N° 1-6736
Scope available
on www.cofrac.fr

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 adapter card**
Brand Name	**Intel®**
Model Name	**BE201D2W**
Date of Test Start/End	**2024-01-09 / 2024-02-20**
Features	**2x2 Wi-Fi - Bluetooth®** (see section 5)
Description	**Modular sample**

Applicant	**Intel Corporation SAS**
Address	**425 Rue de Goa – Le Cargo B6 – 06600 Antibes, FRANCE**
Contact Person	**Irina Vicente**
Telephone/Fax/ Email	**irina.vicente@intel.com**

Reference Standards	**ETSI EN 300 440 v2.2.1** (see section 0)

Test Report identification	**231120-05.TR06**
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

Digitally signed by Requin
Date: 2024.02.23 15:59:24 +01'00'

Cedric Requin
(Test Engineer Lead)

Reviewed by

Digitally signed by zayd
DN: cn=zayd, email=zayd.ouachicha@intel.com, c=US
Date: 2024.02.23 18:15:36 +01'00'

Zayd OUACHICHA
(Technical Manager)

Table of Contents

1. Standards, reference documents and applicable test methods

1. ETSI EN 300 440 v2.2.1 Short Range Devices (SRD). Radio equipment to be used in the 1 GHz to 40 GHz frequency range. Harmonised Standard for access to radio spectrum.

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 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	23.5± 1.6ºC
Humidity	43.8± 7.7%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	231120-05.S06	WiFi 7 Module	BE201D2W	WFM: 60452EB8A41B	2024-01-05	Conducted Tests
	200525-01.S01	Laptop	HP (HSN-I41C)	00095001L0	2020-06-04	
	231109-03.S51	CRF DB 2230 BNJ Extender Board	PCB00862-00_A	2305108149	2023-12-20	
#02	231120-05.S12	WIFI 7 Module	BE201D2W	WFM: F8FE5ECDC927	2024-02-06	Blocking and adjacent channel selectivity
	231109-03.S49	Extender	PCB00862-00_A	2305108150	2023-11-10	
	200702-02.S03	Laptop	HP(HSN-I41C-5)	00095002JP	2020-07-10	
#03	231120-05.S03	WiFi 7 Module	BE201D2W	60452EB8A3BC	2024-01-05	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	
	230223-02.S47	Triband Antenna	-	005	2023-04-20	
	230223-02.S48	Triband Antenna	-	006	2023-04-20	
	231120-05.S21	WiFi 7 Module	BE201D2W	F8FE5CDCA49	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	
#04	231120-05.S02	WiFi 7 Module	BE201D2W	60452EB8A407	2024-01-05	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	
	230223-02.S49	Triband Antenna	-	007	2023-04-20	
	230223-02.S50	Triband Antenna	-	008	2023-04-20	
	231120-05.S20	WiFi 7 Module	BE201D2W	F8FE5ECDCB43	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	
#05	231120-05.S04	WiFi 7 Module	BE201D2W	WFM:60452EB8A42F	2024-01-05	Extreme Temperature Conducted Tests
	200525-01.S01	Laptop	HP (HSN-I41C)	00095001L0	2020-06-04	
	231109-03.S51	CRF DB 2230 BNJ Extender Board	PCB00862-00_A	2305108149	2023-12-20	

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®</td></tr>
<tr><td>Model Name</td><td>BE201D2W</td></tr>
<tr><td>Software Version</td><td>Radiated: DRTU.05312.99.0.85
Conducted: DRTU.05726.99.0.86</td></tr>
<tr><td>Driver Version</td><td>Radiated: 99.0.85.3
Conducted: 99.0.86.3 + 99.0.86.4</td></tr>
<tr><td>Supported Radios</td><td>802.11b/g/n/ax/be 2.4GHz
802.11a/n/ac/ax/be 5.2GHz
5.6GHz
5.8GHz
802.11ax/be 6.0GHz
Bluetooth 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>Antenna peak gain (dBi)</td><td>+5</td><td>+5</td></tr>
</table>
</td></tr>
</table>

6. Remarks and comments

1. According to the standard ETSI EN 300 440 v2.2.1 , and the applicant declaration, the device BE201D2W operating in 802.11a/n/ac/ax/be mode is considered as a receiver category 1.
2. At customer request, the LBT test 4.4.2 of EN 300 440 was not tested as not required per ECC REC70-03 on non-specific SRD Annex 1 (J) : spectrum access and mitigation requirements N/A
3. At customer request, all tests except Equivalent Isotropically radiated power (e.i.r.p.) (4.2.2) were carried out at higher Tx Power: +7dB vs nominal declared power.
4. At customer request, all normal condition tests were carried out at tune up power (+0.5dB) Vs device setting

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

EN 300 440	Test name	Verdict
4.2.2	Transmitter: Equivalent Isotropically radiated power (e.i.r.p.)	P
4.2.3	Transmitter: Permitted range of operating frequencies	P
4.2.4	Transmitter: Unwanted Emissions in the spurious domain (radiated)	P
4.3.3	Adjacent channel selectivity	P
4.3.4	Blocking or desensitization	P
4.3.5	Receiver: Spurious emissions (radiated)	P
4.4.2	Listen Before Talk (LBT)	NA

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

8. Document Revision History

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

Annex A. Test & System Description

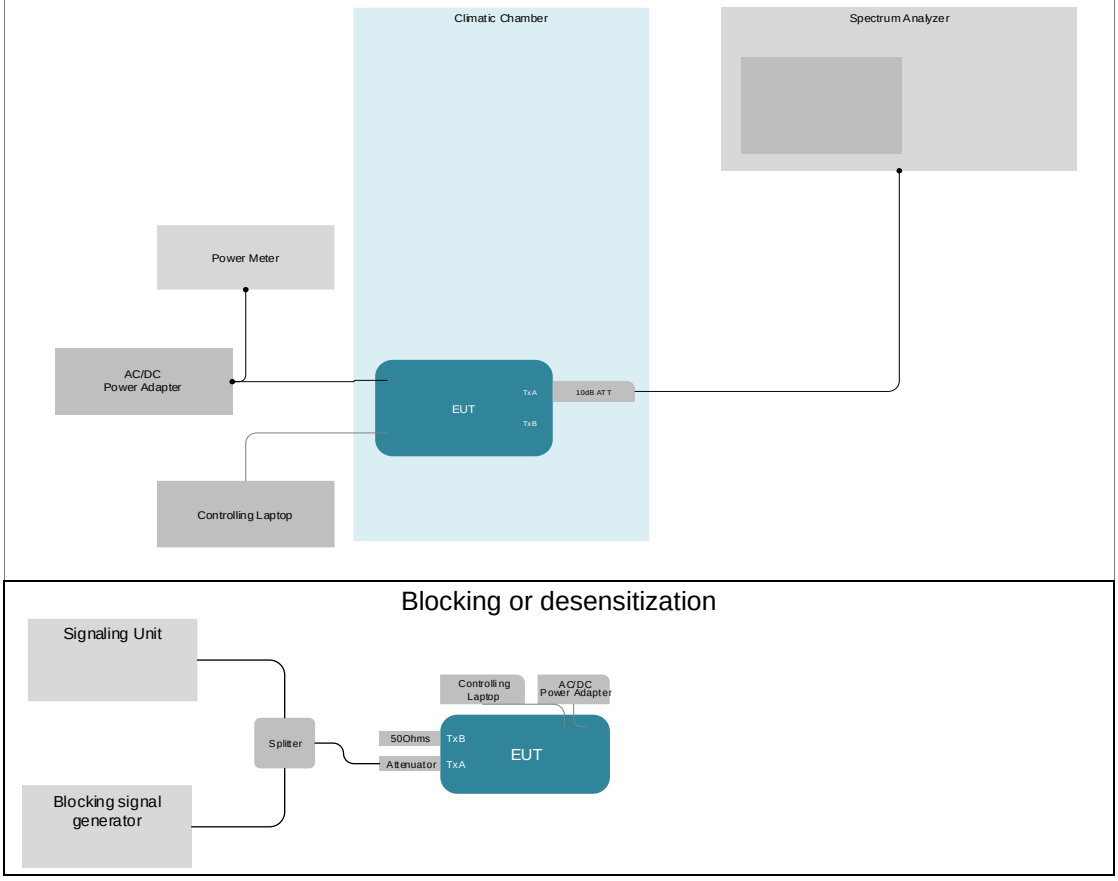
A.1 Measurement System

Measurements were performed using the following setups, made in accordance to the general provisions of ETSI EN 300 440 v2.2.1.

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.

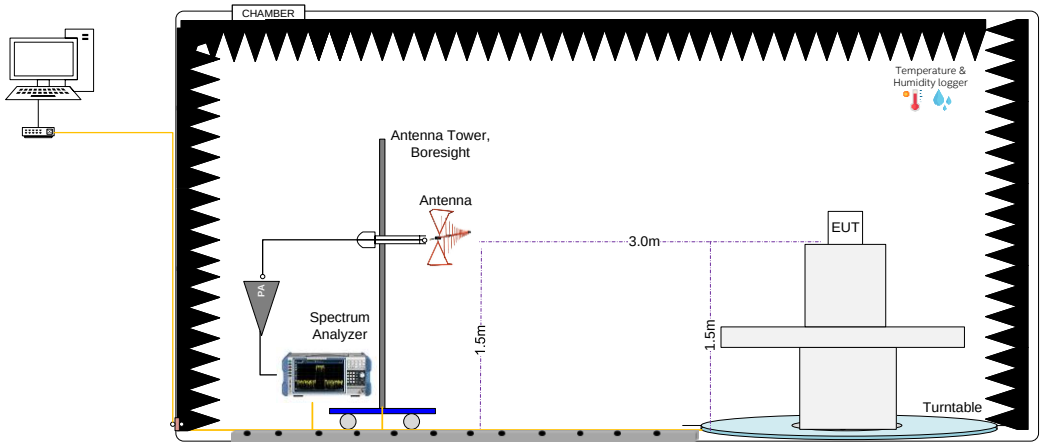
Setups for conducted and radiated measurements are shown below.

