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

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card**
Brand Name	**Intel® Wi-Fi 6E AX211**
Model Name	**AX211D2W**
Date of Test Start/End	**2020-12-03 / 2021-07-23**
Features	**802.11ax, Dual Band, 2x2 Wi-Fi + Bluetooth® 5.2** (see section 5)

Applicant	**Intel Corporation SAS**
Address	**425 rue de Goa - Le Cargo B6 - 06600, Antibes, FRANCE**
Contact Person	**Laurence Peignot**
Telephone/Fax/ Email	**laurence.peignot@intel.com**

Reference Standards	**ETSI EN 300 440 v2.2.1** (see section 1)

Test Report identification	**201120-03.TR16**
Revision Control	**Rev. 02** **This test report revision replaces any previous test report revision** (see section 8)

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by

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Date: 2023.04.03 11:39:34 +02'00'

Cedric REQUIN
(Test Engineer Lead)

Reviewed by

Digitally signed by Z.OUACHICHA
Date: 2023.04.03 11:45:13 +02'00'

Zayd OUACHICHA
(Technical Manager)

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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 Corporation SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED #1000Y.
- ✓ 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	22.6ºC ± 2.5ºC
Humidity	38.8% ± 11.5%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	201120-03.S03	WiFi 6E Module	AX211D2W	WFM:D8F8834C251B	2020-23-11	Conducted tests
	170000-01.S19	Laptop	Latitude E5450	4TXV562	2020-02-04	
	200611-01.S12	Extender	PCB00651_01	-	2020-11-30	
#02	201120-03.S09	WiFi 6E Module	AX211D2W	WFM:DF8834E4C92	2020-11-23	Used 1GHz-6.4GHz tests, 6.4-18GHz MIMO and 18GHz-40GHz Tx Radiated Spurious Emissions tests
	200102-01.S03	Extender	ADEXELEC	-	2020-01-02	
	200611-01.S06	Adaptor	PowerBy SNJ A4	-	2020-11-30	
	200602-03.S06	Absorber	MCS0	-	2020-07-03	
	180000-01.S05	Socket	Adapter 1216SD to M.2	-	2017-08-09	
	170801-01.S10	Laptop	Latitude E7470	7KNOXF2	2017-09-08	
	200611-03.S28	Main Antenna	SkyCross	-	2020-07-01	
	200611-03.S29	Aux Antenna	SkyCross	-	2020-07-01	
#03	201120-03.S08	WiFi 6E Module	AX211D2W	WFM:D8F8834E56AB	2020-11-23	Used for 25MHz-1GHz Radiated Spurious Emission tests, and 6.4GHz-18GHz SISO Tx Radiated Spurious Emissions tests
	200611-03.S26	Extender	ADEXELEC	-	2020-07-01	
	200611-01.S07	Adaptor	PowerBy SNJ A4	-	2020-11-30	
	200602-03.S06	Absorber	MCS0	-	2020-07-03	
	180000-01.S02	Socket	Adapter 1216SD to M.2	-	2017-08-09	
	170000-01.S01	Laptop	Latitude E5470	DBPLMC2	2017-03-28	
	200928-03.S08	Main Antenna	SkyCross	-	2020-09-01	
	200928-03.S09	Aux Antenna	SkyCross	-	2020-09-01	
#04	201120-03.S02	WiFi 6E Module	AX211D2W	WFM:D8F8834C2462	2020-11-23	Used for 1GHz-40GHz Rx Radiated Spurious Emission tests
	200611-01.S06	Adaptor	PowerBy SNJ A4	-	2020-11-30	
	200602-03.S06	Absorber	MCS0	-	2020-07-03	
	200615-05.S06	Host	Latitude 7490	63QMRQ2	2020-06-12	

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 colspan="3">Intel® Wi-Fi 6E AX211</td></tr>
<tr><td>Model Name</td><td colspan="3">AX211D2W</td></tr>
<tr><td>Software Version</td><td colspan="3">DRTU version: 11195_99_2100_51G</td></tr>
<tr><td>Driver Version</td><td colspan="3">V99.0.58.3_t64</td></tr>
<tr><td>Prototype / Production</td><td colspan="3">Production</td></tr>
<tr><td>Supported Radios</td><td colspan="3">802.11b/g/n/ax 2.4GHz (2400.0 – 2483.5 MHz)
802.11a/n/ac/ax 5.2GHz (5150.0 – 5350.0 MHz)
5.6GHz (5470.0 – 5725.0 MHz)
5.8GHz (5725.0 – 5875.0 MHz)
Bluetooth 5.2 2.4GHz (2400.0 – 2483.5 MHz)</td></tr>
<tr><td>Antenna Information</td><td colspan="3"><table>
<tr><td>Transmitter</td><td>Main (chain A)</td><td>Aux (chain B)</td></tr>
<tr><td>Manufacturer</td><td>SkyCross</td><td>Skycross</td></tr>
<tr><td>Antenna type</td><td>PIFA antenna</td><td>PIFA antenna</td></tr>
<tr><td>Part number</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Declared antenna gain (dBi)</td><td>+5</td><td>+5</td></tr>
</table></td></tr>
</table>

6. Remarks and comments

1. As per applicant request, the device is declared as a receiver category 1, the adjacent channel selectivity and Blocking or desensitization test cases have been updated accordingly.
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: +8dB vs nominal declared power.

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

7.1. 802.11 a/n/ac/ax

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 radiation	P
4.4.2	Spectrum access technique : 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	G.Roustan	First Issue
Rev.01	Z.Ouachicha	According to the applicant declaration, the device is considered as a receiver category 1 so the adjacent channel selectivity test case has been added.
Rev.02	Z.Ouachicha	Editorial typo: Report ID updated in the front page

Annex A. Test & System Description

A.1 Measurement System

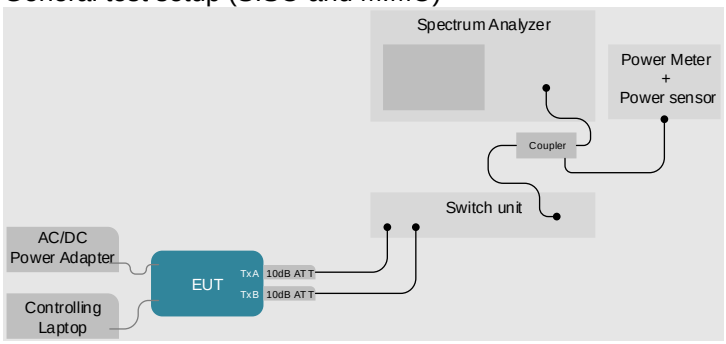
Measurements were performed using the following setups, made in accordance to the general provisions of .

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.

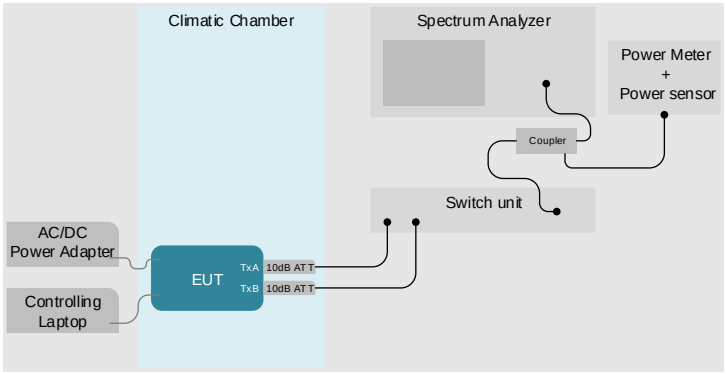
Setups for conducted and radiated measurements are shown below.

Conducted test setup

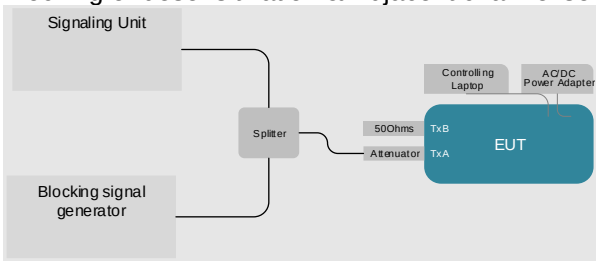
General test setup (SISO and MIMO)



