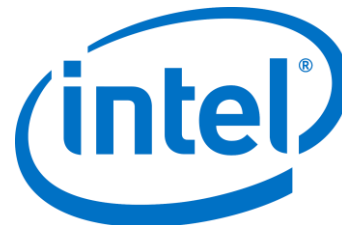




N° 1-6736  
Scope available  
on [www.cofrac.fr](http://www.cofrac.fr)



# TEST REPORT

|                        |                                                                      |
|------------------------|----------------------------------------------------------------------|
| EUT Description        | WLAN and BT, 2x2 PCIe M.2 2230 adapter card                          |
| Brand Name             | Intel® Wi-Fi 6E AX210                                                |
| Model Name             | AX210NGW                                                             |
| Date of Test Start/End | 2020-07-16 / 2021-03-05                                              |
| Features               | 802.11ax, Dual Band, 2x2 Wi-Fi 6 + Bluetooth® 5.2<br>(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<br>(see section 1) |
|---------------------|-------------------------------------------|

|                            |                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------|
| Test Report identification | 200611-03.TR47                                                                                     |
| Revision Control           | Rev. 01<br>This test report revision replaces any previous test report revision<br>(see section 8) |

The test results relate only to the samples tested.

This report shall not be reproduced, except in full, without the written approval of the laboratory.

Reference to accreditation shall be used only by full reproduction of test report.

Issued by

Digitally signed by  
Z.OUACHICHA  
Date: 2021.03.17 19:02:23  
+01'00'

Zayd OUACHICHA  
(Test Engineer Lead)

Reviewed by

Digitally signed by Ines  
Kharrat  
Date: 2021.03.18 09:02:45  
+01'00'

Ines KHARRAT  
(Technical Manager)

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

# Table of Contents

---

|                                                                             |           |
|-----------------------------------------------------------------------------|-----------|
| <b>1. Standards, reference documents and applicable test methods .....</b>  | <b>3</b>  |
| <b>2. General conditions, competences and guarantees .....</b>              | <b>3</b>  |
| <b>3. Environmental Conditions .....</b>                                    | <b>3</b>  |
| <b>4. Test samples .....</b>                                                | <b>4</b>  |
| <b>5. EUT Features .....</b>                                                | <b>6</b>  |
| <b>6. Remarks and comments .....</b>                                        | <b>6</b>  |
| <b>7. Test Verdicts summary .....</b>                                       | <b>6</b>  |
| 7.1. 802.11 A/N/AC/AX .....                                                 | 6         |
| <b>8. Document Revision History .....</b>                                   | <b>7</b>  |
| <b>Annex A. Test &amp; System Description .....</b>                         | <b>8</b>  |
| A.1 MEASUREMENT SYSTEM.....                                                 | 8         |
| A.2 TEST EQUIPMENT LIST .....                                               | 11        |
| A.3 MEASUREMENT UNCERTAINTY EVALUATION .....                                | 13        |
| <b>Annex B. Test Results .....</b>                                          | <b>14</b> |
| B.1 TEST CONDITIONS.....                                                    | 14        |
| B.2 TEST RESULTS .....                                                      | 16        |
| B.2.1 Transmitter: Equivalent Isotropically radiated power (e.i.r.p.) ..... | 16        |
| B.2.2 Transmitter: Permitted range of operating frequencies.....            | 19        |
| B.2.3 Blocking or desensitization .....                                     | 28        |
| B.2.4 Receiver: Spurious emissions (radiated) .....                         | 30        |
| <b>Annex C. Photographs .....</b>                                           | <b>32</b> |
| C.1 TEST SETUP .....                                                        | 32        |
| C.2 TEST SAMPLE .....                                                       | 33        |

## 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 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
- ✓ Complete or partial reproduction of the report cannot be made without written permission of Intel WRF Lab.

## 3. Environmental Conditions

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

|             |            |
|-------------|------------|
| Temperature | 23°C ± 4°C |
| Humidity    | 49% ± 10%  |

#### 4. Test samples

| Sample | Control #     | Description    | Model               | Serial #         | Date of receipt | Note                                  |
|--------|---------------|----------------|---------------------|------------------|-----------------|---------------------------------------|
| #01    | 200611-03.S03 | WiFi 6E Module | AX210NGW            | WFM:9C297662CA0A | 2020-07-15      | Used for Tx 1 GHz-6.4 GHz RSE tests   |
|        | 170209-01.S16 | Laptop         | Dell Latitude E5470 | C1HTPF2          | 2017-05-24      |                                       |
|        | 200226-02.S04 | Extender       | ADEXELEC            | -                | 2020-04-30      |                                       |
|        | 200611-03.S13 | Main Antenna   | Skycross            | -                | 2020-07-15      |                                       |
|        | 200611-03.S14 | Aux Antenna    | Skycross            | -                | 2020-07-15      |                                       |
| #02    | 200611-03.S01 | WiFi 6E Module | AX210NGW            |                  |                 | Used for Tx 6.4 GHz-18 GHz RSE tests  |
|        | 170000-01.S01 | Laptop         | Dell Latitude E5470 | DBPLMC2          | 2017-03-28      |                                       |
|        | 200611-03.S26 | Extender       | ADEXELEC            | -                | 2020-07-01      |                                       |
|        | 200611-03.S20 | Main Antenna   | Skycross            | -                | 2020-07-01      |                                       |
|        | 200611-03.S21 | Aux Antenna    | Skycross            | -                | 2020-07-01      |                                       |
| #03    | 200611-03.S08 | WiFi 6E Module | AX210NGW            | WFM:9C297662B5B5 | 2020-07-15      | Used for Rx 1 GHz-18GHz RSE tests     |
|        | 170000-01.S01 | Laptop         | Dell Latitude E5470 | DBPLMC2          | 2017-03-28      |                                       |
|        | 200611-03.S26 | Extender       | ADEXELEC            | -                | 2020-07-01      |                                       |
|        | 200611-03.S20 | Main Antenna   | Skycross            | -                | 2020-07-01      |                                       |
|        | 200611-03.S21 | Aux Antenna    | Skycross            | -                | 2020-07-01      |                                       |
| #04    | 200611-03.S03 | WiFi 6E Module | AX210NGW            | WFM:9C297662CA0A | 2020-07-15      | Used for Rx 18 GHz - 40 GHz RSE tests |
|        | 200615-05.S07 | Host           | Latitude 5401       | 5Q9LK13          | 2020-06-12      |                                       |
| #05    | 200611-03.S03 | WiFi 6E Module | AX210NGW            | WFM:9C297662CA0A | 2020-07-15      | Used for Tx 25MHz – 1GHz RSE tests    |
|        | 170000-01.S01 | Laptop         | Dell Latitude E5470 | DBPLMC2          | 2017-03-28      |                                       |
|        | 200611-03.S26 | Extender       | ADEXELEC            | -                | 2020-07-01      |                                       |
|        | 200611-03.S11 | Main Antenna   | Skycross            | -                | 2020-07-15      |                                       |
|        | 200611-03.S12 | Aux Antenna    | Skycross            | -                | 2020-07-15      |                                       |
| #06    | 200611-03.S01 | WiFi 6E Module | AX210NGW            | WFM:9C297662CA5F | 2020-07-15      | Used for Tx 18GHz – 40GHz RSE tests   |
|        | 200504-04.S07 | Laptop         | Latitude 5401       | SN:BVHLK13       | 2020-06-02      |                                       |
|        | 200504-04.S07 | Extender       | -                   | -                | 2020-06-02      |                                       |
|        | 200611-03.S11 | Main Antenna   | Skycross            | -                | 2020-07-15      |                                       |
|        | 200611-03.S12 | Aux Antenna    | Skycross            | -                | 2020-07-15      |                                       |

| Sample | Control #     | Description    | Model          | Serial #         | Date of receipt | Note            |
|--------|---------------|----------------|----------------|------------------|-----------------|-----------------|
| #07    | 200611-03.S05 | WiFi 6E Module | AX210NGW       | WFM:9C297662B5C4 | 2020-07-15      | Conducted tests |
|        | 170000-01.S19 | Laptop         | Latitude E5450 | 4TXV562          | 2020-02-04      |                 |
|        | 170524-01.S12 | Extender       | PCB00495       | 4955013-375      | 2017-05-29      |                 |
| #08    | 200611-03.S04 | WiFi 6E Module | AX210NGW       | WFM:9C297662BD9E | 2020-07-15      | Rx Blocking     |
|        | 170000-01.S14 | Laptop         | Latitude E5450 | 90LKMC2          | 2018-01-18      |                 |
|        | 180000-01.S08 | Extender       | PCB00495       | PCB00495         | 2018-11-22      |                 |

## 5. EUT Features

The herein information is provided by the customer

|                     |                                                                                                                                                                                                                                                                                                                                                                                 |              |              |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| Brand Name          | Intel® Wi-Fi 6E AX210                                                                                                                                                                                                                                                                                                                                                           |              |              |
| Model Name          | AX210NGW                                                                                                                                                                                                                                                                                                                                                                        |              |              |
| Software Version    | OEM_DRTU_00830_99_3500_51W                                                                                                                                                                                                                                                                                                                                                      |              |              |
| Driver Version      | 99.0.55.2 V0.13.2.15                                                                                                                                                                                                                                                                                                                                                            |              |              |
| Supported Radios    | <div> <div>802.11b/g/n/ax</div> <div>2.4GHz (2400.0 – 2483.5 MHz)</div> </div> <div> <div>802.11a/n/ac/ax</div> <div>5.2GHz (5150.0 – 5350.0 MHz)</div> </div> <div> <div></div> <div>5.6GHz (5470.0 – 5725.0 MHz)</div> </div> <div> <div></div> <div>5.8GHz (5725.0 – 5875.0 MHz)*</div> </div> <div> <div>Bluetooth 5.2</div> <div>2.4GHz (2400.0 – 2483.5 MHz)</div> </div> |              |              |
| Antenna Information | Note*: EUTs frequency range 5850.0 – 5875.0 MHz is not enabled in Chile                                                                                                                                                                                                                                                                                                         |              |              |
|                     | Transmitter                                                                                                                                                                                                                                                                                                                                                                     | Main         | Aux          |
|                     | Manufacturer                                                                                                                                                                                                                                                                                                                                                                    | SkyCross     | SkyCross     |
|                     | Antenna type                                                                                                                                                                                                                                                                                                                                                                    | PIFA Antenna | PIFA Antenna |
|                     | Part number                                                                                                                                                                                                                                                                                                                                                                     | NA           | NA           |
|                     | Declared antenna gain (dBi)                                                                                                                                                                                                                                                                                                                                                     | +5dBi        | +5dBi        |

## 6. Remarks and comments

- 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
- According to the standard ETSI EN 300 440 v2.2.1 , and the applicant declaration, the device AX210NGW operating in 802.11a/n/ac/ax mode is considered as a receiver category 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

