

Test Report No:
2280486R-RFNAOTHV02-B

VARIANT TEST REPORT

FCC Rules&Regulations

Product Name	Dual-band Wireless-AC1200 USB Adapter
Brand Name	ASUS
Model No.	USB-AC53 Nano
FCC ID	MSQ-USBACRN00
Applicant's Name / Address	ASUSTeK Computer Inc 1F, No. 15, Lide Rd. Beitou, Taipei, 112, Taiwan
Manufacturer's Name / Address	ASUSTeK Computer Inc 1F, No. 15, Lide Rd. Beitou, Taipei, 112, Taiwan
Test Method Requested, Standard	FCC CFR Title 47 Part 15 Subpart E Section 15.407 ANSI C63.10-2013
Verdict Summary	IN COMPLIANCE
Documented By	<i>Hailey Peng</i> Hailey Peng / Senior Engineer
Approved By	<i>Rueyuan Lin</i> Rueyuan Lin / Supervisor
Date of Receipt	Aug. 16, 2022
Date of Issue	Mar. 25, 2023
Report Version	V1.0

INDEX

	page
Competences and Guarantees.....	4
General Conditions	4
Revision History	5
Permissive Change.....	6
1. General Information	7
1.1. EUT Description.....	7
1.2. Test Mode	9
1.3. Comments and Remarks.....	9
1.4. Tested System Details	10
1.5. Configuration of tested System	10
1.6. EUT Operation of during Test	10
1.7. Test Facility	11
1.8. List of Test Equipment	12
1.9. Measurement Uncertainty	13
1.10. Duty Cycle	14
2. Antenna Requirements	15
3. Emission Bandwidth.....	16
3.1. Test Setup.....	16
3.2. Test Limit.....	16
3.3. Test Procedure	16
3.4. Test Specification.....	16
3.5. Test Result of Emission Bandwidth	17
4. Maximum Conducted Output Power	18
4.1. Test Setup.....	18
4.2. Test Limit.....	18
4.3. Test Procedure	19
4.4. Test Specification.....	19
4.5. Test Result of Maximum Conducted Output Power	20
5. Maximum Power Spectral Density	21
5.1. Test Setup.....	21
5.2. Test Limit.....	21
5.3. Test Procedure	21
5.4. Test Specification.....	21
5.5. Test Result of Maximum Power Spectral Density.....	22
6. Radiated Emission	23
6.1. Test Setup.....	23
6.2. Test Limit.....	24

6.3.	Test Procedure	25
6.4.	Test Specification.....	25
6.5.	Test Result of Radiated Emissions (30 MHz ~ 1 GHz).....	26
6.6.	Test Result of Radiated Emissions (1 GHz ~ 10 th Harmonic)	27
7.	Radiated Emission Band Edge	28
7.1.	Test Setup.....	28
7.2.	Test Limit.....	29
7.3.	Test Procedure	30
7.4.	Test Specification.....	30
7.5.	Test Result of Radiated Emission Band Edge.....	31
Appendix A.....		32
☐	Test Setup Photograph	32

Competences and Guarantees

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

General Conditions

1. The test results relate only to the samples tested.
2. 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.
3. This report must not be used to claim product endorsement by TAF or any agency of the government.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
5. 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.

Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Mar. 25, 2023

Permissive Change

Report No.	Version	Description	Issued Date
1690125R-RFUSP45V00	V1.0	Original application.	Dec. 07, 2016
1690125R-RFUSP45V00-A	V1.0	<u>Class I Permissive Change (C1PC)</u> Adding the second source of thermal pad (Manufacturer: LiPOLY). After evaluating, it was verified the radiation below 1 GHz test, does not affect the test result.	Jan. 16, 2017
2280486R-RFNAOTHV02-B	V1.0	<u>Class II Permissive Change (C2PC)</u> 1. Changing the address of applicant and manufacturer to "1F, No. 15, Lide Rd. Beitou, Taipei, 112, Taiwan" from "4F, No. 150, Li-Te Rd., Beitou, Taipei, Taiwan". 2. There is no hardware or electrical modification made to the applying modular transmitter itself. Adding 1 set (set 2 antenna) same type of monopole antenna with lower gain than the original certificate. After evaluating, it was verified for all test items, and they are based on worst case of original test report to perform test.	Mar. 25, 2023

1. General Information

1.1. EUT Description

Product Name	Dual-band Wireless-AC1200 USB Adapter	
Brand Name	ASUS	
Model No.	USB-AC53 Nano	
EUT Voltage	DC 5V (host equipment)	
Frequency Range / Channel Number	IEEE 802.11a / IEEE 802.11n (20 MHz) / IEEE 802.11ac (20 MHz)	5180 ~ 5240 MHz / 4 Channels 5745 ~ 5825 MHz / 5 Channels
	IEEE 802.11n (40 MHz) / IEEE 802.11ac (40 MHz)	5190 ~ 5230 MHz / 2 Channels 5755 ~ 5795 MHz / 2 Channels
	IEEE 802.11ac (80 MHz)	5210 MHz / 1 Channel 5775 MHz / 1 Channel
Type of Modulation	IEEE 802.11a/n/ac	OFDM
Data Rate	IEEE 802.11a	6, 9, 12, 18, 24, 36, 48, 54 Mbps
	IEEE 802.11n	Support a subset of the combination of GI, MCS 0 ~ MCS 15 and bandwidth defined in 802.11n
	IEEE 802.11ac	Support a subset of the combination of GI, MCS 0 ~ MCS 9 and bandwidth defined in 802.11ac

The EUT has two has two sources of thermal pad for marketing:

Sources of thermal pad	Manufacturer
Main source	CHENG RUENN
Second source	LiPOLY

Antenna Information							
Set	Ant.	Brand Name	Model No.	Type	Antenna Gain (dBi)		
					2.4GHz	5GHz Band 1	5GHz Band 4
1	0	WIESON	GY197HT632-002	Monopole	1.81	0.08	1.70
	1	WIESON	GY197HT632-002	Monopole	0.36	-0.23	-4.63
Set	Ant.	Brand Name	Model No.	Type	Antenna Gain (dBi)		
					2.4GHz	5GHz Band 1	5GHz Band 4
2	0	FOXCONN	7B0911V00-G1J-G	Monopole	1.20	-0.80	1.20
	1	FOXCONN	7B0911V00-G1J-G	Monopole	-0.20	-0.60	-4.50

The EUT has two sets of antenna and there are two antennas for each set.

Because set 1 antenna and set 2 antenna are the same type antennas, only the higher gain antennas "set 1 antenna" was tested and recorded in the original report (DEKRA project number: 1690125R).

<WiFi 2.4GHz - 802.11b/g/n and 5GHz Function - 802.11a/n/ac>

For IEEE 802.11a/b/g: (1TX/1RX)

Only Ant. 0 can be used as transmitting/receiving functions.

For IEEE 802.11n/ac: (2TX, 2RX)

Both Ant. 0 and Ant. 1 can be used as transmitting/receiving antennas, and them can transmit/receive signal simultaneously.

