



CFR 47 FCC PART 15 SUBPART E

CERTIFICATION TEST REPORT

For

WLAN+Bluetooth Module

MODEL NUMBER: LBEE5PK2BC

PROJECT NUMBER: 4790016144.1

REPORT NUMBER: 4790016144.1-BC-4

FCC ID: VPYLB2BC

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Prepared for

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	08/02/2022	Initial Issue	

1. Introduction

LBEE5PK2BC and LBEE5PK2AE have identical PCB layout, antenna, SW implementation for Bluetooth and Wi-Fi. Based on their similarity, the FCC Part 15C (equipment class: DTS), Part 15E (equipment class: NII) test data issued data of VPYLB2AE references the text data of existing report.

The applicant takes full responsibility that the test data referenced below represents compliance for this FCC ID.

2. Differences

LBEE5PK2BC and LBEE5PK2AE have identical PCB layout, antenna, SW implementation for Bluetooth and Wi-Fi. The two models are identical except for the operation temperature declared by the client.

3. Spot Check Verification Data Section

The two models are identical except for the operation temperature declared by the client, according to general guidance of KDB 484596 D01 (please refer to clause 1). a) b) c)), we used all the original test data to apply the new FCC ID for VPYLB2BC (IC: 772C-LB2BC), but added the conducted output power, conducted spurious emission spot check and radiated spurious emission worst case test in this report to demonstrate that the referenced test data remains valid for the new device.

4. Reference Section

The Murata Manufacturing Co., Ltd. takes full responsibility that the test data as referenced table 1 below represents compliance for FCC ID: LBEE5PK2BC.

[Table 1]

Data type	FCC Rule Parts	Operating Frequency range (MHz)	Technology	Test Report No.
Reference data	15C	2402 - 2480	Bluetooth	4790016144.1-AE-1
	15C	2402 - 2480	Bluetooth LE	4790016144.1-AE-2
	15C	2412 - 2472	WLAN 802.11b/g/n	4790016144.1-AE-3
	15E	5180-5825	WLAN 802.11a/n/ac	4790016144.1-EA-4



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Murata Manufacturing Co., Ltd.
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Manufacturer Information

Company Name: Murata Manufacturing Co., Ltd.
Address: 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan

EUT Description

Product Name: WLAN+Bluetooth Module
Model Name: LBEE5PK2BC
Sample Number: 4059724
Data of Receipt Sample: Jul. 12, 2021
Date Tested: Jul. 23, 2021 ~ Jul. 06, 2022

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART E	PASS



Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	Conducted Output Power Spot Check	FCC 15.407 (a)	PASS
2	Radiated Bandedge and Spurious Emission Spot Check	FCC 15.407 (b) FCC 15.209 FCC 15.205	PASS
3	Conducted Emission Test for AC Power Port	FCC 15.207	PASS
4	Frequency Stability	FCC 15.407 (g)	PASS
5	Antenna Requirement	FCC 15.203	PASS
Note: 1) The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15 E> when <Accuracy Method> 2) It is a slave device without radar detection.			

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, CFR 47 FCC Part 2, CFR 47 FCC Part 15, KDB 789033 D02 v02r01, RSS-GEN Issue 5, RSS-247 Issue 2, KDB414788 D01 Radiated Test Site v01r01, KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02, KDB 905462 D03 UNII clients without radar detection New Rules v01r02, KDB 905462 D04 Operational Modes for DFS Testing New Rules v01 and KDB 905462 D06 802 11 Channel Plans New Rules v02.

3. FACILITIES AND ACCREDITATIO

Test Location	UL-CCIC Company Limited, EMC&RF Lab
Address	No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China
Accreditation Certificate	A2LA (Certificate No.: 4829.01) UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1247) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 25056 CAB No.: CN0073) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.

Remark 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of China

Remark 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS based on KDB 414788.

Remark 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	3.1dB
Uncertainty for Radiation Emission test (include Fundamental emission) (9kHz-30MHz)	3.4dB
Uncertainty for Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	3.4dB
Uncertainty for Radiation Emission test (1GHz to 40GHz) (include Fundamental emission)	3.9dB (1GHz-18Gz)
	4.2dB (18GHz-26.5Gz)
	4.6dB (26.5GHz-40Gz)
Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Product Name:	WLAN+Bluetooth Module
Model No.:	LBEE5PK2BC
Operating Frequency:	IEEE 802.11a/n/ac 20MHz: 5180MHz to 5240MHz, 5260MHz to 5320MHz, 5500MHz to 5720MHz (ISED not include 5600MHz to 5640MHz), 5745MHz to 5825MHz IEEE 802.11n/ac 40MHz: 5190MHz to 5230MHz, 5270MHz to 5310MHz, 5510MHz to 5710MHz (ISED not include 5590MHz to 5630MHz), 5755MHz-5795MHz IEEE 802.11ac 80MHz: 5210MHz, 5290MHz, 5530MHz to 5690MHz (ISED not include 5610MHz), 5775MHz
	This report just including 5G WIFI part.
Type of Modulation:	IEEE for 802.11a: BPSK, QPSK, 16QAM, 64QAM IEEE for 802.11 n HT20/HT40: BPSK, QPSK, 16QAM, 64QAM IEEE for 802.11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM
Channels Step:	Channels with 5MHz step
Rated Input	DC 3.3V
Test software of EUT:	SecureCRT (manufacturer declare)
Antenna Type:	Type 1: PCB Antenna Type 2: External Dipole Antenna
Antenna Gain:	Type 1: 3.0 dBi for 2.4G band; 3.3 dBi for 5G band Type 2: 3.4 dBi for 2.4G band; 4.75 dBi for 5G band
	Note: 1. The product has only one transmission chain and two antenna types are provided. 2. This data is provided by customer and our lab isn't responsible for this data.



5.2. MAXIMUM OUTPUT POWER

UNII-1 BAND

IEEE Std. 802.11	Frequency (MHz)	Maximum Average Conducted Power [dBm]	Max Average EIRP [dBm]
a	5150 ~ 5250	16.85	21.60
ac VHT20		16.00	20.75
ac VHT40		14.31	19.06
ac VHT80		11.12	15.87

UNII-2A BAND

IEEE Std. 802.11	Frequency (MHz)	Maximum Average Conducted Power
		[dBm]
a	5250 ~ 5350	18.13
ac VHT20		17.21
ac VHT40		15.69
ac VHT80		12.47

UNII-2C BAND

IEEE Std. 802.11	Frequency (MHz)	Max Power
		[dBm]
a	5470 ~ 5725	17.85
ac VHT20		16.95
ac VHT40		15.37
ac VHT80		12.39

UNII-3 BAND

IEEE Std. 802.11	Frequency (MHz)	Max Power
		[dBm]
a	5725 ~ 5850	17.58
ac VHT20		16.65
ac VHT40		14.89
ac VHT80		12.02



5.3. CHANNEL LIST

UNII-1 (For Bandwidth = 20 MHz)		UNII-1 (For Bandwidth = 40 MHz)		UNII-1 (For Bandwidth = 80 MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

UNII-2A (For Bandwidth = 20 MHz)		UNII-2A (For Bandwidth = 40 MHz)		UNII-2A (For Bandwidth = 80 MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

UNII-2C (For Bandwidth = 20 MHz)		UNII-2C (For Bandwidth = 40 MHz)		UNII-2C (For Bandwidth = 80 MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	138	5690
112	5560	126	5630		
116	5580	134	5670		
120	5600	142	5710		
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				
144	5720				

UNII-3 (For Bandwidth = 20 MHz)		UNII-3 (For Bandwidth = 40 MHz)		UNII-3 (For Bandwidth = 80 MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				



5.4. TEST CHANNEL CONFIGURATION

UNII-1 Test Channel Configuration		
IEEE Std.	Test Channel Number	Frequency
802.11a	CH 36, CH 40, CH44, CH 48	5180 MHz, 5200 MHz, 5220MHz, 5240 MHz
802.11n HT20	CH 36, CH 40, CH44, CH 48	5180 MHz, 5200 MHz, 5220MHz, 5240 MHz
802.11n HT40	CH 38, CH 46	5190 MHz, 5230 MHz
802.11ac VHT20	CH 36, CH 40, CH44, CH 48	5180 MHz, 5200 MHz, 5220MHz, 5240 MHz
802.11ac VHT40	CH 38, CH 46	5190 MHz, 5230 MHz
802.11ac VHT80	CH 42	5210 MHz

UNII-2A Test Channel Configuration		
IEEE Std.	Test Channel Number	Frequency
802.11a	CH 52, CH 56, CH60, CH 64	5260 MHz, 5280 MHz, 5300 MHz, 5320 MHz
802.11n HT20	CH 52, CH 56, CH60, CH 64	5260 MHz, 5280 MHz, 5300 MHz, 5320 MHz
802.11n HT40	CH 54, CH 62	5270 MHz, 5310 MHz
802.11ac VHT20	CH 52, CH 56, CH60, CH 64	5260 MHz, 5280 MHz, 5300 MHz, 5320 MHz
802.11ac VHT40	CH 54, CH 62	5270 MHz, 5310 MHz
802.11ac VHT80	CH 58	5290 MHz

UNII-2C Test Channel Configuration		
IEEE Std.	Test Channel Number	Frequency
802.11a	CH 100, CH 104, CH120, CH 136, CH 140, CH 144	5500 MHz, 5520 MHz, 5600 MHz, 5680 MHz, 5700 MHz, 5720 MHz
802.11n HT20	CH 100, CH 104, CH120, CH 136, CH 140, CH 144	5500 MHz, 5520 MHz, 5600 MHz, 5680 MHz, 5700 MHz, 5720 MHz
802.11n HT40	CH 102, CH 110, CH 118, CH 126, CH 134, CH 142	5510 MHz, 5550 MHz, 5590 MHz, 5630 MHz, 5670 MHz, 5710 MHz
802.11ac VHT20	CH 100, CH 104, CH120, CH 136, CH 140, CH 144	5500 MHz, 5520 MHz, 5600 MHz, 5680 MHz, 5700 MHz, 5720 MHz
802.11ac VHT40	CH 102, CH 110, CH 118, CH 126, CH 134, CH 142	5510 MHz, 5550 MHz, 5590 MHz, 5630 MHz, 5670 MHz, 5710 MHz
802.11ac VHT80	CH 106, CH 122, CH 138	5530 MHz, 5610 MHz, 5690 MHz

UNII-3 Test Channel Configuration		
IEEE Std.	Test Channel Number	Frequency
802.11a	CH 149, CH 157, CH165	5745 MHz, 5785 MHz, 5825 MHz
802.11n HT20	CH 149, CH 157, CH165	5745 MHz, 5785 MHz, 5825 MHz
802.11n HT40	CH 151, CH 159	5755 MHz, 5795 MHz
802.11ac VHT20	CH 149, CH 157, CH165	5745 MHz, 5785 MHz, 5825 MHz
802.11ac VHT40	CH 151, CH 159	5755 MHz, 5795 MHz
802.11ac VHT80	CH 155	5775 MHz



5.5. POWER GRADE

UNII-1

IEEE Std. 802.11	Channel	Power Grade
a	36	14
	40	17
	44	17
	48	17
n HT20	36	14
	40	16
	44	16
	48	16
n HT40	38	10
	46	14
ac VHT20	36	14
	40	16
	44	16
	48	16
ac VHT40	38	10
	46	14
ac VHT80	42	11

UNII-2A

IEEE Std. 802.11	Channel	Power Grade
a	52	17
	56	17
	60	17
	64	14
n HT20	52	16
	56	16
	60	16
	64	14
n HT40	54	14
	62	10
ac VHT20	52	16
	56	16
	60	16
	64	14
ac VHT40	54	14
	62	10
ac VHT80	58	11



UNII-2C

IEEE Std. 802.11	Channel	Power Grade
a	100	13
	104	17
	108	17
	112	17
	116	17
	120	17
	124	17
	128	17
	132	17
	136	17
	140	13
	144	17
n HT20	100	12
	104	16
	108	16
	112	16
	116	16
	120	16
	124	16
	128	16
	132	16
	136	16
	140	12
	144	16
n HT40	102	10
	110	14
	118	14
	126	14
	134	10
	142	14
ac VHT20	100	12
	104	16
	108	16
	112	16
	116	16
	120	16
	124	16
	128	16
	132	16
	136	16
	140	12
	144	16
ac VHT40	102	10
	110	14
	118	14
	126	14
	134	10
	142	14
ac VHT80	106	11
	122	11
	138	11



UNII-3

IEEE Std. 802.11	Channel	Power Grade
a	149	17
	153	17
	157	17
	161	17
	165	17
ac VHT20	149	16
	153	16
	157	16
	161	16
	165	16
ac VHT40	151	14
	159	14
ac VHT80	155	11



5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency Band	Antenna Type	Maximum Antenna Gain
			(dBi)
1	UNII-1	PCB Antenna	3.3
		External Dipole Antenna	4.75
1	UNII-2A	PCB Antenna	3.3
		External Dipole Antenna	4.75
1	UNII-2C	PCB Antenna	3.3
		External Dipole Antenna	4.75
1	UNII-3	PCB Antenna	3.3
		External Dipole Antenna	4.75

IEEE Std. 802.11	Transmit and Receive Mode	Description
a20	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
n HT20	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
n HT40	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
ac VHT20	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
ac VHT40	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
ac VHT80	☒ 1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
Note: 2.4 GHz WLAN& 5 GHz WLAN can't transmit simultaneously. (Declared by customer.)		



