

TEST REPORT

EUT Description	WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card
Brand Name	Intel® Wi-Fi 6E AX211
Model Name	AX211D2WH
FCC/IC ID	FCC ID: PD9AX211D2H; IC ID 1000M-AX211D2H
Date of Test Start/End	2022-02-14 / 2023-10-25
Features	802.11ax, Tri Band, 2x2 Wi-Fi 6E + Bluetooth® 5.2 (see section 5)

Applicant	Intel Corporation SAS
Address	425 Rue de Goa – Le Cargo B6 – 06600 Antibes, FRANCE
Contact Person	Benjamin Lavenant
Telephone/Fax/ Email	Benjamin.lavenant@intel.com

Reference Standards	FCC CFR Title 47 Part 15 C RSS-247 issue 3, RSS-Gen issue 5 A1 (see section 1)
---------------------	--

Test Report identification	220117-04.TR63
Revision Control	Rev. 02 This test report revision replaces any previous test report revision (see section 8)

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by _____

Reviewed by _____

Cedric REQUIN
(Test Engineer Lead)

Cheiel IN
(Technical Lead)

Intel Corporation S.A.S – WRF Lab
425 rue de Goa – Le Cargo B6 - 06600, Antibes, France
Tel. +33493001400 / Fax +33493001401

Table of Contents

1. Standards, reference documents and applicable test methods	3
2. General conditions, competences and guarantees	3
3. Environmental Conditions	3
4. Test samples	4
5. EUT Features	5
6. Remarks and comments	5
7. Test Verdicts summary	5
7.1. BLE	5
8. Document Revision History	5
Annex A. Test & System Description	6
A.1 MEASUREMENT SYSTEM.....	6
A.2 TEST EQUIPMENT LIST	9
A.3 MEASUREMENT UNCERTAINTY EVALUATION	11
Annex B. Test Results	12
B.1 TEST RESULTS BLE	12
B.1.1 6dB & 99% Bandwidth.....	12
B.1.2 Maximum Output Power and antenna gain.....	16
B.1.3 Power Spectral Density	21
B.1.4 Out-of-band emission (Conducted).....	22
B.1.5 Radiated spurious emission.....	25
Annex C. Photographs	28
C.1 TEST SETUP	28
C.2 TEST SAMPLE	30

1. Standards, reference documents and applicable test methods

FCC	<ol style="list-style-type: none"> 1. FCC Title 47 CFR part 15 - Subpart C – §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. 2021-10-01 edition 2. FCC Title 47 CFR part 15 - Subpart C – §15.209 Radiated emission limits; general requirements. 2021-10-01 edition 3. FCC OET KDB 558074 D01 v05r02 - Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules. 4. FCC OET KDB 662911 D01 v02r01 - Emissions Testing of Transmitters with Multiple Outputs in the Same Band. 5. ANSI C63.10-2013 - American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ISED	<ol style="list-style-type: none"> 1. RSS-247 Issue 3 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices. 2. RSS-Gen Issue 5 A1- General Requirements for Compliance of Radio Apparatus. 3. FCC OET KDB 558074 D01 v05r02 - Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules. 4. FCC OET KDB 662911 D01 v02r01 - Emissions Testing of Transmitters with Multiple Outputs in the Same Band. 5. ANSI C63.10-2013 - American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2. General conditions, competences and guarantees

- ✓ Tests performed under FCC standards identified in section 1 are covered by A2LA accreditation.
- ✓ Tests performed under ISED standards identified in section 1 are covered by Cofrac accreditation.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 testing laboratory accredited by the French Committee for Accreditation (Cofrac) with the certificate number 1-6736.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED #1000Y and CAB identifier FR0005.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

- ✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	21.5°C ± 3.6°C
Humidity	37.15% ± 8.95%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#1	220117-04.S01	WiFi 6E Module	AX211D2WH	7C0DA7F5B6AD	2022-01-19	Used for 30 MHz-1 GHz Spurious Emissions tests
	180001-01.S21	Socket	WsP/ThP /GfP/HrP	-	2021-06-07	
	200803-01.S01	Extender	ADEXELEC	139245	2020-08-31	
	200611-01.S09	adaptor	PowerBy SNJ A4	-	2020-11-30	
	200602-03.S06	Absorber	-	-	2020-07-03	
	220117-04.S16	Laptop	Latitude 5401	7GJLK13	2022-02-11	
	220117-04.S10	Antenna 2.4G	WRF-6dBi-PIFA-2.4G	-	2022-02-09	
	220117-04.S13	Antenna 2.4G	WRF-6dBi-PIFA-2.4G	-	2022-02-09	
#2	220117-04.S01	WiFi 6E Module	AX211D2WH	7C0DA7F5B6AD	2022-01-19	Used for 1-26 GHz Spurious Emissions tests
	180001-01.S21	Socket	WsP/ThP /GfP/HrP	-	2021-06-07	
	200611-03.S31	Extender	ADEXELEC		2020-08-19	
	200611-01.S09	Adaptor	PowerBy SNJ A4	-	2020-11-30	
	200602-03.S06	Absorber	-	-	2020-07-03	
	200615-05.S09	Laptop	Latitude 5401	GVGLK13	2020-06-12	
	220117-04.S10	Antenna 2.4G	WRF-6dBi-PIFA-2.4G	-	2022-02-09	
	220117-04.S13	Antenna 2.4G	WRF-6dBi-PIFA-2.4G	-	2022-02-09	
#3	220117-04.S05	WiFi 6E Module	AX211D2WH	2C0DA7F5B9B4	2022-01-19	RF Conducted
	220117-04.S08	WiFi 6E Module	AX211D2WH	2C0DA7F5B8CE	2022-01-19	
	180000-01.S01	Adapter 1216SD to M.2	Adapter M2	N/A	2017-08-09	
	170000-01.S02	Laptop	Latitude E5450	21HTPF2	2017-03-28	
	200611-01.S12	Extender	XVT EXTENDER SNJ A4	-	2020-11-30	

5. EUT Features

The herein information is provided by the customer.

Intel WRF Lab declines any responsibility for the accuracy of the stated customer provided information, especially if it has any impact on the correctness of test results presented in this report.

Brand Name	Intel® Wi-Fi 6E AX211		
Model Name	AX211D2WH		
Software Version	DRTU_00699_99.0.69C (RSE tests) DRTU_11195_99_2100_51G DRTU.05236.99.0.84		
Driver Version	22.110.0.2 / 22.180.0.2		
Prototype / Production	Production		
Supported Radios	802.11b/g/n/ax 802.11a/n/ac/ax Bluetooth 5.2	2.4GHz (2400.0 – 2483.5 MHz) 5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5895.0 MHz) 6.0GHz (5925.0 - 7125.0MHz) 2.4GHz (2400.0 – 2483.5 MHz)	
Antenna Information	Transmitter	Aux – port 1 (chain A)	Main – port 2 (chain B)
	Manufacturer	Intel	Intel
	Antenna type	PIFA	PIFA
	Part number	WRF-6dBi-PIFA-2.4G	WRF-6dBi-PIFA-2.4G
	Declared antenna gain (dBi) 2.4 GHz	+ 6.4 dBi	+6.4 dBi

6. Remarks and comments

- No deviations were made from the test methods listed in section 1 of this report

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

7.1. BLE

FCC part	RSS part	Test name	Verdict
15.247 (a) (2)	RSS-247 Clause 5.2 (a)	6dB Bandwidth	P
15.247 (b) (3)	RSS-247 Clause 5.4 (d)	Maximum output power and E.I.R.P.	P
15.247 (e)	RSS-247 Clause 5.2 (b)	Power spectral density	P
15.247 (d) 15.209	RSS-247 Clause 5.5 RSS-Gen A1 Clause 8.9	Out-of-band Emissions (conducted)	P
15.247 (d) 15.209	RSS-247 Clause 5.5 RSS-Gen A1 Clause 8.9	Spurious Emissions (radiated)	P

