

FCC RF Test Report

For

System Monitoring Tablet

Model Number : K1002C-POE-K001
FCC ID : 2A2UHK1002C-POE
Date of Receipt : Septemebr 29, 2021
Date of Report : December 1, 2021

Prepared for

Rivertech Co., Ltd.

5F., No. 34, Songde Rd., Xinyi dist., Taipei city Taiwan(R.O.C)



Prepared by

Central Research Technology Co.

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Verification of Compliance

Equipment under Test : System Monitoring Tablet
Model No. : K1002C-POE-K001
FCC ID : 2A2UHK1002C-POE
Applicant : Rivertech Co., Ltd.
Address : 5F., No. 34, Songde Rd., Xinyi dist., Taipei city Taiwan(R.O.C)
Applicable Standards : 47 CFR part 15, Subpart C
ANSI C63.10:2013
Date of Testing : October 13 ~ December 1, 2021
Deviation : The method, configuration and arrangement of the tests are following the requirement of customer and the applicable standards cited above.
Condition of Test Sample : Mass Production



We, **Central Research Technology Co.**, hereby certify that one sample of the designated product was tested in our facility during the period mentioned above. The test records, data evaluation and Equipment Under Test (EUT) configurations shown in the present report are true and accurate representation of the measurements of the sample's RF characteristics under the conditions herein specified.

The test results show that the EUT as described in the present report is in compliance with the requirements set forth in the standards mentioned above and apply to the tested sample identified in the present report only. The test report shall not be reproduced, except in its entirety, without the written approval of Central Research Technology Co.

PREPARED BY : Cathy Chen , **DATE** : December 1, 2021
(Cathy Chen/ Technical Manager)

APPROVED BY : Sam Chien , **DATE** : December 1, 2021
(Sam Chien /General Manager)

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1 General Description

1.1 General Description of EUT

Equipment under Test : System Monitoring Tablet
Model No. : K1002C-POE-K001
Power in : 120 Vac /60 Hz
Frequency Range : 2402 MHz – 2480 MHz
Modular Function : GFSK, $\Pi/4$ DQPSK, 8DPSK
Channel No. : 79
Antenna Spec : Brand/Mode No.: South Star/ SMB-K1002
Type: FPCB Antenna
Antenna Gain : 2.76dBi

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Test Mode

Test item	Operation Frequency	
	1M/2M/3M	CH 0, CH 39, CH 78
Conducted power test	1M/2M/3M	CH 0, CH 39, CH 78
Radiated emission above 1 GHz *	1M/3M	CH 0, CH 39, CH 78
Radiated emission below 1 GHz	Normal mode	
Line conducted emission	Normal mode	

Note: According to conducted test, 1M/3M were taken as the representative condition for radiated emission above 1GHz and its data are recorded in the present document.

EUT Test step:

1. EUT turn on the power.
2. Enter engineer mode.
3. Adjust test mode, channel, setting power.
4. Press start testing.
5. EUT run test program and transmit signal.

1.2 Applied standards

(1) Maximum peak conducted output power

According to FCC 15.247(b)(1), The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) Outside of band

According to FCC 15.247(d), 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. 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) (see § 15.205(c)).

(3) Frequency Separation

According to FCC 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

(4) Hopping number and occupied time

According to FCC 15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

(5) Radiated emission

For intentional device, according to FCC 15.209, the general requirement of field strength of radiated emissions from intentional radiator at a distance of 3 meters shall not exceed the below table.

Frequency (MHz)	Measurement Distance (m)	Field Strength (uV/m)	Field Strength (dBuV/m)
0.009-0.490	300	2400/F(kHz)	
0.490-1.705	30	24000/F(kHz)	
1.705-30.0	3	30	29.5
30 – 88	3	100	40.0
88 – 216	3	150	43.5
216 – 960	3	200	46.0
above 1610	3	500	54.0

Note1 : At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

Note 2: At frequencies below 30 MHz, 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. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade)

(6) Line Conduction Emission

For intentional device, according to FCC 15.207(a), line conduction emission limit is as below table.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

(7) Restricted Band

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

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

1.3 Test result

Test Item	FCC standard section	Report section	Test result
Maximum peak conducted output power	15.247(b)(1)	2	PASS
20 dB Bandwidth	15.247(a)(1)	3	PASS
Frequency separation	15.247(a)(1)	4	PASS
Hopping number	15.247(a)(1)(iii)	5	PASS
Occupied time	15.247(a)(1)(iii)	6	PASS
Conducted spurious emission	15.247(d)	7	PASS
Radiated spurious emission	15.209	8	PASS
Line Conduction Emission	15.207(a)	9	PASS
Pseudorandom Frequency Hopping Sequence	15.247(a)(1)	-	PASS *

Note: The device is designed according to specifications of SIG , So it has a full support to Medium access protocol and fully compliant with the KDB558074 standard. The device is compliant Pseudorandom hopping, Equal hopping frequency, receiver bandwidth synchronize and have same bandwidth with transmitted signal. And the ability to have adaptive hopping when encountering other signals.

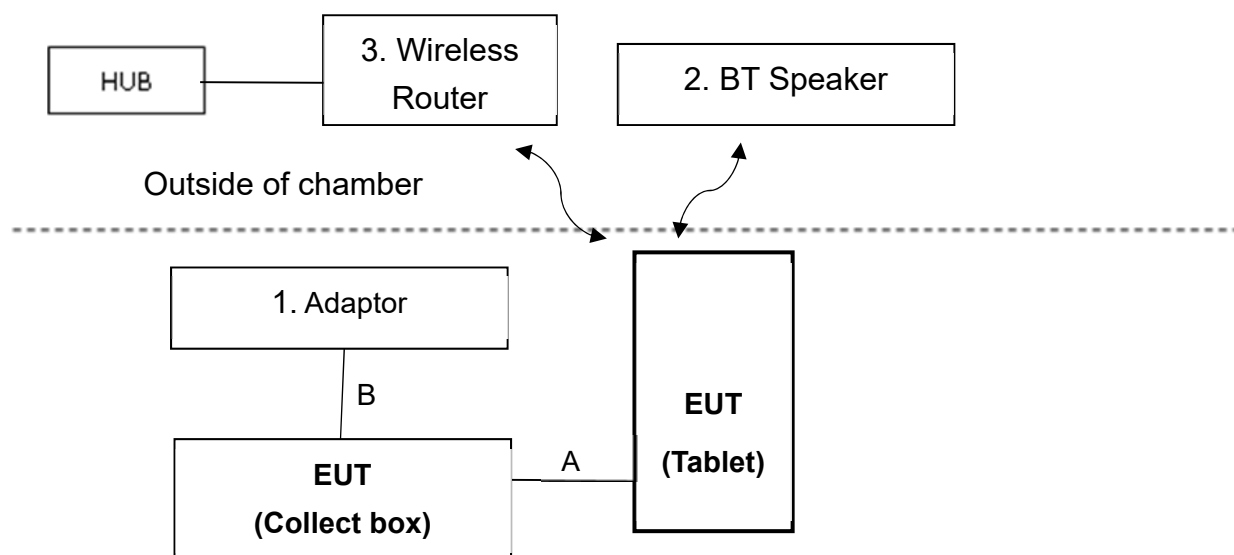
According to ANSI C63.10, determining compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

1.4 The Support Units

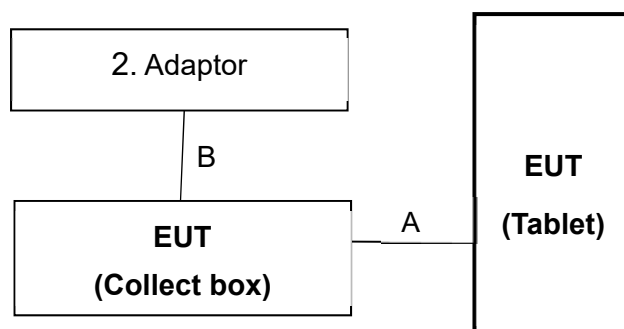
No.	Unit	Model No.	Trade Name	Power Code	Supported by lab.
1.	Adaptor	ICP30-120-2500	Cullpower		
2.	BT Speaker	XMYX03YM	Mi		√
3	Wireless Router	RT-AC51U	ASUS		√

1.5 Layout of Setup

Normal mode



Other Test



Connecting Cables :

No.	Cable	Length	Shielded	Core	Shielded Backshell	Supported by lab.	Note
A	Micro USB cable	0.35m	✓				
B	Power cable	1.2m		✓			

1.6 Test Instruments

Conducted Emission Test

Test Site and Equipment	Manufacturer	Model No. /Serial No.	Last Calibration Date	Calibration Due Date
Spectrum Alayzer	R&S	FSV40/ 101609	2021/10/18	2022/10/18
RFcable	JMCA	MWX/ C0150~C0153, C0161~C0163	2020/12/3	2021/12/3
Test software	R&S	EMC32/ V11.10.00	NCR	NCR
Test room	N/A	TR13	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Radiated Emission Test (Below 1GHz)

Test Site and Equipment	Manufacturer	Model No. /Serial No.	Last Calibration Date	Calibration Due Date
EMI Receiver	R&S	ESCS30/ 836858/020	2020/10/30	2021/10/30
Spectrum Alayzer	Agilent	E4407B/ MY45106795	2021/6/23	2022/6/23
Antenna	SCHWARZBECK & Mini-Circuits	VULB 9168 & BW-N5W5+/ VULB 9168-668 & 003	2021/5/6	2022/5/6
Pre-amplifier	Mini-circuit	ZKL-1R5+/ 004	2021/7/13	2022/1/13
RF cable	JYEBAO	0214/ C0080-4 + C0080-1 + C0080- 2+RSU(CRC- 011/11)+C0080-3	2021/7/13	2022/1/13
Test software	Audix	e3/ V6.20110303a2	NCR	NCR
Semi-anechoic chamber	ETS. LINDGREN	TR11/ 906-A	2021/4/10	2022/4/10

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the semi-anechoic chamber listed above is the date of NSA measurement.

Radiated Emission Test (Above 1 GHz)

Test Site and Equipment	Manufacturer	Model No. /Serial No.	Last Calibration Date	Calibration Due Date
Antenna	EMCO	3117/ 0082847	2020/11/3	2021/11/3
Antenna	Com-Power	AH-840/ 101098	2020/12/31	2021/12/31
Pre-amplifier	MITEQ	TTA1800-30-HG- N-M/ 1904295	2020/10/28	2021/10/28
Pre-amplifier	MITEQ	TTA1840-35-HG/ 2034375	2021/9/9	2022/9/9
RFcable	JMCA	MWX241/B/ C0103~C0104	2021/4/9	2022/4/9
RFcable	JMCA	MWX241/B/ C0103~C0104	2021/4/9	2022/4/9
RFcable	Suhner	Sucoflex 106P / C0091	2021/10/4	2022/10/4
RFcable	JMCA	MWX241/B/ C0103~C0104	2021/4/9	2022/4/9
MXA signal analyzer	KeySight	N9020A/ MY54420147	2021/7/5	2022/7/5
Test software	Audix	e3/ V9 20150907c	NCR	NCR
Semi-anechoic chamber	ETS. LINDGREN	TR1/ 17627-B	2021/2/9	2022/2/9

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the chamber TR1 listed above is the date of site VSWR measurement.

For Power Line Conducted Measurement

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Test Receiver	R&S	ESCI/ 100316/003	2021/4/9	2022/4/9
LISN	R&S	ESH2-Z5/ 880669/039	2021/4/23	2022/4/23
2 nd LISN	R&S	ESH2-Z5/ 836613/001	2021/9/6	2022/9/6
50Ω terminator	SHHNER	65 BNC-50-0-1/133 NE/004	2021/6/1	2022/6/1
RF Cable	JYBAO	0214/ C0113 + RSU + C0114	2021/8/18	2022/2/18
RF Cable	JYBAO	0214/ C0112 + RSU + C0114	2021/8/18	2022/2/18
Test Software	Audix	e3/ V6.20110303a2	NCR	NCR
TR20 shielded room	ETS LINDGREN	T R20/ 17873-2	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

1.7 Test Capability

Test Facility

The test facility used for evaluating the conformance of the EUT with each standard in the present report meets what required in CISPR16 series and ANSI C63.4:2014 amended as per ANSI C63.4a:2017.

Test Room	Type of Test Room	Descriptions
TR1	10m semi-anechoic chamber	For the radiated emission measurement (below 1GHz)
TR1	3m fully-anechoic chamber	For the radiated emission measurement (above 1GHz)
TR11	3m semi-anechoic chamber	For the radiated emission measurement (below 1GHz)
TR13	Test Site	For the RF conducted emission measurement.
TR5	Shielding Room	For the conducted emission measurement.
TR20	Shielding Room	

Test Laboratory Competence Information

Central Research Technology Co. has been accredited / filed / authorized by the agencies listed in the following table.

Certificate	Nation	Agency	Code	Mark
Accreditation Certificate	USA	NVLAP	200575-0	ISO/IEC 17025
	USA	FCC	TW1104, TW0019	ISO/IEC 17025
	R.O.C. (Taiwan)	TAF	0905	ISO/IEC 17025
	R.O.C. (Taiwan)	BSMI	SL2-IN-E-0033, SL2-IS-E-0033, SL2-R1/R2-E-0033, SL2-A1-E-0033, SL2-L1-E-0033	ISO/IEC 17025
	Canada	ISED	TW0905	ISO/IEC 17025
Site Filing Document	Japan	VCCI	R-11527,C-11609,T-11441, G-10010,C-20010, G-10614, T-20009	Test facility list & NSA Data
Authorization Certificate	Germany	TUV	UA 50235497	ISO/IEC 17025

The copy of each certificate can be downloaded from our web site: www.crc-lab.com

1.8 Measurement Uncertainty

The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{CISPR} in table 1 of CISPR 16-4-2.

Test Item	Measurement Uncertainty	
Radiated Emission: (9kHz~30MHz)	Horizontal 3.92dB ; Vertical 3.92dB	
Radiated Emission: (30MHz~1000MHz)	Horizontal 4.42dB ; Vertical 5.98dB	
Radiated Emission: (1GHz~6GHz)	Horizontal 4.60dB ; Vertical 4.48dB	
Radiated Emission: (6GHz~18GHz)	Horizontal 4.66dB ; Vertical 4.58dB	
Radiated Emission: (18GHz~40GHz)	Horizontal 4.74dB ; Vertical 4.76dB	
Line Conducted Emission	NSLK-8128-RC	2.48 dB
	ENV 4200	2.52 dB
	ESH2-Z5	2.20 dB

2 Maximum peak conducted output power

Result: Pass

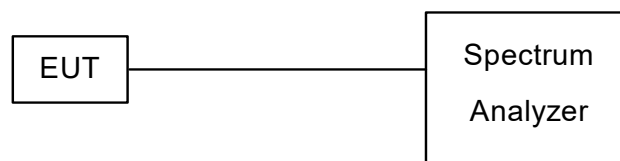
2.1 Applied standard

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

2.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit data at middle channel frequencies individually.
- c. Test procedures follow ANSI C63.10 Section 7.8.5
- d. Spectrum alayzer setting: RBW=1 MHz, VBW=3 MHz(for 1M); RBW=2 MHz, VBW=10 MHz(for 2M/3M), Max peak
- e. Measure the maximum peak conducted output power and compare with the required limit.

2.3 Test configuration



2.4 Test Data

Test Mode : Continuous Transmitting

Tester : Wayne

Ambient Temperature : 24°C

Relative Humidity : 51%

Test Date : 110/11/29

1M

Operating Frequency (MHz)	output power (dBm)	Limit (dBm)	Margin (dB)
2402	5.3	21	15.7
2440	5.2	21	15.8
2480	4.9	21	16.1

Note:

1. $\text{Margin(dB)} = \text{Limit} - \text{output power}$

2M

Operating Frequency (MHz)	output power (dBm)	Limit (dBm)	Margin (dB)
2402	4.3	21	16.7
2440	4.3	21	16.7
2480	4.0	21	17.0

Note:

1. $\text{Margin(dB)} = \text{Limit} - \text{output power}$

3M

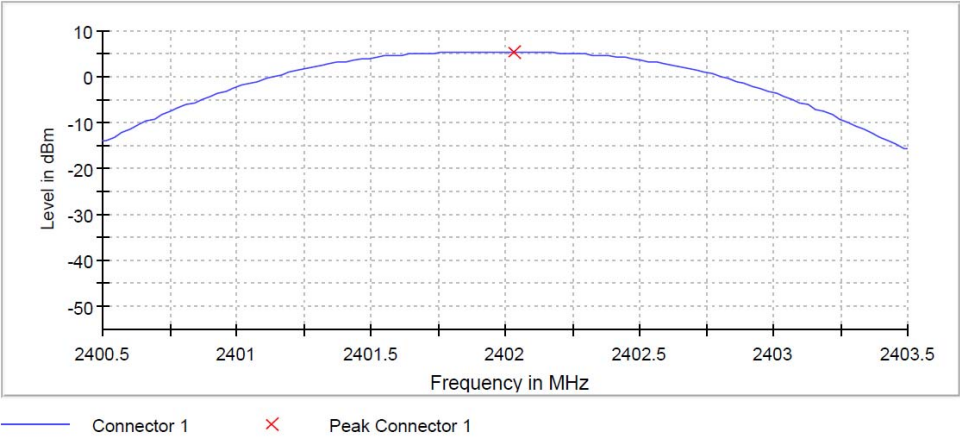
Operating Frequency (MHz)	output power (dBm)	Limit (dBm)	Margin (dB)
2402	4.3	21	16.7
2440	5.0	21	16.0
2480	4.8	21	16.2

Note:

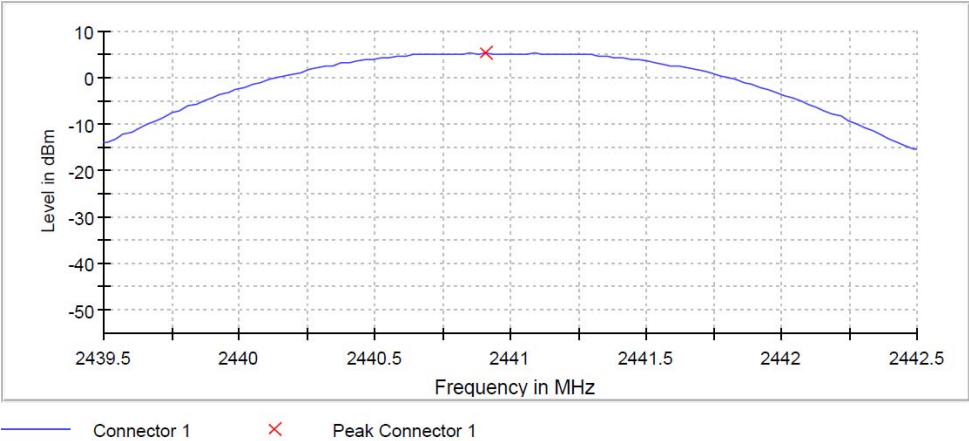
1. $\text{Margin(dB)} = \text{Limit} - \text{output power}$