EUT Operational Condition	
Testing Voltage	DC 5V

IEEE 802.11a & IEEE 802.11n/ac (20 MHz)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz	48	5240 MHz
149	5745 MHz	153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	-	-	-	-	-	-

IEEE 802.11n/ac (40 MHz)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	151	5755 MHz	159	5795 MHz

IEEE 802.11ac (80 MHz)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	155	5775 MHz	-	-	-	-

Note: The above EUT information is declared by the manufacturer.

1.2. Test Mode

DEKRA has verified the construction and function in typical operation. The preliminary tests were performed in different data rate, and to find the worst condition, which was shown in this test report. The following table is the final test mode.

Test Mode	Mode 1: Transmit
-----------	------------------

Test Items	Test Mode	Modulation	Channel	Antenna	Result
Emission Bandwidth	Mode 1	11a	36	0	Pass
Maximum Conducted Output Power	Mode 1	11a	36/44/48/149/157/165	0	Pass
		11n (20 MHz)	36/44/48/149/157/165	0+1	Pass
		11n (40 MHz)	38/46/151/159	0+1	Pass
		11ac (80 MHz)	42/155	0+1	Pass
Maximum Power Spectral Density	Mode 1	11a	36	0	Pass
Radiated Emission	Mode 1	11a	165	0	Pass
Radiated Emission Band Edge	Mode 1	11a	165	0	Pass

Note: Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

1.3. Comments and Remarks

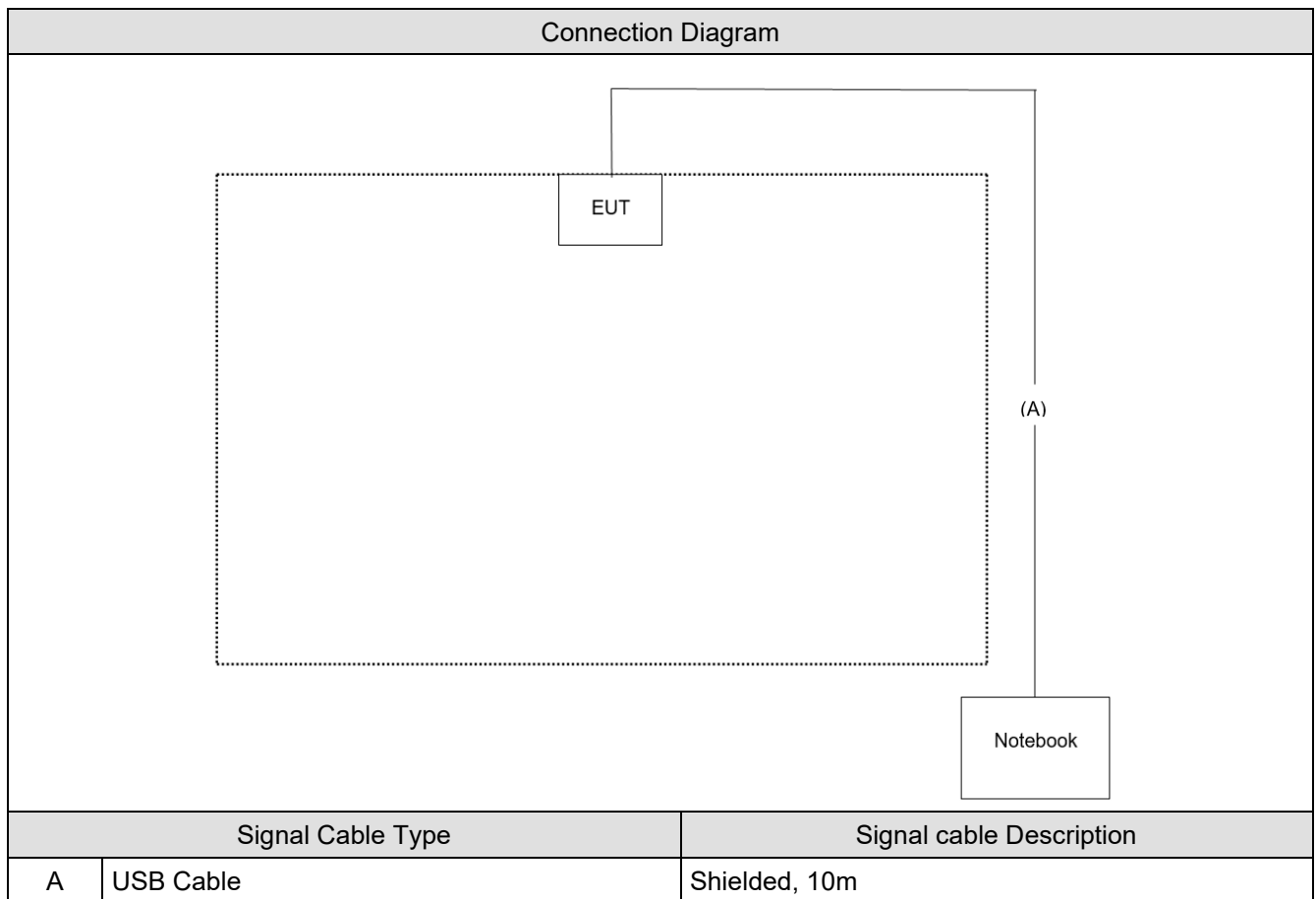
The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy.

1.4. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system.

	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook	DELL	Latitude E6320	8208580717	N/A

1.5. Configuration of tested System



1.6. EUT Operation of during Test

1	Execute control command by software "MP Tool v6.03".
2	Configure the test mode, the test channel, and the data rate.
3	Press "Start TX" to start the continuous transmitting.
4	Verify that the EUT works properly.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Actually	Tested by	Test Date	Test Site
Temperature (°C)	99% & 26dB & DTS Bandwidth	21.3	Scott Chang	2023/03/24	HC-SR12
Humidity (%RH)		58			
Temperature (°C)	Maximum Conducted Output Power	19.1	Scott Chang	2023/03/23	HC-SR12
Humidity (%RH)		55			
Temperature (°C)	Maximum Power Spectral Density	21.3	Scott Chang	2023/03/24	HC-SR12
Humidity (%RH)		58			
Temperature (°C)	Radiated Emission	23	Cyri Chen	2023/03/23	HC-CB02
Humidity (%RH)		61			
Temperature (°C)	Radiated Emission Band Edge	23	Cyri Chen	2023/03/23	HC-CB02
Humidity (%RH)		61			

Note: Test site information refers to Laboratory Information.

Laboratory Information

USA : FCC Registration Number: TW3024
Canada : CAB identifier : TW3024

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
E mail address	info.tw@dekra.com
Website	http://www.dekra.com.tw
Note: Test site number for address 1 includes HC-SR02. Test site number for address 2 includes HC-CB02, HC-CB03, HC-CB04, HC-SR10 and HC-SR12.	

