# FCC Part 15C TEST REPORT

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|---|---|---|
| **Report Number** | 047/23/02961/FCC | Rev. 01 |
| | | |
| **Date of document** | 2024-03-07 | |
| **Total number of pages** | Pag. 56 | |
| **OBJECT** | FCC Part15C | |
| **CUSTOMER** | PROTOS GmbH | |
| **EQUIPMENT UNDER TEST - DESCRIPTION** | Bluetooth Headset | |
| **MODEL** | BTCOM | |

**SUMMARY**



| | | |
|---|---|---|
| ***Tested by*** *(Name + Signature)* | MARCO NICOLE' *Test engineer* | Documento firmato da: NICOLE' MARCO 15.03.2024 15:03:04 UTC |
| ***Verified by*** *(Name + Signature)* | ANDREA CUPIDO *Lab Manager* | Documento firmato da: CUPIDO ANDREA 18.03.2024 07:45:53 UTC |
| ***Approved and issued by*** *(Name + Signature)* | ALESSANDRO ZUCCATO *Lab Director* | Documento firmato da: ZUCCATO ALESSANDRO 18.03.2024 11:32:58 UTC |

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| History sheet of test Report | | | |
|---|---|---|---|
| **Report Number** | **Rev.** | **Date** | **Description of modification** |
| 047/23/02961/RED | R00 | 2023-04-13 | Initial Test report |
| 047/23/02961/RED | R01 | 2024-03-07 | Removed BLE part (for changes see the black sidebars in the document) |

## 1 OBJECT OF THE TESTS

The objective of the tests is the evaluation of the conformity of the EUT to the requirements of the standards and test methods specified on par. 4 of present Test Report.

## 2 IDENTIFICATION

### 2.1 Laboratory

Name : Kiwa Creiven S.r.l.
Street: Corso Spagna, 12
City : 35127 Padova - ITALY
Phone : +39.049.8704036
Fax: +39.049.8707037
E-mail : info.creiven@kiwa.com
**FCC Designation number: IT0016**
**ISED CAB Identifier: IT0007**

### 2.2 Customer

Customer: PROTOS GmbH
Street: Herrschaftswiesen 11
City: 6842 Koblach - Austria
Phone: +43 59 50 50-200
Refer to : Anton Armin Pfanner

## 3 EQUIPMENT UNDER TEST (EUT)

### 3.1 EUT identification (declared under responsibility of the customer)

EUT Description: Bluetooth Headset
Model: BTCOM
Code: --
Serial N°: P2P4Z, P2P41
Software release: 2.1
Size: 220 x 110 x 40 [mm]
Supply voltage: 4.1 V c.c.
Rated Electrical Power: 0.41 W
Rated input current: 400 mA
FCC ID: 2A98QBTCOM

### 3.2 EUT classifications

The manufacture declared the following classification:

| Object | Descriptions |
|---|---|
| Operating Frequency | 2,4 – 2,4835 GHz |
| Equipment type | Bluetooth classic |
| Channel spacing | 1 MHz (BT classic) |
| Number of Channels | 80 for Bluetooth classic |
| Antenna Type | Integrated antenna PIFA |
| Antenna Peak Gain | 1.3 dBi |
| Frequency Hopping Spread Spectrum | YES |
| Extreme Temperature Range | 0°C ÷ +50°C |
| Manufacturer declaration | 03005LP |
| In case of FHSS modulation | In case of Adaptive Frequency Hopping Equipment:<br>The maximum number of Hopping Frequencies: 80 (BT)<br>The minimum number of Hopping Frequencies: 20<br>The (average) Dwell Time: 6.25 ms |
| Adaptive / non-adaptive equipment | ☐ non-adaptive Equipment<br>☒ adaptive Equipment without the possibility to switch to a non-adaptive mode<br>☐ adaptive Equipment which can also operate in a non-adaptive mode |

