

TEST REPORT

EUT Description	WLAN and BT, 2x2 PCIe M.2 1216 adapter card
Brand Name	Intel®
Model Name	BE201D2WP
FCC ID	PD9BE201D2P
Date of Test Start/End	2024-06-05 / 2024-06-25
Features	2x2 WiFi - 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 CFR Title 47 Part 15 C FCC CFR Title 47 Part 15 E (see section 1)
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Test Report identification	240521-02.TR20
Revision Control	Rev. 00 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



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1. Standards, reference documents and applicable test methods

FCC	1. FCC Title 47 CFR part 15 – Subpart C – §15.209 Radiated emission limits; general requirements. 2023-10-01 Edition
	2. 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. 2023-10-01 Edition
	3. FCC Title 47 CFR part 15 – Subpart E – Unlicensed National Information Infrastructure Devices. 2023-10-01 Edition
	4. 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.
	5. FCC OET KDB 789033 D02 v02r01 General U-NII Test Procedures New Rules – Guidelines for compliance testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E).
	6. FCC OET KDB 291074 D01 v01 - General Requirements
	7. FCC OET KDB 291074 D02 v01 - EMC Measurement
	8. FCC OET KDB 291074 D03 v01 - QA General Questions and Answers
	9. FCC OET KDB 291074 D04 v01 – UN5GHz Checklist v01
	10. FCC OET KDB 662911 D01 v02r01 - Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
	11. FCC OET KDB 987594 D01 U-NII 6GHz General Requirements v02r01
	12. FCC OET KDB 987594 D02 U-NII 6 GHz EMC Measurement v02r01
	13. FCC OET KDB 987594 D03 U-NII 6 GHz QA v02
	14. 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	22.2°C ± 1.1°C
Humidity	54.7% ± 4.5%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	240521-02.S05	Wifi 7 Module	BE201D2WP	F8FE5ECDC9B3	2024-05-22	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	231109-03.S48	Adaptor	PCB00866-00_A	124627	2023-11-24	
	200611-03.S31	Extender	ADEXELEC	-	2020-08-19	
	200504-04.S07	Laptop	Latitude 5401	BVHLK13	2020-06-02	
	220117-04.S30	Antenna 2.4GHz	ANT24-S624-00	-	2022-04-29	
	220117-04.S31	Antenna 2.4GHz	ANT24-S624-00	-	2022-04-29	
	220117-04.S34	Antenna 5GHz	ANT24-S855-00	-	2022-04-29	
	220117-04.S35	Antenna 5GHz	ANT24-S855-00	-	2022-04-29	
	220117-04.S39	Antenna 6GHz	ANT24-S865-00	-	2022-04-29	
	220117-04.S40	Antenna 6GHz	ANT24-S865-00	-	2022-04-29	
	231120-05.S21	WiFi 7 Module	BE201D2WP	F8FE5CDCA49	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	
#02	240521-02.S04	Wifi 7 Module	BE201D2WP	F8FE5ECDCA08	2024-05-22	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	231109-03.S47	Adaptor	PCB00866-00_A	124727	2023-11-24	
	220915-09.S01	Extender	ADEXELEC	-	2022-04-06	
	200611-03.S30	Laptop	Latitude 5401	6DJLK13	2020-08-19	
	220117-04.S30	Antenna 2.4GHz	ANT24-S624-00	-	2022-04-29	
	220117-04.S31	Antenna 2.4GHz	ANT24-S624-00	-	2022-04-29	
	220117-04.S34	Antenna 5GHz	ANT24-S855-00	-	2022-04-29	
	220117-04.S35	Antenna 5GHz	ANT24-S855-00	-	2022-04-29	
	220117-04.S39	Antenna 6GHz	ANT24-S865-00	-	2022-04-29	
	220117-04.S40	Antenna 6GHz	ANT24-S865-00	-	2022-04-29	
	231120-05.S20	WiFi 7 Module	BE201D2WP	F8FE5CDCA49	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	

