

## TEST REPORT

BNNetzA-CAB-02/21-102

Test report no.: 1-3977/22-03-04

### Testing laboratory

**CTC advanced GmbH**

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <https://www.ctcadvanced.com>

e-mail: [mail@ctcadvanced.com](mailto:mail@ctcadvanced.com)

**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

### Applicant

**SAGEMCOM BROADBAND SAS**

250, route de l' Empereur

92848 Rueil-Malmaison Cedex / FRANCE

Phone: -/-

Contact: Ludovic Bomba

e-mail: [ludovic.bomba@sagemcom.com](mailto:ludovic.bomba@sagemcom.com)

### Manufacturer

**SAGEMCOM BROADBAND SAS**

250, route de l' Empereur

92848 Rueil-Malmaison Cedex / FRANCE

### Test standard/s

FCC - Title 47 CFR Part 15    FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:**                      **Gateway**

**Model name:**                         **F5688W**

**FCC ID:**                                 **VW3F5688W**

**Frequency:**                            UNII bands: 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5470 MHz to 5725 MHz; 5725 MHz to 5850 MHz

**Technology tested:**                 **WLAN**

**Antenna:**                               **4 integrated antennas**

**Power supply:**                        **120 V AC by power mains**

**Temperature range:**                **0°C to +50°C**

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorized:



cn=Andreas Luckenbill, o=CTC advanced GmbH, ou=LUC-180217, email=andreas.luckenbill@ctcadvanced.com, c=DE  
2023.01.16 11:41:01 +01'00'

Andreas Luckenbill  
Head of Department  
Radio Communications

### Test performed:



cn=Michael Dorongovski, o=CTC advanced GmbH, ou=DOR-210422, email=Michael.Dorongovski@ctcadvanced.com, c=DE  
2023.01.16 12:59:08 +01'00'

Michael Dorongovski  
Lab Manager  
Radio Communications

## 1 Table of contents

|       |                                                             |     |
|-------|-------------------------------------------------------------|-----|
| 1     | Table of contents .....                                     | 2   |
| 2     | General information .....                                   | 4   |
| 2.1   | Notes and disclaimer .....                                  | 4   |
| 2.2   | Application details .....                                   | 4   |
| 2.3   | Test laboratories sub-contracted .....                      | 4   |
| 3     | Test standard/s, references and accreditations .....        | 5   |
| 4     | Reporting statements of conformity – decision rule .....    | 6   |
| 5     | Test environment .....                                      | 7   |
| 6     | Test item.....                                              | 7   |
| 6.1   | General description .....                                   | 7   |
| 6.2   | Additional information .....                                | 7   |
| 7     | Description of the test setup.....                          | 8   |
| 7.1   | Shielded semi anechoic chamber .....                        | 9   |
| 7.2   | Shielded fully anechoic chamber.....                        | 10  |
| 7.3   | Radiated measurements > 18 GHz.....                         | 12  |
| 7.4   | Conducted measurements .....                                | 13  |
| 7.5   | AC conducted .....                                          | 14  |
| 8     | Sequence of testing .....                                   | 15  |
| 8.1   | Sequence of testing radiated spurious 9 kHz to 30 MHz ..... | 15  |
| 8.2   | Sequence of testing radiated spurious 30 MHz to 1 GHz ..... | 16  |
| 8.3   | Sequence of testing radiated spurious 1 GHz to 18 GHz ..... | 17  |
| 8.4   | Sequence of testing radiated spurious above 18 GHz .....    | 18  |
| 9     | Measurement uncertainty .....                               | 19  |
| 10    | Summary of measurement results .....                        | 20  |
| 11    | Additional comments .....                                   | 21  |
| 12    | Measurement results .....                                   | 29  |
| 12.1  | Identify worst case data rate .....                         | 29  |
| 12.2  | Antenna gain.....                                           | 30  |
| 12.3  | Duty cycle .....                                            | 31  |
| 12.4  | Maximum output power.....                                   | 32  |
| 12.5  | Power spectral density .....                                | 36  |
| 12.6  | Minimum emission bandwidth for the band 5.725-5.85 GHz..... | 41  |
| 12.7  | Spectrum bandwidth / 26 dB bandwidth.....                   | 44  |
| 12.8  | Occupied bandwidth / 99% emission bandwidth .....           | 48  |
| 12.9  | Band edge compliance radiated .....                         | 52  |
| 12.10 | Spurious emissions radiated below 30 MHz.....               | 88  |
| 12.11 | Spurious emissions radiated 30 MHz to 1 GHz .....           | 108 |
| 12.12 | Spurious emissions radiated 1 GHz to 40 GHz .....           | 113 |
| 12.13 | Spurious emissions conducted < 30 MHz.....                  | 151 |
| 13    | Glossary .....                                              | 154 |

|    |                                                   |     |
|----|---------------------------------------------------|-----|
| 14 | Document history.....                             | 155 |
| 15 | Accreditation Certificate – D-PL-12076-01-05..... | 156 |

## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.

The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".

CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.

All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH. In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### 2.2 Application details

Date of receipt of order: 2022-10-04

Date of receipt of test item: 2022-10-04

Start of test:\* 2022-11-16

End of test:\* 2022-12-16

Person(s) present during the test: -/-

\*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

### 2.3 Test laboratories sub-contracted

None

### 3 Test standard/s, references and accreditations

| Test standard              | Date | Description                                                                                     |
|----------------------------|------|-------------------------------------------------------------------------------------------------|
| FCC - Title 47 CFR Part 15 |      | FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |

| Guidance         | Version | Description                                                                                                                                                         |
|------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KDB 789033 D02   | v02r01  | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E                                            |
| ANSI C63.4-2014  | -/-     | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| ANSI C63.10-2013 | -/-     | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices                                                                      |
| KDB 662911 D01   | v02r01  | Emissions Testing of Transmitters with Multiple Outputs in the Same Band                                                                                            |

| Accreditation    | Description                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D-PL-12076-01-04 | Telecommunication and EMC Canada<br><a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf</a>   |
| D-PL-12076-01-05 | Telecommunication FCC requirements<br><a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf</a> |


 Deutsche  
 Akkreditierungsstelle  
 D-PL-12076-01-04

 Deutsche  
 Akkreditierungsstelle  
 D-PL-12076-01-05

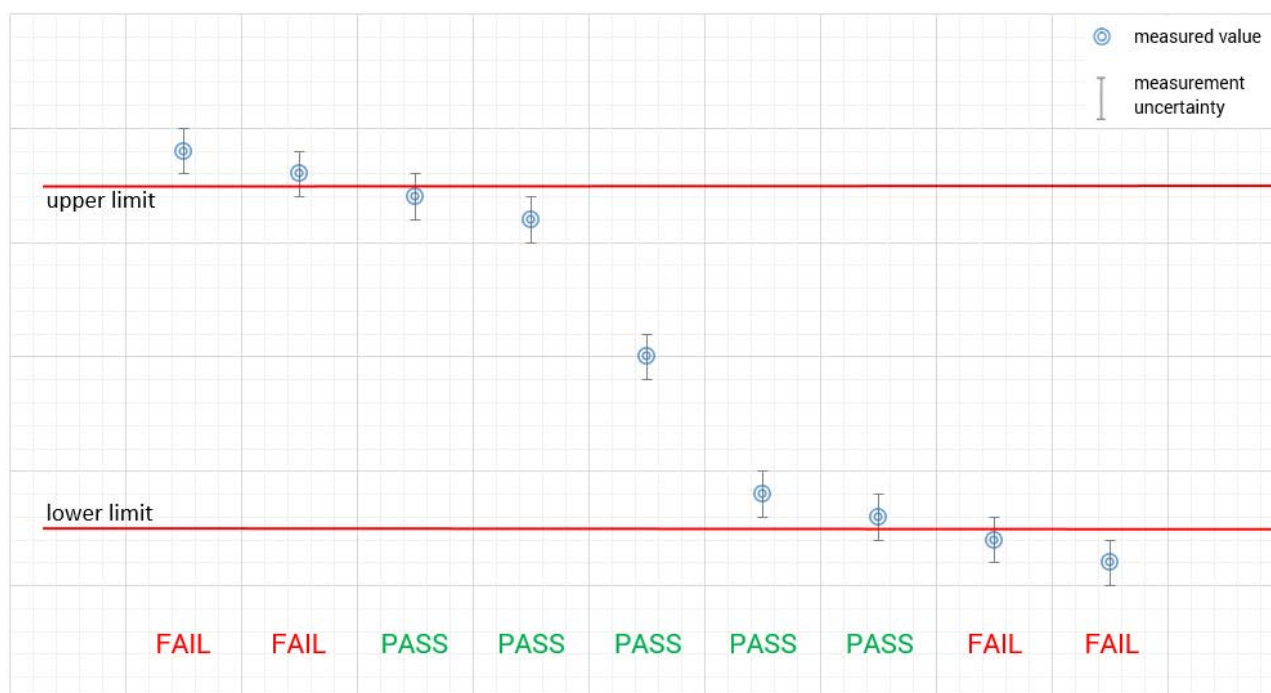
FCC designation number: DE0002

#### 4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."

measured value, measurement uncertainty, verdict



## 5 Test environment

|                             |                                                          |                                                                                                                                                                |
|-----------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature :               | T <sub>nom</sub><br>T <sub>max</sub><br>T <sub>min</sub> | +22 °C during room temperature tests<br>No tests under extreme environmental conditions required.<br>No tests under extreme environmental conditions required. |
| Relative humidity content : |                                                          | 45 %                                                                                                                                                           |
| Barometric pressure :       |                                                          | 1021 hpa                                                                                                                                                       |
| Power supply :              | V <sub>nom</sub><br>V <sub>max</sub><br>V <sub>min</sub> | 120 V AC by power mains<br>No tests under extreme environmental conditions required.<br>No tests under extreme environmental conditions required.              |

## 6 Test item

### 6.1 General description

|                                                             |                                                                                                                                                         |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of test item :                                         | Gateway                                                                                                                                                 |
| Model name :                                                | F5688W                                                                                                                                                  |
| S/N serial number :                                         | Rad. QS2212959002844 (HL antenna sample)<br>QS2212959002927 (COLFLY antenna sample)<br>QS2212959002917 (WALSIN antenna sample)<br>Cond. QS2212959002927 |
| Hardware status :                                           | V1.2                                                                                                                                                    |
| Software status :                                           | SGJi10105-0.1.52                                                                                                                                        |
| Firmware status :                                           | SGJi10105-0.1.52                                                                                                                                        |
| Frequency band :                                            | UNII bands: 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5470 MHz to 5725 MHz; 5725 MHz to 5850 MHz                                                      |
| Type of radio transmission :<br>Use of frequency spectrum : | OFDM                                                                                                                                                    |
| Type of modulation :                                        | CCK, (D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM, 256 – QAM                                                                                                    |
| Number of channels :                                        | 25 with 20 MHz channel bandwidth<br>12 with 40 MHz channel bandwidth<br>6 with 80 MHz channel bandwidth<br>2 with 160 MHz bandwidth (80+80)             |
| Antenna :                                                   | 4 integrated antennas                                                                                                                                   |
| Power supply :                                              | 120 V AC by power mains                                                                                                                                 |
| Temperature range :                                         | 0°C to +50°C                                                                                                                                            |

### 6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report:      1-3977/22-03-01\_AnnexA  
                                                                                                  1-3977/22-03-01\_AnnexB  
                                                                                                  1-3977/22-03-01\_AnnexD

## 7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

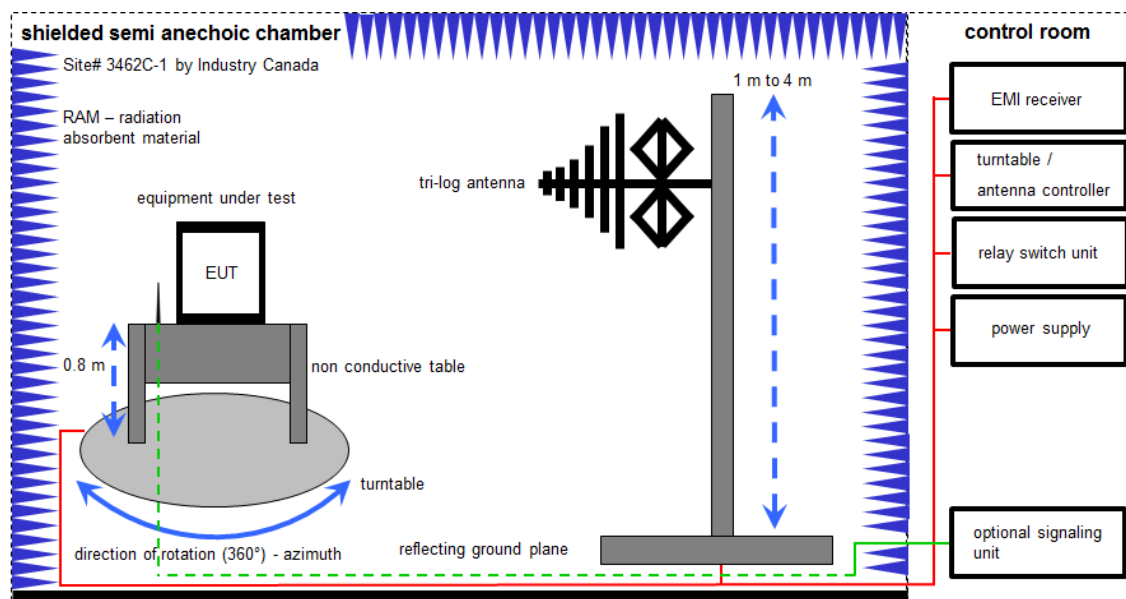
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

### **Agenda:** Kind of Calibration

|      |                                            |     |                                                      |
|------|--------------------------------------------|-----|------------------------------------------------------|
| k    | calibration / calibrated                   | EK  | limited calibration                                  |
| ne   | not required (k, ev, izw, zw not required) | zw  | cyclical maintenance (external cyclical maintenance) |
| ev   | periodic self verification                 | izw | internal cyclical maintenance                        |
| Ve   | long-term stability recognized             | g   | blocked for accredited testing                       |
| vlk! | Attention: extended calibration interval   |     |                                                      |
| NK!  | Attention: not calibrated                  | *)  | next calibration ordered / currently in progress     |

## 7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter; EMC32 software version: 10.59.00

$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

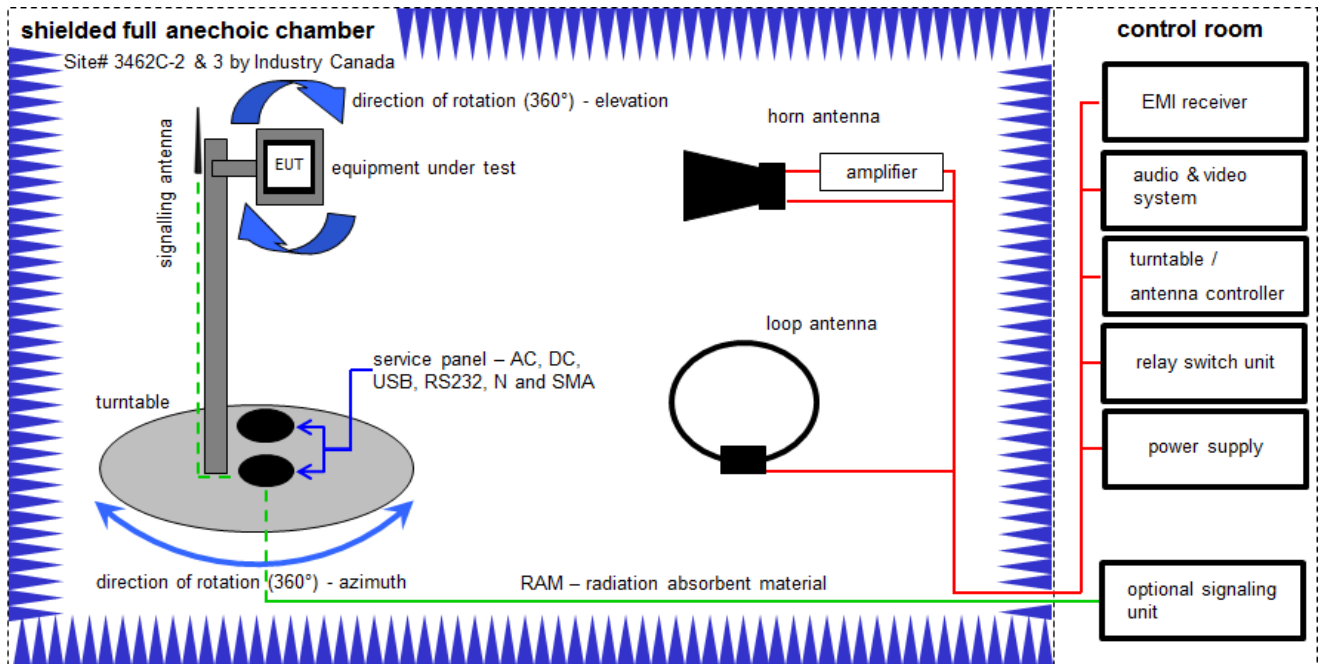
Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V/m]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m)}$$

### Equipment table:

| No. | Lab / Item | Equipment                                    | Type             | Manufacturer                | Serial No.       | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|----------------------------------------------|------------------|-----------------------------|------------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Switch-Unit                                  | 3488A            | HP                          | 2719A14505       | 300000368 | ev                  | -/-              | -/-              |
| 2   | A          | Meßkabine 1                                  | HF-Absorberhalle | MWB AG 300023               | Batch no. 699714 | 300000551 | ne                  | -/-              | -/-              |
| 3   | A          | Antenna Tower                                | Model 2175       | ETS-Lindgren                | 64762            | 300003745 | izw                 | -/-              | -/-              |
| 4   | A          | Positioning Controller                       | Model 2090       | ETS-Lindgren                | 64672            | 300003746 | izw                 | -/-              | -/-              |
| 5   | A          | Turntable Interface-Box                      | Model 105637     | ETS-Lindgren                | 44583            | 300003747 | izw                 | -/-              | -/-              |
| 6   | A          | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163         | Schwarzbeck Mess-Elektronik | 295              | 300003787 | vKII                | 21.04.2021       | 20.04.2023       |
| 7   | A          | EMI Test Receiver                            | ESR3             | Rohde & Schwarz             | 102587           | 300005771 | k                   | 20.05.2022       | 31.05.2023       |

## 7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

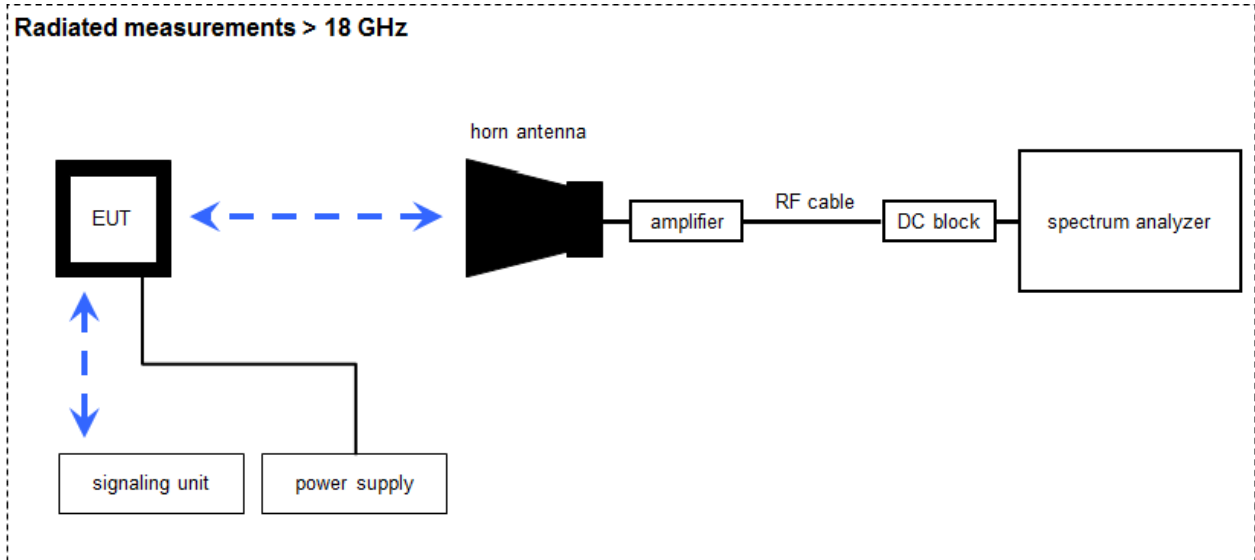
$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m)}$$

### Equipment table:

| No. | Setup   | Equipment                                      | Type                                  | Manufacturer         | Serial No.      | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|---------|------------------------------------------------|---------------------------------------|----------------------|-----------------|-----------|---------------------|------------------|------------------|
| 1   | C       | Active Loop Antenna 9 kHz to 30 MHz            | 6502                                  | EMCO                 | 2210            | 300001015 | vKI!                | 01.07.2021       | 31.07.2023       |
| 2   | A, B    | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115                                  | EMCO                 | 9107-3696       | 300001604 | vKI!                | 12.03.2021       | 11.03.2023       |
| 3   | A       | Highpass Filter                                | WHKX7.0/18G-8SS                       | Wainwright           | 18              | 300003789 | ne                  | -/-              | -/-              |
| 4   | A, B    | Broadband Amplifier 0.5-18 GHz                 | CBLU5184540                           | CERNEX               | 22051           | 300004483 | ev                  | -/-              | -/-              |
| 5   | A, B, C | 4U RF Switch Platform                          | L4491A                                | Agilent Technologies | MY50000032      | 300004510 | ne                  | -/-              | -/-              |
| 6   | A, B, C | Computer                                       | Intel Core i3 3220/3,3 GHz, Prozessor |                      | 2V2403033A54 21 | 300004591 | ne                  | -/-              | -/-              |
| 7   | A, B, C | NEXIO EMV-Software                             | BAT EMC V3.21.0.27                    | EMCO                 |                 | 300004682 | ne                  | -/-              | -/-              |
| 8   | A, B, C | Anechoic chamber                               |                                       | TDK                  |                 | 300003726 | ne                  | -/-              | -/-              |
| 9   | A, B, C | EMI Test Receiver 9kHz-26,5GHz                 | ESR26                                 | Rohde & Schwarz      | 101376          | 300005063 | k                   | 15.12.2021       | 31.12.2022       |
| 10  | A       | Band Reject Filter                             | WRCJV12-5120-5150-5350-5380-40SS      | Wainwright           | 5               | 300005168 | ev                  | -/-              | -/-              |
| 11  | A       | Band Reject Filter                             | WRCJV12-5695-5725-5850-5880-40SS      | Wainwright           | 5               | 300005169 | ev                  | -/-              | -/-              |

|    |      |                    |                                          |                 |         |           |    |     |     |
|----|------|--------------------|------------------------------------------|-----------------|---------|-----------|----|-----|-----|
| 12 | A    | Band Reject Filter | WRCJV16-5440-<br>5470-5725-5755-<br>40SS | Wainwright      | 9       | 300005170 | ev | -/- | -/- |
| 13 | A, B | RF-Amplifier       | AMF-6F06001800-<br>30-10P-R              | NARDA-MITEQ Inc | 2011571 | 300005240 | ev | -/- | -/- |

### 7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

FS = UR + CA + AF

(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:

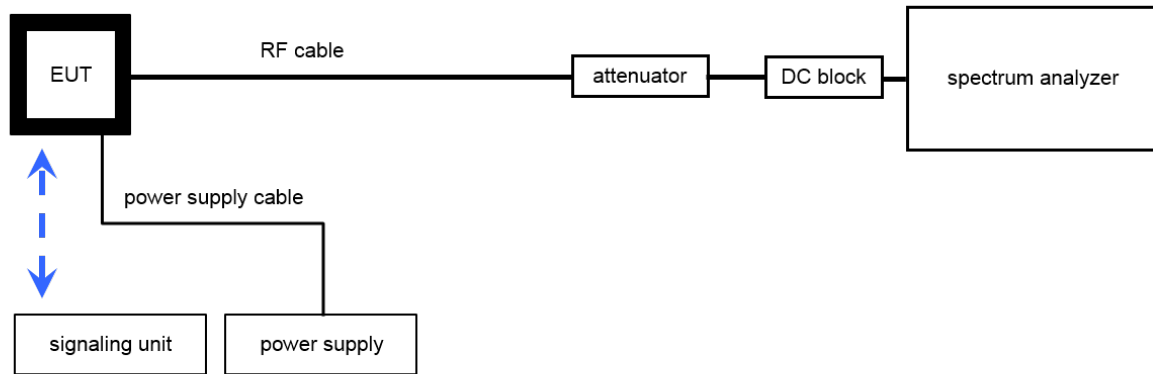
FS [dB $\mu$ V/m] = 40.0 [dB $\mu$ V/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB $\mu$ V/m] (6.79  $\mu$ V/m)

#### Equipment table:

| No. | Lab / Item | Equipment                                | Type              | Manufacturer   | Serial No.       | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|------------------------------------------|-------------------|----------------|------------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Microwave System Amplifier, 0.5-26.5 GHz | 83017A            | HP             | 00419            | 300002268 | ev                  | -/-              | -/-              |
| 2   | A          | Std. Gain Horn Antenna 18.0-26.5 GHz     | 638               | Narda          | 01096            | 300000486 | vKI!                | 17.01.2022       | 31.01.2024       |
| 3   | A          | Std. Gain Horn Antenna 26.5-40.0 GHz     | V637              | Narda          | 82-16            | 300000510 | vKI!                | 17.01.2022       | 31.01.2024       |
| 4   | A          | Broadband Low Noise Amplifier 18-50 GHz  | CBL18503070-XX    | CERNEX         | 19338            | 300004273 | ev                  | -/-              | -/-              |
| 5   | A          | RF-Cable                                 | ST18/SMAM/SMAM/48 | Huber & Suhner | Batch no. 600918 | 400001182 | ev                  | -/-              | -/-              |
| 6   | A          | Signal Analyzer 40 GHz                   | FSV40             | R&S            | 101042           | 300004517 | k                   | 25.01.2022       | 31.01.2023       |

## 7.4 Conducted measurements

### Conducted measurements normal conditions



$$OP = AV + CA$$

(OP-output power; AV-analyzer value; CA-loss signal path)

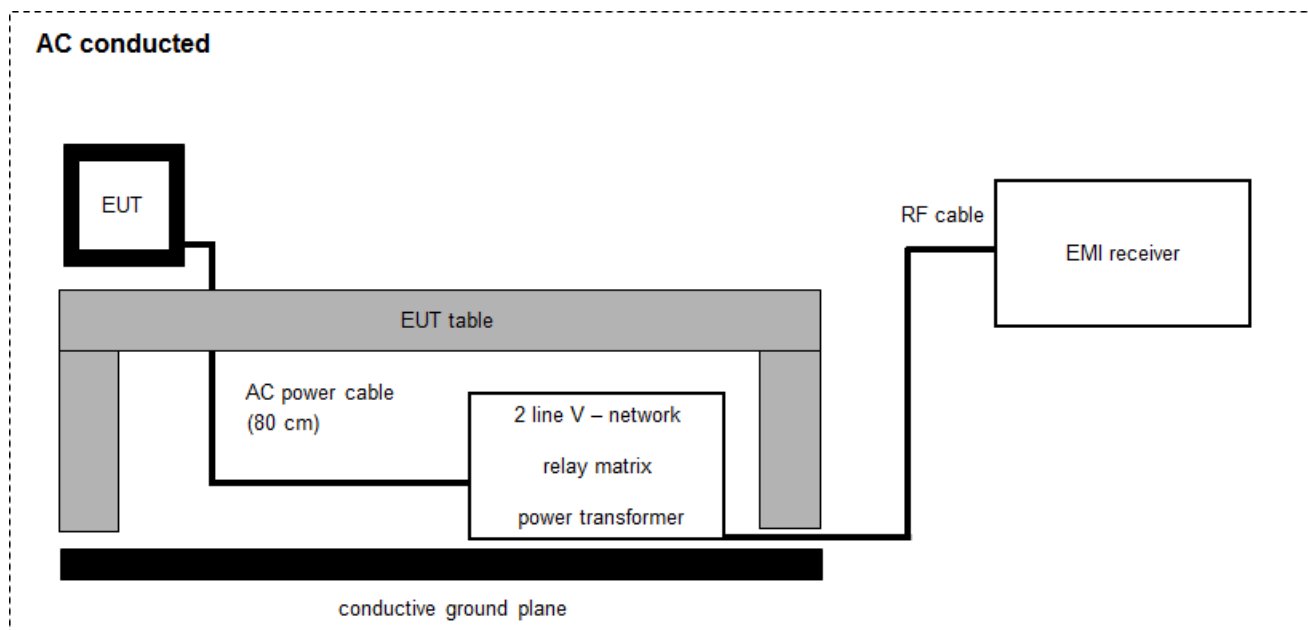
#### Example calculation:

$$OP \text{ [dBm]} = 6.0 \text{ [dBm]} + 11.7 \text{ [dB]} = 17.7 \text{ [dBm]} \text{ (58.88 mW)}$$

#### Equipment table:

| No. | Setup | Equipment                                             | Type                                  | Manufacturer      | Serial No.       | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|-------|-------------------------------------------------------|---------------------------------------|-------------------|------------------|-----------|---------------------|------------------|------------------|
| 1   | A     | Signal analyzer                                       | FSV40                                 | Rohde&Schwarz     | 101042           | 300004517 | k                   | 25.01.2022       | 31.01.2023       |
| 2   | A     | PC Tester R005                                        | Intel Core i3 3220/3,3 GHz, Prozessor |                   | 2V2403033A4523   | 300004589 | ne                  | -/-              | -/-              |
| 3   | A     | PowerSplitter/Combiner 150-6000MHz N-Type             | ZB3PD-63-N+                           | Mini-Circuits     |                  | 400000451 | ev                  | -/-              | -/-              |
| 4   | A     | RF-Cable                                              | ST18/SMAm/SMAm /60                    | Huber & Suhner    | Batch no. 606844 | 400001181 | ev                  | -/-              | -/-              |
| 5   | A     | RF-Cable                                              | ST18/SMAm/SMAm /48                    | Huber & Suhner    | Batch no. 600918 | 400001182 | ev                  | -/-              | -/-              |
| 6   | A     | RF-Cable                                              | ST18/SMAm/SMAm /48                    | Huber & Suhner    | Batch no. 127377 | 400001183 | ev                  | -/-              | -/-              |
| 7   | A     | RF-Cable                                              | ST18/SMAm/SMAm /72                    | Huber & Suhner    | Batch no. 699714 | 400001184 | ev                  | -/-              | -/-              |
| 8   | A     | Tester Software RadioStar (C.BER2 for BT Conformance) | Version 1.0.0.X                       | CTC advanced GmbH | 0001             | 400001380 | ne                  | -/-              | -/-              |

## 7.5 AC conducted



$$FS = UR + CF + VC$$

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

Equipment table:

| No. | Setup | Equipment                                         | Type     | Manufacturer    | Serial No.      | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|-------|---------------------------------------------------|----------|-----------------|-----------------|-----------|---------------------|------------------|------------------|
| 1   | A     | Two-line V-Network (LISN) 9 kHz to 30 MHz         | ESH3-Z5  | Rohde & Schwarz | 892475/017      | 300002209 | vIKI!               | 14.12.2021       | 13.12.2023       |
| 2   | A     | RF-Filter-section                                 | 85420E   | HP              | 3427A00162      | 300002214 | NK!                 | -/-              | -/-              |
| 3   | A     | EMI Test Receiver                                 | ESCI 3   | R&S             | 100083          | 300003312 | k                   | 09.12.2021       | 08.12.2022       |
| 4   | A     | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1 | SPS             | A3509 07/0 0205 | 300003314 | vIKI!               | 29.12.2021       | 28.12.2023       |
| 5   | A     | Hochpass 150 kHz                                  | EZ-25    | R&S             | 100010          | 300003798 | ev                  | -/-              | -/-              |
| 6   | A     | PC                                                | TecLine  | F+W             |                 | 300003532 | ne                  | -/-              | -/-              |
| 7   | A     | Switch-Unit                                       | 3488A    | HP              | 2719A14505      | 300000368 | ev                  | -/-              | -/-              |

NOTE: Test was performed before 2022-12-08.

