FCC Radio Test Report

FCC ID: XMF-MID8001

Original Grant

Report No.	:	TB-FCC143145
Applicant	:	Lightcomm Technology Co., Ltd.
Equipment Under Test (EUT)		
EUT Name	:	MID
Model No.	:	MID8001-IB
Series Model No.	:	DL801W
Brand Name	:	N/A
Receipt Date	:	2015-01-20
Test Date	:	2015-01-20 to 2015-01-26
Issue Date	:	2015-01-27
Standards	:	FCC Part 15, Subpart C (15.247:2014)
Test Method	:	ANSI C63.4:2003
Conclusions	:	**PASS**

In the configuration tested, the EUT complied with the standards specified above,
The EUT technically complies with the FCC and IC requirements

Test/Witness Engineer	:	
Approved& Authorized	:	

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, China
Tel: +86 75526509301 Fax: +86 75526509195

Contents

1. General Information about EUT

1.1 Client Information

Applicant	:	Lightcomm Technology Co., Ltd.
Address	:	RM 1708-10, 17/F, PROSPERITY CENTRE, 25 CHONG YIP STREET, KWUN TONG, KOWLOON, HONG KONG
Manufacturer	:	Huizhou Hengdu Electronics Co.,Ltd.
Address	:	DIP South Area, Huiao Highway, Huizhou, Guangdong, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	MID	
Models No.	:	MID8001-IB, DL801W	
Model Difference	:	All models are identical in the same PCB layout, interior structure and electrical circuit, The only difference is model name for commercial purpose.	
Product Description	:	Operation Frequency: 2402MHz~2480MHz	
		Number of Channel:	Bluetooth 4.0 (BLE): 40 channels **see note(3)**
		RF Output Power:	5.778 dBm Conducted Power
		Antenna Gain:	0 dBi FPC Antenna
		Modulation Type:	GFSK
		Bit Rate of Transmitter:	1Mbps(GFSK)
Power Supply	:	DC power supplied by AC/DC Adapter DC Voltage supplied from Li-ion battery.	
Power Rating	:	Input: AC 100~240V 50/60Hz 0.35A Max Output: 5V 2A DC 3.7V from Li-ion battery	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

Note:

(1) This Test Report is FCC Part 15.247 for Bluetooth BLE, the test procedure follows the FCC KDB 558074 D01 DTS Meas Guidance v03r02.

(2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(3) Antenna information provided by the applicant.

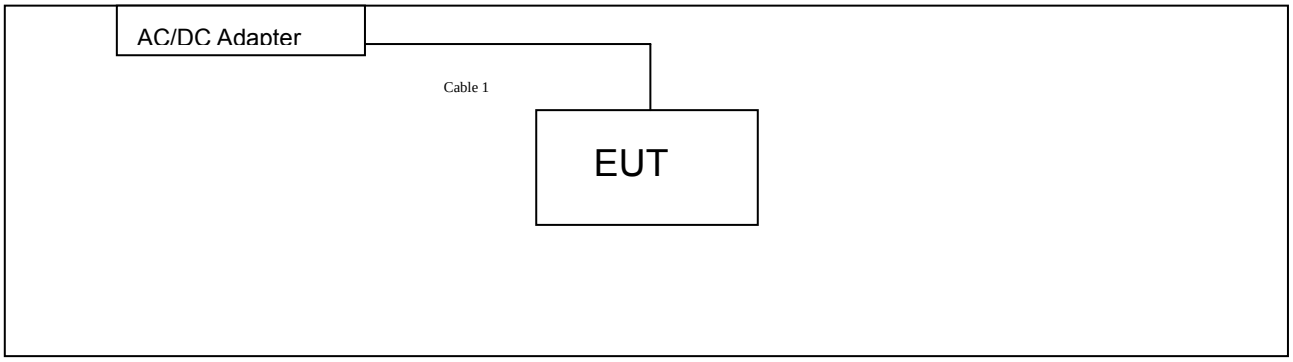
(4) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)

00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

1.3 Block Diagram Showing the Configuration of System Tested

TX Mode



1.4 Description of Support Units

Equipment Information				
Name	**Model**	**S/N**	**Manufacturer**	**Used "√"**
/	/	/	/	/
Cable Information				
Number	**Shielded Type**	**Ferrite Core**	**Length**	**Note**
Cable 1	YES	NO	1.1M	Accessories

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test	
Final Test Mode	**Description**
Mode 1	AC Charging with TX Mode

For Radiated Test	
Final Test Mode	**Description**
Mode 2	AC Charging with TX Mode
Mode 3	TX Mode (Channel 00/20/39)

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.
According to ANSI C63.4 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:
Bluetooth BLE Mode: GFSK Modulation Transmitting mode.

(2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.

(3) The EUT is considered a mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	**Realtek Bluetooth MP--RTK_BT_CHIP_ID_RTL8723B**		
Channel	**CH 00**	**CH 20**	**CH 39**
BLE Mode	DEF	DEF	DEF

1.7 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at:

1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.

At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. Test Summary

FCC Part 15 Subpart C(15.247)/RSS-210: 2010				
Standard Section		Test Item	Judgment	Remark
FCC	IC			
15.203	/	Antenna Requirement	PASS	N/A
15.207	RSS-GEN 7.2.4	Conducted Emission	PASS	N/A
15.205	RSS-GEN 7.2.2	Restricted Bands	PASS	N/A
15.247(a)(2)	RSS-210 A.8.2(a)	6dB Bandwidth	PASS	N/A
15.247(b)	RSS-210 A.8.4(4)	Peak Output Power	PASS	N/A
15.247(e)	RSS-210 A.8.2(b)	Power Spectral Density	PASS	N/A
15.247(d)	RSS-210 Annex 8 (A8.5)	Transmitter Radiated Spurious Emission	PASS	N/A
Note: "/" for no requirement for this test item. N/A is an abbreviation for Not Applicable.				

3. Conducted Emission Test

3.1 Test Standard and Limit

3.1.1Test Standard

FCC Part 15.207

3.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

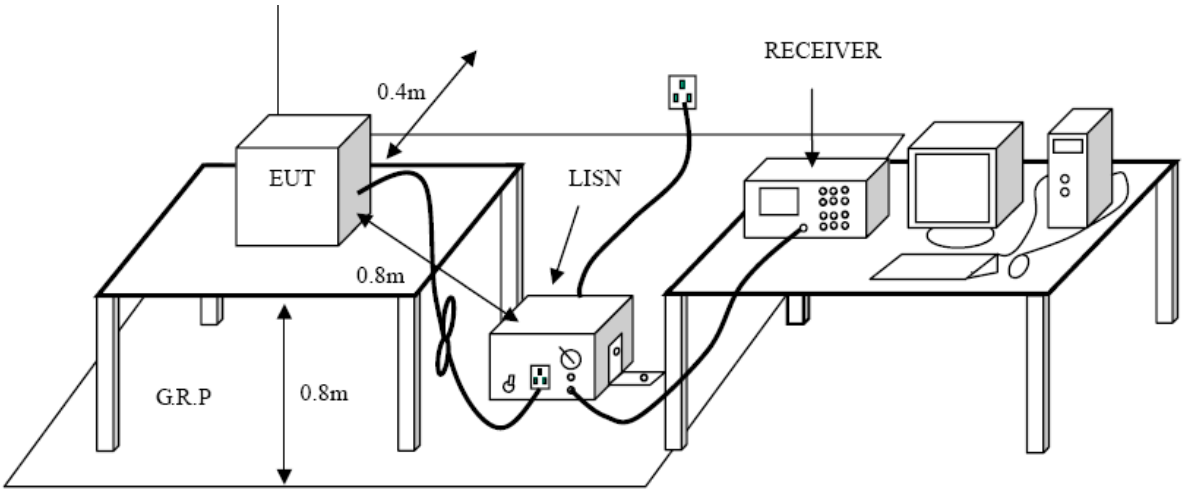
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2 Test Setup



3.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

3.4 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100321	Aug. 08, 2014	Aug. 07, 2015
50ΩCoaxial Switch	Anritsu	MP59B	X10321	Aug. 08, 2014	Aug. 07, 2015
L.I.S.N	Rohde & Schwarz	ENV216	101131	Aug. 08, 2014	Aug. 07, 2015
L.I.S.N	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 08, 2014	Aug. 07, 2015

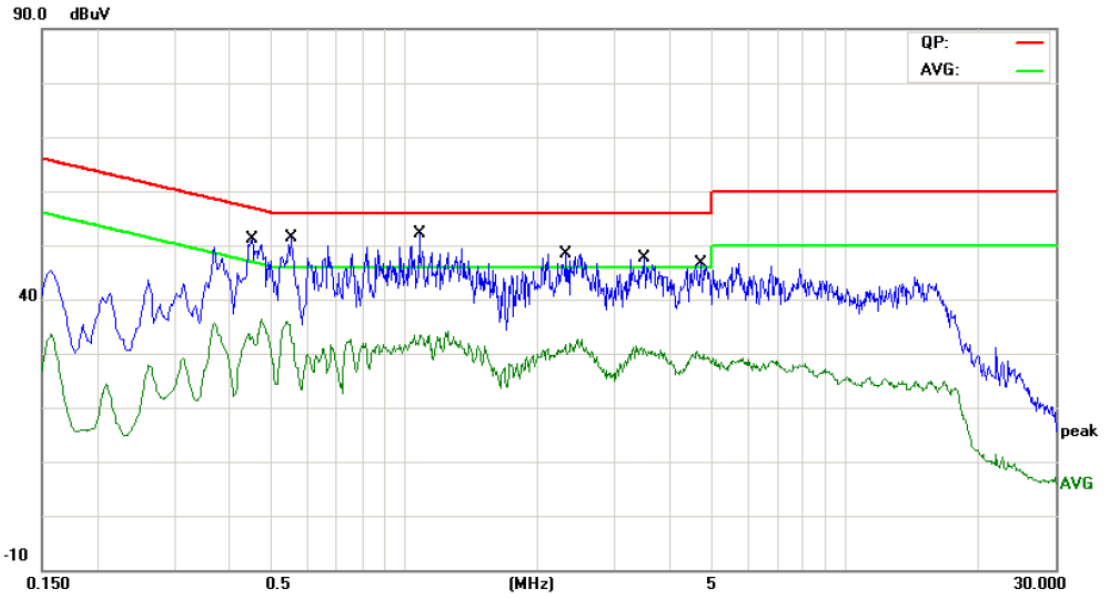
3.5 EUT Operating Mode

Please refer to the description of test mode.

3.6 Test Data

Please see the next page.

