

# FCC 47 CFR PART 15 SUBPART C

## Canada RSS-247 Issue2

## Canada RSS-Gen Issue5

# TEST REPORT

For

Product Name: Mi Electric Scooter Pro

Model No: DDHBC03NEB

Series Model: N/A

FCC ID: 2ALS8-MJ1048

IC: 22636-MJ1048

Test Report Number:

C180927R01-RPB1

Issued for

Ninebot (Changzhou) Tech Co., Ltd.

16F-17F, Block A, Building 3, Changwu Mid Road 18#, Wujin Dist., Changzhou, Jiangsu, China

Issued by

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### Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	October 27, 2018	C180927R01-RPB1	ALL	N/A
01	November 27, 2018	C180927R01-RPB1	P6; P8; P36; P38; P39; P48	Revised the height description of test configuration for radiated emissions and conducted emissions.
02	November 29, 2018	C180927R01-RPB1	P36-P37; P51	Add section 6.6 for frequency stability. Delete powerline conducted emission test result.

# 1 TEST RESULT CERTIFICATION

<b>Product Name:</b>	Mi Electric Scooter Pro
<b>Model Name:</b>	DDHBC03NEB
<b>Series Model:</b>	N/A
<b>Applicant Discrepancy:</b>	Initial
<b>Device Category:</b>	mobile unit
<b>Date of Test:</b>	October 10, 2018~October 24, 2018 and November 29, 2018
<b>Applicant:</b>	<b>Ninebot (Changzhou) Tech Co., Ltd.</b> 16F-17F, Block A, Building 3, Changwu Mid Road 18#, Wujin Dist., Changzhou, Jiangsu, China
<b>Manufacturer:</b>	<b>Ninebot (Changzhou) Tech Co., Ltd.</b> 16F-17F, Block A, Building 3, Changwu Mid Road 18#, Wujin Dist., Changzhou, Jiangsu, China
<b>Application Type:</b>	Certification

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted
Canada RSS-247 Issue2	No non-compliance noted
Canada RSS-Gen Issue5	No non-compliance noted

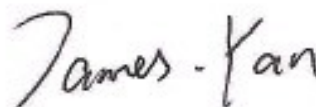
The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 and IC rules RSS-247 Issue2, RSS-Gen Issue5.

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

**Approved by:**



**Reviewed by:**



Jeff.Fang  
Manager  
Compliance Certification Services Inc.

James.Yan  
RF Section Manager  
Compliance Certification Services Inc.

## 2 EUT DESCRIPTION

<b>Product Name:</b>	Mi Electric Scooter Pro
<b>Model Name:</b>	DDHBC03NEB
<b>Series Model:</b>	N/A
<b>Model Discrepancy:</b>	N/A
<b>EUT Power Rating:</b>	ADAPTER Model: BCTA+71420-1700 INPUT:100-240V~ 50/60Hz 2.0A MAX OUTPUT:42V --- 1.7A POWER SUPPLY Model: NED1004-K 37V 12800mAh/474Wh
<b>Frequency Range :</b>	Bluetooth:2402 ~ 2480 MHz
<b>Peak output Power:</b>	Bluetooth LE4.1: 0.00dBm(1.00mW)
<b>Peak e.i.r.p:</b>	Bluetooth LE4.1: -1.26dBm(0.75mW)
<b>Average output Power:</b>	Bluetooth LE4.1: -0.62dBm(0.87mW)
<b>Average e.i.r.p:</b>	Bluetooth LE4.1: -1.88dBm(0.65mW)
<b>Channel Spacing</b>	Bluetooth LE4.1: 2MHz
<b>Modulation type:</b>	Bluetooth LE4.1: GFSK
<b>Transmit Data Rate :</b>	Bluetooth LE4.1: 1 Mbps
<b>Number of Channels :</b>	Bluetooth LE4.1: 40 Channels
<b>Antenna Specification :</b>	PCB Antenna
<b>Antenna Specification:</b>	-1.26dBi

### Remark:

- 1.The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
- 2.This submittal(s) (test report) is intended for **FCC ID: 2ALS8-MJ1048** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.
- 3.This submittal(s) (test report) is intended for **IC: 22636-MJ1048** filing to comply with IC rules RSS-247 Issue2, RSS-Gen Issue5.

### 3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209, 15.247, KDB 558074 and IC rules RSS-247 Issue2, RSS-Gen Issue5.

#### 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### 3.2 EXERCISE EUT

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### 3.3 GENERAL TEST PROCEDURES

##### Conducted Emissions

The EUT is placed on the turntable, which is 12 mm above ground plane. According to the requirements in Section 6.2 of ANSI C63.10 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### Radiated Emissions

Under 1GHz

The EUT is placed on a turn table, which is 12 mm above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.4 & 6.5 of ANSI C63.10:2013.

Above 1GHz

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.6 of ANSI C63.10:2013

### 3.4 TEST MODE

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Antenna
6dB Bandwidth	GFSK	1 Mbps	0/19/39	1
99% bandwidth	GFSK	1 Mbps	0/19/39	1
Peak Output Power	GFSK	1 Mbps	0/19/39	1
Power Spectral Density	GFSK	1 Mbps	0/19/39	1
Conducted Band Edges and Spurious Emission	GFSK	1 Mbps	0/19/39	1
Frequency Stability	GFSK	1 Mbps	0/19/39	1
Radiated Band Edges and Spurious Emission	GFSK	1 Mbps	0/19/39	1
AC Conducted Emission	CTX	-	-	-

Remark:

1. For radiated test cases below 1 GHz, the worst mode data rate channel 39 was reported only, because this data rate has the highest RF output power at preliminary tests.

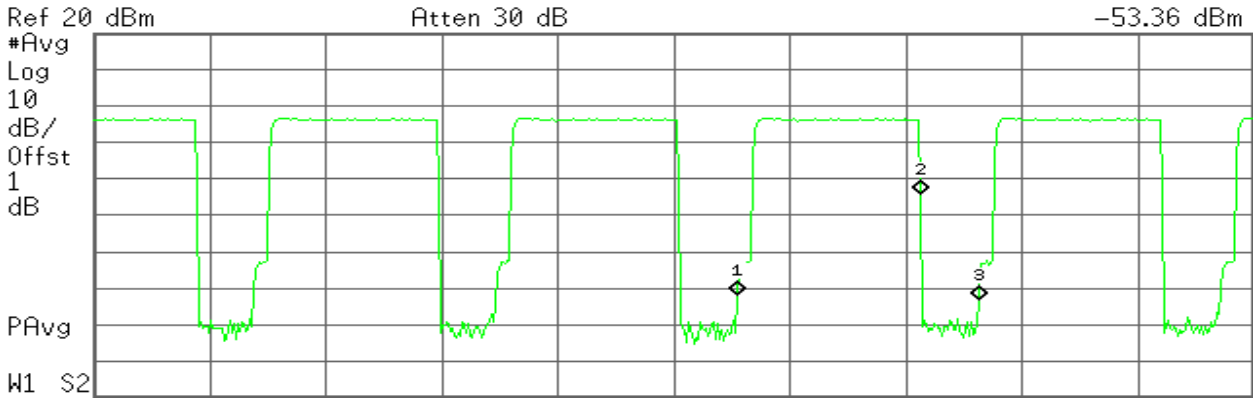
## 3.5 Duty cycle

Configuration	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting(kHz)
BLE	76	0.475	2.11	3

Agilent

R T

Mkr3 2.29 ms  
-53.36 dBm



Ref 20 dBm Atten 30 dB  
#Avg 10 Log 10 dB/Offst 1 dB  
PAvg  
W1 S2  
Center 2.440 000 GHz Span 0 Hz  
Res BW 1 MHz #VBW 3 MHz Sweep 3 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Time	1.665 ms	-52.03 dBm
2	(1)	Time	2.14 ms	-24.08 dBm
3	(1)	Time	2.29 ms	-53.36 dBm



### 3.6 RESTRICTED BANDS OF OPERATIONS

#### FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS:

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.0900 - 0.1100	16.420 - 16.423	399.9 - 410.0	4.50 - 5.15
0.4950 - 0.505 <sup>(1)</sup>	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960.0 - 1240	7.25 - 7.75
4.1250 - 4.1280	25.50 - 25.67	1300 - 1427	8.025 - 8.500
4.17725 - 4.17775	37.50 - 38.25	1435.0 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73.0 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.2150 - 6.2180	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108.00 - 121.94	1718.8 - 1722.2	13.25 - 13.40
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.50
8.2910 - 8.2940	149.90 - 150.05	2310 - 2390	15.35 - 16.20
8.3620 - 8.3660	156.52475 - 156.52525	2483.5 - 2500.0	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.1700	3260 - 3267	23.6 - 24.0
12.2900 - 12.2930	167.72 - 173.20	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345 - 3358	36.43 - 36.5 <sup>(2)</sup>
12.57675 - 12.57725	322.0 - 335.4	3600 - 4400	
13.3600 - 13.4100			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

**RSS-Gen RESTRICTED BANDS OF OPERATIONS**

Except as shown RSS-Gen 8.10, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	GHz
0.090 - 0.110	156.7 - 156.9	9.0 - 9.2
0.495 - 0.505	162.0125 - 167.17	9.3 - 9.5
2.1735 - 2.1905	167.72 - 173.2	10.6 - 12.7
3.020 - 3.026	240 - 285	13.25 - 13.4
4.125 - 4.128	322 - 335.4	14.47 - 14.5
4.17725 - 4.17775	399.9 - 410	15.35 - 16.2
4.20725 - 4.20775	608 - 614	17.7 - 21.4
5.677 - 5.683	960 - 1427	22.01 - 23.12
6.215 - 6.218	1435 - 1626.5	23.6 - 24.0
6.26775 - 6.26825	1645.5 - 1646.5	31.2 - 31.8
6.31175 - 6.31225	1660 - 1710	36.43 - 36.5
8.291 - 8.294	1718.8 - 1722.2	Above 38.6
8.362 - 8.366	2200 - 2300	
8.37625 - 8.38675	2310 - 2390	
8.41425 - 8.41475	2483.5 - 2500	
12.29 - 12.293	2655 - 2900	
12.51975 - 12.52025	3260 - 3267	
12.57675 - 12.57725	3332 - 3339	
13.36 - 13.41	3345.8 - 3358	
16.42 - 16.423	3500 - 4400	
16.69475 - 16.69525	4500 - 5150	
16.80425 - 16.80475	5350 - 5460	
25.5 - 25.67	7250 - 7750	
37.5 - 38.25	8025 - 8500	
73 - 74.6	4500 - 5150	
74.8 - 75.2	5350 - 5460	
108 - 138	7250 - 7750	
149.9 - 150.05	8025 - 8500	
156.52475 - 156.52525		

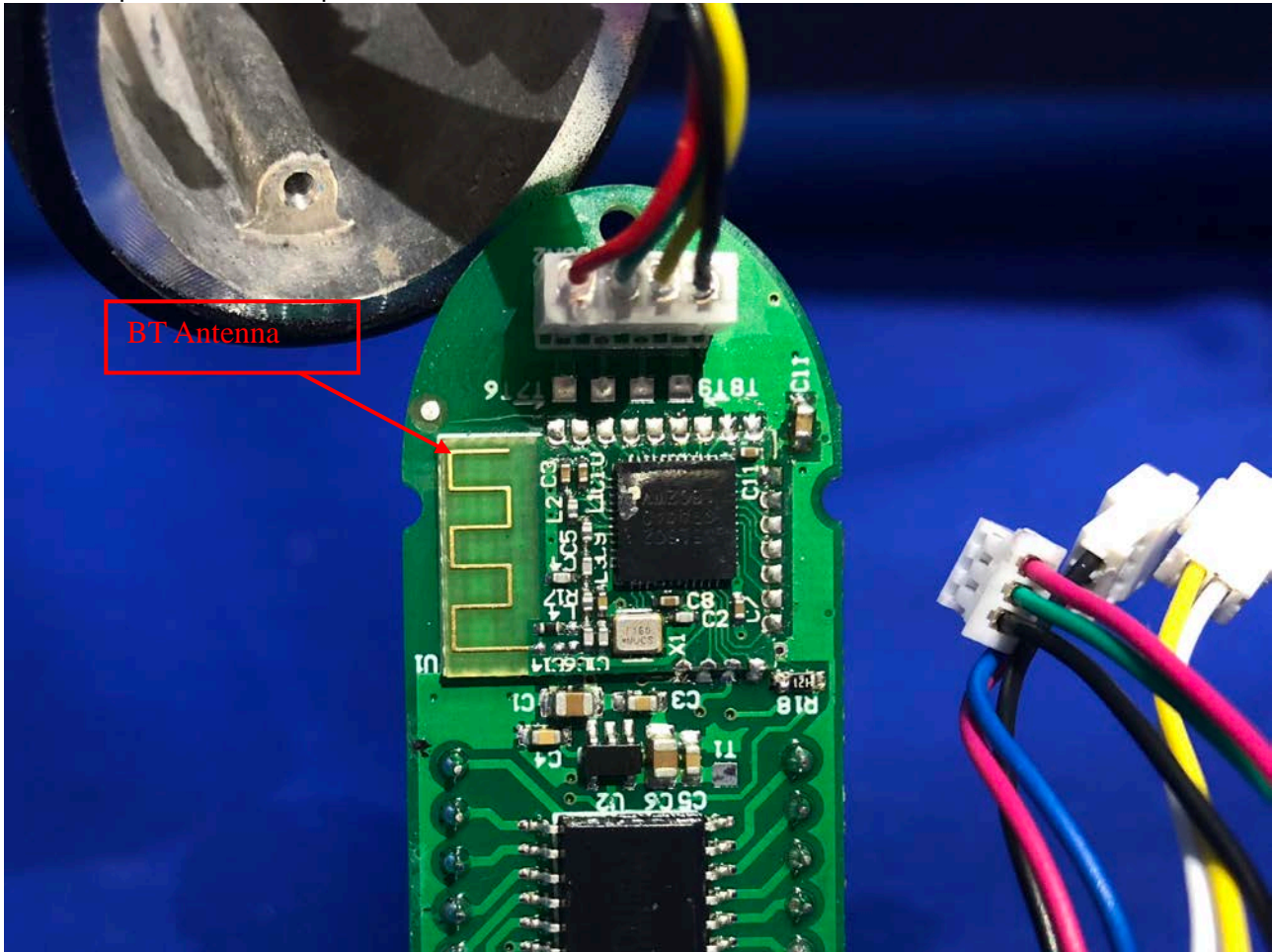
\* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

### 3.7 ANTENNA DESCRIPTION

#### According to FCC 47 CFR 15.203

“an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section”

As the photo below, the EUT use a unique coupling to the intentional radiator attached antenna, so the EUT complies with the requirement of 15.203.



## 4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards. facilities and accreditations

## 5 FACILITIES AND ACCREDITATIONS

### 5.1 FACILTIES

All measurement facilities used to collect the measurement data are located at CCS China Kunshan Lab at 10#Weiye Rd, Innovation Park Eco. & Tec. Development Zone Kunshan city JiangSu, (215300), CHINA.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5.3 LABORATORY ACCREDITATIONS AND LISTING

FCC –Designation Number: CN1172.

Compliance Certification Services Inc. Kun shan 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 in our files and the Designation Number: CN1172.

