



Solutions

TEST REPORT

Test Report No.: UL-RPT-RP-14978163-116-FCC-BLE

Applicant * : Robert Bosch GmbH
Model No. * : CTP3NA
FCC ID * : 2AUXS-CTP3NA
Technology * : Bluetooth – Low Energy
Test Standard(s) : **FCC Parts 15.209(a) & 15.247**

For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. Test Report Version 1.0
5. Result of the tested sample: **PASS**
6. All information marked with a (*) were provided by customer / applicant or authorized representative

Prepared by: Muhammad Faiq Khan
Title: Project Engineer
Date: 09 November 2023

Approved by: Rachid, Acharkaoui
Title: Operations Manager
Date: 09 November 2023



Deutsche
Akkreditierungsstelle
D-PL-19381-02-00

This laboratory is accredited by DAkkS.
The tests reported herein have been performed in
accordance with its' terms of accreditation.

UL INTERNATIONAL GERMANY GMBH

Hedelfinger Str. 61
70327 Stuttgart, Germany
STU.CTECHLab@ul.com

This page has been left intentionally blank.

Table of Contents

1. Customer Information *	4
1.1. Applicant Information	4
1.2. Manufacturer Information	4
1.1. Summary of Testing	5
1.2. General Information	5
Applied FCC Rule Part(s)	5
Location	5
Date Information	5
1.3. Summary of Test Results	6
1.4. Methods and Procedures	6
1.5. Deviations from the Test Specification	6
2. Equipment Under Test (EUT)	7
2.1. Identification of Equipment Under Test (EUT) *	7
2.2. Description of EUT *	7
2.3. Modifications Incorporated in the EUT	7
2.4. Additional Information Related to Testing *	8
2.5. Support Equipment	8
A. Support Equipment (In-house)	8
B. Support Equipment (Manufacturer supplied)	8
3. Operation and Monitoring of the EUT during Testing	9
3.1. Operating Modes	9
3.2. Configuration and Peripherals	9
4. Measurements, Examinations and Derived Results	10
4.1. General Comments	10
4.2. Test Results	11
4.2.1. Transmitter Duty Cycle	11
4.2.2. Transmitter Radiated Emissions	13
4.2.3. Transmitter Band Edge Radiated Emissions	22
5. Measurement Uncertainty	26
6. Used equipment	27
7. Report Revision History	28

1. Customer Information *

1.1. Applicant Information

Company Name:	Robert Bosch GmbH
Company Address:	Robert-Bosch-Platz 1 70839 Gerlingen GERMANY
Contact Person:	Karin Silberhorn
Contact E-Mail Address:	karin.silberhorn@de.bosch.com
Contact Phone No.:	+49 5121-49-7662

1.2. Manufacturer Information

Company Name:	Robert Bosch GmbH
Company Address:	Robert-Bosch-Platz 1 70839 Gerlingen GERMANY
Contact Person:	Karin Silberhorn
Contact E-Mail Address:	karin.silberhorn@de.bosch.com
Contact Phone No.:	+49 5121-49-7662

1.1. Summary of Testing

1.2. General Information

Applied FCC Rule Part(s)

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.209

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Strasse. 61, 70327 Stuttgart, GERMANY
Registration Number:	399704

Date Information

Order Date:	19 September 2023
EUT Arrived:	20 September 2023
Test Dates:	20 September 2023 to 28 September 2023
EUT Returned:	-/-

1.3. Summary of Test Results

DIGITAL TRANSMISSION SYSTEMS (DTS): 2400-2483.5 MHz					
FCC Part 15 Clause	Compliance Test Description	Test Result			
		C	N.C.	N.P.	N.A.
15.207	Transmitter AC Power Line Conducted Emissions ⁽¹⁾	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15.35(c)	Transmitter Duty Cycle ⁽²⁾	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth ⁽³⁾	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(b)(3)	Transmitter Maximum Peak Output Power ⁽³⁾	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(e)	Transmitter Power Spectral Density ⁽³⁾	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(d) & 15.209(a)	Transmitter Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C: COMPLIED N.C.: NOT COMPLIED N.P.: NOT PERFORMED N.A.: NOT APPLICABLE					
Decision rule: If the decision rule is not included in the applied customer specification or testing standard, the binary statement for simple acceptance, as defined in ILAC G8: 2019 Section 4.2.1, is applied as the decision rule for a pass/ fail statement. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8: 2019					

Note(s):

1. The EUT is vehicular equipment and will be powered by the battery of the vehicle, therefore no AC conducted emission tests are required.
2. The measurement was performed to assist the other average measurements.
3. At the client's request, only partial testing was performed for the radiated spurious emissions and the band edge radiated emissions as the EUT is a host product that contains a pre-certified radio module (Model: ATC6NPL002C)

1.4. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB 558074 D01 DTS Meas. Guidance v05r02 April 2, 2019
Title:	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

1.5. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT) *

Brand Name:	Bosch
Model Name:	CTP3NA
Model Number:	CTP3NA Ext
Test Sample Serial Number:	1150003350
Hardware Version:	C2
Software Version:	DAIMLER_CTP3_ISTANBUL_RC2_HF2_S.010
FCC ID:	2AUXS-CTP3NA

2.2. Description of EUT *

The equipment under test was an In-Vehicle-Telematic-Unit, contains Model Name: CTP3NA, , supporting WLAN 2.4 GHz, WLAN 5 GHz, Bluetooth LE and Bluetooth BR/EDR technologies.

While testing Bluetooth LE EUT were operating in 2400-2483.5 MHz ISM band. All other supported radio technologies were either switched off or were in idle mode.

