

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant:	HTC Corporation No. 88, Sec. 3, Zhongxing Rd. Xindian Dist., New Taipei City 231, Taiwan
Product Name:	VIVE Headset
Brand Name:	VIVE
Model No.:	2Q7Y100
Model Difference:	N/A
Report Number:	E2/2021/60089
FCC ID	NM82Q7Y100
Issue Date:	August 27, 2021
Date of Test:	July 7, 2021 ~ August 18, 2021
Date of EUT Received:	July 1, 2021

Jit, Pei

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	
E2/2021/60089	00	Original	August 27, 2021	Tiffany Kao	

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# **Contents**

1	GENERAL INFORMATION	4
2	SYSTEM TEST CONFIGURATION	6
3	SUMMARY OF TEST RESULTS	9
4	DESCRIPTION OF TEST MODES	. 10
5	MEASUREMENT UNCERTAINTY	. 12
6	CONDUCTED EMISSION TEST	. 13
7	PEAK OUTPUT POWER MEASUREMENT	. 17
8	EMISSION BANDWIDTH MEASUREMENT	. 19
9	CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT	. 23
10	RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT	. 29
11	FREQUENCY SEPARATION	. 65
12	NUMBER OF HOPPING FREQUENCY	. 66
13	TIME OF OCCUPANCY (DWELL TIME)	. 68
14	ANTENNA REQUIREMENT	.75

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### **GENERAL INFORMATION** 1

### 1.1 **Product Description**

Product Name:	VIVE Headset
Brand Name:	VIVE
Model No.:	2Q7Y100
Model Difference:	N/A
Hardware Version:	XG
Firmware Version:	0.27.999.02
EUT Series No.:	5A11X2S00133
Power Supply:	3.85Vdc from Rechargeable Lithium-Ion Polymer Battery or 5V from USB cable

### 1.2 **RF Specification**

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	10.02dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	$\leq$ 0.4s

## 1.3 Antenna Designation

Antenna	Supplier	Antenna	Freq.	Peak Antenna
Type		Model No.	(MHz)	Gain (dBi)
Dipole	Amphenol	2Q7Y100	2402-2480	-1.5

Note: 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 Designa- tion number	IC CAB identifier
		SAC 1		
		SAC 3		
		Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1		
	Industrial Park, Wuku District, New	Conducted 2	TW0027	
	Taipei City, Taiwan.	Conducted 3		TW3702
		Conducted 4		
		Conducted 5	-	
		Conducted 6		
SGS Taiwan Ltd. Central RF Lab.	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
(TAF code 3702)		SAC C		
(1AI COUE 5702)		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

tion 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 a 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 a 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-ane choic 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 **Test Configuration**





Fig 2-2 Radiated Emission



Fig 2-3 Conduction (AC Power Line) Radiated Emission



# 2.6 Control Unit(s)

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
1	Bluetooth Test Software	N/A	N/A	N/A
2	Notebook	Lenovo	L420	S0011721
3	Adapter	Sony	AC-0400-TW	3504600
4	Notebook	Lenovo	T470	P0001293

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### SUMMARY OF TEST RESULTS 3

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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### **DESCRIPTION OF TEST MODES** 4

### 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 The field strength of radiation emission was measured as EUT three orthogonal planes, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst position is tested and recorded.
- Investigation has been done on all the possible configurations for searching the worst case. 4

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE		
RADIATED EMISSION TEST (BELOW 1 GHz)						
Bluetooth	0 to 78	39	GFSK	DH5		
	RADIATED EMISSION TEST (ABOVE 1 GHz)					
Bluetooth 0 to 78 0,39,78 GFSK DH5						
<b>Note:</b> The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie						

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 position was reported.

	ANTNNA PORT CONDUCTED TEST					
MODE	MODE AVAILABLE TESTED CHANNEL CHANNEL		MODULATION	PACKET TYPE		
	Peak Output Power, 20dB Band Width					
	0 to 78	0,39,78	GFSK	DH5		
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5		
	0 to 78	0,39,78	8-DPSK	3DH5		
	Band Edge					
Bluetooth	0 to 78	0,78	GFSK/8-DPSK	DH5/3DH5		
		Frequency Separation				
Bluetooth	0 to 78	0,1,2,38,39,40,76,77,78	GFSK/8-DPSK	DH5/3DH5		
		Number of hopping freque	ncy			
Bluetooth	0 to 78	0 to 78	GFSK/8-DPSK	DH5/3DH5		
		Fime of Occupancy(Dwell t	ime)			
			GFSK	DH1/DH3/DH5		
Bluetooth	0 to 78	39	π/4-DQPSK	2DH1/2DH3/2DH5		
			8-DPSK	3DH1/3DH3/3DH5		

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### **MEASUREMENT UNCERTAINTY** 5

Test Items	ι	Incertair	nty
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				
	+/-	2.64	dB	9kHz~30MHz
Polarization: Vertical	+/-	4.93	dB	30MHz - 1000MHz
	+/-	4.81	dB	1GHz - 18GHz
	+/-	4.52	dB	18GHz - 40GHz
	+/-	2.64	dB	9kHz~30MHz
Polarization: Horizontal	+/-	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.

	mits (W/)
uB	(uv)
Quasi-peak	Average
66 to 56	56 to 46
56	46
60	50
	dB Quasi-peak 66 to 56

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	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Test Software	audix	e3	Ver. 6.11- 20180419c	N.C.R	N.C.R	
LISN	SCHWARZBEC K Mess- Elektronik	NSLK8127	974	04/19/2021	04/18/2022	
EMI Test Receiver	R&S	ESCI	101342	04/28/2021	04/27/2022	
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	
USB Cable	сохос	C807M3A03 E1E2	N/A	N.C.R	N.C.R	
USB to Type-c	A-GOOD	USB to Type-c	N/A	N.C.R	N.C.R	

Note: N.C.R refers to Not Calibrated Required

## 6.3 EUT Setup

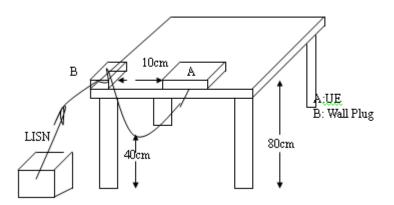
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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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	/60089	Test	Site :Con	duction Room (	2
Test Mode	:BT		Test	Date :202 <sup>°</sup>	1-07-22	
Power	:120V/60	Hz	Temp	o./Humi. :24.0	/64	
Probe	:L1		Engi	neer :Jack	Tseng	
			· · ·		C C	
oc Level (dBuV)						
80						
70						
60						
50						
40 1 2						—
30 30	4		6			
20	month Mrs	man and purposed and and and and and and and and and an	her when		hu	
20			ALL WAY AND	Martin Martin	and and have been and a second	num.
10						
0 <mark>0.15 0.2</mark>	0.5	<u>    </u> 1	2	5	10 20	30
			uency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBμV	dB	FS dBµV	dBµV	dB
		ασμν	UD	Ϥⅅμν	ασμν	UD
0.16	Peak	27.83	10.30	38.13	65.69	-27.56
0.17	Peak	24.38	10.30	34.68	64.72	-30.04
0.19	Peak	19.01	10.30	29.31	64.06	-34.75
0.46	Peak	18.18	10.31	28.49	56.63	-28.14
1.75	Peak	16.73	11.01	27.74	56.00	-28.26
3.60	Peak	19.30	10.77	30.07	56.00	-25.93

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Report Number	:E2/2021	/60089	Test S	Site :Cono	duction Room	С
Test Mode	:BT		Test [	Date :2021	-07-22	
Power	:120V/60	Hz	Temp	./Humi. :24.0/	/64	
Probe	:N		Engin		Tseng	
			0		5	
Lovel (dBu)/)						
80 Level (dBuV)						
70						
60						
50						
40						
2			6			
30	5					
20	and the second	The way and the way way and	market Market	M. M. M. M. M. M. M.	Marine Marine .	AL
10		Net of the second s	. Alter a the second		Muhaselule Muhababa Arturnaluk	
0						
0.15 0.2	0.5	1 Free	2 quency (MHz)	5	10 20	30
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	10.11	
MHz	PK/QP/AV	dBμV	dB	dBµV	dBµV	dB
0.16	Peak	27.65	10.31	37.96	65.65	-27.69
0.10	Peak	22.93	10.31	33.24	64.90	-31.66
0.18	Peak	20.00	10.30	30.30	64.33	-34.03
0.22	Peak	19.03	10.30	29.33	62.79	-33.46
0.44	Peak	13.62	10.32	23.94	56.98	-33.04
2.33	Peak	25.29	11.07	36.36	56.00	-19.64

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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 G						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Power Meter	Anritsu	ML2496A	1512003	07/23/2020	07/22/2021	
Power Sensor	Anritsu	MA2411B	1339378	07/23/2020	07/22/2021	
Power Sensor	Anritsu	MA2411B	1339379	07/23/2020	07/22/2021	
Attenuator	Marvelous	WATT- 218FS-10	RF22	11/19/2020	11/18/2021	
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021	
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	

## 7.3 Test Set-up:

EUT Attenuz	r Power Sensor	Power Meter
-------------	----------------	-------------

## 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 band-width)
- 4. Record the max. reading.
- 5. Repeat above procedures until all default test channel is completed.

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Max. Output include

tune up

tolerance Power (dBm)

6.39

6.96

7.64

Output

Power

(mW)

4.350

4.960

5.801

Limit

(mW)

1000

1000

1000

#### 7.5 **Peak & Average Power Measurement Result**

1M BR mode (Peak):

СН	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	6.61	4.581	1000
Mid	2441	8	7.37	5.458	1000
High	2480	8	7.80	6.026	1000

### 2M EDR mode (Peak):

СН	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	6.64	4.613	125
Mid	2441	8	7.29	5.358	125
High	2480	8	7.82	6.053	125

### 3M EDR mode (Peak):

СН	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	6.99	5.000	125
Mid	2441	8	10.02	10.046	125
High	2480	8	8.08	6.427	125

NOTE: cable loss as 10.65dB that offsets in the spectrum

## 2M EDR mode (Average):

1M BR mode (Average):

СН

Low

Mid

High

Frea.

(MHz)

2402

2441

2480

Power

set

8

8

8

	io (nitorago).	1			1
СН	Freq. (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	4.10	2.568	125
Mid	2441	8	4.78	3.004	125
High	2480	8	5.49	3.537	125

### 3M FDR mode (Average):

UN EBR mode (Wordgo).					
СН	Freq. (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	4.35	2.720	125
Mid	2441	8	5.45	3.504	125
High	2480	8	5.60	3.627	125

\*Note: Max. Output include tune up tolerance Power measured by using average detector.

