

Report No.: SUCR241100045503

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## **TEST REPORT**

**Application No.:** SUCR2411000455AT

Shanghai Sunmi Technology Co.,Ltd. Applicant:

Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China **Address of Applicant:** 

Shanghai Sunmi Technology Co., Ltd. Manufacturer:

Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China Address of Manufacturer:

POS System **EUT Description:** 

Model No.: 

Please refer to section 2 of this report which indicates which model was

actually tested and which were electrically identical.

Trade Mark: **SUNMI** 

FCC ID: 2AH25T3

Standards: FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

**Date of Receipt:** November 14, 2024

**Date of Test:** November 20, 2024 to December 20, 2024

Date of Issue: December 23, 2024

Test Result: PASS \*

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

Hayley Zhang

Approved by: Cloud Peng/ **Technical Manager** 

Cloud Peng

Prepared by: Hayley Zhang/ Project Manager

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### Version

Revision Record								
Version	Version Chapter Date Modifier Remark							
01		December 23, 2024		Original				

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**Test Summary** 

Test Item	FCC Rule No.	Test Method	Test Result	Result
Antenna Requirement	15.203/15.247(b)		Clause 3.1	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013 Section 6.2	Clause 3.2	PASS
Duty cycle		ANSI C63.10 2013 Section 11.6	Clause 3.3	For Report Purpose
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013 Section11.9.1.3	Clause 3.4	PASS
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10 2013 Section 11.8 Option 2 / 6.9.3	Clause 3.5	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10 2013 Section 11.10.2	Clause 3.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013 Section 11.13.3	Clause 3.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013 Section 11.11	Clause 3.8	PASS
Radiated Spurious Emissions	15.205/15.209	ANSI C63.10 2013 Section 11.12	Clause 3.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.205/15.209	ANSI C63.10 2013 Section 11.12	Clause 3.10	PASS

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### 2 General Information

### 2.1 Details of Client

Applicant:	Shanghai Sunmi Technology Co.,Ltd.				
Address of Applicant:	Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China				
Manufacturer:	Shanghai Sunmi Technology Co.,Ltd.				
Address of Manufacturer:	Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China				

#### 2.2 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, King-p Li

### 2.3 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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### 2.4 General Description of EUT

EUT Description:	POS System
Model No.:	L15C1, L15D1
Trade Mark:	SUNMI
Hardware Version:	6225Coreboard_MB_V3.0
Software Version:	1.0.0
Power Supply:	24V
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:	Internal Antenna
	2.2dBi
Antenna Gain:	Note: The antenna gain are derived from the gain information report provided by the manufacturer.
RF Cable*:	1dB

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.

- The only difference between the two models is that L15C1 comes with a printer and L15D1 does not come with a printer, everything else is exactly the same. Based on the above differences, complete testing will be conducted for L15C1 model, while L15D1 model will only check EMC.
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		Opera	tion Frequen	cy of each ch	nannel			
Channel	el Frequency Channel F		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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### 2.5 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	24			
Remark:					

NV: Normal Voltage NT: Normal Temperature

### 2.6 Description of Support Units

The EUT has been tested as an independent unit.

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

### 3.1 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 Internal Antenna and no consideration of replacement.

The best case gain

of the antenna is 2.2dBi.

Note:

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

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### 3.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207							
Test Method:	ANSI C63.10: 2013 Section 6.2							
Test Frequency Range:	150kHz to 30MHz							
Receiver Setup:	RBW = 9kHz, VBW = 30kHz							
Limit:	(MI  )	Limit (d	BuV)					
	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:	room.  2) The EUT was connect Impedance Stabilizat impedance. The pow connected to a secon plane in the same was multiple socket outlet single LISN provided  3) The tabletop EUT was ground reference plane placed on the horizor  4) The test was performed the EUT shall be 0.4 vertical ground reference plane. The unit under test and be mounted on top of the the closest points of the and associated equip  5) In order to find the man and all of the interface.	ted to AC power source throuse ion Network) which provides er cables of all other units of ad LISN 2, which was bonded by as the LISN 1 for the unit be strip was used to connect me the rating of the LISN was not a placed upon a non-metallicate. And for floor-standing arrantal ground reference plane. The work of the vertical ground reference plane was bonded to the LISN 1 was placed 0.8 m from the LISN 1 was placed 0.8 m from the LISN 1 and the EUT. All coment was at least 0.8 m from aximum emission, the relative ce cables must be changed an conducted measurement.	igh a LISN 1 (Line a 50Ω/50μH + 5Ω linear the EUT were It to the ground reference eing measured. A ultiple power cables to a pot exceeded. It table 0.8m above the angement, the EUT was rence plane. The rear of ference plane. The horizontal ground im the boundary of the plane for LISNs is distance was between other units of the EUT in the LISN 2.					

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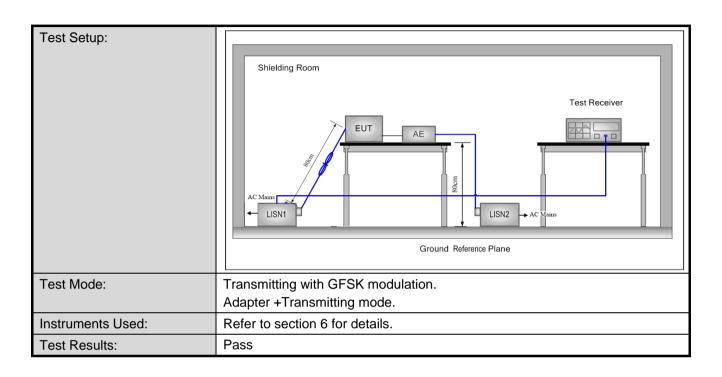
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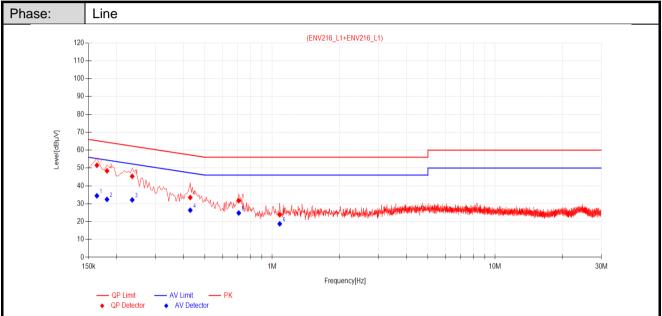
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#### Measurement Data

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

#### were detected.



Final	Final 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	0.1635	10.20	41.32	51.52	65.28	13.76	24.22	34.42	55.28	20.86	PASS
2	0.1815	10.19	38.20	48.39	64.42	16.03	22.23	32.42	54.42	22.00	PASS
3	0.2355	10.16	35.17	45.33	62.25	16.92	21.97	32.13	52.25	20.12	PASS
4	0.4290	10.17	23.32	33.49	57.27	23.78	16.19	26.36	47.27	20.91	PASS
5	0.7080	10.20	21.49	31.69	56.00	24.31	14.60	24.80	46.00	21.20	PASS
6	1.0815	10.09	13.75	23.84	56.00	32.16	8.66	18.75	46.00	27.25	PASS

