

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



**Applicant:** Opticon sensors Europé B.V.  
Opaallaan 35, 2132 XV Hoofddorp, The Netherlands

**Product Name:** Companion scanner

**Brand Name:** Opticon

**Model No.:** RS-3000

**Model Difference:** N/A

**Report Number:** E2/2021/60084

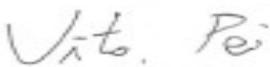
**FCC ID** Q2Q-RS3000

**Issue Date:** Aug.11,2021

**Date of Test:** Jun.30,2021~ Aug.11,2021

**Date of EUT Received:** Jun.30,2021

**Approved By**

  
Vito Pei

### We hereby certify that:

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

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/60084	Rev.00	Original.	Aug.11,2021	Viola Su

**Note:**

- 1、Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279

f (886-2) 2298-0488

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	Companion scanner
Brand Name:	Opticon
Model No.:	RS-3000
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	000028
Power Supply:	3.7V DC

### 1.2 RF Specification

Radio Technology:	BT BR
Channel number:	79 channels
Modulation type:	GFSK
Transmit Power:	7.74 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	≤ 0.4s

### 1.3 Antenna Designation

Antenna Type	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain
PIFA	2.4GHz	-1.00	V

**Note:**

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

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## 1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas. Guidance v05r02

ANSI C63.10:2013

## 1.5 Test Facility

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

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

## 1.6 Special Accessories

There is no special accessory used while test was conducted.

## 1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

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

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

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

#### 2.3.2 Conducted Test (RF)

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

#### 2.3.3 Radiated Emissions

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

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## 2.4 Measurement Results Explanation Example

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

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

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

### 2.4.2 For all conducted test items:

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

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## 2.5 Configuration of Tested System

Fig. 2-1 Conducted Setup & Radiated Setup



Fig. 2-2 Conduction Setup

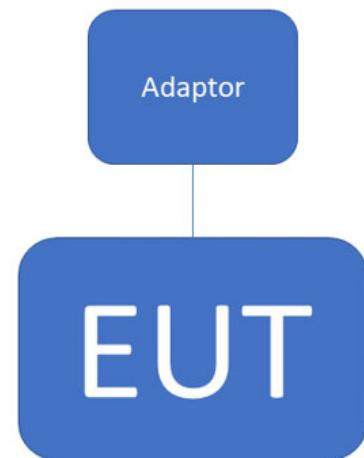


Table 2-1 Equipment Used in Tested System

Item	Equipment	MFR/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Test Software	audix	e3	Ver. 6.11-20180419c	N/A	N/A
2	Adapter	Sony	AC-0400-TW	3504600	N/A	N/A
3	Test Software	audix	e3	20923 sgs Ver.9	N/A	N/A
4	Notebook	Lenovo	L440	P0000367	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)(1)	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency Time of Occupancy	Compliant
§15.203	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	21	2422 MHz	41	2442 MHz	71	2462 MHz
2	2403 MHz	22	2423 MHz	42	2443 MHz	72	2463 MHz
3	2404 MHz	23	2424 MHz	43	2444 MHz	73	2464 MHz
4	2405 MHz	24	2425 MHz	44	2445 MHz	74	2465 MHz
5	2406 MHz	25	2426 MHz	45	2446 MHz	75	2466 MHz
6	2407 MHz	26	2427 MHz	46	2447 MHz	76	2467 MHz
7	2408 MHz	27	2428 MHz	47	2448 MHz	77	2468 MHz
8	2409 MHz	28	2429 MHz	48	2449 MHz	78	2469 MHz
9	2410 MHz	29	2430 MHz	49	2450 MHz	79	2470 MHz
10	2411 MHz	30	2431 MHz	50	2451 MHz	70	2471 MHz
11	2412 MHz	31	2432 MHz	51	2452 MHz	71	2472 MHz
12	2413 MHz	32	2433 MHz	52	2453 MHz	72	2473 MHz
13	2414 MHz	33	2434 MHz	53	2454 MHz	73	2474 MHz
14	2415 MHz	34	2435 MHz	54	2455 MHz	74	2475 MHz
15	2416 MHz	35	2436 MHz	55	2456 MHz	75	2476 MHz
16	2417 MHz	36	2437 MHz	56	2457 MHz	76	2477 MHz
17	2418 MHz	37	2438 MHz	57	2458 MHz	77	2478 MHz
18	2419 MHz	38	2439 MHz	58	2459 MHz	78	2479 MHz
19	2420 MHz	39	2440 MHz	59	2460 MHz	79	2480 MHz
20	2421 MHz	40	2441 MHz	60	2461 MHz		

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#### 4.2 The Worst Test Modes and Channel Details

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
<b>RADIATED EMISSION TEST (BELOW 1 GHZ)</b>				
Bluetooth	0 to 78	39	GFSK	DH5
<b>RADIATED EMISSION TEST (ABOVE 1 GHZ)</b>				
Bluetooth	0 to 78	0,39,78	GFSK	DH5

**Note:** The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case E1 plane position was reported.

<b>ANTNNA PORT CONDUCTED TEST</b>				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
<b>Peak Output Power, 20dB Band Width</b>				
Bluetooth	0 to 78	0,39,78	GFSK	DH5
<b>Band Edge</b>				
Bluetooth	0 to 78	0,78	GFSK	DH5
<b>Frequency Separation</b>				
Bluetooth	0 to 78	0,1,2,38,39,40,76,77,78	GFSK	DH5
<b>Number of hopping frequency</b>				
Bluetooth	0 to 78	0 to 78	GFSK	DH5
<b>Time of Occupancy(Dwell time)</b>				
Bluetooth	0 to 78	39	GFSK	DH1/DH3/DH5

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.34	dB
Peak Output Power	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
100 kHz Bandwidth Of Frequency Band Edges	+/-	1.69	dB
Frequency Separation	+/-	1.53	Hz
Number of hopping frequency	+/-	1.53	Hz
Time of Occupancy	+/-	1.53	Hz
Temperature	+/-	0.4	°C
Humidity	+/-	3.5	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty		
Polarization: Vertical	+/- 2.64 dB	9kHz~30MHz
	+/- 4.93 dB	30MHz - 1000MHz
	+/- 4.81 dB	1GHz - 18GHz
	+/- 4.52 dB	18GHz - 40GHz
Polarization: Horizontal	+/- 2.64 dB	9kHz~30MHz
	+/- 4.45 dB	30MHz - 1000MHz
	+/- 4.81 dB	1GHz - 18GHz
	+/- 4.52 dB	18GHz - 40GHz

**Note:**

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

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable

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

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

**Note**

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

### 6.2 Measurement Equipment Used

Radiated Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	audix	e3	Ver. 6.11-20180419c	N.C.R	N.C.R
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	03/25/2021	03/24/2022
EMI Test Receiver	R&S	ESCI	101342	04/27/2021	04/26/2022
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2021	03/26/2022
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2021	03/26/2022
Adapter	Sony	AC-0400-TW	3504600	N.C.R	N.C.R

### 6.3 EUT Setup

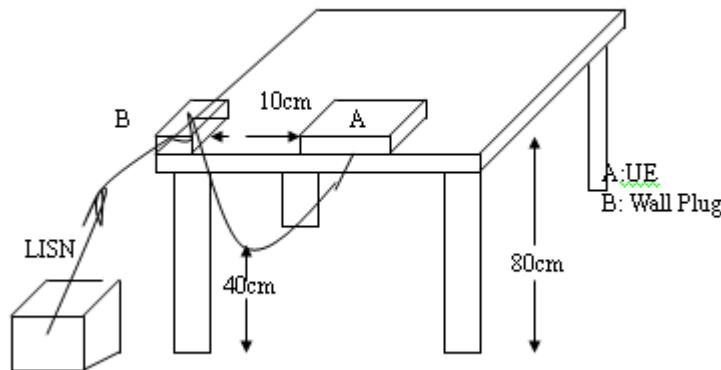
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## 6.6 Measurement Result

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

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

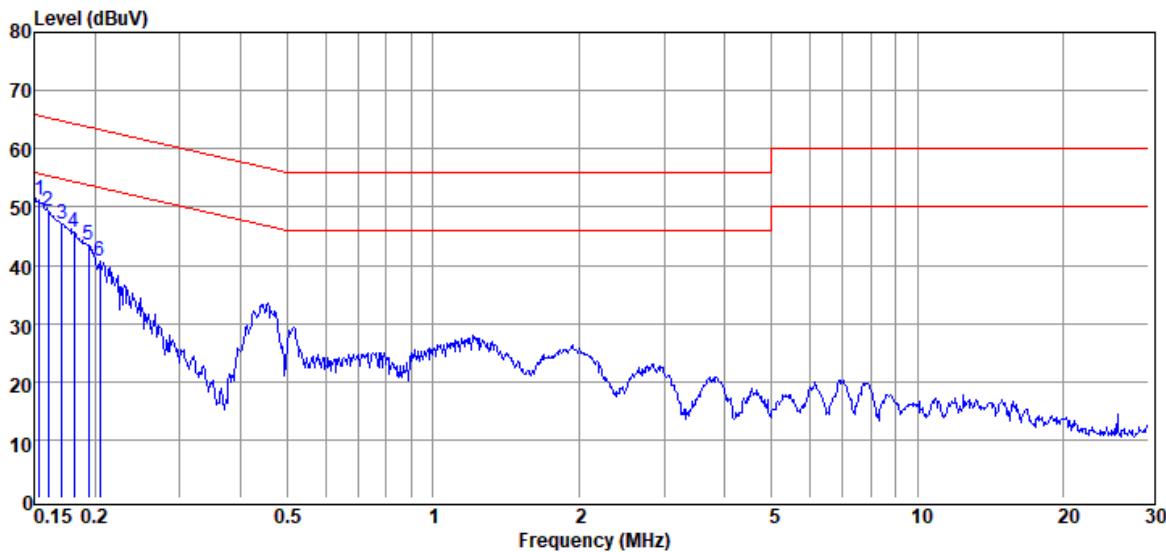
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**AC POWER LINE CONDUCTED EMISSION TEST DATA**

