OBW
d) Set VBW ≥ 3 · RBW
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99 % power bandwidth function of the instrument (if available).
g) If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Limit: No limit

26dB Bandwidth Test Result: Test data should be referred to Appendix A for 709502405028-00C.

6dB Bandwidth Test Result: Test data should be referred to Appendix A for 709502405028-00C.

99% Bandwidth Test Result Test data should be referred to Appendix A for 709502405028-00C.

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10.3 Maximum conducted output power and EIRP

Test Method
According to C63.10, the EUT was places on 0.8m height table, the RF output of EUT was connected to the Spectrum Analyzer by RF cable. The path loss was compensated to the results for each measurement.

1. Measure the duty cycle
2. Use the following spectrum analyzer settings:
   RBW=1MHz, VBW≥3MHz, Span≥ the 99% Bandwidth of the emission being measured
   Sweep = auto, Detector function = power averaging.
3. Trace average at least 100 traces in power averaging (rms) mode
4. 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

15.407 Limits:

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26dB emission bandwidth in megahertz.
For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

RSS 247 Limits:

For client devices in the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

For the 5.25-5.35 GHz bands,
shall comply with the following:
a) The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less;
b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

For the 5.47-5.6 and 5.65-5.725 GHz bands, The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.
The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.
For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

Maximum conducted output power Test Result:

Test data should be referred to Appendix A for 709502405028-00C.

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10.4 Maximum power spectral density

Test Method

According to C63.10, the EUT was places on 0.8m height table, the RF output of EUT was connected to the test power meter by RF cable. The path loss was compensated to the results for each measurement.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power….” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:
a) If Method SA-2 or SA-2 Alternative was used, add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum.
b) If Method SA-3 Alternative was used and the linear mode was used in II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 MHz reference bandwidth.
5. For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5) & RSS-247 6.2. For devices operating in the band 5.725−5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ≥ 1/T, where T is defined in II.B.I.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

Limit: The maximum power spectral density shall not exceed 11dBm for the 5.15-5.25GHz, 5.25-5.35GHz, 5.47-5.725 GHz Band in any 1 megahertz band.
For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 1 500kHz band.

Test Result: Test data should be referred to Appendix A for 709502405028-00C.

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10.5 Frequencies Stability

Test Method

1. Connect the UUT to the spectrum analyzer
2. Set Centre Frequency of the channel under test.
3. Set Detector PEAK
4. Set RBW: 10KHz, VBW: 3RBW
5. Set Span: Encompass the entire emissions bandwidth (EBW) of the signal.
6. Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
User manual temperature is 10 to 30 °C.

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Limit: 20ppm

Test Results (All conditions and all modes were performed, only list Worst-Case in the report)
Remark: NV is normal Voltage: 120V~, HV is High Voltage: 138V~, LV is Low Voltage: 102V~, NT is normal Temperature: +20 °C.

Test Result:

Test data should be referred to Appendix A for 709502405028-00C.

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10.6 Unwanted emissions

Transmitting spurious emission test result as below:

Test Method

Radiated Mode:

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned
5. Use the following spectrum analyzer settings According to C63.10:
   For Above 1GHz
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
   For Below 1GHz
   Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

(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.

According to part 15.407(b) & RSS-247 6.2, the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205 and RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209 & RSS-GEN 8.9.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case listed in the report.

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Transmitting spurious emission worse case test result:

Antenna 1

Test mode:5G_U-NII-1_802.11a_5180MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.84	68.20	26.36	PK	Hor
2480.06*	47.96	68.20	20.24	PK	Ver
4725.22	45.97	74.00	28.03	PK	Ver
5149.12	50.30	74.00	23.70	PK	Ver
5150.05	58.21	74.00	15.79	PK	Hor
5150.05	41.50	54.00	12.50	AV	Hor
7181.625*	50.79	68.20	17.41	PK	Hor
10362.75*	49.04	68.20	19.16	PK	Ver
10363.28*	48.84	68.20	19.36	PK	Hor

Test mode:5G_U-NII-1_802.11a_5200MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
1040.31	48.48	74.00	25.52	PK	Hor
2399.84*	42.12	68.20	26.08	PK	Hor
2399.84*	39.59	68.20	28.61	PK	Ver
10403.65*	47.63	68.20	20.57	PK	Ver

Test mode:5G_U-NII-1_802.11a_5240MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	43.38	68.20	24.82	PK	Ver
2399.84*	41.70	68.20	26.50	PK	Hor
5351.03	43.97	74.00	30.03	PK	Hor
5351.85	42.84	74.00	31.16	PK	Ver
10478.03*	48.83	68.20	19.37	PK	Hor
10484.41*	50.20	68.20	18.00	PK	Ver

