FCC PART 15C TEST REPORT FOR CERTIFICATION

On Behalf of

Funai Electric R & D (Shenzhen) Co., Ltd.

WiFi module

U9W42

FCC ID: 2AU3BU9W42

Prepared for : Funai Electric R & D (Shenzhen) Co., Ltd.
B303 Technology Building II, 1057 Nanhai Road, Nanshan District, Shenzhen, China 518067

Prepared By : Audix Technology (Shenzhen) Co., Ltd.
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Report Number	:	ACS-F20002
Date of Test	:	Nov.21~Dec.01,2019 & Apr.14~15,2020
Date of Report	:	Apr.16,2020

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TEST REPORT CERTIFICATION

Applicant	:	Funai Electric R & D (Shenzhen) Co., Ltd.
Manufacturer	:	Funai Electric R & D (Shenzhen) Co., Ltd.
Product	:	WiFi module
FCC ID	:	2AU3BU9W42
		(A) Model No. : U9W42
		(B) Test Voltage : DC 3.3V

Tested for comply with:

FCC CFR47 Part 15 Subpart C
Test procedure used: ANSI C63.10: 2013;
KDB 558074 D01v05r02

The device described above is tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to confirm comply with all the FCC Part 15 Subpart C requirements. The test results are contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements. This report contains data that are not covered by the NVLAP accreditation.

This Report is made under FCC Part 2.1074. No modifications were required during testing to bring this product into compliance.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Nov.21~Dec.01,2019 & Apr.14~15,2020 Report of date: Apr.16,2020

Prepared by : Brave Zhang / Assistant Reviewed by : Sunny Lu/ Deputy Manager

信華科技（深圳）有限公司
Audix Technology (Shenzhen) Co., Ltd.
EMC 部門報告專用章
Stamp only for EMC Dept. Report
Signature: David Jin

Approved & Authorized Signer : David Jin / Deputy General Manager

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT has been tested according to the applicable standards as referenced below.

EMISSION		
Description of Test Item	**Standard**	**Results**
Power Line Conducted Emission Test	FCC Part 15: 15.207 ANSI C63.10 :2013	PASS
Radiated Emission Test	FCC Part 15: 15.209 FCC Part 15: 15.205 FCC Part 15: 15.247(d) ANSI C63.10 : 2013	PASS
Conducted Spurious Emissions	FCC Part 15: 15.247(d) ANSI C63.10 : 2013	PASS
Carrier Frequency Separation Test	FCC Part 15: 15.247(a)(2) ANSI C63.10 : 2013	N/A
6dB Bandwidth Test	FCC Part 15: 15.247(b)(3) ANSI C63.10 : 2013	PASS
Maximum Peak Output Power Test	FCC Part 15: 15.247(d) ANSI C63.10 : 2013	PASS
Band Edge Compliance Test	FCC Part 15: 15.247(e) ANSI C63.10 : 2013	PASS
Power Spectral Density Test	FCC Part 15: 15.207 ANSI C63.10 :2013	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

2. GENERAL INFORMATION

2.1.Description of Equipment Under Test

Applicant	Funai Electric R & D (Shenzhen) Co., Ltd.
Applicant Address	B303 Technology Building II, 1057 Nanhai Road, Nanshan District, Shenzhen, China 518067
Manufacturer	Funai Electric R & D (Shenzhen) Co., Ltd.
Manufacturer Address	B303 Technology Building II, 1057 Nanhai Road, Nanshan District, Shenzhen, China 518067
Factory	Funai (Thailand) Company Limited
Factory Address	835 Moo18, Pakchong-Lumsompung Road, Tambon, Chantuek, Amphur Pakchong, Nakhon Ratchasima 30130, Thailand
Product	WiFi module
Model No.	U9W42
FCC ID	2AU3BU9W42
Sample Type	Prototype production
Date of Receipt	Nov.18,2019
Date of Test	Nov.21~Dec.01,2019 & Apr.14~15,2020
Remark: This report only for Bluetooth V5.0.	

2.2.Feature of Equipment Under Test

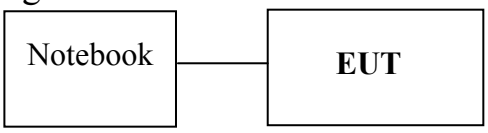
Product Feature & Specification		
Product	WiFi module	
Model No.	U9W42	
Radio	IEEE802.11 a/b/g/n/ac; Bluetooth V3.0+EDR; Bluetooth V5.0	
Power Source	☐ Commercial Power	AC 100 ~ 240V
	☒ External Power Source	DC 3.3V
	☐ Lithium battery	DC V, mAh
	☐ UM battery	DC V
Bluetooth		
Bluetooth Version	V5.0 dual mode	
Frequency Range	2402-2480MHz	
Type of Modulation	GFSK, π/4DQPSK, 8DPSK	
Data Rate	1Mbps, 2Mbps, 3Mbps	
Quantity of Channels	79/40	
Channel Separation	1MHz/2MHz	
2.4GHz Wi-Fi		
Support Modes	802.11b/g/n20/n40	
Frequency Range	2412-2462MHz	
Type of Modulation	802.11b(DSSS): CCK, QPSK, BPSK; 802.11g/n(OFDM): 64QAM,16QAM, QPSK, BPSK	
Data Rate	802.11b: 1/2/5.5/11 Mbps; 802.11g: 6/9/12/18/24/36/48/54 Mbps; 802.11n: up to 300Mbps	
Channel Separation	5MHz	
5GHz Wi-Fi		
Support Modes	802.11a/n20/n40/ac20/ac40/ac80	
Frequency Range	5180-5240MHz, 5745-5825MHz	
Type of Modulation	802.11a/n (OFDM): QPSK, BPSK, 16QAM, 64QAM 802.11ac (OFDM): QPSK, BPSK, 16QAM, 64QAM,256QAM	
Data Rate	802.11a: 6/9/12/18/24/36/48/54 Mbps; 802.11n: up to 300Mbps; 802.11ac: up to 867Mbps	
Channel Separation	5MHz	

Antenna System	
Type of Antenna	PCB Antenna
Antenna Peak Gain	Bluetooth Peak Gain: -7.4dBi DTS Band (2400-2483.5MHz) Peak Gain: ANT A: -2.3dBi; ANT B: -1dBi. U-NII-1 Band(5150-5250MHz) Peak Gain: ANT A: 2.9dBi; ANT B: -3.8dBi. U-NII-3 Band (5725-5850MHz) Peak Gain: ANT A: -1.9dBi; ANT B: -4.5dBi.

2.3. Tested Supporting System Details

No.	Description	ACS No.	Manufacturer	Model	Serial Number
1.	Notebook	N/A	acer	ZOW	NVX7C
		USB Cable: Shielded, Detachable, 1.0m			

2.4. Block Diagram of connection between EUT and simulators



(EUT: WiFi module)

2.5. Test information

A special software was used to control EUT work in Continuous TX mode (GFSK modulation), and select test channel.

Tested mode, channel, and data rate information			
Mode	data rate (Mbps)	Channel	Frequency (MHz)
Tx Mode GFSK modulation	1	Low :CH 0	2402
	1	Middle: CH19	2440
	1	High: CH39	2480
	2	Low :CH 0	2402
	2	Middle: CH19	2440
	2	High: CH39	2480

2.6. Test Facility

Site Description

Name of Firm : Audix Technology (Shenzhen) Co., Ltd.
No. 6, Kefeng Road, Science & Technology Park,
Nanshan District , Shenzhen, Guangdong, China

EMC Lab. : Certificated by Industry Canada
Registration Number: IC 5183A-1
Valid Date: May.07, 2020

: Certificated by DAkkS, Germany
Registration No: D-PL-12151-01-00
Valid Date: Dec.07, 2021

: Accredited by NVLAP, USA
NVLAP Code: 200372-0
Valid Date: Mar.31, 2021

: Certificated by FCC USA.
Designation No.: CN5022
Valid Date: Mar.31, 2021

2.7. Measurement Uncertainty (95% confidence levels, k=2)

Test Item	Uncertainty
Uncertainty for Conduction emission test in No. 1 Conduction	2.6dB(150KHz to 30MHz)
Uncertainty for Radiation Emission test in 3m chamber	3.6dB(30~200MHz, Polarization: H)
	4.0dB(30~200MHz, Polarization: V)
	3.6dB(200M~1GHz, Polarization: H)
	3.8dB(200M~1GHz, Polarization: V)
Uncertainty for Radiation Emission test in 3m chamber(1GHz-25GHz)	4.6dB(1~6GHz, Distance: 3m)
	4.6dB(6~25GHz, Distance: 3m)
Uncertainty for Radiated Spurious Emission test in RF chamber	3.7dB(30MHz~1000MHz)
	3.3dB(1~26.5GHz)
Uncertainty for Conduction Spurious emission test	2.0dB
Uncertainty for Output power test	0.8dB
Uncertainty for Bandwidth test	83kHz
Uncertainty for DC power test	0.1%
Uncertainty for test site temperature and humidity	0.6℃
	3%

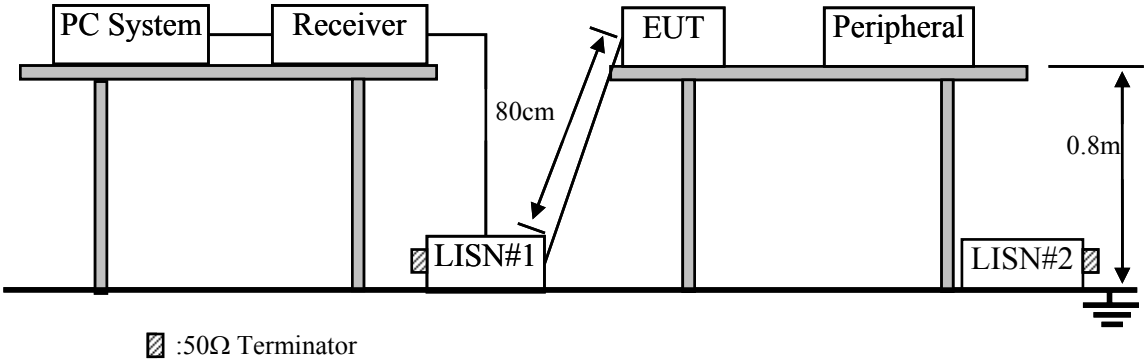
Note: EMI uncertainty is evaluated by CISPR16-4-2.
The value of measurement uncertainty of EMI is less than U_{CISPR}.
The value is not calculated in the test results.

3. POWER LINE CONDUCTED EMISSION TEST

3.1.Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	1# Shielding Room	AUDIX	N/A	N/A	May.17,18	3 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100842	Apr.14,19	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100842	Apr.12,20	1 Year
4.	L.I.S.N.#1	Rohde & Schwarz	ENV216	102160	Oct.13,19	1 Year
5.	L.I.S.N.#2	Kyoritsu	K NW-403D	8-1750-2	Apr.18,19	1 Year
6.	L.I.S.N.#2	Kyoritsu	KNW-407	8-1636-1	Apr.12,20	1 Year
7.	Terminator	Hubersuhner	50Ω	No.1	Apr.14,19	1 Year
8.	Terminator	Hubersuhner	50Ω	No.2	Apr.14,19	1 Year
9.	Terminator	Hubersuhner	50Ω	No.1	Apr.12,20	1 Year
10.	Terminator	Hubersuhner	50Ω	No.2	Apr.12,20	1 Year
11.	RF Cable	Fujikura	RG55/U	No.2	Apr.13,19	1 Year
12.	RF Cable	Fujikura	RG55/U	No.1	Apr.12,20	1 Year
13.	Test Software	AUDIX	e3	6.100913a	N/A	N/A
Note: N/A means Not applicable.						

3.2.Block Diagram of Test Setup



3.3.Power Line Conducted Emission Test Limits

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

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.4. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4.1. WiFi module (EUT)

Model No. : U9W42
Serial No. : N/A

3.4.2. Support Equipment: As Tested Supporting System Details, in Section 2.2.

3.5. Operating Condition of EUT

3.5.1. Setup the EUT as shown as Section 3.2.

3.5.2. Turn on the power of EUT.

3.5.3. PC run test software to control EUT work in Tx mode.

3.6. Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power Via AC unit connected to the power mains through a line impedance stabilization network (L.I.S.N. #1). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Test.

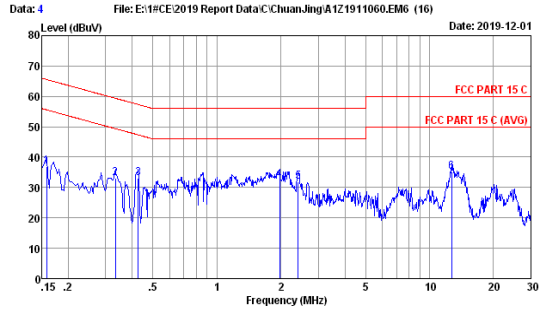
The bandwidth of test receiver (R & S ESCI) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.7. Power Line Conducted Emission Test Results

PASS. **(**All emissions not reported below are too low against the prescribed limits.)

Bluetooth V4.0(1Mbps):



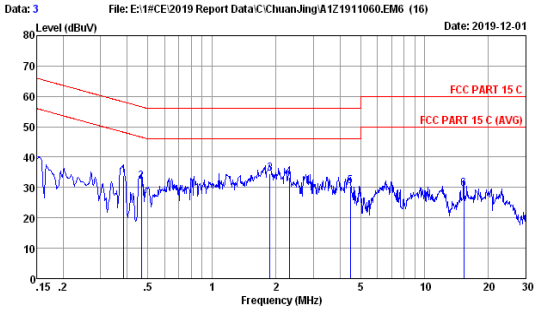
Site no :1# Conduction
Dis./Lisn :2019 ENV216 L
Limit :FCC PART 15 C
Env./Ins. :22.3*C/50%
Power Rating :DC 3.3V
Test Mode :BT4.0 TX

Data No :4
LISN phase:

Engineer :Garry

No	Freq (MHz)	LISN Factor (dB)	Cable loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.158	9.60	0.04	27.33	36.97	65.56	28.59	QP
2	0.334	9.60	0.05	23.34	32.99	59.35	26.36	QP
3	0.426	9.60	0.05	23.43	33.08	57.33	24.25	QP
4	1.970	9.60	0.07	22.83	32.50	56.00	23.50	QP
5	2.409	9.60	0.07	22.23	31.90	56.00	24.10	QP
6	12.716	9.70	0.14	25.31	35.15	60.00	24.85	QP

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.