Conducted test setup:

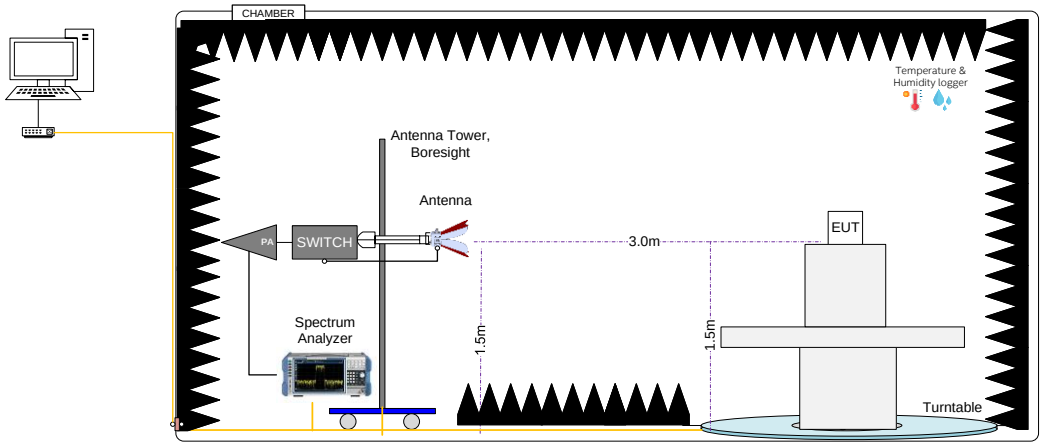


Radiated test setup

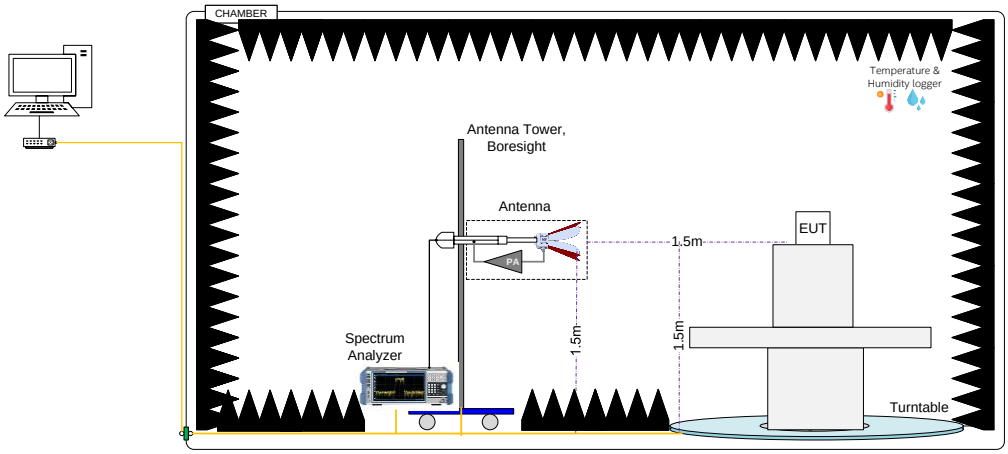
Radiated Setup 25 MHz - 1 GHz (Transmitter tests)



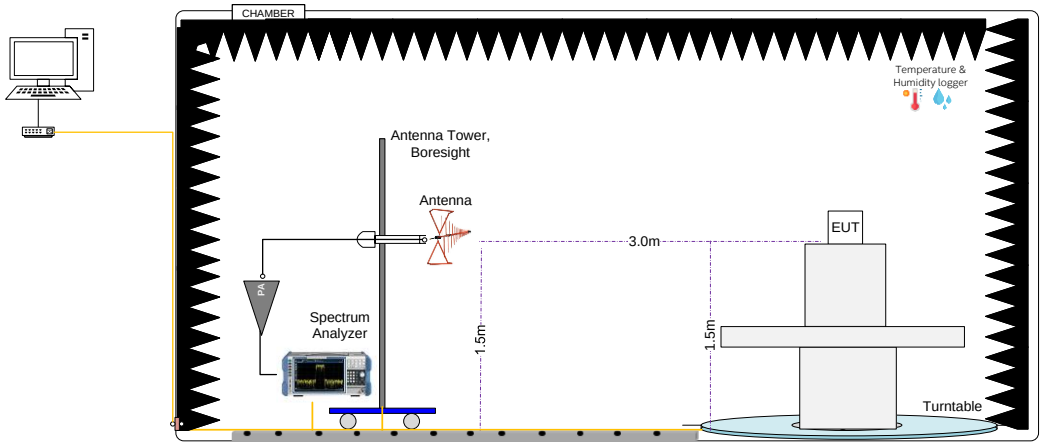
Radiated Setup 1 GHz – 11 GHz (Transmitter tests)



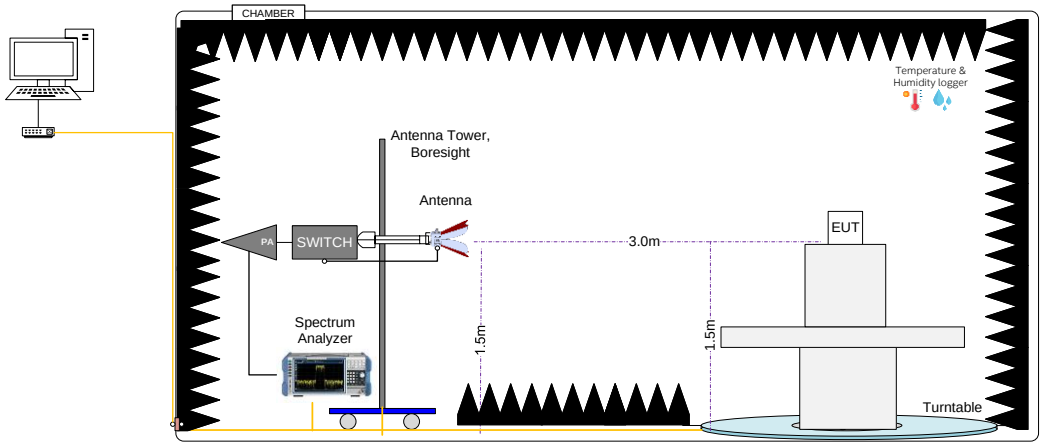
Radiated Setup 11 GHz - 40 GHz (Transmitter tests)



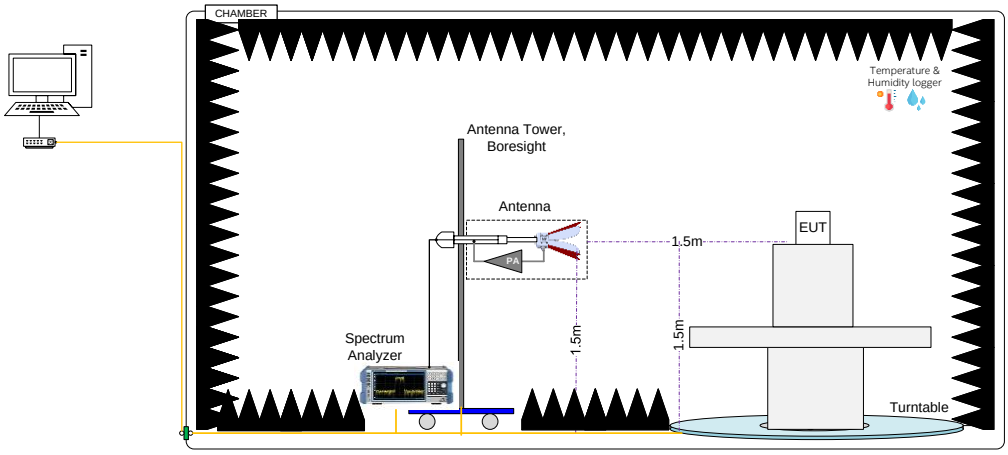
Radiated Setup 25 MHz – 1 GHz (Receiver tests)



Radiated Setup 1 GHz - 11 GHz (Receiver tests)



Radiated Setup 11 GHz - 40 GHz (Receiver tests)



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	2023-03-29	2025-03-29
019-003	SMA-SMA 100cm Cable	FLC-1M-SMSM+	21112742	Mini-Circuits	2023-03-03	2024-03-03
019-004	Attenuator 10dB + SMA-MH4	3M-6	3M-6	WEINSCHEL	2023-03-03	2024-03-03
133-000	Oscilloscope	RTE1052	101135	Rohde & Schwarz	2022-03-25	2024-03-25
363-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D0EB1A	AVITECH	2023-09-28	2025-09-28
413-000	Measurement SW v1.5.4.2	Octopi	N/A	Step AT	N/A	N/A
304-000	DC Power supply	E3614A	MY40000800	Agilent	N/A	N/A
060-000	Digital Multimeter	34401A	US36054685	HP	2022-11-29	2024-11-29
122-000	Climatic chamber	LHU-113	1012-00-5753	ESPEC	2022-09-14	2024-09-14
281-000	Thermometer	t3000FC	46320036	Fluke	2022-03-03	2024-03-03

N/A: Not Applicable

Receiver blocking and adjacent channel selectivity Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
125-000	Communication tester	CMW500	129337	Rohde & Schwarz	2023-04-20	2025-04-20
130-000	Signal generator	SMB100A	178217	Rohde & Schwarz	2023-07-26	2025-07-26
018-005	SMA-SMA 45cm RF Cable	FMC020285-18	-	Fairview Microwave	2023-03-03	2024-03-03
363-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D0EB1A	AVTECH	2023-09-28	2025-09-28
018-000	2 Way SMA Power Divider	PE2084	-	Pasternack	2023-03-03	2024-03-03
016-003	SMA-SMA 45cm RF Cable	FMC0202085-18	-	Fairview Microwave	2023-03-03	2024-03-03
018-006	SMA-SMA 45cm RF Cable	FMC0202085-18	-	Fairview Microwave	2023-03-03	2024-03-03

