

Report No.: SEWM2209000164RG03

Rev.: 01

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TEST REPORT

Application No.: SEWM2209000164RG
Applicant: Quectel Wireless Solutions Co., Ltd.
Address of Applicant: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer: Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
EUT Description: Multi-mode Smart LTE Module
Model No.: SC206E-NA
Trade Mark: Quectel
FCC ID: XMR2022SC206ENA
Standards: FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart C
Date of Receipt: 2022/05/07
Date of Test: 2022/05/10 to 2022/06/24
Date of Issue: 2022/09/07

Test Result :	PASS *
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* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Panta Sun

Panta Sun
Wireless Laboratory Manager



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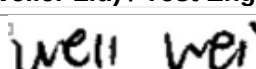
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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022/09/07		Original

Prepared By	
	(Weller Liu) / 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 2013 Section 6.2	Clause 4.2	PASS
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013 Section 11.9.2.3	Clause 4.4	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 4.5	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10 2013 Section 11.10.2	Clause 4.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013 Section 11.11	Clause 4.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013 Section 11.11	Clause 4.8	PASS
Radiated Spurious Emissions	15.205/15.209	ANSI C63.10 2013 Section 11.12	Clause 4.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.205/15.209	ANSI C63.10 2013 Section 11.12	Clause 4.10	PASS



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Remark for SEWA2205000012RG03 issue on 2022/06/24:

According to customer statement, SC200E-NA has two versions of samples, full test LPDDR4X version, LPDDR3 version to check LPDDR4X worse mode, the final report only presents the worst data of the two versions.

Remark for SEWM2209000164RG03 issue on 2022/09/07:

This test report (Report No.: SEWM2209000164RG03 issue on 2022/09/07) is based on the original report with report number SEWA2205000012RG03 issue on 2022/06/24.

Review this report and original report, this report just changing FCC ID, Model No. and Software Version, Which according to the declaration letter from client.

Therefore in this report all items do not need to retest and all test data in this report are based on the previous report with report number SEWA2205000012RG03 issue on 2022/06/24.



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3 General Information

3.1 Details of Client

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address of Applicant:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer:	Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

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:	Lves 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:	Multi-mode Smart LTE Module
Model No.:	SC206E-NA
Trade Mark:	Quectel
Hardware Version:	LPDDR4X: R1.0 LPDDR3: R1.1
Software Version:	SC206ENANAR60A02
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
Rates Type*:	☒ Provided by client 1M PHY
Antenna Type:	☒ External, ☐ Integrated
Antenna Gain:	0.47dBi(Ant0) Note: The antenna gain are derived from the gain information report provided by the manufacturer.
RF Cable*:	☒ Provided by client 0.5dB
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. Remark: As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.	



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Operation Frequency of each channel							
Channel	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	44~60 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~25	3.8
LTVN	-35	3.8
HTNV	75	3.8
Remark: NV: Normal Voltage NT: Normal Temperature LT: Low Extreme Test Temperature HT: High Extreme Test Temperature		

3.6 Description of Support Units

Description	Manufacturer	Model No.
Mother board	Quectel	EVB-G2_V1.3
Remark: all above the information of table are provided by client.		



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4 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.	
Non-standard antenna connector is used. The antenna peak gain of EUT is less than 6 dBi, Therefore, it is not necessary to reduce maximum peak output power limit.	



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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: 2013 Section 6.2		
Test Frequency Range:	150kHz to 30MHz		
Receiver Setup:	RBW = 9kHz, VBW = 30kHz		
Limit:	Frequency range(MHz)	Limit (dBuV)	
		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 logarithm of the frequency.			
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 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. 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. 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. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.		



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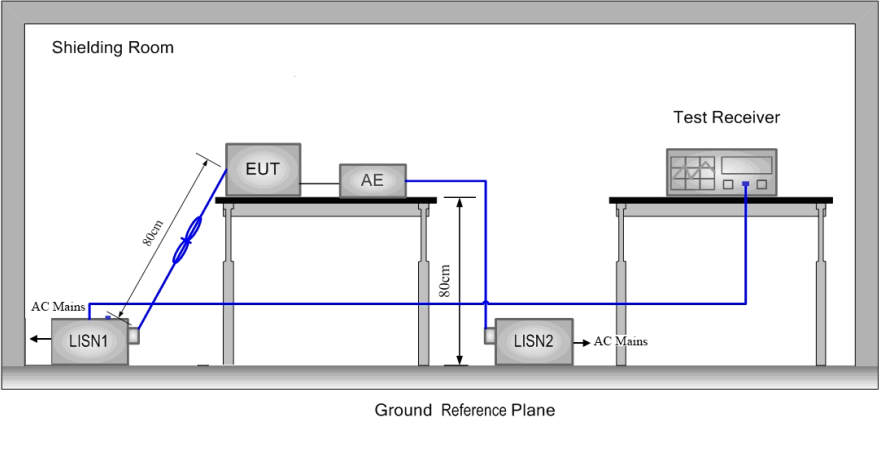
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Test Setup:	
Test Mode:	Transmitting with GFSK modulation. Charge +Transmitting mode.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



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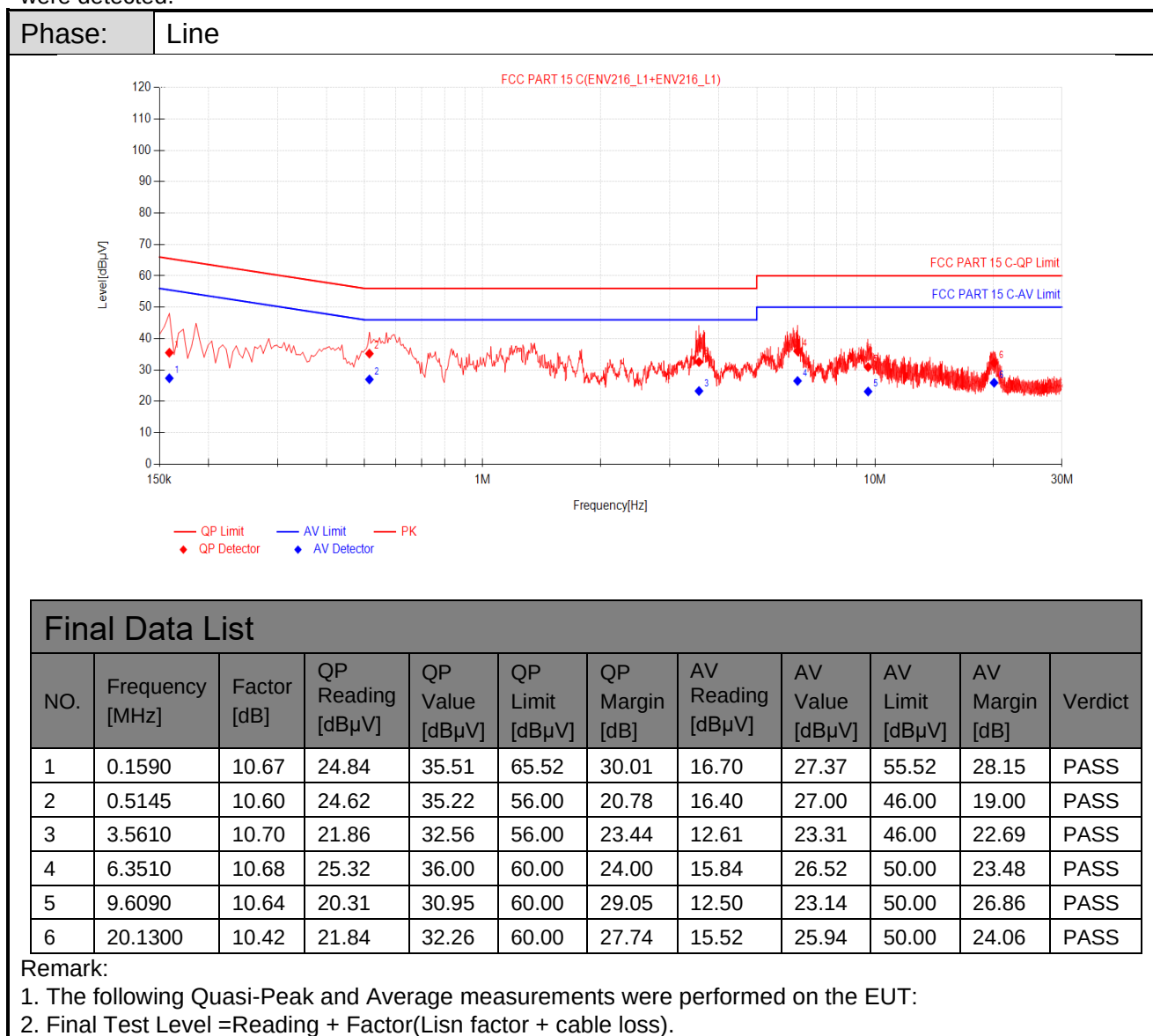
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Measurement Data

