

# TEST REPORT

|                        |                                                                    |
|------------------------|--------------------------------------------------------------------|
| EUT Description        | WLAN and BT, 2x2 PCIe M.2 1216 adapter card                        |
| Brand Name             | Intel® Wi-Fi 6E AX211                                              |
| Model Name             | AX211D2W                                                           |
| Date of Test Start/End | 2020-12-04 / 2021-01-22                                            |
| Features               | 802.11ax, Dual Band, 2x2 Wi-Fi + Bluetooth® 5.2<br>(see section 5) |

|                      |                                                       |
|----------------------|-------------------------------------------------------|
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|                     |                                           |
|---------------------|-------------------------------------------|
| Reference Standards | ETSI EN 300 328 V2.2.2<br>(see section 1) |
|---------------------|-------------------------------------------|

|                            |                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------|
| Test Report identification | 201120-03.TR11                                                                                     |
| Revision Control           | Rev. 00<br>This test report revision replaces any previous test report revision<br>(see section 8) |

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## 1. Standards, reference documents and applicable test methods

1. ETSI EN300 328 v2.2.2, Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; 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.
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## 3. Environmental Conditions

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

|             |                |
|-------------|----------------|
| Temperature | 22.6°C ± 2.5°C |
| Humidity    | 38.8% ± 11.5%  |

#### 4. Test samples

| Sample | Control #     | Description    | Model                 | Serial #         | Date of receipt | Note                                                                                                           |
|--------|---------------|----------------|-----------------------|------------------|-----------------|----------------------------------------------------------------------------------------------------------------|
| #01    | 201120-03.S03 | WiFi 6E Module | AX211D2W              | WFM:D8F8834C251B | 2020-23-11      | Conducted tests                                                                                                |
|        | 170000-01.S19 | Laptop         | Latitude E5450        | 4TXV562          | 2020-02-04      |                                                                                                                |
|        | 200611-01.S12 | Extender       | PCB00651_01           | -                | 2020-11-30      |                                                                                                                |
| #02    | 201120-03.S09 | WiFi 6E Module | AX211D2W              | WFM:DF8834E4C92  | 2020-11-23      | Used for 1GHz-6.4GHz Tx Radiated Spurious Emission tests                                                       |
|        | 200102-01.S03 | Extender       | ADEXELEC              | -                | 2020-01-02      |                                                                                                                |
|        | 200611-01.S06 | Adaptor        | PowerBy SNJ A4        | -                | 2020-11-30      |                                                                                                                |
|        | 200602-03.S06 | Absorber       | MCS0                  | -                | 2020-07-03      |                                                                                                                |
|        | 180000-01.S05 | Socket         | Adapter 1216SD to M.2 | -                | 2017-08-09      |                                                                                                                |
|        | 170801-01.S10 | Laptop         | Latitude E7470        | 7KNOXF2          | 2017-09-08      |                                                                                                                |
|        | 200611-03.S28 | Main Antenna   | SkyCross              | -                | 2020-07-01      |                                                                                                                |
|        | 200611-03.S29 | Aux Antenna    | SkyCross              | -                | 2020-07-01      |                                                                                                                |
| #03    | 201120-03.S08 | WiFi 6E Module | AX211D2W              | WFM:D8F8834E56AB | 2020-11-23      | Used for 30MHz-1GHz Radiated Spurious Emission tests, and 6.4GHz-12.75GHz Tx Radiated Spurious Emissions tests |
|        | 200611-03.S26 | Extender       | ADEXELEC              | -                | 2020-07-01      |                                                                                                                |
|        | 200611-01.S07 | Adaptor        | PowerBy SNJ A4        | -                | 2020-11-30      |                                                                                                                |
|        | 200602-03.S06 | Absorber       | MCS0                  | -                | 2020-07-03      |                                                                                                                |
|        | 180000-01.S02 | Socket         | Adapter 1216SD to M.2 | -                | 2017-08-09      |                                                                                                                |
|        | 170000-01.S01 | Laptop         | Latitude E5470        | DBPLMC2          | 2017-03-28      |                                                                                                                |
|        | 200928-03.S08 | Main Antenna   | SkyCross              | -                | 2020-09-01      |                                                                                                                |
|        | 200928-03.S09 | Aux Antenna    | SkyCross              | -                | 2020-09-01      |                                                                                                                |
| #04    | 201120-03.S02 | WiFi 6E Module | AX211D2W              | WFM:D8F8834C2462 | 2020-11-23      | Used for 1-12.75GHz Rx Radiated Spurious Emission tests                                                        |
|        | 200611-01.S06 | Adaptor        | PowerBy SNJ A4        | -                | 2020-11-30      |                                                                                                                |
|        | 200602-03.S06 | Absorber       | MCS0                  | -                | 2020-07-03      |                                                                                                                |
|        | 200615-05.S06 | Host           | Latitude 7490         | 63QMRQ2          | 2020-06-12      |                                                                                                                |

|                        |                                                                                                                                                                                                                                                                                                                              |                |                 |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|
| Brand Name             | Intel® Wi-Fi 6E AX211                                                                                                                                                                                                                                                                                                        |                |                 |
| Model Name             | AX211D2W                                                                                                                                                                                                                                                                                                                     |                |                 |
| Software Version       | DRTU version: 11195_99_2100_51G                                                                                                                                                                                                                                                                                              |                |                 |
| Driver Version         | 99.0.58.3_t64                                                                                                                                                                                                                                                                                                                |                |                 |
| Prototype / Production | Production                                                                                                                                                                                                                                                                                                                   |                |                 |
| 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>5.6GHz (5470.0 – 5725.0 MHz)</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    | Transmitter                                                                                                                                                                                                                                                                                                                  | Main (chain A) | Aux (chain B)   |
|                        | Manufacturer                                                                                                                                                                                                                                                                                                                 | SkyCross       | Skycross        |
|                        | Antenna type                                                                                                                                                                                                                                                                                                                 | PIFA antenna   | PIFA antenna    |
|                        | Part number                                                                                                                                                                                                                                                                                                                  | N/A            | N/A             |
|                        | Declared antenna gain (dBi)                                                                                                                                                                                                                                                                                                  | +3             | +3              |
| Document               | Filename                                                                                                                                                                                                                                                                                                                     |                | Date of receipt |
|                        | Intel_Ref_Antenna data_HMC-M2 Ant_Spec_Universe_SkyCross Antenna                                                                                                                                                                                                                                                             |                | 2013-01-28      |
|                        | Annex E_EN300328 V2 2 2 for 2x2.pdf                                                                                                                                                                                                                                                                                          |                | 2020-13-08      |

## 6. Remarks and comments

1. According to the applicant declaration the device AX211D2W operating in 802.11b/g/n/a/ac/ax mode is an adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. so it is considered as receiver category 1.

## 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. 802.11b/g/n/ax

| Mode   | ETSI clause | Test                                                              | Verdict |
|--------|-------------|-------------------------------------------------------------------|---------|
| 2.4GHz | 4.3.2.2     | RF output power                                                   | P       |
|        | 4.3.2.3     | Power Spectral Density                                            | P       |
|        | 4.3.2.4     | Duty Cycle, Tx-sequence, TX gap                                   | NA      |
|        | 4.3.2.5     | Medium Utilization (MU) factor.                                   | NA      |
|        | 4.3.2.6     | Adaptivity (adaptive equipment using modulations other than FHSS) | P       |
|        | 4.3.2.7     | Occupied Channel Bandwidth                                        | P       |
|        | 4.3.2.8     | Transmitter unwanted emissions in the out-of-band domain          | P       |
|        | 4.3.2.9     | Transmitter unwanted emissions in the spurious domain             | P       |
|        | 4.3.2.10    | Receiver spurious emissions                                       | P       |
|        | 4.3.2.11    | Receiver Blocking                                                 | P       |

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

## 8. Document Revision History

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

# Annex A. Test & System Description

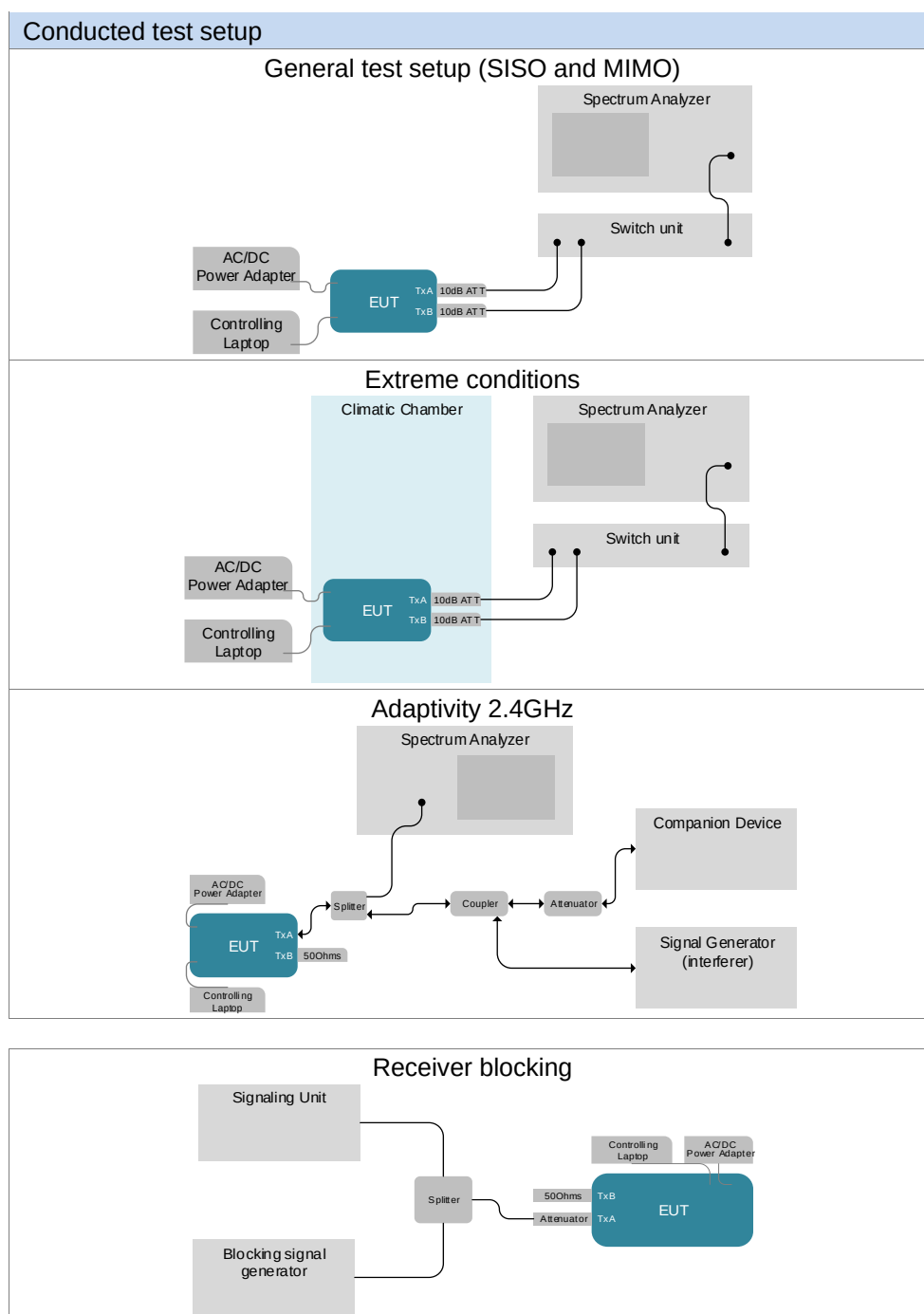
## A.1 Measurement System

Measurements were performed using the following setups and made in accordance to the general provisions of ETSI EN 300 328 V2.2.2

Rohde & Schwarz TS8997 system with the switching unit OSP120, OSP B-157 and software EMC32 were employed.

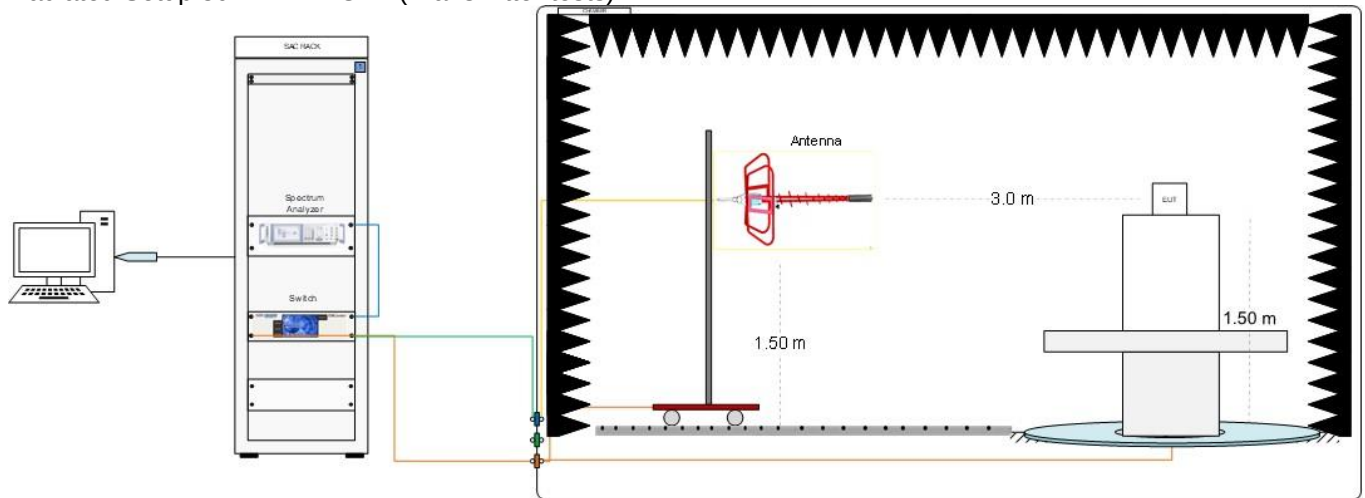
The DUT was installed in a test fixture and then connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary tool DRTU.

Setups for conducted and radiated measurements are shown below.

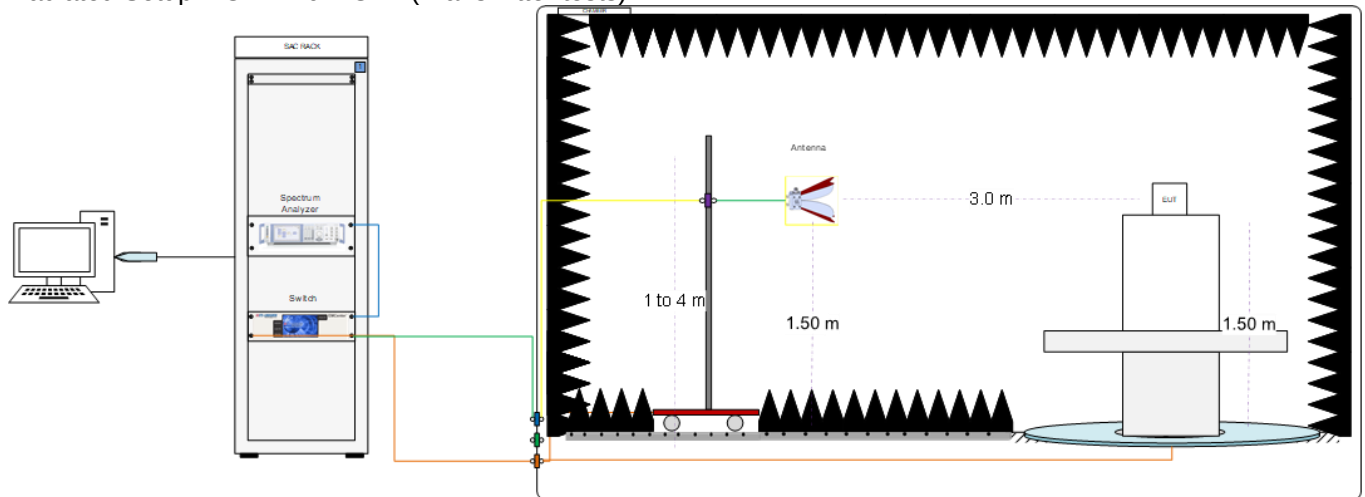


## Radiated test setup

### Radiated Setup 30 MHz - 1 GHz (Transmitter tests)

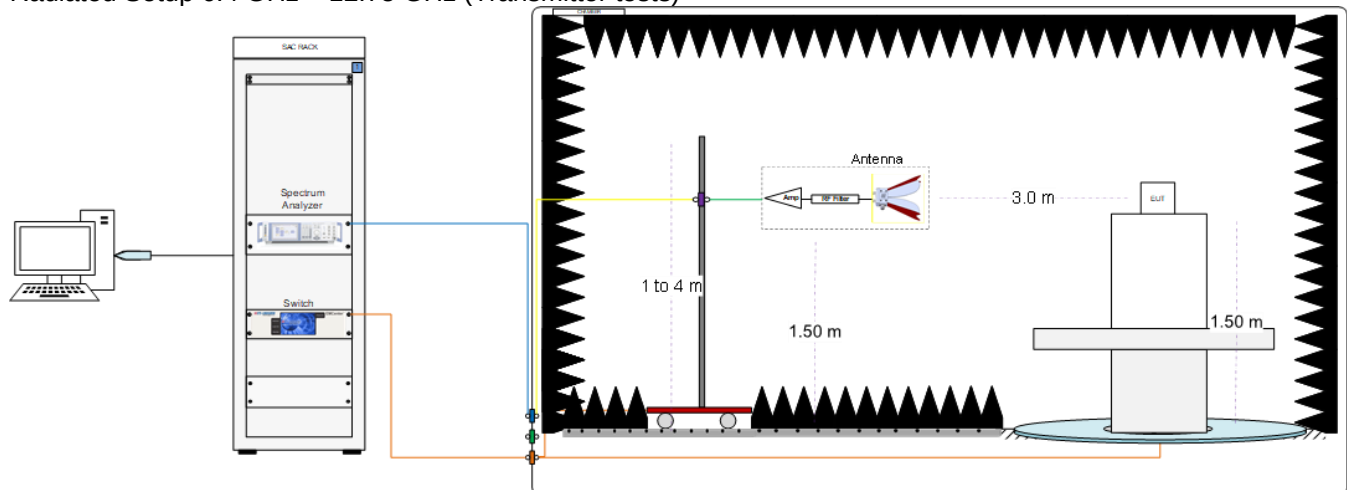


### Radiated Setup 1 GHz – 6.4 GHz (Transmitter tests)

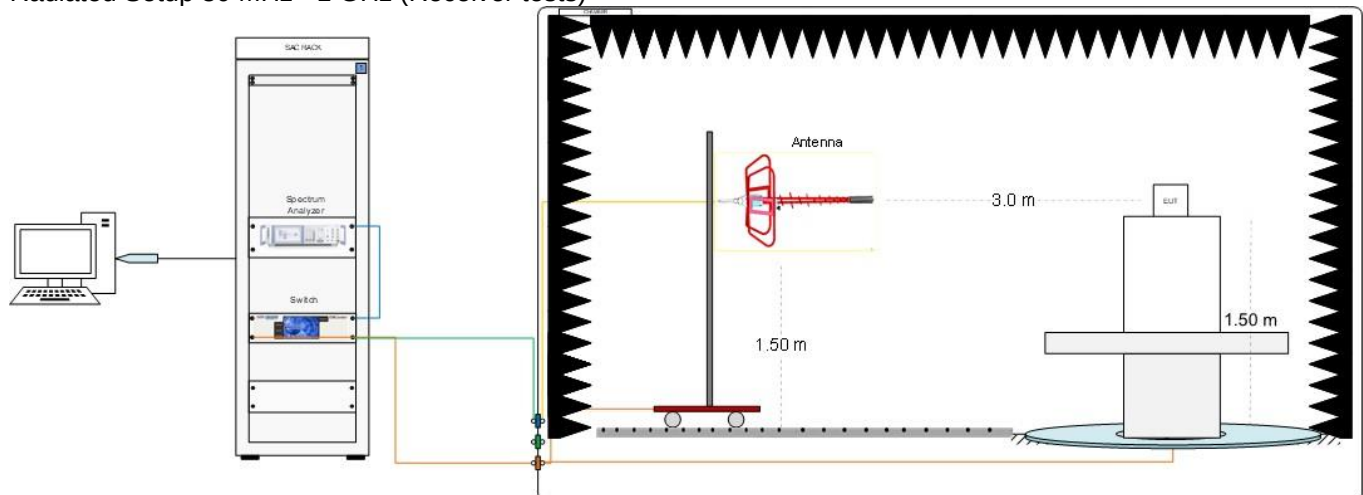




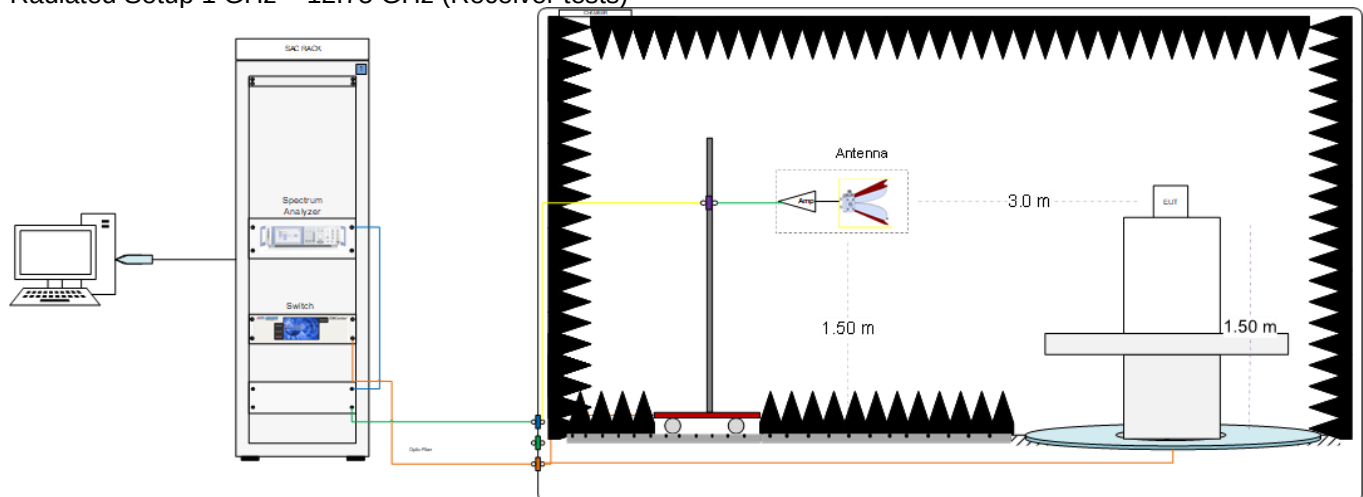
### Radiated Setup 6.4 GHz – 12.75 GHz (Transmitter tests)



### Radiated Setup 30 MHz - 1 GHz (Receiver tests)



### Radiated Setup 1 GHz – 12.75 GHz (Receiver tests)



## A.2 Test Equipment List

### Conducted Setup

| ID#  | Device                   | Type/Model      | Serial #       | Manufacturer    | Cal. Date  | Cal. Due Date |
|------|--------------------------|-----------------|----------------|-----------------|------------|---------------|
| 0017 | Vector signal generator  | SMJ100A         | 100458         | Rohde & Schwarz | 2019-04-23 | 2021-04-23    |
| 0016 | Signal Generator         | SMF100A         | 102117         | Rohde & Schwarz | 2020-05-14 | 2022-05-14    |
| 0056 | Switch unit              | OSP 120         | 100945         | Rohde & Schwarz | 2020-04-21 | 2022-04-21    |
| 0261 | Access point             | Aironet IOS     | FTX134390GV    | Cisco           | N/A        | N/A           |
| 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    |
| 0318 | Spectrum analyzer        | FSV30           | 103310         | Rohde & Schwarz | 2020-06-03 | 2022-06-03    |
| 0581 | Temp & Humidity Logger   | RA12E-TH1-RAS   | RA12-B89BE3    | Avtech          | 2020-01-23 | 2022-01-23    |
| 0741 | Measurement Software     | EMC32 v11.00.00 | 200226         | Rohde & Schwarz | N/A        | N/A           |
| 0847 | RF Cable 0.5m            | PE3CA1039       | -              | Pasternack      | 2020-08-26 | 2021-02-26    |
| 0848 | RF Cable 1.2m            | PE3C0666        | -              | Pasternack      | 2020-08-26 | 2021-02-26    |
| 0869 | Cable SMA Male to ML51-P | HRMP-ML51LP     | DTR178-100RS   | Hirose          | 2020-08-26 | 2021-02-26    |
| 0870 | Cable SMA Male to ML51-P | HRMP-ML51LP     | DTR178-100RS   | Hirose          | 2020-08-26 | 2021-02-26    |
| 0876 | Thermometer              | t3000FC         | -              | Fluke           | 2019-11-29 | 2021-11-29    |
| 0991 | RF Cable 2m + 10dB ATT   | 0900670672000PJ | 1936949        | Radiall         | 2020-08-26 | 2021-02-26    |
| 0992 | RF Cable 2m + 10dB ATT   | 0900670672000PJ | 1936947        | Radiall         | 2020-08-26 | 2021-02-26    |

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 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    | 2020-01-07 | 2022-01-07    |
| 0136 | Turn Table                                    | ETS                   | -                    | ETS-Lindgren    | N/A        | N/A           |
| 1076 | Spectrum Analyzer                             | FSW43                 | 101847               | Rohde & Schwarz | 2020-11-02 | 2022-11-02    |
| 0530 | Measurement SW                                | EMC32, v10.40.10      | 100623               | Rohde & Schwarz | N/A        | N/A           |
| 0147 | Switch & Positioning systems                  | EMC Center            | 00159757             | ETS-Lindgren    | N/A        | N/A           |
| 0137 | Biconilog Antenna                             | 3142E                 | 00156946             | ETS-Lindgren    | 2020-03-12 | 2022-03-12    |
| 0141 | Horn Antenna+ Amplifier + HPF6.4              | 3117                  | 00157736             | ETS-Lindgren    | 2020-04-02 | 2022-04-02    |
| 0325 | Horn antenna 3117                             | 3117                  | 00157734             | ETS-Lindgren    | 2019-08-12 | 2021-08-12    |
| 0343 | Double-Ridged Horn Antenna with Pre-Amplifier | 3117-PA               | 00201542             | ETS-Lindgren    | 2019-08-16 | 2021-08-16    |
| 1098 | Cable 1.5m - DC-18GHz                         | CBL-1.5M-SMSM+        | 202879               | Mini-Circuits   | 2020-11-27 | 2021-05-27    |
| 0263 | Cable 1m - 1GHz to 18GHz                      | UFA147A               | -                    | Utilflex        | 2020-08-25 | 2021-02-25    |
| 0371 | Cable 1m - 30 MHz - 18GHz                     | UFB311A-0-0590-50U50U | MFR 64639 223230-001 | Micro-coax      | 2020-08-25 | 2021-02-25    |
| 1099 | Cable 7m DC-18 GHz                            | 0501051057000GX       | 19.35.850            | Radial          | 2020-11-27 | 2021-05-27    |
| 0859 | Cable 2.5m - 30MHz to 18GHz                   | 0500990992500KE       | 19.23.395            | Radiall         | 2020-11-27 | 2021-05-27    |
| 1033 | Boresight antenna mast                        | BAM 4.0-P             | P/278/2890.01        | Maturo          | N/A        | N/A           |
| 0797 | Temp & Humidity Logger                        | RA12E-TH1-RAS         | RA12-D0EB1A          | Avtech          | 2019-07-04 | 2021-07-04    |