## 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       |
| 4.3.4      | 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    | G. Roustan  | First Issue                                                                                                                                                                                                    |
| Rev.01     | Z.Ouachicha | -Remove the CH173 (5865MHz) & CH167(5835MHz).<br>-Implementation additional tests: CH165(5825MHz) & CH159(5795MHz) for chile.Test cases impacted:Transmitter EIRP and Permitted range of operating frequencies |

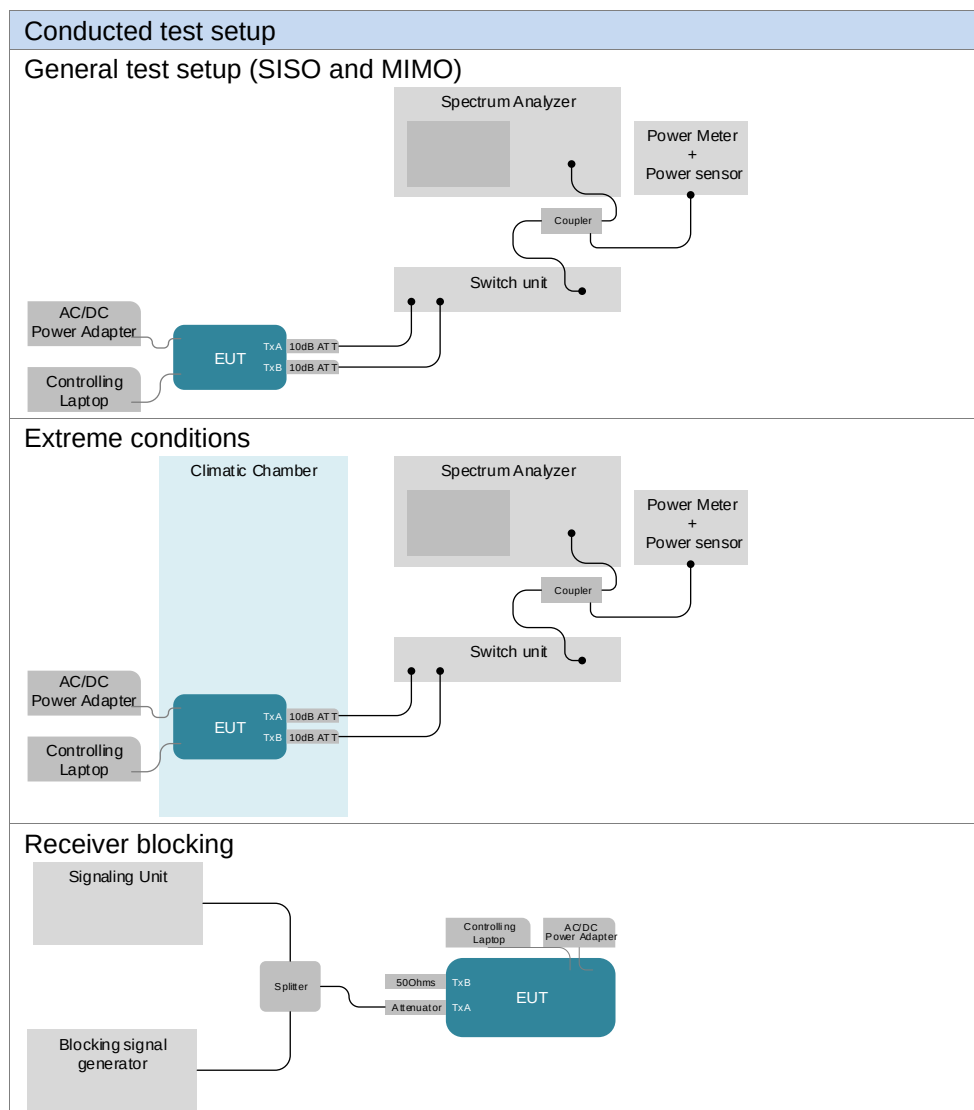
# Annex A. Test & System Description

## 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.

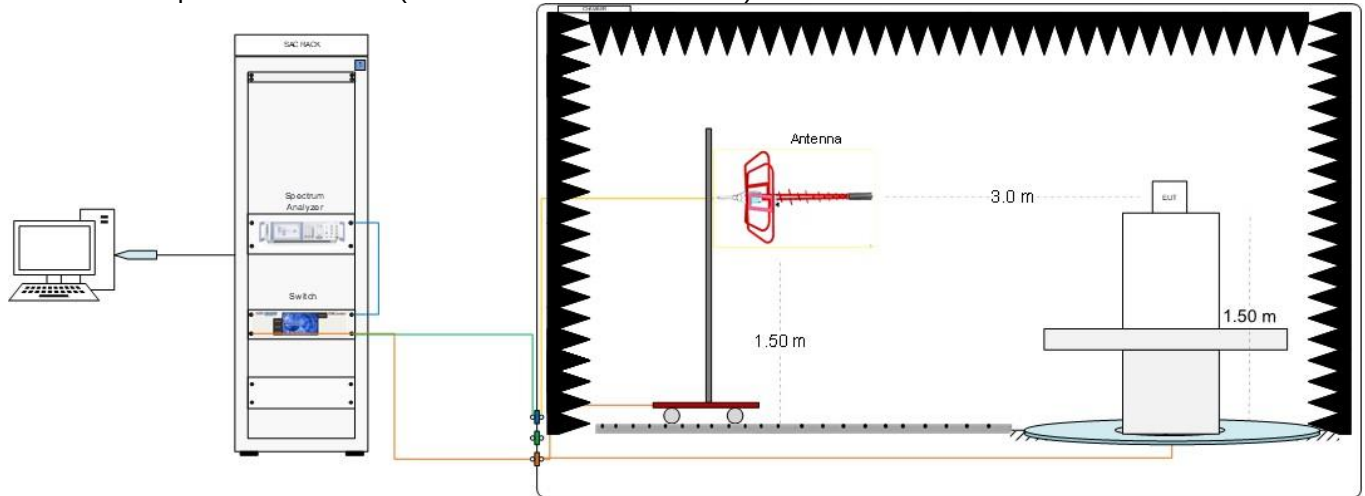
The DUT was installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary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

Setups for conducted and radiated measurements are shown below.

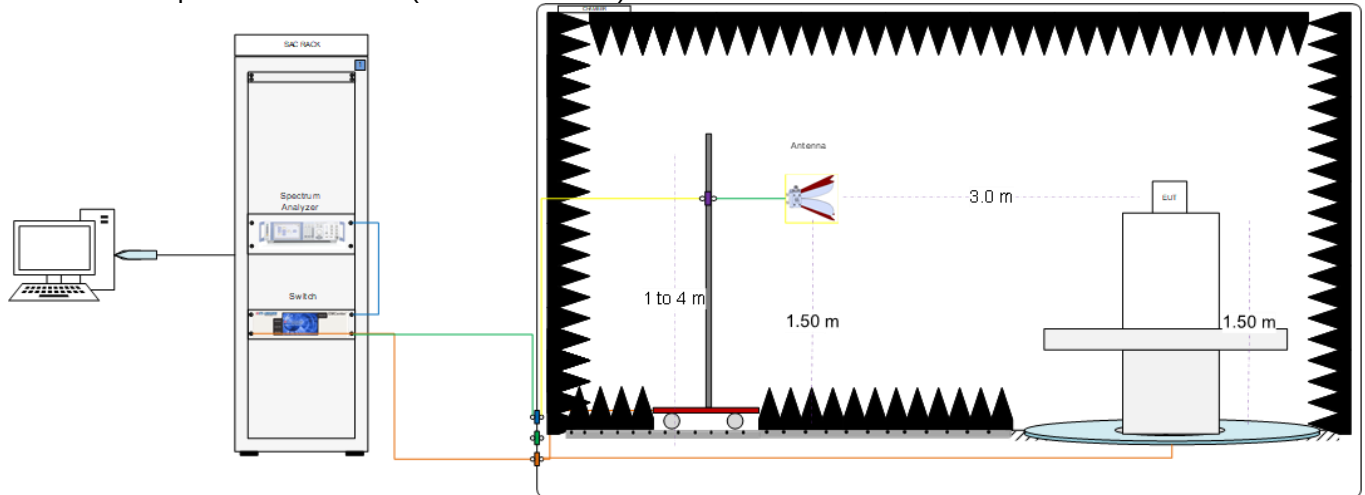


## Radiated test setup

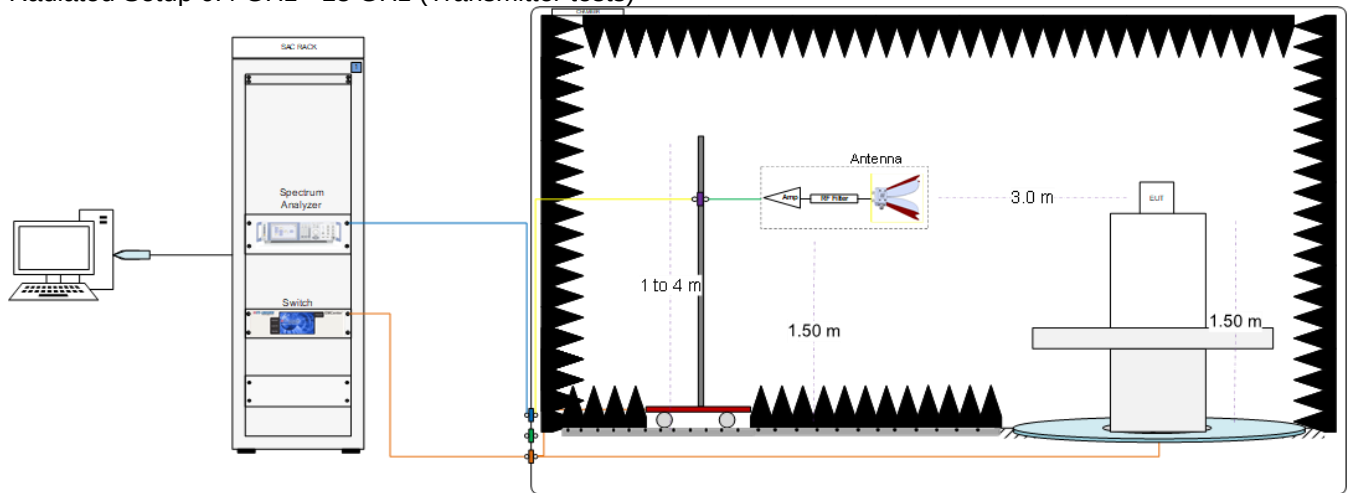
### Radiated Setup 25 MHz - 1 GHz (Transmitter & Receiver tests)