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Antenna 2

Test mode:5G_U-NII-1_802.11a_5180MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.25	68.20	26.95	PK	Hor
2399.84*	42.48	68.20	25.72	PK	Ver
4988.93	49.49	74.00	24.51	PK	Ver
5148.95	50.60	74.00	23.40	PK	Ver
5149.77	59.93	74.00	14.07	PK	Hor
5149.77	45.70	54.00	8.30	AV	Hor
10368.06*	48.05	68.20	20.15	PK	Hor
10369.65*	48.55	68.20	19.66	PK	Ver

Test mode:5G_U-NII-1_802.11a_5200MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.05	68.20	27.15	PK	Ver
2399.84*	41.91	68.20	26.29	PK	Hor
10398.87*	49.41	68.20	18.79	PK	Hor
10407.37*	49.04	68.20	19.16	PK	Ver

Test mode:5G_U-NII-1_802.11a_5240MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.63	68.20	26.57	PK	Hor
2399.84*	41.17	68.20	27.03	PK	Ver
5350.68	45.35	74.00	28.65	PK	Ver
5350.96	44.69	74.00	29.32	PK	Hor
10471.65*	49.13	68.20	19.07	PK	Ver
10484.40*	48.70	68.20	19.50	PK	Hor

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MIMO Mode

Test mode:5G_U-NII-1_802.11ac20_5180MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.07	68.20	26.13	PK	Ver
2399.84*	39.90	68.20	28.30	PK	Hor
5145.29	59.40	74.00	14.61	PK	Hor
5145.29	46.90	54.00	7.10	AV	Hor
5150.05	59.31	74.00	14.69	PK	Ver
5150.05	47.70	54.00	6.30	AV	Ver
10361.15*	47.68	68.20	20.52	PK	Hor
10371.78*	48.09	68.20	20.11	PK	Ver

Test mode:5G_U-NII-1_802.11ac20_5200MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.19	68.20	27.01	PK	Ver
2399.84*	41.78	68.20	26.42	PK	Hor
10403.65*	49.26	68.20	18.94	PK	Ver
10431.28*	49.62	68.20	18.58	PK	Hor

Test mode:5G_U-NII-1_802.11ac20_5240MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.37	68.20	26.84	PK	Hor
2399.84*	45.87	68.20	22.33	PK	Ver
5349.99	44.63	74.00	29.37	PK	Ver
5350.06	42.84	74.00	31.16	PK	Hor
10478.56*	49.38	68.20	18.82	PK	Ver
10479.09*	49.42	68.20	18.78	PK	Hor

Test mode:5G_U-NII-1_802.11ac40_5190MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	43.16	68.20	25.04	PK	Hor
4370.78	52.21	74.00	21.79	PK	Ver
5147.02	64.81	74.00	9.19	PK	Hor
5149.37	61.05	74.00	12.96	PK	Ver
5149.37	52.00	54.00	2.00	AV	Ver
10381.34*	49.18	68.20	19.02	PK	Hor
10381.88*	47.93	68.20	20.27	PK	Ver

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Test mode:5G_U-NII-1_802.11ac40_5230MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.31*	38.99	68.20	29.21	PK	Ver
2399.84*	42.33	68.20	25.87	PK	Hor
5350.50	45.73	74.00	28.27	PK	Ver
5350.53	44.43	74.00	29.57	PK	Hor
10459.43*	49.32	68.20	18.89	PK	Hor
10462.09*	48.70	68.20	19.51	PK	Ver

Test mode:5G_U-NII-1_802.11ac80_5210MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	38.98	68.20	29.22	PK	Ver
2399.84*	41.65	68.20	26.55	PK	Hor
4532.35	47.85	74.00	26.15	PK	Hor
5146.37	61.92	74.00	12.08	PK	Ver
5146.37	51.20	54.00	2.80	AV	Ver
5148.86	50.50	54.00	3.50	AV	Hor
5148.86	60.92	74.00	13.08	PK	Hor
5350.27	48.69	74.00	25.32	PK	Ver
5350.94	47.03	74.00	26.97	PK	Hor
10424.90*	48.99	68.20	19.21	PK	Hor
10427.03*	48.85	68.20	19.35	PK	Ver

Test mode:5G_U-NII-1_802.11n20_5180MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	39.08	68.20	29.12	PK	Ver
2399.84*	39.87	68.20	28.33	PK	Hor
5143.22	58.22	74.00	15.78	PK	Ver
5147.98	62.09	74.00	11.91	PK	Hor
5147.98	49.60	54.00	4.40	AV	Hor
5148.22	47.30	54.00	6.70	AV	Ver
10361.69*	48.07	68.20	20.14	PK	Ver
10370.72*	47.38	68.20	20.82	PK	Hor