### 3.3 EUT additional information

| Object | Descriptions |
|---|---|
| Classification of installation and use | ☐ Stand-alone<br>☒ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)<br>☐ Plug-in radio device (Equipment intended for a variety of host systems)<br>☐ Other |
| Means for connection to the supply: | ☐ Supply cord fitted with a plug<br>☐ Supply cord without plug (for permanently connection to fixed wiring)<br>☒ Appliance inlet<br>☐ Appliance provided with a set of terminals allowing the connection of cables or fixed wiring |
| Date of receipt of test item | 2023-02-06 |
| Date(s) of performance of tests | See the data specified in test results details |

### 3.4 EUT cables

The EUT has been configured by the manufacturer with the following input / output cables:

| Classification | Description | Cable | | note |
|---|---|---|---|---|
| | | Shielded | Specified max. length | |
| DC power port<br>(used only for the recharge) | d.c. input cable | ☐ | ☐ none<br>☒ ≤ 1m<br>☐ ≤ 3m<br>☐ ≤ 10m<br>☐ ≤ 30m | type of power source:<br>☐ Internal Power Supply<br>☐ External Power Supply or AC/DC adapter<br>☒ Battery<br>☐ Other |

### 3.5 EUT Auxiliary Equipments (AEs)

To ensure the correct functioning of the EUT, it has been necessary to make use of the following auxiliary equipment (AE):

Auxiliary Equipment AE N°01

Description : DC power supply
Model: LABPS3003
Manufacturer: VELLEMAN

Auxiliary Equipment AE N°02

Description : Laptop + debugger
Model: --
Manufacturer: ASUS

### 3.6 Sampling and adopted criteria

Equipment used for testing was selected by the customer. Sampling criteria adopted by the customer is unknown to Kiwa Creiven laboratory.

### 3.7 EUT documents

The following documentations have been provided by the customer

| Kiwa Creiven document reference | Descriptions |
|---|---|
| 03005LP | Manufacturer declaration |

## 4 STANDARDS AND TEST METHODS

### 4.1 Reference standards

| DOCUMENT | DATE | OBJECT |
|---|---|---|
| ANSI C63.10 | 2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |

Note: **KDB 558074 D01 v05r02 taken into consideration.**

### 4.1.1 Test summary

The following table specifies the tests required by the reference standard and test performed on EUT.

| TEST | FCC Rule | Note | Results |
|---|---|---|---|
| 20 dB Bandwidth | ***§15.215 (c)*** | --- | ***Complies*** |
| Channel Separation | ***§15.247 (a)(1)*** | --- | ***Complies*** |
| Minimum Hopping Channel | ***§15.247 (a)(1)(iii)*** | --- | ***Complies*** |
| Dwell Time | ***§15.247 (a)(1)(iii)*** | --- | ***Complies*** |
| Peak Output Power (Conduction) | ***§15.247 (b)(3)*** | --- | ***Complies*** |
| Spurious Emissions (Radiation) | ***§15.209*** | --- | ***Complies*** |
| Band edge measurement | ***§15.247 (d)*** | --- | ***Complies*** |
| Power-line conducted emissions | ***§15.207*** | --- | ***Complies*** |

## 4.2 Test methods

| DOCUMENT | DATE | METHOD | ACCREDIA accreditation | Test Sequence (See Note 1) |
|---|---|---|---|---|
| C63.10 | 2013 | 20 dB Bandwidth | Yes | 01 |
| C63.10 | 2013 | Channel Separation | Yes | 03 |
| C63.10 | 2013 | Minimum Hopping Channel | Yes | 04 |
| C63.10 | 2013 | Dwell Time | Yes | 07 |
| C63.10 | 2013 | Peak Output Power (Conduction) | Yes | 05 |
| C63.10 | 2013 | Spurious Emissions (Radiation) | Yes | 02 |
| C63.10 | 2013 | Band edge measurement | Yes | 06 |
| C63.10 | 2013 | Standard test method for ac power-line conducted emissions from unlicensed wireless devices | Yes | 08 |
| Note :<br>1) The tests have been carried out in the order specified in this column | | | | |