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# 8 EMISSION BANDWIDTH MEASUREMENT

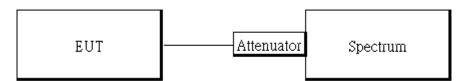
## 8.1 Standard Applicable

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 G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNAC K	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

### 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**

СН	20 dB BW	2/3 BW
СП	(MHz)	(MHz)
Low	0.9371	0.62
Mid	0.9371	0.62
High	0.9383	0.63

### π/4-DQPSK

СН	20 dB BW	2/3 BW
СП	(MHz)	(MHz)
Low	1.281	0.85
Mid	1.279	0.85
High	1.280	0.85

### 8-DPSK

СН	20 dB BW	2/3 BW
СП	(MHz)	(MHz)
Low	1.296	0.86
Mid	1.293	0.86
High	1.295	0.86

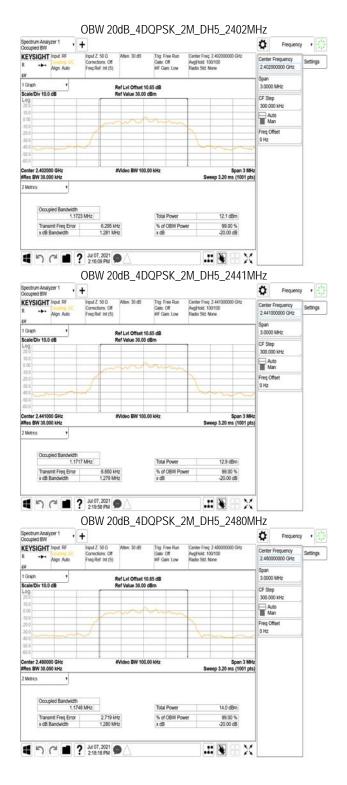
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### Report No.: E2/2021/60089 Page: 21 of 75





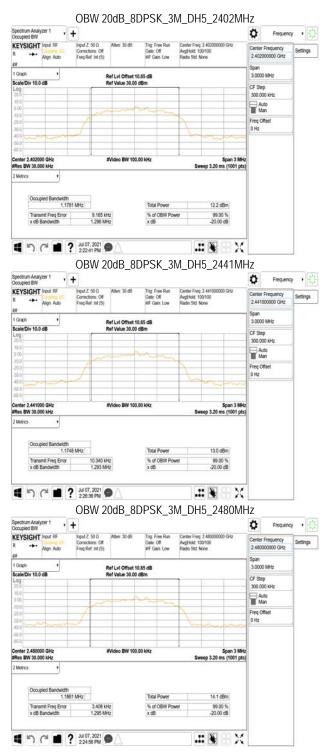
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# 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

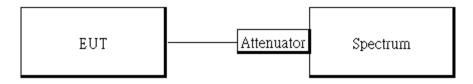
## 9.1 Standard Applicable

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).

	Conducted Emission Test Site: Conducted G						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021		
DC Block	PASTERNAC K	PE8210	RF151	11/19/2020	11/18/2021		
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A		

### 9.2 Measurement Equipment Used

## 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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### Report No.: E2/2021/60089 Page: 25 of 75

#### 4 – 4 CECK 1M DUE 2402MU

pectrum Analyzer 1 v	+					Z Ž	Frequenc	y .
EYSIGHT Input RF	Input Z 50 Q Corrections: Off	#Atten: 30 dB	PNO Fast Gate Off	Avg Type: Log-Power Trig: Free Run	173456	-	Frequency	Setting
++ Align: Auto	Freq Ref. Int (S)		IF Gain Low Sig Track: Off	ing. Hee Kun	MWWWWW PNNNNN	2.3650	00000 GHz	Searg
spectrum v	÷	1		Mkr3 23	99 87 GHz	Span		
cale/Div 10 dB		ef Lvi Offset 10. tef Level 30.00 d			48.08 dBm		0000 MHz Jept Span	
.0g		I				TZe	ro Span	
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0.00					0.1-0.44	Start Fr		
20.0						2.3100 Stop Fr	00000 GHz	
40.0 50.0				10000			00000 GHz	
enter 2.36500 GHz		#Video BW 300	kHz		pan 110.0 MHz	AL	TO TUNE	
Res BW 100 kHz				Sweep 10.5	ms (1001 pts)	CF Ster	p 000 MHz	
Marker Table						A	to	1
Mode Trace Scale	X 2.402 18 GHz	Y 6.265 dBm	Function F	unction Width Fur	ction Value	Ma		
2 N 1 f 3 N 1 f	2.400 00 GHz 2.399 87 GHz	-48.94 dBm -48.08 dBm				Freq Of 0 Hz	rset	
4	E.MOVIN CITE					X Axis S	Scale	
5						Lo	9	I.
	Jul 07, 2021	Δ.		.:: 🖲	<b>X</b> B	(Signal 1		
	2:05:20 PM					USpan Z	imo	
		.dge_G	FSK_1	/_DH5_2	180MH	CTTO C		
wept on	+					٥	Frequenc	y •
EYSIGHT Input RF	Input Z: 50 Q Corrections: Off	#Atten: 30 dB	PNO Fast Gate Off	Avg Type: Log-Power Trig: Free Run	1 7 3 4 5 6 MWWWWW		Frequency	Setting
Align: Auto	Freq Ref. Int (S)		IF Gain Low Sig Track: Off		PNNNNN		00000 GHz	
Spectrum v		ef Lvi Offset 10.		Mkr3 2.49	8 375 GHz	Span 25.000	0000 MHz	
scale/Div 10 dB		ef Level 30.00 d			47.83 dBm	- SM	ept Span	1
-0g 20.0		1				Ze	ro Span	
10.0					-	1	Full Span	
10.0					21.118 24	Start Fr		
20.0							00000 GHz	
40.0	2 02				¢3-	Stop Fr	eq 00000 GHz	
50.0			the state of the s		-			
Center 2.48750 GHz	-	#Video BW 300	kHz	S	pan 25.00 MHz		ITO TUNE	4
Res BW 100 kHz		consumer proceed also		Sweep 2.40	ms (1001 pts)		p 00 MHz	
i Marker Table						A	to	1
Mode Trace Scale	X 2.480 025 GHz	Y 8.025 dBm	Function F	Function Width Fun	ction Value	Ma	n	
2 N 1 f 3 N 1 f	2.483 500 GHz 2.498 375 GHz	-49.76 dBm -47.83 dBm				Freq Of 0 Hz	rset	1
4	2.400 370 012	-H7.63 GDm				X Axis :	Scale	
5						Lo	g	
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	2.01.001181	dao 0F	0000 2	M_DH5_2		USban,Z) I –	limo	1
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wept SA	+ Input Z 50 0	#Atten: 30 dB	PNO Fast	Aut Tune I on Deven	Ale a se -	0	Frequenc	¥ •
(EYSIGHT Input RF	Corrections: Off	Shalen, 30 do	Gate: Off	Avg Type: Log-Power Trig: Free Run	1 7 3 4 5 6 MWWWWW	Center	Frequency 00000 GHz	Setting
Align: Auto	Freq Ref. Int (S)		IF Gain Low Sig Track: Off		PNNNNN	Span	CONF GIL	Ĩ
l Spectrum 🛛 🕈	R	ef Lvi Offset 10.	65 dB		29 14 GHz		0000 MHz	
Scale/Div 10 dB		ef Level 30.00 d		-	48.32 dBm	E SA	ept Span	1
.0g					-		ro Span	
10.0				\$ <sup>1</sup>			Full Span	
10.01		-				Start Fr		
10.0						2.3100 Stop Fr	00000 GHz	
30.0				92			eq 00000 GHz	
30.0 40.0 50.0						AL	TO TUNE	
30.0 40.9 50.0			1.11.					
300 400 500 600 Center 2.36500 GHz		#Video BW 300	kHz	Sweep 10.5	pan 110.0 MHz ms (1001 pts)	CF Ster	p	-
300 300 400 500 Center 2.36500 GHz Res BW 100 kHz 5 Marker Table T		#Video BW 300	kHz	Sweep 10.5	ms (1001 pts)	11.000	000 MHz	
300 409 500 500 Center 2.36500 GHz Res BW 100 kHz	x	Y		Sweep 10.5	ction Value		000 MHz to	-
200 400 000 000 000 000 000 000 000 000	X 2.402 18 GHz	Y 4.540 dBm		Sweep 10.5	ms (1001 pts)	11.000	000 MHz to in	
300         400           400         500           400         600           400         600           400         600           400         600           400         700           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100           400         7100      <	x	Y		Sweep 10.5	ms (1001 pts)	11.000 Au Ma	000 MHz to in	
300         0           400         0           Anter 2,36500 GHz         0           Res BW 100 kHz         0           Maker Table         1           Mode Trace Scale         1           1         N         1           2         N         1	X 2.402 18 GHz 2.400 00 GHz	Y 4.540 dBm -48.89 dBm		Sweep 10.5	ms (1001 pts)	11.000 Au Ma Freq Of	000 MHz to in fiset Scale g	

台灣

Band Edge\_8DPSK\_3M\_DH5\_2480MHz Frequency • +

Spectrum Analyzer 1 Sweet SA

KEYSIG		Input R Align: A				50 Ω tions: Off ef: Int (S)	#Atten: 30 dB	PNO Fast Gate Off IF Gain Low Sig Track O			173456 MWWWWW PNNNNN	Center Frequency 2.487500000 GHz	Setting
l Spectrum	C	1.2			Ċ.	R	ef Lvi Offset 10.			r3 2.48	6 825 GHz	Span 25.0000000 MHz	
Scale/Div	10 di	3	-			R	ef Level 30.00 d	Bm		-	8.07 dBm	Swept Span	-
20.0							T			1	1	Zero Span	
10.0		-		0					_	-	-	Full Span	1
10.0			1								21.000	Start Freq 2.475000000 GHz	
30.0 40.0 50.0		J	-		pal-	02	●3					Stop Freq 2.50000000 GHz	
60.0 Center 2.4	0750	00.		t			#Video BW 300	1444			an 25.00 MHz	AUTO TUNE	1
Res BW 1							avideo Bvy 300	KHE	S		ms (1001 pts)	CF Step	4
5 Marker Ta	the .			_								2.500000 MHz	
Mo		Trace	Scal	e		C	Y	Function	Function Widt	h Func	tion Value	Auto Man	
1 N			1			175 GHz	6.313 dBm					Freq Offset	-
2 N 3 N		1	+	-		500 GHz	-49.78 dBm -48.07 dBm			_		0 Hz	
4	-			-	4.400	OLD OPE							=
5												X Axis Scale Log	
4 6	) (	2		?	Jul 07 2:24:	, 2021 03 PM			].	: ¥	XB	Signal Track	

