CERTIFICATE #3478.01

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 2230 adapter card**
Brand Name	**Intel® BE211NGW**
Model Name	**BE211NGW, BE211NGW M**
FCC	**PD9BE211NG**
Date of Test Start/End	**2025-07-31 / 2025-09-11**
Features	**2x2 Wi-Fi - Bluetooth®** (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 Title 47 CFR part 15 - Subpart C** (see section 1)

Test Report identification	**250519-01.TR04**
Revision Control	**Rev. 03** **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
Digitally signed by Khodor RIDA Date: 2025.09.15 10:37:18 +02'00'	ines kharrat 2025.09.15 10:42:02 +02'00'
Khodor RIDA (Test Engineer Lead)	Ines KHARRAT (Technical Officer)

Intel Corporation S.A.S – WRF Lab
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Table of Contents

1. Standards, reference documents and applicable test methods

FCC	1. FCC Title 47 CFR part 15 - Subpart C – §15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.. 2024-10-01 Edition 2. FCC Title 47 CFR part 15 - Subpart C – §15.209 Radiated emission limits; general requirements. 2024-10-01 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 C63.10-2020 - 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.
- ✓ 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 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	MIN : 22.79°C MAX : 23.39°C
Humidity	MIN: 50.98% MAX: 60.33%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt
#01	250514-01.S06	Module	BE211NGW	28920086B83E	2025-05-14
	200904-01.S14	Extender	ADEXELEC	12	2023-06-22
	170000-01.S56	Adapter	BNJ C0 V3	E1578726888186A	2025-03-24
	200611-03.S30	Test PC	Latitude 5401	6DJLK13	2020-08-19
	230223-02.S48	Triband Antenna	-	006	2023-04-20
	230526-09.S08	Triband Antenna	-	016	2023-07-06

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.

<table>
<tr><td>Brand Name</td><td>Intel® BE211NGW</td></tr>
<tr><td>Model Name</td><td>BE211NGW, BE211NGW M</td></tr>
<tr><td>Software Version</td><td>DRTU.08927.99.0.99</td></tr>
<tr><td>Driver Version</td><td>23.162.25274.12484</td></tr>
<tr><td>Prototype / Production</td><td>Production</td></tr>
<tr><td>Supported Radios</td><td>802.11b/g/n/ac/ax/be 2.4GHz
802.11a/n/ac/ax/be 5.2GHz
5.6GHz
5.8GHz
802.11ax/be 6.0GHz
Bluetooth 2.4GHz
Bluetooth-Channel sounding 2.4GHz</td></tr>
<tr><td>Antenna Information</td><td>
<table>
<tr><th>Transmitter</th><th>Chain A(1)</th><th>Chain B(2)</th></tr>
<tr><td>Manufacturer</td><td>Intel WRF Lab</td><td>Intel WRF Lab</td></tr>
<tr><td>Antenna type</td><td>PIFA</td><td>PIFA</td></tr>
<tr><td>Part number</td><td>WRF-Tri Band-Antenna</td><td>WRF-Tri Band-Antenna</td></tr>
<tr><td>Declared antenna gain (dBi)</td><td>+3.0</td><td>+3.0</td></tr>
</table>
</td></tr>
</table>

6. Remarks and comments

1. 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.

FCC part	Test name	Verdict
15.249 (a)	Maximum Output Power	Pass
15.249 (d) 15.209	Out-of-band Emissions	Pass
15.249 (d) 15.209	Spurious Emissions	Pass