P: Pass

F: Fail

NM: Not Measured

NA: Not Applicable

8. Document Revision History

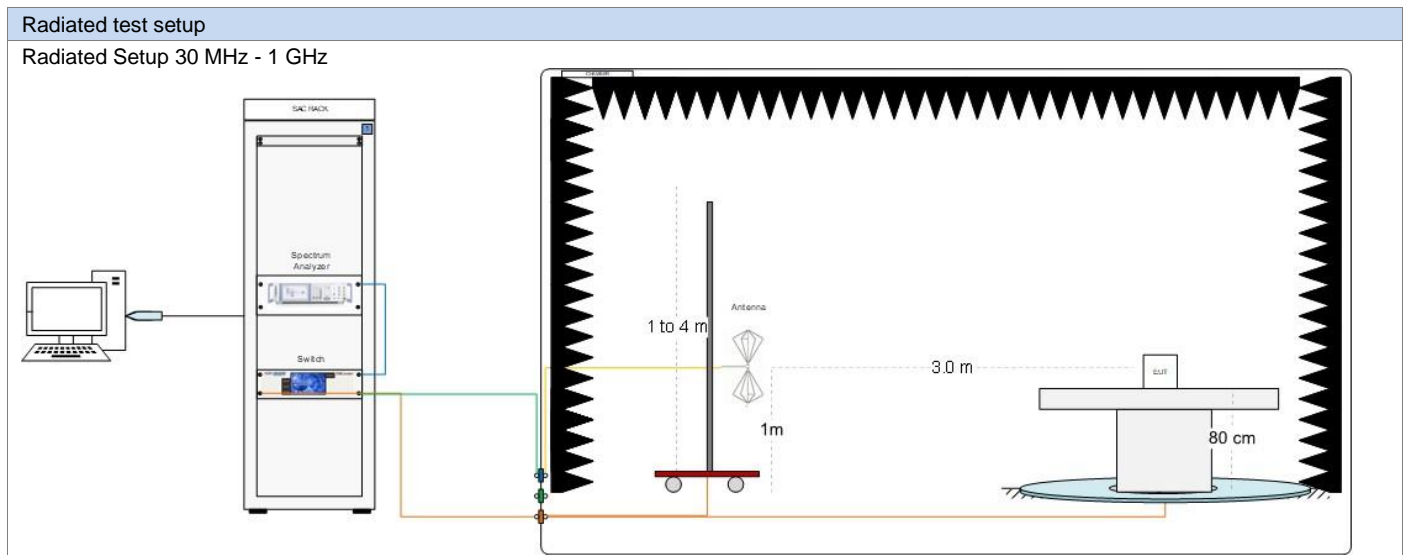
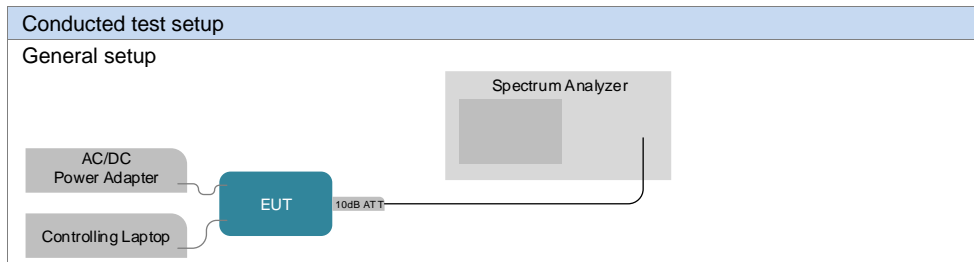
Revision #	Modified by	Revision Details
Rev. 00	K.KHATIB, V.KACULINI	First Issue
Rev. 01	C. REQUIN	Antenna reference of the 2.4 GHz updated
Rev. 02	C. REQUIN	Front page, section 1 and 2 updated. According to customer request, results in section B.1. have been updated using new DRTu and driver version. A typo on duty cycle value has been noticed and corresponding RMS TX output power levels were updated accordingly with correct values.

Annex A. Test & System Description

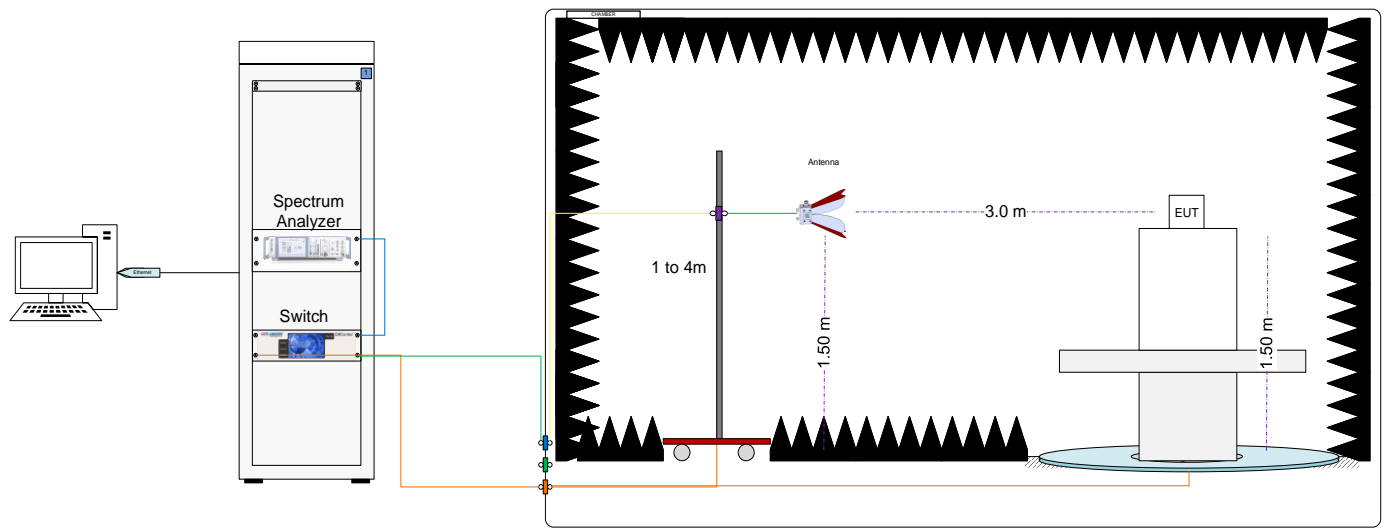
A.1 Measurement System

Measurements were performed using the following setups, made in accordance to the general provisions of FCC OET KDB 558074 D01 DTS Meas Guidance.

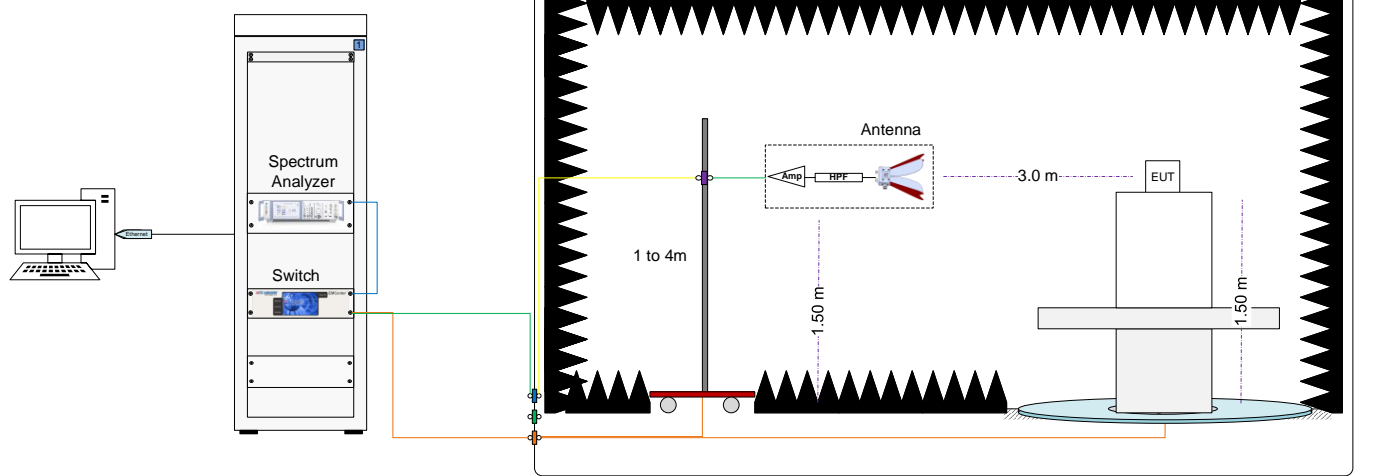
The DUT was installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary tool DRTU.