## 8 Sequence of testing

### 8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement\*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

#### Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

\*Note: The sequence will be repeated three times with different EUT orientations.

## 8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position  $\pm 45^\circ$  and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

### 8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

#### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 8.4 Sequence of testing radiated spurious above 18 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

### Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

### Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

## 9 Measurement uncertainty

| Measurement uncertainty                                  |                                         |               |
|----------------------------------------------------------|-----------------------------------------|---------------|
| Test case                                                | Uncertainty                             |               |
| Antenna gain                                             | $\pm 3$ dB                              |               |
| Power spectral density                                   | $\pm 1.56$ dB                           |               |
| DTS bandwidth                                            | $\pm 100$ kHz (depends on the used RBW) |               |
| Occupied bandwidth                                       | $\pm 100$ kHz (depends on the used RBW) |               |
| Maximum output power conducted                           | $\pm 1.56$ dB                           |               |
| Detailed spurious emissions @ the band edge - conducted  | $\pm 1.56$ dB                           |               |
| Band edge compliance radiated                            | $\pm 3$ dB                              |               |
| Spurious emissions conducted                             | > 3.6 GHz                               | $\pm 1.56$ dB |
|                                                          | > 7 GHz                                 | $\pm 1.56$ dB |
|                                                          | > 18 GHz                                | $\pm 2.31$ dB |
|                                                          | $\geq 40$ GHz                           | $\pm 2.97$ dB |
| Spurious emissions radiated below 30 MHz                 | $\pm 3$ dB                              |               |
| Spurious emissions radiated 30 MHz to 1 GHz              | $\pm 3$ dB                              |               |
| Spurious emissions radiated 1 GHz to 12.75 GHz           | $\pm 3.7$ dB                            |               |
| Spurious emissions radiated above 12.75 GHz              | $\pm 4.5$ dB                            |               |
| Spurious emissions conducted below 30 MHz (AC conducted) | $\pm 2.6$ dB                            |               |

## 10 Summary of measurement results

|                                     |                                                                                                                          |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | No deviations from the technical specifications were ascertained                                                         |
| <input type="checkbox"/>            | There were deviations from the technical specifications ascertained                                                      |
| <input checked="" type="checkbox"/> | This test report is only a partial test report.<br>The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description          | Verdict   | Date       | Remark |
|---------------|----------------------|-----------|------------|--------|
| RF-Testing    | CFR Title 47 Part 15 | See table | 2023-01-16 | -/-    |

| Test specification clause | Test case                                         | C                                   | NC                       | NA                       | NP                       | Remark                        |
|---------------------------|---------------------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|-------------------------------|
| -/-                       | Output power verification (cond.)                 | -/-                                 |                          |                          |                          | Declared                      |
| -/-                       | Antenna gain                                      | -/-                                 |                          |                          |                          | Declared                      |
| U-NII Part 15             | Duty cycle                                        | -/-                                 |                          |                          |                          | -/-                           |
| §15.407(a)                | Maximum output power                              | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407(a)                | Power spectral density                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407(e)                | Spectrum bandwidth<br>6dB bandwidth               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407(a)                | Spectrum bandwidth<br>26dB bandwidth              | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407(a)                | Spectrum bandwidth<br>99% bandwidth               | -/-                                 |                          |                          |                          | -/-                           |
| §15.205                   | Band edge compliance radiated                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407(b)                | TX spurious emissions radiated                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.209(a)                | Spurious emissions radiated<br>< 30 MHz           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.107(a)<br>§15.207     | Spurious emissions conducted<br>emissions< 30 MHz | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                           |
| §15.407                   | DFS                                               | -/-                                 |                          |                          |                          | See report<br>1-3977/22-03-05 |

Notes:

|    |           |     |               |     |                |     |               |
|----|-----------|-----|---------------|-----|----------------|-----|---------------|
| C: | Compliant | NC: | Not compliant | NA: | Not applicable | NP: | Not performed |
|----|-----------|-----|---------------|-----|----------------|-----|---------------|

## 11 Additional comments

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference documents:        | DFS report: 1-3977/22-03-05<br>Annex list :<br>1-3977_22-03-04_Annex_MR_A1.pdf (a-mode)<br>1-3977_22-03-04_Annex_MR_A2.pdf (nHT20-mode)<br>1-3977_22-03-04_Annex_MR_A3.pdf (nHT40-mode)<br>1-3977_22-03-04_Annex_MR_A4.pdf (acVHT20-mode)<br>1-3977_22-03-04_Annex_MR_A5.pdf (acVHT40-mode)<br>1-3977_22-03-04_Annex_MR_A6.pdf (acVHT80-mode)<br>1-3977_22-03-04_Annex_MR_A7.pdf (acVHT80+80-mode)<br>1-3977_22-03-04_Annex_MR_A8.pdf (axHE20-mode)<br>1-3977_22-03-04_Annex_MR_A9.pdf (axHE40-mode)<br>1-3977_22-03-04_Annex_MR_A10.pdf (axHE80-mode)<br>1-3977_22-03-04_Annex_MR_A11.pdf (axHE80+80-mode)                                                                                                                                               |
| Special test descriptions:  | All tests were performed with the EUT transmitting on all ports/antennas simultaneously with >98% duty cycle.<br>For 160 MHz modes the conducted tests were performed with a 2x2 splitter on two ports simultaneously. Therefor the mode is named as 80+80.<br>There are three different versions of the device. The only differences in the versions are the antennas. All antennas have the same type, size and characteristics but they are provided by different manufacturers (COLFLY, HL and WAL SIN). Therefore antenna gains slightly differ (See chapter 12.2 for detailed information). Full radiated tests were performed with the COLFLY antennas. On HL and WAL SIN antennas only partial testing in the worst case scenarios was performed. |
| Configuration descriptions: | Supported modes:<br>a-mode<br>nHT20-mode<br>nHT40-mode<br>acVHT20-mode<br>acVHT40-mode<br>acVHT80-mode<br>acVHT160-mode (80+80 only)<br>axHE20-mode<br>axHE40-mode<br>axHE80-mode<br>axHE160-mode (80+80 only)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| EUT selection:              | <input type="checkbox"/> Only one device available<br><input type="checkbox"/> Devices selected by the customer<br><input checked="" type="checkbox"/> Devices selected by the laboratory (Randomly)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Provided channels and used power settings for all modes:

a-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |      |             |             |             |      |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|------|-------------|-------------|-------------|------|-------------|
| channel                                                                                               | <b>36</b>   | <b>40</b>   | 44   | <b>48</b>   | <b>52</b>   | <b>56</b>   | 60   | <b>64</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5180</b> | <b>5200</b> | 5220 | <b>5240</b> | <b>5260</b> | <b>5280</b> | 5300 | <b>5320</b> |
| Power setting                                                                                         | <b>20</b>   | <b>23</b>   | 23   | <b>23</b>   | <b>17</b>   | <b>16</b>   | 16   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |      |      |      |             |      |      |      |      |             |
|----------------------------------------------------------------------|-------------|------|------|------|------|-------------|------|------|------|------|-------------|
| channel                                                              | <b>100</b>  | 104  | 108  | 112  | 116  | <b>120</b>  | 124  | 128  | 132  | 136  | <b>144</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5500</b> | 5520 | 5540 | 5560 | 5580 | <b>5600</b> | 5620 | 5640 | 5660 | 5680 | <b>5720</b> |
| Power setting                                                        | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |      |             |      |             |
|---------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                             | <b>149</b>  | 153  | <b>157</b>  | 161  | <b>165</b>  |
| f <sub>c</sub> / MHz                                                | <b>5745</b> | 5765 | <b>5785</b> | 5805 | <b>5825</b> |
| Power setting                                                       | <b>23</b>   | 23   | <b>23</b>   | 23   | <b>23</b>   |

nHT20-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |      |             |             |             |      |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|------|-------------|-------------|-------------|------|-------------|
| channel                                                                                               | <b>36</b>   | <b>40</b>   | 44   | <b>48</b>   | <b>52</b>   | <b>56</b>   | 60   | <b>64</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5180</b> | <b>5200</b> | 5220 | <b>5240</b> | <b>5260</b> | <b>5280</b> | 5300 | <b>5320</b> |
| Power setting                                                                                         | <b>20</b>   | <b>23</b>   | 23   | <b>23</b>   | <b>16</b>   | <b>16</b>   | 16   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |      |      |      |             |      |      |      |      |             |
|----------------------------------------------------------------------|-------------|------|------|------|------|-------------|------|------|------|------|-------------|
| channel                                                              | <b>100</b>  | 104  | 108  | 112  | 116  | <b>120</b>  | 124  | 128  | 132  | 136  | <b>144</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5500</b> | 5520 | 5540 | 5560 | 5580 | <b>5600</b> | 5620 | 5640 | 5660 | 5680 | <b>5720</b> |
| Power setting                                                        | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |      |             |      |             |
|---------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                             | <b>149</b>  | 153  | <b>157</b>  | 161  | <b>165</b>  |
| f <sub>c</sub> / MHz                                                | <b>5745</b> | 5765 | <b>5785</b> | 5805 | <b>5825</b> |
| Power setting                                                       | <b>24</b>   | 24   | <b>24</b>   | 24   | <b>24</b>   |

acVHT20-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |      |             |             |             |      |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|------|-------------|-------------|-------------|------|-------------|
| channel                                                                                               | <b>36</b>   | <b>40</b>   | 44   | <b>48</b>   | <b>52</b>   | <b>56</b>   | 60   | <b>64</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5180</b> | <b>5200</b> | 5220 | <b>5240</b> | <b>5260</b> | <b>5280</b> | 5300 | <b>5320</b> |
| Power setting                                                                                         | <b>20</b>   | <b>23</b>   | 23   | <b>23</b>   | <b>17</b>   | <b>17</b>   | 16   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |      |      |      |             |      |      |      |      |             |
|----------------------------------------------------------------------|-------------|------|------|------|------|-------------|------|------|------|------|-------------|
| channel                                                              | <b>100</b>  | 104  | 108  | 112  | 116  | <b>120</b>  | 124  | 128  | 132  | 136  | <b>144</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5500</b> | 5520 | 5540 | 5560 | 5580 | <b>5600</b> | 5620 | 5640 | 5660 | 5680 | <b>5720</b> |
| Power setting                                                        | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |      |             |      |             |
|---------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                             | <b>149</b>  | 153  | <b>157</b>  | 161  | <b>165</b>  |
| f <sub>c</sub> / MHz                                                | <b>5745</b> | 5765 | <b>5785</b> | 5805 | <b>5825</b> |
| Power setting                                                       | <b>24</b>   | 24   | <b>24</b>   | 24   | <b>24</b>   |

axHE20-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |      |             |             |             |      |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|------|-------------|-------------|-------------|------|-------------|
| channel                                                                                               | <b>36</b>   | <b>40</b>   | 44   | <b>48</b>   | <b>52</b>   | <b>56</b>   | 60   | <b>64</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5180</b> | <b>5200</b> | 5220 | <b>5240</b> | <b>5260</b> | <b>5280</b> | 5300 | <b>5320</b> |
| Power setting                                                                                         | <b>19</b>   | <b>23</b>   | 23   | <b>23</b>   | <b>17</b>   | <b>16</b>   | 16   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |      |      |      |             |      |      |      |      |             |
|----------------------------------------------------------------------|-------------|------|------|------|------|-------------|------|------|------|------|-------------|
| channel                                                              | <b>100</b>  | 104  | 108  | 112  | 116  | <b>120</b>  | 124  | 128  | 132  | 136  | <b>144</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5500</b> | 5520 | 5540 | 5560 | 5580 | <b>5600</b> | 5620 | 5640 | 5660 | 5680 | <b>5720</b> |
| Power setting                                                        | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   | 15   | 15   | 15   | 15   | <b>15</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |      |             |      |             |
|---------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                             | <b>149</b>  | 153  | <b>157</b>  | 161  | <b>165</b>  |
| f <sub>c</sub> / MHz                                                | <b>5745</b> | 5765 | <b>5785</b> | 5805 | <b>5825</b> |
| Power setting                                                       | <b>24</b>   | 24   | <b>24</b>   | 24   | <b>24</b>   |

nHT40-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |             |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| channel                                                                                               | <b>38</b>   | <b>46</b>   | <b>54</b>   | <b>62</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5190</b> | <b>5230</b> | <b>5270</b> | <b>5310</b> |
| Power setting                                                                                         | <b>18</b>   | <b>24</b>   | <b>18</b>   | <b>18</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |             |      |             |
|----------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                              | <b>102</b>  | 110  | <b>118</b>  | 126  | <b>142</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5510</b> | 5550 | <b>5590</b> | 5630 | <b>5710</b> |
| Power setting                                                        | <b>17</b>   | 17   | <b>17</b>   | 17   | <b>17</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |             |
|---------------------------------------------------------------------|-------------|-------------|
| channel                                                             | <b>151</b>  | <b>159</b>  |
| f <sub>c</sub> / MHz                                                | <b>5755</b> | <b>5795</b> |
| Power setting                                                       | <b>24</b>   | <b>24</b>   |

acVHT40-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |             |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| channel                                                                                               | <b>38</b>   | <b>46</b>   | <b>54</b>   | <b>62</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5190</b> | <b>5230</b> | <b>5270</b> | <b>5310</b> |
| Power setting                                                                                         | <b>17</b>   | <b>24</b>   | <b>18</b>   | <b>18</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |      |             |      |             |
|----------------------------------------------------------------------|-------------|------|-------------|------|-------------|
| channel                                                              | <b>102</b>  | 110  | <b>118</b>  | 126  | <b>142</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5510</b> | 5550 | <b>5590</b> | 5630 | <b>5710</b> |
| Power setting                                                        | <b>18</b>   | 17   | <b>17</b>   | 17   | <b>17</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |             |
|---------------------------------------------------------------------|-------------|-------------|
| channel                                                             | <b>151</b>  | <b>159</b>  |
| f <sub>c</sub> / MHz                                                | <b>5755</b> | <b>5795</b> |
| Power setting                                                       | <b>24</b>   | <b>24</b>   |

axHE40-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |             |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| channel                                                                                               | <b>38</b>   | <b>46</b>   | <b>54</b>   | <b>62</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5190</b> | <b>5230</b> | <b>5270</b> | <b>5310</b> |
| Power setting                                                                                         | <b>18</b>   | <b>24</b>   | <b>18</b>   | <b>17</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |             |             |             |             |
|----------------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|
| channel                                                              | <b>102</b>  | <b>110</b>  | <b>118</b>  | <b>126</b>  | <b>142</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5510</b> | <b>5550</b> | <b>5590</b> | <b>5630</b> | <b>5710</b> |
| Power setting                                                        | <b>17</b>   | <b>17</b>   | <b>17</b>   | <b>17</b>   | <b>17</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |             |
|---------------------------------------------------------------------|-------------|-------------|
| channel                                                             | <b>151</b>  | <b>159</b>  |
| f <sub>c</sub> / MHz                                                | <b>5755</b> | <b>5795</b> |
| Power setting                                                       | <b>24</b>   | <b>24</b>   |

acVHT80-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|
| channel                                                                                               | <b>42</b>   | <b>58</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5210</b> | <b>5290</b> |
| Power setting                                                                                         | <b>18</b>   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |             |             |
|----------------------------------------------------------------------|-------------|-------------|-------------|
| channel                                                              | <b>106</b>  | <b>122</b>  | <b>138</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5530</b> | <b>5610</b> | <b>5690</b> |
| Power setting                                                        | <b>17</b>   | <b>17</b>   | <b>17</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |
|---------------------------------------------------------------------|-------------|
| channel                                                             | <b>155</b>  |
| f <sub>c</sub> / MHz                                                | <b>5775</b> |
| Power setting                                                       | <b>24</b>   |

axHE80-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |             |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|
| channel                                                                                               | <b>42</b>   | <b>58</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5210</b> | <b>5290</b> |
| Power setting                                                                                         | <b>18</b>   | <b>16</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |             |             |
|----------------------------------------------------------------------|-------------|-------------|-------------|
| channel                                                              | <b>106</b>  | <b>122</b>  | <b>138</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5530</b> | <b>5610</b> | <b>5690</b> |
| Power setting                                                        | <b>17</b>   | <b>17</b>   | <b>17</b>   |

| U-NII-3 (5725 MHz to 5850 MHz)<br>channel number & center frequency |             |
|---------------------------------------------------------------------|-------------|
| channel                                                             | <b>155</b>  |
| f <sub>c</sub> / MHz                                                | <b>5775</b> |
| Power setting                                                       | <b>24</b>   |

acVHT80+80-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |
|-------------------------------------------------------------------------------------------------------|-------------|
| channel                                                                                               | <b>50</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5250</b> |
| Power setting                                                                                         | <b>17</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |
|----------------------------------------------------------------------|-------------|
| channel                                                              | <b>114</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5570</b> |
| Power setting                                                        | <b>17</b>   |

axHE80+80-mode:

| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz)<br>channel number & center frequency |             |
|-------------------------------------------------------------------------------------------------------|-------------|
| channel                                                                                               | <b>50</b>   |
| f <sub>c</sub> / MHz                                                                                  | <b>5250</b> |
| Power<br>setting                                                                                      | <b>17</b>   |

| U-NII-2C (5470 MHz to 5725 MHz)<br>channel number & center frequency |             |
|----------------------------------------------------------------------|-------------|
| channel                                                              | <b>114</b>  |
| f <sub>c</sub> / MHz                                                 | <b>5570</b> |
| Power<br>setting                                                     | <b>16</b>   |

Note: The channels used for the tests were marked in bold in the list.

Test mode:

- ☐ No test mode available.  
Iperf is used to transmit data to a companion device
- ☒ Special software is used.  
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

- ☐ Operating mode 1 (single antenna)
- Equipment with 1 antenna,
  - Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,
  - Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)
- ☐ Operating mode 2 (multiple antennas, no beamforming)
- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.
- ☒ Operating mode 3 (multiple antennas, with beamforming)
- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.  
In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

## 12 Measurement results

### 12.1 Identify worst case data rate

Declared by manufacturer:

a-mode: 6 Mbps

nHT20/acVHT20 / axHE20: MCS0

nHT40/acVHT40 / axHE40: MCS0

acVHT80/axHE80: MCS0

acVHT80+80/ax80+80: MCS0

## 12.2 Antenna gain

Limits:

| Antenna Gain                                                      |
|-------------------------------------------------------------------|
| 6 dBi / > 6 dBi output power and power density reduction required |

Declared by manufacturer:

**Results:** HL antennas

| Combined gain for 4x4 MIMO | UNII-1 & UNII-2A | UNII-2C | UNII-3 |
|----------------------------|------------------|---------|--------|
| Gain [dBi] / Declared      | 5.4              |         |        |

**Results:** COLFLY antennas

| Combined gain for 4x4 MIMO | UNII-1 & UNII-2A | UNII-2C | UNII-3 |
|----------------------------|------------------|---------|--------|
| Gain [dBi] / Declared      | 5.8              |         |        |

**Results:** WALSIN antennas

| Combined gain for 4x4 MIMO | UNII-1 & UNII-2A | UNII-2C | UNII-3 |
|----------------------------|------------------|---------|--------|
| Gain [dBi] / Declared      | 6.27             | 6.2     | 5.57   |

## 12.3 Duty cycle

Results:

Duty cycle: >98% for all modes and channels

## 12.4 Maximum output power

| Measurement parameter               |                                                                                |
|-------------------------------------|--------------------------------------------------------------------------------|
| According to: KDB789033 D02, E.2.e. |                                                                                |
| External result file(s)             | 1-3977_22-01-05_Annex_MR_A1 to A11<br>FCC Part 15.407 Max Output Power and PSD |
| Used test setup:                    | See chapter 7.4 – A                                                            |
| Measurement uncertainty:            | See chapter 9                                                                  |
| Standard parts:                     | FCC: § 15.407 (a)                                                              |

Limits:

| Limits                               |                                                                    |
|--------------------------------------|--------------------------------------------------------------------|
| Radiated output power                | Conducted output power                                             |
| Band 5150 MHz – 5250 MHz             |                                                                    |
| Conducted power + 6 dBi antenna gain | <b>For an indoor access point</b><br>output power $\leq 30$ dBm*   |
| Band 5250MHz – 5350 MHz              |                                                                    |
| Conducted power + 6 dBi antenna gain | Minimum of 24 dBm or $11 \text{ dBm} + 10 \cdot \log(\text{BW})^*$ |
| Band 5470MHz – 5725 MHz              |                                                                    |
| Conducted power + 6 dBi antenna gain | Minimum of 24 dBm or $11 \text{ dBm} + 10 \cdot \log(\text{BW})^*$ |
| Band 5725MHz – 5850 MHz              |                                                                    |
| Conducted power + 6 dBi antenna gain | 30 dBm*                                                            |

\*If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. This leads to the following limits:

| Bands        | UNII-1 | UNII-2A | UNII-2C | UNII-3 |
|--------------|--------|---------|---------|--------|
| Limits [dBm] | 29.73  | 23.73   | 23.8    | 30.0   |

## Results:

| 802.11a<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                               | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                | 19.5 | 21.7 | 21.5 | 15.6 | 14.9 | 15.9 | 15.3 | 15.7 | 15.5 | 23.7 | 23.2 | 23.0 |
| Port 2                                | 20.0 | 22.0 | 22.0 | 16.7 | 14.7 | 16.2 | 13.8 | 14.1 | 15.0 | 23.2 | 22.7 | 23.5 |
| Port 3                                | 19.8 | 22.3 | 21.1 | 16.6 | 15.7 | 15.7 | 14.8 | 15.6 | 14.9 | 24.2 | 24.0 | 23.8 |
| Port 4                                | 19.3 | 22.2 | 21.7 | 14.7 | 15.5 | 14.3 | 15.1 | 15.2 | 14.7 | 23.1 | 23.4 | 23.9 |
| SUM                                   | 25.7 | 28.1 | 27.6 | 22.0 | 21.2 | 21.6 | 20.8 | 21.2 | 21.0 | 29.6 | 29.4 | 29.6 |

| 802.11n HT20<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                    | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                     | 19.8 | 21.8 | 21.2 | 14.6 | 16.0 | 16.0 | 15.9 | 14.9 | 15.7 | 22.5 | 22.6 | 22.3 |
| Port 2                                     | 19.9 | 22.0 | 22.1 | 16.0 | 15.7 | 16.2 | 14.8 | 14.5 | 15.6 | 22.8 | 22.2 | 22.9 |
| Port 3                                     | 19.9 | 22.5 | 21.3 | 16.0 | 15.1 | 15.9 | 15.1 | 15.3 | 14.8 | 23.5 | 23.8 | 24.0 |
| Port 4                                     | 19.4 | 22.3 | 21.8 | 11.2 | 15.0 | 14.4 | 14.8 | 15.1 | 14.7 | 22.5 | 22.6 | 23.2 |
| SUM                                        | 25.8 | 28.2 | 27.6 | 21.5 | 21.0 | 21.7 | 21.2 | 21.0 | 21.3 | 28.9 | 28.9 | 29.2 |

| 802.11n HT40<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |  |
|--------------------------------------------|------|------|------|------|------|------|------|------|------|--|
| Channel                                    | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |  |
| Port 1                                     | 17.9 | 22.7 | 17.3 | 17.8 | 17.4 | 17.3 | 17.2 | 23.1 | 22.8 |  |
| Port 2                                     | 18.0 | 23.3 | 18.1 | 18.1 | 17.2 | 17.0 | 17.6 | 23.6 | 23.1 |  |
| Port 3                                     | 18.3 | 22.8 | 17.4 | 17.9 | 15.8 | 17.9 | 17.2 | 23.9 | 24.1 |  |
| Port 4                                     | 18.0 | 22.5 | 16.5 | 16.6 | 17.6 | 17.3 | 16.9 | 23.0 | 22.9 |  |
| SUM                                        | 24.1 | 28.9 | 23.4 | 23.7 | 23.1 | 23.4 | 23.2 | 29.4 | 29.3 |  |

| 802.11ac VHT20<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                      | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                       | 19.5 | 21.7 | 21.6 | 15.3 | 16.2 | 14.4 | 15.5 | 14.9 | 14.9 | 22.3 | 22.2 | 22.6 |
| Port 2                                       | 19.9 | 22.0 | 21.7 | 17.0 | 16.6 | 15.9 | 14.1 | 14.5 | 14.5 | 23.2 | 22.8 | 22.0 |
| Port 3                                       | 19.8 | 22.5 | 21.2 | 16.9 | 15.9 | 16.1 | 18.8 | 15.4 | 15.7 | 24.1 | 23.0 | 23.0 |
| Port 4                                       | 19.5 | 22.2 | 21.8 | 14.7 | 15.9 | 15.9 | 15.2 | 15.3 | 14.9 | 22.5 | 22.8 | 23.4 |
| SUM                                          | 25.7 | 28.1 | 27.6 | 22.1 | 22.2 | 21.7 | 21.0 | 21.0 | 21.0 | 29.1 | 28.7 | 28.8 |

| 802.11ac VHT40<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |
|----------------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                                      | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                                       | 17.1 | 22.7 | 17.3 | 17.7 | 18.2 | 17.3 | 17.1 | 23.0 | 22.8 |
| Port 2                                       | 17.2 | 23.4 | 18.1 | 18.0 | 16.6 | 16.5 | 17.8 | 23.5 | 23.1 |
| Port 3                                       | 17.4 | 22.8 | 17.5 | 17.9 | 18.0 | 18.1 | 17.4 | 23.9 | 24.1 |
| Port 4                                       | 17.1 | 22.5 | 16.6 | 16.6 | 18.3 | 17.3 | 17.0 | 23.0 | 22.8 |
| SUM                                          | 23.2 | 28.9 | 23.4 | 23.6 | 23.8 | 23.4 | 23.4 | 29.4 | 29.3 |

| 802.11ac VHT80<br>Maximum output power [dBm] |      |      |      |      |      |      |
|----------------------------------------------|------|------|------|------|------|------|
| Channel                                      | 42   | 58   | 106  | 122  | 138  | 155  |
| Port 1                                       | 17.3 | 15.4 | 17.3 | 17.1 | 17.2 | 22.6 |
| Port 2                                       | 17.9 | 16.1 | 15.6 | 16.7 | 17.6 | 23.0 |
| Port 3                                       | 17.6 | 15.6 | 17.5 | 17.3 | 17.2 | 23.7 |
| Port 4                                       | 17.0 | 14.4 | 17.5 | 17.1 | 17.2 | 22.6 |
| SUM                                          | 23.5 | 21.4 | 23.1 | 23.1 | 23.3 | 29.0 |

| 802.11ac VHT80+80<br>Maximum output power [dBm] |      |      |
|-------------------------------------------------|------|------|
| Channel                                         | 50   | 114  |
| Port 1+3                                        | 20.2 | 20.1 |
| Port 2+4                                        | 20.1 | 20.6 |
| SUM                                             | 23.1 | 23.4 |

| 802.11ax HE20<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                     | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                      | 18.8 | 22.0 | 21.7 | 16.2 | 15.3 | 16.3 | 15.5 | 15.7 | 14.8 | 22.6 | 22.7 | 23.1 |
| Port 2                                      | 19.3 | 22.5 | 22.3 | 17.0 | 15.2 | 16.3 | 14.8 | 15.7 | 15.5 | 23.1 | 22.9 | 23.2 |
| Port 3                                      | 19.4 | 22.9 | 21.6 | 17.1 | 15.9 | 14.1 | 15.0 | 14.5 | 14.5 | 23.3 | 23.4 | 23.5 |
| Port 4                                      | 18.9 | 22.6 | 22.2 | 15.2 | 16.0 | 16.1 | 15.7 | 15.5 | 15.1 | 22.7 | 23.0 | 23.5 |
| SUM                                         | 25.1 | 28.5 | 28.0 | 22.4 | 21.6 | 21.9 | 21.3 | 21.4 | 21.0 | 29.0 | 29.0 | 29.3 |

| 802.11ax HE40<br>Maximum output power [dBm] |      |      |      |      |      |      |      |      |      |
|---------------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                                     | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                                      | 18.0 | 23.5 | 17.4 | 16.1 | 17.7 | 17.5 | 17.3 | 23.6 | 23.2 |
| Port 2                                      | 18.2 | 22.7 | 18.3 | 17.3 | 17.4 | 18.2 | 17.5 | 23.9 | 23.3 |
| Port 3                                      | 18.4 | 23.0 | 17.7 | 17.6 | 15.9 | 17.5 | 17.6 | 24.1 | 24.2 |
| Port 4                                      | 18.1 | 22.6 | 16.7 | 17.1 | 17.4 | 18.0 | 17.2 | 23.2 | 23.0 |
| SUM                                         | 24.2 | 29.0 | 23.6 | 23.1 | 23.2 | 23.8 | 23.4 | 29.7 | 29.5 |

| 802.11ax HE80<br>Maximum output power [dBm] |      |      |      |      |      |      |
|---------------------------------------------|------|------|------|------|------|------|
| Channel                                     | 42   | 58   | 106  | 122  | 138  | 155  |
| Port 1                                      | 17.7 | 15.7 | 17.4 | 17.6 | 17.7 | 23.0 |
| Port 2                                      | 18.1 | 16.5 | 15.6 | 17.2 | 17.5 | 23.2 |
| Port 3                                      | 18.0 | 16.0 | 17.8 | 17.7 | 17.9 | 24.0 |
| Port 4                                      | 17.5 | 14.8 | 17.5 | 17.4 | 17.4 | 22.9 |
| SUM                                         | 23.9 | 21.8 | 23.2 | 23.5 | 23.6 | 29.3 |

| 802.11ax HE80+80<br>Maximum output power [dBm] |      |      |
|------------------------------------------------|------|------|
| Channel                                        | 50   | 114  |
| Port 1+3                                       | 20.2 | 20.6 |
| Port 2+4                                       | 20.8 | 21.0 |
| SUM                                            | 23.5 | 23.8 |

## 12.5 Power spectral density

### Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

### Measurement:

| Measurement parameter           |                                                                                |
|---------------------------------|--------------------------------------------------------------------------------|
| According to: KDB789033 D02, F. |                                                                                |
| External result file(s)         | 1-3977_22-01-05_Annex_MR_A1 to A11<br>FCC Part 15.407 Max Output Power and PSD |
| Used test setup:                | See chapter 7.4 – A                                                            |
| Measurement uncertainty:        | See chapter 9                                                                  |
| Standard parts:                 | FCC: § 15.407 (a)                                                              |

