Test report

REP001909-1R3TRFWL

Date of issue: September 18, 2023

Applicant:
JTECH An HME Company

Product description:
LinkWear Range Extender

PMN:
LWRP00100

Model:
LWEXT

FCC ID:
WDC-JLWEXT

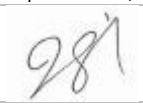
ISED certification number:
7752A-JLWEXT

Specifications:

- FCC 47 CFR Part 15, Subpart C – §15.247
  Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, 5727 – 5850 MHz
- Industry Canada RSS-247, Issue 2
  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Lab and test locations

Company name	Nemko USA Inc.
Address	2210 Faraday Ave, Suite 150
City	Carlsbad
State	California
Postal code	92008
Country	USA
Telephone	+1 760 444 3500
Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943 Designation Number: US5058
ISED Test Site	2040B-3

Tested by	Martha Espinoza, Wireless Test Engineer
Reviewed by	James Cunningham, EMC/MIL/WL Supervisor
Review date	September 18, 2023
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Applicant

Company name	JTECH An HME Company
Address	1400 Northbrook Parkway, Suite 320
City	Suwanee
Province/State	GA
Postal/Zip code	30024
Country	USA

1.2 Manufacturer

Company name	JTECH An HME Company
Address	1400 Northbrook Parkway, Suite 320
City	Suwanee
Province/State	GA
Postal/Zip code	30024
Country	USA

1.3 Test specifications

FCC 47 CFR Part 15, Subpart C – §15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
IC RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.4 Test methods

ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
558074 D01 DTS Measurement Guidance v05r02 (April 2019)	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.5 Exclusions

None

1.6 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.7 Test report revision history

Table 1.7-1: *Test report revision history*

Revision #	Details of changes made to test report
REP001909-1TRFWL	Original report issued
REP001909-1R1TRFWL	Updated following TCB feedback
REP001909-1R2TRFWL	Additional clarifications
REP001909-1R3TRFWL	Updated with new antenna gain data

Notes: None

Section 2 Summary of test results

2.1 FCC Part 15 Subpart C, general requirements

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass
§15.203	Antenna requirement	Pass

Notes: The integrated antenna is located within the protective cover of EUT

2.2 FCC Part 15.247

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Pass
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Not applicable
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Pass
§15.247(b)(4)	Transmitting antennas of directional gain greater than 6 dBi	Not applicable
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Pass
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

2.3 IC RSS-247, Issue 2

Part	Test description	Verdict
5.1 (a)	Bandwidth of a frequency hopping channel	Not applicable
5.1 (b)	Minimum channel spacing for frequency hopping systems	Not applicable
5.1 (c)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.1 (d)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (e)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2 (a)	Minimum 6 dB bandwidth	Pass
5.2 (b)	Maximum power spectral density	Pass
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4 (a)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.4 (b)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.4 (c)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (d)	Systems employing digital modulation techniques	Pass
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Out-of-band emissions	Pass

2.4 IC RSS-GEN, Issue 5

Part	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus	Pass

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date	November 28, 2022
Nemko sample ID number	PRJ0012694

3.2 EUT information

Product name	LinkWear Range Extender
Model	LWEXT
Serial number	N/A
Part number	N/A

3.3 Technical information

Frequency band	2400 – 2483.5 MHz
Minimum frequency (MHz)	2402
Maximum frequency (MHz)	2480
Type of modulation	GFSK
Power requirements	100-240V_{AC}, 50-60 Hz
Antenna information	Integrated antenna. 2.10 dBi Max Gain (2402 MHz = 2.10 dBi, 2440 MHz = 1.70 dBi, 2480 MHz = 1.54 dBi)

3.4 EUT exercise and monitoring details

The EUT was controlled by a support laptop running Smart RF studio 7 tool and set to transmit BLE signals at 5 dBm power level while on the Low, Middle, and High channels.

Table 3.4-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
N/A	N/A	N/A	N/A	N/A

Table 3.4-2: *EUT interface ports*

Description	Qty.
Ethernet port	1

Table 3.4-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
AC/DC Adapter	N/A	N/A	N/A	--
PCB development kit	Texas Instrument	N/A	N/A	--
Laptop	Dell	N/A	N/A	--

Table 3.4-4: *Inter-connection cables*

Cable description	From	To	Length (m)
USB	Support laptop	EUT	0.5

3.5 EUT setup diagram

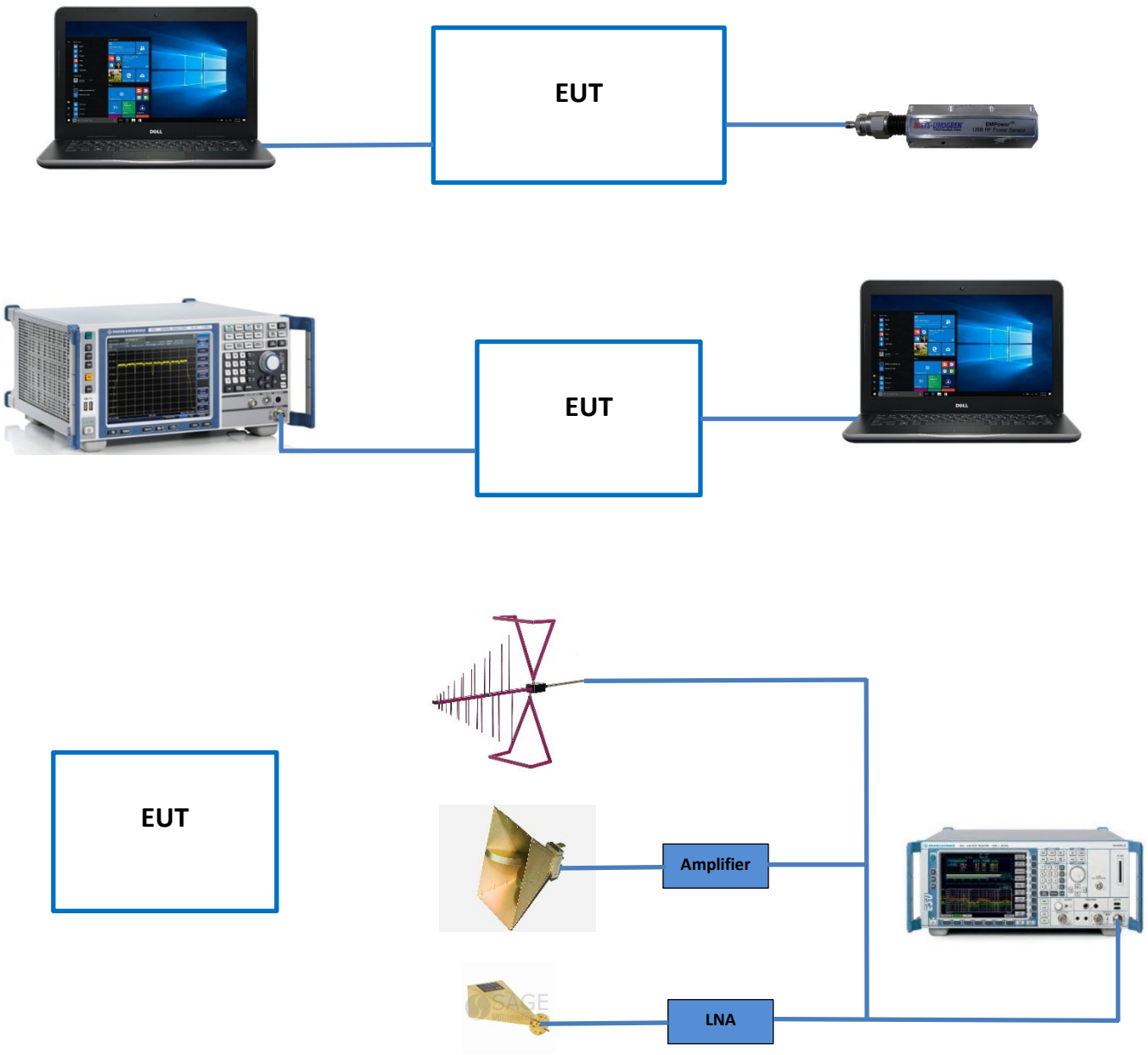


Figure 3.5-1: *Setup diagram*

Section 4 Engineering considerations

4.1 Surveyed power levels

The power settings in the Smart RF studio 7 is 5 dBm for all testing.

4.2 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.3 Technical judgment

None

4.4 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15-30 °C
Relative humidity	20-75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Table 6.1-1: *Measurement uncertainty calculations*

Measurement		**U_{cispr} dB**	**U_{lab} dB**
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

Notes: Compliance assessment:

If U_{lab} is less than or equal to U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If U_{lab} is greater than U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit

V-AMN: V type artificial mains network
AAN: Asymmetric artificial network
CP: Current probe
CVP: Capacitive voltage probe
SAC: Semi-anechoic chamber
FAR: Fully anechoic room

Section 7 Test Equipment

Table 6.1-1: *Test Equipment List*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 7	E1026	1 year	03-22-2023
Transient Limiter	Hewlett-Packard	11947A	681	VOU	VOU
Two Line V-Network	Rohde & Schwarz	ENV216	E1019	1 year	09-30-2023
Signal and spectrum analyzer	Rohde & Schwarz	FSV40	E1120	2 years	12-09-2023
Power sensor	ETS Lindgren	7002-006	E1061	1 year	06-21-2023
EMI Test Receiver	Rohde & Schwarz	ESU40	E1131	1 year	03-02-2023
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Bilog Antenna (30-1000 MHz)	Schaffner	CBL 6111D	1763	2 years	04-01-2024
DRG Horn (1-18 GHz)	ETS-Lindgren	3117-PA	E1139	2 years	04-19-2023
Horn antenna (18-26 GHz)	Eravant	SAZ-2410-42-S1	EW107	1 year	11-22-2023
Low noise amplifier	Sage Millimeter, Inc.	SBL-1834034030-KFKF	E1228	VOU	VOU
2.4GHz notch filter	Micro-Tonics	HPM50110-01	E1142	NCR	NCR

Notes: NCR - no calibration required
VOU - verify on use

Table 6.1-2: *Test Software*

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.60.10 (AC conducted emissions)
Rohde & Schwarz	EMC 32 V10.60.15 (radiated emissions)

Notes: None

Section 8 Testing data

8.1 FCC 15.207(a) and IC RSS-GEN, Issue 5 8.8 AC power line conducted emissions.

8.1.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.207(a)
RSS-Gen → §8.8

For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.

Table 8.1-1: *Conducted emissions limit.*

Frequency of emission, MHz	Conducted limit, dBµV	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - Decreases with the logarithm of the frequency.

8.1.2 Test summary

Verdict	Pass		
Test date	December 5, 2022	Temperature	20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1005 mbar
Test location	Ground Plane	Relative humidity	50 %

8.1.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).

Testing was performed according to ANSI C63.10 §6.2.

8.1.4 Setup details

Port under test	AC main
EUT setup configuration	Tabletop
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	– Peak (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak and Average preview measurement) – 5000 ms (Quasi-peak final measurement) – 5000 ms (CAverage final measurement)

8.1.5 Test data

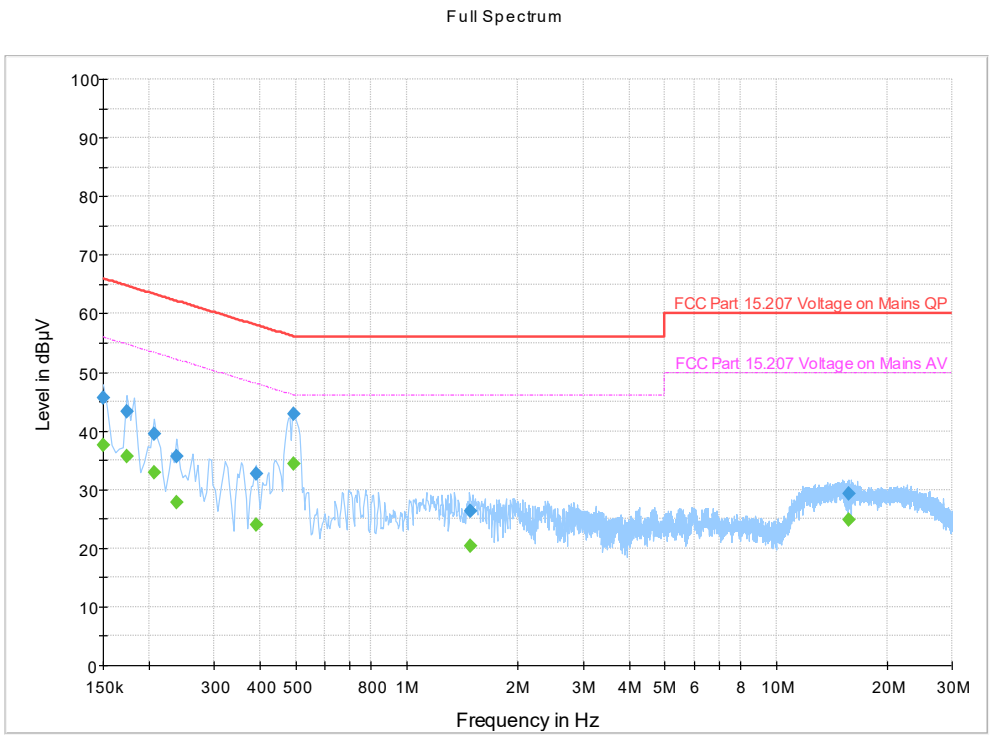


Figure 8.1-1: *AC conducted emissions spectral plot, Low channel: 2402 MHz.*

Table 8.1-2: *AC conducted emissions data, 150 kHz – 30 MHz, Low channel: 2402 MHz.*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	37.60	56.00	18.40	5000.0	9.000	N	ON	19.7
0.150000	45.58	---	66.00	20.42	5000.0	9.000	N	ON	19.7
0.174000	---	35.58	54.77	19.19	5000.0	9.000	N	ON	19.6
0.174000	43.27	---	64.77	21.50	5000.0	9.000	N	ON	19.6
0.206000	39.58	---	63.37	23.79	5000.0	9.000	N	ON	19.6
0.206000	---	32.99	53.37	20.38	5000.0	9.000	N	ON	19.6
0.238000	35.74	---	62.17	26.42	5000.0	9.000	N	ON	19.6
0.238000	---	27.76	52.17	24.41	5000.0	9.000	N	ON	19.6
0.390000	---	24.01	48.06	24.05	5000.0	9.000	N	ON	19.5
0.390000	32.76	---	58.06	25.30	5000.0	9.000	N	ON	19.5
0.494000	---	34.31	46.10	11.79	5000.0	9.000	N	ON	19.5
0.494000	42.82	---	56.10	13.28	5000.0	9.000	N	ON	19.5
1.482000	26.35	---	56.00	29.65	5000.0	9.000	L1	ON	19.5
1.482000	---	20.38	46.00	25.62	5000.0	9.000	L1	ON	19.5
15.690000	29.22	---	60.00	30.78	5000.0	9.000	L1	ON	20.3
15.690000	---	24.89	50.00	25.11	5000.0	9.000	L1	ON	20.3