Report Number :E2-2021-60084 Test Site :Conduction Room C  
Test Mode :BT Test Date :2021-07-13  
Power :120V/60Hz Temp./Humi. :22.6/60  
Probe :L1 Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V	Limit dB $\mu$ V	Margin dB
0.15	Peak	40.84	10.30	51.14	65.78	-14.64
0.16	Peak	38.96	10.30	49.26	65.43	-16.17
0.17	Peak	36.86	10.30	47.16	64.90	-17.74
0.18	Peak	35.27	10.30	45.57	64.42	-18.85
0.19	Peak	33.30	10.30	43.60	63.84	-20.24
0.21	Peak	30.32	10.30	40.62	63.40	-22.78

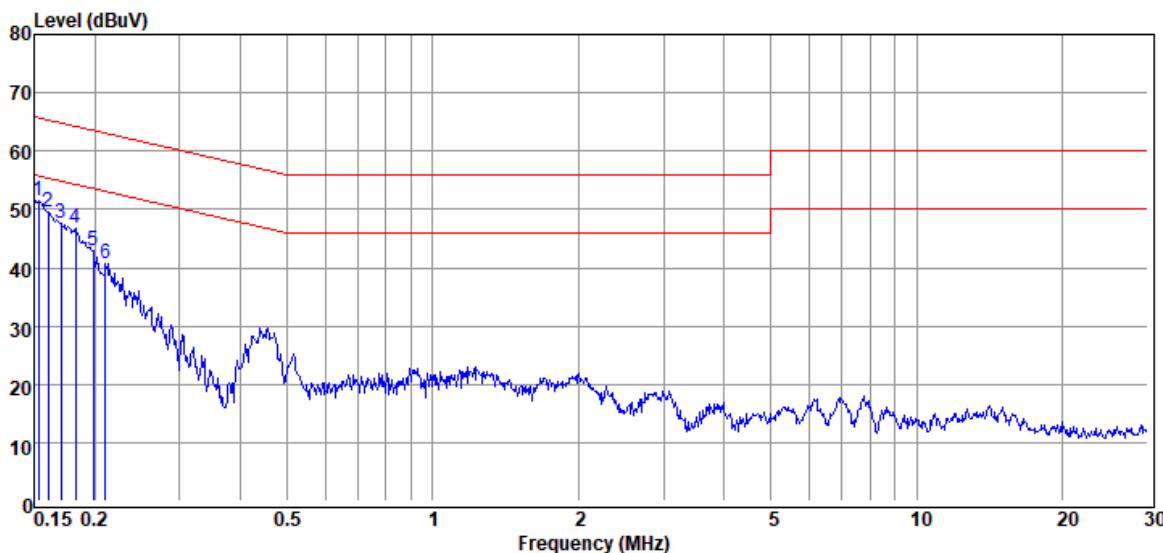
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Report Number :E2-2021-60084  
Test Mode :BT  
Power :120V/60Hz  
Probe :N

Test Site :Conduction Room C  
Test Date :2021-07-13  
Temp./Humi. :22.6/60  
Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading dBrV	Factor dB	Actual FS dBrV	Limit dBrV	Margin dB
0.15	Peak	41.15	10.31	51.46	65.82	-14.36
0.16	Peak	39.31	10.31	49.62	65.43	-15.81
0.17	Peak	37.44	10.31	47.75	64.94	-17.19
0.18	Peak	36.38	10.30	46.68	64.37	-17.69
0.20	Peak	32.66	10.30	42.96	63.67	-20.71
0.21	Peak	30.44	10.30	40.74	63.18	-22.44

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## 7 PEAK OUTPUT POWER MEASUREMENT

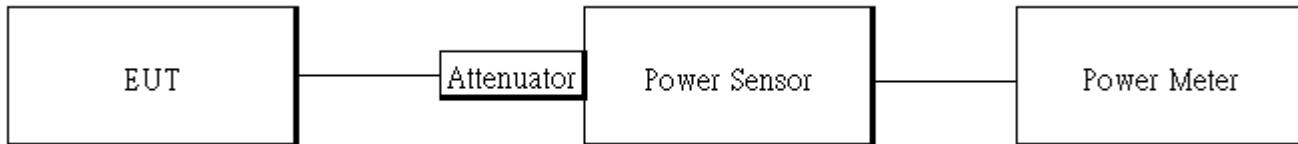
### 7.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

### 7.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 7.3 Test Set-up:



### 7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10 Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
4. Record the max. reading.
5. Repeat above procedures until all default test channel is completed.

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## 7.5 Peak & Average Power Measurement Result

1M BR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	<b>7.74</b>	5.943	1000
Mid	2441	default	7.69	5.875	1000
High	2480	default	7.71	5.902	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	7.12	5.146	1000
Mid	2441	default	6.91	4.904	1000
High	2480	default	7.07	5.088	1000

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## 8 EMISSION BANDWIDTH MEASUREMENT

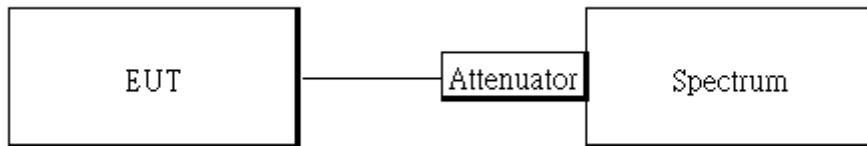
### 8.1 Standard Applicable

For frequency hopping systems operating in the 2400 MHz-2483.5 MHz no limit for 20dB bandwidth.

### 8.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 8.3 Test Set-up



### 8.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set the spectrum analyzer as  
RBW= 1 % to 5% of OBW ,  
VBW = 3 X RBW,  
Span= 2 to 5 times of the OBW,  
Sweep=auto,  
Detector = Peak, and Max hold for 20dB Bandwidth test.
5. Mark the peak frequency and -20dB (upper and lower) frequency
6. Repeat above procedures until all test default channel is completed

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## 8.5 20dB Bandwidth

### GFSK

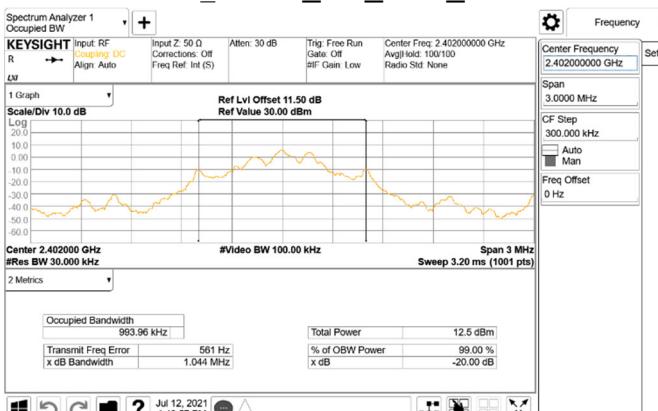
CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.044	0.70
Mid	1.046	0.70
High	1.046	0.70

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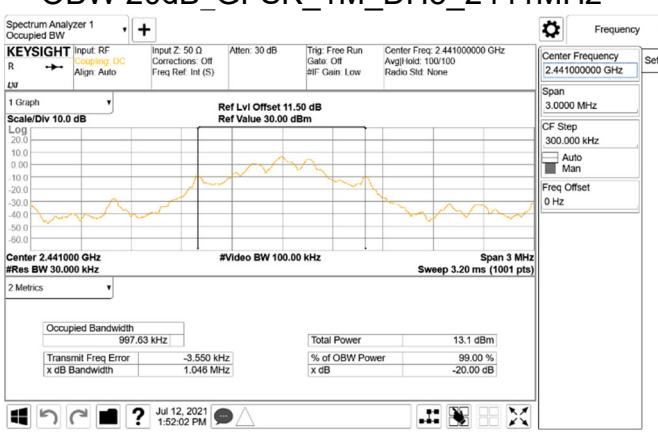
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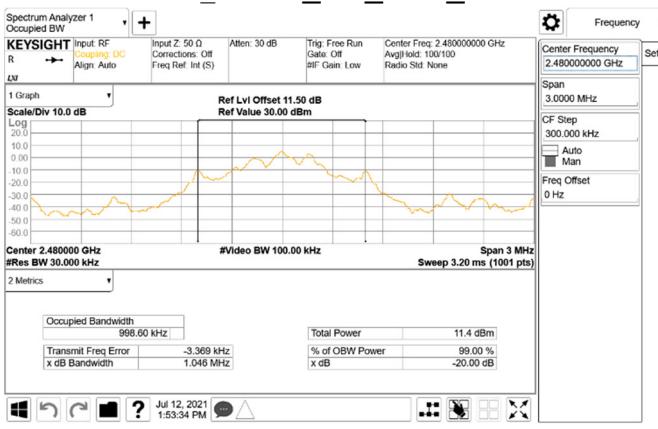
### OBW 20dB\_GFSK\_1M\_DH5\_2402MHz



