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TEST REPORT					
Report No. ·····:	CTC20230752E04				
FCC ID	2A9FYSL02				
Applicant:	Cyclops Marine Limited				
Address:	Unit 25 The Slipway, Port Solent, Portsmouth PO6 4TR UK				
Manufacturer	Boqun Electronics Technology CO. Ltd.				
Address:	NO.8 XiFu Street, Houjie town, Dongo	guan, Guangdong, China			
Product Name······:	Smart Load				
Trade Mark······:	/				
Model/Type reference······:	SL002				
Listed Model(s) ·····:	: SR09, SR10, SR11, SR12, SR13, SS01, SS02, SE01, FE02, FE03, FE04, TS07, TS08, TS02, TS03, TS05, TS06				
Standard:	FCC CFR Title 47 Part 15 Subpart C	Section 15.247			
Date of receipt of test sample:	Mar. 27, 2023				
Date of testing	Mar. 27, 2023 to Apr. 17, 2023				
Date of issue	Apr. 18, 2023				
Result:	PASS				
Compiled by:		T: Jiang			
(Printed name+signature)	Jim Jiang	Jim in g			
Supervised by:		Jim Jiang Zric zhang			
(Printed name+signature)	Eric Zhang				
Approved by:					
(Printed name+signature)	Totti Zhao	/			
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correspond to the test sample.



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# 1. TEST SUMMARY

# 1.1. Test Standards

The tests were performed according to following standards:

<u>FCC Rules Part 15.247</u>: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz. <u>RSS-247 Issue 2</u>: Standard Specifications for Frequency Hopping Systems (FHSs) and Digital Transmission Systems (DTSs) Operating in the Bands 902-928MHz, 2400-2483.5MHz and 5725-5850MHz. <u>ANSI C63.10-2013</u>: American National Standard for Testing Unlicensed Wireless Devices.

# 1.2. Report Version

Revised No.	Date of issue	Description
01	Apr. 18, 2023	Original

# 1.3. Test Description

FCC Part 15 Subpart C (15.247) / RSS-247 Issue 2					
Test Item	Standard	Section	Result	Test	
	FCC	IC	Result	Engineer	
Antenna Requirement	15.203	/	Pass	Jim Jiang	
Conducted Emission	15.207	RSS-Gen 8.8	N/A	N/A	
Band Edge Emissions	15.247(d)	RSS-247 5.5	Pass	Jim Jiang	
6dB Bandwidth	15.247(a)(2)	RSS-247 5.2 (a)	Pass	Jim Jiang	
Conducted Max Output Power	15.247(b)(3)	RSS-247 5.4 (d)	Pass	Jim Jiang	
Power Spectral Density	15.247(e)	RSS-247 5.2 (b)	Pass	Jim Jiang	
Transmitter Radiated Spurious	15.209&15.247(d)	RSS-247 5.5& RSS-Gen 8.9	Pass	Jim Jiang	

Note:

N/A: Not applicable.

The measurement uncertainty is not included in the test result.



# 1.4. Test Facility

## CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

## Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

## A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for r the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

## Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

## FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

# **1.5. Measurement Uncertainty**

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement characteristics; Part 2" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.



Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth		(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

# **1.6. Environmental Conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature:	21°C~27°C
Relative Humidity:	40%~60%
Air Pressure:	101kPa



# 2. GENERAL INFORMATION

# 2.1. Client Information

Applicant:	Cyclops Marine Limited	
Address:	Unit 25 The Slipway, Port Solent, Portsmouth PO6 4TR UK	
Manufacturer:	anufacturer: Boqun Electronics Technology CO. Ltd.	
Address: NO.8 XiFu Street, Houjie town, Dongguan, Guangdong, China		
Factory: Boqun Electronics Technology CO. Ltd.		
Address: NO.8 XiFu Street, Houjie town, Dongguan, Guangdong, China		

# 2.2. General Description of EUT

Product Name:	Smart Load	
Trade Mark:	/	
Model/Type reference:	SL002	
Listed Model(s):	SR09, SR10, SR11, SR12, SR13, SS01, SS02, SE01, FE02, FE03, FE04, TS07, TS08, TS02, TS03, TS05, TS06	
Model Difference:All these models are identical in the same PCB, layout, electrical circ difference is the model name.		
Power supply:	DC 3.6V	
Hardware version:	/	
Software version:	/	
Bluetooth 5.1/ BLE		
Modulation:	GFSK	
Operation frequency:	2402MHz~2480MHz	
Channel number:	40	
Channel separation:	2MHz	
Antenna type:	PCB Antenna	
Antenna gain:	0.93dBi	



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# 2.3. Accessory Equipment Information

Equipment Information						
Name	Model	S/N	Manufacturer			
Notebook	ThinkPad T460s	/	Lenovo			
XDSII0 DEBUG PROBE	TMDSEMU110-U	7554600527	Texas			
Cable Information	Cable Information					
Name	Shielded Type	Ferrite Core	Length			
USB Cable	Unshielded	NO	80cm			
Test Software Information						
Name	Version	/	/			
SmartRF Studio	2.28.0	/	/			



# 2.4. Operation State

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT BLE, 40 channels are provided to the EUT. Channels 00/19/39 were selected for testing. Operation Frequency List:

Channel	Frequency (MHz)
00	2402
01	2404
:	:
18	2438
19	2440
20	2442
:	:
38	2478
39	2480

Note: The display in grey were the channel selected for testing.

#### Test mode

For RF test items:

The engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions:

The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.

For Radiated spurious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.



EN

# 2.5. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023
2	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
3	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
4	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 16, 2023
5	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 16, 2023
6	Power Sensor	Keysight	U2021XA	MY55130004	Mar. 14, 2024
7	Power Sensor	Keysight	U2021XA	MY55130006	Mar. 14, 2024
8	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 16, 2023
9	High and low temperature box	ESPEC	MT3035	/	Mar. 24, 2024
10	JS1120 RF Test system	TONSCEND	v2.6	/	/
Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until

Raula	Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9163	01026	Dec. 18, 2024	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 01, 2024	
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023	
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023	
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023	
6	3m chamber 3	YIHENG	EE106	/	Sep. 09, 2023	



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Condu	ucted Emission				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 16, 2023
2	LISN	R&S	ENV216	101113	Dec. 16, 2023
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 16, 2023
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 16, 2023
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 16, 2023

Note: The Cal. Interval was one year.

# 3. TEST ITEM AND RESULTS

# 3.1. Conducted Emission

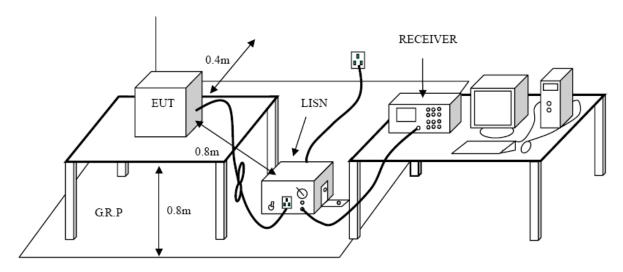
## <u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.207/ RSS - Gen 8.8

	Limit (d	BuV)
Frequency range (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

## **Test Configuration**



## Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.

2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.

