

Prüfbericht-Nr.: Test report no.:	SE23X7R2-002	Auftrags-Nr.: Order no.:	0290100320	Seite 1 von 52 Page 1 of 52
Kunden-Referenz-Nr.: Client reference no.:	1288994	Auftragsdatum: Order date:	2022.12.02	
Auftraggeber: Client:	ASSA ABLOY Entrance Systems AB			
Prüfgegenstand: Test item:	Wireless IoT Gateway			
Bezeichnung / Typ-Nr.: Identification / Type no.:	IoT Gateway 2.0, FCC ID: 2A8JO-IOT20A			
Auftrags-Inhalt: Order content:	Accredited Testing			
Prüfgrundlage: Test specification:	FCC 47 CFR Part 15.247 with parts 15.207 & 15.209 ANSI C63.10: 2013			
Wareneingangsdatum: Date of sample receipt:	2023.03.16			
Prüfmuster-Nr.: Test sample no.:	See section 2.3			
Prüfzeitraum: Testing period:	2023.03.17 - 2023.07.14			
Ort der Prüfung: Place of testing:	Lund, Sweden			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland Sweden			
Prüfergebnis*: Test result*:	Pass			
überprüft von: reviewed by:	X 	genehmigt von: authorized by:	X 	
Datum: 2024.04.15 Date:	Signed by: Maria Nytlun	Datum: 2024.04.15 Date:	Signed by: Hakan Ahlberg	
Stellung / Position:	Test Engineer	Stellung / Position:	Lab Manager	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts.</i>				

Revision History

REVISION	DATE	REMARKS	AUTHOR
001	2024-03-26	First Release	Niall Forrester /Maria Nyiltun
002	2024-04-15	Updated version	Maria Nyiltun
Note: Latest revision report will replace all previous reports			
This report based on FCC Part 15.247 Template version 1.4			

Summary of Test Results

FCC 47 CFR Rule Part	Test Description	Applicability	Report Section	RESULT	REMARKS
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	YES	4.1	PASS	
15.209	Radiated Emissions (Intentional Radiators)	YES	4.2	PASS	
15.247 (d)	Antenna Conducted Emissions	NO	4.3	N/A	Radiated testing performed
15.247 (d)	Band Edge Compliance (Authorized Band)	YES	4.4	PASS	
15.247 (d)	Band Edge Compliance (Restricted Band)	YES	4.5	PASS	
15.247 (a)(1)	20dB Bandwidth	NO	4.6	N/A	BLE is non-hopping
15.247 (a)(1)	Carrier (Hopping Channel) Separation	NO	4.7	N/A	BLE is non-hopping
15.247 (a)(1)	Number of Hopping Channels	NO	4.8	N/A	BLE is non-hopping
15.247 (a)(1)	Time of Occupancy (Dwell Time)	NO	4.9	N/A	BLE is non-hopping
15.247 (a)(2)	6dB Bandwidth	YES	4.10	PASS	
15.247 (b)	Peak Conducted Output Power	YES	4.11	PASS	
15.247 (e)	Power Spectral Density	YES	4.12	PASS	

Possible test case verdicts:

- | | |
|--|-----------------------|
| - Test case does not apply to the test object: | N/A |
| - Test object complies with the requirement: | PASS or COMPLIANT |
| - Test object does not meet the requirement: | FAIL or NOT COMPLIANT |
| - Test case not performed on the test object: | N.P. |

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1. GENERAL INFORMATION

1.1 Test Site

Test Facility:	TÜV Rheinland Sweden AB
Address:	Mobilvägen 10
	223 62 Lund
	Sweden
Swedac Registration Number:	10325
FCC Test Firm Registration Number:	517458
ISED Test Site Registration Number:	24753

1.2 Client Information

Company Name:	ASSA ABLOY Entrance Systems AB
Address:	PO Box 822
	SE-261 27 Landskrona
	Sweden
Contact Person:	Fredrik Brödje
Contact e-Mail / Telephone	fredrik.brodje@assaabloy.com +46 10 47 48 907

2. PRODUCT INFORMATION

2.1 General Description

Model name:	IoT Gateway 2
Manufacturer:	ASSA ABLOY Entrance Systems AB
Model number / Marketing name:	IoT Gateway 2
FCC ID:	2A8JO-IOT20A
Description:	Wireless IoT Gateway
Ancillary Equipment:	See section 2.7

2.2 Device Characteristics

Type of Power Supply	DC via Jack or RJ45 connector
Nominal Supply Voltage	24V DC
Supply Voltage Range	5 to 28V DC
Operating Temperature Range	-
Operating Air Humidity Range	-
Highest Internal Frequency Source	2690 MHz

2.3 Test Samples

EUT #	EUT ID	Description	Used For:
1	A003435986-004	Standard Sample	Radiated Emissions
2	A003435986-005	Standard Sample	Conducted Emissions
3	A003435986-006	Standard Sample	Conducted Radio

2.4 Wireless Technologies and Bands Supported by the EUT

Technology	Band	Frequency Range (Tx)	Evaluation Performed*
Bluetooth Low Energy	2.4 GHz	2402.0 MHz – 2480.0 MHz	YES
LTE FDD	1	1920.0 MHz – 1980.0 MHz	N/A
LTE FDD	2	1840.0 MHz – 1910.0 MHz	N/A
LTE FDD	3	1710.0 MHz – 1785.0 MHz	N/A
LTE FDD	4	1710.0 MHz – 1755.0 MHz	N/A
LTE FDD	5	824.0 MHz – 849.0 MHz	N/A
LTE FDD	7	2500.0 MHz – 2570.0 MHz	N/A
LTE FDD	8	880.0 MHz – 915.0 MHz	N/A
LTE FDD	12	699.0 MHz – 716.0 MHz	N/A
LTE FDD	13	777.0 MHz – 787.0 MHz	N/A
LTE FDD	18	815.0MHz – 830.0 MHz	N/A
LTE FDD	19	830.0 MHz – 845.0 MHz	N/A
LTE FDD	20	832.0 MHz – 862.0 MHz	N/A
LTE FDD	26	814.0MHz – 849.0 MHz	N/A
LTE FDD	28	703.0MHz – 748.0 MHz	N/A
LTE TDD	38	2570.0 MHz – 2620.0 MHz	N/A
LTE TDD	39	1880.0 MHz – 1920.0 MHz	N/A
LTE TDD	40	2300.0 MHz – 2400.0 MHz	N/A
LTE TDD	41	2496.0 MHz – 2690.0 MHz	N/A

*This statement refers only to this report. Other wireless technologies may be covered by other reports.

2.5 Antenna Information

Technology	Band	Number of Antennas	Antenna Type(s)	Gain
Bluetooth Low Energy	2.4 GHz	1	PCB antenna	2.9 dBi
LTE FDD LTE FDD	5, 8, 12, 13, 18, 19, 20, 26, 28	1	FPC Embedded Antenna	2.9 dBi
LTE FDD LTE TDD	1, 2, 3, 4, 7 38, 39, 40, 41			4.3 dBi

2.6 Wireless Technology Details

Technology*	Band	Modulation Type(s)	No. of Channels	Channel Spacing	Adaptivity
Bluetooth Low Energy	2.4 GHz	GFSK	40	2 MHz	N/A
LTE FDD	1, 2, 3, 4, 5, 7, 8, 12, 13, 18 19, 20 26, 28	QPSK 16-QAM 64-QAM 256-QAM	According to LTE specs	According to LTE specs	N/A
LTE TDD	38, 39, 40, 41				

*Note: No simultaneous transmissions for BLE and LTE.

2.7 Ancillary Equipment

A003435986-001	Assa Abloy 1007773 Control Unit
A003435986-002	Phihong PSM050-320A Switching Power Supply

2.8 EUT Diagrams

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3. TEST METHODS

3.1 Test Standards

Testing was performed according to the following standards / references

Standard	Version	Description
FCC 47 CFR 15.247	-	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR 15.207	-	Conducted limits
FCC 47 CFR 15.209	-	Radiated emission limits; general requirements

3.2 Additional references

The following standards / references were also considered for the testing

Standard	Version	Description
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.3 Limits

FCC 47 CFR Rule Part	Test Description	Limit Reference (FCC 47 CFR Reference)
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	15.207 (a)
15.209	Radiated Emissions (Intentional Radiators)	15.209 (a) *See Note 1
15.247 (d)	Out of Band Emissions	15.247 (d)
15.247 (d)	Band Edge Compliance (Authorized Band)	15.247 (d)
15.247 (d)	Band Edge Compliance (Restricted Band)	15.247 (d)
15.247 (a)(1)	20dB Bandwidth	15.247 (a)(1)
15.247 (a)(1)	Carrier (Hopping Channel) Separation	15.247 (a)(1)
15.247 (a)(1)	Number of Hopping Channels	15.247 (a)(1)
15.247 (a)(1)	Time of Occupancy (Dwell Time)	15.247 (a)(1)
15.247 (a)(2)	6dB Bandwidth	15.247 (a)(2)
15.247 (b)	Peak Conducted Output Power	15.247 (b)(1) [Hopping] 15.247 (b)(3) [Non-Hopping]
15.247 (e)	Power Spectral Density	15.247 (e)

Interpretation of the measurement results has been performed in accordance with ANSI C63.10 section 1.3

Compliance with the requirements has been based on the results of the measurements compared to the specified limits, not taking into account measurement instrumentation uncertainty.

Measurement Uncertainty figures are stated in section 6

Note 1

Radiated Emissions limits in the tables from 47 CFR sections 15.109 & 15.209 are presented in $\mu\text{V/m}$. Measurements on the test system are made in $\text{dB}\mu\text{V/m}$. To convert between these, the following adjustment is used:

$$\text{New Limit} = 20 \log \left(\frac{\text{Original Limit}}{10^6} \right) + 120$$

Example: from 15.209(a) the limit for 30MHz – 88MHz is $100\mu\text{V/m}$ at 3m. This gives:

$$\text{New Limit} = 20 \log \left(\frac{100}{10^6} \right) + 120 = 40\text{dB}\mu\text{V/m at 3m}$$

Additionally, in some cases testing has been performed at distances other than those specified in the tables. When this has occurred, the limits have been adjusted in accordance with the requirements in 47 CFR 15.31, using an extrapolation factor of 40dB/decade at frequencies below 30MHz and 20dB/decade at or above 30MHz

Example: from 15.209(a) the limit for 1.705MHz – 30MHz is $30\mu\text{V/m}$ (=29.54 $\text{dB}\mu\text{V/m}$) at 30m

$$\text{Limit@3m} = \text{Limit@30m} + 40 \log \left(\frac{30}{3} \right) = 29.54 + 40.00 = 69.54 \text{ dB}\mu\text{V/m at 3m}$$

Example: from 15.209(a) the limit for 1GHz – 18GHz is $500\mu\text{V/m}$ (=53.98 $\text{dB}\mu\text{V/m}$) at 3m

$$\text{Limit@1m} = \text{Limit@3m} + 20 \log \left(\frac{3}{1} \right) = 53.98 + 9.54 = 63.52 \text{ dB}\mu\text{V/m at 1m}$$

3.4 Description of Test Methods and Equipment Setup

3.4.1 General Description

Testing was performed in accordance with the various requirements of ANSI C63.4 and ANSI C63.10. Any deviations from the test methods are described in section 3.7

Where different arrangements of equipment were used for different types of measurements, these are tabulated in section 3.4.2 and details of each arrangement are included in subsequent sections

3.4.2 Test Equipment Setup Used by Test Type

FCC 47 CFR Rule Part	Test Description	Test Equipment Used
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	Conducted Emissions
15.209	Radiated Emissions (Intentional Radiators)	SAC5
15.247 (d)	Out of Band Emissions	CTE
15.247 (d)	Band Edge Compliance (Authorized band)	CTE
15.247 (d)	Band Edge Compliance (Restricted band)	SAC 5
15.247 (a)(1)	20dB Bandwidth	N/A
15.247 (a)(1)	Carrier (Hopping Channel) Separation	N/A
15.247 (a)(1)	Number of Hopping Channels	N/A
15.247 (a)(1)	Time of Occupancy (Dwell Time)	N/A
15.247 (a)(2)	6dB Bandwidth	CTE
15.247 (b)	Peak Conducted Output Power	CTE
15.247 (e)	Power Spectral Density	CTE

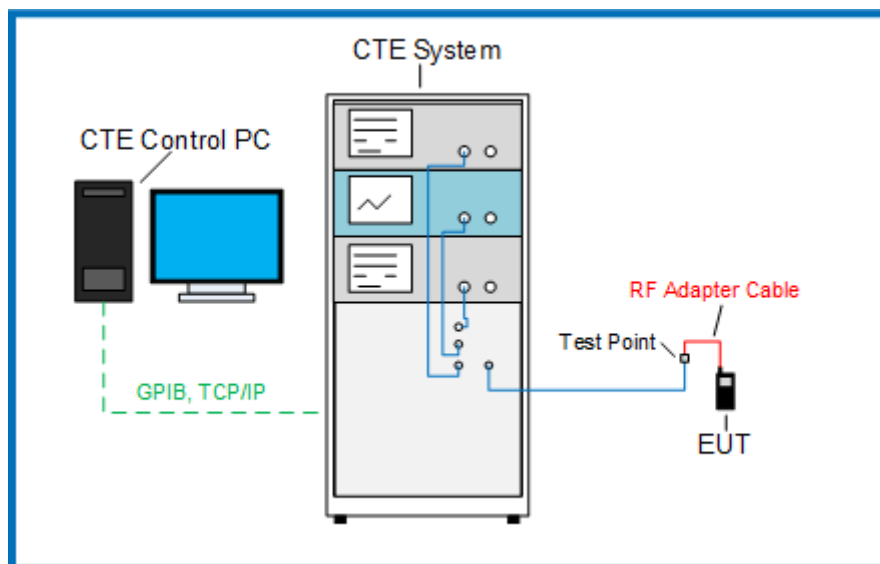
3.4.3 Test Equipment Setup – CTE System

The Comprehensive Test Environment (CTE) system consists of a number of instruments (see section 5.1.1) mounted in a rack together with automated relays and interconnecting hardware. The instruments and other equipment are controlled from a standard PC running software provided by the manufacturer. The RF output of the EUT is connected to the test system via a coaxial cable.

Tests are in the form of pre-defined scripts that can be loaded on the PC. The scripts, as well as the hardware setup, have been verified for conformance with the relevant test specifications.

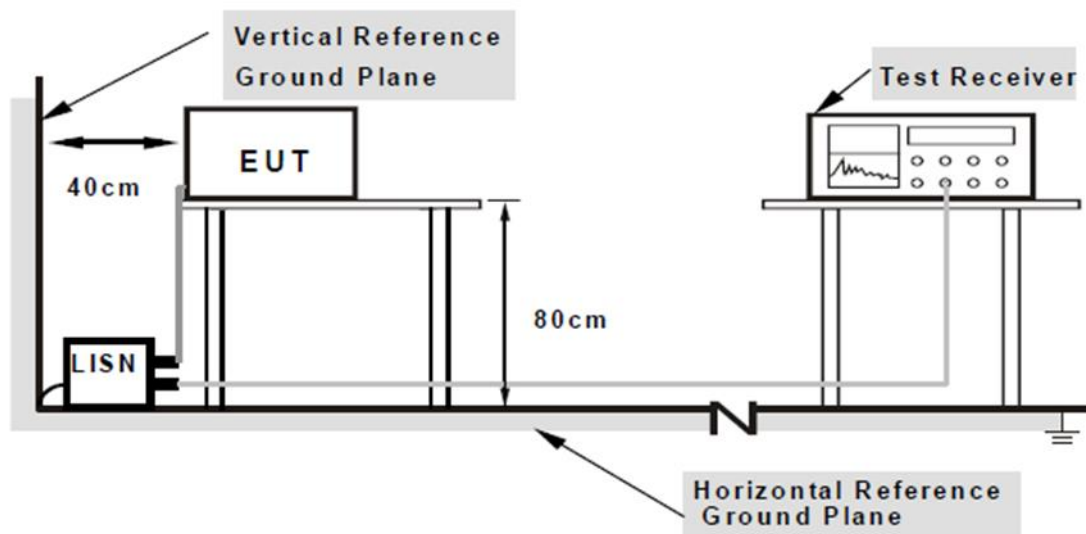
Losses in the cables and interconnects have been measured using the system's own automated routines and are compensated for automatically. Any additional loss in RF adapter cables supplied together with the EUT can be compensated for using the known characteristics of that adapter.