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

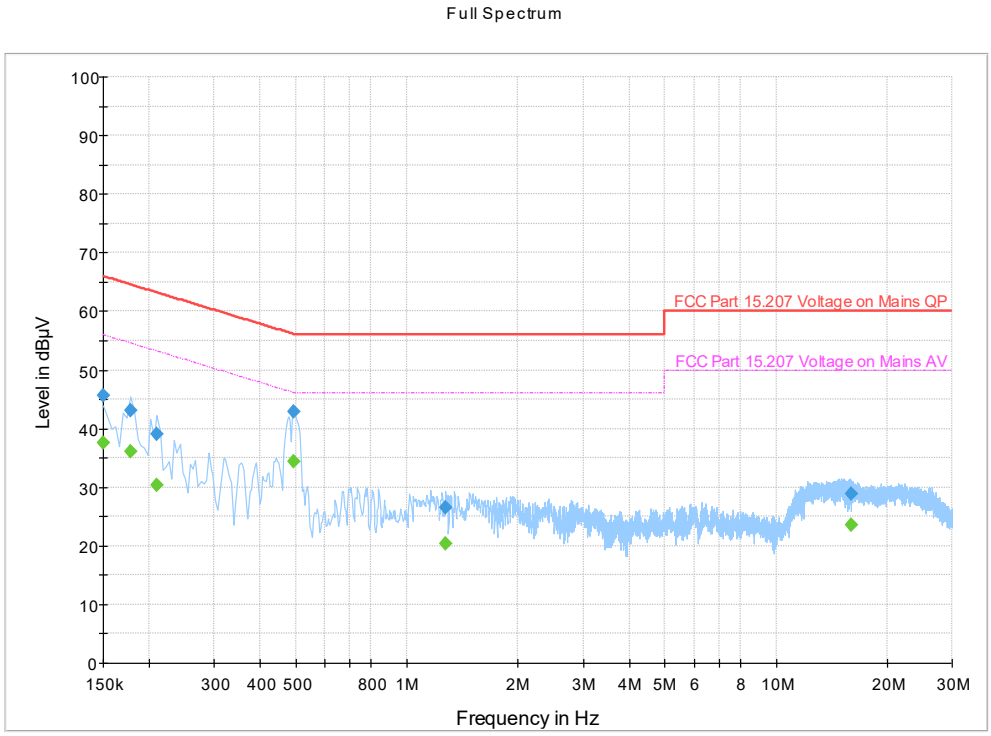


Figure 8.1-2: *AC conducted emissions spectral plot, Middle channel: 2440 MHz.*

Table 8.1-3: *AC conducted emissions data, 150 kHz – 30 MHz, Middle channel: 2440 MHz.*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	45.66	---	66.00	20.34	5000.0	9.000	N	ON	19.7
0.150000	---	37.61	56.00	18.39	5000.0	9.000	N	ON	19.7
0.178000	43.06	---	64.58	21.51	5000.0	9.000	N	ON	19.6
0.178000	---	36.14	54.58	18.44	5000.0	9.000	N	ON	19.6
0.210000	39.03	---	63.21	24.18	5000.0	9.000	N	ON	19.6
0.210000	---	30.41	53.21	22.79	5000.0	9.000	N	ON	19.6
0.494000	42.82	---	56.10	13.28	5000.0	9.000	N	ON	19.5
0.494000	---	34.34	46.10	11.76	5000.0	9.000	N	ON	19.5
1.274000	---	20.36	46.00	25.64	5000.0	9.000	L1	ON	19.5
1.274000	26.50	---	56.00	29.50	5000.0	9.000	L1	ON	19.5
16.010000	---	23.63	50.00	26.37	5000.0	9.000	L1	ON	20.3
16.010000	28.81	---	60.00	31.19	5000.0	9.000	L1	ON	20.3

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

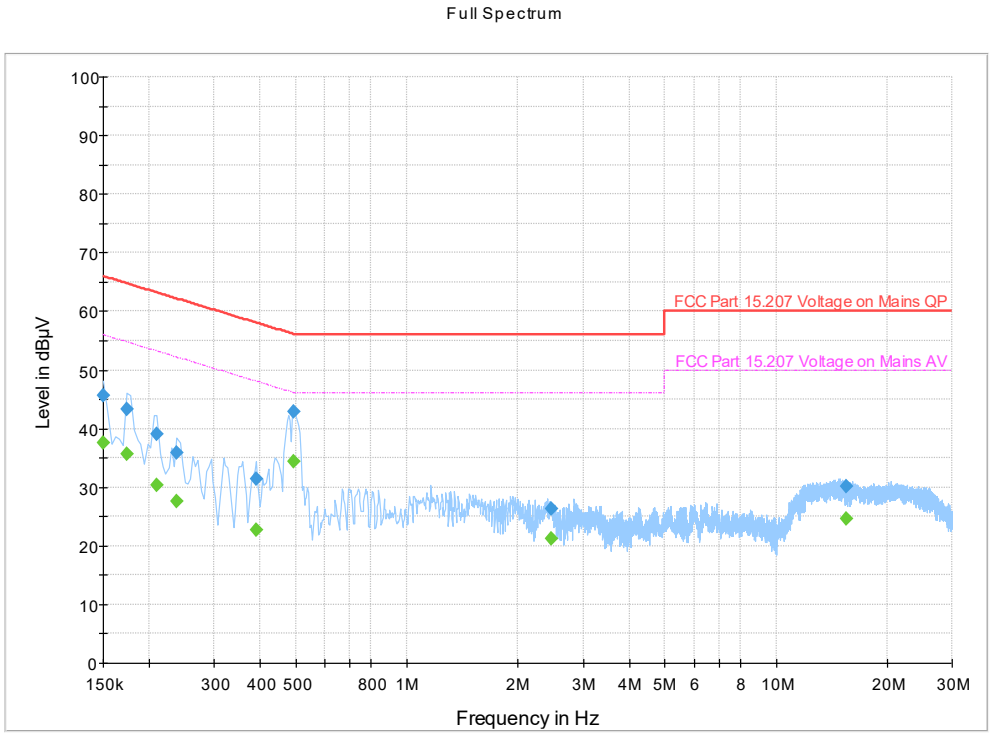


Figure 8.1-3: *AC conducted emissions spectral plot, High channel: 2480 MHz.*

Table 8.1-4: *AC conducted emissions data, 150 kHz – 30 MHz, High channel: 2480 MHz*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	37.55	56.00	18.45	5000.0	9.000	N	ON	19.7
0.150000	45.60	---	66.00	20.40	5000.0	9.000	N	ON	19.7
0.174000	---	35.65	54.77	19.12	5000.0	9.000	N	ON	19.6
0.174000	43.35	---	64.77	21.42	5000.0	9.000	N	ON	19.6
0.210000	39.00	---	63.21	24.21	5000.0	9.000	N	ON	19.6
0.210000	---	30.27	53.21	22.93	5000.0	9.000	N	ON	19.6
0.238000	35.90	---	62.17	26.26	5000.0	9.000	N	ON	19.6
0.238000	---	27.70	52.17	24.47	5000.0	9.000	N	ON	19.6
0.390000	31.44	---	58.06	26.62	5000.0	9.000	L1	ON	19.5
0.390000	---	22.80	48.06	25.27	5000.0	9.000	L1	ON	19.5
0.494000	42.84	---	56.10	13.26	5000.0	9.000	N	ON	19.5
0.494000	---	34.43	46.10	11.67	5000.0	9.000	N	ON	19.5
2.462000	---	21.25	46.00	24.75	5000.0	9.000	L1	ON	19.5
2.462000	26.39	---	56.00	29.61	5000.0	9.000	L1	ON	19.5
15.450000	---	24.55	50.00	25.45	5000.0	9.000	N	ON	20.3
15.450000	30.06	---	60.00	29.94	5000.0	9.000	N	ON	20.3

Notes: Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

8.2 FCC 15.247(a)(2) and RSS-247 5.2(1) Minimum 6 dB bandwidth for systems using digital modulation techniques References

8.2.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(a)(2)
RSS-247 → §5.2(a)

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

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

8.2.2 Test summary

Verdict	Pass		
Test date	November 30, 2022	Temperature	19 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1005 mbar
Test location	Wireless bench (Conducted)	Relative humidity	53 %

8.2.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).

8.2.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless Bench
Measurement method	558074 D01 DTS Measurement Guidance §8.2 ANSI C63.10 §11.8.1 using built-in marker function of the spectrum analyzer

Receiver/spectrum analyzer settings:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.2.5 Test data

Table 8.2-1: *6 dB occupied bandwidth test data*

Test Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)
2402	665.885	> 500
2440	669.917	> 500
2480	674.229	> 500

8.2.5 Test data, continued

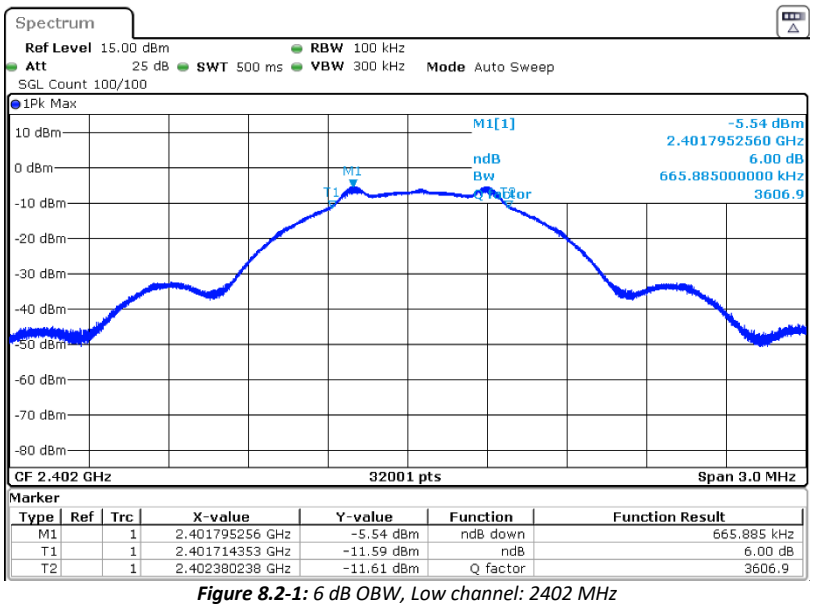


Figure 8.2-1: *6 dB OBW, Low channel: 2402 MHz*

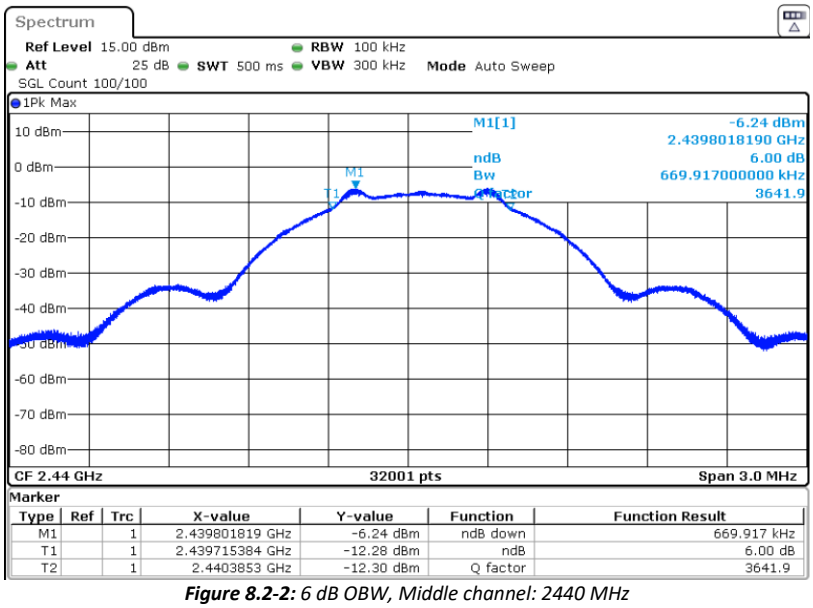


Figure 8.2-2: *6 dB OBW, Middle channel: 2440 MHz*

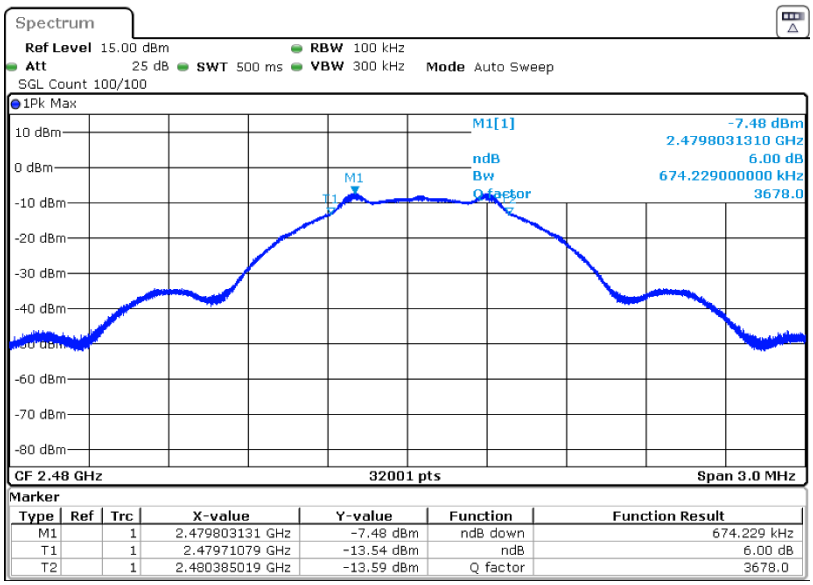


Figure 8.2-3: *6 dB OBW, High channel: 2480 MHz*

8.3 FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements

8.3.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(b)(2) / (3)