8. Document Revision History

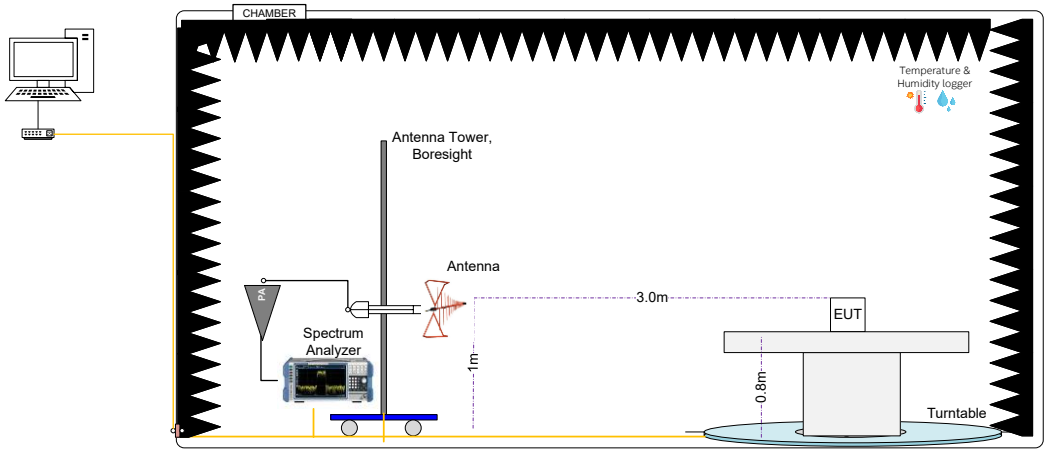
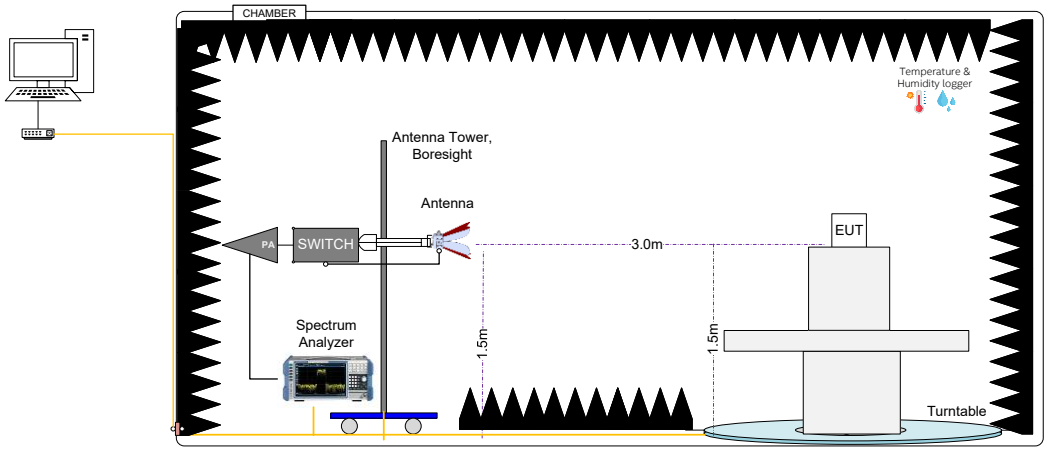
Revision #	Modified by	Revision Details
Rev. 00	K.RIDA T.MATHIEU	First Issue
Rev. 01	K.RIDA	-Retest all the test cases in radiated following TCB request. -Add low and mid channels for spurious emissions tests
Rev. 02	K.RIDA	-Band edge plot of low channel updated with wider frequency range. -Band edge AVG detector plot updated with calculated values instead of measured values. -Spurious emission tables modified to include calculated average power according to duty cycle value.
Rev.03	K.RIDA	-Add BT- Channel sounding feature in section 5 -Remove duty cycle plot on 100ms window. -Measurement distance added in the table result of the maximum output power test case.

Annex A. Test & System Description

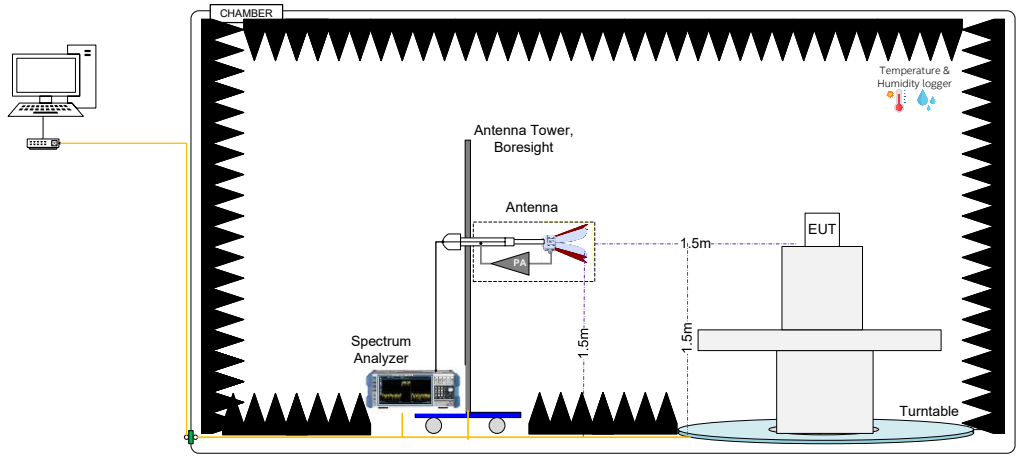
A.1 Measurement System

Measurements were performed using the following setups.

