





TEST REPORT

EUT Description WLAN and BT, 2x2 PCIe M.2 1625 SD adapter card

Brand Name Intel® Wi-Fi 6E AX411

Model Name AX411E2W

FCC/IC ID FCC ID: PD9AX411E2/ IC 1000M-AX411E2

Date of Test Start/End 2021-12-24 / 2022-01-25

802.11ax, Tri Band, 2x2 Wi-Fi 6E + Bluetooth® 5.2

Features + CDB (Concurrent Dual Band simultaneous Wi-Fi connection)

(see section 5)

Applicant Intel Mobile Communications

Address 100 Center Point Circle, Suite 200 Columbia, South Carolina 29210

USA

Contact Person Steven Hackett

Telephone/Fax/ Email steven.c.hackett@intel.com

FCC CFR Title 47 Part 15 C
FCC CFR Title 47 Part 15 E

Reference Standards RSS-247 issue 2, RSS-Gen issue 5 A1

(see section 1)

Test Report identification 211130-05.TR01

Rev. 01

Revision Control 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)

Ines KHARRAT (Technical Manager)

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



Table of Contents

1.	Standards, reference documents and applicable test methods					
2.	Ger	neral conditions, competences and guarantees	3			
3.	Enν	vironmental Conditions	3			
4.	. Test samples					
5.	EU ⁻	6				
6.	Rer	marks and comments				
7.		st Verdicts summary				
8.		cument Revision History				
Α	.1	MEASUREMENT SYSTEM				
Α	.2	TEST EQUIPMENT LIST	10			
Α	.3	MEASUREMENT UNCERTAINTY EVALUATION	12			
В	.1	TEST CONDITIONS	13			
В	.2	RADIATED SPURIOUS EMISSION	14			
В	.2.1	802.11 B/G/N/AX 2.4GHz	14			
В	.2.2	BLE	16			
В	.2.3	BT	18			
В	.2.4	802.11 A/G/N/AX U-NII-1	20			
В	.2.5	802.11 A/G/N/AX U-NII-2A	22			
В	.2.6	802.11 A/G/N/AX U-NII-2C	24			
В	.2.7	802.11 A/G/N/AX U-NII-3	26			
В	.2.8	CDB Mode	28			
С	.1	TEST SETUP	31			
С	.2	TEST SAMPLE	32			

Rev. 00

1. Standards, reference documents and applicable test methods

FCC	 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. 2019-10-01 Edition FCC Title 47 CFR part 15 - Subpart E - Unlicensed National Information Infrastructure Devices. 2019-10-01 Edition FCC Title 47 CFR part 15 - Subpart C - §15.209 Radiated emission limits; general requirements. 2019-10-01 Edition 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. 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). FCC OET KDB 662911 D01 v02r01 - Emissions Testing of Transmitters with Multiple Outputs in the Same Band. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
ISED	 RSS-Gen Issue 5 Amendment 1 - General Requirements for Compliance of Radio Apparatus. RSS-247 Issue 2 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices. 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) 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. FCC OET KDB 662911 D01 v02r01 - Emissions Testing of Transmitters with Multiple Outputs in the Same Band. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2. General conditions, competences and guarantees

- ✓ Tests performed under FCC standards identified in section 1 are covered by A2LA accreditation.
- ✓ Tests performed under ISED standards identified in section 1 are covered by Cofrac accreditation.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 testing laboratory accredited by the French Committee for Accreditation (Cofrac) with the certificate number 1-6736.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED #1000Y.
- ✓ Intel WRF Lab declines any responsibility with respect to the identified information provided by the customer and that may affect the validity of results.
- ✓ 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.

