

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant: Product Name:	Quanta Computer Inc. No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City 33377, Taiwan Clover Station Pro Terminal
Brand Name:	clover
Model No.:	C503
HVIN:	C503W
Model Difference:	N/A
Report Number:	E2/2021/60097
FCC ID	HFS-CX03W
IC:	1787B-CX03W
Issue Date:	Aug. 03, 2021
Date of Test:	Jul. 01, 2021~Jul. 15, 2021
Date of EUT Received:	Jul. 01, 2021

Jay Lin Approved By

Jay Lin

### 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, ISED RSS-247.

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Revision History							
Report Number       Revision       Description       Issue Date       Revised By							
E2/2021/60097	Rev.00	Original.	Aug. 03, 2021	Yi-Shan Tsai			

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SGS Taiwan Ltd.	No.134,Wu Kung Road, New Taipei Industrial	Park, Wuku District, New Taipei City, Taiwan/新北市五股區	新北產業園區五工路 134 號
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
			NA 1 (000 0



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### **GENERAL INFORMATION** 1

#### 1.1 **Product Description**

Product Name:	Clover Station Pro Terminal
Brand Name:	clover
Model No.:	C503
HVIN:	C503W
Model Difference:	N/A
Hardware Version:	C503W
Firmware Version:	N/A
EUT Series No.:	PJ216216001 (Radiated) C053UQ11620145 (Conducted) C153UQ11620149 (Conduction)
Power Supply:	12V from AC/DC Adapter

#### 1.2 **RF Specification**

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	6.24 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	$\leq$ 0.4s

#### 1.3 **Antenna Designation**

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain		
PIFA	SAA	GD9321-15-001-R	2402~2480	-0.20			
PIFA	Luxshare-ICT	LA81FP018-1H	2402~2480	0.9	V		
Note:							

 Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.

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 RSS-247 issue 2 Feb. 2017 RSS-Gen. issue 5 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 A	 	
(TAF code 3702)		SAC C		
(1AF 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.

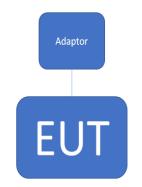
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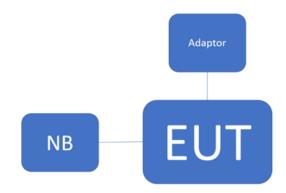


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## 2.5 Configuration of Tested System Fig. 2-1 Conduction (AC Power Line)



### Fig. 2-2 Conducted (Antenna Port) Configuration & Radiated Emission



### **Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2	Adapter	clover	FSP040-RHBN3	N/A	N/A	N/A
3	Notebook	Lenovo	L440	P0000367	N/A	N/A

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## **3 SUMMARY OF TEST RESULTS**

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b)(1)	RSS-247 §5.4 b	Peak Output Power	Compliant
§15.247(a)(1)	RSS-247 §5.1 b RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	RSS-247 §5.1 b	Frequency Separation	Compliant
§15.247(a)(1)(iii)	RSS-247 §5.1 d	Number of hopping frequency Time of Occupancy	Compliant
§15.203	N/A	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 Investigation has been done on all the possible configurations for searching the worst case.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE			
	RADIATED EMISSION TEST (BELOW 1 GHz)						
Bluetooth	0 to 78	39	GFSK	DH5			
	RAI	DIATED EMISSION 1	EST (ABOVE 1 GHz)				
Bluetooth	Bluetooth 0 to 78 0,39,78 GFSK, 8-DPSK DH5						
<b>Note:</b> 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 position was							

reported.

ANTENNA PORT CONDUCTED TEST							
MODE	MODE AVAILABLE TESTED MODULATION		PACKET TYPE				
	Peak Output Power, 20dB Band Width						
Bluetooth	Bluetooth 0 to 78 0,39,78 GFSK, π/4-DQPSK, 8-DPSK DH5/2DH5/3DH5						
Band Edge							
Bluetooth 0 to 78 0,78 GFSK, 8-DPSK DH5/3DH5							
		Frequence	cy Separation				
Bluetooth	0 to 78	0,1,2,38,39,40,76,77,78	GFSK, π/4-DQPSK	DH5/2DH5			
		Number of he	opping frequency				
Bluetooth	0 to 78	0 to 78	GFSK, π/4-DQPSK	DH5/2DH5			
		Time of Occu	oancy (Dwell time)				
			GFSK	DH5			
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5			
			8-DPSK	3DH5			

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## **5 MEASUREMENT UNCERTAINTY**

Test Items	ι	Incertair	nty
AC Power Line Conducted Emission	+/- 2.34 dE		
Peak Output Power	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
100 kHz Bandwidth Of Frequency Band Edges	+/- 1.69 d		
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.

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 A								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM- BER	LAST CAL.	CAL DUE.			
Test Software	audix	e3	Ver. 6.11- 20180419c	N.C.R	N.C.R			
LISN	SCHWARZBECK Mess-El- ektronik	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			

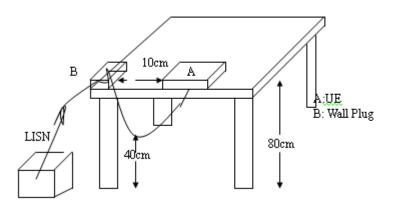
### 6.3 EUT Setup

- 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.

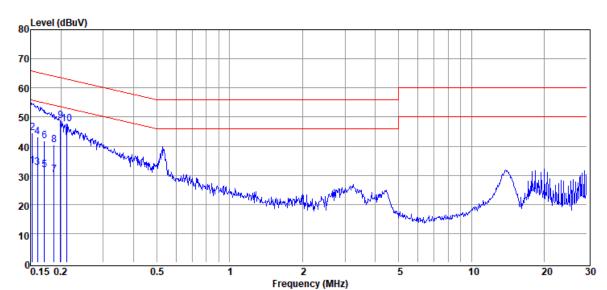
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# AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:E2/2021/60097	Test Site	:Conduction Room C
Test Mode	:BT	Test Date	:2021-07-09
Power	:120V/60Hz	Temp./Humi.	:24.8/54
Probe	:L1	Engineer	:Ashton Chiu
Note:	: Adapter:FSP040-RHBN3		

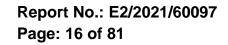


Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.15	Average	23.12	10.22	33.34	55.87	-22.53
0.15	QP	34.32	10.22	44.54	65.87	-21.33
0.16	Average	22.33	10.22	32.55	55.43	-22.88
0.16	QP	32.98	10.22	43.20	65.43	-22.23
0.17	Average	21.52	10.22	31.74	54.90	-23.16
0.17	QP	31.65	10.22	41.87	64.90	-23.03
0.19	Average	19.85	10.22	30.07	54.15	-24.08
0.19	QP	30.22	10.22	40.44	64.15	-23.71
0.20	Peak	38.52	10.30	48.82	63.62	-14.80
0.21	Peak	37.39	10.30	47.69	63.14	-15.45

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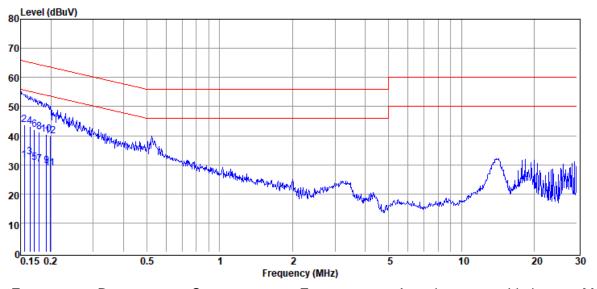
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Report Number	:E2/2021/60097	Test Site	:Conduction Room C
Test Mode	:BT	Test Date	:2021-07-09
Power	:120V/60Hz	Temp./Humi.	:24.8/54
Probe	:N	Engineer	:Ashton Chiu
Note:	: Adapter:FSP040-RHBN3		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dBµV	dB
0.16	Average	21.38	10.21	31.59	55.69	-24.10
0.16	QP	33.62	10.21	43.83	65.69	-21.86
0.16	Average	22.33	10.21	32.54	55.25	-22.71
0.16	QP	32.92	10.21	43.13	65.25	-22.12
0.17	Average	20.65	10.21	30.86	54.90	-24.04
0.17	QP	31.89	10.21	42.10	64.90	-22.80
0.18	Average	19.85	10.21	30.06	54.50	-24.44
0.18	QP	31.05	10.21	41.26	64.50	-23.24
0.19	Average	19.52	10.21	29.73	53.93	-24.20
0.19	QP	30.13	10.21	40.34	63.93	-23.59
0.20	Average	18.64	10.21	28.85	53.67	-24.82
0.20	QP	29.61	10.21	39.82	63.67	-23.85

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# 7 PEAK OUTPUT POWER MEASUREMENT

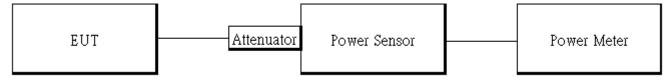
## 7.1 Standard Applicable

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. The e.i.r.p. shall not exceed 4 W.