- 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[dB $\mu$ V] Value[dB $\mu$ V]

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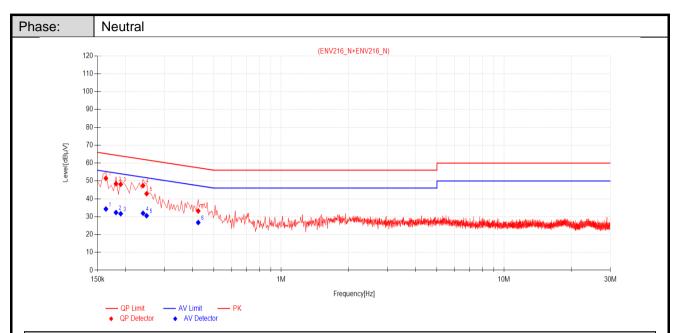
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Final	Final Data List										
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1635	10.20	41.27	51.47	65.28	13.81	24.10	34.30	55.28	20.98	PASS
2	0.1815	10.19	38.22	48.41	64.42	16.01	22.13	32.32	54.42	22.10	PASS
3	0.1905	10.19	37.93	48.12	64.01	15.89	21.47	31.66	54.01	22.35	PASS
4	0.2400	10.16	37.22	47.38	62.10	14.72	21.75	31.91	52.10	20.19	PASS
5	0.2490	10.16	32.68	42.84	61.79	18.95	20.37	30.53	51.79	21.26	PASS
6	0.4245	10.16	23.04	33.20	57.36	24.16	16.56	26.72	47.36	20.64	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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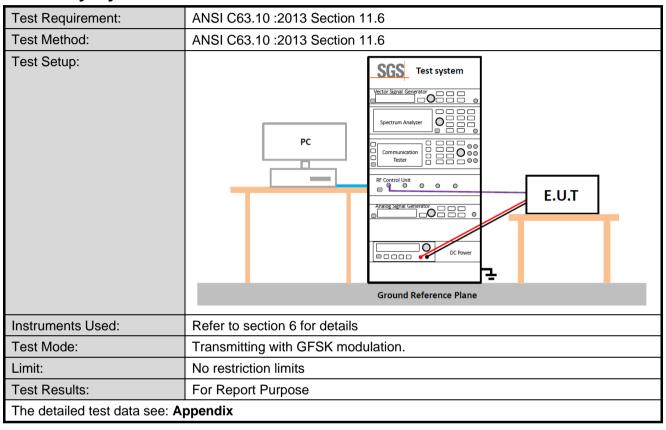
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### 3.3 Duty Cycle



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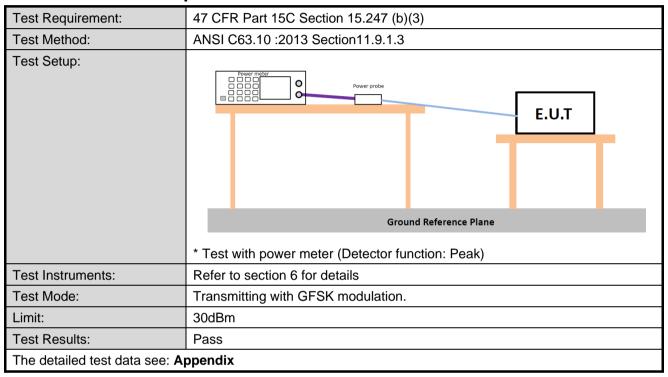
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### 3.4 Conducted Output Power



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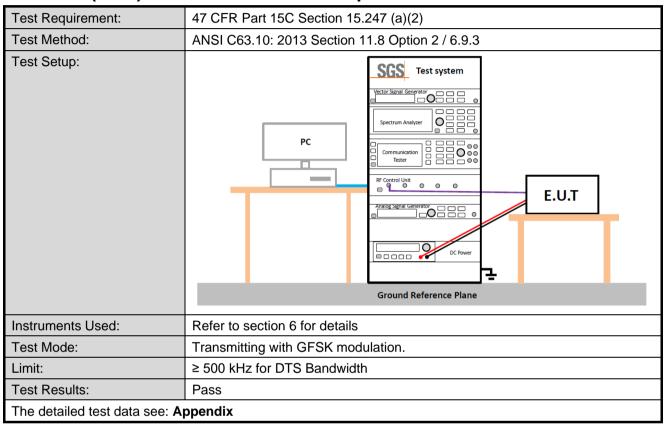
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### 3.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth



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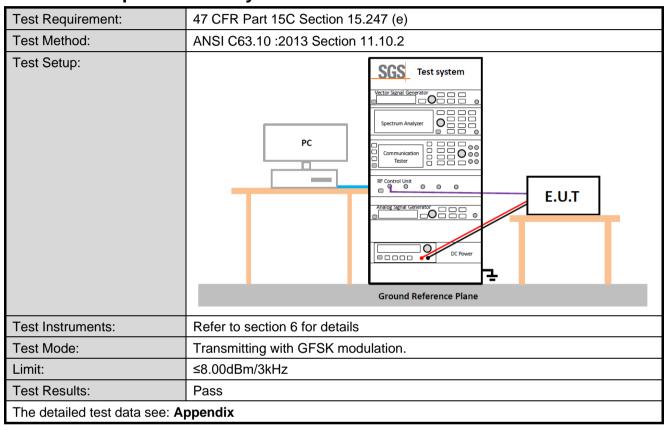
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### 3.6 Power Spectral Density



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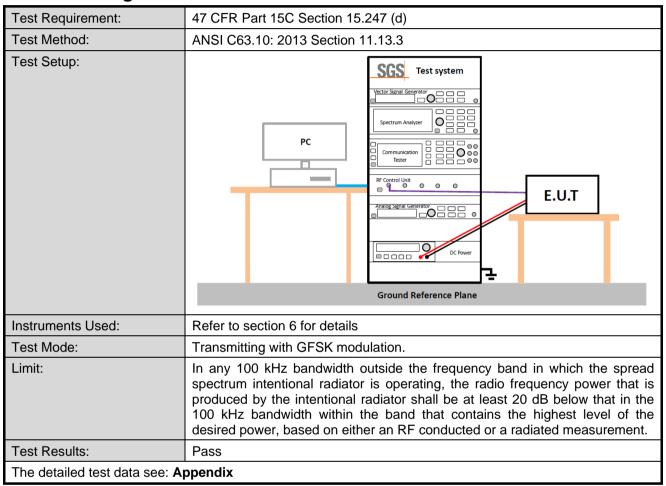
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### 3.7 Band-edge for RF Conducted Emissions



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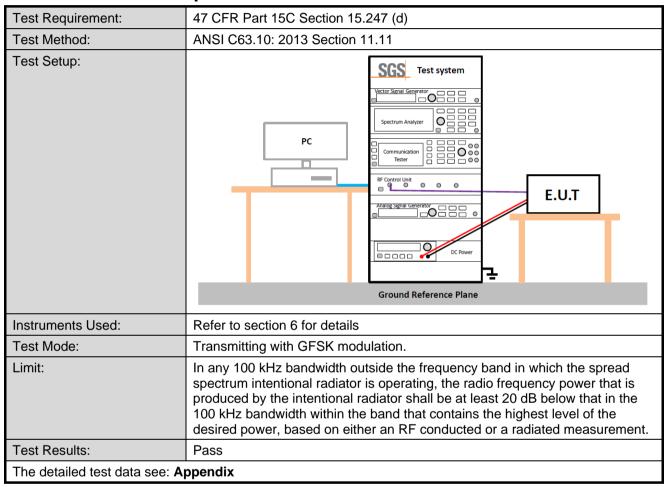
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### 3.8 RF Conducted Spurious Emissions