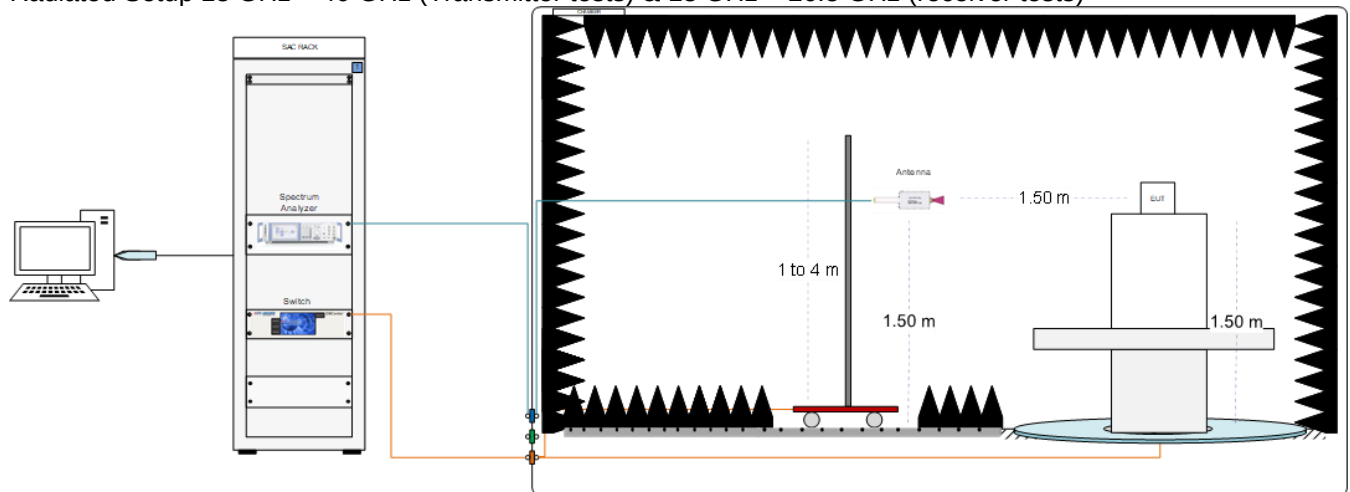
### Radiated Setup 1 GHz – 6.4 GHz (Transmitter tests)



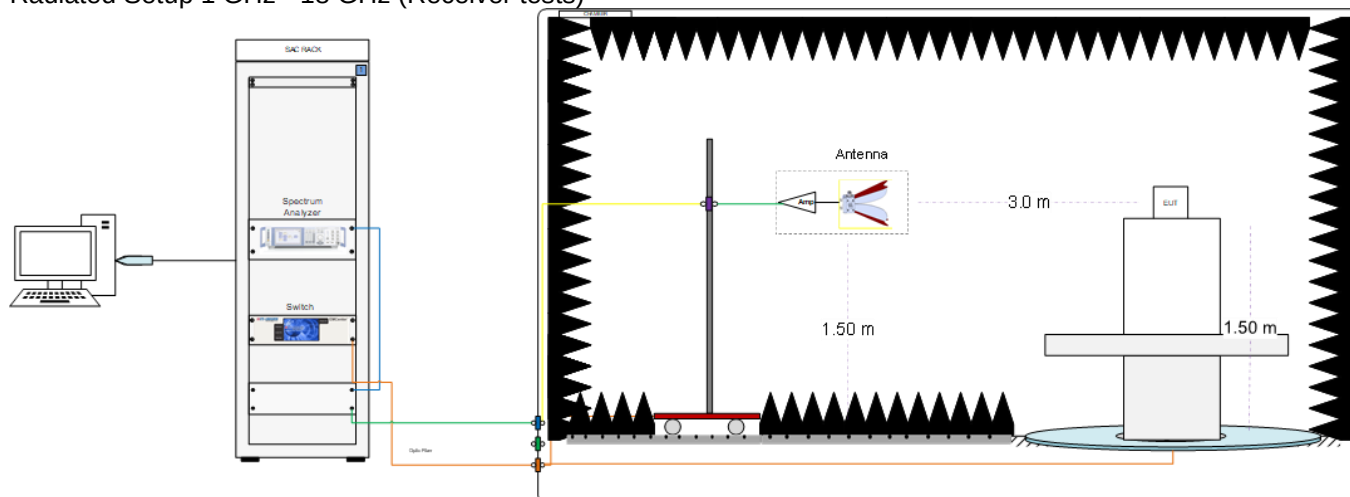
### Radiated Setup 6.4 GHz - 18 GHz (Transmitter tests)



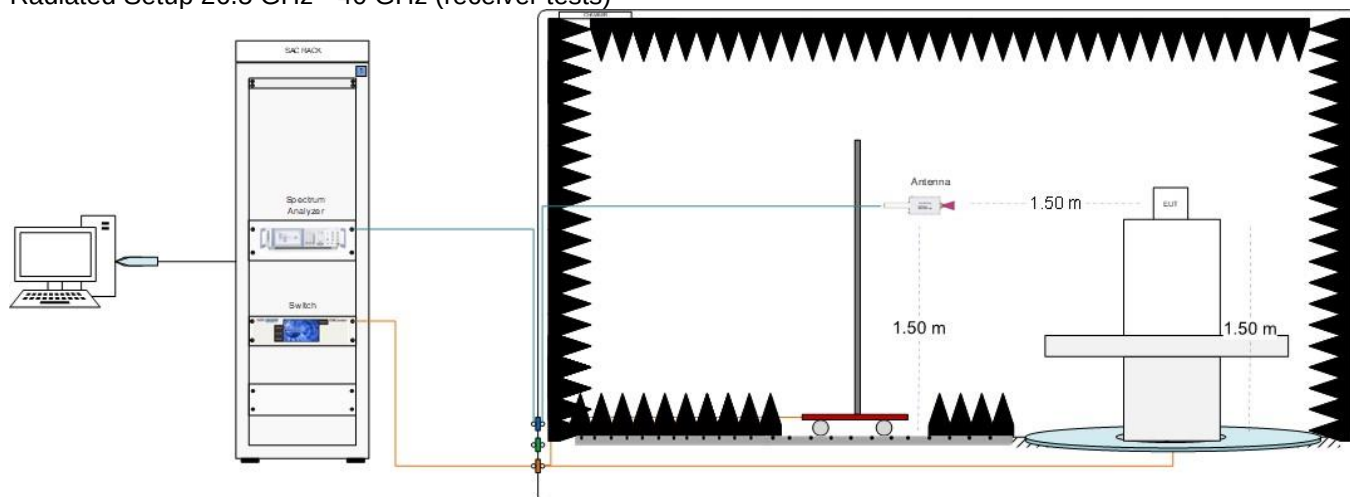
Radiated Setup 18 GHz – 40 GHz (Transmitter tests) & 18 GHz – 26.5 GHz (receiver tests)



Radiated Setup 1 GHz - 18 GHz (Receiver tests)



Radiated Setup 26.5 GHz - 40 GHz (receiver tests)



## A.2 Test Equipment List

### Conducted Setup

| 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 | 2021-08-26    |
| 0870 | Cable SMA Male to ML51-P | HRMP-ML51LP     | DTR178-100RS   | Hirose          | 2020-08-26 | 2021-08-26    |
| 0876 | Thermometer              | t3000FC         | -              | Fluke           | 2019-11-29 | 2021-11-29    |
| 0991 | RF Cable 2m + 10dB ATT   | 0900670672000PJ | 1936949        | Radiall         | 2020-08-26 | 2021-08-26    |
| 0992 | RF Cable 2m + 10dB ATT   | 0900670672000PJ | 1936947        | Radiall         | 2020-08-26 | 2021-08-26    |

N/A: Not Applicable

### 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<br>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

## Radiated Setup #1

| ID#  | Device                                                                 | Type/Model                           | Serial #                  | Manufacturer    | Cal. Date  | Cal. Due Date |
|------|------------------------------------------------------------------------|--------------------------------------|---------------------------|-----------------|------------|---------------|
| 0135 | Anechoic Chamber                                                       | FACT3                                | 5720                      | ETS-Lindgren    | 2020-07-06 | 2022-07-06    |
| 0136 | Turn Table                                                             | ETS                                  | -                         | ETS-Lindgren    | N/A        | N/A           |
| 0137 | Biconlog Antenna                                                       | 3142E                                | 00156946                  | ETS-Lindgren    | 2020-03-12 | 2022-03-12    |
| 0420 | Spectrum Analyzer                                                      | FSV40                                | 101556                    | Rohde & Schwarz | 2020-05-25 | 2022-05-25    |
| 0530 | Measurement SW, v10.40.10                                              | EMC32                                | 100623                    | Rohde & Schwarz | N/A        | N/A           |
| 0147 | Switch & Positioning systems                                           | EMC Center                           | 00159757                  | ETS-Lindgren    | N/A        | N/A           |
| 0993 | Biconical antenna<br>30 MHz – 1 GHz                                    | UBAA9115 +<br>BBVU9135 +<br>DGA9552N | 0286 + CH 9044            | Schwarzbeck     | 2019-11-22 | 2021-11-22    |
| 0325 | Horn antenna 3117                                                      | 3117                                 | 00157734                  | ETS-Lindgren    | 2019-08-12 | 2021-08-12    |
| 0141 | Horn Antenna 3117 +<br>Amplifier + HPF6.4                              | 3117                                 | 00157736                  | ETS-Lindgren    | 2020-04-01 | 2022-04-01    |
| 0202 | Cable 1m - 30MHz to 18 GHz                                             | UFB311A-0-3360-<br>50U300            | MFR 64639223229-<br>001   | Micro-coax      | N/A        | N/A           |
| 0206 | Cable 1.2m – 18 to 40 GHz                                              | UFA147A-0-0480-<br>200200            | MFR 64639223720-<br>003   | Micro-coax      | N/A        | N/A           |
| 0207 | RF Cable 1.85m 0.03-40GHz                                              |                                      |                           | Micro-coax      | N/A        | N/A           |
| 0208 | RF Cable 2.5m 30MHz-<br>40GHz                                          | UFA147A-0-0980-<br>200200            | MFR<br>6463922723-001     | Micro-coax      | N/A        | N/A           |
| 0209 | RF Cable 2.5m 30MHz-<br>40GHz                                          | UFA147A-0-0720-<br>200200            | MFR 64639223722-<br>001   | Micro-coax      | N/A        | N/A           |
| 0263 | Cable 1m - 1GHz to 18GHz                                               | UFA147A                              | -                         | Utilflex        | N/A        | N/A           |
| 0309 | Signal Generator                                                       | SMB100A                              | 178217                    | Rohde & Schwarz | 2020-04-17 | 2022-04-17    |
| 0321 | Double Ridged Horn (10-40<br>GHz)                                      | 3116C                                | 00157511                  | ETS-Lindgren    | 2018-08-10 | 2020-08-10    |
| 0334 | Double-Ridged Waveguide<br>Horn with Pre-Amplifier 18<br>GHz to 40 GHz | 3116C+PA                             | 00169308bis +<br>00196308 | ETS-Lindgren    | 2019-07-24 | 2021-07-24    |
| 0343 | Double ridged horn antenna                                             | 3117-PA                              | 00201542+00169546         | ETS-Lindgren    | 2019-08-16 | 2021-08-16    |
| 0346 | Multimeter                                                             | 34401A                               | US36054685                | Agilent         | 2018-08-21 | 2020-08-21    |
| 0369 | Cable 2m - 26.5GHz to<br>40GHz                                         | 794-9191-2000A                       | E00327                    | Atem            | N/A        | N/A           |
| 0371 | Cable 1m – 30 MHz - 18GHz                                              | UFB311A-0-0590-<br>50U50U            | MFR 64639 223230-<br>001  | Micro-coax      | N/A        | N/A           |
| 0758 | Cable 7.5m - 30MHz to<br>18GHz                                         | 0501051057000GX                      | 18.23.181                 | Radiall         | N/A        | N/A           |
| 0797 | Temp & Humidity Logger                                                 | RA12E-TH1-RAS                        | RA12-D0EB1A               | Avtech          | 2019-07-04 | 2021-07-04    |
| 0809 | Cable 7m - 18GHz to 40GHz                                              | R286304009                           | -                         | Radiall         | N/A        | N/A           |
| 0859 | Cable 2.5m - 30MHz to<br>18GHz                                         | 0500990992500KE                      | 19.23.395                 | Radiall         | N/A        | N/A           |
| 1033 | Boresight antenna mast                                                 | BAM 4.0-P                            | P/278/2890.01             | Maturo          | N/A        | N/A           |