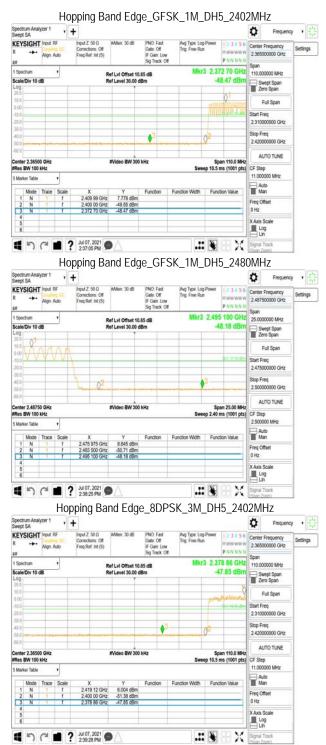
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### Report No.: E2/2021/60089 Page: 26 of 75





Hopping Band Edge\_8DPSK\_3M\_DH5\_2480MHz Spectrum Analyzer Swept SA Frequency . Ö 1 + KEYSIGHT Input RF wd 7 50.0 PNO Eas Center Fr Settings 2.487500000 GH -PNNN 25.0000000 MHz ur3 2.497 575 GHz 1 Spectrum Ref Lvi Offset 10.65 dB Ref Level 30.00 dBm Scale/Div 10 df 48.12 0 Swept Span Zero Span Full Span Start Freq 2.47500 00.04 Stop Freq 2.5000000 AUTO TUNE nter 2.48750 GH #Video BW 300 kHz an 25.00 M Res BW 100 kHz ep 2.40 ms (1001 pts) CF Step 2.500000 MP Auto Man Mode Trace Sc Function Width Function Value Function 2.475 875 GH Freq Offset 0 Hz 2.483 500 GHz 2.497 575 GHz -50.48 dBi X Axis Scale Log Lin .:: 😵 Signal Trad

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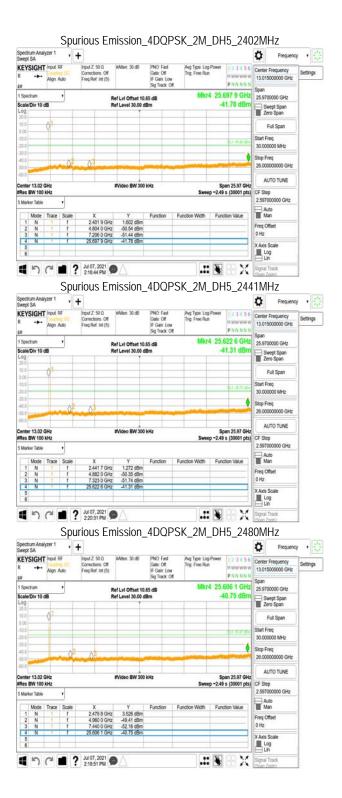
(新子方方式) (小山市古宅未留) 無人、(本市員員) 「同時山橋本田町米留砂(人) 株田三米留か(人) 雪田市町 (小山市町) 保設 This document is issued by the Company subject to is General Conditions of Service printed overleaf, available on request or accessible at <u>http://www.sgs.com.tw/Terms-and-Conditions</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>http://www.sgs.com.tw/Terms-and-Conditions</u>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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### Report No.: E2/2021/60089 Page: 27 of 75



