



# RF - TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : ZLX-15P-G2-US

Product Description : Powered speaker

Applicant : Bosch Security Systems, LLC

Address : 130 Perinton Parkway

Fairport; NY 14450, USA

Manufacturer : Bosch Security Systems, LLC

Address : 130 Perinton Parkway

Fairport; NY 14450, USA

Test Result according to the standards  
listed in clause 1 test standards:

**POSITIVE**

Test Report No. : **80168519-08 Rev\_0**

01. December 2023

Date of issue



Deutsche  
Akkreditierungsstelle  
D-PL-12030-01-03  
D-PL-12030-01-04

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ATTACHMENT E as separate supplement

ATTACHMENT F as separate supplement

# **1 TEST STANDARDS**

The tests were performed according to following standards:

## **FCC Rules and Regulations Part 15, Subpart A - General (September 2022)**

|                                   |                                               |
|-----------------------------------|-----------------------------------------------|
| 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 (September 2022)**

|                                                  |                                                                                                                                             |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 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 (October 2022)**

|                                    |                                                                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                          |

## 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 to his/her instructions.

### 2.3 General remarks

None.

### 2.4 Photo documentation

Detailed photos of EUT see ATTACHMENT E.

Detailed photos of Test Setup see ATTACHMENT F.

### 2.5 Equipment type

BLE device

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

The EUT is a powered speaker that outputs the amplified feeded audio signal on the built-in loudspeaker. The speaker can be operated on a pole or standing on the ground.

Number of tested samples: 1  
Serial number: 095598137809000001  
Firmware version: Host: V.1.0.0 BT:V1.0.1

### 2.7 Variants of the EUT

ZLX G2: ZLX-15P-G2, ZLX-15P-G2-EU, ZLX-15P-G2-US

## 2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan BLE:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 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            |

## 2.9 Transmit operating modes

The EUT allows the user to select the following modes:

- TX modulated 1 Mbps
- TX modulated 2 Mbps
- RX

## 2.10 Antenna

The EUT has only an internal antenna, no temporary connector and no external antenna to be connected.

| Type                 | Model             | Frequency Range | Gain   |
|----------------------|-------------------|-----------------|--------|
| Internal FPC antenna | PulseLARSEN W3921 | 2400-2500 MHz   | +1 dBi |

## 2.11 Power supply system utilised

Power supply voltage,  $V_{nom}$  : 120 V, 60 Hz

## 2.12 Peripheral devices and interface cables

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

- UART Cable: to interface the BT-Module Model : \_\_\_\_\_
- Laptop: to set BT-Module in test modes Model : \_\_\_\_\_
- \_\_\_\_\_ Model : \_\_\_\_\_

## 2.13 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.

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

| BLE V5   | Available channel | Tested channels | Power setting | Modulation | Modulation type | Data rate |
|----------|-------------------|-----------------|---------------|------------|-----------------|-----------|
| 802.15.1 | 0 - 39            | 37, 17, 39      | default       | DSSS       | GFSK            | 1 Mbps    |
| 802.15.1 | 0 - 36            | 37, 17, 39      | default       | DSSS       | GFSK            | 2 Mbps    |

### 2.13.1 Test jig

No test jig is used.

### 2.13.2 Test software

The special test software Qualcomm "BlueTest 3"

### 3 TEST RESULT SUMMARY

BLE device using digital modulation and operates in the 2400 MHz – 2483.5 MHz band:

| FCC Rule Part                | RSS Rule Part                | Description                         | Result     |
|------------------------------|------------------------------|-------------------------------------|------------|
| 15.207(a)                    | RSS-Gen, 8.8                 | AC power line conducted emissions   | passed     |
| 15.247(a)(2)                 | RSS-247, 5.2(a)              | -6 dB EBW                           | Not tested |
| 15.247(b)(3)<br>15.247(b)(4) | RSS-247, 5.4(d)              | Maximum peak conducted output power | Not tested |
| 15.247(d)<br>15.209          | RSS-247, 5.5<br>RSS-Gen, 8.9 | Spurious emissions                  | passed     |
| 15.247(e)                    | RSS-247, 5.2(b)              | PSD                                 | Not tested |
| 15.35(c)                     | RSS-Gen, 8.2                 | Pulsed operation                    | Not tested |
| 15.203                       |                              | Antenna requirement                 | Not tested |
| -                            | RSS-Gen, 6.7                 | 99 % Bandwidth                      | Not tested |

#### 3.1 Revision history of test report

| Test report No | Rev. | Issue Date       | Changes             |
|----------------|------|------------------|---------------------|
| 80168519-08    | 0    | 29 November 2023 | Initial test report |

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

#### 3.2 Final assessment

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

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

Testing commenced on : 07 August 2023

Testing concluded on : 27 November 2023

Checked by:

 Jürgen Pessinger  
2023.12.01 14:27:47  
+01'00'

Jürgen Pessinger  
Radio Team

Tested by:

 Lukas Scheuermann  
2023.12.01 12:38:45  
+01'00'

Lukas Scheuermann  
Radio Team

## 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%                  | $\pm 3.29 \text{ dB}$    |
| 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%                  | $\pm 3.53 \text{ dB}$    |
| Radiated Spurious Emissions     | 30 MHz to 1000 MHz      | 95%                  | $\pm 3.71 \text{ dB}$    |
| Radiated Spurious Emissions     | 1000 MHz to 10000 MHz   | 95%                  | $\pm 2.34 \text{ dB}$    |
| Peak conducted output power     | 902 MHz to 928 MHz      | 95%                  | $\pm 0.35 \text{ dB}$    |
| Conducted Spurious Emissions    | 9 kHz to 10000 MHz      | 95%                  | $\pm 2.15 \text{ dB}$    |

## 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 ISCED

### 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".

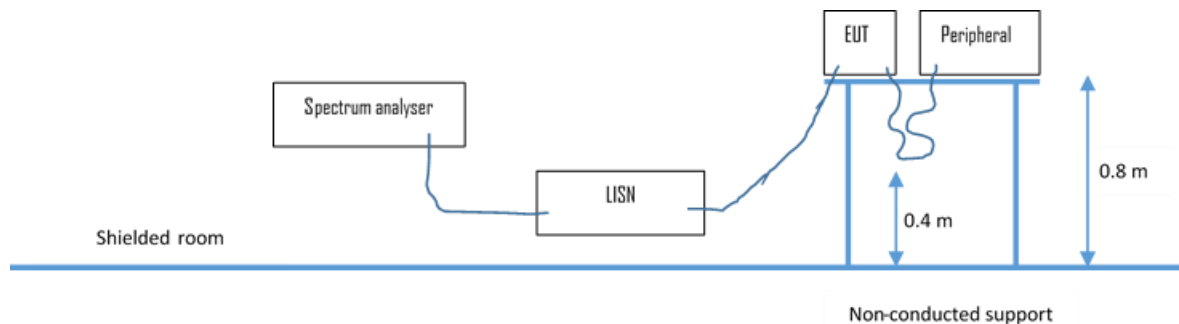
#### 4.5.2.1 Justification

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 dB $\mu$ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

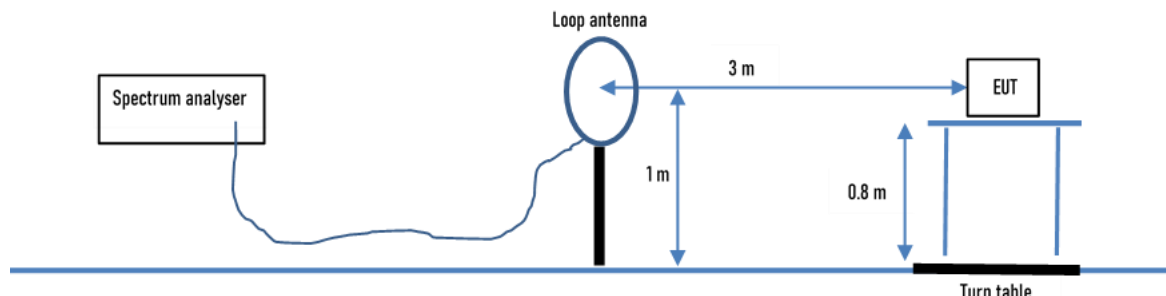
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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  $\Omega$  / 50  $\mu$ H (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.

