



Test report No. : 4790317368-US-R7-V0  
Page : 1 of 41  
Issued date : Nov. 9, 2022  
FCC ID : RYK-WPEQ268AXB

# CO-LOCATION RADIO TEST REPORT

**Product** : Wi-Fi 6E BT Half Min PCIe Module

**Model Name** : WPEQ-268AXI(BT)

**Series Model** : WPEQ-268AX(BT)

**FCC ID** : RYK-WPEQ268AXB

**Test Regulation** : FCC 47 CFR PART 15 Subpart C (Section 15.247)  
FCC 47 CFR PART 15 Subpart E (Section 15.407)

**Received Date** : 2022/4/18

**Test Date** : 2022/4/29 ~ 2022/5/24

**Issued Date** : 2022/11/9

**Applicant** : SparkLAN Communications, Inc.  
5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067,  
Taiwan

**Issued By** : Underwriters Laboratories Taiwan Co., Ltd.  
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,  
Zhudong Township, Hsinchu County, Taiwan



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

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Doc No: 17-EM-F0876 / 6.0



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## REVISION HISTORY

**Original Test Report No.: 4790317368-US-R7-V0**

Rev.	Test report No.	Date	Page revised	Contents
Original	4790317368-US-R7-V0	2022/11/9	-	Initial issue



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## 1. Attestation of Test Results

**APPLICANT:** SparkLAN Communications, Inc.  
 5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan

**MANUFACTURER:** SparkLAN Communications, Inc.  
 5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan

**EUT DESCRIPTION:** Wi-Fi 6E BT Half Min PCIe Module

**BRAND:** SparkLAN

**MODEL:** WPEQ-268AXI(BT)

**SERIES MODEL:** WPEQ-268AX(BT)

**SAMPLE STAGE:** Engineering Verification Test sample

**DATE of TESTED:** 2022/4/29 ~ 2022/5/24

<b>APPLICABLE STANDARDS</b>	
<b>STANDARD</b>	<b>Test Results</b>
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS
FCC 47 CFR PART 15 Subpart E (Section 15.407)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Cindy Hsin  
 Project Handler

Date : 2022/11/9

Approved and Authorized By:

Kent Liu  
 Senior Laboratory Engineer

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## 2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.205 / 15.209 / 15.247(d) / 15.407(b) (1/2/3/4(i/ii)/9) /15.407(b)(5)(8)	Radiated Spurious Emission	PASS
15.207 15.407(b)(9)	AC Power Conducted Emission	PASS

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### 3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB 789033 D02 General UNII Test Procedure New Rules v02r01, KDB 987594 D02 U-NII 6 GHz EMC Measurement v01r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

### 4. Facilities and Accreditation

<b>Test Location</b>	Underwriters Laboratories Taiwan Co., Ltd.
<b>Address</b>	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
<b>Accreditation Certificate</b>	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

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## 5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k=2$ .

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	$\pm 2.9$ dB
RF Conducted	9 kHz - 40GHz	$\pm 2.4$ dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	$\pm 1.9$ dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	$\pm 5.8$ dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	$\pm 4.8$ dB

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## 6. Equipment under Test

### 6.1. Description of EUT

<b>Product</b>	Wi-Fi 6E BT Half Min PCIe Module	
<b>Brand Name</b>	SparkLAN	
<b>Model Name</b>	WPEQ-268AXI(BT)	
<b>Series Model</b>	WPEQ-268AX(BT)	
<b>Operating Frequency</b>	WLAN	<b>2.4GHz:</b> 2412MHz ~ 2462MHz <b>5GHz:</b> 5180MHz ~ 5240MHz 5260MHz ~ 5320MHz 5500MHz ~ 5720MHz 5745MHz ~ 5825MHz <b>6GHz:</b> 5955MHz ~ 6415MHz 6435MHz ~ 6525MHz 6525MHz ~ 6875MHz 6875MHz ~ 7115MHz
	Bluetooth EDR	2402MHz ~ 2480MHz
	Bluetooth LE	2402MHz ~ 2480MHz
<b>Modulation</b>	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA
	Bluetooth EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	Bluetooth LE	GFSK
<b>Transfer Rate</b>	WLAN	802.11a: up to 54 Mbps 802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS15 802.11ac: up to MCS9 802.11ax: up to MCS11
	Bluetooth EDR	Up to 3 Mbps
	Bluetooth LE	Up to 2 Mbps

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<b>Number of Channel</b>	2.4G WLAN 2412 ~ 2462 MHz	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20) 7 for 802.11n (HT40), 802.11ax (HE40)
	5G WLAN 5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
	5G WLAN 5260 ~ 5320 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
		1 for 802.11ac (VHT160), 802.11ax (HE160)
	5G WLAN 5500 ~ 5720 MHz	12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		6 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		3 for 802.11ac (VHT80), 802.11ax (HE80),
		1 for 802.11ac (VHT160), 802.11ax (HE160)
	5G WLAN 5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
Bluetooth EDR	79	
Bluetooth LE	40	

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<b>Number of Channel</b>	6G WLAN 5925 ~ 6425MHz	24 for 802.11a, 802.11ax (HE20)
		12 for 802.11ax (HE40)
		6 for 802.11ax (HE80)
		3 for 802.11ax (HE160)
	6G WLAN 6425 ~ 6525MHz	5 for 802.11a,802.11ax (HE20)
		3 for 802.11ax (HE40)
		2 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6G WLAN 6525 ~ 6855MHz	17 for 802.11a,802.11ax (HE20)
		8 for 802.11ax (HE40)
		3 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6G WLAN 6875 ~ 7125MHz	13 for 802.11a,802.11ax (HE20)
		6 for 802.11ax (HE40)
		3 for 802.11ax (HE80)
		2 for 802.11ax (HE160)
<b>Normal Voltage</b>	3.3 Vdc	
<b>Sample ID</b>	4862912	

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Note:

1. The models difference table as below:

Model	Difference
WPEQ-268AXI(BT)	Operating Temp -40~+75°C
WPEQ-268AX(BT)	Operating Temp -10~+65°C

2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX
802.11ac (VHT160)	2TX,2RX
802.11ax (HE20)	2TX,2RX
802.11ax (HE40)	2TX,2RX
802.11ax (HE80)	2TX,2RX
802.11ax (HE160)	2TX,2RX

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40 / VHT80 / VHT160 and 802.11ax mode for HE20 / HE40 / HE80 / HE160, therefore investigated worst case to representative mode in test report.

3. The EUT contains following accessory devices:

Product	Brand	Model	Description
Antenna 1	SparkLAN	AD-506AX	-
Antenna 2	SparkLAN	AD-501AX	-
Antenna 3	SparkLAN	AD-312N	-
Antenna 4	SparkLAN	AD-509AX	-
Antenna 5	SparkLAN	AD-103AG	-
Antenna 6	SparkLAN	AD-302N	-
Antenna 7	SparkLAN	AD-303N	-
Antenna 8	SparkLAN	AD-315N	-
Antenna 9	SparkLAN	AD-507AX	-
Antenna 10	SparkLAN	AD-508AX	-
I-PEX Cable	SparkLAN	N/A	RP-SMA to I-PEX

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

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## 6.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Radiated Spurious Emission	966-2	23~26°C/ 60~65%RH	3.3Vdc	2022/04/29~ 2022/05/24	Mike Cai
AC power Line Conducted Emission	SR1	23~26°C/ 60~65%RH	120Vac/60Hz	2022/05/24~ 2022/05/24	Mike Cai

FCC Test Firm Registration Number: 498077

### Sample Calculation:

#### Radiated Spurious Emission:

- Where relevant, the follow sample calculation is provided:  
Result Value (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).  
Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).  
Example: Result Value (34.5dBuV/m) = Reading Value (40.1dBm) + Antenna Factor (18.7dB/m)  
+ Cable Loss (4.2dB) - Preamp Factor (28.5dB).

#### AC power Line Conducted Emission:

- Where relevant, the follow sample calculation is provided:  
Result Value (dBuV) = Reading Value (dBuV) + Correction Factor (dB).  
Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).  
Example: Result Value (53.7dBuV) = Reading Value (35.1dBm) + Insertion loss(18.1dB) + Cable loss(0.5dB).