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### 3.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205								
Test Method:	ANSI C63.10 :2013 Section 11.12								
Test Site:	Measurement Distance:	3m (Semi-Anecho	ic Chamber)	l					
Test Frequency:	9kHz ~ 25GHz								
Limit:	Frequency	Frequency Field strength (dBuV/m) Remark Measurement distance (m)							
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300				
	0.490MHz-1.705MHz	24000/F(kHz)	-	1	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:

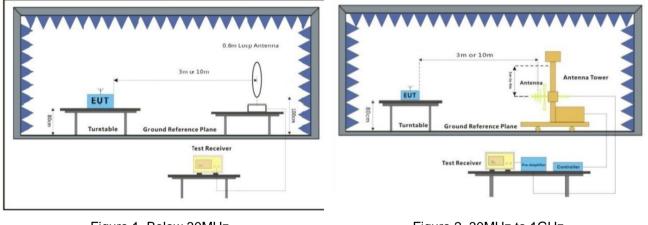


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

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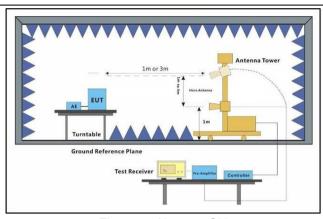


Figure 3. Above 1 GHz

#### 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.
- 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(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 f. 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.
- i. 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.

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Test Configuration:	Measurements below 30MHz  • RBW = 10 kHz  • VBW = 30 kHz  • Detector = Peak & Average & Quasi-peak  • Trace mode = max hold
	Measurements Below 1000MHz  • RBW = 120 kHz  • VBW = 300 kHz  • Detector = Quasi-peak  • Trace mode = max hold Peak Measurements Above 1000 MHz
	<ul> <li>RBW = 1 MHz</li> <li>VBW ≥ 3 MHz</li> <li>Detector = Peak</li> <li>Sweep time = auto</li> <li>Trace mode = max hold</li> <li>Average Measurements Above 1000MHz</li> <li>RBW = 1 MHz</li> <li>VBW = 10 Hz, when duty cycle is no less than 98 percent.</li> <li>VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</li> </ul>
Exploratory Test Mode:	Transmitting with GFSK modulation. Adapter + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation.  Pretest the EUT at Adapter + Transmitting mode,  For below 1GHz part, through pre-scan all channels, but 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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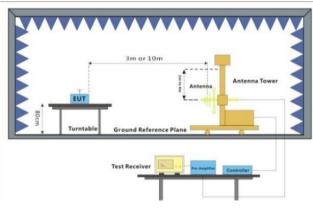
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### 3.10Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 1	47 CFR Part 15C Section 15.209 and 15.205					
Test Method:	ANSI C63.10: 2013 Section	n 11.12					
Test Site:	Measurement Distance: 3m	(Semi-Anechoic Cham	nber)				
Limit:	Frequency	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 1011-	54.0	Average Value				
	Above 1GHz	74.0	Peak Value				

#### Test Setup:



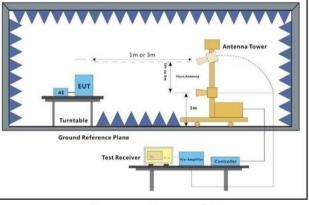


Figure 1. 30MHz to 1GHz

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

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Test Configuration:	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 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.  Measurements Below 1000MHz
rest Configuration:	
	• RBW = 120 kHz
	VBW = 300 kHz      Detector = Oversigned
	Detector = Quasi-peak     Trace mode = max hold
	Irace mode = max noid     Peak Measurements Above 1000 MHz
	RBW = 1 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 Mode:	Transmitting with GFSK modulation.
	Adapter + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation.
	Pretest the EUT at Adapter + 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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Measurement Uncertainty (95% confidence levels, k=2) 4

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%		
5	Duty Cycle	±0.37%		
6	Occupied Bandwidth	1%		
7	Conduction Emission	± 2.90dB (150kHz to 30MHz)		
		± 3.13dB (9k -30MHz)		
	Dadieted Emission	± 4.80dB (30M -1GHz)		
8	Radiated Emission	± 4.80dB (1GHz to 18GHz)		
		± 4.80dB (Above 18GHz)		

#### Remark:

The Ulab (lab Uncertainty) is less than UcispiteTSI (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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**Equipment List** 

RF Test Equipment								
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date			
Shielding Room	Brilliant-emc	N/A	SUWI-04-08-01	11/9/2022	11/8/2025			
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2/18/2024	2/17/2025			
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	5/8/2024	5/7/2025			
Measurement Software	Tonscend	TST272 V2.0	SUWI-03-55-03	NCR	NCR			
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	5/8/2024	5/7/2025			
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-02	5/9/2024	5/8/2025			
Wideband Radio Communication Tester	communication ROHDE&SCHWARZ		SUWI-01-16-05	2/4/2024	2/3/2025			
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2/4/2024	2/3/2025			
Power meter	Anritsu	ML2495A	SUWI-01-31-01	11/19/2024	11/18/2025			
Pulse power sensor	Anritsu	MA2411B SUW		11/19/2024	11/18/2025			
MXG Vector signal genitor	KEYSIGHT	N5182B	SUWI-01-38-01	2/4/2024	2/3/2025			
Router	ASUS	GT- AXE11000(FCC ID MSQ- RTAXJF00)	SUWI-03-14-02	NCR	NCR			
Router	Router TP-LINK 2		SUWI-03-14-03	NCR	NCR			
Signal Generator	ROHDE&SCHWARZ	SMM100A	SUWI-01-07-04	2/16/2024	2/15/2025			
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-07	11/19/2024	11/18/2025			

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CE Test System								
Equipment	Cal Due Date							
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2/1/2024	1/31/2025			
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2/4/2024	2/3/2025			
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-03	2/4/2024	2/3/2025			
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-04	2/4/2024	2/3/2025			
Measurement Software	Tonscend	JS32-CE 4.0.0.2	SUWI-02-09-05	NCR	NCR			

	RSE Test Equipment								
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date				
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	6/3/2023	6/2/2026				
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2/18/2024	2/17/2025				
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	5/8/2024	5/7/2025				
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-07	11/21/2024	11/20/2025				
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2/1/2024	1/31/2025				
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	VULB 9163	SUWI-01-11-01	5/13/2023	5/12/2025				
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	5/13/2023	5/12/2025				
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9170	SUWI-01-11-03	5/12/2023	5/11/2025				
Active Loop Antenna	SCHWRZBECK MESS- ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	5/13/2023	5/12/2025				
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2/1/2024	1/31/2025				
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2/1/2024	1/31/2025				
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2/1/2024	1/31/2025				
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR				

Remark: NCR=No Calibration Requirement.