N/A: Not Applicable

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	2024-02-21
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
007-008	Double Horn Ridged antenna +PA	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2023-0-30	2025-05-30
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	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
009-007	RF Filter	ZHSS-k11G+	8493 1831830	Mini-Circuits	2023-06-09	2024-06-09
006-068	RF Switch	RC-2SP6T-40	02112090061	Micro-Circuits	2023-08-22	2024-08-22
006-066	Cable 7m – 25MHz to 40GHz	R286304174	20.46.370	Radiall	2023-08-16	2024-08-16
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
098-000	generator	SMW200A	1037732	Rohde & Schwarz	2022-09-14	2024-09-14
291-000	Multimeter	2000	4009301	KEITHLEY	2022-03-08	2024-03-08
006-015	Biconical antenna	3110C	161548	ETS-Lindgren	2023-03-03	2025-03-03
006-017	Log-Periodic antenna	3148B	166243	ETS-Lindgren	2023-07-14	2025-07-14
189-000	Double Horn Ridged antenna	3116C	227716	ETS-Lindgren	2022-04-27	2024-04-27

N/A: Not Applicable
*Within a grace period of 30 days

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	2024-03-14
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
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	2023-02-20	2024-02-20
007-011*	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Atem	2023-02-15	2024-03-15
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
007-014*	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2023-02-16	2024-03-16
007-022*	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2023-02-13	2024-03-13
007-015*	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2023-02-13	2024-03-13
007-018*	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2023-02-13	2024-03-13
007-020*	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2023-02-15	2024-03-15
349-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D4F8C3	Avtech	2023-11-30	2025-11-30

N/A: Not Applicable
*Within a grace period of 30 days

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

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	Limit	Unit
Frequency Stability	±6.18	±10	ppm
RF Output Power, (conducted)	±0.99	±1.5	dB
Radiated emission of transmitter < 1GHz	±4.03	±6	dB
Radiated emission of transmitter 1GHz - 40 GHz	±5.09	±8	dB
Radiated emission of receiver < 1GHz	±4.03	±6	dB
Radiated emission of receiver 1GHz - 40 GHz	±5.09	±8	dB
Temperature	±0.95	±1	ºC
Humidity	2.6	±5	%

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
Transmitter: Equivalent Isotropically radiated power (e.i.r.p.)	T.Gamain
Transmitter: Permitted range of operating frequencies	T.Gamain
Transmitter: Unwanted Emissions in the spurious domain (radiated)	K.Khatib, R.Simonini
Blocking or desensitization and adjacent channel selectivity	Z.Ouachicha
Receiver: Spurious emissions (radiated)	K.Khatib, R.Simonini

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/be 40 (40MHz channel bandwidth), 802.11ac80, 802.11ax/be 80 (80MHz 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 output power and spurious levels at the band edges:

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

B.2 Test results

B.2.1 Transmitter: Equivalent Isotropically radiated power (e.i.r.p.)

Test limits

<table>
<tr><th>EN 300 440</th><th>Limits</th></tr>
<tr><td>4.2.2.4</td><td>The transmitter maximum e.i.r.p. under normal and extreme test conditions is provided in table 2.

Table 2 : Maximum radiated power (e.i.r.p.)
<table>
<tr><th>Frequency Band [MHz]</th><th>Mean e.i.r.p. [dBm]</th><th>Application</th></tr>
<tr><td>5 725 to 5 875</td><td>25 mW e.i.r.p (13.98 dBm)</td><td>Non-specific short range devices</td></tr>
</table></td></tr>
</table>

Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the RF output power at the highest power. The antenna terminal of the EUT is connected to the power meter through an attenuator and a cable. The power meter reading is compensated to include the RF path loss.

Antenna gain is taken into account and added to the measurement. The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

The measurement is performed in normal and extreme conditions (temperature and voltage).

Results tables

EIRP Nominal voltage:3.3V						Normal Condition Ambient temperature +23ºC		Extreme Condition High temperature +70ºC		Extreme Condition Low temperature -10ºC	
Mode	Meas Duty cycle %	Rate	#Ch	Freq [MHz]	Antenna	Measured Conducted [dBm]	EIRP [dBm]	Measured Conducted [dBm]	EIRP [dBm]	Measured Conducted [dBm]	EIRP [dBm]
802.11a	97.9	6Mbps	149	5745	SISO A	8.88	13.88	8.68	13.68	8.52	13.52
					SISO B	8.97	13.97	7.95	12.95	8.71	13.71
			161	5805	SISO A	8.85	13.85	8.43	13.43	8.43	13.43
					SISO B	8.74	13.74	7.81	12.81	8.41	13.41
			173	5865	SISO A	5.82	10.82	4.98	9.98	5.35	10.35
					SISO B	4.86	9.86	4.06	9.06	4.39	9.39
802.11n20	98.9	HT0	149	5745	SISO A	8.82	13.82	8.57	13.57	8.44	13.44
					SISO B	8.90	13.90	7.86	12.86	8.57	13.57
			161	5805	SISO A	8.71	13.71	8.36	13.36	8.33	13.33
					SISO B	8.95	13.95	8.03	13.03	8.54	13.54
			173	5865	SISO A	5.53	10.53	5.15	10.15	5.05	10.05
					SISO B	5.79	10.79	4.97	9.97	5.35	10.35
	98.9	HT8	149	5745	MIMO A+B	8.86	13.86	8.27	13.27	8.53	13.53
			161	5805	MIMO A+B	8.86	13.86	8.27	13.27	8.51	13.51
			173	5865	MIMO A+B	8.75	13.75	7.11	12.11	7.19	12.19
802.11n40	98.9	HT0	151	5755	SISO A	8.93	13.93	8.77	13.77	8.65	13.65
					SISO B	8.94	13.94	7.91	12.91	8.61	13.61
			167	5835	SISO A	8.78	13.78	8.55	13.55	8.36	13.36
					SISO B	8.69	13.69	7.87	12.87	8.33	13.33
	98.9	HT8	151	5755	MIMO A+B	8.69	13.69	8.31	13.31	8.54	13.54
			167	5835	MIMO A+B	8.81	13.81	8.30	13.30	8.41	13.41
802.11ac80	98.9	VHT0	155	5775	SISO A	8.71	13.71	8.37	13.37	8.29	13.29
					SISO B	8.92	13.92	7.81	12.81	8.53	13.53
	99.4				MIMO A+B	8.87	13.87	8.21	13.21	8.50	13.50
802.11ax/be 20	98.8	MCS0	149	5745	SISO A	8.86	13.86	8.54	13.54	8.50	13.50
					SISO B	8.83	13.83	7.73	12.73	8.46	13.46
			161	5805	SISO A	8.87	13.87	8.52	13.52	8.51	13.51
					SISO B	8.84	13.84	7.95	12.95	8.49	13.49
			173	5865	SISO A	5.86	10.86	5.52	10.52	5.45	10.45
					SISO B	5.16	10.16	4.39	9.39	4.75	9.75
	99.3		149	5745	MIMO A+B	8.63	13.63	8.14	13.14	8.44	13.44
			161	5805	MIMO A+B	8.55	13.55	8.20	13.20	8.42	13.42
			173	5865	MIMO A+B	8.15	13.15	7.78	12.78	7.85	12.85
802.11ax/be 40	98.8	MCS0	151	5755	SISO A	8.78	13.78	8.54	13.54	8.44	13.44
					SISO B	8.85	13.85	7.81	12.81	8.54	13.54
			167	5835	SISO A	8.70	13.70	8.47	13.47	8.26	13.26
					SISO B	8.89	13.89	8.00	13.00	8.50	13.50
	99.3		151	5755	MIMO A+B	8.68	13.68	8.17	13.17	8.39	13.39
			167	5835	MIMO A+B	8.65	13.65	8.32	13.32	8.43	13.43
802.11ax/be 80	98.7	MCS0	155	5775	SISO A	8.88	13.88	8.54	13.54	8.51	13.51
					SISO B	8.83	13.83	7.73	12.73	8.47	13.47
	99.1				MIMO A+B	8.60	13.60	8.15	13.15	8.48	13.48

EIRP Ambient temperature: +23ºC						Extreme Condition High Voltage V_{max} = +3.465 V		Extreme Condition Low Voltage V_{min} = +3.135 V	
Mode	Meas Duty cycle %	Rate	#Ch	Freq [MHz]	Antenna	Measured Conducted [dBm]	EIRP [dBm]	Measured Conducted [dBm]	EIRP [dBm]
802.11a	97.9	6Mbps	149	5745	SISO A	8.91	13.91	8.90	13.90
					SISO B	8.91	13.91	8.85	13.85
			161	5805	SISO A	8.78	13.78	8.85	13.85
					SISO B	8.74	13.74	8.78	13.78
			173	5865	SISO A	5.76	10.76	5.79	10.79
					SISO B	4.90	9.90	4.93	9.93
802.11n20	98.9	HT0	149	5745	SISO A	8.81	13.81	8.80	13.80
					SISO B	8.94	13.94	8.92	13.92
			161	5805	SISO A	8.70	13.70	8.69	13.69
					SISO B	8.95	13.95	8.97	13.97
			173	5865	SISO A	5.49	10.49	5.42	10.42
					SISO B	5.78	10.78	5.79	10.79
	98.9	HT8	149	5745	MIMO A+B	8.90	13.90	8.90	13.90
			161	5805	MIMO A+B	8.93	13.93	8.90	13.90
			173	5865	MIMO A+B	7.63	12.63	8.95	13.95
802.11n40	98.9	HT0	151	5755	SISO A	8.81	13.81	8.86	13.86
					SISO B	8.94	13.94	8.78	13.78
			167	5835	SISO A	8.74	13.74	8.77	13.77
					SISO B	8.73	13.73	8.73	13.73
	98.9	HT8	151	5755	MIMO A+B	8.84	13.84	7.63	12.63
			167	5835	MIMO A+B	8.93	13.93	8.84	13.84
802.11ac80	98.9	VHT0	155	5775	SISO A	8.75	13.75	8.73	13.73
					SISO B	8.94	13.94	8.95	13.95
	99.4				MIMO A+B	8.90	13.90	8.82	13.82
802.11ax/be 20	98.8	MCS0	149	5745	SISO A	8.85	13.85	8.80	13.80
					SISO B	8.85	13.85	8.85	13.85
			161	5805	SISO A	8.92	13.92	8.89	13.89
					SISO B	8.87	13.87	8.84	13.84
			173	5865	SISO A	5.89	10.89	5.86	10.86
					SISO B	5.18	10.18	5.19	10.19
	99.3		149	5745	MIMO A+B	8.80	13.80	8.79	13.79
			161	5805	MIMO A+B	8.83	13.83	8.79	13.79
			173	5865	MIMO A+B	8.28	13.28	8.84	13.84
802.11ax/be 40	98.8	MCS0	151	5755	SISO A	8.80	13.80	8.74	13.74
					SISO B	8.88	13.88	8.91	13.91
			167	5835	SISO A	8.68	13.68	8.67	13.67
					SISO B	8.89	13.89	8.85	13.85
	99.3		151	5755	MIMO A+B	8.77	13.77	8.29	13.29
			167	5835	MIMO A+B	8.91	13.91	8.83	13.83
802.11ax/be 80	98.7	MCS0	155	5775	SISO A	8.91	13.91	8.90	13.90
					SISO B	8.87	13.87	8.88	13.88
	99.1				MIMO A+B	8.85	13.85	8.90	13.90

