

ELECTROMAGNETIC EMISSIONS **COMPLIANCE REPORT**



FCC Applicant:	Quanta Computer Inc. No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan
FCC Manufacturer:	Quanta Computer Inc. No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan
Product Name:	QOCA wireless digital stethoscope
Brand Name:	Quanta, QOCA
Model No.:	steth02
Report Number:	TERF2212002786E2
FCC ID	HFSMHA
Date of EUT Received:	December 16, 2022
Date of Test:	January 09, 2023 \sim February 15, 2023
Issue Date:	February 23, 2024

Vit, lei Approved By

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.

The results of this report relate only to the sample identified in this 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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Revision History							
Report Number	Revision	Description	Issue Date	Revised By	Remark		
TERF2212002786E2	00	Original.	November 01, 2023	Kate Lai			
TERF2212002786E2	01	Revise: 1.3 Antenna Designation 5 MEASUREMENT UNCERTAINTY 9.4 Measurement Result	January 30, 2024	Kate Lai	*		
TERF2212002786E2	02	Revise: 8.2.2 Output Power 8.3.2 Output Power 8.5 Output Power:	February 06, 2024	Kate Lai	*		
TERF2212002786E2	03	Revise: 8.2.2 Output Power	February 20, 2024	Kate Lai	*		
TERF2212002786E2	04	Revise: 8.3.2 Output Power	February 23, 2024	Kate Lai	*		

Note:

- 1 . The remark "*" indicates modification of the report upon requests from certification body.
- 2 Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received...

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GENERAL INFORMATION 1

1.1 **Product Description**

Product Name:	QOCA wireless digital stethoscope			
Brand Name:	Quanta, QOCA			
Model No.:	steth02			
Hardware Version:	N/A			
Firmware Version:	N/A			
EUT Series No.:	TE_SP_202301100346			
Power Supply:	3.85V			
Test Software (Name/Version)	Smart RF Studio 2.27.0			

1.2 **RF** Specification

Radio Technology:	BLE			
Frequency Range:	2402 – 2480MHz			
Channel number:	40 channels			
Modulation type:	GFSK			
Transmit Power:	BLE 1M: 3.48 dBm BLE 2M: 3.44 dBm			

1.3 **Antenna Designation**

Antenna	Supplier	Antenna	Freq.	Peak Antenna
Type		Part No.	(MHz)	Gain (dBi)
FPC Antenna	Pulse (Suzhou) Wireless Products Co., Ltd	TZ24853	2402 – 2480	-1.66

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	
	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1 SAC 2 SAC 3 Conduction 1 Conducted 1 Conducted 2 Conducted 3 Conducted 4 Conducted 5	TW0027		
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conducted 6 Conduction C SAC C SAC D SAC G Conducted A Conducted B Conducted D Conducted D Conducted F Conducted G	TW0028	TW3702	
Note: Test site name is remarked on the equipment list in each section of this report as an indica- tion where measurements occurred in specific test site and address.					

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

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SYSTEM TEST CONFIGURATION 2

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*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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

2.4.2 For all conducted test items:

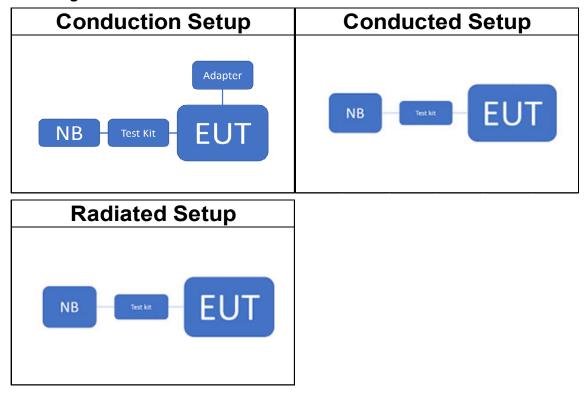
The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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Test Configuration 2.5



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2.6 Control Unit(s)

	AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
USB Cable	MI	SJX10ZM	N/A	N.C.R	N.C.R	
Notebook	Lenovo	L480	P0002332	N.C.R	N.C.R	
Test Kit	ТІ	LAUNCHXL- CC2642R1 Evaluation board	N/A	N.C.R	N.C.R	
USB cable	ТІ	LAUNCHXL- CC2642R1 Micro- USB cable	N/A	N.C.R	N.C.R	
Adapter	Sony	AC-0400-TW	N/A	N.C.R	N.C.R	
	C	conducted Emission 1	Test Site: Conducted	F		
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Test Kit	ТІ	LAUNCHXL- CC2642R1 Evaluation board	N/A	N.C.R	N.C.R	
USB cable	ТІ	LAUNCHXL- CC2642R1 Micro- USB cable	N/A	N.C.R	N.C.R	
Notebook	Lenovo	L480	P0002332	N.C.R	N.C.R	
		Radiated Emissio	n Test Site: SAC C			
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Notebook	Lenovo	L480	P0002332	N.C.R	N.C.R	
Test Kit	ТІ	LAUNCHXL- CC2642R1 Evaluation board	N/A	N.C.R	N.C.R	
USB cable	ТІ	LAUNCHXL- CC2642R1 Micro- USB cable	N/A	N.C.R	N.C.R	

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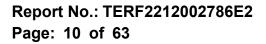
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SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	Emission Bandwidth	Compliant
§15.247(d) §15.205 §15.209	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203	Antenna Requirement	Compliant

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DESCRIPTION OF TEST MODES 4

4.1 **Operating Frequencies**

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	15	2430 MHz	29	2458 MHz
2	2404 MHz	16	2432 MHz	30	2460 MHz
3	2406 MHz	17	2434 MHz	31	2462 MHz
4	2408 MHz	18	2436 MHz	32	2464 MHz
5	2410 MHz	19	2438 MHz	33	2466 MHz
6	2412 MHz	20	2440 MHz	34	2468 MHz
7	2414 MHz	21	2442 MHz	35	2470 MHz
8	2416MHz	22	2444 MHz	36	2472 MHz
9	2418 MHz	23	2446 MHz	37	2474 MHz
10	2420 MHz	24	2448 MHz	38	2476 MHz
11	2422 MHz	25	2450 MHz	39	2478 MHz
12	2424 MHz	26	2452 MHz	40	2480 MHz
13	2426 MHz	27	2454 MHz		
14	2428 MHz	28	2456 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 the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.
- 4. Investigation has been done on all the possible configurations for searching the worst case.