7.2	Measurement Equipment Used
-----	----------------------------

Conducted Emission Test Site: Conducted D							
EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
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	MVE2213-10	RF12	11/19/2020	11/18/2021		
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021		
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021		
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R		
Test Software	SGS Taiwan	Radio Test Soft- ware	Ver.21	N.C.R	N.C.R		

### 7.3 Test Set-up:



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### 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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### 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	6.24	4.207	1000
Mid	2441	8	5.52	3.565	1000
High	2480	8	6.19	4.159	1000

### 2M EDR mode (Peak):

СН	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	5.49	3.540	125
Mid	2441	8	4.61	2.891	125
High	2480	8	5.36	3.436	125

### 3M EDR mode (Peak):

СН	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	5.46	3.516	125
Mid	2441	8	4.54	2.844	125
High	2480	8	5.33	3.412	125

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

### 1M BR mode (Average):

IIII BITIIIeae	(				
СН	Freq. (MHz)	Power set	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	5.82	3.815	1000
Mid	2441	8	5.39	3.455	1000
High	2480	8	5.98	3.958	1000

### 2M EDR mode (Average):

СН	Freq. (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	2.41	1.740	125
Mid	2441	8	2.21	1.662	125
High	2480	8	2.92	1.957	125

### 3M EDR mode (Average):

СН	Freq. (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	8	2.89	1.943	125
Mid	2441	8	2.20	1.658	125
High	2480	8	3.05	2.016	125

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

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### 7.6 EIRP Measurement Result

### 1M BR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	5.82	0.90	4.694	4000
Mid	2441	8	5.39	0.90	4.251	4000
High	2480	8	5.98	0.90	4.870	4000

### 2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	2.41	0.90	2.140	4000
Mid	2441	8	2.21	0.90	2.044	4000
High	2480	8	2.92	0.90	2.407	4000

### 3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg.Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	8	2.89	0.90	2.391	4000
Mid	2441	8	2.20	0.90	2.039	4000
High	2480	8	3.05	0.90	2.480	4000

\* *Note:* EIRP = Average Power + Gain

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## 8 EMISSION BANDWIDTH MEASUREMENT

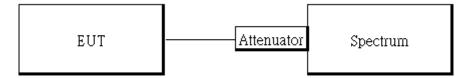
### 8.1 Standard Applicable

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	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
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	MVE2213-10	RF12	11/19/2020	11/18/2021		
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021		
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021		
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R		
Test Software	SGS Taiwan	Radio Test Soft- ware	Ver.21	N.C.R	N.C.R		

### 8.3 Test Set-up



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### 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
- Set the spectrum analyzer as RBW= 1 % to 5% of 99% Bandwidth , VBW ≥ 3 X RBW, Span= large enough to capture all products of the modulation process, Sweep=auto, Detector = Peak, and Max hold for 99% Bandwidth test.
- 7. Mark the peak frequency and 99%dB (upper and lower) frequency
- 8. Repeat above procedures until all test default channel is completed

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### 8.5 20dB Bandwidth

### GFSK

СН	20 dB BW (MHz)	2/3 BW (MHz)			
Low	0.7579	0.51			
Mid	0.7565	0.50			
High	0.7593	0.51			

### π/4-DQPSK

СН	20 dB BW	2/3 BW
	(MHz)	(MHz)
Low	1.156	0.77
Mid	1.156	0.77
High	1.152	0.77
	-	•

### 8-DPSK

СН	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.154	0.77
Mid	1.157	0.77
High	1.154	0.77

### 8.6 99% Bandwidth

GFSK

СН	99% BW (MHz)		
Low	0.7797		
Mid	0.7808		
High	0.7795		
π/4-DQPSK			
СЦ	99% BW		
СН	99% BW (MHz)		
CH			
	(MHz)		
Low	<b>(MHz)</b> 1.0886		

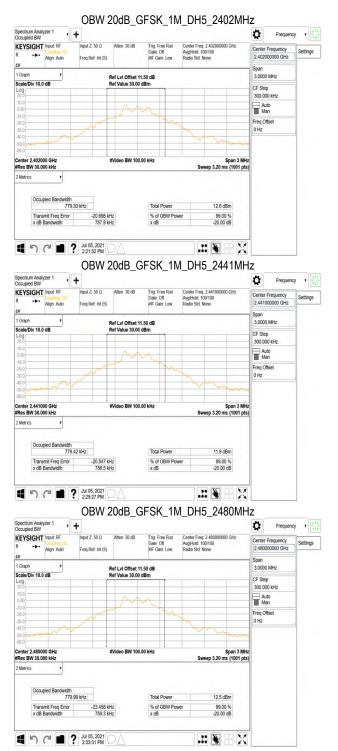
99% BW (MHz)
1.0863
1.0855
1.0851

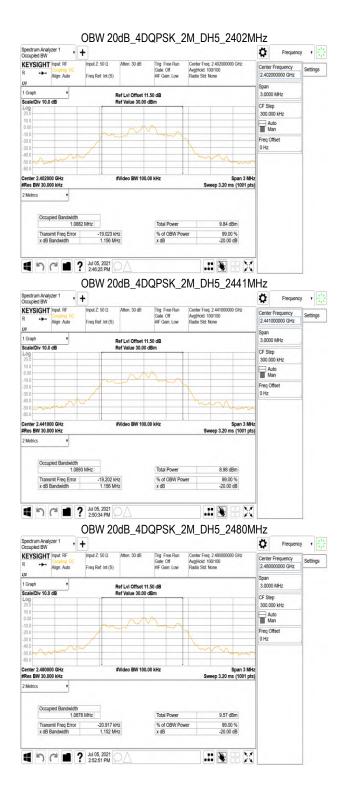
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台灣檢驗科技股份有限公司	t (886-2) 2299-3279 f (886-2) 2298-0488 www.sgs.com.tw					
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#### OBW 20dB 8DPSK 3M DH5 2402MHz Spectrum Analyzer 1 Occupied BW • + Frequency . Ö Trig: Free Run Gale: Off #IF Gain: Low KEYSIGHT Input RF Input Z: 50 Q Atten: 30 dB Center Freq: 2.4020 Center Fre Settings Avg[Hold: 100/1 Radio Std: None Align: Auto eg Ref: Int (S) L)0 3.0000 MHz 1 Graph Ref LvI Offset 11.50 dB Ref Value 30.00 dBm Scale/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz Center 2.402000 GHz #Res BW 30.000 kHz #Video BW 100.00 kH Span 3 Mi Sweep 3.20 ms (1001 pts) Metrics Occupied Bandwidth 1.0869 MHz Total Power 9.31 dBm Transmit Freq Error x dB Bandwidth % of OBW Power x dB -10.187 kHz 1.154 MHz 99.00 % -20.00 dB 4 5 C 1 ? Jul 05, 2021 2:56:03 PM .# 😽 – 🗶 OBW 20dB\_8DPSK\_3M\_DH5\_2441MHz Spectrum Analyzer 1 Occupied BW Ö Frequency . . + KEYSIGHT Input: RF Input Z: 50 Q Atten: 30 dB Trig: Free Run Gate: Off #IF Gain: Low Center Freq: 2.441000000 GHz Avg|Hold >100/100 Radio Std. None Center Fre ettings Align: Auto Freq Ref: Int (S) 2.441000000 GH Grapt Ref LvI Offset 11.50 dB Ref Value 30.00 dBm 3,0000 MHz Scale/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz Center 2.441000 GHz #Res BW 30.000 kHz eo BW 100.00 kH Span 3 MH Sweep 3.20 ms (1001 pt 2 Metrics Occupied Bandwidth 1.0846 MHz Total Power 8.41 dBm Transmit Freq Error x dB Bandwidth -11.576 kHz 1.157 MHz % of OBW Power x dB 99.00 % -20.00 dB .# 💽 – 🗙 OBW 20dB\_8DPSK\_3M\_DH5\_2480MHz Spectrum Analyzer 1 Occupied BW Ö Frequency . • + KEYSIGHT Input: RF Trig: Free Run Gate: Off #IF Gain: Low Center Freq: 2.480 Avg[Hold: 100/100 Radio Std: None iput Z: 50 Ω Atten: 30 dB quency Settings Align: Auto Freq Ref: Int (S) L)J 1 Grant 3.0000 MHz Ref LvI Offset 11.50 dB Ref Value 30.00 dBm le/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz Center 2.480000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Span 3 MH Sweep 3.20 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0858 MHz Total Power 9.08 dBm Transmit Freq Error x dB Bandwidth -12.714 kHz 1.154 MHz % of OBW Power x dB 99.00 % -20.00 dB ■ <sup>(1)</sup> <sup>(2)</sup> ■ ? Jul 05, 2021 3:02:10 PM .# 🖲 🗄 🗙