The test facilities are listed with Industry Canada, Laboratory Division, 2324E-1 for 10m chamber, 2324E-2 for 3m chamber.

## 5.4 TABLE OF ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

<b>Taiwan</b>	TAF
<b>USA</b>	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

<b>Canada</b>	Industry Canada
<b>Japan</b>	VCCI
<b>Taiwan</b>	BSMI
<b>USA</b>	FCC

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>

## 5.5 LIST OF MEASURING EQUIPMENT

Conducted Emissions Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Data	Calibration Due
Signal Analyzer	Agilent	E4446A	US44300398	2018-7-13	2019-7-12
Power meter	Anritsu	ML2495A	1445010	2018-4-26	2019-4-25
Power sensor	Anritsu	MA2411B	1339220	2018-4-26	2019-4-25
Power SPLITTER	Mini-Circuits	ZN2PD-9G	SF078500430	N.C.R	N.C.R
DC Power Supply	AGILENT	E3632A	MY50340053	N.C.R	N.C.R
Cable	N/A	Cable-05	N/A	2018-4-24	2019-4-23
Cable	N/A	Cable-06	N/A	2018-4-24	2019-4-23
6dB Attenuator	N/A	N/A	N/A	2018-4-24	2019-4-23
Temp. / Humidity Gauge	Anymetre	TH603	CCS007	2017-10-24	2018-10-23
Temp. / Humidity Gauge	Anymetre	TH603	CCS007	2018-10-23	2019-10-22
Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	2018-4-23	2019-4-22
Test Software			EZ-EMC		

Conducted Emission					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI TEST RECEIVER	R&S	ESCI	100781	2018-2-26	2019-2-25
V (V-LISN)	SCHWARZBECK	NNLK 8129	8129-143	2017-10-29	2018-10-28
TWO-LINE V-NETWORK	R&S	ENV216	101604	2017-10-29	2018-10-28
Pulse LIMITER	R&S	ESH3-Z2	100524	2017-12-27	2018-12-26
Cable	Thermax	Cable-02	14	2017-12-27	2018-12-26
Test Software			EZ-EMC		

977 Chamber					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Data	Calibration Due
Spectrum Analyzer	RS	FSU26	200789	2018-7-13	2019-7-12
EMI Test Receiver	R&S	ESCI	101378	2017-12-26	2018-12-25
Amplifier	COM-POWER	PAM-840A	461332	2017-11-29	2018-11-28
Amplifier	COM-POWER	PAM-118A	551044	2018-4-26	2019-4-25
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9170	9170-515	2018-2-27	2019-2-26
Bilog Antenna	SCHAFFNER	CBL6112D	36996	2018-7-7	2019-7-6
Loop Antenna	COM-POWER	AL-130R	10160008	2018-5-8	2019-5-7
Horn-antenna	SCHWARZBECK	9120D	D:266	2018-2-26	2019-2-25
Horn-antenna	SCHWARZBECK	9120D	D:267	2017-11-5	2018-11-4
Turn Table	CT	CT123	4165	N.C.R	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R	N.C.R
Controller	CT	CT100	95637	N.C.R	N.C.R
Cable	REBES MICROWAVE	Cable-93	N/A	2017-10-29	2018-10-28
Cable	REBES MICROWAVE	Cable-94	N/A	2017-10-29	2018-10-28
Cable	REBES MICROWAVE	Cable-95	N/A	2017-10-29	2018-10-28
Cable	N/A	Cable-03	N/A	2018-4-24	2019-4-23
Cable	N/A	Cable-04	N/A	2018-4-24	2019-4-23
2.4G Filter	N/A	N/A	N/A	2018-4-24	2019-4-23
Test Software			EZ-EMC		

**Remark:** Each piece of equipment is scheduled for calibration once a year.

## 5.6 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor)  $k = 1,96$  or  $k = 2$  (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Table 6 is based on such expansion factors.

**Table 6: Maximum measurement uncertainty**

Parameter	Uncertainty
RF output power, conducted	$\pm 1.129\text{dB}$
Unwanted Emissions, conducted	$\pm 2.406\text{dB}$
RF Power density, conducted	$\pm 2.379\text{dB}$
Conducted emissions	$\pm 2.582\text{dB}$
All emissions, radiated (Below 1GHz)	$\pm 4.725\text{dB}$
All emissions, radiated (Above 1GHz)	$\pm 4.818\text{dB}$
Temperature	$\pm 0.3\text{dB}$
Supply voltages	$\pm 0.2\%$



## 5.7 SETUP CONFIGURATION

See test photographs attached in setup photo for the actual connections between EUT and support equipment.

## 5.8 SUPPORT EQUIPMENT

No.	Equipment	Brand	Model	Series No.	FCC ID
N/A					

**Remark:**

- 1.All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2.Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 6 FCC PART 15.247 & RSS-247 REQUIREMENTS

### 6.1 PEAK POWER

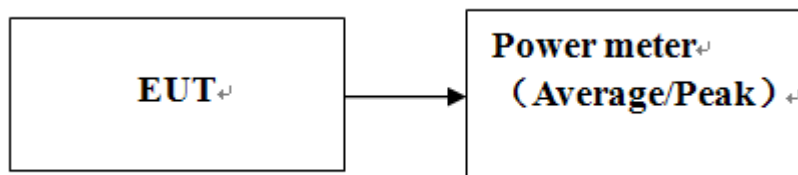
#### Limit of peak output power

1). According to FCC part 15.247, the maximum peak output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

2). According to RSS-247 section 5.4, For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e)

#### Test Configuration



**Remark:** Each piece of equipment is scheduled for calibration once a year.

#### Test Procedure

1. The testing follows the Measurement Procedure of Sub-clause 11.9 of ANSI C63.10.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure fundamental emission output power and record the results in the test report.

**Test RESULTS**

*No non-compliance noted*

**BLE4.1 GFSK Modulation 1Mbps mode**

<b>Test mode:</b>	Bluetooth LE4.1	<b>Temperature:</b>	23°C
<b>Test By:</b>	Lily.Wang	<b>Test Date:</b>	2018-10-15

Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	e.i.r.p. (dBm)	Limit (dBm)
Low	2402	0.00	30.00	-1.26	36.02
Mid	2440	-1.22	30.00	-2.48	36.02
High	2480	-2.39	30.00	-3.65	36.02

Channel	Frequency (MHz)	Average Output Power (dBm)	e.i.r.p. (dBm)
Low	2402	-0.62	-1.88
Mid	2440	-1.78	-3.04
High	2480	-3.08	-4.34

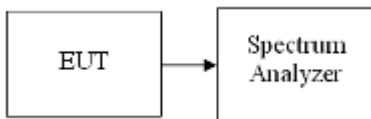
**Note:**Duty factor has been offsetted with cableloss

## 6.2 PEAK POWER SPECTRAL DENSITY

### Limit

- 1). According to FCC part 15.247, the peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
- 2). According to RSS-247 section 5.2, The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

### Test Configuration



### Test Procedure

1. The testing follows Measurement Procedure of Sub-clause 11.10 of ANSI C63.10
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

**Test Results of power Spectral Density**

<b>Test mode:</b>	Bluetooth LE4.1	<b>Temperature:</b>	23°C
<b>Test By:</b>	Lily.Wang	<b>Test Date:</b>	2018-10-15

Channel	Frequency (MHz)	PSD/3kHz (dBm)	Limit (dBm)	Result
00	2402	-14.36	8	PASS
19	2440	-15.86		PASS
39	2480	-16.29		PASS

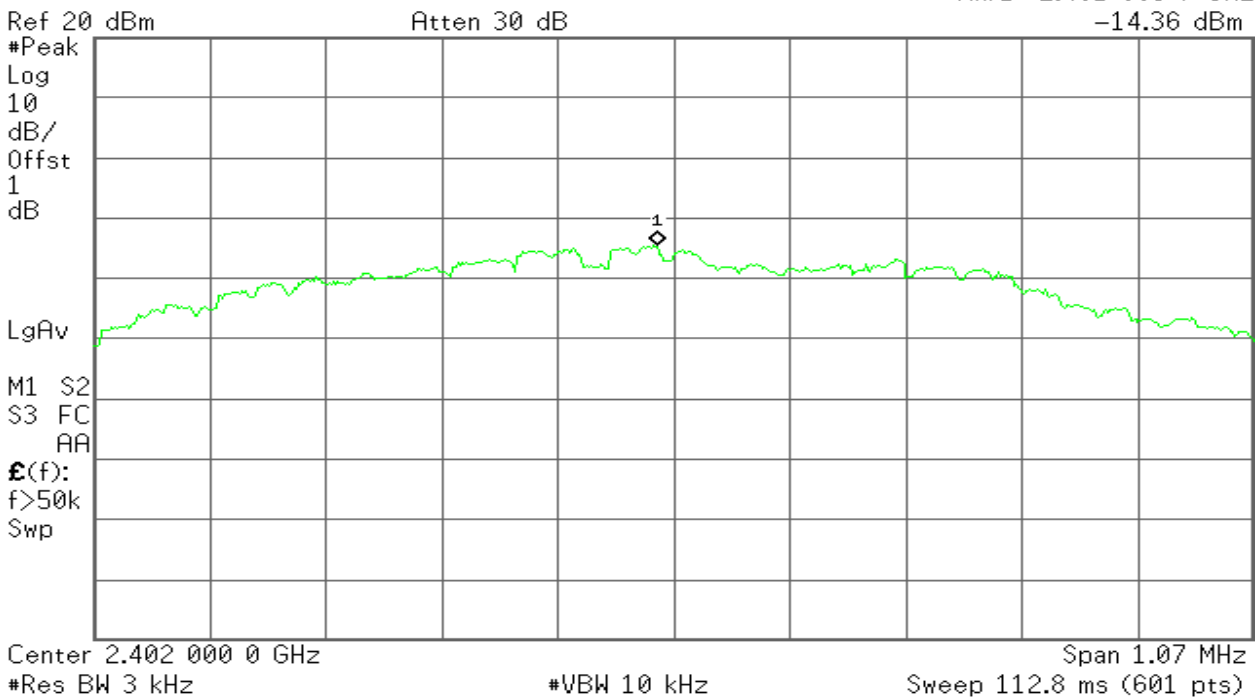
**Test Plot of power Spectral Density**

**Channel 00**

Agilent

R T

Mkr1 2.401 983 7 GHz  
-14.36 dBm



### Channel 19

Agilent

R T

Mkr1 2.439 936 8 GHz  
-15.86 dBm

Ref 20 dBm

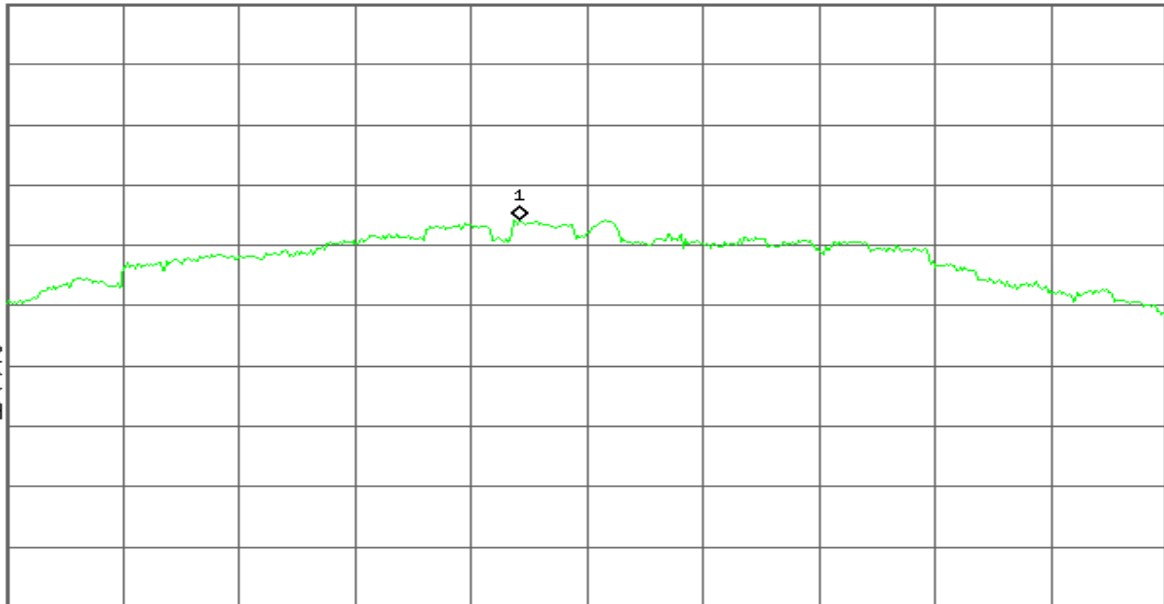
Atten 30 dB

#Peak  
Log  
10  
dB/  
Offst  
1  
dB

LgAv

M1 S2  
S3 FC  
AA

f(f):  
f>50k  
Swp



Center 2.440 000 0 GHz

Span 1.07 MHz

#Res BW 3 kHz

#VBW 10 kHz

Sweep 112.8 ms (601 pts)

### Channel 39

Agilent

R T

Mkr1 2.480 014 5 GHz  
-16.29 dBm

Ref 20 dBm

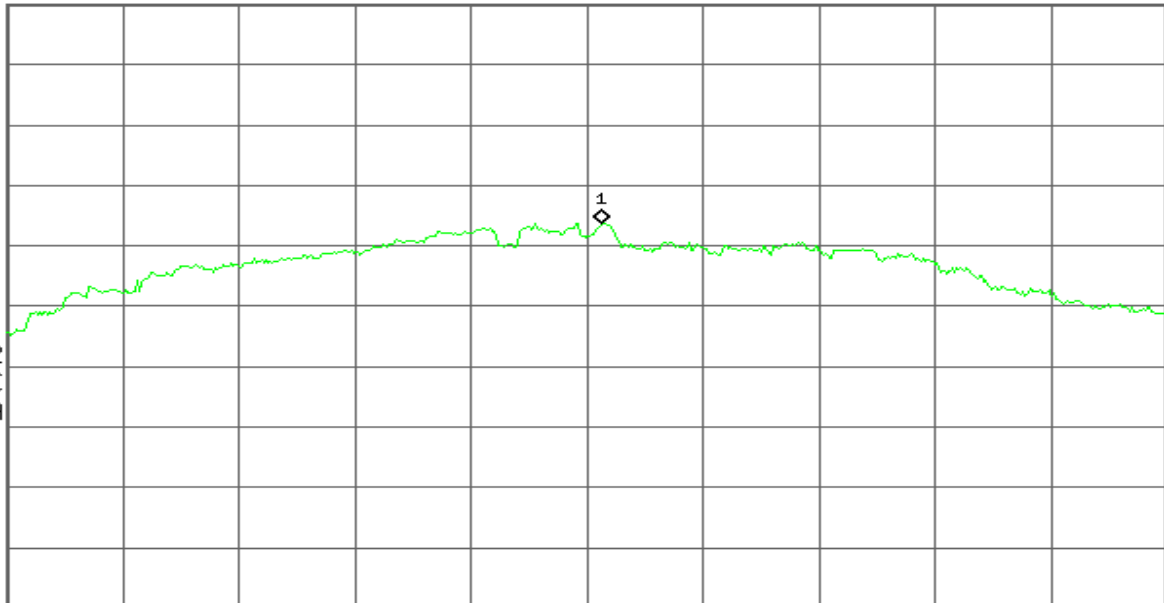
Atten 30 dB

#Peak  
Log  
10  
dB/  
Offst  
1  
dB

LgAv

M1 S2  
S3 FC  
AA

f(f):  
f>50k  
Swp



Center 2.480 000 0 GHz

Span 1.07 MHz

#Res BW 3 kHz

#VBW 10 kHz

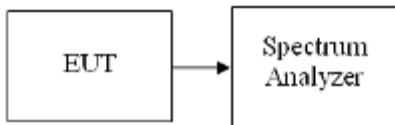
Sweep 112.8 ms (601 pts)