CONDUCTED TEST						
MODE AVAILABLE TESTED MODULATION DATA RA CHANNEL CHANNEL MODULATION (Mbps)						
Bluetooth LE	0 to 39	0,20,39	GFSK	1		
Bluetooth LE	0 to 39	0,20,39	GFSK	2		

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		
Bluetooth LE	0 to 39	20	GFSK	1		
Bluetooth LE	0 to 39	20	GFSK	2		
	RADIATED	EMISSION TEST (ABOVE 1 GHz)			
MODE AVAILABLE TESTED MODULATION DATA RATE (Mbps)						
Bluetooth LE	0 to 39	0,20,39	GFSK	1		
Bluetooth LE	0 to 39	0,20,39	GFSK	2		

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5 MEASUREMENT UNCERTAINTY

Test Items	U	ncertaint	y
AC Power Line Conducted Emission	+/-	2.32	dB
Output Power measurement	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
Conducted emission measurement	+/-	1.68	dB
Peak Power Density	+/-	2.16	dB
Temperature	+/-	0.7	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty					
	+/-	2.8	dB	9kHz~30MHz	
Polarization: Vertical	+/-	4.82	dB	30MHz - 1000MHz	
Polarization. Vertical	+/-	4.37	dB	1GHz - 18GHz	
	+/-	4.21	dB	18GHz - 40GHz	
	+/-	2.8	dB	9kHz~30MHz	
Polarization: Horizontal	+/-	4.54	dB	30MHz - 1000MHz	
Folarization: Horizontal	+/-	4.37	dB	1GHz - 18GHz	
	+/-	4.21	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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MEASUREMENT EQUIPMENT USED 6

6.1 **Emission from AC power line**

	AC Power-Line Conducted Emission Test Site: Conduction C							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	04/13/2022	04/12/2023			
EMI Test Receiver	R&S	ESCI	101342	04/25/2022	04/24/2023			
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2022	03/26/2023			
Coaxial Cable	EMC Instruments Corp	EMC5D-BM-BM- 3000	1401004	03/27/2022	03/26/2023			
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R			

6.2 **Conducted Measurement**

Conducted Emission Test Site: Conducted F						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071574	06/20/2022	06/19/2023	
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R	
Attenuator	Woken	WATT-218FS-10	RF20	11/16/2022	11/15/2023	
DC Block	PASTERNACK	PE8210	RF153	11/16/2022	11/15/2023	

6.3 **Radiated Measurement**

	Radiated Emission Test Site: SAC C						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/19/2022	12/18/2023		
Horn Antenna	Schwarzbeck	BBHA9170	184	12/30/2022	12/29/2023		
Horn Antenna	Schwarzbeck	BBHA9170	185	08/22/2022	08/21/2023		
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/31/2022	05/30/2023		
Loop Antenna	ETS.LINDGREN	6502	143303	05/14/2022	05/13/2023		
3m Site NSA	SGS	966 chamber D	N/A	04/30/2022	04/29/2023		
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R		
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	10/25/2022	10/24/2023		
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/16/2022	11/15/2023		
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/16/2022	11/15/2023		
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/16/2022	11/15/2023		
Coaxial Cable	Huber Suhner	EMC106-SM-SM- 7200	150703	11/16/2022	11/15/2023		
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/16/2022	11/15/2023		

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

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CONDUCTED EMISSION TEST 7

7.1 **Standard Applicable:**

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

Frequency range		imits BµV)
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
NL (

Note

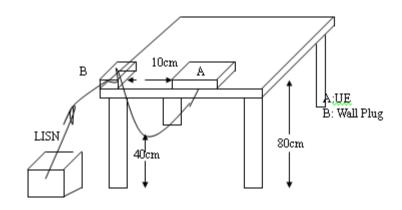
1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

7.2 **EUT Setup:**

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 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.

7.3 **Test Setup**



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7.4 **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 phases of power being supplied by given UE are completed

7.5 **Measurement Result:**

Note: Refer to next page for measurement data and plots. Note2: The * reveals the worst-case results that closest to the limit.

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AC DOWER LINE CONDUCTED EMISSION TEST DATA

A	C POWER LINE COND	UCTED EMIS	SION TEST DAT	A
Report Number	:TERF2212002786E2	Test Site	:Conduction C	
Test Mode	:BLE	Test Date	:2023-02-15	
Power	:120/60Hz	Temp./Humi.	:22.1/56	
		•		
Probe	:L1	Engineer	:Howard Huang	
80 Level (0	dBuV)			
70.0				_
60.0 24				-
50.0				-
40.0		7		-
30.0	Marine and	monu	MANNA 8	-
20.0			- many many	-
10.0			×	•
0.15	0.5 1 Freque	2 5 ncy (MHz)	10 20 3	30
Freq.	Detector Spectrum Mode Reading Level		ctual Limit FS	Margin
MHz I	PK/QP/AV dBμV		BµV dBµV	dB
0.155	Average 21.90	10.27 32	2.17 55.74	-23.57
0.155	QP 45.60	10.27 5	5.87 65.74	-9.87
0.178	Average 20.60	10.27 30	0.87 54.59	-23.72
0.178	QP 43.40	10.27 53	3.67 64.59	-10.92
0.456	Peak 31.68	10.31 4	1.99 56.76	-14.77
0.968	Peak 24.47	10.37 34	4.83 56.00	-21.17
<u> </u>	D I O I O I O I O I O I O I O I O I O I O I O I O I O O O O O O O O O O			