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, v10.50.10              | EMC32           | 100401                 | Rohde & Schwarz | N/A        | N/A           |
| 0419 | Spectrum Analyzer                      | FSW67           | 103266                 | Rohde & Schwarz | 2019-02-04 | 2021-02-04    |
| 0138 | Double Ridge Horn (1- 18GHz)           | 3117            | 00152266               | ETS Lindgren    | 2020-03-08 | 2022-03-08    |
| 0860 | RF Cable 1-18GHz, 1.2 m                | 2301761761200PJ | 12.22.1104             | Radiall         | N/A        | N/A           |
| 0275 | RF Cable 1-18GHz - 6.5m                | 140-8500-11-51  | 001                    | Spectrum        | N/A        | N/A           |
| 0684 | RF Cable 1GHz-18GHz 1.5m               | -               | -                      | Spirent         | N/A        | N/A           |
| 0133 | Spectrum Analyzer                      | FSV40           | 101358                 | Rohde & Schwarz | 2020-02-25 | 2022-02-25    |
| 0141 | Horn Antenna 3117 + Amplifier + HPF6.4 | 3117            | 00157736               | ETS-Lindgren    | 2020-04-01 | 2022-04-01    |
| 0871 | RF Cable 1-18GHz - 1.5m                | 0501050991200GX | 19.21.710              | Radiall         | N/A        | N/A           |
| 0343 | Double ridged horn antenna+ Amplifier  | 3117-PA         | 00201542 + 00169546    | ETS-Lindgren    | 2019-08-16 | 2021-08-16    |
| 0334 | Double Horn Ridged antenna             | 3116C-PA        | 00169308bis + 00196308 | ETS-Lindgren    | 2019-07-24 | 2021-07-24    |
| 0028 | RF Cable 1.2m 40MHz-40GHz              | 794-9191-1200A  | DA585                  | Atem            | N/A        | N/A           |
| 0679 | RF Cable 18-40 GHz 6m                  | R286304009      | 1747364                | Radiall         | N/A        | N/A           |
| 0796 | Temp & Humidity Logger                 | RA12E-TH1-RAS   | RA12-D4F316            | Avtech          | 2019-07-05 | 2021-07-05    |

## 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  | Limit     | Unit |
|------------------------------------------------|--------------|-----------|------|
| Frequency Stability                            | $\pm 7.00$   | $\pm 10$  | ppm  |
| RF Output Power, (conducted)                   | $\pm 1.00$   | $\pm 1.5$ | dB   |
| Radiated emission of transmitter < 1GHz        | $\pm 4.04$   | $\pm 6$   | dB   |
| Radiated emission of transmitter 1GHz - 40 GHz | $\pm 4.61$   | $\pm 8$   | dB   |
| Radiated emission of receiver < 1GHz           | $\pm 4.04$   | $\pm 6$   | dB   |
| Radiated emission of receiver 1GHz - 40 GHz    | $\pm 4.61$   | $\pm 8$   | dB   |
| Temperature                                    | $\pm 0.30$   | $\pm 1$   | °C   |
| Humidity                                       | $\pm 1.20$   | $\pm 5$   | %    |
| Voltage (DC)                                   | $< \pm 0.01$ | $\pm 1$   | %    |
| Voltage (AC)                                   | $\pm 0.09$   | $\pm 2$   | %    |

# Annex B. Test Results

The herein test results were performed by:

| Test case measurement                                             | Test Engineer                                                 |
|-------------------------------------------------------------------|---------------------------------------------------------------|
| Transmitter: Equivalent Isotropically radiated power (e.i.r.p.)   | G.Roustan                                                     |
| Transmitter: Permitted range of operating frequencies             | G.Roustan                                                     |
| Blocking or desensitization                                       | Z. Ouachicha                                                  |
| Transmitter: Unwanted Emissions in the spurious domain (radiated) | R. Luciani<br>N. Bui<br>A. Lounes<br>I. Kharrat<br>N. Nachabe |
| Receiver: Spurious emissions (radiated)                           |                                                               |

## 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  $\pm 0.25$  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          | -          |
|          |          |           | 165  | 5825        | 8.5                                 | 8.5          | -          |
| 802.11n  | 20       | HT0 HT8*  | 149  | 5745        | 8.5                                 | 8.5          | 8.5        |
|          |          |           | 161  | 5805        | 8.5                                 | 8.5          | 8.5        |
|          |          |           | 165  | 5825        | 8.5                                 | 8.5          | 8.5        |
|          | 40       | HT0 HT8*  | 151  | 5755        | 8.5                                 | 8.5          | 8.5        |
|          |          |           | 159  | 5795        | 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        |
|          |          |           | 165  | 5825        | 8.5                                 | 8.5          | 8.5        |
|          | 40       |           | 151  | 5755        | 8.5                                 | 8.5          | 8.5        |
|          |          |           | 159  | 5795        | 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

| EN 300 440     | Limits                                                                                                                                                                                                           |                                  |                     |             |                |                           |                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------|-------------|----------------|---------------------------|----------------------------------|
| 4.2.2.4        | The transmitter maximum e.i.r.p. under normal and extreme test conditions is provided in table 2.                                                                                                                |                                  |                     |             |                |                           |                                  |
|                | <b>Table 2 : Maximum radiated power (e.i.r.p.)</b>                                                                                                                                                               |                                  |                     |             |                |                           |                                  |
|                | <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> | Frequency Band [MHz]             | Mean e.i.r.p. [dBm] | Application | 5 725 to 5 875 | 25 mW e.i.r.p (13.98 dBm) | Non-specific short range devices |
|                | Frequency Band [MHz]                                                                                                                                                                                             | Mean e.i.r.p. [dBm]              | Application         |             |                |                           |                                  |
| 5 725 to 5 875 | 25 mW e.i.r.p (13.98 dBm)                                                                                                                                                                                        | Non-specific short range devices |                     |             |                |                           |                                  |
|                |                                                                                                                                                                                                                  |                                  |                     |             |                |                           |                                  |

