Radio Testing of the
Dexcom Inc.
Glucose Monitoring System
Model: G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver)

In accordance with FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 3 August 2023

America

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Dexcom Inc.
6340 Sequence Dr.
San Diego, CA 92121
USA

COMMERCIAL-IN-CONFIDENCE

Date: April 2024
Document Number: 72194262B Issue 01 | Version Number: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Omar Castillo	April 08, 2024	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

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 3 August 2023.

A2LA Cert. No. 2955.13

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REPORT ON	Radio Testing of the Dexcom Inc. Model: G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver)
TEST REPORT NUMBER	72194262B
TEST REPORT DATE	April 2024
PREPARED FOR	Dexcom Inc. 6340 Sequence Dr. San Diego, CA 92121 USA
CONTACT PERSON	Renold Rodrigues Sr. Staff Compliance Engineer renold.rodrigues@dexcom.com +1 (860) 378-7422
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer / Wireless Team Lead
APPROVED BY	Omar Castillo **Name** Authorized Signatory Title: Senior EMC/Wireless Test Engineer
DATED	April 08, 2024

Revision History

72194262B Dexcom Inc. Model: G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver)					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
04/04/2024	—	Initial Release			Omar Castillo
04/08/2024		Issue 02	Model # update to pg. 6 Radio # number upate pg. 8	Pages 6,8	Joe Salvador

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Dexcom Inc.
G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver)

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver) Glucose Monitoring System to the requirements of FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 3 August 2023.

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	Dexcom Inc.
EUT	G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver)
Model Number	MT-26023-60
Radio Model Number	R60260
FCC ID	PH29799
ISED/IC Number	9290A-900620
FCC Classification	Low power Communications Device Transmitter (DTS)
Serial Number(s)	740352591808
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.247 (October 1, 2023). • RSS-247–Digital Transmission Systems (DTS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices (Issue 3, August 2023). • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 5, Amendment 2 February 2021).
Start of Test	December 20, 2023
Finish of Test	January 15, 2024
Name of Engineer(s)	Ferdinand Custodio
Related Document(s)	• 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. • 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 3 August 2023 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	N/A	
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	
0	§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 applicable. EUT is battery powered.
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 EUT is a wearable G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver) and is part of the G7 continuous Glucose Monitoring System. The Dexcom G7 App from Dexcom allows the patient to receive continuous blood glucose information via wireless transmission to a Dexcom approved device. The Bluetooth LE function (1Mbps only) of the EUT was verified in this test report.

1.3.2 EUT General Description

EUT Description	G7 Transmitter MT-26023-60 (SiLabs BG24 BLE Transceiver) part of G7 Glucose Monitoring System
Model Number	MT-26023-60
Radio Model Number	R60260
Rated Voltage	3.0VDC Lithium-Ion battery
Mode Verified	Bluetooth LE
Capability	Bluetooth LE and NFC
Primary Unit (EUT)	☐ Production
	☒ Pre-Production
	☐ Engineering (same as Production)
Manufacturer Declared Temperature Range	10°C to 42°C
Antenna Type	PCB Inverted F
Manufacturer	Dexcom Inc.
Antenna Model	N/A
Antenna Gain	-1.57 dBi

1.3.3 Maximum Conducted Output Power

Bluetooth Low Energy (LE)	Frequency Range (MHz)	Gated RMS (dBm)	Duty Cycle (%)
	2402-2480	-0.5	84.761

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Client is present during testing and was responsible for programming the RF configurations of the EUT. Mode used are Low, Mid and High BLE channels (2402MHz, 2440MHz and 2480MHz) continuous modulated TX at max EUT power. Production EUT only supports BLE 1M PHY. Programming is done via NFC using a support Adafruit PN532 NFC/RFID controller breakout board.

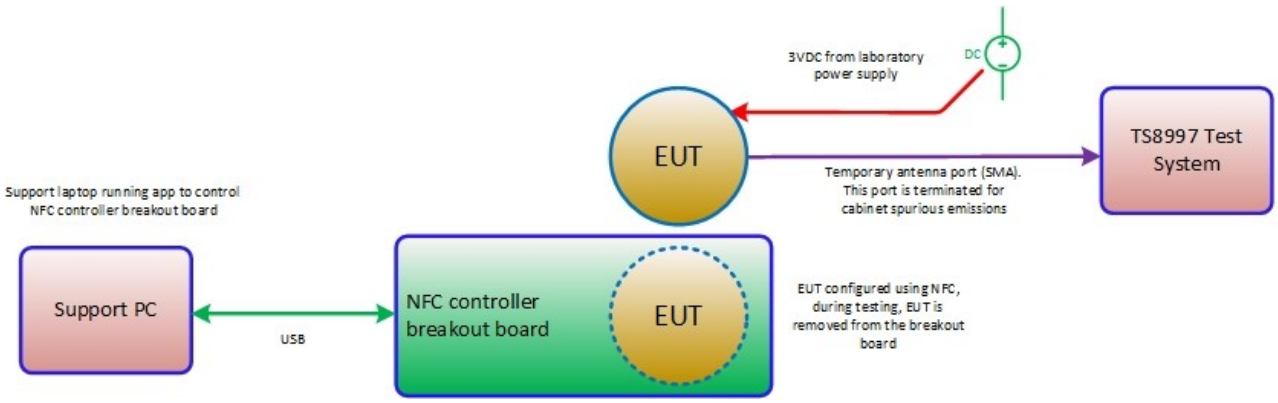
1.4.2 EUT Exercise Software

Support laptop running Adafruit-PN532

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Adafruit	Support controller breakout board	Model PN532 NFC/RFID V1.6

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-0412 and A-0413

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
Dexcom Inc.
G7 Transmitter MT-26023-60 (SiLabs BG24 BLE 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: 740352591808 / Default Test Configuration

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

December 20, 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	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 kPa

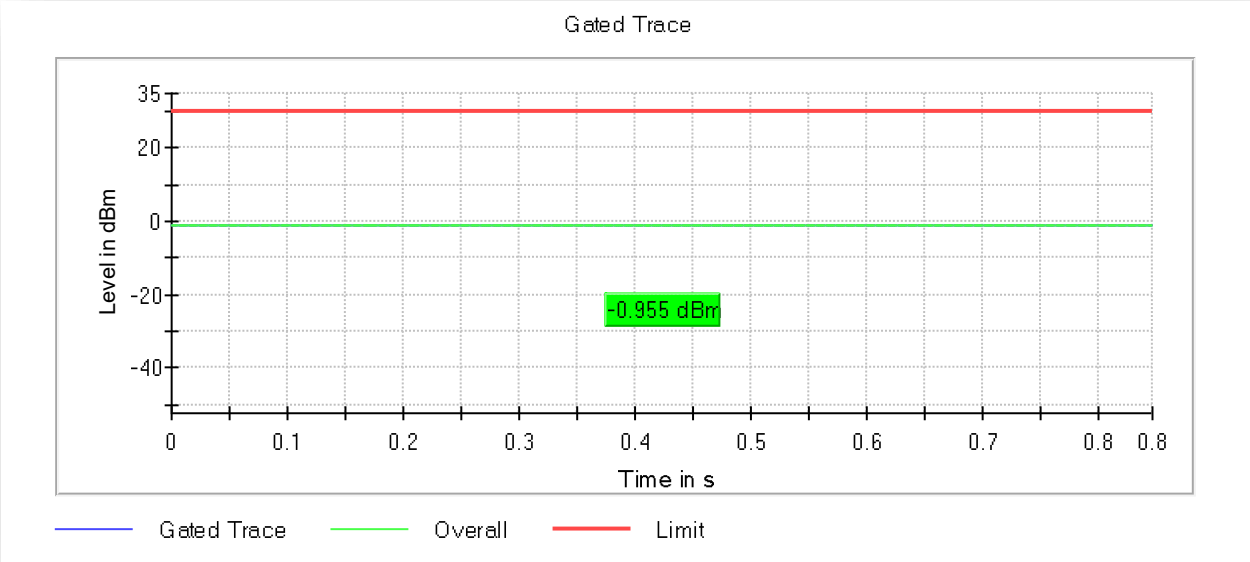
2.1.7 Additional Observations

- 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.

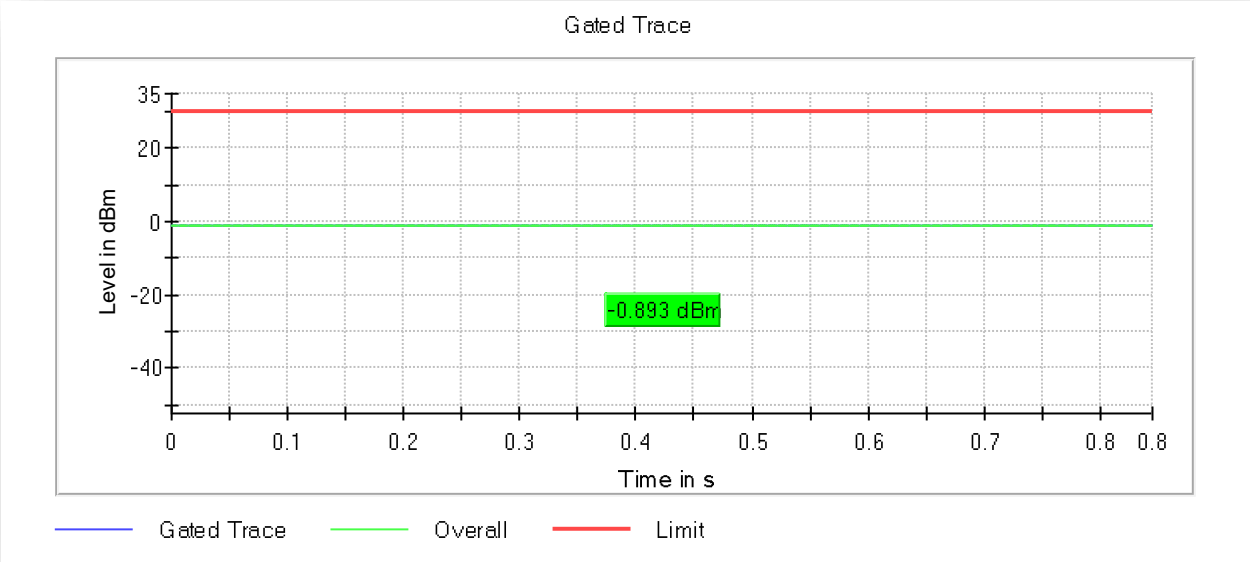
2.1.8 Test Results

DUT Frequency (MHz)	PHY	Gated RMS* (dBm)	Limit Max (dBm)	DutyCycle (%)	Result
2402.000000	1M	-1.0	30.0	84.977	PASS
2440.000000	1M	-0.9		84.682	PASS
2480.000000	1M	-0.5		84.761	PASS

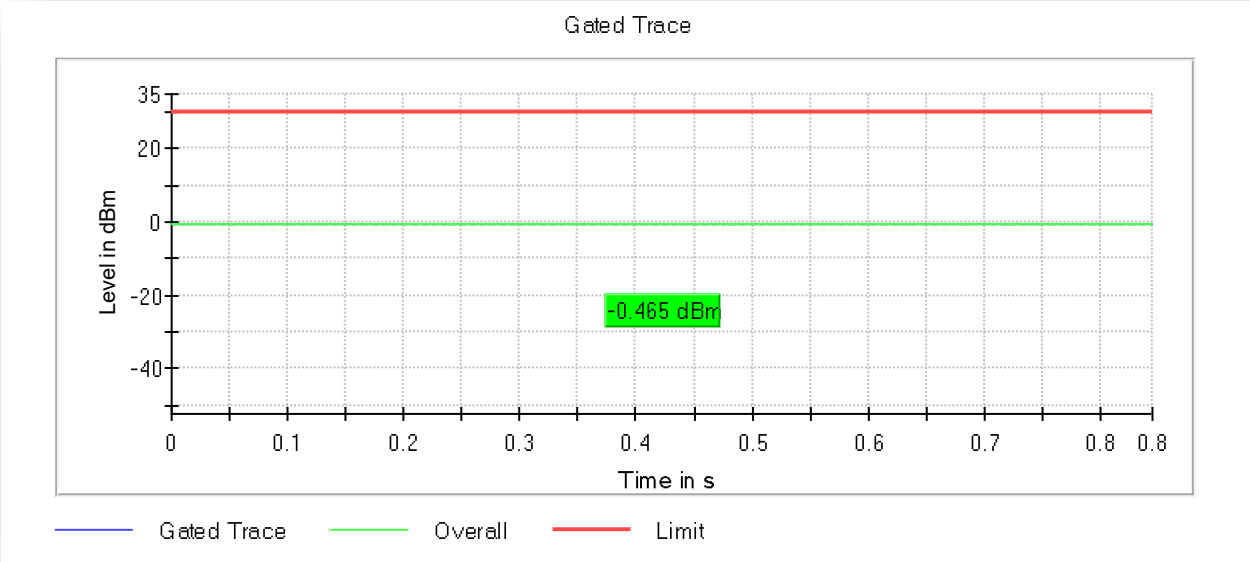
2.1.9 Test Plots



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 µs	1.000 µs

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

Not applicable. EUT is battery powered.

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: 740352591808 / Default Test Configuration

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

December 20, 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	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 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.

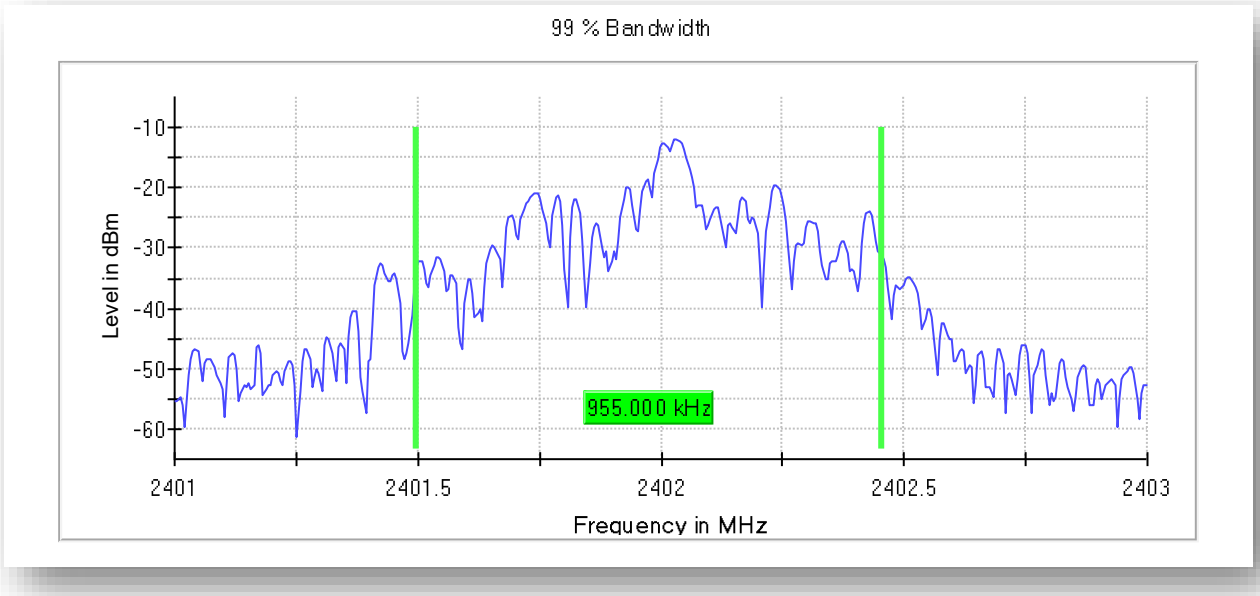
2.3.8 Sample Measurement Settings

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	-10.000 dBm	-10.000 dBm
Attenuation	10.000 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	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.30 dB

