

CTC Laboratories, Inc.

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-	FEST REPORT			
Report No. ·····:	CTC20220249E02			
FCC ID······:	2A4YK-T89			
Applicant:	Shenzhen Tongxin Youpin Technolo	ogy Co., Ltd		
Address······	6th Floor, Building B, Weijian industrial District, Shenzhen, GuangDong, China			
Manufacturer	Shenzhen Tongxin Youpin Technology	^r Co., Ltd		
Address	6th Floor, Building B, Weijian industrial District, Shenzhen, GuangDong, China			
Product Name:	Keyboard Case			
Trade Mark······	/			
Model/Type reference······:	T89 Magic			
Listed Model(s) ······:	1			
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247			
Date of receipt of test sample:	Feb. 25, 2022			
Date of testing	Feb. 26, 2022 ~ Mar. 03, 2022			
Date of issue	Mar. 04, 2022			
Result:	PASS			
Compiled by:				
(Printed name+signature)	Terry Su	Tenny Su Miller Ma Lennas		
Supervised by:		naillair Ma		
(Printed name+signature)	Miller Ma	///////////////////////////////////////		
Approved by:		1 mas		
(Printed name+signature)	Totti Zhao	/ see		
Testing Laboratory Name:	CTC Laboratories, Inc.			
Address	1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China			
not be reproduced except in full, w use it to claim product endorseme	completely for legal use with the appro- vithout the written approval of our labora nt by CTC. The test results in the report valid without all the signatures of testing	atory. The client should not to not to the tested		

approver. Any objections must be raised to CTC within 15 days since the date when the report is

received. It will not be taken into consideration beyond this limit. The test report merely correspond to the test sample.



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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	Mar. 04, 2022	Original



1.3. Test Description

FCC Part 15 Subpart C (15.247) / RSS 247 Issue 2				
Test Item	Standard Section		Result	Test Engineer
lest item	FCC IC		Result	
Antenna Requirement	15.203	/	Pass	Alicia Liu
Conducted Emission	15.207	RSS-Gen 8.8	Pass	Eva Feng
Conducted Band Edge and Spurious Emissions	15.247(d)	RSS 247 5.5	Pass	Alicia Liu
Radiated Band Edge and Spurious Emissions	15.205&15.209& 15.247(d)	RSS 247 5.5	Pass	Alicia Liu
6dB Bandwidth	15.247(a)(2)	RSS 247 5.2 (a)	Pass	Alicia Liu
Conducted Max Output Power	15.247(b)(3)	RSS 247 5.4 (d)	Pass	Alicia Liu
Power Spectral Density	15.247(e)	RSS 247 5.2 (b)	Pass	Alicia Liu
Transmitter Radiated Spurious	15.209&15.247(d)	RSS 247 5.5& RSS-Gen 8.9	Pass	Alicia Liu

Note: The measurement uncertainty is not included in the test result.





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:

CNAS-Lab Code: L5365

CTC Laboratories, Inc. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation. Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

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 of mobile radio equipment characteristics; Part 1" 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	3.08 dB	(1)
Radiated Emissions 30~1000MHz	4.51 dB	(1)
Radiated Emissions 1~18GHz	5.84 dB	(1)
Radiated Emissions 18~40GHz	6.12 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=1.96.

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:	Shenzhen Tongxin Youpin Technology Co., Ltd
Address:	6th Floor, Building B, Weijian industrial park, Shiyan Street, Bao An District, Shenzhen, GuangDong, China
Manufacturer:	Shenzhen Tongxin Youpin Technology Co., Ltd
Address:	6th Floor, Building B, Weijian industrial park, Shiyan Street, Bao An District, Shenzhen, GuangDong, China

2.2. General Description of EUT

Product Name:	Keyboard Case		
Trade Mark:	1		
Model/Type reference:	T89 Magic		
Listed Model(s):	1		
Power supply:	5Vdc from USB Cable 3.7Vdc/300mAh from Li-ion Battery		
Hardware version:	1		
Software version:	re version: /		
BT 5.2/ BLE Support 1M PHY, 2M PHY, Code PHY(S=2, S=8)			
Modulation:	GFSK		
Operation frequency:	2402MHz~2480MHz		
Channel number:	40		
Channel separation:	2MHz		
Data rate:	1Mbps, 2Mbps		
Antenna type:	PCB Antenna		
Antenna gain:	1.87dBi Max		



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2.3. Accessory Equipment information

Equipment Information						
Name	S/N	Manufacturer				
Notebook	X220	R9-NCMYL 12/04	Lenovo			
1	1	1	1			
Cable Information	Cable Information					
Name Shielded Type Ferrite Core Length						
USB Cable	With	Without	1M			
Test Software Information						
Name	Versions	1	1			
Pixart BLE Tool.exe	V2.0.1	1	1			



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.



2.5. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 23, 2022
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 15, 2022
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 23, 2022
4	Signal Generator	Agilent	E8257D	MY46521908	Dec. 23, 2022
5	Power Sensor	Agilent	U2021XA	MY5365004	Mar. 15, 2022
6	Power Sensor	Agilent	U2021XA	MY5365006	Mar. 15, 2022
7	High and low temperature box	ESPEC	MT3035	N/A	Mar. 24, 2022
8	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	102414	Dec. 23, 2022
9	300328 v2.2.2 test system	TONSCEND	v2.6	/	/

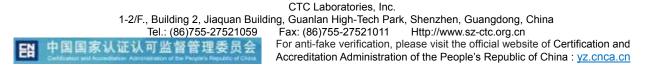
Radiat	Radiated emission(3m chamber 2)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Jan. 12, 2023	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 23, 2022	
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 23, 2022	
4	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 15, 2022	
5	Pre-Amplifier	SONOMA	310	186194	Dec. 23, 2022	
6	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 23, 2022	
7	Test Receiver	R&S	ESCI7	100967	Dec. 23, 2022	

Radiate	Radiated emission(3m chamber 3)											
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until							
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-759	Nov. 09, 2022							
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 23, 2022							
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 23, 2022							
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 23, 2022							
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 23, 2022							

Condu	Conducted Emission											
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until							
1	LISN	R&S	ENV216	101112	Dec. 23, 2022							
2	LISN	R&S	ENV216	101113	Dec. 23, 2022							
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 23, 2022							

Note:1. The Cal. Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.





3. TEST ITEM AND RESULTS

3.1. Conducted Emission

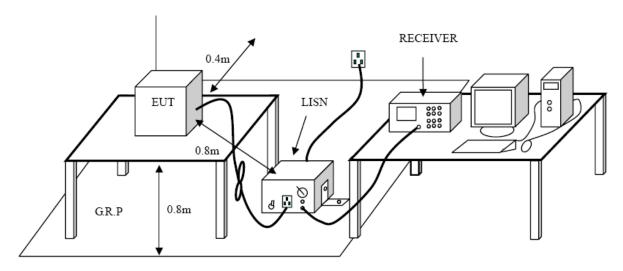
<u>Limit</u>

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

Eroquonov rongo (MHz)	Limit (dBuV)					
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.

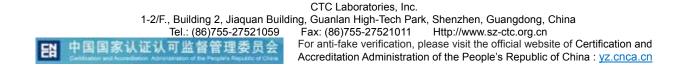
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram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

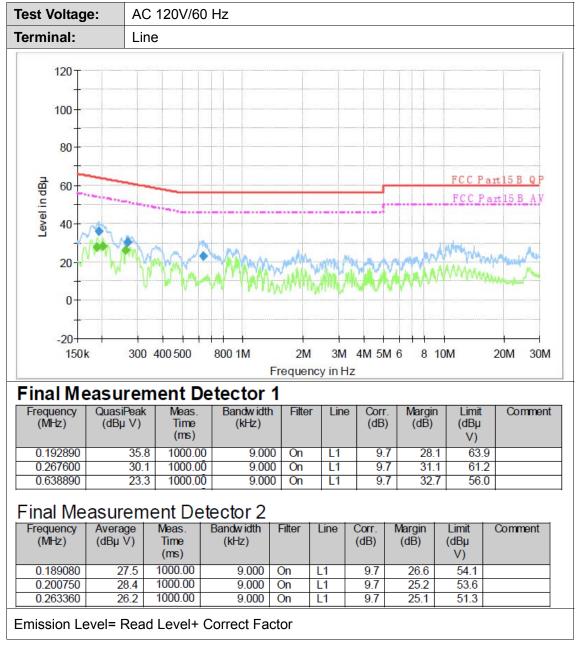




Test Mode:

Please refer to the clause 2.4.