#### 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<br>Nominal voltage:3.3V |                            |       |     |               |          | Normal Condition<br>Ambient temperature<br>+23°C |               | Extreme Condition<br>High temperature<br>+70°C |               | Extreme Condition<br>Low temperature<br>-10°C |               |
|------------------------------|----------------------------|-------|-----|---------------|----------|--------------------------------------------------|---------------|------------------------------------------------|---------------|-----------------------------------------------|---------------|
| Mode                         | Meas<br>Duty<br>cycle<br>% | Rate  | #Ch | Freq<br>[MHz] | Antenna  | Measured<br>Conducted<br>[dBm]                   | EIRP<br>[dBm] | Measured<br>Conducted<br>[dBm]                 | EIRP<br>[dBm] | Measured<br>Conducted<br>[dBm]                | EIRP<br>[dBm] |
| 802.11a                      | 97.3                       | 6Mbps | 149 | 5745          | SISO A   | 8.5                                              | 13.5          | 8.3                                            | 13.3          | 8.8                                           | 13.8          |
|                              |                            |       |     |               | SISO B   | 8.4                                              | 13.4          | 8.9                                            | 13.9          | 8.7                                           | 13.7          |
|                              |                            |       | 161 | 5805          | SISO A   | 8.6                                              | 13.6          | 8.4                                            | 13.4          | 8.6                                           | 13.6          |
|                              |                            |       |     |               | SISO B   | 8.5                                              | 13.5          | 8.4                                            | 13.4          | 8.4                                           | 13.4          |
|                              |                            |       | 165 | 5825          | SISO A   | 8.5                                              | 13.5          | 8.9                                            | 13.9          | 8.9                                           | 13.9          |
|                              |                            |       |     |               | SISO B   | 8.7                                              | 13.7          | 8.7                                            | 13.7          | 8.5                                           | 13.5          |
| 802.11n20                    | 98.5                       | HT0   | 149 | 5745          | SISO A   | 8.6                                              | 13.6          | 8.6                                            | 13.6          | 8.6                                           | 13.6          |
|                              |                            |       |     |               | SISO B   | 8.7                                              | 13.7          | 8.5                                            | 13.5          | 8.7                                           | 13.7          |
|                              |                            |       | 161 | 5805          | SISO A   | 8.6                                              | 13.6          | 8.6                                            | 13.6          | 8.3                                           | 13.3          |
|                              |                            |       |     |               | SISO B   | 8.5                                              | 13.5          | 8.0                                            | 13.0          | 8.1                                           | 13.1          |
|                              |                            |       | 165 | 5825          | SISO A   | 8.3                                              | 13.3          | 8.4                                            | 13.4          | 8.3                                           | 13.3          |
|                              |                            |       |     |               | SISO B   | 8.5                                              | 13.5          | 8.8                                            | 13.8          | 8.3                                           | 13.3          |
|                              | 98.5                       | HT8   | 149 | 5745          | MIMO A+B | 8.5                                              | 13.5          | 8.7                                            | 13.7          | 8.6                                           | 13.6          |
|                              |                            |       | 161 | 5805          | MIMO A+B | 8.5                                              | 13.5          | 8.7                                            | 13.7          | 8.4                                           | 13.4          |
|                              |                            |       | 165 | 5825          | MIMO A+B | 8.5                                              | 13.5          | 8.7                                            | 13.7          | 8.3                                           | 13.3          |
|                              |                            |       |     |               |          |                                                  |               |                                                |               |                                               |               |
| 802.11n40                    | 98.6                       | HT0   | 151 | 5755          | SISO A   | 8.5                                              | 13.5          | 8.1                                            | 13.1          | 7.8                                           | 12.8          |
|                              |                            |       |     |               | SISO B   | 8.4                                              | 13.4          | 8.6                                            | 13.6          | 8.7                                           | 13.7          |
|                              |                            |       | 159 | 5795          | SISO A   | 8.4                                              | 13.4          | 8.8                                            | 13.8          | 8.5                                           | 13.5          |
|                              |                            |       |     |               | SISO B   | 8.4                                              | 13.4          | 8.7                                            | 13.7          | 8.4                                           | 13.4          |
|                              | 98.6                       | HT8   | 151 | 5755          | MIMO A+B | 8.5                                              | 13.5          | 8.3                                            | 13.3          | 8.8                                           | 13.8          |
|                              |                            |       | 159 | 5795          | MIMO A+B | 8.6                                              | 13.6          | 8.5                                            | 13.5          | 8.3                                           | 13.3          |
|                              |                            |       |     |               | SISO A   | 8.4                                              | 13.4          | 8.3                                            | 13.3          | 8.5                                           | 13.5          |
|                              |                            |       |     |               | SISO B   | 8.5                                              | 13.5          | 7.9                                            | 12.9          | 8.6                                           | 13.6          |
| 802.11ac80                   | 98.8                       | VHT0  | 155 | 5775          | MIMO A+B | 8.5                                              | 13.5          | 8.9                                            | 13.9          | 8.6                                           | 13.6          |
|                              | 98.5                       |       |     |               |          |                                                  |               |                                                |               |                                               |               |
| 802.11ax20                   | 98.5                       | HE0   | 149 | 5745          | SISO A   | 8.6                                              | 13.6          | 8.2                                            | 13.2          | 8.5                                           | 13.5          |
|                              |                            |       |     |               | SISO B   | 8.6                                              | 13.6          | 8.2                                            | 13.2          | 8.4                                           | 13.4          |
|                              |                            |       | 161 | 5805          | SISO A   | 8.6                                              | 13.6          | 8.4                                            | 13.4          | 8.6                                           | 13.6          |
|                              |                            |       |     |               | SISO B   | 8.5                                              | 13.5          | 8.4                                            | 13.4          | 8.7                                           | 13.7          |
|                              |                            |       | 165 | 5825          | SISO A   | 8.4                                              | 13.4          | 8.5                                            | 13.5          | 8.7                                           | 13.7          |
|                              |                            |       |     |               | SISO B   | 8.6                                              | 13.6          | 8.8                                            | 13.8          | 8.6                                           | 13.6          |
|                              | 98.5                       |       | 149 | 5745          | MIMO A+B | 8.4                                              | 13.4          | 8.5                                            | 13.5          | 8.7                                           | 13.7          |
|                              |                            |       | 161 | 5805          | MIMO A+B | 8.6                                              | 13.6          | 8.4                                            | 13.4          | 8.5                                           | 13.5          |
|                              |                            |       | 165 | 5825          | MIMO A+B | 8.4                                              | 13.4          | 8.6                                            | 13.6          | 8.7                                           | 13.7          |
| 802.11ax40                   | 98.2                       | HE0   | 151 | 5755          | SISO A   | 8.4                                              | 13.4          | 8.1                                            | 13.1          | 8.9                                           | 13.9          |
|                              |                            |       |     |               | SISO B   | 8.6                                              | 13.6          | 8.3                                            | 13.3          | 8.8                                           | 13.8          |
|                              |                            |       | 159 | 5795          | SISO A   | 8.4                                              | 13.4          | 8.6                                            | 13.6          | 8.4                                           | 13.4          |
|                              |                            |       |     |               | SISO B   | 8.4                                              | 13.4          | 8.7                                            | 13.7          | 8.4                                           | 13.4          |
|                              | 98.2                       |       | 151 | 5755          | MIMO A+B | 8.6                                              | 13.6          | 8.7                                            | 13.7          | 8.7                                           | 13.7          |
|                              |                            |       | 159 | 5795          | MIMO A+B | 8.4                                              | 13.4          | 8.6                                            | 13.6          | 8.5                                           | 13.5          |
| 802.11ax80                   | 97.6                       | HE0   | 155 | 5775          | SISO A   | 8.5                                              | 13.5          | 8.3                                            | 13.3          | 8.6                                           | 13.6          |
|                              | SISO B                     |       |     |               | 8.7      | 13.7                                             | 8.5           | 13.5                                           | 8.7           | 13.7                                          |               |
|                              | 98.3                       |       |     |               | MIMO A+B | 8.5                                              | 13.5          | 8.5                                            | 13.5          | 8.7                                           | 13.7          |

| EIRP<br>Ambient temperature: +23°C |                   |          |           |            |          | Extreme Condition<br>High Voltage<br>V <sub>max</sub> = +3.465 V |            | Extreme Condition<br>Low Voltage<br>V <sub>min</sub> = +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   | 8.5                                                              | 13.5       | 7.9                                                             | 12.9       |
|                                    |                   |          |           |            | SISO B   | 8.4                                                              | 13.4       | 8.8                                                             | 13.8       |
|                                    |                   |          | 161       | 5805       | SISO A   | 8.5                                                              | 13.5       | 7.5                                                             | 12.5       |
|                                    |                   |          |           |            | SISO B   | 8.7                                                              | 13.7       | 8.9                                                             | 13.9       |
|                                    |                   |          | 165       | 5825       | SISO A   | 8.8                                                              | 13.8       | 8.7                                                             | 13.7       |
|                                    |                   |          |           |            | SISO B   | 8.5                                                              | 13.5       | 8.3                                                             | 13.3       |
| 802.11n20                          | 98.5              | HT0      | 149       | 5745       | SISO A   | 8.4                                                              | 13.4       | 8.3                                                             | 13.3       |
|                                    |                   |          |           |            | SISO B   | 8.5                                                              | 13.5       | 8.5                                                             | 13.5       |
|                                    |                   |          | 161       | 5805       | SISO A   | 8.2                                                              | 13.2       | 8.3                                                             | 13.3       |
|                                    |                   |          |           |            | SISO B   | 8.0                                                              | 13.0       | 8.5                                                             | 13.5       |
|                                    |                   |          | 165       | 5825       | SISO A   | 8.5                                                              | 13.5       | 8.3                                                             | 13.3       |
|                                    |                   |          |           |            | SISO B   | 8.6                                                              | 13.6       | 8.3                                                             | 13.3       |
|                                    | 98.5              | HT8      | 149       | 5745       | MIMO A+B | 8.8                                                              | 13.8       | 8.4                                                             | 13.4       |
|                                    |                   |          | 161       | 5805       | MIMO A+B | 8.3                                                              | 13.3       | 8.1                                                             | 13.1       |
|                                    |                   |          | 165       | 5825       | MIMO A+B | 8.4                                                              | 13.4       | 8.4                                                             | 13.4       |
|                                    |                   |          | 802.11n40 | 98.6       | HT0      | 151                                                              | 5755       | SISO A                                                          | 8.3        |
| SISO B                             | 8.9               | 13.9     |           |            |          |                                                                  |            | 8.8                                                             | 13.8       |
| 159                                | 5795              | SISO A   |           |            |          | 8.4                                                              | 13.4       | 8.4                                                             | 13.4       |
|                                    |                   | SISO B   |           |            |          | 8.4                                                              | 13.4       | 8.4                                                             | 13.4       |
| 98.6                               | HT8               | 151      |           | 5755       | MIMO A+B | 8.7                                                              | 13.7       | 8.4                                                             | 13.4       |
|                                    |                   | 159      |           | 5795       | MIMO A+B | 8.5                                                              | 13.5       | 8.4                                                             | 13.4       |
| 802.11ac80                         | 98.8              | VHT0     | 155       | 5775       | SISO A   | 8.2                                                              | 13.2       | 7.7                                                             | 12.7       |
|                                    | SISO B            |          |           |            | 8.5      | 13.5                                                             | 8.3        | 13.3                                                            |            |
|                                    | 98.5              |          |           |            | MIMO A+B | 8.5                                                              | 13.5       | 8.6                                                             | 13.6       |
| 802.11ax20                         | 98.5              | HE0      | 149       | 5745       | SISO A   | 8.1                                                              | 13.1       | 7.8                                                             | 12.8       |
|                                    |                   |          |           |            | SISO B   | 8.3                                                              | 13.3       | 8.4                                                             | 13.4       |
|                                    |                   |          | 161       | 5805       | SISO A   | 8.3                                                              | 13.3       | 7.9                                                             | 12.9       |
|                                    |                   |          |           |            | SISO B   | 8.1                                                              | 13.1       | 8.6                                                             | 13.6       |
|                                    |                   |          | 165       | 5825       | SISO A   | 8.7                                                              | 13.7       | 8.6                                                             | 13.6       |
|                                    |                   |          |           |            | SISO B   | 8.5                                                              | 13.5       | 8.4                                                             | 13.4       |
|                                    | 98.5              |          | 149       | 5745       | MIMO A+B | 8.2                                                              | 13.2       | 8.7                                                             | 13.7       |
|                                    |                   |          | 161       | 5805       | MIMO A+B | 8.4                                                              | 13.4       | 8.4                                                             | 13.4       |
| 165                                |                   | 5825     | MIMO A+B  | 8.6        | 13.6     | 8.9                                                              | 13.9       |                                                                 |            |
| 802.11ax40                         | 98.2              | HE0      | 151       | 5755       | SISO A   | 8.1                                                              | 13.1       | 7.8                                                             | 12.8       |
|                                    |                   |          |           |            | SISO B   | 8.9                                                              | 13.9       | 8.3                                                             | 13.3       |
|                                    |                   |          | 159       | 5795       | SISO A   | 8.6                                                              | 13.6       | 8.4                                                             | 13.4       |
|                                    |                   |          |           |            | SISO B   | 8.5                                                              | 13.5       | 8.5                                                             | 13.5       |
|                                    | 98.2              |          | 151       | 5755       | MIMO A+B | 8.4                                                              | 13.4       | 8.5                                                             | 13.5       |
| 159                                | 5795              | MIMO A+B | 8.6       | 13.6       | 8.7      | 13.7                                                             |            |                                                                 |            |
| 802.11ax80                         | 97.6              | HE0      | 155       | 5775       | SISO A   | 8.7                                                              | 13.7       | 7.6                                                             | 12.6       |
|                                    | SISO B            |          |           |            | 8.6      | 13.6                                                             | 8.7        | 13.7                                                            |            |
|                                    | 98.3              |          |           |            | MIMO A+B | 8.5                                                              | 13.5       | 8.2                                                             | 13.2       |

## B.2.2 Transmitter: Permitted range of operating frequencies

### Test limits

| EN 300 440 | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.2.3.5    | <p>The width of the power spectrum envelope is <math>f_H - f_L</math> 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 <math>f_L</math> and the highest value of <math>f_H</math> resulting from the adjustment of the equipment to the lowest and highest operating frequencies.</p> <p>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.</p> <p>The frequency band must be comprised between 5725 MHz to 5875 MHz</p> |