## 6.3 6dB Bandwidth Measurement

### Limit

- 1). According to FCC part 15.247, The minimum 6 dB bandwidth shall be at least 500 kHz.
- 2). According to RSS-247 section 5.2, DTSs include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400-2483.5 MHz: The minimum 6 dB bandwidth shall be 500 kHz

### Test Configuration



### Test Procedure

1. The testing follows Sub-clause 11.8 of ANSI C63.10.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

### Test Results of Bandwidth

No non-compliance noted

<b>Test mode:</b>	Bluetooth LE4.1	<b>Temperature:</b>	23°C
<b>Test By:</b>	Lily.Wang	<b>Test Date:</b>	2018-10-15

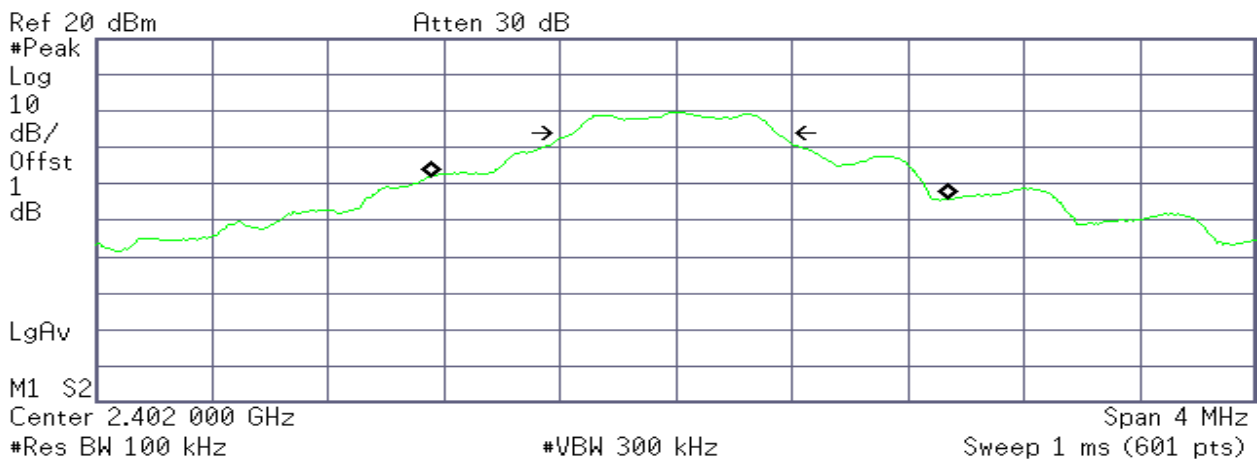
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit (MHz)	Result
00	2402	0.705	0.5	Pass
19	2440	0.715	0.5	Pass
39	2480	0.714	0.5	Pass

### Test Plot

#### Channel 00

Agilent

R T



**Occupied Bandwidth**  
1.7883 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

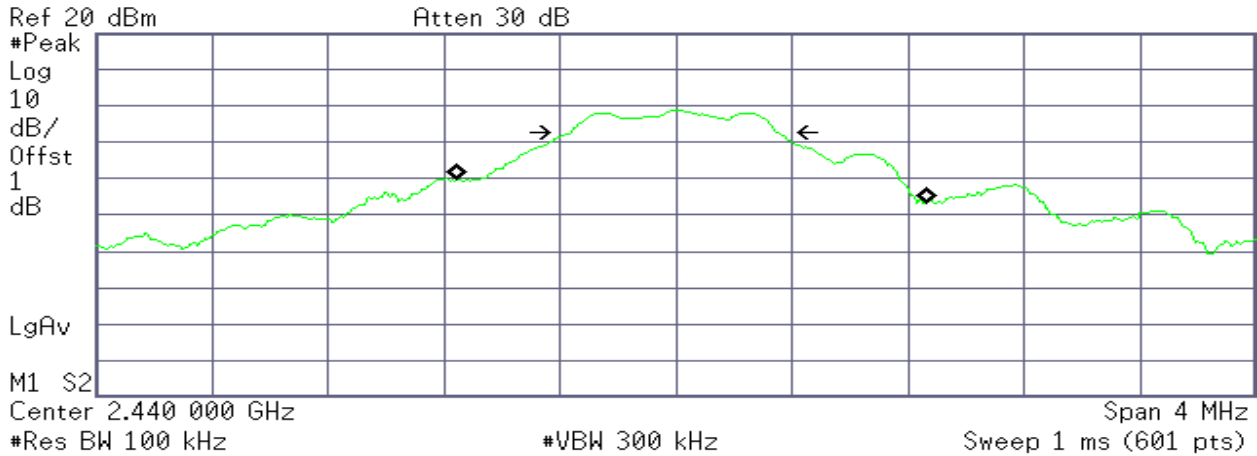
**Transmit Freq Error** 45.646 kHz  
**x dB Bandwidth** 705.247 kHz



### Channel 19

Agilent

R T



**Occupied Bandwidth**  
1.6231 MHz

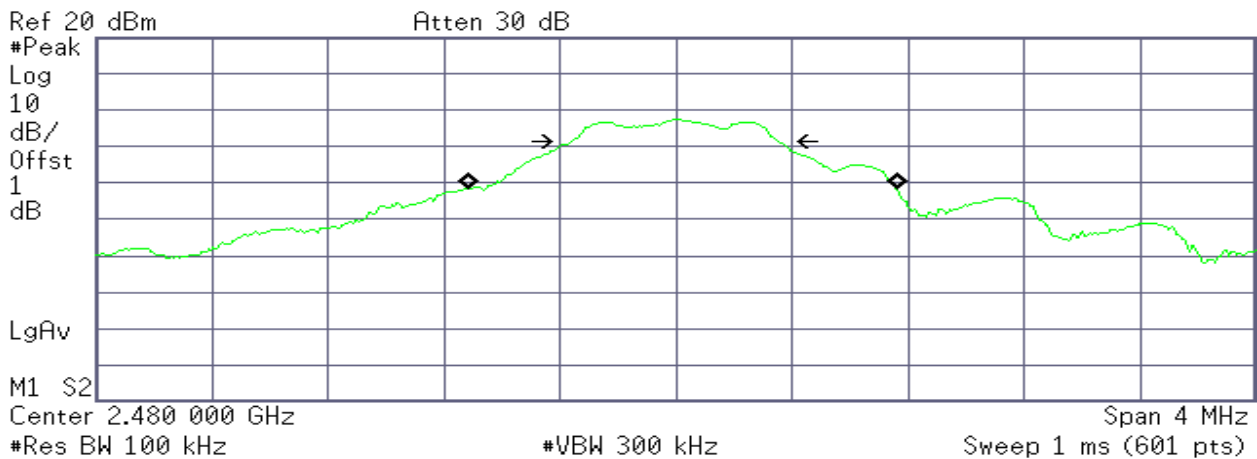
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 55.674 kHz  
**x dB Bandwidth** 714.807 kHz

### Channel 39

Agilent

R T



**Occupied Bandwidth**  
1.4732 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

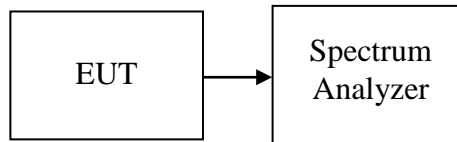
**Transmit Freq Error** 22.924 kHz  
**x dB Bandwidth** 713.534 kHz

## 6.4 99% Bandwidth Measurement

### LIMIT

None; for reporting purposes only  
RSS-Gen 6.6

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW shall be in the range of 1% to 5% of the occupied bandwidth and VBW shall be approximately 3x RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

## TEST RESULTS

No non-compliance noted

### Test Data

Test mode:	Bluetooth LE4.1	Temperature:	23°C
Test By:	Lily.Wang	Test Date:	2018-10-15

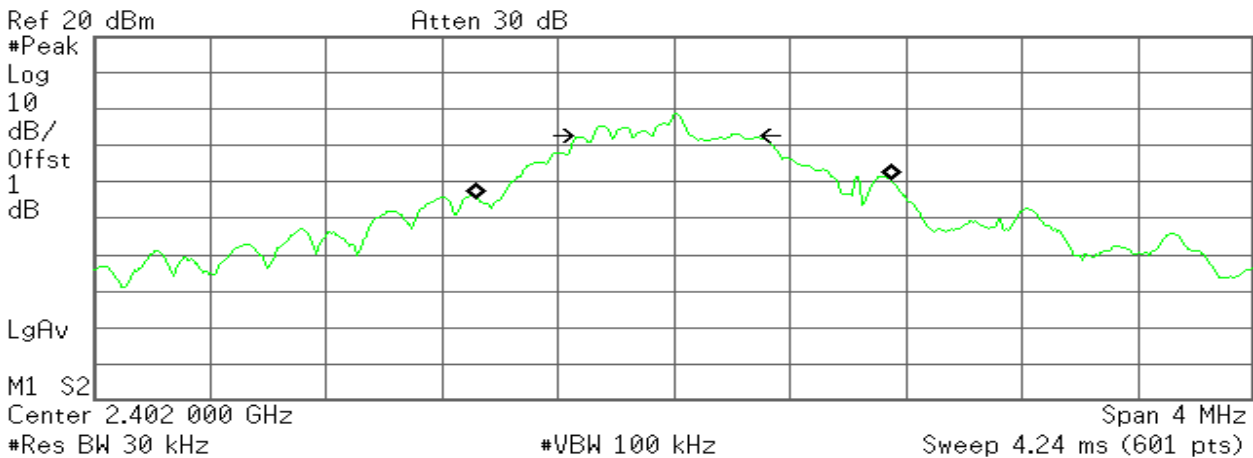
Channel	Frequency (MHz)	99% Bandwidth (MHz)
00	2402	1.423
19	2440	1.251
39	2480	1.195

### Test Plot

#### Channel 00

Agilent

R T



Occupied Bandwidth  
1.4226 MHz

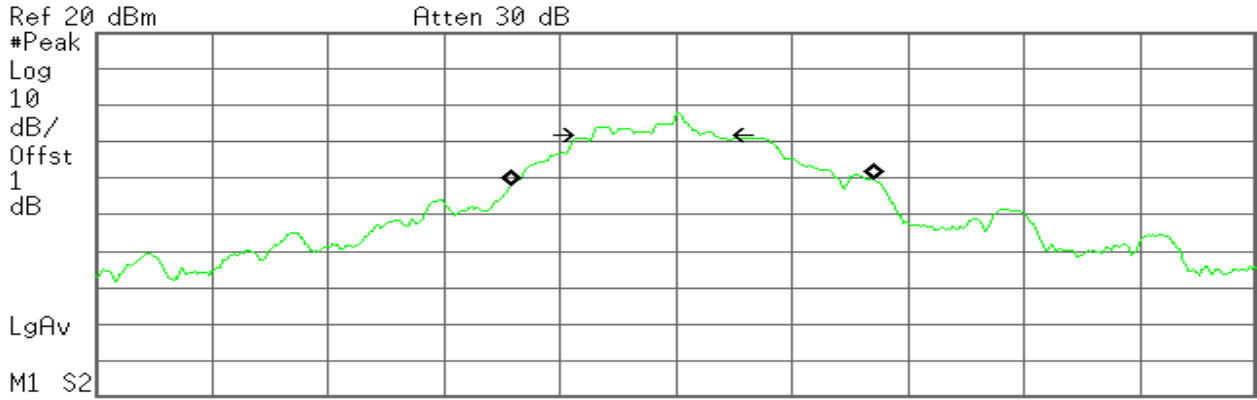
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error 33.894 kHz  
x dB Bandwidth 509.289 kHz

### Channel 19

Agilent

R T



Center 2.440 000 GHz Span 4 MHz  
#Res BW 30 kHz #VBW 100 kHz Sweep 4.24 ms (601 pts)

**Occupied Bandwidth**  
1.2512 MHz

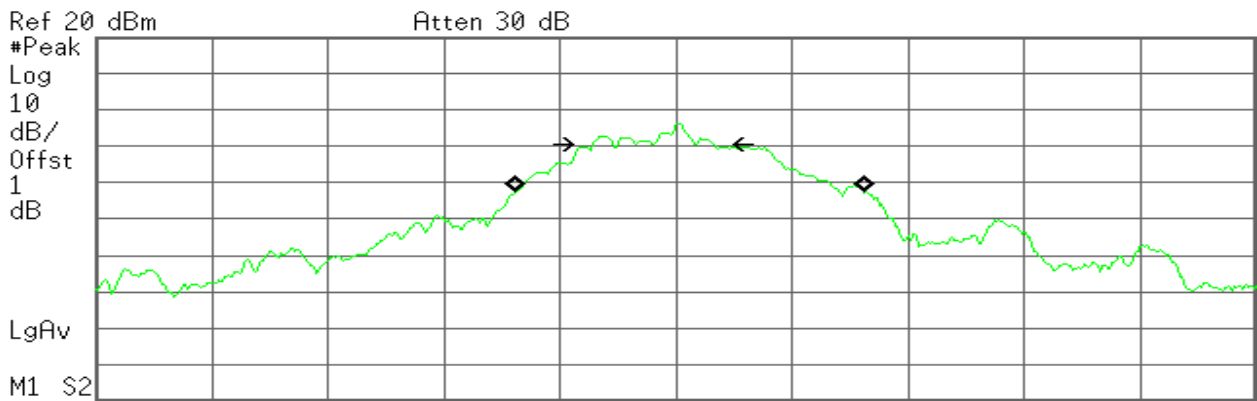
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 56.027 kHz  
**x dB Bandwidth** 422.101 kHz

### Channel 39

Agilent

R T



Center 2.480 000 GHz Span 4 MHz  
#Res BW 30 kHz #VBW 100 kHz Sweep 4.24 ms (601 pts)

**Occupied Bandwidth**  
1.1954 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

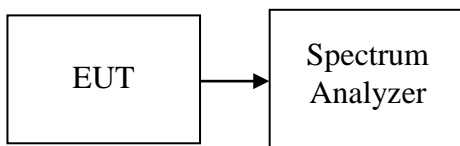
**Transmit Freq Error** 46.714 kHz  
**x dB Bandwidth** 423.430 kHz

## 6.5 Conducted Band Edges and Spurious Emission Measurement

### LIMIT

- 1). According to §15.247(d), in any 100kHz bandwidth outside the frequency bands 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 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).
- 2). According to RSS-247 section 5.5, In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### Test Configuration



### TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

Measurements are made over the 30MHz to 25GHz range with the transmitter set to the lowest, middle, and highest channels.