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Terminal:	Line		
Test Mode:	AC Charging with BLE TX 2402 MHz		
Remark:	Only worse case is reported		

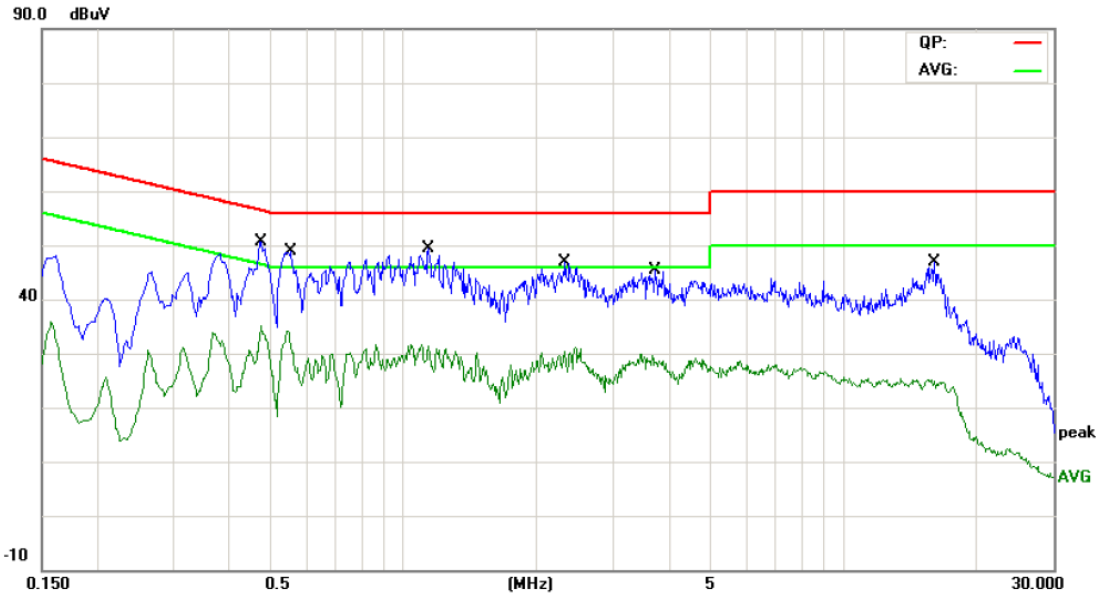


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.4500	32.07	10.02	42.09	56.87	-14.78	QP
2		0.4500	21.96	10.02	31.98	46.87	-14.89	AVG
3		0.5540	32.16	10.05	42.21	56.00	-13.79	QP
4		0.5540	22.16	10.05	32.21	46.00	-13.79	AVG
5	*	1.0780	32.71	10.06	42.77	56.00	-13.23	QP
6		1.0780	22.31	10.06	32.37	46.00	-13.63	AVG
7		2.3220	29.60	10.05	39.65	56.00	-16.35	QP
8		2.3220	20.95	10.05	31.00	46.00	-15.00	AVG
9		3.5060	28.75	10.01	38.76	56.00	-17.24	QP
10		3.5060	20.24	10.01	30.25	46.00	-15.75	AVG
11		4.7180	26.63	9.97	36.60	56.00	-19.40	QP
12		4.7180	18.76	9.97	28.73	46.00	-17.27	AVG

*:Maximum data x:Over limit !:over margin

Emission Level= Read Level+ Correct Factor

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Terminal:	Neutral		
Test Mode:	AC Charging with BLE TX 2402 MHz		
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.4740	37.43	10.03	47.46	56.44	-8.98	QP
2		0.4740	24.39	10.03	34.42	46.44	-12.02	AVG
3		0.5540	34.49	10.02	44.51	56.00	-11.49	QP
4		0.5540	21.35	10.02	31.37	46.00	-14.63	AVG
5		1.1380	33.20	10.15	43.35	56.00	-12.65	QP
6		1.1380	19.45	10.15	29.60	46.00	-16.40	AVG
7		2.3260	31.15	10.06	41.21	56.00	-14.79	QP
8		2.3260	19.04	10.06	29.10	46.00	-16.90	AVG
9		3.7300	27.67	10.06	37.73	56.00	-18.27	QP
10		3.7300	17.56	10.06	27.62	46.00	-18.38	AVG
11		16.0660	26.30	10.06	36.36	60.00	-23.64	QP
12		16.0660	13.29	10.06	23.35	50.00	-26.65	AVG

*:Maximum data x:Over limit !:over margin

Emission Level= Read Level+ Correct Factor

4. Radiated Emission Test

4.1 Test Standard and Limit

4.1.1 Test Standard

FCC Part 15.209

4.1.2 Test Limit

Radiated Emission Limits (9kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/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
Above 960	500	3

Radiated Emission Limit (Above 1000MHz)

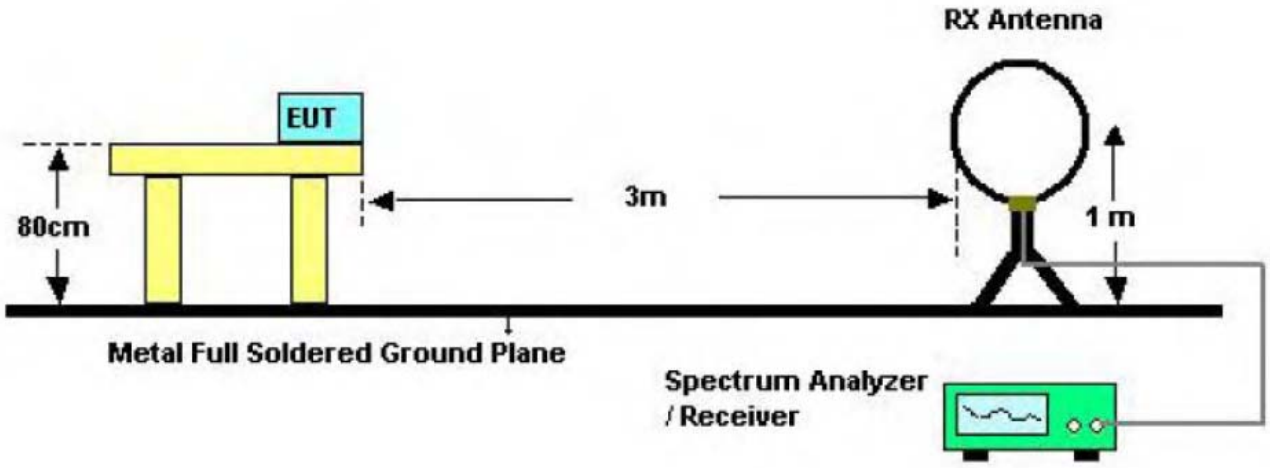
Frequency (MHz)	Class A (dBuV/m)(at 3 M)		Class B (dBuV/m)(at 3 M)	
	Peak	Average	Peak	Average
Above 1000	80	60	74	54

Note:

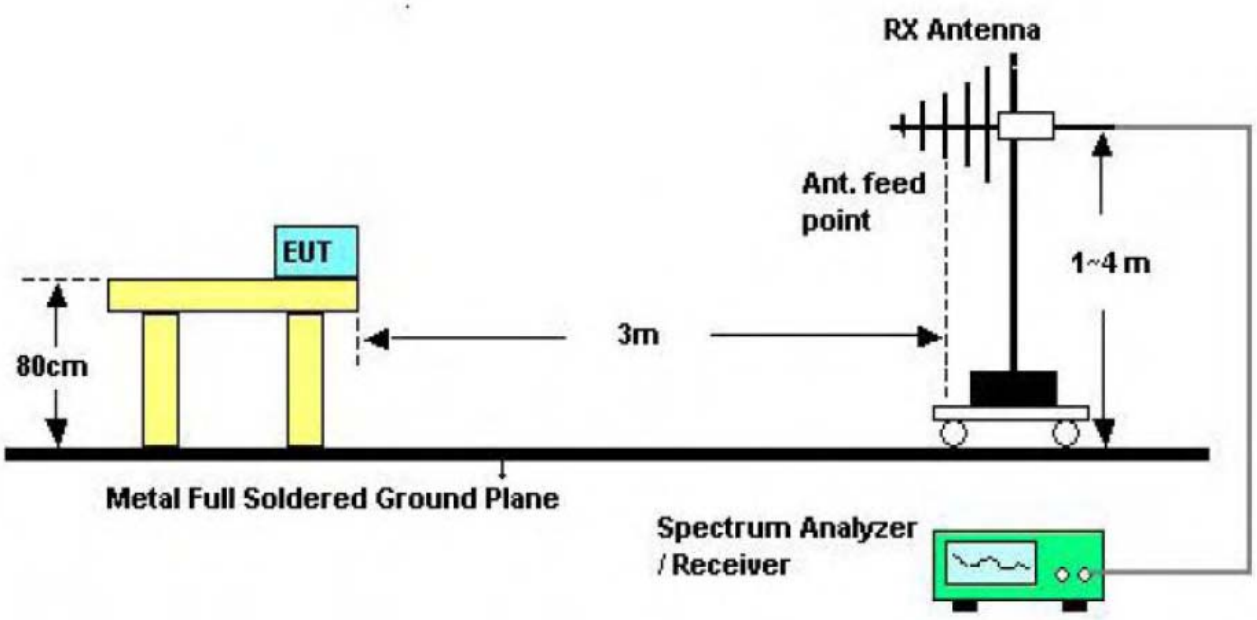
(1) The tighter limit applies at the band edges.

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

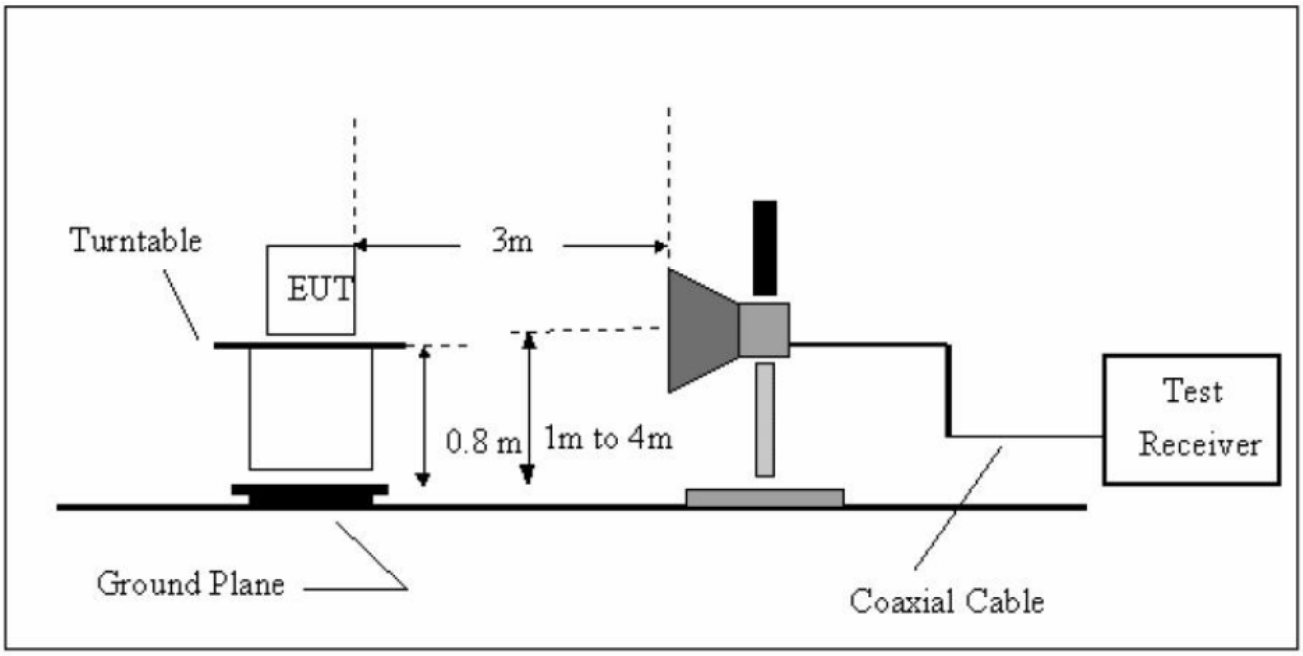
4.2 Test Setup



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

4.3 Test Procedure

(1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above the ground, the table was rotated 360 degrees to determine the position of the highest radiation.
(2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
(3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
(4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
(5) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
(6) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
(7) For the actual test configuration, please see the test setup photo.