Test Results





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	100-										
	80-										
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Freq (M 1.8 3.2 12.1 Fina	-20 1501 al M uency 1Hz) 392340 243770 110880	easu	IFE ak μ V) 27.3 28.3 28.3 28.3	Meas. Time (ms) 1000.00 1000.00 1000.00 ent De Meas. Time	F etector ' Bandwidth (kHz) 9 9.000 9.000	requency 1 Filter 0 0 0 0 0 0 0 0	y in Hz	Corr. (dB) 10.0 10.0 10.0	Margin (dB) 28.7	Limit (dBµ V) 56.0 56.0 60.0 Limit (dBµ	
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Emission Level= Read Level+ Correct Factor



3.2. Radiated Emission

<u>Limit</u>

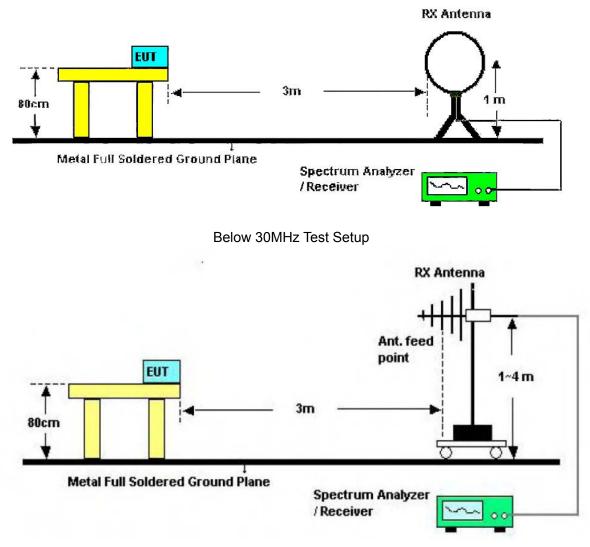
FCC CFR Title 47 Part 15 Subpart C Section 15.209/ RSS – Gen 8.9

Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
	54.00	Average
Above 1 GHz	74.00	Peak

Note:

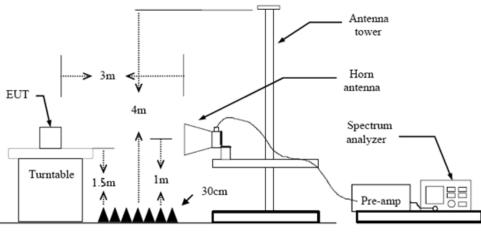
- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

Test Configuration



Below 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. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable 3. height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (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^{th} harmonic:

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

RBW=1MHz, VBW≥1/T Peak detector for Average value.

Note 1: For the 1/T& Duty Cycle please refer to clause 3.8 Duty Cycle.

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.



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0 30.000 No.	Frequer (MHz	60.00 ncy 2) 33	Rea (dB 53	ading 3u∨)	(MHz) Factor (dB/m)	Level (dBuV/m	u.u. Limit (dBuV/m)	Margin (dB)	1000.	
No.	Frequer (MHz 251.48	60.00 ncy 2) 33 00	Rea (dB 53 55	ading 3u∨) 5.53	(MHz) Factor (dB/m) -14.61	Level (dBuV/m 38.92	u Limit) (dBuV/m) 46.00	Margin (dB) -7.08	1000. Detector	
No.	Frequer (MHz 251.48 301.60	60.00 ncy 2) 33 00 00	Rea (dB 53 55 53	ading BuV) 5.53 5.42	(MHz) Factor (dB/m) -14.61 -13.50	31 Level (dBuV/m 38.92 41.92	Limit (dBuV/m) 46.00 46.00	Margin (dB) -7.08 -4.08	Detector QP QP	
No. 1 3 !	Frequer (MHz 251.48 301.60 352.04	60.00 hcy) 33 00 00 67	Rea (dB 53 55 53 53	ading 8uV) 5.53 5.42 5.80	(MHz) Factor (dB/m) -14.61 -13.50 -12.25	31 Level (dBuV/m 38.92 41.92 41.55	Limit (dBuV/m) 46.00 46.00 46.00	Margin (dB) -7.08 -4.08 -4.45	Detector QP QP QP	

Remarks:

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Ant	t. Pol		Vert	ical						
Tes	st Mo	de:	ТХ	1Mbp	s Mode	e 2402MHz				
Rei	mark	:	Only	y wor	se cas	e is reported	ł			
90.0) dB	uV/m								
80										
70										
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2	1	(MHz) 251.48	33 33	(dE 39 46	3uV) 0.06	(dB/m) -14.61	(dBuV/m) 24.45	(dBuV/m) 46.00	(dB) -21.55	QP
2	1	(MHz 251.48 301.92	33 33 33 00	(dE 39 46 42	3u∨) 9.06 9.67	(dB/m) -14.61 -13.49	(dBuV/m) 24.45 33.18	(dBuV/m) 46.00 46.00	(dB) -21.55 -12.82	QP QP
2	1 2 * 3	(MHz 251.48 301.92 352.04	33 33 00 66	(dE 39 46 42 40	3u∨) 9.06 9.67 2.22	(dB/m) -14.61 -13.49 -12.25	(dBuV/m) 24.45 33.18 29.97	(dBuV/m) 46.00 46.00 46.00	(dB) -21.55 -12.82 -16.03	QP QP QP

Remarks:

EN

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0.0 dBu	V/m							
o						FCC Part15 (C - Above 1	
o 📃								
o								
, —						FCC Part15 (C - Above 1	GAV
,	ş							
) —	1.							
ı								
) —								
	3500.00 6	000.00	8500.00 11	000.00 (MHz)	16000.00	8500.00 21000).00 23500	.00 26000
No.	Frequer (MHz		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4803.0	17	26.13	2.16	28.29	54.00	-25.71	AVG
2	4804.9	21	40.55	2.16	42.71	74.00	-31.29	peak



FN

nt. Po est Mo		Vert		Mode 2402				
Remark		No r		e emission		than 10 dB I	below the	;
0.0 dB	uV/m	p. 00						
10						FCC Part15	C - Above 1	G PK
'o 📃								
io								
0						FCC Part15	C - Above 1	GAV
0	ş							
	1							
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:0								
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)								
	0 3500.00 6	000.00	8500.00 1	1000.00 (MHz)	16000.00	18500.00 2100	0.00 23500	.00 26000
No.	Frequer (MHz	-	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4803.04	47	26.52	2.16	28.68	54.00	-25.32	AVG
	4803.8	29	40.54	2.16	42.70	74.00	-31.30	peak



Ant	t. Pol	•		Horiz	zont	al								
Tes	t Mo	de:		TX E	BLE	1Mbps	Mode 24	40	MHz					
Rer	nark:	:				rt for the ed limit.	e emissic	n v	vhich	more t	han 10 dB	below th	е	
90.0	dBu	V/m												
80											500 D	0.41		
70											FCC Part15	C - Above		
60														
50											FCC Part15	C - Above	IG AV	
			X											
40														
30			š											
20														
10														
0														
-10		3500.00	6	000.00	950	0.00 11	000.00 (M	Hz)	100	00.00 1	8500.00 2100	0.00 2350	0 0 0 0 0 0	00.0
	00.000	3300.00	0	000.00	030	0.00 11	000.00 (M	112)	100	00.00	0500.00 2100	0.00 2330	0.00 200	00.u
1	No. Frequency (MHz)					ading BuV)	Facto (dB/m			vel iV/m)	Limit (dBuV/m)	Margin (dB)	Detect	tor
	1	487	9.9	06	4	1.36	2.31		43	.67	74.00	-30.33	pea	k
	2 *	488	0.4	75	2	5.78	2.31		28	.09	54.00	-25.91	AVG	3

Page 20 of 61

Remarks:



EN

VIII. F	Pol.	Vert	ical					
	/lode:		BLE 1Mbps					
lema	rk:	No i pres	report for the scribed limit.	e emission v	which more t	than 10 dB I	below the	;
90.0	dBuV/m	_						
30 -						FCC Part15	C - Above 1	GPK
'o 🗖						Teeran		
0							0.41-0.1	
o 🗖						FCC Part15	C-ADOVE I	GAV
0	*							
0 -	Š							
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o								
10	.000 3500.00	6000.00	8500.00 1	1000.00 (MHz)	16000.00	18500.00 2100	0.00 23500	.00 26000
No.	(MH	z)	Reading (dBu∀)	Factor (dB/m)		Limit (dBuV/m)		Detector
1	4879.3	282	41.55	2.31	43.86	74.00	-30.14	peak
2 *	4879.	714	26.10	2.31	28.41	54.00	-25.59	AVG



Ant	t. Pol.		Horiz	zont	al										
Tes	st Moo	de:	TX E	BLE	1Mbps I	Mode 248	01	ЛНz							
	mark:				t for the ed limit.	emission	W	hich ı	more t	han 10 dB t	pelow the	1			
90.0	dBu	√/m													
80				FCC Part1								G PK			
70															
60															
50										FCC Part15	C - Above 1	GAV			
40		¥													
30		Š													
20															
10															
0															
-10 11	000.000	3500.00 6	000.00	850)0.00 11	000.00 (MH	z)	160	100.00 1	18500.00 2100	0.00 23500	.00 260	00.0		
1															
1	No.	Freque (MHz			ading BuV)	Factor (dB/m)			vel iV/m)	Limit (dBuV/m)	Margin (dB)	Detecto	r		
	1	4959.5	25	4	0.01	2.48		42	.49	74.00	-31.51	peak	(
	2 *	4960.0	89	2	5.65	2.48		28	.13	54.00	-25.87	AVG	i		

Page 22 of 61

Remarks:



ht. I	Pol.		Vert	ical									
est	Mod	le:	TX	BLE	1Mbps	Mode 24	80	MHz					
lema	ark:				t for the	e emissio	on v	vhich	more t	han 10	dB I	pelow th	e
0.0	dBuV	//m					_						
										FCC	Dort1E	C - Above	10 PK
0											ans	C - ADUVE	
0										F00 F		0.41	10.11/
0										FUCE	anis	C - Above	
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	1 000	3500.00	6000.00	850	0.00 11	000.00 (N	(Hz)	160	00.00 1	8500.00	2100	0.00 2350	0.00 26000
				1				1				1	
No		Freque (MH			ading BuV)	Facto (dB/m			vel iV/m)	Lim (dBu\		Margir (dB)	Detecto
1	*	4959.	997	2	5.87	2.48		28	.35	54.0	00	-25.65	5 AVG
2		4960.	604	4	1.89	2.48		44	.37	74.0	00	-29.63	B peak
2		4960.	604	4	1.89	2.48		44	.37	74.(00	-29.63	3 peak

Remarks:

EN



FN

Ant. Po	ol.	Hori	zontal					
Fest M	ode:	TX E	BLE 2Mbps	Mode 2402	MHz			
Remar	k:		eport for the cribed limit.		vhich more f	than 10 dB I	pelow the	;
0.0 dE	3uV/m							
						FCC Part15	C - Above 1	G PK
'0 <u> </u>								
50 - 0						FCC Part15	C - Above 1	GAV
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10	X							
30	Š							
20								
0								
)								
10	00 3500.00 6	000.00	8500.00 11	000.00 (MHz)	16000.00 1	18500.00 2100	0.00 23500	.00 26000
No.	Freque (MHz		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4803.0	44	40.77	2.16	42.93	74.00	-31.07	peak
2 *	4803.3	16	26.22	2.16	28.38	54.00	-25.62	AVG
Remarl								



Test Mo Remark		ТХ В	LE 2Mbps I	Mode 2402					
Remark			X BLE 2Mbps Mode 2402MHz o report for the emission which more than 10 dB below the						
			eport for the cribed limit.	emission v	vhich more t	han 10 dB b	elow the	:	
90.0 dBi	ıV/m								
80						FCC Part15 (C-Above 10	G PK	
70									
60									
50						FCC Part15 (C-Above 10	<u>AV</u>	
40	1×								
	ž								
30	×								
20									
10									
-10 1000.00	0 3500.00 6	000.00	8500.00 110	000.00 (MHz)	16000.00 1	8500.00 21000	.00 23500.	.00 26000.	
No.	Freque (MH:	-	Reading (dBuV)	Factor		Limit	Margin	Detector	
4	`	·		(dB/m)		(dBuV/m)	(dB)		
1	4803.6		40.95	2.16	43.11	74.00	-30.89	peak	
2 *	4804.9	135	26.88	2.16	29.04	54.00	-24.96	AVG	

Page 25 of 61

Remarks:



nt. P	-	Horizon										
	Node:		TX BLE 2Mbps Mode 2440MHz No report for the emission which more than 10 dB below the									
Rema	ırk:	No repo prescrib			which more	than 10 dB I	pelow the	;				
0.0	dBuV/m		1									
10						FCC Part15	C - Above 1	C PK				
'0 –						Teeraris						
50 -												
0						FCC Part15	C - Above 1	GAV				
10	Š											
0	1											
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0												
10	.000 3500.00	000.00 85	00.00 11	000.00 (MHz)	16000.00	18500.00 2100	0.00 23500	.00 26000				
No.	Freque	•	ading	Factor	Level	Limit	Margin	Detector				
110.	(MHz	· `	BuV)	(dB/m)		(dBuV/m)	(dB)					
	4879.0	07 2	6.99	2.31	29.30	54.00	-24.70	AVG				
1 *	4879.0		0.81	2.31	43.12	74.00	-30.88	peak				

Remarks:

EN



nt. Po	ol.	Verti	cal					
est M	ode:			Mode 2440				
emar	k:	No ro pres	eport for th cribed limit	e emission v	which more t	han 10 dB t	pelow the	;
.0 dE	Bu∀/m							
						FCC Part15	C - Above 1	G PK
						FCC Part15	C - Above 1	GAV
	Š							
	1							
	*							
0 1000 00	00 3500.00 6	000.00	8500.00 1	1000.00 (MHz)	16000.00 1	8500.00 21000	0.00 23500	.00 26000
				1				
No.	Frequer (MHz		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4879.0	74	26.68	2.31	28.99	54.00	-25.01	AVG
2	4879.1	84	40.16	2.31	42.47	74.00	-31.53	peak

Remarks:

FN



nt. Po		Horizo						
lest M Remar				Mode 2480	MHz which more 1	ban 10 dP	olow the	
			ibed limit.					
10.0 df	3uV/m							
o								
0						FCC Part15	C-Above 10	a PK
0								
						FCC Part15	C - Above 10	S AV
io	ş							
80	*							
:0								
o								
,								
10	00 3500.00 6	000.00	8500.00 11	000.00 (MHz)	16000.00 1	18500.00 21000).00 23500	.00 26000
	Frequer	ncy F	Reading	Factor	Level	Limit	Margin	
	(MHz		(dBuV)	(dB/m)		(dBuV/m)	(dB)	Detecto
No.	(• • • •	29.77	54.00	-24.23	AVG
No.	4959.4	57	27.29	2.48	29.77	54.00	24.20	

EN



nt. Pol	-	Verti	cal					
est Mo	de:	TX E	BLE 2Mbps	Mode 2480	MHz			
lemark			eport for the cribed limit.	emission v	which more	han 10 dB t	pelow the	9
10.0 dBu	uV/m							
0						FCC Part15	C - Ahove 1	GPK
0						1001 41(15		
0								
0						FCC Part15	C - Above 1	G AV
0	1×							
	Z							
0	X							
0								
0								
10								
	0 3500.00 8	6000.00	8500.00 11	000.00 (MHz)	16000.00	18500.00 2100	0.00 2350	1.00 26000
No.	Frequer (MHz		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4959.7	07	40.47	2.48	42.95	74.00	-31.05	peak
2 *	4960.5	18	27.12	2.48	29.60	54.00	-24.40	AVG

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Remarks:



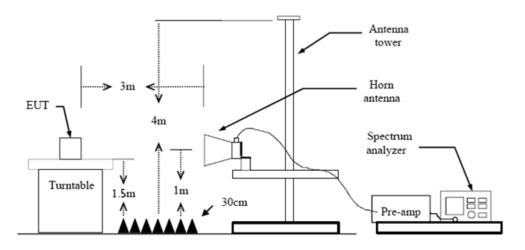
3.3. Band Edge Emissions (Radiated)