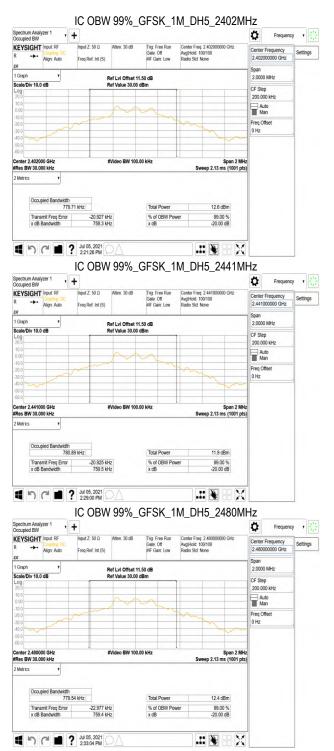
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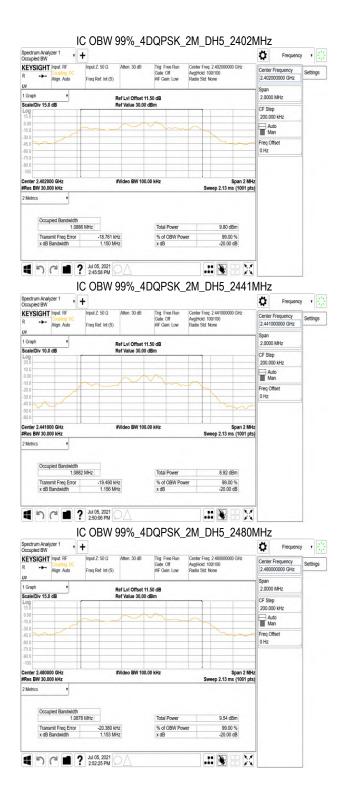
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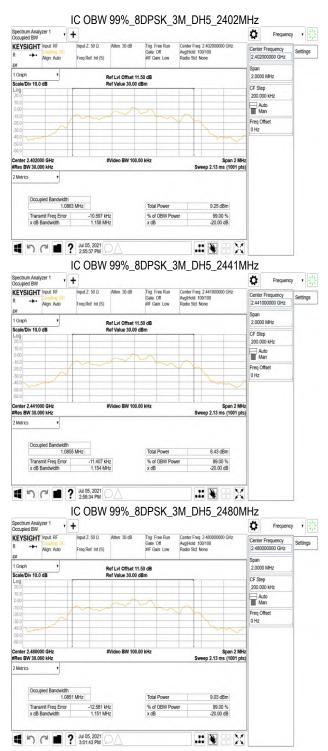


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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.sgs.com.tw



# 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

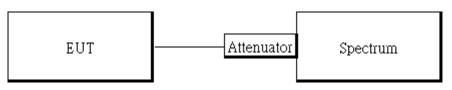
### 9.1 Standard Applicable

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) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

Conducted Emission Test Site: Conducted D							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM- BER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
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	MVE2213-10	RF12	11/19/2020	11/18/2021		
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021		
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021		
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R		
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R		

## 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

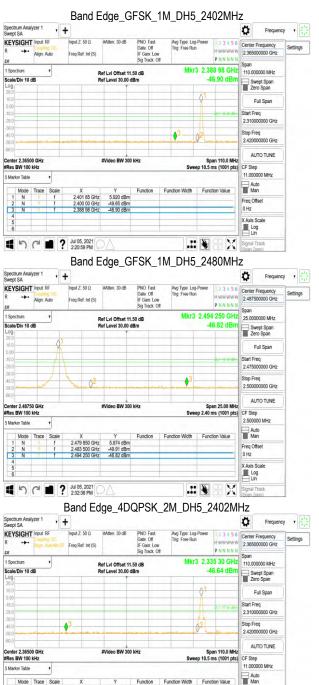
See next page for test plots.

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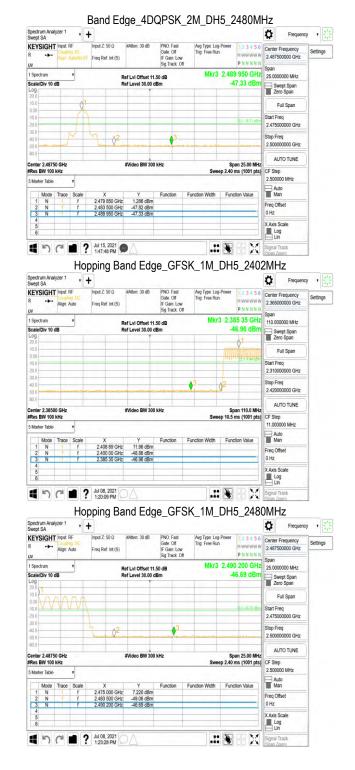
2.401 96 GHz

2.400 00 GHz

1 5 C 1 ? Jul 15, 2021

2.456 dBm

-48.02 dBr -46.64 dBr



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.

Freq Offse

X Axis Sc Log

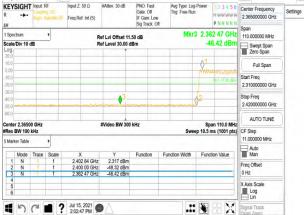
0 Hz

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Frequency .

Ö

Hopping Band Edge\_4DQPSK\_2M\_DH5\_2480MHz

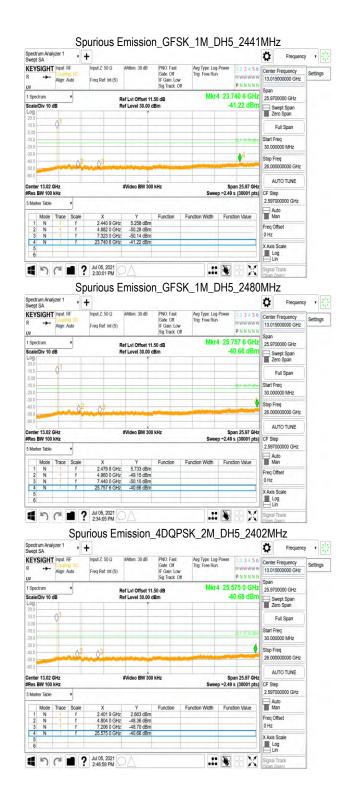


Spurious Emission\_GFSK\_1M\_DH5\_2402MHz Ö · . Spectrum Analyzer 1 Frequency + KEYSIGHT Input RF Center 13.015 r Frequency Settings -Alian: Auto eq Ref: Int (S) PNNNN Mkr4 25 602 7 GHz 25.9700000 GHz Ref Lvi Offset 11.50 dB Ref Level 30.00 dBm le/Div 10 dl -40.13 dB Swept Span Full Spa 30.000000 MH Stop Freq 26.00000 000 GHz AUTO TUNE #Video BW 300 kHz n 25.97 G r 13.02 GH Span 2 Sweep ~2.49 s (30 #Res BW 100 k 01 pts) CF Step 2.597000 Marker Tabl Auto Man Function Width Function Value Mode Trace Function

2.401 9 GHz

Jui 05, 2021 2:22:28 PM

5.887 dBm



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.

Freq Offse

X Axis Sc Log Lin

0 Hz

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.# 🖹 – X

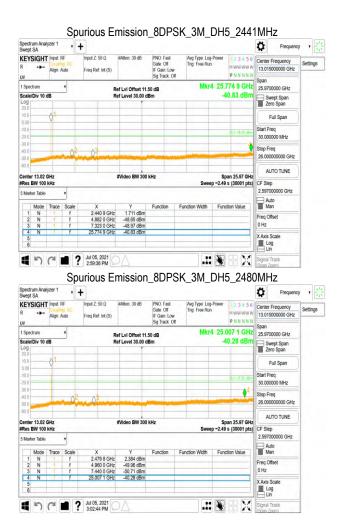
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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.sgs.com.tw		
			Member of SGS Group		