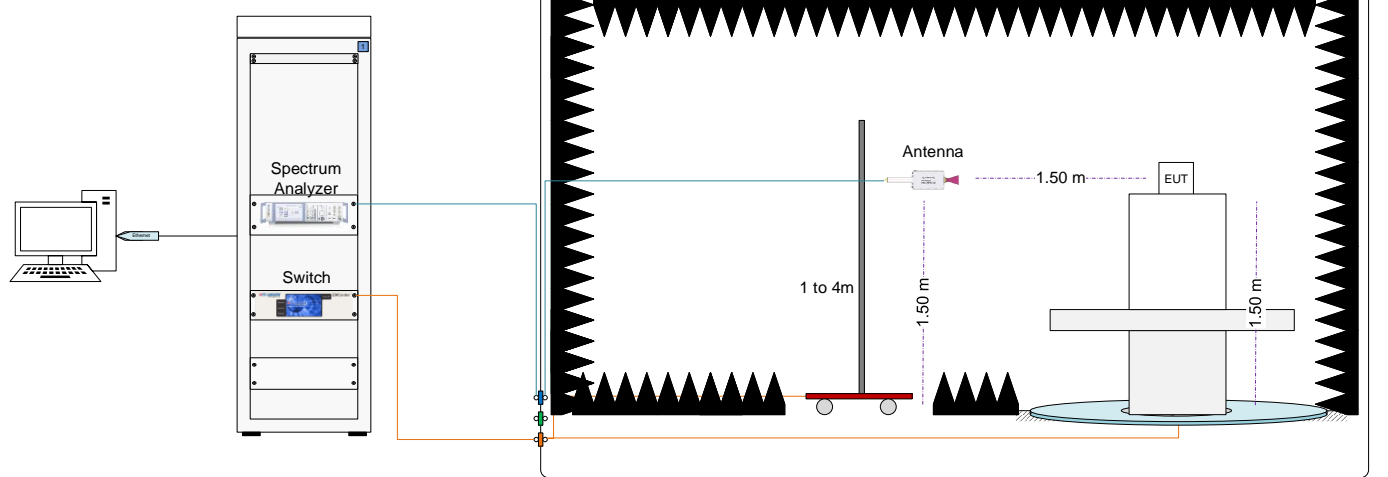
Radiated Setup 1 GHz – 9.5 GHz



Radiated Setup 9.5 GHz - 18 GHz



Radiated Setup 18 GHz – 26 GHz



Sample Calculation

The spurious received voltage $V(\text{dB}\mu\text{V})$ in the spectrum Analyzer is converted to Electric field strength using the transducer factor F corresponding to the Rx path Loss:

$$\mathbf{F \text{ (dB/m)} = Rx \text{ Antenna Factor (dB/m) + Cable losses (dB) - Amplifiers Gain (dBi)}$$
$$\mathbf{E \text{ (dB}\mu\text{V)} = V(\text{dB}\mu\text{V}) + F \text{ (dB/m)}}$$

For field strength measurements made at other than the distance at which the applicable limit is specified, the field strength of the emission at the distance specified by the limit is deduced as follows:

$$\mathbf{E_{SpecLimit} = E_{Meas} + 20 \cdot \log(D_{Meas}/D_{SpecLimit})}$$

where

$E_{SpecLimit}$ is the field strength of the emission at the distance specified by the limit, in $\text{dB}\mu\text{V/m}$

E_{Meas} is the field strength of the emission at the measurement distance, in $\text{dB}\mu\text{V/m}$

D_{Meas} is the measurement distance, in m

$D_{SpecLimit}$ is the distance specified by the limit, in m

A.2 Test Equipment List

Conducted setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
265-000*	Spectrum Analyzer	FSV30	101318	Rohde & Schwarz	2020-05-28	2022-05-28
134-000	Spectrum Analyzer	FSV30	103308	Rohde & Schwarz	2023-07-26	2025-07-26
018-002*	Peak Power Meter	MA24406A	11138	ANRITSU	2021-11-24	2023-11-24
019-000*	RF cable 100cm	PE360-100CM	N/A	PASTERNAK	2022-02-04	2022-08-04
019-002*	10dB Attenuator + MH4	N/A	N/A	N/A	2022-02-04	2022-08-04
322-000*	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B89702	AVTECH	2021-09-02	2023-09-02
413-000	Measurement SW v1.5.4.2	Octopi	N/A	Step AT	N/A	N/A
280-000	Spectrum Analyzer	FSV30	103310	Rohde & Schwarz	2023-06-22	2025-06-22
019-003	SMA-SMA 100cm Cable	FLC-1M-SMSM+	21112742	Mini-Circuits	2023-06-02	2024-06-02
019-004	Attenuator 6dB + SMA-MH4	3M-6	3M-6	WEINSCHEL	2023-06-02	2024-06-02
322-000 *	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B89702	AVITECH	2021-09-02	2023-09-02
407-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-E16EDA	AVITECH	2023-07-12	2025-07-12

* Equipment not used during out of calibration period

Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
006-000*	Anechoic chamber	FACT 3	5720	ETS Lindgren	2022-01-12	2024-01-12
006-001	Turntable	-	-	ETS Lindgren	NA	NA
006-008	Measurement Software v11.30.00	EMC32	100623	Rohde & Schwarz	N/A	N/A
147-000*	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2020-11-02	2022-11-02
006-002	Switch & Positioning	EMC center	00159757	ETS Lindgren	N/A	N/A
006-011	Boresight antenna mast	BAM4.0-P	P/278/2890.01	Maturo	N/A	N/A
006-019*	Biconical antenna 30 MHz – 1 GHz	UBAA9115 + BBVU9135 + DGA9552N	0286 + CH 9044	Schwarzbeck	2022-02-01	2024-02-01
006-020*	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157734	ETS Lindgren	2021-08-05	2023-08-05
057-000*	Horn Antenna 3117 + Amplifier + HPF9.5	3117	00167062+00169546	ETS-Lindgren	2020-06-15	2022-06-15
007-008*	Double Horn Ridged antenna	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2021-08-05	2023-08-05
006-058*	RF Cable 7.5m	TestPro5	20 50 162	Radiall	2022-02-08	2022-08-08
006-051*	RF Cable 1.0m	CBL-1.5M-SMSM+	202879	Mini-Circuits	2022-02-02	2022-08-02
006-030*	RF Cable 1.2m	UFA147A-0-0480-200200	MFR 64639223720-003	Micro-coax	2022-02-02	2022-08-02
006-034*	RF Cable 1.0m	UFA147A	-	Utilflex	2022-02-02	2022-08-02
006-036*	RF Cable 1.0m	UFB311A-0-0590-50U50U	MFR 64639 223230-001	Micro-coax	2022-02-02	2022-08-02
006-038*	RF Cable 7.0m	R286304009	-	Radiall	2022-02-02	2022-08-02
006-039*	RF Cable 2.5m	0500990992500KE	19.23.395	Radiall	2022-02-02	2022-08-02
365-000*	Temperature & Humidity logger	RA12E-TH1-RAS	00-80-A3-E1-6E-55	Avtech	2021-03-08	2023-03-08

* Equipment not used during out of calibration period

N/A: Not Applicable

Radiated Setup #2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
007-000*	Anechoic chamber	RFD-FA-100	5996	ETS Lindgren	2021-09-14	2023-09-14
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-006	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
007-005	Measurement SW, V11.20.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
127-000*	Spectrum Analyzer	FSV40	101358	Rohde & Schwarz	2021-01-15	2023-01-15
007-007*	Double Ridge Horn (1-18GHz)	3117	00152266	ETS Lindgren	2020-03-18	2022-03-18
057-000*	Horn Antenna 3117 + Amplifier + HPF9.5	3117	00167062+00169546	ETS-Lindgren	2020-06-15	2022-06-15
007-008*	Double Horn Ridged antenna	3116C-PA	00169308bis 00196308	ETS-Lindgren	2021-08-05	2023-08-05
007-022*	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2022-02-03	2022-08-03
007-020*	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2022-02-03	2022-08-03
007-011*	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Spectrum	2022-02-03	2022-08-03
007-015*	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2022-02-03	2022-08-03
007-014*	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2022-02-03	2022-08-03
007-023*	RF Cable 1m DC-40GHz	PE360-100CM	-	Pasternack	2022-02-03	2022-08-03
007-018*	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2022-02-03	2022-08-03
325-000*	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B9B7C6	Avtech	2022-01-17	2024-01-17

* Equipment not used during out of calibration period

N/A: Not Applicable

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
412-000	DRTU Power finder V2.0	-	-	Intel	NA	NA
139-000*	Power Sensor	NRP-Z81	104383	Rohde & Schwarz	2021-04-07	2023-04-07
140-000*	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2020-04-08	2022-04-08

* Equipment not used during out of calibration period

N/A: Not Applicable

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of $k = 2$ to indicate a 95% level of confidence:

Measurement type	Uncertainty	Unit
Timing	± 0.12	%
Power Spectral density	± 1.47	dB
Occupied bandwidth	± 2.07	%
Conducted Power	± 1.03	dB
Conducted Out of band Emission <7 GHz	± 1.67	dB
Radiated tests <1GHz	± 6.07	dB
Radiated tests 1GHz – 26.5 GHz	± 5.92	dB

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
6dB Bandwidth	C.Requin, V.Kaculini, T. Mathieu
Maximum output power and E.I.R.P.	C.Requin, V.Kaculini, T. Mathieu
Power spectral density	C.Requin, V.Kaculini, T. Mathieu
Out-of-band Emissions (conducted)	C.Requin, V.Kaculini, T. Mathieu
Out-of-band Emissions (radiated)	K.Khatib, R.Simonini, N.Bui

B.1 Test Results BLE

B.1.1 6dB & 99% Bandwidth

Test limits

FCC part	RSS part	Limits
15.247 (a) (2)	RSS-247 Clause 5.2 (a)	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.

