

Report No.: SEWM2305000160RG04

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### **TEST REPORT**

Application No.: SEWM2305000160RG

**Applicant:** Xiaomi Communications Co., Ltd.

Address of Applicant: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing,

China, 100085

Manufacturer: Xiaomi Communications Co., Ltd.

Address of Manufacturer: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing,

China, 100085

**EUT Description:** Mobile Phone

Model No.: 23076RA4BR, XIG03

Trade Mark: Redmi

**FCC ID**: 2AFZZRA4BR

**Standards:** FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

**Date of Receipt:** 2023/04/26

**Date of Test:** 2023/04/28 to 2023/05/20 (for original report SEWM2304000137RG04)

2023/05/12 to 2023/06/07 (for new report SEWM2305000160RG04)

**Date of Issue:** 2023/06/12

Test Result : PASS \*

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Panta Sun Wireless Laboratory Manager



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#### 1 Version

Revision Record						
Version	Remark					
01		2023/06/12		Original		

Prepared By	(Ives Cheng) / Test Engineer
Checked By	(Well Wei) / Reviewer



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2 Test Summary

Test Item	FCC Rule No.	Test Method	Test Result	Result
Antenna Requirement	15.203/15.247(b)		Clause 4.1	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10-2020 Section 6.2	Clause 4.2	PASS
Conducted Output Power	15.247 (b)(3)	ANSI C63.10-2020 Section11.9.1.2	Clause 4.4	PASS
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10-2020 Section 11.8 Option 2 / 6.9.3	Clause 4.5	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10-2020 Section 11.10.2	Clause 4.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.8	PASS
Radiated Spurious Emissions	15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.10	PASS



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#### Remark:

This test report (Report No.: SEWM2305000160RG04 issue on 2023/06/12) is based on the original test report (Report No.: SEWM2304000137RG04 issue on 2023/05/29).

Review this report and original report, this report just changing the parts according to the declaration letter from client.

Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report only the items of Power and AC Power Line Conducted Emission were tested, Transmitter emission Above 1GHz and Restricted bands around fundamental frequency were performed based on the worst case of the original report with report number SEWM2304000137RG04 issue on 2023/05/29 and other test data in this report are based on the previous report with report number SEWM2304000137RG04 issue on 2023/05/29.



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#### 3 General Information

#### 3.1 Details of Client

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

#### 3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	Ives Cheng, Tizzy Song

#### 3.3 Test Facility

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

#### • A2LA (Certificate No. 6336.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

#### • Innovation, Science and Economic Development Canada

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

#### • FCC -Designation Number: CN1312

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an

accredited testing laboratory. Designation Number: CN1312.

Test Firm Registration Number: 717327



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### 3.4 General Description of EUT

EUT Description:	Mobile Phone				
Model No.:	23076RA4BR, XIG03				
Trade Mark:	Redmi				
Hardware Version:	P1.1				
Software Version:	MIUI 14				
IMEI:	RF Conducted	IMEI1: 863532060007349 IMEI2: 863532060007356			
IIVIEI.	RSE & AC power line	IMEI1: 866672060051306 IMEI2: 866672060051314			
Operation Frequency:	2400MHz~2483.5MHz fc = 2402 MHz + N * 2 MHz, where: -fc = "Operating Frequency" in MHz, -N = "Channel Number" with the range from 0 to 39.				
Bluetooth version:	Bluetooth V5.0				
Modulation Type:	GFSK				
Number of Channel:	40				
Datas Type*:	⊠Provided by client				
Rates Type*:	1M PHY				
Antenna Type:	IFA Antenna				
	-0.6dBi (Ant6)				
Antenna Gain:	Note:  The antenna gain are derived from the gain information report provided by the manufacturer.				
RF Cable:	1.0dB				

Note: \*Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information , SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.

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	Operation Frequency of each channel							
Channel	annel Frequency Channel		Frequency	Channel	Frequency	Channel	Frequency	
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz	
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz	
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz	
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz	
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz	
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz	
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz	
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz	
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz	
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz	

#### Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The Lowest channel(CH0)	2402MHz
The Middle channel(CH19)	2440MHz
The Highest channel(CH39)	2480MHz



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#### 3.5 Test Environment

Environment Parameter	101.0 kPa Selected Values During Tests					
Relative Humidity	44-46 % RH Ambient					
Value	Temperature(°C)	Voltage(V)				
NTNV	22~23	3.85				
Remark:						

NV: Normal VoltageNT: Normal Temperature

#### 3.6 Description of Support Units

The EUT has been tested as an independent unit.



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#### **Test results and Measurement Data**

#### 4.1 Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203 /247(b)

15.203 requirement:

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

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna is IFA Antenna and no consideration of replacement.

The best case gain of the antenna is -0.6dBi (Ant6). \*

\*Note:

The antenna gain are derived from the gain information report provided by the manufacturer. Remark:

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#### 4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207					
Test Method:	ANSI C63.10-2020 Section 6.2					
Test Frequency Range:	150kHz to 30MHz					
Receiver Setup:	RBW = 9kHz, VBW = 30	kHz				
Limit:	Limit (dBuV)					
	Frequency range(MHz)	Quasi-peak	Average			
	0.15-0.5	66 to 56*	56 to 46*			
	0.5-5	56	46			
	5-30	60	50			
	* Decreases with the log	arithm of the frequency.				
Test Procedure:	The mains terminal di room.	sturbance voltage test was co	onducted in a shielded			
	<ul> <li>room.</li> <li>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</li> <li>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.</li> <li>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.</li> <li>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to</li> </ul>					



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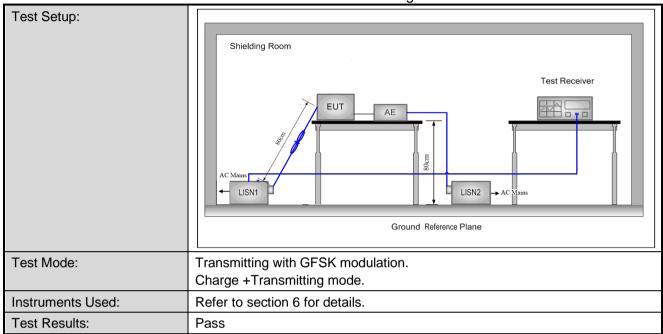
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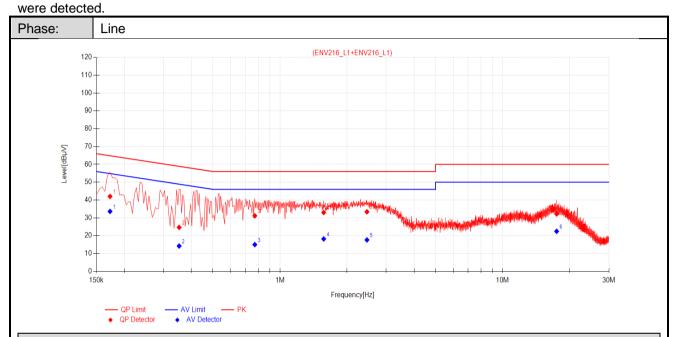
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#### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission



Data I	Data List										
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1725	11.75	30.27	42.02	64.84	22.82	21.87	33.62	54.84	21.22	PASS
2	0.3525	11.61	13.07	24.68	58.90	34.22	2.61	14.22	48.90	34.68	PASS
3	0.7710	11.69	19.47	31.16	56.00	24.84	3.33	15.02	46.00	30.98	PASS
4	1.5720	11.73	21.29	33.02	56.00	22.98	6.45	18.18	46.00	27.82	PASS
5	2.4585	11.73	21.67	33.40	56.00	22.60	5.91	17.64	46.00	28.36	PASS
6	17.4840	11.96	20.27	32.23	60.00	27.77	10.52	22.48	50.00	27.52	PASS