Extreme conditions

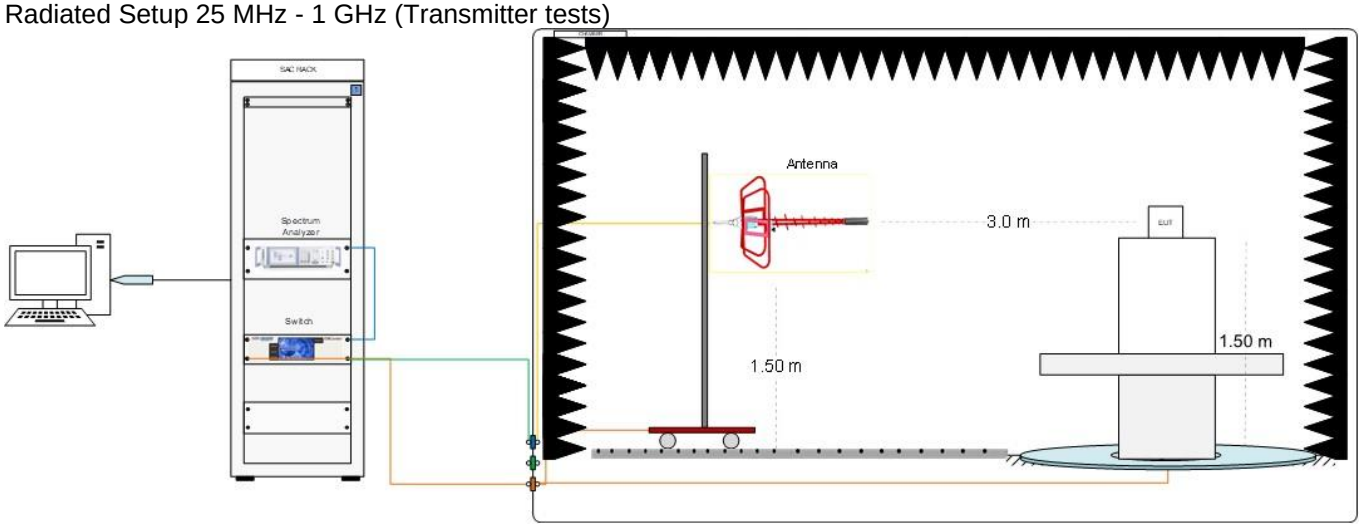


Blocking or desensitization & Adjacent channel selectivity

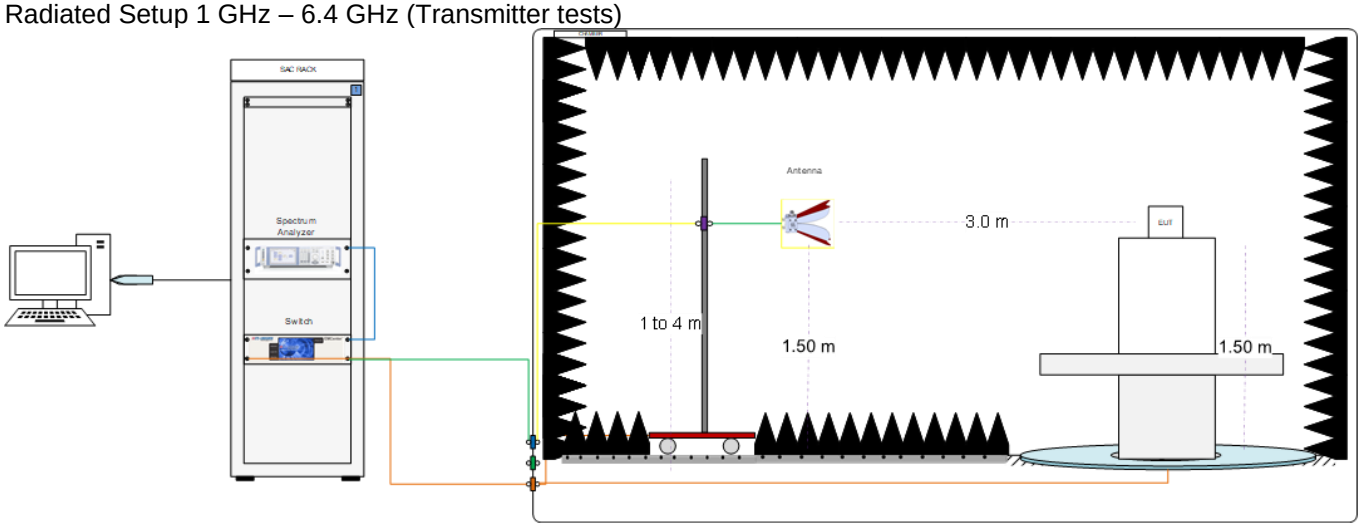


Radiated test setup

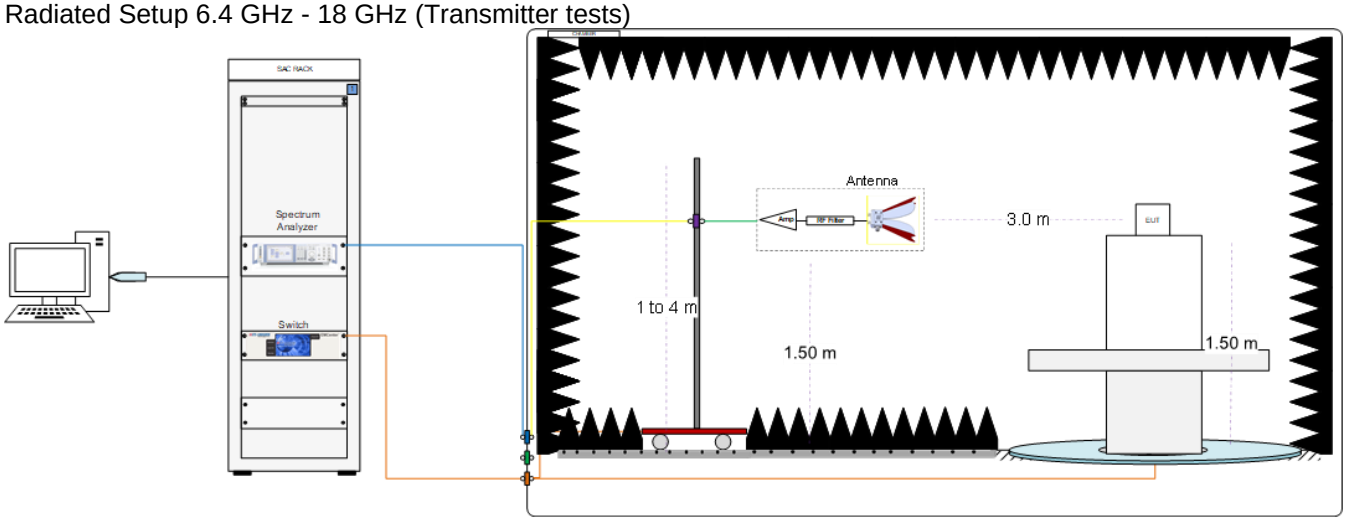
Radiated Setup 25 MHz - 1 GHz (Transmitter tests)



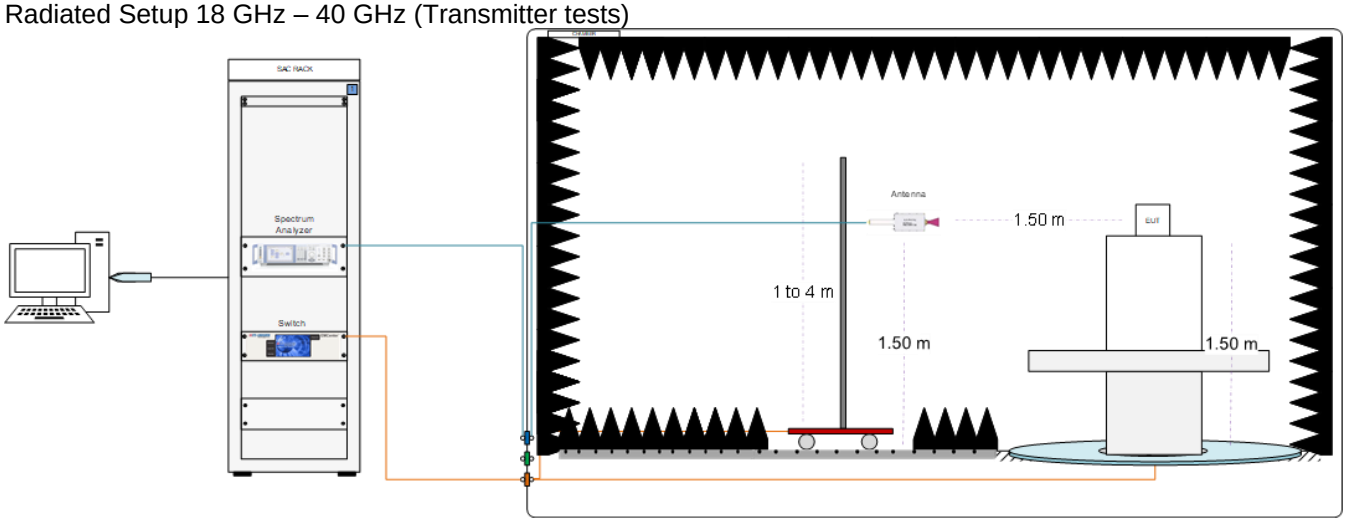
Radiated Setup 1 GHz – 6.4 GHz (Transmitter tests)



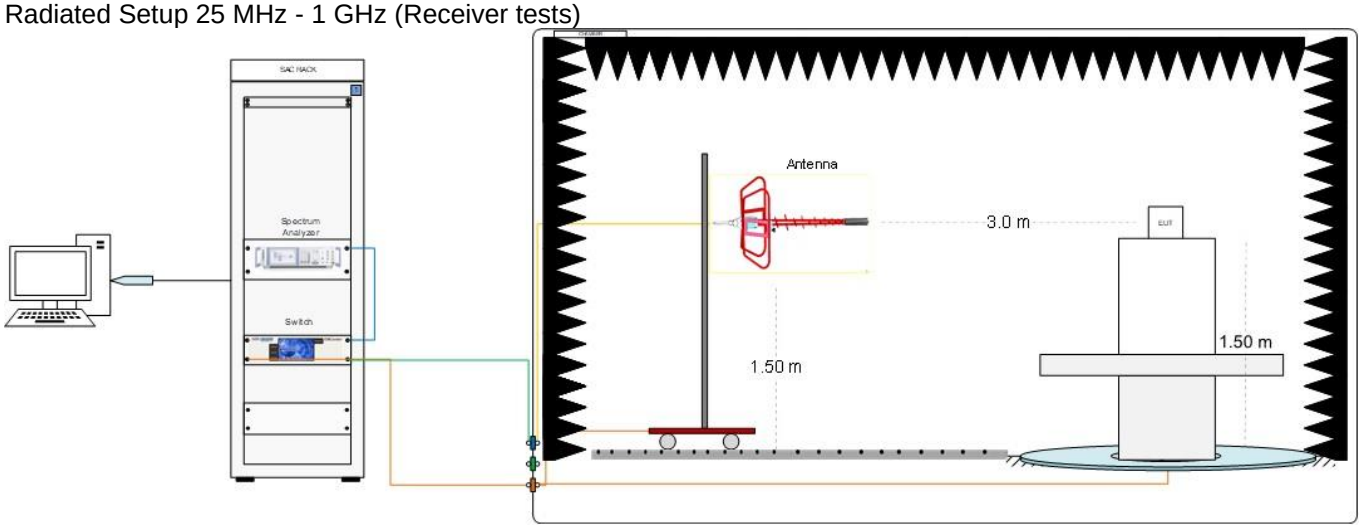
Radiated Setup 6.4 GHz - 18 GHz (Transmitter tests)