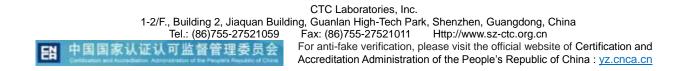
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

7. During the above scans, the emissions were maximized by cable manipulation.

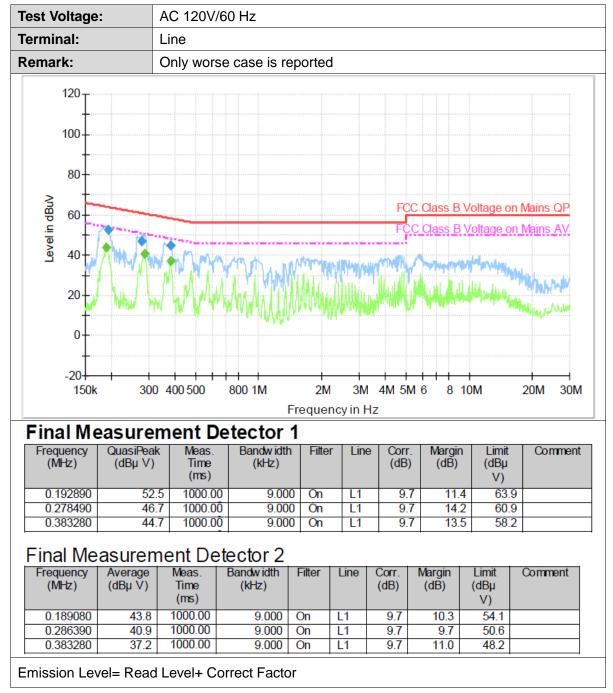




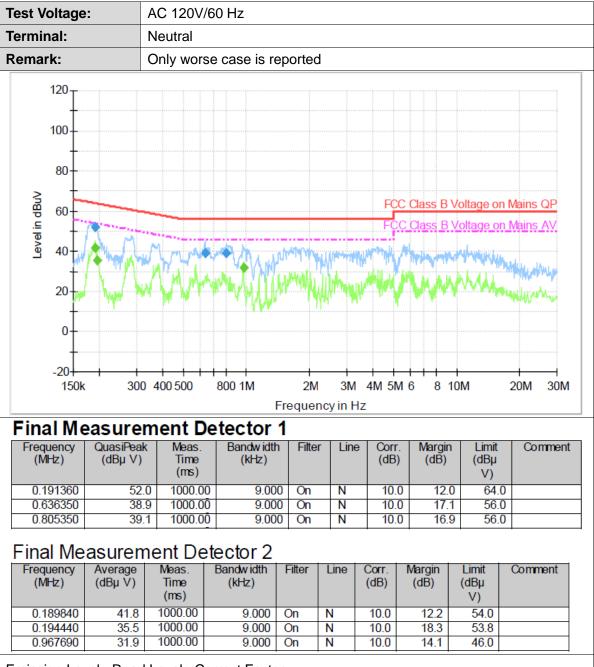
## Test Mode:

Please refer to the clause 2.4.

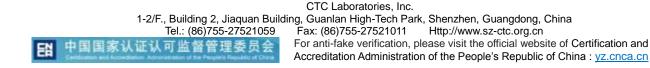
#### **Test Results**







Emission Level= Read Level+ Correct Factor





# 3.2. Radiated Emission

<u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.209/ RSS - Gen 8.9

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

	dB(uV/m) (a	at 3 meters)
Frequency (MHz)	Peak	Average
Above 1000	74	54

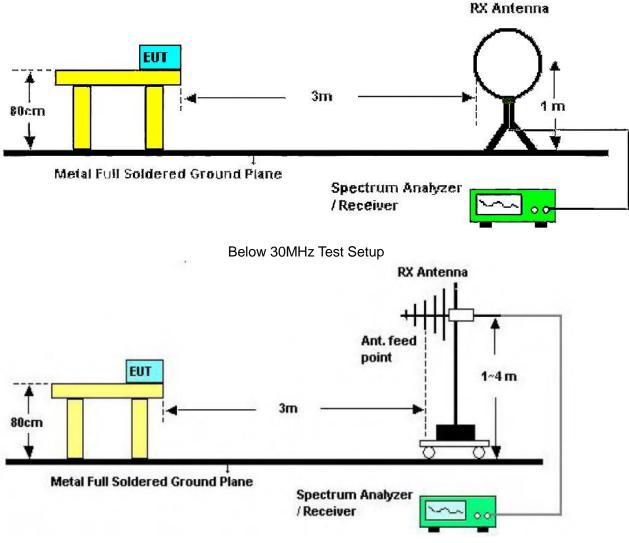
## Note:

(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

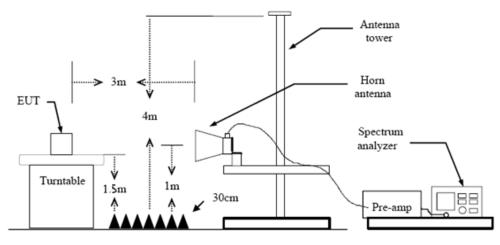
## **Test Configuration**





30-1000MHz Test Setup





Above 1GHz Test Setup

## **Test Procedure**

1. The EUT was setup and tested according to ANSI C63.10:2013

2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for

above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level. 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.

For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower 4. (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

Set to the maximum power setting and enable the EUT transmit continuously. 5.

Use the following spectrum analyzer settings 6.

(1) Span shall wide enough to fully capture the emission being measured;

(2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to 10<sup>th</sup> harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=10Hz with Peak Detector for Average Value.

#### **Test Mode**

Please refer to the clause 2.4.

#### **Test Result**

#### 9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

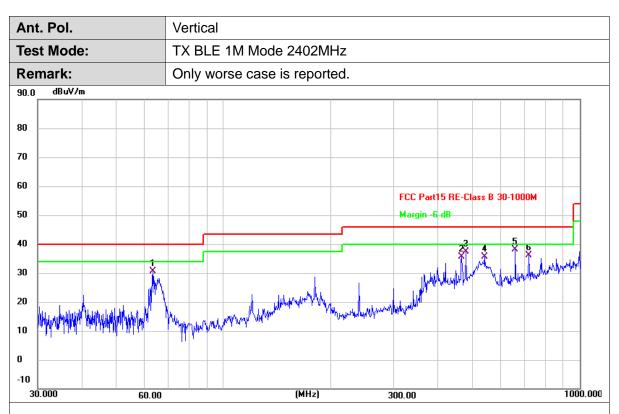


## 30MHz-1GHz

4nt	t. Pol.		Н	orizo	ontal					
Tes	t Mode	:	T	X BL	.E 1N	Mode 2402N	1Hz			
Rei	mark:		0	nly v	vorse	case is repor	ted.			
90.0	dBu∀/m									
80										
70			_							
60			_					FCC Part15 RE-I	Class B 30-10	DOM
50			_					Margin -6 dB		
40				<b>[</b>				* 5	× ×	<sup>‡ 3</sup> §
30		A						h and when have a h	. Juntar Aufrender	w.W.M. Konstan Jan White
20		allimatically and			1	Normania	anny when the strenk	Mary Provide	10Y'	
10	Mada a mindanni	all a subhar a la far.	""W	when	NY WAR	N				
0			_							
-10 30	).000	60.0	D			(MHz)	30	0.00		1000.
						1	I	1	1	
	No.	Frequence (MHz)	;y		adin BuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	1	359.186	0	4	8.37	-12.25	36.12	46.00	-9.88	QP
	2	478.845	5	4	5.17	-9.37	35.80	46.00	-10.20	QP
	3	658.836			1.42	-5.17	36.25	46.00	-9.75	QP
	4 *	719.199			1.18	-4.20	36.98	46.00	-9.02	QP
	5	779.606			9.60	-3.17	36.43	46.00	-9.57	QP
	6	932.271	5	- 30	6.62	-0.93	35.69	46.00	-10.31	QP

2.Margin value = Level -Limit value





No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	63.0916	46.68	-15.93	30.75	40.00	-9.25	QP
2	465.5994	45.27	-9.67	35.60	46.00	-10.40	QP
3	478.8455	46.68	-9.37	37.31	46.00	-8.69	QP
4	539.4775	43.30	-7.78	35.52	46.00	-10.48	QP
5 *	658.8361	43.33	-5.17	38.16	46.00	-7.84	QP
6	719.1995	40.41	-4.20	36.21	46.00	-9.79	QP