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.

Radiated test setup
Radiated Setup 30 MHz – 1 GHz (Transmitter tests) 
Radiated Setup 1 GHz – 11 GHz (Transmitter tests) 

Radiated Setup 11 GHz – 26 GHz (Transmitter tests)



Sample Calculation

The spurious received voltage V(dBuV) in the spectrum Analyzer is converted to Electric field strength using the transducer factor F corresponding to the Rx path Loss:

F (dB/m)= Rx Antenna Factor (dB/m) + Cable losses (dB) – Amplifiers Gain (dBi)

E (dBuV/m) = V(dBuV) + F (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:

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

where

$E_{SpecLimit}$ is the field strength of the emission at the distance specified by the limit, in dBµV/m
E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/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

Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
006-000	Anechoic Chamber	FACT3	5720	ETS-Lindgren	2024-01-17	2026-01-17
006-001	Turn Table	ETS	-	ETS-Lindgren	N/A	N/A
094-002	Temp & Humidity Logger	RMS-HCD-S	24050486	Rotronic	2024-09-02	2026-09-02
006-011	Boresight antenna mast	BAM 4.0-P	P/278/2890.01	Maturo	N/A	N/A
006-002	Switch & Positioning systems	EMCenter	00159757	ETS-Lindgren	N/A	N/A
147-000	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2025-03-07	2027-03-07
006-008	Measurement SW, v11.3	EMC32	100623	Rohde & Schwarz	N/A	N/A
301-000	Amplifier 9kHz-1300MHz	8447F	3113A07440	HP	2025-02-11	2026-02-11
006-067	Low Pass Filter 1.6GHz	LPM17671	G002	Micro-Tronics	2025-02-11	2026-02-11
007-034	Broadband RF Power Amplifier 0.5-40.0GHz	DEPA0540-43	2024A02	Diamond Engineering	2025-02-11	2026-02-11
189-000	Double Horn Ridged antenna 10GHz-40GHz	3116C	227716	ETS-Lindgren	2024-05-29	2026-05-29
057-000	Double ridged horn antenna (1GHz to 18GHz)	ETS-Lindgren-3117	167062	ETS-Lindgren	2024-07-23	2026-07-23
006-061	Bi-Log Periodic antenna	CBL6143A	61382	Teseq	2024-11-13	2026-11-13
006-068	RF Switch DC-40GHz	LPM17671	G002	Mini-Circuits	2025-02-11	2026-02-11
261-000	RF Amplifier Used for 1 GHz-11GHz	ETS-Lindgren-3117-PA	00157993	ETS-Lindgren	2025-02-11	2026-02-11
009-007	Filter HPF 11GHz	Mini-Circuits-ZHSS-k11G+	84931831830	Mini-Circuits	2025-02-11	2026-02-11
006-051	RF Cable 1.0m	CBL-1.5M-SMSM+	202879	Mini-Circuits	2025-03-12	2026-03-12
006-066	Cable 7m – 25MHz to 40GHz	R286304174	20.46.370	Radiall	2025-02-10	2026-02-10
006-063	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2025-02-10	2026-02-10
006-064	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2025-02-10	2026-02-10
006-065	Cable 60cm – 25MHz to 1GHz	PE300-24	-	Pasternack	2025-02-10	2026-02-10

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	2024-01-18	2026-01-18
138-000	Spectrum Analyzer	FSV40	101556	Rohde & Schwarz	2024-02-27	2026-02-27
007-007	Double Ridge Horn Antenna (1- 18GHz)	3117	00152266	ETS Lindgren	2024-03-26	2026-03-26
026-008	Low noise amplifier 1-18GHz	LA1018N3209	J10100000407	A-INFO	2025-02-19	2026-02-19
007-004	Switch & Positioner	EMCenter	00162359	ETS Lindgren	N/A	N/A
007-006	EMControl & EMSwitch	EMCenter	00151232	ETS Lindgren	N/A	N/A
007-036	SMA-SMA 6.5m Cable	140-8500-11-51-001	001	Atem	2025-03-12	2026-03-12
007-005	Measurement SW, v11.30.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
007-001	Styrofoam Column, 151mm	-	-	-	N/A	N/A
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-015	N-SMA 1.5m Cable	-	-	Spirent	2025-02-19	2026-02-19
007-018	SMA-SMA 1.2m Cable	0500990991200KE	-	Radiall	2025-02-19	2026-02-19
094-001	Temp & Humidity Logger	RMS-HCD-S	24050487	Rotronic	2024-09-02	2026-09-02