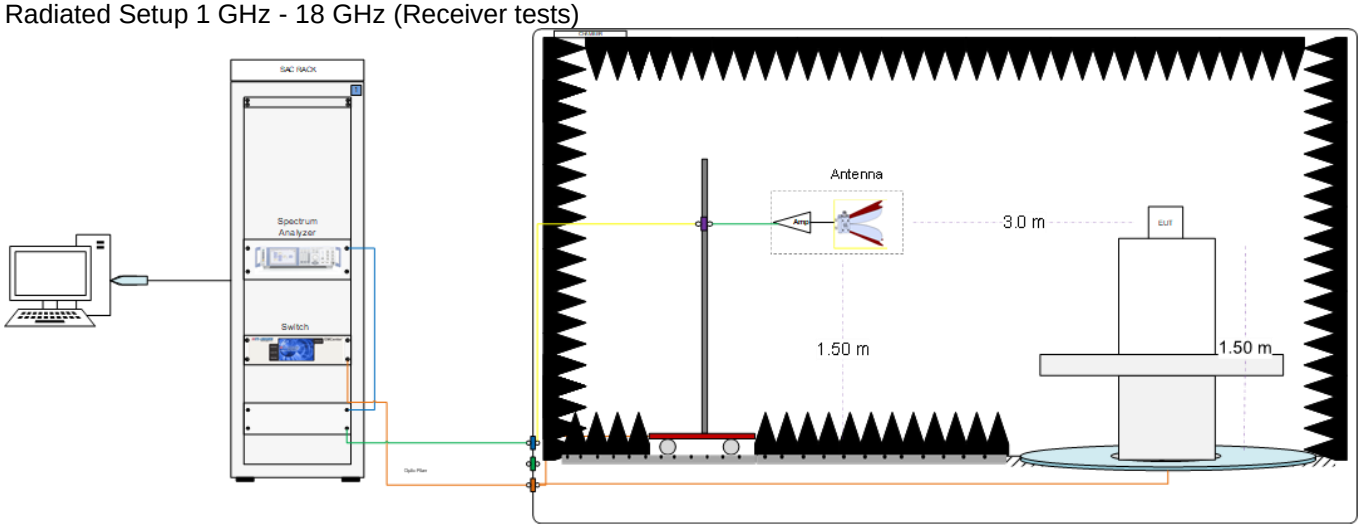
Radiated Setup 18 GHz – 40 GHz (Transmitter tests)



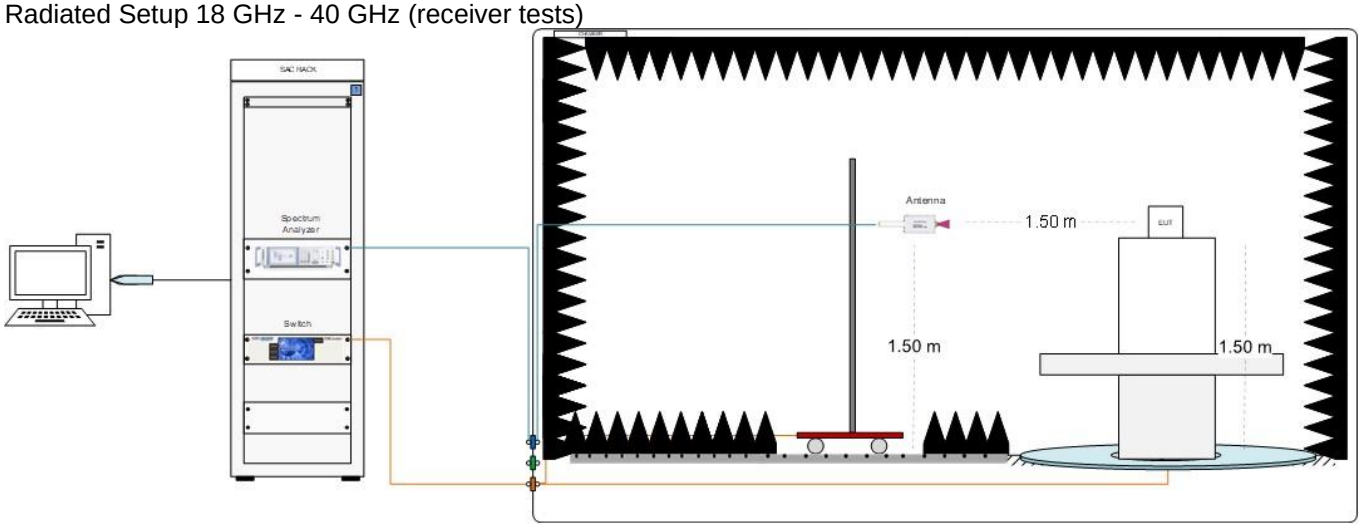
Radiated Setup 25 MHz - 1 GHz (Receiver tests)



Radiated Setup 1 GHz - 18 GHz (Receiver tests)



Radiated Setup 18 GHz - 40 GHz (receiver tests)



A.2 Test Equipment List

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0056	Switch unit	OSP 120	100945	Rohde & Schwarz	2020-04-21	2022-04-21
0293	DC Power supply	E3640A	MY40006885	Agilent	N/A	N/A
0299	Multimeter	34401A	US36065790	HP	2019-12-11	2021-12-11
0300	Climatic chamber	SLT34/40	56746020930010	Secasi	2019-11-20	2021-11-20
0312	Oscilloscope	RTE1052	101135		2020-04-06	2022-04-06
0318	Spectrum analyzer	FSV30	103310	Rohde & Schwarz	2020-06-03	2022-06-03
0390	Power sensor	NRP-Z57	101486	Rohde & Schwarz	2020-03-17	2022-03-17
0581	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-B89BE3	Avtech	2020-01-23	2022-01-23
0843	Pass band filter	PE8702	-	Pasternack	N/A	N/A
0844	RF detector	PE8016	-	Pasternack	N/A	N/A
0846	10dB directional coupler	MC2047-10	01-062	Fairview	N/A	N/A
0847	RF Cable 0.5m	PE3CA1039	-	Pasternack	2020-08-26	2021-02-26
0869	Cable SMA Male to ML51-P	HRMP-ML51LP	DTR178-100RS	Hirose	2020-08-26	2021-02-26
0870	Cable SMA Male to ML51-P	HRMP-ML51LP	DTR178-100RS	Hirose	2020-08-26	2021-02-26
0876	Thermometer	t3000FC	-	Fluke	2019-11-29	2021-11-29
0991	RF Cable 2m + 10dB ATT	0900670672000PJ	1936949	Radiall	2020-08-26	2021-02-26
0992	RF Cable 2m + 10dB ATT	0900670672000PJ	1936947	Radiall	2020-08-26	2021-02-26

Receiver blocking Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0100	Communication tester	CMW500	129337	Rohde & Schwarz	2019-04-02	2021-04-02
0309	Signal generator	SMB100A	178217	Rohde & Schwarz	2020-04-17	2022-04-17
0378	RF Cable 1.2m	UFA147A-0-0480-200200	MFR 64639 223720-001	Micro-coax	2020-08-26	2021-02-26
0796	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D4F316	Avtech	2019-07-05	2021-07-05
0866	RF Cable 0.5m	FMC0202085-18	-	Fairview	2020-08-26	2021-02-26
0873	RF splitter	PE2083	-	Pasternack	N/A	N/A
0874	RF Cable 0.9m	PE3CA 1039-36	-	Pasternack	2020-08-26	2021-02-26

N/A: Not Applicable

Adjacent channel selectivity setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
125-000	Communication tester	CMW500	129337	Rohde & Schwarz	2021-04-12	2023-04-12
098-000	Vector Signal generator	SMW200A	103732	Rohde & Schwarz	2020-07-19	2022-07-19
408-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-E21FC8	AVTECH	2021-06-02	2023-06-02
018-000	2 Way SMA Power Divider	PE2084	-	Pasternack	2021-02-26	2021-08-26
018-005	Cable SMA Male to SMA Male 45CM	FMC0202085-18	-	Fairview Microwave	2021-02-26	2021-08-26
018-006	Cable SMA Male to SMA Male 45CM	FMC0202085-18	-	Fairview Microwave	2021-02-26	2021-08-26
016-003	Cable SMA Male to SMA Male 45CM	FMC0202085-18	-	Fairview Microwave	2021-02-26	2021-08-26