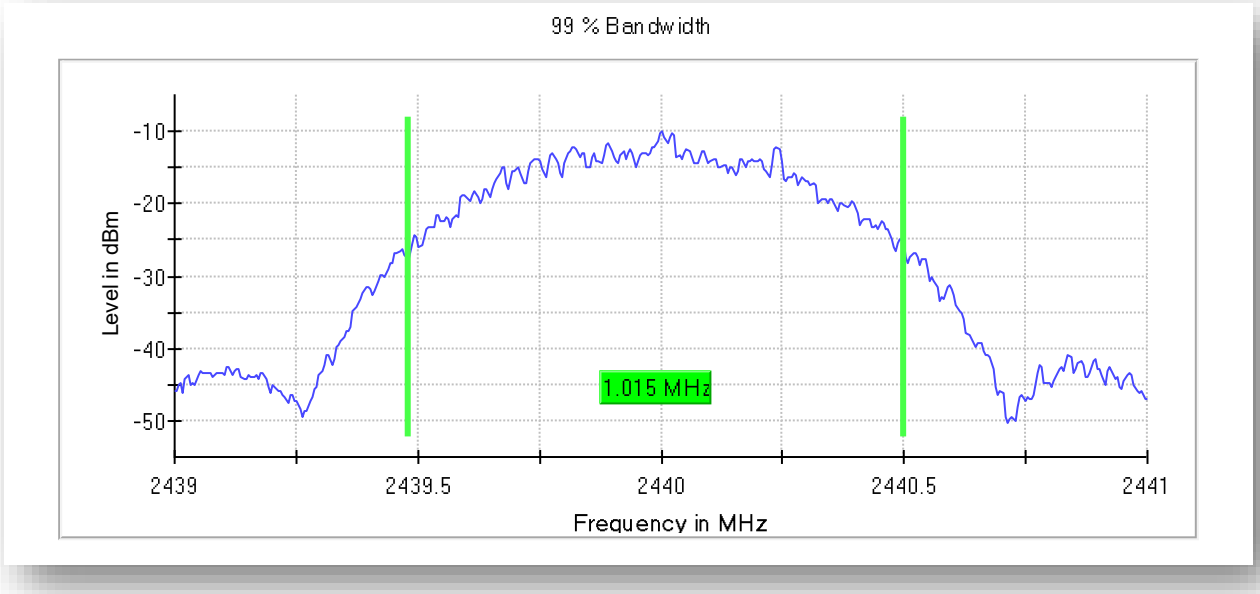
2.3.9 Test Results

DUT Frequency (MHz)	PHY	99% Bandwidth	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402.000000	1M	0.955000	***2401.497500***	2402.452500	PASS
2440.000000	1M	1.015000	2439.482500	2440.497500	PASS
2480.000000	1M	1.015000	2479.482500	***2480.497500***	PASS

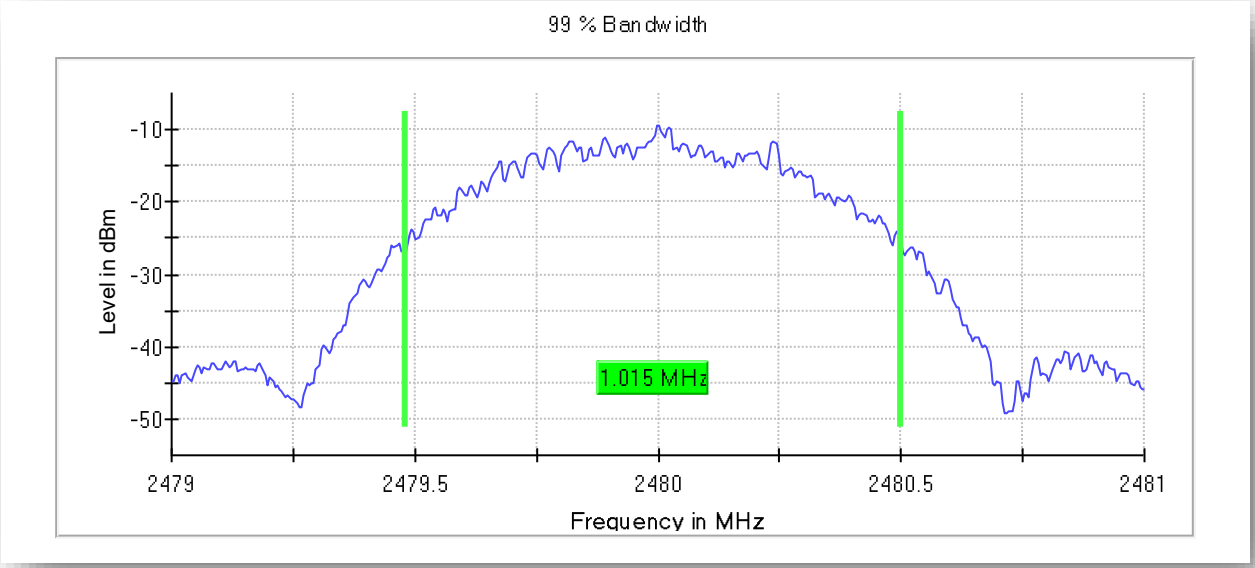
2.3.10 Test Plots



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: 740352591808 / Default Test Configuration

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

December 20, 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	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 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.

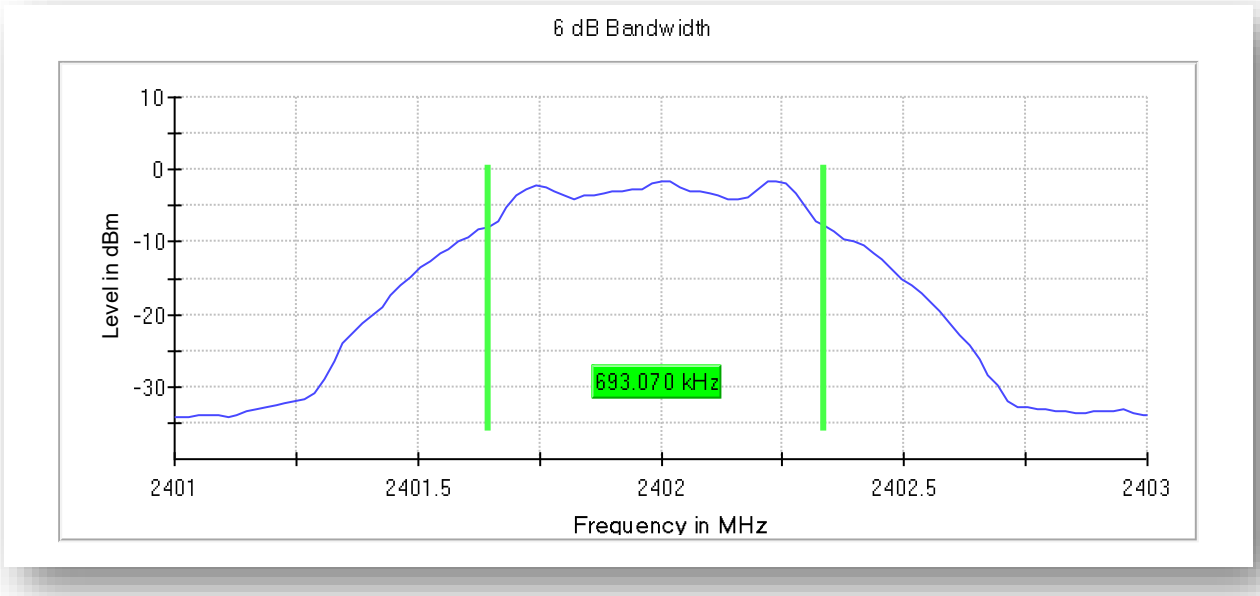
2.4.8 Sample Measurement Settings

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 µs	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 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	5 / 5	5
Max Stable Difference	0.00 dB	0.50 dB

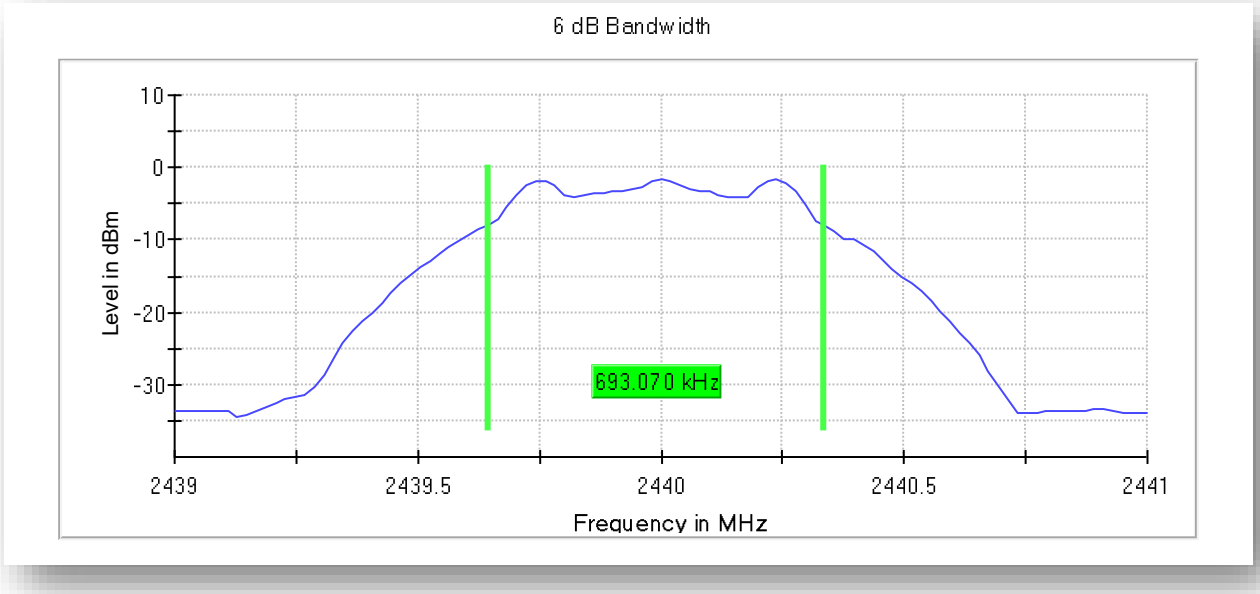
2.4.9 Test Results

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

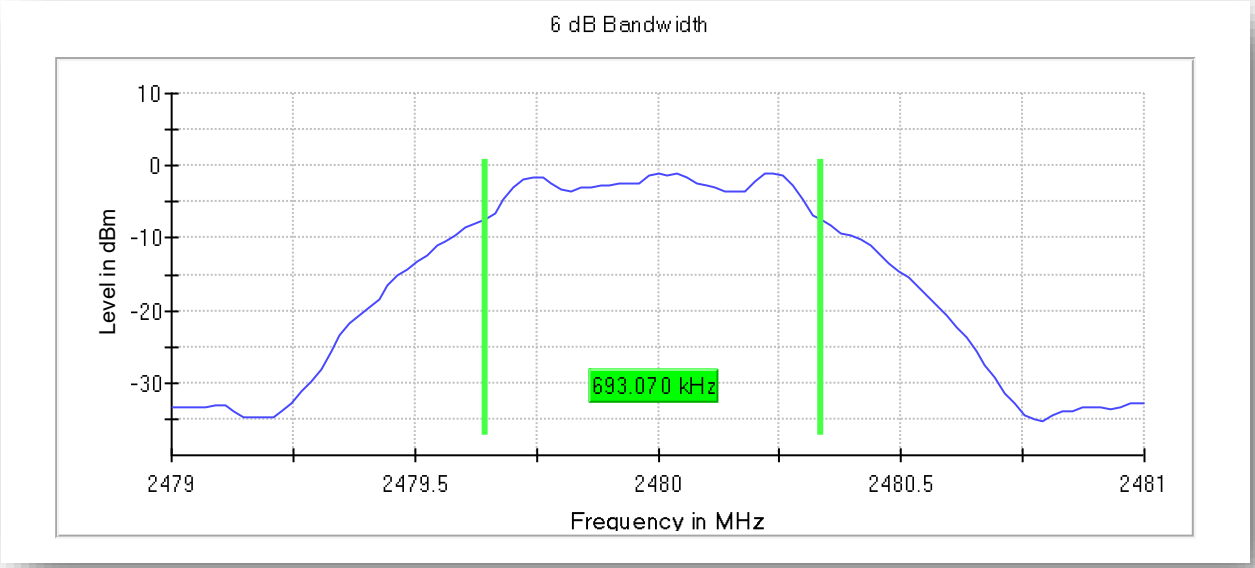
2.4.10 Test Plots



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 Equipment Under Test and Modification State

Serial No: 740352591808 / Default Test Configuration

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

December 20, 2023 / FSC

2.5.5 Test Equipment Used

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

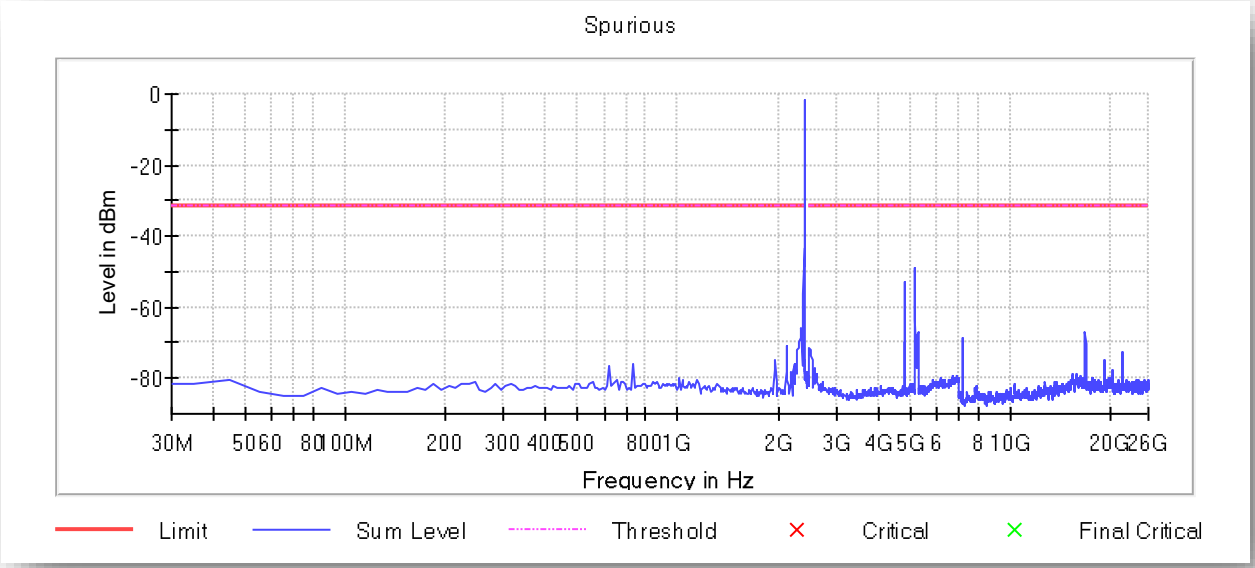
2.5.6 Environmental Conditions (Rancho Bernardo Satellite Facility)

Ambient Temperature	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 kPa

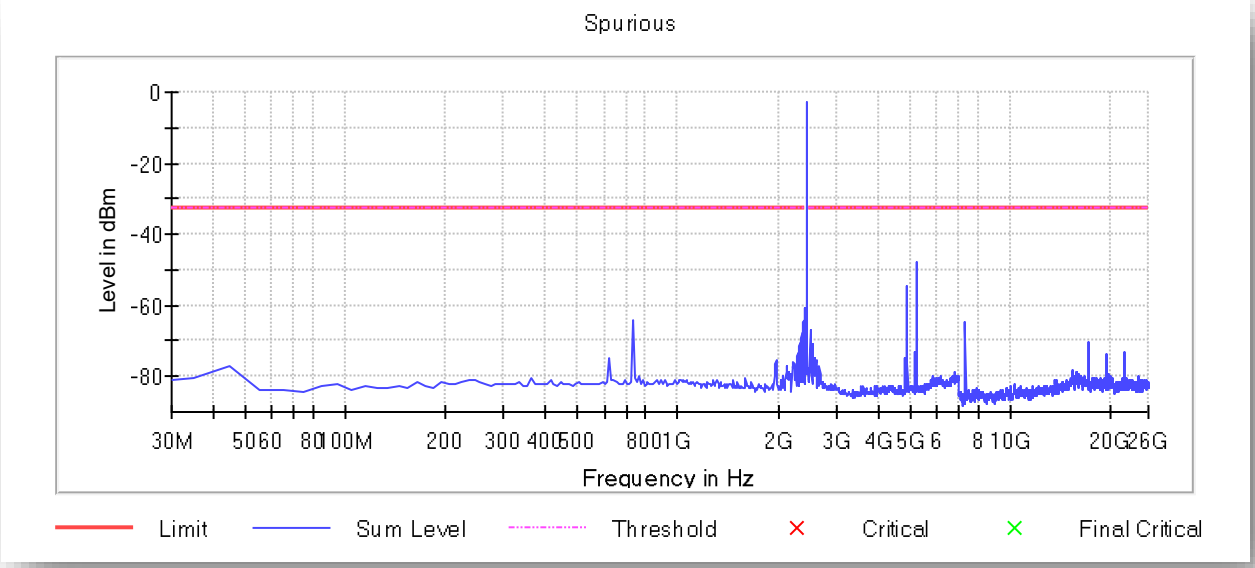
2.5.7 Additional Observations

- 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.