wept SA	+					Frequen	cy · ;
EYSIGHT Input RF	Input Z: 50 0 Corrections: Off Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low	Avg Type: Log-Po Trig: Free Run	MWWWWW	Center Frequency 13.015000000 GHz	Settings
1			Sig Track: Off	Allow a	PNNNNN	Span	=
Scale/Div 10 dB	R	ef Lvi Offset 10.6 ef Level 30.00 dE	i5 dB	MINE 4	-41.18 dBm	25.9700000 GHz	-
.og	N	er bever 30.00 de	2011	1	41.10 0011	Swept Span Zero Span	
20.0						Full Span	1
0.00				-			4
10.0 20.0 30.0					STARE.	Start Freq 30.000000 MHz	
40.0 50.0	Q3	-		-		Stop Freq 26.00000000 GHz	
60.0						AUTO TUNE	7
Center 13.02 GHz Res BW 100 kHz		#Video BW 300 k	(Hz	Sweep ~	Span 25.97 GHz 2.49 s (30001 pts)		-
5 Marker Table 🔹						2.597000000 GHz	-
Mode Trace Scale	X	Y	Function F	Function Width	Function Value	Man	
1 N 1 f 2 N 1 f	2.401 9 GHz 4.804 0 GHz	5.233 dBm -50.11 dBm				Freq Offset	
3 N 1 1 4 N 1 1	7.206 0 GHz 25.725 6 GHz	-48.26 dBm -41.18 dBm				0 Hz	=
5						X Axis Scale	
contraction contraction and the	Jul 07, 2021	Δ.			XBR	Signal Track	-
						(Span Zoom)	
	purious E	mission	_GFSk	(_1M_DF	45_2441	MHz	
wept on	+					Prequen	cy · ;
KEYSIGHT Input RF Coupling LC Align: Auto N	Input Z: 50 0 Corrections: Off Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log-Po Trig: Free Run	Mer 1 2 3 4 5 6 MWWWWW P NN NN N	Center Frequency 13.015000000 GHz	Settings
I Spectrum V		ef Lvi Offset 10.6	5 48	Mkr4	25.566 3 GHz	Span 25.9700000 GHz	
Scale/Div 10 dB Log	R	ef Level 30.00 dB	Bm		-42.20 dBm	Swept Span	1
20.0						Zero Span	5
0.00						Full Span	1
10.0	_		_		0,1 13 16 dbm	Start Freq 30.000000 MHz	
30.0 40.0	~				(	Stop Freq	-
50.0	0.9	-	-			26.00000000 GHz	-
Center 13.02 GHz		#Video BW 300 k	dHz		Span 25.97 GHz	AUTO TUNE	J
		na en en el esta de 1960		Sweep ~	2.49 s (30001 pts)	CF Step 2.597000000 GHz	
						Auto	-
5 Marker Table 🔹					Function Value	Man	
5 Marker Table   Mode Trace Scale	X 2.440.9 GHz	Y 6.345 dBm	Function F	Function Width	Puncoon value		=
5 Marker Table   Mode Trace Scale  1 N 1 f 2 N 1 f	2.440 9 GHz 4.882 0 GHz	Y 6.345 dBm -50.99 dBm	Function I	Function Width	Puncoun value	Freq Offset	-
5 Marker Table   Mode Trace Scale  Mode Trace Scale  N	2.440 9 GHz		Function H	Function Width	FURCOUN VAIUE	0 Hz	
5 Marker Table	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz	-50.99 dBm -51.04 dBm	Function F	Function Width			
Marker Table         V           Mode         Trace         Scale           1         N         1         f           2         N         1         f           3         N         1         f           4         N         1         f           5         6	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz	-50.99 dBm -51.04 dBm -42.20 dBm	Function F	Function Width		0 Hz X Axis Scale	
Mode         Trace         Scale           Node         Trace         Scale           N         1         f           2         N         1           3         N         1           4         N         1           5         6         6	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz 21239 PM	-50.99 dBm -51.04 dBm -42.20 dBm				0 Hz X Axis Scale Log Lin Signal Track USpan Zoomi	
Mode         Trace         Scale           1         N         1         f           2         N         1         f           3         N         1         f           3         N         1         f           5         6         6         6           6         0         0         0         S           5         6         0         S         S	2,440 9 GHz 4,882 0 GHz 7,323 0 GHz 25,566 3 GHz 2,12,39 PM	-50.99 dBm -51.04 dBm -42.20 dBm				0 Hz X Axis Scale Log Un Signal Track ISaas Zoomi MHZ	
S Marker Table	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz 21:239 PM purious E +	-50.99 dBm -51.04 dBm -42.20 dBm	n_GFSk		15_2480	0 Hz X Axis Scale Log Un Signal Track Stass Zoomi MHZ Frequen	q •
Statem Table         •           Idde Trace Scale         •           1         N         1           2         N         1           3         N         1           4         N         1           5         -         -           6         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz 212.39 PM purious E + Ingut Z 50 0 Corrections: 08	-50.99 dBm -51.04 dBm -42.20 dBm	n_GFSk		15_2480	0 Hz X Axis Scale Cog Un Signal Track Signal Track	cy •
3 Marker Table         •           1         Marker Table         •           2         Marker Table         •           3         Marker Table         •           4         Marker Table         •           4         Marker Table         •           5         •         •           6         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         •           9         •         • <t< td=""><td>2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz 212.39 PM purious E + ngư Z 50.0</td><td>-50.99 dBm -51.04 dBm -42.20 dBm</td><td>n_GFSk</td><td>Avg Type Log-Por Ting Free Run</td><td>H5_2480</td><td>0 Hz X Axis Scale Log Un Signal Track Stass Zoomi MHZ Frequen</td><td>1</td></t<>	2.440 9 GHz 4.882 0 GHz 7.323 0 GHz 25.566 3 GHz 212.39 PM purious E + ngư Z 50.0	-50.99 dBm -51.04 dBm -42.20 dBm	n_GFSk	Avg Type Log-Por Ting Free Run	H5_2480	0 Hz X Axis Scale Log Un Signal Track Stass Zoomi MHZ Frequen	1
3 Marken Table         •           Image: Trace Scale         •           2         N         1           2         N         1           3         N         1           4         N         1           5         -         -           6         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -	2.440 9.04z 4.882 0.44 7.322 0.04z 2.566 3.04z 2.123 9.0 purious E + Ingui 2.50 0 Correctore. Cel Fing Ret Int (5) R	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 Hz X Avis Scale Log Log Signal Track Center Frequency 13.01500000 GHz Span 25.9700000 GHz	1
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Statem Table         •           Image: Trace Scale         •           1         N         1           2         N         1           3         N         1           4         N         1           5         -         -           6         -         -           7         -         -           8         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           9         -         -           10         -         -           10         -         -           10         -         -           10         -         -           10         -         -           10         -         -           10         -         -     <	2.440 9.04z 4.882 0.44 7.322 0.04z 2.566 3.04z 2.123 9.0 purious E + Ingui 2.50 0 Correctore. Cel Fing Ret Int (5) R	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 Hz X Ads Scale Log Signal Track Scale Zone MHZ Center Frequency 13.01500000 GHz Span 25.970000 GHz Swept Span	1
S Narker Table	2.440 9.04z 4.882 0.44 7.322 0.04z 2.566 3.04z 2.123 9.0 purious E + Ingui 2.50 0 Correctore. Cel Fing Ret Int (5) R	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 Hz X Ads Scale Log Signal Track Control Track Control Track Control Track Span 25 9700000 GHz Swapt Span Full Span Full Span	1
3 Marken Table         •           •         Mode         Trace         Scale           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •           •         •         •         •         •         •           •         •         •         •         •         •         •           •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         • <td>2.440 9.04z 4.882 0.44 7.322 0.04z 2.566 3.04z 2.123 9.0 purious E + Ingui 2.50 0 Correctore. Cel Fing Ret Int (5) R</td> <td>-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6</td> <td>PND Fast Gate Off Sig Track Off</td> <td>Avg Type Log-Por Ting Free Run</td> <td>H5_2480</td> <td>0 Hz X Ads Scale Log Signal Track Scale Zone MHZ Center Frequency 13.01500000 GHz Span 25.970000 GHz Swept Span</td> <td>1</td>	2.440 9.04z 4.882 0.44 7.322 0.04z 2.566 3.04z 2.123 9.0 purious E + Ingui 2.50 0 Correctore. Cel Fing Ret Int (5) R	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 Hz X Ads Scale Log Signal Track Scale Zone MHZ Center Frequency 13.01500000 GHz Span 25.970000 GHz Swept Span	1
3 Marker Table         •           Image: Trace Scale	2 449 Geb; 4 82 Geb; 7 323 Geb; 2 5563 Geb; 2 1239 FM Purious E + Input 2 50 G Connetions, Cf Fine Ret. Int (5)	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 H2 X Attis Scale Log Dyna Tradi Veren Zoom MHZ Center Frequency 13:015000000 GH2 Span 2:5970000 GH2 Span Staf Freq Despt Span Staf Freq 3:000000 GH2	1
Statem Table         •           Image: Trace Scale	2449 Get; 482 Get; 7323 Get; 25563 Get; 2423 PM 2123 PM purious E + Input 2 50 D Connctons Of Fine Ref. Int (5)	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	PND Fast Gate Off Sig Track Off	Avg Type Log-Por Ting Free Run	H5_2480	0 H2 X Attis Scale Log Dynu Trad Year Trad Year Trad Cetter Frequent 10 J5000000 GH2 Span 25 970000 GH2 Span Full Span Start Freq 20 00000000 GH2	1
3 Marken Table         •           •         Mode         Trace         Scale           •         N         •         •         •           •         N         •         •         •         •           •         N         •         •         •         •         •           •         N         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         •         • <td>2409 Get 482 Get 7323 Get 25563 Get 25563 Get 21239 PM put Z 50 G page Z 50 G</td> <td>-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6</td> <td>D_GFSk PND Fact IF Gate Of IF Gate A</td> <td>Ang Type Log Por Ing Free Log Por Miter 4</td> <td>H5_24800</td> <td>0112 X Atta Scale Log Dyna Thao Year Joon MHZ Center Frequency 13.015000000 GHz Sam Zam Span Suat Freq 20.000000 GHz Stop Freq 20.00000 GHz Stop Freq 20.00000 GHz</td> <td>1</td>	2409 Get 482 Get 7323 Get 25563 Get 25563 Get 21239 PM put Z 50 G page Z 50 G	-50 99 dBm -51 04 dBm -42 20 dBm Mission Matter: 30 dB ef Lvi Offset 10.6	D_GFSk PND Fact IF Gate Of IF Gate A	Ang Type Log Por Ing Free Log Por Miter 4	H5_24800	0112 X Atta Scale Log Dyna Thao Year Joon MHZ Center Frequency 13.015000000 GHz Sam Zam Span Suat Freq 20.000000 GHz Stop Freq 20.00000 GHz Stop Freq 20.00000 GHz	1
Statem Table         •           Image: Trace Scale         •           Image: Trace Trace Scale         •           Image: Trace Trace Scale         •           Image: Trace Trace	2409 Get 482 Get 7323 Get 25563 Get 25563 Get 21239 PM put Z 50 G page Z 50 G	-40.99 c6m -51.04 d6m -42.20 d6m 	D_GFSk PND Fact IF Gate Of IF Gate A	Ang Type Log Por Ing Free Log Por Miter 4	C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C      C	0112 X Atta Scale Log Dyna Thao Year Joon MHZ Center Frequency 13.015000000 GHz Sam Zam Span Suat Freq 20.000000 GHz Stop Freq 20.00000 GHz Stop Freq 20.00000 GHz	1
S Marker Table	2 449 Geb; 4 82 G Geb; 7 323 G Geb; 2 5565 3 Geb; 2 12 39 FM Purious E + Input 2 50 0 Commission, Cit Fms Ret Int (5) R	-40.99 c6m -51.04 d6m -42.20 d6m 	n_GFSk PNO Fact pro fact for Low 55 g Track Of 55 dB	And Type Lop Por Trop Fee Ras Miter 4 1 Sweep -	Каран 25.37 GHz Бран 25.37 GHz Бран 25.37 GHz	0 H2 X Atts Scale Log Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Safe Freq Scale Freq 2xer Span Full Span Staf Freq Scole Freq 2xer Span Staf Span Staf Freq Scole Freq 2xer Span Uggs Trad Uggs	1
S Marker Table           Image: Strategy Str	2409 Get 482 Get 7323 Get 25563 Get 2423 PM Purious E + Input 2 50 0 Committees C R R R	-009 00m -35.04 d8m -42.20 08m mission index 30 d6 ef Livel 30.00 d8 ef Livel 30.00 d8	n_GFSk PNO Fact pro fact for Low 55 g Track Of 55 dB	And Type Lop Por Trop Fee Ras Miter 4 1 Sweep -	H5_24800	0 H2 X Atts Scale Log Log Very Trad. Very Trad.	1
Mode         Trace         Scale           1         N         1         1           2         N         1         1           3         N         1         1           3         N         1         1           3         N         1         1           3         N         1         1           3         N         1         1           3         N         1         1           5         S         1         1           5         N         1         1           5         N         1         1           5         National Statestrain         National Statestrain         S           Spectrum Analyzer 1         Novel Statestrain         National Statestrain         S           Spectrum Analyzer 1         Novel Statestrain         National Statestrain         S           Social Statestraine         National Statestraine         National Statestraine         National Statestraine	2409 Ger 482 Ger 7323 Ger 25563 Ger 24526 Ger 24526 Ger 24526 Ger 24526 Ger 24526 Ger 24526 Ger 4 Pourious E + Peel 250 Constant of Preg Ret Int(S)	-009 00m -310 00m -4220 00m mission skten 30 d0 et Level 30,00 d0	n_GFSk PNO Fact pro fact for Low 55 g Track Of 55 dB	And Type Lop Por Trop Fee Ras Miter 4 1 Sweep -	Каран 25.37 GHz Бран 25.37 GHz Бран 25.37 GHz	0 H2 X Atts Scale Log Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Uggs Trad Safe Freq Scale Freq 2xer Span Full Span Staf Freq Scole Freq 2xer Span Staf Span Staf Freq Scole Freq 2xer Span Uggs Trad Uggs	1
3 Marken Table         •           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0           •         0	2499 Ger: 482 Ger: 7323 Ger: 2556 Ger: 2459 Ger: Part 250 Constant Constant Reveal 250 Constant Reveal 250 Cons	-009 00m -310 00m -4220 00m -4220 00m -4220 00m -4220 00m -4220 00m -4220 00m -4220 00m -4220 00m -4220 00m -4342 00m	n_GFSk PNO Fact pro fact for Low 55 g Track Of 55 dB	And Type Lop Por Trop Fee Ras Miter 4 1 Sweep -	Каран 25.37 GHz Бран 25.37 GHz Бран 25.37 GHz	0 H2 X Atts Scale Log Log Cognum Took Yean You Yean	1
S Marker Table	2409 Get: 482 Get: 7323 Get: 25563 Get: 2423 PM 2123 PM purious E + Ingut 2 50 D Connctons Of Fine Ret Int (5) R R X 2478 Get: 4000 Get: 1400 Get:	-00 90 cBm -35 04 dBm -42 20 dBm mission Mden 30 dB ef Level 30.00 dB ef Level 30.00 dB y 7 000 dBm -49.22 cBm -51.19 dBm	n_GFSk PNO Fact pro fact for Low 55 g Track Of 55 dB	And Type Lop Por Trop Fee Ras Miter 4 1 Sweep -	Каран 25.37 GHz Бран 25.37 GHz Бран 25.37 GHz	0142 XAdis Scale Log Log Log Varyan Tradi Varyan Varyan Salat Frequency Salat Freq Varyan Varyan Salat Freq Varyan	1



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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			Member of SGS Group