B.2.2 Transmitter: Permitted range of operating frequencies

Test limits

EN 300 440	Limits
4.2.3.5	The width of the power spectrum envelope is f_H -f_L for a given operating frequency. In equipment that allows adjustment or selection of different operating frequencies, the power envelope takes up different positions in the allowed band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequencies. The occupied bandwidth (i.e. the bandwidth in which 99 % of the wanted emission is contained) of the transmitter shall fall within the assigned frequency band. The frequency band must be comprised between 5725 MHz to 5875 MHz

Test procedure

The conducted setups shown in section *Test & System Description* were used to verify the range of operating frequency of the EUT.
The f_L (Frequency Low) and the f_H (Frequency High) are searched with marker function; 30 kHz resolution bandwidth has been used. 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

Nominal Voltage: 3.3V						Normal Condition Ambient temperature +23ºC			Extreme Condition High temperature +70ºC			Extreme Condition Low temperature -10ºC		
Chain	Mode	Rate	Ant	#Ch	Freq (MHz)	fL [MHz]	fH [MHz]	fH -fL [MHz]	fL [MHz]	fH [MHz]	fH -fL [MHz]	fL [MHz]	fH [MHz]	fH -fL [MHz]
A	802.11a	6Mbps	SISO	149	5745	5732.19	NA	NA	5732.19	NA	NA	5732.48	NA	NA
				173	5865	NA	5874.63	142.43	NA	5874.71	142.53	NA	5874.66	142.18
	802.11n20	HT0	SISO	149	5745	5732.11	NA	NA	5732.17	NA	NA	5732.14	NA	NA
				173	5865	NA	5874.76	142.64	NA	5874.71	142.54	NA	5874.78	142.64
		HT8	MIMO	149	5745	5733.10	NA	NA	5732.89	NA	NA	5733.13	NA	NA
				173	5865	NA	5874.36	141.26	NA	5874.27	141.38	NA	5874.41	141.28
	802.11n40	HT0	SISO	151	5755	5733.43	NA	NA	5733.82	NA	NA	5733.46	NA	NA
				167	5835	NA	5856.54	123.11	NA	5856.61	122.80	NA	5856.64	123.17
		HT8	MIMO	151	5755	5734.97	NA	NA	5735.43	NA	NA	5735.52	NA	NA
				167	5835	NA	5855.64	120.67	NA	5855.39	119.97	NA	5855.58	120.07
	802.11ac80	VHT0	SISO	155	5775	5734.12	5815.64	81.52	5734.53	5816.93	82.40	5734.64	5815.65	81.01
			MIMO		5775	5735.97	5814.01	78.04	5736.47	5814.08	77.61	5736.13	5814.03	77.90
	802.11ax/be 20	MCS0	SISO	149	5745	5731.86	NA	NA	5732.37	NA	NA	5732.35	NA	NA
				173	5865	NA	5874.79	142.92	NA	5874.84	142.47	NA	5874.79	142.45
			MIMO	149	5745	5732.56	NA	NA	5732.55	NA	NA	5733.18	NA	NA
				173	5865	NA	5874.64	142.08	NA	5874.75	142.20	NA	5874.67	141.49
	802.11ax/be 40	MCS0	SISO	151	5755	5732.97	NA	NA	5733.40	NA	NA	5732.84	NA	NA
				167	5835	NA	5856.84	123.87	NA	5857.12	123.72	NA	5857.40	124.56
			MIMO	151	5755	5734.47	NA	NA	5734.92	NA	NA	5734.87	NA	NA
				167	5835	NA	5855.94	121.47	NA	5855.61	120.70	NA	5855.47	120.60
	802.11ax/be 80	MCS0	SISO	155	5775	5733.45	5816.41	82.96	5733.72	5815.83	82.11	5734.29	5815.33	81.04
			MIMO		5775	5735.60	5814.85	79.24	5735.72	5814.76	79.04	5735.76	5814.71	78.95
B	802.11a	6Mbps	SISO	149	5745	5731.87	NA	NA	5732.22	NA	NA	5732.26	NA	NA
				173	5865	NA	5874.43	142.56	NA	5874.33	142.11	NA	5874.65	142.40
	802.11n20	HT0	SISO	149	5745	5731.87	NA	NA	5732.48	NA	NA	5732.13	NA	NA
				173	5865	NA	5874.64	142.77	NA	5874.47	142.00	NA	5874.65	142.52
		HT8	MIMO	149	5745	5732.74	NA	NA	5733.18	NA	NA	5732.88	NA	NA
				173	5865	NA	5874.64	141.90	NA	5874.50	141.32	NA	5874.65	141.77
	802.11n40	HT0	SISO	151	5755	5733.47	NA	NA	5733.50	NA	NA	5733.44	NA	NA
				167	5835	NA	5856.62	123.15	NA	5856.26	122.76	NA	5856.91	123.47
		HT8	MIMO	151	5755	5734.67	NA	NA	5735.33	NA	NA	5735.26	NA	NA
				167	5835	NA	5855.05	120.38	NA	5855.96	120.63	NA	5854.76	119.51
	802.11ac80	VHT0	SISO	155	5775	5733.49	5816.00	82.51	5735.57	5814.83	79.26	5735.01	5816.02	81.01
			MIMO		5775	5735.94	5814.36	78.41	5736.07	5814.11	78.04	5735.76	5814.16	78.40
	802.11ax/be 20	MCS0	SISO	149	5745	5732.01	NA	NA	5731.94	NA	NA	5731.87	NA	NA
				173	5865	NA	5874.78	142.77	NA	5874.79	142.85	NA	5874.73	142.86
			MIMO	149	5745	5732.40	NA	NA	5732.96	NA	NA	5732.89	NA	NA
				173	5865	NA	5874.78	142.38	NA	5874.76	141.80	NA	5874.80	141.91
	802.11ax/be 40	MCS0	SISO	151	5755	5732.97	NA	NA	5733.64	NA	NA	5733.49	NA	NA
				167	5835	NA	5857.05	124.09	NA	5856.56	122.92	NA	5856.45	122.96
			MIMO	151	5755	5734.21	NA	NA	5734.97	NA	NA	5734.31	NA	NA
				167	5835	NA	5855.91	121.70	NA	5855.72	120.75	NA	5855.35	121.05
	802.11ax/be 80	MCS0	SISO	155	5775	5732.03	5816.72	84.70	5735.23	5815.55	80.32	5733.91	5815.10	81.19
			MIMO	155	5775	5735.39	5814.52	79.13	5735.78	5814.41	78.63	5735.61	5814.33	78.72

Ambient temperature +23ºC						Extreme Condition High Voltage V_{max} = +3.465 V			Extreme Condition Low Voltage V_{min} = +3.135 V		
Chain	Mode	Rate	Ant	#Ch	Freq (MHz)	f_L [MHz]	f_H [MHz]	f_H -f_L [MHz]	f_L [MHz]	f_H [MHz]	f_H -f_L [MHz]
A	802.11a	6Mbps	SISO	149	5745	5732.25	NA	NA	5731.86	NA	NA
				173	5865	NA	5874.70	142.45	NA	5874.75	142.88
	802.11n20	HT0	SISO	149	5745	5731.88	NA	NA	5732.21	NA	NA
				173	5865	NA	5874.70	142.82	NA	5874.66	142.45
		HT8	MIMO	149	5745	5732.49	NA	NA	5732.74	NA	NA
				173	5865	NA	5874.17	141.69	NA	5874.39	141.65
	802.11n40	HT0	SISO	151	5755	5733.44	NA	NA	5733.44	NA	NA
				167	5835	NA	5856.60	123.16	NA	5856.59	123.15
		HT8	MIMO	151	5755	5734.97	NA	NA	5734.98	NA	NA
				167	5835	NA	5854.75	119.78	NA	5855.32	120.34
	802.11ac80	VHT0	SISO	155	5775	5734.61	5815.63	81.01	5734.36	5815.62	81.27
			MIMO		5775	5735.61	5814.00	78.39	5735.98	5814.37	78.40
	802.11ax/be 20	MCS0	SISO	149	5745	5731.91	NA	NA	5731.65	NA	NA
				173	5865	NA	5874.79	142.89	NA	5874.79	143.14
			MIMO	149	5745	5732.56	NA	NA	5732.49	NA	NA
				173	5865	NA	5874.64	142.08	NA	5874.64	142.16
	802.11ax/be 40	MCS0	SISO	151	5755	5732.82	NA	NA	5733.23	NA	NA
				167	5835	NA	5856.88	124.06	NA	5857.17	123.94
			MIMO	151	5755	5734.76	NA	NA	5734.29	NA	NA
				167	5835	NA	5855.93	121.17	NA	5855.55	121.27
	802.11ax/be 80	MCS0	SISO	155	5775	5733.45	5815.63	82.18	5734.26	5816.32	82.06
			MIMO		5775	5735.68	5814.31	78.63	5735.71	5814.26	78.55
B	802.11a	6Mbps	SISO	149	5745	5731.86	NA	NA	5731.87	NA	NA
				173	5865	NA	5874.63	142.76	NA	5874.63	142.76
	802.11n20	HT0	SISO	149	5745	5731.86	NA	NA	5732.12	NA	NA
				173	5865	NA	5874.63	142.77	NA	5874.64	142.52
		HT8	MIMO	149	5745	5732.73	NA	NA	5732.73	NA	NA
				173	5865	NA	5874.63	141.90	NA	5874.63	141.90
	802.11n40	HT0	SISO	151	5755	5732.82	NA	NA	5733.47	NA	NA
				167	5835	NA	5856.28	123.46	NA	5856.60	123.13
		HT8	MIMO	151	5755	5734.73	NA	NA	5734.39	NA	NA
				167	5835	NA	5855.37	120.63	NA	5855.63	121.25
	802.11ac80	VHT0	SISO	155	5775	5733.74	5815.88	82.14	5734.36	5816.00	81.64
			MIMO		5775	5735.74	5814.38	78.64	5735.73	5814.37	78.64
	802.11ax/be 20	MCS0	SISO	149	5745	5732.06	NA	NA	5731.90	NA	NA
				173	5865	NA	5874.78	142.72	NA	5874.79	142.89
			MIMO	149	5745	5732.56	NA	NA	5732.78	NA	NA
				173	5865	NA	5874.78	142.22	NA	5874.71	141.93
	802.11ax/be 40	MCS0	SISO	151	5755	5732.82	NA	NA	5733.19	NA	NA
				167	5835	NA	5856.88	124.06	NA	5856.80	123.61
			MIMO	151	5755	5733.74	NA	NA	5734.14	NA	NA
				167	5835	NA	5855.54	121.81	NA	5855.55	121.41
	802.11ax/be 80	MCS0	SISO	155	5775	5733.44	5815.68	82.23	5733.19	5816.02	82.83
			MIMO		5775	5735.60	5814.53	78.92	5735.39	5814.52	79.14