### Report No.: E2/2021/60097 Page: 32 of 81



Spectrum Anal Swept SA	yzer 1	+						ø	Frequency	,
EYSIGHT	Input: RF Coupling DC Align: Auto	Input Z: 50 Ω Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate. Off IF Gain: Low	Avg Type: Log Trig: Free Run	м	2.34.56 wwwww		Frequency 000000 GHz	Settings
a Spectrum				Sig Track: Of		4 24.15	NNNNN 70GHz	Span		
cale/Div 10 c			ef Lvi Offset 11. ef Level 30.00 d		iniki.		42 dBm		0000 GHz	
0g	-							Ze	ro Span	
0.0	01			-				F	ull Span	
0.0						0	1+1525 dBm	Start Fr 30.000	eq 000 MHz	
ia 0 10.0		2 03	-	-	- Antonio		4	Stop Fr 26.000	eq 000000 GHz	
0.0 enter 13.02 (	GHz		#Video BW 300	kHz		Span	25.97 GHz		JTO TUNE	
Res BW 100 Marker Table	kHz •				Swee	p ~2.49 s (	30001 pts)		00000 GHz	
Mode	Trace Scale	X	Y	Function	Function Width	Function	Value	Au Ma	to in	
1 N 2 N	1 f	2.440 9 GHz 4.882 0 GHz	1.755 dBm -48.78 dBm					Freq Of	fset	
3 N 4 N	1 1	7.323 0 GHz 24.157 0 GHz	-50.91 dBm -41.42 dBm			-		0 Hz		
5								Lo Lir	g	
5		? Jul 05, 2021 2:51:08 PM	$\Delta$				X	Signal 1 (Scan Z	pom)	
		urious Err	nission_	4DQP	SK_2M_	DH5	_248		Hz	
pectrum Anal wept SA		+						Ö	Frequency	'
EYSIGHT	Input: RF Coupling DC Align: Auto	Input Z: 50 Ω Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low	Avg Type: Log Trig: Free Run	м	2 3 4 5 6 WWWWW		Frequency 000000 GHz	Settings
u				Sig Track Of		P 4 25.75	NNNNN	Span		
Spectrum cale/Div 10 c	'B	R	ef Lvi Offset 11. ef Level 30.00 d	50 dB Bm	MKI		84 dBm		0000 GHz vept Span	
.og									ro Span	
0.0	01			_	_	_	-	F	Full Span	
10.0						0	1 -17.64 dBm	Start Fr	eq 000 MHz	
30.0				_	_		-4			
40.0 50.0 60.0		2			-	-	_	Stop Fr 26.000	eq 000000 GHz	
enter 13.02 (	GH7		#Video BW 300	kH7		Span	25.97 GHz	AL	JTO TUNE	
Res BW 100 Marker Table					Swee	p~2.49 s (		CF Ster 2.5970	00000 GHz	
Mode	Trace Scale	x	Y	Function	Function Width	Function	Value			
1 N 2 N		2.479 8 GHz 4.960 0 GHz	2.365 dBm -49.31 dBm					Freq OI	fset	
3 N 4 N 5	1 1	7.440 0 GHz 25.753 3 GHz	-49.65 dBm -40.84 dBm	_	_	-		0 Hz X Axis S		
6		Jui 05, 2021			1				ĩ	
5		2:53:26 PM					X	Signal 7 (Span Z)	oom)	
		purious Er	mission	_8DPS	SK_3M_	DH5_	2402	2MH	z	
pectrum Anal wept SA CEYSIGHT	-	+ Input Ζ: 50 Ω	#Atten: 30 dB	PNO: Fast	Avg Type: Log	-Prwer 4	23456	Q	Frequency	
	Coupling DC Align: Auto	Freq Ref: Int (S)		Gate: Off IF Gain: Low Sig Track: Off	Trig: Free Run	м	WWWWW NNNNN	13.015	Frequency 000000 GHz	Settings
Spectrum		P	ef Lvi Offset 11.		Mkr	4 25.71	2 6 GHz	Span 25.970	0000 GHz	
icale/Div 10 d		R	ef Level 30.00 d	Bm		-40.	24 dBm	- Sw	ept Span	
.0g								Ze	ro Span	
10.0	Q.							F	Full Span	
10.0				_			1-1/ 37 dBm	Start Fr		
20.0	A.	2 13					4	Stop Fr		
50.0	all in the second	. Q <sup>4</sup>		diameter of				26.000	000000 GHz	
enter 13.02			#Video BW 300	kHz			25.97 GHz		JTO TUNE	
Res BW 100 Marker Table	kHz ,				Swee	p ~2.49 s (	30001 pts)		00000 GHz	
	Trace Scale		Y	Function	Function Width	Function	Value	Au Ma	to in	
Mode		2.401 9 GHz	2.622 dBm					Freq Of	fset	
1 N	1 1 1 f		-49.06 dBm							
1 N 2 N 3 N	$   \begin{array}{c}     1 \\     1 \\     1 \\     1   \end{array} $	4.804 0 GHz 7.206 0 GHz	-49.06 dBm -50.04 dBm -40.24 dBm		_			0 Hz		
1 N 2 N		4.804 0 GHz	-49.06 dBm -50.04 dBm -40.24 dBm						Scale g	



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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 RSS-Gen §8.9 Table 5 and 6 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13.2.a, 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	MODEL NUM- BER	SERIAL NUM- BER	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.LIND- GREN	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 Instru- ments	EMC330	980096	11/19/2020	11/18/2021	
Pre-Amplifier	EMC Instru- ments	EMC0011830	980199	11/19/2020	11/18/2021	
Pre-Amplifier	EMC Instru- ments	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	

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

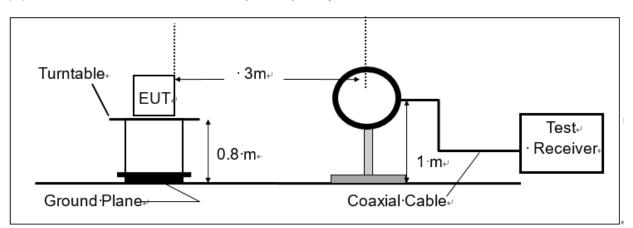
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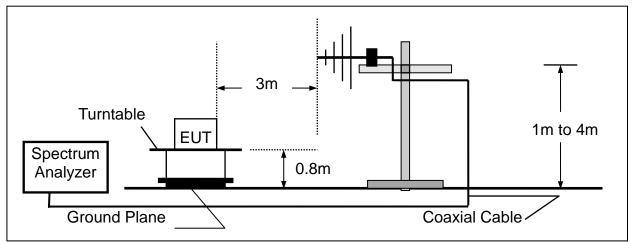


### 10.3 Test SET-UP

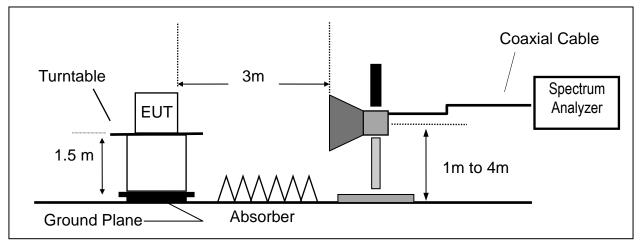
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(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.
- Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.</li>
- 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.
- 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 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) & RSS-GEN §6.13.2 was not reported.

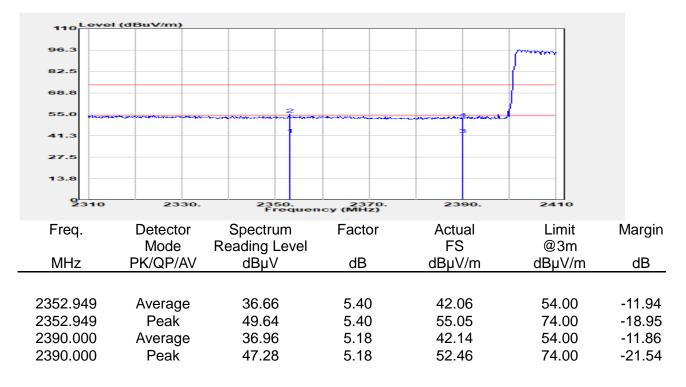
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## 10.7 Measurement Result: 10.7.1 Radiated Bandedge Result (Hopping Mode)

Report Number	:E2/2021/60097	Test Site	:966 Chamber C
Operation Mode	:BT EDR Hopping	Test Date	:2021-07-06
Test Frequency	:2402 MHz	Temp./Humi.	:23.1/54
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Ashton Chiu



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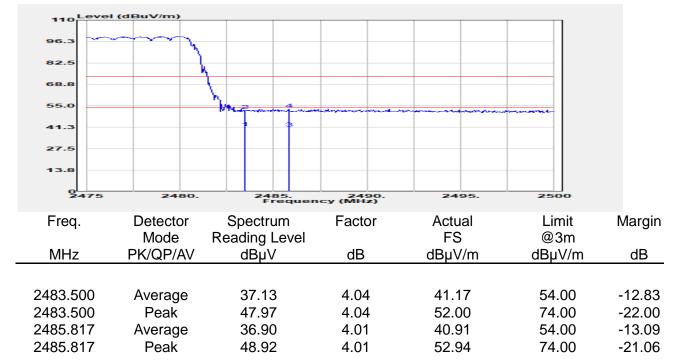
Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/0 :BT EDR H :2402 MH :BE CH L0 :H Plane	Hopping z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-06 :23.1/54 :Horizontal :Ashton Chiu	
110 Level (d 96.3 82.5 68.8 55.0 41.3 27.5 13.8	IBuV/m)					
2310	2330.	2350. Frequen	2370. cy (MHz)	2390.	2410	
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2387.885 2387.885 2390.000 2390.000	Average Peak Average Peak	36.77 49.18 37.00 47.83	5.09 5.09 5.18 5.18	41.86 54.27 42.18 53.01	54.00 74.00 54.00 74.00	-12.14 -19.73 -11.82 -20.99

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Report Number	:E2/2021/60097
Operation Mode	:BT EDR Hopping
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.1/54
Antenna Pol.	:Vertical
Engineer	:Ashton Chiu



