Test Result for Inspection

Product Name	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Model No.	9560NGW
FCC ID	HLZ9560NG
IC	1754F-9560NG

Applicant	Acer Incorporated
FCC Address	8F, 88, Sec. 1, Xintai 5th Rd. Xizhi, New Taipei City 221 Taiwan
IC Address	8F., No.88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221 Taiwan

Date of Receipt	Oct. 13, 2022
Issue Date	Dec. 14, 2022
Report No.	22A0294R-RFNAOTHV03-11
Report Version	V1.0

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
This report must not be used to claim product endorsement by TAF or any agency of the government.
The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Product Name	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Applicant	Acer Incorporated
FCC Address	8F, 88, Sec. 1, Xintai 5th Rd. Xizhi, New Taipei City 221 Taiwan
IC Address	8F., No.88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221 Taiwan
Manufacturer	Acer Incorporated
Model No.	9560NGW
FCC ID	HLZ9560NG
IC	1754F-9560NG
EUT Rated Voltage	DC 3.3V
EUT Test Voltage	DC 3.3V (Power by Test Platform)
Trade Name	acer
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C FCC CFR Title 47 Part 15 Subpart E RSS-247 Issue 2 (Feb, 2017) ANSI C63.4: 2014, ANSI C63.10: 2013 KDB Publication 789033
Test Result	Complied

Documented By : Ida Tung

(Project Specialist / Ida Tung)

Tested By : Bill Lin

(Senior Engineer / Bill Lin)

Approved By : Alan Chen

(Senior Engineer / Alan Chen)

TABLE OF CONTENTS

Revision History

Report No.	Version	Description	Issued Date
22A0294R-RFNAOTHV03-11	V1.0	Initial issue of report.	Dec. 14, 2022

1. General Information

1.1. EUT Description

Product Name	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Trade Name	acer
Model No.	9560NGW
FCC ID	HLZ9560NG
IC	1754F-9560NG
Frequency Range for FCC	802.11b/g/n-20 MHz: 2412-2472 MHz ,802.11n-40 MHz: 2422-2462 MHz 802.11a/n-20 MHz: 5180-5320 MHz, 5500-5700 MHz, 5720 MHz, 5745-5825 MHz 802.11n-40 MHz: 5190-5310 MHz, 5510-5670 MHz, 5710 MHz, 5755-5795 MHz 802.11ac-80 MHz: 5210-5290 MHz, 5530-5690 MHz, 5775 MHz 802.11ac-160 MHz: 5250 MHz, 5570 MHz
Frequency Range for IC	802.11b/g/n-20 MHz: 2412-2472 MHz ,802.11n-40 MHz: 2422-2462 MHz 802.11a/n-20 MHz: 5180-5320 MHz, 5500-5580 MHz, 5660-5720 MHz, 5745-5825 MHz 802.11n-40 MHz: 5190-5310 MHz, 5510-5550 MHz, 5670-5710 MHz, 5755-5795 MHz 802.11ac-80 MHz: 5210-5290 MHz, 5530, 5690 MHz, 5775 MHz 802.11ac-160 MHz: 5250 MHz, 5570 MHz
Number of Channels for FCC	2.4 GHz: 802.11b/g/n-20 MHz: 13, 802.11n-40 MHz: 9 5 GHz: 802.11a/n-20 MHz: 25, 802.11n-40 MHz: 12, 802.11ac-80 MHz: 6, 802.11ac-160 MHz: 2
Number of Channels for IC	2.4 GHz: 802.11b/g/n-20 MHz: 13, 802.11n-40 MHz: 9 5 GHz: 802.11a/n-20 MHz: 21, 802.11n-40 MHz: 10, 802.11ac-80 MHz: 5, 802.11ac-160 MHz: 1
Data Speed	802.11b: 1-11 Mbps 802.11a/g: 6-54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 1733.3 Mbps

Channel separation	2.4 GHz: 802.11b/g/n: 5 MHz 5 GHz: 802.11a/n-20 MHz: 20 MHz 802.11n-40 MHz: 40 MHz 802.11ac-80 MHz: 80 MHz 802.11ac-160 MHz: 320 MHz
Type of Modulation	802.11b: DSSS, DBPSK, DQPSK, CCK 802.11g/n/ac: OFDM, BPSK, QPSK, 16QAM, 64QAM, 256QAM
Antenna Type	PIFA
Channel Control	Auto
Antenna Gain	Refer to the Antenna List
Power Adapter	MFR: LITEON, M/N: PA-1450-26 Input: AC 100-240V~1.2A 50-60Hz Output: 19.0V⎓2.37A Cable Out: Non-shielded, 1.5m, with one ferrite core bonded. Power Cord: Non-shielded, 1m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	WNC (NB)	HQ20605054000 (81EABU15.G19) (Main)	PIFA	1.26 dBi for 2400 MHz 1.69 dBi for 5150~5250 MHz 1.77 dBi for 5250~5350 MHz 0.79 dBi for 5470~5725 MHz 1.06 dBi for 5725~5850 MHz
		HQ20605054000 (81EABU15.G19) (Aux)		2.91 dBi for 2400 MHz 1.52 dBi for 5150~5250 MHz 0.73 dBi for 5250~5350 MHz 0.95 dBi for 5470~5725 MHz 1.27 dBi for 5725~5850 MHz
2	WNC (PAD)	HQ20605054000 (81EABU15.G19) (Main)	PIFA	0.90 dBi for 2400 MHz 1.11 dBi for 5150~5250 MHz 1.11 dBi for 5250~5350 MHz 1.23 dBi for 5470~5725 MHz 0.94 dBi for 5725~5850 MHz
		HQ20605054000 (81EABU15.G19) (Aux)		2.91 dBi for 2400 MHz 0.82 dBi for 5150~5250 MHz 0.82 dBi for 5250~5350 MHz 1.16 dBi for 5470~5725 MHz 1.37 dBi for 5725~5850 MHz

Note:

1. The antenna of EUT is conforming to FCC 15.203.
2. Only the higher gain antenna was tested and recorded in this report.