## Limits:

| Power Spectral Density                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Band 5150 MHz – 5250 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>For an outdoor access point power spectral density conducted <math>\leq 17</math> dBm in any 1 MHz band*</p> <p>For an indoor access point power spectral density conducted <math>\leq 17</math> dBm in any 1 MHz band*</p> <p>For fixed point-to-point access points power spectral density conducted <math>\leq 17</math> dBm in any 1 MHz band**</p> <p>For client devices point power spectral density conducted <math>\leq 11</math> dBm in any 1 MHz band*</p> <p>*If transmitting antennas of directional gain greater than 6 dBi are used the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p> <p>**Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.</p> |
| Band 5250MHz – 5350 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>power spectral density conducted <math>\leq 11</math> dBm in any 1 MHz band*</p> <p>*If transmitting antennas of directional gain greater than 6 dBi are used the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Band 5470MHz – 5725 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>power spectral density conducted <math>\leq 11</math> dBm in any 1 MHz band*</p> <p>*If transmitting antennas of directional gain greater than 6 dBi are used the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Band 5725MHz – 5850 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>power spectral density conducted <math>\leq 30</math> dBm in any 500 kHz band</p> <p>If transmitting antennas of directional gain greater than 6 dBi are used the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Results:

| 802.11a                                           |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |      |      |      |      |      |      |      |      |      |      |
| Channel                                           | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                            | 8.4  | 10.6 | 10.5 | 4.4  | 3.9  | 5.1  | 5.0  | 5.2  | 4.6  | 10.1 | 9.7  | 9.0  |
| Port 2                                            | 9.0  | 10.9 | 11.0 | 5.2  | 3.1  | 5.5  | 3.6  | 4.2  | 4.7  | 9.9  | 9.0  | 10.3 |
| Port 3                                            | 8.2  | 10.9 | 9.8  | 5.2  | 4.7  | 4.5  | 3.6  | 4.2  | 4.0  | 10.8 | 10.5 | 10.0 |
| Port 4                                            | 8.2  | 11.2 | 10.6 | 3.5  | 4.4  | 3.2  | 4.6  | 5.2  | 5.1  | 10.1 | 10.4 | 10.5 |
| SUM                                               | 14.5 | 16.9 | 16.5 | 10.6 | 10.1 | 10.7 | 10.3 | 10.8 | 10.7 | 16.3 | 16.0 | 29.6 |

| 802.11n HT20                                      |      |      |      |     |      |      |      |      |      |      |      |      |
|---------------------------------------------------|------|------|------|-----|------|------|------|------|------|------|------|------|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |      |     |      |      |      |      |      |      |      |      |
| Channel                                           | 36   | 40   | 48   | 52  | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                            | 8.4  | 10.2 | 9.9  | 3.5 | 5.1  | 5.3  | 5.4  | 4.2  | 5.3  | 8.5  | 8.4  | 8.1  |
| Port 2                                            | 8.4  | 10.5 | 11.1 | 4.9 | 4.4  | 5.0  | 3.6  | 3.9  | 5.5  | 9.6  | 8.8  | 8.8  |
| Port 3                                            | 8.4  | 10.9 | 9.9  | 4.7 | 3.6  | 3.0  | 3.6  | 3.8  | 4.1  | 9.8  | 9.7  | 9.7  |
| Port 4                                            | 7.9  | 11.0 | 10.8 | 0.9 | 3.9  | 4.6  | 3.9  | 5.3  | 4.3  | 9.1  | 8.6  | 9.7  |
| SUM                                               | 14.3 | 16.7 | 16.5 | 9.8 | 10.3 | 10.6 | 10.2 | 10.4 | 10.8 | 15.3 | 15.9 | 15.1 |

| 802.11n HT40                                      |     |      |     |     |     |     |      |      |      |
|---------------------------------------------------|-----|------|-----|-----|-----|-----|------|------|------|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |     |      |     |     |     |     |      |      |      |
| Channel                                           | 38  | 46   | 54  | 62  | 102 | 118 | 134  | 151  | 159  |
| Port 1                                            | 3.8 | 8.6  | 3.4 | 4.2 | 4.0 | 4.0 | 3.6  | 6.8  | 6.0  |
| Port 2                                            | 2.6 | 9.5  | 4.4 | 4.3 | 2.5 | 3.3 | 5.6  | 7.2  | 6.3  |
| Port 3                                            | 3.7 | 8.2  | 2.9 | 3.6 | 2.7 | 3.6 | 3.1  | 6.7  | 6.9  |
| Port 4                                            | 3.8 | 8.5  | 2.9 | 2.4 | 4.3 | 4.4 | 3.9  | 7.4  | 7.0  |
| SUM                                               | 9.8 | 14.8 | 9.5 | 9.7 | 9.5 | 9.9 | 10.2 | 13.0 | 12.6 |

| 802.11ac VHT20                                    |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |      |      |      |      |      |      |      |      |      |      |
| Channel                                           | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                            | 8.1  | 10.3 | 10.1 | 4.0  | 5.5  | 3.0  | 4.7  | 4.2  | 3.9  | 8.7  | 8.4  | 8.3  |
| Port 2                                            | 8.1  | 10.4 | 10.3 | 6.1  | 5.3  | 4.5  | 3.7  | 3.8  | 2.9  | 8.9  | 7.9  | 8.3  |
| Port 3                                            | 8.5  | 10.9 | 9.6  | 5.4  | 4.1  | 4.9  | 3.4  | 3.8  | 6.0  | 10.5 | 8.7  | 8.7  |
| Port 4                                            | 7.9  | 10.9 | 10.7 | 3.5  | 4.6  | 5.3  | 4.6  | 5.6  | 4.6  | 9.2  | 9.3  | 9.8  |
| SUM                                               | 14.2 | 16.6 | 16.2 | 10.9 | 10.9 | 10.5 | 10.2 | 10.4 | 10.5 | 15.4 | 14.6 | 14.9 |

| 802.11ac VHT40<br>Power spectral density [dBm/1MHz] or [dBm/500kHz] |     |      |     |     |      |      |      |      |      |
|---------------------------------------------------------------------|-----|------|-----|-----|------|------|------|------|------|
| Channel                                                             | 38  | 46   | 54  | 62  | 102  | 118  | 134  | 151  | 159  |
| Port 1                                                              | 2.9 | 8.6  | 3.4 | 4.2 | 5.1  | 4.3  | 3.9  | 6.7  | 5.9  |
| Port 2                                                              | 2.8 | 9.5  | 4.4 | 4.2 | 3.1  | 3.5  | 5.1  | 7.2  | 6.2  |
| Port 3                                                              | 2.8 | 8.3  | 2.9 | 3.5 | 3.6  | 3.7  | 3.7  | 6.8  | 6.9  |
| Port 4                                                              | 2.9 | 8.5  | 2.8 | 2.4 | 4.8  | 4.4  | 3.8  | 7.4  | 6.9  |
| SUM                                                                 | 8.9 | 14.8 | 9.5 | 9.6 | 10.3 | 10.0 | 10.2 | 13.0 | 12.5 |

| 802.11ac VHT80<br>Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |     |      |     |     |
|---------------------------------------------------------------------|------|------|-----|------|-----|-----|
| Channel                                                             | 42   | 58   | 106 | 122  | 138 | 155 |
| Port 1                                                              | -0.1 | -1.1 | 1.2 | 0.9  | 0.6 | 3.2 |
| Port 2                                                              | 0.5  | -1.0 | 0.3 | 0.5  | 2.2 | 3.3 |
| Port 3                                                              | 0.6  | -1.6 | 0.4 | -0.2 | 0.5 | 3.7 |
| Port 4                                                              | -0.2 | -2.6 | 1.4 | 1.1  | 1.6 | 3.6 |
| SUM                                                                 | 6.3  | 4.5  | 6.9 | 6.6  | 7.3 | 9.5 |

| 802.11ac VHT80+80<br>Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |
|------------------------------------------------------------------------|------|------|
| Channel                                                                | 50   | 114  |
| Port 1+3                                                               | 0.2  | -0.1 |
| Port 2+4                                                               | -0.2 | 0.9  |
| SUM                                                                    | 3.0  | 3.5  |

| 802.11ax HE20<br>Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                                            | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                                             | 6.9  | 10.7 | 10.0 | 4.7  | 3.7  | 4.8  | 4.8  | 5.2  | 4.5  | 8.1  | 8.1  | 8.3  |
| Port 2                                                             | 7.6  | 10.8 | 10.5 | 5.7  | 3.2  | 5.4  | 2.9  | 3.8  | 4.4  | 9.1  | 9.1  | 9.4  |
| Port 3                                                             | 7.5  | 11.1 | 9.7  | 5.6  | 4.2  | 3.8  | 3.9  | 4.5  | 3.5  | 8.7  | 9.2  | 9.1  |
| Port 4                                                             | 7.2  | 11.1 | 10.9 | 3.4  | 4.9  | 4.2  | 4.5  | 5.0  | 4.5  | 9.0  | 8.7  | 9.6  |
| SUM                                                                | 13.3 | 16.9 | 16.3 | 10.9 | 10.1 | 10.6 | 10.1 | 10.7 | 10.3 | 14.8 | 14.8 | 15.2 |

| 802.11ax HE40<br>Power spectral density [dBm/1MHz] or [dBm/500kHz] |     |      |     |     |     |      |      |      |      |
|--------------------------------------------------------------------|-----|------|-----|-----|-----|------|------|------|------|
| Channel                                                            | 38  | 46   | 54  | 62  | 102 | 118  | 134  | 151  | 159  |
| Port 1                                                             | 3.7 | 9.4  | 3.3 | 1.6 | 4.1 | 4.7  | 3.5  | 6.9  | 6.0  |
| Port 2                                                             | 3.8 | 8.4  | 4.4 | 2.7 | 2.8 | 3.7  | 5.2  | 7.1  | 6.1  |
| Port 3                                                             | 3.7 | 8.2  | 2.8 | 3.6 | 2.0 | 3.6  | 3.3  | 6.7  | 6.8  |
| Port 4                                                             | 3.8 | 8.5  | 2.8 | 3.4 | 4.3 | 5.3  | 3.9  | 7.5  | 6.9  |
| SUM                                                                | 9.7 | 14.7 | 9.4 | 8.9 | 9.4 | 10.4 | 10.1 | 13.1 | 12.5 |

| 802.11ax HE80                                     |     |      |     |     |     |     |
|---------------------------------------------------|-----|------|-----|-----|-----|-----|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |     |      |     |     |     |     |
| Channel                                           | 42  | 58   | 106 | 122 | 138 | 155 |
| Port 1                                            | 0.3 | -0.8 | 1.3 | 1.4 | 1.0 | 3.5 |
| Port 2                                            | 0.7 | -0.6 | 0.3 | 0.9 | 2.3 | 3.3 |
| Port 3                                            | 1.0 | -1.3 | 0.6 | 0.2 | 1.3 | 3.8 |
| Port 4                                            | 0.2 | -2.2 | 1.5 | 1.4 | 1.3 | 3.8 |
| SUM                                               | 6.6 | 4.8  | 6.9 | 7.0 | 7.5 | 9.6 |

| 802.11ax HE80+80                                  |      |     |
|---------------------------------------------------|------|-----|
| Power spectral density [dBm/1MHz] or [dBm/500kHz] |      |     |
| Channel                                           | 50   | 114 |
| Port 1+3                                          | -0.3 | 0.9 |
| Port 2+4                                          | 0.4  | 0.8 |
| SUM                                               | 3.1  | 3.9 |

## 12.6 Minimum emission bandwidth for the band 5.725-5.85 GHz

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

| Measurement parameter             |                                                                            |
|-----------------------------------|----------------------------------------------------------------------------|
| According to: KDB789033 D02, C.2. |                                                                            |
| External result file(s)           | 1-3977_22-01-05_Annex_MR_A12<br>FCC Part 15.407 & ISED Minimum Emission BW |
| Used test setup:                  | See chapter 7.4 – A                                                        |
| Measurement uncertainty:          | See chapter 9                                                              |

Limits:

| FCC                                                   | ISED |
|-------------------------------------------------------|------|
| The minimum 6 dB bandwidth shall be at least 500 kHz. |      |

## Results:

| 802.11a<br>6 dB bandwidth [MHz] |      |      |      |
|---------------------------------|------|------|------|
| Channel                         | 149  | 157  | 165  |
| Port 1                          | 15.2 | 15.4 | 16.4 |
| Port 2                          | 16.4 | 16.4 | 15.4 |
| Port 3                          | 15.3 | 15.7 | 16.3 |
| Port 4                          | 16.3 | 16.1 | 15.7 |

| 802.11n HT20<br>6 dB bandwidth [MHz] |      |      |      |
|--------------------------------------|------|------|------|
| Channel                              | 149  | 157  | 165  |
| Port 1                               | 16.8 | 17.2 | 16.2 |
| Port 2                               | 15.1 | 17.2 | 16.1 |
| Port 3                               | 16.1 | 17.6 | 17.2 |
| Port 4                               | 15.1 | 16.4 | 17.2 |

| 802.11n HT40<br>6 dB bandwidth [MHz] |      |      |
|--------------------------------------|------|------|
| Channel                              | 151  | 159  |
| Port 1                               | 35.5 | 35.8 |
| Port 2                               | 35.7 | 35.1 |
| Port 3                               | 35.7 | 35.3 |
| Port 4                               | 35.7 | 35.7 |

| 802.11ac VHT20<br>6 dB bandwidth [MHz] |      |      |      |
|----------------------------------------|------|------|------|
| Channel                                | 149  | 157  | 165  |
| Port 1                                 | 17.2 | 16.0 | 17.3 |
| Port 2                                 | 17.7 | 17.6 | 16.4 |
| Port 3                                 | 16.9 | 17.6 | 17.6 |
| Port 4                                 | 16.9 | 16.3 | 17.0 |

| 802.11ac VHT40<br>6 dB bandwidth [MHz] |      |      |
|----------------------------------------|------|------|
| Channel                                | 151  | 159  |
| Port 1                                 | 36.0 | 36.0 |
| Port 2                                 | 35.7 | 35.0 |
| Port 3                                 | 34.1 | 35.7 |
| Port 4                                 | 35.7 | 35.7 |

| 802.11ac VHT80<br>6 dB bandwidth [MHz] |      |
|----------------------------------------|------|
| Channel                                | 155  |
| Port 1                                 | 75.2 |
| Port 2                                 | 75.2 |
| Port 3                                 | 75.2 |
| Port 4                                 | 75.2 |

| 802.11ax HE20<br>6 dB bandwidth [MHz] |      |      |      |
|---------------------------------------|------|------|------|
| Channel                               | 149  | 157  | 165  |
| Port 1                                | 19.0 | 19.0 | 18.8 |
| Port 2                                | 15.2 | 18.6 | 16.8 |
| Port 3                                | 18.5 | 18.5 | 17.9 |
| Port 4                                | 17.3 | 16.5 | 18.8 |

| 802.11ax HE40<br>6 dB bandwidth [MHz] |      |      |
|---------------------------------------|------|------|
| Channel                               | 151  | 159  |
| Port 1                                | 38.0 | 38.1 |
| Port 2                                | 37.3 | 37.6 |
| Port 3                                | 38.0 | 37.9 |
| Port 4                                | 37.7 | 36.5 |

| 802.11ax HE80<br>6 dB bandwidth [MHz] |      |
|---------------------------------------|------|
| Channel                               | 155  |
| Port 1                                | 75.2 |
| Port 2                                | 75.2 |
| Port 3                                | 75.2 |
| Port 4                                | 75.2 |

## 12.7 Spectrum bandwidth / 26 dB bandwidth

Description:

Measurement of the 26 dB bandwidth of the modulated signal.

Measurement:

| Measurement parameter             |                                                                          |
|-----------------------------------|--------------------------------------------------------------------------|
| According to: KDB789033 D02, C.1. |                                                                          |
| External result file(s)           | 1-3977_22-01-05_Annex_MR_A1 to A11<br>FCC Part 15.407 & ISSED Bandwidths |
| Used test setup:                  | See chapter 7.4 – A                                                      |
| Measurement uncertainty:          | See chapter 9                                                            |

Limits:

| Spectrum Bandwidth – 26 dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>IC:</b> Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.</p> <p><b>FCC:</b> Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.</p> |

## Results:

| 802.11a<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                          | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 144  | 149  | 157  | 165  |
| Port 1                           | 19.6 | 20.1 | 19.8 | 19.8 | 19.7 | 19.5 | 19.0 | 19.7 | 19.7 | 29.4 | 27.1 | 34.2 |
| Port 2                           | 19.3 | 20.8 | 20.8 | 19.5 | 19.5 | 19.3 | 18.8 | 19.7 | 19.4 | 21.2 | 21.0 | 20.2 |
| Port 3                           | 19.5 | 20.7 | 19.7 | 19.5 | 19.6 | 19.7 | 19.4 | 19.8 | 19.5 | 23.4 | 22.2 | 24.1 |
| Port 4                           | 19.5 | 20.2 | 19.4 | 19.4 | 19.3 | 19.5 | 19.3 | 19.0 | 19.3 | 19.8 | 19.3 | 22.0 |

## 22.2

| 802.11n HT20<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                               | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 144  | 149  | 157  | 165  |
| Port 1                                | 20.6 | 21.1 | 20.9 | 20.7 | 20.5 | 20.4 | 20.5 | 20.7 | 20.1 | 37.7 | 38.1 | 32.5 |
| Port 2                                | 20.7 | 21.4 | 21.2 | 20.8 | 20.7 | 20.5 | 20.8 | 20.9 | 20.7 | 21.7 | 23.2 | 29.5 |
| Port 3                                | 20.8 | 21.5 | 21.0 | 20.6 | 20.7 | 20.7 | 20.6 | 21.0 | 20.4 | 27.3 | 36.6 | 40.6 |
| Port 4                                | 20.2 | 21.2 | 20.5 | 21.0 | 20.6 | 20.7 | 20.6 | 19.8 | 20.3 | 26.6 | 23.5 | 27.2 |

## 27.3

| 802.11n HT40<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                               | 38   | 46   | 54   | 62   | 102  | 118  | 142  | 151  | 159  |
| Port 1                                | 40.2 | 43.7 | 40.4 | 40.6 | 39.8 | 39.8 | 40.2 | 79.4 | 79.9 |
| Port 2                                | 40.4 | 44.6 | 40.0 | 40.3 | 39.7 | 39.9 | 39.7 | 75.7 | 49.7 |
| Port 3                                | 40.6 | 49.1 | 40.5 | 40.2 | 40.9 | 40.4 | 40.4 | 73.7 | 78.9 |
| Port 4                                | 39.7 | 41.5 | 40.2 | 40.1 | 40.2 | 39.9 | 39.5 | 43.9 | 41.7 |

| 802.11ac VHT20<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|-----------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                 | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 144  | 149  | 157  | 165  |
| Port 1                                  | 20.8 | 20.9 | 20.9 | 20.7 | 20.7 | 20.5 | 20.5 | 20.8 | 20.9 | 35.9 | 33.9 | 32.7 |
| Port 2                                  | 20.8 | 21.6 | 22.1 | 20.1 | 20.8 | 20.6 | 19.9 | 20.6 | 20.3 | 29.0 | 27.9 | 24.9 |
| Port 3                                  | 20.7 | 21.1 | 21.1 | 20.6 | 20.7 | 20.6 | 20.7 | 21.0 | 21.0 | 32.4 | 27.5 | 30.5 |
| Port 4                                  | 20.5 | 21.3 | 20.8 | 20.7 | 20.8 | 20.7 | 20.7 | 20.3 | 20.2 | 23.6 | 22.7 | 28.1 |

| 802.11ac VHT40<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|-----------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                                 | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                                  | 40.7 | 44.6 | 40.5 | 40.6 | 40.1 | 40.3 | 40.5 | 78.8 | 79.6 |
| Port 2                                  | 40.0 | 45.4 | 40.0 | 40.0 | 40.8 | 39.3 | 39.6 | 68.4 | 58.9 |
| Port 3                                  | 40.6 | 55.8 | 40.6 | 40.3 | 40.3 | 40.6 | 40.5 | 75.6 | 78.1 |
| Port 4                                  | 39.7 | 41.0 | 39.8 | 40.3 | 40.2 | 39.6 | 39.9 | 46.5 | 43.8 |

| 802.11ac VHT80<br>26 dB bandwidth [MHz] |      |      |      |      |      |       |
|-----------------------------------------|------|------|------|------|------|-------|
| Channel                                 | 42   | 58   | 106  | 122  | 138  | 155   |
| Port 1                                  | 82.4 | 82.0 | 82.2 | 81.6 | 82.0 | 84.8  |
| Port 2                                  | 81.8 | 81.6 | 80.8 | 81.4 | 81.2 | 120.4 |
| Port 3                                  | 82.4 | 82.0 | 82.4 | 82.2 | 81.4 | 82.4  |
| Port 4                                  | 81.4 | 81.4 | 81.4 | 81.4 | 81.0 | 93.4  |

| 802.11ac VHT80+80<br>26 dB bandwidth [MHz] |       |       |
|--------------------------------------------|-------|-------|
| Channel                                    | 50    | 114   |
| Port 1+3                                   | 163.2 | 164.0 |
| Port 2+4                                   | 163.6 | 163.2 |

| 802.11ax HE20<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                                | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                 | 21.5 | 21.2 | 21.9 | 21.6 | 21.2 | 21.7 | 21.3 | 20.6 | 21.4 | 51.8 | 40.6 | 36.6 |
| Port 2                                 | 21.2 | 21.3 | 22.9 | 21.4 | 21.3 | 21.1 | 21.9 | 21.1 | 21.3 | 25.6 | 27.4 | 28.7 |
| Port 3                                 | 21.1 | 22.0 | 21.6 | 21.1 | 21.6 | 21.7 | 21.3 | 21.4 | 21.2 | 26.8 | 32.7 | 36.6 |
| Port 4                                 | 21.5 | 22.0 | 21.9 | 21.5 | 21.2 | 21.4 | 21.4 | 21.1 | 21.1 | 32.9 | 27.4 | 33.6 |

| 802.11ax HE40<br>26 dB bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|----------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                                | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                                 | 40.7 | 47.2 | 40.8 | 41.1 | 40.8 | 40.8 | 40.5 | 80.2 | 79.5 |
| Port 2                                 | 41.1 | 49.6 | 40.9 | 40.6 | 40.2 | 41.3 | 40.8 | 79.0 | 61.3 |
| Port 3                                 | 41.2 | 52.0 | 40.9 | 40.9 | 41.5 | 41.3 | 41.0 | 69.1 | 75.8 |
| Port 4                                 | 40.7 | 41.6 | 40.7 | 41.4 | 40.7 | 40.4 | 40.9 | 47.7 | 55.2 |

| 802.11ax HE80<br>26 dB bandwidth [MHz] |      |      |      |      |      |       |
|----------------------------------------|------|------|------|------|------|-------|
| Channel                                | 42   | 58   | 106  | 122  | 138  | 155   |
| Port 1                                 | 82.4 | 82.0 | 82.2 | 81.6 | 82.0 | 84.8  |
| Port 2                                 | 81.8 | 81.6 | 80.8 | 81.4 | 81.2 | 82.4  |
| Port 3                                 | 82.4 | 82.0 | 82.4 | 82.2 | 81.4 | 120.4 |
| Port 4                                 | 81.4 | 81.4 | 81.4 | 81.4 | 81.0 | 93.4  |

| 802.11ax HE80+80<br>26 dB bandwidth [MHz] |       |       |
|-------------------------------------------|-------|-------|
| Channel                                   | 50    | 114   |
| Port 1+3                                  | 164.4 | 165.2 |
| Port 2+4                                  | 164.0 | 163.6 |

## 12.8 Occupied bandwidth / 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement:

| Measurement parameter    |                                                                         |
|--------------------------|-------------------------------------------------------------------------|
| External result file(s)  | 1-3977_22-01-05_Annex_MR_A1 to A11<br>FCC Part 15.407 & ISED Bandwidths |
| Test setup:              | See chapter 7.4 – A                                                     |
| Measurement uncertainty: | See chapter 9                                                           |

Usage:

|                                          |      |
|------------------------------------------|------|
| -/-                                      | ISED |
| OBW is necessary for Emission Designator |      |

## Results:

| 802.11a<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                        | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                         | 16.4 | 16.4 | 16.4 | 16.5 | 16.5 | 16.5 | 16.3 | 16.6 | 16.5 | 16.9 | 16.8 | 17.5 |
| Port 2                         | 16.4 | 16.6 | 16.6 | 16.4 | 16.4 | 16.4 | 16.2 | 16.7 | 16.5 | 16.8 | 16.8 | 16.5 |
| Port 3                         | 16.5 | 16.5 | 16.5 | 16.4 | 16.5 | 16.4 | 16.4 | 16.5 | 16.4 | 16.5 | 16.5 | 16.7 |
| Port 4                         | 16.4 | 16.4 | 16.4 | 16.4 | 16.4 | 16.4 | 16.4 | 16.4 | 16.5 | 16.6 | 16.5 | 16.5 |

| 802.11n HT20<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                             | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                              | 17.6 | 17.7 | 17.7 | 17.6 | 17.5 | 17.5 | 17.5 | 17.7 | 17.5 | 23.0 | 19.1 | 18.2 |
| Port 2                              | 17.6 | 17.7 | 17.6 | 17.6 | 17.6 | 17.6 | 17.7 | 17.7 | 17.7 | 17.5 | 17.8 | 18.0 |
| Port 3                              | 17.6 | 17.7 | 17.6 | 17.5 | 17.6 | 17.6 | 17.6 | 17.7 | 17.6 | 17.8 | 18.8 | 22.4 |
| Port 4                              | 17.6 | 17.6 | 17.6 | 17.7 | 17.6 | 17.6 | 17.6 | 17.5 | 17.6 | 17.8 | 17.7 | 17.9 |

| 802.11n HT40<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|-------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                             | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                              | 36.0 | 36.4 | 36.1 | 36.2 | 36.2 | 36.0 | 36.1 | 42.5 | 39.4 |
| Port 2                              | 36.0 | 36.5 | 36.1 | 36.1 | 35.9 | 36.0 | 36.3 | 37.2 | 36.6 |
| Port 3                              | 36.3 | 36.5 | 36.3 | 36.2 | 36.2 | 36.2 | 36.2 | 37.5 | 38.7 |
| Port 4                              | 36.0 | 36.2 | 36.1 | 36.1 | 36.1 | 35.9 | 35.9 | 36.3 | 36.4 |

| 802.11ac VHT20<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                               | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                                | 17.6 | 17.6 | 17.7 | 17.7 | 17.6 | 17.5 | 17.5 | 17.7 | 17.7 | 21.1 | 18.4 | 18.4 |
| Port 2                                | 17.7 | 17.7 | 17.7 | 17.6 | 17.6 | 17.6 | 17.3 | 17.7 | 17.6 | 18.2 | 18.1 | 17.8 |
| Port 3                                | 17.6 | 17.7 | 17.6 | 17.5 | 17.6 | 17.5 | 17.6 | 17.7 | 17.7 | 18.3 | 18.1 | 18.2 |
| Port 4                                | 17.6 | 17.7 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.5 | 17.4 | 17.7 | 17.7 | 17.9 |

| 802.11ac VHT40<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                               | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                                | 36.0 | 36.5 | 36.2 | 36.2 | 36.2 | 36.1 | 36.2 | 41.7 | 39.4 |
| Port 2                                | 36.0 | 36.4 | 36.1 | 36.1 | 36.5 | 35.9 | 36.2 | 37.3 | 36.6 |
| Port 3                                | 36.3 | 36.6 | 36.3 | 36.1 | 36.2 | 36.2 | 36.3 | 37.7 | 38.6 |
| Port 4                                | 36.0 | 36.2 | 36.2 | 36.1 | 36.2 | 36.0 | 36.1 | 36.4 | 36.4 |

| 802.11ac VHT80<br>99% bandwidth [MHz] |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|
| Channel                               | 42   | 58   | 106  | 122  | 138  | 155  |
| Port 1                                | 75.3 | 75.5 | 75.5 | 78.9 | 75.3 | 75.5 |
| Port 2                                | 75.5 | 75.5 | 75.1 | 75.3 | 75.1 | 76.5 |
| Port 3                                | 75.5 | 75.5 | 75.5 | 75.5 | 75.3 | 75.7 |
| Port 4                                | 75.3 | 75.1 | 75.1 | 74.9 | 74.9 | 75.5 |

| 802.11ac VHT80+80<br>99% bandwidth [MHz] |       |       |
|------------------------------------------|-------|-------|
| Channel                                  | 50    | 114   |
| Port 1+3                                 | 153.8 | 155.0 |
| Port 2+4                                 | 154.6 | 154.2 |

| 802.11ax HE20<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Channel                              | 36   | 40   | 48   | 52   | 60   | 64   | 100  | 120  | 140  | 149  | 157  | 165  |
| Port 1                               | 18.9 | 18.9 | 19.0 | 19.0 | 18.9 | 19.0 | 19.1 | 18.8 | 18.9 | 20.9 | 19.6 | 19.7 |
| Port 2                               | 18.9 | 18.9 | 19.0 | 19.0 | 19.0 | 18.9 | 19.0 | 19.0 | 18.9 | 18.8 | 19.2 | 19.2 |
| Port 3                               | 18.9 | 19.0 | 19.0 | 18.9 | 18.9 | 18.9 | 19.0 | 19.0 | 18.9 | 19.1 | 19.1 | 19.6 |
| Port 4                               | 19.0 | 19.0 | 19.0 | 18.9 | 18.9 | 19.0 | 19.1 | 18.9 | 19.1 | 19.0 | 19.0 | 19.3 |

| 802.11ax HE40<br>99% bandwidth [MHz] |      |      |      |      |      |      |      |      |      |
|--------------------------------------|------|------|------|------|------|------|------|------|------|
| Channel                              | 38   | 46   | 54   | 62   | 102  | 118  | 134  | 151  | 159  |
| Port 1                               | 37.8 | 38.0 | 37.8 | 37.8 | 37.7 | 37.8 | 37.6 | 44.0 | 40.5 |
| Port 2                               | 37.9 | 38.1 | 37.8 | 37.8 | 37.5 | 38.1 | 37.8 | 38.8 | 38.0 |
| Port 3                               | 37.8 | 38.1 | 37.8 | 37.8 | 37.8 | 37.9 | 37.8 | 38.7 | 38.6 |
| Port 4                               | 37.7 | 37.8 | 37.8 | 37.9 | 37.7 | 37.8 | 37.8 | 37.9 | 38.1 |

| 802.11ax HE80<br>99% bandwidth [MHz] |      |      |      |      |      |      |
|--------------------------------------|------|------|------|------|------|------|
| Channel                              | 42   | 58   | 106  | 122  | 138  | 155  |
| Port 1                               | 75.3 | 75.5 | 75.5 | 74.9 | 75.3 | 75.5 |
| Port 2                               | 75.5 | 75.3 | 75.1 | 75.3 | 75.1 | 75.7 |
| Port 3                               | 75.5 | 75.5 | 75.5 | 75.5 | 75.3 | 76.5 |
| Port 4                               | 75.3 | 75.1 | 75.1 | 74.9 | 74.9 | 75.5 |

| 802.11ax HE80+80<br>99% bandwidth [MHz] |       |       |
|-----------------------------------------|-------|-------|
| Channel                                 | 50    | 114   |
| Port 1+3                                | 155.8 | 156.6 |
| Port 2+4                                | 156.2 | 155.4 |

## 12.9 Band edge compliance radiated

### Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. Measurement distance is 3m.