N/A: Not Applicable

## Radiated Setup #2

| ID#  | Device                                        | Type/Model       | Serial #    | Manufacturer    | Cal. Date  | Cal. Due Date |
|------|-----------------------------------------------|------------------|-------------|-----------------|------------|---------------|
| 0337 | Anechoic chamber                              | RFD-FA-100       | 5996        | ETS Lindgren    | 2020-07-06 | 2022-07-06    |
| 0238 | Switch & Positioner                           | EMCenter         | 00151232    | ETS Lindgren    | N/A        | N/A           |
| 0382 | Antenna Tower                                 | 2171B-3.0M       | 00150123    | ETS Lindgren    | N/A        | N/A           |
| 0383 | Turntable                                     | -                | -           | ETS Lindgren    | N/A        | N/A           |
| 0329 | Measurement SW                                | EMC32, v10.50.10 | 100401      | Rohde & Schwarz | N/A        | N/A           |
| 0133 | Spectrum Analyzer                             | FSV40            | 101358      | Rohde & Schwarz | 2020-02-25 | 2022-02-25    |
| 0138 | Double Ridge Horn (1-18GHz)                   | 3117             | 00152266    | ETS Lindgren    | 2020-03-08 | 2022-03-08    |
| 0141 | Horn Antenna 3117 + Amplifier + HPF6.4        | 3117             | 00157736    | ETS-Lindgren    | 2020-04-01 | 2022-04-01    |
| 0343 | Double-Ridged Horn Antenna with Pre-Amplifier | 3117-PA          | 00201542    | ETS-Lindgren    | 2019-08-16 | 2021-08-16    |
| 0871 | RF Cable 1-18GHz, 1.5 m                       | 0501050991200GX  | 19.21.710   | Radiall         | 2020-08-20 | 2021-02-20    |
| 0860 | RF Cable 1-18GHz, 1.2 m                       | 2301761761200PJ  | 12.22.1104  | Radiall         | 2020-08-20 | 2021-02-20    |
| 0275 | RF Cable 1-18GHz - 6.5m                       | 140-8500-11-51   | 001         | Spectrum        | 2020-08-20 | 2021-02-20    |
| 0684 | RF Cable 1GHz-18GHz 1.5m                      | -                | -           | Spirent         | 2020-08-20 | 2021-02-20    |
| 0725 | RF Cable 1-9.5GHz 1.2m                        | 0500990991200KE  | -           | Radiall         | 2020-08-20 | 2021-02-20    |
| 0796 | Temp & Humidity Logger                        | RA12E-TH1-RAS    | RA12-D4F316 | Avtech          | 2019-07-05 | 2021-07-05    |

## Shared Radiated Equipment

| ID#  | Device       | Type/Model | Serial # | Manufacturer    | Cal. Date  | Cal. Due Date |
|------|--------------|------------|----------|-----------------|------------|---------------|
| 0616 | Power Sensor | NRP-Z81    | 104385   | Rohde & Schwarz | 2020-04-08 | 2022-04-08    |
| 0617 | Power Sensor | NRP-Z81    | 104386   | Rohde & Schwarz | 2020-04-08 | 2022-04-08    |
| 0618 | Power Sensor | NRP-Z81    | 104382   | Rohde & Schwarz | 2020-04-08 | 2022-04-08    |

### A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of  $k = 2$  to indicate a 95% level of confidence:

| Measurement type                  | Uncertainty  | Unit |
|-----------------------------------|--------------|------|
| Occupied Channel Bandwidth        | $\pm 2.08$   | %    |
| RF Output Power, conducted        | $\pm 0.99$   | dB   |
| Power Spectral Density, conducted | $\pm 0.99$   | dB   |
| Unwanted Emission, conducted      | $\pm 1.53$   | dB   |
| Radiated test < 1GHz              | $\pm 4.04$   | dB   |
| Radiated test 1GHz –12.75 GHz     | $\pm 4.01$   | dB   |
| Temperature                       | $\pm 0.30$   | °C   |
| Supply voltages                   | $< \pm 0.01$ | %    |
| Time                              | $\pm 0.12$   | %    |

# Annex B. Test Results

The herein test results were performed by:

| Test case measurement                                             | Test Engineer                 |
|-------------------------------------------------------------------|-------------------------------|
| RF output power                                                   | G. Roustan                    |
| Power spectral density                                            | G. Roustan                    |
| Adaptivity (adaptive equipment using modulations other than FHSS) | G. Roustan                    |
| Occupied channel bandwidth                                        | G. Roustan                    |
| Transmitter unwanted emission in the out-of-band domain           | G. Roustan                    |
| Transmitter unwanted emissions in the spurious domain             | N. Nachabe, A. Lounes, N. Bui |
| Receiver spurious emissions                                       | A. Lounes, N. Bui             |
| Receiver blocking                                                 | Z. Ouachicha                  |

## B.1 Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                      | ETSI EN 300 328<br>V2.2.2 Annex E                                                                                              |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 5.1.2.1     | The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:<br>• Temperature: +15 °C to +35 °C;<br>• Relative humidity: 20 % to 75 %. | <br>“Information provided by the customer” |
| 5.1.2.2     | The normal test voltage for the equipment shall be the nominal voltage for which the equipment was designed.                                                                                                                    |                                                                                                                                |
| 5.1.3       | Some tests in the present document need to be repeated at extreme temperatures. Where that is the case, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.        |                                                                                                                                |

For 802.11b 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), 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  $\pm 0.25$  dB from the declared target values.

| 2.4GHz   |          |           |      |             | Conducted Power, Target Value (dBm) |              |            |
|----------|----------|-----------|------|-------------|-------------------------------------|--------------|------------|
| Mode     | BW (MHz) | Data Rate | CH # | Freq. (MHz) | SISO Chain A                        | SISO Chain B | MIMO A + B |
| 802.11b  | 20       | 1Mbps     | 1    | 2412        | 16.0                                | 16.0         | -          |
|          |          |           | 7    | 2442        | 16.0                                | 16.0         | -          |
|          |          |           | 13   | 2472        | 16.0                                | 16.0         | -          |
| 802.11g  | 20       | 6 Mbps    | 1    | 2412        | 16.5                                | 16.5         | -          |
|          |          |           | 7    | 2442        | 16.5                                | 16.5         | -          |
|          |          |           | 13   | 2472        | 16.5                                | 16.5         | -          |
| 802.11n  | 20       | HT0 HT8*  | 1    | 2412        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 7    | 2442        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 13   | 2472        | 16.5                                | 16.5         | 16.5       |
|          | 40       | HT0 HT8*  | 3    | 2422        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 7    | 2442        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 11   | 2462        | 16.5                                | 16.5         | 16.5       |
| 802.11ax | 20       | HE0       | 1    | 2412        | 16.0                                | 16.5         | 16.0       |
|          |          |           | 7    | 2442        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 13   | 2472        | 16.5                                | 16.5         | 16.5       |
|          | 40       | HE0       | 3    | 2422        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 7    | 2442        | 16.5                                | 16.5         | 16.5       |
|          |          |           | 11   | 2462        | 16.5                                | 16.5         | 16.5       |

\* 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         | 802.11b  | 20              | 1Mbps                |
|              | 802.11g  | 20              | 6Mbps                |
|              | 802.11n  | 20              | HT0                  |
|              |          | 40              | HT0                  |
|              | 802.11ax | 20              | HE0                  |
|              |          | 40              | HE0                  |
| MIMO         | 802.11n  | 20/40           | HT8                  |
|              | 802.11ax | 20/40           | HE0                  |

## B.2 RF output power

### Test limits

| ETSI clause | Limits                                                                                                                                                                     |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.3.2.2.3   | The RF output power for non-FHSS equipment shall be equal to or less than 20 dBm. This limit shall apply for any combination of power level and intended antenna assembly. |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                                   |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.2.1     | <p>The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.</p> <p>For non-FHSS equipment, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.</p> |

### Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the RF output power. The antenna terminal of the EUT is connected to the OSP120 through a 10dB attenuator and a cable, the spectrum analyzer is connected to the receiver port of the OSP. System connection cable loss is compensated by the EMC32 software

Antenna gain is taken into account and added by the software to the measurements. The E.I.R.P. power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. The declared maximum antenna gain is +3dBi.

For MIMO modes accordingly to the test procedure described in ETSI EN 300 328 V2.2.2 §5.4.2.2.1.2, the measurement is done synchronously on all transmit ports, the power of the individual samples is sum for all ports and then the reported power is the highest calculated RMS power for the active bursts.

**Results tables**

| RF Output Power |                            |       |      |               |       | 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] | Chain | Measured<br>Conducted<br>[dBm]                   | EIRP<br>[dBm] | Measured<br>Conducted<br>[dBm]                  | EIRP<br>[dBm] | Measured<br>Conducted<br>[dBm]                 | EIRP<br>[dBm] |
| 802.11b         | 99.5                       | 1Mbps | 1    | 2412          | A     | 15.8                                             | 18.8          | 15.7                                            | 18.7          | 16.0                                           | 19.0          |
|                 |                            |       |      |               | B     | 15.9                                             | 18.9          | 15.7                                            | 18.7          | 16.2                                           | 19.2          |
|                 |                            |       | 7    | 2442          | A     | 15.9                                             | 18.9          | 15.8                                            | 18.8          | 16.1                                           | 19.1          |
|                 |                            |       |      |               | B     | 15.8                                             | 18.8          | 15.6                                            | 18.6          | 16.0                                           | 19.0          |
|                 |                            |       | 13   | 2472          | A     | 15.9                                             | 18.9          | 15.8                                            | 18.8          | 16.1                                           | 19.1          |
|                 |                            |       |      |               | B     | 15.9                                             | 18.9          | 15.7                                            | 18.7          | 16.0                                           | 19.0          |
| 802.11g         | 97.9                       | 6Mbps | 1    | 2412          | A     | 16.4                                             | 19.4          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.3                                             | 19.3          | 16.2                                            | 19.2          | 16.5                                           | 19.5          |
|                 |                            |       | 7    | 2442          | A     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.5                                           | 19.5          |
|                 |                            |       | 13   | 2472          | A     | 16.4                                             | 19.4          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.2                                            | 19.2          | 16.5                                           | 19.5          |
| 802.11n20       | 98.9                       | HT0   | 1    | 2412          | A     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.3                                             | 19.3          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       | 7    | 2442          | A     | 16.4                                             | 19.4          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 | 13                         | 2472  | A    | 16.5          | 19.5  | 16.5                                             | 19.5          | 16.6                                            | 19.6          |                                                |               |
|                 |                            |       | B    | 16.4          | 19.4  | 16.3                                             | 19.3          | 16.6                                            | 19.6          |                                                |               |
|                 | 98.8                       | HT8   | 1    | 2412          | A+B   | 16.3                                             | 19.3          | 16.2                                            | 19.2          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | A+B   | 16.5                                             | 19.5          | 16.4                                            | 19.4          | 16.8                                           | 19.8          |
| 7               |                            |       | 2442 | A+B           | 16.5  | 19.5                                             | 16.4          | 19.4                                            | 16.8          | 19.8                                           |               |
|                 |                            |       |      | A+B           | 16.7  | 19.7                                             | 16.5          | 19.5                                            | 16.9          | 19.9                                           |               |
| 802.11n40       | 97.9                       | HT0   | 3    | 2422          | A     | 16.4                                             | 19.4          | 16.5                                            | 19.5          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.5                                             | 19.5          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       | 7    | 2442          | A     | 16.6                                             | 19.6          | 16.5                                            | 19.5          | 16.7                                           | 19.7          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.2                                            | 19.2          | 16.5                                           | 19.5          |
|                 | 97.9                       | HT8   | 11   | 2462          | A     | 16.4                                             | 19.4          | 16.5                                            | 19.5          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.5                                             | 19.5          | 16.5                                            | 19.5          | 16.6                                           | 19.6          |
|                 |                            |       | 3    | 2422          | A+B   | 16.3                                             | 19.3          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | A+B   | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
| 802.11ax20      | 98.8                       | HE0   | 1    | 2412          | A     | 15.9                                             | 18.9          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.5                                             | 19.5          | 16.4                                            | 19.4          | 16.7                                           | 19.7          |
|                 |                            |       | 7    | 2442          | A     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 | 99.4                       | HE0   | 13   | 2472          | A     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.5                                           | 19.5          |
|                 |                            |       |      |               | B     | 16.5                                             | 19.5          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       | 1    | 2412          | A+B   | 16.1                                             | 19.1          | 16.3                                            | 19.3          | 16.8                                           | 19.8          |
|                 |                            |       |      |               | A+B   | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.7                                           | 19.7          |
| 802.11ax40      | 98.9                       | HE0   | 3    | 2422          | A     | 16.5                                             | 19.5          | 16.5                                            | 19.5          | 16.7                                           | 19.7          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.4                                            | 19.4          | 16.6                                           | 19.6          |
|                 |                            |       | 7    | 2442          | A     | 16.7                                             | 19.7          | 16.5                                            | 19.5          | 16.6                                           | 19.6          |
|                 |                            |       |      |               | B     | 16.3                                             | 19.3          | 16.3                                            | 19.3          | 16.5                                           | 19.5          |
|                 | 99.4                       | HE0   | 11   | 2462          | A     | 16.3                                             | 19.3          | 16.4                                            | 19.4          | 16.5                                           | 19.5          |
|                 |                            |       |      |               | B     | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
|                 |                            |       | 3    | 2422          | A+B   | 16.5                                             | 19.5          | 16.4                                            | 19.4          | 16.7                                           | 19.7          |
|                 |                            |       |      |               | A+B   | 16.4                                             | 19.4          | 16.3                                            | 19.3          | 16.6                                           | 19.6          |
| 99.4            | HE0                        | 7     | 2442 | A+B           | 16.4  | 19.4                                             | 16.3          | 19.3                                            | 16.6          | 19.6                                           |               |
|                 |                            |       |      | A+B           | 16.4  | 19.4                                             | 16.3          | 19.3                                            | 16.6          | 19.6                                           |               |
|                 |                            | 11    | 2462 | A+B           | 16.5  | 19.5                                             | 16.4          | 19.4                                            | 16.7          | 19.7                                           |               |
|                 |                            |       |      | A+B           | 16.5  | 19.5                                             | 16.4          | 19.4                                            | 16.7          | 19.7                                           |               |



### B.3 Power Spectral Density

#### Test limits

| ETSI clause | Limits                                                                       |
|-------------|------------------------------------------------------------------------------|
| 4.3.2.3.3   | The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz. |

#### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                           |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.3.1     | <p>These measurements shall only be performed at normal test conditions.</p> <p>The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range.</p> <p>For the duration of the test, the equipment shall not change its operating frequency.</p> |

#### Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the power spectral density (PSD). The antenna terminal of the EUT is connected to the OSP120 through a 10dB attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software to measure all parameters.

Antenna gain is taken into account and added by the software to the measurements. The E.I.R.P. power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. The declared maximum antenna gain is +3dBi.

For MIMO modes, accordingly to the test procedure described in ETSI EN 300 328 V2.2.2 §5.4.3.2.1, the measurement is done separately on each transmit ports and the power of the individual samples per frequency is sum for all ports. From all the recorded results, the highest value is the maximum Power Spectral Density.

**Results tables**

| Mode       | Meas.<br>Duty<br>cycle % | Rate  | CH Number | Frequency<br>[dBm] | Chain | PSD [dBm/MHz] |
|------------|--------------------------|-------|-----------|--------------------|-------|---------------|
| 802.11b    | 99.5                     | 1Mbps | 1         | 2412               | A     | 9.75          |
|            |                          |       |           |                    | B     | 9.82          |
|            |                          |       | 7         | 2442               | A     | 9.74          |
|            |                          |       |           |                    | B     | 9.68          |
|            |                          |       | 13        | 2472               | A     | 9.85          |
|            |                          |       |           |                    | B     | 9.75          |
| 802.11g    | 97.9                     | 6Mbps | 1         | 2412               | A     | 7.50          |
|            |                          |       |           |                    | B     | 7.44          |
|            |                          |       | 7         | 2442               | A     | 7.50          |
|            |                          |       |           |                    | B     | 7.50          |
|            |                          |       | 13        | 2472               | A     | 7.49          |
|            |                          |       |           |                    | B     | 7.52          |
| 802.11n20  | 98.9                     | HT0   | 1         | 2412               | A     | 7.59          |
|            |                          |       |           |                    | B     | 7.15          |
|            |                          |       | 7         | 2442               | A     | 7.25          |
|            |                          |       |           |                    | B     | 7.28          |
|            |                          |       | 13        | 2472               | A     | 7.39          |
|            |                          |       |           |                    | B     | 7.35          |
|            | 98.8                     | HT8   | 1         | 2412               | A+B   | 7.15          |
|            |                          |       | 7         | 2442               | A+B   | 7.35          |
|            |                          |       | 13        | 2472               | A+B   | 7.58          |
| 802.11n40  | 97.9                     | HT0   | 3         | 2422               | A     | 4.41          |
|            |                          |       |           |                    | B     | 4.44          |
|            |                          |       | 7         | 2442               | A     | 4.56          |
|            |                          |       |           |                    | B     | 4.38          |
|            |                          |       | 11        | 2462               | A     | 4.34          |
|            |                          |       |           |                    | B     | 4.44          |
|            | 97.9                     | HT8   | 3         | 2422               | A+B   | 4.26          |
|            |                          |       | 7         | 2442               | A+B   | 4.40          |
|            |                          |       | 11        | 2462               | A+B   | 4.37          |
| 802.11ax20 | 98.8                     | HE0   | 1         | 2412               | A     | 6.33          |
|            |                          |       |           |                    | B     | 6.98          |
|            |                          |       | 7         | 2442               | A     | 6.90          |
|            |                          |       |           |                    | B     | 6.89          |
|            |                          |       | 13        | 2472               | A     | 6.98          |
|            |                          |       |           |                    | B     | 7.02          |
|            | 99.4                     | HE0   | 1         | 2412               | A+B   | 6.48          |
|            |                          |       | 7         | 2442               | A+B   | 6.85          |
|            |                          |       | 13        | 2472               | A+B   | 7.01          |
| 802.11ax40 | 98.9                     | HE0   | 3         | 2422               | A     | 4.13          |
|            |                          |       |           |                    | B     | 3.97          |
|            |                          |       | 7         | 2442               | A     | 4.34          |
|            |                          |       |           |                    | B     | 3.99          |
|            |                          |       | 11        | 2462               | A     | 4.01          |
|            |                          |       |           |                    | B     | 3.97          |
|            | 99.4                     | HE0   | 3         | 2422               | A+B   | 4.15          |
|            |                          |       | 7         | 2442               | A+B   | 3.98          |
|            |                          |       | 11        | 2462               | A+B   | 4.16          |

## B.4 Adaptivity (adaptive equipment using modulations other than FHSS)

### Test limits

| ETSI clause   | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.3.2.6.3.2.3 | <p><i>Load Based Equipment</i></p> <p>Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect as described in IEEE 802.11™-2012 [i.3], clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8 providing the equipment complies with the conformance requirements referred to in clause 4.3.2.6.3.4. Load Based Equipment not using any of the mechanisms referenced above shall comply with the following minimum set of requirements:</p> <p>1) Before a transmission or a burst of transmissions, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately.</p> <p>2) If the equipment finds the channel occupied, it shall not transmit on this channel (see also the next paragraph). The equipment shall perform an Extended CCA check in which the channel is observed for a random duration in the range between 18 µs and at least 160 µs. If the extended CCA check has determined the channel to be no longer occupied, the equipment may resume transmissions on this channel. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied.</p> <p>NOTE: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.</p> <p>The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.</p> <p>3) The total time that an equipment makes use of a RF channel is defined as the Channel Occupancy Time. This Channel Occupancy Time shall be less than 13 ms, after which the device shall perform a new CCA as described in step 1 above.</p> <p>4) The equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames (e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of transmissions by the equipment without a new CCA shall not exceed the maximum channel occupancy time as defined in step 3 above.</p> <p>For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.</p> <p>5) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the CCA threshold level may be relaxed to:</p> $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out}) \text{ (Pout in mW e.i.r.p.)}$ <p>6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 11.</p> |

| 4.3.2.6.4.2 | Table11: Unwanted Signal parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                 |                             |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------|
|             | Wanted signal mean power from companion device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Unwanted signal frequency (MHz) | Unwanted signal power (dBm) |
|             | sufficient to maintain the link (see note 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2 395 or 2 488,5 (see note 1)   | -35 (see note 3)            |
|             | <p>NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.</p> <p>NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.</p> <p>NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna.</p> |                                 |                             |
|             | If implemented, Short Control Signalling Transmissions of adaptive non-FHSS equipment shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                 |                             |

### Test conditions

| ETSI clause | Conditions                                                            |
|-------------|-----------------------------------------------------------------------|
| 5.4.6.1     | These measurements shall only be performed at normal test conditions. |

### Test procedure

The adaptivity setup shown in section *Test & System Description* was used to measure adaptivity. The EUT (client) is connected to an access point through a power splitter and an attenuator. Proprietary software was used on the EUT to configure a normal transmission with sufficient payload.

Interference and unwanted signals are emulated by using a modulated signal and a continuous wave (CW) respectively, generated by the vector signal generator (VSG) and the continuous wave generator.

The power levels for the signals at the input of the receiver are as follows:

- EUT = max power level
- Companion device = -30dBm/MHz
- Interference signal = **TL + Antenna gain - Margin** = -72dBm/MHz
- Unwanted signal (CW) = **cwPower + Antenna gain - Margin** = -37dBm
  - TL** = -70 dBm/MHz, limit of the ED Threshold Level assuming 0dBi antenna gain
  - cwPower** = -35dBm, assuming 0dBi antenna gain
  - Antenna gain** = Antenna gain declared by the applicant (+3dBi)
  - Margin** = Additional margin requested by the applicant (5dB)

The frequency used for the interference signal is the same as the transmission frequency of the tested channel. The unwanted signal is fixed at 2488.5 MHz for the lowest channel tested and at 2395 MHz for the highest channel tested.

**Results tables****802.11b Channel 1 – 2412 MHz, 1Mbps****Normal Operation**

| DutyCycle<br>DUT<br>(%) | Monitoring<br>Length<br>(ms) | COT Max<br>(ms) | Limit Max<br>(ms) | COT Min<br>(ms) | Number of<br>COTs | CCA Time<br>Min<br>(ms) | CCA Time<br>Max<br>(ms) | CCA Time<br>Limit Min<br>(ms) |
|-------------------------|------------------------------|-----------------|-------------------|-----------------|-------------------|-------------------------|-------------------------|-------------------------------|
| 100.000                 | 10000.000                    | 12.815          | 13.000            | 0.308           | 973               | 0.024                   | 24.661                  | 0.018                         |

**Reaction on Interferer and Blocker**

| DC* in max DC Evaluation<br>Window<br>(%) | Limit Max<br>(%) | Result | Length of max DC Evaluation<br>Window<br>(ms) | Start of max DC Evaluation<br>Window<br>(ms) |
|-------------------------------------------|------------------|--------|-----------------------------------------------|----------------------------------------------|
| 3.698                                     | 10.000           | PASS   | 50.000                                        | 1957.006                                     |

| Stop of max DC Evaluation<br>Window<br>(ms) | Interferer On<br>(ms) | Blocker On<br>(ms) | Monitoring Offset<br>(ms) | Monitoring Start<br>(ms) | Monitoring Length<br>(ms) |
|---------------------------------------------|-----------------------|--------------------|---------------------------|--------------------------|---------------------------|
| 2007.006                                    | 1000.000              | 62000.000          | 13.000                    | 1013.000                 | 121987.000                |

\*Note: the DC is TxOn / (TxOn + TxOff) ratio of short control signaling transmissions.

**802.11b Channel 11 – 2462 MHz, 1Mbps****Normal Operation**

| DutyCycle<br>DUT<br>(%) | Monitoring<br>Length<br>(ms) | COT Max<br>(ms) | Limit Max<br>(ms) | COT Min<br>(ms) | Number of<br>COTs | CCA Time<br>Min<br>(ms) | CCA Time<br>Max<br>(ms) | CCA Time<br>Limit Min<br>(ms) |
|-------------------------|------------------------------|-----------------|-------------------|-----------------|-------------------|-------------------------|-------------------------|-------------------------------|
| 100.000                 | 10000.000                    | 12.815          | 13.000            | 0.072           | 964               | 0.024                   | 34.390                  | 0.018                         |

**Reaction on Interferer and Blocker**

| DC in max DC Evaluation Window<br>(%) | Limit Max<br>(%) | Result | Length of max DC Evaluation<br>Window<br>(ms) | Start of max DC Evaluation<br>Window<br>(ms) |
|---------------------------------------|------------------|--------|-----------------------------------------------|----------------------------------------------|
| 3.692                                 | 10.000           | PASS   | 50.000                                        | 5804.117                                     |

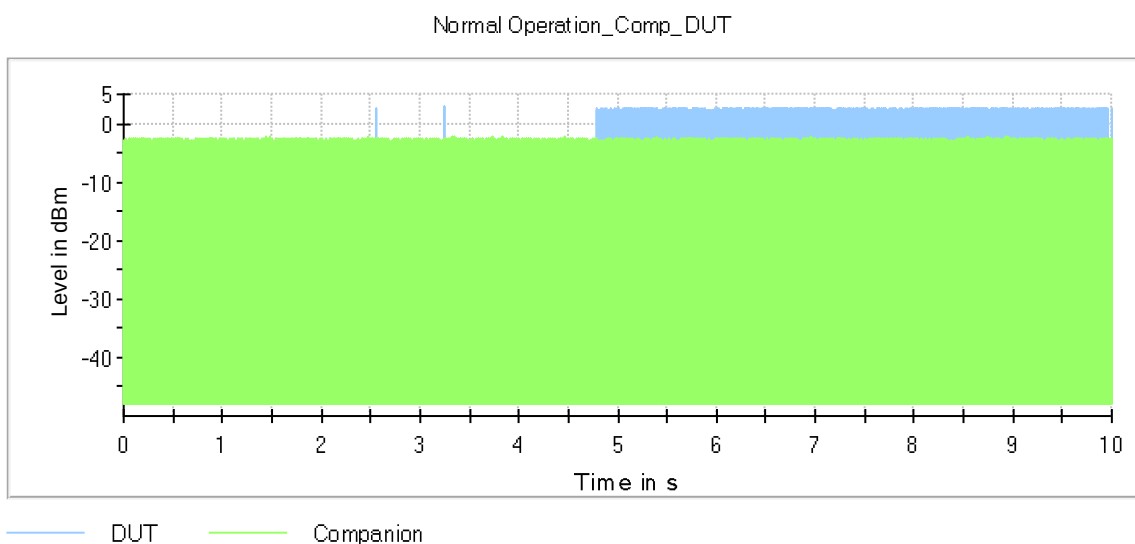
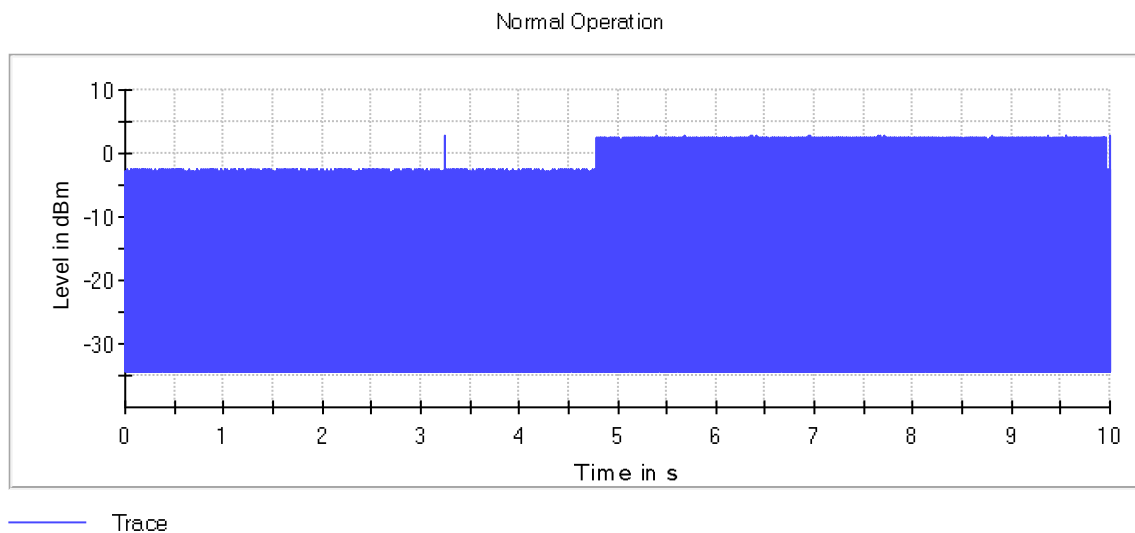
| Stop of max DC<br>Evaluation Window<br>(ms) | Interferer On<br>(ms) | Blocker On<br>(ms) | Monitoring Offset<br>(ms) | Monitoring Start<br>(ms) | Monitoring Length<br>(ms) |
|---------------------------------------------|-----------------------|--------------------|---------------------------|--------------------------|---------------------------|
| 5854.117                                    | 1000.000              | 62000.000          | 13.000                    | 1013.000                 | 121987.000                |

\*Note: the DC is TxOn / (TxOn + TxOff) ratio of short control signaling transmissions.