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 W (30 dBm). As an alternative to a peak power measurement, compliance with the one-Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this Section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this Section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this Section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 → §5.4(d)

(d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

8.3.2 Test summary

Verdict	Pass		
Test date	December 1, 2022	Temperature	20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	57 %

8.3.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).
The attenuation of the interconnecting path was included in the power meter software as a correction factor.
The antenna gain for each channel is: 2402 MHz = 2.10 dBi, 2440 MHz = 1.70 dBi, 2480 MHz = 1.54 dBi.
EIRP = Conducted Power + Declared Antenna Gain

8.3.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless Bench
Measurement method	ANSI C63.10 §11.9.1.3 PKPM1 (Peak Power Meter) method

8.3.5 Test data

Table 8.3-1: *Output power*

Test Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	Conducted Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
2402	18.68	30.0	2.10	20.78	36.0
2440	18.32	30.0	1.70	20.03	36.0
2480	17.29	30.0	1.54	18.83	36.0

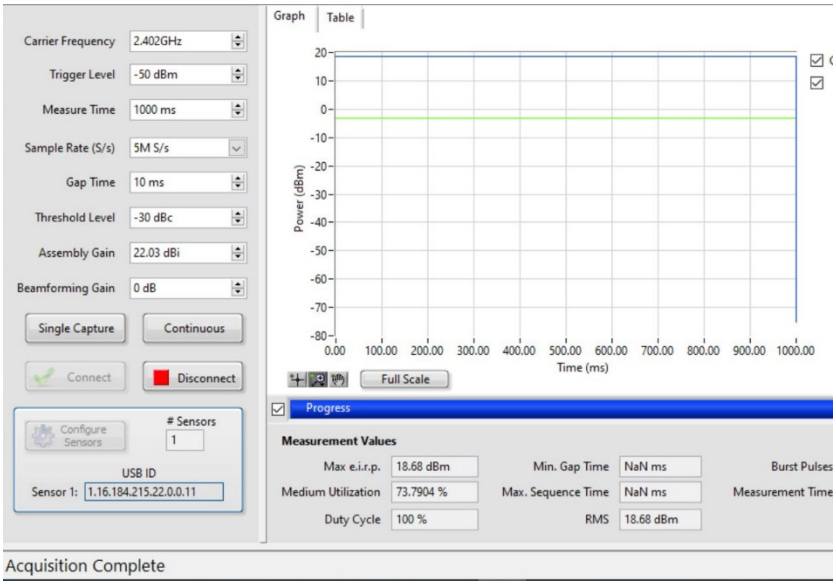


Figure 8.3-1: *Output power, Low channel: 2402 MHz*

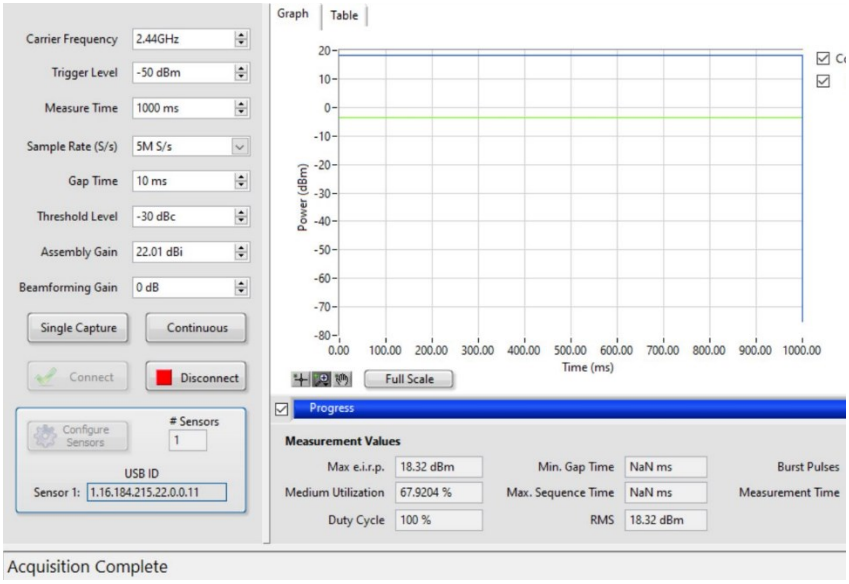


Figure 8.3-2: *Output power, Middle channel: 2440 MHz*

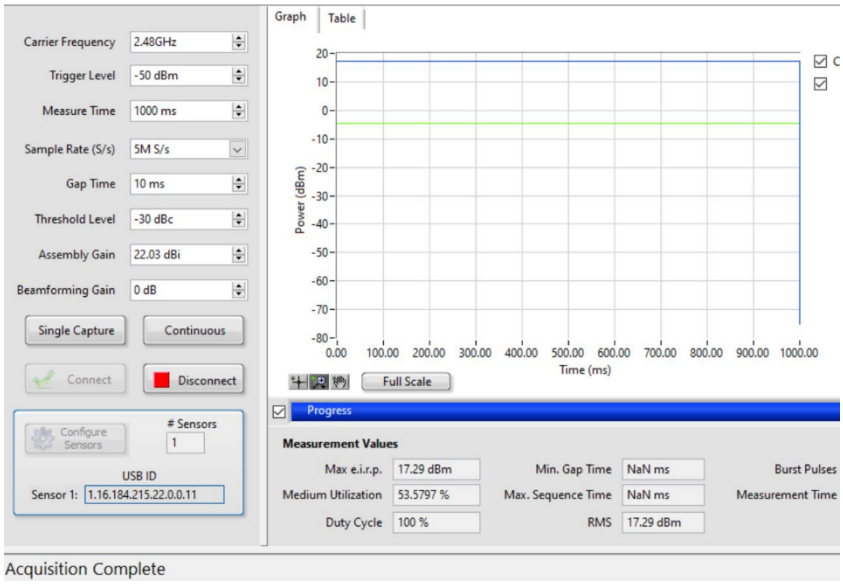


Figure 8.3-3: *Output power, High channel: 2480 MHz*

8.4 FCC Part 15.247(d) and RSS-247 5.5 Conducted band-edge spurious emissions.

8.4.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

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

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.4.2 Test summary

Verdict	Pass		
Test date	December 1, 2022	Temperature	20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	57 %

8.4.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).
For conducted measurements, an offset corresponding to the path losses was added in the spectrum analyzer.
In each measurement, the limit was derived by subtracting 20 dB from a power spectral density reference measurement and the frequency limit were the band limits: 2400 MHz for low channel and 2483.5 MHz for high channel.

8.4.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless bench
Measurement details	Conducted band edge measurement performed as per C63.10 §6.10.4

Spectrum analyzer settings for conducted spurious emissions:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.4.5 Test data

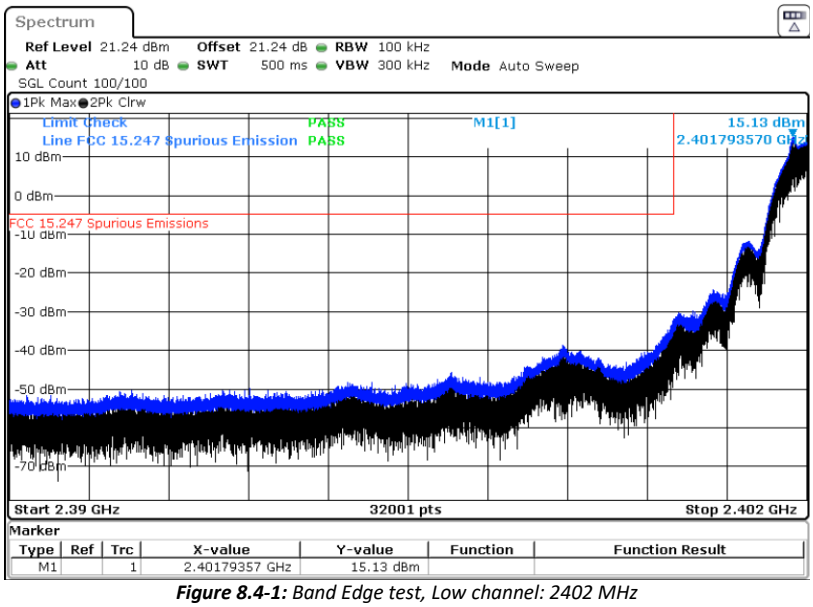


Figure 8.4-1: *Band Edge test, Low channel: 2402 MHz*

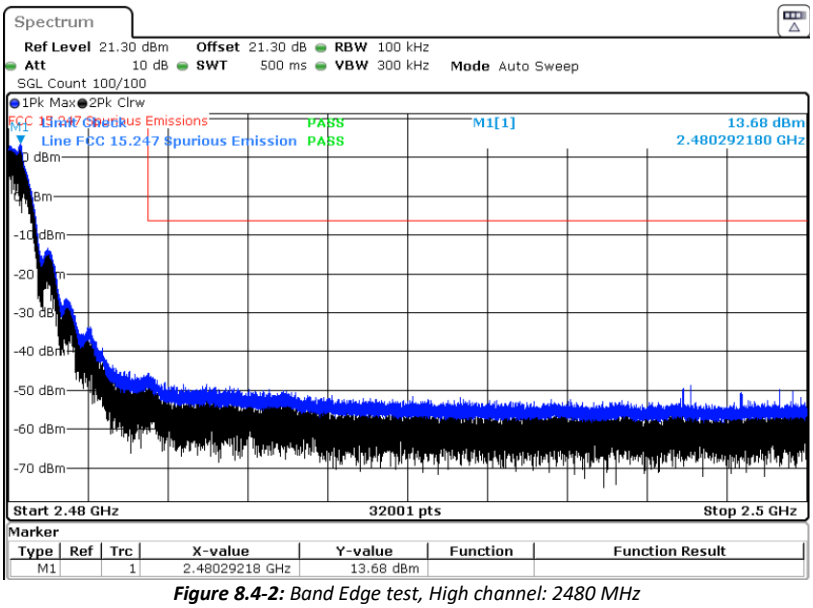


Figure 8.4-2: *Band Edge test, High channel: 2480 MHz*

8.5 FCC 15.247(d) and RSS-247 5.5 Conducted spurious emissions.

8.5.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

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

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.5.2 Test summary

Verdict	Pass		
Test date	December 1, 2022	Temperature	20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	57 %

8.5.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).
The spectrum was search from 100 kHz to 26 GHz (above the 10th harmonic of the highest transmit frequency of 2480 MHz).
For conducted measurements, an offset corresponding to the path losses was added in the spectrum analyzer.
In each measurement, the limit was derived by subtracting 20 dB from a power spectral density reference measurement.

8.5.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless bench
Measurement details	Conducted spurious emissions measurement performed as per C63.10 §11.11.3

Spectrum analyzer settings for conducted spurious emissions:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.5.5 Test data