#### Remark:

- 1. The following Quasi-Peak and Average measurements were performed on the EUT:
- 2. Value =Reading[dBµV] + Factor(Lisn factor[dB] + cable loss[dB]).
- 3. Margin = Limit[dBμV] Value[dBμV]



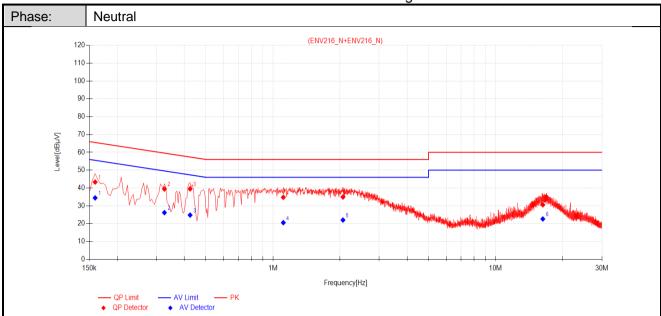
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Data	List										
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1590	11.82	31.51	43.33	65.52	22.19	22.62	34.44	55.52	21.08	PASS
2	0.3255	11.62	27.83	39.45	59.57	20.12	14.56	26.18	49.57	23.39	PASS
3	0.4245	11.62	27.87	39.49	57.36	17.87	13.20	24.82	47.36	22.54	PASS
4	1.1130	11.72	23.06	34.78	56.00	21.22	8.84	20.56	46.00	25.44	PASS
5	2.0625	11.73	23.22	34.95	56.00	21.05	10.31	22.04	46.00	23.96	PASS
6	16.2915	11.94	18.65	30.59	60.00	29.41	10.70	22.64	50.00	27.36	PASS

#### Remark:

- 1. The following Quasi-Peak and Average measurements were performed on the EUT:
- 2. Value = Reading[dB $\mu$ V] + Factor(Lisn factor[dB] + cable loss[dB]).
- 3. Margin = Limit[ $dB\mu V$ ] Value[ $dB\mu V$ ]



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### 4.3 Duty Cycle

The detailed test data see: Appendix



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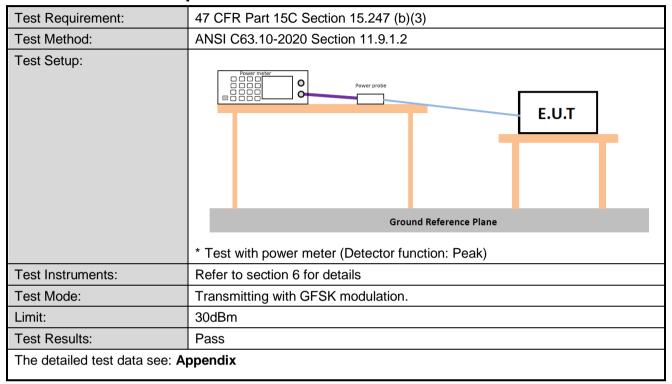
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#### 4.4 Conducted Output Power





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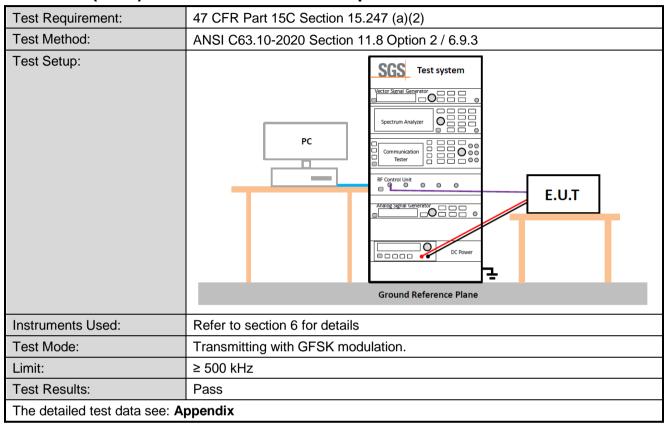
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#### 4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth





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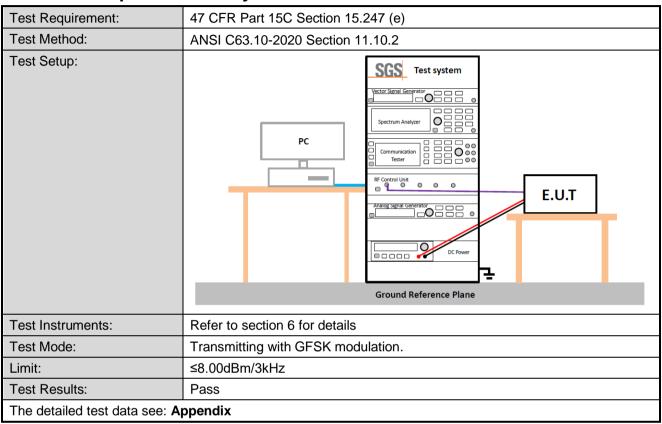
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#### 4.6 Power Spectral Density





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### 4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)			
Test Method:	ANSI C63.10-2020 Section 11.11			
Test Setup:	PC    Spectrum Analyzer   O   O   O   O   O   O   O   O   O			
Instruments Used:	Refer to section 6 for details			
Test Mode:	Transmitting with GFSK modulation.			
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.			
Test Results:	Pass			
The detailed test data see: A	ppendix			



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### 4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10-2020 Section 11.11
Test Setup:	PC    Spectrum Analyzer   O   O   O   O   O   O   O   O   O
Instruments Used:	Refer to section 6 for details
Test Mode:	Transmitting with GFSK modulation.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass
The detailed test data see: A	ppendix



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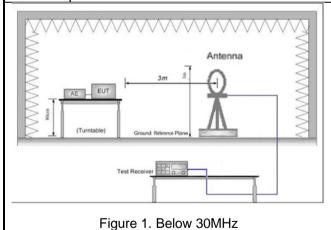
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#### 4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section	47 CFR Part 15C Section 15.209 and 15.205						
Test Method:	ANSI C63.10-2020 Section 11.12							
Test Site:	Measurement Distance:	3m (Semi-Anecho	ic Chamber)					
Test Frequency:	9kHz ~ 25GHz							
Limit:	Frequency	Field strength Limit (microvolt/meter) (dBuV/m) Remar		Remark	Measurement distance (m)			
	0.009MHz-0.490MHz	//Hz 2400/F(kHz)		-	300			
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30			
	1.705MHz-30MHz	30	-	-	30			
	30MHz-88MHz	100	40.0	Quasi-peak	3			
	88MHz-216MHz	150	43.5	Quasi-peak	3			
	216MHz-960MHz	200	46.0	Quasi-peak	3			
	960MHz-1GHz	500	54.0	Quasi-peak	3			
	Above 1GHz	500	54.0	Average	3			
	Remark: 15.35(b),Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.							

