

# ELECTROMAGNETIC EMISSIONS **COMPLIANCE REPORT**



Applicant: Manufacturer:	Sensitech INC. 800 Cummings Ctr Suite 258X, Beverly, Massachusetts, United States 01915 Team Precision PCL. 198 MOO 13, Suwansorn Rd., Dong-Khee-Lek, Muang Pra- chinburi, Thailand
Product Name:	Temp/Humidity Data Logger / Tracker
Brand Name:	Sensitech
Model No.:	T11013210, T11013220, T11013230, T11013240
Model Difference:	Please refer to section 1.4 for more details.
Report Number:	TERF2306001502ER
FCC ID	SRM-010166SST
IC:	6654A-010166SST
Date of EUT Received:	June 15, 2023
Date of Test:	June 16, 2023~August 28, 2023
Issue Date:	October 20, 2023
	LITTLI CLIEN/

CHUN, CHIZEH, CHEN

Approved By\_\_\_\_

## CHUN-CHIEH. CHEN

### 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.

The results of this report relate only to the sample identified in this report.

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Revision History							
Report Number	Revision	Description	Issue Date	Revised By	Remark		
TERF2306001502ER	00	Original	September 8, 2023	Celery Wei			
TERF2306001502ER	01	<ol> <li>Revise applicant and manufacturer information</li> <li>Add note in section 1.2</li> <li>Add 6dB bandwidth in P23</li> </ol>	September 26, 2023	Celery Wei	*		
TERF2306001502ER	02	<ol> <li>Revise description in section 9</li> <li>Revise typo</li> </ol>	October 11, 2023	Celery Wei	*		
TERF2306001502ER	03	Revise description in clause 9.3.2.	October 12, 2023	Celery Wei	*		
TERF2306001502ER	04	Add note in revision history	October 20, 2023	Celery Wei	*		

### 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. And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).
- 3 · According to manufacture provide information and RF technical judgement, the full function and complex model is T11013220, could be as representative mode and perform full test.

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#### **GENERAL INFORMATION** 1

#### 1.1 **Product Description**

Product Name:	Temp/Humidity Data Logger / Tracker
Brand Name:	Sensitech
Model No.:	T11013210, T11013220, T11013230, T11013240
Model Difference:	Please refer to section 1.4 for more details.
Hardware Version:	R2.1
Firmware Version:	SVN 03
EUT Series No.:	MEG9J000Q4
Power Supply:	4.5Vdc from alkaline battery / 6Vdc from lithium battery
Test Software (Name/Version)	EspRFTestTool/2.8

#### 1.2 **RF Specification**

Radio Technology:	BLE
Frequency Range:	2402 – 2480MHz
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	BLE 1M: 4.12 dBm BLE 2M: 4.57 dBm

#### 1.3 **Antenna Designation**

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak An- tenna Gain (dBi)
Ceramic Chip	ABRACON	ACAG0301-2450-T	2402~2480	5.19

Note: Antenna information is provided by the applicant.

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#### 1.4 Model difference

	Part number	Description	battery type	Remarks
MAIN	T11013220	TTGEO XE, Air Temperature Tracker, Extended	Lithium	without probe
Variant 1	T11013210	TTGEO X, Air Temperature Tracker Non-Lithium	Alkaline	without probe
Variant 2	T11013230	TTGEO XP, Air Probe Temperature Tracker, Non-Lithium	Alkaline	with probe
Variant 3	T11013240	TTGEO XEP, Air Probe Temperature Tracker, Extended	Lithium	with probe

#### 1.5 **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 April 2018 ANSI C63.10:2013

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#### 1.6 **Test Facility**

Laboratory	Test Site Address	Test Site Name	FCC Designa- tion number	IC CAB identifier
		SAC 1		
		SAC 2		
		SAC 3		
		Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1	T\4/0007	
	Industrial Park, Wuku District, New	Conducted 2	TW0027	TW3702
	Taipei City, Taiwan.	Conducted 3		
		Conducted 4	-	
SGS Taiwan Ltd.		Conducted 5		
		Conducted 6		
Central RF Lab.		Conduction C	-	
(TAF code 3702)		SAC C		
		SAC D		
		SAC G		
	No 2 Kali dat Del Oviahan District	Conducted A		
	No.2, Keji 1st Rd., Guishan District,	Conducted B	TW0028	
	Taoyuan City, Taiwan 333	Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

site name is remarked on the equipment list in each section of this report as an indic tion where measurements occurred in specific test site and address.

#### 1.7 **Special Accessories**

There are no special accessories used while test was conducted.

#### 1.8 **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."

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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.

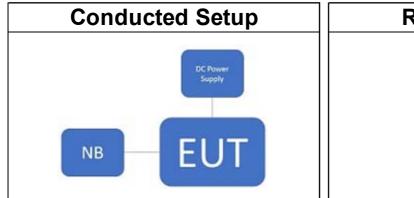
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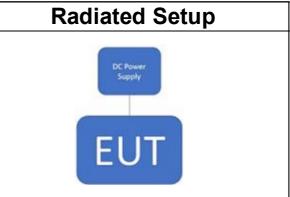
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#### 2.5 **Test Configuration**





#### 2.6 Control Unit(s)

Conducted Emission Test Site: Conducted 1						
EQUIPMENT TYPE MFR MODEL NUMBER SERIAL NUMBER LAST CAL. CAL DUE.						
Notebook HP HSN-Q35C-4 5CD238GDV7 N/A N/A						

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#### 3 SUMMARY OF TEST RESULTS

FCC Rules	ISED Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Not Required
§15.247(b) (3)	RSS-247 §5.4 d	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 a RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.247(d) §15.205 §15.209	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2 b	Peak Power Density	Compliant
§15.203	N/A	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

- 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							
MODEAVAILABLE CHANNELTESTED CHANNELMODULATIONDATA RATE (Mbps)							
Bluetooth LE	0 to 39	0,20,39	GFSK	1			
Bluetooth LE	0 to 39	0,20,39	GFSK	2			

TRANSMIT 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		
	TRANSMIT RAD	DIATED EMISSION T	EST (ABOVE 1 GHz)			
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	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		ncertaint	ÿ
AC Power Line Conducted Emission	+/-	2.32	dB
Output Power measurement	+/-	1	dB
Emission Bandwidth	+/-	1.53	Hz
Undesignable radiated 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						
Polarization: Vertical	+/-	2.8	dB	9kHz~30MHz		
	+/-	4.82	dB	30MHz - 1000MHz		
	+/-	4.37	dB	1GHz - 18GHz		
	+/-	4.21	dB	18GHz - 40GHz		
	+/-	2.8	dB	9kHz~30MHz		
Delerization, Herizantel	+/-	4.54	dB	30MHz - 1000MHz		
Polarization: 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**