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

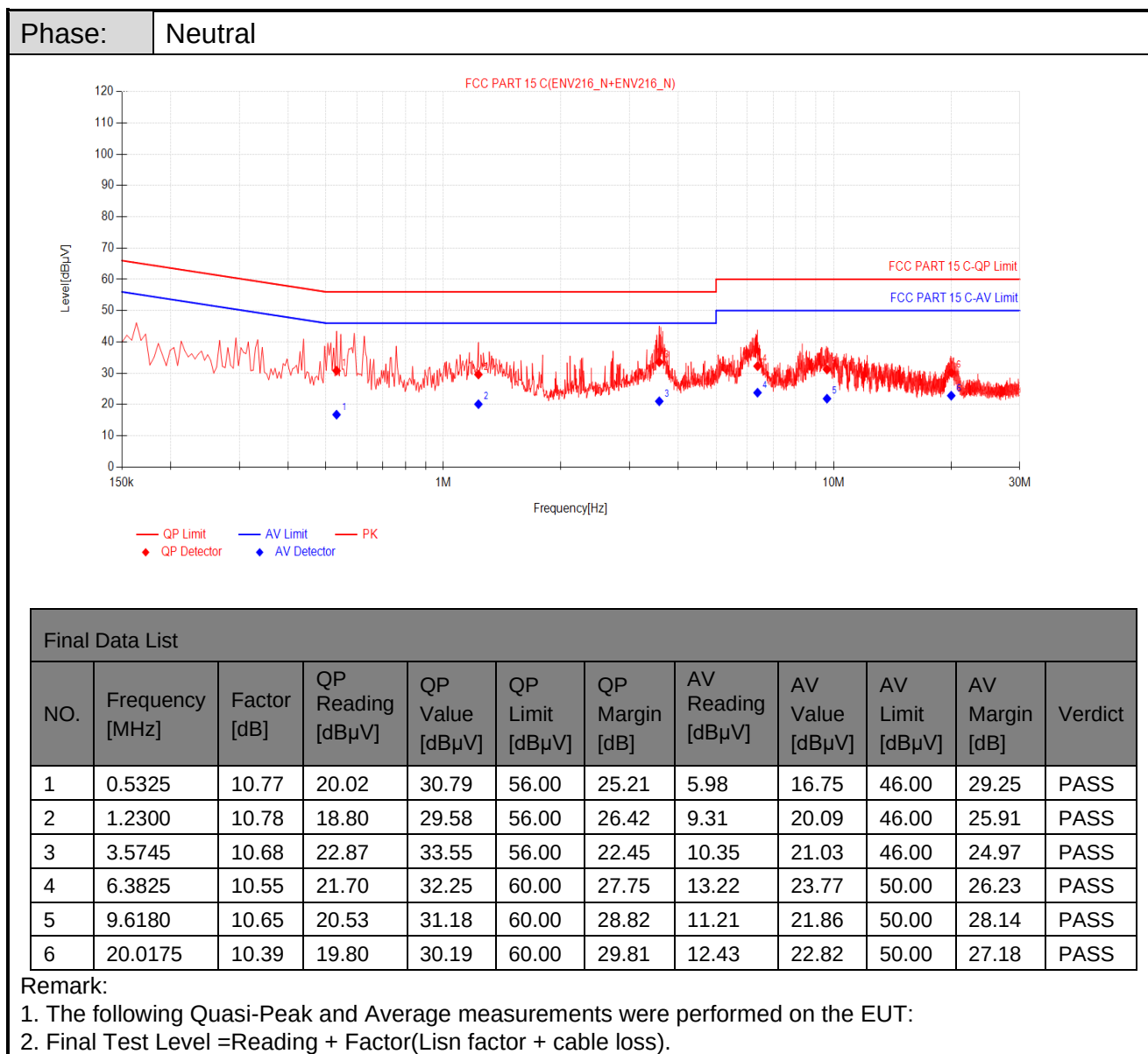
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.



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4.3 Duty Cycle

The detailed test data see: **Appendix**



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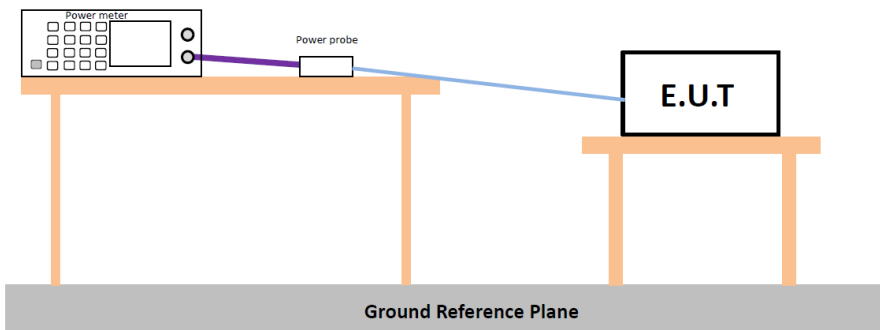
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4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section11.9.2.3
Test Setup:	 * Test with power meter (Detector function: Peak)
Test Instruments:	Refer to section 6 for details
Test Mode:	Transmitting with GFSK modulation.
Limit:	30dBm
Test Results:	Pass
The detailed test data see: Appendix	



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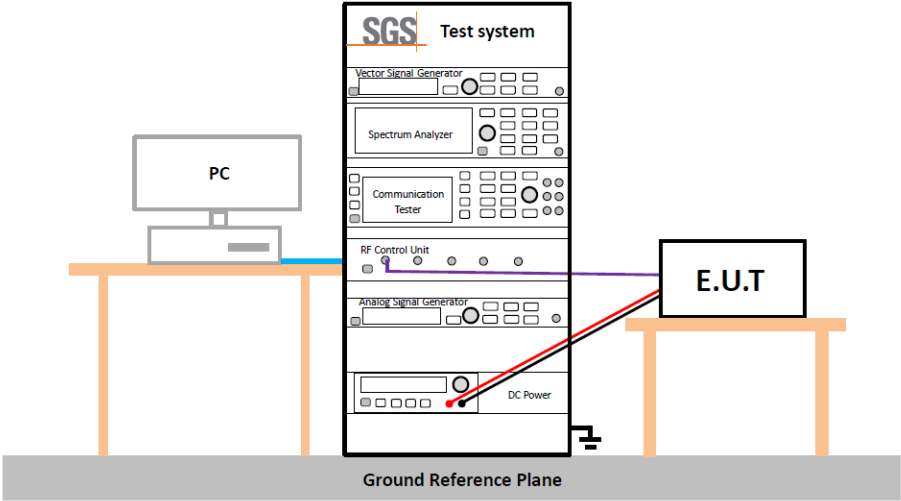
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4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8 Option 2 / 6.9.3
Test Setup:	
Instruments Used:	Refer to section 6 for details
Test Mode:	Transmitting with GFSK modulation.
Limit:	≥ 500 kHz
Test Results:	Pass
The detailed test data see: Appendix	



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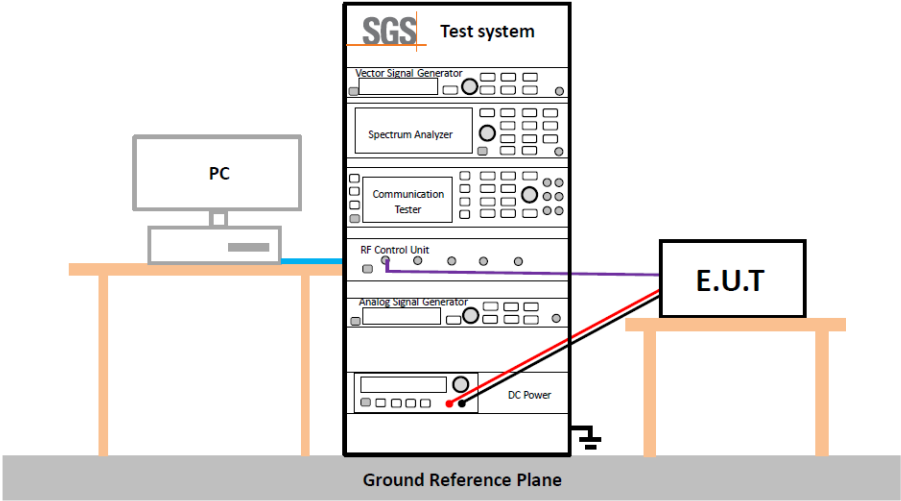
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4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 6 for details
Test Mode:	Transmitting with GFSK modulation.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass
The detailed test data see: Appendix	



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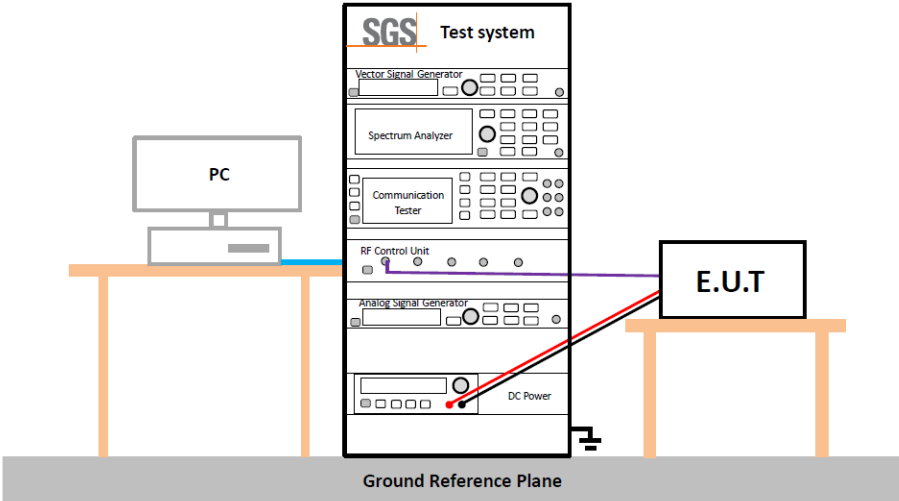
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4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
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: Appendix	



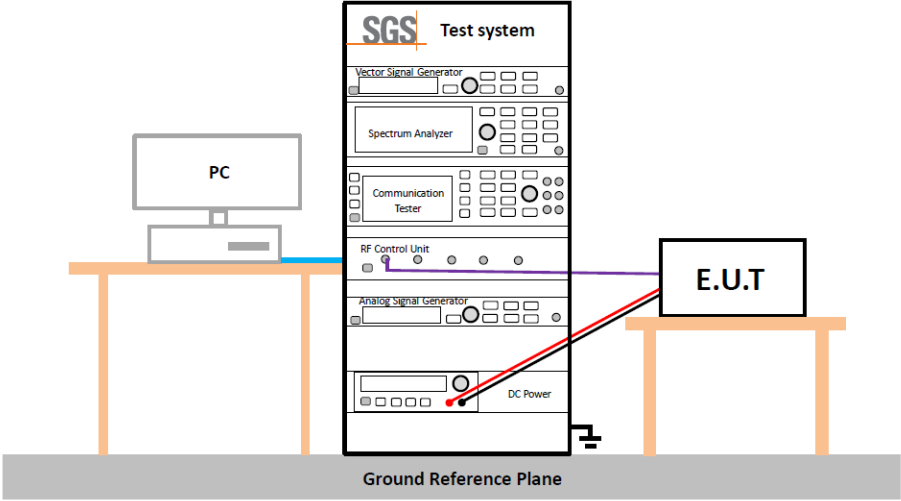
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4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
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: Appendix	



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4.9 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-Anechoic Chamber)				
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	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:

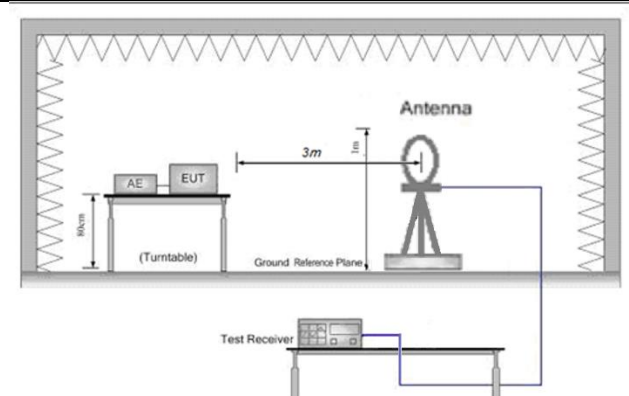


Figure 1. Below 30MHz

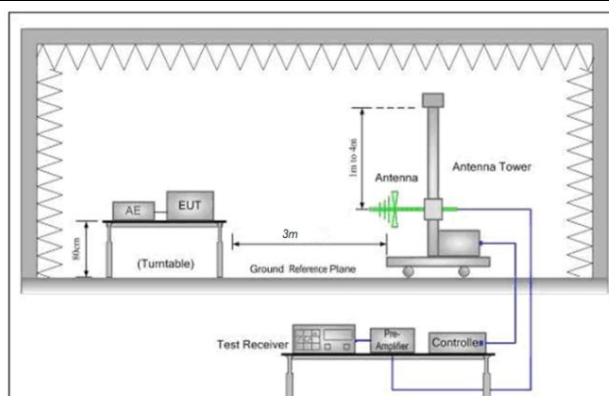


Figure 2. 30MHz to 1GHz



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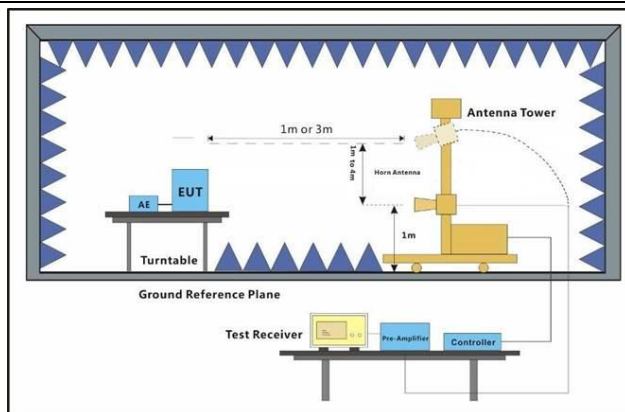


Figure 3. Above 1 GHz

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 chamber. 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 chamber. 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 $20 \cdot \log(3/1) = 9.54 \text{ dB}$.
Test Configuration:	Measurements Below 1000MHz - RBW = 120 kHz - VBW = 300 kHz - Detector = Peak - Trace mode = max hold

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	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 ≥ [3 *RBW] • Detector = RMS (power averaging), if span / (# of points in sweep) ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak. • Sweep time = auto • Perform a trace average of at least 100 traces. Value = Reading + Factor(Antenna Factor + Cable loss – Preamplifier Factor).
Exploratory Test Mode:	Transmitting with GFSK modulation. Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation. 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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4.10 Restricted bands around fundamental frequency

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-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 1GHz	54.0	Average Value
		74.0	Peak Value

Test Setup:

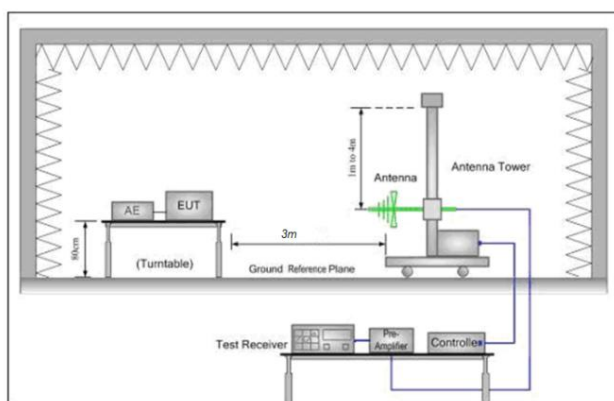


Figure 1. 30MHz to 1GHz

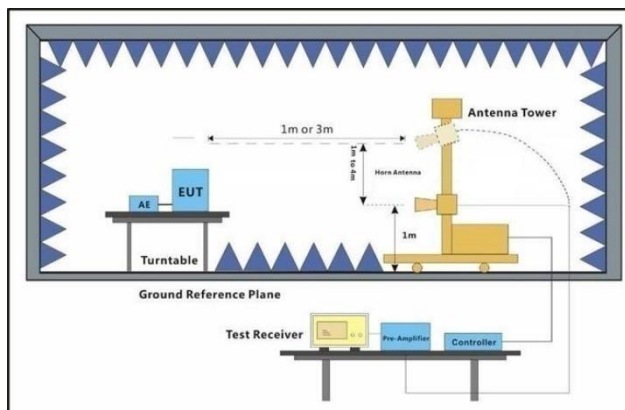


Figure 2. Above 1 GHz

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 chamber. 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 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.
- 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

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	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 = 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 ≥ [3 *RBW] • Detector = RMS (power averaging), if span / (# of points in sweep) ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak. • Sweep time = auto • Perform a trace average of at least 100 traces. Value = Reading + Factor(Antenna Factor + Cable loss).
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: Appendix	



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

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.54\text{dB}$
2	RF power density, conducted	$\pm 1.03\text{dB}$
3	Spurious emissions, conducted	$\pm 0.54\text{dB}$
4	Radio Frequency	$\pm 1.0\%$
5	Duty Cycle	$\pm 0.37\%$
6	Occupied Bandwidth	$\pm 1.0\%$
7	Conduction Emission	$\pm 2.90\text{dB}$ (150kHz to 30MHz)
8	Radiated Emission	$\pm 3.13\text{dB}$ (9k -30MHz)
		$\pm 4.80\text{dB}$ (30M -1GHz)
		$\pm 4.80\text{dB}$ (1GHz to 18GHz)
		$\pm 4.80\text{dB}$ (Above 18GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (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					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
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	2022/02/16	2023/02/15
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	2021/05/28	2022/05/27
				2022/05/17	2023/05/16
Measurement Software	Tonscend	JS1120-3 Test System V3.1.55	SUWI-02-09-09	NCR	NCR
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2022/02/15	2023/02/14
Power meter	Anritsu	ML2495A	SUWI-01-31-01	2021/12/04	2022/12/03
Pulse power sensor	Anritsu	MA2411B	SUWI-01-32-01	2021/12/04	2022/12/03

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	SUWI-04-03-01	2021/05/08	2024/05/07
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-01	2022/02/19	2023/02/18
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-02	2022/02/19	2023/02/18
Measurement Software	Tonscend	JS32-CE V4.0.0.2	SUWI-02-09-05	NCR	NCR
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2022/02/19	2023/02/18
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2022/02/16	2023/02/15



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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	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2022/02/16	2023/02/15
Signal Analyzer*	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2021/05/28	2022/05/27
				2022/05/28	2023/05/27
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	2021/12/04	2022/12/03
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2022/02/19	2023/02/18
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2022/02/15	2023/02/14
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	VULB 9163	SUWI-01-11-01	2021/05/16	2023/05/15
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2021/05/16	2023/05/15
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2021/05/14	2023/05/13
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2022/02/14	2023/02/13
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2022/02/14	2023/02/13
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2022/02/19	2023/02/18
Active Loop Antenna	SCHWRZBECK MESS- ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2021/06/10	2023/06/09
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR
Measurement Software	Tonscend	JS32-RSE V4.0.0.1	SUWI-02-09-06	NCR	NCR

*Note: This equipment was not used for testing on 2022/05/27.



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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
BLE_1M	Ant0	2402	0.67	2401.66	2402.32	≥ 0.5	PASS
		2440	0.67	2439.66	2440.33	≥ 0.5	PASS
		2480	0.67	2479.66	2480.33	≥ 0.5	PASS



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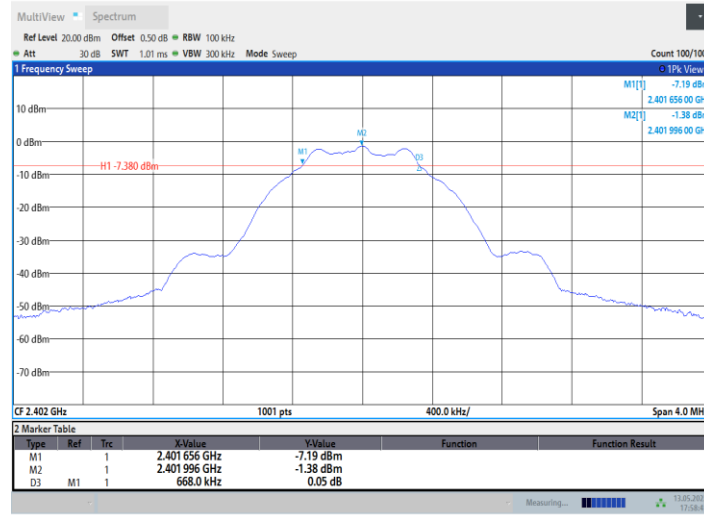
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Test Graphs

BLE_1M_Ant0_2402



17:58:42 13.05.2022

BLE_1M_Ant0_2440



18:01:16 13.05.2022



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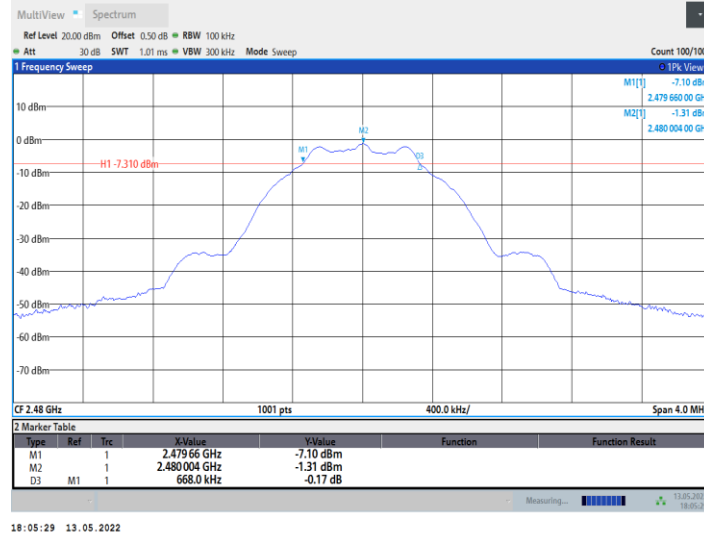
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BLE_1M_Ant0_2480



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Occupied Channel Bandwidth Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant0	2402	1.031	2401.485	2402.516	---	---
		2440	1.032	2439.485	2440.518	---	---
		2480	1.031	2479.486	2480.517	---	---