#### Test Setup:



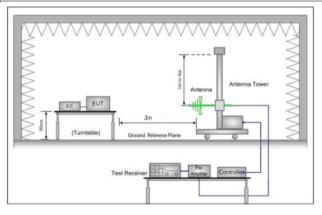


Figure 2. 30MHz to 1GHz



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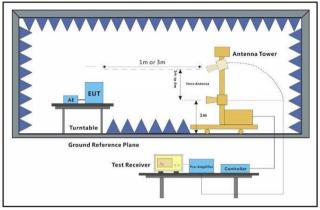


Figure 3. Above 1 GHz

#### Test Procedure:

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation (Distance from antenna to EUT is 1m for measurements >18GHz).
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.
- The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported
- The disturbance above 18GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed.
- At a measurement distance of 1 meter the limit line was increased by 20\*LOG(3/1) = 9.54 dB.

#### **Test Configuration:**

#### Measurements below 30MHz

- RBW = 10 kHz
- VBW = 30 kHz
- Detector = Peak & Average & Quasi-peak
- Trace mode = max hold



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	Measurements Below 1000MHz
	• RBW = 120 kHz
	• VBW = 300 kHz
	Detector = Quasi-peak
	Trace mode = max hold
	Peak Measurements Above 1000 MHz
	• RBW = 1 MHz
	• VBW ≥ 3 MHz
	Detector = Peak
	Sweep time = auto
	Trace mode = max hold
	Average Measurements Above 1000MHz
	• RBW = 1 MHz
	VBW = 10 Hz, when duty cycle is no less than 98 percent.
	<ul> <li>VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum</li> </ul>
	transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test	Transmitting with GFSK modulation.
Mode:	Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation.
i iliai Test Mode.	Pretest the EUT at Charge + Transmitting mode,
	For below 1GHz part, through pre-scan, the worst case is the lowest channel. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass
The detailed test data	see: Appendix



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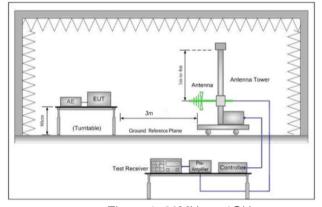
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#### 4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15	47 CFR Part 15C Section 15.209 and 15.205						
Test Method:	ANSI C63.10-2020 Section	ANSI C63.10-2020 Section 11.12						
Test Site:	Measurement Distance: 3m	Measurement Distance: 3m (Semi-Anechoic Chamber)						
Limit:	Frequency	Limit (dBuV/m)	Remark					
	30MHz-88MHz	40.0	Quasi-peak					
	88MHz-216MHz	43.5	Quasi-peak					
	216MHz-960MHz	46.0	Quasi-peak					
	960MHz-1GHz	54.0	Quasi-peak					
	Above 4CH=	54.0	Average Value					
	Above 1GHz	74.0	Peak Value					

#### Test Setup:



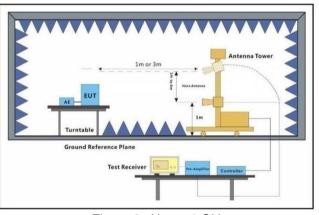


Figure 1. 30MHz to 1GHz

Figure 2. Above 1 GHz

#### Test Procedure:

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. Place a marker at the end of the restricted band closest to the transmit



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	frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and
	modulation for lowest and highest channel
	h. Test the EUT in the lowest channel, the Highest channel
	i. The radiation measurements are performed in X, Y, Z axis positioning for
	Transmitting mode, And found the X axis positioning which it is worse case.
	j. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	Measurements Below 1000MHz
	• RBW = 120 kHz
	• VBW = 300 kHz
	Detector = Quasi-peak
	Trace mode = max hold
	Peak Measurements Above 1000 MHz
	• RBW = 1 MHz
	• VBW ≥ 3 MHz
	Detector = Peak
	Sweep time = auto
	Trace mode = max hold
	Average Measurements Above 1000MHz
	• RBW = 1 MHz
	<ul> <li>VBW = 10 Hz, when duty cycle is no less than 98 percent.</li> </ul>
	<ul> <li>VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum</li> </ul>
	transmission duration over which the transmitter is on and is transmitting at its
	maximum power control level for the tested mode of operation
Exploratory Test Mode:	Transmitting with GFSK modulation.
	Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation.
	Pretest the EUT at Charge + Transmitting mode.
	Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass
The detailed test data see	e: Appendix



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### 5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.54dB
2	RF power density, conducted	±1.03dB
3	Spurious emissions, conducted	±0.54dB
4	Radio Frequency	±1.0 %
5	Duty Cycle	±0.37%
6	Occupied Bandwidth	±1.0 %
7	Conduction Emission	± 2.90dB (150kHz to 30MHz)
		± 3.13dB (9k to 30MHz)
8	Redicted Emission	± 4.88dB (30M to 1GHz)
0	Radiated Emission	± 4.75dB (1GHz to 18GHz)
		± 4.77dB (Above 18GHz)

#### Remark:

The U<sub>lab</sub> (lab Uncertainty) is less than U<sub>cispt/ETSI</sub> (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;

non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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6 Equipment List

RF Test Equipment							
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)		
Shielding Room	Brilliant-emc	N/A	SUWI-04-01-06	2021/05/08	2024/05/07		
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2023/02/06	2024/02/05		
Signal Analyzor	ROHDE&	FSV3030	SUWI-01-02-02	2022/05/17	2023/05/16		
Signal Analyzer	SCHWARZ	F3 V3030	30771-01-02-02	2023/05/11	2024/05/10		
Measurement Software	Tonscend	JS1120-3 Test System V3.1.55	SUWI-02-09-09	NCR	NCR		
Cianal Analyzar	ROHDE&	ECM/40	CLIM/I 04 02 04	2022/05/28	2023/05/27		
Signal Analyzer	SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10		
Wideband Radio Communication Tester	ROHDE& SCHWARZ	CMW500	SUWI-01-16-05	2023/02/06	2024/02/05		
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05		
Power meter	Anritsu	ML2495A	SUWI-01-31-01	2022/11/23	2023/11/22		
Pulse power sensor	Anritsu	MA2411B	SUWI-01-32-01	2022/11/23	2023/11/22		
MXG Vector signal genitor	KEYSIGHT	N5182B	SUWI-01-38-01	2023/02/06	2024/02/05		
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2023/02/06	2024/02/05		
Signal Generator	ROHDE&SCHWARZ	SMM100A	SN:101716	2023/02/22	2024/02/21		

Conduction Test Equipment								
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)			
Shielding Room	Brilliant-emc	N/A	SUWI-04-03-01	2021/05/08	2024/05/07			
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05			
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07			
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2023/02/07	2024/02/06			
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-03	2023/02/08	2024/02/07			
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-04	2023/02/08	2024/02/07			
Measurement Software	Tonscend	JS32-CE V4.0.0.2	SUWI-02-09-05	NCR	NCR			



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		RSE Test S	System			
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)	
Semi- Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-02	2021/11/25	2024/11/24	
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-13	2023/02/07	2024/02/06	
Signal	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2022/05/28	2023/05/27	
Analyzer	RONDEASCHWARZ	F3VV43	30771-01-02-04	2023/05/11	2024/05/10	
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-06	2022/11/23	2023/11/22	
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07	
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05	
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9168	SUWI-01-11-04	2021/12/05	2023/12/04	
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-05	2021/12/05	2023/12/04	
Receiving	SCHWRZBECK	BBHA 9170	SUWI-01-11-03	2021/05/14	2023/05/13	
antenna	MESS-ELEKTRONIK	вына 9170	30001-01-11-03	2023/05/12	2024/05/11	
Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2021/06/10	2023/06/09	
Amplifier	Tonscend	TAP9K3G32	SUWI-01-14-06	2022/11/23	2023/11/22	
Amplifier	Tonscend	TAP01018050	SUWI-01-14-04	2022/11/23	2023/11/22	
Amplifier	Tonscend	TAP30M7G30	SUWI-01-14-05	2022/11/23	2023/11/22	
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR	