N/A: Not Applicable

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
139-000	Power Sensor	NRP-Z81	104383	Rohde & Schwarz	2025-05-20	2027-05-20
140-000	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2024-04-04	2026-04-04

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
Radiated tests <1GHz	±6.33	dB
Radiated tests 1GHz – 26.5 GHz	±5.87	dB

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
Maximum Peak Output Power and antenna gain	K. RIDA
Out-of-band Emissions	K. RIDA
Spurious Emissions	K. RIDA

B.1 Test Conditions

The EUT can only transmit on CHAIN A.

The following packet types were selected based on preliminary testing that identified those packet types as the worst cases for output power and spurious levels at the band edges:

Transmission	Bluetooth Type	Mode	Worst Case Packet Type
SISO A	Channel Sounding	Tone	LE 1M

B.2 Maximum Peak Output Power antenna gain

B.2.1 Test Limits

FCC part	Limits
15.249 (a)	(a)The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: **Fundamental frequency** / **Field strength of fundamental (millivolts/meter)** 2400-2483.5 MHz / 50
15.249 (c)	(c) Field strength limits are specified at a distance of 3 meters.

B.2.2 Test procedure

The following limits in dBµV/m were applied for the average detector according to FCC 47 CFR part 15 - Subpart C – §15.249(a). The limits for peak detector are 20dB above the indicated values in the table.

§15.249(a)			Converted values	
Freq Range (MHz)	Distance (m)	Field strength (millivolts/meter)	Field strength (Average) (dB microvolts/meter)	Field strength (Peak) (dB microvolts/meter)
2403-2479 MHz	3	50	93.98	113.98

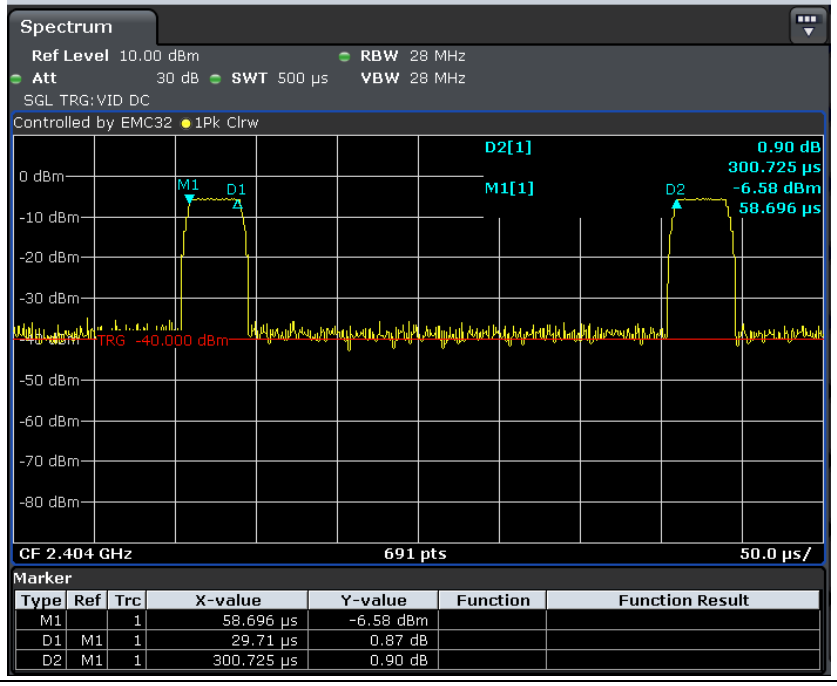
The radiated setup shown in section *Test & System Description* was used to measure the maximum peak output power. The average values are calculated by using the duty cycle factor correction based on the following equation:

$$E_{avg}\left(dB\mu\frac{V}{m}\right) = E_{Peak}\left(dB\mu\frac{V}{m}\right) + 20log_{10}(Duty\ cycle)$$

B.2.3 Result tables

Duty cycle:

Chain	Packet	Duty cycle
SISO A	LE_1M	0.1

Duty cycle measured on 500µs window


Output power test results:

Chain	Packet	Channel	Frequency [MHz]	Measurement distance (m)	Peak Power [dBµV/m]	Duty cycle correction factor (dB)	Calculated Average Power [dBµV/m]
SISO A	LE_1M	**2**	**2404**	3	109	-20	89
		39	**2441**	3	110.6	-20	90.6
		76	**2478**	3	110.8	-20	90.8