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Test mode:5G_U-NII-1_802.11n20_5200MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	40.41	68.20	27.79	PK	Hor
2399.84*	38.86	68.20	29.34	PK	Ver
10436.06*	49.64	68.20	18.56	PK	Ver
10450.41*	49.47	68.20	18.73	PK	Hor

Test mode:5G_U-NII-1_802.11n20_5240MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.33	68.20	26.87	PK	Hor
2519.38*	37.61	68.20	30.59	PK	Ver
5350.06	43.72	74.00	30.28	PK	Ver
5350.15	46.25	74.00	27.75	PK	Hor
10480.15*	47.72	68.20	20.48	PK	Hor
10482.81*	48.94	68.20	19.26	PK	Ver

Test mode:5G_U-NII-1_802.11n40_5190MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	47.48	68.20	20.73	PK	Ver
2399.84*	42.18	68.20	26.02	PK	Hor
5148.23	61.94	74.00	12.06	PK	Hor
5148.23	51.60	54.00	2.40	AV	Hor
5148.87	65.30	74.00	8.71	PK	Ver
5148.87	52.90	54.00	1.10	AV	Ver
10380.28*	47.92	68.20	20.28	PK	Ver
10386.12*	48.07	68.20	20.13	PK	Hor

Test mode:5G_U-NII-1_802.11n40_5230MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	43.01	68.20	25.20	PK	Hor
2399.84*	42.14	68.20	26.06	PK	Ver
5349.78	45.50	74.00	28.50	PK	Ver
5350.25	45.41	74.00	28.59	PK	Hor
10460.5*	50.55	68.20	17.65	PK	Ver
10467.93*	49.08	68.20	19.12	PK	Hor

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Test mode:5G_U-NII-1_802.11ax20_5180MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.12	68.20	26.08	PK	Hor
2399.84*	39.74	68.20	28.46	PK	Ver
5147.50	62.31	74.00	11.69	PK	Ver
5147.50	49.00	74.00	25.00	PK	Ver
5149.77	60.98	74.00	13.03	PK	Hor
5149.77	47.60	74.00	26.40	AV	Hor
10361.69*	48.01	68.20	20.19	PK	Ver
10369.65*	48.27	68.20	19.93	PK	Hor

Test mode:5G_U-NII-1_802.11ax20_5200MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.39	68.20	25.81	PK	Hor
2399.84*	43.32	68.20	24.88	PK	Ver
10414.28*	50.33	68.20	17.88	PK	Ver
10421.18*	50.81	68.20	17.39	PK	Hor

Test mode:5G_U-NII-1_802.11ax20_5240MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	40.27	68.20	27.93	PK	Hor
2399.84*	39.70	68.20	28.50	PK	Ver
5350.01	45.28	74.00	28.72	PK	Hor
5350.04	47.85	74.00	26.15	PK	Ver
10481.13*	49.19	68.20	19.01	PK	Ver
10486.53*	48.23	68.20	19.97	PK	Hor

Test mode:5G_U-NII-1_802.11ax40_5190MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	38.87	68.20	29.34	PK	Hor
2399.84*	45.75	68.20	22.45	PK	Ver
5147.80	52.30	54.00	1.70	AV	Hor
5147.80	63.37	74.00	10.63	PK	Hor
5148.30	63.20	74.00	10.80	AV	Ver
5148.30	53.40	74.00	20.60	AV	Ver
10381.34*	48.47	68.20	19.73	PK	Ver
10384.53*	47.86	68.20	20.34	PK	Hor

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Test mode:5G_U-NII-1_802.11ax40_5230MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.29	68.20	25.91	PK	Ver
2399.84*	42.24	68.20	25.96	PK	Hor
5350.25	45.87	74.00	28.13	PK	Hor
5351.53	48.56	74.00	25.45	PK	Ver
10461.03*	47.11	68.20	21.09	PK	Ver
10468.46*	48.60	68.20	19.60	PK	Hor

Test mode:5G_U-NII-1_802.11ax80_5210MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.97	68.20	26.23	PK	Ver
2399.84*	43.50	68.20	24.70	PK	Hor
5148.86	50.80	54.00	3.20	AV	Ver
5148.86	49.90	54.00	4.10	AV	Hor
5148.86	66.42	74.00	7.58	PK	Ver
5148.86	65.69	74.00	8.31	PK	Hor
5350.66	46.11	74.00	27.89	PK	Hor
5368.03	50.73	74.00	23.27	PK	Ver
10419.06*	47.51	68.20	20.69	PK	Ver
10426.51*	47.47	68.20	20.73	PK	Hor