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®		
Model Name	BE201D2WP		
Software Version	DRTU.05726.99.0.86		
Driver Version	99.0.86.3		
Prototype / Production	Production		
Supported Radios	<div> <div>802.11b/g/n/ax/be</div> <div>2.4GHz</div> </div> <div> <div>802.11a/n/ac/ax/be</div> <div>5.2GHz</div> </div> <div> <div></div> <div>5.6GHz</div> </div> <div> <div></div> <div>5.8GHz</div> </div> <div> <div>802.11ax/be</div> <div>6.0GHz</div> </div> <div> <div>Bluetooth</div> <div>2.4GHz</div> </div>		
Additional information	Transmitter	Chain A (1)	Chain B (2)
	Manufacturer	Intel	Intel
	Antenna type	Slot	Slot
	Part Number	ANT24-S624-00 ANT24-S855-00 ANT24-S865-00	ANT24-S624-00 ANT24-S855-00 ANT24-S865-00
	Declared Antenna gain (dBi) - 2.4GHz	6.07	6.07
	Declared Antenna gain (dBi) – 5GHz	7.84	7.84
	Declared Antenna gain (dBi) – 6 GHz	7.80	7.80

6. Remarks and comments

- The low, mid, high channels were tested for each RF chain (A, B or A+B), bandwidth, modulation and sub-band. Only the worst case among the low, mid, and high channels per sub-band has been reported.
- At customer request, Radiated tests were carried out at higher Tx Power vs nominal declared power.

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
802.11 b/g/n/ax/be–2.4GHz	15.247 (d) 15.209	Spurious Emission (radiated)	P
BLE	15.247 (d) 15.209	Spurious Emission (radiated)	P
BT	15.247 (d) 15.209	Spurious Emission (radiated)	P
802.11 a/n/ac/ax/be – U-NII-1	15.407 (b) (1) 15.209	Spurious Emission (radiated)	P
802.11 a/n/ac/ax/be – U-NII-2A	15.407 (b) (2) 15.209	Spurious Emission (radiated)	P
802.11 a/n/ac/ax/be – U-NII-2C	15.407 (b) (3) 15.209	Spurious Emission (radiated)	P
802.11 a/n/ac/ax/be – U-NII- 3	15.407 (b) (4) 15.209	Spurious Emission (radiated)	P
802.11 a/n/ac/ax/be – U-NII- 4	15.407 (b) (4) 15.209	Spurious Emission (radiated)	P
802.11 ax/be – UNII-5 to 8	15.209 15.35 (b) 15.407 (b) (5) (8)	Spurious Emission (radiated)	P

P: Pass
F: Fail
NM: Not Measured
NA: Not Applicable

8. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	R.SIMONINI	First Issue

Annex A. Test & System Description

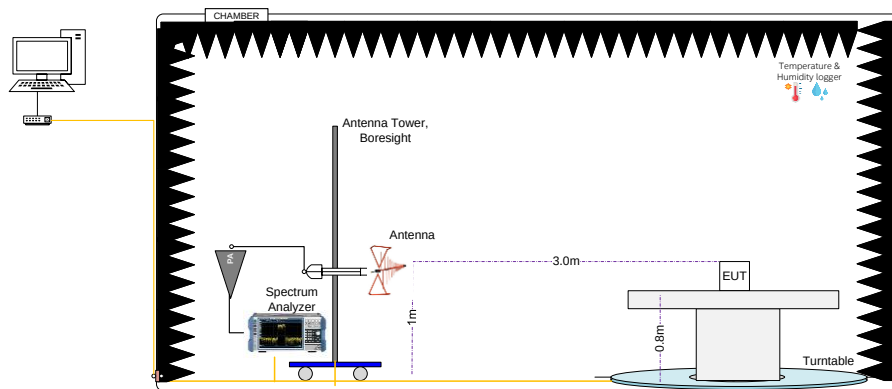
A.1 Measurement System

Measurements were performed using the following setups, made in accordance to the general provisions of FCC KDB 789033 D02 General DTS, UNII,6GHz Test Procedures.

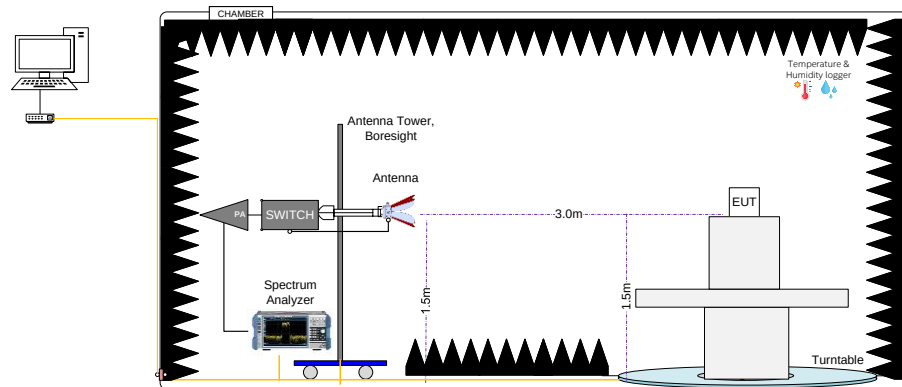
The DUT was installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary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