4.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

4.5 Test Equipment

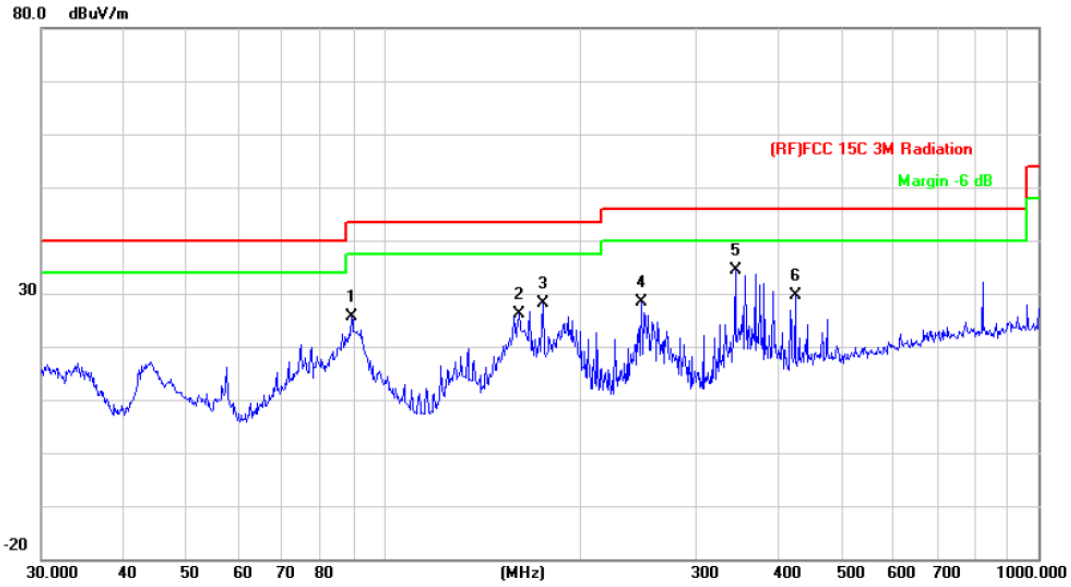
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Mar. 20, 2014	Mar. 19, 2015
Spectrum Analyzer	Rohde & Schwarz	FSP30	DE25181	Aug. 08, 2014	Aug. 07, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Aug. 08, 2014	Aug. 07, 2015
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 07, 2014	Mar.06, 2015
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 07, 2014	Mar.06, 2015
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 07, 2014	Mar.06, 2015
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 07, 2014	Mar.06, 2015
Pre-amplifier	HP	11909A	185903	Mar. 07, 2014	Mar.06, 2015
Pre-amplifier	HP	8447B	3008A00849	Mar. 07, 2014	Mar.06, 2015
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 07, 2014	Mar.06, 2015
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Feb. 11, 2014	Feb.10, 2015
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A

4.6 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10Hz with Peak Detector for Average Values.

Test data please refer the following pages.

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE TX 2402 Mode		
Remark:	Only worse case is reported		

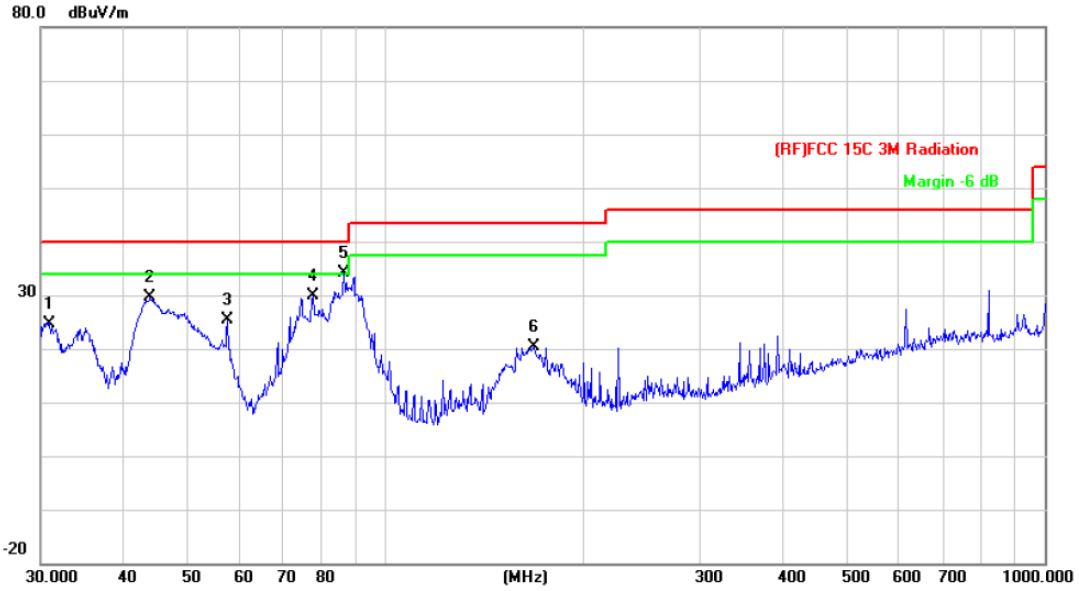


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		89.2764	48.26	-22.74	25.52	43.50	-17.98	peak
2		160.9089	46.81	-20.57	26.24	43.50	-17.26	peak
3		175.0368	48.90	-20.88	28.02	43.50	-15.48	peak
4		247.6819	46.72	-18.23	28.49	46.00	-17.51	peak
5	*	344.3855	49.46	-14.96	34.50	46.00	-11.50	peak
6		425.0280	42.50	-12.92	29.58	46.00	-16.42	peak

*:Maximum data x:Over limit !:over margin

Emission Level= Read Level+ Correct Factor

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE TX 2402 Mode		
Remark:	Only worse case is reported		

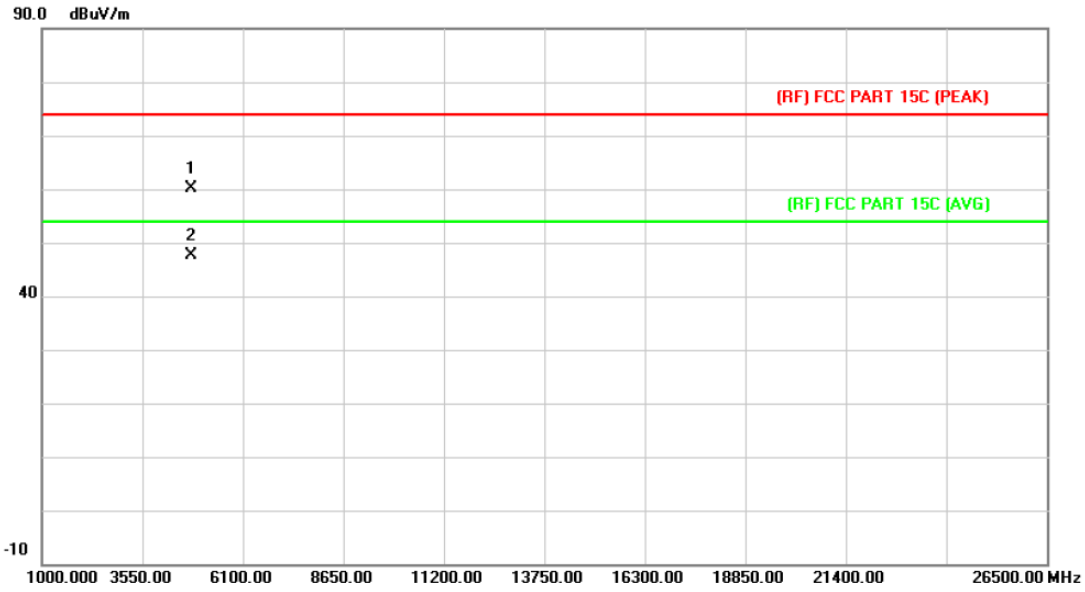


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		30.9619	39.31	-14.56	24.75	40.00	-15.25	peak
2		43.9658	51.53	-21.84	29.69	40.00	-10.31	peak
3		57.5939	49.80	-24.50	25.30	40.00	-14.70	peak
4		77.5928	53.35	-23.36	29.99	40.00	-10.01	peak
5	*	86.5029	57.00	-22.89	34.11	40.00	-5.89	peak
6		167.8243	41.47	-21.04	20.43	43.50	-23.07	peak

*:Maximum data x:Over limit !:over margin

Emission Level= Read Level+ Correct Factor

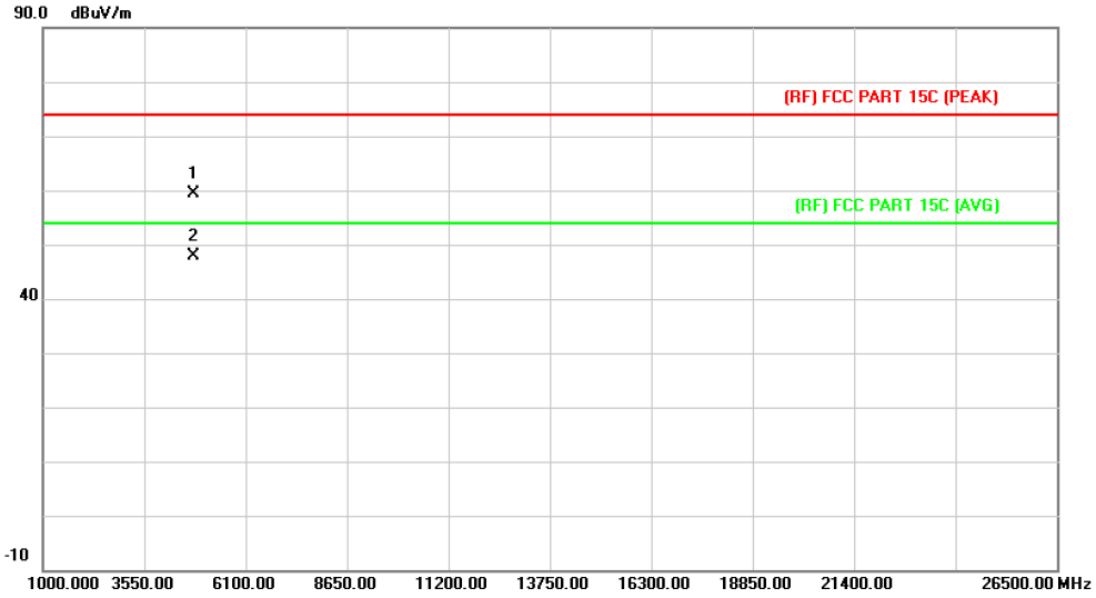
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.982	46.61	13.44	60.05	74.00	-13.95	peak
2	*	4803.994	34.21	13.44	47.65	54.00	-6.35	AVG