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Antenna 1

Test mode:5G_U-NII-3_802.11a_5745MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.49	68.20	25.72	PK	Hor
2399.84*	45.06	68.20	23.14	PK	Ver
11484.19	51.78	74.00	22.22	PK	Hor
11486.34	55.47	74.00	18.53	PK	Ver

Test mode:5G_U-NII-3_802.11a_5785MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	43.07	68.20	25.13	PK	Hor
2399.84*	44.92	68.20	23.28	PK	Ver
11562.31	51.50	74.00	22.50	PK	Hor
11575.06	53.71	74.00	20.29	PK	Ver

Test mode:5G_U-NII-3_802.11a_5825MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.15	74.00	31.85	PK	Hor
2399.84*	44.79	74.00	29.21	PK	Ver
11647.84	50.98	74.00	23.02	PK	Ver
11651.56	50.68	74.00	23.33	PK	Hor

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Antenna 2

Test mode:5G_U-NII-3_802.11a_5745MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	42.54	68.20	25.66	PK	Hor
2399.84*	44.45	68.20	23.75	PK	Ver
11487.59	49.93	74.00	24.07	PK	Hor
11492.19	55.46	74.00	18.54	PK	Ver

Test mode:5G_U-NII-3_802.11a_5785MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	41.25	68.20	26.95	PK	Hor
2399.84*	45.10	68.20	23.10	PK	Ver
11566.56	53.90	74.00	20.10	PK	Ver
11567.09	50.32	74.00	23.68	PK	Hor

Test mode:5G_U-NII-3_802.11a_5825MHz					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2399.84*	45.55	68.20	22.65	PK	Ver
2399.84*	41.91	68.20	26.29	PK	Hor
11639.34	51.14	74.00	22.86	PK	Ver
11651.56	51.43	74.00	22.57	PK	Hor

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MIMO Mode

Test mode:5G_U-NII-3_802.11ac20_5745MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	45.85	68.20	22.35	PK	Ver
2399.84*	42.98	68.20	25.22	PK	Hor
11486.34	57.41	74.00	16.59	PK	Ver
11486.34	50.71	74.00	23.29	PK	Hor

Test mode:5G_U-NII-3_802.11ac20_5785MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	46.65	68.20	21.55	PK	Ver
2399.84*	43.75	68.20	24.45	PK	Hor
11563.91	51.07	74.00	22.93	PK	Hor
11571.88	52.44	74.00	21.56	PK	Ver

Test mode:5G_U-NII-3_802.11ac20_5825MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	46.32	68.20	21.88	PK	Ver
2399.84*	42.07	68.20	26.13	PK	Hor
11643.59	49.61	74.00	24.39	PK	Hor
11651.56	51.29	74.00	22.71	PK	Ver

Test mode:5G_U-NII-3_802.11ac40_5755MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	42.85	68.20	25.35	PK	Hor
2400.37*	44.31	68.20	23.89	PK	Ver
9999.37*	51.14	68.20	17.06	PK	Ver
11502.81	48.96	74.00	25.04	PK	Ver
11504.41	49.41	74.00	24.59	PK	Hor

Test mode:5G_U-NII-3_802.11ac40_5795MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	43.22	68.20	24.98	PK	Hor
2399.84*	45.37	68.20	22.83	PK	Ver
11598.97	48.59	74.00	25.41	PK	Hor
11608.53	49.99	74.00	24.01	PK	Ver

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Test mode:5G_U-NII-3_802.11ac80_5775MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	39.04	68.20	29.16	PK	Ver
2399.84*	44.33	68.20	23.87	PK	Hor
11552.22	48.83	74.00	25.17	PK	Ver
11553.28	48.98	74.00	25.02	PK	Hor

Test mode:5G_U-NII-3_802.11n20_5745MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	43.81	68.20	24.39	PK	Hor
2399.84*	46.50	68.20	21.70	PK	Ver
11485.81	53.33	74.00	20.67	PK	Ver
11492.19	50.11	74.00	23.89	PK	Hor

Test mode:5G_U-NII-3_802.11n20_5785MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	46.85	68.20	21.35	PK	Ver
2399.84*	44.53	68.20	23.67	PK	Hor
11573.47	54.83	74.00	19.17	PK	Ver
11593.13	51.19	74.00	22.81	PK	Hor
111573.47	44.60	54.00	9.40	AV	Ver