Radiated test setup

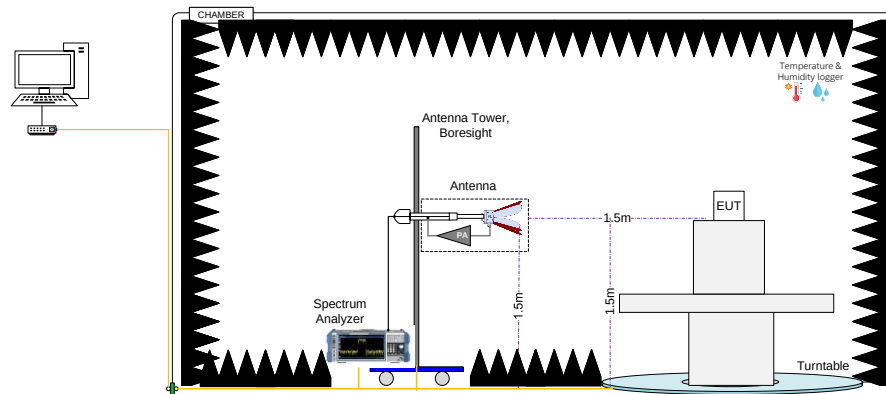
Radiated Setup 30MHz - 1GHz



Radiated Setup 1GHz – 11GHz



Radiated Setup 11GHz – 40GHz



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:

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

$$E (\text{dB}\mu\text{V/m}) = V(\text{dB}\mu\text{V}) + F (\text{dB/m})$$

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:

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

where

$E_{\text{SpecLimit}}$ 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

$D_{\text{SpecLimit}}$ 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
006-008	Measurement SW, v11.30	EMC32	100623	Rohde & Schwarz	N/A	N/A
259-000	Temp & Humidity Logger	RA12E-TH-RAS	RA12-B9BD70	Avtech	2022-06-27	2024-06-27
006-001	Turn Table	ETS	-	ETS-Lindgren	N/A	N/A
006-011	Boresight antenna mast	BAM 4.0-P	P/278/2890.01	Maturo	N/A	N/A
057-000	Double Horn Ridged antenna	3117	167062	ETS-Lindgren	2022-07-08	2024-07-08
058-000	Double Horn Ridged antenna	3116C	157511	ETS-Lindgren	2022-10-21	2024-10-21
006-061	Bi-Log Periodic antenna	CBL6143A	61382	Teseq	2022-10-24	2024-10-24
147-000	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2022-11-30	2024-11-30
301-000	Amplifier 9kHz-1300MHz	8447F	3113A07440	HP	2024-03-19	2025-03-19
261-000	Amplifier 1GHz-18GHz	3117-PA	00157993	ETS-Lindgren	2024-03-14	2025-03-14
502-006	Amplifier 0.5GHz-40GHz	DEPA0540-43	2023A05	Diamond Engineering	2024-03-19	2025-03-19
009-007	RF Filter	ZHSS-k11G+	8493 1831830	Mini-Circuits	2024-03-19	2025-03-19
006-068	RF Switch	RC-2SP6T-40	02112090061	Micro-Circuits	2024-03-14	2025-03-14
006-066	Cable 7m – 25MHz to 40GHz	R286304174	20.46.370	Radiall	2024-03-14	2025-03-14
006-063	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2024-03-14	2025-03-14
006-064	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2024-03-14	2025-03-14
006-065	Cable 60cm – 25MHz to 1GHz	PE300-24	-	Pasternack	2024-03-12	2025-03-12

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
127-000	Spectrum Analyzer	FSV40	101358	Rohde & Schwarz	2023-01-27	2025-01-27
007-007	Double Ridge Horn (1- 18GHz)	3117	00152266	ETS Lindgren	2024-03-26	2026-03-26
007-006	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
059-000	Double Ridge Horn (1- 18GHz)	3117	201542	ETS-Lindgren	2023-09-26	2025-09-26
264-000	Amplifier 1GHz-18GHz	3117-PA	00169546	ETS-Lindgren	2024-03-14	2025-03-14
007-011	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Atem	2024-03-15	2025-03-15
007-005	Measurement SW, v11.20.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-022	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2024-03-12	2025-03-12
007-015	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2024-03-12	2025-03-12
007-018	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2024-03-12	2025-03-12
007-020	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2024-03-15	2025-03-15
349-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D4F8C3	Avtech	2023-11-30	2025-11-30