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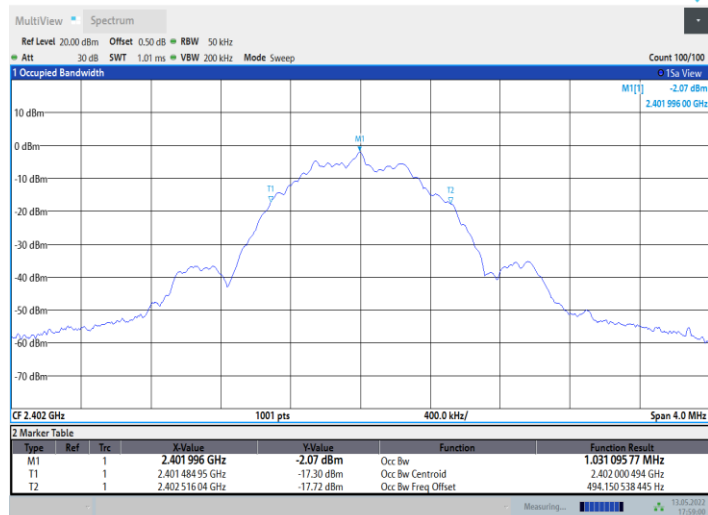
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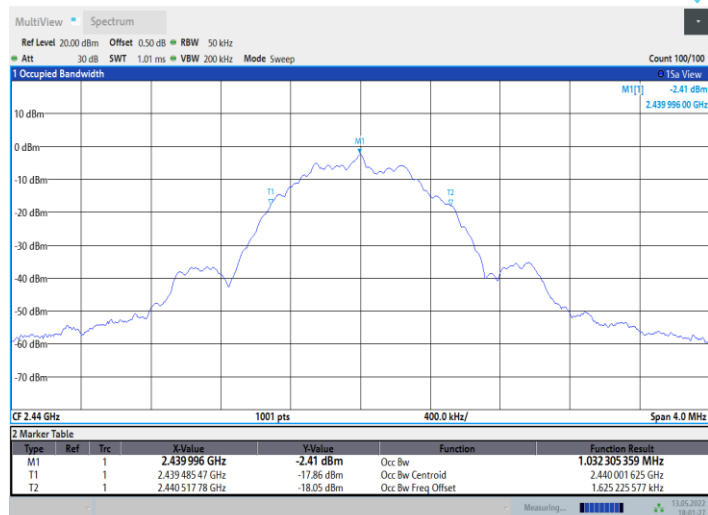
Test Graphs

BLE_1M_Ant0_2402



17:59:01 13.05.2022

BLE_1M_Ant0_2440



18:01:28 13.05.2022



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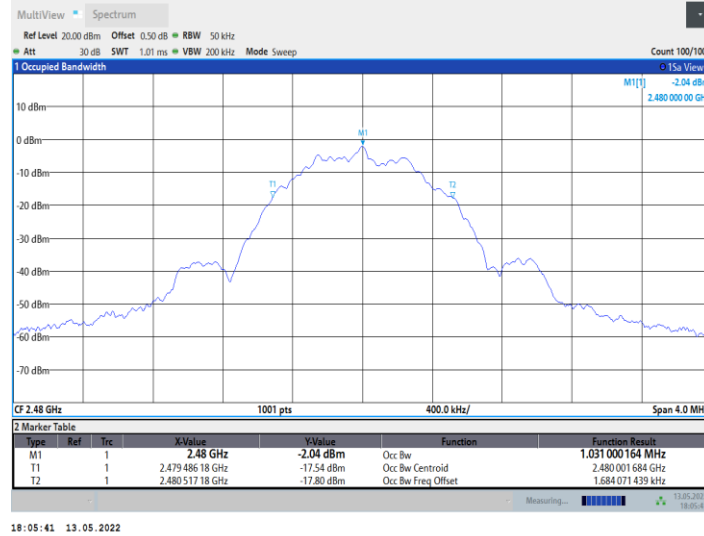
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Maximum conducted output power Test Result Peak

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
BLE_1M	Ant0	2402	0.35	≤30	PASS
		2440	1.23	≤30	PASS
		2480	1.20	≤30	PASS



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Maximum power spectral density Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant0	2402	-14.94	≤8.00	PASS
		2440	-14.05	≤8.00	PASS
		2480	-14.07	≤8.00	PASS



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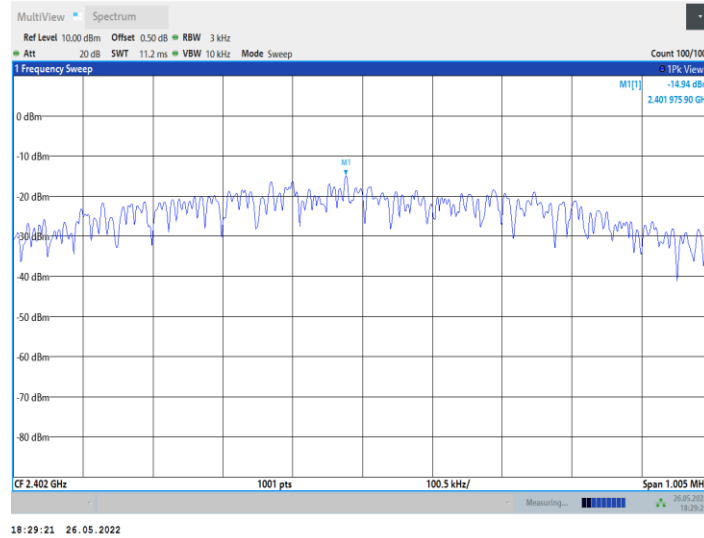
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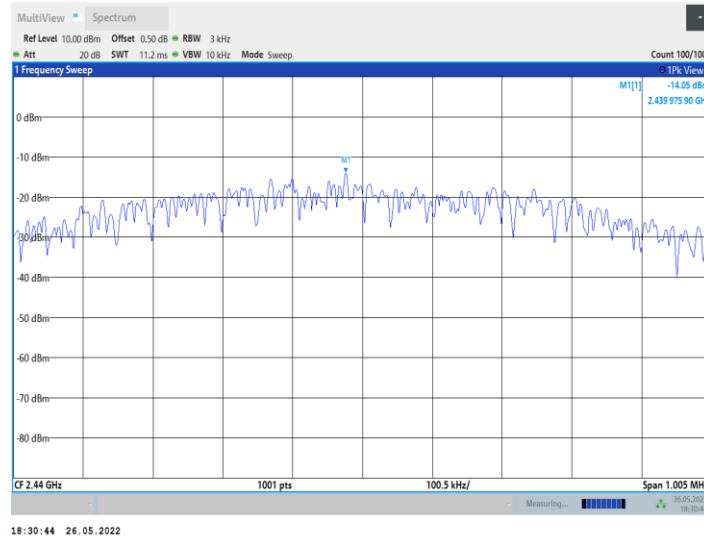
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Test Graphs

BLE_1M_Ant0_2402



BLE_1M_Ant0_2440



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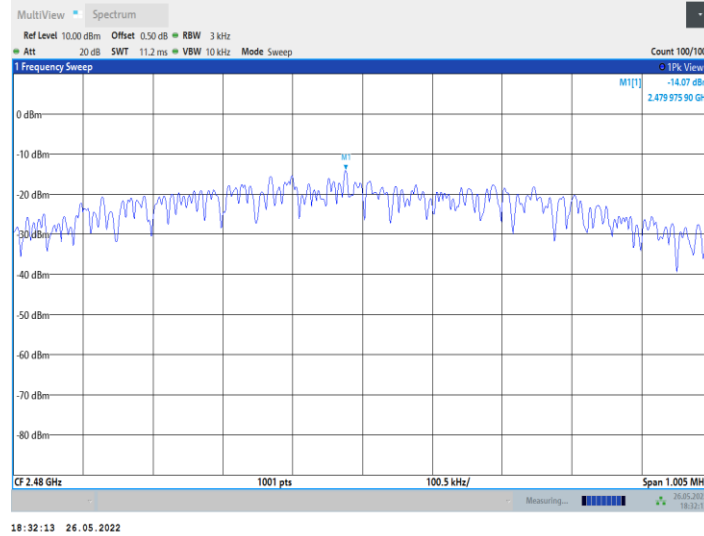
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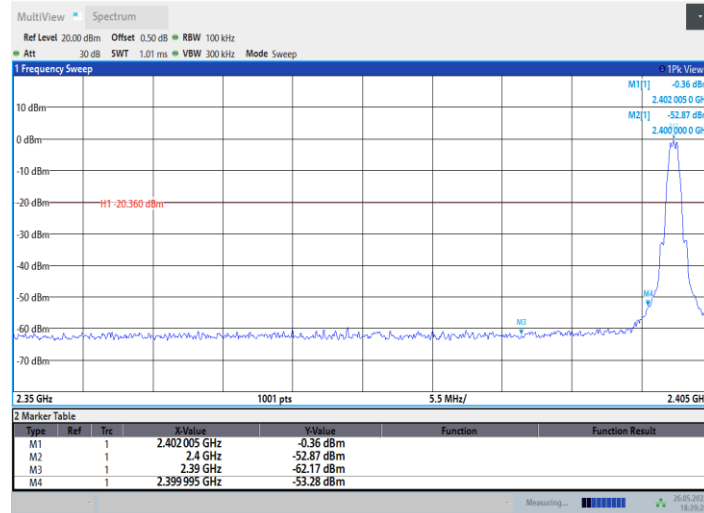
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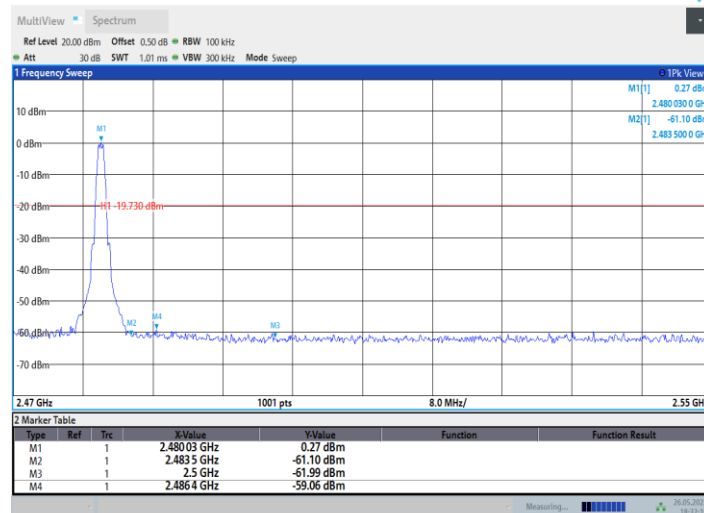
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Band edge measurements Test Graphs