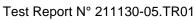
3. Environmental Conditions

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

Temperature	22.0°C ± 1.9°C
Humidity	40.6% ± 11.4%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
	210611-03.S01	WiFi 6E Module	AX411E2W	WM:3413E8F0D70A	2021-07-05	
	210611-03.S25	Socket	Adaptor 1625	-	2021-07-16	
	210611-02.S17	Adaptor	PowerBy SNJ A4	-	2021-07-02	
#04	200602-03.S06	Absorber	-	-	2020-07-03	Used for 30MHz- 1Ghz and 18-
#01	200611-03.S26	Extender	ADEXELEC	-	2020-07-01	40GHz Spurious Emissions tests
	170000-01.S01	Laptop	Lattitude E5470	DBPLMC2	2017-03-28	
	200921-01.S03	Wieson Antenna	-	-	2020-09-28	
	200921-01.S04	Wieson Antenna	-	-	2020-09-28	
	210611-03.S02	WiFi 6E Module	AX411E2W	WM:3413E8F0DA75	2021-07-05	
	210611-03.S26	Socket	Adaptor 1625	-	2021-07-16	
	210611-02.S15	Adaptor	PowerBy SNJ A4	-	2021-07-02	Used for 1-9.5GHz Spurious Emissions
#00	200602-03.S06	Absorber	-	-	2020-07-03	
#02	200102-01.S03	Extender	ADEXELEC	-	2020-01-02	tests
	170801-01.S10	Laptop	Latitude E7470	7KNOXF2	2017-09-08	
	200921-01.S01	Wieson Antenna	-	-	2020-09-28	
	200921-01.S02	Wieson Antenna	-	-	2020-09-28	
	210611-03.S01	WiFi 6E Module	AX411E2W	WM:3413E8F0D70A	2021-07-05	
	210611-03.S25	Socket	Adaptor 1625	-	2021-07-16	
	210611-02.S17	Adaptor	PowerBy SNJ A4	-	2021-07-02	Used for CDB tests
#00	200602-03.S06	Absorber	-	-	2020-07-03	and 9.5-18GHz
#03	200611-03.S26	Extender	ADEXELEC	-	2020-07-01	Spurious Emissions tests except test
	170000-01.S01	Laptop	Lattitude E5470	DBPLMC2	2017-03-28	cases in Note 1
	200921-01.S01	Wieson Antenna	-	-	2020-09-28	
	200921-01.S02	Wieson Antenna	-	-	2020-09-28	
	210611-03.S14	WiFi 6E Module	AX411E2W	WFM:3413E8F11B8E	2021-07-05	
	210611-02.S17	Adaptor	PowerBy SNJ A4	-	2021-07-02	
	200602-03.S06	Absorber	-	-	2020-07-03	Used for 9.5 GHz- 18 GHz Radiated
#04	200611-03.S26	Extender	ADEXELEC	-	2020-07-01	Spurious Emissions tests for the test
	170000-01.S01	Laptop	Lattitude E5470	DBPLMC2	2017-03-28	cases in Note 1
	200921-01.S01	Wieson Antenna	-	-	2020-09-28	
	200921-01.S02	Wieson Antenna	-	-	2020-09-28	





Note 1: The following test cases 9.5-18GHz RSE used sample #04

Mode	Rate	Channel	Freq [MHz]	Antenna
000.44-	802.11a 6Mbps	0.4	5000	SISO A
802.11a		64	5320	SISO B
	HT0			SISO A
802.11n20	HT0	64	5320	SISO B
	HT8			MIMO A+B
		64	5320	SISO A
802.11ax20	MCS0			SISO B
				MIMO A+B
	HT0		5310	SISO A
802.11n40	HT0	62		SISO B
	HT8			MIMO A+B
000 4440	MCCO	F.4	5070	SISO B
802.11ax40	MCS0	54	5270	MIMO A+B
				SISO A
802.11ax40	MCS0	62	5310	SISO B
				MIMO A+B