1M

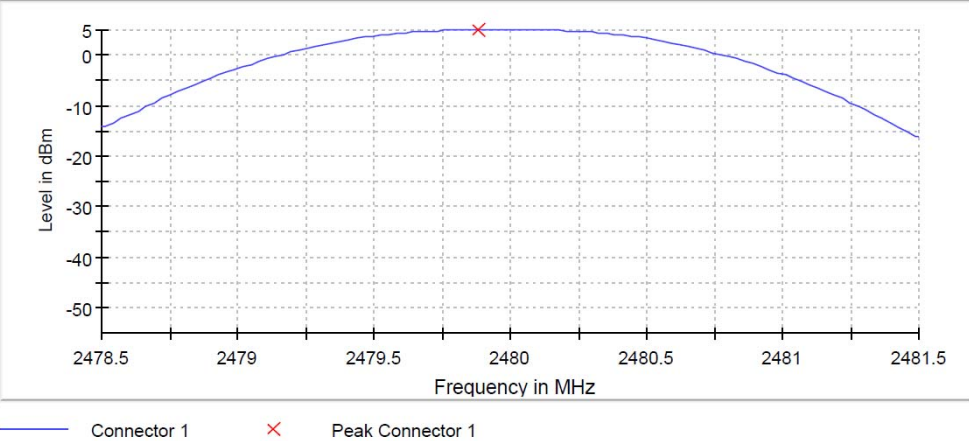
2402MHz



2441MHz

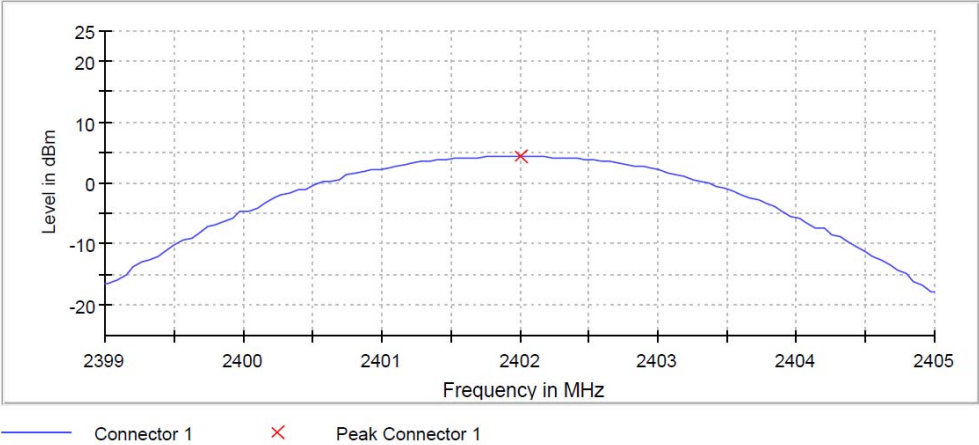


2480MHz

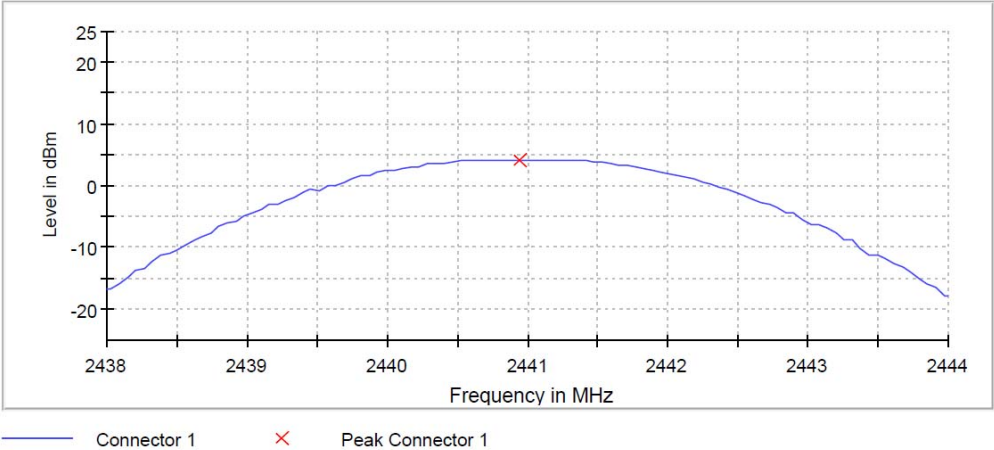


2M

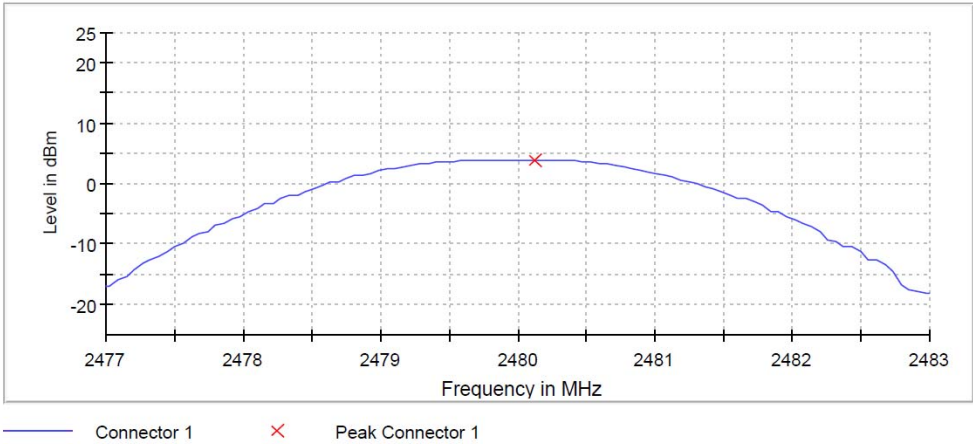
2402MHz



2441MHz

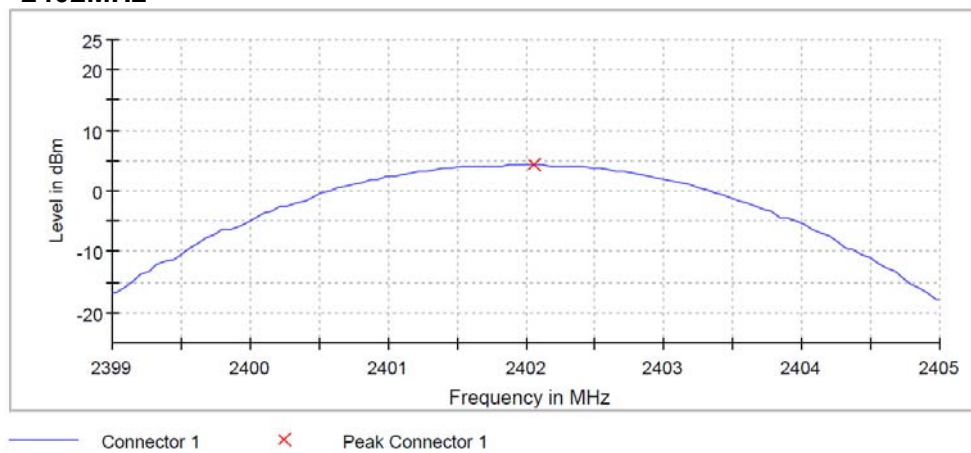


2480MHz

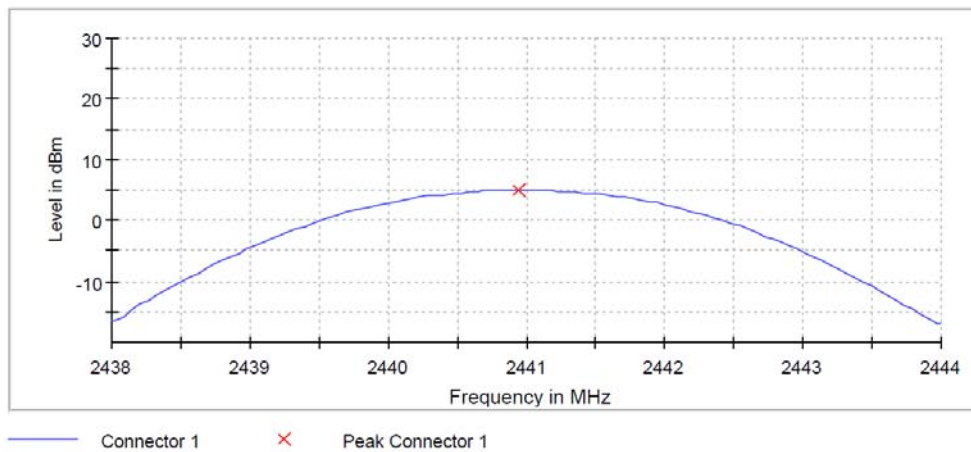


3M

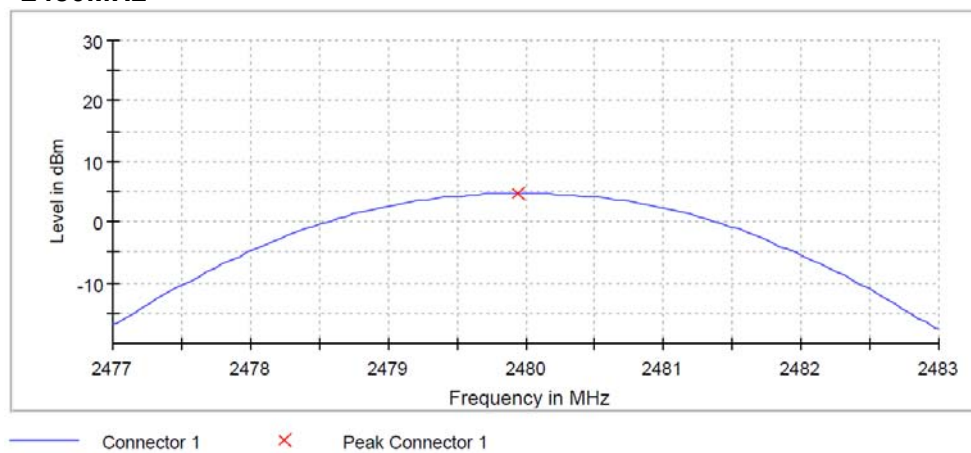
2402MHz



2441MHz



2480MHz



3 20 dB Bandwidth

Result: Pass

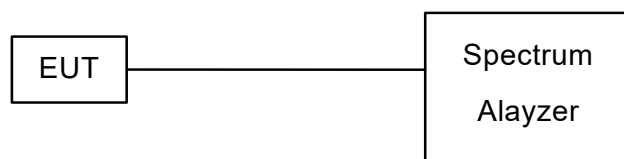
3.1 Applied standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

3.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. Test procedures follow ANSI C63.10 section 7.8.7
- c. Spectrum alayzer setting: RBW=10 kHz, VBW=30 kHz (for 1M), RBW=20 kHz, VBW=100 kHz (for 2M/3M)Max peak
- d. Measurement the 20 dB Bandwidth and compare with the required limit.

3.3 Test configuration



3.4 Test Data

Test Mode : Continuous Transmitting

Tester : Wayne

Ambient Temperature : 24°C

Relative Humidity : 51%

Test Date : 110/12/1

1M

Operating Frequency (MHz)	20 dB Bandwidth (kHz)
2402	885
2441	885
2480	885

2M

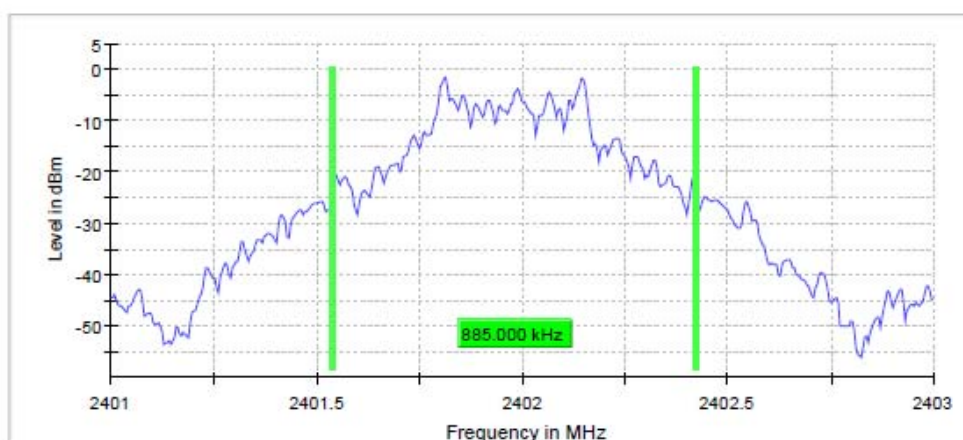
Operating Frequency (MHz)	20 dB Bandwidth (MHz)
2402	1.14
2441	1.14
2480	1.14

3M

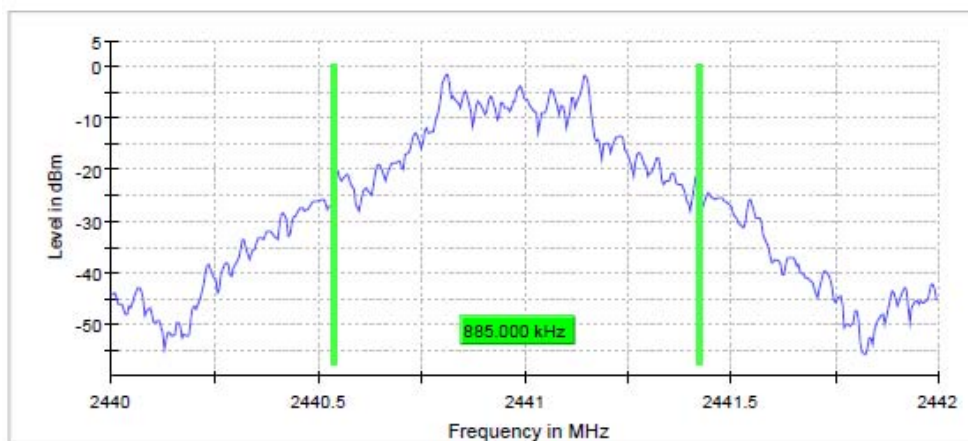
Operating Frequency (MHz)	20 dB Bandwidth (MHz)
2402	1.12
2441	1.12
2480	1.12

1M

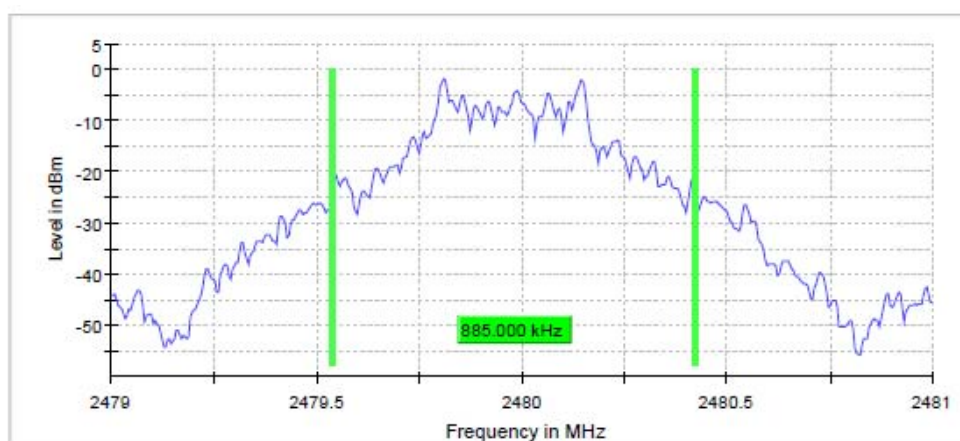
2402MHz



2441MHz



2480MHz

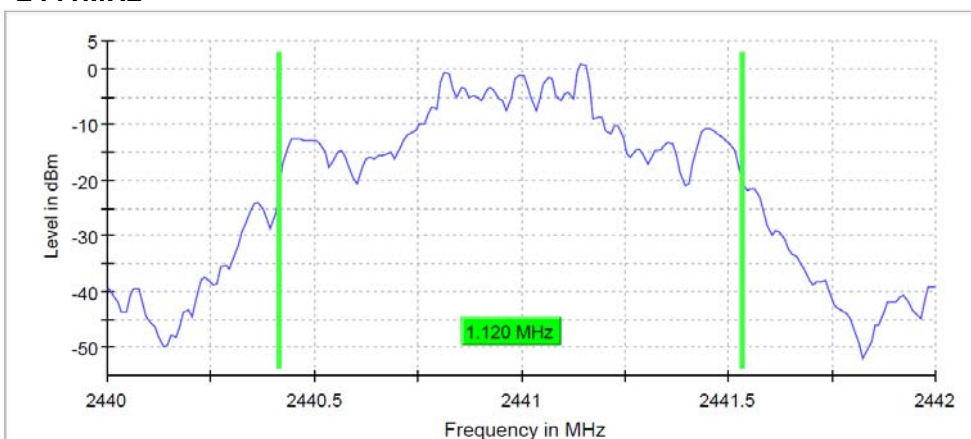


2M

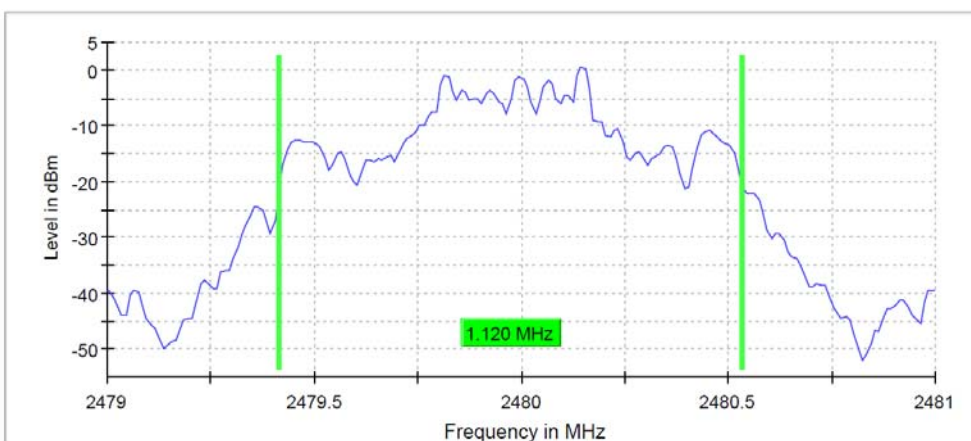
2402MHz



2441MHz

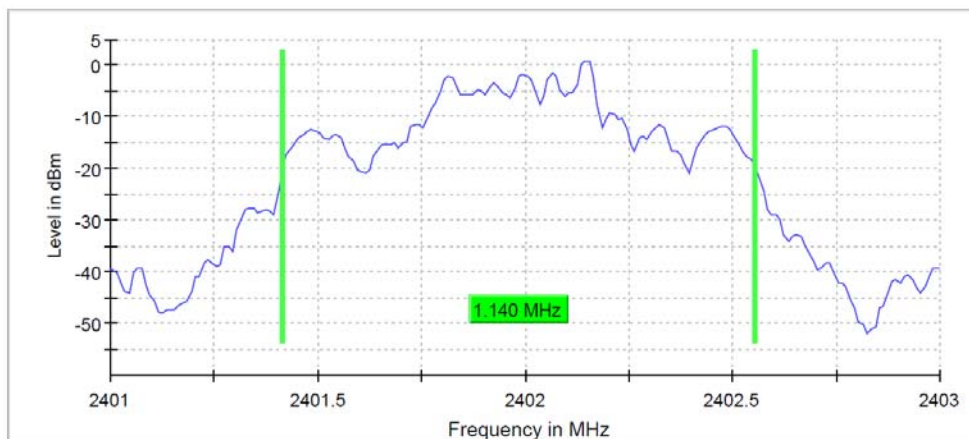


2480MHz

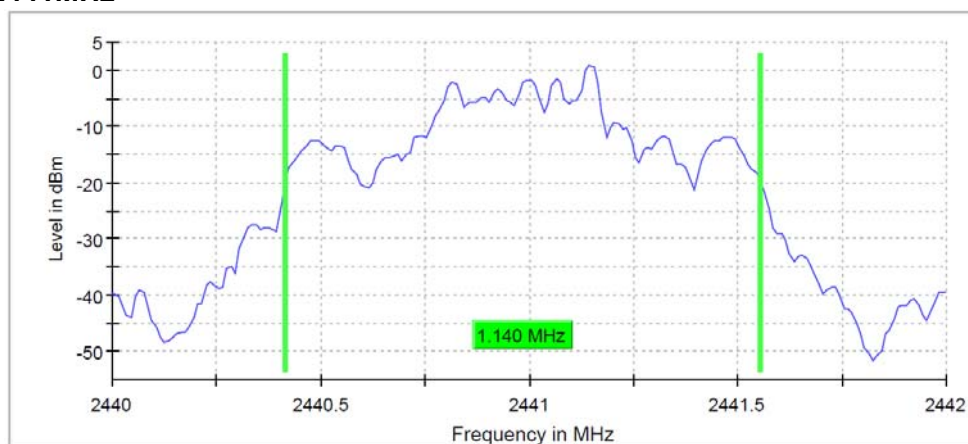


3M

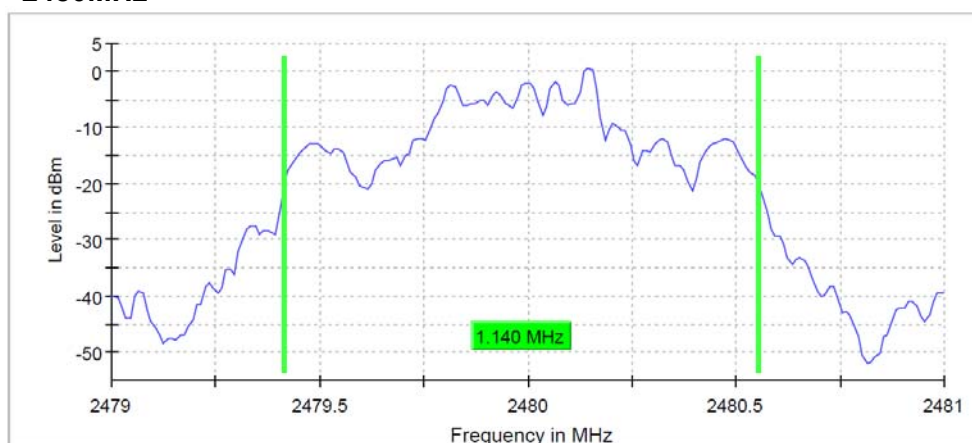
2402MHz



2441MHz



2480MHz



4 Frequency separation

Result: Pass

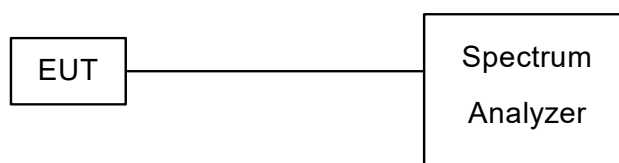
4.1 Applied standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

4.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. Test procedures follow ANSI C63.10 section 7.8.2
- c. Spectrum alayzer setting: RBW=300 kHz, VBW=300 kHz, Max peak
- d. Measure the frequency separation and compare with the required limit.

4.3 Test configuration



4.4 Test Data

Test Mode : Continuous Transmitting

Tester : Wayne

Ambient Temperature : 24°C

Relative Humidity : 51%

Test Date : 110/11/29

1M

Operating Frequency (MHz)	Frequency Separation (MHz)	Limit (MHz)
2402	1.01	0.59
2441	1.01	0.59
2480	1.01	0.59

Note: $20 \text{ dB BW} \times 2/3 = 0.59 \text{ MHz} > 25 \text{ kHz}$

2M

Operating Frequency (MHz)	Frequency Separation (MHz)	Limit (MHz)
2402	1.01	0.76
2441	1.01	0.76
2480	1.01	0.76

Note: $20 \text{ dB BW} \times 2/3 = 0.76 \text{ MHz} > 25 \text{ kHz}$

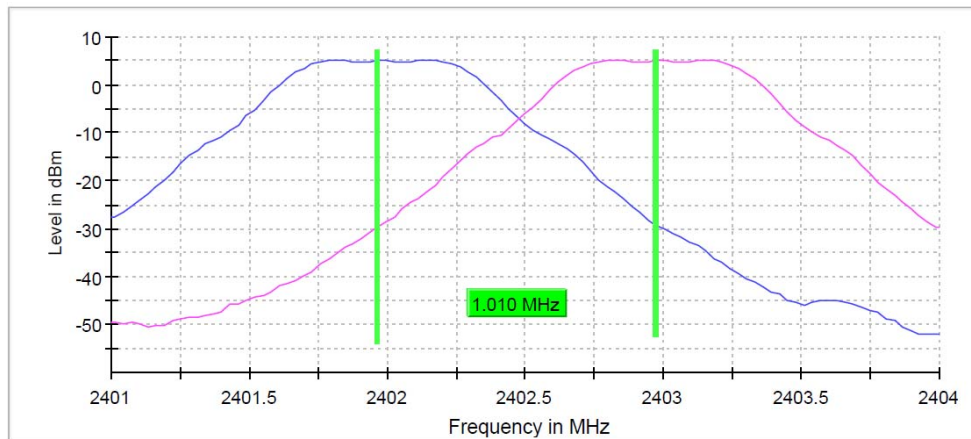
3M

Operating Frequency (MHz)	Frequency Separation (MHz)	Limit (MHz)
2402	1.01	0.76
2441	1.01	0.76
2480	1.01	0.76

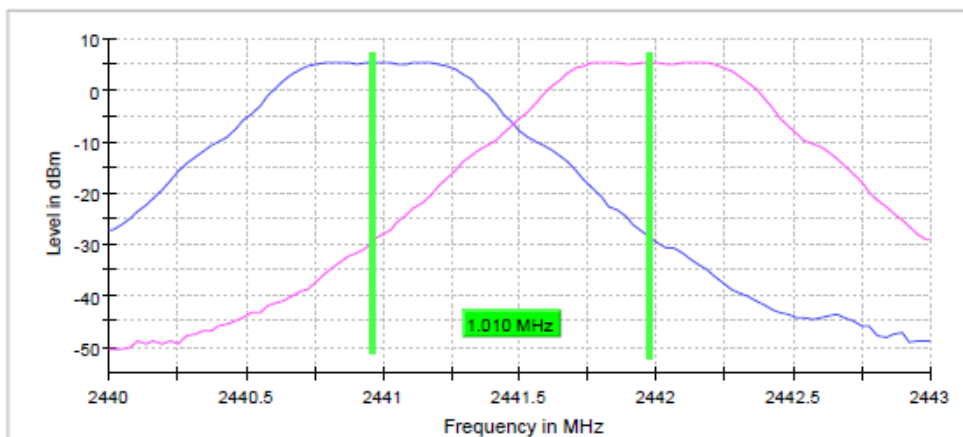
Note: $20 \text{ dB BW} \times 2/3 = 0.76 \text{ MHz} > 25 \text{ kHz}$

