

Radio Testing of the
Nextivity Inc.
Bluetooth Transceiver
Model: A71-JV4



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In accordance with FCC Part 15 Subpart C
§15.247 and IC RSS-247 Issue 2 February 2017

Nextivity Inc.
16550 West Bernardo Drive, Bldg 5, Suite 550
San Diego, CA 92127 USA

COMMERCIAL-IN-CONFIDENCE

Date: September 2023
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EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 2 February 2017.



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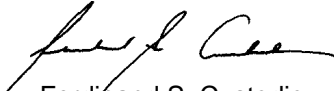
REPORT ON Radio Testing of the
Nextivity Inc.
Model: Smart Server Antenna (Bluetooth Transceiver)


TEST REPORT NUMBER 72192194B

TEST REPORT DATE September 2023

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DATED September 28, 2023



Revision History

72192194B Nextivity Inc. Model: Smart Server Antenna					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
09/28/2023	—	Initial Release			Omar Castillo



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SECTION 1

REPORT SUMMARY

Radio Testing of the
Nextivity Inc.
A71-JV4 Bluetooth Transceiver



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Smart Server Antenna Bluetooth Transceiver to the requirements of FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 2 February 2017.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Nextivity Inc.
EUT	Bluetooth Transceiver
Model #	A71-JV4
Product Name	Smart Server Antenna
FCC ID	YETA71-JV4
ISED/IC Number	9298A-A71JV4
FCC Classification	Low power Communications Device Transmitter (DTS)
Serial Number(s)	813317000065
Number of Samples Tested	1
Test Specification/Issue/Date	<ul style="list-style-type: none">• FCC Part 15 Subpart C §15.247 (October 1, 2022).• RSS-247–Digital Transmission Systems (DTS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices (Issue 2, February 2017).• RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 5, Amendment 2 February 2021).
Start of Test	August 09, 2023
Finish of Test	August 28, 2023
Name of Engineer(s)	Ferdinand Custodio
Related Document(s)	<ul style="list-style-type: none">• ANSI C63.10-2013. American National Standard of Procedures for Compliance testing of Unlicensed Wireless Devices.• KDB 558074 D01 15.247 v05r02 Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under Section 15.247 of the FCC rules.



- FB Reg Test set-up_20230731.pdf
- Firesman_Brew A71-JV_BT_Antenna_data_Ver1 CK.pdf
- Product Spec for RFQ_Firemans Brew_v2.2.pdf
- Supporting documents for EUT certification are separate exhibits.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 2 February 2017 with cross-reference to the corresponding IC RSS standard are shown below.

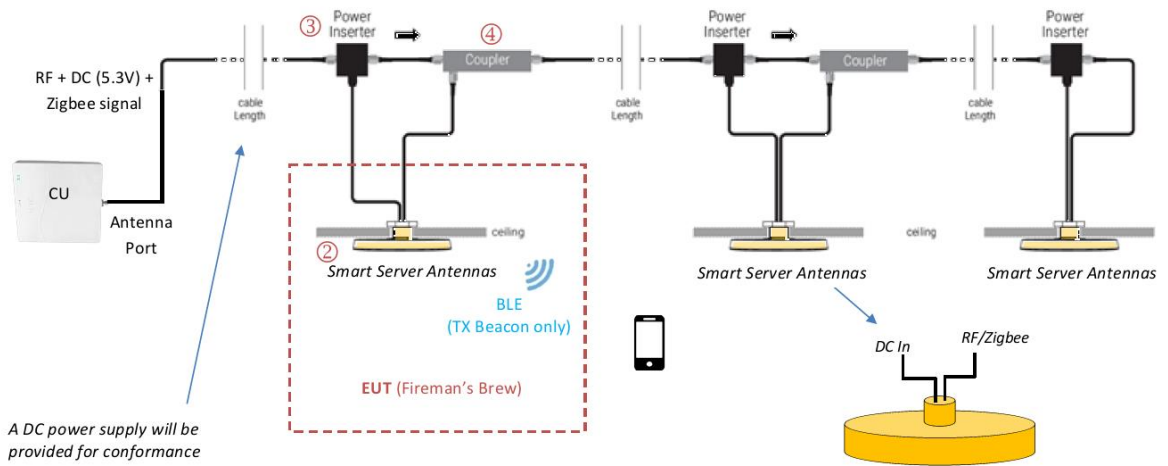
Section	§15.247 Spec Clause	RSS	Test Description	Result	Comments /Base Standard
2.1	§15.247(b)(3)	RSS-247 5.4(d)	Peak Output Power	Compliant	
2.2	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	Compliant	
2.3	-	RSS-Gen 6.7	99% Emission Bandwidth	Compliant	
2.4	§15.247(a)(2)	RSS-247 5.2(a)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-247 5.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-247 5.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-247 5.5	Radiated Spurious Emissions	Compliant	
	-	RSS-Gen 7.3 and 7.4	Receiver Spurious Emissions	N/A	
2.8	§15.247(e)	RSS-247 5.2(b)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A Not required as per RSS-Gen 5.3 The EUT does not fall into any category defined as Receiver under RSS-Gen.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Bluetooth Transceiver, part of a smart sensor system. The EUT is to be used with Cel-Fi QUATRA Cellular repeaters and connects directly to CU antenna port. EUT contains a Bluetooth LE transceiver which transmit beacon signals for installation and functional check purpose. The communications within the system are via “wired Zigbee” protocol*. Power Inserter and Coupler are provided by customer. Up to 32 Smart Server Antennas can be connected (in series) to a CU port. The BLE function of the EUT is verified in this test report.



A DC power supply will be provided for conformance

*Zigbee tests/cert not required. Signal is for internal use only.


1.3.2 EUT General Description

EUT Description	Bluetooth Transceiver
Product Code Name	Smart Server Antenna
Model Number	A71-JV4
Rated Voltage	12VDC (powered from RF cable from Power Inserter)
Mode Verified	Bluetooth LE
Capability	Bluetooth LE
Primary Unit (EUT)	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering (same as Production)
Manufacturer Declared Temperature Range	0°C to 40°C



Manufacturer Declared DC Input Range 3.3VDC to 13.2VDC
Antenna Type Wire Monopole Antenna
Manufacturer Nextivity Inc.
Antenna Model A71-JV4 BT Antenna
Antenna Gain 1.3dBi

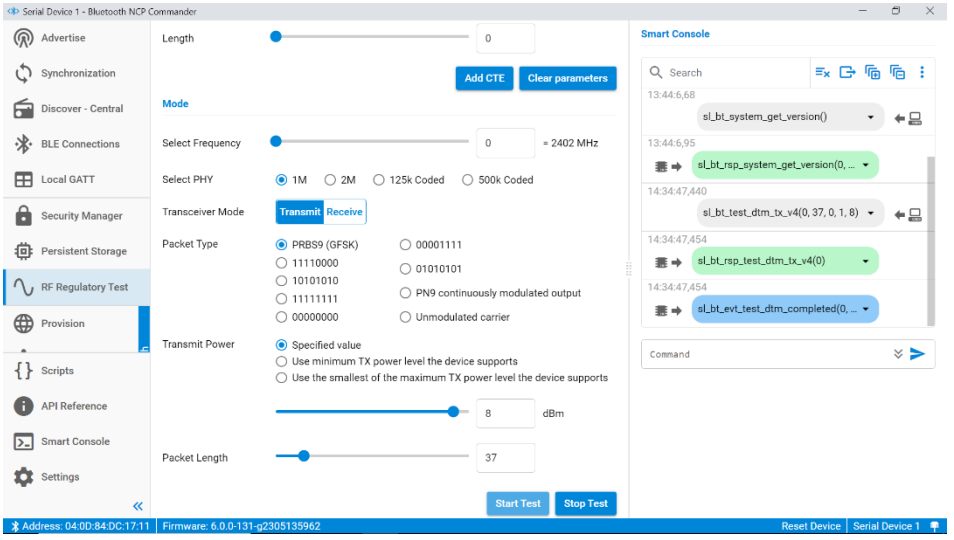
1.3.3 Maximum Conducted Output Power

Bluetooth Low Energy (LE)	Frequency Range (MHz)	Gated RMS (dBm)	Duty Cycle (%)
	2402-2480	3.8	67.986 %



1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	<p>Conducted antenna port test configuration. A temporary antenna port (SMA) is provided. A wireless kit board is connected to the EUT through a STK/WSTK debug adapter. The board is connected via USB to a support laptop running Bluetooth NCP Commander for RF test configurations:</p> 

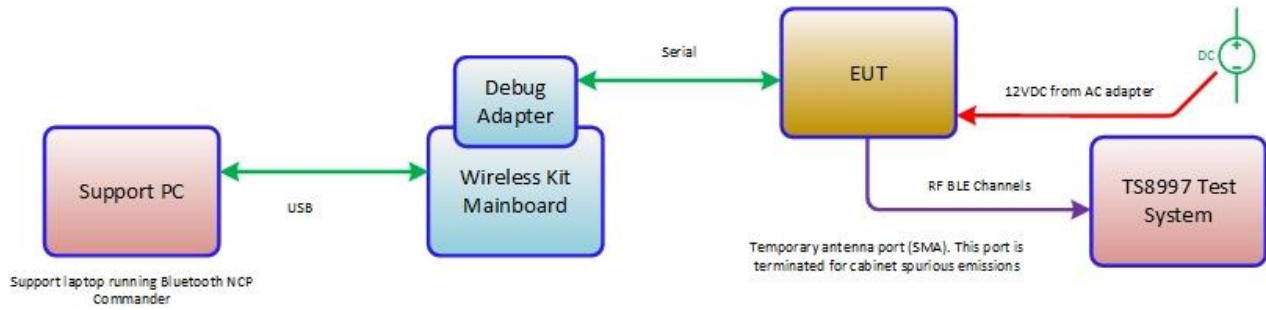
1.4.2 EUT Exercise Software

Support laptop running Silicon Labs Bluetooth NCP Commander

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Silicon Labs	Support Wireless Kit Mainboard	Model BRD4001A Rev A02 S/N 214018263
Lenovo	Support Laptop	Model Thinkpad T440S S/N PC-03BBGR

1.4.1 Simplified Test Configuration Diagram





1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: No modifications		
N/A	-	-

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

For conducted and radiated emissions, the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2013. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: (858) 678-1400 FAX: (858) 546-0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: (858) 678-1400 FAX: (858) 546-0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation No.: US1146

TÜV SÜD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.



1.9.2 Innovation, Science and Economic Development Canada (ISED) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TÜV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TÜV SÜD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP0002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

TÜV SÜD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TÜV SÜD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TÜV SÜD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.



SECTION 2

TEST DETAILS

Radio Testing of the
Nextivity Inc.
A71-JV4 Bluetooth Transceiver



2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(b)(3)
RSS-247, Clause 5.4 (d)

2.1.2 Standard Applicable

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands, the maximum peak conducted output shall not exceed 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

2.1.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.1.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	24.2 °C
Relative Humidity	57.4 %
ATM Pressure	99.7 kPa

2.1.7 Additional Observations

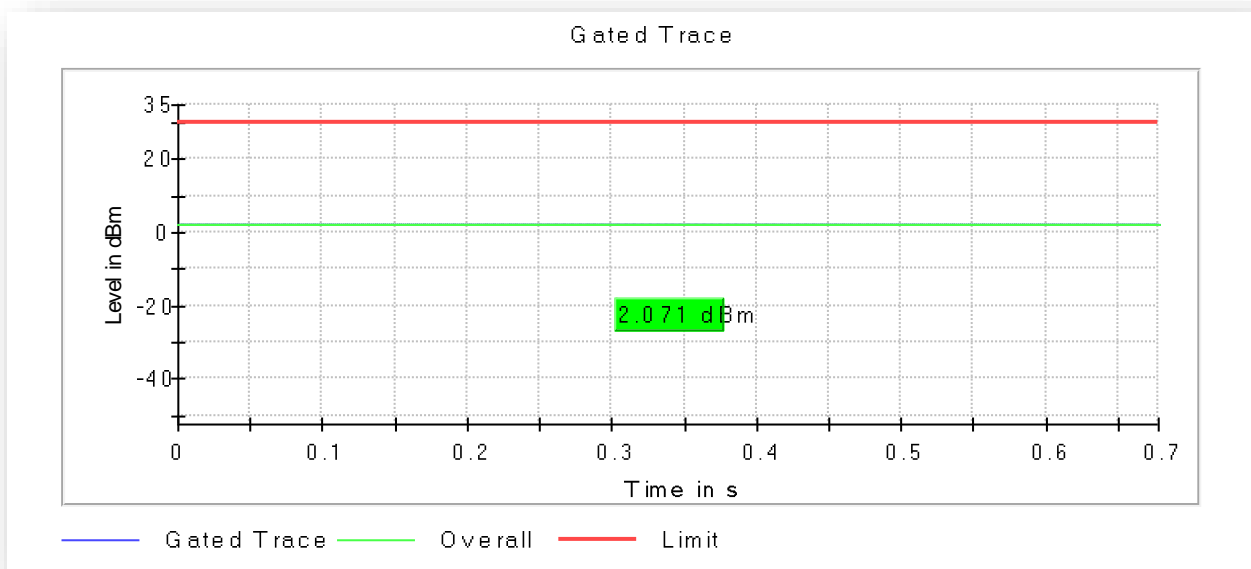
- This is a conducted test using direct connection to the TS8997 Test System.
- The path loss was all accounted for with the test system calibration.
- Test methodology is per FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.9.2.3.2.



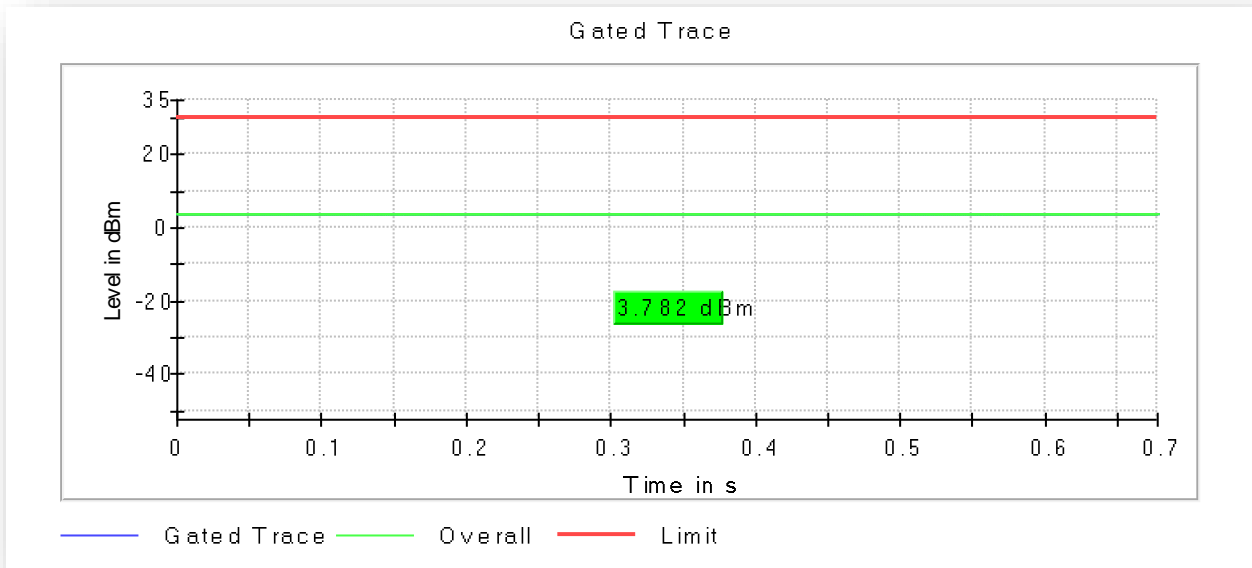
2.1.8 Test Results

DUT Frequency (MHz)	PHY	Gated RMS* (dBm)	Limit Max (dBm)	DutyCycle (%)	Result
2402.000000	1M	2.1	30.0	67.977	PASS
2440.000000	1M	3.8		67.986	PASS
2480.000000	1M	2.7		67.977	PASS

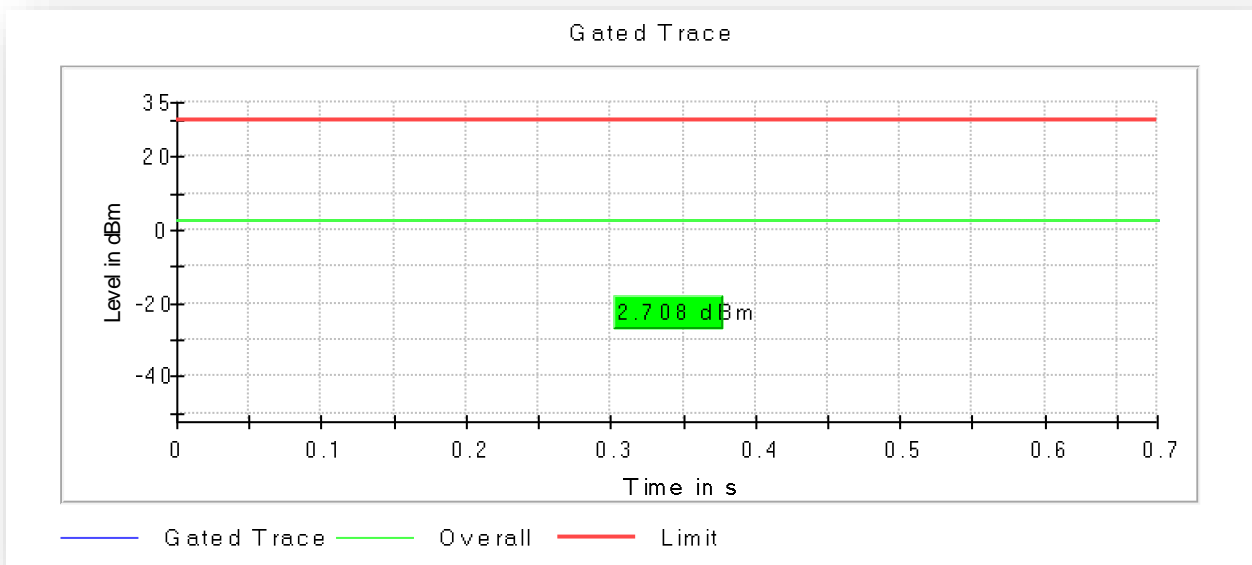
2.1.9 Test Plots



Bluetooth LE. Low Channel



Bluetooth LE. Mid Channel



Bluetooth LE. High Channel



2.1.10 Power Meter Settings

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μ s	1.000 μ s



2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.207(a)
 RSS-GEN, Clause 8.8

2.2.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.2.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.2.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature 24.2 °C
 Relative Humidity 57.4 %
 ATM Pressure 99.7 kPa

2.2.7 Additional Observations

Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.