N/A

#### 6.2 **Conducted Measurement**

Conducted Emission Test Site: Conducted 1								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/07/2023	06/06/2024			
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R			
Power Meter	Anritsu	ML2496A	1242004	10/26/2022	10/25/2023			
Power Sensor	Anritsu	MA2411B	1207365	10/26/2022	10/25/2023			
Power Sensor	Anritsu	MA2411B	1207368	10/26/2022	10/25/2023			
DC Power Supply	HILA	DP-3003N	11233K0716024	03/17/2023	03/16/2024			
DC Block	Mini-Circuits	BLK-18-S+	1	12/13/2022	12/12/2023			

#### 6.3 **Radiated Measurement**

Radiated Emission Test Site: SAC 1							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	12/30/2022	12/29/2023		
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	12/27/2022	12/26/2023		
Loop Antenna	ETS.LINDGREN	6502	148045	10/05/2022	10/04/2023		
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/30/2022	12/29/2023		
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	10/06/2022	10/05/2023		
Test Software	Audix	e3	Ver. 9.210322	N.C.R	N.C.R		
DC Power Supply	Agilent	E3640A	MY40005907	10/07/2022	10/06/2023		
EMI Test Receiver	R&S	ESR 7	102525	02/18/2023	02/17/2024		
Site Cal	SGS	SAC 1	N/A	01/01/2023	12/31/2023		
Pre-Amplifier	HP	8447D	2944A09469	12/13/2022	12/12/2023		
Pre-Amplifier	HP	8449B	3008A01973	12/13/2022	12/12/2023		
Pre-Amplifier	EMCI	EMC184045B	980135	10/27/2022	10/26/2023		
Bandreject Filter 2400-2483.5	EWT	EWT-14-0166	M1	12/13/2022	12/12/2023		
4GHz High Pass Filter	WI	WHKX4.0/18G-10SS	WHKX4.0/18G-10SS	12/13/2022	12/12/2023		
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	12/13/2022	12/12/2023		
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	12/13/2022	12/12/2023		
Coaxial Cable	Huber Suhner	EMC 104-SM-SM- 2000	160123	12/13/2022	12/12/2023		
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/13/2022	12/12/2023		
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/13/2022	12/12/2023		

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	Limits (dBµV)				
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

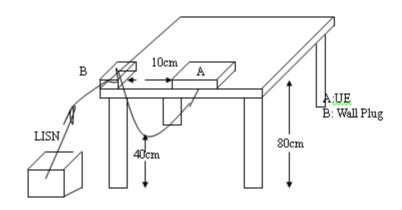
1. The lower limit shall apply at the transition frequencies

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

#### 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:**

N/A; Powered from Alkaline or Lithium battery.

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#### PEAK OUTPUT POWER MEASUREMENT 8

#### 8.1 **Standard Applicable:**

#### 8.1.1 **Duty Cycle**

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.

#### 8.1.2 FCC

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.

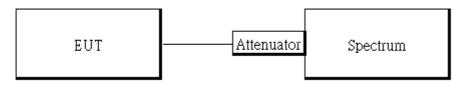
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

#### 8.1.3 ISED

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt and the e.i.r.p. shall not exceed 4 W (ISED only).

#### 8.2 Test Setup

## 8.2.1 Duty Cycle



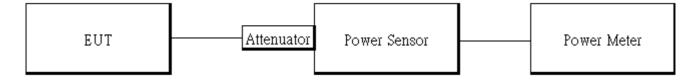
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## 8.2.2 Output Power



#### 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 power meter.
- 4. Record the max. Reading as observed from Power Meter.
- 5. Repeat above procedures until all test default channel measured was complete.

#### **Duty Factor:** 8.4

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
BLE 1M	83.80	0.77	0.48	1.00
BLE 2M	56.53	2.48	0.94	1.00

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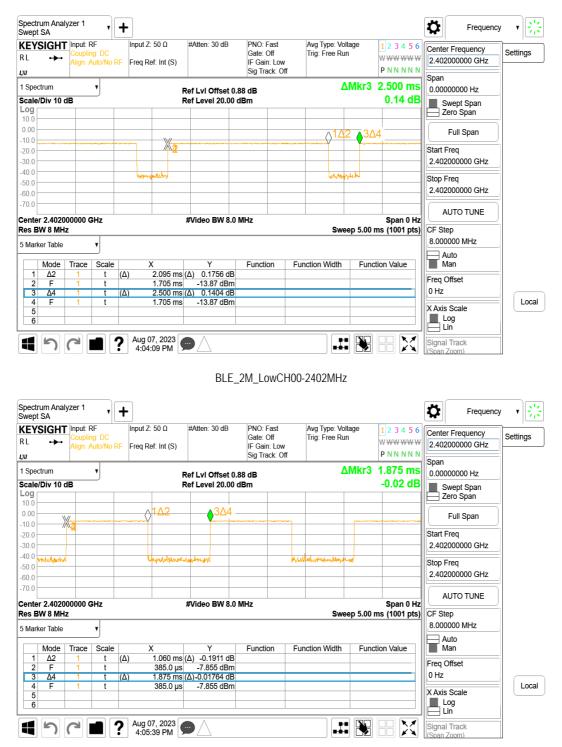
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BLE\_1M\_LowCH00-2402MHz



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#### 8.5 **Output Power:**

#### 8.5.1 Peak & Avg

### BLE 1M mode:

СН	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2402	9	3.79	30
Mid	2442	9	4.08	30
High	2480	9	4.12	30
СН	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2402	9	2.83	30
Mid	2442	9	3.13	30
High	2480	9	3.16	30

\*Note:

1.Measured by power meter, cable loss 0.88 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.

### BLE 2M mode:

СН	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2402	9	4.05	30
Mid	2442	9	4.57	30
High	2480	9	4.28	30
СН	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2402	9	3.09	30
Mid	2442	9	3.60	30
High	2480	9	3.24	30

\*Note:

1.Measured by power meter, cable loss 0.88 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.

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#### 8.5.2 EIRP

### EIRP BLE 1M mode

СН	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit	
Low	2402	9	2.83	5.19	8.02	4W=	36	dBm
Mid	2442	9	3.13	5.19	8.32	4W=	36	dBm
High	2480	9	3.16	5.19	8.35	4W=	36	dBm

\* Note: EIRP = Average Power + Gain

### EIRP BLE 2M mode

СН	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit	
Low	2402	9	3.09	5.19	8.28	4W=	36	dBm
Mid	2442	9	3.60	5.19	8.79	4W=	36	dBm
High	2480	9	3.24	5.19	8.43	4W=	36	dBm

\* Note: EIRP = Average Power + Gain

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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 6dB BW 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.

#### 9.3.2 99% BW measurements

1. The testing follows the Measurement Procedure of the RSS-Gen section 6.7.

2. Set the spectrum analyzer as RBW= 1 % to 5% of 99%, VBW  $\geq$  3 X RBW. Span= large enough to capture all products of the modulation process Sweep=auto, Detector = Peak, and Max hold.

