FCC/ISED RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Rugged Tablet

ISSUED TO
Shenzhen UniStrong Science & Technology Co., Ltd.

B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China

Report No.:	BL-EC1840167-604
EUT Name:	Rugged Tablet
Model Name:	UT30
Brand Name:	UniStrong
Test Standard:	47 CFR Part 15 Subpart E RSS-Gen (Issue 4, November 2014) RSS-247 (Issue 2, February 2017)
FCC ID:	2AOPD-UT30
ISED Number:	11546A-UT30
Test Conclusion:	Pass
Test Date:	May 10, 2018 ~ Jun. 27, 2018
Date of Issue:	Jul. 09, 2018

Prepared by: Hu Chao
Hu Chao
(Engineer)
Date Jul. 09, 2018

Approved by: Liao Jianming
Liao Jianming
(Technical Director)
Date Jul. 09. 2018

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Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
TEL: +86-755-66850100, FAX: +86-755-61824271
Email: qc@baluntek.com
www.baluntek.com

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jul. 09, 2018	Initial Issue

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v4.2.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant

Applicant	Shenzhen UniStrong Science & Technology Co., Ltd.
Address	B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China

2.2 Manufacturer

Manufacturer	Shenzhen UniStrong Science & Technology Co., Ltd.
Address	B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China

2.3 Factory

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Rugged Tablet
Under Test Model Name	UT30
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	UT30_V103
Software Version	UT30_V1.0
Dimensions (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	SJYEnergy
	Model No.	BA820
	Serial No.	N/A
	Capacity	8200 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	4.35 V
Ancillary Equipment 2	Adapter	
	Brand Name	N/A
	Model No.	ASUC71W
	Serial No.	N/A
	Rated Input	100-240 V~, 0.7 A, 50/60 Hz
	Rated Output	5 V⎓ 3 A
Ancillary Equipment 3	USB Cable	
	Length (Approx.)	1.0 m

2.6 Technical Information

Network and Wireless connectivity	2G Network GSM/GPRS/EDGE 850/900/1800/1900 MHz 3G Network WCDMA/HSDPA/HSUPA Band 1/2/5/8 CDMA Band Class 0 EVDO Rel. 0/Rev. A Band Class 0 4G Network FDD LTE Band 1/2/3/4/5/7/8/12/13/17/20/25/28 TDD LTE Band 38/39/40/41 Bluetooth 4.2 (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g and 802.11n(HT20), 802.11ac NFC, GPS, GLONASS, BDS

Frequency Range	Band I: 5150 MHz to 5250 MHz, Band IV: 5725 MHz to 5850 MHz
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Modulation technology	OFDM
Modulation Type	256QAM, 64QAM, 16QAM, BPSK, QPSK
Product Type	Indoor for IC standard Mobile and portable for FCC standard
Transfer Rate (Mbps) (Single RF path)	802.11a: 54/ 48/ 36/ 24/ 18/ 12/ 9/ 6 Mbps 802.11n: up to 150 Mbps 802.11ac: up to VHT-MCS9
Channel Bandwidth	802.11a: 20 MHz 802.11n: 20 MHz 802.11ac: 20 MHz, 40 MHz, 80 MHz
Maximum Output Power	Band I: 12.78 dBm Band IV: 12.78 dBm
Antenna System (eg., MIMO, Smart Antenna)	N/A
Categorization as Correlated or Completely Uncorrelated	N/A
Antenna Type	FPC Antenna
Antenna Gain	Band I: 5150 MHz to 5250 MHz: 0.83 dBi Band IV: 5725 MHz to 5850 MHz: 0.22 dBi
About the Product	The equipment is Rugged Tablet, intended for used with information technology equipment.

2.7 Additional Instructions

EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

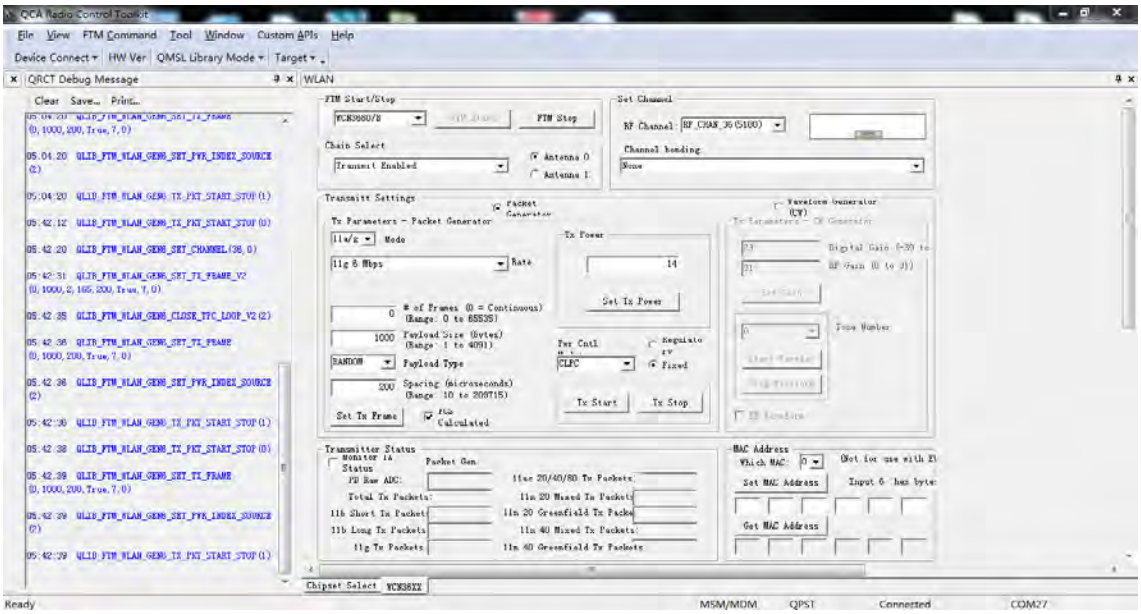
During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Test Software Version	QRCT3

Band I (5150 - 5250 MHz) Power level setup in software			
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH36	5180	15
11a	CH44	5220	
11a	CH48	5240	
11n (HT20)	CH36	5180	
11n (HT20)	CH44	5220	
11n (HT20)	CH48	5240	
11ac (VHT20)	CH36	5180	
11ac (VHT20)	CH44	5220	
11ac (VHT20)	CH48	5240	
11ac (VHT40)	CH38	5190	
11ac (VHT40)	CH46	5230	
11ac (VHT80)	CH42	5210	

Band IV (5725 - 5850 MHz) Power level setup in software			
Mode	Channel	Frequency (MHz)	Soft Set
11a	CH149	5745	12
11a	CH157	5785	
11a	CH165	5825	
11n (HT20)	CH149	5745	
11n (HT20)	CH157	5785	
11n (HT20)	CH165	5825	
11ac (VHT20)	CH149	5745	
11ac (VHT20)	CH157	5785	
11ac (VHT20)	CH165	5825	
11ac (VHT40)	CH151	5755	
11ac (VHT40)	CH159	5795	
11ac (VHT80)	CH155	5775	

Run Software



2.8 Channel List

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	**5180**	**38**	**5190**	**42**	**5210**
40	5200	**46**	**5230**	**155**	**5775**
44	**5220**	**151**	**5755**		
48	**5240**	**159**	**5795**		
149	**5745**				
153	5765				
157	**5785**				
161	5805				
165	**5825**				

Note: Until further notice, devices subject to this section shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of weather radars operating in this band.

The Lowest frequency, the middle frequency and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/ n(HT20)/ ac(VHT20)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
44	Mid	5220	157	Mid	5785
48	High	5240	165	High	5825

For 802.11ac(VHT40)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	151	Low	5755
46	High	5230	159	High	5795

For 802.11ac(VHT80)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
42	Mid	5210	155	Mid	5775

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Modulation Type	Band I Channel	Band IV Channel
RF Output Power	11a	6	BPSK	48/44/36	165/157/149
	11n(20 MHz)	6.5		48/44/36	165/157/149
	11ac(20 MHz)	6.5		48/44/36	165/157/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	MCS0		42	155
Emission Bandwidth & 99% Occupied Bandwidth	11a	6	BPSK	48/44/36	165/157/149
	11n(20 MHz)	6.5		48/44/36	165/157/149
	11ac(20 MHz)	6.5		48/44/36	165/157/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	VHT-MCS0		42	155
6 dB bandwidth	11a	6	BPSK	N/A	165/157/149
	11n(20 MHz)	6.5		N/A	165/157/149
	11ac(20 MHz)	6.5		N/A	165/157/149
	11ac(40 MHz)	13.5		N/A	159/151
	11ac(80 MHz)	MCS0		N/A	155
Power Spectral Density	11a	6	BPSK	48/44/36	165/157/149
	11n(20 MHz)	6.5		48/44/36	165/157/149
	11ac(20 MHz)	6.5		48/44/36	165/157/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	MCS0		42	155
Conducted Spurious Emission and Band Edge (Authorized-band)	11a	6	BPSK	48/44/36	165/157/149
	11n(20 MHz)	6.5		48/44/36	165/157/149
	11ac(20 MHz)	6.5		48/44/36	165/157/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	MCS0		42	155
Radiated Spurious Emissions	11a	6	BPSK	48/44/36	165/157/149
	11n(20 MHz)	6.5		48/44/36	165/157/149
	11ac(20 MHz)	6.5		48/44/36	165/157/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	MCS0		42	155
Band Edge (Restricted-band)	11a	6	BPSK	48/36	165/149
	11n(20 MHz)	6.5		48/36	165/149
	11ac(20 MHz)	6.5		48/36	165/149
	11ac(40 MHz)	13.5		46/38	159/151
	11ac(80 MHz)	MCS0		42	155
Frequency Stability	Unmodulated	N/A	N/A	N/A	N/A

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart E (10-1-16 Edition)	Unlicensed National Information Infrastructure Devices
2	KDB Publication 789033 D02v01r04	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
3	RSS-Gen (Issue 4, Nov. 2014)	General Requirements for Compliance of Radio Apparatus
4	RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE-LAN) Devices
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	RSS Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	RSS-247, 6.2	--	Pass[Note1]
2	RF Output Power	15.407(a)	RSS-247, 6.2	ANNEX A.1	Pass
3	Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	RSS-247, 6.2	ANNEX A.2	Pass
4	6 dB bandwidth	15.407(e)	RSS-247, 6.2	ANNEX A.3	Pass
5	Power Spectral Density	15.407(a)	RSS-247, 6.2	ANNEX A.4	Pass
6	Conducted Emission	15.207	RSS-GEN, 8.8	ANNEX A.5	Pass
7	Conducted Spurious Emission and Band Edge (Authorized-band)	15.407(b) 15.209	RSS-247, 6.2	ANNEX A.6	Pass
8	Radiated Spurious Emissions and Band Edge (Restricted-band)	15.407(b)	RSS-247, 6.2	ANNEX A.7	Pass
9	Frequency Stability	15.407(g)	--	ANNEX A.8	Pass
10	Receiver Spurious Emissions	--	RSS-Gen, 7.1.2	--	N/A[Note2]

Note [1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note [2]: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% to 55%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
	LT (Low Temperature)	-20℃
	HT (High Temperature)	+60℃
Working Voltage of the EUT	NV (Normal Voltage)	3.8 V
	LV (Low Voltage)	3.7 V
	HV (High Voltage)	4.2 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2018.06.11	2019.06.10
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2018.06.11	2019.06.10
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2017.09.07	2018.09.06
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2018.06.21	2019.06.20
LISN	SCHWARZBECK	NSLK 8127	8127-687	2018.06.21	2019.06.20
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2018.06.11	2019.06.10
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2018.06.11	2019.06.10
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2018.06.21	2019.06.20
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2018.06.21	2019.06.20
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2018.06.21	2019.06.20
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2017.11.07	2019.11.08
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2017.07.22	2019.07.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2016.07.12	2018.07.11
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2017.01.07	2019.01.06
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2019.02.20
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2016.08.09	2018.08.08
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2018.06.11	2019.06.10
Power Amplifier	OPHIR RF	5225F	1037	2018.02.16	2019.02.15

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power Amplifier	OPHIR RF	5273F	1016	2018.02.16	2019.02.15
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A
Feld Strength Meter	Narda	EP601	511WX51129	2018.05.21	2019.05.20
Mouth Simulator	B&K	4227	2423931	2017.11.16	2018.11.15
Sound Calibrator	B&K	4231	2430337	2017.11.16	2018.11.15
Sound Level Meter	B&K	NL-20	00844023	2017.11.16	2018.11.15
Ear Simulator	B&K	4185	2409449	2017.11.16	2018.11.15
Ear Simulator	B&K	4195	2418189	2017.11.16	2018.11.15
Audio analyzer	B&K	UPL 16	100129	2017.11.16	2018.11.15