#### 4.5.3.2 Radiated emission

##### 4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

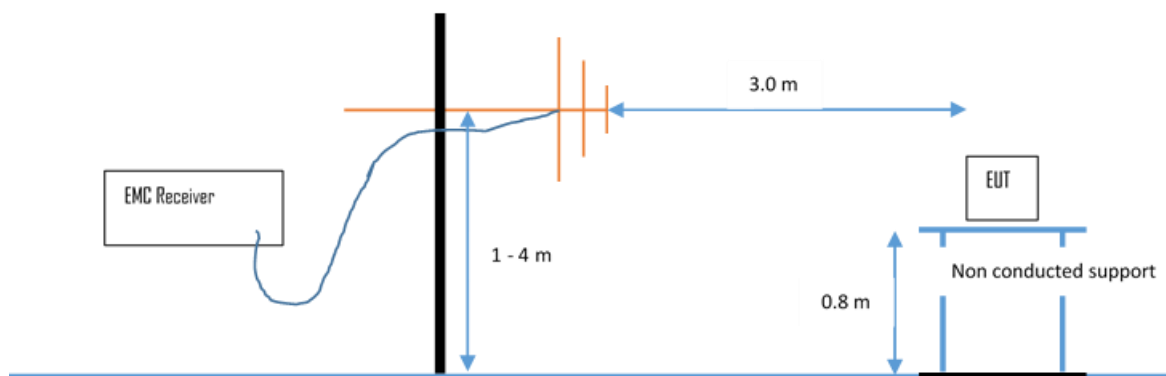
Test setup according ANSI C63.10



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 dB $\mu$ V/m is calculated by taking the reading from the EMI receiver (Level dB $\mu$ V) 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:

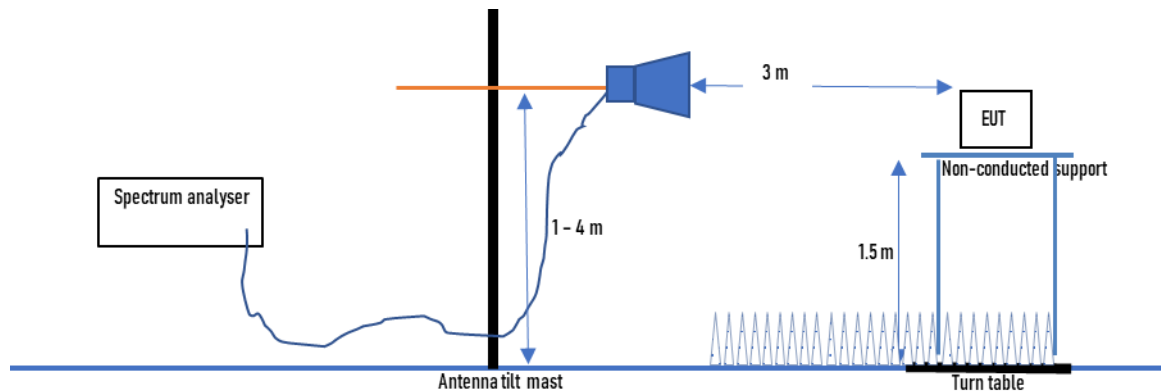
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

| Frequency<br>(MHz) | Level<br>(dB $\mu$ V) | + | Factor<br>(dB) | = | Level<br>(dB $\mu$ V/m) | - | Limit<br>(dB $\mu$ V/m) | = | Delta<br>(dB) |
|--------------------|-----------------------|---|----------------|---|-------------------------|---|-------------------------|---|---------------|
| 719.0              | 75.0                  | + | 32.6           | = | 107.6                   | - | 110.0                   | = | -2.4          |

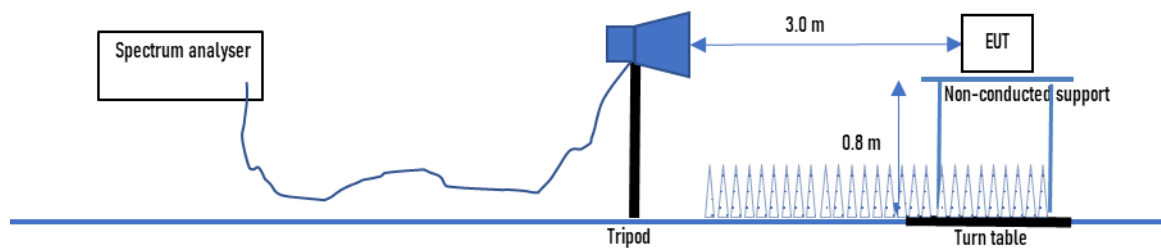
#### 4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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 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, 0.8 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 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.

## 5 TEST CONDITIONS AND RESULTS

### 5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

#### 5.1.1 Description of the test location

Test location: Shielded Room S2

#### 5.1.2 Photo documentation of the test set-up

See Attachment F for detailed photo documentation of the test set-up.

#### 5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

#### 5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

### 5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz  
 Min. limit margin **-7.9 dB**

Limit according to FCC Part 15, Section 15.207(a):

| Frequency of Emission (MHz) | Conducted limit (dBμV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency

Limit according to RSS-Gen 8.8:

| Frequency of Emission (MHz) | Conducted limit (dBμV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

**Remarks:**

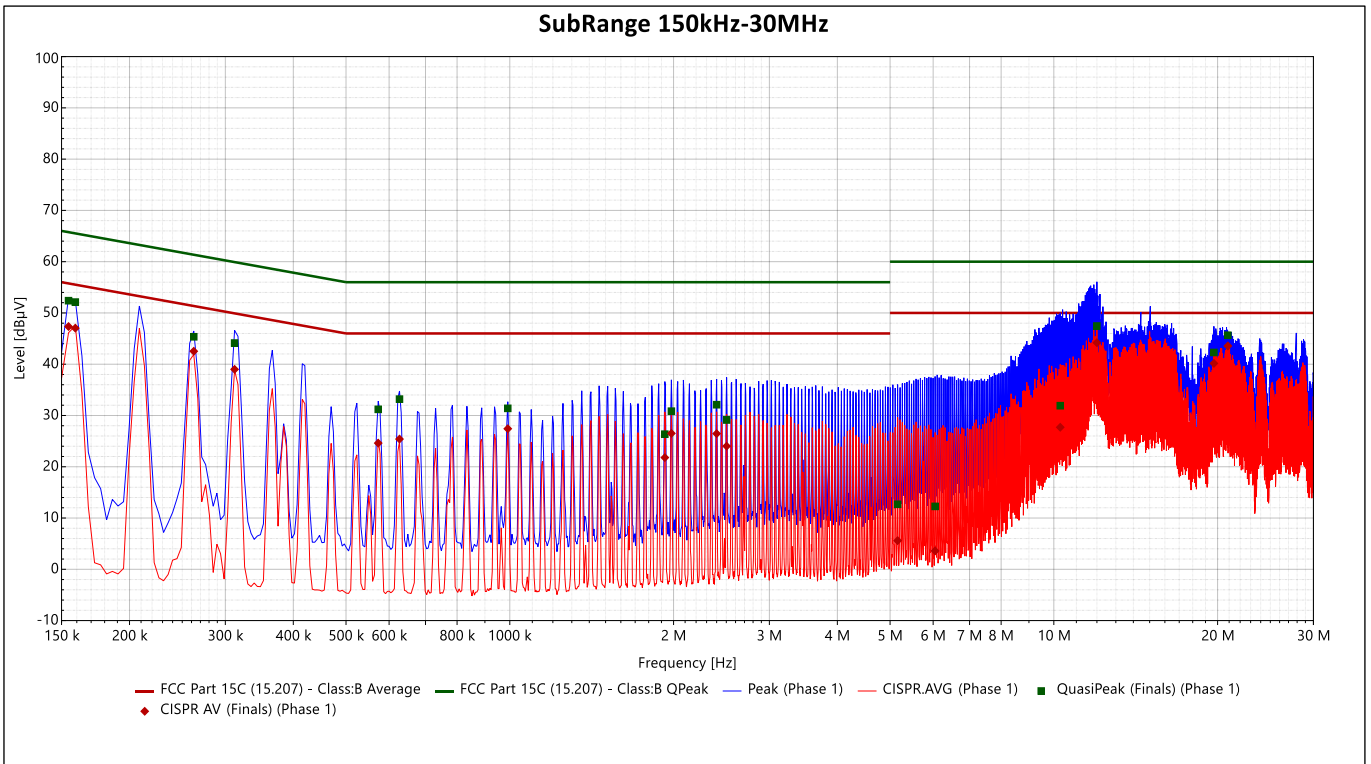
For detailed test result please refer to following test protocols.