Test mode:5G_U-NII-3_802.11n20_5825MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	46.43	68.20	21.77	PK	Ver
2399.84*	42.92	68.20	25.28	PK	Hor
11647.31	50.71	74.00	23.29	PK	Hor
11648.38	50.94	74.00	23.06	PK	Ver

Test mode:5G_U-NII-3_802.11n40_5755MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	42.74	68.20	25.46	PK	Hor
2399.84*	44.89	68.20	23.31	PK	Ver
11516.09	51.32	74.00	22.68	PK	Hor
11518.22	50.59	74.00	23.41	PK	Ver

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Test mode:5G_U-NII-3_802.11n40_5795MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	42.60	68.20	25.60	PK	Hor
2399.84*	46.16	68.20	22.04	PK	Ver
10596.50	48.85	74.00	25.15	PK	Ver
11594.19	49.80	74.00	24.20	PK	Hor

Test mode:5G_U-NII-3_802.11ax20_5745MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	42.69	68.20	25.51	PK	Hor
2399.84*	44.90	68.20	23.30	PK	Ver
11485.81	54.48	74.00	19.52	PK	Ver
11487.41	49.20	74.00	24.80	PK	Hor

Test mode:5G_U-NII-3_802.11ax20_5785MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	44.01	68.20	24.19	PK	Ver
2399.84*	42.17	68.20	26.03	PK	Hor
11571.34	51.14	74.00	22.86	PK	Hor
11571.88	50.24	74.00	23.76	PK	Ver

Test mode:5G_U-NII-3_802.11ax20_5825MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	44.87	68.20	23.33	PK	Ver
2399.84*	43.26	68.20	24.94	PK	Hor
11638.38	51.42	74.00	22.58	PK	Hor
11643.06	50.81	74.00	23.19	PK	Ver

Test mode:5G_U-NII-3_802.11ax40_5755MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	46.94	68.20	21.26	PK	Ver
2399.84*	43.62	68.20	24.58	PK	Hor
11509.72	48.69	74.00	25.31	PK	Hor
11516.09	50.55	74.00	23.45	PK	Ver

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Test mode:5G_U-NII-3_802.11ax40_5795MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	44.67	68.20	23.53	PK	Ver
2399.84*	45.77	68.20	22.43	PK	Hor
11591.53	49.69	74.00	24.31	PK	Ver
11597.91	49.39	74.00	24.61	PK	Hor

Test mode:5G_U-NII-3_802.11ax80_5775MHz					
Frequency MHz	**Measure Level (dBuV/m)**	**Limit (dBuV/M**	**Margin (dB)**	**Detector**	**Polarization**
2399.84*	42.48	68.20	25.72	PK	Hor
2399.84*	46.02	68.20	22.18	PK	Ver
11550.09	48.79	74.00	25.21	PK	Ver
11554.88	49.90	74.00	24.10	PK	Hor

Remark:

(1) Above 1GHz Corrector factor= Antenna Factor +Cable Loss - Amp. Factor.
(2) Below 1GHz Corrector factor= Antenna Factor +Cable Loss.
(3) "*" is not in restricted band, its limit is -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.
(4) All the test result for unwanted emissions and band edge (included the restricted bands) are shown from page 22 to 34.
(5) We test all modes and only the worst case for each bandwidth recorded in the report.
(6) The frequency, which start from 9KHz to 30MHz and 18-40GHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