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### 7 Photographs - Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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# **Appendix**



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#### DTS Bandwidth Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2402	0.68	2401.66	2402.34	≥0.5	PASS
BLE_1M	Ant6	2440	0.68	2439.66	2440.33	≥0.5	PASS
		2480	0.68	2479.65	2480.34	≥0.5	PASS



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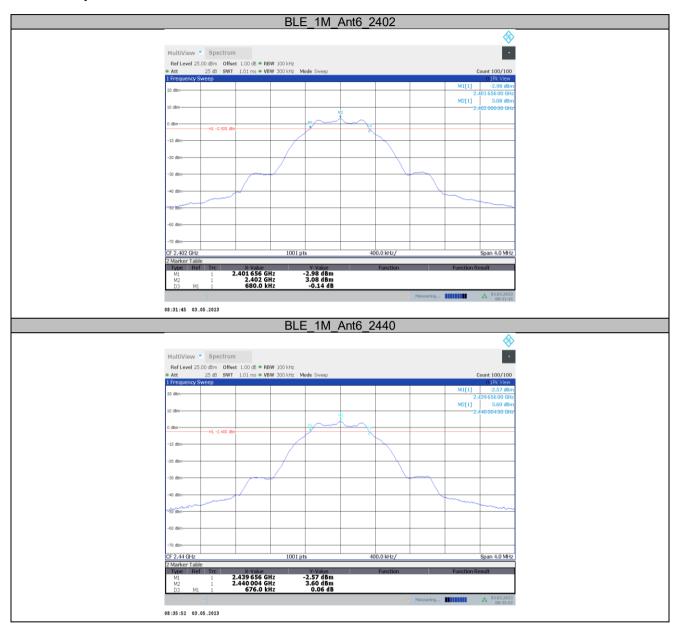


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#### **Test Graphs**





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# Occupied Channel Bandwidth Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
		2402	1.031	2401.489	2402.519	For
BLE_1M	Ant6	2440	1.035	2439.486	2440.521	Report
		2480	1.033	2479.485	2480.519	Purpose



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#### **Test Graphs**





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### Maximum conducted output power Test Result Peak

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
		2402	3.58	≤30	PASS
BLE_1M	Ant6	2440	3.78	≤30	PASS
_		2480	4.13	≤30	PASS



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### Maximum power spectral density Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
		2402	-11.61	≤8.00	PASS
BLE_1M	Ant6	2440	-11.49	≤8.00	PASS
		2480	-10.98	≤8.00	PASS



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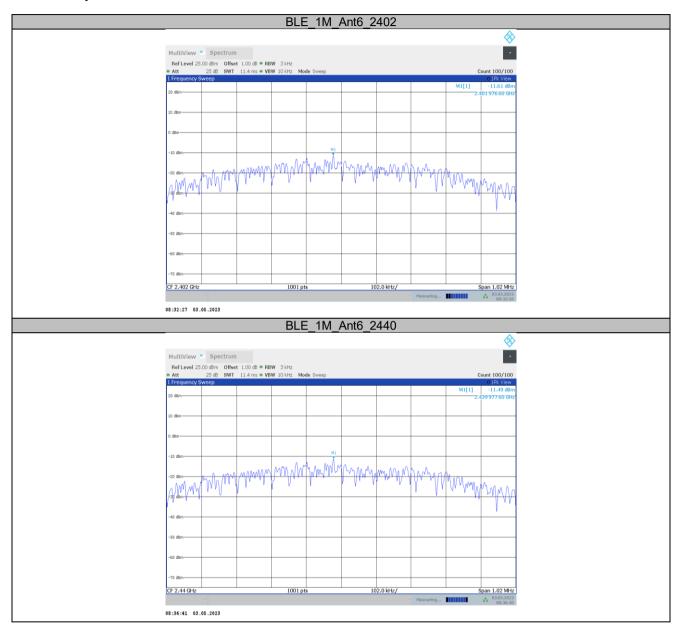


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### **Test Graphs**





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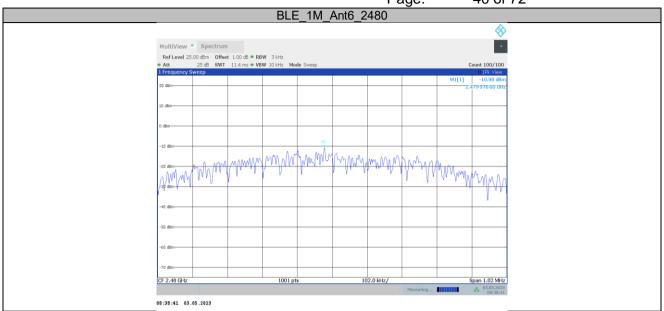
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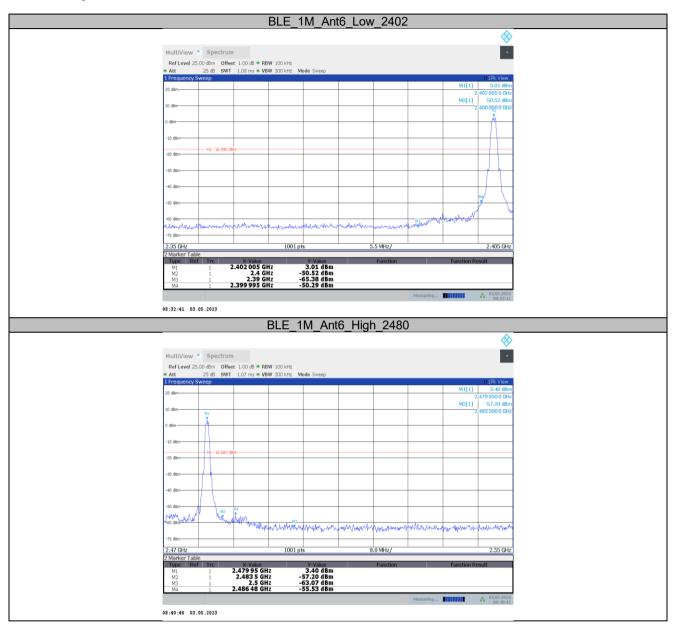


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### Band edge measurements Test Graphs





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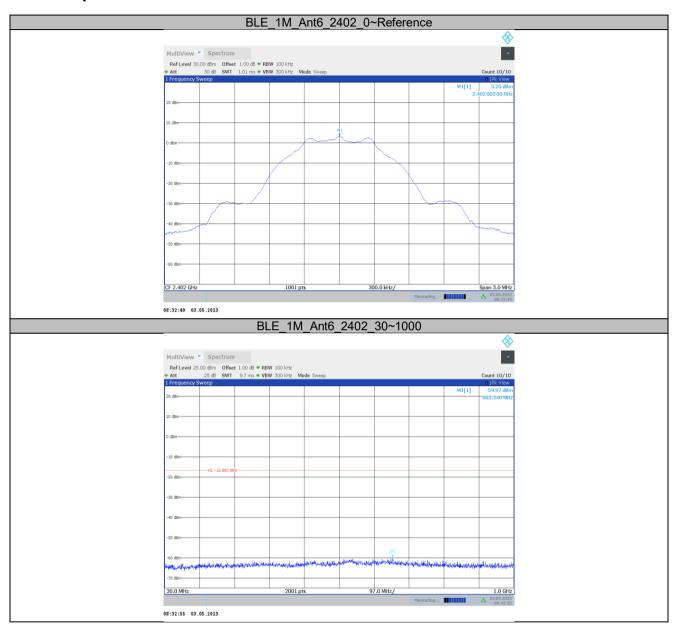