BLE 1M Ant0 Low 2402



BLE 1M Ant0 High 2480



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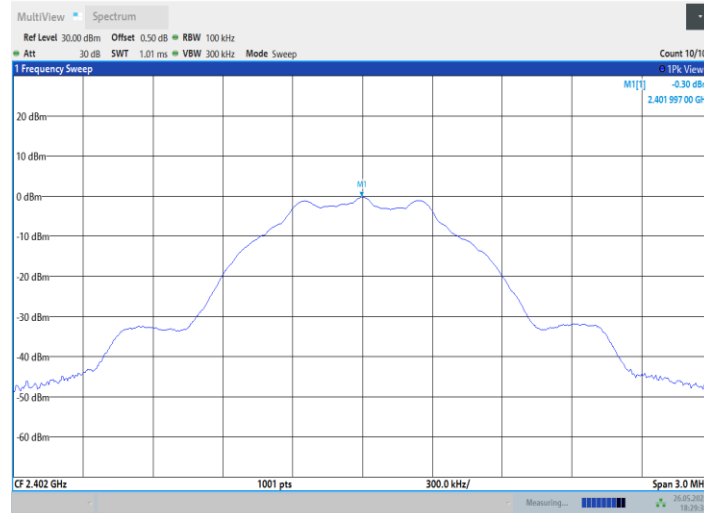
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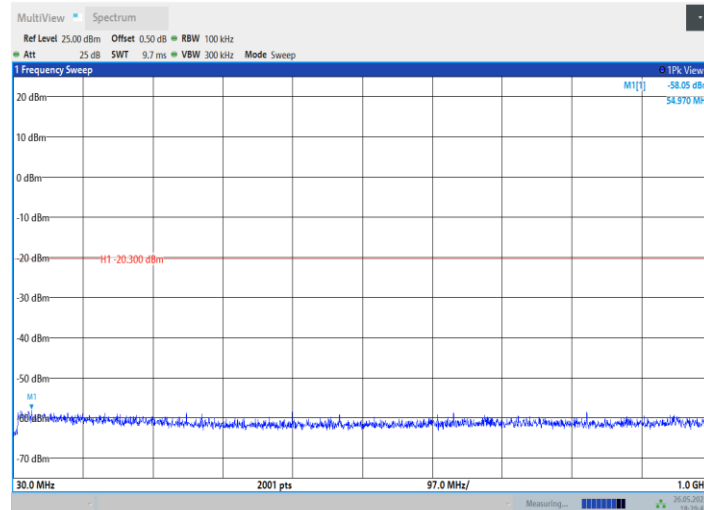
Conducted Spurious Emission Test Graphs

BLE_1M_Ant0_2402_0~Reference



18:29:39 26.05.2022

BLE_1M_Ant0_2402_30~1000



18:29:46 26.05.2022



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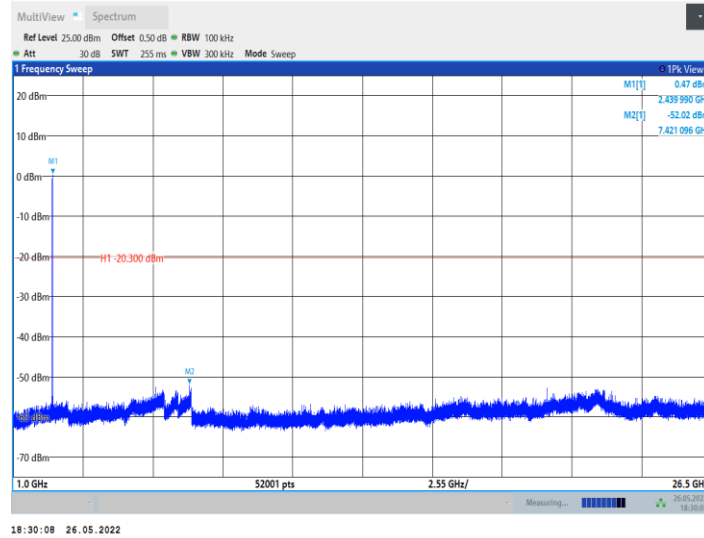
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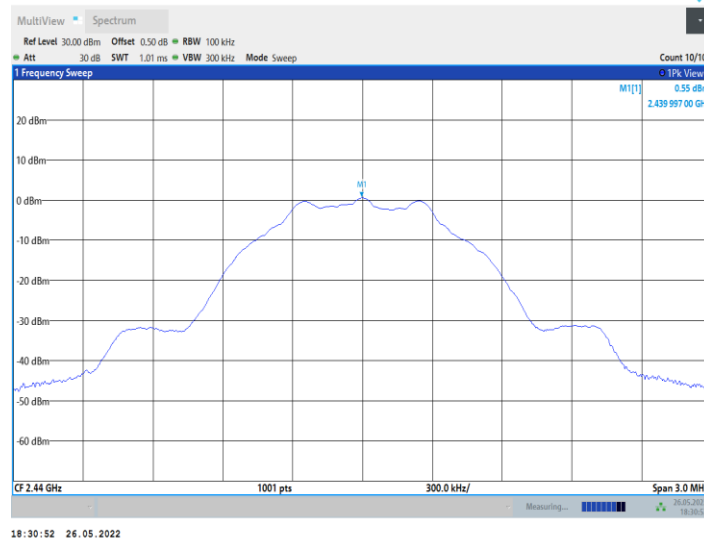
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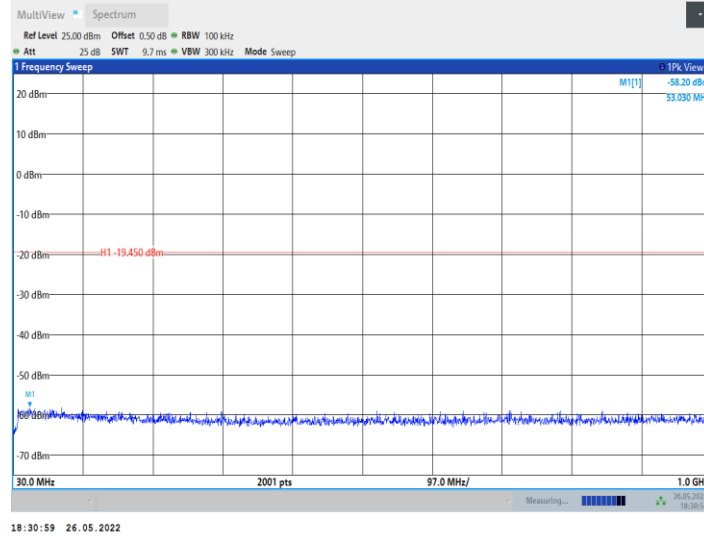
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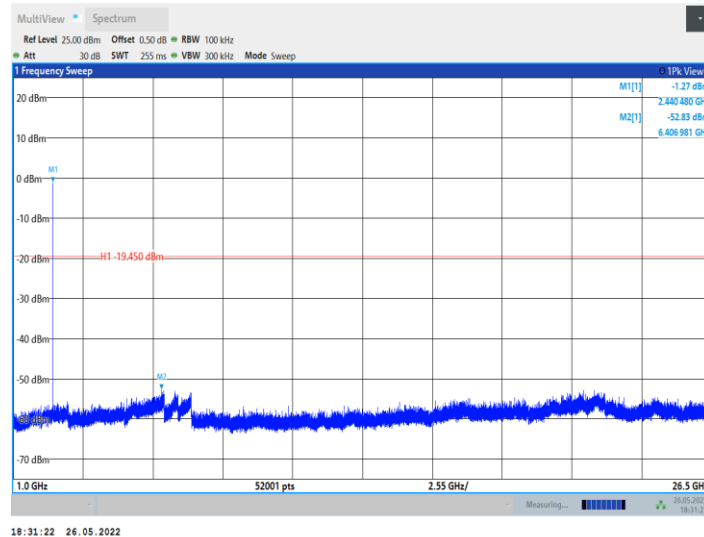
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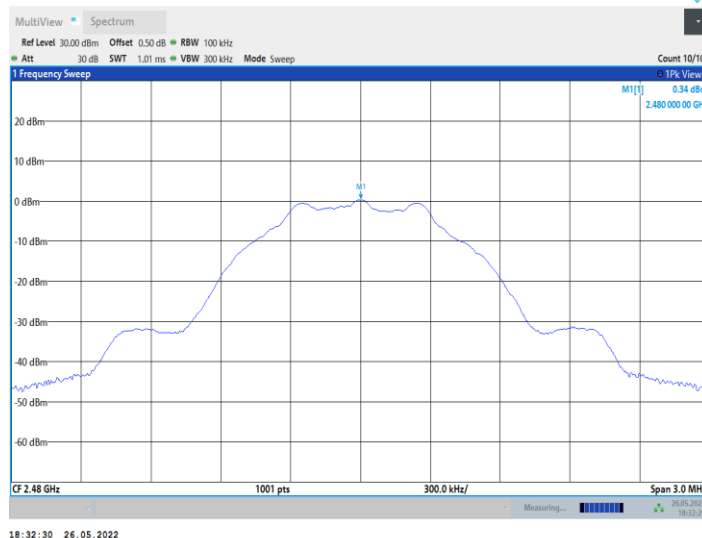
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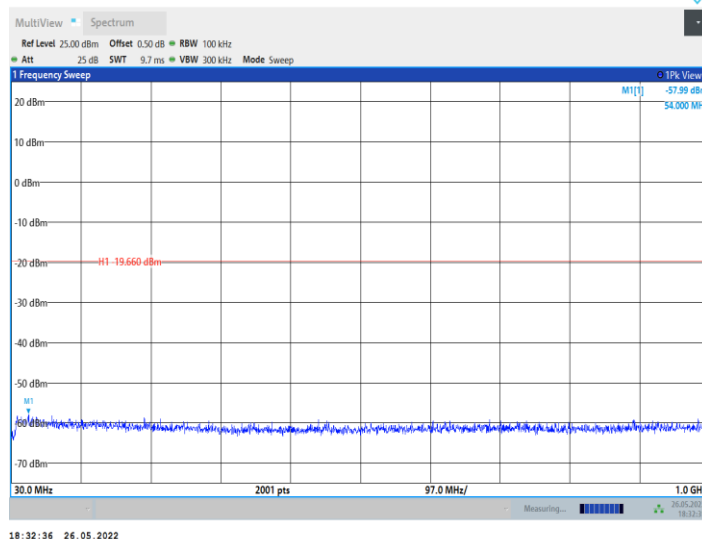
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BLE 1M Ant0 2480 0~Reference



BLE 1M Ant0 2480 30~1000



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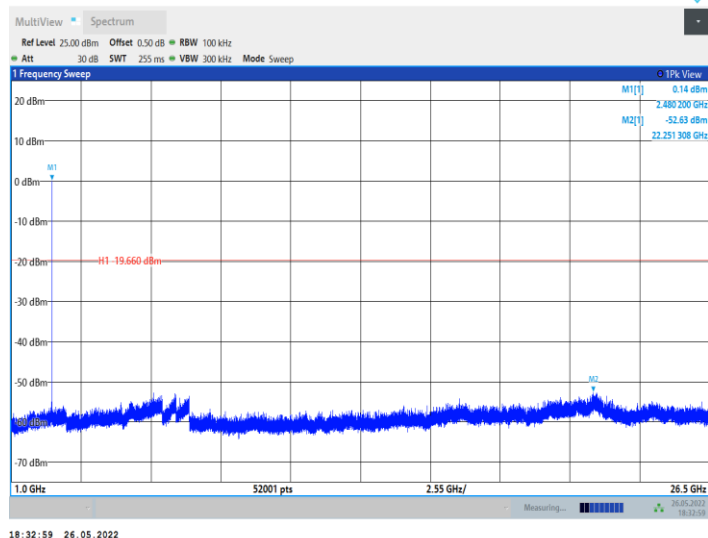
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BLE 1M Ant0 2480 1000~26500