CTE Block Diagram



3.4.4 Test Equipment Setup – Conducted Emissions

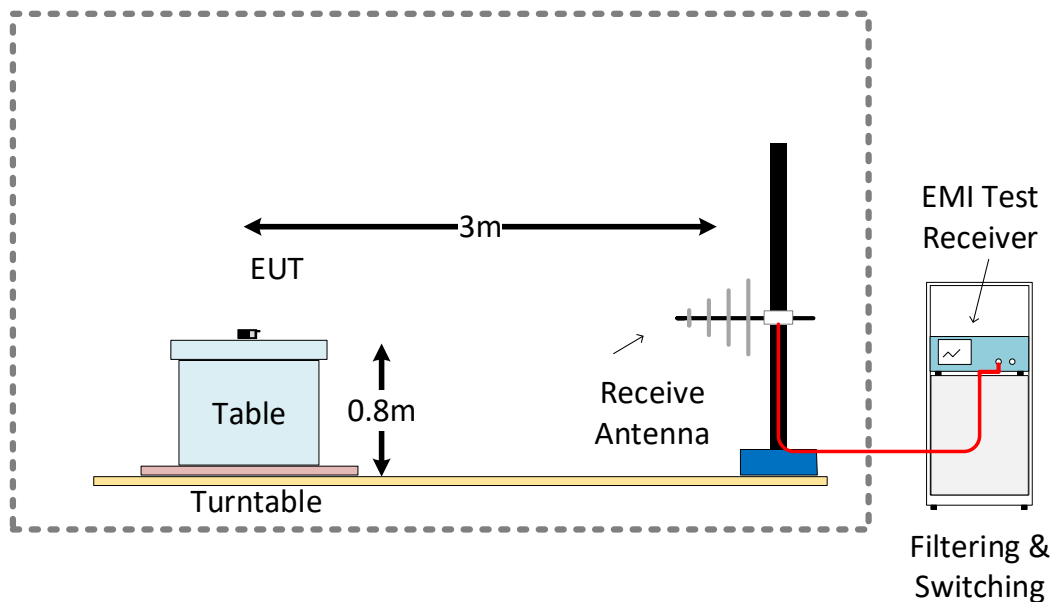
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The LISNs provide $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument.
- The lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10 dB under the prescribed limits could not be reported.



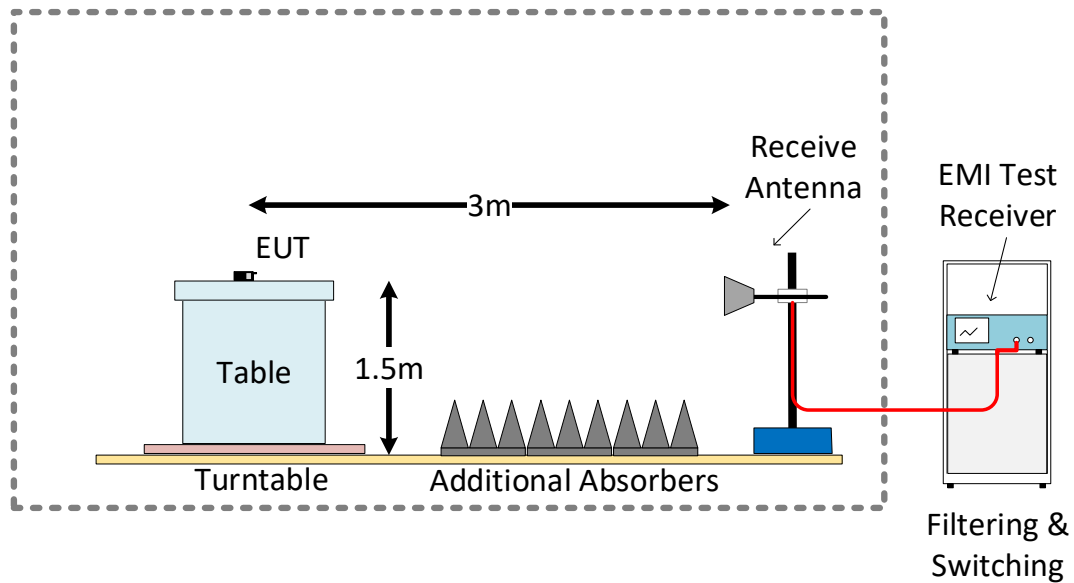
3.4.5 Test Equipment Setup – SAC 5 (Radiated Emissions and Restricted Band Edge)

- For frequency range 30MHz-1GHz Log-Periodic Antenna was used. Antenna elevated from 100 cm from floor to 400 cm from floor, and was placed at 3 m from center of turntable in tilted position. The equipment under test (EUT) was placed at the middle of the turntable at 80 cm height from floor. The antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.
- For frequency range 1GHz-18GHz horn Antenna was used. Antenna elevated from 100 cm from floor to 200 cm from floor, and was placed at 3 m from center of turntable. The equipment under test (EUT) was placed at the middle of the turntable at 150 cm height from floor. The antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.
- For frequency range 18GHz-40GHz double horn Antenna was used. Antenna's height was adjusted to 150 cm from floor, and 1 m distance to center of turntable. The equipment under test (EUT) was placed at the middle of the turntable on at 150 cm height from floor.
- For all frequency ranges the turntable was rotated 360° for obtaining the maximum emission.

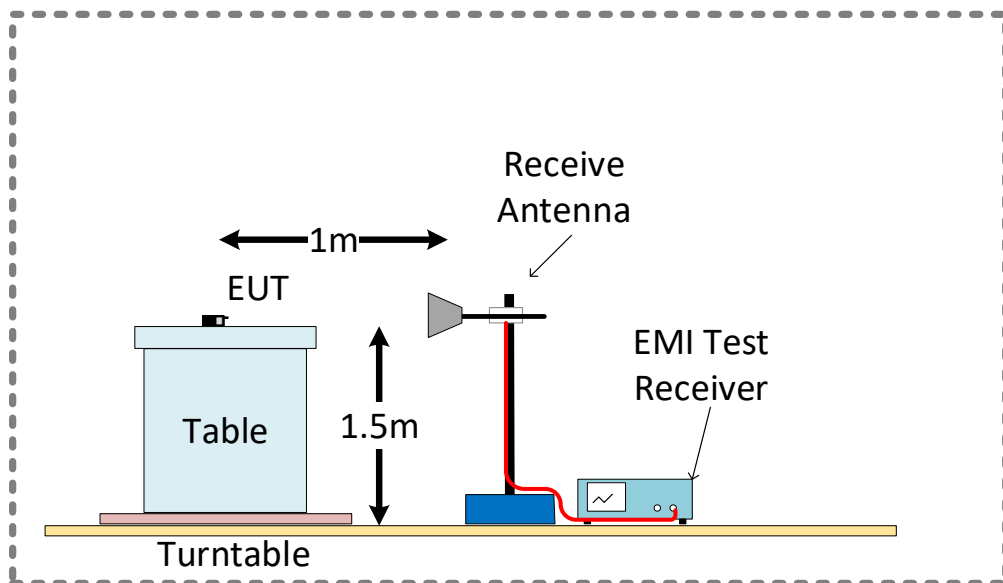
SAC 5 Test Setup Configuration 30MHz – 1GHz



SAC 5 Test Setup Configuration 1GHz – 18GHz

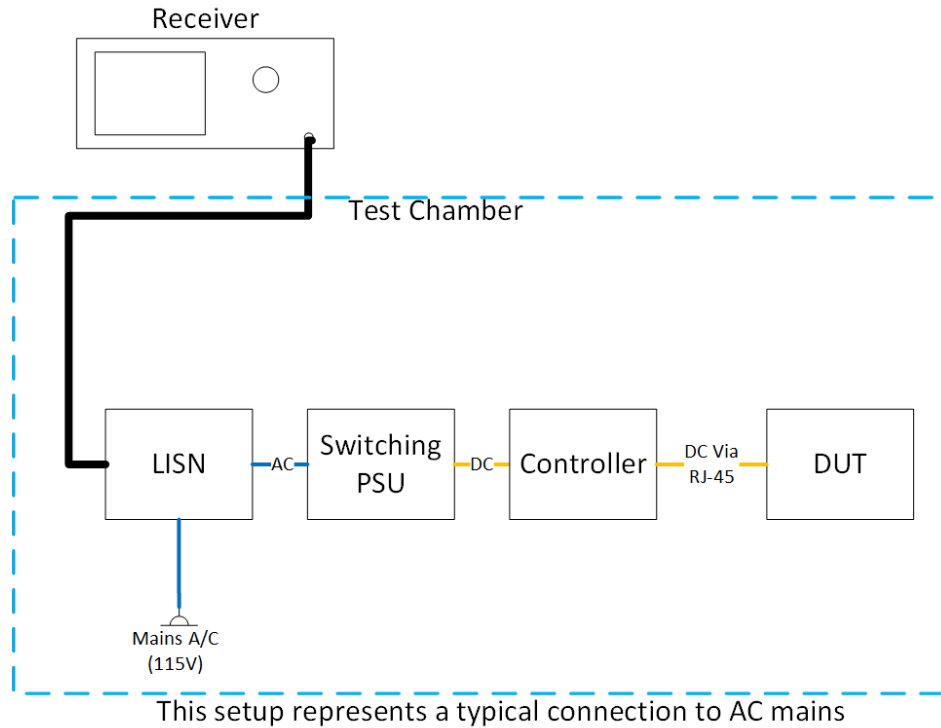


SAC 5 Test Setup Configuration 18GHz – 40GHz

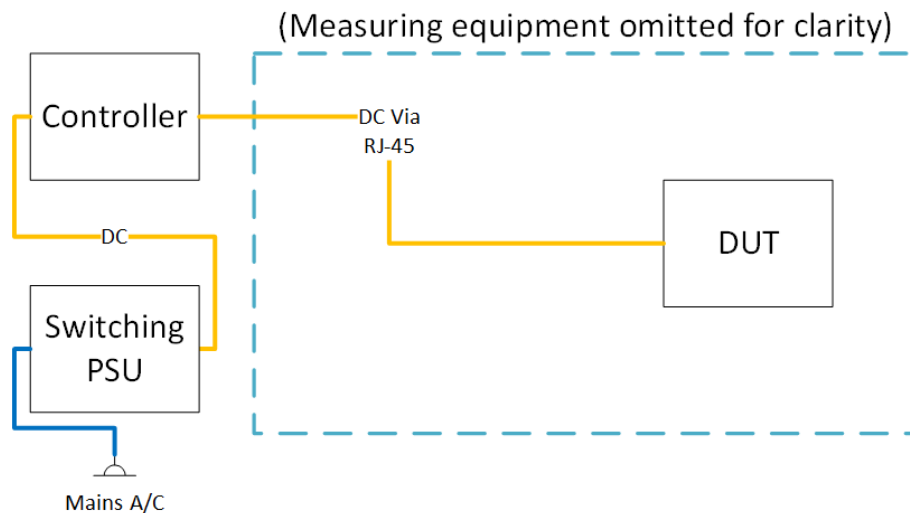


3.5 EUT Configuration During Test

3.5.1 Block Diagram for Conducted Emissions EUT Setup



3.5.2 Block Diagram for Radiated Emissions EUT Setup



3.6 EUT Operation Modes

Operation mode	Description
Idle	Device is powered up with radio transmitters in receive mode (not transmitting). Power supplied via RJ-45
BT Tx - Continuous	Device is powered up and a test mode is used to set the device to continuously transmit dummy data on an appropriate Bluetooth channel. Other transmitters are not actively transmitting. Power supplied via RJ-45
BT Tx – DTM	Device is powered up and the built in Direct test Mode is used to control the Bluetooth transmitter directly from the test system. Other transmitters are not actively transmitting. Power supplied via RJ-45

3.7 Deviations from the Test Standard

None

3.8 Environmental Conditions

3.8.1 Environmental Conditions – CTE System

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.05.29	15:30	21.2	37
2023.05.30	08:04	21.4	34

3.8.2 Environmental Conditions – Conducted Emissions System

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.07.14	10:19	22.8	52

3.8.3 Environmental Conditions – SAC5 (Radiated Emissions)

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.03.17	08:50	18.3	28
2023.03.20	08:22	19.2	37
2023.03.23	07:50	18.7	41
2023.03.30	07:50	19.3	31
2023.03.31	08:35	18.2	37

4. TEST RESULTS

4.1 Test Results – AC Power Line Conducted Emissions (Intentional Transmitter)

4.1.1 AC Power Line Conducted Emissions (Intentional) – Test Summary

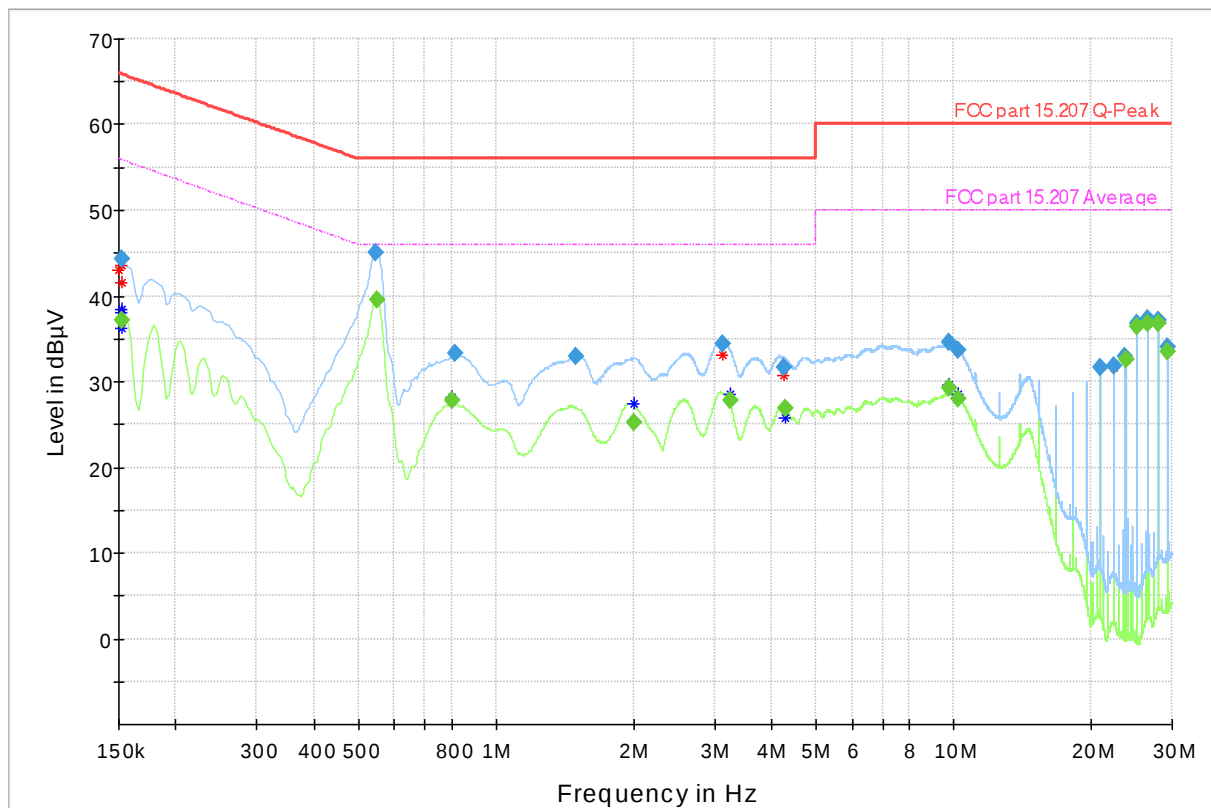
Test Specification	FCC 47 CFR 15.207 (Part 15 Subpart C)		
Test Engineer & Date	Niall Forrester	2023.07.14	
EUT and Ancillary Equipment IDs	A003435986-005	A003435986-001 A003435986-002	
EUT Operation Mode(s)	BT Tx - Continuous		
EUT Wireless Configuration(s)	Bluetooth Low Energy LE_2M – see below for details		
EUT Hardware Configuration(s)	N/A		
Overall Result	PASS		