B.3 Out-of-band emissions

B.3.1 Standard references

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.249 (a)</td><td>The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
<table>
<tr><th>Fundamental frequency</th><th>Field strength of harmonics (microvolts/meter)</th></tr>
<tr><td>2400-2483.5 MHz</td><td>500</td></tr>
</table></td></tr>
<tr><td>15.249 (c)</td><td>Field strength limits are specified at a distance of 3 meters.</td></tr>
<tr><td>15.249 (d)</td><td>Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>15.209(a)
15.209(d)</td><td>(a)
<table>
<tr><th>Freq Range (MHz)</th><th>Field Strength (µV/m)</th><th>Field Strength (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<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>
</table>
(d) The emission limits shown in the above table are based on measurements employing a 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.</td></tr>
<tr><td>15.249 (e)</td><td>As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.</td></tr>
</table>

B.3.2 Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the the peak band-edge.
The final measurement is done by varying the antenna height from 1 m to 4 m, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The average values are calculated by using the duty cycle factor correction based on the following equation:

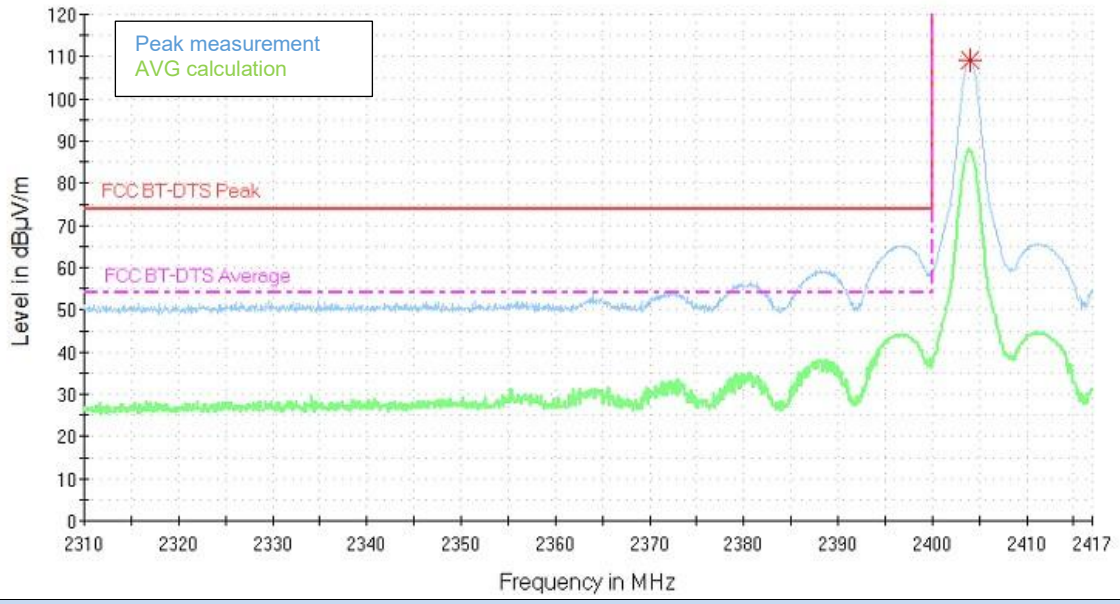
$$E_{avg}\left(dB\mu\frac{V}{m}\right) = E_{Peak}\left(dB\mu\frac{V}{m}\right) + 20log_{10}(Duty\ cycle)$$