N/A: Not Applicable

Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0135	Anechoic Chamber	FACT3	5720	ETS-Lindgren	2020-01-07	2022-01-07
0136	Turn Table	ETS	-	ETS-Lindgren	N/A	N/A
0137	Biconilog Antenna	3142E	00156946	ETS-Lindgren	2020-03-12	2022-03-12
0147	Switch & Positioning systems	EMC Center	00159757	ETS-Lindgren	N/A	N/A
0530	Measurement SW	EMC32 , v10.40.10	100623	Rohde & Schwarz	N/A	N/A
1033	Boresight antenna mast	BAM 4.0-P	P/278/2890.01	Maturo	N/A	N/A
1076	Spectrum Analyzer	FSW43	101847	Rohde & Schwarz	2020-11-02	2022-11-02
0325	Horn antenna	3117	00157734	ETS-Lindgren	2019-08-12	2021-08-12
0141	Horn Antenna + Amplifier + HPF6.4	3117	00157736	ETS-Lindgren	2020-04-02	2022-04-02
0343	Double-Ridged Horn Antenna with Pre-Amplifier	3117-PA	00201542+00169546	ETS-Lindgren	2019-08-16	2021-08-16
0334	Double-Ridged Waveguide Horn with Pre-Amplifier 18 GHz to 40 GHz	3116C+PA	00169308bis + 00196308	ETS-Lindgren	2019-07-24	2021-07-24
0138	Double Ridge Horn (1-18GHz)	3117	00152266	ETS Lindgren	2020-03-08	2022-03-08
1098	Cable 1.5m - DC-18GHz	CBL-1.5M-SMSM+	202879	Mini-Circuits	2020-11-27	2021-05-27
0206	Cable 1.2m – 18 to 40 GHz	UFA147A-0-0480-200200	MFR 64639223720-003	Micro-coax	2020-08-25	2021-02-25
0263	Cable 1m - 1GHz to 18GHz	UFA147A	-	Utilflex	2020-08-25	2021-02-25
0369	Cable 2m - 26.5GHz to 40GHz	794-9191-2000A	E00327	Atem	2020-08-25	2021-02-25
0371	Cable 1m – 30 MHz - 18GHz	UFB311A-0-0590-50U50U	MFR 64639 223230-001	Micro-coax	2020-08-25	2021-02-25
1099	Cable 7m DC-18 GHz	0501051057000GX	19.35.850	Radial	2020-11-27	2021-05-27
0809	Cable 7m - 18GHz to 40GHz	R286304009	-	Radiall	2020-08-25	2021-02-25
0859	Cable 2.5m - 30MHz to 18GHz	0500990992500KE	19.23.395	Radiall	2020-08-25	2021-02-25
0797	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D0EB1A	Avtech	2019-07-04	2021-07-04
0143	Biconical 30MHz- 3GHz	3180B	00165215	ETS-Lindgren	2020-04-15	2022-04-15
0207	RF Cable 1.85m 30MHz-40GHz	UFA147A-0-0720-200200	MFR 64639223722-001	Micro-coax	2020-08-25	2021-02-25
0029	RF Cable 1.2m40MHz-40GHz	794-9191-1200A	-	Atem	2020-08-20	2021-02-20
0209	RF Cable 2.5m 30MHz-40GHz	UFA147A-0-1380-50U200	MFR 64639223219-001	Micro-coax	2020-08-25	2021-02-25
0309	Signal Generator	SMB100A	178217	Rohde & Schwarz	2020-04-17	2022-04-17
0024	Double Ridged Horn (10-40 GHz)	2000	4009301	KEITHLEY	2020-03-19	2022-03-19
0095	Multimeter	34401A	US36054685	Agilent	2020-01-15	2022-01-15

N/A: Not Applicable

Radiated Setup #2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0337	Anechoic chamber	RFD-FA-100	5996	ETS Lindgren	2020-07-06	2022-07-06
0238	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
0382	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
0383	Turntable	-	-	ETS Lindgren	N/A	N/A
0329	Measurement SW	EMC32, v10.50.10	100401	Rohde & Schwarz	N/A	N/A
0133	Spectrum Analyzer	FSV40	101358	Rohde & Schwarz	2020-02-25	2022-02-25
0138	Double Ridge Horn (1- 18GHz)	3117	00152266	ETS Lindgren	2020-03-08	2022-03-08
0141	Horn Antenna + Amplifier + HPF6.4	3117	00157736	ETS-Lindgren	2020-04-02	2022-04-02
0343	Double-Ridged Horn Antenna with Pre-Amplifier	3117-PA	00201542	ETS-Lindgren	2019-08-16	2021-08-16
0334	Double-Ridged Horn Antenna	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2019-07-24	2021-07-24
0871	RF Cable 1-18GHz, 1.5 m	0501050991200GX	19.21.710	Radiall	2020-08-20	2021-02-20
0860	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2020-08-20	2021-02-20
0275	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Spectrum	2020-08-20	2021-02-20
0684	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2020-08-20	2021-02-20
0679	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2020-08-20	2021-02-20
0028	K-K 1.2m Cable	794-9191-1200A	DA585	Atem	2020-08-20	2021-02-20
0725	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2020-08-20	2021-02-20
0796	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D4F316	Avtech	2019-07-05	2021-07-05
0309	Signal Generator	SMB100A	178217	Rohde & Schwarz	2020-04-17	2022-04-17
0024	Double Ridged Horn (10-40 GHz)	2000	4009301	KEITHLEY	2020-03-19	2022-03-19
0095	Multimeter	34401A	US36054685	Agilent	2020-01-15	2022-01-15
0325	Horn antenna 3117	3117	00157734	ETS-Lindgren	2019-08-12	2021-08-12
0207	K-K 1.85m Cable	UFA147A-0-0720-200200	MFR 64639223722-001	Micro-coax	2020-08-20	2021-02-20
0857	K-K Cable	2301761762000PJ	19.23.596	Radiall	2020-08-20	2021-02-20

N/A: Not Applicable

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0616	Power Sensor	NRP-Z81	104385	Rohde & Schwarz	2020-04-08	2022-04-08
0617	Power Sensor	NRP-Z81	104386	Rohde & Schwarz	2020-04-08	2022-04-08
0618	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
Frequency Stability	±6.18	ppm
RF Output Power, (conducted)	±1.00	dB
Radiated emission of transmitter < 1GHz	±4.03	dB
Radiated emission of transmitter 1GHz - 40 GHz	±4.68	dB
Radiated emission of transmitter 26.5GHz - 40 GHz	±5.09	dB
Radiated emission of receiver < 1GHz	±4.03	dB
Radiated emission of receiver 1GHz – 26.5 GHz	±4.68	dB
Radiated emission of receiver 26.5GHz - 40 GHz	±5.09	dB
Temperature	±0.30	ºC
Humidity	±1.60	%
Voltage (DC)	<±0.01	%
Voltage (AC)	±0.09	%

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.)	G. Roustan
Transmitter: Permitted range of operating frequencies	G. Roustan
Transmitter: Unwanted Emissions in the spurious domain (radiated)	N. Nachabe, N. Bui, A. Lounes
Adjacent channel selectivity	Z.Ouachicha
Blocking or desensitization	Z. Ouachicha
Receiver: Spurious emissions (radiated)	N. Nachabe, N. Bui, A. Lounes

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, 802.11ax20 (20 MHz channel bandwidth), 802.11n40, 802.11ax40 (40MHz channel bandwidth), 802.11ac80, 802.11ax80 (80MHz channel bandwidth) modes the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, and also simultaneously.

The conducted RF output power at each chain was adjusted according to the client's supplied target values (see following table) using the Intel DRTU tool and measuring the power by using a calibrated average power meter. Measured values for adjustment were within ±0.25 dB from the declared Target values.

5.8GHz					Conducted Power, Target Value (dBm)		
Mode	BW (MHz)	Data Rate	CH #	Freq. (MHz)	SISO Chain A	SISO Chain B	MIMO A + B
802.11a	20	6Mbps	149	5745	8.5	8.5	-
			161	5805	8.5	8.5	-
			173	5865	3.5	3.5	-
802.11n	20	HT0 HT8*	149	5745	8.5	8.5	8.5
			161	5805	8.5	8.5	8.5
			173	5865	3.5	3.5	3.5
	40	HT0 HT8*	151	5755	8.5	8.5	8.5
			167	5835	8.5	8.5	8.5
802.11ac	80	VHT0	155	5775	8.5	8.5	8.5
802.11ax	20	HE0	149	5745	8.5	8.5	8.5
			161	5805	8.5	8.5	8.5
			173	5865	3.5	3.5	3.5
	40		151	5755	8.5	8.5	8.5
			167	5835	8.5	8.5	8.5
	80		155	5775	8.5	8.5	8.5

* Note: HT8 for MIMO modes only.

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	20	HE0
		40	HE0
		80	HE0
MIMO	802.11n	20/40	HT8
	802.11ac	80	VHT0
	802.11ax	20/40/80	HE0

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 +70º C		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	97.8	6Mbps	149	5745	SISO A	8.5	13.5	8.6	13.6	8.6	13.6
					SISO B	8.3	13.3	8.5	13.5	8.4	13.4
			161	5805	SISO A	8.5	13.5	8.7	13.7	8.7	13.7
					SISO B	8.5	13.5	8.7	13.7	8.6	13.6
			173	5865	SISO A	3.6	8.6	2.0	7.0	2.4	7.4
					SISO B	3.7	8.7	3.7	8.7	2.8	7.8
802.11n	98.8	HT0	149	5745	SISO A	8.4	13.4	8.7	13.7	8.7	13.7
					SISO B	8.6	13.6	8.2	13.2	8.3	13.3

20			161	5805	SISO A	8.5	13.5	8.5	13.5	8.8	13.8
					SISO B	8.6	13.6	8.6	13.6	8.6	13.6
			173	5865	SISO A	3.8	8.8	3.0	8.0	3.7	8.7
					SISO B	3.6	8.6	3.0	8.0	4.0	9.0
	97.9	HT8	149	5745	MIMO A+B	8.6	13.6	8.4	13.4	8.2	13.2
			161	5805	MIMO A+B	8.6	13.6	8.5	13.5	8.4	13.4
			173	5865	MIMO A+B	3.4	8.4	3.4	8.4	3.9	8.9
802.11n40	98.8	HT0	151	5755	SISO A	8.5	13.5	8.9	13.9	8.9	13.9
					SISO B	8.6	13.6	8.8	13.8	8.7	13.7
			167	5835	SISO A	8.6	13.6	8.6	13.6	8.7	13.7
					SISO B	8.6	13.6	8.7	13.7	8.8	13.8
	98.8	HT8	151	5755	MIMO A+B	8.5	13.5	8.5	13.5	8.6	13.6
			167	5835	MIMO A+B	8.5	13.5	9.0	14.0	8.4	13.4
802.11ac80	98.8	VHT0	155	5775	SISO A	8.5	13.5	8.6	13.6	8.9	13.9
					SISO B	8.6	13.6	8.9	13.9	8.9	13.9
	98.8				MIMO A+B	8.3	13.3	8.5	13.5	8.8	13.8
802.11ax20	98.8	HE0	149	5745	SISO A	8.5	13.5	8.5	13.5	8.5	13.5
					SISO B	8.6	13.6	8.0	13.0	7.8	12.8
			161	5805	SISO A	8.6	13.6	8.4	13.4	8.0	13.0
					SISO B	8.4	13.4	8.4	13.4	8.4	13.4