Site no :1# Conduction
Dis./Lisn :2019 ENV216 N
Limit :FCC PART 15 C
Env./Ins. :22.3*C/50%
Power Rating :DC 3.3V
Test Mode : BT4.0 TX

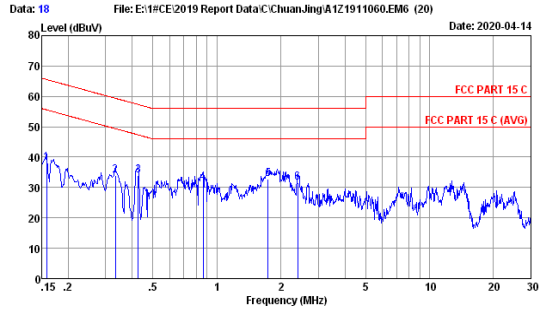
Data No :3
LISN phase:

Engineer :Garry

No	Freq (MHz)	LISN Factor (dB)	Cable loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.385	9.60	0.05	24.27	33.92	58.17	24.25	QP
2	0.466	9.60	0.05	22.14	31.79	56.58	24.79	QP
3	1.878	9.60	0.07	24.80	34.47	56.00	21.53	QP
4	2.309	9.60	0.07	23.71	33.38	56.00	22.62	QP
5	4.478	9.60	0.09	20.69	30.38	56.00	25.62	QP
6	15.307	9.61	0.15	19.63	29.39	60.00	30.61	QP

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

Bluetooth V5.0(2Mbps):



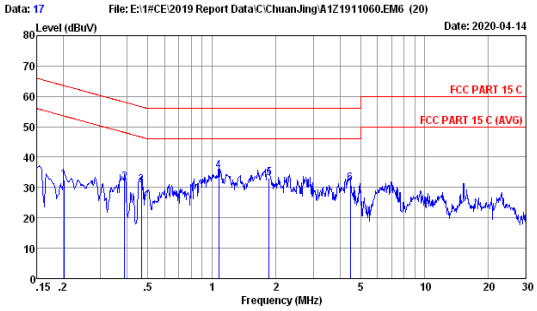
Site no :1# Conduction
Dis./Lisn :2019 ENV216 L
Limit :FCC PART 15 C
Env./Ins. :22.3*C/50%
Power Rating :DC 3.3V
Test Mode :BLE-2M TX

Data No :18
LISN phase:

Engineer :Garry

No	Freq (MHz)	LISN Factor (dB)	Cable loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.158	9.60	0.04	28.33	37.97	65.56	27.59	QP
2	0.334	9.60	0.05	24.34	33.99	59.35	25.36	QP
3	0.426	9.60	0.05	24.43	34.08	57.33	23.25	QP
4	0.862	9.60	0.06	22.06	31.72	56.00	24.28	QP
5	1.744	9.60	0.07	23.21	32.88	56.00	23.12	QP
6	2.396	9.60	0.07	21.90	31.57	56.00	24.43	QP

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.



Site no :1# Conduction
Dis./Lisn :2019 ENV216 N
Limit :FCC PART 15 C
Env./Ins. :22.3*C/50%
Power Rating :DC 3.3V
Test Mode :BLE-2M TX

Data No :17
LISN phase:

Engineer :Garry

No	Freq (MHz)	LISN Factor (dB)	Cable loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.202	9.60	0.04	22.76	32.40	63.54	31.14	QP
2	0.389	9.60	0.05	21.84	31.49	58.08	26.59	QP
3	0.466	9.60	0.05	21.14	30.79	56.58	25.79	QP
4	1.077	9.60	0.06	25.88	35.54	56.00	20.46	QP
5	1.858	9.60	0.07	23.52	33.19	56.00	22.81	QP
6	4.478	9.60	0.09	21.69	31.38	56.00	24.62	QP

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

4. RADIATED EMISSION MEASUREMENT

4.1. Test Equipment

Frequency range: 30~1000MHz

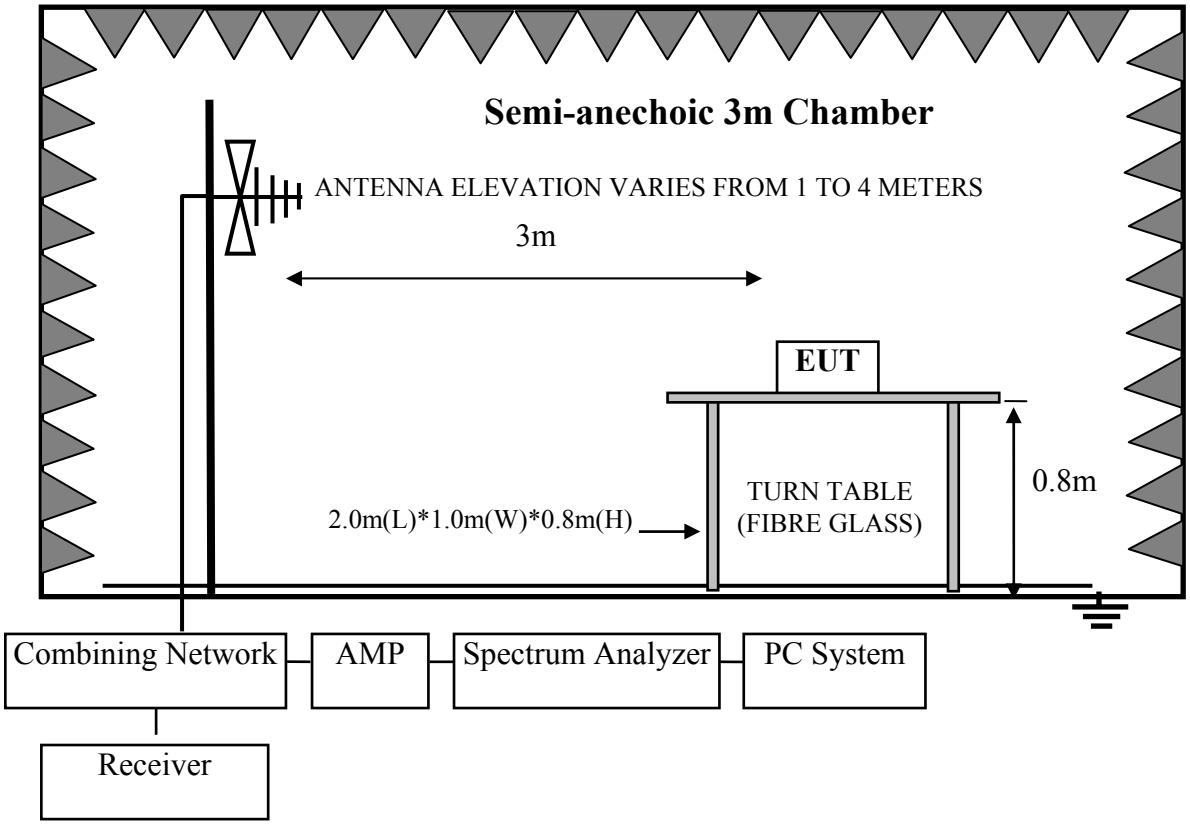
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	3#Chamber(NSA)	AUDIX	N/A	N/A	May.10,19	1 Year
2.	3#Chamber(SE)	AUDIX	N/A	N/A	May.17,18	3 Year
3.	Signal Analyzer	Rohde & Schwarz	FSV30	104050	Apr.14,19	1 Year
4.	Signal Analyzer	Rohde & Schwarz	FSV30	104050	Apr.11,20	1 Year
5.	EMI Test Receiver	Rohde & Schwarz	ESR7	101547	Apr.14,19	1 Year
6.	EMI Test Receiver	Rohde & Schwarz	ESR7	101547	Apr.12,20	1 Year
7.	Amplifier	HP	8447D	2648A04738	Apr.14,19	1 Year
8.	Amplifier	HP	8447D	2648A04738	Apr.11,19	1 Year
9.	Tri-log-Broadband Antenna	SCHWARZBECK	VULB 9168	493	Jul.24,19	1 Year
10.	NSA Cable	HUBER+SUHNER	CFD400NL-LW	No.3	Oct.13,19	1 Year
11.	Coaxial Switch	Anritsu	MP59B	6201397222	Apr.14,19	1 Year
12.	Coaxial Switch	Anritsu	MP59B	6201397222	Apr.11,20	1 Year
13.	Test Software	AUDIX	e3	6.2009-5-21a(n)	N/A	N/A
Note: N/A means Not applicable.						

Frequency range: above 1000MHz

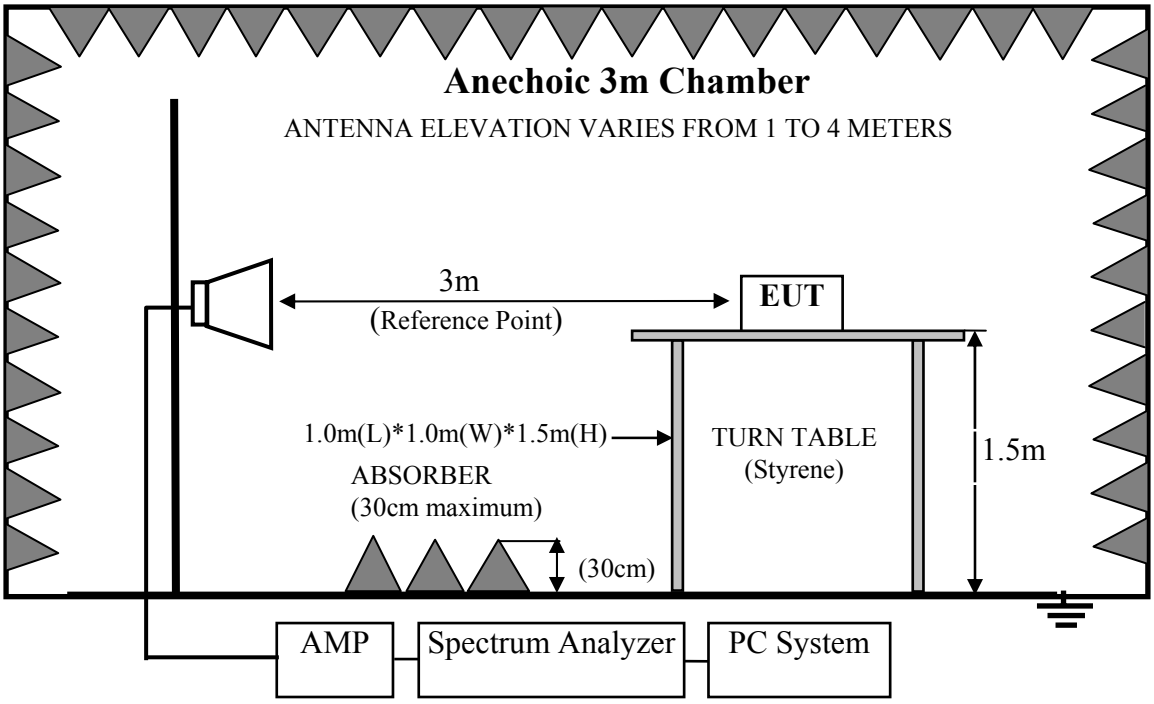
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	3#Chamber(Svswr)	AUDIX	N/A	N/A	Apr.18,19	1 Year
2.	3#Chamber(SE)	AUDIX	N/A	N/A	May.17,18	3 Year
3.	Signal Analyzer	Rohde & Schwarz	FSV30	104050	Apr.14,19	1 Year
4.	Signal Analyzer	Rohde & Schwarz	FSV30	104050	Apr.11,20	1 Year
5.	Horn Antenna	EMCO	3115	9510-4580	Dec.13,18	3 Year
6.	Horn Antenna	ETC	MCTD 1209	DRH15F03007	Jun.17,19	1 Year
7.	Horn Antenna	ETS	3116	00060089	Dec.02,19	1 Year
8.	Amplifier	Agilent	83017A	MY53270084	Oct.13,19	1 Year
9.	RF Cable	Hubersuhner	SUCOFLEX-106	505238/6	Apr.13,19	1 Year
10.	RF Cable	Hubersuhner	SUCOFLEX-106	505238/6	Apr.11,20	1 Year
11.	Test Software	AUDIX	e3	6.2009-5-21a(n)	N/A	N/A
Note: N/A means Not applicable.						

4.2. Block Diagram of Test Setup

For frequency range 30MHz-1000MHz



For frequency range 1GHz-25GHz



4.3. Radiated Emission Limit Standard:

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000MHz	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark： (1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

(4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

4.4. EUT Configuration on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4.1. WiFi module (EUT)

Model Number : U9W42
Serial Number : N/A

4.5. Operating Condition of EUT

4.5.1. Setup the EUT and simulator as shown as Section 4.2.

4.5.2. Turn on the power of all equipments.

4.5.3. Let EUT work in BLE Tx mode.

4.6. Test Procedure

Frequency below 30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground for frequency 30MHz~1000MHz, 1.5 meter high above ground for frequency above 1GHz and put the absorbing with 2.4m(L)*2.4m(W)*0.3m(H) on the ground . The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it.EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna for frequency 30MHz~1000MHz, and the Horm antenna is used as receiving antenna for frequency above 1GHz. Both horizontal and vertical polarization of the antenna is set on Test. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10-2013 on radiated emission Test.

This test was performed with EUT in X, Y, Z position, and the worse case was found when EUT in X position as the test photo indicated.

The bandwidth of the EMI test receiver (R&S ESR7) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's RBW is set at 1MHz and VBW is set at 3MHz for peak emissions measurement above 1GHz.

This device is pulse Modulated, a duty cycle factor was used to calculated average level based measured peak level.

The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

4.7. Radiated Emission Test Results

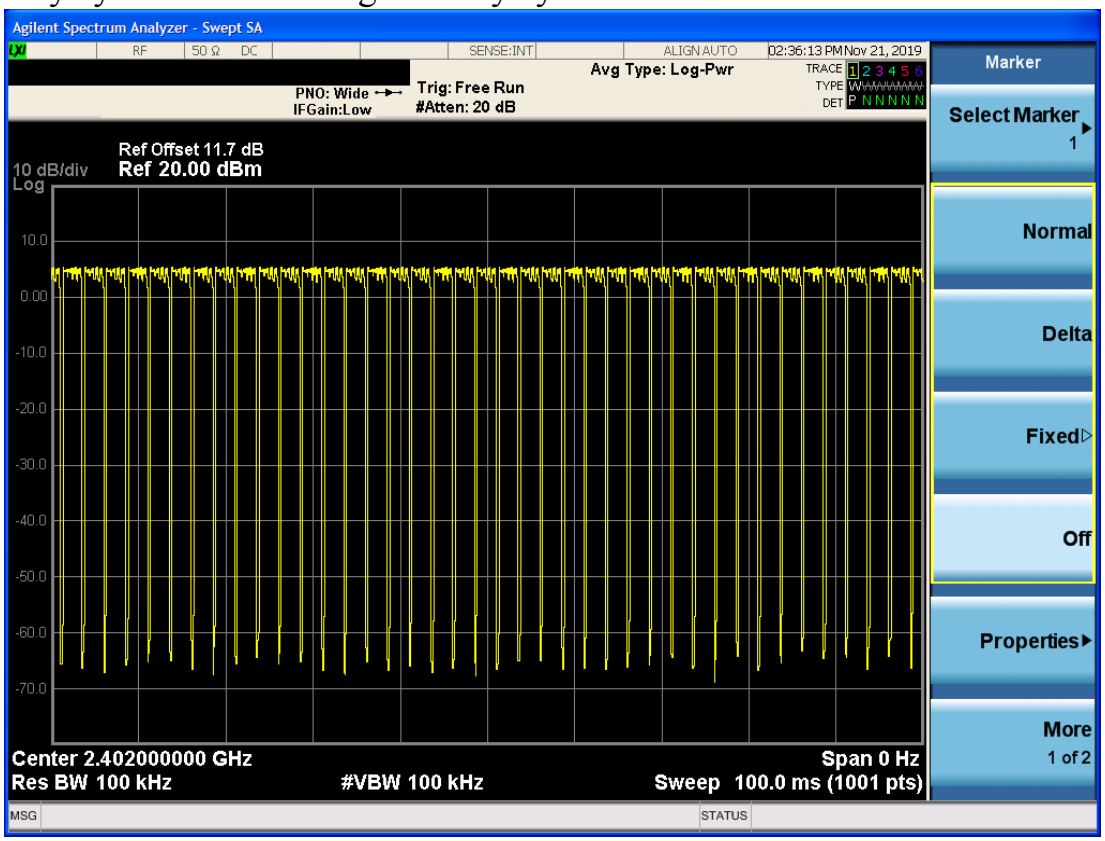
PASS.