### TEST RESULTSD

*No non-compliance noted*

## Test Plot

### OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

#### CH Low

Agilent

R T

Mkr1 2.402 003 6 GHz  
-0.16 dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

1

dB

DI

-20.2

dBm

LgAv

M1 S2

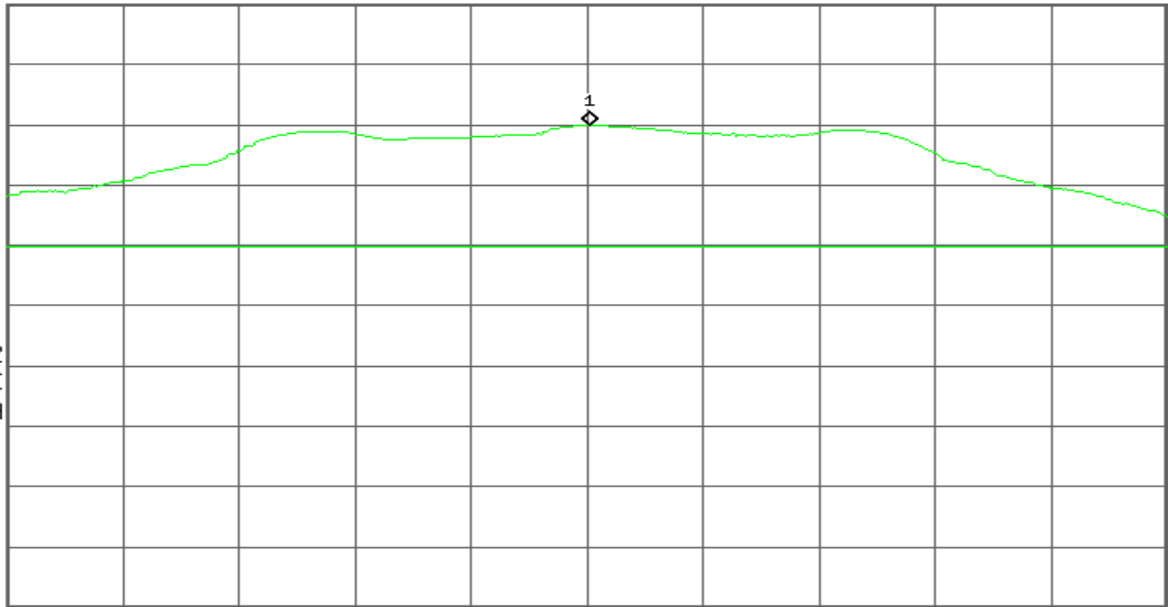
S3 FC

AA

£(f):

f>50k

Swp



Center 2.402 000 0 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 1.07 MHz

Sweep 1 ms (601 pts)

Agilent

R T

Mkr1 2.336 173 GHz  
-44.10 dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

1

dB

DI

-20.2

dBm

LgAv

M1 S2

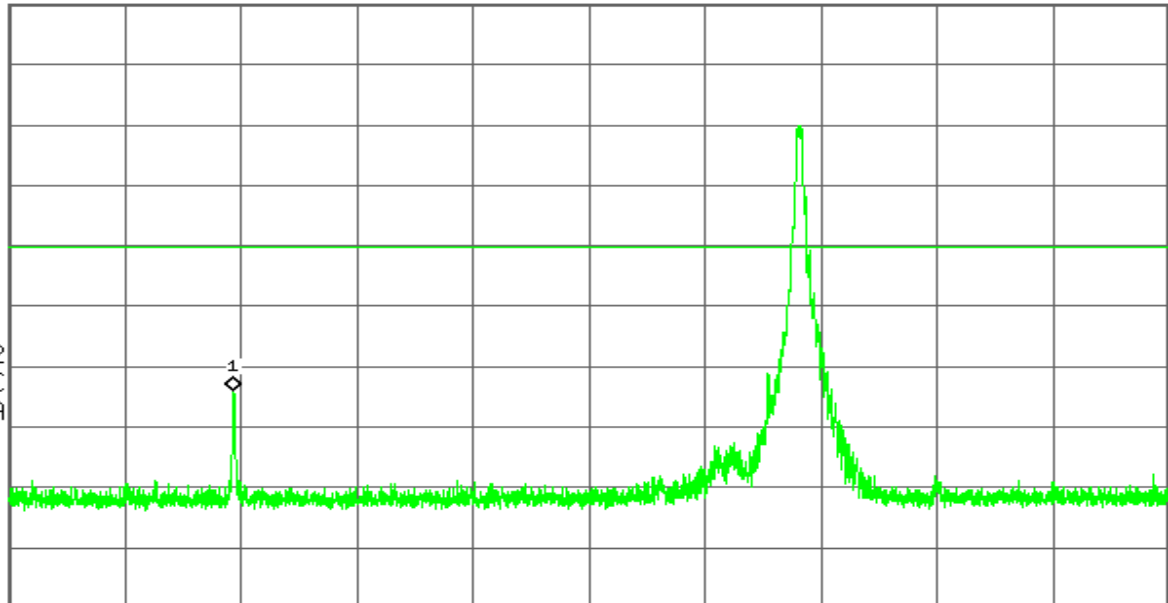
S3 FC

AA

£(f):

FTun

Swp



Start 2.310 000 GHz

#Res BW 100 kHz

#VBW 300 kHz

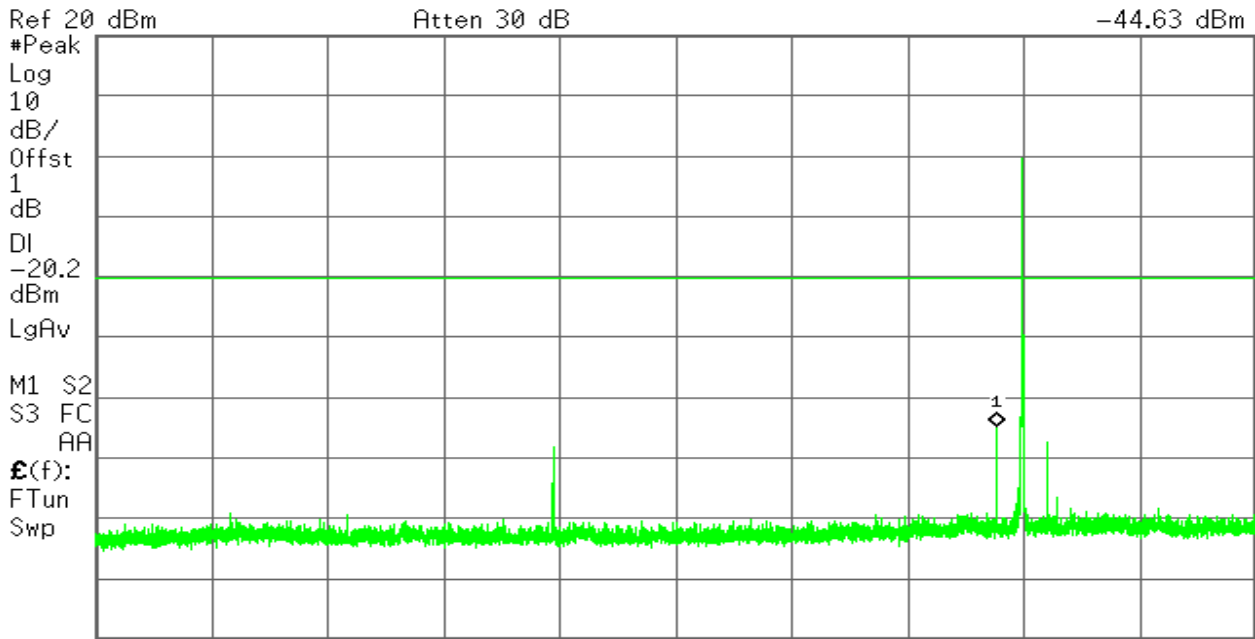
Stop 2.445 000 GHz

Sweep 13.11 ms (8192 pts)

Agilent

R T

Mkr1 2.336 1 GHz  
-44.63 dBm

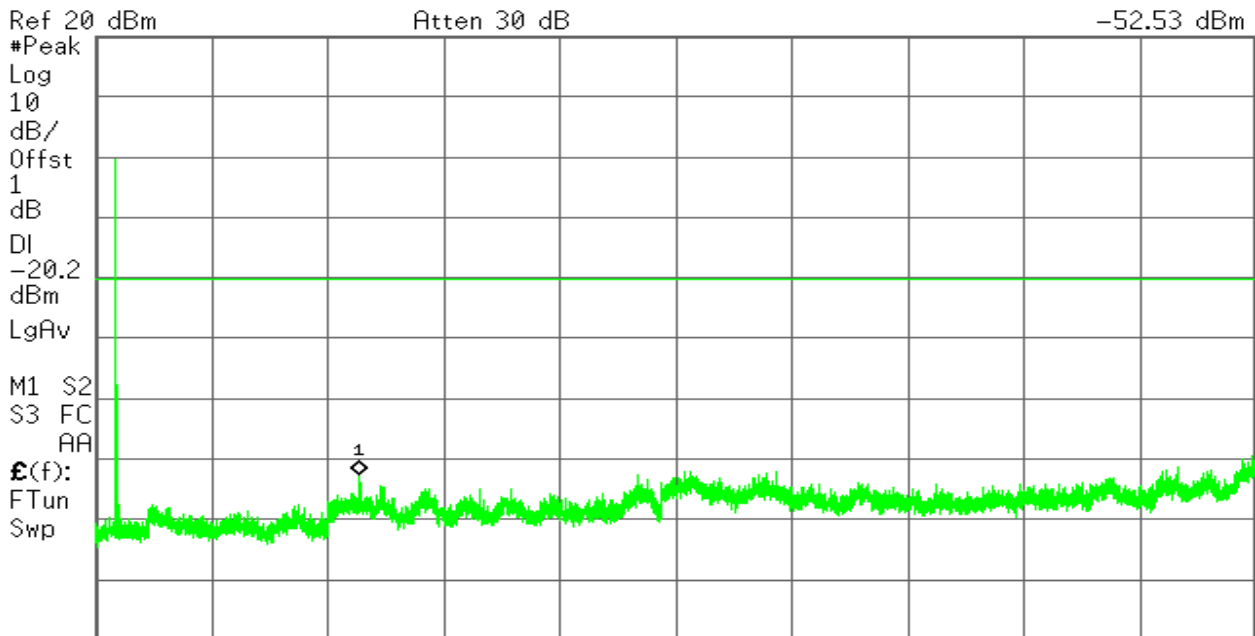


Start 30.0 MHz      Stop 3.000 0 GHz  
#Res BW 100 kHz      #VBW 300 kHz      Sweep 284 ms (8192 pts)

Agilent

R T

Mkr1 7.206 0 GHz  
-52.53 dBm



Start 2.000 0 GHz      Stop 25.000 0 GHz  
#Res BW 100 kHz      #VBW 300 kHz      Sweep 2.198 s (8192 pts)

## CH Mid

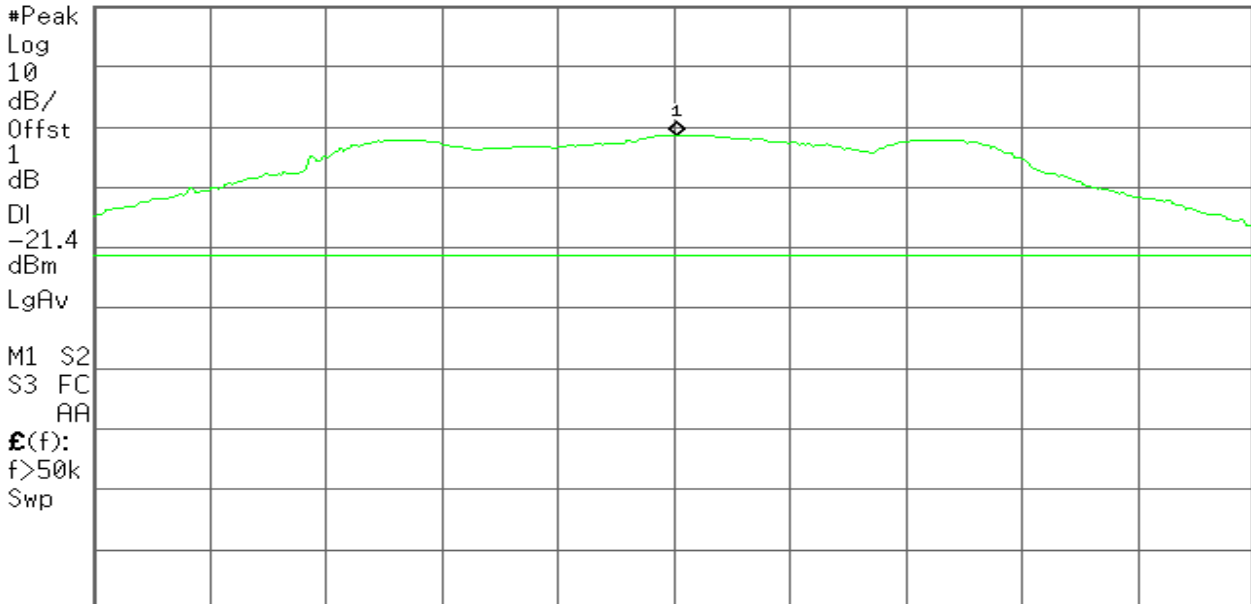
Agilent

R T

Mkr1 2.440 003 6 GHz  
-1.37 dBm

Ref 20 dBm

Atten 30 dB



Center 2.440 000 00 GHz

Span 1.07 MHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 1 ms (601 pts)