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### 6.3. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Frequency Band (MHz)	Maximum Gain (dBi)	Remark
1	Chain (0)+(1)	SparkLAN	AD-506AX	Dipole	2400~2483	2.65	I-PEX
					5150~5250	4.35	
					5250~5350	4.35	
					5470~5725	4.35	
					5725~5850	4.81	
					5925~6425	4.98	
					6425~6525	4.85	
					6525~6875	4.79	
2	Chain (0)+(1)	SparkLAN	AD-501AX	Dipole	2400~2483	3.7	RP-SMA
					5150~5850	5	
					5925~7125	5	
3	Chain (0)+(1)	SparkLAN	AD-312N	Dipole	2400~2483	2.65	I-PEX
					5150~5875	4.86	
4	Chain (0)+(1)	SparkLAN	AD-509AX	Dipole	2400~2483	3.7	I-PEX
					5150~5850	5	
					5925~7125	5	
5	Chain (0)+(1)	SparkLAN	AD-103AG	Dipole	2400~2483	2.02	RP-SMA
					5150~5875	2.03	
6	Chain (0)+(1)	SparkLAN	AD-302N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	2.87	
7	Chain (0)+(1)	SparkLAN	AD-303N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	3.45	
8	Chain (0)+(1)	SparkLAN	AD-315N	Dipole	2400~2483	3	I-PEX
					5150~5875	5	
9	Chain (0)+(1)	SparkLAN	AD-507AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6525~6875	4.94	
10	Chain (0)+(1)	SparkLAN	AD-508AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6525~6875	4.94	
					6875~7125	4.94	

- Note: 1. The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.  
2. For above antenna connector type: RP-SMA need to be combined with I-PEX cable.

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## 6.4. Test Mode Applicability and Tested Channel Detail

Simultaneously transmission condition:

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	BT-GFSK	WLAN (5GHz)
3	WLAN (2.4GHz)	WLAN (6GHz)
4	BT-GFSK	WLAN (6GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

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## 7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
<b>Radiated Spurious Emission</b>					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck	VULB 9168 & N-6-05	774 & AT-N0538	2022/2/8	2023/2/7
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck	VULB 9168 & N-6-05	773 & AT-N0539	2022/4/6	2023/4/5
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2021/12/13	2022/12/12
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01686	2021/12/13	2022/12/12
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2021/12/17	2022/12/16
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	759	2021/12/1	2022/11/30
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2021/6/8	2022/6/7
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2022/2/16	2023/2/15
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2021/5/19	2022/5/18
				2022/5/17	2023/5/16
Signal Generator	Keysight	N5173B	MY53271122	2022/1/18	2023/1/17
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/12/3	2022/12/2
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/12/3	2022/12/2

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<b>Test Equipment List</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Expired date</b>
<b>AC power Line Conducted Emission</b>					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20 020A300-1	2022/3/16	2023/3/15

<b>UL Software</b>		
<b>Description</b>	<b>Name</b>	<b>Version</b>
Radiated measurement	e3	6.191211 (V6)
AC power Line Conducted Emission	EZ_EM	UL-3A1.2

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## 8. Description of Test Setup

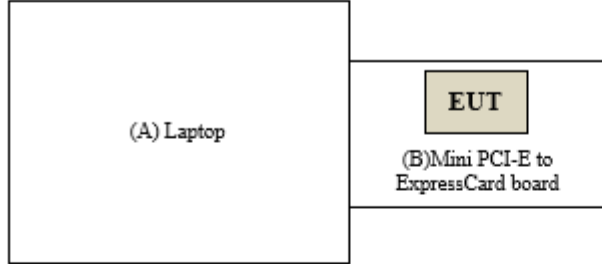
### Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	Dell	Latitude E6430	2MMN3X1	Provide by lab
B	Mini PCI-E to ExpressCard board	N/A	N/A	N/A	Provide by lab

### Test Setup

Controlled using a bespoke application (QSPR\_Version 5.0-00197) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

### Setup Diagram for Test



-----  
**Under Table**

-----  
**Remote Site**

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## 9. Test Results

### 9.1. Radiated Spurious Emission

#### Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
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.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

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Doc No: 17-EM-F0876 / 6.0



Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *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.			

Note:

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

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

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## **Test Procedures**

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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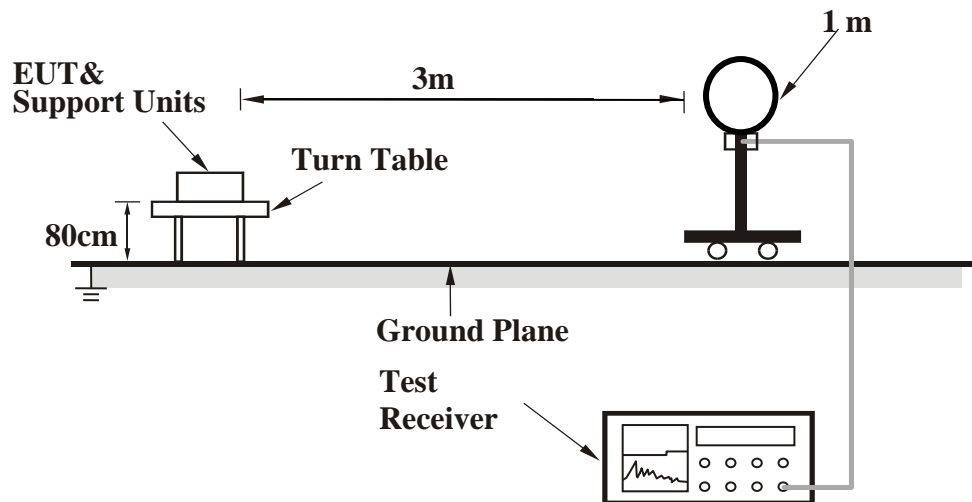
Doc No: 17-EM-F0876 / 6.0

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
5. Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
6. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
7. Test data of Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
8. Test data of Notation "@" = Fundamental Frequency
9. Test data of Notation "\*" = The peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

### Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



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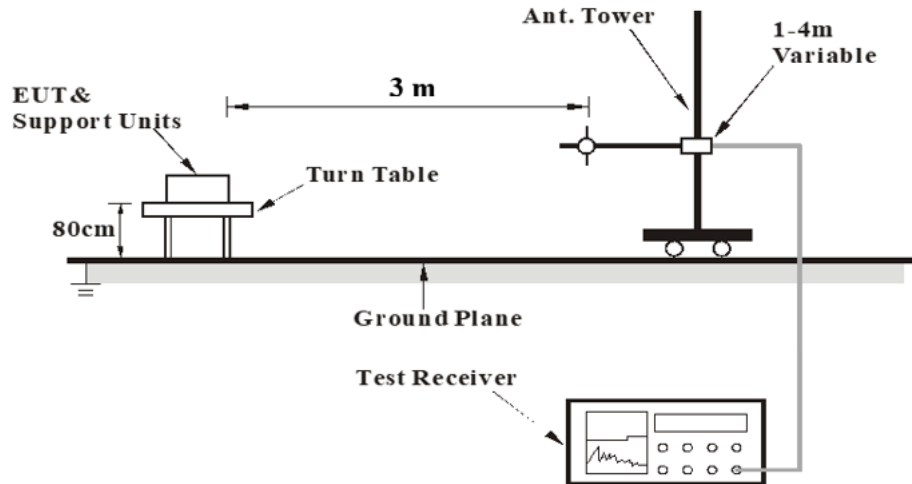
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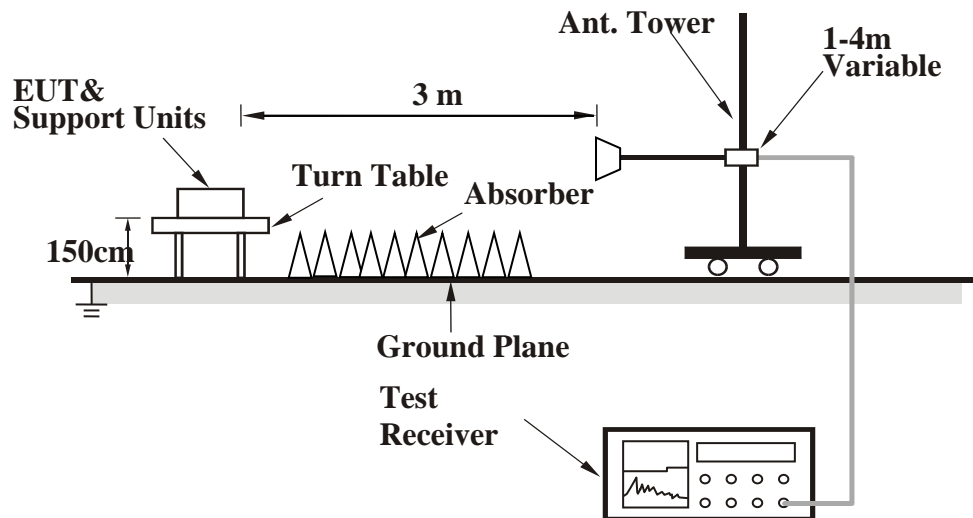
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<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