### OBW 20dB\_GFSK\_1M\_DH5\_2441MHz



### OBW 20dB\_GFSK\_1M\_DH5\_2480MHz



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## 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

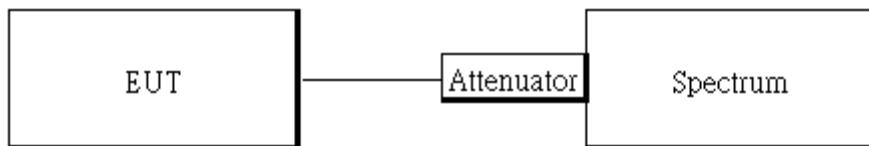
### 9.1 Standard Applicable

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

### 9.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 9.3 Test SET-UP



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## 9.4 Measurement Procedure

### 9.4.1 Conducted Band Edge:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
6. Mark Peak, 2.3999GHz and 2.4836GHz and record the max. level.
7. Repeat above procedures until all frequency measured were complete.

### 9.4.2 Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows ANSI C63.10:2013.
3. Set RBW = 100 kHz & VBW = 300 kHz, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

## 9.5 Measurement Result

See next page for test plots.

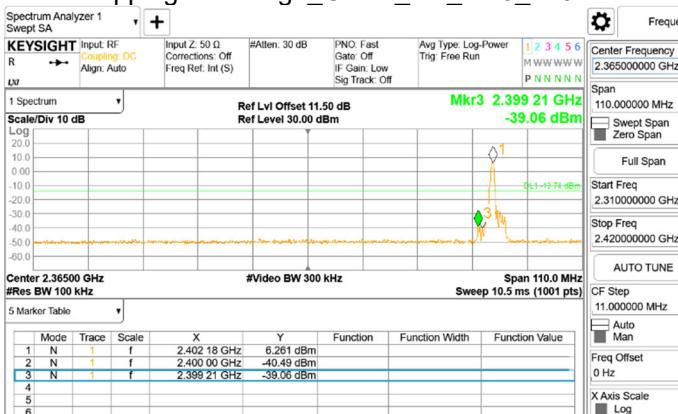
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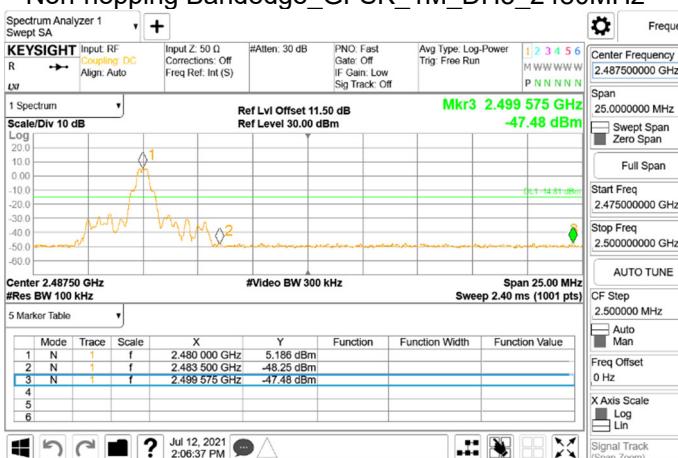
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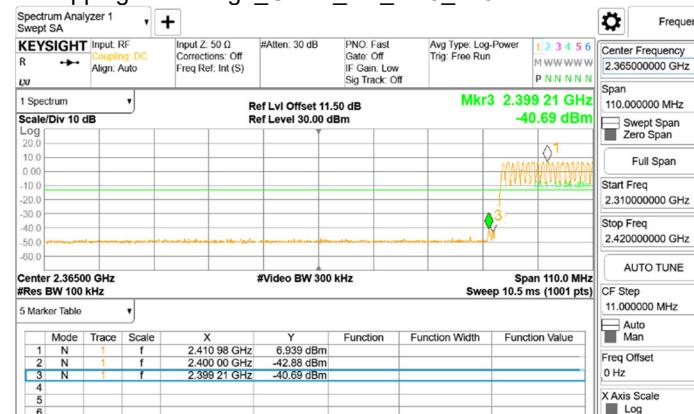
Non-hopping Bandedge\_GFSK\_1M\_DH5\_2402MHz



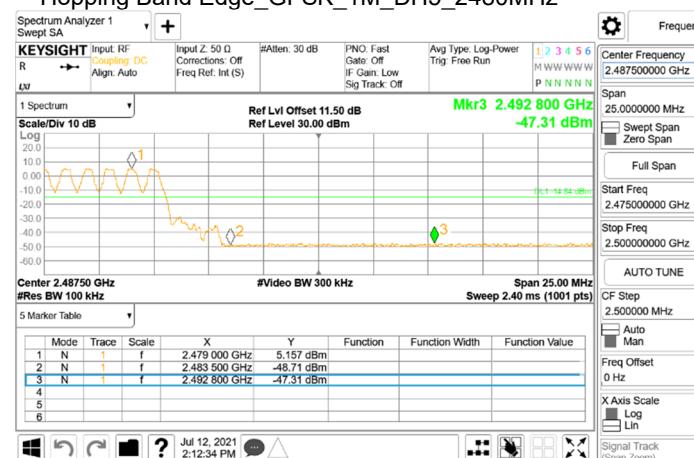
Non-hopping Bandedge\_GFSK\_1M\_DH5\_2480MHz



Hopping Band Edge\_GFSK\_1M\_DH5\_2402MHz



Hopping Band Edge\_GFSK\_1M\_DH5\_2480MHz



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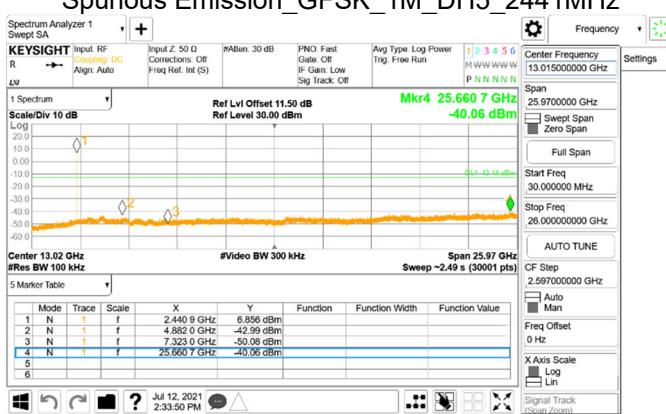
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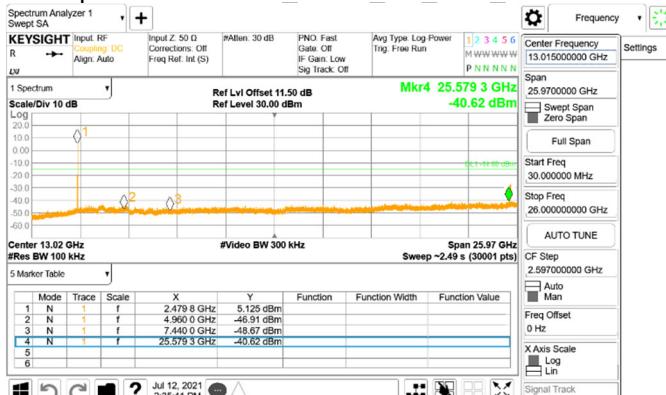
### Spurious Emission\_GFSK\_1M\_DH5\_2402MHz



### Spurious Emission\_GFSK\_1M\_DH5\_2441MHz



### Spurious Emission\_GFSK\_1M\_DH5\_2480MHz



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## 10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 and limit as below. And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

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

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## 10.2 Measurement Equipment Used

### Radiated Emission Test Site: SAC C

EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/08/2020	09/07/2021
Horn Antenna	Schwarzbeck	BBHA9170	185	07/30/2020	07/29/2021
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/11/2021	01/10/2022
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022
EMI Test Receiver	R&S	ESU 40	100363	04/28/2021	04/27/2022
Pre-Amplifier	EMC Instruments	EMC330	980096	11/19/2020	11/18/2021
Pre-Amplifier	EMC Instruments	EMC0011830	980199	11/19/2020	11/18/2021
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2020	10/26/2021
Attenuator	Marvelous	WATT-218FS-10	RF20	11/19/2020	11/18/2021
Band Rejection Filter	Micro-Tronics	BRM50701-01	RF201	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/19/2020	11/18/2021
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R
Notebook	Lenovo	L440	P0000367	N/A	N/A