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EYSIGHT Input RF	Input Z 50 0 Corrections: Off	#Atten: 30 dB	PNO Fast Gate Off	Avg Type: Log Trig: Free Ru		23456	Center Freq		Settings
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enter 13.02 GHz		#Video BW 3001	-			25.97 GHz	AUTOT	UNE	
Res BW 100 kHz		#Video BW 3001	KH2	Swee		(30001 pts)	CF Step		
i Marker Table 🔹							2.59700000	0 GHz	
Mode Trace Scale	X 2.401 9 GHz	Y 1.733 dBm	Function	Function Width	Functio	n Value	Man Man		
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	ourious E	mission	_8Db2	K_3IVI_	DHD	_244	(100 C		
wept an	+						Ö	Frequency	
KEYSIGHT Input RF	Input Z 50 D Corrections: Off	#Atten: 30 dB	PNO Fast Gate: Off	Avg Type Log Trig: Free Ru	0.000	2 3 4 5 6 WWWWW	Center Freq		Settings
Align: Auto	Freq Ref: Int (S)		IF Gain Low Sig Track: Off			NNNNN	13.0150000	00 GHz	ĩ
l Spectrum 🛛 🔻	R	tef Lvi Offset 10.6	55 dB	Mkr	4 25.76		Span 25.9700000	GHz	
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Res BW 100 kHz				Swee		(30001 pts)			
5 Marker Table •							2.59700000	0 GH2	
Mode Trace Scale	X 2.440.9 GHz	Y 0.4123 dBm	Function	Function Width	Functio	n Value	Man		
2 N 1 f	4.882 0 GHz 7.323 0 GHz	-50.72 dBm -51.66 dBm					Freq Offset 0 Hz		
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Sector destants	ourious E	1111221011	_ODP3		ַנחט	_2400			
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R + Algo: Auto						7 9 GHz	25.9700000		
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KEYSIGHT Input RF R +++ Coupling ICC Align: Auto xV Scale/Div 10 dB L0g		tef Lvi Offset 10.0 tef Level 30.00 di		Mkr		13 dBm	Swept S	Span an	
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KEYSIGHT Inout 6 R + Align Addo Si Spectrum + Sculetion + 0 dB - 00 - 00	2 0 <sup>3</sup>		Bm		-42 Spar	13 dBm	Swept S Zero Sp Full S Start Freq 26.000000 AUTO 1	an pan MHz 00 GHz	
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KEYSIGHT input BF R + Agen Auto ScaleBirt Of dB Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Cong Con	2	#Video BW 300 (	Bm -	Swee	-42 Spar ep ~2.49 s	13 dBm	Swept S           Zero Sp           Full S           Start Freq           30.0000001           Stop Freq           26.0000000           AUTO 1           CF Step           2.59700000           Auto 1	an pan MHz 00 GHz rune	
KEYSIGHT Input BF R + Aggn Auto ScaleBirt Of dB Cop 200 200 200 200 200 200 200 20	X 2.4798 GHz	#Video BW 300	Bm -		-42 Spar ep ~2.49 s	13 dBm	Swept 3 Zerro Sp Full S Start Freq 30.0000000 Stop Freq 26.0000000 AUTO 1 CF Step 2.59700000 Auto Man	an pan MHz 00 GHz rune	
KEYSIGHT input 87 R + Agen Auto ScaleBort 0 dB 00 00 00 00 00 00 00 00 00 0	X 2.479 8 GHz 4.800 0 GHz 7.440 0 GHz	Er Level 30.00 dB #Video BW 300 i Y 2.214 dBm -4.951 dBm -5.214 dBm	Bm -	Swee	-42 Spar ep ~2.49 s	13 dBm	Swept S           Zero Sp           Full S           Start Freq           30.0000001           Stop Freq           26.0000000           AUTO 1           CF Step           2.59700000           Auto 1	an pan MHz 00 GHz rune	
KEYSIGHT         Input BF           8         ++         Aign Aub           9         -         Aign Aub           1 Spectrum         •         Comparison           1 Spectrum         •         Comparison           1 Spectrum         •         Comparison           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200         •         •           200	X 2.479 8 GHz 4.400 GHz	In Level 30.00 dB In Level 30.	Bm -	Swee	-42 Spar ep ~2.49 s	13 dBm	Swept S Zerro Sp Full S Start Freq 30.0000000 AUTO 1 CF Step 2.59700000 AUTO 1 CF Step 2.59700000 AUTO 1 CF Step Freq Offset	an pan MHz 00 GHz rune 0 GHz	

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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 D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/08/2020	09/07/2021
Horn Antenna	Schwarzbeck	BBHA9120D	1341	06/04/2021	06/03/2022
Horn Antenna	Schwarzbeck	BBHA9170	185	07/30/2020	07/29/2021
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022
3m Site NSA	SGS	966 chamber D	N/A	07/12/2021	07/11/2022
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	03/22/2021	03/21/2022
Pre-Amplifier	EMC Instruments	EMC184045 B	980135	10/27/2020	10/26/2021
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/19/2020	11/18/2021
Pre-Amplifier	EMC Instruments	EMC12630S E	980271	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT- 218FS-10	RF25	11/19/2020	11/18/2021
High Pass Filter	R&S	F13 HPF 3GHz	RF175	11/19/2020	11/18/2021
Lowpass Filter	Woken	EWT-56- 0019	RF173	11/19/2020	11/18/2021
Notch Filter	Woken	EWT-54- 0038	RF178	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	EMC106- SM-SM- 7200	150703	11/19/2020	11/18/2021
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/19/2020	11/18/2021
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R
USB Cable	сохос	C807M3A03 E1E2	N/A	N.C.R	N.C.R
Notebook	Lenovo	T470	P0001293	N/A	N/A
USB to Type-c	A-GOOD	USB to Type-c	N/A	N.C.R	N.C.R

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

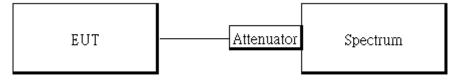
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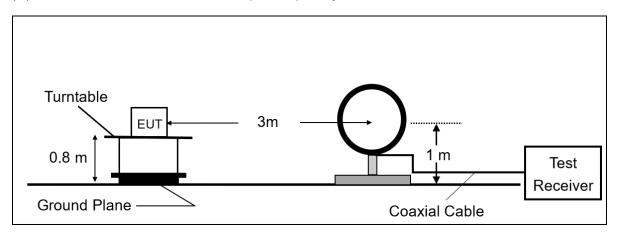
### 10.3 **Test SET-UP**

## 10.3.1 Duty Cycle Correction Factor

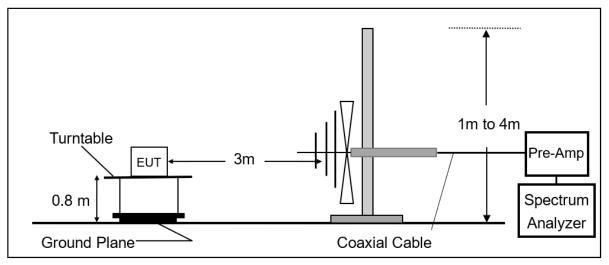


## 10.3.2 Radiated Emission

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



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



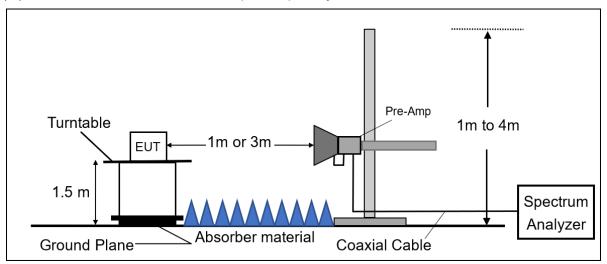
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(C) Radiated Emission Test Set-Up, Frequency Above 1 GHz.



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### 10.4 Measurement Procedure

- 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. According to C63.10:2013 Section 7.5 Procedure for determining the average value of pulsed emissions with duty cycle correction factor 20 log (T<sub>on</sub>/100ms).
- 9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 12. Repeat above procedures until all default test channel measured were complete.

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## 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 RA = Reading Amplitude AF = Antenna Factor CL = Cable Attenuation Factor (Cable Loss) AG = Amplifier Gain

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

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB) Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

## 10.6 Test Results of Radiated Spurious Emissions form 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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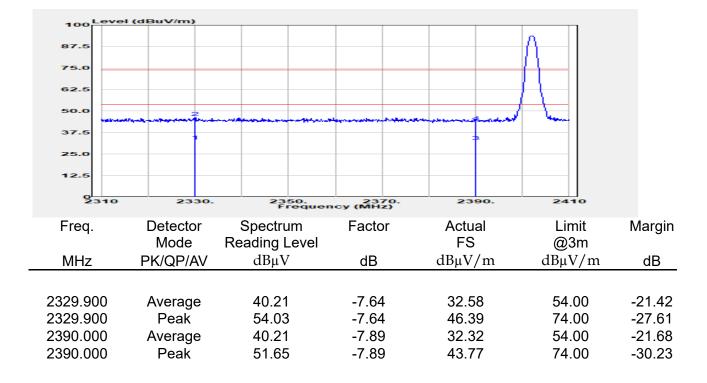
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## 10.7 Measurement Result: 10.7.1 Bandedge Result

Report Number	:E2/2021/60089
Operation Mode	:BT BR
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng



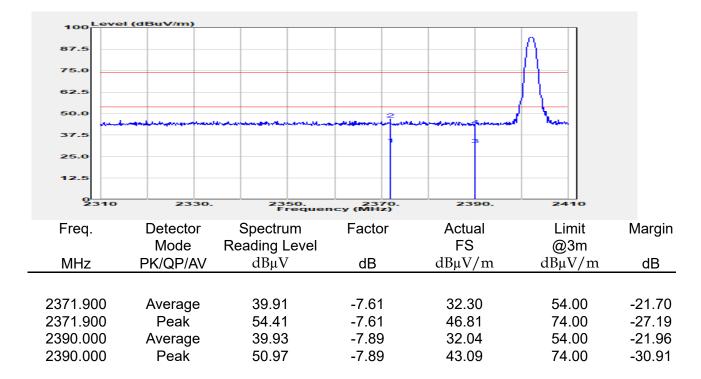
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Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng



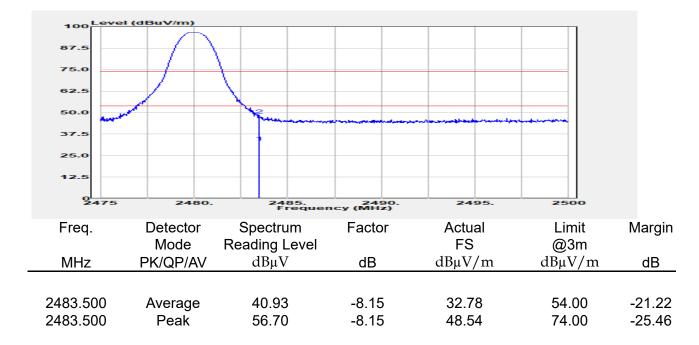
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Report Number	:E2/2021/60089
Operation Mode	:BT BR
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

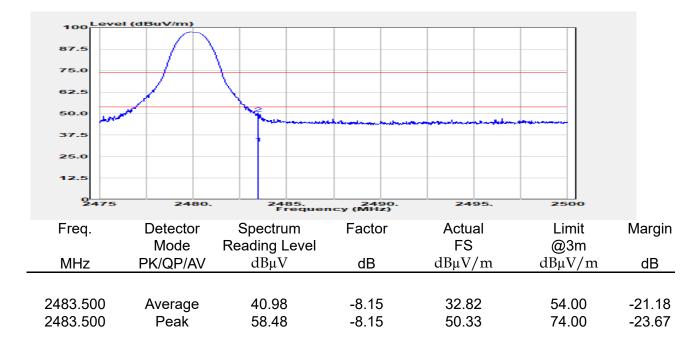
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





:E2/2021/60089
:BT BR
:2480 MHz
:BE CH HIGH
:H Plane

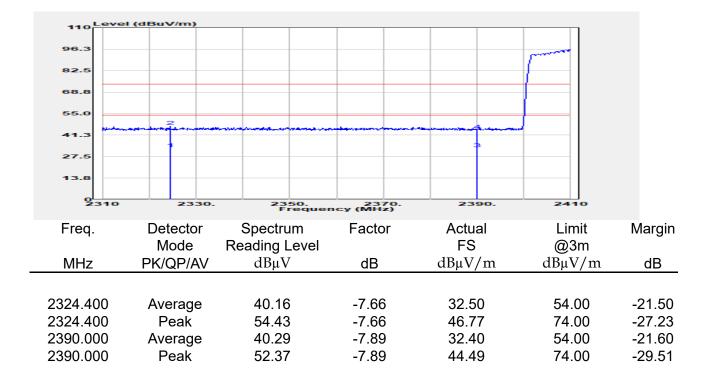
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR HOPPING
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