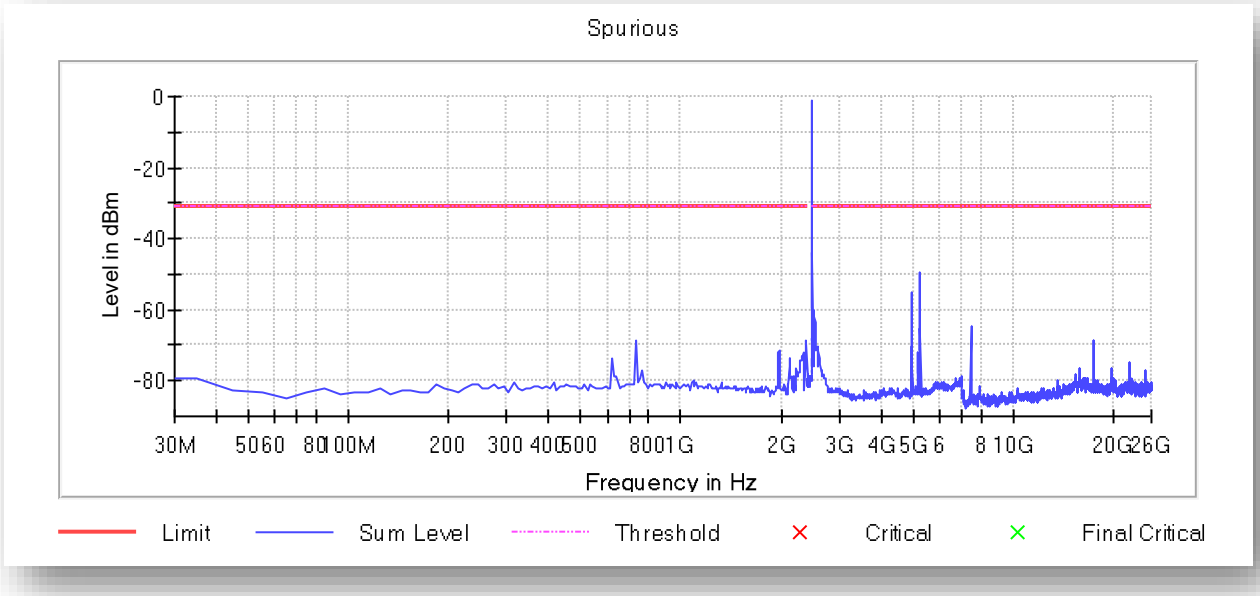
2.5.8 Test Results Plots (§15.247 requirements)



Low Channel



Middle Channel



High Channel

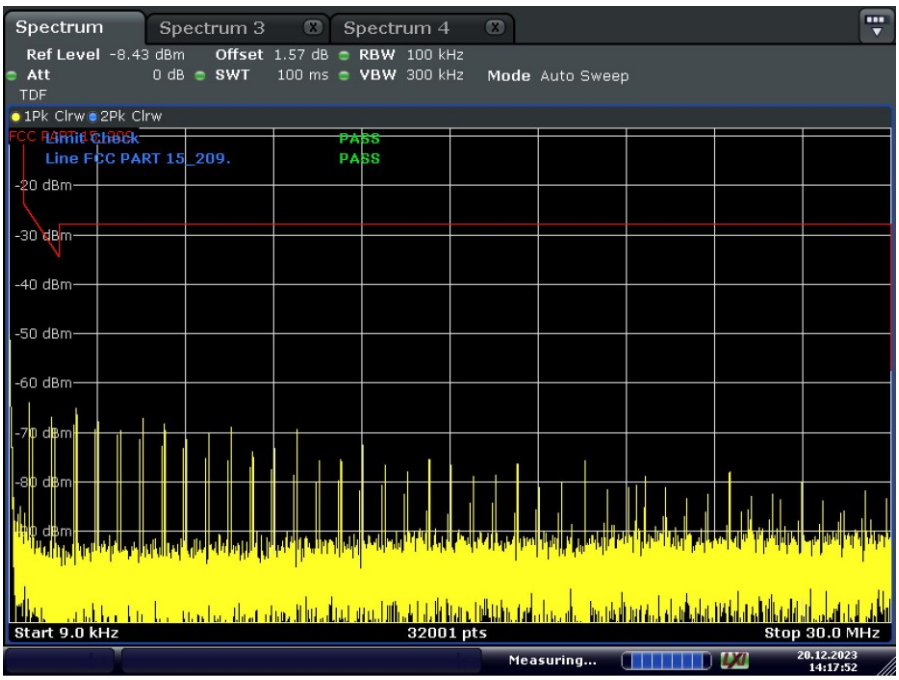
2.5.9 Test Results Plots (§15.205 requirements)

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)

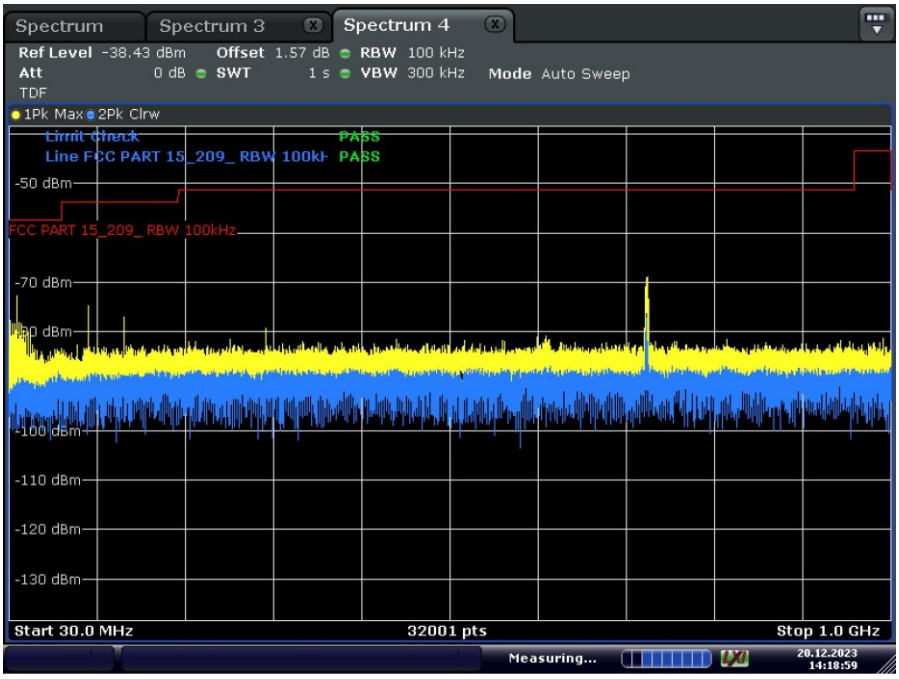
Duty Cycle for Middle Channel	= 84.682%
DCCF	= 20 log (0.84682)
	= -1.44 dB

Therefore, to obtain Average measurement from Peak measurement for Middle Channel, a factor of -1.44 dB shall be used. However, all Peak measurements complies with Average limits, conversion is not required.



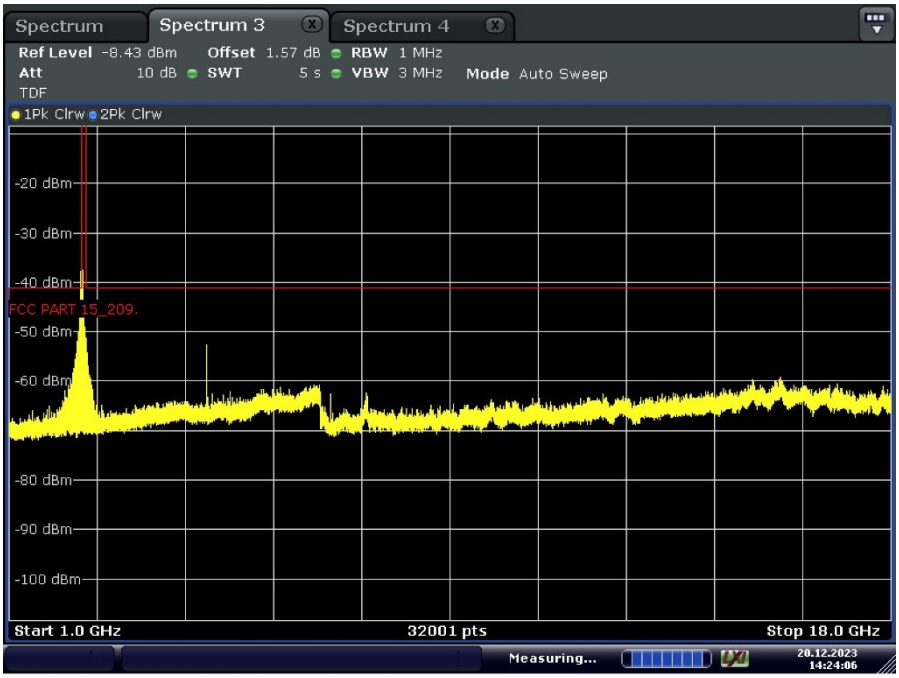
Date: 20.DEC.2023 14:17:52

BLE Low Channel (9kHz to 30MHz)



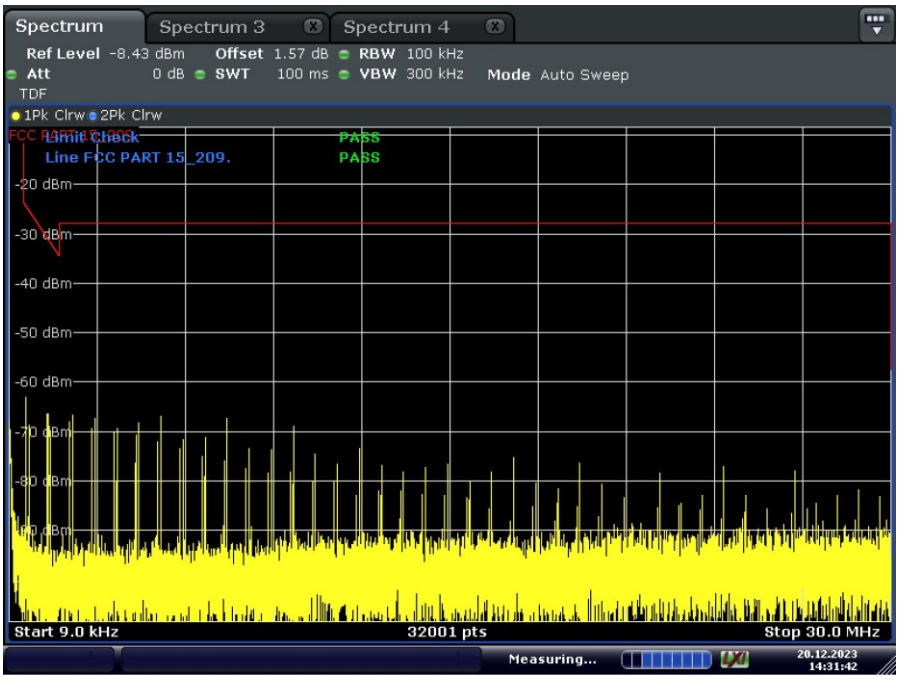
Date: 20.DEC.2023 14:19:00

BLE Low Channel (30MHz to 1GHz)



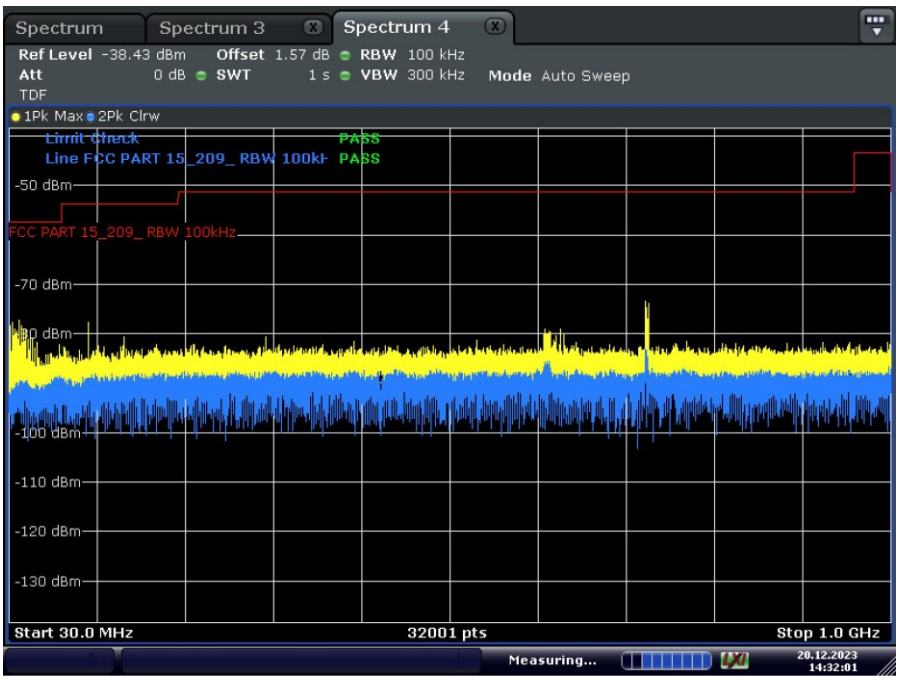
Date: 20.DEC.2023 14:24:07

BLE Low Channel (1GHz to 18GHz)