2.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

2.4. Additional Information Related to Testing *

Technology Tested:	Bluetooth – Low Energy		
FCC Equipment Classification:	Digital Transmission System (DTS)		
Type of Unit:	Transceiver		
Operating Frequency Range:	2402 MHz to 2480 MHz		
Channel Spacing:	2 MHz		
Tested Data Rate(s) & Modulation(s):	2 Mbps	GFSK	
Maximum Conducted Output Power:	0.2 dBm		
Declared Antenna Gain:	6.2 dBi		
Antenna Type:	combinatorial Antenna		
Antenna Details:	A 006 820 39 75		
Transmit Channels Tested:	Channel ID	RF Channel	Frequency(MHz)
	Bottom	0 (Note 1)	2402
	Top	39 (Note 1,2)	2480
Power Supply Requirement(s):	Nominal	12 - 24 V DC	
Highest internally generated clock and/ or oscillator frequency:	radio frequency: WiFi 5GHz: 5825 MHz internal clock frequency: 125MHz		
(Note 1) At the client’s request, only partial testing was performed for the band edge radiated emissions.			
(Note 2) At the client’s request, only partial testing was performed for the radiated spurious emissions.			

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	-/-	-/-	-/-	-/-

B. Support Equipment (Manufacturer supplied)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Laptop	Fujitsu	H770	DS1U006875

3. Operation and Monitoring of the EUT during Testing

3.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Continuously transmitting modulated carrier with combination of
 - BT-LE | 2 Mbps | PWR MAX | Channel Top | PRBS9 | ⁽¹⁾
 - BT-LE | 2 Mbps | PWR MAX | Channel Bottom / Top | PRBS9 | ⁽²⁾

⁽¹⁾ According to customer declaration the unwanted (spurious) radiated emissions measurement was performed on this mode.

⁽²⁾ According to customer declaration this mode was used for Band edge measurements.

3.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

EUT Power Supply:

- The EUT was powered with 24V DC.

Test Mode Activation:

- The EUT can be connected to the Test laptop via USB supplied by the customer.
- The test modes were activated by the terminal software "Kitty". The commands to setup the respective modes and power were defined by the customer.

Radiated Measurements:

- The worst case position was declared by the customer.
- Radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set at 100 cm.
- Radiated measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range.
- R&S® EMC32 V11.30.00 Software was used for the Radiated spurious emission measurements.

Duty Cycle Correction Details:

- As the EUT continuous transmission of the EUT ($D \geq 98\%$) can be achieved and EUT was transmitting continuously with a constant Duty Cycle of 30.16 % duty cycle (duty cycle variations are less than $\pm 2\%$). Therefore, Duty Cycle Correction Factors of 5.21 dB was added to all average measurements to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

4. Measurements, Examinations and Derived Results

4.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 *Measurement Uncertainty* for details.

In accordance with DAkkS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

4.2. Test Results

4.2.1. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Muhammad Faiq Khan	Test Date:	21 September 2023
Test Sample Serial Number:	1150003350		
Test Site Identification	SR 1/2		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 558074 Section 9.b) referencing ANSI C63.10 Section 7.5

Environmental Conditions:

Temperature (°C):	24.7
Relative Humidity (%):	45.6

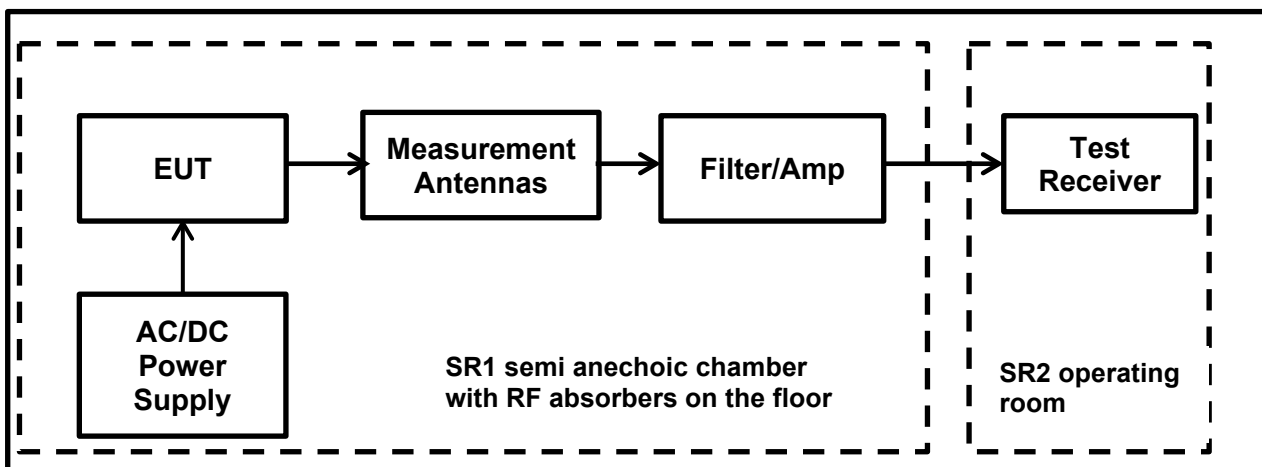
Note:

- The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

$$Duty\ Cycle\ (\%) = 100 \times [On\ Time\ (T_{ON})] / [Period(T_{ON} + T_{OFF})\ or\ 100ms\ whichever\ is\ the\ lesser]$$

$$Duty\ Cycle\ Correction\ Factor = 10 \log 1 / [On\ Time\ (T_{ON})] / [Period(T_{ON} + T_{OFF})\ or\ 100ms\ whichever\ is\ the\ lesser]$$