4.3 Measurement Uncertainty

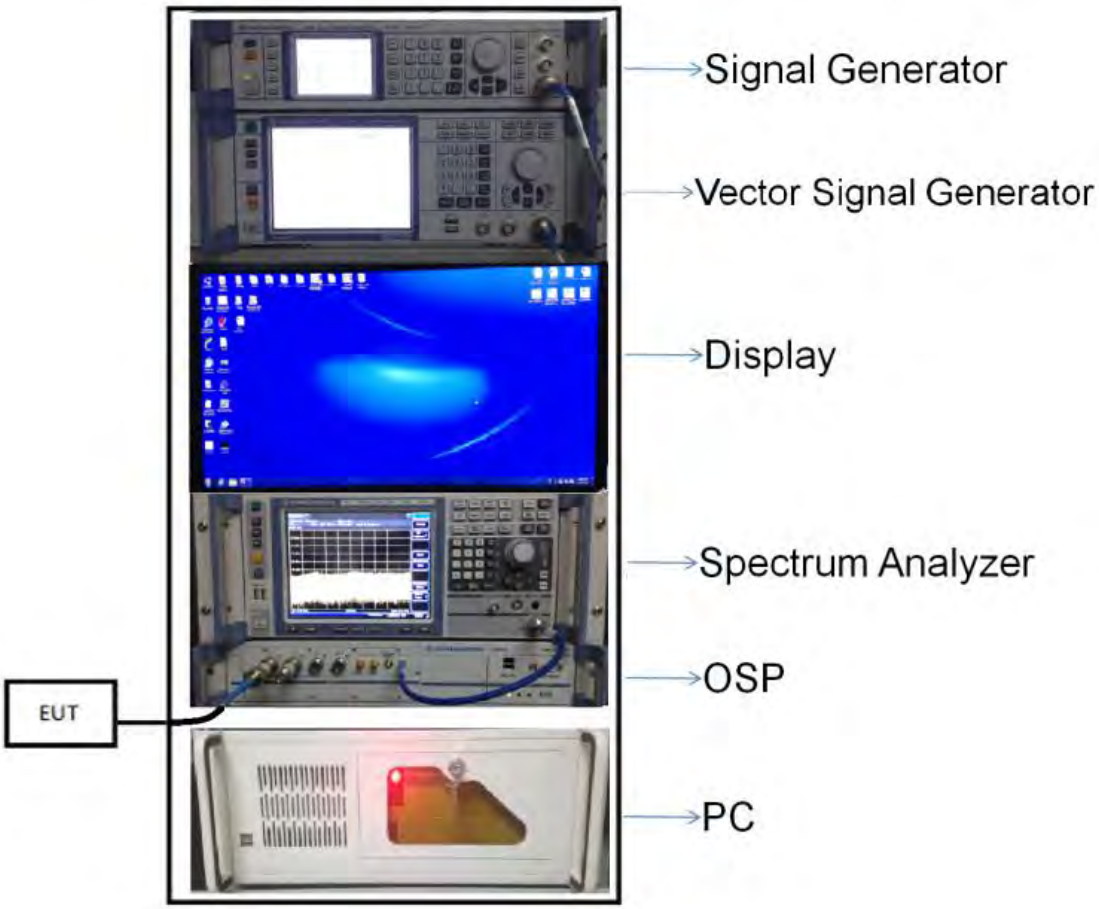
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Occupied Channel Bandwidth	±4%
RF output power, conducted	±1 .4 dB
Power Spectral Density, conducted	±2.5 dB
Unwanted Emissions, conducted	±2.8 dB
All emissions, radiated	±5.4 dB
Temperature	±1°C
Humidity	±4%

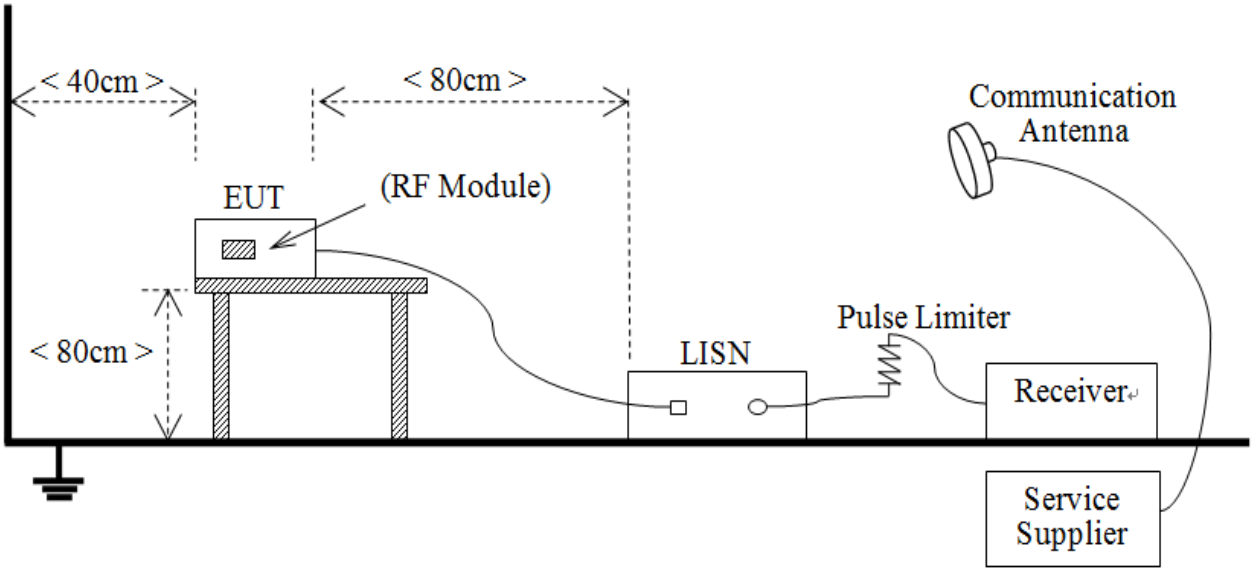
4.4 Description of Test Setup

4.4.1 For Antenna Port Test



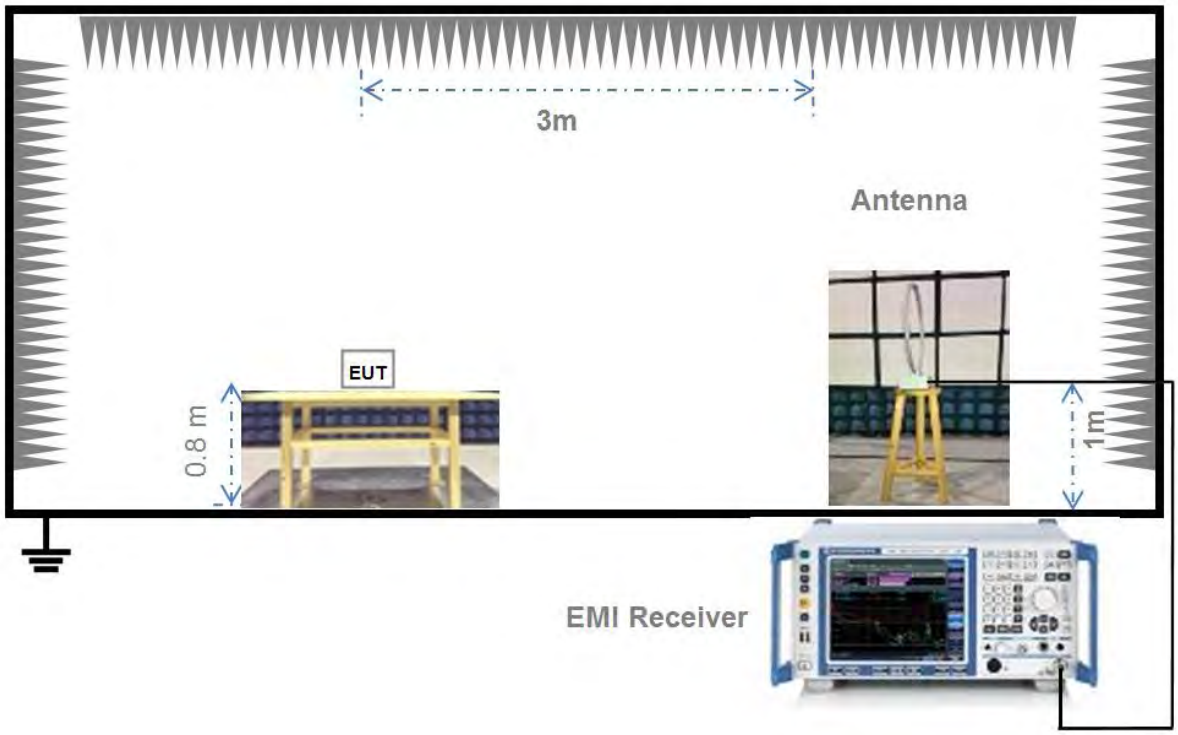
(Diagram 1)

4.4.2 For AC Power Supply Port Test



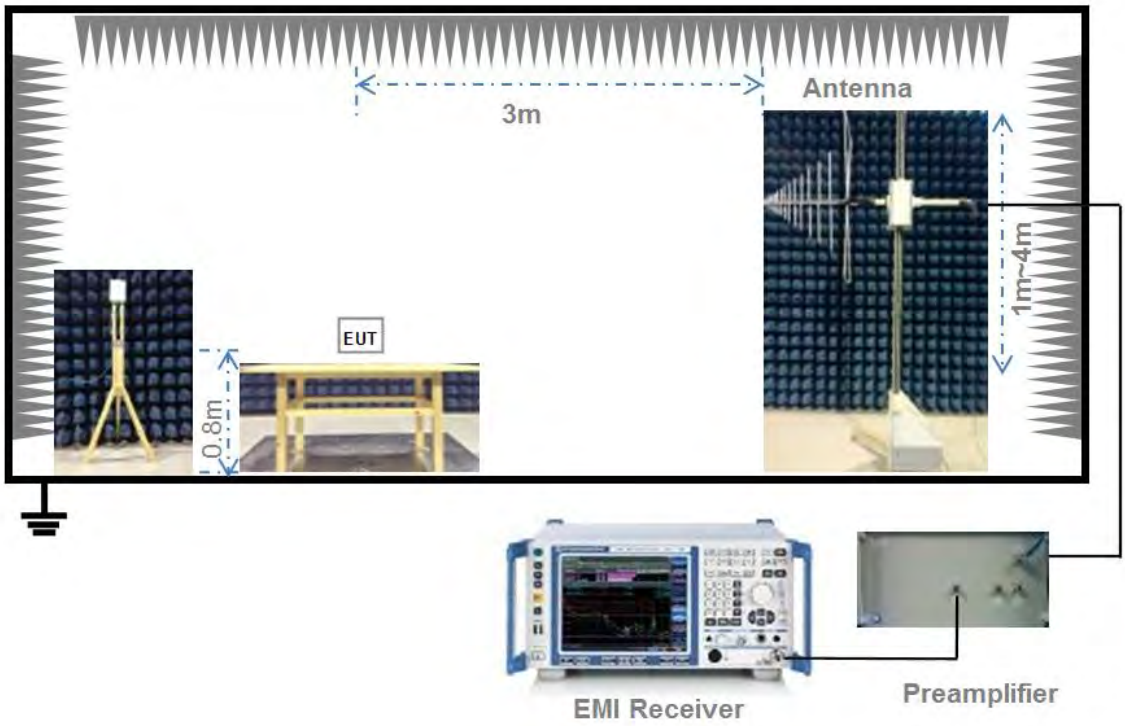
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



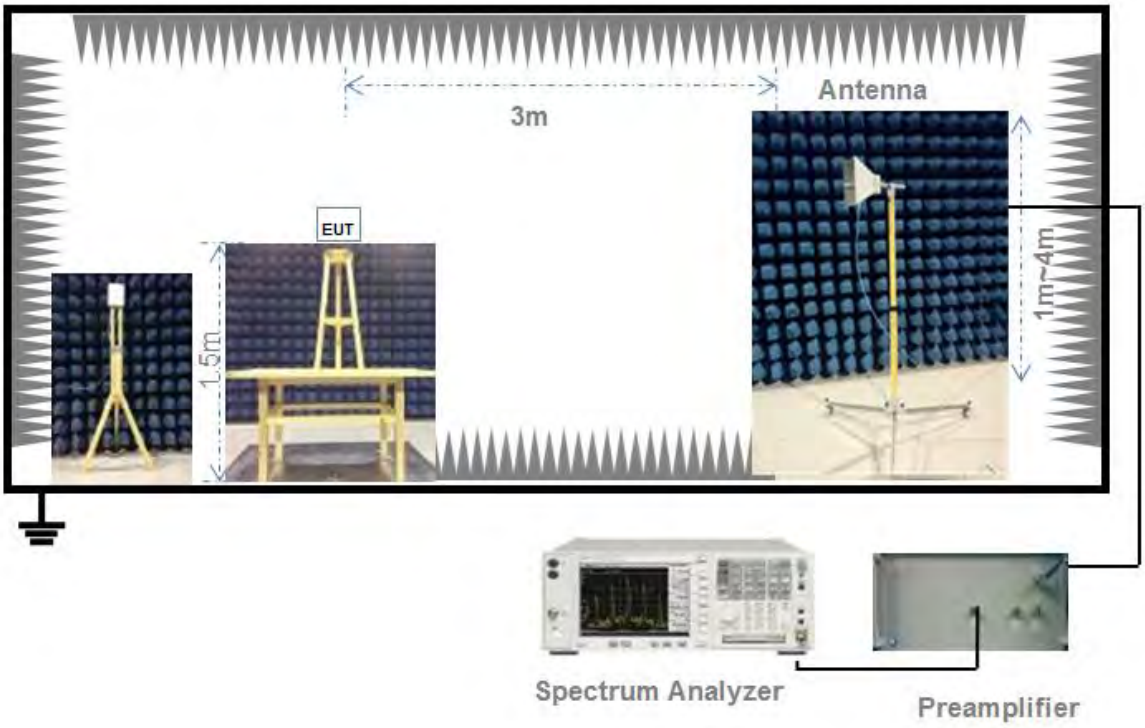
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



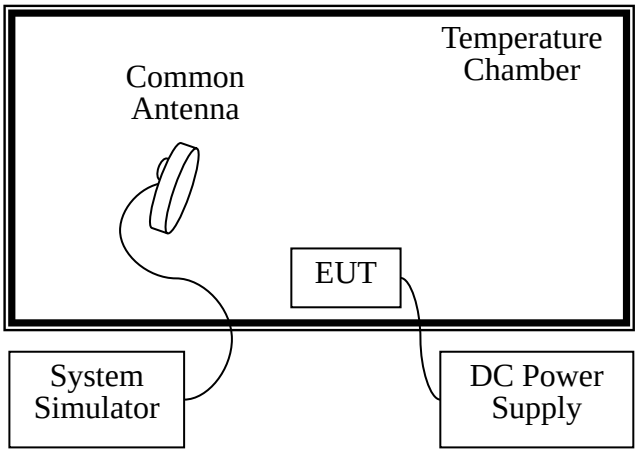
(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.4.6 For Frequency Stability Test



(Diagram 6)

5 TEST ITEMS

5.1 RF Output Power

5.1.1 Test Limit

FCC §15.407(a)

The maximum conducted output power should not exceed:

Frequency Band (MHz)	Limit
5150-5250	250 mW
5250-5350	250 mW or 11 dBm + 10log B, whichever is less.
5470-5725	250 mW or 11 dBm + 10log B, whichever is less.
5725-5850	1 W
Note: Where “B” is the 26 dB emissions bandwidth in MHz.	

RSS-247, 6.2

The maximum conducted output power shall not exceed:

Frequency Band (MHz)	Limit
5150-5250	N/A
5250-5350	250 mW or 11 dBm + 10log B, whichever is less.
5470-5725	250 mW or 11 dBm + 10log B, whichever is less.
5725-5850	1 W
Note: Where “B” is the 99% emissions bandwidth in MHz.	

The maximum e.i.r.p. shall not exceed:

Frequency Band (MHz)	Limit
5150-5250	200 mW or 10 dBm + 10log B, whichever is less.
5250-5350	1W or 17 dBm + 10log B, whichever is less.
5470-5725	1W or 17 dBm + 10log B, whichever is less.
5725-5850	N/A
Note: Where “B” is the 99% emissions bandwidth in MHz.	