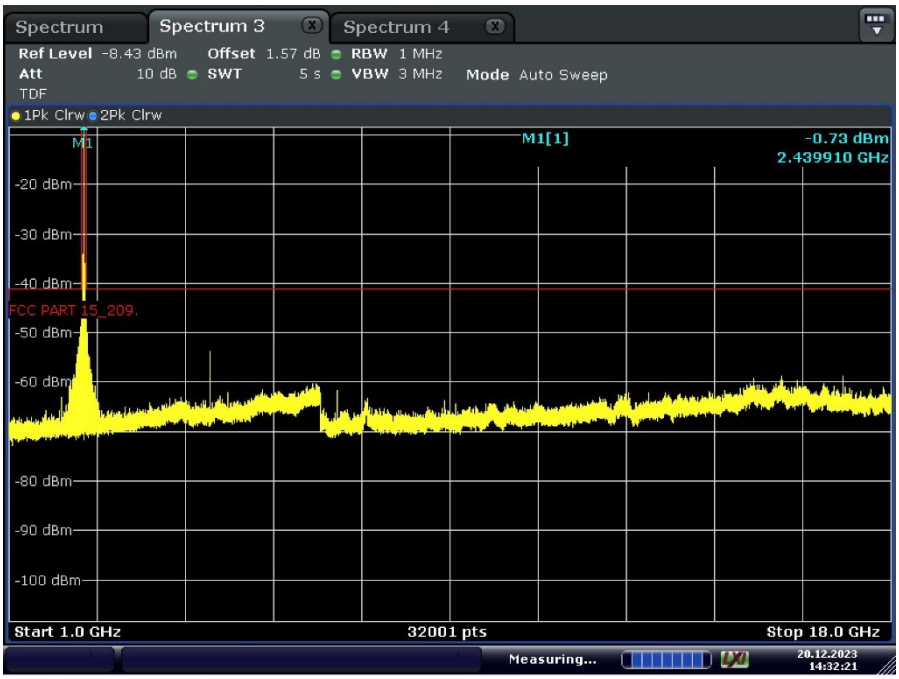
Date: 20.DEC.2023 14:31:42

BLE Mid Channel (9kHz to 30MHz)



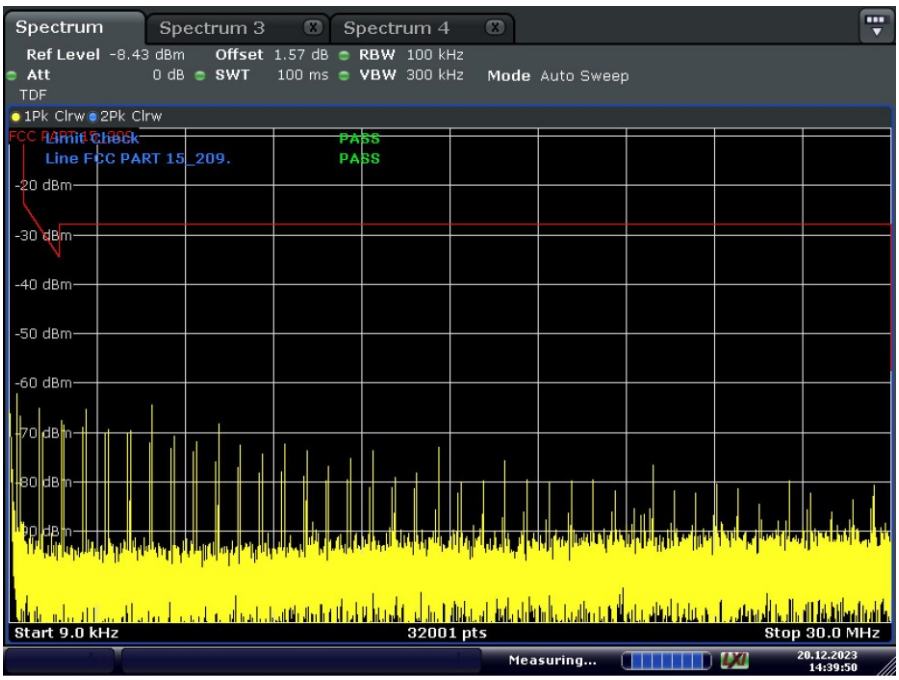
Date: 20.DEC.2023 14:32:02

BLE Mid Channel (30MHz to 1GHz)



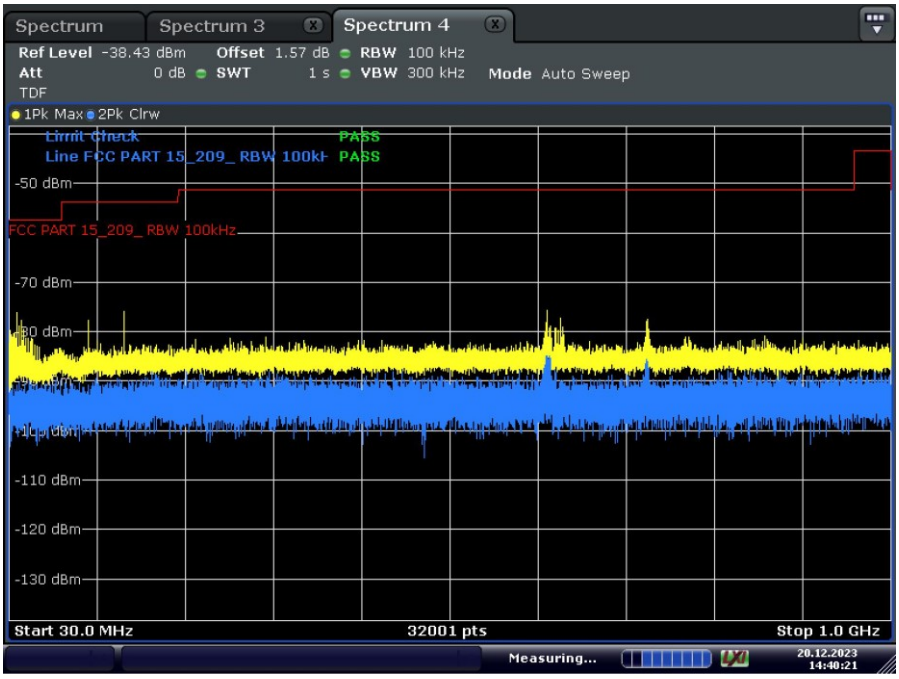
Date: 20.DEC.2023 14:32:21

BLE Mid Channel (1GHz to 18GHz)



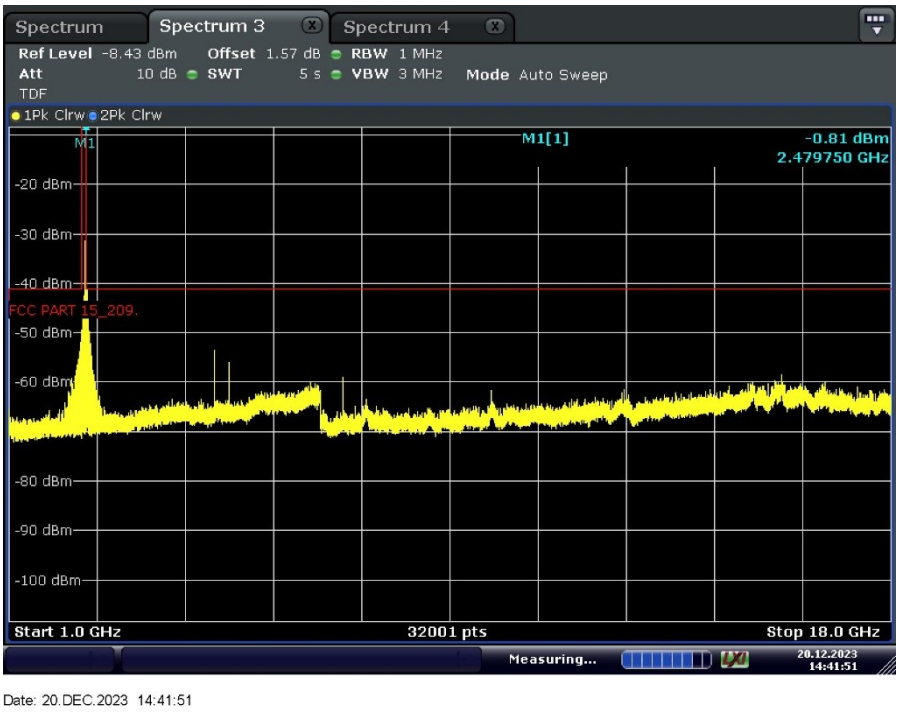
Date: 20.DEC.2023 14:39:50

BLE High Channel (9kHz to 30MHz)



Date: 20.DEC.2023 14:40:21

BLE High Channel (30MHz to 1GHz)



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: 740352591808 / Default Test Configuration

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

December 20, 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	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 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 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	0.50 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 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	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.03 dB	0.50 dB

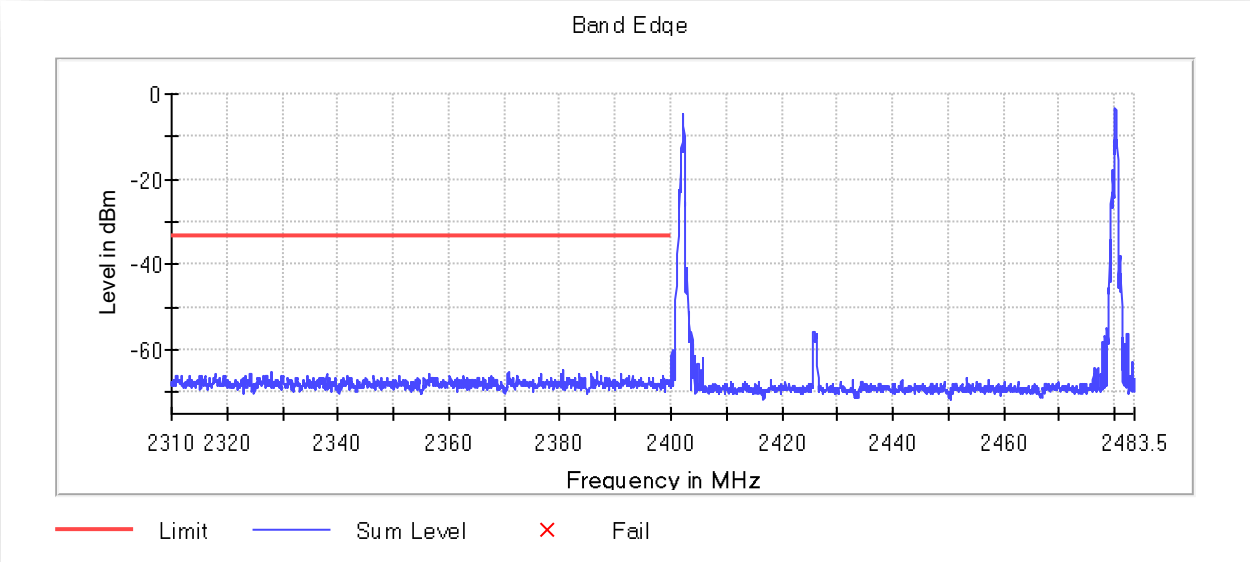
2.6.9 Test Results (Lower Band Edge)

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2380.575000	-64.7	31.2	-33.5	PASS
2380.525000	-64.9	31.4	-33.5	PASS
2386.725000	-64.9	31.4	-33.5	PASS
2386.775000	-64.9	31.4	-33.5	PASS
2370.675000	-65.3	31.8	-33.5	PASS
2327.925000	-65.4	31.9	-33.5	PASS
2380.125000	-65.4	31.9	-33.5	PASS
2324.225000	-65.4	31.9	-33.5	PASS
2385.625000	-65.4	32.0	-33.5	PASS
2324.175000	-65.5	32.0	-33.5	PASS
2356.425000	-65.5	32.0	-33.5	PASS
2383.525000	-65.5	32.0	-33.5	PASS
2385.575000	-65.5	32.1	-33.5	PASS
2370.625000	-65.6	32.1	-33.5	PASS
2337.975000	-65.6	32.1	-33.5	PASS

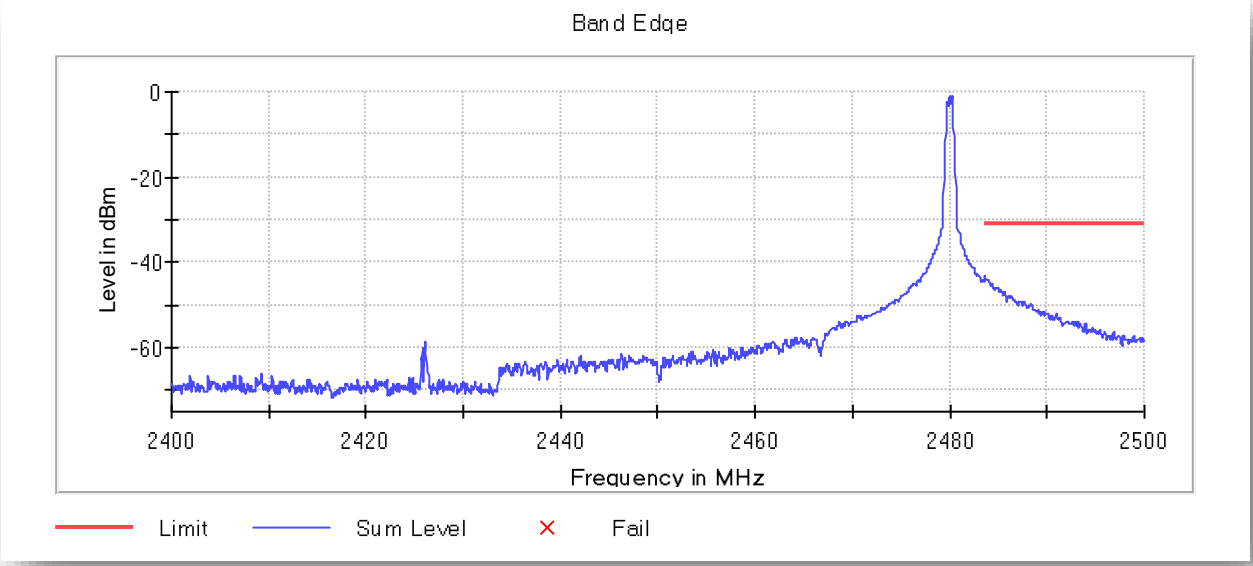
2.6.10 Test Results (Upper Band Edge)

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.575000	-43.3	12.2	-31.1	PASS
2483.625000	-43.3	12.2	-31.1	PASS
2483.525000	-43.4	12.3	-31.1	PASS
2483.675000	-43.6	12.4	-31.1	PASS
2483.725000	-43.9	12.8	-31.1	PASS
2483.925000	-44.0	12.9	-31.1	PASS
2483.975000	-44.1	12.9	-31.1	PASS
2483.875000	-44.1	13.0	-31.1	PASS
2483.825000	-44.2	13.1	-31.1	PASS
2483.775000	-44.3	13.1	-31.1	PASS
2484.025000	-44.3	13.1	-31.1	PASS
2484.075000	-44.6	13.5	-31.1	PASS
2484.125000	-44.9	13.7	-31.1	PASS
2484.275000	-45.2	14.0	-31.1	PASS
2484.325000	-45.2	14.0	-31.1	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.