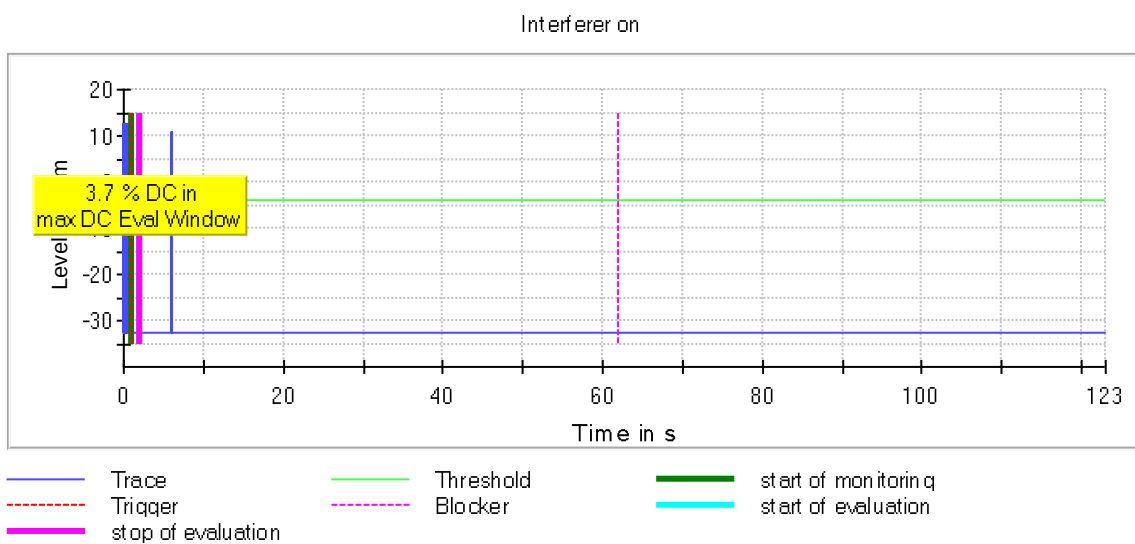
## Results Screenshot

### 802.11b Channel 1 – 2412 MHz, 1Mbps

#### Normal Operation



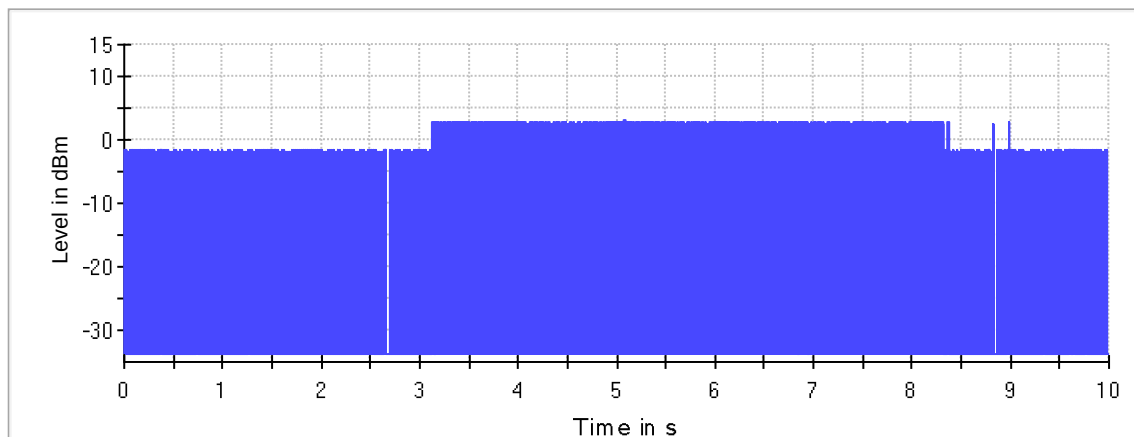
#### Reaction on Interferer and Blocker



## 802.11b Channel 11 – 2462 MHz, 1Mbps

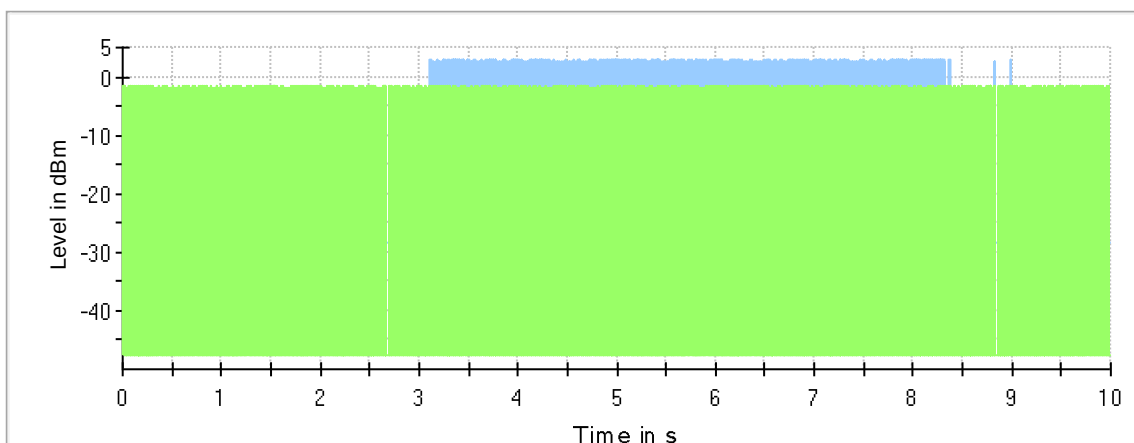
### Normal Operation

Normal Operation



Trace

Normal Operation\_Comp\_DUT

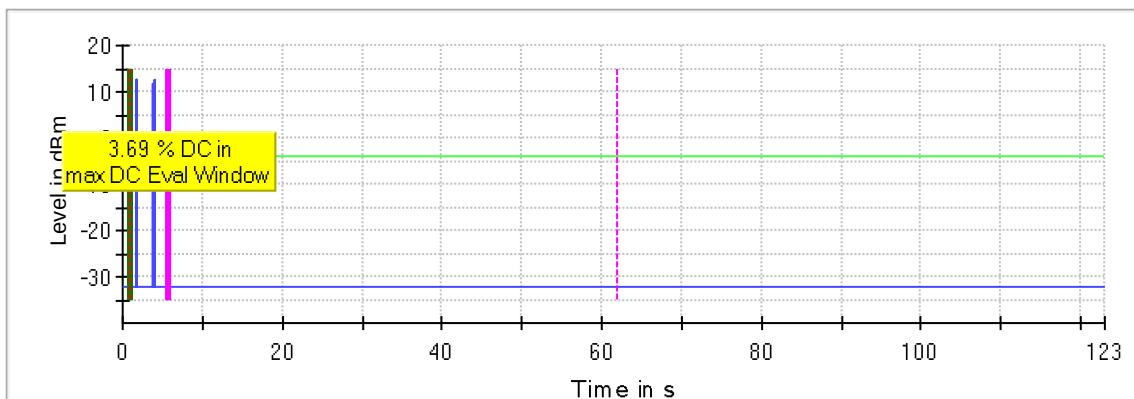


DUT

Companion

### Reaction on Interferer and Blocker

Interferer on



Trace

Trigger

stop of evaluation

Threshold

Blocker

start of monitoring

start of evaluation

## B.5 Occupied Channel Bandwidth

### Tests limits

| ETSI clause | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                         |          |                          |         |                          |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------|----------|--------------------------|---------|--------------------------|
| 4.3.2.7.3   | <p>The Occupied Channel Bandwidth shall fall completely within the band given in Table 1 (2.4 GHz to 2.4835 GHz).</p> <p style="text-align: center;"><b>Table 1: Service frequency bands</b></p> <table> <tr> <th></th><th>Service frequency bands</th></tr> <tr> <td>Transmit</td><td>2 400 MHz to 2 483,5 MHz</td></tr> <tr> <td>Receive</td><td>2 400 MHz to 2 483,5 MHz</td></tr> </table> <p>In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.</p> |  | Service frequency bands | Transmit | 2 400 MHz to 2 483,5 MHz | Receive | 2 400 MHz to 2 483,5 MHz |
|             | Service frequency bands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                         |          |                          |         |                          |
| Transmit    | 2 400 MHz to 2 483,5 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                         |          |                          |         |                          |
| Receive     | 2 400 MHz to 2 483,5 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                         |          |                          |         |                          |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.7.1     | <p>These measurements shall only be performed at normal test conditions.</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).</p> <p>The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range.</p> <p>If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then each channel bandwidth shall be tested separately.</p> |

### Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the occupied bandwidth accordingly to the test method described in ETSI EN 300 328 V2.2.2 §5.4.7.2.1. The antenna terminal of the EUT is connected to the OSP120 through a 10 dB attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on measured parameters.

For MIMO modes, occupied bandwidth measurements are performed on Chain A.



**Results tables****Low channel**

| Mode       | Rate  | #Ch | Freq [MHz] | Chain | 99% BW [MHz] | Lowest Freq [MHz] |
|------------|-------|-----|------------|-------|--------------|-------------------|
| 802.11b    | 1Mbps | 1   | 2412       | A     | 13.42        | 2405.2919         |
|            |       |     |            | B     | 13.42        | 2405.2919         |
| 802.11g    | 6Mbps |     |            | A     | 16.89        | 2403.5528         |
|            |       |     |            | B     | 16.89        | 2403.5528         |
| 802.11n20  | HT0   |     |            | A     | 17.89        | 2403.0559         |
|            |       |     |            | B     | 17.89        | 2403.0559         |
|            | HT8   |     |            | A+B   | 17.89        | 2403.0559         |
| 802.11n40  | HT0   | 3   | 2422       | A     | 36.77        | 2403.6149         |
|            |       |     |            | B     | 36.77        | 2403.6149         |
|            | HT8   |     |            | A+B   | 36.77        | 2403.6149         |
| 802.11ax20 | HE0   | 1   | 2412       | A     | 19.38        | 2402.3106         |
|            |       |     |            | B     | 19.13        | 2402.3106         |
|            | HE0   |     |            | A+B   | 19.13        | 2402.3106         |
| 802.11ax40 | HE0   | 3   | 2422       | A     | 37.76        | 2403.1180         |
|            |       |     |            | B     | 37.76        | 2403.1180         |
|            | HE0   |     |            | A+B   | 37.76        | 2403.1180         |

**High channel**

| Mode       | Rate  | #Ch | Freq [MHz] | Chain | 99% BW [MHz] | Highest Freq [MHz] |
|------------|-------|-----|------------|-------|--------------|--------------------|
| 802.11b    | 1Mbps | 13  | 2472       | A     | 13.42        | 2478.7081          |
|            |       |     |            | B     | 13.42        | 2478.7081          |
| 802.11g    | 6Mbps |     |            | A     | 16.40        | 2480.1988          |
|            |       |     |            | B     | 16.40        | 2480.1988          |
| 802.11n20  | HT0   |     |            | A     | 17.89        | 2480.9441          |
|            |       |     |            | B     | 17.89        | 2480.9441          |
|            | HT8   |     |            | A+B   | 17.89        | 2480.9441          |
| 802.11n40  | HT0   | 11  | 2462       | A     | 36.77        | 2480.3851          |
|            |       |     |            | B     | 36.77        | 2480.3851          |
|            | HT8   |     |            | A+B   | 36.77        | 2480.3851          |
| 802.11ax20 | HE0   | 13  | 2472       | A     | 18.88        | 2481.4410          |
|            |       |     |            | B     | 18.88        | 2481.4410          |
|            | HE0   |     |            | A+B   | 18.88        | 2481.4410          |
| 802.11ax40 | HE0   | 11  | 2462       | A     | 37.76        | 2480.8820          |
|            |       |     |            | B     | 37.76        | 2480.8820          |
|            | HE0   |     |            | A+B   | 37.76        | 2480.8820          |

## B.6 Transmitter unwanted emissions in the out-of-band domain

### Test limits

| ETSI clause | Limits                                                                                                                                                                                                                                                                                                                          |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.3.2.8.3   | <p>The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask below</p> <p>A: -10 dBm/MHz e.i.r.p.<br/>B: -20 dBm/MHz e.i.r.p.<br/>C: Spurious Domain limits</p> <p>BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater</p> |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.8.1     | <p>These measurements shall only be performed at normal test conditions.</p> <p>For non-FHSS equipment, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These operating channels shall be recorded.</p> <p>The equipment shall be configured to operate under its worst case situation with respect to output power.</p> <p>If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then each channel bandwidth shall be tested separately.</p> |

### Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the unwanted emissions in the out of band domain accordingly to the test method described in ETSI EN 300 328 V2.2.2 §5.4.8.2.1. The antenna terminal of the EUT is connected to the OSP120 through a 10dB attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on measured parameters.

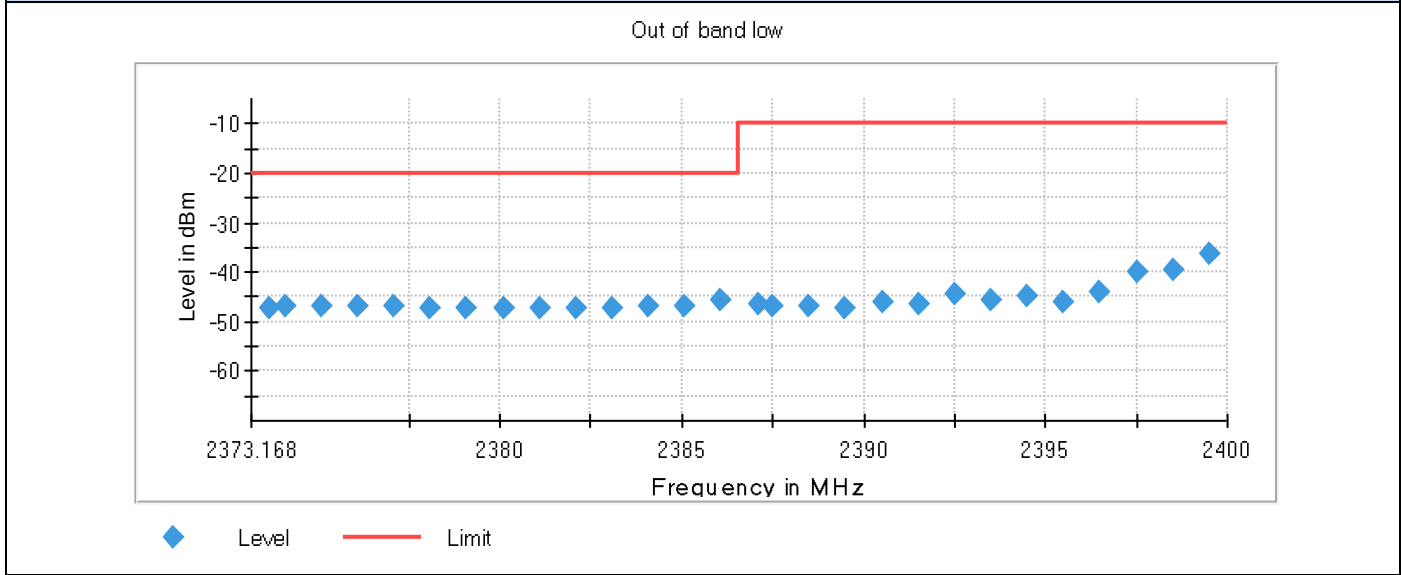
EMC32 provides the mask and the frequency limits based in the measured channel bandwidth. Maximum values for each limit level (-10dBm and -20dBm) are pointed using markers.

For MIMO modes the measurement is done separately on each transmit ports and the power of the individual 1MHz segments is sum for all ports.

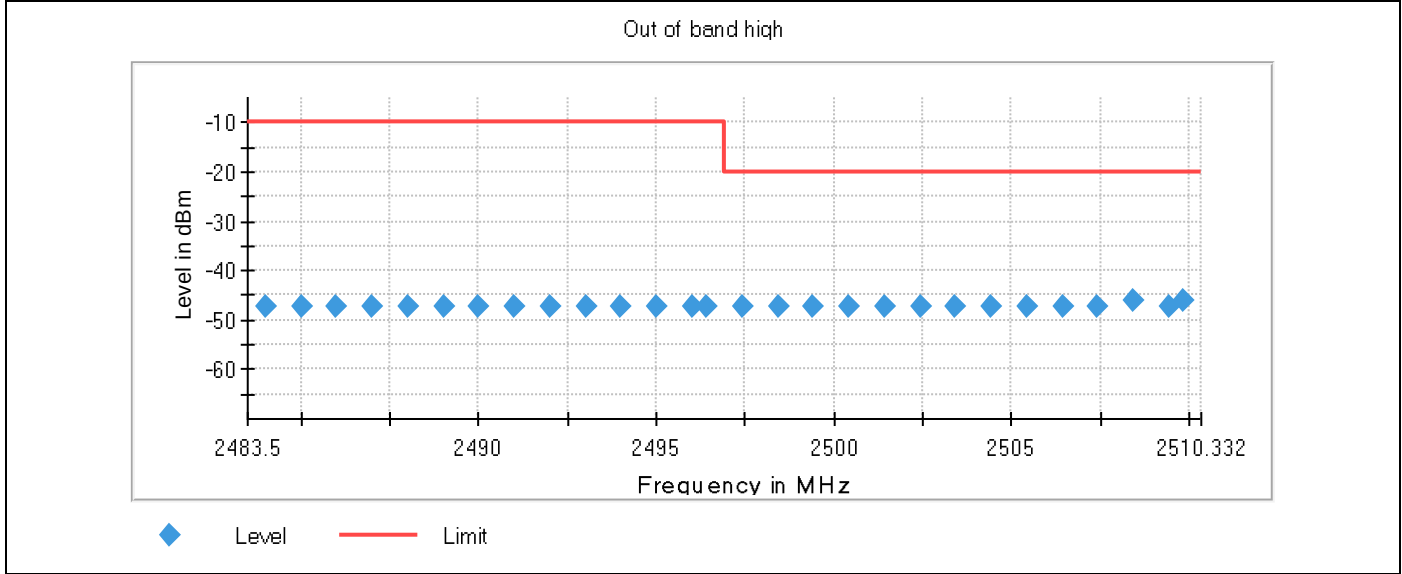
Results Screenshot

802.11b, 1Mbps – Chain A

UNWANTED OOB Low Freq Section, Channel 1

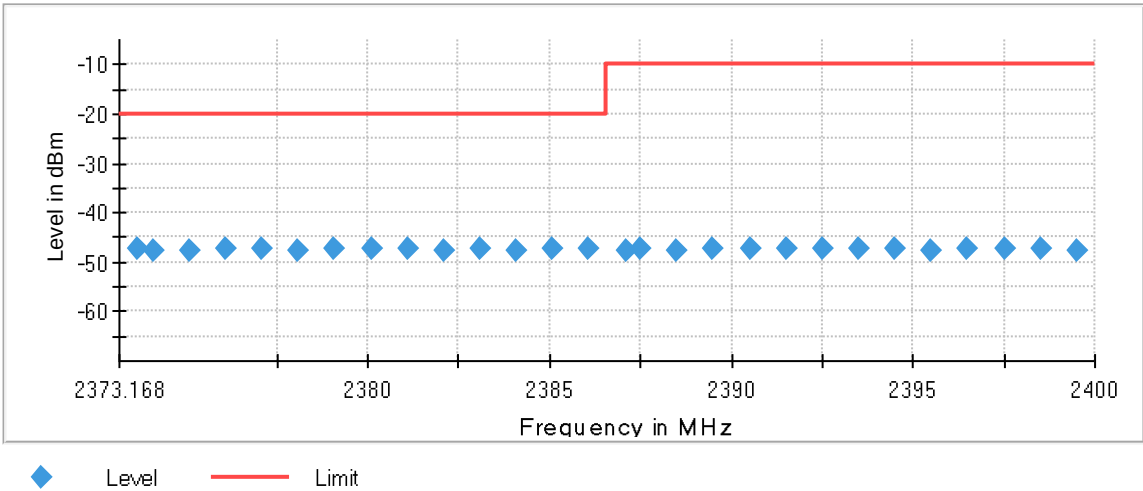


UNWANTED OOB High Freq Section, Channel 1



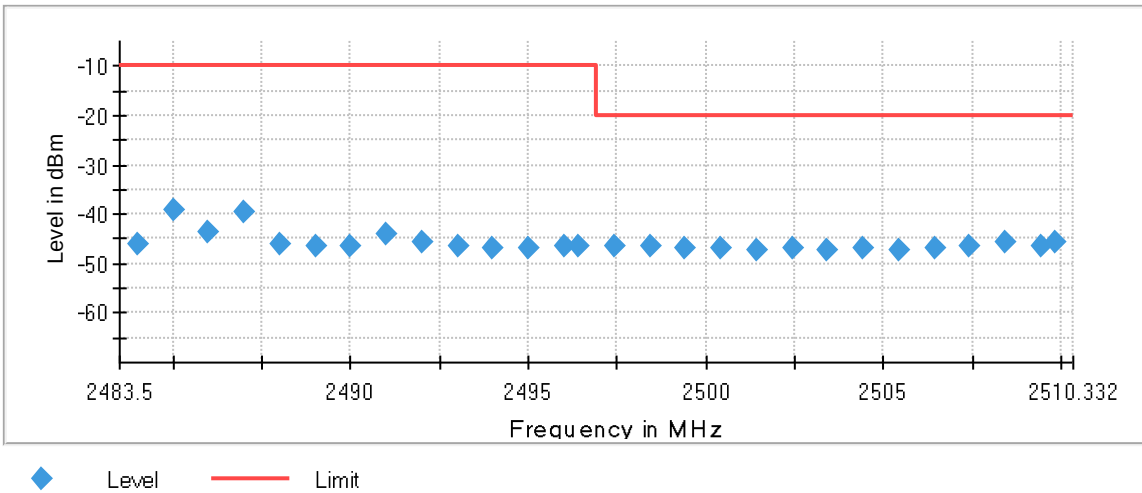
UNWANTED OOB Low Freq Section, Channel 13

Out of band low



UNWANTED OOB High Freq Section, Channel 13

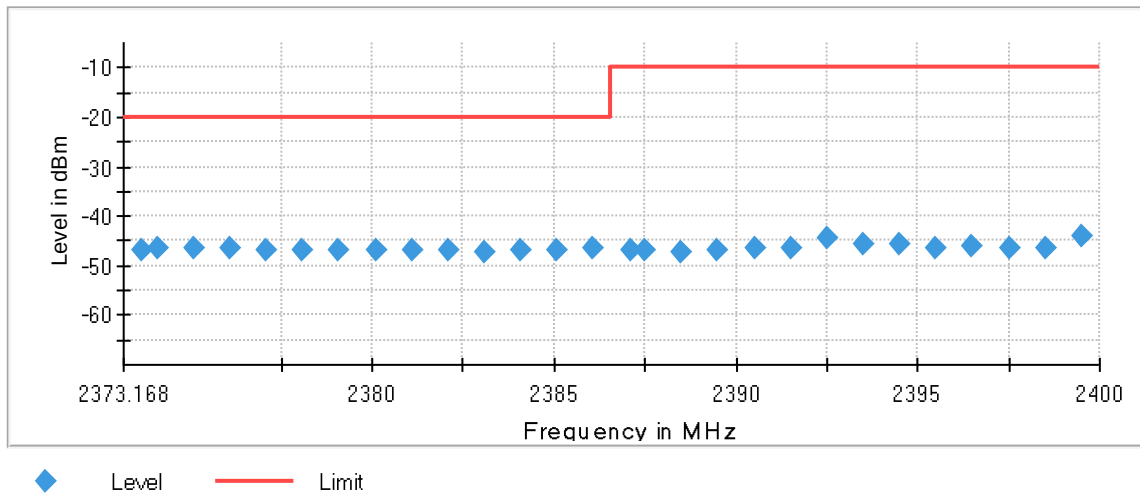
Out of band high



## 802.11b, 1Mbps – Chain B

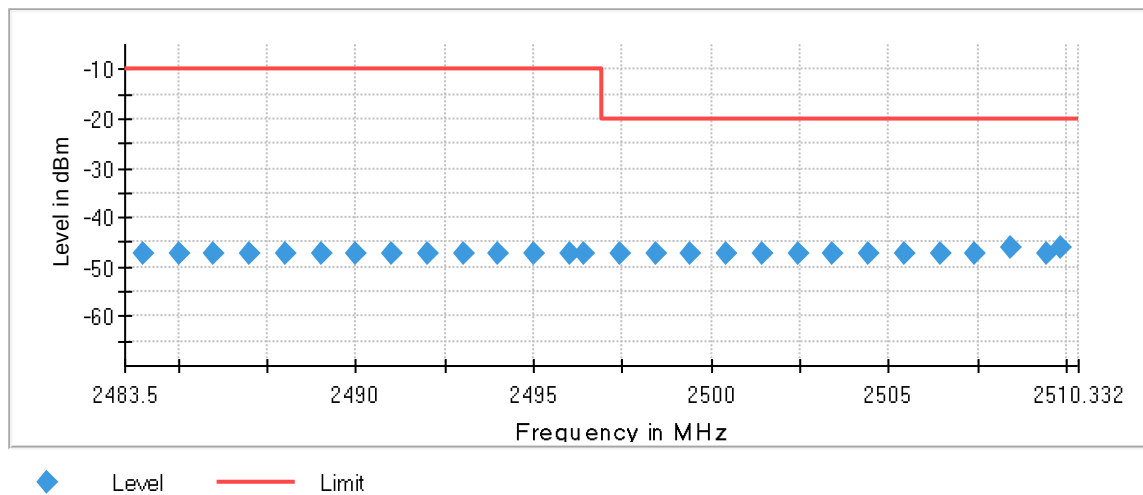
### UNWANTED OOB Low Freq Section, Channel 1