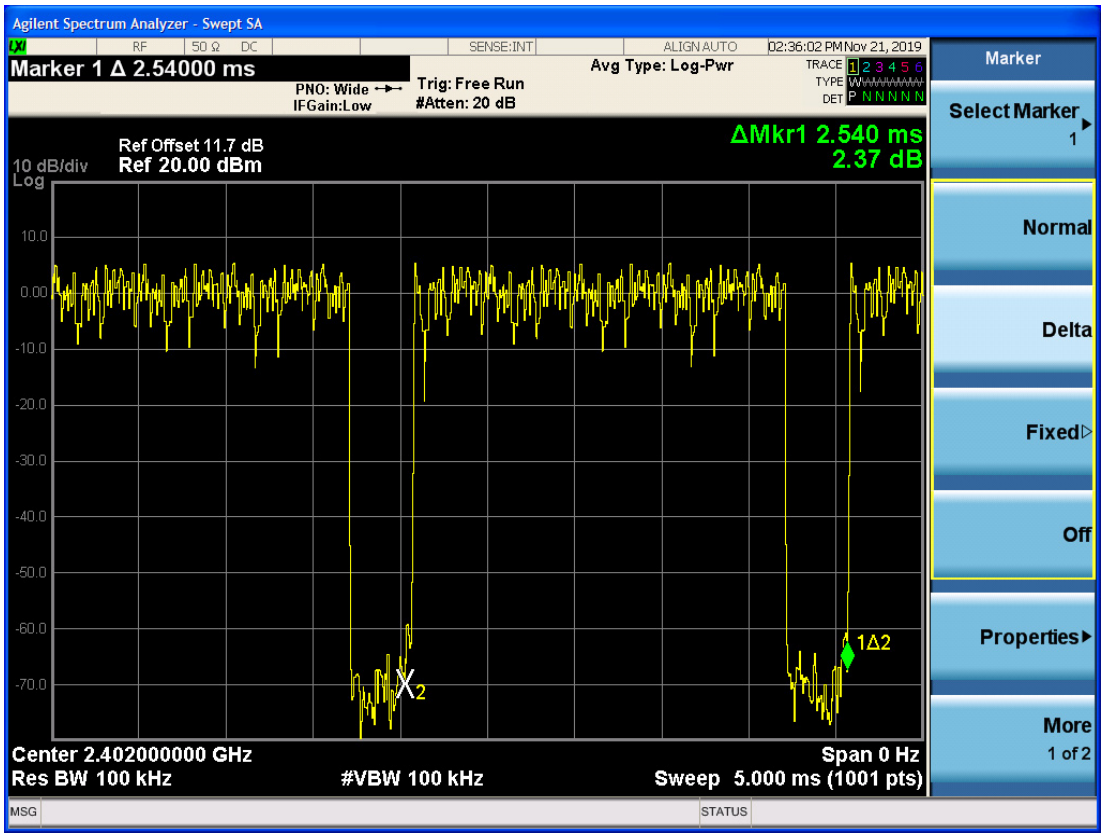
All the emissions from 30MHz to 25GHz were comply with the 15.209 Limit.

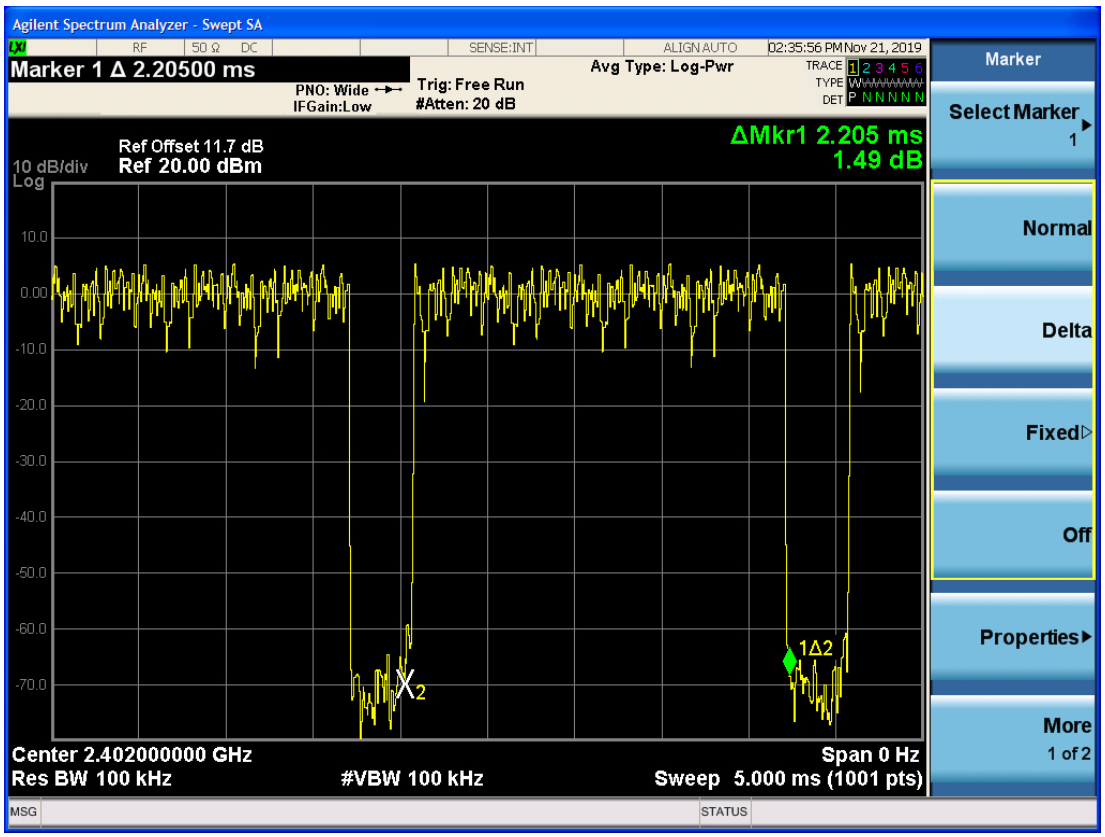
Note: The duty cycle factor for calculate average level is -1.229dB for Bluetooth V4.0, The duty cycle factor for calculate average level is -4.554dB for Bluetooth V5.0, and average limit is 20dB below peak limit, so if peak measured level comply with average limit, the average level was deemed to comply with average limit.

Bluetooth V4.0(1Mbps):

Duty cycle factor = 20log（1/duty cycle）=-1.229dB

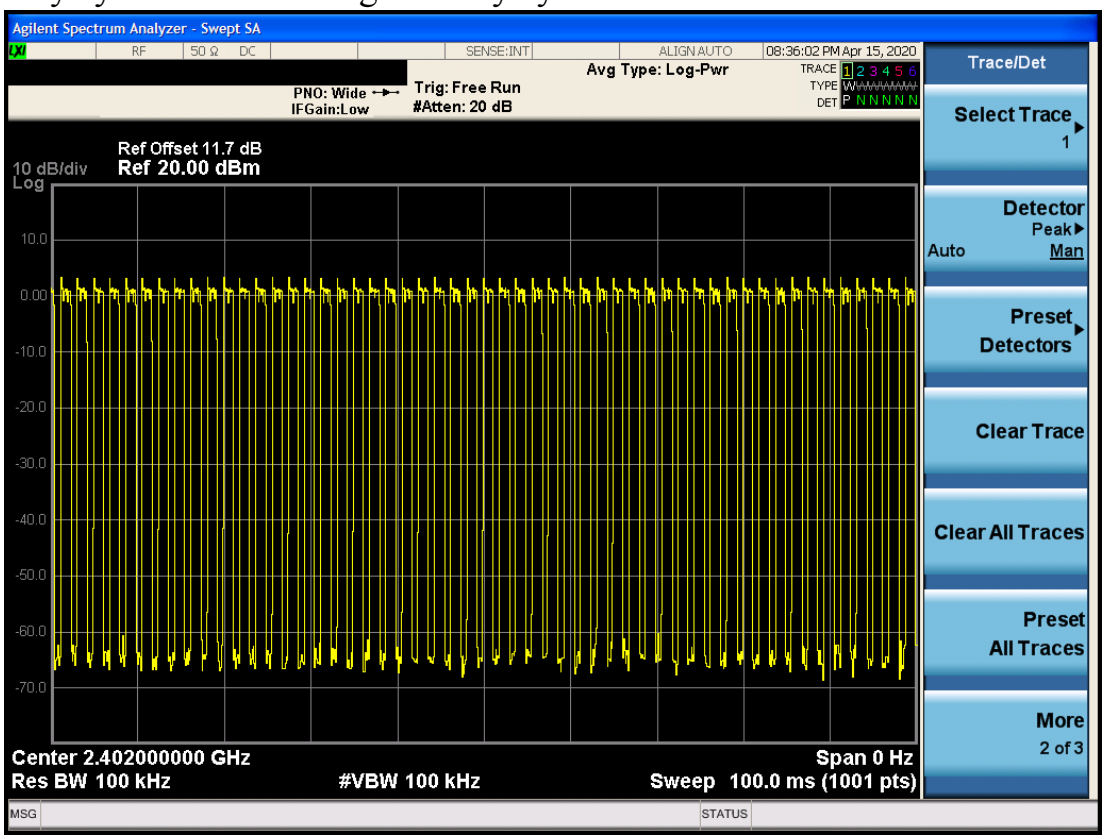


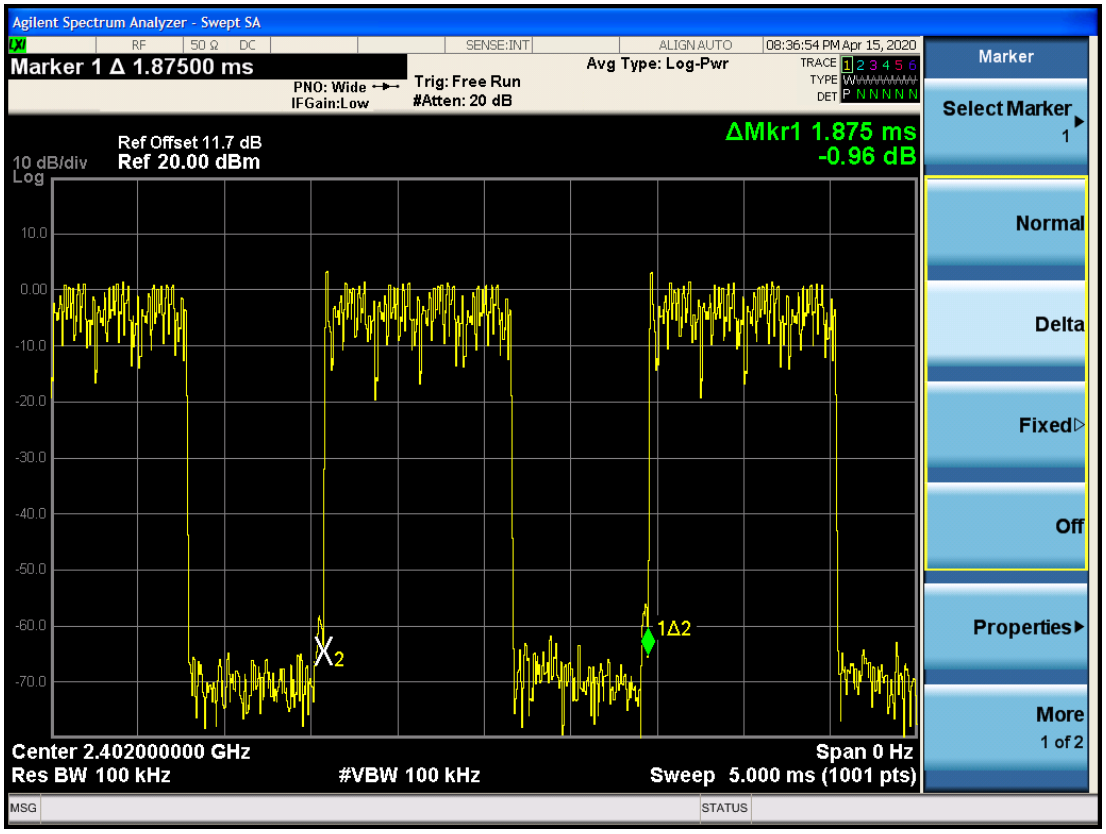


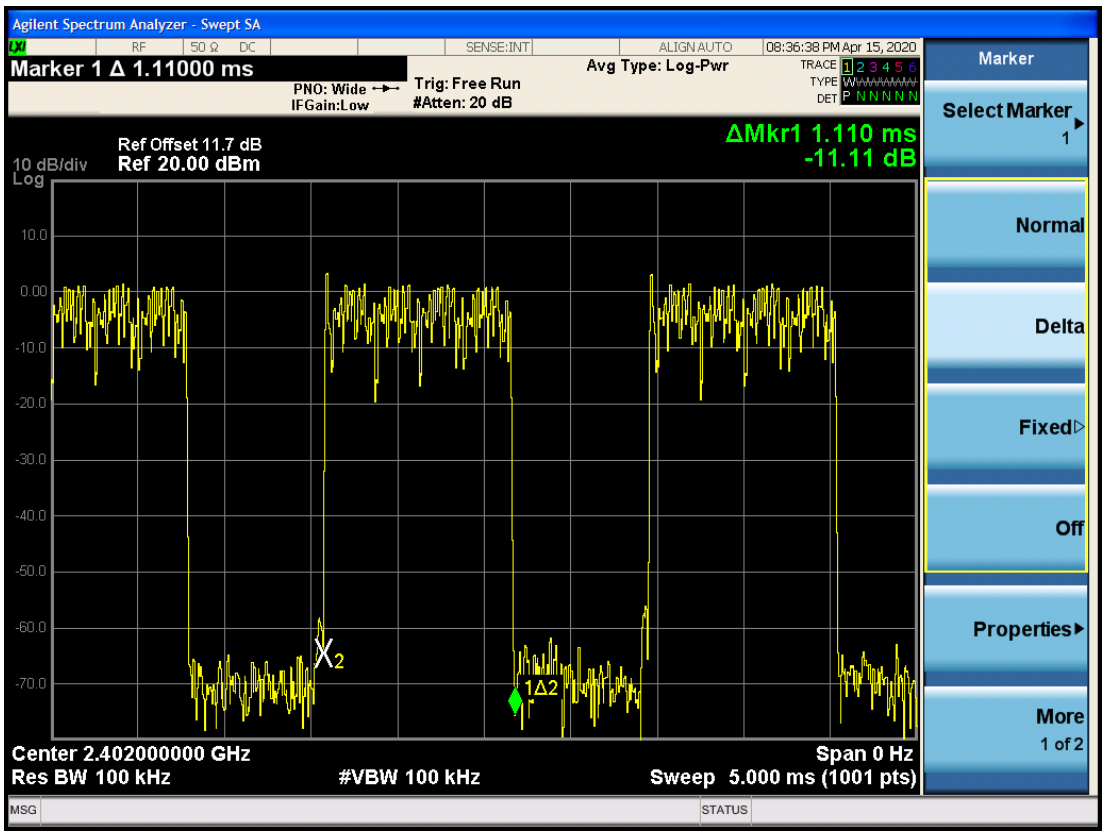

Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
02:35:56 PM Nov 21, 2019
Marker 1 Δ 2.20500 ms
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE
DET P N N N N N
Ref Offset 11.7 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr1 2.205 ms
1.49 dB
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1Δ2
Center 2.402000000 GHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
MSG
STATUS
Marker
Select Marker 1
Normal
Delta
Fixed
Off
Properties
More 1 of 2