E(dBµV/m) = EIRP (dBm) + 95.2
= (-43.4 dBm – 1.57 dBi antenna gain) + 95.2
= 50.23 dBµV/m @ 3 meters (Peak complies with 54 dBµV/m Average limit)

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: 740352591808 / Default Test Configuration

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

January 15, 2024 / JS

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	23.5 °C
Relative Humidity	49.1 %
ATM Pressure	100.2 kPa

2.7.7 Additional Observations

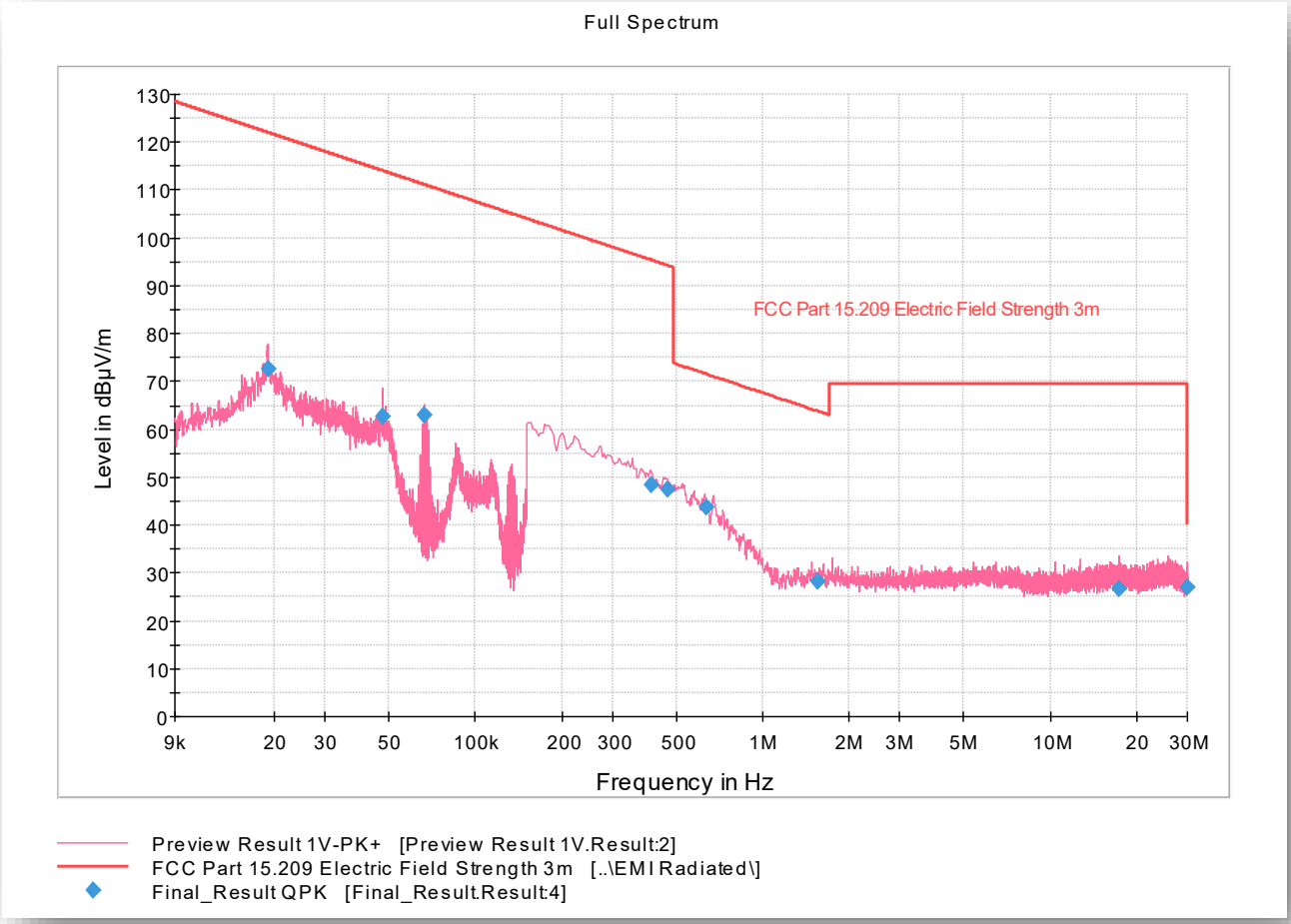
- This is a radiated test. The spectrum was searched from 9kHz to the 10th harmonic.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Only the worst case BLE Channels presented. There are no significant differences 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 (dbµV) @ 30 MHz			-0.8
Correction Factor (dB/m)	Asset# 1066 (cable)	18.1	12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**11.8**

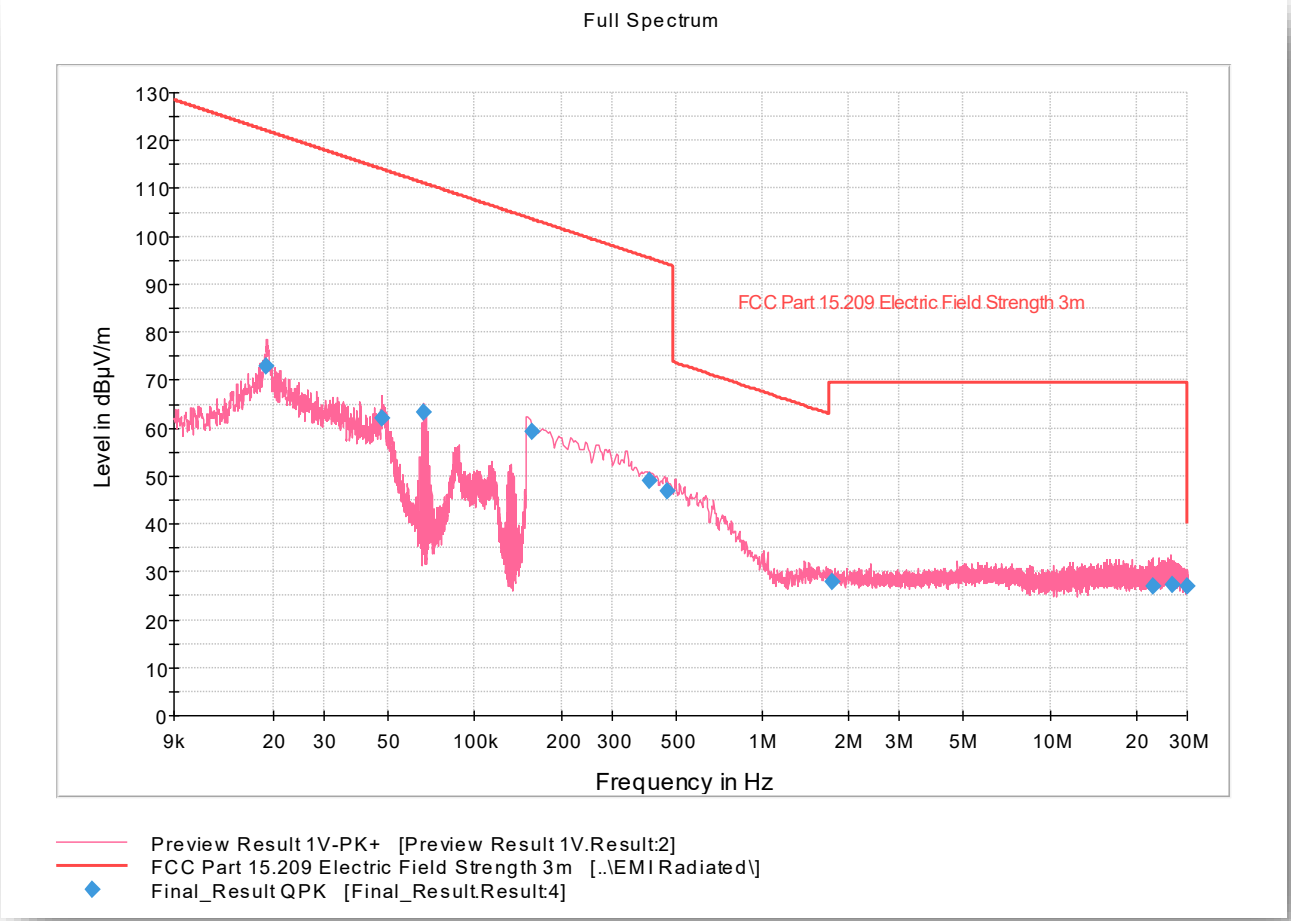
2.7.9 Test Results for 9kHz to 30MHz (Low Channel)



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)
0.019040	72.71	122.00	49.29	1000.	0.200	100.0	H	137.0	22
0.047636	62.52	114.04	51.52	1000.	0.200	100.0	H	16.0	20
0.066491	62.84	111.14	48.31	1000.	0.200	100.0	H	16.0	20
0.410775	48.30	95.33	47.03	1000.	9.000	100.0	H	351.0	19
0.465625	47.62	94.24	46.63	1000.	9.000	100.0	H	51.0	20
0.634860	43.79	71.55	27.75	1000.	9.000	100.0	H	143.0	20
1.547887	28.32	63.80	35.48	1000.	9.000	100.0	H	78.0	20
17.316621	26.60	69.50	42.90	1000.	9.000	100.0	H	189.0	22
29.866015	26.97	69.50	42.53	1000.	9.000	100.0	H	257.0	25

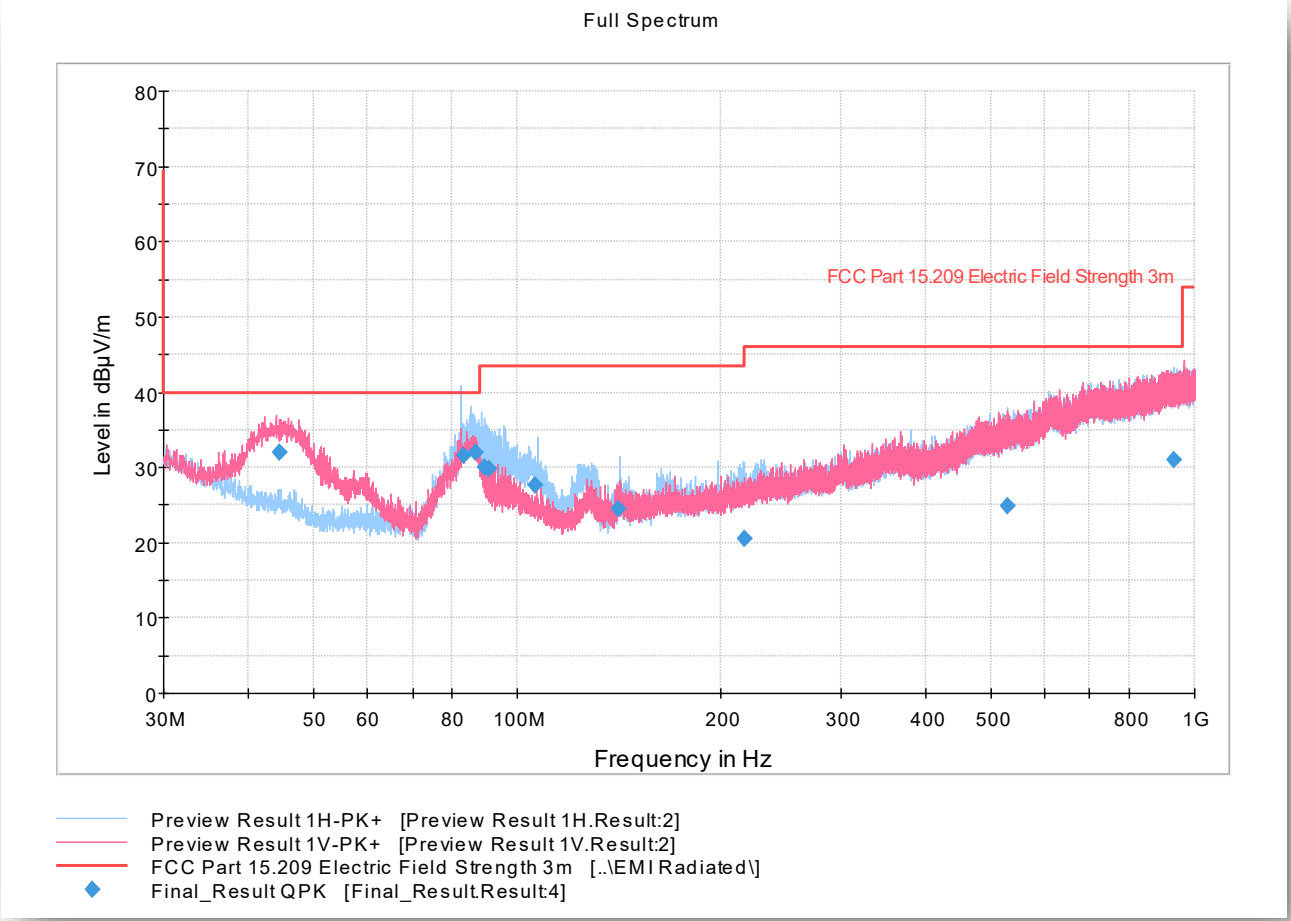
2.7.10 Test Results for 9kHz to 30MHz (High Channel)



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)
0.018798	72.90	122.11	49.22	1000.	0.200	100.0	H	15.0	22
0.047683	61.96	114.03	52.07	1000.	0.200	100.0	H	15.0	20
0.066502	63.19	111.14	47.95	1000.	0.200	100.0	H	84.0	20
0.158500	59.36	103.60	44.24	1000.	9.000	100.0	H	272.0	20
0.405760	49.11	95.44	46.33	1000.	9.000	100.0	H	15.0	19
0.468550	46.95	94.19	47.24	1000.	9.000	100.0	H	340.0	20
1.753633	28.07	69.50	41.43	1000.	9.000	100.0	H	313.0	20
22.838333	27.03	69.50	42.47	1000.	9.000	100.0	H	319.0	24
26.512505	27.45	69.50	42.05	1000.	9.000	100.0	H	227.0	25
29.883020	26.95	69.50	42.55	1000.	9.000	100.0	H	17.0	25

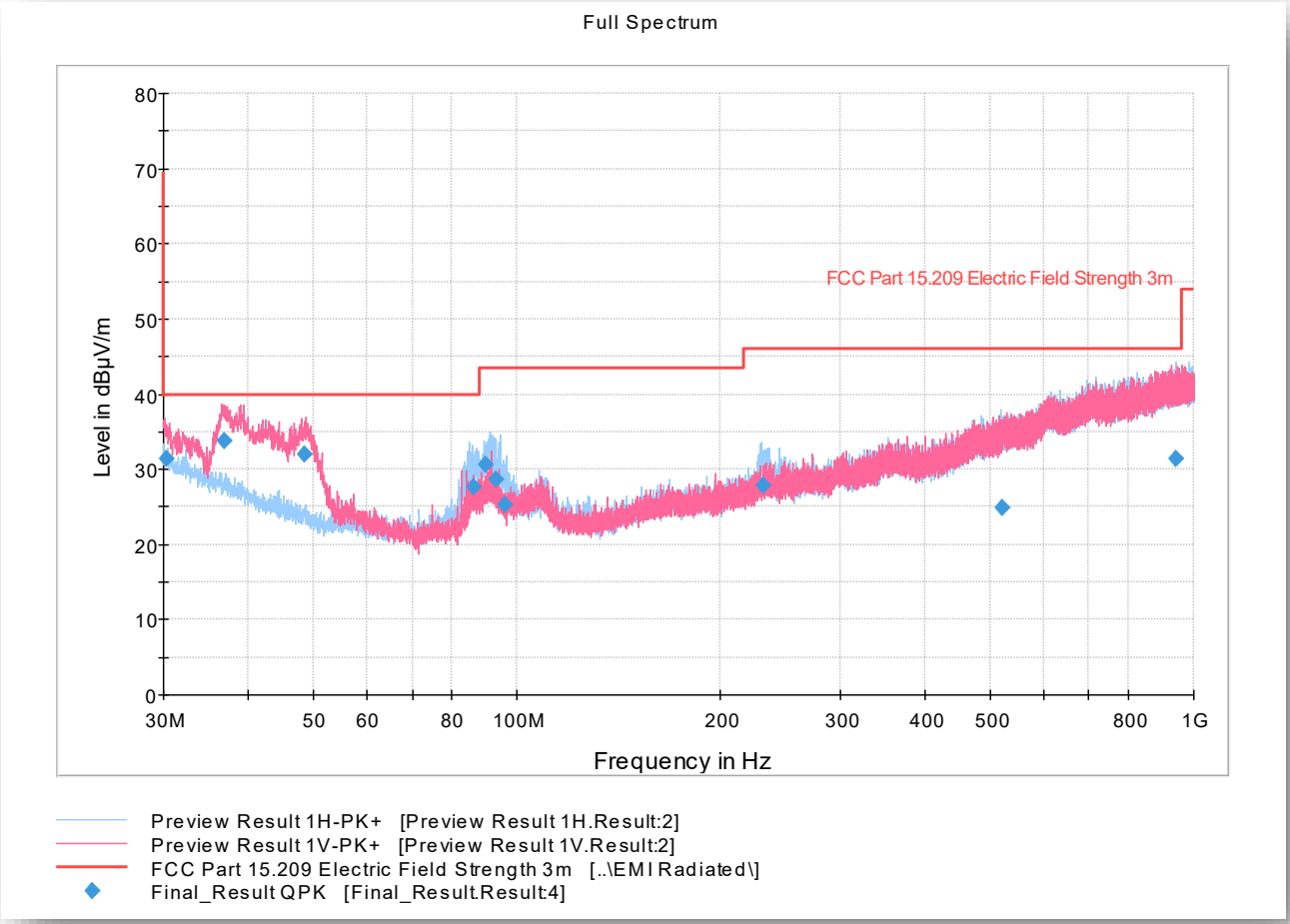
2.7.11 Test Results for 30MHz to 1GHz (Low Channel)