<u>Limit</u>

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

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

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

nt. Po	ol.	Horiz	zontal					
est M	ode:	BLE	1Mbps Mod	le 2402MHz	7			
20.0 d	BuV/m							
10								
00								
90 -								
30					FCC	Part15 RE-Class	s B Abovo 1	C PK
70 -					100		5 D ADOVE 1	
50					ERC	Dent1E DE Class	Dáboro 1	
50 -					×	Part15 RE-Class	X	
10			manufacture		<u> </u>	an la managed all and a state		
30							^	
20								
2305.1	30 2315.13	2325.13	2335.13 23	45.13 (MHz)	2365.13 2	375.13 2385.	13 2395.1	3 2405.1
No.	Freque (MH		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecto
1 *	2369.	930	9.15	30.75	39.90	54.00	-14.10	AVG
	2370.	063	22.55	30.75	53.30	74.00	-20.70	peak
2								
2 3	2390.	000	21.68	30.84	52.52	74.00	-21.48	peak

Remarks:

EN



Ant. Po	I.	Vert	ical					
Fest Mo	de:	BLE	1Mbps Mod	de 2402MH	z			
120.0 dBu	ıV/m	ĺ						
110								
30								
					FCC	Part15 RE-Clas	s B Above 1	<u>G PK</u>
70								
					FCC	Part15 RE-Clas	s E Above 1 X	GAV
50								
10	order market war	norman de la compansión de	w.~	hourse downlow		mutammen	mig man	and the
10								
20								
0.0								
	0 2315.50	2325.50	2335.50 23	45.50 (MHz)	2365.50	2375.50 2385.	50 2395.9	50 2405.50
Na	Frequ	ency	Reading	Factor	Level	Limit	Margin	Detector
No.	(M⊢	lz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)		Detector
1	2390.	.000	21.50	30.84	52.34	74.00	-21.66	peak
2 *	2390.	000	6.02	30.84	36.86	54.00	-17.14	AVG
					-			
	(dB/m)		na Factor (c -Limit value	dB/m)+Cabl	e Factor (dE	3)-Pre-ampli	fier Facto	or



nt. Pol	. Н	orizontal					
est Mo	de: B	LE 1Mbps Mod	de 2480 MH	z			
20.0 dBu	V/m	1					
10							
ΡA							
ם בין בין בי				FCC	Part15 RE-Clas	s B Above 1	G PK
י דד י							
)				ECO	Part15 RE-Clas	o P Abour 1	CAV
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ЪЦ	2						
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).0 2476.500	2486.50 2496	.50 2506.50 25	516.50 (MHz)	2536.50	2546.50 2556	.50 2566.9	50 2576.5
No.	Frequency (MHz)	/ Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	21.21	31.24	52.45	74.00	-21.55	peak
2 *	2483.500	6.91	31.24	38.15	54.00	-15.85	AVG

Remarks:



Ant. Po		Vert	ical					
Test Mo	de:	BLE	1Mbps Mo	de 2480 MH	z			
120.0 dBu	V/m							
110								
100								
90								
80					FCC	Part15 RE-Clas	s B Above 1	IG PK
70								
60	1				FCC	Part15 RE-Clas	s B Above 1	G AV
50	×							
40 📕 🔪	2 Mar matrice	Muchmann	monometry	My A. M. May March and Shakes and a	administration and and and		- Pargentani Jaharan Manda	undander
30								
20								
10								
0.0	2486.50	2496.50	2506.50 2	516.50 (MHz)	2536.50 2	2546.50 2556.	50 2566.	50 2576.5
<u>.</u>								
No.	Freque (MH		Reading (dBu∀)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.	500	22.15	31.24	53.39	74.00	-20.61	peak
2 *	2483.	500	8.01	31.24	39.25	54.00	-14.75	AVG
	(dB/m) =		na Factor (Limit value	dB/m)+Cabl	e Factor (dB)-Pre-ampli	fier Facto	or



Ant. Pol.

Test Mode:

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0								
								0
					FCC	Part15 RE-Clas	s B Above 1	G PK
								++
					ECC	Part15 RE-Clas	s R Above 1	day
							X	
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	w~.s~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-	and the second	Strange States and a strange	and the second	e del sense un serie del sense	and a second	
.0								
	00 2315.50	2325.50	2335.50 23	345.50 (MHz)	2365.50	2375.50 2385	.50 2395.	50 2405.
			Reading	Factor	Level	Limit	Margin	Detector
No.	Freque (MHz		(dBuV)	(dB/m)		(dBuV/m)		Detector
No.		z)	-					peak

Remarks:



Ant. Po	Ι.	Vert	ical								
Test Mo		BLE	2Mbps Mod	de 2402MH	Z						
120.0 dBu	iV/m										
110											
100											
90											
80		_	FCC Part15 RE-Class B Above 1G PK								
70											
60		_									
50					FCC	Part15 RE-Class	X X				
40	I so a second and some of the		• #	March ashed and a second with the	e	and all mathe And and an an	3				
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20		_									
10											
0.0) 2315.50 2	2325.50	2335.50 23	45.50 (MHz)	2365.50 2	375.50 2385.	50 2395.5	0 2405.50			
No.	Freque (MHz	-	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			
1	2390.0	000	21.23	30.84	52.07	74.00	-21.93	peak			
2 *	2390.0	000	6.98	30.84	37.82	54.00	-16.18	AVG			
	-						-				
	(dB/m) =		na Factor (o Limit value	dB/m)+Cabl	e Factor (dB)-Pre-ampli	fier Facto	or			



Ant. Pol		Hori	zontal									
Test Mo	de:	BLE	2Mbps N	Лod	le 2480	MH	z					
120.0 dBu	iV/m	_										
110												
100												
90												
80								500			10.5%	
70								FCC	Part15 RE-Cla	ass B Above	TG PK	
60												
50	<u></u>							FCC	Part15 RE-Clo	ass B Above	1G AV	
40	Englishan											
30	Xarrandon	here the second	where we are a second sec	an a	the Andrew Market Market	mpade	www.elerget	n.V.M.M.M.	and the second descent	a mandada	whenhamon	
20												
10												
	2486.50	2496.50	2506.50	25	16.50 (N	IHz)	253	6.50	2546.50 255	6.50 2566	.50 2576	.50
No.	Freque (MH	-	Readin (dBuV		Facto (dB/m			vel V/m)	Limit (dBuV/m	Margin	Detecto	
1	2483.	500	22.18		31.24	Ļ	53	.42	74.00	-20.58	peak	_
2 *	2483.	500	7.95		31.24	ŀ	39	.19	54.00	-14.81	AVG	_

Remarks:

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



		BLE						
	11		2Mbps Moc	le 2480 MH	z			
10	7m	_						
10								
י⊢A–					FCC	Part15 RE-Class	s B Above 1	G PK
++								
ı / - ↓								
,	:				FCC	Part15 RE-Class	s B Above 1	GAV
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)								
)								
0								
).0 2476.500	240C E0	2496.50	2506.50 25	16.50 (MHz)	2536.50 2	546.50 2556.	50 2566.5	0 2576.5
No.	Freque		Reading	Factor		Limit	Margin	Detector
	(MH	Z)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.	500	21.26	31.24	52.50	74.00	-21.50	peak
2 *	2483.	500	8.92	31.24	40.16	54.00	-13.84	AVG
Remarks								
		Anten	na Factor (c	IB/m)+Cable	e Factor (dB)-Pre-ampli	fier Facto	or

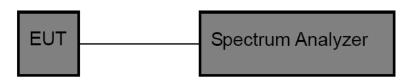


3.4. Band edge and Spurious Emissions (Conducted)

<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
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10th harmonic.
- Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

Test Mode

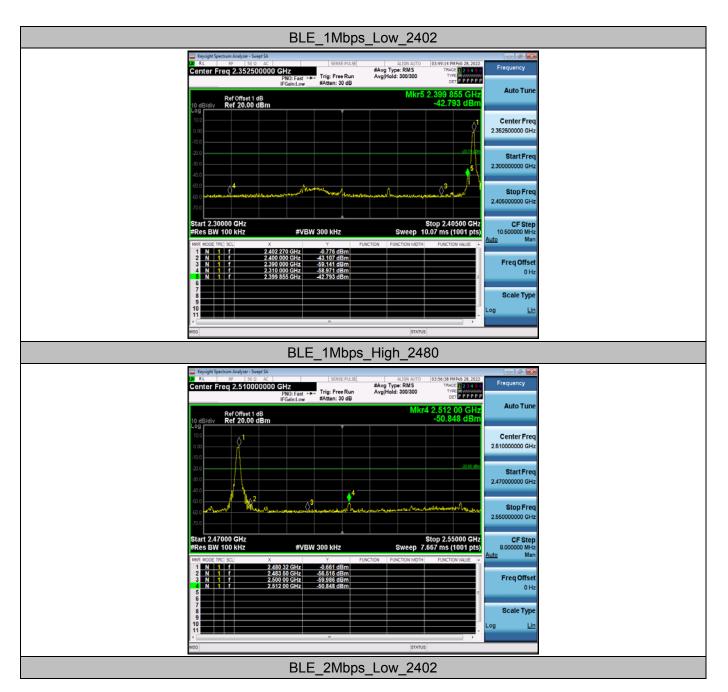
Please refer to the clause 2.4.