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21.71

11.03

Peak

Peak

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11.13

10.86

32.84

21.89

2.144

19.224

f (886-2) 2298-0488

56.00

60.00

-23.16

-38.11



Report Number	:TERF2212002786E2	Test Site	:Conduction	C
Test Mode	:BLE	Test Date	:2023-02-15	
Power	:120/60Hz	Temp./Humi.	:22.1/56	
Probe	:N	Engineer	:Howard Hua	na
TIODC		Engineer	.noward nda	ng
80 Level (dBuV)			
70.0				
60.0				
50.0	M.			
40.0	- IM Man			
30.0 3	My my whom	March		
20.0		. which many	Manhanna	
10.0				
0.15	0.5 1	2 5	10 2	0 30
_		ency (MHz)		
Freq.	Detector Spectrum Mode Reading Level		ctual I FS	Limit Margin
MHz I	PK/QP/AV dBµV			lBμV dB
			•	
0.153	Average 22.00	10.28 3	2.28 5	5.82 -23.54
0.153	QP 46.60			5.82 -8.94
0.178	Average 19.20	-		64.59 -25.12
0.178	QP 43.40			64.59 -10.92
0.456	Peak 26.32			6.76 -20.14
1.172	Peak 18.54			ie.00 -26.94
2.012	Peak 16.25			6.00 -28.62
19.224	Peak 10.18	10.83 2	1.01 6	60.00 -38.99

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PEAK OUTPUT POWER MEASUREMENT 8

8.1 **Standard Applicable:**

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

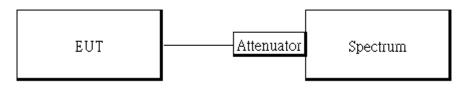
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

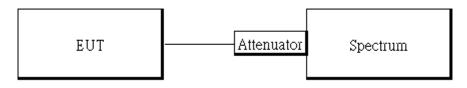
All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

8.2 Test Setup

8.2.1 Duty Cycle



8.2.2 Output Power



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8.3 **Measurement Procedure:**

8.3.1 **Duty Cycle**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Set span = Zero
- 3. RBW = 8MHz, VBW = 8MHz,
- 4. Detector = Peak

8.3.2 **Output Power**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Record the max. Reading as observed from Spectrum Analyzer.
- 5. Repeat above procedures until all test default channel measured was complete.

8.4 **Duty Factor:**

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log(1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
BLE 1M	100.00	0.00	0.33	0.01
BLE 2M	100.00	0.00	0.33	0.01

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Report No.: TERF2212002786E2 Page: 21 of 63

BLE_1M_LowCH00-2402

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2 F 1 t 1.000 msi 2.236 dBm Feed Unset <	Mode	Trace Scale	•	Х	Y	Function	Function Width	n Fund	tion Value			
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Log Jan 10, 2023 BLE_2M_LowCH00-2402 BLE_2M_LowCH00-2402 BLE_2M_LowCH00-2402 BLE_2M_LowCH00-2402 BLE_2M_LowCH00-2402 PNNNN Support Analyzer 1 + PSIGHT Input. RF Corrections. Off Mayn. AutoNo RF Freq Ref. Int (S) PNN NNN Support AutoNo RF Freq Consections (MB) PNN NNN PNN NNN Support AutoNo RF Freq Consections (MB) PNN NNN PNN NNN Support AutoNo RF Freq Consections (MB) PNN NNN PNN NNN PNN		1 t		1.000 ms	2.236 dBm					X Axis	Scale	
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8.5 **Output Power:**

8.5.1 Peak & Avg

BLE 1M mode:

СН	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	5	3.48	30
Mid	2442	5	3.46	30
High	2480	5	3.21	30
СН	Frequency (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit (dBm)
Low	2402	5	3.46	30
Mid	2442	5	3.33	30
High	2480	5	3.05	30

*Note: Measured by spectrum analyzer, cable loss 10.8 dB + Duty cycle factor has been offseted to the spectrum analyzer for Avg. power and cable loss has been offseted for Peak power measurement.

BLE 2M mode:

СН	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	5	3.41	30
Mid	2442	5	3.44	30
High	2480	5	3.17	30
СН	Frequency (MHz)	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit (dBm)
			(ubiii)	
Low	2402	5	3.38	30
Low Mid	2402 2442	5 5	· · · ·	30 30

*Note: Measured by spectrum analyzer, cable loss 10.8 dB + Duty cycle factor has been offseted to the spectrum analyzer for Avg. power and cable loss has been offseted for Peak power measurement.

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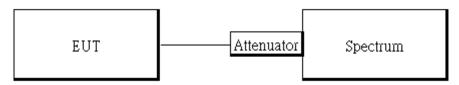


9 EMISSION BANDWIDTH MEASUREMENT

9.1 **Standard Applicable**

The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 **Test Setup**



9.3 **Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

9.3.1 FCC measurements

- 1. The testing follows the Measurement Procedure of the KDB 558074 D01.
- 2. Set the spectrum analyzer as RBW= 100 kHz, VBW = 3 X RBW. Span= 2 to 5 times of the OBW, Sweep=auto, Detector = Peak, and Max hold.
- 3. Mark the upper and lower frequencies of -6dB.
- 4. Repeat above procedures until all test default channel is completed.

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9.4 **Measurement Result:**

BLE 1M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.6898	\ge 0.5	PASS
2442	0.7162	≧ 0.5	PASS
2480	0.703	≧ 0.5	PASS

BLE 2M mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	1.338	\ge 0.5	PASS
2442	1.387	\ge 0.5	PASS
2480	1.335	\ge 0.5	PASS

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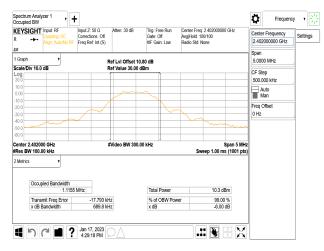
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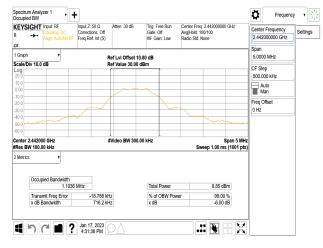
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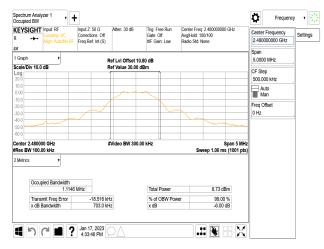
OBW_BLE 1M_LowCH00-2402MHz