5. EUT Features

The herein information is provided by the customer

Brand Name	Intel® Wi-Fi 6E AX411	Intel® Wi-Fi 6E AX411					
Model Name	AX411E2W						
Software Version	DRTU Version: 99.2100.64.0-OEM.DRTU.12485						
Driver Version	99.0.63.5						
Prototype / Production	Production						
	802.11b/g/n/ax	2.	4GHz (2400.0 – 24	83.5 MHz)			
	802.11a/n/ac/ax		2GHz (5150.0 – 53				
Supported Radios			6GHz (5470.0 – 57 8GHz (5725.0 – 58				
	802.11ax		0GHz (5925.0 - 71	•			
	Bluetooth 5.2	2.	4GHz (2400.0 – 24	83.5 MHz)			
	The EUT is a WiFi module supporting concurrent dual band (CDB) transmission modes						
	Mode	TX Cha	nin B		TX Chain A		
		CDB Mod	de + Co-run BT:				
	BT Co-run – CDB SISO	WLAN 2.4GHz + WLAN 5GHz		ВТ			
		WLAN 2.4GHz + WLAN 6GHz		ВТ			
	CDB only SISO	WLAN 2.4GHz	+ WLAN 5GHz		-		
Additional information		WLAN 2.4GHz	+ WLAN 6GHz		-		
	CDB only SISO	-		WLAN	2.4GHz + WLAN 5GHz		
	-			WLAN 2.4GHz + WLAN 6GHz			
	CDB only MIMO	MIMO WLAN 2.4GHz + WLAN 5GHz		WLAN 2.4GHz + WLAN 5GHz			
		WLAN 2.4GHz	+ WLAN 6GHz	WLAN	2.4GHz + WLAN 6GHz		
	BT Co-run (CDB SISO)	WLAN 2	.4GHz	\	WLAN 5GHz + BT		
	BT Co-run (CDB SISO)	WLAN 2	.4GHz	١	WLAN 6GHz + BT		
	Transmitter		Chain 1 (A)		Chain 2 (B)		
	Manufacturer		Wieson		Wieson		
	Antenna type		Dipole		Dipole		
Antenna Information	Part number		ARY121-0009-00)2-H0	ARY121-0009-002-H0		
	Declared Antenna gain (dBi)		+3.10		+3.10		
	Declared Antenna gain (dBi)		+4.11 +5.17		+4.11 +5.17		
	Declared Antenna gain (dBi) – 5.5GHz Declared Antenna gain (dBi) – 5.8 GHz		+5.17		+5.17		
	2001a10a / Wilcillia galii (dbi)	5.0 OI IZ	. 0. 17		. 0.17		



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. For CDB mode, the worst cases found in modular report 210611-03.TR51 were tested and 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.

	FCC part	RSS part	Test name	Verdict
802.11 b/g/n/ax 2.4GHz	15.247 (d) 15.209	RSS-247 Clause 5.5 RSS-Gen A1 Clause 8.9	Spurious Emission (radiated)	Р
BLE	15.247 (d) 15.209	RSS-247 Clause 5.5 RSS-GEN A1 Clause 8.9	Spurious Emission (radiated)	Р
ВТ	15.247 (d) 15.209	RSS-247 Clause 5.5 RSS-GEN A1 Clause 8.9	Spurious Emission (radiated)	Р
802.11 a/n/ac/ax – U-NII-1	15.407 (b) (1) 15.209	RSS-247 Clause 6.2.1.2 RSS-GEN A1, Clause 8.9	Spurious Emission (radiated)	Р
802.11 a/n/ac/ax – U-NII-2A	15.407 (b) (2) 15.209	RSS-247 Clause 6.2.2.2 RSS-GEN A1, Clause 8.9	Spurious Emission (radiated)	Р
802.11 a/n/ac/ax – U-NII-2C	15.407 (b) (3) 15.209	RSS-247 Clause 6.2.3.2 RSS-GEN A1 Clause 8.9	Spurious Emission (radiated)	Р
802.11 a/n/ac/ax – U-NII- 3	15.407 (b) (4) 15.209	RSS-247 Clause 6.2.4.2 RSS-GEN A1 Clause 8.9	Spurious Emission (radiated)	Р