Test Results

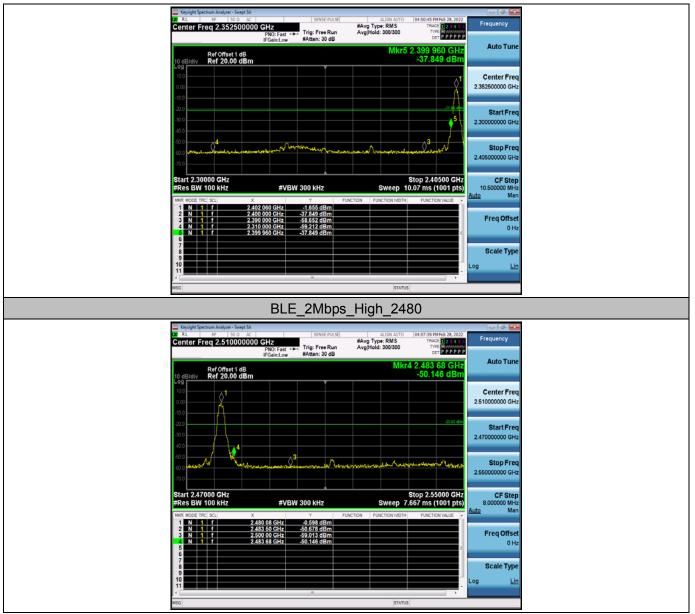
(1) Band edge Conducted Test

Test Mode	Frequency[MHz]	Ref Level[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE 1Mbps	2402	-0.78	-42.79	<=-20.78	PASS
	2480	-0.66	-50.85	<=-20.66	PASS
	2402	-1.66	-37.85	<=-21.66	PASS
BLE 2Mbps	2480	-0.60	-50.15	<=-20.6	PASS







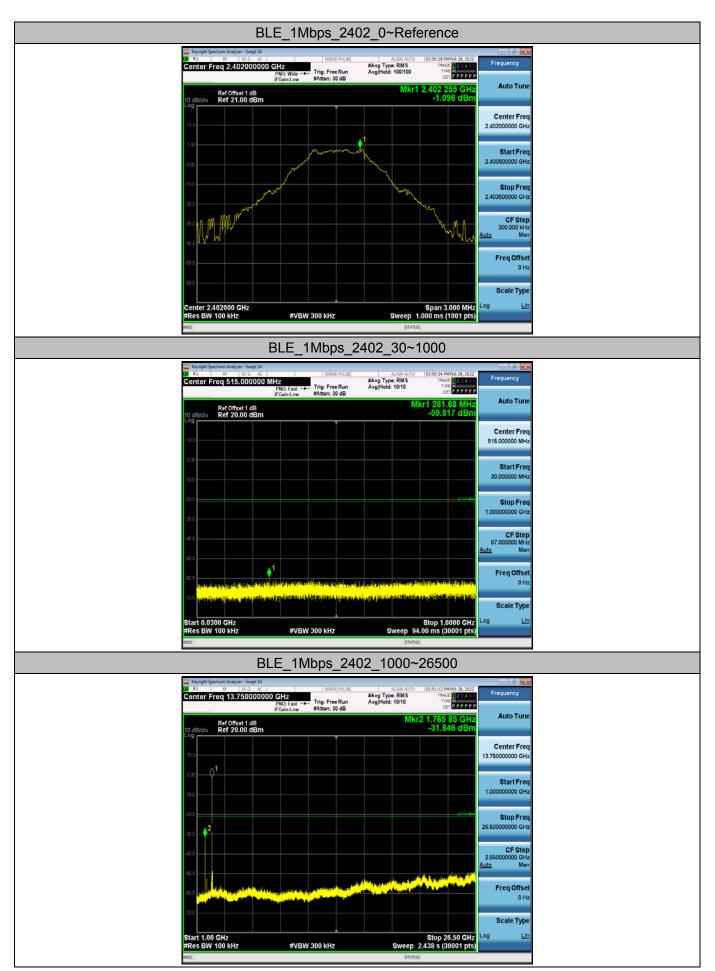




(2) Conducted Spurious Emissions Test

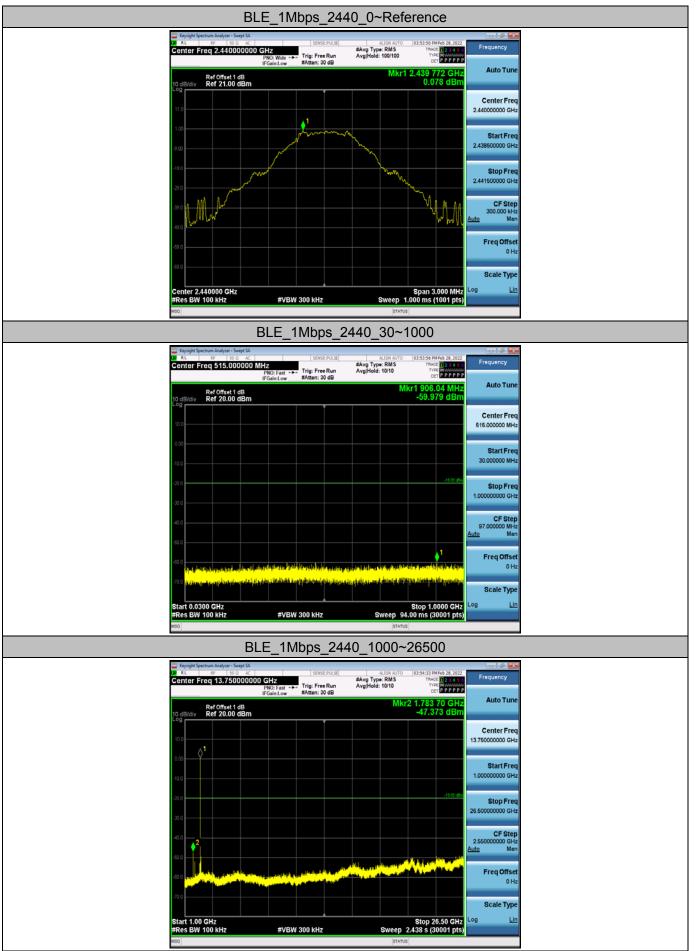
Test Mode	Frequency [MHz]	Freq Range [MHz]	Ref Level [dBm]	Result[dBm]	Limit[dBm]	Verdict
		Reference	-1.10	-1.10		PASS
	2402	30~1000	-1.10	-59.82	<=-21.1	PASS
		1000~26500	-1.10	-31.85	<=-21.1	PASS
		Reference	0.08	0.08		PASS
BLE 1Mbps	2440	30~1000	0.08	-59.98	<=-19.92	PASS
		1000~26500	0.08	-47.37	<=-19.92	PASS
		Reference	-0.25	-0.25		PASS
	2480	30~1000	-0.25	-59.13	<=-20.25	PASS
		1000~26500	-0.25	-36.01	<=-20.25	PASS
	2402	Reference	-2.43	-2.43		PASS
		30~1000	-2.43	-59.45	<=-22.43	PASS
		1000~26500	-2.43	-48.23	<=-22.43	PASS
		Reference	-0.11	-0.11		PASS
BLE 2Mbps	2440	30~1000	-0.11	-59.91	<=-20.11	PASS
		1000~26500	-0.11	-48.86	<=-20.11	PASS
		Reference	-2.42	-2.42		PASS
	2480	30~1000	-2.42	-59.78	<=-22.42	PASS
		1000~26500	-2.42	-48.72	<=-22.42	PASS