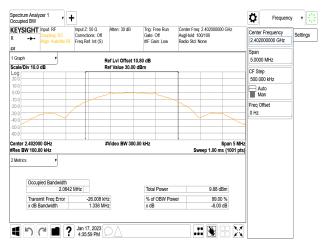
OBW_BLE 1M_MidCH20-2442MHz



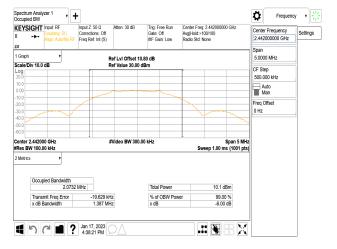
OBW_BLE 1M_HighCH39-2480MHz



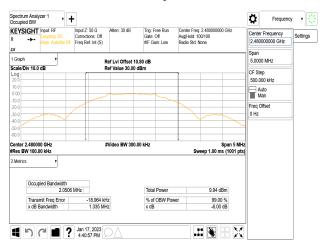
OBW_BLE 2M_LowCH00-2402MHz



OBW_BLE 2M_MidCH20-2442MHz



OBW_BLE 2M_HighCH39-2480MHz



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10 CONDUCTED BAND EDGES 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, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

10.2 Test Setup



10.3 Measurement Procedure

10.3.1 Reference Level of Emission Limit:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

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10.3.2 **Conducted Band Edge:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Set DL as the limit = reading on marker of reference level measurement 20dBm
- Mark the highest readings of the emissions outside of 2400MHz~2483.5MHz.
- 8. Repeat above procedures until all default test channel (low and high) was complete.

10.3.3 **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set RBW = 100 kHz & VBW=300 kHz, Detector =Peak, Sweep = Auto
- 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.

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10.4 **Measurement Result**

BLE 1M_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	1.92	-18.08
2442	1.77	-18.23
2480	1.53	-18.47

NOTE: cable loss as 10.8dB that offsets in the spectrum NOTE: Refer to next page for plots.

BLE 2M_Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	0.93	-19.07
2442	0.70	-19.30
2480	0.34	-19.66

NOTE: cable loss as 10.8dB that offsets in the spectrum NOTE: Refer to next page for plots.

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Reference Level_BLE 1M_LowCH00-2402MHz



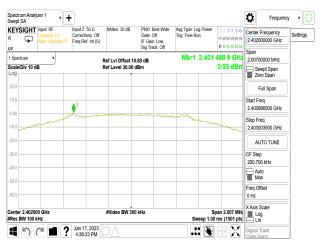
Reference Level_BLE 1M_MidCH20-2442MHz



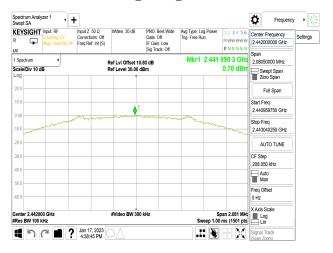
Reference Level_BLE 1M_HighCH39-2480MHz



Reference Level_BLE 2M_LowCH00-2402MHz



Reference Level_BLE 2M_MidCH20-2442MHz



Reference Level_BLE 2M_HighCH39-2480MHz



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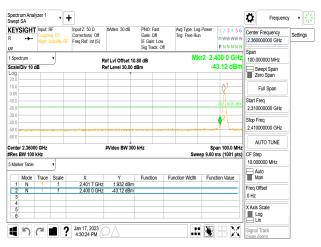
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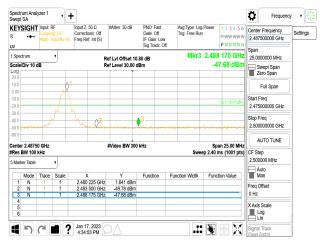
Report No.: TERF2212002786E2 Page: 30 of 63



Band Edge_BLE 1M_LowCH00-2402MHz



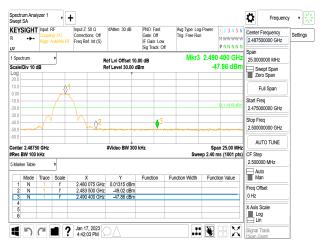
Band Edge_BLE 1M_HighCH39-2480MHz



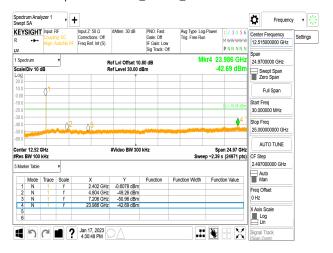
Band Edge_BLE 2M_LowCH00-2402MHz



Band Edge_BLE 2M_HighCH39-2480MHz



Spurious Emission_BLE 1M_LowCH00-2402MHz



Spurious Emission_BLE 1M_MidCH20-2442MHz

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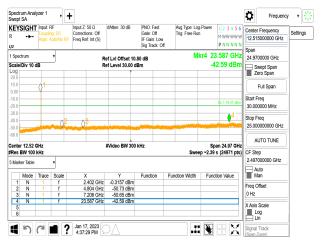
Report No.: TERF2212002786E2 Page: 31 of 63



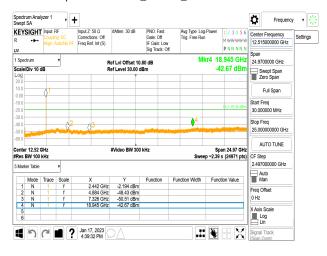
Spurious Emission_BLE 1M_HighCH39-2480MHz

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3 N 1 f 7.440 GHz -49.45 dBm 0 Hz	
4 N 1 f 23.880 GHz -41.74 dBm	
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6 Log	

Spurious Emission BLE 2M LowCH00-2402MHz



Spurious Emission_BLE 2M_MidCH20-2442MHz



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Spurious Emission_BLE 2M_HighCH39-2480MHz

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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 **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 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.