### 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<br>Ambient temperature<br>+23°C |                         |                                          | Extreme Condition<br>High temperature<br>+70°C |                         |                                          | Extreme Condition<br>Low temperature<br>-10°C |                         |                                          |
|-----------------------|------------|-------|------|-----|---------------|--------------------------------------------------|-------------------------|------------------------------------------|------------------------------------------------|-------------------------|------------------------------------------|-----------------------------------------------|-------------------------|------------------------------------------|
| Chain                 | Mode       | Rate  | Ant  | #Ch | Freq<br>(MHz) | f <sub>L</sub><br>[MHz]                          | f <sub>H</sub><br>[MHz] | f <sub>H</sub> - f <sub>L</sub><br>[MHz] | f <sub>L</sub><br>[MHz]                        | f <sub>H</sub><br>[MHz] | f <sub>H</sub> - f <sub>L</sub><br>[MHz] | f <sub>L</sub><br>[MHz]                       | f <sub>H</sub><br>[MHz] | f <sub>H</sub> - f <sub>L</sub><br>[MHz] |
| A                     | 802.11a    | 6Mbps | SISO | 149 | 5745          | 5731.86                                          | NA                      | NA                                       | 5731.88                                        | NA                      | NA                                       | 5731.87                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5835.58                 | 103.72                                   | NA                                             | 5835.69                 | 103.81                                   | NA                                            | 5836.08                 | 104.21                                   |
|                       | 802.11n20  | HT0   | SISO | 149 | 5745          | 5731.83                                          | NA                      | NA                                       | 5731.84                                        | NA                      | NA                                       | 5731.85                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.07                 | 104.24                                   | NA                                             | 5836.01                 | 104.17                                   | NA                                            | 5835.72                 | 103.87                                   |
|                       |            | HT8   | MIMO | 149 | 5745          | 5732.48                                          | NA                      | NA                                       | 5732.5                                         | NA                      | NA                                       | 5732.48                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.05                 | 103.57                                   | NA                                             | 5836.32                 | 103.82                                   | NA                                            | 5836.08                 | 103.6                                    |
|                       | 802.11n40  | HT0   | SISO | 151 | 5755          | 5732.81                                          | NA                      | NA                                       | 5732.52                                        | NA                      | NA                                       | 5733.44                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.15                 | 81.34                                    | NA                                             | 5814.09                 | 81.57                                    | NA                                            | 5814.23                 | 80.79                                    |
|                       |            | HT8   | MIMO | 151 | 5755          | 5734.31                                          | NA                      | NA                                       | 5734.41                                        | NA                      | NA                                       | 5734.06                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.01                 | 79.7                                     | NA                                             | 5814.1                  | 79.69                                    | NA                                            | 5814.23                 | 80.17                                    |
|                       | 802.11ac80 | VHT0  | SISO | 155 | 5775          | 5732.86                                          | 5818.12                 | 85.26                                    | 5732.75                                        | 5817.51                 | 84.76                                    | 5732.74                                       | 5817.24                 | 84.5                                     |
|                       |            |       | MIMO | 155 | 5775          | 5735.23                                          | 5814.37                 | 79.14                                    | 5735.62                                        | 5815.02                 | 79.4                                     | 5735.57                                       | 5814.37                 | 78.8                                     |
|                       | 802.11ax20 | HE0   | SISO | 149 | 5745          | 5731.61                                          | NA                      | NA                                       | 5731.66                                        | NA                      | NA                                       | 5731.53                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5835.79                 | 104.18                                   | NA                                             | 5836.1                  | 104.44                                   | NA                                            | 5835.79                 | 104.26                                   |
|                       |            |       | MIMO | 149 | 5745          | 5732.47                                          | NA                      | NA                                       | 5732.58                                        | NA                      | NA                                       | 5732.22                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.17                 | 103.7                                    | NA                                             | 5836.1                  | 103.52                                   | NA                                            | 5836.19                 | 103.97                                   |
|                       | 802.11ax40 | HE0   | SISO | 151 | 5755          | 5732.44                                          | NA                      | NA                                       | 5732.05                                        | NA                      | NA                                       | 5732.71                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.34                 | 81.9                                     | NA                                             | 5814.39                 | 82.34                                    | NA                                            | 5814.47                 | 81.76                                    |
|                       |            |       | MIMO | 151 | 5755          | 5733.11                                          | NA                      | NA                                       | 5733.67                                        | NA                      | NA                                       | 5733.82                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.39                 | 81.28                                    | NA                                             | 5814.69                 | 81.02                                    | NA                                            | 5814.47                 | 80.65                                    |
|                       | 802.11ax80 | HE0   | SISO | 155 | 5775          | 5732.34                                          | 5817.91                 | 85.57                                    | 5733.06                                        | 5816.61                 | 83.55                                    | 5732.97                                       | 5816.65                 | 83.68                                    |
|                       |            |       | MIMO | 155 | 5775          | 5735.05                                          | 5817.91                 | 82.86                                    | 5735.07                                        | 5815.09                 | 80.02                                    | 5735.39                                       | 5815.47                 | 80.08                                    |
| B                     | 802.11a    | 6Mbps | SISO | 149 | 5745          | 5731.85                                          | NA                      | NA                                       | 5731.88                                        | NA                      | NA                                       | 5731.85                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.31                 | 104.46                                   | NA                                             | 5835.93                 | 104.05                                   | NA                                            | 5835.65                 | 103.8                                    |
|                       | 802.11n20  | HT0   | SISO | 149 | 5745          | 5731.23                                          | NA                      | NA                                       | 5731.64                                        | NA                      | NA                                       | 5731.85                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.02                 | 104.79                                   | NA                                             | 5836.07                 | 104.43                                   | NA                                            | 5835.74                 | 103.89                                   |
|                       |            | HT8   | MIMO | 149 | 5745          | 5732.47                                          | NA                      | NA                                       | 5732.16                                        | NA                      | NA                                       | 5732.12                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5835.98                 | 103.51                                   | NA                                             | 5836.07                 | 103.91                                   | NA                                            | 5836.03                 | 103.91                                   |
|                       | 802.11n40  | HT0   | SISO | 151 | 5755          | 5732.48                                          | NA                      | NA                                       | 5732.47                                        | NA                      | NA                                       | 5732.79                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.18                 | 81.7                                     | NA                                             | 5814.09                 | 81.62                                    | NA                                            | 5814.09                 | 81.3                                     |
|                       |            | HT8   | MIMO | 151 | 5755          | 5733.76                                          | NA                      | NA                                       | 5734.06                                        | NA                      | NA                                       | 5734.03                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.16                 | 80.4                                     | NA                                             | 5814.08                 | 80.02                                    | NA                                            | 5814.11                 | 80.08                                    |
|                       | 802.11ac80 | VHT0  | SISO | 155 | 5775          | 5732.73                                          | 5817.12                 | 84.39                                    | 5732.77                                        | 5816.60                 | 83.83                                    | 5733.41                                       | 5817.50                 | 84.09                                    |
|                       |            |       | MIMO | 155 | 5775          | 5734.98                                          | 5815                    | 80.02                                    | 5735.02                                        | 5815.05                 | 80.03                                    | 5734.36                                       | 5815.01                 | 80.65                                    |
|                       | 802.11ax20 | HE0   | SISO | 149 | 5745          | 5731.63                                          | NA                      | NA                                       | 5731.66                                        | NA                      | NA                                       | 5731.52                                       | NA                      | NA                                       |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.11                 | 104.48                                   | NA                                             | 5836.16                 | 104.5                                    | NA                                            | 5836.12                 | 104.6                                    |
|                       |            |       | MIMO | 149 | 5745          | 5731.63                                          | NA                      | 104.48                                   | 5731.66                                        | NA                      | NA                                       | 5731.52                                       | NA                      | 104.6                                    |
|                       |            |       |      | 165 | 5825          | NA                                               | 5836.09                 | 104.01                                   | NA                                             | 5836.38                 | 104.37                                   | NA                                            | 5836.08                 | 103.81                                   |
|                       | 802.11ax40 | HE0   | SISO | 151 | 5755          | 5732.01                                          | NA                      | NA                                       | 5732.26                                        | NA                      | NA                                       | 5732.16                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.28                 | 82.27                                    | NA                                             | 5814.44                 | 82.18                                    | NA                                            | 5814.41                 | 82.25                                    |
|                       |            |       | MIMO | 151 | 5755          | 5733.14                                          | NA                      | NA                                       | 5733.55                                        | NA                      | NA                                       | 5733.52                                       | NA                      | NA                                       |
|                       |            |       |      | 159 | 5795          | NA                                               | 5814.29                 | 81.15                                    | NA                                             | 5814.44                 | 80.89                                    | NA                                            | 5814.43                 | 80.91                                    |
|                       | 802.11ax80 | HE0   | SISO | 155 | 5775          | 5732.23                                          | 5816.77                 | 84.54                                    | 5732.04                                        | 5817.12                 | 85.08                                    | 5732.42                                       | 5816.26                 | 83.84                                    |
|                       |            |       | MIMO | 155 | 5775          | 5734.61                                          | 5815.25                 | 80.64                                    | 5735.03                                        | 5815.65                 | 80.62                                    | 5734.98                                       | 5814.92                 | 79.94                                    |