Test Parameter	Wireless Configuration	Frequency Range	Result*
AC Conducted Power Line Emissions – “N” Line	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	150 kHz – 30 MHz	PASS
AC Conducted Power Line Emissions – “L1” Line	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	150 kHz – 30 MHz	PASS

* For detailed measurements, see tables and graphs in sections below

4.1.2 AC Power Line Conducted Emissions (Intentional) – Test Details

Test	Conducted Emission	
Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Standard	47 CFR Part 15.207	
EUT	A003435986-005	A003435986-005
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.07.14



— Preview Result 2-CAV
— Preview Result 1-QPK
— FCC part 15.207 Q-Peak
— FCC part 15.207 Average
* Critical_Freqs CAV
◆ Final_Result CAV
◆ Final_Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.152250	---	37.18	55.88	18.70	1000.0	9.000	L1	ON
0.152250	44.24	---	65.88	21.63	1000.0	9.000	L1	ON
0.546000	45.05	---	56.00	10.95	1000.0	9.000	L1	ON
0.548250	---	39.51	46.00	6.49	1000.0	9.000	L1	ON
0.802500	---	27.86	46.00	18.14	1000.0	9.000	N	ON
0.811500	33.31	---	56.00	22.69	1000.0	9.000	N	ON
1.495500	32.92	---	56.00	23.08	1000.0	9.000	N	ON
1.999500	---	25.24	46.00	20.76	1000.0	9.000	N	ON
3.135750	34.32	---	56.00	21.68	1000.0	9.000	L1	ON
3.261750	---	27.85	46.00	18.15	1000.0	9.000	L1	ON
4.249500	31.71	---	56.00	24.29	1000.0	9.000	L1	ON
4.301250	---	26.91	46.00	19.09	1000.0	9.000	L1	ON
9.768750	34.64	---	60.00	25.36	1000.0	9.000	N	ON
9.771000	---	29.29	50.00	20.71	1000.0	9.000	N	ON
10.230000	33.75	---	60.00	26.25	1000.0	9.000	N	ON
10.234500	---	28.03	50.00	21.97	1000.0	9.000	N	ON
20.935500	31.60	---	60.00	28.40	1000.0	9.000	N	ON
22.332750	31.77	---	60.00	28.23	1000.0	9.000	N	ON
23.727750	33.02	---	60.00	26.98	1000.0	9.000	L1	ON
23.730000	---	32.59	50.00	17.41	1000.0	9.000	N	ON
25.122750	36.84	---	60.00	23.16	1000.0	9.000	N	ON
25.125000	---	36.50	50.00	13.50	1000.0	9.000	N	ON
26.520000	---	36.85	50.00	13.15	1000.0	9.000	L1	ON
26.520000	37.41	---	60.00	22.59	1000.0	9.000	N	ON
27.915000	37.23	---	60.00	22.77	1000.0	9.000	N	ON
27.917250	---	36.81	50.00	13.19	1000.0	9.000	L1	ON
29.312250	---	33.54	50.00	16.46	1000.0	9.000	N	ON
29.312250	34.12	---	60.00	25.88	1000.0	9.000	N	ON

4.2 Test Results – Radiated Emissions (Intentional Transmitter)

4.2.1 Radiated Emissions (Intentional) – Test Summary

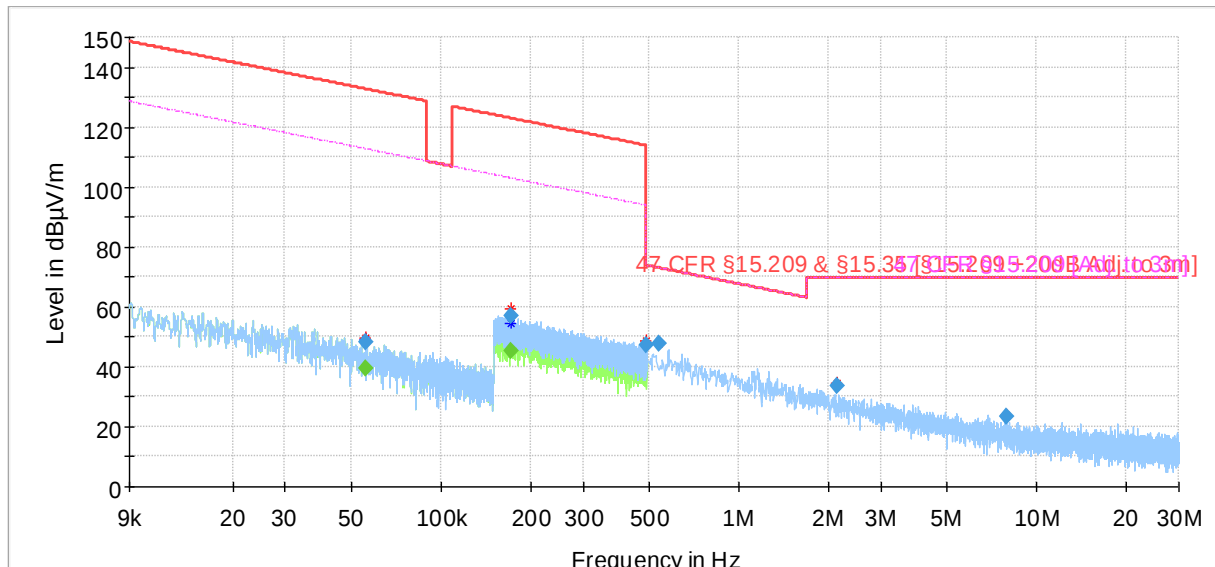
Test Specification		FCC 47 CFR 15.209 (Part 15 Subpart C)	
Test Engineer & Date		Niall Forrester Sam Ebadeh	2023.03.17 – 2023.03.31
EUT and Ancillary Equipment IDs		A003435986-004	A003435986-001 A003435986-002
EUT Operation Mode(s)		BT Tx - Continuous	
EUT Wireless Configuration(s)		Bluetooth Low Energy LE_2M – see below for details	
EUT Hardware Configuration(s)		N/A	
Overall Result		PASS	

Test Parameter	Wireless Configuration	Frequency Range	Result
Radiated Emissions	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	18 GHz – 40 GHz	PASS

4.2.2 Radiated Emissions (Intentional) – Test Details

Low Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Axis

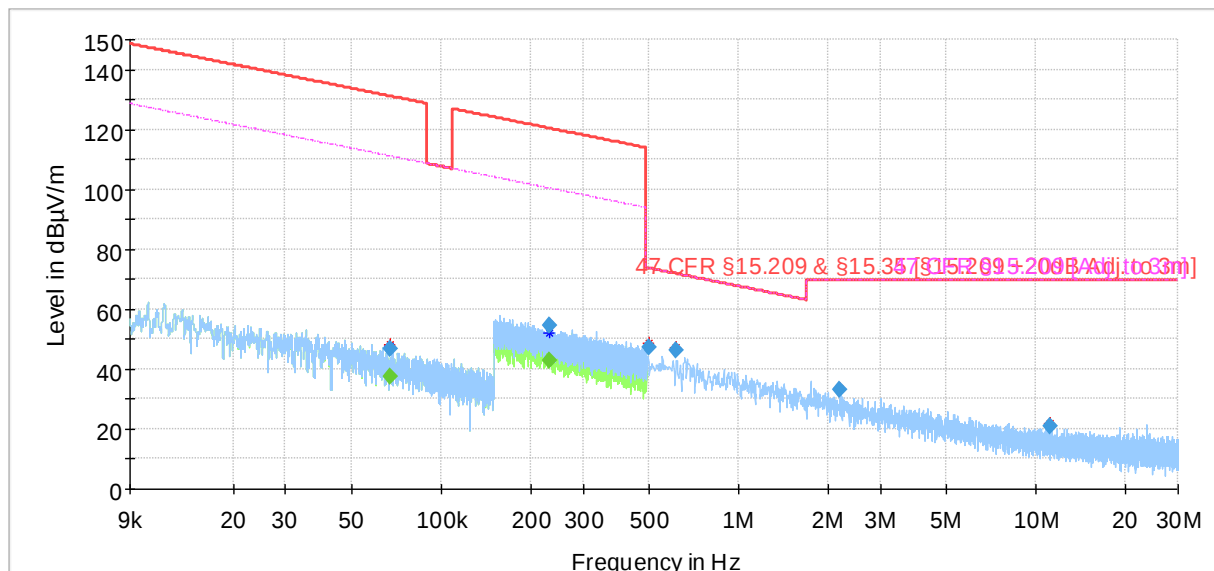
Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Parallel to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	



Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.055882	48.05	---	132.66	84.61	1000.0	0.200	100.0	H	135.0
0.055882	---	39.37	112.66	73.29	1000.0	0.200	100.0	H	135.0
0.172786	56.88	---	122.85	65.98	1000.0	9.000	100.0	H	229.0
0.172786	---	45.51	102.85	57.35	1000.0	9.000	100.0	H	229.0
0.491360	47.24	---	73.78	26.54	1000.0	9.000	100.0	H	76.0
0.539694	47.95	---	72.96	25.01	1000.0	9.000	100.0	H	269.0
2.147672	33.42	---	69.50	36.08	1000.0	9.000	100.0	H	45.0
7.938334	23.21	---	69.50	46.29	1000.0	9.000	100.0	H	192.0

Low Channel: 9 kHz – 30 MHz: Measuring Antenna Perpendicular to Axis

Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Perpendicular to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	

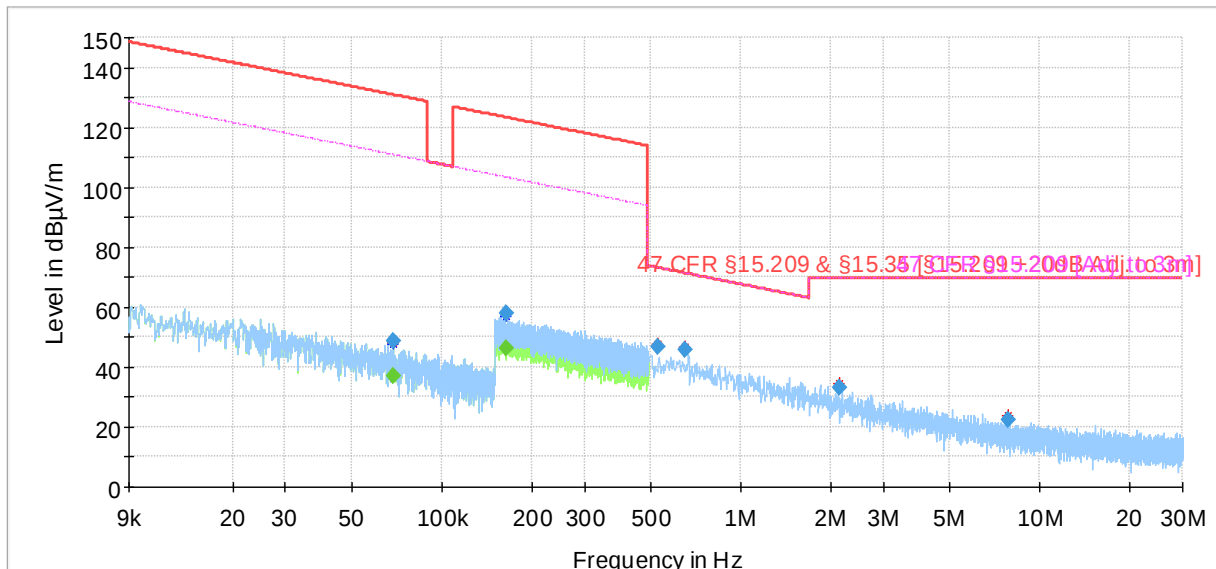


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.067746	---	37.49	110.99	73.50	1000.0	0.200	100.0	H	102.0
0.067746	46.84	---	130.99	84.15	1000.0	0.200	100.0	H	102.0
0.231643	---	43.01	100.31	57.30	1000.0	9.000	100.0	H	229.0
0.231643	54.60	---	120.31	65.71	1000.0	9.000	100.0	H	229.0
0.498195	47.28	---	73.66	26.37	1000.0	9.000	100.0	H	269.0
0.613873	46.16	---	71.85	25.68	1000.0	9.000	100.0	H	102.0
2.189281	32.96	---	69.50	36.54	1000.0	9.000	100.0	H	80.0
11.172954	21.03	---	69.50	48.47	1000.0	9.000	100.0	H	64.0

Low Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Floor

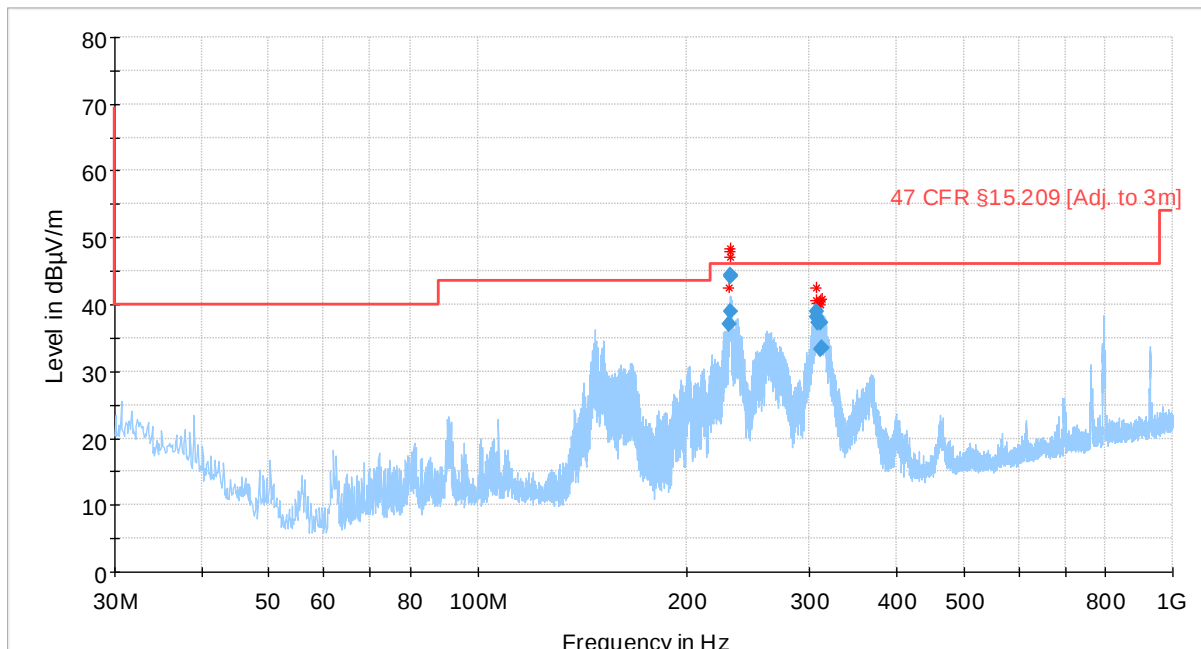
Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Parallel to Floor	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.068723	---	37.25	110.86	73.61	1000.0	0.200	100.0	H	-41.0
0.068723	48.49	---	130.86	82.37	1000.0	0.200	100.0	H	-41.0
0.164796	---	46.05	103.27	57.21	1000.0	9.000	100.0	H	45.0
0.164796	58.06	---	123.27	65.21	1000.0	9.000	100.0	H	45.0
0.531115	46.82	---	73.10	26.28	1000.0	9.000	100.0	H	101.0
0.648061	45.90	---	71.38	25.48	1000.0	9.000	100.0	H	139.0
2.147422	33.25	---	69.50	36.25	1000.0	9.000	100.0	H	179.0
7.856114	22.49	---	69.50	47.01	1000.0	9.000	100.0	H	167.0