Bluetooth V5.0(2Mbps):

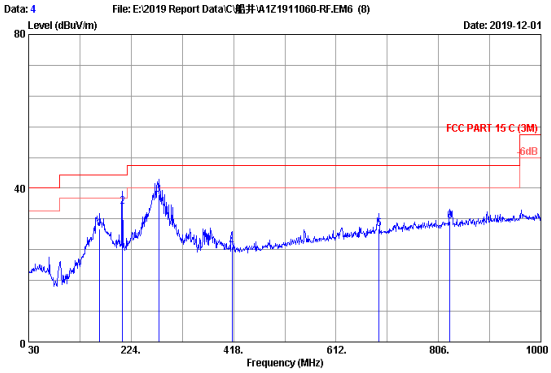
Duty cycle factor = 20log（1/duty cycle）=-4.554dB






Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
08:36:38 PM Apr 15, 2020
Marker 1 Δ 1.11000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET P N N N N N
Ref Offset 11.7 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr1 1.110 ms
-11.11 dB
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
X2
1Δ2
Center 2.402000000 GHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
Marker
Select Marker 1
Normal
Delta
Fixed
Off
Properties
More 1 of 2
MSG
STATUS

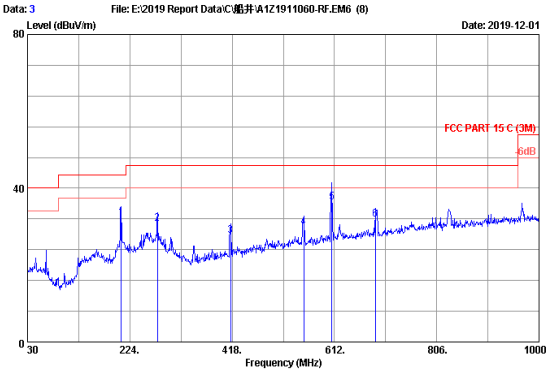
Frequency: 30MHz~1GHz
Bluetooth V4.0(1Mbps):



Site no. : 3m Chamber
Dis. / Ant. : 3m 2019 VULB9168-493
Limit : FCC PART 15 C (3M)
Env. / Ins. : 22.4°C/53%
Power rating : DC 3.3V
Test Mode : BT 4.0 TX
Data no. : 4
Ant. pol. : HORIZONTAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	164.830	19.50	1.29	8.55	29.34	43.50	14.16	QP
2	207.510	17.00	1.47	16.66	35.13	43.50	8.37	QP
3	276.380	19.24	1.72	17.36	38.32	46.00	7.68	QP
4	415.090	22.50	2.09	0.13	24.72	46.00	21.28	QP
5	693.480	27.00	2.86	-0.49	29.37	46.00	16.63	QP
6	827.340	28.64	3.23	-0.36	31.51	46.00	14.49	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

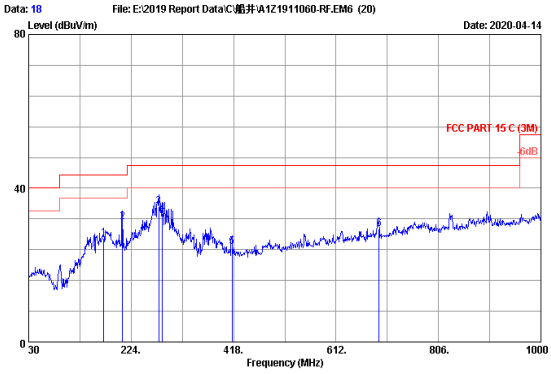


Site no. : 3m Chamber
Dis. / Ant. : 3m 2019 VULB9168-493
Limit : FCC PART 15 C (3M)
Env. / Ins. : 22.4°C/53%
Power rating : DC 3.3V
Test Mode : BT 4.0 TX
Data no. : 3
Ant. pol. : VERTICAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	207.510	17.00	1.47	13.83	32.30	43.50	11.20	QP
2	276.380	19.24	1.72	9.78	30.74	46.00	15.26	QP
3	415.090	22.50	2.09	3.10	27.69	46.00	18.31	QP
4	553.800	25.00	2.51	2.27	29.78	46.00	16.22	QP
5	607.150	25.88	2.67	7.86	36.41	46.00	9.59	QP
6	689.600	27.00	2.85	1.92	31.77	46.00	14.23	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

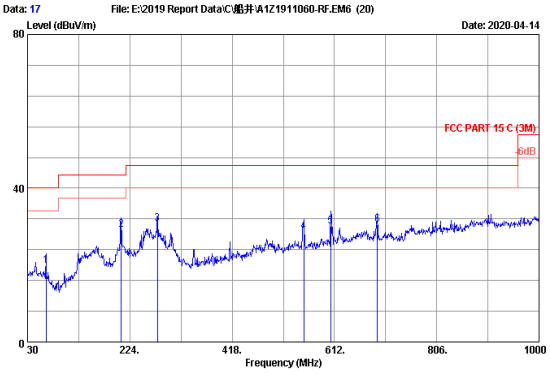
Bluetooth V5.0(2Mbps):



Site no. : 3m Chamber
Dis. / Ant. : 3m 2019 VULB9168-493
Limit : FCC PART 15 C (3M)
Env. / Ins. : 22.4°C/53%
Power rating : DC 3.3V
Test Mode : BLE-2M TX
Data no. : 18
Ant. pol. : HORIZONTAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	172.590	18.80	1.32	6.93	27.05	43.50	16.45	QP
2	207.510	17.00	1.47	12.66	31.13	43.50	12.37	QP
3	276.380	19.24	1.72	14.36	35.32	46.00	10.68	QP
4	283.170	19.46	1.75	12.17	33.38	46.00	12.62	QP
5	415.090	22.50	2.09	0.13	24.72	46.00	21.28	QP
6	693.480	27.00	2.86	-0.49	29.37	46.00	16.63	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

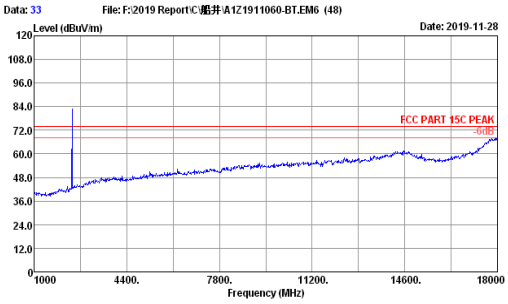


Site no. : 3m Chamber
Dis. / Ant. : 3m 2019 VULB9168-493
Limit : FCC PART 15 C (3M)
Env. / Ins. : 22.4°C/53%
Power rating : DC 3.3V
Test Mode : BLE-2M TX
Data no. : 17
Ant. pol. : VERTICAL
Engineer : Garry

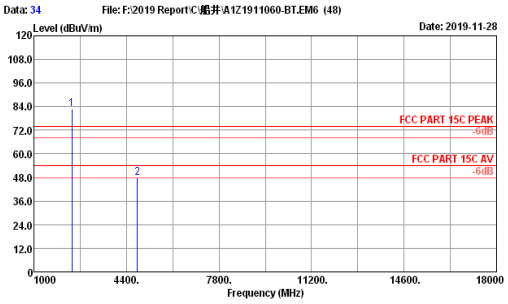
No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	64.920	19.00	0.76	0.16	19.92	40.00	20.08	QP
2	207.510	17.00	1.47	10.83	29.30	43.50	14.20	QP
3	276.380	19.24	1.72	9.78	30.74	46.00	15.26	QP
4	553.800	25.00	2.51	1.27	28.78	46.00	17.22	QP
5	605.210	25.80	2.67	1.61	30.08	46.00	15.92	QP
6	693.480	27.00	2.86	0.57	30.43	46.00	15.57	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Frequency: 1GHz~18GHz
Bluetooth V4.0(1Mbps):



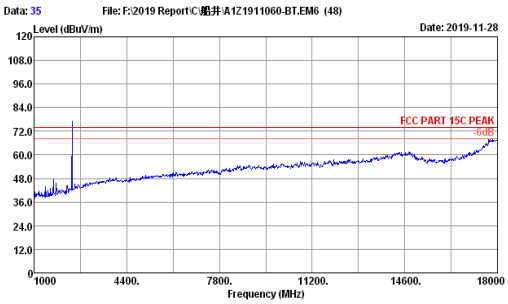
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode
Data no. : 33
Ant. pol. : HORIZONTAL
Engineer : Garry



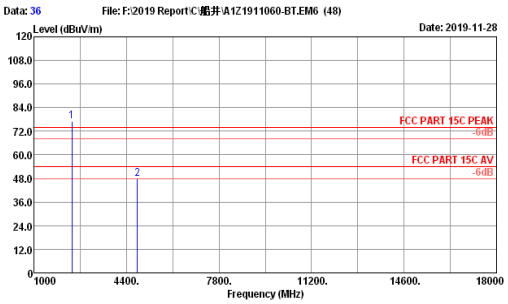
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode
Data no. : 34
Ant. pol. : HORIZONTAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.71	3.04	87.25	35.04	82.96	74.00	-8.96	Peak
2	4804.00	32.10	4.27	45.81	34.36	47.82	74.00	26.18	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



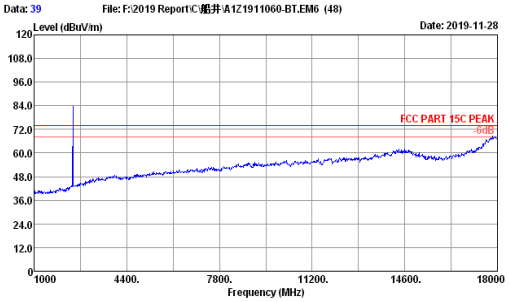
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode
Data no. : 35
Ant. pol. : VERTICAL
Engineer : Garry



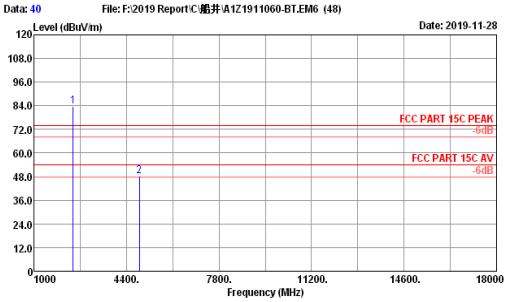
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode
Data no. : 36
Ant. pol. : VERTICAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.71	3.04	81.12	35.04	76.83	74.00	-2.83	Peak
2	4804.00	32.10	4.27	45.79	34.36	47.80	74.00	26.20	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



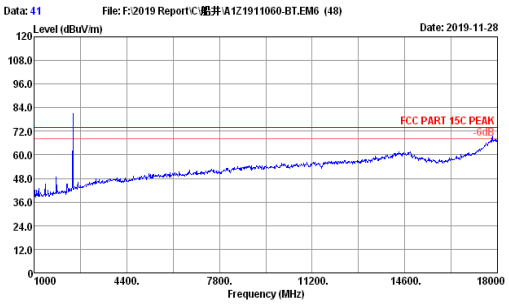
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2440MHz Tx Mode
Data no. : 39
Ant. pol. : HORIZONTAL
Engineer : Garry



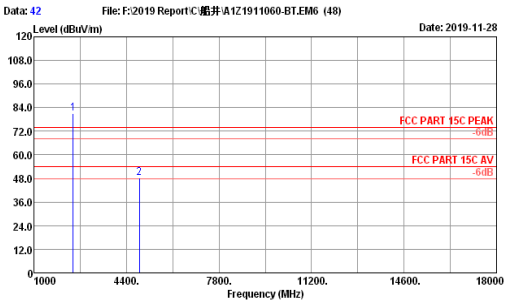
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2440MHz Tx Mode
Data no. : 40
Ant. pol. : HORIZONTAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.87	3.08	87.89	35.02	83.82	74.00	-9.82	Peak
2	4880.00	32.25	4.30	46.14	34.38	48.31	74.00	25.69	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



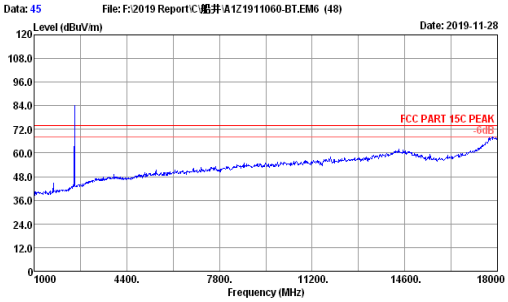
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2440MHz Tx Mode
Data no. : 41
Ant. pol. : VERTICAL
Engineer : Garry



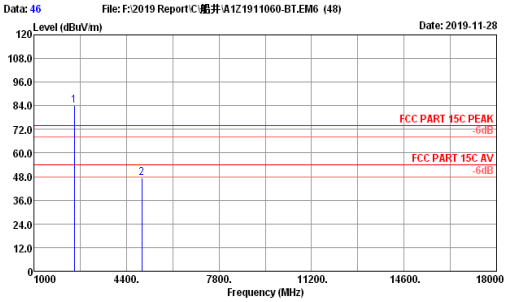
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2440MHz Tx Mode
Data no. : 42
Ant. pol. : VERTICAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.87	3.08	84.89	35.02	80.82	74.00	-6.82	Peak
2	4880.00	32.25	4.30	46.04	34.38	48.21	74.00	25.79	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



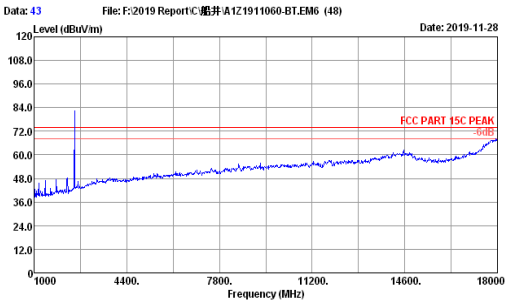
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode
Data no. : 45
Ant. pol. : HORIZONTAL
Engineer : Garry