2.2.8 Sample Computation (Conducted Emission – Quasi Peak)

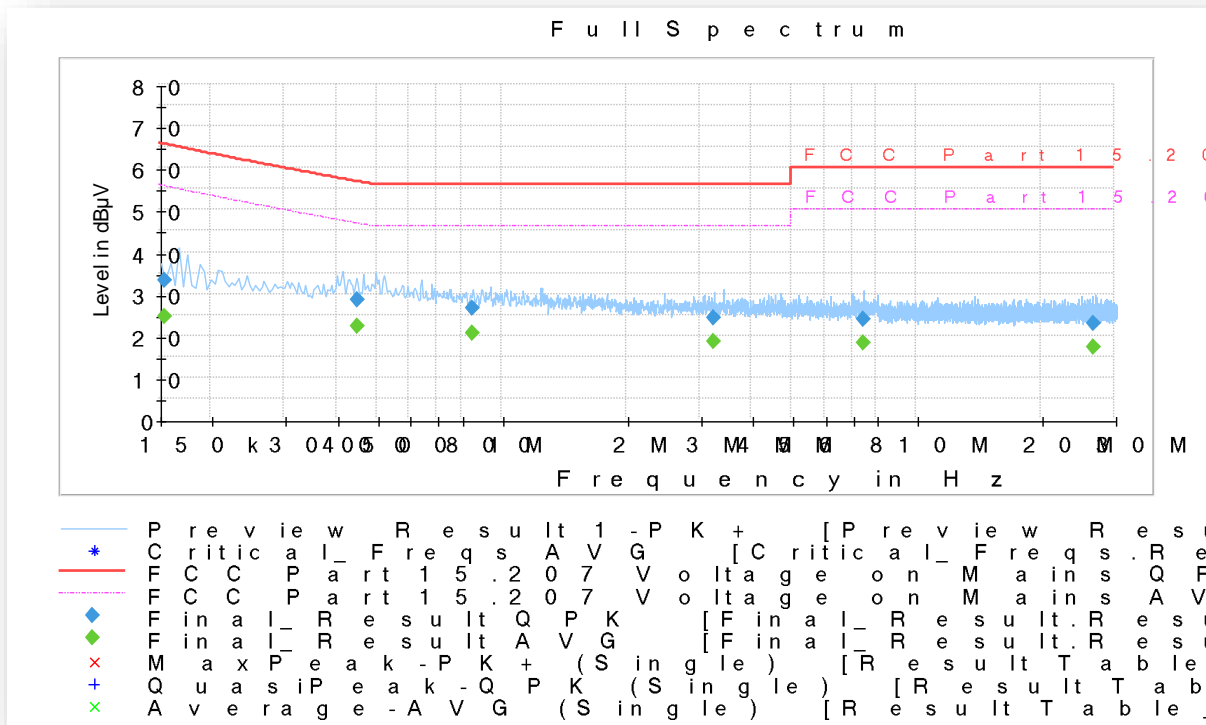
Measuring equipment raw measurement (db μ V) @ 150kHz		5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9
	Asset# 1177 (cable)	0.15
	Asset# 1176 (cable)	0.35
	Asset# 7568 (LISN)	0.30
Reported QuasiPeak Final Measurement (dbμV) @ 150kHz		26.2

2.2.9 Test Results

Compliant. See attached plots and tables.



2.2.10 TX Mode (120V-60Hz) Line 1



Quasi Peak Data

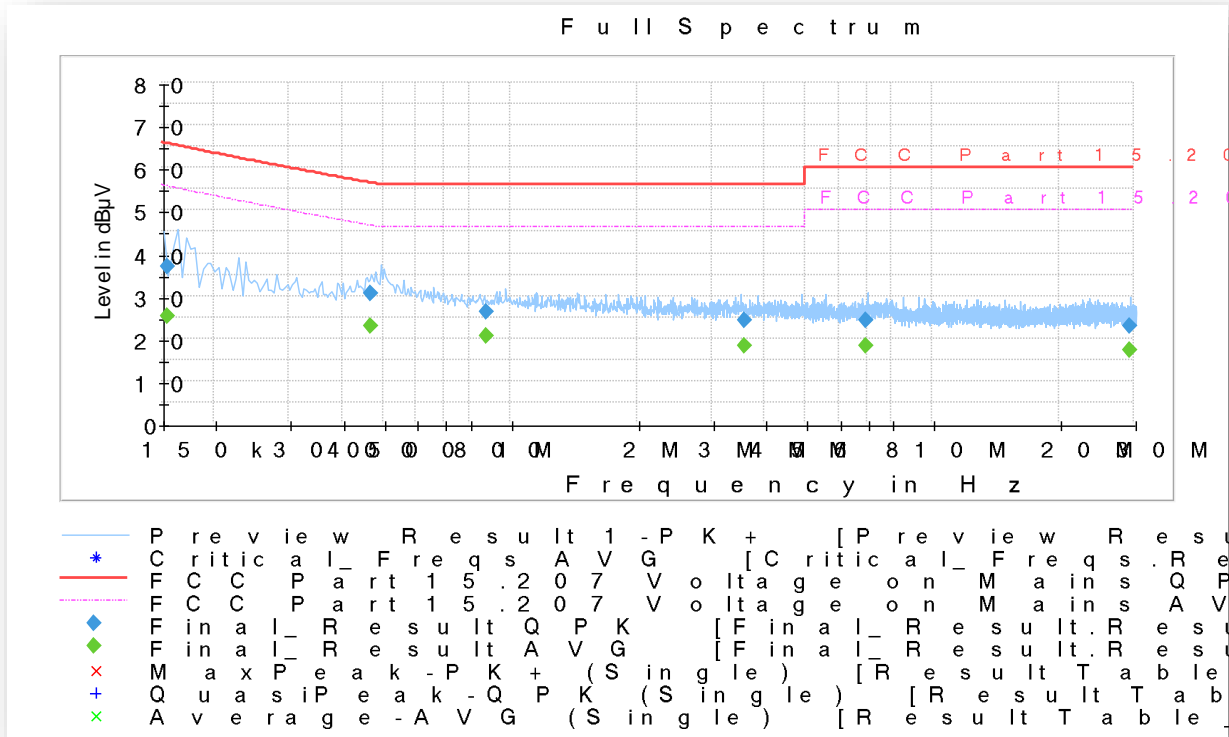
Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	33.36	65.73	32.37	1000.0	9.000	L1	ON	20.5
0.449000	28.51	56.83	28.32	1000.0	9.000	L1	ON	20.3
0.853000	26.44	56.00	29.56	1000.0	9.000	L1	ON	20.3
3.258500	24.11	56.00	31.89	1000.0	9.000	L1	ON	20.5
7.457000	23.98	60.00	36.02	1000.0	9.000	L1	ON	20.5
26.828000	22.98	60.00	37.02	1000.0	9.000	L1	ON	21.0

Average Data

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	24.62	55.73	31.11	1000.0	9.000	L1	ON	20.5
0.449000	22.18	46.82	24.63	1000.0	9.000	L1	ON	20.3
0.853000	20.64	46.00	25.36	1000.0	9.000	L1	ON	20.3
3.258500	18.43	46.00	27.57	1000.0	9.000	L1	ON	20.5
7.457000	18.32	50.00	31.68	1000.0	9.000	L1	ON	20.5
26.828000	17.12	50.00	32.88	1000.0	9.000	L1	ON	21.0



2.2.11 TX Mode (120V-60Hz) Line 2



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	36.84	65.73	28.90	1000.0	9.000	N	ON	20.6
0.467500	30.46	56.52	26.06	1000.0	9.000	N	ON	20.4
0.880500	26.26	56.00	29.74	1000.0	9.000	N	ON	20.4
3.604000	24.32	56.00	31.68	1000.0	9.000	N	ON	20.5
6.957000	24.14	60.00	35.86	1000.0	9.000	N	ON	20.5
29.251500	22.76	60.00	37.24	1000.0	9.000	N	ON	20.9

Average Data

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	25.31	55.73	30.42	1000.0	9.000	N	ON	20.6
0.467500	23.00	46.51	23.51	1000.0	9.000	N	ON	20.4
0.880500	20.54	46.00	25.46	1000.0	9.000	N	ON	20.4
3.604000	18.42	46.00	27.58	1000.0	9.000	N	ON	20.5
6.957000	18.21	50.00	31.79	1000.0	9.000	N	ON	20.5
29.251500	17.10	50.00	32.90	1000.0	9.000	N	ON	20.9



2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 6.7

2.3.2 Standard Applicable

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth. When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

Note: Video averaging is not permitted.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.3.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	24.2 °C
Relative Humidity	57.4 %
ATM Pressure	99.7 kPa

2.3.7 Additional Observations

- This is a conducted test using direct connection to the TS8997 Test System.



- The path loss was all accounted for with the test system calibration.
- Test methodology is per Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1.

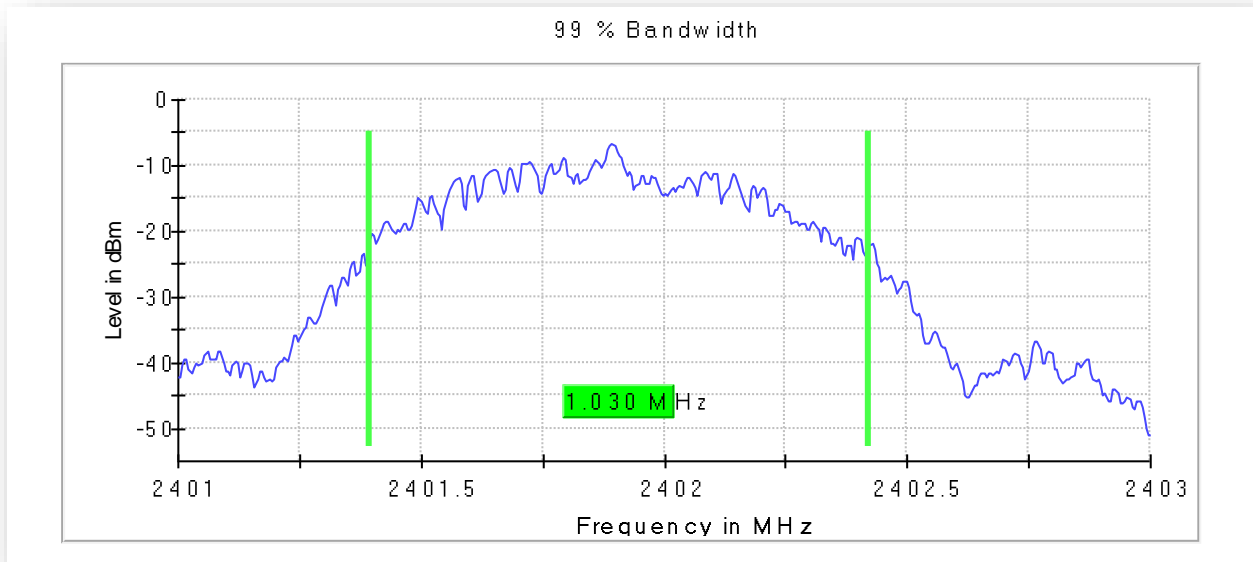
2.3.8 Sample Measurement Settings

Setting	Instrument Value	Target Value
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	6 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.05 dB	0.30 dB

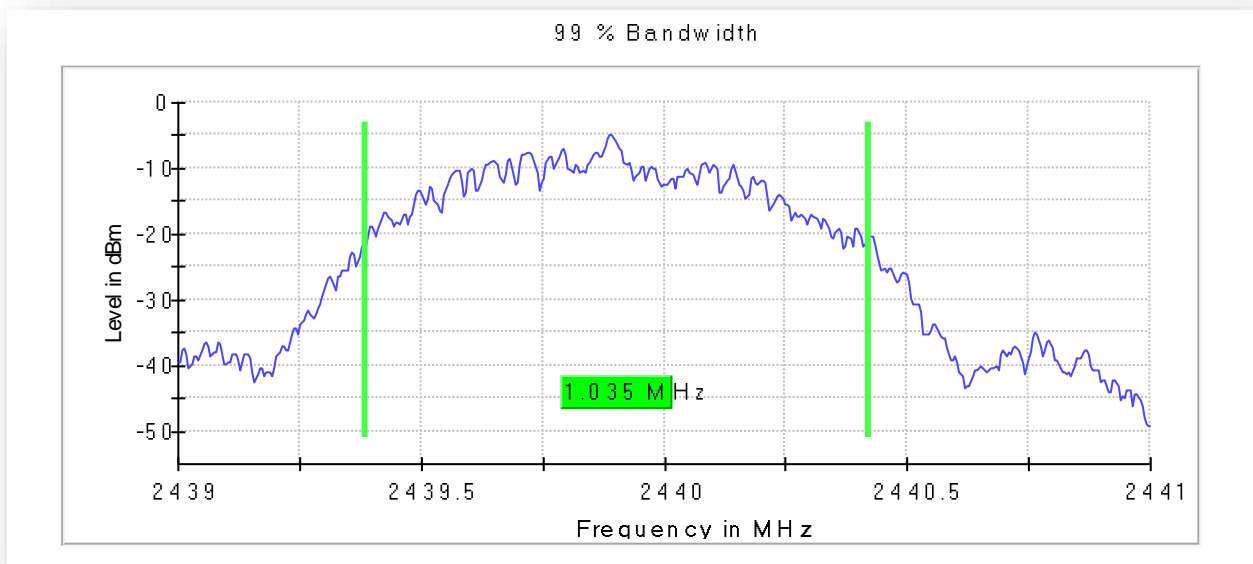
2.3.9 Test Results

DUT Frequency (MHz)	PHY	99% Bandwidth	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402.000000	1M	1.030000	2401.392500	2402.422500	PASS
2440.000000	1M	1.035000	2439.387500	2440.422500	PASS
2480.000000	1M	1.030000	2479.387500	2480.417500	PASS

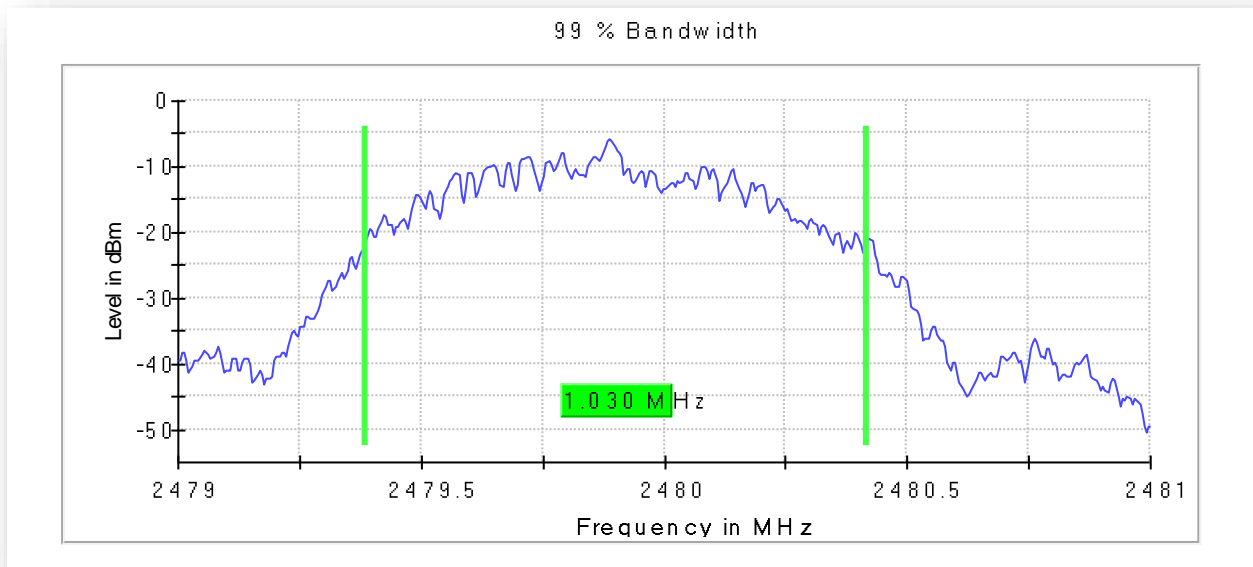
2.3.10 Test Plots



Bluetooth LE Low Channel



Bluetooth LE Middle Channel



Bluetooth LE High Channel



2.4 MINIMUM 6 DB RF BANDWIDTH

2.4.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(a)(2)
RSS-247, Clause 5.2 (a)

2.4.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.4.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.4.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	24.2 °C
Relative Humidity	57.4 %
ATM Pressure	99.7 kPa

2.4.7 Additional Observations

- This is a conducted test using direct connection to the TS8997 Test System.
- The path loss was all accounted for with the test system calibration.
- Test methodology is per FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1.