5.1.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

The maximum peak conducted output power may be measured using a broadband Average RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.

The E.I.R.P used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Emission Bandwidth and 6 dB Bandwidth

5.2.1 Limit

FCC §15.407(a), RSS-247, 6.2

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.2.2 Test Setup

The test setup photo please refer to 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Emission bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.

2. Set VBW ≥ 3*RBW,

3. Detector = Peak.

4. Trace mode = Max hold.

5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

Occupied Bandwidth

1. Set Span = 1.5 times to 5.0 times the OBW

2. Set RBW = 1% to 5% of the OBW.

3. Set VBW ≥ 3*RBW, Detector = Peak.

4. Trace mode = Max hold.

5. Use the 99% power bandwidth function of the instrument.

6 dB bandwidth

1. Set RBW = 100 kHz, VBW = 300 kHz.

2. Detector = Peak.Trace mode = Max hold.

3. Allow the trace to stabilize.

4. 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.

5.2.4 Test Result

Please refer to ANNEX A.2 and ANNEX A.3.

5.3 Power Spectral density (PSD)

5.3.1 Limit

FCC §15.407(a)

The maximum power spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	11 dBm/MHz
5250-5350	11 dBm/MHz
5470-5725	11 dBm/MHz
5725-5850	30 dBm/500kHz

RSS-247, 6.2

The maximum power spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	N/A
5250-5350	11 dBm/MHz
5470-5725	11 dBm/MHz
5725-5850	30 dBm/500kHz

The e.i.r.p. spectral density should not exceed:

Frequency Band (MHz)	Limit
5150-5250	10 dBm/MHz
5250-5350	N/A
5470-5725	N/A
5725-5850	N/A

5.3.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.

1. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS.
2. Allow the sweeps to continue until the trace stabilizes.
3. Use the peak marker function to determine the maximum amplitude level.
4. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.

5.3.4 Test Result

Please refer to ANNEX A.4.

5.4 Conducted Emission

5.4.1 Limit

FCC §15.207, RSS-GEN, 8.8

For an intentional radiator 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 within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.4.2 Test Setup

The section 4.4.2 (Diagram 2) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

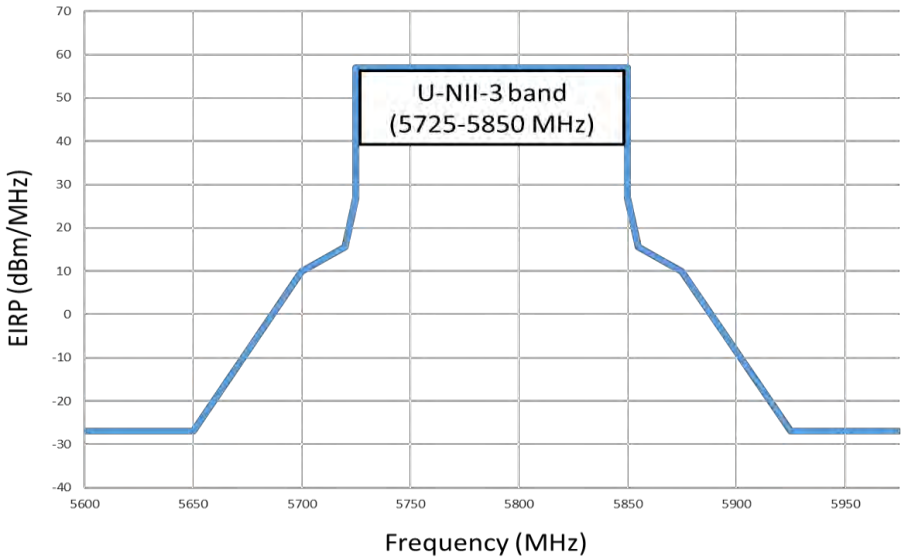
5.4.4 Test Result

Please refer to ANNEX A.5.

5.5 Conducted Spurious Emission and Band Edge (Authorized-band)

5.5.1 Limit

FCC §15.407(b)

Un-restricted band emissions	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	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. 

RSS-247, 6.2

Un-restricted band emissions	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm, However, any unwanted emissions that fall into the band 5250-5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz.
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm. And any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of 10 dBm/MHz, The device shall be labelled “for indoor use only.”
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm 5850 -5860 MHz: e.i.r.p. -17 dBm Other un-restricted band: e.i.r.p .-27 dBm

5.5.2 Test Setup

See section 4.4.2 (Diagram 2) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.5.4 Test Result

Please refer to ANNEX A.6.

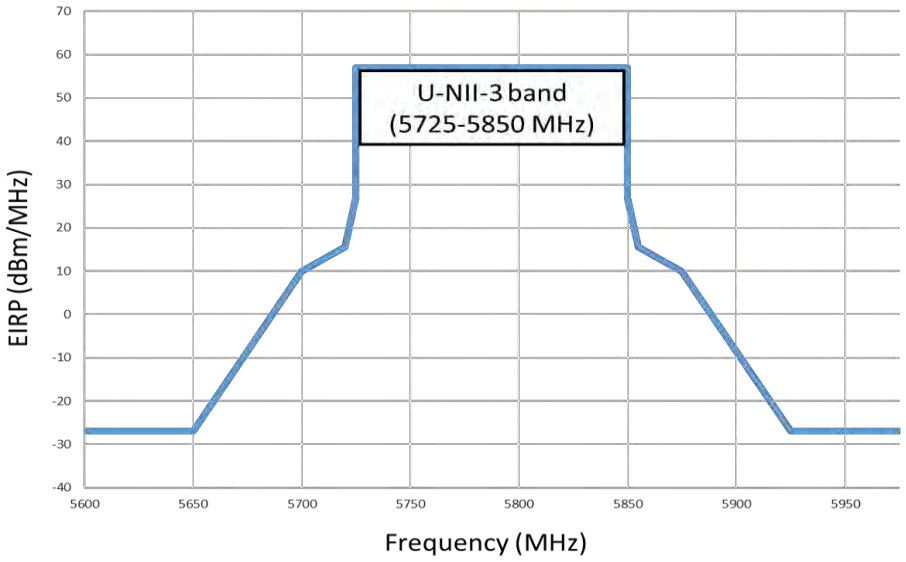
5.6 Radiated Spurious Emissions and Band Edge (Restricted-band)

5.6.1 Limit

FCC §15.209 & 15.407(b), RSS-247, 6.2

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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 [1]: The Limit for radiated test was performed according to FCC Part 15C
Note [2]: The tighter limit applies at the band edge.

Un-restricted band emissions	
Out Operating Band (MHz）	Limit
5150 - 5250	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5250 - 5350	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5470 - 5725	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5725 - 5850	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. 

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength.

5.6.2 Test Setup

The section 4.4.3-4.4.5 (Diagram 3 - Diagram 5) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

General Procedure for conducted measurements in restricted bands

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$E = EIRP – 20\log D + 104.8$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 1.

b) VBW ≥ 3 x RBW.

c) Detector = Peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle ≥ 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW ≥ 3 x RBW.

e) Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is 20 log(1/x), where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off

with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.6.4 Test Result

Please refer to ANNEX A.7 and Please refer to ANNEX A.9

5.7 Frequency Stability

5.7.1 Limit

FCC §15.407(g)

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.

5.7.2 Test Setup

The section 4.4.6 (Diagram 6) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

The EUT is installed in an environment test chamber with external power source.
Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.
A sufficient stabilization period at each temperatures is used prior to each frequency measurement.
When temperature is stabled, measure the frequency stability.
The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage.
Change setting of chamber and external power source to complete all conditions.

5.7.4 Test Result

Please refer to ANNEX A.8.

ANNEX A TEST RESULT

A.1 RF Output Power

Note [1]: For FCC standard, if transmitting antennas of directional gain greater than 6 dBi are used, all band maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note [2]: For IC standard, the band IV (5725 - 5850 MHz) maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Data

Conducted Power

Band I (5150 - 5250 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	FCC Limit (mW)	Verdict
11a	CH36	5180	12.20	16.60	250	Pass
11a	CH44	5220	12.59	18.16	250	Pass
11a	CH48	5240	12.57	18.07	250	Pass
11n (HT20)	CH36	5180	12.24	16.75	250	Pass
11n (HT20)	CH44	5220	12.66	18.45	250	Pass
11n (HT20)	CH48	5240	12.58	18.11	250	Pass
11ac (VHT20)	CH36	5180	12.20	16.60	250	Pass
11ac (VHT20)	CH44	5220	12.61	18.24	250	Pass
11ac (VHT20)	CH48	5240	12.57	18.07	250	Pass
11ac (VHT40)	CH38	5190	12.70	18.62	250	Pass
11ac (VHT40)	CH46	5230	12.78	18.97	250	Pass
11ac (VHT80)	CH42	5210	11.65	14.62	250	Pass

Band IV (5725 - 5850 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power Total (mW)	FCC/IC Limit (W)	Verdict
11a	CH149	5745	12.77	18.92	1	Pass
11a	CH157	5785	11.75	14.96	1	Pass
11a	CH165	5825	11.40	13.80	1	Pass
11n (HT20)	CH149	5745	12.74	18.79	1	Pass
11n (HT20)	CH157	5785	11.63	14.55	1	Pass
11n (HT20)	CH165	5825	11.35	13.65	1	Pass
11ac (VHT20)	CH149	5745	12.78	18.97	1	Pass
11ac (VHT20)	CH157	5785	12.21	16.63	1	Pass
11ac (VHT20)	CH165	5825	11.83	15.24	1	Pass
11ac (VHT40)	CH151	5755	12.50	17.78	1	Pass
11ac (VHT40)	CH159	5795	12.05	16.03	1	Pass
11ac (VHT80)	CH155	5775	11.44	13.93	1	Pass

EIRP Power

Mode	Channel	Frequency (MHz)	EIRP Power Total (dBm)	EIRP Power Total (mW)	IC Limit (mW)	Verdict
11a	CH36	5180	13.03	20.09	164	Pass
11a	CH44	5220	13.42	21.98	165	Pass
11a	CH48	5240	13.40	21.88	166	Pass
11n (HT20)	CH36	5180	13.07	20.28	176	Pass
11n (HT20)	CH44	5220	13.49	22.34	176	Pass
11n (HT20)	CH48	5240	13.41	21.93	176	Pass
11ac (VHT20)	CH36	5180	13.03	20.09	176	Pass
11ac (VHT20)	CH44	5220	13.44	22.08	176	Pass
11ac (VHT20)	CH48	5240	13.40	21.88	176	Pass
11ac (VHT40)	CH38	5190	13.53	22.54	200	Pass
11ac (VHT40)	CH46	5230	13.61	22.96	200	Pass
11ac (VHT80)	CH42	5210	12.48	17.70	200	Pass

A.2 Emission Bandwidth & 99% Bandwidth

Note: Test plots please refer to the document “Annex No.: BL-EC1840167-604 Data Part 1.pdf”.

Test Data

Band I (5150 - 5250 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	21.44	16.79
11a	CH44	5220	21.56	16.79
11a	CH48	5240	20.72	16.79
11n (HT20)	CH36	5180	22.00	17.83
11n (HT20)	CH44	5220	21.96	17.89
11n (HT20)	CH48	5240	20.00	17.95
11ac (VHT20)	CH36	5180	21.80	17.83
11ac (VHT20)	CH44	5220	21.76	17.89
11ac (VHT20)	CH48	5240	20.92	17.83
11ac (VHT40)	CH38	5190	43.10	36.35
11ac (VHT40)	CH46	5230	41.40	36.47
11ac (VHT80)	CH42	5210	82.00	74.79

Band IV (5725 - 5850 MHz)			
Mode	Channel	Frequency (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	16.85
11a	CH157	5785	16.79
11a	CH165	5825	16.79
11n (HT20)	CH149	5745	17.89
11n (HT20)	CH157	5785	17.83
11n (HT20)	CH165	5825	17.89
11ac (VHT20)	CH149	5745	17.89
11ac (VHT20)	CH157	5785	17.89
11ac (VHT20)	CH165	5825	17.89
11ac (VHT40)	CH151	5755	36.35
11ac (VHT40)	CH159	5795	36.47
11ac (VHT80)	CH155	5775	74.79

A.3 6 dB Bandwidth

Note: Test plots please refer to the document “Annex No.: BL-EC1840167-604 Data Part 2.pdf”.

Test Data

Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (kHz)	Verdict
11a	CH149	5745	16.67	500	Pass
11a	CH157	5785	16.47	500	Pass
11a	CH165	5825	16.47	500	Pass
11n (HT20)	CH149	5745	17.77	500	Pass
11n (HT20)	CH157	5785	17.67	500	Pass
11n (HT20)	CH165	5825	17.72	500	Pass
11ac (VHT20)	CH149	5745	17.92	500	Pass
11ac (VHT20)	CH157	5785	17.87	500	Pass
11ac (VHT20)	CH165	5825	17.92	500	Pass
11ac (VHT40)	CH151	5755	35.52	500	Pass
11ac (VHT40)	CH159	5795	36.42	500	Pass
11ac (VHT80)	CH155	5775	43.86	500	Pass

A.4 Power Spectral Density

Note: Test plots please refer to the document “Annex No.: BL-EC1840167-604 Data Part 3.pdf”.