- 3. Mark the upper and lower frequencies of 99%.
- 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	0.6392	$\ge$ 0.5	PASS
2442	0.6451	≧ 0.5	PASS
2480	0.6429	<b>≧ 0.5</b>	PASS

### **BLE 2M mode**

Frequency (MHz)	6dB Requi BW BW (MHz) (MHz		Result
2402	1.11	$\ge$ 0.5	PASS
2442	1.106	≧ 0.5	PASS
2480	1.105	≧ 0.5	PASS

## **BLE 1M mode**

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0253
2442	1.0241
2480	1.027

### **BLE 2M mode**

Frequency (MHz)	99%Bandwidth (MHz)
2402	2.0237
2442	2.0252
2480	2.0265

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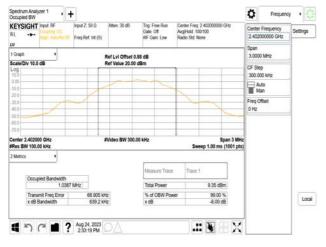
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### 6dB BW

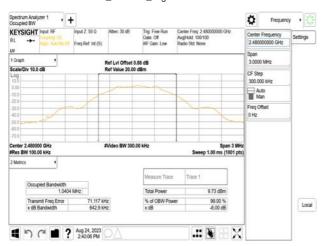
### OBW\_BLE 1M\_LowCH00-2402MHz

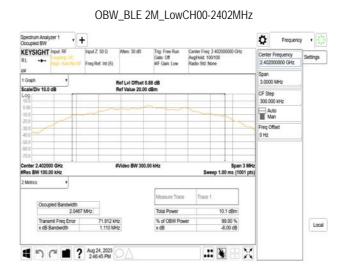


### OBW\_BLE 1M\_MidCH20-2442MHz

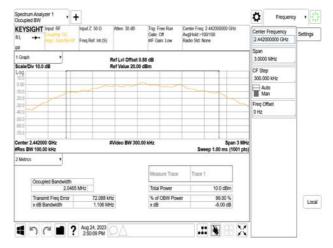


### OBW\_BLE 1M\_HighCH39-2480MHz

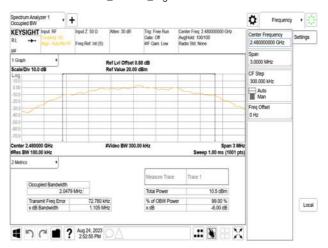




OBW\_BLE 2M\_MidCH20-2442MHz



### OBW\_BLE 2M\_HighCH39-2480MHz



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### 99% BW

### OBW\_BLE 1M\_LowCH00-2402MHz

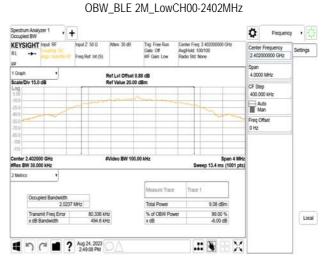


### OBW\_BLE 1M\_MidCH20-2442MHz

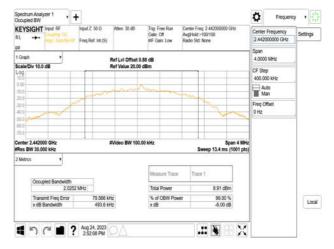


### OBW\_BLE 1M\_HighCH39-2480MHz

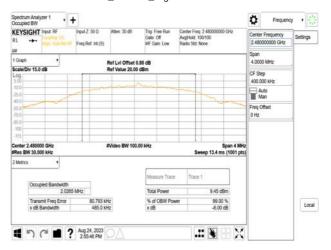




### OBW\_BLE 2M\_MidCH20-2442MHz



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

#### 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.
- 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 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
- 7. 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
- 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.

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#### 10.4 Measurement Result

Frequency RF Power (MHz) Density (dBm)		Reference Level of Limit = PSD - 20dB (dBm)				
2402	3.16	-16.84				
2442	3.13	-16.87				
2480	3.48	-16.52				
*Noto:						

### BLF 1M Reference Level of Limit

\*Note:

1.cable loss as 0.88dB that offsets in the spectrum

2. 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	3.17	-16.83
2442	3.28	-16.72
2480	3.71	-16.29

\*Note:

1.cable loss as 0.88dB that offsets in the spectrum

2. Refer to next page for plots.

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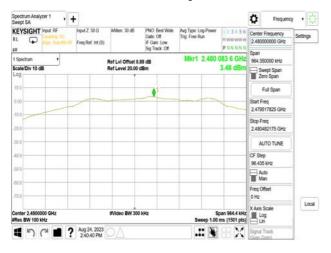
### Reference Level\_BLE 1M\_LowCH00-2402MHz



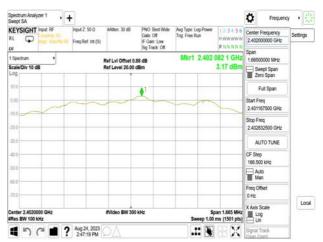
Reference Level\_BLE 1M\_MidCH20-2442MHz



Reference Level\_BLE 1M\_HighCH39-2480MHz



### Reference Level\_BLE 2M\_LowCH00-2402MHz



Reference Level\_BLE 2M\_MidCH20-2442MHz







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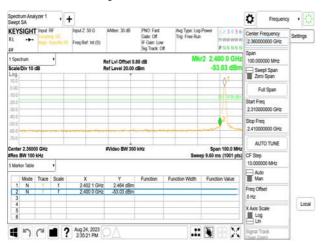
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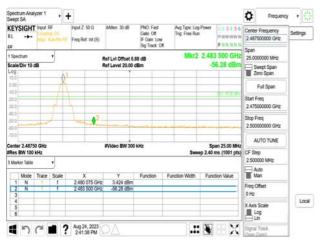
## Report No.: TERF2306001502ER Page: 30 of 63



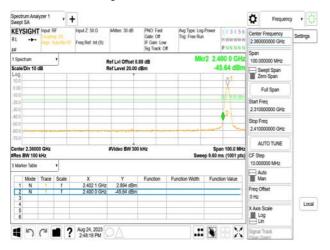
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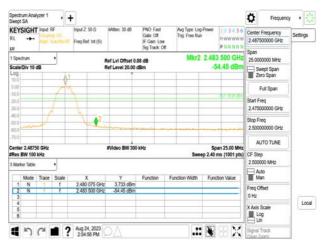
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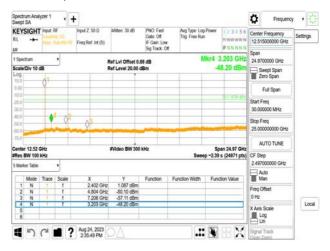
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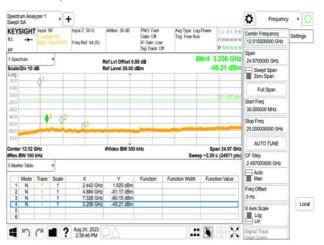
### Band Edge\_BLE 2M\_HighCH39-2480MHz



Spurious Emission\_BLE 1M\_LowCH00-2402MHz



### Spurious Emission\_BLE 1M\_MidCH20-2442MHz



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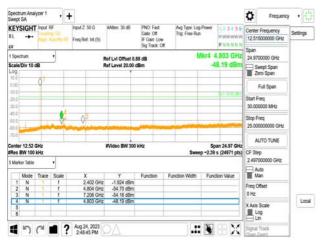
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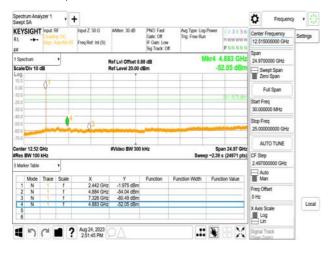
### Spurious Emission\_BLE 1M\_HighCH39-2480MHz

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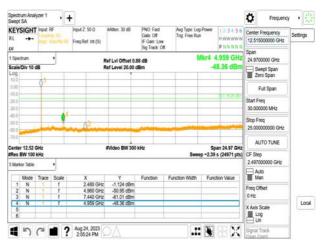
Spurious Emission\_BLE 2M\_LowCH00-2402MHz



Spurious Emission\_BLE 2M\_MidCH20-2442MHz



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 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: The lower limit shall apply at the transition frequencies.