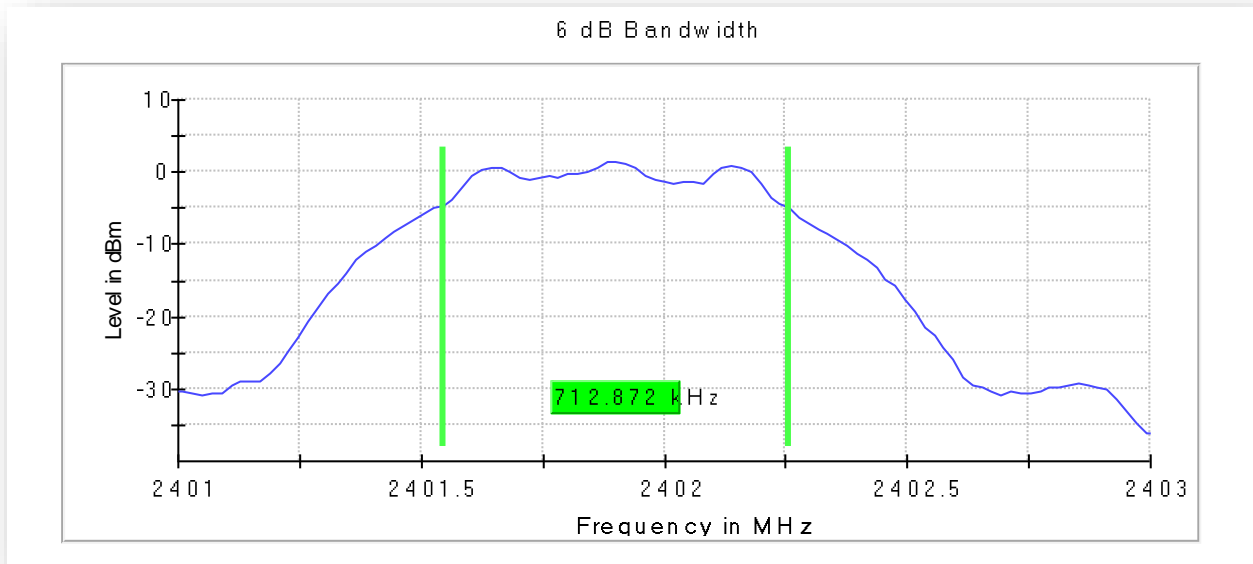
2.4.8 Sample Measurement Settings

Setting	Instrument Value	Target Value
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 40
SweepTime	18.938 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.06 dB	0.50 dB

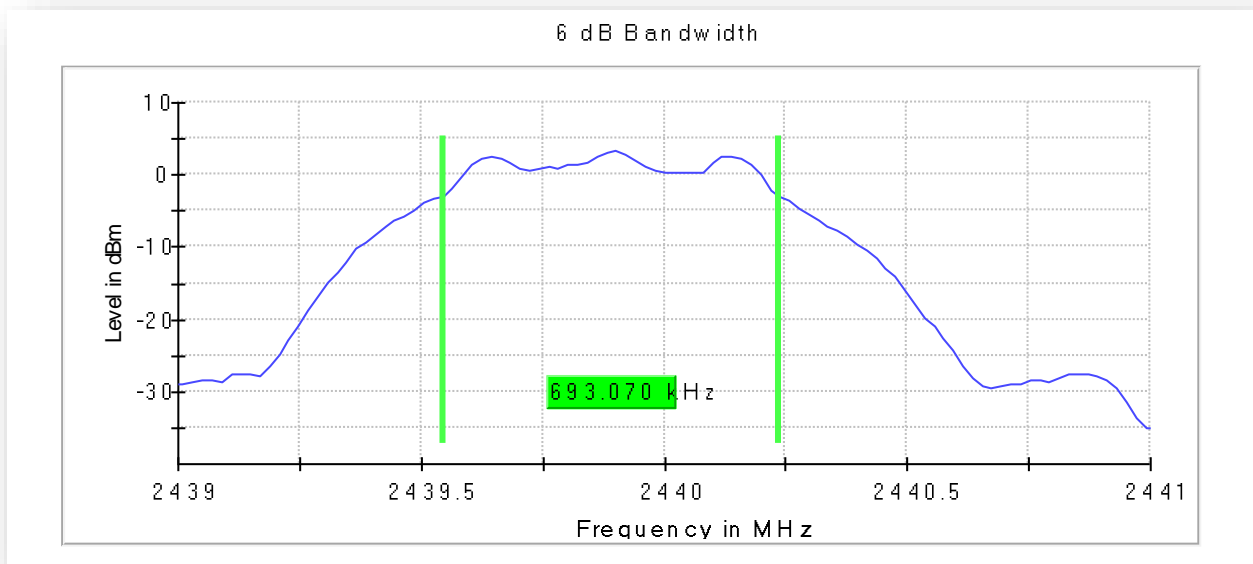
2.4.9 Test Results

DUT Frequency (MHz)	PHY	Limit Min (MHz)	Bandwidth (MHz)	Result
2402.000000	1M	0.500000	0.712872	PASS
2440.000000	1M		0.693070	PASS
2480.000000	1M		0.693070	PASS

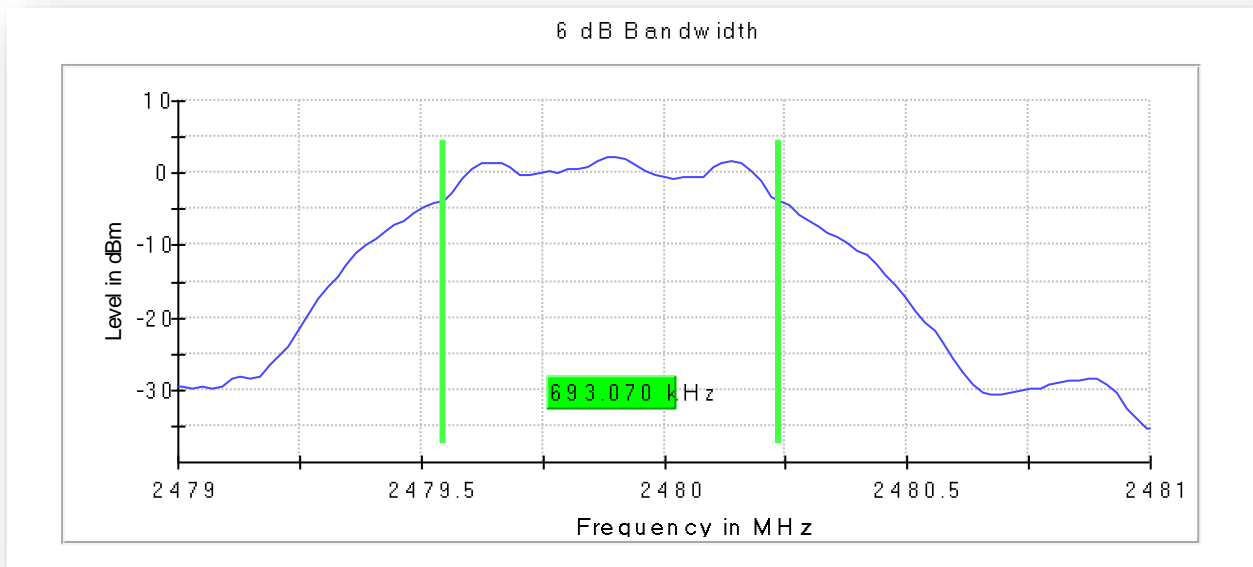
2.4.10 Test Plots



Bluetooth LE Low Channel



Bluetooth LE Middle Channel



Bluetooth LE High Channel



2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

2.5.2 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.5.3 Date of Test/Initial of test personnel who performed the test

August 18, 2023 / FSC

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions (Rancho Bernardo Satellite Facility)

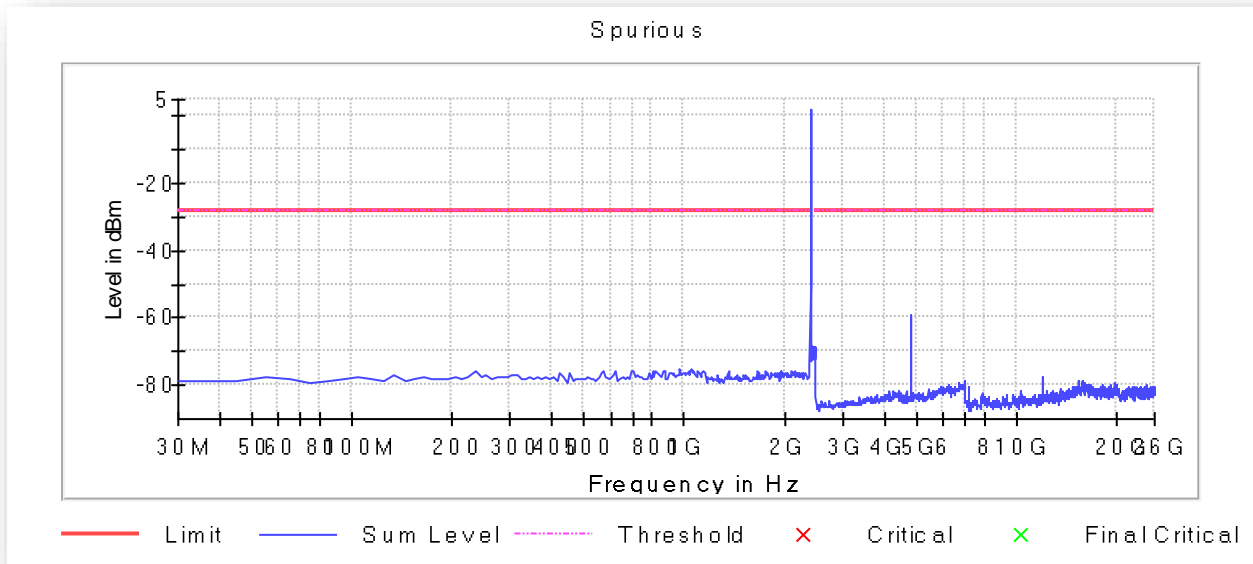
Ambient Temperature	24.3 °C
Relative Humidity	55.3 %
ATM Pressure	99.8 kPa

2.5.6 Additional Observations

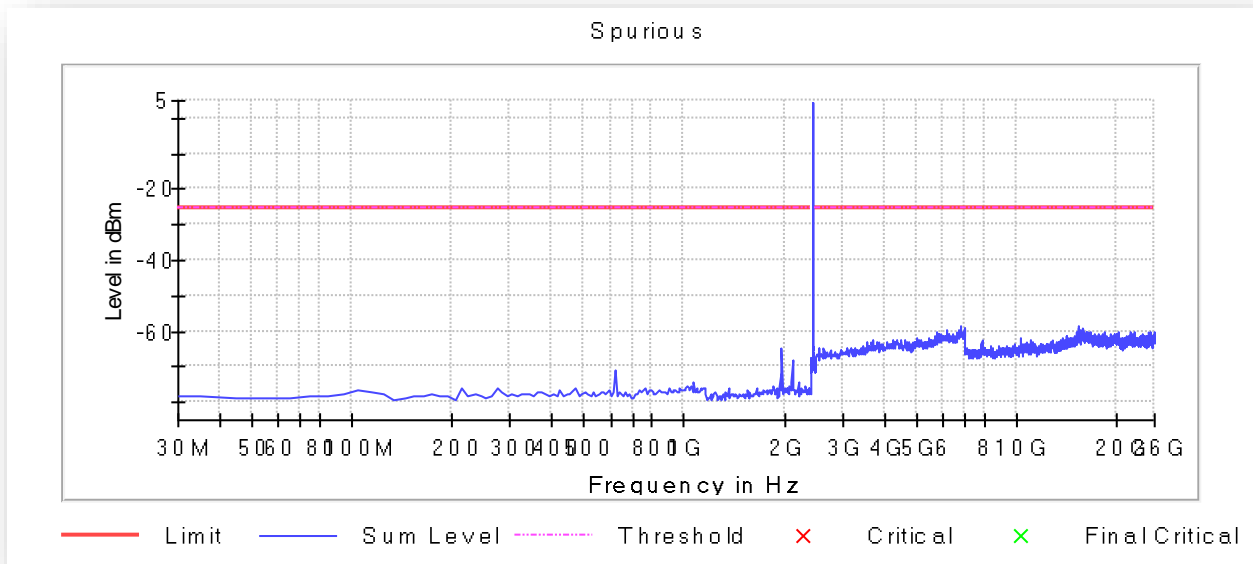
- This is a conducted test using a spectrum analyser.
- The path loss was all accounted for using a transducer factor (TDF).
- Test methodology is per FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.11.2 & 11.11.3.
- Both §15.205 and §15.247(d) requirements verified.
- Limits of §15.209 is converted to EIRP using formula from Clause 12.7.2(d) of ANSI C63.10-2013. Appropriate antenna gain is programmed as Offset for §15.205 verification.
- There are no emissions observed beyond 18GHz (only up to 18GHz presented) during §15.205 verification as confirmed by the §15.247(d) verifications (Section 2.5.8).
- For §15.247(d) requirement, no emissions observed within the measurement threshold during prescan, further verification is not required.



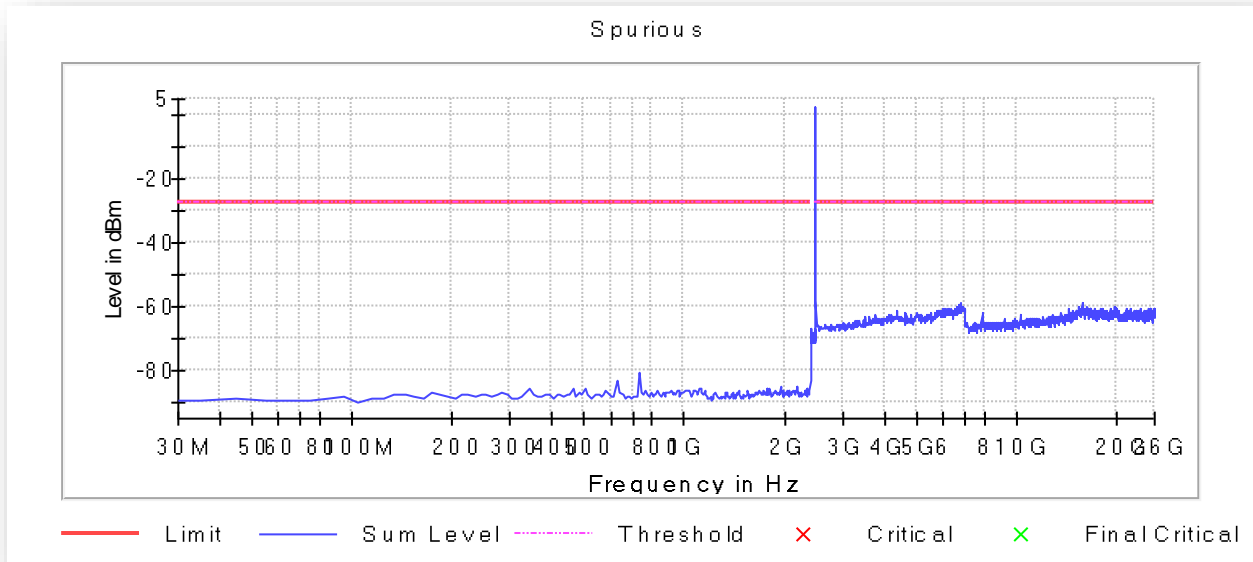
2.5.7 Test Results Plots (§15.247 requirements)



Low Channel



Middle Channel



High Channel

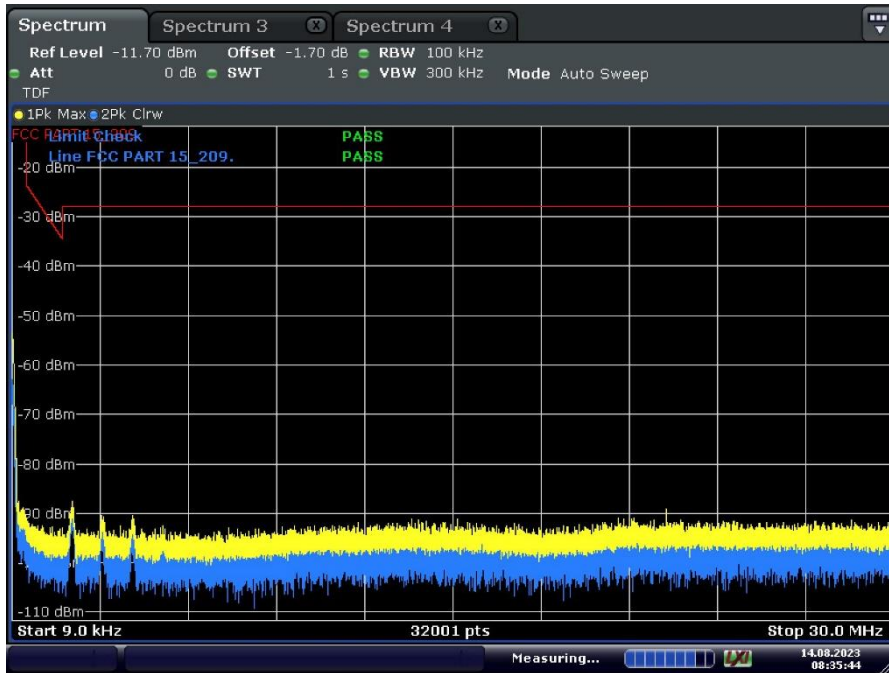
2.5.8 Test Results Plots (§15.205 requirements)

Plots presented under this Section are using Peak Detector with corresponding antenna gain as declared by the manufacturer as an Offset (including insertion loss of the SMA pig tail). TDF (Transducer Factor) is used for other losses along the measurement path. Limit used is for Average measurement. To obtain corresponding Average value from Peak measurement, Duty Cycle Correction factor will be applied as applicable.

