# RF – TEST REPORT

**- FCC Part 15.247, RSS-247 -**

**Type / Model Name** : 2861-009 – Model: 861A

**Product Description** : BLE5.0 remote control

**Applicant** : ruwido austria gmbh

Address : Koestendorfer Strasse 8

5202 NEUMARKT, AUSTRIA

**Manufacturer** : ruwido austria gmbh

Address : Koestendorfer Strasse 8

5202 NEUMARKT, AUSTRIA

| | |
|---|---|
| **Test Result** according to the standards listed in clause 1 test standards: | **POSITIVE** |

| | |
|---|---|
| **Test Report No. : 80205297-00 Rev_1** | 11. March 2025<br>Date of issue |

Deutsche Akkreditierungsstelle
D-PL-12030-01-00

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

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ATTACHMENT A as separate supplement

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# 1 TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules and Regulations Part 15, Subpart A - General (October 2024)**

| | |
|---|---|
| Part 15, Subpart A, Section 15.31 | Measurement standards |
| Part 15, Subpart A, Section 15.33 | Frequency range of radiated measurements |
| Part 15, Subpart A, Section 15.35 | Measurement detector functions and bandwidths |

**FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October 2024)**

| | |
|---|---|
| Part 15, Subpart C, Section 15.203 | Antenna requirement |
| Part 15, Subpart C, Section 15.204 modifications | External radio frequency power amplifiers and antenna |
| Part 15, Subpart C, Section 15.205 | Restricted bands of operation |
| Part 15, Subpart C, Section 15.207 | Conducted limits |
| Part 15, Subpart C, Section 15.209 | Radiated emission limits, general requirements |
| Part 15, Subpart C, Section 15.247 | Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz |
| ANSI C63.10: 2013 | Testing Unlicensed Wireless Devices |
| KDB 558074 D01 v05r02 | Guidance for compliance measurements on DTS; FHSS and hybrid system devices operating under Section 15.247 of the FCC rules, April 2, 2019. |

**ISED Canada Rules and Regulations**

| | |
|---|---|
| RSS-Gen, Issue 5 + Amendment 1 + 2 | General Requirements for Compliance of Radio Apparatus |
| RSS-247, Issue 3 | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |
| ANSI C63.10: 2013 | Testing Unlicensed Wireless Devices |

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# 2 EQUIPMENT UNDER TEST

## 2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

## 2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

## 2.3 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

## 2.4 Equipment type

BLE device

## 2.5 Short description of the equipment under test (EUT)

The EUT is a Bluetooth Low Energy wireless remote control. A single PCB antenna is used within the system. The EUT has only one integrated antenna, no temporary connector and no external antenna can be connected.

| | | |
|---|---|---|
| Number of tested samples: | 1x radiated sample | 1x conducted sample |
| Serial number: | 169076 | prototype |
| Firmware version: | 0.0.235 | 0.0.235 |

## 2.6 Variants of the EUT

There are no variants.

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## 2.7 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

| Channel | Frequency | Channel | Frequency |
|---|---|---|---|
| 37 | 2402 | 18 | 2442 |
| 0 | 2404 | 19 | 2444 |
| 1 | 2406 | 20 | 2446 |
| 2 | 2408 | 21 | 2448 |
| 3 | 2410 | 22 | 2450 |
| 4 | 2412 | 23 | 2452 |
| 5 | 2414 | 24 | 2454 |
| 6 | 2416 | 25 | 2456 |
| 7 | 2418 | 26 | 2458 |
| 8 | 2420 | 27 | 2460 |
| 9 | 2422 | 28 | 2462 |
| 10 | 2424 | 29 | 2464 |
| 38 | 2426 | 30 | 2466 |
| 11 | 2428 | 31 | 2468 |
| 12 | 2430 | 32 | 2470 |
| 13 | 2432 | 33 | 2472 |
| 14 | 2434 | 34 | 2474 |
| 15 | 2436 | 35 | 2476 |
| 16 | 2438 | 36 | 2478 |
| 17 | 2440 | 39 | 2480 |

Note: the marked frequencies are determined for final testing.

## 2.8 Transmit operating modes

The EUT uses GFSK modulation and may provide following data rates:

- 1000 kbps (kbps = *kilobits per second)*
- 2000 kbps

## 2.9 Antenna

The following antennas shall be used with the EUT:
The EUT has only an integrated PCB antenna with -2 dBi gain, no temporary connector and no external antenna to be connected.

## 2.10 Power supply system utilised

Power supply voltage, $V_{nom}$ : 3 $V_{DC}$ battery powered

## 2.11 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- - Model : -

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## 2.12 Determination of worst-case conditions for final measurement

Preliminary tests are performed in all three orthogonal axes of the EUT to locate at which position and at what setting of the EUT produce the maximum of the emissions.

The tests are carried out in the following frequency band:

**2400 MHz – 2483.5 MHz**

**For the final test the following channels and test modes are selected:**

| Wireless system | Available channel | Tested channels | Power setting | Modulation | Modulation type | Data rate |
|---|---|---|---|---|---|---|
| 802.15.1 | 0 - 39 | 37, 18, 39 | Pmax | DSSS | GFSK | 1000 kbps |
| 802.15.1 | 0 - 39 | 37, 18, 39 | Pmax | DSSS | GFSK | 2000 kbps |

### 2.12.1 Test jig

No test jig is used.

### 2.12.2 Test software

The test software for the EUT provides power setting, the special test mode RX and the TX continuous mode, modulated.

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# 3 TEST RESULT SUMMARY

| FCC Rule Part | RSS Rule Part | Description | Result |
|---|---|---|---|
| 15.207(a) | RSS-Gen, 8.8 | AC power line conducted emissions[1] | Not applicable |
| 15.247(a)(2) | RSS-247, 5.2(a) | -6 dB EBW | passed |
| 15.247(b)(3) | RSS-247, 5.4(d) | Maximum peak output power | passed |
| 15.247(d) | RSS-247, 5.5 | Unwanted emission, radiated | passed |
| 15.247(d) | RSS-Gen, 8.10 | Emissions in restricted bands | passed |
| 15.247(e) | RSS-247, 5.2(b) | Power Spectral Density | passed |
| 15.35(c) | RSS-Gen, 6.10 | Pulsed operation | passed |
| 15.203 | - | Antenna requirement | passed |
| | RSS-Gen, 6.11 | Transmitter frequency stability | passed |
| | RSS-Gen, 6.7 | 99 % Bandwidth | passed |

Note: [1] No AC power line, battery powered device.

## 3.1 Revision history of test report

| Test report No | Rev. | Issue Date | Changes |
|---|---|---|---|
| 80205297-00 | 0 | 17 October 2024 | Initial test report |
| 80205297-00 | 1 | 11. March 2025 | EIRP added, test modes updated |

The test report with the highest revision number replaces the previous test reports.

## 3.2 Final assessment

The equipment under test fulfils the requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 15 April 2024

Testing concluded on : 25 April 2024

Checked by:

Klaus Gegenfurtner
2025.03.12
09:55:45 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Christopher Thaller
2025.03.12
09:39:45 +01'00'

Christopher Thaller
Radio Team

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# 4 TEST ENVIRONMENT

## 4.1 Address of the test laboratory

**CSA Group Bayern GmbH**
**Ohmstrasse 1-4**
**94342 STRASSKIRCHEN**
**GERMANY**

## 4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15 - 35 °C

Humidity: 30 - 60 %

Atmospheric pressure: 86 - 106 kPa

## 4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

| Measurement Type | Range | Confidence Level (%) | Calculated Uncertainty |
|---|---|---|---|
| AC Conducted Spurious Emissions | 0.15 MHz to 30 MHz | 95% | ± 3.29 dB |
| 20 dB Bandwidth | Center frequency of EUT | 95% | $\pm 2.5 \times 10^{-7}$ |
| 99% Occupied Bandwidth | Center frequency of EUT | 95% | $\pm 2.5 \times 10^{-7}$ |
| Radiated Spurious Emissions | 9 kHz to 30 MHz | 95% | ± 3.53 dB |
| Radiated Spurious Emissions | 30 MHz to 1000 MHz | 95% | ± 3.71 dB |
| Radiated Spurious Emissions | 1000 MHz to 10000 MHz | 95% | ± 2.34 dB |
| Peak conducted output power | 902 MHz to 928 MHz | 95% | ± 0.35 dB |
| Conducted Spurious Emissions | 9 kHz to 10000 MHz | 95% | ± 2.15 dB |

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## 4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w$ = 0).
Details can be found in the procedure CSA_B_V50_29.

## 4.5 Measurement protocol for FCC and ISED

### 4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

**FCC: DE 0011**
**ISED: DE0009**

### 4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

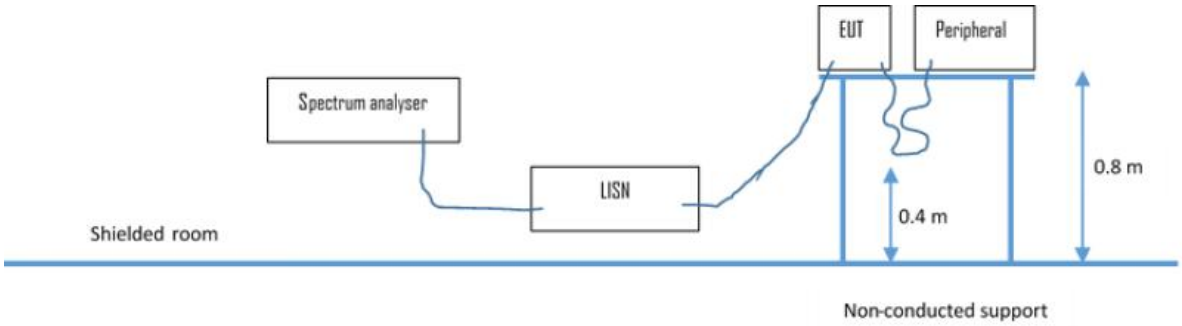
#### 4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

### 4.5.3 Details of test procedures

#### 4.5.3.1 Conducted emission

Test setup according ANSI C63.10




The final level, expressed in dBμV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)
μV = Inverse log(dBμV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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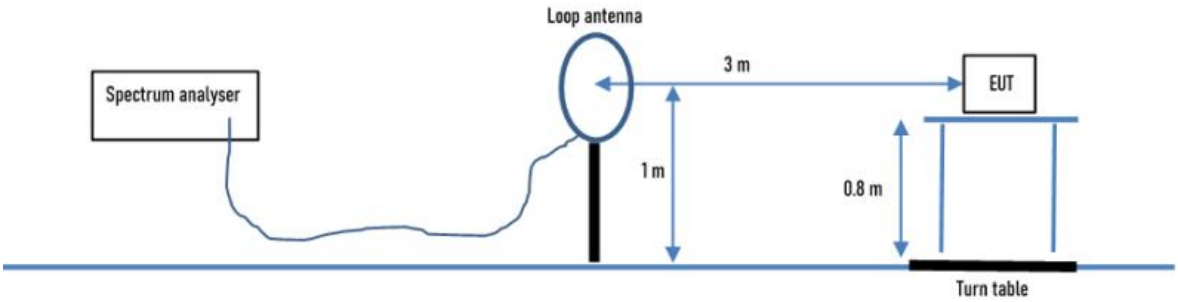
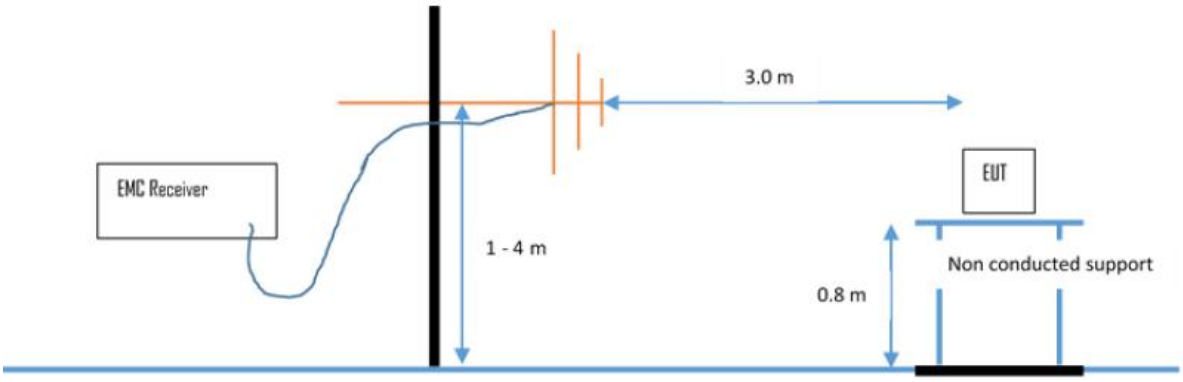
4.5.3.2 Radiated emission

**4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):**
Test setup according ANSI C63.10




Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

**4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):**
Test setup according ANSI C63.10.




Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

| Frequency (MHz) | Level (dBµV) | + | Factor (dB) | = | Level (dBµV/m) | - | Limit (dBµV/m) | = | Delta (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 719.0 | 75.0 | + | 32.6 | = | 107.6 | - | 110.0 | = | -2.4 |

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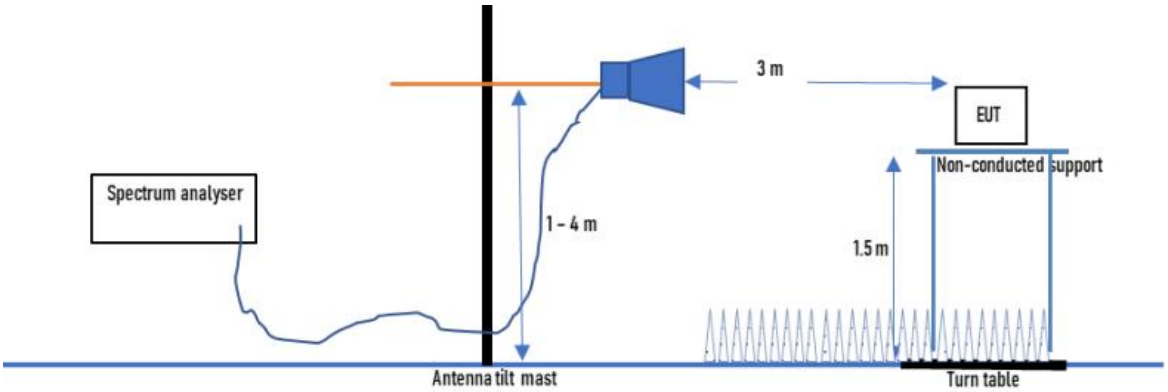
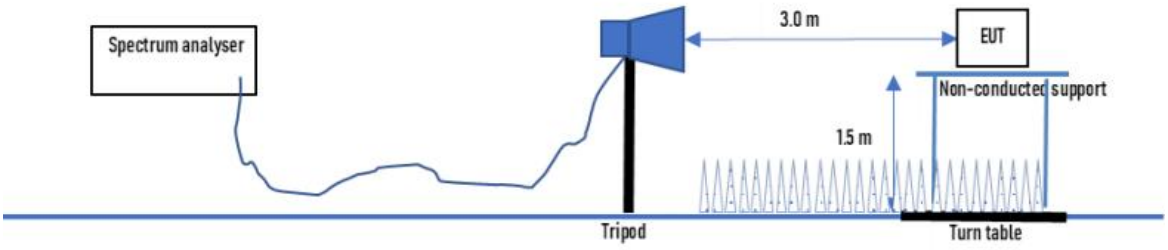
#### 4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.




Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

#### 4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)




Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit is adopted.

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# 5 TEST CONDITIONS AND RESULTS

## 5.1 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

### 5.1.1 Description of the test location

Test location: Shielded Room S6

### 5.1.2 Photo documentation of the test set-up – see Attachment B

### 5.1.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):
Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.1.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings for EBW:
RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak

Spectrum analyser settings for OBW:
RBW: 1-5% OBW, VBW: 3 RBW, Detector: Max peak

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### 5.1.5 Test results

**EBW 6dB**

1 Mbps:

| Channel | Centre frequency (MHz) | 6 dB bandwidth (kHz) | Minimum limit (MHz) |
|---|---|---|---|
| 37 | 2402 | 701.1 | 0.5 |
| 18 | 2442 | 717.2 | 0.5 |
| 39 | 2480 | 685.1 | 0.5 |

2 Mbps:

| Channel | Centre frequency (MHz) | 6 dB bandwidth (kHz) | Minimum limit (MHz) |
|---|---|---|---|
| 37 | 2402 | 1392.9 | 0.5 |
| 18 | 2442 | 1316.9 | 0.5 |
| 39 | 2480 | 1335.9 | 0.5 |

**OBW99**

1 Mbps:

| Channel | Centre frequency (MHz) | 99 % bandwidth (kHz) |
|---|---|---|
| 37 | 2402 | 1088.1 |
| 18 | 2442 | 1102.1 |
| 39 | 2480 | 1082.0 |

2 Mbps:

| Channel | Centre frequency (MHz) | 99 % bandwidth (kHz) |
|---|---|---|
| 37 | 2402 | 2063.1 |
| 18 | 2442 | 2052.5 |
| 39 | 2480 | 2056.3 |

The requirements are **FULFILLED.**

**Remarks:** For detailed test result please see the following test protocols

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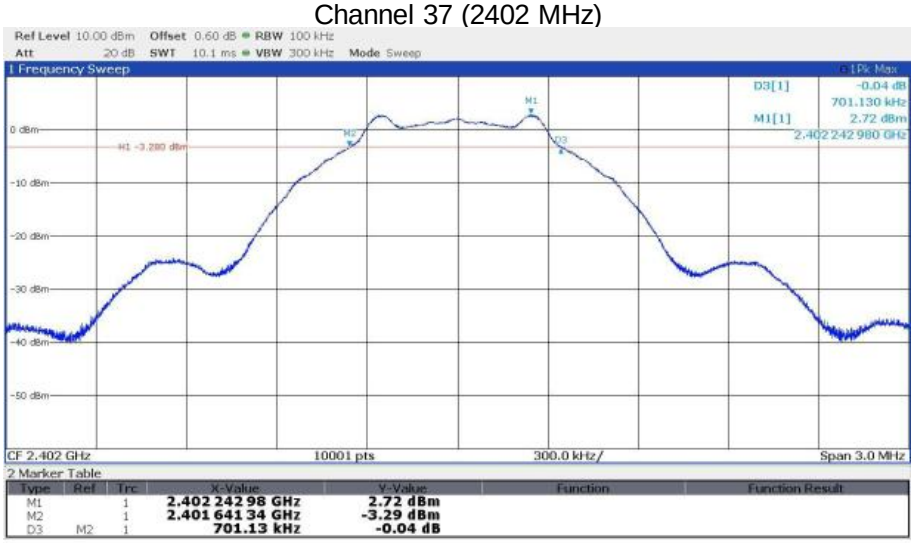
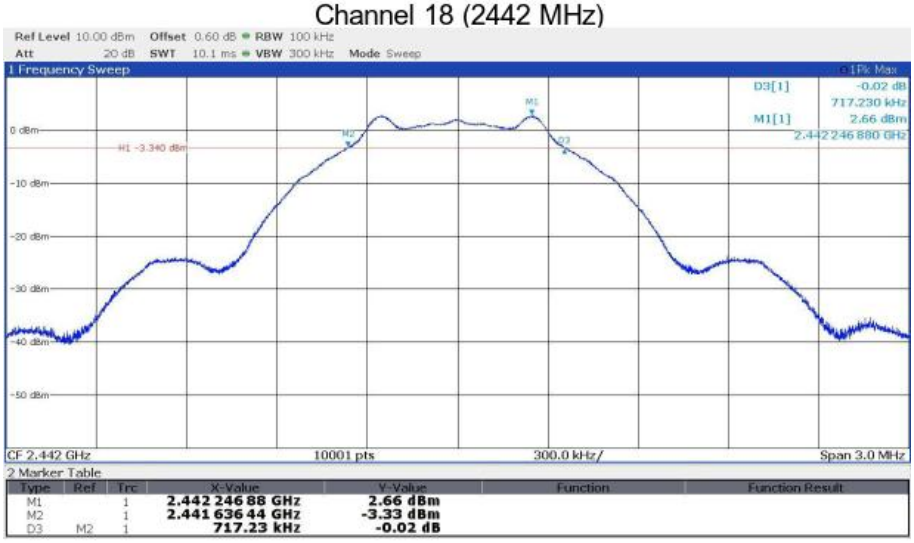
### 5.1.6 Test protocols EBW

**1 Mbps:**

Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)

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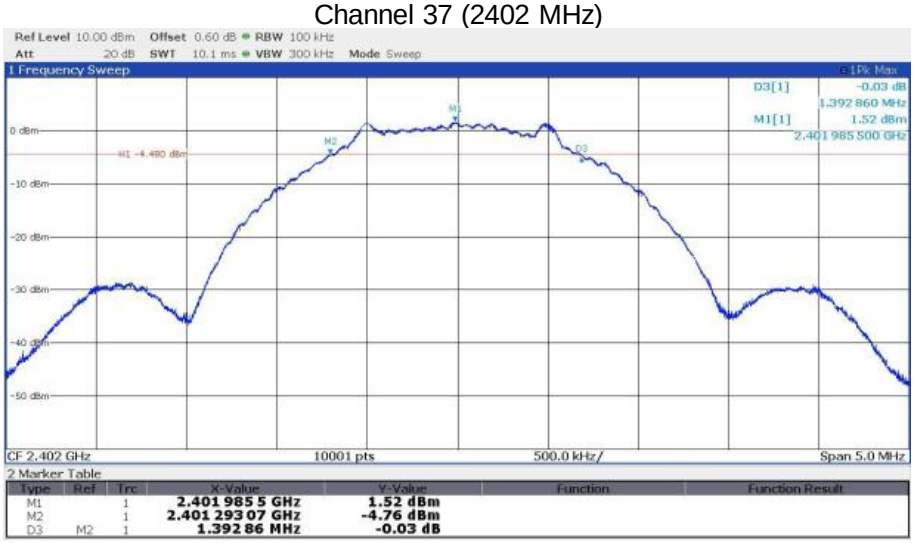
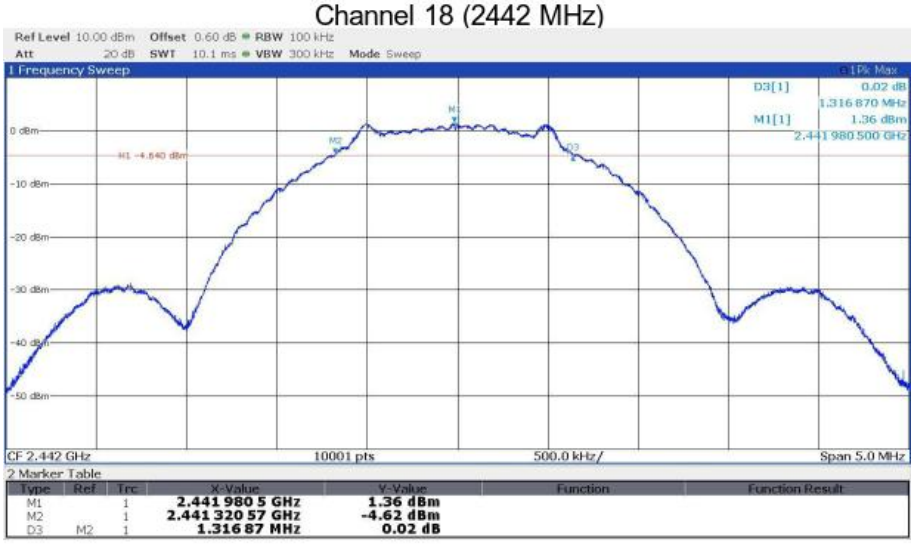
**2 Mbps:**

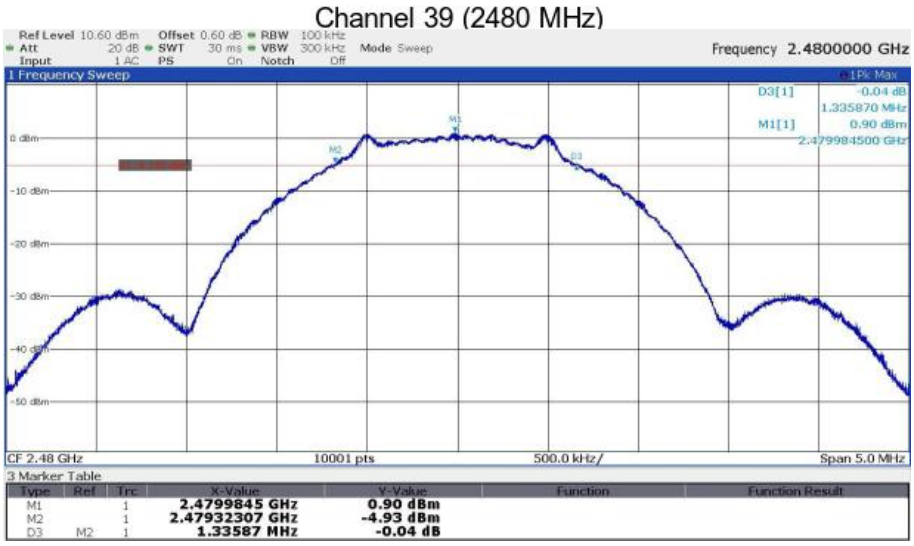
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)



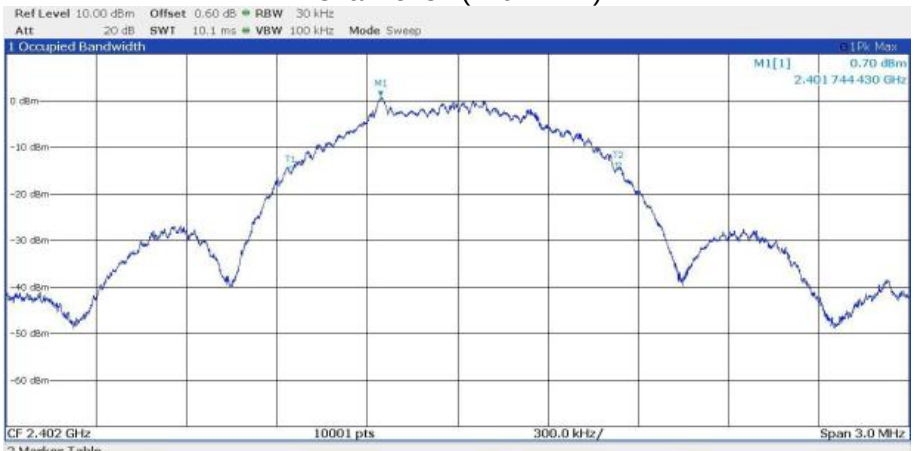

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

### 5.1.7 Test protocols OBW

**1Mbps:**

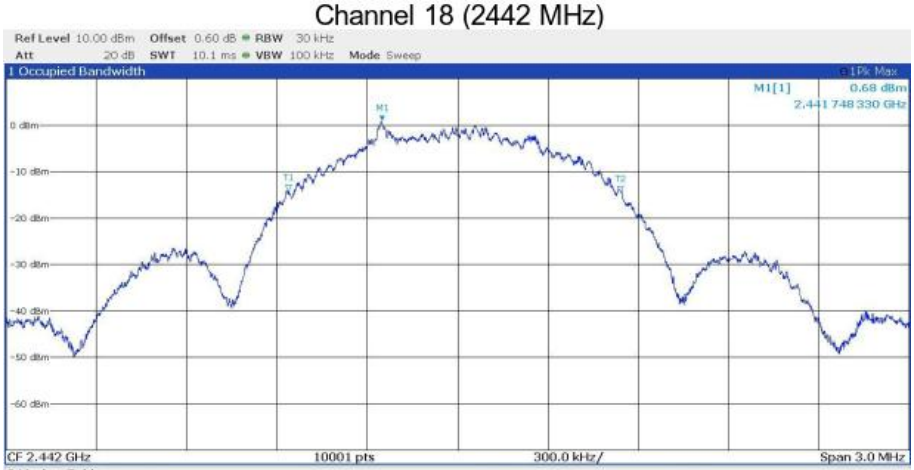
Channel 37 (2402 MHz)