## 5.1.6 Test protocol

Test point L1  
Operation mode: Transmission at 2.402 GHz  
Remarks: -

Result: passed

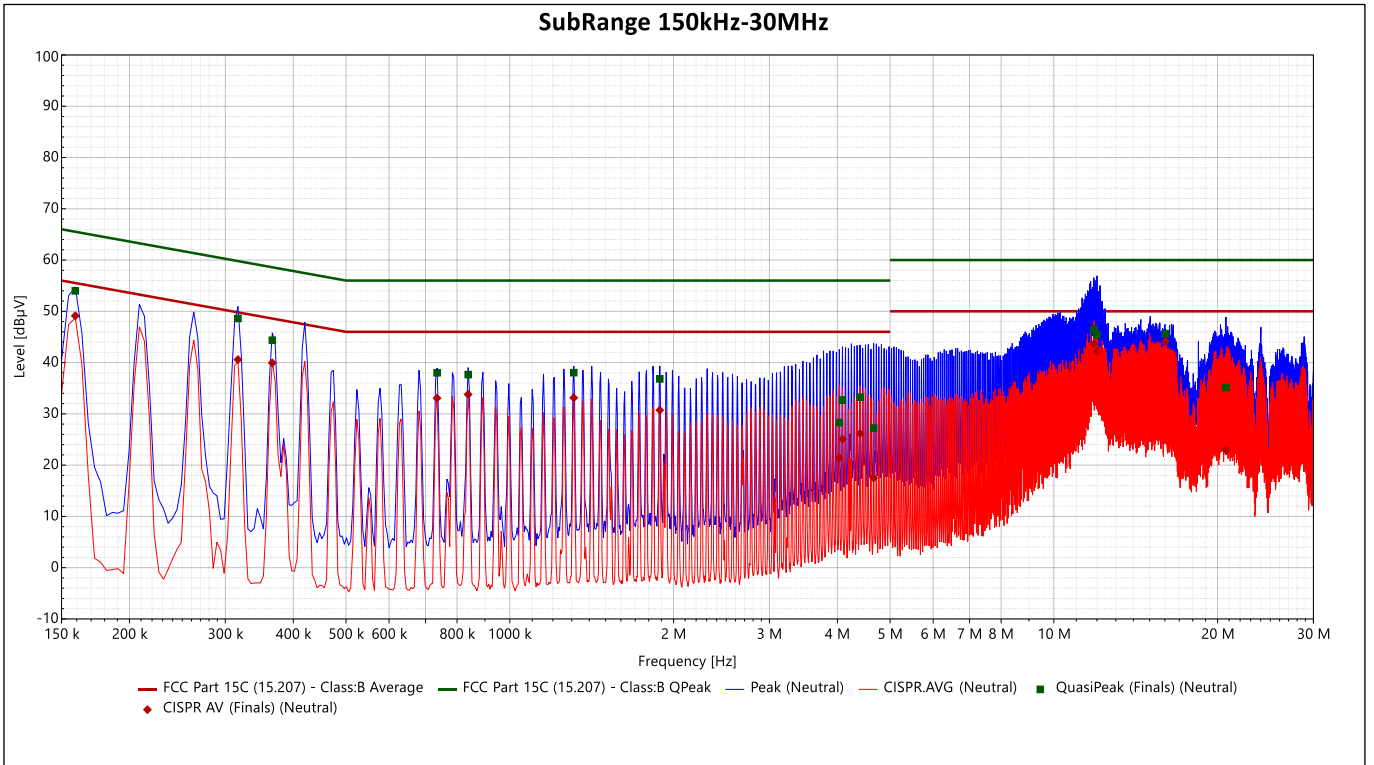
| Frequency (Hz) | QuasiPeak (dBμV) | QP Margin | QP Limit (dBμV) | CISPR AV (dBμV) | CISPR AV Margin | AV Limit (dBμV) | Line    | RBW (Hz) | Meas.Time (s) | Correction (dB) |
|----------------|------------------|-----------|-----------------|-----------------|-----------------|-----------------|---------|----------|---------------|-----------------|
| 154.5 k        | 52.389           | -13.366   | 65.754          | 47.348          | -8.406          | 55.754          | Phase 1 | 9000     | 1             | 10.105          |
| 159 k          | 52.116           | -13.4     | 65.516          | 47.042          | -8.474          | 55.516          | Phase 1 | 9000     | 1             | 10.106          |
| 262.5 k        | 45.353           | -15.999   | 61.352          | 42.53           | -8.822          | 51.352          | Phase 1 | 9000     | 1             | 10.129          |
| 312 k          | 44.133           | -15.784   | 59.917          | 38.999          | -10.918         | 49.917          | Phase 1 | 9000     | 1             | 10.142          |
| 573 k          | 31.202           | -24.798   | 56              | 24.614          | -21.386         | 46              | Phase 1 | 9000     | 1             | 10.193          |
| 627 k          | 33.19            | -22.81    | 56              | 25.399          | -20.601         | 46              | Phase 1 | 9000     | 1             | 10.197          |
| 991.5 k        | 31.393           | -24.607   | 56              | 27.417          | -18.583         | 46              | Phase 1 | 9000     | 1             | 10.252          |
| 1.9275 M       | 26.347           | -29.653   | 56              | 21.788          | -24.212         | 46              | Phase 1 | 9000     | 1             | 10.312          |
| 1.9815 M       | 30.842           | -25.158   | 56              | 26.51           | -19.49          | 46              | Phase 1 | 9000     | 1             | 10.314          |
| 2.4 M          | 32.102           | -23.898   | 56              | 26.463          | -19.537         | 46              | Phase 1 | 9000     | 1             | 10.357          |
| 2.5035 M       | 29.123           | -26.877   | 56              | 24.022          | -21.978         | 46              | Phase 1 | 9000     | 1             | 10.365          |
| 5.163 M        | 12.682           | -47.318   | 60              | 5.592           | -44.408         | 50              | Phase 1 | 9000     | 1             | 10.522          |
| 6.0495 M       | 12.266           | -47.734   | 60              | 3.595           | -46.405         | 50              | Phase 1 | 9000     | 1             | 10.615          |
| 10.275 M       | 31.906           | -28.094   | 60              | 27.704          | -22.296         | 50              | Phase 1 | 9000     | 1             | 10.779          |
| 11.9985 M      | 47.448           | -12.552   | 60              | 44.201          | -5.799          | 50              | Phase 1 | 9000     | 1             | 10.961          |
| 19.689 M       | 42.294           | -17.706   | 60              | 40.161          | -9.839          | 50              | Phase 1 | 9000     | 1             | 11.385          |
| 20.886 M       | 45.651           | -14.349   | 60              | 43.555          | -6.445          | 50              | Phase 1 | 9000     | 1             | 11.439          |



Test point N  
Operation mode: Transmission at 2.402 GHz  
Remarks: -

Result: passed

| Frequency (Hz) | QuasiPeak (dBμV) | QP Margin | QP Limit (dBμV) | CISPR AV (dBμV) | CISPR AV Margin | AV Limit (dBμV) | Line    | RBW (Hz) | Meas.Time (s) | Correction (dB) |
|----------------|------------------|-----------|-----------------|-----------------|-----------------|-----------------|---------|----------|---------------|-----------------|
| 159 k          | 53.986           | -11.53    | 65.516          | 49.116          | -6.4            | 55.516          | Neutral | 9000     | 1             | 10.137          |
| 316.5 k        | 48.608           | -11.19    | 59.798          | 40.586          | -9.212          | 49.798          | Neutral | 9000     | 1             | 10.182          |
| 366 k          | 44.356           | -14.235   | 58.591          | 39.936          | -8.655          | 48.591          | Neutral | 9000     | 1             | 10.195          |
| 735 k          | 38.007           | -17.993   | 56              | 33.056          | -12.944         | 46              | Neutral | 9000     | 1             | 10.241          |
| 838.5 k        | 37.658           | -18.342   | 56              | 33.786          | -12.214         | 46              | Neutral | 9000     | 1             | 10.249          |
| 1.311 M        | 38.04            | -17.96    | 56              | 33.126          | -12.874         | 46              | Neutral | 9000     | 1             | 10.31           |
| 1.887 M        | 36.816           | -19.184   | 56              | 30.72           | -15.28          | 46              | Neutral | 9000     | 1             | 10.342          |
| 4.0335 M       | 28.3             | -27.7     | 56              | 21.41           | -24.59          | 46              | Neutral | 9000     | 1             | 10.484          |
| 4.0875 M       | 32.698           | -23.302   | 56              | 25.064          | -20.936         | 46              | Neutral | 9000     | 1             | 10.489          |
| 4.4025 M       | 33.267           | -22.733   | 56              | 26.167          | -19.833         | 46              | Neutral | 9000     | 1             | 10.504          |
| 4.6635 M       | 27.226           | -28.774   | 56              | 17.505          | -28.495         | 46              | Neutral | 9000     | 1             | 10.512          |
| 11.8455 M      | 46.452           | -13.548   | 60              | 43.634          | -6.366          | 50              | Neutral | 9000     | 1             | 10.874          |
| 12.003 M       | 45.414           | -14.586   | 60              | 42.162          | -7.838          | 50              | Neutral | 9000     | 1             | 10.882          |
| 16.0395 M      | 45.672           | -14.328   | 60              | 44.157          | -5.843          | 50              | Neutral | 9000     | 1             | 11.059          |
| 20.7195 M      | 35.143           | -24.857   | 60              | 22.957          | -27.043         | 50              | Neutral | 9000     | 1             | 11.289          |



## 5.2 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER 1, SER 2, SER 3.**

### 5.2.1 Description of the test location

Test location: OATS 1  
 Test location: Anechoic chamber 1  
 Test distance: 3 m

### 5.2.2 Photo documentation of the test set-up

See Attachment F for detailed photo documentation of the test set-up.

### 5.2.3 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)).

### 5.2.4 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 SER1, SER2:

|              |              |                       |                  |
|--------------|--------------|-----------------------|------------------|
| 9kHz-150kHz  | RBW: 200 Hz  | Detector: Quasi peak* | Meas. Time: 1 s, |
| 150kHz-30MHz | RBW: 9 kHz   | Detector: Quasi peak* | Meas. Time: 1 s, |
| 30MHz-1GHz   | RBW: 120 MHz | Detector: Quasi peak  | Meas. Time: 1 s, |

\*AV Detector in the ranges 9-90kHz and 110-490kHz

FCC-ID: ESV-ZLXG2 IC-ID: 1249A-ZLXG2

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:

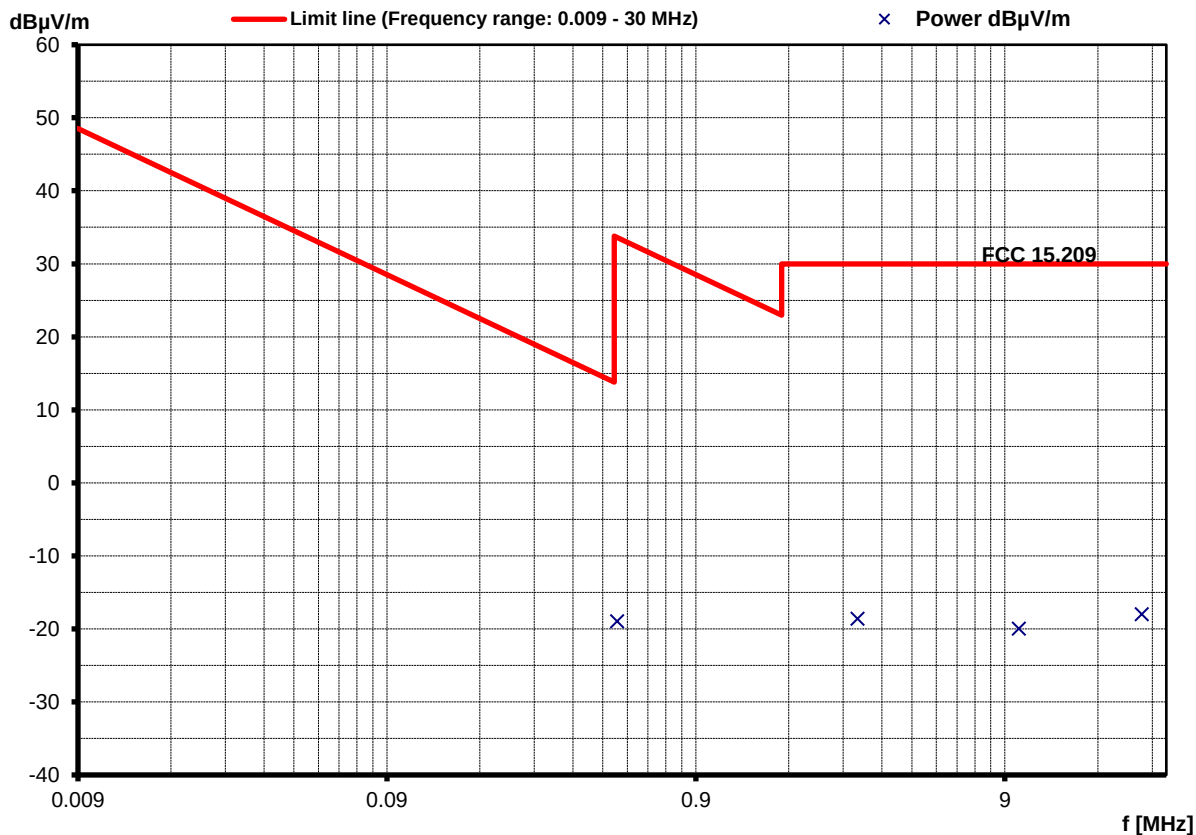
Spectrum analyser settings:

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

## 5.2.5 Test result

9 kHz < f < 30 MHz:

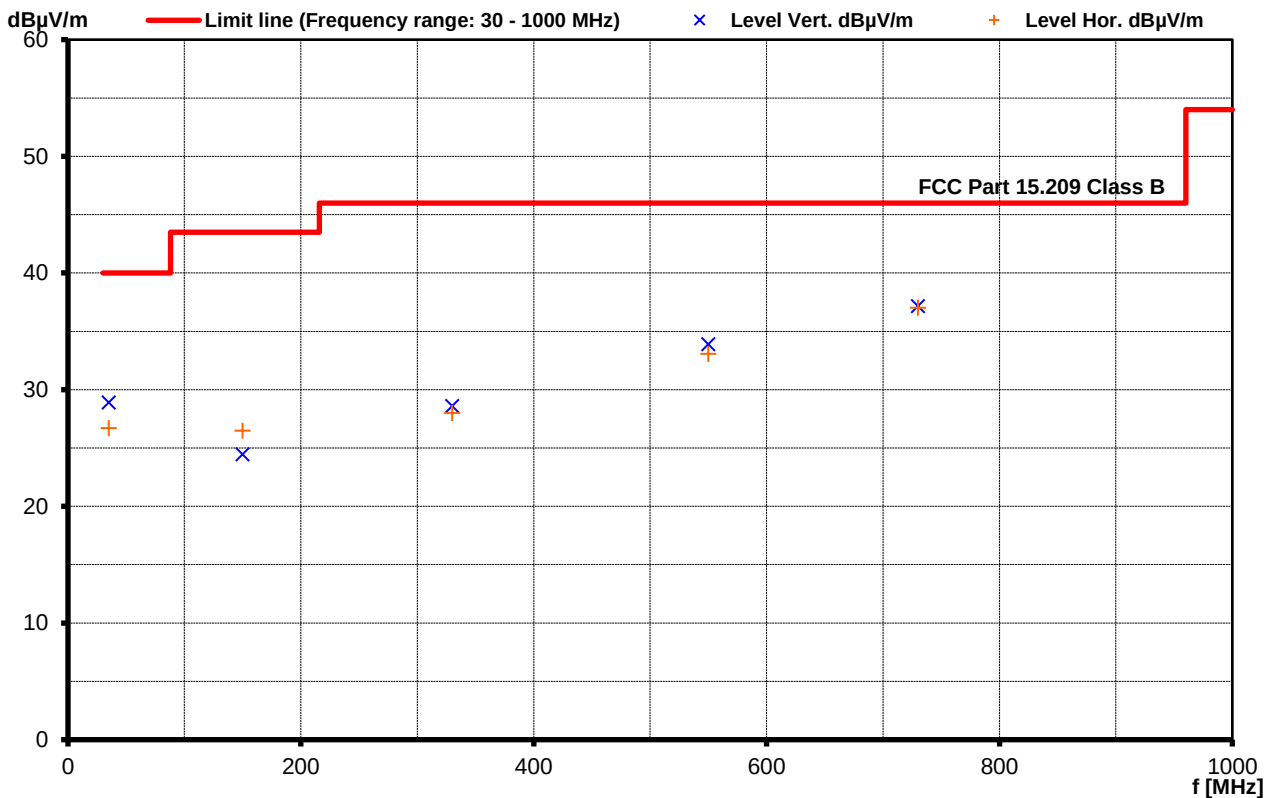
| Frequency (MHz) | Reading (dBμV) | Correction * (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Dlimit (dB) |
|-----------------|----------------|-------------------|-------------------------|----------------|-------------|
| 0.010           | -12.0          | -59.4             | -71.4                   | 47.6           | -119.0      |
| 0.100           | 3.7            | 18.3              | -58.0                   | 27.6           | -85.6       |
| 0.500           | 4.0            | 17.1              | -18.9                   | 33.6           | -52.5       |
| 3.000           | 3.5            | 17.9              | -18.6                   | 30.0           | -48.6       |
| 10.000          | 3.6            | 16.4              | -20.0                   | 30.0           | -50.0       |
| 25.000          | 3.7            | 18.3              | -18.0                   | 30.0           | -48.0       |



Note: No emissions detected in the frequency range below 1 GHz. The recorded values are solely noise values of the OATS.