N/A: Not Applicable

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
412-000	DRTU Power finder V2.1	-	-	Intel	NA	NA
139-000	Power Sensor	NRP-Z81	104383	Rohde & Schwarz	2023-04-21	2025-04-21
061-000	Power Sensor	NRP-Z81	104386	Rohde & Schwarz	2024-04-09	2026-04-09
140-000	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2024-04-04	2026-04-04

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
Radiated tests <1GHz	±6.23	dB
Radiated tests 1GHz – 40 GHz	±6.40	dB

Annex B. Test Results

B.1 Test Condition

For 802.11b, g and a mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, but not simultaneously.

For 802.11n20 & 802.11ax/be20 (20 MHz channel bandwidth), 802.11n40 & 802.11ax/be40 (40MHz channel bandwidth), 802.11ac80 & 802.11ax/be80 (80MHz channel bandwidth), 802.11ac160 & 802.11ax/be160 (160MHz channel bandwidth) and 802.11be320 (320MHz channel bandwidth) modes the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, and also simultaneously.

The following data rates were selected based on preliminary testing that identified those rates as the worst cases for the spurious level:

Transmission	Mode	Bandwidth (MHz)	Worst Case Data Rate
SISO	802.11b	20	1Mbps
	802.11g, a	20	6Mbps
	802.11n	20	HT0
		40	HT0
	802.11ac	80	VHT0
		160	VHT0
	802.11ax/be	20	MCS0
		40	MCS0
		80	MCS0
		160	MCS0
	802.11be	320	MCS0
MIMO	802.11n	20/40	HT8
	802.11ac	80/160	VHT0
	802.11ax/be	20/40/80/160	MCS0
	802.11be	320	MCS0

B.2 Radiated spurious emission

The herein test results were performed by:

Test case measurement	Test Personnel
Radiated spurious emissions	K.KHATIB, R.SIMONINI

B.2.1 DTS

Standard references

FCC part	Limits																				
15.247 (d) 15.209	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):																				
	<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>	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																	
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 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.																					

Test procedure

The radiated setups shown in section A.1 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.

Test Results**Radiated spurious - 30 MHz – 1 GHz****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	37.8	Quasi-Peak	40.0	2.2	V
47.8	37.2	Quasi-Peak	40.0	2.8	V
50.0	38.9	Quasi-Peak	40.0	1.1	V

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

1 GHz – 26 GHz, 802.11b, 1Mbps, Chain A**Radiated Spurious – CH1**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10975.0	56.5	Peak	74.0	17.5	V
10975.0	47.9	Average	54.0	6.1	V
12060.0	44.3	Peak	74.0	29.7	V
12060.0	38.3	Average	54.0	15.7	V
16881.8	49.6	Peak	74.0	24.4	H
16882.5	43.6	Average	54.0	10.4	H

B.2.2 BLE

Standards references.

FCC part	Limits																				
15.247 (d) 15.209	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):																				
	<table><tr><th>Freq Range (MHz)</th><th>Field Stregh (μV/m)</th><th>Field Stregh (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>	Freq Range (MHz)	Field Stregh (μV/m)	Field Stregh (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 Stregh (μV/m)	Field Stregh (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																	
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands above 1000MHz. 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.																					

Test procedure

The radiated setups shown in section A.1 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.

Test Results

Radiated spurious - 30 MHz – 1 GHz

Radiated Spurious – All modes

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
44.9	32.1	Quasi-Peak	40.0	7.9	V
49.9	35.8	Quasi-Peak	40.0	4.2	V

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

1 GHz – 26 GHz, BLE

Radiated Spurious – 2440 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10499.8	59.5	Peak	74.0	14.5	V
10500.7	48.0	Average	54.0	6.0	V
12700.2	45.7	Peak	74.0	28.3	H
12700.2	34.2	Average	54.0	19.8	V
25406.0	51.8	Peak	74.0	22.2	V
25407.0	39.2	Average	54.0	14.8	H

B.2.3 BTStandard references

FCC part	Limits																				
15.247 (d) 15.209 (a)	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):																				
	<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>	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																	
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 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.																					

Test procedure

The radiated setups shown in section A.1 were used to measure the radiated spurious emissions. Depending on 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 360° and for both Vertical and Horizontal polarizations.