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

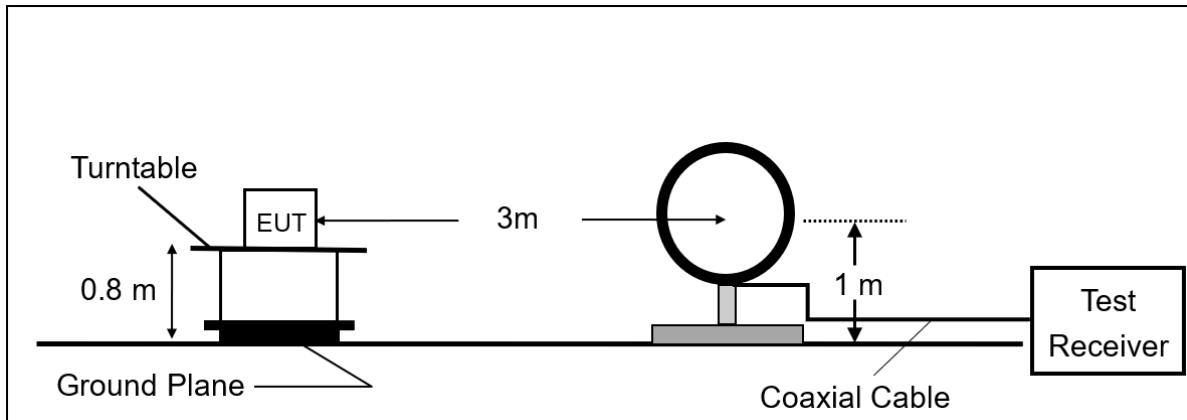
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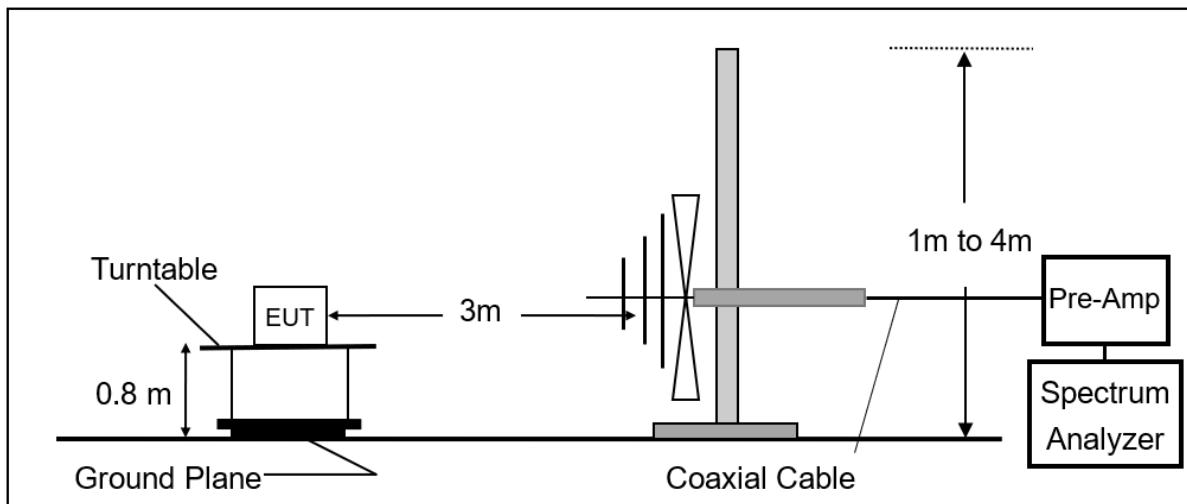
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### 10.3 Test SET-UP

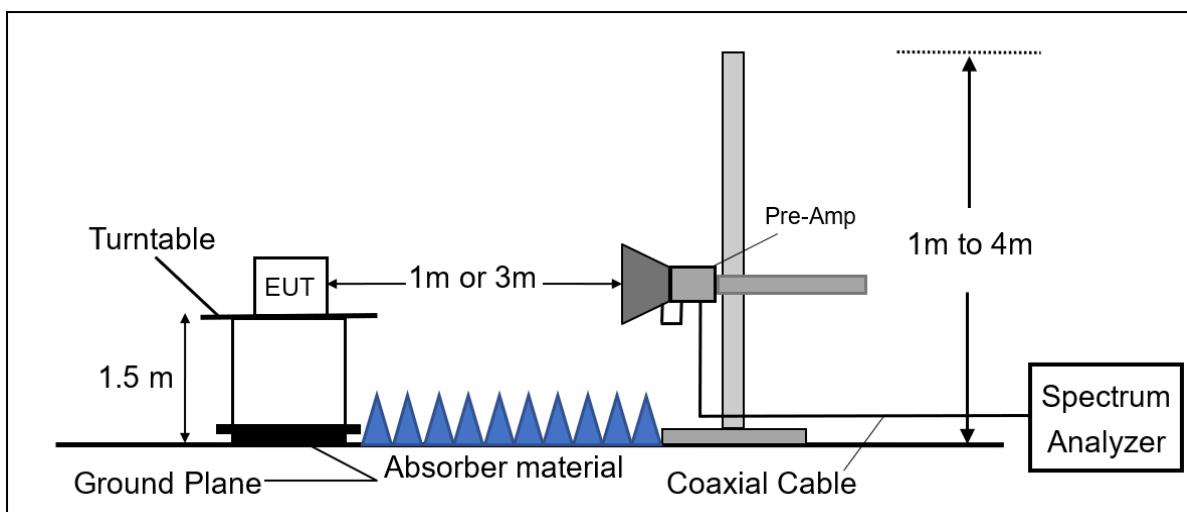
#### (A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



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



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## 10.4 Measurement Procedure

### 10.4.1 Radiated Emission

1. The testing follows the Measurement Procedure of ANSI C63.10:2013.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW  $\geq 1/T$  (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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## 10.5 Field Strength Calculation

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

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

Where  $FS$  = Field Strength

$CL$  = Cable Attenuation Factor (Cable Loss)

$RA$  = Reading Amplitude

$AG$  = Amplifier Gain

$AF$  = Antenna Factor

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

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

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

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

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

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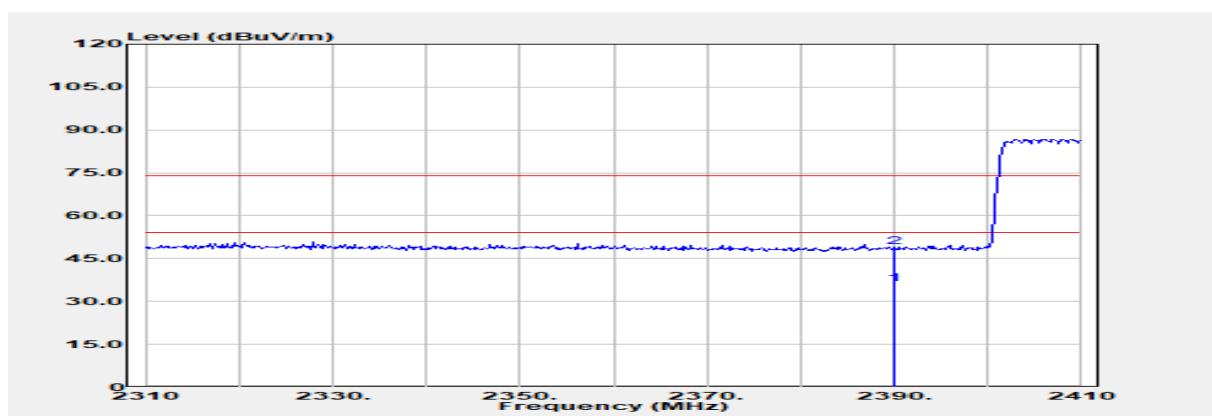
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## 10.7 Measurement Result:

### 10.7.1 Radiated Bandedge Result (Hopping Mode)

Report Number	:E2/2021/60084	Test Site	:SAC C
Operation Mode	:BT BR Hopping	Test Date	:2021-07-12
Test Frequency	:2402 MHz	Temp./Humi.	:23.1/51
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:E1 Plane	Engineer	:Enzo Chang



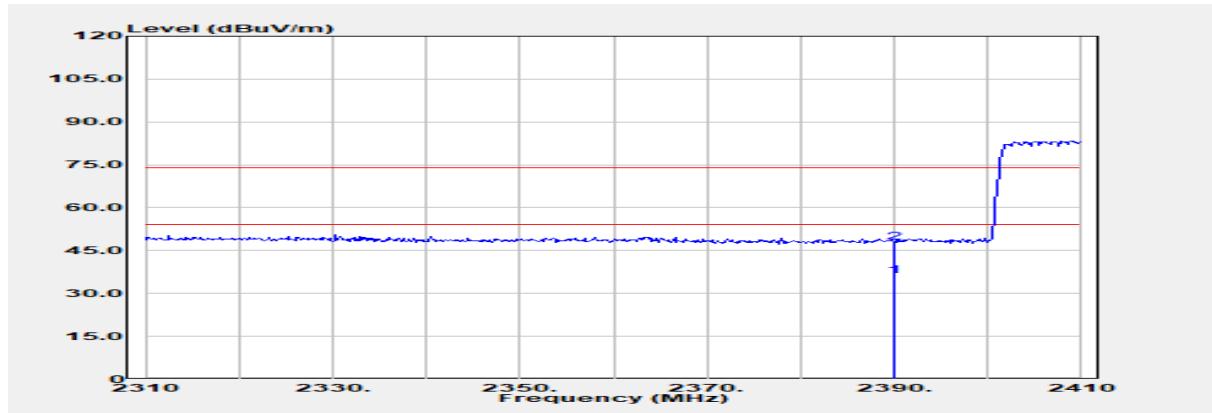
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2390.000	Average	31.01	5.18	36.19	54.00	-17.81
2390.000	Peak	43.82	5.18	49.00	74.00	-25.00