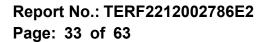
Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note: The lower limit shall apply at the transition frequencies.

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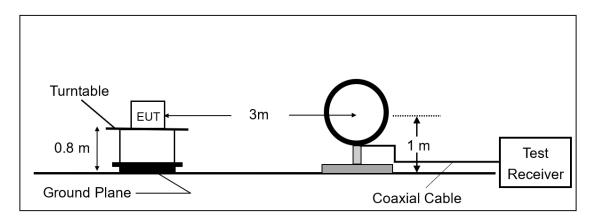
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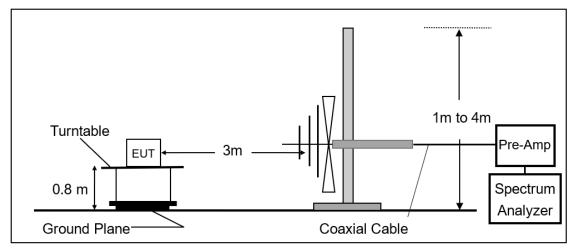


11.2 Test Setup

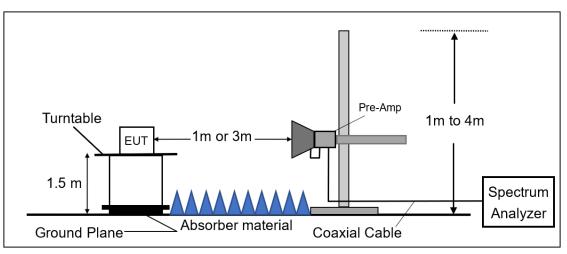
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



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



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11.3 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
- 6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
- 8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
- 9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 12. Repeat above procedures until all default test channel measured were complete.

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11.4 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)

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

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

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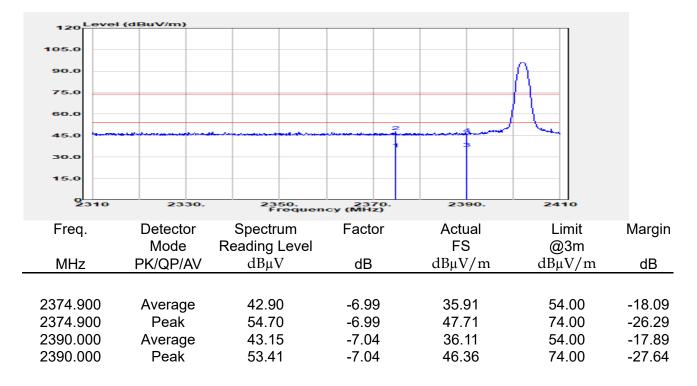
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11.6 **Measurement Result:**

11.6.1 **Radiated Band Edge Measurement Result**

Report Number	:TERF2212002786E2	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2023-01-09
Test Frequency	:2402 MHz	Temp./Humi.	:23.2/54
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Howard Huang



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Report Numbe Operation Moo Test Frequenc Test Mode EUT Pol	de :BLE 1M	łz		Test Site Test Date Temp./Humi. Antenna Pol. Engineer		
120 Level (105.0 90.0 75.0 60.0 45.0 30.0 15.0 2310	2339.	2350.		2390.		
		Frequen				
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
2316.800 2316.800 2390.000 2390.000	Average Peak Average Peak	42.66 55.04 42.72 52.64	-6.81 -6.81 -7.04 -7.04	35.86 48.24 35.68 45.59	54.00 74.00 54.00 74.00	-18.14 -25.76 -18.32 -28.41

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	BLE 1M	02786E2	-	Test Date Temp./Humi. Antenna Pol.		
120 Level (d 105.0 90.0 75.0 60.0 45.0 30.0 15.0						
	2480.	2485. Frequence		2495.	2500	
Freq.	Mode Re	Spectrum ading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.500 2483.500 2484.125 2484.125	Average Peak Average Peak	48.04 56.62 45.44 57.43	-7.20 -7.20 -7.20 -7.20	40.84 49.42 38.24 50.23	54.00 74.00 54.00 74.00	-13.16 -24.58 -15.76 -23.77

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	BLE 1M	002786E2		Test Site Test Date Temp./Humi. Antenna Pol. Engineer		
120 Level (d 105.0 90.0 75.0 60.0 45.0 30.0 15.0	BuV/m)		4			
2475	2480.	2485. Frequen	2490. cy (MHz)	2495.	2500	
Freq.	Detector Mode R	Spectrum eading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.500 2483.500 2489.175 2489.175	Average Peak Average Peak	44.74 53.82 42.93 54.92	-7.20 -7.20 -7.22 -7.22	37.54 46.62 35.71 47.70	54.00 74.00 54.00 74.00	-16.46 -27.38 -18.29 -26.30

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	e :BLE 2M	Z		Test Date :: Temp./Humi. :: Antenna Pol. :		
120 Level (0 105.0 90.0 75.0 60.0 45.0 15.0 2310	2330.	2	2370. cy (MHz)	2390.		
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	Reading Level dBµV	dB	dBµV/m	@3m dBµV/m	dB
2339.300 2339.300 2390.000 2390.000	Average Peak Average Peak	42.48 54.17 42.89 52.22	-6.88 -6.88 -7.04 -7.04	35.61 47.29 35.84 45.18	54.00 74.00 54.00 74.00	-18.39 -26.71 -18.16 -28.82

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	BLE 2M			Test Date	:2023-01-09	
Test Frequency	:2402 MH	z		Temp./Humi.	:23.2/54	
Test Mode	:Bandedg	е		Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				-	-	
120 Level (d	BuV/m)			1		
105.0						
90.0						
75.0					-++	
60.0						
45.0						
30.0						
15.0						
2310	2330.	2350. Frequen	2370. cy (MHz)	2390.	2410	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBμV/m	dB
		ασμν	uВ	α <i>D</i> μ v / III	α σμν/ π	UD
2389.200	Average	42.61	-7.04	35.57	54.00	-18.43
2389.200	Peak	54.02	-7.04	46.98	74.00	-27.02
2390.000	Average	42.76	-7.04	35.71	54.00	-18.29
2390.000	Peak	52.20	-7.04	45.15	74.00	-28.85