Firmware/Software Version

1	HW Version Identification Number (HVIN)	9560NGW
2	Firmware Version Identification Number (FVIN)	NB6305A_MB
3	Test SW Version	DRTU Version DRTU.02297.22.160.0
4	RF power setting in TEST SW	☐ RF power setting was not able to alter during testing. ☒ RF power setting was able to alter during testing. (See the following table)

NB MODE

Parameters of test software setting

Frequency	2467MHz
802.11b	19

Frequency	5250MHz
802.11ac160 MHz	13.375

PAD MODE

Parameters of test software setting

Frequency	2467MHz
802.11b	19

Frequency	5250MHz
802.11ac160 MHz	13.375

For FCC:

802.11b/g/n-20 MHz Center Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	02	2417	03	2422	04	2427
05	2432	06	2437	07	2442	08	2447
09	2452	10	2457	11	2462	12	2467
13	2472						

802.11n-40 MHz Center Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	04	2427	05	2432	06	2437
07	2442	08	2447	09	2452	10	2457
11	2462						

802.11a/n-20 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
036	5180	040	5200	044	5220	048	5240
052	5260	056	5280	060	5300	064	5320
100	5500	104	5520	108	5540	112	5560
116	5580	120	5600	124	5620	128	5640
132	5660	136	5680	140	5700	144	5720
149	5745	153	5765	157	5785	161	5805
165	5825						

802.11n-40 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
038	5190	046	5230	054	5270	062	5310
102	5510	110	5550	118	5590	126	5630
134	5670	142	5710	151	5755	159	5795

802.11ac-80 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
042	5210	058	5290	106	5530	122	5610
138	5690	155	5775				

802.11ac-160 MHz Carrier Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)				
50	5250	114	5570				

For IC:

802.11b/g/n-20 MHz Center Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	02	2417	03	2422	04	2427
05	2432	06	2437	07	2442	08	2447
09	2452	10	2457	11	2462	12	2467
13	2472						

802.11n-40 MHz Center Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	04	2427	05	2432	06	2437
07	2442	08	2447	09	2452	10	2457
11	2462						

802.11a/n-20 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
036	5180	040	5200	044	5220	048	5240
052	5260	056	5280	060	5300	064	5320
100	5500	104	5520	108	5540	112	5560
116	5580	136	5680	140	5700	144	5720
149	5745	153	5765	157	5785	161	5805
165	5825						

802.11n-40 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
038	5190	046	5230	054	5270	062	5310
102	5510	110	5550	134	5670	142	5710
151	5755	159	5795				

802.11ac-80 MHz Center Working Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
042	5210	058	5290	106	5530	138	5690
155	5775						

802.11ac-160 MHz Carrier Frequency of Each Channel:

Channel	Frequency (MHz)						
50	5250						

Note:

1. The EUT is a WLAN and BT, 2x2 PCIe M.2 2230 adapter card with a built-in WLAN with Bluetooth transceiver, this report for WLAN.
2. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.
3. This is a permissive change for FCC ID: HLZ9560NG, IC: 1754F-9560NG. According to the major change, DEKRA tests Peak Power Output, Radiated Emission, worst-case and other testing data refer to original module report (report no.: 170524-02.TR01, 170524-02.TR02, 170524-02.TR03, 170524-02.TR04 and 170524-02.TR09). Additional the host: Notebook Computer, Brand: acer, Model number: N23H1 is contain this module's FCC ID, IC.
4. These tests were conducted on a sample for the purpose of demonstrating compliance of 2.4GHz transmitter with Part 15 Subpart C Paragraph 15.247 and RSS-247 Issue 2 (Feb, 2017) for spread spectrum devices.

Test Mode (2.4GHz)	Mode 1	SISO B Transmit (802.11b)
Test Mode (5GHz)		SISO B Transmit (802.11ac-160 MHz)