5.7. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter	
Test Software	Secure CRT

UNII-1

IEEE Std. 802.11	Rate	Channel	Test Software Setting Value
a	54M	36	14
		40	17
		44	17
		48	17
n HT20	MCS8	36	14
		40	16
		44	16
		48	16
n HT40	MCS9	38	10
		46	14
ac VHT20	MCS8	36	14
		40	16
		44	16
		48	16
ac VHT40	MCS9	38	10
		46	14
ac VHT80	MCS9	42	11

UNII-2A

IEEE Std. 802.11	Rate	Channel	Test Software Setting Value
a	54M	52	17
		56	17
		60	17
		64	14
n HT20	MCS8	52	16
		56	16
		60	16
		64	14
n HT40	MCS9	54	14
		62	10
ac VHT20	MCS8	52	16
		56	16
		60	16
		64	14
ac VHT40	MCS9	54	14
		62	10
ac VHT80	MCS9	58	11



UNII-2C

IEEE Std. 802.11	Rate	Channel	Test Software Setting Value
a	54M	100	13
		104	17
		120	17
		136	17
		140	13
		144	17
n HT20	MCS8	100	12
		104	16
		120	16
		136	16
		140	12
		144	16
n HT40	MCS9	102	10
		110	14
		118	14
		126	14
		134	10
		142	14
ac VHT20	MCS8	100	12
		104	16
		120	16
		136	16
		140	12
		144	16
ac VHT40	MCS9	102	10
		110	14
		118	14
		126	14
		134	10
		142	14
ac VHT80	MCS9	106	11
		122	11
		138	11



UNII-3

IEEE Std. 802.11	Rate	Channel	Test Software Setting Value
a	54M	149	17
		157	17
		165	17
n HT20	MCS8	149	16
		157	16
		165	16
n HT40	MCS9	151	14
		159	14
ac VHT20	MCS8	149	16
		157	16
		165	16
ac VHT40	MCS9	151	14
		159	14
ac VHT80	MCS9	155	11

Remark: Since 802.11ac VHT20/VHT40 modes are different from 802.11n HT20/HT40 only in control messages, so all the tests are performed on the worst case (802.11ac VHT20/802.11ac VHT40) mode between these 4 modes and only the worst data was recorded in this report.



5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E590	/
2	Brix	GIGABYTE	/	/
3	DC Power Supply	Tektronix	PWS2326	INPUT: AC 230V OUTPUT: 0-32V, 6A

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	RJ45	RJ45	LAN	100cm Length	/

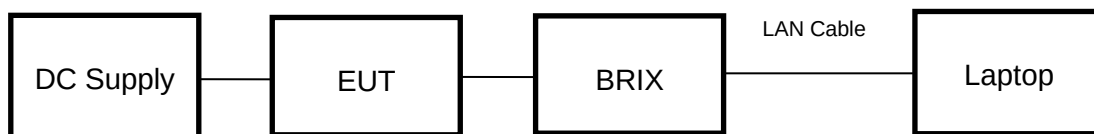
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	/	/	/	/

TEST SETUP

The EUT can work in an engineer mode with a software through a PC.

SETUP DIAGRAM FOR TESTS





5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☒	EMI Test Receiver	R&S	ESR3	126700	2020-12-05	2021-12-04	2022-12-03
☒	Two-Line V-Network	R&S	ENV216	126701	2020-12-05	2021-12-04	2022-12-03
☒	Artificial Mains Networks	R&S	ENY81	126711	2020-10-13	2021-10-12	2022-10-11
Software							
Used	Description		Manufacturer		Name	Version	
☒	Test Software for Conducted disturbance		R&S		EMC32	Ver. 9.25	
Radiated Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☒	Spectrum Analyzer	Keysight	N9010B	155727	2021-05-09	2022-04-09	2023-04-08
☒	EMI test receiver	R&S	ESR26	126703	2020-12-05	2021-12-04	2022-12-03
☒	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1513	155456	2018-06-15	2021-06-03	2024-06-02
☒	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB1	177821	2019-01-19	2022-01-18	2025-01-17
☒	Receiver Antenna (1GHz-18GHz)	R&S	HF907	126705	2019-01-27	2022-02-28	2025-02-27
☒	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170	126706	2019-02-29	2022-02-28	2025-02-27
☒	Receiver Antenna (26.5GHz-40GHz)	TOYO	HAP 26-40W	155567	2020-07-22	2021-07-29	2022-07-28
☒	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G18-50	178825	2021-03-26	2022-03-01	2023-02-28
☒	Pre-amplification (To 26.5GHz)	R&S	SCU-26D	135391	2020-12-05	2021-12-04	2022-12-03
☒	Band Reject Filter	Wainwright	WRCJV12-5120-5150-5350-5380-40SS	3	2021-05-09	2022-05-08	2023-05-07
☒	Highpass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	6	2021-05-09	2022-05-08	2023-05-07
Software							
Used	Description		Manufacturer		Name		Version
☒	Test Software for Radiated disturbance		Tonscend		TS+		Ver. 2.5
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☒	Spectrum Analyzer	Keysight	N9010B	155368	2021-05-09	2022-04-09	2023-04-08
☒	Power Meter	Keysight	U2021XA	155370	2021-05-09	2022-04-09	2023-04-08



6. ANTENNA PORT TEST RESULTS

6.1. MAXIMUM CONDUCTED AVERAGE OUTPUT POWER

LIMITS

CFR 47 FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	☐ Outdoor Access Point: 1 W (30 dBm) ☐ Indoor Access Point: 1 W (30 dBm) ☐ Fixed Point-To-Point Access Points: 1 W (30 dBm) ☒ Client Devices: 250 mW (24 dBm)	5150 ~ 5250
	Shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.	5250 ~ 5350 5470 ~ 5725
	Shall not exceed 1 Watt (30 dBm).	5725 ~ 5850

Remark:

The above limits are based upon the maximum antenna gain does not exceed 6 dBi.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



TEST PROCEDURE

Refer to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 section II.E.

Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep):

- (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (ii) Set RBW = 1 MHz.
- (iii) Set VBW $\geq$ 3 MHz.
- (iv) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.
- (vi) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
- (vii) If transmit duty cycle $< 98\%$, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
- (viii) Trace average at least 100 traces in power averaging (rms) mode.
- (ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

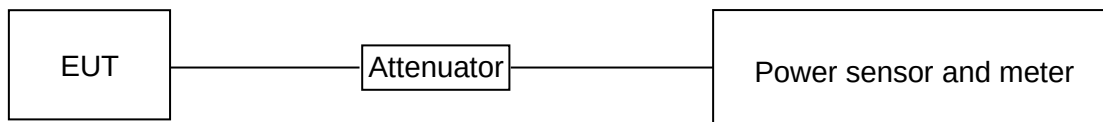
Method PM (Measurement using an RF average power meter):

- (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
 - a. The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
 - b. At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 - c. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- (ii) If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in II.B.
- (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (iv) Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g., $10 \log (1/0.25)$ if the duty cycle is 25 %).

Straddle channel power was measured using spectrum analyzer.



TEST SETUP



TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	65%
Atmospheric Pressure:	101kPa
Temperature	21.5°C
Test Voltage	DC 3.3V
Test Date	05/05/2022

TEST RESULT TABLE

Mode	Frequency (MHz)	Average Conducted Output Power (dBm)		Delta (dBm)
		Original Model	Spot Check Model	
802.11a	5180	14.51	14.44	-0.07
	5200	16.71	16.63	-0.08
	5220	16.93	16.74	-0.19
	5240	16.96	16.85	-0.11
	5260	17.73	17.65	-0.08
	5280	17.89	17.76	-0.13
	5300	18.21	18.13	-0.08
	5320	15.62	15.50	-0.12
	5500	14.16	14.09	-0.07
	5520	17.72	17.63	-0.09
	5600	17.80	17.73	-0.07
	5680	17.94	17.85	-0.09
	5700	14.25	14.12	-0.13
	5720_UNII-2C	16.40	16.32	-0.08
	5720_UNII-3	9.76	9.65	-0.11
	5745	17.15	17.03	-0.12
	5785	17.65	17.58	-0.07
	5825	17.38	17.27	-0.11



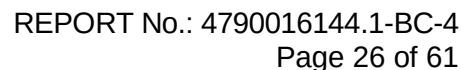
Mode	Frequency (MHz)	Average Conducted Output Power (dBm)		Delta (dBm)
		Original Model	Spot Check Model	
802.11 ac VHT20	5180	14.49	14.36	-0.13
	5200	15.82	15.65	-0.17
	5220	16.04	15.91	-0.13
	5240	16.11	16.00	-0.11
	5260	16.95	16.77	-0.18
	5280	17.06	16.89	-0.17
	5300	17.35	17.21	-0.14
	5320	15.56	15.42	-0.14
	5500	13.36	13.18	-0.18
	5520	16.92	16.75	-0.17
	5600	17.01	16.95	-0.06
	5680	17.07	16.93	-0.14
	5700	13.44	13.28	-0.16
	5720_UNII-2C	15.60	15.48	-0.12
	5720_UNII-3	9.10	8.96	-0.14
	5745	16.38	16.21	-0.17
	5785	16.80	16.65	-0.15
	5825	16.42	16.29	-0.13



Mode	Frequency (MHz)	Average Conducted Output Power (dBm)		Delta (dBm)
		Original Model	Spot Check Model	
802.11 ac VHT40	5190	10.55	10.43	-0.12
	5230	14.44	14.31	-0.13
	5270	15.83	15.69	-0.14
	5310	11.88	11.70	-0.18
	5510	11.42	11.29	-0.13
	5550	15.38	15.21	-0.17
	5590	15.52	15.37	-0.15
	5630	15.38	15.25	-0.13
	5670	11.98	11.82	-0.16
	5710_UNII-2C	15.07	14.92	-0.15
	5710_UNII-3	3.40	3.26	-0.14
	5755	15.01	14.88	-0.13
	5795	15.06	14.89	-0.17

Mode	Frequency (MHz)	Average Conducted Output Power (dBm)		Delta (dBm)
		Original Model	Spot Check Model	
802.11 ac VHT80	5210	11.18	11.12	-0.06
	5290	12.60	12.47	-0.13
	5530	12.13	12.00	-0.13
	5610	12.54	12.39	-0.15
	5690_UNII-2C	12.28	12.11	-0.17
	5690_UNII-3	-2.79	-2.82	-0.03
	5775	12.14	12.02	-0.12

Note: The test results have already included the duty cycle correction factor. About correction Factor please refer to section 6.2.



For Straddle channel:

Test Mode	Test Channel	Verdict
11A	5720_UNII-3	PASS

The screenshot displays the Keysight Spectrum Analyzer 1 Channel Power interface. The main plot shows a signal spectrum with a yellow trace. The plot is titled "1 Graph" and "Scale/Div 10.0 dB". The x-axis is labeled "Ref Lvl Offset 12.16 dB" and "Ref Value 30.00 dBm". The y-axis is labeled "Log" and ranges from -60.0 to 20.0 dB. The plot shows a signal with a peak around 0 dB and a roll-off towards -60 dB.