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# **Conducted Spurious Emission Test Graphs**





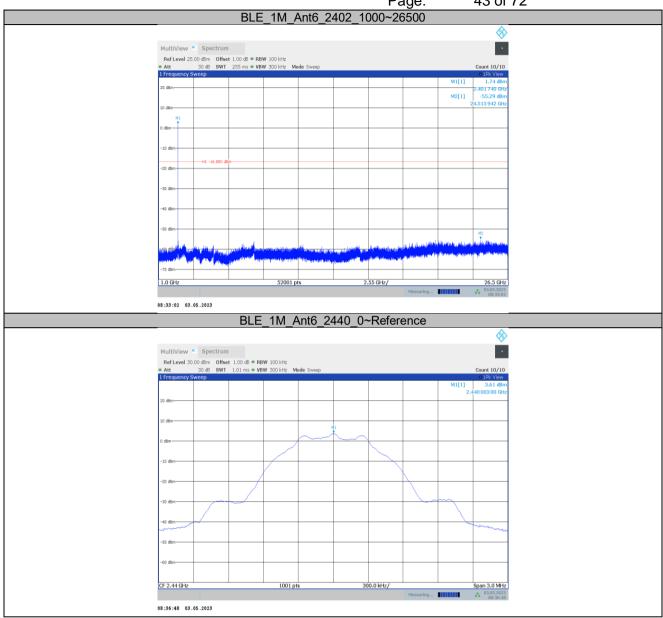
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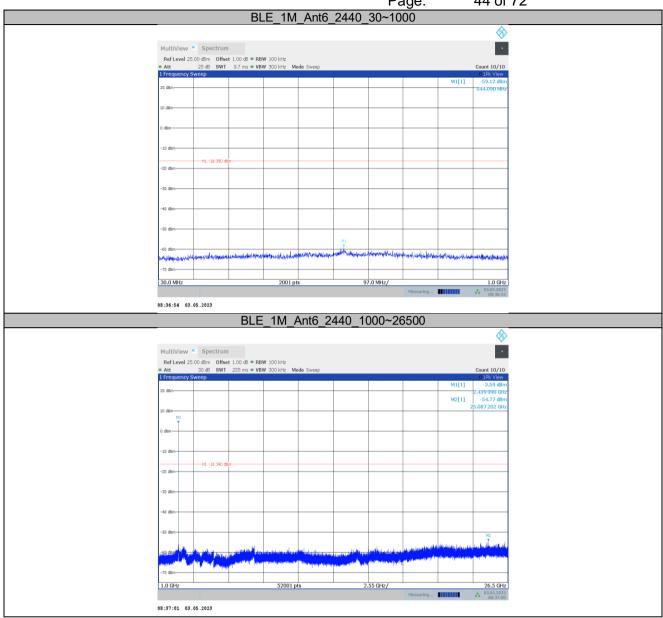
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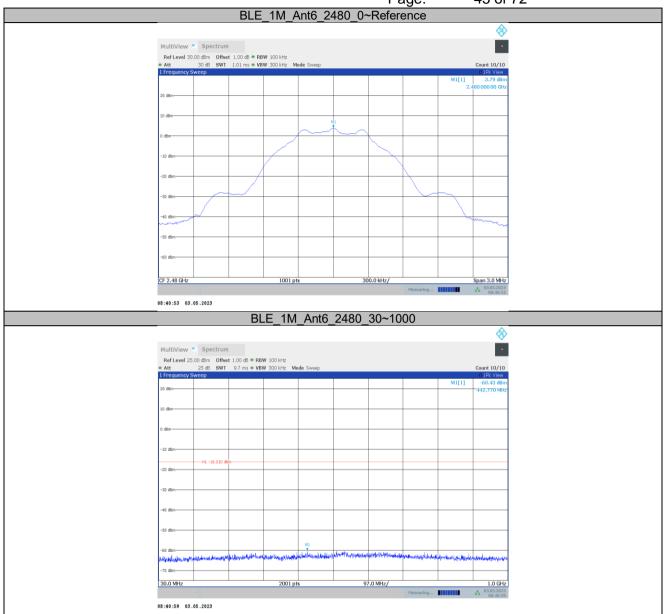
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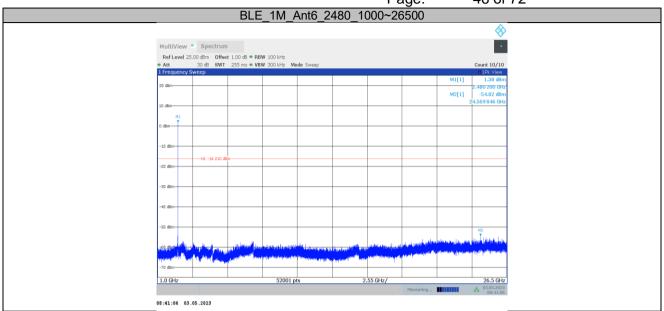
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### **Duty Cycle** Test Result

TestMode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	Ant6	2402	0.39	0.63	61.90	2.08

#### Note:

Radiated Emission Average VBW = 1 / T

TestMode	T[ms]	Period[ms]	Duty Cycle[%]	1/T[kHz]	VBW Setting
BLE 1M	0.39	0.63	61.90	2.56410	2.7KHz



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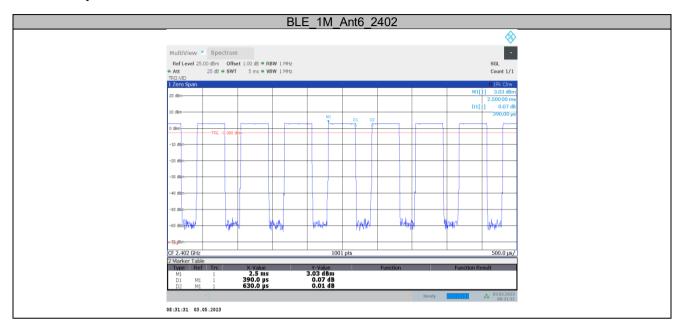


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### **Test Graphs**





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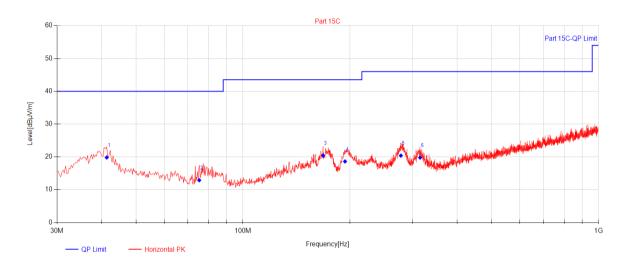


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# Radiated Spurious Emissions Radiated emission below 1GHz