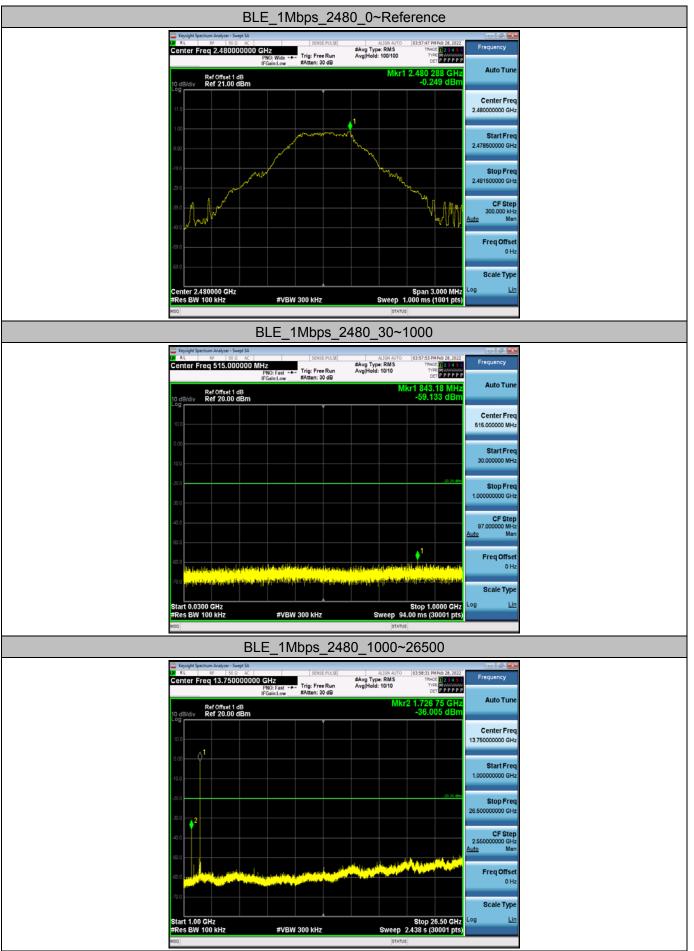
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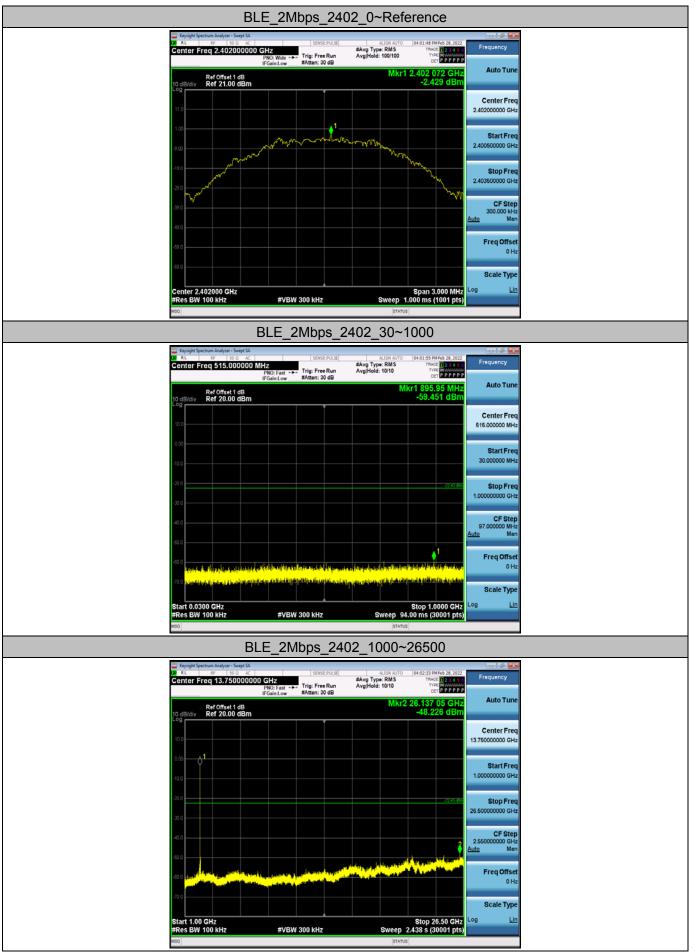


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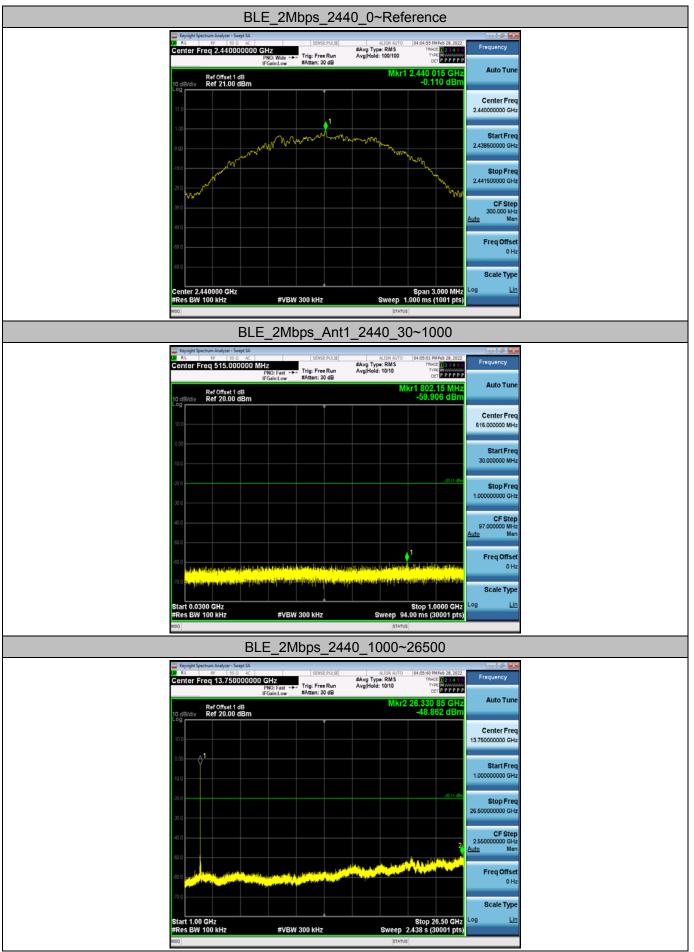






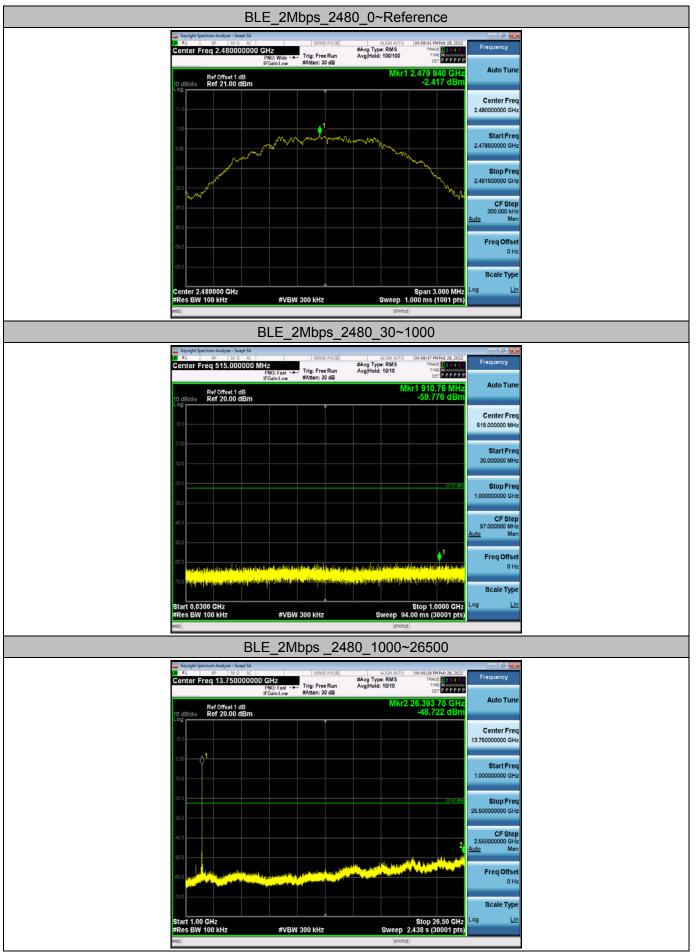






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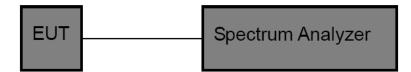
3.5. DTS Bandwidth

<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

- 5. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 6. 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) \geq 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Test Mode

Please refer to the clause 2.4.