Emission Level= Read Level+ Correct Factor

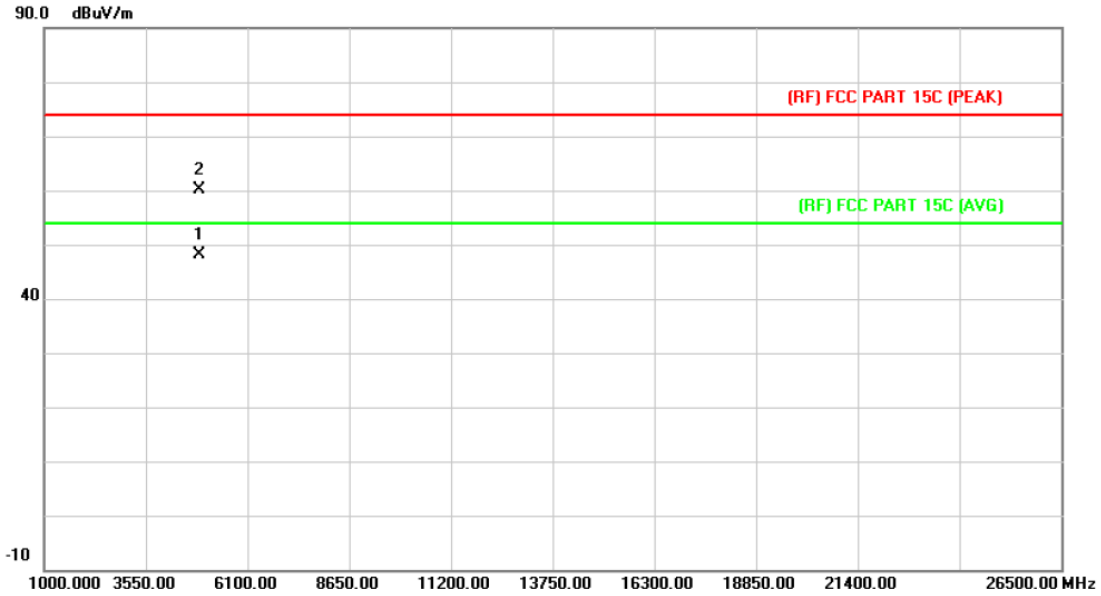
EUT:	MID	**Model:**	MID8001-IB
Temperature:	25 ℃	**Relative Humidity:**	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.994	45.89	13.44	59.33	74.00	-14.67	peak
2	*	4804.048	34.34	13.44	47.78	54.00	-6.22	AVG

Emission Level= Read Level+ Correct Factor

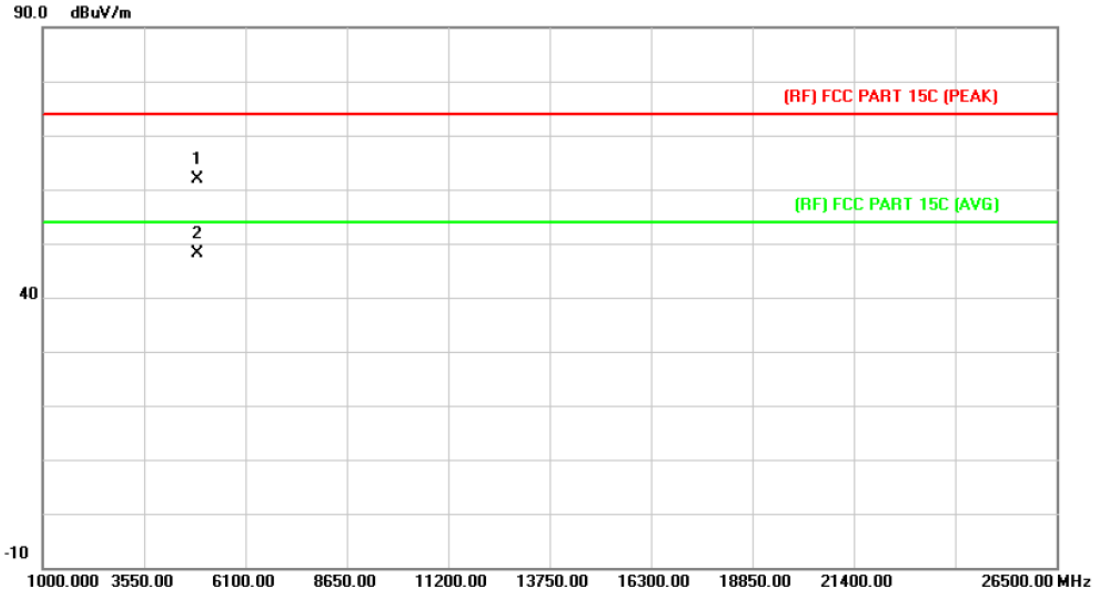
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2442 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4883.997	34.22	13.92	48.14	54.00	-5.86	AVG
2		4884.015	46.15	13.92	60.07	74.00	-13.93	peak

Emission Level= Read Level+ Correct Factor

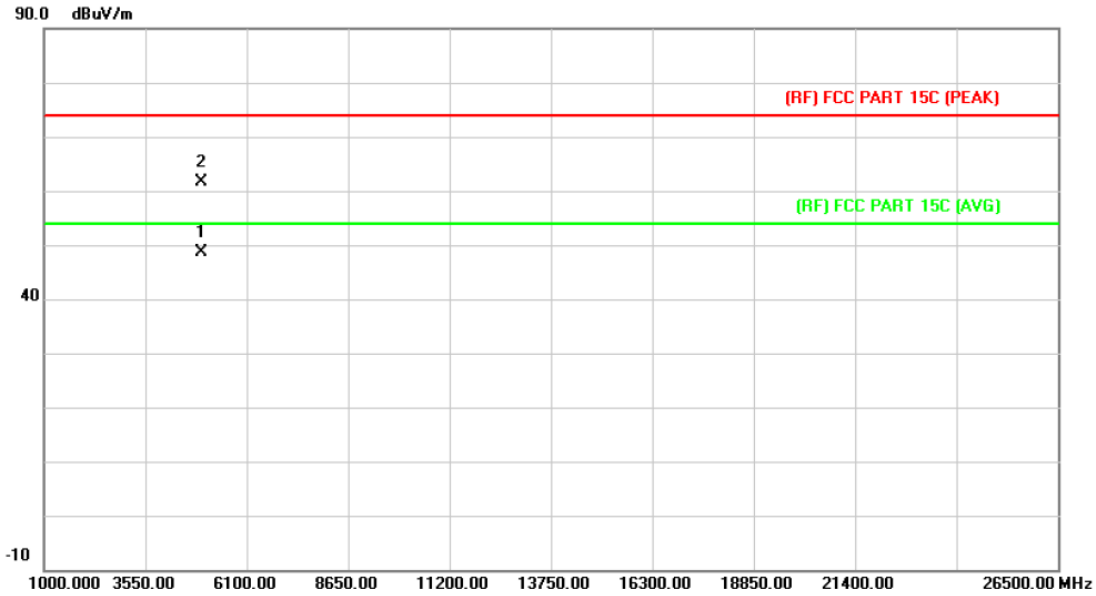
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2442 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4883.985	48.04	13.92	61.96	74.00	-12.04	peak
2	*	4883.991	34.23	13.92	48.15	54.00	-5.85	AVG

Emission Level= Read Level+ Correct Factor

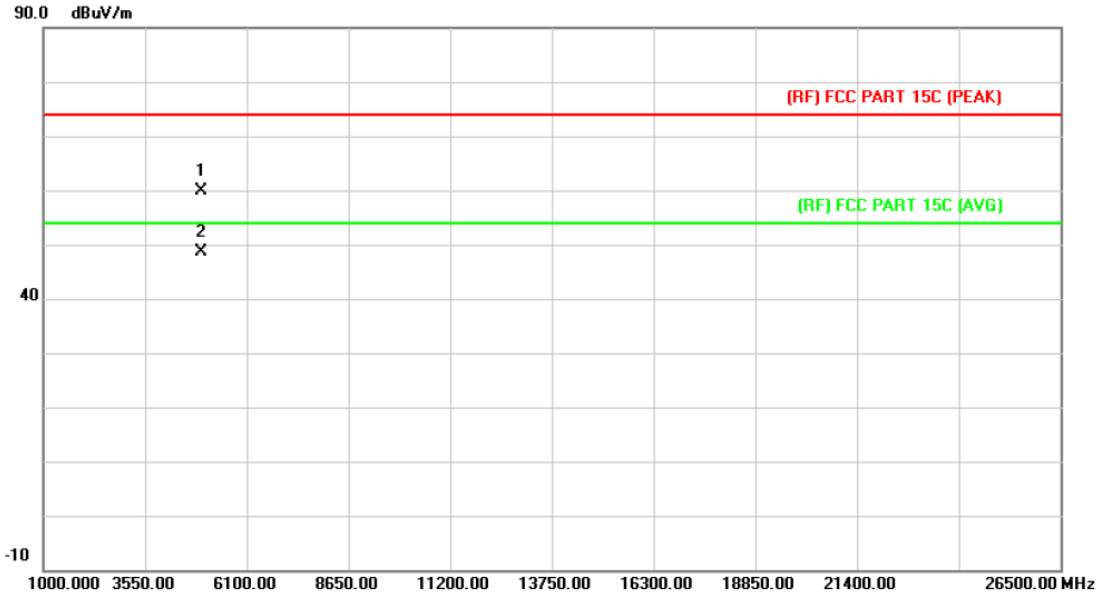
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4960.021	34.33	14.36	48.69	54.00	-5.31	AVG
2		4960.027	47.32	14.36	61.68	74.00	-12.32	peak

Emission Level= Read Level+ Correct Factor

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.991	45.62	14.36	59.98	74.00	-14.02	peak
2	*	4959.997	34.30	14.36	48.66	54.00	-5.34	AVG

