

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



**Applicant:** Qualcomm Technologies, Inc.  
5775 Morehouse Drive, San Diego, CA 92121-1714, United States

**Manufacturer:** Qualcomm Technologies, Inc.  
5775 Morehouse Drive, San Diego, CA 92121-1714, United States

**Product Name:** Micro-Power Wi-Fi LGA Module for IoT applications

**Brand Name:** Qualcomm

**Model No.:** QCC730M-0X

**Report Number:** TERF2501000169E2

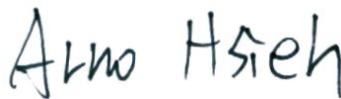
**FCC ID:** J9C-QCC730M0X

**Date of EUT Received:** January 09, 2025

**Date of Test:** January 14, 2025 ~ April 24, 2025

**Issue Date:** May 16, 2025

Approved By



Arno Hsieh

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247.

The results of this report relate only to the sample identified in this report.

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2501000169E2	00	Original	May 16, 2025	Sharon Kuo	

**Note:**

- 1、The remark "\*" indicates modification of the report upon requests from certification body.
- 2、Variant information of HW SKU is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.  
And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).

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## Table of Contents

1. GENERAL INFORMATION .....	4
2. SYSTEM TEST CONFIGURATION .....	7
3. SUMMARY OF TEST RESULTS.....	10
4. DESCRIPTION OF TEST MODES .....	11
5. MEASUREMENT UNCERTAINTY .....	13
6. MEASUREMENT EQUIPMENT USED.....	14
7. CONDUCTED EMISSION TEST .....	16
8. PEAK OUTPUT POWER MEASUREMENT.....	20
9. EMISSION BANDWIDTH MEASUREMENT .....	26
10. CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT .....	35
11. BANDEDGE AND SPURIOUS EMISSION MEASUREMENT.....	46
12. POWER SPECTRAL DENSITY.....	114
13. ANTENNA REQUIREMENT .....	119

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name	Micro-Power Wi-Fi LGA Module for IoT applications
Brand Name	Qualcomm
Model No.	QCC730M-0X
HW SKU	QCC730M-0XB, QCC730M-0XU
Hardware Version	N/A
Firmware Version	N/A
EUT Series No.	02E0X19489016
Power Supply	3.3Vdc
Test Software (Name/Version)	QSPR/ Version 6.00.00156.1

### 1.2 RF Specification

#### WLAN 2.4GHz

Mode	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology
			Peak	Avg.	
802.11b	2412~2472	13	26.03	21.28	DSSS
802.11g	2412~2472	13	25.55	21.72	OFDM
802.11n_HT20	2412~2472	13	26.43	21.59	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS in 802.11b			
		64QAM, 16QAM, QPSK, BPSK for OFDM in 802.11g,11n			
Data Rate:		802.11b: 1/2/5.5/11 Mbps			
		802.11g: 6/9/12/18/24/36/48/54 Mbps			
		802.11n_HT20:up to 72.2Mbps			

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### 1.3 HW SKU Difference Table

HW SKU	QCC730M-0XU	QCC730M-0XB
Antenna type	3 types: PIFA, Monopole, Dipole	1 type: PCB
ANT	No antenna matching	L3=0.3nH C40=0R L4=0.2pF L6=0R L7=NC

### 1.4 Antenna Designation

Antenna Type	Antenna Part No.	Freq.	Peak Antenna Gain (dBi)
PCB Antenna	RFIQM0730010XB001	2.4GHz	2.07
PIFA Antenna	RFPCA303510EMMB101		3.33
Dipole Antenna	RFPCA331010EMMB101		3.11
Monopole Antenna	RFPCA501010EMMB101		3.27

**Note:**

1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. Antenna information is provided by the applicant.

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## 1.5 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10:2013

## 1.6 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd.	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1 SAC 2 SAC 3 Conduction 1 Conducted 1 Conducted 2 Conducted 3 Conducted 4 Conducted 5 Conducted 6	TW0027	TW3702
Central RF Lab. (TAF code 3702)	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C SAC C SAC D SAC G Conducted A Conducted B Conducted C Conducted D Conducted E Conducted F Conducted G	TW0028	

**Note:** Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

## 1.7 Special Accessories

There are no special accessories used while test was conducted.

## 1.8 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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## 2.4 Measurement Results Explanation Example

### 2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

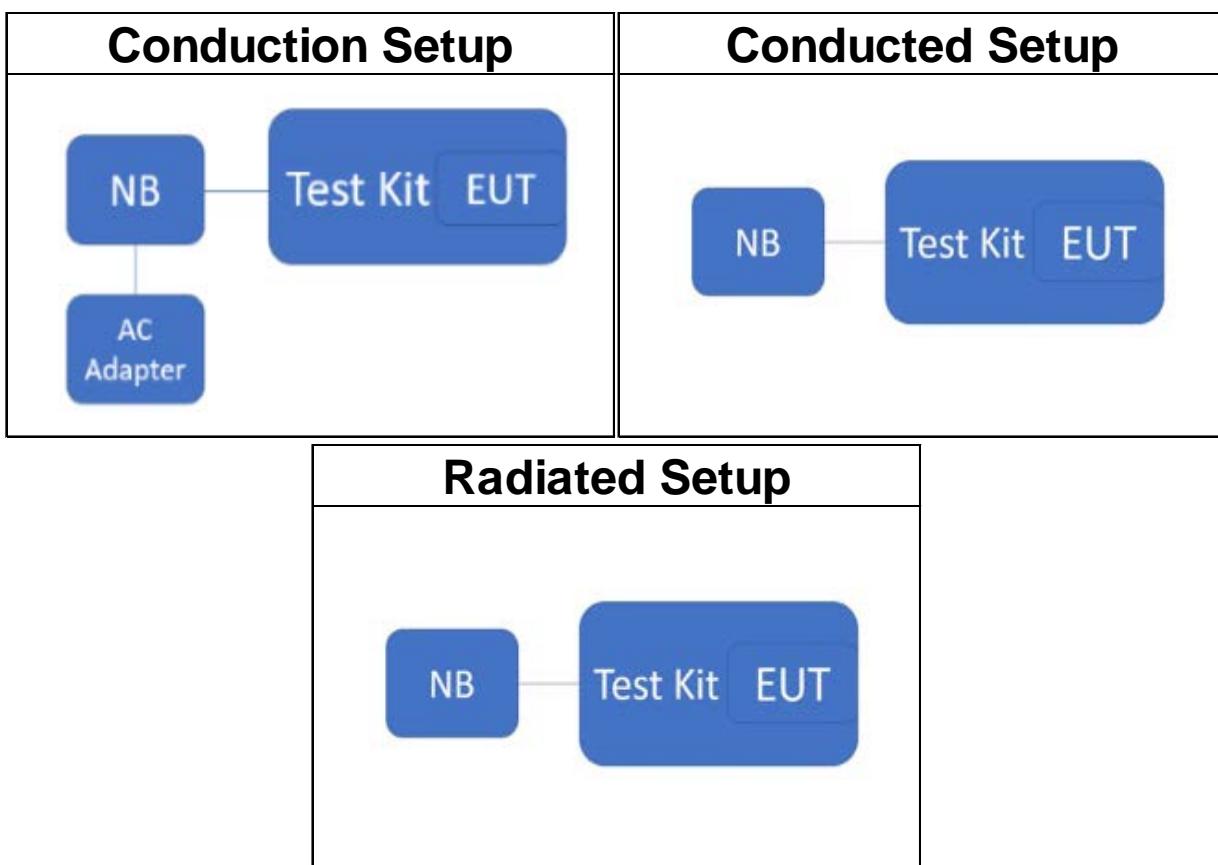
Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

## 2.5 Test Configuration



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## 2.6 Control Unit(s)

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
USB to Type-c	A-GOOD	USB to Type-c	N/A	N/A	N/A
USB Cable	Qionho	USB-C100	N/A	N/A	N/A
Notebook	Lenovo	L412	S0011357	N/A	N/A
NB Adapter	Lenovo	ADLX65YLC3A	8SSA10M13945L1C Z88N0F8W	N/A	N/A
QCC73X Module Development Kit Board	Walsin	QCC730-DVK	N/A	N/A	N/A

Conducted Emission Test Site: Conducted F					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Notebook	Lenovo	T14	P0003332	N/A	N/A
Type C USB cable	PowerSync	CUBCVARA0010	N/A	N/A	N/A
QCC73X Module Development Kit Board	Walsin	QCC730-DVK	N/A	N/A	N/A

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
USB to Type-c	A-GOOD	USB to Type-c	N/A	N/A	N/A
USB Cable	Qionho	USB-C100	N/A	N/A	N/A
Notebook	Lenovo	L412	S0011357	N/A	N/A
QCC73X Module Development Kit Board	Walsin	QCC730-DVK	N/A	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	Emission Bandwidth	Compliant
§15.209 §15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.209 §15.247(d)	Radiated Spurious Emission	Compliant
§15.205	Restricted Bands	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operating Frequencies

2400~2483.5 MHz	
20MHz	
CH	Freq. (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462
12	2467
13	2472

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## 4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among below modes.

