

TEST REPORT

EUT Description	2x2 Wi-Fi and BT, M.2 1216 adapter card
Brand Name	Intel® BE200D2W
Model Name	BE200D2W
IC ID	1000M-BE200D2
Date of Test Start/End	2023-07-08 / 2023-07-20
Features	2x2 Wi-Fi - IEEE 802.11be - 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	RSS-247 issue 3, RSS-Gen A1 issue 5 - A1 (see section 1)
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Test Report identification	230526-09.TR99
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

Reviewed by

Khodor RIDA
(Test Engineer Lead)

Zayd OUACHICHA
(Technical Manager)

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

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1. Standards, reference documents and applicable test methods

ISED	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 789033 D02 General U-NII Test Procedures New Rules v02r01 – Guidelines for compliance testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E). 4. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
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2. General conditions, competences and guarantees.

- ✓ 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	29°C ± 0.1°C
Humidity	48.4% ± 5.1%

4. Test samples@

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	230526-09.S34	WiFi 7 Module	BE200D2W	743AF406E046	2023-06-08	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	200904-01.S14	Extender	ADEXELEC	12	2023-06-22	
	200525-02.S05	Laptop	HP (HSN-I41C-4)	00095000X0	2023-04-24	
	230526-08.S71	Monopole Antenna	OEM Hong-Bo	AD03	2023-06-26	
	230526-08.S72	Monopole Antenna	OEM Hong-Bo	AD04	2023-06-26	
#02	230526-09.S27	WiFi 7 Module	BE200D2W	743AF406E5C8	2023-06-08	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	220915-09.S01	Extender	ADEXELEC	-	2022-04-06	
	200611-03.S30	Laptop	Latitude 5401	6DJLK13	2020-08-19	
	230526-08.S69	Monopole Antenna	OEM Hong-Bo	AD01	2023-06-26	
	230526-08.S70	Monopole Antenna	OEM Hong-Bo	AD02	2023-06-26	
#03	230526-09.S27	WiFi 7 Module	BE200D2W	743AF406E5C8	2023-06-08	Used for Radiated Spurious Emissions tests
	230724-02.S15	WiFi 7 Module	BE200D2W	04E8B963C3A1	2023-07-24	
	180001-01.S16	Socket	-	-	2022-06-23	
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	220904-01.S13	Extender	ADEXELEC	11	2023-06-22	
	200904-01.S12	Laptop	HP-(HSN-I42C)	000075059J	2023-04-24	
	230526-08.S69	Monopole Antenna	OEM Hong-Bo	AD01	2023-06-26	
	230526-08.S70	Monopole Antenna	OEM Hong-Bo	AD02	2023-06-26	

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® BE200D2W		
Model Name	BE200D2W		
Software Version	DRTU.04696.99.0.81 DRTU. 04902.99.0.82		
Driver Version	xVT 99.0.81.3 xVT 99.0.82.1		
Prototype / Production	Production		
Supported Radios	802.11b/g/n/ax/be 2.4GHz (2400.0 – 2483.5 MHz) 802.11a/n/ac/ax/be 5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5850.0 MHz) 5.9GHz (5850.0 – 5895.0 MHz) 802.11ax/be 6.0GHz (5925.0 – 7125 MHz) Bluetooth 2.4GHz (2400.0 – 2483.5 MHz)		
Antenna Information	Transmitter	Main(2)/Chain A	Aux(1)/Chain B
	Manufacturer	Changshu HongBo	Changshu HongBo
	Antenna type	Monopole	Monopole
	Part number	260-25095	260-25095
	Declared Antenna gain (dBi) – 5.9 GHz	+4.43	+4.43

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.