## 4.3 Deviation from test methods

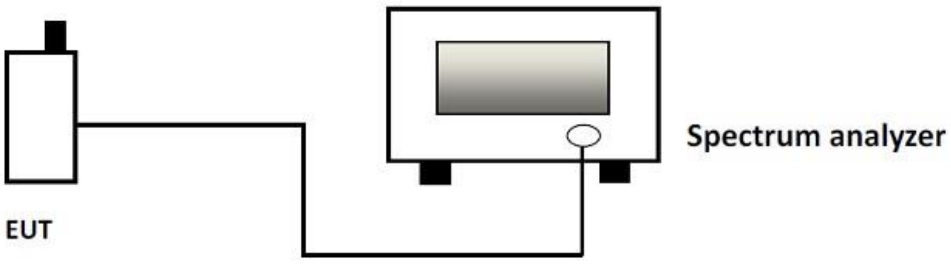
None.

## 5 EUT OPERATING CONDITIONS DURING TESTS

The EUT was set to function as indicated in Table 1, in compliance with the manufacturer's prescriptions and with that which is stated in the applied standards, test methods and procedures.

| OPERATING CONDITION | DESCRIPTION OF FUNCTIONING |
|---|---|
| TX01 | EUT details : during the test the EUT<br>• was powered at 4.1 Vdc<br>• was in continuous working state/ Device operated in standard continuous transmit mode (Cont TX function)<br>• **Lowest** frequency activated (2402 MHz) – **Classic Bluetooth**<br>• Was set **packet type** DH5 or 2-DH5 or 3-DH5 and was report the worst case<br>• Was set **TX power** to **20 dBm**<br>• Was set **Ext 255** and **Int 50**<br>• AE details : during the test the Auxiliary Equipment (AE), connected to EUT, was :<br>• AE N°01 connected to Power supply of EUT<br>• AE N°02 connected only to set the device |
| TX02 | EUT details : during the test the EUT<br>• was powered at 4.1 Vdc<br>• was in continuous working state/ Device operated in standard continuous transmit mode (Cont TX function)<br>• **Medium** frequency activated (2441 MHz) – **Classic Bluetooth**<br>• Was set **packet type** DH5 or 2-DH5 or 3-DH5 and was report the worst case<br>• Was set **TX power** to **20 dBm**<br>• Was set **Ext 255** and **Int 50**<br>• AE details : during the test the Auxiliary Equipment (AE), connected to EUT, was :<br>• AE N°01 connected to Power supply of EUT<br>• AE N°02 connected only to set the device |
| TX03 | EUT details : during the test the EUT<br>• was powered at 4.1 Vdc<br>• was in continuous working state/ Device operated in standard continuous transmit mode (Cont TX function)<br>• **Highest** frequency activated (2480 MHz) – **Classic Bluetooth**<br>• Was set **packet type** DH5 or 2-DH5 or 3-DH5 and was report the worst case<br>• Was set **TX power** to **20 dBm**<br>• Was set **Ext 255** and **Int 50**<br>• AE details : during the test the Auxiliary Equipment (AE), connected to EUT, was :<br>• AE N°01 connected to Power supply of EUT<br>• AE N°02 connected only to set the device |
| TX07 | EUT details : during the test the EUT<br>• was powered at 4.1 Vdc<br>• was in continuous working state/ Device operated in hopping mode<br>• **Classic Bluetooth** activated<br>• Was set **TX power** to **20 dBm**<br>• Was set **Ext 255** and **Int 50**<br>• AE details : during the test the Auxiliary Equipment (AE), connected to EUT, was :<br>• AE N°01 connected to Power supply of EUT<br>• AE N°02 connected only to set the device |
| OC09 | EUT details : during the test the EUT<br>• was in recharge mode (AE N°01 powered with 120V @60Hz)<br>• Radio transmission not activated<br>• AE details : during the test the Auxiliary Equipment (AE), connected to EUT, was :<br>• EUT connected via USB to AE N°02 |