2 Marker Table

| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **2.401 744 43 GHz** | **0.70 dBm** | Occ Bw | **1.088 130 856 MHz** |
| T1 | | 1 | 2.401 445 157 GHz | -15.70 dBm | Occ Bw Centroid | 2.401 989 223 GHz |
| T2 | | 1 | 2.402 533 288 GHz | -14.78 dBm | Occ Bw Freq Offset | -10.777 420 546 kHz |

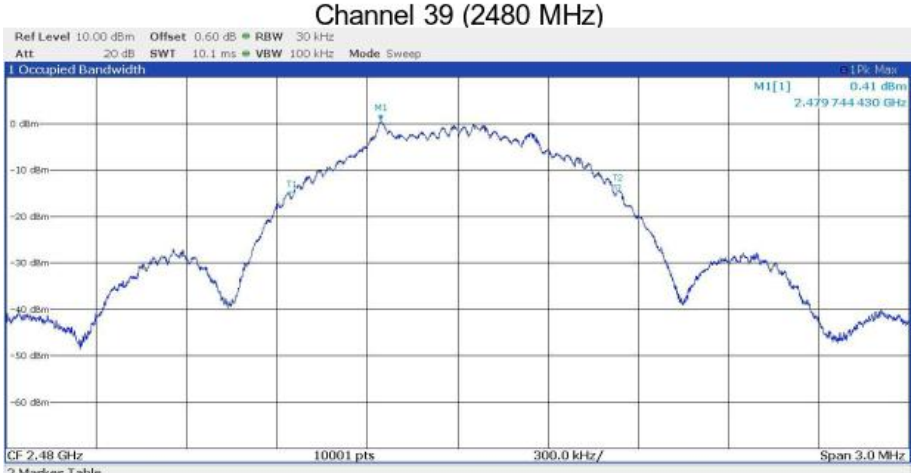
Channel 18 (2442 MHz)




2 Marker Table

| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **2.441 748 33 GHz** | **0.68 dBm** | Occ Bw | **1.102 124 676 MHz** |
| T1 | | 1 | 2.441 438 737 GHz | -14.31 dBm | Occ Bw Centroid | 2.441 989 799 GHz |
| T2 | | 1 | 2.442 540 862 GHz | -14.62 dBm | Occ Bw Freq Offset | -10.200 592 715 kHz |

Channel 39 (2480 MHz)




2 Marker Table

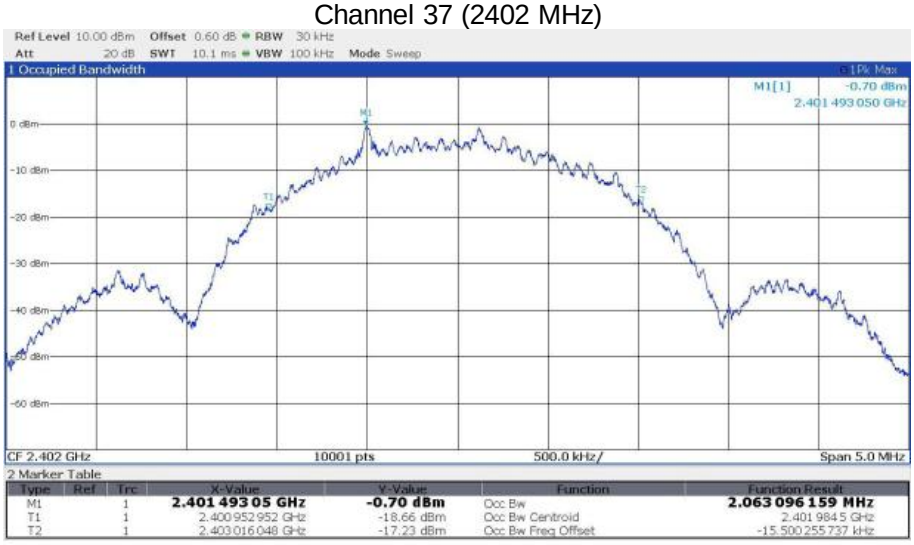
| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **2.479 744 43 GHz** | **0.41 dBm** | Occ Bw | **1.082 001 524 MHz** |
| T1 | | 1 | 2.479 449 933 GHz | -16.04 dBm | Occ Bw Centroid | 2.479 990 933 GHz |
| T2 | | 1 | 2.480 531 934 GHz | -14.74 dBm | Occ Bw Freq Offset | -9.066 718 2 kHz |

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

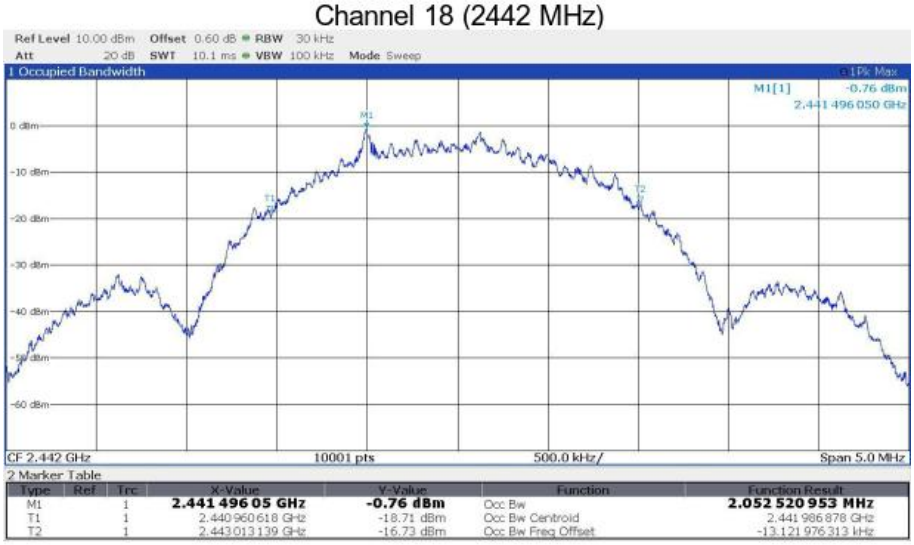
**FCC ID: XYN861A** **IC ID: 8748A-861A**

**2Mbps:**

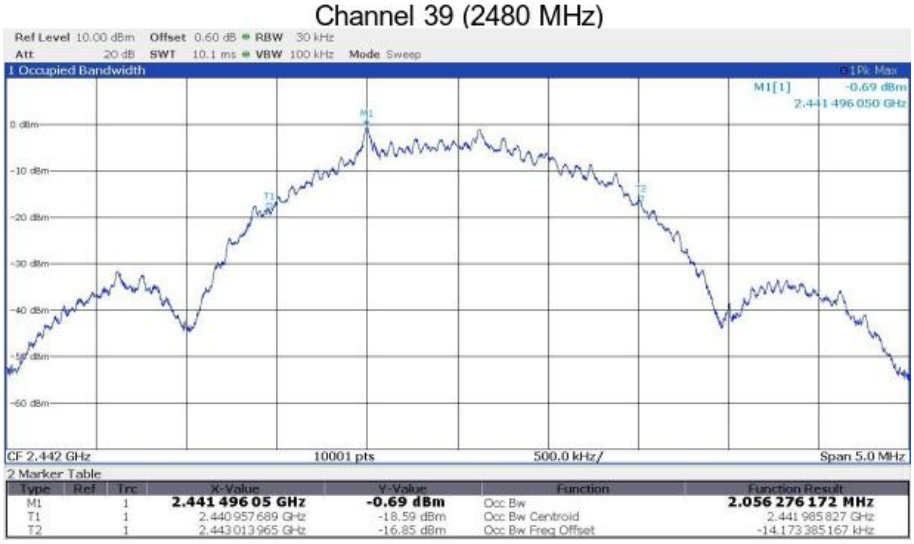
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

## 5.2 Maximum peak output power

For test instruments and accessories used see section 6 Part **MB**.

### 5.2.1 Description of the test location

Test location: Shielded Room S6

### 5.2.2 Photo documentation of the test set-up – see Attachment B

### 5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):
The maximum peak conducted output power of the intentional radiator shall not exceed the following:
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

### 5.2.4 Description of Measurement

The maximum peak radiated output power is measured using a spectrum analyser following the procedure set out in ANSI C63.10, item 11.9.2.2. The EUT is set in TX continuous mode while measuring. The radiated measurement was performed in terms of fieldstrength. Therefore, the formula set out in ANSI C63.10, item 9.5 (Equation 22) is changed into the following term:

$$E = EIRP - (20*\log_{10}(3)) + 104.7$$

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

### 5.2.5 Test result

| Conducted Measurement | | | | | |
|---|---|---|---|---|---|
| **FCC §15.247 (b)(3) \| RSS-247 5.4 (d)** | | | | | |
| **Modulation** | **Channel** | **Frequency** | **Measured Conducted TX Power** | **Conducted Tx-Power Limit** | **Margin** |
| | | MHz | dBm | dBm | dB |
| 1 Mbps | CH37 | 2402 | 2.8 | 30.0 | -27.2 |
| | CH18 | 2442 | 2.5 | 30.0 | -27.5 |
| | CH39 | 2480 | 2.2 | 30.0 | -27.8 |
| 2 Mbps | CH37 | 2402 | 2.7 | 30.0 | -27.3 |
| | CH18 | 2442 | 2.5 | 30.0 | -27.5 |
| | CH39 | 2480 | 2.3 | 30.0 | -27.7 |

| RSS-247 5.4 (d) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Modulation** | **Channel** | **Frequency** | **Measured Conducted TX Power** | **Antenna gain** | **Calculated EIRP** | **EIRP Limit** | **Margin** |
| | | MHz | dBm | dBi | dBm | dBm | dB |
| 1 Mbps | CH37 | 2402 | 2.8 | -2.0 | 0.8 | 36 | -35.2 |
| | CH18 | 2442 | 2.5 | -2.0 | 0.5 | 36 | -35.5 |
| | CH39 | 2480 | 2.2 | -2.0 | 0.2 | 36 | -35.8 |
| 2 Mbps | CH37 | 2402 | 2.7 | -2.0 | 0.7 | 36 | -35.3 |
| | CH18 | 2442 | 2.5 | -2.0 | 0.5 | 36 | -35.5 |
| | CH39 | 2480 | 2.3 | -2.0 | 0.3 | 36 | -35.7 |

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

| Frequency (MHz) | Peak Power Limit | |
|---|---|---|
| | (dBm) | (Watt) |
| 902-928 | 30 | 1.0 |
| **2400-2483.5** | **30** | **1.0** |
| 5725-5850 | 30 | 1.0 |

Peak output power limit according to RSS-247 5.4(d):

| Frequency (MHz) | Peak Power Limit | |
|---|---|---|
| | (dBm) | (W) |
| 902-928 | 30 | 1.0 |
| **2400-2483.5** | **30** | **1.0** |

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

EIRP Limit according to RSS-247 5.4 (d):

| Frequency (MHz) | EIRP Limit | |
|---|---|---|
| | (dBm) | (Watt) |
| 902-928 | 36 | 4.0 |
| **2400-2483.5** | **36** | **4.0** |
| 5725-5850 | 36 | 4.0 |

The requirements are **FULFILLED.**

**Remarks:** For more details of the measurements please refer to following test plots.

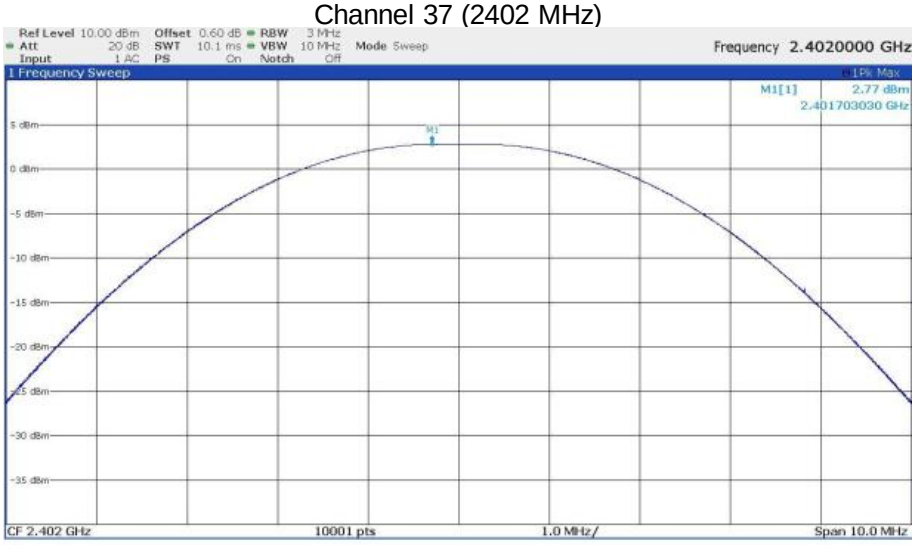
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