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Margin

dB

-12.53 -21.18

-12.65

-21.09

74.00

:966 Chamber C



:E2/2021/60097

Peak

2485.817

**Report Number** 

Operation Mode:BT EDR HoppingTest Date:2021-07-06Test Frequency:2480 MHzTemp./Humi.:23.1/54Test Mode:BE CH HIGHAntenna Pol.:HorizontalEUT Pol:H PlaneEngineer:Ashton ChiuImage: Second Colspan="2">Image: Second Colspan="2">Image: Second Colspan="2">Image: Second Colspan="2">Image: Second Colspan="2">Second Colspan="2">Image: Second Colspan="2"Image: Image: Image: Image: Image: Image: Image	•	• _ • •					
Test Mode ::BE CH HIGH Antenna Pol. :Horizontal EUT Pol ::H Plane Engineer :Ashton Chiu	Operation Mode	:BT EDR H	lopping		Test Date	:2021-07-06	
EUT Pol : H Plane Enginer : Aston Chu	Test Frequency	:2480 MHz	<u> </u>		Temp./Humi.	:23.1/54	
$\frac{1}{2483.500} + \frac{1}{2483.500} + \frac{1}{2483.500} + \frac{1}{2483.79} + \frac{1}{2487} + \frac$	Test Mode	:BE CH HI	GH		Antenna Pol.	:Horizontal	
$\frac{1}{2483.500} \xrightarrow{\text{Average}}{\text{Average}} \xrightarrow{37.43} \underbrace{4.04}{4.04} \underbrace{41.47}{52.82} \xrightarrow{54.00}{74.00}$	EUT Pol	:H Plane			Engineer	:Ashton Chiu	
Parrs	96.3 92.5 68.8 55.0 41.3		A Barbaran Arean				
Frequency (MHz)Freq.Detector ModeSpectrum Reading Level dBµVFactor dBActual FS dBµV/mLimit @3m dBµV/m2483.500Average Peak37.43 48.794.0441.47 4.0454.00 52.82							
Mode       Reading Level       FS       @3m         MHz       PK/QP/AV       dBµV       dB       dBµV/m       dBµV/m         2483.500       Average       37.43       4.04       41.47       54.00         2483.500       Peak       48.79       4.04       52.82       74.00	2475	2480.	2485. Frequen	2490. cy (MHz)	2495.	2500	
2483.500       Average       37.43       4.04       41.47       54.00         2483.500       Peak       48.79       4.04       52.82       74.00	Freq.			Factor			
2483.500 Peak 48.79 4.04 52.82 74.00	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	
2483.500 Peak 48.79 4.04 52.82 74.00							
		-		-			
2485.817 Average 37.34 4.01 41.35 54.00							
	2485.817	Average	37.34	4.01	41.35	54.00	

Test Site

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48.90

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4.01

52.91



# 10.7.2 Radiated Bandedge Result (Non-Hopping Mode)

Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/ :BT BR :2402 MH :BE CH L0 :H Plane	Z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-06 :23.6/55 :Vertical :Ashton Chiu	
96.3 82.5 68.8 55.0 41.3 27.5 13.8	IBuV/m)					
2310	2330.	2350. Frequen	2370. cy (MHz)	2390.	2410	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2373.942 2373.942 2390.000 2390.000	Average Peak Average Peak	36.79 48.68 36.87 47.64	4.87 4.87 5.18 5.18	41.66 53.55 42.05 52.82	54.00 74.00 54.00 74.00	-12.34 -20.45 -11.95 -21.18

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/6 :BT BR :2402 MH: :BE CH LC :H Plane	z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber :2021-07-06 :23.6/55 :Horizontal :Ashton Chiu	С
110 Level (d 96.3 82.5 68.8 55.0 41.3 27.5 13.8	IBuV/m)					
2310	2330.	2350. Frequen	2370. cy (MHz)	2390.	2410	
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2383.077 2383.077 2390.000 2390.000	Average Peak Average Peak	37.16 48.85 37.15 48.37	4.88 4.88 5.18 5.18	42.04 53.73 42.33 53.55	54.00 74.00 54.00 74.00	-11.96 -20.27 -11.67 -20.45

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:966 Chamber C



:E2/2021/60097

**Report Number** 

Report Number	.LZ/Z0Z1/00037					
Operation Mode	:BT BR		Te	st Date	:2021-07-06	
Test Frequency	:2480 MHz		Те	mp./Humi.	:23.6/55	
Test Mode	:BE CH HIGH	4	Ar	ntenna Pol.	:Vertical	
EUT Pol	:H Plane		Er	ngineer	:Ashton Chiu	
Level (d	IBuV/m)					
96.3						
82.5						
68.8	+ + + +					
55.0		NN 2				
41.3			and a second		a source the sector	
27.5						
13.8						
2475	2480.	2485. Frequen	2490. cy (MHz)	2495.	2500	
Freq.	Detector Mode Re	Spectrum eading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	-	dB
		•			•	
2483.500	Average	37.62	4.04	41.66	54.00	-12.34
2483.500	Peak	49.79	4.04	53.83	74.00	-20.17

Test Site

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除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。



Report Number	:E2/2021/60097	,	Test Site	:966 Chamber C
Operation Mode	:BT BR		Test Date	:2021-07-06
Test Frequency	:2480 MHz		Temp./Humi.	:23.6/55
Test Mode	:BE CH HIGH		Antenna Pol.	:Horizontal
EUT Pol	:H Plane		Engineer	:Ashton Chiu
110 Level (d	BuV/m)			
96.3				
82.5	+ + + +			
68.8				
55.0		Monte day and a second	- Anno mar and a second and a second	and
41.3				
27.5				
13.8				
2475	2480.	2485. 24 Frequency (MH	90. 2495. z)	. 2500

Fre	•	ector Spect ode Reading		r Actual FS	Limit @3m	Margin
MF	lz PK/C	QP/AV dBµ	IV dB	dBµV/n	n dBµV/m	dB
2483	.500 Ave	erage 37.3	4.04	41.41	54.00	-12.59
2483	.500 Pe	eak 48.2	4.04	52.31	74.00	-21.69

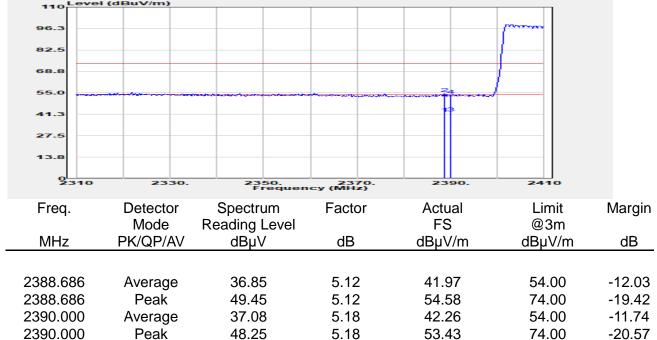
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Report Number	:E2/2021/60097			Test	Site	
Operation Mode	:BT BR	Норр	ing		Test	Date
Test Frequency	:2402 N	ИНz			Tem	p./H
Test Mode	:BE C⊦	I LOW			Antenna	
EUT Pol	:H Plan	ne			Eng	ineei
110 Level (d	BuV/m)					
96.3						
82.5						
68.8						
55.0				 *******		
41.3						

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.5/61
Antenna Pol.	:Vertical
Engineer	:Ashton Chiu

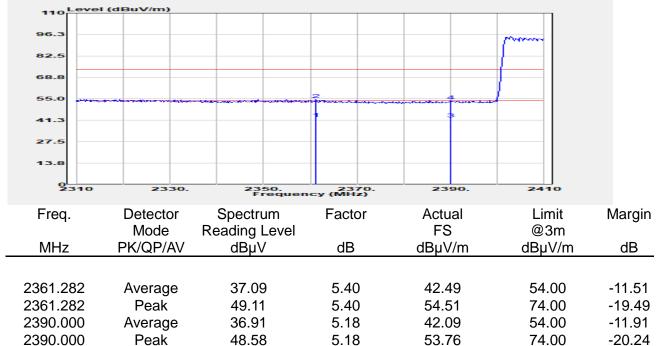


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Report Number	:E2/2021/60097
Operation Mode	:BT BR Hopping
Test Frequency	:2402 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane
110 Level (d	BuV/m)

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.5/61
Antenna Pol.	:Horizontal
Engineer	:Ashton Chiu

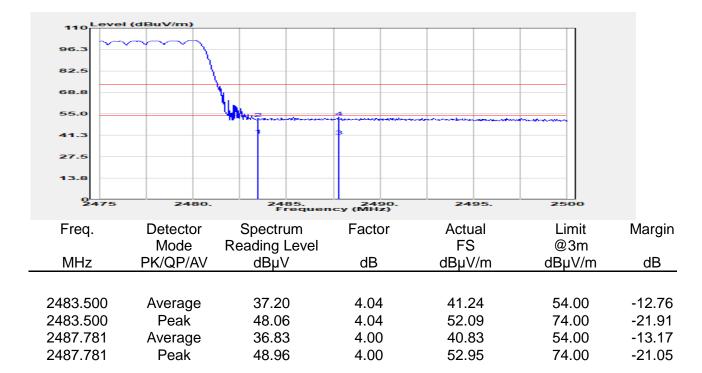


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Report Number	:E2/2021/60097
Operation Mode	:BT BR Hopping
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.5/61
Antenna Pol.	:Vertical
Engineer	:Ashton Chiu