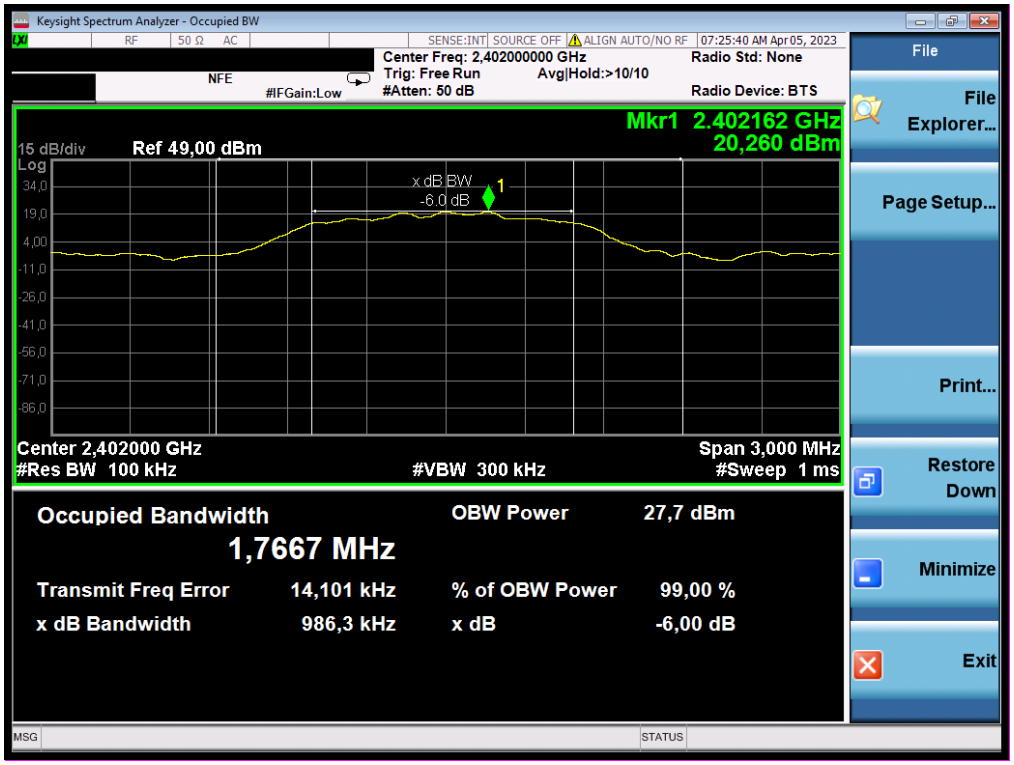
## 6 TEST RESULTS

| **Test method:** | **FCC part 15 C - §15.215 (c)**<br>**20 dB Bandwidth**<br>For details see par. 4 of this report | |
|---|---|---|
| Operator | Marco Nicolè | |
| Test Date | 2023-02-23 | |
| Test Temperature | 21 °C | |
| Test Humidity | 30 % | |
| Test Pressure | 1001 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | D.c. input cable | 3.0 |
| Operating conditions | TX01; TX02; TX03<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | The minimum 20 dB bandwidth shall be at least 500 kHz. | |
| Test set up |  | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |

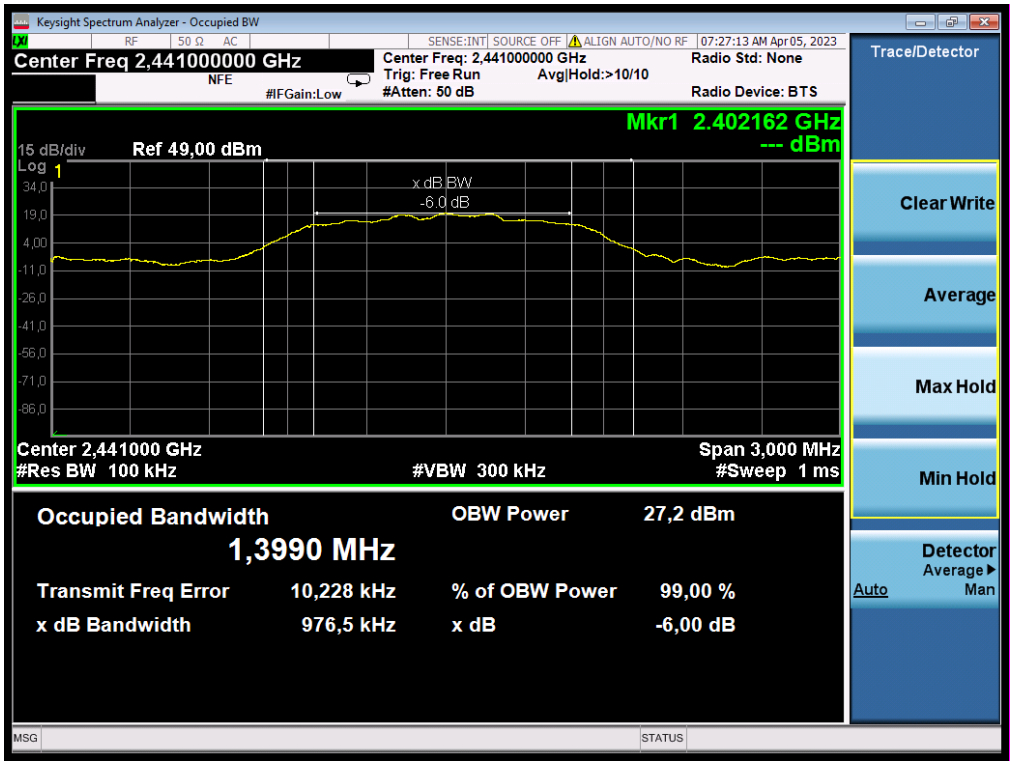
| Operating condition | 20 dB bandwidth | LIMIT | RESULT |
|---|---|---|---|
| TX01 | 986.3 kHz | At least 500 kHz | **COMPLIES** |
| TX02 | 976.5 kHz | At least 500 kHz | **COMPLIES** |
| TX03 | 981.4 kHz | At least 500 kHz | **COMPLIES** |

| | |
|---|---|
| Test Procedure | Use the following spectrum analyser settings:<br>RBW = 100kHz<br>VBW ≥ 3 x RBW<br>Sweep = auto<br>Detector function = peak<br>Trace = max hold<br>The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. |
| EUT modification during this test | None |