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



An	t. Pol.		Horizontal						
Tes	st Mode	•:	TX BLE 1M N	lode 2402N	lHz				
Re	mark:		No report for to to rescribed lim		n which mor	re than 20	dB below	the	
	No	Frequency	Reading	Factor	Level	Limit	Margin	Detector	

No.	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Detector
1 *	4803.894	37.54	2.56	40.10	54.00	-13.90	AVG
2	4803.950	46.06	2.56	48.62	74.00	-25.38	peak

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX BLE 1M Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1 *	4803.859	31.37	2.56	33.93	54.00	-20.07	AVG
2	4803.900	41.23	2.56	43.79	74.00	-30.21	peak

Remarks:



Ant. Pol.		Horizontal					
Test Mode	<b>:</b>	TX BLE 1M M	1ode 2440N	1Hz			
Remark:		No report for to to rescribed lim		n which moi	re than 20 o	dB below	the
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1 *	4879.945	36.47	2.79	39.26	54.00	-14.74	AVG

2

4879.997

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

2.79

47.99

74.00

-26.01

peak

45.20

٩nt	. Pol.	N	/ertical					
<b>Fes</b>	t Mode:	:	TX BLE 1M M	1ode 2440N	1Hz			
Ren	nark:		No report for prescribed lim		n which mo	re than 20	dB below	the
г								
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.		-					Detector AVG

Remarks:



Ant. Pol.		H	Horizontal					
Test Mode:			TX BLE 1M Mode 2480MHz					
Remark:			lo report for t rescribed lim		n which moi	e than 20 o	B below	the
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.		· · · ·				-	Detector AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.	١	/ertical					
Test Mode	: T	TX BLE 1M Mode 2480MHz					
Remark:		lo report for prescribed lin		n which moi	re than 20	dB below the	
	Frequency	Reading	Factor	Level	Limit	Margin	

No.	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	Detector
1	4959.917	40.47	3.04	43.51	74.00	-30.49	peak
2 *	4960.010	29.93	3.04	32.97	54.00	-21.03	AVG

Remarks:



Ant. Pol.			lorizontal					
Tes	t Mode	: Т	TX BLE 2M Mode 2402MHz					
Remark:			lo report for t rescribed lim		n which moi	re than 20 o	dB below	the
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.		· · · ·				-	Detector peak

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX BLE 2M Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	4804.093	41.27	2.56	43.83	74.00	-30.17	peak
2 *	4804.100	30.60	2.56	33.16	54.00	-20.84	AVG

Remarks:



Ant. Pol.		Horizontal					
Test Mod	le:	TX BLE 2M Mode 2440MHz					
Remark:		No report for prescribed lin		n which moi	re than 20 (	dB below	the
	Frequency	Reading	Factor	Lovel	Limit	Morgin	
No.	(MHz)	(dBm)	(dB)	Level (dBm)	(dBm)	Margin (dB)	Detector
No.	(MHz) 4880.024						Detector peak

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.		Vertical					
Test Mod	Test Mode:TX BLE 2M Mode 2440MHzRemark:No report for the emission which more than 20 dB below the						
Remark:		No report for prescribed lin		n which moi	re than 20 c	dB below	the
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector

Remarks:

2 \*

4880.012

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

2.79

33.49

54.00

-20.51

AVG

30.70



Ant. Pol.			orizontal					
Tes	t Mode:	: Т	X BLE 2M M	lode 2480M	lHz			
Remark:			o report for t rescribed lim		n which mor	re than 20 o	dB below	the
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.						-	Detector AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.		Vertical		Vertical						
st Mode	:	TX BLE 2M Mode 2480MHz								
emark:		No report for prescribed lin		n which mo	re than 20	dB below	the			
	1		1							
No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector			
No.		-				-	Detector peak			

Remarks:



# 3.3. Band Edge Emissions (Radiated)

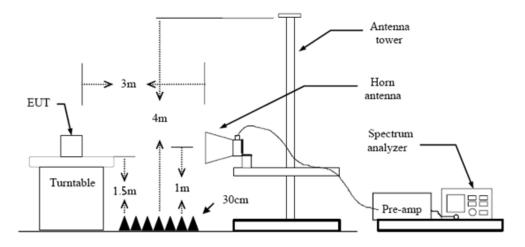
<u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d)/ RSS-247 5.5:

Restricted Frequency Band	(dBuV/m	n)(at 3m)
(MHz)	Peak	Average
2310 ~ 2390	74	54
2483.5 ~ 2500	74	54

Conducted band edge limit: The highest point of the operating frequency waveform down 20dB

## Test Configuration



#### Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5. The receiver set as follow:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.8 Duty Cycle.

#### Test Mode

Please refer to the clause 2.4.

#### Test Results

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#### (1) Radiation Test

est M	ol.		H	lorizontal						
Test Mode:			Т	X BLE 1M N	/lode 2402	MHz				
20.0 d	Bu¥/m	1			1	i		1		
10										
									1	1
30										
							FCC Part15	C - Above 1	G PK	
70										t
							FCC Part15	C - Above 10	GAV	
50								1 X		
10							 	2	ant	VL
30										
20							 			
10										
0.0 2288.0	00 220	0.00 231	2.00	2324.00 233	36.00 (MHz)	2360.00	 372.00 23	B4.00 23	96.00	24
N	<b>o</b> .	Frequer (MHz		Reading (dBuV)	Factor (dB/m)	Level (dBuV/r	Limit IBuV/m)	Margin (dB)	Dete	ctor
1	1	2390.0	00	14.92	30.84	45.76	74.00	-28.24	pea	ak
· · · ·	*	2390.0	00	4.93	30.84	35.77	54.00	-18.23	AV	G

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nt. Pol.		Verti	cal					
est Mode	:	TX E	BLE 1M M	1ode 2402N	/Hz			
20.0 dBuV/m								1
0								
0								
·								
						ECC Part15	C - Above 10	G PK
								A
						FCC Part15	C - Above 10	
							1 X	
						and a second	2	- man h
0								
	299.40 2311.4	40 232	23. <b>4</b> 0 233	15.40 (MHz)	2359.40	2371.40 23	B3.40 23	95.40 2
	Frequence		eading	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecto
No.	(MHz)	(	dBuV)	(ub/iii)	(aba min)	(		
No.	(MHz) 2390.00		15.99	30.84	46.83	74.00	-27.17	peak

FN



	l.	Ho	orizontal					
est Mo	de:	ТХ	BLE 1M N	1ode 2480N	ЛНz			
0.0 dBu	iV/m							
o								
0								
·   _A								
						FCC Part15	C - Above 10	G PK
Ħ								
						FCC Part15	C - Above 10	G AV
	1 X							
- Jan	2 manual man	- experiendentee		and a state of the second s			yaaurenne	Andream and the contraction of the
.0								
	2486.60 249	98.60 2	2510.60 252	22.60 (MHz)	2546.60	2558.60 25	70.60 25	82.60 259
2474.600								
No	Freque		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
		z)						Detector peak