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)
44.535667	32.08	40.00	7.92	1000.	120.000	119.0	V	288.0	16
83.309333	31.68	40.00	8.32	1000.	120.000	192.0	H	240.0	13
86.499333	32.07	40.00	7.93	1000.	120.000	177.0	H	217.0	14
89.500333	30.01	43.50	13.49	1000.	120.000	201.0	H	233.0	14
90.876333	29.87	43.50	13.63	1000.	120.000	205.0	H	221.0	14
106.08433	27.64	43.50	15.86	1000.	120.000	169.0	H	224.0	16
140.94066	24.56	43.50	18.94	1000.	120.000	108.0	H	82.0	15
215.83500	20.62	43.50	22.88	1000.	120.000	370.0	H	220.0	18
530.26400	24.85	46.00	21.15	1000.	120.000	117.0	H	20.0	26
929.62133	30.97	46.00	15.03	1000.	120.000	125.0	H	18.0	31

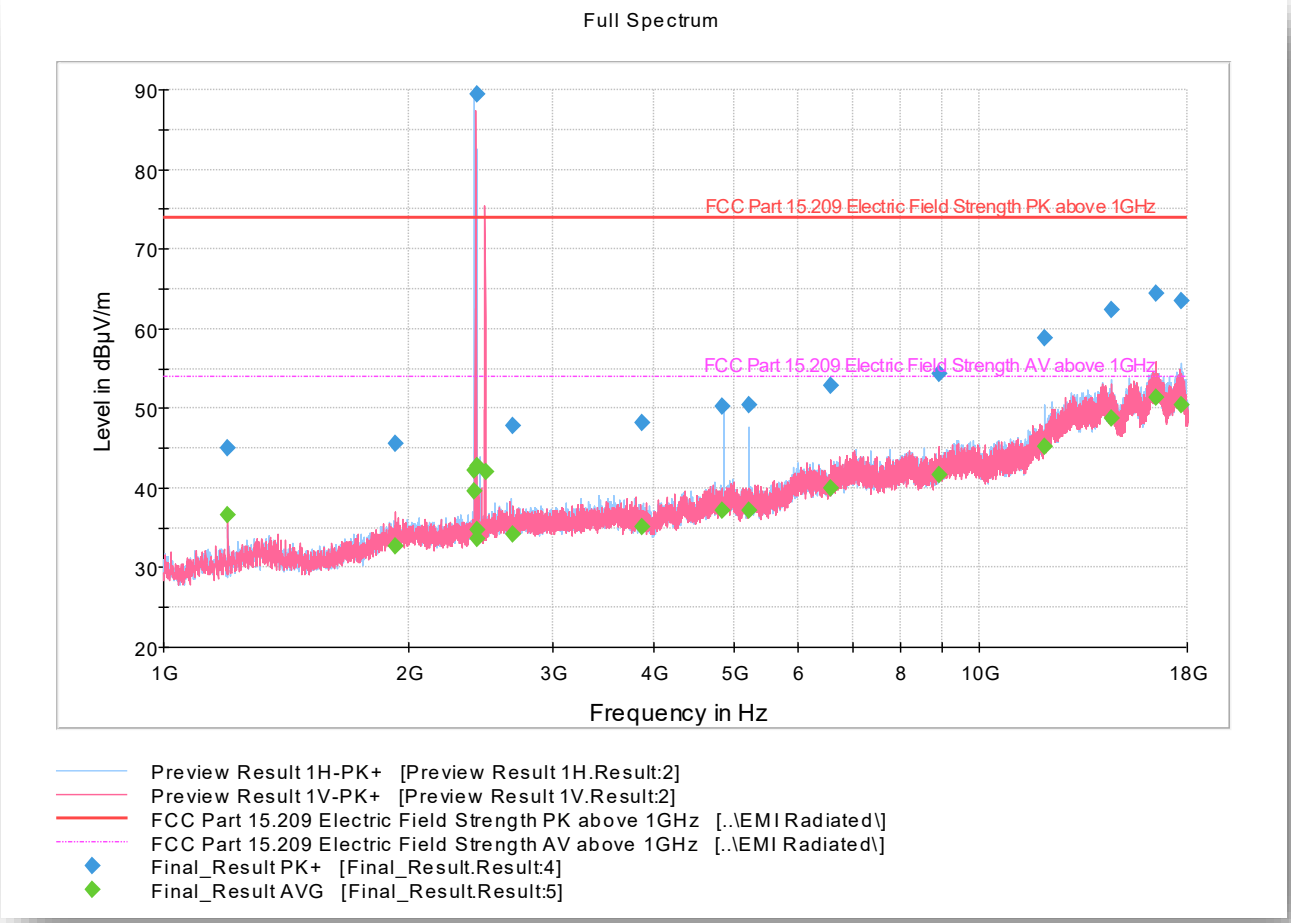
2.7.12 Test Results for 30MHz to 1GHz (High Channel)



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)
30.280000	31.31	40.00	8.69	1000.	120.000	100.0	V	252.0	22
36.876000	33.71	40.00	6.29	1000.	120.000	114.0	V	140.0	19
48.465667	32.01	40.00	7.99	1000.	120.000	100.0	V	308.0	15
86.343667	27.70	40.00	12.30	1000.	120.000	350.0	H	35.0	14
90.008667	30.54	43.50	12.96	1000.	120.000	205.0	H	237.0	14
93.082000	28.65	43.50	14.85	1000.	120.000	195.0	H	209.0	15
95.894333	25.22	43.50	18.28	1000.	120.000	194.0	H	220.0	15
231.58333	27.77	46.00	18.23	1000.	120.000	285.0	H	120.0	19
520.15900	24.84	46.00	21.16	1000.	120.000	338.0	H	202.0	26
939.55266	31.39	46.00	14.61	1000.	120.000	269.0	H	10.0	31

2.7.13 Test Results for 1GHz to 18GHz Low Channel



Peak Data

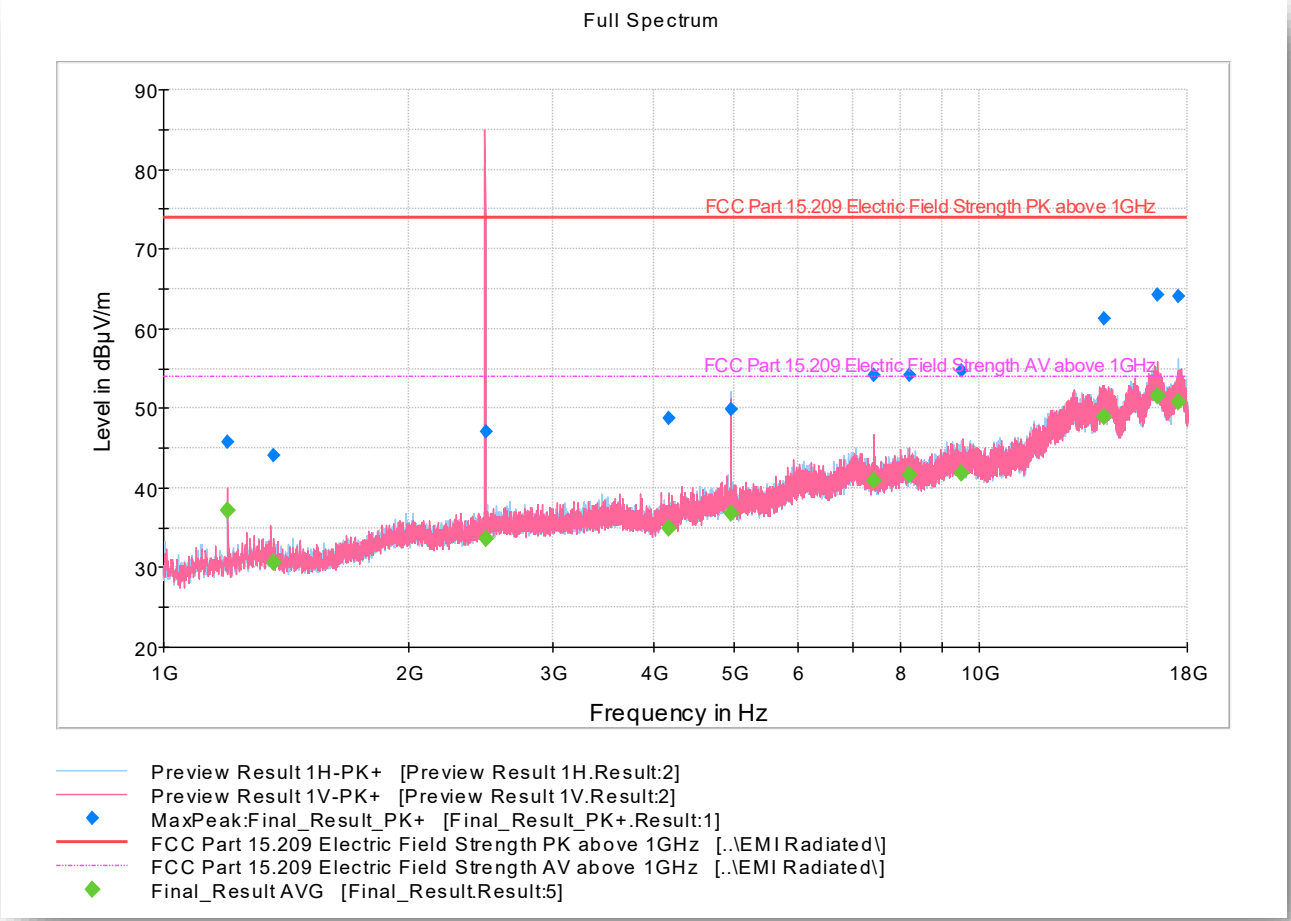
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	45.04	73.90	28.86	1000.0	1000.000	250.0	V	178.0	-1
1925.53333	45.57	73.90	28.33	1000.0	1000.000	365.0	V	7.0	4
2676.36666	47.76	73.90	26.14	1000.0	1000.000	262.0	H	10.0	5
3853.43333	48.14	73.90	25.76	1000.0	1000.000	252.0	H	190.0	6
4850.46666	50.29	73.90	23.61	1000.0	1000.000	334.0	H	351.0	8
5219.23333	50.41	73.90	23.49	1000.0	1000.000	314.0	H	316.0	8
6584.10000	52.87	73.90	21.03	1000.0	1000.000	275.0	H	149.0	9
8946.26666	54.42	73.90	19.48	1000.0	1000.000	363.0	V	188.0	13
12026.3666	58.91	73.90	14.99	1000.0	1000.000	318.0	H	112.0	17
14540.4333	62.33	73.90	11.57	1000.0	1000.000	325.0	V	228.0	18
16505.5000	64.46	73.90	9.44	1000.0	1000.000	365.0	V	20.0	21
17665.0666	63.48	73.90	10.42	1000.0	1000.000	102.0	H	331.0	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	36.60	53.90	17.30	1000.0	1000.000	250.0	V	178.0	-1
1925.53333	32.61	53.90	21.29	1000.0	1000.000	365.0	V	7.0	4
2676.36666	34.17	53.90	19.73	1000.0	1000.000	262.0	H	10.0	5
3853.43333	35.16	53.90	18.74	1000.0	1000.000	252.0	H	190.0	6
4850.46666	37.15	53.90	16.75	1000.0	1000.000	334.0	H	351.0	8
5219.23333	37.25	53.90	16.65	1000.0	1000.000	314.0	H	316.0	8
6584.10000	39.91	53.90	13.99	1000.0	1000.000	275.0	H	149.0	9
8946.26666	41.68	53.90	12.22	1000.0	1000.000	363.0	V	188.0	13
12026.3666	45.23	53.90	8.67	1000.0	1000.000	318.0	H	112.0	17
14540.4333	48.81	53.90	5.09	1000.0	1000.000	325.0	V	228.0	18
16505.5000	51.44	53.90	2.46	1000.0	1000.000	365.0	V	20.0	21
17665.0666	50.48	53.90	3.42	1000.0	1000.000	102.0	H	331.0	23