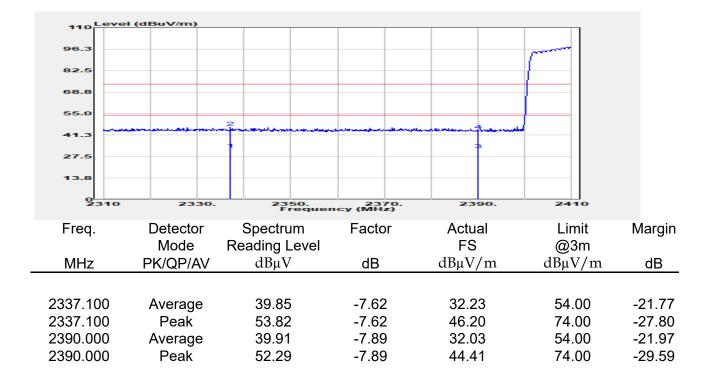
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR HOPPING
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

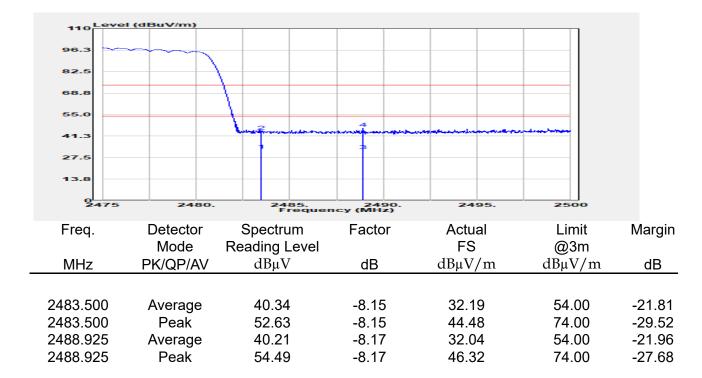
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
Operation Mode	:BT BR HOPPING
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

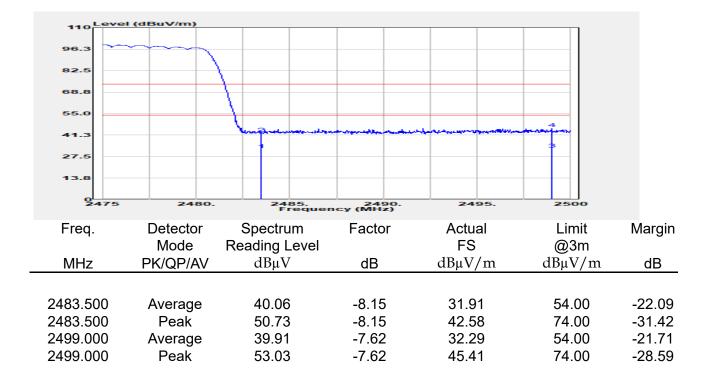
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR HOPPING
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

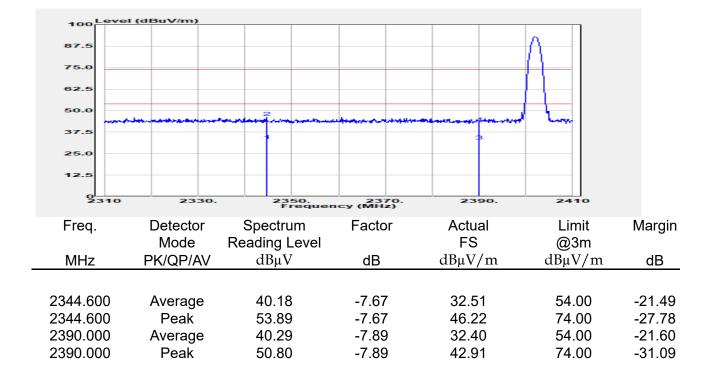
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng





:E2/2021/60089
:BT EDR
:2402 MHz
:BE CH LOW
:H Plane

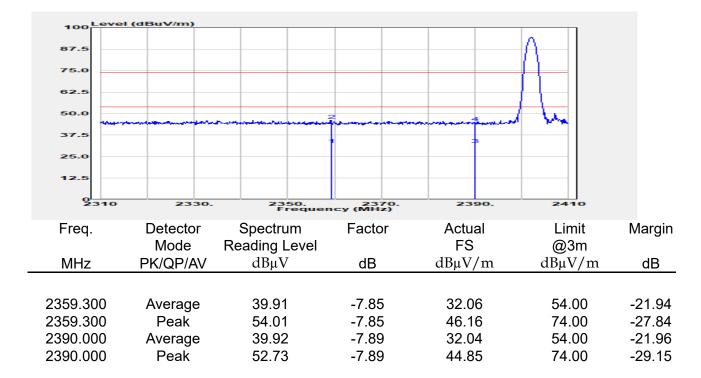
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





:E2/2021/60089
:BT EDR
:2402 MHz
:BE CH LOW
:H Plane

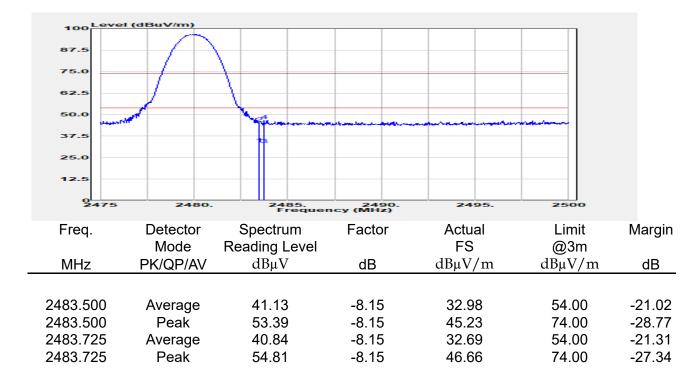
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
Operation Mode	:BT EDR
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

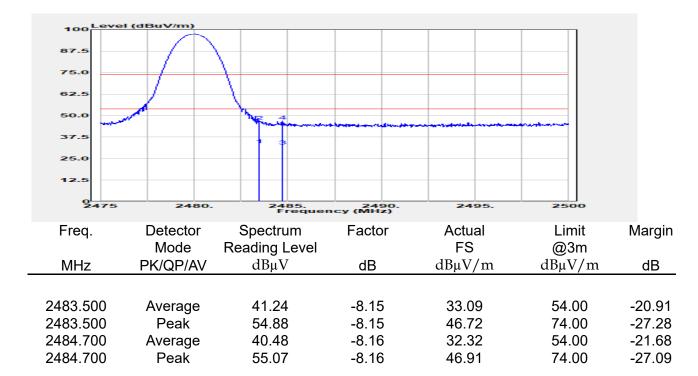
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT EDR
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng

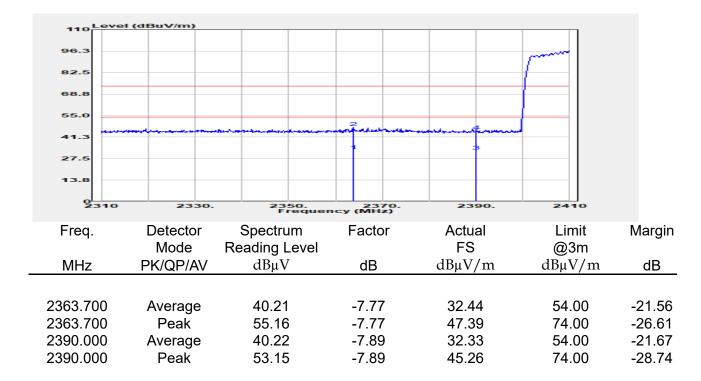


Report No.: E2/2021/60089 Page: 47 of 75



Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT EDR HOPPING
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng

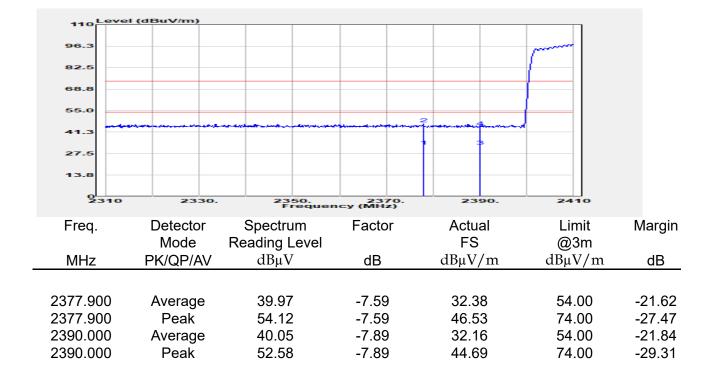


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Report Number	:E2/2021/60089
Operation Mode	:BT EDR HOPPING
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

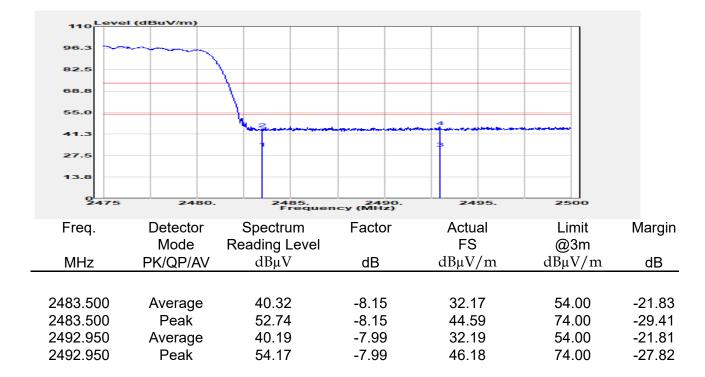
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
Operation Mode	:BT EDR HOPPING
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

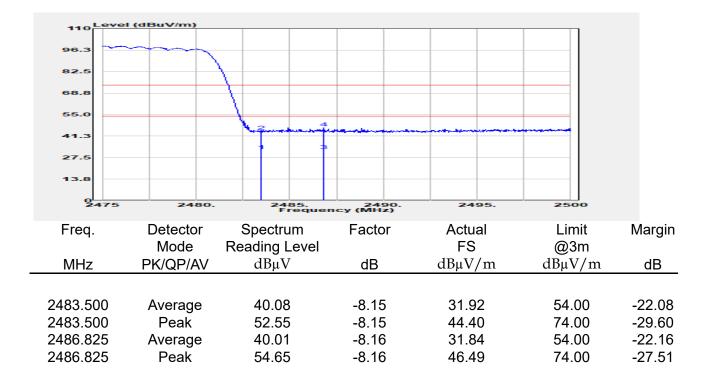
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Vertical
Engineer	:Jack Tseng