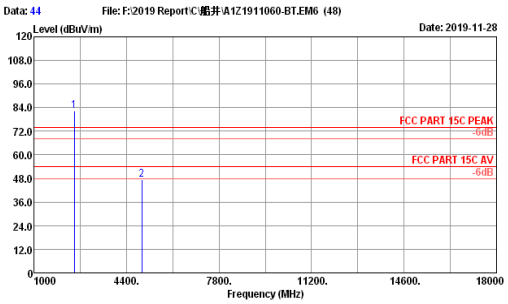
Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode
Data no. : 46
Ant. pol. : HORIZONTAL
Engineer : Garry

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.98	3.10	88.23	35.01	84.30	74.00	-10.30	Peak
2	4960.00	32.43	4.33	45.18	34.39	47.55	74.00	26.45	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode
Data no. : 43
Ant. pol. : VERTICAL
Engineer : Garry

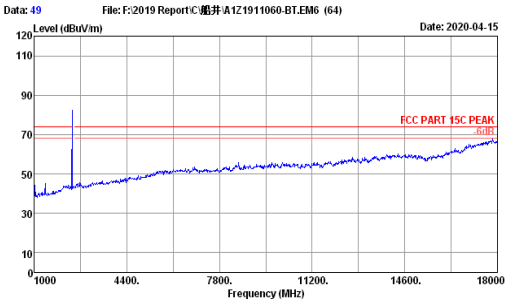


Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode
Data no. : 44
Ant. pol. : VERTICAL
Engineer : Garry

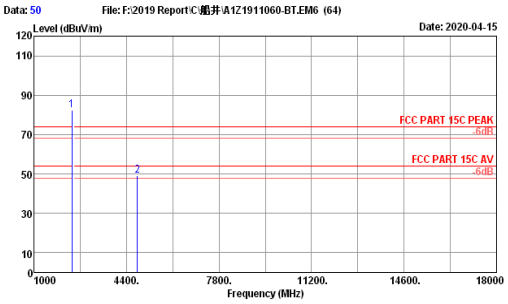
No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.98	3.10	86.51	35.01	82.58	74.00	-8.58	Peak
2	4960.00	32.43	4.33	44.88	34.39	47.25	74.00	26.75	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

Bluetooth V5.0(2Mbps):



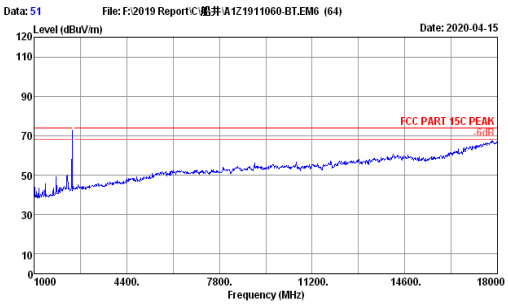
Site no. : 3m Chamber Data no. : 49
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode



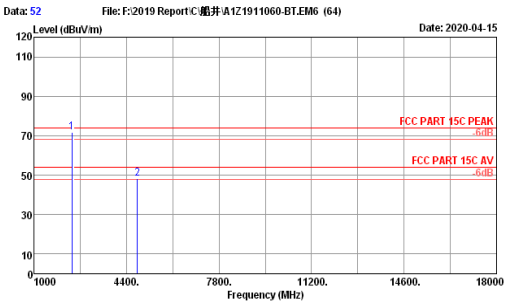
Site no. : 3m Chamber Data no. : 50
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	27.70	3.04	86.51	35.04	82.21	------	------	Peak
2	4804.000	31.70	4.27	47.67	34.36	49.28	74.00	24.72	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



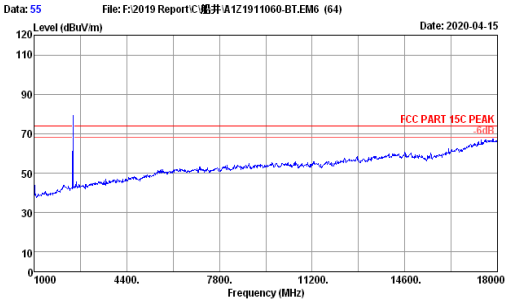
Site no. : 3m Chamber Data no. : 51
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode



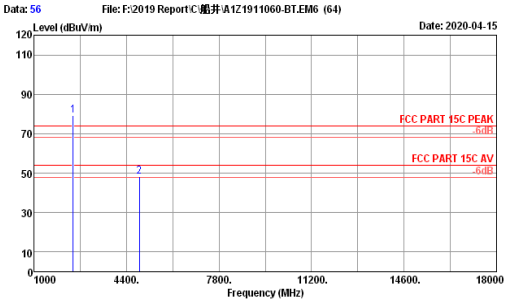
Site no. : 3m Chamber Data no. : 52
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	27.70	3.04	75.83	35.04	71.53	------	------	Peak
2	4804.000	31.70	4.27	46.74	34.36	48.35	74.00	25.65	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



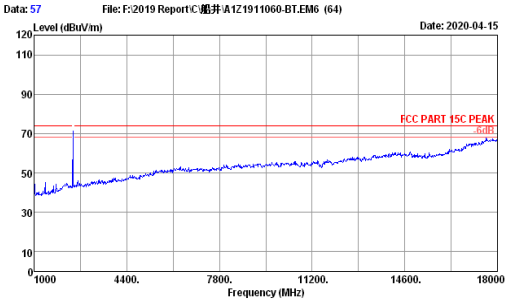
Site no. : 3m Chamber Data no. : 55
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2440MHz Tx Mode



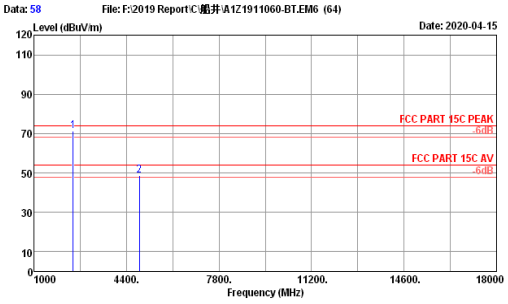
Site no. : 3m Chamber Data no. : 56
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2440MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.000	27.90	3.08	83.30	35.02	79.26	------	------	Peak
2	4880.000	32.02	4.30	46.33	34.38	48.27	74.00	25.73	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 57
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2440MHz Tx Mode

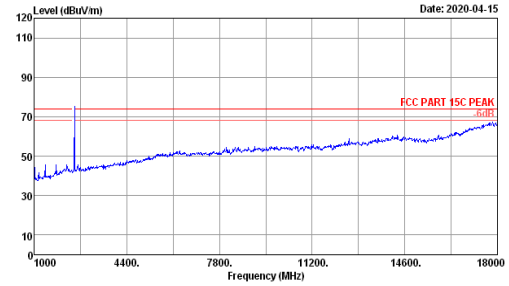


Site no. : 3m Chamber Data no. : 58
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2440MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.000	27.90	3.08	75.46	35.02	71.42	------	------	Peak
2	4880.000	32.02	4.30	46.86	34.38	48.80	74.00	25.20	Peak

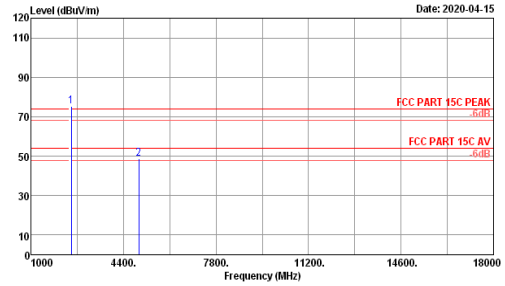
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

Data: 59 File: F:\2019 Report\C\船井\A1Z1911060-BT.EM6 (64)



Site no. : 3m Chamber Data no. : 59
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

Data: 60 File: F:\2019 Report\C\船井\A1Z1911060-BT.EM6 (64)

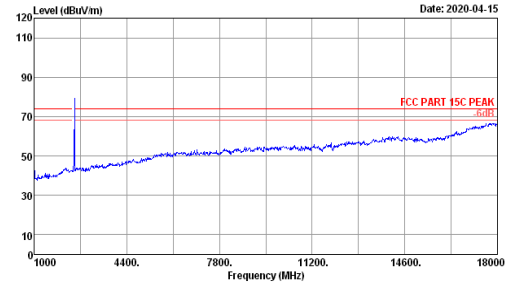


Site no. : 3m Chamber Data no. : 60
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.03	3.10	79.16	35.01	75.28	------	------	Peak
2	4960.000	32.70	4.33	45.87	34.39	48.51	74.00	25.49	Peak

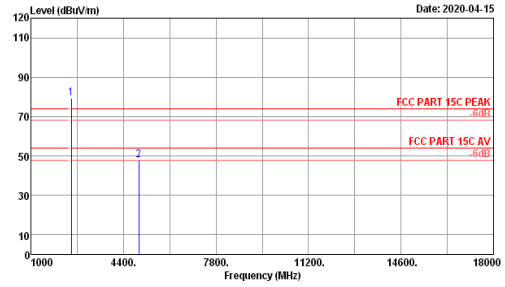
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

Data: 61 File: F:\2019 Report\C\船井\A1Z1911060-BT.EM6 (64)



Site no. : 3m Chamber Data no. : 61
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

Data: 62 File: F:\2019 Report\C\船井\A1Z1911060-BT.EM6 (64)



Site no. : 3m Chamber Data no. : 62
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.03	3.10	83.32	35.01	79.44	------	------	Peak
2	4960.000	32.70	4.33	45.17	34.39	47.81	74.00	26.19	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

5. CONDUCTED SPURIOUS EMISSIONS

5.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
3.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

5.2. Block Diagram of Test Setup

Please reference to section 2.4.

5.3. Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

5.4. Test Procedure

Use the test method descried in ANSI C63.10:
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions With peak detector.

5.5. Test result

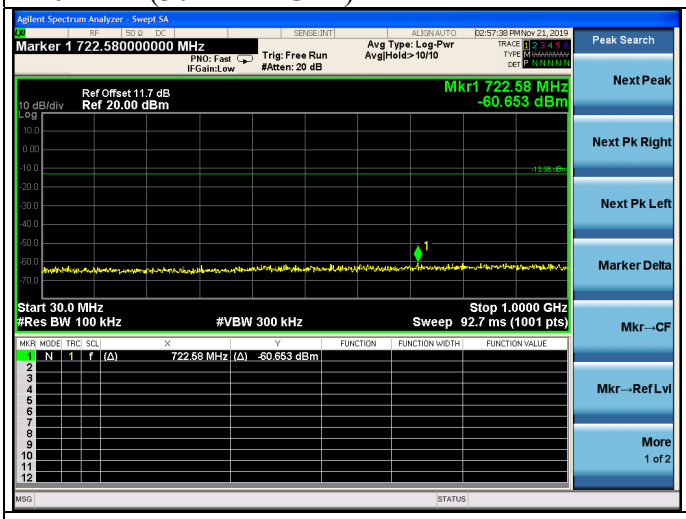
PASS (The testing data was attached in the next pages.)

EUT: WiFi module		
M/N: U9W42		
Test date: 2019-11-21 &2020-04-15	Pressure: 102.1±1.0 kpa	Humidity: 51.1±3.0%
Tested by: Garry	Test site: RF site	Temperature:22.8±0.6 ℃

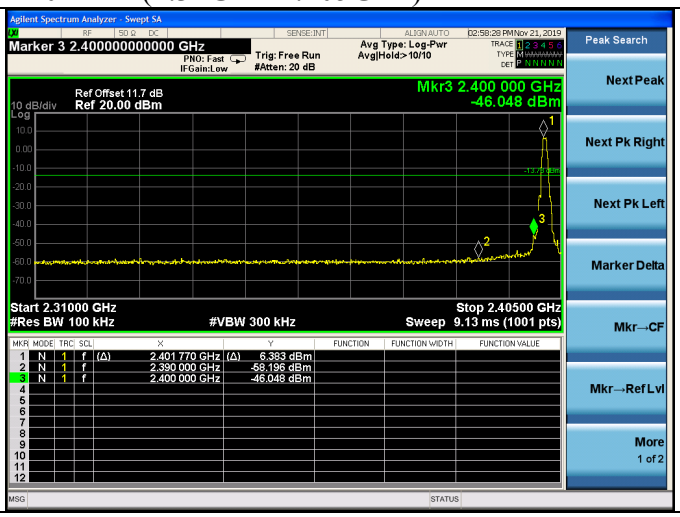
Bluetooth V4.0(1Mbps):

GFSK

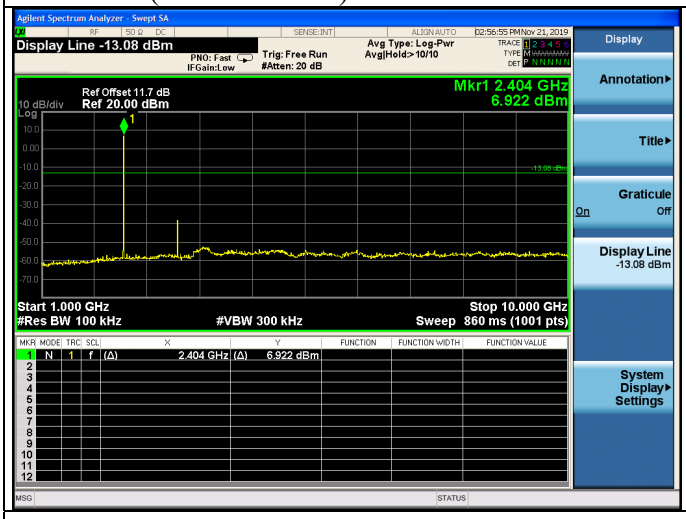
2402MHz(30MHz-1GHz)



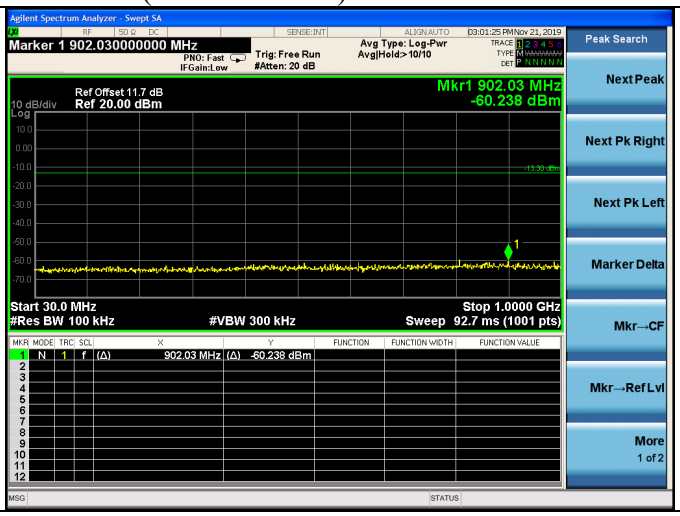
2402MHz(2.31GHz-2.405GHz)