Test Results

Test Mode	Frequency[MHz]	DTS BW[MHz]	Limit[MHz]	Verdict
	2402	0.696	>=0.5	PASS
BLE 1Mbps	2440	0.700	>=0.5	PASS
	2480	0.704	>=0.5	PASS
	2402	1.164	>=0.5	PASS
BLE 2Mbps	2440	1.352	>=0.5	PASS
	2480	1.192	>=0.5	PASS











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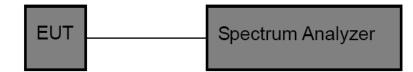
3.6. Peak Output Power

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

2. Spectrum Setting:

Peak Detector: RBW≥DTS Bandwidth, VBW≥3*RBW.

Sweep time=Auto.

Detector= Peak.

Trace mode= Maxhold.

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	Frequency[MHz]	Result[dBm]	Limit[dBm]	Verdict
BLE 1Mbps	2402	0.09	<=30	PASS
	2440	1.27	<=30	PASS
	2480	0.19	<=30	PASS
BLE 2Mbps	2402	0.04	<=30	PASS
	2440	1.30	<=30	PASS
	2480	0.85	<=30	PASS



Test plot as follows: BLE_1Mbps_2402 RL № S0 Ω AC Center Freq 2.402000000 GHz PN0: Fast Trig: Free Run #Geind.tow Trig: Free Run Frequence #Avg Type: RMS Avg|Hold: 100/100 12345 M Auto Tur 041 25 G 0.088 dE Ref Offset 1 dB Ref 30.00 dBm Center Free 2.402000000 GH: Start Free 2.399000000 GH: 1 Stop Free 2.405000000 GH CF Step Freq Offse 0 H Scale Typ enter 2.402000 GHz Res BW 2.0 MHz Span 6.000 MHz Sweep 1.067 ms (8001 pts) Li #VBW 6.0 MHz BLE_1Mbps_2440 RL 8² | 50.2 AC | | Stroc-russ Center Freq 2.4400000000 PHZ PN0: Fast →→ IFGeint.tow #Atten: 40 dB #Avg Type: RMS Avg|Hold: 100/100 1 2 3 4 5 0 M P P P P P P Auto Tun /kr1 2.440 198 75 G 1.270 dE Ref Offset 1 dB Ref 30.00 dBm Center Free 2.44000000 GH: Start Free **♦**¹ 2.437000000 GH Stop Free 2.443000000 GH CF Step Freq Offse 0 H Scale Typ Span 6.000 MHz Sweep 1.067 ms (8001 pts) enter 2.440000 GHz Res BW 2.0 MHz Log #VBW 6.0 MHz BLE_1Mbps_2480 enter Freq 2.480000000 GHz #Avg Type: RMS Avg|Hold: 100/100 PNO: Fast +++ Trig: Free Run IFGain:Low #Atten: 40 dB 1 2 3 4 5 6 M P P P P P P Auto Tun 841 75 GI 0.194 dE Ref Offset 1 dB Ref 30.00 dBm Center Free 2.48000000 GH Start Free ¢¹ 2.477000000 GH Stop Fred 2.483000000 GH: CF Step Freq Offse OН Scale Type enter 2.480000 GHz Res BW 2.0 MHz Li Span 6.000 MHz Sweep 1.067 ms (8001 pts) Log #VBW 6.0 MHz

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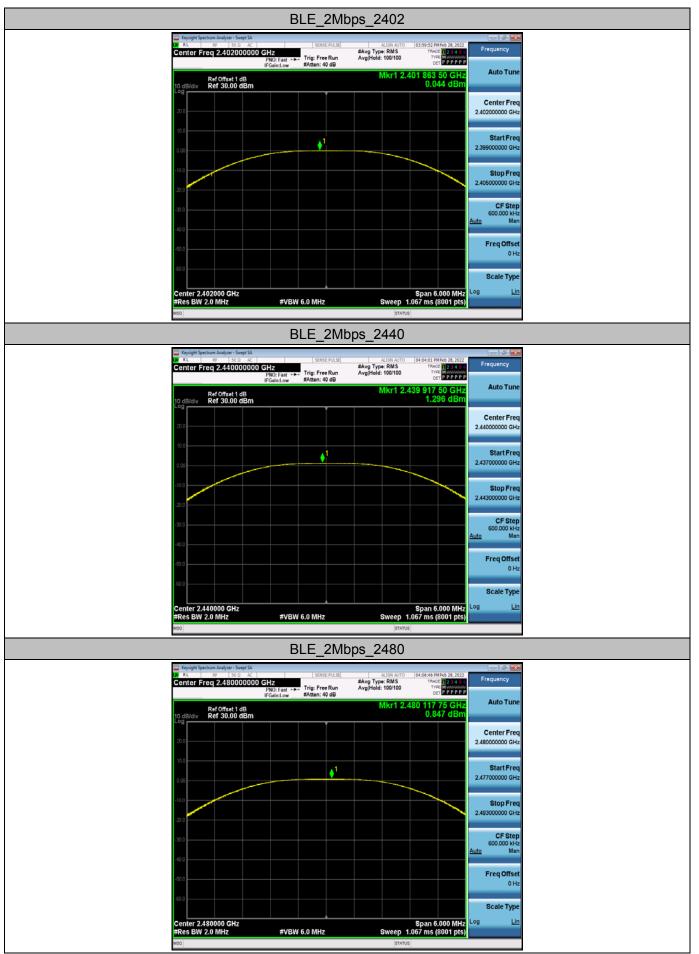
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Accreditation Administration of the People's Republic of China : yz.cnca.cn









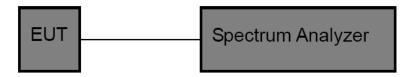
3.7. Power Spectral Density

<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	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE 1Mbps	2402	-15.19	<=8	PASS
	2440	-12.68	<=8	PASS
	2480	-14.17	<=8	PASS
BLE 2Mbps	2402	-18.54	<=8	PASS
	2440	-17.06	<=8	PASS
	2480	-17.37	<=8	PASS



BLE_1Mbps_2402 Center Freq 2.402000000 GHz Frequency Trig: Free Run #Atten: 30 dB #Avg Type: RMS Avg|Hold: 100/100 12345 M Auto Tur -15.186 dB Ref Offset 1 dB Ref 21.00 dBm Center Fre 2.402000000 GH Start Free 2.401304000 GH **♦**¹ Stop Fre AuN/ 2.402696000 GH CF Step 139.200 kH: Auto M Freq Offse 0 F Scale Typ Span 1.392 MHz Sweep 148.0 ms (30000 pts) er 2.4020000 GHz BW 3.0 kHz #VBW 10 kHz BLE_1Mbps_2440 Center Freq 2.440000000 GHz Frequence #Avg Type: RMS Avg|Hold: 100/100 Trig: Free Run 12345 M Auto Tun -12.677 dB Ref Offset 1 dB Ref 21.00 dBm Center Free 2.44000000 GH Start Free 2.439300000 GH **♦** Stop Fre JWW . 2.440700000 GH CF Ste 140.000 kH \uto M Freq Offse 0 H Scale Typ Span 1.400 MHz Sweep 148.0 ms (30000 pts) enter 2.4400000 GHz Res BW 3.0 kHz Log Li #VBW 10 kHz BLE_1Mbps_2480 Center Freq 2.480000000 GHz PN0: Wide → Trig: Free Run PN0: Wide → Atten: 30 dB Frequency #Avg Type: RMS Avg|Hold: 100/100 12345 M..... PPPPP Auto Tur -14.169 di Ref Offset 1 dB Ref 21.00 dBm Center Free 2.480000000 GH Start Free 2.479296000 GH Stop Fre Sam Mr. Was 2.480704000 GH CF Step 140,800 kH \uto M Freq Offse 0 H Scale Typ Span 1.408 MHz Sweep 150.0 ms (30000 pts) enter 2.4800000 GHz Res BW 3.0 kHz Li #VBW 10 kHz