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Hopping Test Date :2021-07-12  
Test Frequency :2402 MHz Temp./Humi. :23.1/51  
Test Mode :BE CH LOW Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



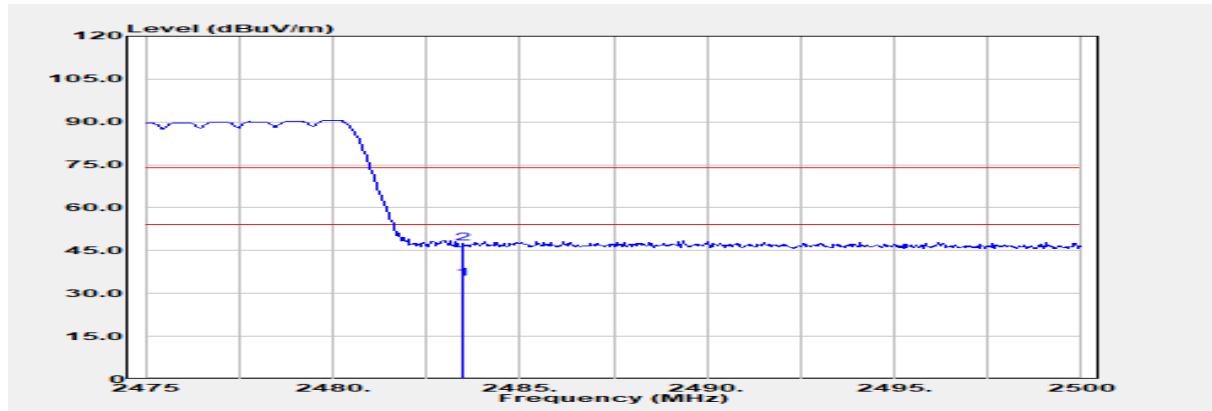
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2390.000	Average	30.91	5.18	36.09	54.00	-17.91
2390.000	Peak	42.70	5.18	47.88	74.00	-26.12

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Hopping Test Date :2021-07-12  
Test Frequency :2480 MHz Temp./Humi. :23.1/51  
Test Mode :BE CH HIGH Antenna Pol. :Vertical  
EUT Pol :E1 Plane Engineer :Enzo Chang



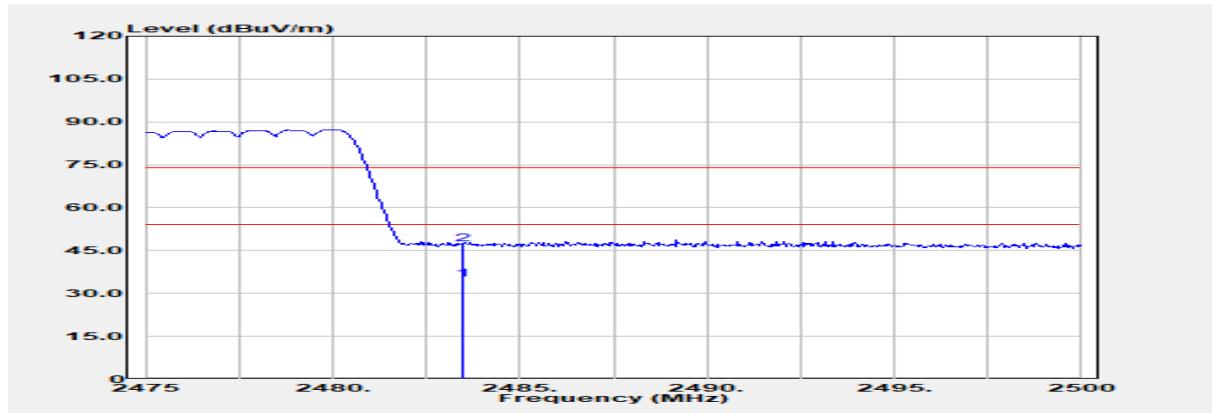
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	31.04	4.04	35.08	54.00	-18.92
2483.500	Peak	43.56	4.04	47.59	74.00	-26.41

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Hopping Test Date :2021-07-12  
Test Frequency :2480 MHz Temp./Humi. :23.1/51  
Test Mode :BE CH HIGH Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	30.88	4.04	34.92	54.00	-19.08
2483.500	Peak	43.06	4.04	47.10	74.00	-26.90

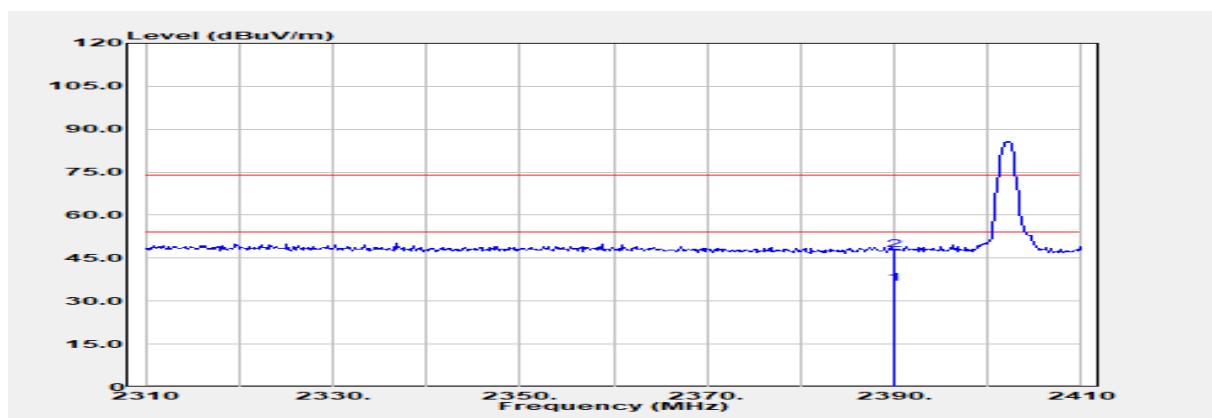
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### 10.7.2 Radiated Bandedge Result (Non-Hopping Mode)

Report Number	:E2/2021/60084	Test Site	:SAC C
Operation Mode	:BT BR	Test Date	:2021-07-12
Test Frequency	:2402 MHz	Temp./Humi.	:23.1/51
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:E1 Plane	Engineer	:Enzo Chang



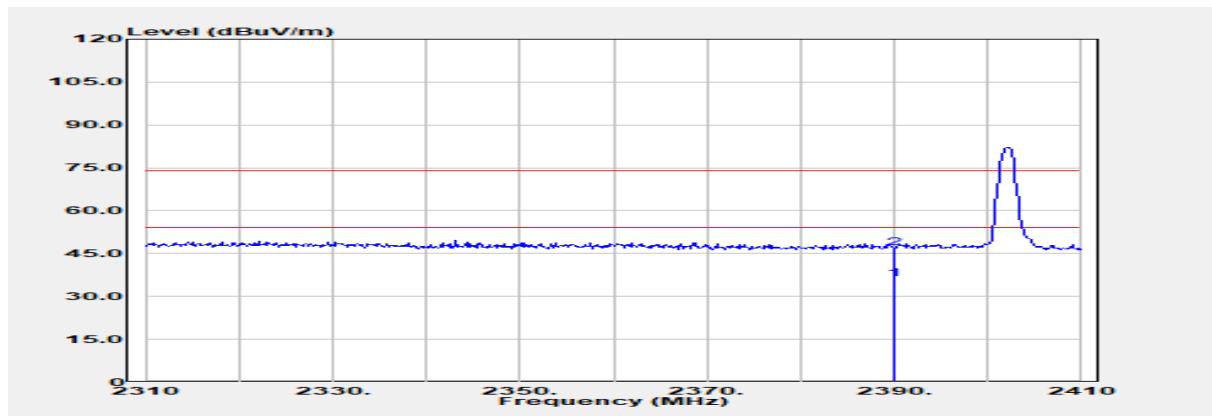
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>μ</sub> V	Factor dB	Actual FS dB <sub>μ</sub> V/m	Limit @3m dB <sub>μ</sub> V/m	Margin dB
2390.000	Average	31.01	5.18	36.19	54.00	-17.81
2390.000	Peak	42.52	5.18	47.70	74.00	-26.30

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2402 MHz Temp./Humi. :23.1/51  
Test Mode :BE CH LOW Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