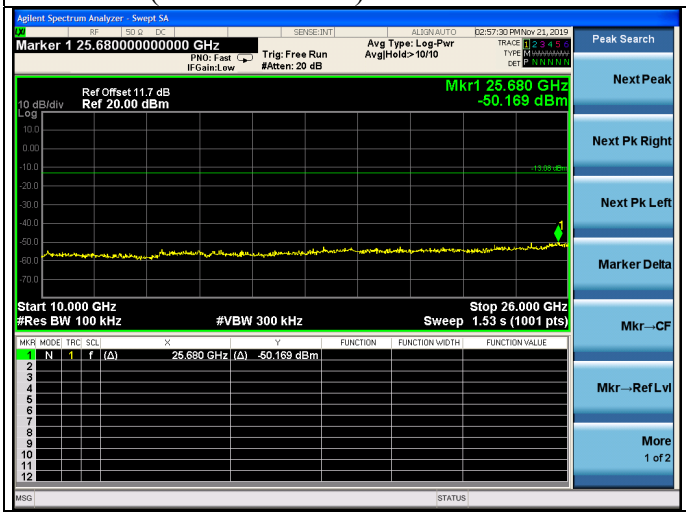
2402MHz(1GHz-10GHz)



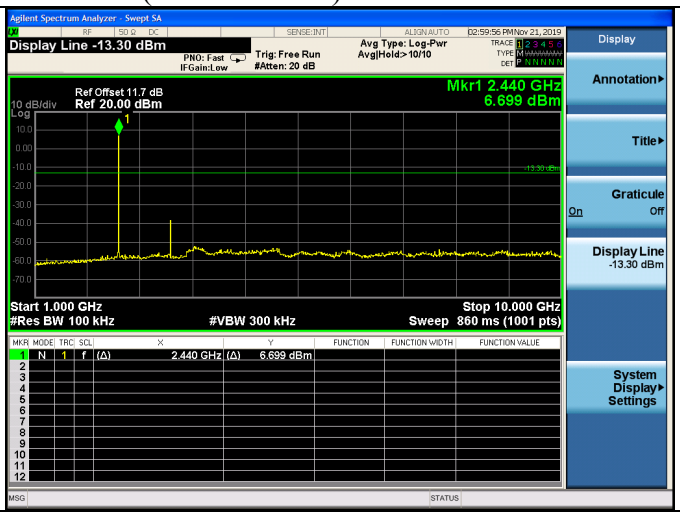
2440MHz(30MHz-1GHz)



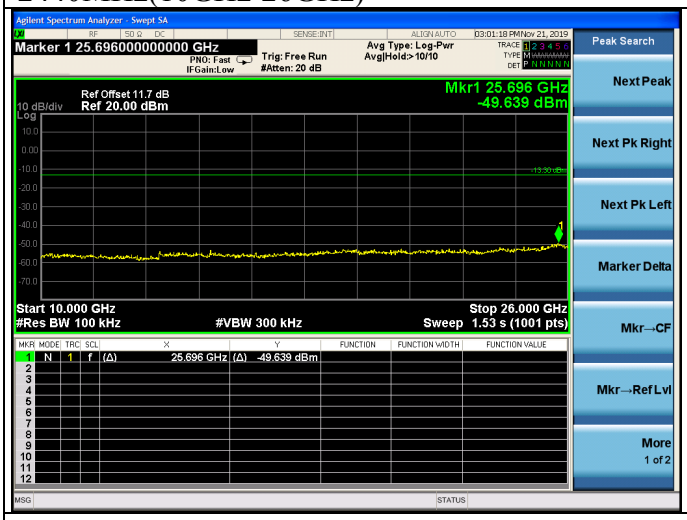
2402MHz(10GHz-26GHz)



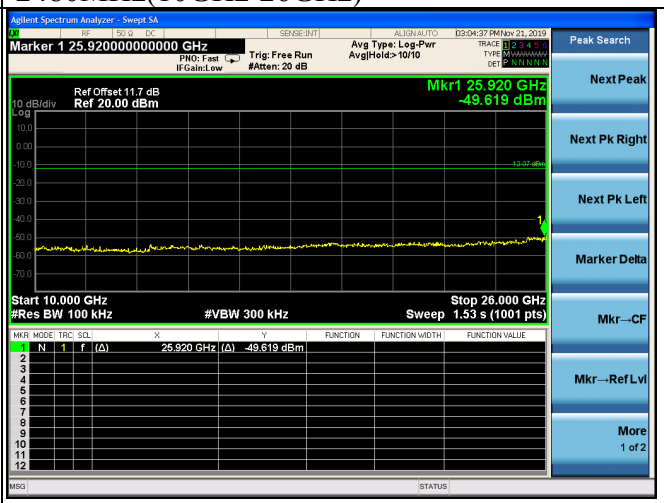
2440MHz(1GHz-10GHz)



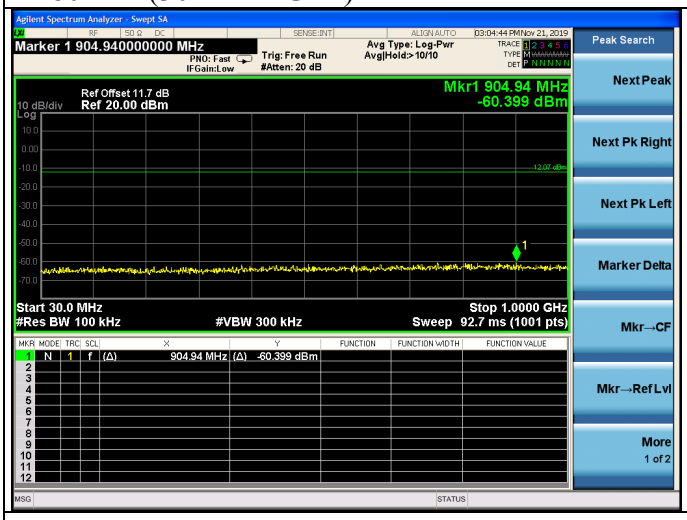
2440MHz(10GHz-26GHz)



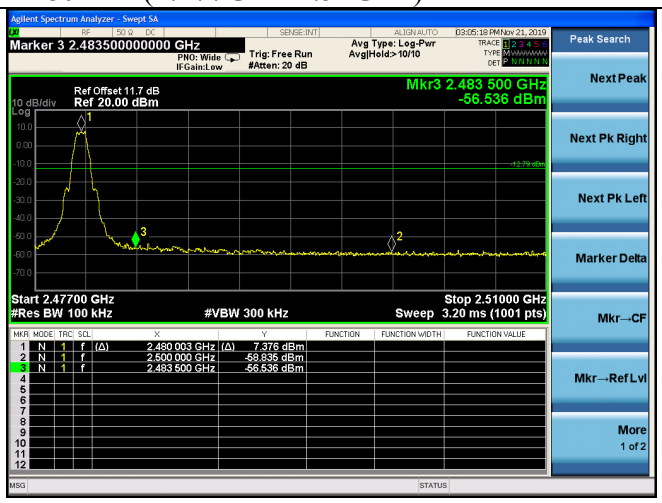
2480MHz(10GHz-26GHz)



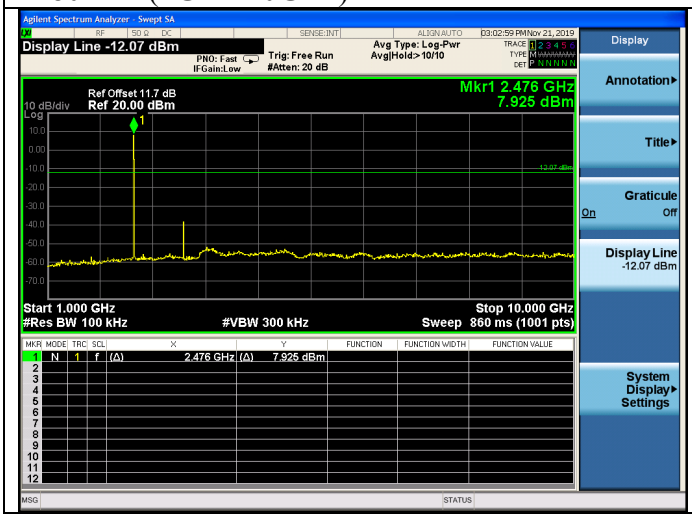
2480MHz(30MHz-1GHz)



2480MHz(2.477GHz-2.51GHz)



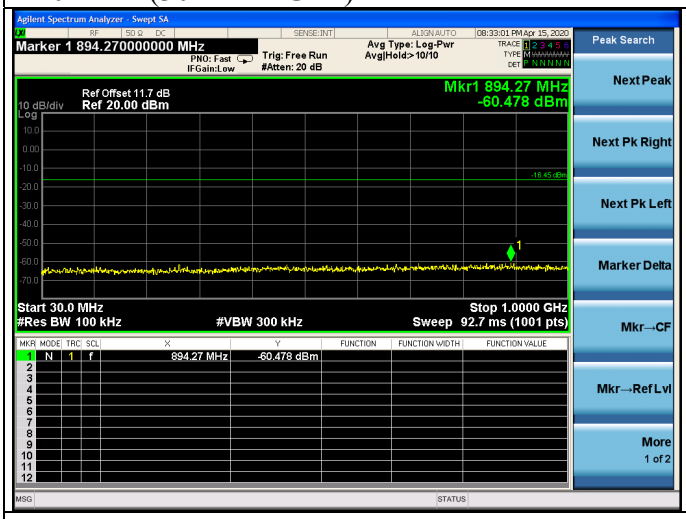
2480MHz(1GHz-10GHz)



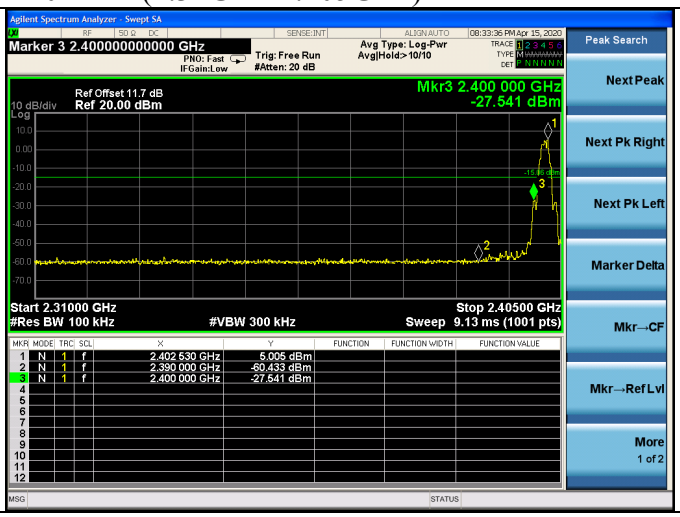
Bluetooth V5.0(2Mbps):

GFSK

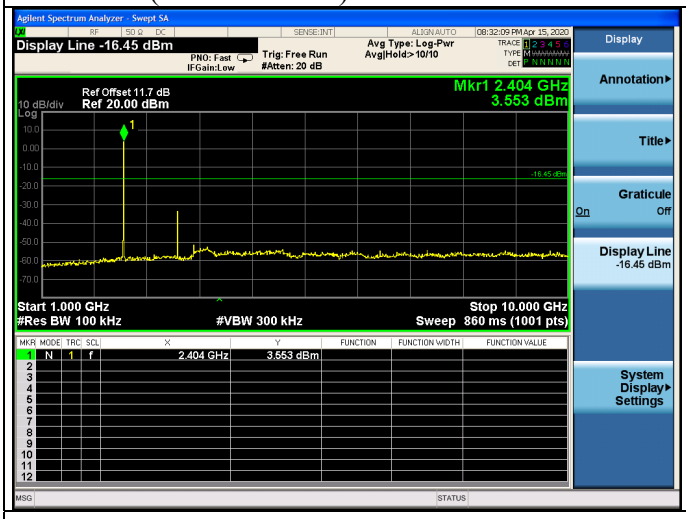
2402MHz(30MHz-1GHz)



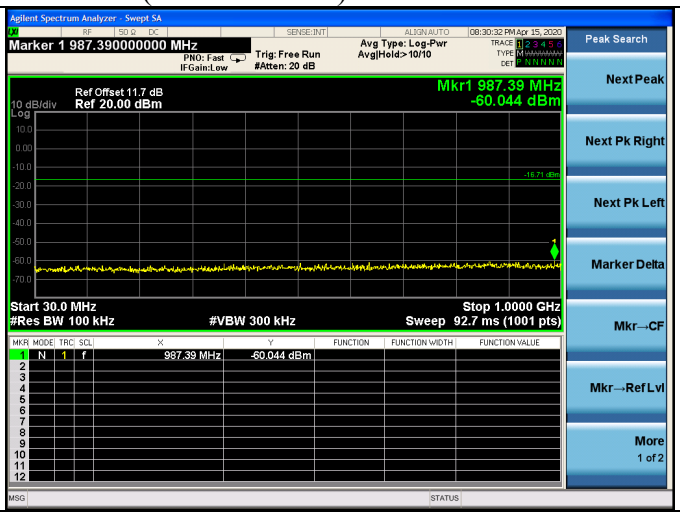
2402MHz(2.31GHz-2.405GHz)



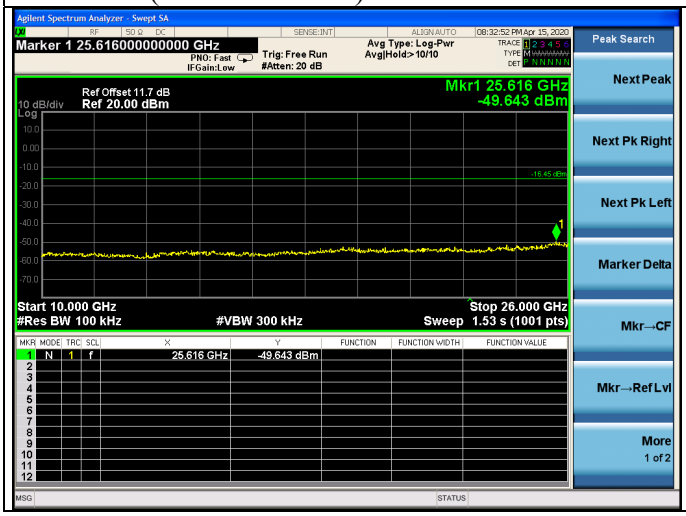
2402MHz(1GHz-10GHz)



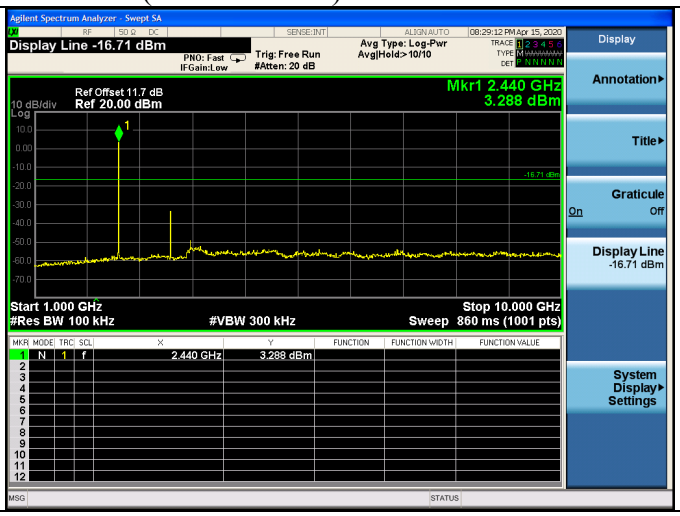
2440MHz(30MHz-1GHz)