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. 802.11 a/n/ac/ax/be – U-NII- 4

RSS part	Test name	Verdict
RSS-247 Clause 6.2.5.3	Undesirable emissions limits: 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	First Issue

Annex A. Test & System Description

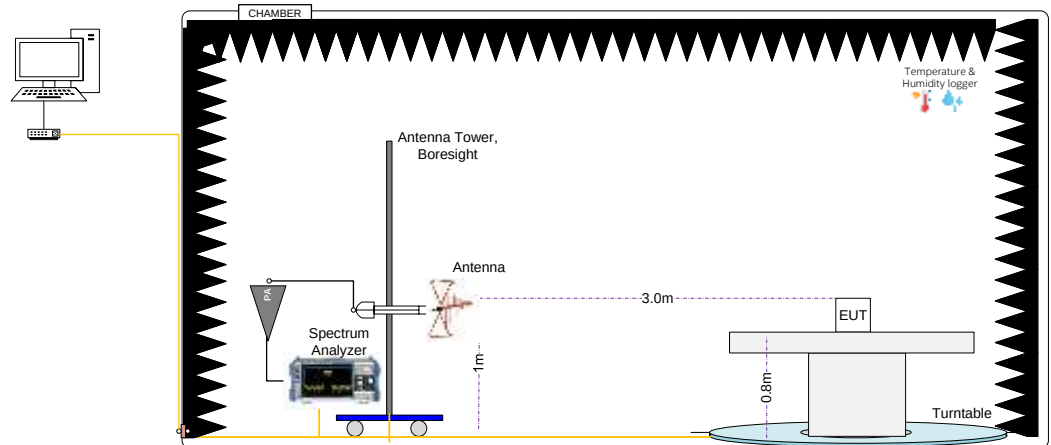
A.1 Measurement System

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

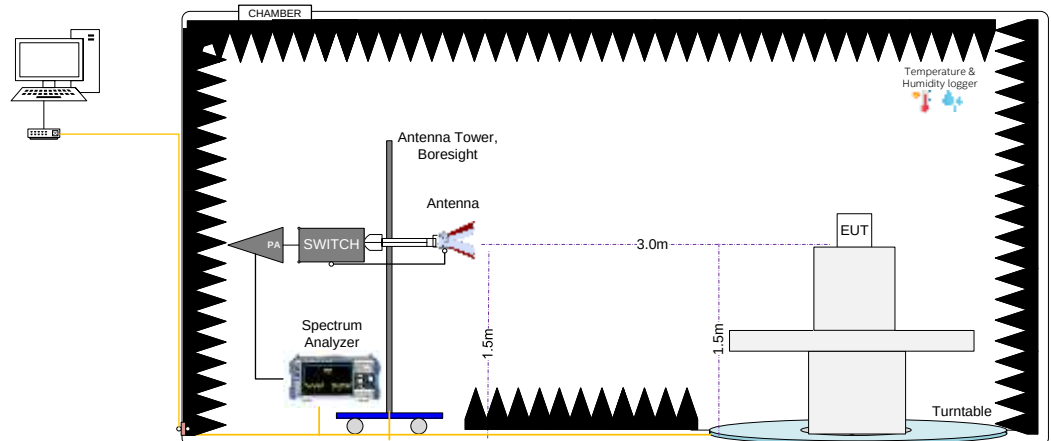
The DUT was installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary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

Radiated test setup

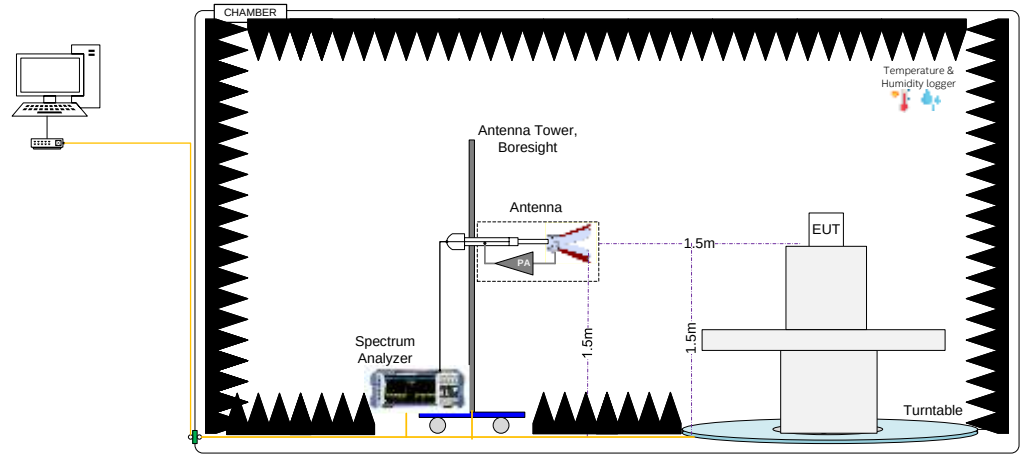
Radiated Setup 30MHz - 1GHz (Transmitter tests)