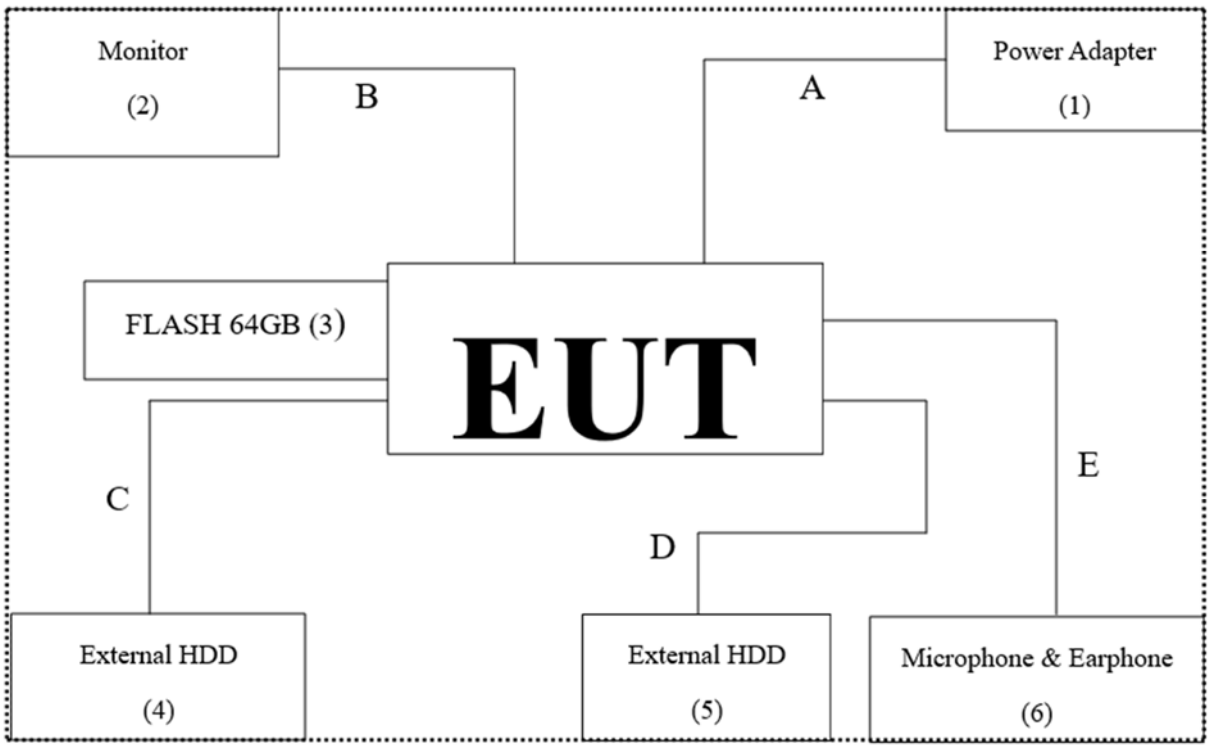
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Power Adapter	LITEON	PA-1450-26	N/A	N/A
2	Monitor	DELL	U2415	CN-01RMGX-74261-63H-09UL-A02	Non-shielded, 1.8m
3	FLASH 64GB	Transcend	JetFlash 790C	N/A	N/A
4	External HDD	Transcend	TS1TSJ25H3B	F21786-0005	N/A
5	External HDD	Transcend	TS1TSJ25H3B	F21786-0103	N/A
6	Microphone & Earphone	Verbatim	C09024VB	N/A	N/A

Cable Type		Cable Description
A	Power Cable	Non-shielded, 1.5m, with one ferrite core bonded.
B	HDMI Cable	Shielded, 1.8m
C	USB Cable	Shielded, 0.5m
D	USB Cable	Shielded, 0.5m
E	Microphone & Earphone Cable	Non-shielded, 1.2m

1.3. Configuration of Tested System



1.4. EUT Exercise Software

1. Setup the EUT as shown in Section 1.3.
2. Execute software “DRTU Version DRTU.02297.22.160.0” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 ℃	25.3 ℃
	Humidity (%RH)	10~90 %	57.3 %
Conductive	Temperature (°C)	10~40 ℃	22.0 ℃
	Humidity (%RH)	10~90 %	55.0 %

USA : **FCC Registration Number: TW0033**

Canada : **CAB Identifier Number: TW3023 / Company Number: 26930**

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No. 5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan
Performed Location : No. 26, Huaya 1st Rd., Guishan Dist.,Taoyuan City 333411, Taiwan, R.O.C.
Phone Number : +886-3-275-7255
Fax Number : +886-3-327-8031
Email Address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.6. List of Test Item and Equipment

For Conducted measurements / HY-SR02

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
V	Spectrum Analyzer	R&S	FSV30	103466	2021/12/27	2022/12/26
V	Peak Power Analyzer	KEYSIGHT	8990B	MY51000539	2022/05/27	2023/05/26
V	Power Sensor	KEYSIGHT	N1923A	MY59240002	2022/05/19	2023/05/18
V	Power Sensor	KEYSIGHT	N1923A	MY59240003	2022/05/19	2023/05/18

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software version: RF Conducted Test Tools R3 V3.0.1.14.

For Radiated measurements / HY-CB03

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
	Loop Antenna	AMETEK	HLA6121	49611	2022/03/18	2023/03/17
	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2021/08/11	2023/08/10
V	Horn Antenna	RF SPIN	DRH18-E	210508A18ES	2022/06/08	2023/06/07
V	Horn Antenna	Com-Power	AH-840	101100	2021/10/04	2023/10/03
	Pre-Amplifier	SGH	SGH0301-9	20211007-10	2022/02/22	2023/02/21
V	Pre-Amplifier	SGH	PRAMP118	20200701	2022/07/28	2023/07/27
	Pre-Amplifier	EMCI	EMC05820SE	980310	2022/07/28	2023/07/27
V	Pre-Amplifier	EMCI	EMC184045SE	980369	2022/05/12	2023/05/11
	Coaxial Cable	EMCI	EMC102-KM-KM-600	1160314		
	Coaxial Cable	EMCI	EMC102-KM-KM-7000	170242		
V	Filter	MICRO TRONICS	BRM50702	G251	2022/07/27	2023/07/26
V	Filter	MICRO TRONICS	BRM50716	G188	2022/07/27	2023/07/26
	EMI Test Receiver	R&S	ESR3	102793	2021/12/15	2022/12/14
V	Spectrum Analyzer	R&S	FSV3044	101113	2022/01/25	2023/02/24
V	Coaxial Cable	SGH	SGH18	2021005-1	2022/03/18	2023/03/17
	Coaxial Cable	SGH	SGH18	202108-4		
	Coaxial Cable	SGH	SGH18	GD20110223-1		
	Coaxial Cable	SGH	HA800	GD20110222-3		

Note:

1. Bi-Log Antenna and Horn Antenna(AH-840) is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software Version: E3 210616 dekra V9.