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

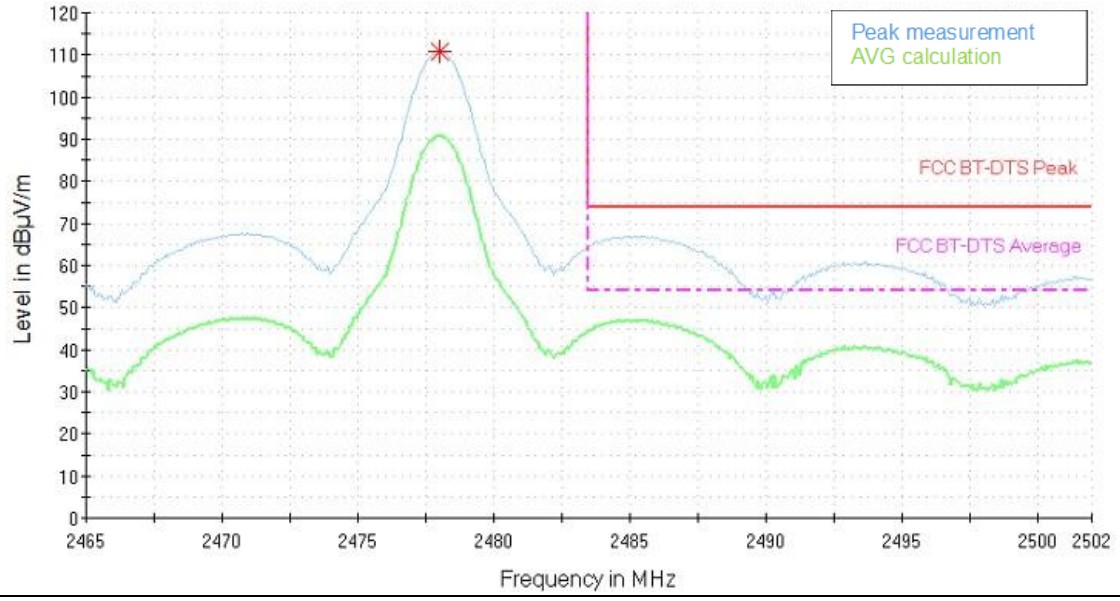
§15.209(a)			Converted values	
Freq Range (MHz)	Distance (m)	Field strength (microvolts/meter)	Field strength (Average) (dB microvolts/meter)	Field strength (Peak) (dB microvolts/meter)
Above 960	3	500	54.0	74.0

For frequency range from 2390MHz-2400MHz, emissions shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation. In our case, the general radiated emissions limits in 15.209 were applied since it is presenting the lesser attenuation.

BE R Low Freq Section – CH2



BE R High Freq Section – CH76



B.4 Spurious emissions

B.4.1 Standards references

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.249 (a)</td><td>The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
<table>
<tr><th>Fundamental frequency</th><th>Field strength of harmonics (microvolts/meter)</th></tr>
<tr><td>2400-2483.5 MHz</td><td>500</td></tr>
</table></td></tr>
<tr><td>15.249 (c)</td><td>Field strength limits are specified at a distance of 3 meters.</td></tr>
<tr><td>15.249 (d)</td><td>(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.</td></tr>
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15.209(d)</td><td>(a)
<table>
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<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
(d) The emission limits shown in the above table are based on measurements employing a 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.</td></tr>
<tr><td>15.249 (e)</td><td>As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.</td></tr>
</table>

B.4.2 Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the radiated spurious emissions using peak detector.
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 m to 4 m, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emission was measured on the worst case configuration found.
The average values are calculated by using the duty cycle correction factor (DCCF) based on the following equation:

$$E_{avg}\left(dB\mu\frac{V}{m}\right) = E_{Peak}\left(dB\mu\frac{V}{m}\right) + 20log_{10}(Duty\ cycle)$$

B.4.3 Test results

30 MHz – 26.5 GHz, LE1M , Chain A

Radiated Spurious – CH2 – 2404 MHz

Frequency	Level	DCCF	Detector	Limit	Margin	Polar
MHz	dBµV/m	dB	---	dBµV/m	dB	---
4808.1	50.6	NA	Peak	74.0	23.4	H
4808.1	30.6	-20	Average	54.0	23.4	H
9616.2	54.7	NA	Peak	74.0	19.3	H
9616.2	34.7	-20	Average	54.0	19.3	H

Radiated Spurious – CH39 – 2441 MHz

Frequency	Level	DCCF	Detector	Limit	Margin	Polar
MHz	dBµV/m	dB	---	dBµV/m	dB	---
4882.5	50.1	NA	Peak	74.0	23.9	H
4882.5	30.1	-20	Average	54.0	23.9	H
9764.7	55.5	NA	Peak	74.0	18.5	V
9764.7	35.5	-20	Average	54.0	18.5	V

Radiated Spurious – CH76 – 2478 MHz

Frequency	Level	DCCF	Detector	Limit	Margin	Polar
MHz	dBµV/m	dB	---	dBµV/m	dB	---
4956.3	50.6	NA	Peak	74.0	23.4	H
4956.3	30.6	-20	Average	54.0	23.4	H
9912.3	55.7	NA	Peak	74.0	18.3	V
9912.3	35.7	-20	Average	54.0	18.3	V

NA: Not Applicable