Worst case Mode: BLE 1M\_Channel 39



Data	Data List												
NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	AF [dB/m]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity			
1	41.3975	42.11	-36.25	13.95	19.81	40.00	20.19	215	102	Horizontal			
2	75.3475	38.91	-36.04	10.00	12.87	40.00	27.13	145	161	Horizontal			
3	167.9825	41.23	-35.18	14.36	20.41	43.50	23.09	185	31	Horizontal			
4	193.6875	42.52	-35.32	11.41	18.60	43.50	24.90	163	360	Horizontal			
5	278.0775	42.56	-34.45	12.26	20.37	46.00	25.63	261	173	Horizontal			
6	314.9375	41.00	-34.35	13.11	19.76	46.00	26.24	188	183	Horizontal			



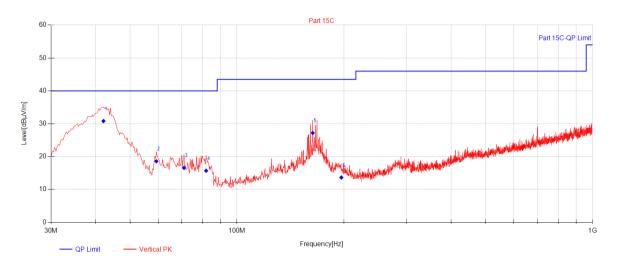
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Data	Data List												
NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	AF [dB/m]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity			
1	42.125	53.16	-36.24	13.89	30.81	40.00	9.19	126	189	Vertical			
2	59.3425	42.16	-36.38	12.80	18.58	40.00	21.42	154	349	Vertical			
3	70.9825	42.33	-36.43	10.67	16.57	40.00	23.43	182	66	Vertical			
4	81.895	42.16	-35.78	9.32	15.70	40.00	24.30	136	218	Vertical			
5	163.375	48.22	-35.26	14.23	27.19	43.50	16.31	251	249	Vertical			
6	196.5975	38.18	-35.25	10.71	13.64	43.50	29.86	177	76	Vertical			

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Value = Reading(dB $\mu$ V) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit( $dB\mu V/m$ ) – Value( $dB\mu V/m$ )

2) All channels have been tested, but only the worst case data displayed in this report.



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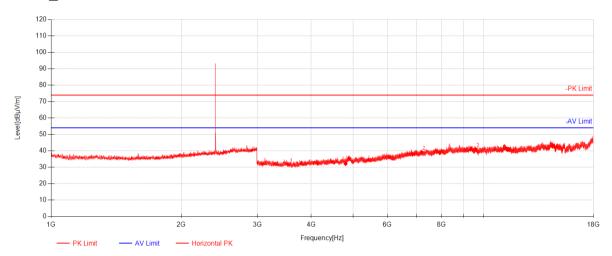


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### **Transmitter emission Above 1GHz**

### **BLE 1M\_Channel 00**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4804.0000	45.29	32.33	-45.54	32.08	74.00	41.92	188	150	Horizontal		
2	7206.0000	46.02	36.60	-43.44	39.18	74.00	34.82	253	1	Horizontal		
3	9608.0000	42.13	38.43	-39.65	40.91	74.00	33.09	156	275	Horizontal		



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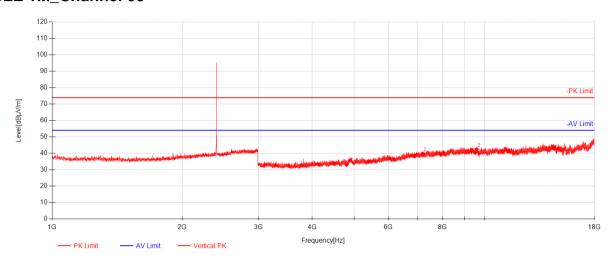
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### **BLE 1M\_Channel 00**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4804.0000	46.14	32.33	-45.54	32.93	74.00	41.07	188	336	Vertical		
2	7206.0000	46.42	36.60	-43.44	39.58	74.00	34.42	142	20	Vertical		
3	9608.0000	43.70	38.43	-39.65	42.48	74.00	31.52	136	147	Vertical		



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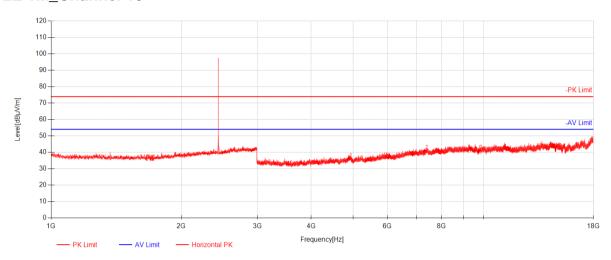
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### **BLE 1M\_Channel 19**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4880.0000	48.95	32.54	-45.53	35.96	74.00	38.04	211	42	Horizontal		
2	7320.0000	47.89	36.53	-43.68	40.74	74.00	33.26	148	62	Horizontal		
3	9760.0000	42.03	38.26	-39.46	40.83	74.00	33.17	175	336	Horizontal		



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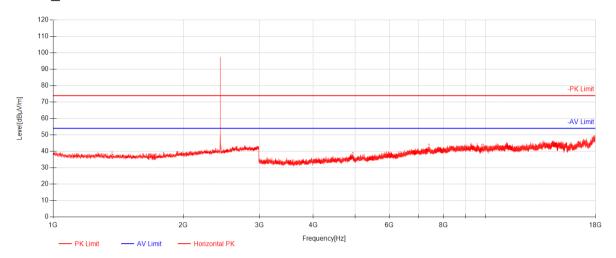


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### **BLE 1M\_Channel 19**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4880.0000	48.95	32.54	-45.53	35.96	74.00	38.04	211	42	Horizontal		
2	7320.0000	47.89	36.53	-43.68	40.74	74.00	33.26	148	62	Horizontal		
3	9760.0000	42.03	38.26	-39.46	40.83	74.00	33.17	175	336	Horizontal		



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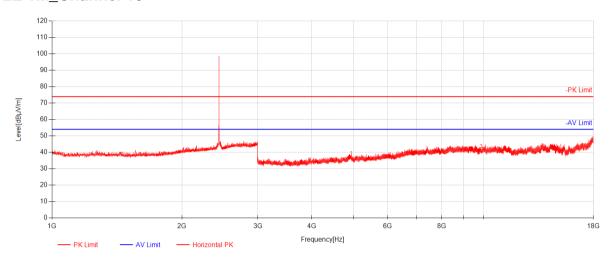
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### **BLE 1M\_Channel 19**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4880.0000	49.94	32.54	-45.53	36.95	74.00	37.05	142	193	Horizontal		
2	7320.0000	46.94	36.53	-43.68	39.79	74.00	34.21	136	52	Horizontal		
3	9760.0000	42.32	38.26	-39.46	41.12	74.00	32.88	259	80	Horizontal		



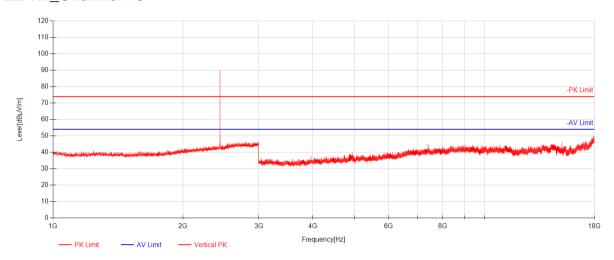
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### **BLE 1M\_Channel 19**



Data	Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4880.0000	48.77	32.54	-45.53	35.78	74.00	38.22	122	276	Vertical		
2	7320.0000	47.88	36.53	-43.68	40.73	74.00	33.27	142	108	Vertical		
3	9760.0000	41.51	38.26	-39.46	40.31	74.00	33.69	136	194	Vertical		