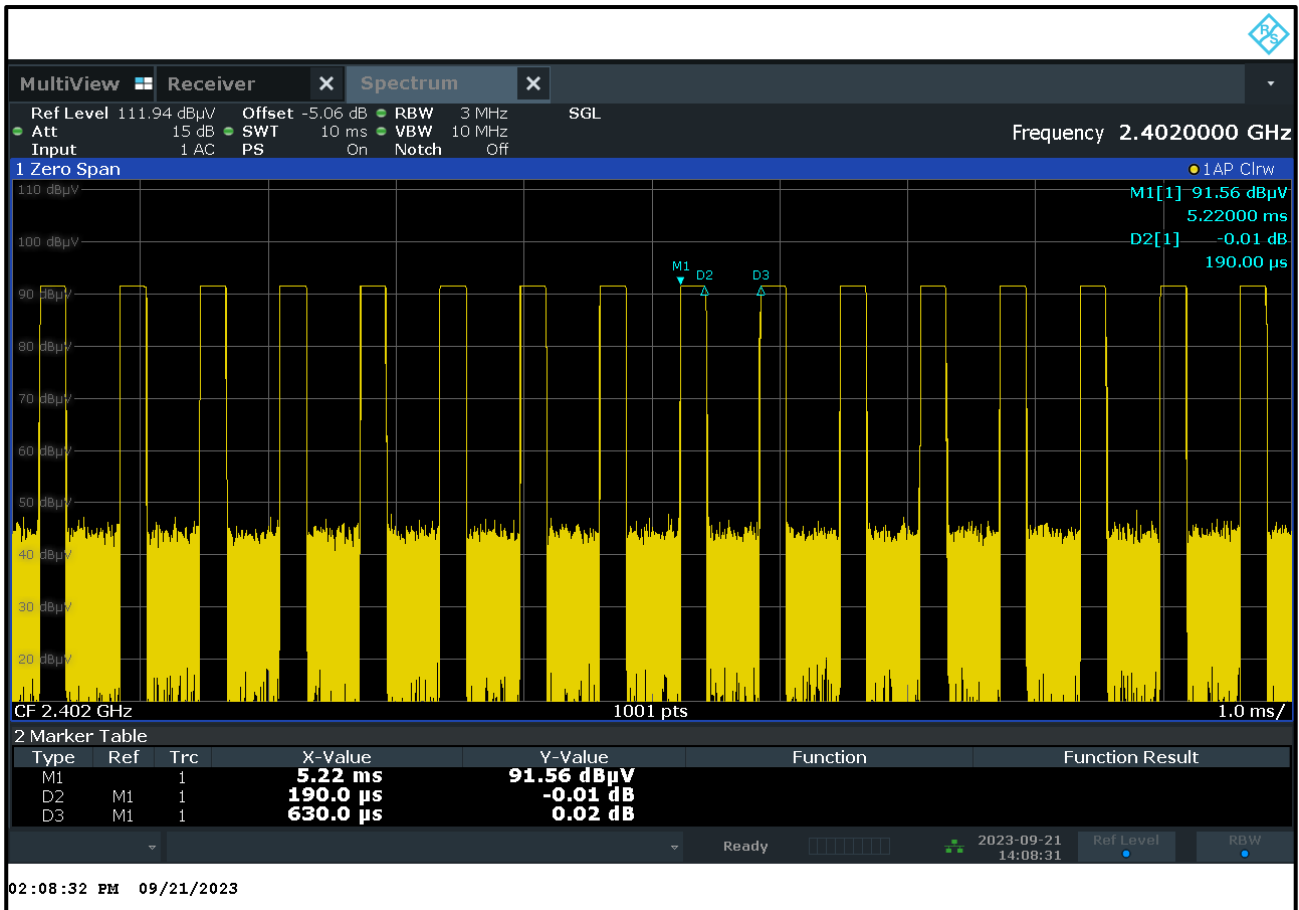
Test Setup:



Transmitter Duty Cycle (continued)

Results: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Bottom Channel

Pulse On Time (T _{ON}) (ms)	Pulse Period (T _{ON} +T _{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.190	0.630	30.16	5.21



4.2.2. Transmitter Radiated Emissions**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	26 September 2023
Test Sample Serial Number:	1150003350		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range	9 kHz to 30 MHz

Environmental Conditions:

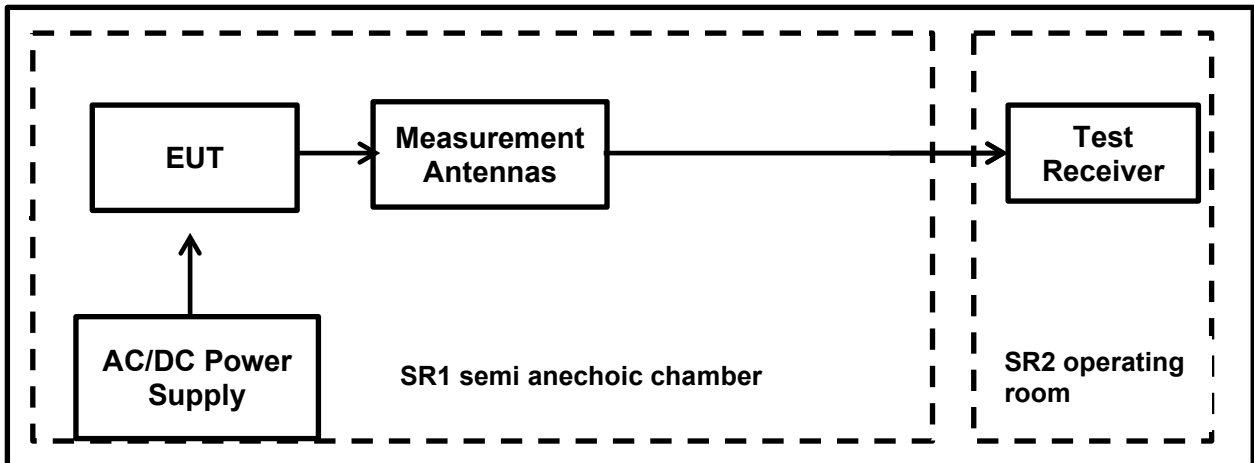
Temperature (°C):	24.5
Relative Humidity (%):	46.6

Notes:

- In accordance with FCC KDB 414788 D01 Radiated Test Site & ANSI C63.10 clause 5.2 an alternative test site that can demonstrate equivalence to an open area test site may be used. Therefore, the measurement was performed in a Semi Anechoic Chamber. (The OATS / SAC comparison data is available upon request).
- The limits are specified at a test distance of 30 and 300 metres. However, as specified in FCC Section 15.31 (f)(2) & ANSI C63.10 clause 6.4.3, measurements may be performed at a closer distance and the measured level extrapolated to the specified measurement distance using the method described in clauses 6.4.4, specifically sub-clause 6.4.4.1 which specifies that the measured level shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade. Therefore, measurements were performed at measurement distance of 3m.
- Therefore, the limit values are extrapolated to a measurement distance of 3 m.
 - 9 kHz- 490 kHz: limits extrapolated from 300 m to 3 m by adding 80 dB at 40 dB /decade.
 - 490 kHz-1705 kHz: limits extrapolated from 30 m to 3 m by adding 40 dB at 40 dB /decade.
- Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT is a floor standing device and was placed in the centre of the chamber turntable. The height of the moveable Integrated Radio module / box was adjusted to be 50 cm above the reference ground plane. The measurement loop antenna height was 100 cm.
- The EUT was configured with the following modes:
 - BT-LE | 2 Mbps | PRBS9 | PWR MAX | Top Channel |
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- All other emissions shown on the pre-scan plots were investigated and found to be below system noise floor.
- Pre-scans were performed, and markers placed on the highest measured levels. The test receiver was set to:
 - Frequency range: 9 kHz-150 kHz: RBW: 1 kHz /VBW: 3 kHz
 - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
 - Detector: Max-Peak detector
 - Trace Mode: Max Hold

Transmitter Radiated Emissions (continued)

Test Setup:

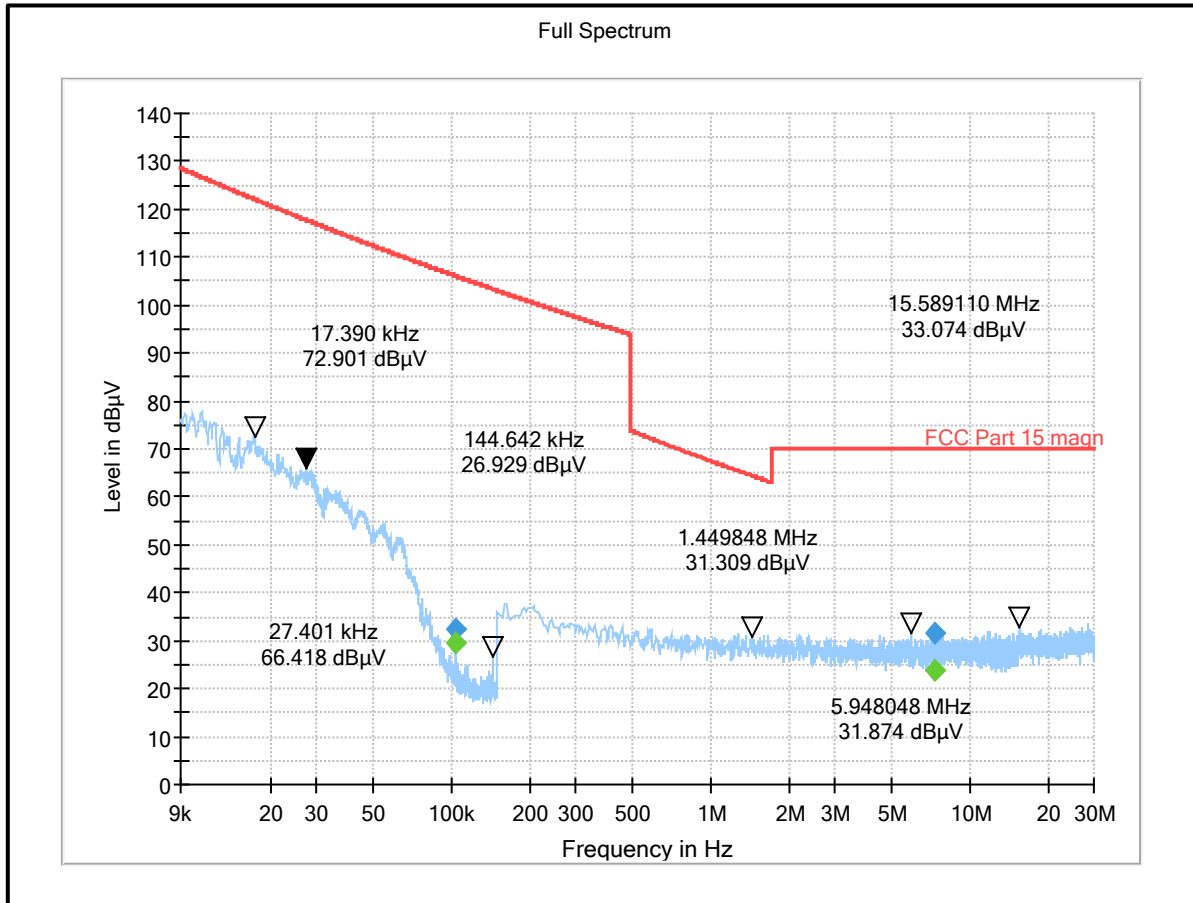


Transmitter Radiated Emissions (continued)

Results: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel

Frequency (MHz)	Loop Antenna Orientation	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
0.103964	0° to the EUT	32.20	105.98	73.78	Complied
7.258888	90° to the EUT	31.55	70.00	38.45	Complied

Plot: 9 kHz – 30 MHz: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel



Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Muhammad Faiq Khan	Test Date:	22 September 2023
Test Sample Serial Number:	1150003350		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

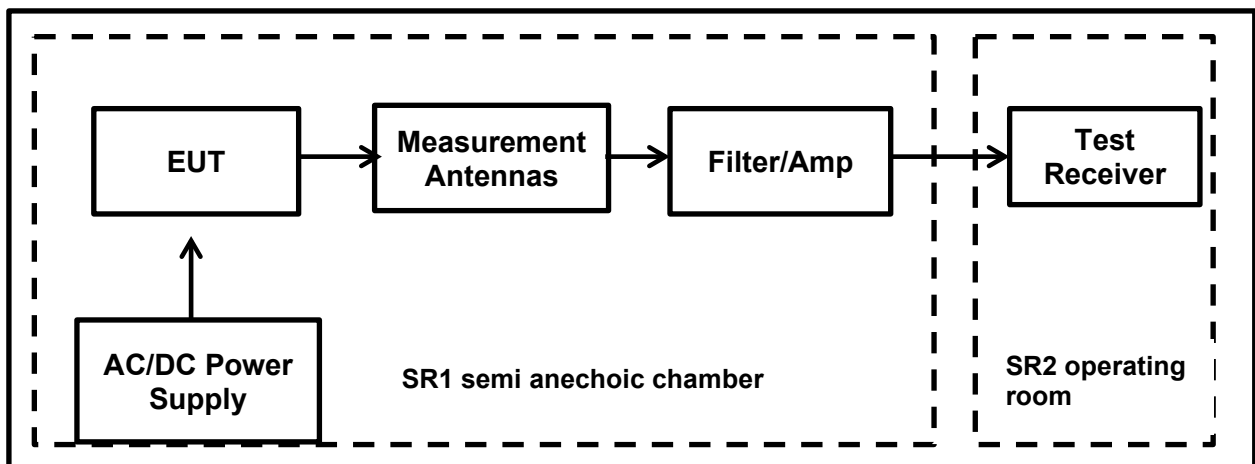
Environmental Conditions:

Temperature (°C):	23.8
Relative Humidity (%):	53.0

Note(s):

1. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 50 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
2. Pre-scans were performed, and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
3. The EUT was configured with the following modes:
 - BT-LE | 2 Mbps | PRBS9 | PWR MAX | Top Channel |
4. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
5. All other emissions shown on the pre-scan plots were investigated and found to be below system noise floor.

Test Setup:

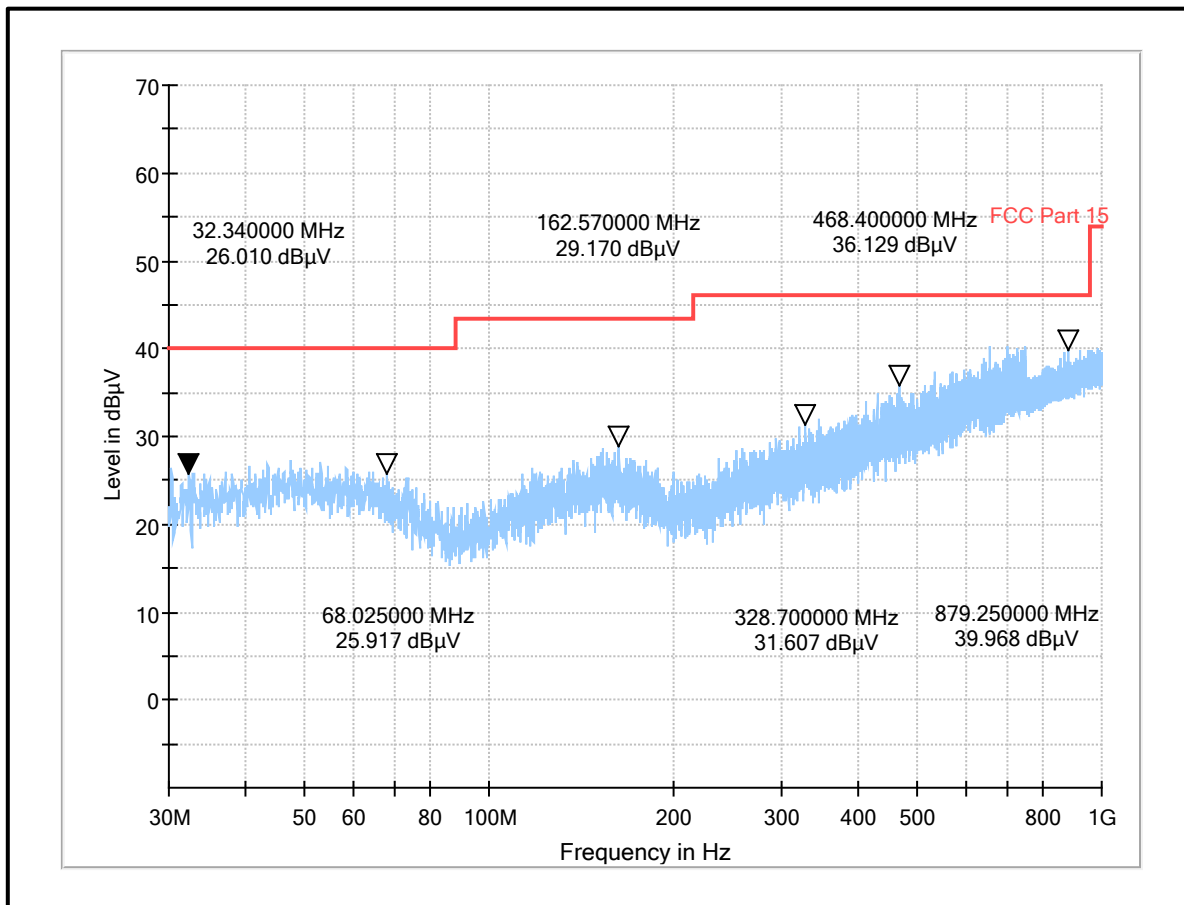


Transmitter Radiated Emissions (continued)

Results : BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
No critical spurious emissions were detected					

Plot: 30 MHz – 1 GHz: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel



Result: Pass

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	20 September 2023
Test Sample Serial Number:	1150003350		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d), 15.209(a) & 15.205(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6
Frequency Range	1 GHz to 26.5 GHz

Environmental Conditions:

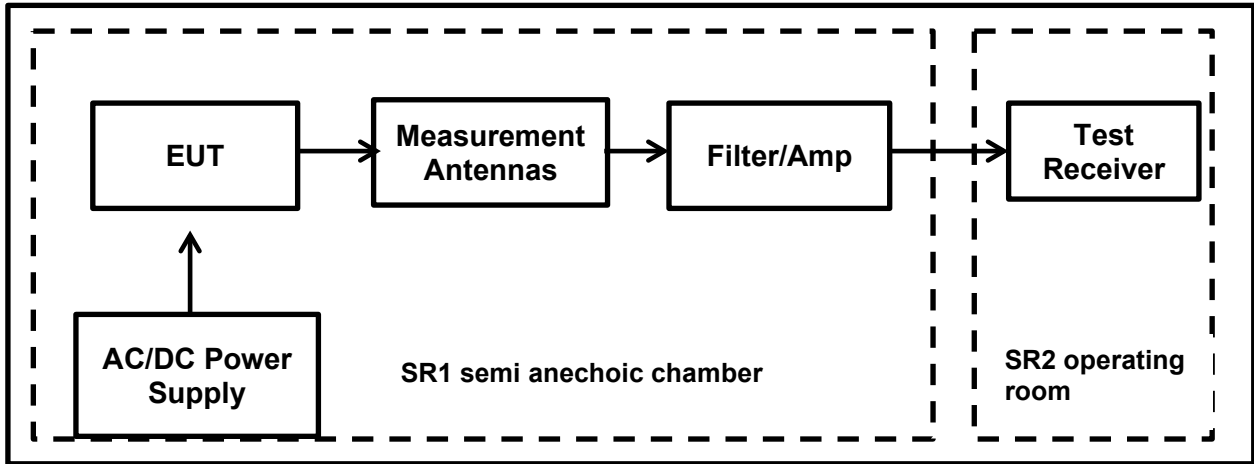
Temperature (°C):	24.0
Relative Humidity (%):	50.0

Note(s):

- Pre-scans above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 m above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
- The emissions shown at frequencies approximately 2.4 GHz to 2.4835 GHz on the 1 GHz to 18 GHz plots are the EUT fundamental for the tested channel.
- The EUT was configured with the following modes:
 - BT-LE | 2 Mbps | PRBS9 | PWR MAX | Top Channel |
- Pre-scans were performed, and marker placed on the highest measured level of the plot. The test receiver RBW was set to 1 MHz and VBW 3 MHz. The sweep time was set to auto.
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- All other emissions shown on the pre-scan plots were investigated and found to be below system noise floor.
- In accordance with ANSI C63.10 Section 6.6.4.3 (Note 1), if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
- In accordance with ANSI C63.10-2013 Section 5.3.3 & 6.5.3 measurements above 18 GHz were performed at closer distance (1 m); because at specified measurement distance (3m) for compliance the instrumentation noise floor was typically close to the radiated emission limit.
- For frequency range between 18 GHz and 26.5 GHz, on the pre-scan plots were investigated and found to be below system noise floor.

Transmitter Radiated Emissions (continued)

Test Setup:



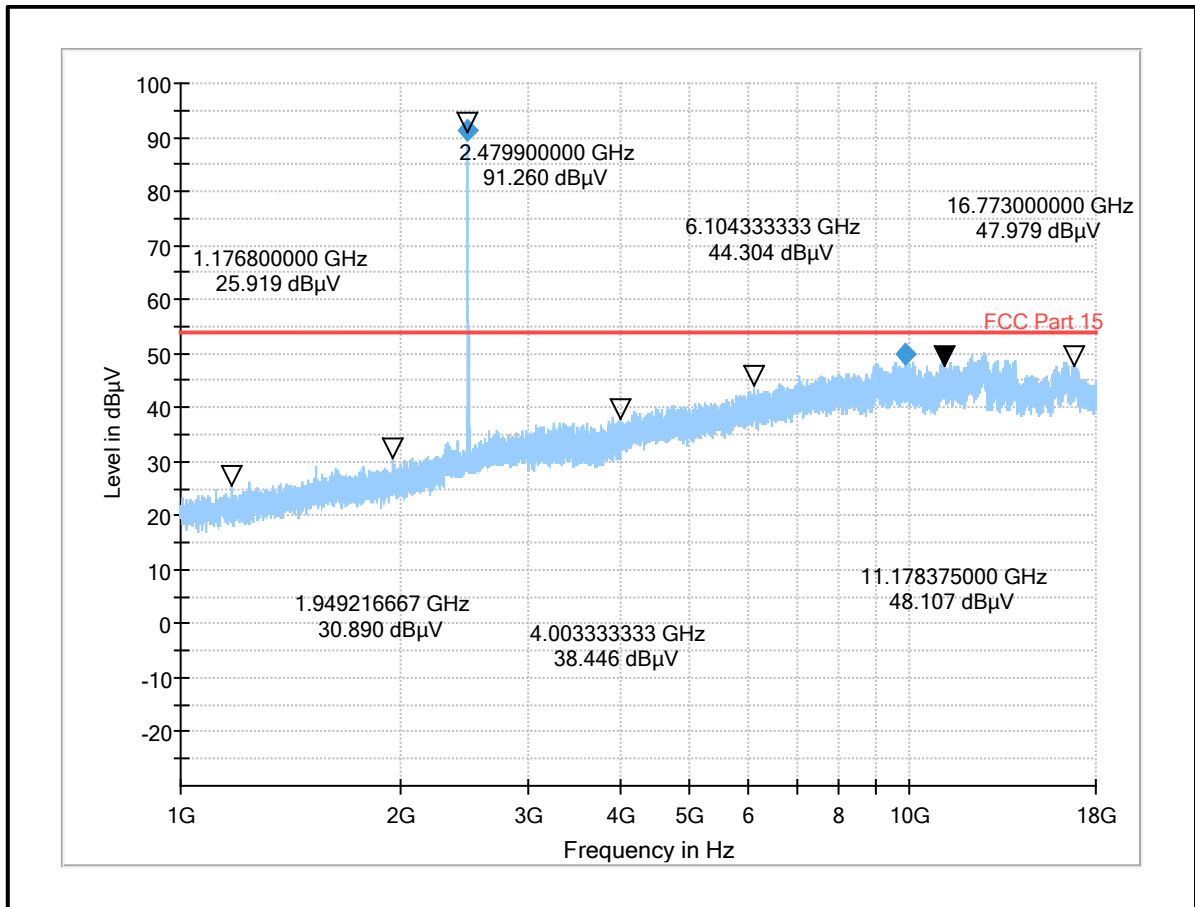
Transmitter Radiated Emissions (continued)

Results : BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel

Non restricted Band:

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB μ V/m)	-20 dB Limit (dB μ V/m)	Margin (dB)	Result
9835.333333	Horizontal	50.03	54.00	3.97	Complied