Low Channel: 30 MHz – 1 GHz

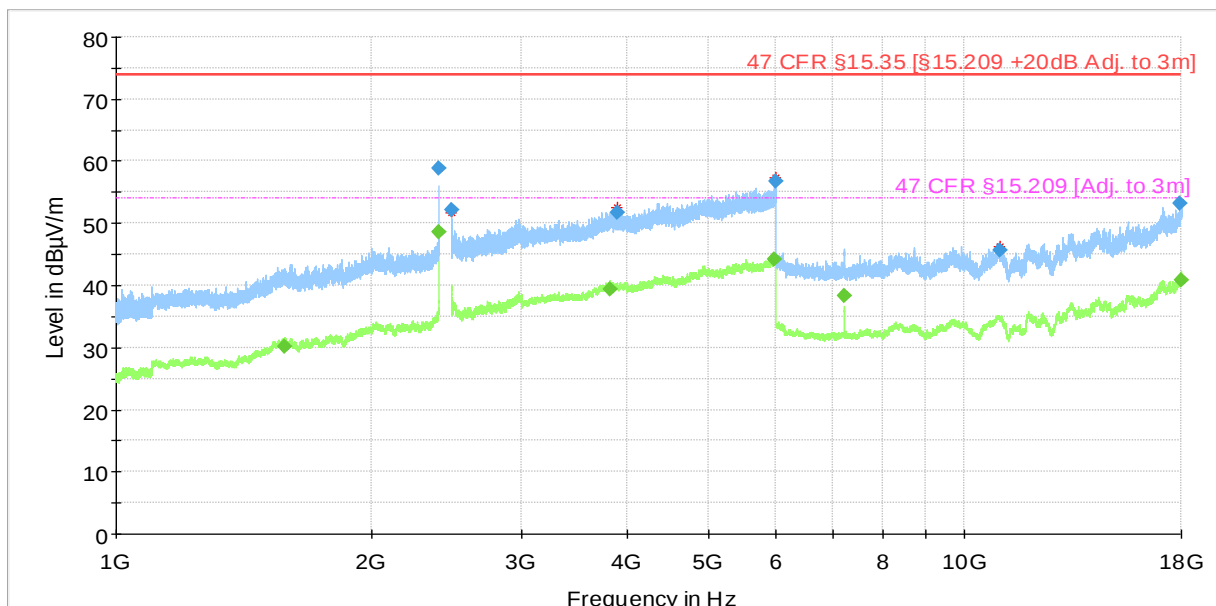
Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30MHz – 1GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Sam Ebadeh	Date: 2023.03.17
Chamber details	Chamber: SAC 5	



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
229.799480	36.98	46.02	9.04	1000.0	120.000	225.0	H	116.0
230.414360	39.00	46.02	7.02	1000.0	120.000	125.0	H	252.0
230.414840	44.47	46.02	1.55	1000.0	120.000	179.0	H	99.0
231.015800	44.22	46.02	1.80	1000.0	120.000	104.0	H	68.0
306.883400	38.97	46.02	7.05	1000.0	120.000	225.0	V	64.0
307.464560	38.09	46.02	7.94	1000.0	120.000	179.0	V	53.0
308.595280	37.30	46.02	8.72	1000.0	120.000	179.0	V	53.0
310.784640	37.21	46.02	8.81	1000.0	120.000	175.0	V	53.0
311.438000	33.22	46.02	12.80	1000.0	120.000	179.0	V	26.0
311.936960	33.44	46.02	12.58	1000.0	120.000	175.0	V	53.0

Low Channel: 1 GHz – 18 GHz

Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1GHz – 18GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.20
Chamber details	Chamber: SAC 5	

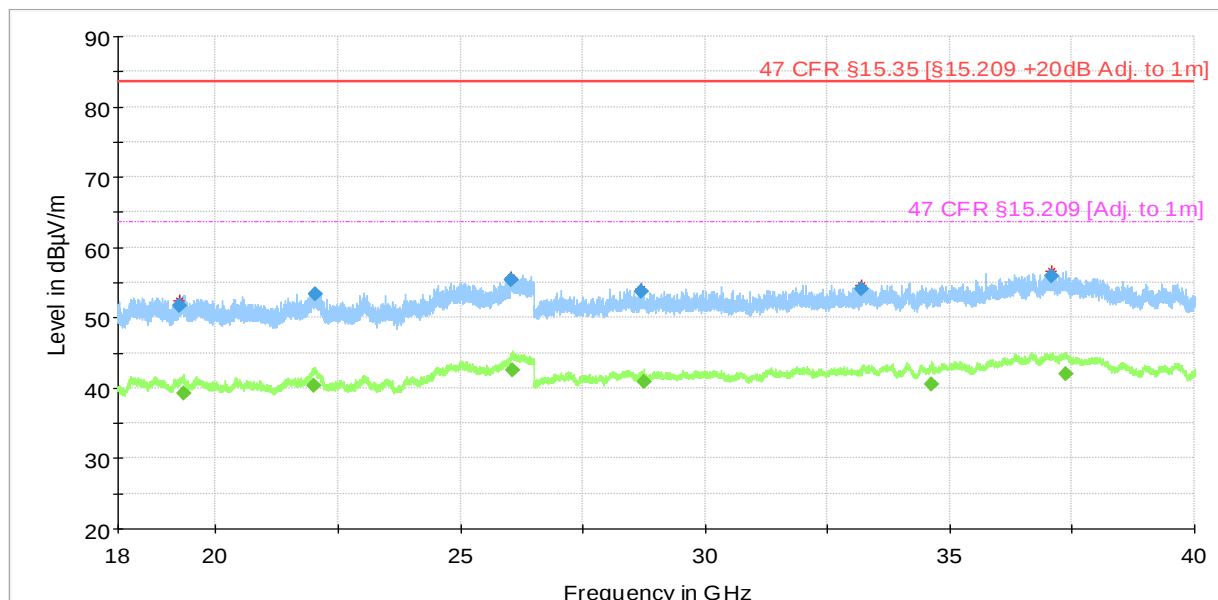


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 3m]	47 CFR §15.209 [Adj. to 3m]
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1577.617000	---	30.16	53.98	23.82	1000.0	1000.000	102.0	V	202.0
2399.978500	---	48.61	53.98	5.37	1000.0	1000.000	160.0	H	144.0
2399.988500	58.83	---	73.98	15.15	1000.0	1000.000	170.0	H	144.0
2483.843000	52.05	---	73.98	21.93	1000.0	1000.000	175.0	H	252.0
3824.188000	---	39.27	53.98	14.71	1000.0	1000.000	175.0	H	248.0
3898.224000	51.76	---	73.98	22.21	1000.0	1000.000	128.0	V	158.0
5975.125000	---	44.21	53.98	9.77	1000.0	1000.000	175.0	V	144.0
5991.085000	56.79	---	73.98	17.19	1000.0	1000.000	175.0	H	11.0
7207.246000	---	38.25	53.98	15.73	1000.0	1000.000	175.0	H	162.0
10995.734000	45.71	---	73.98	28.27	1000.0	1000.000	125.0	V	26.0
17931.936000	53.11	---	73.98	20.87	1000.0	1000.000	185.0	H	162.0
17994.748000	---	40.76	53.98	13.22	1000.0	1000.000	100.0	V	86.0

Low Channel: 18 GHz – 40 GHz

Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18GHz – 40GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	

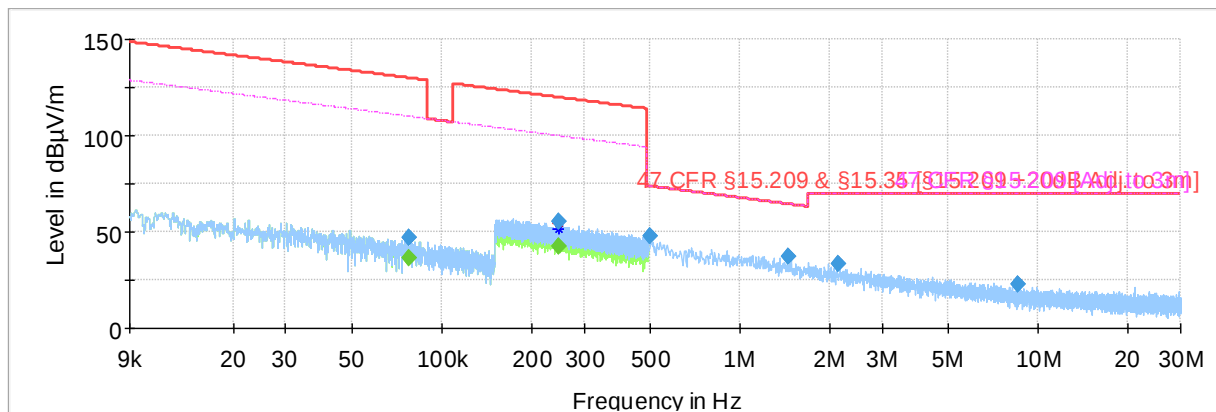


—◆ Preview Result 2-AVG
—◆ Preview Result 1-PK+
* Critical_Freqs AVG
—◆ Critical_Freqs PK+
— 47 CFR §15.35 [§15.209 +20dB Adj. to 1m]
— 47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+
◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19254.514000	51.69	---	83.52	31.83	1000.0	1000.000	155.0	V	96.0
19351.095000	---	39.26	63.52	24.26	1000.0	1000.000	155.0	V	232.0
22003.261000	---	40.27	63.52	23.25	1000.0	1000.000	155.0	V	338.0
22035.085000	53.29	---	83.52	30.23	1000.0	1000.000	155.0	H	6.0
26038.047000	55.38	---	83.52	28.14	1000.0	1000.000	155.0	H	246.0
26054.351000	---	42.45	63.52	21.07	1000.0	1000.000	155.0	V	322.0
28685.939000	53.75	---	83.52	29.77	1000.0	1000.000	155.0	V	278.0
28745.399000	---	40.81	63.52	22.71	1000.0	1000.000	155.0	V	158.0
33204.029000	54.07	---	83.52	29.46	1000.0	1000.000	155.0	H	38.0
34620.694000	---	40.54	63.52	22.98	1000.0	1000.000	155.0	H	8.0
37082.319000	55.97	---	83.52	27.55	1000.0	1000.000	155.0	V	158.0
37358.556000	---	41.90	63.52	21.62	1000.0	1000.000	155.0	H	26.0

Mid Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Axis

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Parallel to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	

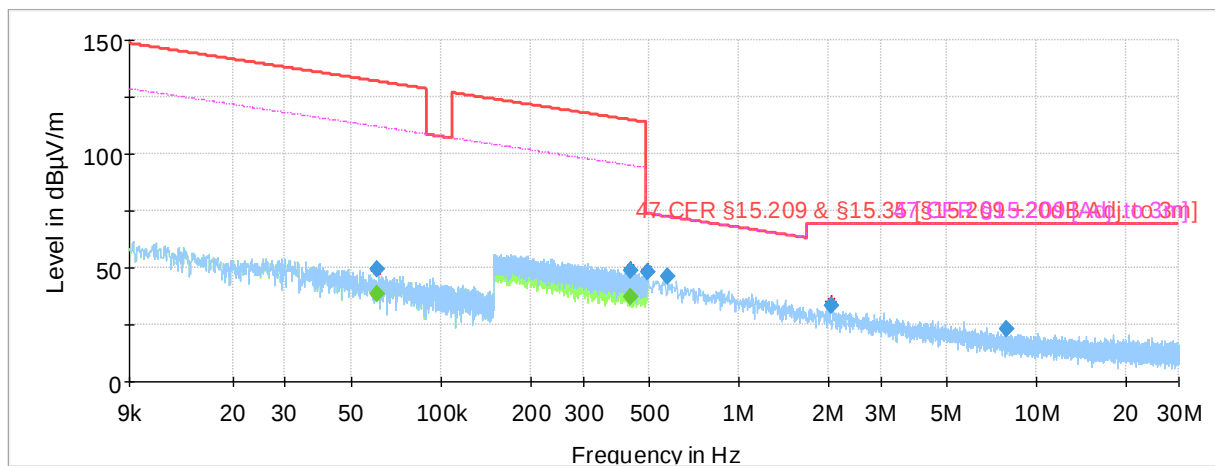


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG
- × MaxPeak-PK+ (Single)
- + Average-AVG (Single)
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.078200	---	36.25	109.74	73.49	1000.0	0.200	100.0	H	64.0
0.078200	47.07	---	129.74	82.67	1000.0	0.200	100.0	H	64.0
0.246349	---	42.29	99.77	57.49	1000.0	9.000	100.0	H	49.0
0.246349	55.12	---	119.77	64.65	1000.0	9.000	100.0	H	49.0
0.502308	47.55	---	73.59	26.04	1000.0	9.000	100.0	H	167.0
1.451411	36.92	---	64.40	27.48	1000.0	9.000	100.0	H	-45.0
2.137495	33.09	---	69.50	36.41	1000.0	9.000	100.0	H	244.0
8.595218	22.98	---	69.50	46.52	1000.0	9.000	100.0	H	115.0

Mid Channel: 9 kHz – 30 MHz: Measuring Antenna Perpendicular to Axis

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Perpendicular to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	

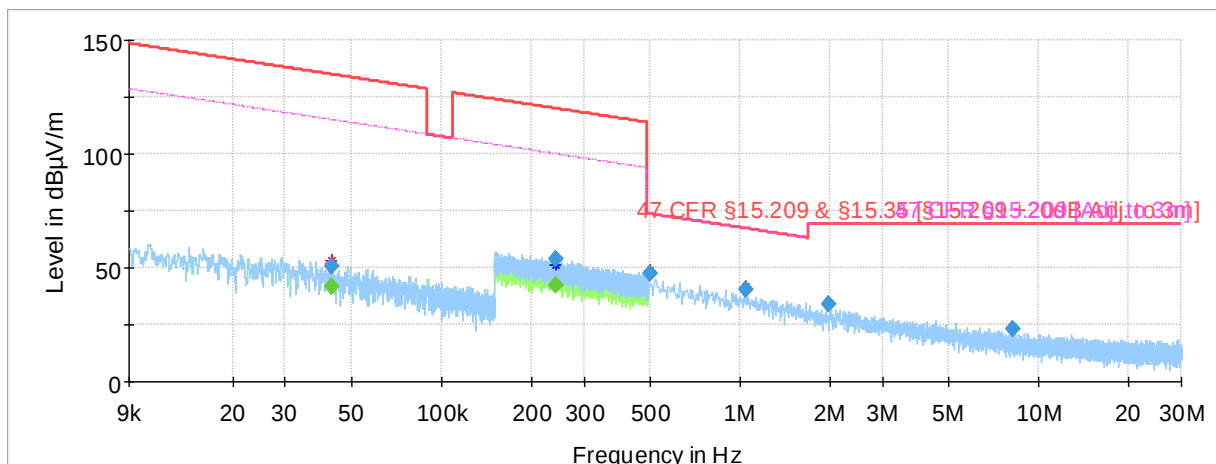


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.061043	49.35	---	131.89	82.54	1000.0	0.200	100.0	H	256.0
0.061043	---	38.35	111.89	73.54	1000.0	0.200	100.0	H	256.0
0.433562	---	37.30	94.86	57.57	1000.0	9.000	100.0	H	282.0
0.433562	48.62	---	114.86	66.24	1000.0	9.000	100.0	H	282.0
0.497116	47.98	---	73.68	25.70	1000.0	9.000	100.0	H	179.0
0.578571	46.12	---	72.36	26.24	1000.0	9.000	100.0	H	225.0
2.043750	33.62	---	69.50	35.88	1000.0	9.000	100.0	H	102.0
7.896934	23.16	---	69.50	46.34	1000.0	9.000	100.0	H	294.0