Test Results**Radiated spurious - 30 MHz – 1 GHz****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	38.1	Quasi-Peak	40.0	1.9	V
47.8	37.1	Quasi-Peak	40.0	2.9	V
50.0	38.0	Quasi-Peak	40.0	2.0	V

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

1 GHz – 26 GHz, EDR – $\pi/4$ -DQPSK**Radiated Spurious – CH39 2DH5**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10499.8	60.9	Peak	74.0	13.1	H
10500.7	48.0	Average	54.0	6.0	V
12120.9	47.5	Peak	74.0	26.5	H
12121.2	34.9	Average	54.0	19.1	H
25435.5	51.1	Peak	74.0	22.9	H
25435.5	39.5	Average	54.0	14.5	H

B.2.4 U-NII-1Standard references

FCC part	Limits			
15.407 (b) (1)	For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.			
15.209	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):			
	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
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 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.				

Test procedure

The radiated setup shown in section A.1 was 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, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Test Results**Radiated spurious - 30 MHz – 1 GHz****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	38.2	Quasi-Peak	40.0	1.8	V
34.7	36.1	Quasi-Peak	40.0	3.9	V
50.0	38.2	Quasi-Peak	40.0	1.8	V

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

802.11ax/be**1 GHz – 40 GHz, 802.11a, 6Mbps, Chain A****Radiated Spurious – CH36**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10990.1	58.6	Peak	74.0	15.4	H
10990.1	47.9	Average	54.0	6.1	V
15536.6	39.7	Average	54.0	14.3	H
15541.4	48.7	Peak	74.0	25.3	H

B.2.5 U-NII-2AStandard references

FCC part	Limits
15.407 (a) (2)	For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
15.209	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):

Test procedure

The radiated setups shown in section A.1 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, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Test Results**Radiated spurious - 30 MHz – 1 GHz****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	37.3	Quasi-Peak	40.0	2.7	V
34.7	35.8	Quasi-Peak	40.0	4.2	V
50.0	38.5	Quasi-Peak	40.0	1.5	V
64.2	30.8	Quasi-Peak	40.0	9.2	V

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

802.11ax/be**1 GHz – 40 GHz, 802.11a, 6Mbps, Chain B****Radiated Spurious – CH64**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
1111.0	49.5	Peak	74.0	24.5	H
1115.9	38.6	Average	54.0	15.4	H
7989.7	58.3	Peak	68.2	9.9	H
39992.8	56.1	Peak	74.0	17.9	V
39992.8	47.8	Average	54.0	6.2	V

B.2.6 U-NII-2CStandard references

FCC part	Limits																				
15.407 (b) (3)	For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.																				
15.209	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):																				
	<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>	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 above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.</p> <p>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 A.1 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 m to 4 m, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Test Results**Radiated spurious - 30 MHz – 1 GHz****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	38.4	Quasi-Peak	40.0	1.6	V
43.9	33.9	Quasi-Peak	40.0	6.1	V
50.0	38.1	Quasi-Peak	40.0	1.9	V

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

802.11ax/be**1 GHz – 40 GHz, 802.11ax/be40, MCS0, Chain A+B****Radiated Spurious – CH114**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
1455.0	43.3	Average	54.0	10.7	H
1455.0	54.0	Peak	74.0	20.0	H
5420.0	59.1	Peak	74.0	14.9	H
5420.5	52.1	Average	54.0	1.9	H
8490.5	49.1	Average	54.0	4.9	H
8490.8	58.1	Peak	74.0	15.9	H
11319.5	39.5	Average	54.0	14.5	H
11320.0	47.2	Peak	74.0	26.8	H
16980.8	51.0	Peak	68.2	17.2	V
22641.6	52.3	Peak	74.0	21.7	V
22642.0	49.8	Average	54.0	4.2	V
28301.9	53.2	Peak	68.2	15.0	V

B.2.7 U-NII-3

Standard references

FCC part	Limits																				
15.407 (b) (4)	For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.																				
15.209	<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><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 above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.</p> <p>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

The radiated setups shown in section A.1 were used to measure the radiated spurious emissions.