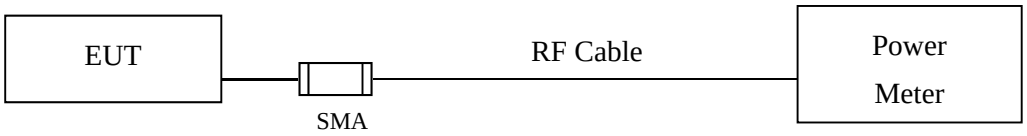
1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	**Uncertainty**	
Peak Power Output (2.4GHz)	Power Meter ±0.89 dB	Spectrum Analyzer ±2.06 dB
Radiated Emission (2.4GHz)	Under 1 GHz ±4.05 dB	Above 1 GHz ±3.73 dB
Duty Cycle (2.4GHz)	±2.31 ms	
Maximum conducted output power (5GHz)	Power Meter ±0.89 dB	Spectrum Analyzer ±2.06 dB
Radiated Emission (5GHz)	Under 1 GHz ±4.05 dB	Above 1 GHz ±3.73 dB
Duty Cycle (5GHz)	±2.31 ms	

2. Peak Power Output (2.4GHz)

2.1. Test Setup



2.2. Limits

The maximum peak power shall be less 1 Watt and the e.i.r.p. shall not exceed 4 Watt.

2.3. Test Procedure

The EUT was tested according to C63.10:2013 for compliance to RSS-247 requirements. The maximum peak conducted output power using C63.10:2013 Section 11.9.1.3 PKPM1 Peak power meter method. The maximum average conducted output power using C63.10:2013 Section 11.9.2.3 Measurement using a power meter (PM). (Measurement using a gated RF average-reading power meter).

2.4. Test Result of Peak Power Output

Product : WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item : Peak Power Output
Test Mode : SISO B Transmit (802.11b) (NB)
Test Date : 2022/11/08

Channel No.	Frequency (MHz)	Data Rate (Mbps)	Average Power Output (dBm)	Limit (dBm)	Result
12	2467	1	18.62	<30dBm	Pass

Note: Average Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

Channel No.	Frequency (MHz)	Data Rate (Mbps)	Peak Power Output (dBm)	Limit (dBm)	Result
12	2467	1	20.47	<30dBm	Pass

Note: Peak Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

Channel No.	Frequency Range (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
12	2467	20.47	2.91	23.38	36	Pass

Product : WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item : Peak Power Output
Test Mode : SISO B Transmit (802.11b) (PAD)
Test Date : 2022/11/08

Channel No.	Frequency (MHz)	Data Rate (Mbps)	Average Power Output (dBm)	Limit (dBm)	Result
12	2467	1	18.62	<30dBm	Pass

Note: Average Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

Channel No.	Frequency (MHz)	Data Rate (Mbps)	Peak Power Output (dBm)	Limit (dBm)	Result
12	2467	1	20.47	<30dBm	Pass

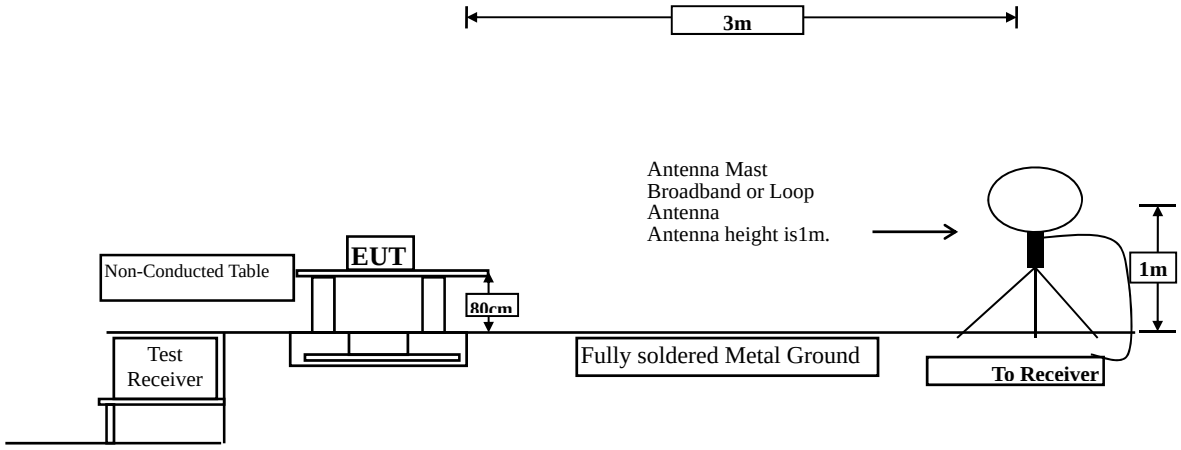
Note: Peak Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

Channel No.	Frequency Range (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
12	2467	20.47	2.91	23.38	36	Pass