Duty Cycle Calculation (if required)

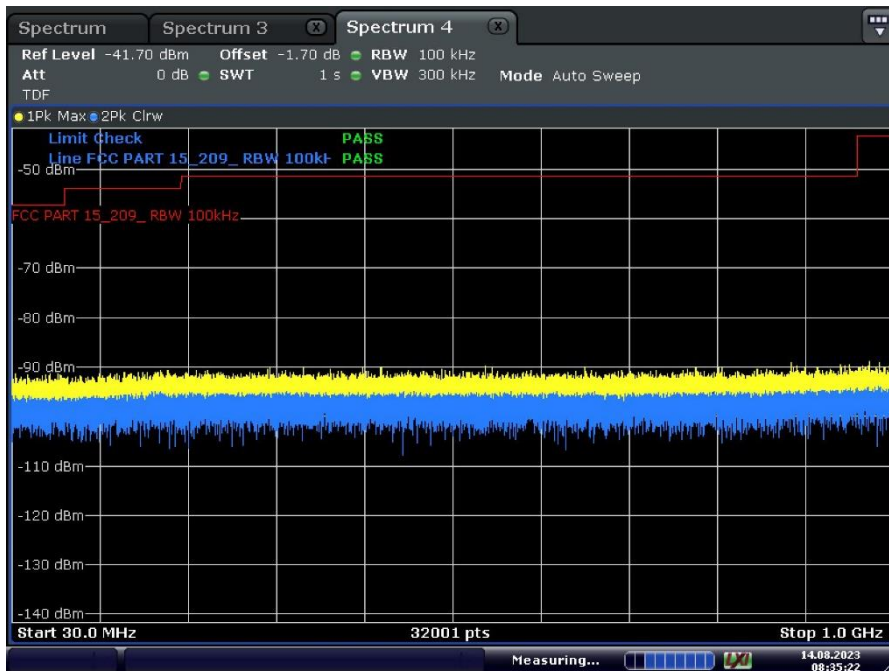
Duty Cycle for Middle Channel	= 67.986%
DCCF	= $20 \log(0.59583)$
	= 3.3 dB

Therefore, to obtain Average measurement from Peak measurement for Middle Channel, a factor of 3.3dB shall be used. However, all Peak measurements complies with Average limits, conversion is not required.



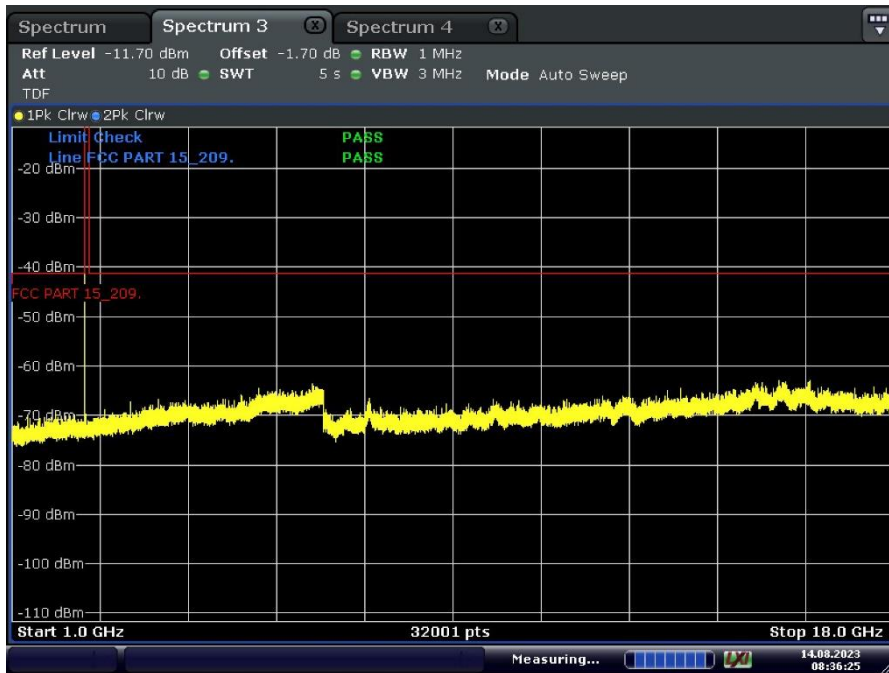
Date: 14.AUG.2023 08:35:44

BLE Low Channel (9kHz to 30MHz)



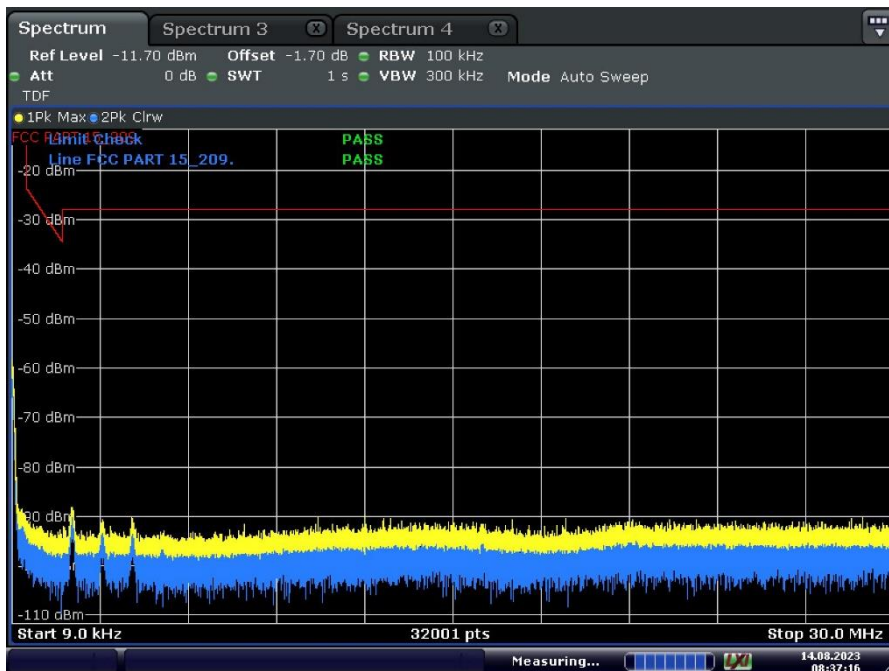
Date: 14.AUG.2023 08:35:22

BLE Low Channel (30MHz to 1GHz)



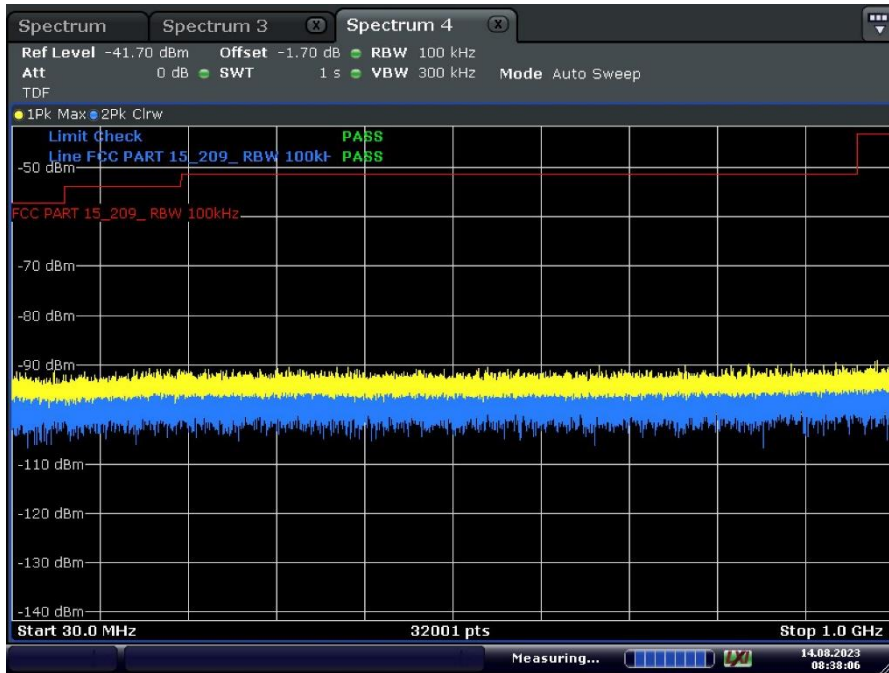
Date: 14.AUG.2023 08:36:25

BLE Low Channel (1GHz to 18GHz)



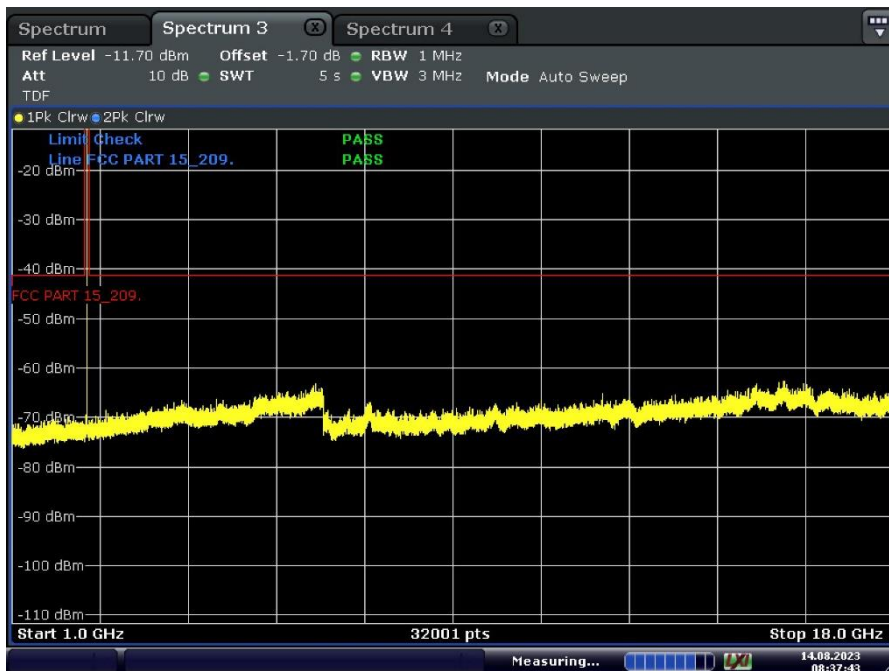
Date: 14.AUG.2023 08:37:17

BLE Mid Channel (9kHz to 30MHz)



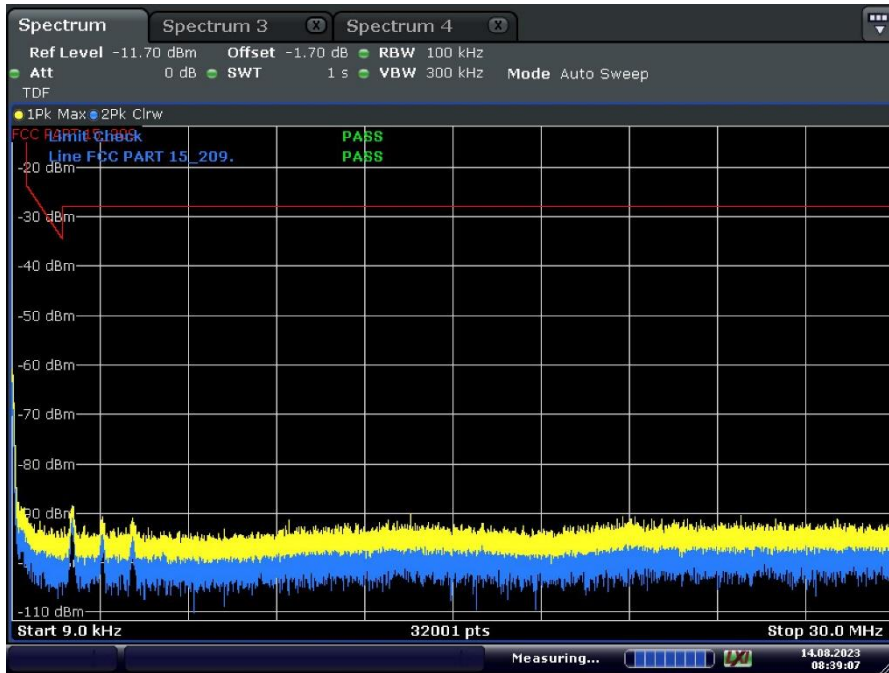
Date: 14.AUG.2023 08:38:06

BLE Mid Channel (30MHz to 1GHz)



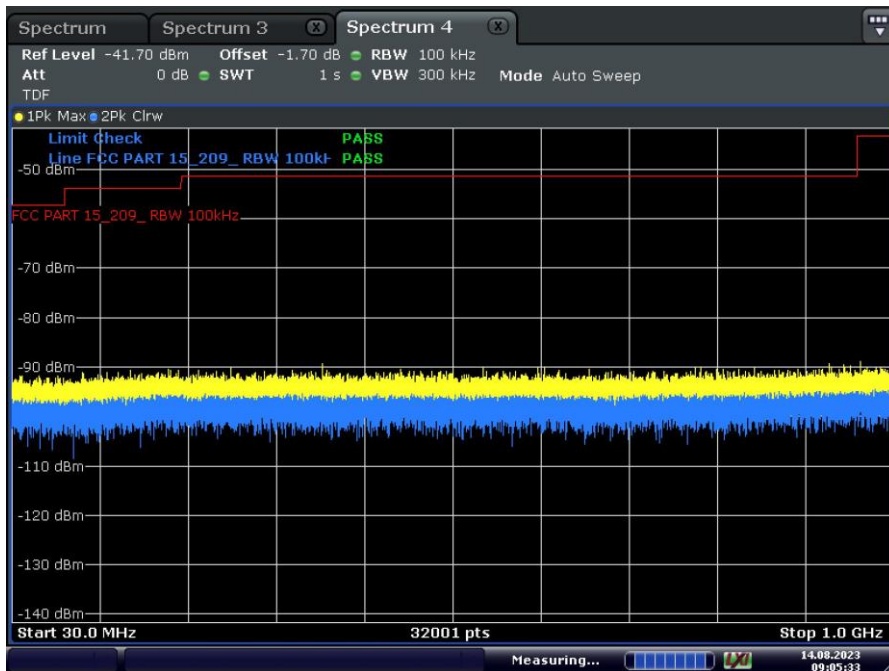
Date: 14.AUG.2023 08:37:43

BLE Mid Channel (1GHz to 18GHz)



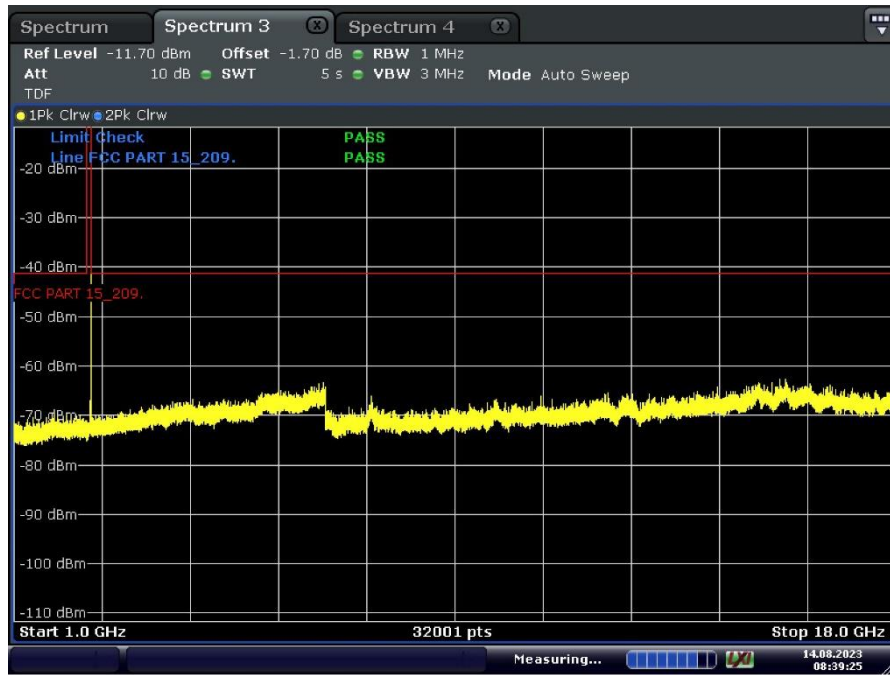
Date: 14.AUG.2023 08:39:07

BLE High Channel (9kHz to 30MHz)



Date: 14.AUG.2023 09:05:33

BLE High Channel (30MHz to 1GHz)



Date: 14.AUG.2023 08:39:25

BLE High Channel (1GHz to 18GHz)



2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
FCC 47 CFR Part 15, Clause 15.205
RSS-247, Clause 5.5

2.6.2 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.6.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.6.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	24.2 °C
Relative Humidity	57.4 %
ATM Pressure	99.7 kPa

2.6.7 Additional Observations

- This is a conducted test using direct connection to the Spectrum Analyzer being controlled by the TS8997 Test System.
- The path loss was all accounted for with the test system calibration.
- Test methodology is per FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 8.7 and ANSI C63.10-2013.