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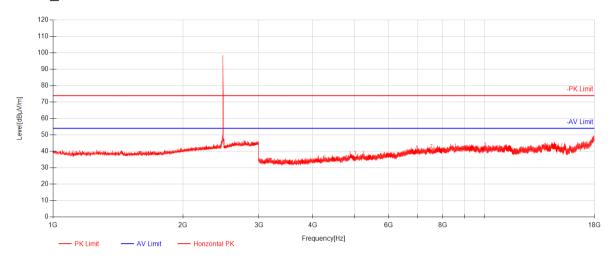


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### **BLE 1M\_Channel 39**



Data List												
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4960.0000	49.23	32.77	-45.60	36.40	74.00	37.60	188	6	Horizontal		
2	7440.0000	47.39	36.47	-43.30	40.56	74.00	33.44	146	135	Horizontal		
3	9920.0000	42.40	38.38	-39.31	41.47	74.00	32.53	218	304	Horizontal		



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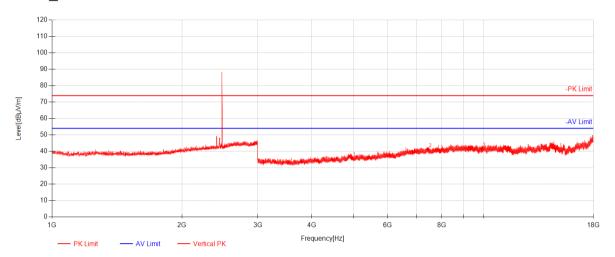
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### **BLE 1M\_Channel 39**



Data List												
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4960.0000	48.53	32.77	-45.60	35.70	74.00	38.30	147	6	Vertical		
2	7440.0000	47.89	36.47	-43.30	41.06	74.00	32.94	148	165	Vertical		
3	9920.0000	42.45	38.38	-39.31	41.52	74.00	32.48	186	136	Vertical		

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Level = Reading( $dB\mu V$ ) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit( $dB\mu V/m$ ) – Level( $dB\mu V/m$ )

- 2) All channels have been tested, but only the worst case data displayed in this report.
- 3) Both peak and average measured complies with the limit line, so test result is "PASS"



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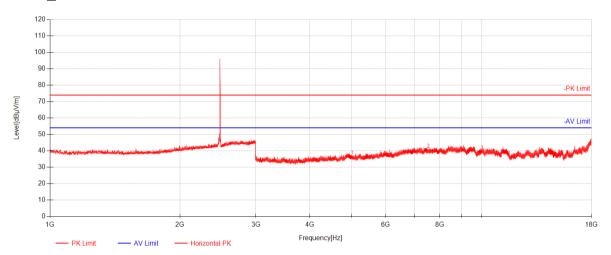
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### Test on the worst case:

### **BLE 1M Channel 39**



Data List												
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	4960.0000	49.14	32.77	-45.60	36.31	74.00	37.69	165	84	Horizontal		
2	7440.0000	47.41	36.47	-43.30	40.58	74.00	33.42	125	280	Horizontal		
3	9920.0000	40.40	38.38	-39.31	39.47	74.00	34.53	174	139	Horizontal		



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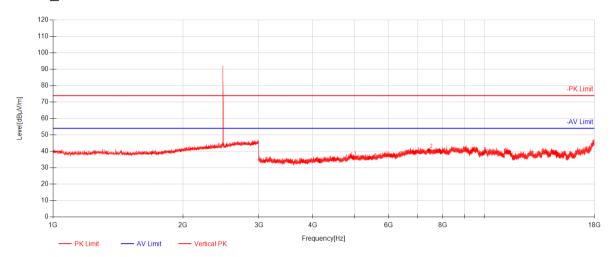
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### **BLE 1M\_Channel 39**



Data	List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4960.0000	48.83	32.77	-45.60	36.00	74.00	38.00	136	166	Vertical
2	7440.0000	47.49	36.47	-43.30	40.66	74.00	33.34	214	310	Vertical
3	9920.0000	39.57	38.38	-39.31	38.64	74.00	35.36	175	221	Vertical

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Level = Reading( $dB\mu V$ ) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit( $dB\mu V/m$ ) – Level( $dB\mu V/m$ )

2) Both peak and average measured complies with the limit line, so test result is "PASS"



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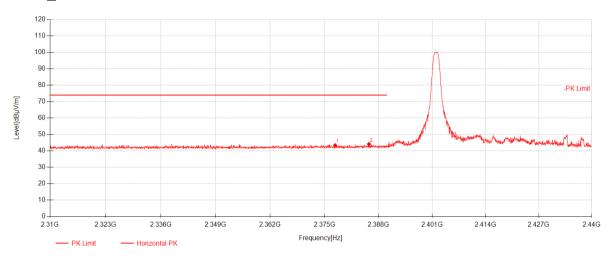


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### Restricted bands around fundamental frequency

### BLE 1M\_Channel 00



Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2377.5567	39.53	27.43	-23.57	43.39	74.00	30.61	155	117	Horizontal	
2	2385.7033	40.24	27.43	-23.57	44.10	74.00	29.90	155	117	Horizontal	



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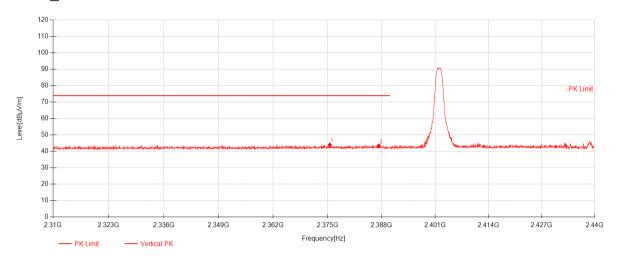
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### BLE 1M\_Channel 00



Data	List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2375.5633	40.13	27.43	-23.57	43.99	74.00	30.01	199	78	Vertical
2	2387.35	39.50	27.43	-23.57	43.36	74.00	30.64	199	78	Vertical



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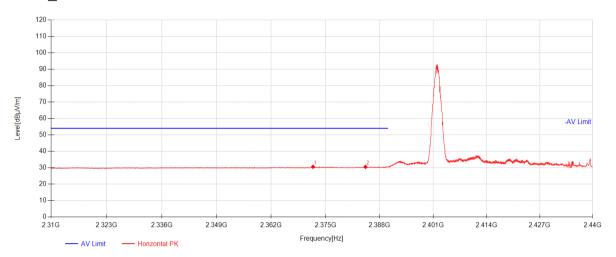


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### BLE 1M\_Channel 00



Data	List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2372.01	26.70	27.43	-23.57	30.55	54.00	23.45	155	117	Horizontal
2	2384.62	26.63	27.43	-23.57	30.49	54.00	23.51	155	117	Horizontal



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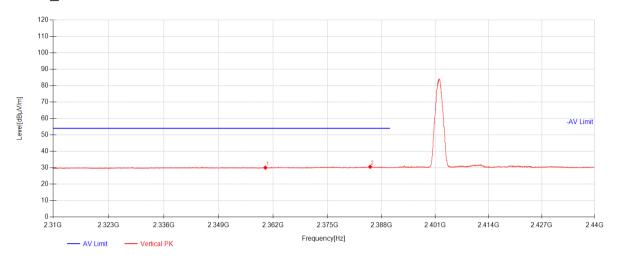