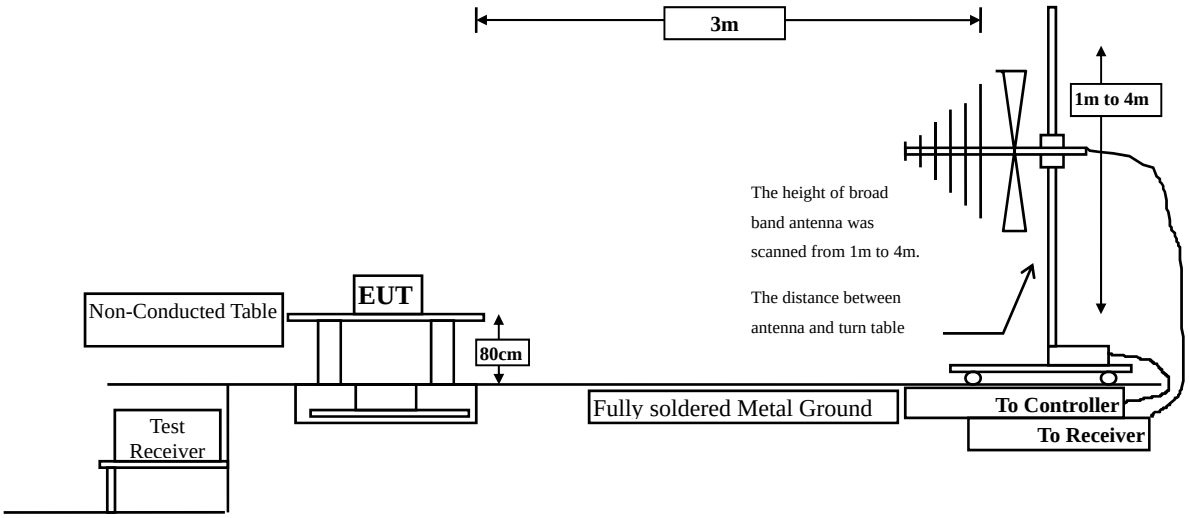
3. Radiated Emission

3.1. Test Setup

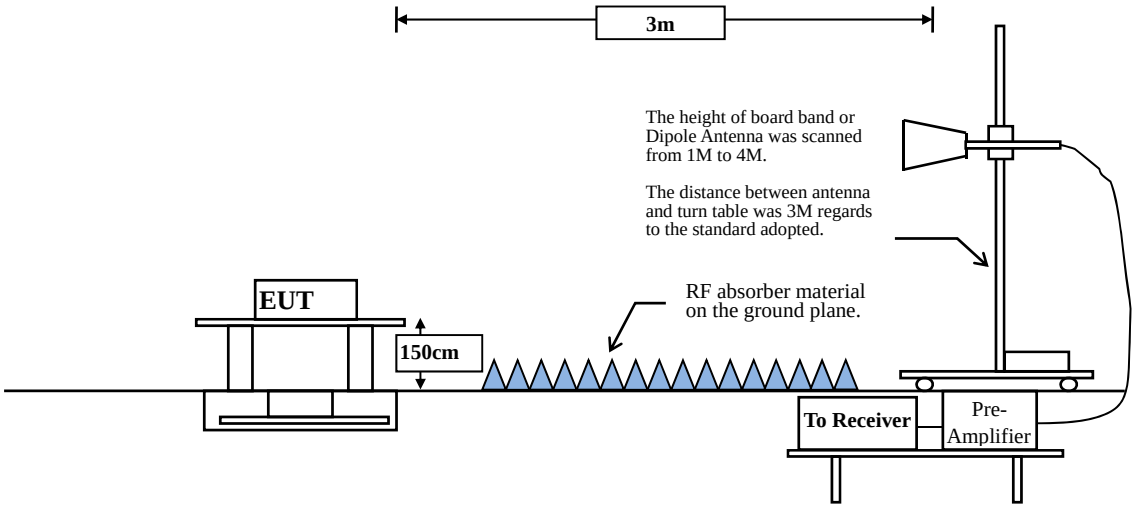
Radiated Emission Under 30 MHz



Radiated Emission Below 1 GHz



Radiated Emission Above 1 GHz



3.2. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

RSS-Gen Issue 5 Section 8.9 **FCC Part 15 Subpart C Paragraph 15.209**		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks:

1. RF Voltage (dBμV) = 20 log RF Voltage (μV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

Measuring the frequency range below 1 GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1 GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30 MHz setting on the field strength meter is 9 kHz and

30 MHz~1 GHz is 120 kHz and above 1 GHz is 1 MHz.

Radiated emission measurements below 30 MHz are made using Loop Antenna and 30 MHz~1 GHz are made using broadband Bilog antenna and above 1 GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range form 9 kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure.

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

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

According to C63.10 Section 11.12.2.5 Average measurement procedure.

RBW = 1 MHz.

VBW = 10 Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

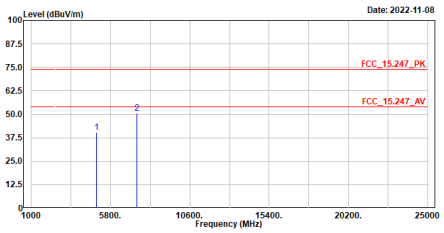
2.4 GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
802.11 b	98.88	12.3300	81	10

Note: Duty Cycle Refer to Section 4.

3.4. Test Result of Radiated Emission

NB_SISO B:

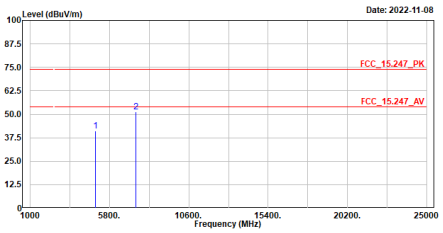
Site :HY-CB03
Condition :3m ,HORIZONTAL
Mode :TX_b_2467MHz
TEST BY :Jing Chang



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4934.000	40.47	74.00	-33.53	54.56	-14.09	Peak
2	7401.000	50.71	74.00	-23.29	57.67	-6.96	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Site :HY-CB03
Condition :3m ,VERTICAL
Mode :TX_b_2467MHz
TEST BY :Jing Chang

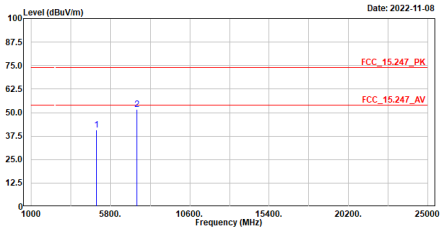


No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4934.000	41.06	74.00	-32.94	55.15	-14.09	Peak
2	7401.000	51.44	74.00	-22.56	58.40	-6.96	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

PAD_SISO B:

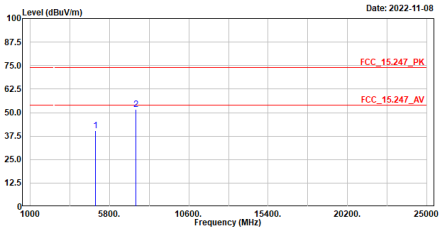
Site :HY-CB03
Condition :3m ,HORIZONTAL
Mode :TX_b_2467MHz
TEST BY :Jing Chang



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4934.000	40.87	74.00	-33.13	54.96	-14.09	Peak
2	7401.000	51.86	74.00	-22.14	58.82	-6.96	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Site :HY-CB03
Condition :3m ,VERTICAL
Mode :TX_b_2467MHz
TEST BY :Jing Chang

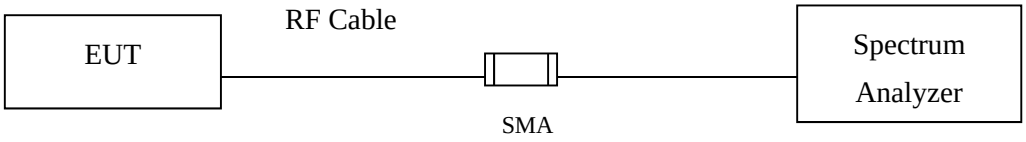


No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4934.000	40.26	74.00	-33.74	54.35	-14.09	Peak
2	7401.000	51.60	74.00	-22.40	58.56	-6.96	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. Duty Cycle (2.4GHz)

4.1. Test Setup



4.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to ANSI C63.10 2013 for compliance to RSS-247 Issue 2 requirements.

4.3. Test Result of Duty Cycle

Product : WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item : Duty Cycle
Test Mode : Transmit

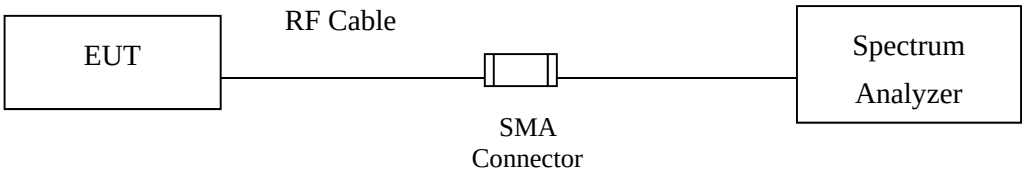
Duty Cycle Formula:
Duty Cycle = Ton / (Ton + Toff)
Duty Factor = 10 Log (1/Duty Cycle)
SISO B Results:

2.4 GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	12.3300	12.4700	98.88	0.05

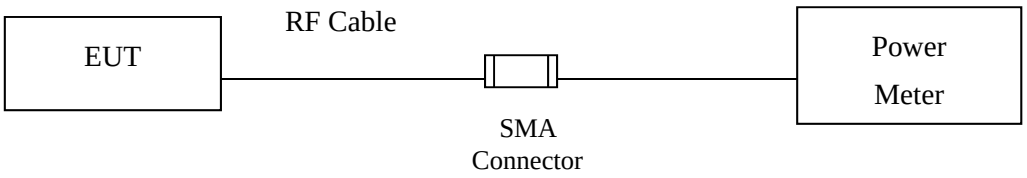
5. Maximum conducted output power (5GHz)

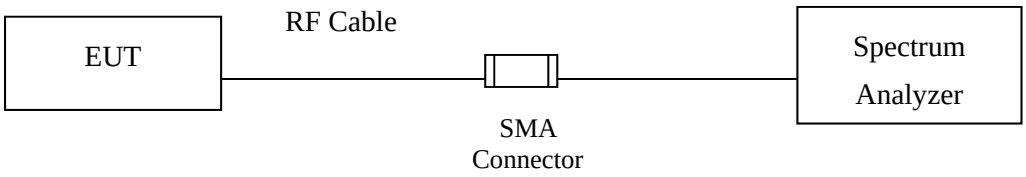
5.1. Test Setup

Occupied Bandwidth



Conduction Power Measurement





5.2. Limits

For FCC 15.407

For the band 5.15-5.25 GHz,

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition. 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.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 99% emission bandwidth in megahertz. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition. 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. However, fixed point-to-point UNII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

For RSS-247

1. For the band 5.15-5.25 GHz:

i. For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 log10B, dBm, whichever is less stringent. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

ii. For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

2. For the band 5.25-5.35 GHz, 5.47-5.6 GHz and 5.65-5.725 GHz, The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz.
3. For the band 5.725-5.825 GHz, the maximum conducted output power shall not exceed 1 W. If transmitting antenna of directional gain greater than 6 dBi are used, the Maximum conducted output power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
4. The maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3. Test Procedure

As an alternative to FCC KDB-789033, the EUT maximum conducted output power was measured with an average power meter employing a video bandwidth greater the 6dB BW of the emission under test. Maximum conducted output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of FCC KDB-789033, and provides more accurate measurements.

Maximum conducted output power using KDB 789033 section E)3)b) Method PM-G (Measurement using a gated RF average power meter)
Note: the power meter have a video bandwidth that is greater than or equal to the measurement bandwidth.
Maximum conducted output power using KDB 789033 section E)2)d) Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

When transmitted signals consist of two or more non-contiguous spectrum segments (e.g., 80+80 MHz mode) or when a single spectrum segment of a transmission crosses the boundary between two adjacent U-NII bands, KDB 644545 D03 section D) procedure is used for measurements.