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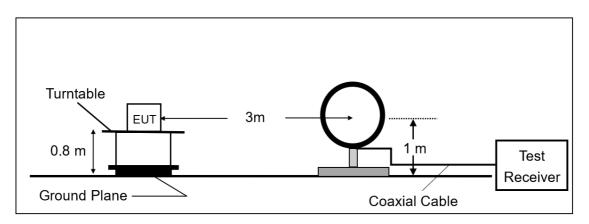
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Report No.: TERF2306001502ER Page: 33 of 63

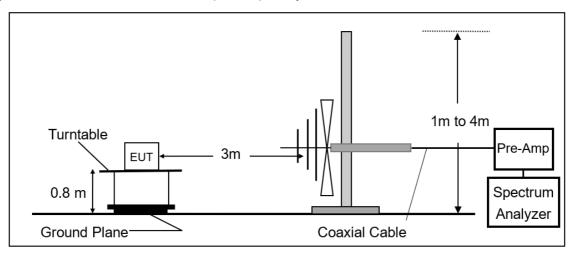


#### 11.2 Test Setup

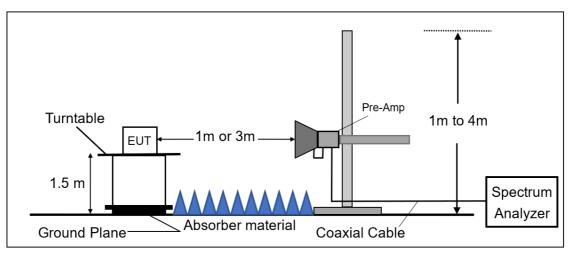
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(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) & RSS-GEN §6.13.2 was not reported.

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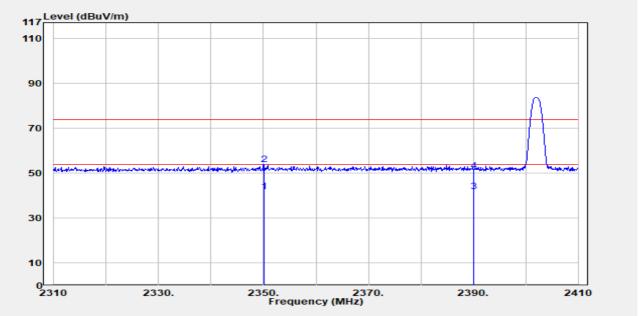
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#### 11.6 **Measurement Result:**

#### 11.6.1 **Radiated Band Edge Measurement Result**

Report Number	:TERF2306001502ER	Test Site	:SAC 1
Operation Mode	:BLE 1M	Test Date	:2023-08-25
Test Frequency	:2402 MHz	Temp./Humi.	:25.1°C/58%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E1 Plane	Engineer	:WJ Lin



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2350.10	Average	41.32	0.63	41.95	54.00	-12.05
2350.10	Peak	53.20	0.63	53.84	74.00	-20.16
2390.00	Average	41.18	0.76	41.94	54.00	-12.06
2390.00	Peak	50.33	0.76	51.09	74.00	-22.91

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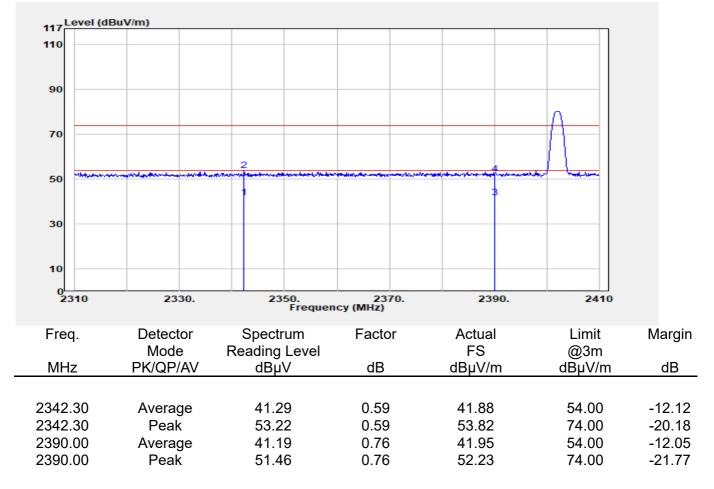
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Report Number	:TERF2306001502ER	Test Site	:SAC 1
Operation Mode	:BLE 1M	Test Date	:2023-08-25
Test Frequency	:2402 MHz	Temp./Humi.	:25.1℃/58%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:E1 Plane	Engineer	:WJ Lin

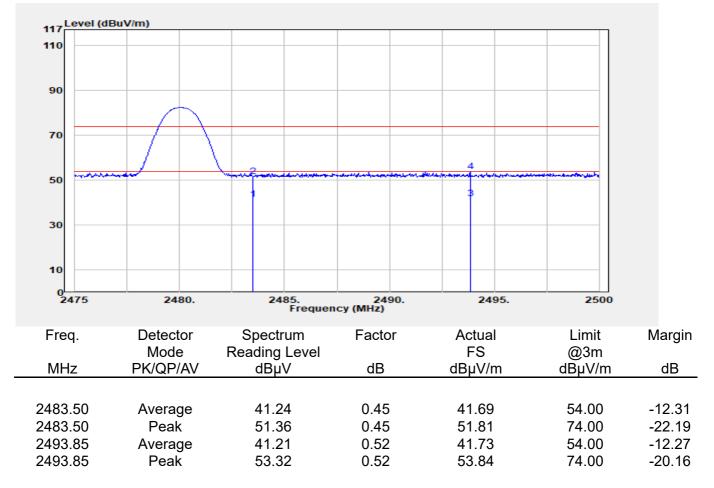


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Report Number	:TERF2306001502ER	Test Sit
<b>Operation Mode</b>	:BLE 1M	Test Da
Test Frequency	:2480 MHz	Temp./I
Test Mode	:Bandedge	Antenn
EUT Pol	:E1 Plane	Engine