Emission Level= Read Level+ Correct Factor

5. Restricted Bands Requirement

5.1 Test Standard and Limit

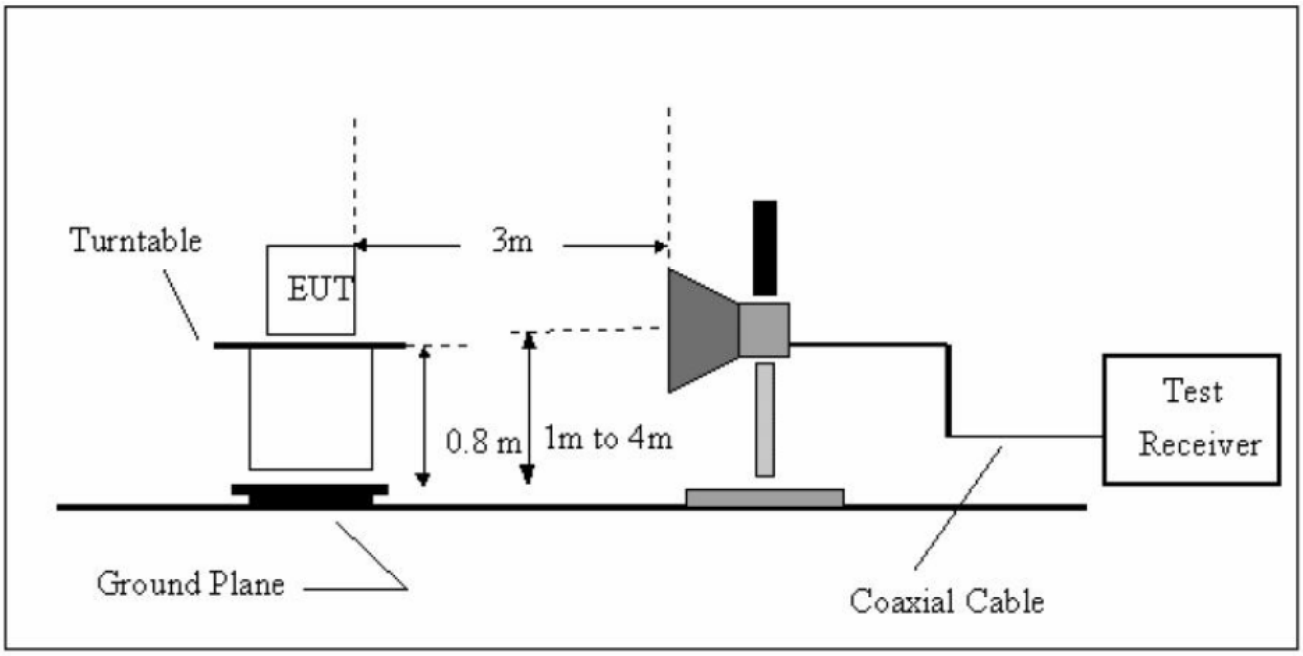
5.1.1 Test Standard

FCC Part 15.209 FCC Part 15.205

5.1.2 Test Limit

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

5.2 Test Setup



5.3 Test Procedure

(1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

(2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

(3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

(4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit

Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.

(5) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.

(6) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

(7) For the actual test configuration, please see the test setup photo.

5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

5.5 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Mar. 20, 2014	Mar. 19, 2015
Spectrum Analyzer	Rohde & Schwarz	FSP30	DE25181	Aug. 08, 2014	Aug. 07, 2015
EMI Test Receiver	Rohde & Schwarz	ESCI	101165	Aug. 08, 2014	Aug. 07, 2015
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 07, 2014	Mar.06, 2015
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 07, 2014	Mar.06, 2015
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 07, 2014	Mar.06, 2015
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 07, 2014	Mar.06, 2015
Pre-amplifier	HP	11909A	185903	Mar. 07, 2014	Mar.06, 2015
Pre-amplifier	HP	8447B	3008A00849	Mar. 07, 2014	Mar.06, 2015
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 07, 2014	Mar.06, 2015
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Feb. 11, 2014	Feb.10, 2015
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A

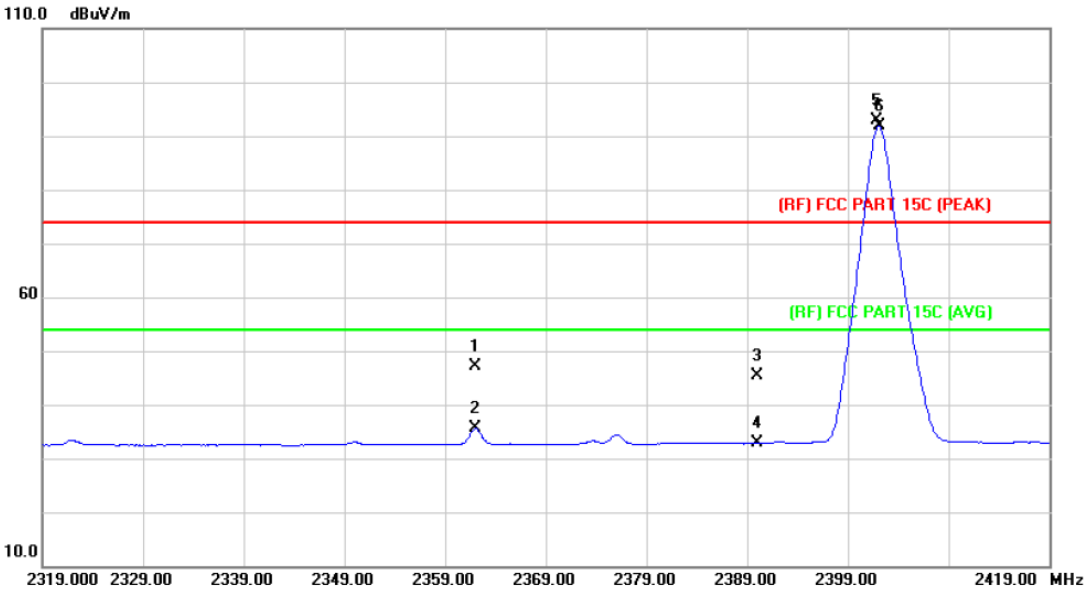
5.6 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10Hz with Peak Detector for Average Values.

Test data please refer the following pages.

(1) Radiation Test

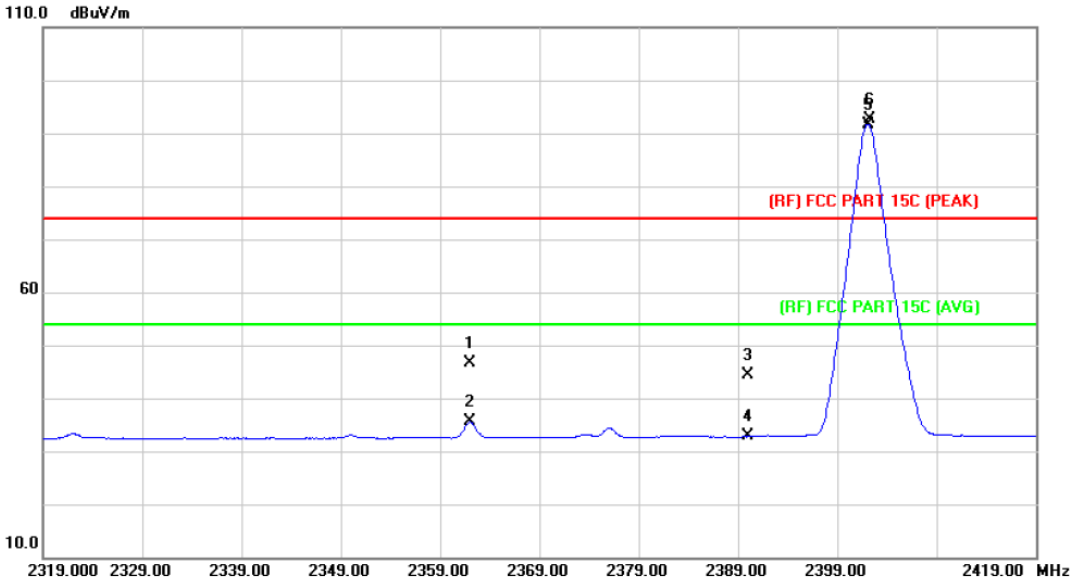
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2362.000	46.60	0.65	47.25	74.00	-26.75	peak
2		2362.000	34.91	0.65	35.56	54.00	-18.44	AVG
3		2390.000	44.70	0.77	45.47	74.00	-28.53	peak
4		2390.000	32.04	0.77	32.81	54.00	-21.19	AVG
5	X	2401.800	92.02	0.82	92.84	Fundamental Frequency		peak
6	*	2402.100	91.01	0.82	91.83	Fundamental Frequency		AVG

Emission Level= Read Level+ Correct Factor

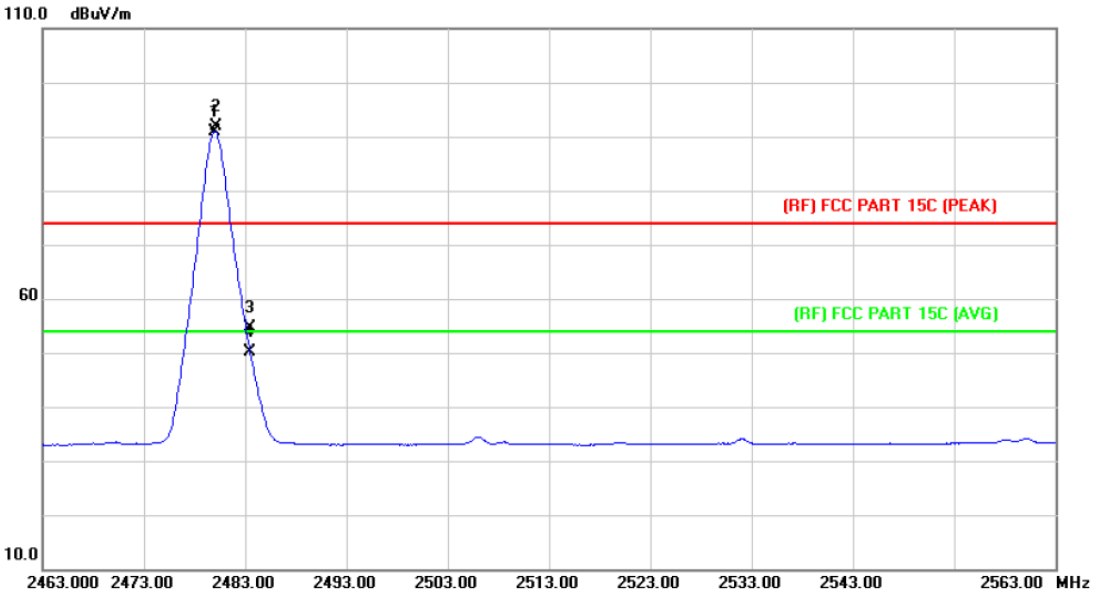
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2362.000	45.95	0.65	46.60	74.00	-27.40	peak
2		2362.000	34.86	0.65	35.51	54.00	-18.49	AVG
3		2390.000	43.57	0.77	44.34	74.00	-29.66	peak
4		2390.000	32.03	0.77	32.80	54.00	-21.20	AVG
5	*	2402.100	90.91	0.82	91.73	Fundamental Frequency		AVG
6	X	2402.300	91.92	0.82	92.74	Fundamental Frequency		peak