5.4. Test Result of Maximum conducted output power

Product	:	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item	:	Maximum conducted output power
Test Mode	:	SISO B Transmit (802.11ac-160 MHz) (NB)
Test Date	:	2022/11/08

Maximum conducted output power measurement:

Channel No.	Frequency Range (MHz)	Output Power (dBm)	Required Limit	Result
50	5250	13.62	<24 dBm	Pass

Maximum EIRP measurement:

Channel No.	Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
50	5250	13.62	1.77	15.39	<30	Pass

Product	:	WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item	:	Maximum conducted output power
Test Mode	:	SISO B Transmit (802.11ac-160 MHz) (PAD)
Test Date	:	2022/11/08

Maximum conducted output power measurement:

Channel No.	Frequency Range (MHz)	Output Power (dBm)	Required Limit	Result
50	5250	13.62	<24 dBm	Pass

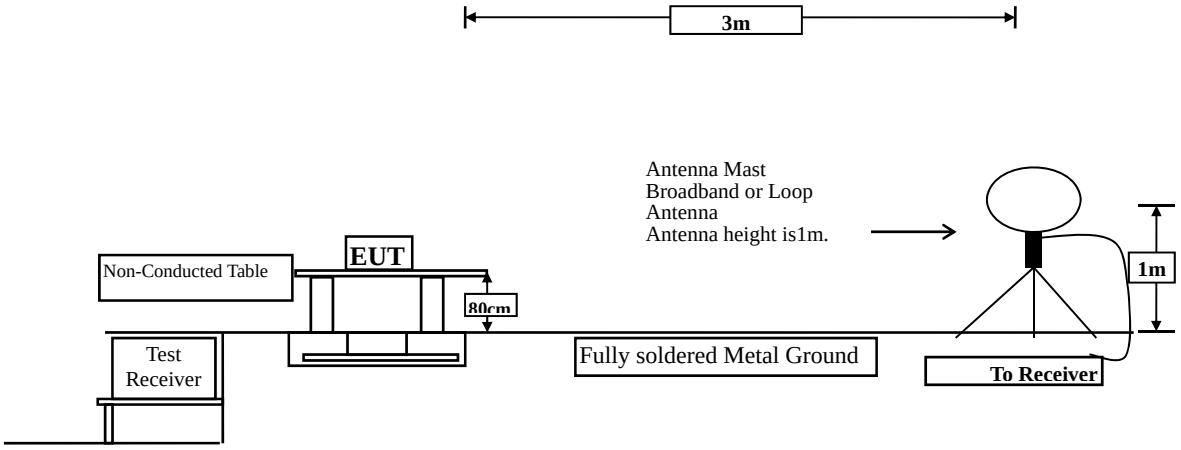
Maximum EIRP measurement:

Channel No.	Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
50	5250	13.62	1.11	14.73	<30	Pass