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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	Ant0	2402	0.39	0.63	61.90	2.08



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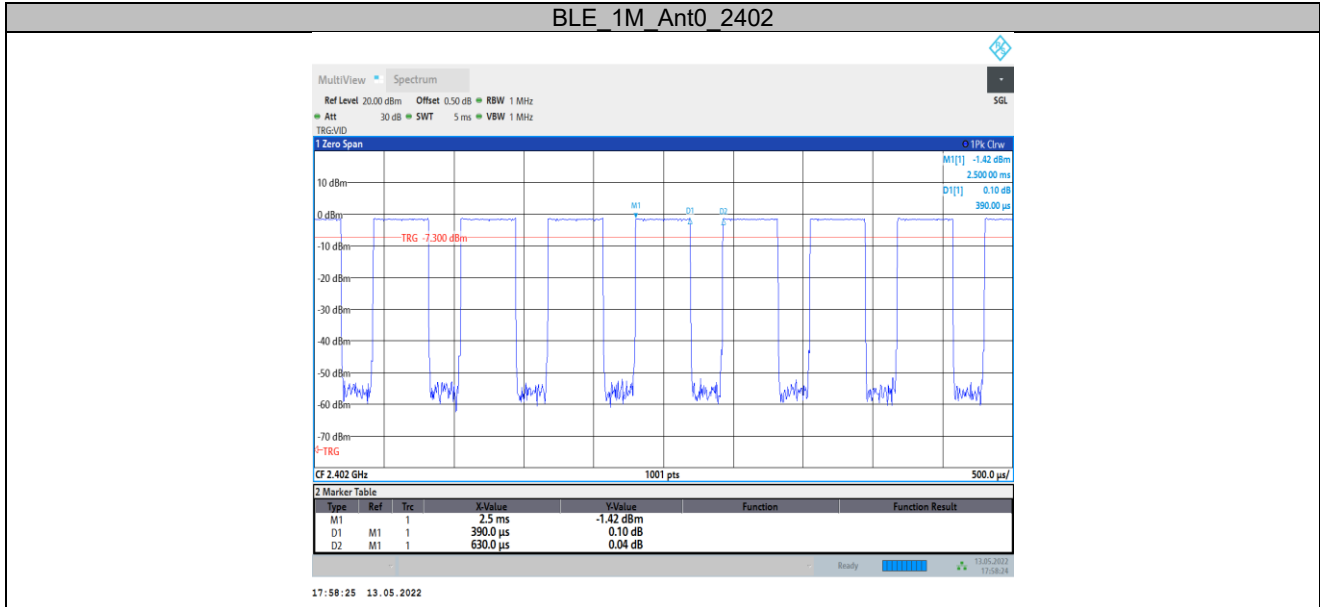
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Test Graphs



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Wireless Laboratory

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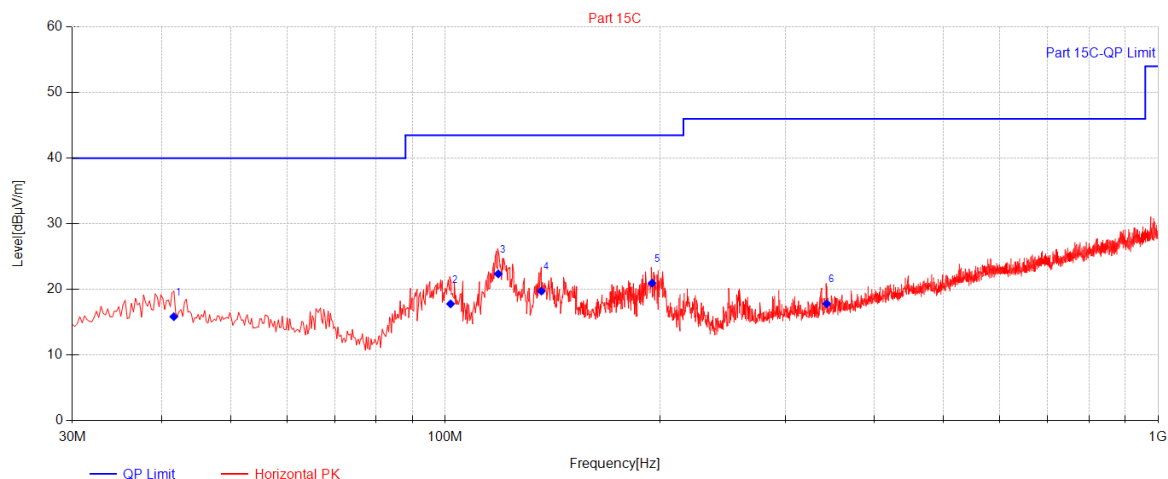
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Radiated Spurious Emissions

Radiated emission below 1GHz

Worst case Mode: BLE _ Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	41.64	38.15	-22.32	15.83	40.00	24.17	155	84	Horizontal
2	101.78	43.28	-25.50	17.78	43.50	25.72	166	237	Horizontal
3	118.755	46.41	-24.05	22.36	43.50	21.14	184	260	Horizontal
4	136.4575	42.06	-22.33	19.73	43.50	23.77	172	75	Horizontal
5	195.1425	45.18	-24.23	20.95	43.50	22.55	190	285	Horizontal
6	343.0675	38.19	-20.39	17.80	46.00	28.20	140	299	Horizontal



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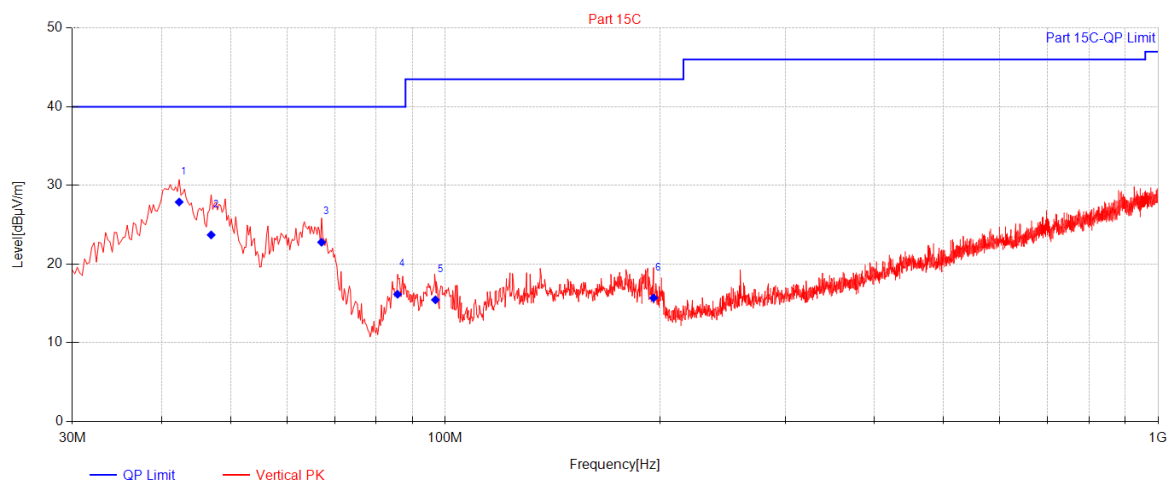
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Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	42.3675	50.26	-22.37	27.89	40.00	12.11	152	146	Vertical
2	46.975	46.28	-22.57	23.71	40.00	16.29	184	171	Vertical
3	67.1025	47.89	-25.11	22.78	40.00	17.22	179	251	Vertical
4	85.775	42.89	-26.72	16.17	40.00	23.83	123	73	Vertical
5	96.93	41.49	-26.03	15.46	43.50	28.04	254	105	Vertical
6	196.1125	40.13	-24.43	15.70	43.50	27.80	268	89	Vertical



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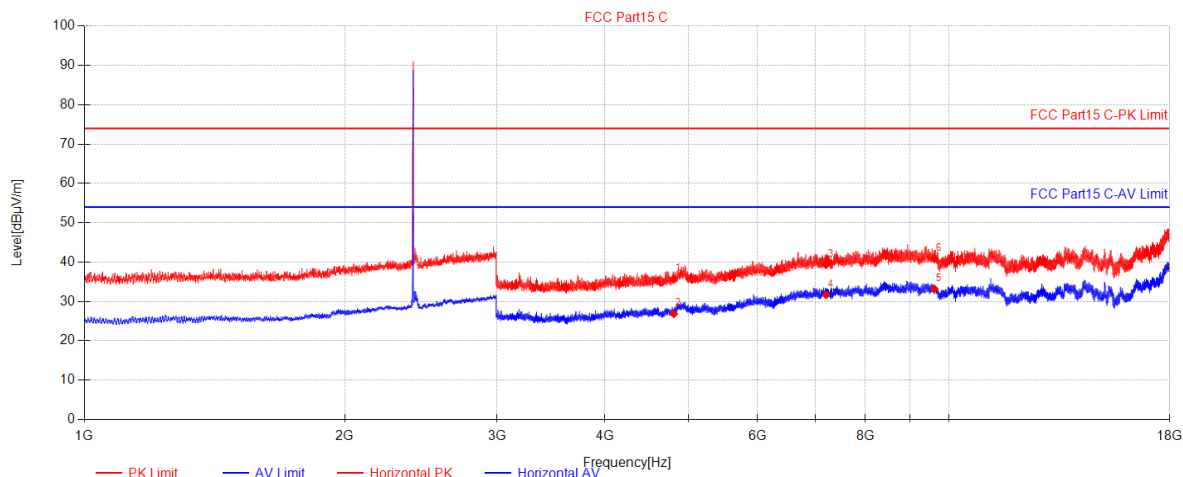
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Transmitter emission Above 1GHz

BLE_1M_Channel 00



Final Data List									
NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4804.0000	48.93	-13.21	35.72	74.00	38.28	241	299	Horizontal
2	4804.0000	40.06	-13.21	26.85	54.00	27.15	152	24	Horizontal
3	7206.0000	46.16	-6.84	39.32	74.00	34.68	166	88	Horizontal
4	7206.0000	38.52	-6.84	31.68	54.00	22.32	184	300	Horizontal
5	9608.0000	34.42	-1.22	33.20	54.00	20.80	172	45	Horizontal
6	9608.0000	42.10	-1.22	40.88	74.00	33.12	230	130	Horizontal