1.8. List of Test Equipment

HC-SR12

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2022/11/02	2023/11/01
Pulse Power Sensor	Anritsu	MA2411B	1531043	2022/11/02	2023/11/01
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2022/12/13	2023/12/12
Pulse Power Sensor	Anritsu	MA2411B	1531044	2022/11/02	2023/11/01
Signal and Spectrum Analyzer	R&S	FSVA40	101435	2022/05/30	2023/05/29

HC-CB02

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2022/09/29	2023/09/28
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2022/12/13	2023/12/12
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	1272	2022/05/19	2023/05/18
Double Ridged Horn Antenna	RF SPIN	DRH18-E	211211A18EN	2022/11/15	2023/11/14
Horn Antenna	Schwarzbeck	BBHA 9170	203	2023/02/13	2024/02/12
Pre-Amplifier	EMCI	EMC01820I	980365	2022/04/15	2023/04/14
Pre-Amplifier	EMEC	EM01G18GA	060741	2022/05/06	2023/05/05
Pre-Amplifier	DEKRA	AP-400C	201801231	2022/09/27	2023/09/26
EMI Test Receiver	R&S	ESR7	102260	2022/12/01	2023/11/30
Magnetic Loop Antenna	Teseq	HLA 6121	44287	2022/10/21	2023/10/20
Coaxial Cable(13m)	Suhner	SF104	HC-CB02	2022/08/15	2023/08/14
Coaxial Cable(3m)	Suhner,Rosno	SF102_UP0264	HC-CB02_1	2022/08/14	2023/08/13
Radiated Software	AUDIX	e3 V9	HC-CB02_1	N/A	N/A

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

1.9. Measurement Uncertainty

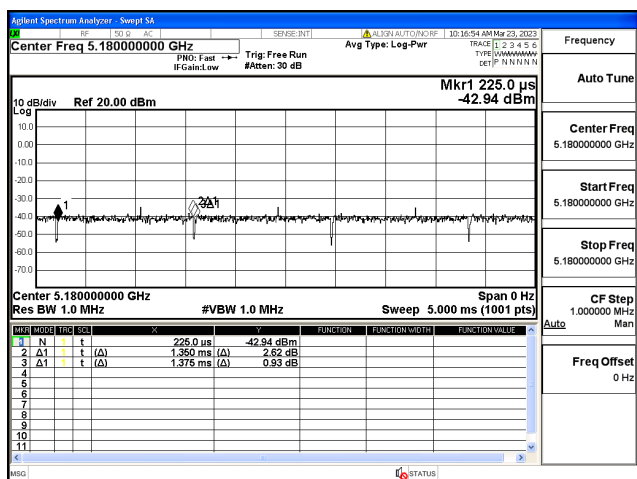
Uncertainties have been calculated according to the DEKRA internal document with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

Test Item	Uncertainty
99% & 26dB & DTS Bandwidth	± 636.54 Hz
Maximum Conducted Output Power	± 1.16 dB
Maximum Power Spectral Density	± 2.47 dB
Radiated Emission	± 3.52 dB below 1 GHz ± 3.56 dB above 1 GHz
Radiated Emission Band Edge	± 3.56 dB

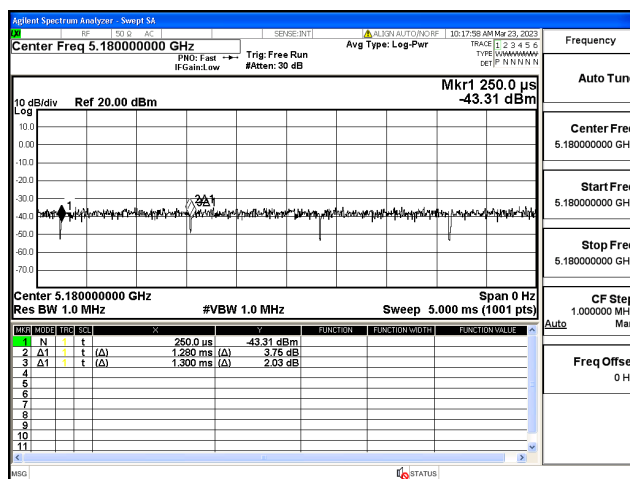
1.10. Duty Cycle

Modulation	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	1.350	1.375	98.54	0.064	0.010
802.11n (20 MHz)	1.280	1.300	98.46	0.067	0.010
802.11n (40 MHz)	0.614	0.655	93.74	0.281	1.629
802.11ac (80 MHz)	0.290	0.337	86.05	0.652	3.448

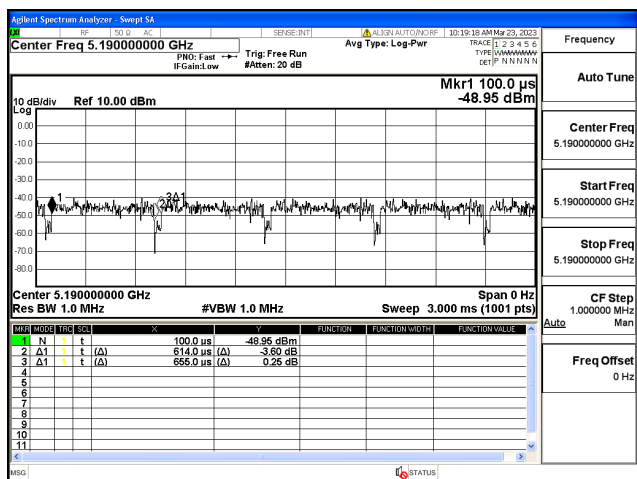
802.11a



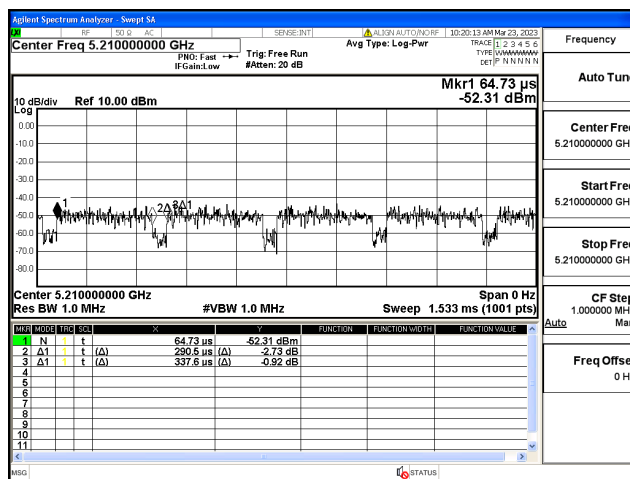
802.11n (20 MHz)



802.11n (40 MHz)



802.11ac (80 MHz)