Mode	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
<input checked="" type="checkbox"/> 802.11 b	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> 1TX	<input type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 g	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> 1TX	<input type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 n	<input checked="" type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> 1TX	<input type="checkbox"/> 2TX
<input type="checkbox"/> 802.11 ax	<input type="checkbox"/> Ch0	<input type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> 1TX	<input type="checkbox"/> 2TX

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 13	1,6,10,11,12,13	DSSS	1	Ch0
802.11g	1 to 13	1,2,3,6,8,9,10,11,12,13	OFDM	6	Ch0
802.11n_HT20	1 to 13	1,2,3,4,6,7,8,9,10,11,12,13	OFDM	MCS0	Ch0

TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 13	6	OFDM	6	Ch0

TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 13	1,6,11,12,13	DSSS	1	Ch0
802.11g	1 to 13	1,6,11,12,13	OFDM	6	Ch0
802.11n20	1 to 13	1,6,11,12,13	OFDM	MCS0	Ch0

### Note:

1. The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.
2. Radiated test was done with 50ohm terminator on antenna port.

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 1.54 dB
Output Power measurement	+/- 0.97 dB
Emission Bandwidth	+/- 1.38 Hz
Conducted emission measurement	+/- 0.77 dB
Peak Power Density	+/- 0.61 dB
Temperature	+/- 0.6 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
<b>Polarization: Vertical</b>	+/- 1.89 dB	9kHz~30MHz	
	+/- 4.1 dB	30MHz - 1000MHz	
	+/- 3.37 dB	1GHz - 18GHz	
	+/- 3.83 dB	18GHz - 40GHz	
<b>Polarization: Horizontal</b>	+/- 1.89 dB	9kHz~30MHz	
	+/- 4.1 dB	30MHz - 1000MHz	
	+/- 3.37 dB	1GHz - 18GHz	
	+/- 3.83 dB	18GHz - 40GHz	
<b>Radiated Spurious Emission</b>	+/- 2 dB	33GHz-50GHz	
	+/- 1.59 dB	50GHz-60GHz	
	+/- 1.71 dB	60GHz-90GHz	
	+/- 1.64 dB	90GHz-140GHz	
	+/- 3.84 dB	140GHz-220GHz	

**Note:**

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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## 6 MEASUREMENT EQUIPMENT USED

### 6.1 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2025	03/26/2026
EMI Test Receiver	R&S	ESCI	101342	04/29/2024	04/28/2025
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/26/2024	06/25/2025
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2025	03/26/2026
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

### 6.2 Conducted Measurement

Conducted Emission Test Site: Conducted F					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Attenuator	Marvelous	MVE2213-10	RF04	11/14/2024	11/13/2025
Attenuator	Woken	WATT-218FS-10	RF12	11/14/2024	11/13/2025
DC Block	PASTERNACK	PE8210	RF38	11/14/2024	11/13/2025
Power Meter	Anritsu	ML2496A	2138005	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911395	09/25/2024	09/24/2025
Power Sensor	Anritsu	MA2411B	1911396	09/25/2024	09/24/2025
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071574	06/28/2024	06/27/2025
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

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### 6.3 Radiated Measurement

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
3m Site NSA	SGS	966 chamber D	N/A	04/30/2024	04/29/2025
Attenuator	Woken	WATT-218FS-10	RF17	11/14/2024	11/13/2025
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/17/2024	12/16/2025
Coaxial Cable	EMCI+Huber Suhner	RG 214/U+EMC104-SM-SM-500+SUCAFLEX 104+16+EMC105-SM-SM-11000+EMC106-SM-SM-2300	W22.01+W21.01+150707+MY969/4+16+190825+150702	11/14/2024	11/13/2025
High Pass Filter	Titan Microwave	T04H30001800070 S01	RF188	11/14/2024	11/13/2025
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/30/2024	05/29/2025
Horn Antenna	Schwarzbeck	BBHA9170	184	12/20/2024	12/19/2025
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/14/2024	11/13/2025
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/14/2024	11/13/2025
Pre-Amplifier	EMC Instruments	EMC184045SEE	980881	11/14/2024	11/13/2025
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	10/16/2024	10/15/2025
H-Loop Near Field Antenna	LANGER EMV-Technik	LF-R 400	02-1597	N.C.R	N.C.R
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

**NOTE:** N.C.R refers to Not Calibrated Required.

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## 7 CONDUCTED EMISSION TEST

### 7.1 Standard Applicable

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits (dBuV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

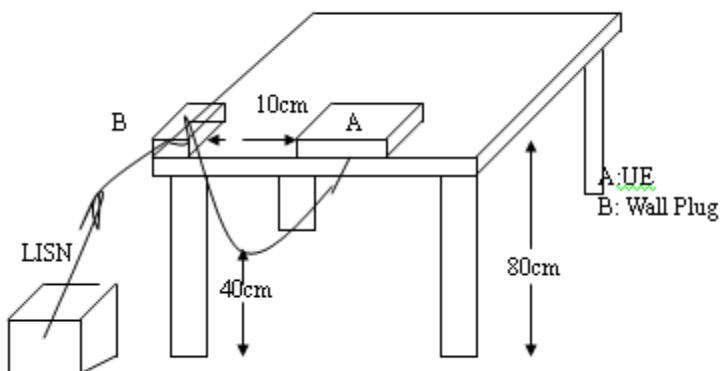
#### Note

1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 7.2 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

### 7.3 Test Setup



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## 7.4 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

## 7.5 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closest to the limit.

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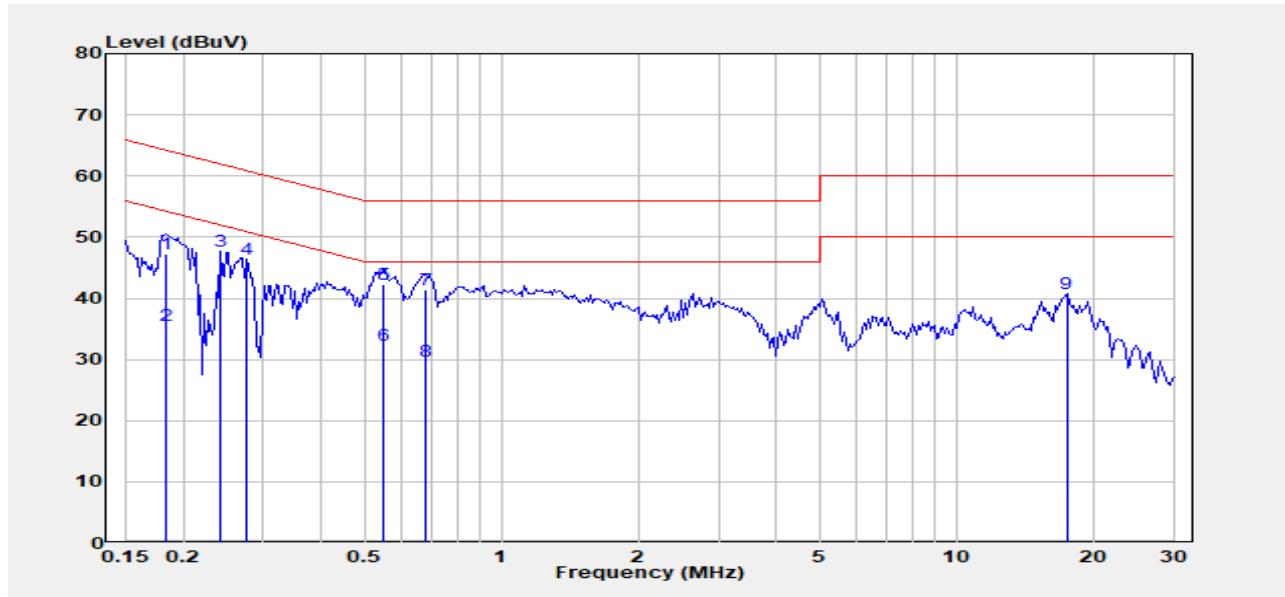
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :TERF2501000169E2  
 Test Mode :2.4G  
 Power :120V/60Hz  
 Probe :L1