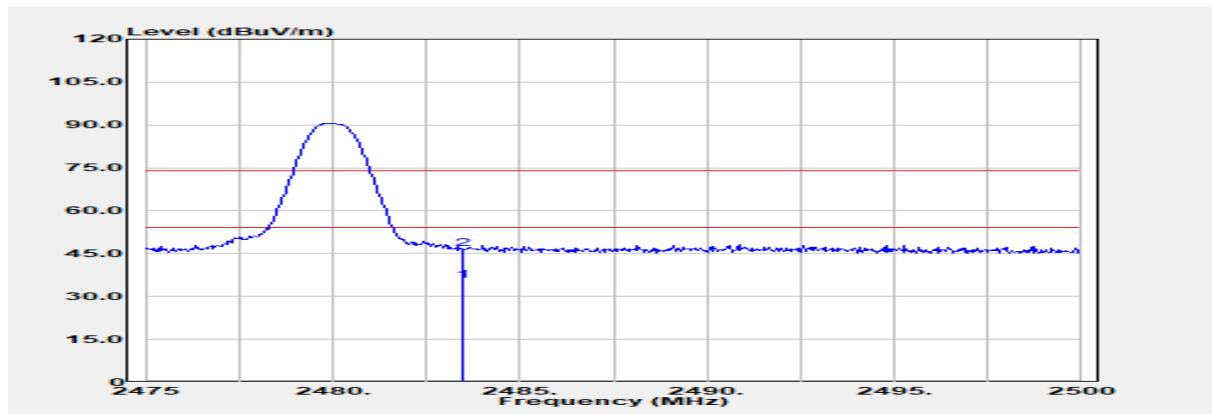
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2390.000	Average	30.89	5.18	36.07	54.00	-17.93
2390.000	Peak	41.89	5.18	47.07	74.00	-26.93

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2480 MHz Temp./Humi. :23.1/51  
Test Mode :BE CH HIGH Antenna Pol. :Vertical  
EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	31.46	4.04	35.50	54.00	-18.50
2483.500	Peak	42.45	4.04	46.49	74.00	-27.51

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Report Number :E2/2021/60084

Test Site :SAC C

Operation Mode :BT BR

Test Date :2021-07-12

Test Frequency :2480 MHz

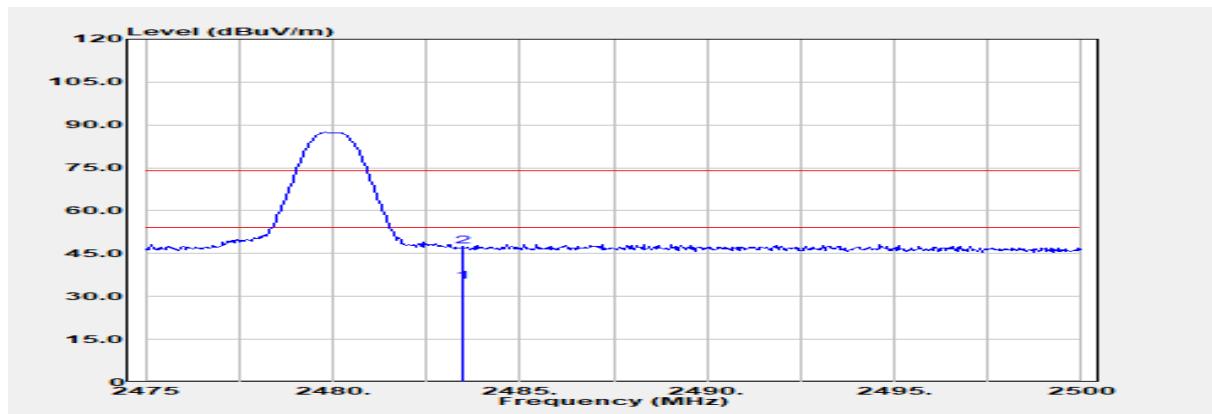
Temp./Humi. :23.1/51

Test Mode :BE CH HIGH

Antenna Pol. :Horizontal

EUT Pol :E1 Plane

Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.500	Average	31.07	4.04	35.11	54.00	-18.89
2483.500	Peak	43.41	4.04	47.45	74.00	-26.55

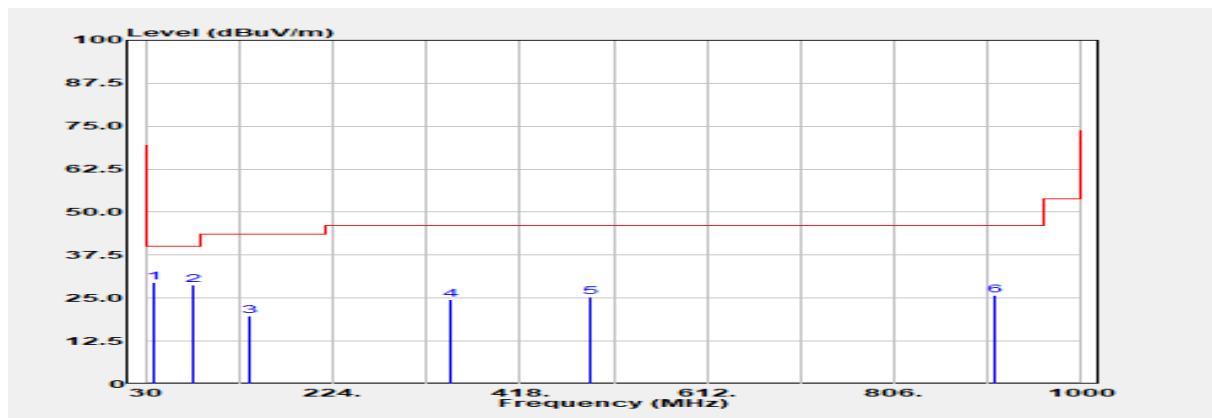
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**10.7.3 Radiated Spurious Emission form 30MHz to 1000MHz:**

Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2441 MHz Temp./Humi. :23.1/50  
Test Mode :TX CH MID Antenna Pol. :VERTICAL  
EUT Pol :E1 Plane Engineer :Enzo Chang



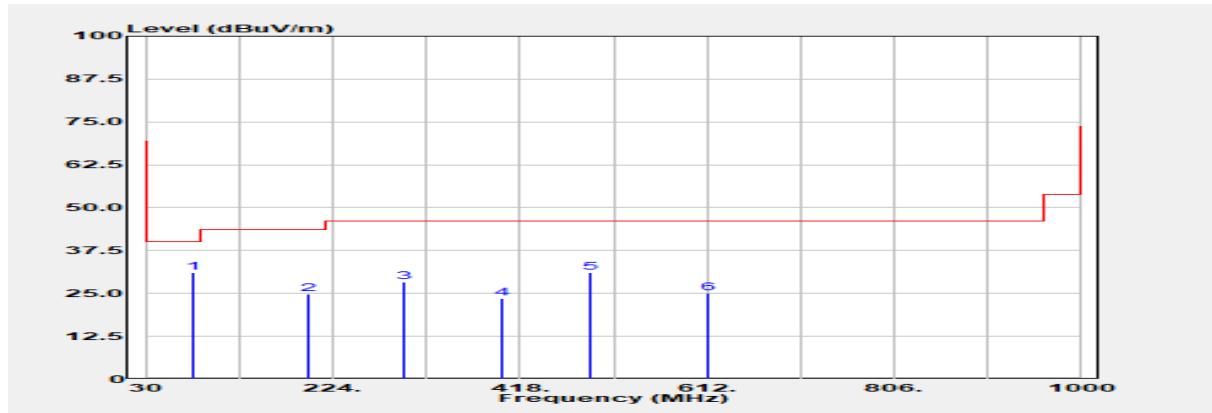
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
37.772	Peak	40.37	-10.79	29.58	40.00	-10.42
79.744	Peak	50.46	-21.60	28.86	40.00	-11.14
137.260	Peak	36.98	-17.13	19.85	43.50	-23.65
345.561	Peak	39.28	-14.60	24.68	46.00	-21.32
491.683	Peak	35.76	-10.55	25.22	46.00	-20.78
909.840	Peak	31.84	-5.97	25.88	46.00	-20.12

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2441 MHz Temp./Humi. :23.1/50  
Test Mode :TX CH MID Antenna Pol. :HORIZONTAL  
EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
79.744	Peak	52.58	-21.60	30.98	40.00	-9.02
199.439	Peak	44.57	-19.69	24.88	43.50	-18.62
298.926	Peak	43.81	-15.51	28.30	46.00	-17.70
399.968	Peak	35.90	-12.33	23.57	46.00	-22.43
491.683	Peak	41.59	-10.55	31.05	46.00	-14.95
612.933	Peak	34.10	-9.07	25.02	46.00	-20.98