FN



FN

	Vertical					
:	TX BLE 1M	Mode 2480N	/Hz			
			i i		i	
				FCC Part15	C - Above 16	i PK
				FCC Part15	C - Above 16	i AV
in the second second			,			and the second second second
186.60 2498.6	0 2510.60 25	622.60 (MHz)	2546.60	2558.60 257	70.60 258	32.60 2594
Frequenc (MHz)	y Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2483.500	) 17.82	31.24	49.06	74.00	-24.94	peak
2483.500	) 5.94	31.24	37.18	54.00	-16.82	AVG
	B6.60 2498.60	TX BLE 1M I TX BLE 1M I EACTOR 1000000000000000000000000000000000000	TX BLE 1M Mode 2480N	TX BLE 1M Mode 2480MHz         Image: Colspan="2">Image: Colspan="2" Image: C	TX BLE 1M Mode 2480MHz         TX BLE 1M Mode 2480MHz         Image: Colspan="2">Image: Colspan="2">FCC Part15         Image: Colspan="2">Image: Colspan="2"         Image: Colspan="2"<	TX BLE 1M Mode 2480MHz         TX BLE 1M Mode 2480MHz         Image: State of the state of th



nt. Pol.		Hori	zontal					
est Mode	:	TX E	3LE 2M N	/lode 2402N	ЛНz			
20.0 dBu¥/m	1							
0								
)0								
)								$\wedge$
)						ECC Part15	C - Above 10	S PK
)								
ı								
,						FCC Part15	C - Above 10	
							1 X	
)			presence and man	and a construction of the second s	-	-		man h
)								
)								
ı								
).0 2286.800 22	98.80 2310.8		22.80 233	34.80 (MHz)	2358.80	2370.80 23	B2.80 23	94.80 24
No.	Frequenc (MHz)	-	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	)	16.91	30.84	47.75	74.00	-26.25	peak
2 *	2390.000	)	4.80	30.84	35.64	54.00	-18.36	AVG



nt. Pol.		Vertical					
st Mode	:	TX BLE 2M N	/lode 2402N	1Hz			
.0 dBuV/m	1		i i		1	i	
ı							
					FCC Part15	C - Above 11	G PK
							Λ
					FCC Part15	C - Above 10	
						1 X	
				- the second second second second	have an an an and a second	Ş	
287.400 22	299.40 2311.4	0 2323.40 23	35.40 (MHz)	2359.40	2371.40 23	B3.40 23	95.40 240
No.	Frequenc (MHz)	y Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
-	2390.000	) 15.12	30.84	45.96	74.00	-28.04	peak
1		0 4.30	30.84	35.14	54.00	-18.86	AVG

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nt. Pol.		Horiz	zontal					
est Mode	:	TX B	LE 2M N	1ode 2480N	/Hz			
20.0 dBuV/m							1	
10								
)   -     -						FCC Part15	C - Above 16	e PK
						FCC Part15	C - Above 16	AV
ı X								
' <del>/ &amp;</del> .	no manageria		more and				motoriantestan	
l								
) ).0								
	486.60 2498.	60 251	0.60 252	2.60 (MHz)	2546.60	2558.60 25	70.60 250	B2.60 25
2474.600 24	86.60 2498.	60 251	0.60 252	2.60 (MHz)	2546.60	2558.60 25	70.60 250	82.60 25
No.	Frequen (MHz)	-	eading dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
No.	Frequen (MHz) 2483.50	(	eading dBuV) 20.15	Factor (dB/m) 31.24		Limit (dBuV/m) 74.00		Detector peak

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Ant. Pol.		Ver	tical					
Test Mode	):	TX	BLE 2M M	1ode 2480N	/Hz			
20.0 dBuV/n	n							
110								
100								
0								
30						FCC Part15	C - Above 1G	i PK
ro 📃 🔿								
50						FCC Part15	C - Above 16	AV
50 1 X								
	Magneting and an and a start of and		New and the second second		w.~~******	adamenta and a second		hanter og andre
0								
0.0								
	486.60 2498	.60 2	510.60 252	22.60 (MHz)	2546.60	2558.60 25	70.60 258	32.60 25
0.0 2474.600 2	Frequen (MHz)	icy I	510.60 252 Reading (dBuV)	Factor (dB/m)	Level	2558.60 25 Limit (dBuV/m)	Margin	32.60 25 Detector
		·	16.93	31.24	48.17	74.00	-25.83	peak
1	2483.50		10.00	31.24	36.45	54.00	-17.55	AVG
1	2483.50	<i></i>						

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

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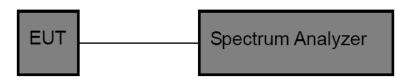


# 3.4. Band edge and Spurious Emissions (Conducted)

## <u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

## Test Configuration



#### Test Procedure

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- 3. Use the following spectrum analyzer settings:
  - RBW = 100 kHz, VBW  $\geq$  RBW, scan up through 10<sup>th</sup> harmonic.
- Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### Test Mode

Please refer to the clause 2.4.

#### Test Results

#### (1) Band edge Conducted Test

Test Mode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE 1M	Ant1	Low	2402	-13.19	-57.49	≤-33.19	PASS
DLC_IW	Anti	High	2480	-11.54	-59.30	≤-31.54	PASS
BLE 2M	Ant1	Low	2402	-14.76	-48.18	≤-34.76	PASS
	AILI	High	2480	-13.73	-58.68	≤-33.73	PASS



# Test plot as follows:

BLE_1M_Ant1_Low_2402
Adjent Spectrum Analyzer - Swept SA         Selection()         Allow OFF         07-49:15 AM Apr 03, 2023         Frequency           Center Freq 2.352520000 GHz         #Avg Type: RMS         Itext         22.856         Frequency
Ref Offset 0.5 dB Mkr5 2.399 960 GHz
10 dBldiv Ref 20.00 dBm -37.458 dBm 100 100 100 2.362500000 GHz
100 100 100 100 100 100 100 100 100 100
30.0 30.0 30.0 20.0 20.0 GHz
400 600 700 700
Start 2.30000 GHz         Stop 2.40500 GHz         CF Step           #Res BW 100 kHz         #VBW 300 kHz         Sweep 10.07 ms (1001 pts)         10.500000 MHz           MKR MODE TRC SQL         X         Y         Function water         Auto         Man
Image: No. 2002         Control of the sector of the s
6         N         1         f         2.399 960 GHz         .57.498 dBm         0
BLE_1M_Ant1_High_2480
Aglient Spectrum Analyzer - Swept SA         Selves: NY1         ▲ ALISN OFF         DB 00:37 MM Apr 03, 2023           Center Freq 2.510000000 GHz         Trig: Free Run         #Avg Type: RMS         Trace         123 4 56           Frequency         Trig: Free Run         Avg[Hold: 300,800         Trif         PP PP P
Ref Offset 0.5 dB Mkr4 2.523 92 GHz 10 dB/div Ref 20.00 dBm -59.296 dBm
Cog         Center Freq           0:00         0:00           0:00         0:00
100 Start Freq 300 Start Freq 247000000 GHz
40.0 60.0 $40.0$ $3$ $4$ $4$ $50.0$ $5$
700 255000000 GHz
Start 2.4 / 000 GHz         Stop 2.3 stop 2
N         I         C 2 M 3 r 0 Griz         Fi 1 SA2 UBIII           2         N         I         f         C 2483 50 Griz         -51 915 dBm           3         N         I         f         2 500 00 Griz         -52 323 dBm         Freq Offset           4         N         I         f         2 53 92 Griz         -59 296 dBm         0 Hz
BLE_2M_Ant1_Low_2402 Agilent Spectrum Analyzer - Swept SA
Image: Non-State State         Selectivity         ▲ May OFF         08:09:13:04:46:03,2023         Frequency           Center Freq 2:352500000 GHz: PR0:: Test +→ IFGain:Low         Trig: Free Run #Atten: 30 dB         AugHold: 300:300         Trig: Prequency         Frequency
Ref Offset 0.5 dB Mkr5 2.399 960 GHz 10 dB/div Ref 20.00 dBm -48.180 dBm
10.0 Center Freq 2.352500000 GHz
300         Start Freq           300         30.5 dr
400 D 400 D 40
Start 2.30000 GHz         Stop 2.40500 GHz         CF Step
1         N         1         f         2.401535 GHz         -14.763 dBm
BLE_2M_Ant1_High_2480