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#### 6 **Photographs - Setup Photos**

Refer to Appendix A.2 BT&WLAN Setup Photos.

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### 7 Appendix

1. Duty Cycle

1.1 Test Result

### 1.1.1 Ant1

	Ant1								
Mode	TX	Frequency	T_on	Period	Duty Cycle	Duty Cycle	Max. DC		
Mode	Type	(MHz)	(ms)	(ms)	(%)	Correction Factor (dB)	Variation (%)		
		2402	0.393	0.625	62.88	2.01	0.03		
1M	SISO	2440	0.393	0.625	62.88	2.01	0.03		
		2480	0.393	0.625	62.88	2.01	0.03		

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### 2. Bandwidth

### 2.1 Test Result

#### 2.1.1 OBW

Mode	TX	Frequency	ANT	99% Occupied Bandwidth (MHz)		Verdict
iviode	Туре	(MHz)	ANI	Result	Limit	verdict
		2402	1	1.041	/	Pass
1M	SISO	2440	1	1.042	/	Pass
		2480	1	1.042	/	Pass

#### 2.1.2 6dB BW

Mada	TX			6dB Bandv	\/ordiot	
Mode Type	(MHz)	(MHz) ANT	Result	Limit	Verdict	
		2402	1	0.674	>=0.5	Pass
1M	SISO	2440	1	0.675	>=0.5	Pass
		2480	1	0.672	>=0.5	Pass

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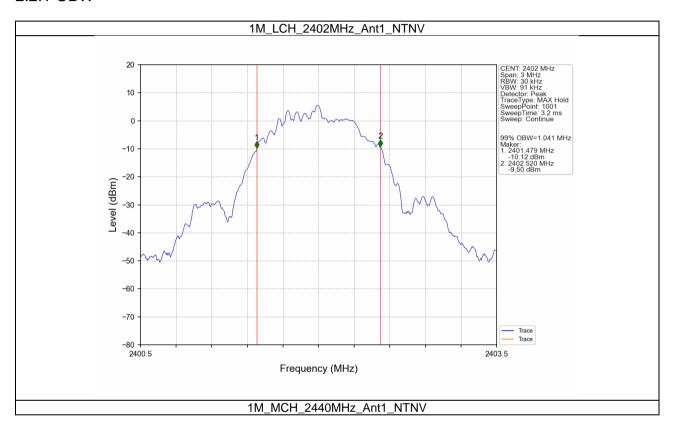


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### 2.2 Test Graph

#### 2.2.1 OBW



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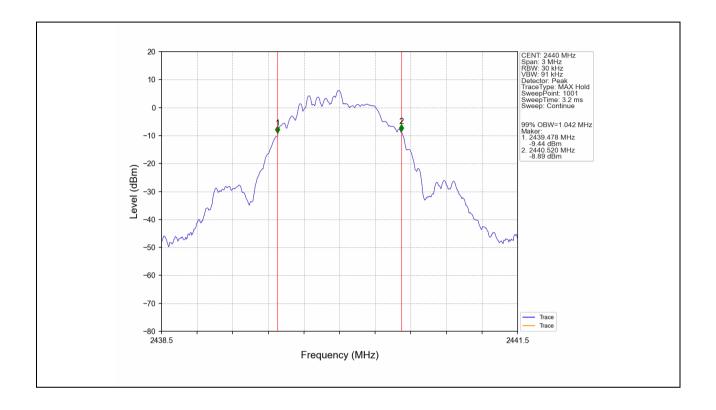
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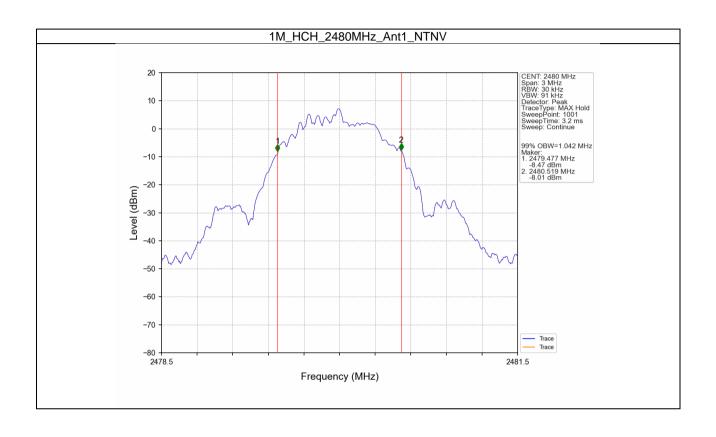
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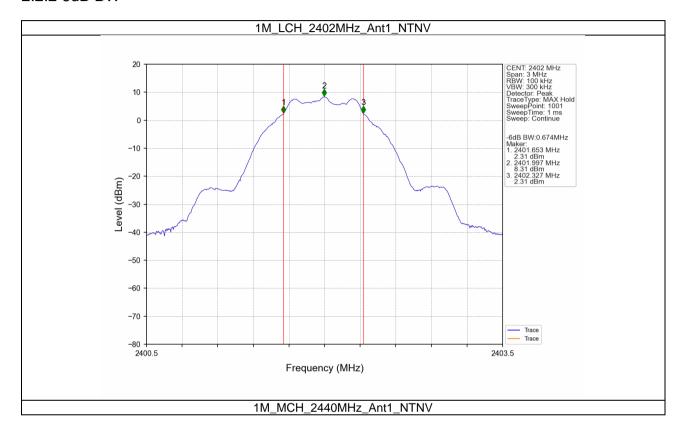


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#### 2.2.2 6dB BW



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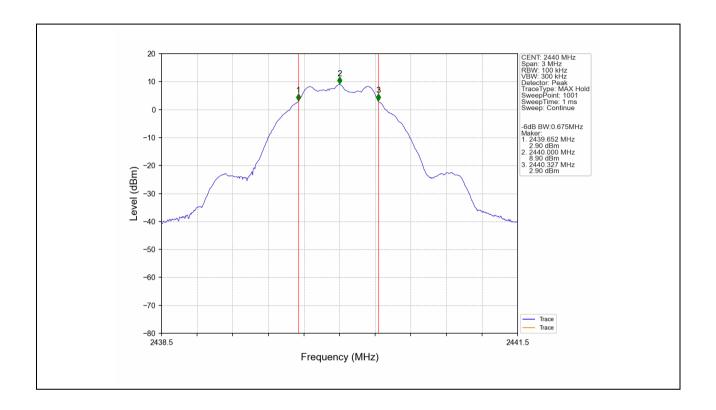
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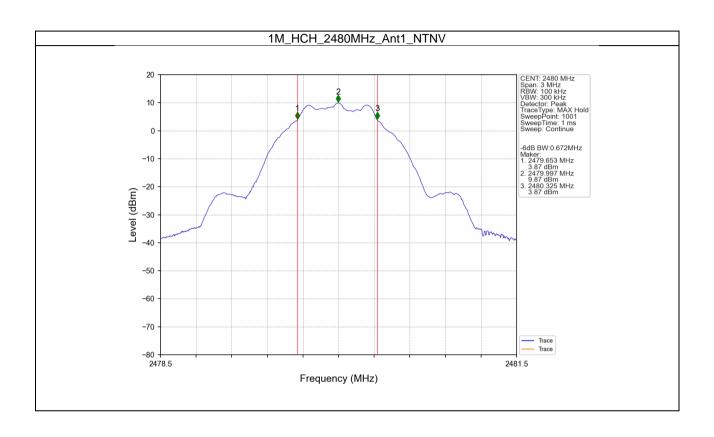
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### 3. Maximum Conducted Output Power