Test Site :Conduction C  
 Test Date :2025-04-23  
 Temp./Humi. :23.0°C/63%  
 Engineer :Temo Chen



Freq. MHz	Detector Mode	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual		Margin dB
				FS dB $\mu$ V	Limit dB $\mu$ V	
0.183	QP	36.70	10.65	47.35	64.33	-16.98
0.183	Average	25.00	10.65	35.65	54.33	-18.68
0.242	Peak	37.01	10.64	47.65	62.04	-14.39
0.274	Peak	35.72	10.64	46.36	60.98	-14.62
0.552	QP	31.60	10.63	42.23	56.00	-13.77
0.552	Average	21.60	10.63	32.23	46.00	-13.77
0.683	QP	30.70	10.65	41.35	56.00	-14.65
0.683	Average	19.00	10.65	29.65	46.00	-16.35
17.475	Peak	29.63	11.12	40.75	60.00	-19.25

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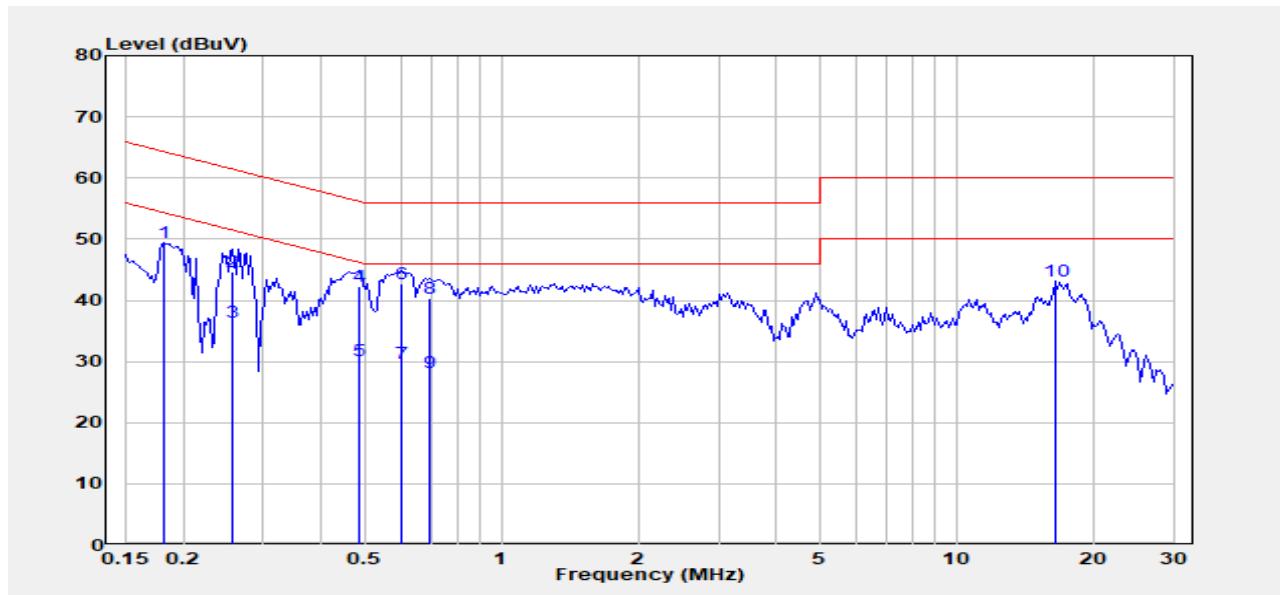
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Report Number :TERF2501000169E2  
Test Mode :2.4G  
Power :120V/60Hz  
Probe :N

Test Site :Conduction C  
Test Date :2025-04-23  
Temp./Humi. :23.0°C/63%  
Engineer :Temo Chen



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual	Limit dB $\mu$ V	Margin dB
				FS		
				dB $\mu$ V		
0.182	Peak	38.77	10.65	49.43	64.42	-14.99
0.258	QP	34.10	10.64	44.74	61.51	-16.77
0.258	Average	25.70	10.64	36.34	51.51	-15.17
0.486	QP	31.71	10.60	42.32	56.23	-13.91
0.486	Average	19.51	10.60	30.12	46.23	-16.11
0.601	QP	32.11	10.62	42.73	56.00	-13.27
0.601	Average	19.01	10.62	29.63	46.00	-16.37
0.697	QP	29.72	10.63	40.35	56.00	-15.65
0.697	Average	17.52	10.63	28.15	46.00	-17.85
16.573	Peak	31.99	11.10	43.09	60.00	-16.91

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## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable

#### 8.1.1 Duty Cycle

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

#### 8.1.2 FCC

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

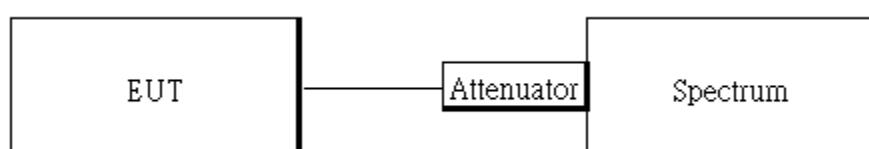
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

**Note:**

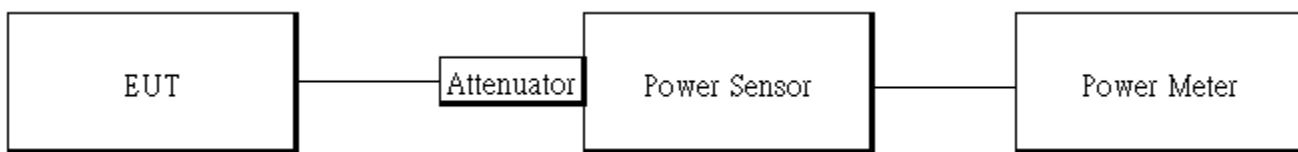
When the antenna gain is greater than 6 dBi, the power limit attenuated accordingly.

### 8.2 Test Setup

#### 8.2.1 Duty Cycle



#### 8.2.2 Output Power:



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## 8.3 Measurement Procedure

### 8.3.1 Duty Cycle:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

### 8.3.2 Output Power

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

#### Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

**\* Note: The duty cycle factor and below is compensated to obtain the maximum value of measurement in average.**

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## 8.4 Measurement Result

### 8.4.1 Duty Cycle:

Mode	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) = $10^{\log(1/\text{Duty Cycle})}$	1/T (kHz)	VBW setting (kHz)
802.11b	99.19	0.04	0.08	0.01
802.11g	98.90	0.05	0.49	0.01
802.11n_20	98.82	0.05	0.53	0.01

### 8.4.2 Duty Cycle test plots

802.11b\_20MHz\_Chain0\_2412MHz



802.11n\_20MHz\_Chain0\_2412MHz



802.11g\_20MHz\_Chain0\_2412MHz



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### 8.4.3 Output Power

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	382.82	25.83	30.00	PASS
6	2437	1	400.87	26.03	30.00	PASS
10	2457	1	392.64	25.94	30.00	PASS
11	2462	1	303.39	24.82	30.00	PASS
12	2467	1	93.76	19.72	30.00	PASS
13	2472	1	25.59	14.08	30.00	PASS

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	130.48	21.16	30.00	PASS
6	2437	1	134.13	21.28	30.00	PASS
10	2457	1	131.68	21.20	30.00	PASS
11	2462	1	106.06	20.26	30.00	PASS
12	2467	1	31.73	15.02	30.00	PASS
13	2472	1	9.03	9.56	30.00	PASS

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## 802.11g Ch0

CH	Freq. (MHz)	Data Rate	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	100.69	20.03	30.00	PASS
2	2417	6	260.02	24.15	30.00	PASS
3	2422	6	345.14	25.38	30.00	PASS
6	2437	6	358.92	25.55	30.00	PASS
8	2447	6	341.19	25.33	30.00	PASS
9	2452	6	285.76	24.56	30.00	PASS
10	2457	6	263.63	24.21	30.00	PASS
11	2462	6	215.77	23.34	30.00	PASS
12	2467	6	23.28	13.67	30.00	PASS
13	2472	6	8.36	9.22	30.00	PASS