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Report Numbe Operation Mod Test Frequency Test Mode EUT Pol	le :BLE 2M	Z		Test Site Test Date Temp./Humi. Antenna Pol. Engineer		
105.0 90.0 75.0 60.0 45.0 30.0 15.0	dBuV/m)					
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 2483.500 2483.600 2483.600	Average Peak Average Peak	57.67 59.31 55.55 59.18	-7.20 -7.20 -7.20 -7.20	50.47 52.11 48.35 51.99	54.00 74.00 54.00 74.00	-3.53 -21.89 -5.65 -22.01

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Report Number Operation Mode Test Frequency Test Mode EUT Pol		E2	Test Site Test Date Temp./Humi. Antenna Pol. Engineer		
120 Level (d) 105.0 90.0 75.0 60.0 45.0 30.0 15.0 92475	2480. 248	B5. 2490 equency (MH2)	. 2495.	2500	
Freq.	Detector Spectru Mode Reading L		Actual FS	Limit @3m	Margin
MHz F	PK/QP/AV dBµV	⁷ dB	dBµV/m	dBµV/m	dB
2483.500 2483.500 2483.800 2483.800	Average 53.38 Peak 56.76 Average 49.04 Peak 56.25	6 -7.20 4 -7.20	46.18 49.56 41.84 49.05	54.00 74.00 54.00 74.00	-7.82 -24.44 -12.16 -24.95

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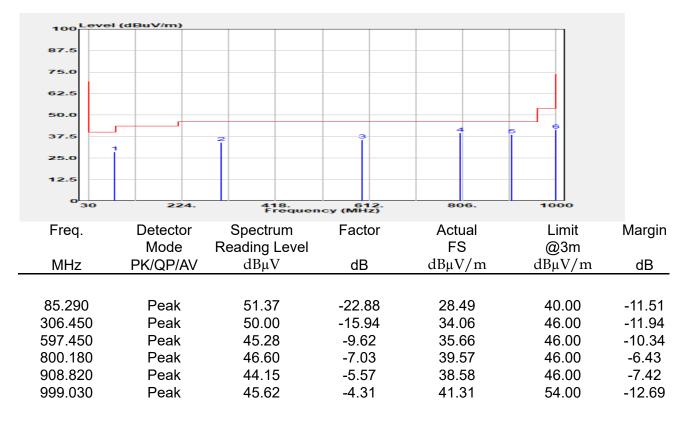
Report No.: TERF2212002786E2 Page: 44 of 63



11.6.2 **Radiated Spurious Emission**

Report Number :TERF2212002786E2 **Operation Mode :BLE 1M** Test Frequency :2442 MHz Test Mode :Tx EUT Pol :H Plane

Test Site	:SAC D
Test Date	:2023-01-09
Temp./Humi.	:23.2/54
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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Report Number	:TERF22 ²	12002786E2		Test Site	:SAC D	
Operation Mode	:BLE 1M			Test Date	:2023-01-09	
Test Frequency	:2442 MH	Iz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
100 Level (d	BuV/m)]	
87.5						
75.0						
62.5						
50.0						
37.5	2		4		6	
25.0		3				
12.5						
0 30	224.	418. Frequen	612. cy (MHz)	806.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz F	PK/QP/AV	dBµV	dB	dBµV/m	u dBµV/m	dB
85.290	Peak	55.67	-22.88	32.80	40.00	-7.20
240.490	Peak	52.44	-18.14	34.30	46.00	-11.70
419.940	Peak	41.53	-13.14	28.39	46.00	-17.61
598.420	Peak	44.58	-9.60	34.99	46.00	-11.01
799.210	Peak	42.14	-7.03	35.11	46.00	-10.89
960.230	Peak	40.50	-4.42	36.09	54.00	-17.91

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	:BLE 2M			Test Date	:2023-01-09	
Test Frequency	:2442 M⊦	łz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Vertical	
EUT Pol	:H Plane			Engineer	:Howard Huang	
100 Level (dl	BuV/m)					
87.5						
75.0						
62.5						
50.0						
37.5		2	3	4	5 6	
25.0						
12.5						
0 30	224.	418. Frequen	612. cy (MHz)	806.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS IBuV/m	@3m	
MHz F	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
85.290	Peak	51.27	-22.88	28.40	40.00	-11.60
311.300	Peak	49.43	-22.00	33.71	46.00	-12.29
594.540	Peak	45.13	-9.67	35.46	46.00	-10.54
797.270	Peak	44.61	-7.05	37.56	46.00	-8.44
921.430	Peak	42.86	-5.09	37.77	46.00	-8.23
996.120	Peak	42.45	-4.24	38.21	54.00	-15.79

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	:BLE 2M			Test Date	:2023-01-09	
Test Frequency	:2442 M⊢	lz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
100 Level (d	BuV/m)		1			
87.5						
75.0						
62.5						
50.0						
37.5	2	3	4	5		
25.0						
12.5						
0 30	224.	418. Frequen	612. cy (MHz)	806.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz F	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
		αυμν	uD	α <i>Δμν</i> /Π		ub
84.320	Peak	55.56	-22.83	32.74	40.00	-7.26
240.490	Peak	52.18	-18.14	34.04	46.00	-11.96
419.940	Peak	41.43	-13.14	28.28	46.00	-17.72
598.420	Peak	47.31	-9.60	37.72	46.00	-8.28
800.180 960.230	Peak Peak	42.49 40.41	-7.03 -4.42	35.47 35.99	46.00 54.00	-10.53 -18.01
300.200	i can	י ד.טד	-7.72	00.00	07.00	-10.01