Mid Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Floor

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Parallel to Floor	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.31
Chamber details	Chamber: SAC 5	

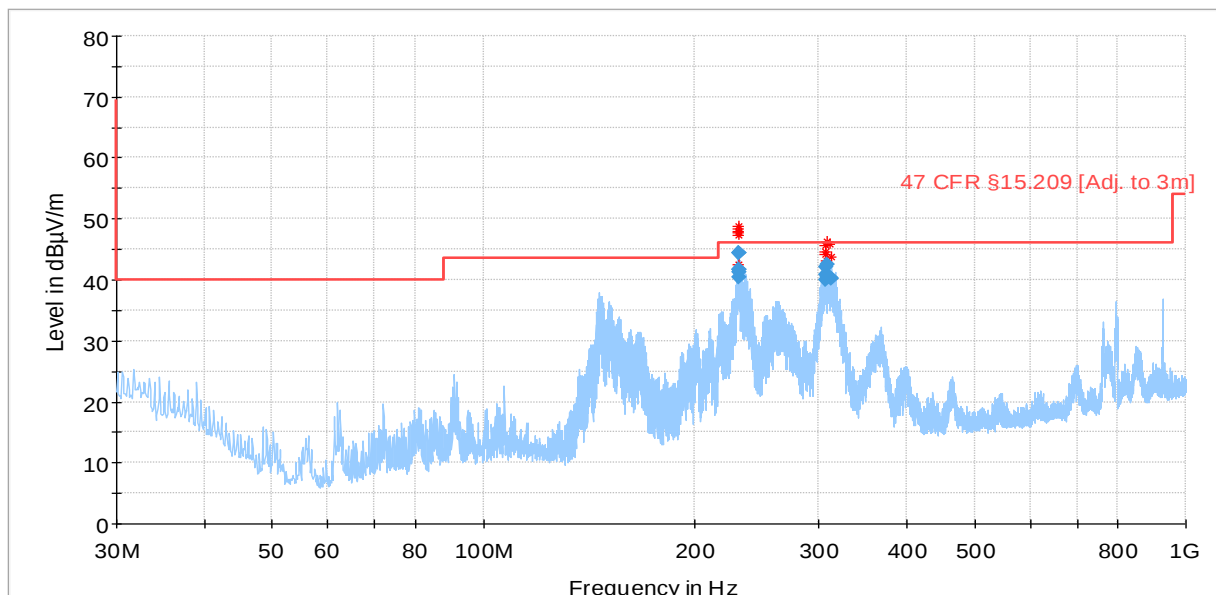


- Preview Result 2-AVG
- Preview Result 1-PK+
- Critical_Freqs AVG
- Critical_Freqs PK+
- Critical_Freqs AVG
- Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- Final_Result PK+
- Final_Result AVG
- Final_Result PK+
- Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.042775	50.55	---	134.98	84.43	1000.0	0.200	100.0	H	183.0
0.042775	---	41.59	114.98	73.40	1000.0	0.200	100.0	H	183.0
0.243084	53.82	---	119.89	66.07	1000.0	9.000	100.0	H	45.0
0.243084	---	42.49	99.89	57.40	1000.0	9.000	100.0	H	45.0
0.502011	47.49	---	73.59	26.10	1000.0	9.000	100.0	H	45.0
1.040808	40.57	---	67.28	26.71	1000.0	9.000	100.0	H	315.0
1.976103	33.80	---	69.50	35.70	1000.0	9.000	100.0	H	88.0
8.210415	22.93	---	69.50	46.57	1000.0	9.000	100.0	H	26.0

Mid Channel: 30 MHz – 1 GHz

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30MHz – 1GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Sam Ebadeh	Date: 2023.03.17
Chamber details	Chamber: SAC 5	

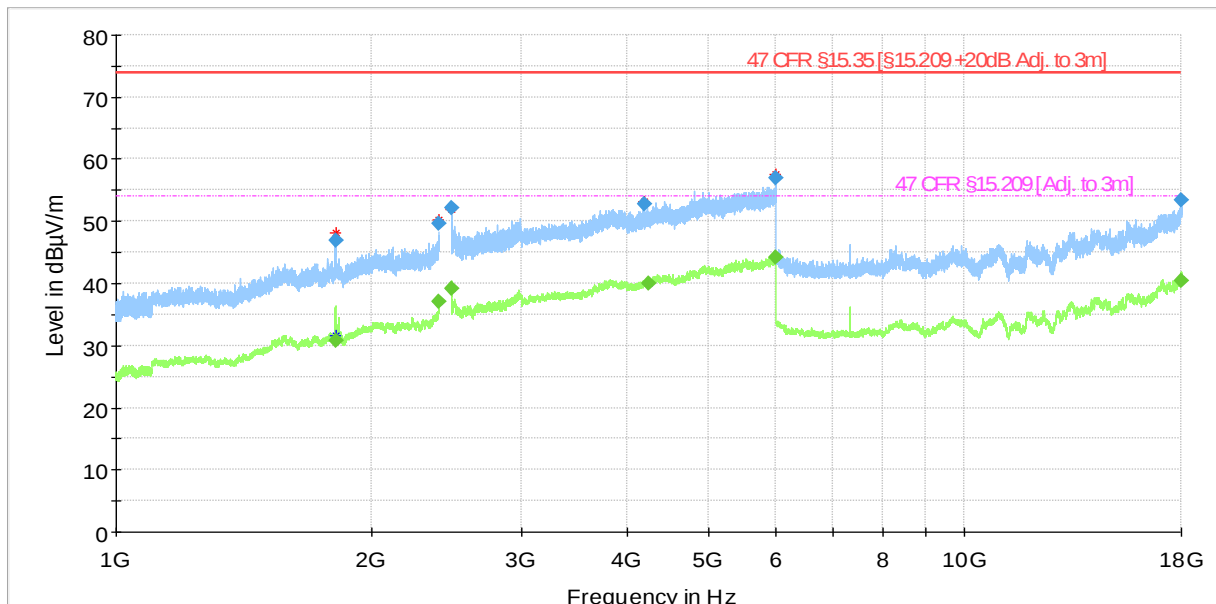


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.209 [Adj. to 3m]	◆ Final_Result QPK
◆ Final_Result AVG	

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
230.392040	40.48	46.02	5.54	1000.0	120.000	175.0	H	87.0
230.978960	41.67	46.02	4.35	1000.0	120.000	175.0	H	87.0
230.985920	44.32	46.02	1.70	1000.0	120.000	125.0	H	72.0
230.997080	41.25	46.02	4.77	1000.0	120.000	175.0	H	72.0
230.997400	41.64	46.02	4.38	1000.0	120.000	175.0	H	87.0
231.048600	44.38	46.02	1.64	1000.0	120.000	179.0	H	112.0
306.855640	40.77	46.02	5.25	1000.0	120.000	175.0	H	72.0
306.949520	39.97	46.02	6.05	1000.0	120.000	125.0	H	86.0
307.502800	42.14	46.02	3.88	1000.0	120.000	129.0	H	110.0
307.963440	40.38	46.02	5.64	1000.0	120.000	125.0	H	68.0
308.008320	42.47	46.02	3.55	1000.0	120.000	125.0	H	102.0
311.397000	40.44	46.02	5.58	1000.0	120.000	129.0	H	99.0
312.480200	40.12	46.02	5.90	1000.0	120.000	157.0	H	68.0

Mid Channel: 1 GHz – 18 GHz

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1GHz – 18GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.20
Chamber details	Chamber: SAC 5	

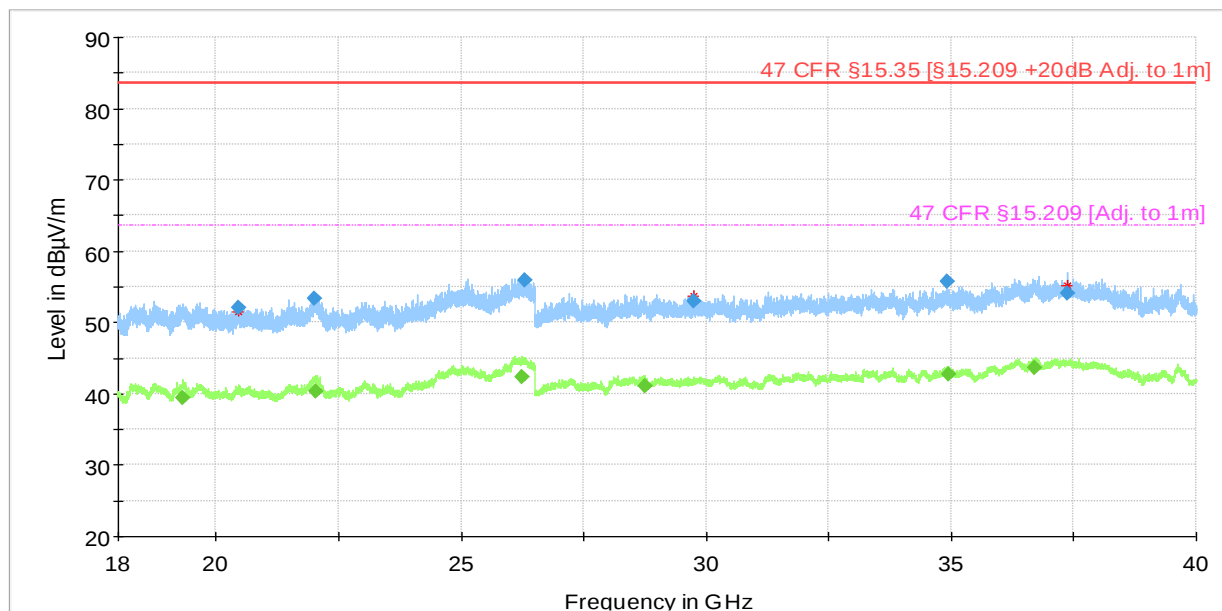


	Preview Result 2-AVG		Preview Result 1-PK+
	Critical_Freqs AVG		Critical_Freqs PK+
	47 CFR §15.35 [§15.209 +20dB Adj. to 3m]		47 CFR §15.209 [Adj. to 3m]
	Final_Result PK+		Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1812.585000	---	30.69	53.98	23.29	1000.0	1000.000	137.0	H	202.0
1812.808000	46.98	---	73.98	27.00	1000.0	1000.000	137.0	H	158.0
2399.992000	49.73	---	73.98	24.25	1000.0	1000.000	121.0	H	-18.0
2399.999000	---	37.04	53.98	16.93	1000.0	1000.000	125.0	V	202.0
2483.525258	---	39.12	53.98	14.86	1000.0	1000.000	112.0	V	22.0
2483.571446	52.10	---	73.98	21.87	1000.0	1000.000	177.0	V	112.0
4199.238000	52.75	---	73.98	21.23	1000.0	1000.000	102.0	V	292.0
4239.977000	---	39.90	53.98	14.08	1000.0	1000.000	197.0	V	290.0
5982.462000	---	44.13	53.98	9.85	1000.0	1000.000	111.0	H	206.0
5990.423000	56.93	---	73.98	17.05	1000.0	1000.000	175.0	V	158.0
17986.215000	53.43	---	73.98	20.55	1000.0	1000.000	110.0	V	72.0
17989.935000	---	40.51	53.98	13.47	1000.0	1000.000	175.0	V	116.0

Mid Channel: 18 GHz – 40 GHz

Test mode condition	Bluetooth Low Energy LE_2M Mid Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18GHz – 40GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	

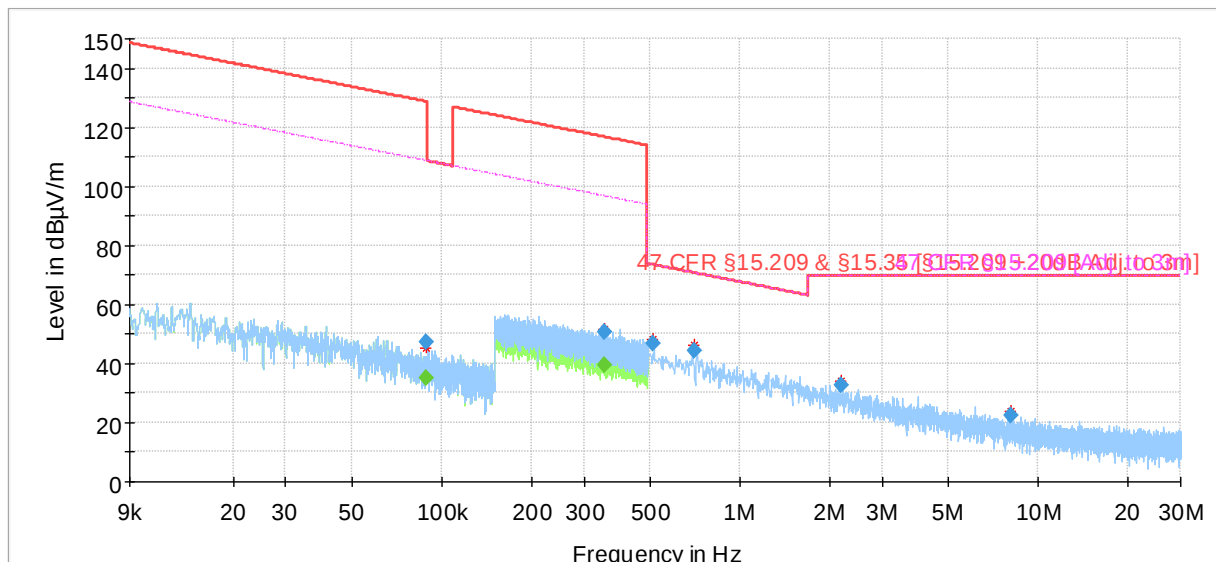


— Preview Result 2-AVG	— Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
— 47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	— 47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19307.988000	---	39.47	63.52	24.05	1000.0	1000.000	155.0	H	132.0
20465.643000	52.01	---	83.52	31.51	1000.0	1000.000	155.0	H	186.0
22014.288000	53.37	---	83.52	30.15	1000.0	1000.000	155.0	H	8.0
22041.892000	---	40.34	63.52	23.18	1000.0	1000.000	155.0	V	22.0
26239.301000	---	42.30	63.52	21.23	1000.0	1000.000	155.0	V	158.0
26283.335000	55.89	---	83.52	27.63	1000.0	1000.000	155.0	V	352.0
28750.830000	---	41.01	63.52	22.51	1000.0	1000.000	155.0	H	98.0
29747.147000	52.89	---	83.52	30.63	1000.0	1000.000	155.0	H	248.0
34920.543000	55.67	---	83.52	27.85	1000.0	1000.000	155.0	H	128.0
34931.537000	---	42.67	63.52	20.85	1000.0	1000.000	155.0	V	156.0
36713.094000	---	43.72	63.52	19.80	1000.0	1000.000	155.0	H	316.0
37358.189000	54.11	---	83.52	29.42	1000.0	1000.000	155.0	H	-4.0

High Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Axis

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Parallel to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	