P: Pass F: Fail

NM: Not Measured NA: Not Applicable

8. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	N.Bui	First Issue

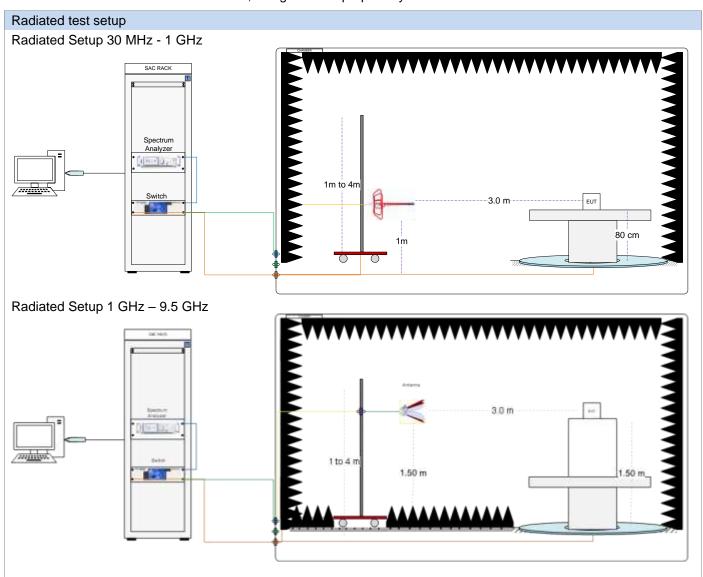


Annex A. Test & System Description

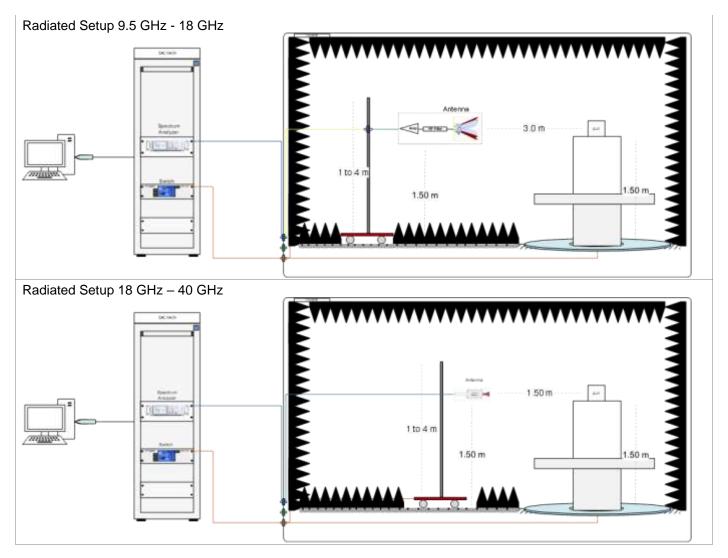
A.1 Measurement System

Measurements were performed using the following setups, made in accordance to the general provisions of ANSI 63.10-2013 Test Procedures.

The DUT is 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.







Sample Calculation

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

F (dB/m)= Rx Antenna Factor (dB/m) + Cable losses (dB) – Amplifiers Gain (dBi)
**E (dB
$$\mu$$
V/m) =** V(dB μ V) + F (dB/m)