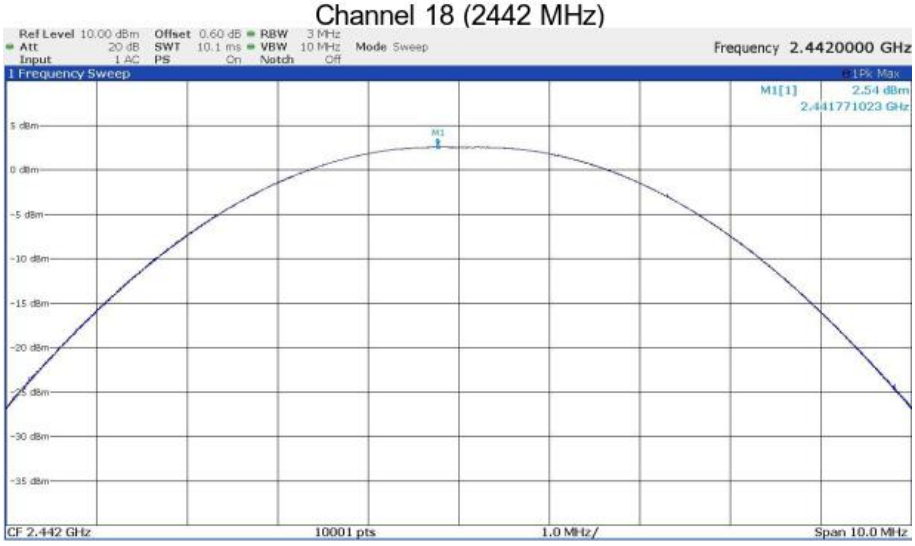
### 5.2.6 Test protocols

**1 Mbps:**

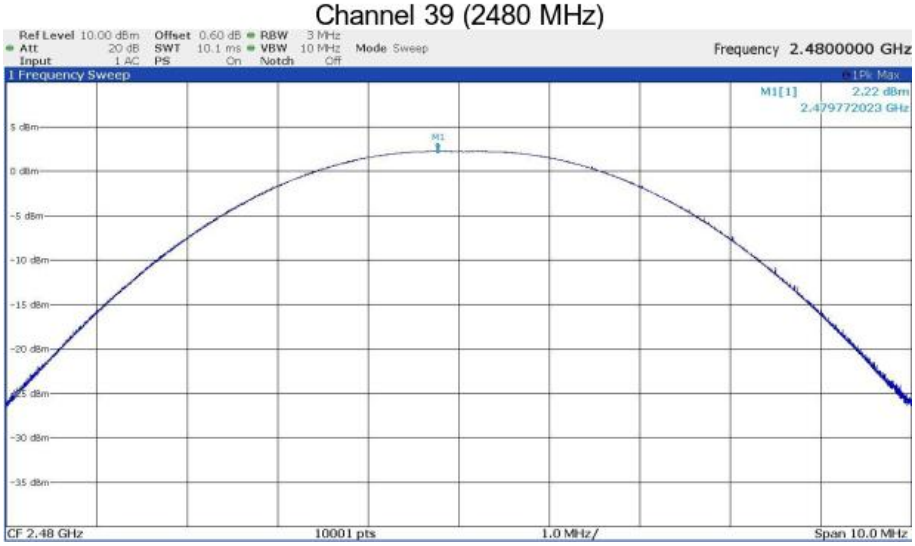
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)

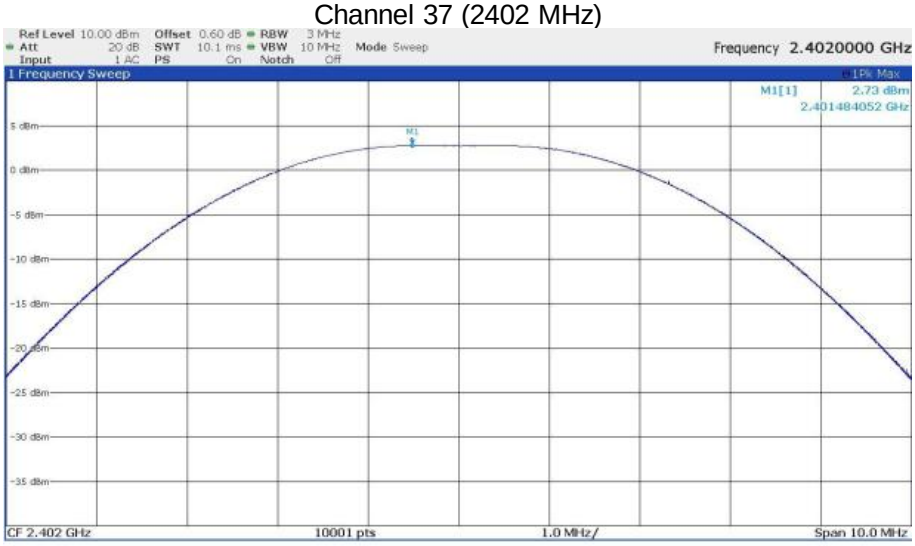



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

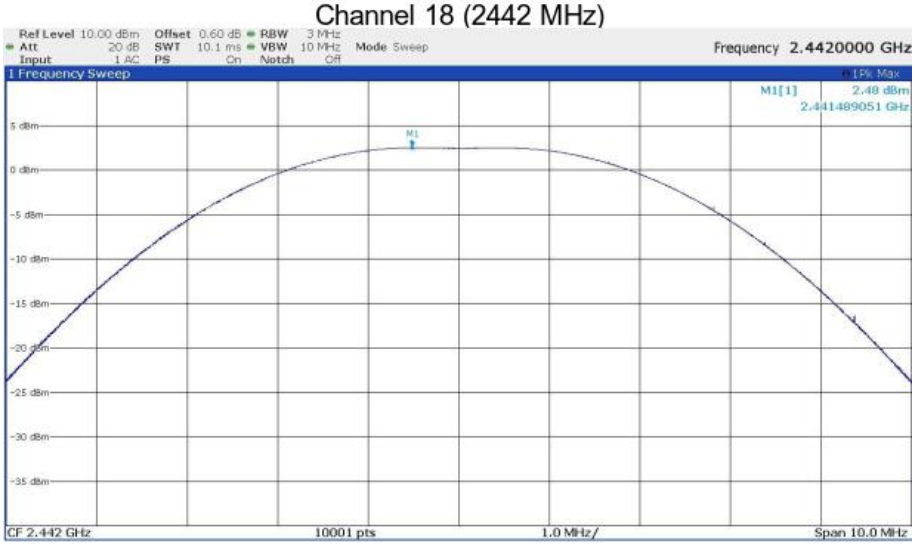
**FCC ID: XYN861A** **IC ID: 8748A-861A**

**2 Mbps:**

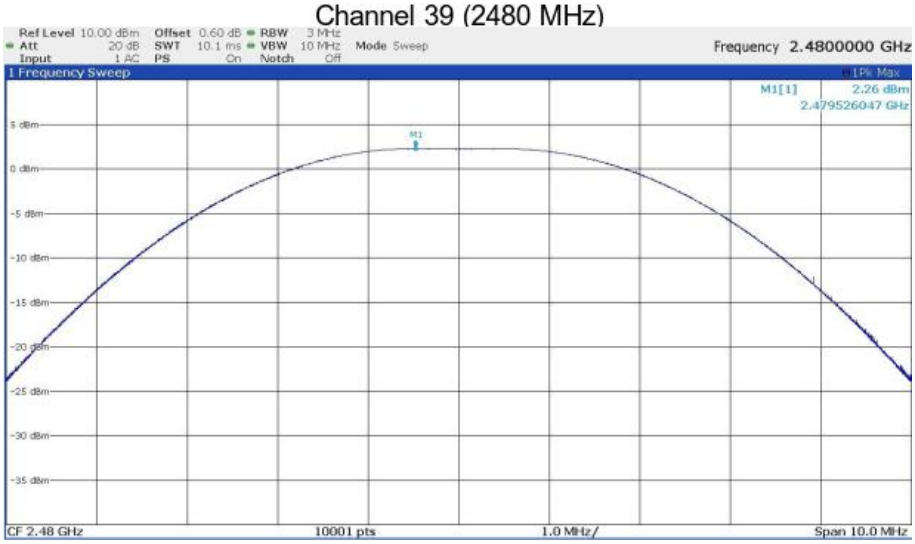
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

## 5.3 Power spectral density

For test instruments and accessories used see section 6 Part **MB**.

### 5.3.1 Description of the test location

Test location: Shielded Room S6

### 5.3.2 Photo documentation of the test set-up – see Attachment B

### 5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(e):
For digitally modulated systems, the power spectral density radiated from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the radiated output power shall be used to determine the power spectral density.

### 5.3.4 Description of Measurement

The measurement is performed using the procedure set out in 11.10 of ANSI C63.10. The power measurement was done as peak power measurement. Therefore, the PKPSD is measured. The max peak was located and with the spectrum analyser and a marker set to peak.

Spectrum analyser settings:
RBW: 3 kHz, VBW: 10 kHz, Detector: Peak, Sweep time: Auto

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

### 5.3.5 Test result

| FCC §15.247 (e ) \| RSS-247 5.2 (b) | | | | | |
|---|---|---|---|---|---|
| Modulation | Channel | Frequency | Measured Conducted | Conducted PSD Limit | Margin |
| | | MHz | dBm/3kHz | dBm/3kHz | dB |
| 1 Mbps | CH37 | 2402 | -7.3 | 8.0 | -15.3 |
| | CH18 | 2442 | -7.1 | 8.0 | -15.1 |
| | CH39 | 2480 | -7.5 | 8.0 | -15.5 |
| 2 Mbps | CH37 | 2402 | -10.6 | 8.0 | -18.6 |
| | CH18 | 2442 | -11.0 | 8.0 | -19.0 |
| | CH39 | 2480 | -10.7 | 8.0 | -18.7 |

Power spectral density limit according to FCC Part 15, Section 15.247(e):

| Frequency (MHz) | Power spectral density limit (dBm/3 kHz) |
|---|---|
| 2400 - 2483.5 | 8 |

The requirements are **FULFILLED.**

**Remarks:** For detailed test result please see the following test protocols

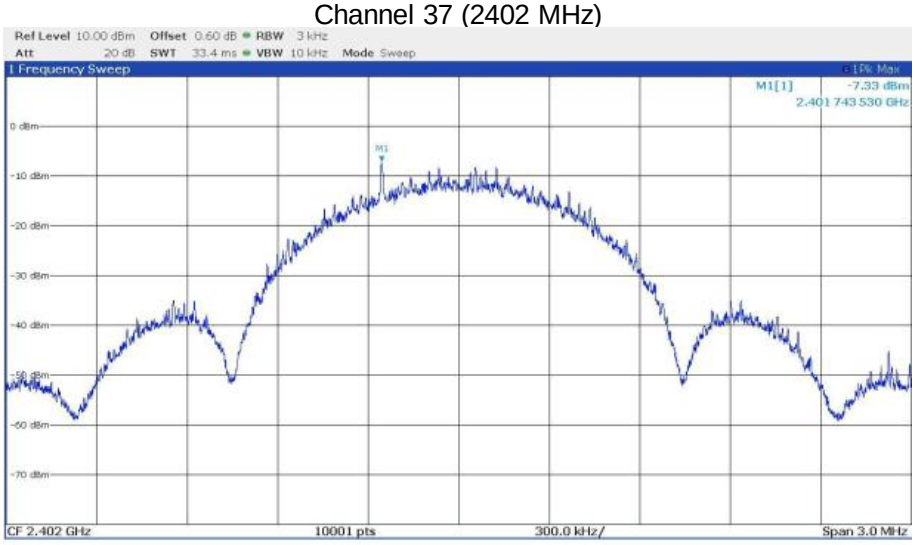
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