### Measurement:

| Measurement parameter    |                            |
|--------------------------|----------------------------|
| Detector:                | Peak / RMS                 |
| Sweep time:              | Auto                       |
| Resolution bandwidth:    | 1 MHz                      |
| Video bandwidth:         | $\geq 3 \times \text{RBW}$ |
| Span:                    | See plots                  |
| Trace mode:              | Max Hold                   |
| Test setup:              | See sub clause 7.2 – B     |
| Measurement uncertainty: | See chapter 9              |

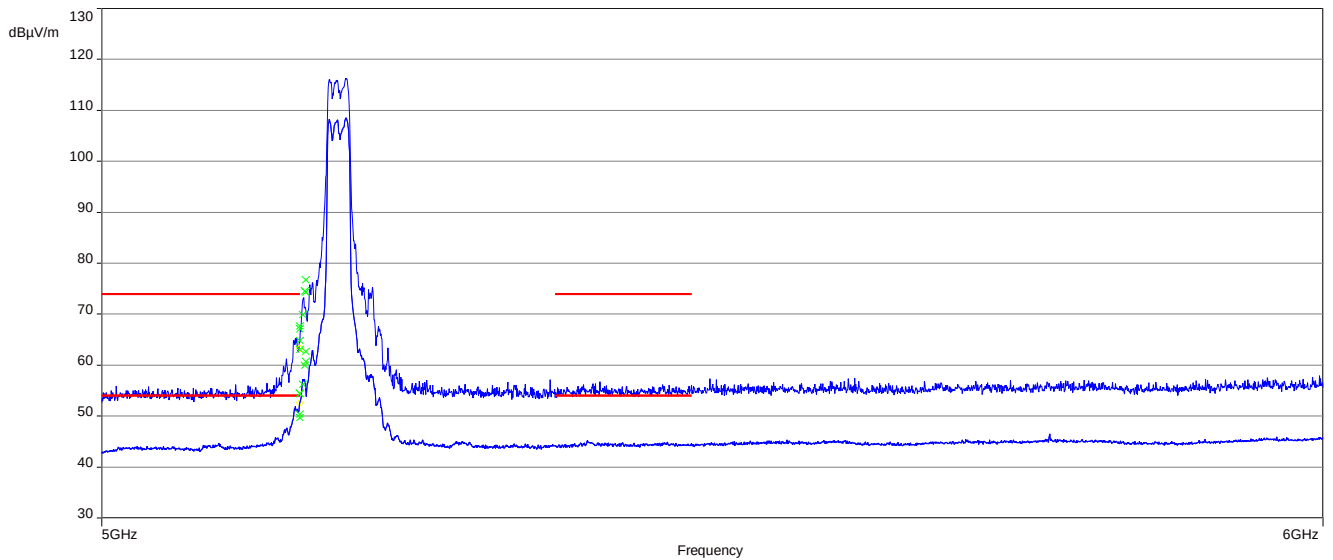
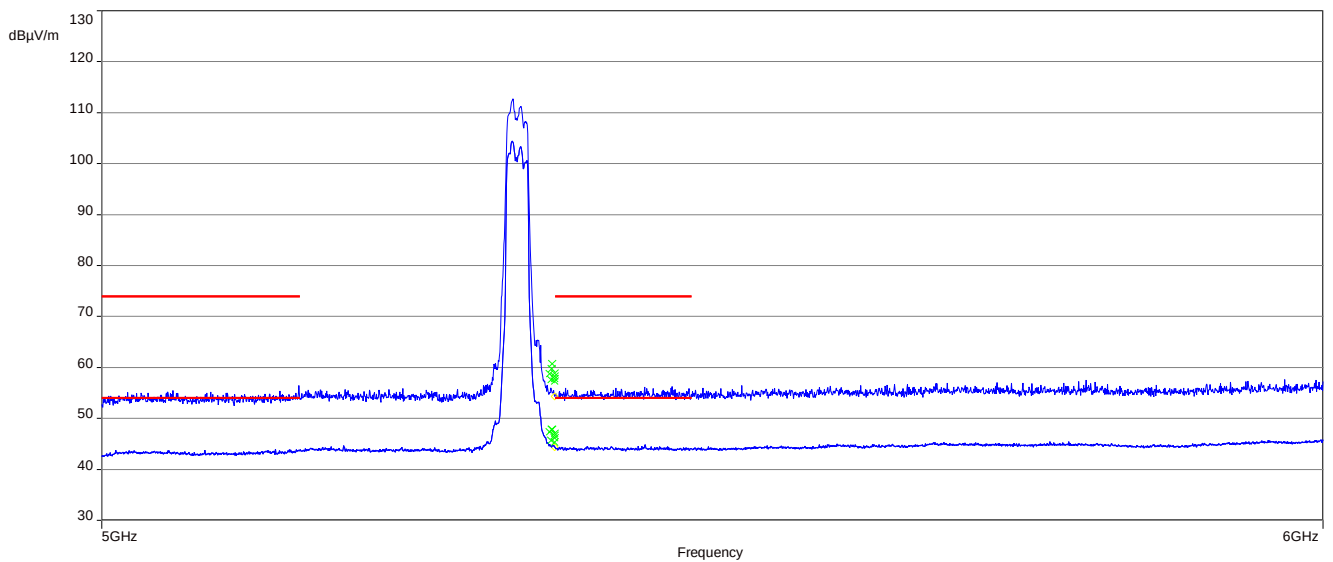
### Limits:

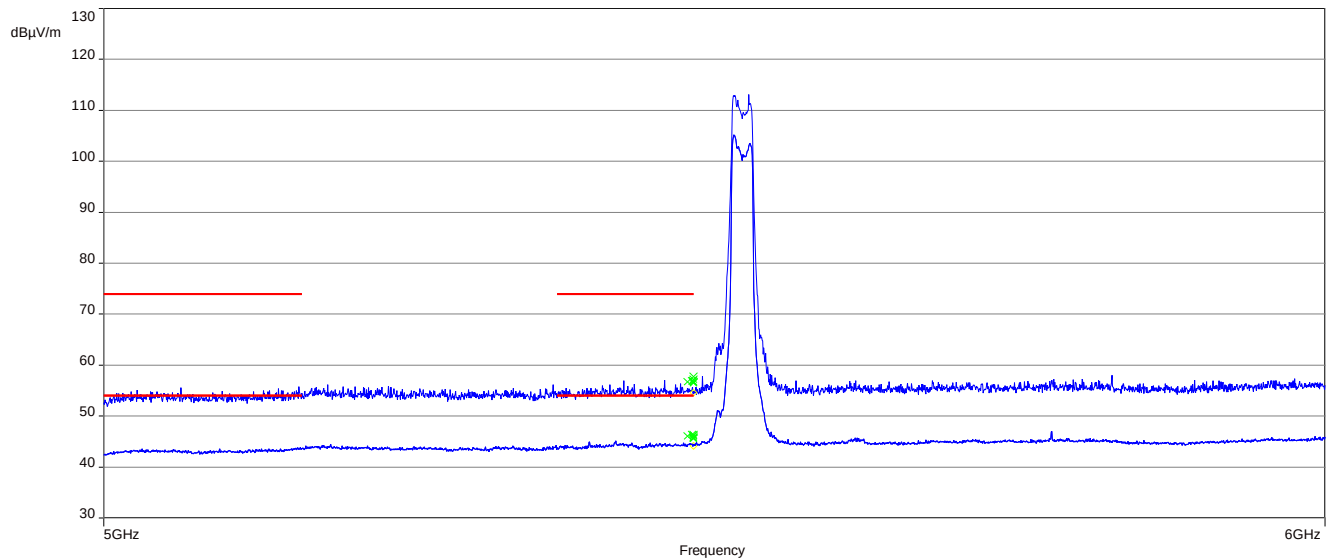
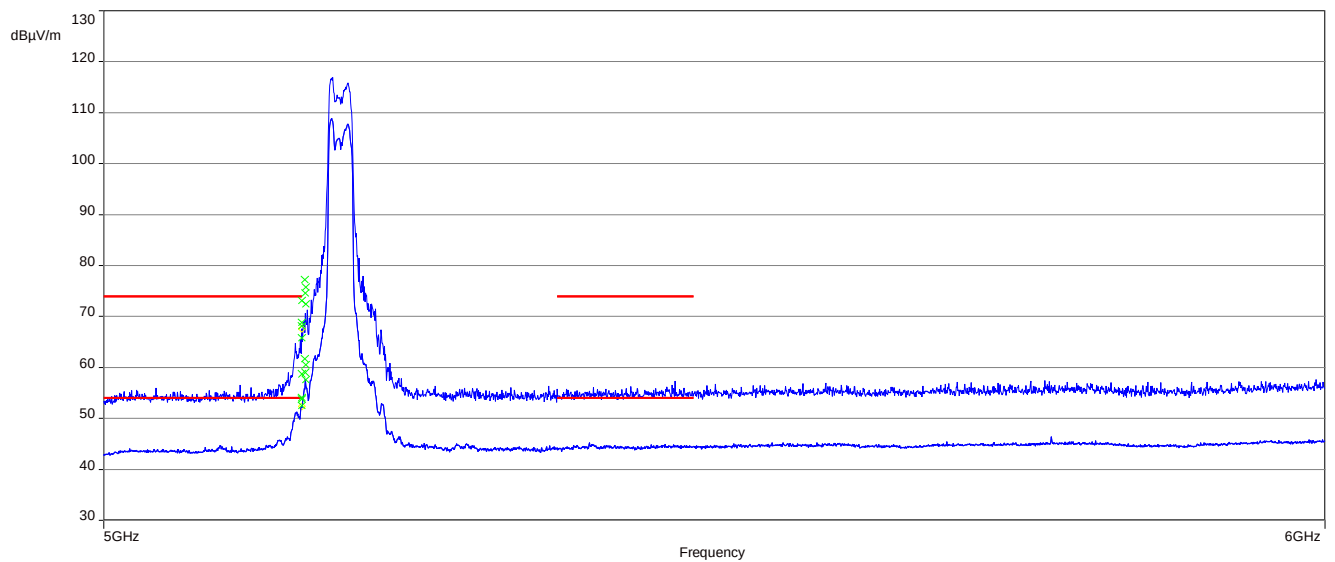
| Band Edge Compliance Radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)). |
| 74 dB $\mu$ V/m (peak)<br>54 dB $\mu$ V/m (average)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

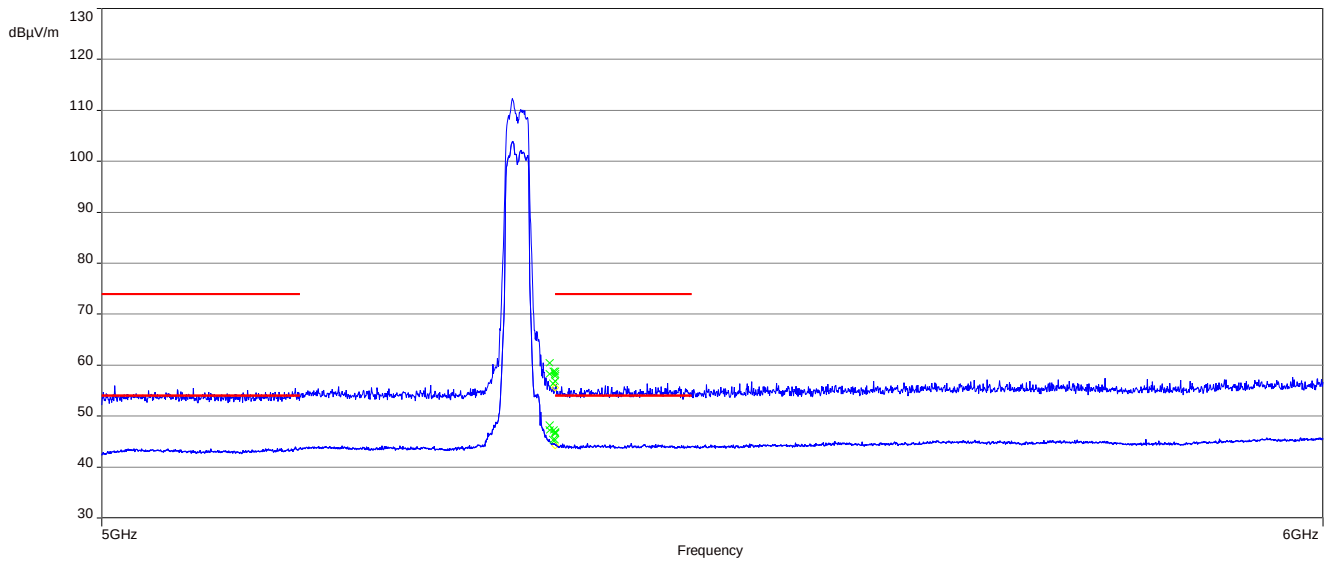
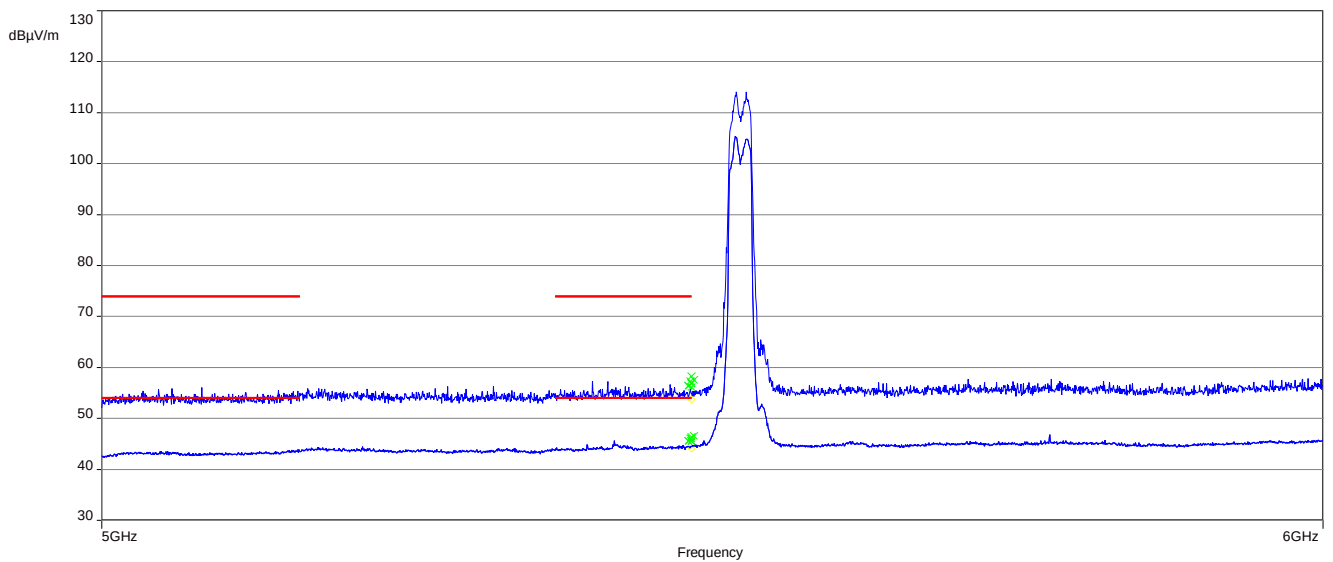
## Results: COLFLY antennas

| Band Edge Compliance radiated                              | Emission frequency [MHz] | Detector | Level [dBuV/m] |
|------------------------------------------------------------|--------------------------|----------|----------------|
| Lower band edge; U-NII-1; lowest channel, 802.11a          | 5150                     | Peak     | 69.7           |
|                                                            |                          | AVG      | 51.5           |
| Upper band edge; U-NII-2A; highest channel, 802.11a        | 5350                     | Peak     | 59.0           |
|                                                            |                          | AVG      | 47.1           |
| Lower band edge; U-NII-2C; lowest channel, 802.11a         | 5460                     | Peak     | 57.7           |
|                                                            |                          | AVG      | 46.4           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT20     | 5150                     | Peak     | 71.0           |
|                                                            |                          | AVG      | 53.1           |
| Upper band edge; U-NII-2A; highest channel, 802.11n HT20   | 5350                     | Peak     | 58.7           |
|                                                            |                          | AVG      | 46.6           |
| Lower band edge; U-NII-2C; lowest channel, 802.11n HT20    | 5460                     | Peak     | 58.3           |
|                                                            |                          | AVG      | 46.4           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT40     | 5150                     | Peak     | 71.4           |
|                                                            |                          | AVG      | 53.9           |
| Upper band edge; U-NII-2A; highest channel, 802.11n HT40   | 5350                     | Peak     | 67.2           |
|                                                            |                          | AVG      | 50.9           |
| Lower band edge; U-NII-2C; lowest channel, 802.11n HT40    | 5460                     | Peak     | 60.0           |
|                                                            |                          | AVG      | 47.3           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT20   | 5150                     | Peak     | 70.9           |
|                                                            |                          | AVG      | 53.0           |
| Upper band edge; U-NII-2A; highest channel, 802.11ac VHT20 | 5350                     | Peak     | 57.5           |
|                                                            |                          | AVG      | 46.7           |
| Lower band edge; U-NII-2C; lowest channel, 802.11ac VHT20  | 5460                     | Peak     | 57.4           |
|                                                            |                          | AVG      | 45.7           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT40   | 5150                     | Peak     | 72.7           |
|                                                            |                          | AVG      | 53.9           |
| Upper band edge; U-NII-2A; highest channel, 802.11ac VHT40 | 5350                     | Peak     | 67.6           |
|                                                            |                          | AVG      | 51.4           |
| Lower band edge; U-NII-2C; lowest channel, 802.11ac VHT40  | 5460                     | Peak     | 59.0           |
|                                                            |                          | AVG      | 47.6           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT80   | 5150                     | Peak     | 70.7           |
|                                                            |                          | AVG      | 53.9           |
| Upper band edge; U-NII-2A; highest channel, 802.11ac VHT80 | 5350                     | Peak     | 63.2           |
|                                                            |                          | AVG      | 48.7           |
| Lower band edge; U-NII-2C; lowest channel, 802.11ac VHT80  | 5460                     | Peak     | 64.8           |
|                                                            |                          | AVG      | 50.1           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE20    | 5150                     | Peak     | 72.3           |
|                                                            |                          | AVG      | 51.4           |
| Upper band edge; U-NII-2A; highest channel, 802.11ax HE20  | 5350                     | Peak     | 58.7           |
|                                                            |                          | AVG      | 46.8           |
| Lower band edge; U-NII-2C; lowest channel, 802.11ax HE20   | 5460                     | Peak     | 56.3           |
|                                                            |                          | AVG      | 45.4           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE40    | 5150                     | Peak     | 70.3           |
|                                                            |                          | AVG      | 51.6           |

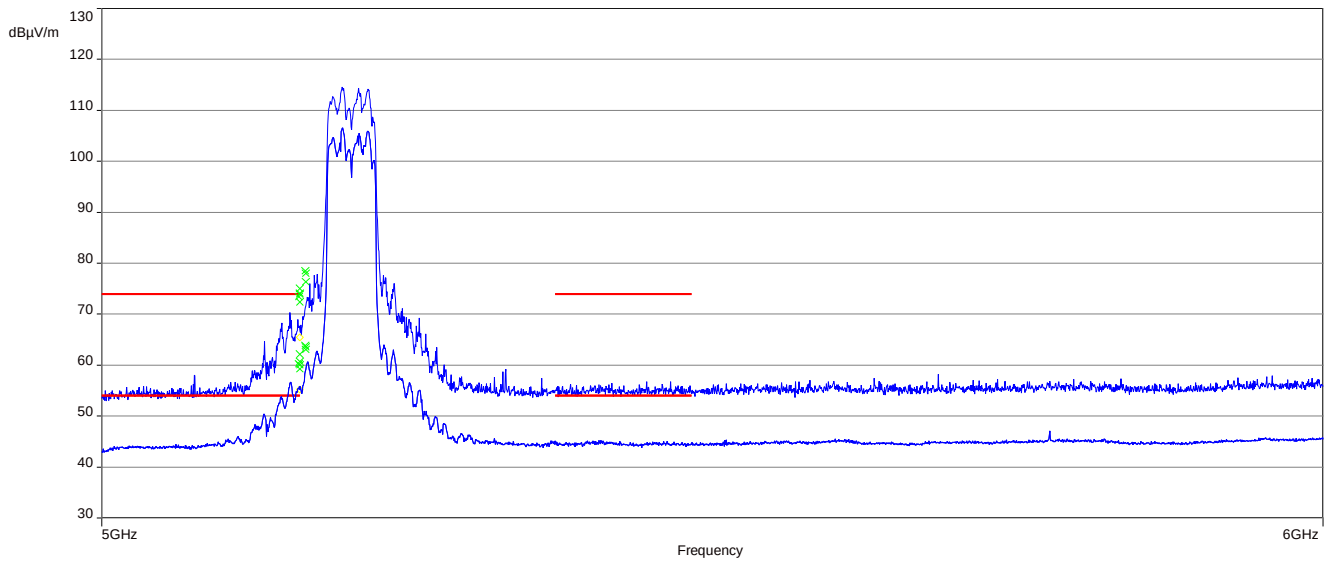
|                                                                         |      |      |      |
|-------------------------------------------------------------------------|------|------|------|
| Upper band edge; U-NII-2A; highest channel, 802.11 ax HE40              | 5350 | Peak | 72.9 |
|                                                                         |      | AVG  | 53.4 |
| Lower band edge; U-NII-2C; lowest channel, 802.11 ax HE40               | 5460 | Peak | 66.9 |
|                                                                         |      | AVG  | 48.6 |
| Lower band edge; U-NII-1; lowest channel, 802.11 ax HE80                | 5150 | Peak | 73.9 |
|                                                                         |      | AVG  | 53.9 |
| Upper band edge; U-NII-2A; highest channel, 802.11 ax HE80              | 5350 | Peak | 64.3 |
|                                                                         |      | AVG  | 51.4 |
| Upper band edge; U-NII-2C; lowest channel, 802.11 ax HE80               | 5460 | Peak | 65.8 |
|                                                                         |      | AVG  | 50.8 |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11 ac VHT80+80 | 5050 | Peak | 63.6 |
|                                                                         |      | AVG  | 53.3 |
|                                                                         | 5150 | Peak | 69.0 |
|                                                                         |      | AVG  | 53.9 |
|                                                                         | 5350 | Peak | 67.0 |
|                                                                         |      | AVG  | 53.5 |
| Upper band edge; U-NII-2C; middle channel, 802.11 ac VHT80+80           | 5370 | Peak | 60.8 |
|                                                                         |      | AVG  | 52.4 |
|                                                                         | 5460 | Peak | 63.8 |
|                                                                         |      | AVG  | 51.5 |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11 ax HE80+80  | 5050 | Peak | 60.4 |
|                                                                         |      | AVG  | 51.2 |
|                                                                         | 5130 | Peak | 66.3 |
|                                                                         |      | AVG  | 52.8 |
|                                                                         | 5150 | Peak | 69.8 |
|                                                                         |      | AVG  | 53.0 |
|                                                                         | 5350 | Peak | 66.6 |
|                                                                         |      | AVG  | 51.3 |
| Upper band edge; U-NII-2C; middle channel, 802.11 ax HE80+80            | 5370 | Peak | 63.7 |
|                                                                         |      | AVG  | 52.5 |
|                                                                         | 5460 | Peak | 73.7 |
|                                                                         |      | AVG  | 53.9 |

**Plots:** COLFLY antennas**Plot 1:** lower band edge; U-NII-1; lowest channel, 802.11a**Plot 2:** upper band edge; U-NII-2A; highest channel, 802.11a

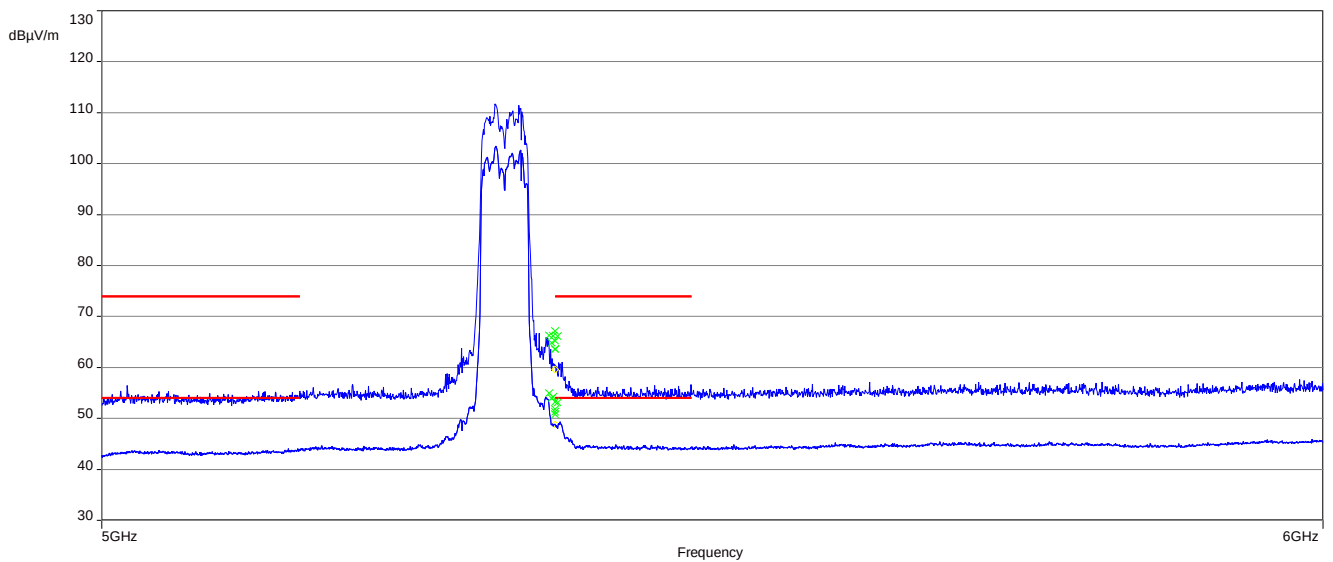
**Plot 3:** lower band edge; U-NII-2C; lowest channel, 802.11a**Plot 4:** lower band edge; U-NII-1; lowest channel, 802.11n HT20

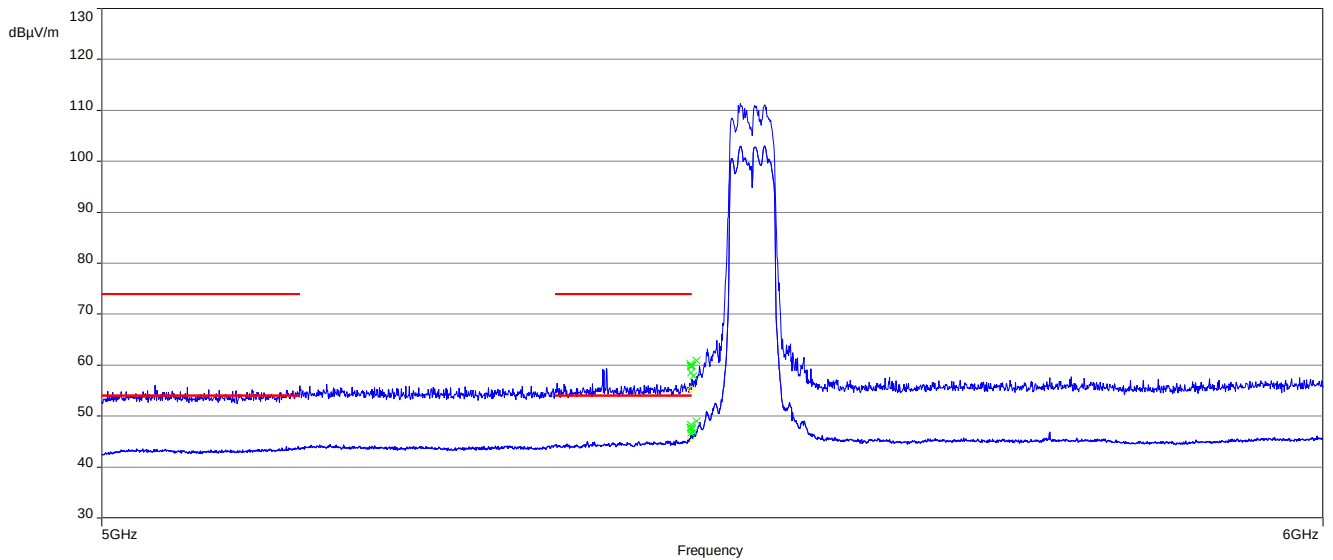
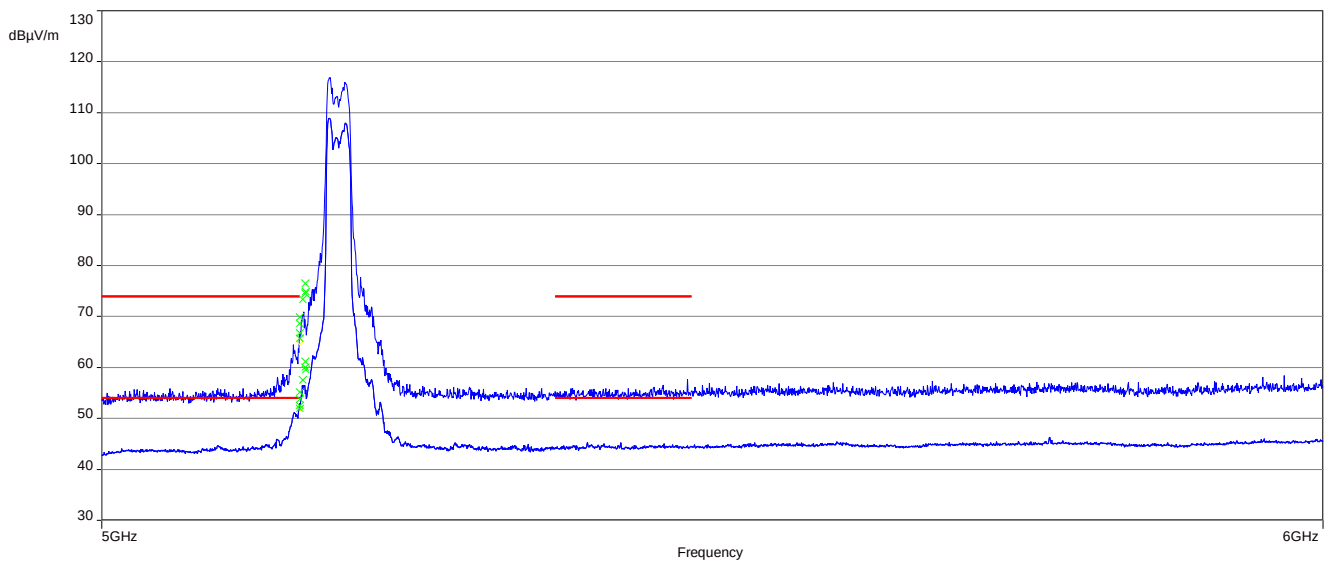
**Plot 5:** upper band edge; U-NII-2A; highest channel, 802.11n HT20**Plot 6:** lower band edge; U-NII-2C; lowest channel, 802.11n HT20