1M

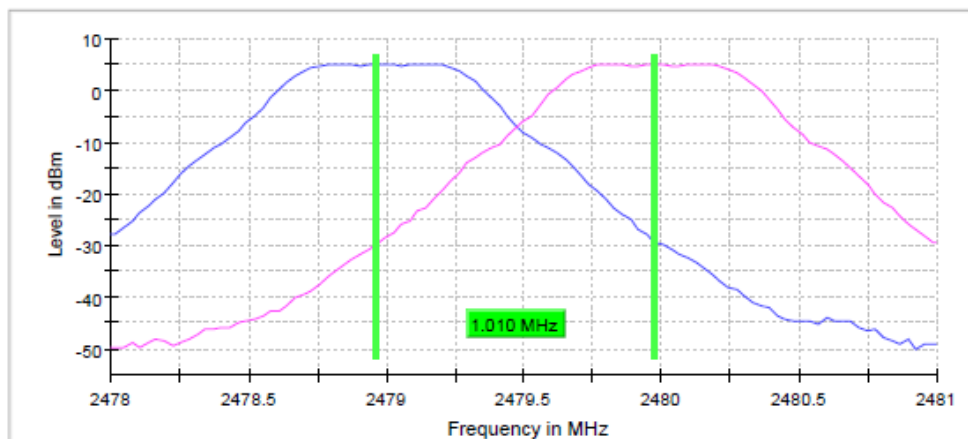
2402MHz



2441MHz

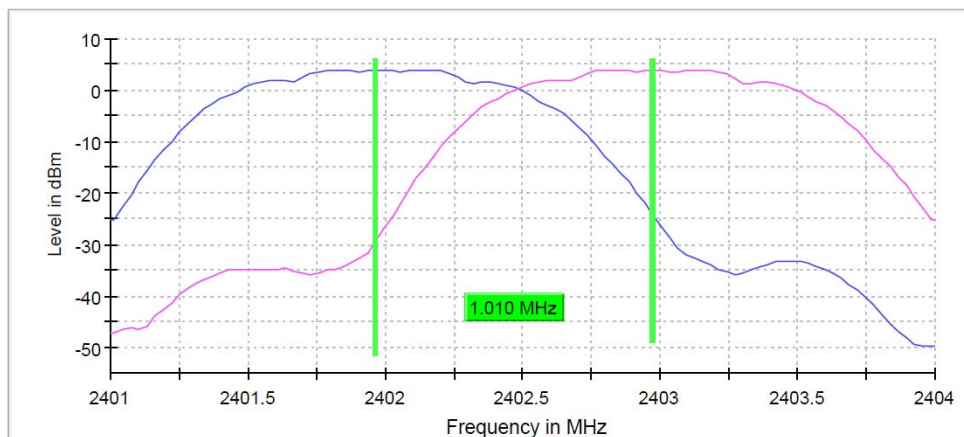


2480MHz

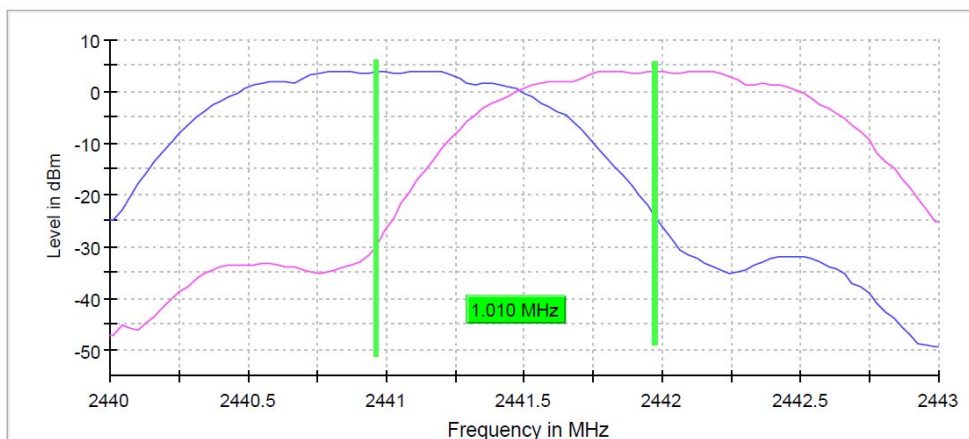


2M

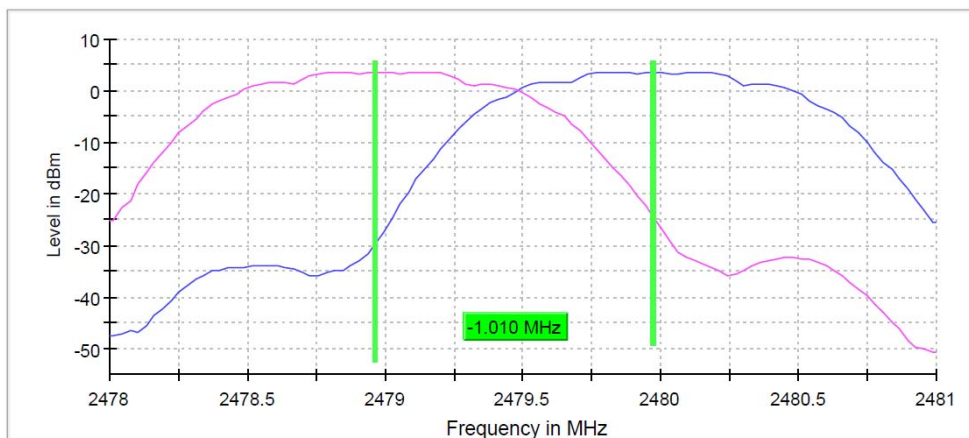
2402MHz



2441MHz

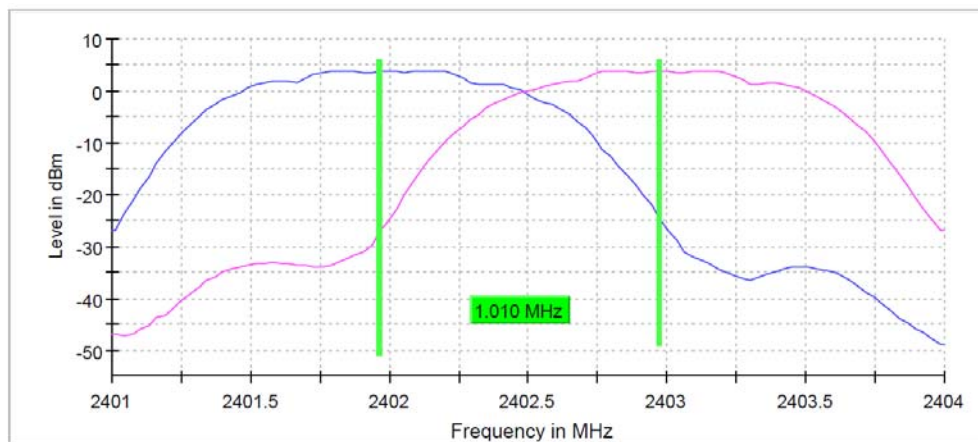


2480MHz

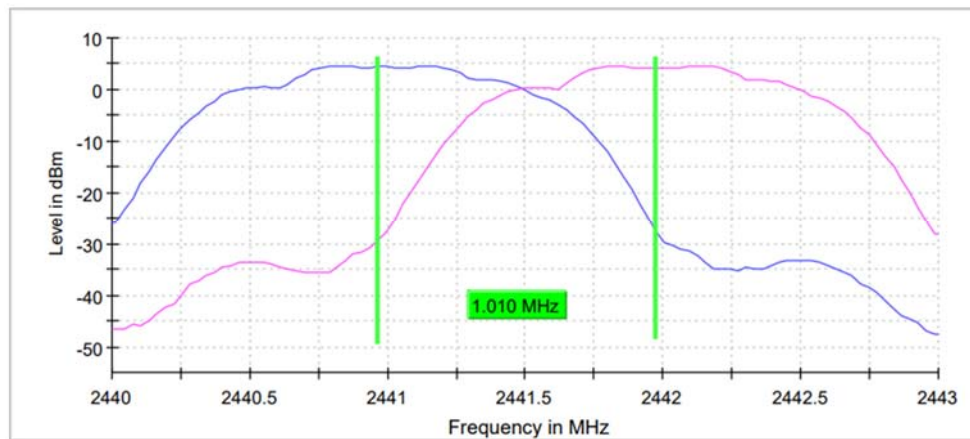


3M

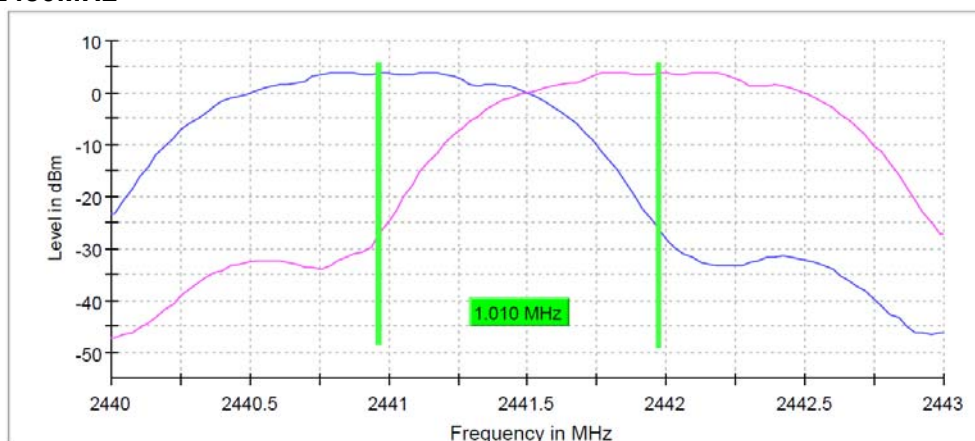
2402MHz



2440MHz



2480MHz



5 Hopping Number

Result: Pass

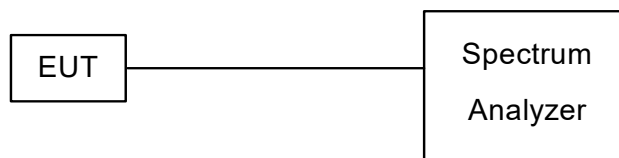
5.1 Applied standard

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. Test procedures follow ANSI C63.10 section 7.8.3.
- c. Spectrum alayzer setting: RBW=200 kHz, VBW=200 kHz, Max peak
- d. Measure the hopping number and compare with the required limit.

5.3 Test configuration

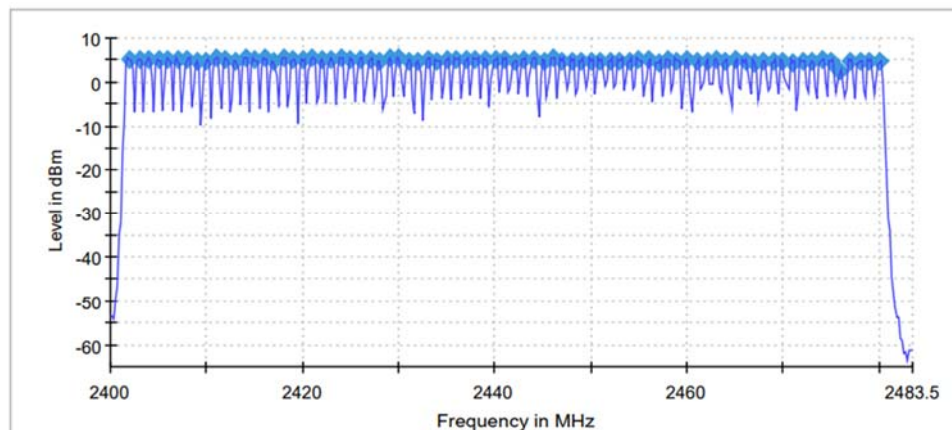


5.4 Test Data

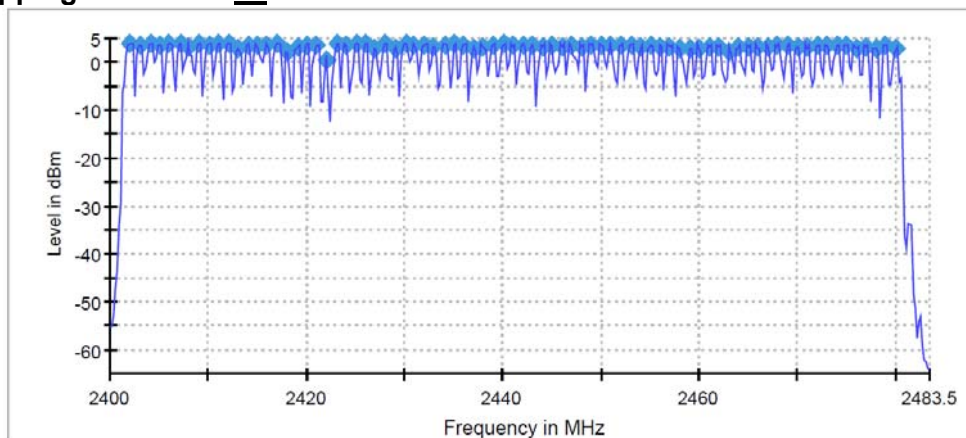
Test Mode : Hopping
Ambient Temperature : 24°C
Test Date : 110/11/29

Tester : Wayne
Relative Humidity : 51%

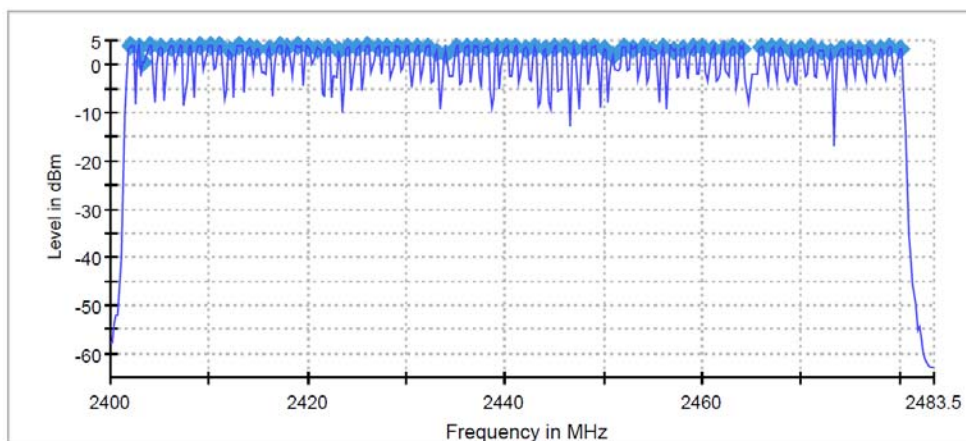
1M, Hopping number is 79



2M, Hopping number is 79



3M, Hopping number is 79



6 Occupied Time

Result: Pass

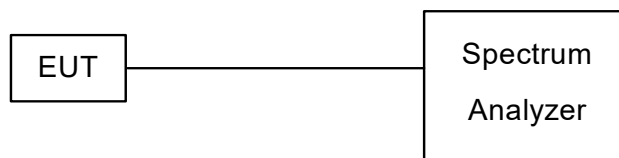
6.1 Applied standard

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

6.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. Test procedures follow ANSI C63.10 section 7.8.4.
- c. Spectrum alayzer setting: RBW=500 kHz, VBW=1 MHz, Max peak
- d. Measure the occupied time and compare with the required limit.

6.3 Test configuration



6.4 Test Data

Test Mode : Hopping, 2441 MHz

Tester : Wayne

Ambient Temperature : 25°C

Relative Humidity : 50%

Test Date : 110/11/29

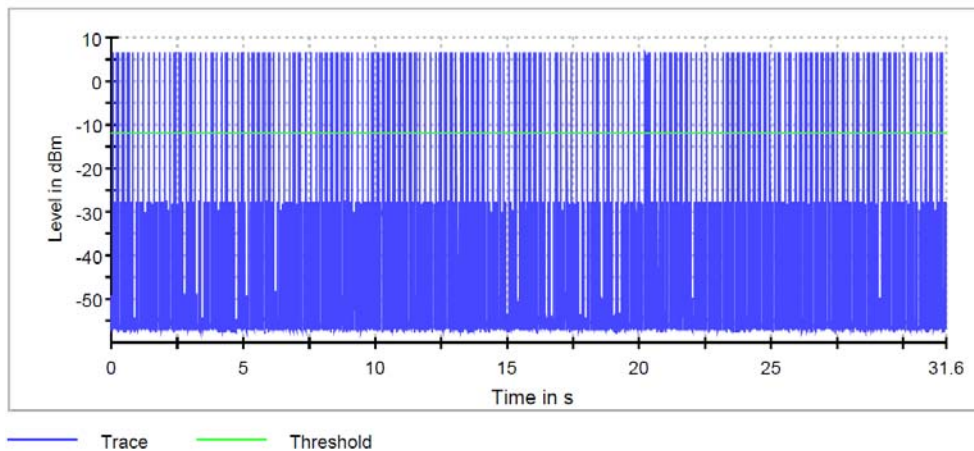
Mode		Transmission duration(T) (ms)	Period (s)	Dwell Time (ms)	Limit (ms)
DH1	1M	0.4	31.6	128.0	400
	2M	1.6	31.6	255.8	400
	3M	3.7	31.6	395.2	400
DH3	1M	0.4	31.6	128.0	400
	2M	1.6	31.6	255.8	400
	3M	2.8	31.6	299.1	400
DH5	1M	0.4	31.6	128.0	400
	2M	1.7	31.6	271.8	400
	3M	2.9	31.6	309.7	400

Note :

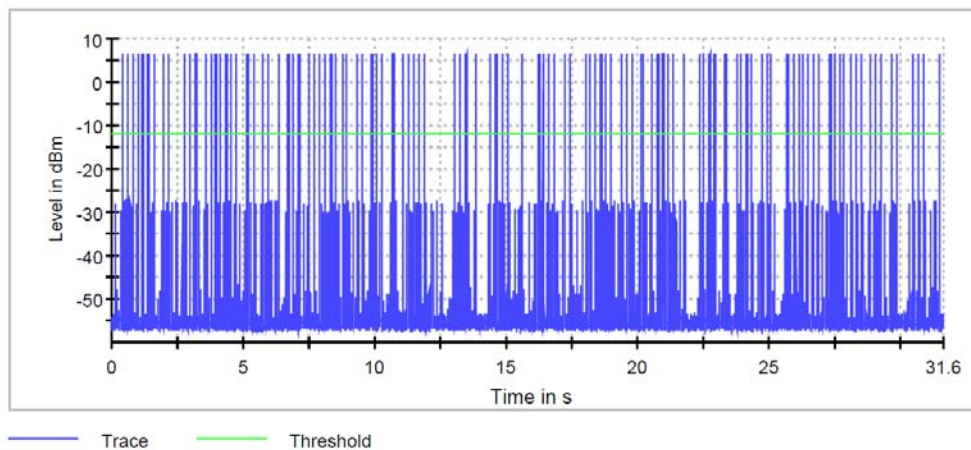
1. DH1 package hop rate: $1600/2/79=10.13$ times °
2. DH3 package hop rate : $1600/4/79=5.06$ times °
3. DH5 package hop rate $1600/6/79=3.38$ times °
4. Dwell Time (ms) = T x hop rate x Period

1M

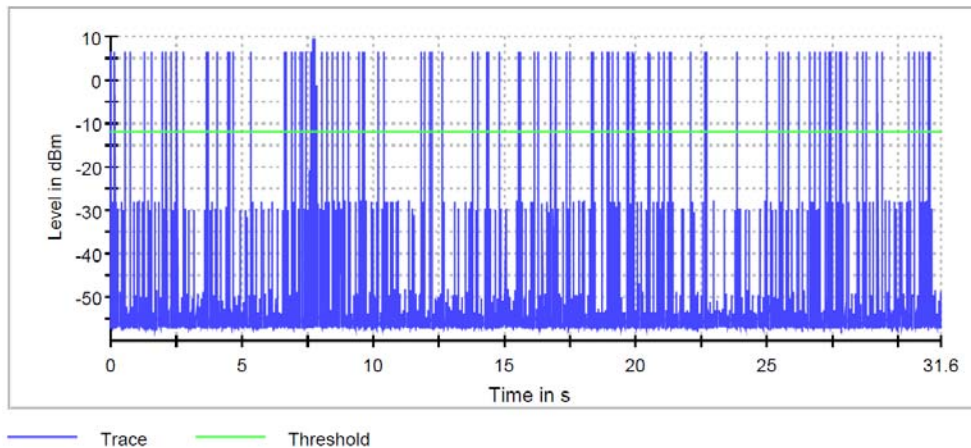
DH1



DH3

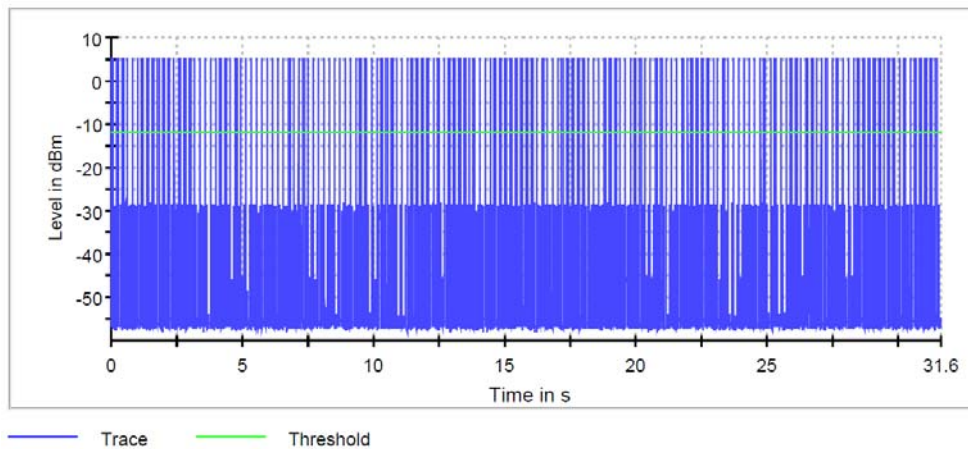


DH5

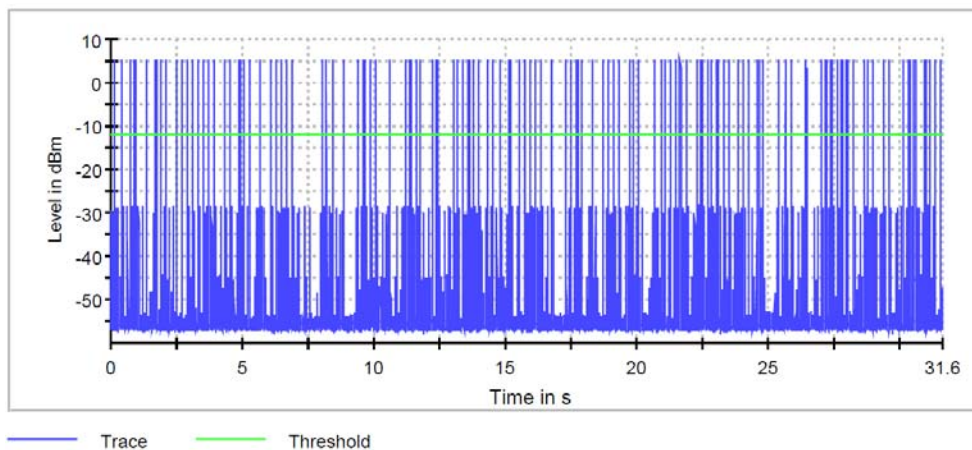


2M

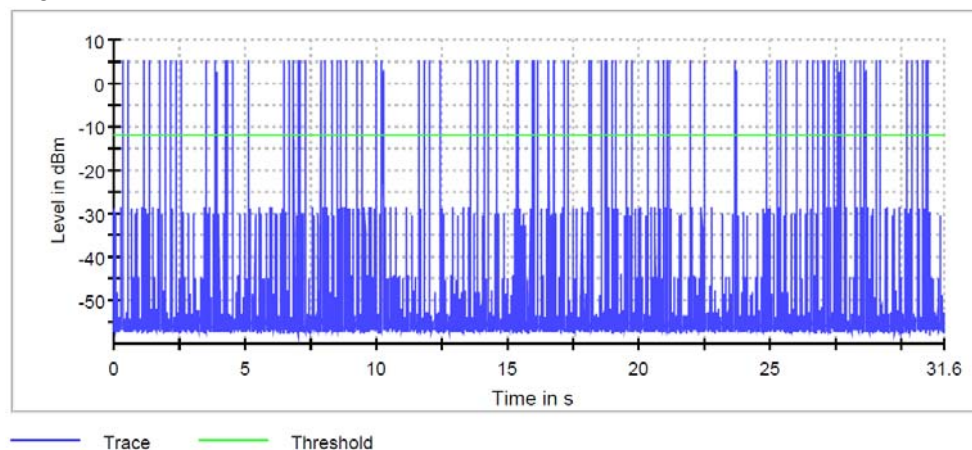
DH1



DH3

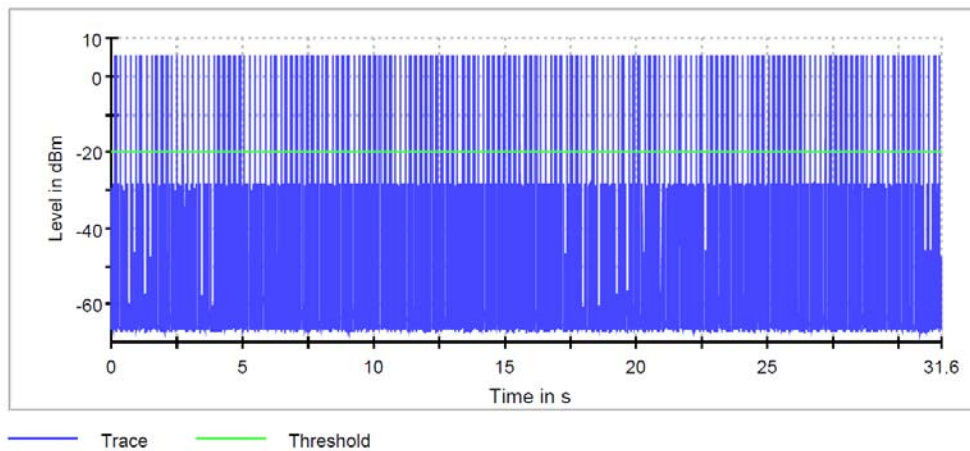


DH5

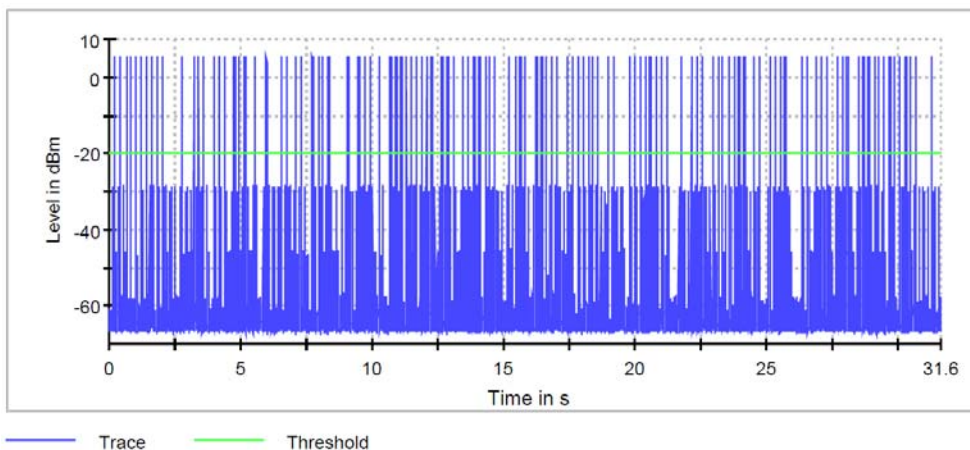


3M

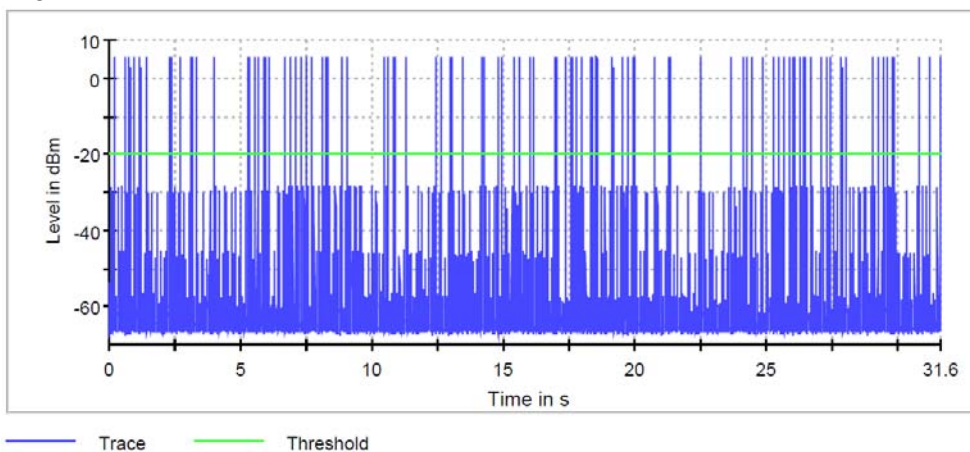
DH1



DH3



DH5



7 Conducted Spurious emission

Result: Pass

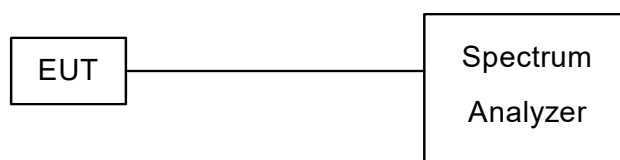
7.1 Applied standard

According to FCC 15.247(d), 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph FCC 15.247(b)(3), the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in FCC 15.209(a) are not required.