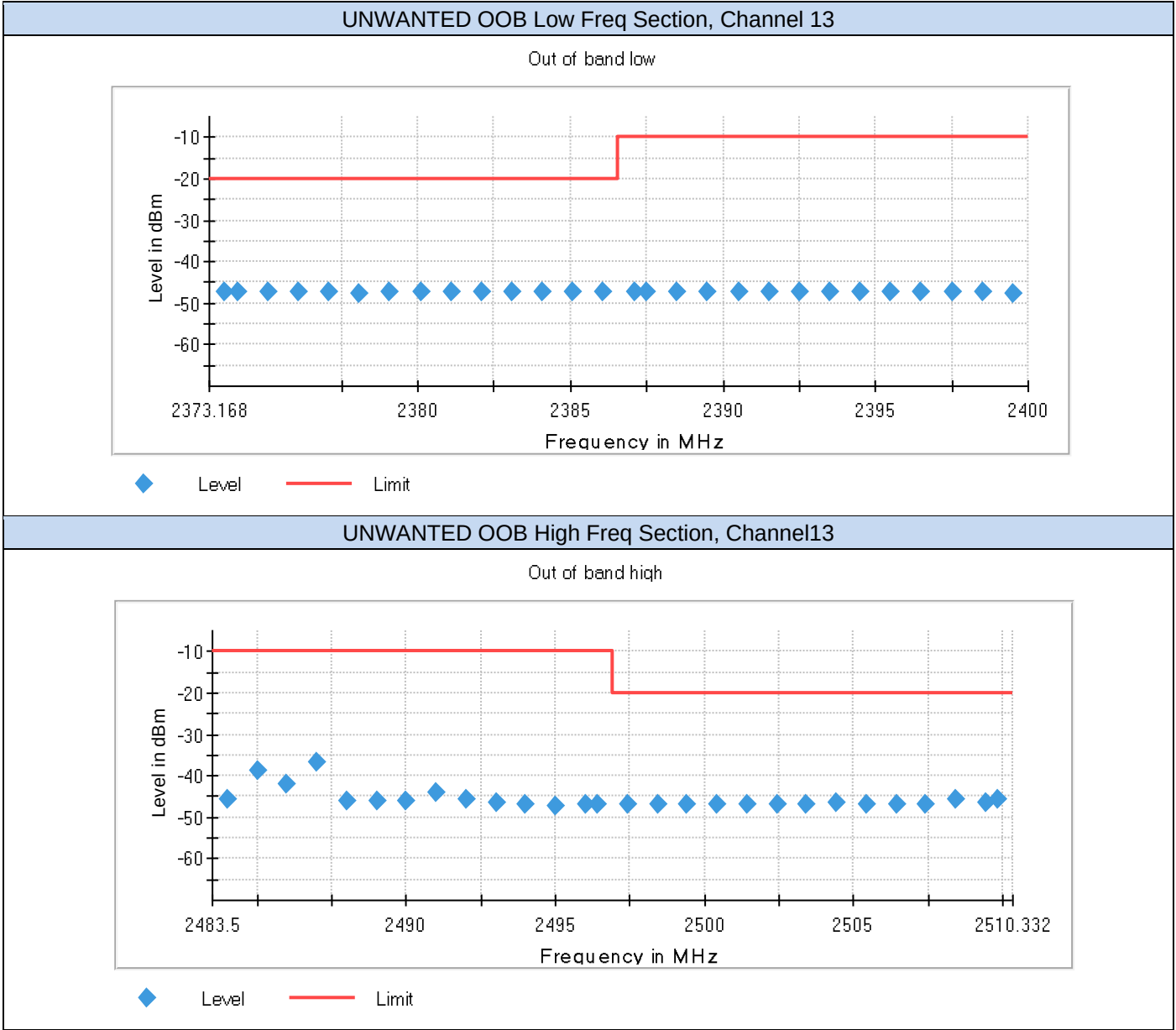
Out of band low



### UNWANTED OOB High Freq Section, Channel 1

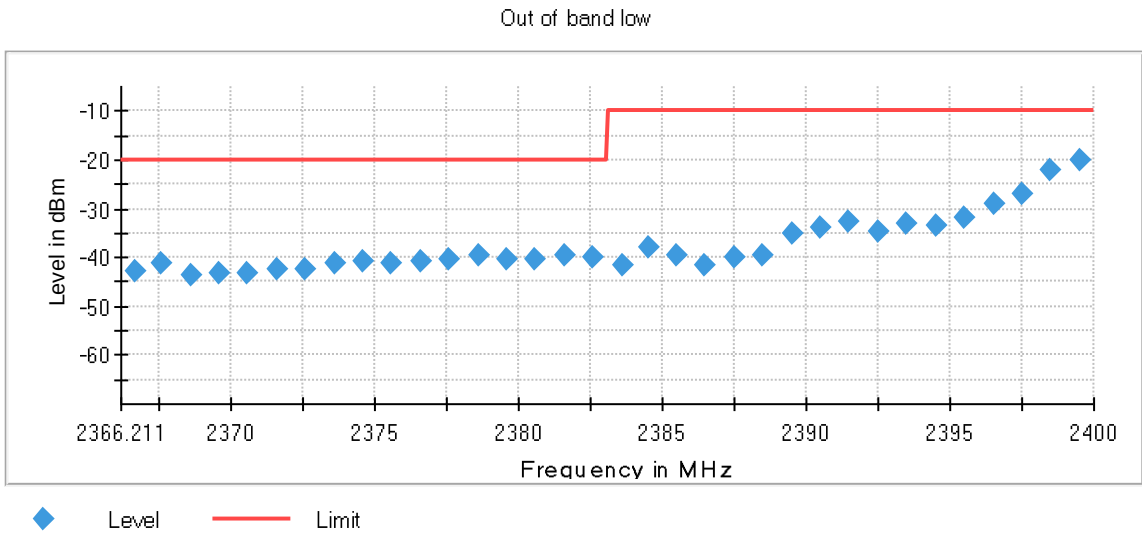
Out of band high



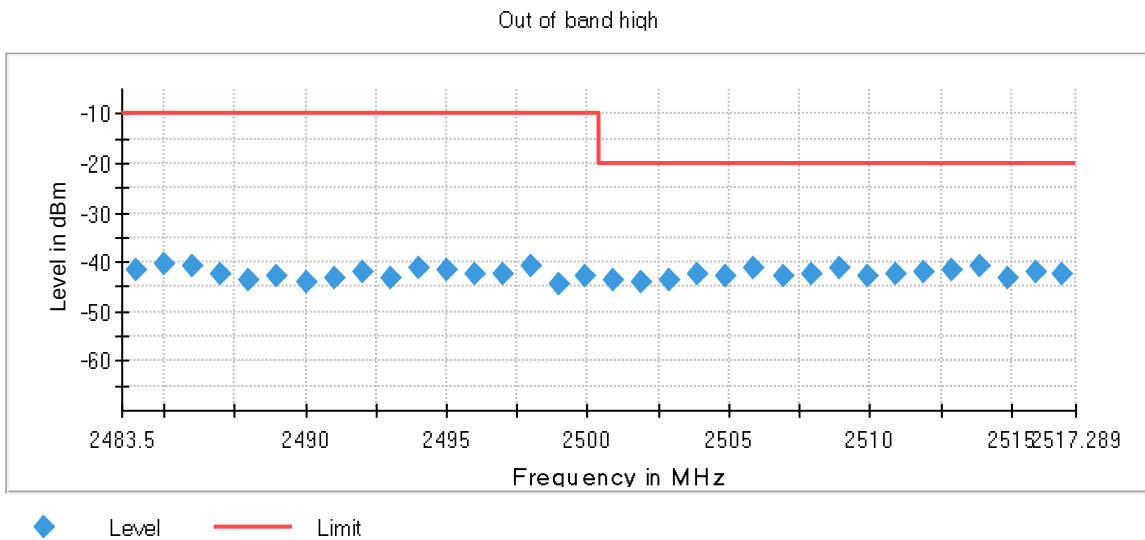


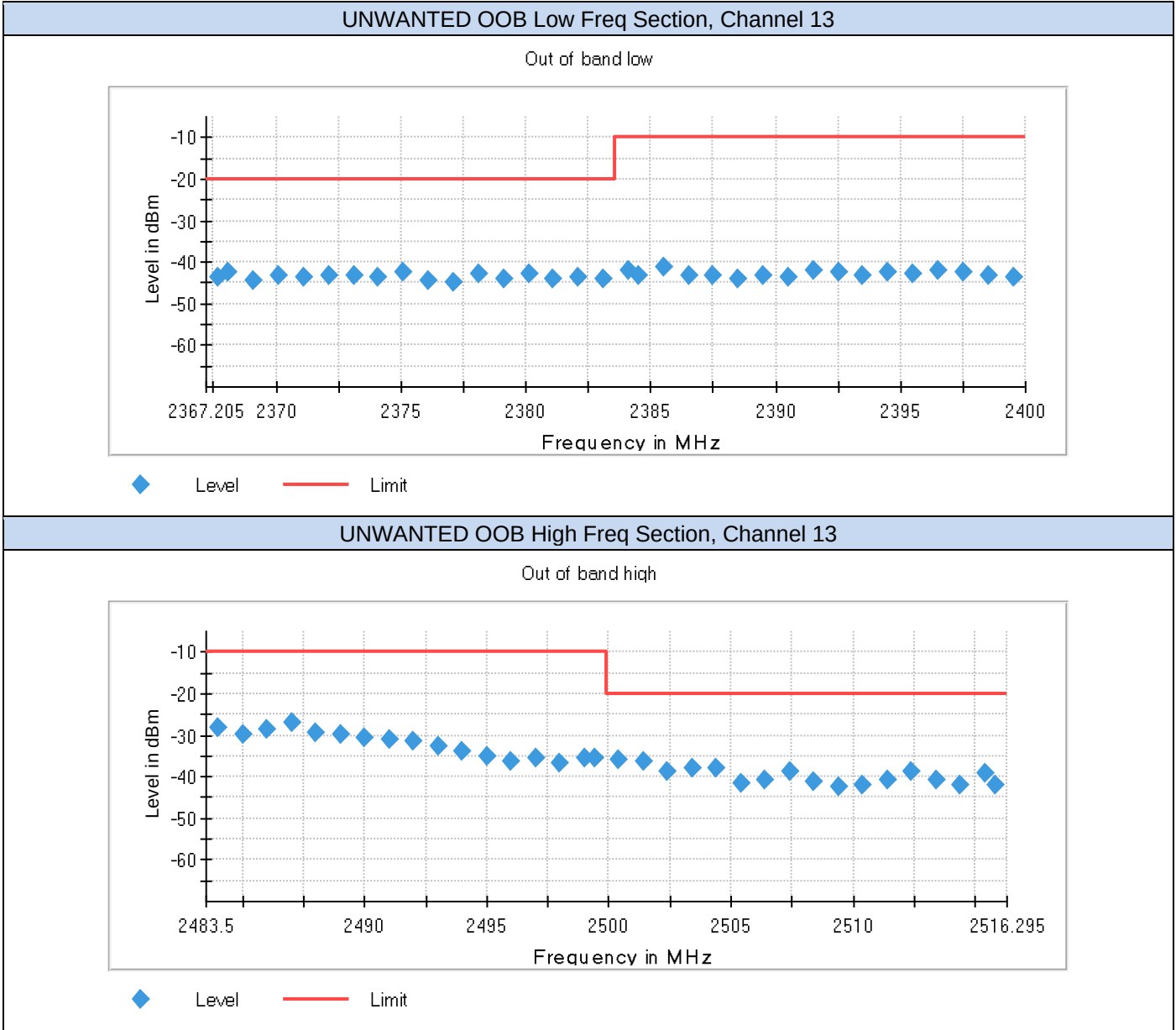
802.11g, 6 Mbps – Chain A

UNWANTED OOB Low Freq Section, Channel 1



UNWANTED OOB High Freq Section, Channel 1



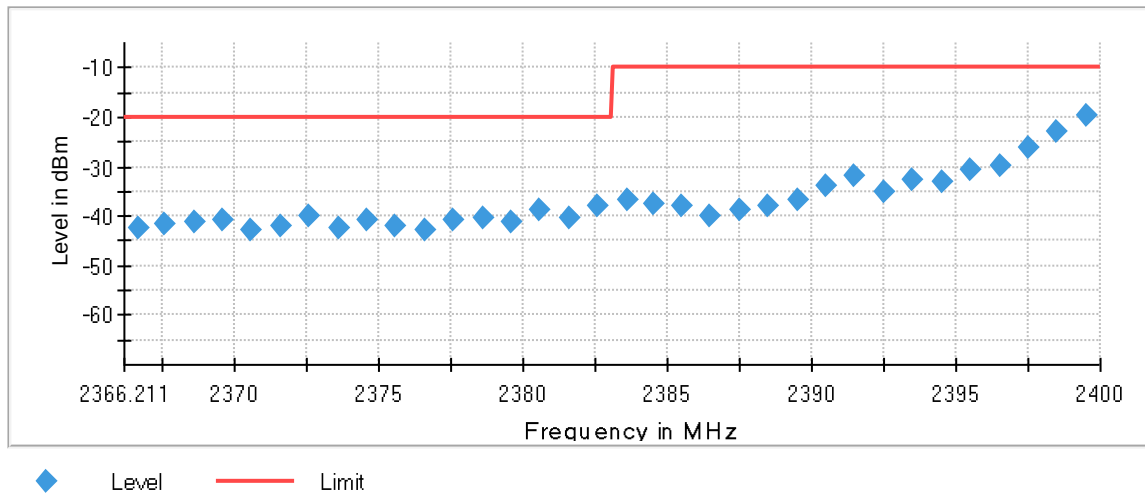




## 802.11g, 6 Mbps – Chain B

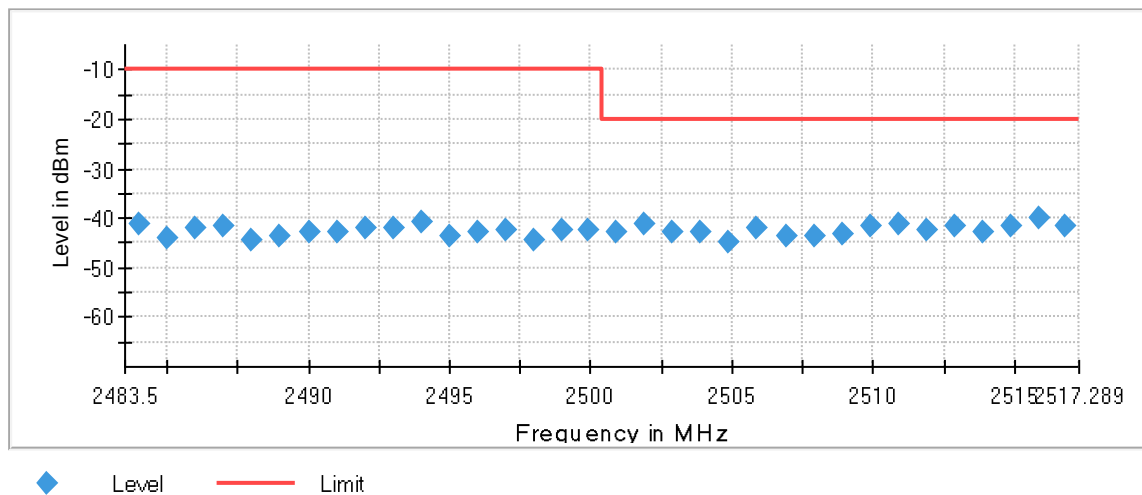
### UNWANTED OOB Low Freq Section, Channel 1

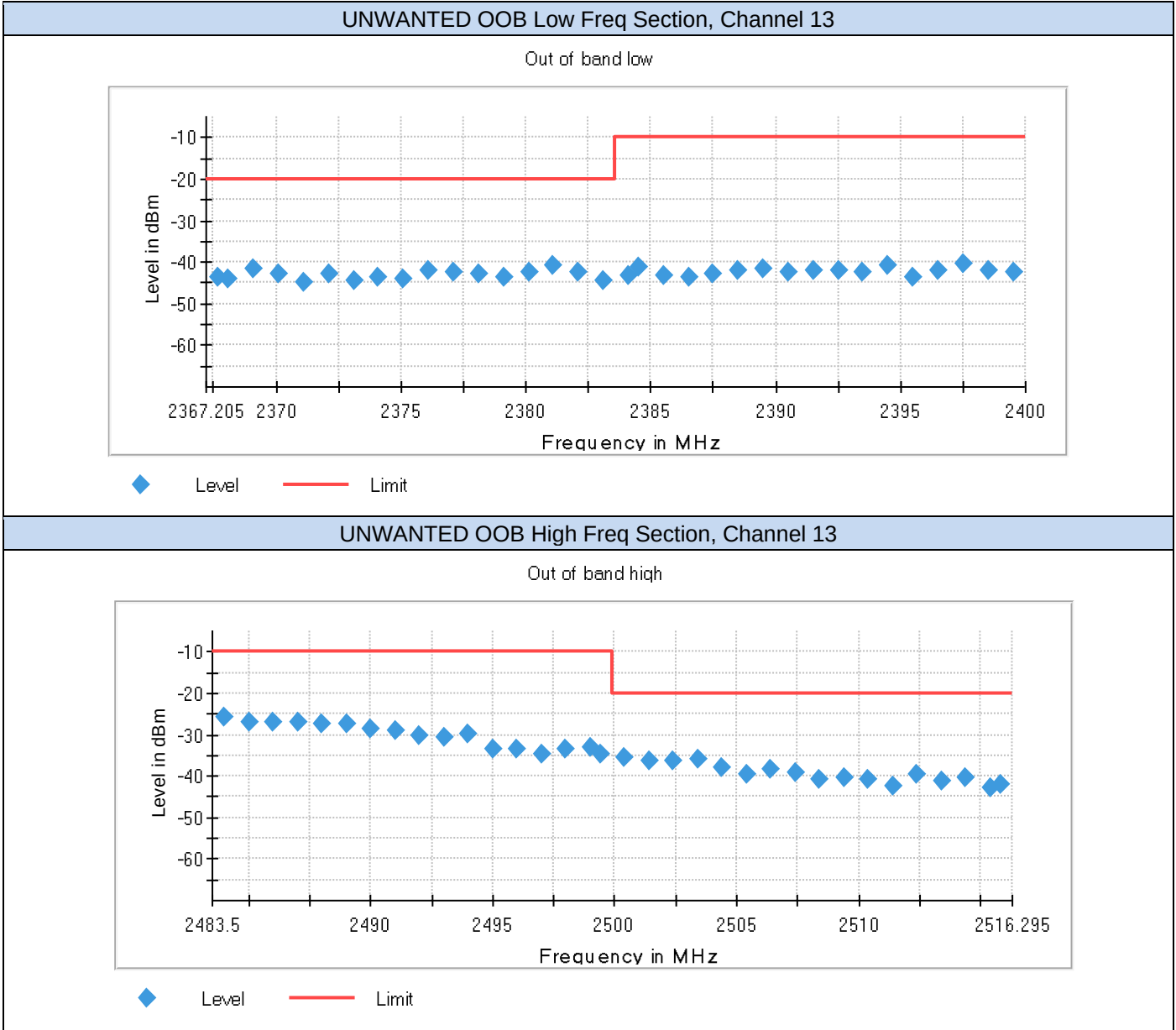
Out of band low



### UNWANTED OOB High Freq Section, Channel 1

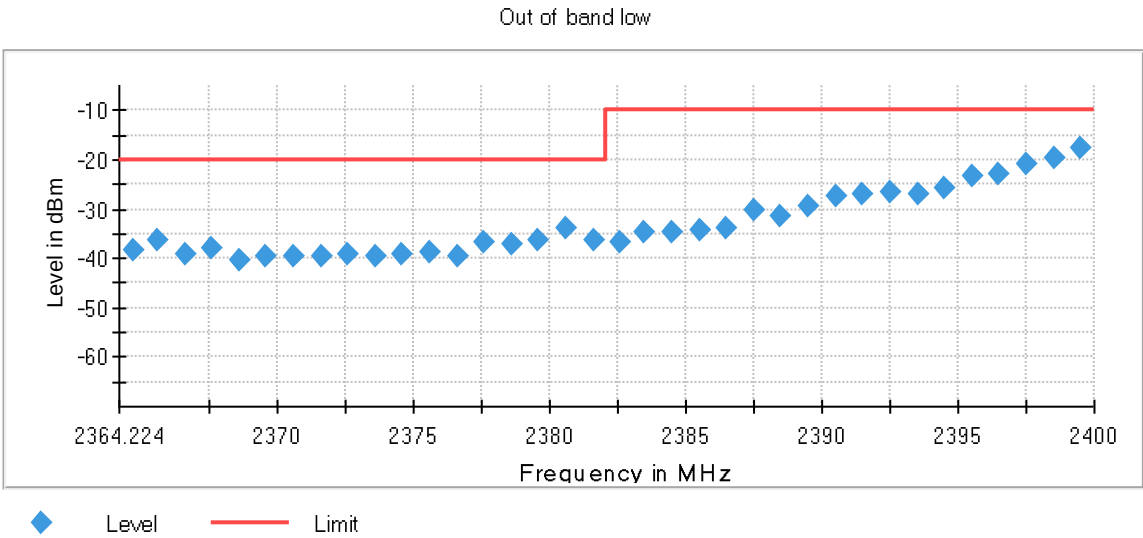
Out of band high



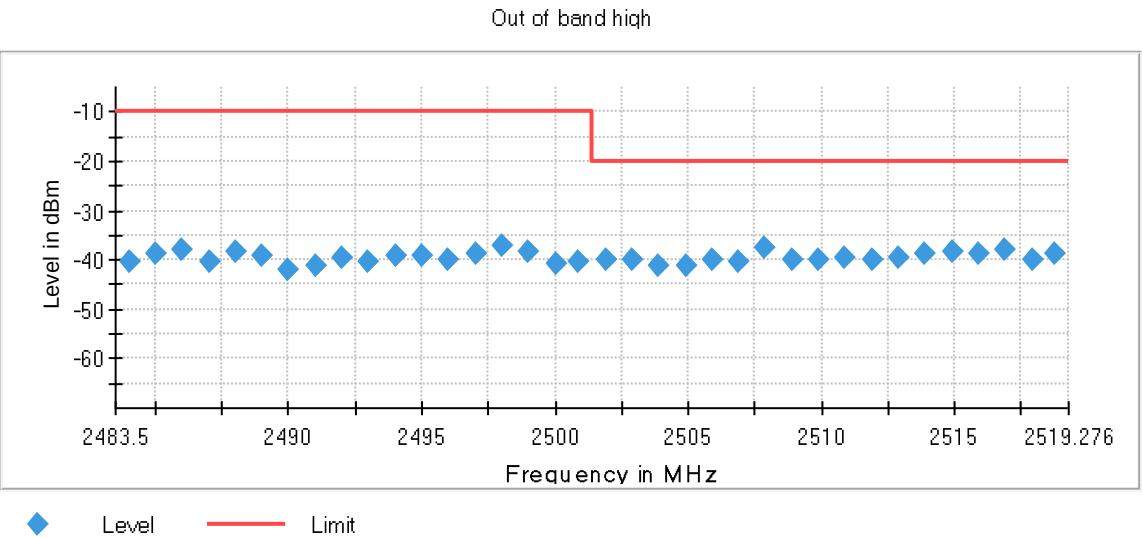


802.11n20, HT0 (SISO) – Chain A

UNWANTED OOB Low Freq Section, Channel 1

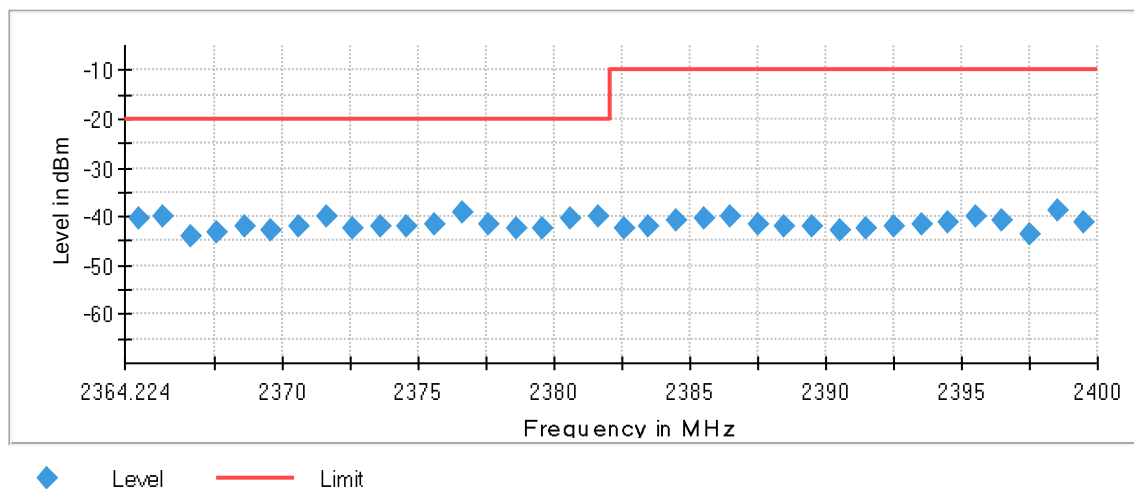


UNWANTED OOB High Freq Section, Channel 1



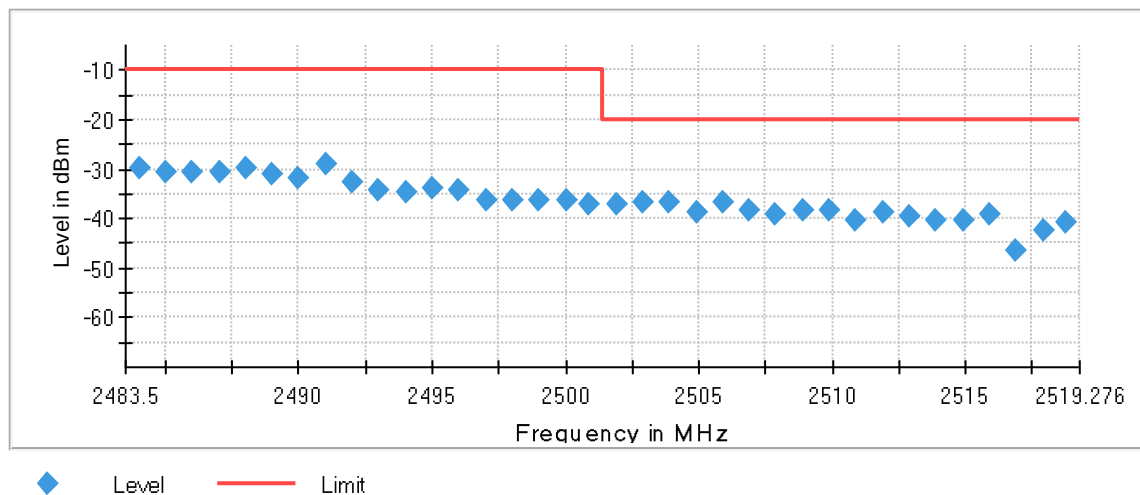
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



### UNWANTED OOB High Freq Section, Channel 13

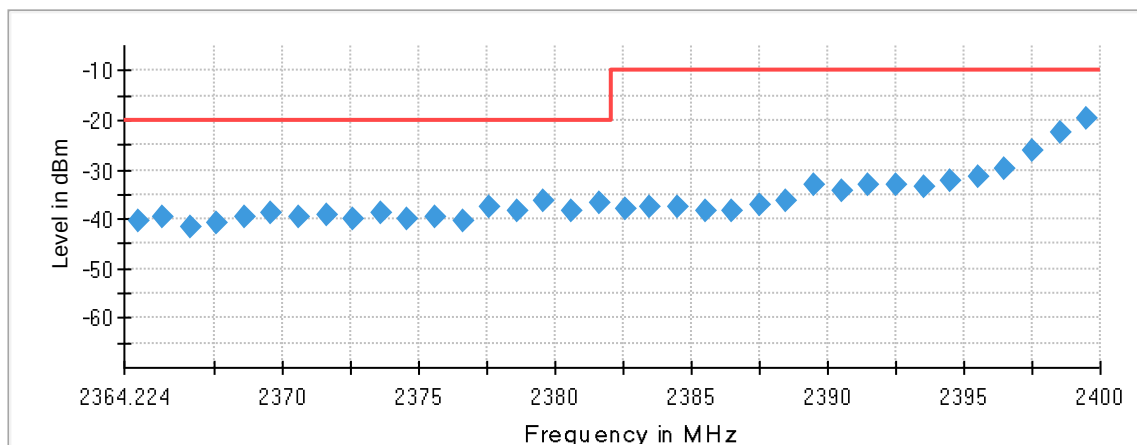
Out of band high



## 802.11n20, HT0 (SISO) – Chain B

### UNWANTED OOB Low Freq Section, Channel 1

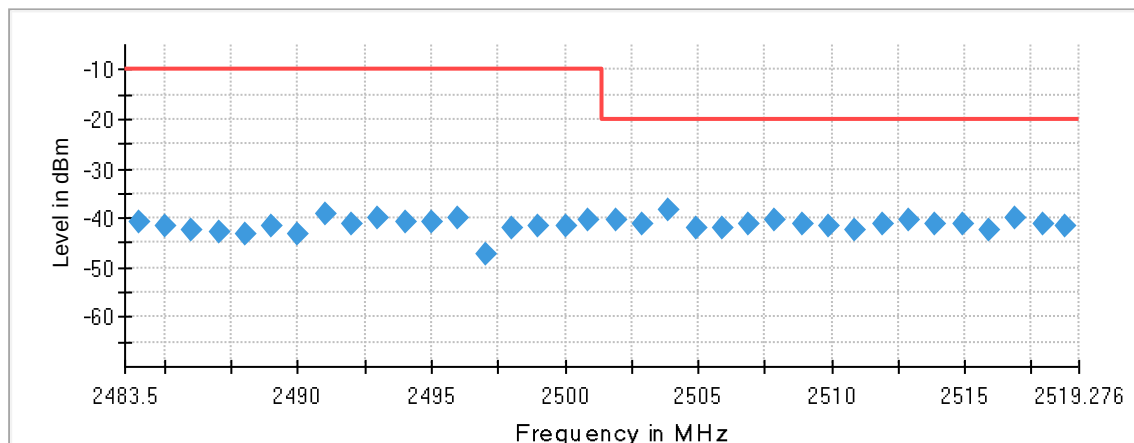
Out of band low



◆ Level — Limit

### UNWANTED OOB High Freq Section, Channel 1

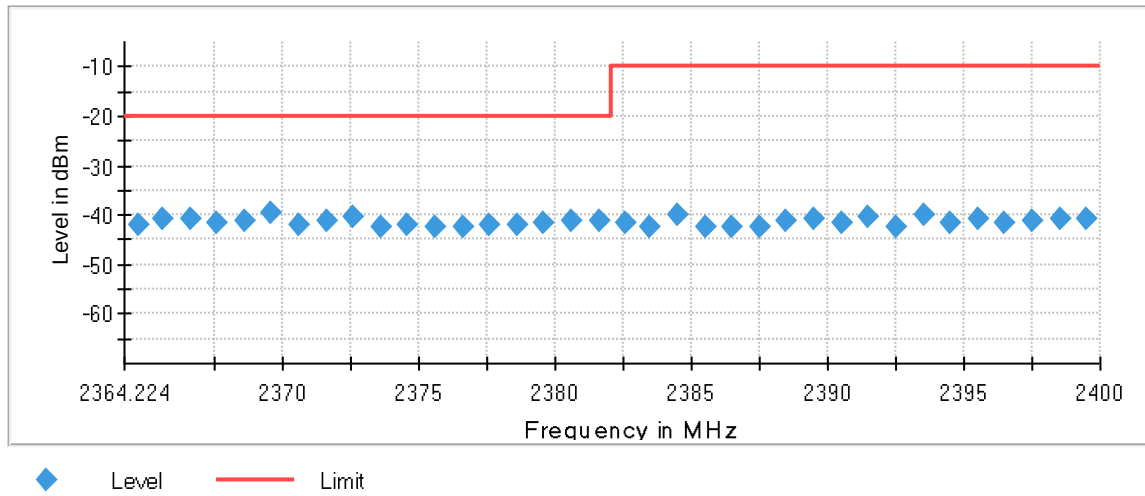
Out of band high



◆ Level — Limit

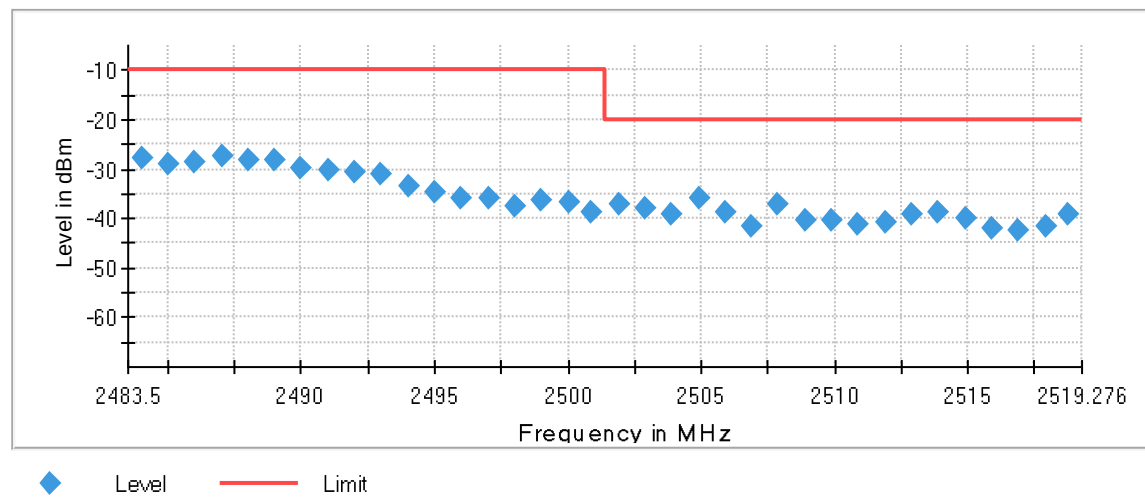
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