| Ambient temperature<br>+23°C |            |       |      |     |               | Extreme Condition<br>High Voltage<br>V <sub>max</sub> = +3.465 V |                         |                                          | Extreme Condition<br>Low Voltage<br>V <sub>min</sub> = +3.135 V |                         |                                          |
|------------------------------|------------|-------|------|-----|---------------|------------------------------------------------------------------|-------------------------|------------------------------------------|-----------------------------------------------------------------|-------------------------|------------------------------------------|
| Chain                        | Mode       | Rate  | Ant  | #Ch | Freq<br>(MHz) | f <sub>L</sub><br>[MHz]                                          | f <sub>H</sub><br>[MHz] | f <sub>H</sub> - f <sub>L</sub><br>[MHz] | f <sub>L</sub><br>[MHz]                                         | f <sub>H</sub><br>[MHz] | f <sub>H</sub> - f <sub>L</sub><br>[MHz] |
| A                            | 802.11a    | 6Mbps | SISO | 149 | 5745          | 5731.85                                                          | NA                      | NA                                       | 5731.84                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5835.90                 | 104.05                                   | NA                                                              | 5835.40                 | 103.56                                   |
|                              | 802.11n20  | HT0   | SISO | 149 | 5745          | 5731.85                                                          | NA                      | NA                                       | 5731.84                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.02                 | 104.17                                   | NA                                                              | 5836.27                 | 104.43                                   |
|                              |            | HT8   | MIMO | 149 | 5745          | 5732.47                                                          | NA                      | NA                                       | 5732.47                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA 47                                                            | 5836.02                 | 103.55                                   | NA                                                              | 5836.03                 | 103.56                                   |
|                              | 802.11n40  | HT0   | SISO | 151 | 5755          | 5732.81                                                          | NA                      | NA                                       | 5733.14                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.03                 | 81.22                                    | NA                                                              | 5814.09                 | 80.95                                    |
|                              |            | HT8   | MIMO | 151 | 5755          | 5734.02                                                          | NA                      | NA                                       | 5734.08                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.06                 | 80.04                                    | NA                                                              | 5814.52                 | 80.44                                    |
|                              | 802.11ac80 | VHT0  | SISO | 155 | 5775          | 5732.83                                                          | 5817.5                  | 84.67                                    | 5733.08                                                         | 5817.49                 | 84.41                                    |
|                              |            |       | MIMO |     | 5775          | 5735.35                                                          | 5815                    | 79.65                                    | 5735.28                                                         | 5815.01                 | 79.73                                    |
|                              | 802.11ax20 | HE0   | SISO | 149 | 5745          | 5731.67                                                          | NA                      | NA                                       | 5731.63                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.05                 | 104.38                                   | NA                                                              | 5835.74                 | 104.11                                   |
|                              |            |       | MIMO | 149 | 5745          | 5732.48                                                          | NA                      | NA                                       | 5732.47                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5835.94                 | 103.46                                   | NA                                                              | 5836.12                 | 103.65                                   |
|                              | 802.11ax40 | HE0   | SISO | 151 | 5755          | 5732.41                                                          | NA                      | NA                                       | 5732.74                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.44                 | 82.03                                    | NA                                                              | 5814.39                 | 81.65                                    |
|                              |            |       | MIMO | 151 | 5755          | 5733.58                                                          | NA                      | NA                                       | 5733.56                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.35                 | 80.77                                    | NA                                                              | 5814.33                 | 80.77                                    |
|                              | 802.11ax80 | HE0   | SISO | 155 | 5775          | 5732.34                                                          | 5817.09                 | 84.75                                    | 5732.41                                                         | 5817.06                 | 84.65                                    |
|                              |            |       | MIMO |     | 5775          | 5735.37                                                          | 5815.21                 | 79.84                                    | 5735.49                                                         | 5814.67                 | 79.18                                    |
| B                            | 802.11a    | 6Mbps | SISO | 149 | 5745          | 5731.87                                                          | NA                      | NA                                       | 5731.60                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.02                 | 104.15                                   | NA                                                              | 5836.03                 | 104.43                                   |
|                              | 802.11n20  | HT0   | SISO | 149 | 5745          | 5731.62                                                          | NA                      | NA                                       | 5731.60                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.27                 | 104.65                                   | NA                                                              | 5836.29                 | 104.69                                   |
|                              |            | HT8   | MIMO | 149 | 5745          | 5732.11                                                          | NA                      | NA                                       | 5732.17                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5835.94                 | 103.83                                   | NA                                                              | 5836.02                 | 103.85                                   |
|                              | 802.11n40  | HT0   | SISO | 151 | 5755          | 5732.78                                                          | NA                      | NA                                       | 5732.78                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.27                 | 81.49                                    | NA                                                              | 5814.06                 | 81.28                                    |
|                              |            | HT8   | MIMO | 151 | 5755          | 5734.06                                                          | NA                      | NA                                       | 5733.73                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.28                 | 80.22                                    | NA                                                              | 5814.04                 | 80.31                                    |
|                              | 802.11ac80 | VHT0  | SISO | 155 | 5775          | 5732.49                                                          | 5817.49                 | 85                                       | 5732.49                                                         | 5818.1                  | 85.61                                    |
|                              |            |       | MIMO |     | 5775          | 5734.73                                                          | 5815.63                 | 80.9                                     | 5734.67                                                         | 5815.63                 | 80.96                                    |
|                              | 802.11ax20 | HE0   | SISO | 149 | 5745          | 5731.54                                                          | NA                      | NA                                       | 5731.61                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.09                 | 104.55                                   | NA                                                              | 5836.49                 | 104.88                                   |
|                              |            |       | MIMO | 149 | 5745          | 5732.25                                                          | NA                      | NA                                       | 5731.93                                                         | NA                      | NA                                       |
|                              |            |       |      | 165 | 5825          | NA                                                               | 5836.24                 | 103.99                                   | NA                                                              | 5836.03                 | 104.10                                   |
|                              | 802.11ax40 | HE0   | SISO | 151 | 5755          | 5731.26                                                          | NA                      | NA                                       | 5731.26                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | NA                      | 83.14                                    | NA                                                              | 5814.43                 | 83.17                                    |
|                              |            |       | MIMO | 151 | 5755          | 5733.44                                                          | NA                      | NA                                       | 5733.77                                                         | NA                      | NA                                       |
|                              |            |       |      | 159 | 5795          | NA                                                               | 5814.34                 | 80.90                                    | NA                                                              | 5814.39                 | 80.62                                    |
|                              | 802.11ax80 | HE0   | SISO | 155 | 5775          | 5731.94                                                          | 5817.6                  | 85.66                                    | 5732.88                                                         | 5818.05                 | 85.17                                    |
|                              |            |       | MIMO |     | 5775          | 5734.91                                                          | 5815                    | 80.09                                    | 5734.50                                                         | 5814.81                 | 80.31                                    |

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

### Standard references

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

### Test condition

| EN 300 440 | Test conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.2.4.3    | <p>The level of spurious emissions shall be measured as either:</p> <p>a) their power level in a specified load (conducted emission); and their effective radiated power when radiated by the cabinet and structure of the equipment (cabinet radiation); or</p> <p>b) their effective radiated power when radiated by the cabinet and the integral or dedicated antenna, in the case of equipment fitted with such an antenna and no permanent RF connector</p> |

### 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 360° 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  | Margin | Polarization |
|-----------|------------|--------|--------|--------------|
| MHz       | dBm        | dBm    | dB     |              |
| 96.0      | -61.6      | -51.85 | 9.8    | H            |
| 192.2     | -63.4      | -51.85 | 11.5   | H            |
| 860.5     | -57.9      | -51.85 | 6.0    | V            |

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

### Tx Spurious Emissions – 1 GHz to 40GHz

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3358.0    | -49.5 | -27.85 | 21.6   | H            |
| 17069.1   | -57.7 | -27.85 | 29.8   | H            |
| 39659.5   | -45.5 | -27.85 | 17.6   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3294.0    | -49.1 | -27.85 | 21.2   | H            |
| 17997.1   | -58.2 | -27.85 | 30.3   | V            |
| 39848.5   | -44.9 | -27.85 | 17.0   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 2964.5    | -49.3 | -27.85 | 21.4   | H            |
| 17997.6   | -59.0 | -27.85 | 31.1   | H            |
| 39859.8   | -45.0 | -27.85 | 17.1   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3136.5    | -48.6 | -27.85 | 20.7   | H            |
| 17103.4   | -56.0 | -27.85 | 28.1   | V            |
| 39851.5   | -45.4 | -27.85 | 17.5   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3190.0    | -49.4 | -27.85 | 21.5   | V            |
| 17997.6   | -59.1 | -27.85 | 31.2   | H            |
| 27739.8   | -52.5 | -27.85 | 24.6   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 1896.5    | -52.4 | -27.85 | 24.5   | V            |
| 17997.6   | -58.9 | -27.85 | 31.0   | V            |
| 39829.0   | -45.4 | -27.85 | 17.5   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 2703.0    | -49.8 | -27.85 | 21.9   | H            |
| 11603.1   | -60.4 | -27.85 | 32.5   | V            |
| 39865.8   | -45.6 | -27.85 | 17.7   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3280.0    | -49.4 | -27.85 | 21.5   | H            |
| 17120.8   | -56.6 | -27.85 | 28.7   | V            |
| 39033.2   | -47.7 | -27.85 | 19.8   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3138.0    | -49.1 | -27.85 | 21.2   | H            |
| 17049.3   | -57.1 | -27.85 | 29.2   | V            |
| 39844.8   | -45.6 | -27.85 | 17.7   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3131.0    | -49.4 | -27.85 | 21.5   | V            |
| 16435.0   | -56.5 | -27.85 | 28.6   | V            |
| 39845.5   | -45.3 | -27.85 | 17.4   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3367.0    | -49.7 | -27.85 | 21.8   | V            |
| 16435.5   | -56.0 | -27.85 | 28.1   | V            |
| 39039.2   | -48.2 | -27.85 | 20.3   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3192.0    | -49.2 | -27.85 | 21.3   | V            |
| 17997.6   | -58.8 | -27.85 | 30.9   | H            |
| 39845.5   | -45.0 | -27.85 | 17.2   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3174.5    | -49.2 | -27.85 | 21.3   | H            |
| 11553.3   | -58.9 | -27.85 | 31.0   | V            |
| 17330.1   | -59.7 | -27.85 | 31.8   | V            |
| 39854.5   | -45.5 | -27.85 | 17.6   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3372.0    | -49.7 | -27.85 | 21.8   | H            |
| 11552.8   | -58.3 | -27.85 | 30.4   | V            |
| 39847.8   | -44.3 | -27.85 | 16.4   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3227.0    | -49.6 | -27.85 | 21.7   | V            |
| 17331.1   | -59.0 | -27.85 | 31.0   | V            |
| 39850.8   | -45.2 | -27.85 | 17.3   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3315.5    | -49.1 | -27.85 | 21.2   | V            |
| 17331.1   | -60.2 | -27.85 | 32.3   | V            |
| 39848.5   | -44.9 | -27.85 | 17.0   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3249.0    | -49.6 | -27.85 | 21.7   | V            |
| 11553.8   | -58.8 | -27.85 | 30.9   | V            |
| 17331.1   | -51.9 | -27.85 | 24.0   | V            |
| 39855.2   | -44.5 | -27.85 | 16.7   | V            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3215.0    | -49.4 | -27.85 | 21.5   | V            |
| 7180.6    | -59.7 | -27.85 | 31.8   | H            |
| 11474.5   | -53.8 | -27.85 | 25.9   | H            |
| 39847.8   | -45.1 | -27.85 | 17.2   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3106.5    | -49.5 | -27.85 | 21.6   | H            |
| 11473.1   | -58.8 | -27.85 | 30.9   | V            |
| 39852.2   | -45.2 | -27.85 | 17.3   | H            |

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

| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 3062.5    | -49.9 | -27.85 | 22.0   | V            |
| 11474.0   | -51.9 | -27.85 | 24.0   | V            |
| 22948.4   | -56.8 | -27.85 | 28.9   | V            |