Emission Level= Read Level+ Correct Factor

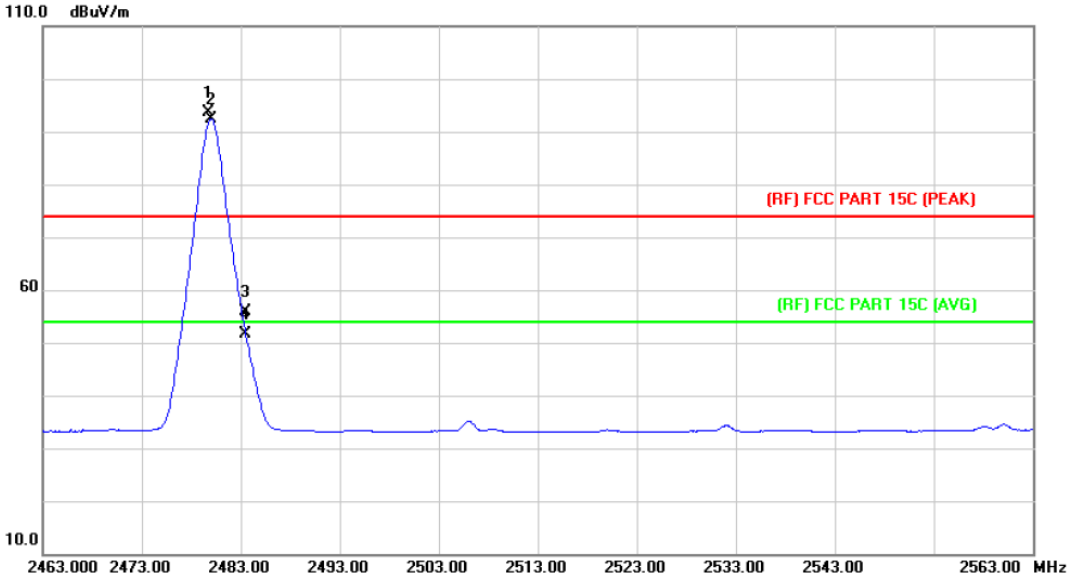
EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2480.000	89.69	1.15	90.84	Fundamental Frequency		AVG
2	X	2480.100	90.77	1.15	91.92	Fundamental Frequency		peak
3		2483.500	53.47	1.17	54.64	74.00	-19.36	peak
4		2483.500	48.99	1.17	50.16	54.00	-3.84	AVG

Emission Level= Read Level+ Correct Factor

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60 Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		

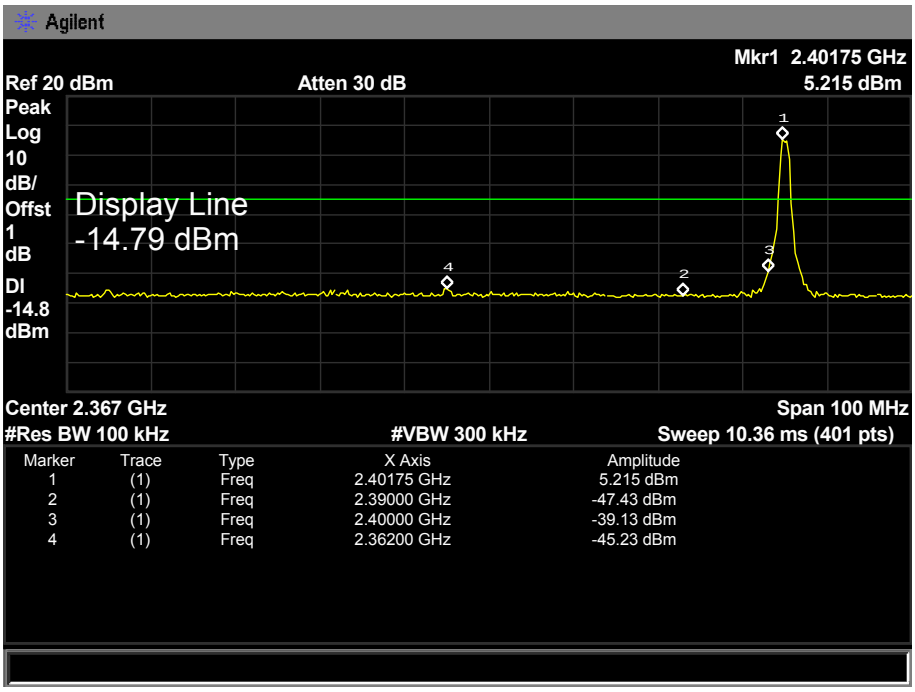


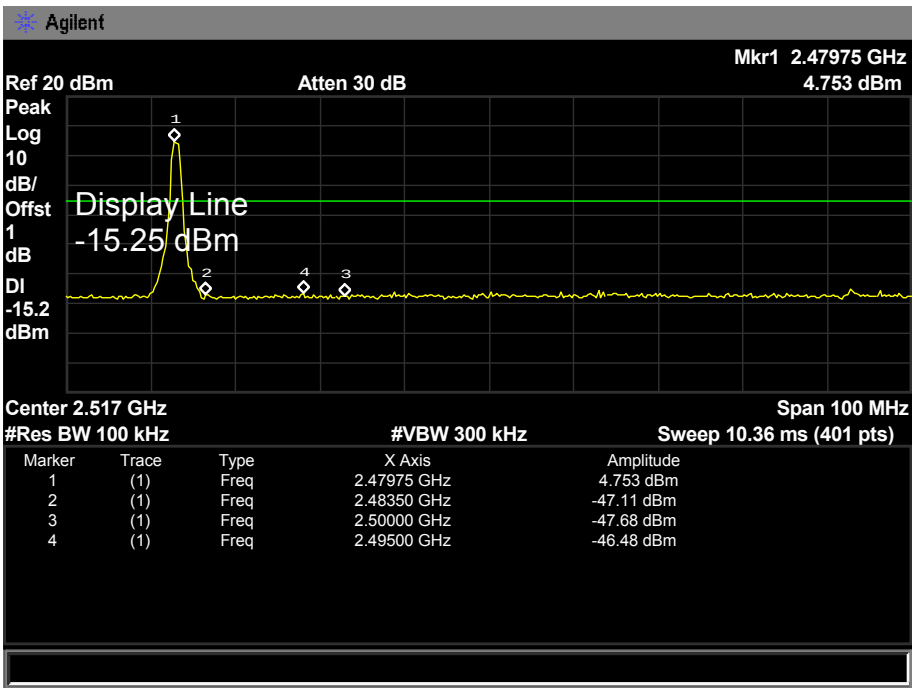
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.700	92.42	1.15	93.57	Fundamental Frequency		peak
2	*	2480.000	91.23	1.15	92.38	Fundamental Frequency		AVG
3		2483.500	54.73	1.17	55.90	74.00	-18.10	peak
4		2483.500	50.54	1.17	51.71	54.00	-2.29	AVG

Emission Level= Read Level+ Correct Factor

(2) Conducted Test

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	BLE Mode TX 2402MHz / BLE Mode TX 2480MHz		
Remark:	The EUT is programed in continuously transmitting mode		





6. Bandwidth Test

6.1 Test Standard and Limit

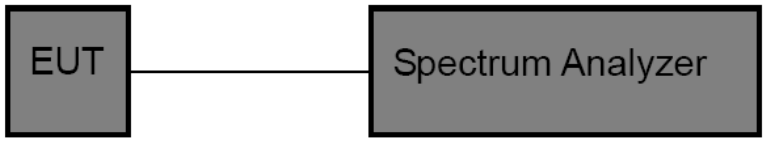
6.1.1 Test Standard

FCC Part 15.247 (a)(2)

6.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-210		
Test Item	**Limit**	**Frequency Range(MHz)**
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5

6.2 Test Setup



6.3 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 bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.

(3)Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:100 kHz, and Video Bandwidth:300 kHz, Detector: Peak, Sweep Time set auto.

6.4 EUT Operating Condition

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

6.5 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Mar. 20, 2014	Mar. 19, 2015

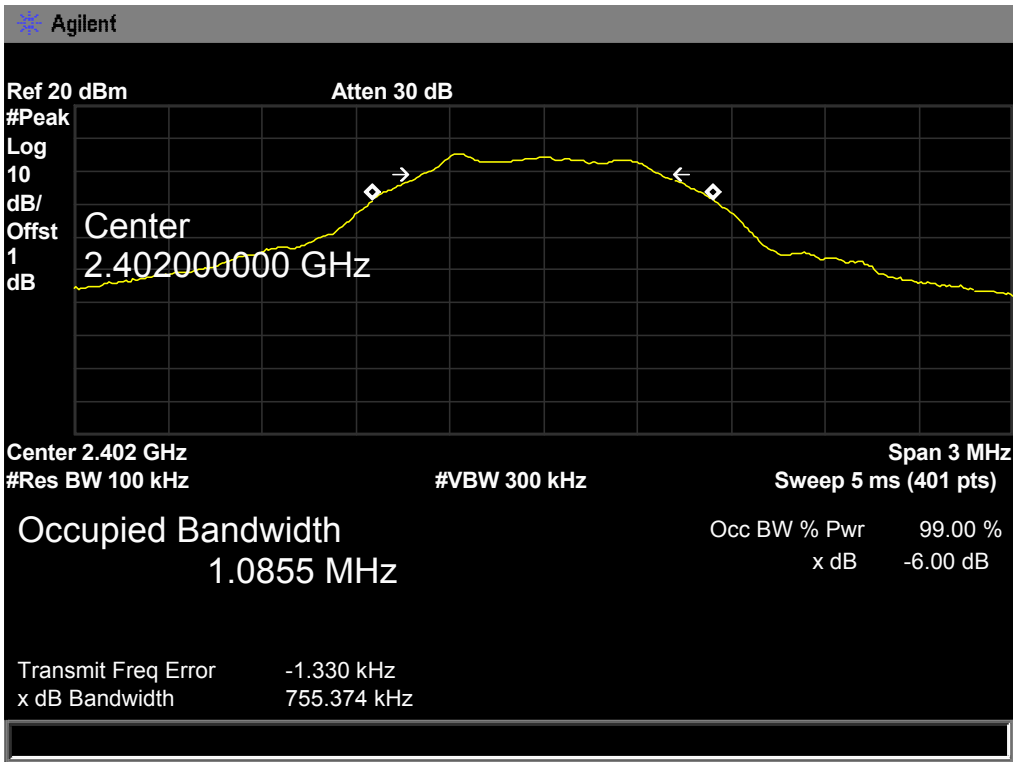
6.6 Test Data

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	BLE TX Mode		

Channel frequency (MHz)	6dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
2402	755.374	1085.50	>=500
2442	762.401	1084.70	
2480	727.942	1085.30	