Below the plot, the following parameters are displayed:

- Center: 5.731 GHz
- #Res BW: 1.0000 MHz
- #Video BW: 3.0000 MHz
- Span: 22.88 MHz
- #Sweep Time: 10.0 ms (1001 pts)

At the bottom, the "2 Metrics" section shows:

- Total Channel Power: 9.65 dBm / 11.4 MHz
- Total Power Spectral Density: -60.92 dBm/MHz

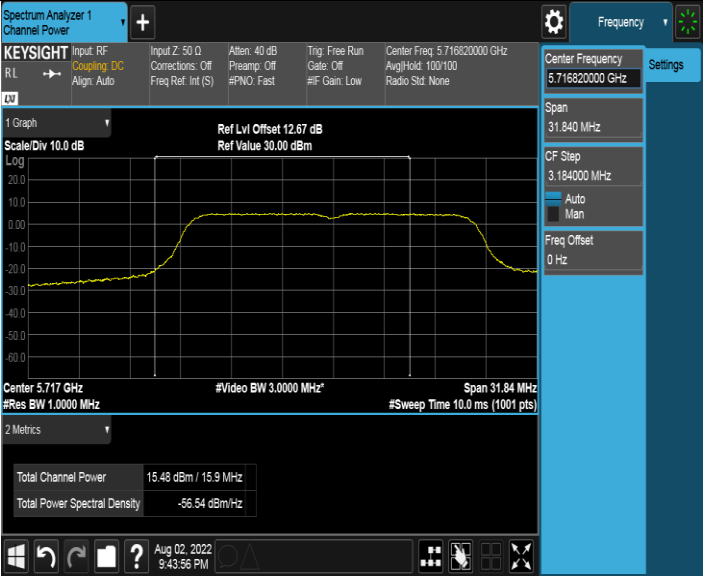
The right sidebar contains the "Frequency" settings, including:

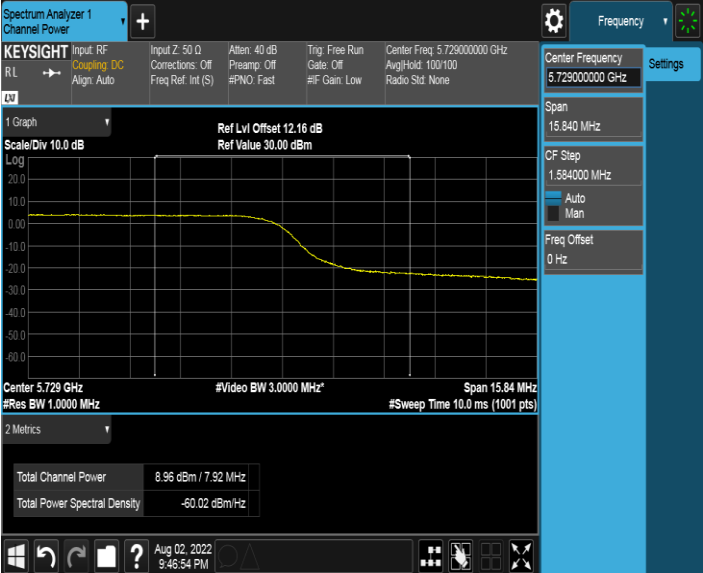
- Center Frequency: 5.731000000 GHz
- Span: 22.880 MHz
- CF Step: 2.288000 MHz
- Auto Man (selected)
- Freq Offset: 0 Hz

The top status bar shows the following settings:

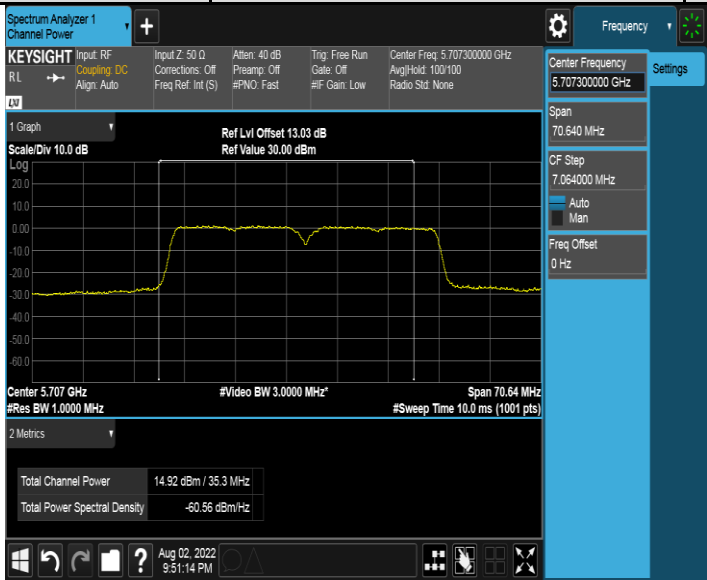
- Input RF: Coupling DC
- Input Z: 50 Ω
- Attenuation: 40 dB
- Trig: Free Run
- Center Freq: 5.731000000 GHz

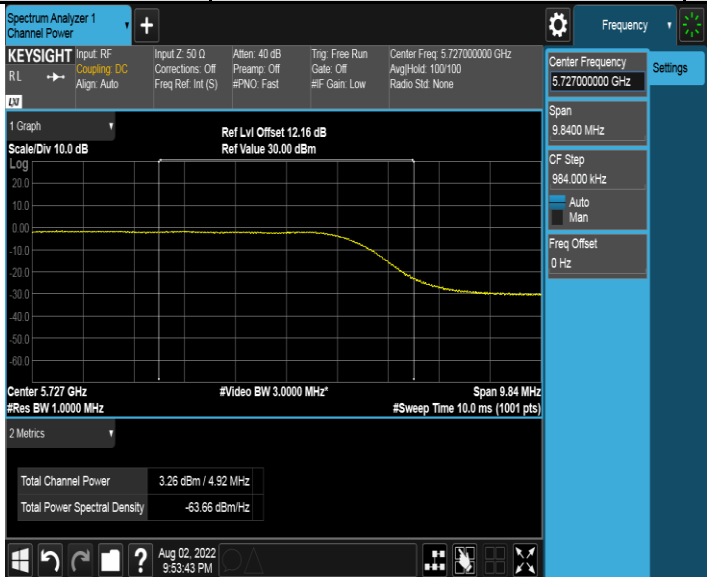


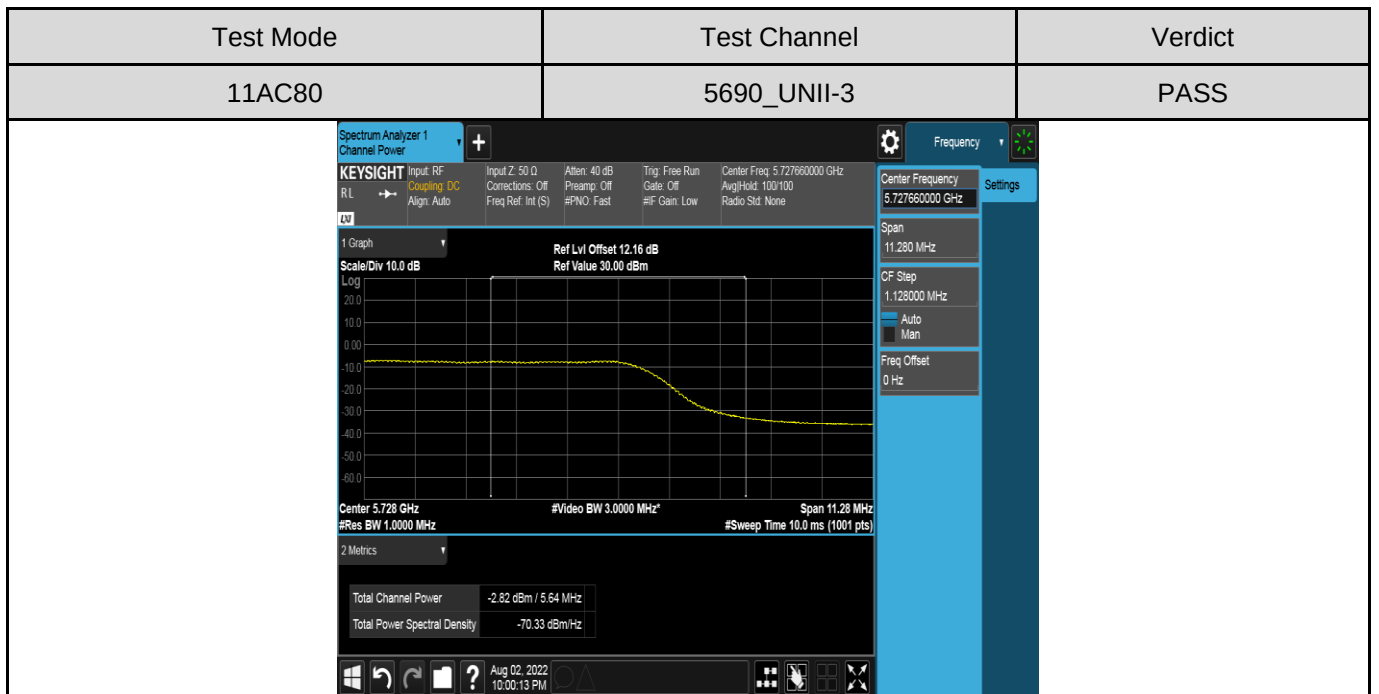
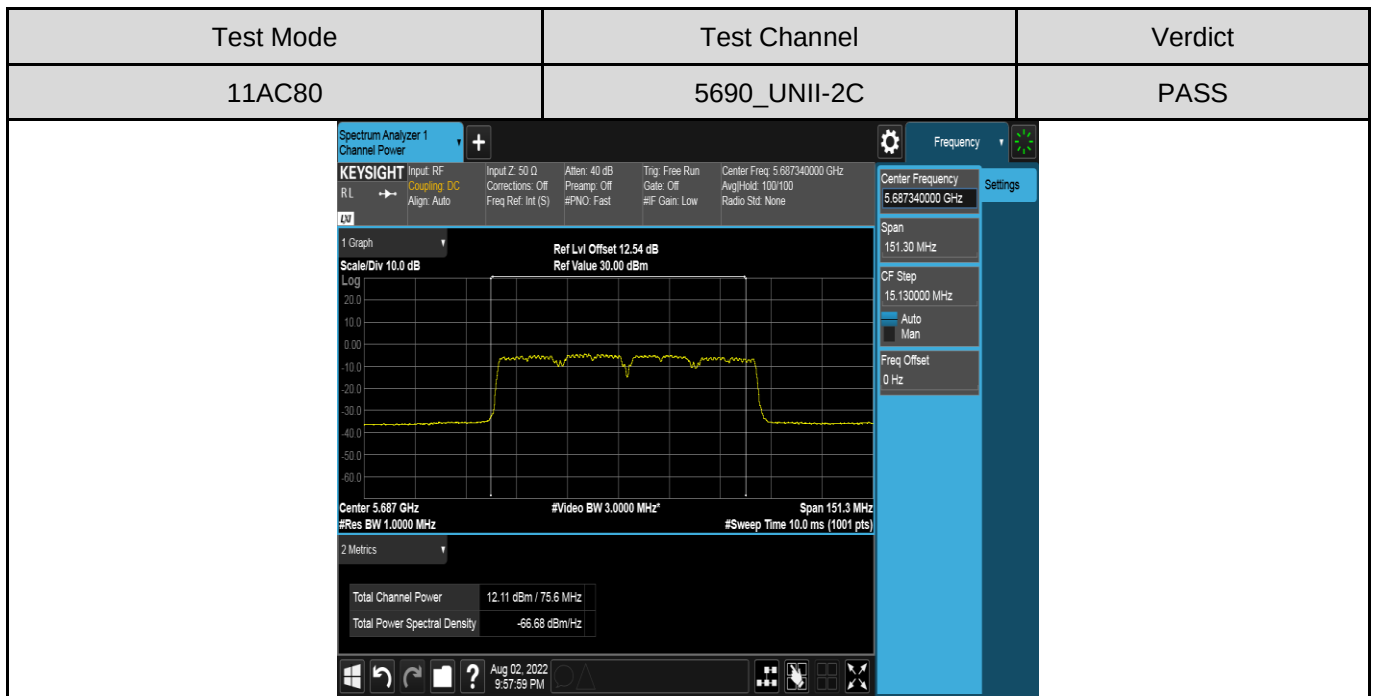
Test Mode	Test Channel	Verdict
11AC20	5720_UNII-2C	PASS
		

Test Mode	Test Channel	Verdict
11AC20	5720_UNII-3	PASS
		



Test Mode	Test Channel	Verdict
11AC40	5710_UNII-2C	PASS
		

Test Mode	Test Channel	Verdict
11AC40	5710_UNII-3	PASS
		





7. RADIATED TEST RESULTS

LIMITS

Refer to CFR 47 FCC §15.205, §15.209 and §15.407 (b).