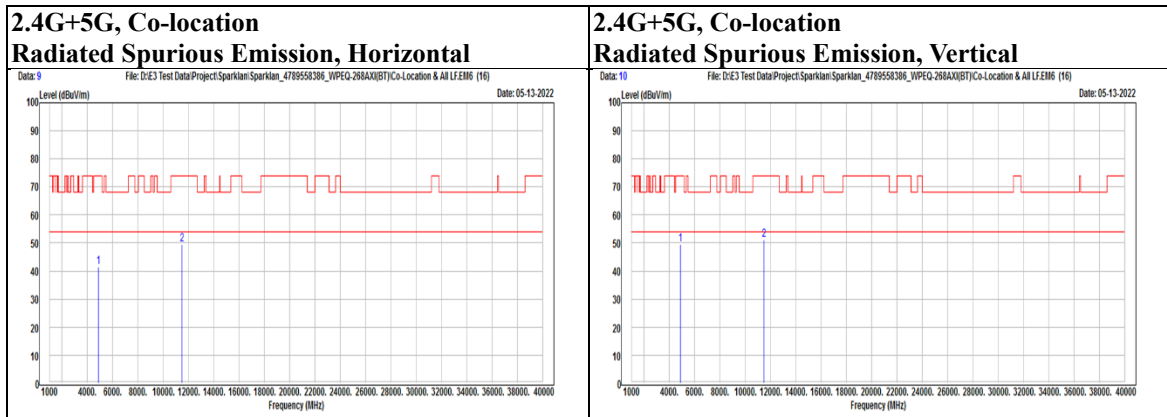


## Test Data

### Above 1 GHz

Mode	WLAN 2.4GHz + WLAN 5GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI5G_A_Ch149
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal	*	4874	39.02	2.4	41.42	74	-32.58	PK
	*	11490	30.04	19.33	49.37	74	-24.63	PK
Vertical	*	4874	47.22	2.4	49.62	74	-24.38	PK
	*	11490	31.8	19.33	51.13	74	-22.87	PK



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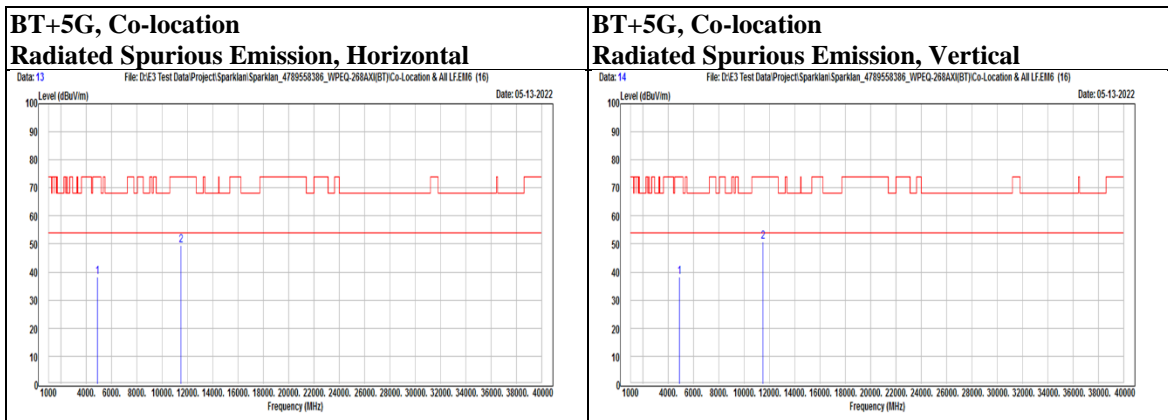
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Mode	Bluetooth + WLAN 5GHz	Channel	BT_GFSK_Ch39 WIFI5G_A_Ch149
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal	*	4882	35.9	2.41	38.31	74	-35.69	PK
	*	11490	30.12	19.33	49.45	74	-24.55	PK
Vertical	*	4882	35.96	2.41	38.37	74	-35.63	PK
	*	11490	31.35	19.33	50.68	74	-23.32	PK



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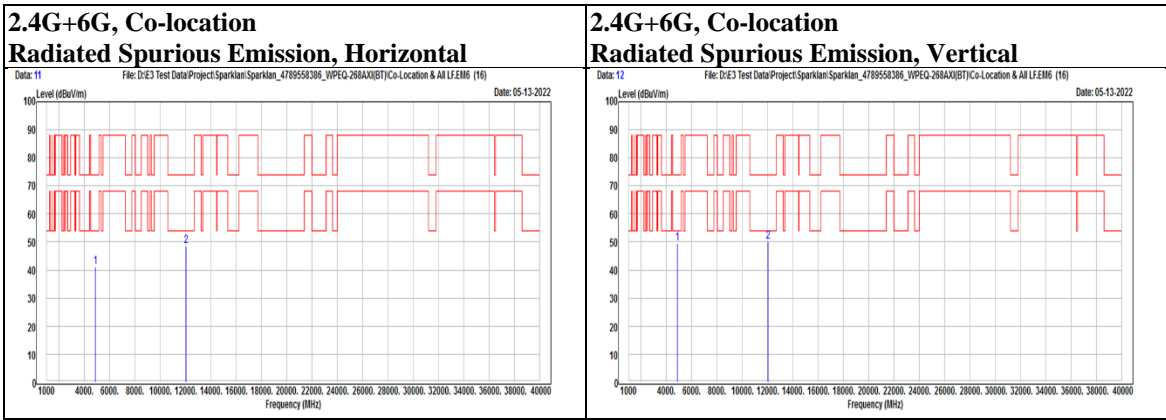
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Mode	WLAN 2.4GHz + WLAN 6GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI6e_AX160_Ch15
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal	*	4874	38.88	2.4	41.28	74	-32.72	PK
	*	12050	29.62	18.97	48.59	74	-25.41	PK
Vertical	*	4874	47.19	2.4	49.59	74	-24.41	PK
	*	12050	31.18	18.97	50.15	74	-23.85	PK