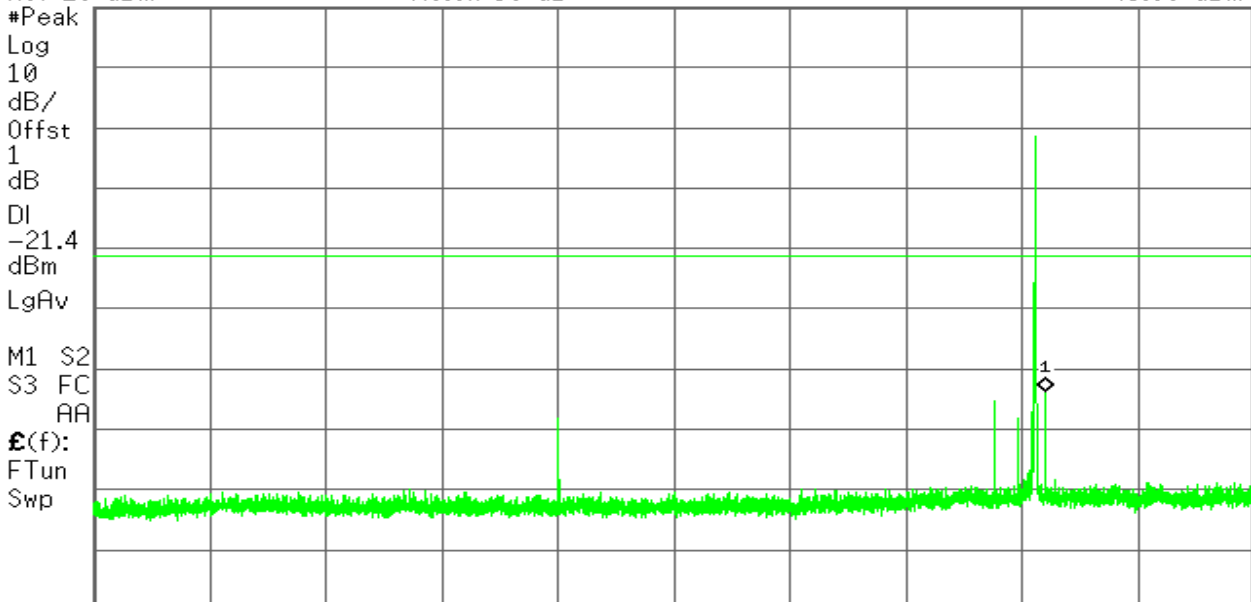
Agilent

R T

Mkr1 2.466 6 GHz  
-43.80 dBm

Ref 20 dBm

Atten 30 dB



Start 30.0 MHz

Stop 3.000 0 GHz

#Res BW 100 kHz

#VBW 300 kHz

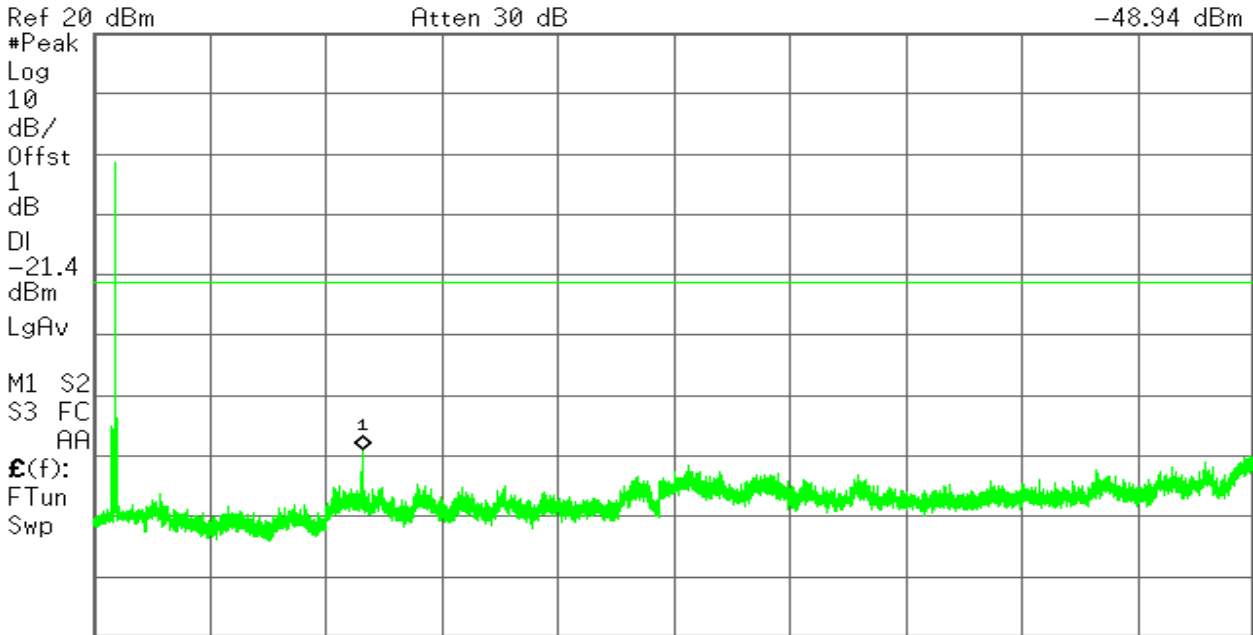
Sweep 284 ms (8192 pts)



Agilent

R T

Mkr1 7.318 3 GHz  
-48.94 dBm

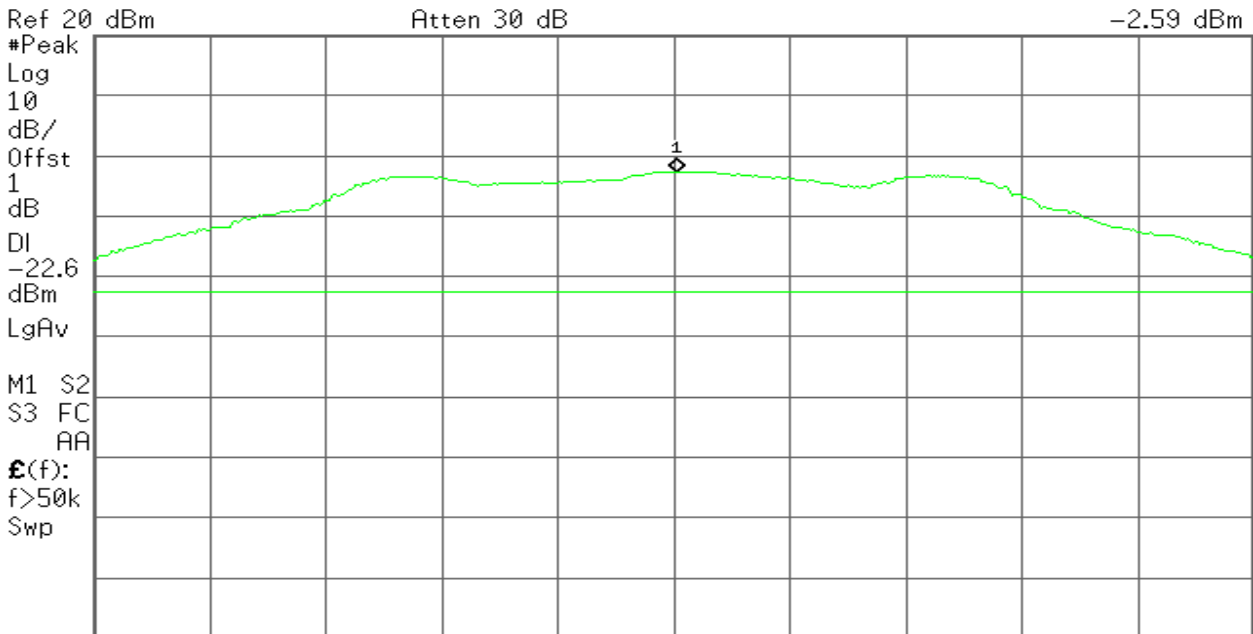


### CH High

Agilent

R T

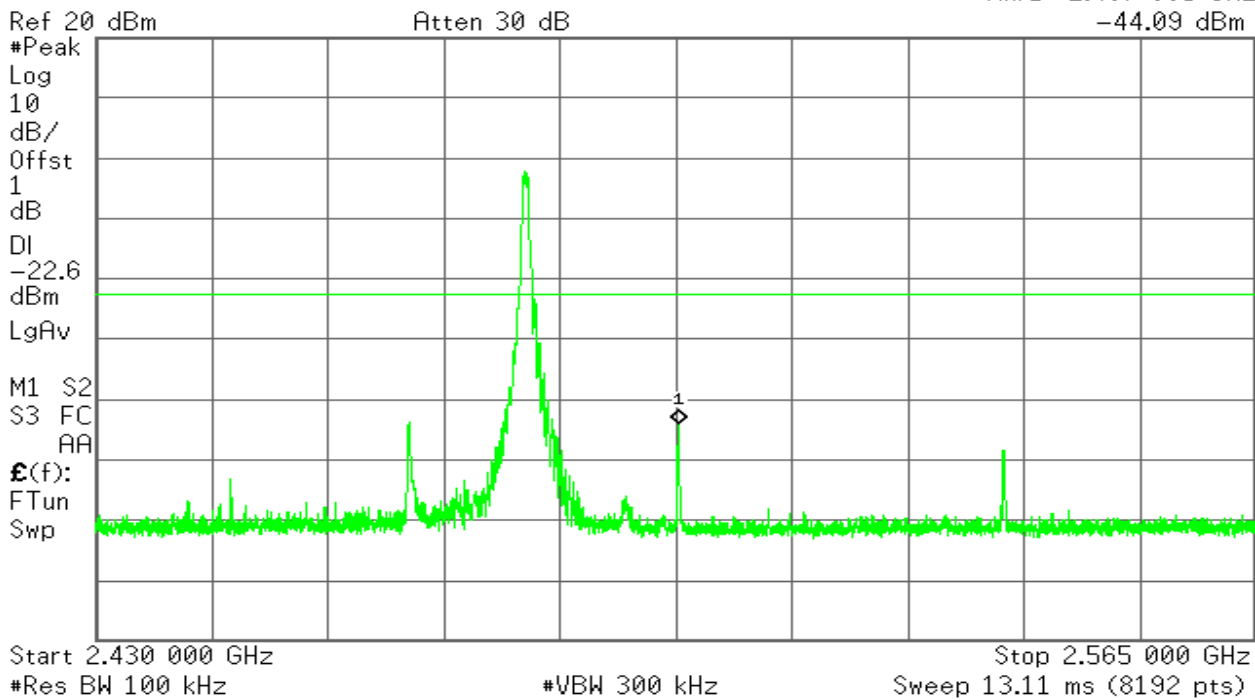
Mkr1 2.480 003 6 GHz  
-2.59 dBm



Agilent

R T

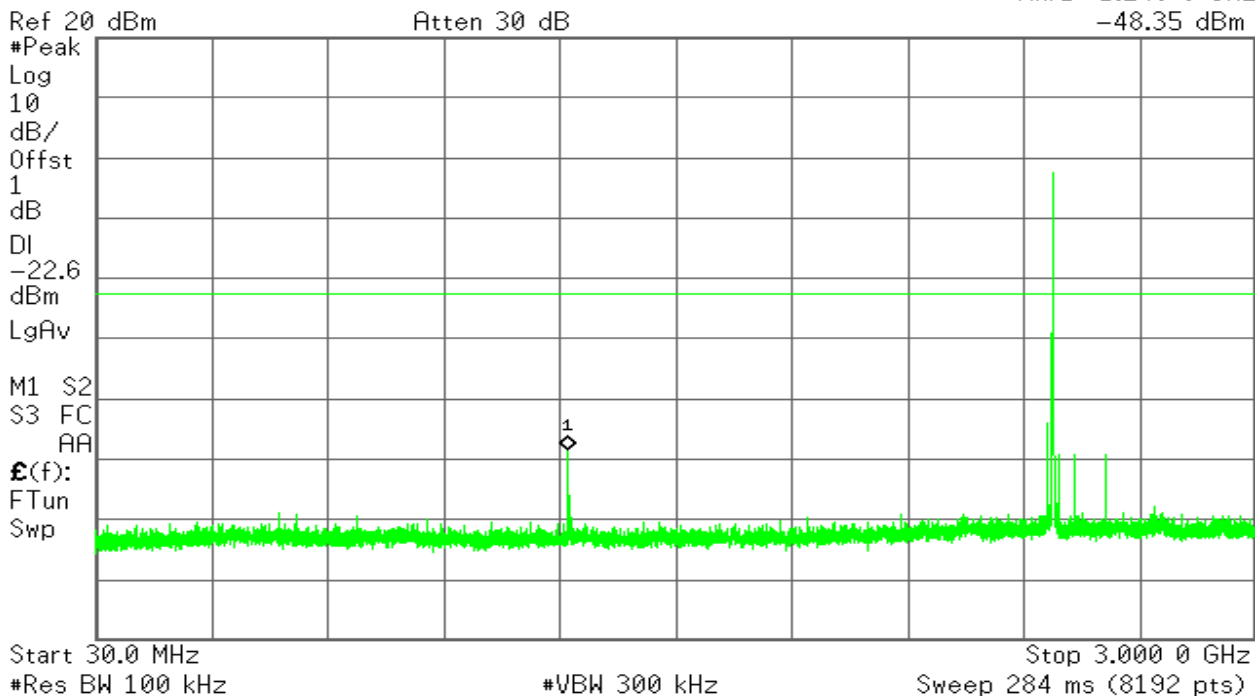
Mkr1 2.497 805 GHz  
-44.09 dBm



Agilent

R T

Mkr1 1.240 0 GHz  
-48.35 dBm



Agilent

R T

Mkr1 7.439 0 GHz  
-45.16 dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

1

dB

DI

-22.6

dBm

LgAv

M1 S2

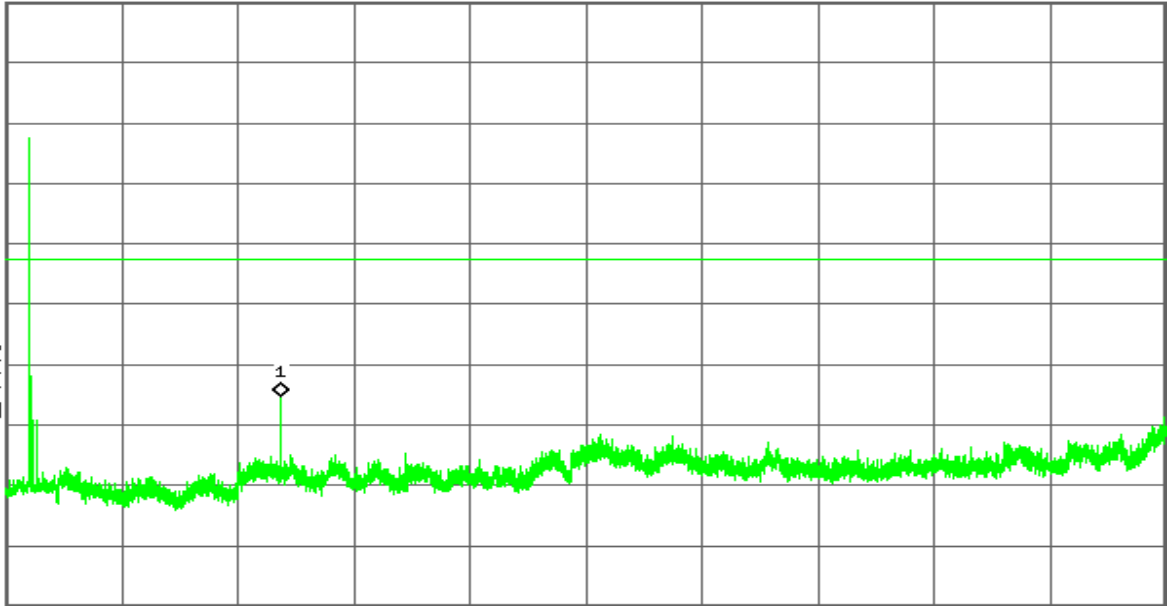
S3 FC

AA

$\mathcal{E}(f)$ :

FTun

Swp



Start 2.000 0 GHz

\*Res BW 100 kHz

\*VBW 300 kHz

Stop 25.000 0 GHz

Sweep 2.198 s (8192 pts)

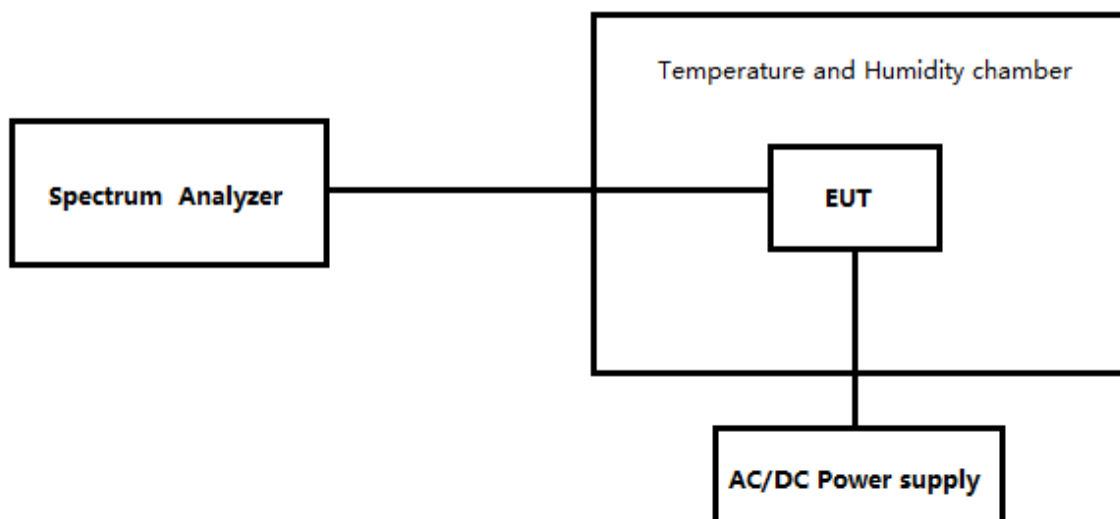
## 6.6 Frequency Stability

### LIMIT

According to RSS-Gen Issue 5 section 8.11:

If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation.