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz ~ 1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30



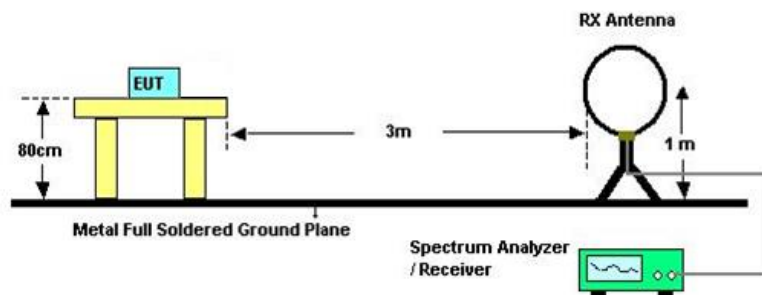
FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Remark: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30 MHz

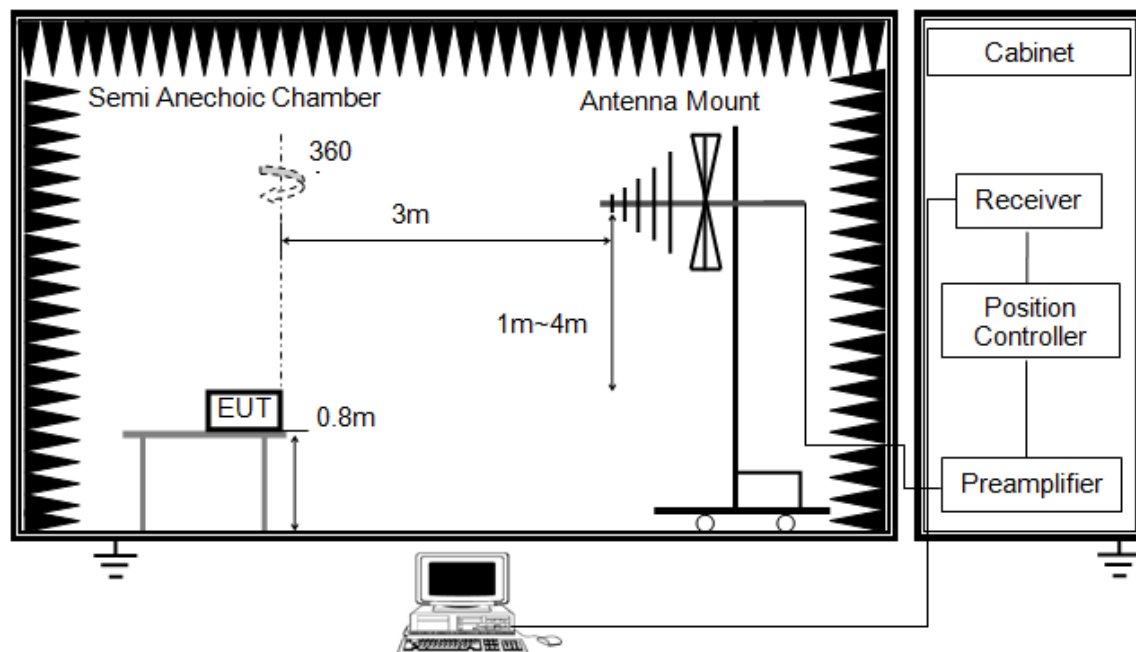


The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 and KDB 414788.
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ω . For example, the measurement frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

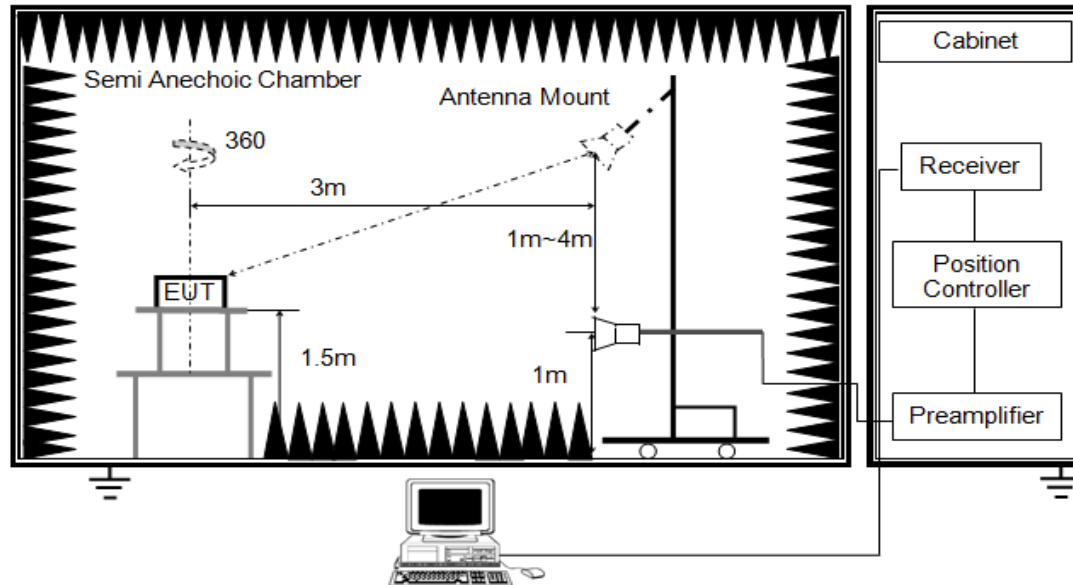


The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 11.11.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1G

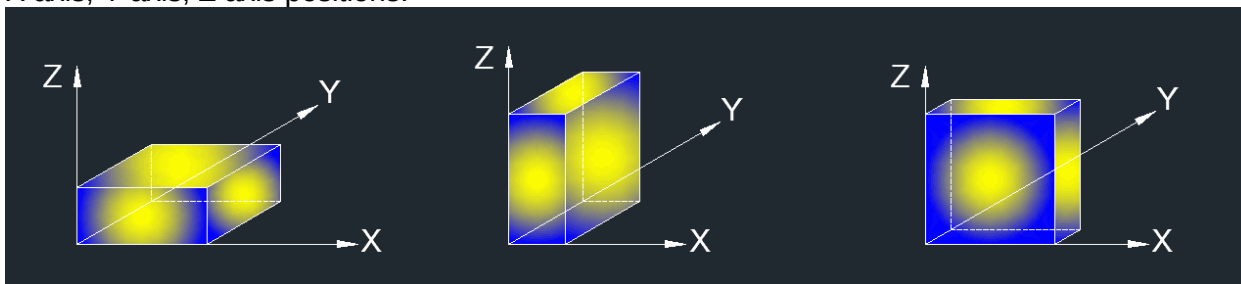


The setting of the spectrum analyzer

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see Remark 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the Antenna 1re set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector. For the Duty Cycle please refer to clause 6.2. ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Remark 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

7.1. WORST CASE VERIFICATION SUMMERY

Antenna Type	Test Item	Test Mode	Test Channel	Frequency	Worst Case Test Result		Delta
					Original Model	Spot CheckModel	
			MHz	MHz	dBuV/m	dBuV/m	dB
External Dipole Antenna	Restricted Bandedge	11AC80	5290	5362.5832	68.49	67.11	-1.38
	Spurious Emission	11A	5745	17135.4392	57.03	55.48	-1.55

Conclusion:

The worst case test result show that the new devices still comply with the standard and the new test result was close to the original test result, so it can demonstrate that the referenced test data remains valid for the new device.



7.2. RESTRICTED BANDEDGE

TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	60%
Atmospheric Pressure:	100.2kPa
Temperature	25°C
Test Voltage	DC 3.3V
Test Date	03/25/2022-04/26/2022

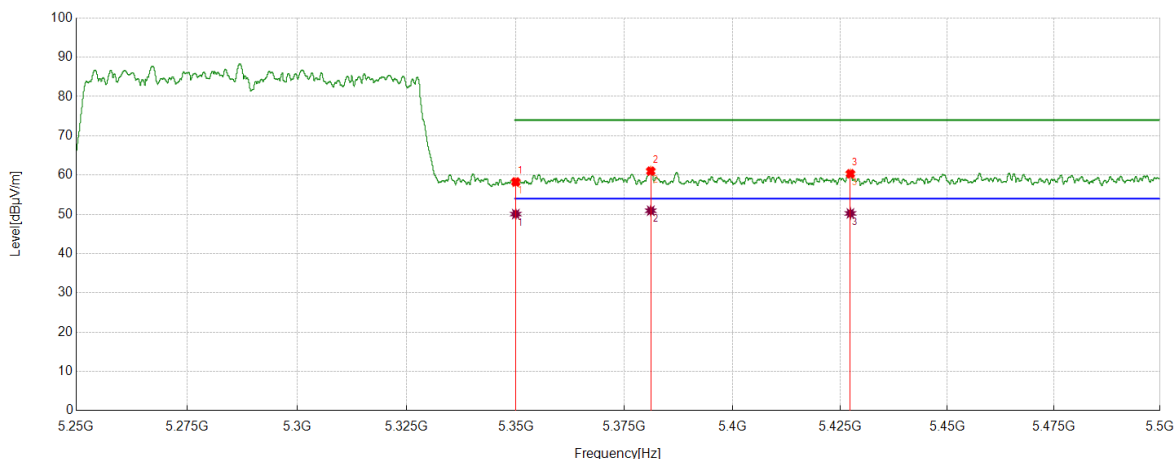
TEST RESULT TABLE

Antenna Type	Test Mode	Channel	Puw(dBm)	Verdict
External Dipole Antenna	11AC80	5290	<Limit	PASS



TEST GRAPHS

Test Mode	Channel	Polarization	Verdict
11AC80	5290	Horizontal	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	5350	37.41	20.70	58.11	74.00	-15.89	Horizontal
2	5381.0881	40.07	20.95	61.02	74.00	-12.98	Horizontal
3	5427.3927	39.39	20.92	60.31	74.00	-13.69	Horizontal

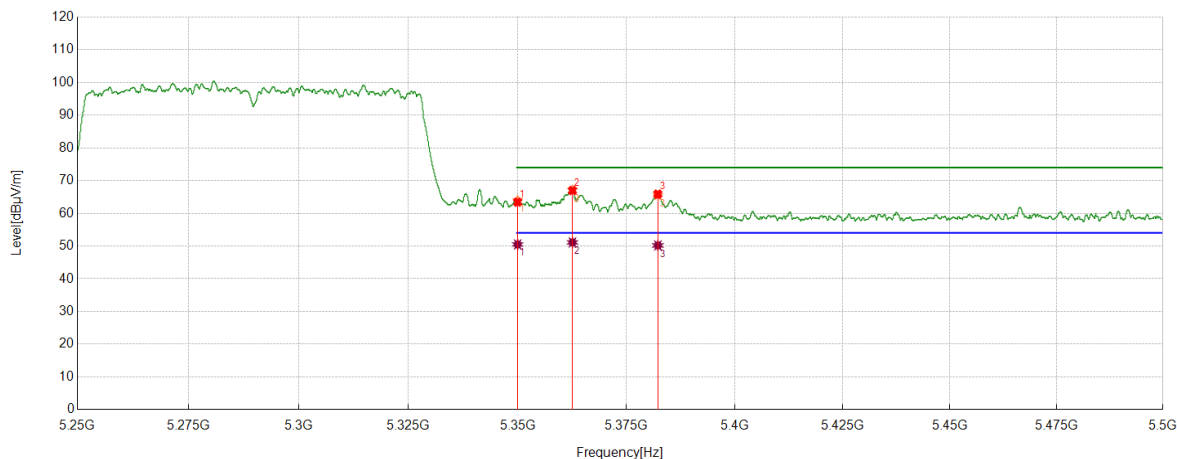
AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	5350	29.36	20.70	50.06	54.00	-3.94	Horizontal
2	5381.0881	29.97	20.95	50.92	54.00	-3.08	Horizontal
3	5427.3927	29.31	20.92	50.23	54.00	-3.77	Horizontal

- Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.
4. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



Test Mode	Channel	Polarization	Verdict
11AC80	5290	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	5350	43.27	20.70	63.97	74.00	-10.03	Vertical
2	5362.5832	46.31	20.80	67.11	74.00	-6.89	Vertical
3	5382.2437	44.52	20.97	65.49	74.00	-8.51	Vertical

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	5350	29.79	20.70	50.49	54.00	-3.51	Vertical
2	5362.5832	30.32	20.80	51.12	54.00	-2.88	Vertical
3	5382.2437	29.22	20.97	50.19	54.00	-3.81	Vertical

- Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.
4. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

7.3. HARMONICS AND SPURIOUS EMISSIONS

TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	60%
Atmospheric Pressure:	100.2kPa
Temperature	25°C
Test Voltage	DC 3.3V
Test Date	03/25/2022-04/26/2022

TEST RESULT TABLE

Note: The EUT was test with two type antennas, the radiation results of the EUT with external dipole antenna were worse case and recorded fully in this report.
For the PCB antenna, only the worst results of all channels of harmonics spurious emission were recorded in this report.