Report Number	:E2/2021/60089
Operation Mode	:BT EDR HOPPING
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:20.5/67
Antenna Pol.	:Horizontal
Engineer	:Jack Tseng

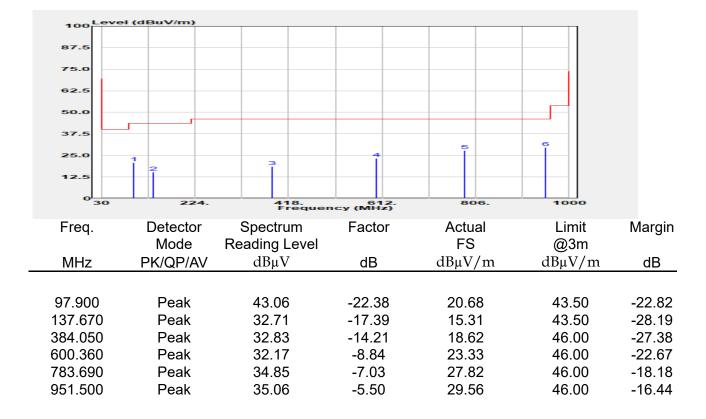




## 10.7.2 Radiated Spurious Emission

Report Number	:E2/2021/60089
Operation Mode	:BT BR
Test Frequency	:2441 MHz
Test Mode	:TX CH MID
EUT Pol	:H Plane

Test Site:SAC DTest Date:2021-07-21Temp./Humi.:21.8/66Antenna Pol.:VerticalEngineer:Andy Wang



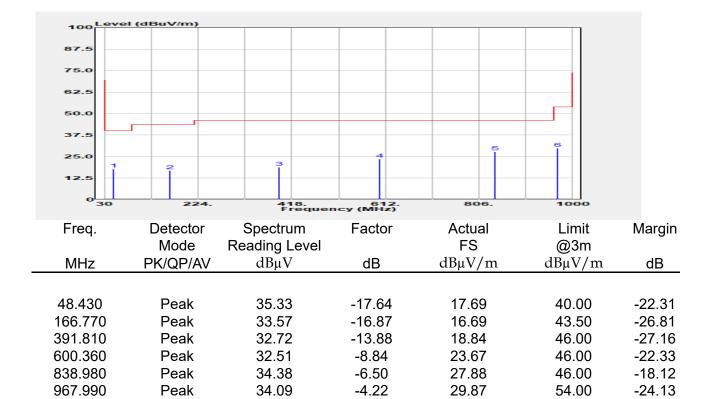
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:E2/2021/60089
:BT BR
:2441 MHz
:TX CH MID
:H Plane

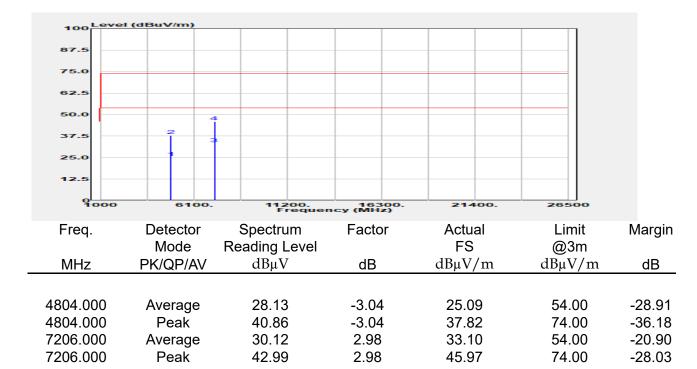
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.8/66
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR
Test Frequency	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:H Plane

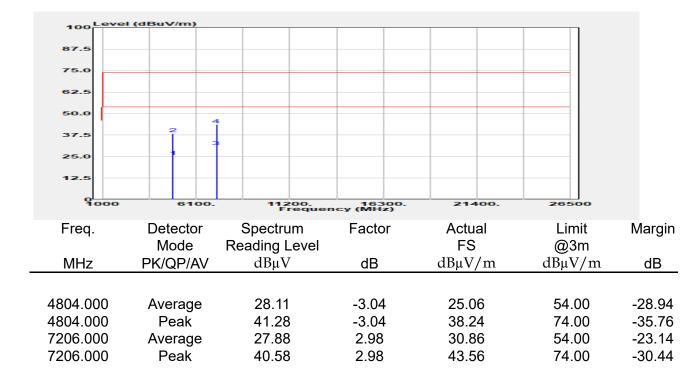
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR
Test Frequency	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:H Plane

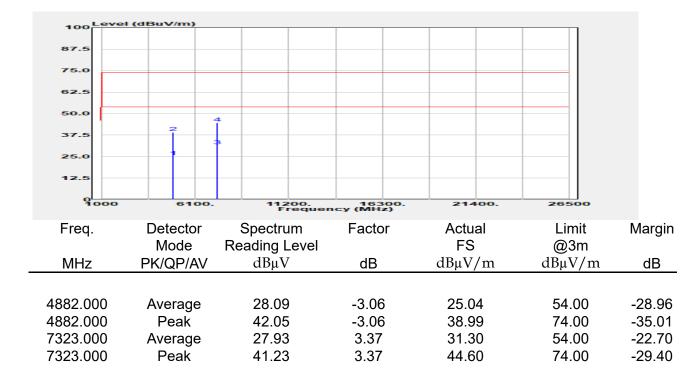
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





:E2/2021/60089
:BT BR
:2441 MHz
:TX CH MID
:H Plane

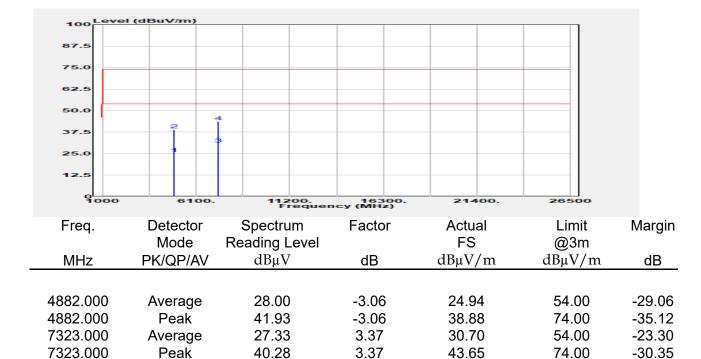
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





:E2/2021/60089
:BT BR
:2441 MHz
:TX CH MID
:H Plane

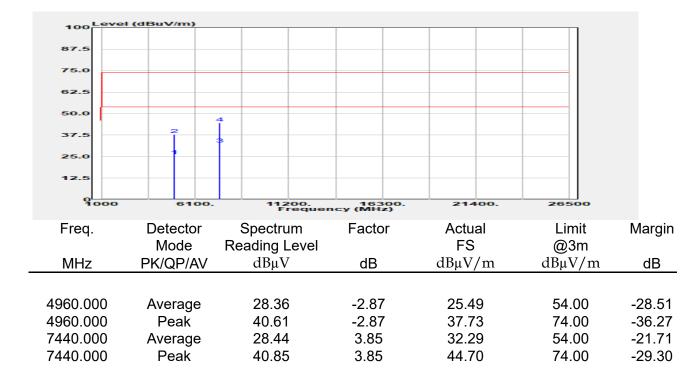
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





Report Number	:E2/2021/60089
Operation Mode	:BT BR
Test Frequency	:2480 MHz
Test Mode	:TX CH HIGH
EUT Pol	:H Plane

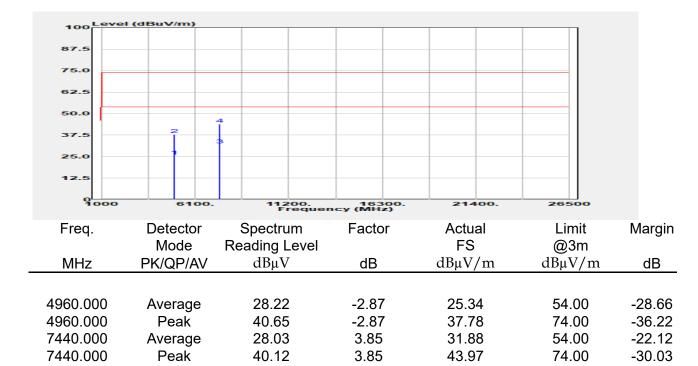
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT BR
Test Frequency	:2480 MHz
Test Mode	:TX CH HIGH
EUT Pol	:H Plane

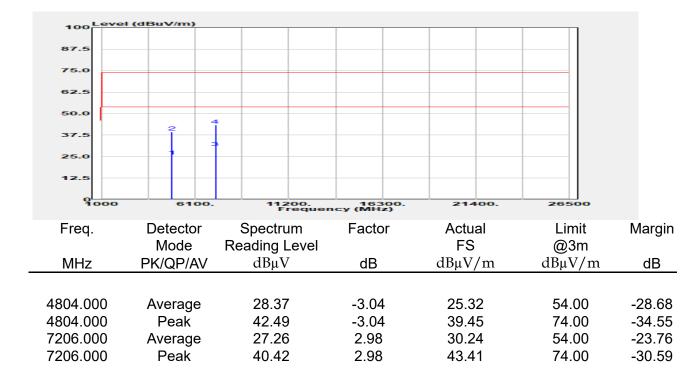
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





Report Number	:E2/2021/60089
Operation Mode	:BT EDR
Test Frequency	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:H Plane

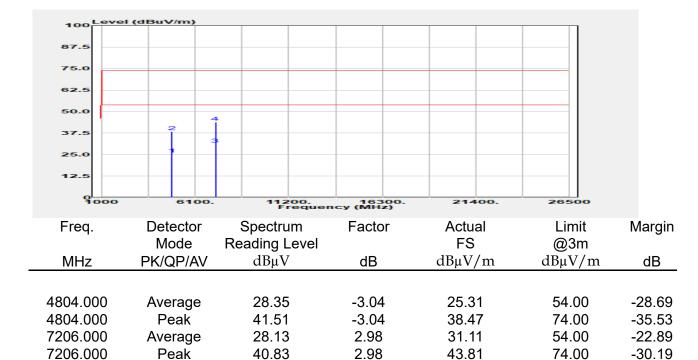
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT EDR
Test Frequency	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:H Plane

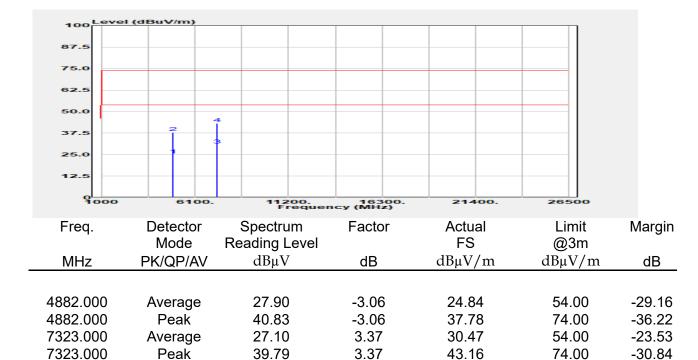
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