			173	5865	SISO A	3.7	8.7	2.8	7.8	3.9	8.9
					SISO B	3.4	8.4	3.6	8.6	1.9	6.9
	97.5		149	5745	MIMO A+B	8.5	13.5	8.8	13.8	8.4	13.4
			161	5805	MIMO A+B	8.5	13.5	8.5	13.5	8.9	13.9
			173	5865	MIMO A+B	3.5	8.5	3.5	8.5	4.0	9.0
802.11ax40	98.8	HE0	151	5755	SISO A	8.5	13.5	8.9	13.9	8.8	13.8
					SISO B	8.6	13.6	8.8	13.8	8.6	13.6
			167	5835	SISO A	8.4	13.4	8.3	13.3	8.0	13.0
					SISO B	8.5	13.5	8.5	13.5	8.0	13.0
	98.8		151	5755	MIMO A+B	8.3	13.3	8.3	13.3	8.1	13.1
			167	5835	MIMO A+B	8.4	13.4	8.9	13.9	8.9	13.9
802.11ax80	98.8	HE0	155	5775	SISO A	8.6	13.6	8.5	13.5	8.4	13.4
					SISO B	8.6	13.6	8.5	13.5	8.2	13.2
	97.8				MIMO A+B	8.4	13.4	8.9	13.9	8.4	13.4

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	97.3	6Mbps	149	5745	SISO A	8.3	13.3	8.6	13.6
					SISO B	8.3	13.3	8.1	13.1
			161	5805	SISO A	8.4	13.4	8.0	13.0
					SISO B	8.5	13.5	8.7	13.7
			173	5865	SISO A	2.2	7.2	2.5	7.5
					SISO B	2.6	7.6	2.6	7.6
802.11n20	98.3	HT0	149	5745	SISO A	7.8	12.8	8.6	13.6
					SISO B	8.7	13.7	8.2	13.2
			161	5805	SISO A	8.3	13.3	7.9	12.9
					SISO B	8.6	13.6	8.7	13.7
			173	5865	SISO A	4.3	9.3	3.3	8.3
					SISO B	3.7	8.7	3.5	8.5
	98.3	HT8	149	5745	MIMO A+B	8.2	13.2	8.9	13.9
			161	5805	MIMO A+B	8.6	13.6	8.2	13.2
			173	5865	MIMO A+B	3.8	8.8	3.6	8.6
802.11n40	98.8	HT0	151	5755	SISO A	8.6	13.6	8.9	13.9
					SISO B	8.5	13.5	8.6	13.6
			167	5835	SISO A	8.6	13.6	8.8	13.8
					SISO B	8.4	13.4	8.4	13.4
	98.8	HT8	151	5755	MIMO A+B	8.3	13.3	8.9	13.9
			167	5835	MIMO A+B	8.5	13.5	8.8	13.8
802.11ac80	98.8	VHT0	155	5775	SISO A	8.7	13.7	8.7	13.7
					SISO B	8.7	13.7	8.9	13.9
					MIMO A+B	8.6	13.6	8.6	13.6
802.11ax20	98.8	HE0	149	5745	SISO A	8.3	13.3	8.0	13.0
					SISO B	8.7	13.7	8.2	13.2
			161	5805	SISO A	8.1	13.1	8.5	13.5
					SISO B	8.6	13.6	8.1	13.1
			173	5865	SISO A	2.6	7.6	3.7	8.7
					SISO B	3.7	8.7	3.8	8.8
	98.8		149	5745	MIMO A+B	7.9	12.9	8.4	13.4
			161	5805	MIMO A+B	8.9	13.9	8.7	13.7
			173	5865	MIMO A+B	3.5	8.5	3.4	8.4
802.11ax40	98.8	HE0	151	5755	SISO A	8.6	13.6	8.3	13.3
					SISO B	8.9	13.9	8.9	13.9
			167	5835	SISO A	8.7	13.6	8.6	13.6
					SISO B	8.4	13.4	8.5	13.5
	98.8		151	5755	MIMO A+B	8.5	13.5	8.5	13.5
			167	5835	MIMO A+B	8.4	13.4	8.2	13.2
802.11ax80	98.8	HE0	155	5775	SISO A	8.1	13.1	7.7	12.7
					SISO B	8.5	13.5	8.1	13.1
	97.8				MIMO A+B	8.4	13.4	8.9	13.9

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)	f_L [MHz]	f_H [MHz]	$f_H - f_L$ [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	5731.81	NA	NA	5731.9	NA	NA	5731.84	NA	NA
				173	5865	NA	5874.44	142.63	NA	5874.63	142.73	NA	5874.4	142.56
	802.11n20	HT0	SISO	149	5745	5731.49	NA	NA	5731.89	NA	NA	5731.6	NA	NA
				173	5865	NA	5874.66	143.17	NA	5874.82	142.93	NA	5874.79	143.19
		HT8	MIMO	149	5745	5732.47	NA	NA	5732.27	NA	NA	5732.1	NA	NA
				173	5865	NA	5874.66	142.19	NA	5874.82	142.55	NA	5874.79	142.69
	802.11n40	HT0	SISO	151	5755	5732.46	NA	NA	5732.82	NA	NA	5732.11	NA	NA
				167	5835	NA	5857.54	125.08	NA	5857.79	124.97	NA	5858.71	126.6
		HT8	MIMO	151	5755	5734.06	NA	NA	5733.8	NA	NA	5732.44	NA	NA
				167	5835	NA	5856.27	122.21	NA	5857.58	123.78	NA	5856.23	123.79
	802.11ac80	VHT0	SISO	155	5775	5731.86	5818	86.14	5732.54	5818.43	85.89	5733.74	5874.4	140.66
			MIMO		5775	5731.86	5818	86.14	5732.54	5815.4	82.86	5732.48	5874.64	142.16
	802.11ax20	HE0	SISO	149	5745	5731.63	NA	NA	5731.67	NA	NA	5731.5	NA	NA
				173	5865	NA	5874.77	143.14	NA	5874.82	143.15	NA	5874.73	143.23
			MIMO	149	5745	5732.12	NA	NA	5732.38	NA	NA	5732.27	NA	NA
				173	5865	NA	5874.64	142.52	NA	5874.63	142.25	NA	5874.69	142.42
	802.11ax40	HE0	SISO	151	5755	5732.01	NA	NA	5732.46	NA	NA	5732.39	NA	NA
				167	5835	NA	5858.78	126.77	NA	5858.83	126.37	NA	5858.78	126.39
			MIMO	151	5755	5733.47	NA	NA	5733.77	NA	NA	5733.59	NA	NA
				167	5835	NA	5856.57	123.1	NA	5856.75	122.98	NA	5856.6	123.01
	802.11ax80	HE0	SISO	155	5775	5734.21	5817	82.79	5732.46	5817.08	84.62	5734.21	5818.26	84.05
			MIMO		5775	5734.21	5815	80.79	5734.77	5816.19	81.42	5734.21	5815.47	81.26
B	802.11a	6Mbps	SISO	149	5745	5731.85	NA	NA	5731.87	NA	NA	5731.87	NA	NA
				173	5865	NA	5874.38	142.53	NA	5874.79	142.89	NA	5874.38	142.78
	802.11n20	HT0	SISO	149	5745	5731.83	NA	NA	5731.9	NA	NA	5731.23	NA	NA
				173	5865	NA	5874.64	142.81	NA	5874.79	142.89	NA	5874.98	143.75
		HT8	MIMO	149	5745	5732.46	NA	NA	5732.52	NA	NA	5732.11	NA	NA
				173	5865	NA	5874.38	141.92	NA	5874.4	141.88	NA	5874.63	142.52
	802.11n40	HT0	SISO	151	5755	5732.16	NA	NA	5732.53	NA	NA	5732.45	NA	NA
				167	5835	NA	5857.54	125.38	NA	5857.59	125.06	NA	5857.56	125.11
		HT8	MIMO	151	5755	5734.02	NA	NA	5733.8	NA	NA	5734.08	NA	NA
				167	5835	NA	5856.58	122.56	NA	5856.31	122.51	NA	5856.25	122.17
	802.11ac80	VHT0	SISO	155	5775	5732.49	5817.75	85.26	5732.54	5817.56	85.02	5731.24	5818.09	86.85
			MIMO		5775	5734.98	5815.61	80.63	5734.43	5816.96	82.53	5734.65	5815.37	80.72
	802.11ax20	HE0	SISO	149	5745	5731.25	NA	NA	5731.67	NA	NA	5731.53	NA	NA
				173	5865	NA	5874.81	143.56	NA	5874.88	143.21	NA	5874.78	143.25
			MIMO	149	5745	5732.25	NA	NA	5731.85	NA	NA	5732.05	NA	NA
				173	5865	NA	5874.7	142.45	NA	5874.67	142.82	NA	5874.79	142.74
	802.11ax40	HE0	SISO	151	5755	5732.04	NA	NA	5732.59	NA	NA	5732.42	NA	NA
				167	5835	NA	5858.78	126.73	NA	5858.83	125.52	NA	5858.78	126.77
			MIMO	151	5755	5733.33	NA	NA	5732.2	NA	NA	5733.51	NA	NA
				167	5835	NA	5856.47	123.14	NA	5856.82	124.62	NA	5856.94	123.43
	802.11ax80	HE0	SISO	155	5775	5732.4	5817.5	85.1	5732.84	5817.12	84.28	5734.5	5815.25	80.75
			MIMO		5775	5734.36	5815.76	81.4	5734.08	5815.79	81.71	5732.56	5817.09	84.53