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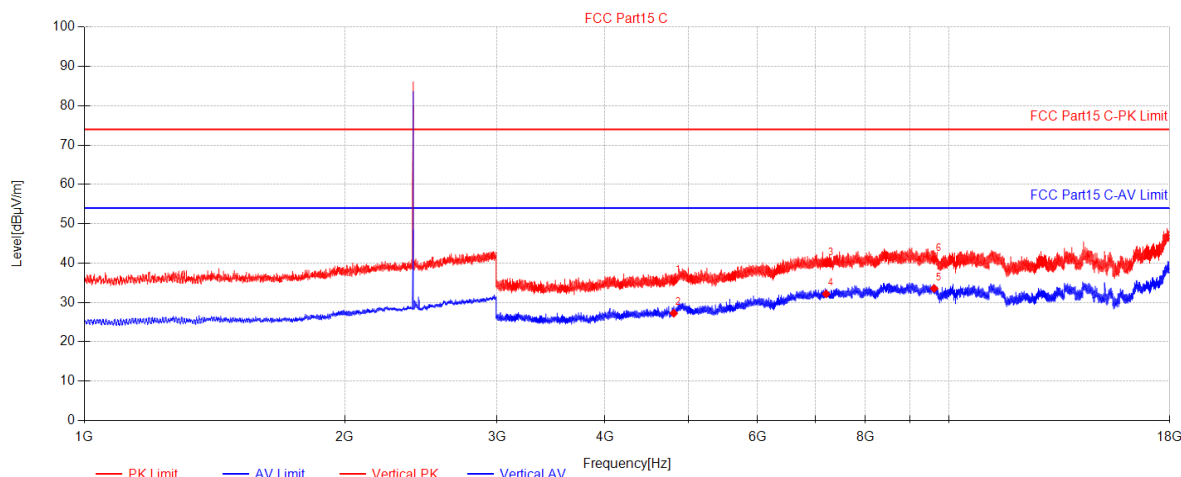
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BLE_1M_Channel 00



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4804.0000	48.59	-13.21	35.38	74.00	38.62	188	355	Vertical
2	4804.0000	40.46	-13.21	27.25	54.00	26.75	175	87	Vertical
3	7206.0000	46.75	-6.84	39.91	74.00	34.09	176	128	Vertical
4	7206.0000	39.00	-6.84	32.16	54.00	21.84	194	359	Vertical
5	9608.0000	34.77	-1.22	33.55	54.00	20.45	201	214	Vertical
6	9608.0000	42.19	-1.22	40.97	74.00	33.03	133	355	Vertical



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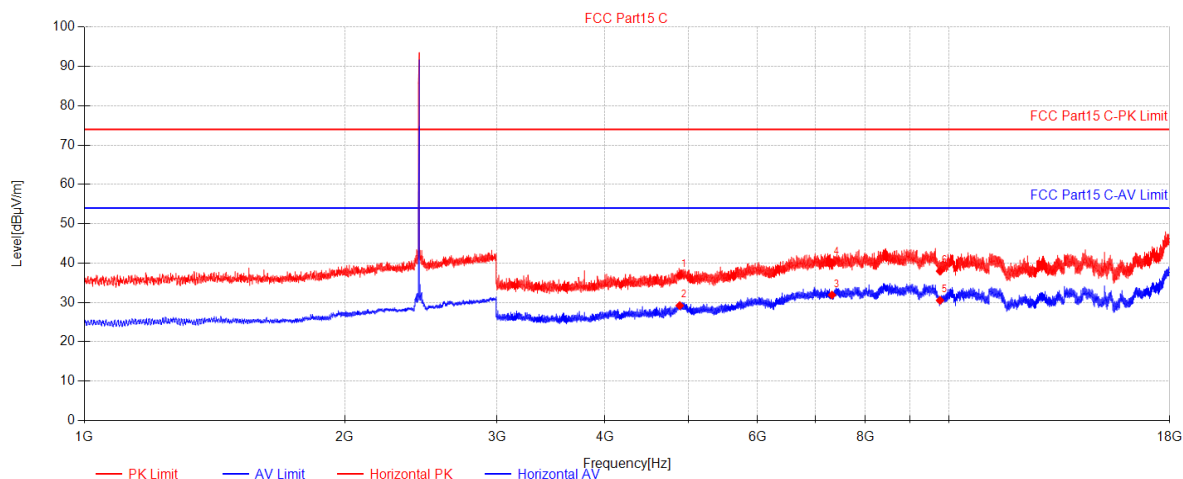
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BLE_1M_Channel 19



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4880.0000	49.83	-12.99	36.84	74.00	37.16	168	105	Horizontal
2	4880.0000	42.19	-12.99	29.20	54.00	24.80	180	168	Horizontal
3	7320.0000	39.05	-7.15	31.90	54.00	22.10	164	146	Horizontal
4	7320.0000	47.30	-7.15	40.15	74.00	33.85	194	1	Horizontal
5	9760.0000	31.73	-1.20	30.53	54.00	23.47	233	62	Horizontal
6	9760.0000	39.16	-1.20	37.96	74.00	36.04	172	146	Horizontal



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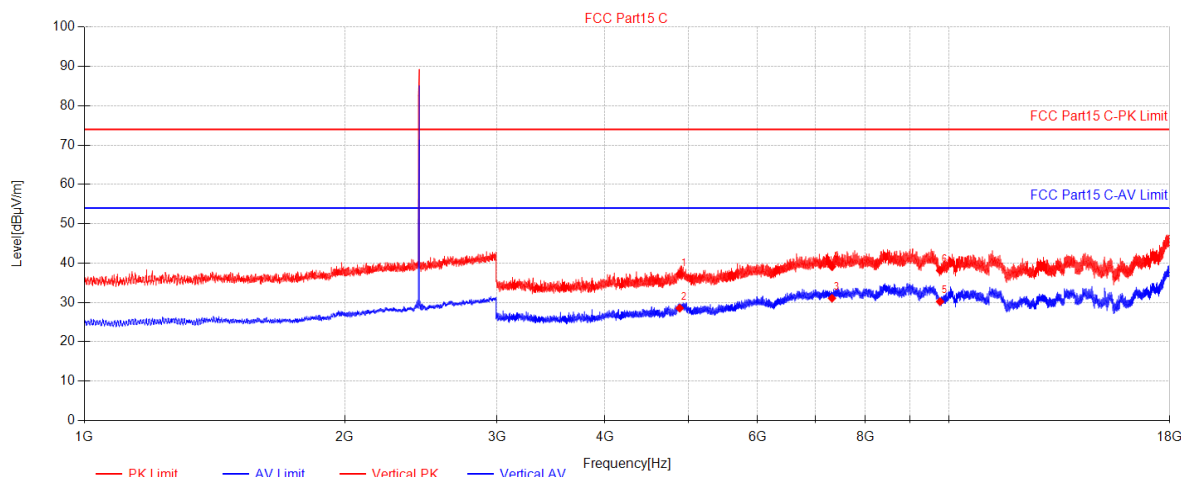
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BLE_1M_Channel 19



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NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4880.0000	50.24	-12.99	37.25	74.00	36.75	177	271	Vertical
2	4880.0000	41.53	-12.99	28.54	54.00	25.46	191	40	Vertical
3	7320.0000	38.23	-7.15	31.08	54.00	22.92	168	146	Vertical
4	7320.0000	46.25	-7.15	39.10	74.00	34.90	194	61	Vertical
5	9760.0000	31.42	-1.20	30.22	54.00	23.78	254	40	Vertical
6	9760.0000	39.34	-1.20	38.14	74.00	35.86	172	209	Vertical



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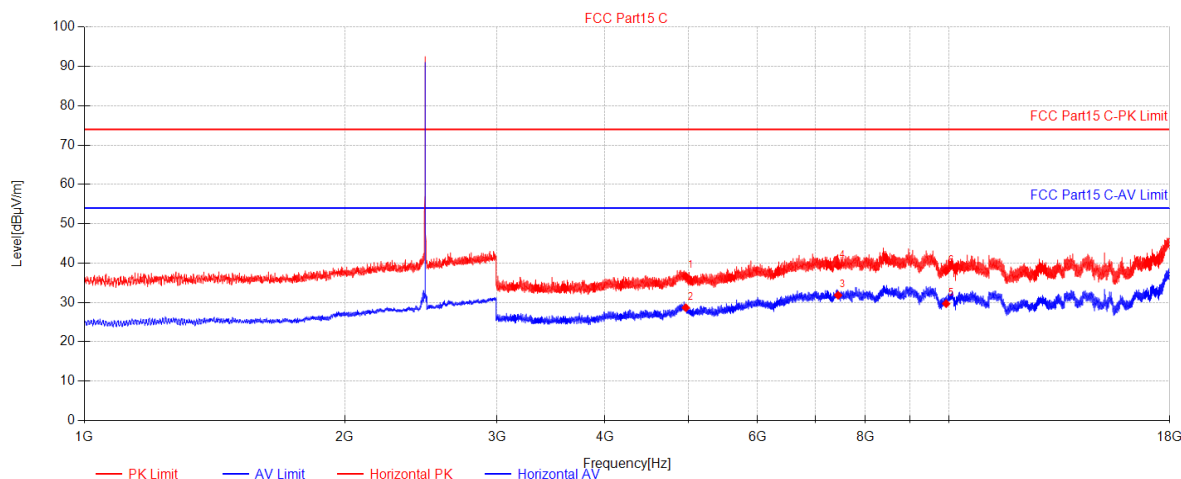
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NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4960.0000	49.48	-12.83	36.65	74.00	37.35	123	146	Horizontal
2	4960.0000	41.49	-12.83	28.66	54.00	25.34	254	20	Horizontal
3	7440.0000	38.67	-6.83	31.84	54.00	22.16	214	275	Horizontal
4	7440.0000	46.15	-6.83	39.32	74.00	34.68	126	5	Horizontal
5	9920.0000	30.62	-0.93	29.69	54.00	24.31	188	83	Horizontal
6	9920.0000	38.95	-0.93	38.02	74.00	35.98	194	209	Horizontal