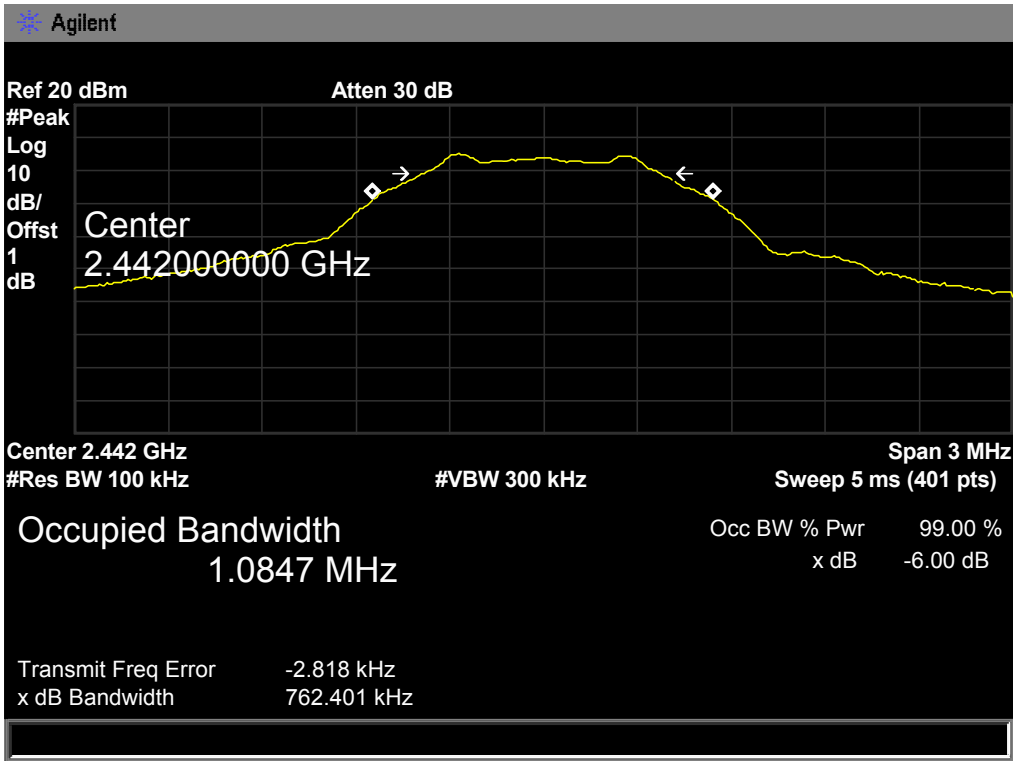
BLE Mode

2402 MHz



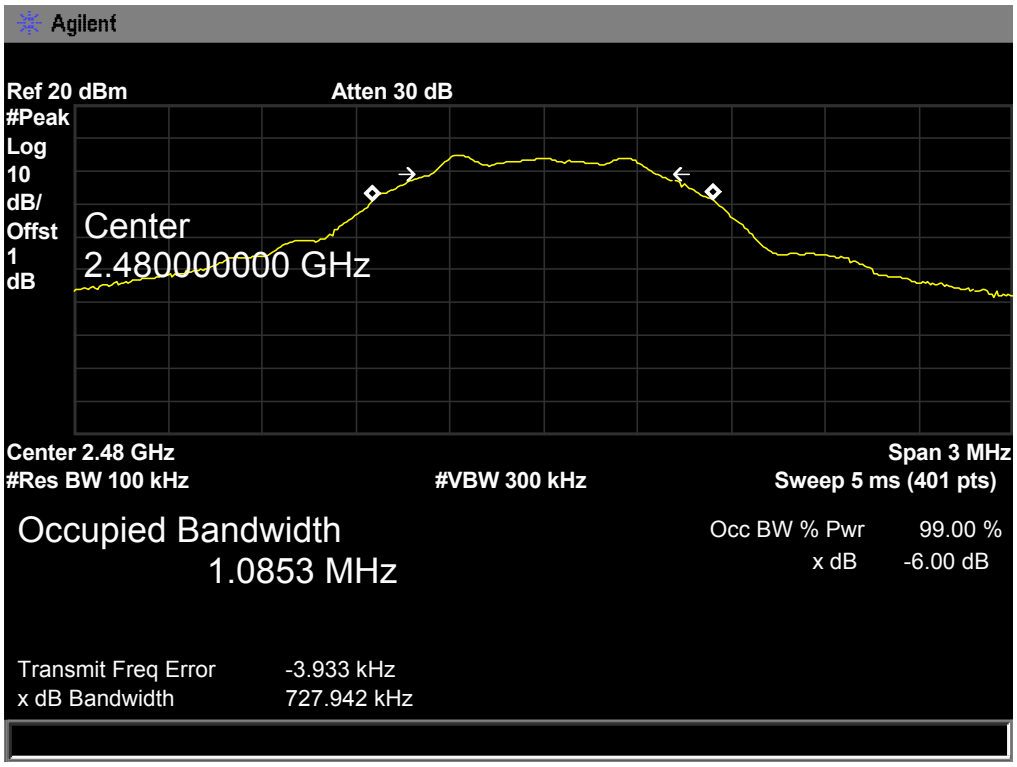
BLE Mode

2442 MHz



BLE Mode

2480 MHz



7. Peak Output Power Test

7.1 Test Standard and Limit

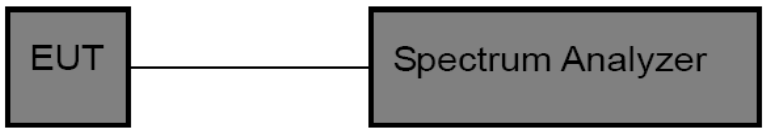
7.1.1 Test Standard

FCC Part 15.247 (b)

7.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-210		
Test Item	**Limit**	**Frequency Range(MHz)**
Peak Output Power	1 Watt or 30 dBm	2400~2483.5

7.2 Test Setup



7.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to section 9.1.1 of KDB 558074 D01 DTS Meas Guidance v03r02.

(1) Set the RBW≥DTS Bandwidth
(2) Set VBW≥3*RBW
(3) Set Span≥3*RBW
(4) Sweep time=auto
(5) Detector= peak
(6) Trace mode= maxhold.
(7) Allow trace to fully stabilize, and then use peak marker function to determine the peak amplitude level.

7.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

7.5 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Mar. 20, 2014	Mar. 19, 2015

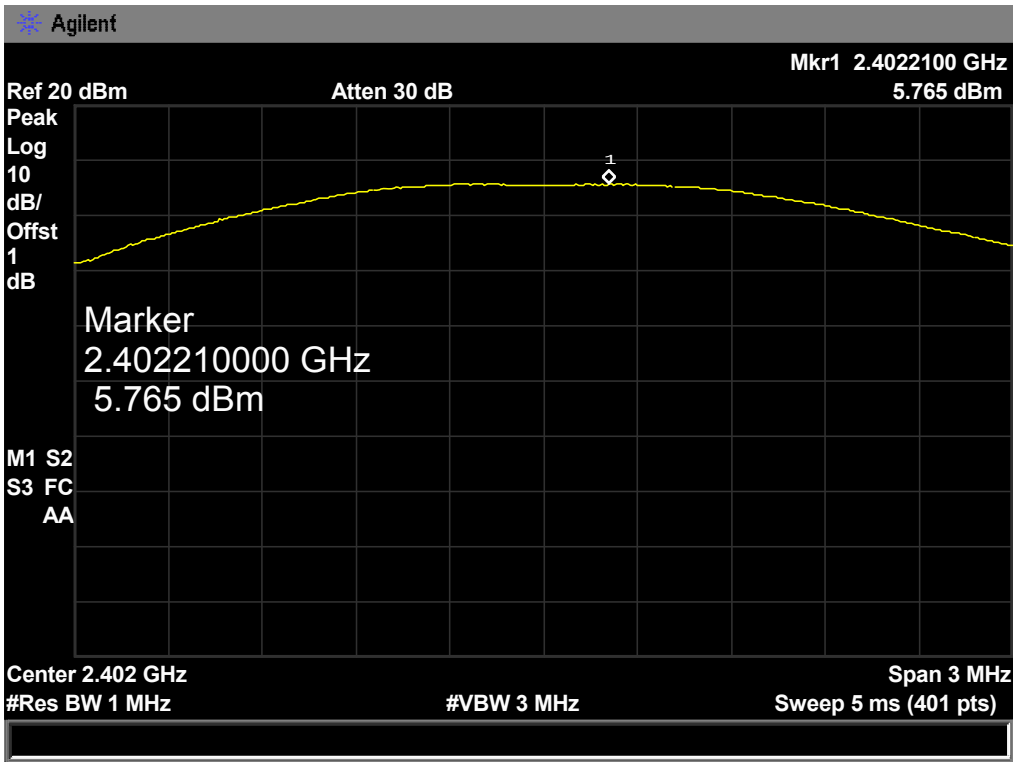
7.6 Test Data

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	BLE TX Mode		

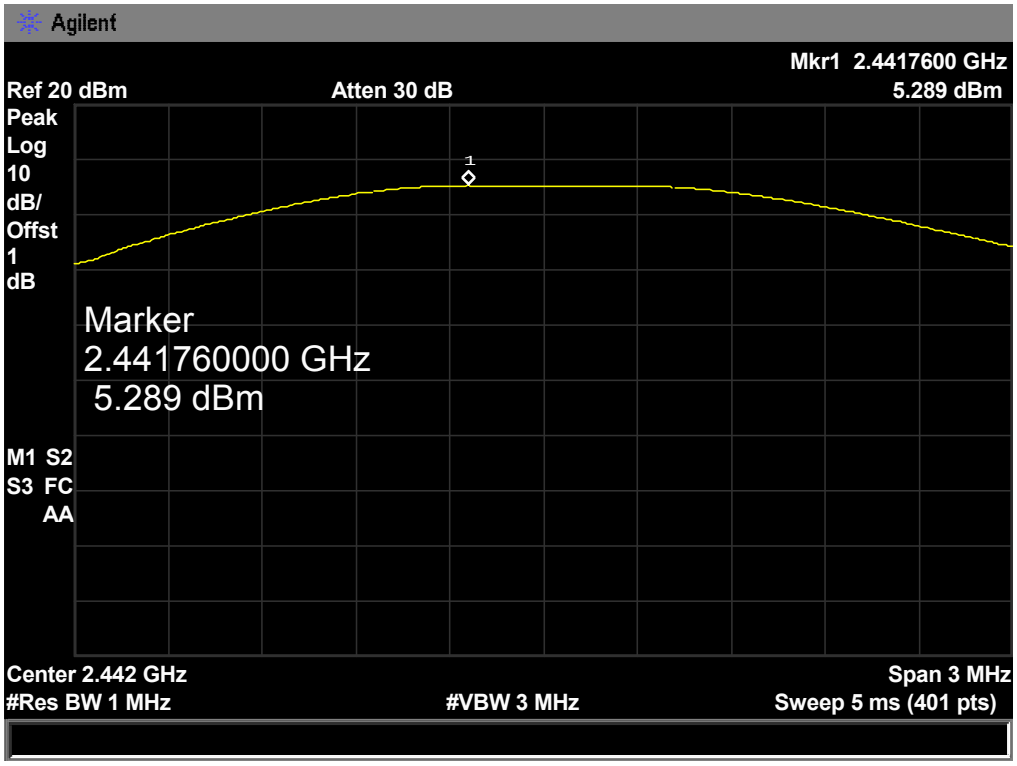
Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	5.765	30
2442	5.289	
2480	5.778	