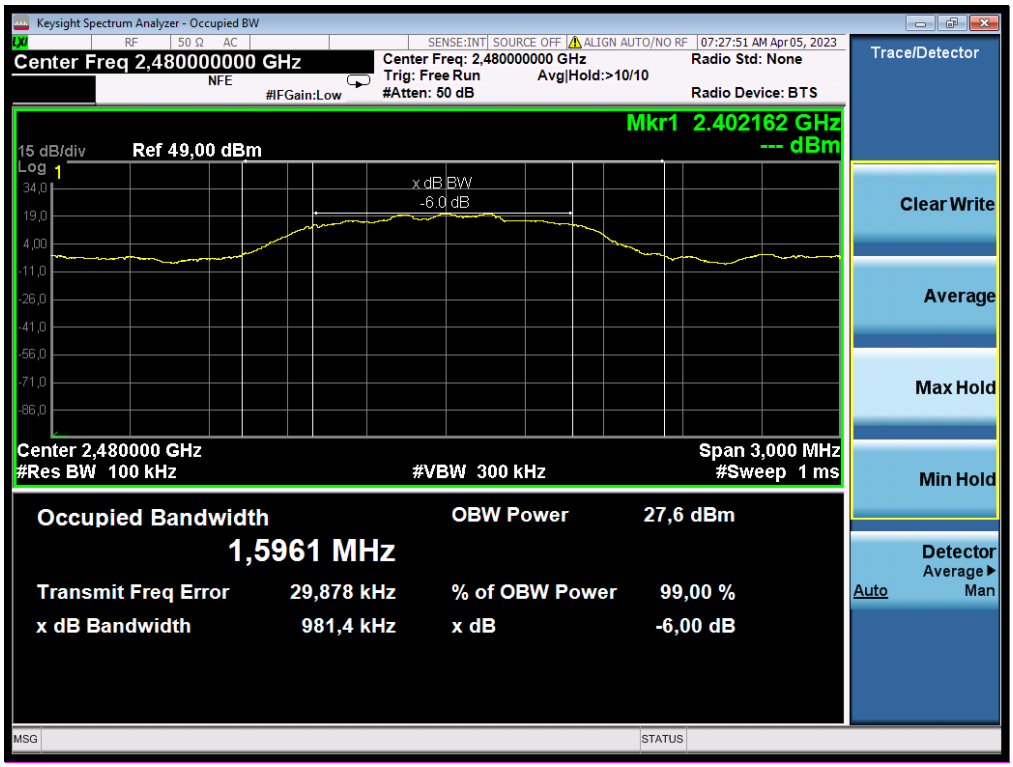
**Test result TX01**

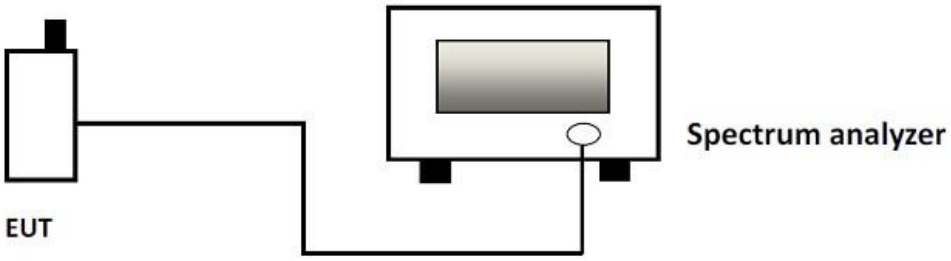


**Test result TX02**




**Test result TX03**



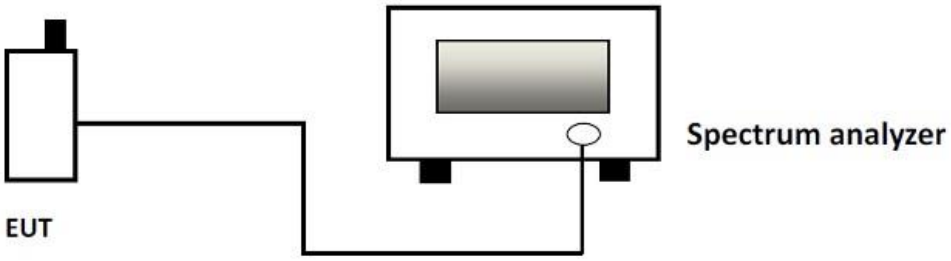
| **Test method:** | **FCC part 15 C - §15.247 (a)(1)**<br>**Channel Separation**<br>For details see par. 4 of this report | |
|---|---|---|
| Operator | Marco Nicolè | |
| Test Date | 2023-03-22 | |
| Test Temperature | 23 °C | |
| Test Humidity | 41 % | |
| Test Pressure | 1009 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | D.c. input cable | 3.0 |
| Operating conditions | TX07<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater | |
| Test set up |  | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |

| Test result | Operative condition | Channel separation value [dB] | LIMIT [dB] | RESULT |
|---|---|---|---|---|
| 1 | TX07 | 24.158 | 20 | **COMPLIES** |
| **Test result** | **Operative condition** | **Channel separation value [kHz]** | **LIMIT [kHz]** | **RESULT** |
| 3 | TX07 | 1043 | 25 | **COMPLIES** |

| | |
|---|---|
| Test Procedure | The EUT have its hopping function enabled. Use the following spectrum analyser settings:<br>Span = wide enough to capture the peaks of two adjacent channels<br>Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span<br>Video (or Average) Bandwidth (VBW) ≥ RBW<br>Sweep = auto<br>Detector function = peak<br>Trace = max hold<br>Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. |
| EUT modification during this test | None |