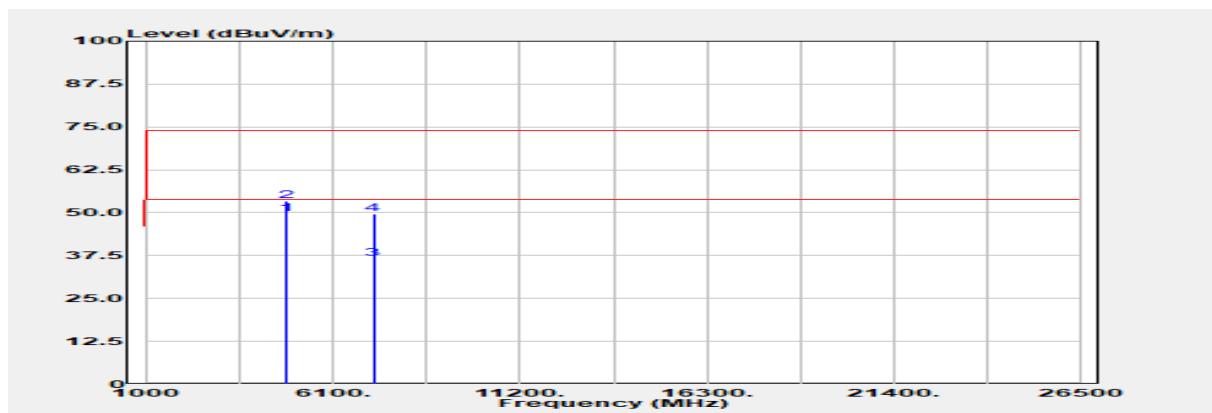
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## 10.7.4 Radiated Spurious Emission above 1 GHz:

Report Number :E2/2021/60084 Test Site :SAC C  
 Operation Mode :BT BR Test Date :2021-07-12  
 Test Frequency :2402 MHz Temp./Humi. :23.5/54  
 Test Mode :TX CH LOW Antenna Pol. :Vertical  
 EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>u</sub> V	Factor dB	Actual FS dB <sub>u</sub> V/m	Limit @3m dB <sub>u</sub> V/m	Margin dB
4804.000	Average	38.69	10.87	49.56	54.00	-4.44
4804.000	Peak	42.53	10.87	53.40	74.00	-20.60
7206.000	Average	19.26	17.27	36.53	54.00	-17.47
7206.000	Peak	32.41	17.27	49.68	74.00	-24.32

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2402 MHz Temp./Humi. :23.5/54  
Test Mode :TX CH LOW Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



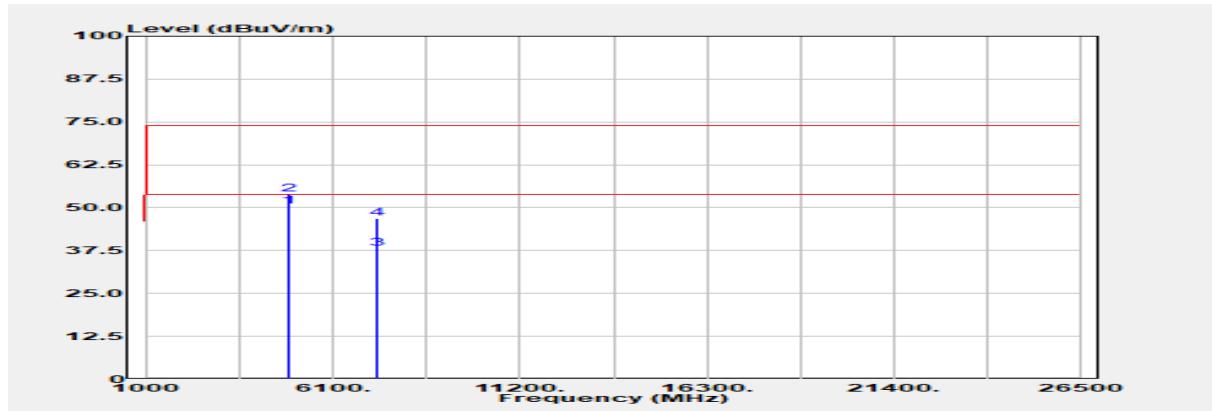
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4804.000	Average	40.91	10.87	51.78	54.00	-2.22
4804.000	Peak	44.53	10.87	55.40	74.00	-18.60
7206.000	Average	21.29	17.27	38.56	54.00	-15.44
7206.000	Peak	30.82	17.27	48.09	74.00	-25.91

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2441 MHz Temp./Humi. :23.5/54  
Test Mode :TX CH MID Antenna Pol. :Vertical  
EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Average	40.31	10.12	50.43	54.00	-3.57
4882.000	Peak	43.89	10.12	54.00	74.00	-20.00
7323.000	Average	19.66	18.49	38.15	54.00	-15.85
7323.000	Peak	28.50	18.49	46.99	74.00	-27.01

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2441 MHz Temp./Humi. :23.5/54  
Test Mode :TX CH MID Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



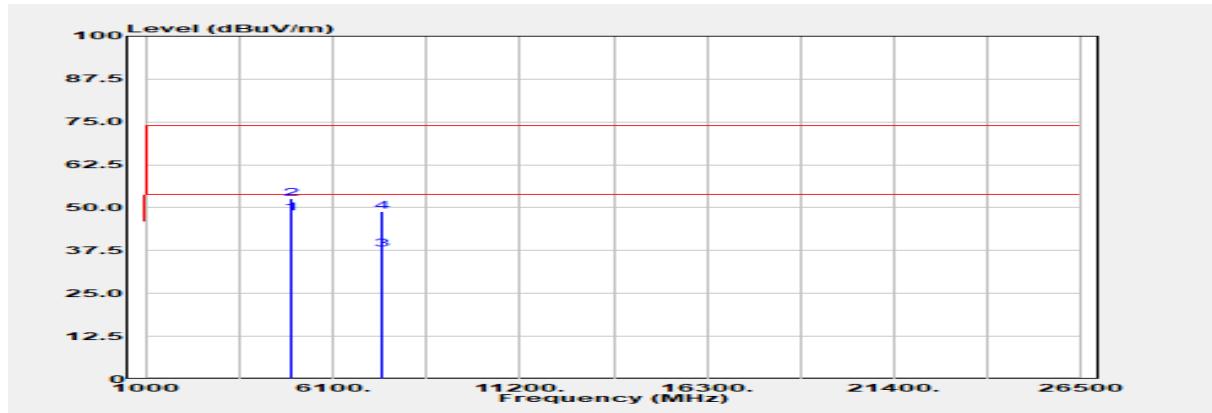
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4882.000	Average	39.38	10.12	49.50	54.00	-4.50
4882.000	Peak	42.99	10.12	53.11	74.00	-20.89
7323.000	Average	22.97	18.49	41.46	54.00	-12.54
7323.000	Peak	30.14	18.49	48.63	74.00	-25.37

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2480 MHz Temp./Humi. :23.5/54  
Test Mode :TX CH HIGH Antenna Pol. :Vertical  
EUT Pol :E1 Plane Engineer :Enzo Chang



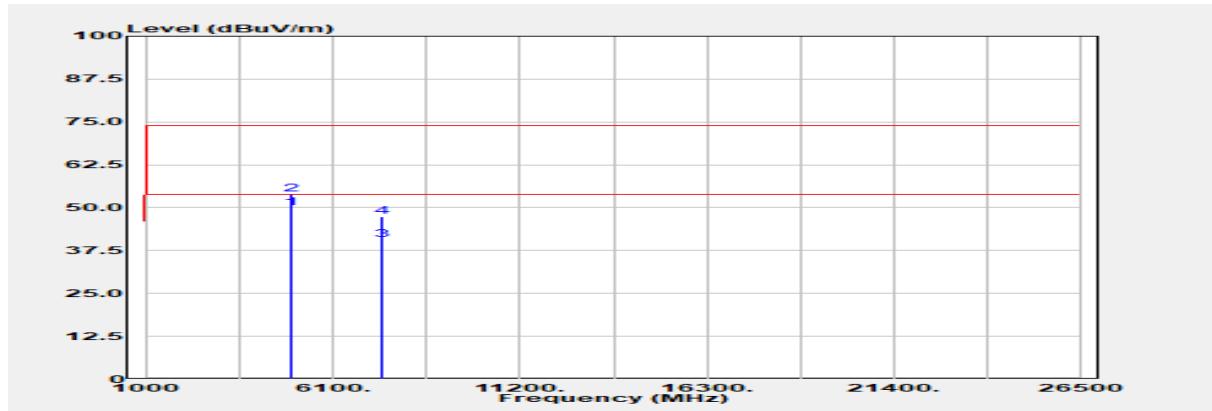
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4960.000	Average	38.24	10.20	48.44	54.00	-5.56
4960.000	Peak	42.30	10.20	52.51	74.00	-21.49
7440.000	Average	19.87	17.86	37.73	54.00	-16.27
7440.000	Peak	30.96	17.86	48.82	74.00	-25.18

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Report Number :E2/2021/60084 Test Site :SAC C  
Operation Mode :BT BR Test Date :2021-07-12  
Test Frequency :2480 MHz Temp./Humi. :23.5/54  
Test Mode :TX CH HIGH Antenna Pol. :Horizontal  
EUT Pol :E1 Plane Engineer :Enzo Chang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4960.000	Average	39.69	10.20	49.89	54.00	-4.11
4960.000	Peak	43.60	10.20	53.81	74.00	-20.19
7440.000	Average	22.78	17.86	40.64	54.00	-13.36
7440.000	Peak	29.53	17.86	47.39	74.00	-26.61

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## 11 FREQUENCY SEPARATION

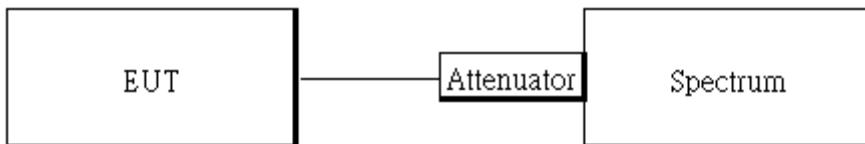
### 11.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3\*20dB bandwidth of the hopping channel, whichever is greater.