## 802.11g Ch0

CH	Freq. (MHz)	Data Rate	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	33.33	15.23	30.00	PASS
2	2417	6	85.27	19.31	30.00	PASS
3	2422	6	140.54	21.48	30.00	PASS
6	2437	6	148.53	21.72	30.00	PASS
8	2447	6	139.25	21.44	30.00	PASS
9	2452	6	91.79	19.63	30.00	PASS
10	2457	6	91.58	19.62	30.00	PASS
11	2462	6	69.15	18.40	30.00	PASS
12	2467	6	8.05	9.06	30.00	PASS
13	2472	6	2.92	4.66	30.00	PASS

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802.11n\_HT\_20M Ch0

CH	Freq. (MHz)	Data Rate	Peak Output Power (mW)	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	82.41	19.16	30.00	PASS
2	2417	MCS0	258.82	24.13	30.00	PASS
3	2422	MCS0	387.26	25.88	30.00	PASS
4	2427	MCS0	431.52	26.35	30.00	PASS
6	2437	MCS0	439.54	26.43	30.00	PASS
7	2442	MCS0	408.32	26.11	30.00	PASS
8	2447	MCS0	350.75	25.45	30.00	PASS
9	2452	MCS0	285.76	24.56	30.00	PASS
10	2457	MCS0	258.23	24.12	30.00	PASS
11	2462	MCS0	227.51	23.57	30.00	PASS
12	2467	MCS0	37.41	15.73	30.00	PASS
13	2472	MCS0	14.76	11.69	30.00	PASS

802.11n\_HT\_20M Ch0

CH	Freq. (MHz)	Data Rate	Avg. Output Power (mW)	Avg. Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	25.54	14.07	30.00	PASS
2	2417	MCS0	81.13	19.09	30.00	PASS
3	2422	MCS0	116.99	20.68	30.00	PASS
4	2427	MCS0	141.96	21.52	30.00	PASS
6	2437	MCS0	144.26	21.59	30.00	PASS
7	2442	MCS0	138.09	21.40	30.00	PASS
8	2447	MCS0	106.70	20.28	30.00	PASS
9	2452	MCS0	86.93	19.39	30.00	PASS
10	2457	MCS0	79.83	19.02	30.00	PASS
11	2462	MCS0	69.05	18.39	30.00	PASS
12	2467	MCS0	10.05	10.02	30.00	PASS
13	2472	MCS0	4.13	6.16	30.00	PASS

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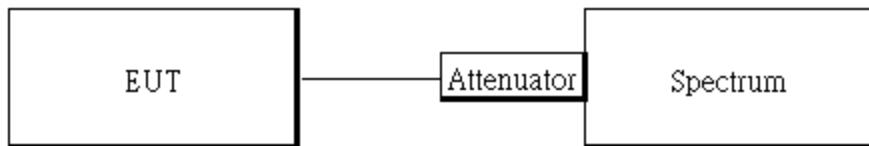
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## 9 EMISSION BANDWIDTH MEASUREMENT

### 9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 9.2 Test Setup



### 9.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

#### 9.3.1 6dB BW measurements

1. The testing follows the Measurement Procedure of the KDB 558074 D01.
2. Set the spectrum analyzer as  
RBW= 100 kHz ,  
VBW = 3 X RBW,  
Span= 2 to 5 times of the OBW,  
Sweep=auto, Detector = Peak, and Max hold.
3. Mark the upper and lower frequencies of -6dB.
4. Repeat above procedures until all test default channel is completed.

#### 9.3.2 99% BW measurements

3. The testing follows the Measurement Procedure of the RSS-Gen section 6.7.
4. Set the spectrum analyzer as  
RBW= 1 % to 5% of 99%,  
VBW  $\geq$  3 X RBW,  
Span= large enough to capture all products of the modulation process  
Sweep=auto, Detector = Peak, and Max hold.
5. Mark the upper and lower frequencies of 99%.
6. Repeat above procedures until all test default channel is completed.

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## 9.4 Measurement Result:

### 9.4.1 6dB BW measurements

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	9605	$\geq 500$	PASS
2437	9602	$\geq 500$	PASS
2462	10070	$\geq 500$	PASS
2467	10110	$\geq 500$	PASS
2472	10100	$\geq 500$	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15770	$\geq 500$	PASS
2437	15770	$\geq 500$	PASS
2462	15940	$\geq 500$	PASS
2467	15460	$\geq 500$	PASS
2472	15450	$\geq 500$	PASS

802.11n\_HT\_20M Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16660	$\geq 500$	PASS
2437	16580	$\geq 500$	PASS
2462	16120	$\geq 500$	PASS
2467	15950	$\geq 500$	PASS
2472	15750	$\geq 500$	PASS

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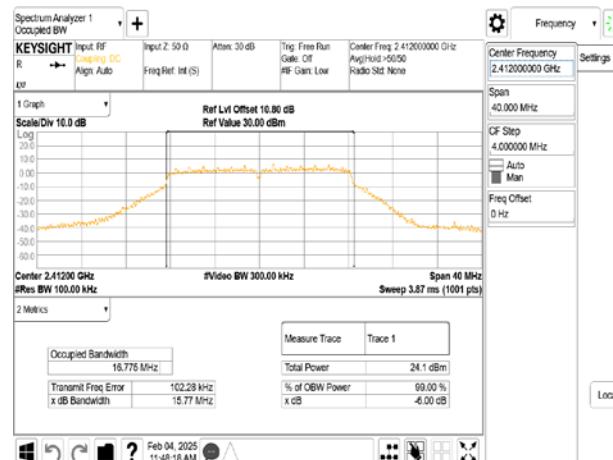
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## 802.11b\_20MHz\_Chain0\_2437MHz



802.11b\_20MHz\_Chain0\_2462MHz



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## 802.11g\_20MHz\_Chain0\_2437MHz



## 802.11g\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain0\_2467MHz

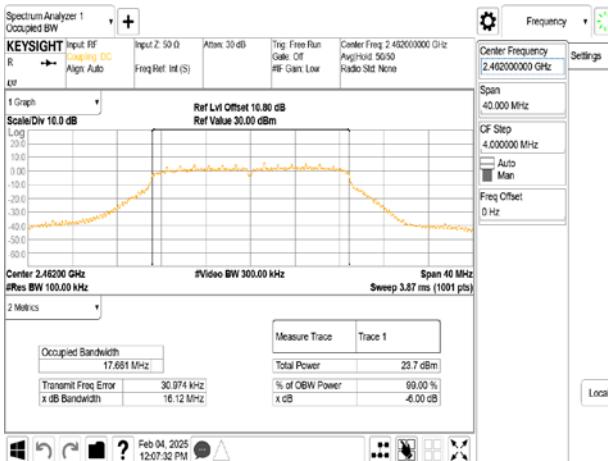


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802.11n\_20MHz\_Chain0\_2462MHz



802.11n\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2472MHz



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## 9.4.2 99% Bandwidth

802.11b Ch0

Freq. (MHz)	99% BW (MHz)
2412	11.577
2437	11.589
2462	11.648
2467	11.897
2472	11.907

802.11g Ch0

Freq. (MHz)	99% BW (MHz)
2412	17.059
2437	17.052
2462	17.034
2467	16.628
2472	16.615

802.11n\_HT20M Ch0

Freq. (MHz)	99% BW (MHz)
2412	17.843
2437	17.89
2462	17.854
2467	17.438
2472	17.435

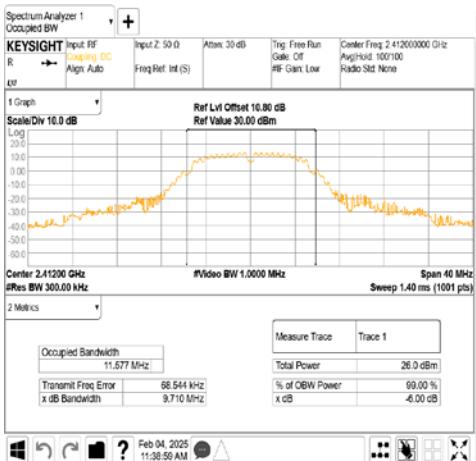
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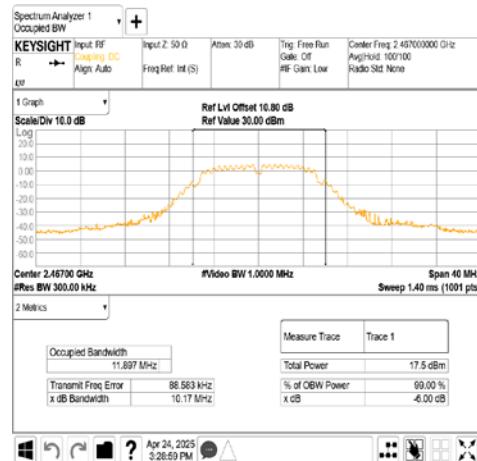
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802.11b\_20MHz\_Chain0\_2412MHz