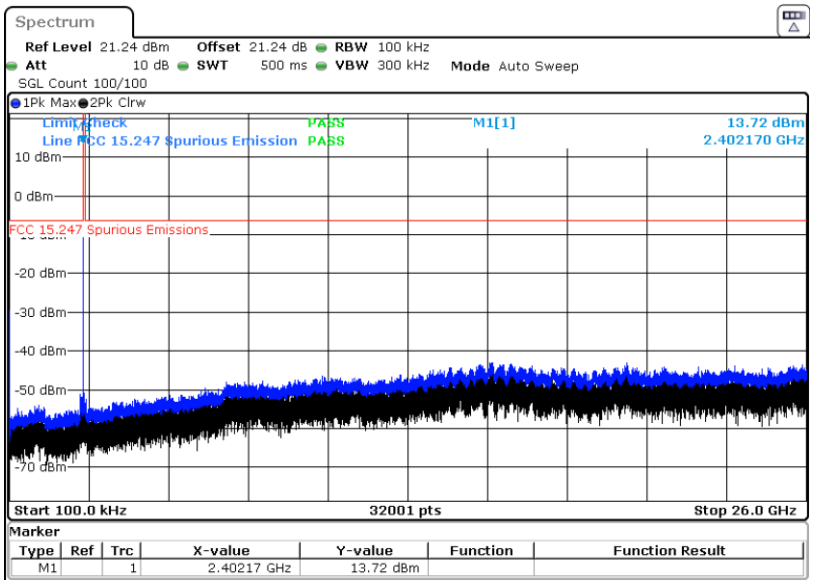


Figure 8.5-1: *Conducted spurious Emission, Low channel: 2402 MHz.*

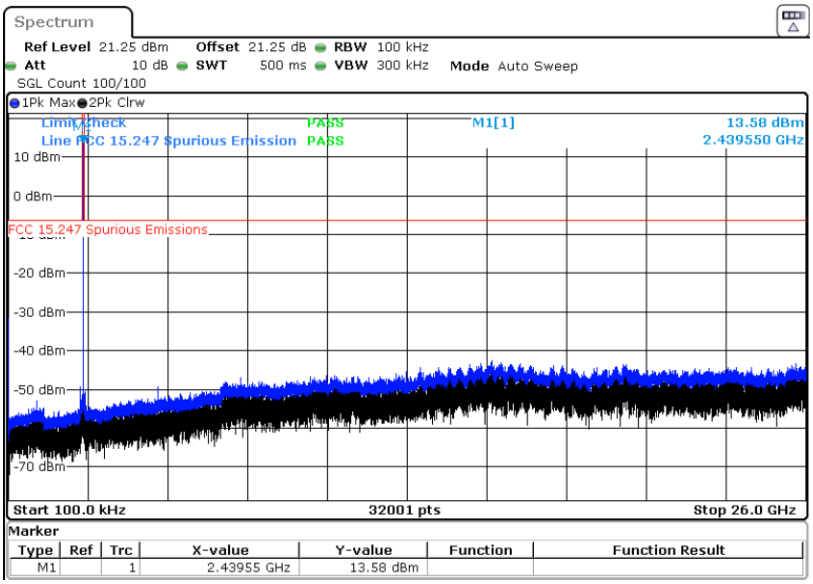


Figure 8.5-2: *Conducted spurious Emission, Middle channel: 2440 MHz.*

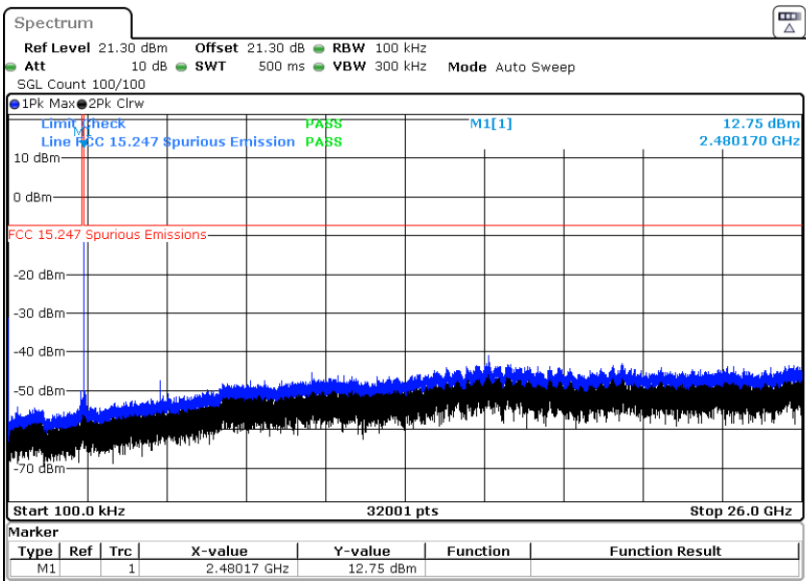


Figure 8.5-3: *Conducted spurious Emission, High channel: 2480 MHz.*

8.6 FCC 15.247(d) and RSS-247 5.5 Radiated restricted band-edges and spurious emission

8.6.1 Definition and limits

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(d)

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

RSS-247 → §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.6-1: *FCC §15.209– Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Table 8.6-2: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.6.2 Test summary

Verdict	Pass		
Test date	December 2, 2022; December 5, 2022	Temperature	19 °C; 20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1001 mbar; 1006 mbar
Test location	3m semi-anechoic chamber (Radiated)	Relative humidity	55 %; 58 %

8.6.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).
The spectrum was searched from 30 MHz to 26 GHz (10^{th} harmonic approximately).
Radiated measurements were performed at a 3 m measurement distance.

A correction factor related to duty cycle was added in the high channel (2480 MHz) of this model, specifically for transmitter harmonics in the range from 1-18 GHz. The duty cycle was measured using a sensor power and all the data for all operational modes was recorded. Different modes were tested, and the maximum duty cycle recorded was selected as the worst-case scenario. For this model the maximum duty cycle was:

The following operational use cases were investigated to identify the operational mode with the worst-case (highest) duty cycle operation:

- OTA pair Extend to Hub, monitor from power up
- OTA update of Extend
- Monitor Extend Keep Alive
- Unassign role of Smartband through Extend
- Delete Smartband from device list through Extend
- Unassign role of Call Button through Extend
- Delete Call Button from device list through Extend
- Assign role to Smartband through Extend
- Assign role to Call Button through Extend
- Message Smartband from UI Dashboard through Extend
- Message single Smartband from Call Button through Extend, button press
- Message multiple Smartbands from Call Button through Extend, button press
- Delete Extend from Hub

The output of the transmitter was monitored using a fast-sampling power meter (5 MSamples/second) over a period of 10 seconds (sufficiently long for the user operation to complete). The power meter data was analyzed and the worst case duty cycle over a 100 ms period was identified.

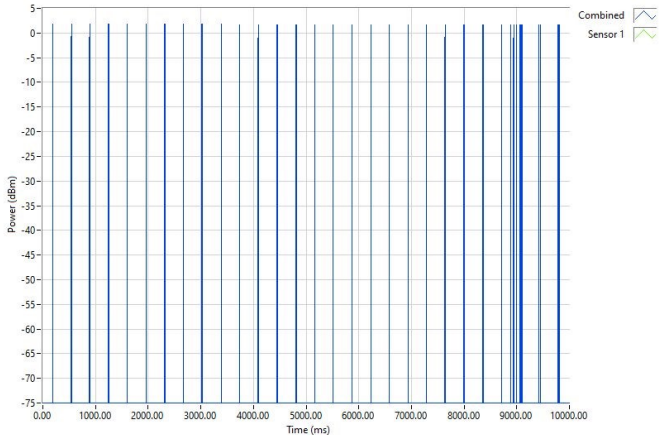
The analysis comprised:
For each burst in the table below, add up the TX On of all the bursts that occur within 100ms of the start of the burst. Then, the highest TX On time in 100ms is identified and used as the worst-case operational mode duty cycle.

For example, with reference to the table below: Starting at the start time of the first burst, we observe:

1. A transmission burst of duration 1.194 ms starting at 186.619 ms.
2. A transmission burst of duration 1.194 ms starting at 188.089 ms.
3. A transmission burst of duration 1.194 ms starting at 189.559 ms.
4. A transmission burst of duration 3.37 ms starting at 191.059 ms.
5. The next observed transmission burst starts at 540.657 ms therefore, for this calculation, there are no more transmission bursts within 100 ms of the observation start time of 186.619 ms. So, the total TX On from 186.619 ms to 186.619 + 100 = 286.619 ms is (4 x 1.194) + 3.37 = 13.48 ms. This gives a duty cycle in this particular period of 100 x (13.48 ms / 100 ms) = 13.48 %.

This analysis is repeated for each transmission burst in the table below and the highest calculated duty cycle is then used for average emission level calculations.

For this EUT the maximum duty cycle was observed in the use case: “Unassign role of Smartband through Extend”. Below is the transmit power versus time:



And the exported record of transmitter on/off bursts:

Burst #	Combined Start Time (ms)	Combined Stop Time (ms)	Combined Power (dBm)	TxOn Time (ms)	TxOff Time (ms)
1	186.619	187.813	-0.81	1.194	0.276
2	188.089	189.283	1.84	1.194	0.276
3	189.559	190.753	-0.77	1.194	0.306
4	191.059	194.429	1.85	3.37	346.246
5	540.675	541.869	-0.77	1.194	0.276
6	542.145	543.339	1.83	1.194	0.276
7	543.615	544.808	-0.83	1.193	0.307
8	545.115	548.485	1.86	3.37	338.199
9	886.684	887.877	-0.81	1.193	0.277
10	888.154	889.347	1.85	1.193	0.277
11	889.624	890.817	-0.76	1.193	0.307
12	891.124	894.494	1.86	3.37	348.199
13	1242.693	1243.887	-0.81	1.194	0.276
14	1244.163	1245.357	1.84	1.194	0.276
15	1245.633	1246.827	-0.78	1.194	0.306
16	1247.133	1250.503	1.85	3.37	345.228
17	1595.731	1596.924	1.88	1.193	0.277
18	1597.201	1598.394	-0.75	1.193	0.277
19	1598.671	1599.864	-0.82	1.193	0.307
20	1600.171	1603.54	1.86	3.369	356.221
21	1959.761	1960.954	-0.78	1.193	0.277
22	1961.231	1962.424	-0.74	1.193	0.274
23	1962.698	1963.891	-0.77	1.193	0.31
24	1964.201	1967.571	1.86	3.37	344.248
25	2311.819	2313.013	-0.73	1.194	0.276
26	2313.289	2314.483	-0.8	1.194	0.276
27	2314.759	2315.953	1.85	1.194	0.306
28	2316.259	2319.629	1.85	3.37	346.214
29	2665.843	2667.036	-0.79	1.193	0.277
30	2667.313	2668.507	1.86	1.194	0.276
31	2668.783	2669.976	-0.76	1.193	0.307
32	2670.283	2673.653	1.86	3.37	345.222
33	3018.875	3020.069	-0.82	1.194	0.276
34	3020.345	3021.539	1.83	1.194	0.276
35	3021.815	3023.009	-0.76	1.194	0.306
36	3023.315	3026.685	1.86	3.37	358.296
37	3384.981	3386.175	-0.75	1.194	0.276
38	3386.451	3387.645	1.84	1.194	0.276
39	3387.921	3389.114	-0.8	1.193	0.307
40	3389.421	3392.791	1.87	3.37	340.244
41	3733.035	3734.228	-0.96	1.193	0.277
42	3734.505	3735.698	1.68	1.193	0.277
43	3735.975	3737.168	-1.07	1.193	0.307
44	3737.475	3740.844	1.7	3.369	347.228
45	4088.072	4089.265	-1.04	1.193	0.277

Burst #	Combined Start Time (ms)	Combined Stop Time (ms)	Combined Power (dBm)	TxOn Time (ms)	TxOff Time (ms)
46	4089.542	4090.735	-0.96	1.193	0.277
47	4091.012	4092.206	1.69	1.194	0.306
48	4092.512	4095.882	1.69	3.37	348.197
49	4444.079	4445.272	-0.96	1.193	0.277
50	4445.549	4446.742	1.69	1.193	0.277
51	4447.019	4448.212	-1.06	1.193	0.307
52	4448.519	4451.889	1.7	3.37	355.19
53	4807.079	4808.272	-1.04	1.193	0.277
54	4808.549	4809.742	-0.97	1.193	0.277
55	4810.019	4811.213	1.68	1.194	0.306
56	4811.519	4814.889	1.7	3.37	342.192
57	5157.081	5158.274	-1.05	1.193	0.277
58	5158.551	5159.744	1.7	1.193	0.277
59	5160.021	5161.214	-0.96	1.193	0.307
60	5161.521	5164.89	1.69	3.369	341.285
61	5506.175	5507.368	-1.05	1.193	0.277
62	5507.645	5508.838	-0.93	1.193	0.277
63	5509.115	5510.308	1.7	1.193	0.307
64	5510.615	5513.984	1.7	3.369	355.197
65	5869.181	5870.374	-1.05	1.193	0.277
66	5870.651	5871.845	1.69	1.194	0.276
67	5872.121	5873.315	-0.97	1.194	0.306
68	5873.621	5876.991	1.69	3.37	350.211
69	6227.202	6228.396	-1.05	1.194	0.276
70	6228.672	6229.866	-0.96	1.194	0.276
71	6230.142	6231.336	1.67	1.194	0.306
72	6231.642	6235.012	1.69	3.37	340.176
73	6575.188	6576.382	1.67	1.194	0.276
74	6576.658	6577.851	-1.07	1.193	0.277
75	6578.128	6579.321	-0.99	1.193	0.307
76	6579.628	6582.998	1.68	3.37	355.237
77	6938.235	6939.428	-0.97	1.193	0.277
78	6939.705	6940.898	1.67	1.193	0.277
79	6941.175	6942.368	-1.08	1.193	0.307
80	6942.675	6946.044	1.69	3.369	336.192
81	7282.236	7283.43	-0.96	1.194	0.276
82	7283.706	7284.9	-1.06	1.194	0.276
83	7285.176	7286.37	1.67	1.194	0.306
84	7286.676	7290.046	1.68	3.37	347.192
85	7637.238	7638.432	-0.93	1.194	0.276
86	7638.708	7639.902	-1.07	1.194	0.276
87	7640.178	7641.372	1.69	1.194	0.306
88	7641.678	7645.048	1.69	3.37	346.183
89	7991.231	7992.424	-1.04	1.193	0.277
90	7992.701	7993.894	-0.96	1.193	0.277
91	7994.171	7995.365	1.67	1.194	0.306
92	7995.671	7999.041	1.7	3.37	355.242
93	8354.283	8355.477	-1.05	1.194	0.276
94	8355.753	8356.946	-0.94	1.193	0.277
95	8357.223	8358.417	1.69	1.194	0.306
96	8358.723	8362.093	1.71	3.37	345.236
97	8707.329	8708.523	-0.95	1.194	0.276
98	8708.799	8709.993	1.69	1.194	0.276
99	8710.269	8711.463	-1.09	1.194	0.306
100	8711.769	8715.139	1.68	3.37	166.274
101	8881.413	8882.606	-1.07	1.193	0.277
102	8882.883	8884.076	1.67	1.193	0.277
103	8884.353	8885.546	-0.99	1.193	0.307
104	8885.853	8889.222	1.69	3.369	50.485
105	8939.707	8940.901	-1.07	1.194	0.276
106	8941.177	8942.371	-0.96	1.194	0.276
107	8942.647	8943.841	1.66	1.194	0.306
108	8944.147	8947.517	1.68	3.37	44.53

Burst #	Combined Start Time (ms)	Combined Stop Time (ms)	Combined Power (dBm)	TxOn Time (ms)	TxOff Time (ms)
109	8992.047	8993.24	1.68	1.193	0.277
110	8993.517	8994.71	-1.08	1.193	0.277
111	8994.987	8996.18	-0.98	1.193	0.307
112	8996.487	8999.856	1.68	3.369	61.541
113	9061.397	9062.59	1.7	1.193	0.277
114	9062.867	9064.06	-1.06	1.193	0.277
115	9064.337	9065.53	-0.97	1.193	0.307
116	9065.837	9069.206	1.67	3.369	23.472
117	9092.678	9093.872	-1.07	1.194	0.276
118	9094.148	9095.342	-0.99	1.194	0.276
119	9095.618	9096.812	1.69	1.194	0.306
120	9097.118	9102.856	1.68	5.738	313.609
121	9416.465	9417.658	-0.92	1.193	0.276
122	9417.934	9419.128	1.68	1.194	0.276
123	9419.404	9420.598	-1.07	1.194	0.306
124	9420.904	9424.274	1.68	3.37	21.472
125	9445.746	9446.939	-1.06	1.193	0.277
126	9447.216	9448.409	-0.98	1.193	0.274
127	9448.683	9449.876	-0.99	1.193	0.31
128	9450.186	9455.924	1.69	5.738	316.589
129	9772.513	9773.707	1.71	1.194	0.276
130	9773.983	9775.176	-0.97	1.193	0.277
131	9775.453	9776.646	-1.09	1.193	0.307
132	9776.953	9780.322	1.69	3.369	22.473
133	9802.795	9803.988	1.68	1.193	0.277
134	9804.265	9805.458	-0.98	1.193	0.277
135	9805.735	9806.928	-1.07	1.193	0.307
136	9807.235	9812.972	1.68	5.737	187.028

The worst-case duty cycle over 100 ms was calculated from the above data.