Test Site	:SAC 1
Test Date	:2023-08-25
Temp./Humi.	:25.1°C/58%
Antenna Pol.	:Vertical
Engineer	:WJ Lin



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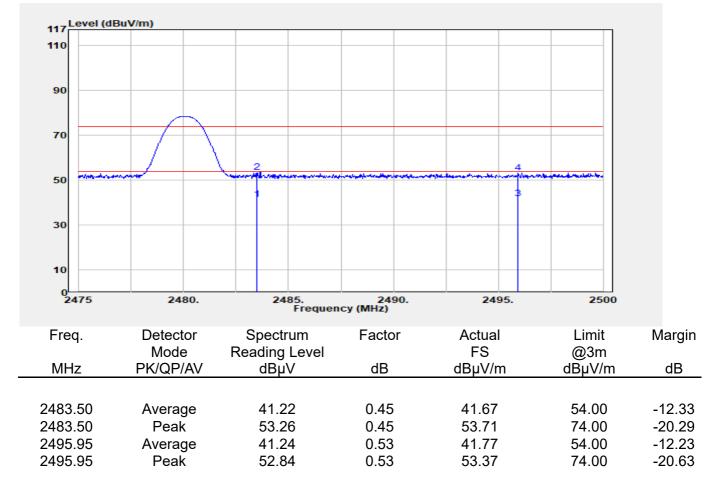
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Report Number	:TERF2306001502ER	Test
Operation Mode	:BLE 1M	Test
Test Frequency	:2480 MHz	Terr
Test Mode	:Bandedge	Ante
EUT Pol	:E1 Plane	Eng

Test Site	:SAC 1
Test Date	:2023-08-25
Temp./Humi.	:25.1°C/58%
Antenna Pol.	:Horizontal
Engineer	:WJ Lin



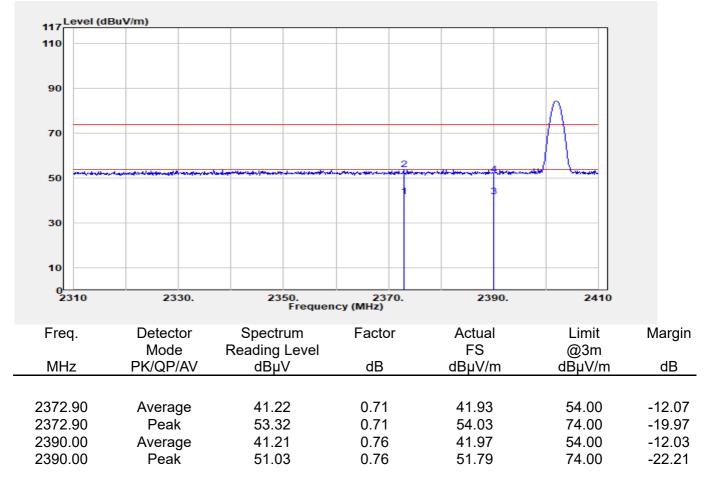
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Report Number	:TERF2306001502ER	Test Site	:SAC 1
Operation Mode	:BLE 2M	Test Date	:2023-08-25
Test Frequency	:2402 MHz	Temp./Humi.	:25.1°C/58%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E1 Plane	Engineer	:WJ Lin



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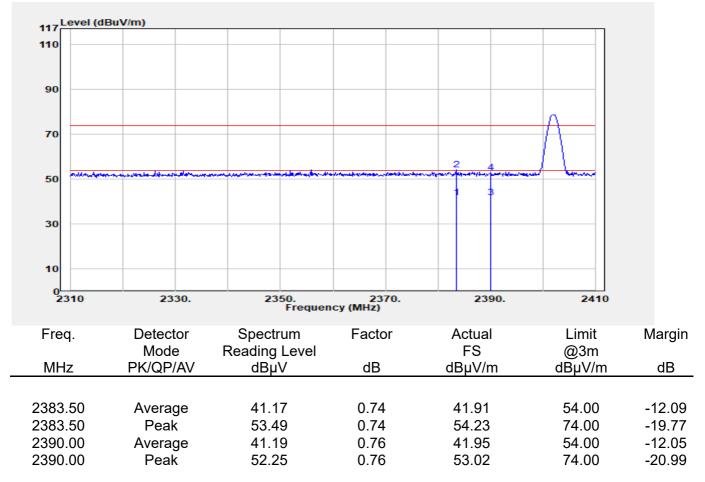
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Report Number	:TERF2306001502ER	Test Site	:SAC 1
Operation Mode	:BLE 2M	Test Date	:2023-08-25
Test Frequency	:2402 MHz	Temp./Humi.	:25.1℃/58%
Test Mode	:Bandedge	Antenna Pol.	:Horizontal
EUT Pol	:E1 Plane	Engineer	:WJ Lin



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:SAC 1

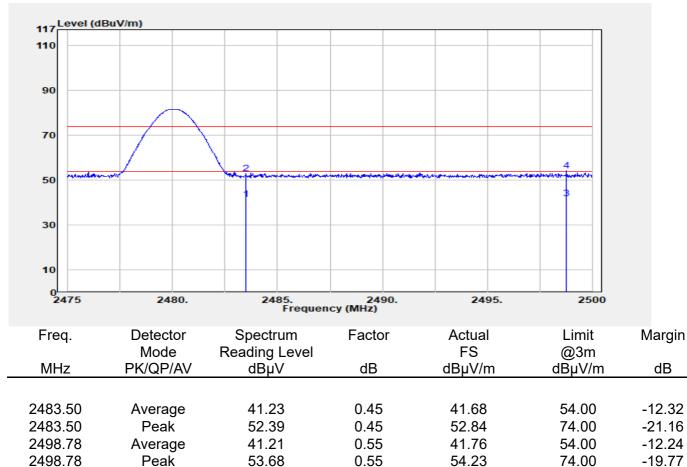
:Vertical :WJ Lin

:2023-08-25

:25.1°C/58%



Report Number	:TERF2306001502ER	Test Site
Operation Mode	:BLE 2M	Test Date
Test Frequency	:2480 MHz	Temp./Humi.
Test Mode	:Bandedge	Antenna Pol.
EUT Pol	:E1 Plane	Engineer



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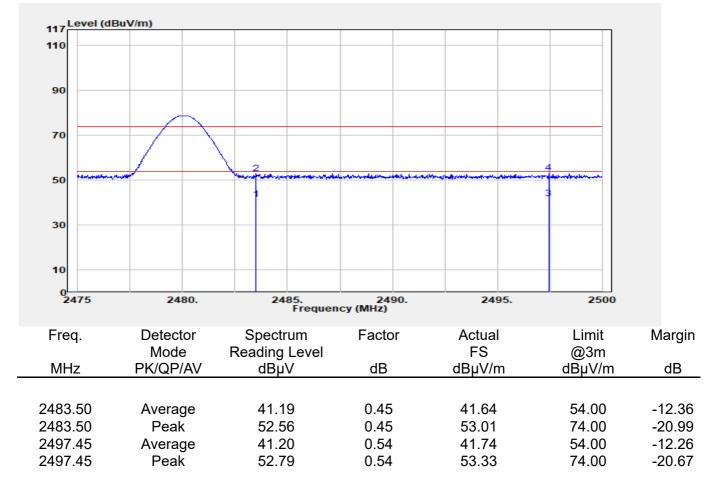
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Report Number	:TERF2306001502ER	Т
Operation Mode	:BLE 2M	Т
Test Frequency	:2480 MHz	Т
Test Mode	:Bandedge	A
EUT Pol	:E1 Plane	E