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

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

where

EspecLimit is the field strength of the emission at the distance specified by the limit, in dBµV/m E_{Meas} is the field strength of the emission at the measurement distance, in dB_µV/m D_{Meas} is the measurement distance, in m DspecLimit 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	FACT 3	5720	ETS Lindgren	2020-01-07	2022-01-07
006-008	Measurement Software v11.30.00	EMC32	100623	Rohde & Schwarz	N/A	N/A
147-000	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2020-11-02	2022-11-02
006-002	Switch & Positioning	EMC center	00159757	ETS Lindgren	N/A	N/A
006-011	Boresight antenna mast	BAM4.0-P	P/278/2890.01	Maturo	N/A	N/A
057-000	Horn Antenna 3117 + Amplifier + HPF9.5	3117	00167062+00169546	ETS-Lindgren	2020-06-15	2022-06-15
007-008	Double Horn Ridged antenna	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2021-08-05	2023-08-05
006-022	Biconilog Antenna	3142E	00156946	ETS-Lindgren	2020-03-12	2022-03-12
006-020	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157734	ETS Lindgren	2021-08-05	2023-08-05
006-052	RF Cable 7.5m	0501051057000GX	19.35.850	Radiall	2021-08-12	2022-02-12
006-051	RF Cable 1.0m	CBL-1.5M-SMSM+	202879	Mini-Circuits	2021-08-12	2022-02-12
006-030	RF Cable 1.2m	UFA147A-0-0480- 200200	MFR 64639223720- 003	Micro-coax	2021-08-12	2022-02-12
006-034	RF Cable 1.0m	UFA147A	=	Utilflex	2021-08-12	2022-02-12
006-036	RF Cable 1.0m	UFB311A-0-0590- 50U50U	MFR 64639 223230- 001	Micro-coax	2021-08-12	2022-02-12
006-038	RF Cable 7.0m	R286304009	-	Radiall	2021-08-12	2022-02-12
006-039	RF Cable 2.5m	0500990992500KE	19.23.395	Radiall	2021-08-12	2022-02-12
365-000	Temperature & Humidity logger	RA12E-TH1-RAS	00-80-A3-E1-6E-55	Avtech	2021-03-08	2023-03-08

*Items not used during out of calibration period N/A: Not Applicable



Test Report N° 211130-05.TR01

Rev. 00

Radiated Setup #2

tadiated Co						
ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
007-000	Anechoic chamber	RFD-FA-100	5996	ETS Lindgren	2021-09-14	2023-09-14
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-006	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
007-005	Measurement SW, V11.20.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
127-000	Spectrum Analyzer	FSV40	101358	Rohde & Schwarz	2021-01-15	2023-01-15
007-007	Double Ridge Horn (1- 18GHz)	3117	00152266	ETS Lindgren	2020-03-18	2022-03-18
057-000	Horn Antenna 3117 + Amplifier + HPF9.5	3117	00167062+00169546	ETS-Lindgren	2020-06-15	2022-06-15
007-008	Double Horn Ridged antenna	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2021-08-05	2023-08-05
007-022	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2021-08-12	2022-02-12
007-020	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2021-08-12	2022-02-12
007-011	RF Cable 1-18GHz – 6.5m	140-8500-11-51	001	Spectrum	2021-08-12	2022-02-12
007-015	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2021-08-12	2022-02-12
007-014	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2021-08-12	2022-02-12
007-023	RF Cable 1m DC-40GHz	PE360-100CM	-	Pasternack	2021-08-12	2022-02-12
007-018	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2021-08-12	2022-02-12
145-000*	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B89BE3	Avtech	2020-01-22	2022-01-22
325-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B9B7C6	Avtech	2022-01-17	2024-01-17

^{*}Items not used during out of calibration period N/A: Not Applicable

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
412-000	DRTU Power finder V2.0	Software	=	Intel	N/A	N/A
022-000	Power Sensor	NRP-Z81	104385	Rohde & Schwarz	2020-04-08	2022-04-08
061-000	Power Sensor	NRP-Z81	104386	Rohde & Schwarz	2020-04-08	2022-04-08
140-000	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2020-04-08	2022-04-08



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	±6.07	dB
Radiated tests 1GHz – 40 GHz	±6.04	dB



Annex B. Test Results

B.1 Test Conditions

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

For 802.11n20 & 802.11ax20 (20 MHz channel bandwidth), 802.11n40 & 802.11ax40 (40MHz channel bandwidth), 802.11ac80 & 802.11ax80 (80MHz channel bandwidth) and 802.11ac160 & 802.11ax160 (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
	802.11b	20	1Mbps
	802.11g, a	20	6Mbps
	000.445	20	HT0
	802.11n	40	HT0
CICO	000.4400	80	VHT0
SISO	802.11ac	160	VHT0
		20	HE0
	802.11ax	40	HE0
		80	HE0
		160	HE0
	802.11n	20/40	HT8
MIMO	802.11ac	80/160	VHT0
	802.11ax	20/40/80/160	HE0