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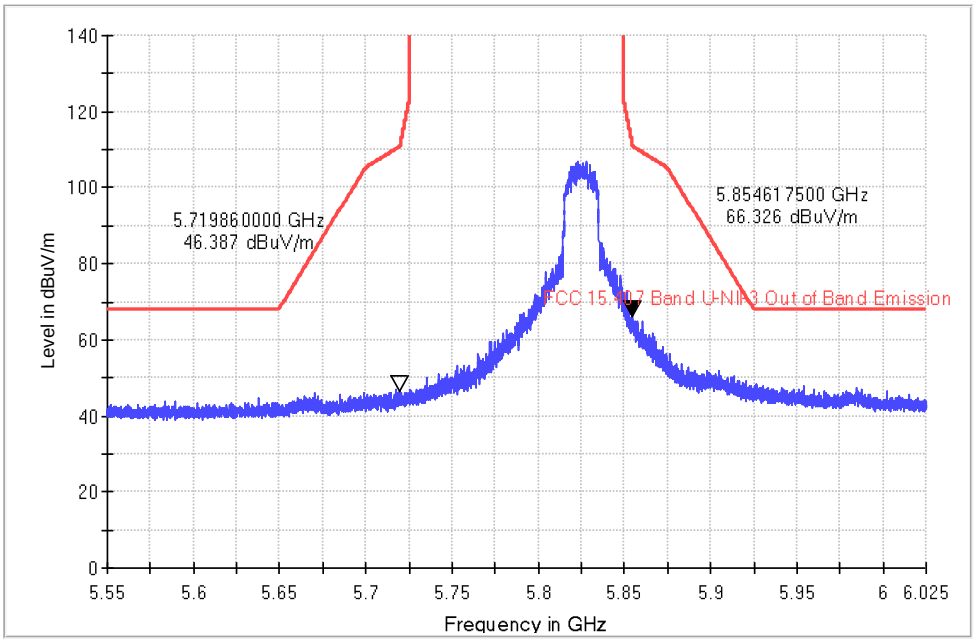
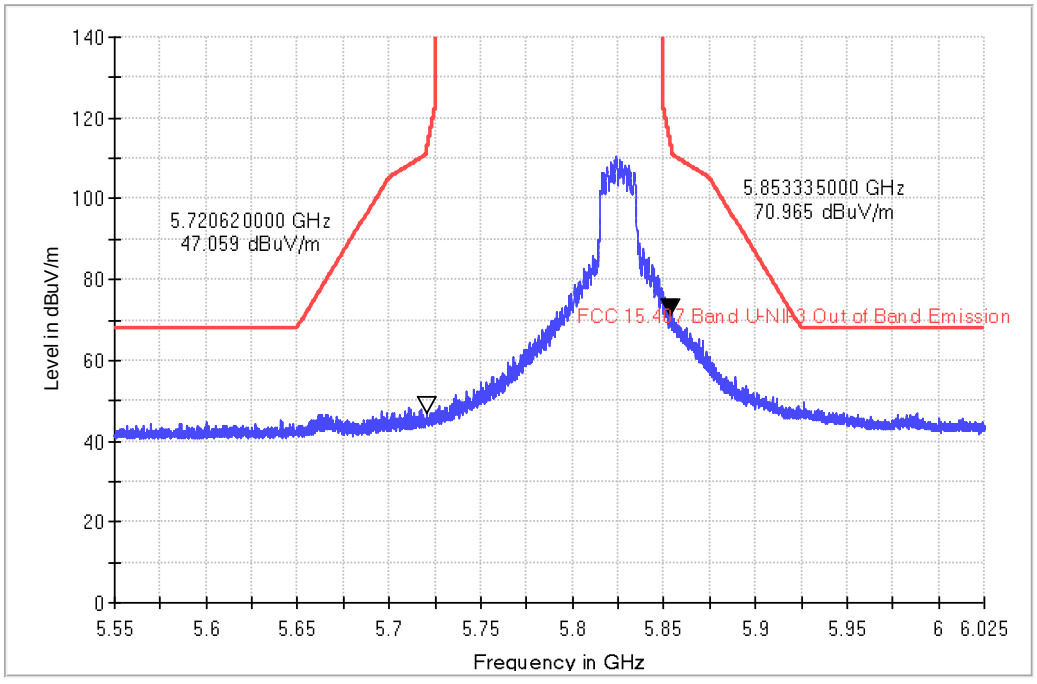
The worst case (which is subject to the maximum EIRP) of Radiated Emission for 5745-5825MHz

Out of Band Emission
802.11ax20: CH 5825MHz (MIMO)
Horizontal



Vertical



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The worst case of Radiated Emission below 1GHz:

30-1000MHz Radiated Emission

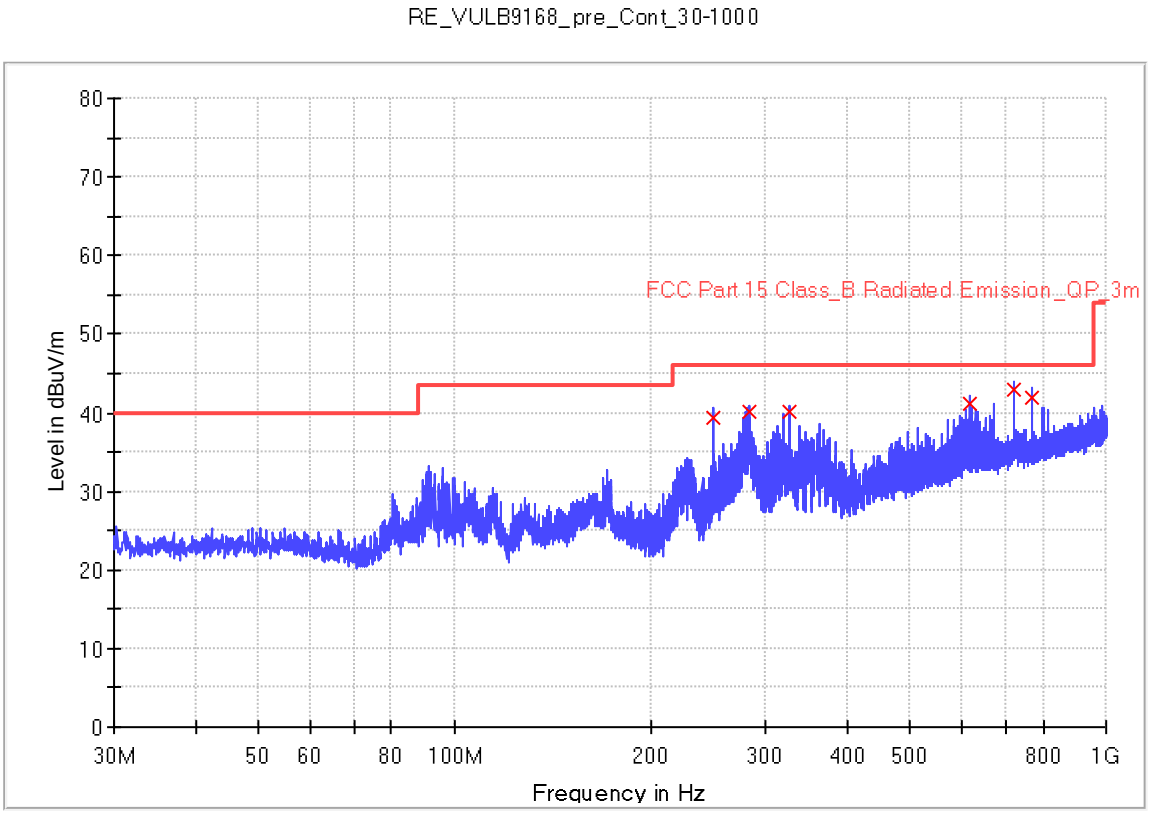
EUT Information

EUT Name:	Laser 3D Scanner
Model	FreeScan UE Pro2
Client:	Shining 3D Tech Co.,Ltd
Op Cond	TX MIMO 802.11ac 5240MHz,120V,60Hz
Operator:	Chengjie GUO
Standard	FCC part 15.209(a)
Sample No.:	SHA-828049-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB



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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)
250.000000	39.4	1000.0	120.000	198.0	H	132.0	19.9	6.6
282.720000	40.1	1000.0	120.000	133.0	H	221.0	21.1	5.9
325.640000	40.2	1000.0	120.000	198.0	H	217.0	22.5	5.8
616.280000	41.3	1000.0	120.000	172.0	H	321.0	29.3	4.7
720.000000	42.8	1000.0	120.000	132.0	H	175.0	31.0	3.2
767.960000	41.9	1000.0	120.000	126.0	H	216.0	31.9	4.1

(continuation of the "Limit and Margin" table from column 16 ...)

Frequency (MHz)	Limit - QPK (dBuV/m)	Comment
250.000000	46.0	
282.720000	46.0	
325.640000	46.0	
616.280000	46.0	
720.000000	46.0	
767.960000	46.0	

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30-1000MHz Radiated Emission