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Agilent Spectrum Analyzer - Sw	rept SA			
(20) RL RF 50 Ω Center Freq 2.5100		INSE:INT ALIGN OFF #Avg Type: RMS ee Run Avg Hold: 300/300 30 dB	08:25:36 AM Apr 03, 2023 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P	Frequency
Ref Offset 0. 10 dB/div Ref 20.00	5 dB		(r4 2.519 20 GHz -58.682 dBm	Auto Tune
10.0 0.00 -10.0				Center Freq 2.51000000 GHz
-20.0			-33.73 dBm	Start Freq 2.470000000 GHz
-50.0 -70.0 -70.0	3	4	and an and a state of the state	<b>Stop Freq</b> 2.550000000 GHz
Start 2.47000 GHz #Res BW 100 kHz	#VBW 300 kH:	Z SWeep	Stop 2.55000 GHz 7.667 ms (1001 pts)	CF Step 8.00000 MHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 6	2.479 52 GHz -13.726 c 2.483 50 GHz -51.094 c 2.500 00 GHz -61.900 c 2.519 20 GHz -58.682 c	Bm Bm Bm		Freq Offset 0 Hz
7 8 9 10 11			~	
MSG		STA	TUS	



(2) Conducted Spurious Emissions Test

Test Mode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
			Reference	-14.49	-14.49		PASS
		2402	30~1000	-14.49	-69.84	≤-34.49	PASS
			1000~26500	-14.49	-46.54	≤-34.49	PASS
			Reference	-13.32	-13.32		PASS
BLE_1M	Ant1	2440	30~1000	-13.32	-69.94	≤-33.32	PASS
			1000~26500	-13.32	-45.97	≤-33.32	PASS
			Reference	-12.80	-12.80		PASS
		2480	30~1000	-12.80	-69.35	≤-32.80	PASS
			1000~26500	-12.80	-42.63	≤-32.80	PASS
			Reference	-17.02	-17.02		PASS
		2402	30~1000	-17.02	-70.48	≤-37.02	PASS
			1000~26500	-17.02	-47.19	≤-37.02	PASS
			Reference	-15.82	-15.82		PASS
BLE_2M	Ant1	2440	30~1000	-15.82	-69.80	≤-35.82	PASS
			1000~26500	-15.82 -47	-47.12	≤-35.82	PASS
			Reference	-14.98	-14.98		PASS
		2480	30~1000	-14.98	-70.24	≤-34.98	PASS
			1000~26500	-14.98	-46.88	≤-34.98	PASS



### Test plot as follows:

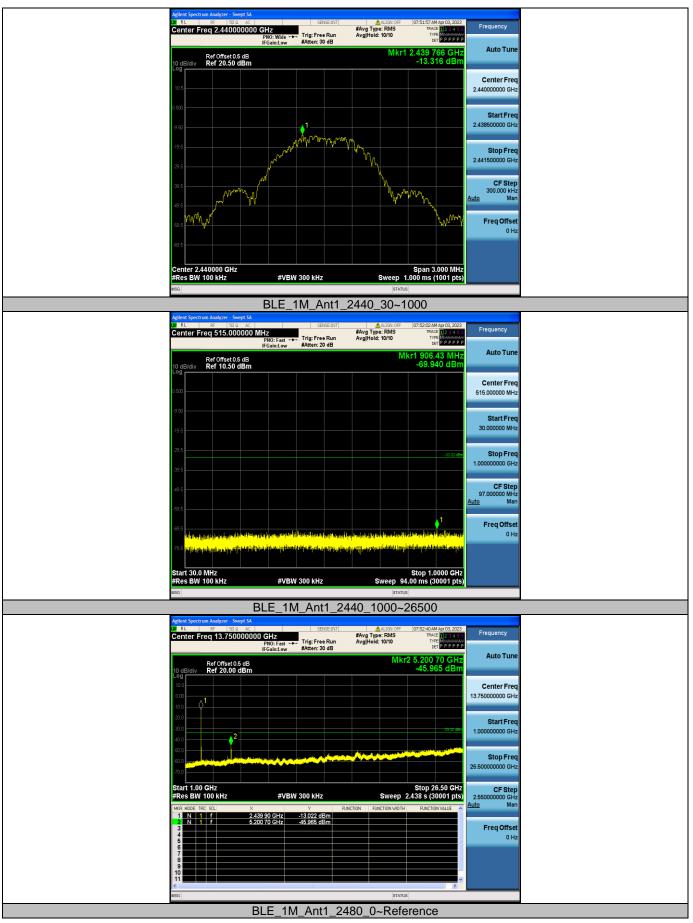
BLE_1M_Ant1_2402_0~Reference
Agilent Spectrum Analyzer - Swept SA UR RL RF   50 0, AC SEVISEINT  ANUISY OFF   07/43/21 AM Apr/03, 2023
PNO: Wilde → IFG-init.tw #Atten: 30 dB 0010 0010 0010 0010 0010 0010 0010
Ref Offset 0.5 dB Mkr1 2.402 033 GHz 10 dB/div Ref 20.50 dBm -14.490 dBm
Center Freq
105 2.40200000 GHz
500 Start Freq 2.40050000 GHz
We Mary Man
19.5 Stop Freq 22.403500000 GHz
39.5 CF Step 300.000 HHz
335 300,000 kHz 435 Man
and the second s
Center 2.402000 GHz Span 3.000 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)
#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)
BLE_1M_Ant1_2402_30~1000 Agtert Spectrum Analyzer - Swept SA
■ RL RF 50.0 AC SENSE:NT ALVOF 07:43:26 AN Agr 03,2023 Frequency
PNO: has ++ Ing. Tee tail Bygroot. W/W Det PPPPP
Ref Offset 0.5 dB Mkr1 911.31 MHz Auto Tune 10 dB/div Ref 10.50 dBm -69.837 dBm
0.600 Center Freq 515.000000 MHz
a so Start Freq
30.00000 MHz
29.5 Stop Freq 1.0000000 GHz
39.5 CF Step
495 97.00000 MH2 Auto Man
and the second s
Alterna Level and a set a fille deep second a charafter filler a statistic a statistic a filler providence filler provid
Start 30.0 MHz         Stop 1.0000 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 94.00 ms (30001 pts)
BLE_1M_Ant1_2402_1000~26500
Agilent Spectrum Analyzer - Swept SA
Center Freq 13,730000000 CFIZ FreeRun Avgifield: 10/10 Der PPPP PROC Fast ++- IFGeint.tow #Atten: 30 dB
Ref offset 0.5 dB Mkr2 25.819 15 GHz 10 dB/div Ref 20.00 dBm -46.539 dBm
100 Center Freq
Start Freq           300         Start Freq           100000000 GHz         100000000 GHz
Stop Freq
200 million and a second secon
Start 1.00 GHz         Stop 26.50 GHz         CF Step           #Res BW 100 kHz         #VBW 300 kHz         Sweep 2.438 s (30001 pts)         255000000 GHz
MRR MODE TRC: Scl.         X         Y         FUNCTION         FUNCTION         Man           1         N         1         f         2402.50 GHz         -144.183 GBm         Man           2         N         1         f         22.6319 15 GHz         -45.559 dBm         Man
3 Freq Offset 4 0 Hz
 MSG STATUS
BLE_1M_Ant1_2440_0~Reference