Maximum duty cycle = 40.03 %
Correction factor related to duty cycle: 7.95 dB (20 Log(Duty Cycle %))

8.6.4 Setup details

EUT setup configuration	Tabletop
Test facility	3M Chamber
Measurement details	Radiated spurious emissions measurement performed as per C63.10 §11.12

Receiver settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurements) Quasi-Peak (final measurements)
Trace mode	Max Hold

Receiver settings for radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Average and peak (final measurements)
Trace mode	Max Hold

8.6.5 Test data

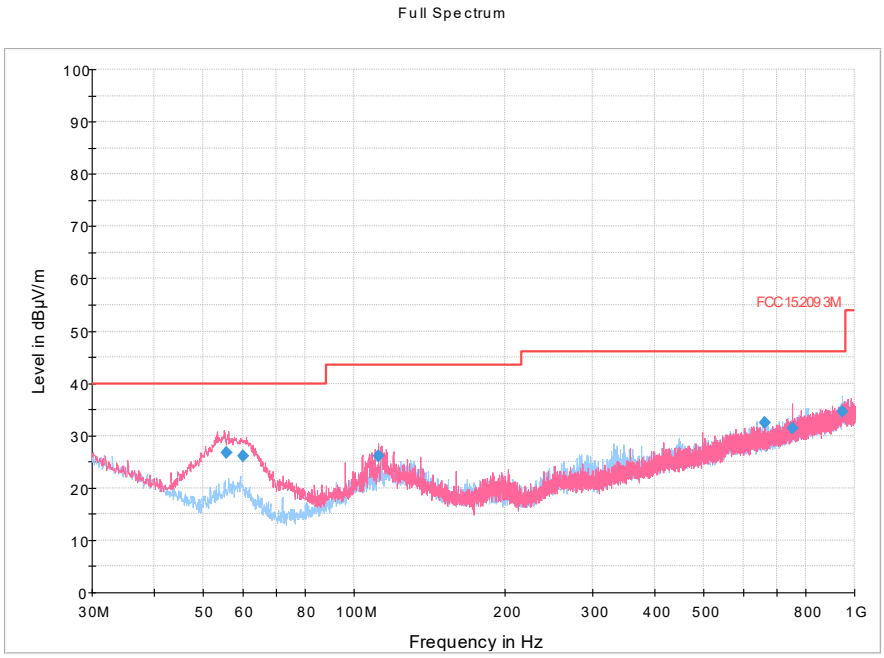


Figure 8.6-1: *Radiated spurious emissions plot, 30-1000 MHz, Low channel (2402 MHz)*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
55.626000	26.67	40.00	13.33	5000.0	120.000	115.0	V	22.0	13.7
59.943000	26.19	40.00	13.81	5000.0	120.000	100.0	V	0.0	12.8
112.045000	26.05	43.50	17.45	5000.0	120.000	377.0	V	303.0	19.0
659.975000	32.46	46.00	13.54	5000.0	120.000	350.0	H	231.0	29.9
749.750000	31.46	46.00	14.54	5000.0	120.000	345.0	V	288.0	31.7
946.861000	34.54	46.00	11.46	5000.0	120.000	213.0	H	317.0	34.8

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-3: *Radiated spurious emissions results, 30-1000 MHz, Low channel (2402 MHz)*

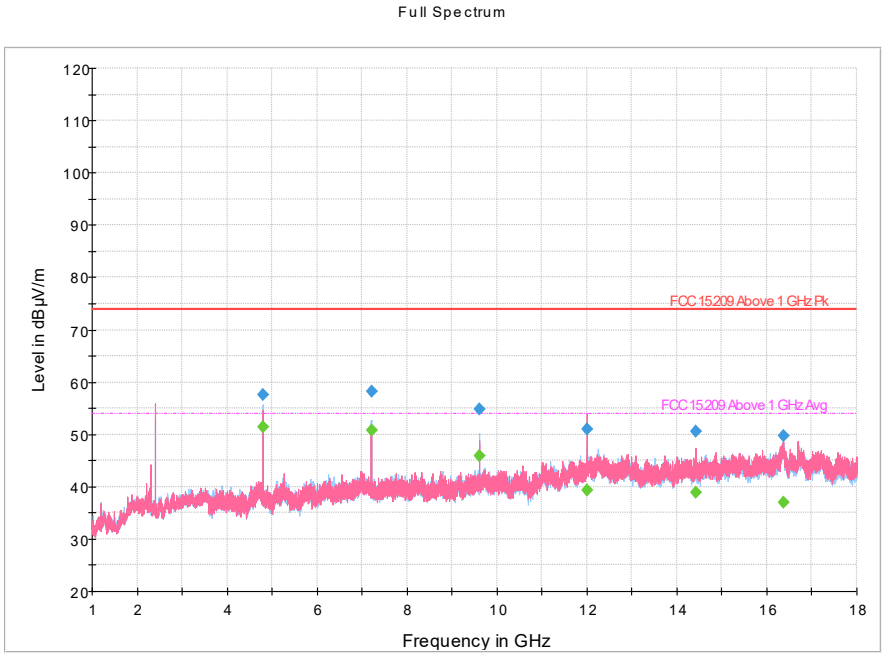


Figure 8.6-2: *Radiated spurious emissions plot, 1 – 18 GHz, Low channel (2402 MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.477778	57.51	---	73.90	16.39	5000.0	1000.0	223.0	H	213.0	-2.3
4804.477778	---	51.52	53.90	2.38	5000.0	1000.0	223.0	H	213.0	-2.3
7206.888889	---	50.80	53.90	3.10	5000.0	1000.0	235.0	H	140.0	0.4
7206.888889	58.29	---	73.90	15.61	5000.0	1000.0	235.0	H	140.0	0.4
9607.011111	54.74	---	73.90	19.16	5000.0	1000.0	218.0	H	338.0	3.5
9607.011111	---	45.83	53.90	8.07	5000.0	1000.0	218.0	H	338.0	3.5
12008.877778	---	39.40	53.90	14.50	5000.0	1000.0	275.0	V	186.0	6.2
12008.877778	50.90	---	73.90	23.00	5000.0	1000.0	275.0	V	186.0	6.2
14410.711111	---	38.94	53.90	14.96	5000.0	1000.0	189.0	V	160.0	10.0
14410.711111	50.50	---	73.90	23.40	5000.0	1000.0	189.0	V	160.0	10.0
16373.777778	---	36.94	53.90	16.96	5000.0	1000.0	182.0	V	224.0	12.8
16373.777778	49.74	---	73.90	24.16	5000.0	1000.0	182.0	V	224.0	12.8

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.
[4] Fundamental emission at ~ 2.4 GHz is attenuated by a notch filter to protect measurement equipment. This fundamental emission is not assessed against the limits.

Table 8.6-4: *Radiated spurious emissions results, 1 – 18 GHz, Low channel (2402 MHz)*

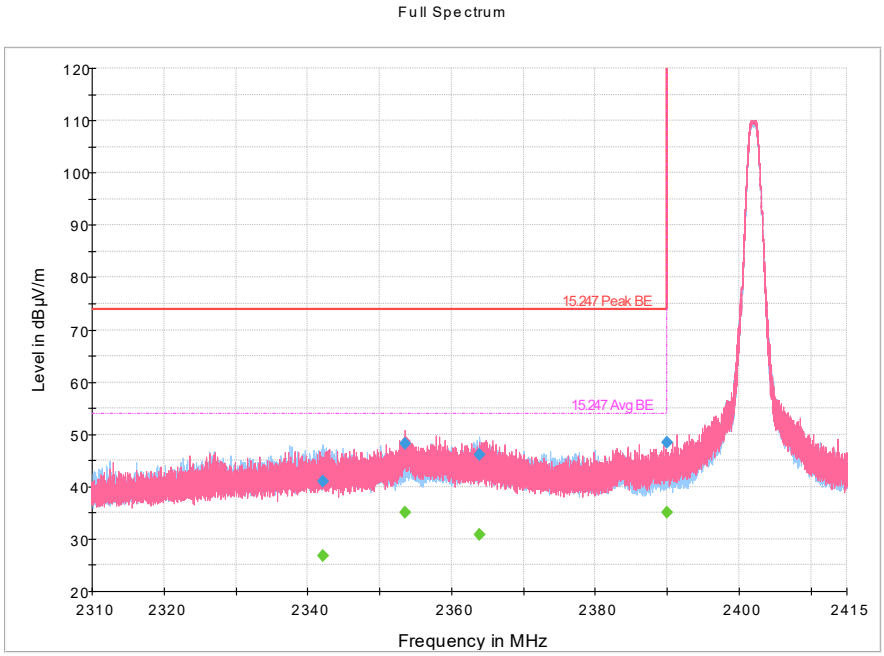


Figure 8.6-3: *Low band edge (Low channel: 2402 MHz) Radiated spurious emissions plot, 2310-2415 MHz.*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2342.186000	---	26.74	53.90	27.16	5000.0	1000.0	380.0	H	117.0	-10.2
2342.186000	41.08	---	73.90	32.82	5000.0	1000.0	380.0	H	117.0	-10.2
2353.568000	---	35.01	53.90	18.89	5000.0	1000.0	397.0	H	338.0	-10.1
2353.568000	48.29	---	73.90	25.61	5000.0	1000.0	397.0	H	338.0	-10.1
2363.886000	---	30.83	53.90	23.07	5000.0	1000.0	149.0	H	334.0	-10.1
2363.886000	46.17	---	73.90	27.73	5000.0	1000.0	149.0	H	334.0	-10.1
2390.000000	---	35.05	53.90	18.85	5000.0	1000.0	130.0	H	212.0	-10.0
2390.000000	48.37	---	73.90	25.53	5000.0	1000.0	130.0	H	212.0	-10.0

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Figure 8.6-5: *Low band edge (Low channel: 2402 MHz) Radiated spurious emissions results, 2310-2415 MHz.*

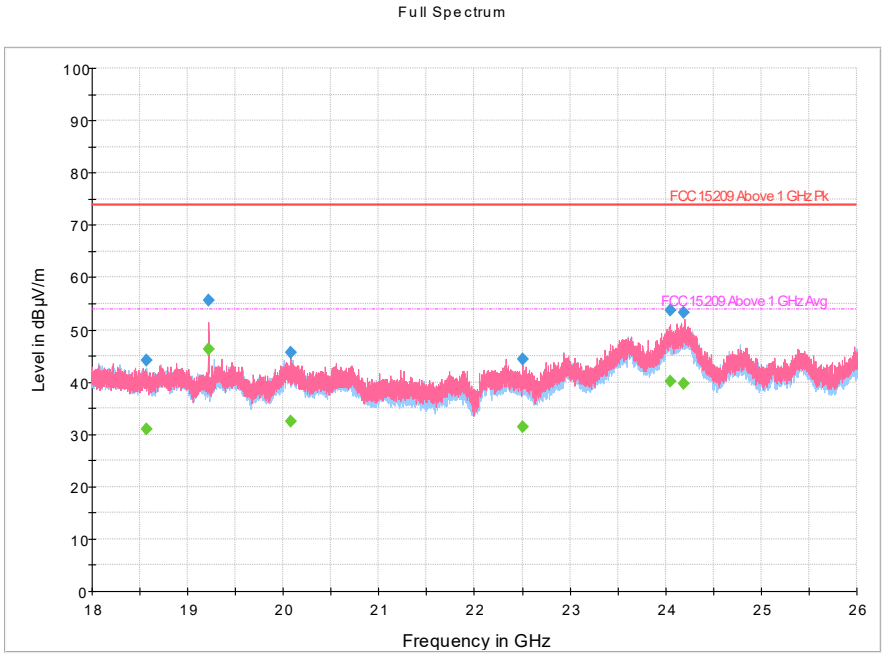


Figure 8.6-4: *Radiated spurious emissions plot, 18-26 GHz, Low channel (2402 MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18563.500000	---	31.08	53.90	22.82	5000.0	1000.0	214.0	H	296.0	18.0
18563.500000	44.06	---	73.90	29.84	5000.0	1000.0	214.0	H	296.0	18.0
19214.200000	55.55	---	73.90	18.35	5000.0	1000.0	178.0	V	174.0	18.1
19214.200000	---	46.23	53.90	7.67	5000.0	1000.0	178.0	V	174.0	18.1
20080.900000	45.62	---	73.90	28.28	5000.0	1000.0	391.0	V	46.0	18.8
20080.900000	---	32.43	53.90	21.47	5000.0	1000.0	391.0	V	46.0	18.8
22508.700000	44.40	---	73.90	29.50	5000.0	1000.0	174.0	V	60.0	19.5
22508.700000	---	31.34	53.90	22.56	5000.0	1000.0	174.0	V	60.0	19.5
24048.900000	---	40.19	53.90	13.71	5000.0	1000.0	328.0	V	281.0	29.7
24048.900000	53.61	---	73.90	20.29	5000.0	1000.0	328.0	V	281.0	29.7
24191.100000	53.30	---	73.90	20.60	5000.0	1000.0	295.0	V	0.0	29.2
24191.100000	---	39.81	53.90	14.09	5000.0	1000.0	295.0	V	0.0	29.2