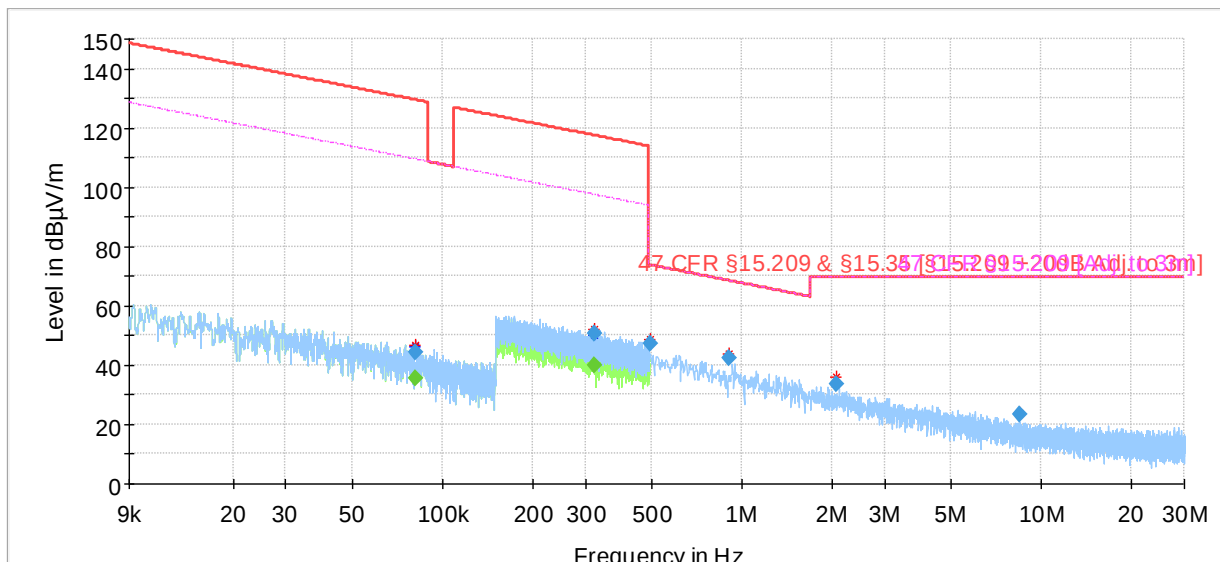


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.088677	---	35.30	108.65	73.35	1000.0	0.200	100.0	H	-41.0
0.088677	47.28	---	128.65	81.37	1000.0	0.200	100.0	H	-41.0
0.352460	---	39.22	96.66	57.44	1000.0	9.000	100.0	H	45.0
0.352460	50.50	---	116.66	66.16	1000.0	9.000	100.0	H	45.0
0.513135	46.64	---	73.40	26.76	1000.0	9.000	100.0	H	135.0
0.705455	44.40	---	70.64	26.25	1000.0	9.000	100.0	H	218.0
2.190474	32.56	---	69.50	36.94	1000.0	9.000	100.0	H	179.0
8.138415	22.52	---	69.50	46.98	1000.0	9.000	100.0	H	307.0

High Channel: 9 kHz – 30 MHz: Measuring Antenna Perpendicular to Axis

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Perpendicular to Axis	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	

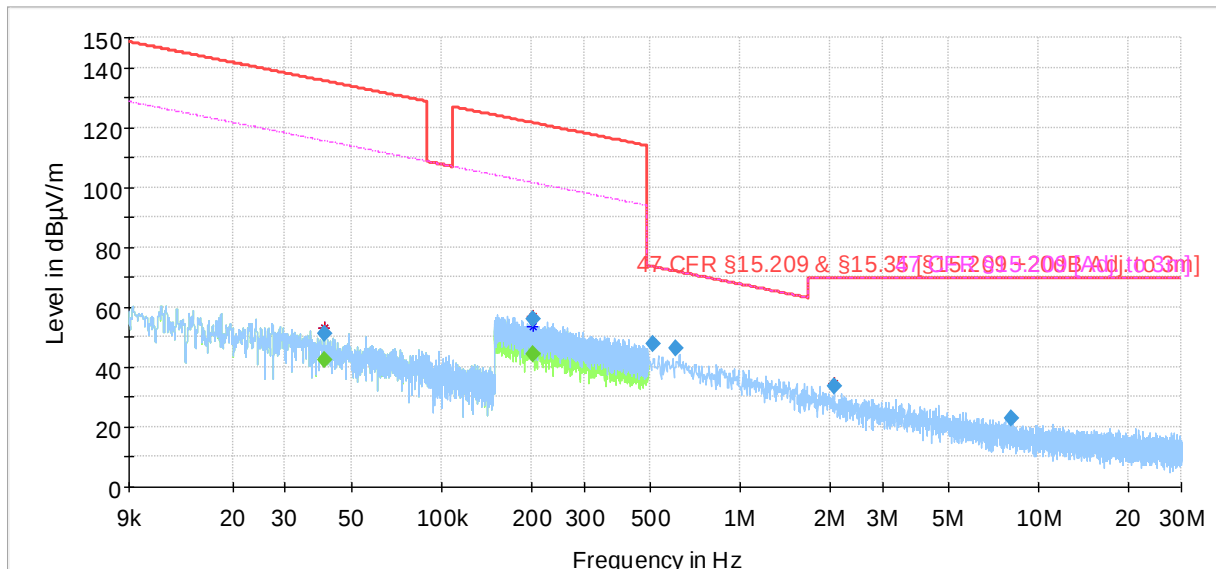


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.081547	---	35.46	109.38	73.92	1000.0	0.200	100.0	H	115.0
0.081547	44.32	---	129.38	85.05	1000.0	0.200	100.0	H	115.0
0.322865	---	39.87	97.42	57.55	1000.0	9.000	100.0	H	66.0
0.322865	50.71	---	117.42	66.71	1000.0	9.000	100.0	H	66.0
0.494311	47.43	---	73.72	26.29	1000.0	9.000	100.0	H	127.0
0.907631	42.52	---	68.46	25.94	1000.0	9.000	100.0	H	225.0
2.076796	33.69	---	69.50	35.81	1000.0	9.000	100.0	H	114.0
8.474111	23.21	---	69.50	46.29	1000.0	9.000	100.0	H	298.0

High Channel: 9 kHz – 30 MHz: Measuring Antenna Parallel to Floor

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Parallel to Floor	
Sweep frequency	9KHz – 30MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	

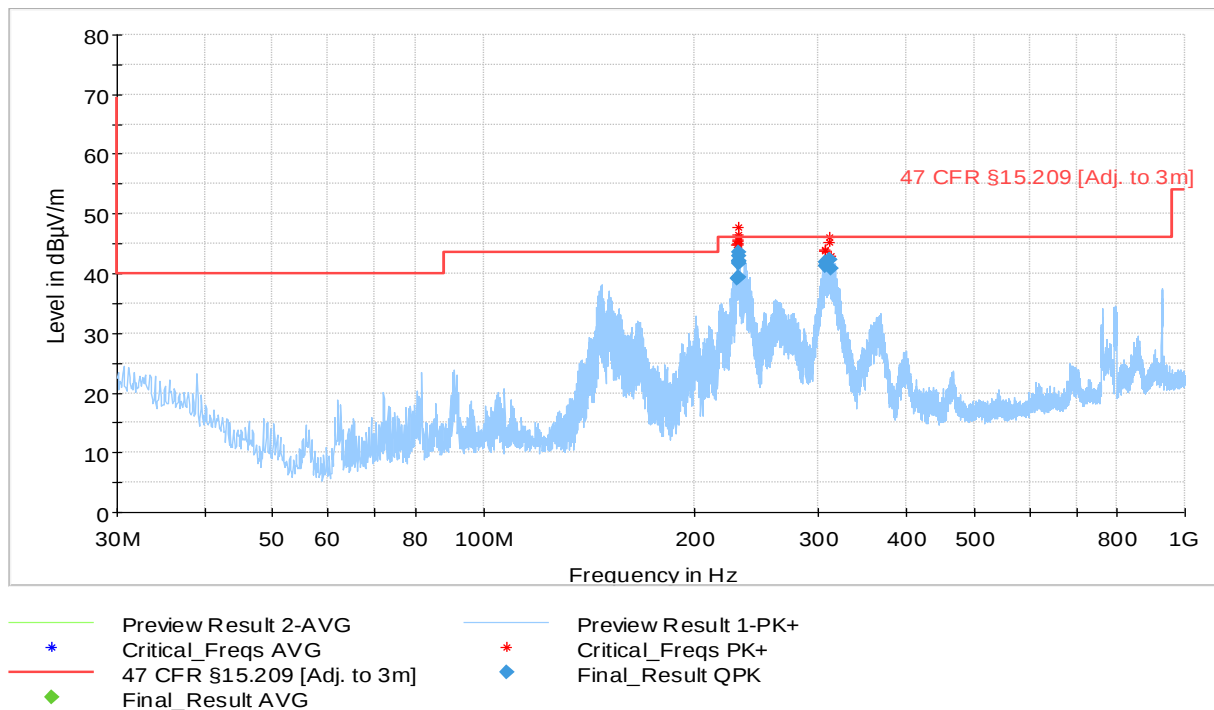


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.040779	50.97	---	135.40	84.42	1000.0	0.200	100.0	H	229.0
0.040779	---	42.42	115.40	72.98	1000.0	0.200	100.0	H	229.0
0.202140	55.77	---	121.49	65.72	1000.0	9.000	100.0	H	281.0
0.202140	---	44.41	101.49	57.08	1000.0	9.000	100.0	H	281.0
0.512254	47.55	---	73.42	25.86	1000.0	9.000	100.0	H	45.0
0.610544	46.08	---	71.90	25.82	1000.0	9.000	100.0	H	64.0
2.075123	33.38	---	69.50	36.12	1000.0	9.000	100.0	H	45.0
8.061335	22.73	---	69.50	46.77	1000.0	9.000	100.0	H	135.0

High Channel: 30 MHz – 1 GHz

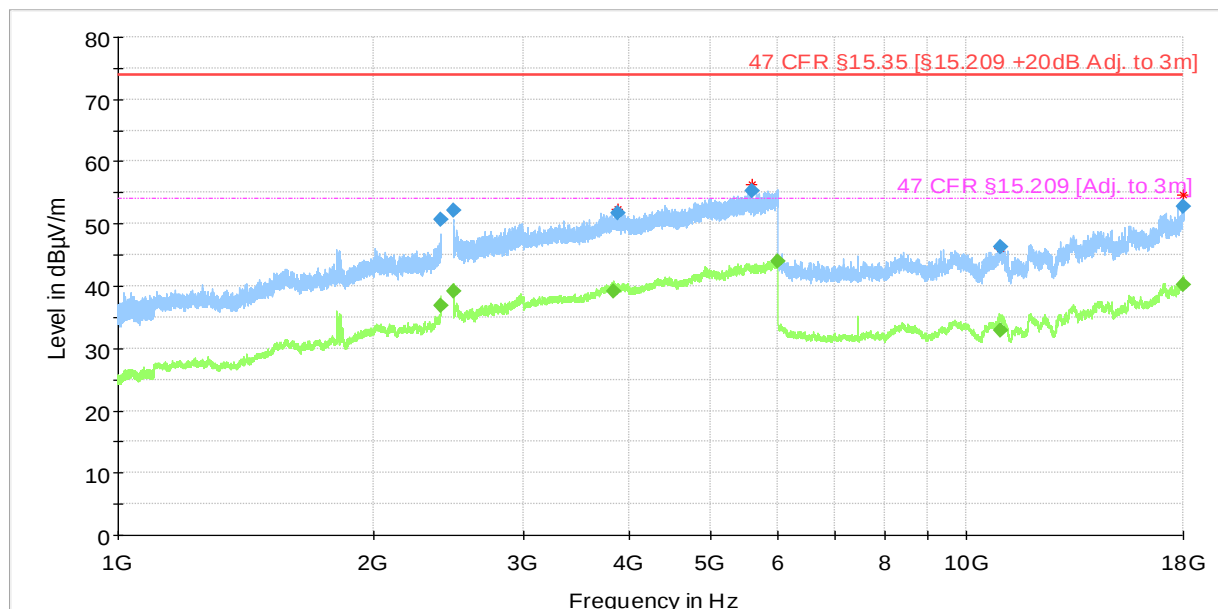
Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30MHz – 1GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Sam Ebadeh	Date: 2023.03.17
Chamber details	Chamber: SAC 5	



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
229.909800	39.17	46.02	6.85	1000.0	120.000	175.0	H	252.0
230.410680	41.78	46.02	4.24	1000.0	120.000	175.0	H	252.0
230.451000	43.57	46.02	2.45	1000.0	120.000	179.0	H	112.0
230.969280	42.84	46.02	3.18	1000.0	120.000	208.0	H	68.0
230.974640	42.08	46.02	3.94	1000.0	120.000	175.0	H	248.0
230.985800	42.13	46.02	3.89	1000.0	120.000	100.0	H	279.0
231.042040	39.37	46.02	6.65	1000.0	120.000	225.0	H	267.0
231.042320	41.58	46.02	4.44	1000.0	120.000	175.0	H	267.0
306.218360	41.23	46.02	4.79	1000.0	120.000	125.0	H	99.0
307.517000	41.98	46.02	4.04	1000.0	120.000	100.0	H	99.0
311.889680	42.29	46.02	3.73	1000.0	120.000	100.0	H	87.0
311.920640	42.35	46.02	3.67	1000.0	120.000	100.0	H	110.0
313.092000	40.89	46.02	5.13	1000.0	120.000	125.0	H	99.0

High Channel: 1 GHz – 18 GHz

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1GHz – 18GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.17
Chamber details	Chamber: SAC 5	

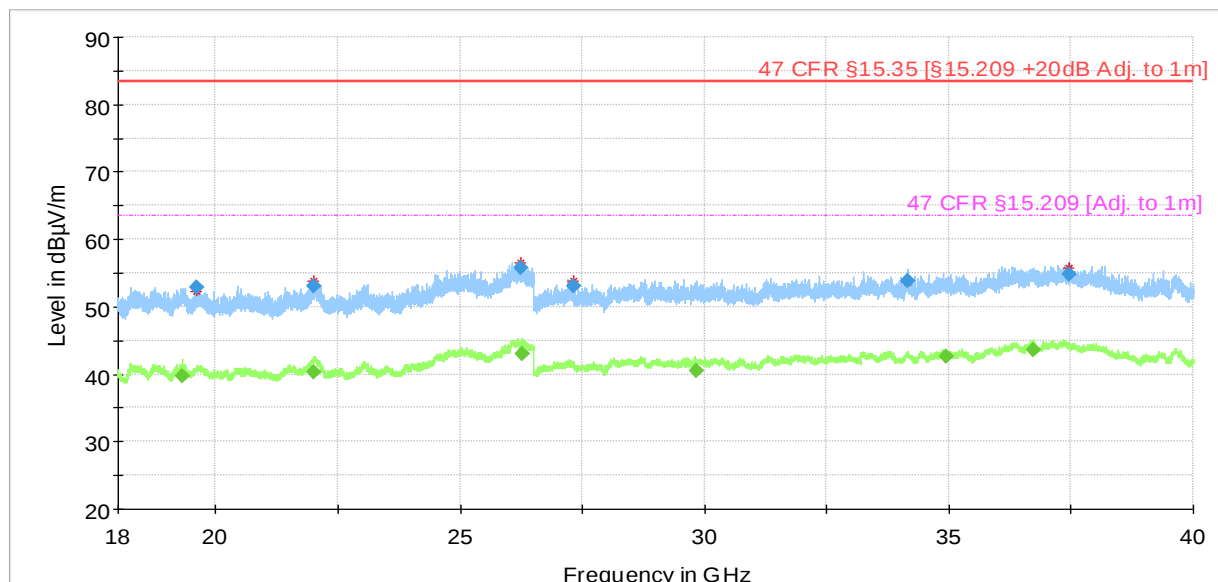


—	Preview Result 2-AVG	—	Preview Result 1-PK+
*	Critical_Freqs AVG	*	Critical_Freqs PK+
—	47 CFR §15.35 [§15.209 +20dB Adj. to 3m]	—	47 CFR §15.209 [Adj. to 3m]
◆	Final_Result PK+	◆	Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2399.934500	---	36.77	53.98	17.21	1000.0	1000.000	100.0	V	42.0
2399.971596	50.74	---	73.98	23.24	1000.0	1000.000	125.0	H	54.0
2483.503536	---	39.18	53.98	14.80	1000.0	1000.000	125.0	H	290.0
2483.680849	52.17	---	73.98	21.81	1000.0	1000.000	125.0	V	88.0
3833.598000	---	39.13	53.98	14.85	1000.0	1000.000	177.0	V	110.0
3881.549000	51.74	---	73.98	22.24	1000.0	1000.000	121.0	H	42.0
5583.144000	55.38	---	73.98	18.60	1000.0	1000.000	160.0	V	112.0
5980.815000	---	44.04	53.98	9.94	1000.0	1000.000	199.0	V	20.0
10942.175000	---	32.98	53.98	21.00	1000.0	1000.000	170.0	V	26.0
10966.720000	46.24	---	73.98	27.74	1000.0	1000.000	210.0	V	248.0
17993.481000	---	40.20	53.98	13.78	1000.0	1000.000	170.0	H	176.0
17996.752140	52.86	---	73.98	21.12	1000.0	1000.000	210.0	H	68.0