Test procedure

The conducted setup shown in section *Test & System Description* was used to measure the 6dB & 99% Bandwidth. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

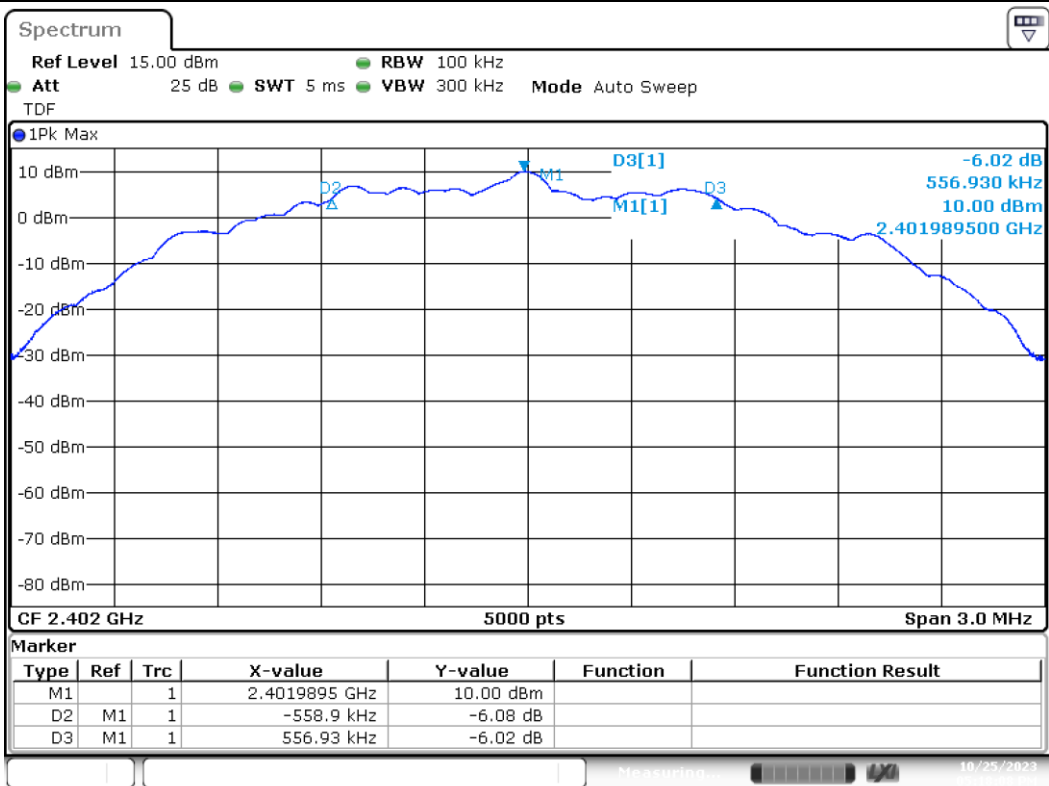
Results tables

Mode	Frequency [MHz]	6dB BW [MHz]	99% BW [MHz]
BLE	2402	1.116	2.088
	2440	1.123	2.082
	2480	1.135	2.088