### Test Configuration



### TEST PROCEDURE

1. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
2. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

### TEST RESULTS

*No non-compliance noted*

**TEST DATA**

Test Conditions		Test Result (MHz)		
Voltage	Temp (°C)	2402	2440	2480
Normal	Extreme (-20)	2402.022	2440.028	2480.025
	Extreme (+20)	2402.015	2440.020	2480.016
	Extreme (+50)	2402.019	2440.020	2480.017
Extreme (+15%)	Normal (20)	2402.022	2440.029	2480.024
Extreme (-15%)		2402.023	2440.028	2480.023

## 6.7 Radiated Band Edge and Spurious Emission Measurement

### LIMIT

1). According to FCC rules:

Radiated emissions from 9 kHz to 25 GHz were measured according to the methods defines in ANSI C63.10-2013. The EUT was placed above the ground plane, 12mm for frequency below 1GHz and 1.5m for frequency above 1GHz. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FREQUENCIES(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
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength ( $\mu$ V/m at 3-meter)	Field Strength (dB $\mu$ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

2). According to IC rules:

According to RSS-Gen section 8.9, Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Frequency	Magnetic field strength (H-Field) ( $\mu\text{A/m}$ )	Measurement distance (m)
9 - 490 kHz 1	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

**Note:** The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector. Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the relevant RSS.

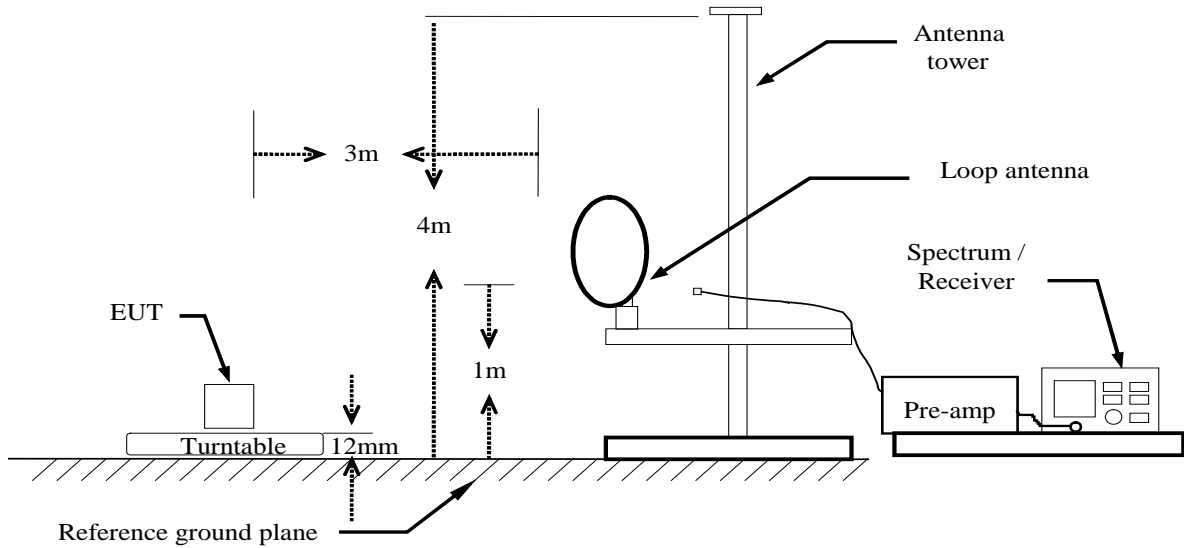
In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

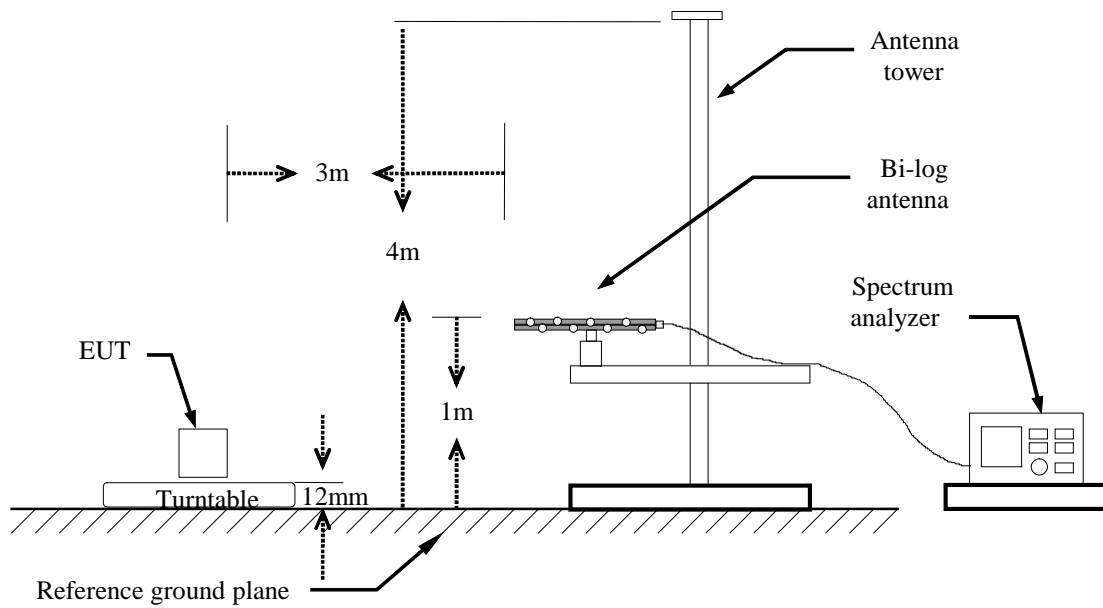
**Note:** Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

## Test Configuration

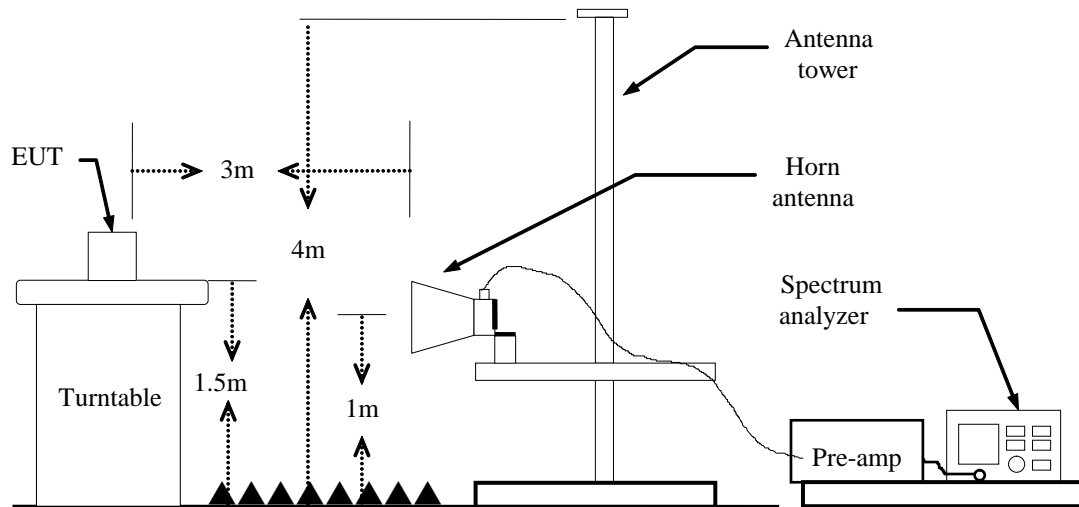
### Below 30MHz



### Below 1 GHz

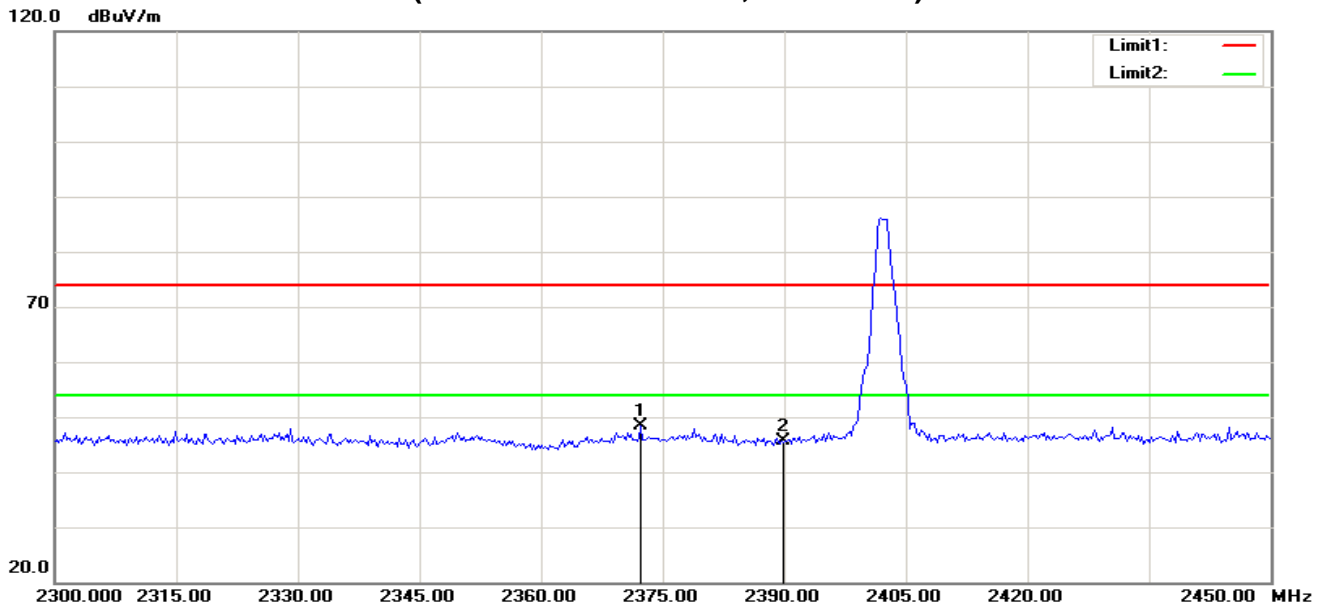




**Above 1 GHz****TEST PROCEDURE**

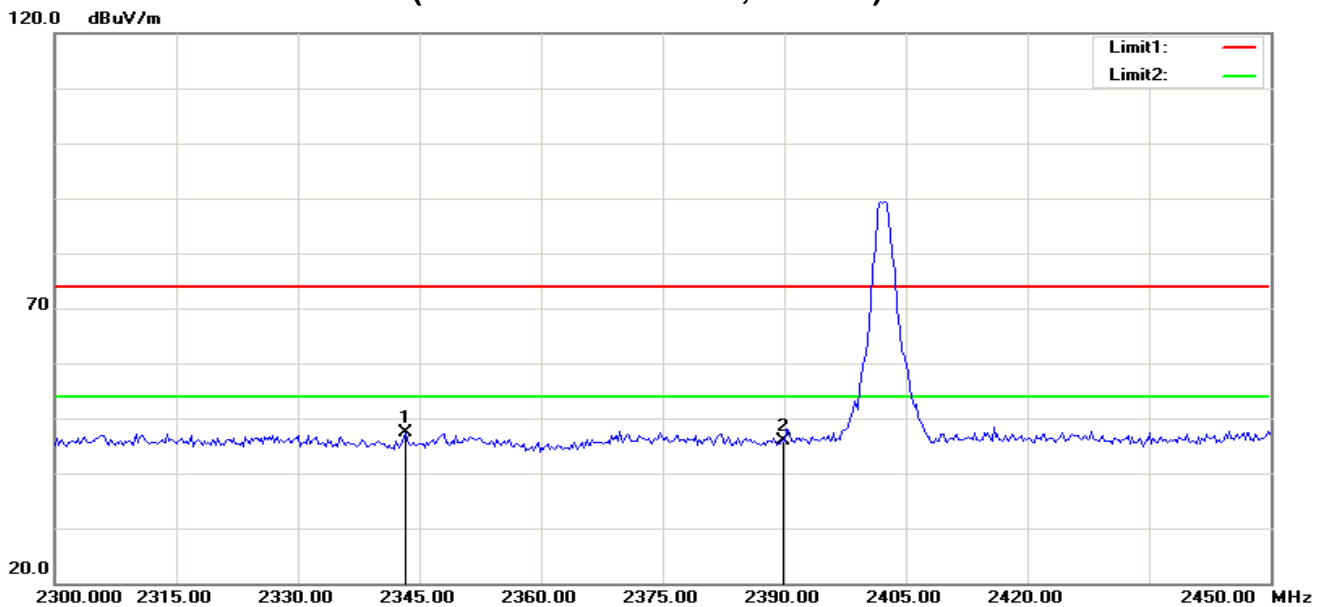
1. The testing follows Sub-clause 11.12 and 11.13 of ANSI C63.10.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable above ground plane, which is 12mm for frequency below 1GHz and 1.5m for frequency above 1GHz.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading:  $\text{Antenna Factor} + \text{Cable Loss} + \text{Read Level} - \text{Preamp Factor} = \text{Level}$
6. For measurement below 1GHz, 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.
7. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz; VBW =3 RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f > 1$  GHz for peak measurement.
 For average measurement:
  - VBW = 10 Hz, when duty cycle is no less than 98 percent.
  - $\text{VBW} \geq 1/T=3\text{KHz}$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### RESTRICTED BANDEDGE (BLE4.1 on Channel 0, Horizontal)