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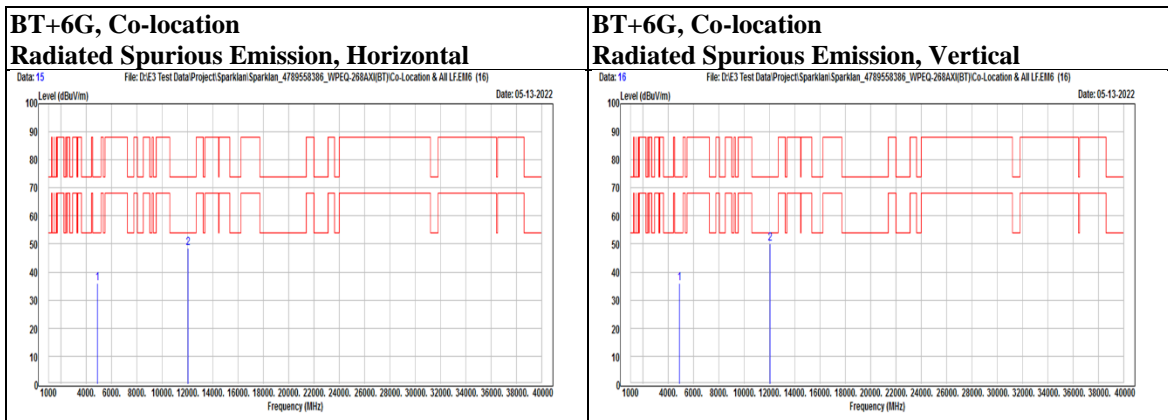
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Mode	Bluetooth + WLAN 6GHz	Channel	BT_GFSK_Ch39 WIFI6e_AX160_Ch15
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal	*	4882	33.55	2.41	35.96	74	-38.04	PK
	*	12050	29.49	18.97	48.46	74	-25.54	PK
Vertical	*	4882	33.65	2.41	36.06	74	-37.94	PK
	*	12050	31.05	18.97	50.02	74	-23.98	PK



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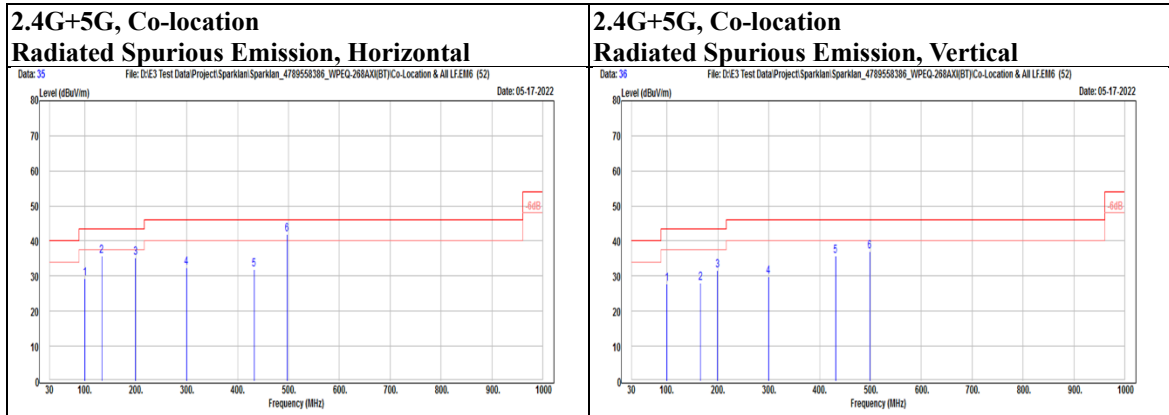
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**Below 1 GHz**

Mode	WLAN 2.4GHz + WLAN 5GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI5G_A_Ch149
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		99.84	45.71	-16.47	29.24	43.5	-14.26	PK
		132.82	48.82	-12.95	35.87	43.5	-7.63	PK
		199.75	49.3	-13.94	35.36	43.5	-8.14	QP
		299.66	42.35	-9.99	32.36	46	-13.64	PK
		432.55	38.14	-6.24	31.9	46	-14.1	PK
		497.54	46.79	-4.86	41.93	46	-4.07	PK
Vertical		99.84	44.23	-16.47	27.76	43.5	-15.74	PK
		165.8	39.11	-11.16	27.95	43.5	-15.55	PK
		199.75	45.5	-13.94	31.56	43.5	-11.94	PK
		299.66	39.81	-9.99	29.82	46	-16.18	PK
		431.58	42.1	-6.25	35.85	46	-10.15	PK
		498.51	41.9	-4.86	37.04	46	-8.96	QP



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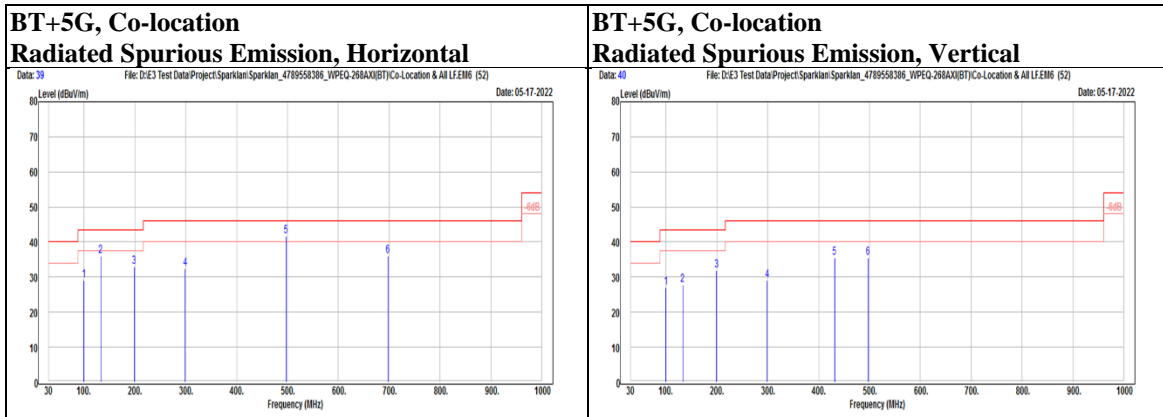
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Mode	Bluetooth + WLAN 5GHz	Channel	BT_GFSK_Ch39 WIFI5G_A_Ch149
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		99.84	45.48	-16.47	29.01	43.5	-14.49	PK
		132.82	48.97	-12.95	36.02	43.5	-7.48	PK
		198.78	46.9	-13.93	32.97	43.5	-10.53	QP
		298.69	42.43	-10.04	32.39	46	-13.61	PK
		497.54	46.43	-4.86	41.57	46	-4.43	PK
		697.36	36.57	-0.57	36	46	-10	PK
Vertical		99.84	43.37	-16.47	26.9	43.5	-16.6	PK
		132.82	40.81	-12.95	27.86	43.5	-15.64	PK
		199.75	45.81	-13.94	31.87	43.5	-11.63	PK
		298.69	39.07	-10.04	29.03	46	-16.97	PK
		431.58	41.88	-6.25	35.63	46	-10.37	PK
		497.54	40.3	-4.86	35.44	46	-10.56	QP



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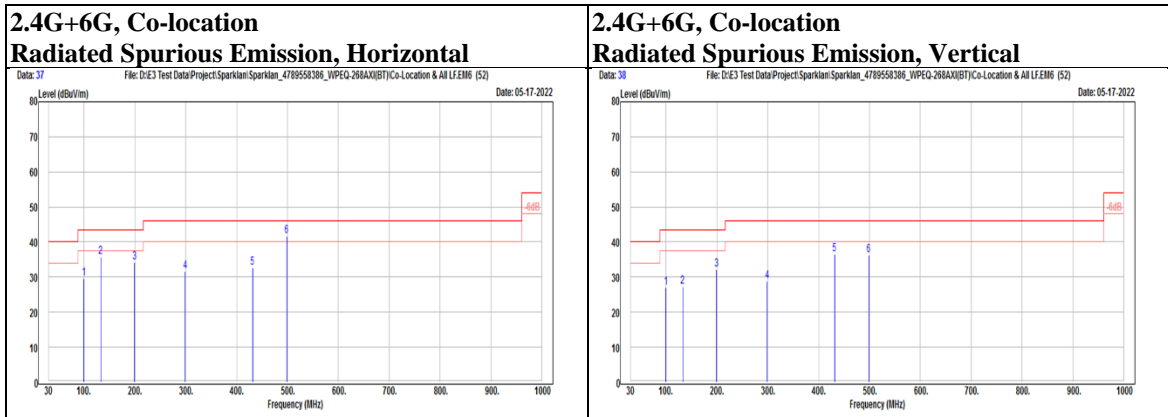
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Mode	WLAN 2.4GHz + WLAN 6GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI6e_AX160_Ch15
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		99.84	45.98	-16.47	29.51	43.5	-13.99	PK
		132.82	48.8	-12.95	35.85	43.5	-7.65	PK
		199.75	48.2	-13.94	34.26	43.5	-9.24	QP
		298.69	41.59	-10.04	31.55	46	-14.45	PK
		431.58	38.8	-6.25	32.55	46	-13.45	PK
		498.51	46.56	-4.86	41.7	46	-4.3	PK
Vertical		99.84	43.55	-16.47	27.08	43.5	-16.42	PK
		132.82	40.31	-12.95	27.36	43.5	-16.14	PK
		199.75	46.13	-13.94	32.19	43.5	-11.31	PK
		298.69	38.73	-10.04	28.69	46	-17.31	PK
		431.58	42.71	-6.25	36.46	46	-9.54	PK
		498.51	41.2	-4.86	36.34	46	-9.66	QP