Test Site	:SAC 1
Test Date	:2023-08-25
Temp./Humi.	:25.1°C/58%
Antenna Pol.	:Horizontal
Engineer	:WJ Lin



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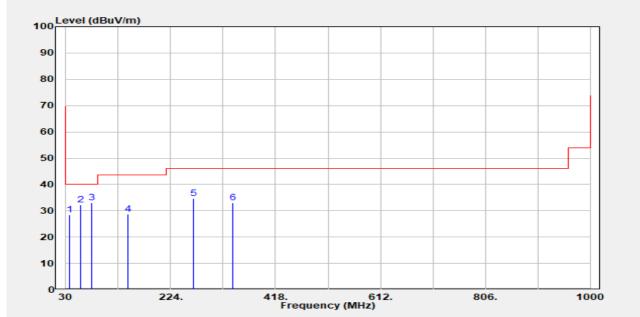
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Report No.: TERF2306001502ER Page: 44 of 63



### 11.6.2 **Radiated Spurious Emission**

Report Number	:TERF2306001502ER	Test Site	:SAC 1
Operation Mode	:BLE 1M	Test Date	:2023-08-28
Test Frequency	:2442 MHz	Temp./Humi.	:24.7°C/56%
Test Mode	:Tx	Antenna Pol.	:Vertical
EUT Pol	:E1 Plane	Engineer	:WJ Lin



Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level		FS	@3m	Ū
	•	٩D		0	ЧD
PN/QP/AV	ασμν	uБ	ασμν/π	ασμν/π	dB
Peak	37.60	-9.15	28.45	40.00	-11.55
QP	49.91	-17.76	32.15	40.00	-7.85
QP	50.44	-17.25	33.19	40.00	-6.81
Peak	41.58	-12.73	28.85	43.50	-14.65
Peak	43.83	-9.11	34.72	46.00	-11.28
Peak	41.38	-8.26	33.12	46.00	-12.88
	QP QP Peak Peak	Mode PK/QP/AVReading Level dBµVPeak37.60QP49.91QP50.44Peak41.58Peak43.83	Mode PK/QP/AVReading Level dBµVdBPeak37.60-9.15QP49.91-17.76QP50.44-17.25Peak41.58-12.73Peak43.83-9.11	Mode PK/QP/AV         Reading Level dBμV         FS dBμV/m           Peak         37.60         -9.15         28.45           QP         49.91         -17.76         32.15           QP         50.44         -17.25         33.19           Peak         41.58         -12.73         28.85           Peak         43.83         -9.11         34.72	Mode PK/QP/AVReading Level dBµVFS dB@3m dBµV/mPeak37.60-9.1528.4540.00QP49.91-17.7632.1540.00QP50.44-17.2533.1940.00Peak41.58-12.7328.8543.50Peak43.83-9.1134.7246.00

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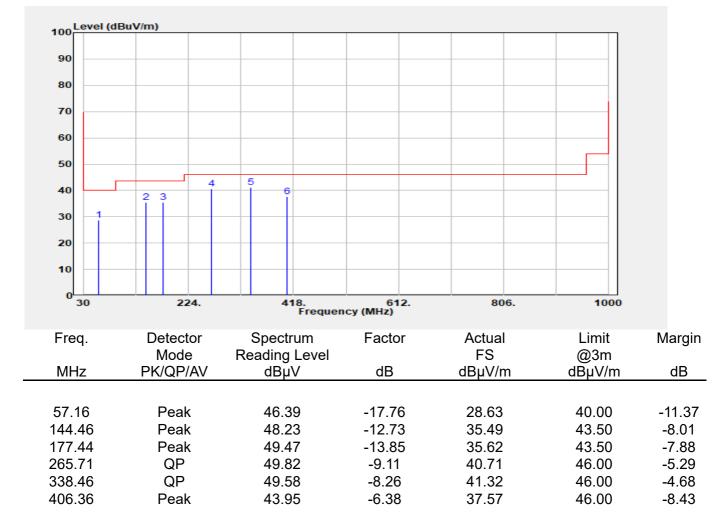
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Report No.: TERF2306001502ER Page: 45 of 63



Report Number	:TERF2306001502ER
Operation Mode	:BLE 1M
Test Frequency	:2442 MHz
Test Mode	:Tx
EUT Pol	:E1 Plane

Test Site :SAC 1 Test Date :2023-08-28 Temp./Humi. :24.7°C/56% Antenna Pol. :Horizontal :WJ Lin Engineer



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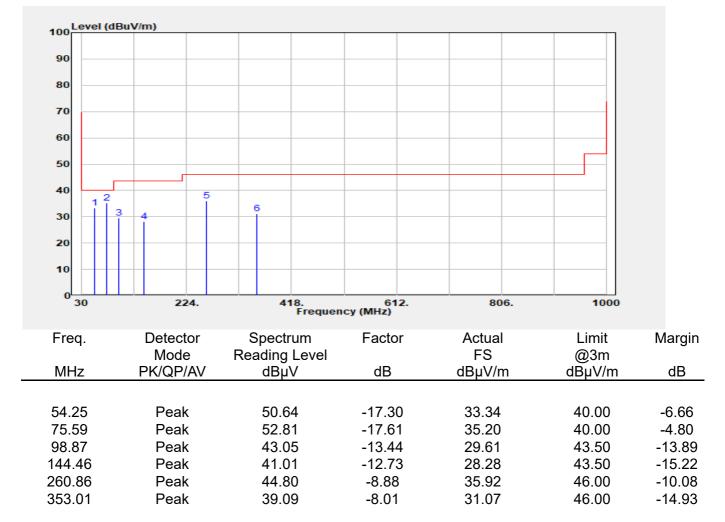
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Report No.: TERF2306001502ER Page: 46 of 63



Report Number	:TERF2306001502ER
Operation Mode	:BLE 2M
Test Frequency	:2442 MHz
Test Mode	:Tx
EUT Pol	:E1 Plane

Test Site :SAC 1 Test Date :2023-08-28 Temp./Humi. :24.7°C/56% Antenna Pol. :Vertical :WJ Lin Engineer