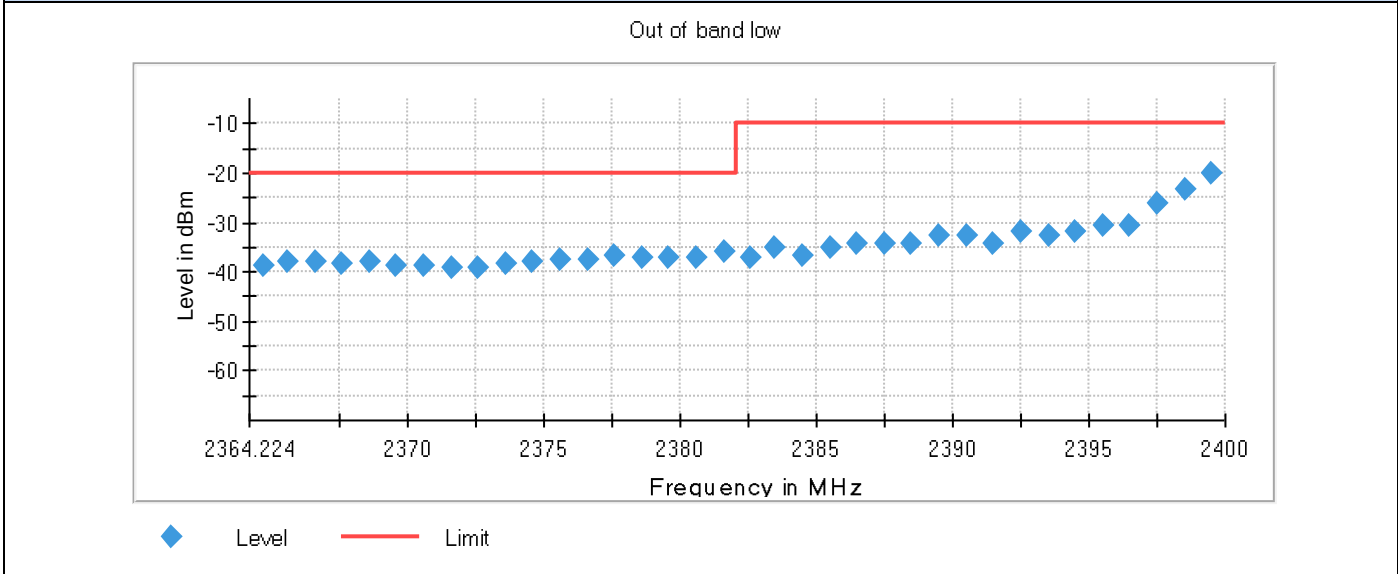
### UNWANTED OOB High Freq Section, Channel 13

Out of band high

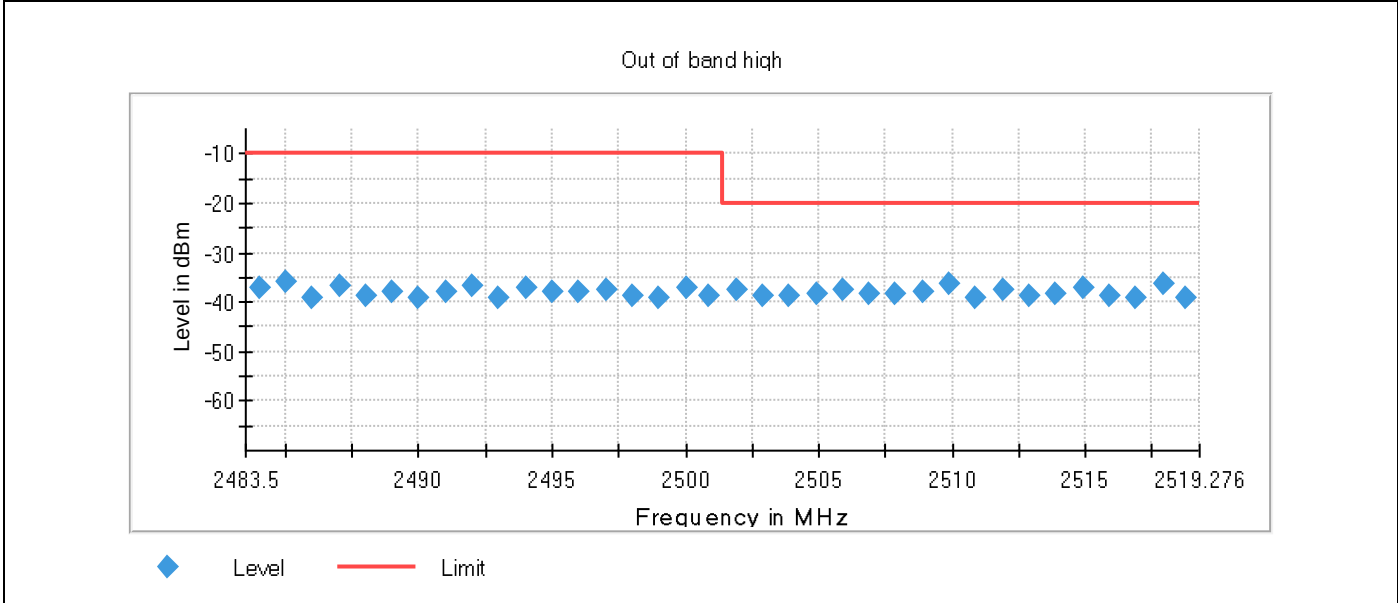


802.11n20, HT8 (MIMO)

UNWANTED OOB Low Freq Section, Channel 1

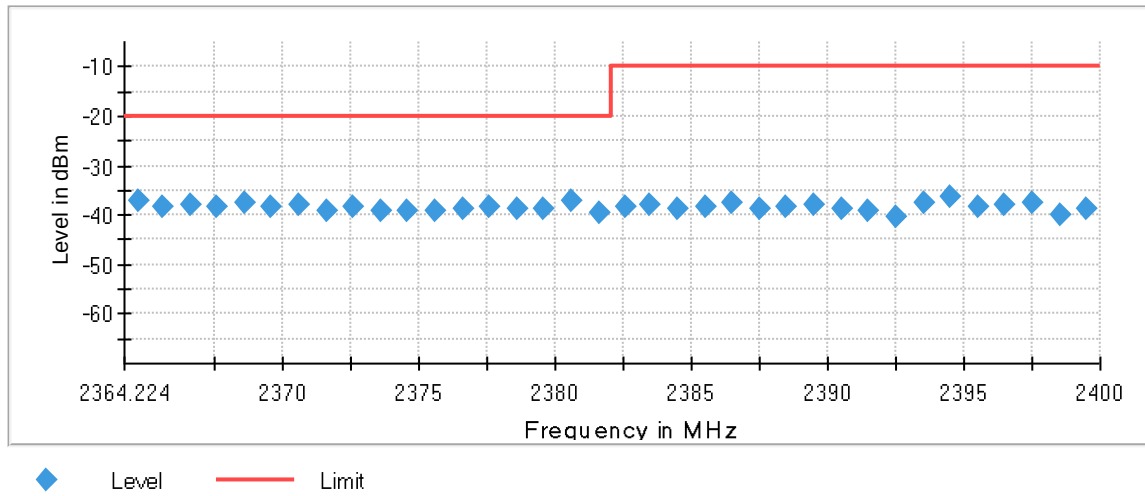


UNWANTED OOB High Freq Section , Channel 1



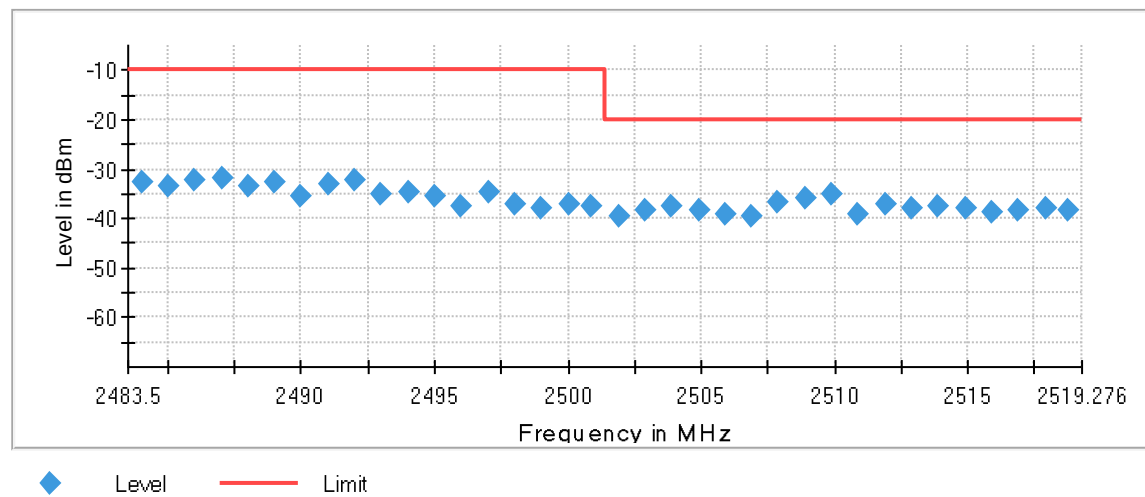
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



### UNWANTED OOB High Freq Section, Channel 13

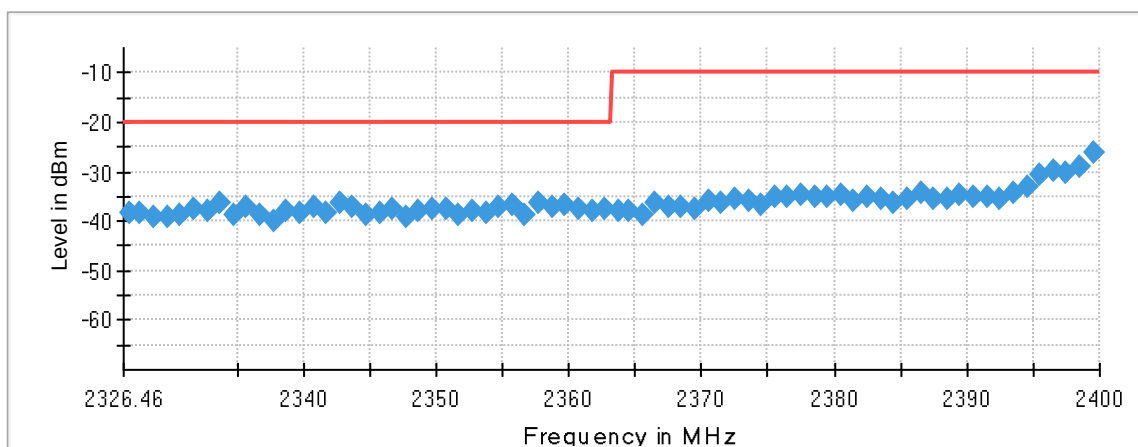
Out of band high





**802.11n40, HT0 (SISO) – Chain A****UNWANTED OOB Low Freq Section, Channel 3**

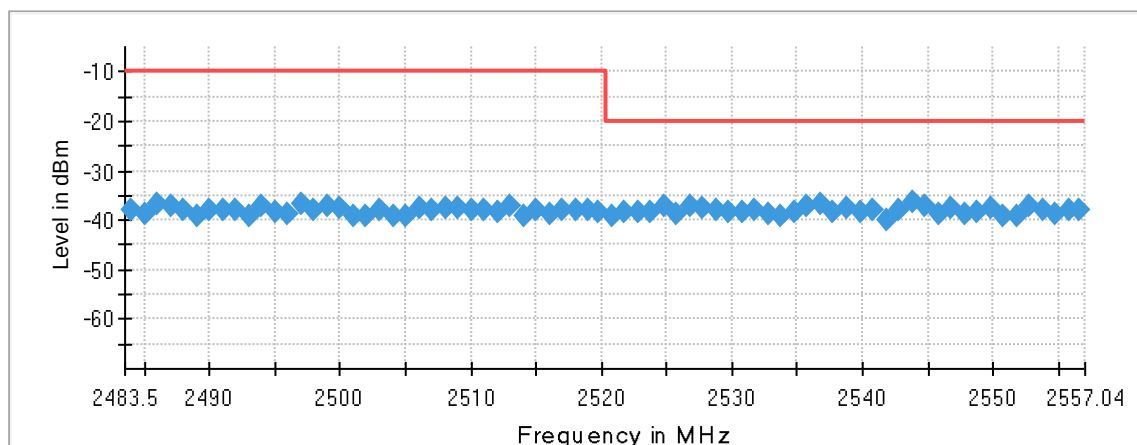
Out of band low



◆ Level — Limit

**UNWANTED OOB High Freq Section, Channel 3**

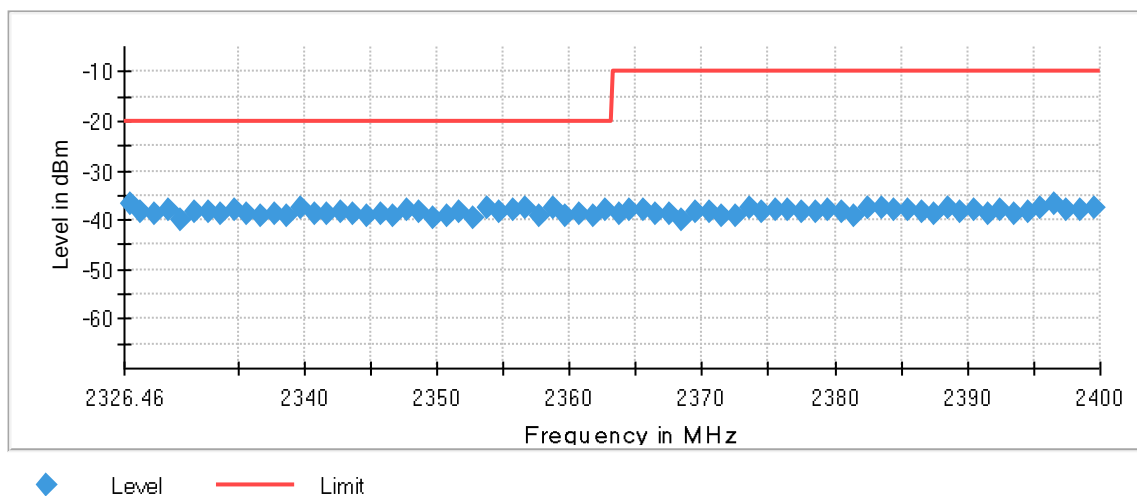
Out of band high



◆ Level — Limit

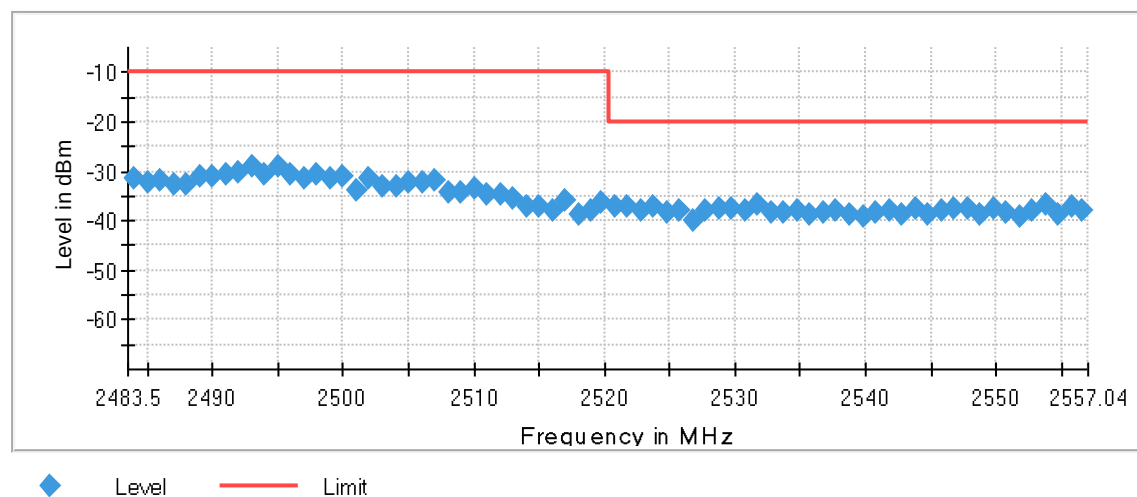
### UNWANTED OOB Low Freq Section, Channel 11

Out of band low



### UNWANTED OOB High Freq Section, Channel 11

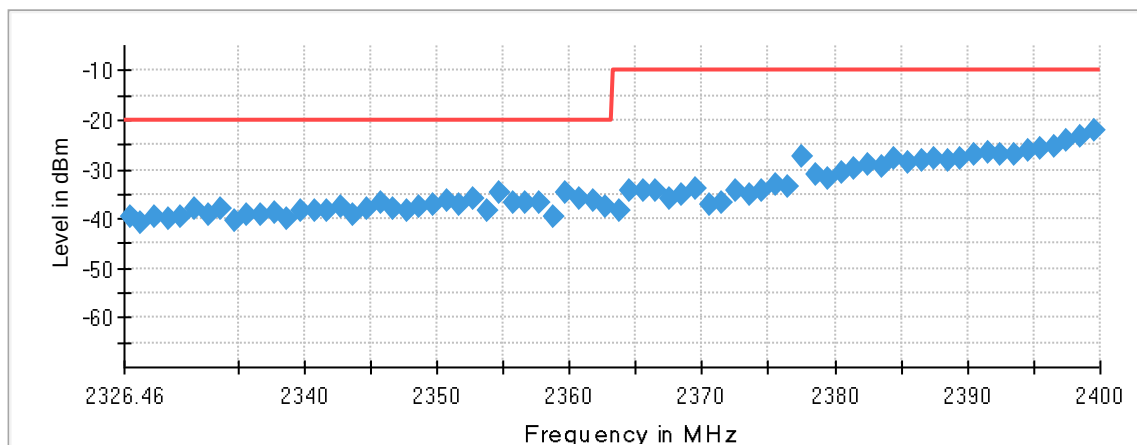
Out of band high



## 802.11n40, HT0 (SISO) – Chain B

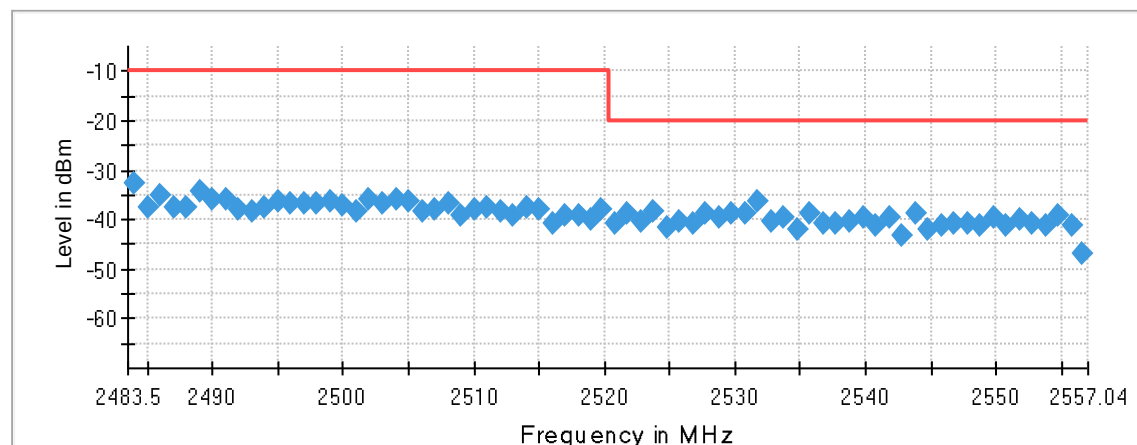
### UNWANTED OOB Low Freq Section, Channel 3

Out of band low



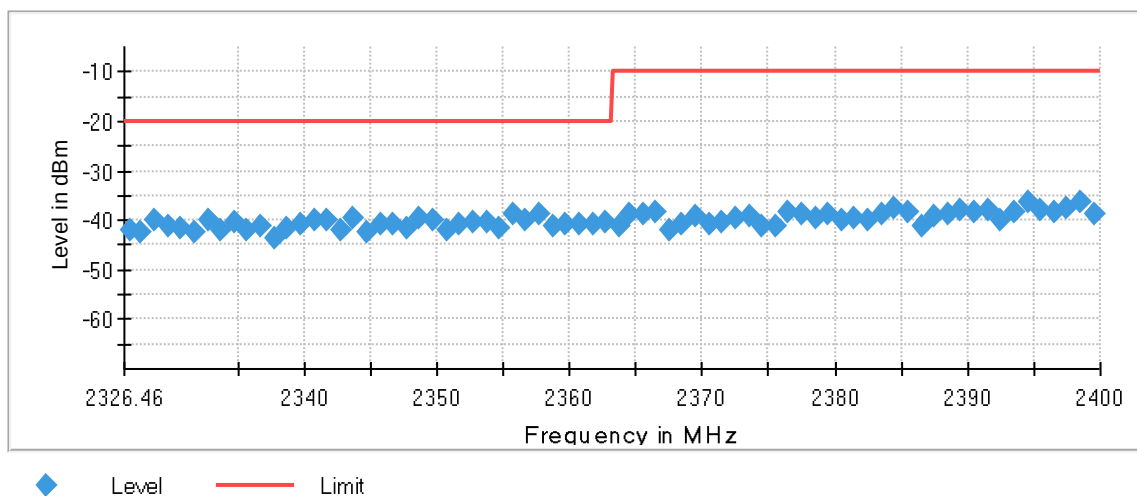
### UNWANTED OOB High Freq Section, Channel 3

Out of band high



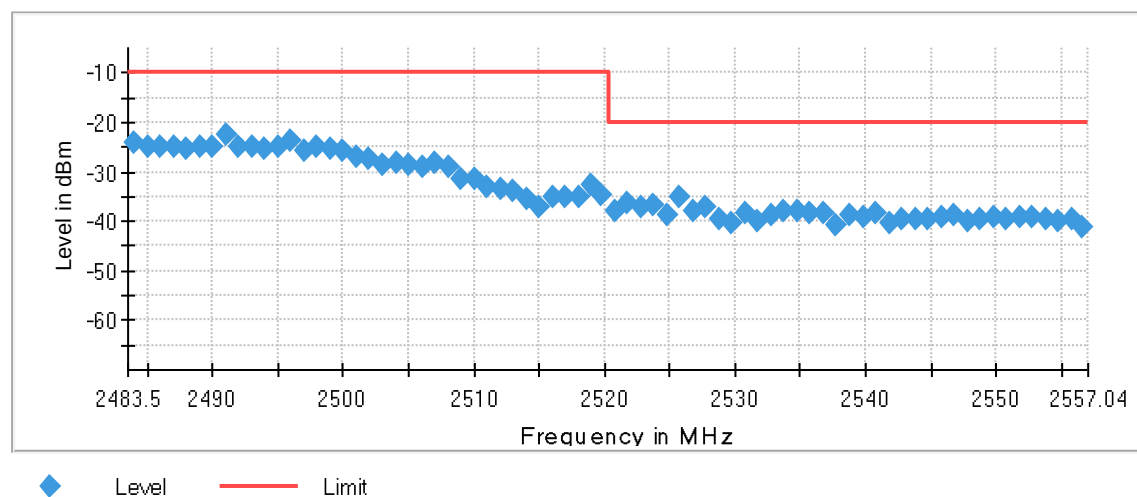
### UNWANTED OOB Low Freq Section, Channel 11

Out of band low



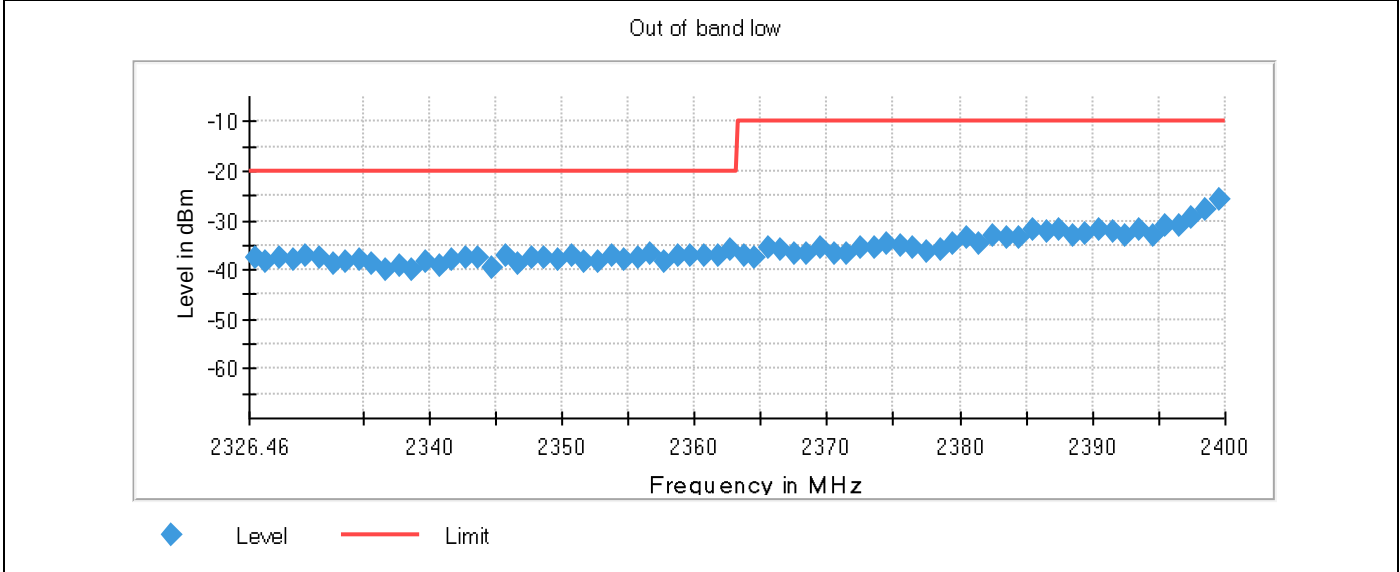
### UNWANTED OOB High Freq Section, Channel 11