**Plot 7:** lower band edge; U-NII-1; lowest channel, 802.11n HT40

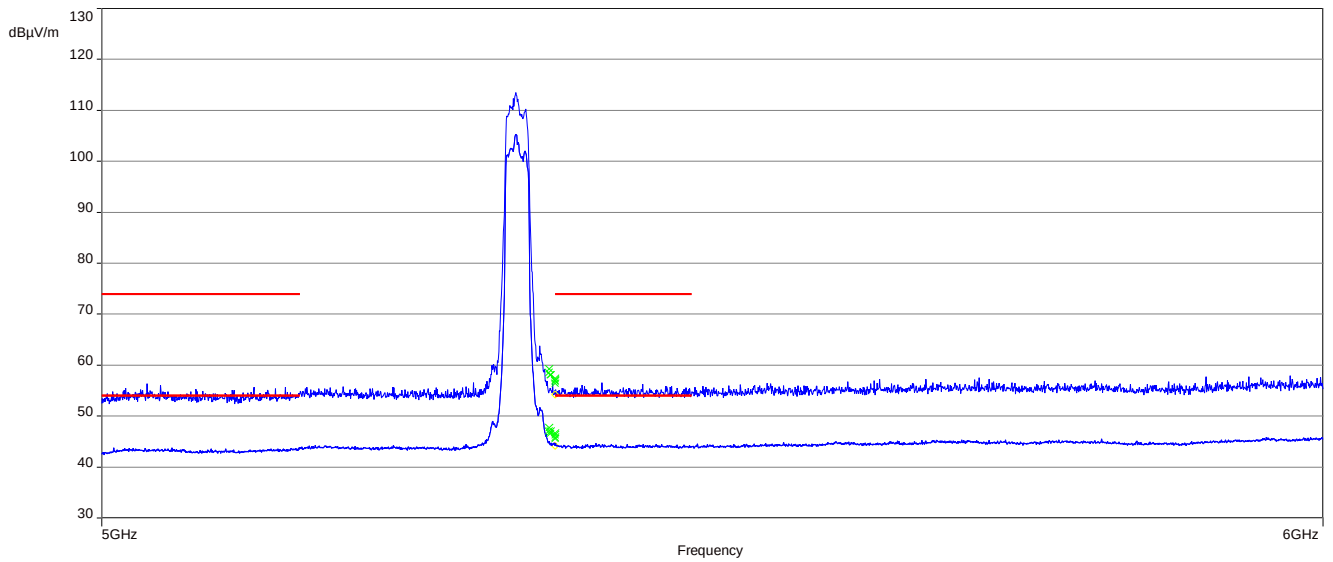


**Plot 8:** upper band edge; U-NII-2A; highest channel, 802.11n HT40

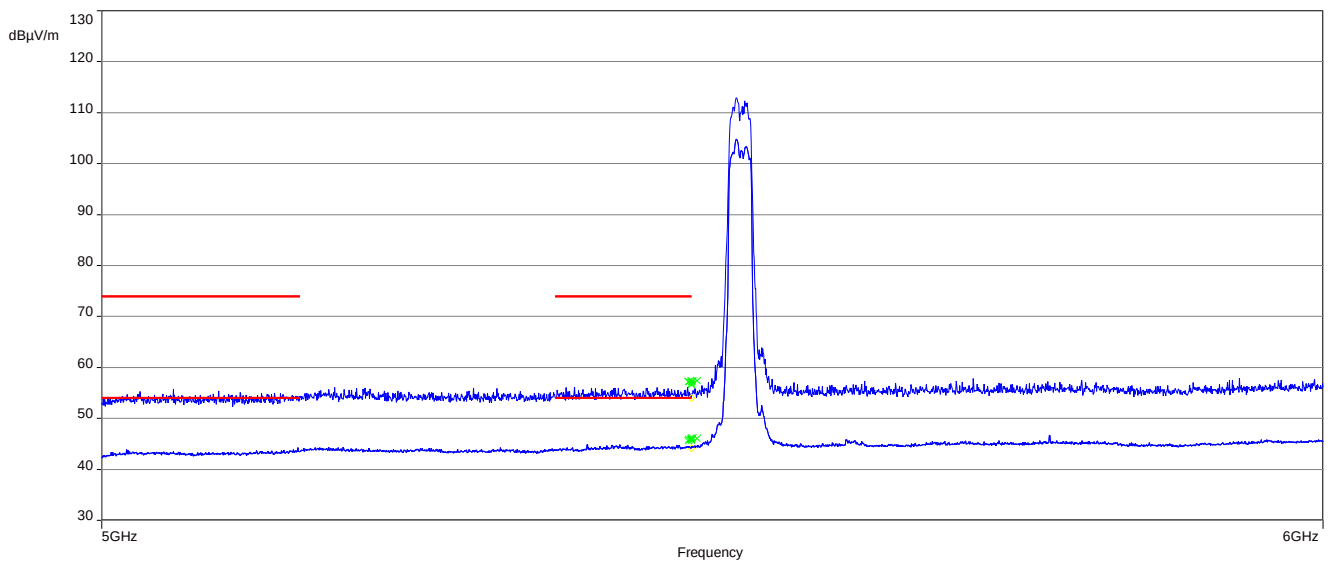


**Plot 9:** lower band edge; U-NII-2C; lowest channel, 802.11n HT40**Plot 10:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT20

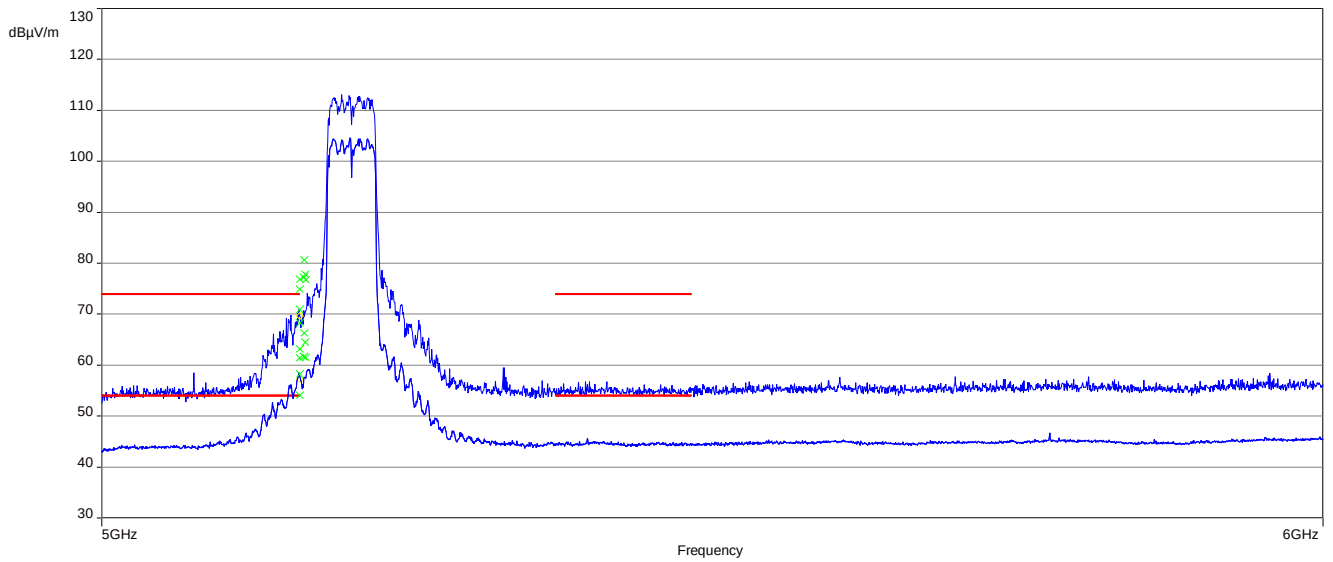
**Plot 11:** upper band edge; U-NII-2A; highest channel, 802.11ac VHT20



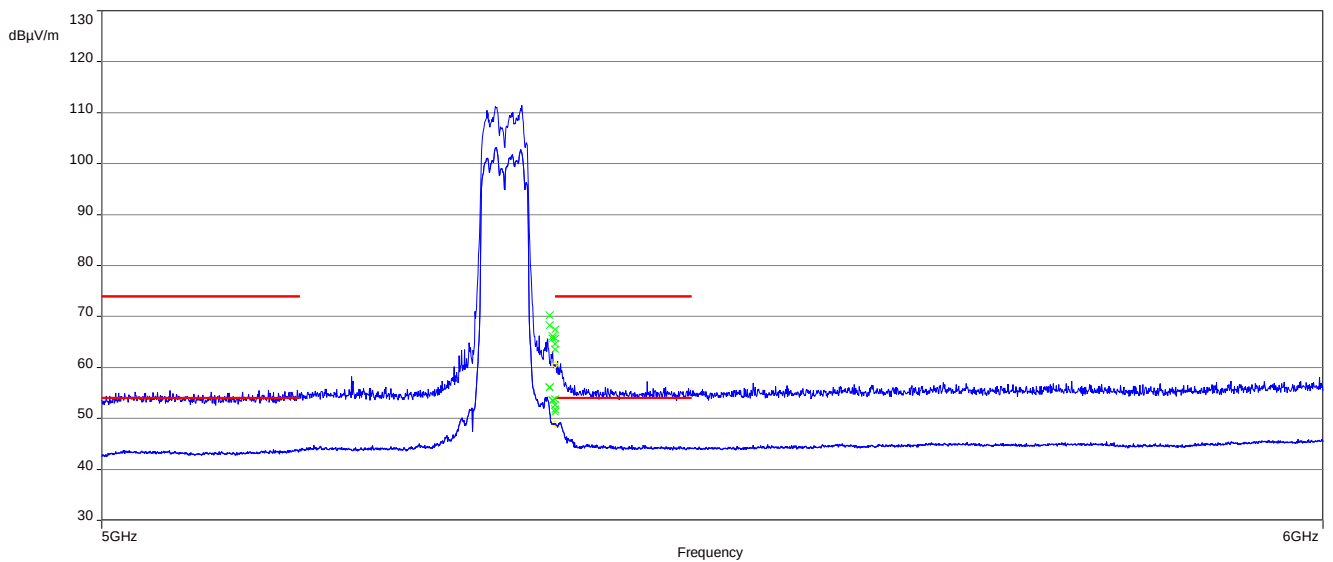
**Plot 12:** lower band edge; U-NII-2C; lowest channel, 802.11ac VHT20



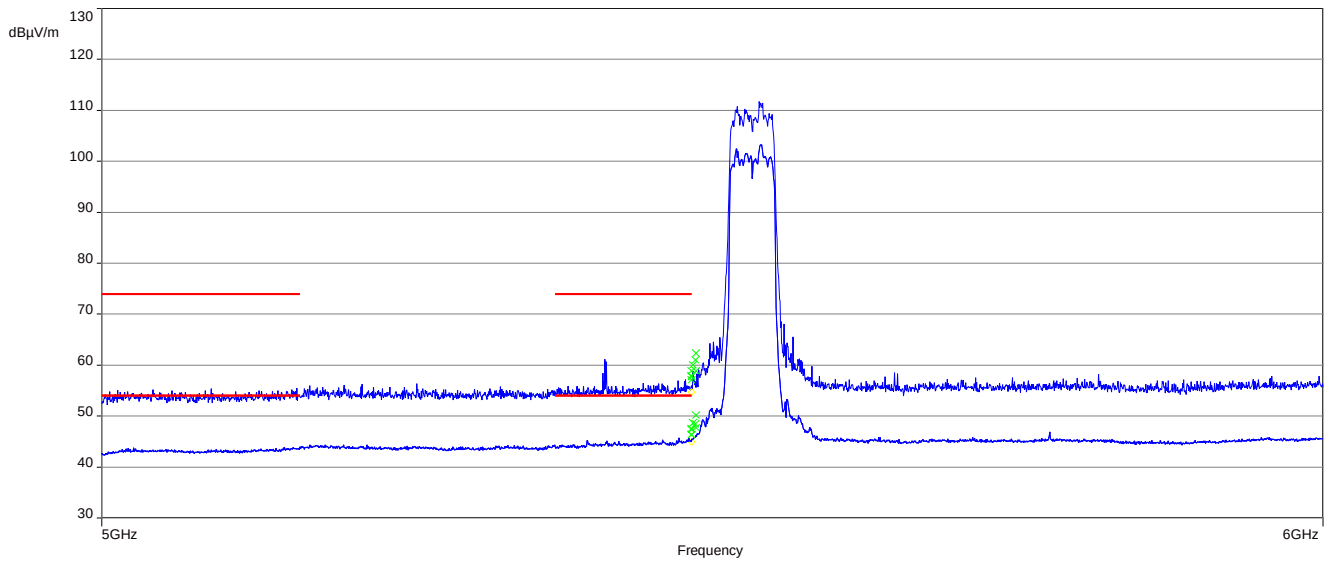
**Plot 13:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT40



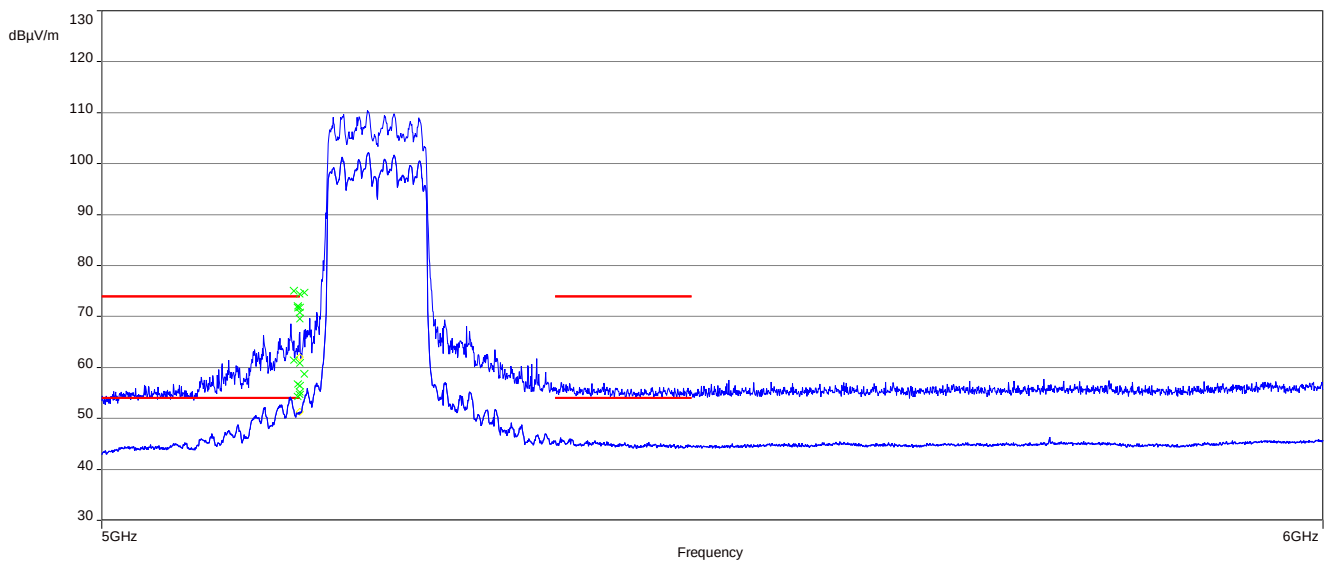
**Plot 14:** upper band edge; U-NII-2A; highest channel, 802.11ac VHT40

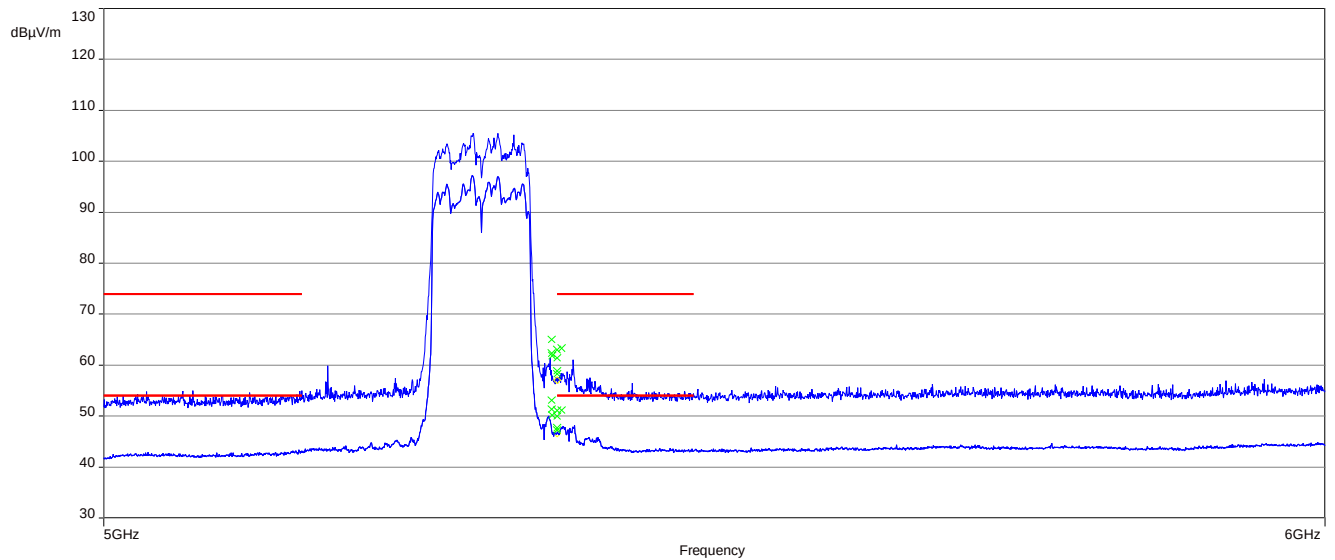
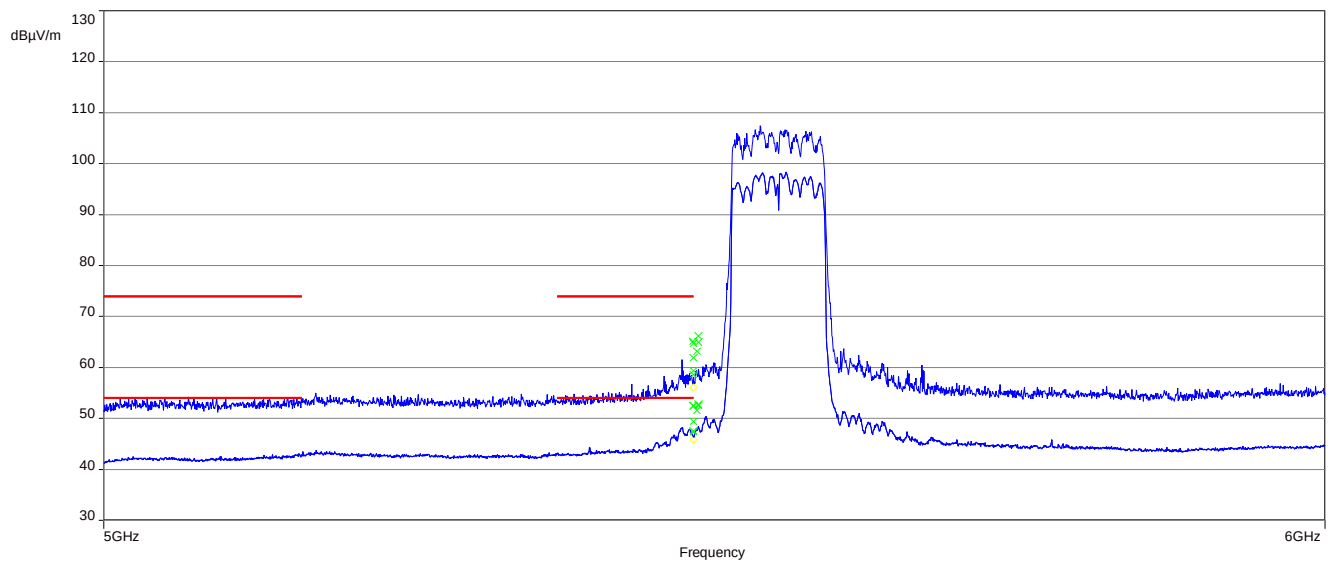


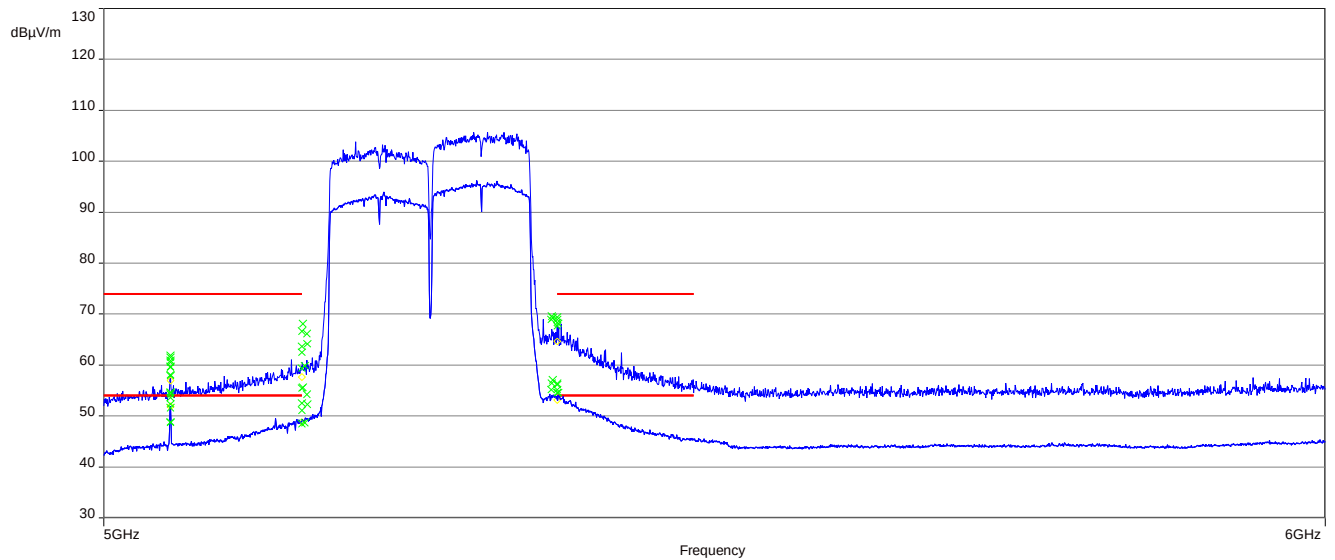
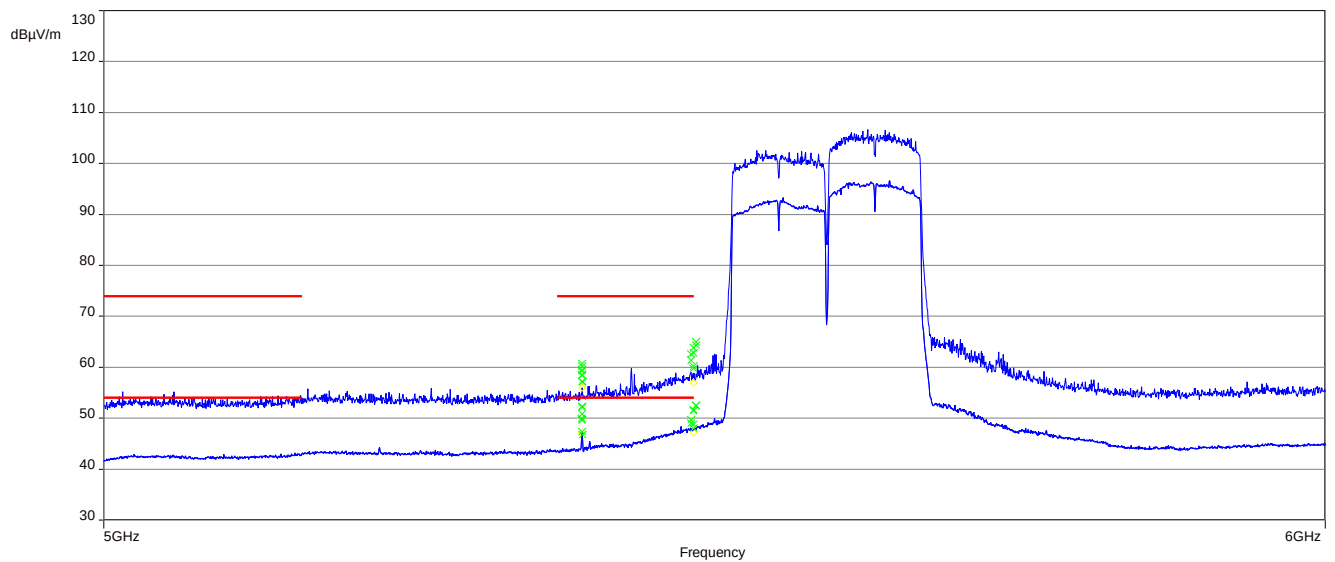
**Plot 15:** lower band edge; U-NII-2C; lowest channel, 802.11ac VHT40



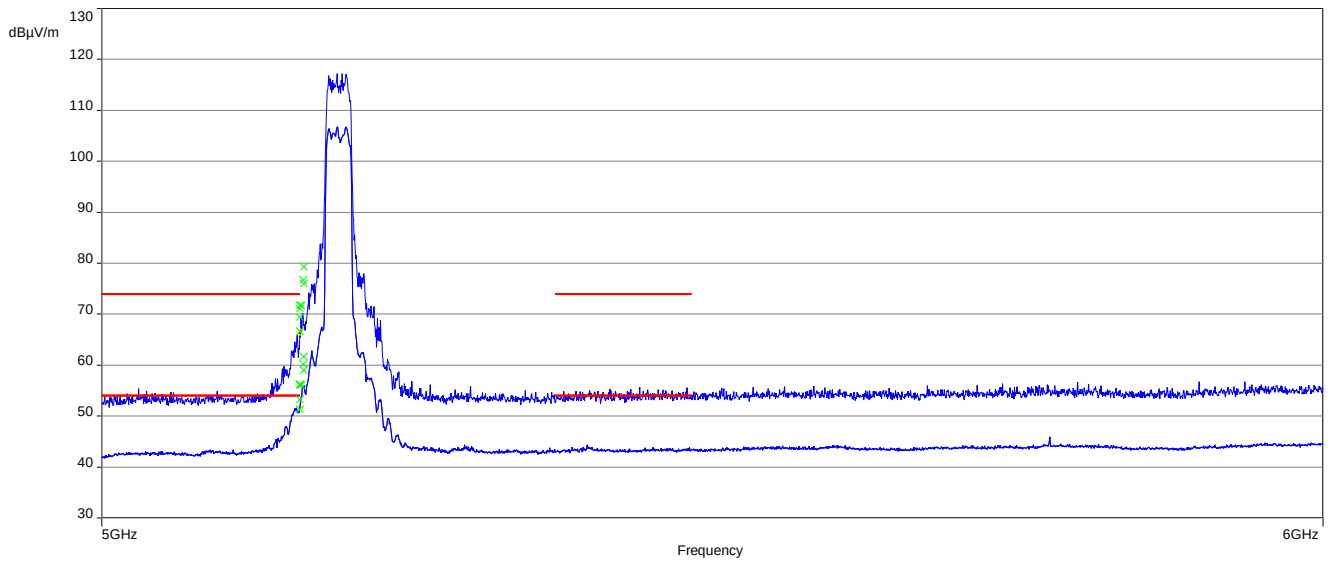
**Plot 16:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT80



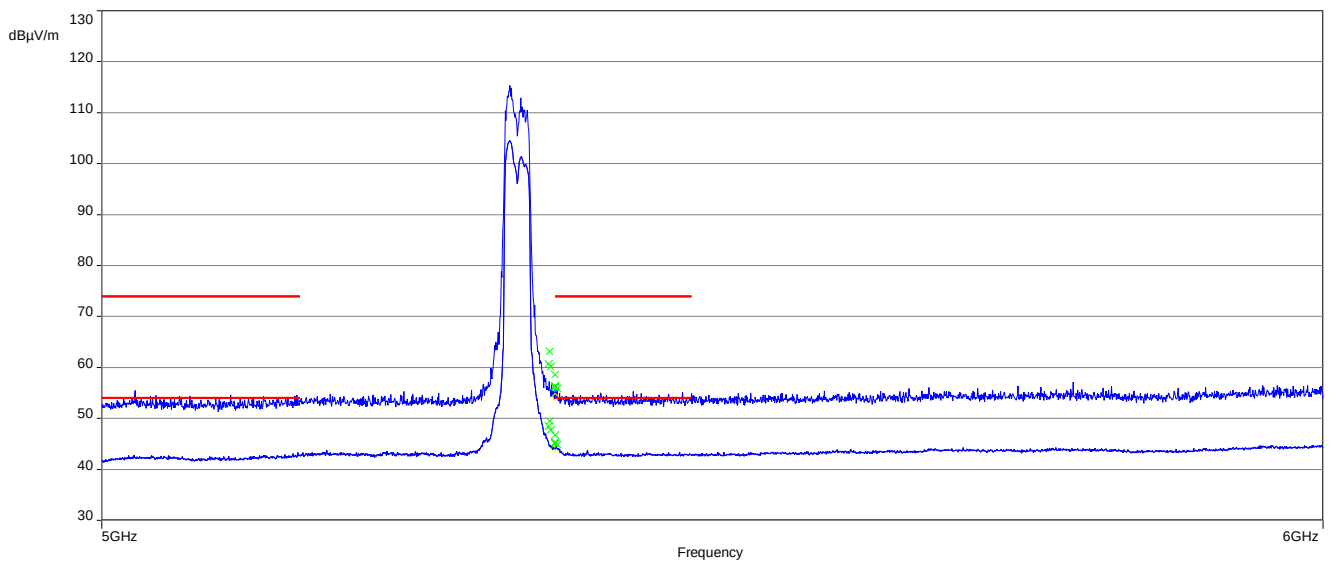
**Plot 17:** upper band edge; U-NII-2A; highest channel, 802.11ac VHT80**Plot 18:** lower band edge; U-NII-2C; lowest channel, 802.11ac VHT80

**Plot 19:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ac VHT80+80**Plot 20:** upper band edge; U-NII-2C; middle channel, 802.11ac VHT80+80

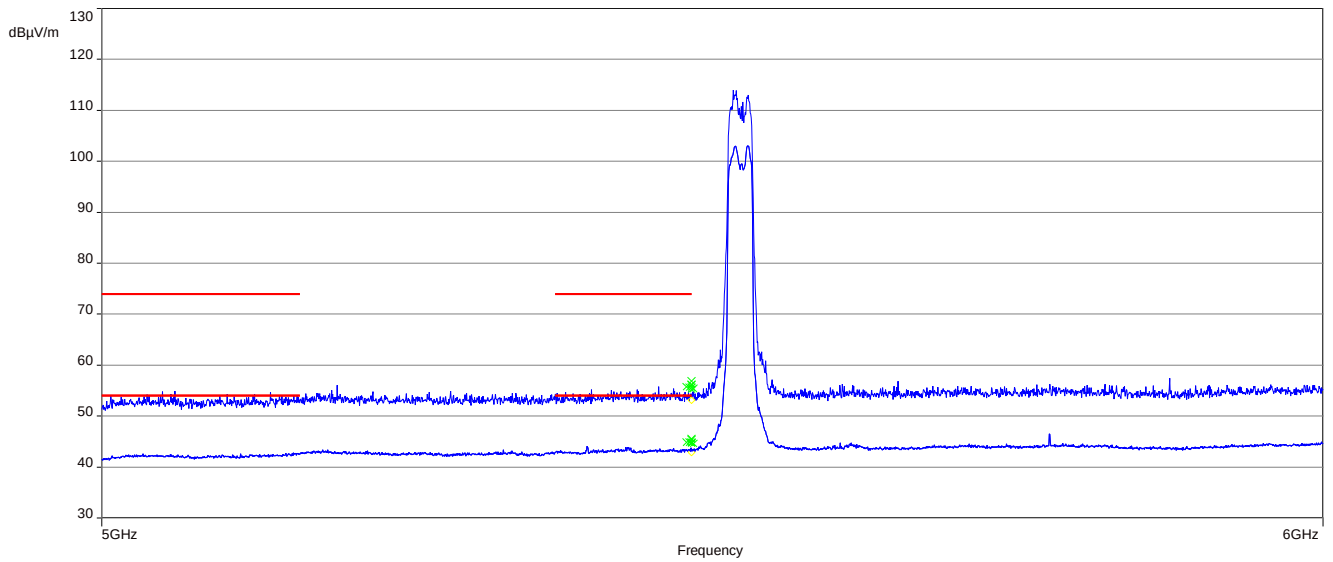
**Plot 21:** lower band edge; U-NII-1; lowest channel, 802.11 ax HE20