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-6: *Radiated spurious emissions results, 18 – 26 GHz, Low channel (2402 MHz)*

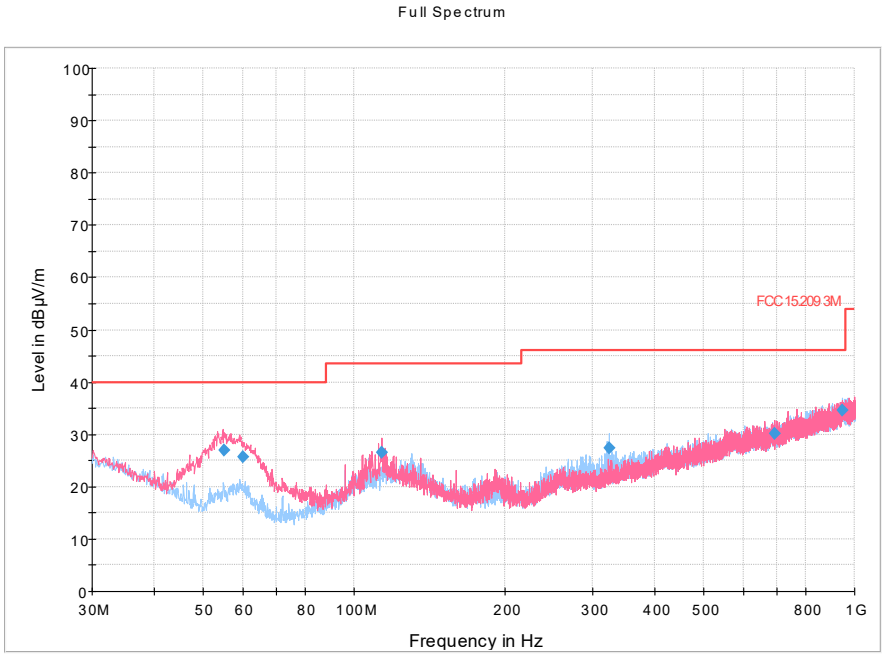


Figure 8.6-5: *Radiated spurious emissions plot, 30-1000 MHz, Mid channel (2440 MHz)*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
55.095000	26.98	40.00	13.02	5000.0	120.000	100.0	V	20.0	13.8
60.097000	25.74	40.00	14.26	5000.0	120.000	100.0	V	0.0	12.8
113.654000	26.57	43.50	16.93	5000.0	120.000	400.0	V	300.0	19.2
324.025000	27.44	46.00	18.56	5000.0	120.000	111.0	H	293.0	22.8
693.143000	30.07	46.00	15.93	5000.0	120.000	275.0	V	237.0	30.5
945.782000	34.53	46.00	11.47	5000.0	120.000	269.0	H	140.0	34.7

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-7: *Radiated spurious emissions results, 30-1000 MHz, Mid channel (2440 MHz)*

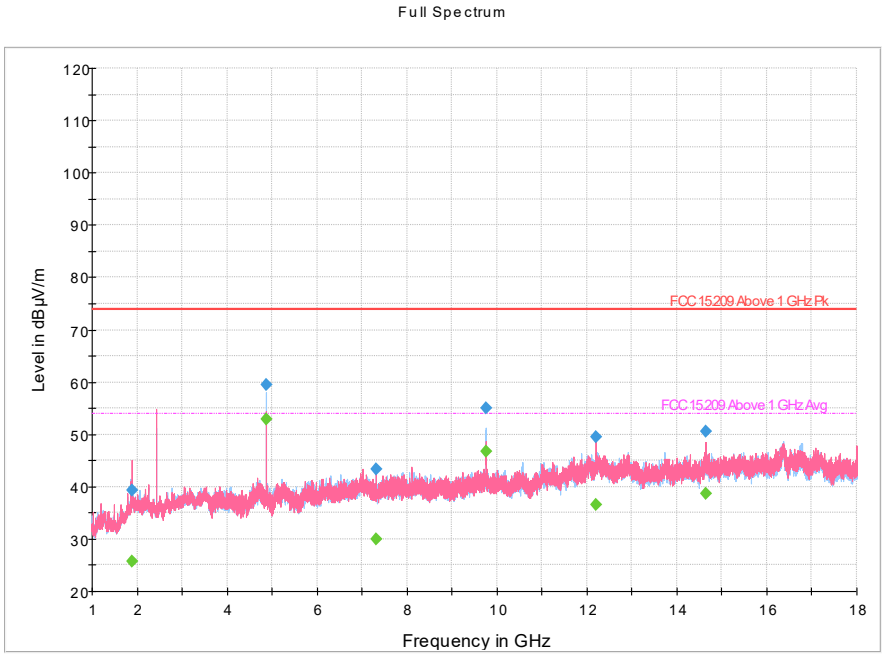


Figure 8.6-6: *Radiated spurious emissions plot, 1 – 18 GHz, Mid channel (2440 MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1882.800000	---	25.78	53.90	28.12	5000.0	1000.0	151.0	V	158.0	-10.7
1882.800000	39.41	---	73.90	34.49	5000.0	1000.0	151.0	V	158.0	-10.7
4880.577778	---	52.98	53.90	0.92	5000.0	1000.0	233.0	H	196.0	-2.3
4880.577778	59.54	---	73.90	14.36	5000.0	1000.0	233.0	H	196.0	-2.3
7312.877778	---	30.06	53.90	23.84	5000.0	1000.0	279.0	V	297.0	0.6
7312.877778	43.42	---	73.90	30.48	5000.0	1000.0	279.0	V	297.0	0.6
9761.066667	---	46.85	53.90	7.05	5000.0	1000.0	223.0	H	139.0	3.6
9761.066667	54.98	---	73.90	18.92	5000.0	1000.0	223.0	H	139.0	3.6
12201.477778	49.60	---	73.90	24.30	5000.0	1000.0	261.0	V	186.0	6.8
12201.477778	---	36.50	53.90	17.40	5000.0	1000.0	261.0	V	186.0	6.8
14638.755556	50.58	---	73.90	23.32	5000.0	1000.0	190.0	V	159.0	9.2
14638.755556	---	38.64	53.90	15.26	5000.0	1000.0	190.0	V	159.0	9.2

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.
[4] Fundamental emission at ~ 2.4 GHz is attenuated by a notch filter to protect measurement equipment. This fundamental emission is not assessed against the limits.

Table 8.6-8: *Radiated spurious emissions results, 1 – 18 GHz, Mid channel (2440 MHz)*

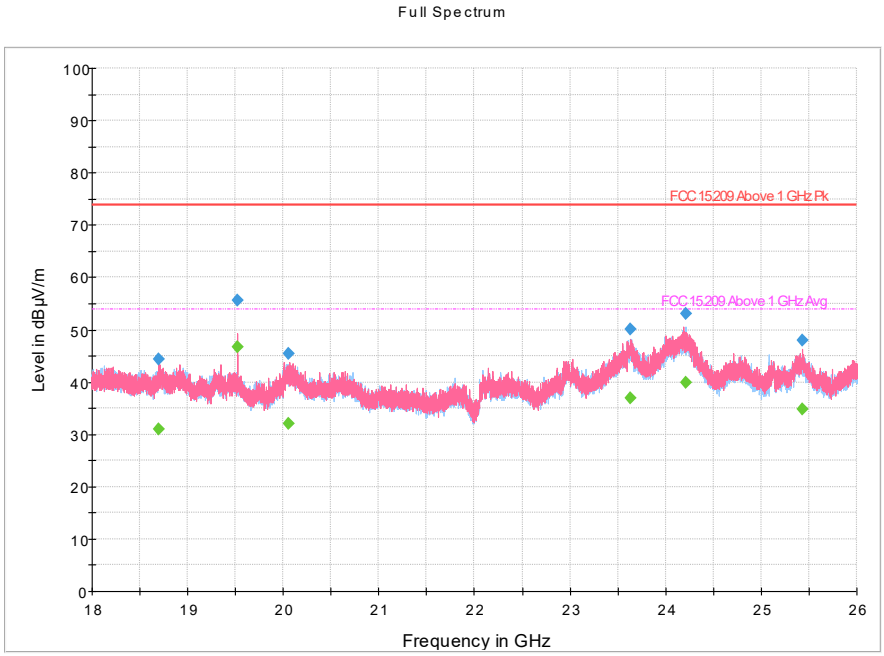


Figure 8.6-7: *Radiated spurious emissions plot, 18-26 GHz, Mid channel (2440MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18697.500000	---	31.03	53.90	22.87	5000.0	1000.0	100.0	V	238.0	17.8
18697.500000	44.41	---	73.90	29.49	5000.0	1000.0	100.0	V	238.0	17.8
19518.200000	---	46.62	53.90	7.28	5000.0	1000.0	174.0	V	176.0	18.1
19518.200000	55.64	---	73.90	18.26	5000.0	1000.0	174.0	V	176.0	18.1
20055.700000	---	32.10	53.90	21.80	5000.0	1000.0	133.0	V	150.0	18.7
20055.700000	45.48	---	73.90	28.42	5000.0	1000.0	133.0	V	150.0	18.7
23631.300000	---	36.95	53.90	16.95	5000.0	1000.0	308.0	H	103.0	25.7
23631.300000	50.12	---	73.90	23.78	5000.0	1000.0	308.0	H	103.0	25.7
24208.000000	---	39.98	53.90	13.92	5000.0	1000.0	366.0	H	337.0	29.2
24208.000000	53.02	---	73.90	20.88	5000.0	1000.0	366.0	H	337.0	29.2
25431.900000	---	34.79	53.90	19.11	5000.0	1000.0	107.0	V	240.0	23.9
25431.900000	47.92	---	73.90	25.98	5000.0	1000.0	107.0	V	240.0	23.9

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-9: *Radiated spurious emissions results, 18 – 26 GHz, Mid channel (2440 MHz)*

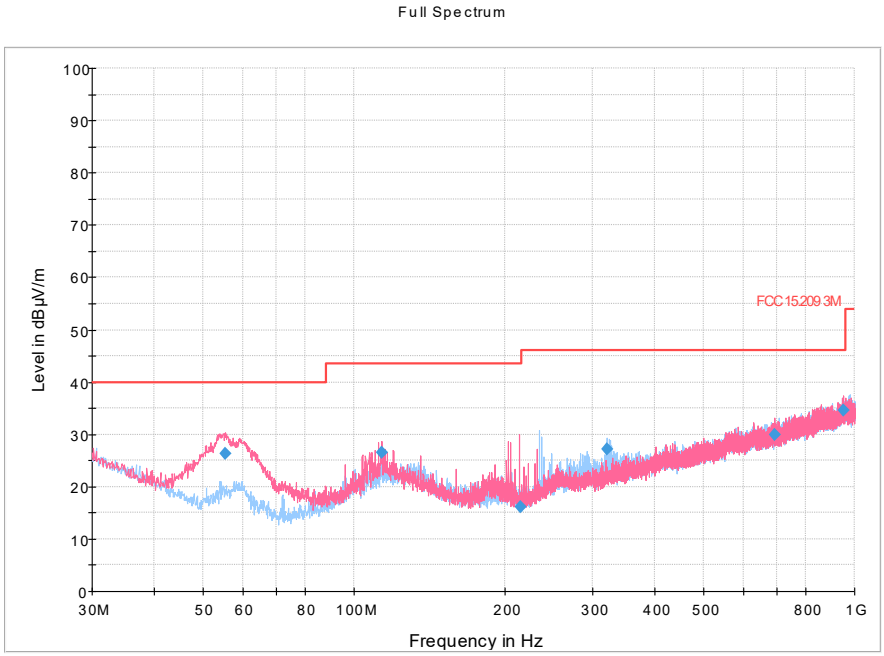


Figure 8.6-8: *Radiated spurious emissions plot, 30-1000 MHz, High channel (2480 MHz)*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
55.294000	26.39	40.00	13.61	5000.0	120.000	107.0	V	0.0	13.8
113.654000	26.57	43.50	16.93	5000.0	120.000	397.0	V	48.0	19.2
214.763000	16.20	43.50	27.30	5000.0	120.000	369.0	V	100.0	17.9
320.480000	27.08	46.00	18.92	5000.0	120.000	100.0	H	289.0	22.6
691.940000	30.03	46.00	15.97	5000.0	120.000	376.0	V	237.0	30.5
948.247000	34.67	46.00	11.33	5000.0	120.000	356.0	V	35.0	34.9

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-10: *Radiated spurious emissions results, 30-1000 MHz, High channel (2480 MHz)*

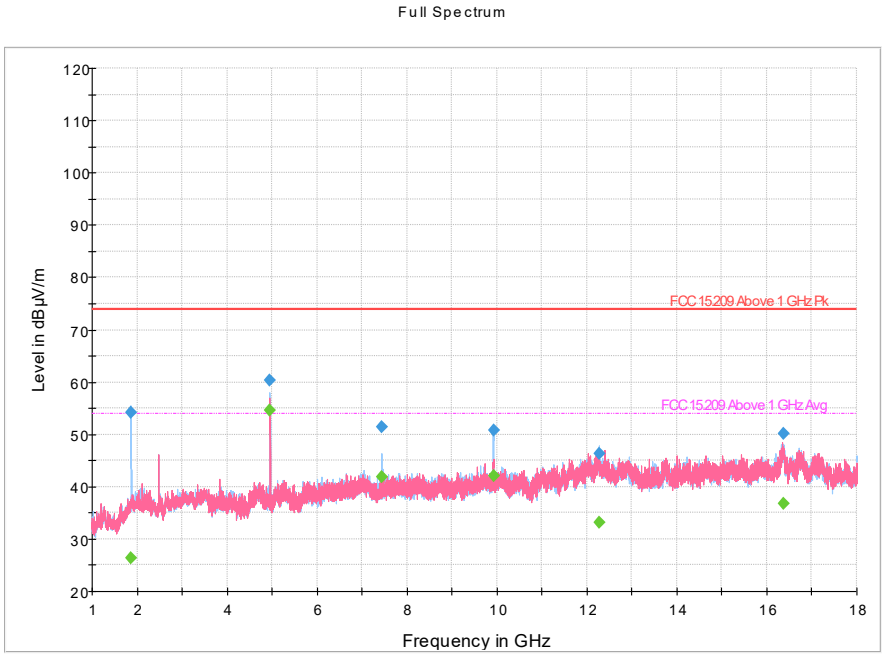


Figure 8.6-9: *Radiated spurious emissions plot, 1 – 18 GHz, High channel (2480 MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1871.066667	---	26.32	53.90	27.58	5000.0	1000.0	263.0	H	10.0	-10.9
1871.066667	54.14	---	73.90	19.76	5000.0	1000.0	263.0	H	10.0	-10.9
4959.655556	---	**52.30 (*)**	53.90	1.60	5000.0	1000.0	172.0	H	219.0	-2.4
4959.655556	60.25	---	73.90	13.65	5000.0	1000.0	172.0	H	219.0	-2.4
7440.822222	---	41.78	53.90	12.12	5000.0	1000.0	220.0	H	220.0	1.2
7440.822222	51.37	---	73.90	22.53	5000.0	1000.0	220.0	H	220.0	1.2
9920.933333	50.70	---	73.90	23.20	5000.0	1000.0	149.0	H	174.0	3.3
9920.933333	---	42.17	53.90	11.73	5000.0	1000.0	149.0	H	174.0	3.3
12269.655556	---	33.12	53.90	20.78	5000.0	1000.0	387.0	H	237.0	7.1
12269.655556	46.36	---	73.90	27.54	5000.0	1000.0	387.0	H	237.0	7.1
16363.322222	---	36.84	53.90	17.06	5000.0	1000.0	275.0	V	0.0	13.0
16363.322222	50.15	---	73.90	23.75	5000.0	1000.0	275.0	V	0.0	13.0

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.
[4] Fundamental emission at ~ 2.4 GHz is attenuated by a notch filter to protect measurement equipment. This fundamental emission is not assessed against the limits.