Test Data

Band I (5150 - 5250 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	FCC Limit (dBm/MHz)	Verdict
11a	CH36	5180	7.88	11	Pass
11a	CH44	5220	8.59	11	Pass
11a	CH48	5240	8.51	11	Pass
11n (HT20)	CH36	5180	7.97	11	Pass
11n (HT20)	CH44	5220	9.14	11	Pass
11n (HT20)	CH48	5240	8.23	11	Pass
11ac (VHT20)	CH36	5180	7.75	11	Pass
11ac (VHT20)	CH44	5220	8.39	11	Pass
11ac (VHT20)	CH48	5240	8.04	11	Pass
11ac (VHT40)	CH38	5190	5.80	11	Pass
11ac (VHT40)	CH46	5230	5.34	11	Pass
11ac (VHT80)	CH42	5210	1.58	11	Pass

Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	FCC/IC Limit (dBm/500 kHz)	Verdict
11a	CH149	5745	3.48	30	Pass
11a	CH157	5785	2.71	30	Pass
11a	CH165	5825	2.22	30	Pass
11n (HT20)	CH149	5745	3.26	30	Pass
11n (HT20)	CH157	5785	2.37	30	Pass
11n (HT20)	CH165	5825	1.83	30	Pass
11ac (VHT20)	CH149	5745	3.39	30	Pass
11ac (VHT20)	CH157	5785	2.93	30	Pass
11ac (VHT20)	CH165	5825	2.75	30	Pass
11ac (VHT40)	CH151	5755	-15.41	30	Pass
11ac (VHT40)	CH159	5795	-17.09	30	Pass
11ac (VHT80)	CH155	5775	-2.52	30	Pass

EIRP PSD

Band I (5150 - 5250 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	IC Limit (dBm/MHz)	Verdict
11a	CH36	5180	8.71	10	Pass
11a	CH44	5220	9.42	10	Pass
11a	CH48	5240	9.34	10	Pass
11n (HT20)	CH36	5180	8.80	10	Pass
11n (HT20)	CH44	5220	9.97	10	Pass
11n (HT20)	CH48	5240	9.06	10	Pass
11ac (VHT20)	CH36	5180	8.58	10	Pass
11ac (VHT20)	CH44	5220	9.22	10	Pass
11ac (VHT20)	CH48	5240	8.87	10	Pass
11ac (VHT40)	CH38	5190	6.63	10	Pass
11ac (VHT40)	CH46	5230	6.17	10	Pass
11ac (VHT80)	CH42	5210	2.41	10	Pass

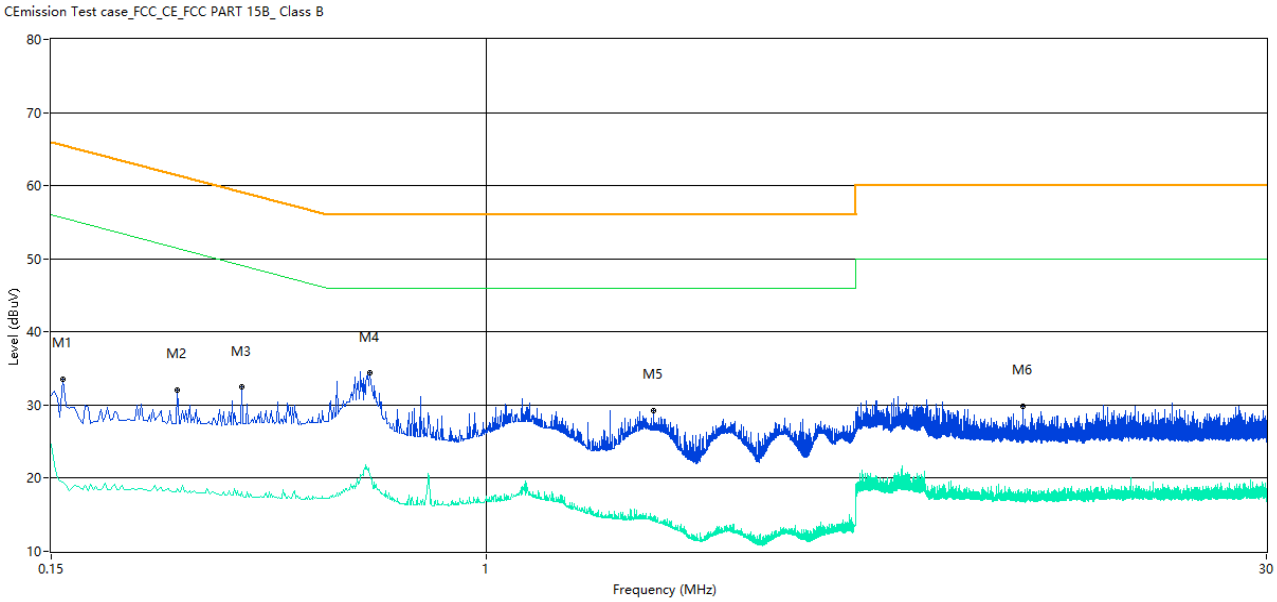
A.5 Conducted Emissions

Note [1]: The EUT is working in the Normal link mode.

Note [2]: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Test Data and Plots

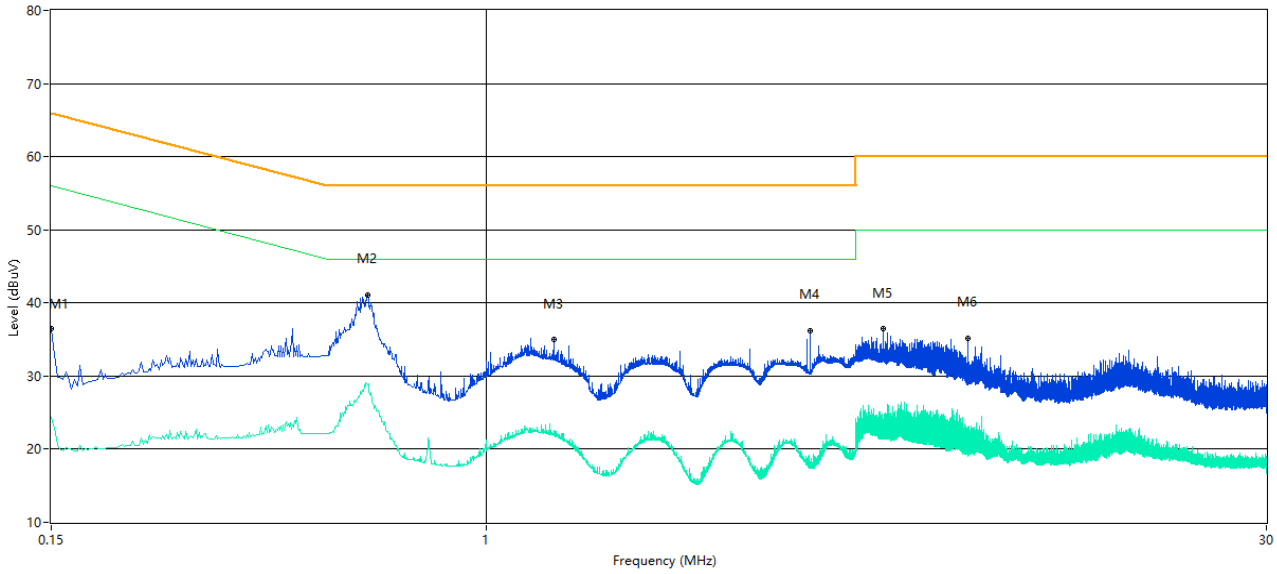
PHASE L



Frequency (MHz)	Peak Level (dBuV)	Q-peak Level (dBuV)	Average Level (dBuV)	Factor (dB)	QP Limit (dBuV)	AV Limit (dBuV)	Margin (dB)	Line	Verdict
0.158	32.95	23.87	18.89	10.01	65.6	55.6	36.71	L Line	Pass
0.260	31.22	23.17	18.35	10.01	61.4	51.4	33.05	L Line	Pass
0.344	29.95	22.05	17.25	10.01	59.1	49.1	31.85	L Line	Pass
0.602	35.50	26.43	17.79	10.02	56.0	46.0	28.21	L Line	Pass
2.072	28.67	19.18	12.83	10.07	56.0	46.0	33.17	L Line	Pass
10.386	23.57	13.95	9.88	10.35	60.0	50.0	40.12	L Line	Pass

PHASE N

CEmission Test case_FCC_CE_FCC PART 15B_ Class B



Frequency (MHz)	Peak Level (dBuV)	Q-peak Level (dBuV)	Average Level (dBuV)	Factor (dB)	QP Limit (dBuV)	AV Limit (dBuV)	Margin (dB)	Line	Verdict
0.150	40.19	28.34	25.12	10.00	66.0	56.0	30.88	N Line	Pass
0.596	41.92	35.43	29.68	10.02	56.0	46.0	16.32	N Line	Pass
1.342	34.39	27.45	22.00	10.04	56.0	46.0	24.00	N Line	Pass
4.106	35.73	24.83	17.55	10.14	56.0	46.0	28.45	N Line	Pass
5.654	34.79	26.61	19.10	10.19	60.0	50.0	30.90	N Line	Pass
8.156	31.62	24.92	16.79	10.27	60.0	50.0	33.21	N Line	Pass

A.6 Conducted Spurious Emission and Band Edge (Authorized-band)

Note: Test plots please refer to the document “Annex No.: BL-EC1840167-604 Data Part 4.pdf”.

Test Band	Mode	Channel	Verdict
Band I	802.11a	Low	Pass
		Middle	Pass
		High	Pass
	802.11n(HT20)	Low	Pass
		Middle	Pass
		High	Pass
	802.11ac(VHT20)	Low	Pass
		Middle	Pass
		High	Pass
	802.11ac(VHT40)	Low	Pass
		High	Pass
	802.11ac(VHT80)	Middle	Pass
Band IV	802.11a	Low	Pass
		Middle	Pass
		High	Pass
	802.11n(HT20)	Low	Pass
		Middle	Pass
		High	Pass
	802.11ac(VHT20)	Low	Pass
		Middle	Pass
		High	Pass
	802.11ac(VHT40)	Low	Pass
		High	Pass
	802.11ac(VHT80)	Middle	Pass

A.7 Radiated Spurious Emissions and Band Edge (Restricted-band)

Test Data

Cabinet Radiated spurious emission test

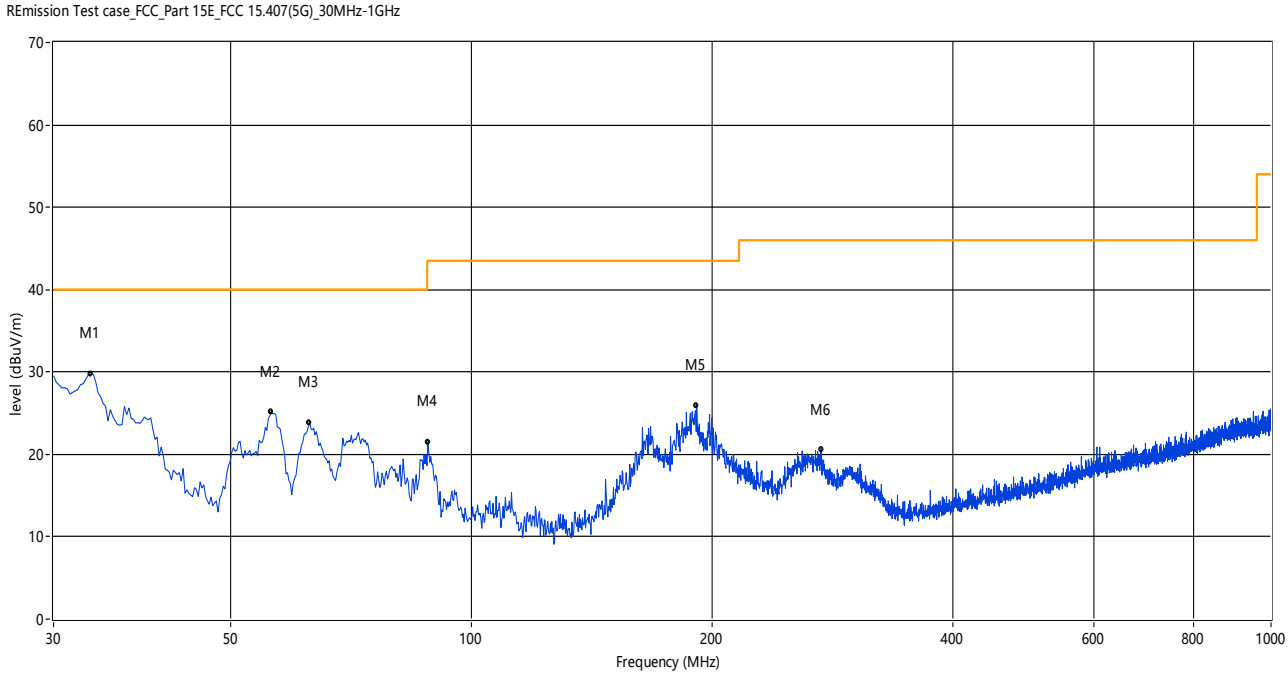
Note [1]: The symbol of "--" in the table which means not application.

Note [2]: For the test data above 1 GHz，According the ANSI C63.4, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note [3]: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note [4]: The EUT is working in the Normal link mode below 1 GHz.

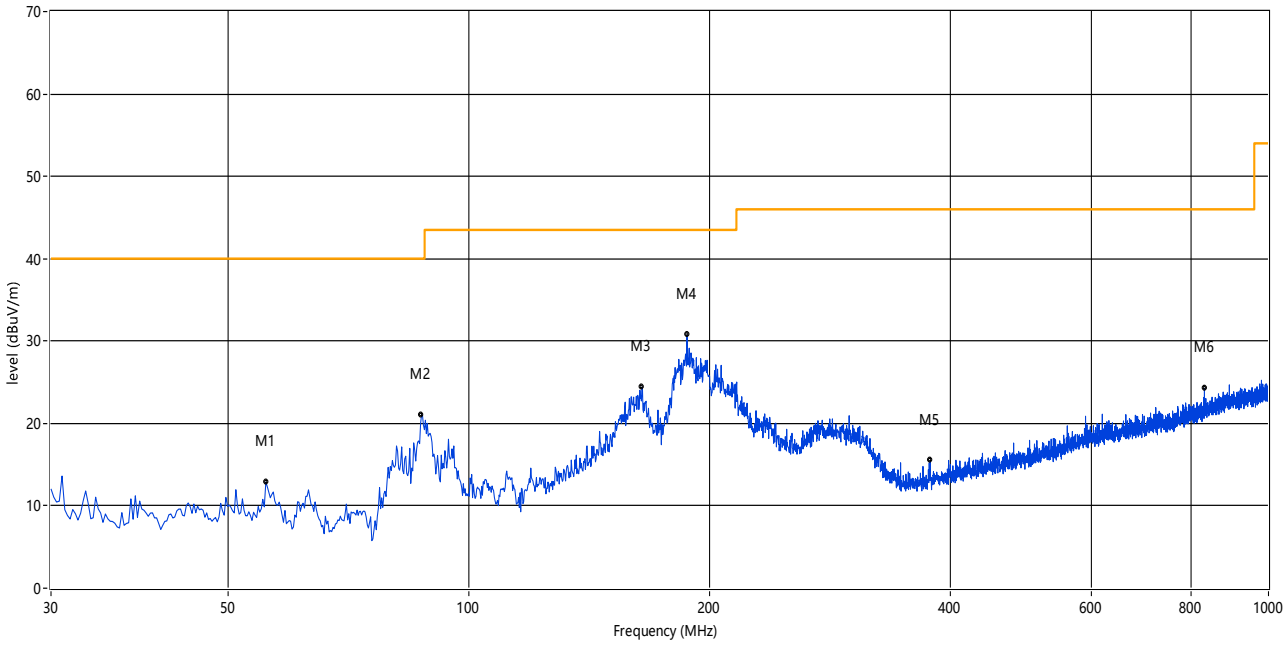
30 MHz to 1 GHz, ANT V



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
33.394	29.70	--	--	-28.58	--	40.0	--	10.30	338.70	100	Vertical	Pass
56.183	25.10	--	--	-27.48	--	40.0	--	14.90	24.20	100	Vertical	Pass
62.729	23.87	--	--	-28.72	--	40.0	--	16.13	360.00	200	Vertical	Pass
88.185	21.45	--	--	-30.88	--	43.5	--	22.05	336.00	100	Vertical	Pass
191.222	25.88	--	--	-29.43	--	43.5	--	17.62	119.50	100	Vertical	Pass
273.894	20.51	--	--	-26.85	--	46.0	--	25.49	360.00	200	Vertical	Pass