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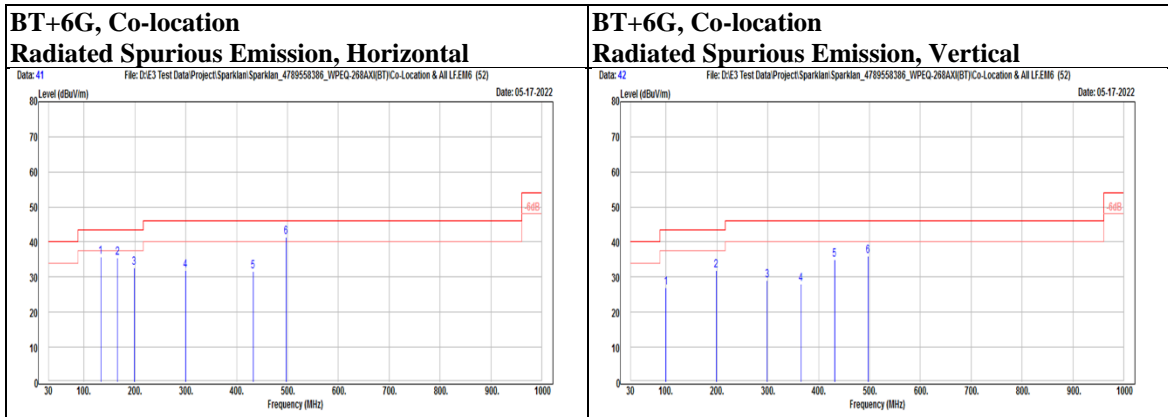
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Mode	Bluetooth + WLAN 6GHz	Channel	BT_GFSK_Ch39 WIFI6e_AX160_Ch15
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		132.82	48.66	-12.95	35.71	43.5	-7.79	PK
		165.8	46.77	-11.16	35.61	43.5	-7.89	PK
		198.78	46.5	-13.93	32.57	43.5	-10.93	QP
		299.66	41.8	-9.99	31.81	46	-14.19	PK
		432.55	37.83	-6.24	31.59	46	-14.41	PK
		497.54	46.26	-4.86	41.4	46	-4.6	PK
Vertical		99.84	43.57	-16.47	27.1	43.5	-16.4	PK
		198.78	45.8	-13.93	31.87	43.5	-11.63	PK
		298.69	39.21	-10.04	29.17	46	-16.83	PK
		365.62	36.16	-8.04	28.12	46	-17.88	PK
		431.58	41.16	-6.25	34.91	46	-11.09	PK
		497.54	40.9	-4.86	36.04	46	-9.96	QP



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### 9 kHz ~ 30 MHz Data:

For 9 kHz to 30 MHz radiated emission have performed all modes of operation were investigated. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

No non-compliance noted:

### **KDB 414788 D01 OATS and Chamber Correlation Justification**

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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## 9.2. AC Power Line Conducted Emission

### Requirements

Frequency (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

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

### Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
3. Test data of Result value (dB $\mu$ V) = Reading value (dB $\mu$ V) + Correction Factor (dB).
4. Test data of Margin(dB) = Result value (dB $\mu$ V) - Limit value (dB $\mu$ V).
5. Test data of Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).

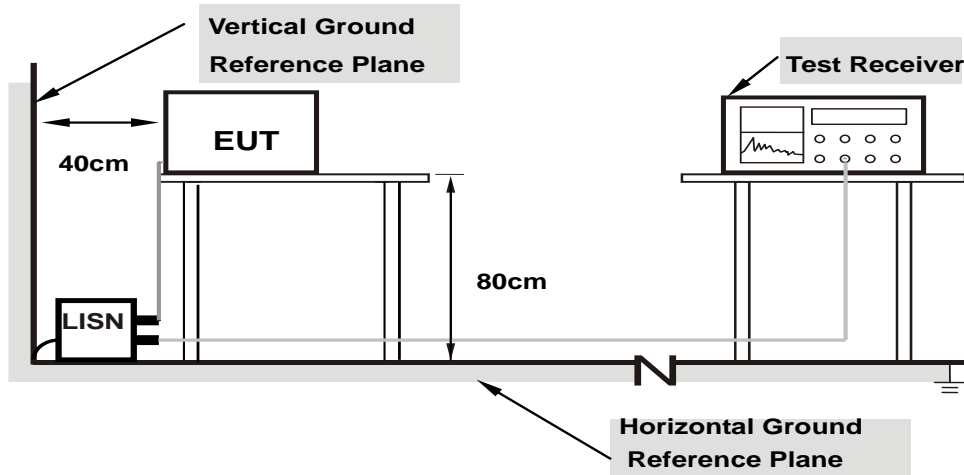
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## Test Setup



**Note: 1.Support units were connected to second LISN.**

For the actual test configuration, please refer to the Setup Configurations.

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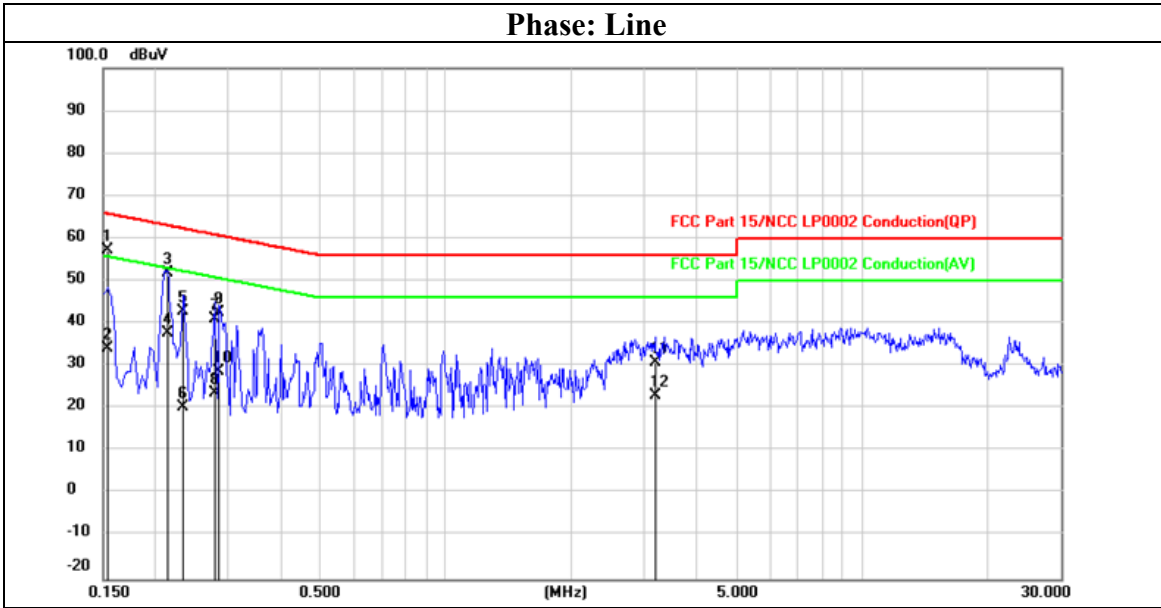
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**Test Data**

Mode	WLAN 2.4GHz + WLAN 5GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI5G A Ch149
------	-------------------------	---------	-------------------------------------