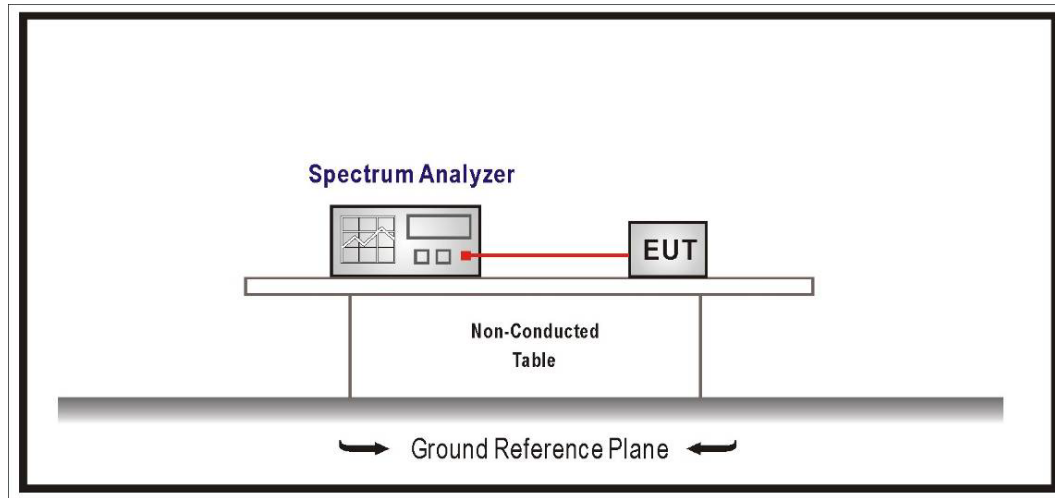


2. Antenna Requirements

According to FCC 47CFR 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.

3. Emission Bandwidth

3.1. Test Setup



3.2. Test Limit

99% & 26dB Bandwidth : No Required

6dB Bandwidth $\geq$ 500kHz

3.3. Test Procedure

99% & 26dB Bandwidth :

The EUT was tested according to U-NII test procedure of KDB 789033.D02 V02r01

Set RBW 1% of the emission bandwidth, VBW equal to 3 times the RBW.

DTS Bandwidth :

Set RBW = 100kHz, VBW $\geq$ 3xRBW, Sweep time=Auto, Set Peak detector.

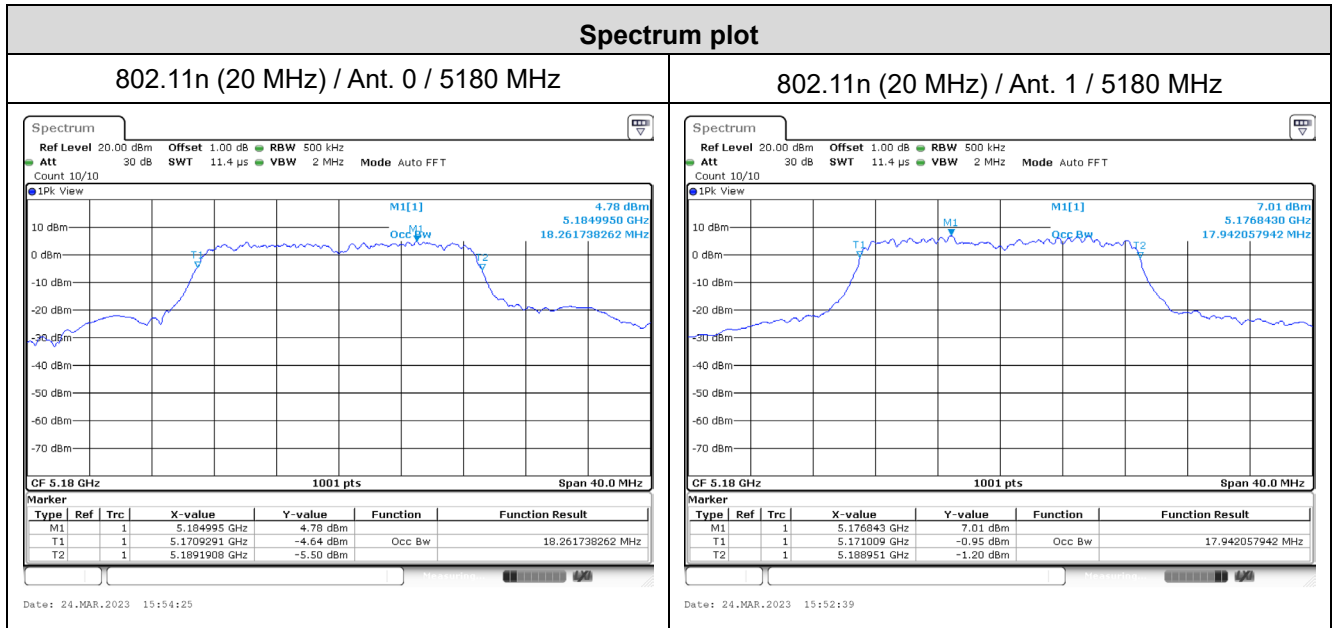
3.4. Test Specification

According to FCC CFR Title 47 Part 15 Subpart E.

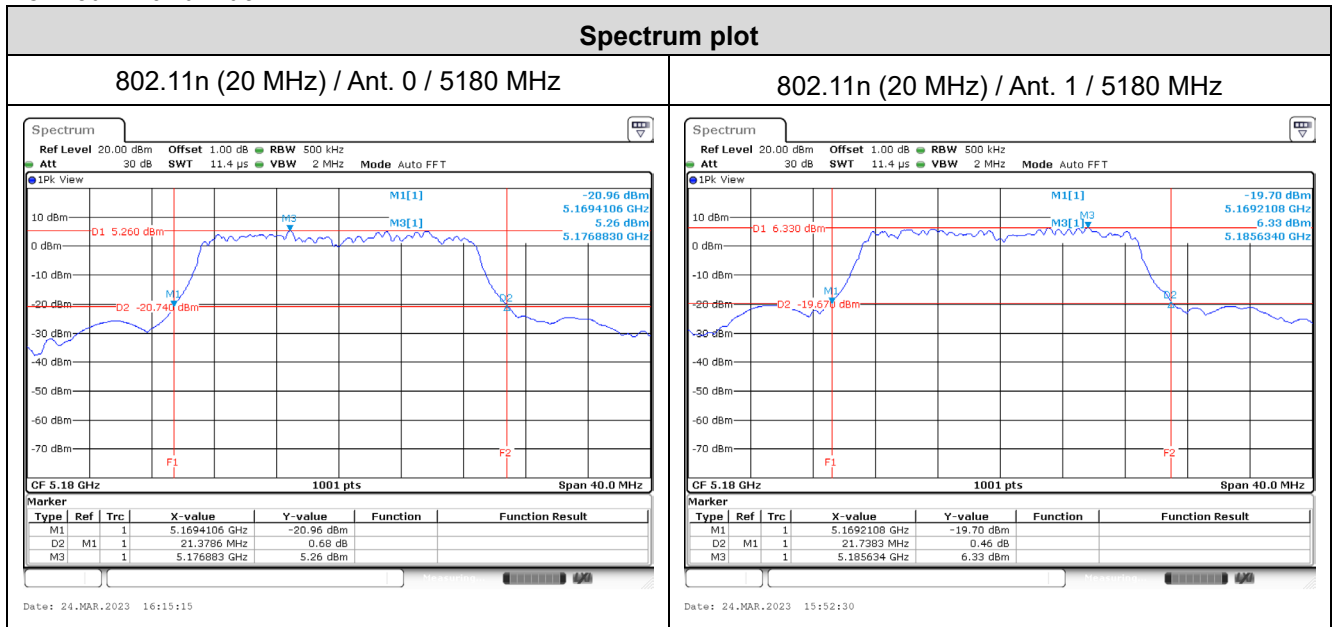
3.5. Test Result of Emission Bandwidth

Modulation	Channel	Frequency (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		Limit (MHz)
			Ant. 0	Ant. 1	Ant. 0	Ant. 1	99% & 26dB Bandwidth
802.11n (20 MHz)	36	5180	18.261	17.940	21.378	21.738	-