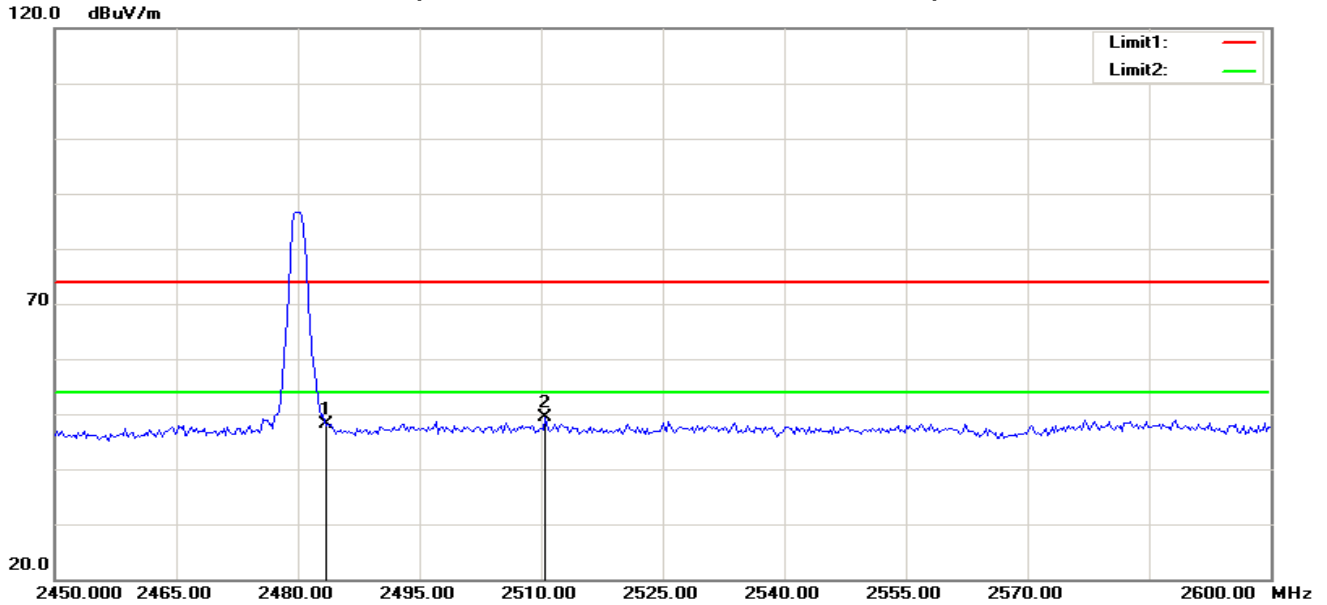
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2372.356	57.48	-9.06	48.42	74.00	-25.58	100	358	peak
2	2390.000	54.53	-8.95	45.58	74.00	-28.42	100	205	peak

### RESTRICTED BANDEDGE (BLE4.1 on Channel 0, Vertical)



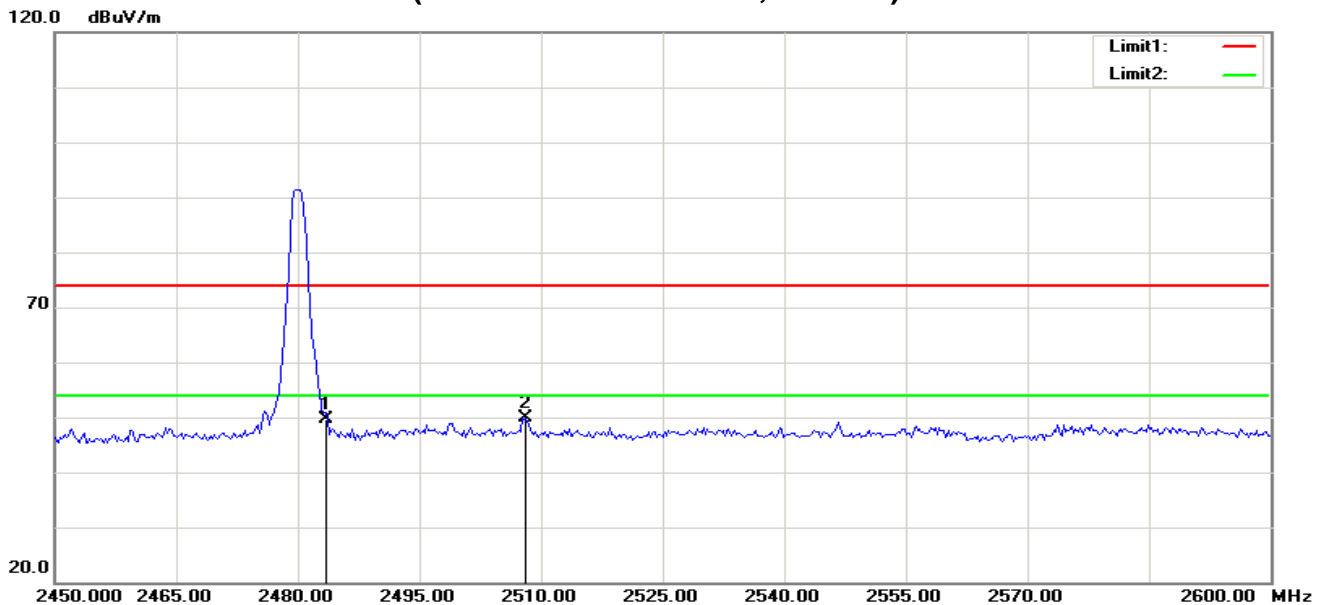
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2343.269	56.68	-9.25	47.43	74.00	-26.57	100	197	peak
2	2390.000	54.77	-8.95	45.82	74.00	-28.18	100	257	peak

## RESTRICTED BANDEDGE (BLE4.1 on Channel 39, Horizontal)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.500	56.36	-8.35	48.01	74.00	-25.99	100	274	peak
2	2510.577	57.56	-8.19	49.37	74.00	-24.63	100	360	peak

## RESTRICTED BANDEDGE (BLE4.1 on Channel 39, Vertical)



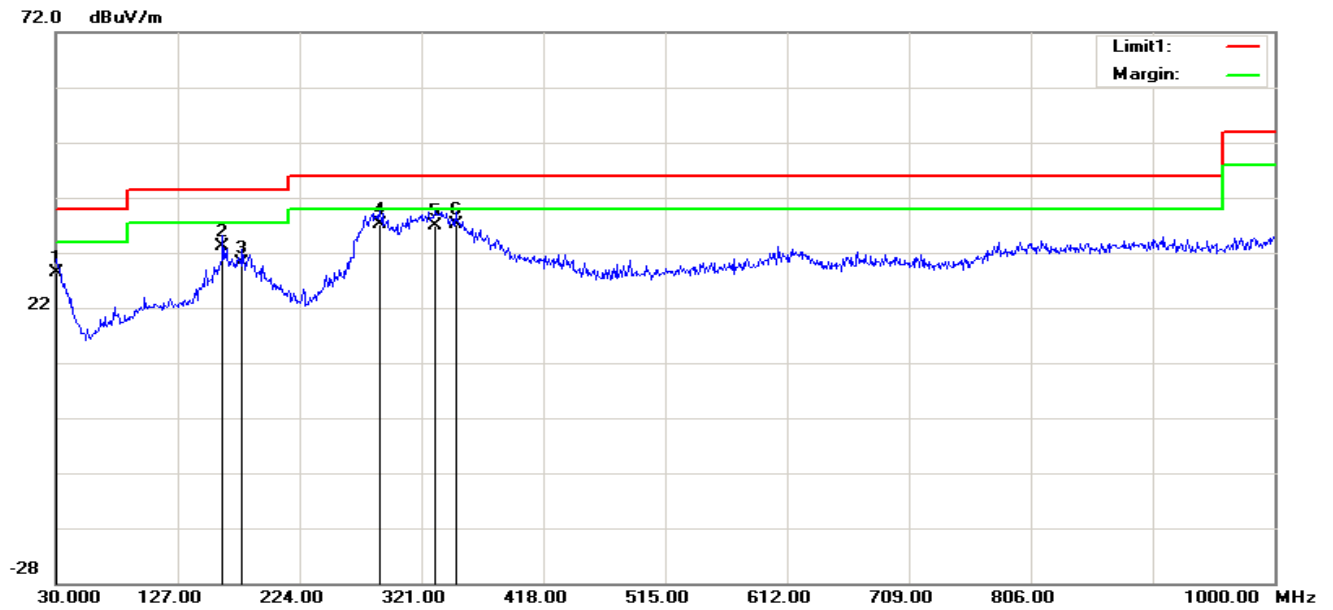
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.500	57.90	-8.35	49.55	74.00	-24.45	100	135	peak
2	2508.173	58.01	-8.20	49.81	74.00	-24.19	100	136	peak

### Test Result of Radiated Emission

Below 30MHz and above 18GHz. The measured value have enough margin over 20dB than the limit, therefore they are not reported.

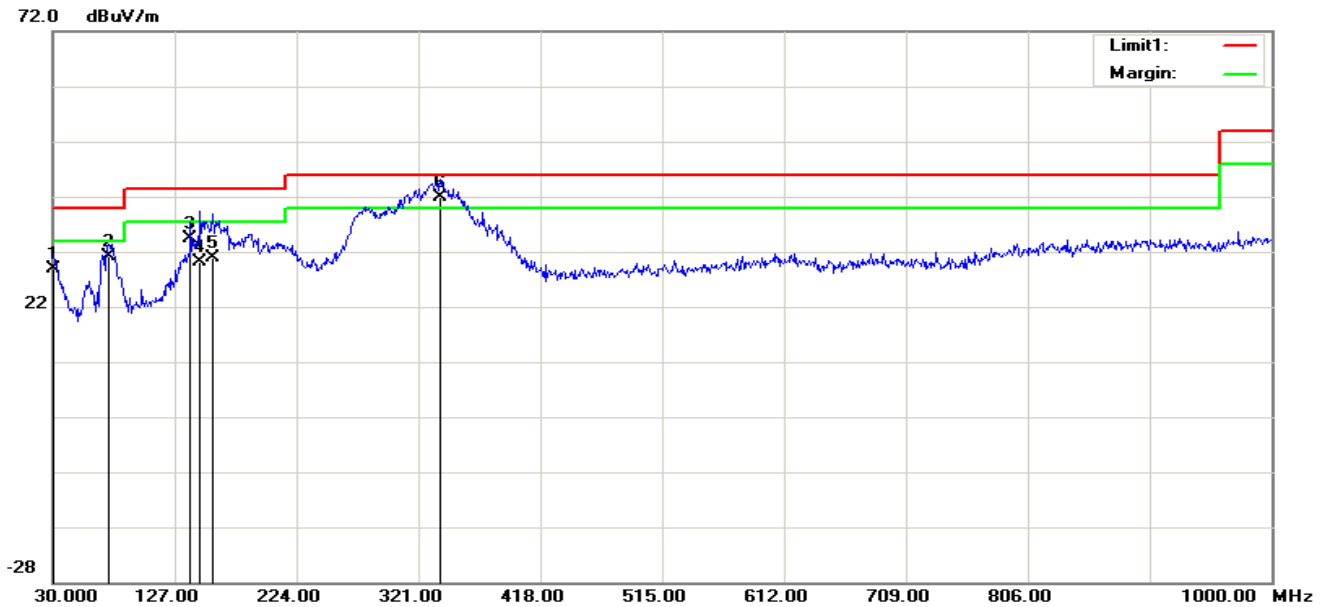
### 30MHz-1GHz

<b>Operation Mode:</b>	Normal Link	<b>Test Date:</b>	2018-10-24
<b>Temperature:</b>	25°C	<b>Tested by:</b>	Lily.Wang
<b>Humidity:</b>	51% RH	<b>Polarity:</b>	Hor.



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.1200	2.65	25.68	28.33	40.00	-11.67	200	360	QP
2	162.8900	15.48	17.66	33.14	43.50	-10.36	200	360	QP
3	178.4100	12.70	17.45	30.15	43.50	-13.35	200	333	QP
4	288.0200	17.43	19.82	37.25	46.00	-8.75	100	119	QP
5	331.6700	12.92	24.06	36.98	46.00	-9.02	100	130	QP
6	348.1600	11.04	26.08	37.12	46.00	-8.88	100	41	QP

<b>Operation Mode:</b>	Normal Link	<b>Test Date:</b>	2018-10-24
<b>Temperature:</b>	25°C	<b>Tested by:</b>	Lily.Wang
<b>Humidity:</b>	51% RH	<b>Polarity:</b>	Ver.



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.9700	3.89	25.09	28.98	40.00	-11.02	100	0	QP
2	74.6200	16.53	14.72	31.25	40.00	-8.75	100	311	QP
3	139.6100	16.40	17.86	34.26	43.50	-9.24	100	334	QP
4	147.3700	12.32	17.84	30.16	43.50	-13.34	100	307	QP
5	157.0700	13.21	17.74	30.95	43.50	-12.55	100	3	QP
6	338.4600	17.01	24.89	41.90	46.00	-4.10	100	0	QP

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz (No emission found between lowest internal used/generated frequency to 30 MHz).
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
4. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).