2.6.8 Sample Measurement Settings

Measurement 1		
Setting	Instrument Value	Target Value
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

Measurement 2		
Setting	Instrument Value	Target Value
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.03 dB	0.50 dB



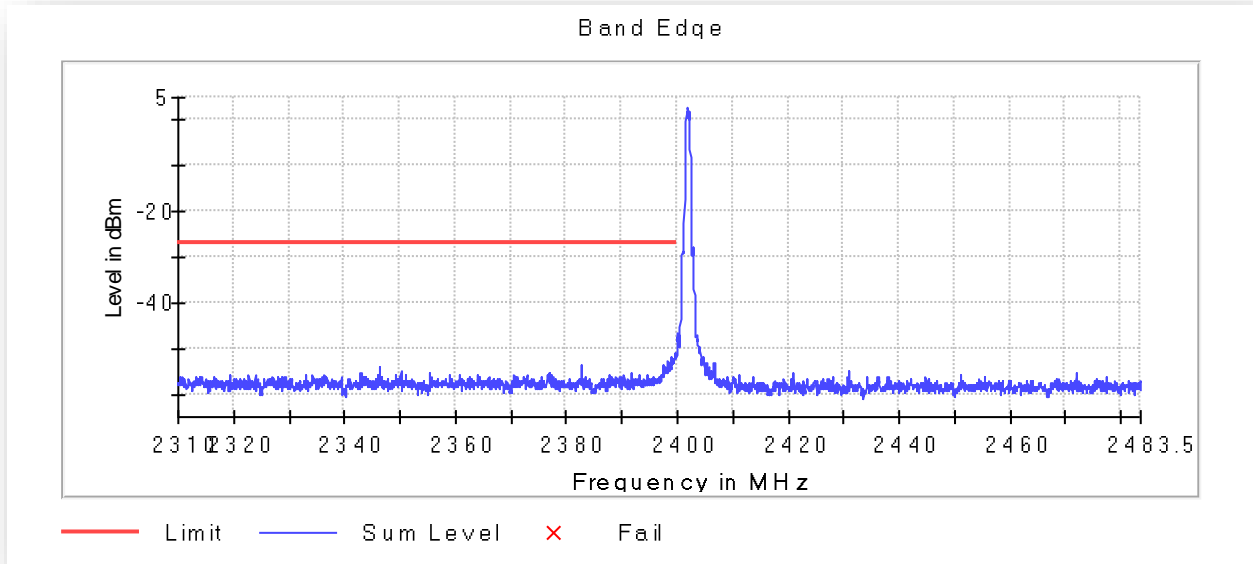
2.6.9 Test Results (Lower Band Edge)

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-47.6	20.5	-27.1	PASS
2399.925000	-48.1	21.0	-27.1	PASS
2399.625000	-50.8	23.7	-27.1	PASS
2399.675000	-51.2	24.1	-27.1	PASS
2399.875000	-51.2	24.1	-27.1	PASS
2399.725000	-51.3	24.2	-27.1	PASS
2399.825000	-51.5	24.3	-27.1	PASS
2399.575000	-51.6	24.4	-27.1	PASS
2399.525000	-51.7	24.6	-27.1	PASS
2399.475000	-51.9	24.8	-27.1	PASS
2398.975000	-52.0	24.9	-27.1	PASS
2399.775000	-52.2	25.0	-27.1	PASS
2399.375000	-52.2	25.1	-27.1	PASS
2399.425000	-52.6	25.4	-27.1	PASS
2398.925000	-52.7	25.5	-27.1	PASS

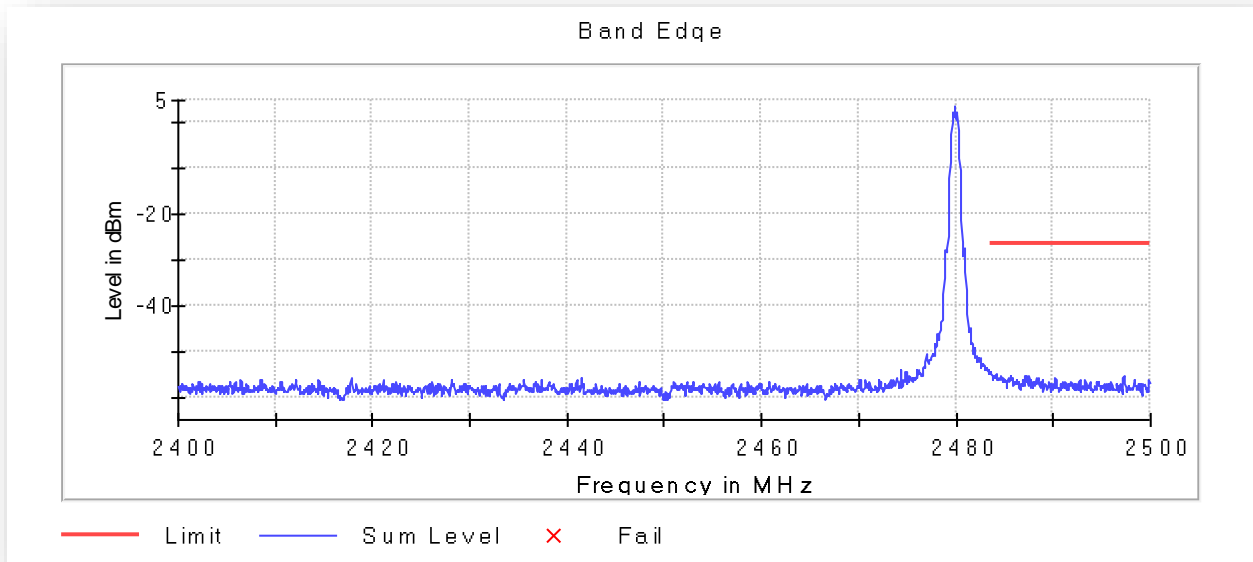
2.6.10 Test Results (Upper Band Edge)

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.575000	-54.6	28.2	-26.5	PASS
2484.175000	-54.8	28.3	-26.5	PASS
2483.675000	-55.0	28.5	-26.5	PASS
2483.525000	-55.0	28.5	-26.5	PASS
2483.625000	-55.0	28.5	-26.5	PASS
2484.125000	-55.1	28.7	-26.5	PASS
2487.175000	-55.2	28.7	-26.5	PASS
2484.575000	-55.3	28.8	-26.5	PASS
2487.575000	-55.3	28.9	-26.5	PASS
2487.125000	-55.3	28.9	-26.5	PASS
2483.925000	-55.3	28.9	-26.5	PASS
2483.725000	-55.3	28.9	-26.5	PASS
2484.625000	-55.4	28.9	-26.5	PASS
2485.575000	-55.4	28.9	-26.5	PASS
2483.875000	-55.4	29.0	-26.5	PASS

2.6.11 Test Plots



Bluetooth LE Low Band Edge 2400MHz 1M PHY



Bluetooth LE Upper Band Edge 2483.5MHz 1M PHY



2.6.12 Upper band edge calculation (2483.5 MHz) within Restricted Band:

- 2483.525000 MHz (in the restricted bands)
- Procedure is per Clause 12.7.2 of ANSI C63.10-2013.
- Use the following formula as per Clause 12.7.2(d) of ANSI C63.10-2013.

$$\begin{aligned} E(\text{dB}\mu\text{V}/\text{m}) &= \text{EIRP (dBm)} + 95.2 \\ &= (-54.6 \text{ dBm} + 1.3 \text{ dBi antenna gain}) + 95.2 \\ &= 41.9 \text{ dB}\mu\text{V}/\text{m} @ 3 \text{ meters (Peak complies with 54 dB}\mu\text{V}/\text{m Average limit)} \end{aligned}$$



2.7 RADIATED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

2.7.2 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.7.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.7.4 Date of Test/Initial of test personnel who performed the test

August 28, 2023 / FSC

2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.6 Environmental Conditions (Mira Mesa Facility)

Ambient Temperature	24.2 °C
Relative Humidity	54.9 %
ATM Pressure	100.1 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 9kHz to the 10th harmonic.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Only the worst case BLE Channel presented below 1GHz. There are no significant differences in emissions between channels when verifying cabinet spurious emissions.
- Antenna port terminated with 50 Ω load. Emissions coming out of the cabinet being verified



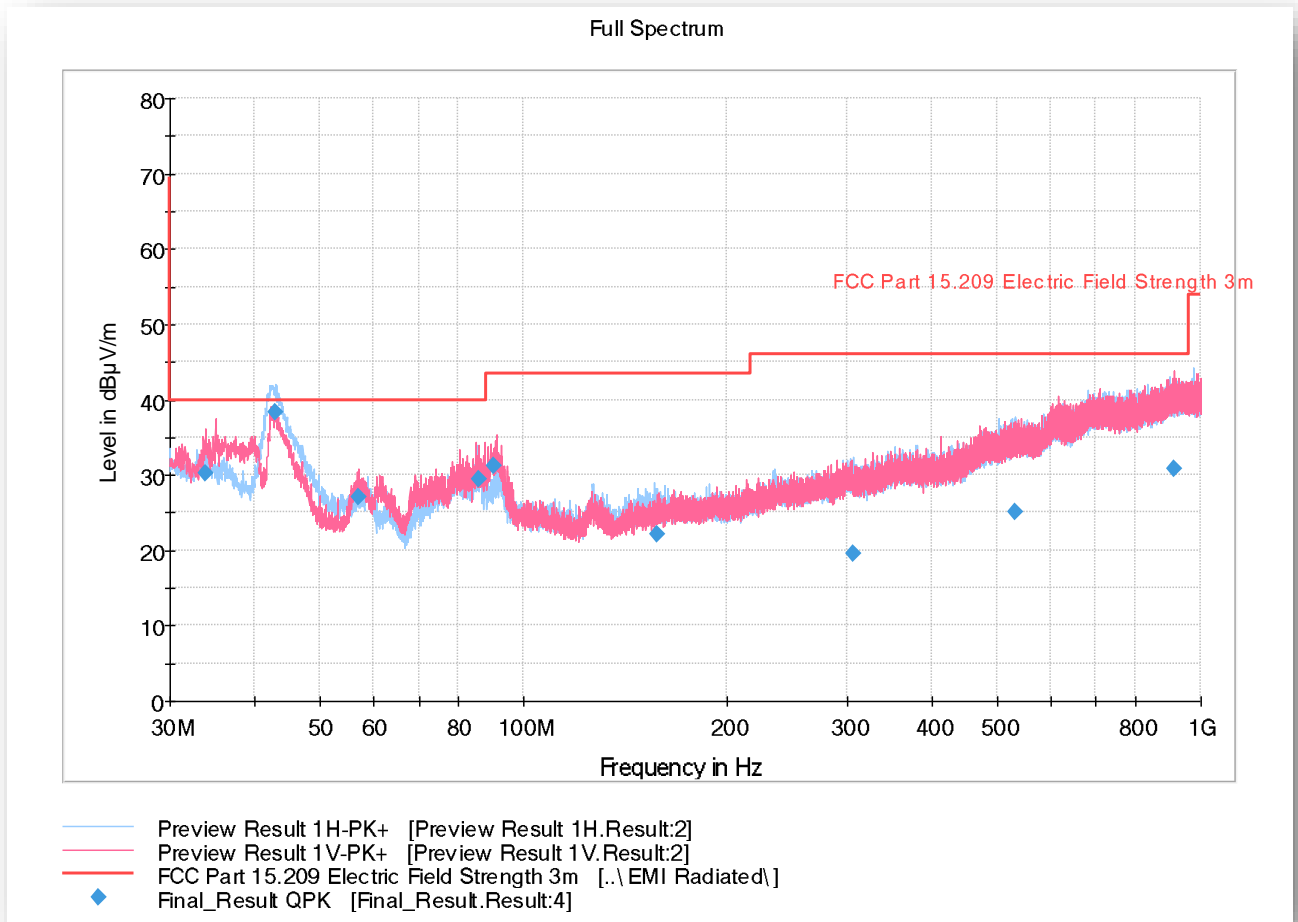
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.7.8 for sample computation.

2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 30 MHz		-0.8
Correction Factor (dB)	Asset# 1066 (cable)	18.1
	Asset# 1172 (cable)	0.3
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
Reported QuasiPeak Final Measurement (dbμV/m) @ 30MHz		11.8



2.7.9 Test Results for 30MHz to 1GHz

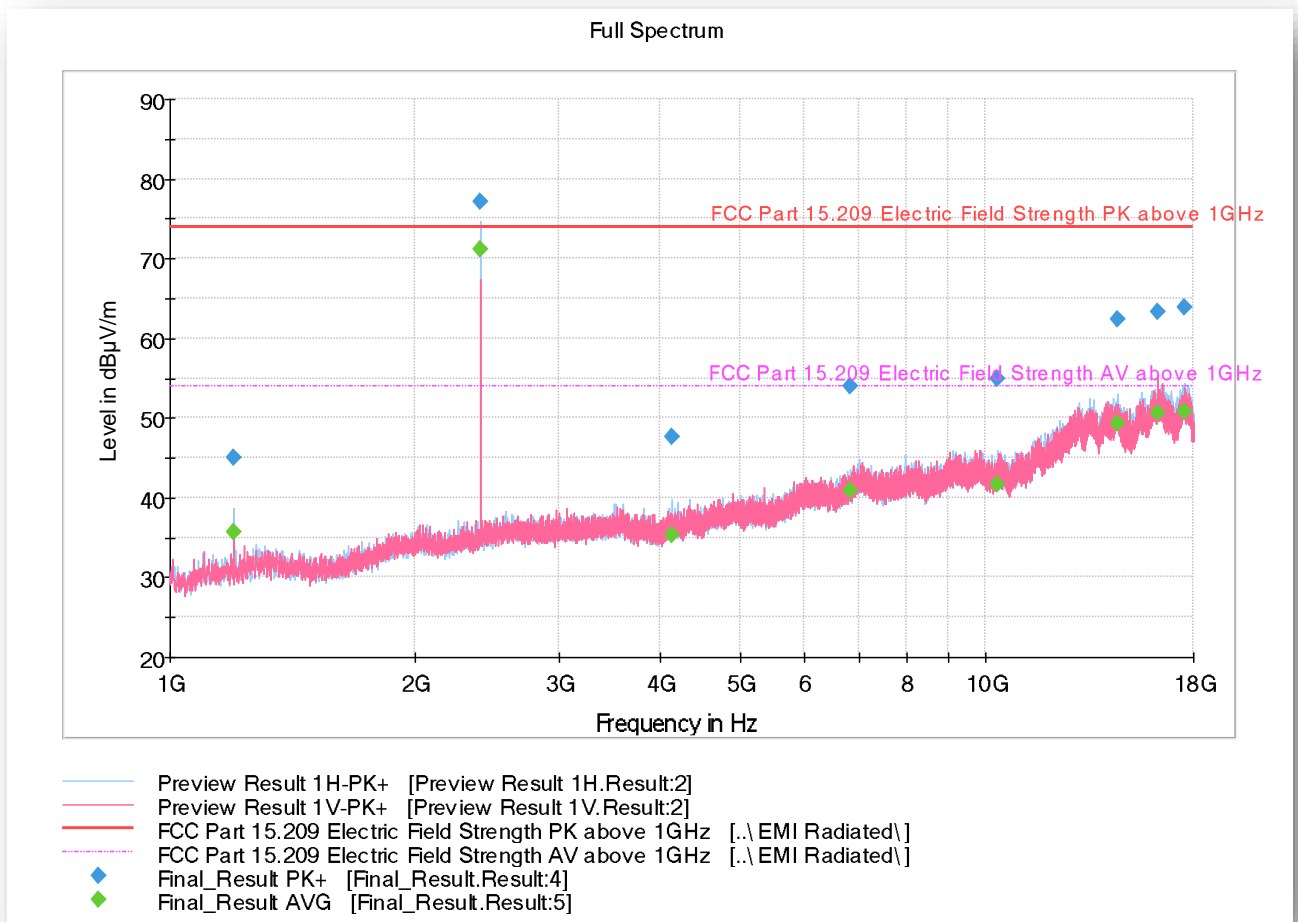


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
33.811667	30.16	40.00	9.84	1000.	120.000	111.0	V	122.0	20
42.910333	38.39	40.00	1.61	1000.	120.000	155.0	H	136.0	16
57.101333	27.05	40.00	12.95	1000.	120.000	121.0	V	300.0	14
85.949667	29.47	40.00	10.53	1000.	120.000	107.0	V	75.0	13
90.077667	31.26	43.50	12.24	1000.	120.000	125.0	V	146.0	14
156.97833	22.11	43.50	21.39	1000.	120.000	205.0	H	217.0	16
306.06433	19.60	46.00	26.40	1000.	120.000	125.0	H	311.0	21
533.06766	24.99	46.00	21.01	1000.	120.000	400.0	H	20.0	26
912.98333	30.76	46.00	15.24	1000.	120.000	365.0	V	-1.0	31