802.11b\_20MHz\_Chain0\_2467MHz



802.11b\_20MHz\_Chain0\_2437MHz



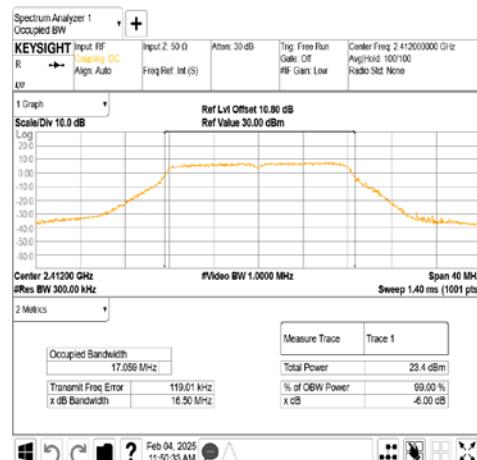
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802.11b\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain0\_2412MHz



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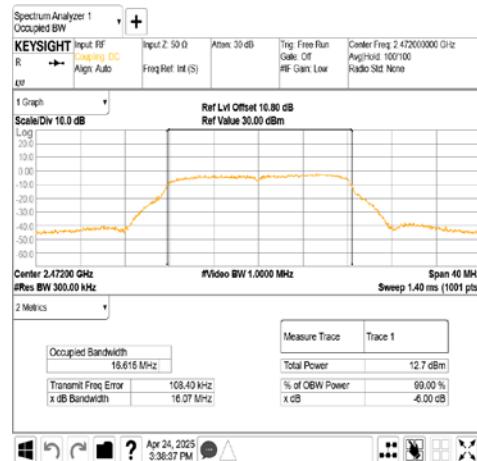
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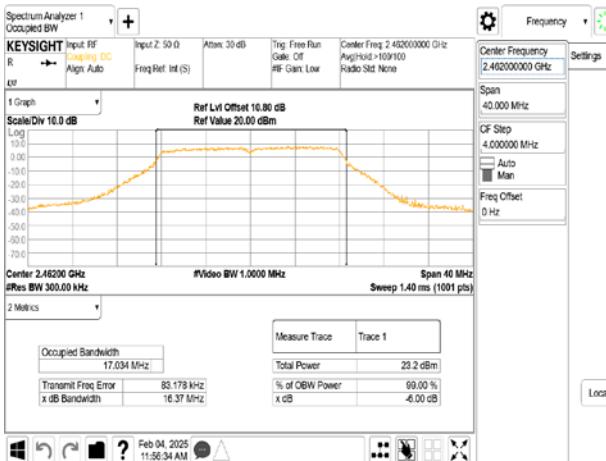
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802.11g\_20MHz\_Chain0\_2472MHz



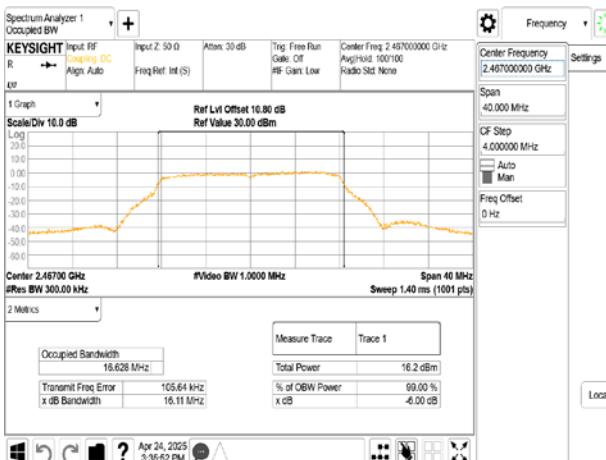
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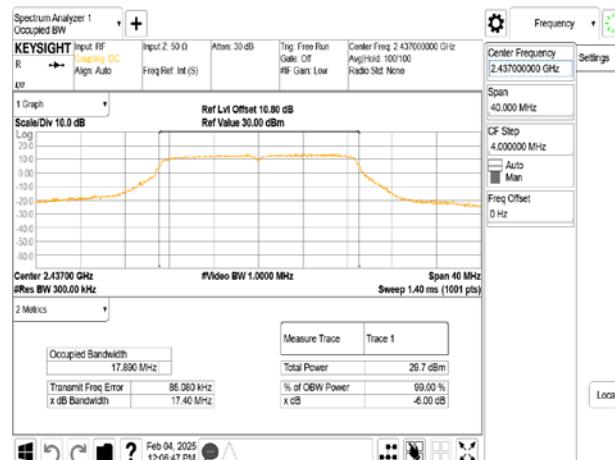
802.11n\_20MHz\_Chain0\_2412MHz



802.11g\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2437MHz



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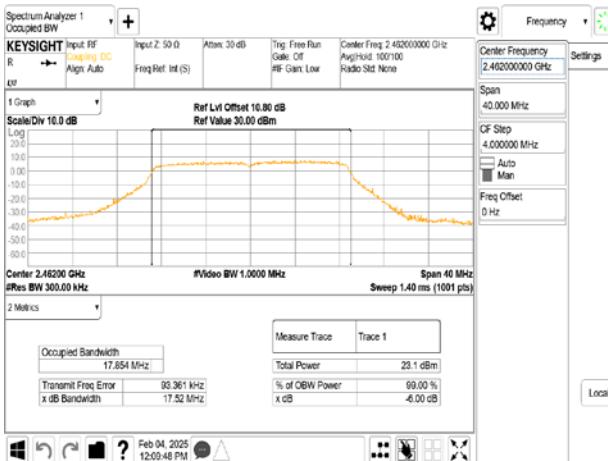
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802.11n\_20MHz\_Chain0\_2462MHz



802.11n\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2472MHz



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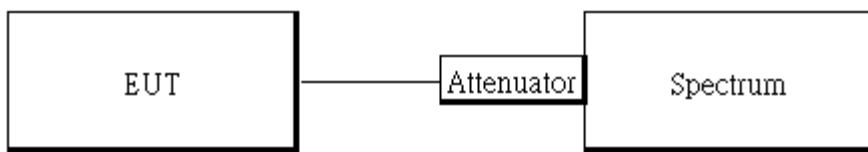
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## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 10.2 Test Setup



### 10.3 Measurement Procedure

#### 10.3.1 Reference Level of Emission Limit:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 100kHz & VBW = 300 kHz.
5. Detector = peak
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

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### 10.3.2 Conducted Band Edge:

In any 100 kHz bandwidth outside the frequency band

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker of reference level measurement -20 dBm
8. Mark the highest readings of the emissions outside of 2400MHz~2483.5MHz.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

### 10.3.3 Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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## 10.4 Measurement Result

### 802.11b Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	13.48	-6.52
2437	13.54	-6.46
2462	12.32	-7.68
2467	4.90	-15.10
2472	1.26	-18.74

### 802.11g Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.60	-13.40
2437	12.53	-7.47
2462	6.24	-13.76
2467	-0.20	-20.20
2472	-4.01	-24.01

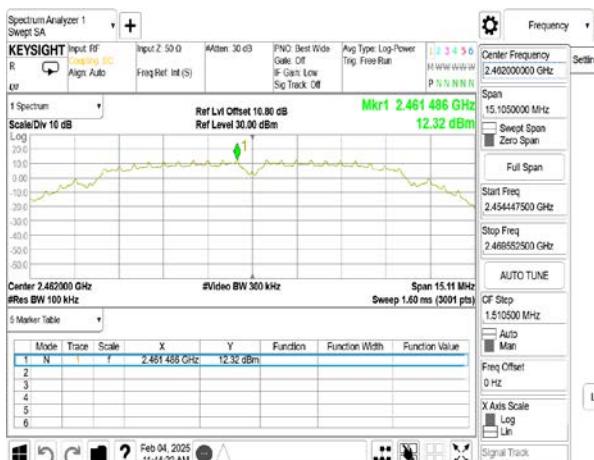
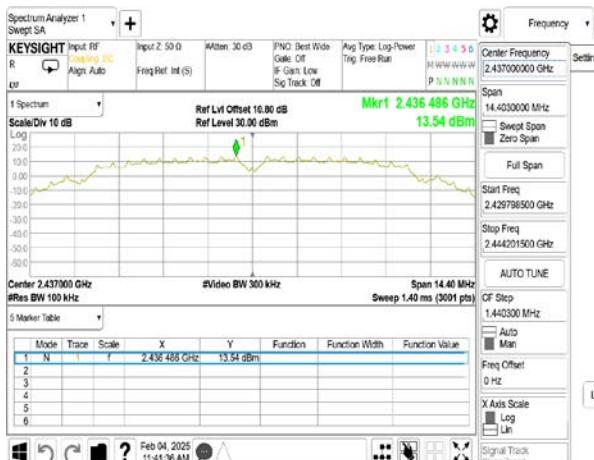
### 802.11n\_HT\_20M Ch0