1) For 1GHz to 6.5GHz part:

Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS

2) For 6.5GHz to 18GHz part:

Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS

3) For 18GHz to 26.5GHz part:

Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS

4) For 26.5GHz to 40GHz part:

Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS

5) For 30MHz to 1GHz part:

Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS

6) For 9kHz~30MHz

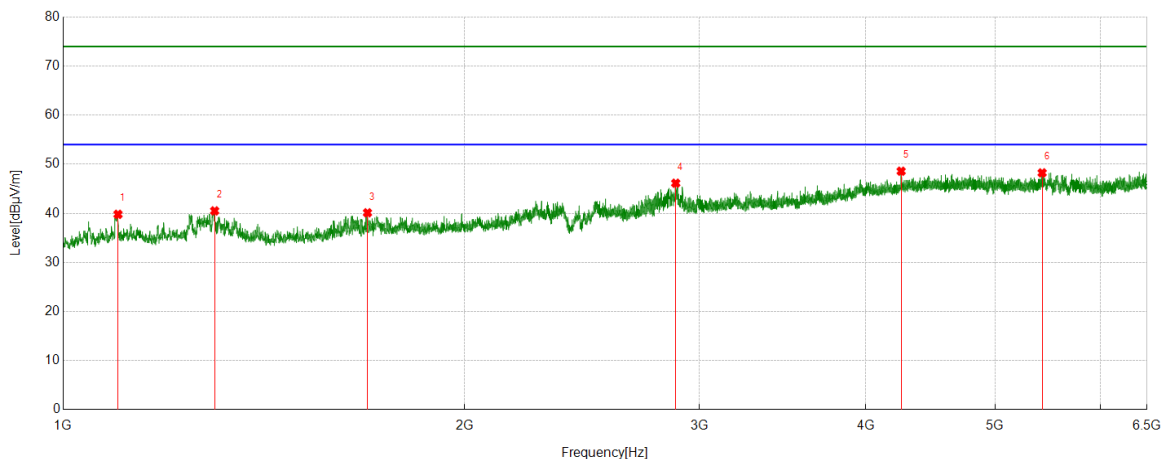
Test Mode	Channel	Puw(dBm)	Verdict
11A	5745	<Limit	PASS



TEST GRAPHS:

PART 1: For 1GHz to 6.5GHz:

Test Mode	Channel	Polarization	Verdict
11A	5745	Horizontal	PASS



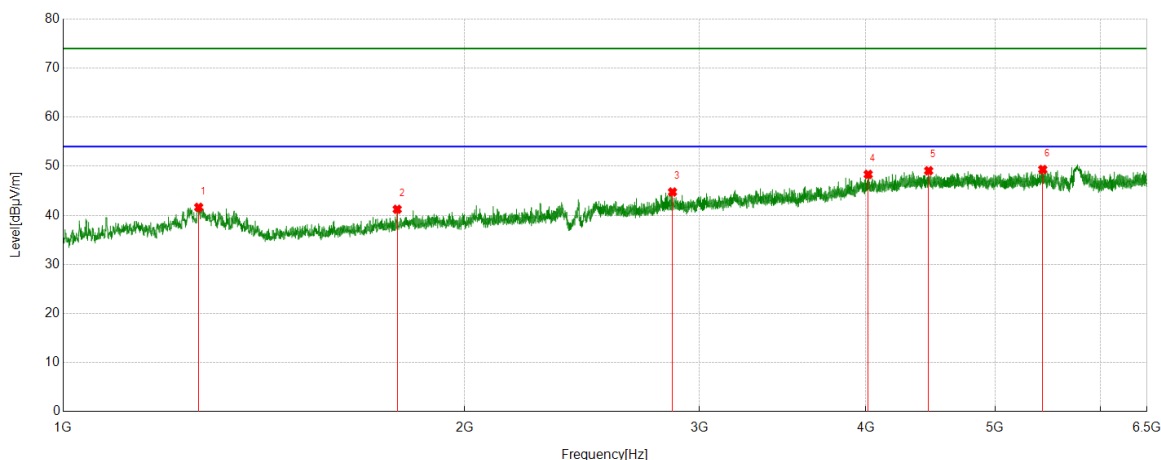
PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	1099.3499	45.38	-5.58	39.80	74.00	-34.20	Horizontal
2	1299.0498	46.33	-5.83	40.50	74.00	-33.50	Horizontal
3	1691.4486	44.87	-4.76	40.11	74.00	-33.89	Horizontal
4	2880.3134	45.84	0.30	46.14	74.00	-27.86	Horizontal
5	4251.1946	41.75	6.83	48.58	74.00	-25.42	Horizontal
6	5423.047	39.91	8.33	48.24	74.00	-25.76	Horizontal

- Remark: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Peak: Peak detector.
5. AVG: VBW refer to section 6.2.
6. For below 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for Band Reject Filter losses.
The proper operation of the transmitter prior to adding the filter to the measurement chain.
7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



Test Mode	Channel	Polarization	Verdict
11A	5745	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	1263.7106	47.23	-5.60	41.63	74.00	-32.37	Vertical
2	1780.4634	45.18	-3.95	41.23	74.00	-32.77	Vertical
3	2864.3107	44.62	0.13	44.75	74.00	-29.25	Vertical
4	4015.8907	42.20	6.14	48.34	74.00	-25.66	Vertical
5	4458.1065	41.78	7.30	49.08	74.00	-24.92	Vertical
6	5428.881	40.92	8.41	49.33	74.00	-24.67	Vertical

Remark: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Peak: Peak detector.

5. AVG: VBW refer to section 6.2.

6. For below 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for Band Reject Filter losses.

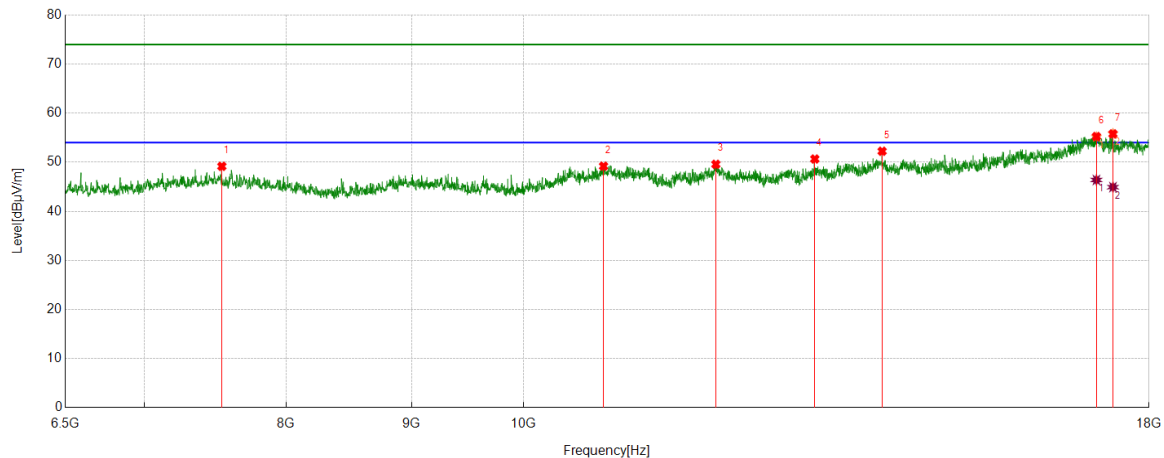
The proper operation of the transmitter prior to adding the filter to the measurement chain.

7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



PART 2: For 6.5GHz to 18GHz:

Test Mode	Channel	Polarization	Verdict
11A	5745	Horizontal	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	7531.3386	39.57	9.60	49.17	74.00	-24.83	Horizontal
2	10780.6301	36.67	12.53	49.20	74.00	-24.80	Horizontal
3	11980.6634	36.10	13.48	49.58	74.00	-24.42	Horizontal
4	13148.108	38.17	12.49	50.66	74.00	-23.34	Horizontal
5	14006.9178	37.09	15.15	52.24	74.00	-21.76	Horizontal
6	17131.6053	36.10	19.03	55.13	74.00	-18.87	Horizontal
7	17399.9833	36.53	19.29	55.82	74.00	-18.18	Horizontal

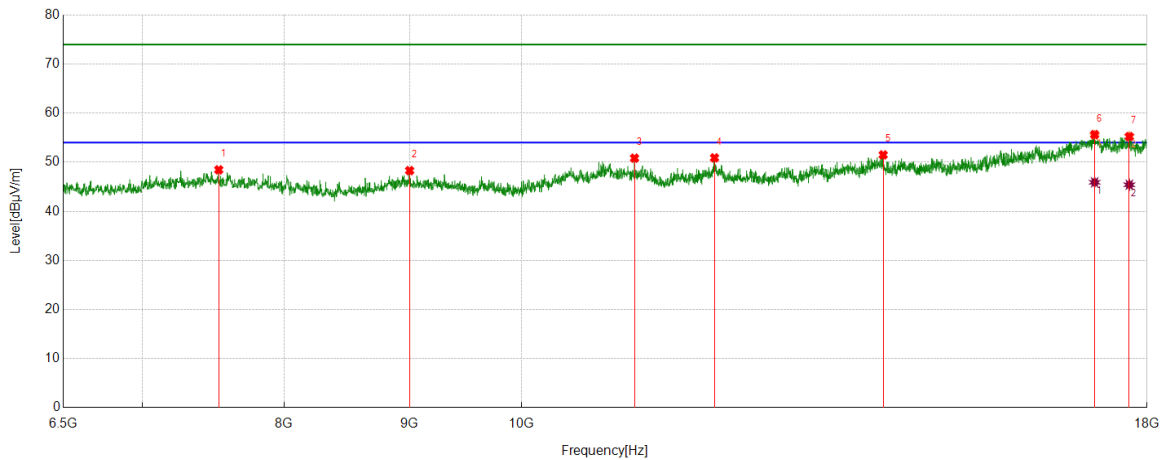
AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	17131.6053	27.36	19.03	46.39	54.00	-7.61	Horizontal
2	17399.9833	25.64	19.29	44.93	54.00	-9.07	Horizontal

- Remark: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Peak: Peak detector.
5. AVG: VBW refer to section 6.2.
6. For above 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for HPF losses. The proper operation of the transmitter prior to adding the filter to the measurement chain.
7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



Test Mode	Channel	Polarization	Verdict
11A	5745	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	7523.6706	39.02	9.44	48.46	74.00	-25.54	Vertical
2	9001.6669	38.58	9.72	48.30	74.00	-25.70	Vertical
3	11119.9367	38.28	12.55	50.83	74.00	-23.17	Vertical
4	11988.3314	37.32	13.58	50.90	74.00	-23.10	Vertical
5	14047.1745	36.72	14.78	51.50	74.00	-22.50	Vertical
6	17135.4392	36.35	19.13	55.48	74.00	-18.52	Vertical
7	17702.8671	36.6	18.68	55.28	74.00	-18.72	Vertical