(*) The average value was calculated by subtracting the worst case duty cycle correction factor (7.95 dB) from the peak measurement: 60.25 – 7.95 = 52.30 dBµV/m.

Table 8.6-11: *Radiated spurious emissions results, 1 – 18 GHz, High channel (2480 MHz)*

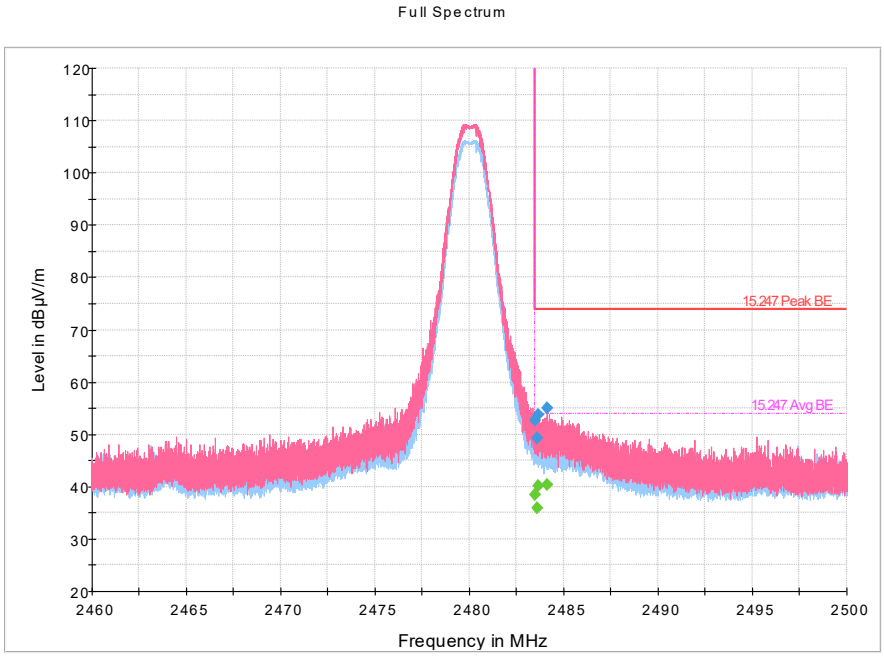


Figure 8.6-10: *High band edge (High channel: 2480 MHz) Radiated spurious emissions plot, 2460-2500 MHz.*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	38.55	53.90	15.35	5000.0	1000.0	149.0	H	190.0	-9.7
2483.500000	52.68	---	73.90	21.22	5000.0	1000.0	149.0	H	190.0	-9.7
2483.592000	---	35.94	53.90	17.96	5000.0	1000.0	149.0	H	127.0	-9.7
2483.592000	49.37	---	73.90	24.53	5000.0	1000.0	149.0	H	127.0	-9.7
2483.669333	---	40.22	53.90	13.68	5000.0	1000.0	113.0	H	196.0	-9.7
2483.669333	53.73	---	73.90	20.17	5000.0	1000.0	113.0	H	196.0	-9.7
2484.101333	---	40.44	53.90	13.46	5000.0	1000.0	124.0	V	146.0	-9.7
2484.101333	55.02	---	73.90	18.88	5000.0	1000.0	124.0	V	146.0	-9.7

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Figure 8.6-12: *High band edge (High channel: 2480 MHz) Radiated spurious emissions results, 2460-2500 MHz.*

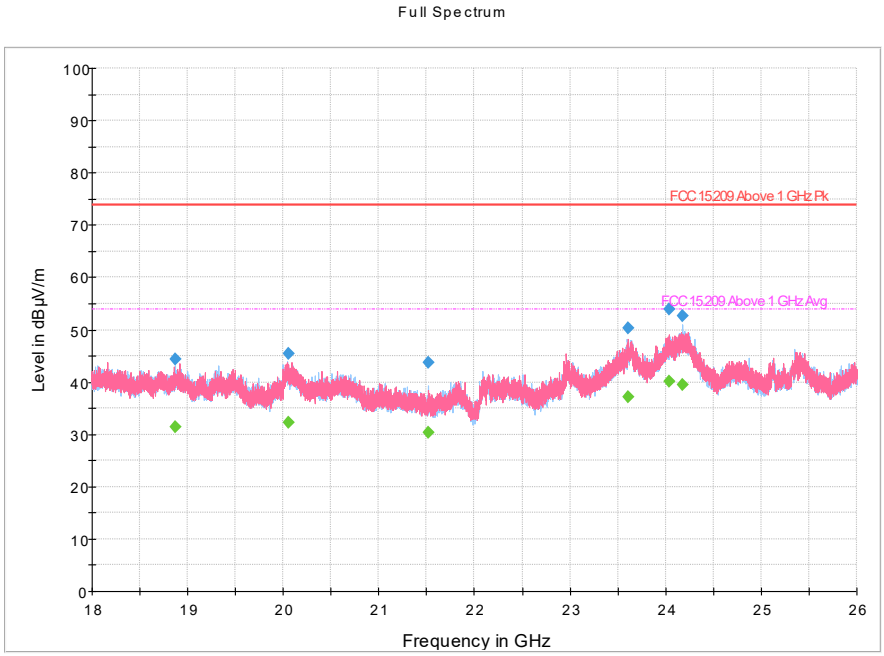


Figure 8.6-11: *Radiated spurious emissions plot, 18-26 GHz, High channel (2480 MHz)*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18866.400000	44.46	---	73.90	29.44	5000.0	1000.0	187.0	H	137.0	17.5
18866.400000	---	31.41	53.90	22.49	5000.0	1000.0	187.0	H	137.0	17.5
20054.500000	---	32.29	53.90	21.61	5000.0	1000.0	196.0	H	352.0	18.7
20054.500000	45.54	---	73.90	28.36	5000.0	1000.0	196.0	H	352.0	18.7
21522.800000	43.70	---	73.90	30.20	5000.0	1000.0	191.0	H	265.0	18.7
21522.800000	---	30.42	53.90	23.48	5000.0	1000.0	191.0	H	265.0	18.7
23608.700000	50.27	---	73.90	23.63	5000.0	1000.0	353.0	V	140.0	25.8
23608.700000	---	37.14	53.90	16.76	5000.0	1000.0	353.0	V	140.0	25.8
24041.400000	---	40.16	53.90	13.74	5000.0	1000.0	356.0	V	35.0	29.7
24041.400000	53.89	---	73.90	20.01	5000.0	1000.0	356.0	V	35.0	29.7
24182.800000	52.66	---	73.90	21.24	5000.0	1000.0	214.0	H	325.0	29.3
24182.800000	---	39.54	53.90	14.36	5000.0	1000.0	214.0	H	325.0	29.3

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] FCC 15.209 Limits are equivalent to FCC 15.247 Limits.

Table 8.6-13: *Radiated spurious emissions results, 18 – 26 GHz, High channel (2480 MHz)*

8.7 FCC 15.247(e) and RSS-247 5.2(b) Power spectral density of digital transmission system

8.7.1 References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.247(e) / ANSI C63.10: 2013

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

RSS-247 → §5.2(b)

(a) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

8.7.2 Test summary

Verdict	Pass		
Test date	December 1, 2022	Temperature	20 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1006 mbar
Test location	Wireless bench (Conducted)	Relative humidity	57 %

8.7.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).
For conducted measurements, an offset corresponding to the path losses was added in the spectrum analyzer.

8.7.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless Bench
Measurement details	Measurement performed as per C63.10 §11.10.2 (Method PKPSD)

Receiver/spectrum analyzer settings:

Resolution bandwidth	3 kHz
Video bandwidth	10 kHz (≥ 3 x RBW)
Frequency span	1 MHz (1.5 x DTS bandwidth)
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.7.5 Test data

Table 8.7-1: *Power spectral density of DTS*

Transmitter Frequency (MHz)	Measured Level (dBm/3 kHz)	Limit (dBm/3 kHz)
2402	6.21	8.00
2440	5.90	8.00
2480	4.48	8.00

8.7.6 Test data, continued

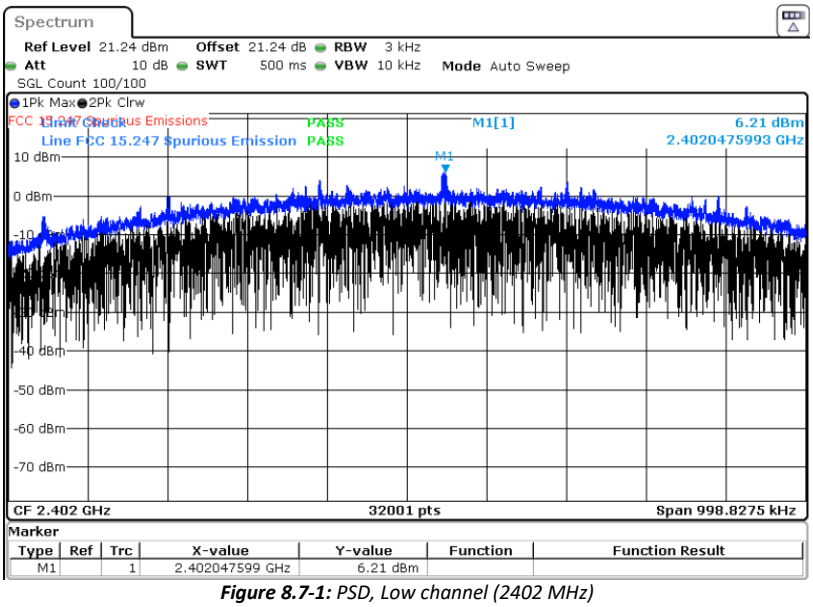


Figure 8.7-1: *PSD, Low channel (2402 MHz)*

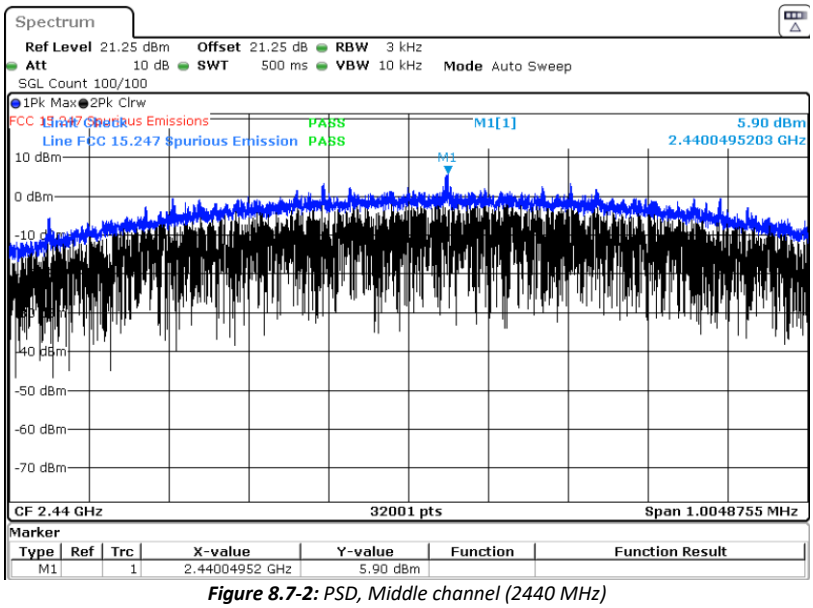


Figure 8.7-2: *PSD, Middle channel (2440 MHz)*

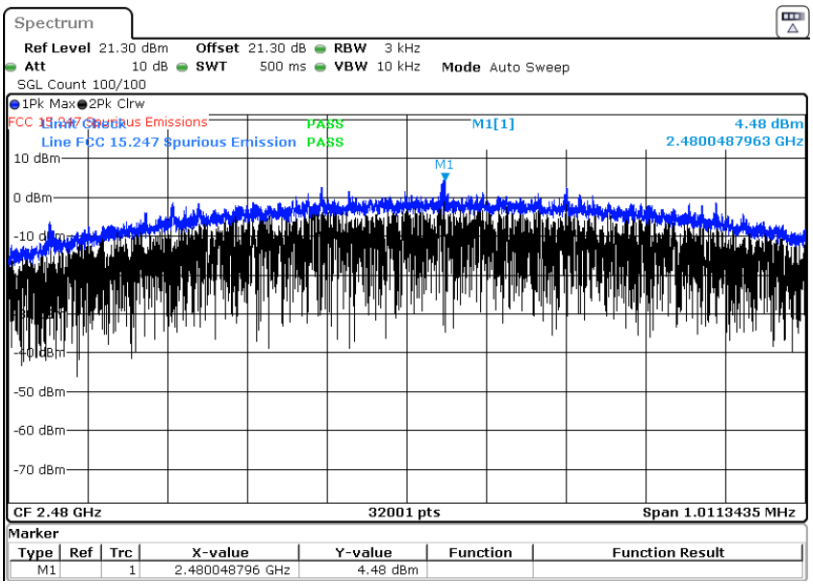


Figure 8.7-3: *PSD, High channel (2480 MHz)*

8.8 RSS-GEN 6.7 Occupied bandwidth (or 99% emission bandwidth)

8.8.1 References

RSS-Gen → §6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.8.2 Test summary

Test date	November 30, 2022	Temperature	19 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1005 mbar
Test location	Wireless bench (Conducted)	Relative humidity	53 %

8.8.3 Notes

Testing was performed with the BLE transmitter operating on a fixed channel at 5 dBm (software set up).