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	37.80	19.51	57.31	65.79	-8.48	QP
2	0.1539	14.53	19.51	34.04	55.79	-21.75	AVG
3	0.2140	32.39	19.51	51.90	63.05	-11.15	QP
4	0.2140	18.28	19.51	37.79	53.05	-15.26	AVG
5	0.2340	23.48	19.51	42.99	62.31	-19.32	QP
6	0.2340	0.99	19.51	20.50	52.31	-31.81	AVG
7	0.2779	21.58	19.51	41.09	60.88	-19.79	QP
8	0.2779	4.00	19.51	23.51	50.88	-27.37	AVG
9	0.2860	23.07	19.51	42.58	60.64	-18.06	QP
10	0.2860	9.10	19.51	28.61	50.64	-22.03	AVG
11	3.1820	11.34	19.57	30.91	56.00	-25.09	QP
12	3.1820	3.46	19.57	23.03	46.00	-22.97	AVG

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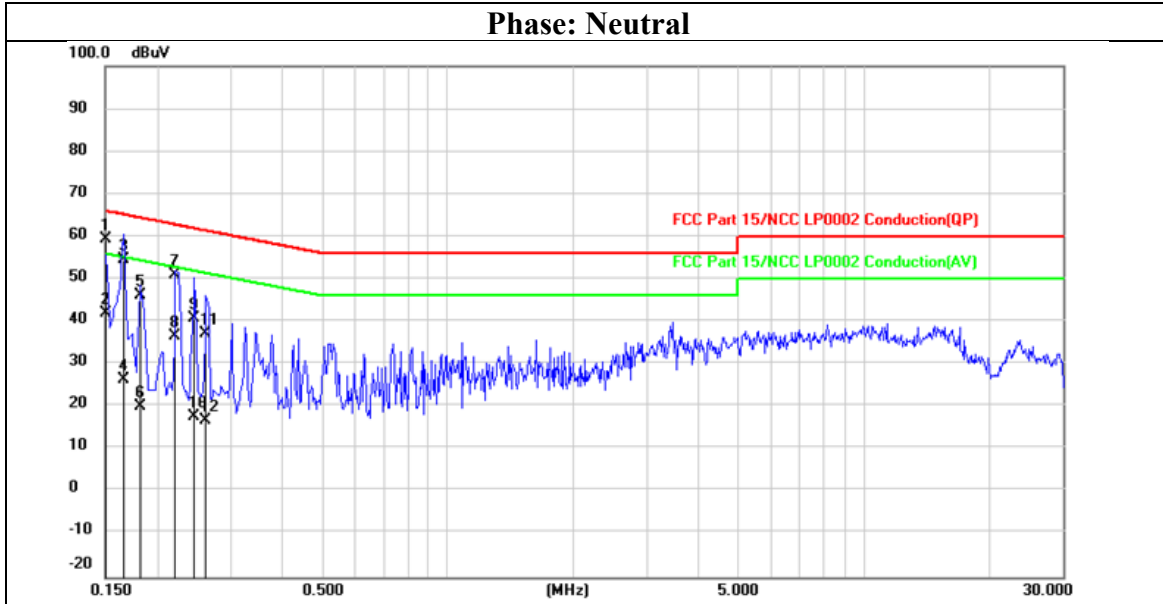
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Mode	WLAN 2.4GHz + WLAN 5GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI5G A_Ch149
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	39.81	19.51	59.32	66.00	-6.68	QP
2	0.1500	22.57	19.51	42.08	56.00	-13.92	AVG
3	0.1660	34.97	19.51	54.48	65.16	-10.68	QP
4	0.1660	6.72	19.51	26.23	55.16	-28.93	AVG
5	0.1819	26.57	19.51	46.08	64.40	-18.32	QP
6	0.1819	0.41	19.51	19.92	54.40	-34.48	AVG
7	0.2220	31.47	19.51	50.98	62.74	-11.76	QP
8	0.2220	16.96	19.51	36.47	52.74	-16.27	AVG
9	0.2460	21.21	19.51	40.72	61.89	-21.17	QP
10	0.2460	-1.88	19.51	17.63	51.89	-34.26	AVG
11	0.2620	17.59	19.51	37.10	61.37	-24.27	QP
12	0.2620	-2.72	19.51	16.79	51.37	-34.58	AVG

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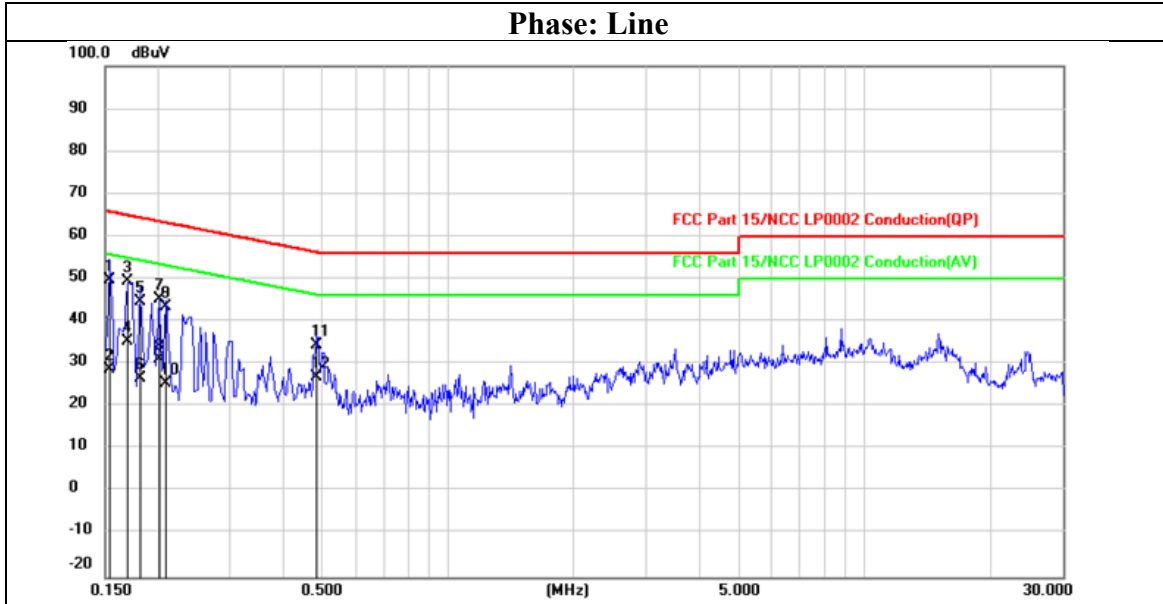
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Mode	WLAN 2.4GHz + WLAN 6GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI6e_AX160_Ch15
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	30.24	19.51	49.75	65.79	-16.04	QP
2	0.1539	9.22	19.51	28.73	55.79	-27.06	AVG
3	0.1700	29.86	19.51	49.37	64.96	-15.59	QP
4	0.1700	15.73	19.51	35.24	54.96	-19.72	AVG
5	0.1819	25.26	19.51	44.77	64.40	-19.63	QP
6	0.1819	7.11	19.51	26.62	54.40	-27.78	AVG
7	0.2020	25.69	19.51	45.20	63.53	-18.33	QP
8	0.2020	11.51	19.51	31.02	53.53	-22.51	AVG
9	0.2100	23.89	19.51	43.40	63.21	-19.81	QP
10	0.2100	5.92	19.51	25.43	53.21	-27.78	AVG
11	0.4860	15.06	19.51	34.57	56.24	-21.67	QP
12	0.4860	7.48	19.51	26.99	46.24	-19.25	AVG