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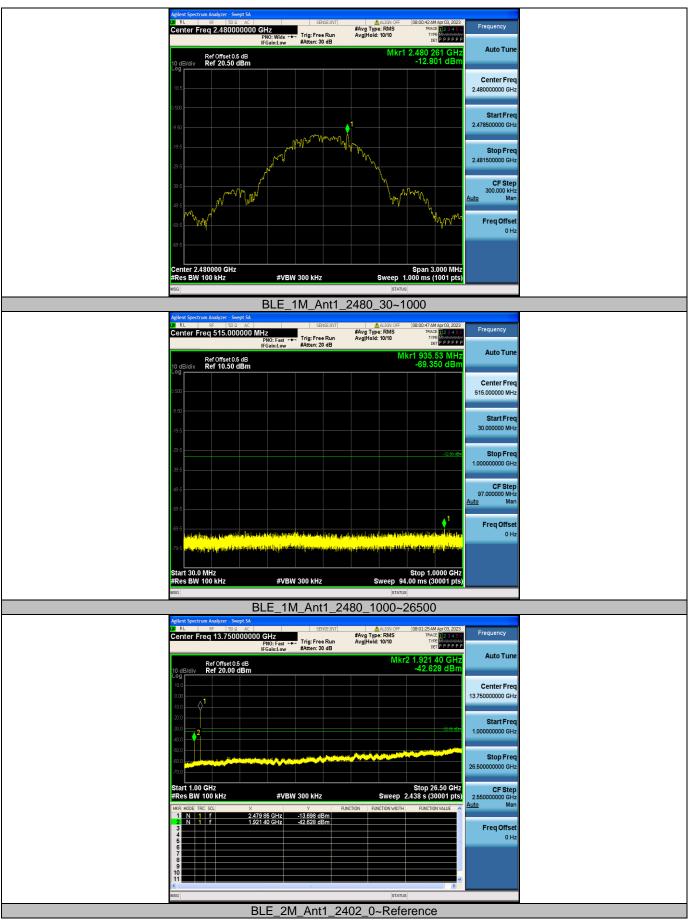
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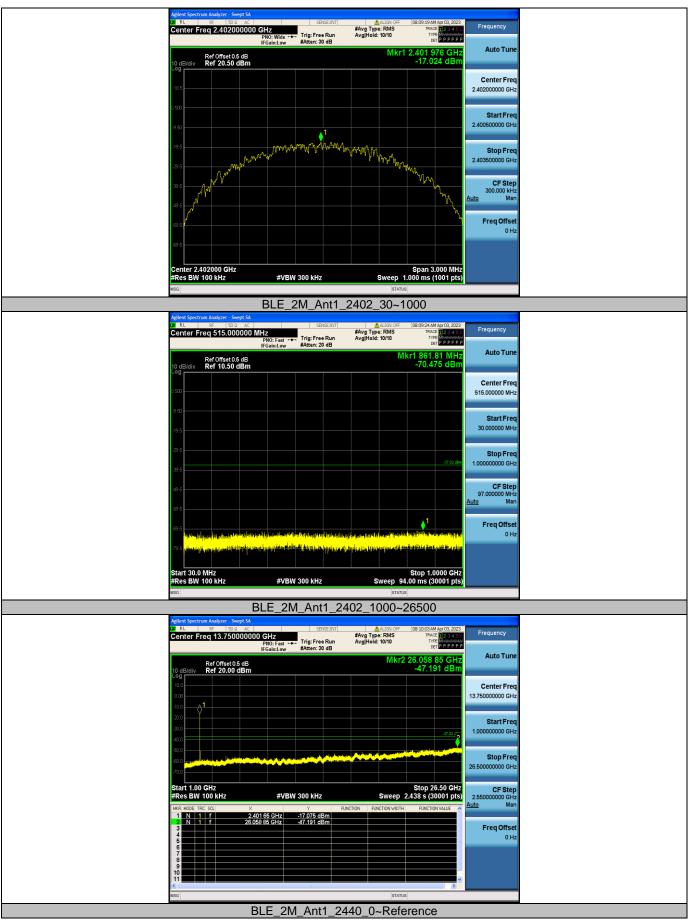
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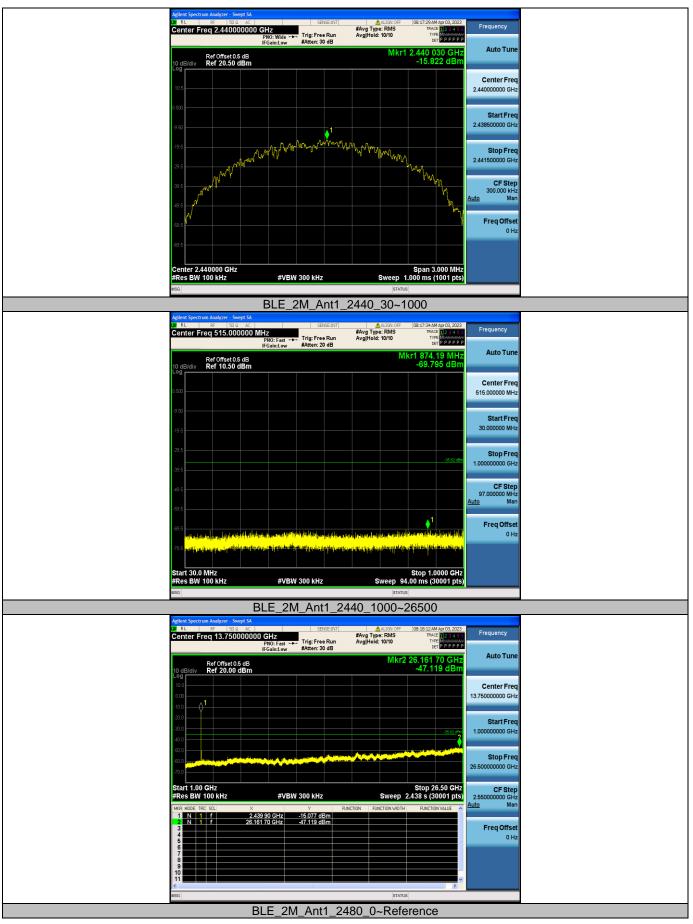






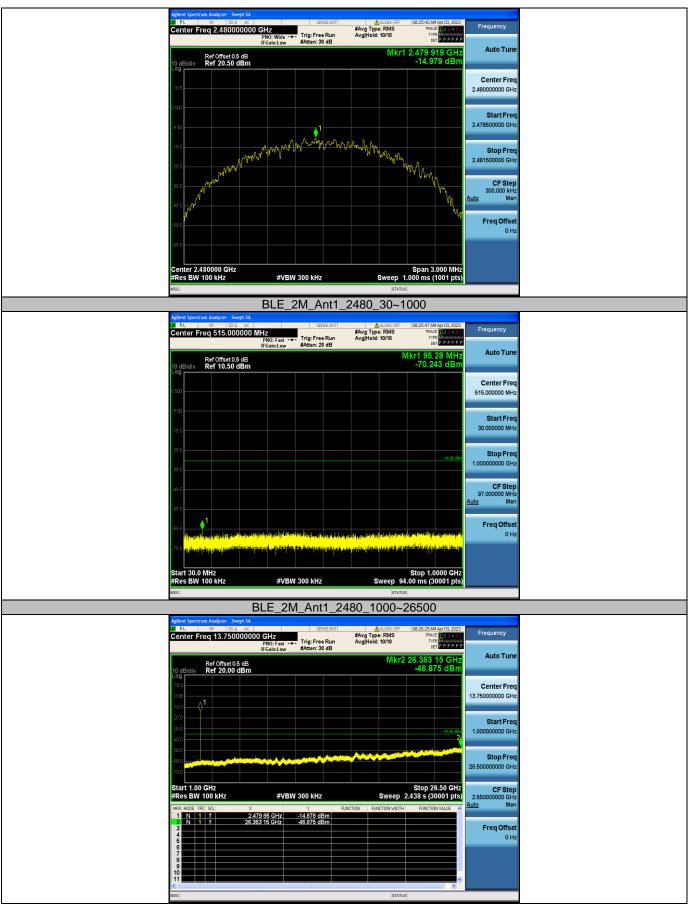
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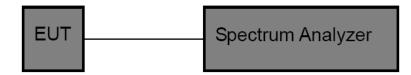
# 3.5. DTS Bandwidth

<u>Limit</u>

# FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2)/ RSS-247 5.2 a:

Test Item	Limit	Frequency Range(MHz)
DTS Bandwidth	≥500 KHz (6dB bandwidth)	2400~2483.5

### Test Configuration



#### Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. DTS Spectrum Setting:
  - (1) Set RBW = 100 kHz.
  - (2) Set the video bandwidth (VBW)  $\geq$  3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.
  - OCB Spectrum Setting:
  - (1) Set RBW =  $1\% \sim 5\%$  occupied bandwidth.
  - (2) Set the video bandwidth (VBW)  $\ge$  3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

#### Test Mode

Please refer to the clause 2.4.