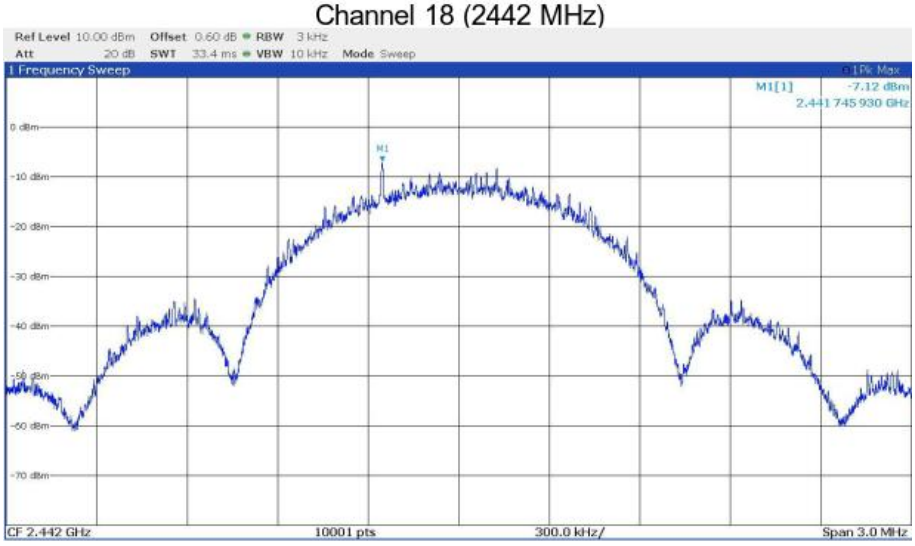
### 5.3.6 Test protocols

**1Mbps:**

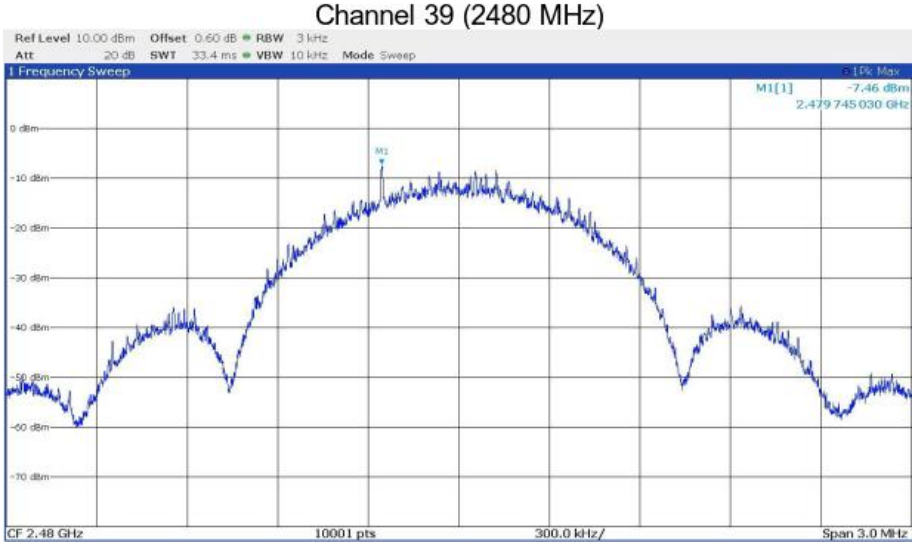
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)

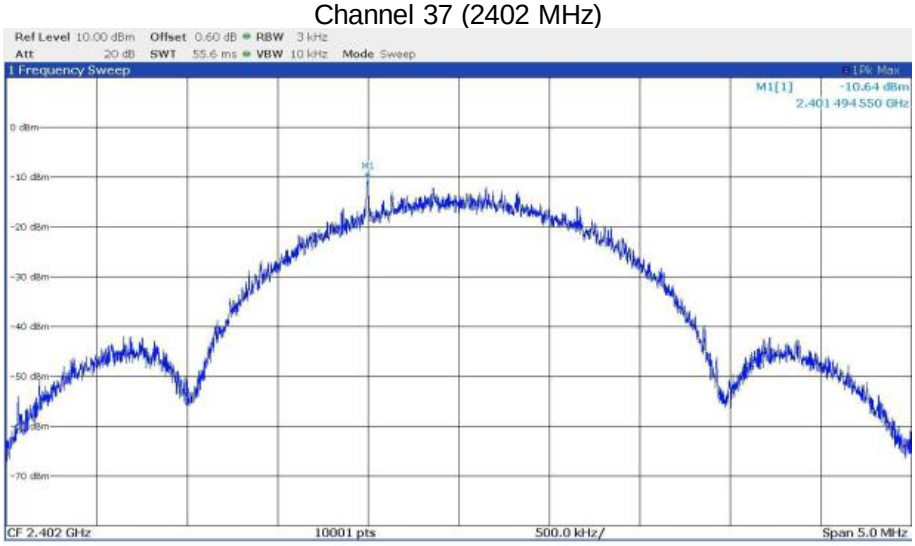



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

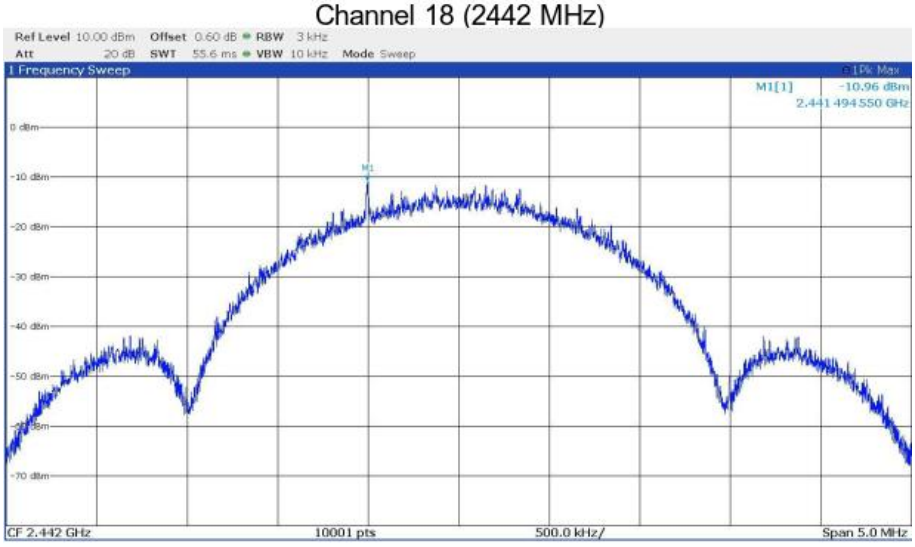
**FCC ID: XYN861A** **IC ID: 8748A-861A**

**2Mbps:**

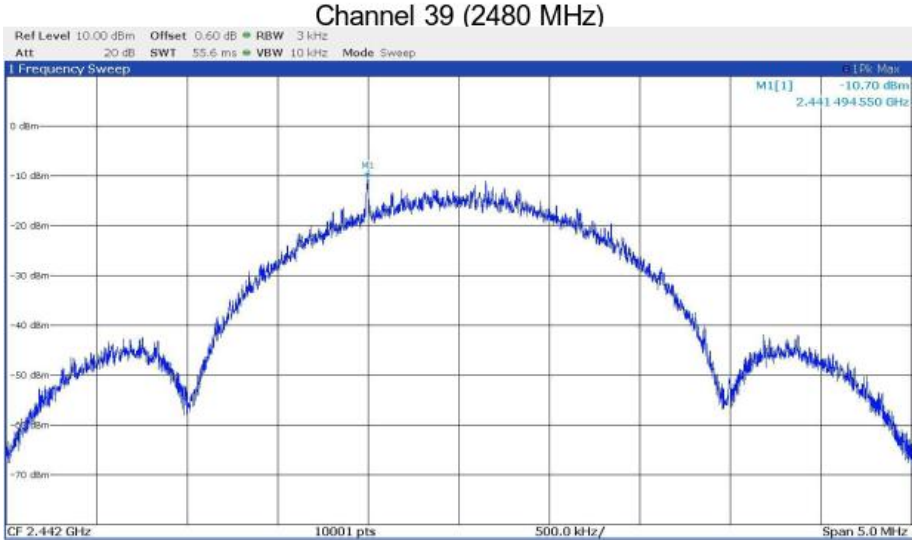
Channel 37 (2402 MHz)




Channel 18 (2442 MHz)




Channel 39 (2480 MHz)




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

## 5.4 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER1, SER 2, SER 3**.

### 5.4.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

Test distance: 3 m

### 5.4.2 Photo documentation of the test set-up – see Attachment B

### 5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(d):
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, provided the transmitter demonstrates compliance with the peak conducted power limits.
Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

According to RSS-247 5.5:
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

### 5.4.4 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Measurements are performed in following order:

1) Measurement of emissions according to General Limit specified in section 15.209(a):

Test receiver settings for SER2:
30MHz-1GHz RBW: 120 MHz Detector: Quasi peak Meas. Time: 1 s,

Spectrum analyser settings for SER3:
1GHz-26GHz RBW: 1 MHz Detector: Max. peak Trace: Max. hold Sweep: Auto

2) If emissions outside the Restricted Bands are above General Limit additional measurements of emissions according to Spurious Emissions Limit specified in section 15.247(d) are performed:

Spectrum analyser settings:
RBW: 100 kHz VBW: 300 kHz Detector: Max. peak Trace: Max. hold Sweep: Auto

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

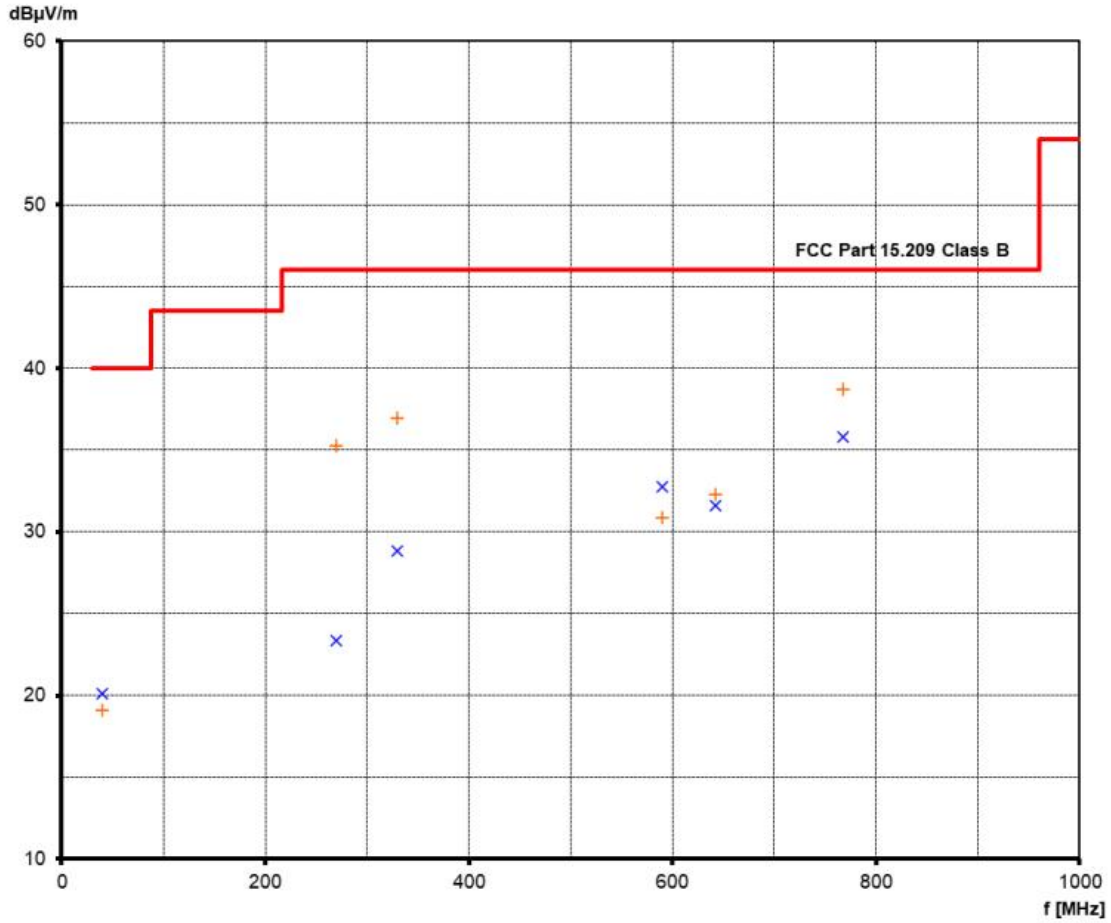
**FCC ID: XYN861A** **IC ID: 8748A-861A**

### 5.4.5 Test result

**f < 1000 MHz**

| Frequency (MHz) | Reading (dBµV) | Correction * (dB) | Field strength (dBµV/m) | Limit (dBµV/m) | Dlimit (dB) |
|---|---|---|---|---|---|
| 0.050 | 25.0 | -61.1 | -36.1 | 33.6 | -69.7 |
| 0.300 | 27.5 | 17.3 | -35.2 | 18.1 | -53.3 |
| 1.400 | 4.8 | 18.2 | -17.0 | 24.7 | -41.7 |
| 4.000 | 9.3 | 17.9 | -12.8 | 30.0 | -42.8 |
| 15.000 | 10.5 | 18.3 | -11.2 | 30.0 | -41.2 |

| Frequency (MHz) | Reading Vert. (dBµV) | Reading Hor. (dBµV) | Correct. Vert. (dB) | Correct. Hor. (dB) | Level Vert. (dBµV/m) | Level Hor. (dBµV/m) | Limit (dBµV/m) | Dlimit (dB) |
|---|---|---|---|---|---|---|---|---|
| 40.00 | 3.3 | 1.1 | 16.8 | 18.0 | 20.1 | 19.1 | 40.0 | -19.9 |
| 270.00 | 4.0 | 15.7 | 19.4 | 19.5 | 23.4 | 35.2 | 46.0 | -10.8 |
| 330.00 | 7.7 | 15.3 | 21.1 | 21.6 | 28.8 | 36.9 | 46.0 | -9.1 |
| 590.00 | 4.7 | 2.5 | 28.1 | 28.4 | 32.8 | 30.9 | 46.0 | -13.2 |
| 642.00 | 2.7 | 3.0 | 28.9 | 29.3 | 31.6 | 32.3 | 46.0 | -13.7 |
| 768.00 | 4.8 | 7.3 | 31.0 | 31.4 | 35.8 | 38.7 | 46.0 | -7.3 |