### 3.1 Test Result

### 3.1.1 Power

Mode	TX	Frequency	Maximum Peak Conduc	Maximum Peak Conducted Output Power (dBm)					
iviode	Type	(MHz)	ANT1	Limit	Verdict				
		2402	4.67	<=30	Pass				
1M	SISO	2440	5.48	<=30	Pass				
		2480	6.56	<=30	Pass				
Note1: Antenna Gain: Ant1: 2.20dBi;									

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### 4. Maximum Power Spectral Density

### 4.1 Test Result

### 4.1.1 PSD

Mode	TX	Frequency	Maximum PS	Verdict					
	Type	(MHz)	ANT1	Limit	Verdict				
		2402	-10.22	<=8	Pass				
1M	SISO	2440	-9.41	<=8	Pass				
		2480	-8.33	<=8	Pass				
Note1: Antenna Gain: Ant1: 2.20dBi;									

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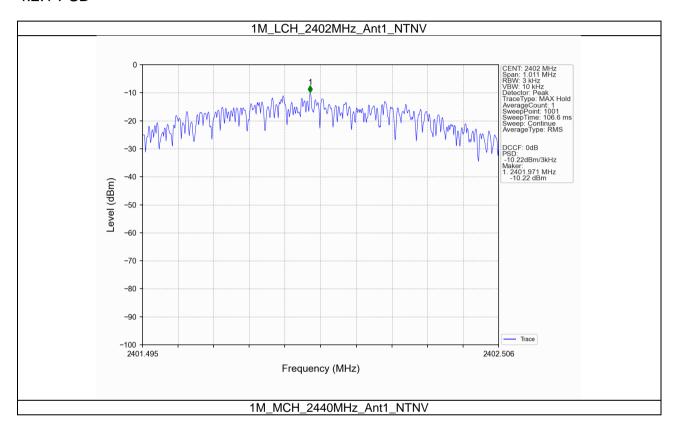


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4.2 Test Graph

### 4.2.1 PSD



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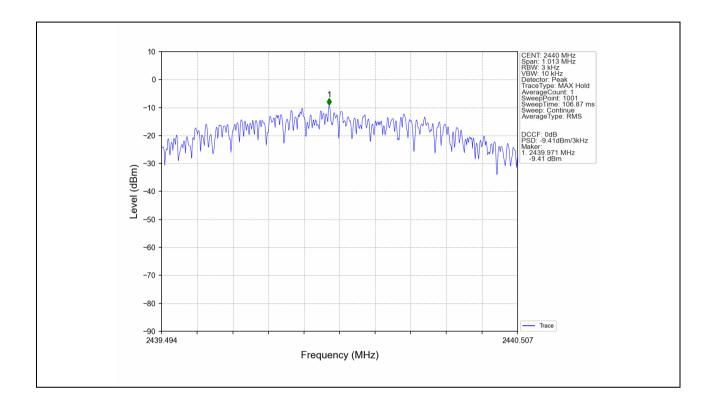
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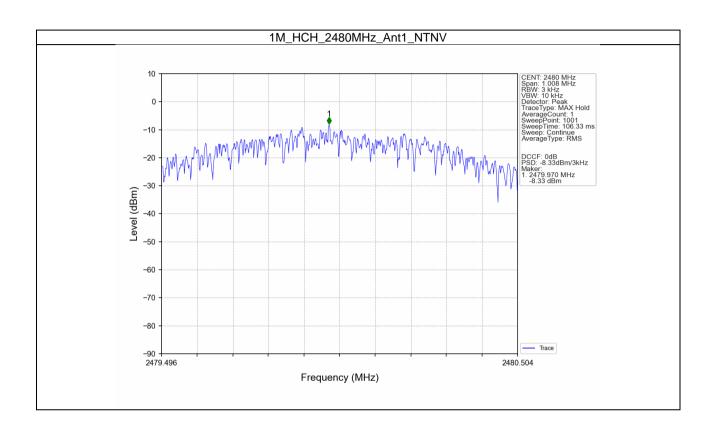
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### 5. Unwanted Emissions In Non-restricted Frequency Bands

### 5.1 Test Result

### 5.1.1 Ref

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
		2402	1	8.26
1M	SISO	2440	1	8.88
		2480	1	9.84

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

### 5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
		2402	1	9.84	-10.16	Pass
1M	SISO	2440	1	9.84	-10.16	Pass
		2480	1	9.84	-10.16	Pass

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

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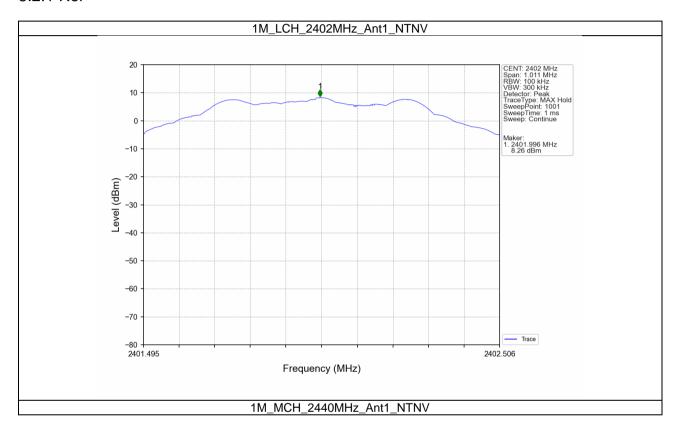
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### 5.2 Test Graph