30 MHz to 1 GHz, ANT H

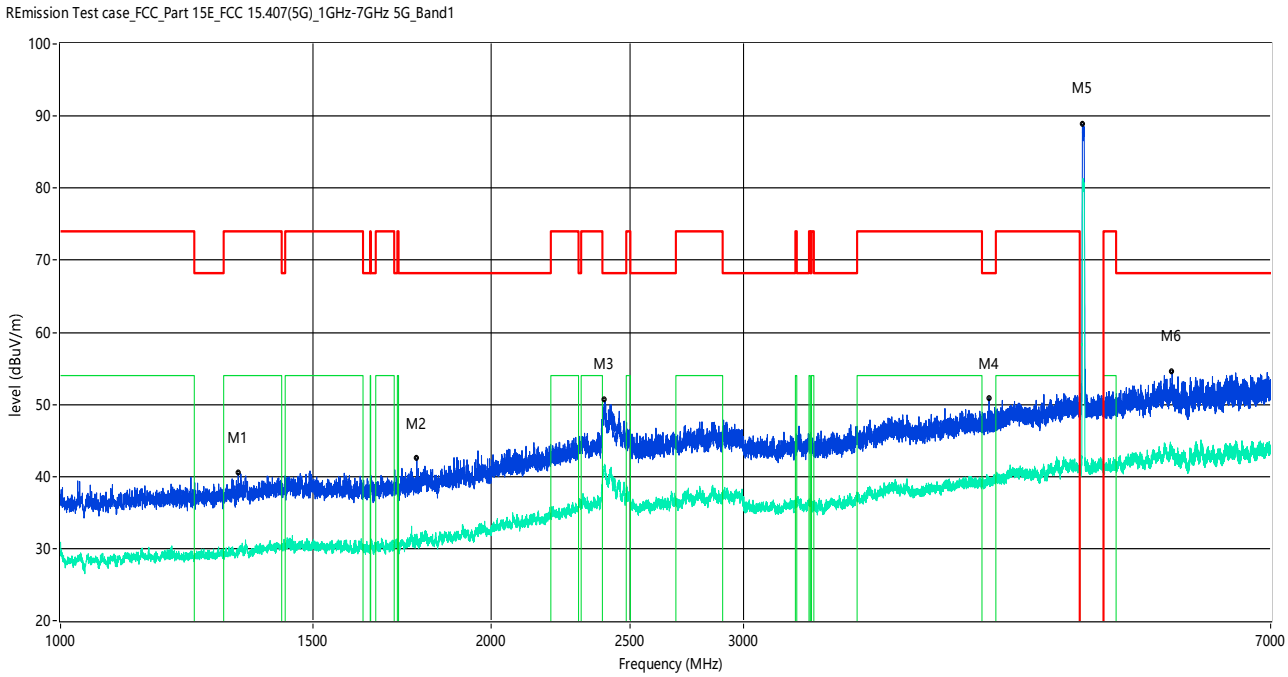
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_30MHz-1GHz



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
55.699	12.90	--	--	-27.34	--	40.0	--	27.10	13.10	100	Horizontal	Pass
87.216	21.07	--	--	-31.17	--	40.0	--	18.93	0.20	200	Horizontal	Pass
164.554	24.40	--	--	-31.35	--	43.5	--	19.10	18.60	100	Horizontal	Pass
187.343	30.72	--	--	-29.81	--	43.5	--	12.78	359.90	100	Horizontal	Pass
377.416	15.47	--	--	-24.71	--	46.0	--	30.53	360.00	200	Horizontal	Pass
831.505	24.27	--	--	-14.96	--	46.0	--	21.73	322.10	100	Horizontal	Pass

Note: The spurious from 18G-40G is noise only, do not show on the report.

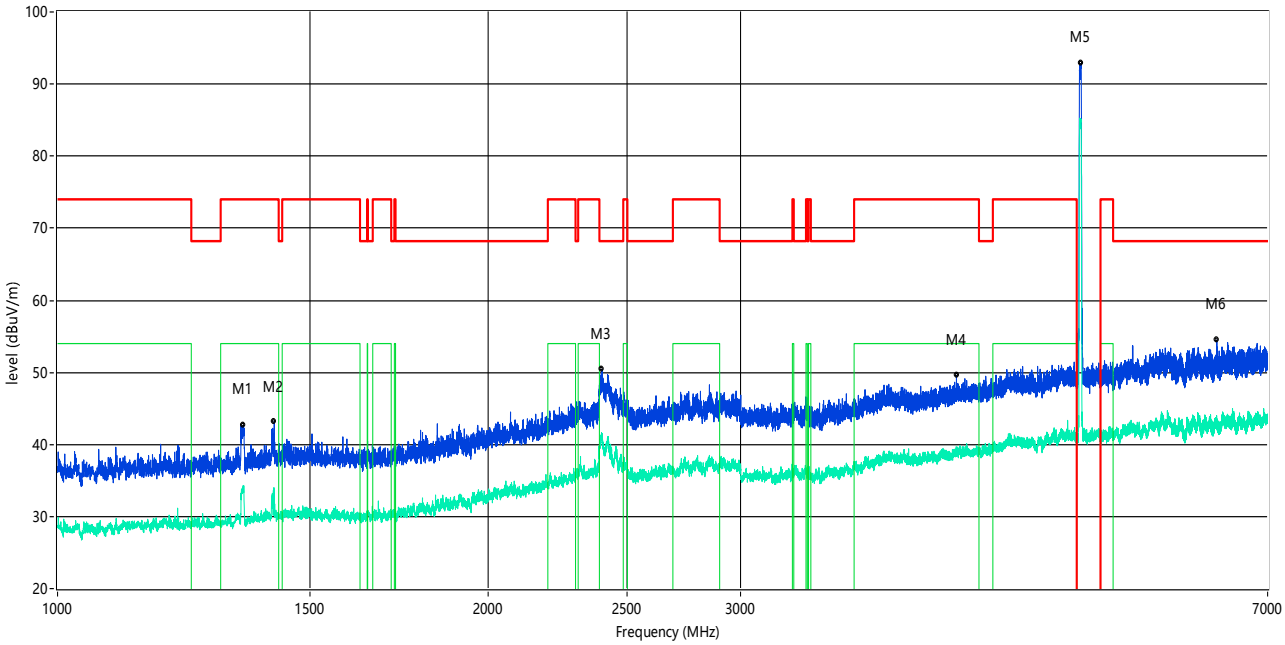
1 GHz to 7 GHz, Band I 11a Low channel ANT V



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1330.709	40.40	--	29.9	-12.09	74.0	--	54.0	24.10	69.00	150	Vertical	Pass
1773.403	42.43	--	32.0	-10.66	68.2	--	--	25.77	289.00	150	Vertical	Pass
2399.325	50.53	--	41.2	-0.07	68.2	--	--	17.67	106.00	150	Vertical	Pass
4451.069	50.82	--	39.8	-1.53	68.2	--	--	17.38	189.00	150	Vertical	Pass
5172.103	88.82	--	80.9	0.50	--	--	--	--	303.00	150	Vertical	Pass
5974.503	54.52	--	43.9	3.89	68.2	--	--	13.68	163.00	150	Vertical	Pass

1 GHz to 7 GHz, Band I 11a Low channel ANT H

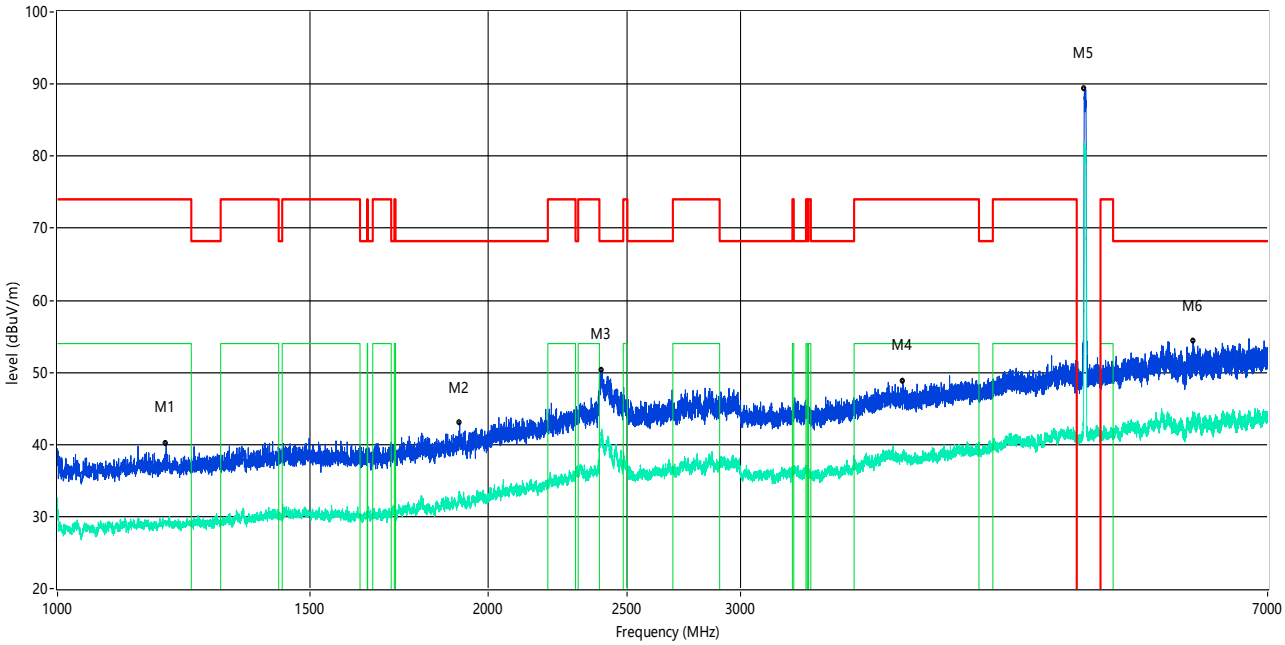
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1347.707	42.63	--	34.1	-12.24	74.0	--	54.0	19.90	36.00	150	Horizontal	Pass
1416.948	43.23	--	33.3	-11.89	74.0	--	54.0	20.70	210.00	150	Horizontal	Pass
2400.075	50.44	--	40.7	-0.08	68.2	--	--	17.76	48.00	150	Horizontal	Pass
4244.469	49.57	--	39.5	-2.14	74.0	--	54.0	14.50	22.00	150	Horizontal	Pass
5183.727	92.84	--	85.0	0.38	--	--	--	--	140.00	150	Horizontal	Pass
6450.569	54.45	--	43.1	4.83	68.2	--	--	13.75	165.00	150	Horizontal	Pass

1 GHz to 7 GHz, Band I 11a Middle channel ANT V

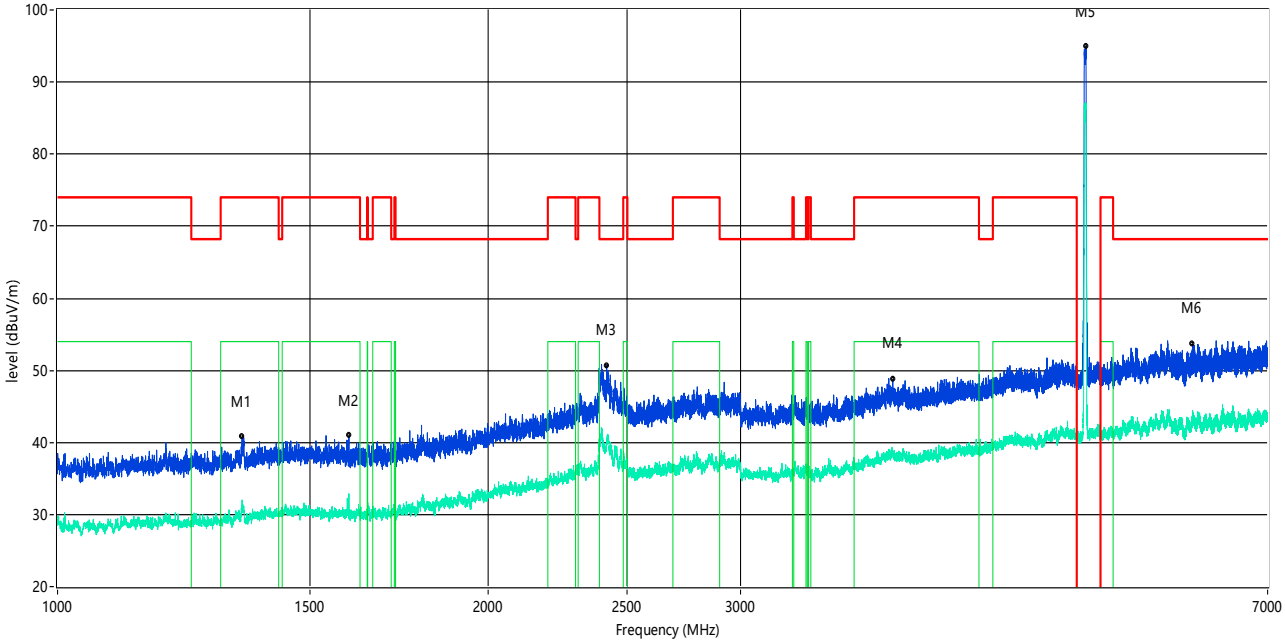
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1190.726	40.17	--	29.2	-11.80	74.0	--	54.0	24.80	230.00	150	Vertical	Pass
1909.136	43.03	--	33.5	-8.87	68.2	--	--	25.17	99.00	150	Vertical	Pass
2400.075	50.21	--	41.4	-0.08	68.2	--	--	17.99	335.00	150	Vertical	Pass
3893.138	48.71	--	38.0	-2.94	74.0	--	54.0	16.00	318.00	150	Vertical	Pass
5214.098	89.28	--	81.5	0.68	--	--	--	--	224.00	150	Vertical	Pass
6208.849	54.29	--	43.5	4.49	68.2	--	--	13.91	132.00	150	Vertical	Pass