30 MHz < f < 1000 MHz:

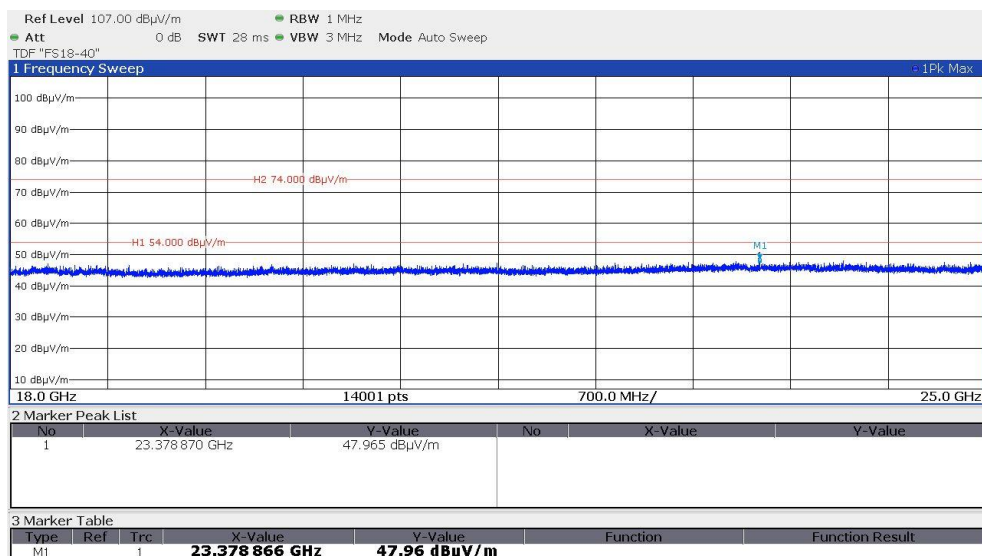
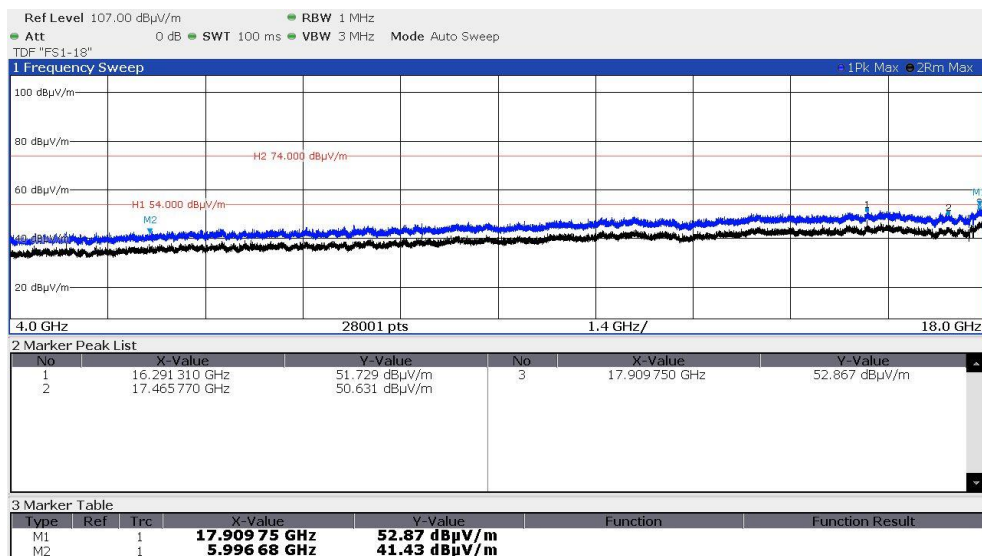
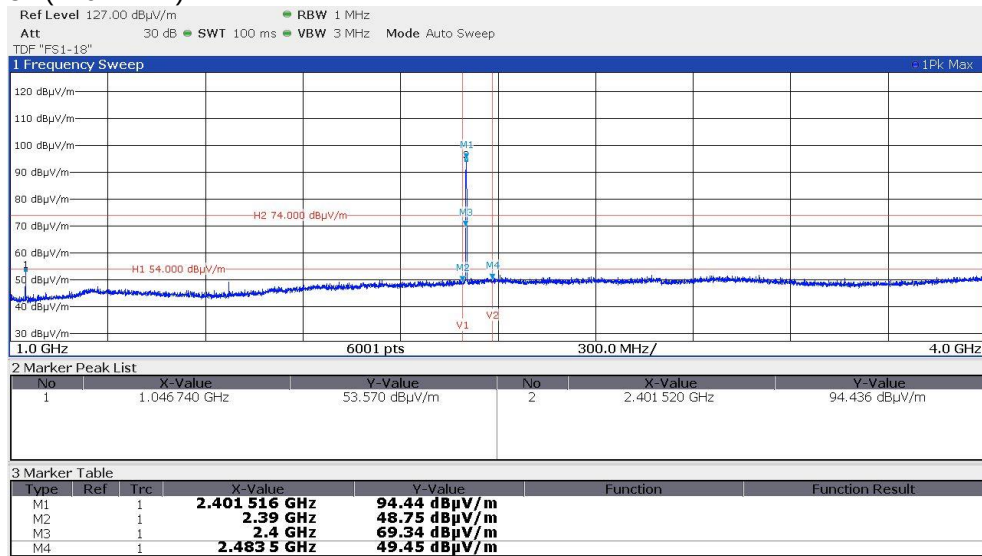
| Frequency (MHz) | Reading Vert. (dBμV) | Reading Hor. (dBμV) | Correct. Vert. (dB) | Correct. Hor. (dB) | Level Vert. (dBμV/m) | Level Hor. (dBμV/m) | Limit (dBμV/m) | Dlimit (dB) |
|-----------------|----------------------|---------------------|---------------------|--------------------|----------------------|---------------------|----------------|-------------|
| 35.00           | 15.0                 | 14.0                | 13.9                | 12.7               | 28.9                 | 26.7                | 40.0           | -11.1       |
| 150.00          | 10.5                 | 11.7                | 13.9                | 14.8               | 24.4                 | 26.5                | 43.5           | -17.0       |
| 330.00          | 10.8                 | 10.6                | 17.8                | 17.4               | 28.6                 | 28.0                | 46.0           | -17.4       |
| 550.00          | 9.9                  | 9.3                 | 24.0                | 23.8               | 33.9                 | 33.1                | 46.0           | -12.1       |
| 730.00          | 9.4                  | 9.8                 | 27.8                | 27.2               | 37.2                 | 37.0                | 46.0           | -8.8        |



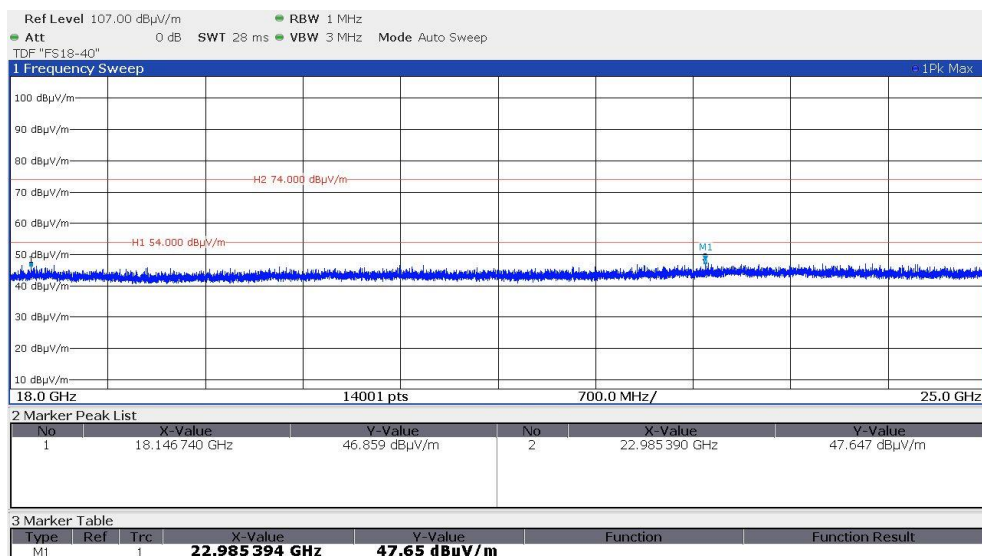
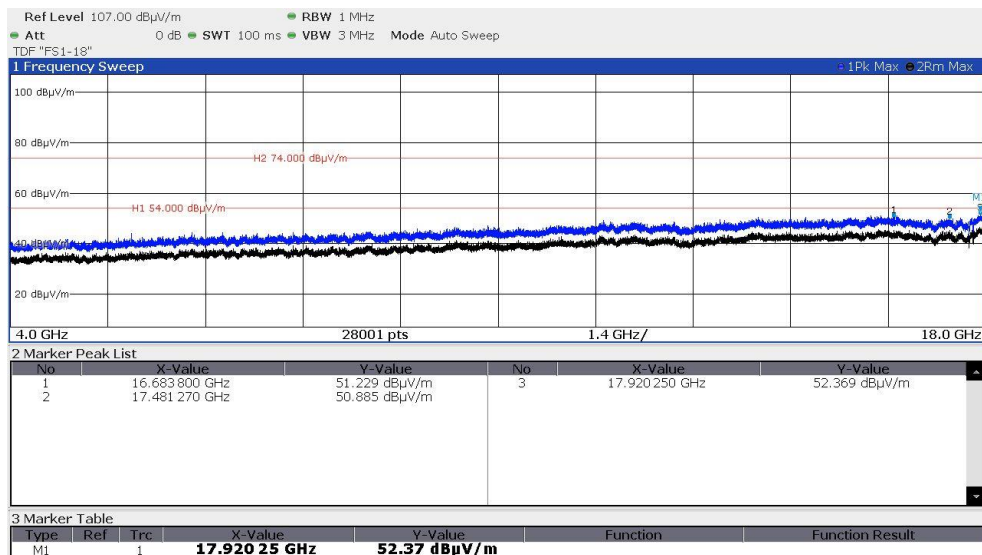
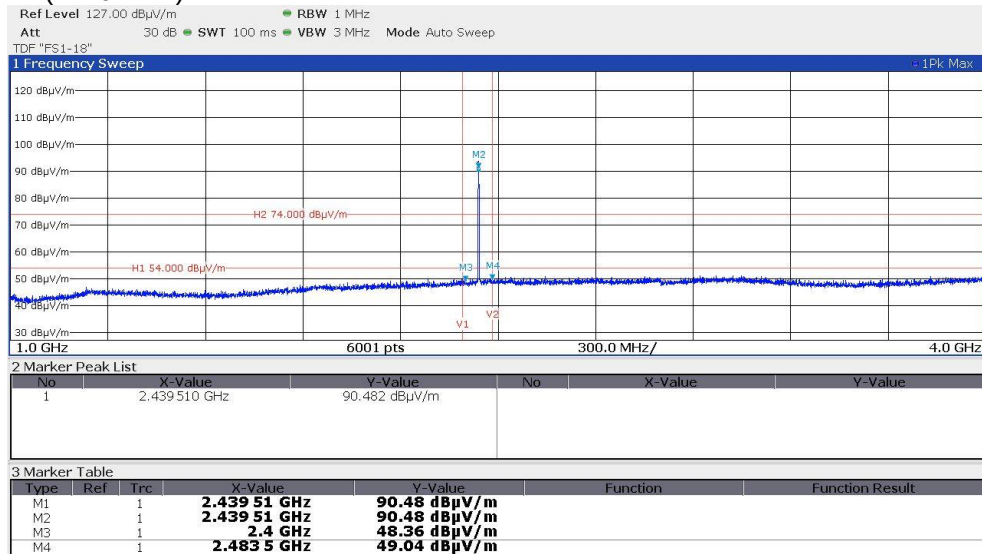
Note: No emissions detected in the frequency range below 1 GHz. The recorded values are solely noise values of the OATS.