#### Test Results

Test Mode	Channel	99% Bandwidth (MHz)	DTS Bandwidth (MHz)	Limit (kHz)	Result	
	00	1.084	0.680			
BLE_1M	19	1.093	0.668	≥500	Pass	
	39	1.081	0.680	≥500		
	00	2.037	1.360			
BLE_2M	19	2.078	1.420	≥500	Pass	
	39	2.059	1.352			

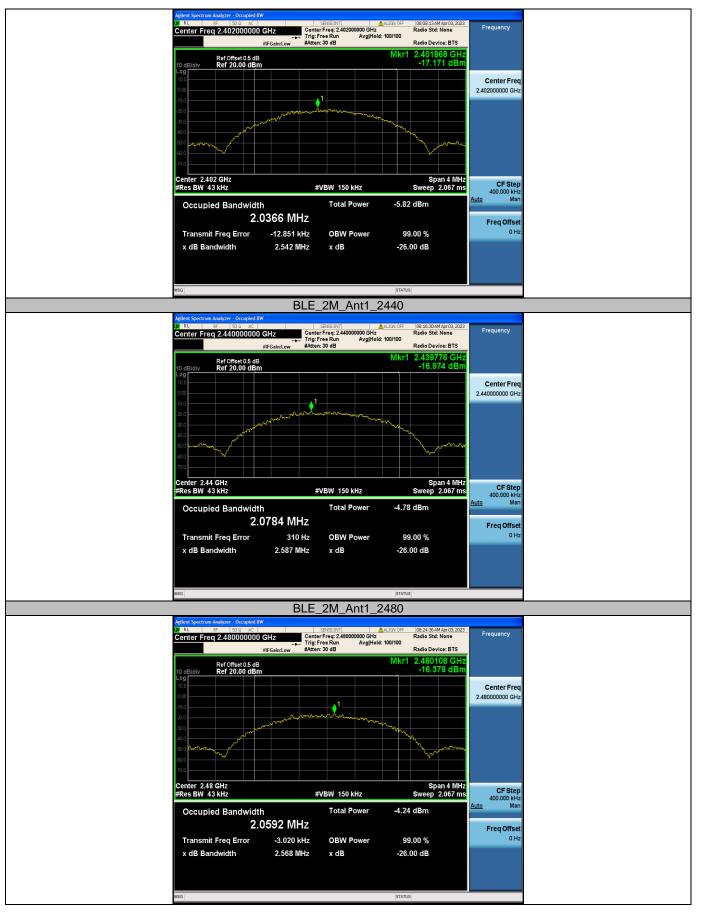




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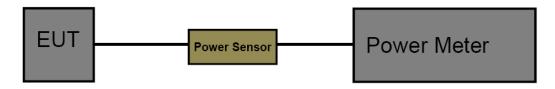
# 3.6. Peak Output Power

<u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3)/ RSS-247 5.4 d:

Section	Test Item	Limit	Frequency Range(MHz)
CFR 47 FCC 15.247(b)(3)	Maximum conducted output power	1 Watt or 30dBm	2400~2483.5
ISED RSS-247 5.4 d	EIRP	4 Watt or 36dBm	2400~2483.5

### Test Configuration



### Test Procedure

- 1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
- 2. Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
- 3. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
- 4. Record the measurement data.

#### Test Mode

Please refer to the clause 2.4.

# Test Result

Test Mode	Channel	Output power (dBm)	Limit (dBm)	Result
	00	-12.30		
BLE_1M	19	-11.76	≤30.00 Pass	Pass
	39	-11.28		
	00	-13.24		
BLE_2M	19	-12.07	≤30.00 Pass	Pass
	39	-11.54		



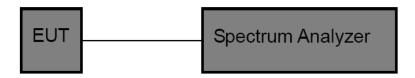
# 3.7. Power Spectral Density

# <u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e)/ RSS-247 5.2 b:

Test Item	Limit	Frequency Range(MHz)	
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5	

## Test Configuration



#### Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.

3. Spectrum Setting:

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz

Set the VBW to: 10 kHz

Detector: peak

Sweep time: auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

#### Test Mode

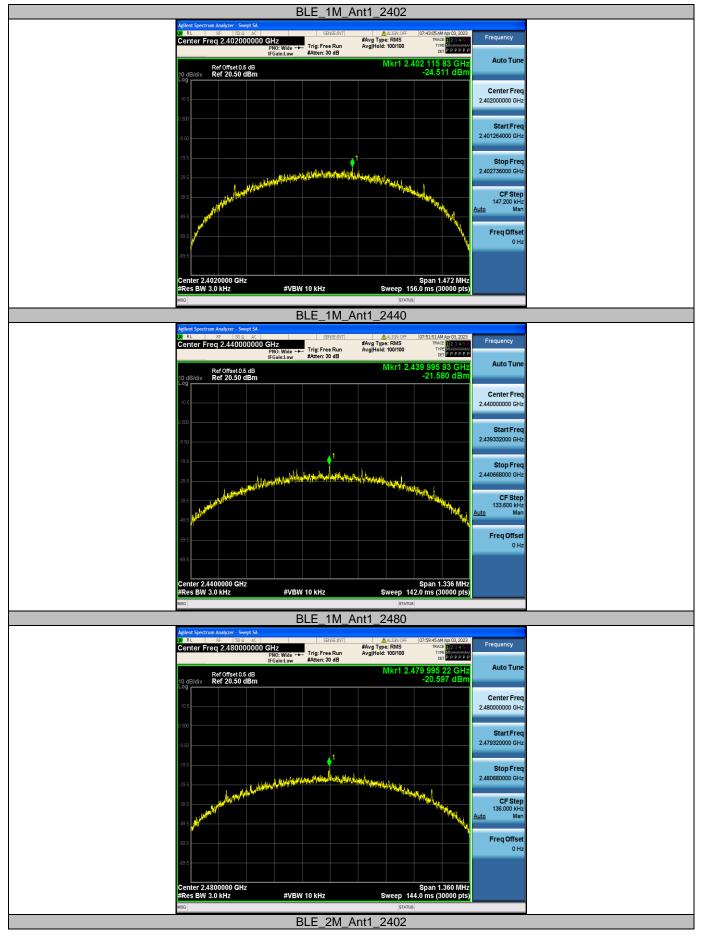
Please refer to the clause 2.4.