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	17135.4392	26.78	19.13	45.91	54.00	-8.09	Vertical
2	17702.8671	26.73	18.68	45.41	54.00	-8.59	Vertical

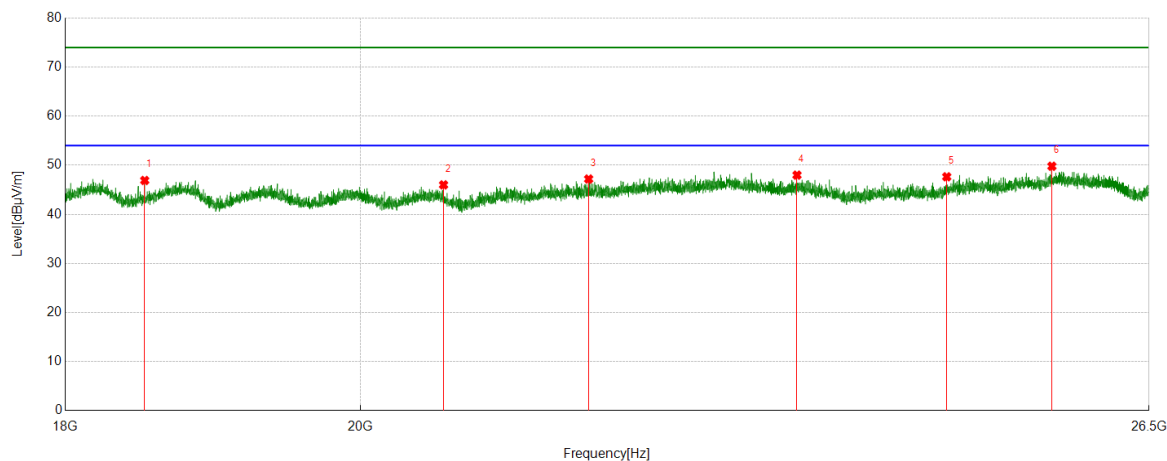
- Remark: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Peak: Peak detector.
5. AVG: VBW refer to section 6.2.
6. For above 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for HPF losses. The proper operation of the transmitter prior to adding the filter to the measurement chain.
7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



Part 3: 18GHz~26.5GHz

SPURIOUS EMISSIONS 18GHz TO 26.5GHz (WORST-CASE CONFIGURATION)

Test Mode	Channel	Polarization	Verdict
11A	5745	Horizontal	PASS



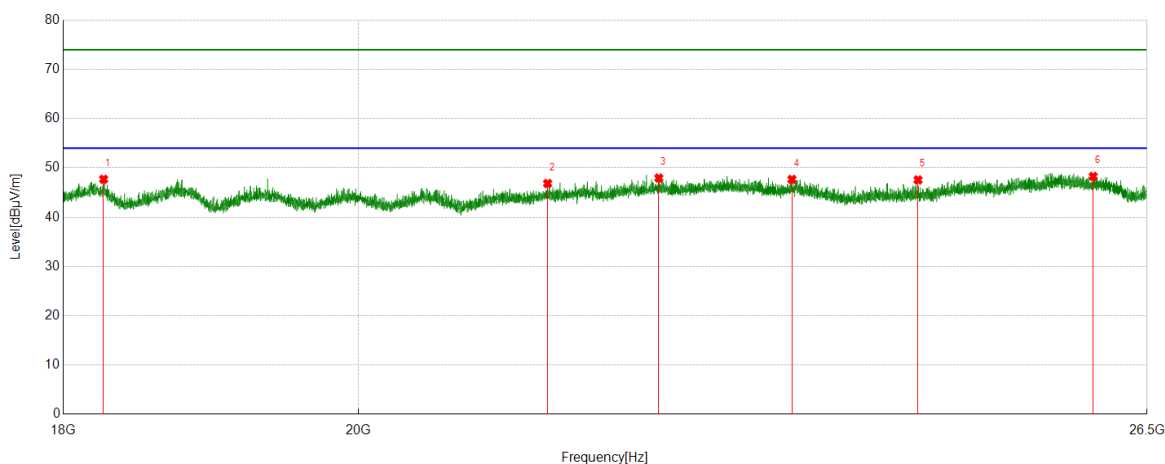
PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	18518.5519	48.24	-1.34	46.90	74.00	-27.10	Horizontal
2	20602.1102	47.04	-1.04	46.00	74.00	-28.00	Horizontal
3	21697.0197	47.75	-0.56	47.19	74.00	-26.81	Horizontal
4	23371.6872	48.00	-0.01	47.99	74.00	-26.01	Horizontal
5	24654.4654	48.52	-0.87	47.65	74.00	-26.35	Horizontal
6	25597.2097	49.31	0.49	49.80	74.00	-24.20	Horizontal

Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Test Mode	Channel	Polarization	Verdict
11A	5745	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	18261.8262	49.13	-1.43	47.70	74.00	-26.30	Vertical
2	21396.9397	47.64	-0.79	46.85	74.00	-27.15	Vertical
3	22263.1763	47.94	0.00	47.94	74.00	-26.06	Vertical
4	23346.1846	47.62	0.05	47.67	74.00	-26.33	Vertical
5	24420.6921	48.72	-1.15	47.57	74.00	-26.43	Vertical
6	25995.8996	47.22	1.06	48.28	74.00	-25.72	Vertical

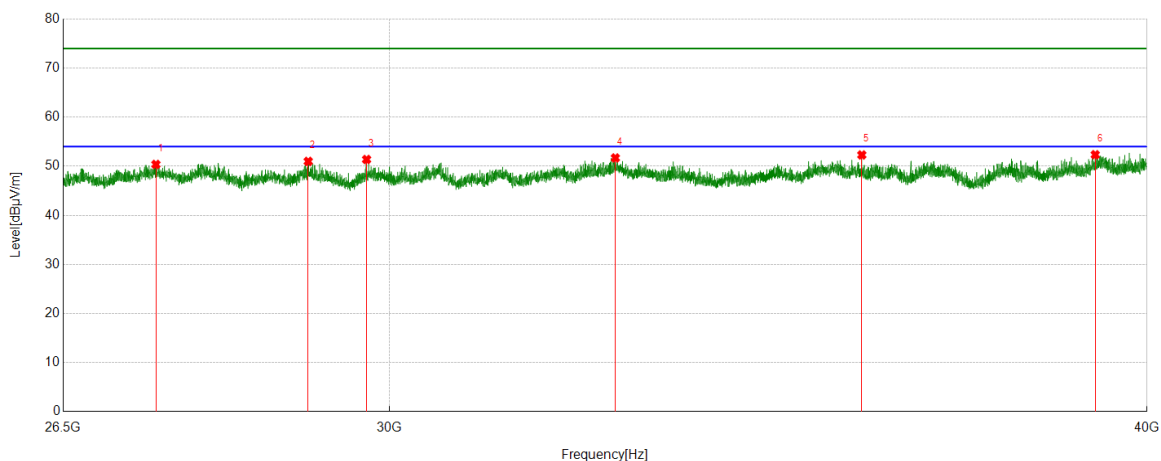
- Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Part 4: 26.5GHz~40GHz

SPURIOUS EMISSIONS 26.5GHz TO 40GHz (WORST-CASE CONFIGURATION)

Test Mode	Channel	Polarization	Verdict
11A	5745	Horizontal	PASS



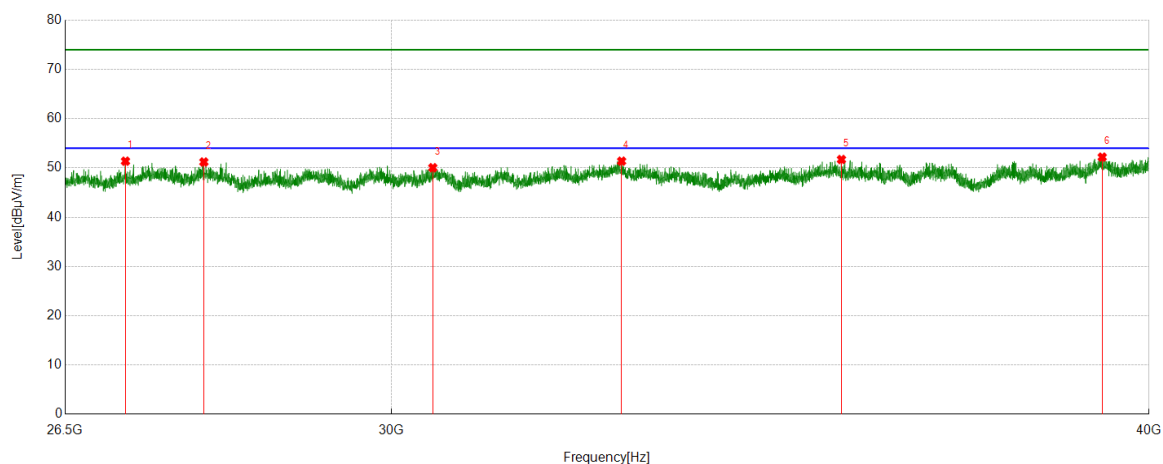
PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	27450.495	57.54	-7.17	50.37	74.00	-23.63	Horizontal
2	29085.5086	57.61	-6.62	50.99	74.00	-23.01	Horizontal
3	29737.6238	58.31	-6.93	51.38	74.00	-22.62	Horizontal
4	32684.9685	57.50	-5.81	51.69	74.00	-22.31	Horizontal
5	35892.8893	54.74	-2.44	52.30	74.00	-21.70	Horizontal
6	39220.9721	49.52	2.83	52.35	74.00	-21.65	Horizontal

Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Test Mode	Channel	Polarization	Verdict
11A	5745	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV/m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
1	27114.3114	58.57	-7.20	51.37	74.00	-22.63	Vertical
2	27933.8434	58.05	-6.85	51.20	74.00	-22.80	Vertical
3	30472.0972	56.96	-6.92	50.04	74.00	-23.96	Vertical
4	32737.6238	57.16	-5.79	51.37	74.00	-22.63	Vertical
5	35589.1089	54.45	-2.74	51.71	74.00	-22.29	Vertical
6	39295.2295	49.23	2.96	52.19	74.00	-21.81	Vertical

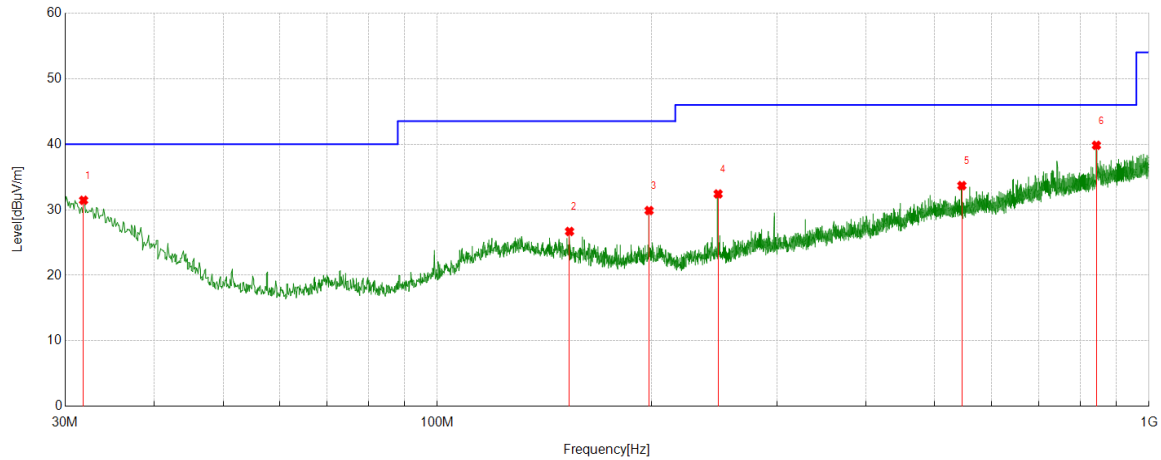
- Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Part 5: 30MHz~1GHz