### 5.2.1 Ref



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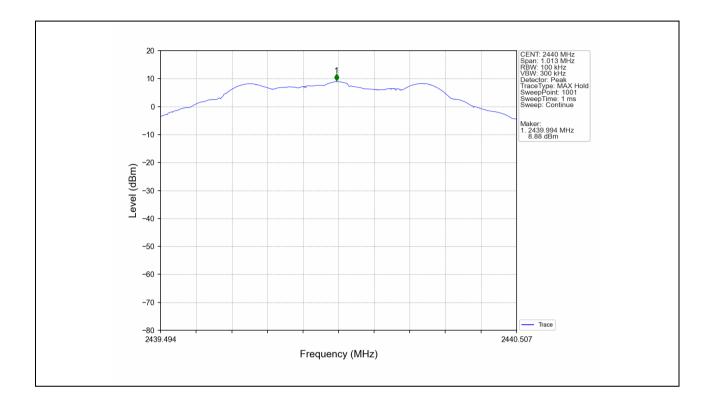
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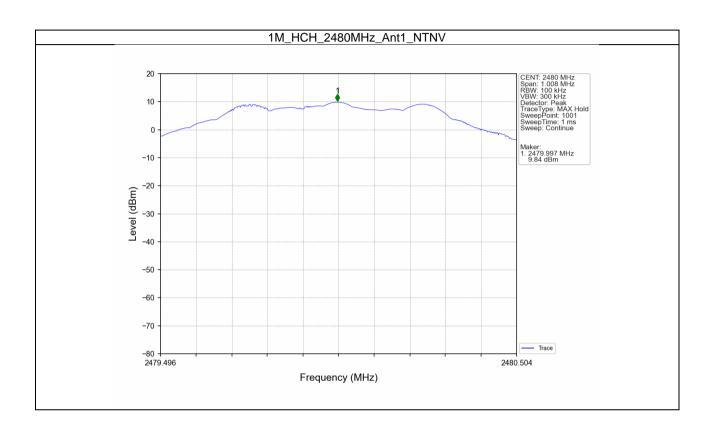
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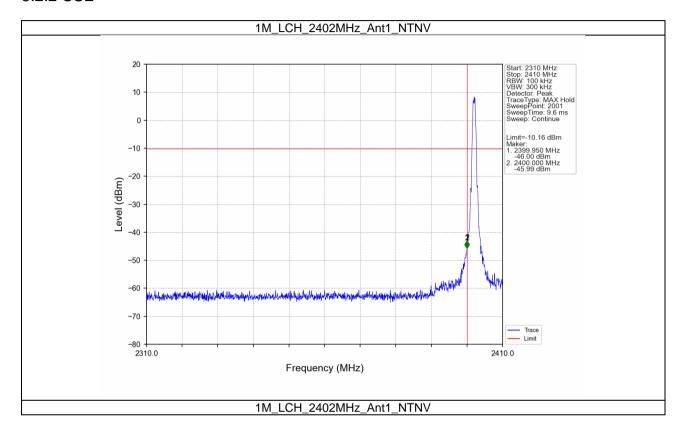


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### 5.2.2 CSE



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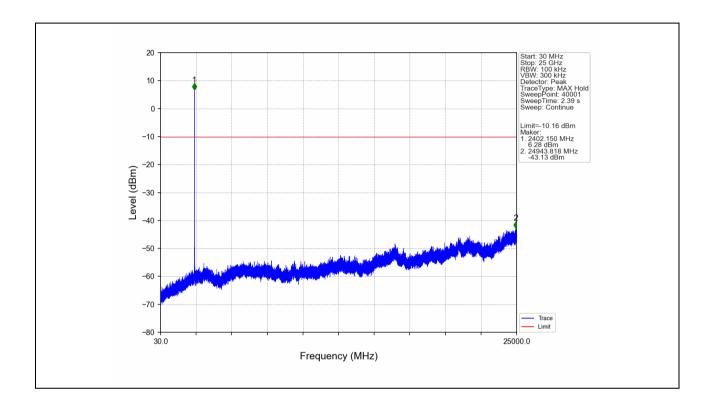
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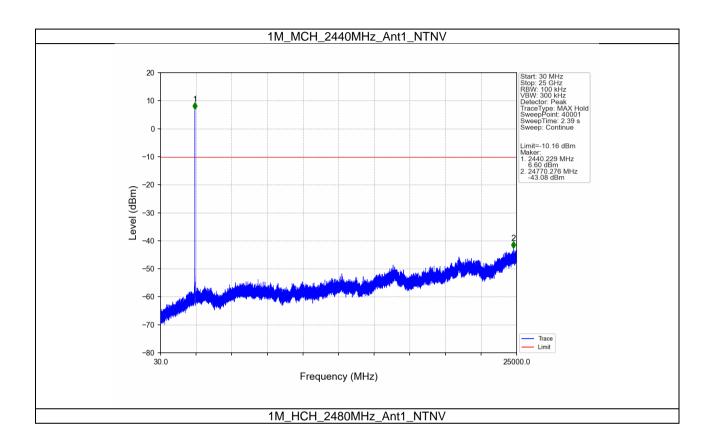
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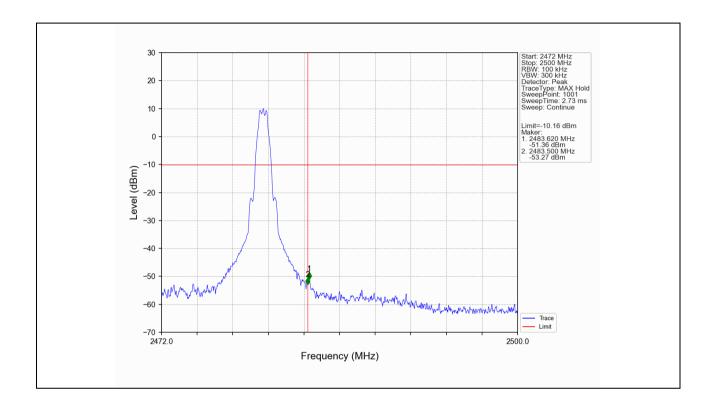
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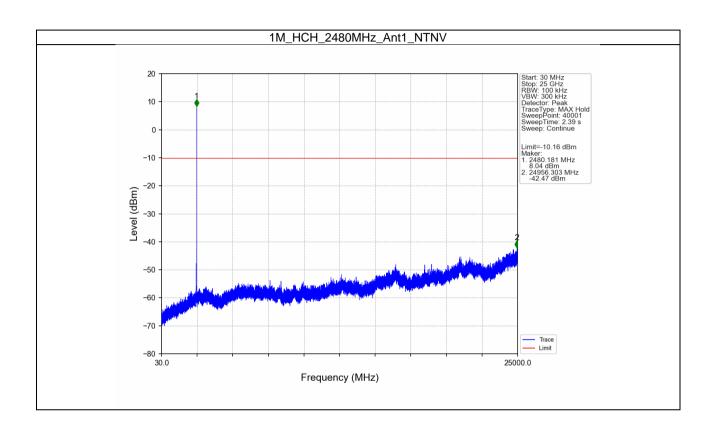
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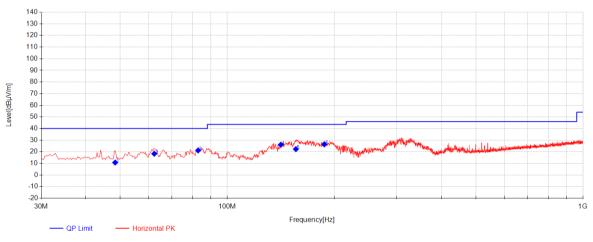
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### **Radiated Spurious Emissions**

### Radiated emission below 1GHz

Worst case Mode: BLE 1M Channel 39



QP Detector

Final	Final Data List												
NO.	Frequency [MHz]]	Reading [dΒμV]	Factor [dB]	AF [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity					
1	48.4552	25.91	-33.98	18.80	10.73	40.00	29.27	Horizontal					
2	62.4091	34.64	-33.83	17.50	18.31	40.00	21.69	Horizontal					
3	82.8836	40.27	-33.63	14.51	21.15	40.00	18.85	Horizontal					
4	141.5437	40.83	-33.23	18.46	26.06	43.50	17.44	Horizontal					
5	155.9952	36.62	-33.11	18.77	22.28	43.50	21.22	Horizontal					
6	187.5449	43.56	-32.83	15.64	26.37	43.50	17.13	Horizontal					