B.2.3 Transmitter: Unwanted Emissions in the spurious domain (radiated)

Standard references

<table>
<tr><th>EN 300 440</th><th>Limits</th></tr>
<tr><td>4.2.4.4</td><td>The maximum power limits of any unwanted emissions in the spurious domain are given in table below
<table>
<tr><td>Frequency ranges
State</td><td>47 MHz to 74 MHz
87.5 MHz to 108 MHz
174 MHz to 230 MHz
470 MHz to 862 MHz</td><td>Other frequencies
≤ 1 000 MHz</td><td>Frequencies
> 1 000 MHz</td></tr>
<tr><td>Operating</td><td>4 nW (-54 dBm)</td><td>250 nW (-36 dBm)</td><td>1 µW (-30 dBm)</td></tr>
<tr><td>Standby</td><td>2 nW (-57 dBm)</td><td>2 nW (-57 dBm)</td><td>20 nW (-47 dBm)</td></tr>
</table>
Note: the Standby mode correspond to the receiver mode</td></tr>
</table>

Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the transmission spurious emissions. Depending of the frequency range and bands being tested, different antennas and filters were used, in consequence different setups are employed.

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

The radiated spurious emission was measured on the worst case configuration on one channel for each transmission mode.

Test Results

25 MHz – 1 GHz, Tx spurious emissions

Radiated Spurious – All modes

Frequency	Level	Detector	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	---	dBm	dB	---
47.0	-66.3	Quasi-Peak	-51.9	14.4	V
50.0	-66.7	Quasi-Peak	-51.9	14.8	V
187.5	-67.0	Quasi-Peak	-51.9	15.1	H

Tx Spurious Emissions – 1GHz to 40GHz

802.11a

Tx Spurious Emissions – 802.11a (SISO A), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8228.3	-50.1	RMS	-27.9	22.2	H
17355.3	-55.2	RMS	-27.9	27.3	H

Tx Spurious Emissions – 802.11a (SISO B), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8231.2	-50.1	RMS	-27.9	22.2	V
23935.9	-55.1	RMS	-27.9	27.2	V
39841.5	-50.0	RMS	-27.9	22.1	H

Tx Spurious Emissions – 802.11a (SISO A), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8251.6	-50.0	RMS	-27.9	22.1	H
17538.5	-55.1	RMS	-27.9	27.2	H

Tx Spurious Emissions – 802.11a (SISO B), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8251.6	-50.3	RMS	-27.9	22.4	H
23956.2	-55.0	RMS	-27.9	27.1	V
39872.4	-49.9	RMS	-27.9	22.0	H

802.11n

Tx Spurious Emissions – 802.11n20 (SISO A), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9479.2	-48.3	RMS	-27.9	20.4	V
17352.9	-55.6	RMS	-27.9	27.7	H

Tx Spurious Emissions – 802.11n20 (SISO B), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9481.3	-48.1	RMS	-27.9	20.2	H
23990.1	-55.0	RMS	-27.9	27.1	H
39950.7	-50.1	RMS	-27.9	22.2	H

Tx Spurious Emissions – 802.11n20 (MIMO A+B), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9485.7	-48.2	RMS	-27.9	20.3	H
17353.4	-55.2	RMS	-27.9	27.3	H

Tx Spurious Emissions – 802.11n40 (SISO A), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9489.5	-48.1	RMS	-27.9	20.2	H
23966.4	-54.4	RMS	-27.9	26.5	V
39954.1	-50.4	RMS	-27.9	22.5	H

Tx Spurious Emissions – 802.11n40 (SISO B), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
7986.5	-50.0	RMS	-27.9	22.1	H
23960.1	-55.1	RMS	-27.9	27.2	H
39652.5	-49.2	RMS	-27.9	21.3	H

Tx Spurious Emissions – 802.11n40 (MIMO A+B), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8691.2	-48.3	RMS	-27.9	20.4	V
23938.8	-55.0	RMS	-27.9	27.1	V
39952.2	-50.2	RMS	-27.9	22.3	H

Tx Spurious Emissions – 802.11n20 (SISO A), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9482.8	-48.2	RMS	-27.9	20.3	H
17536.6	-55.5	RMS	-27.9	27.6	H

Tx Spurious Emissions – 802.11n20 (SISO B), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9462.6	-48.4	RMS	-27.9	20.5	H
23989.1	-54.9	RMS	-27.9	27.0	H
39969.6	-50.0	RMS	-27.9	22.1	H

Tx Spurious Emissions – 802.11n20 (MIMO A+B), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8767.6	-47.4	RMS	-27.9	19.5	V
23930.6	-55.0	RMS	-27.9	27.1	H
39726.4	-49.8	RMS	-27.9	21.9	H

Tx Spurious Emissions – 802.11n40 (SISO A), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9481.0	-48.4	RMS	-27.9	20.5	V
23925.3	-55.0	RMS	-27.9	27.1	V
39982.1	-50.5	RMS	-27.9	22.6	H

Tx Spurious Emissions – 802.11n40 (SISO B), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9493.0	-48.2	RMS	-27.9	20.3	H
23963.0	-55.0	RMS	-27.9	27.1	V
39951.2	-50.1	RMS	-27.9	22.2	H

Tx Spurious Emissions – 802.11n40 (MIMO A+B), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
9394.7	-48.2	RMS	-27.9	20.3	H
23949.0	-55.0	RMS	-27.9	27.1	V
39950.7	-50.0	RMS	-27.9	22.1	H

802.11ac

Tx Spurious Emissions – 802.11ac80 (SISO A), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8240.5	-50.1	RMS	-27.9	22.2	H
23941.7	-54.9	RMS	-27.9	27.0	H
39664.1	-49.1	RMS	-27.9	21.2	H

Tx Spurious Emissions – 802.11ac80 (SISO B), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8169.4	-50.3	RMS	-27.9	22.4	V
23887.6	-55.2	RMS	-27.9	27.3	V
39873.8	-49.8	RMS	-27.9	21.9	H

Tx Spurious Emissions – 802.11ac80 (MIMO A+B), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8301.5	-49.9	RMS	-27.9	22.0	H
23908.9	-54.8	RMS	-27.9	26.9	V
39957.5	-50.1	RMS	-27.9	22.2	H

802.11ax/be

Tx Spurious Emissions – 802.11ax/be20 (SISO A), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8666.1	-47.5	RMS	-27.9	19.6	V
17330.2	-50.1	RMS	-27.9	22.2	H
28883.3	-52.6	RMS	-27.9	24.7	H

Tx Spurious Emissions – 802.11ax/be20 (SISO B), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8665.5	-44.1	RMS	-27.9	16.2	H
17329.2	-53.9	RMS	-27.9	26.0	H
23105.6	-50.3	RMS	-27.9	22.4	V

Tx Spurious Emissions – 802.11ax/be20 (MIMO A+B), CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8664.3	-43.8	RMS	-27.9	15.9	V
11552.5	-55.7	RMS	-27.9	27.8	H
17329.2	-49.4	RMS	-27.9	21.5	H
23105.1	-50.6	RMS	-27.9	22.7	V
28882.4	-51.9	RMS	-27.9	24.0	V

Tx Spurious Emissions – 802.11ax/be20 (SISO A), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8344.4	-50.1	RMS	-27.9	22.2	H
11672.3	-56.5	RMS	-27.9	28.6	H
17509.5	-50.8	RMS	-27.9	22.9	H

Tx Spurious Emissions – 802.11ax/be20 (SISO B), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8754.8	-44.4	RMS	-27.9	16.5	V
11673.3	-57.0	RMS	-27.9	29.1	H
17509.5	-52.7	RMS	-27.9	24.8	H
23345.3	-52.5	RMS	-27.9	24.6	V
29183.0	-51.9	RMS	-27.9	24.0	V

Tx Spurious Emissions – 802.11ax/be20 (MIMO A+B), CH169

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8755.3	-42.1	RMS	-27.9	14.2	V
11672.8	-52.8	RMS	-27.9	24.9	H
17509.0	-51.2	RMS	-27.9	23.3	H
23346.8	-51.7	RMS	-27.9	23.8	V
29183.0	-51.9	RMS	-27.9	24.0	V

Tx Spurious Emissions – 802.11ax/be40 (SISO A), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8677.8	-47.5	RMS	-27.9	19.6	V
11570.8	-57.6	RMS	-27.9	29.7	H
17355.8	-48.4	RMS	-27.9	20.5	H