SPURIOUS EMISSIONS 30M TO 1GHz (WORST-CASE CONFIGURATION)

Test Mode	Channel	Polarization	Verdict
11A	5745	Horizontal	PASS

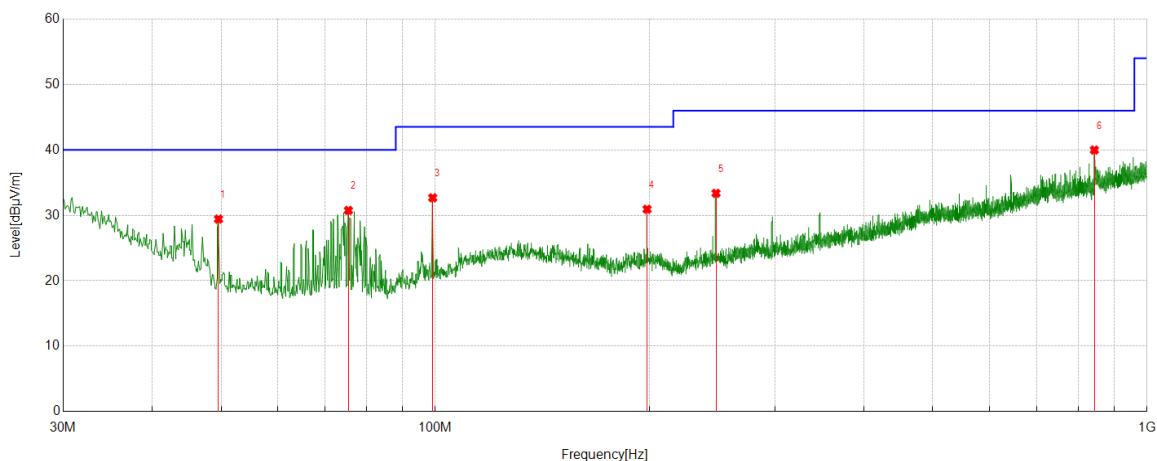


No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	31.8432	5.58	25.87	31.45	40.00	-8.55	peak
2	153.3963	7.52	19.17	26.69	43.50	-16.81	peak
3	198.4088	10.81	19.07	29.88	43.50	-13.62	peak
4	248.0778	13.45	18.96	32.41	46.00	-13.59	peak
5	545.8006	7.59	26.09	33.68	46.00	-12.32	peak
6	843.4263	9.47	30.36	39.83	46.00	-6.17	peak

Remark: 1. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
2. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Test Mode	Channel	Polarization	Verdict
11A	5745	Vertical	PASS



No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	49.596	14.63	14.80	29.43	40.00	-10.57	peak
2	75.4976	16.19	14.56	30.75	40.00	-9.25	peak
3	99.1679	16.01	16.67	32.68	43.50	-10.82	peak
4	198.4088	11.86	19.07	30.93	43.50	-12.57	peak
5	247.9808	14.41	18.96	33.37	46.00	-12.63	peak
6	843.4263	9.62	30.36	39.98	46.00	-6.02	peak

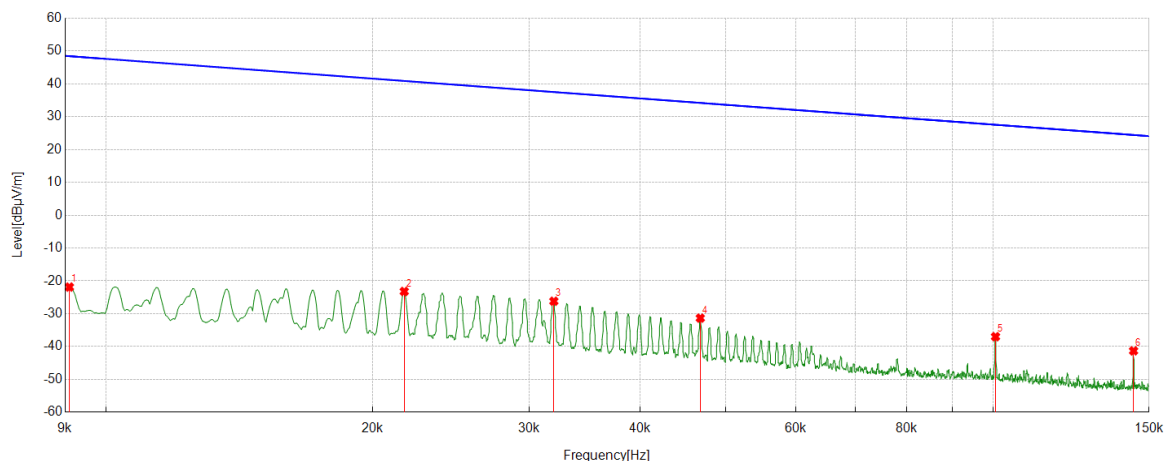
Remark: 1. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
2. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.



Part 6: 9kHz~30MHz

SPURIOUS EMISSIONS Below 30MHz (WORST CASE CONFIGURATION-FACE ON)

Test Mode	Channel	Frequency Range	Verdict
11A	5745	9kHz~150kHz	PASS

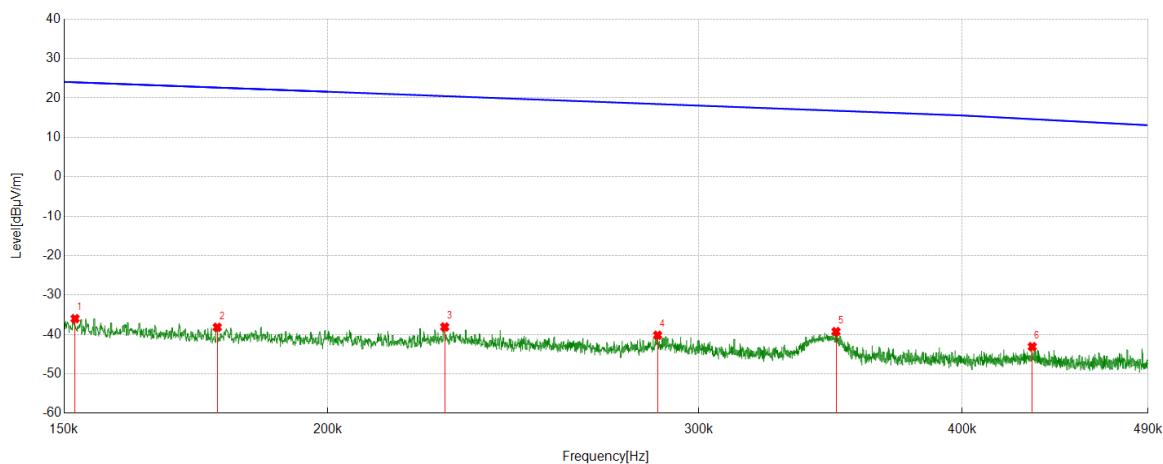


No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.0091	39.46	-61.33	-21.87	48.43	-70.30	peak
2	0.0217	37.65	-60.86	-23.21	40.87	-64.08	peak
3	0.032	34.73	-60.92	-26.19	37.50	-63.69	peak
4	0.0468	29.69	-61.02	-31.33	34.19	-65.52	peak
5	0.1007	23.75	-60.73	-36.98	27.54	-64.52	peak
6	0.1441	19.95	-61.25	-41.30	24.43	-65.73	peak

- Remark:
1. Measurement = Reading Level + Correct Factor.
 2. Result 300m= Result 3m-80 dBuV/m
 3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
 4. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report



Test Mode	Channel	Frequency Range	Verdict
11A	5745	150kHz~490kHz	PASS

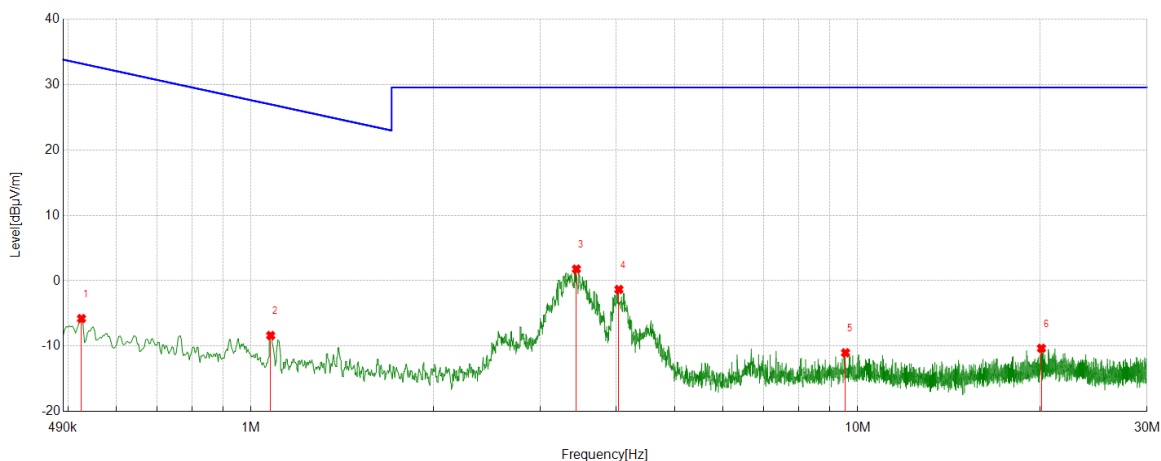


No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.1518	25.32	-61.31	-35.99	23.98	-59.97	peak
2	0.1773	23.00	-61.18	-38.18	22.63	-60.81	peak
3	0.2273	22.82	-60.92	-38.10	20.47	-58.57	peak
4	0.2868	20.57	-60.77	-40.20	18.45	-58.65	peak
5	0.3485	21.45	-60.72	-39.27	16.76	-56.03	peak
6	0.4318	17.55	-60.65	-43.10	14.62	-57.72	peak

- Remark: 1. Measurement = Reading Level + Correct Factor.
2. Result 300m= Result 3m-80 dBuV/m
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
4. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report



Test Mode	Channel	Frequency Range	Verdict
11A	5745	490kHz~30MHz	PASS



No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.5254	14.83	-20.60	-5.77	33.19	-38.96	peak
2	1.0773	11.99	-20.35	-8.36	26.96	-35.32	peak
3	3.4383	22.07	-20.28	1.79	29.54	-27.75	peak
4	4.0404	18.72	-20.05	-1.33	29.54	-30.87	peak
5	9.5505	7.92	-18.92	-11.00	29.54	-40.54	peak
6	20.0925	7.02	-17.34	-10.32	29.54	-39.86	peak

- Remark: 1. Measurement = Reading Level + Correct Factor.
2. Result 30m= Result 3m-40 dBuV/m
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
4. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report

8. FREQUENCY STABILITY

LIMITS

The frequency of the carrier signal shall be maintained within band of operation

TEST SETUP AND PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

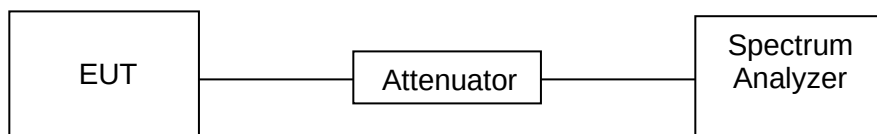
Center Frequency	The center frequency of the channel under test
Detector	PEAK
RBW	10kHz
VBW	$\geq 3 \times \text{RBW}$
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

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 -20°C~70°C.

TEST SETUP





TEST ENVIRONMENT

Environment Parameter:	Selected Values During Tests	
Relative Humidity:	55 ~ 65%	
Atmospheric Pressure:	101kPa	
Temperature:	TL	-20°C
	TN	23 ~ 28°C
	TH	70°C
Voltage:	VL	DC 2.805V
	VN	DC 3.3V
	VH	DC 3.795V

Note: TL= Lower Extreme Temperature
TN= Normal Temperature
TH= Upper Extreme Temperature
VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage



TEST RESULTS

Not applicable, the customer will declare the extreme used temperature and voltage in the user manual.