2.7.10 Test Results for 1GHz to 18GHz Low Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	45.08	73.90	28.82	1000.0	1000.000	365.0	H	50.0	-1
2401.96666	77.03	73.90	-3.13	1000.0	1000.000	226.0	H	162.0	4
4128.83333	47.69	73.90	26.21	1000.0	1000.000	365.0	H	149.0	7
6826.26666	53.88	73.90	20.02	1000.0	1000.000	175.0	H	38.0	10
10347.1000	54.89	73.90	19.01	1000.0	1000.000	315.0	H	10.0	14
14520.1666	62.33	73.90	11.57	1000.0	1000.000	255.0	H	99.0	18
16306.3333	63.38	73.90	10.52	1000.0	1000.000	365.0	V	104.0	20
17559.4666	63.92	73.90	9.98	1000.0	1000.000	308.0	H	334.0	23



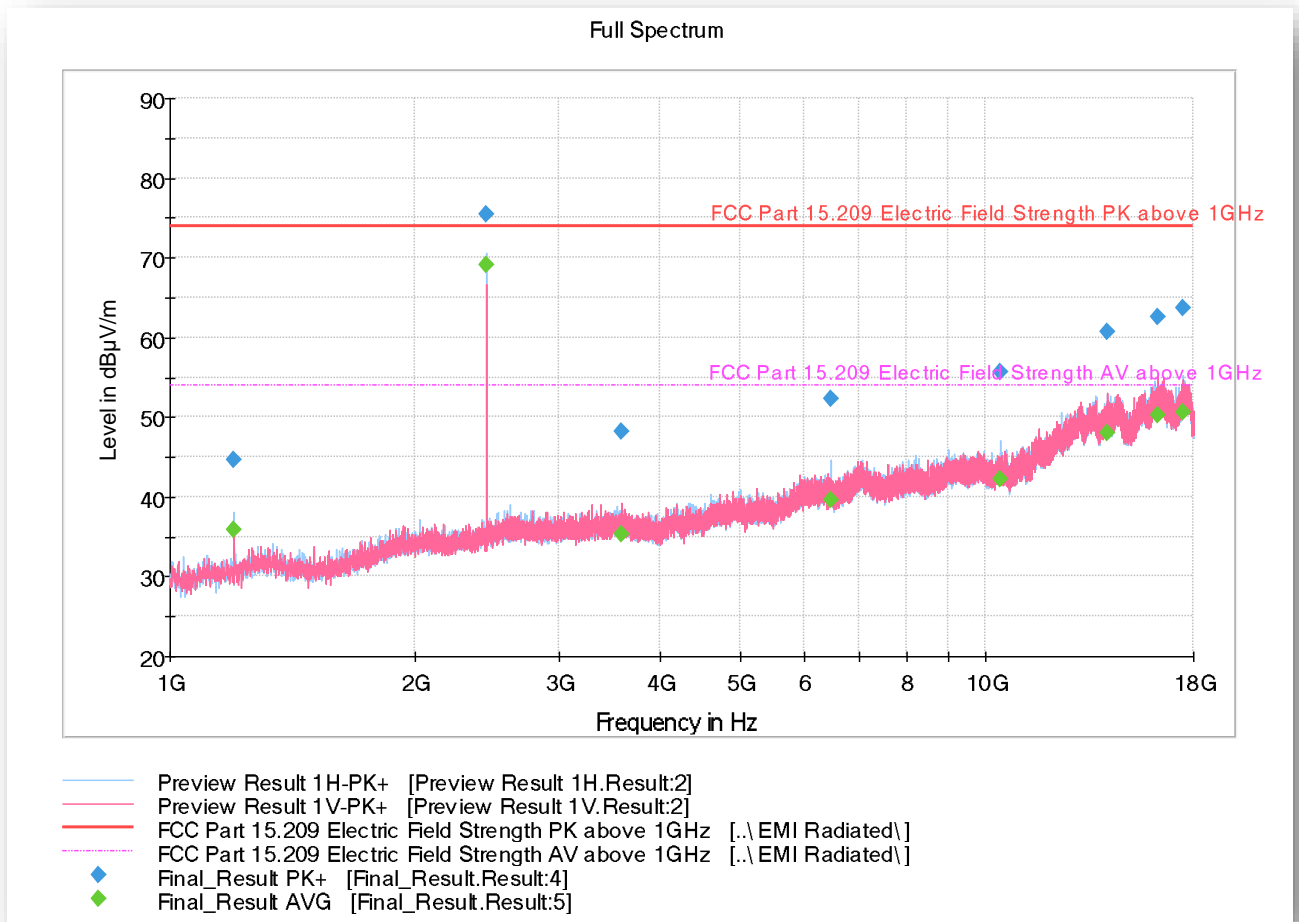
Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	35.69	53.90	18.21	1000.0	1000.000	365.0	H	50.0	-1
2401.96666	71.17	53.90	-17.27	1000.0	1000.000	226.0	H	162.0	4
4128.83333	35.25	53.90	18.65	1000.0	1000.000	365.0	H	149.0	7
6826.26666	40.84	53.90	13.06	1000.0	1000.000	175.0	H	38.0	10
10347.1000	41.72	53.90	12.18	1000.0	1000.000	315.0	H	10.0	14
14520.1666	49.27	53.90	4.63	1000.0	1000.000	255.0	H	99.0	18
16306.3333	50.65	53.90	3.25	1000.0	1000.000	365.0	V	104.0	20
17559.4666	50.77	53.90	3.13	1000.0	1000.000	308.0	H	334.0	23

Test Notes: Fundamental will be ignored for this test (antenna port terminated).



2.7.11 Test Results for 1GHz to 18GHz Mid Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	44.65	73.90	29.25	1000.0	1000.000	365.0	H	329.0	-1
2441.80000	75.40	73.90	-1.50	1000.0	1000.000	221.0	H	14.0	4
3585.66666	48.14	73.90	25.76	1000.0	1000.000	365.0	V	296.0	6
6456.50000	52.29	73.90	21.61	1000.0	1000.000	335.0	H	41.0	10
10433.6666	55.57	73.90	18.33	1000.0	1000.000	311.0	H	246.0	14
14100.9666	60.70	73.90	13.20	1000.0	1000.000	255.0	V	40.0	18
16287.5666	62.56	73.90	11.34	1000.0	1000.000	175.0	V	4.0	20
17468.2333	63.66	73.90	10.24	1000.0	1000.000	365.0	H	39.0	22



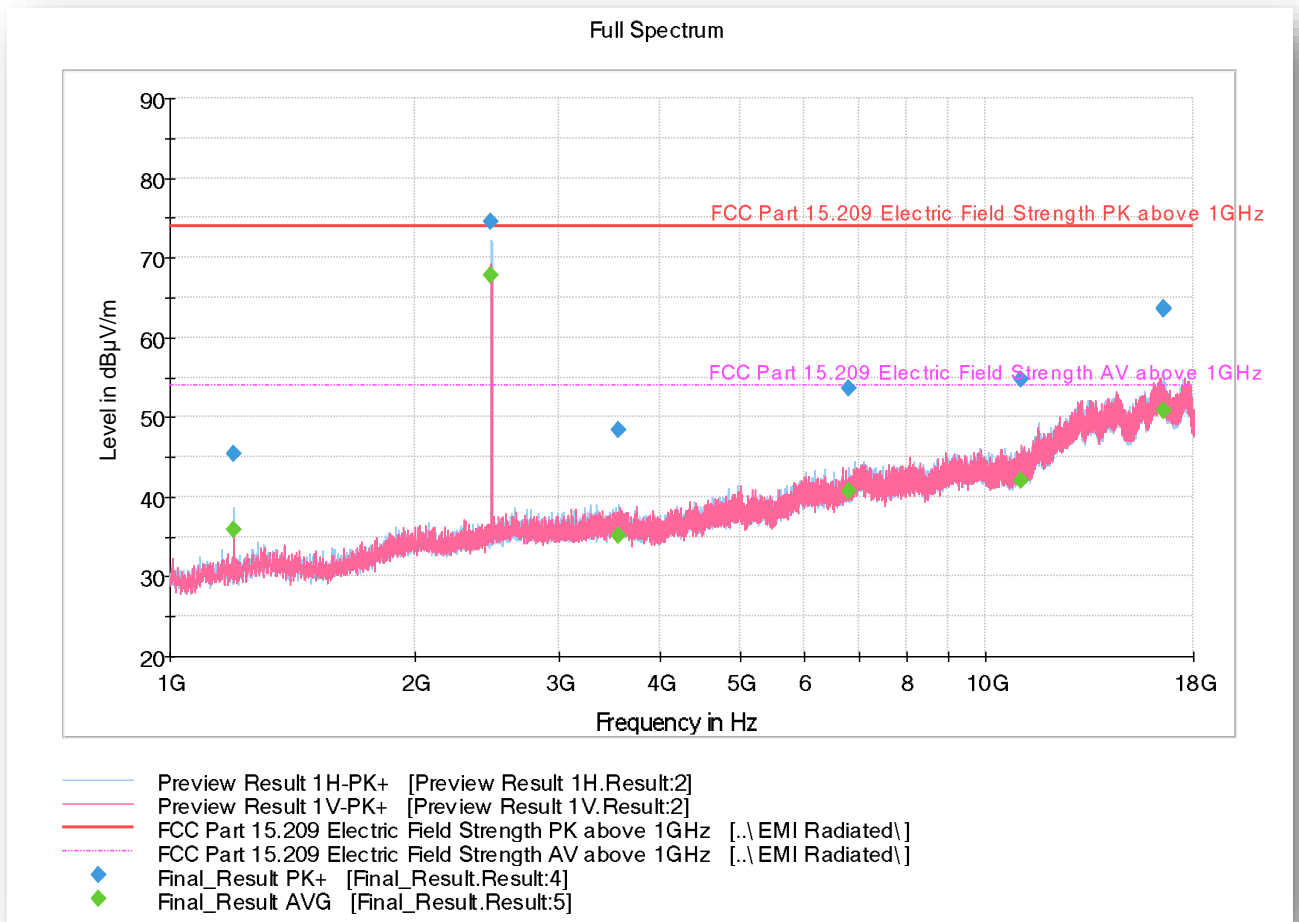
Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	35.87	53.90	18.03	1000.0	1000.000	365.0	H	329.0	-1
2441.80000	69.04	53.90	-15.14	1000.0	1000.000	221.0	H	14.0	4
3585.66666	35.22	53.90	18.68	1000.0	1000.000	365.0	V	296.0	6
6456.50000	39.69	53.90	14.21	1000.0	1000.000	335.0	H	41.0	10
10433.6666	42.28	53.90	11.62	1000.0	1000.000	311.0	H	246.0	14
14100.9666	48.09	53.90	5.81	1000.0	1000.000	255.0	V	40.0	18
16287.5666	50.16	53.90	3.74	1000.0	1000.000	175.0	V	4.0	20
17468.2333	50.59	53.90	3.31	1000.0	1000.000	365.0	H	39.0	22

Test Notes: Fundamental will be ignored for this test (antenna port terminated).



2.7.12 Test Results for 1GHz to 18GHz High Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	45.31	73.90	28.59	1000.0	1000.000	354.0	H	284.0	-0.6
2479.76666	74.48	73.90	-0.58	1000.0	1000.000	255.0	H	231.0	4.3
3553.76666	48.34	73.90	25.56	1000.0	1000.000	335.0	H	224.0	5.8
6812.86666	53.68	73.90	20.22	1000.0	1000.000	332.0	H	94.0	9.8
11052.3666	54.70	73.90	19.20	1000.0	1000.000	335.0	V	38.0	15.5
16530.3666	63.75	73.90	10.15	1000.0	1000.000	175.0	H	32.0	20.7
16535.1666	63.55	73.90	10.35	1000.0	1000.000	138.0	H	28.0	20.7



America

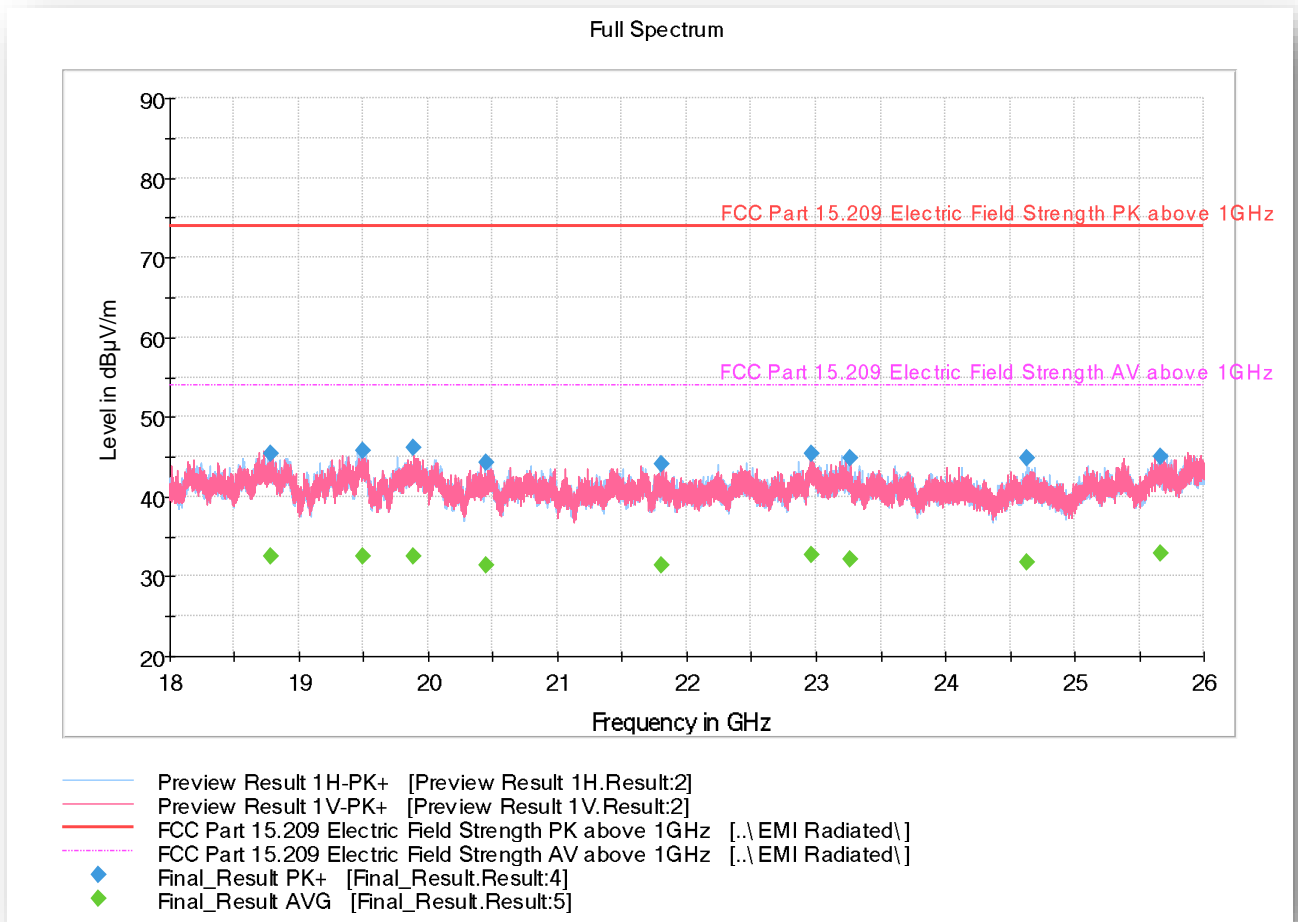
Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	35.95	53.90	17.95	1000.0	1000.000	340.0	H	278.0	-0.6
2479.76666	67.81	53.90	-13.91	1000.0	1000.000	255.0	H	231.0	4.3
3553.76666	35.12	53.90	18.78	1000.0	1000.000	335.0	H	224.0	5.8
6812.86666	40.81	53.90	13.09	1000.0	1000.000	332.0	H	94.0	9.8
11052.3666	42.03	53.90	11.87	1000.0	1000.000	335.0	V	38.0	15.5
16530.3666	50.72	53.90	3.18	1000.0	1000.000	175.0	H	32.0	20.7
16535.1666	50.72	53.90	3.18	1000.0	1000.000	138.0	H	28.0	20.7

Test Notes: Fundamental will be ignored for this test (antenna port terminated).