:E2/2021/60089
:BT EDR
:2441 MHz
:TX CH MID
:H Plane

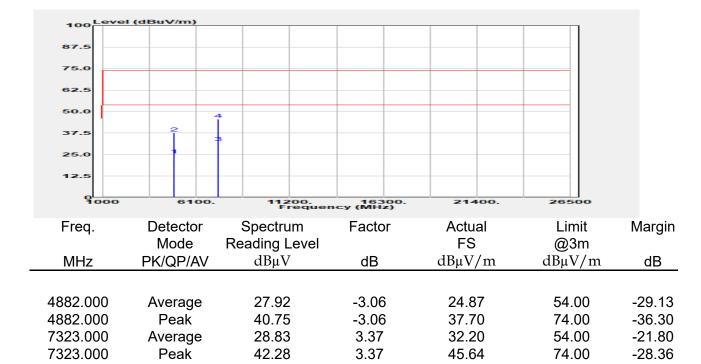
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





Report Number	:E2/2021/60089
<b>Operation Mode</b>	:BT EDR
Test Frequency	:2441 MHz
Test Mode	:TX CH MID
EUT Pol	:H Plane

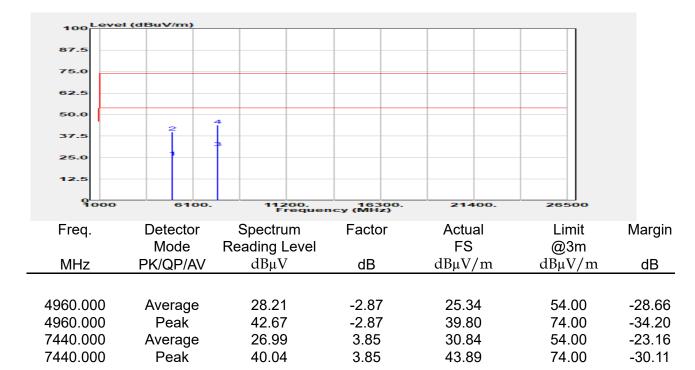
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





Report Number	:E2/2021/60089		
Operation Mode	:BT EDR		
Test Frequency	:2480 MHz		
Test Mode	:TX CH HIGH		
EUT Pol	:H Plane		

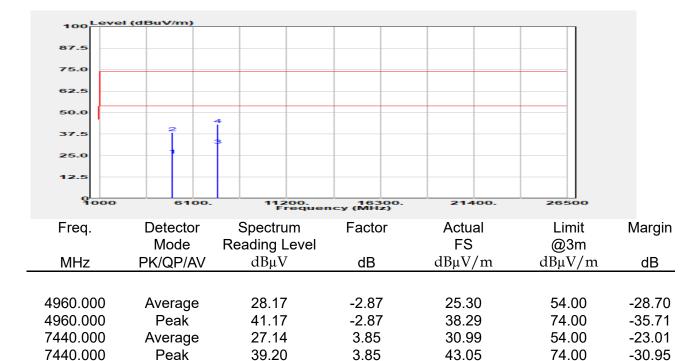
Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Vertical
Engineer	:Andy Wang





Report Number	:E2/2021/60089		
<b>Operation Mode</b>	:BT EDR		
Test Frequency	:2480 MHz		
Test Mode	:TX CH HIGH		
EUT Pol	:H Plane		

Test Site	:SAC D
Test Date	:2021-07-21
Temp./Humi.	:21.3/68
Antenna Pol.	:Horizontal
Engineer	:Andy Wang





# **11 FREQUENCY SEPARATION**

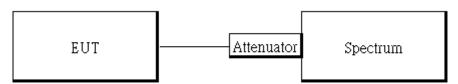
## 11.1 Standard Applicable

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 G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNAC K	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

## 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

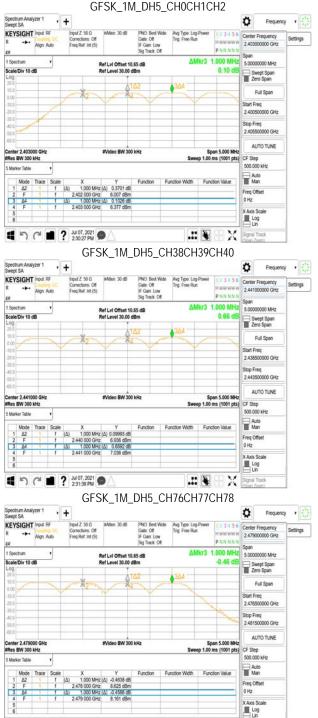
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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.sgs.com.tw
			Member of SGS Group

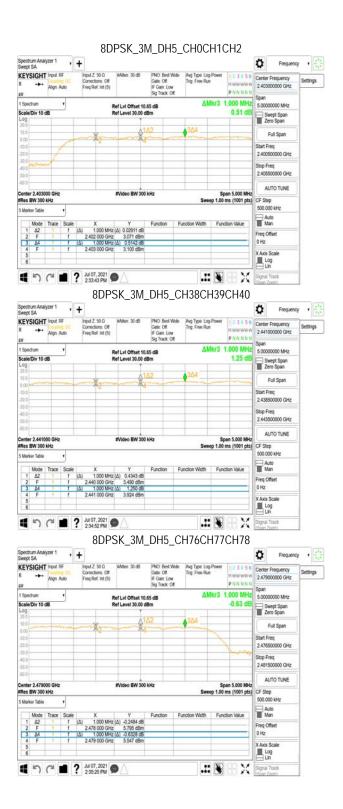
## Report No.: E2/2021/60089 Page: 66 of 75





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# **12 NUMBER OF HOPPING FREQUENCY**

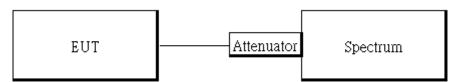
## 12.1 Standard Applicable

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 G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNAC K	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

## 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	
2.441 GHz – 2.4835 GHz	39	>15
2.4 GHz ~2.4835 GHz	(40+39) = 79	

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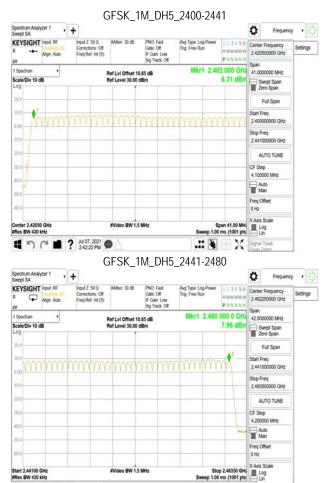
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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.sgs.com.tw
			Member of SGS Group

## Report No.: E2/2021/60089 Page: 68 of 75

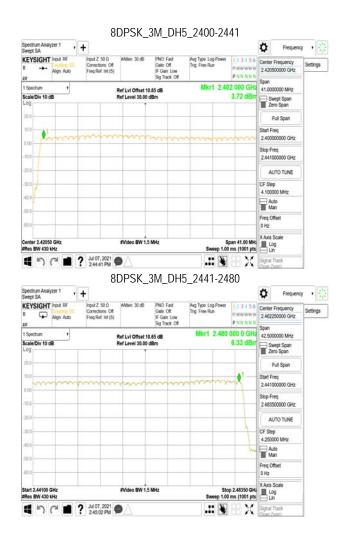


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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.sgs.com.tw
			Member of SGS Group



# 13 TIME OF OCCUPANCY (DWELL TIME)

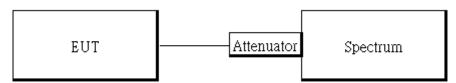
## 13.1 Standard Applicable

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.

	Conducted Emission Test Site: Conducted G							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022			
Attenuator	Marvelous	WATT- 218FS-10	RF23	11/19/2020	11/18/2021			
DC Block	PASTERNAC K	PE8210	RF151	11/19/2020	11/18/2021			
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A			

## 13.2 Measurement Equipment Used

## 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 C63.10:2015.
- 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

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

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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)
	DH1	123.20	400ms	2.597	3.00
Mid	DH3	262.40	400ms	0.610	1.00
	DH5	307.20	400ms	0.347	1.00

#### π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
	2DH1	123.20	400ms	2.597	3.00
Mid	2DH3	262.40	400ms	0.610	1.00
	2DH5	308.80	400ms	0.345	1.00

#### 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
	3DH1	123.20	400ms	2.597	3.00
Mid	3DH3	262.40	400ms	0.610	1.00
	3DH5	308.80	400ms	0.345	1.00

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## GFSK (1Mbps):

CH Mid	DH1 time slot =	0.385 *	(1600/2/79) *	31.6 =	123.20 (ms)
	DH3 time slot =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	DH5 time slot =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)

#### $\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slo =	0.385 *	(1600/2/79) *	31.6 =	123.20 (ms)
	2DH3 time slo =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	2DH5 time slo =	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)

#### 8-DPSK (3Mbps):

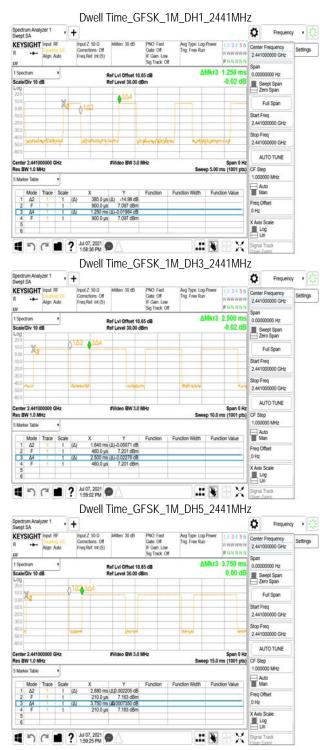
CH Mid	3DH1 time slo =	0.385 *	(1600/2/79) *	31.6 =	123.20 (ms)
	3DH3 time slo =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	3DH5 time slo =	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)

A period time = 0.4 (s) \* 79 = 31.6 (s)

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## Report No.: E2/2021/60089 Page: 73 of 75





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台灣檢

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			Member of SGS Group	1



Swept SA KEYSIGHT Input RF	+						ø	Frequency	•
Coupling DC	Input Z 50 Q Corrections: Off	#Atten: 30 dB	PNO Fast Gate Off	Avg Type: Log Trig: Free Run	Power	1 2 3 4 5 6 WWWWWW		Frequency 000000 GHz	Setting
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			Member of SGS Group



## **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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