Results screenshot

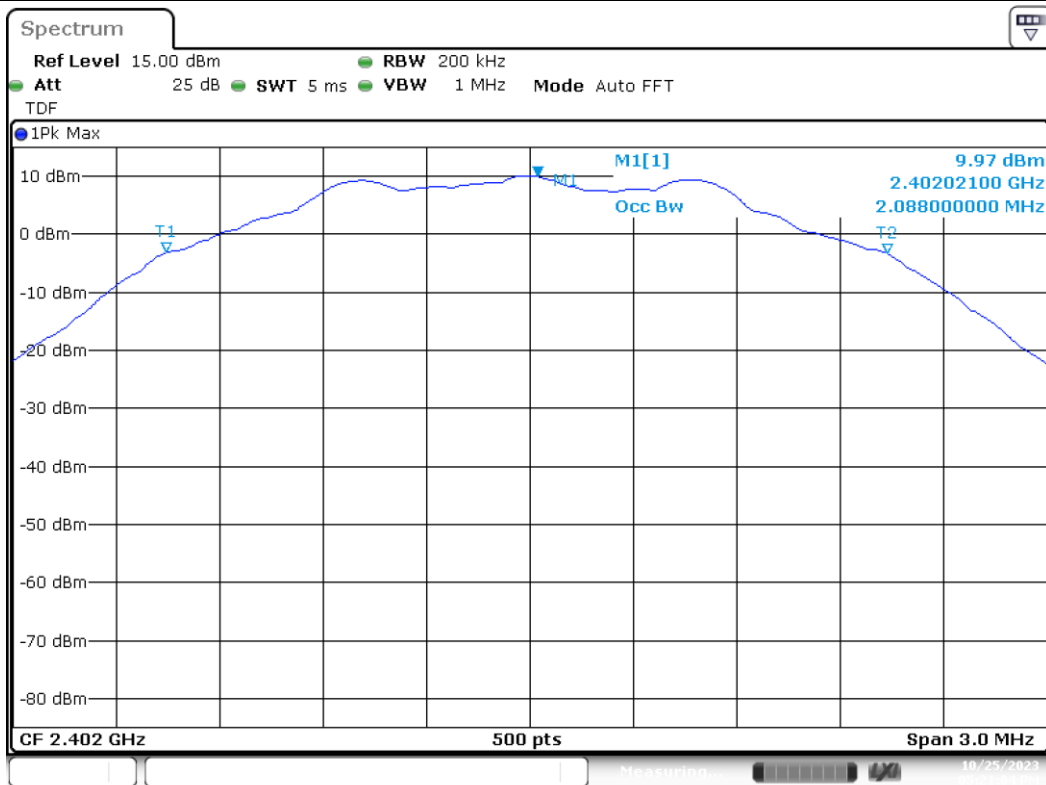
BLE

6dB BW – 2402 MHz



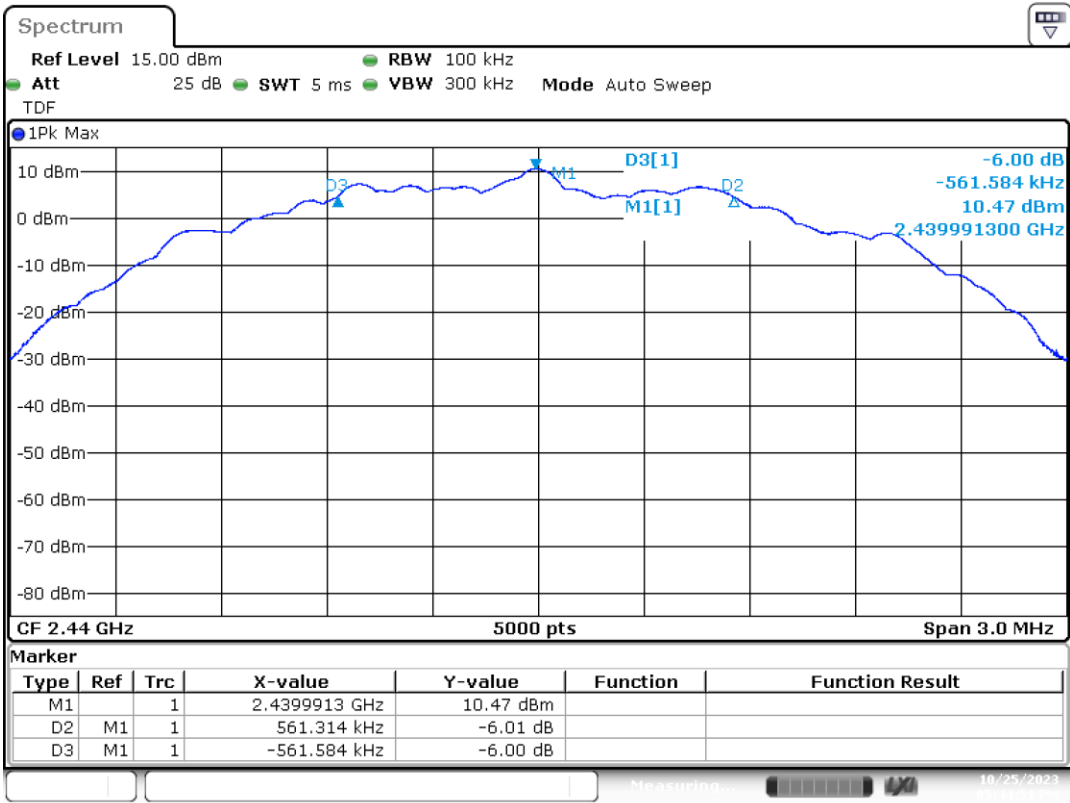
Date 25.OCT.2023 17:18:07

99% BW – 2402 MHz

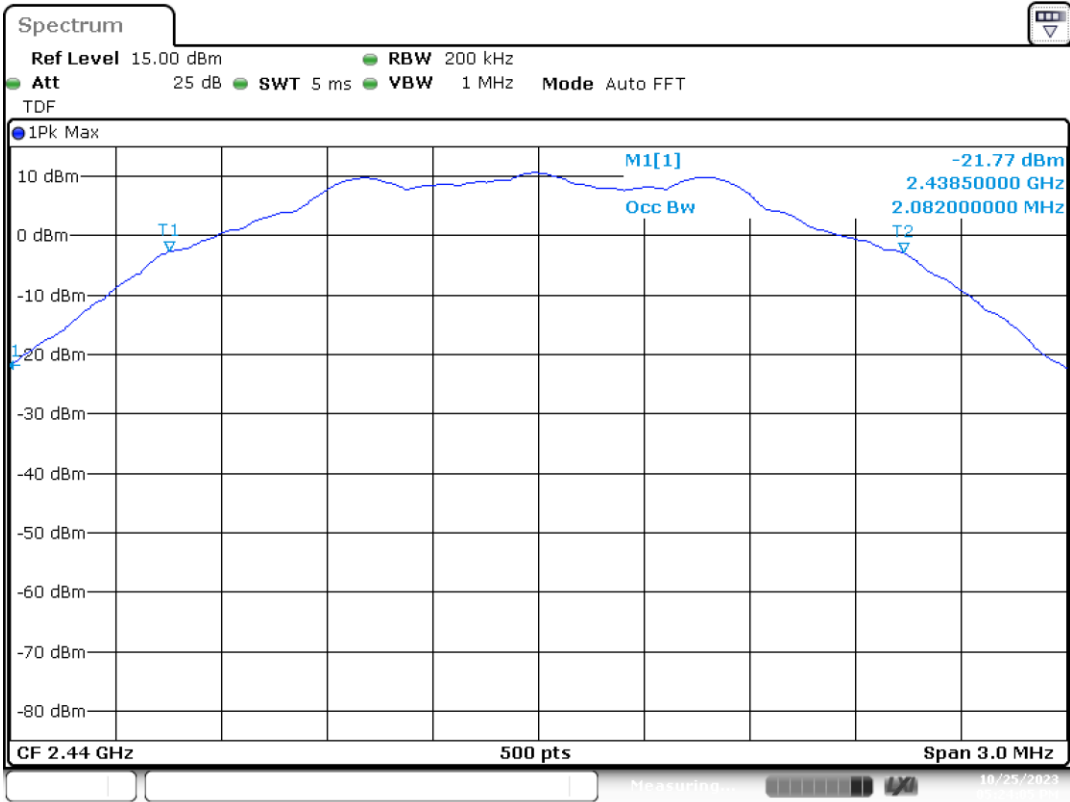


Date 25.OCT.2023 17:21:04

6dB BW – 2440 MHz



99% BW – 2440 MHz



B.1.2 Maximum Output Power and antenna gain

Test limits

	Limits
FCC Part 15.247 (b) (3)	<p>(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:</p> <p>(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.</p> <p>(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.</p>
RSS-247 Clause 5.4 (d)	<p>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 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).</p> <p>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</p>

Test procedure:

The Maximum peak conducted output power was measured using the $RBW \geq DTS \text{ bandwidth}$ method defined in paragraph 11.9.1.1 of ANSI C63.10-2013.

The Maximum conducted average output power was measured using the channel integration method according to Method AVGSA-2, defined in paragraph 11.9.2.2.4 of ANSI C63.10-2013.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

The conducted setup shown in section *Test & System Description* was used to measure the maximum conducted output power. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

Results tables

Mode	Meas. Duty Cycle [%]	Frequency [MHz]	Peak Power [dBm]		
			Measured Conducted Output Power	EIRP	Peak Output Power [mW]
BLE	31.50	2402	10.19	16.59	10.45
		2440	10.65	17.05	11.61
		2480	6.78	13.18	4.76

Max Value

Min Value

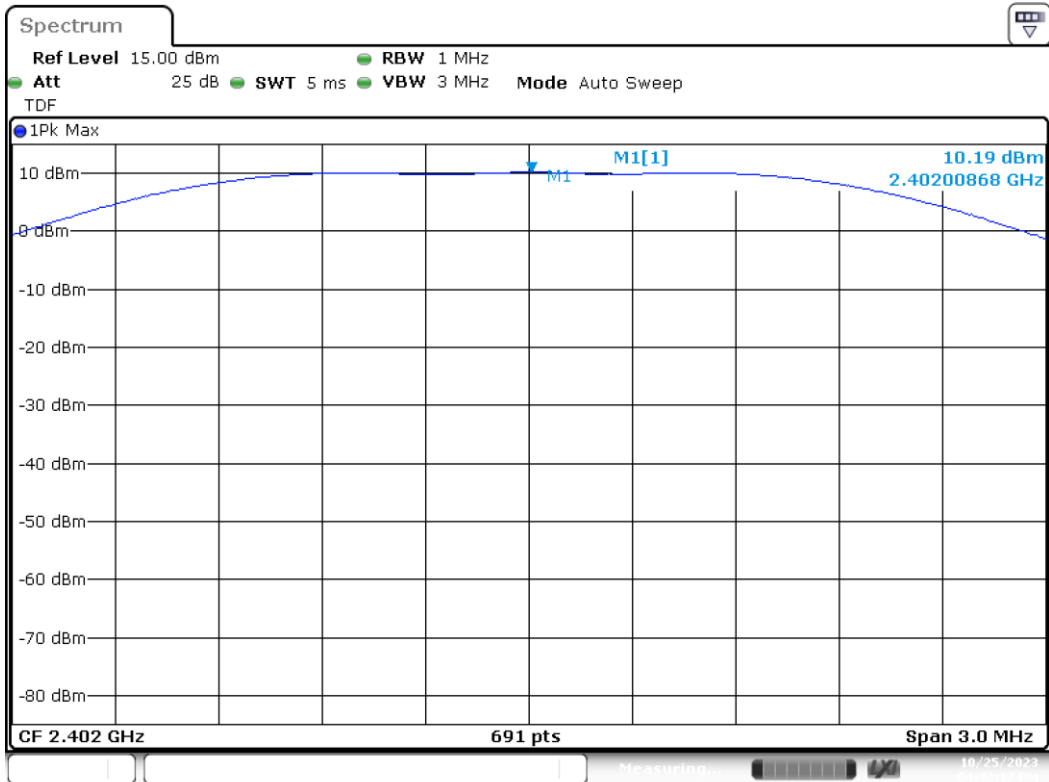
Mode	Meas. Duty Cycle [%]	Frequency [MHz]	Average Output Power* [dBm]			
			Maximum Conducted Output Power	Maximum Conducted Output Power Duty cycle Compensated	EIRP	Average Output Power [mW]
BLE	31.50	2402	5.22	10.24	16.64	10.56
		2440	5.70	10.72	17.12	11.79
		2480	1.89	6.91	13.31	4.91