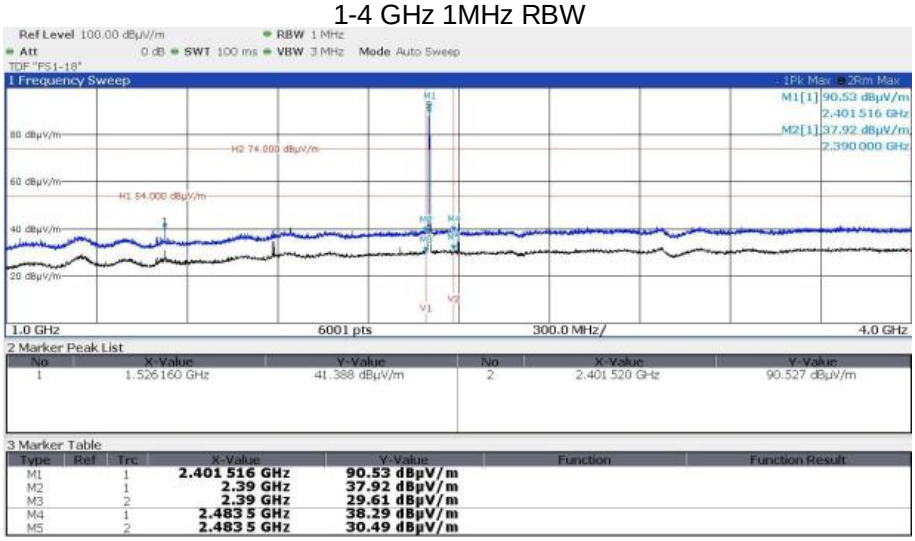

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

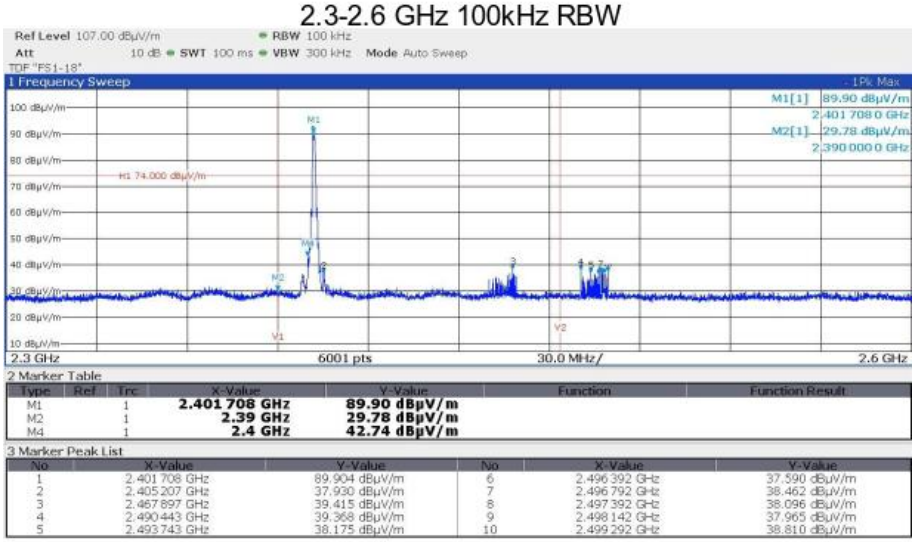
**f > 1000 MHz**
**1Mbps:**

Channel 37 (2402 MHz)

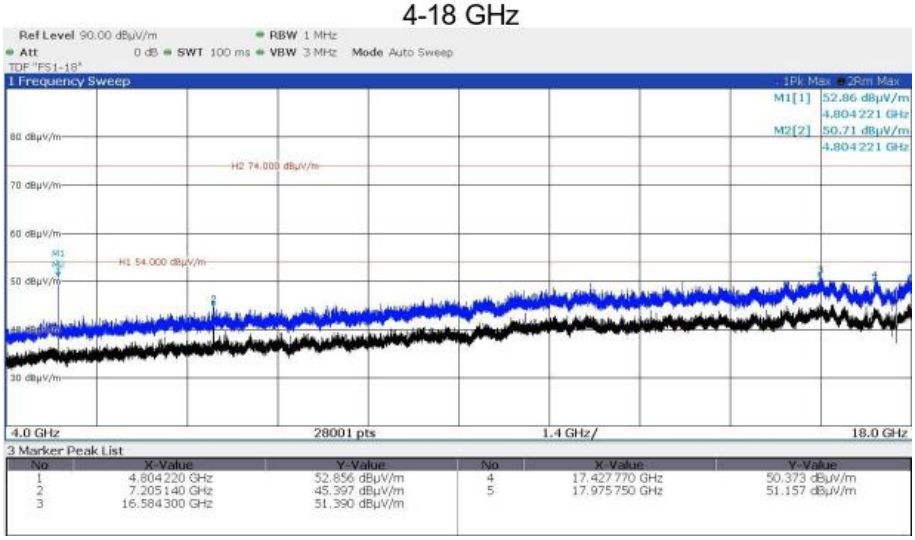
1-4 GHz 1MHz RBW




2.3-2.6 GHz 100kHz RBW



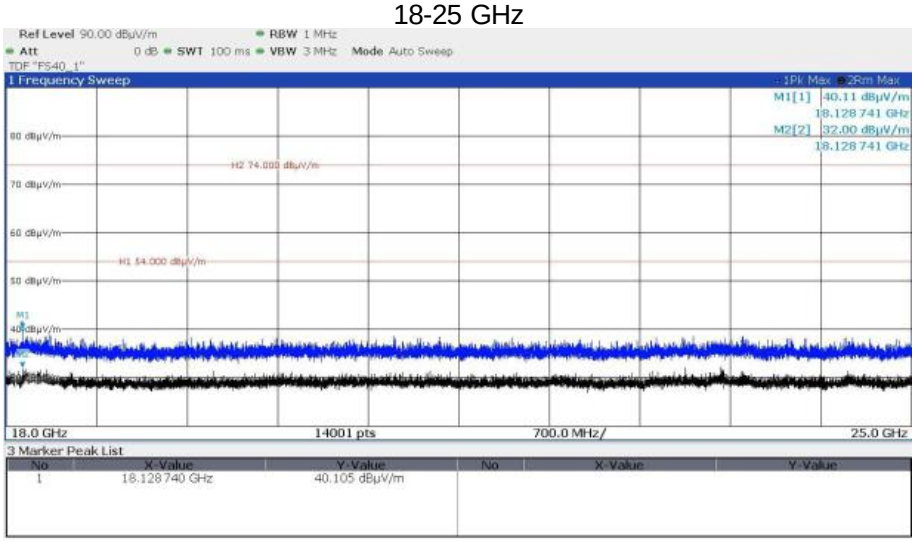

4-18 GHz




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

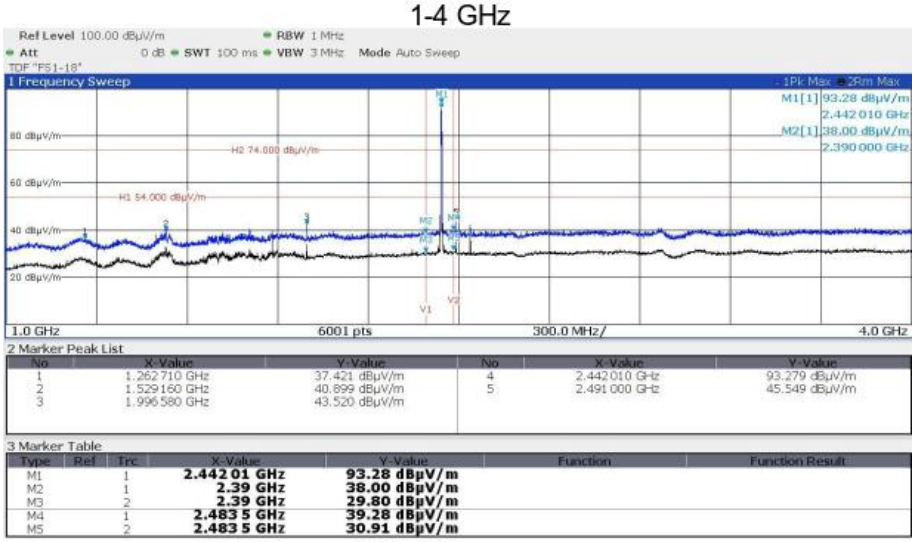
**FCC ID: XYN861A** **IC ID: 8748A-861A**

18-25 GHz

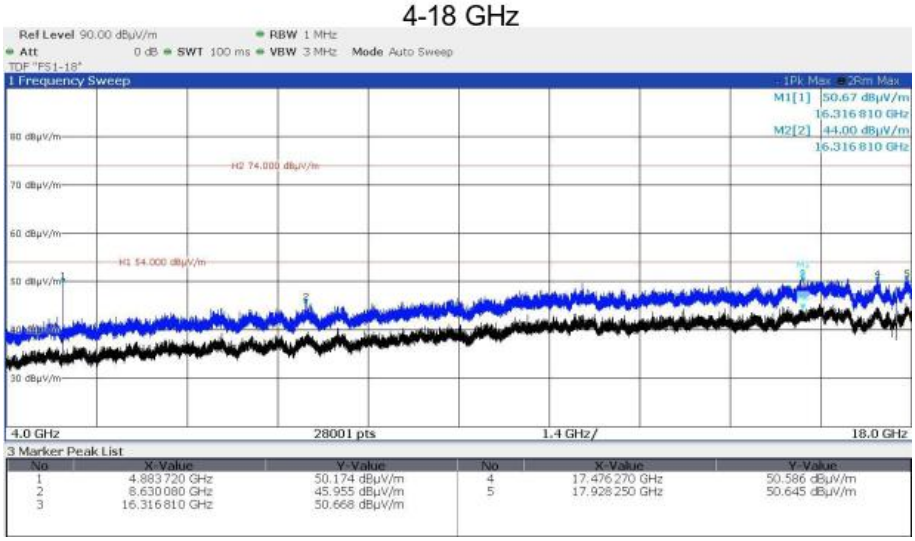



Channel 18 (2442 MHz)

1-4 GHz



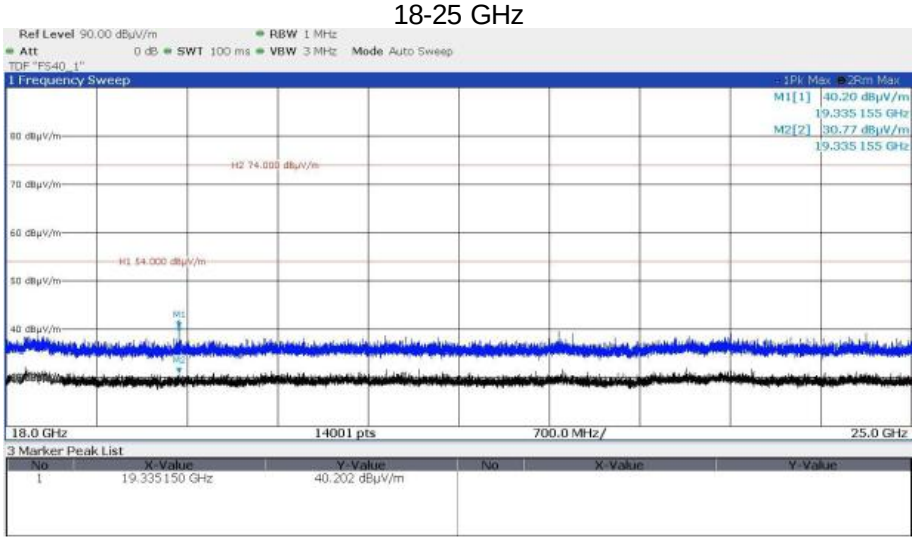

4-18 GHz




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

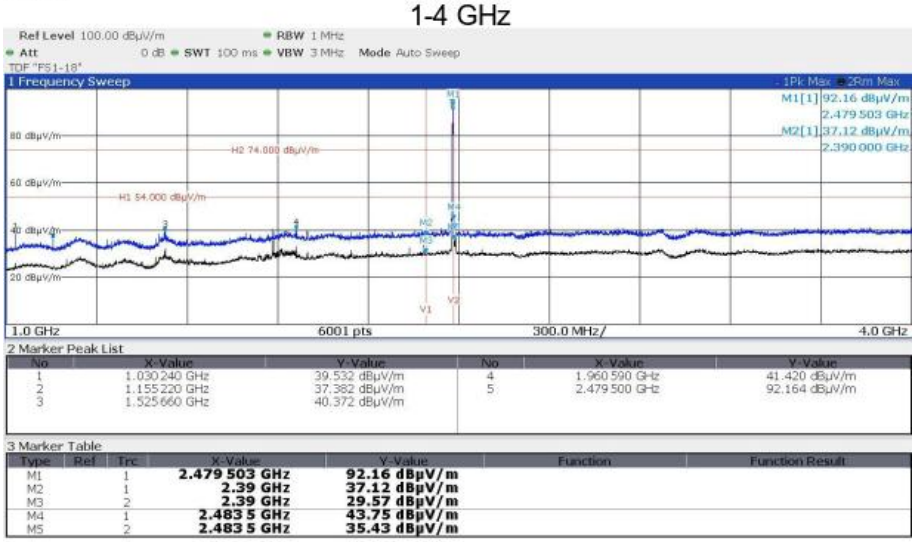
**FCC ID: XYN861A** **IC ID: 8748A-861A**