#### Test Result

Test Mode	Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
	00	-24.51		
BLE_1M	19	-21.58	≤8.00	Pass
	39	-20.60		
	00	-27.38		
BLE_2M	19	-26.55	≤8.00 Pass	
	39	-25.13		



# Test plot as follows:



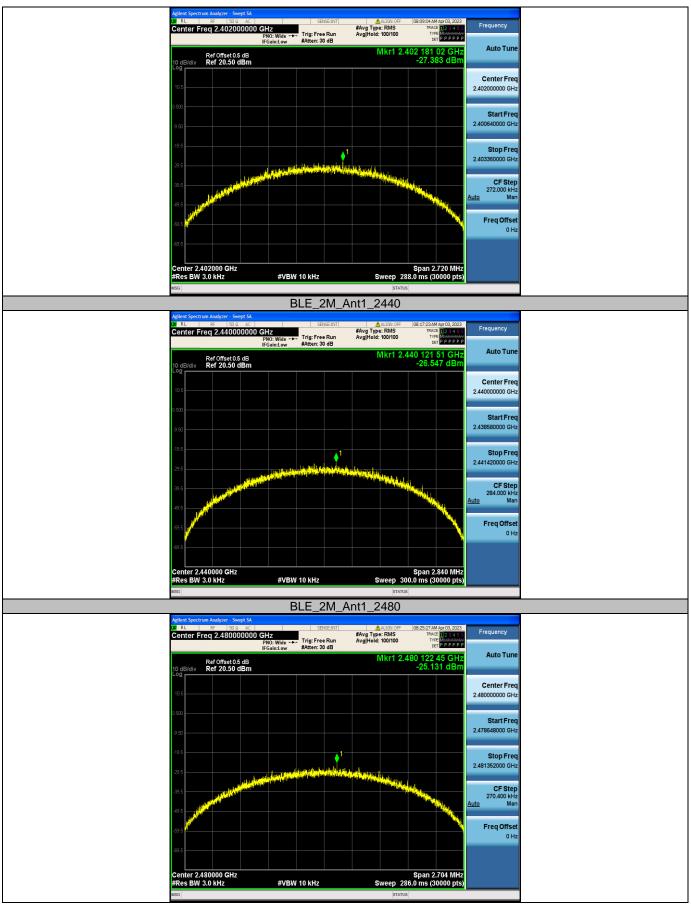
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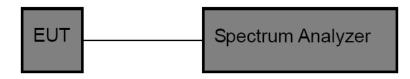


# 3.8. Duty Cycle

<u>Limit</u>

None, for report purposes only.

## Test Configuration



#### Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.

3. Spectrum Setting:

Set analyzer center frequency to test channel center frequency.

Set the span to 0Hz

Set the RBW to 10MHz Set the VBW to 10MHz

Set the VBW to 10

Detector: Peak Sweep time: Auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

#### Test Mode

Please refer to the clause 2.4.

#### <u>Test Result</u>

Test Mode	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
	2402	0	0	100	/	0.01
BLE 1M	2440	0	0	100	/	0.01
	2480	0	0	100	/	0.01
	2402	0	0	100	/	0.01
BLE 2M	2440	0	0	100	/	0.01
	2480	0	0	100	/	0.01

Note: Duty Cycle>98%, VBW=10Hz

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#### Test plot as follows: BLE\_1M\_Ant1\_2402 ALIGN C #Avg Type: RMS Center Freq 2.402000000 GHz Frequency Trig: Free Rui #Atten: 30 dB WWWWWW :Fast ++ Auto Tur Ref Offset 0.5 dB Ref 20.00 dBm Center Free 2.40200000 GH; Start Free 2.40200000 GH Stop Fre 2.402000000 GH CF Step 8.000000 MHz Auto Ma Freq Offse 0 H: Span 0 Hz Sweep 50.13 ms (8000 pts) Center 2.402000000 GHz Res BW 8 MHz #VBW 8.0 MHz BLE\_1M\_Ant1\_2440 ALIGN C #Avg Type: RMS Frequency TYPE Auto Tun Ref Offset 0.5 dB Ref 20.00 dBm Center Fred 2.440000000 GH Start Freq 2.44000000 GHz Stop Free 2.440000000 GH: Span 0 Hz Sweep 50.13 ms (8000 pts) Center 2.440000000 GHz Res BW 8 MHz CF Step 8.000000 MH: #VBW 8.0 MHz Ma Auto Freq Offse 0 H BLE\_1M\_Ant1\_2480 RL 8F 502 AC enter Freq 2.480000000 GHz Fl(0.Fast ---#Gainclow #Avg Type: RMS Frequency Auto Tur Ref Offset 0.5 dB Ref 20.00 dBm Center Free 2.480000000 GH Start Free 2.48000000 GH Stop Fre 2.48000000 GH ter 2.480000000 GHz BW 8 MHz Span 0 Hz CF Step 8.000000 MHz #VBW 8.0 MHz Sweep 50.13 ms (8 Ma Auto Freq Offse 0 H BLE\_2M\_Ant1\_2402

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Agilent Spectrum Analyzer - Swept SA           DM         RL         RF         50 Q         AC         SENSE:INT	ALIGN OFF 08:07:52 AM Apr 03, 2023		
Center Freq 2.402000000 GHz	Avg Type: Log-Pwr TRACE 23456 TYPE WALLAND DET P P P P P	Frequency	
IFGain:Low #Atten: 30 dB	DETPPPPP	Auto Tune	
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm			
		Country From	
0.00		Center Freq 2.402000000 GHz	
-10.0			
-20.0		Start Freq	
-30.0		2.402000000 GHz	
-40.0			
-60.0		Stop Freq	
-70.0		2.402000000 GHz	
Center 2.402000000 GHz	Span 0 Hz Sweep 50.13 ms (8000 pts)	CF Step	
Res BW 8 MHz #VBW 8.0 MHz		8.000000 MHz <u>Auto</u> Man	
MKR MODE TRC SCL X Y FI	INCTION FUNCTION WIDTH FUNCTION VALUE		
2 3		Freq Offset	
5		0 Hz	
7			
9 10			
	×		
MSG	STATUS		
BLE_2M_/	Ant1_2440		
Agilent Spectrum Analyzer - Swept SA			
Center Freq 2.440000000 GHz	ALIGN OFF 08:16:10 AM Apr 03, 2023 #Avg Type: RMS TRACE 23456	Frequency	
PN0: Fast →→ IFGain:Low #Atten: 30 dB	#Avg Type: RMS TRACE 123456 TYPE WATCHANG DET P P P P P		
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm		Auto Tune	
10 dB/div Ref 20.00 dBm			
10.0		Center Freq	
		2.440000000 GHz	
0.00		Otest Error	
40.0		Start Freq 2.44000000 GHz	
-20.0		Stop Freq	
30.0		2.440000000 GHz	
-40.0		CF Step 8.000000 MHz	
-50.0		Auto Man	
		Freq Offset	
-60.0		0 Hz	
-70.0			
Center 2.440000000 GHz	Span 0 Hz		
Res BW 8 MHz #VBW 8.0 MHz	Sweep 50.13 ms (8000 pts)		
BLE_2M_/	\nt1 2420		
	AHL1_240U		
Agilent Spectrum Analyzer - Swept SA	ALIGN OFF 08:24:15 AM Apr 03, 2023 #Avg Type: RMS TRACE 2 2 3 4 5 6	Frequency	
Center Freq 2.480000000 GHz PNO: Fast IFGain:Low #Atten: 30 dB	#Avg Type: RMS TRACE 23450 TYPE WWWWWW DET PPPP		
		Auto Tune	
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm Log			
10.0		Center Freq	
0.00		2.480000000 GHz	
-10.0			
-20.0		Start Freq	
-30.0		2.480000000 GHz	
-50.0		Stop From	
-60.0		Stop Freq 2.48000000 GHz	
F70:0			
Center 2.480000000 GHz Res BW 8 MHz #VBW 8.0 MHz	Span 0 Hz Sweep 50.13 ms (8000 pts)	CF Step	
		8.000000 MHz Auto Man	
		Freq Offset	
5 6 <b></b>		0 Hz	
8			
9 10 10 10 10 10 10 10 10 10 10 10 10 10			
11 <	>		
MSG	STATUS		

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# 3.9. Antenna Requirement

#### **Requirement**

#### FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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 antenna that uses a unique coupling to the intentional radiator, 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.

#### FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.