High Channel: 18 GHz – 40 GHz

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18GHz – 40GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.30
Chamber details	Chamber: SAC 5	



Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
— 47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	— 47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+	◆ Final_Result AVG
× MaxPeak-PK+ (Single)	+ Average-AVG (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19313.648000	---	39.64	63.52	23.88	1000.0	1000.000	155.0	V	52.0
19605.949000	52.94	---	83.52	30.59	1000.0	1000.000	155.0	V	162.0
22004.380000	---	40.21	63.52	23.31	1000.0	1000.000	155.0	H	22.0
22016.632000	53.10	---	83.52	30.42	1000.0	1000.000	155.0	H	142.0
26245.279000	55.86	---	83.52	27.66	1000.0	1000.000	155.0	V	248.0
26271.274000	---	43.04	63.52	20.48	1000.0	1000.000	155.0	V	112.0
27324.412000	53.15	---	83.52	30.37	1000.0	1000.000	155.0	H	156.0
29820.484000	---	40.41	63.52	23.12	1000.0	1000.000	155.0	H	-8.0
34163.857000	53.89	---	83.52	29.63	1000.0	1000.000	155.0	H	52.0
34935.891000	---	42.67	63.52	20.85	1000.0	1000.000	155.0	V	232.0
36722.923000	---	43.63	63.52	19.89	1000.0	1000.000	155.0	V	292.0
37449.566000	54.86	---	83.52	28.66	1000.0	1000.000	155.0	V	142.0

4.3 Test Results – Antenna Conducted Emissions

4.3.1 Antenna Conducted Emissions – Test Summary

Emissions measurements have been performed as radiated test (see section 4.2)

4.4 Test Results – Band Edge Compliance (Authorized Band)

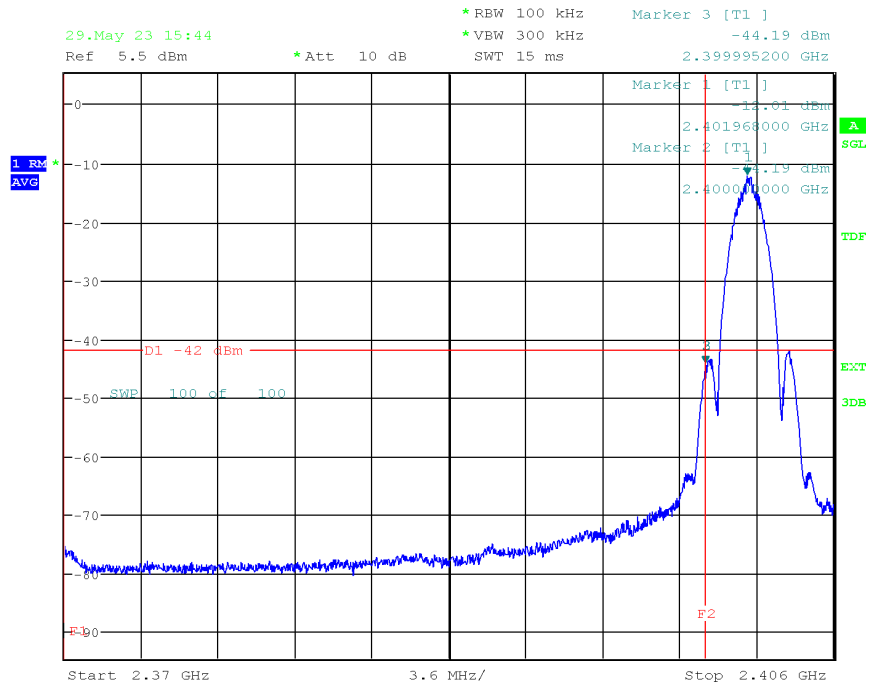
4.4.1 Band Edge Compliance (Authorized Band) – Test Summary

Test Specification	47 CFR 15.247 (d)			
Test Engineer & Date	Niall Forrester		2023.05.29	
EUT and Ancillary Equipment IDs	A003435986-006		N/A	
EUT Operation Mode(s)	BT Tx – DTM			
EUT Wireless Configuration(s)	Bluetooth Low Energy – see below for details			
EUT Hardware Configuration(s)	N/A			
Overall Result	PASS			

Test Parameter	Wireless Configuration	Measured Level (dBm)	Limit (dBm)	Result
Peak Emissions at Band Edge (Auth. Band – Low Edge)	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402 MHz)	-48.21	-20.71	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402 MHz)	-63.75	-38.49	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	-37.14	-21.23	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	-44.19	-42.01	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	Bluetooth Low Energy LE_1M High Channel (GFSK 2480 MHz)	-54.93	-20.88	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	Bluetooth Low Energy LE_1M High Channel (GFSK 2480 MHz)	-70.00	-38.54	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	-54.78	-21.29	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	-66.60	-41.68	PASS

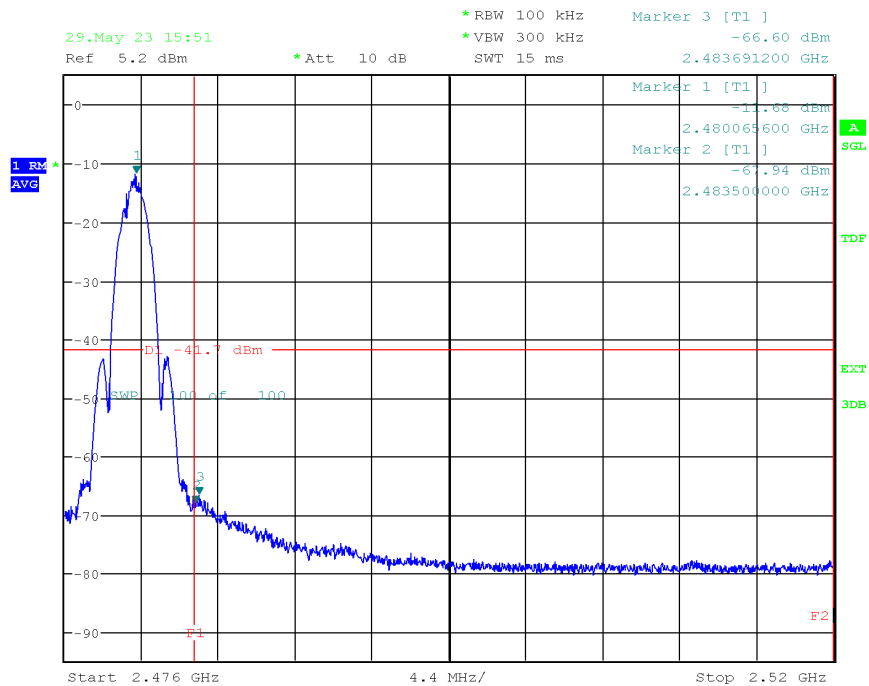
4.4.2 Band Edge Compliance (Authorized Band) – Test Details (Worst Case Plots)

Low Channel, LE_2M, Average



Date: 29.MAY.2023 15:44:54

High Channel, LE_2M, Average



Date: 29.MAY.2023 15:51:54

4.5 Test Results – Band Edge Compliance (Restricted Band)

4.5.1 Band Edge Compliance (Restricted Band) – Test Summary

Test Specification	47 CFR 15.209 & 15.247 (d)	
Test Engineer & Date	Niall Forrester	2023.03.23
EUT and Ancillary Equipment IDs	A003435986-004	A003435986-001 A003435986-002
EUT Operation Mode(s)	BT Tx - Continuous	
EUT Wireless Configuration(s)	Bluetooth Low Energy LE_2M – see below for details	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

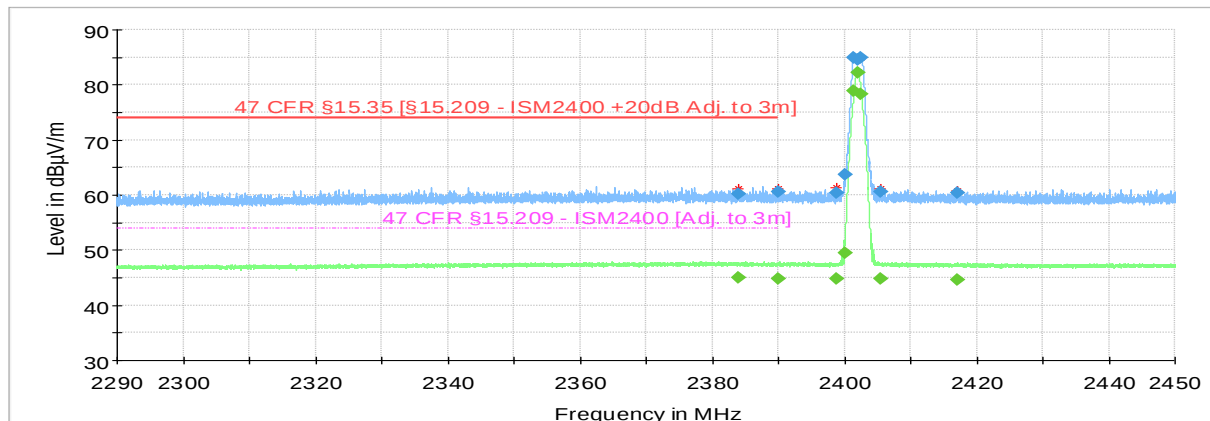
Test Parameter	Wireless Configuration	Result*
Emissions at Band Edge (Rest. Band – Low Edge)	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	PASS
Emissions at Band Edge (Rest. Band – High Edge)	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	PASS

* For detailed measurements, see tables and graphs in sections below

4.5.2 Band Edge Compliance (Restricted Band) – Test Details

Restricted Band – Low Edge - Low Channel

Test mode condition	Bluetooth Low Energy LE_2M Low Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.23
Chamber details	Chamber: SAC 5	

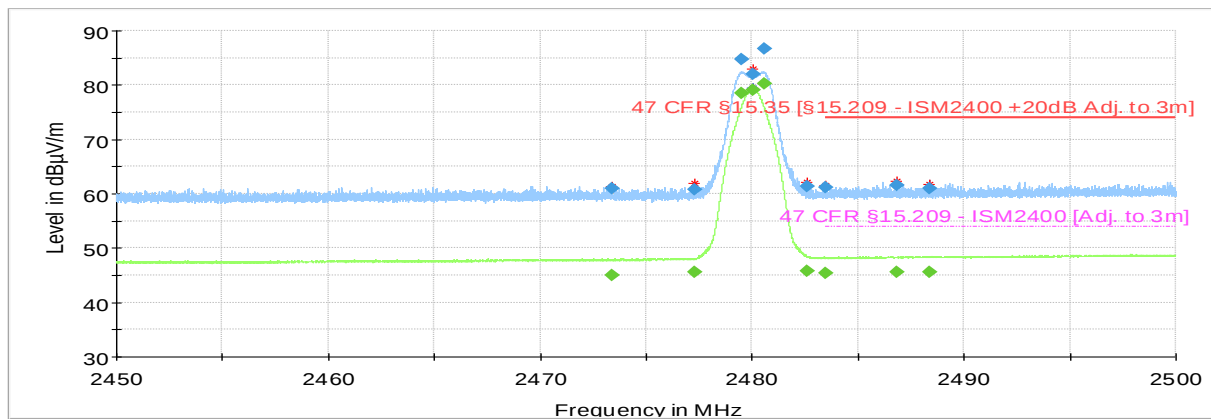


- Existing (2)-AVG
- Existing (1)-PK+
- Critical_Freqs AVG
- Critical_Freqs PK+
- 47 CFR §15.35 [§15.209 - ISM2400 +20dB Adj. to 3m]
- 47 CFR §15.209 - ISM2400 [Adj. to 3m]
- Final_Result PK+
- Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2383.968000	60.26	---	73.98	13.72	1000.0	1000.000	143.0	H	122.0
2383.968000	---	44.93	53.98	9.05	1000.0	1000.000	143.0	H	122.0
2390.000000	---	44.86	53.98	9.12	1000.0	1000.000	175.0	H	326.0
2390.000000	60.60	---	73.98	13.37	1000.0	1000.000	175.0	H	326.0
2398.896000	60.31	---	---	---	1000.0	1000.000	125.0	V	152.0
2398.896000	---	44.85	---	---	1000.0	1000.000	125.0	V	152.0
2400.000000	---	49.42	---	---	1000.0	1000.000	125.0	H	-7.0
2400.000000	63.61	---	---	---	1000.0	1000.000	125.0	H	-7.0
2401.504000	84.91	---	---	---	1000.0	1000.000	193.0	H	131.0
2401.504000	---	78.90	---	---	1000.0	1000.000	193.0	H	131.0
2402.000000	84.60	---	---	---	1000.0	1000.000	193.0	H	137.0
2402.000000	---	82.13	---	---	1000.0	1000.000	193.0	H	137.0
2402.528000	84.89	---	---	---	1000.0	1000.000	193.0	H	131.0
2402.528000	---	78.28	---	---	1000.0	1000.000	193.0	H	131.0
2405.424000	---	44.90	---	---	1000.0	1000.000	125.0	H	86.0
2405.424000	60.59	---	---	---	1000.0	1000.000	125.0	H	86.0
2416.992000	60.33	---	---	---	1000.0	1000.000	125.0	V	220.0
2416.992000	---	44.66	---	---	1000.0	1000.000	125.0	V	220.0

Restricted Band – High Edge - High Channel

Test mode condition	Bluetooth Low Energy LE_2M High Channel	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003435986-004	
Ancillary Equipment	A003435986-001, A003435986-002	
Test Engineer	Niall Forrester	Date: 2023.03.23
Chamber details	Chamber: SAC 5	



- Preview Result 2-AVG
- Preview Result 1-PK+
- Critical_Freqs AVG
- Critical_Freqs PK+
- 47 CFR §15.35 [§15.209 - ISM2400 +20dB Adj. to 3m]
- 47 CFR §15.209 - ISM2400 [Adj. to 3m]
- Final_Result PK+
- Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2473.405000	60.98	---	---	---	1000.0	1000.000	180.0	H	36.0
2473.405000	---	45.01	---	---	1000.0	1000.000	180.0	H	36.0
2477.305000	60.74	---	---	---	1000.0	1000.000	116.0	H	122.0
2477.305000	---	45.50	---	---	1000.0	1000.000	116.0	H	122.0
2479.515000	---	78.45	---	---	1000.0	1000.000	204.0	V	140.0
2479.515000	84.67	---	---	---	1000.0	1000.000	204.0	V	140.0
2480.020000	---	79.09	---	---	1000.0	1000.000	139.0	V	133.0
2480.020000	81.97	---	---	---	1000.0	1000.000	139.0	V	133.0
2480.545000	---	80.32	---	---	1000.0	1000.000	204.0	V	74.0
2480.545000	86.68	---	---	---	1000.0	1000.000	204.0	V	74.0
2482.615000	61.29	---	---	---	1000.0	1000.000	140.0	V	151.0
2482.615000	---	45.77	---	---	1000.0	1000.000	140.0	V	151.0
2483.500000	---	45.47	53.98	8.51	1000.0	1000.000	210.0	V	169.0
2483.500000	61.26	---	73.98	12.71	1000.0	1000.000	210.0	V	169.0
2486.855000	---	45.52	53.98	8.46	1000.0	1000.000	109.0	H	190.0
2486.855000	61.54	---	73.98	12.44	1000.0	1000.000	109.0	H	190.0
2488.385000	61.00	---	73.98	12.98	1000.0	1000.000	126.0	V	189.0
2488.385000	---	45.57	53.98	8.41	1000.0	1000.000	126.0	V	189.0

4.6 Test Results – 20dB Bandwidth

4.6.1 20dB Bandwidth – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.7 Test Results – Carrier (Hopping Channel) Separation