Reference Level of Limit		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	5.21	-14.79
2437	12.64	-7.36
2462	6.10	-13.90
2467	-0.68	-20.68
2472	-3.14	-23.14

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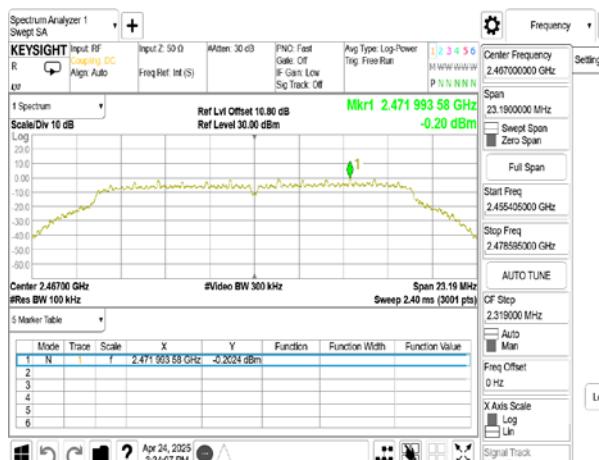
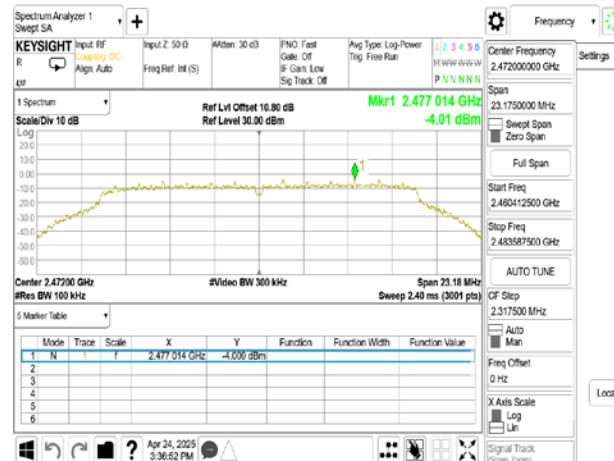
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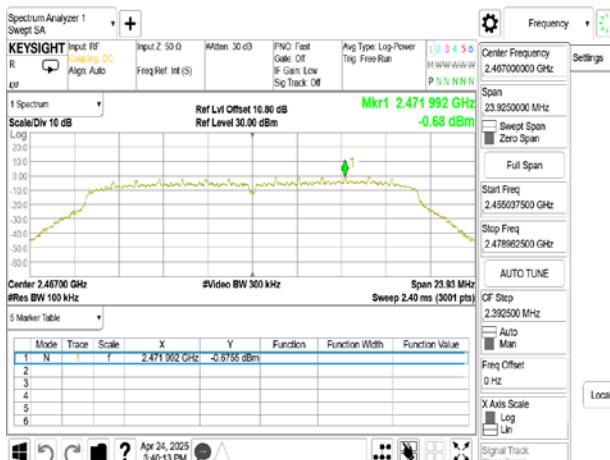
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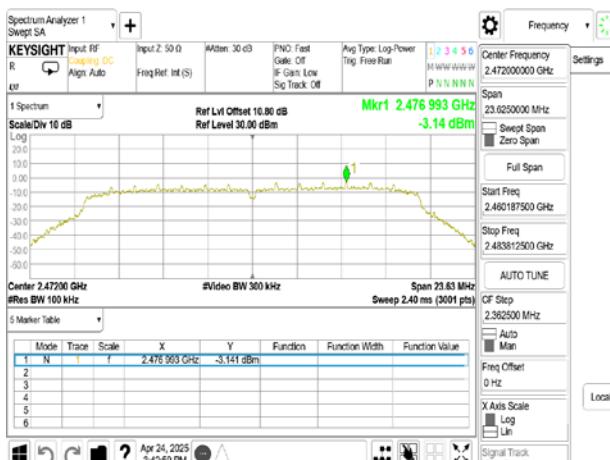
802.11n\_20MHz\_Chain0\_2462MHz



802.11n\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2472MHz



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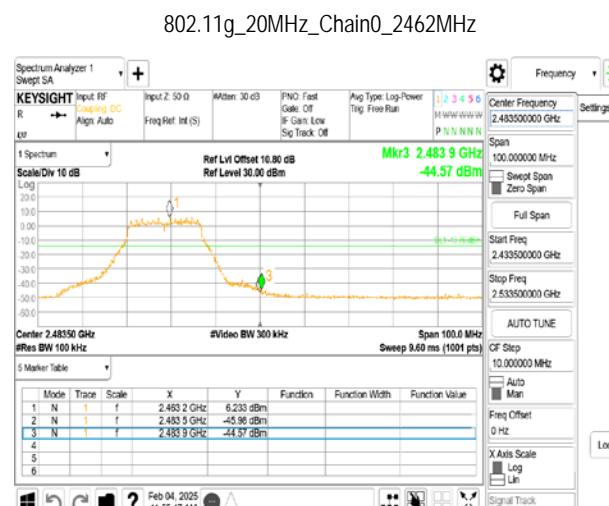
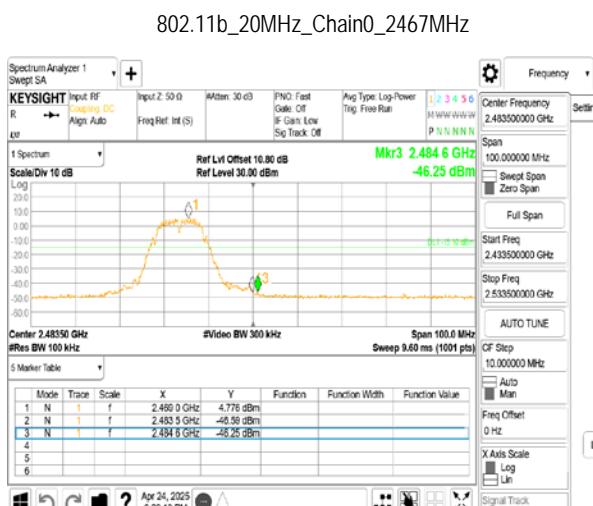
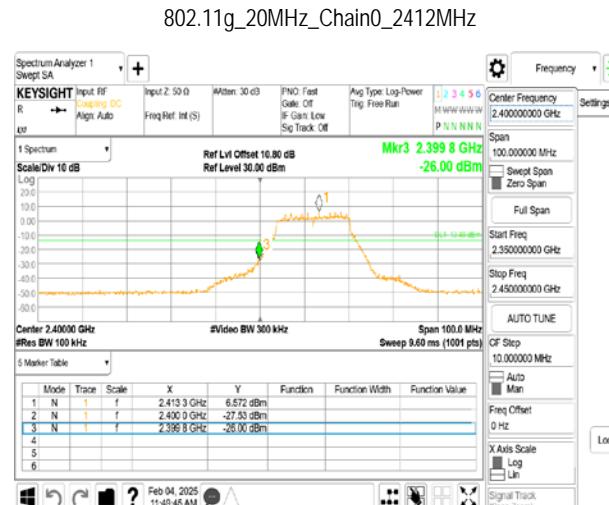
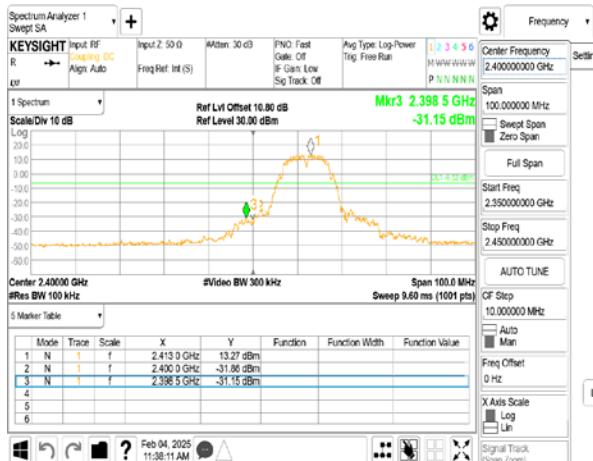
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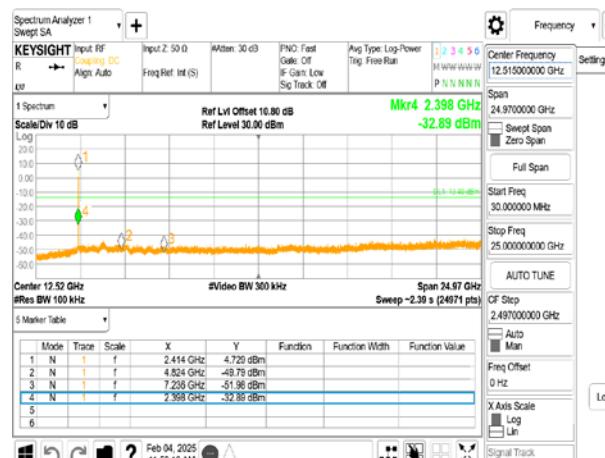
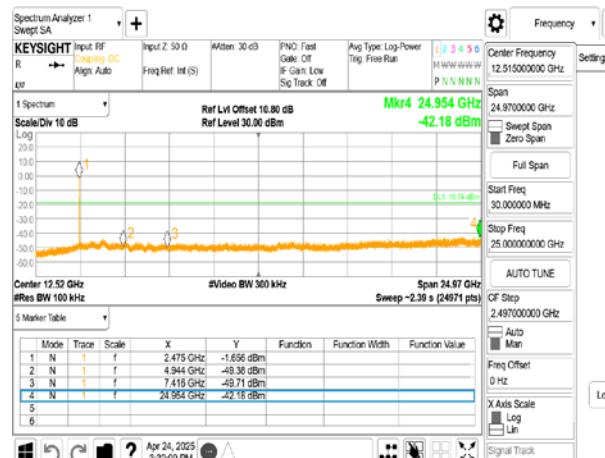
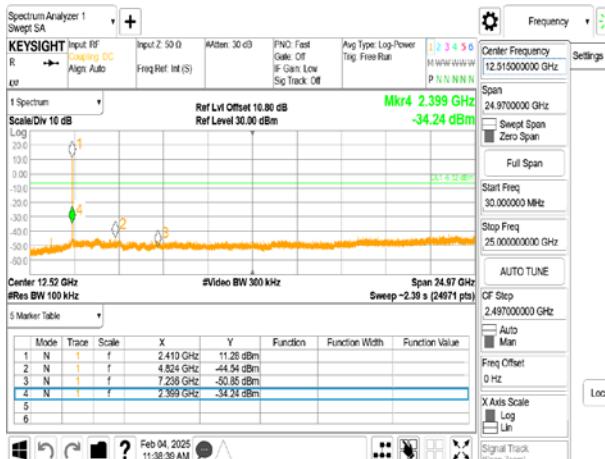
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802.11g\_20MHz\_Chain0\_2462MHz