7.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. The software provided by client enabled the EUT to transmit data at low and high channel frequencies individually.
- c. Test procedures follow ANSI C63.10 section 7.8.6 and 7.8.8
- d. Spectrum analyzer setting: RBW=100 kHz, VBW=300 MHz, Max peak
- e. Measurement the conducted spurious emission and compare with the required limit.

7.3 Test configuration



7.4 Test Data

Bandedge

Test Mode : Hopping
Ambient Temperature : 24°C
Test Date : 110/11/29

Tester : Wayne
Relative Humidity : 51%

1M

Testing band	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
Low	5.0	2398.1	-63.9	-15.0	48.9
High	5.1	2486.0	-65.7	-14.9	50.8

Note:

1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

2M

Testing band	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
Low	3.9	2399.6	-63.5	-16.1	47.4
High	3.9	2483.9	-64.0	-16.1	47.9

Note:

1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

3M

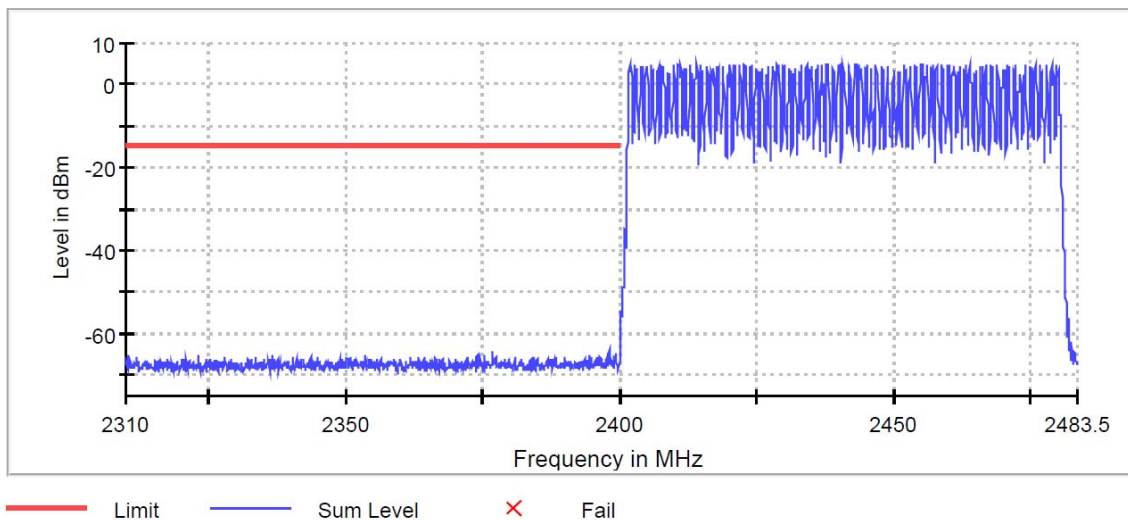
Testing band	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
Low	4.0	2320.0	-64.2	-16.0	48.2
High	4.0	2495.9	-64.6	-16.0	48.6

Note:

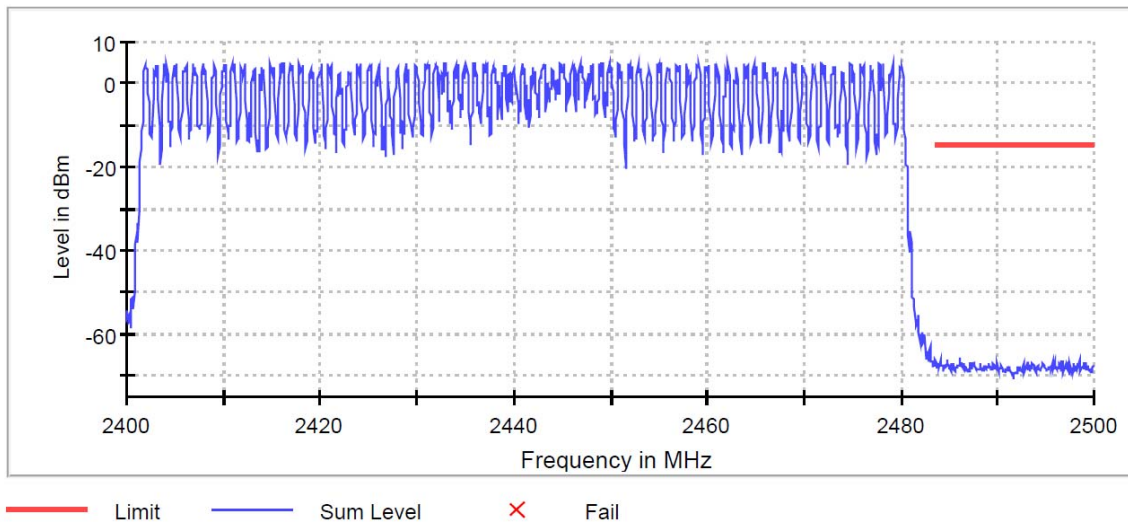
1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

1M

2402MHz

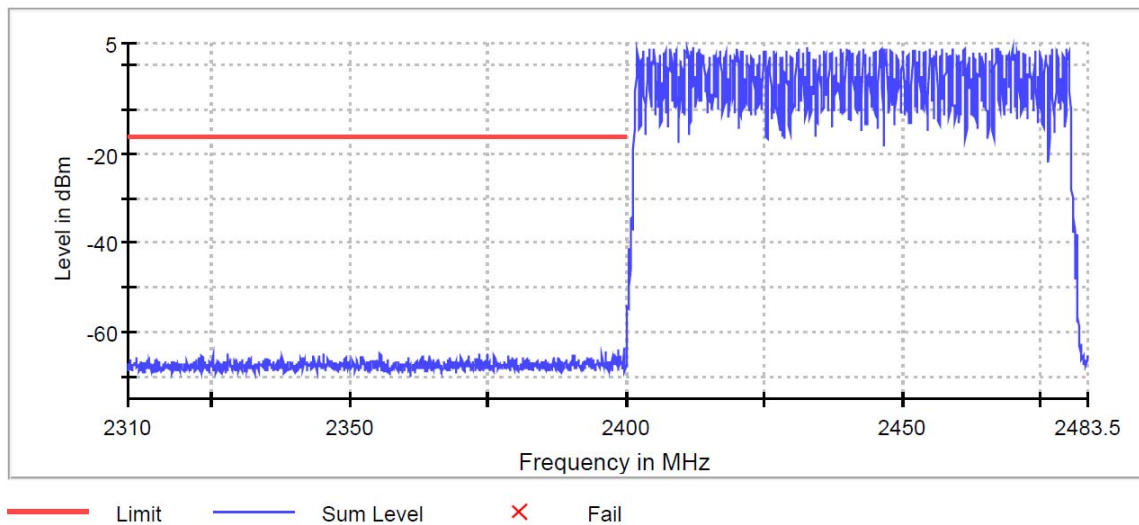


2480MHz

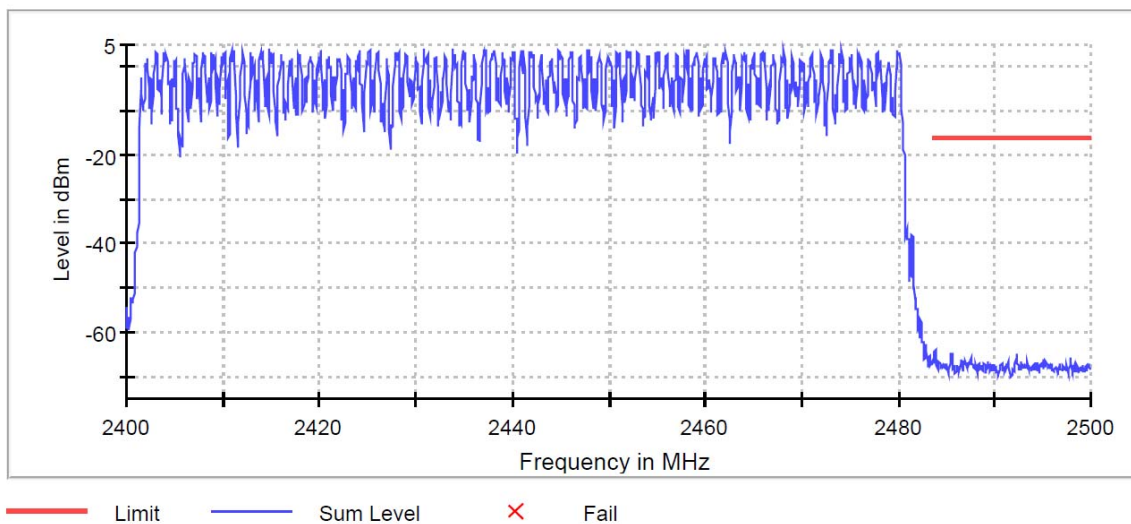


2M

2402MHz

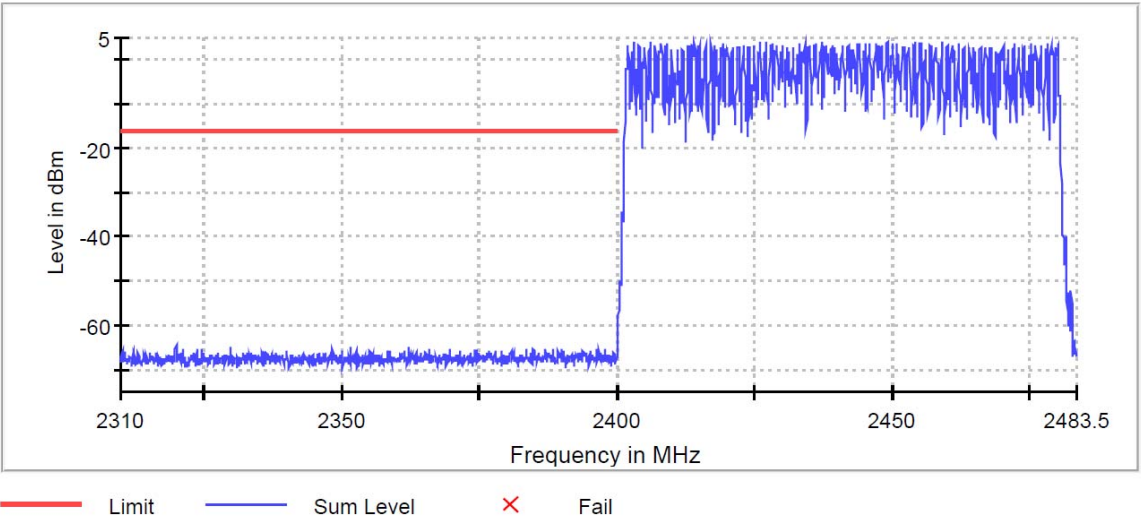


2480MHz

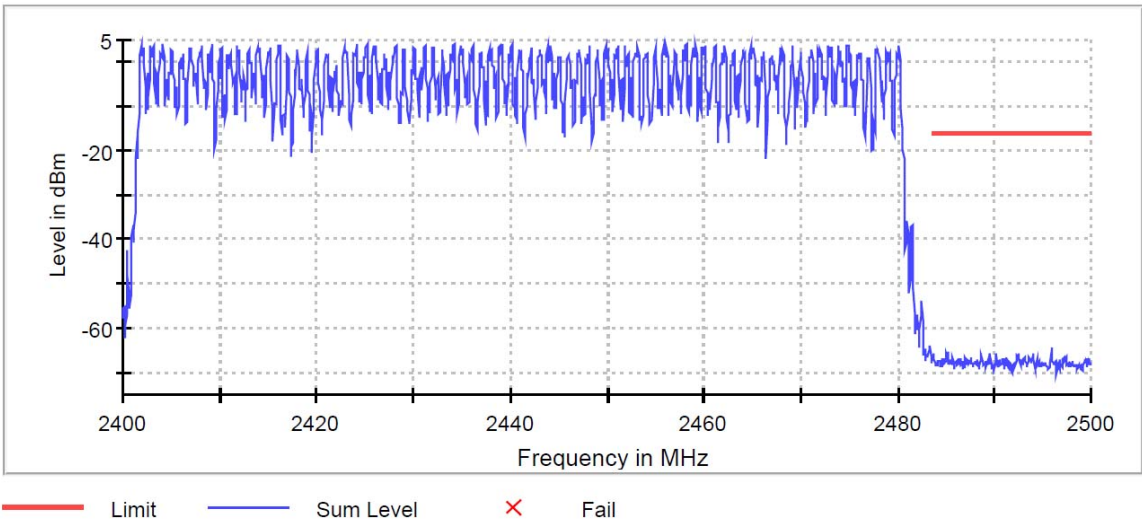


3M

2402MHz



2480MHz



Test Mode : Continuous Transmitting

Tester : Wayne

Ambient Temperature : 24°C

Relative Humidity : 51%

Test Date : 110/11/29

1M

Operating Frequency (MHz)	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
2402	5.0	2400.0	-53.2	-15.0	38.2
2480	4.7	2484.3	-62.3	-15.3	47.0

Note:

1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

2M

Operating Frequency (MHz)	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
2402	3.7	2399.6	-52.5	-16.3	36.2
2480	3.6	2484.3	-61.8	-16.4	45.4

Note:

1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

3M

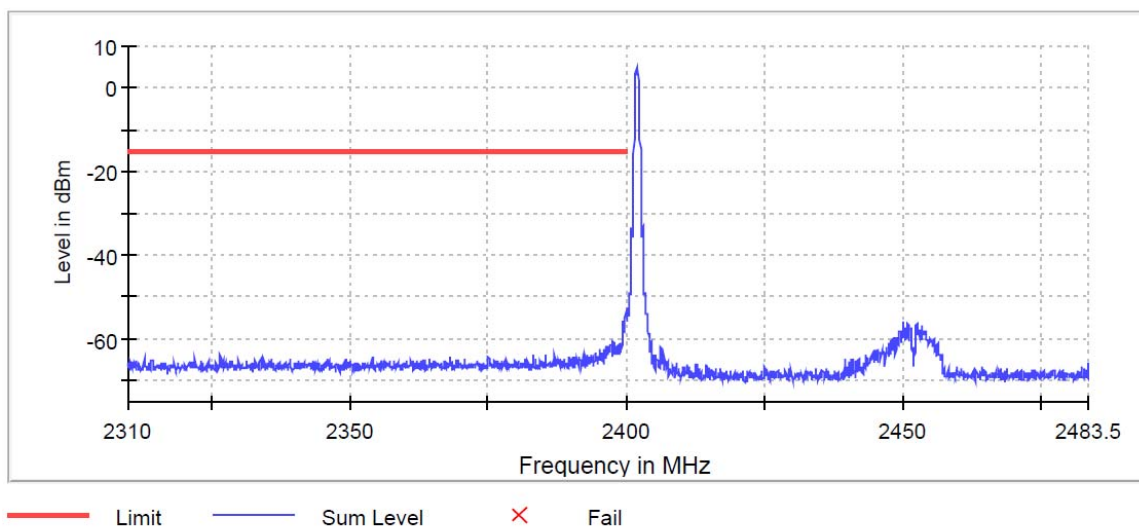
Operating Frequency (MHz)	Max emission of in band (dBm)	Frequency of out band max emission (MHz)	Max emission of out band (dBm)	Limit (dBm)	Margin (dB)
2402	3.8	2399.5	-48.0	-16.2	31.8
2480	3.0	2484.0	-60.3	-17.0	43.3

Note:

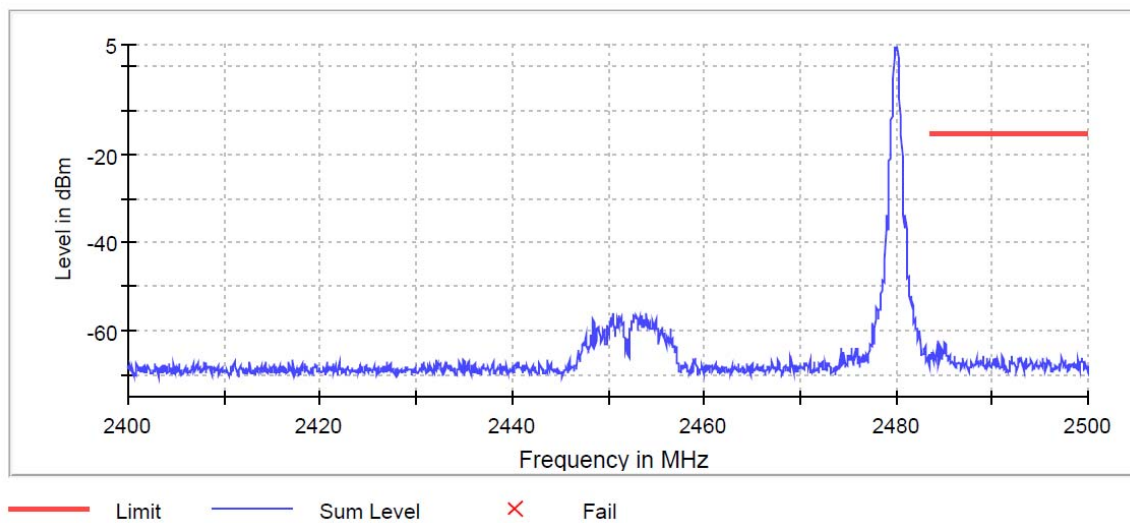
1. Limit(dBm) = Max emission of in band - 20
2. Margin (dB) = Limit – Max emission of out band