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Report Number	:TERF22	12002786E2	Te	est Site	:SAC D	
Operation Mode	e:BLE 1M		Te	est Date	:2023-01-09	
Test Frequency	:2402 Mł	Ηz	Te	emp./Humi.	:23.2/54	
Test Mode	:Tx		A	ntenna Pol.	:Vertical	
EUT Pol	:H Plane		E	ngineer	:Howard Huang	
				-	-	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0	2 4	· · · · · · · · · · · · · · · · · · ·				
37.5	3					
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level	10	FS	@3m	10
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4804.000	Average	44.38	-2.06	42.32	54.00	-11.68
4804.000	Peak	48.61	-2.06	46.55	74.00	-27.45
7206.000	Average	29.52	4.26	33.78	54.00	-20.22
7206.000	Peak	40.01	4.26	44.27	74.00	-29.73

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	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	e :BLE 1M			Test Date	:2023-01-09	
Test Frequency	:2402 Mł	Ηz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				J	-	
100 Level (d	IBuV/m)					
87.5						
75.0						
62.5						
50.0	2 4	· · · · · · · · · · · · · · · · · · ·				
37.5	3	•				
25.0						
12.5						
9 1000	6100.	11200. Frequen	16300. су (MHz)	. 21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	15
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.000	Average	48.49	-2.06	46.43	54.00	-7.57
4804.000	Peak	51.33	-2.00	40.43	74.00	-24.73
7206.000	Average	29.68	4.26	33.93	54.00	-20.07
7206.000	Peak	40.53	4.26	44.79	74.00	-29.21

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	e:BLE1M			Test Date	:2023-01-09	
Test Frequency	:2442 Mł	Ηz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Vertical	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				-	_	
100 Level (d	lBuV/m)					
87.5						
75.0						
62.5						
50.0	2 4	L .				
37.5	3	3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level	٩D	FS JP. W/m	@3m	
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4884.000	Average	43.74	-2.12	41.62	54.00	-12.38
4884.000	Peak	47.33	-2.12	45.20	74.00	-28.80
7326.000	Average	29.12	4.73	33.85	54.00	-20.15
7326.000	Peak	38.95	4.73	43.68	74.00	-30.32

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	e:BLE1M			Test Date	:2023-01-09	
Test Frequency	:2442 Mł	Ηz		Temp./Humi. :23.2/54		
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				-	-	
100 Level (d	IBuV/m)					
87.5						
75.0						
62.5						
50.0	2	L .				
37.5		3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dB _u V	dB	FS dBµV/m	@3m dBµV/m	dB
	PN/QP/AV	αδμν	uБ	αδμν/Π	αδμν/ Πι	<u>ud</u>
4884.000	Average	48.11	-2.12	45.99	54.00	-8.01
4884.000	Peak	50.77	-2.12	48.65	74.00	-25.35
7326.000	Average	28.84	4.73	33.57	54.00	-20.43
7326.000	Peak	39.25	4.73	43.98	74.00	-30.02

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Report Number	:TERF22	12002786E2	Т	Fest Site	:SAC D	
Operation Mode	BLE 1M		Т	Fest Date	:2023-01-09	
Test Frequency	:2480 MF	2480 MHz		Temp./Humi. :23.2/54		
Test Mode	:Tx		A	Antenna Pol.	:Vertical	
EUT Pol	:H Plane		E	Engineer	:Howard Huang	
				-	-	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0		<u></u>				
37.5		3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
		ασμν	UD	ασμν/ Πι	ασμν/ π	UD
4960.000	Average	49.04	-1.59	47.44	54.00	-6.56
4960.000	Peak	52.32	-1.59	50.72	74.00	-23.28
7440.000	Average	28.76	3.95	32.71	54.00	-21.29
7440.000	Peak	39.24	3.95	43.19	74.00	-30.81

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Report Number	:TERF22	12002786E2	Te	est Site	:SAC D	
Operation Mode	e:BLE1M		Te	est Date	:2023-01-09	
Test Frequency	:2480 Mł	Ηz	Te	emp./Humi.	:23.2/54	
Test Mode	:Tx		Ai	ntenna Pol.	:Horizontal	
EUT Pol	:H Plane		E	ngineer	:Howard Huang	
				•		
100 Level (d	IBuV/m)					
87.5						
75.0						
62.5						
50.0		1				
37.5		8				
25.0						
12.5						
9 1000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level	JD	FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4960.000	Average	50.75	-1.59	49.16	54.00	-4.84
4960.000	Peak	53.53	-1.59	51.94	74.00	-22.06
7440.000	Average	28.83	3.95	32.78	54.00	-21.22
7440.000	Peak	38.66	3.95	42.62	74.00	-31.38

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Report Number	:TERF22	12002786E2	1	Fest Site	:SAC D	
Operation Mode	e:BLE 2M		T	Fest Date	:2023-01-09	
Test Frequency	:2402 Mł	Ηz	T	Temp./Humi.	:23.2/54	
Test Mode	:Tx		A	Antenna Pol.	:Vertical	
EUT Pol	:H Plane		E	Engineer	:Howard Huang	
100 Level (d	lBuV/m)					
87.5						
75.0						
62.5						
50.0	2 4					
37.5	1 3	•				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (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	39.46	-2.06	37.41	54.00	-16.59
4804.000	Peak	46.05	-2.06	43.99	74.00	-30.01
7206.000	Average	28.64	4.26	32.90	54.00	-21.10
7206.000	Peak	38.71	4.26	42.97	74.00	-31.03

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Report Number	· :TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	e :BLE 2M			Test Date	:2023-01-09	
Test Frequency	2402 Mł	Ηz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				0	C	
100 Level (iBuV/m)				1	
87.5						
75.0						
62.5						
50.0	2	L				
37.5	3	•				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (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	46.24	-2.06	44.18	54.00	-9.82
4804.000	Peak	50.49	-2.00	48.44	74.00	-25.56
7206.000	Average	29.15	4.26	33.41	54.00	-20.59
7206.000	Peak	38.70	4.26	42.96	74.00	-31.04