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	5731.82	NA	NA	5731.87	NA	NA
				173	5865	NA	5874.43	142.61	NA	5874.76	142.89
	802.11n20	HT0	SISO	149	5745	5731.85	NA	NA	5731.62	NA	NA
				173	5865	NA	5874.75	142.9	NA	5874.77	143.15
		HT8	MIMO	149	5745	5732.48	NA	NA	5731.87	NA	NA
				173	5865	NA	5874.75	142.27	NA	5874.33	142.46
	802.11n40	HT0	SISO	151	5755	5732.50	NA	NA	5732.45	NA	NA
				167	5835	NA	5857.55	125.05	NA	5857.55	125.1
		HT8	MIMO	151	5755	5733.99	NA	NA	5733.75	NA	NA
				167	5835	NA	5855.97	121.96	NA	5856.57	122.56
	802.11ac80	VHT0	SISO	155	5775	5732.49	5817.73	85.24	5732.49	5817.5	85.01
			MIMO		5775	5732.49	5816.25	83.76	5734.35	5815.87	81.52
	802.11ax20	HE0	SISO	149	5745	5731.64	NA	NA	5731.69	NA	NA
				173	5865	NA	5874.72	143.08	NA	5874.77	143.08
			MIMO	149	5745	5732.41	NA	NA	5732.12	NA	NA
				173	5865	NA	5874.64	142.23	NA	5874.64	142.52
	802.11ax40	HE0	SISO	151	5755	5732.56	NA	NA	5732.09	NA	NA
				167	5835	NA	5858.78	126.22	NA	5858.77	126.68
			MIMO	151	5755	5732.89	NA	NA	5733.33	NA	NA
				167	5835	NA	5856.56	123.67	NA	5856.95	123.62
	802.11ax80	HE0	SISO	155	5775	5732.35	5818.12	85.77	5732.35	5817.36	85.01
			MIMO		5775	5734.22	5815.94	81.72	5734.73	5815.25	80.52
B	802.11a	6Mbps	SISO	149	5745	5731.85	NA	NA	5731.85	NA	NA
				173	5865	NA	5874.43	142.58	NA	5874.64	142.79
	802.11n20	HT0	SISO	149	5745	5731.85	NA	NA	5731.85	NA	NA
				173	5865	NA	5874.73	142.88	NA	5875	143.15
		HT8	MIMO	149	5745	5732.10	NA	NA	5732.47	NA	NA
				173	5865	NA	5874.37	142.27	NA	5874.37	141.9
	802.11n40	HT0	SISO	151	5755	5732.44	NA	NA	5732.47	NA	NA
				167	5835	NA	5857.55	125.11	NA	5857.55	125.08
		HT8	MIMO	151	5755	5733.75	NA	NA	5733.99	NA	NA
				167	5835	NA	5856.56	122.81	NA	5856.25	122.26
	802.11ac80	VHT0	SISO	155	5775	5732.49	5818.12	85.63	5732.49	5817.5	85.01
			MIMO		5775	5734.10	5815.62	81.52	5734.74	5817.49	82.75
	802.11ax20	HE0	SISO	149	5745	5731.64	NA	NA	5731.64	NA	NA
				173	5865	NA	5874.72	143.08	NA	5874.78	143.14
			MIMO	149	5745	5731.64	NA	NA	5732.15	NA	NA
				173	5865	NA	5874.72	143.08	NA	5874.64	142.49
	802.11ax40	HE0	SISO	151	5755	5732.52	NA	NA	5732.23	NA	NA
				167	5835	NA	5858.77	126.25	NA	5858.78	126.55
			MIMO	151	5755	5732.52	NA	NA	5733.33	NA	NA
				167	5835	NA	5858.77	126.25	NA	5856.42	123.09
	802.11ax80	HE0	SISO	155	5775	5732.35	5858.77	126.42	5732.90	5817.58	84.68
			MIMO		5775	5733.75	5857.28	123.53	5734.03	5815.33	81.3

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

Tx Spurious Emissions – 25MHz to 1GHz

Tx Spurious Emissions – All modes

Frequency	Quasi-Peak	Limit (e.i.r.p)	Margin	Polarization
MHz	dBm	dBm	dB	---
71.9	-60.1	-51.9	8.2	V

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

Tx Spurious Emissions – 30MHz to 40GHz

802.11a

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3371.5	-48.9	-27.9	21.0	H
11568.3	-53.8	-27.9	25.9	H
39704.9	-49.5	-27.9	21.6	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3393.0	-49.6	-27.9	21.7	H
11570.7	-57.2	-27.9	29.3	V
39661.1	-47.5	-27.9	19.6	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3385.0	-49.5	-27.9	21.6	H
11690.1	-56.8	-27.9	28.9	V
39703.0	-49.6	-27.9	21.7	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3385.0	-49.2	-27.9	21.3	V
17836.2	-54.5	-27.9	26.6	V
39663.0	-47.4	-27.9	19.5	H

802.11n

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3393.5	-49.6	-27.9	21.7	H
11569.7	-54.6	-27.9	26.7	H
39627.3	-47.3	-27.9	19.4	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3394.0	-49.3	-27.9	21.4	V
17349.4	-53.9	-27.9	26.0	H
39633.1	-49.6	-27.9	21.7	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3364.0	-48.8	-27.9	20.9	H
11572.1	-56.4	-27.9	28.5	V
23137.3	-55.9	-27.9	28.0	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3378.5	-49.3	-27.9	21.4	H
11694.4	-56.9	-27.9	29.0	V
24244.2	-58.1	-27.9	30.2	V
39760.4	-49.8	-27.9	21.9	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3376.5	-49.2	-27.9	21.3	H
17911.5	-53.9	-27.9	26.0	V
24248.9	-58.2	-27.9	30.3	V
39654.3	-49.2	-27.9	21.3	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3385.0	-49.2	-27.9	21.3	H
11690.1	-48.0	-27.9	20.1	H
23375.3	-56.3	-27.9	28.4	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3380.0	-49.3	-27.9	21.4	H
11587.1	-56.3	-27.9	28.4	H
24249.9	-57.8	-27.9	29.9	V
39620.1	-49.5	-27.9	21.6	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3390.0	-49.5	-27.9	21.6	H
17843.4	-54.9	-27.9	27.0	V
24259.3	-57.7	-27.9	29.8	H
39651.9	-49.1	-27.9	21.2	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3372.0	-48.9	-27.9	21.0	H
11590.5	-55.5	-27.9	27.6	H
23178.9	-56.7	-27.9	28.8	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3369.5	-48.7	-27.9	20.8	V
17919.8	-53.7	-27.9	25.8	H
39650.4	-49.7	-27.9	21.8	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3371.0	-48.4	-27.9	20.5	V
17985.0	-49.5	-27.9	21.6	V
39636.0	-47.8	-27.9	19.9	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3388.0	-49.6	-27.9	21.7	V
11670.8	-52.9	-27.9	25.0	H
23346.5	-57.6	-27.9	29.7	V

802.11ac

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3368.5	-48.7	-27.9	20.8	V
17831.8	-54.5	-27.9	26.6	V
39655.3	-49.5	-27.9	21.6	V

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3377.5	-48.7	-27.9	20.8	V
17886.9	-55.2	-27.9	27.3	H
39666.8	-47.4	-27.9	19.5	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3378.0	-49.1	-27.9	21.2	V
17867.1	-54.5	-27.9	26.6	V
24539.3	-58.2	-27.9	30.3	V
39645.1	-49.7	-27.9	21.8	V

802.11ax

Tx Spurious Emissions – 802.11ax20 (SISO A), CH157

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3376.5	-49.0	-27.9	21.1	H
11552.8	-44.7	-27.9	16.8	V
17329.6	-52.7	-27.9	24.8	H
23105.2	-57.0	-27.9	29.1	H

Tx Spurious Emissions – 802.11ax20 (SISO B), CH157

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3371.0	-48.9	-27.9	21.0	H
11552.8	-54.0	-27.9	26.1	V
17330.1	-49.8	-27.9	21.9	H
23106.1	-56.2	-27.9	28.3	V

Tx Spurious Emissions – 802.11ax20 (MIMO A+B), CH157

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3372.0	-48.7	-27.9	20.8	V
11552.8	-51.9	-27.9	24.0	V
17329.6	-49.5	-27.9	21.6	H
23106.1	-53.2	-27.9	25.3	V

Tx Spurious Emissions – 802.11ax20 (SISO A), CH169

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3392.0	-49.4	-27.9	21.5	H
11673.2	-55.5	-27.9	27.6	H
17509.9	-50.6	-27.9	22.7	H
39625.9	-49.6	-27.9	21.7	V

Tx Spurious Emissions – 802.11ax20 (SISO B), CH169

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3367.0	-48.6	-27.9	20.7	H
17509.4	-50.4	-27.9	22.5	H
23346.0	-53.3	-27.9	25.4	V

Tx Spurious Emissions – 802.11ax20 (MIMO A+B), CH169

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3369.5	-49.0	-27.9	21.1	H
6495.7	-58.7	-27.9	30.8	V
11673.2	-44.3	-27.9	16.4	H
11683.3	-56.0	-27.9	28.1	H
11698.8	-56.1	-27.9	28.2	H
17508.5	-52.7	-27.9	24.8	V
23346.0	-50.3	-27.9	22.4	V

Tx Spurious Emissions – 802.11ax40 (SISO A), CH159

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3370.0	-48.6	-27.9	20.7	V
11553.3	-50.1	-27.9	22.2	H
17331.5	-51.6	-27.9	23.7	H
39627.8	-49.3	-27.9	21.4	V