For 99% Bandwidth:

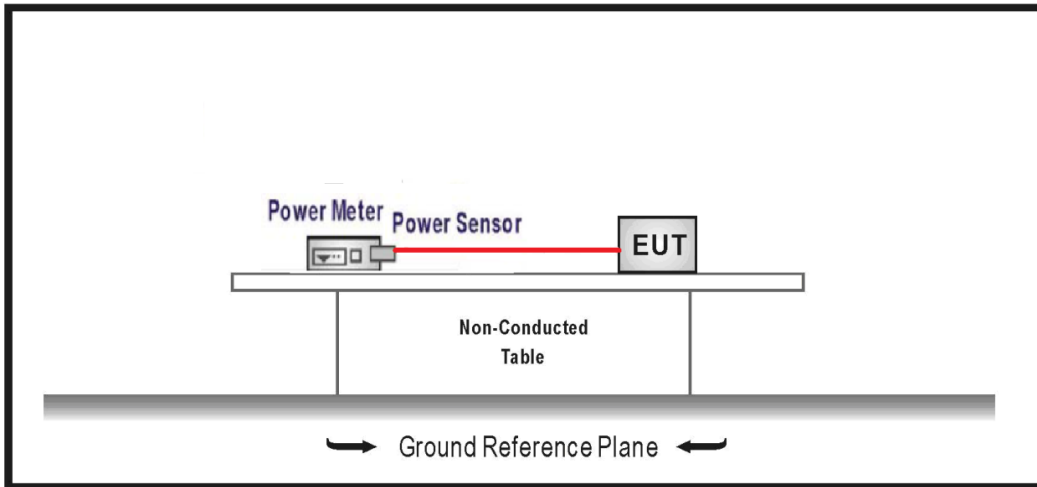


For 26dB Bandwidth:



4. Maximum Conducted Output Power

4.1. Test Setup



4.2. Test Limit

1. For an outdoor access point and an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
2. 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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
3. For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.3. Test Procedure

The EUT was setup to ANSI C63.10: 2013; tested to U-NII test procedure of 789033 D02 V02r01 for compliance to FCC CFR Title 47 Part 15 Subpart E.

4.4. Test Specification

According to FCC CFR Title 47 Part 15 Subpart E.

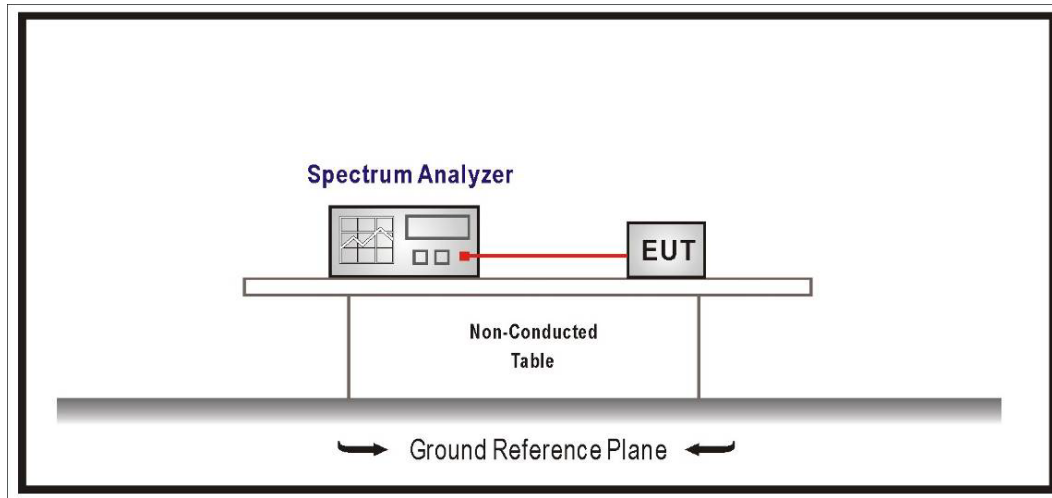
4.5. Test Result of Maximum Conducted Output Power

Modulation	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result
			Ant. 0		
802.11a	36	5180	12.28	≤ 24.00	Pass
	44	5220	12.65	≤ 24.00	Pass
	48	5240	12.85	≤ 24.00	Pass
	149	5745	12.55	≤ 30.00	Pass
	157	5785	12.48	≤ 30.00	Pass
	165	5825	12.67	≤ 30.00	Pass

Modulation	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)			Limit (dBm)	Result
			Ant. 0	Ant. 1	Total		
802.11n (20 MHz)	36	5180	12.46	12.66	15.57	≤ 24.00	Pass
	44	5220	12.75	12.55	15.66	≤ 24.00	Pass
	48	5240	12.72	12.51	15.62	≤ 24.00	Pass
	149	5745	12.71	12.68	15.70	≤ 30.00	Pass
	157	5785	12.66	12.44	15.56	≤ 30.00	Pass
	165	5825	12.65	12.51	15.59	≤ 30.00	Pass
802.11n (40 MHz)	38	5190	9.47	9.44	12.46	≤ 24.00	Pass
	46	5230	12.72	12.65	15.69	≤ 24.00	Pass
	151	5755	12.74	12.71	15.73	≤ 30.00	Pass
	159	5795	12.79	12.45	15.63	≤ 30.00	Pass
802.11ac (80 MHz)	42	5210	7.46	7.33	10.40	≤ 24.00	Pass
	155	5775	11.35	11.47	14.42	≤ 30.00	Pass

5. Maximum Power Spectral Density

5.1. Test Setup



5.2. Test Limit

1. For the band 5.15 ~ 5.25 GHz, the peak power spectral density shall not exceed 17 dBm in any 1 MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
2. For client devices in the 5.15 ~ 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi
3. For the 5.25 ~ 5.35 GHz ,5470 ~ 5600 MHz and 5650 ~ 5725 MHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
4. For the band 5.725 ~ 5.850 GHz, the peak power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

5.3. Test Procedure

The EUT was setup to ANSI C63.10: 2013; tested to U-NII test procedure of KDB 789033.D02 V02r01 for compliance to FCC CFR Title 47 Part 15 Subpart E requirements.