B.2 Radiated spurious emission

The herein test results were performed by:

Test case measurement	Test Personnel
Radiated spurious emissions	N.Bui

B.2.1 802.11 b/g/n/ax 2.4GHz

Standard references

FCC part	RSS part	Limits					
		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	Field Stregth	Field Stregth	Meas. Distance		
		(MHz)	(μV/m)	(dB _µ V/m)	(m)		
		30-88	100	40	3		
	RSS-247	88-216	150	43.5	3		
		216-960	200	46	3		
15.247 (d)	Clause 5.5	Above 960	500	54	3		
15.209 [^]	RSS-Gen A1 Clause 8.9	The emission linemploying CISP kHz. 110-490 kHthree bands are For average radia limit specified v 20 dB above the	R quasi-peak de Iz and above 10 based on measu ated emission m vhen measuring	tector except for 1000 MHz. Radiat rements employi easurements about with peak detector	r the frequency be sed emission limi- ing an average de ove 1000 MHz. th	pands 9-90 ts in these etector. here is also	

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 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBμV/m	dBμV/m	dBμV/m	
45.6	27.8	40.0	12.2	V

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

1 GHz - 26.5 GHz, 802.11ax40, HE0, Chain A+B

Radiated Spurious – CH3

Frequency	MaxPeak	Average	Limit	Margin	Polar
4849.6	58.7		74.0	15.3	V
4850.5		51.8	54.0	2.2	V
10359.9		50.8	54.0	3.2	V
10359.9		50.9	54.0	3.1	V
25629.4	47.6		74.0	26.4	Н
25632.6		38.1	54.0	15.9	V

B.2.2 BLE

Standards references

FCC part	RSS part		Limits					
			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 Stregth (μV/m)	Field Stregth (dBμV/m)	Meas. Distance (m)		
			30-88	100	40	3		
	15.247 (d) 15.209 RSS-247 Clause 5.5 RSS-Gen A1 Clause 8.9		88-216	150	43.5	3		
			216-960	200	46	3		
` '			Above 960	500	54	3		
15.209		emplo kHz, three For a a limi	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 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.					

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 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious – All modes

Frequency	QuasiPeak	Limit	Margin	Polar
46.7	25.3	40.0	14.7	V
212.5	30.5	43.5	13.0	Н

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 - CH39

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBμV/m	dBµV/m	dB	
9056.0	55.3		74.0	18.7	Н
9056.5		43.0	54.0	11.0	V
11154.5	49.1		74.0	24.9	V
11154.5		39.9	54.0	14.1	V
23125.0	49.1		74.0	24.9	Н
23133.0		36.7	54.0	17.3	Н

B.2.3 BT

Standard references

FCC part	RSS part		Limits					
			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 Stregth (μV/m)	Field Stregth (dBµV/m)	Meas. Distance (m)		
			30-88	100	40	3		
	RSS-247 Clause 5.5		88-216	150	43.5	3		
			216-960	200	46	3		
15.247 (d)			Above 960	500	54	3		
15.247 (d) 15.209 (a)	RSS GEN A1 Clause 8.9	emplo kHz, three For a a limi	oying CISPR qua 110-490 kHz an bands are base verage radiated t specified wher	asi-peak detecto d above 1000 M d on measureme emission measu	r except for the IHz. Radiated ents employing arements above 1 peak detector for	sed on measurer frequency bands mission limits in a average detecto 000 MHz, there is unction, correspo	these or.	