Tx Spurious Emissions – 802.11ax40 (SISO B), CH159

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3370.0	-48.9	-27.9	21.0	H
11554.3	-54.2	-27.9	26.3	H
17331.5	-51.5	-27.9	23.6	H
23108.5	-55.4	-27.9	27.5	V

Tx Spurious Emissions – 802.11ax40 (MIMO A+ B), CH159

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3390.0	-49.4	-27.9	21.5	V
11553.8	-48.6	-27.9	20.7	H
17332.5	-50.1	-27.9	22.2	V
23108.0	-53.0	-27.9	25.1	H

Tx Spurious Emissions – 802.11ax80 (SISO A), CH155

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3384.0	-49.1	-27.9	21.2	V
7180.6	-58.6	-27.9	30.7	V
11474.0	-43.8	-27.9	15.9	H
11489.0	-55.7	-27.9	27.8	V
22947.9	-56.2	-27.9	28.3	H

Tx Spurious Emissions – 802.11ax80 (SISO B), CH155

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3370.5	-48.7	-27.9	20.8	V
7180.6	-58.5	-27.9	30.6	V
11474.0	-53.6	-27.9	25.7	V
17211.2	-50.9	-27.9	23.0	H
39641.8	-47.8	-27.9	19.9	H

Tx Spurious Emissions – 802.11ax80 (MIMO A+ B), CH155

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3373.0	-49.0	-27.9	21.1	H
7180.1	-56.6	-27.9	28.7	H
11474.0	-46.3	-27.9	18.4	V
17211.7	-51.8	-27.9	23.9	H
22947.9	-57.2	-27.9	29.3	V

Tx Spurious Emissions – 802.11ax40 (SISO A), CH167

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3371.5	-48.8	-27.9	20.9	H
11634.5	-54.2	-27.9	26.3	H
17451.4	-50.4	-27.9	22.5	H
24258.8	-57.6	-27.9	29.7	H
39678.9	-47.6	-27.9	19.7	H

Tx Spurious Emissions – 802.11ax40 (SISO B), CH167

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3379.5	-49.2	-27.9	21.3	V
11634.0	-56.5	-27.9	28.6	H
17451.4	-50.0	-27.9	22.1	H
23268.6	-53.3	-27.9	25.4	V

Tx Spurious Emissions – 802.11ax40 (MIMO A+B), CH167

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
3375.0	-48.8	-27.9	20.9	V
11633.5	-45.3	-27.9	17.4	V
23268.1	-47.8	-27.9	19.9	V
23291.2	-55.2	-27.9	27.3	V

B.2.4 Adjacent channel selectivity

Test limits

EN 300 440	Limits
4.3.3.4	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 frequency 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.

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 SMW200A.

Result tables

Configuration tested: 802.11a, Chain A, Channel 157 (5785MHz), 6Mbps, 20MHz

- **Minimum performance result without interferer**

Wanted signal mean power from companion device: Pmin [dBm]	PER [%]
-79.00	17.00

- **Minimum performance results with interferer**

Wanted signal mean power from companion device:

Pmin [dBm] + 3dB = -76.00 dBm

Blocking signal Frequency (MHz)	Minimum Blocking signal power* (dBm)	PER (%)	Maximum Blocking signal power (dBm)	PER (%)	Verdict
5805	-53.29	3.90	-11.00	15.15	Pass
5765	-53.23	4.55	-10.15	13.05	Pass

***** Assuming antenna gain

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, 20MHz.

- **Minimum performance result without interferer**

Wanted signal mean power from companion device: Pmin [dBm]	PER [%]
-79.55	18.15

- **Minimum performance results with interferer**

Wanted signal mean power from companion device:

✓ Pmin [dBm] + 3dB = -76.55 dBm

Blocking signal Frequency (MHz)	Minimum Blocking signal power* (dBm)	PER (%)	Maximum Blocking signal power (dBm)	PER (%)	Verdict
4775	-66.59	3.15	6.90	16.50	Pass
5375	-67.62	2.77	5.15	13.50	Pass
5575	-67.94	3.40	2.80	17.20	Pass
5995	-68.57	3.20	1.70	16.45	Pass
6195	-68.85	1.89	4.15	18.00	Pass
6795	-69.65	1.70	6.85	16.90	Pass

*Assuming antenna gain

Note: The results shown above correspond to receiver category 2. Since the maximum reported blocking signal power exceed the minimum requirements of the category 1. The above data results are valid for category 1 as well.

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.

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

Test Results Rx

Rx Spurious Emissions – 25MHz to 1GHz

Rx Spurious Emissions – All modes

Frequency	Quasi-Peak	Limit (e.i.r.p)	Margin	Polarization
MHz	dBm	dBm	dB	---
29.0	-61.3	-54.9	6.4	V

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

Rx Spurious Emissions – 1 GHz to 40GHz

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
15051.0	-54.2	-44.9	9.3	V
39598.4	-51.4	-44.9	6.5	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
15132.0	-55.4	-44.9	10.5	H
39515.9	-51.6	-44.9	6.7	H

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

Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
15103.0	-54.5	-44.9	9.6	V
39665.4	-51.7	-44.9	6.8	H

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

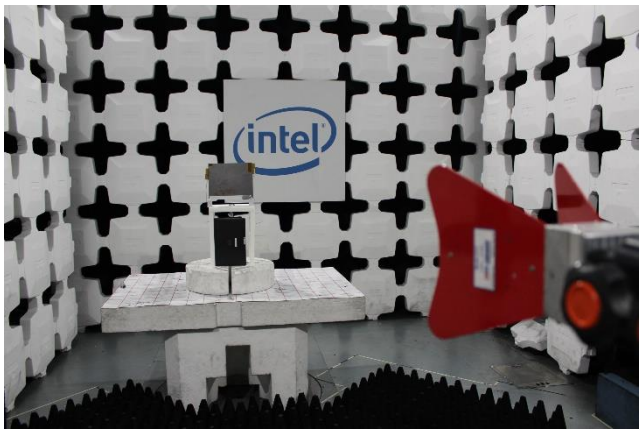
Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
15113.5	-54.2	-44.9	9.3	V
39555.0	-51.6	-44.9	6.7	H

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

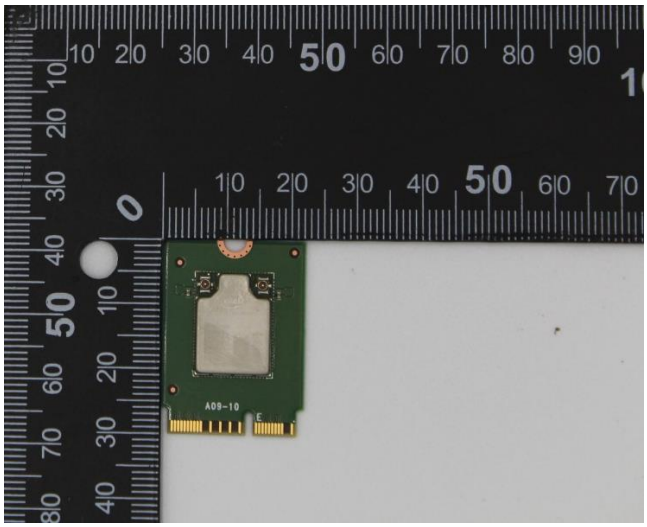
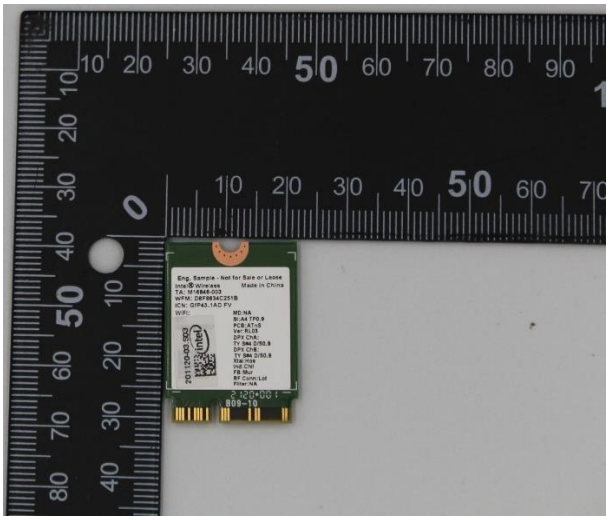
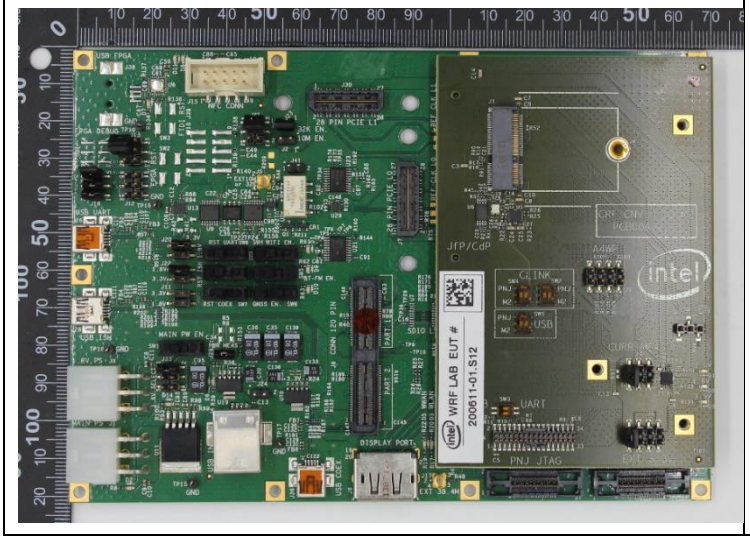
Frequency	RMS	Limit (e.i.r.p)	Margin	Polar
MHz	dBm	dBm	dB	---
15052.5	-54.6	-44.9	9.7	H
39623.9	-51.8	-44.9	6.9	H