802.11g\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2412MHz



802.11n\_20MHz\_Chain0\_2437MHz



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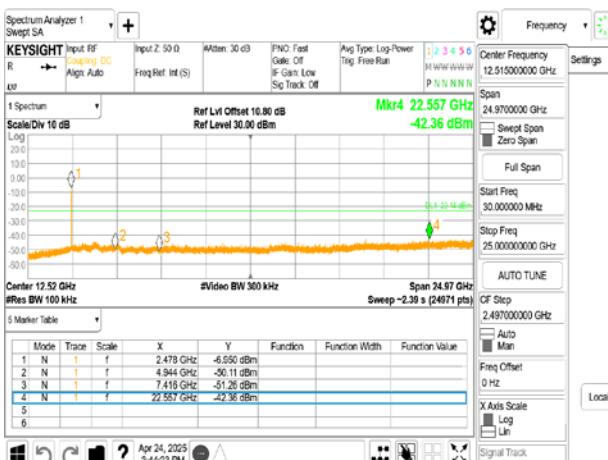
802.11n\_20MHz\_Chain0\_2462MHz



802.11n\_20MHz\_Chain0\_2467MHz



802.11n\_20MHz\_Chain0\_2472MHz



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## 11 BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

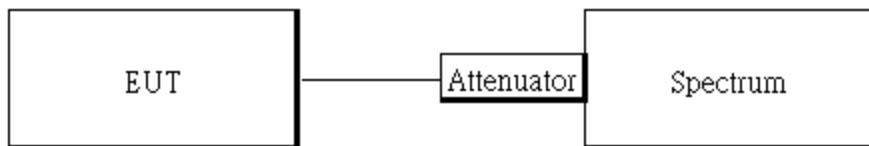
And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
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

**Note:**

1. The lower limit shall apply at the transition frequencies.

### 11.2 Bandedge & Emission



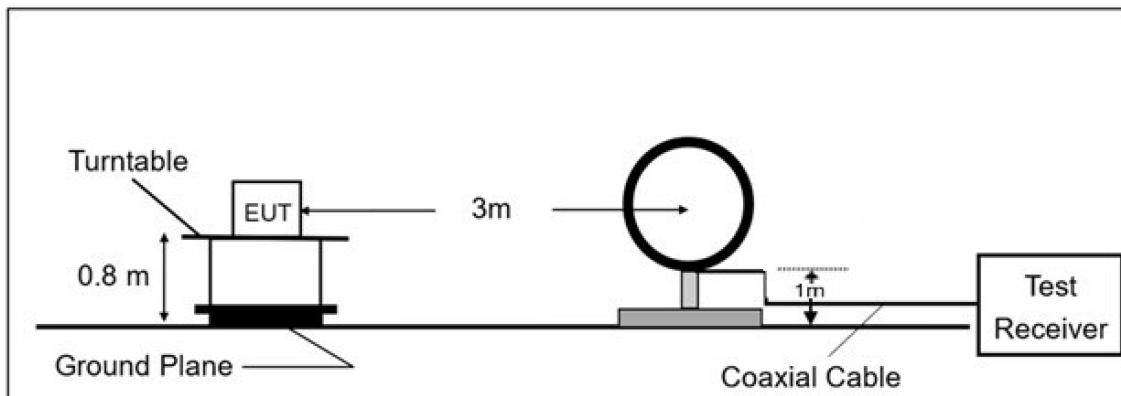
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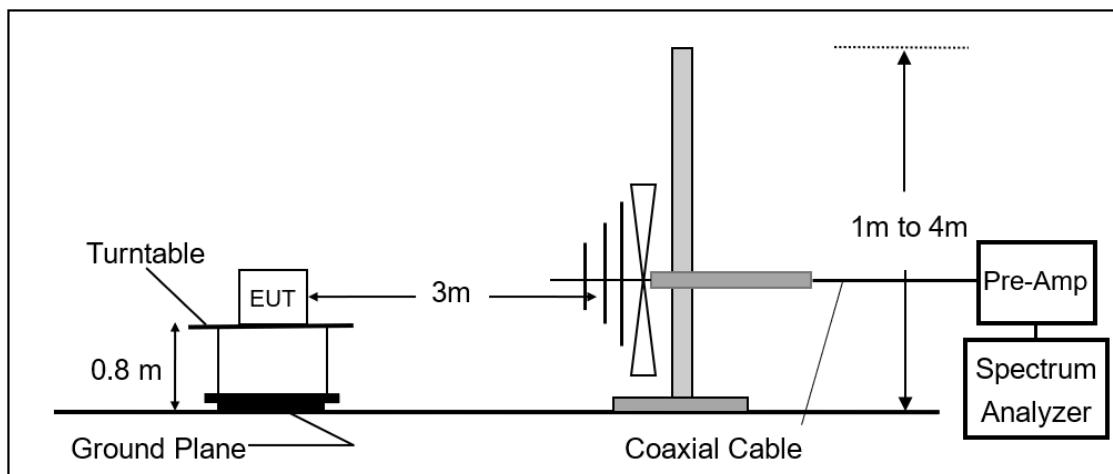
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### 11.3 Spurious Emission