TEST RESULTS (WORST-CASE CONFIGURATION)

Frequency Error vs. Voltage:

Frequency Error vs. Temperature									
802.11a: 5200 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)
TN	VL	5199.94	-11.5385	5199.95	-9.6154	5199.95	-9.6154	5199.95	-9.6154
TN	VN	5199.94	-11.5385	5199.96	-7.6923	5199.96	-7.6923	5199.96	-7.6923
TN	VH	5199.93	-13.6415	5199.94	-11.5385	5199.95	-9.6154	5199.95	-9.6154

Frequency Error vs. Temperature:

Frequency Error vs. Temperature									
802.11a: 5200 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)
70	VN	5199.94	-11.5385	5199.96	-7.6923	5199.96	-7.6923	5199.96	-7.6923
60	VN	5199.93	-13.4615	5199.95	-9.6154	5199.95	-9.6154	5199.96	-7.6923
50	VN	5199.94	-11.5385	5199.97	-5.7692	5199.97	-5.7692	5199.97	-5.7692
40	VN	5199.94	-11.5385	5199.95	-9.6154	5199.95	-9.6154	5199.95	-9.6154
30	VN	5199.94	-11.5385	5199.96	-7.6923	5199.96	-7.6923	5199.96	-7.6923
20	VN	5199.93	-13.4615	5199.95	-9.6154	5199.95	-9.6154	5199.95	-9.6154
10	VN	5199.94	-11.5385	5199.97	-5.7692	5199.97	-5.7692	5199.97	-5.7692
0	VN	5199.94	-11.5385	5199.96	-7.6923	5199.96	-7.6923	5199.96	-7.6923
-10	VN	5199.93	-13.4615	5199.95	-9.6154	5199.97	-5.7692	5199.97	-5.7692
-20	VN	5199.94	-11.5385	5199.95	-9.6154	5199.95	-9.6154	5199.95	-9.6154

Remark: All the modulation and channels had been tested, but only the worst data recorded in the report.



Frequency Error vs. Voltage:

Frequency Error vs. Temperature									
802.11a: 5825 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)
TN	VL	5824.94	-10.3004	5824.96	-6.86695	5824.96	-6.86695	5824.95	-8.58369
TN	VN	5824.94	-10.3004	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
TN	VH	5824.95	-8.5837	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695

Frequency Error vs. Temperature:

Frequency Error vs. Temperature									
802.11a: 5825 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)	Freq.Error (MHz)	Tolerance (ppm)
70	VN	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369
60	VN	5824.95	-8.58369	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
50	VN	5824.95	-8.58369	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
40	VN	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369
30	VN	5824.94	-10.3004	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369
20	VN	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369
10	VN	5824.95	-8.58369	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
0	VN	5824.95	-8.58369	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
-10	VN	5824.95	-8.58369	5824.96	-6.86695	5824.96	-6.86695	5824.96	-6.86695
-20	VN	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369	5824.95	-8.58369

Remark: All the modulation and channels had been tested, but only the worst data recorded in the report.

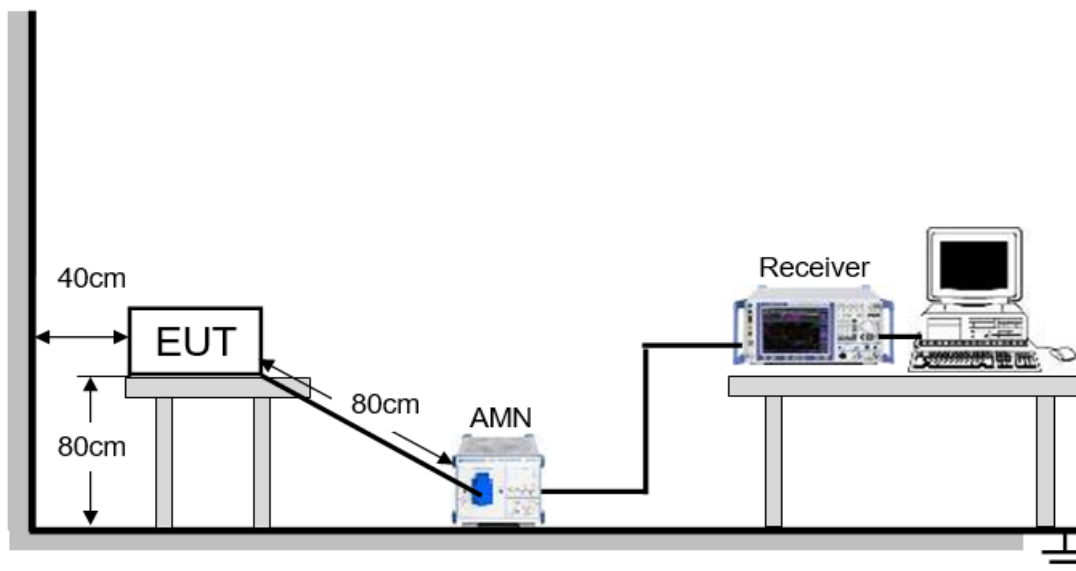
9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a)

FREQUENCY (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE



The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

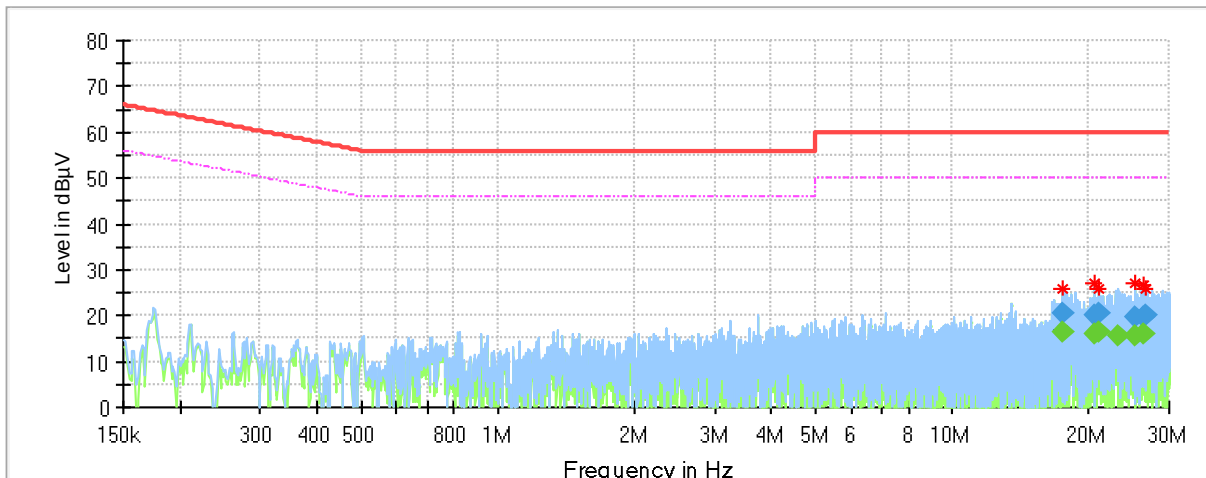


TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	65%
Atmospheric Pressure:	100.2kPa
Temperature	25°C
Test Voltage	AC 120V
Test Date	05/22/2022

TEST RESULTS (WORST CASE CONFIGURATION)

For L Line:

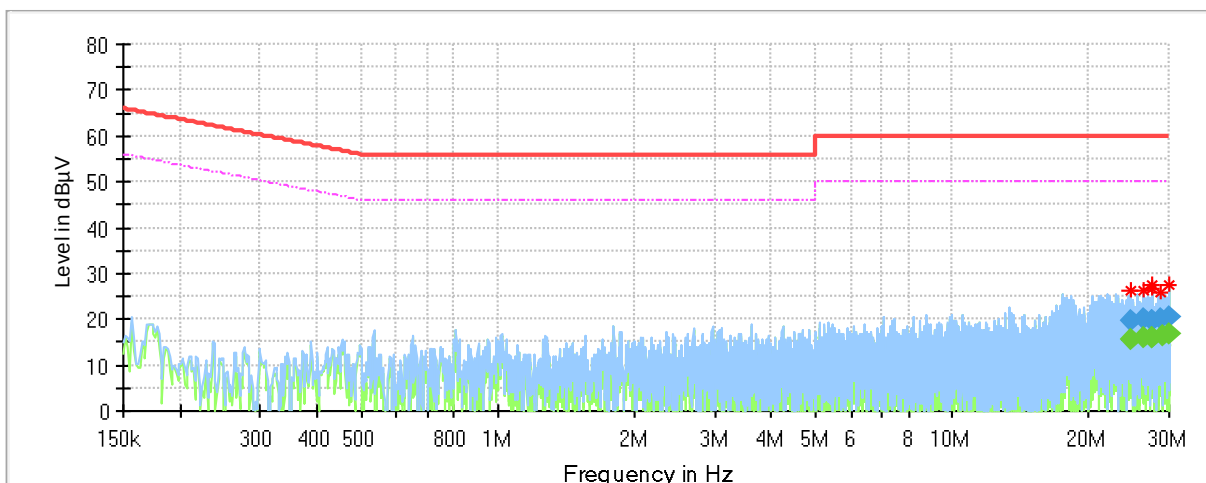


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
17.485388	---	16.53	50.00	33.47	1000.0	9.000	L1	OFF	9.6
17.485388	20.70	---	60.00	39.30	1000.0	9.000	L1	OFF	9.6
20.621130	---	15.99	50.00	34.01	1000.0	9.000	L1	OFF	9.8
20.621130	20.13	---	60.00	39.87	1000.0	9.000	L1	OFF	9.8
20.930078	20.47	---	60.00	39.53	1000.0	9.000	L1	OFF	9.8
20.930078	---	16.46	50.00	33.54	1000.0	9.000	L1	OFF	9.8
23.277780	---	15.64	50.00	34.36	1000.0	9.000	L1	OFF	9.8
25.297133	19.67	---	60.00	40.33	1000.0	9.000	L1	OFF	9.8
25.297133	---	15.76	50.00	34.24	1000.0	9.000	L1	OFF	9.8
26.353823	19.87	---	60.00	40.13	1000.0	9.000	L1	OFF	9.8
26.353823	---	16.00	50.00	34.00	1000.0	9.000	L1	OFF	9.8
26.510535	19.94	---	60.00	40.06	1000.0	9.000	L1	OFF	9.8

- Note: 1. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
3. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
4. The extension cord/outlet strip was calibrated with the LISN as required by ANSI C63.10:2013 Clause 6.2.2.
5. The EUT was test with two type antennas, the result of the EUT with type 2 antenna was worse case and recorded in this report.
6. Pre-testing all test modes and channels, and find the 5745MHz of 11A mode which is the worst case, so only the worst case is included in this test report.

For N Line:



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
24.616553	---	15.63	50.00	34.37	1000.0	9.000	N	OFF	9.9
24.616553	19.51	---	60.00	40.49	1000.0	9.000	N	OFF	9.9
26.455313	---	16.07	50.00	33.93	1000.0	9.000	N	OFF	9.8
26.455313	20.15	---	60.00	39.85	1000.0	9.000	N	OFF	9.8
27.383648	---	15.98	50.00	34.02	1000.0	9.000	N	OFF	9.8
27.383648	19.82	---	60.00	40.18	1000.0	9.000	N	OFF	9.8
27.453795	19.87	---	60.00	40.13	1000.0	9.000	N	OFF	9.8
27.453795	---	15.94	50.00	34.06	1000.0	9.000	N	OFF	9.8
28.828388	20.21	---	60.00	39.79	1000.0	9.000	N	OFF	9.8
29.095545	---	16.49	50.00	33.51	1000.0	9.000	N	OFF	9.7
29.877615	---	16.73	50.00	33.27	1000.0	9.000	N	OFF	9.7
29.877615	20.67	---	60.00	39.33	1000.0	9.000	N	OFF	9.7

- Note: 1. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
3. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
4. The extension cord/outlet strip was calibrated with the LISN as required by ANSI C63.10:2013 Clause 6.2.2.
5. The EUT was test with two type antennas, the result of the EUT with type 2 antenna was worse case and recorded in this report.
6. Pre-testing all test modes and channels, and find the 5745MHz of 11A mode which is the worst case, so only the worst case is included in this test report.



10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

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 shall be considered sufficient to comply with the provisions of this section. 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.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA GAIN

The antenna gain of EUT is more than 6 dBi, so the power and power density limit shall be reduced amount in dB that the directional gain of the antenna exceeds 6dBi.

END OF REPORT