Tx Spurious Emissions – 802.11ax/be40 (SISO B), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8677.8	-43.9	RMS	-27.9	16.0	V
17355.3	-52.9	RMS	-27.9	25.0	H
23140.4	-51.0	RMS	-27.9	23.1	V
28925.9	-50.1	RMS	-27.9	22.2	V

Tx Spurious Emissions – 802.11ax/be40 (MIMO A+ B), CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8677.8	-41.1	RMS	-27.9	13.2	H
11570.8	-56.1	RMS	-27.9	28.2	H
17355.8	-48.8	RMS	-27.9	20.9	H
23142.3	-50.2	RMS	-27.9	22.3	V
28927.3	-48.5	RMS	-27.9	20.6	V

Tx Spurious Emissions – 802.11ax/be40 (SISO A), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8738.4	-48.3	RMS	-27.9	20.4	V
11650.6	-56.0	RMS	-27.9	28.1	H
17476.2	-51.3	RMS	-27.9	23.4	H

Tx Spurious Emissions – 802.11ax/be40 (SISO B), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8738.4	-44.8	RMS	-27.9	16.9	V
11651.0	-57.6	RMS	-27.9	29.7	H
17476.7	-53.3	RMS	-27.9	25.4	H
23301.3	-51.7	RMS	-27.9	23.8	V
29126.5	-51.3	RMS	-27.9	23.4	V

Tx Spurious Emissions – 802.11ax/be40 (MIMO A+B), CH167

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8738.7	-43.3	RMS	-27.9	15.4	V
11650.6	-52.5	RMS	-27.9	24.6	H
17476.2	-49.5	RMS	-27.9	21.6	H
23300.8	-52.7	RMS	-27.9	24.8	V
29126.0	-50.5	RMS	-27.9	22.6	V

Tx Spurious Emissions – 802.11ax/be80 (SISO A), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
8629.6	-47.6	RMS	-27.9	19.7	V
17261.6	-52.0	RMS	-27.9	24.1	H
28767.8	-52.8	RMS	-27.9	24.9	V

Tx Spurious Emissions – 802.11ax/be80 (SISO B), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
5160.0	-46.3	RMS	-27.9	18.4	V
8629.9	-43.9	RMS	-27.9	16.0	V
23014.2	-50.0	RMS	-27.9	22.1	V
28768.8	-49.6	RMS	-27.9	21.7	V

Tx Spurious Emissions – 802.11ax/be80 (MIMO A+ B), CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
5160.5	-46.3	RMS	-27.9	18.4	V
8630.2	-42.7	RMS	-27.9	14.8	V
11507.0	-54.9	RMS	-27.9	27.0	H
17261.6	-53.0	RMS	-27.9	25.1	H
23014.7	-53.3	RMS	-27.9	25.4	H
28768.8	-52.0	RMS	-27.9	24.1	V

B.2.4 Adjacent channel selectivity

Test limits

EN 300 440	Limits
4.3.4.4	The adjacent channel selectivity of the equipment under specified conditions shall not be less than -30 dBm + k. The correction factor, k, is as follows: $$k = -20\log f - 10\log BW$$ Where: - f is the frequenyc in GHz; - BW is the channel bandwidth in MHz. The factor k is limited within the following: - - 40dB < k < 0 dB. The measured adjacent channel selectivty shall be stated in the test report.

Test conditions

The test has been conducted in normal test condition.
The general performance criteria for the receiver shall produce after demodulation, a message acceptance ratio of 80 %.

Test procedure

The adjacent channel selectivity setup shown in section *Test & System Description* was used to measure adjacent channel selectivity signal. The signaling Unit in our case is the CMW500.

The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100A.

Result tables

Configuration tested: 802.11a, Chain A, Channel 157 (5785MHz), 6Mbps.

- **Minimum performance result without interferer**

Wanted signal mean power from companion device: Pmin [dBm]	PER [%]
-93.00	18.95

- **Minimum performance results with interferer**

Wanted signal mean power from companion device:

✓ Pmin [dBm] + 3dB = -90.00 dBm

Blocking signal Frequency (MHz)	Minimum Blocking signal power (dBm)	PER (%)	Maximum Blocking signal power (dBm)	PER (%)	Verdict
5805	-53.29	1.09	-7.00	18.45	PASS
5765	-53.23	2.08	-8.50	17.98	PASS

B.2.5 Blocking or desensitization

Test limits

<table>
<tr><th>EN 300 440</th><th>Limits</th></tr>
<tr><td>4.3.4.4</td><td>
The blocking level, for any frequency within the specified ranges, shall not be less than the values given in table 6, except at frequencies on which spurious responses are found.

Table 6: Limits for blocking desensitization
<table>
<tr><th>Receiver category</th><th>Limit</th></tr>
<tr><td>1</td><td>-30 dBm + k</td></tr>
<tr><td>2</td><td>-45 dBm + k</td></tr>
<tr><td>3</td><td>-60 dBm + k</td></tr>
</table>

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

- f is the frequenyc in GHz;
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- - 40dB < k < 0 dB.

The measured blocking level shall be stated in the test report.
</td></tr>
</table>

Test conditions

The test has been conducted in normal test condition.
The General performance criteria for the receiver shall produce after demodulation, a message acceptance ratio of 80 %.

Test procedure

The receiver blocking setup shown in section *Test & System Description* was used to measure receiver blocking signal. The signaling Unit in our case is the CMW500.

The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100A.

Result tables

Configuration tested: 802.11a, Chain A, Channel 157 (5785MHz), 6Mbps.

- **Minimum performance result without interferer**

Wanted signal mean power from companion device: Pmin [dBm]	PER [%]
-93.00	18.95

- **Minimum performance results with interferer**

Wanted signal mean power from companion device:

✓ Pmin [dBm] + 3dB = -90.00dBm

Blocking signal Frequency (MHz)	Minimum Blocking signal power (dBm)	PER (%)	Maximum Blocking signal power (dBm)	PER (%)	Verdict
4775	-51.59	1.07	-6.00	15.85	PASS
5375	-52.62	1.85	-7.00	19.25	PASS
5575	-52.94	0.96	-8.00	18.42	PASS
5995	-53.57	1.37	-8.00	17.45	PASS
6195	-53.85	1.45	-7.00	19.05	PASS
6795	-54.65	1.17	-9.00	18.41	PASS

B.2.6 Receiver: Spurious emissions (radiated)

Test limits

<table>
<tr><th>EN 300 440</th><th>Limits</th></tr>
<tr><td>4.3.5.4</td><td>The power of any spurious emission shall not exceed the following values given in table below
<table>
<tr><th>Frequency ranges
State</th><th>Other frequencies
25 MHz to 1 000 MHz</th><th>Frequencies
> 1 000 MHz</th></tr>
<tr><td>Limit</td><td>2 nW (-57 dBm)</td><td>20 nW (-47 dBm)</td></tr>
</table></td></tr>
</table>

Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the receiver spurious emissions. Depending of the frequency range and bands being tested, different antennas and filters were used; in consequence different setups are employed.

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

Test Results Rx

Rx Spurious Emissions – 25 MHz to 40GHz

Rx Spurious Emissions – 802.11a/n20 (MIMO), Chain A+B, CH157

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
125.0	-61.8	Quasi-Peak	-54.9	6.9	V
10500.0	-48.7	RMS	-44.9	3.8	V
36610.9	-50.9	RMS	-44.9	6.0	V

Rx Spurious Emissions – 802.11n40 (MIMO), Chain A+B, CH159

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
168.5	-68.6	Quasi-Peak	-54.9	13.7	H
10500.0	-48.7	RMS	-44.9	3.8	V
39329.1	-51.5	RMS	-44.9	6.6	V

Rx Spurious Emissions – 802.11ac80 (MIMO), Chain A+B, CH155

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
83.9	-66.5	Quasi-Peak	-54.9	11.6	V
125.0	-61.5	Peak	-54.9	6.6	V
10500.0	-48.6	RMS	-44.9	3.7	V
36373.6	-51.1	RMS	-44.9	6.2	V

Rx Spurious Emissions – 802.11a/n20 (MIMO), Chain A+B, CH169

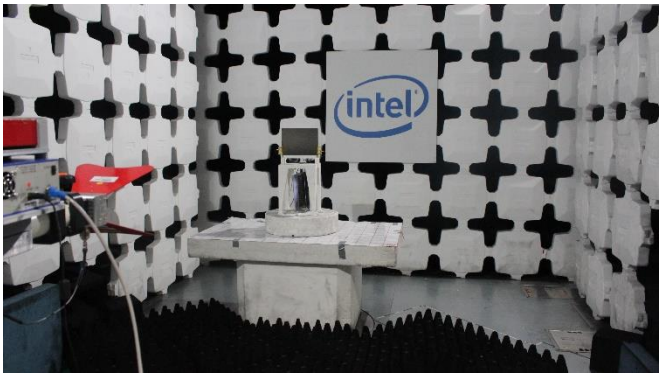
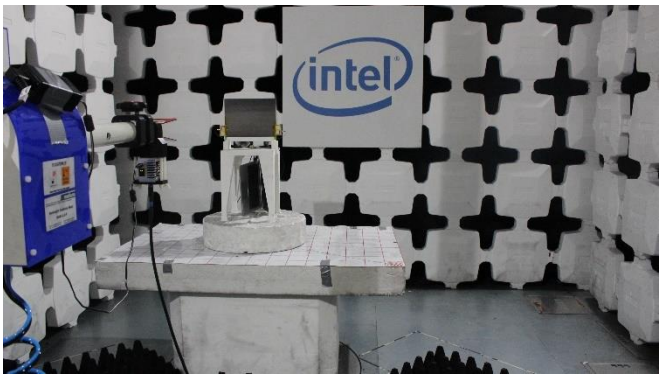
Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
168.7	-69.0	Quasi-Peak	-54.9	14.1	V
10500.7	-53.7	RMS	-44.9	8.8	V
39440.3	-51.4	RMS	-44.9	6.5	V