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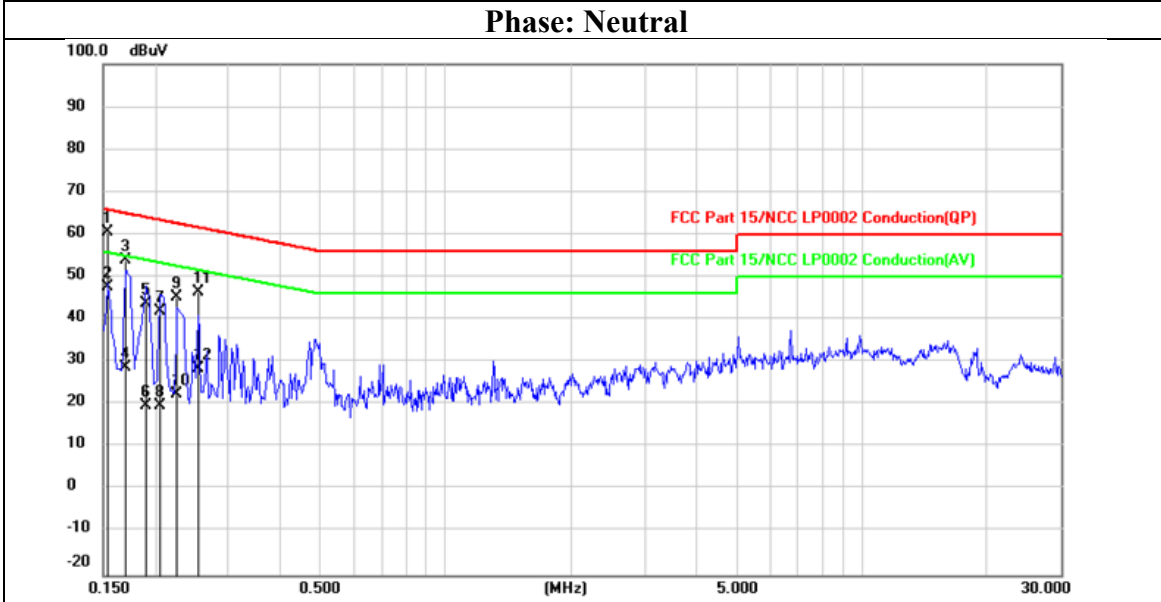
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Mode	WLAN 2.4GHz + WLAN 6GHz	Channel	WIFI2.4G_AX20_Ch6 WIFI6e_AX160_Ch15
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	41.09	19.51	60.60	65.79	-5.19	QP
2	0.1539	28.27	19.51	47.78	55.79	-8.01	AVG
3	0.1700	34.58	19.51	54.09	64.96	-10.87	QP
4	0.1700	9.31	19.51	28.82	54.96	-26.14	AVG
5	0.1900	24.36	19.51	43.87	64.04	-20.17	QP
6	0.1900	0.29	19.51	19.80	54.04	-34.24	AVG
7	0.2060	22.42	19.51	41.93	63.37	-21.44	QP
8	0.2060	0.35	19.51	19.86	53.37	-33.51	AVG
9	0.2260	25.80	19.51	45.31	62.60	-17.29	QP
10	0.2260	3.03	19.51	22.54	52.60	-30.06	AVG
11	0.2540	26.81	19.51	46.32	61.63	-15.31	QP
12	0.2540	8.87	19.51	28.38	51.63	-23.25	AVG

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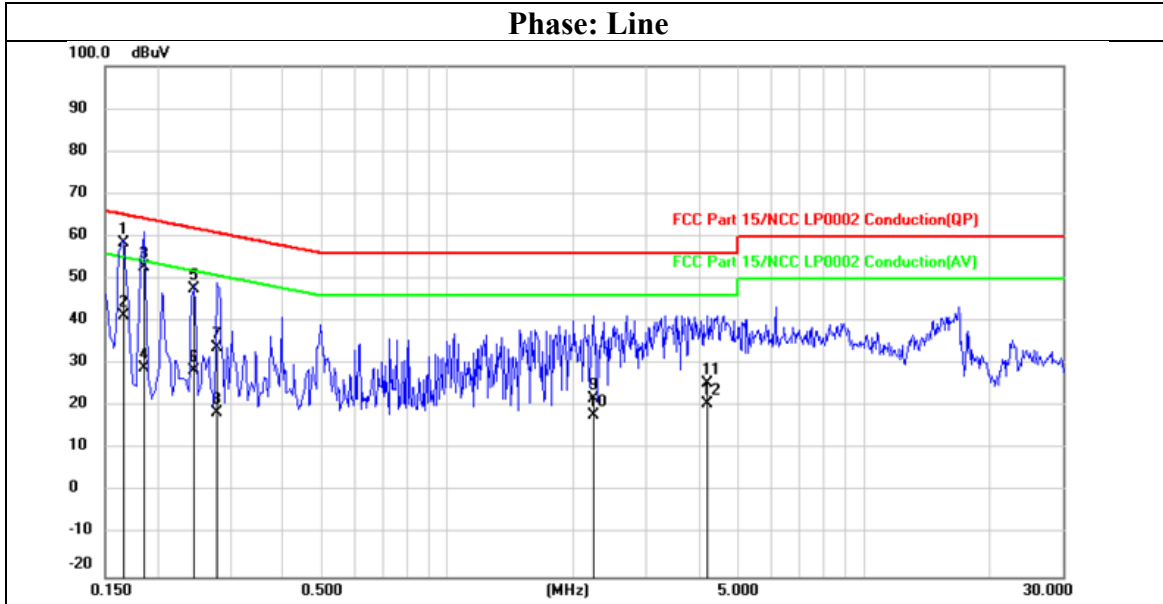
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Mode	Bluetooth + WLAN 5GHz	Channel	BT_GFSK_Ch39 WIFI5G_A_Ch149
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1660	38.99	19.51	58.50	65.16	-6.66	QP
2	0.1660	21.77	19.51	41.28	55.16	-13.88	AVG
3	0.1860	33.25	19.51	52.76	64.21	-11.45	QP
4	0.1860	9.58	19.51	29.09	54.21	-25.12	AVG
5	0.2460	28.00	19.51	47.51	61.89	-14.38	QP
6	0.2460	8.88	19.51	28.39	51.89	-23.50	AVG
7	0.2779	14.38	19.51	33.89	60.88	-26.99	QP
8	0.2779	-1.09	19.51	18.42	50.88	-32.46	AVG
9	2.2460	2.17	19.55	21.72	56.00	-34.28	QP
10	2.2460	-1.62	19.55	17.93	46.00	-28.07	AVG
11	4.2100	5.86	19.59	25.45	56.00	-30.55	QP
12	4.2100	1.21	19.59	20.80	46.00	-25.20	AVG

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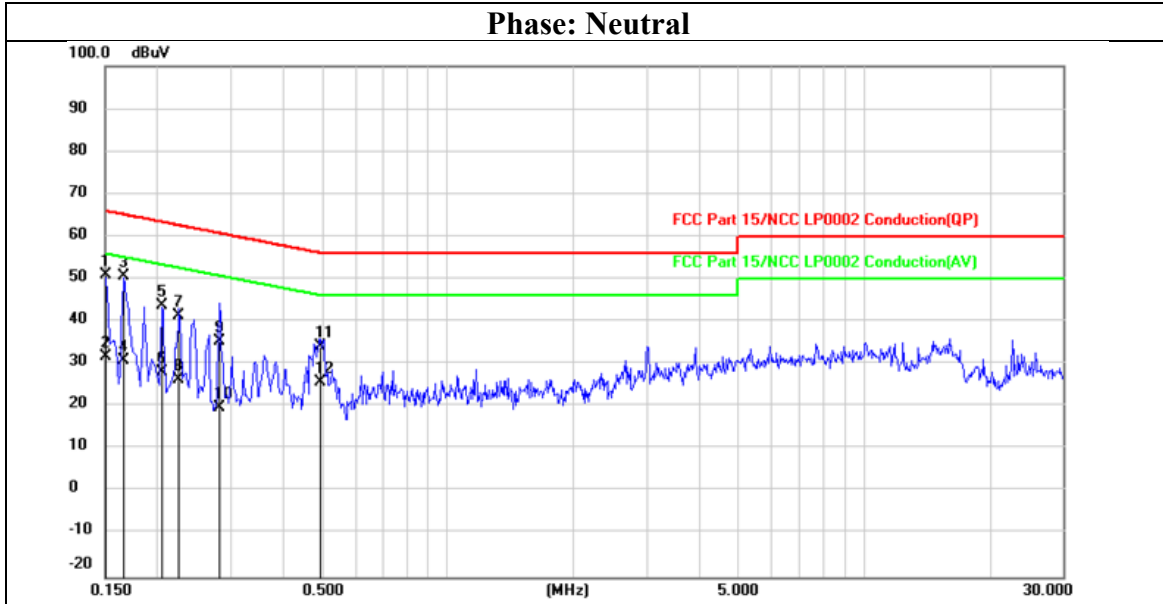
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Mode	Bluetooth + WLAN 5GHz	Channel	BT_GFSK_Ch39 WIFI5G_A_Ch149
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	31.42	19.51	50.93	66.00	-15.07	QP
2	0.1500	12.33	19.51	31.84	56.00	-24.16	AVG
3	0.1660	31.17	19.51	50.68	65.16	-14.48	QP
4	0.1660	11.35	19.51	30.86	55.16	-24.30	AVG
5	0.2060	24.27	19.51	43.78	63.37	-19.59	QP
6	0.2060	8.64	19.51	28.15	53.37	-25.22	AVG
7	0.2260	21.93	19.51	41.44	62.60	-21.16	QP
8	0.2260	6.82	19.51	26.33	52.60	-26.27	AVG
9	0.2819	15.73	19.51	35.24	60.76	-25.52	QP
10	0.2819	0.36	19.51	19.87	50.76	-30.89	AVG
11	0.4940	14.55	19.51	34.06	56.10	-22.04	QP
12	0.4940	6.30	19.51	25.81	46.10	-20.29	AVG