1M

2402MHz

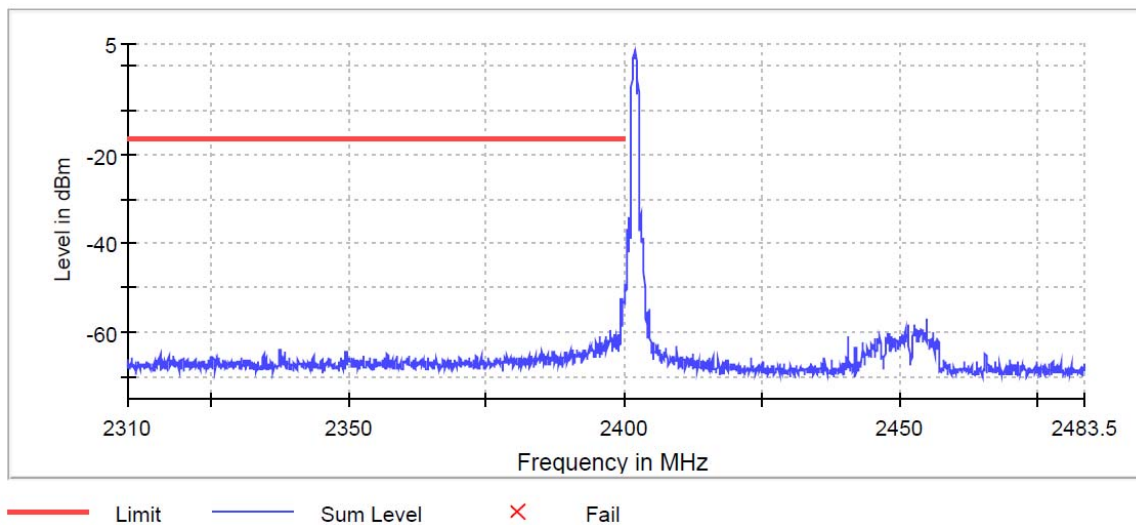


2480MHz

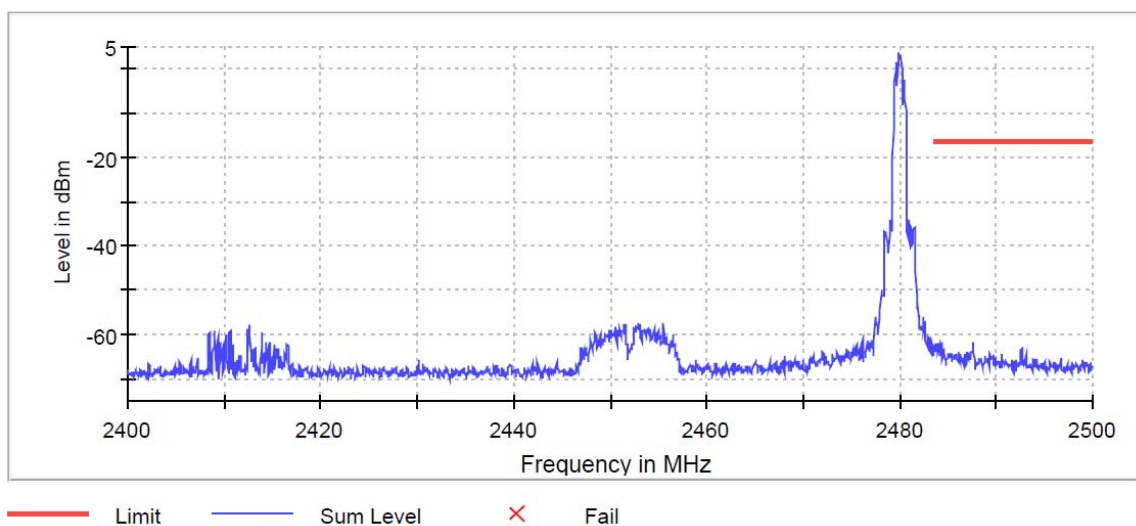


2M

2402MHz

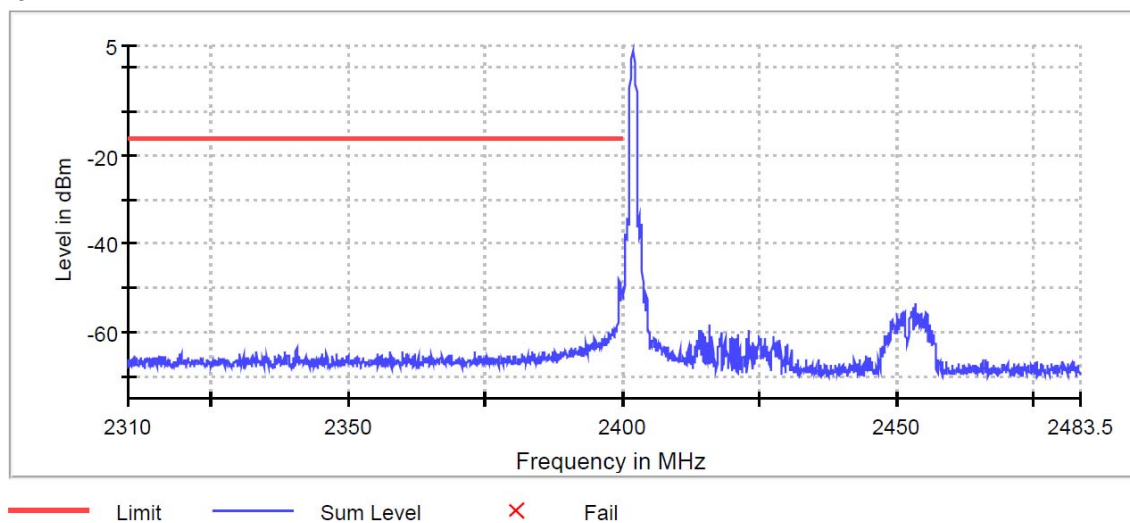


2480MHz

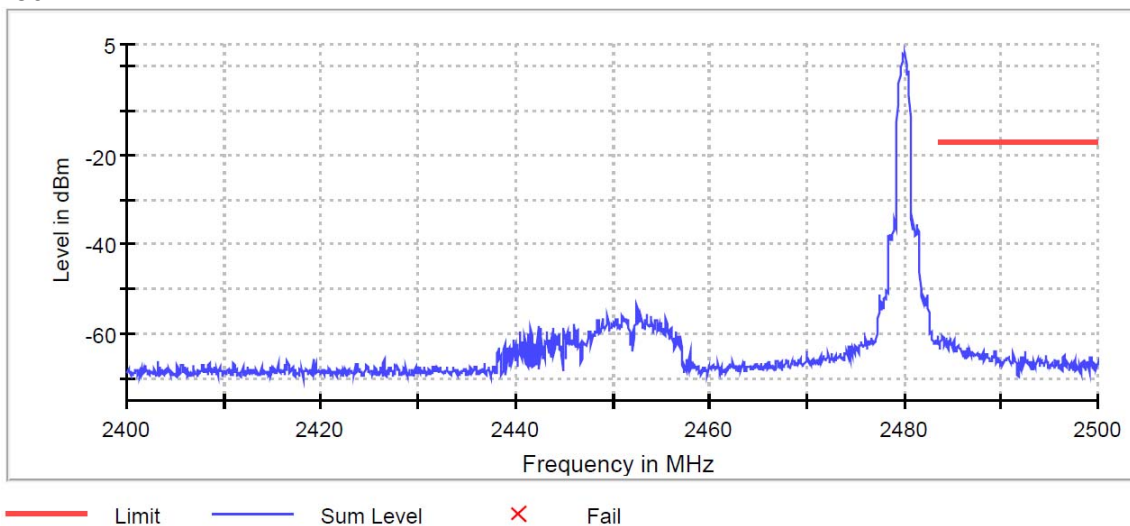


3M

2402MHz



2480MHz

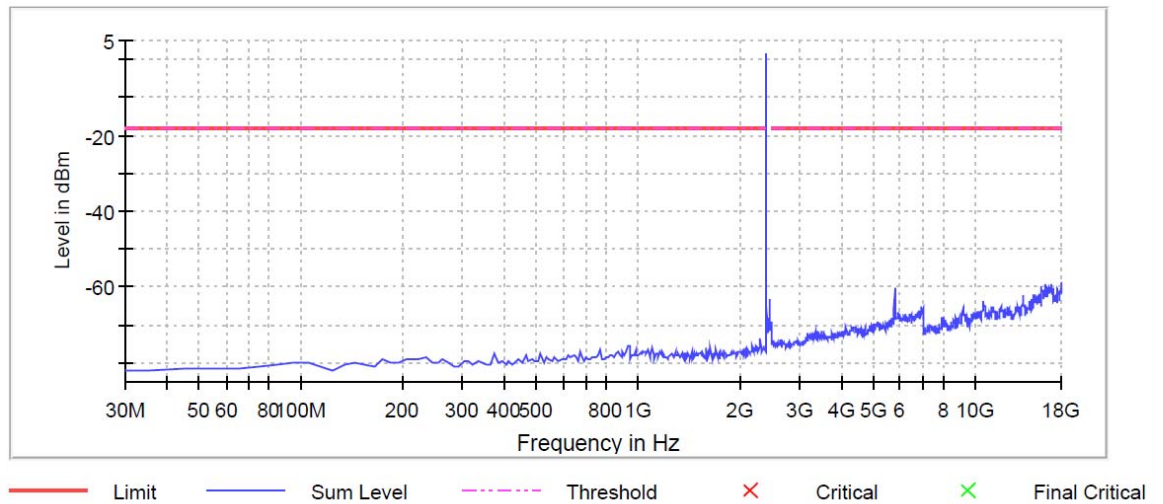


Out of band emission**Test Mode : Continuous Transmitting****Tester : Wayne****Ambient Temperature : 24°C****Relative Humidity : 51%****Test Date : 110/11/29**

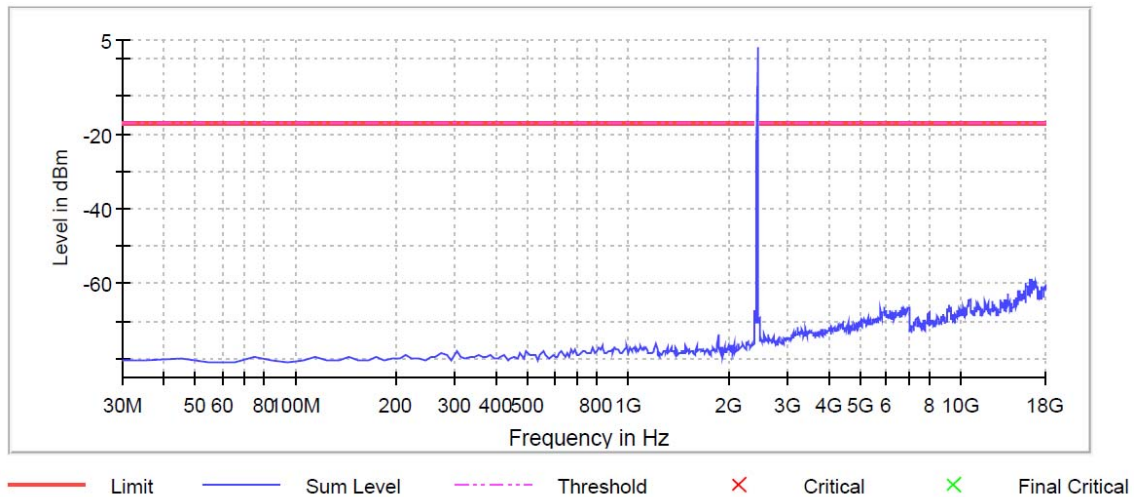
No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz

1M

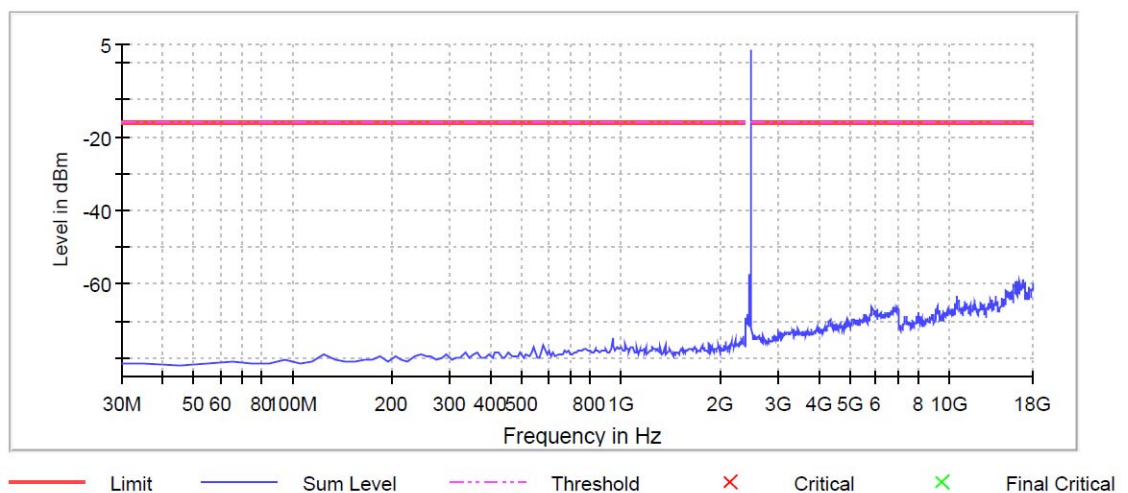
2402MHz



2441MHz

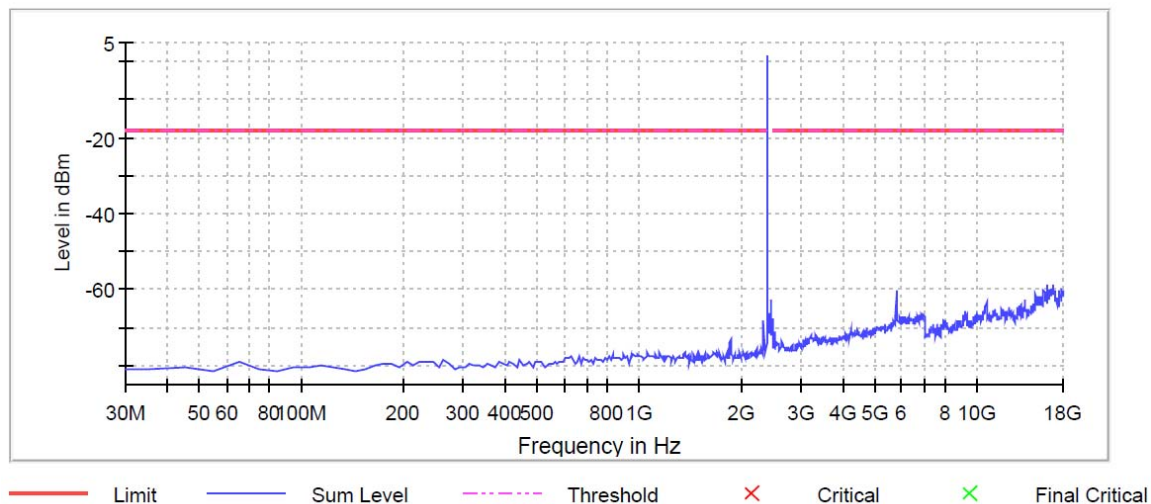


2480MHz

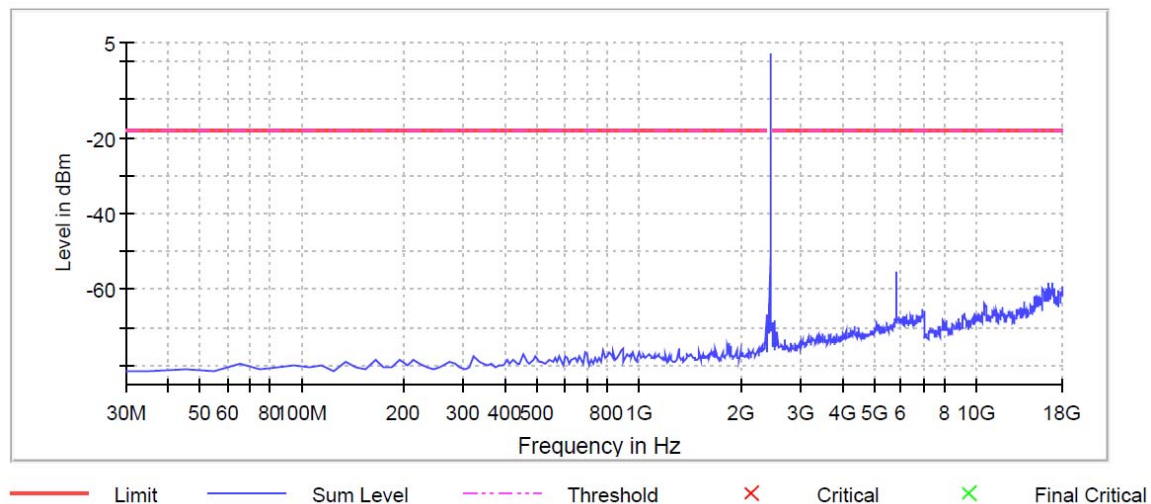


2M

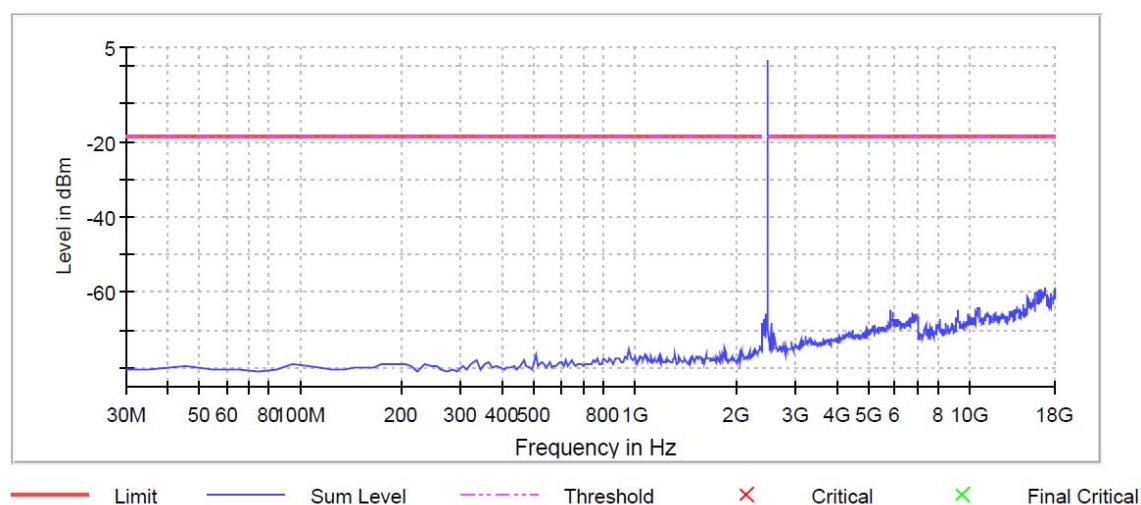
2402MHz



2441MHz

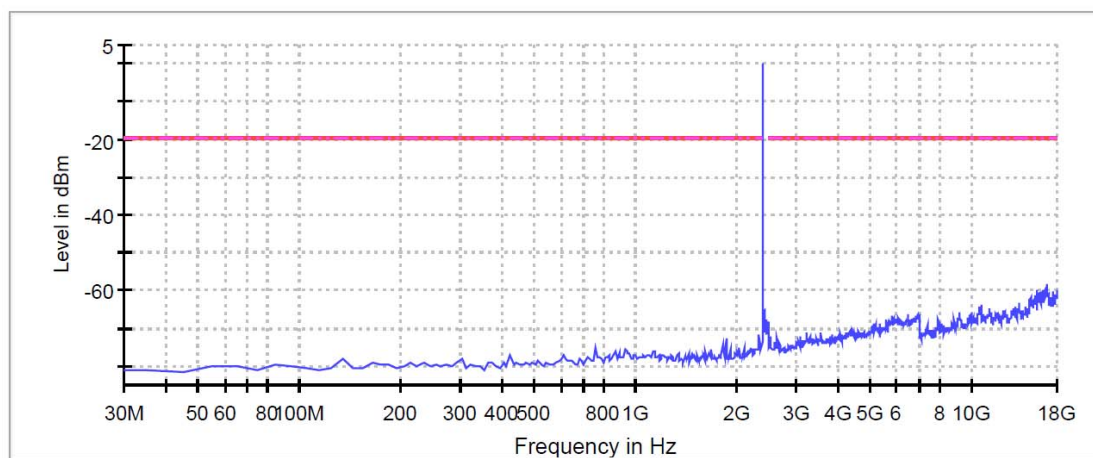


2480MHz



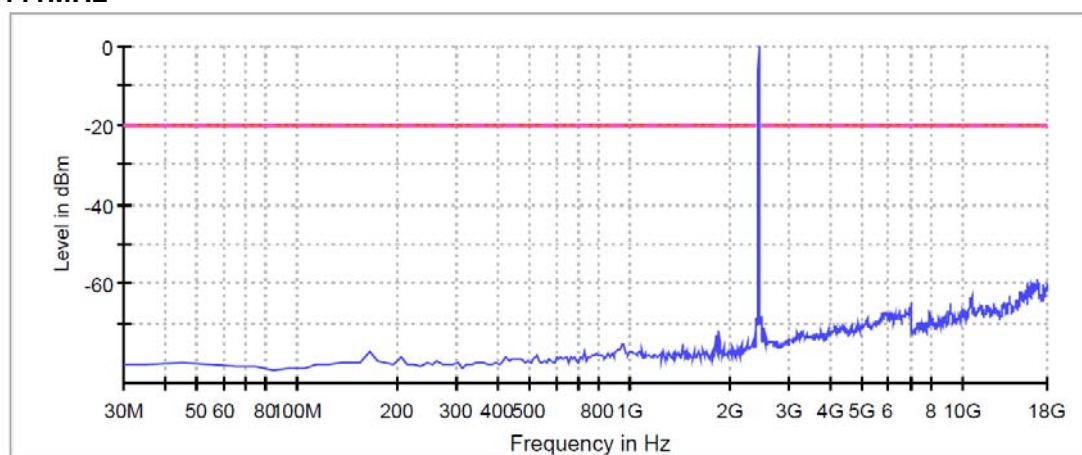
3M

2402MHz



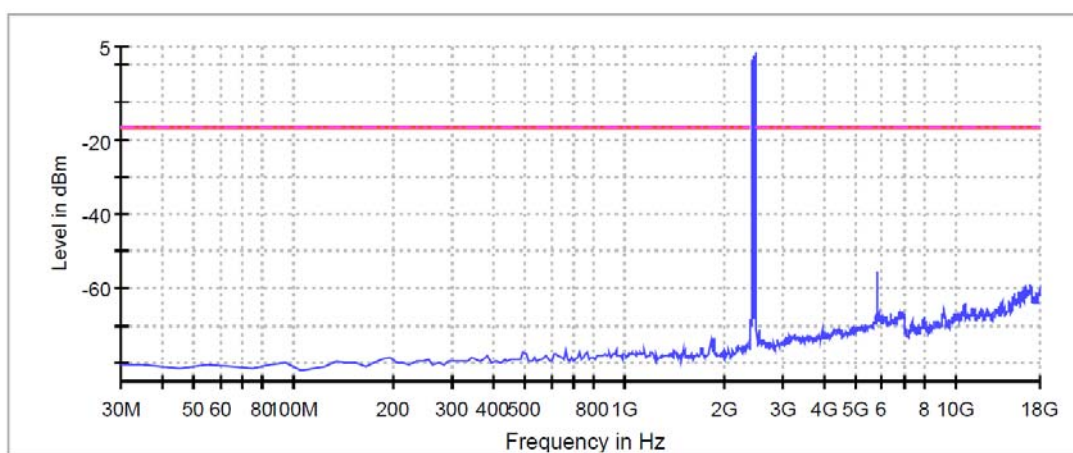
— Limit — Sum Level - - - Threshold × Critical × Final Critical

2441MHz



— Limit — Sum Level - - - Threshold × Critical × Final Critical

2480MHz



— Limit — Sum Level - - - Threshold × Critical × Final Critical

8 Radiated Spurious Emission

Result: Pass

8.1 Applied standard

According to FCC 15.247(d), fall in the restricted bands, as defined in FCC 15.205(a), must also comply with the radiated emission limits specified in FCC 15.209(a).

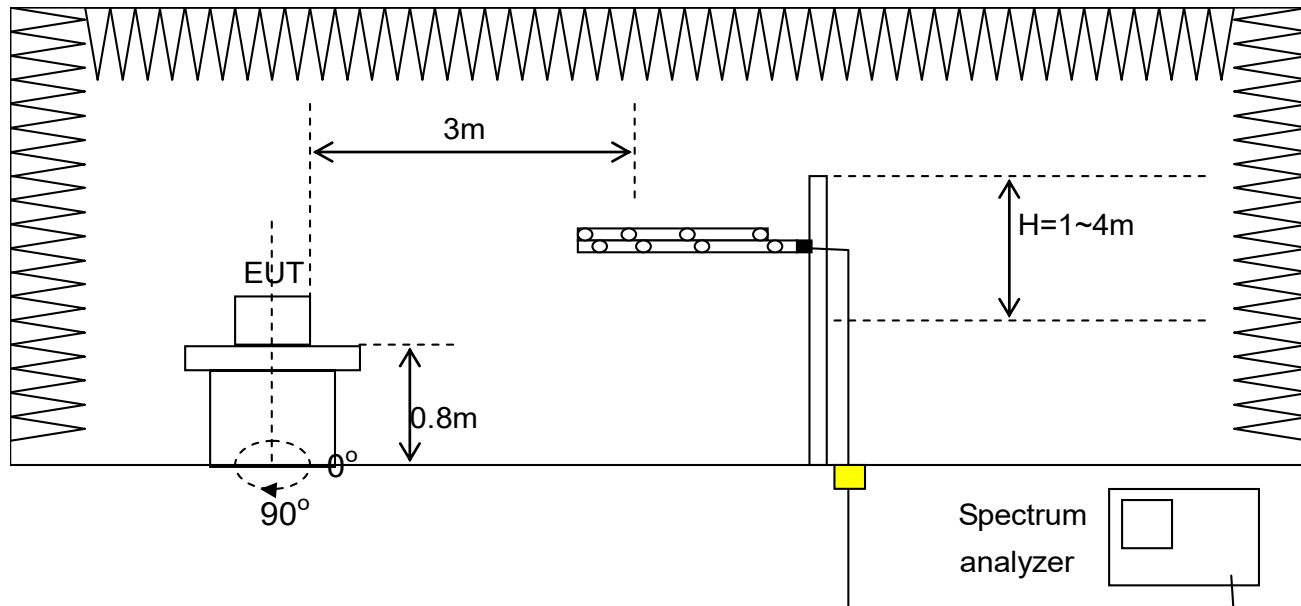
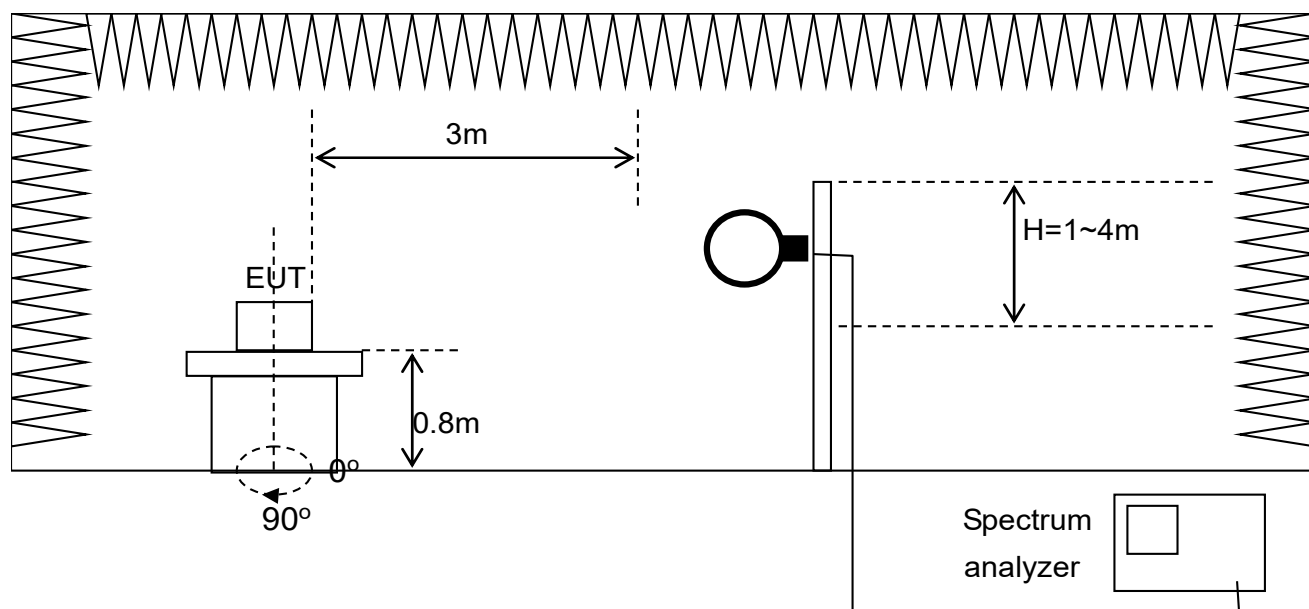
The amplitude of spurious emission are attenuated by more than 20 dB below the permissible value has no need to be reported.