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

2.7.14 Test Results for 1GHz to 18GHz High Channel



Peak Data

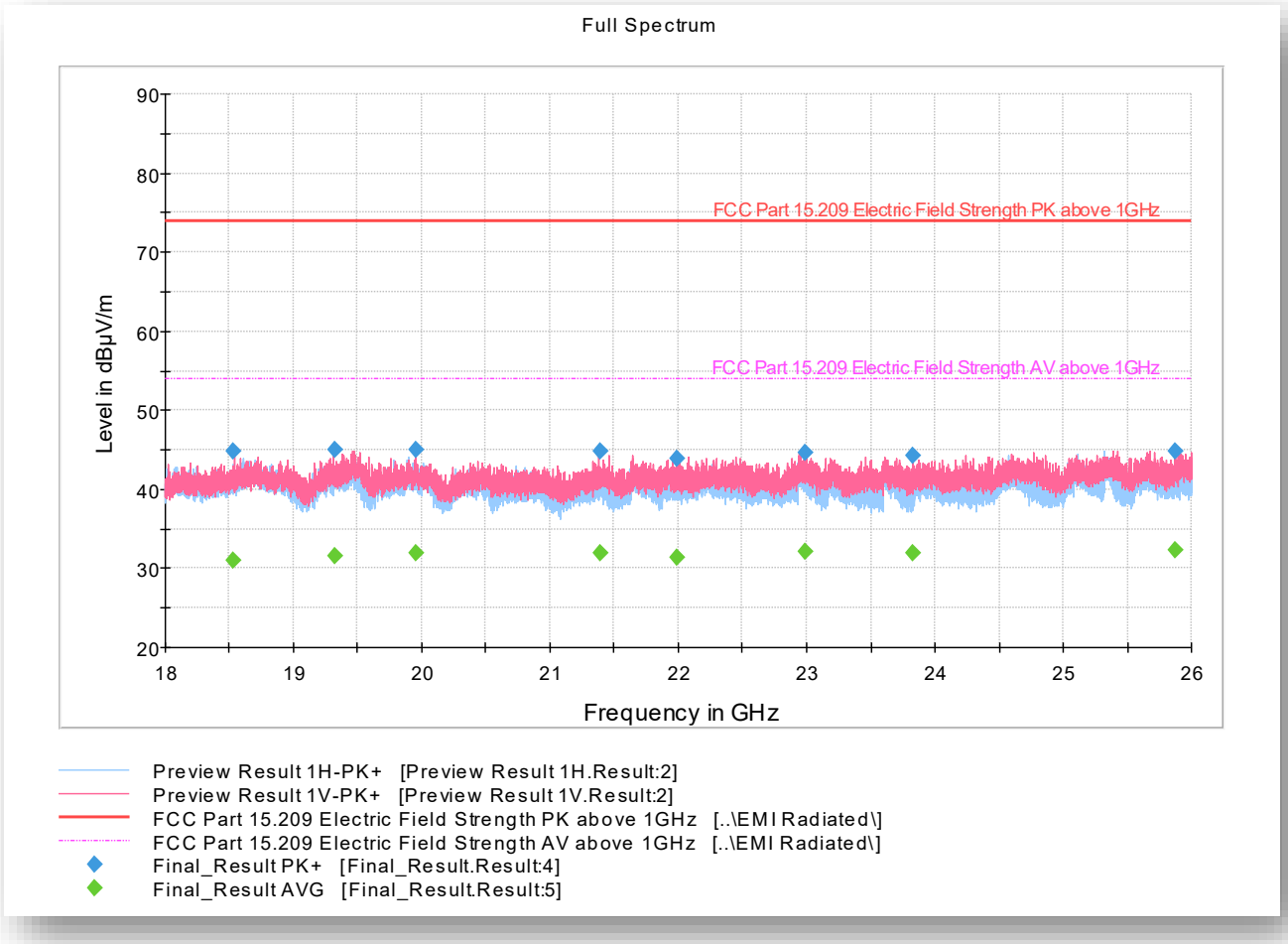
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1200.06666	45.71	73.90	28.19	1000.0	1000.000	236.0	V	48.0	-1
1366.70000	44.02	73.90	29.88	1000.0	1000.000	335.0	V	282.0	0
2482.16666	47.04	73.90	26.86	1000.0	1000.000	318.0	V	106.0	4
4172.03333	48.73	73.90	25.17	1000.0	1000.000	175.0	H	66.0	7
4961.66666	49.95	73.90	23.95	1000.0	1000.000	175.0	H	42.0	8
7434.76666	54.10	73.90	19.80	1000.0	1000.000	175.0	V	211.0	11
8208.63333	54.18	73.90	19.72	1000.0	1000.000	255.0	H	296.0	14
9513.46666	54.74	73.90	19.16	1000.0	1000.000	335.0	H	8.0	12
14249.0000	61.30	73.90	12.60	1000.0	1000.000	315.0	V	156.0	18
16528.5000	64.29	73.90	9.61	1000.0	1000.000	329.0	V	170.0	21
17555.5000	64.12	73.90	9.78	1000.0	1000.000	324.0	H	23.0	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	37.20	53.90	16.70	1000.0	1000.000	236.0	V	48.0	-1
1366.70000	30.66	53.90	23.24	1000.0	1000.000	335.0	V	282.0	0
2482.16666	33.64	53.90	20.26	1000.0	1000.000	318.0	V	106.0	4
4172.03333	34.97	53.90	18.93	1000.0	1000.000	175.0	H	66.0	7
4961.66666	36.81	53.90	17.09	1000.0	1000.000	175.0	H	42.0	8
7434.76666	40.91	53.90	12.99	1000.0	1000.000	175.0	V	211.0	11
8208.63333	41.67	53.90	12.23	1000.0	1000.000	255.0	H	296.0	14
9513.46666	41.84	53.90	12.06	1000.0	1000.000	335.0	H	8.0	12
14249.0000	48.88	53.90	5.02	1000.0	1000.000	315.0	V	156.0	18
16528.5000	51.47	53.90	2.43	1000.0	1000.000	329.0	V	170.0	21
17555.5000	50.89	53.90	3.01	1000.0	1000.000	324.0	H	23.0	23

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

2.7.15 Test Results for 18GHz to 26GHz Low Channel



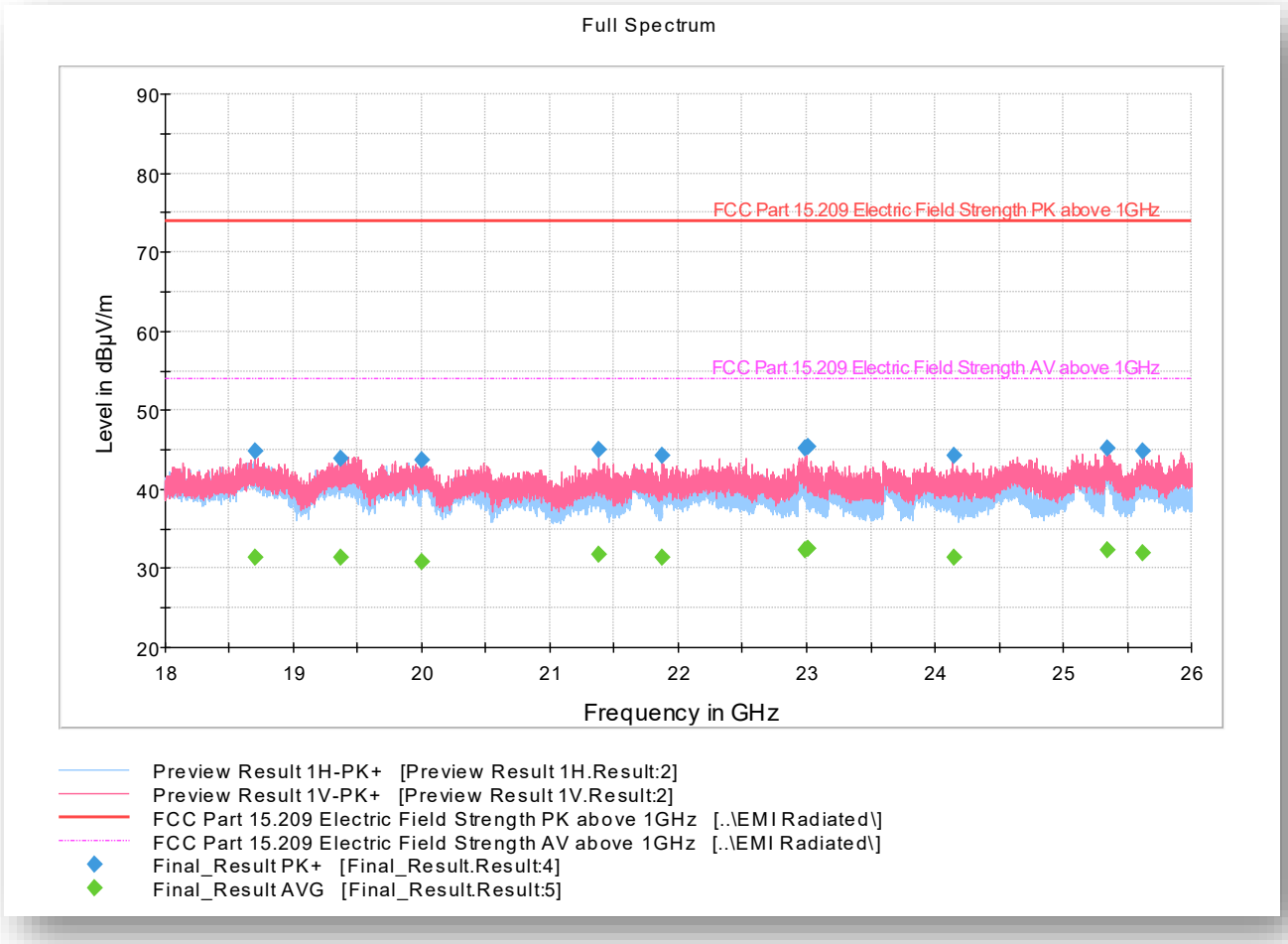
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18529.5955	44.80	73.90	29.10	1000.0	1000.000	163.0	V	131.0	-5
19320.4830	44.99	73.90	28.91	1000.0	1000.000	187.0	V	133.0	-5
19949.0330	44.96	73.90	28.94	1000.0	1000.000	205.0	V	143.0	-5
21385.6780	44.81	73.90	29.09	1000.0	1000.000	149.0	V	170.0	-4
21987.5560	43.92	73.90	29.98	1000.0	1000.000	162.0	V	334.0	-4
22987.3330	44.70	73.90	29.20	1000.0	1000.000	162.0	V	259.0	-3
23823.3075	44.34	73.90	29.56	1000.0	1000.000	137.0	V	48.0	-2
25875.4875	44.86	73.90	29.04	1000.0	1000.000	137.0	V	97.0	-2

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)
18529.5955	31.08	53.90	22.82	1000.0	1000.000	163.0	V	131.0	-5
19320.4830	31.62	53.90	22.28	1000.0	1000.000	187.0	V	133.0	-5
19949.0330	31.93	53.90	21.97	1000.0	1000.000	205.0	V	143.0	-5
21385.6780	31.86	53.90	22.04	1000.0	1000.000	149.0	V	170.0	-4
21987.5560	31.45	53.90	22.45	1000.0	1000.000	162.0	V	334.0	-4
22987.3330	32.09	53.90	21.81	1000.0	1000.000	162.0	V	259.0	-3
23823.3075	32.01	53.90	21.89	1000.0	1000.000	137.0	V	48.0	-2
25875.4875	32.39	53.90	21.51	1000.0	1000.000	137.0	V	97.0	-2

2.7.16 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)
18703.5600	44.82	73.90	29.08	1000.0	1000.000	212.0	V	164.0	-5
19369.3230	43.87	73.90	30.03	1000.0	1000.000	163.0	V	84.0	-5
20000.6725	43.64	73.90	30.26	1000.0	1000.000	212.0	H	160.0	-5
21383.4065	45.04	73.90	28.86	1000.0	1000.000	150.0	V	242.0	-4
21871.3030	44.34	73.90	29.56	1000.0	1000.000	163.0	V	343.0	-4
22991.2040	45.16	73.90	28.74	1000.0	1000.000	163.0	V	349.0	-3
23012.2665	45.34	73.90	28.56	1000.0	1000.000	142.0	V	300.0	-3
24144.7550	44.30	73.90	29.60	1000.0	1000.000	163.0	V	308.0	-3
25346.9465	45.23	73.90	28.67	1000.0	1000.000	163.0	V	277.0	-1
25615.3475	44.88	73.90	29.02	1000.0	1000.000	154.0	V	359.0	-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)
18703.5600	31.47	53.90	22.43	1000.0	1000.000	212.0	V	164.0	-5
19369.3230	31.33	53.90	22.57	1000.0	1000.000	163.0	V	84.0	-5
20000.6725	30.80	53.90	23.10	1000.0	1000.000	212.0	H	160.0	-5
21383.4065	31.77	53.90	22.13	1000.0	1000.000	150.0	V	242.0	-4
21871.3030	31.45	53.90	22.45	1000.0	1000.000	163.0	V	343.0	-4
22991.2040	32.40	53.90	21.50	1000.0	1000.000	163.0	V	349.0	-3
23012.2665	32.43	53.90	21.47	1000.0	1000.000	142.0	V	300.0	-3
24144.7550	31.40	53.90	22.50	1000.0	1000.000	163.0	V	308.0	-3
25346.9465	32.33	53.90	21.57	1000.0	1000.000	163.0	V	277.0	-1
25615.3475	31.88	53.90	22.02	1000.0	1000.000	154.0	V	359.0	-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: 740352591808 / Default Test Configuration

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

December 20, 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	23.0 °C
Relative Humidity	51.6 %
ATM Pressure	99.9 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.

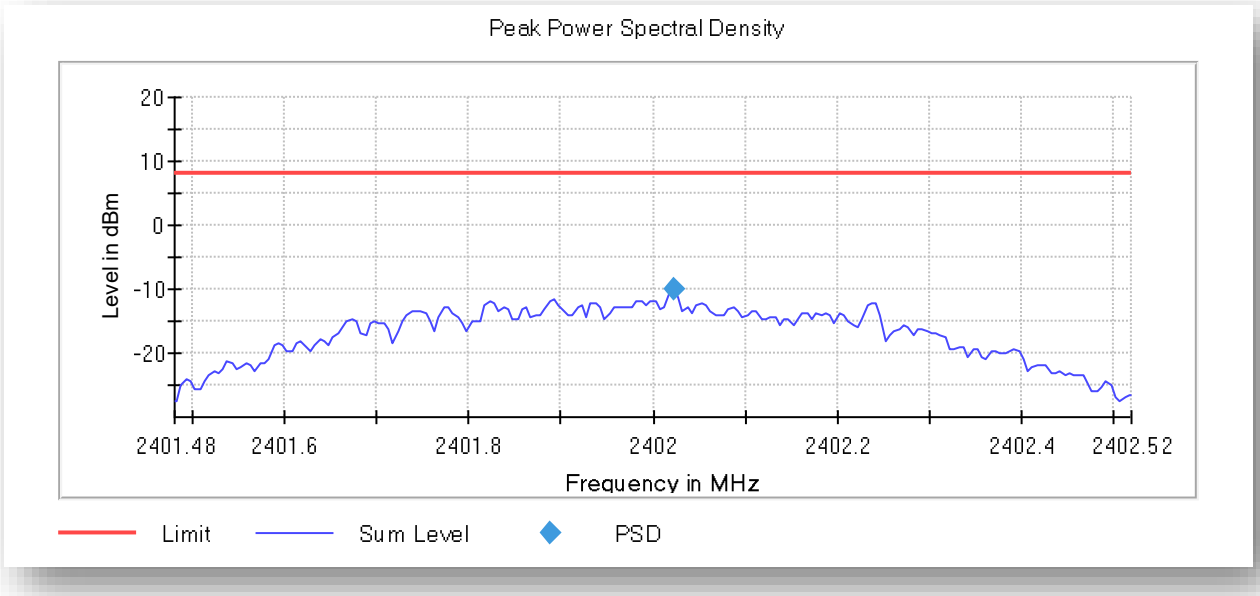
2.8.8 Test Results Summary

DUT Frequency (MHz)	PHY	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	1M	2402.022491	-10.106	8.0	PASS
2440.000000	1M	2439.997501	-9.947	8.0	PASS
2480.000000	1M	2479.997501	-9.275	8.0	PASS