* Output Power RMS values are shown for indicative purpose only

Results screenshot

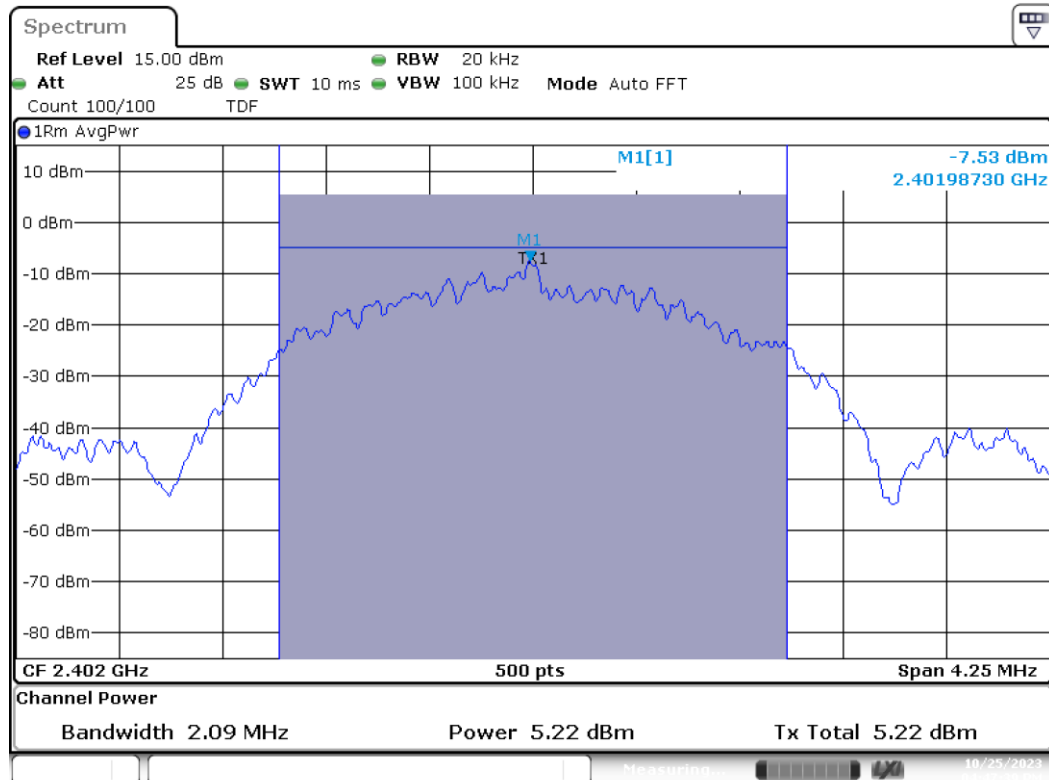
BLE

Max Power Peak – 2402 MHz



Date 25.OCT.2023 16:42:17

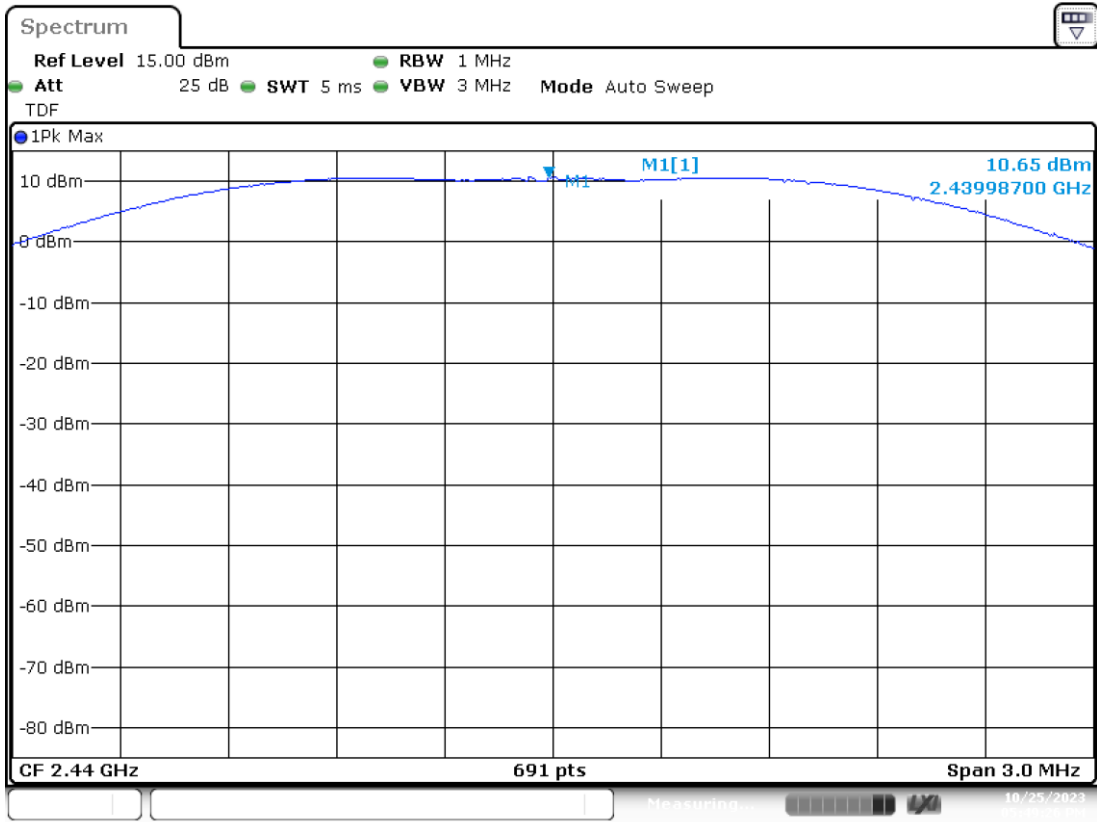
Max Power RMS – 2402 MHz



Date 25.OCT.2023 16:47:39

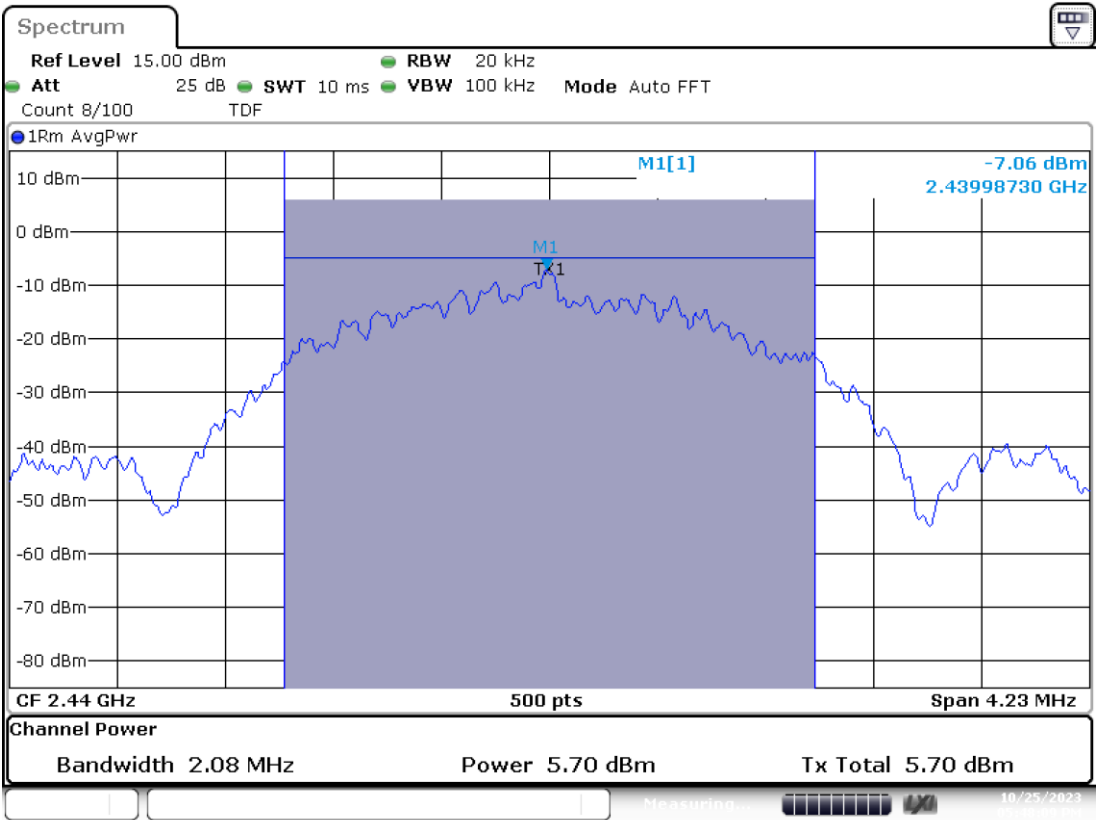
BLE

Max Power Peak – 2440 MHz



Date 25.OCT.2023 17:49:27

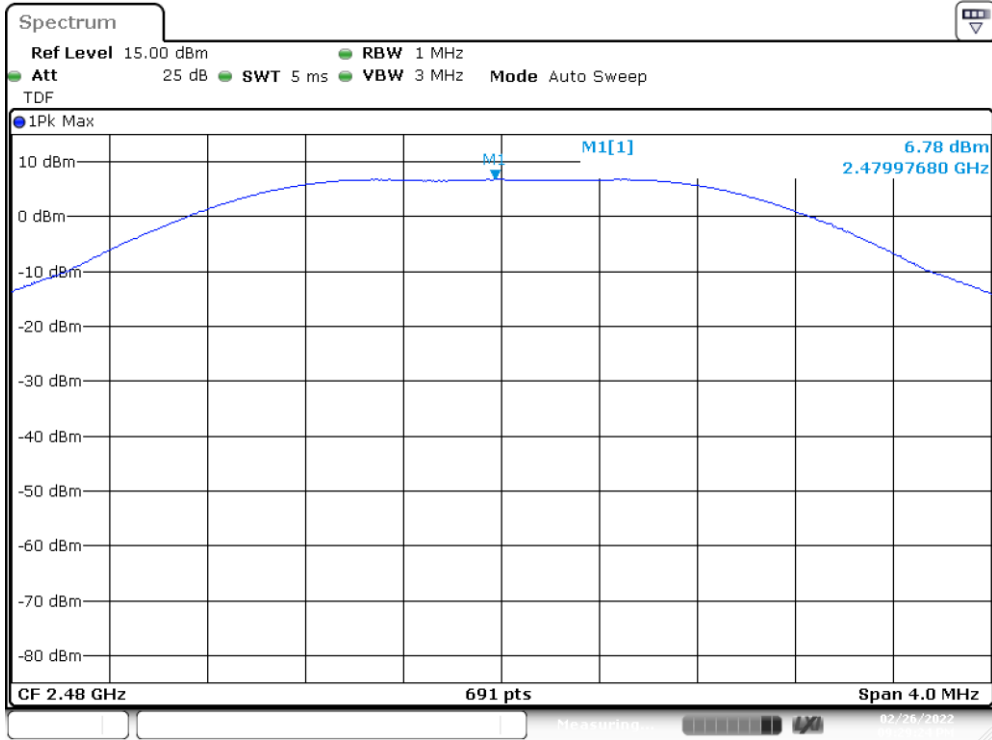
Max Power RMS – 2440 MHz



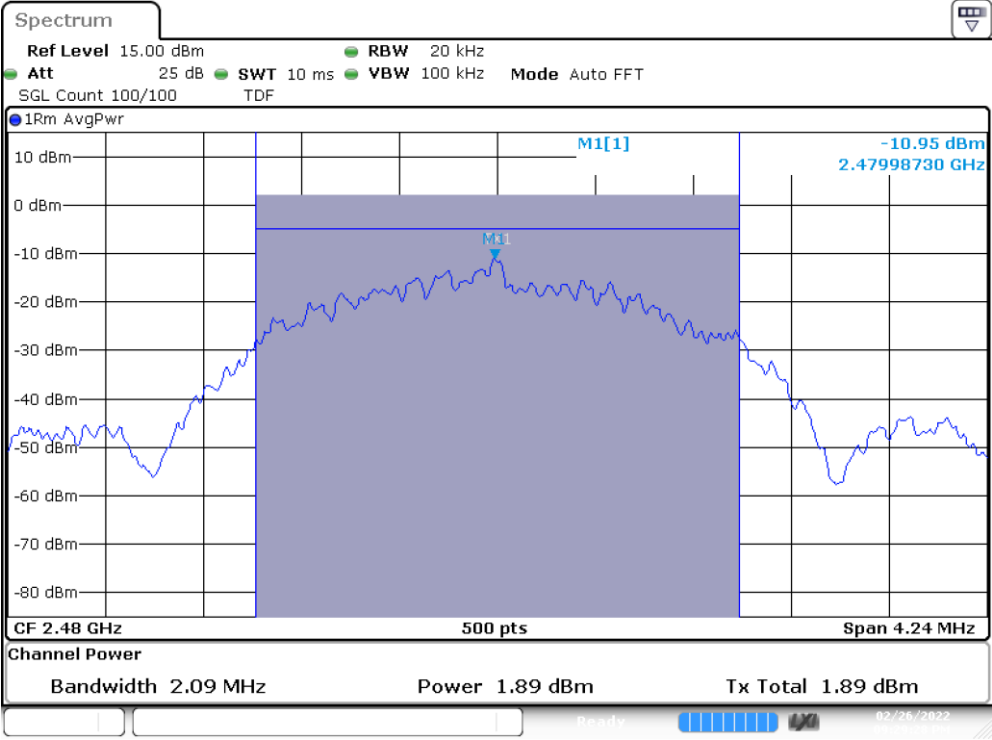
Date 25.OCT.2023 17:48:10

BLE

Max Power Peak – 2480 MHz



Max Power RMS – 2480 MHz



B.1.3 Power Spectral Density

Test limits

FCC part	RSS part	Limits
15.247 (e)	RSS-247 Clause 5.2 (b)	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.

Test procedure

The maximum peak power spectral density level of the fundamental emission was measured using the method PKPSD, defined in paragraph 11.10.2 of ANSI C63.10-2013.

The conducted setup shown in section *Test & System Description* was used to measure the power spectral density. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

Results tables

Mode	CH	Frequency [MHz]	PSD Peak [dBm/3kHz]
BLE	0	2402	-6.99
	19	2440	-7.66
	39	2480	-10.61

B.1.4 Out-of-band emission (Conducted)

Test Limits

FCC part	RSS part	Limits																				
15.247 (d)	RSS-247 Clause 5.5	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.																				