Out of band high

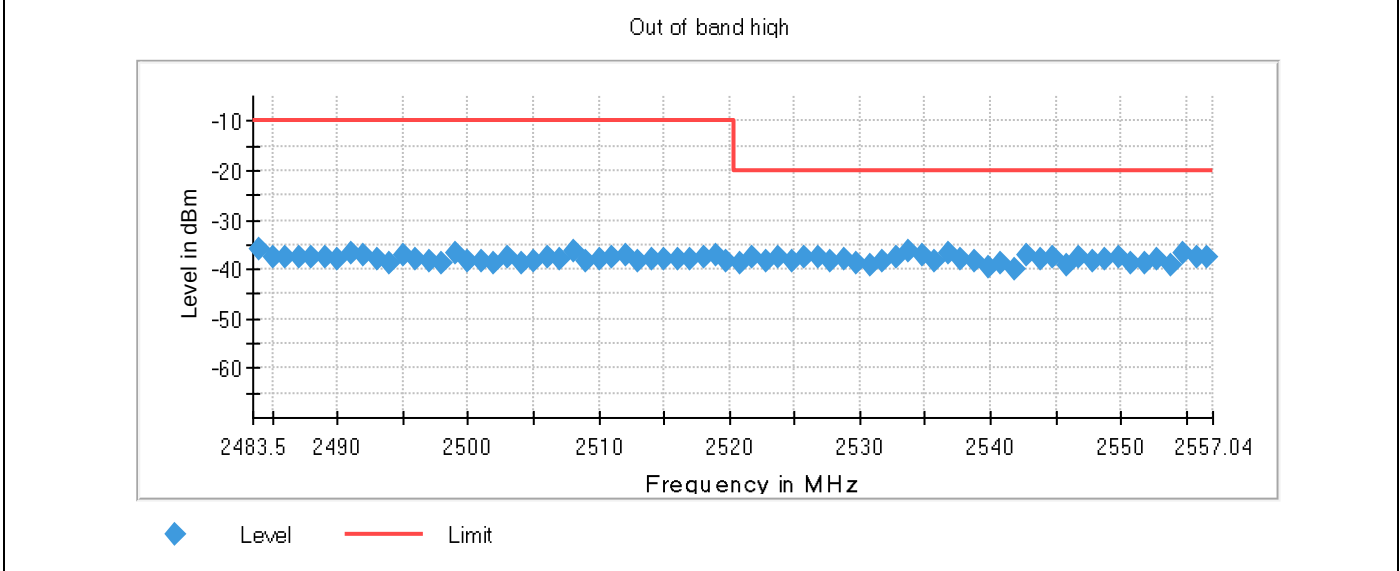


802.11n40, HT8 (MIMO)

UNWANTED OOB Low Freq Section, Channel 3

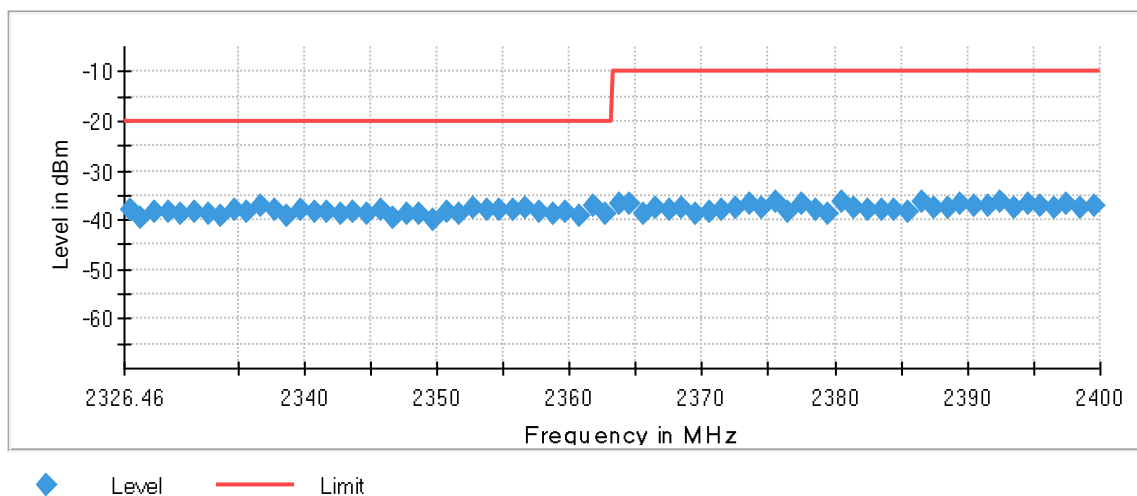


UNWANTED OOB High Freq Section , Channel 3



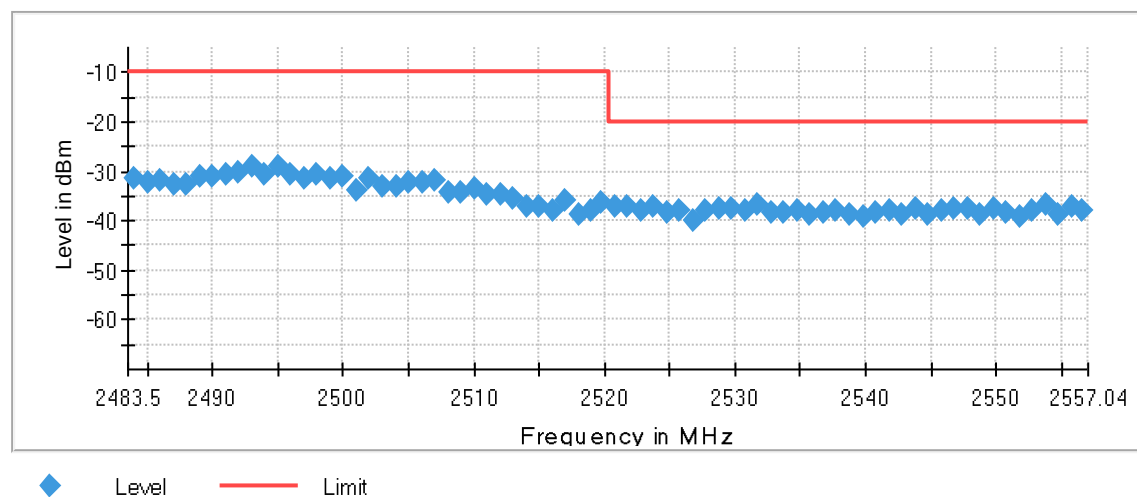
### UNWANTED OOB Low Freq Section, Channel 11

Out of band low



### UNWANTED OOB High Freq Section, Channel 11

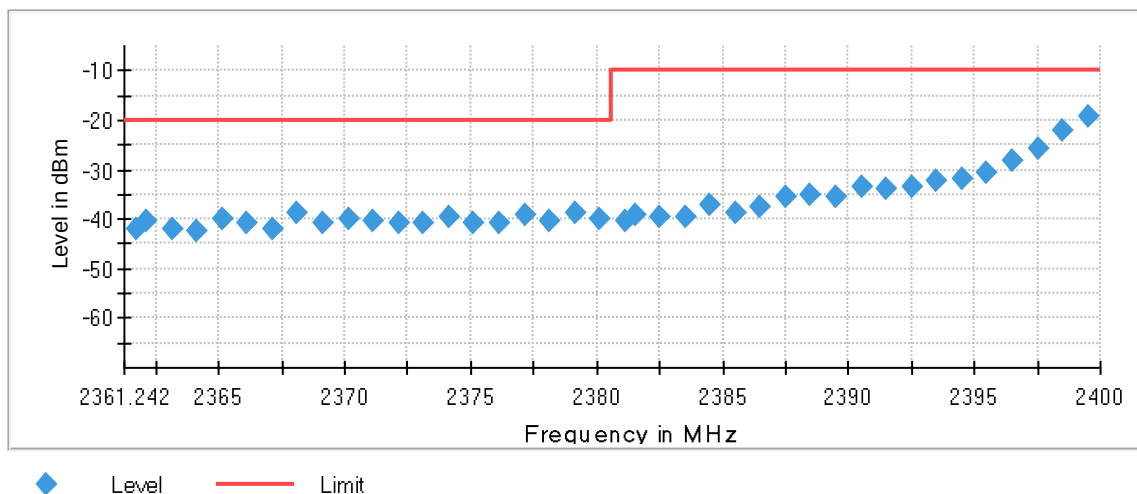
Out of band high



## 802.11ax20, HE0 (SISO) – Chain A

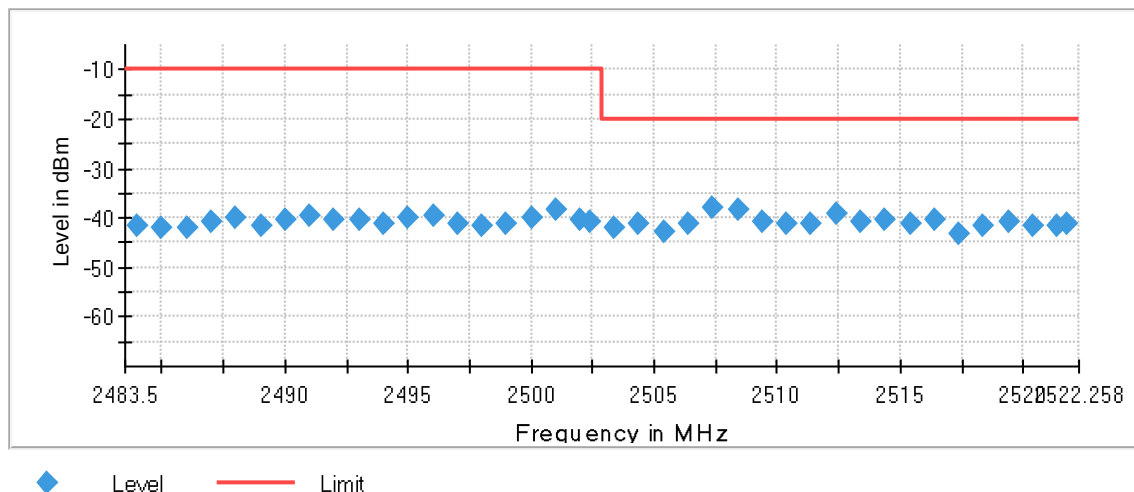
### UNWANTED OOB Low Freq Section, Channel 1

Out of band low



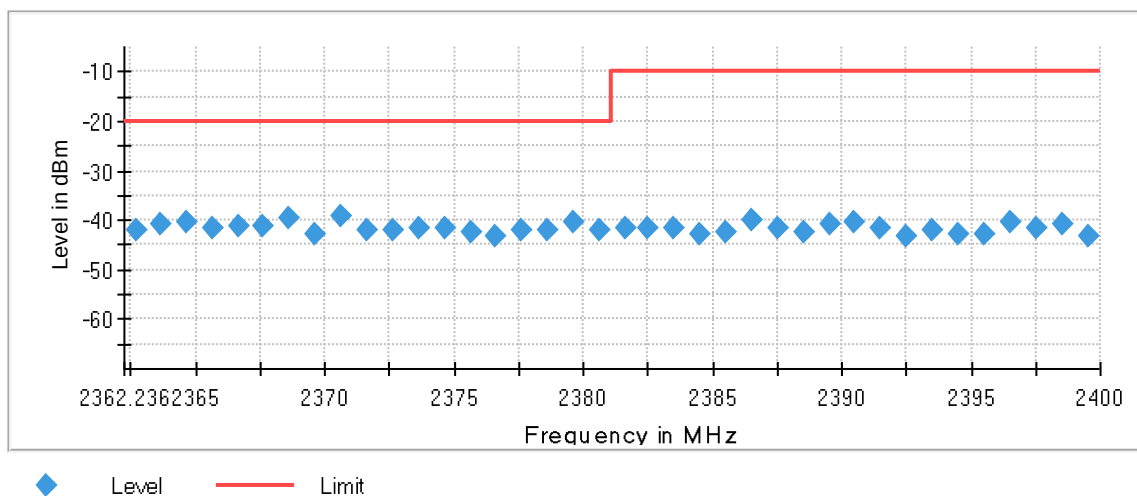
### UNWANTED OOB High Freq Section, Channel 1

Out of band high



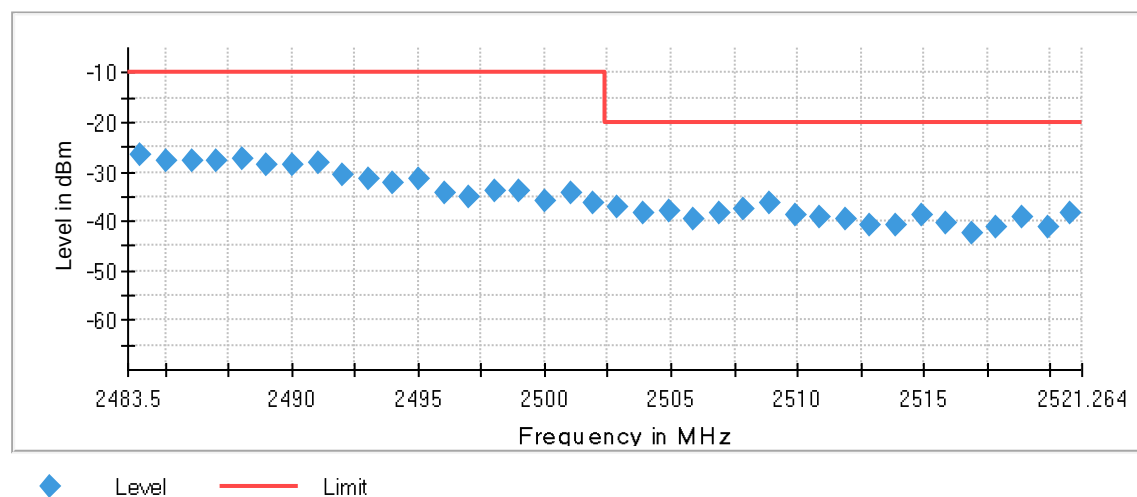
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



### UNWANTED OOB High Freq Section, Channel 13

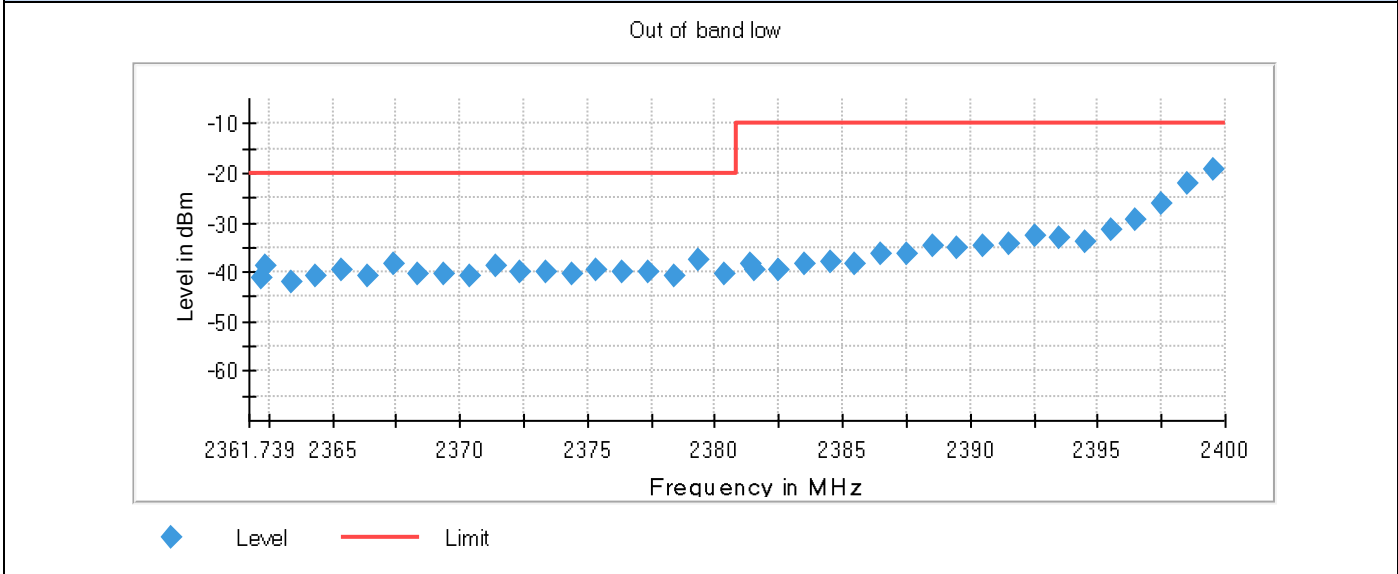
Out of band high



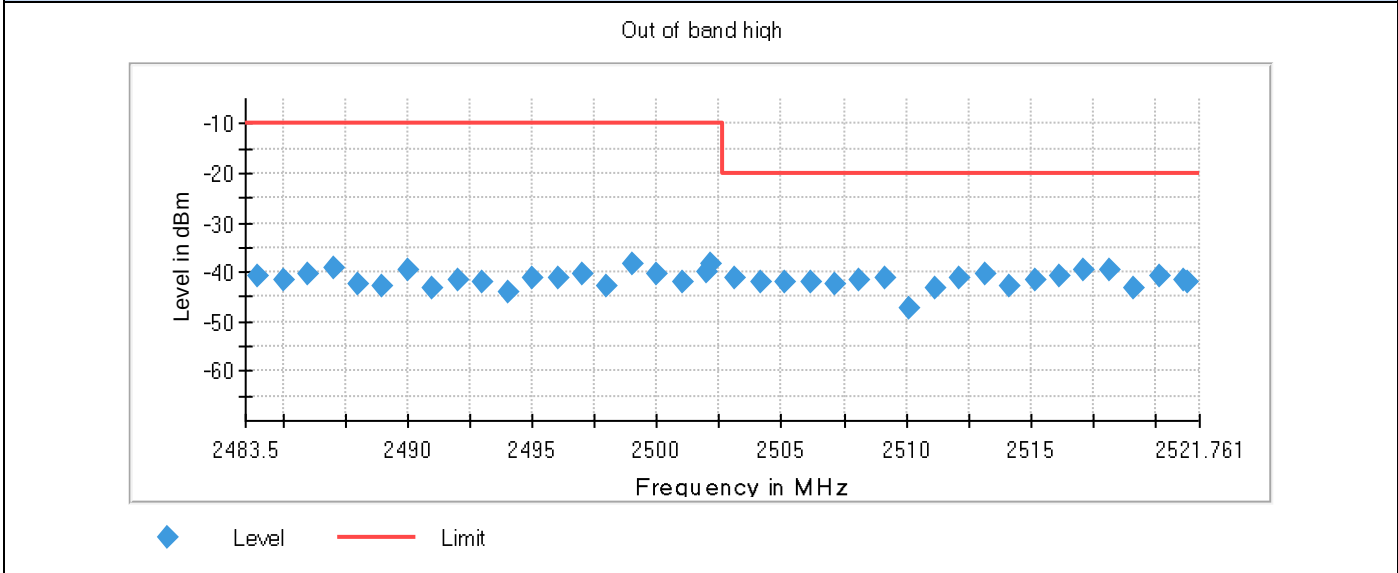


802.11ax20, HE0 (SISO) – Chain B

UNWANTED OOB Low Freq Section, Channel 1

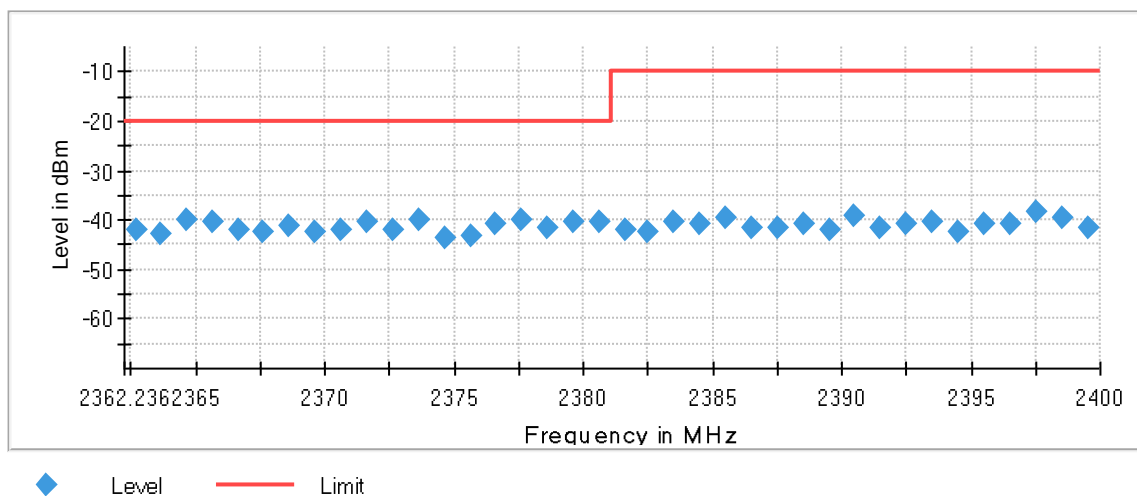


UNWANTED OOB High Freq Section, Channel 1



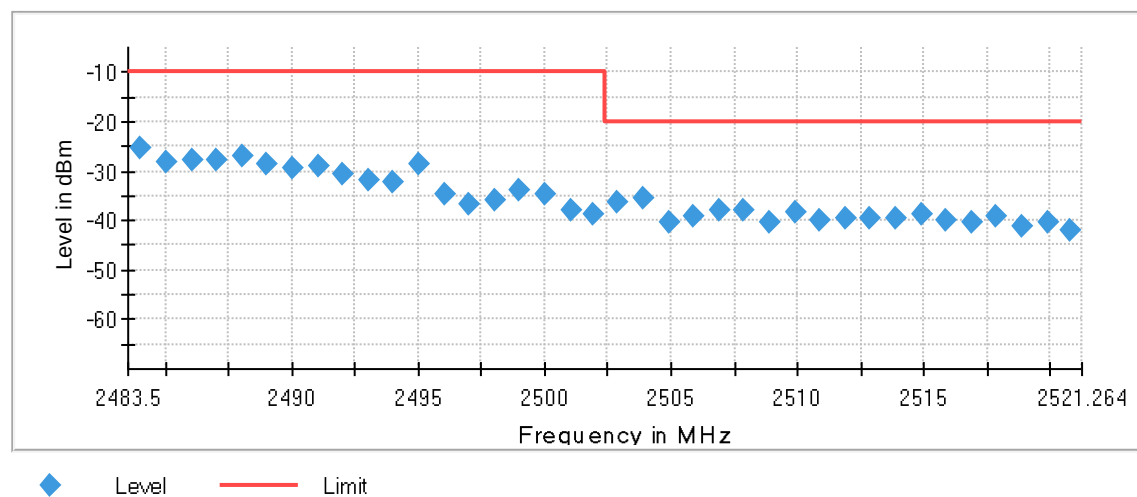
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



### UNWANTED OOB High Freq Section, Channel 13

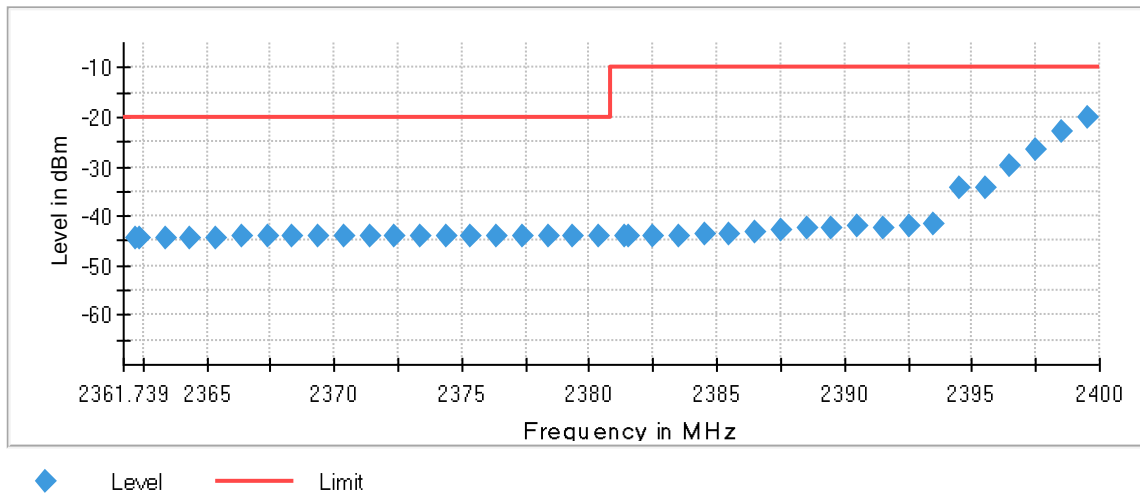
Out of band high



## 802.11ax20, HE0 (MIMO)

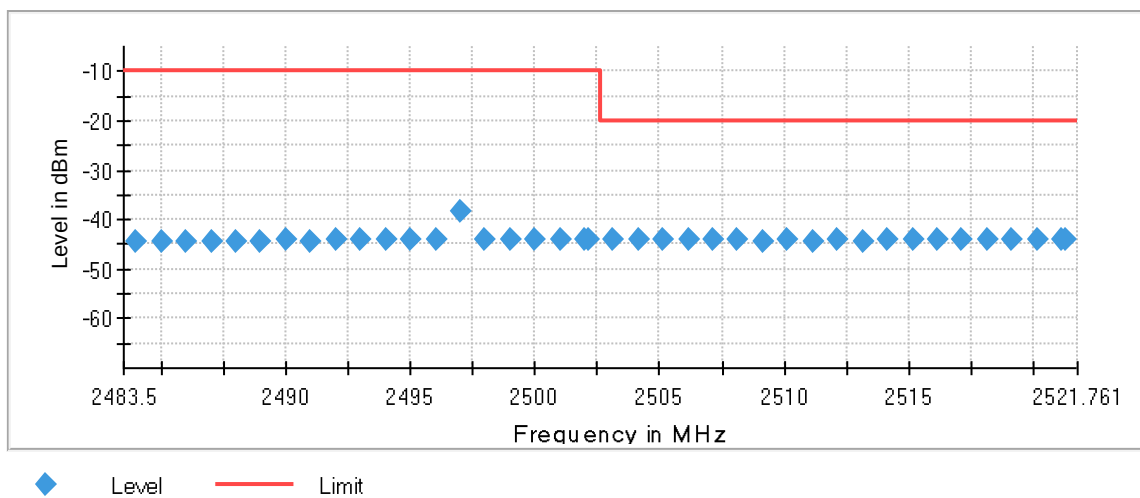
### UNWANTED OOB Low Freq Section, Channel 1

Out of band low



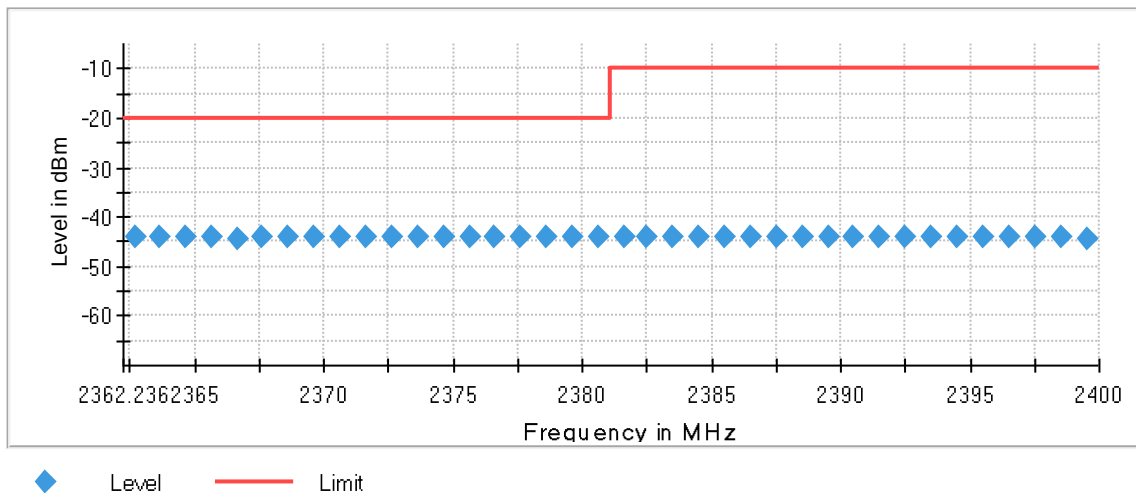
### UNWANTED OOB High Freq Section , Channel 1