18-25 GHz

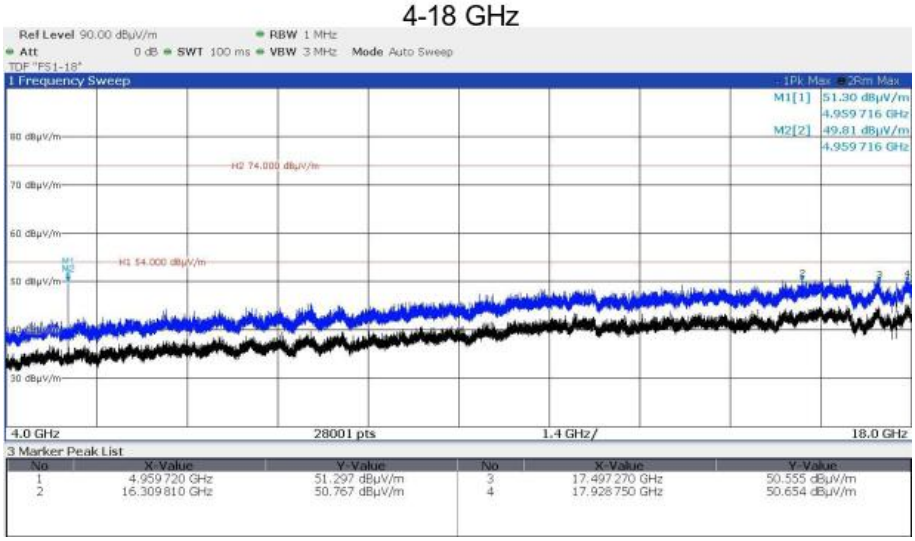



Channel 39 (2480 MHz)

1-4 GHz



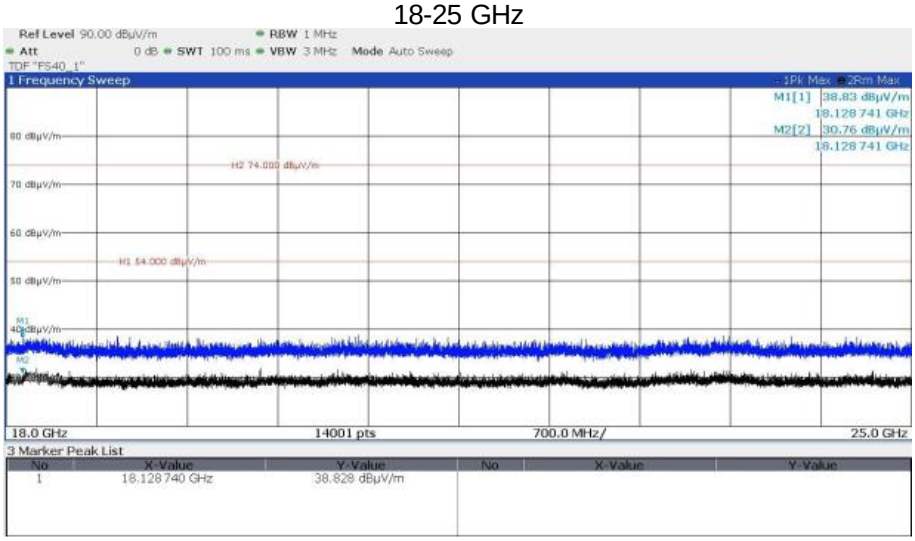

4-18 GHz




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

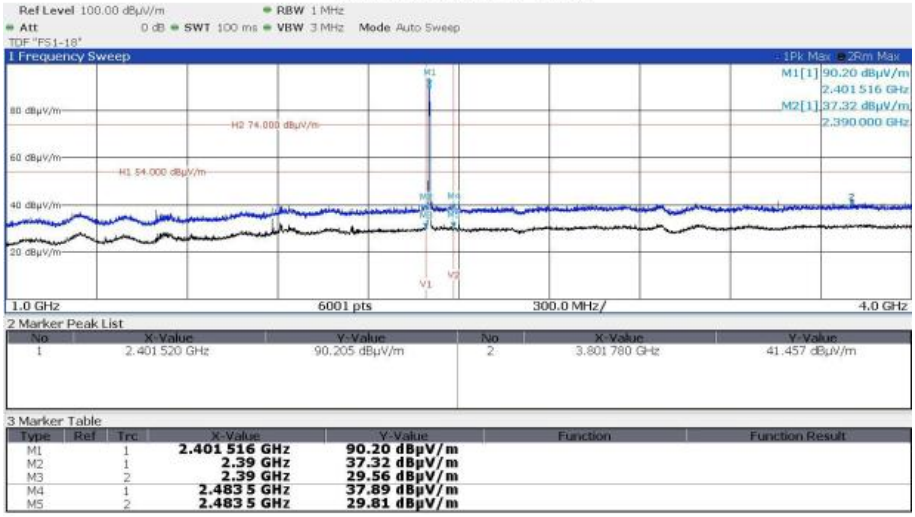
18-25 GHz



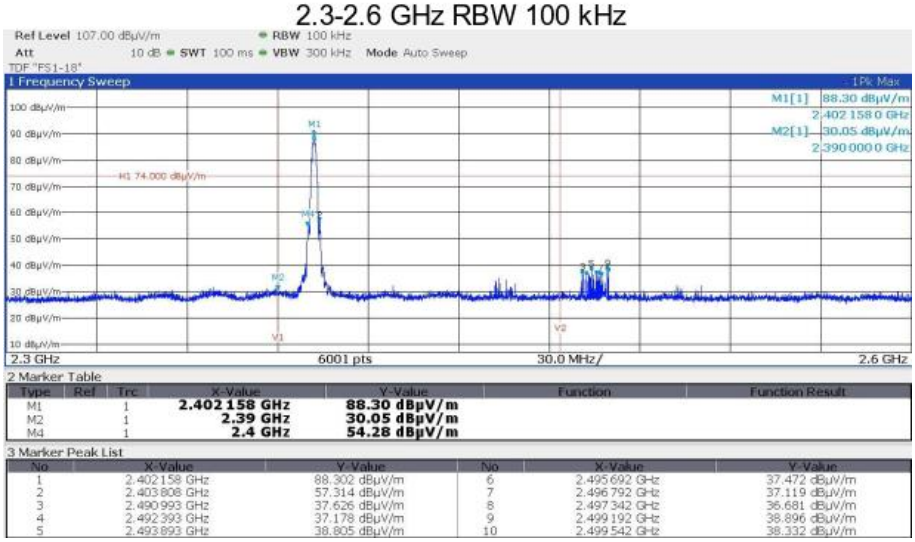

**2Mbps:**

Channel 37 (2402 MHz)

1-4 GHz RBW 1 MHz




2.3-2.6 GHz RBW 100 kHz

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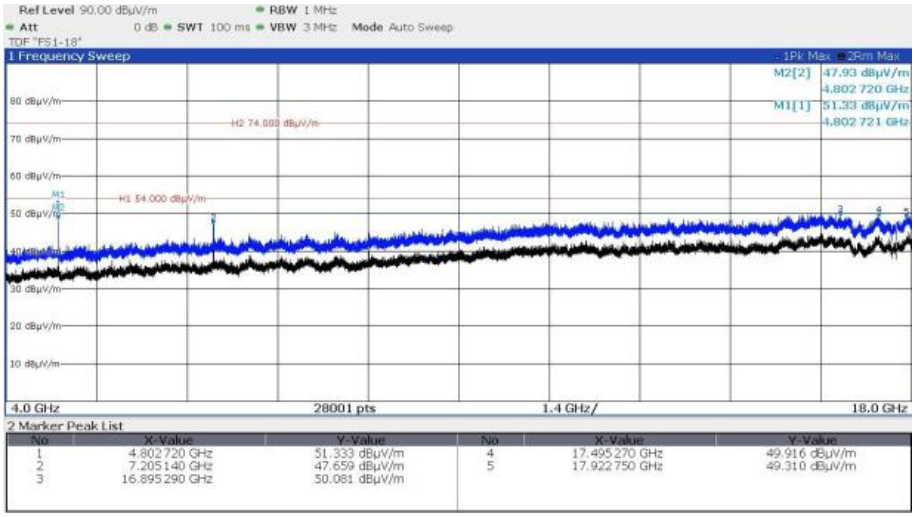
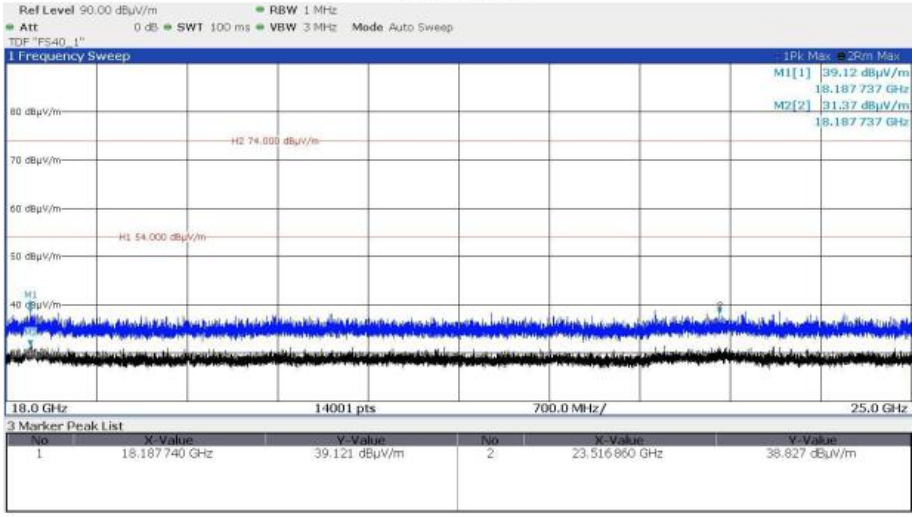
**FCC ID: XYN861A** **IC ID: 8748A-861A**

4-18 GHz

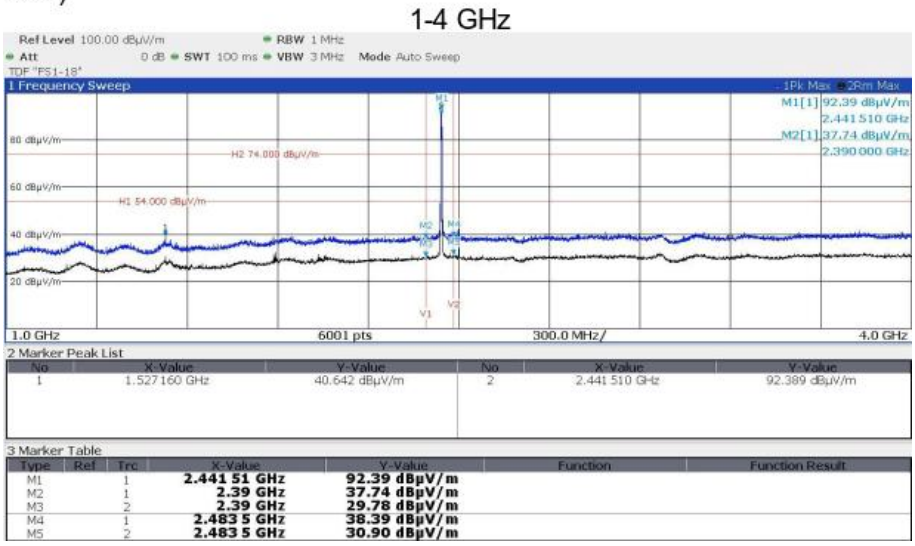



18-25 GHz




Channel 18 (2442 MHz)

1-4 GHz

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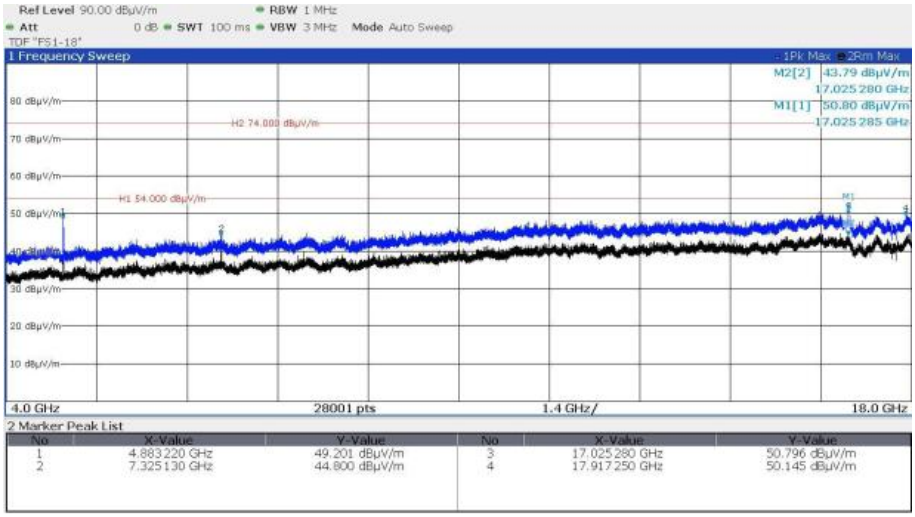
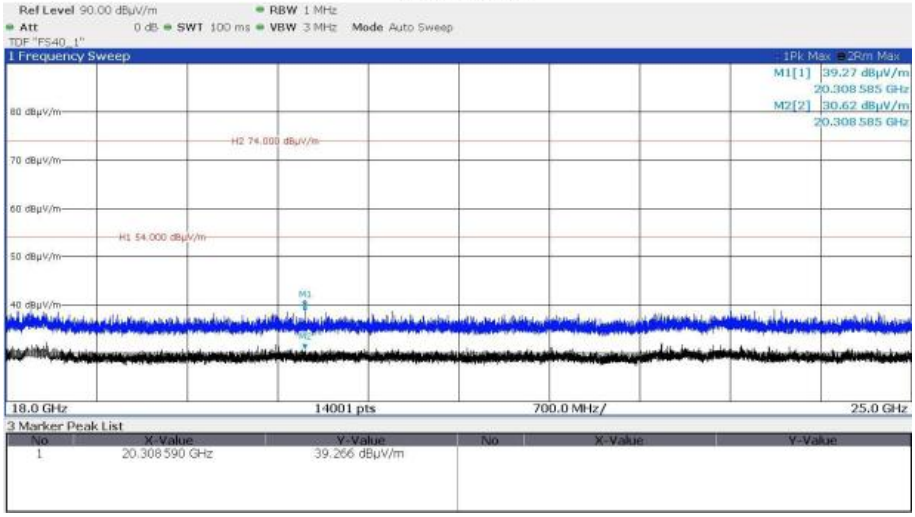
**FCC ID: XYN861A** **IC ID: 8748A-861A**