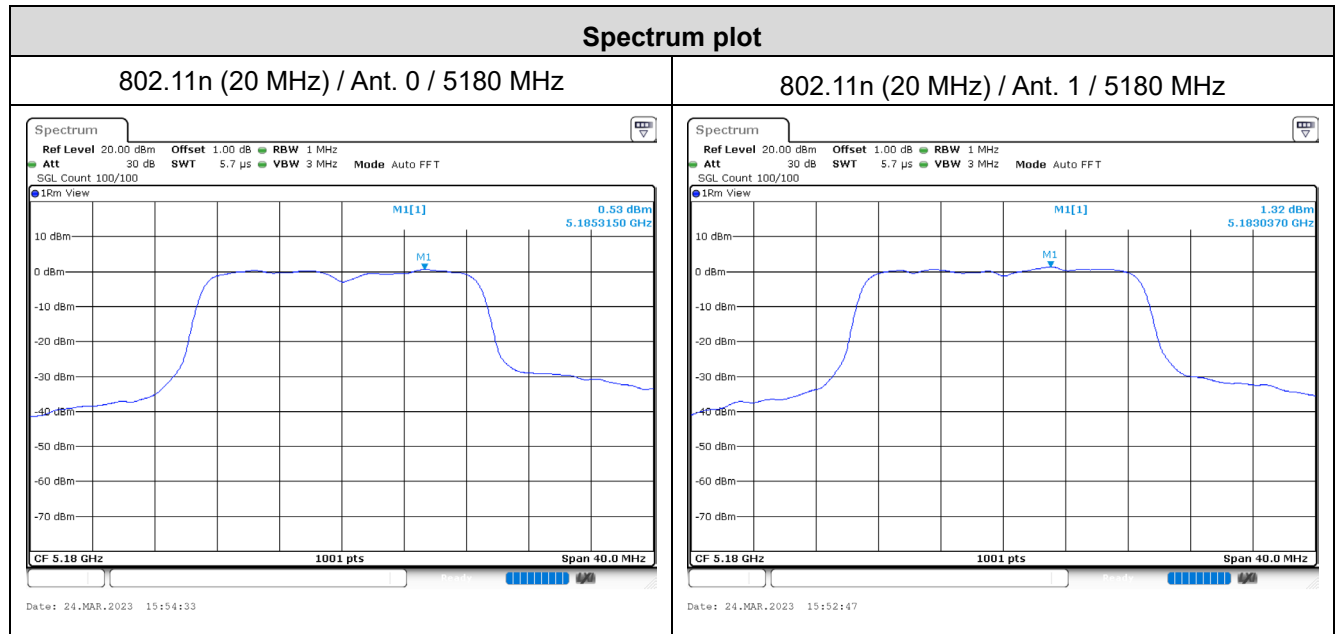
5.4. Test Specification

According to FCC CFR Title 47 Part 15 Subpart E.

5.5. Test Result of Maximum Power Spectral Density

Modulation	Channel	Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
			Ant. 0	Ant. 1	Total		
802.11n (20 MHz)	36	5180	0.530	1.320	4.021	≤ 11.00	Pass

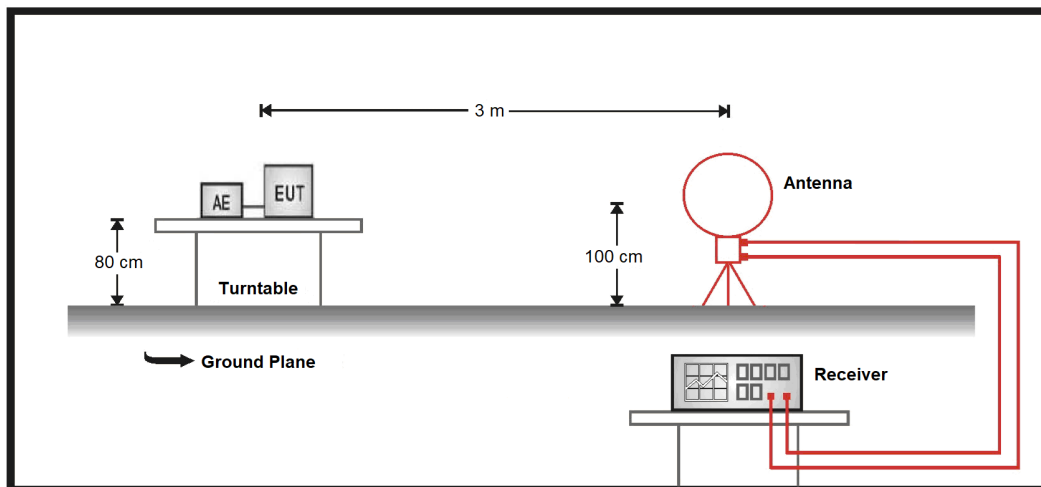
Note: Total power spectral density = power spectral density + duty factor, and the duty factor refer to section 1.10.