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### BLE 1M\_Channel 00



Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2360.1367	26.18	27.42	-23.57	30.03	54.00	23.97	199	78	Vertical	
2	2385.27	26.70	27.43	-23.57	30.56	54.00	23.44	199	78	Vertical	



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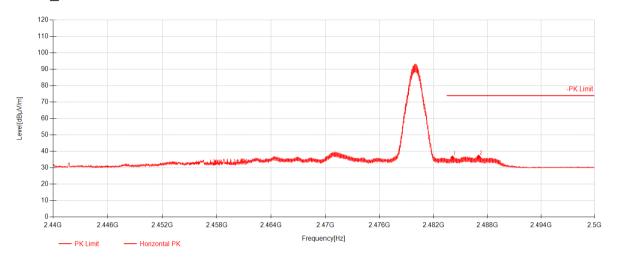


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### **BLE 1M\_Channel 39**



Data List												
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	2484.1075	31.93	27.72	-23.54	36.10	74.00	37.90	211	273	Horizontal		
2	2487.0325	32.46	27.73	-23.54	36.64	74.00	37.36	211	273	Horizontal		



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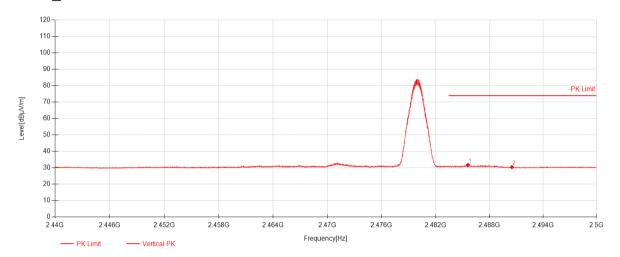
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### **BLE 1M\_Channel 39**



Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2485.615	27.45	27.72	-23.54	31.63	74.00	42.37	199	263	Vertical	
2	2490.5275	26.18	27.74	-23.54	30.38	74.00	43.62	199	263	Vertical	



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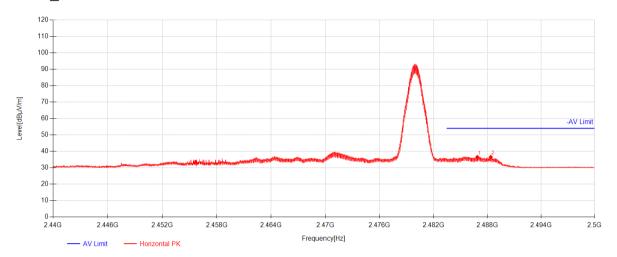


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### **BLE 1M\_Channel 39**



Data	List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2486.89	32.30	27.73	-23.54	36.48	54.00	17.52	211	273	Horizontal
2	2488.39	32.30	27.73	-23.54	36.49	54.00	17.51	211	273	Horizontal



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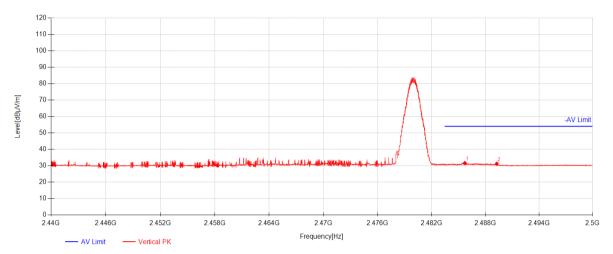


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### **BLE 1M\_Channel 39**



Data List											
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2485.72	27.44	27.72	-23.54	31.62	54.00	22.38	199	263	Vertical	
2	2489.2825	27.01	27.73	-23.54	31.20	54.00	22.80	199	263	Vertical	

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Level = Reading( $dB\mu V$ ) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit( $dB\mu V/m$ ) – Level( $dB\mu V/m$ )

2) Both peak and average measured complies with the limit line, so test result is "PASS"



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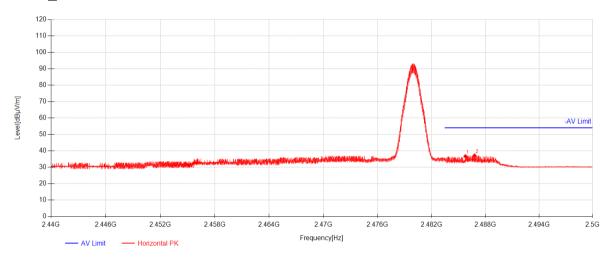
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### Test on the worst case:

### **BLE 1M Channel 39**



Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2485.78	32.50	27.72	-23.54	36.68	54.00	17.32	199	283	Horizontal
2	2486.8	32.94	27.73	-23.54	37.12	54.00	16.88	199	283	Horizontal



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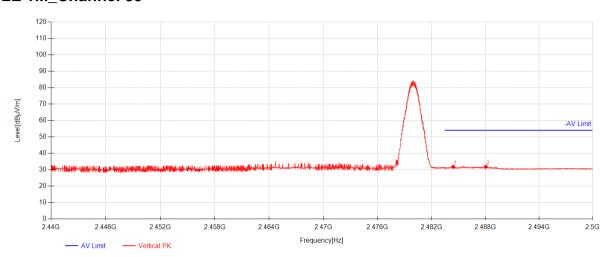
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### **BLE 1M\_Channel 39**



Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2484.415	27.63	27.72	-23.54	31.80	54.00	22.20	188	126	Vertical
2	2488.0525	27.61	27.73	-23.54	31.80	54.00	22.20	188	126	Vertical



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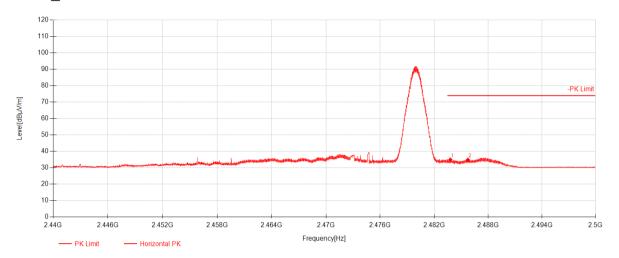
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### **BLE 1M\_Channel 39**



Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2483.8	30.74	27.72	-23.54	34.91	74.00	39.09	199	283	Horizontal
2	2485.75	30.63	27.72	-23.54	34.81	74.00	39.19	199	283	Horizontal



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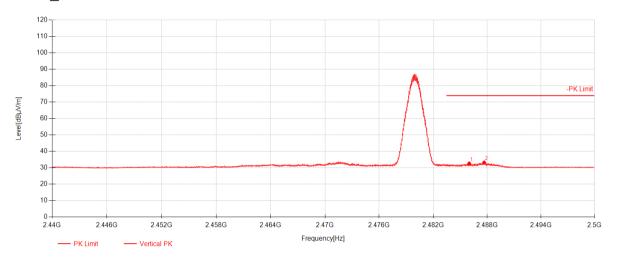
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### **BLE 1M\_Channel 39**



Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2486.0125	28.44	27.72	-23.54	32.62	74.00	41.38	188	126	Vertical
2	2487.67	29.01	27.73	-23.54	33.20	74.00	40.80	188	126	Vertical

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Level = Reading( $dB\mu V$ ) + AF(dB/m) + Factor(dB):

AF = Antenna Factor(dB/m)

Factor = Cable Factor(dB) - Preamplifier gain(dB)

Margin = Limit( $dB\mu V/m$ ) – Level( $dB\mu V/m$ )

2) Both peak and average measured complies with the limit line, so test result is "PASS"

---End of Report---



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