Out of band high



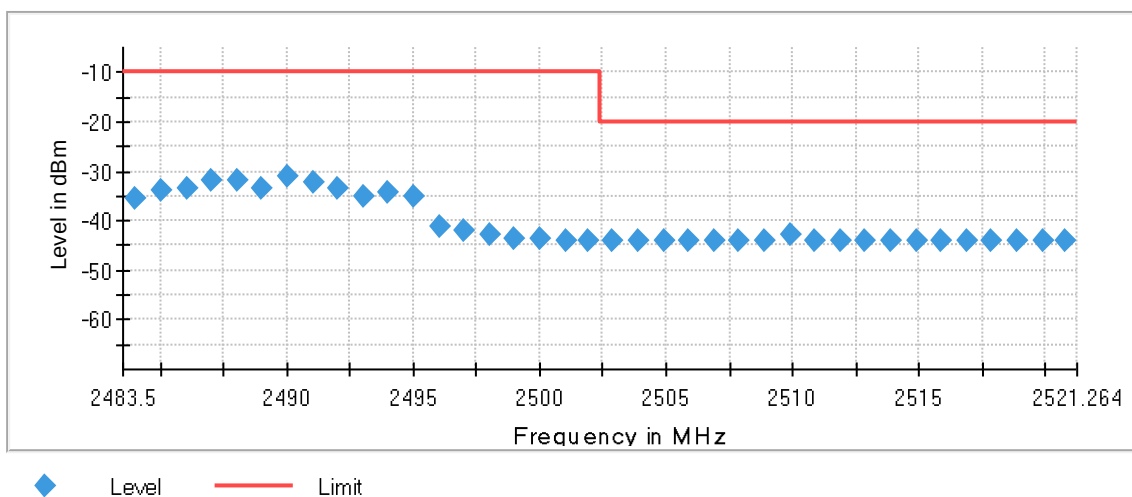
### UNWANTED OOB Low Freq Section, Channel 13

Out of band low



### UNWANTED OOB High Freq Section, Channel 13

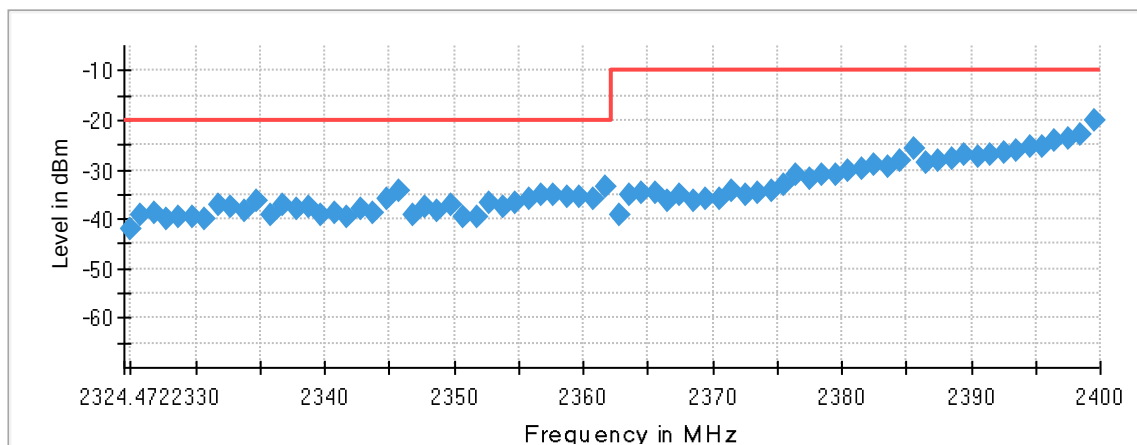
Out of band high



## 802.11ax40, HE0 (SISO) – Chain A

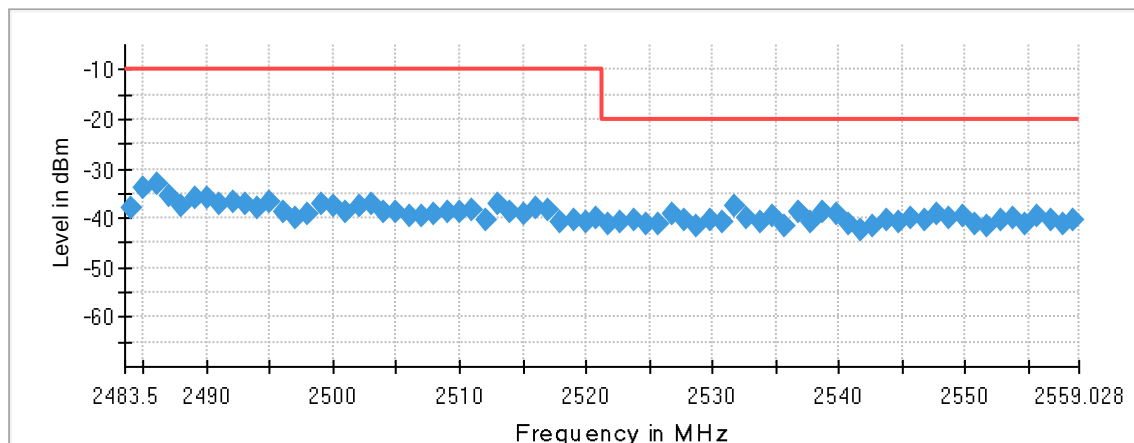
### UNWANTED OOB Low Freq Section, Channel 3

Out of band low



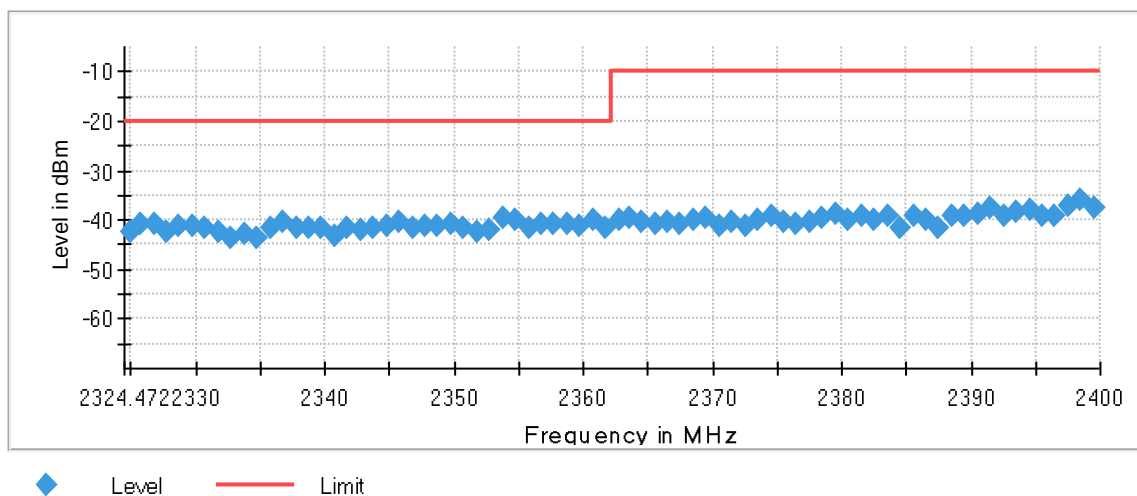
### UNWANTED OOB High Freq Section, Channel 3

Out of band high



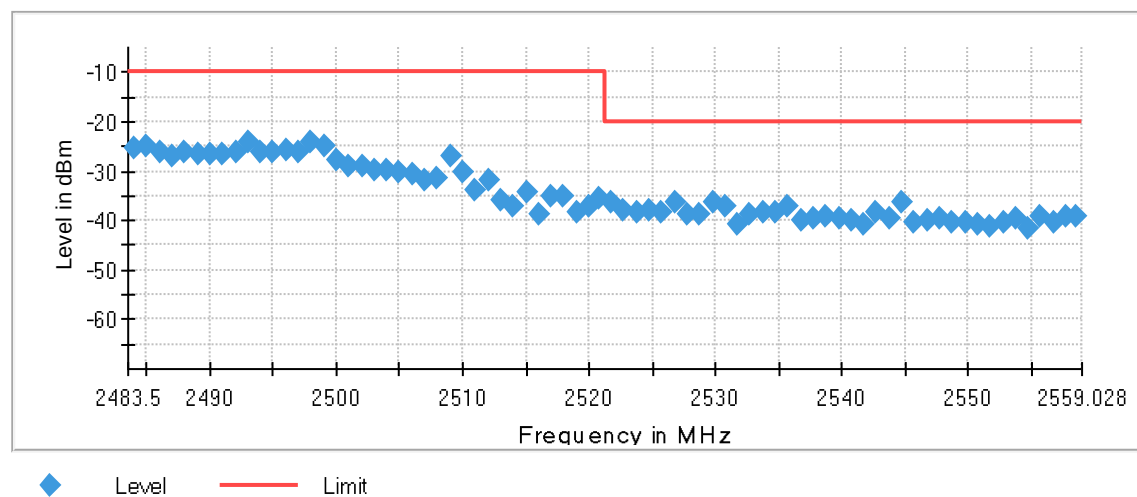
## UNWANTED OOB Low Freq Section, Channel 11

Out of band low



## UNWANTED OOB High Freq Section, Channel 11

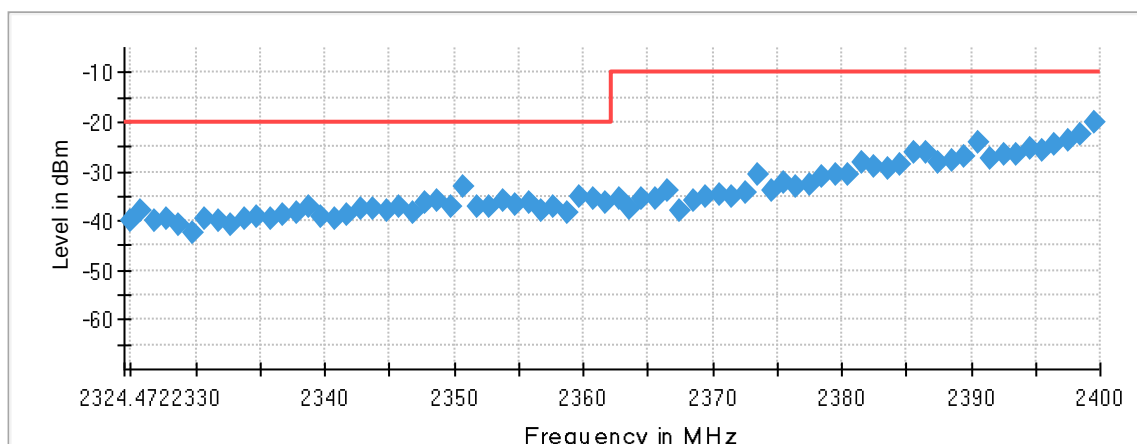
Out of band high



## 802.11ax40, HE0 (SISO) – Chain B

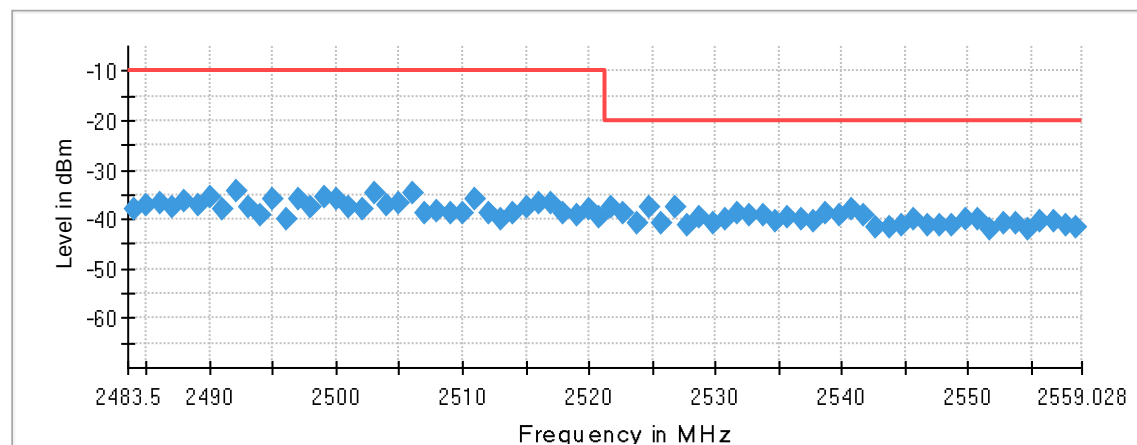
### UNWANTED OOB Low Freq Section, Channel 3

Out of band low



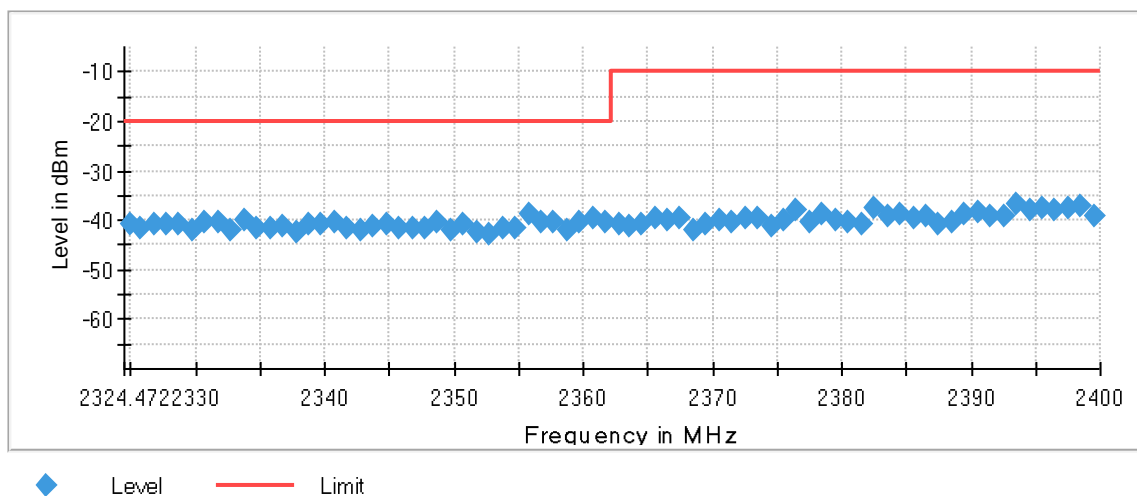
### UNWANTED OOB High Freq Section, Channel 3

Out of band high



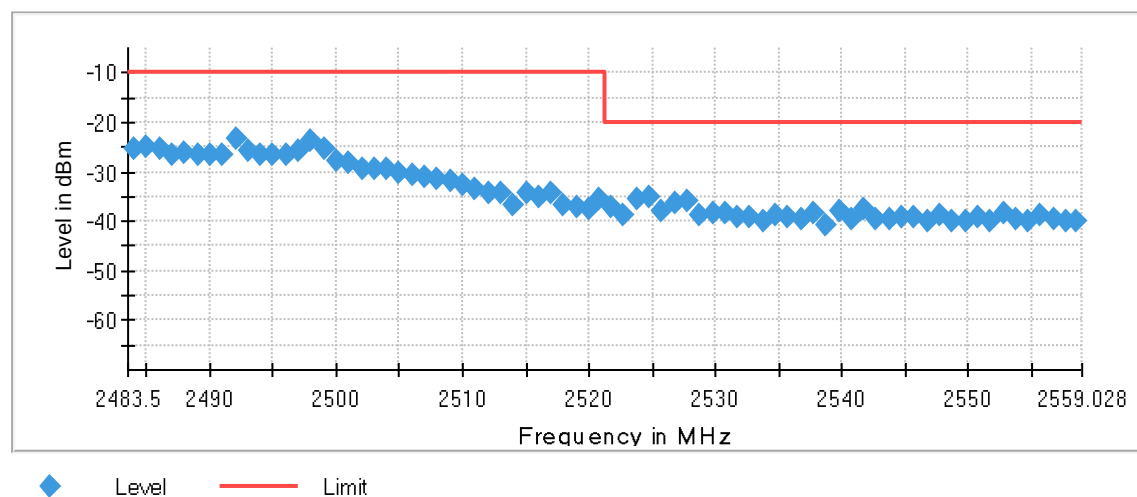
## UNWANTED OOB Low Freq Section, Channel 11

Out of band low



## UNWANTED OOB High Freq Section, Channel 11

Out of band high

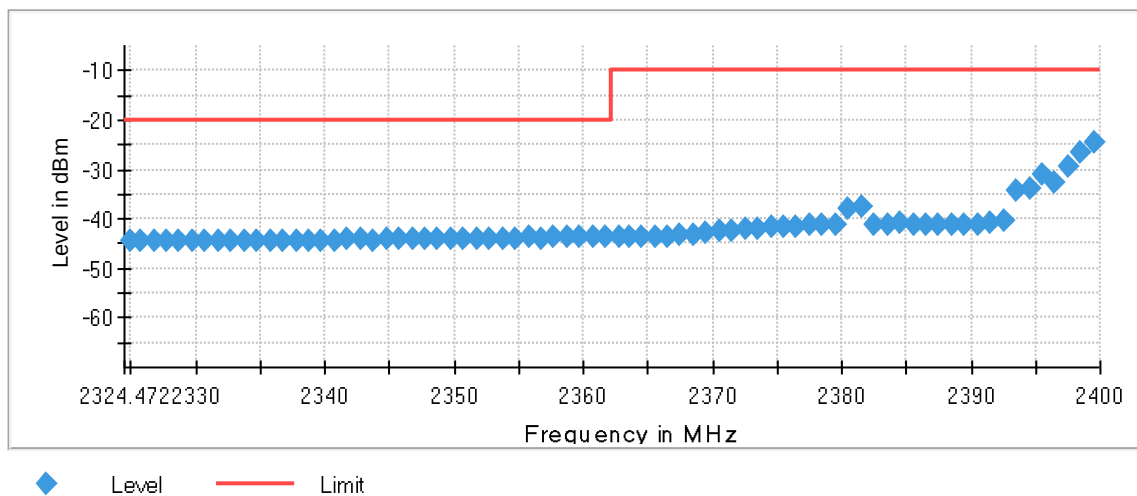




## 802.11ax40, HE0 (MIMO)

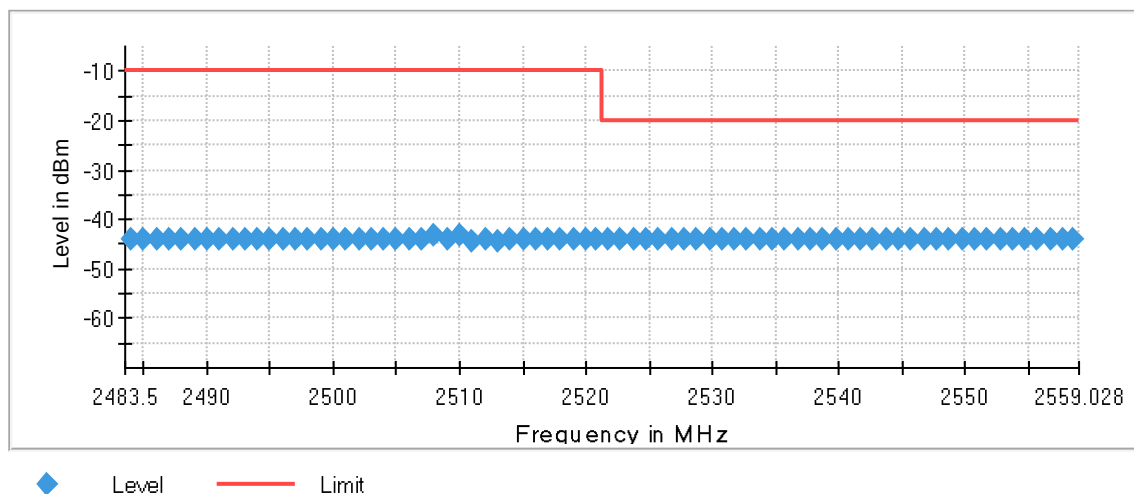
### UNWANTED OOB Low Freq Section, Channel 3

Out of band low



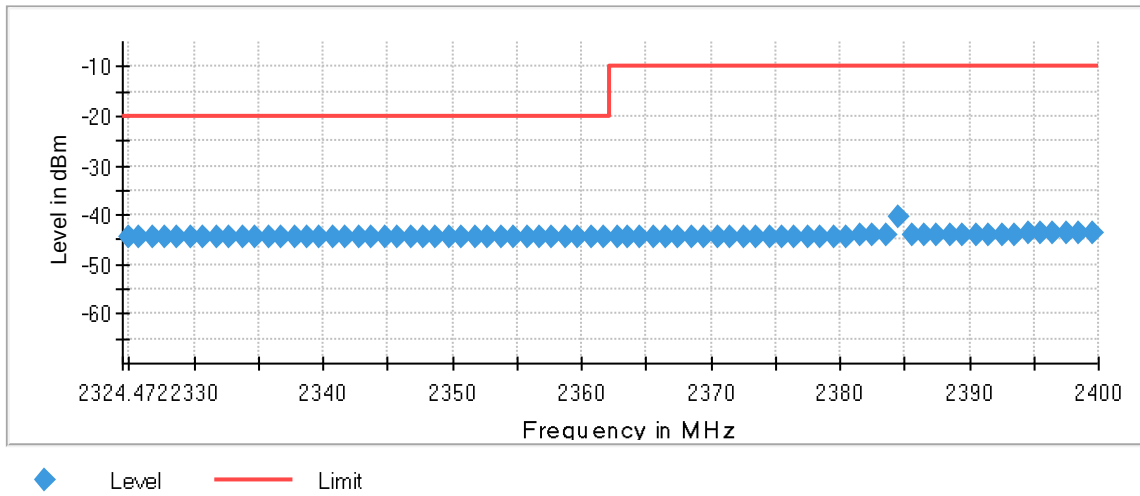
### UNWANTED OOB High Freq Section, Channel 3

Out of band high



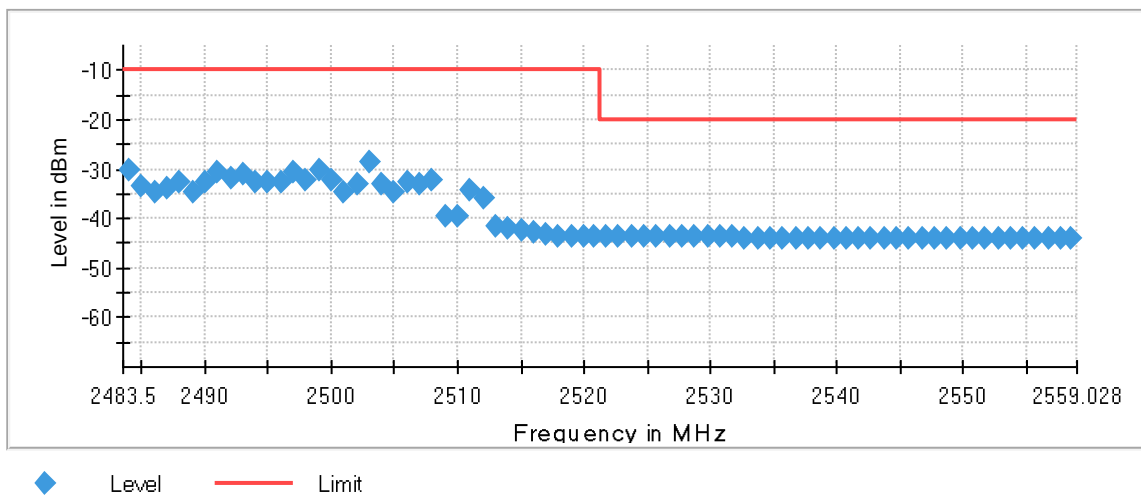
### UNWANTED OOB Low Freq Section, Channel 11

Out of band low



### UNWANTED OOB High Freq Section, Channel 11

Out of band high



## B.7 Transmitter unwanted emissions in the spurious domain

### Test limits

| ETSI clause | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |               |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|-----------|------------------|---------|---------|------------------|---------|---------|--------------------|---------|---------|---------------------|---------|---------|--------------------|---------|---------|--------------------|---------|---------|--------------------|---------|---------|--------------------|---------|---------|------------------|---------|---------|--------------------|---------|-------|
| 4.3.2.9.3   | <p>The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 12.</p> <p>For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.</p> <p style="text-align: center;"><b>Table12: Transmitter limits for spurious emissions</b></p> <table><tr><th>Frequency range</th><th>Maximum power</th><th>Bandwidth</th></tr><tr><td>30 MHz to 47 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr><tr><td>47 MHz to 74 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr><tr><td>74 MHz to 87.5 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr><tr><td>87.5 MHz to 118 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr><tr><td>118 MHz to 174 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr><tr><td>174 MHz to 230 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr><tr><td>230 MHz to 470 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr><tr><td>470 MHz to 694 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr><tr><td>694 MHz to 1 GHz</td><td>-36 dBm</td><td>100 kHz</td></tr><tr><td>1 GHz to 12.75 GHz</td><td>-30 dBm</td><td>1 MHz</td></tr></table> | Frequency range | Maximum power | Bandwidth | 30 MHz to 47 MHz | -36 dBm | 100 kHz | 47 MHz to 74 MHz | -54 dBm | 100 kHz | 74 MHz to 87.5 MHz | -36 dBm | 100 kHz | 87.5 MHz to 118 MHz | -54 dBm | 100 kHz | 118 MHz to 174 MHz | -36 dBm | 100 kHz | 174 MHz to 230 MHz | -54 dBm | 100 kHz | 230 MHz to 470 MHz | -36 dBm | 100 kHz | 470 MHz to 694 MHz | -54 dBm | 100 kHz | 694 MHz to 1 GHz | -36 dBm | 100 kHz | 1 GHz to 12.75 GHz | -30 dBm | 1 MHz |
|             | Frequency range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Maximum power   | Bandwidth     |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 30 MHz to 47 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -36 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 47 MHz to 74 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -54 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 74 MHz to 87.5 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -36 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 87.5 MHz to 118 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -54 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 118 MHz to 174 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -36 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 174 MHz to 230 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -54 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 230 MHz to 470 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -36 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 470 MHz to 694 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -54 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 694 MHz to 1 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -36 dBm         | 100 kHz       |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |
|             | 1 GHz to 12.75 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -30 dBm         | 1 MHz         |           |                  |         |         |                  |         |         |                    |         |         |                     |         |         |                    |         |         |                    |         |         |                    |         |         |                    |         |         |                  |         |         |                    |         |       |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.9.1     | <p>These measurements shall only be performed at normal test conditions.</p> <p>For non-FHSS equipment, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate.</p> <p>The equipment shall be configured to operate under its worst case situation with respect to output power.</p> <p>If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then the equipment shall be configured to operate under its worst case situation with respect to spurious emissions.</p> |

### Test procedure

The radiated setups (transmitter) shown in section *Test & System Description* were used to measure the transmission spurious emissions accordingly with ETSI EN 300 328 V2.2.2§ 5.4.9.2.2. 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 from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

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

**Test Results****Tx Spurious Emissions – 30MHz to 1GHz****Tx Spurious Emissions – All modes**

| Frequency | RMS   | Limit (e.i.r.p) | Margin | Polarization |
|-----------|-------|-----------------|--------|--------------|
| MHz       | dBm   | dBm             | dB     | ---          |
| 72.0      | -62.4 | -51.9           | 10.5   | V            |

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

**802.11b****Tx Spurious Emissions – 1GHz to 12.75GHz****Tx Spurious Emissions – 802.11b (SISO), Chain A – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3379.5    | -49.7 | -30.0 | 19.7   | H     |
| 9966.0    | -58.0 | -30.0 | 28.0   | H     |

**Tx Spurious Emissions – 802.11b (SISO), Chain A – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 4943.9    | -50.8 | -30.0 | 20.8   | H     |
| 11094.6   | -56.0 | -30.0 | 26.0   | V     |

**Tx Spurious Emissions – 802.11b (SISO), Chain B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3391.5    | -49.6 | -30.0 | 19.6   | H     |
| 9996.5    | -58.5 | -30.0 | 28.5   | V     |

**Tx Spurious Emissions – 802.11b (SISO), Chain B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 4943.9    | -52.0 | -30.0 | 22.0   | H     |
| 11545.2   | -55.6 | -30.0 | 25.6   | H     |

**802.11g****Tx Spurious Emissions – 802.11g (SISO), Chain A – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3393.5    | -49.7 | -30.0 | 19.7   | V     |
| 10012.9   | -58.3 | -30.0 | 28.3   | H     |