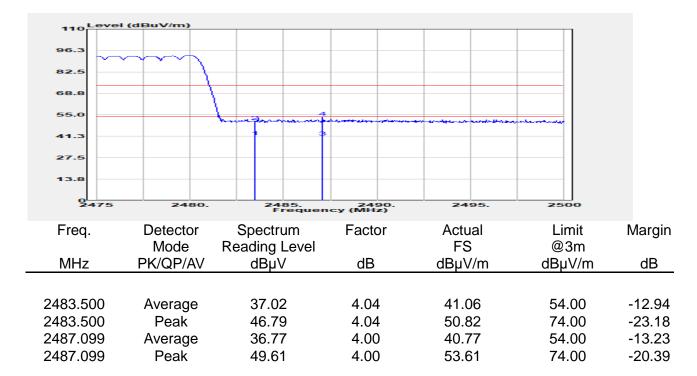


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Report Number	:E2/2021/60097
Operation Mode	:BT BR Hopping
Test Frequency	:2480 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.5/61
Antenna Pol.	:Horizontal
Engineer	:Ashton Chiu



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Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/60 :BT EDR :2402 MHz :BE CH LO :H Plane			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-06 :23.0/55 :Vertical :Ashton Chiu	
110 Level (d 96.3 82.5 68.8 55.0 41.3 27.5 13.8 9 2310	BuV/m)	2250.	2370. cy (MHz)	2390.		
Freq. MHz I	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2358.397 2358.397 2390.000 2390.000	Average Peak Average Peak	37.12 48.83 36.92 48.66	5.45 5.45 5.18 5.18	42.57 54.28 42.10 53.85	54.00 74.00 54.00 74.00	-11.43 -19.72 -11.90 -20.15

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/6 :BT EDR :2402 MHz :BE CH LC :H Plane	:	- - -	Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-06 :23.0/55 :Horizontal :Ashton Chiu	
110 Level (d 96.3 82.5 68.8 55.0 41.3 27.5 13.8	BuV/m)					
2310	2330.	2350. Frequen	2370. cy (MHz)	2390.	2410	
Freq. MHz I	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2360.481 2360.481 2390.000 2390.000	Average Peak Average Peak	36.79 48.74 37.06 46.87	5.44 5.44 5.18 5.18	42.23 54.18 42.24 52.05	54.00 74.00 54.00 74.00	-11.77 -19.82 -11.76 -21.95

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:966 Chamber C



:E2/2021/60097

**Report Number** 

report runnoor		00001				•
Operation Mode	:BT EDR		-	Test Date	:2021-07-06	
Test Frequency	:2480 MH	Z	-	Temp./Humi.	:23.0/55	
Test Mode	:BE CH H	IGH		Antenna Pol.	:Vertical	
EUT Pol	:H Plane		I	Engineer	:Ashton Chiu	
110 Level (d	IBuV/m)					
96.3						
82.5						
68.8						
55.0	er			-lande on - on barring - and a	and a second	
41.3						
27.5						
13.8						
2475	2480.	2485. Frequen	2490. cy (MHz)	2495.	2500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.500	Average	37.63	4.04	41.67	54.00	-12.33
2483.500	Peak	47.48	4.04	51.51	74.00	-22.49
2483.774	Average	37.48	4.03	41.51	54.00	-12.49
2483.774	Peak	49.00	4.03	53.03	74.00	-20.97

Test Site

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.966 Chamber C



·E2/2021/60007

Poport Number

Report Number	:E2/2021/6	50097	10	est Site	:966 Chamber C	j.
Operation Mode	:BT EDR		Te	est Date	:2021-07-06	
Test Frequency	:2480 MHz	Z	Te	emp./Humi.	:23.0/55	
Test Mode	:BE CH HI	GH	A	ntenna Pol.	:Horizontal	
EUT Pol	:H Plane		E	ngineer	:Ashton Chiu	
110 Level (d	BuV/m)					
96.3						
82.5	$  /   \rangle$					
68.8						
55.0			ana ana mado			
41.3						
27.5						
13.8						
0 2475	2480.	2485. Frequen	2490. cy (MHz)	2495.	2500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz F	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.500	Average	37.95	4.04	41.99	54.00	-12.01
2483.500	Peak	47.99	4.04	52.02	74.00	-21.98
	Average	37.97	4.03	42.00	54.00	-12.00
2483.694	Peak	50.37	4.03	54.40	74.00	-19.60

Tast Sita

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

Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/6 :BT BR :2441 MH; :TX CH M :H Plane	Z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-05 :23.2/54 :VERTICAL :Ashton Chiu	
100 Level (0 87.5 75.0 62.5 50.0 37.5 25.0 12.5 0 30	1BuV/m)	418. Frequen	612. cy (MHz)	806.		
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
34.663 78.189 403.077 538.317 841.442 942.484	Peak Peak Peak Peak Peak Peak	38.57 48.85 35.54 33.42 30.85 31.84	-8.86 -21.71 -12.29 -9.37 -6.31 -5.55	29.71 27.15 23.25 24.05 24.54 26.29	40.00 40.00 46.00 46.00 46.00 46.00	-10.29 -12.85 -22.75 -21.95 -21.46 -19.71

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/ :BT BR :2441 MH :TX CH M :H Plane	Z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-05 :23.2/54 :HORIZONTAL :Ashton Chiu	
100 Level ( 87.5 75.0 62.5 50.0 37.5 25.0 12.5 0 30	1BuV/m)	418. Frequen	612. cy (MHz)	5	6	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
45.545 183.894 249.183 440.385 746.619 976.683	Peak Peak Peak Peak Peak Peak	39.83 47.98 43.23 40.66 38.27 31.41	-16.14 -20.19 -16.22 -11.80 -7.79 -5.51	23.69 27.78 27.01 28.86 30.48 25.91	40.00 43.50 46.00 46.00 46.00 54.00	-16.31 -15.72 -18.99 -17.14 -15.52 -28.09

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# 10.7.4 Radiated Spurious Emission above 1 GHz:

Report Number Operation Mode Test Frequency Test Mode EUT Pol	:E2/2021/ :BT BR :2402 MH :TX CH L0 :H Plane	z	ד ד <i>A</i>	Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:966 Chamber C :2021-07-06 :22.8/51 :Vertical :Ashton Chiu	
100 Level (d	BuV/m)				<b></b>	
87.5						
75.0						
62.5						
50.0	4	•				
37.5	2 3					
25.0						
12.5						
9000	6100.	11200. Frequen	16300. cy (MHz)	21400	. 26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804 000	Average	10.00	40.07	20.05	E4.00	00 45
4804.000 4804.000	Average Peak	19.98 30.02	10.87 10.87	30.85 40.89	54.00 74.00	-23.15 -33.11
7206.000	Average	19.12	10.87	40.89 36.39	54.00	-33.11
7206.000	Peak	30.98	17.27	48.25	74.00	-25.75
7206.000	Peak	30.98	17.27	48.25	74.00	-25.75

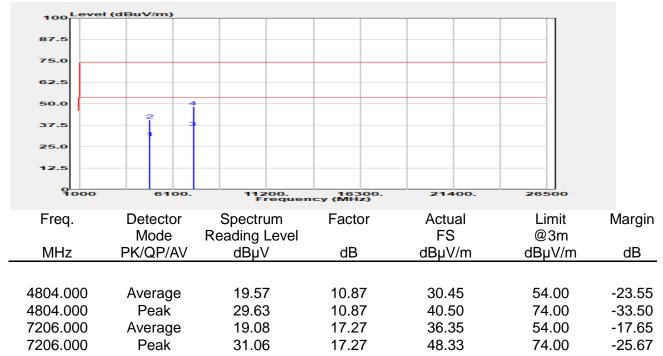
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Report Number	:E2/2021/60097
Operation Mode	:BT BR
Test Frequency	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:H Plane

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:22.8/51
Antenna Pol.	:Horizontal
Engineer	:Ashton Chiu

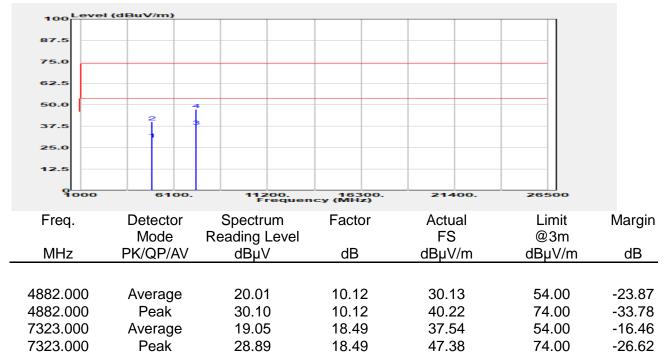


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Report Number	:E2/2021/60097
Operation Mode	:BT BR
Test Frequency	:2441 MHz
Test Mode	:TX CH MID
EUT Pol	:H Plane

Test Site	:966 Chamber C	
Test Date	:2021-07-06	
Temp./Humi.	:22.8/51	
Antenna Pol.	:Vertical	
Engineer	:Ashton Chiu	