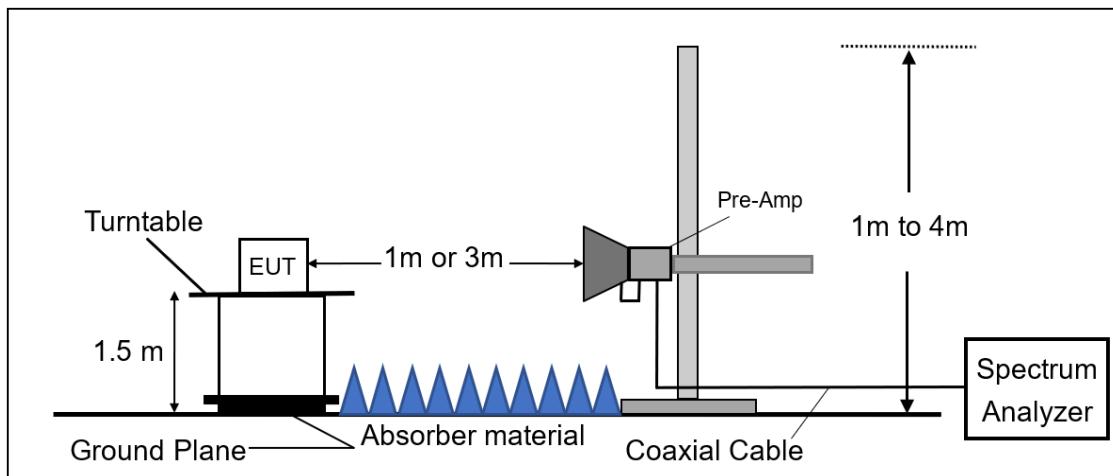
#### (A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



#### (B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



#### (C) Radiated Emission Test Set-Up, Frequency Above 1GHz.



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## 11.4 Measurement Procedure

### 11.4.1 Band edge measurements

1. The testing follows FCC KDB 558074 D01.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz, Detector = Peak for Maximum Emission Measurements at frequency above 1 GHz, Sweep time = No faster than coupled (auto) time ,Trace mode = max-hold ,Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time and number of sweep points may be lengthened for low duty cycle applications.)
4. Set the spectrum analyzer as RBW=100 KHz, VBW=300KHz, Detector = RMS for Maximum Emission Measurements at frequency above 1 GHz, Sweep time = AUTO
5. Compute the power by integrating the spectrum over 1 MHz using the instrument's band-power measurement function with band limits set equal to the emission frequency (femission)  $\pm$  0.5 MHz. If the spectrum analyzer does not have a band-power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by  $f_{\text{emission}} \pm 0.5$  MHz.
6. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle.

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### 11.4.2 Spurious Emission measurements

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW  $\geq$  1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all default test channel measured were complete.

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## 11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

**Where**  $FS$  = Field Strength

$CL$  = Cable Attenuation Factor (Cable Loss)

$RA$  = Reading Amplitude

$AG$  = Amplifier Gain

$AF$  = Antenna Factor

The limit of the emission level is expressed in  $dB\mu V/m$ , which converts  $20 * \log(uV/m)$

Actual  $FS(dB\mu V/m)$  = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )

Factor( $dB$ ) = Antenna Factor( $dB/m$ ) + Cable Loss( $dB$ ) - Pre\_Amplifier Gain( $dB$ )

## 11.6 Test Results of Radiated Spurious Emissions from 9 kHz to 30 MHz

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

## 11.7 Measurement Result

### Note:

1. Refer to next page spectrum analyzer data chart and tabular data sheets.
2. Measurements are completed at peak and average level, the mark of average is the highest emission in restricted bands.

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## 11.7.1 CBE

802.11b

Channel	Frequency (MHz)	Raw Value(dBm)	Duty factor (dB)	Antenna Peak Gain (dBi)	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
		Chain 0		Chain 0				74	PK
1	2412	-30.450	N/A	3.33	-27.12	68.08	-5.92	74	PK
		-45.865	0.00	3.33	-42.54	52.67	-1.34	54	AV
10	2457	-34.360	N/A	3.33	-31.03	64.17	-9.83	74	PK
		-45.950	0.00	3.33	-42.62	52.58	-1.42	54	AV
11	2462	-31.420	N/A	3.33	-28.09	67.11	-6.89	74	PK
		-45.612	0.00	3.33	-42.28	52.92	-1.08	54	AV
12	2467	-27.340	N/A	3.33	-24.01	71.19	-2.81	74	PK
		-45.590	0.00	3.33	-42.26	52.94	-1.06	54	AV
13	2472	-29.690	N/A	3.33	-26.36	68.84	-5.16	74	PK
		-45.376	0.00	3.33	-42.05	53.15	-0.85	54	AV

802.11g

Channel	Frequency (MHz)	Raw Value(dBm)	Duty factor (dB)	Antenna Peak Gain (dBi)	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
		Chain 0		Chain 0				74	PK
1	2412	-31.510	N/A	3.33	-28.18	67.02	-6.98	74	PK
		-46.004	0.00	3.33	-42.67	52.53	-1.47	54	AV
2	2417	-32.080	N/A	3.33	-28.75	66.45	-7.55	74	PK
		-45.212	0.00	3.33	-41.88	53.32	-0.68	54	AV
3	2422	-31.480	N/A	3.33	-28.15	67.05	-6.95	74	PK
		-45.520	0.00	3.33	-42.19	53.01	-0.99	54	AV
8	2447	-33.090	N/A	3.33	-29.76	65.44	-8.56	74	PK
		-45.799	0.00	3.33	-42.47	52.73	-1.27	54	AV
9	2452	-32.486	N/A	3.33	-29.16	66.04	-7.96	74	PK
		-45.498	0.00	3.33	-42.17	53.03	-0.97	54	AV
10	2457	-33.310	N/A	3.33	-29.98	65.22	-8.78	74	PK
		-45.480	0.00	3.33	-42.15	53.05	-0.95	54	AV
11	2462	-32.640	N/A	3.33	-29.31	65.89	-8.11	74	PK
		-45.930	0.00	3.33	-42.60	52.60	-1.40	54	AV
12	2467	-27.600	N/A	3.33	-24.27	70.93	-3.07	74	PK
		-45.126	0.00	3.33	-41.80	53.40	-0.60	54	AV
13	2472	-30.370	N/A	3.33	-27.04	68.16	-5.84	74	PK
		-45.100	0.00	3.33	-41.77	53.43	-0.57	54	AV

802.11n 20M

Channel	Frequency (MHz)	Raw Value(dBm)	Duty factor (dB)	Antenna Peak Gain	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
		Chain 0		Chain 0				74	PK
1	2412	-31.588	N/A	3.33	-28.26	66.94	-7.06	74	PK
		-45.775	0.00	3.33	-42.45	52.76	-1.25	54	AV
2	2417	-32.740	N/A	3.33	-29.41	65.79	-8.21	74	PK
		-45.787	0.00	3.33	-42.46	52.74	-1.26	54	AV
3	2422	-29.640	N/A	3.33	-26.31	68.89	-5.11	74	PK
		-45.138	0.00	3.33	-41.81	53.39	-0.61	54	AV
4	2427	-33.030	N/A	3.33	-29.70	65.50	-8.50	74	PK
		-46.356	0.00	3.33	-43.03	52.17	-1.83	54	AV
7	2442	-32.850	N/A	3.33	-29.52	65.68	-8.32	74	PK
		-46.030	0.00	3.33	-42.70	52.50	-1.50	54	AV
8	2447	-31.090	N/A	3.33	-27.76	67.44	-6.56	74	PK
		-45.423	0.00	3.33	-42.09	53.11	-0.89	54	AV
9	2452	-32.280	N/A	3.33	-28.95	66.25	-7.75	74	PK
		-45.181	0.00	3.33	-41.85	53.35	-0.65	54	AV
10	2457	-34.100	N/A	3.33	-30.77	64.43	-9.57	74	PK
		-45.700	0.00	3.33	-42.37	52.83	-1.17	54	AV
11	2462	-31.890	N/A	3.33	-28.56	66.64	-7.36	74	PK
		-45.138	0.00	3.33	-41.81	53.39	-0.61	54	AV
12	2467	-29.650	N/A	3.33	-26.32	68.88	-5.12	74	PK
		-45.527	0.00	3.33	-42.20	53.00	-1.00	54	AV
13	2472	-26.160	N/A	3.33	-22.83	72.37	-1.63	74	PK
		-45.326	0.00	3.33	-42.00	53.20	-0.80	54	AV

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