8.8.4 Setup details

EUT setup configuration	Tabletop
Test facility	Wireless Bench
Measurement details	Measurement performed as per C63.10 §6.9.3 using the built-in function of the spectrum analyzer

Receiver/spectrum analyzer settings:

Resolution bandwidth	1 – 5 % of OBW
Video bandwidth	3*RBW
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.8.5 Test data

Table 8.8-1: *99% Occupied bandwidth*

Transmitter Frequency (MHz)	99%Bandwidth (MHz)
2402	1.094809537
2440	1.098559420
2480	1.094497047

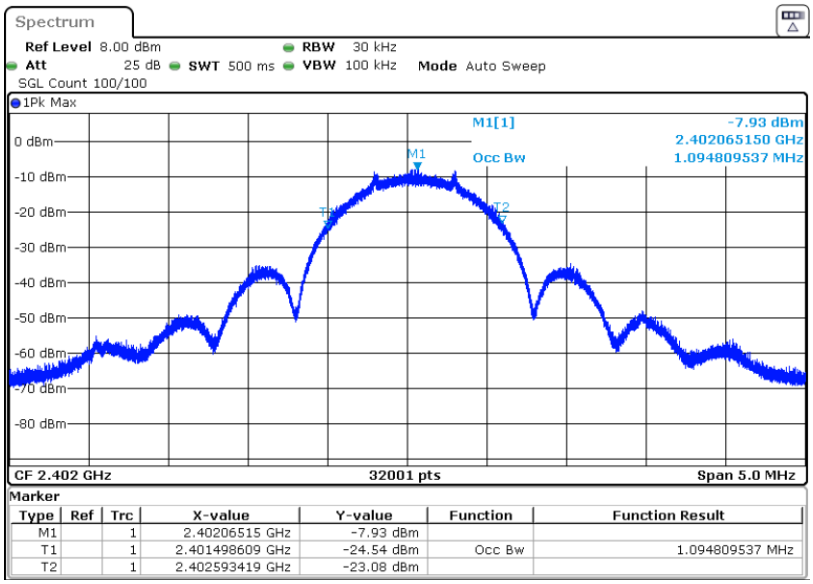


Figure 8.8-1: *99% OBW, Low channel (2402 MHz)*

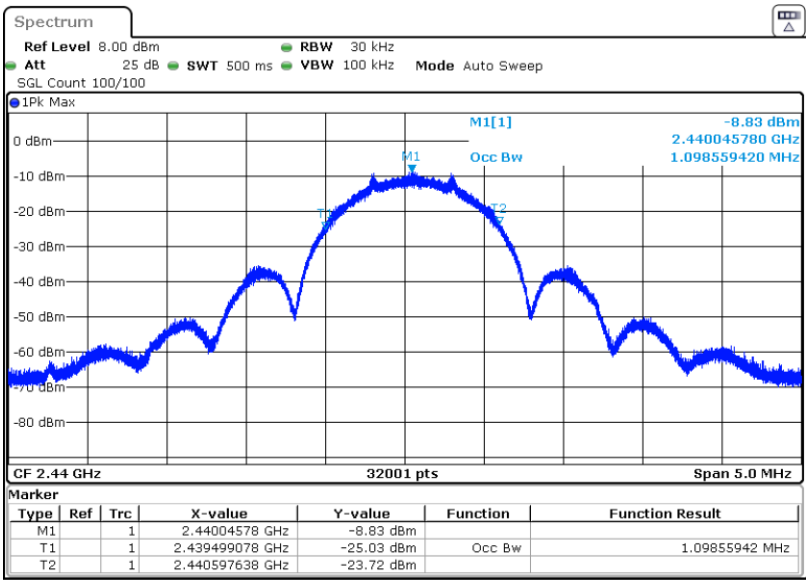


Figure 8.8-2: *99% OBW, Middle channel (2440 MHz)*

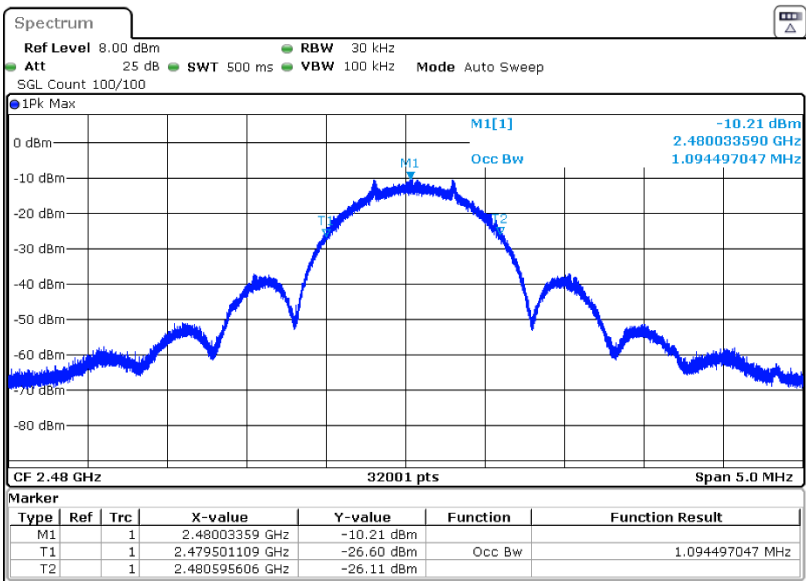


Figure 8.8-3: *99% OBW, High channel (2480 MHz)*

Section 9 Block diagrams of test set-ups

9.1 Radiated emissions set-up

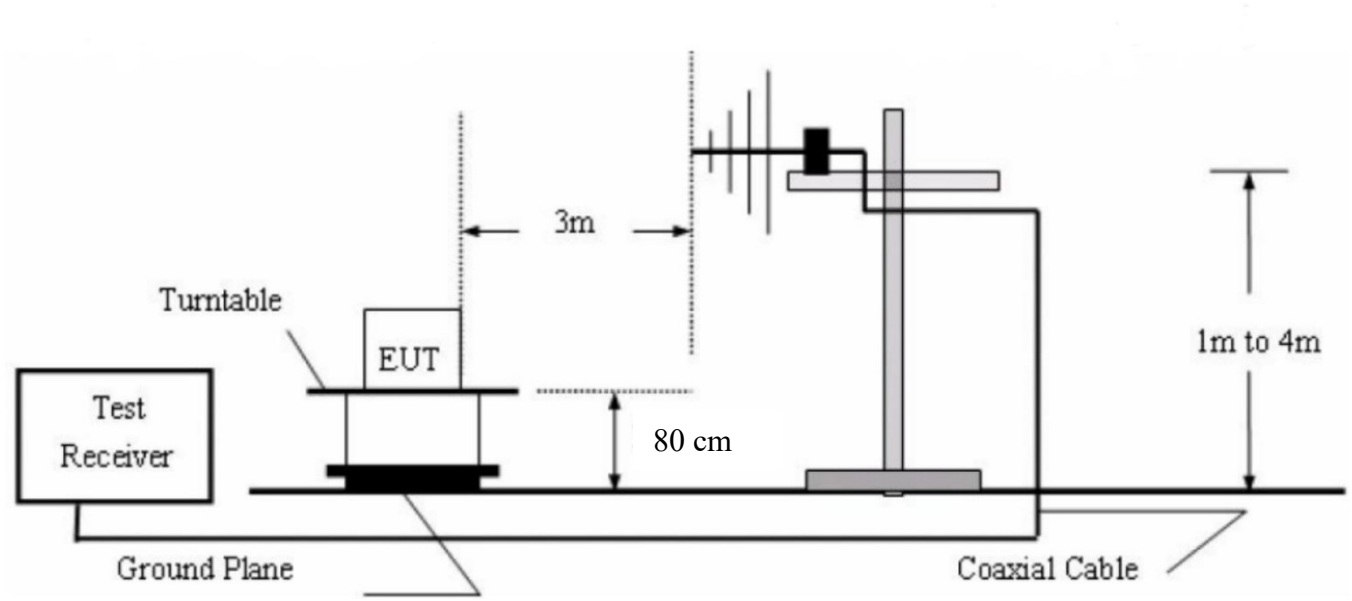


Figure 9.1-1: *30 MHz - 1000 MHz Setup*

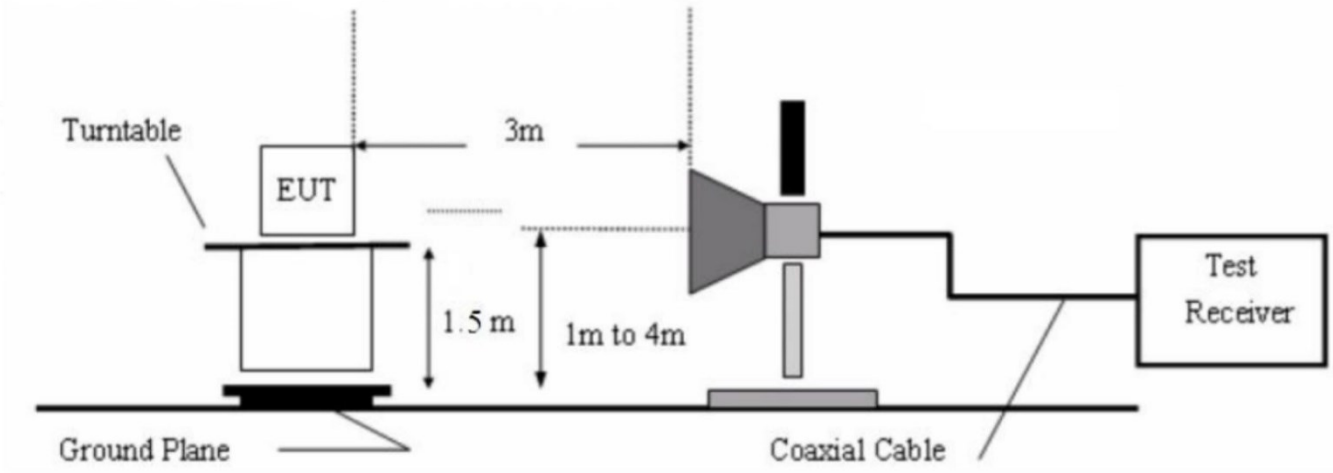


Figure 9.1-2: *1 GHz - 26 GHz Setup*

9.2 Conducted emissions set-up

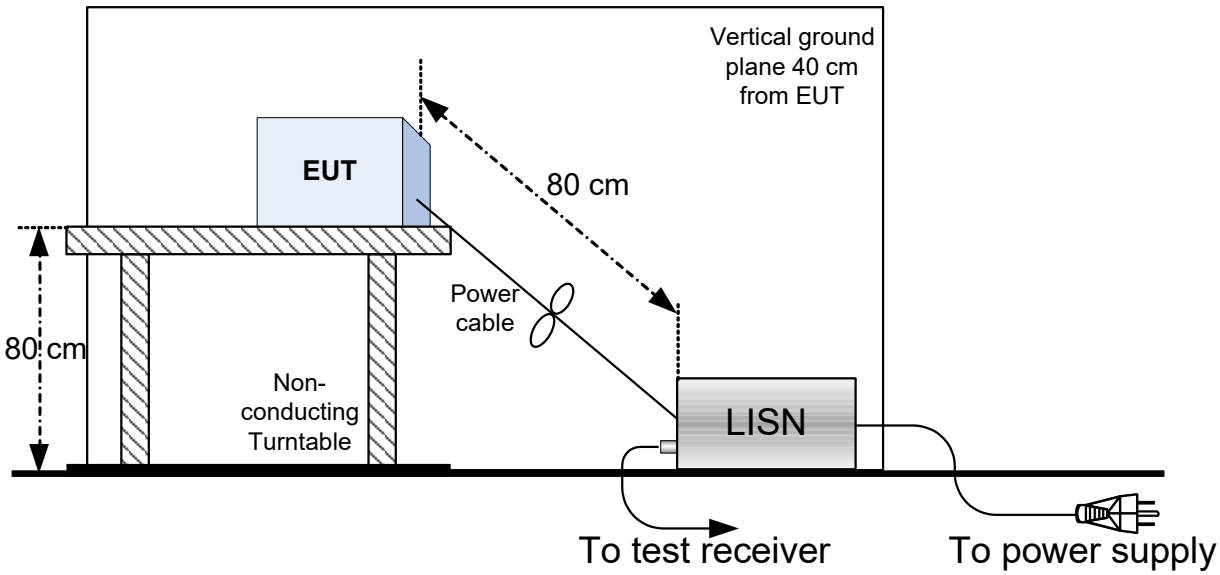


Figure 9.2-1: *150 kHz to 30 MHz Conducted Emissions Setup*