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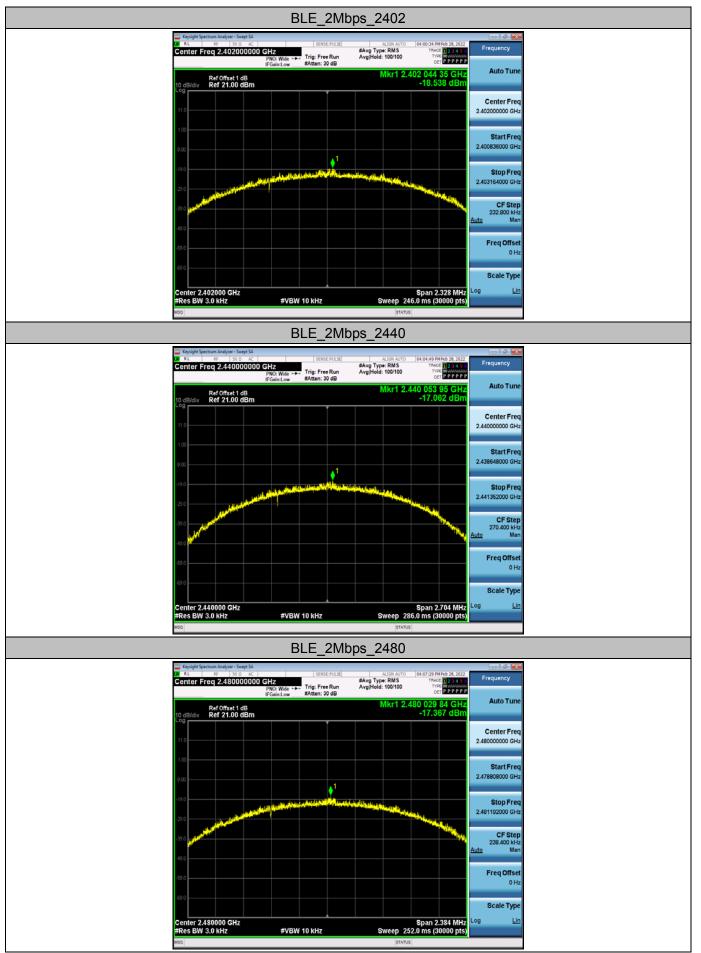
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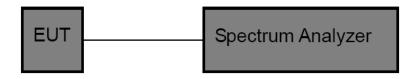


3.8. Duty Cycle

<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 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	2.00	2.44	81.97	0.50	1
BLE 1Mbps	2440	2.06	2.44	84.43	0.49	1
ninps	2480	2.00	2.44	81.97	0.50	1
	2402	0.94	1.88	50.00	1.06	2
BLE 2Mbps	2440	0.94	1.81	51.93	1.06	2
211000	2480	1.00	1.88	53.19	1.00	2



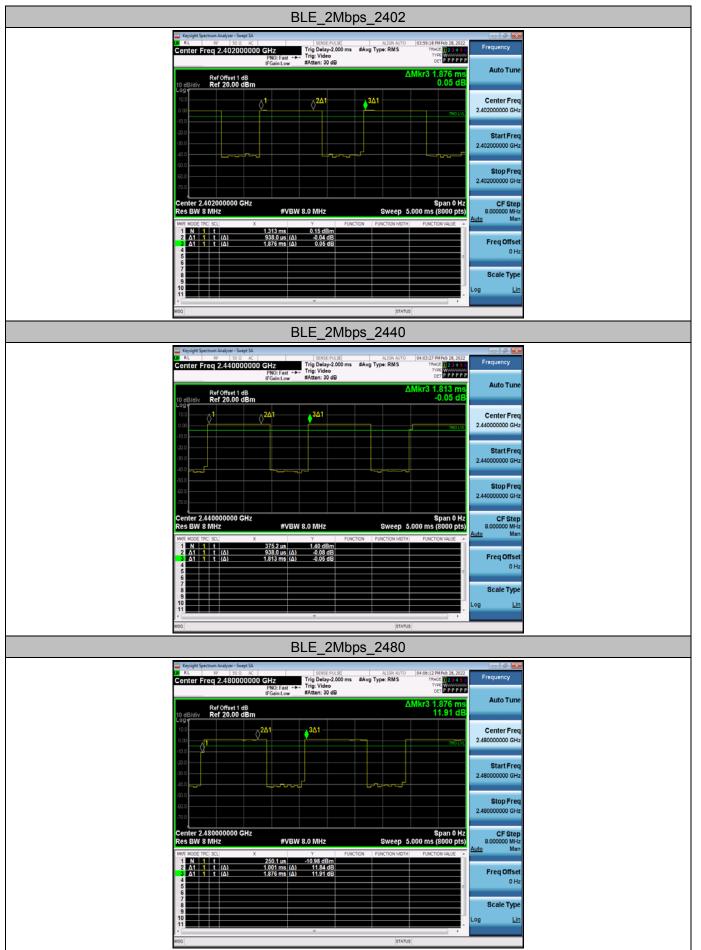
Test plot as follows: BLE_1Mbps_2402 DIE R.L PF [50 ⊕ AC [SINSE-PULSE] ALIGN AL Center Freq 2.402000000 GHz Trig Delay-2.000 ms #Avg Type: RMS PN0: Fast → Trig: Video #Avg Type: RMS If GainLow #Atten: 30 dB #Atten: 30 dB #Atten: 30 dB Frequency PPPPP Auto Tun Ref Offset 1 dB Ref 20.00 dBm 0.01 Center Fred 2.402000000 GH: ² [∆] ¹ _3∆1 Start Free 2.40200000 GH Stop Free 2.40200000 GH Span 0 Hz Sweep 5.000 ms (8000 pts) Center 2.402000000 GHz Res BW 8 MHz CF Step #VBW 8.0 MHz 8.00 N 1 t Δ1 1 t (Δ) Δ1 1 t (Δ) 187.6 μs -0.12 dBm 2.001 ms (Δ) -0.01 dB 2.439 ms (Δ) 0.01 dB Freq Offse 0 H Scale Type BLE_1Mbps_2440 Kryster Sector Frequency 123450 W Auto Tun Ref Offset 1 dB Ref 20.00 dBm 5 04 </241 Center Free 2.440000000 GH 3∆1 Start Free 2.440000000 GH Stop Fred 2.44000000 GH: Center 2.440000000 GHz Res BW 8 MHz Span 0 Hz Sweep 5.000 ms (8000 pts) CF Step 8.000000 MH: #VBW 8.0 MHz 375.2 μs -8.01 dBn 2.064 ms (Δ) 9.22 dE 2.439 ms (Δ) -5.04 dE Δ1 1 t (Δ) Δ1 1 t (Δ) Freq Offse 0 H Scale Typ BLE_1Mbps_2480 RL RF S0 Ω AC SENSE-FULGE Center Freq 2.430000000 GHz Trig Delay-2.000 ms Figure Video PN0: Fast →= Trig: Video Figure Video IFGanto ow #Atten: 30 dB B Frequency #Avg Type: RMS 12345 W : 30 dB Auto Tun Ref Offset 1 dB Ref 20.00 dBm -0.03 d Center Free ٥¹ _<mark>∆2∆</mark>1 2.48000000 GH Start Free 2.48000000 GH Stop Free 2.48000000 GH Center 2.480000000 GHz Res BW 8 MHz Span 0 Hz Sweep 5.000 ms (8000 pts) CF Step 8.000000 MH: #VBW 8.0 MHz Ma 2.314 ms 2.001 ms (Δ) 2.439 ms (Δ) -0.07 dB -0.03 dB Δ1 1 t (Δ) Δ1 1 t (Δ) Freq Offse 0 H Scale Typ Li

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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.