2.7.13 Test Results for 18GHz to 26GHz Low Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18787.1730	45.34	73.90	28.56	1000.0	1000.000	163.0	H	320.0	-3
19498.5605	45.71	73.90	28.19	1000.0	1000.000	163.0	H	104.0	-3
19885.6135	46.22	73.90	27.68	1000.0	1000.000	159.0	V	287.0	-3
20450.4560	44.19	73.90	29.71	1000.0	1000.000	163.0	H	14.0	-3
21806.7715	44.17	73.90	29.73	1000.0	1000.000	158.0	V	190.0	-2
22961.3910	45.38	73.90	28.52	1000.0	1000.000	140.0	V	212.0	-1
23261.9375	44.91	73.90	28.99	1000.0	1000.000	190.0	V	55.0	0
24634.7510	44.79	73.90	29.11	1000.0	1000.000	191.0	H	46.0	-1
25671.4800	45.08	73.90	28.82	1000.0	1000.000	213.0	H	220.0	1

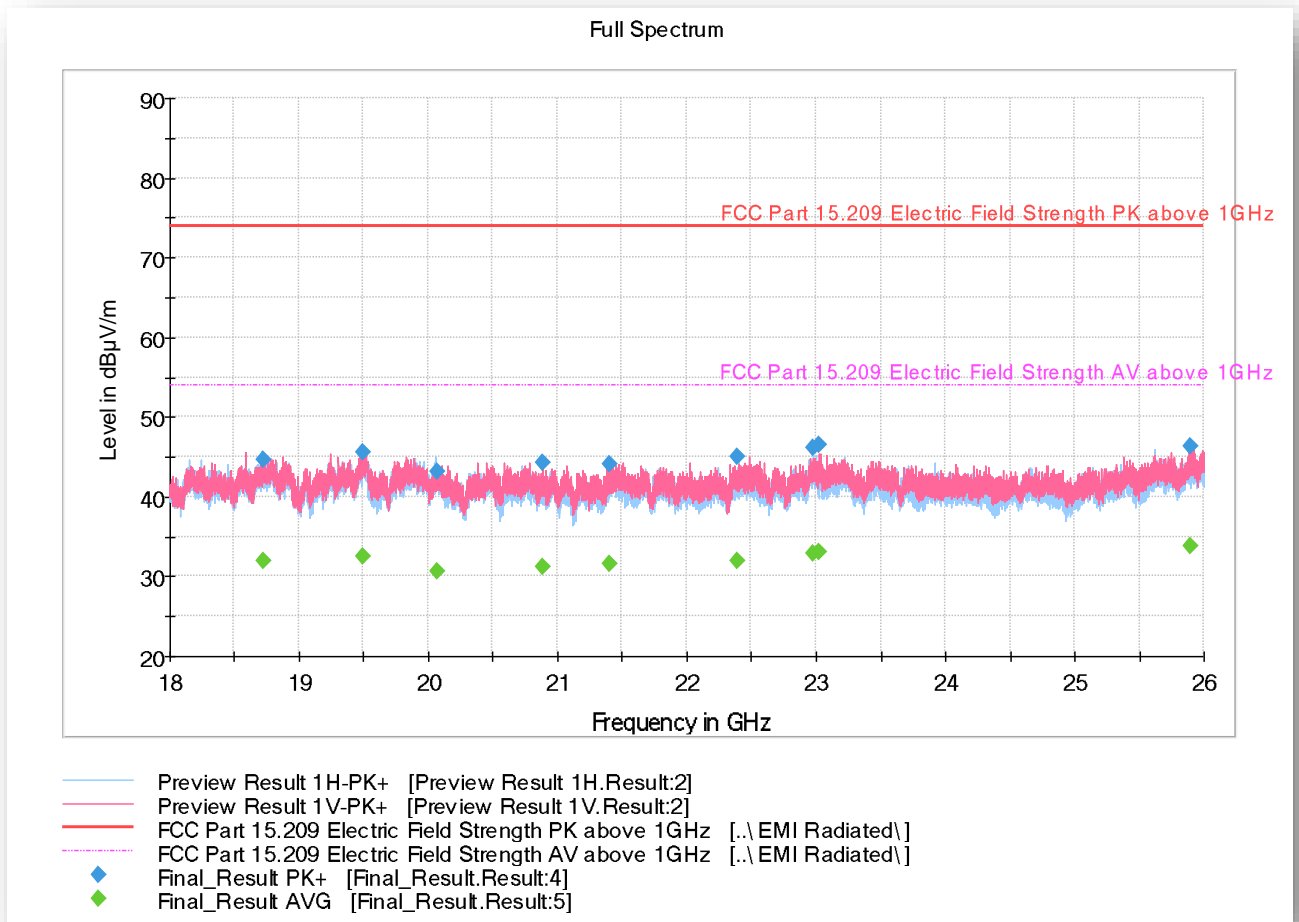


Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18787.1730	32.49	53.90	21.41	1000.0	1000.000	163.0	H	320.0	-3
19498.5605	32.54	53.90	21.36	1000.0	1000.000	163.0	H	104.0	-3
19885.6135	32.60	53.90	21.30	1000.0	1000.000	159.0	V	287.0	-3
20450.4560	31.40	53.90	22.50	1000.0	1000.000	163.0	H	14.0	-3
21806.7715	31.39	53.90	22.51	1000.0	1000.000	158.0	V	190.0	-2
22961.3910	32.68	53.90	21.22	1000.0	1000.000	140.0	V	212.0	-1
23261.9375	32.17	53.90	21.73	1000.0	1000.000	190.0	V	55.0	0
24634.7510	31.67	53.90	22.23	1000.0	1000.000	191.0	H	46.0	-1
25671.4800	32.97	53.90	20.93	1000.0	1000.000	213.0	H	220.0	1



2.7.14 Test Results for 18GHz to 26GHz Mid Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18718.5500	44.72	73.90	29.18	1000.0	1000.000	213.0	H	28.0	-2
19499.7170	45.60	73.90	28.30	1000.0	1000.000	212.0	H	3.0	-3
20069.5730	43.15	73.90	30.75	1000.0	1000.000	157.0	H	55.0	-3
20880.5385	44.33	73.90	29.57	1000.0	1000.000	213.0	V	5.0	-3
21405.9620	44.00	73.90	29.91	1000.0	1000.000	154.0	V	154.0	-2
22390.6995	45.10	73.90	28.80	1000.0	1000.000	213.0	H	19.0	-1
22981.8430	46.12	73.90	27.78	1000.0	1000.000	140.0	H	268.0	0
23025.4100	46.48	73.90	27.42	1000.0	1000.000	163.0	V	252.0	0
25900.0455	46.32	73.90	27.58	1000.0	1000.000	144.0	V	71.0	1

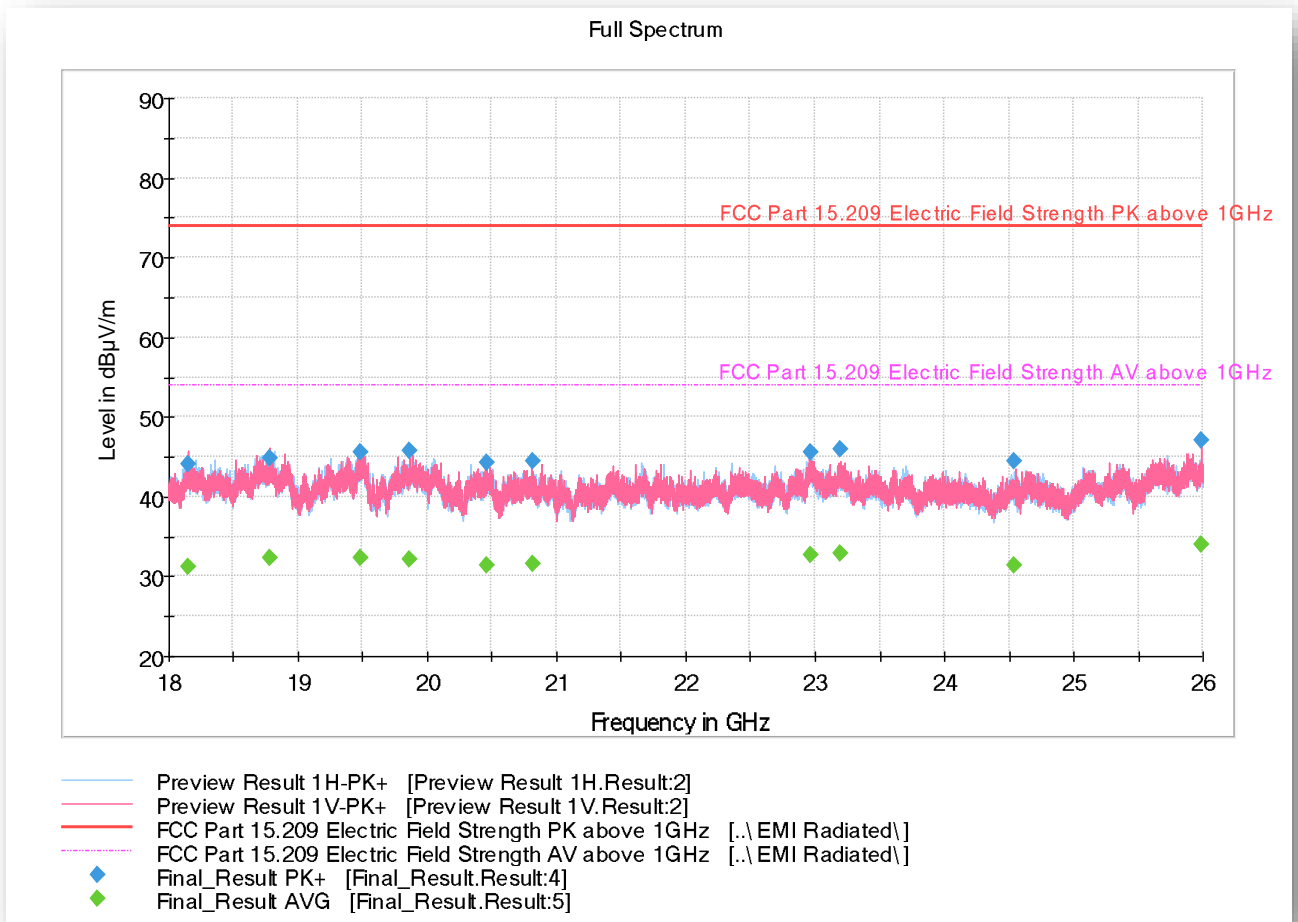


Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18718.5500	31.86	53.90	22.04	1000.0	1000.000	213.0	H	28.0	-2
19499.7170	32.43	53.90	21.47	1000.0	1000.000	212.0	H	3.0	-3
20069.5730	30.68	53.90	23.22	1000.0	1000.000	157.0	H	55.0	-3
20880.5385	31.15	53.90	22.75	1000.0	1000.000	213.0	V	5.0	-3
21405.9620	31.60	53.90	22.30	1000.0	1000.000	154.0	V	154.0	-2
22390.6995	32.01	53.90	21.89	1000.0	1000.000	213.0	H	19.0	-1
22981.8430	32.94	53.90	20.96	1000.0	1000.000	140.0	H	268.0	0
23025.4100	33.14	53.90	20.76	1000.0	1000.000	163.0	V	252.0	0
25900.0455	33.90	53.90	20.00	1000.0	1000.000	144.0	V	71.0	1



2.7.15 Test Results for 18GHz to 26GHz High Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18147.1220	44.08	73.90	29.82	1000.0	1000.000	143.0	V	47.0	-2
18778.2300	44.90	73.90	29.00	1000.0	1000.000	156.0	V	162.0	-3
19481.8905	45.51	73.90	28.39	1000.0	1000.000	163.0	V	338.0	-3
19863.8430	45.76	73.90	28.14	1000.0	1000.000	163.0	H	116.0	-3
20457.1300	44.28	73.90	29.62	1000.0	1000.000	213.0	V	110.0	-3
20814.5280	44.49	73.90	29.41	1000.0	1000.000	137.0	V	141.0	-3
22967.8010	45.52	73.90	28.38	1000.0	1000.000	190.0	H	132.0	-1
23195.1015	46.00	73.90	27.90	1000.0	1000.000	137.0	V	295.0	0
24539.5840	44.50	73.90	29.40	1000.0	1000.000	150.0	V	47.0	-1
25986.9580	46.99	73.90	26.91	1000.0	1000.000	140.0	V	73.0	1



Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18147.1220	31.19	53.90	22.71	1000.0	1000.000	143.0	V	47.0	-2
18778.2300	32.30	53.90	21.60	1000.0	1000.000	156.0	V	162.0	-3
19481.8905	32.28	53.90	21.62	1000.0	1000.000	163.0	V	338.0	-3
19863.8430	32.23	53.90	21.67	1000.0	1000.000	163.0	H	116.0	-3
20457.1300	31.39	53.90	22.51	1000.0	1000.000	213.0	V	110.0	-3
20814.5280	31.56	53.90	22.34	1000.0	1000.000	137.0	V	141.0	-3
22967.8010	32.63	53.90	21.27	1000.0	1000.000	190.0	H	132.0	-1
23195.1015	32.88	53.90	21.02	1000.0	1000.000	137.0	V	295.0	0
24539.5840	31.46	53.90	22.44	1000.0	1000.000	150.0	V	47.0	-1
25986.9580	34.04	53.90	19.86	1000.0	1000.000	140.0	V	73.0	1



2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(e)
RSS-247, Clause 5.2(b)

2.8.2 Standard Applicable

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.8.3 Equipment Under Test and Modification State

Serial No: 813317000065 / Default Test Configuration

2.8.4 Date of Test/Initial of test personnel who performed the test

August 11, 2023 / FSC

2.8.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	24.2 °C
Relative Humidity	57.4 %
ATM Pressure	99.7 kPa

2.8.7 Additional Observations

- This is a conducted test using direct connection to the TS8997 Test System.
- The path loss was all accounted for with the test system calibration.
- Test methodology is per FCC title 47 part 15 §15.247(a),(e), KDB 558074 D01 DTS Meas Guidance v05 F and ANSI C63.10-2013.



2.8.8 Test Results Summary

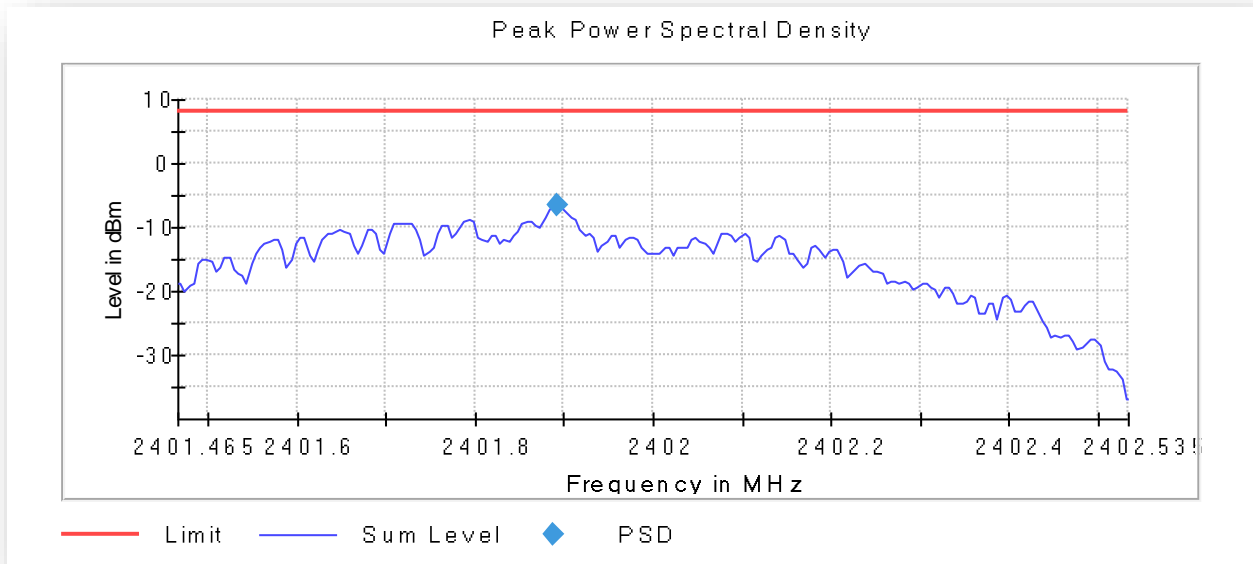
DUT Frequency (MHz)	PHY	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	1M	2401.892570	-6.526	8.0	PASS
2440.000000	1M	2439.887543	-4.741	8.0	PASS
2480.000000	1M	2479.887543	-5.633	8.0	PASS

2.8.9 Sample Measurement Settings

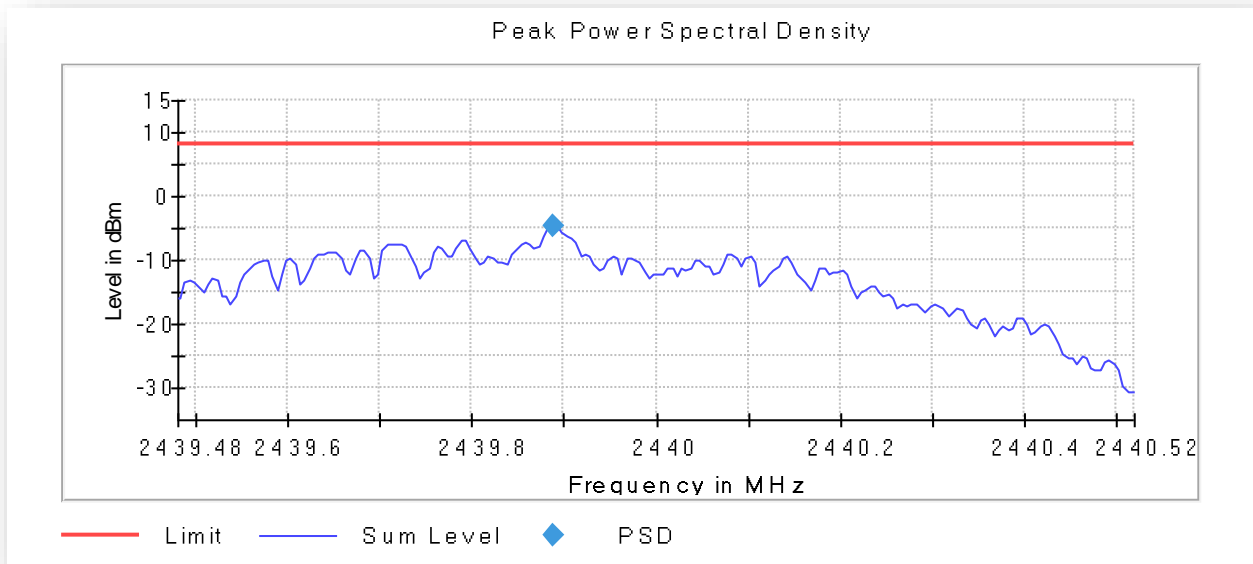
Setting	Instrument Value	Target Value
Span	1.040 MHz	1.040 MHz
RBW	10.000 kHz	<= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	208	~ 208
Sweeptime	1.040 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.08 dB	0.50 dB