BLE Mode

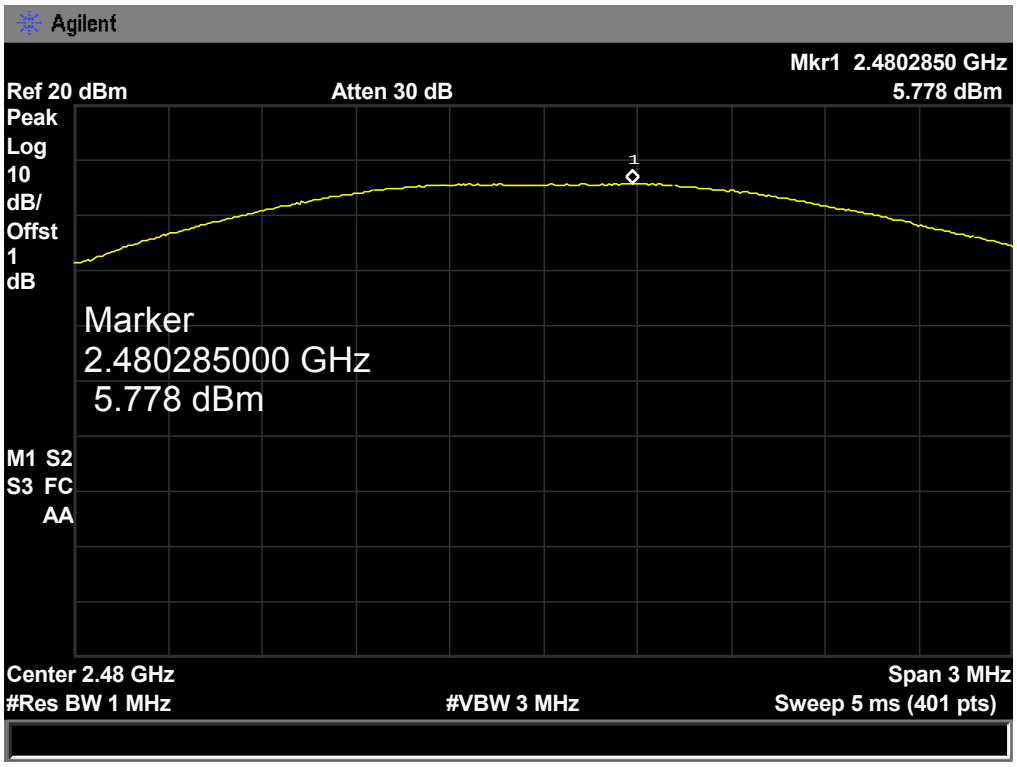
2402 MHz



BLE Mode
2442 MHz



BLE Mode
2480 MHz



8. Power Spectral Density Test

8.1 Test Standard and Limit

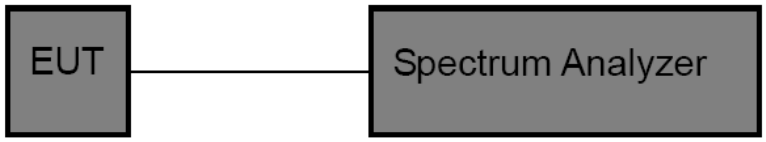
8.1.1 Test Standard

FCC Part 15.247 (e)

8.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	**Limit**	**Frequency Range(MHz)**
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

8.2 Test Setup



8.3 Test Procedure

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 v03r02.

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
(2) Set analyser center frequency to DTS channel center frequenyc.
(3) Set the span to 1.5 times the DTS bandwidth.
(4) Set the RBW to: 3 kHz
(5) Set the VBW to: 10 kHz
(6) Detector: peak
(7) Sweep time: auto
(8) Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

8.4 EUT Operating Condition

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

8.5 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Mar. 20, 2014	Mar. 19, 2015

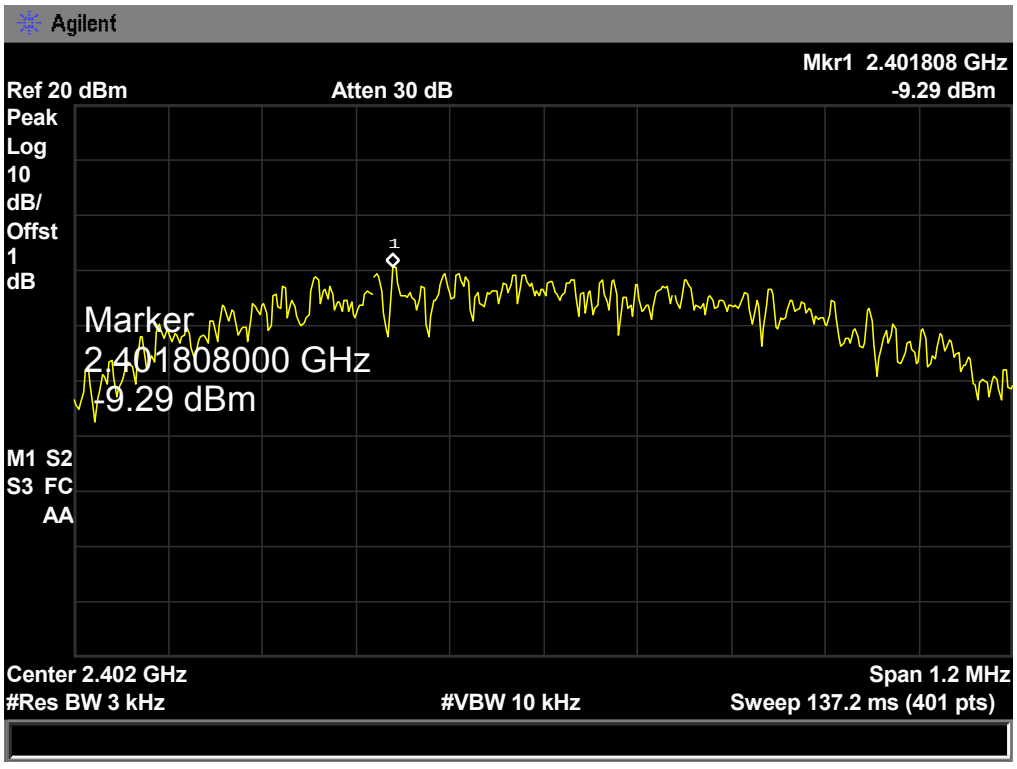
8.6 Test Data

EUT:	MID	Model:	MID8001-IB
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	BLE TX Mode		

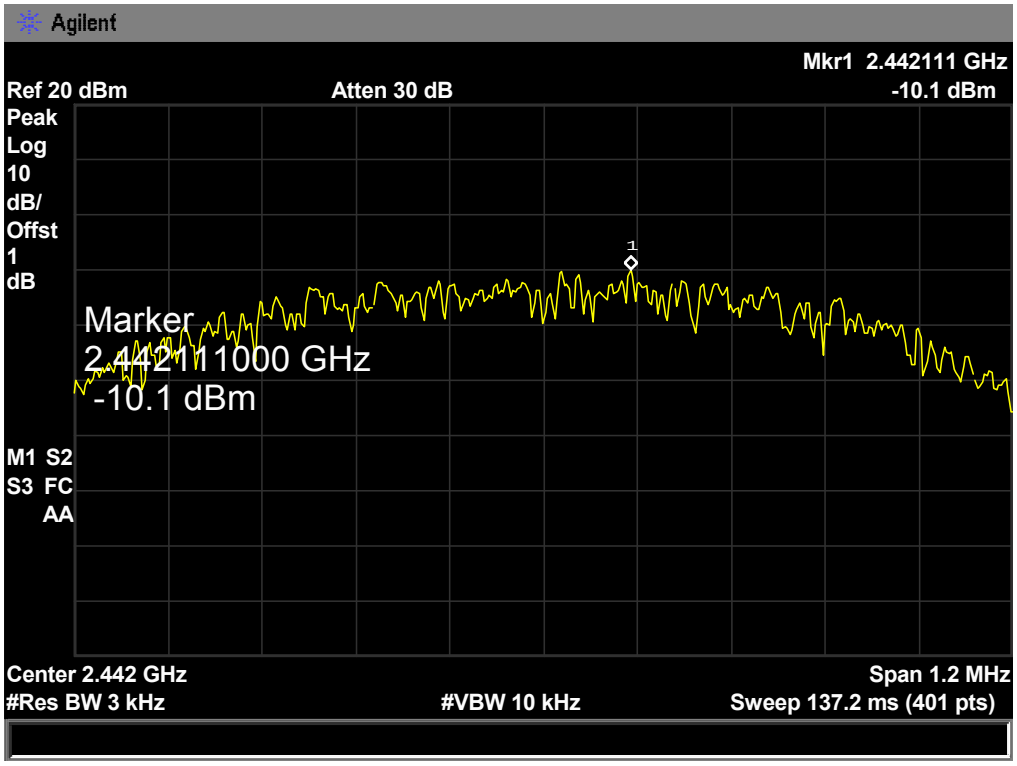
Channel Frequency (MHz)	Power Density (3 kHz/dBm)	Limit (dBm)
2402	-9.29	8
2442	-10.10	
2480	-9.76	

BLE Mode

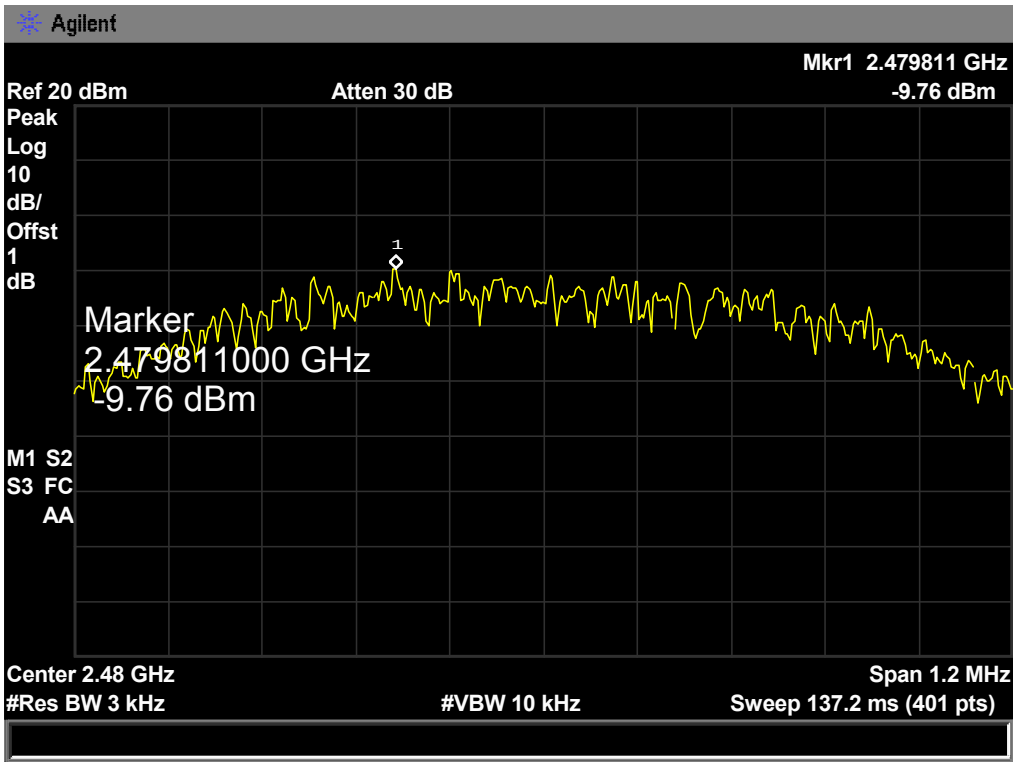
2402 MHz



BLE Mode
2442 MHz



BLE Mode
2480 MHz



9. Antenna Requirement

9.1 Standard Requirement

9.1.1 Standard

FCC Part 15.203

9.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 0dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

9.3 Result

The EUT antenna is a FPC Antenna. It complies with the standard requirement.

Antenna Type
☑ Permanent attached antenna
☐ Unique connector antenna
☐ Professional installation antenna