15.209	RSS-Gen A1 Clause 8.9	<p>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):</p> <table border="1"> <thead> <tr> <th>Freq Range (MHz)</th> <th>Field Strength (μV/m)</th> <th>Field Strength (dBμV/m)</th> <th>Meas. Distance (m)</th> </tr> </thead> <tbody> <tr> <td>30-88</td> <td>100</td> <td>40</td> <td>3</td> </tr> <tr> <td>88-216</td> <td>150</td> <td>43.5</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200</td> <td>46</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>54</td> <td>3</td> </tr> </tbody> </table> <p>The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</p>	Freq Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Meas. Distance (m)	30-88	100	40	3	88-216	150	43.5	3	216-960	200	46	3	Above 960	500	54	3
Freq Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Meas. Distance (m)																			
30-88	100	40	3																			
88-216	150	43.5	3																			
216-960	200	46	3																			
Above 960	500	54	3																			

Test procedure

In case of band edge measurements falling in restricted bands, the declared Antenna Gain is also compensated in the graph.

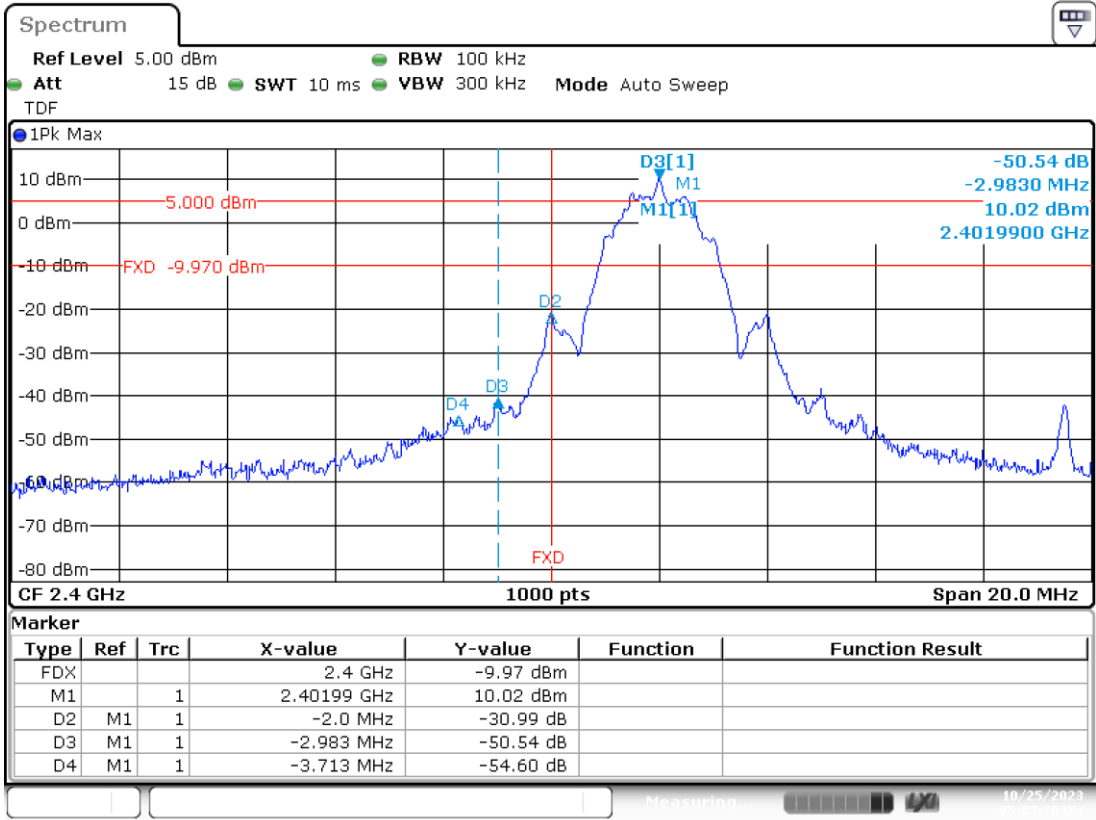
For band edge measurements falling in restricted bands, the following limits in dBm were applied for the average detector after the conversion from the limits detailed above in dBμV/m, according to FCC 47 CFR part 15 - Subpart C – §15.209(a). The limits in dBm for peak detector are 20dB above the indicated values in the table.