8.2 Measurement Procedure

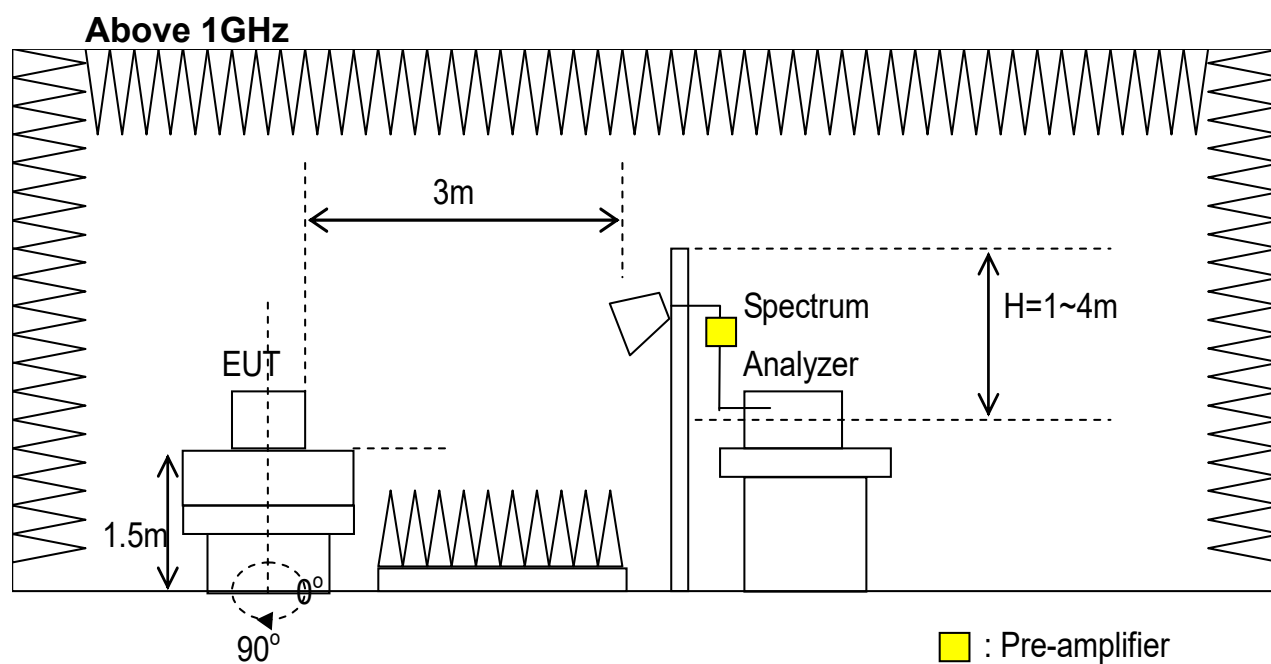
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit and receive data at operating frequency.(if necessary)
- c. If the EUT is tabletop equipment, it should be placed on a wooden table with a height of 0.8 meters above the reference ground plane in the semi-anechoic chamber. If the EUT is floor-standing equipment, it should be placed on a non-conducted support with a height of 12 millimeters above the reference ground plane in the semi-anechoic chamber.
- d. The EUT is set 3m away from the interference receiving antenna.
- e. Rapidly sweep the signal in the test frequency range by using the spectrum through the Maximum-peak detector.
- f. Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 to 4 meters above the reference ground plane continuously to determine at least six frequencies associated with higher emission levels and record them.
- g. Then measure each frequency found from step f. by using the spectrum with rotating the EUT and positioning the receiving antenna height to determine the maximum level.
- h. For measurement of frequency below 1000MHz, set the receiver detector to be Quasi-Peak per CISPR 16-1 to find out the maximum level occurred. Receiver Setting is 9 kHz – 150kHz: RBW=200 Hz. 150kHz – 30 MHz: RBW=9 kHz. 30 MHz- 1 GHz: RBW=120 kHz.
- i. For measurement of frequency above 1000MHz, set the spectrum detector to be Peak or Average to find out the maximum level occurred, if any. Spectrum Analyzer Setting is Peak:RBW=1 MHz, VBW=3 MHz. Average: RBW=1 MHz, VBW=3 kHz.
- j. Record frequency, azimuth angle of the turntable, height, and polarization of the receiving antenna and compare the maximum level with the required limit.
- k. Change the receiving antenna to another polarization to measure radiated emission by following step e. to j. again.
- l. If the peak emission level below 1000MHz measured from step f. is 4dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. value will be measured and presented.
- m. If the peak emission level above 1000MHz measured from step f. is 20dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate A.V. value will be measured and presented.

8.3 Test configuration

Below 1GHz



■ : Pre-amplifier



8.4 Test Data

Bandedge

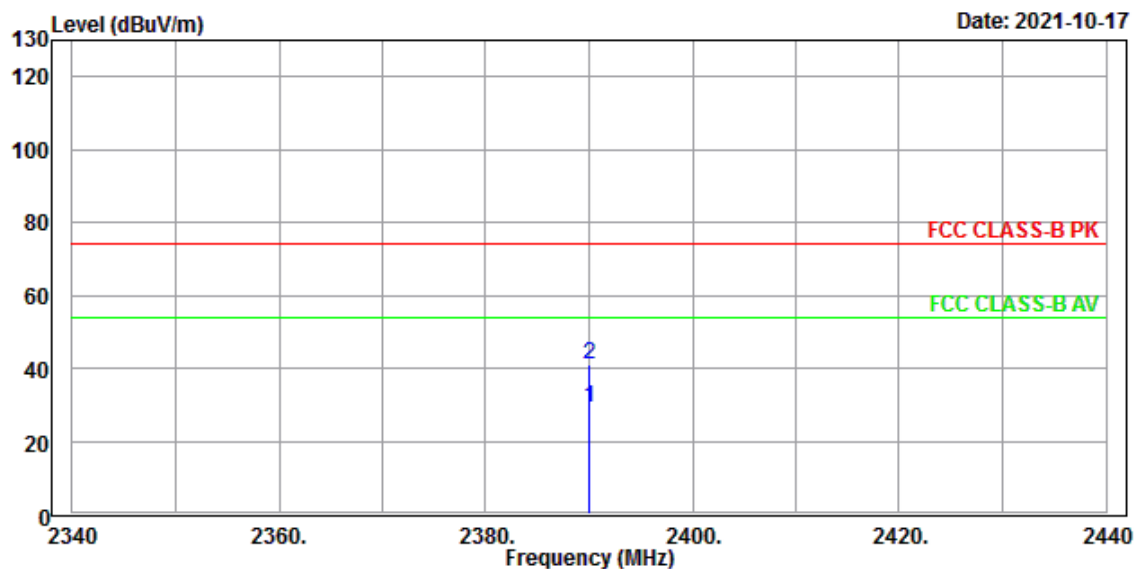
Test Mode : Continuous Transmitting, BR, 2402 MHz

Polarization : Horizontal

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 HORIZONTAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2390.000	28.94	46.17	-17.23	54.00	-25.06	379	360	HORIZONTAL	Average
2	2390.000	40.85	58.08	-17.23	74.00	-33.15	379	360	HORIZONTAL	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

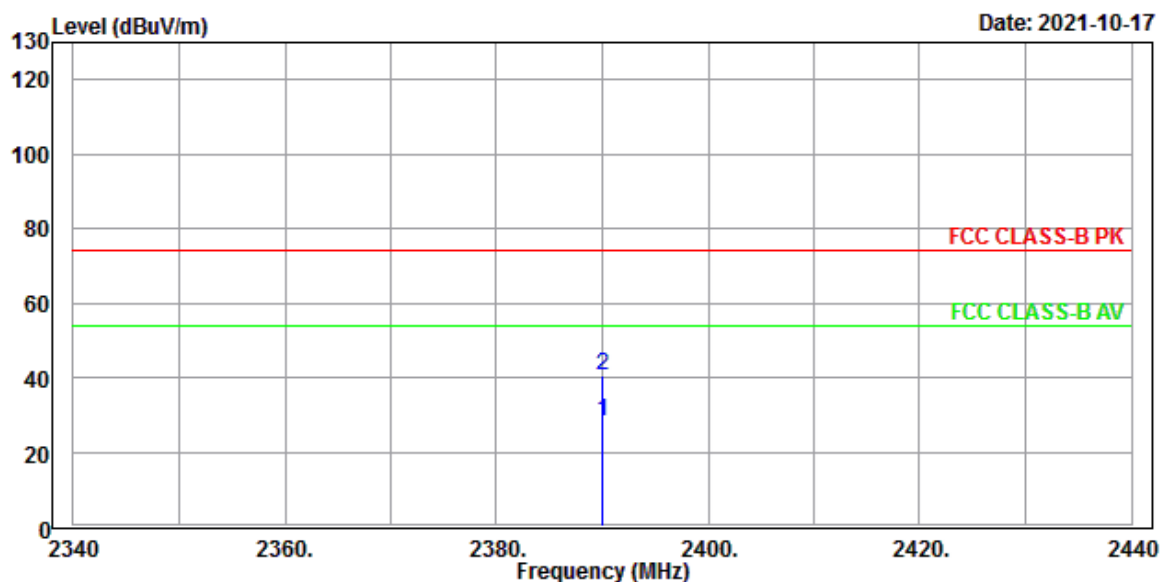
Test Mode : Continuous Transmitting, BR, 2402 MHz

Polarization : Vertical

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 VERTICAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg	
1	2390.000	28.01	45.24	-17.23	54.00	-25.99	311	74 VERTICAL	Average
2	2390.000	40.68	57.91	-17.23	74.00	-33.32	311	74 VERTICAL	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

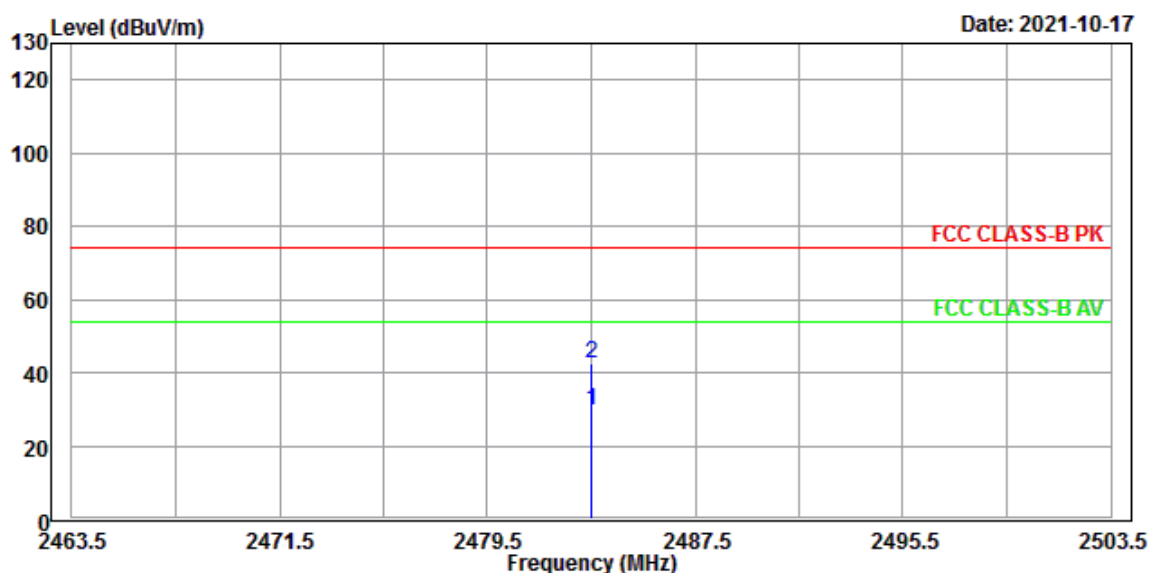
Test Mode : Continuous Transmitting, BR, 2480 MHz

Polarization : Horizontal

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 HORIZONTAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	2483.500	29.49	46.42	-16.93	54.00	-24.51	400	59 HORIZONTAL	Average
2	2483.500	42.54	59.47	-16.93	74.00	-31.46	400	59 HORIZONTAL	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

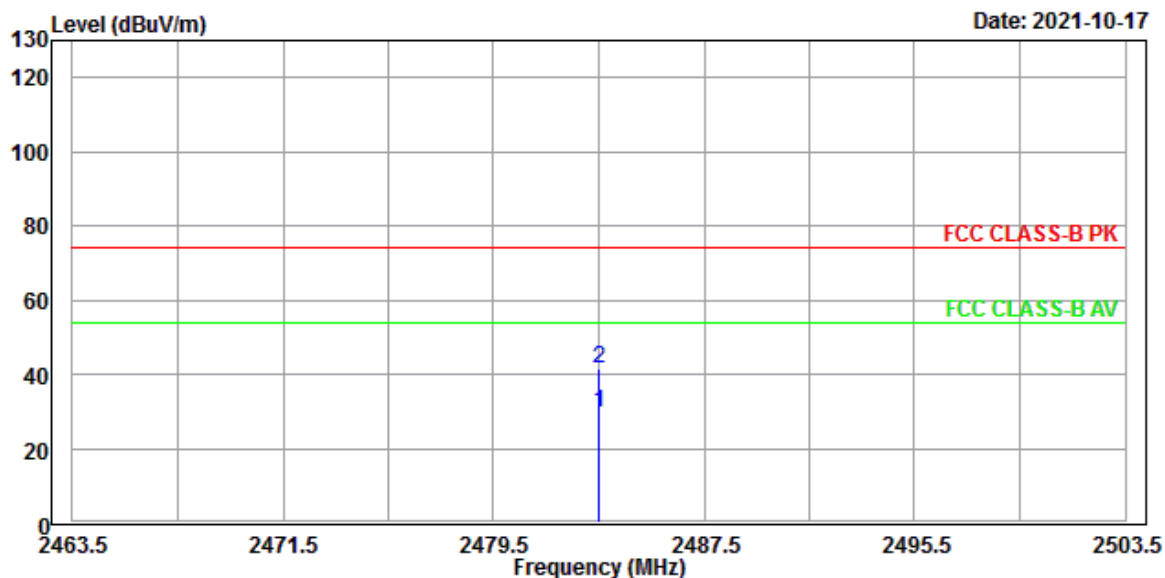
Test Mode : Continuous Transmitting, BR, 2480 MHz

Polarization : Vertical

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 VERTICAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	2483.500	29.44	46.37	-16.93	54.00	-24.56	388	308	VERTICAL Average
2	2483.500	41.59	58.52	-16.93	74.00	-32.41	388	308	VERTICAL Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

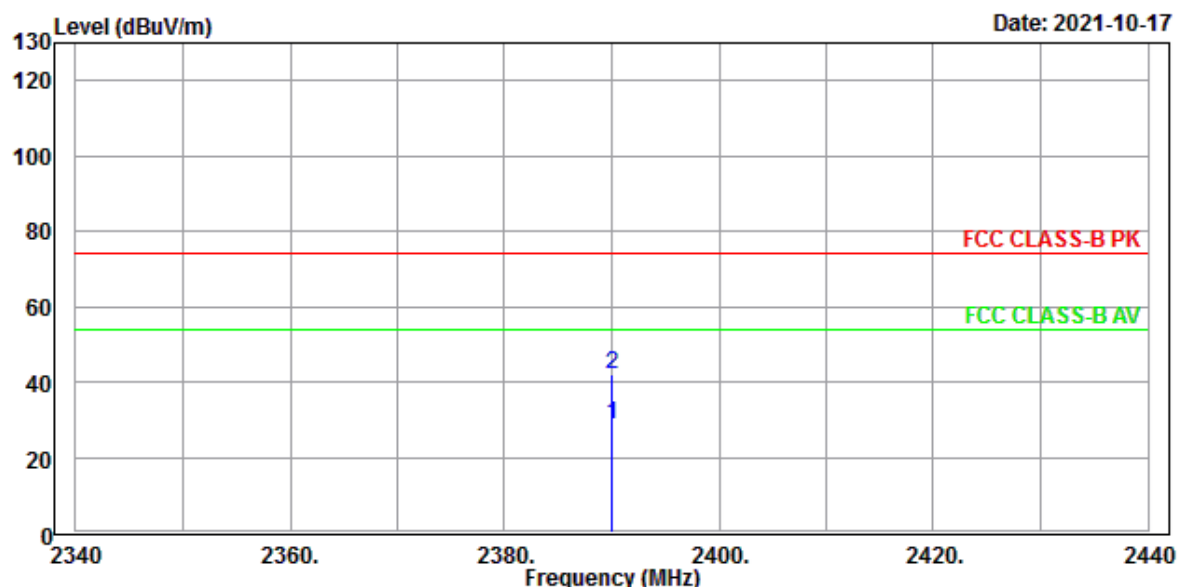
Test Mode : Continuous Transmitting, EDR, 2402 MHz

Polarization : Horizontal

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 HORIZONTAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2390.000	28.83	46.06	-17.23	54.00	-25.17	260	327	HORIZONTAL	Average
2	2390.000	41.85	59.08	-17.23	74.00	-32.15	260	327	HORIZONTAL	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

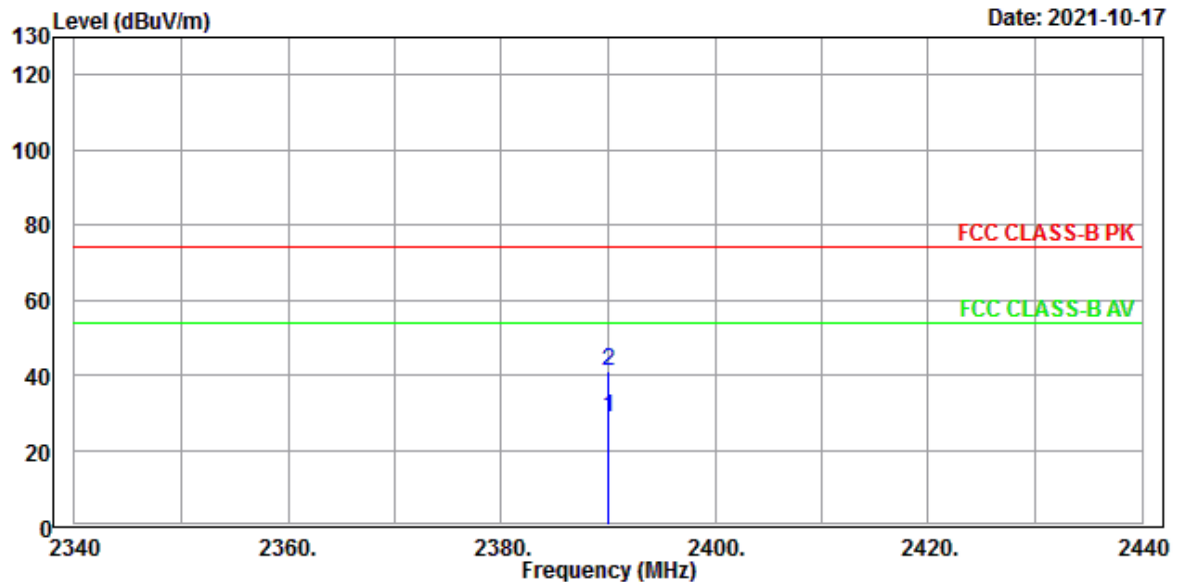
Test Mode : Continuous Transmitting, EDR, 2402 MHz

Polarization : Vertical

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 VERTICAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2390.000	28.83	46.06	-17.23	54.00	-25.17	364	321	VERTICAL	Average
2	2390.000	41.05	58.28	-17.23	74.00	-32.95	364	321	VERTICAL	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

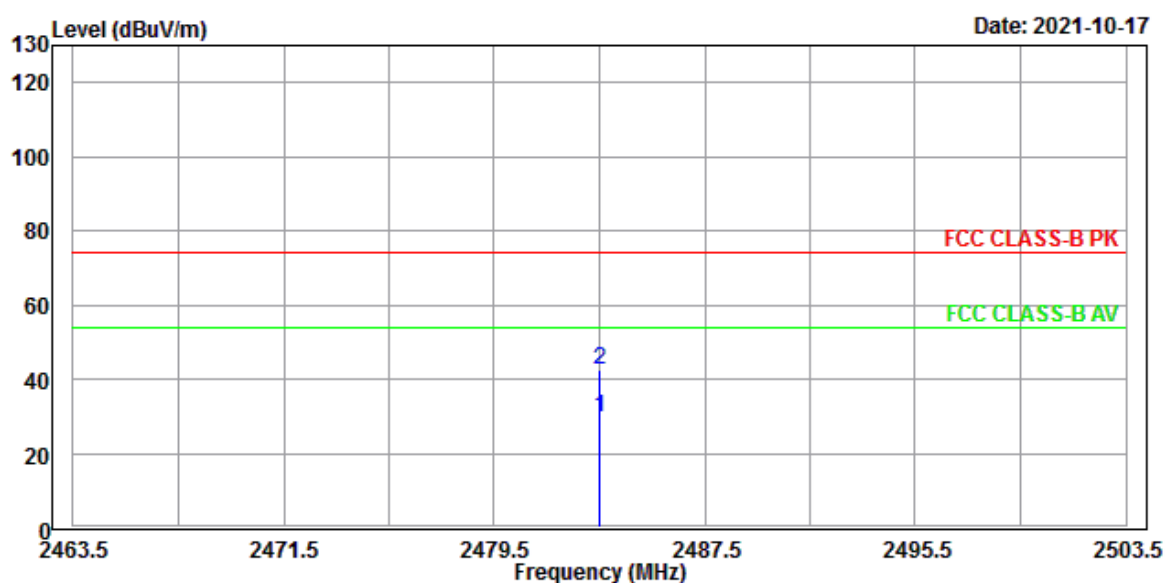
Test Mode : Continuous Transmitting, EDR, 2480 MHz

Polarization : Horizontal

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 HORIZONTAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	2483.500	29.44	46.37	-16.93	54.00	-24.56	328	46	HORIZONTAL Average
2	2483.500	42.38	59.31	-16.93	74.00	-31.62	328	46	HORIZONTAL Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

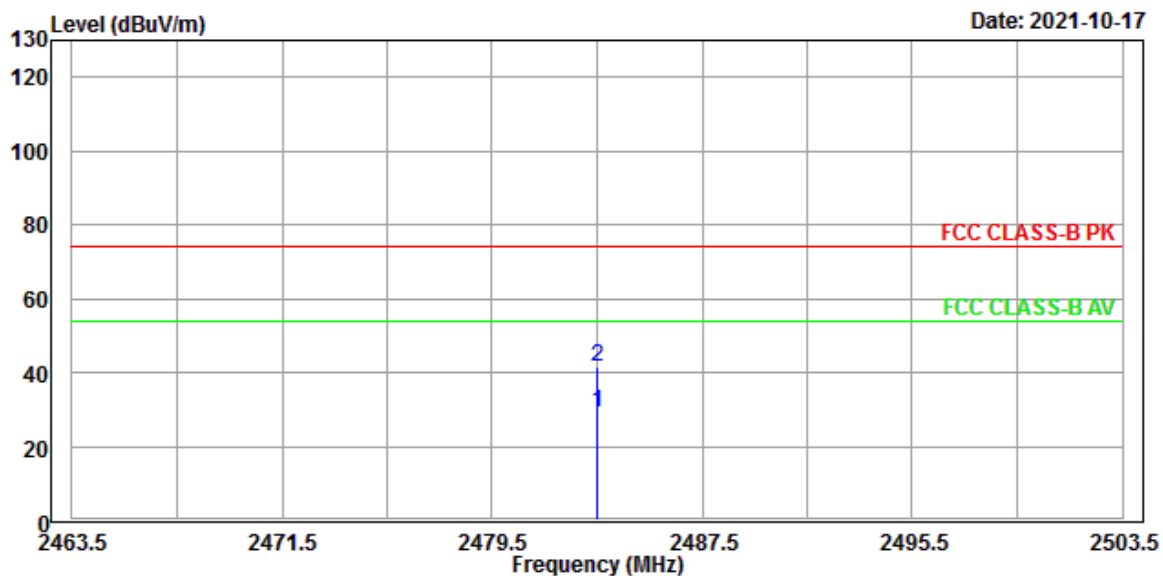
Test Mode : Continuous Transmitting, EDR, 2480 MHz

Polarization : Vertical

Tester : Jeffry

Ambient Temperature : 24°C

Relative Humidity : 58%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 VERTICAL

POWER :

OPERATOR : Jeffry T:24 H:58 P:1009

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBUV/m	dBUV	dB/m	dBUV/m	dB	cm	deg		
1	2483.500	29.40	46.33	-16.93	54.00	-24.60	400	360	VERTICAL	Average
2	2483.500	41.53	58.46	-16.93	74.00	-32.47	400	360	VERTICAL	Peak

Note:

1. Level (dBUV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line

Radiated Emission Measurement below 1000MHz

Test Mode : Normal

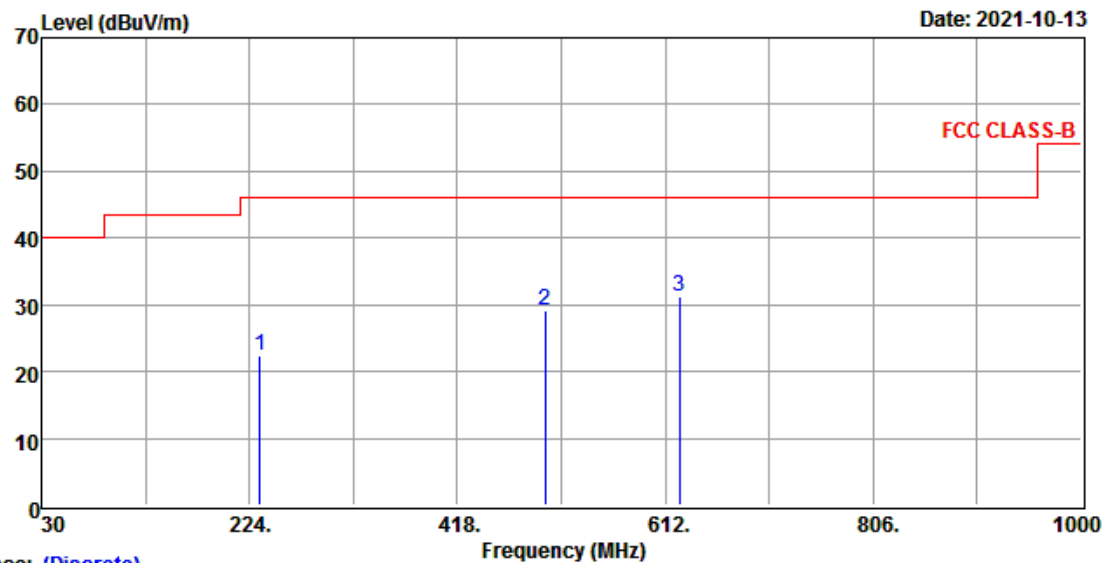
Test Range : 30 MHz ~1 GHz

Polarization : Horizontal

Tester : Martin

Ambient Temperature : 27°C

Relative Humidity : 52%



Trace: (Discrete)

Site : TR11 9*6*6 chamber
 Condition : FCC CLASS-B 3m VULB_9168-668 HORIZONTAL
 Power : 120V / 60Hz
 Operator : Martin T27 H52 P1010

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	234.015	22.49	45.27	-22.78	46.00	-23.51	138	69	HORIZONTAL	QP
2	500.003	29.12	44.02	-14.90	46.00	-16.88	100	96	HORIZONTAL	QP
3	625.000	31.34	43.27	-11.93	46.00	-14.66	225	115	HORIZONTAL	QP

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. QK. is abbreviation of Quasi-Peak
5. The emission levels were too lower against the limit of frequency 9 kHz~ 30 MHz.