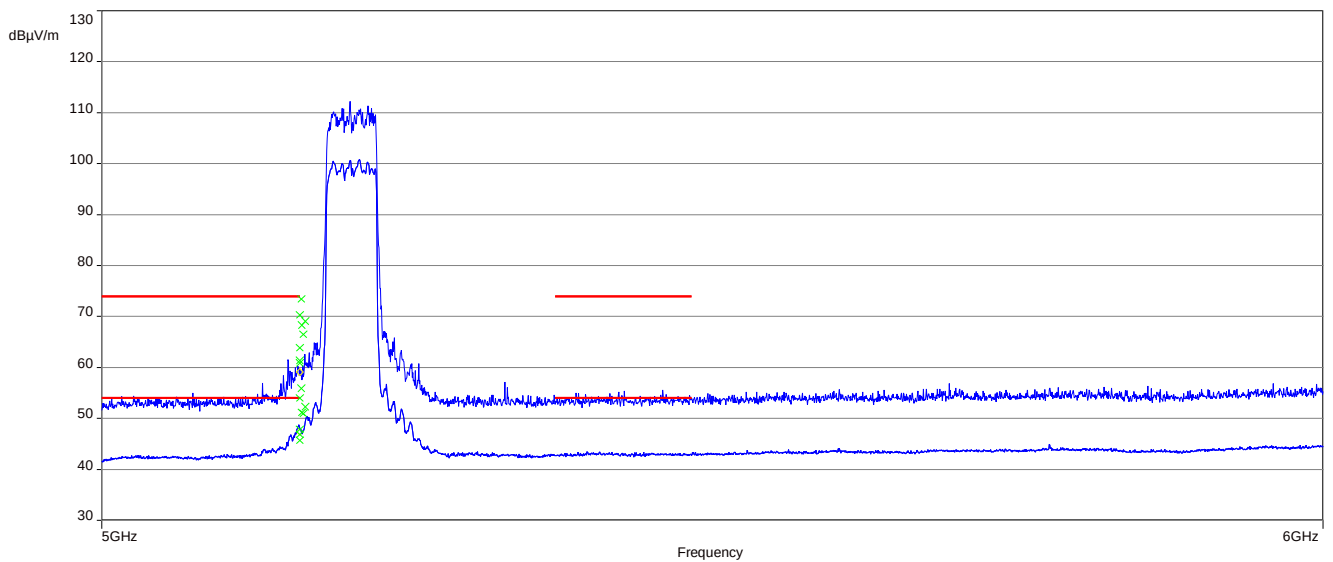
**Plot 22:** upper band edge; U-NII-2A; highest channel, 802.11 ax HE20

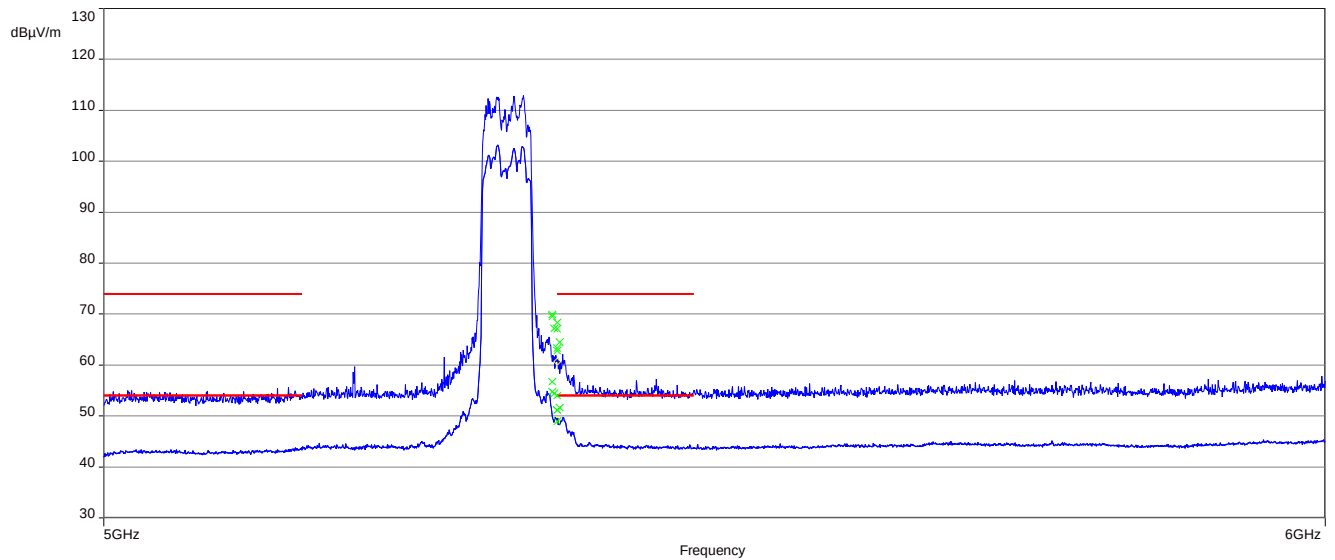
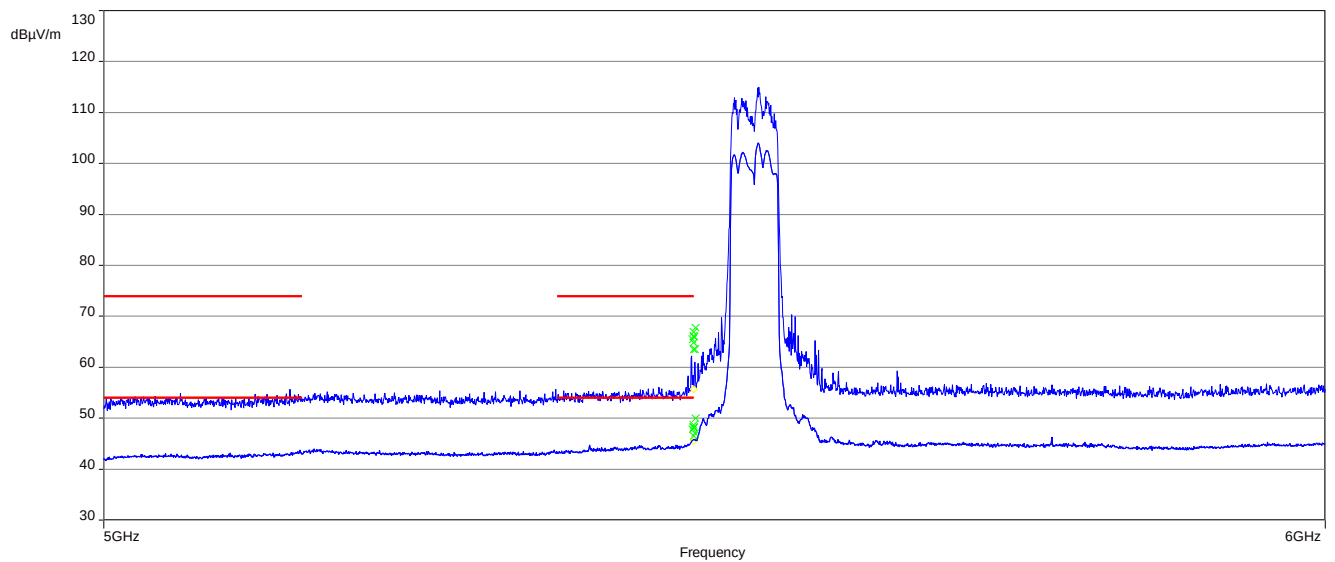


**Plot 23:** lower band edge; U-NII-2C; lowest channel, 802.11 ax HE20

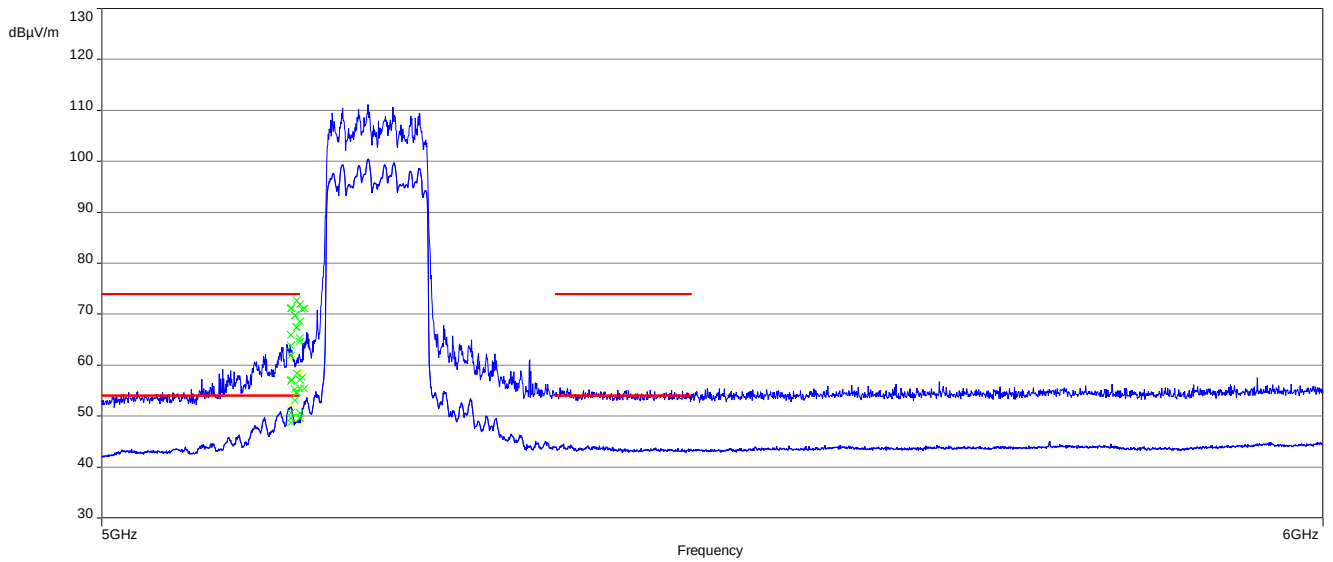


**Plot 24:** lower band edge; U-NII-1; lowest channel, 802.11 ax HE40

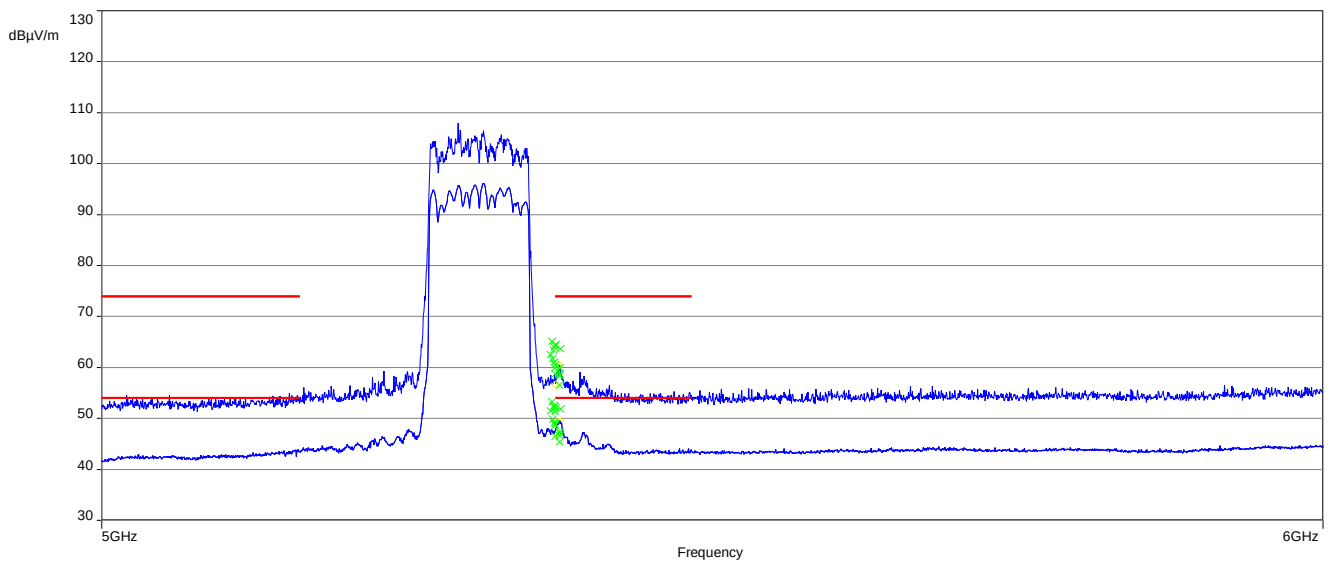


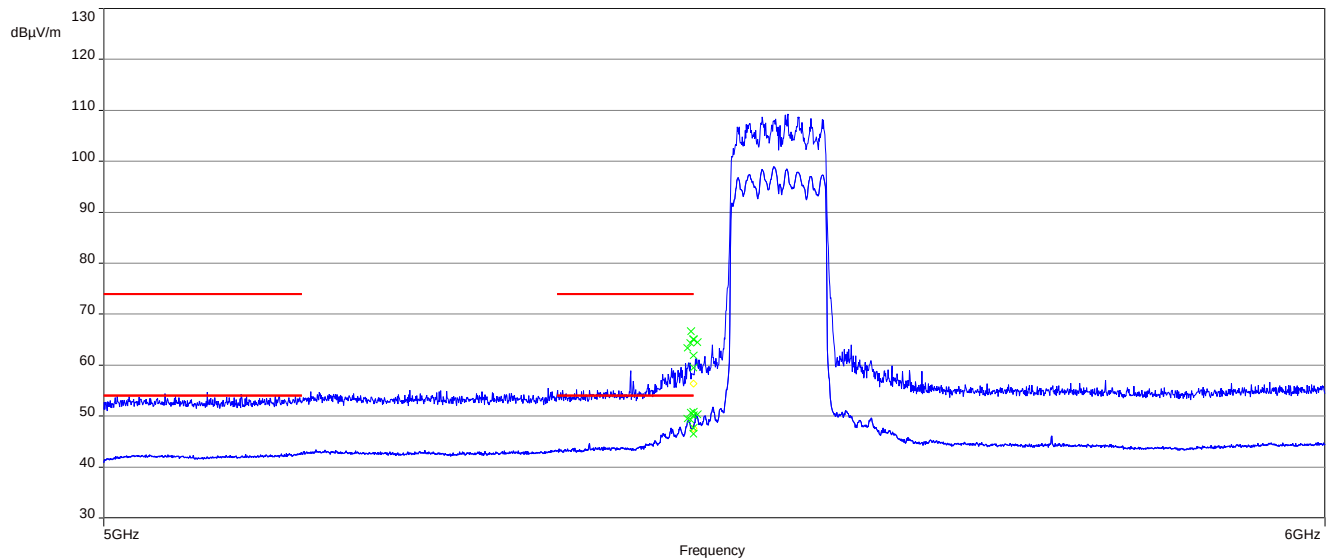
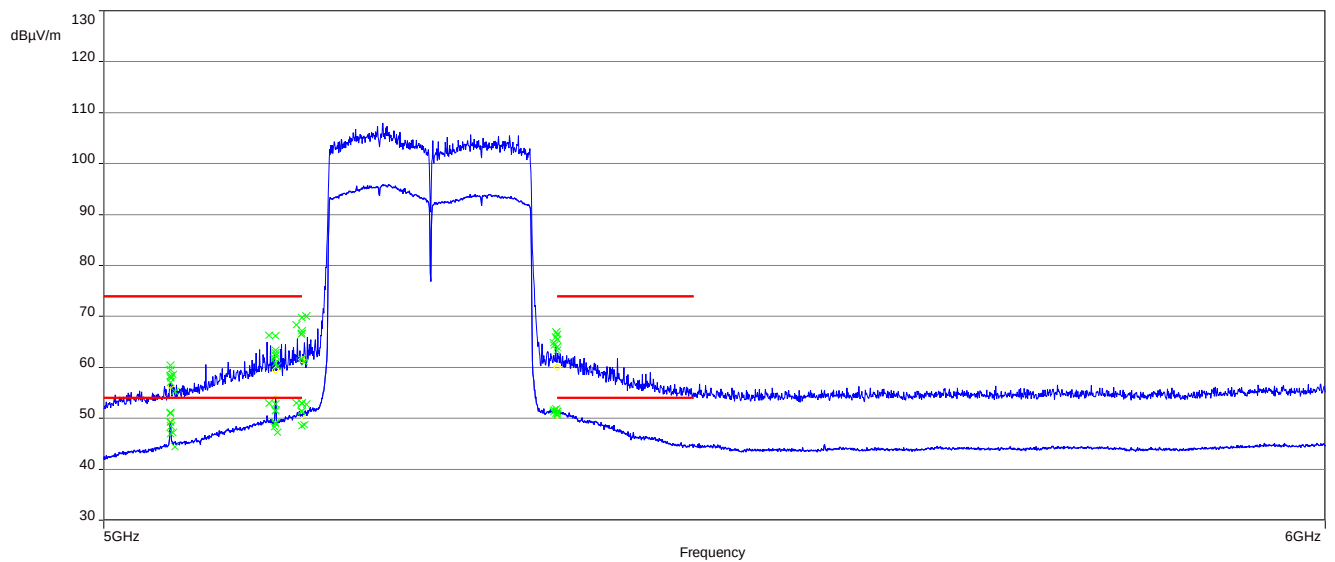
**Plot 25:** upper band edge; U-NII-2A; highest channel, 802.11 ax HE40**Plot 26:** lower band edge; U-NII-2C; lowest channel, 802.11 ax HE40

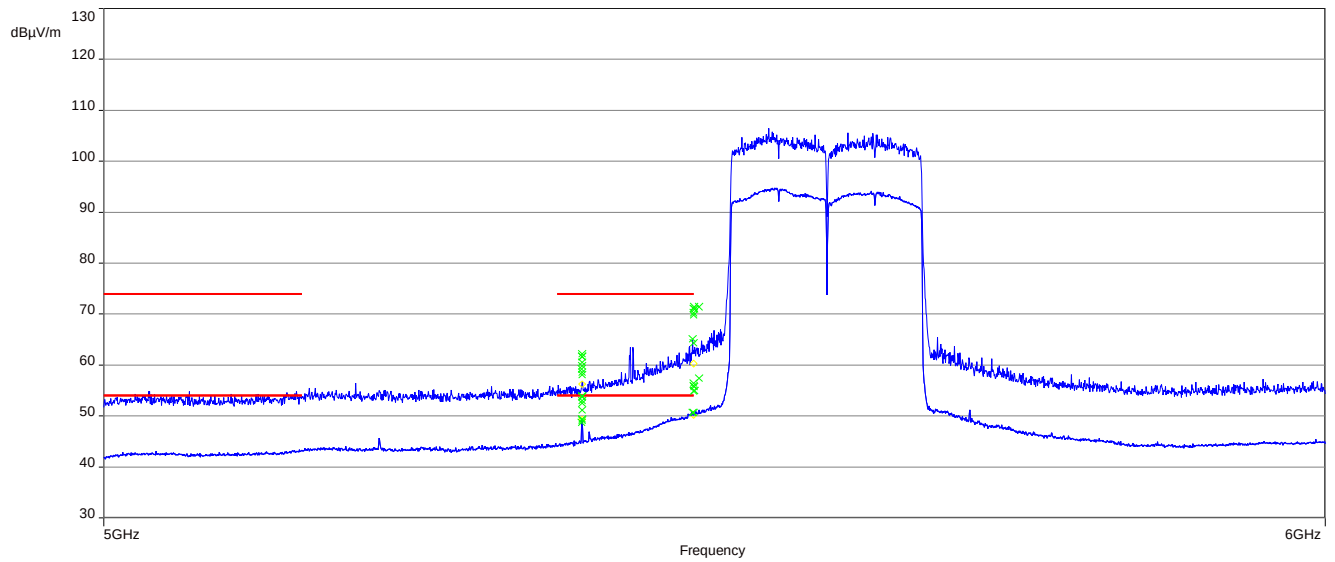
**Plot 27:** lower band edge; U-NII-1; lowest channel, 802.11 ax HE80



**Plot 28:** upper band edge; U-NII-2A; highest channel, 802.11 ax HE80



**Plot 29:** lower band edge; U-NII-2C; lowest channel, 802.11 ax HE80**Plot 30:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11 ax HE80+80

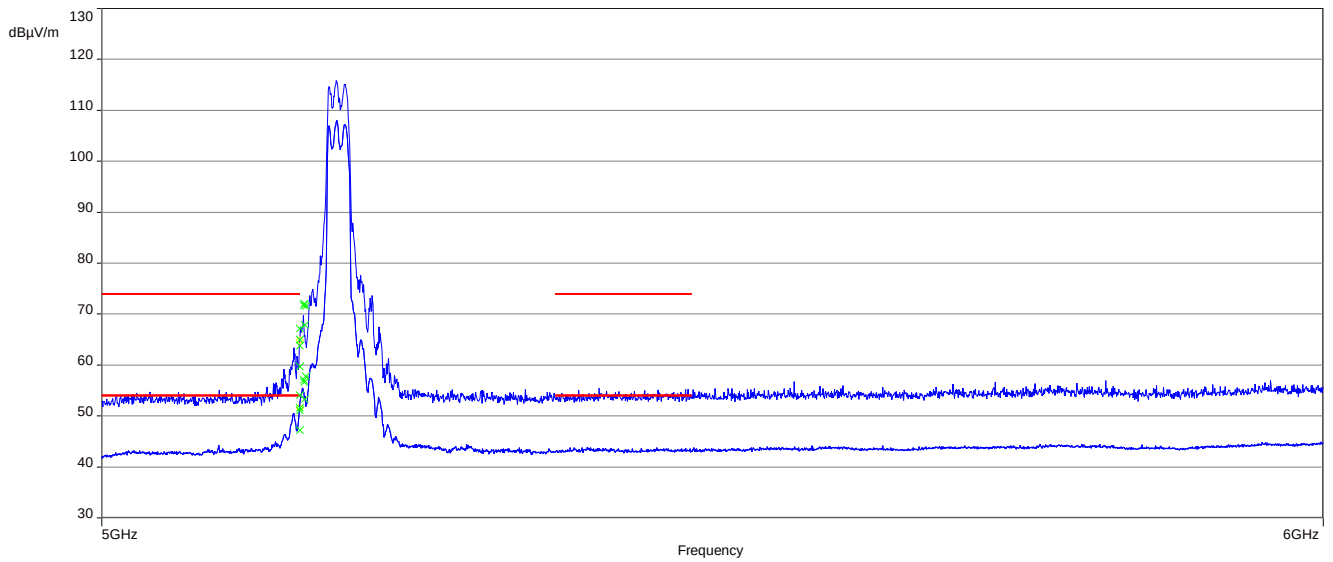
**Plot 31:** upper band edge; U-NII-2C; middle channel, 802.11ax HE80+80

## Results: WALSIN antennas

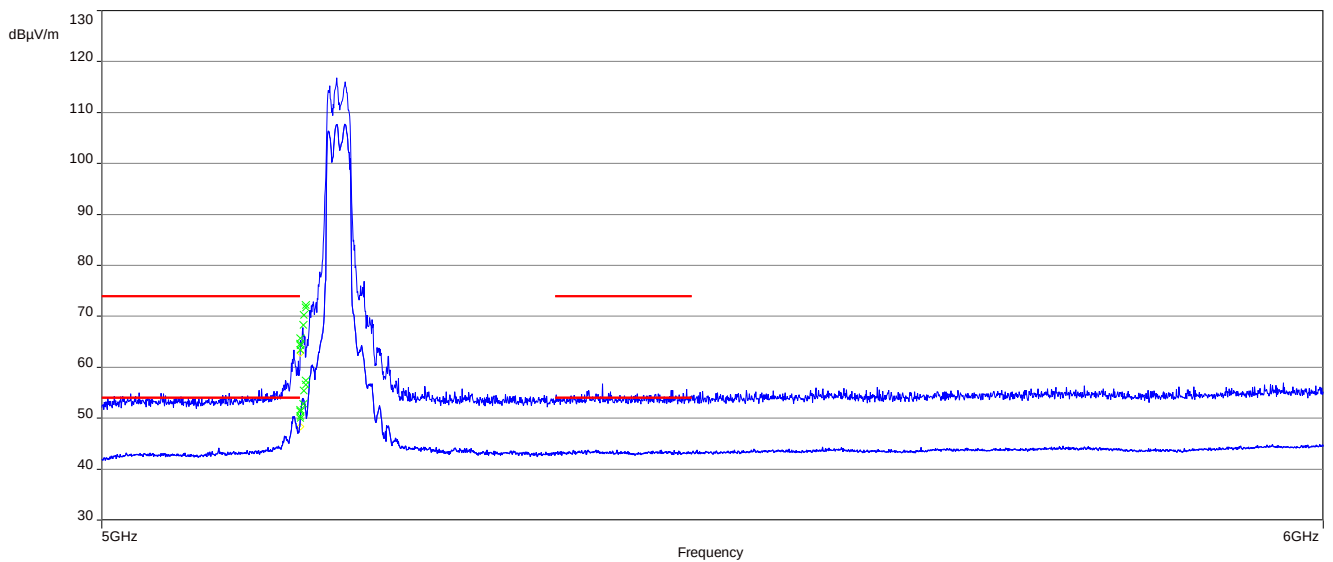
| Band Edge Compliance radiated                                          | Emission frequency [MHz] | Detector | Level [dBuV/m] |
|------------------------------------------------------------------------|--------------------------|----------|----------------|
| Lower band edge; U-NII-1; lowest channel, 802.11a                      | 5150                     | Peak     | 67.3           |
|                                                                        |                          | AVG      | 52.0           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT20                 | 5150                     | Peak     | 65.8           |
|                                                                        |                          | AVG      | 50.7           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT40                 | 5150                     | Peak     | 67.6           |
|                                                                        |                          | AVG      | 52.0           |
| Upper band edge; U-NII-2A; highest channel, 802.11n HT40               | 5350                     | Peak     | 63.1           |
|                                                                        |                          | AVG      | 49.5           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT20               | 5150                     | Peak     | 69.6           |
|                                                                        |                          | AVG      | 53.0           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT40               | 5150                     | Peak     | 67.1           |
|                                                                        |                          | AVG      | 51.7           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT80               | 5150                     | Peak     | 66.4           |
|                                                                        |                          | AVG      | 51.1           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE20                | 5150                     | Peak     | 67.3           |
|                                                                        |                          | AVG      | 52.1           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE40                | 5150                     | Peak     | 70.2           |
|                                                                        |                          | AVG      | 52.0           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE80                | 5150                     | Peak     | 69.5           |
|                                                                        |                          | AVG      | 53.3           |
| Upper band edge; U-NII-2C; lowest channel, 802.11ax HE80               | 5460                     | Peak     | 66.7           |
|                                                                        |                          | AVG      | 52.8           |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ac VHT80+80 | 5050                     | Peak     | 60.8           |
|                                                                        |                          | AVG      | 53.3           |
|                                                                        | 5150                     | Peak     | 61.6           |
|                                                                        |                          | AVG      | 50.6           |
|                                                                        | 5350                     | Peak     | 62.0           |
|                                                                        |                          | AVG      | 50.4           |
| Upper band edge; U-NII-2C; middle channel, 802.11ac VHT80+80           | 5370                     | Peak     | 59.4           |
|                                                                        |                          | AVG      | 52.2           |
|                                                                        | 5460                     | Peak     | 61.4           |
|                                                                        |                          | AVG      | 50.1           |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ax HE80+80  | 5130                     | Peak     | 65.6           |
|                                                                        |                          | AVG      | 52.0           |
|                                                                        | 5150                     | Peak     | 67.4           |
|                                                                        |                          | AVG      | 52.7           |
|                                                                        | 5350                     | Peak     | 65.4           |
|                                                                        |                          | AVG      | 52.2           |
| Upper band edge; U-NII-2C; middle channel, 802.11ax HE80+80            | 5460                     | Peak     | 68.5           |
|                                                                        |                          | AVG      | 53.9           |

**Plots:** WALSIN antennas

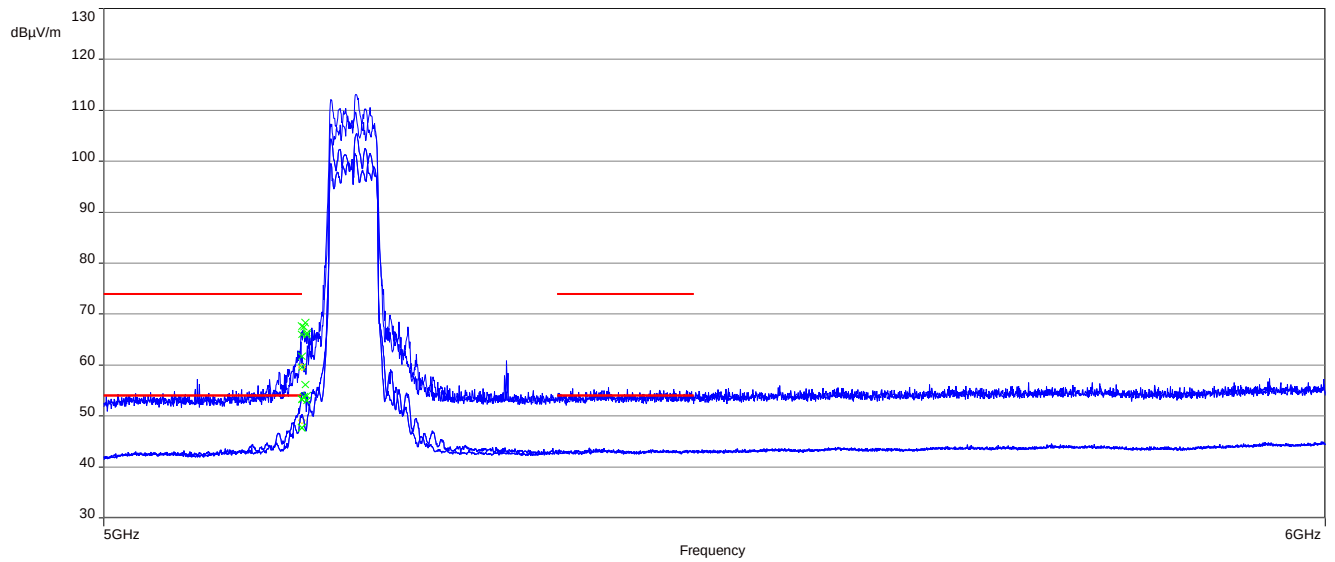
**Plot 1:** lower band edge; U-NII-1; lowest channel, 802.11a



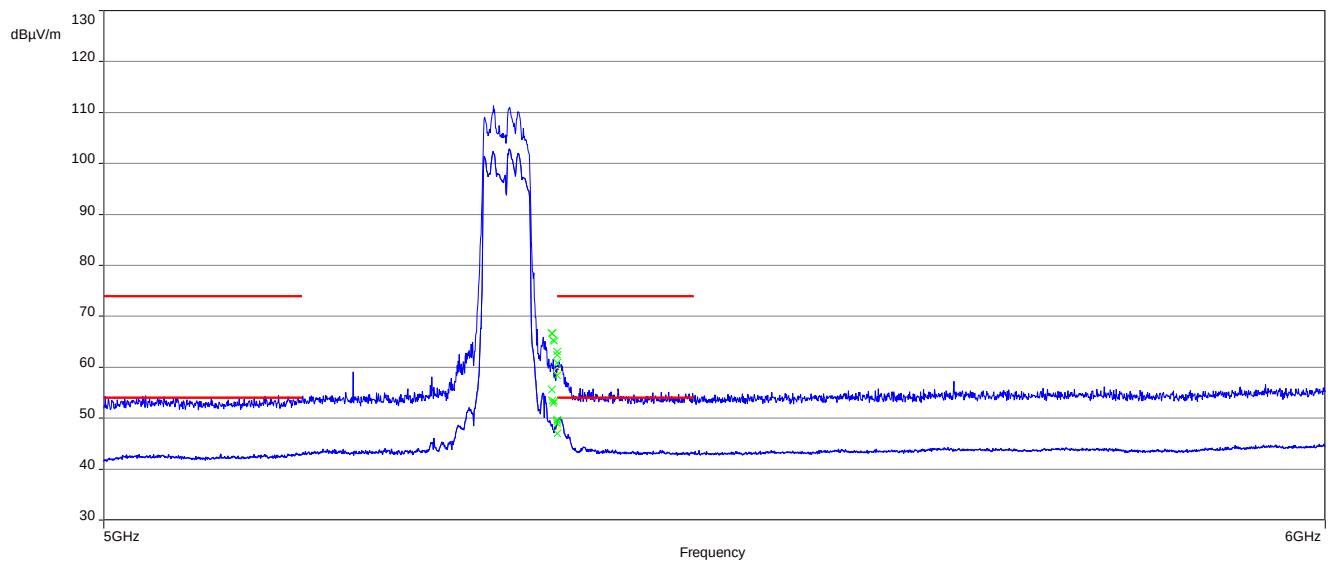
**Plot 2:** lower band edge; U-NII-1; lowest channel, 802.11n HT20