4-18 GHz




18-25 GHz

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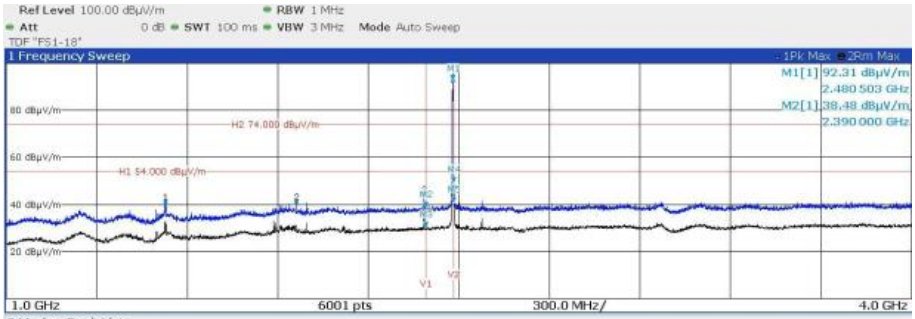
**FCC ID: XYN861A** **IC ID: 8748A-861A**

Channel 39 (2480 MHz)

1-4 GHz



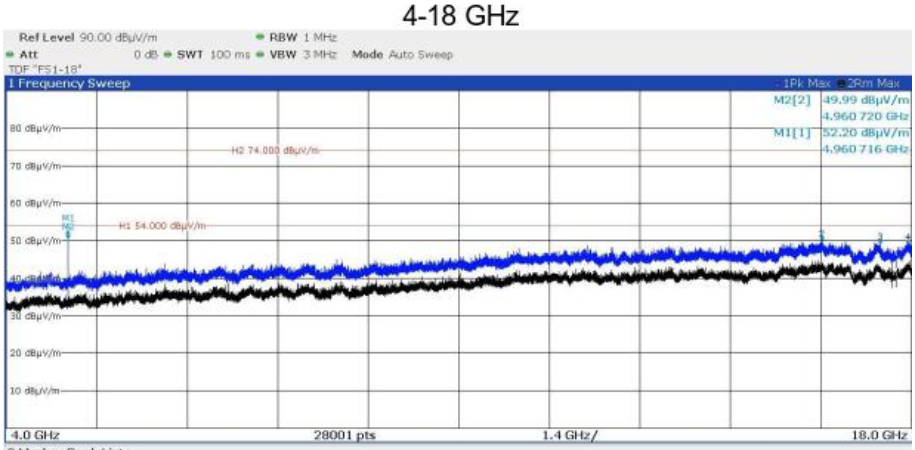

2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 1.527 160 GHz | 41.179 dBµV/m | 3 | 2.384 020 GHz | 44.101 dBµV/m |
| 2 | 1.961 590 GHz | 41.226 dBµV/m | 4 | 2.480 500 GHz | 92.305 dBµV/m |

3 Marker Table

| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **2.480 503 GHz** | **92.31 dBµV/m** | | |
| M2 | | 1 | **2.39 GHz** | **38.48 dBµV/m** | | |
| M3 | | 2 | **2.39 GHz** | **29.87 dBµV/m** | | |
| M4 | | 1 | **2.483 5 GHz** | **48.97 dBµV/m** | | |
| M5 | | 2 | **2.483 5 GHz** | **40.60 dBµV/m** | | |

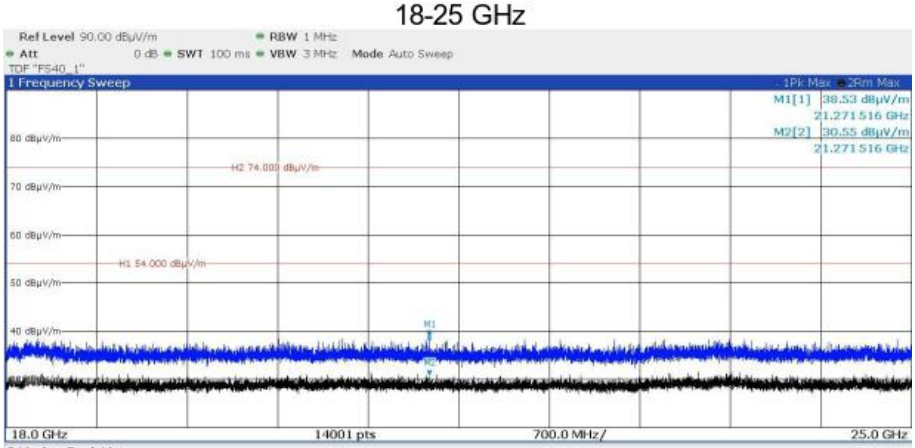
4-18 GHz




2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 4.960 720 GHz | 52.204 dBµV/m | 3 | 17.513 770 GHz | 49.850 dBµV/m |
| 2 | 16.608 800 GHz | 50.544 dBµV/m | 4 | 17.943 250 GHz | 49.716 dBµV/m |

18-25 GHz




3 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 21.271 520 GHz | 38.525 dBµV/m | | | |

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

**FCC ID: XYN861A** **IC ID: 8748A-861A**

Radiated limits according to FCC Part 15, Section 15.209 for spurious emissions which fall in restricted bands:

| Frequency (MHz) | 15.209 Limits (µV/m) | Measurement distance (m) |
|---|---|---|
| 0.009 - -0.49 | 2400/f(kHz) | 300 |
| 0.49 – 1.705 | 24000/f(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

Radiated limits according to RSS-Gen, 8.9 for spurious emissions which fall in restricted bands:

| Frequency (MHz) | RSS-Gen Limits (µA/m) | Measurement distance (m) |
|---|---|---|
| 0.009 - -0.49 | 63.7/f(kHz) | 300 |
| 0.49 – 1.705 | 63.7/f(kHz) | 30 |
| 1.705 – 30.0 | 0.08 | 30 |

| Frequency (MHz) | RSS-Gen Limits (µV/m) | Measurement distance (m) |
|---|---|---|
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

Limit according to FCC Part 15, Section 15.247(d) for emissions falling not in restricted bands:

| Frequency (MHz) | Spurious emission limit |
|---|---|
| Below 1000 | 20 dB below the highest level of the desired power |
| Above 1000 | 20 dB below the highest level of the desired power |

Attenuation below the general limits specified in Section 15.209(a) is not required.

Limit according to RSS-247, 5.5 for emissions falling not in restricted bands:

| Frequency (MHz) | Spurious emission limit |
|---|---|
| Below 1000 | 20 dB below the highest level of the desired power |
| Above 1000 | 20 dB below the highest level of the desired power |

Attenuation below the general limits specified in RSS-Gen is not required.

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**FCC ID: XYN861A** **IC ID: 8748A-861A**

**Restricted bands of operation:**

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 – 0.110 | 16.42 – 16.423 | 399.9 – 410 | 4.5 – 5.15 |
| 0.495 – 0.505 | 16.69475 – 16.69525 | 608 – 614 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 960 – 1240 | 7.25 – 7.75 |
| 4.125 – 4.128 | 25.5 – 25.67 | 1300 – 1427 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 37.5 – 38.25 | 1435 – 1626.5 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 73 – 74.6 | 1645.5 – 1646.5 | 9.3 – 9.5 |
| 6.215 – 6.218 | 74.8 – 75.2 | 1660 – 1710 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 108 – 121.94 | 1718.8 – 1722.2 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 123 – 138 | 2200 – 2300 | 14.47 – 14.5 |
| 8.291 – 8.294 | 149.9 – 150.05 | 2310 – 2390 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.52475 – 156.52525 | 2483.5 – 2500 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 156.7 – 156.9 | 2690 – 2900 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 162.0125 – 167.17 | 3260 – 3267 | 23.6 – 24.0 |
| 12.29 – 12.293 | 167.72 – 173.2 | 3332 – 3339 | 31.2 – 31.8 |
| 12.51975 – 12.52025 | 240 – 285 | 3345.8 – 3358 | 36.43 – 36.5 |
| 12.57675 – 12.57725 | 322 – 335.4 | 3600 – 4400 | Above 38.6 |

RSS-Gen, Table 6 – Restricted Frequency Bands

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 12.57675 - 12.57725 | 399.9 - 410 | 7.250 - 7.750 |
| 0.495 - 0.505 | 13.36 - 13.41 | 608 - 614 | 8.025 – 8.500 |
| 2.1735 - 2.1905 | 16.42 - 16.423 | 960 - 1427 | 9.0 - 9.2 |
| 3.020 - 3.026 | 16.69475 - 16.69525 | 1435 - 1626.5 | 9.3 - 9.5 |
| 4.125 - 4.128 | 16.80425 - 16.80475 | 1645.5 - 1646.5 | 10.6 - 12.7 |
| 4.17725 - 4.17775 | 25.5 - 25.67 | 1660 - 1710 | 13.25 - 13.4 |
| 4.20725 - 4.20775 | 37.5 - 38.25 | 1718.8 - 1722.2 | 14.47 - 14.5 |
| 5.677 - 5.683 | 73 - 74.6 | 2200 - 2300 | 15.35 - 16.2 |
| 6.215 - 6.218 | 74.8 - 75.2 | 2310 - 2390 | 17.7 - 21.4 |
| 6.26775 - 6.26825 | 108 – 138 | 2483.5 - 2500 | 22.01 - 23.12 |
| 6.31175 - 6.31225 | 149.9 - 150.05 | 2655 - 2900 | 23.6 - 24.0 |
| 8.291 - 8.294 | 156.52475 - 156.52525 | 3260 – 3267 | 31.2 - 31.8 |
| 8.362 - 8.366 | 156.7 - 156.9 | 3332 - 3339 | 36.43 - 36.5 |
| 8.37625 - 8.38675 | 162.0125 - 167.17 | 3345.8 - 3358 | Above 38.6 |
| 8.41425 - 8.41475 | 167.72 - 173.2 | 3500 - 4400 | |
| 12.29 - 12.293 | 240 – 285 | 4500 - 5150 | |
| 12.51975 - 12.52025 | 322 - 335.4 | 5350 - 5460 | |

The requirements are **FULFILLED.**

**Remarks:** The measurement was performed up to the 10th harmonic. Only the worst-case plots are listed.

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**FCC ID: XYN861A** **IC ID: 8748A-861A**

## 5.5 Antenna application

### 5.5.1 Applicable standard

According to FCC Part 15C, Section 15.203:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna with -2 dBi. No other antenna can be used with the device.

The supplied antenna meets the requirements of part 15.203 and 15.204.

**Remarks:** None.

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FCC ID: XYN861A IC ID: 8748A-861A

# 6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---|---|---|---|---|---|---|
| CPC 3 | FSW43 | 02-02/11-21-001 | 22/05/2024 | 22/05/2023 | | |
| MB | FSW43 | 02-02/11-21-001 | 22/05/2024 | 22/05/2023 | | |
| SER 1 | ESR 7 | 02-02/03-17-001 | 01/08/2024 | 01/08/2023 | | |
| | HFH 2 - Z 2 | 02-02/24-05-020 | 01/06/2025 | 01/06/2022 | 05/09/2024 | 05/09/2023 |
| SER 2 | VULB 9168 | 01-02/24-14-007 | 26/05/2024 | 26/05/2023 | | |
| | ESR 7 | 02-02/03-17-001 | 01/08/2024 | 01/08/2023 | | |
| | NW-2000-NB | 02-02/50-05-113 | | | | |
| | KK-EF393/U-16N-21N20 m | 02-02/50-12-018 | | | | |
| | KK-SD_7/8-2X21N-33,0M | 02-02/50-15-028 | | | | |
| | 50F-003 N 3 dB | 02-02/50-21-010 | | | | |
| SER 3 | FSW43 | 02-02/11-21-001 | 22/05/2024 | 22/05/2023 | | |
| | AMF-6D-01002000-22-10P | 02-02/17-15-004 | | | | |
| | LNA-40-18004000-33-5P | 02-02/17-20-002 | | | | |
| | 3117 | 02-02/24-05-009 | 12/07/2024 | 12/07/2023 | | |
| | BBHA 9170 | 02-02/24-05-013 | 21/03/2026 | 21/03/2023 | 22/01/2025 | 22/01/2024 |
| | BAM 4.5-P | 02-02/50-17-024 | | | | |
| | NCD | 02-02/50-17-025 | | | | |
| | KK-SF106-2X11N-6,5M | 02-02/50-18-016 | | | | |
| | KMS116-GL140SE-KMS116- | 02-02/50-20-026 | | | | |
| | BAT-EMC 2023.0.8.0 | 02-02/68-13-001 | | | | |

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