Plot: 1 GHz – 18 GHz: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel



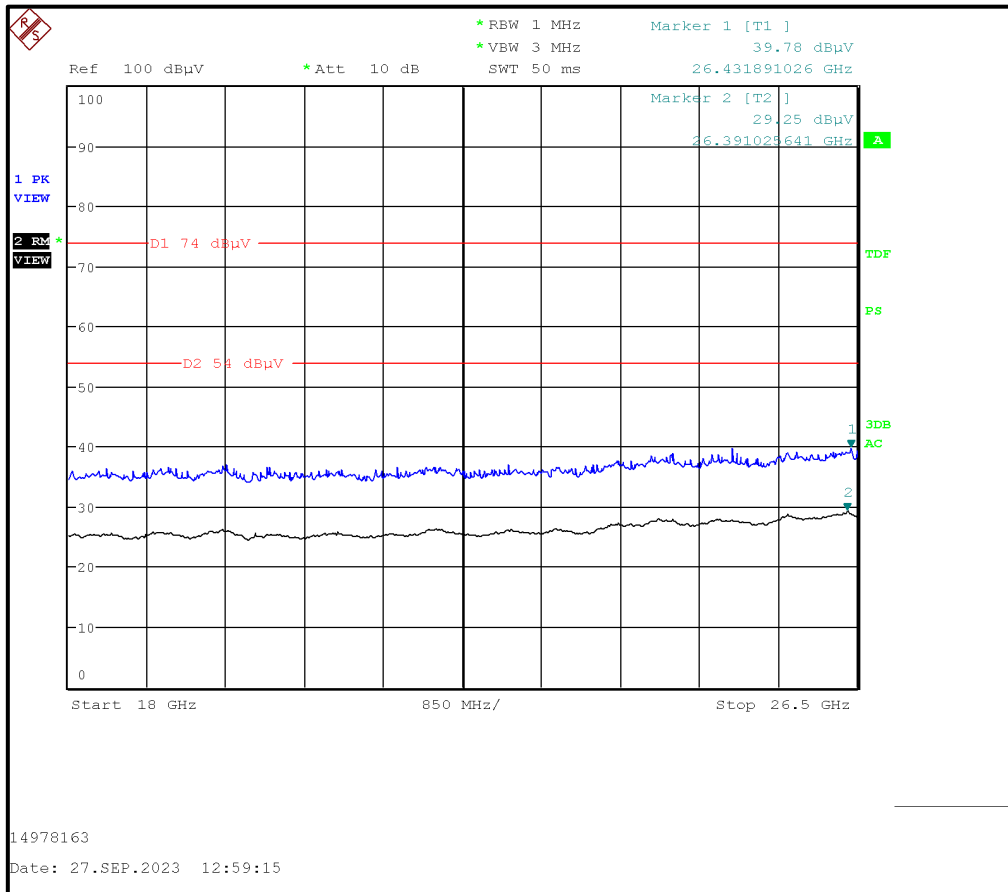
Result: Pass

Transmitter Radiated Emissions (continued)

Results : BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
No critical spurious emissions were detected					

Plot: 18 GHz – 26.5 GHz: BT-LE / 2 Mbps / PRBS9 / PWR MAX / Top Channel



Result: Pass

4.2.3. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	21 September 2023
Test Sample Serial Number:	1150003350		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	DTS emissions in non-restricted frequency bands: FCC KDB 558074 Section 8.5 referencing ANSI C63.10:2013 Sections 11.11
	DTS emissions in restricted frequency bands: FCC KDB 558074 Section 8.6 referencing ANSI C63.10:2013 Sections 11.12
	FCC KDB 558074 Section 8.7 referencing ANSI C63.10:2013 Sections 6.10.4, 6.10.5, 11.13

Environmental Conditions:

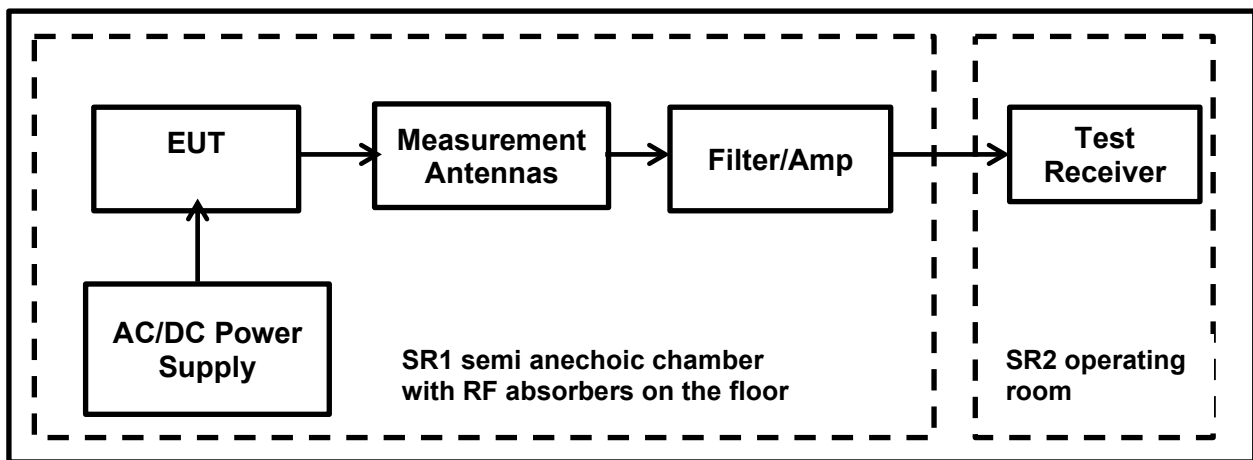
Temperature (°C):	24.7
Relative Humidity (%):	45.6

Note(s):

- The measurements were in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
- As the lower band edge falls within a non-restricted band, measurements were performed in accordance with FCC KDB 558074 Section 8.5 referencing ANSI C63.10 Section 11.11. As the maximum peak conducted output power was previously measured, in accordance with ANSI C63.10 Section 11.11.1(a) lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
- As the lower band edge falls within a non-restricted band, only peak measurements are required. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for 300 sweeps in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. Marker frequencies and levels were recorded.
- The restricted band peak measurements were performed in accordance with ANSI C63.10 Section 11.12.2.4.
- As the upper band edge falls within a restricted band both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz and RMS detector in linear power averaging mode was used. The test receiver was left to sweep for 300 sweeps in order to maximise the carrier level and out-of-band emissions. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher-level emission was present). Marker frequencies and levels were recorded.
- There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.