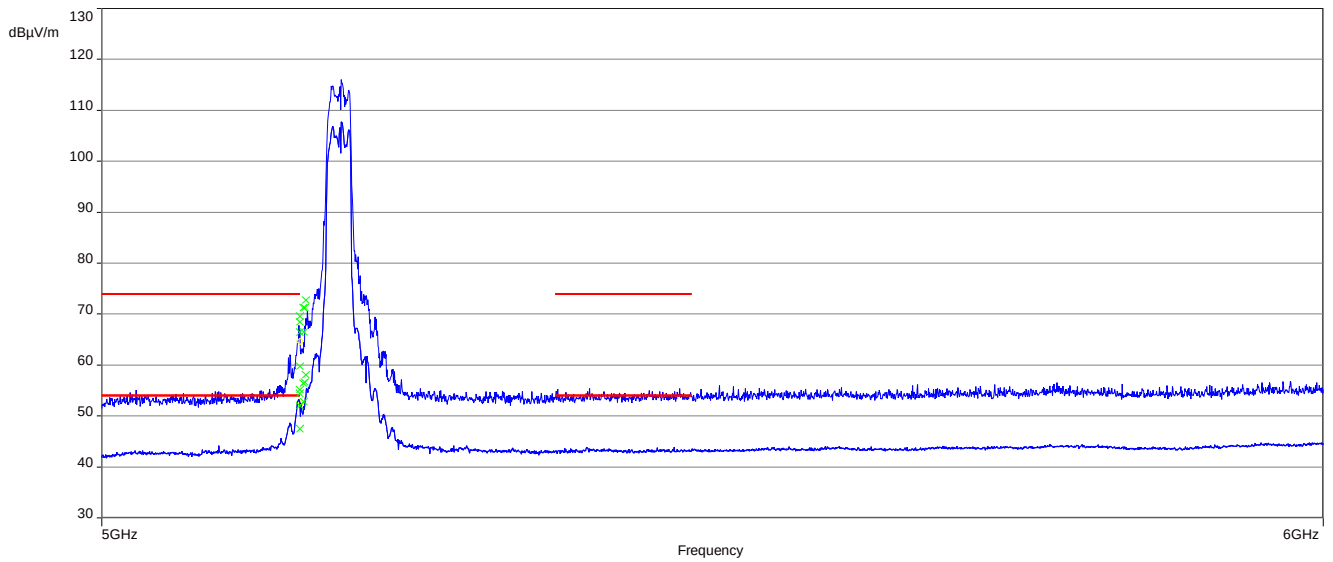
**Plot 3:** lower band edge; U-NII-1; lowest channel, 802.11n HT40



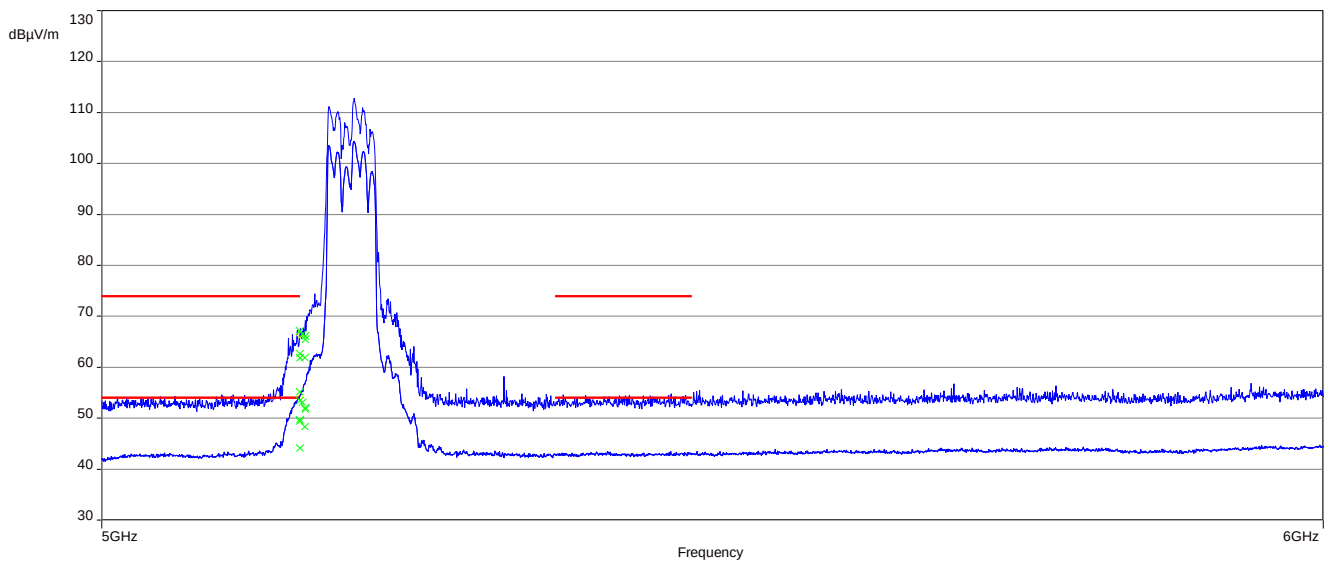
**Plot 4:** upper band edge; U-NII-2A; highest channel, 802.11n HT40



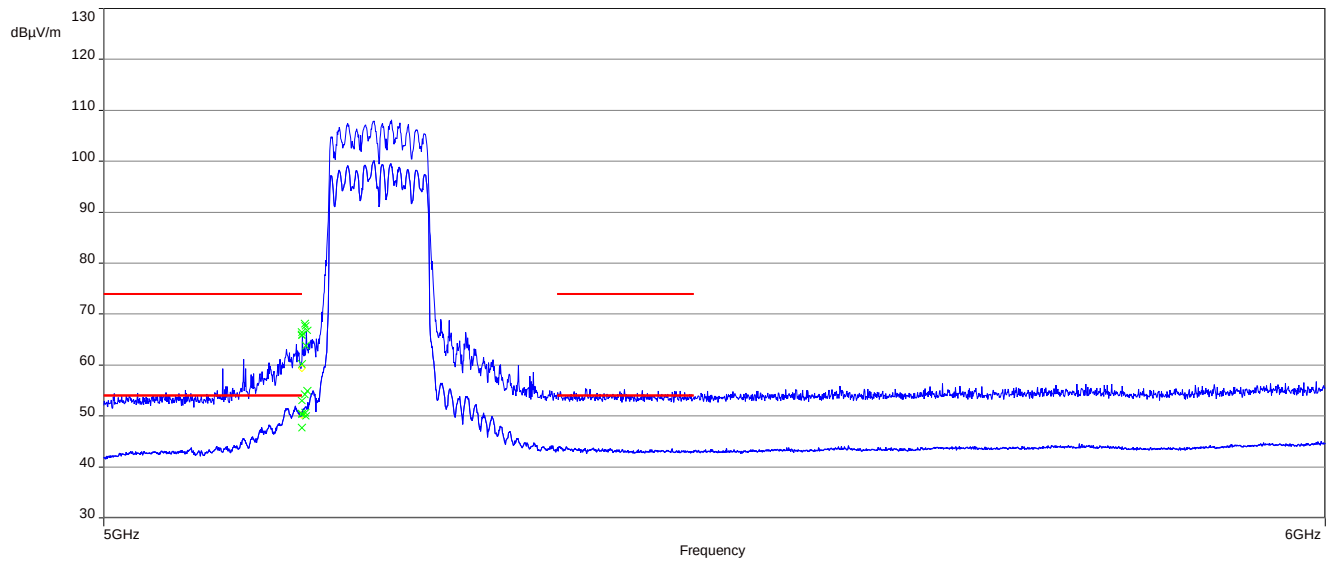
**Plot 5:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT20



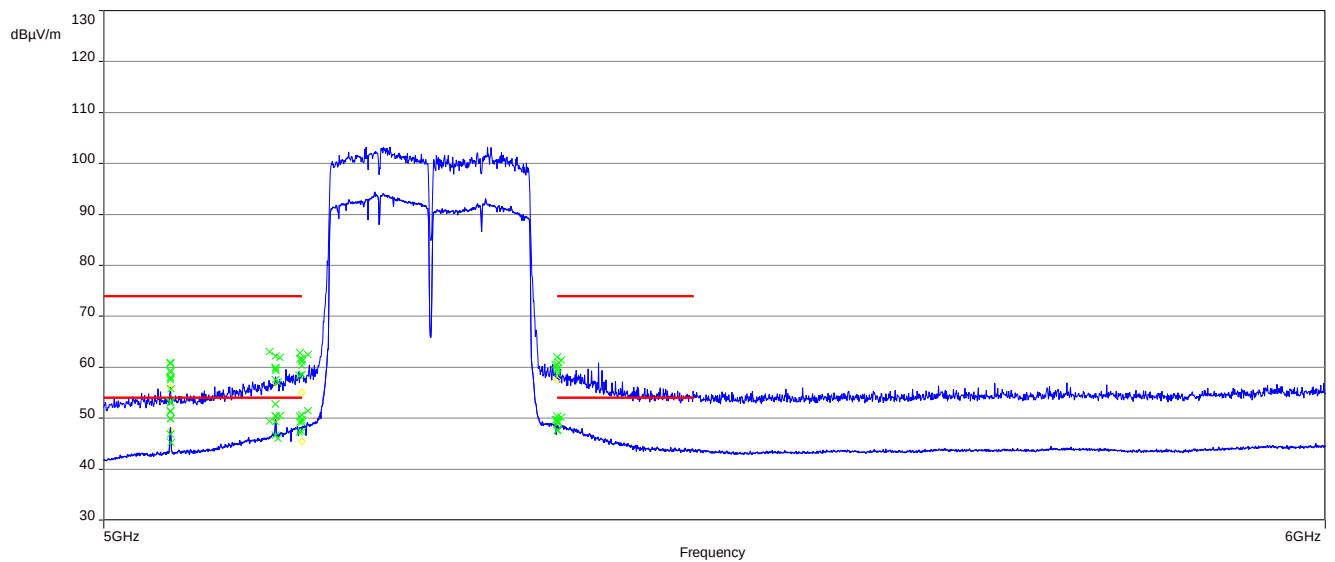
**Plot 6:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT40

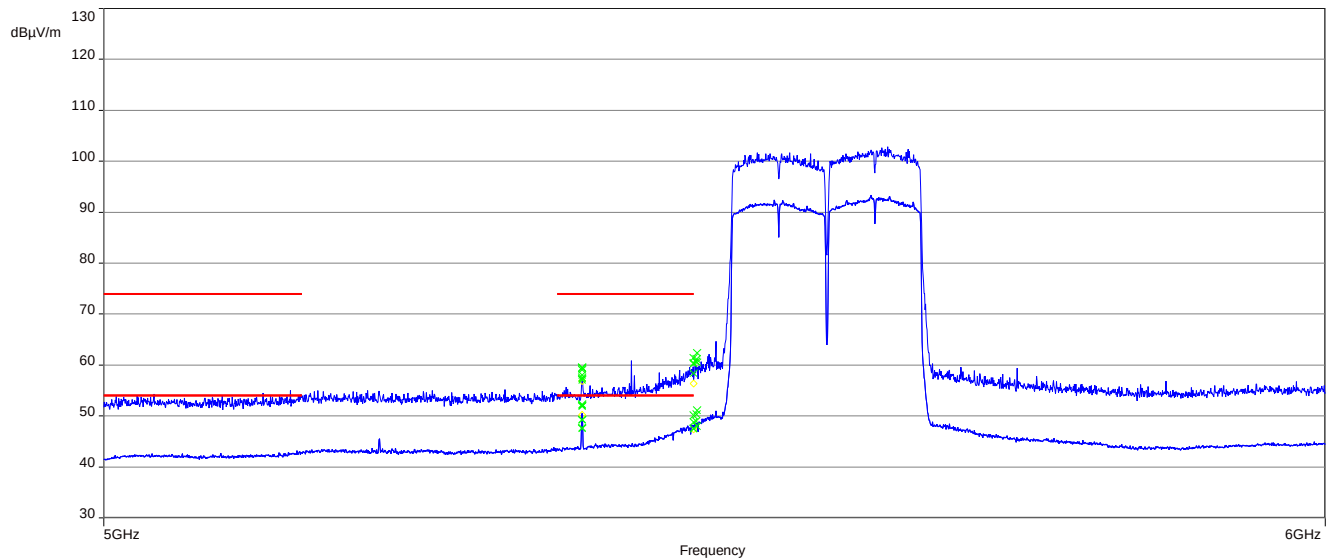
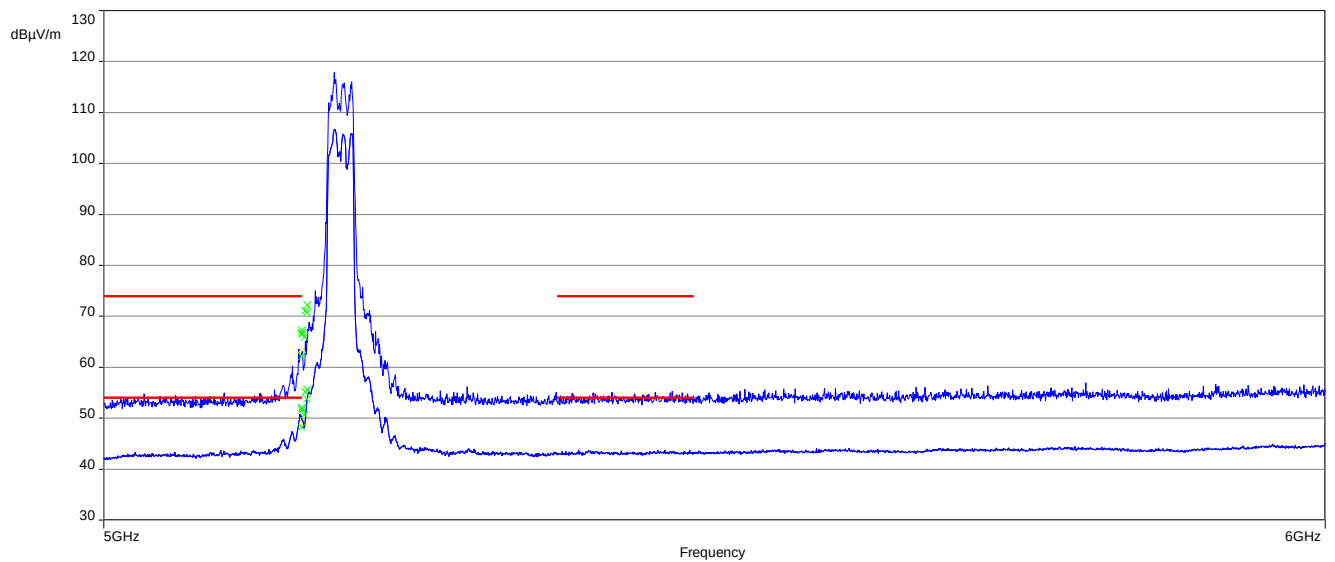


**Plot 7:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT80

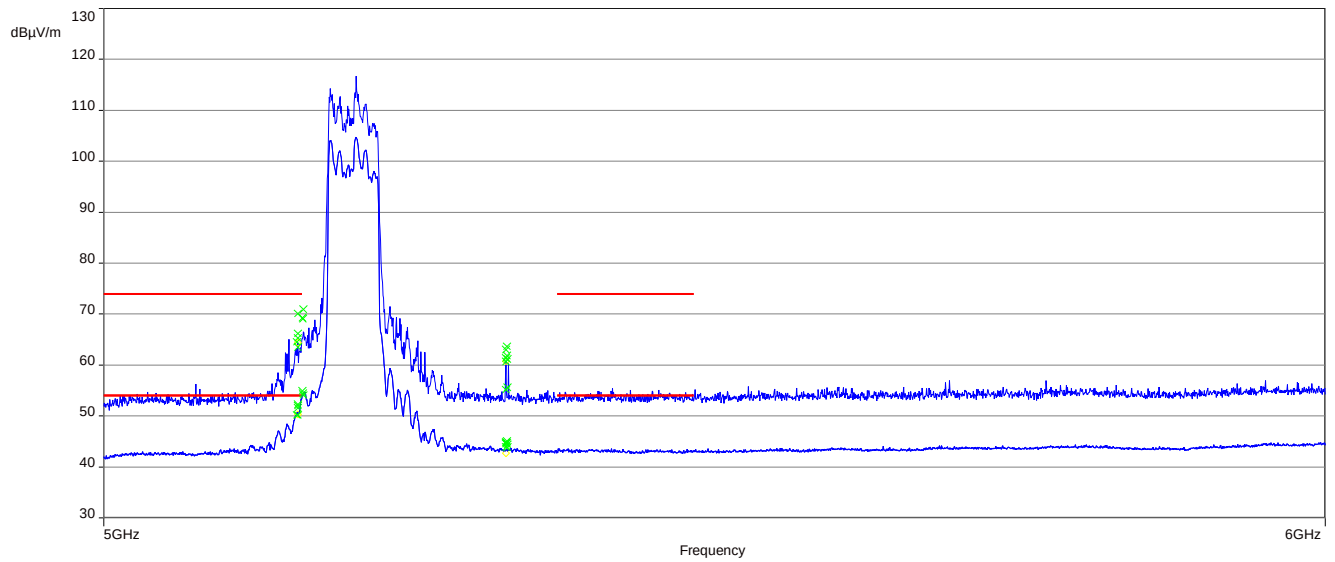


**Plot 8:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ac VHT80+80

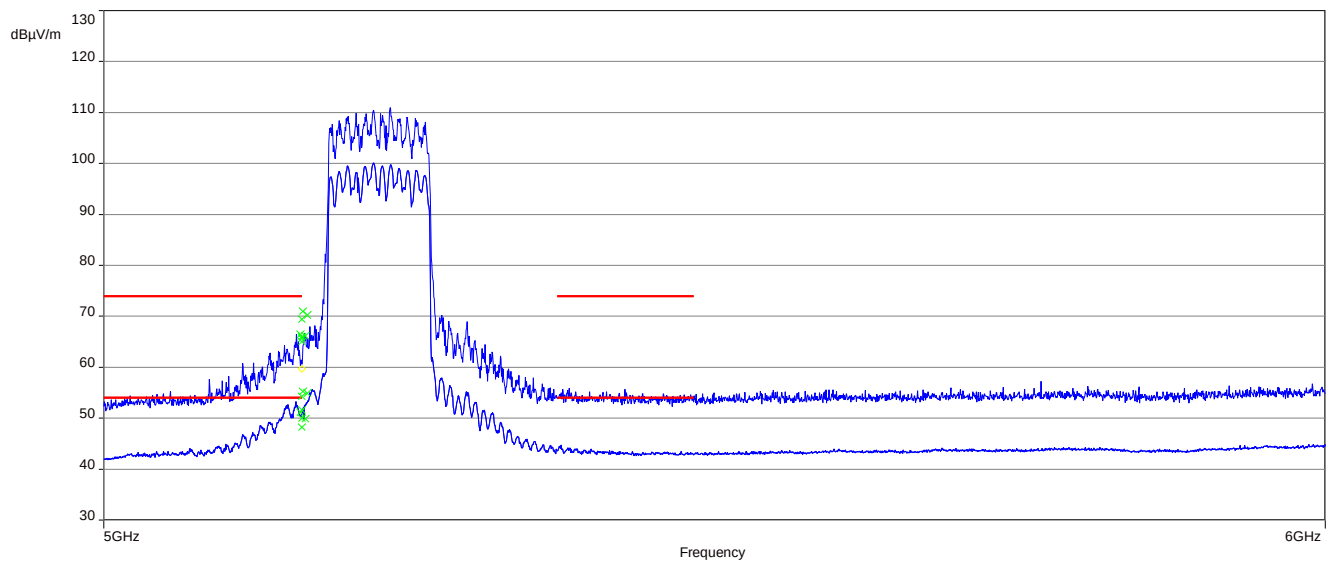


**Plot 9:** upper band edge; U-NII-2C; middle channel, 802.11ac VHT80+80**Plot 10:** lower band edge; U-NII-1; lowest channel, 802.11ax HE20

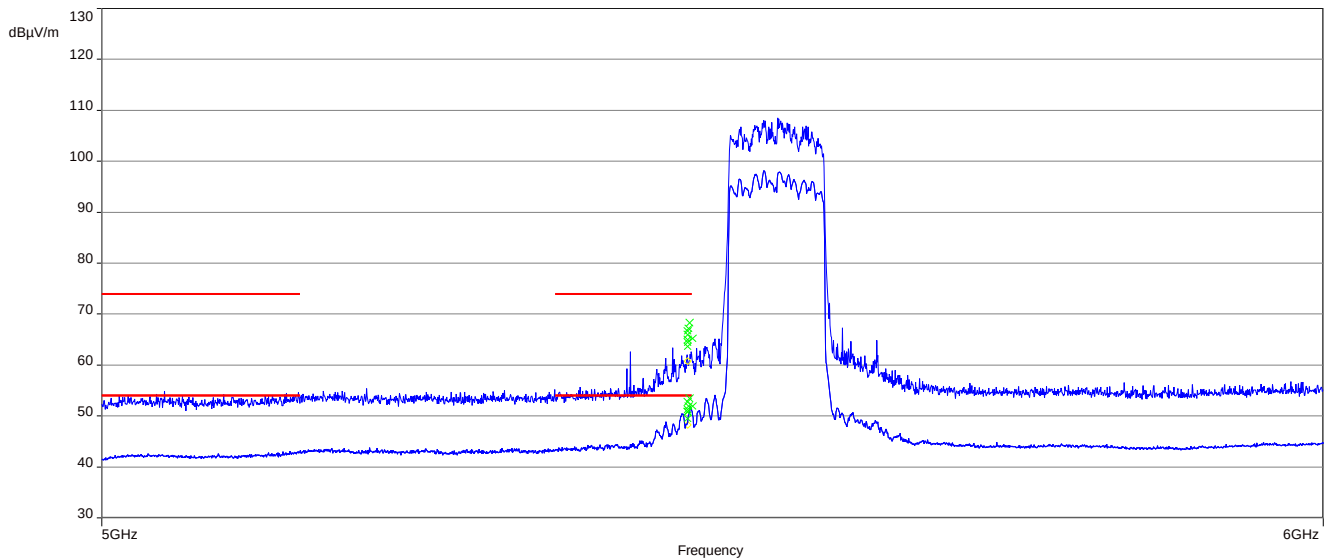
**Plot 11:** lower band edge; U-NII-1; lowest channel, 802.11ax HE40



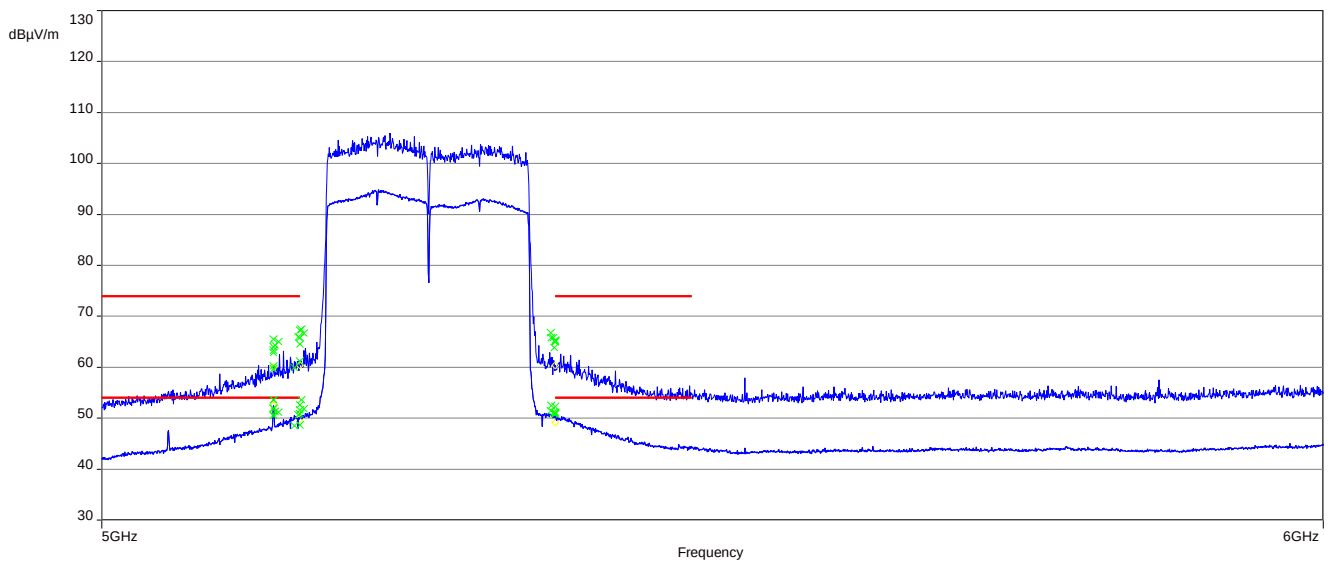
**Plot 12:** lower band edge; U-NII-1; lowest channel, 802.11ax HE80



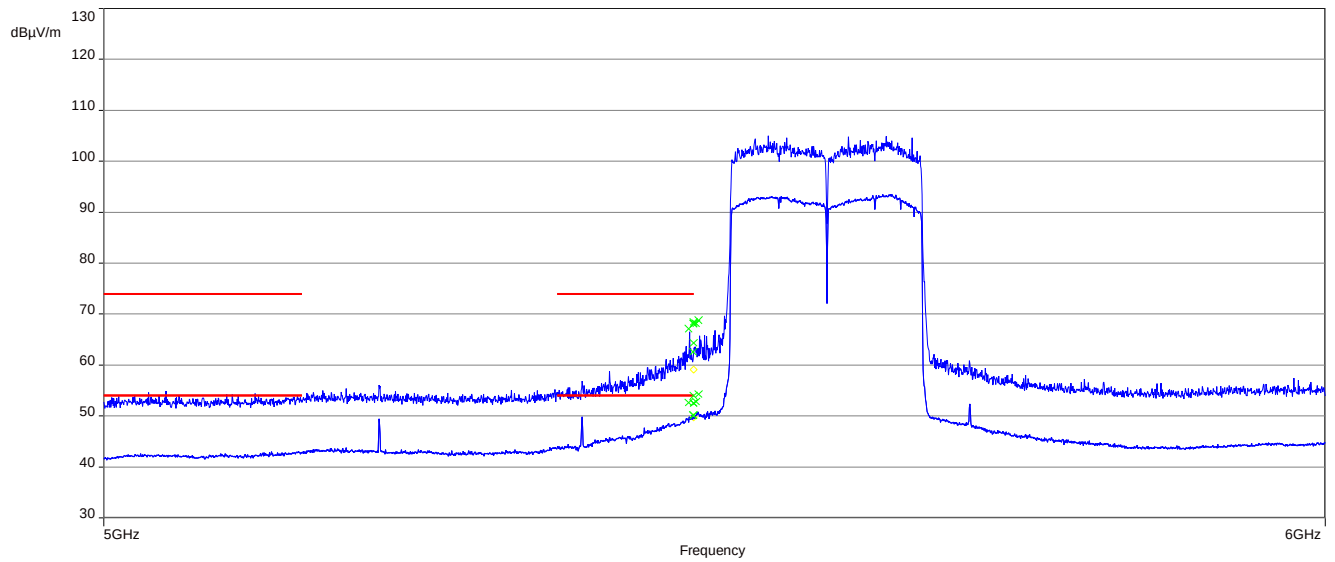
**Plot 13:** lower band edge; U-NII-2C; lowest channel, 802.11 ax HE80