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

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

Test Results

Radiated spurious - 30 MHz – 1 GHz

Radiated Spurious – All modes

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	37.6	Quasi-Peak	40.0	2.4	V
50.0	38.0	Quasi-Peak	40.0	2.0	V
217.9	26.6	Quasi-Peak	46.0	19.4	H

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

802.11ax/be

1 GHz – 40 GHz, 802.11a, 6Mbps, Chain A

Radiated Spurious – CH149

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
1539.5	39.5	Average	54.0	14.5	H
1540.0	48.6	Peak	74.0	25.4	H
39972.0	47.9	Average	54.0	6.1	V
39972.9	56.5	Peak	74.0	17.5	V

B.2.8 U-NII-4Standard references

FCC part	Limits			
15.407 (b) (5) (iii)	For transmitters operating solely in the 5.850-5.895 GHz band or operating on a channel that spans across 5.725-5.895 GHz: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			
15.407 (b) (5) (ii)	For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz			
15.209	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):			
	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
	The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 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.			

Test procedure

The radiated setup shown in section A.1 was 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, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Test Results

Radiated spurious - 30 MHz – 1 GHz

Radiated Spurious – All modes

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	38.1	Quasi-Peak	40.0	1.9	V
50.0	38.4	Quasi-Peak	40.0	1.6	V
66.7	35.7	Quasi-Peak	40.0	4.3	V

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

802.11ax/be

1 GHz – 40 GHz, 802.11a, 6Mbps, Chain B

Radiated Spurious – CH177

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
1678.2	52.0	Peak	74.0	22.0	H
1679.8	41.7	Average	54.0	12.3	H
39926.5	56.2	Peak	74.0	17.8	V
39926.5	47.9	Average	54.0	6.1	V

B.2.9 U-NII-5 to U-NII-8Standard references

FCC part	Limits																				
15.407 (b) (5)	For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of -27 dBm/MHz.																				
15.35 (b)	When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.																				
15.407 (b) (8)	Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in FCC Part 15.209 and RSS-Gen.																				
15.209	<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><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> <p>The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in this band is based on measurements employing an average detector.</p> <p>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

The radiated setups shown in section A.1 were used to measure the radiated spurious emissions.

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

- For frequencies less than or equal to 1000 MHz, measurements were made with the CISPR quasi-peak detector with a resolution bandwidth of 120kHz and a video bandwidth 3 times of the resolution bandwidth.
- For restricted bands, measurements above 1000 MHz were performed using average and peak detectors with a minimum resolution bandwidth of 1 MHz and a video bandwidth 3 times of the resolution bandwidth
- For unrestricted bands, measurements above 1000 MHz were performed using RMS* and peak detectors with a minimum resolution bandwidth of 1 MHz and a video bandwidth 3 times of the resolution bandwidth

*RMS detector is required only for FCC. For ISED tests, only average and peak detectors are measured for both restricted and unrestricted bands above 1GHz.

The final measurement is performed by varying the antenna height from 1 m to 4 m, the EUT rotating in azimuth over 360° for both vertical and horizontal polarizations.

Test Results**30 MHz – 1 GHz, Radiated spurious emissions****Radiated Spurious – All modes**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
30.6	38.1	Quasi-Peak	40.0	1.9	V
50.0	38.3	Quasi-Peak	40.0	1.7	V
66.5	38.1	Quasi-Peak	40.0	1.9	V

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

UNII 5**1 GHz – 40 GHz, 802.11ax/be20, MCS0, Chain A+B****Radiated Spurious – CH1**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10993.6	59.2	Peak	74.0	14.8	H
10994.2	48.0	Average	54.0	6.0	V
17861.9	43.4	Average	54.0	10.6	H
17862.8	57.2	Peak	74.0	16.8	H

UNII 6**1 GHz – 40 GHz, 802.11ax/be20, MCS0, Chain B****Radiated Spurious – CH113**

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
2312.5	40.4	Average	54.0	13.6	H
2312.5	51.3	Peak	74.0	22.7	H
39995.7	55.2	Peak	74.0	18.8	V
39995.7	48.0	Average	54.0	6.0	V

UNII 7

1 GHz – 40 GHz, 802.11ax/be20, MCS0, Chain A+B

Radiated Spurious – CH181

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
10998.5	57.6	Peak	74.0	16.4	V
10998.5	47.9	Average	54.0	6.1	V
39996.1	56.1	Peak	74.0	17.9	H
39996.1	47.8	Average	54.0	6.2	V

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1 GHz – 40 GHz, 802.11ax/be80, MCS0, Chain A+B

Radiated Spurious – CH233

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBμV/m	---	dBμV/m	dB	---
5160.0	57.0	Peak	88.2	31.2	H
5160.0	51.0	RMS	68.2	17.2	H
39986.5	48.0	Average	54.0	6.0	V
39986.9	56.6	Peak	74.0	17.4	H