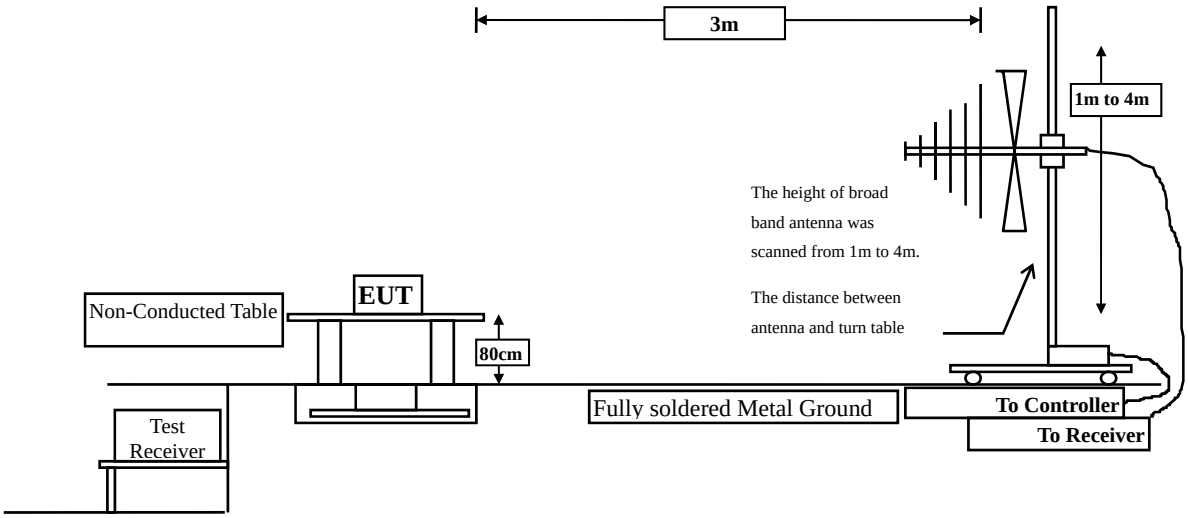
6. Radiated Emission

6.1. Test Setup

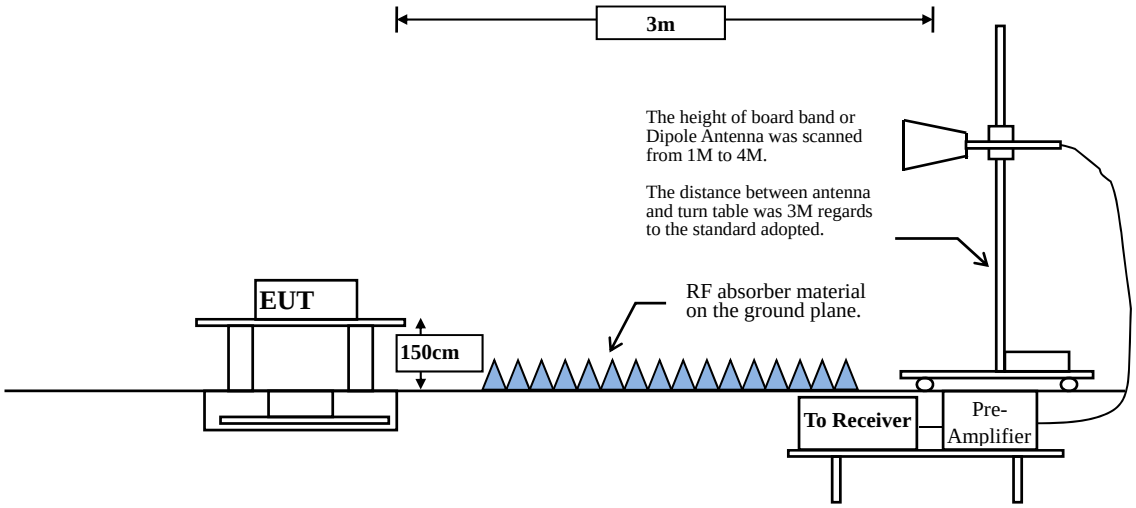
Radiated Emission Under 30 MHz



Radiated Emission Below 1 GHz



Radiated Emission Above 1 GHz



6.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

RSS-Gen Issue 5 Section 8.9 **FCC Part 15 Subpart C Paragraph 15.209(a)**		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBμV/m) = 20 log E field strength (μV/m)

6.3. Test Procedure

Measuring the frequency range below 1 GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1 GHz, the EUT is placed on a turn table which is 1.5 meter above ground.
The turn table is rotated 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.
The resolution bandwidth below 30 MHz setting on the field strength meter is 9 kHz and
30 MHz~1 GHz is 120 kHz and above 1 GHz is 1 MHz.
Radiated emission measurements below 30 MHz are made using Loop Antenna and 30 MHz~1 GHz are made using broadband Bilog antenna and above 1 GHz are made using Horn Antennas.
The measurement is divided into the Preliminary Measurement and the Final Measurement.
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.
The measurement frequency range form 9 kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:
According to KDB 789033 section II.G.5 Procedure for Unwanted Maximum Emissions Measurements above 1000 MHz.
RBW = 1 MHz.
VBW ≥ 3 MHz.

According to KDB 789033 section II.G.6 Procedures for Average Unwanted Emissions Measurements above 1000 MHz.
RBW = 1 MHz.
VBW = 10 Hz, when duty cycle ≥ 98 %
VBW ≥ 1/T, when duty cycle < 98 %
(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

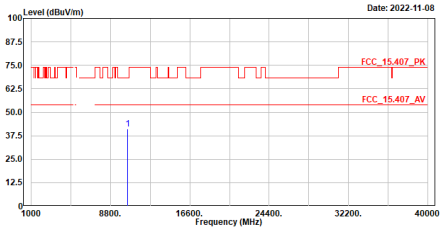
5 GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
802.11 ac160	98.54	5.4000	185	10

Note: Duty Cycle Refer to Section 7.

6.4. Test Result of Radiated Emission

NB_SISO B:

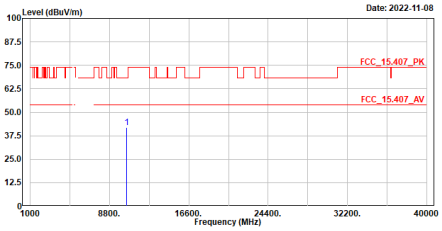
Site :HY-CB03
Condition :3m ,HORIZONTAL
Mode :TX_ac160_5250MHz
TEST BY :Jing Chang



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	10500.000	41.20	68.22	-27.02	46.19	-4.99	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Site :HY-CB03
Condition :3m ,VERTICAL
Mode :TX_ac160_5250MHz
TEST BY :Jing Chang

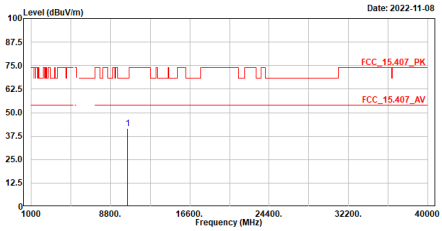


No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	10500.000	41.91	68.22	-26.31	46.90	-4.99	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

PAD_SISO B:

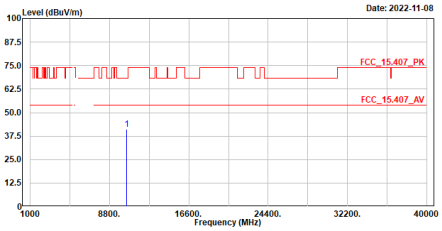
Site :HY-CB03
Condition :3m ,HORIZONTAL
Mode :TX_ac160_5250MHz
TEST BY :Jing Chang



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	10500.000	41.41	68.22	-26.81	46.40	-4.99	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Site :HY-CB03
Condition :3m ,VERTICAL
Mode :TX_ac160_5250MHz
TEST BY :Jing Chang

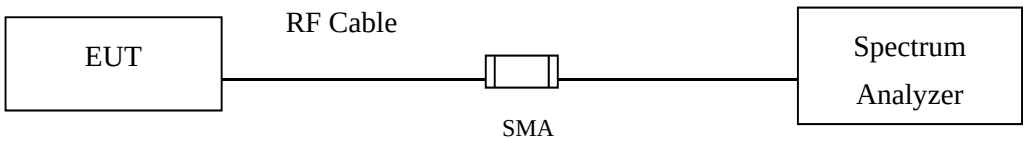


No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	10500.000	41.21	68.22	-27.01	46.20	-4.99	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

7. Duty Cycle (5GHz)

7.1. Test Setup



7.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to U-NII test procedure of KDB789033 for compliance to RSS-247 requirements.

7.3. Test Result of Duty Cycle

Product : WLAN and BT, 2x2 PCIe M.2 2230 adapter card
Test Item : Duty Cycle
Test Mode : Transmit

Duty Cycle Formula:

Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/Duty Cycle)

SISO B Results:

5 GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11 ac160	5.4000	5.4800	98.54	0.06