1 GHz to 7 GHz, Band I 11a Middle channel ANT H

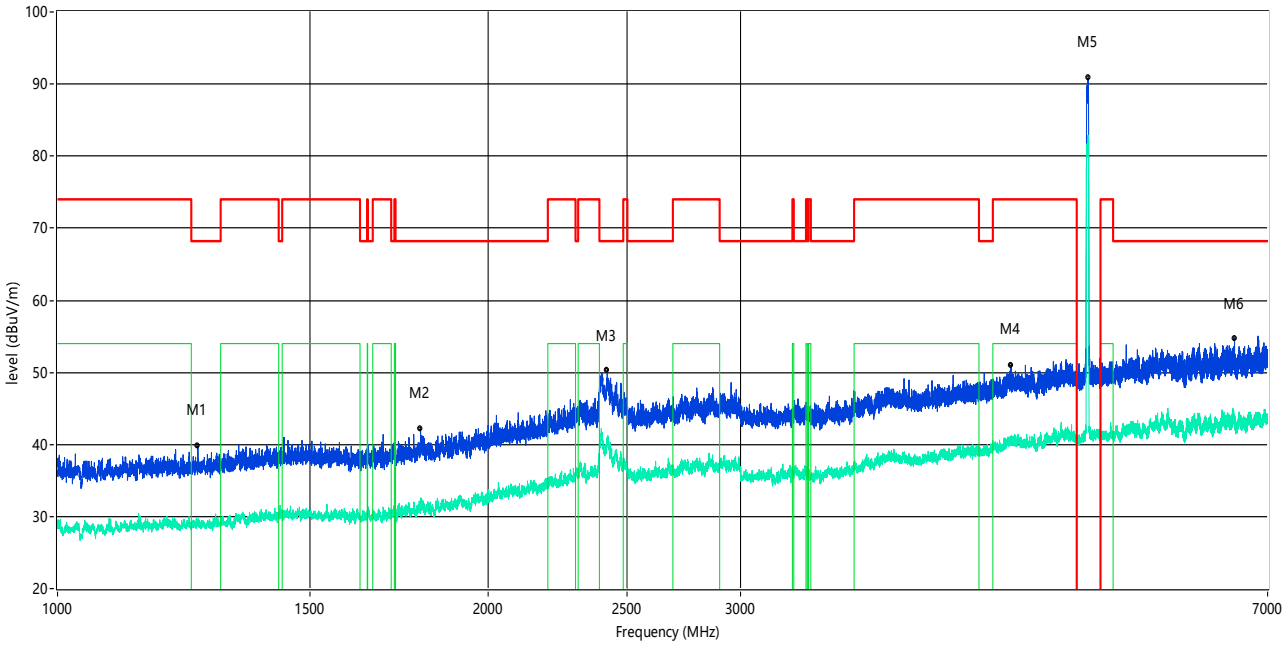
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1345.457	40.77	--	32.0	-12.42	74.0	--	54.0	22.00	44.00	150	Horizontal	Pass
1597.675	40.91	--	32.9	-12.44	74.0	--	54.0	21.10	274.00	150	Horizontal	Pass
2418.073	50.70	--	39.9	-0.72	68.2	--	--	17.50	24.00	150	Horizontal	Pass
3830.896	48.76	--	38.4	-2.94	74.0	--	54.0	15.60	355.00	150	Horizontal	Pass
5226.097	95.00	--	86.8	0.56	--	--	--	--	207.00	150	Horizontal	Pass
6203.850	53.64	--	43.3	4.36	68.2	--	--	14.56	332.00	150	Horizontal	Pass

1 GHz to 7 GHz, Band I 11a High channel ANT V

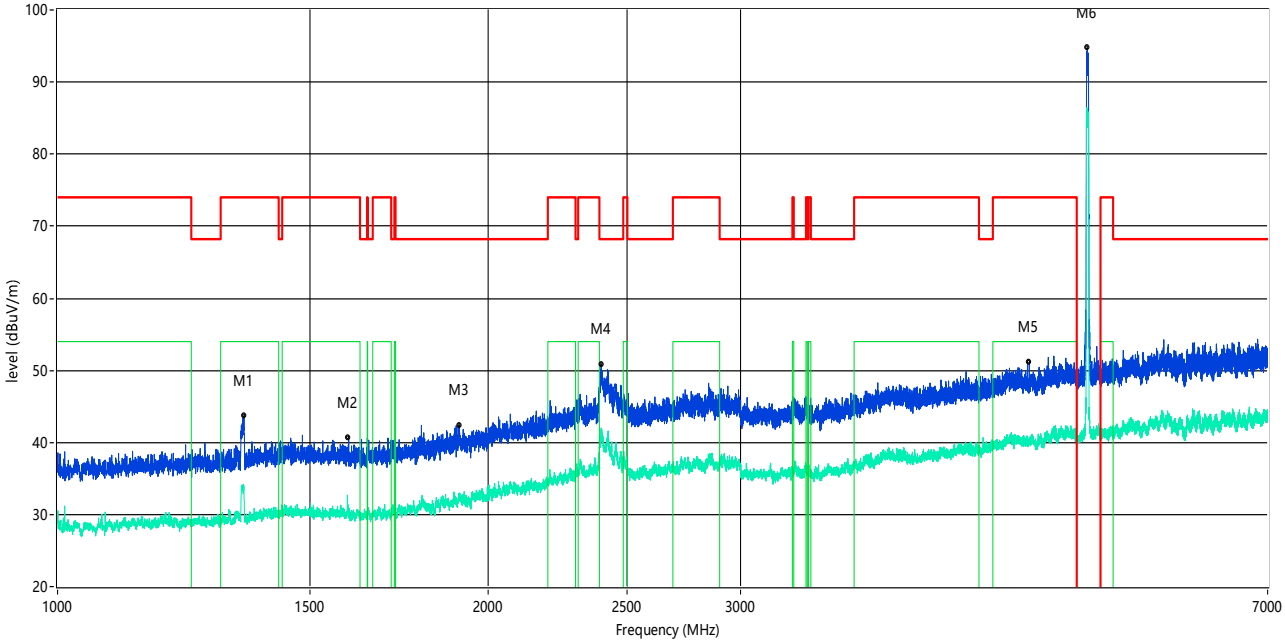
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1253.218	39.79	--	29.4	-12.15	68.2	--	--	28.41	248.00	150	Vertical	Pass
1792.651	42.16	--	31.4	-11.04	68.2	--	--	26.04	215.00	150	Vertical	Pass
2420.822	50.26	--	40.5	-0.79	68.2	--	--	17.94	65.00	150	Vertical	Pass
4632.921	50.96	--	40.0	0.06	74.0	--	54.0	14.00	254.00	150	Vertical	Pass
5244.094	90.79	--	82.9	0.93	--	--	--	--	228.00	150	Vertical	Pass
6636.920	54.73	--	43.9	5.31	68.2	--	--	13.47	51.00	150	Vertical	Pass

1 GHz to 7 GHz, Band I 11a High channel ANT H

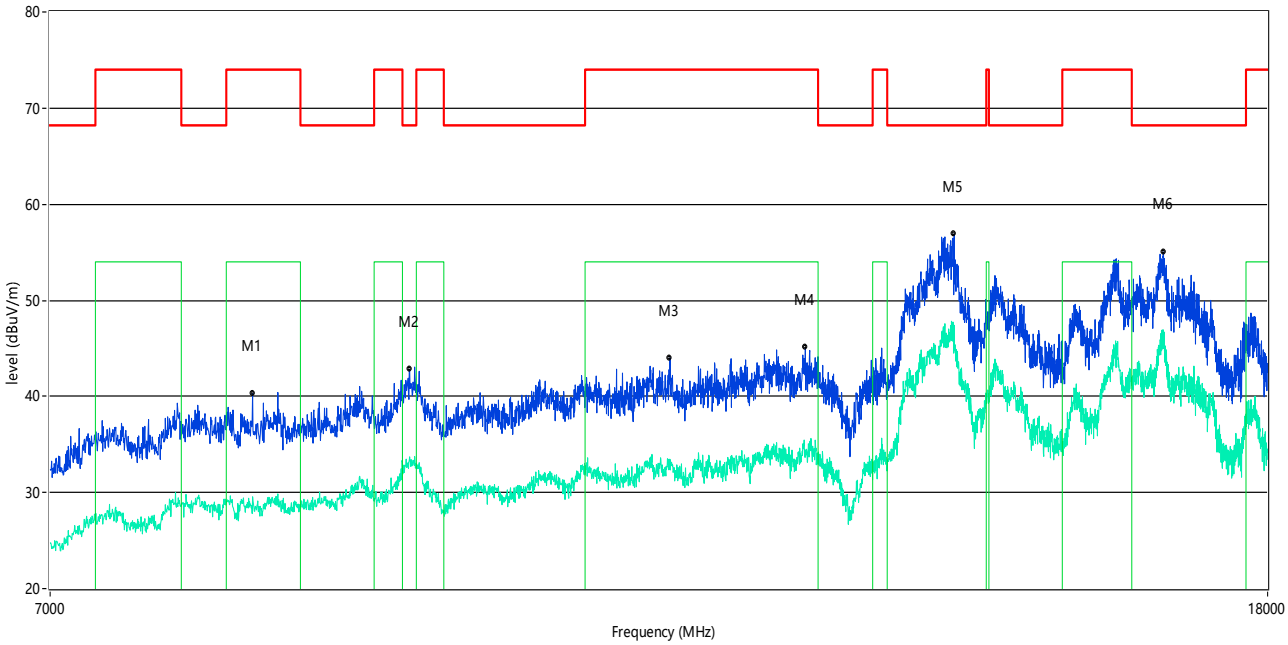
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1349.456	43.71	--	33.8	-12.24	74.0	--	54.0	20.20	186.00	150	Horizontal	Pass
1596.925	40.61	--	29.6	-12.36	74.0	--	54.0	24.40	105.00	150	Horizontal	Pass
1907.387	42.36	--	32.6	-8.93	68.2	--	--	25.84	5.00	150	Horizontal	Pass
2396.825	50.81	--	42.0	0.02	68.2	--	--	17.39	139.00	150	Horizontal	Pass
4771.279	51.11	--	40.6	-0.54	74.0	--	54.0	13.40	97.00	150	Horizontal	Pass
5238.470	94.69	--	85.4	0.60	--	--	--	--	52.00	150	Horizontal	Pass

7 GHz to 18 GHz, Band I 11a Low channel ANT V

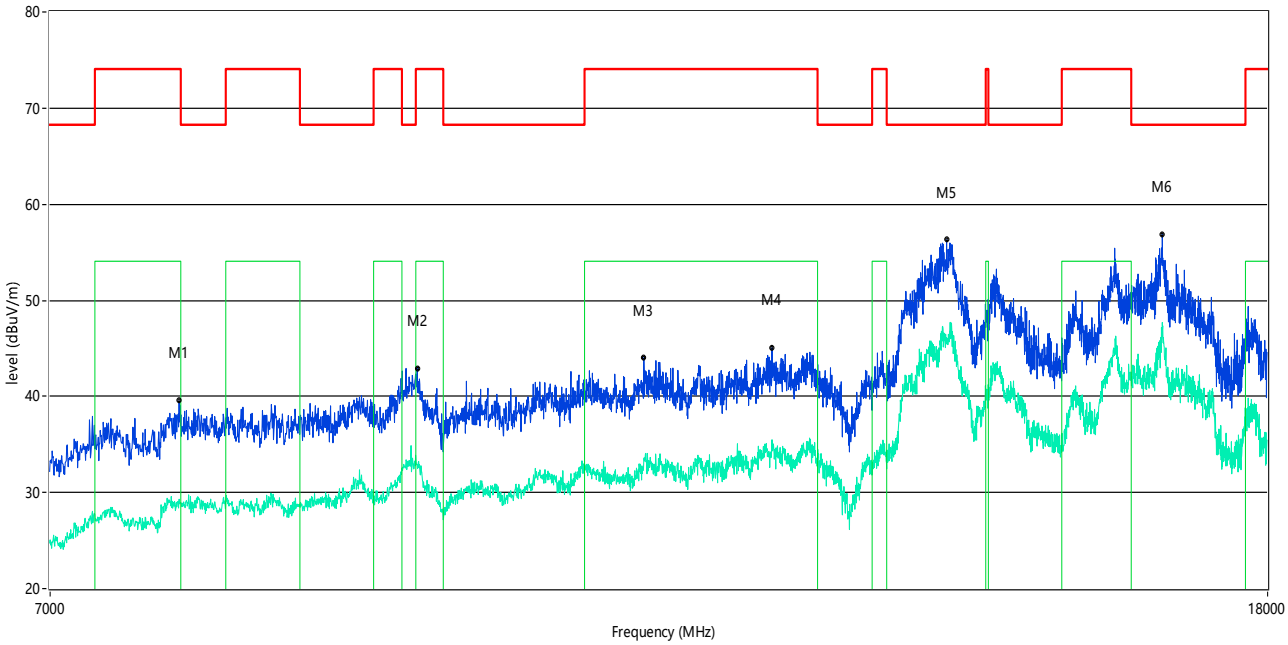
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
8190.452	40.33	--	29.6	-7.75	74.0	--	54.0	24.40	325.00	150	Vertical	Pass
9248.938	42.77	--	33.3	-4.42	68.2	--	--	25.43	290.00	150	Vertical	Pass
11321.920	44.01	--	33.4	-1.70	74.0	--	54.0	20.60	304.00	150	Vertical	Pass
12575.606	45.07	--	34.4	0.08	74.0	--	54.0	19.60	130.00	150	Vertical	Pass
14115.221	56.91	--	47.4	13.79	68.2	--	--	11.29	48.00	150	Vertical	Pass
16600.600	55.03	--	46.7	12.12	68.2	--	--	13.17	210.00	150	Vertical	Pass