Test Mode : Normal

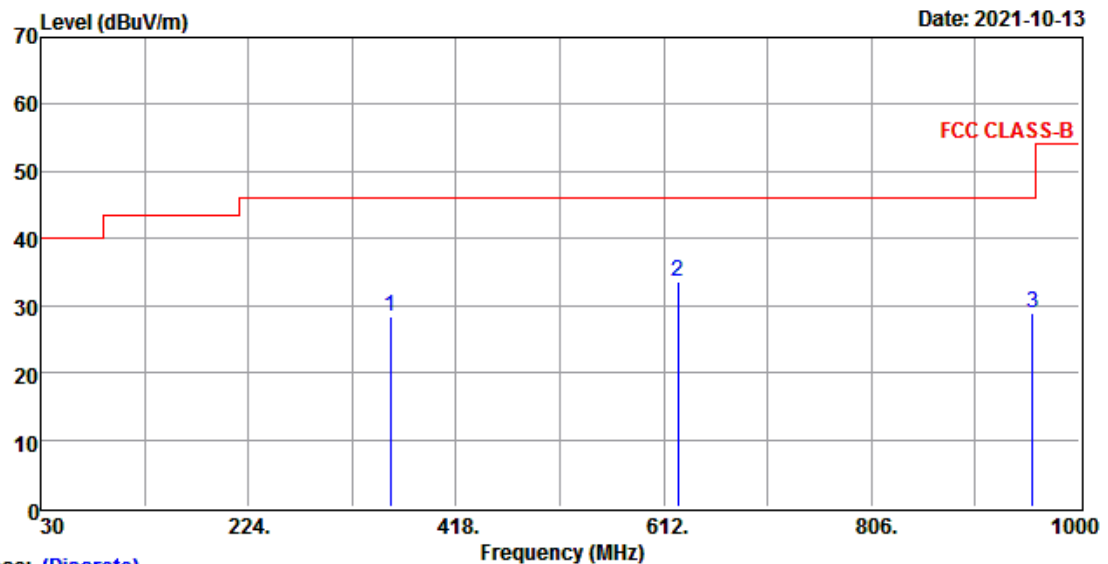
Test Range : 30 MHz ~1GHz

Polarization : Vertical

Tester : Martin

Ambient Temperature : 27°C

Relative Humidity : 52%



Trace: (Discrete)

Site : TR11 9*6*6 chamber
 Condition : FCC CLASS-B 3m VULB_9168-668 VERTICAL
 Power : 120V / 60Hz
 Operator : Martin T27 H52 P1010

	Freq	Level	Read	Level Factor	Limit	Over	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	356.374	28.46	46.92	-18.46	46.00	-17.54	100	360	VERTICAL	QP
2	625.008	33.69	45.60	-11.91	46.00	-12.31	100	209	VERTICAL	QP
3	956.623	28.96	36.48	-7.52	46.00	-17.04	100	0	VERTICAL	QP

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. QK. is abbreviation of Quasi-Peak
5. The emission levels were too lower against the limit of frequency 9 kHz~ 30 MHz.

Radiated Emission Measurement above 1000MHz

Test Mode : Continuous Transmitting, BR, 2402 MHz

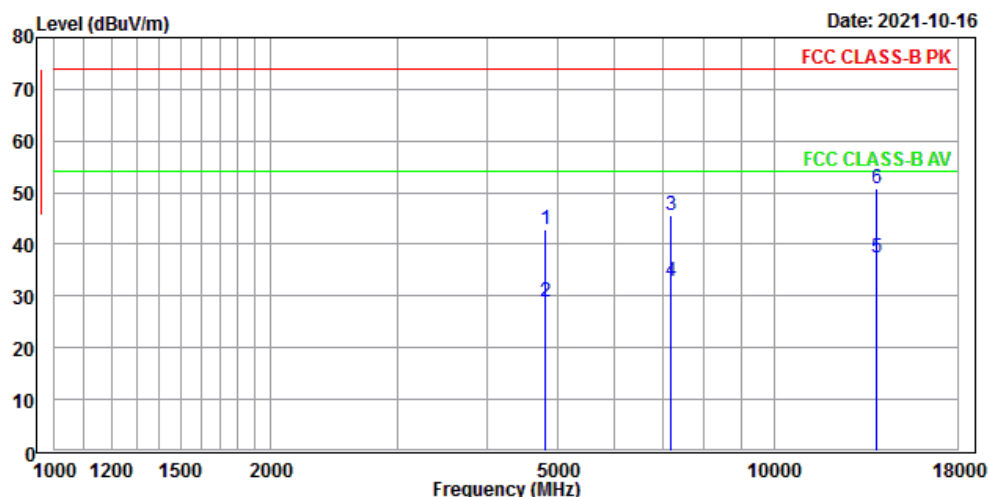
Test Range : 1 GHz ~ 25GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg		
1	4803.720	42.74	58.28	-15.54	74.00	-31.26		218	175	Horizontal	Peak
2	4804.296	28.83	44.37	-15.54	54.00	-25.17		214	179	Horizontal	Average
3	7205.575	45.50	57.90	-12.40	74.00	-28.50		182	315	Horizontal	Peak
4	7206.352	32.96	45.36	-12.40	54.00	-21.04		177	311	Horizontal	Average
5	13869.760	37.46	46.91	-9.45	54.00	-16.54		281	138	Horizontal	Average
6	13870.070	50.78	60.23	-9.45	74.00	-23.22		277	133	Horizontal	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, BR, 2402 MHz

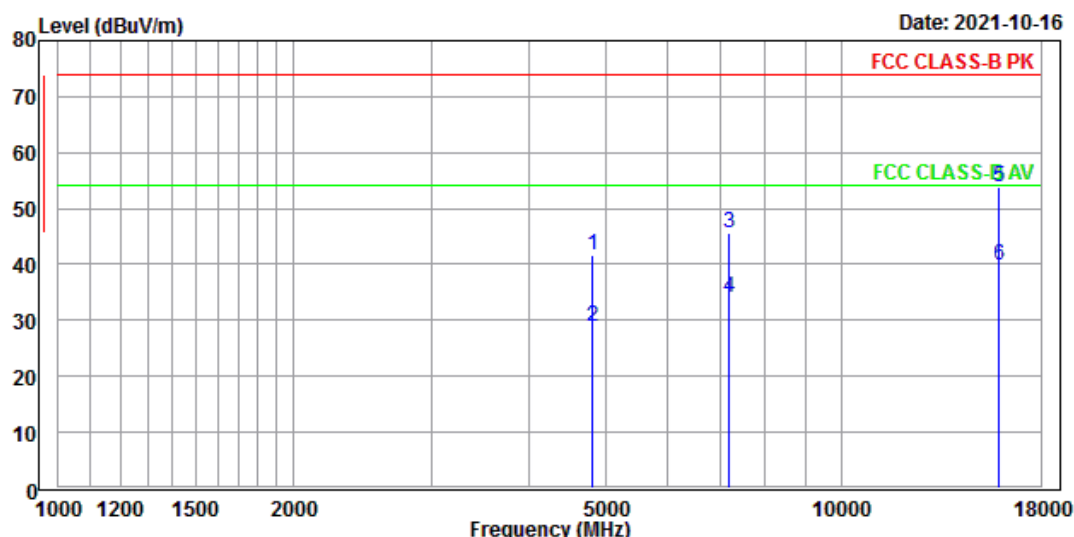
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Vertical

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Line	Limit				
			Factor						
1	4803.810	41.73	57.27	-15.54	74.00	-32.27	167	244 Vertical	Peak
2	4804.147	28.83	44.37	-15.54	54.00	-25.17	161	240 Vertical	Average
3	7205.881	45.72	58.12	-12.40	74.00	-28.28	246	286 Vertical	Peak
4	7206.559	33.92	46.32	-12.40	54.00	-20.08	249	293 Vertical	Average
5	15893.500	53.93	61.37	-7.44	74.00	-20.07	284	316 Vertical	Peak
6	15894.250	39.73	47.17	-7.44	54.00	-14.27	287	311 Vertical	Average

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, BR, 2441 MHz

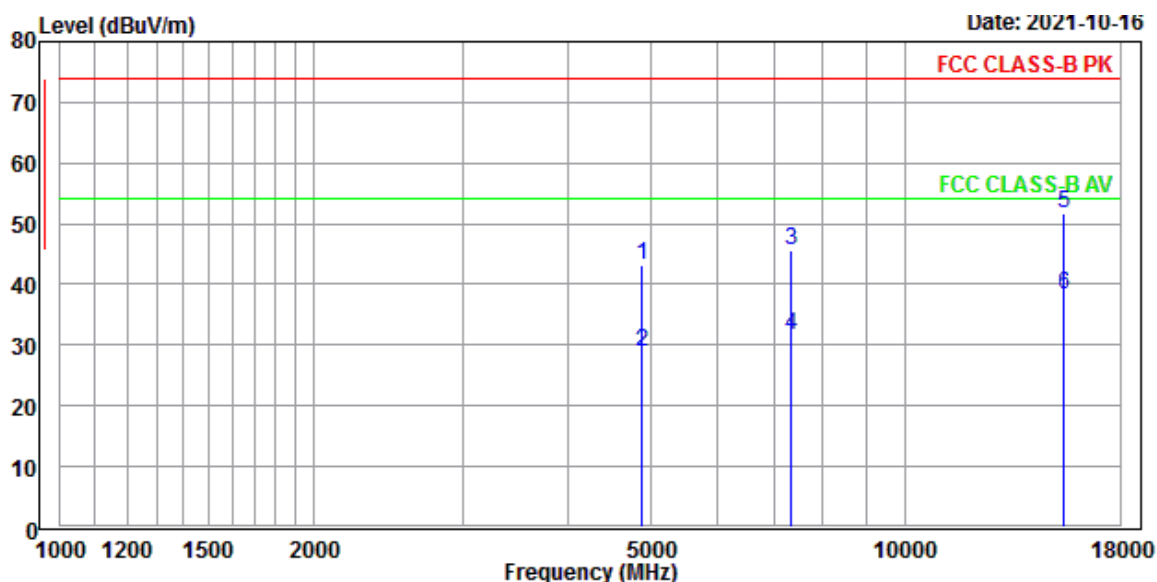
Test Range : 1 GHz ~ 25 GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	4881.509	43.33	58.96	-15.63	74.00	-30.67	249	188	Horizontal	Peak
2	4882.171	28.89	44.52	-15.63	54.00	-25.11	253	184	Horizontal	Average
3	7322.981	45.49	57.85	-12.36	74.00	-28.51	181	246	Horizontal	Peak
4	7323.488	31.55	43.91	-12.36	54.00	-22.45	185	249	Horizontal	Average
5	15440.570	51.64	60.09	-8.45	74.00	-22.36	224	153	Horizontal	Peak
6	15441.110	38.44	46.89	-8.45	54.00	-15.56	228	158	Horizontal	Average

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, BR, 2441 MHz

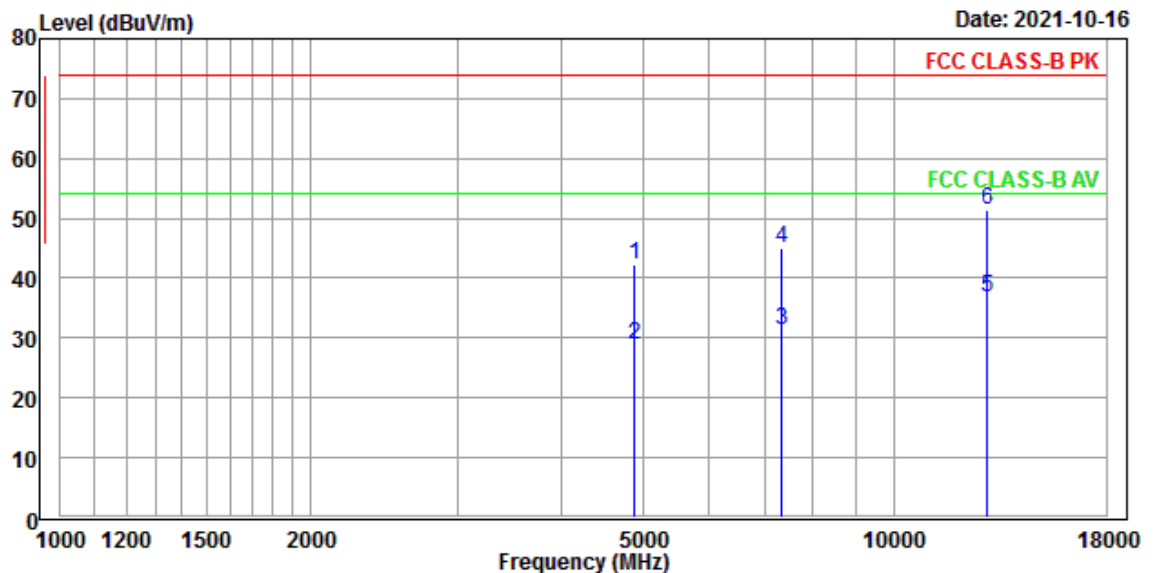
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Vertical

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4881.687	42.17	57.80	-15.63	74.00	-31.83	162	205 Vertical	Peak
2	4882.110	28.84	44.47	-15.63	54.00	-25.16	165	211 Vertical	Average
3	7322.647	31.47	43.83	-12.36	54.00	-22.53	189	282 Vertical	Average
4	7323.048	45.09	57.45	-12.36	74.00	-28.91	194	286 Vertical	Peak
5	12933.680	36.76	44.82	-8.06	54.00	-17.24	246	90 Vertical	Average
6	12934.260	51.52	59.58	-8.06	74.00	-22.48	242	86 Vertical	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, BR, 2480 MHz

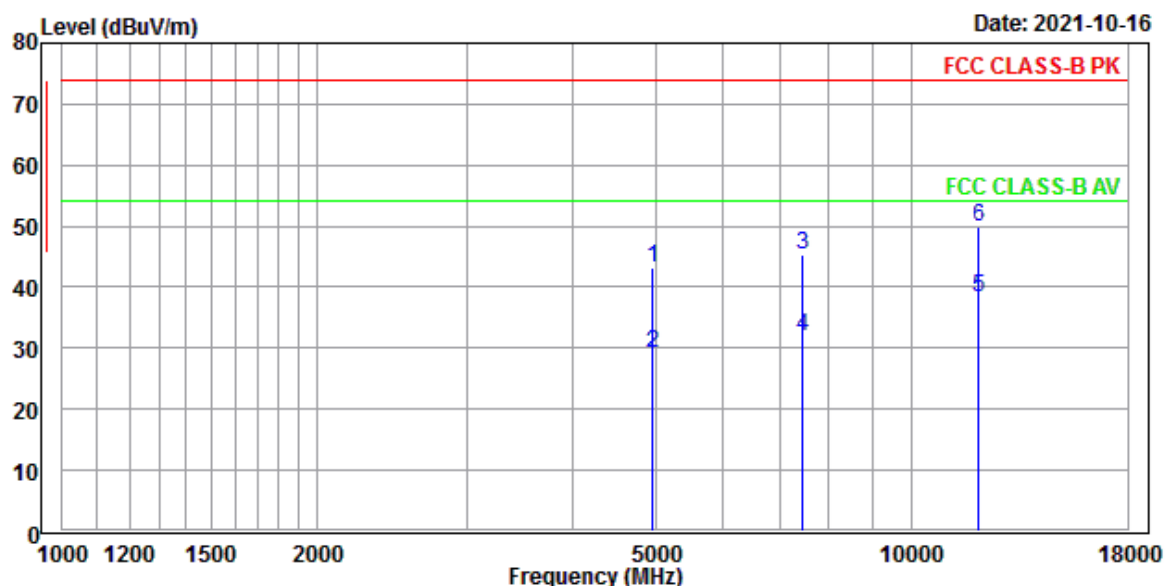
Test Range : 1 GHz ~ 25 GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4959.713	43.29	58.73	-15.44	74.00	-30.71	158	270	Horizontal Peak
2	4960.388	29.13	44.57	-15.44	54.00	-24.87	163	274	Horizontal Average
3	7439.594	45.36	57.39	-12.03	74.00	-28.64	266	185	Horizontal Peak
4	7440.297	31.85	43.87	-12.02	54.00	-22.15	262	181	Horizontal Average
5	12006.680	38.30	45.71	-7.41	54.00	-15.70	245	123	Horizontal Average
6	12007.020	49.83	57.24	-7.41	74.00	-24.17	241	129	Horizontal Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, BR, 2480 MHz

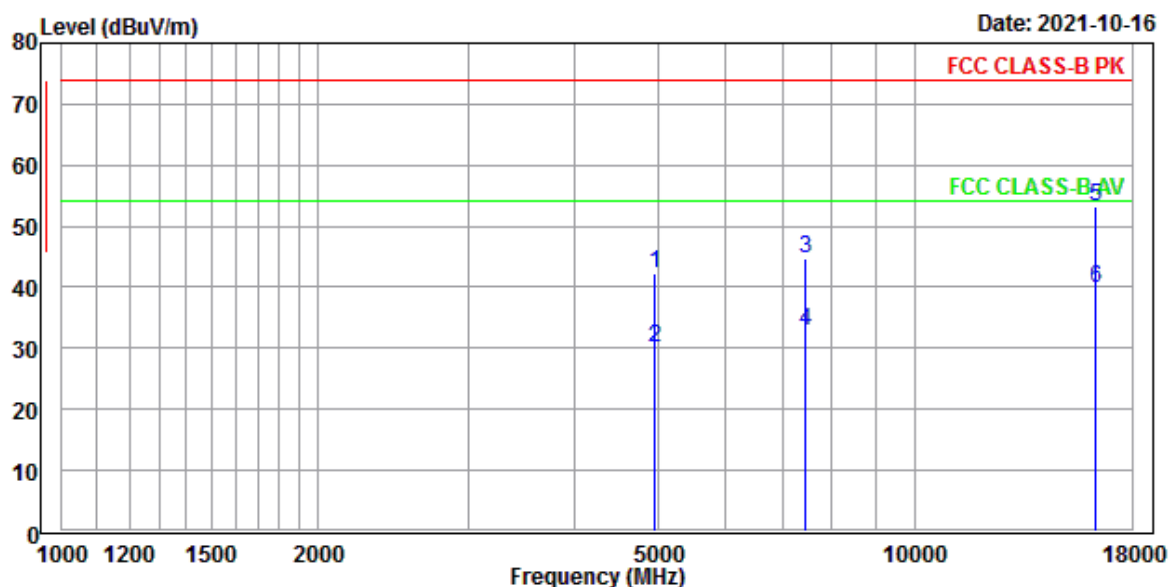
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 21°C

Relative Humidity : 60%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Vertical

POWER :

OPERATOR : Jack T:21 H:60 P:1012

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	4959.651	42.32	57.76	-15.44	74.00	-31.68	184	113	Vertical	Peak
2	4960.358	30.25	45.69	-15.44	54.00	-23.75	188	116	Vertical	Average
3	7439.853	44.66	56.68	-12.02	74.00	-29.34	277	333	Vertical	Peak
4	7440.322	32.85	44.87	-12.02	54.00	-21.15	273	338	Vertical	Average
5	16313.790	53.33	60.26	-6.93	74.00	-20.67	226	168	Vertical	Peak
6	16314.170	39.97	46.90	-6.93	54.00	-14.03	231	163	Vertical	Average

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2402 MHz

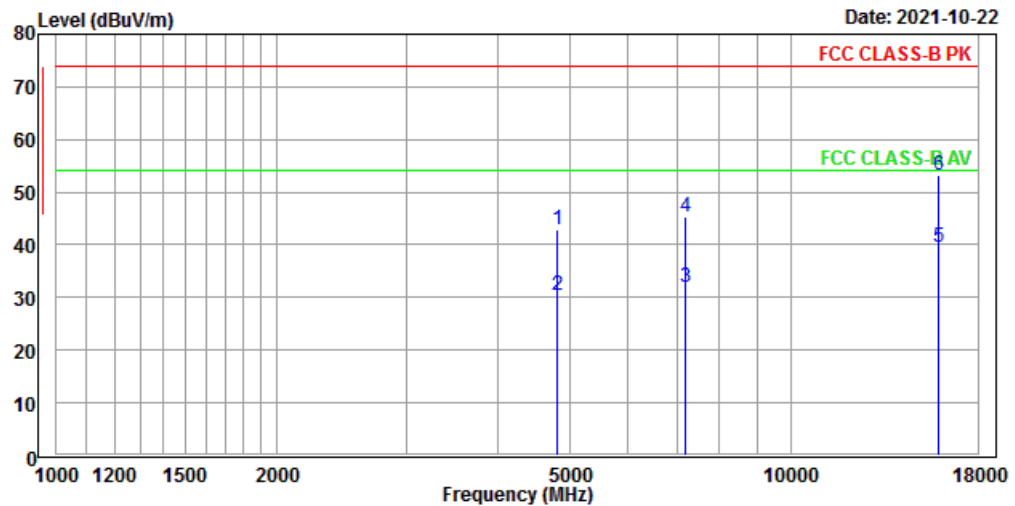
Test Range : 1 GHz ~ 25GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	4803.682	42.75	58.29	-15.54	74.00	-31.25	274	318	Horizontal	Peak
2	4804.324	30.45	45.99	-15.54	54.00	-23.55	278	322	Horizontal	Average
3	7205.682	31.81	44.21	-12.40	54.00	-22.19	339	84	Horizontal	Average
4	7206.267	45.20	57.60	-12.40	74.00	-28.80	332	88	Horizontal	Peak
5	15891.850	39.45	46.90	-7.45	54.00	-14.55	235	193	Horizontal	Average
6	15892.060	53.26	60.71	-7.45	74.00	-20.74	231	199	Horizontal	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2402 MHz