## B.2.4 Blocking or desensitization

### Test limits

| EN 300 440                                                                                                                               | Limits                                                                                                                                                                                |                   |       |   |             |   |             |   |             |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------|---|-------------|---|-------------|---|-------------|
| 4.3.4.4                                                                                                                                  | 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.   |                   |       |   |             |   |             |   |             |
|                                                                                                                                          | <b>Table 6: Limits for blocking desensitization</b>                                                                                                                                   |                   |       |   |             |   |             |   |             |
|                                                                                                                                          | <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> | Receiver category | Limit | 1 | -30 dBm + k | 2 | -45 dBm + k | 3 | -60 dBm + k |
|                                                                                                                                          | Receiver category                                                                                                                                                                     | Limit             |       |   |             |   |             |   |             |
|                                                                                                                                          | 1                                                                                                                                                                                     | -30 dBm + k       |       |   |             |   |             |   |             |
|                                                                                                                                          | 2                                                                                                                                                                                     | -45 dBm + k       |       |   |             |   |             |   |             |
|                                                                                                                                          | 3                                                                                                                                                                                     | -60 dBm + k       |       |   |             |   |             |   |             |
|                                                                                                                                          | The correction factor, <i>k</i> , is as follows:                                                                                                                                      |                   |       |   |             |   |             |   |             |
|                                                                                                                                          | $k = -20\log f - 10\log BW$                                                                                                                                                           |                   |       |   |             |   |             |   |             |
|                                                                                                                                          | Where:                                                                                                                                                                                |                   |       |   |             |   |             |   |             |
| <ul style="list-style-type: none"><li>- <i>f</i> is the frequency in GHz;</li><li>- <i>BW</i> is the channel bandwidth in MHz.</li></ul> |                                                                                                                                                                                       |                   |       |   |             |   |             |   |             |
| The factor <i>k</i> is limited within the following:                                                                                     |                                                                                                                                                                                       |                   |       |   |             |   |             |   |             |
| <ul style="list-style-type: none"><li>- - 40dB &lt; <i>k</i> &lt; 0 dB.</li></ul>                                                        |                                                                                                                                                                                       |                   |       |   |             |   |             |   |             |
| 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 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 [%] |
|------------------------------------------------------------|---------|
| -80.70                                                     | 15.05   |

- Minimum performance results with interferer**

Wanted signal mean power from companion device:

✓ Pmin [dBm] + 3dB = -77.70dBm

| Blocking signal<br>Frequency<br>( MHz ) | Minimum<br>Blocking signal<br>power (dBm) | PER (%) | Maximum Blocking<br>signal power<br>(dBm) | PER (%) | Verdict |
|-----------------------------------------|-------------------------------------------|---------|-------------------------------------------|---------|---------|
| 4775                                    | -67                                       | 0.05    | 8.00                                      | 18.40   | Pass    |
| 5375                                    | -68                                       | 0.05    | 5.30                                      | 1.40    | Pass    |
| 5575                                    | -68                                       | 0.15    | 5.00                                      | 2.80    | Pass    |
| 5995                                    | -69                                       | 0.20    | 5.30                                      | 1.70    | Pass    |
| 6195                                    | -67                                       | 0.05    | 6.00                                      | 14.00   | Pass    |
| 6795                                    | -70                                       | 0.05    | 10.00                                     | 16.50   | Pass    |

## B.2.5 Receiver: Spurious emissions (radiated)

### Test limits

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

### 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 360° 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 – 25 MHz 1 GHz

#### Rx Spurious Emissions – All modes

| Frequency | Quasi-Peak | Limit | Margin | Polarization |
|-----------|------------|-------|--------|--------------|
| MHz       | dBm        | dBm   | dB     |              |
| 25.3      | -67.1      | -54.9 | 12.3   | V            |
| 244.9     | -71.7      | -54.9 | 16.8   | H            |
| 930.6     | -62.9      | -54.9 | 8.1    | H            |

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  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 2481.5    | -63.7 | -44.85 | 18.8   | H            |
| 2663.5    | -61.5 | -44.85 | 16.7   | H            |
| 3194.5    | -57.2 | -44.85 | 12.3   | H            |
| 17793.0   | -56.3 | -44.85 | 11.4   | V            |
| 27542.4   | -55.1 | -44.85 | 10.2   | V            |
| 39678.4   | -52.9 | -44.85 | 8.0    | V            |

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

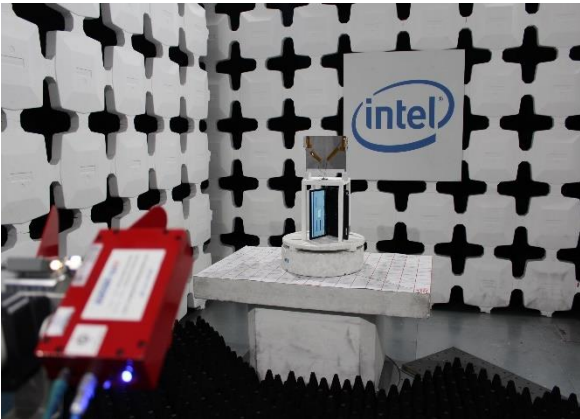
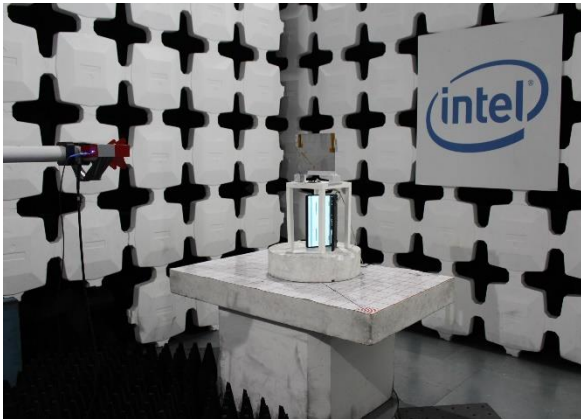
| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 2659.0    | -61.2 | -44.85 | 16.3   | H            |
| 3187.0    | -62.0 | -44.85 | 17.2   | H            |
| 15079.0   | -56.4 | -44.85 | 11.5   | V            |
| 39672.1   | -52.9 | -44.85 | 8.0    | V            |

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

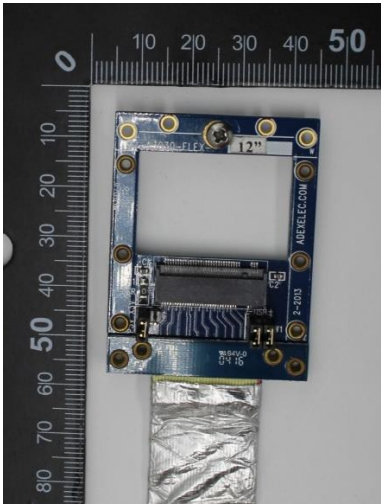
| Frequency | RMS   | Limit  | Margin | Polarization |
|-----------|-------|--------|--------|--------------|
| MHz       | dBm   | dBm    | dB     |              |
| 2658.5    | -61.4 | -44.85 | 16.5   | H            |
| 2724.0    | -60.8 | -44.85 | 16.0   | H            |
| 2751.5    | -61.7 | -44.85 | 16.8   | H            |
| 3191.5    | -61.9 | -44.85 | 17.0   | H            |
| 3230.0    | -62.6 | -44.85 | 17.7   | H            |
| 39669.7   | -52.9 | -44.85 | 8.0    | V            |

# Annex C. Photographs

## C.1 Test Setup

|                                                                                                    |                                                                                      |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Radiated Setup<br/>25 MHz – 1 GHz</p>                                                           | <p>Radiated Setup<br/>1 GHz – 6.4 GHz (Transmitter tests)</p>                        |
|                   |    |
| <p>Radiated Setup<br/>6.4 GHz – 18 GHz (Transmitter tests)<br/>1 GHz – 18 GHz (Receiver tests)</p> | <p>Radiated Setup<br/>18 GHz – 40 GHz</p>                                            |
|                 |  |

C.2 Test Sample

| Sample #01                                                                          |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Module Front                                                                        | Module Back                                                                          |
|    |    |
| Extender board                                                                      | Laptop                                                                               |
|   |   |
| Main Antenna                                                                        | Aux Antenna                                                                          |
|  |  |

| Sample #02                                                                          |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Module Front                                                                        | Module Back                                                                          |
|    |    |
| Extender board                                                                      | Laptop                                                                               |
|   |   |
| Main Antenna                                                                        | Aux Antenna                                                                          |
|  |  |

Sample #03

| Module Front   | Module Back |
|----------------|-------------|
|                |             |
| Extender board | Laptop      |
|                |             |
| Main Antenna   | Aux Antenna |
|                |             |

[Module Back](#)



Host (open)



| Sample #05     |             |
|----------------|-------------|
| Module Front   | Module Back |
|                |             |
| Extender board | Laptop      |
|                |             |
| Main Antenna   | Aux Antenna |
|                |             |

Sample #06

Module Front



Module Back



Extender board



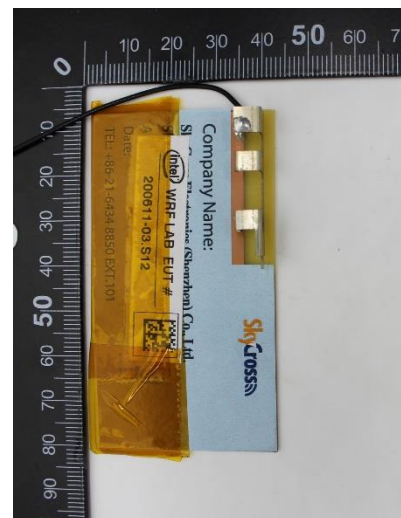
Laptop



Main Antenna

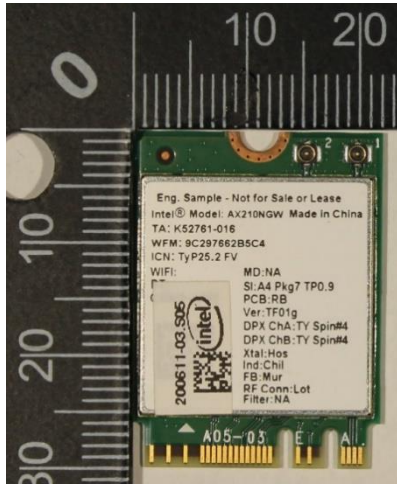


Aux Antenna



Sample #07

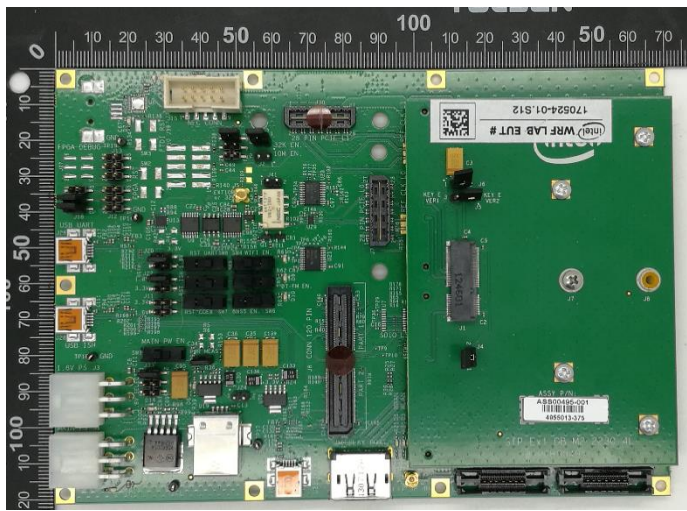
Module Front



Module Back



Extender board



Laptop



[Module Back](#)



Laptop



### **End of the report**

**This page is intentionally left blank and marks the last page of the test report.**