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.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBμV/m	dBµV/m	dBµV/m	
46.7	25.3	40.0	14.7	V
212.5	30.5	43.5	13.0	Н
944.0	34.5	46.0	11.5	Н

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

1 GHz – 26 GHz, EDR π /4-DQPSK

Radiated Spurious - CH0 2-DH5

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
8989.0	55.2		74.0	18.8	Н
9039.5		43.1	54.0	10.9	Н
11154.0		40.1	54.0	13.9	V
11155.5	48.2		74.0	25.8	V
24082.5	49.6		74.0	24.4	V
24107.5		37.1	54.0	16.9	V

B.2.4 802.11 a/g/n/ax U-NII-1

Standard references

FCC part	Limits								
15.407 (b) (1)			the 5.15-5.25 GH n e.i.r.p. of −27 d		sions outside of t	he 5.15-5.35			
		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)				
		0.009-0.490	2400/f(kHz)	1	300				
		0.490-1.705	24000/f(kHz)	ı	300				
		1.705-30.0	30	-	30				
		30-88	100	40	3				
15.209		88-216	150	43.5	3				
10.200		216-960	200	46	3				
		Above 960	500	54	3				
	quasi-peak d MHz. Radiate an average d For average r	etector except for ed emission limit etector. radiated emission ring with peak of	the above table a or the frequency b s in these three b n measurements detector function,	oands 9-90 kHz, oands are based above 1000 MHz	110-490 kHz and on measuremenz, there is also a l	above 1000 ts employing imit specified			

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.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBμV/m	dBµV/m	
44.3	25.6	40.0	14.3	V
45.8	26.1	40.0	13.9	V
216.3	37.4	46.0	8.6	Н

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

1 GHz - 40 GHz, 802.11ax40, HE0, Chain A+B

Radiated Spurious - CH38

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
9447.6	55.2		74.0	18.8	Н
9452.3		44.6	54.0	9.4	Н
10379.8	52.5		68.2	15.7	V
10387.3	62.9		68.2	5.3	V
15579.9		39.7	54.0	14.3	V
15580.8	49.6		74.0	24.4	V
20772.5		43.7	54.0	10.3	Н
20774.0	53.7		74.0	20.3	Н

B.2.5 802.11 a/g/n/ax U-NII-2A

Standard 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.								
		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				
15.209		Above 960	500	54	3				
	quasi-peak de MHz. Radiate an average de For average ra	etector except for d emission limite etector. adiated emission ing with peak of	or the frequency be so in these three be no measurements	oands 9-90 kHz, oands are based above 1000 MHz	asurements empl 110-490 kHz and on measuremen z, there is also a l to 20 dB above	d above 1000 ts employing imit specified			

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.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBμV/m	
216.3	37.8	46.0	8.2	Н

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

1 GHz - 40 GHz, 802.11ax80, HE0, Chain B

Radiated Spurious - CH58

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
1089.2		42.1	54.0	11.9	V
1089.7	49.7		74.0	24.3	V
10580.0	51.3		68.2	16.9	V
10588.5	57.3		68.2	10.9	V
15884.0		40.2	54.0	13.8	V
15885.4	49.5		74.0	24.5	V
21178.3	57.9		74.0	16.1	V
21178.3		49.5	54.0	4.5	V

B.2.6 802.11 a/g/n/ax U-NII-2C

Standard references

FCC part	RSS clause	Limits	Limits				
15.407 (b) (3)	RSS-247 Clause 6.2.3 (2)		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.				
					·	s defined in §15.2 ied in §15.209(a)	` , '
			Freq Range (MHz)	Field Strength (μV/m)	Field Strength (dB _µ V/m)	Meas. Distance (m)	
			30-88	100	40	3	
			88-216	150	43.5	3	
	D00 05N 44		216-960	200	46	3	
15.209	RSS-GEN A1,		Above 960	500	54	3	
	Clause 8.9	employ 110-49 are bas For av- limit sp	ving CISPR quas 10 kHz and above sed on measurer erage radiated e	i-peak detector e 1000 MHz. Radi nents employing mission measure asuring with pea	xcept for the frec ated emission lin an average dete ments above 10 k detector functi	ased on measure quency bands 9-9 nits in these three ector. 000 MHz, there is on, corresponding	90 kHz, bands also a