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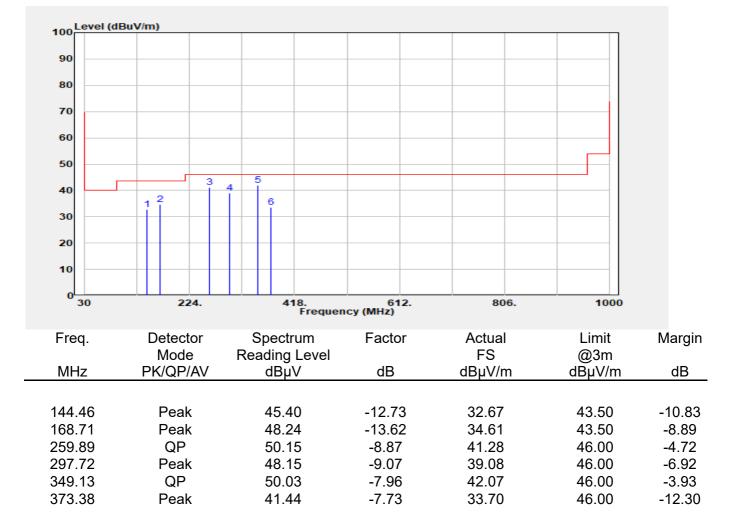
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Report No.: TERF2306001502ER Page: 47 of 63



Report Number	:TERF2306001502ER
Operation Mode	:BLE 2M
Test Frequency	:2442 MHz
Test Mode	:Tx
EUT Pol	:E1 Plane

Test Site :SAC 1 Test Date :2023-08-28 Temp./Humi. :24.7°C/56% Antenna Pol. :Horizontal :WJ Lin Engineer



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Report Numbe Operation Mod Test Frequency Test Mode EUT Pol	e :BLE 1M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7°C/56% :Vertical :WJ Lin	
100 Level (dBu	ıV/m)					
100						
90						
80						
70						
60	4					
50	2 3					
40						
30						
20						
10						
0 1000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Erca	Detector	Spectrum	Factor	Actual	Limit	Morain
Freq.	Mode	Reading Level	Factor	FS	@3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
		f				
4804.00	Average	33.19	8.08	41.27	54.00	-12.73
4804.00	Peak	40.87	8.08	48.95	74.00	-25.05
7206.00	Average	32.05	15.21	47.26	54.00	-6.74
7206.00	Peak	40.23	15.21	55.44	74.00	-18.56

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Report No.: TERF2306001502ER Page: 49 of 63



Report Number Operation Mode Test Frequency Test Mode	e ∷BLE 1M :2402 M⊦ :Tx			Test Site Test Date Temp./Humi. Antenna Pol.	:SAC 1 :2023-08-28 :24.7℃/56% :Horizontal	
EUT Pol	:E1 Plane	e		Engineer	:WJ Lin	
100 Level (dBu)	//m)					
90						
80						
70						
60	4					
50	2 3					
40	1					
30						
20						
10						
0 1000	6100.	11200. Frequen	16300. acy (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
4804.00 4804.00	Average Peak	33.86 40.95	8.08 8.08	41.94 49.03	54.00 74.00	-12.06 -24.97
7206.00	Average	34.48	15.21	49.69	54.00	-4.31

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41.10

Peak

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15.21

56.31

74.00

-17.69

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7206.00

Report No.: TERF2306001502ER Page: 50 of 63



Report Numbe Operation Mod Test Frequency Test Mode EUT Pol	e :BLE 1M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7°C/56% :Vertical :WJ Lin	
100 Level (dBu	IV/m)					
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
0	6100.	11200.	16300.	21400.	26500	
1000	6100.		16300. icy (MHz)	21400.	20000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4884.00	Average	33.25	7.86	41.11	54.00	-12.89
4884.00	Peak	40.71	7.86	48.57	54.00 74.00	-12.69
7326.00	Average	30.82	15.36	46.18	54.00	-7.82
7326.00	Peak	39.03	15.36	54.38	74.00	-19.62

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Report Number Operation Mode Test Frequency Test Mode EUT Pol	:TERF230 :BLE 1M :2442 MF :Tx :E1 Plane		Test Site Test Date Temp./Humi. Antenna Pol. Engineer		
100 Level (dBuV/n	1)				
90					
80					
70					
60	4				
50	2 3				
40					
30					
20					
10					
0					
1000	6100.	11200. Frequen	16300. су (MHz)	21400.	26500
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m

Margin dBµV/m dBµV PK/QP/AV dB dBµV/m dB MHz -10.13 4884.00 Average 7.86 43.87 54.00 36.01 4884.00 42.65 7.86 50.51 74.00 -23.49 Peak 7326.00 Average 33.43 15.36 48.79 54.00 -5.21 7326.00 Peak 40.89 15.36 56.25 74.00 -17.75

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Report Numbe Operation Mod Test Frequency Test Mode EUT Pol	le :BLE 1M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7℃/569 :Vertical :WJ Lin	
100 Level (dBu	ıV/m)					
90						
80						
70						
60	4					
50						
40						
30						
20						
10						
0						
0 1000	6100.	11200. Frequer	16300. Icy (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
	FIVQF/AV	υσμν	UD	ασμν/π	ασμν/π	UD
4960.00	Average	35.66	8.74	44.40	54.00	-9.60
4960.00	Peak	42.36	8.74	51.10	74.00	-22.90
7440.00	Average	30.42	15.32	45.74	54.00	-8.26
7440.00	Peak	39.65	15.32	54.97	74.00	-19.03

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Report No.: TERF2306001502ER Page: 53 of 63

Margin



Report Number Operation Mode Test Frequency Test Mode EUT Pol	:TERF23 :BLE 1M :2480 MF :Tx :E1 Plane	Ηz		Test Site Test Date Temp./Humi. Antenna Pol. Engineer	
100 Level (dBuV/	m)				
90					
80					
70					
60	4				
50	2				
40					
30					
20					
10					
0 1000	6100.	11200. Freque	16300. ncy (MHz)	21400.	26500
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m

•	Mode	Reading Level		FS	@3m	0
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Average	35.29	8.74	44.03	54.00	-9.97
4960.00	Peak	42.39	8.74	51.13	74.00	-22.87
7440.00	Average	31.08	15.32	46.40	54.00	-7.60
7440.00	Peak	39.48	15.32	54.80	74.00	-19.20

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Report No.: TERF2306001502ER Page: 54 of 63



Report Number Operation Mode Test Frequency Test Mode EUT Pol	e :BLE 2M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7℃/56% :Vertical :WJ Lin	
100 Level (dBu	V/m)					
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
0			<u> </u>			
0 <sup>L</sup> 1000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	10
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Average	32.19	8.08	40.27	54.00	-13.73
4804.00	Average Peak	40.69	8.08 8.08	40.27 48.77	54.00 74.00	-13.73
7206.00	Average	29.92	15.21	45.13	54.00	-8.87
7206.00	Peak	39.13	15.21	54.34	74.00	-19.66

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Report Number Operation Mod Test Frequency Test Mode	e :BLE 2M / :2402 MF :Tx			Test Site Test Date Temp./Humi. Antenna Pol.		
EUT Pol	:E1 Plane	9		Engineer	:WJ Lin	
100 Level (dBu	IV/m)					
90						
80						
70						
60	4					
50	2 3					
40						
30						
20						
10						
0 1000	6100.	11200. Frequer	16300. асу (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual FS	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBμV/m	@3m dBµV/m	dB
4804.00	Average	32.03	8.08	40.11	54.00	-13.89
4804.00	Average Peak	40.08	8.08	40.11 48.16	54.00 74.00	-13.69 -25.84
7206.00	Average	32.77	15.21	47.98	54.00	-6.02
7000.00		40.05	15.01	50.40	74.00	47.04