f > 1000 MHz

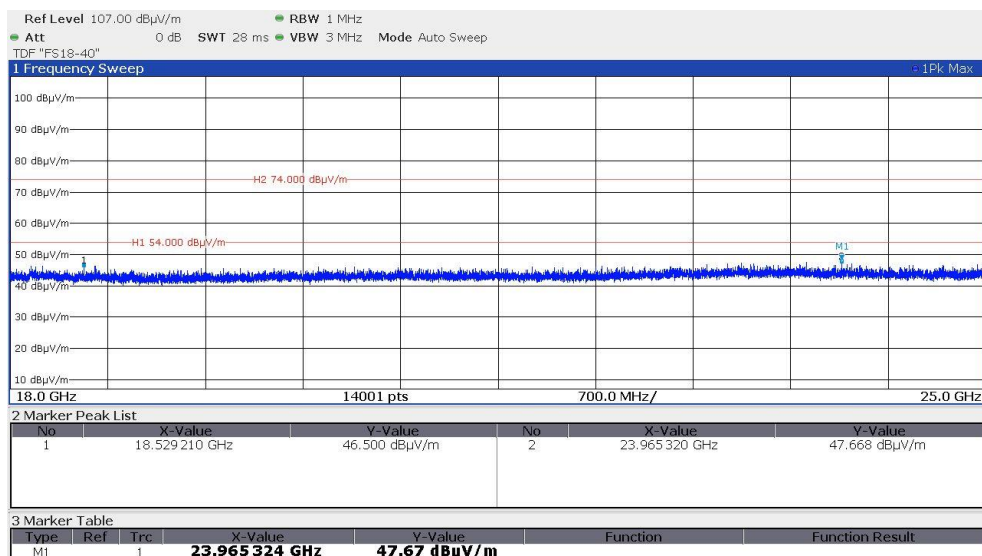
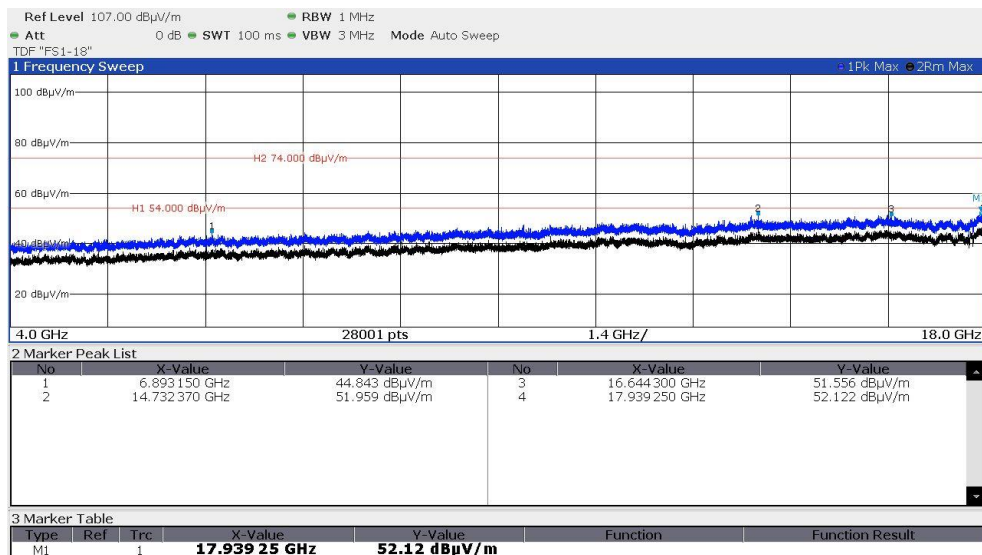
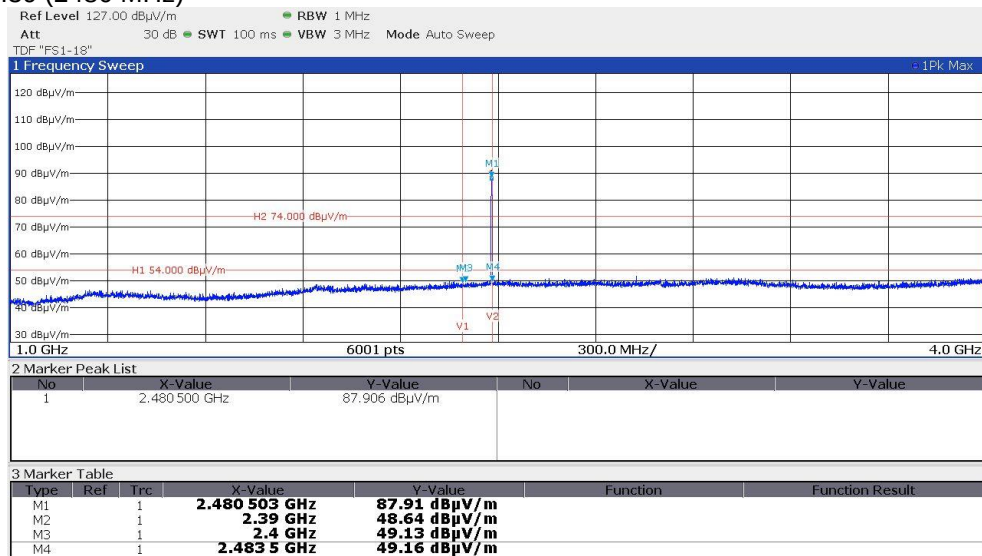
1) Measurement of emissions according to General Limit specified in section 15.209(a) / RSS-Gen 8.9:  
BLE 1 Mbps CH37 (2402 MHz)



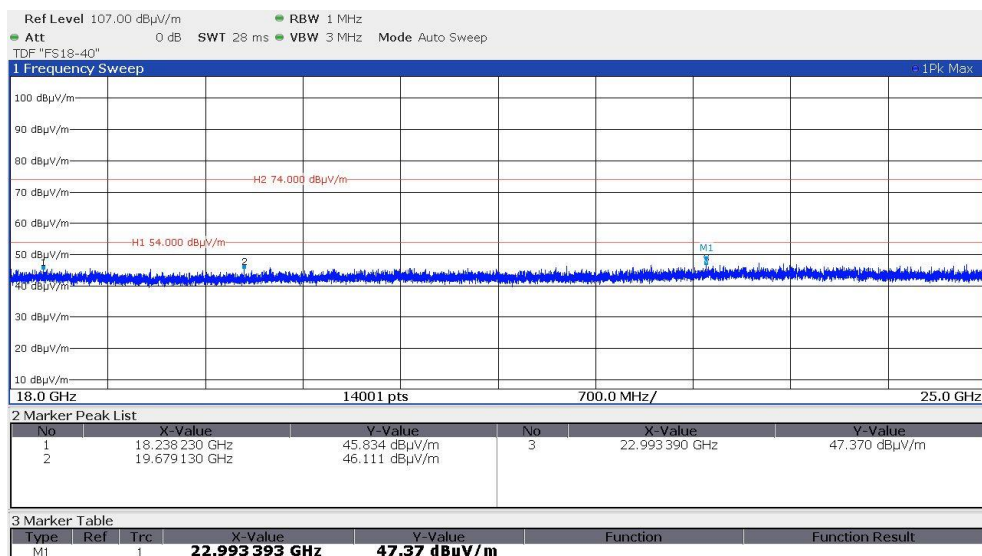
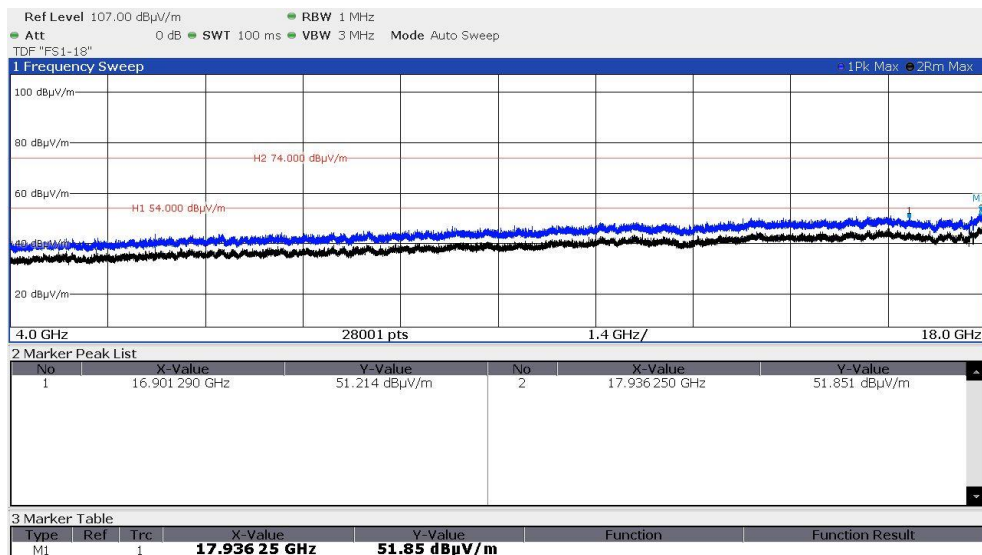
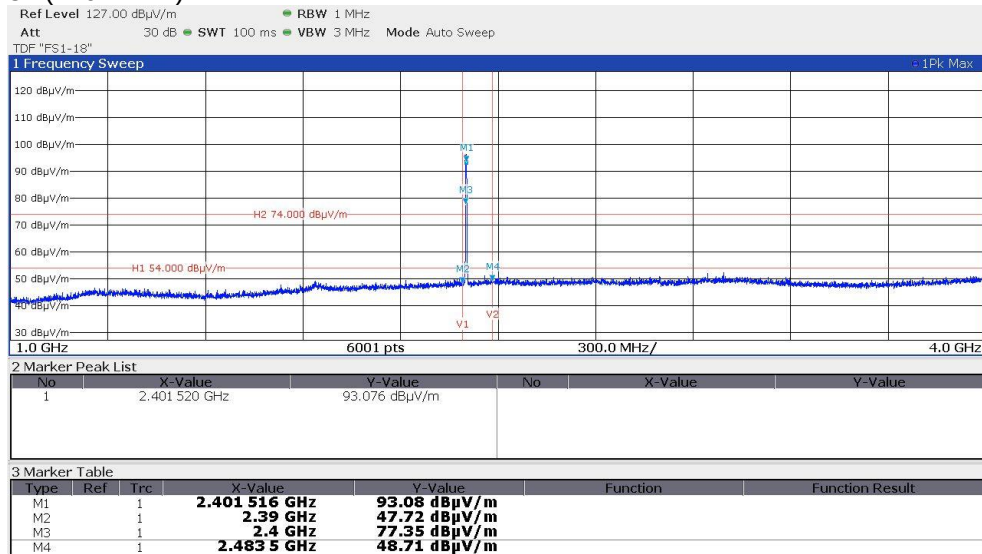
BLE 1 Mbps CH17 (2440 MHz)