7 GHz to 18 GHz, Band I 11a Low channel ANT H

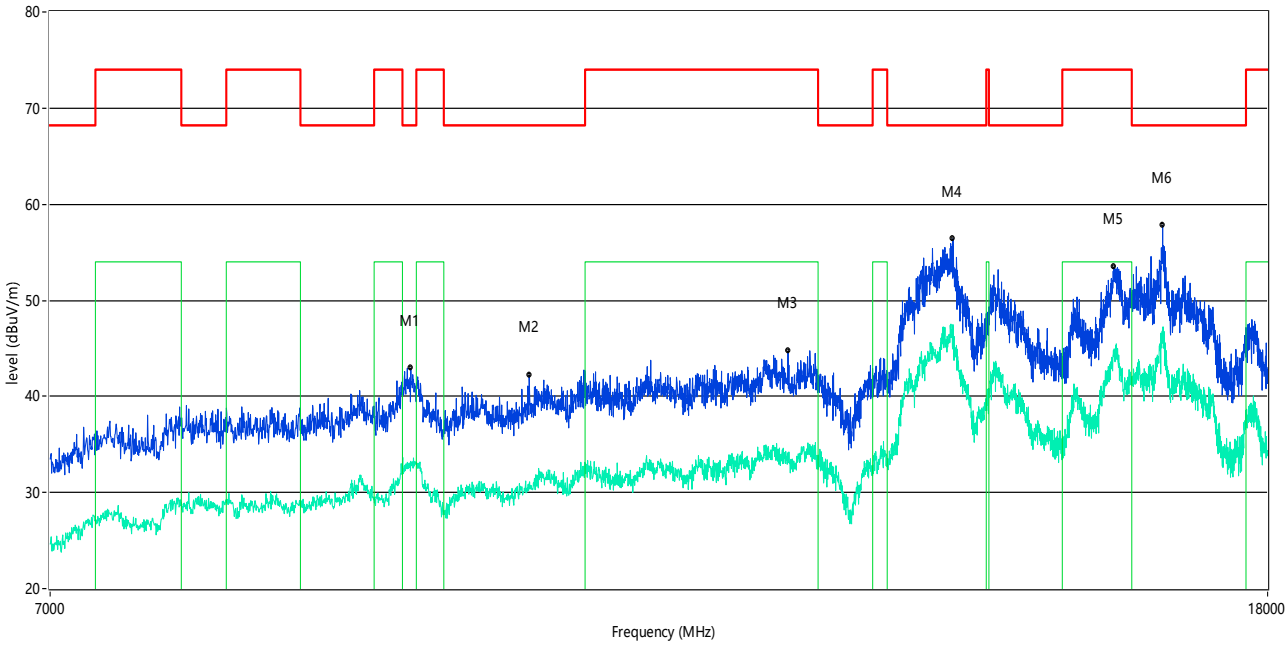
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
7739.565	39.48	--	29.2	-7.95	74.0	--	54.0	24.80	179.00	150	Horizontal	Pass
9309.423	42.88	--	32.9	-4.25	74.0	--	54.0	21.10	325.00	150	Horizontal	Pass
11099.225	43.96	--	33.4	-1.68	74.0	--	54.0	20.60	241.00	150	Horizontal	Pass
12259.435	45.00	--	35.4	-0.41	74.0	--	54.0	18.60	83.00	150	Horizontal	Pass
14038.240	56.23	--	46.1	14.28	68.2	--	--	11.97	280.00	150	Horizontal	Pass
16595.101	56.82	--	47.6	12.00	68.2	--	--	11.38	332.00	150	Horizontal	Pass

7 GHz to 18 GHz, Band I 11a Middle channel ANT V

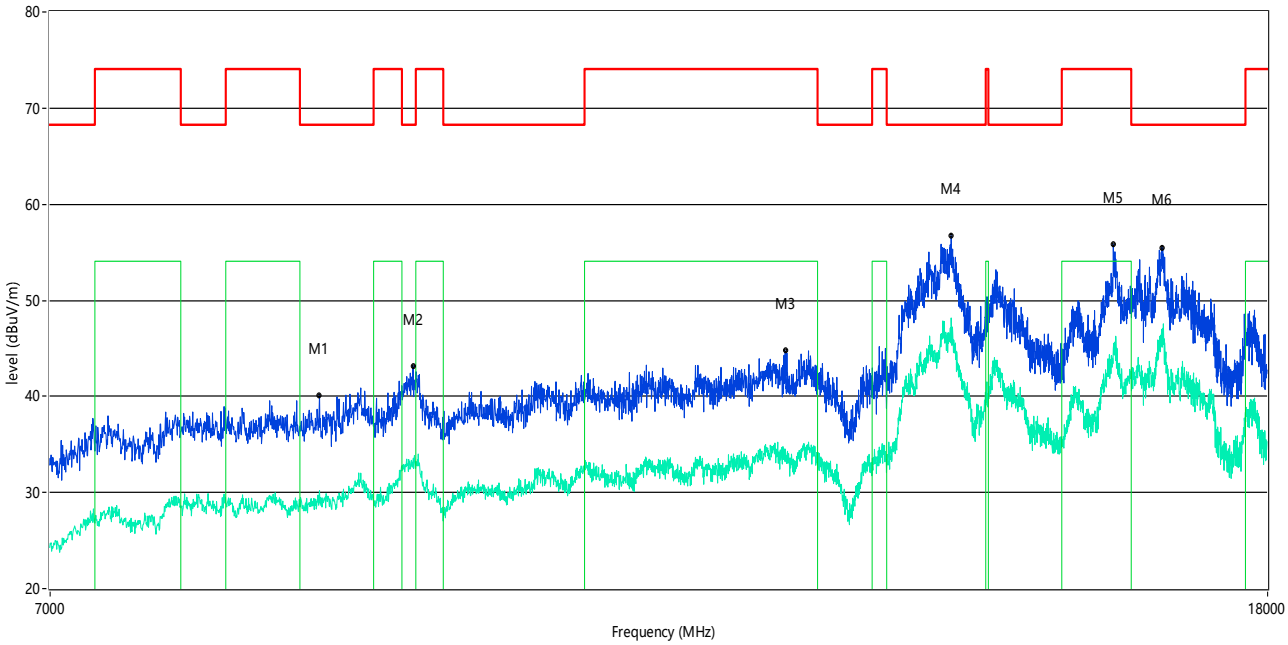
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
9259.935	42.93	--	33.2	-4.28	68.2	--	--	25.27	204.00	150	Vertical	Pass
10150.712	42.23	--	30.9	-3.52	68.2	--	--	25.97	137.00	150	Vertical	Pass
12407.898	44.70	--	33.7	-0.80	74.0	--	54.0	20.30	123.00	150	Vertical	Pass
14101.475	56.41	--	47.5	14.72	68.2	--	--	11.79	143.00	150	Vertical	Pass
15979.255	53.47	--	45.0	10.02	74.0	--	54.0	9.00	141.00	150	Vertical	Pass
16592.352	57.79	--	45.5	11.91	68.2	--	--	10.41	322.00	150	Vertical	Pass

7 GHz to 18 GHz, Band I 11a Middle channel ANT H

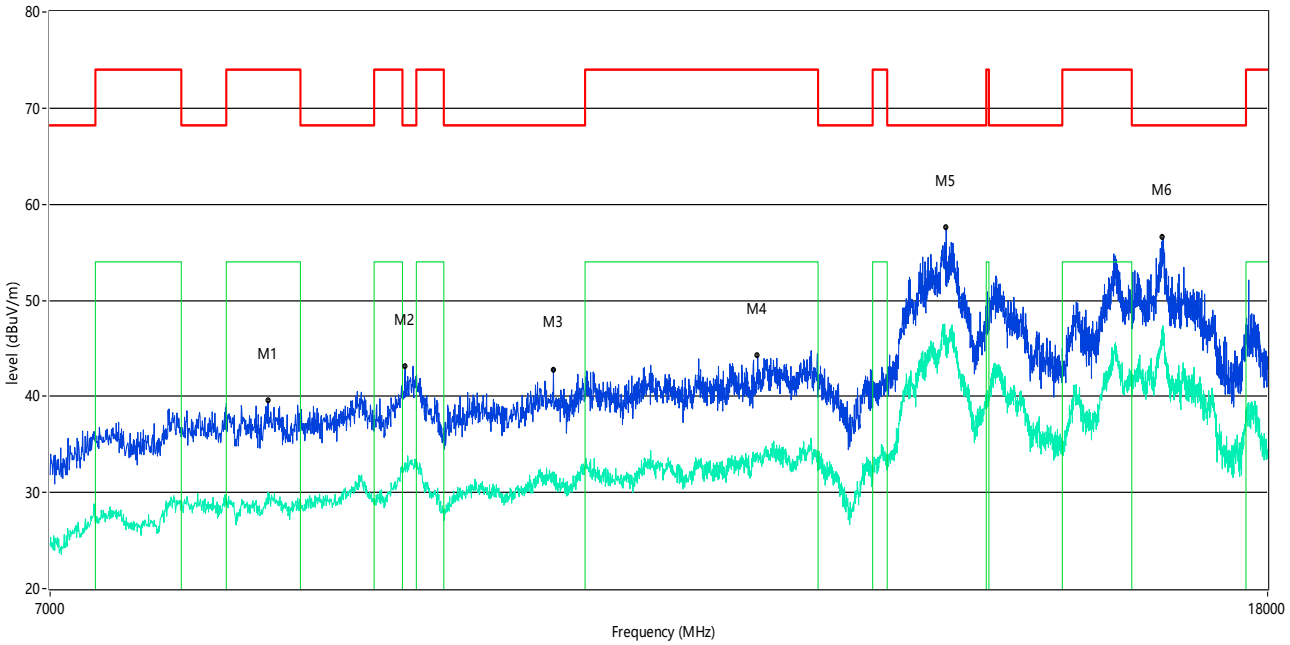
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
8630.342	40.08	--	30.1	-7.17	68.2	--	--	28.12	331.00	150	Horizontal	Pass
9279.180	43.14	--	33.1	-4.15	68.2	--	--	25.06	236.00	150	Horizontal	Pass
12385.904	44.68	--	34.5	-0.82	74.0	--	54.0	19.50	48.00	150	Horizontal	Pass
14087.728	56.66	--	48.1	14.85	68.2	--	--	11.54	242.00	150	Horizontal	Pass
15976.506	55.75	--	44.9	9.93	74.0	--	54.0	9.10	110.00	150	Horizontal	Pass
16589.603	55.43	--	46.9	11.84	68.2	--	--	12.77	276.00	150	Horizontal	Pass

7 GHz to 18 GHz, Band I 11a High channel ANT V

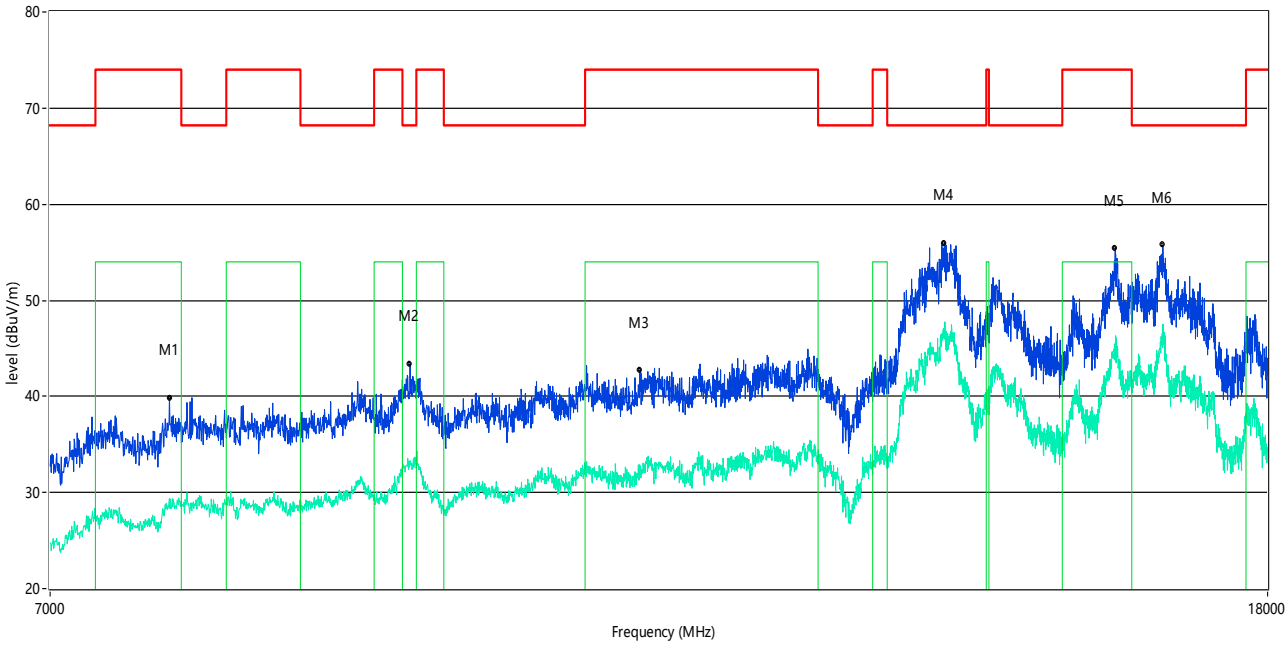
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
8289.428	39.49	--	30.0	-6.88	74.0	--	54.0	24.00	297.00	150	Vertical	Pass
9218.695	43.09	--	33.1	-4.68	68.2	--	--	25.11	297.00	150	Vertical	Pass
10343.164	42.76	--	31.8	-2.52	68.2	--	--	25.44	357.00	150	Vertical	Pass
12119.220	44.17	--	33.6	-1.00	74.0	--	54.0	20.40	228.00	150	Vertical	Pass
14027.243	57.49	--	46.4	14.27	68.2	--	--	10.71	298.00	150	Vertical	Pass
16597.851	56.47	--	47.4	12.09	68.2	--	--	11.73	252.00	150	Vertical	Pass