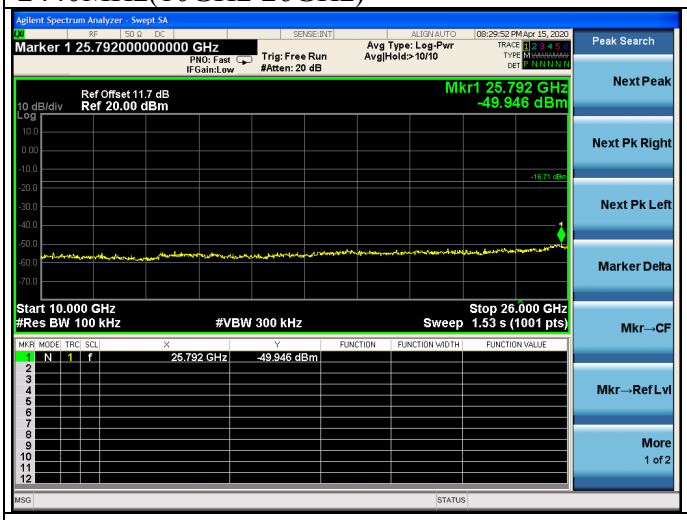
2402MHz(10GHz-26GHz)



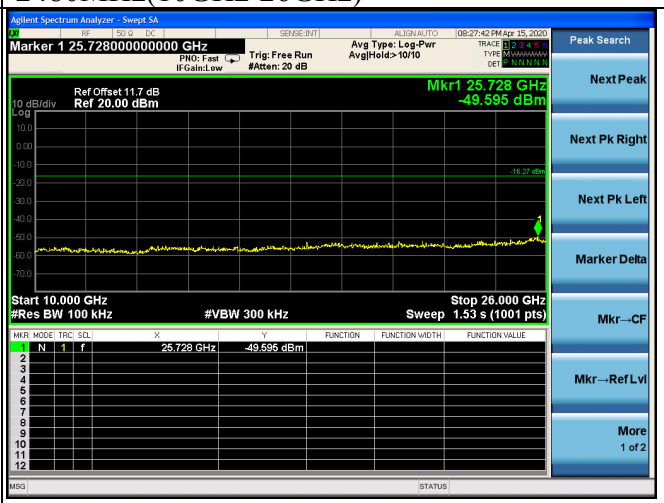
2440MHz(1GHz-10GHz)



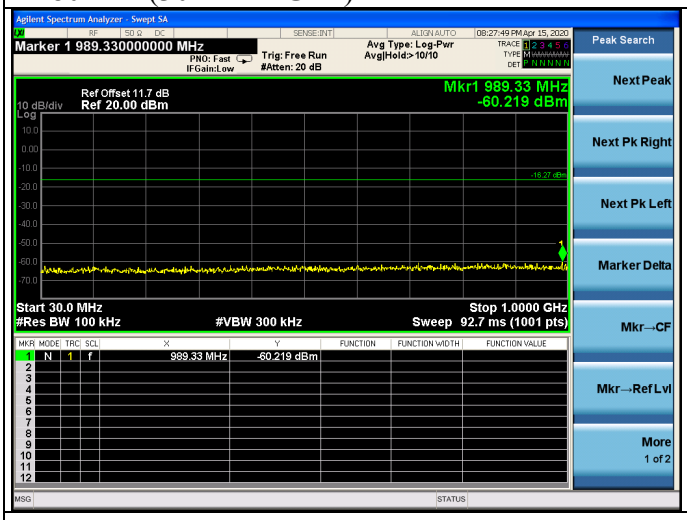
2440MHz(10GHz-26GHz)



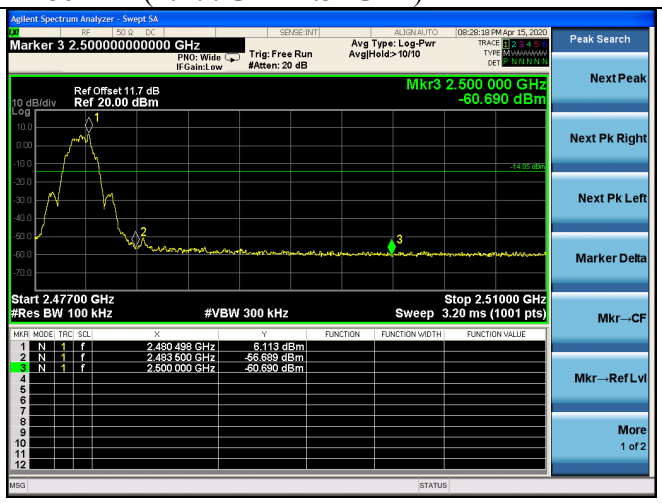
2480MHz(10GHz-26GHz)



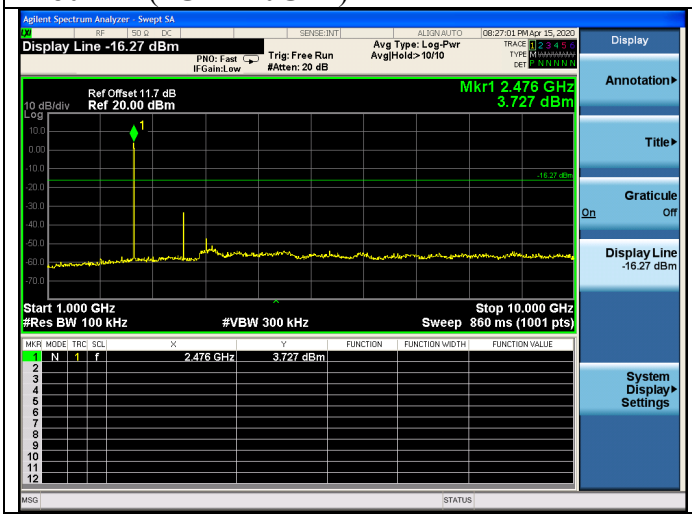
2480MHz(30MHz-1GHz)



2480MHz(2.477GHz-2.51GHz)



2480MHz(1GHz-10GHz)



6. 6DB BANDWIDTH TEST

6.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
3.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

6.2. Block Diagram of Test Setup

Please reference to section 2.4.

6.3. Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

6.4. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.8.2:
The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

6.5. Test Results

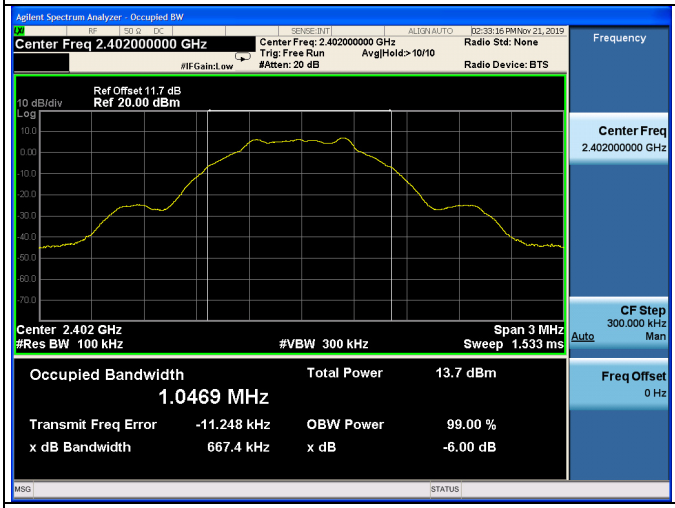
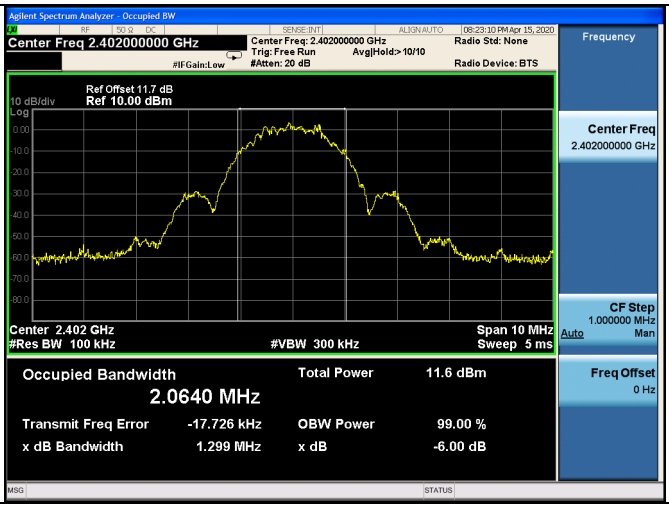
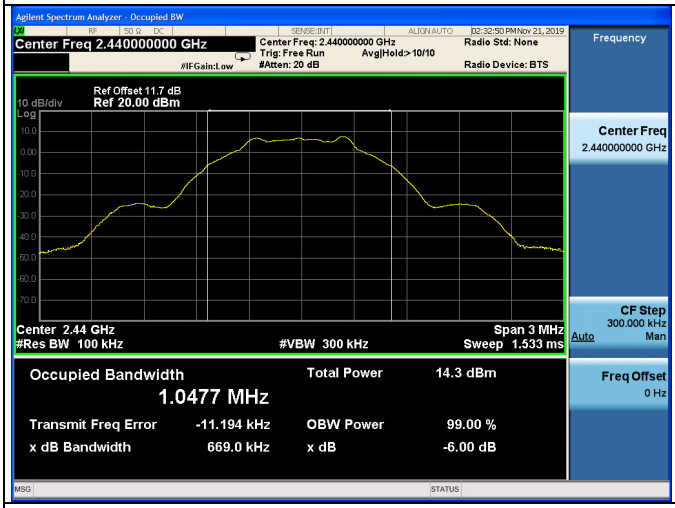
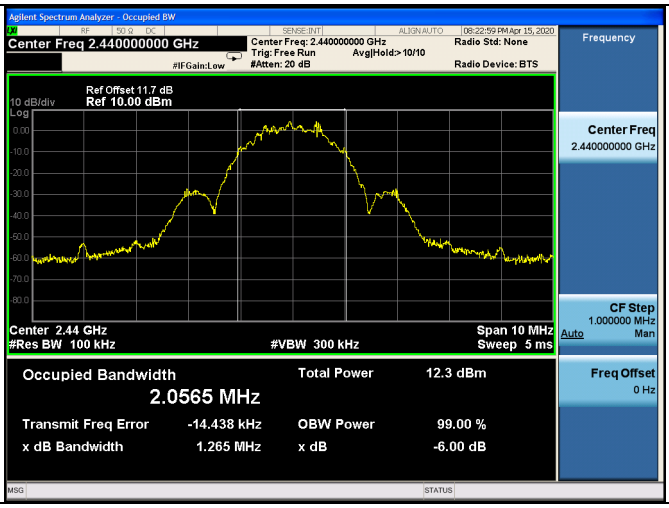
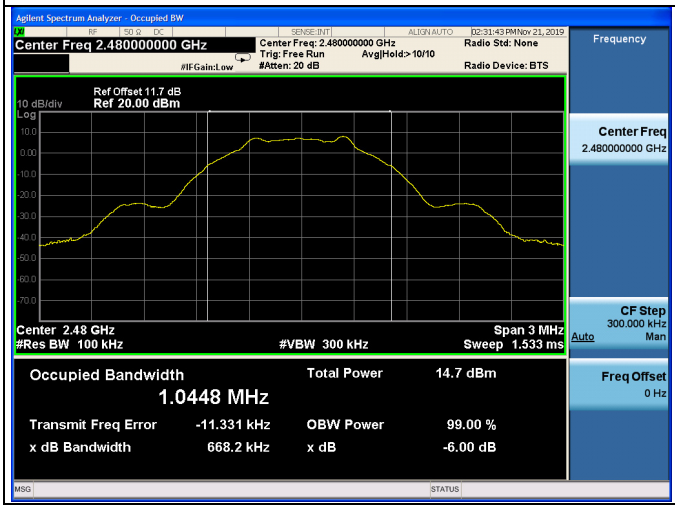
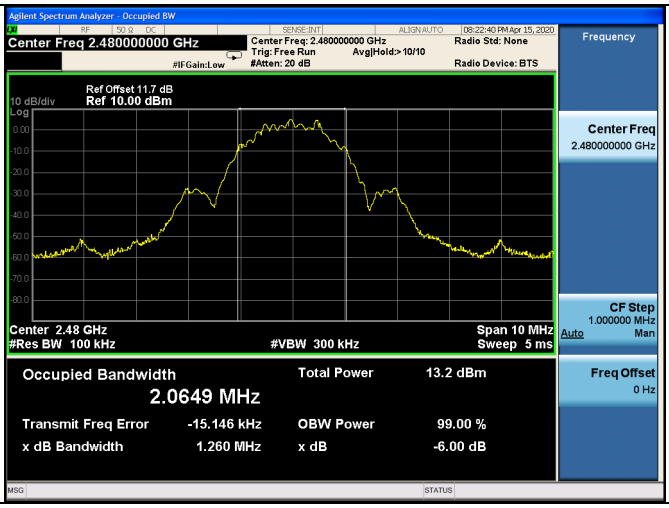
EUT: WiFi module		
M/N: U9W42		
Test date: 2019-11-21 &2020-04-15	Pressure: 102.3±1.0 kpa	Humidity: 53.6±3.0%
Tested by: Garry	Test site: RF site	Temperature: 25.5±0.6℃

Bluetooth V4.0(1Mbps):

Test Mode	Frequency (MHz)	6 dB bandwidth (kHz)	Limit (KHz)
GFSK	2402	667.4	⩾500
	2440	669.0	⩾500
	2480	668.2	⩾500
Conclusion：PASS			

Bluetooth V5.0(2Mbps):

Test Mode	Frequency (MHz)	6 dB bandwidth (MHz)	Limit (KHz)
GFSK	2402	1.299	⩾500
	2440	1.265	⩾500
	2480	1.260	⩾500
Conclusion：PASS			

Bluetooth V4.0(1Mbps):	Bluetooth V5.0(2Mbps):
2402MHz	2402MHz
	
2440MHz	2440MHz
	
2480MHz	2480MHz
	

7. MAXIMUM PEAK OUTPUT POWER TEST

7.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Power meter	HP	436A	2016A07891	Oct.13,19	1 Year
3.	Power sensor	Agilent	8482B	MY41090514	Oct.13,19	1 Year
4.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
5.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

7.2. Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm).

7.3. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.9.1.3:
Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power.

7.4. Test Results

EUT: WiFi module		
M/N: U9W42		
Test date: 2019-11-21 &2020-04-14	Pressure: 102.3±1.0 kpa	Humidity: 53.6±3.0%
Tested by: Garry	Test site: RF site	Temperature: 25.5±0.6℃

Bluetooth V4.0(1Mbps):

Test Mode	Frequency (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	7.180	30
	2440	7.804	30
	2480	8.188	30
Conclusion: PASS			

Bluetooth V5.0(2Mbps):

Test Mode	Frequency (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	6.208	30
	2440	6.784	30
	2480	7.186	30
Conclusion: PASS			

8. BAND EDGE COMPLIANCE TEST

8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Amplifier	Agilent	8449B	3008A02495	Apr.23,19	1 Year
3.	Horn Antenna	EMCO	3115	9510-4580	Dec.13,18	3 Year
4.	Horn Antenna	ETC	MCTD 1209	DRH15F03007	Jun.17,19	1 Year
5.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

8.2. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.3. Test Produce

Use the test method descried in ANSI C63.10 clause 6.10:

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz）from the band-edge use below produce:

1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

   For emissions above two bandwidths away from the band-edge use below produce:

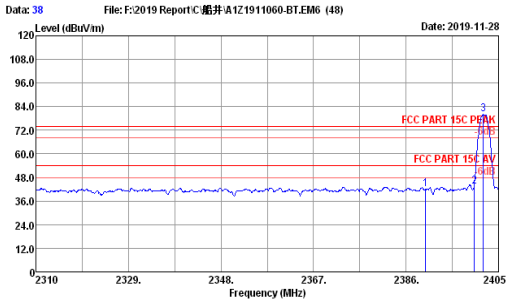
   1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
   2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
   3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
   4. Set the spectrum analyzer in the following setting in order to capture the lower and upperband-edges of the emission:
      (a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO
      (b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

8.4. Test Results

Pass (The testing data was attached in the next pages.)

Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

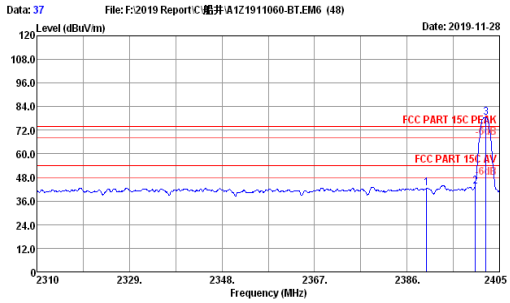
Bluetooth V4.0(1Mbps):



Site no. : 3m Chamber Data no. : 38
Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.71	3.04	46.18	35.04	41.89	74.00	32.11	Peak
2	2400.00	27.71	3.04	47.72	35.04	43.43	74.00	30.57	Peak
3	2401.87	27.71	3.04	84.24	35.04	79.95	74.00	-5.95	Peak

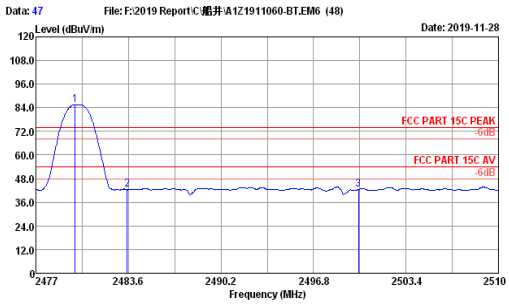
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 37
Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.71	3.04	46.69	35.04	42.40	74.00	31.60	Peak
2	2400.00	27.71	3.04	47.55	35.04	43.26	74.00	30.74	Peak
3	2402.25	27.71	3.04	82.71	35.04	78.42	74.00	-4.42	Peak

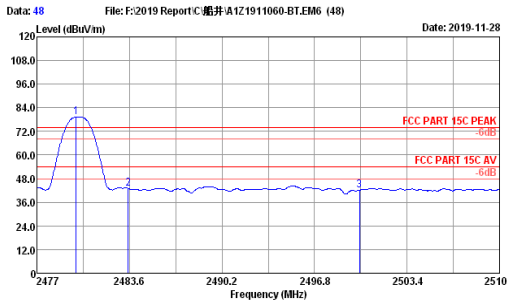
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 47
Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.81	27.98	3.10	89.42	35.01	85.49	74.00	-11.49	Peak
2	2483.50	27.98	3.10	46.30	35.01	42.37	74.00	31.63	Peak
3	2500.00	28.03	3.11	46.37	35.00	42.51	74.00	31.49	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

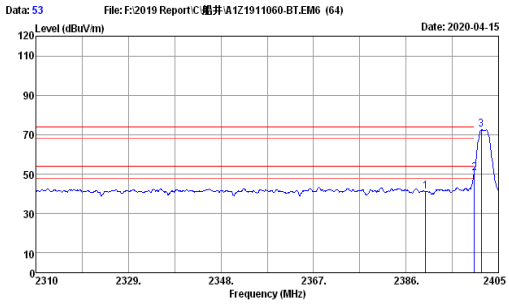


Site no. : 3m Chamber Data no. : 48
Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.81	27.98	3.10	83.14	35.01	79.21	74.00	-5.21	Peak
2	2483.50	27.98	3.10	46.99	35.01	43.06	74.00	30.94	Peak
3	2500.00	28.03	3.11	45.85	35.00	41.99	74.00	32.01	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

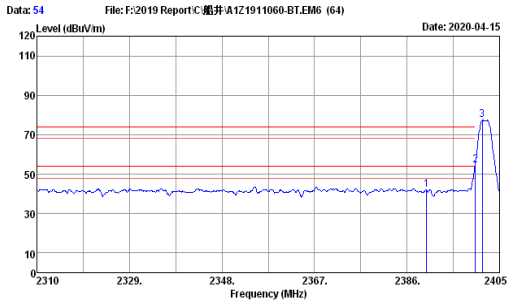
Bluetooth V5.0(2Mbps):



Site no. : 3m Chamber Data no. : 53
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	27.70	3.04	45.48	35.04	41.18	74.00	32.82	Peak
2	2400.000	27.70	3.04	54.89	35.04	50.59	74.00	23.41	Peak
3	2401.485	27.70	3.04	76.84	35.04	72.54	------	------	Peak

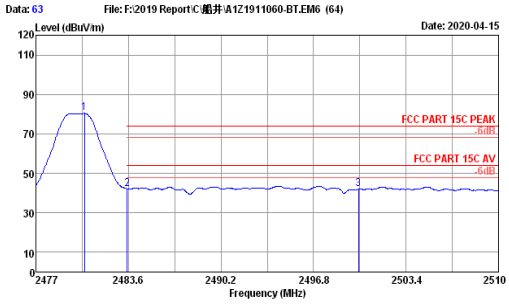
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 54
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2402MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	27.70	3.04	46.17	35.04	41.87	74.00	32.13	Peak
2	2400.000	27.70	3.04	58.92	35.04	54.62	74.00	19.38	Peak
3	2401.485	27.70	3.04	81.69	35.04	77.39	------	------	Peak

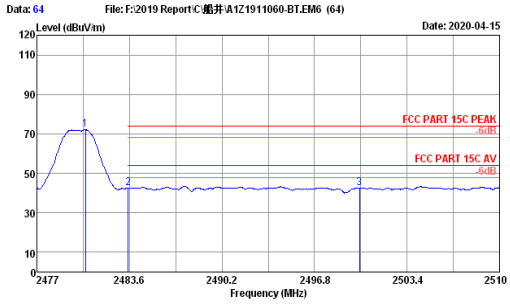
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 63
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.465	28.03	3.10	84.29	35.01	80.41	------	------	Peak
2	2483.500	28.03	3.10	45.95	35.01	42.07	74.00	31.93	Peak
3	2500.000	28.10	3.11	45.71	35.00	41.92	74.00	32.08	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 64
Dis. / Ant. : 3m 2019 MCTD1209-3007 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4°C/52.9% Engineer : Garry
Power rating : DC 3.3V
Test Mode : BLE-2M GFSK 2480MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.465	28.03	3.10	75.92	35.01	72.04	------	------	Peak
2	2483.500	28.03	3.10	46.28	35.01	42.40	74.00	31.60	Peak
3	2500.000	28.10	3.11	46.26	35.00	42.47	74.00	31.53	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

9. POWER SPECTRAL DENSITY TEST

9.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
3.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

9.2. Block Diagram of Test Setup

Please reference to section 2.4.

9.3. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

9.4. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.10.2:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

9.5. Test Results

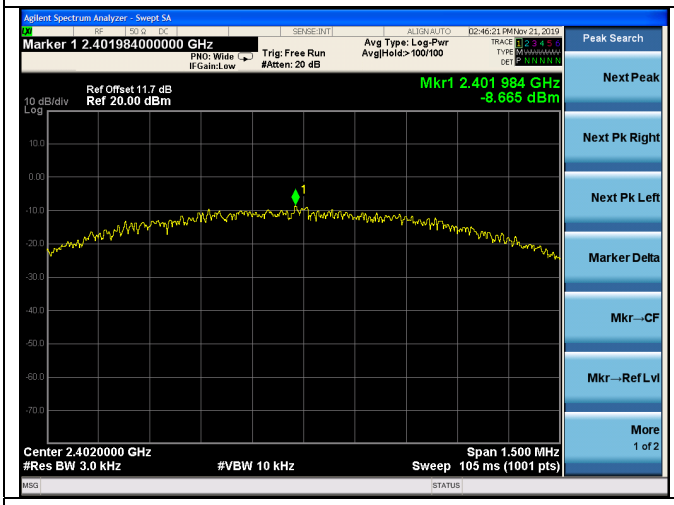
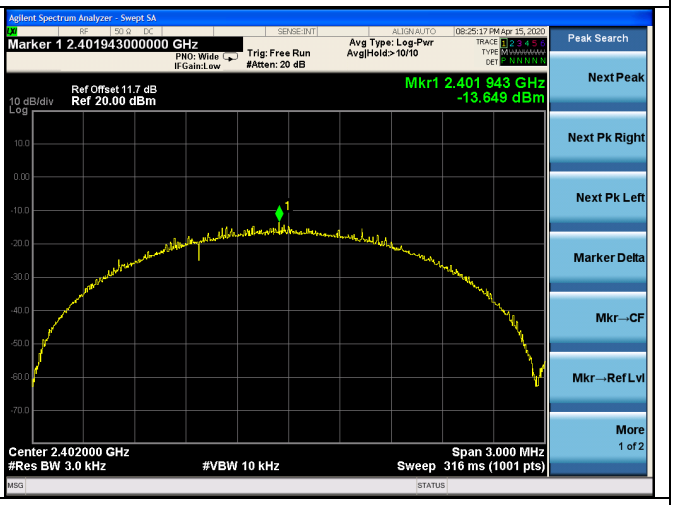
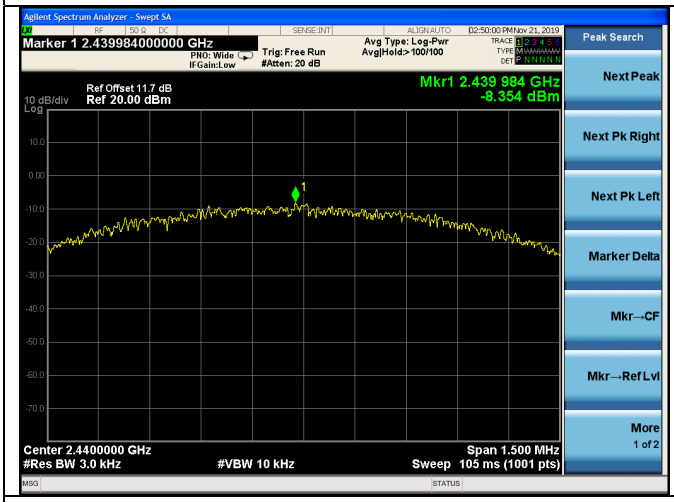
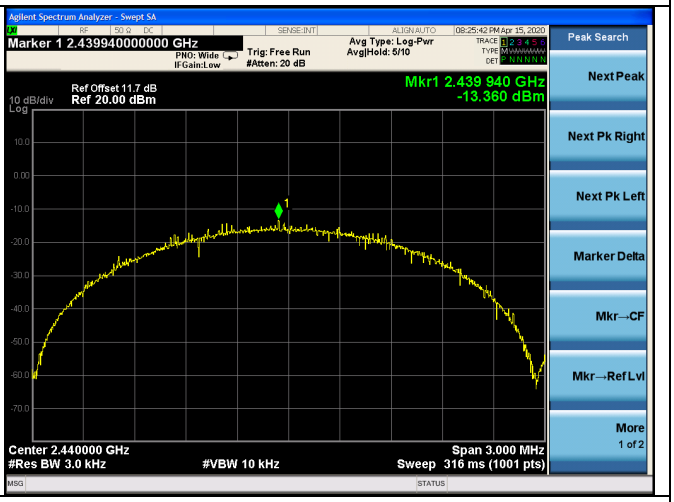
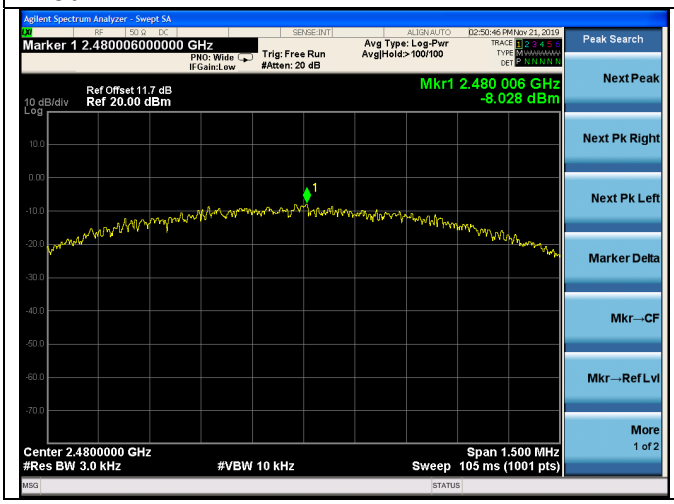
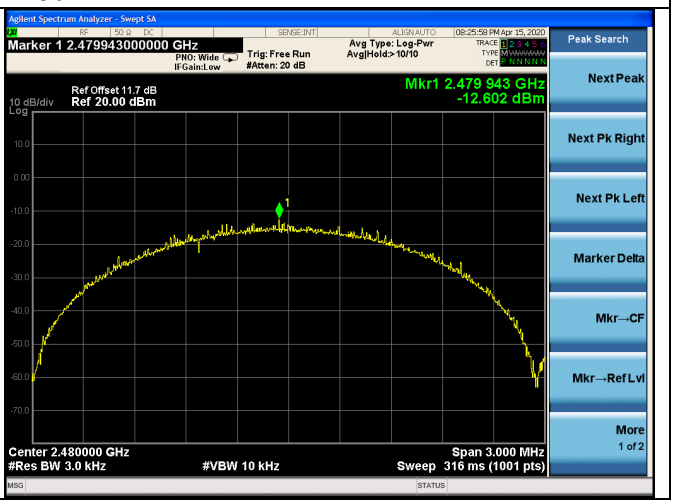
EUT: WiFi module		
M/N: U9W42		
Test date: 2019-11-21 &2020-04-15	Pressure: 102.3±1.0 kpa	Humidity: 53.6±3.0%
Tested by: Garry	Test site: RF site	Temperature: 25.5±0.6℃

Bluetooth V4.0(1Mbps):

Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-8.665	8
	2440	-8.354	8
	2480	-8.028	8
Conclusion：PASS			

Bluetooth V5.0(2Mbps):

Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-13.649	8
	2440	-13.360	8
	2480	-12.602	8
Conclusion：PASS			

Bluetooth V4.0(1Mbps):	Bluetooth V5.0(2Mbps):
2402MHz	2402MHz
	
2440MHz	2440MHz
	
2480MHz	2480MHz
	

10. ANTENNA REQUIREMENT

10.1. STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2. ANTENNA CONNECTED CONSTRUCTION

The antennas used for this product are PCB antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is -7.4dBi.

11. DEVIATION TO TEST SPECIFICATIONS

[NONE]

THE END