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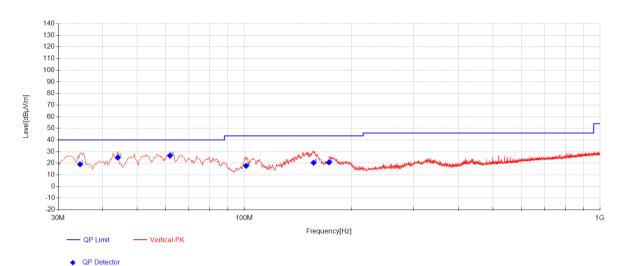
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Final	Final Data List												
NO.	Frequency [MHz]]	Reading [dΒμV]	Factor [dB]	AF [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity					
1	34.5892	34.88	-34.00	18.20	19.08	40.00	20.92	Vertical					
2	44.1750	40.16	-33.99	18.81	24.98	40.00	15.02	Vertical					
3	61.8893	42.98	-33.84	17.40	26.54	40.00	13.46	Vertical					
4	101.2628	36.38	-33.47	14.83	17.74	43.50	25.76	Vertical					
5	156.7673	34.51	-33.10	19.01	20.42	43.50	23.08	Vertical					
6	173.2322	35.41	-32.92	18.24	20.73	43.50	22.77	Vertical					

#### Remark:

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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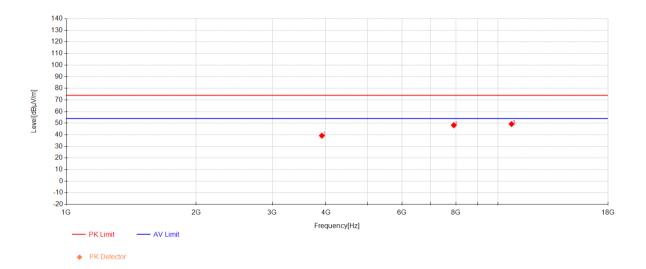
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## **Transmitter emission Above 1GHz**





Data	Data List										
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity			
1	3913.5	51.02	31.01	-42.81	39.22	74.00	34.78	Horizontal			
2	7909	47.84	37.01	-36.65	48.20	74.00	25.80	Horizontal			
3	10762.5	41.56	38.28	-30.61	49.23	74.00	24.77	Horizontal			

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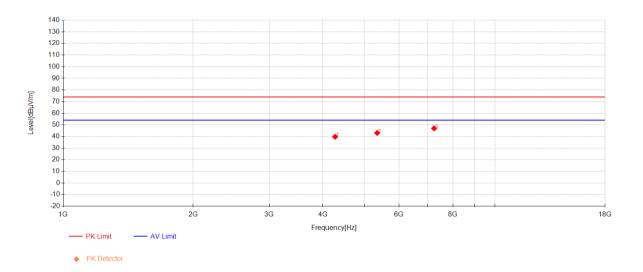
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### **BLE 1M Channel 00**



Data	Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity			
1	4266	50.12	31.73	-42.07	39.77	74.00	34.23	Vertical			
2	5340.5	50.82	33.13	-40.91	43.05	74.00	30.95	Vertical			
3	7233	48.53	36.28	-37.83	46.98	74.00	27.02	Vertical			

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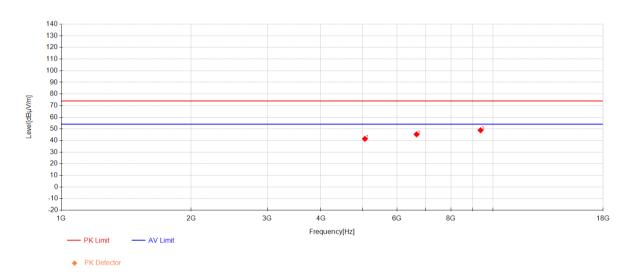
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### **BLE 1M Channel 19**



Data	Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity			
1	5055	49.61	33.19	-41.37	41.43	74.00	32.57	Horizontal			
2	6660	48.26	35.86	-38.86	45.27	74.00	28.73	Horizontal			
3	9368	44.98	37.71	-33.88	48.81	74.00	25.19	Horizontal			

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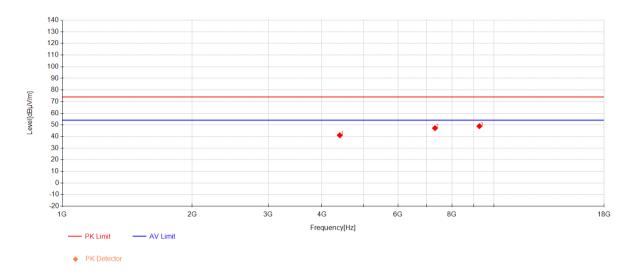


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### **BLE 1M Channel 19**



Data I	Data List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	4399	51.26	31.94	-42.15	41.05	74.00	32.95	Vertical		
2	7307	48.21	36.37	-37.40	47.18	74.00	26.82	Vertical		
3	9260.5	45.43	37.68	-34.27	48.84	74.00	25.16	Vertical		

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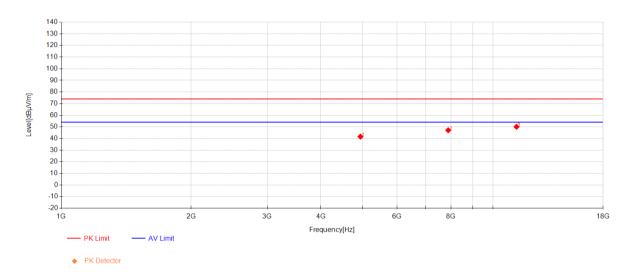
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### **BLE 1M Channel 39**



Data	Data List										
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity			
1	4936.5	49.84	33.06	-41.30	41.60	74.00	32.40	Horizontal			
2	7884	46.77	36.98	-36.68	47.08	74.00	26.92	Horizontal			
3	11349	41.86	38.40	-30.20	50.06	74.00	23.94	Horizontal			

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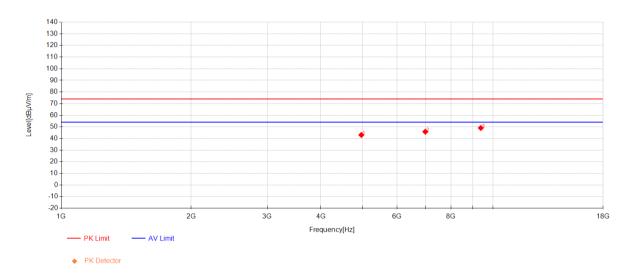
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### **BLE 1M Channel 39**



Data	Data List										
NO.	Frequency [MHz]	Reading [dΒμV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity			
1	4960	51.31	33.11	-41.36	43.06	74.00	30.94	Vertical			
2	6977.5	48.20	35.99	-38.37	45.82	74.00	28.18	Vertical			
3	9380.5	45.16	37.71	-33.83	49.04	74.00	24.96	Vertical			