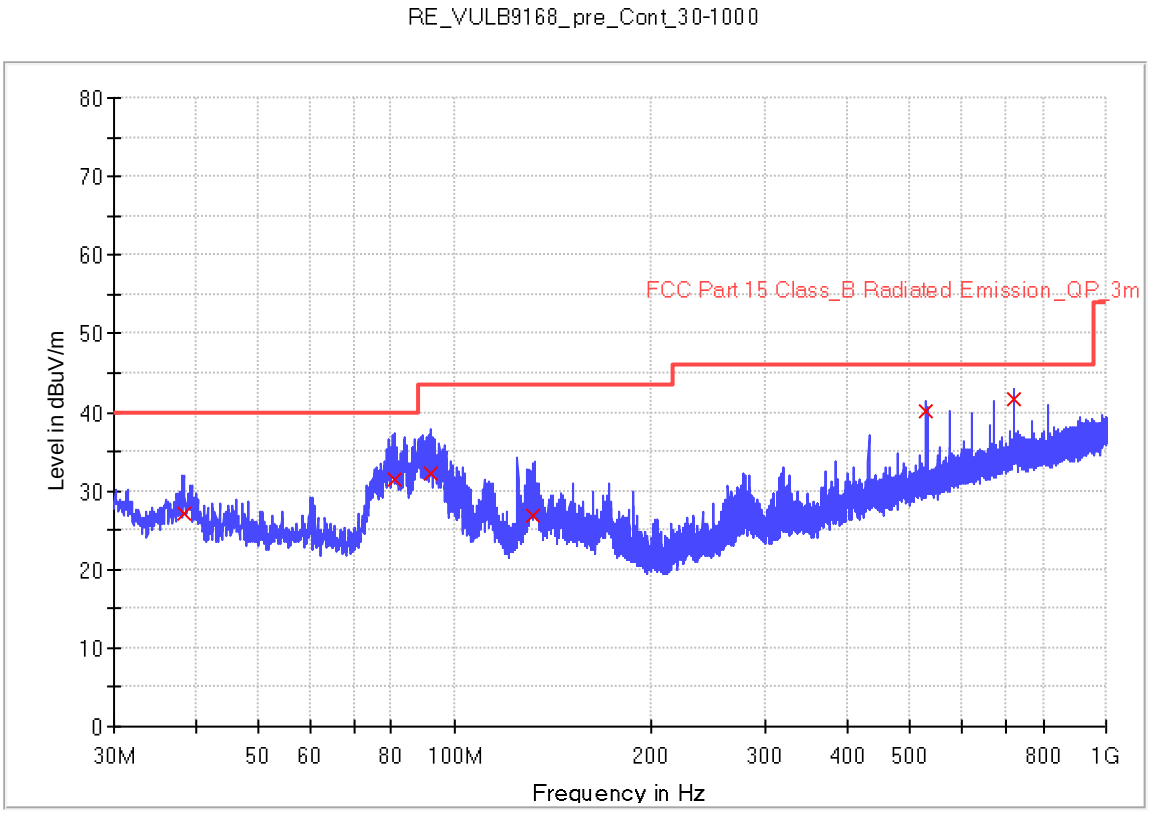
EUT Information

EUT Name:	Laser 3D Scanner
Model	FreeScan UE Pro2
Client:	Shining 3D Tech Co.,Ltd
Op Cond	TX MIMO 802.11ac 5240MHz,120V,60Hz
Operator:	Chengjie GUO
Standard	FCC part 15.207(a)
Sample No.:	SHA-828049-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB



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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)
38.360000	27.1	1000.0	120.000	176.0	V	122.0	19.7	12.9
80.680000	31.5	1000.0	120.000	142.0	V	221.0	15.6	8.5
92.120000	32.3	1000.0	120.000	122.0	V	175.0	15.1	11.2
132.240000	26.8	1000.0	120.000	127.0	V	321.0	19.4	16.7
528.000000	40.1	1000.0	120.000	116.0	V	186.0	27.0	5.9
720.000000	41.8	1000.0	120.000	124.0	V	132.0	31.0	4.2

(continuation of the "Limit and Margin" table from column 16 ...)

Frequency (MHz)	Limit - QPK (dBuV/m)	Comment
38.360000	40.0	
80.680000	40.0	
92.120000	43.5	
132.240000	43.5	
528.000000	46.0	
720.000000	46.0	

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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11 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal spectrum analyzer	Agilent	N9020B	MY59050168	2024-2-19	2025-2-18
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2023-8-1	2024-7-31
	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2024-8-1	2025-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2023-8-1	2024-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2024-8-1	2025-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2021-9-23	2024-9-22
	Horn Antenna	Rohde & Schwarz	HF907	102393	2024-4-14	2027-4-13
	Pre-amplifier	Shenzhen HzEMC	HPA-081843	HYPA23026	2024-4-16	2025-4-15
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2024-6-26	2025-6-25
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C	00246076	2023-7-7	2026-7-6
	3m Semi-anechoic chamber	TDK	9X6X6	----	2024-5-8	2027-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2023-8-1	2024-7-31
	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2024-8-1	2025-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2023-8-1	2024-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2024-8-1	2025-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	MTS 8310	MWRFtest	3.0.0.0
RE	EMC 32	Rohde & Schwarz	V10.50.40
CE	EMC 32	Rohde & Schwarz	V9.15.03

C - Conducted RF tests

- Conducted peak output power
- 6dB Occupied Bandwidth
- Power spectral density*
- Conducted Band Edge and Out-of-Band Emissions

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12 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, ±3.16dB
Radiated Disturbance	30MHz to 1GHz, ±5.03dB (Horizontal) ±5.12dB (Vertical) 1GHz to 18GHz, ±5.15dB (Horizontal) ±5.12dB (Vertical) 18GHz to 25GHz, ±4.76dB

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3.

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13 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

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14 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

THE END

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