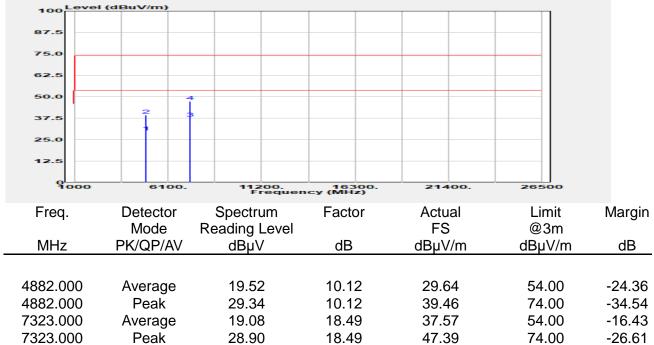


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Report Number	:E2/2021/60097	Т
Operation Mode	:BT BR	Т
Test Frequency	:2441 MHz	Т
Test Mode	:TX CH MID	
EUT Pol	:H Plane	E
100 Level (d	BuV/m)	
87.5		

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:22.8/51
Antenna Pol.	:Horizontal
Engineer	:Ashton Chiu



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-26.69

:966 Chamber C



:E2/2021/60097

**Report Number** 

7440.000

Peak

Repetition		00001				
Operation Mode	:BT BR		Te	est Date	:2021-07-06	
Test Frequency	:2480 MH	Z	Te	emp./Humi.	:22.8/51	
Test Mode	:TX CH H	IGH	A	ntenna Pol.	:Vertical	
EUT Pol	:H Plane		E	ngineer	:Ashton Chiu	
100 Level (	dBuV/m)		1			
87.5						
75.0						
62.5						
50.0		4 				
37.5	2 :	3				
25.0						
12.5						
9	6100.	11200. Frequen	16300. су (MHz)	21400	26500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.000	Average	19.84	10.20	30.04	54.00	-23.96
4960.000 7440.000	Peak Average	29.44 19.05	10.20 17.86	39.64 36.91	74.00 54.00	-34.36 -17.09
7440.000	Average	13.05	17.00	00.31	54.00	-17.09

Test Site

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29.45

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17.86

47.31

74.00

Margin

dB

-24.34

-33.31

-16.96

-26.29

74.00

54.00

74.00

:966 Chamber C

Test Site



:E2/2021/60097

Peak

Average

Peak

Report Number

4960.000 7440.000

7440.000

	topolit l'uniber	. 2021/	00037			
(	Operation Mode	:BT BR		Te	est Date	:2021-07-06
-	Test Frequency	:2480 MH	Z	Te	emp./Humi.	:22.8/51
-	Test Mode	:TX CH H	IGH	A	ntenna Pol.	:Horizontal
E	EUT Pol	:H Plane		E	ngineer	:Ashton Chiu
					-	
	100 Level (d	dBuV/m)				
	87.5					
	75.0					
	62.5					
	50.0		1 1			
	37.5	2	8			
	25.0					
	12.5					
	9000	6100.	11200. Frequen	16300. icy (MHz)	21400	. 26500
	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m
	MHz	PK/QP/AV	Reading Level dBµV	dB	гз dBµV/m	-
	4960.000	Average	19.46	10.20	29.66	54.00

30.48

19.18

29.85

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10.20

17.86

17.86

40.69

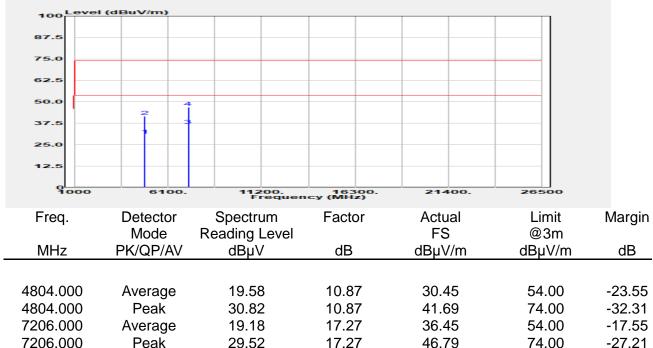
37.04

47.71



Rep	oort Number	:E2/2021/60097
Ope	eration Mode	:BT EDR
Tes	t Frequency	:2402 MHz
Tes	t Mode	:TX CH LOW
EU	T Pol	:H Plane
	Level (d	BuV/m)

Test Site	:966 Chamber C	
Test Date	:2021-07-06	
Temp./Humi.	:23.0/54	
Antenna Pol.	:Vertical	
Engineer	:Ashton Chiu	

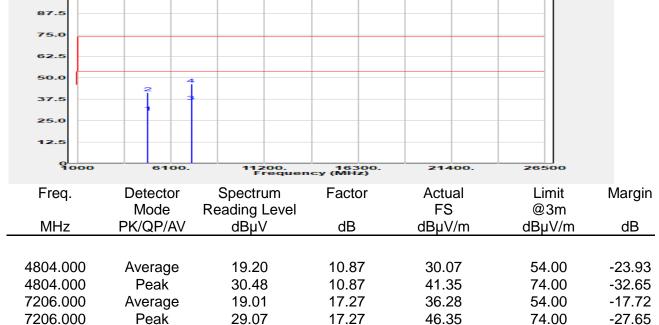


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Report Number	:E2/2021/60097	Test Site
Operation Mode	:BT EDR	Test Date
Test Frequency	:2402 MHz	Temp./Humi.
Test Mode	:TX CH LOW	Antenna Pol.
EUT Pol	:H Plane	Engineer
100 Level (d	BuV/m)	
87.5		
75.0		
62.5		
50.0	4	
37.5	2	
25.0		

Test Site:966 Chamber CTest Date:2021-07-06Temp./Humi.:23.0/54Antenna Pol.:HorizontalEngineer:Ashton Chiu



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:966 Chamber C



:E2/2021/60097

**Report Number** 

Report Ramber	. 2021/	00037				
Operation Mode	:BT EDR		Т	est Date	:2021-07-06	
Test Frequency	:2441 MH	Z	Т	emp./Humi.	:23.0/54	
Test Mode	:TX CH M	IID	А	ntenna Pol.	:Vertical	
EUT Pol	:H Plane		E	ngineer	:Ashton Chiu	
100 Level (	dBuV/m)				<b>_</b>	
87.5						
75.0						
62.5						
50.0		•				
37.5	2	3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	-
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1000 000	•	10.00	40.40	00.04	54.00	~~~~~
4882.000	Average	19.89	10.12	30.01	54.00	-23.99
4882.000	Peak	30.19	10.12	40.30	74.00	-33.70
7323.000	Average	19.25	18.49	37.74	54.00	-16.26
7323.000	Peak	29.19	18.49	47.68	74.00	-26.32

Test Site

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:966 Chamber C



:E2/2021/60097

**Report Number** 

Report Number	.LZ/ZUZ 1/	00097				
Operation Mode	:BT EDR		Te	est Date	:2021-07-06	
Test Frequency	:2441 MH	Z	Te	emp./Humi.	:23.0/54	
Test Mode	:TX CH M	liD	Ar	ntenna Pol.	:Horizontal	
EUT Pol	:H Plane		Er	ngineer	:Ashton Chiu	
100 Level (	dBuV/m)				<b>_</b>	
87.5						
75.0						
62.5						
50.0		• • • • • • • • • • • • • • • • • • •				
37.5	2	3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	· ·
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4992 000		10.00	10.10	20.25	E4 00	04.05
4882.000 4882.000	Average Peak	19.23 29.86	10.12 10.12	29.35 39.98	54.00 74.00	-24.65 -34.02
7323.000	Average	19.14	18.49	39.98	54.00	-34.02 -16.37
7323.000	Peak	28.81	18.49	47.30	74.00	-26.70

Test Site

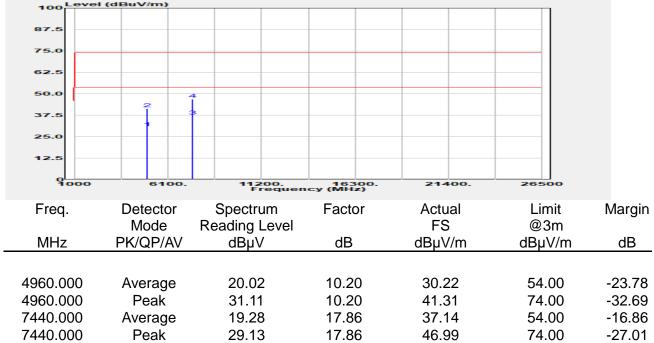
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Report Number	:E2/2021/60097		Test	S
Operation Mode	:BT EDR		Test	: C
Test Frequency	:2480 MHz		Tem	p.
Test Mode	:TX CH HIGH		Ante	en
EUT Pol	:H Plane		Eng	in
100 Level (d	BuV/m)	 		
87.5				
75.0				
62.5				
50.0				
	2			

Test Site	:966 Chamber C
Test Date	:2021-07-06
Temp./Humi.	:23.0/54
Antenna Pol.	:Vertical
Engineer	:Ashton Chiu