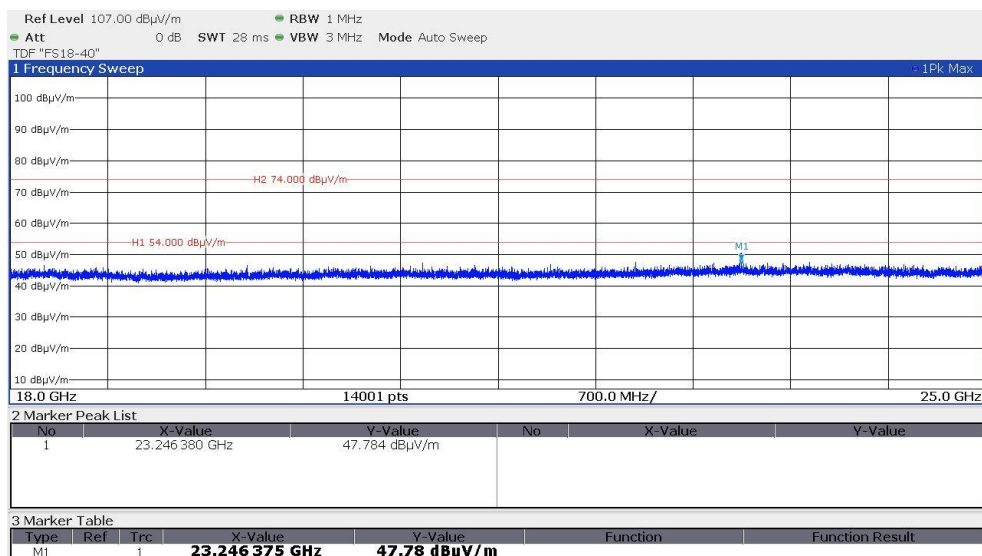
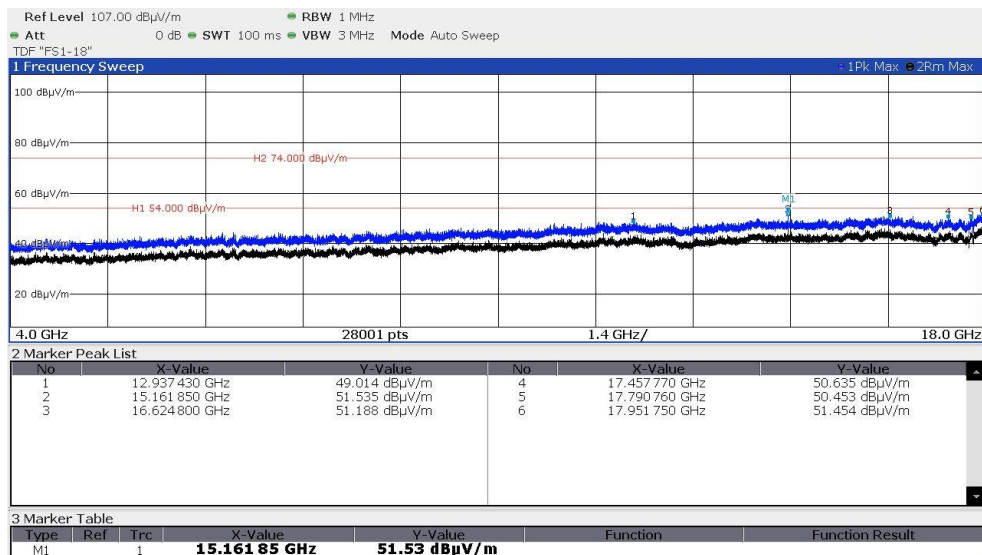
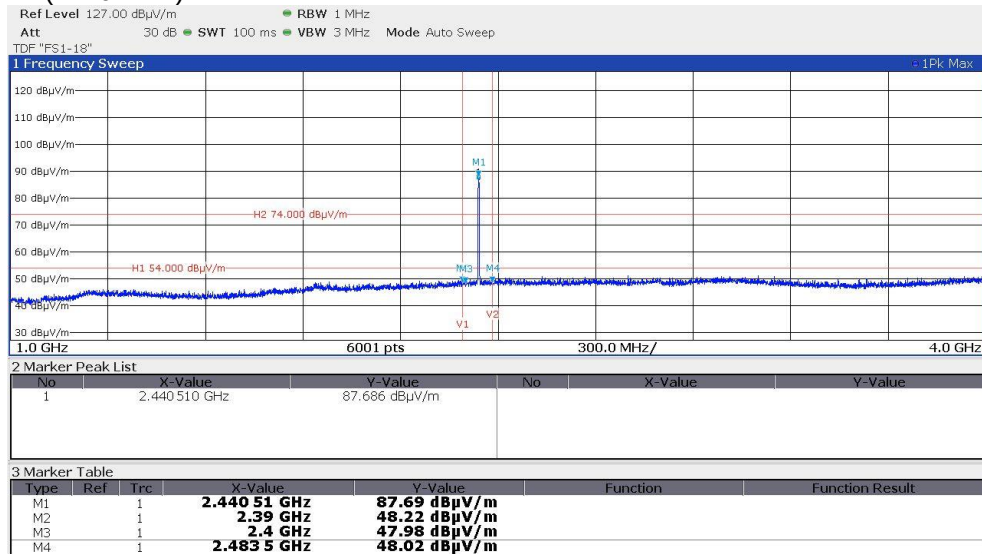
BLE 1 Mbps CH39 (2480 MHz)



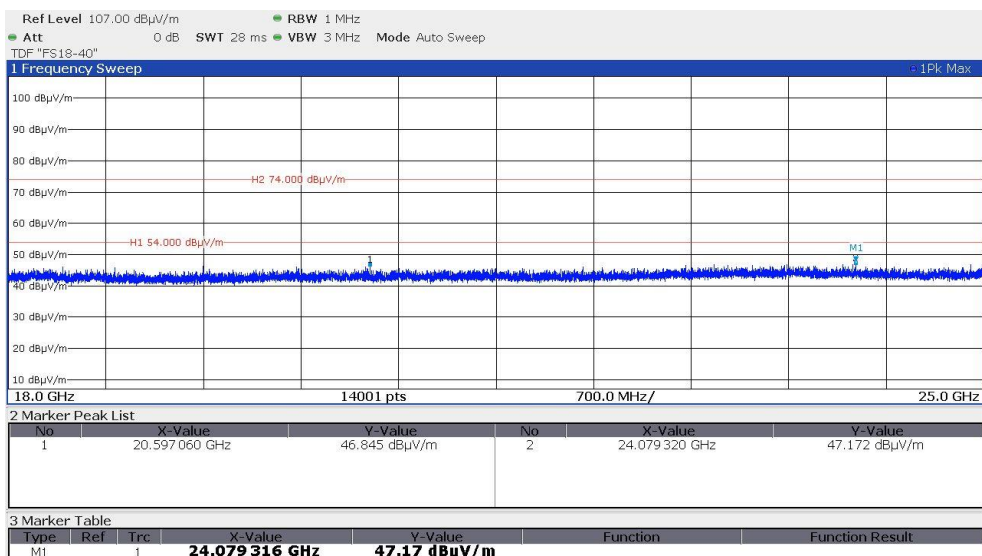
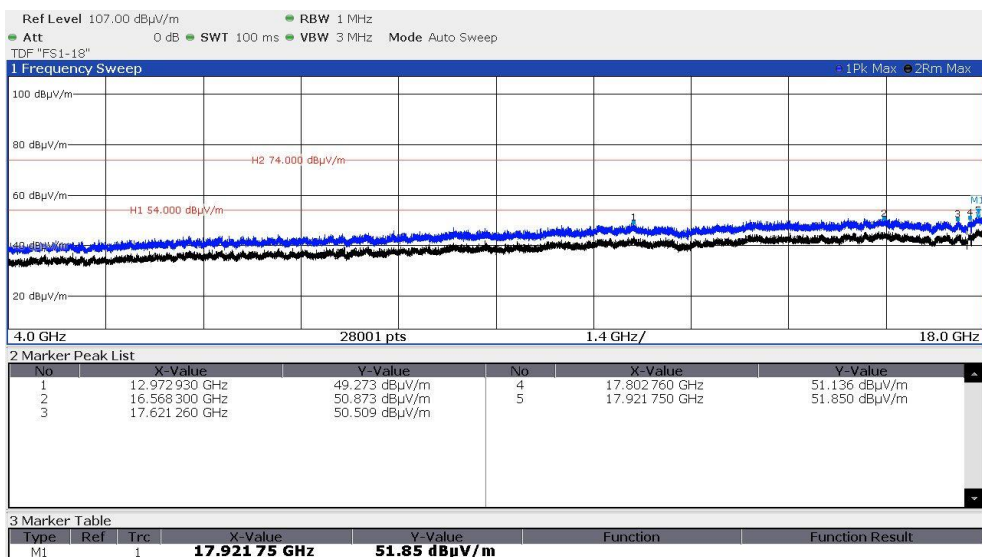
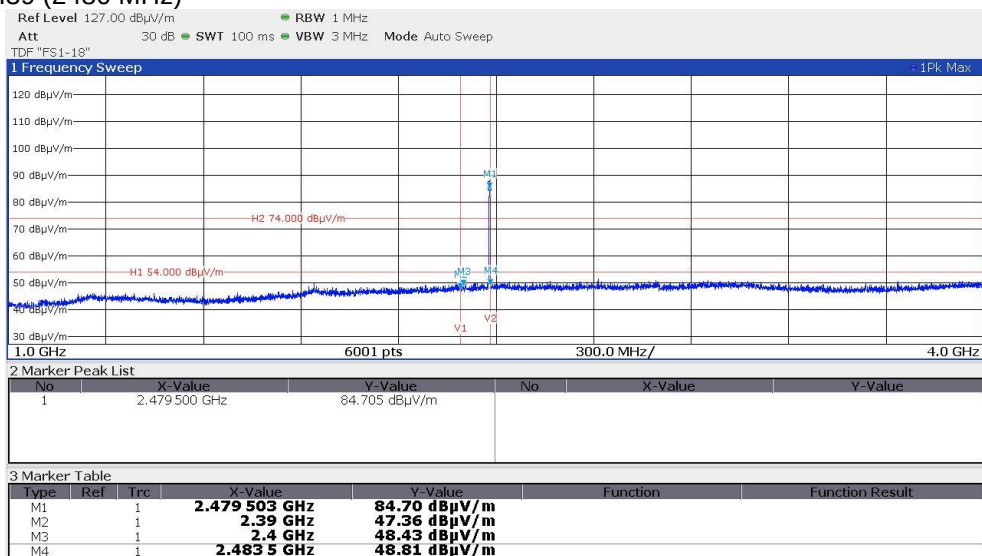
BLE 2 Mbps CH37 (2402 MHz)