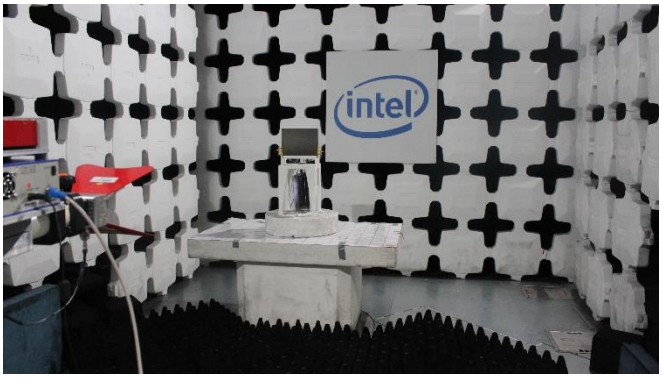
Rx Spurious Emissions – 802.11n40 (MIMO), Chain A+B, CH167F

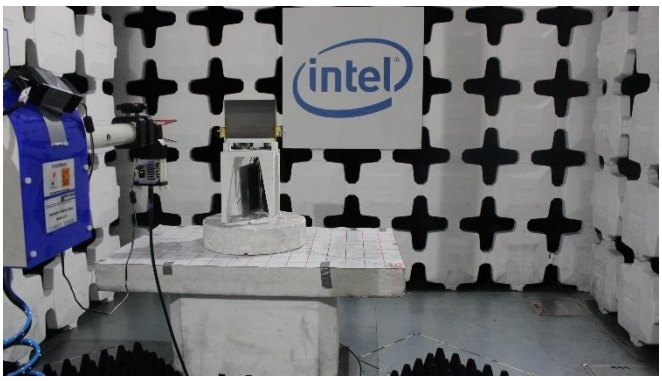
Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
84.0	-65.1	Quasi-Peak	-54.9	10.2	V
10500.7	-48.3	RMS	-44.9	3.4	V
36319.4	-51.5	RMS	-44.9	6.6	V

Annex C. Photographs

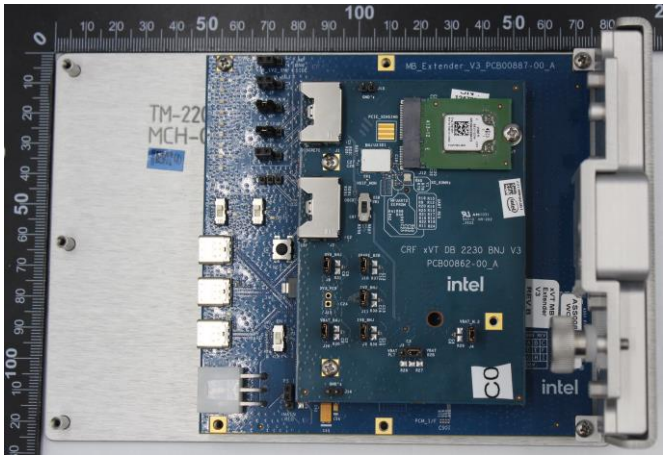
C.1 Test Setup

Radiated Setup 25 MHz – 1 GHz (Transmitter tests)	Radiated Setup 1 GHz – 11 GHz (Transmitter tests)
	
Radiated Setup 11 GHz – 40 GHz (Transmitter tests)	
	

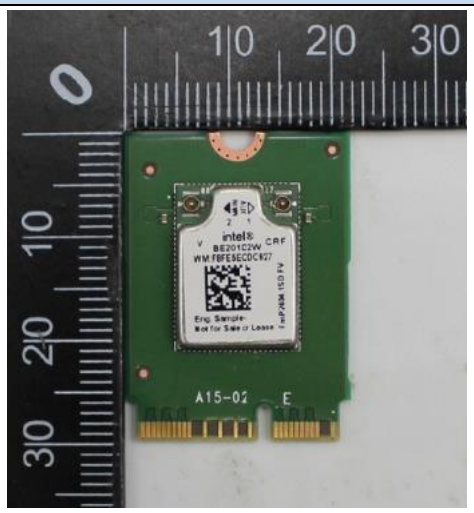
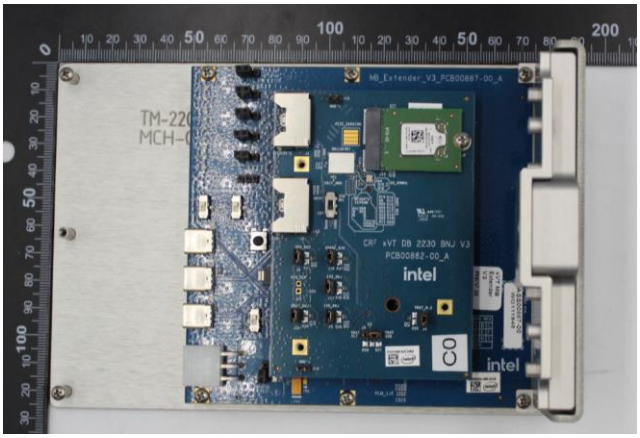
Radiated Setup 25 MHz – 1 GHz (Receiver tests)	Radiated Setup 1 GHz – 11 GHz (Receiver tests)
	

Radiated Setup 11 GHz – 40 GHz (Receiver tests)


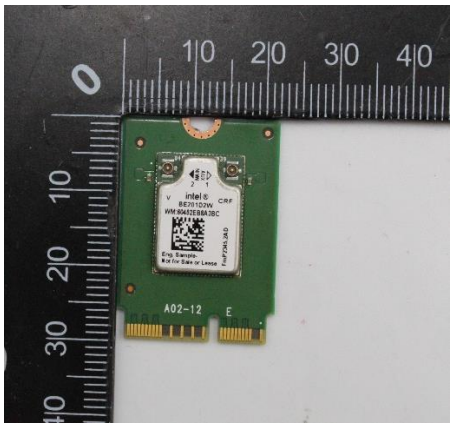
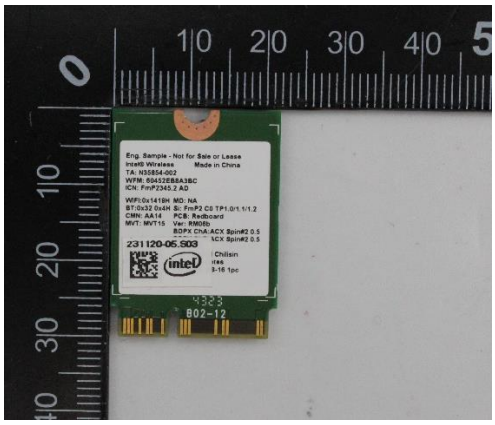
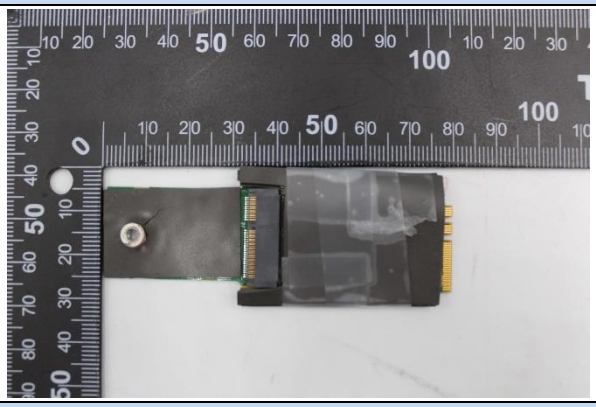
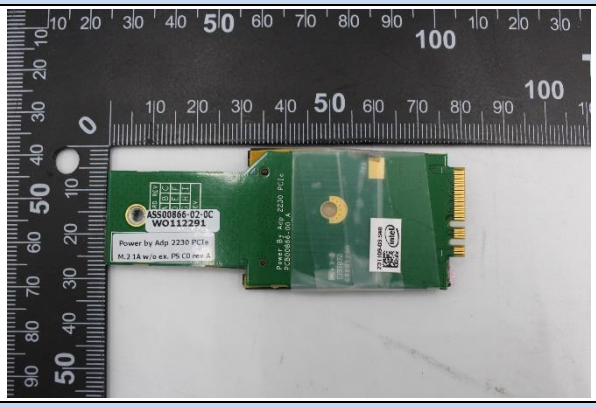
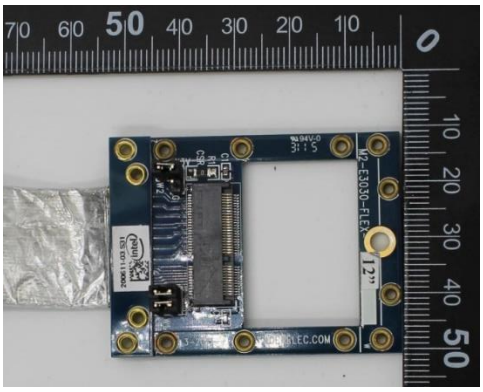
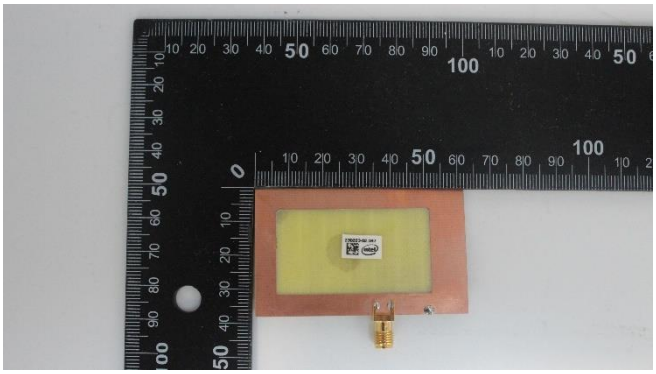
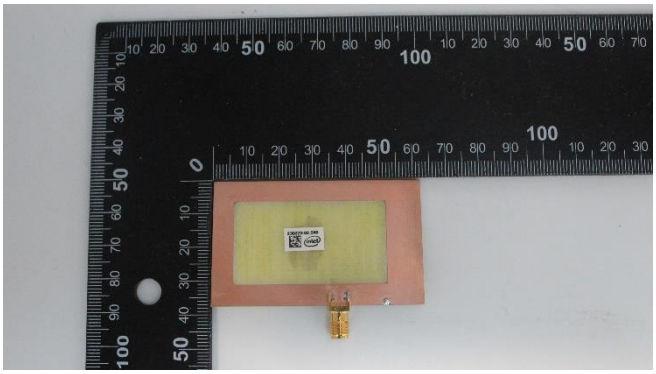
C.2 Test Sample