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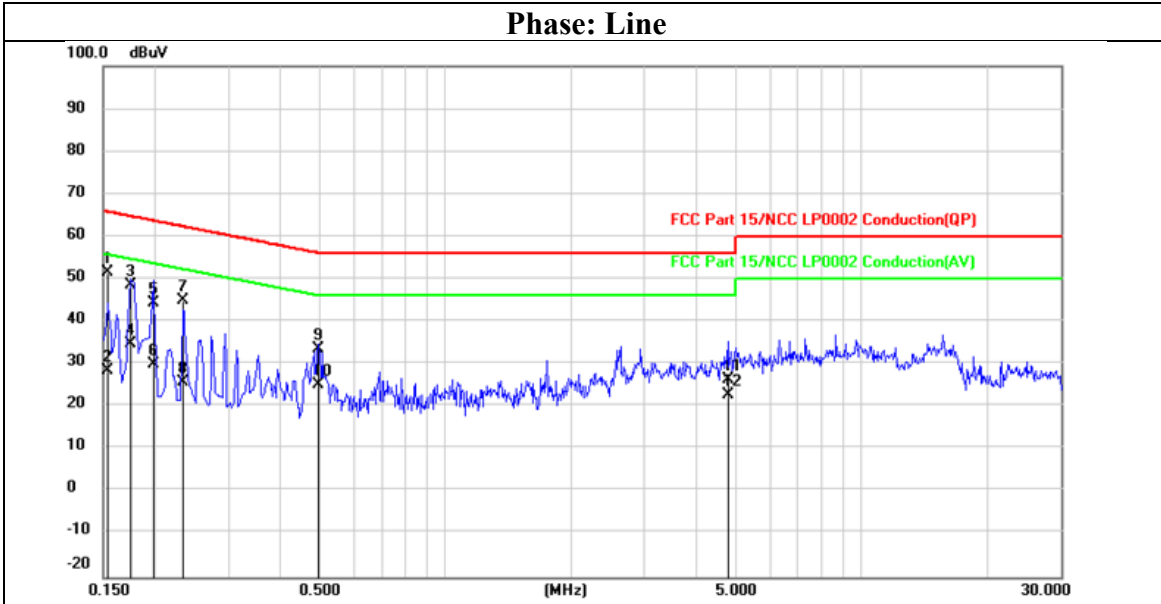
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Mode	Bluetooth + WLAN 6GHz	Channel	BT_GFSK_Ch39 WIFI6e_AX160_Ch15
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	31.95	19.51	51.46	65.79	-14.33	QP
2	0.1539	8.93	19.51	28.44	55.79	-27.35	AVG
3	0.1740	29.01	19.51	48.52	64.77	-16.25	QP
4	0.1740	15.18	19.51	34.69	54.77	-20.08	AVG
5	0.1980	24.96	19.51	44.47	63.69	-19.22	QP
6	0.1980	10.42	19.51	29.93	53.69	-23.76	AVG
7	0.2340	25.48	19.51	44.99	62.31	-17.32	QP
8	0.2340	6.35	19.51	25.86	52.31	-26.45	AVG
9	0.4940	13.91	19.51	33.42	56.10	-22.68	QP
10	0.4940	5.60	19.51	25.11	46.10	-20.99	AVG
11	4.7540	6.84	19.60	26.44	56.00	-29.56	QP
12	4.7540	3.30	19.60	22.90	46.00	-23.10	AVG

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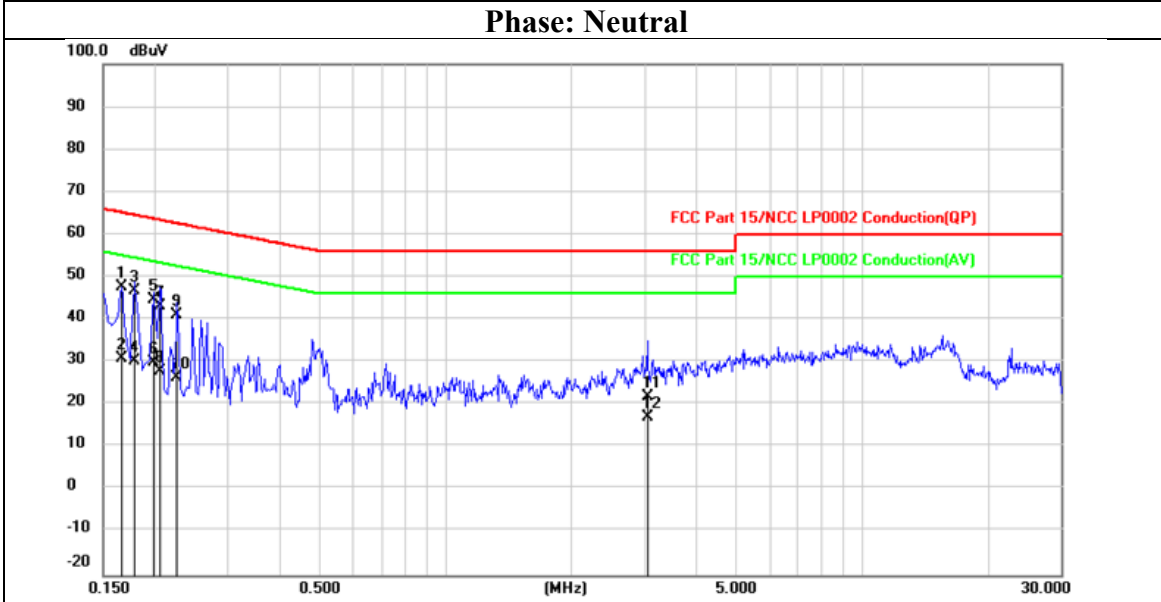
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Mode	Bluetooth + WLAN 6GHz	Channel	BT_GFSK_Ch39 WIFI6e_AX160_Ch15
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1660	28.12	19.51	47.63	65.16	-17.53	QP
2	0.1660	11.30	19.51	30.81	55.16	-24.35	AVG
3	0.1780	27.24	19.51	46.75	64.58	-17.83	QP
4	0.1780	10.74	19.51	30.25	54.58	-24.33	AVG
5	0.1980	25.13	19.51	44.64	63.69	-19.05	QP
6	0.1980	10.56	19.51	30.07	53.69	-23.62	AVG
7	0.2060	23.64	19.51	43.15	63.37	-20.22	QP
8	0.2060	8.49	19.51	28.00	53.37	-25.37	AVG
9	0.2260	21.40	19.51	40.91	62.60	-21.69	QP
10	0.2260	6.98	19.51	26.49	52.60	-26.11	AVG
11	3.0460	2.25	19.56	21.81	56.00	-34.19	QP
12	3.0460	-2.44	19.56	17.12	46.00	-28.88	AVG

**END OF REPORT**

**Underwriters Laboratories Taiwan Co., Ltd.**

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