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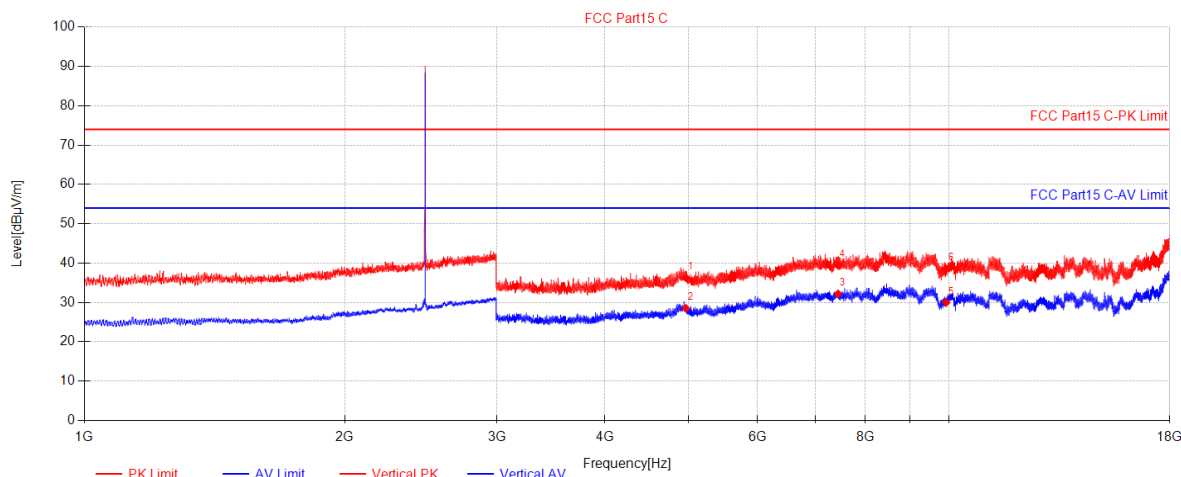
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1	4960.0000	49.14	-12.83	36.31	74.00	37.69	211	294	Vertical
2	4960.0000	41.35	-12.83	28.52	54.00	25.48	184	316	Vertical
3	7440.0000	39.02	-6.83	32.19	54.00	21.81	235	356	Vertical
4	7440.0000	46.25	-6.83	39.42	74.00	34.58	196	168	Vertical
5	9920.0000	30.89	-0.93	29.96	54.00	24.04	155	336	Vertical
6	9920.0000	39.49	-0.93	38.56	74.00	35.44	180	104	Vertical



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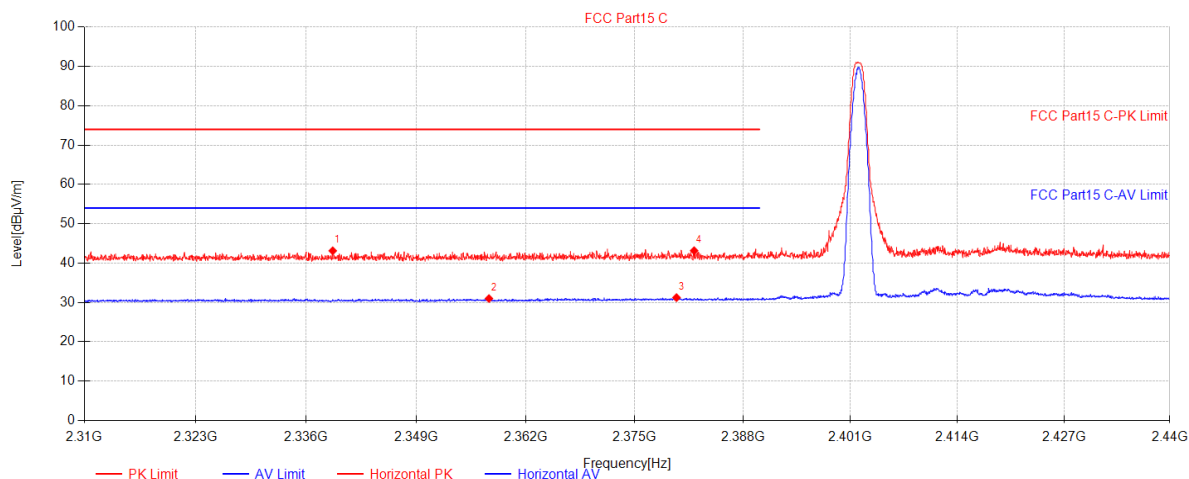
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Restricted bands around fundamental frequency

BLE_1M_Channel 00



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2339.12	40.04	3.09	43.13	74.00	30.87	236	130	Horizontal
2	2357.6233	27.92	3.08	31.00	54.00	23.00	236	130	Horizontal
3	2380.0267	28.15	3.08	31.23	54.00	22.77	236	130	Horizontal
4	2382.15	40.08	3.08	43.16	74.00	30.84	236	130	Horizontal



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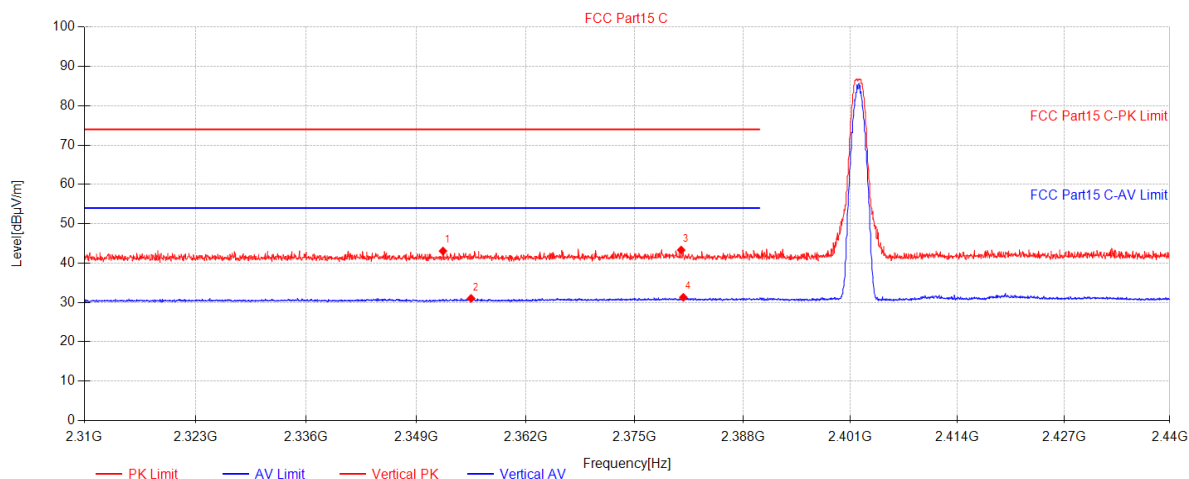
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BLE_1M_Channel 00



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2352.1633	39.99	3.08	43.07	74.00	30.93	145	144	Vertical
2	2355.5	27.94	3.08	31.02	54.00	22.98	145	144	Vertical
3	2380.59	40.24	3.08	43.32	74.00	30.68	145	144	Vertical
4	2380.85	28.22	3.08	31.30	54.00	22.70	145	144	Vertical



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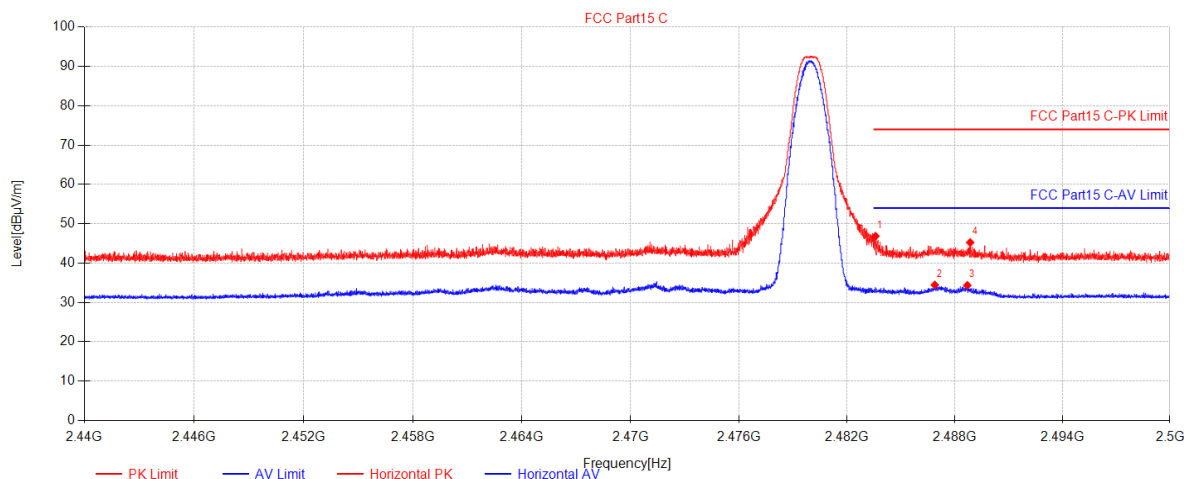
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BLE_1M_Channel 39



Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2483.5825	43.25	3.60	46.85	74.00	27.15	155	346	Horizontal
2	2486.8825	30.83	3.62	34.45	54.00	19.55	155	346	Horizontal
3	2488.69	30.72	3.63	34.35	54.00	19.65	155	346	Horizontal
4	2488.8475	41.61	3.63	45.24	74.00	28.76	155	346	Horizontal



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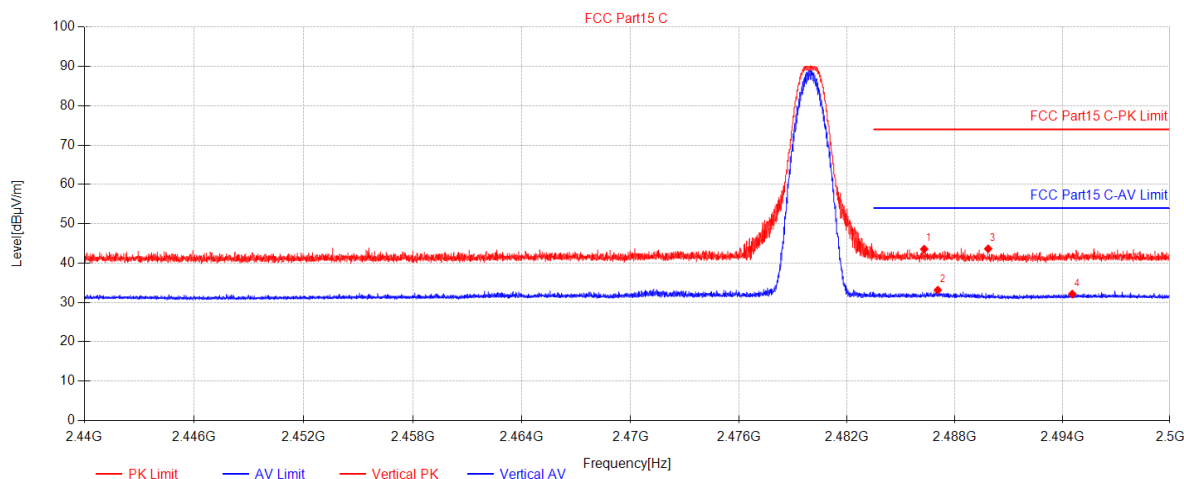
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NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2486.29	39.95	3.61	43.56	74.00	30.44	148	269	Vertical
2	2487.0475	29.52	3.62	33.14	54.00	20.86	148	269	Vertical
3	2489.8525	40.00	3.64	43.64	74.00	30.36	148	269	Vertical
4	2494.54	28.46	3.67	32.13	54.00	21.87	148	269	Vertical

---End of Report---



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