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.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBμV/m	
216.3	38.1	46.0	7.9	Н

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

1 GHz - 40 GHz, 802.11ax40, HE0, Chain B

Radiated Spurious - CH118

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBμV/m	dB	
9374.4		44.4	54.0	9.6	Н
9374.4	56.1		74.0	17.9	V
11186.3	53.4		74.0	20.6	V
11186.3		47.7	54.0	6.3	V
22359.9	54.2		74.0	19.8	Н
22359.9		52.0	54.0	1.9	Н

B.2.7 802.11 a/g/n/ax U-NII-3

Standard references

FCC part	RSS clause		Limits					
15.407 (b) (4)	RSS-247 Clause 6.2.4.2	limited edge in and fro 15.6 dE	For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be mited 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 5.6 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.					
						s defined in §15. ed in §15.209(a) Meas. Distance (m)		
			30-88	100	40	3		
			88-216	150	43.5	3	1	
	RSS-GEN A1,		216-960	200	46	3		
15.209	Clause 8.9		Above 960	500	54	3		
		employ 110-49 are bas For ave limit sp	The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.				90 kHz, e bands s also a	

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.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBμV/m	dBµV/m	dBµV/m	
216.3	37.5	46.0	8.4	Н

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

1 GHz - 40 GHz, 802.11n20, HE0, Chain B

Radiated Spurious - CH149

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
1540.7	42.2		74.0	31.8	V
1540.7		31.2	54.0	22.8	V
6227.5	55.6		68.2	12.6	Н
11486.2		46.8	54.0	7.2	V
11487.1	55.6		74.0	18.4	V
22308.6		43.5	54.0	10.5	V
22309.1	48.6		74.0	25.4	V
22979.8	49.7		74.0	24.3	Н
22979.8		49.6	54.0	4.4	Н



B.2.8 CDB Mode

Test procedure

The radiated setups shown in section *Error! Reference source not found.* were used to measure the radiated spurious e missions.

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 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emissions were measured on the worst-case configuration selected from the chapter B.1 and using the middle channel for each band.

Radiated spurious - 30 MHz - 1 GHz

Radiated Spurious - All modes

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	
54.8	25.4	40.0	14.6	V
216.3	41.2	46.0	4.8	Н

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

CDB only

Tx Radiated Spurious Emissions 1 GHz – 40 GHz 2.4GHz WLAN, Chain B – 5GHz WLAN, Chain B DTS: 802.11b, 20MHz, 1Mbps – UNII: 802.11a, 20MHz, 6Mbps

Radiated Spurious - DTS: CH7 - UNII 3: CH157

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
4884.0	53.7		74.0	20.3	Н
4884.0		47.7	54.0	6.3	Н
11569.8		50.0	54.0	4.0	V
11573.1	59.1		74.0	14.9	V
23139.7	53.1		74.0	20.9	V
23139.7		50.1	54.0	3.9	V

CDB BT CoRun

Tx Radiated Spurious Emissions 1 GHz – 40 GHz 2.4GHz WLAN, Chain B – 5GHz WLAN, Chain B – BT, Chain A DTS: 802.11b, 20MHz, 1Mbps – UNII: 802.11a, 20MHz, 6Mbps – BT: DH5

Radiated Spurious - DTS: CH7 - UNII 2C: CH120 - BT, CH0

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
2360.0		49.6	54.0	4.4	V
2361.0	58.7		74.0	15.3	V
4884.0	56.3		74.0	17.7	Н
4884.0		48.3	54.0	5.7	Н
11199.0	58.6		74.0	15.4	V
11200.0		49.2	54.0	4.8	V
22400.0		51.9	54.0	2.1	Н
22400.0	52.9		74.0	21.1	V
39692.3	57.2		74.0	16.8	Н
39742.7		45.3	54.0	8.7	V