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Report Number	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	e:BLE 2M			Test Date	:2023-01-09	
Test Frequency	:2442 Mł	Ηz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Vertical	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				-	-	
100 Level (d	lBuV/m)					
87.5						
75.0						
62.5						
50.0	2 4	L .				
37.5		3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level	٩D	FS JB. W/m	@3m	
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4884.000	Average	42.20	-2.12	40.07	54.00	-13.93
4884.000	Peak	46.87	-2.12	44.75	74.00	-29.25
7326.000	Average	28.95	4.73	33.68	54.00	-20.32
7326.000	Peak	38.52	4.73	43.25	74.00	-30.75

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Report Number	:TERF22	12002786E2	-	Test Site	:SAC D	
Operation Mode	BLE 2M		-	Test Date	:2023-01-09	
Test Frequency	:2442 MF	Ηz	-	Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
				-	-	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0	2	L .				
37.5	3	B				
25.0						
12.5						
9	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS Buy/m	@3m	
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4884.000	Average	46.18	-2.12	44.06	54.00	-9.94
4884.000	Peak	50.20	-2.12	48.07	74.00	-25.93
7326.000	Average	29.26	4.73	33.99	54.00	-20.01
7326.000	Peak	38.15	4.73	42.88	74.00	-31.12

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Report No.: TERF2212002786E2 Page: 58 of 63



Report Number	:TERF22	12002786E2	Te	est Site	:SAC D	
Operation Mode	BLE 2M		Te	est Date	:2023-01-09	
Test Frequency	:2480 Mł	Ηz	Те	Temp./Humi. :23.2/54		
Test Mode	:Tx		A	ntenna Pol.	:Vertical	
EUT Pol	:H Plane		E	ngineer	:Howard Huang	
				-	-	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0	2	4				
37.5		3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dB _µ V	dB	FS dBµV/m	@3m dBµV/m	dB
	PK/QP/AV	ασμν	uр	ασμν/ Πι	α σμν/ π	uБ
4960.000	Average	46.73	-1.59	45.13	54.00	-8.87
4960.000	Peak	50.90	-1.59	49.31	74.00	-24.69
7440.000	Average	29.55	3.95	33.50	54.00	-20.50
7440.000	Peak	38.43	3.95	42.38	74.00	-31.62

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	:TERF22	12002786E2		Test Site	:SAC D	
Operation Mode	BLE 2M			Test Date	:2023-01-09	
Test Frequency	:2480 MF	Ηz		Temp./Humi.	:23.2/54	
Test Mode	:Tx			Antenna Pol.	:Horizontal	
EUT Pol	:H Plane			Engineer	:Howard Huang	
100 Level (d	BuV/m)					
87.5						
75.0						
62.5						
50.0		1				
37.5		3				
25.0						
12.5						
9000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
	PN/QP/AV	ασμν	uБ	αδμν/Π	ασμν/ π	uБ
4960.000	Average	48.65	-1.59	47.05	54.00	-6.95
4960.000	Peak	52.64	-1.59	51.05	74.00	-22.95
7440.000	Average	28.47	3.95	32.42	54.00	-21.58
7440.000	Peak	38.73	3.95	42.69	74.00	-31.31

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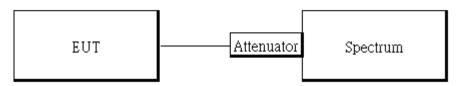


12 POWER SPECTRAL DENSITY

12.1 Standard Applicable:

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

12.2 Test Setup



12.3 Measurement Procedure:

- 1. Set analyzer center frequency to DTS channel center frequency.
- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz. & the VBW = 10 kHz
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

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12.4 **Measurement Result:**

BLE 1M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-9.290	8	PASS
2442	-10.520	8	PASS
2480	-10.210	8	PASS

NOTE: cable loss as 10.8dB that offsets in the spectrum

BLE 2M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-13.680	8	PASS
2442	-13.370	8	PASS
2480	-11.920	8	PASS

NOTE: cable loss as 10.8dB that offsets in the spectrum

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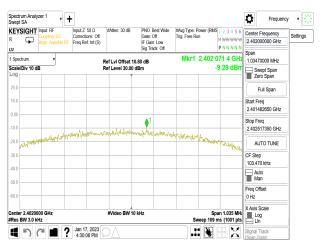
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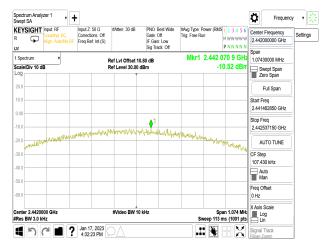
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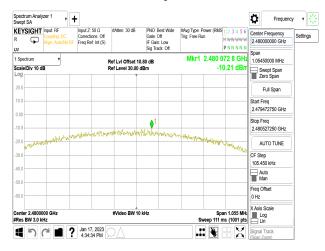
PSD_BLE 1M_LowCH00-2402MHz



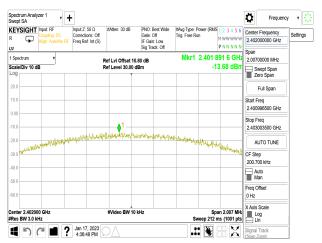
PSD_BLE 1M_MidCH20-2442MHz



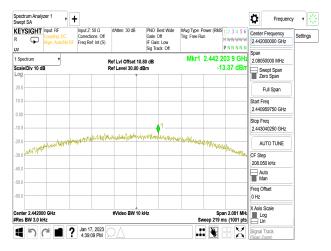
PSD_BLE 1M_HighCH39-2480MHz



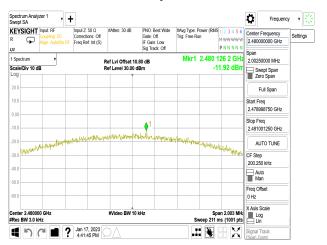
PSD_BLE 2M_LowCH00-2402MHz



PSD_BLE 2M_MidCH20-2442MHz



PSD_BLE 2M_HighCH39-2480MHz



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13 ANTENNA REQUIREMENT

13.1 **Standard Applicable:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

13.2 Antenna Connected Construction:

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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