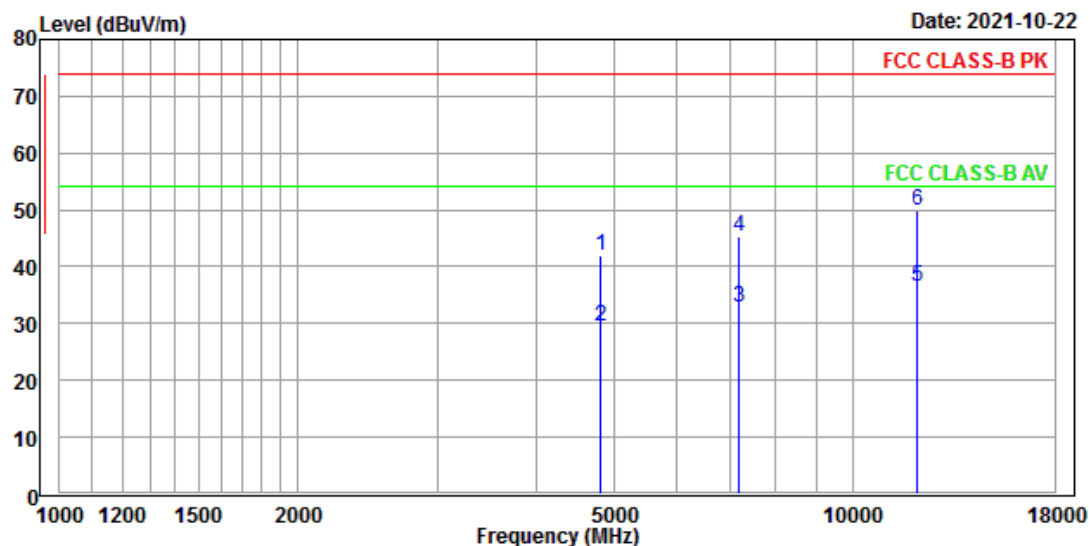
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Vertical

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4803.769	42.12	57.66	-15.54	74.00	-31.88	186	312 Vertical	Peak
2	4804.265	29.39	44.93	-15.54	54.00	-24.61	191	317 Vertical	Average
3	7205.353	32.77	45.17	-12.40	54.00	-21.23	158	121 Vertical	Average
4	7206.213	45.32	57.72	-12.40	74.00	-28.68	153	126 Vertical	Peak
5	12044.870	36.41	43.83	-7.42	54.00	-17.59	211	64 Vertical	Average
6	12045.430	49.98	57.39	-7.41	74.00	-24.02	204	69 Vertical	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2441 MHz

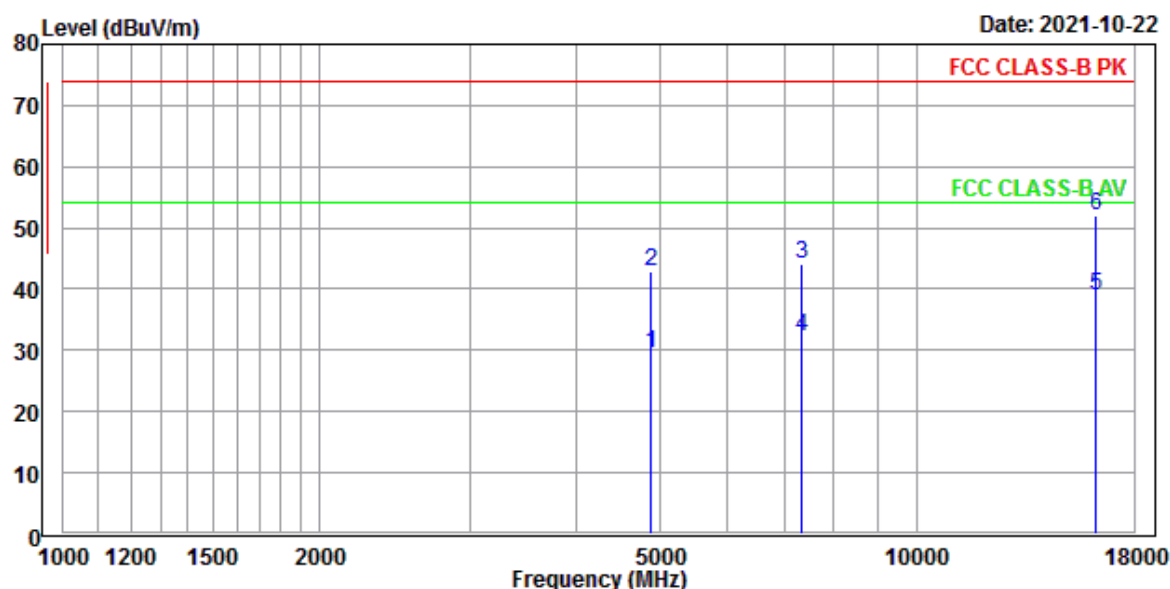
Test Range : 1 GHz ~ 25 GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4881.467	29.65	45.28	-15.63	54.00	-24.35	242	145	Horizontal Average
2	4882.287	43.03	58.66	-15.63	74.00	-30.97	246	140	Horizontal Peak
3	7322.511	44.11	56.47	-12.36	74.00	-29.89	289	167	Horizontal Peak
4	7323.288	32.37	44.73	-12.36	54.00	-21.63	283	171	Horizontal Average
5	16264.760	38.81	45.94	-7.13	54.00	-15.19	187	229	Horizontal Average
6	16265.480	51.97	59.09	-7.12	74.00	-22.03	183	225	Horizontal Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2441 MHz

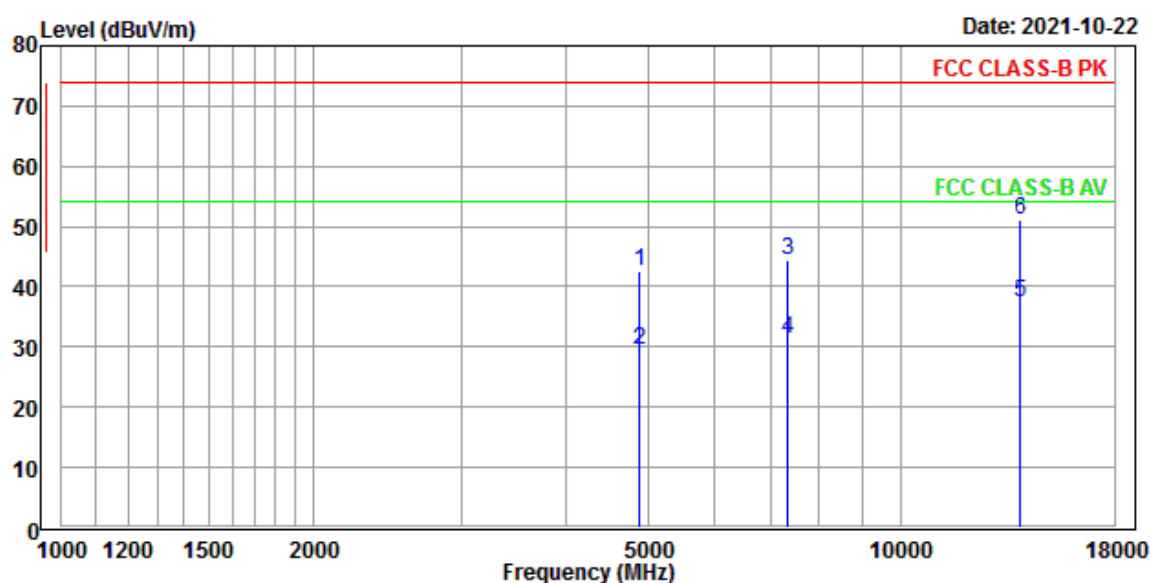
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Vertical

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4881.950	42.67	58.30	-15.63	74.00	-31.33	237	103 Vertical	Peak
2	4882.294	29.57	45.20	-15.63	54.00	-24.43	231	107 Vertical	Average
3	7322.831	44.56	56.92	-12.36	74.00	-29.44	172	328 Vertical	Peak
4	7323.357	31.35	43.71	-12.36	54.00	-22.65	175	332 Vertical	Average
5	13900.410	37.50	46.88	-9.38	54.00	-16.50	250	63 Vertical	Average
6	13901.140	51.22	60.59	-9.37	74.00	-22.78	244	67 Vertical	Peak

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2480 MHz

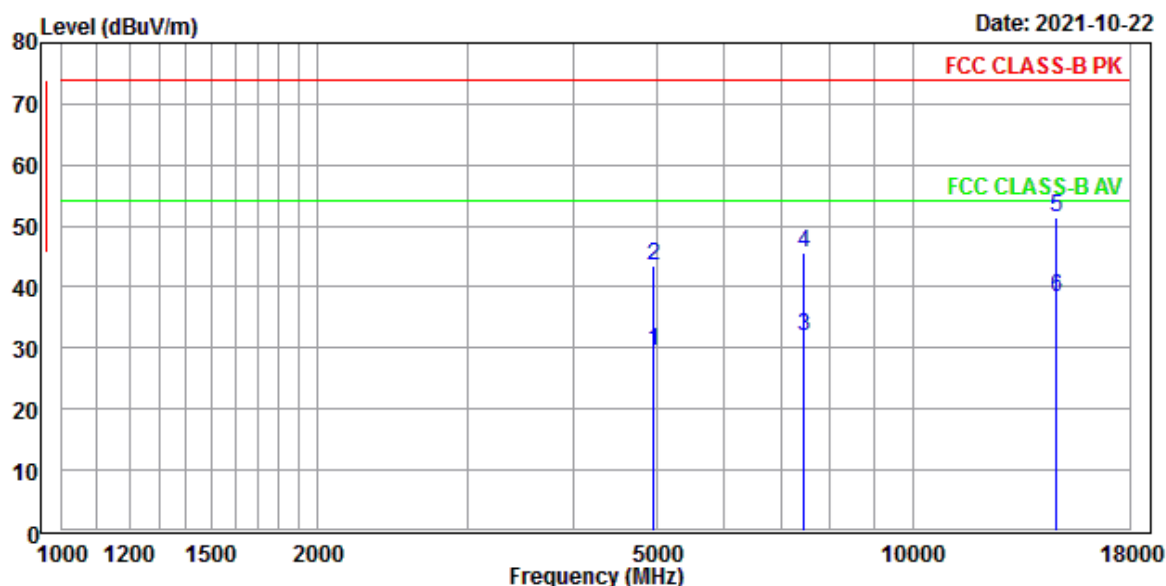
Test Range : 1 GHz ~ 25 GHz

Polarization : Horizontal

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 Horizontal

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4959.588	29.37	44.81	-15.44	54.00	-24.63	188	71	Horizontal Average
2	4960.040	43.44	58.88	-15.44	74.00	-30.56	184	75	Horizontal Peak
3	7439.426	32.08	44.11	-12.03	54.00	-21.92	216	240	Horizontal Average
4	7440.069	45.58	57.60	-12.02	74.00	-28.42	221	246	Horizontal Peak
5	14774.840	51.26	60.32	-9.06	74.00	-22.74	267	148	Horizontal Peak
6	14775.150	38.29	47.35	-9.06	54.00	-15.71	263	142	Horizontal Average

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

Test Mode : Continuous Transmitting, EDR, 2480 MHz

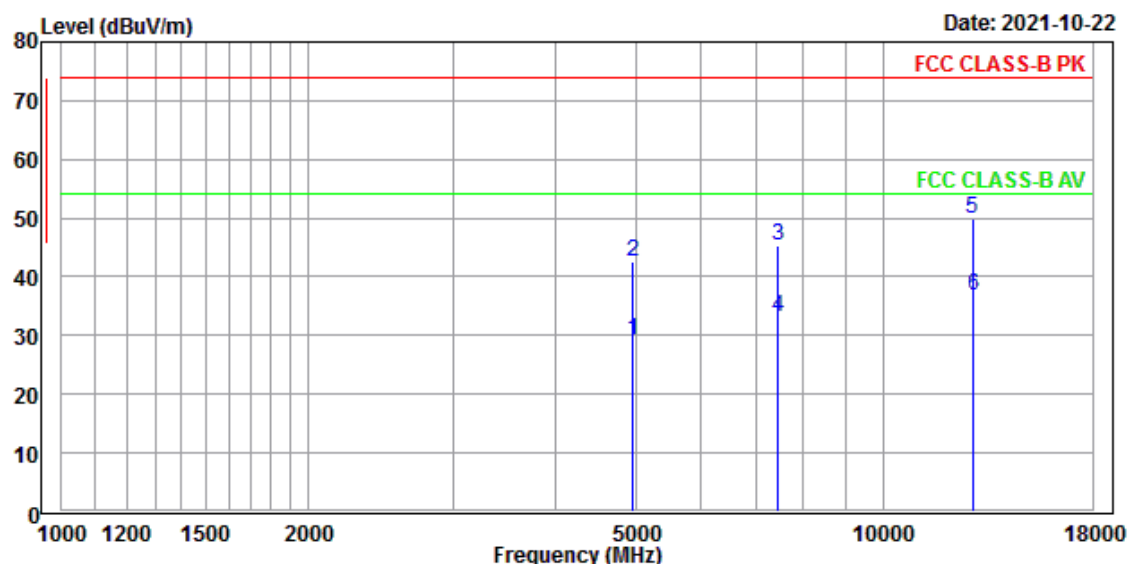
Test Range : 1 GHz ~ 25 GHz

Polarization : Vertical

Tester : Jack

Ambient Temperature : 24°C

Relative Humidity : 57%



Condition : FCC CLASS-B PK 3m EMCO_3117_82847 VERTICAL

POWER :

OPERATOR : Jack T:24 H:57 P:1018

	Freq	Level	Read	Limit	Over	APos	TPos	Pol/Phase	Remark
	MHz	dBuV/m	Level	Factor	Line	Limit			
			dBuV	dB/m	dBuV/m	dB	cm	deg	
1	4959.319	29.19	44.63	-15.44	54.00	-24.81	195	152	VERTICAL Average
2	4960.091	42.69	58.13	-15.44	74.00	-31.31	192	147	VERTICAL Peak
3	7439.562	45.21	57.24	-12.03	74.00	-28.79	146	272	VERTICAL Peak
4	7440.233	33.02	45.04	-12.02	54.00	-20.98	150	277	VERTICAL Average
5	12855.670	49.97	57.89	-7.92	74.00	-24.03	184	45	VERTICAL Peak
6	12856.160	36.75	44.67	-7.92	54.00	-17.25	189	41	VERTICAL Average

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. No signal can be detected above 18 GHz, so the graphs are omitted.

9 Line conducted Emission Measurement

Result: Pass

9.1 Limits for Emission Measurement

According to FCC 15.207(a), line conduction emission limit is as below table.

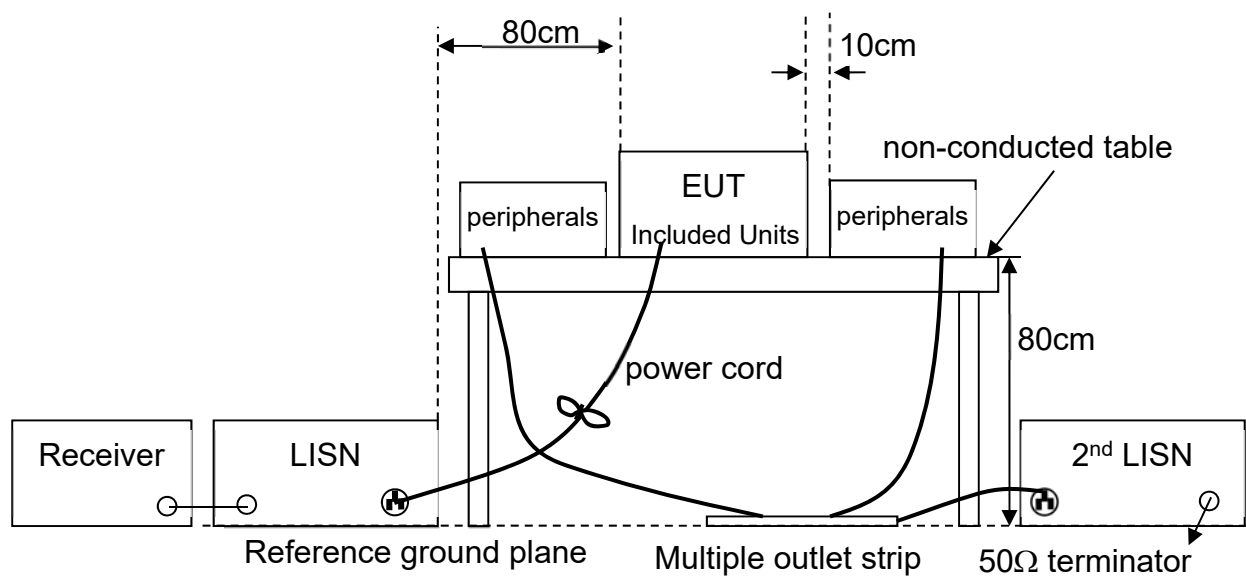
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

9.2 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 0.4 meters from the conducting wall of the shielded room. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 12 millimeters above the reference ground plane.
- c. Connect the EUT's power source to the appropriate power mains through the LISN.
- d. All the other peripherals are connected to the 2nd LISN, if any.
- e. The LISN was placed 0.8 meters from the EUT and at least 0.8 meters from other units and other metal planes.
- f. Measure the conducted emissions on each power line (Neutral Line and Line 1 – Hot side) of the EUT's power source by using the test receiver connected to the coupling RF output port of LISN.
- g. Rapidly scan the signal from 150kHz to 30MHz by using the receiver through the Maximum-Peak detector to determine those frequencies associated with higher emission levels for each measured line. Receiver setting is IF bandwidth=9 kHz.
- h. Then measure the maximum level of conducted disturbance for each frequency found from step g. by using the receiver through the Quasi-Peak and Average detectors per CISPR 16-1.
- i. Record the level for each frequency and compare with the required limit.

9.3 Test Configurations



9.4 Test Data

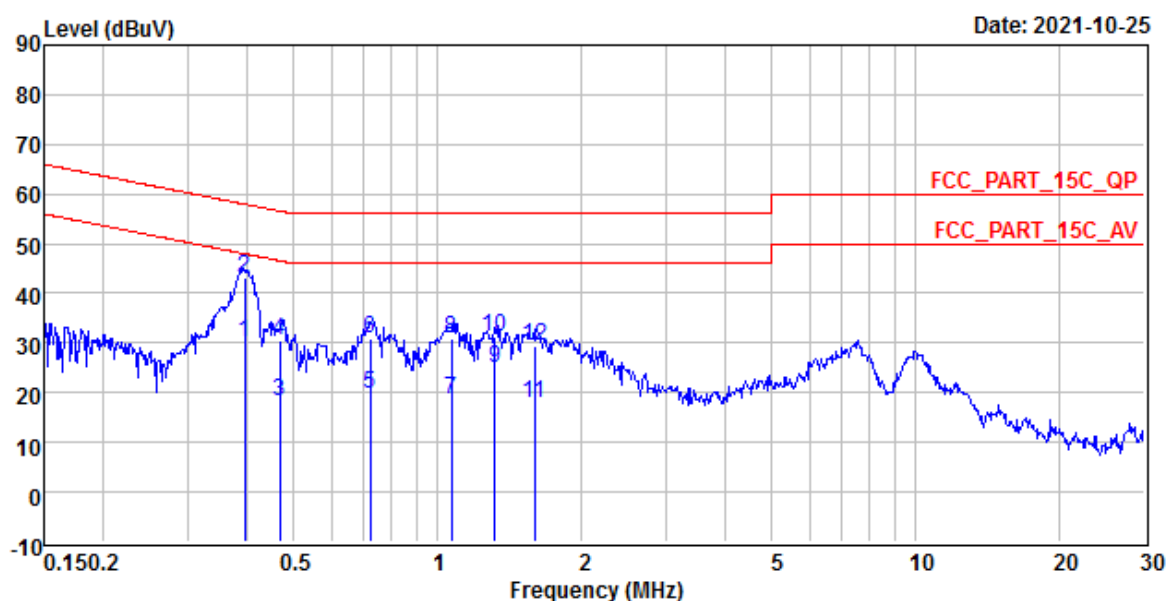
Test Mode : Normal

Phase : Line

Tester : David Lu

Ambient Temperature : 25°C

Relative Humidity : 67%



Site : TR20
 Condition : FCC_PART_15C_QP ESH2-Z5 LINE
 Power : 120V/60Hz
 Operator : David Lu T25 H67 P1016

	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.394	30.32	10.34	19.98	47.98	-17.66	LINE	Average
2	0.394	43.00	10.34	32.66	57.98	-14.98	LINE	QP
3	0.467	18.26	10.34	7.92	46.56	-28.30	LINE	Average
4	0.467	30.56	10.34	20.22	56.56	-26.00	LINE	QP
5	0.721	19.74	10.37	9.37	46.00	-26.26	LINE	Average
6	0.721	31.02	10.37	20.65	56.00	-24.98	LINE	QP
7	1.068	18.46	10.39	8.07	46.00	-27.54	LINE	Average
8	1.068	30.97	10.39	20.58	56.00	-25.03	LINE	QP
9	1.317	24.85	10.41	14.44	46.00	-21.15	LINE	Average
10	1.317	31.33	10.41	20.92	56.00	-24.67	LINE	QP
11	1.590	18.01	10.43	7.58	46.00	-27.99	LINE	Average
12	1.590	29.33	10.43	18.90	56.00	-26.67	LINE	QP

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.

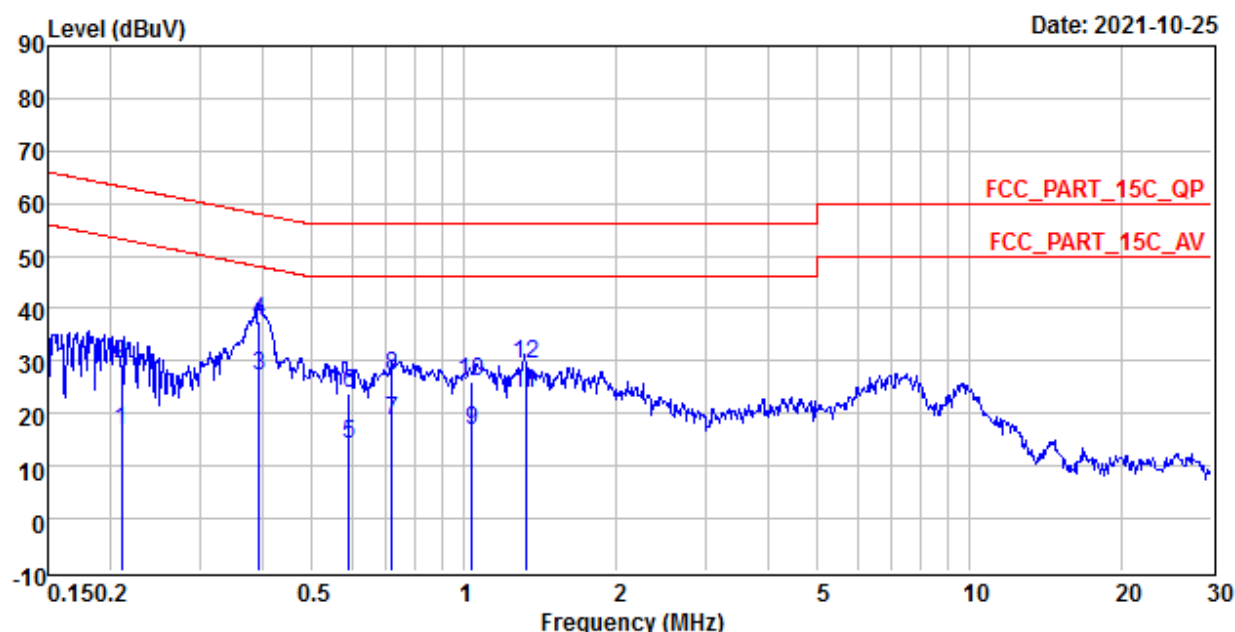
Test Mode : Normal

Phase : Neutral

Tester : David Lu

Ambient Temperature : 25°C

Relative Humidity : 67%



Site : TR20

Condition : FCC_PART_15C_QP ESH2-Z5 NEUTRAL

Power : 120V/60Hz

Operator : David Lu T25 H67 P1016

	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.209	16.81	10.31	6.50	53.23	-36.42	NEUTRAL	Average
2	0.209	29.33	10.31	19.02	63.23	-33.90	NEUTRAL	QP
3	0.393	27.28	10.35	16.93	48.01	-20.73	NEUTRAL	Average
4	0.393	37.48	10.35	27.13	58.01	-20.53	NEUTRAL	QP
5	0.591	14.29	10.37	3.92	46.00	-31.71	NEUTRAL	Average
6	0.591	24.00	10.37	13.63	56.00	-32.00	NEUTRAL	QP
7	0.719	18.47	10.38	8.09	46.00	-27.53	NEUTRAL	Average
8	0.719	27.05	10.38	16.67	56.00	-28.95	NEUTRAL	QP
9	1.037	16.66	10.40	6.26	46.00	-29.34	NEUTRAL	Average
10	1.037	26.12	10.40	15.72	56.00	-29.88	NEUTRAL	QP
11	1.319	23.67	10.42	13.25	46.00	-22.33	NEUTRAL	Average
12	1.319	29.38	10.42	18.96	56.00	-26.62	NEUTRAL	QP

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.