Radiated Setup 1GHz – 11GHz (Transmitter tests)



Radiated Setup 11GHz – 40GHz (Transmitter tests)



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:

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

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

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	2022-01-21	2024-01-21
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
058-000	Double Horn Ridged antenna	3116C	157511	ETS-Lindgren	2022-10-21	2024-10-21
006-020	Horn antenna 3117	3117	00157734	ETS-Lindgren	2021-08-05	2023-08-05
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	2023-03-03	2024-03-03
261-000	Amplifier 1GHz-18GHz	3117-PA	00157993	ETS-Lindgren	2023-02-20	2024-02-20
502-006	Amplifier 0.5GHz-40GHz	DEPA0540-43	2023A05	Diamond Engineering	2023-06-09	2024-06-09
006-059	Cable 7m – 25MHz to 40GHz	R286304174	20.46.369	Radiall	2023-02-20	2024-02-20
006-063	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2023-02-27	2024-02-27
006-064	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2023-02-27	2024-02-27
006-065	Cable 60cm – 25MHz to 1GHz	PE300-24	-	Pasternack	2023-06-02	2024-06-02

N/A: Not Applicable

Radiated Setup #2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
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	2022-03-29	2024-03-29
007-006	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
007-011	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Atem	2023-02-15	2024-02-15
007-005	Measurement SW, v11.20.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
007-000	Anechoic chamber	RFD-FA-100	5996	ETS Lindgren	2021-09-14	2023-09-14
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-014	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2023-02-16	2024-02-16
007-022	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2023-02-13	2024-02-13
007-015	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2023-02-13	2024-02-13
007-018	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2023-02-13	2024-02-13
007-020	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2023-02-15	2024-02-15
325-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B9B7C6	Avtech	2022-01-17	2024-01-17

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	2022-03-25	2024-03-25
140-000	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2022-03-25	2024-03-25
423-000	Power Sensor	NRP-Z81	101152	Rohde & Schwarz	2022-05-18	2024-05-18

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	± 6.40	dB
Radiated tests 1GHz – 40 GHz	± 6.04	dB

Annex B. Test Results U-NII-4

The herein test results were performed by:

Test case measurement	Test Personnel
Radiated spurious emissions	K.Khatib, R.Simonini,Y.Merakeb

B.1 Test Conditions

For 802.11a 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) and 802.11ac160 & 802.11ax/be160 (160MHz 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	802.11a	20	6Mbps
	802.11n	20	HT0
		40	HT0
	802.11ac	80/160	VHT0
	802.11ax/be	20/40/80/160	MCS0
MIMO	802.11n	20/40	HT8
	802.11ac	80/160	VHT0
	802.11ax/be	20/40/80/160	MCS0

B.2 Test Results Tables

B.2.1 Radiated spurious emission

RSS-247	Limits																				
6.2.5.3	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.																				
6.2.5.3	Client devices shall not exceed -5 dBm/MHz e.i.r.p. spectral density at the 5895 MHz band edge and shall decrease linearly to not exceed -27 dBm/MHz e.i.r.p. spectral density at or above 5925 MHz.																				
RSS-GEN A1, Clause 8.9	Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in Table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission. <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> Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for license-exempt radio apparatus stated in applicable RSSs (including RSS-Gen A1) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.	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 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

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	33.8	Quasi-Peak	40.0	6.2	V
210.9	24.5	Quasi-Peak	43.5	19.0	H

1 GHz – 40 GHz, 802.11ax/be40, MCS0, Chain A+B

Radiated Spurious – CH175

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBµV/m	---	dBµV/m	dB	---
10835.8	47.8	Average	54.0	6.2	V
10838.1	59.0	Peak	74.0	15.0	V
11729.8	52.4	Peak	74.0	21.6	H
11730.3	41.6	Average	54.0	12.4	H