§15.209(a)			Converted values	
Freq Range (MHz)	Distance (m)	Field strength (microvolts/meter)	Field strength (dB microvolts/meter)	Power (dBm)
Above 960	3	500	54.0	-41.2

The conducted setup shown in section *Test & System Description* was used to measure the out-of-band emissions. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

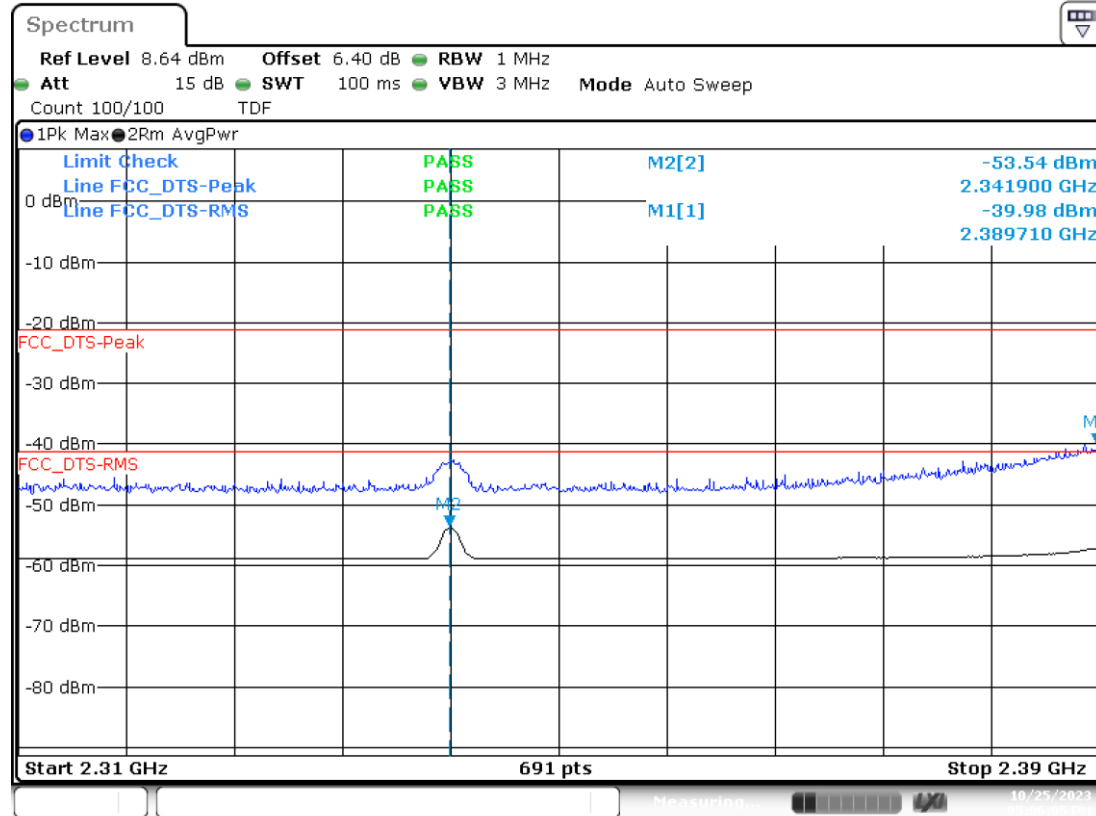
BLE

BE Low Freq Section – 2402 MHz

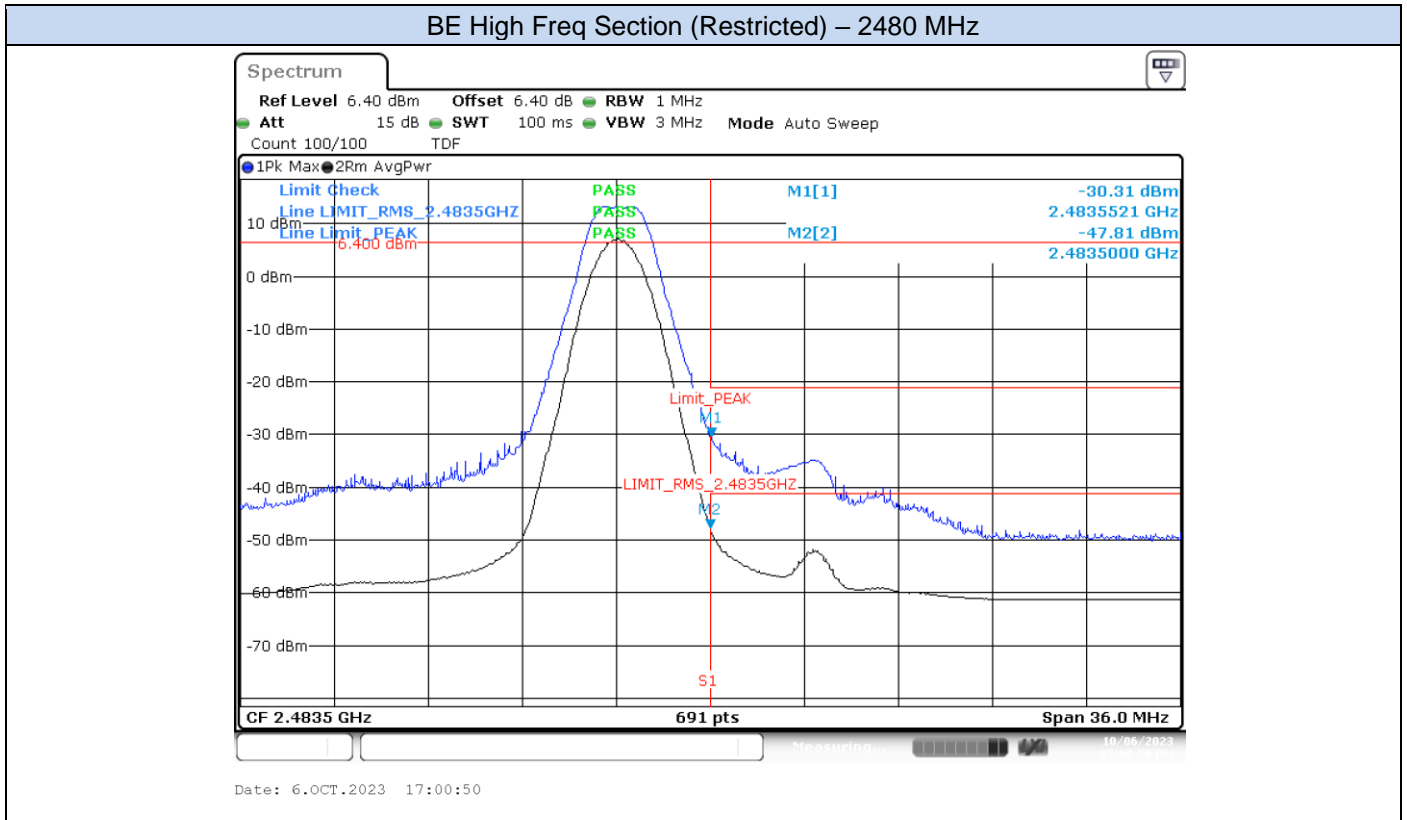


Date 25.OCT.2023 17:02:21

BE Low (Restricted) – 2402 MHz



Date 25.OCT.2023 17:06:06



B.1.5 Radiated spurious emission

Standards references

FCC part	RSS part	Limits																					
<p>15.247 (d) 15.209</p>	<p>RSS-247 Clause 5.5 RSS-Gen A1 Clause 8.9</p>	<p>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):</p>																					
		<table border="1"> <thead> <tr> <th>Freq Range (MHz)</th> <th>Field Strength (μV/m)</th> <th>Field Strength (dBμV/m)</th> <th>Meas. Distance (m)</th> </tr> </thead> <tbody> <tr> <td>30-88</td> <td>100</td> <td>40</td> <td>3</td> </tr> <tr> <td>88-216</td> <td>150</td> <td>43.5</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200</td> <td>46</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>54</td> <td>3</td> </tr> </tbody> </table>	Freq Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Meas. Distance (m)	30-88	100	40	3	88-216	150	43.5	3	216-960	200	46	3	Above 960	500	54	3	
Freq Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Meas. Distance (m)																				
30-88	100	40	3																				
88-216	150	43.5	3																				
216-960	200	46	3																				
Above 960	500	54	3																				
<p>The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</p>																							

Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the radiated spurious emissions. were used to measure the radiated spurious emissions.

Depending of the frequency range and bands being tested, different antennas and filters were used.

The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emissions were measured on the lowest, middle and highest channels.

Test Results

Radiated Spurious - 30 MHz – 1 GHz

All modes

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dB μ V/m	---	dB μ V/m	dB	---
50.2	23.7	Quasi-Peak	40.0	16.3	V

Note 1: The spurious signals detected do not depend on either the operating channel or the modulation mode.

Radiated Spurious - 1 GHz – 26 GHz

BLE – 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dB μ V/m	---	dB μ V/m	dB	---
2342.0	55.3	Peak	74.0	18.7	V
2342.0	43.5	Average	54.0	10.4	V
9607.0	51.7	Peak	74.0	22.3	V
9608.5	40.2	Average	54.0	13.8	V
25850.5	50.6	Peak	74.0	23.4	H
25852.0	38.7	Average	54.0	15.3	H

BLE – 2440 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dB μ V/m	---	dB μ V/m	dB	---
2380.0	48.0	Average	54.0	6.0	V
2380.5	55.9	Peak	74.0	18.1	V
2500.0	44.0	Average	54.0	10.0	V
2500.5	56.3	Peak	74.0	17.7	V
9758.5	50.9	Peak	74.0	23.1	V
9759.0	40.0	Average	54.0	14.0	V
25838.5	50.5	Peak	74.0	23.5	H
25838.5	38.7	Average	54.0	15.3	H

BLE – 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBµV/m	---	dBµV/m	dB	---
2540.0	44.8	Average	54.0	9.2	V
2542.5	56.1	Peak	74.0	17.9	V
17804.0	43.7	Average	54.0	10.3	H
17805.5	56.0	Peak	74.0	18.0	H
25835.0	38.7	Average	54.0	15.3	H
25835.5	51.8	Peak	74.0	22.2	V