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40.95

Peak

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15.21

56.16

74.00

-17.84

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Report No.: TERF2306001502ER Page: 56 of 63



Report Number Operation Mode Test Frequency Test Mode EUT Pol	:TERF2306 :BLE 2M :2442 MHz :Tx :E1 Plane			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7°C/56% :Vertical :WJ Lin	
100 Level (dBuV/m	n)					
90						
80						
70						
60						
50	2					
	1 3					
40						
30						
20						
10						
0						
0 <sup></sup> 1000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq. [	Detector	Spectrum	Factor	Actual	Limit	Margin
		Reading Level		FS	@3m	
MHz P	K/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4884.00 A	Average	32.95	7.86	40.81	54.00	-13.19
4884.00	Average Peak	32.95 40.99	7.86 7.86	40.81 48.85	54.00 74.00	-13.19 -25.15
	Average	29.39	15.36	44.75	54.00	-25.15
7326.00	Peak	38.58	15.36	53.94	74.00	-20.06

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Report No.: TERF2306001502ER Page: 57 of 63



Report Number Operation Mod Test Frequency Test Mode EUT Pol	e :BLE 2M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7℃/56% :Horizontal :WJ Lin	
100 Level (dBu	V/m)					
90						
80						
70						
60	4					
50	2					
	1					
40						
30						
20						
10						
0 <sup>L</sup> 1000	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
1001 00	Average	25 92	7.86	43.69	54.00	10.24
4884.00 4884.00	Average Peak	35.83 42.46	7.86	43.69 50.32	54.00 74.00	-10.31 -23.68
7326.00	Average	32.69	15.36	48.05	54.00	-5.95
7326.00	Peak	41.38	15.36	56.74	74.00	-17.26

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Report No.: TERF2306001502ER Page: 58 of 63



Report Number Operation Mod Test Frequency Test Mode EUT Pol	e :BLE 2M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-28 :24.7℃/56% :Vertical :WJ Lin	
100 Level (dBu	IV/m)					
90						
80					<u> </u>	
70						
60						
50	2 4					
	1 3					
40						
30						
20						
10						
0 1000						
1000	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
4960.00	Average	35.30	8.74	44.04	54.00	-9.96
4960.00	Average Peak	42.08	8.74 8.74	44.04 50.82	54.00 74.00	-9.90 -23.18
7440.00	Average	28.55	15.32	43.87	54.00	-10.13
7440.00	Peak	38.05	15.32	53.37	74.00	-20.63

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Report No.: TERF2306001502ER Page: 59 of 63



Report Numbe Operation Mod Test Frequency Test Mode EUT Pol	le :BLE 2M			Test Site Test Date Temp./Humi. Antenna Pol. Engineer	:SAC 1 :2023-08-2 :24.7°C/569 :Horizontal :WJ Lin	
100 Level (dBu	JV/m)					
100						
90						
80						
70						
60	4					
50	2					
40						
30						
20						
10						
0						
0 1000	6100.	11200. Frequer	16300. Icy (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
4960.00	Average	36.42	8.74	45.16	54.00	-8.84
4960.00	Peak	42.87	8.74	51.61	74.00	-22.39
7440.00	Average	31.83	15.32	47.15	54.00	-6.85
7440.00	Peak	40.38	15.32	55.70	74.00	-18.30

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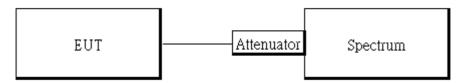
# **12 POWER SPECTRAL DENSITY**

## 12.1 Standard Applicable:

Per Part 15.247 (e) & RSS-247 section 5.2 b

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.
- 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 = 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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#### **Measurement Result:** 12.4

## **BLE 1M mode**

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-12.090	8	PASS
2442	-12.000	8	PASS
2480	-11.110	8	PASS

\*Note:

1.cable loss as 0.88dB that offsets in the spectrum

## BLE 2M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-13.840	8	PASS
2442	-14.270	8	PASS
2480	-13.460	8	PASS

\*Note:

1.cable loss as 0.88dB that offsets in the spectrum

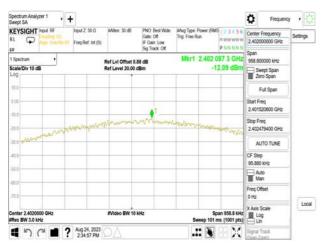
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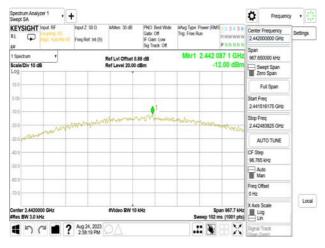
## Report No.: TERF2306001502ER Page: 62 of 63



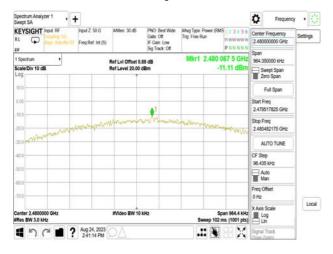
### PSD\_BLE 1M\_LowCH00-2402MHz



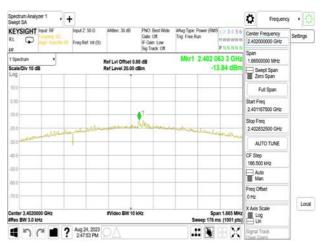
PSD\_BLE 1M\_MidCH20-2442MHz



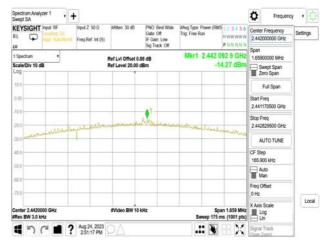
PSD\_BLE 1M\_HighCH39-2480MHz



### PSD\_BLE 2M\_LowCH00-2402MHz









ectrum Analyzer 1 vept SA Ö Frequency . · + PNO Best Wide Gate Off IF Gain Low KEYSIGHT Input RF Input Z 50 D #Atten: 30 dB #Aug Type: Power (RMS 1 2 3 4 5 Center Frequency Settings 9 Freq Ref. Int (S) 2.4800 IF Gan L Sig Track 137 064 6 GHz Ref Lvi Offset 0.88 dB Ref Level 20.00 dBm 1.65750000 MHz -13.46 d Scale/Div 10 dl Swept Span Zero Span Full Span Start Freq 2.479171250 GHz . Stop Freq 2.480828750 GHz AUTO TUNE CF Step 165.750 kHz Auto Man Freq Offset 0 Hz Local Span 1.658 MHz sep 175 ms (1001 pts) Center 2.4800000 #Res BW 3.0 kHz 1 5 C 1 ? Aug 24, 2023 2:54:32 PM .:: 😽 Signal Tra

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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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