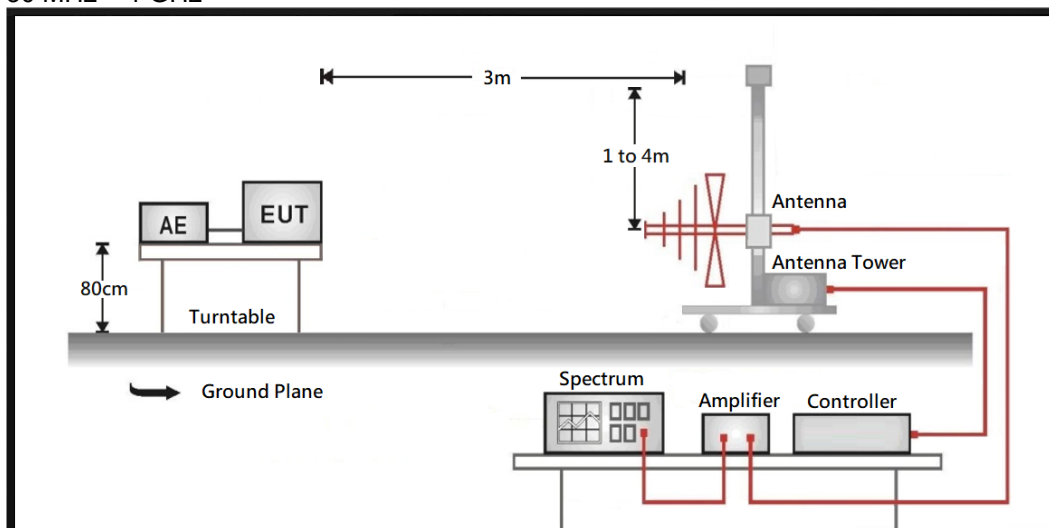
6. Radiated Emission

6.1. Test Setup

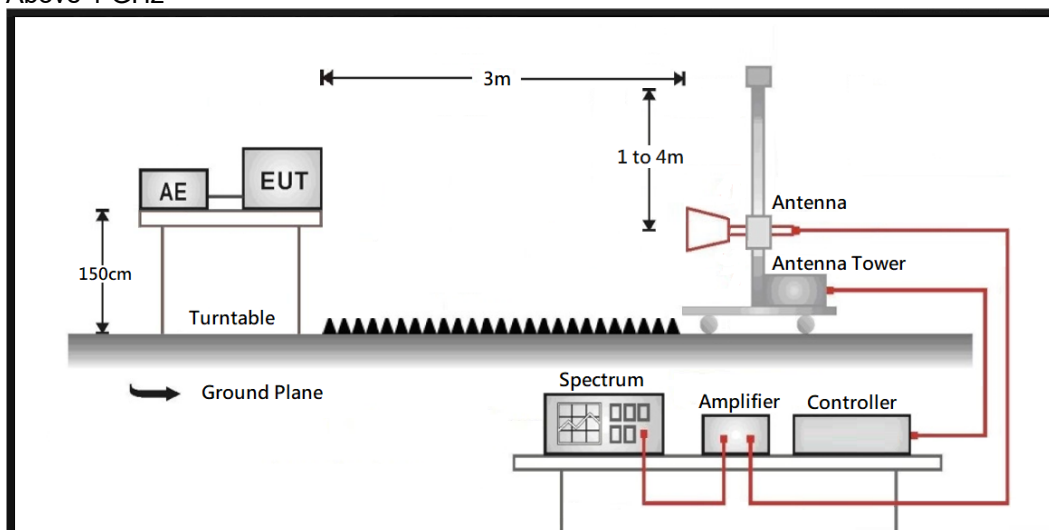
9 kHz ~ 30 MHz



30 MHz ~ 1 GHz



Above 1 GHz



6.2. Test Limit

General Radiated Emission Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 30 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	20 log (2400/F(kHz))	300
0.490 – 1.705	24000/F(kHz)	20 log (24000/F(kHz))	30
1.705 - 30	30	29.5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
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

Unwanted Emission out of the restricted bands Test Limit

Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength (dBuV/m@3m)
5150 - 5250	-27	68.2
5250 - 5350	-27	68.2
5470 - 5725	-27	68.2
5725 - 5850	-27 ^{*1}	68.2 ^{*1}
	10 ^{*2}	105.2 ^{*2}
	15.6 ^{*3}	110.8 ^{*3}
	27 ^{*4}	122.2 ^{*4}

^{*1} beyond 75 MHz or more above of the band edge.

^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.

^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.

^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Remark:

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

$$E = \frac{1000000\sqrt{30P}}{3} \text{ uV/m, where P is the eirp (Watts).}$$

6.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 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 can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The additional latch filter below 1 GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement.

The bandwidth below 1 GHz setting on the field strength meter is 120 kHz, above 1 GHz are 1 MHz.

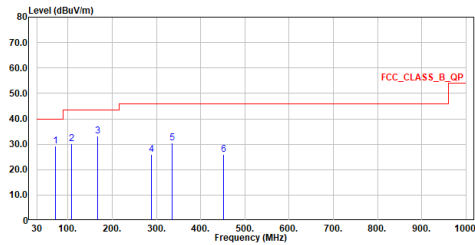
The frequency range from 9 kHz to 10th harmonics and included The frequency range from the lowest oscillator frequency generated within the device up to the 10th harmonic was checked is checked.

6.4. Test Specification

According to FCC CFR Title 47 Part 15 Subpart E.

6.5. Test Result of Radiated Emissions (30 MHz ~ 1 GHz)

Site :HC-CB02
Condition :3m Horizontal
Mode :LF_a_TX_5825MHz
Test by :Cyril

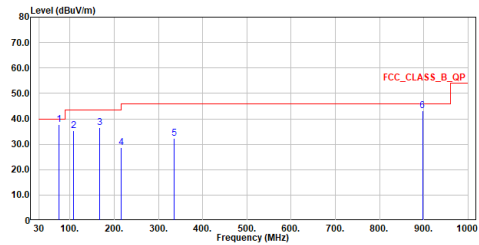


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	72.195	29.28	40.00	-10.72	33.85	-4.57	QP
2	107.988	30.25	43.50	-13.25	36.32	-6.07	QP
3	167.498	33.23	43.50	-10.27	35.91	-2.68	QP
4	287.972	25.97	46.00	-20.03	28.04	-2.07	QP
5	335.065	30.52	46.00	-15.48	31.25	-0.73	QP
6	451.029	26.05	46.00	-19.95	23.59	2.46	QP

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.
5. The other emission levels were very low against the limit.

Site :HC-CB02
Condition :3m Vertical
Mode :LF_a_TX_5825MHz
Test by :Cyril



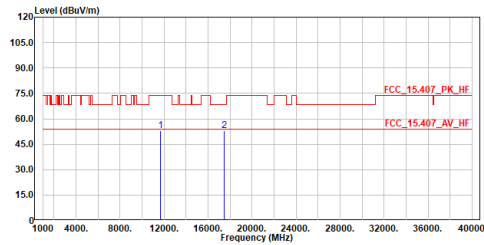
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	75.105	37.63	40.00	-2.37	42.97	-5.34	QP
2	107.988	35.23	43.50	-8.27	41.30	-6.07	QP
3	167.449	36.59	43.50	-6.91	39.26	-2.67	QP
4	215.949	28.72	43.50	-14.78	34.62	-5.90	QP
5	335.696	32.36	46.00	-13.64	33.08	-0.72	QP
6	897.035	43.19	46.00	-2.81	33.01	10.18	QP

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.
5. The other emission levels were very low against the limit.

6.6. Test Result of Radiated Emissions (1 GHz ~ 10th Harmonic)

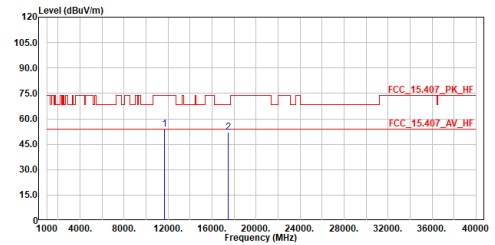
Site :HC-CB02
Condition :3m Horizontal
Mode :a_TX_5825MHz
Test by :Cyril



No.	Frequency MHz	Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	11650.000	53.16	74.00	-20.84	53.20	-0.04	Peak
2	17475.000	52.88	68.20	-15.32	49.46	3.42	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB02
Condition :3m Vertical
Mode :a_TX_5825MHz
Test by :Cyril