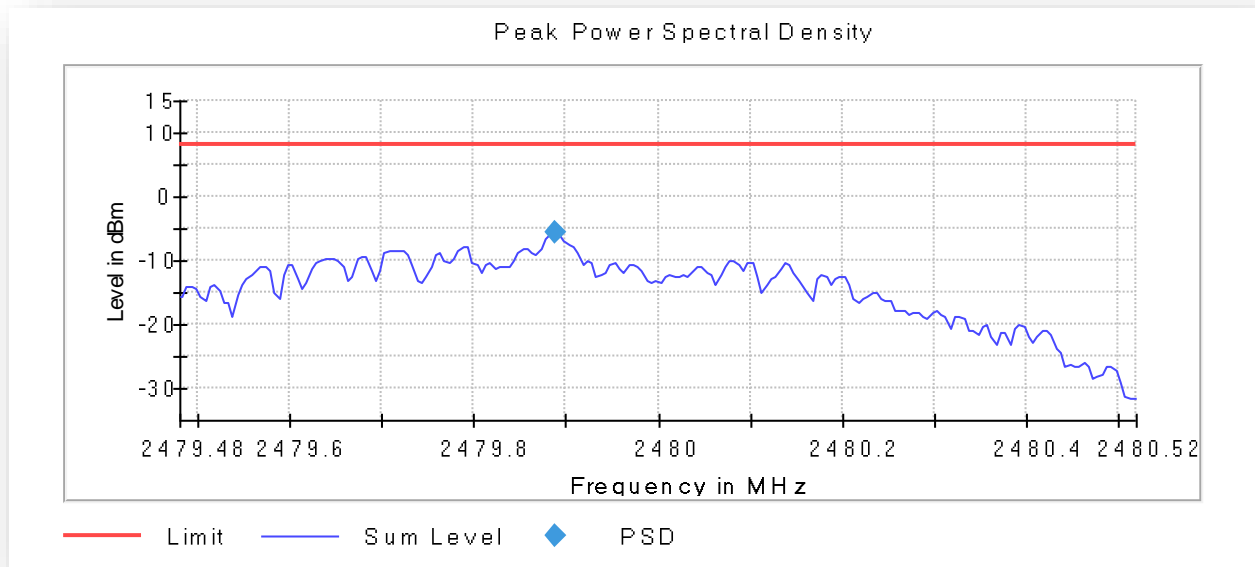
2.8.10 Test Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE High Channel



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Conducted Port Setup						
7643	Signal/Spectrum Analyzer	FSV30	1321.3008K30/103166	Rhode & Schwarz	12/21/22	03/20/24
7655	Vector Signal Generator	SMBV100A	260734	Rhode & Schwarz	12/21/22	12/21/23
7654	Signal Generator	SMB 100A	175750	Rhode & Schwarz	12/21/22	12/21/23
7656	OSP with B157	OSP120	101310	Rhode & Schwarz	12/21/22	12/21/23
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7643 and 7654	
AC Conducted Emissions						
1049	EMI Test Receiver	ESU40	100133	Rohde & Schwarz	04/03/23	04/03/24
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	04/18/23	04/18/24
8870	Bi-Directional Attenuator	34-20-34	BP8030	MCE / Weinschel	12/20/23	12/20/24
Radiated Emission						
1049	EMI Test Receiver	ESU40	100133	Rohde & Schwarz	04/03/23	04/03/24
46797	Preamplifier	PA-122	181925	Com Power	12/03/22	12/03/23
1033	BiConiLog Antenna	3142C	00044556	ETS Lindgren	10/05/21	10/05/23
7575	1-18GHz DRG Horn	3117	155511	ETS Lindgren	08/08/22	08/08/24
40815	Pre-amplifier (18-40 GHz)	19D18	15G27	Spacek Labs	09/06/23	09/06/24
9001	18-26 GHz Antenna	HO42S	101	Custom Microwave Inc.	09/23/21	09/21/23
9002	26-40GHz Antenna	HO28S	102	Custom Microwave Inc.	09/23/21	09/21/23
Miscellaneous						
30215	Barometer/Temperature/Humidity	iBTHX-W	15050268	Omega	06/15/23	06/15/24
43003	True RMS Multimeter	85 III	69880143	Fluke	01/09/23	01/09/24
	Test Software	EMC32	V10.50.40	Rhode & Schwarz	N/A	



3.2 MEASUREMENT UNCERTAINTY

Calculation of Measurement Uncertainty per CISPR 16-4-2:2011 with Corr. 1

3.2.1 AC Conducted Measurements

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	LISN-receiver attenuation	0.10 dB	Normal, k=2	2.000	0.05	0.00
3	LISN voltage division factor	0.30 dB	Normal, k=2	2.000	0.15	0.02
4	Receiver sinewave accuracy	0.36 dB	Normal, k=2	2.000	0.18	0.03
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.00 dB	Rectangular	1.732	0.00	0.00
8	AMN VDF frequency interpolation	0.10 dB	Rectangular	1.732	0.06	0.00
9	Mismatch	0.07 dB	U-shaped	1.414	0.05	0.00
10	LISN impedance	2.65 dB	Triangular	2.449	1.08	1.17
11	Effect of mains disturbance	0.00 dB			0.00	0.00
12	Effect of the environment					
Combined standard uncertainty				Normal	1.66 dB	
Expanded uncertainty				Normal, k=2	3.31 dB	

3.2.2 Radiated Measurements (30MHz to 1GHz)

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.58 dB	Normal, k=2	2.000	0.29	0.08
4	Receiver sinewave accuracy	0.15 dB	Normal, k=2	2.000	0.08	0.01
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarization	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.99 dB	Triangular	2.449	1.63	2.65
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.57 dB	Rectangular	1.732	0.33	0.11
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00



19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
Combined standard uncertainty			Normal	2.97 dB		
Expanded uncertainty			Normal, k=2	5.94 dB		

3.2.1 Radiated Emission Measurements (1GHz to 18GHz)

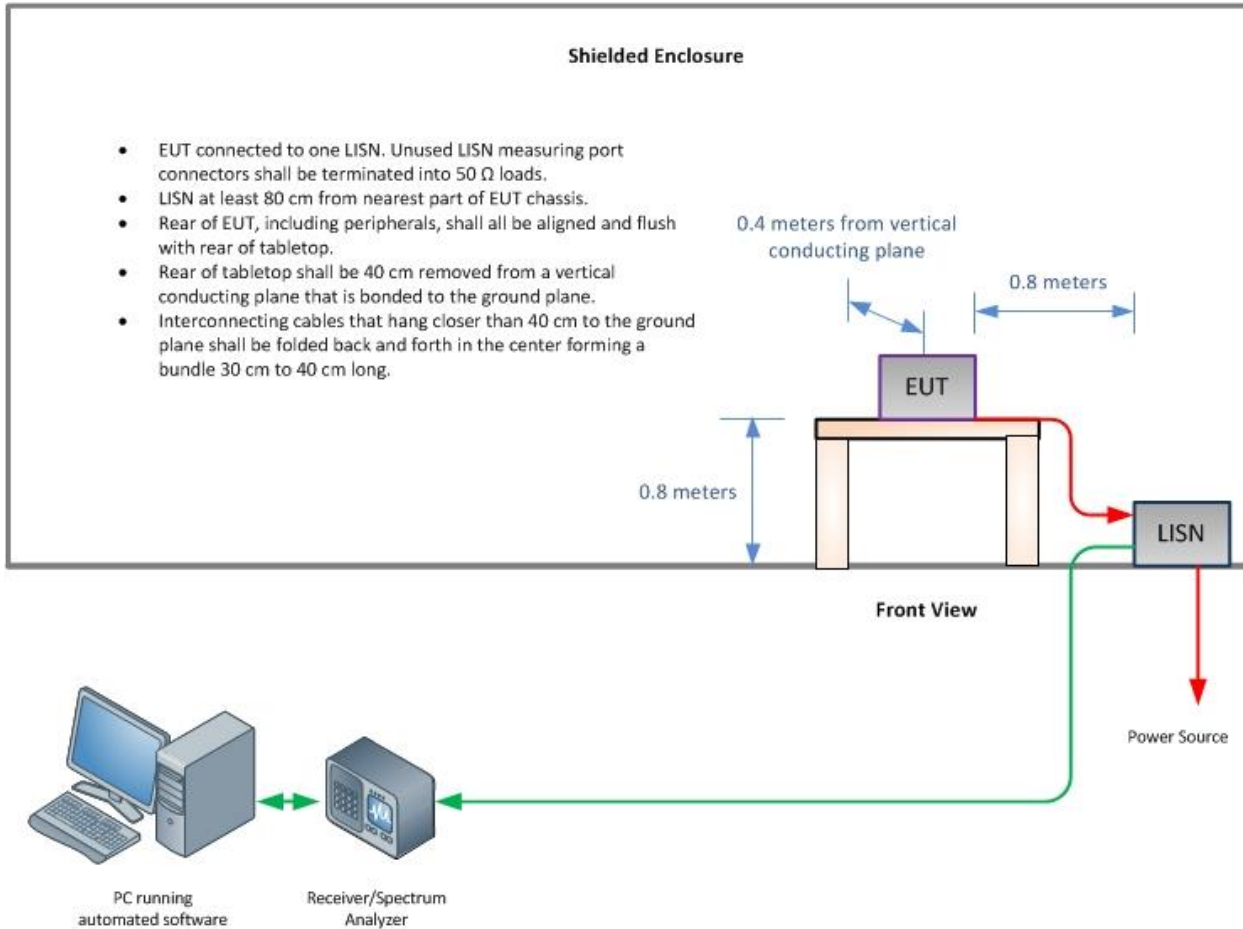
	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.25 dB	Triangular	2.449	1.33	1.76
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
Combined standard uncertainty			Normal	2.85 dB		
Expanded uncertainty			Normal, k=2	5.70 dB		

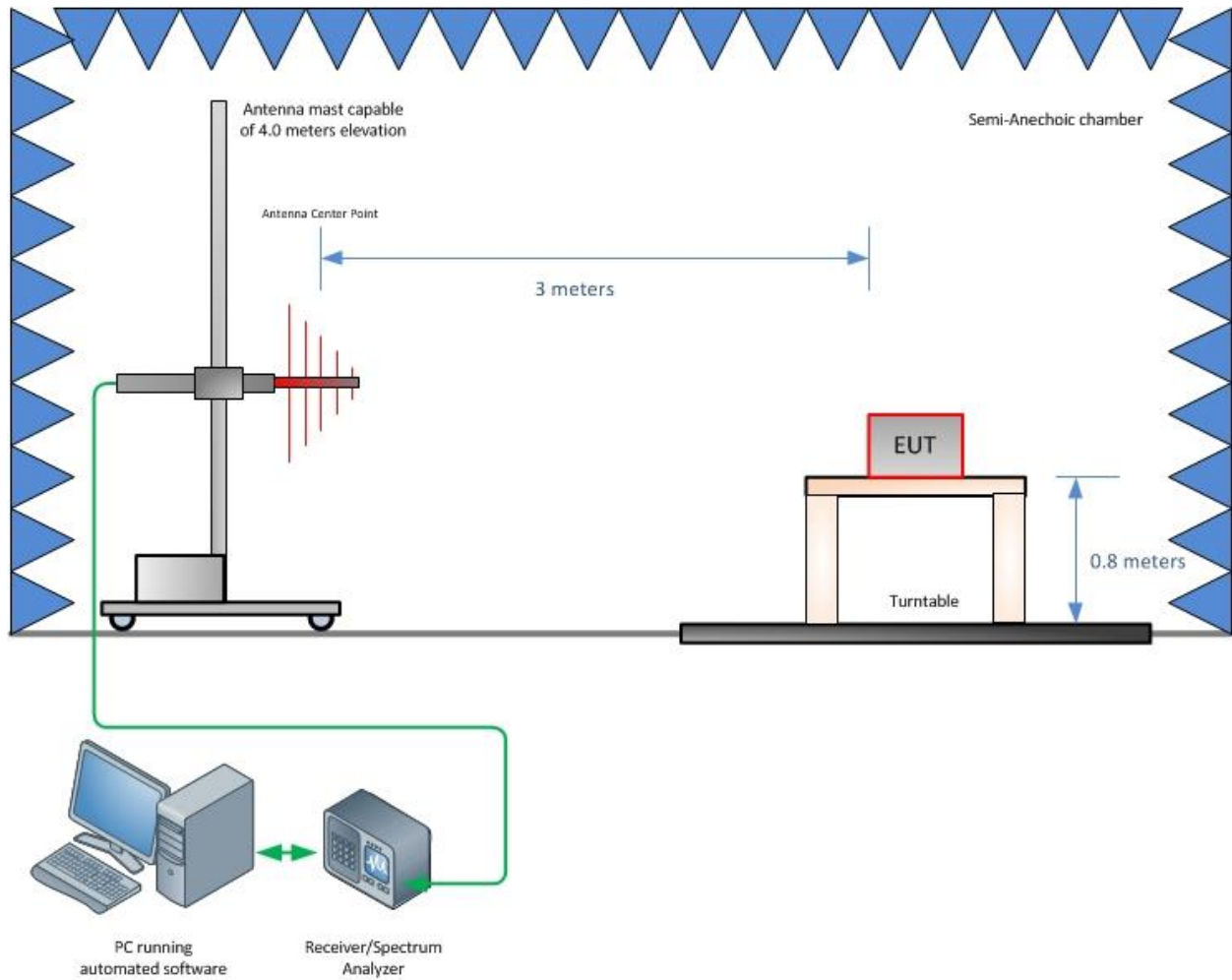


SECTION 4

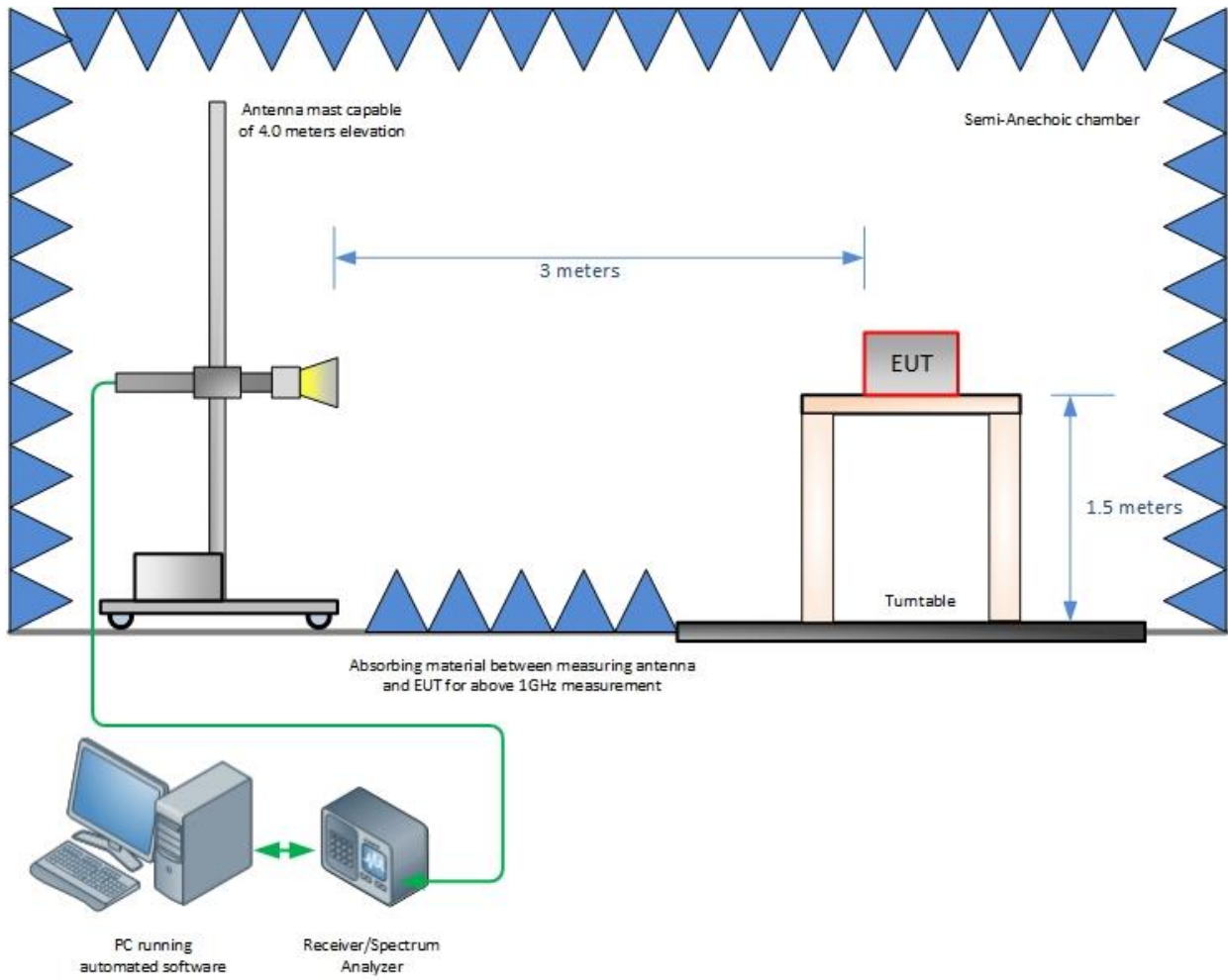
DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM





Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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