### Above 1 GHz

Operation Mode: Bluetooth LE4.1

Test Date: 2018-10-10

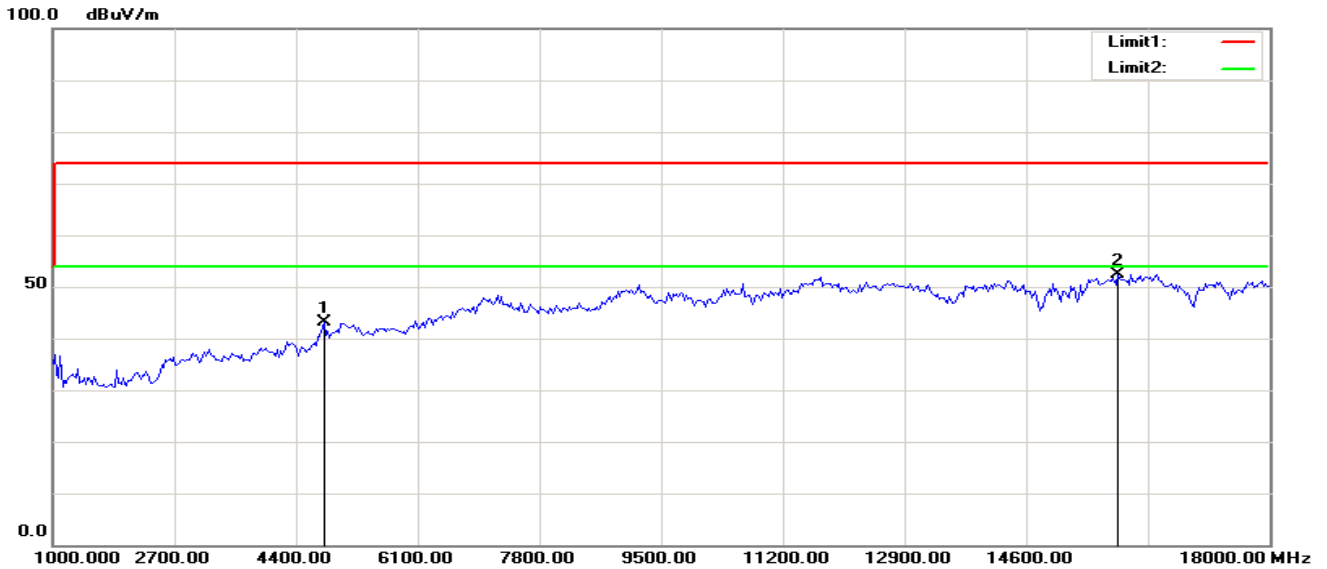
Test Channel: CH00

Tested by: Lily.Wang

Temperature: 25°C

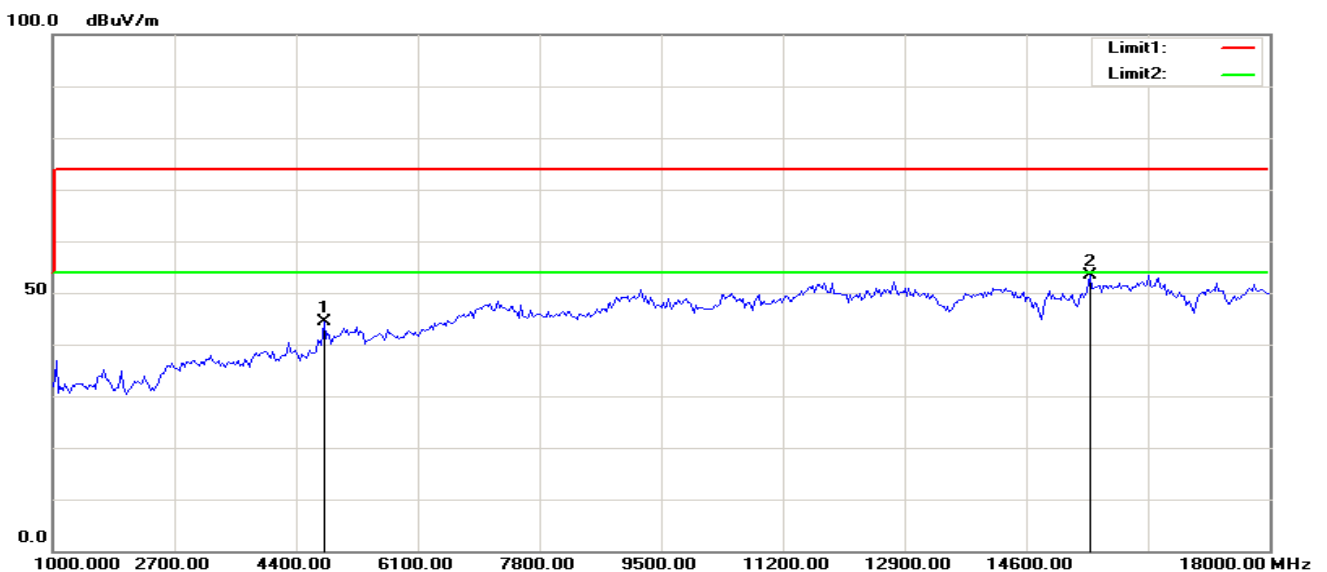
Polarity: Ver. / Hor.

### Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	4786.859	44.16	-1.13	43.03	74.00	-30.97	100	360	peak
2	15875.000	38.28	14.17	52.45	74.00	-21.55	100	179	peak

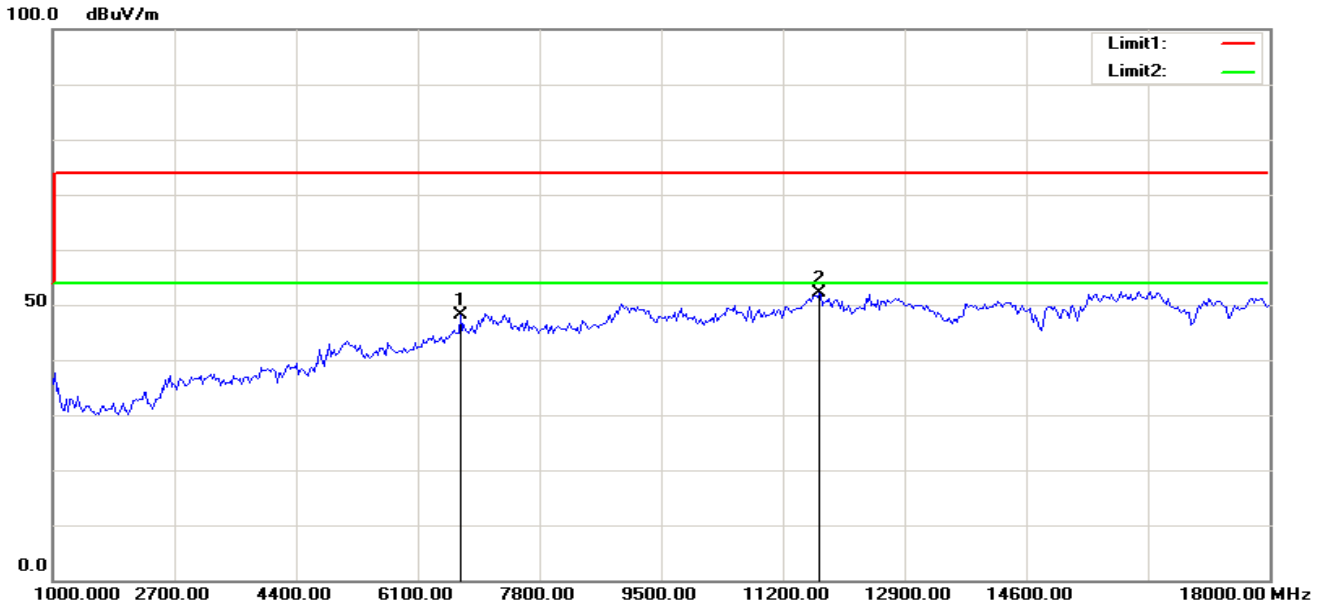
### Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	4786.859	45.42	-1.13	44.29	74.00	-29.71	100	307	peak
2	15493.590	39.53	13.76	53.29	74.00	-20.71	200	0	peak

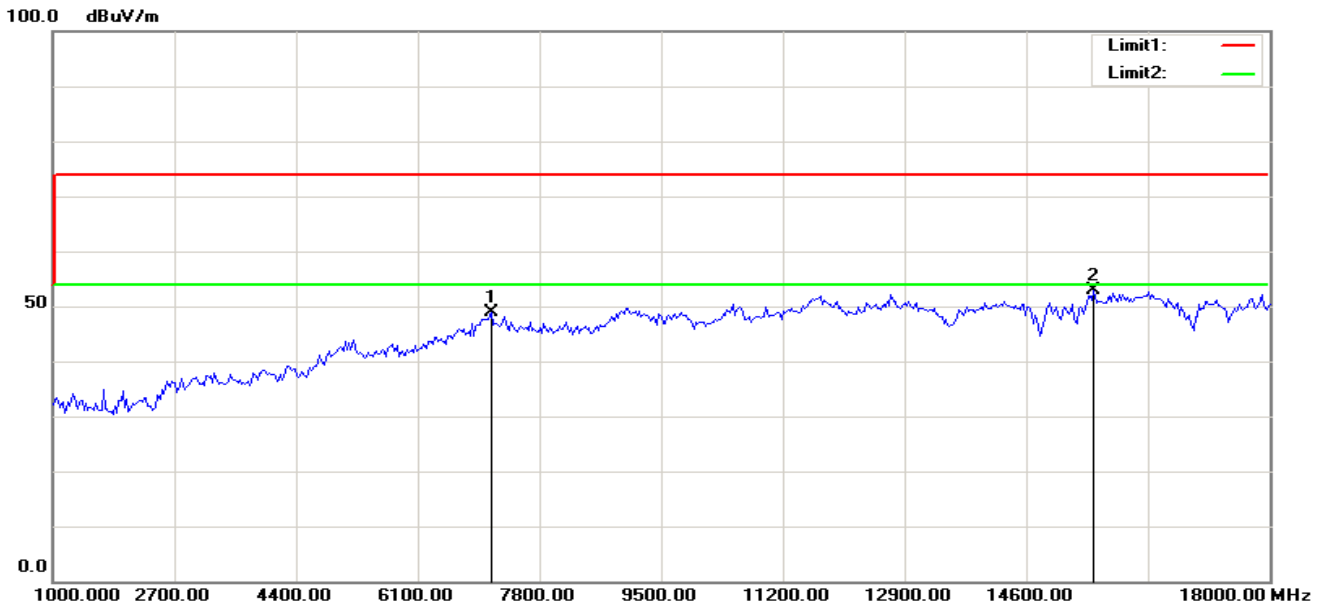
**Operation Mode:** Bluetooth LE4.1      **Test Date:** 2018-10-10  
**Test Channel:** CH19                      **Tested by:** Lily.Wang  
**Temperature:** 25°C                      **Polarity:** Ver. / Hor.

### Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	6693.910	42.96	5.16	48.12	74.00	-25.88	200	358	peak
2	11706.731	40.46	11.64	52.10	74.00	-21.90	100	290	peak

### Vertical

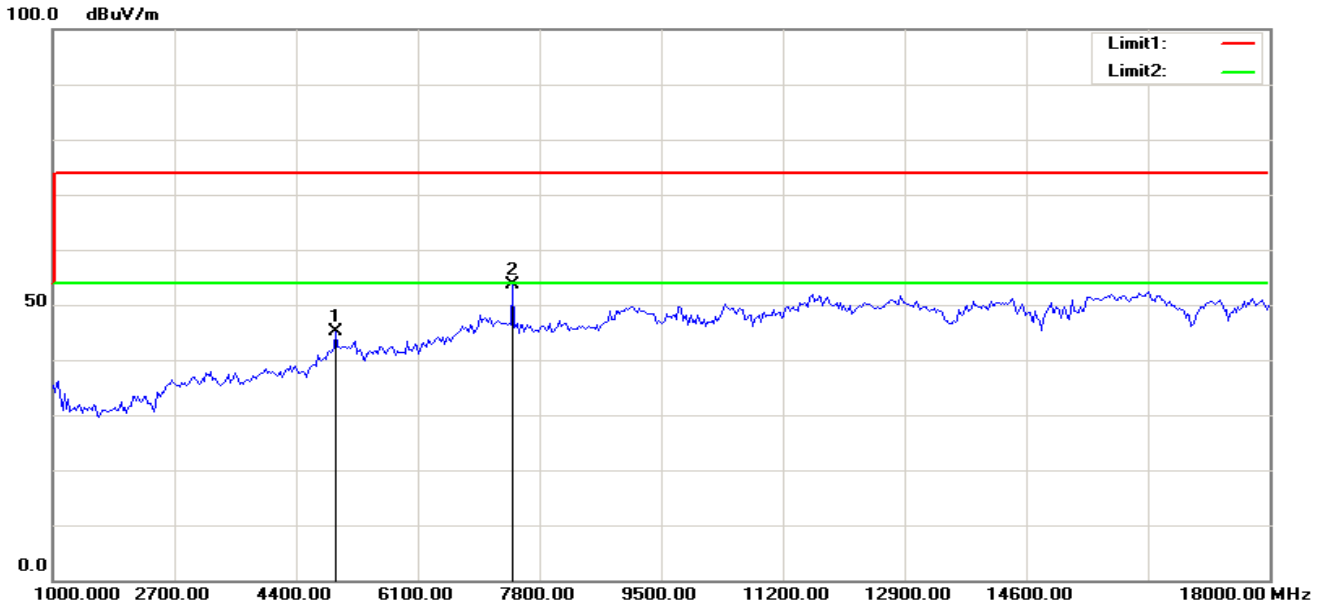


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	7129.808	42.17	6.67	48.84	74.00	-25.16	100	36	peak
2	15548.077	38.96	13.81	52.77	74.00	-21.23	200	0	peak

Operation Mode: Bluetooth LE4.1  
Test Channel: CH39  
Temperature: 25°C

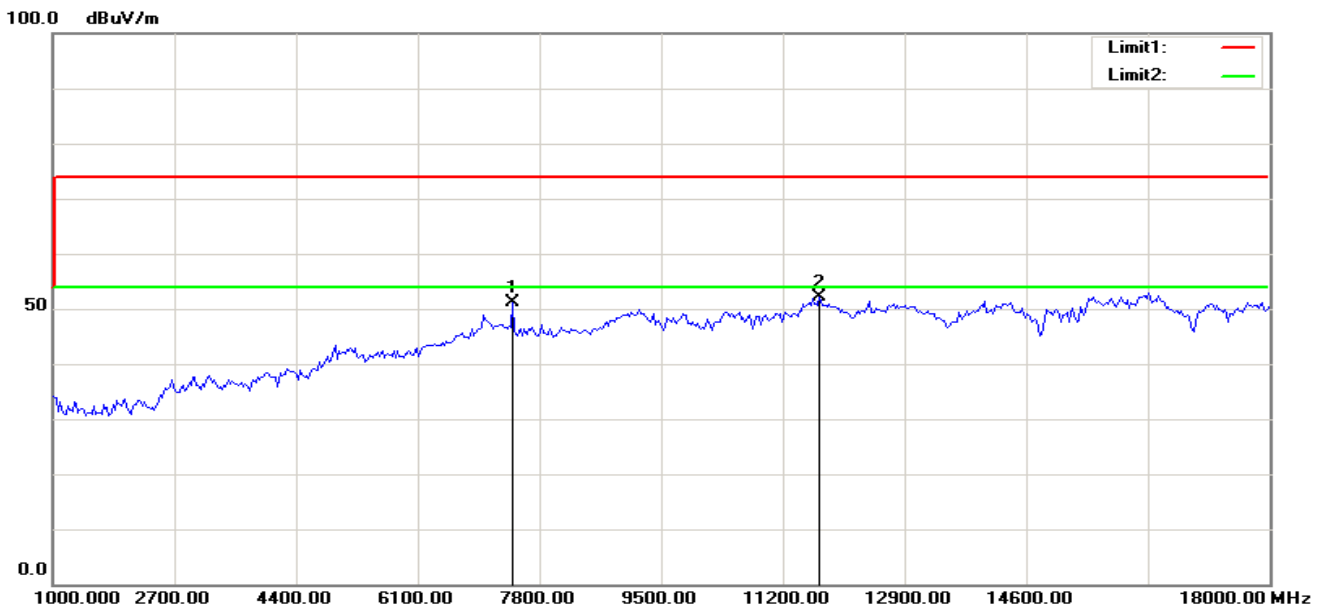
Test Date: 2018-10-10  
Tested by: Lily.Wang  
Polarity: Ver. / Hor.

### Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	4950.320	44.77	0.26	45.03	74.00	-28.97	100	360	peak
2	7429.487	47.38	6.14	53.52	74.00	-20.48	100	27	peak

### Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	7429.487	44.90	6.14	51.04	74.00	-22.96	100	48	peak
2	11706.731	40.38	11.64	52.02	74.00	-21.98	100	29	peak



## 6.8 POWERLINE CONDUCTED EMISSIONS

### LIMIT

- 1) According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

\* Decreases with the logarithm of the frequency.

- 2). According to RSS-GEN 8.8 rules:

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50  $\mu$ H / 50  $\Omega$  line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table below shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Frequency Range (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 <sup>1</sup>	56 to 46 <sup>1</sup>
0.5 - 5	56	46
5 - 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table above outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table above within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

**Test Configuration**

See test photographs attached in Setup photo for the actual connections between EUT and support equipment.

**TEST PROCEDURE**

1. The EUT was placed on a table, which is 12mm above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

**TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

**Test Data**

Note: The BT function can't work on the charging mode, test is not applicable.

**END OF REPORT**