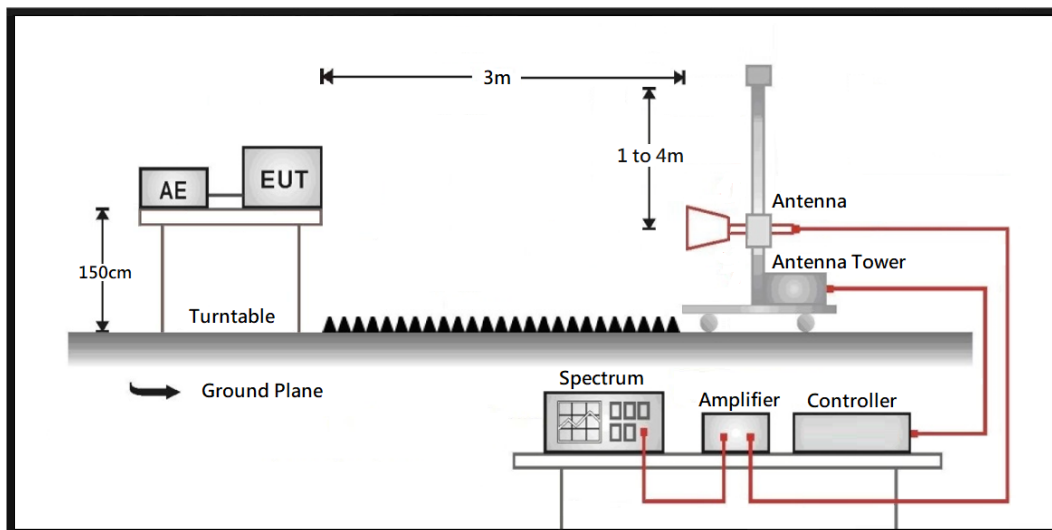


No.	Frequency MHz	Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	11650.000	53.91	74.00	-20.09	53.95	-0.04	Peak
2	17475.000	52.19	68.20	-16.01	48.77	3.42	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

7. Radiated Emission Band Edge

7.1. Test Setup



7.2. Test Limit

General Radiated Emission Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 30 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Remarks:

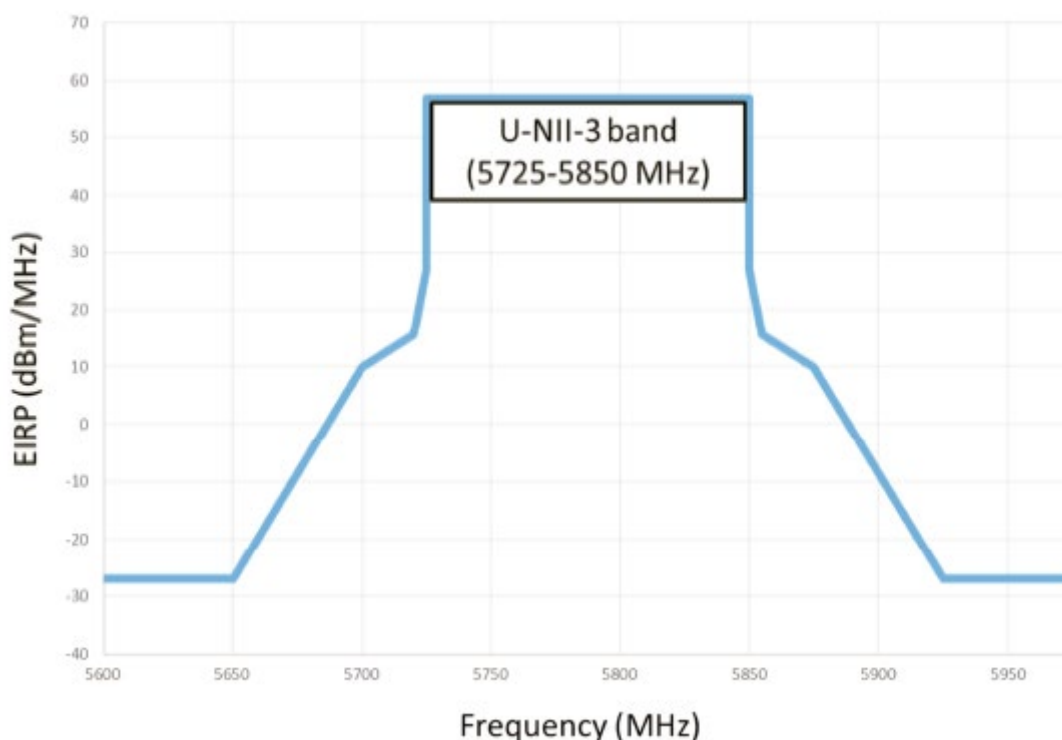
1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Unwanted Emission out of the restricted bands Test Limit

Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength (dBuV/m@3m)
5150 - 5250	-27	68.2
5250 - 5350	-27	68.2
5470 - 5725	-27	68.2

For transmitters operating in the 5.725 ~ 5.85 GHz band

All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.



Remark:

1. For frequencies more than 10 MHz above or below the band edges.
2. For frequency range from the band edges to 10 MHz above or below the band edges.
3.
$$\mu\text{V/m} = \frac{1000000\sqrt{30 \times EIRP}}{3}$$
, RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)

7.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 1.5 meter above ground. The turn table can rotate 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 can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

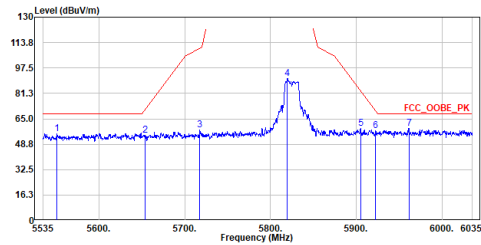
The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz.

7.4. Test Specification

According to FCC CFR Title 47 Part 15 Subpart E.

7.5. Test Result of Radiated Emission Band Edge

Site :HC-CB02
Condition :3m Horizontal
Mode :a_TX_5825MHz
Test by :Cyril

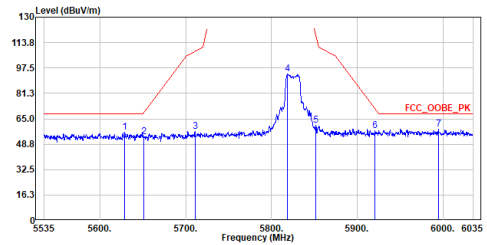


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	5551.000	55.65	68.20	-12.55	30.00	25.65	Peak
2	5653.500	54.67	70.80	-16.13	28.58	26.09	Peak
3	5717.750	57.82	110.17	-52.35	31.45	26.37	Peak
4	5819.750	90.70	-----	-----	63.89	26.81	Peak
5	5905.000	59.05	83.00	-23.95	31.07	27.18	Peak
6	5922.750	57.21	69.87	-12.66	29.96	27.25	Peak
7	5961.500	58.85	68.20	-9.35	31.42	27.43	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB02
Condition :3m Vertical
Mode :a_TX_5825MHz
Test by :Cyril



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	5629.250	56.19	68.20	-12.01	30.20	25.99	Peak
2	5651.250	53.71	69.13	-15.42	27.63	26.08	Peak
3	5711.000	57.05	108.28	-51.23	30.71	26.34	Peak
4	5818.750	93.46	-----	-----	66.66	26.80	Peak
5	5851.750	61.06	118.21	-57.15	34.12	26.94	Peak
6	5920.750	57.48	71.35	-13.87	30.23	27.25	Peak
7	5994.750	58.20	68.20	-10.00	30.63	27.57	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.