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Report Number	:E2/2021/6	60097		Test Site	:966 Chamber (	2
Operation Mode	:BT EDR			Test Date	:2021-07-06	
Test Frequency	:2480 MHz	Z		Temp./Humi.	:23.0/54	
Test Mode	:TX CH HI	GH		Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Ashton Chiu	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0	2					
37.5		<u>}</u>				
25.0						
12.5						
1000	6100.	11200. Frequen	16300. cy (MHz)	21400	. 26500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz F	PK/QP/AV	dBµV	dB	dBµV/m	-	dB
	Average	20.45	10.20	30.65	54.00	-23.35
4960.000 7440.000	Peak Average	30.04 19.35	10.20 17.86	40.25 37.21	74.00 54.00	-33.75 -16.79
7440.000	Peak	30.14	17.86	48.00	74.00	-26.00

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# **11 FREQUENCY SEPARATION**

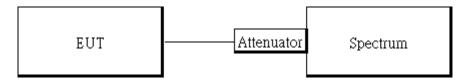
### 11.1 Standard Applicable

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	MODEL NUM- BER	SERIAL NUM- BER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
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	MVE2213-10	RF12	11/19/2020	11/18/2021		
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021		
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021		
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R		
Test Software	SGS Taiwan	Radio Test Soft- ware	Ver.21	N.C.R	N.C.R		

#### 11.3 Test Set-up



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#### 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

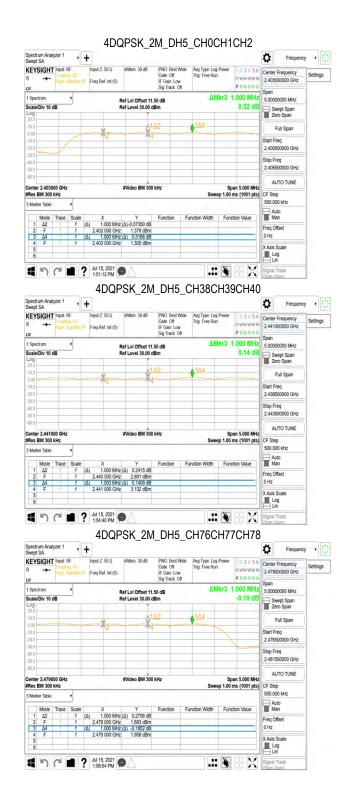
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#### 11.6 Frequency Separation Test Plots





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# **12 NUMBER OF HOPPING FREQUENCY**

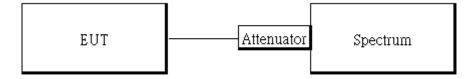
### 12.1 Standard Applicable

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	MODEL NUMBER	SERIAL NUM- BER	LAST CAL.	CAL DUE.	
Spectrum Ana- lyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022	
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	MVE2213-10	RF12	11/19/2020	11/18/2021	
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021	
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021	
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021	
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R	
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R	

#### 12.3 Test Set-up



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#### 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.

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#### 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	

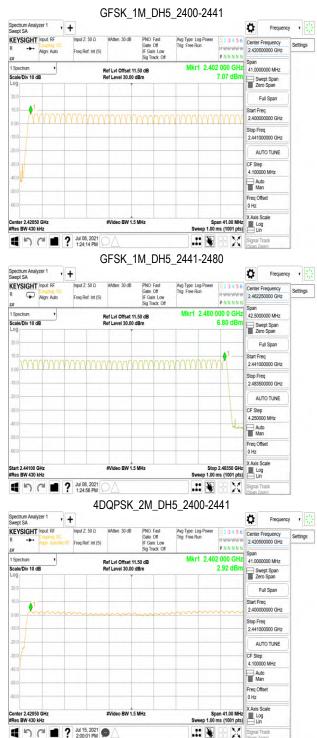
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#### 12.6 Channel Number Test Plots



4DQPSK 2M DH5 2441-2480 Spectrum Analyzer 1 Swept SA · + Ö Frequency . PNO: Fast Gate: Off IF Gain: Low Sig Track: Off KEYSIGHT Input RF Input 7: 50.0 #Atten: 30 dB Avg Type: Log-Powe Trig: Free Run Center Fr Settings 2.462250 Ģ Freq Ref: Int (S) PNNNN Mkr1 2.480 000 0 GHz 42.5000000 MHz 1 Spectrum Ref Lvi Offset 11.50 dB Ref Level 30.00 dBm Scale/Div 10 dB 1.32 d Swept Span Zero Span Full Span Start Freq 2.441000000 GHz ۵ Stop Freq 2.4835000 000 GH AUTO TUNE CF Step 4.250000 MHz Auto Man req Offse 0 Hz X Axis Scale Start 2.44100 GHz #Res BW 430 kHz eo BW 1.5 MHz Stop 2,48350 GH Stop 2.48350 GHz Log Sweep 1.00 ms (1001 pts) 1 5 C 1 ? Jul 15, 2021 Signal Trac

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# 13 TIME OF OCCUPANCY (DWELL TIME)

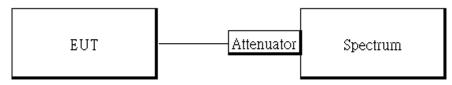
### 13.1 Standard Applicable

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.

	Conducted Emission Test Site: Conducted D						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM- BER	LAST CAL.	CAL DUE.		
Spectrum Ana- lyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022		
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	MVE2213-10	RF12	11/19/2020	11/18/2021		
Attenuator	Marvelous	WATT-218FS-10	RF16	11/19/2020	11/18/2021		
DC Block	PASTER- NACK	PE8210	RF152	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F2A196C	RF62	11/19/2020	11/18/2021		
Test Software	Qualcomm	QRCT	V4.0.00161.0	N.C.R	N.C.R		
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R		

#### 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 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

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)
Mid	2DH1	124.80	400ms	2.564	3.00
	2DH3	262.40	400ms	0.610	1.00
	2DH5	307.20	400ms	0.347	1.00

#### 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
Mid	3DH1	124.80	400ms	2.564	3.00
	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	=	2.895 *	(1600/6/79)	*	31.6 =	308.80 (ms)

#### π/4 -DQPSK (2Mbps):

CH Mid	2DH1 time slot $=$	0.390 *	(1600/2/79)	*	31.6 =	124.80 (ms)
	2DH3 time slot $=$	1.640 *	(1600/4/79)	*	31.6 =	262.40 (ms)
	2DH5 time slot $=$	2.880 *	(1600/6/79)	*	31.6 =	307.20 (ms)

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

CH Mid	3DH1 time slot =	0.390 *	(1600/2/79) *	31.6 =	124.80 (ms)
	3DH3 time slot $=$	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	3DH5 time slot =	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)

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

#### 13.6 Measurement Result

Note: Refer to next page for plots.

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#### Dwell Time\_GFSK\_1M\_DH1\_2441MHz



Marker Tabl

Δ2 E

Δ4 E

Mode Trace Scale

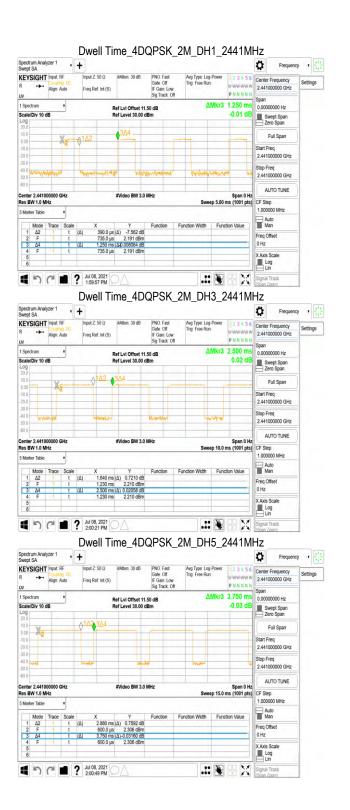
Jui 08, 2021 1:59:26 PM

(Δ)

(Δ)

2.895 ms (Δ) 0.4152 dB

1.905 ms 4.749 dBm 3.750 ms (Δ) 0.03528 dB 1.905 ms 4.749 dBm



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1.000000 MH

Auto Man

Freq Offse

X Axis Sc Log Lin

0 Hz

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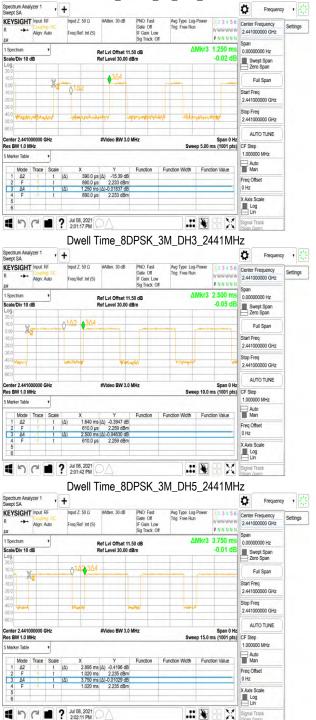
Function Function Width Function Value

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SGS Taiwan Ltd.	NO.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號					



Dwell Time\_8DPSK\_3M\_DH1\_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 with unique RF connector and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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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