### Remark:

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(dBµV) + 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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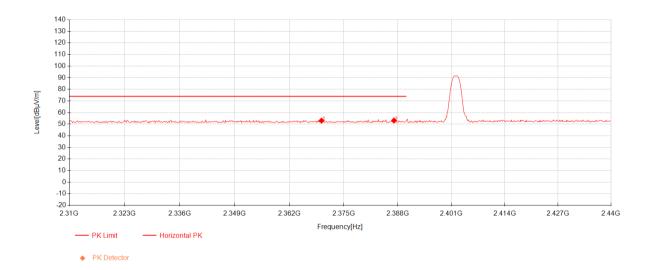


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# Restricted bands around fundamental frequency BLE 1M Channel 00



Data List									
NO.	Frequency [MHz]	Reading [dΒμV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	
1	2369.67	49.24	27.11	-23.30	53.05	74.00	20.95	Horizontal	
2	2387.09	49.30	27.15	-23.31	53.14	74.00	20.86	Horizontal	

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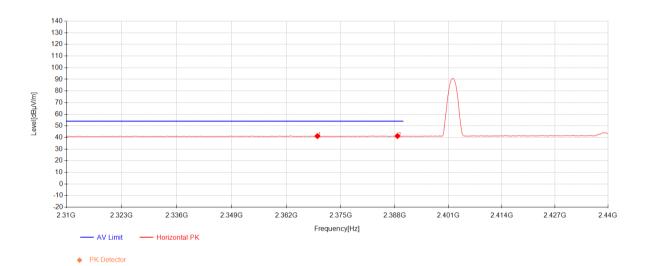
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### **BLE 1M Channel 00**



Data	Data List									
NO.	Frequency [MHz]	Reading [dВµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2369.41	37.39	27.11	-23.30	41.20	54.00	12.80	Horizontal		
2	2388.65	37.46	27.16	-23.31	41.30	54.00	12.70	Horizontal		

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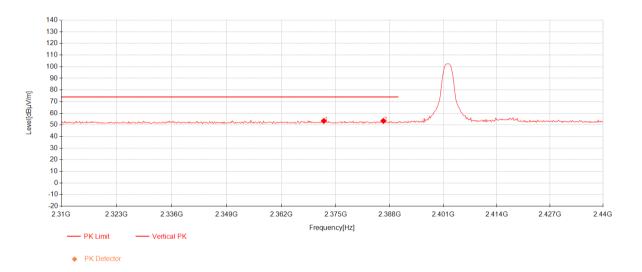
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### **BLE 1M Channel 00**



Data	Data List									
NO.	Frequency [MHz]	Reading [dВµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2372.14	49.58	27.12	-23.30	53.40	74.00	20.60	Vertical		
2	2386.44	49.54	27.15	-23.31	53.38	74.00	20.62	Vertical		

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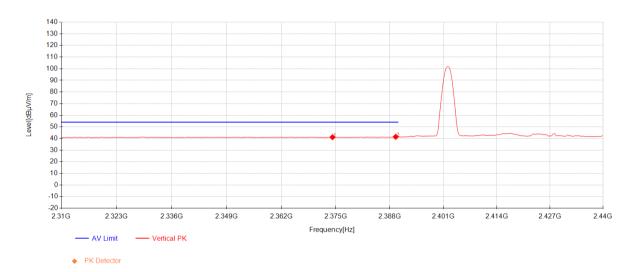


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### **BLE 1M Channel 00**



Data	Data List									
NO.	Frequency [MHz]	Reading [dВµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2374.22	37.30	27.12	-23.30	41.12	54.00	12.88	Vertical		
2	2389.43	37.61	27.16	-23.31	41.45	54.00	12.55	Vertical		

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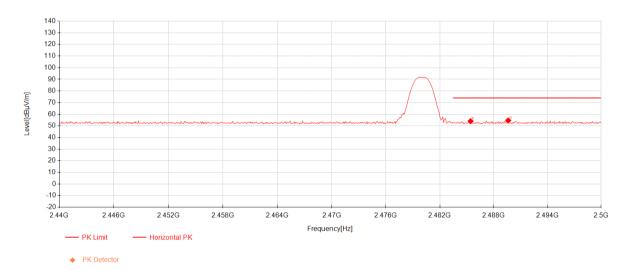
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### **BLE 1M Channel 39**



**Data List** Reading Frequency Factor Level Limit Margin NO. **Polarity** [MHz] [dB/m] [dBµV/m] [dBµV] [dBµV/m] [dB] [dB] 2485.42 49.94 27.37 -23.2754.04 74.00 19.96 Horizontal 1 2 2489.62 50.53 27.38 -23.27 54.64 74.00 19.36 Horizontal

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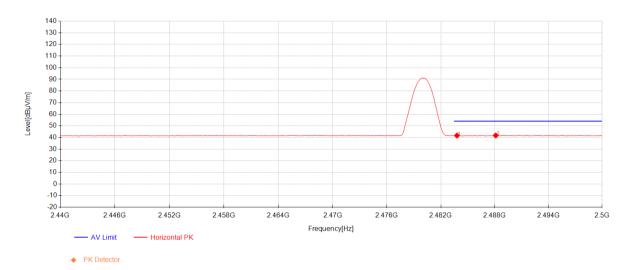
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### **BLE 1M Channel 39**



Data	Data List									
NO.	Frequency [MHz]	Reading [dВµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2483.8	37.59	27.36	-23.27	41.68	54.00	12.32	Horizontal		
2	2488.12	37.64	27.37	-23.27	41.75	54.00	12.25	Horizontal		

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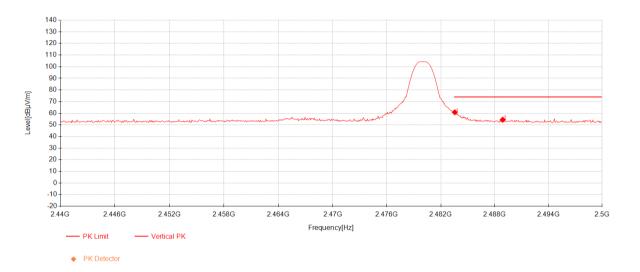
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### **BLE 1M Channel 39**



Data	Data List									
NO.	Frequency [MHz]	Reading [dВµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2483.56	56.72	27.36	-23.27	60.81	74.00	13.19	Vertical		
2	2488.9	50.34	27.38	-23.27	54.45	74.00	19.55	Vertical		

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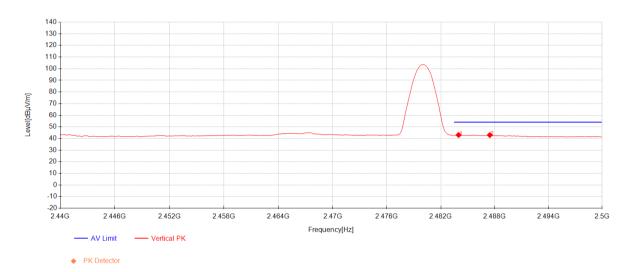
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### **BLE 1M Channel 39**



Data	Data List									
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity		
1	2483.98	38.92	27.36	-23.27	43.02	54.00	10.98	Vertical		
2	2487.46	38.87	27.37	-23.27	42.97	54.00	11.03	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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