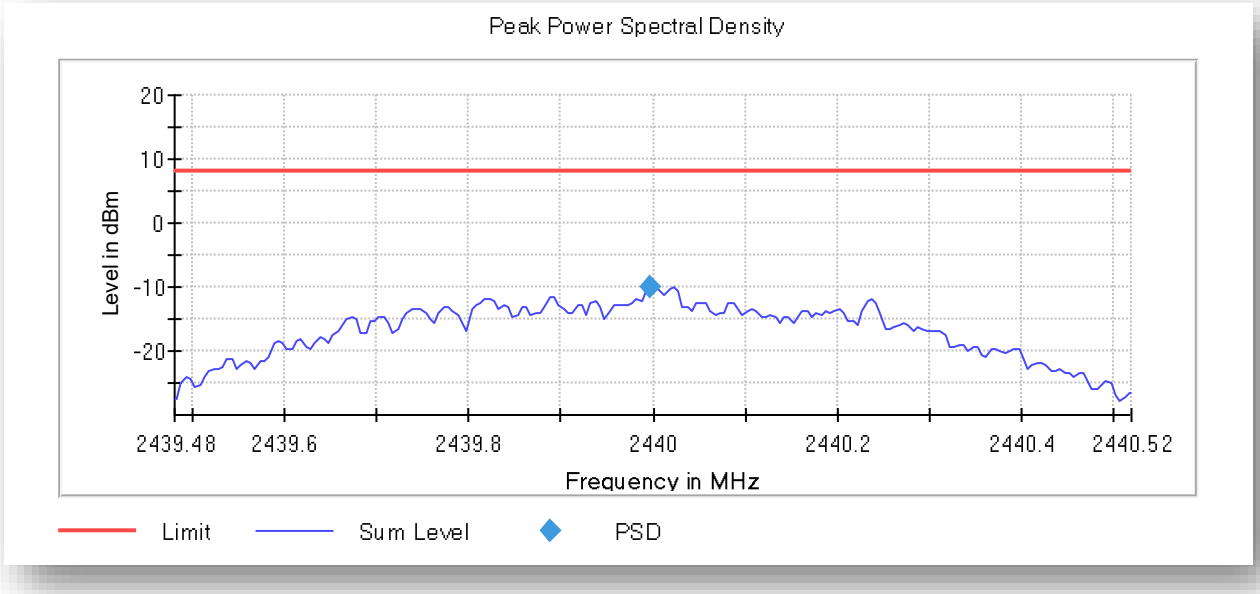
2.8.9 Sample Measurement Settings

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	-10.000 dBm	-10.000 dBm
Attenuation	10.000 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	7 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.11 dB	0.50 dB

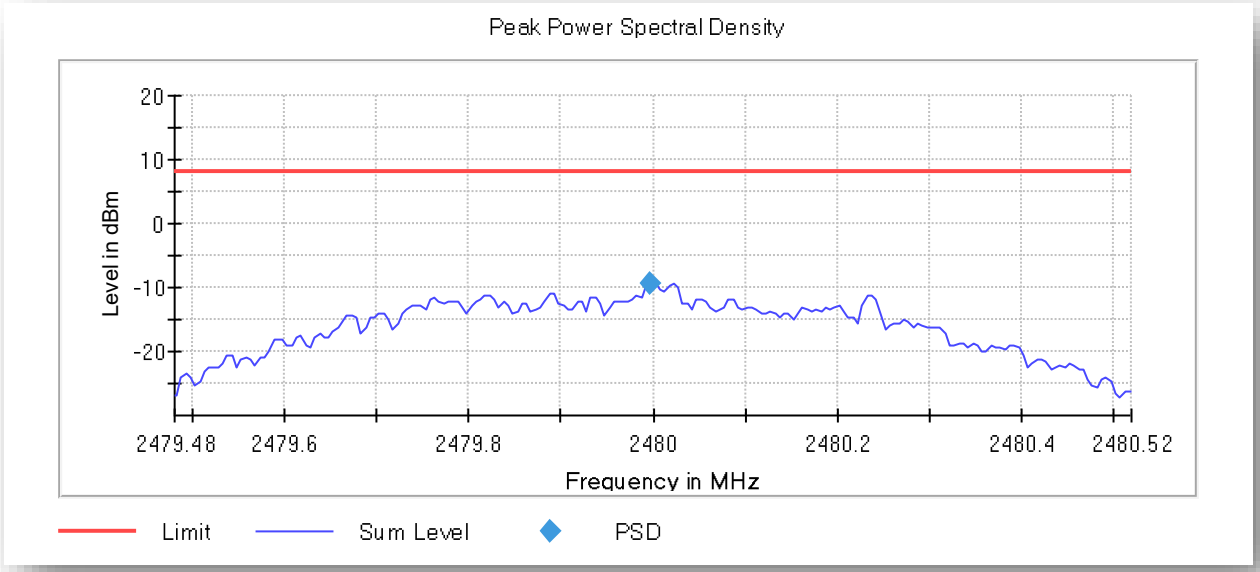
2.8.10 Test Plots



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	01/05/24	01/05/25
1033	BiConiLog Antenna	3142C	00044556	ETS Lindgren	10/16/23	10/16/25
7575	1-18GHz DRG Horn	3117	155511	ETS Lindgren	08/08/21	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.	10/26/23	10/26/25
9002	26-40GHz Antenna	HO28S	102	Custom Microwave Inc.	09/26/23	09/26/25
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 (for reference only)

	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**	

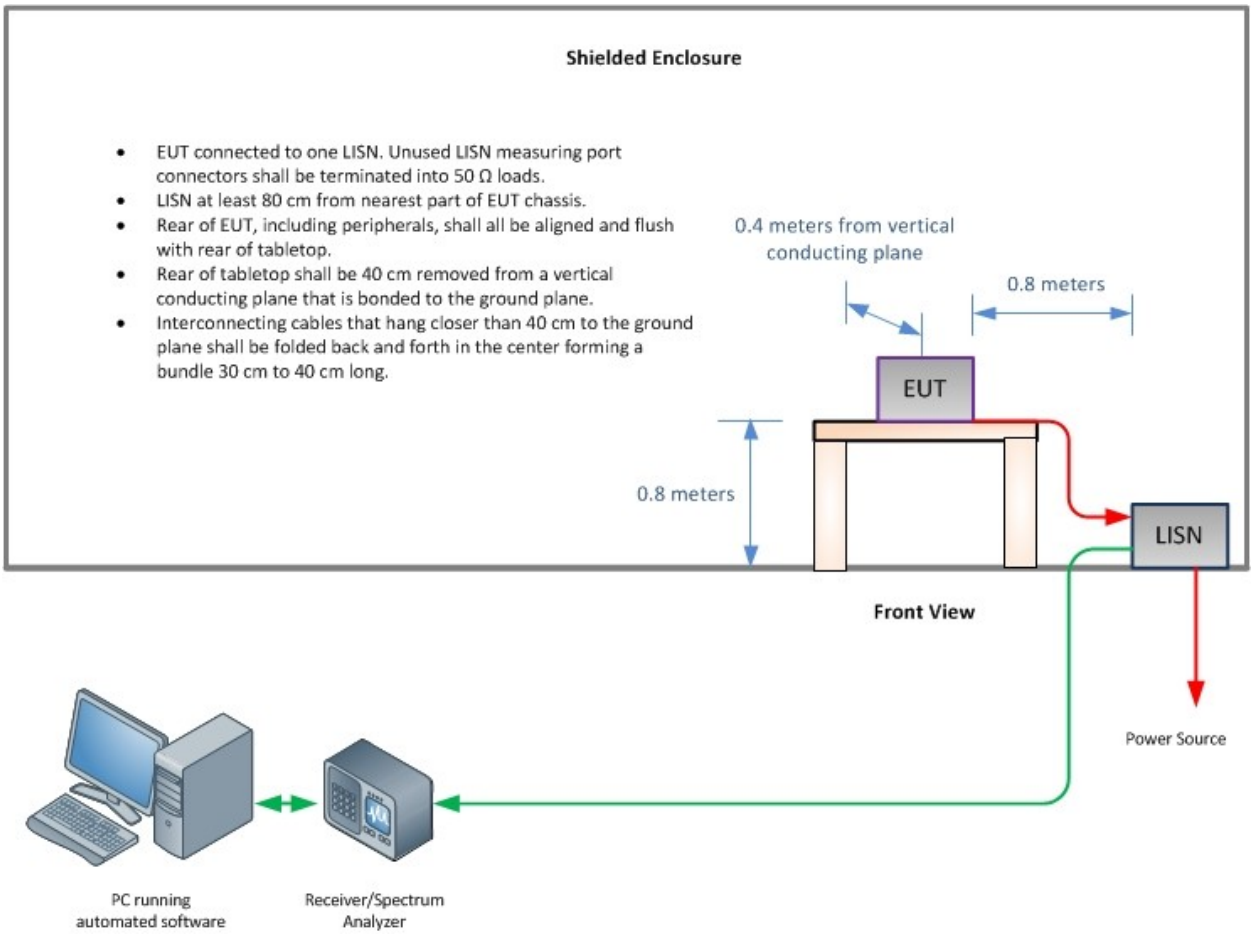
3.2.1 Radiated Emission Measurements (1GHz to 18GHz)

	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**	

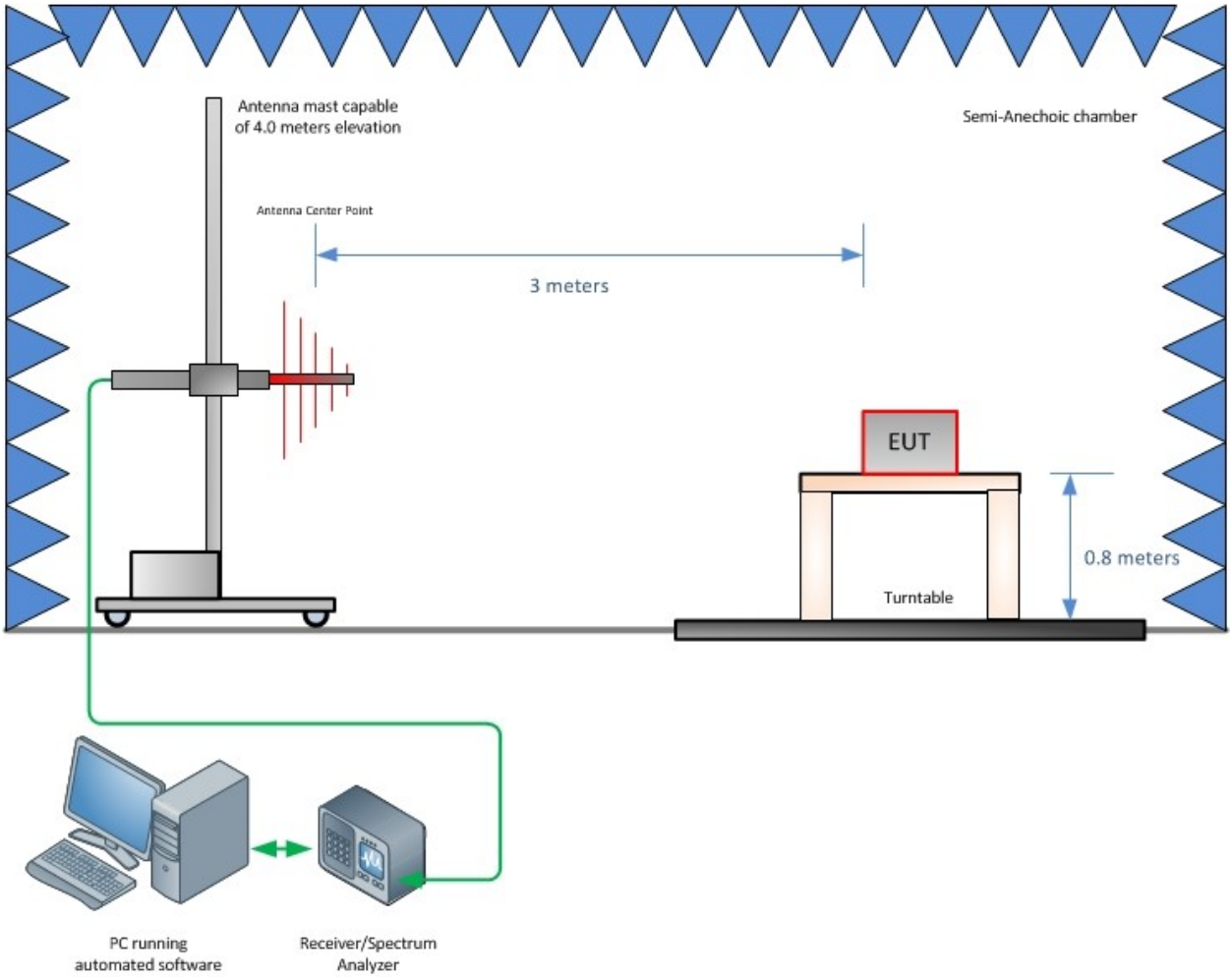
SECTION 4

DIAGRAM OF TEST SETUP

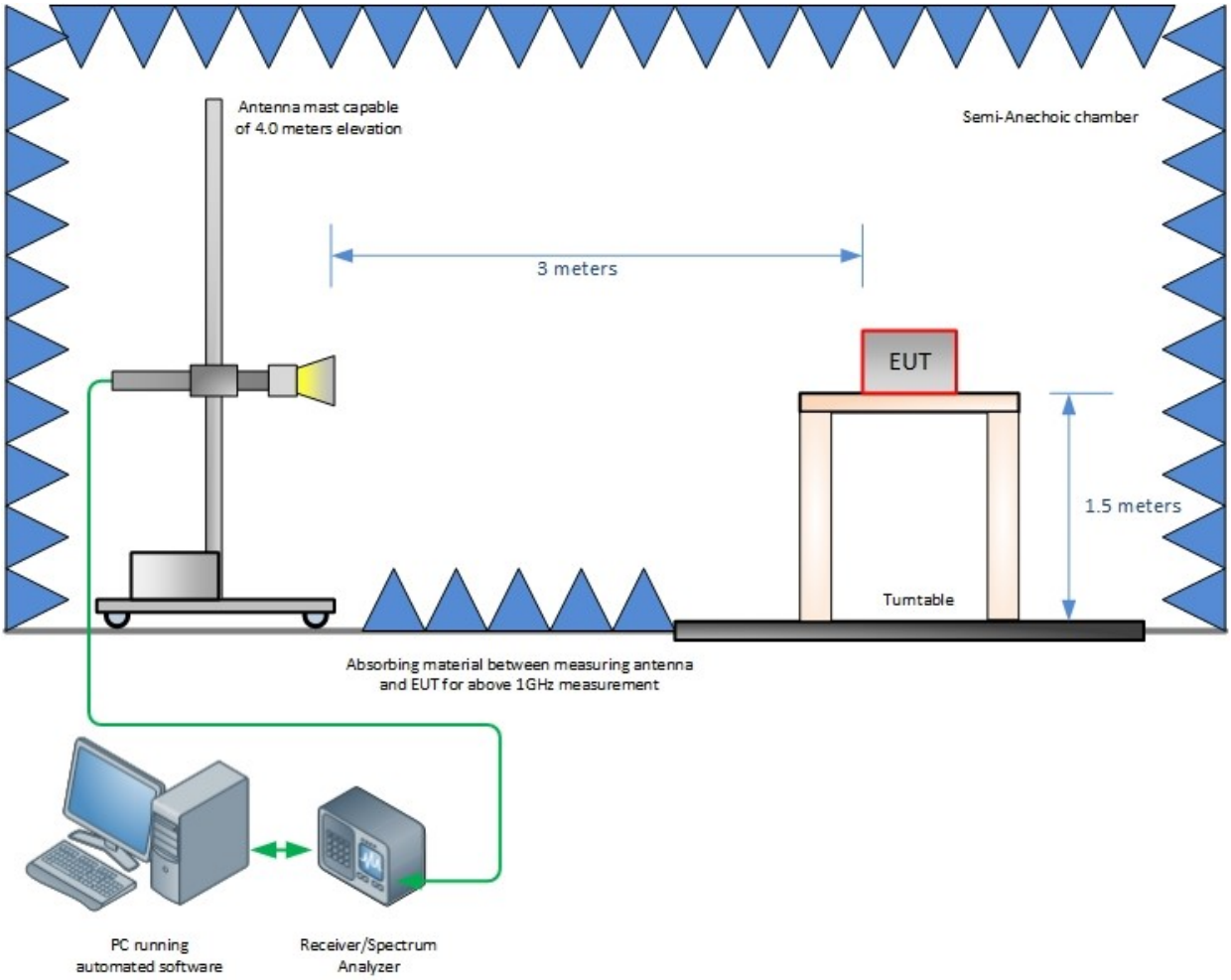
4.1 TEST SETUP DIAGRAM



AC Conducted Emission Test Setup (for reference only)



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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