Transmitter Band Edge Radiated Emissions (continued)**Note(s):**

7. The EUT was configured with the following modes:
 - BT-LE | 2 Mbps | PRBS9 | PWR MAX |
8. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
9. As the EUT continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting continuously with a constant Duty Cycle of 30.16 % (duty cycle variations are less than $\pm 2\%$) in 2 Mbps data rates. Therefore, a Duty Cycle Correction Factor of 5.21 dB was added to all average measurements to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

Test Setup:

Transmitter Band Edge Radiated Emissions (continued)**Results : BT-LE / 2 Mbps / PRBS9 / PWR MAX****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
2399.95	58.36	70.528	12.17	Complied
2400.00	58.60	70.528	11.93	Complied

Results: 2310 to 2390 MHz Restricted Band / Peak

Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2363.11	43.62	74.00	30.38	Complied

Results: 2310 to 2390 MHz Restricted Band / Average

Frequency (MHz)	Average Level (dB μ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
2386.76	31.65	5.21	36.86**	54.0	17.14	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2483.50	47.37	74.00	26.63	Complied
2483.98	62.24	74.00	11.76	Complied

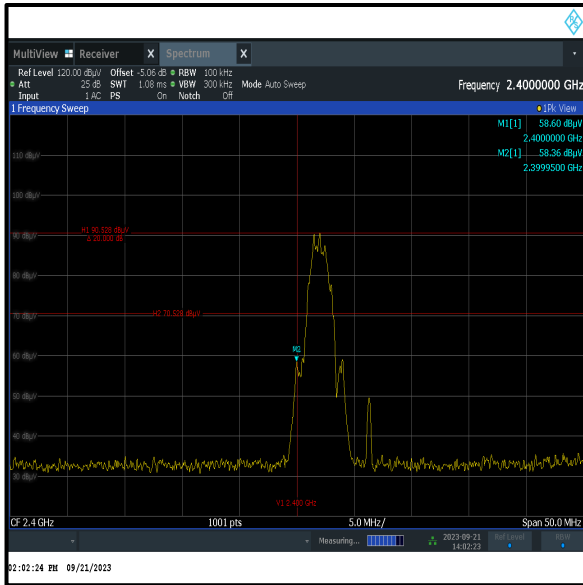
Results: Upper Band Edge / Average

Frequency (MHz)	Average Level (dB μ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
2483.50	35.62	5.21	40.83**	54.0	13.17	Complied
2483.98	35.91	5.21	41.12**	54.0	12.88	Complied

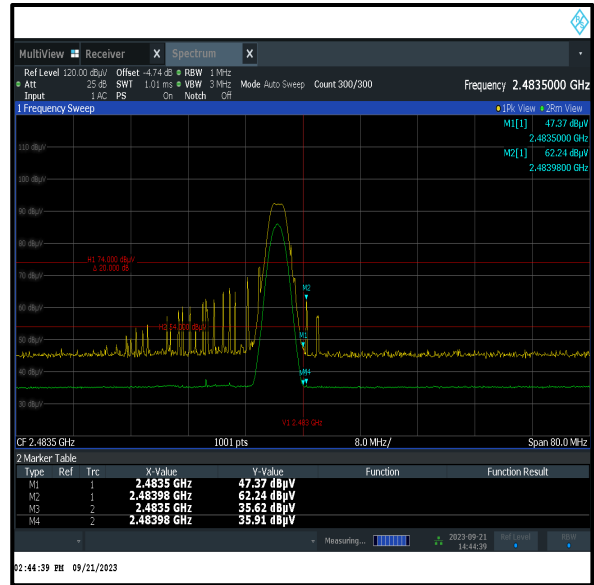
Result: Pass

Transmitter Band Edge Radiated Emissions (continued)

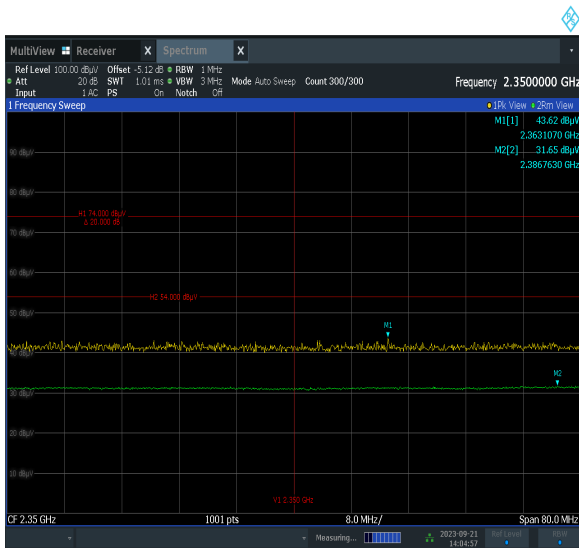
Results : BT-LE / 2 Mbps / PRBS9 / PWR MAX



Lower Band Edge Peak Measurement



Upper Band Edge Peak & Average Measurement



2310 MHz to 2390 MHz Restricted Band

Result: **Pass**

5. Measurement Uncertainty

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Confidence Level (%)	Calculated Uncertainty
Transmitter Duty Cycle	95%	±3.4%
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

6. Used equipment

Test site: SR ½

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	18/07/2023	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	18/07/2023	12
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	18/07/2023	12
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
465	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	42
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	22/08/2022	24
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	13/07/2023	12
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	13/07/2023	18
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	15/10/2019	48
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a
-/-	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
328	SPS	AC/DC power distribution system	PAS 5000	A2464 00/2 0200	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/-	B83117-A1421-T161	n/a	n/a
681	Maturo	Antenna mast, tilting	BAM4.5-P	402/0718.1	n/a	n/a

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	28	-	Initial Version

--- END OF REPORT ---