**Plot 14:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11 ax HE80+80



**Plot 15:** upper band edge; U-NII-2C; middle channel, 802.11ax HE80+80

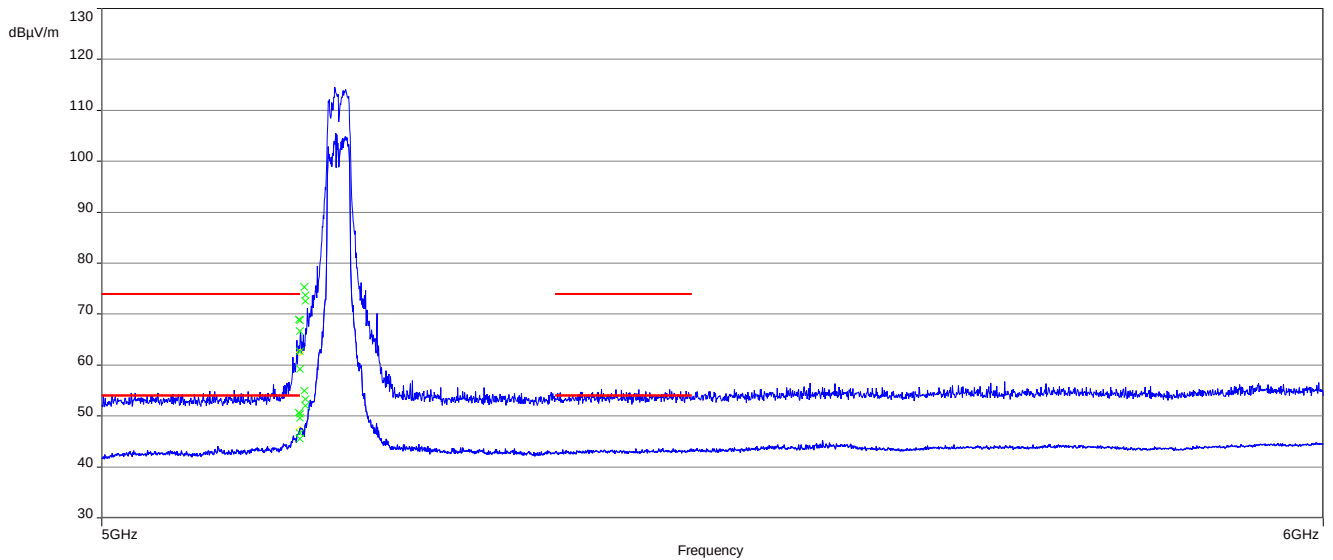


## Results: HL antennas

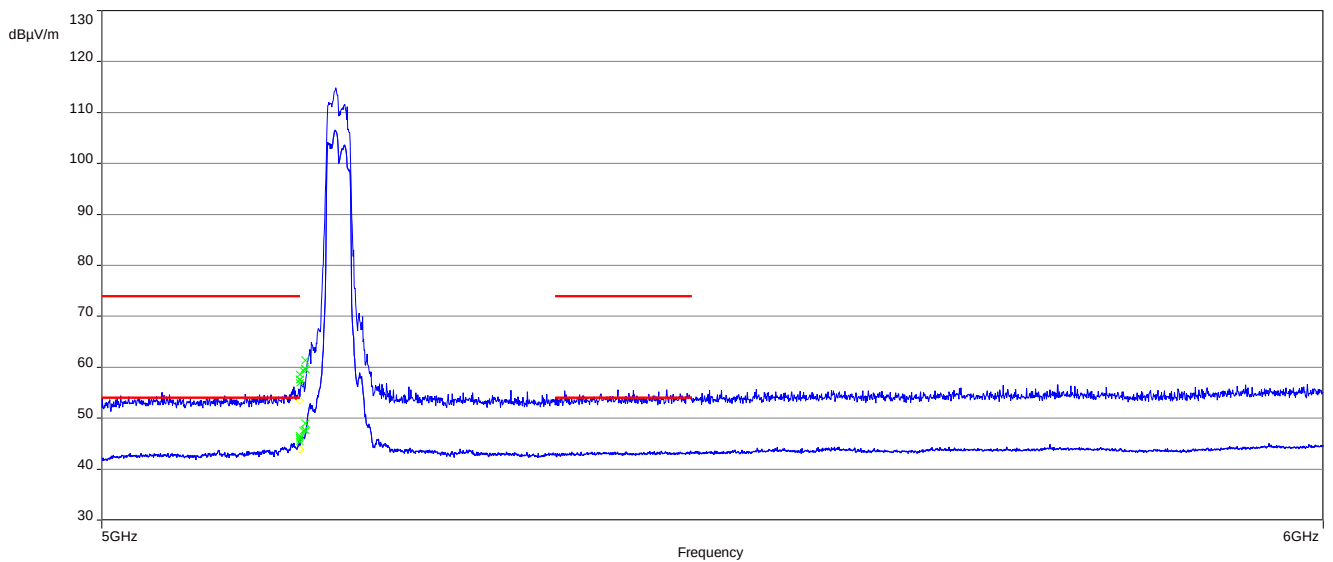
| Band Edge Compliance radiated                                          | Emission frequency [MHz] | Detector | Level [dBuV/m] |
|------------------------------------------------------------------------|--------------------------|----------|----------------|
| Lower band edge; U-NII-1; lowest channel, 802.11a                      | 5150                     | Peak     | 68.8           |
|                                                                        |                          | AVG      | 50.4           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT20                 | 5150                     | Peak     | 58.6           |
|                                                                        |                          | AVG      | 46.6           |
| Lower band edge; U-NII-1; lowest channel, 802.11n HT40                 | 5150                     | Peak     | 59.4           |
|                                                                        |                          | AVG      | 48.3           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT20               | 5150                     | Peak     | 57.6           |
|                                                                        |                          | AVG      | 46.4           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT40               | 5150                     | Peak     | 58.3           |
|                                                                        |                          | AVG      | 46.0           |
| Lower band edge; U-NII-1; lowest channel, 802.11ac VHT80               | 5150                     | Peak     | 59.4           |
|                                                                        |                          | AVG      | 47.9           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE20                | 5150                     | Peak     | 59.2           |
|                                                                        |                          | AVG      | 47.5           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE40                | 5150                     | Peak     | 61.8           |
|                                                                        |                          | AVG      | 47.2           |
| Lower band edge; U-NII-1; lowest channel, 802.11ax HE80                | 5150                     | Peak     | 65.9           |
|                                                                        |                          | AVG      | 47.1           |
| Upper band edge; U-NII-2C; lowest channel, 802.11ax HE80               | 5460                     | Peak     | 63.5           |
|                                                                        |                          | AVG      | 48.7           |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ac VHT80+80 | 5150                     | Peak     | 57.6           |
|                                                                        |                          | AVG      | 47.1           |
| Upper band edge; U-NII-2C; middle channel, 802.11ac VHT80+80           | 5460                     | Peak     | 58.9           |
|                                                                        |                          | AVG      | 47.4           |
| Lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ax HE80+80  | 5150                     | Peak     | 59.5           |
|                                                                        |                          | AVG      | 46.8           |
| Upper band edge; U-NII-2C; middle channel, 802.11ax HE80+80            | 5460                     | Peak     | 63.3           |
|                                                                        |                          | AVG      | 48.7           |

**Plots:** HL antennas

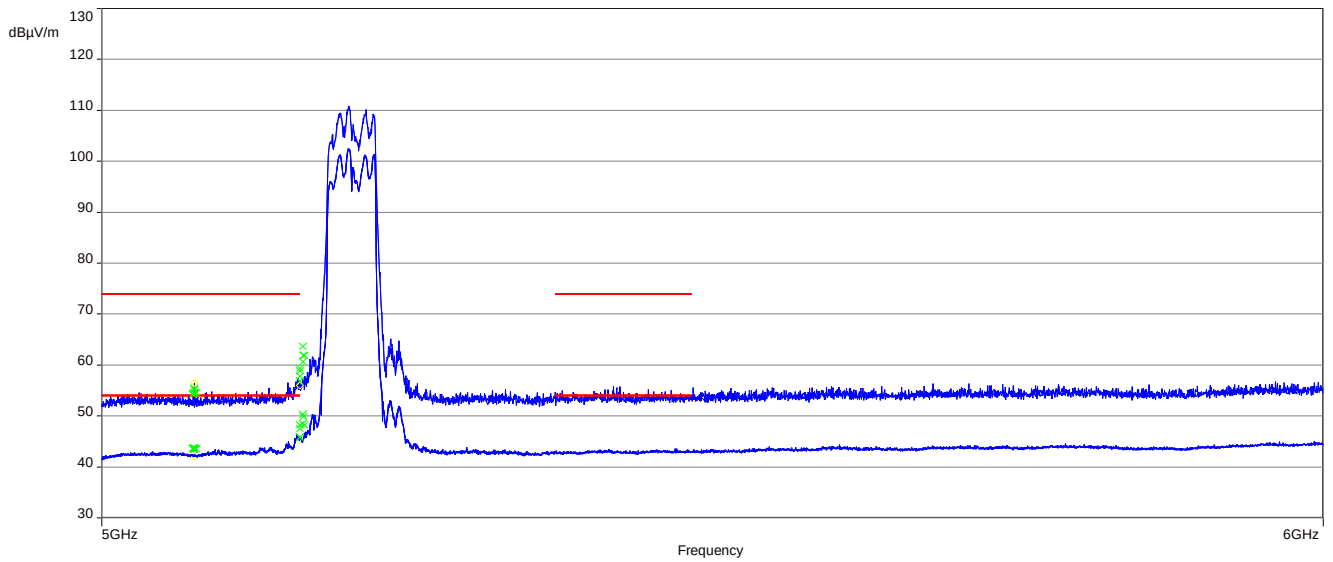
**Plot 1:** lower band edge; U-NII-1; lowest channel, 802.11a



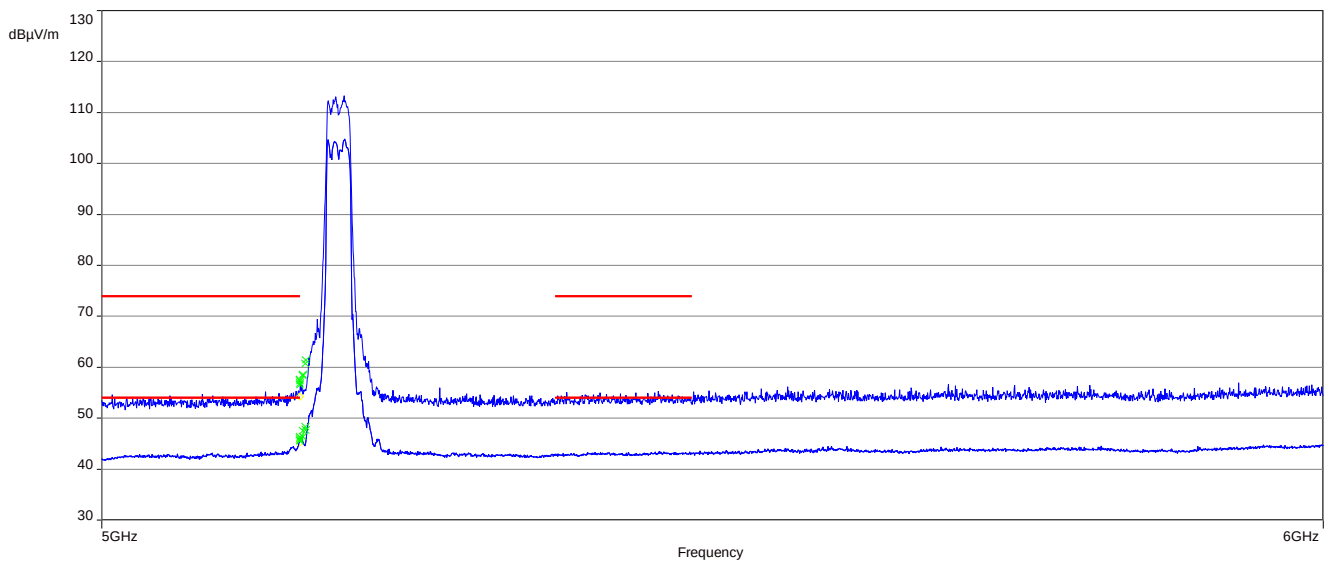
**Plot 2:** lower band edge; U-NII-1; lowest channel, 802.11n HT20

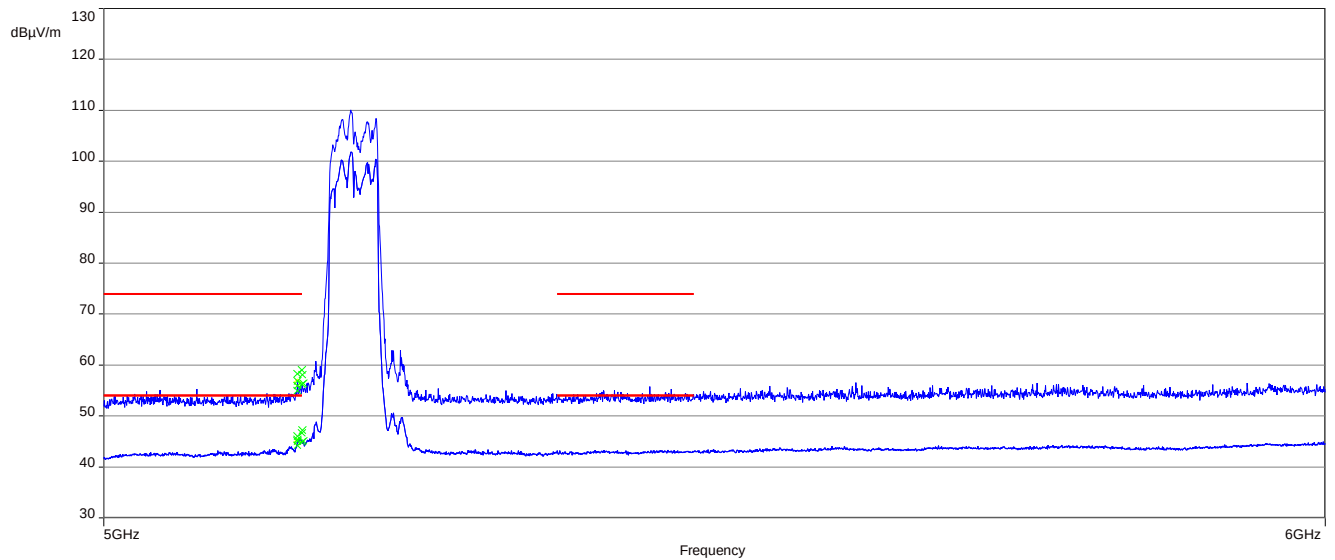
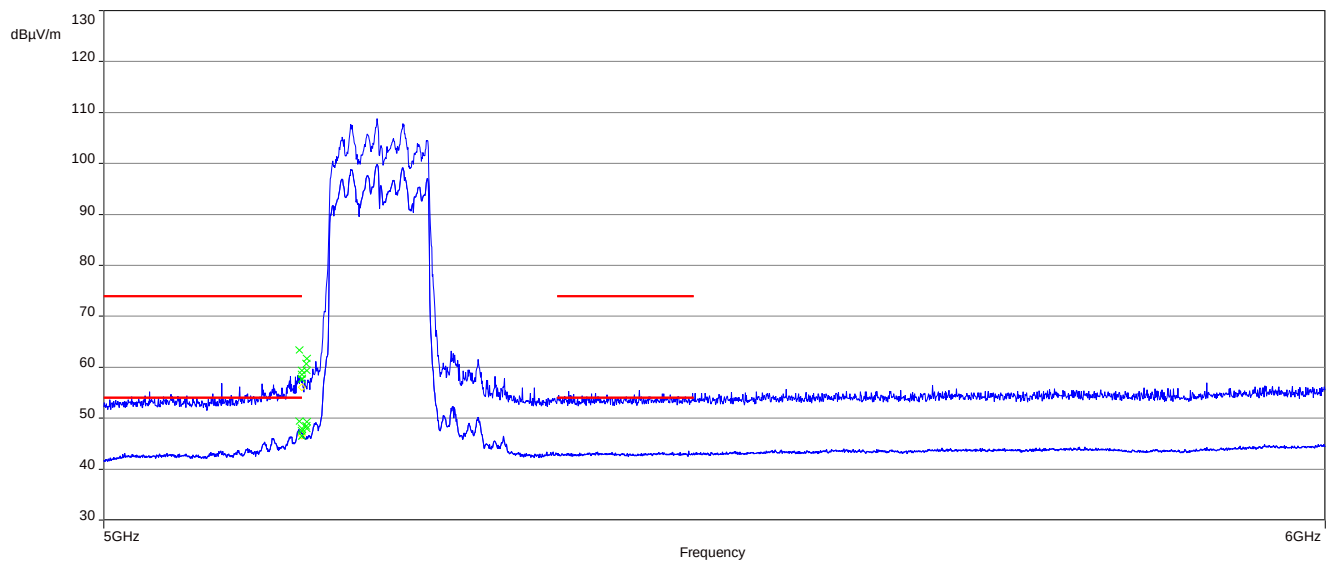


**Plot 3:** lower band edge; U-NII-1; lowest channel, 802.11n HT40

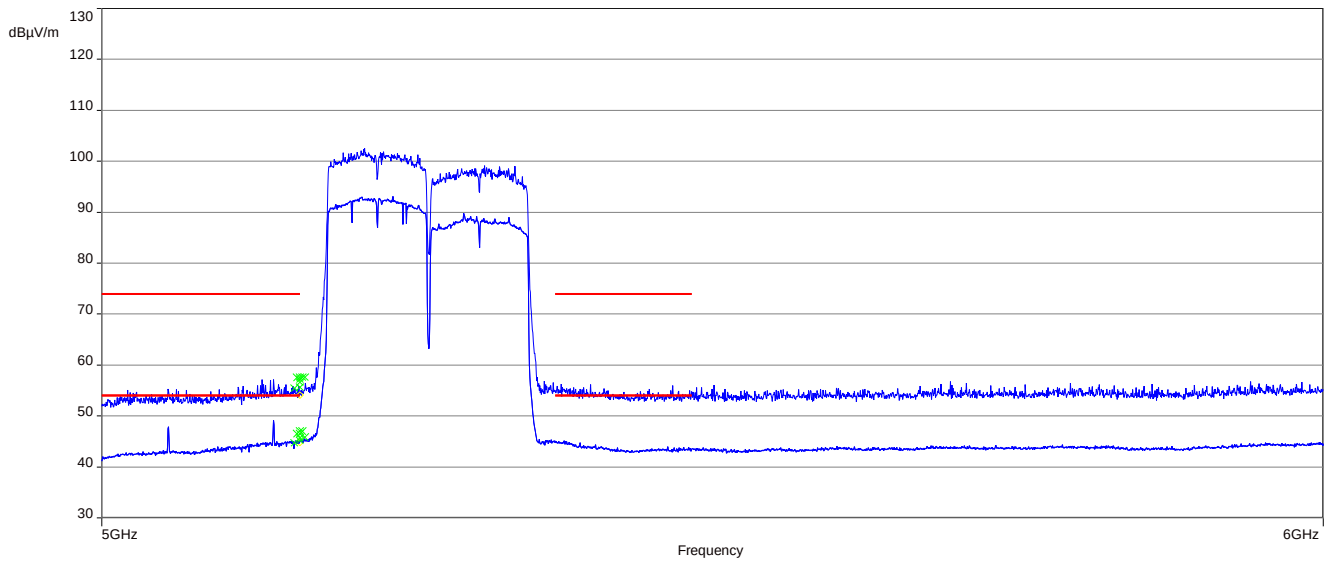


**Plot 4:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT20

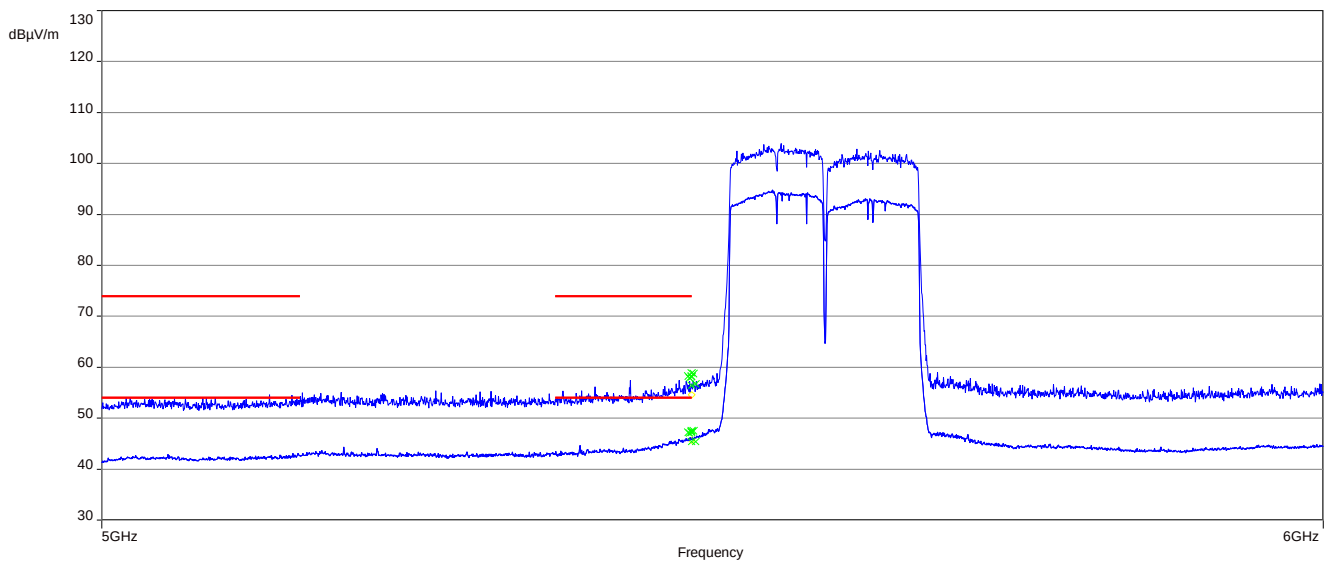


**Plot 5:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT40**Plot 6:** lower band edge; U-NII-1; lowest channel, 802.11ac VHT80

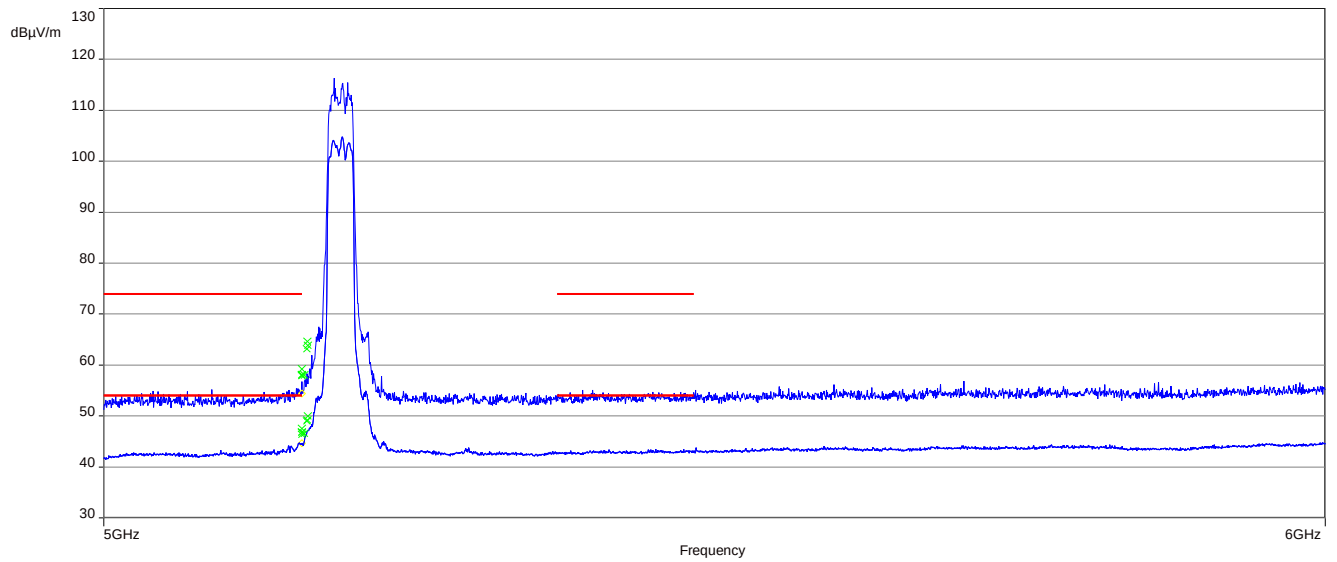
**Plot 7:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11ac VHT80+80



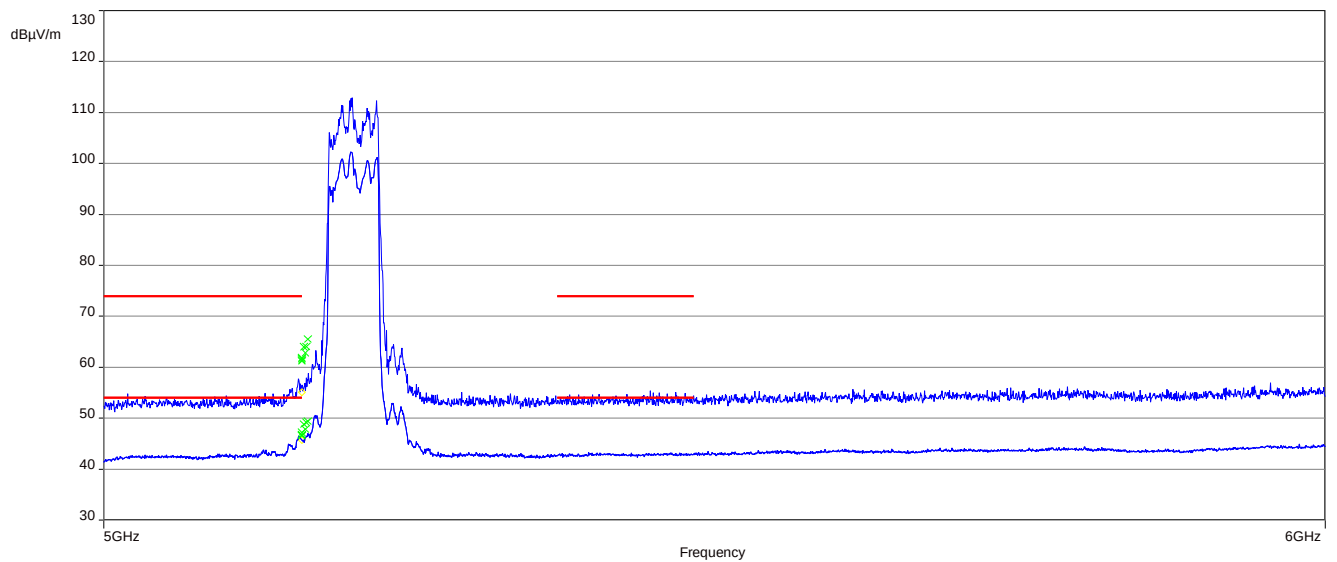
**Plot 8:** upper band edge; U-NII-2C; middle channel, 802.11ac VHT80+80



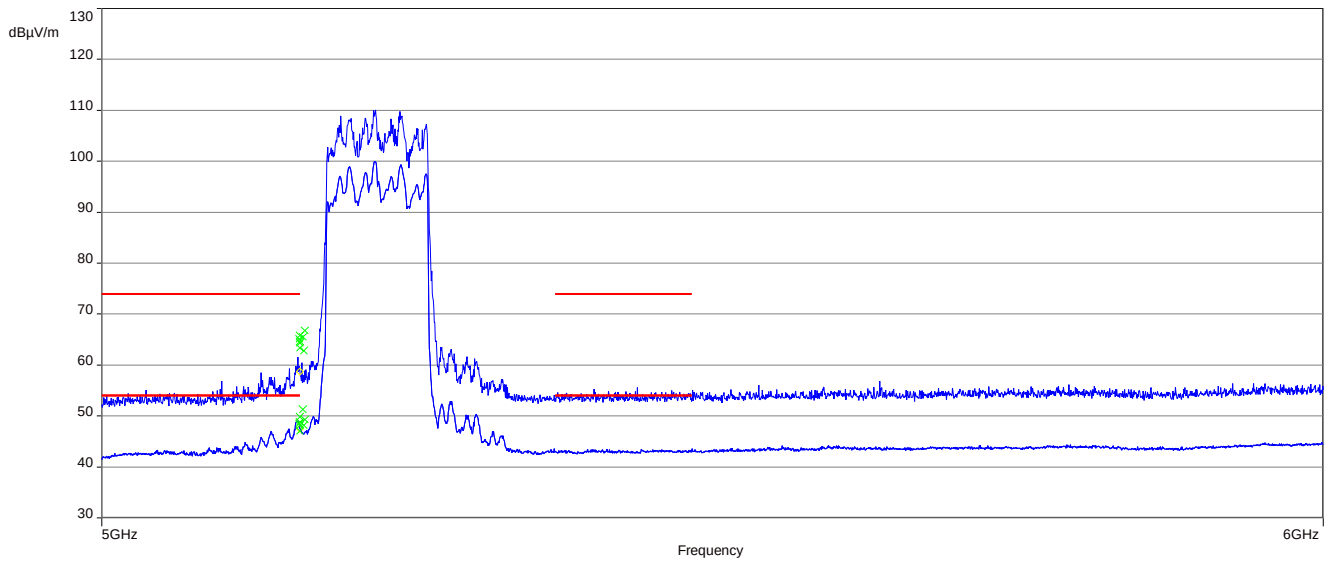
**Plot 9:** lower band edge; U-NII-1; lowest channel, 802.11ax HE20



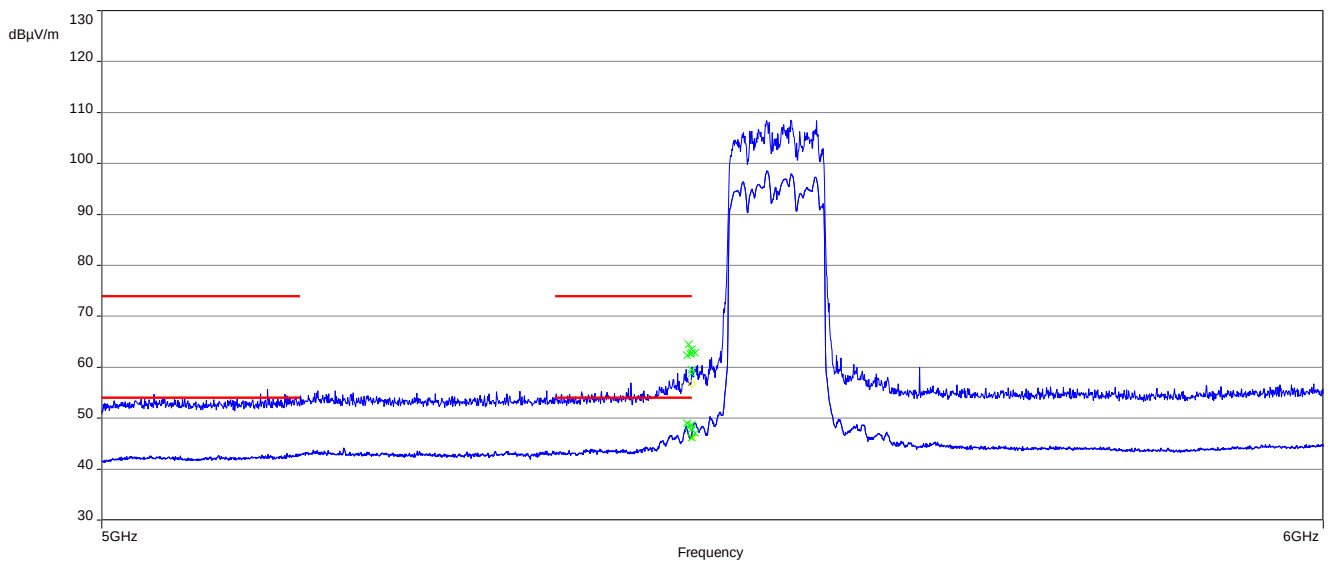
**Plot 10:** lower band edge; U-NII-1; lowest channel, 802.11ax HE40

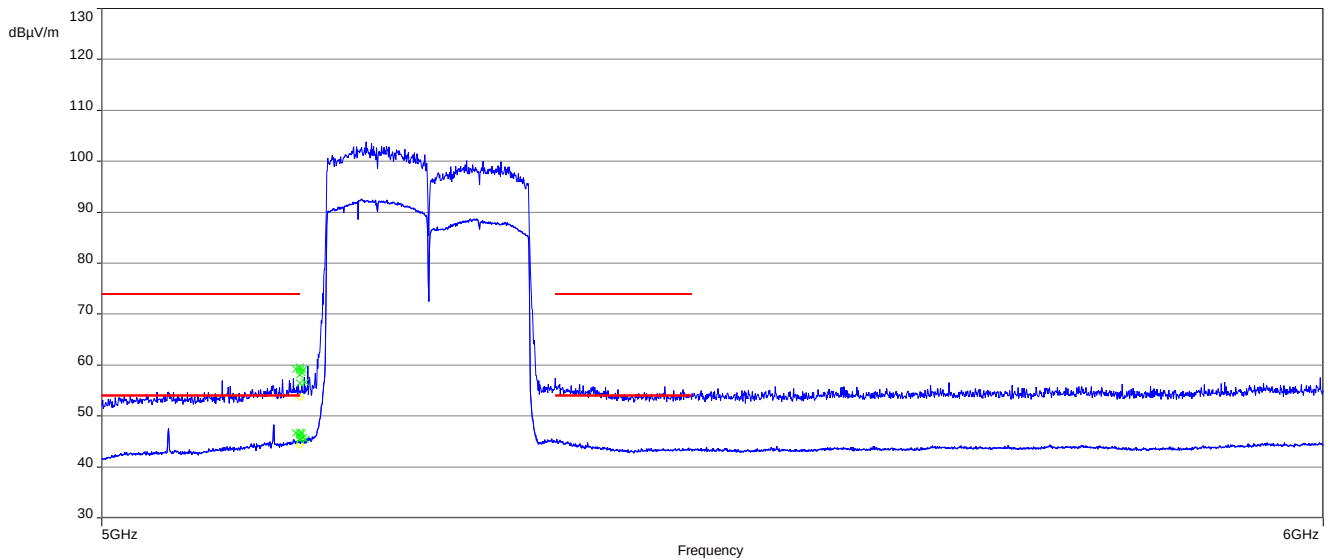


**Plot 11:** lower band edge; U-NII-1; lowest channel, 802.11 ax HE80



**Plot 12:** lower band edge; U-NII-2C; lowest channel, 802.11 ax HE80



**Plot 13:** lower band edge; U-NII-1 & U-NII-2A; middle channel, 802.11 ax HE80+80**Plot 14:** upper band edge; U-NII-2C; middle channel, 802.11 ax HE80+80