**Tx Spurious Emissions – 802.11g (SISO), Chain A – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3257.5    | -45.6 | -30.0 | 15.7   | H     |
| 11056.3   | -56.3 | -30.0 | 26.3   | H     |

**Tx Spurious Emissions – 802.11g (SISO), Chain B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 4832.2    | -54.2 | -30.0 | 24.2   | V     |
| 9957.8    | -57.5 | -30.0 | 27.5   | V     |

**Tx Spurious Emissions – 802.11g (SISO), Chain B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3107.2    | -46.4 | -30.0 | 16.4   | V     |
| 11616.5   | -55.6 | -30.0 | 25.6   | V     |

**802.11n****Tx Spurious Emissions – 802.11n20 (SISO), Chain A – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3365.0    | -48.9 | -30.0 | 18.9   | V     |
| 9942.4    | -57.5 | -30.0 | 27.5   | V     |

**Tx Spurious Emissions – 802.11n20 (SISO), Chain A – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3233.5    | -46.1 | -30.0 | 16.1   | H     |
| 11900.1   | -55.4 | -30.0 | 25.4   | H     |

**Tx Spurious Emissions – 802.11n20 (SISO), Chain B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3376.0    | -49.5 | -30.0 | 19.5   | H     |
| 12049.1   | -57.3 | -30.0 | 27.3   | V     |

**Tx Spurious Emissions – 802.11n20 (SISO), Chain B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3173.0    | -46.0 | -30.0 | 16.0   | H     |
| 11864.7   | -55.2 | -30.0 | 25.2   | H     |

**Tx Spurious Emissions – 802.11n20 (MIMO), Chain A+B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3393.5    | -46.6 | -30.0 | 16.6   | H     |
| 10386.5   | -58.8 | -30.0 | 28.8   | V     |

**Tx Spurious Emissions – 802.11n20 (MIMO), Chain A+B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3243.8    | -46.1 | -30.0 | 16.1   | H     |
| 11757.7   | -55.5 | -30.0 | 25.5   | H     |

**Tx Spurious Emissions – 802.11n40 (SISO), Chain A – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3369.5    | -48.9 | -30.0 | 18.9   | V     |
| 10058.8   | -58.4 | -30.0 | 28.4   | V     |

**Tx Spurious Emissions – 802.11n40 (SISO), Chain A – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3234.0    | -46.2 | -30.0 | 16.2   | V     |
| 11884.7   | -56.1 | -30.0 | 26.1   | H     |

**Tx Spurious Emissions – 802.11n40 (SISO), Chain B – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3375.0    | -49.1 | -30.0 | 19.1   | H     |
| 10152.6   | -58.2 | -30.0 | 28.2   | H     |

**Tx Spurious Emissions – 802.11n40 (SISO), Chain B – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3215.8    | -46.0 | -30.0 | 16.0   | V     |
| 11125.4   | -55.5 | -30.0 | 25.5   | H     |

**Tx Spurious Emissions – 802.11n40 (MIMO), Chain A+B – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3375.0    | -48.7 | -30.0 | 18.7   | V     |
| 10419.9   | -58.4 | -30.0 | 28.4   | H     |

**Tx Spurious Emissions – 802.11n40 (MIMO), Chain A+B – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3238.4    | -45.9 | -30.0 | 15.9   | H     |
| 11402.3   | -55.6 | -30.0 | 25.6   | H     |

**802.11ax****Tx Spurious Emissions – 802.11ax20 (SISO), Chain A – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3397.5    | -49.7 | -30.0 | 19.7   | H     |
| 9997.5    | -58.3 | -30.0 | 28.3   | H     |

**Tx Spurious Emissions – 802.11ax20 (SISO), Chain A – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3227.1    | -46.1 | -30.0 | 16.1   | H     |
| 11141.7   | -55.3 | -30.0 | 25.3   | H     |

**Tx Spurious Emissions – 802.11ax20 (SISO), Chain B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3390.0    | -49.6 | -30.0 | 19.6   | V     |
| 10078.2   | -58.0 | -30.0 | 28.0   | V     |

**Tx Spurious Emissions – 802.11ax20 (SISO), Chain B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3161.7    | -46.2 | -30.0 | 16.2   | H     |
| 11382.1   | -56.0 | -30.0 | 26.1   | V     |



**Tx Spurious Emissions – 802.11ax20 (MIMO), Chain A+B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3389.0    | -46.6 | -30.0 | 16.6   | H     |
| 10405.9   | -58.6 | -30.0 | 28.6   | V     |

**Tx Spurious Emissions – 802.11ax20 (MIMO), Chain A+B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 4927.1    | -50.9 | -30.0 | 20.9   | H     |
| 11649.7   | -56.6 | -30.0 | 26.6   | H     |

**Tx Spurious Emissions – 802.11ax40 (SISO), Chain A – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3222.0    | -50.0 | -30.0 | 20.0   | H     |
| 10012.0   | -58.5 | -30.0 | 28.5   | V     |

**Tx Spurious Emissions – 802.11ax40 (SISO), Chain A – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 4888.8    | -52.9 | -30.0 | 22.9   | H     |
| 11513.7   | -55.5 | -30.0 | 25.5   | H     |

**Tx Spurious Emissions – 802.11ax40 (SISO), Chain B – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3311.5    | -49.2 | -30.0 | 19.2   | V     |
| 10027.9   | -58.5 | -30.0 | 28.5   | V     |

**Tx Spurious Emissions – 802.11ax40 (SISO), Chain B – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3225.1    | -46.1 | -30.0 | 16.1   | H     |
| 11201.6   | -55.4 | -30.0 | 25.4   | V     |

**Tx Spurious Emissions – 802.11ax40 (MIMO), Chain A+B – Channel 3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3388.5    | -46.6 | -30.0 | 16.6   | H     |
| 10361.9   | -58.3 | -30.0 | 28.3   | H     |

**Tx Spurious Emissions – 802.11ax40 (MIMO), Chain A+B – Channel 11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 3178.4    | -46.3 | -30.0 | 16.3   | H     |
| 11246.3   | -55.7 | -30.0 | 25.7   | H     |

## B.8 Receiver spurious emissions

### Test limits

| ETSI clause       | Limits                                                                                                                                                                                                                    |                 |               |           |                |         |         |                   |         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|-----------|----------------|---------|---------|-------------------|---------|
| 4.3.2.10.3        | The spurious emissions of the receiver shall not exceed the values given in table 13.                                                                                                                                     |                 |               |           |                |         |         |                   |         |
|                   | For emissions radiated by the cabinet or for emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.     |                 |               |           |                |         |         |                   |         |
|                   | Table 13: Spurious emission limits for receivers                                                                                                                                                                          |                 |               |           |                |         |         |                   |         |
|                   | <table><tr><th>Frequency range</th><th>Maximum power</th><th>Bandwidth</th></tr><tr><td>30 MHz to 1GHz</td><td>-57 dBm</td><td>100 kHz</td></tr><tr><td>1GHz to 12.75 GHz</td><td>-47 dBm</td><td>1 MHz</td></tr></table> | Frequency range | Maximum power | Bandwidth | 30 MHz to 1GHz | -57 dBm | 100 kHz | 1GHz to 12.75 GHz | -47 dBm |
| Frequency range   | Maximum power                                                                                                                                                                                                             | Bandwidth       |               |           |                |         |         |                   |         |
| 30 MHz to 1GHz    | -57 dBm                                                                                                                                                                                                                   | 100 kHz         |               |           |                |         |         |                   |         |
| 1GHz to 12.75 GHz | -47 dBm                                                                                                                                                                                                                   | 1 MHz           |               |           |                |         |         |                   |         |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                              |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.3.10.1    | <p>These measurements shall only be performed at normal test conditions.</p> <p>Testing shall be performed when the equipment is in a receive-only mode.</p> <p>For non-FHSS equipment, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate</p> |

### Test procedure

The radiated setups (receiver) shown in section *Test & System Description* were used to measure receiver spurious emissions accordingly with ETSI EN 300 328 V2.2.2§ 5.4.10.2.2. Depending of the frequency range and bands being tested, different antennas and filters were used.

The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

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

**Test Results****Rx Spurious Emissions – 30MHz to 1GHz****Rx Spurious Emissions – All modes**

| Frequency | RMS   | Limit (e.i.r.p) | Margin | Polarization |
|-----------|-------|-----------------|--------|--------------|
| MHz       | dBm   | dBm             | dB     | ---          |
| 72.0      | -63.2 | -54.9           | 8.3    | V            |

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

**Rx Spurious Emissions – 1 GHz to 12.75 GHz****Rx Spurious Emissions – b/g/n20/ax20 (MIMO), Chain A+B – Channel 1**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 12343.9   | -57.8 | -47.0 | 10.8   | V     |

**Rx Spurious Emissions – b/g/n20/ax20 (MIMO), Chain A+B – Channel 13**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 12297.6   | -58.5 | -47.0 | 11.5   | V     |

**Rx Spurious Emissions – 802.11n40/ax40 (MIMO), Chain A+B, CH3**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 12279.3   | -59.0 | -47.0 | 12.0   | V     |

**Rx Spurious Emissions – 802.11n40/ax40 (MIMO), Chain A+B, CH11**

| Frequency | RMS   | Limit | Margin | Polar |
|-----------|-------|-------|--------|-------|
| MHz       | dBm   | dBm   | dB     | ---   |
| 12347.4   | -57.7 | -47.0 | 10.7   | H     |

## B.9 Receiver Blocking

### Test limits

| ETSI clause                                                                                | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------|---------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------|------|-----|----|------|------|------|--------------------------------------------------------------------------------------------|------|------|------|------|------|------|
| 4.3.2.11.3<br>4.3.2.11.4                                                                   | <p>The minimum performance criterion shall be a PER less than or equal to 10 %.</p> <p>While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table below.</p> <p style="text-align: center;"><b>Receiver blocking parameters for Receiver Category 1 equipment</b></p> <table><tr><th>Wanted signal mean power from companion device (dBm)<br/>(see notes 1 and 4)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm)<br/>(see note 4)</th><th>Type of blocking signal</th></tr><tr><td rowspan="4">(-133 dBm + 10 × log<sub>10</sub>(OCBW))<br/>or -68 dBm whichever is less<br/>(see note 2)</td><td>2380</td><td rowspan="8">-34</td><td rowspan="8">CW</td></tr><tr><td>2504</td></tr><tr><td>2300</td></tr><tr><td>2584</td></tr><tr><td rowspan="5">(-139 dBm + 10 × log<sub>10</sub>(OCBW))<br/>or -74 dBm whichever is less<br/>(see note 3)</td><td>2300</td></tr><tr><td>2330</td></tr><tr><td>2360</td></tr><tr><td>2524</td></tr><tr><td>2584</td></tr><tr><td>2674</td></tr></table> <p>NOTE 1: OCBW is in Hz</p> <p>NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.</p> | Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 4) | Blocking signal frequency (MHz) | Blocking signal power (dBm)<br>(see note 4) | Type of blocking signal | (-133 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -68 dBm whichever is less<br>(see note 2) | 2380 | -34 | CW | 2504 | 2300 | 2584 | (-139 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -74 dBm whichever is less<br>(see note 3) | 2300 | 2330 | 2360 | 2524 | 2584 | 2674 |
| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 4)                | Blocking signal frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Blocking signal power (dBm)<br>(see note 4)                                 | Type of blocking signal         |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
| (-133 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -68 dBm whichever is less<br>(see note 2) | 2380                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -34                                                                         | CW                              |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2504                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2584                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
| (-139 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -74 dBm whichever is less<br>(see note 3) | 2300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2360                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2524                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
|                                                                                            | 2584                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |
| 2674                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                             |                                 |                                             |                         |                                                                                            |      |     |    |      |      |      |                                                                                            |      |      |      |      |      |      |

### Test conditions

| ETSI clause | Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.4.11.1    | <p>These measurements shall only be performed at normal test conditions. For non-FHSS equipment, having more than one operating channel, the operating channels on which the testing has to be performed shall be selected as follows:</p> <ul style="list-style-type: none"> <li>• For testing blocking frequencies less than 2400 MHz, the equipment shall operate on the lowest operating channel.</li> <li>• For testing blocking frequencies greater than 2500 MHz, the equipment shall operate on the highest operating channel.</li> </ul> <p>Equipment which can change their operating channel automatically (adaptive channel allocation), and where this function cannot be disabled, shall be tested as a FHSS equipment. If the equipment can be configured to operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz) and different data rates, then the combination of the smallest channel bandwidth and the lowest data rate for this channel bandwidth which still allows the equipment to operate as intended shall be used. This mode of operation shall be aligned with the performance criteria defined in clause 4.3.1.12.3 or clause 4.3.2.11.3 and shall be described in the test report..</p> |

Test procedure

The receiver blocking setup (conducted) shown in section *Test & System Description* was used to measure receiver blocking signal. The signaling Unit is a CMW500.The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100A. Antenna gain and insertion loss are taken into account.

Test results

| Configuration                            | 99% Occupied bandwidth [MHz] | Wanted signal mean power from companion device (dBm) | PER [%] Without blocking signal | Blocking signal [MHz] | Blocking signal Power [dBm] | PER [%] With Blocking signal | Verdict |
|------------------------------------------|------------------------------|------------------------------------------------------|---------------------------------|-----------------------|-----------------------------|------------------------------|---------|
|                                          |                              | Without blocking signal                              |                                 | With blocking signal  |                             |                              |         |
| 802.11b Chain A Channel 1 2412MHz 1Mbps  | 13.42                        | -70.00                                               | 1.05                            | 2380                  | -36                         | 2.01                         | Pass    |
|                                          |                              | -76.00                                               | 1.28                            | 2300                  | -36                         | 0.75                         | Pass    |
|                                          |                              |                                                      |                                 | 2330                  | -36                         | 0.22                         | Pass    |
|                                          |                              |                                                      |                                 | 2360                  | -36                         | 0.58                         | Pass    |
| 802.11b Chain A Channel 13 2472MHz 1Mbps | 13.42                        | -70.00                                               | 1.49                            | 2504                  | -36                         | 0.88                         | Pass    |
|                                          |                              | -76.00                                               | 0.65                            | 2524                  | -36                         | 0.11                         | Pass    |
|                                          |                              |                                                      |                                 | 2584                  | -36                         | 1.13                         | Pass    |
|                                          |                              |                                                      |                                 | 2674                  | -36                         | 0.60                         | Pass    |

# Annex C. Photographs

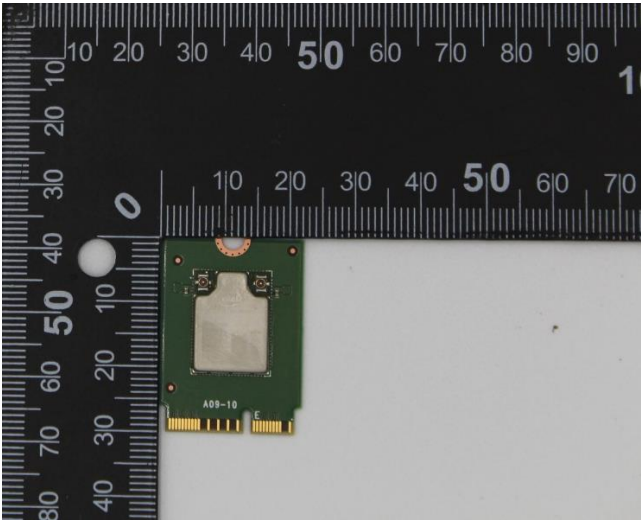
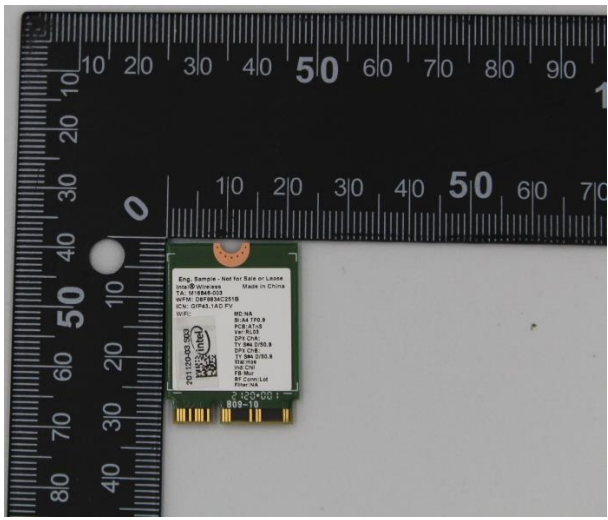
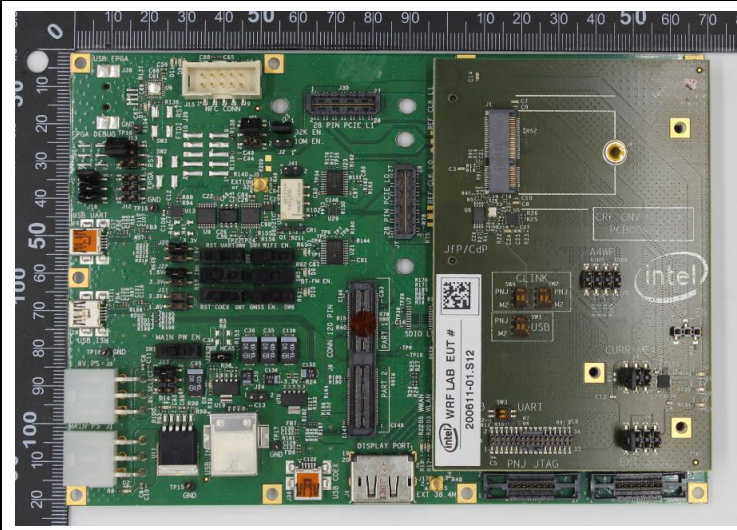
## C.1 Test Setup

|                                                                                                                                                                                                              |                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Radiated Setup<br/>30 MHz – 1 GHz (Transmitter &amp; Receiver tests)</div> <div></div>                                 | <div>Radiated Setup<br/>1 GHz – 6.4 GHz (Transmitter tests)</div> <div></div> |
| <div>Radiated Setup<br/>6.4 GHz – 12.75 GHz (Transmitter tests)<br/>1 GHz – 12.75 GHz (Receiver tests)</div> <div></div> |                                                                                                                                                                 |

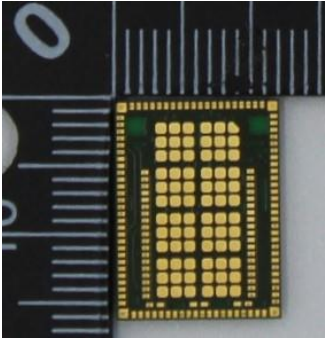
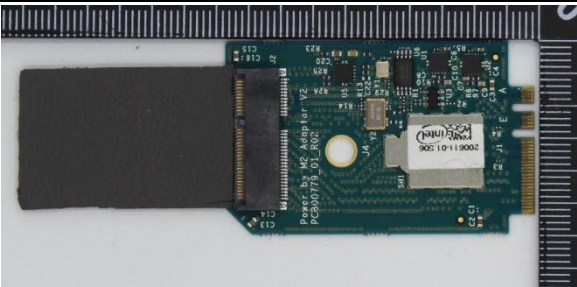
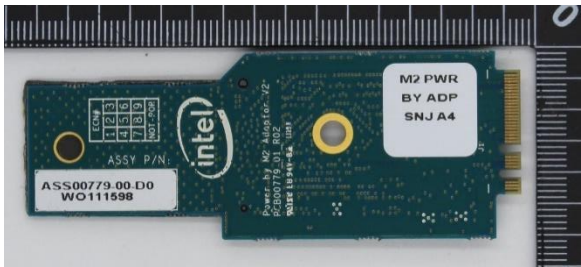
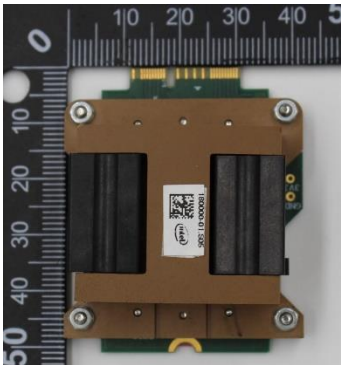
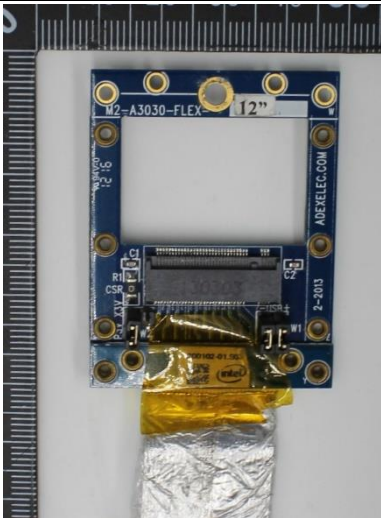


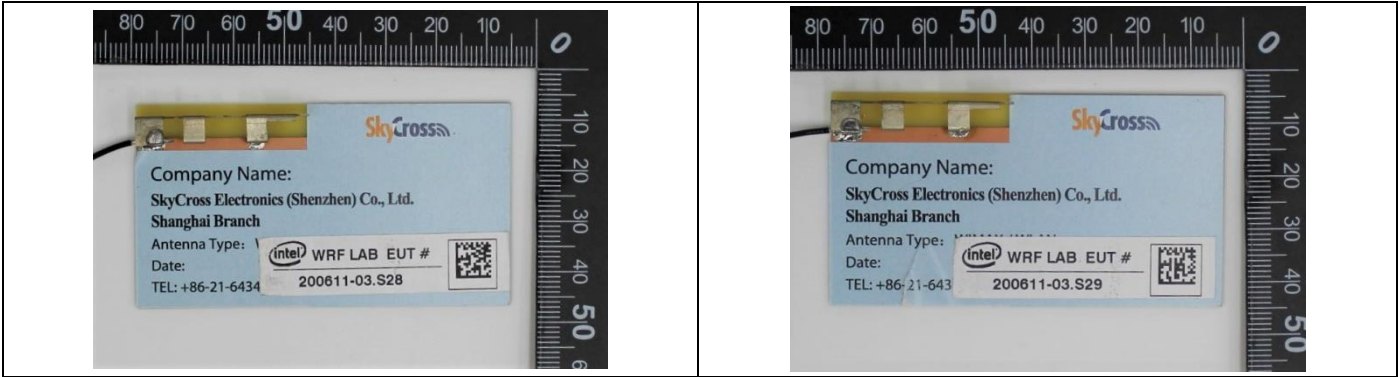
C.2 Test Sample

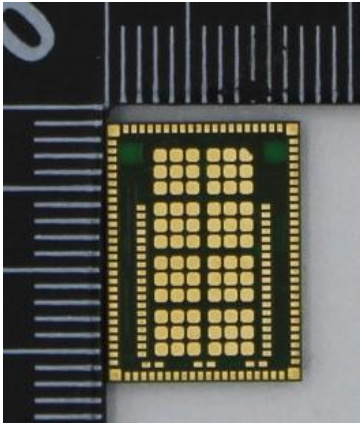
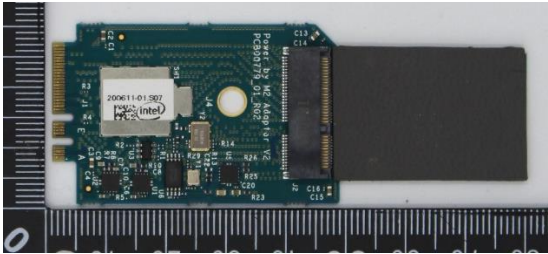
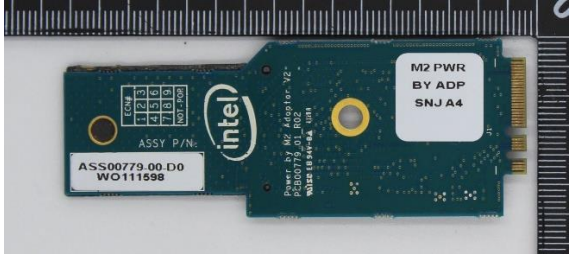
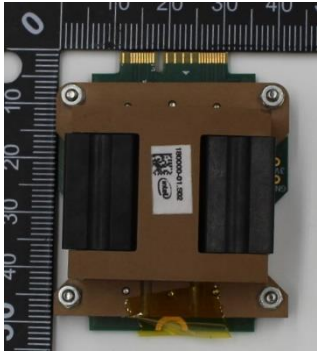
Sample #01

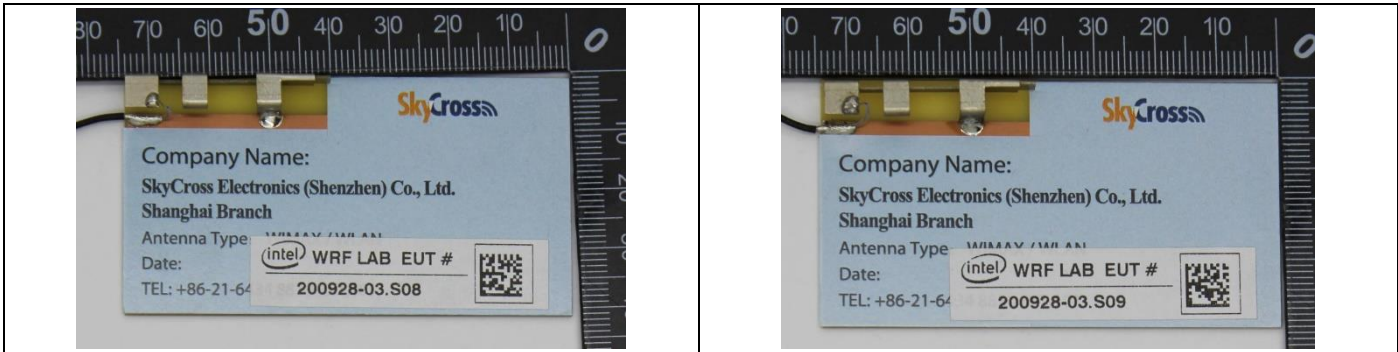
| Module Front                                                                      | Module Back                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |   |
| Extender board                                                                    | Laptop                                                                              |
|  |  |



| Sample #02                                                                          |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Module Front                                                                        | Module Back                                                                          |
|    |    |
| Adaptor front (with absorber)                                                       | Adaptor back                                                                         |
|   |   |
| Socket front                                                                        | Socket back                                                                          |
|  |  |
| Extender board                                                                      | Laptop                                                                               |
|  |  |
| Main Antenna                                                                        | Aux Antenna                                                                          |

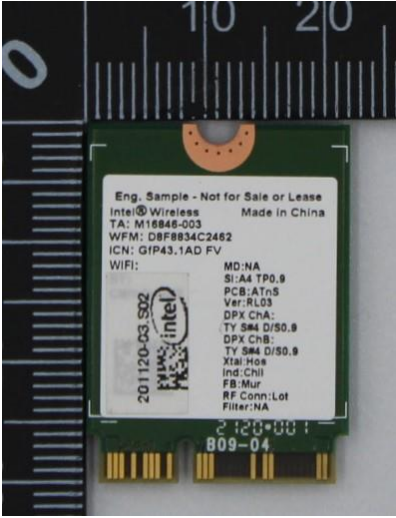
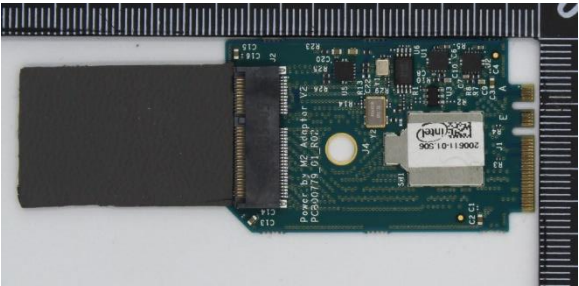
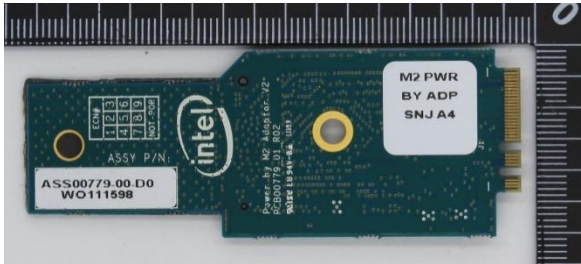


| Sample #03                                                                          |                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Module Front                                                                        | Module Back                                                                           |
|    |     |
| Adaptor front (with absorber)                                                       | Adaptor back                                                                          |
|   |    |
| Socket front                                                                        | Socket back                                                                           |
|  |  |
| Extender board                                                                      | Laptop                                                                                |
|  |   |
| Main Antenna                                                                        | Aux Antenna                                                                           |





Sample #04

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

### **End of the report**

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