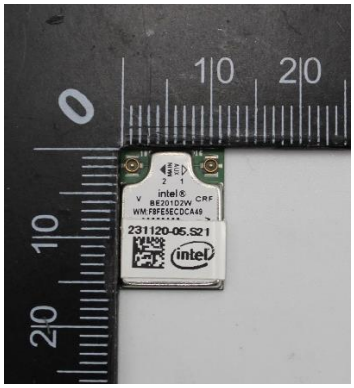
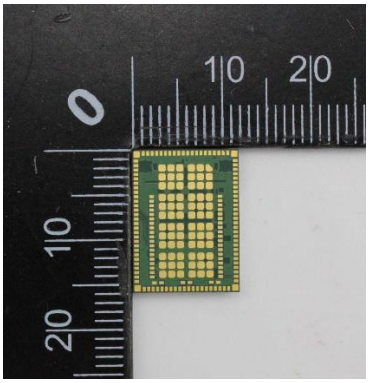
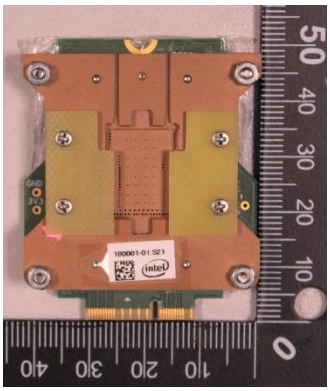
Sample #01	
Module Front	Module Back
	
Extender board	Laptop
	

Sample #02

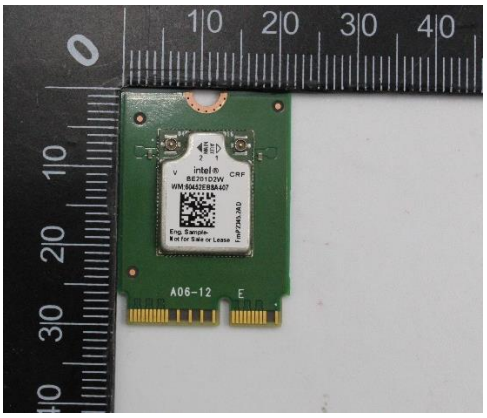
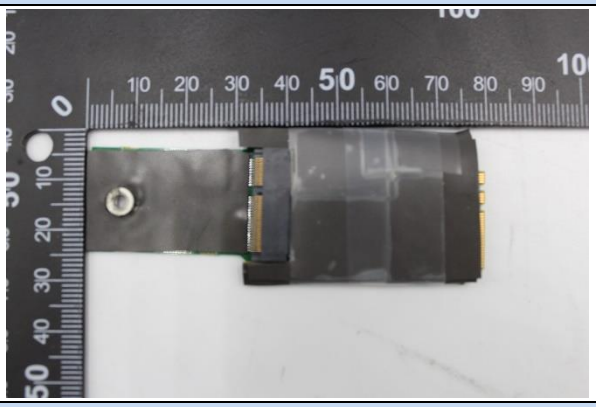
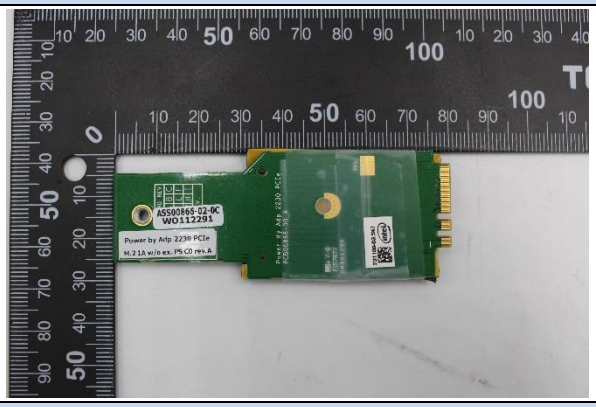
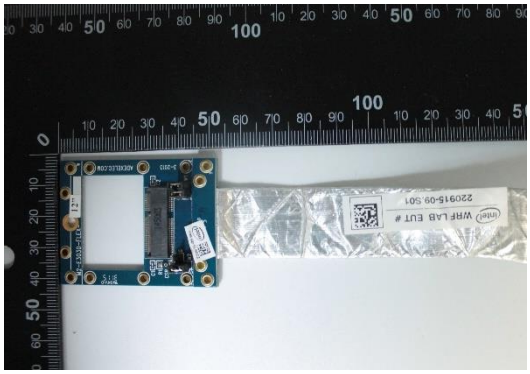
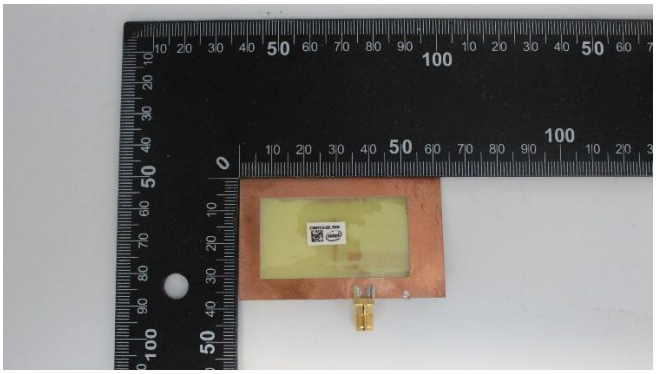
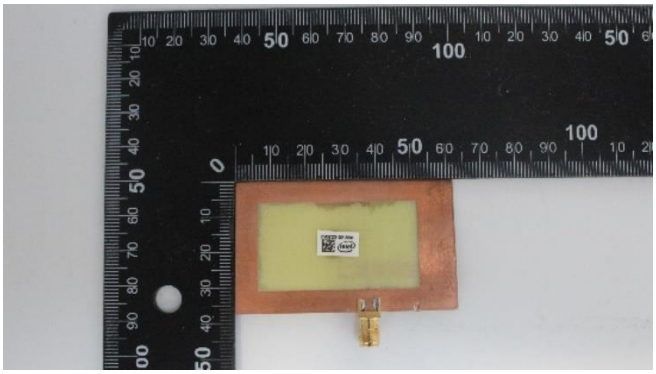
Module Front	Module Back
	
Extender board	**Laptop**
	

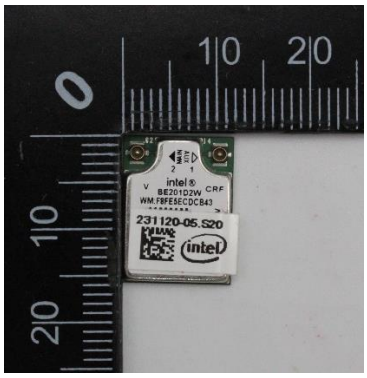
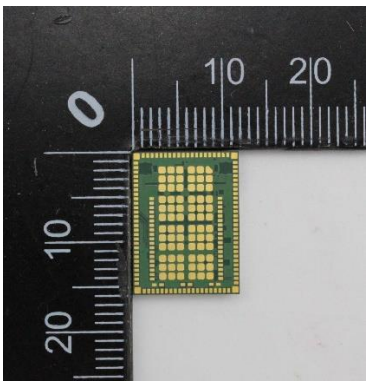
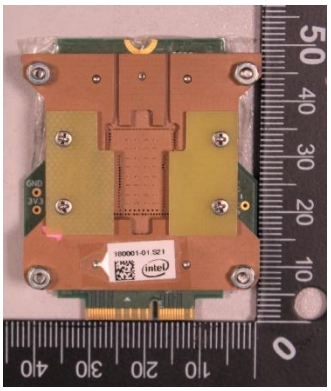
Sample #03

Module Front	Module Back
	
Adaptor Front	**Adaptor Back**
	
Extender board	**Laptop**
	
Main antenna	**Aux antenna**
	

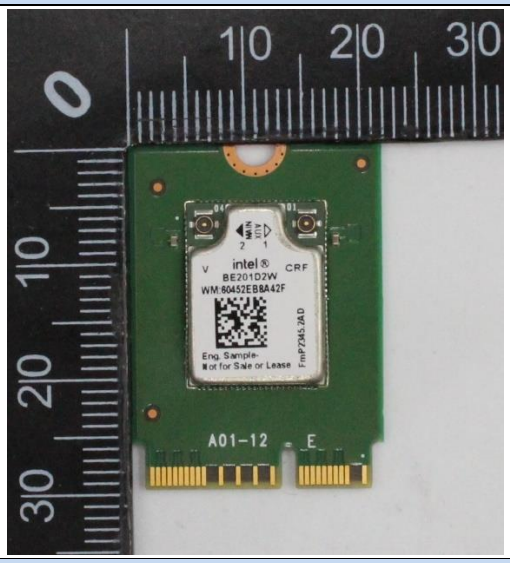
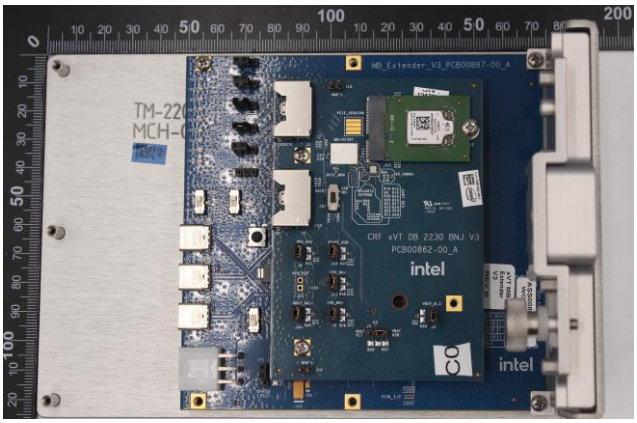
Module Front	Module back
	
Socket Front	**Socket Back**
	

Sample #04

Module Front	Module Back
	
Adaptor Front	**Adaptor Back**
	
Extender board	**Laptop**
	
Main antenna	**Aux antenna**
	

Module Front	Module back
	
Socket Front	**Socket Back**
	

Sample #05

Module Front	Module Front
	
Extender board	**Laptop**
	

End of the report

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