BLE 2 Mbps CH17 (2440 MHz)

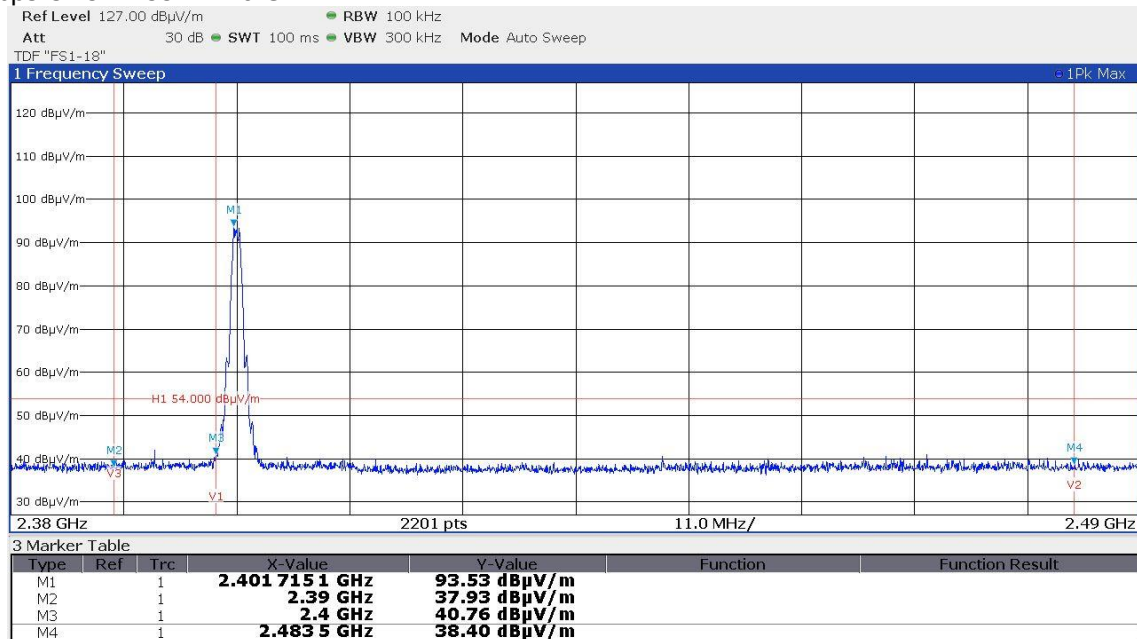


BLE 2 Mbps CH39 (2480 MHz)

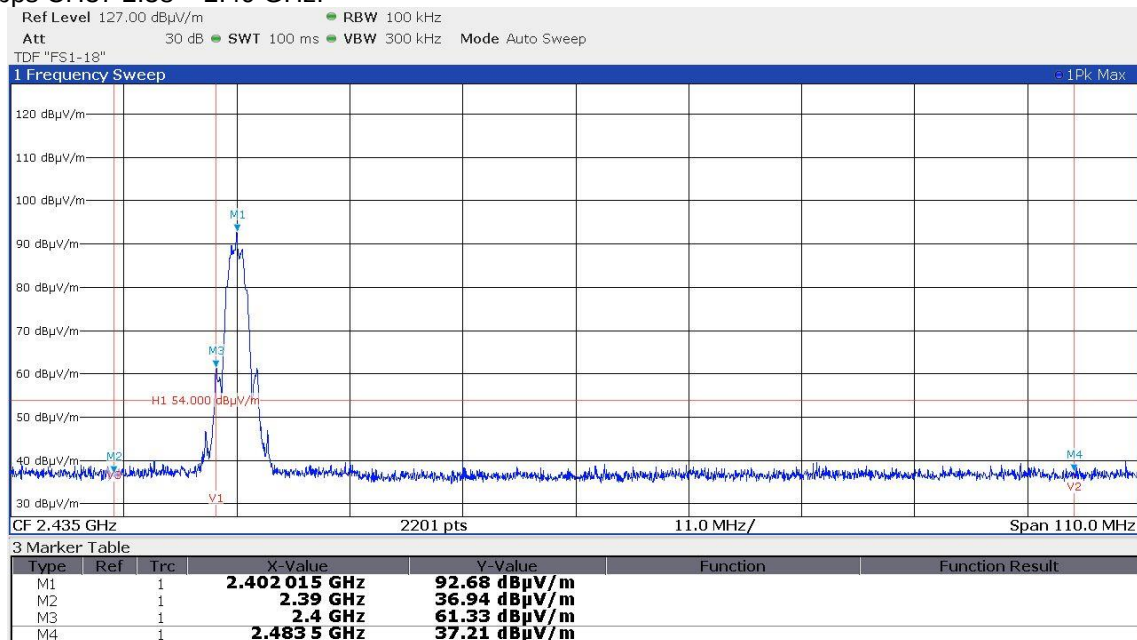


2) Measurements of emissions according to spurious emissions limit specified in section 15.247(d) / RSS-247 5.5:

BLE 1 Mbps CH37 2.38 – 2.49 GHz:



BLE 2 Mbps CH37 2.38 – 2.49 GHz:



**FCC-ID: ESV-ZLXG2 IC-ID: 1249A-ZLXG2**

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.

**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 10<sup>th</sup> harmonic. Only the worst-case plots are listed.

## 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. |
|---------|------------------------|-----------------|-------------|-------------|-------------|-------------|
| A 4     | BAT-EMC 2022.0.23.0    | 01-02/68-13-001 |             |             |             |             |
|         | ESCI                   | 02-02/03-15-001 | 03/07/2024  | 03/07/2023  |             |             |
|         | ESH 2 - Z 5            | 02-02/20-05-004 | 13/10/2025  | 13/10/2022  | 17/10/2023  | 17/04/2023  |
|         | N-4000-BNC             | 02-02/50-05-138 |             |             |             |             |
|         | ESH 3 - Z 2            | 02-02/50-05-155 | 09/11/2025  | 09/11/2022  | 25/01/2024  | 25/07/2023  |
|         | SP 103 /3.5-60         | 02-02/50-05-182 |             |             |             |             |
| SER 1   | ESVS 30                | 02-02/03-05-006 | 27/07/2024  | 27/07/2023  |             |             |
|         | HFH 2 - Z 2            | 02-02/24-05-020 | 01/06/2025  | 01/06/2022  | 05/09/2024  | 05/09/2023  |
|         | 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 2   | ESVS 30                | 02-02/03-05-006 | 27/07/2024  | 27/07/2023  |             |             |
|         | VULB 9168              | 02-02/24-05-005 | 20/04/2024  | 20/04/2023  | 03/05/2024  | 03/05/2023  |
|         | 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                  | 02-02/11-15-001 | 04/05/2024  | 04/05/2023  |             |             |
|         | AMF-6D-01002000-22-10P | 02-02/17-15-004 |             |             |             |             |
|         | LNA-40-18004000-33-5P  | 02-02/17-20-002 |             |             |             |             |
|         | 311702-02/24-05-009    | 12/07/2024      | 12/07/2023  |             |             |             |
|         | BBHA 9170              | 02-02/24-05-013 | 21/03/2026  | 21/03/2023  | 21/03/2024  | 21/03/2023  |
|         | 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 2022.0.23.0    | 02-02/68-13-001 |             |             |             |             |