Annex C. Photographs

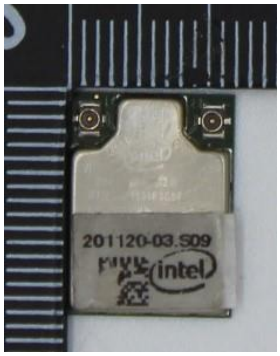
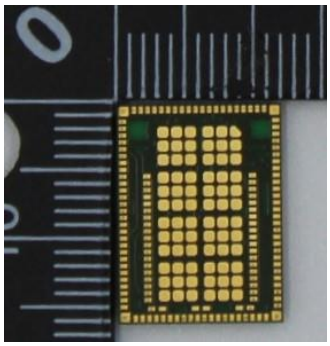
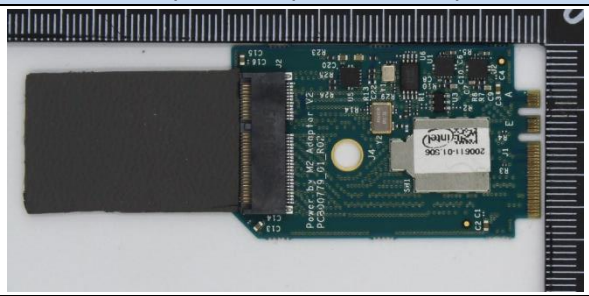
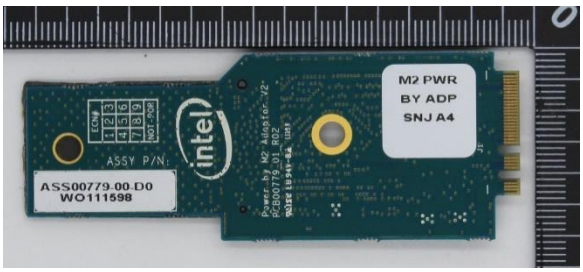
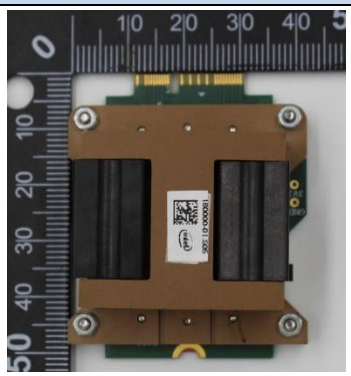
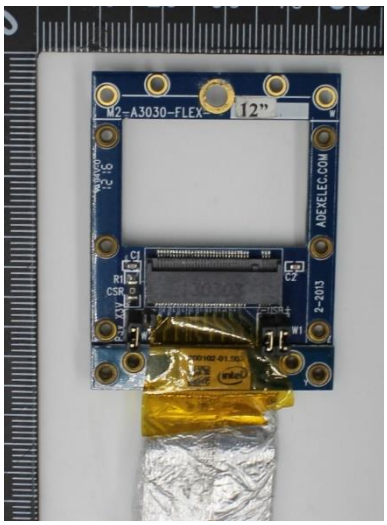
C.1 Test Setup

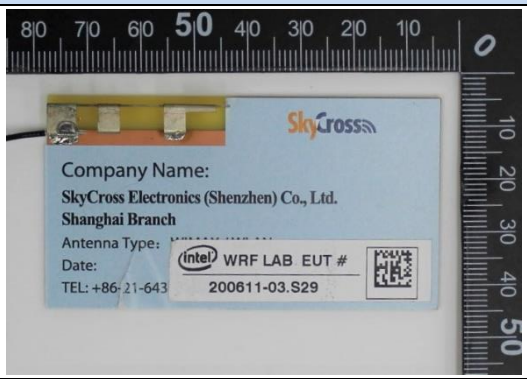
Radiated Setup 25 MHz – 1 GHz	Radiated Setup 1 GHz – 6.4 GHz (Transmitter tests)
	
Radiated Setup 6.4 GHz – 18 GHz (Transmitter tests) 1 GHz – 18 GHz (Receiver tests)	**Radiated Setup 18 GHz – 40 GHz**
	

C.2 Test Sample

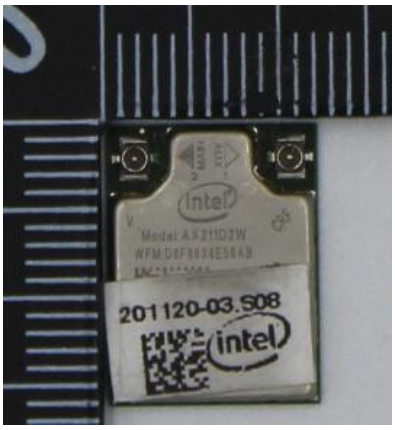
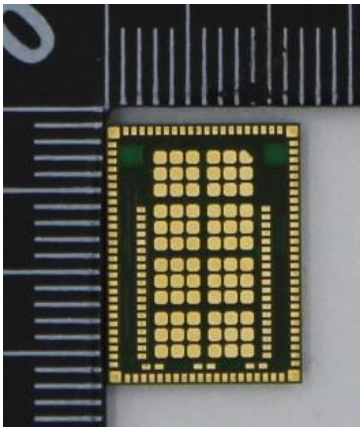
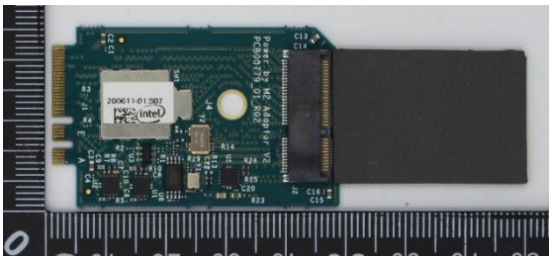
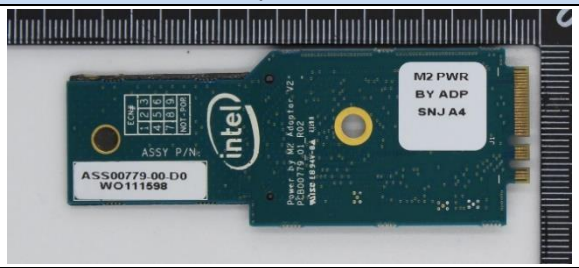
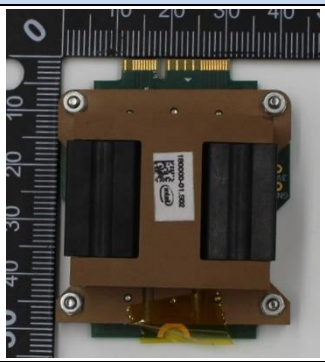
Sample #01	
Module Front	Module Back
	
Extender board	Laptop
	

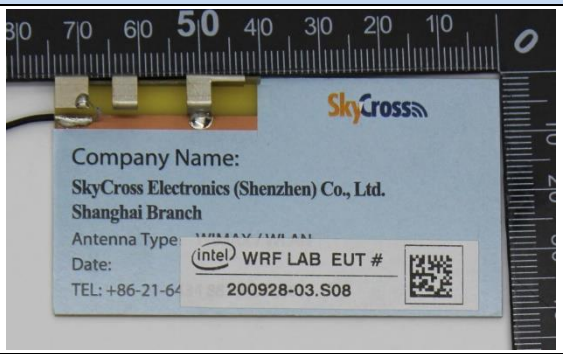
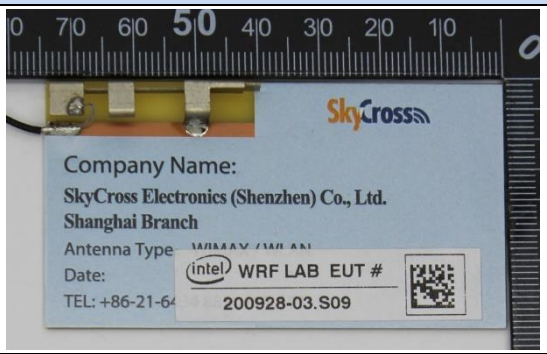
Sample #02

Module Front	Module Back
	
Adaptor front (with absorber)	**Adaptor back**
	
Socket front	**Socket back**
	
Extender board	**Laptop**
	

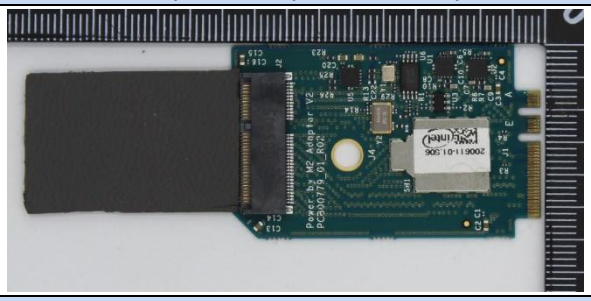
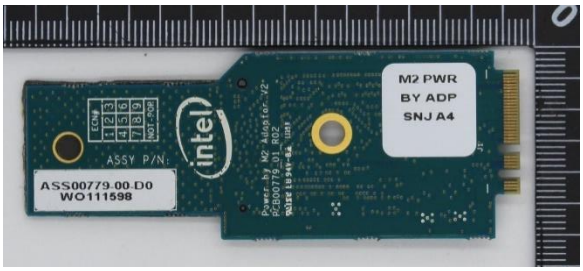
Main Antenna	Aux Antenna
	

Sample #03

Module Front	Module Back
	
Adaptor front (with absorber)	**Adaptor back**
	
Socket front	**Socket back**
	
Extender board	**Laptop**
	

Main Antenna	Aux Antenna
	

Sample #04

Module Front	Module Back
	
Adaptor front (with absorber)	**Adaptor back**
	
Laptop (Host)	
	

End of the report

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