4.7.1 Carrier (Hopping Channel) Separation – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.8 Test Results – Number of Hopping Channels

4.8.1 Number of Hopping Channels – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.9 Test Results – Time of Occupancy (Dwell Time)

4.9.1 Time of Occupancy (Dwell Time) – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.10 Test Results – 6dB & 99% Bandwidth

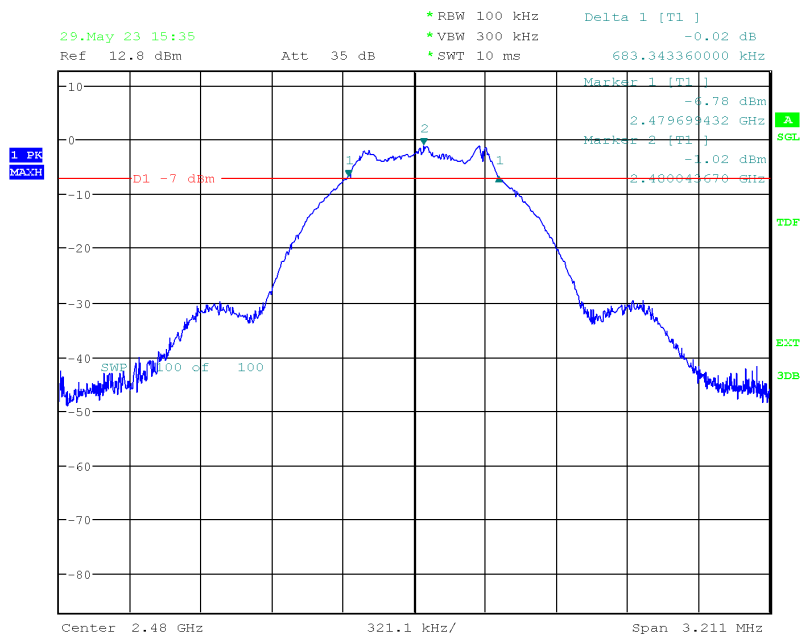
4.10.1 6dB & 99% Bandwidth – Test Summary

Test Specification		15.247 (a)(2)		
Test Engineer & Date		Niall Forrester	2023.05.29	
EUT and Ancillary Equipment IDs		A003435986-006	N/A	
EUT Operation Mode(s)		BT Tx – DTM		
EUT Wireless Configuration(s)		Bluetooth Low Energy – see below for details		
EUT Hardware Configuration(s)		N/A		
Overall Result		PASS		

Test Parameter	Wireless Configuration	Measured Level (kHz)	Limit (kHz)	Result
6dB Bandwidth	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402 MHz)	687.45	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402 MHz)	1052.93	-	Info Only
6dB Bandwidth	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	1129.10	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	2055.98	-	Info Only
6dB Bandwidth	Bluetooth Low Energy LE_1M Mid Channel (GFSK 2440 MHz)	684.88	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_1M Mid Channel (GFSK 2440 MHz)	1050.36	-	Info Only
6dB Bandwidth	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	1130.42	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	2058.31	-	Info Only
6dB Bandwidth	Bluetooth Low Energy LE_1M High Channel (GFSK 2480 MHz)	683.34	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_1M High Channel (GFSK 2480 MHz)	1050.64	-	Info Only
6dB Bandwidth	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	1133.06	>500	PASS
99% Bandwidth	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	2048.47	-	Info Only

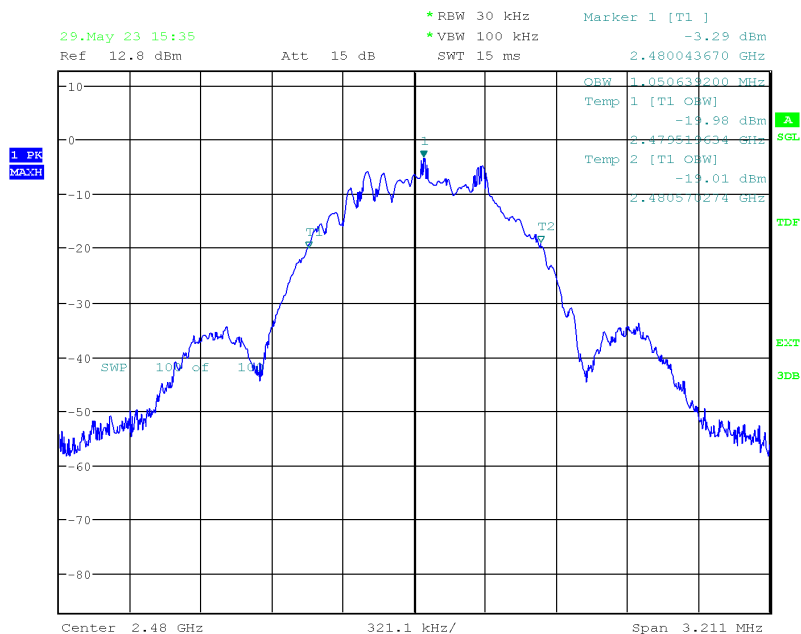
4.10.2 6dB & 99% Bandwidth – Test Details (Worst case plots)

High Channel, LE_1M, 6dB Bandwidth



Date: 29.MAY.2023 15:35:30

High Channel, LE_1M, 99% Bandwidth



Date: 29.MAY.2023 15:35:54

4.11 Test Results – Peak Conducted Output Power

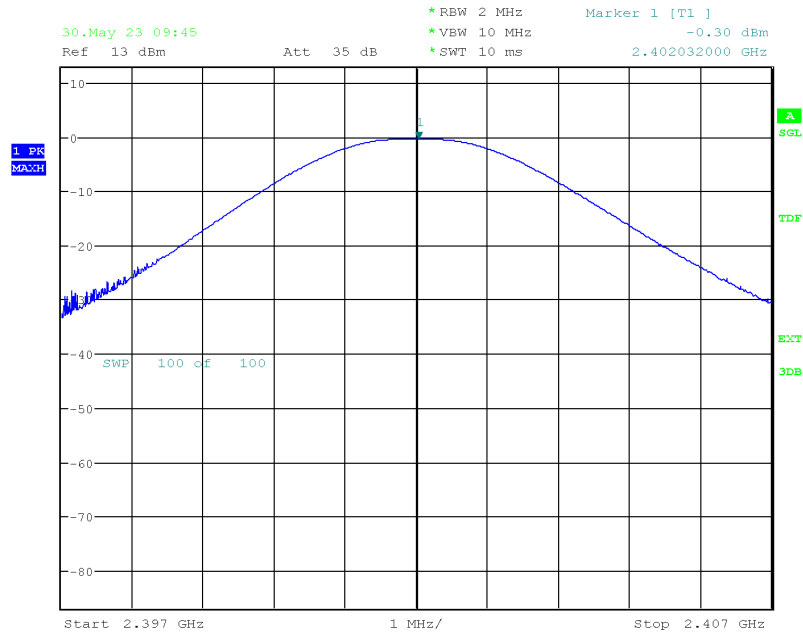
4.11.1 Peak Conducted Output Power – Test Summary

Test Specification	15.247 (b)				
Test Engineer & Date	Niall Forrester			2023.05.30	
EUT and Ancillary Equipment IDs	A003435986-006			N/A	
EUT Operation Mode(s)	BT Tx – DTM				
EUT Wireless Configuration(s)	Bluetooth Low Energy – see below for details				
EUT Hardware Configuration(s)	N/A				
Overall Result	PASS				

Test Parameter	Wireless Configuration	Measured Level (dBm)			Limit (dBm)	Result
		Low 5.0V	Nom 24.0V	High 28.0V		
Peak Conducted Output Power	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402 MHz)	-0.30	-0.32	-0.34	> -20 < 30	PASS
Peak Conducted Output Power	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402 MHz)	-0.30	-0.32	-0.34	> -20 < 30	PASS
Peak Conducted Output Power	Bluetooth Low Energy LE_1M Mid Channel (GFSK 2440 MHz)	-0.38	-0.40	-0.43	> -20 < 30	PASS
Peak Conducted Output Power	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440 MHz)	-0.40	-0.43	-0.44	> -20 < 30	PASS
Peak Conducted Output Power	Bluetooth Low Energy LE_1M High Channel (GFSK 2480 MHz)	-0.59	-0.60	-0.60	> -20 < 30	PASS
Peak Conducted Output Power	Bluetooth Low Energy LE_2M High Channel (GFSK 2480 MHz)	-0.53	-0.55	-0.60	> -20 < 30	PASS

4.11.2 Peak Conducted Output Power – Test Details (Worst case plot)

Low Channel, LE_1M, Low Voltage



Date: 30.MAY.2023 09:45:14

4.12 Test Results – Power Spectral Density

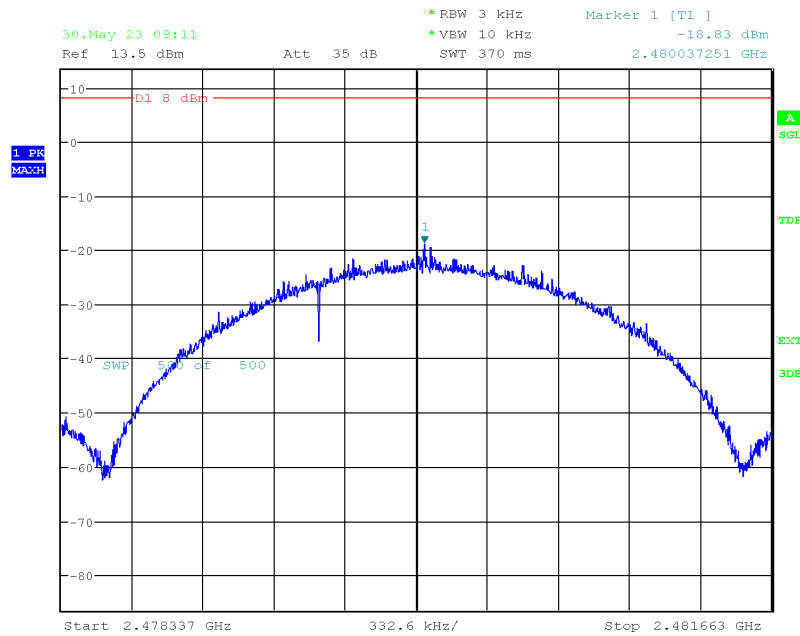
4.12.1 Power Spectral Density – Test Summary

Test Specification		15.247 (e)			
Test Engineer & Date		Niall Forrester		2023.05.30	
EUT and Ancillary Equipment IDs		A003435986-006		N/A	
EUT Operation Mode(s)		BT Tx – DTM			
EUT Wireless Configuration(s)		Bluetooth Low Energy – see below for details			
EUT Hardware Configuration(s)		N/A			
Overall Result		PASS			

Test Parameter	Wireless Configuration	Measured (dBm/3kHz)	Low Limit (dBm/3kHz)	High Limit (dBm/3kHz)	Result
Power Density	Bluetooth Low Energy LE_1M Low Channel (GFSK 2402	-16.45	-30	8	PASS
Power Density	Bluetooth Low Energy LE_2M Low Channel (GFSK 2402	-18.41	-30	8	PASS
Power Density	Bluetooth Low Energy LE_1M Mid Channel (GFSK 2440	-16.58	-30	8	PASS
Power Density	Bluetooth Low Energy LE_2M Mid Channel (GFSK 2440	-18.59	-30	8	PASS
Power Density	Bluetooth Low Energy LE_1M High Channel (GFSK 2480	-16.87	-30	8	PASS
Power Density	Bluetooth Low Energy LE_2M High Channel (GFSK 2480	-18.83	-30	8	PASS

4.12.1 Power Spectral Density – Test Details (Example plot)

High Channel, LE_2M



Date: 30.MAY.2023 09:11:14

5. TEST EQUIPMENT STATUS

5.1 List of Hardware with Calibration Dates

5.1.1 Hardware List – CTE System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
Comprehensive Testing Environment	TÜV Rheinland LGA Products	HWE 6000	00139	N/A	N/A
Bluetooth Signaling Unit	Rohde & Schwarz	CMW500	163750 2711468	2022.07.18	2023.07.18
Spectrum Analyzer	Rohde & Schwarz	FSU26	100308 2704108	2022.07.13	2023.07.13
Vector Signal Generator	Rohde & Schwarz	SMU200A	101584 2704111	2022.09.08	2023.09.08
Power Supply	Keithley	2303	1198722 2717714	2022.08.22	2023.08.22
Multimeter	Keithley	2700	1035251 2704115	2022.07.06	2023.07.06
Average Power Sensor	Rohde & Schwarz	NRP-Z31	102145 2704104	2022.07.14	2023.07.14
Temperature Chamber	Vötsch	VT4002	58566081940010 2717693	N/A	N/A
Single Input Thermometer	Fluke	Fluke-51-2	41410362WS 2807523	2022.07.02	2023.07.02
Temperature probe	Fluke	80PK-1	WPL26041802 2807528	2022.07.02	2023.07.02
Digital Multimeter	Fluke	87	61320241 2744110	2022.07.05	2023.07.05
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.1.2 Hardware List – Conducted Emissions System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
Two-Line V-network	Rohde & Schwarz	ENV216	101090 2704076	2023.07.03	2024.07.03
Test Receiver 9KHz to 3.5 GHz	Rohde & Schwarz	ESR3	101674 2704016	2023.06.29	2024.06.29
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.1.3 Hardware List – SAC5 System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESW44	101760 2881044	2022.07.21	2023.07.21
Ultra Broadband Antenna	Rohde & Schwarz	HL562E	100988 2823181	2021.07.26	2023.07.26
Double Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF907	102678 2823164	2021.07.26	2023.07.26
Horn Antenna	ETS Lindgren	UG-596A/U	20898 2814839	2022.07.26	2024.07.26
Horn Antenna – 40 GHz	ETS Lindgren	UG-600A/U	20623 2814834	2022.07.26	2024.07.26
Control Device	Maturo	NCD	NCD/393/2372.01 2884216	N/A	N/A
Open Switch & Control Unit	Rohde & Schwarz	OSP150	100081 2884198	2022.08.01	2023.08.01
Open Switch & Control Unit	Rohde & Schwarz	OSP120	100084 2761253	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 1	101333 2761265	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 2	101335 2761266	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Base Unit	101330 2761262	2022.08.01	2023.08.01
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.2 Software / Firmware Versions

Equipment	Software / Firmware Name	Version
Comprehensive Testing Environment (CTE)	CTE – TMF CTE – BT	V51.0 V44.0
Conducted Emissions System	EMC 32	V10.60.20
SAC 5	EMC 32	V10.60.20

6. MEASUREMENT UNCERTAINTY

6.1 Measurement Uncertainty for CTE

Parameter	Uncertainty (Coverage Factor k=2)
Maximum Output Power (15.247b)	±0.51 dB
6dB / 20dB Channel Bandwidth & 99% Occupied bandwidth (15.247a)	<5%
Carrier Frequency Separation (15.247a)	N/A
Number of Hopping Channels (15.247a)	N/A
Time of Occupancy – Dwell Time (15.247a)	N/A
Band Edge Compliance of Conducted Emissions (15.247a)	±1.04 dB
Conducted Spurious Emissions (15.247d)	±2.98 dB
Power Spectral Density (15.247e)	±0.51 dB

6.2 Measurement Uncertainty for Conducted Emissions

Parameter	Uncertainty (Coverage Factor k=2)
Conducted emissions with LISN 150KHz to 30 MHz	2.98 dB

6.3 Measurement Uncertainty for SAC 5 (Radiated Emissions & Band Edge)

Parameter	Uncertainty (Coverage Factor k=2)
Field Strength 10 Hz -9 kHz	3.38 dB
Field Strength 9 kHz -30 MHz	3.38 dB
Field Strength 30 MHz -1000 MHz	3.38 dB
Field Strength 1 GHz -18 GHz	4.88 dB
Field Strength 18 GHz - 40 GHz	5.14 dB

7. PHOTOGRAPHS

See Appendix 1 for photographs