7 GHz to 18 GHz, Band I 11a High channel ANT H

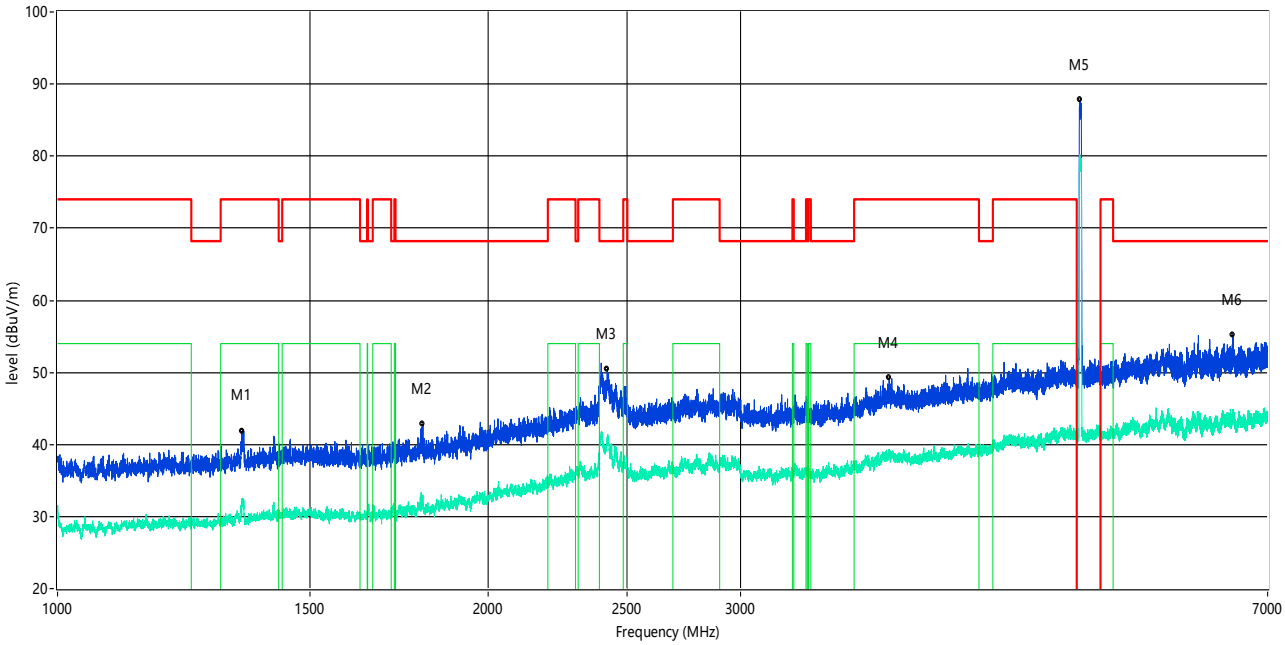
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_7GHz-18GHz_B1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
7679.080	39.84	--	29.4	-8.16	74.0	--	54.0	24.60	324.00	150	Horizontal	Pass
9254.436	43.39	--	33.3	-4.32	68.2	--	--	24.81	59.00	150	Horizontal	Pass
11060.735	42.74	--	32.9	-1.65	74.0	--	54.0	21.10	329.00	150	Horizontal	Pass
14007.998	55.92	--	46.3	14.26	68.2	--	--	12.28	153.00	150	Horizontal	Pass
15993.002	55.45	--	44.8	10.46	74.0	--	54.0	9.20	19.00	150	Horizontal	Pass
16595.101	55.71	--	46.9	12.00	68.2	--	--	12.49	152.00	150	Horizontal	Pass

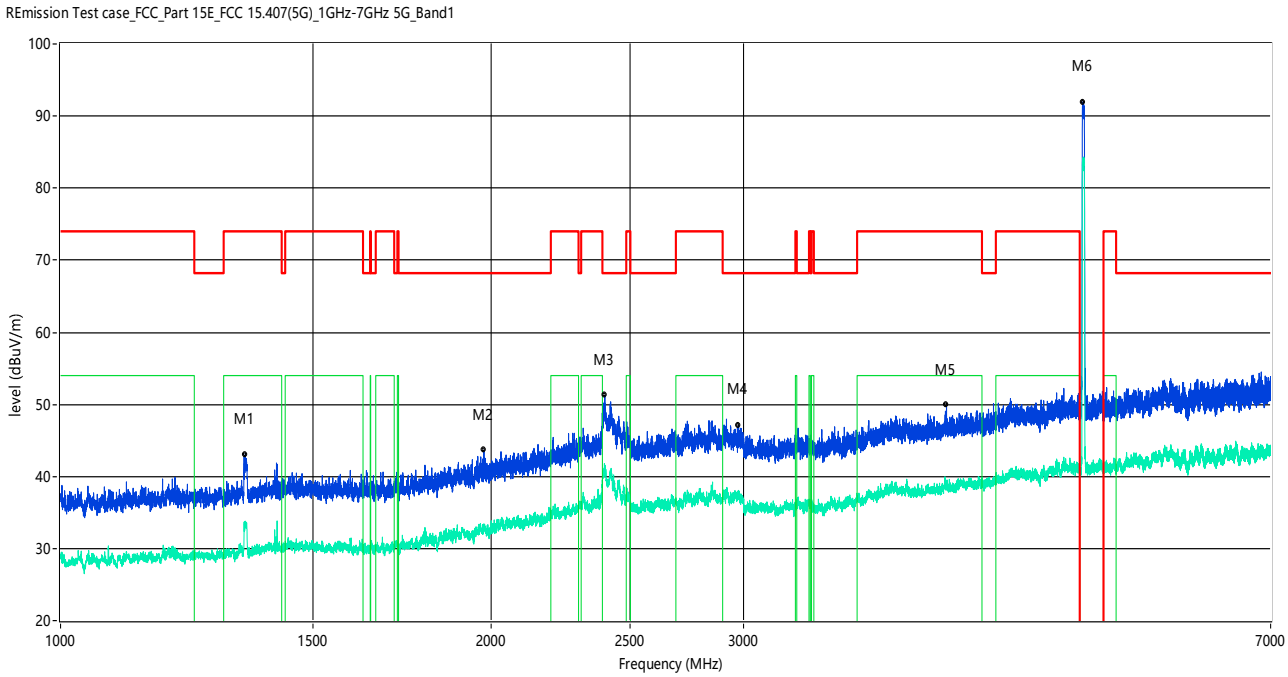
1 GHz to 7 GHz, Band I 11n20 Low channel ANT V

REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1345.207	41.81	--	32.5	-12.44	74.0	--	54.0	21.50	253.00	150	Vertical	Pass
1799.400	42.82	--	33.0	-10.76	68.2	--	--	25.38	285.00	150	Vertical	Pass
2420.322	50.41	--	41.1	-0.78	68.2	--	--	17.79	0.00	150	Vertical	Pass
3808.774	49.19	--	38.4	-2.61	74.0	--	54.0	15.60	333.00	150	Vertical	Pass
5176.228	87.74	--	79.6	0.42	--	--	--	--	3.00	150	Vertical	Pass
6620.047	55.20	--	44.4	5.42	68.2	--	--	13.00	192.00	150	Vertical	Pass

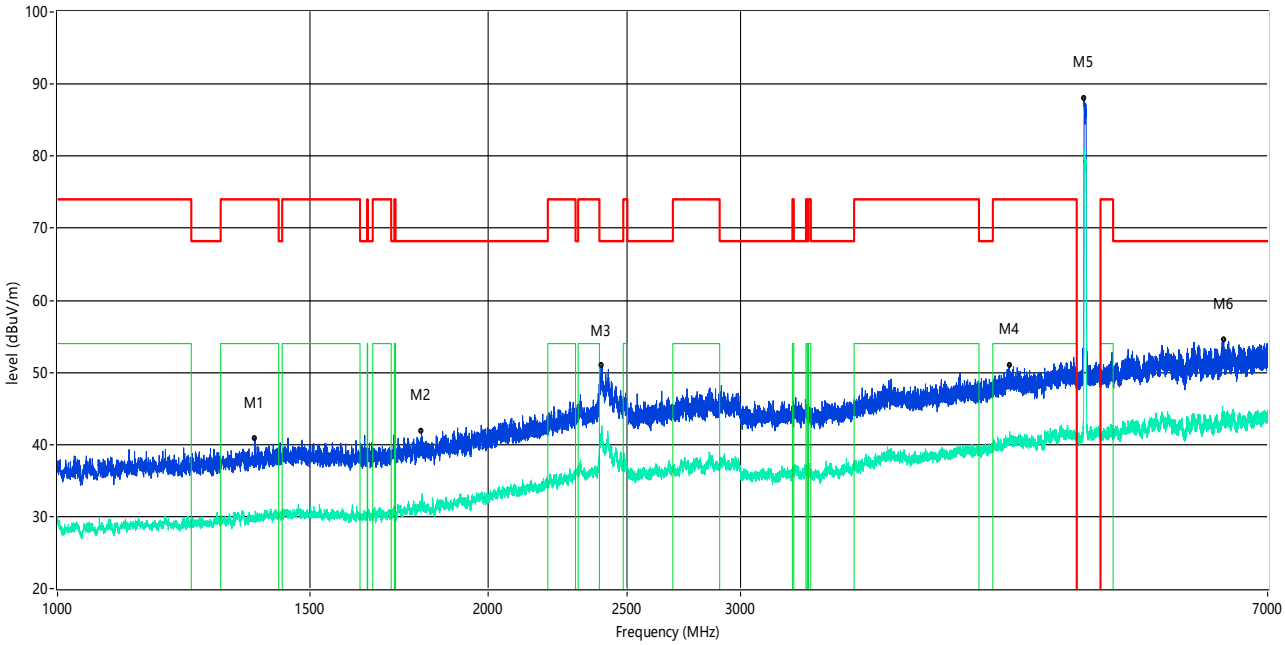
1 GHz to 7 GHz, Band I 11n20 Low channel ANT H



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1345.957	43.06	--	33.5	-12.38	74.0	--	54.0	20.50	118.00	150	Horizontal	Pass
1975.378	43.66	--	33.4	-8.80	68.2	--	--	24.54	211.00	150	Horizontal	Pass
2399.325	51.27	--	41.5	-0.07	68.2	--	--	16.93	254.00	150	Horizontal	Pass
2975.503	47.14	--	37.7	-3.07	68.2	--	--	21.06	56.00	150	Horizontal	Pass
4156.730	49.91	--	38.4	-2.12	74.0	--	54.0	15.60	239.00	150	Horizontal	Pass
5175.478	91.96	--	84.2	0.41	--	--	--	--	90.00	150	Horizontal	Pass

1 GHz to 7 GHz, Band I 11n20 Middle channel ANT V

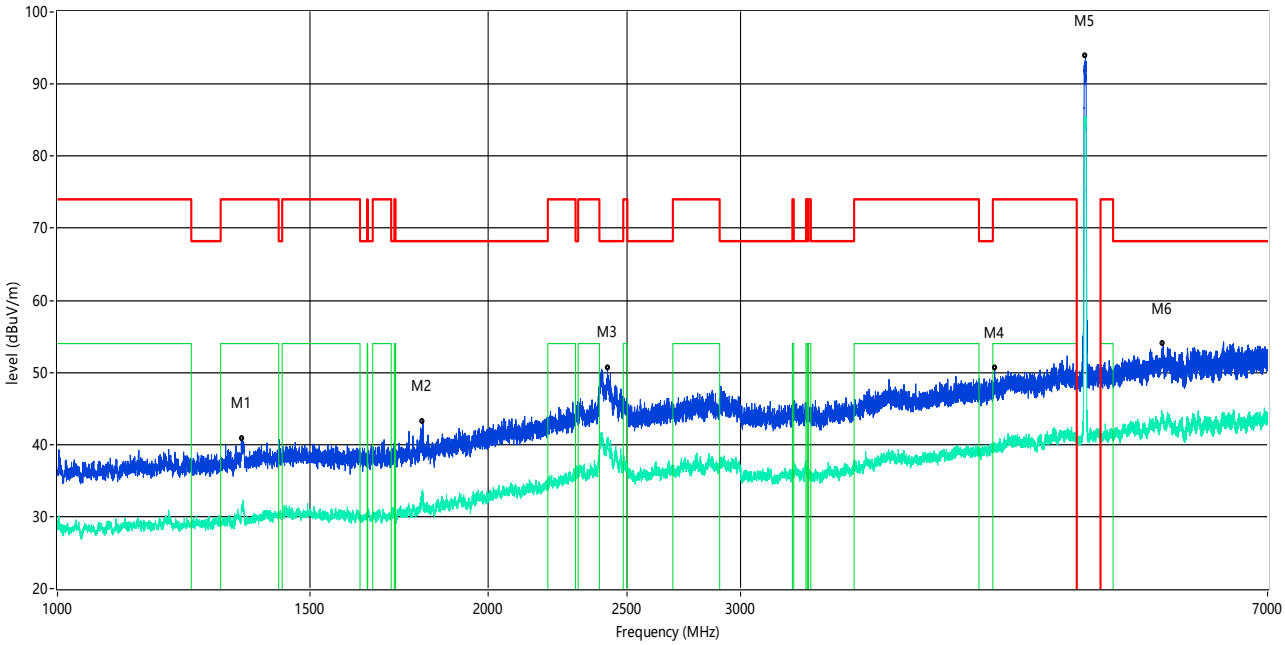
REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1373.453	40.88	--	30.0	-12.13	74.0	--	54.0	24.00	289.00	150	Vertical	Pass
1795.151	41.80	--	31.8	-10.96	68.2	--	--	26.40	174.00	150	Vertical	Pass
2400.575	50.88	--	41.3	-0.10	68.2	--	--	17.32	175.00	150	Vertical	Pass
4621.672	50.94	--	40.7	0.25	74.0	--	54.0	13.30	319.00	150	Vertical	Pass
5213.723	88.06	--	80.3	0.71	--	--	--	--	271.00	150	Vertical	Pass
6522.560	54.44	--	43.5	5.22	68.2	--	--	13.76	158.00	150	Vertical	Pass

1 GHz to 7 GHz, Band I 11n20 Middle channel ANT H

REmission Test case_FCC_Part 15E_FCC 15.407(5G)_1GHz-7GHz 5G_Band1



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1346.457	40.80	--	32.0	-12.34	74.0	--	54.0	22.00	352.00	150	Horizontal	Pass
1799.400	43.23	--	33.2	-10.76	68.2	--	--	24.97	3.00	150	Horizontal	Pass
2421.322	50.54	--	40.3	-0.81	68.2	--	--	17.66	228.00	150	Horizontal	Pass
4512.561	50.55	--	40.3	-1.20	74.0	--	54.0	13.70	359.00	150	Horizontal	Pass
5223.472	93.84	--	85.2	0.64	--	--	--	--	33.00	150	Horizontal	Pass
5917.135	53.97	--	43.4	3.55	68.2	--	--	14.23	106.00	150	Horizontal	Pass