### 11.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 11.3 Test Set-up



### 11.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = middle of hopping channel.
5. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 5MHz, Sweep = auto.
6. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

### 11.5 Measurement Result

Channel separation (MHz)	Limit	Result
1	$\geq 25$ kHz or 2/3 times 20dB bandwidth	PASS

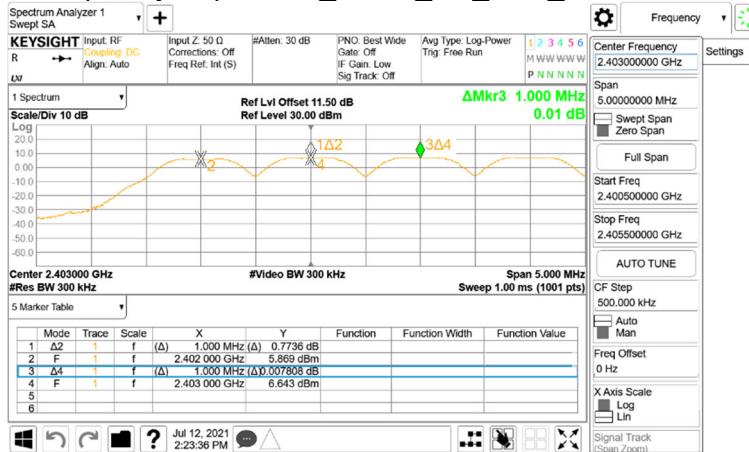
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## 11.6 Frequency Separation Test Plots

Frequency Separation\_GFSK\_1M\_DH5\_CH0CH1CH2



Frequency Separation\_GFSK\_1M\_DH5\_CH38CH39CH40



Frequency Separation\_GFSK\_1M\_DH5\_CH76CH77CH78



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## 12 NUMBER OF HOPPING FREQUENCY

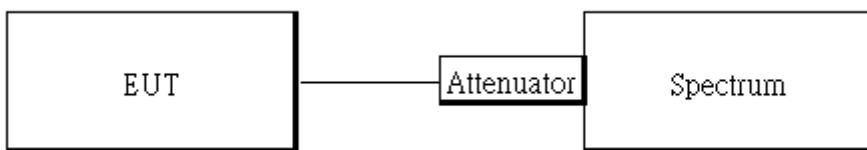
### 12.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

### 12.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 12.3 Test Set-up



### 12.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
5. Set the spectrum analyzer as RBW=430kHz, VBW=1.5MHz., Detector = Peak
6. Max hold, view and count how many channel in the band.

### 12.5 Measurement Result

#### Tabular Data of Total Channel Number

	Channel Number	Limit
2.4 GHz – 2.441 GHz	40	>15
2.441 GHz – 2.4835 GHz	39	
2.4 GHz ~2.4835 GHz	(40+39) = 79	

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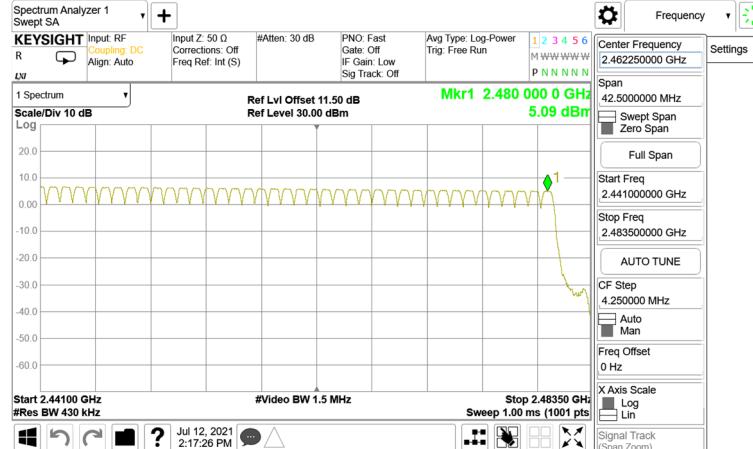
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## 12.6 Channel Number Test Plots

### Hopping Frequency\_GFSK\_1M\_DH5\_2400-2441



### Hopping Frequency\_GFSK\_1M\_DH5\_2441-2480



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## 13 TIME OF OCCUPANCY (DWELL TIME)

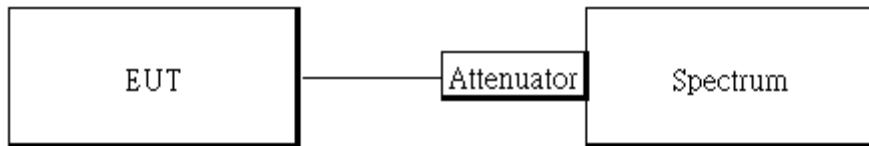
### 13.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

### 13.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted D					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022
Attenuator	Marvelous	MVE2213-10	RF12	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF152	11/19/2020	11/18/2021

### 13.3 Test Set-up



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### 13.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C6310:2015.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep = 2~8ms.
6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4

DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

In AFH mode, hopping rate is 800 hop/s with 6 slots in 20 hopping channels with channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 \* 20 ) (S), Hop Over Occupancy Time comes to (800 / 6 / 20 )\*(0.4 \*20 ) =53.33

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### 13.5 Tabular Result of the Measurement

#### GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
Mid	DH1	126.40	400ms	2.532	3.00
	DH3	264.00	400ms	0.606	1.00
	DH5	308.80	400ms	0.345	1.00

NOTE: cable loss as 11.5dB that offsets in the spectrum

#### GFSK (1Mbps):

$$\begin{aligned} \text{CH Mid} \quad \text{DH1 time slot} &= 0.395 * (1600/2/79) * 31.6 = 126.40 \text{ (ms)} \\ \text{DH3 time slot} &= 1.650 * (1600/4/79) * 31.6 = 264.00 \text{ (ms)} \\ \text{DH5 time slot} &= 2.895 * (1600/6/79) * 31.6 = 308.80 \text{ (ms)} \end{aligned}$$

$$\text{A period time} = 0.4 \text{ (s)} * 79 = 31.6 \text{ (s)}$$

### 13.6 Measurement Result

Note: Refer to next page for plots.

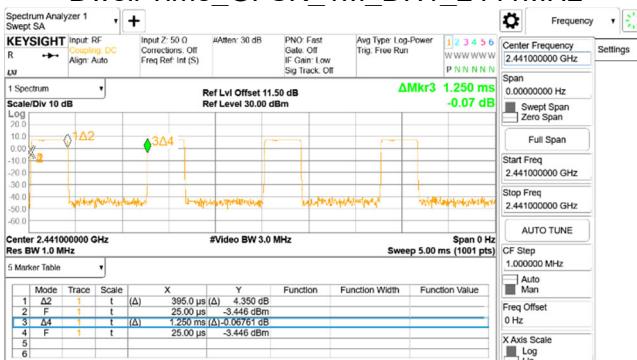
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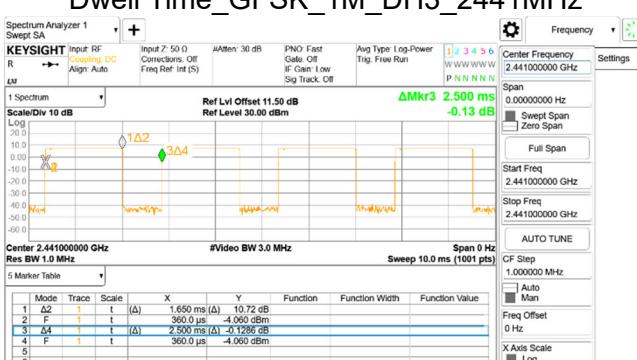
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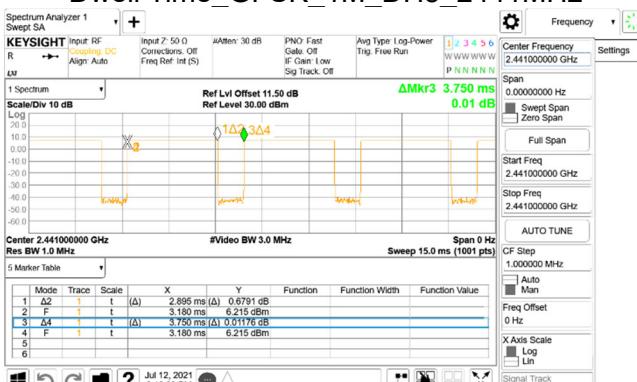
Dwell Time\_GFSK\_1M\_DH1\_2441MHz



Dwell Time\_GFSK\_1M\_DH3\_2441MHz



Dwell Time\_GFSK\_1M\_DH5\_2441MHz



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## 14 ANTENNA REQUIREMENT

### 14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

### 14.2 Antenna Connected Construction

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

*~ End of Report ~*

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