**Test result 1**

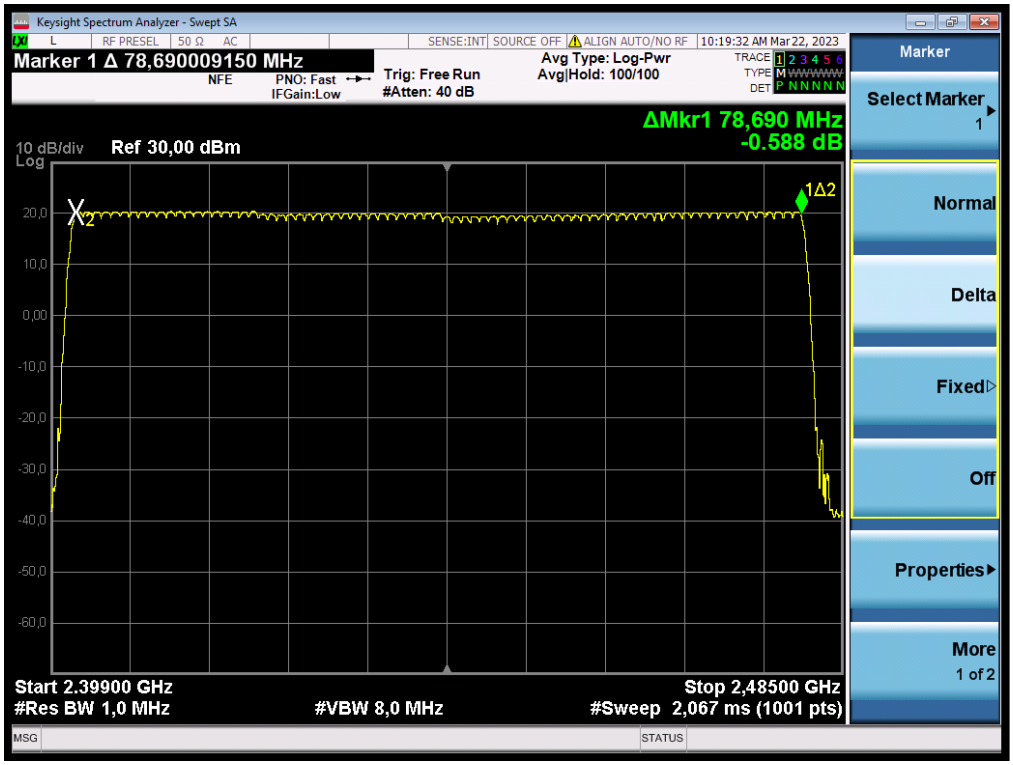

**Test result 3**

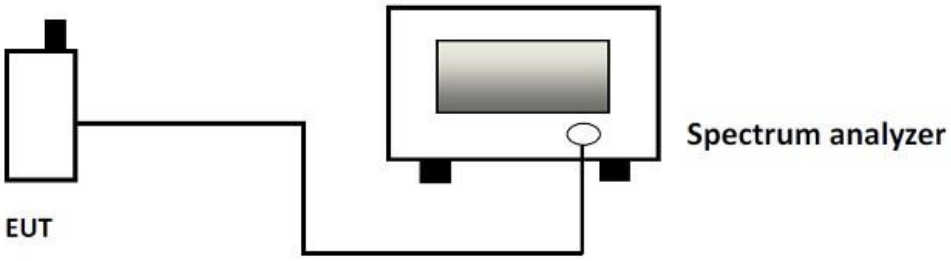
| **Test method:** | **FCC part 15 C - §15.247 (a)(1)(iii)**<br>**Minimum Hopping Channels**<br>For details see par. 4 of this report | |
|---|---|---|
| Operator | Marco Nicolè | |
| Test Date | 2023-03-22 | |
| Test Temperature | 23 °C | |
| Test Humidity | 41 % | |
| Test Pressure | 1009 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | D.c. input cable | 3.0 |
| Operating conditions | TX07<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels | |
| Test set up |  | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |

| Test result | Operative condition | Hopping Channel | Minimum hopping channels | RESULT |
|---|---|---|---|---|
| 1 | TX07 | 79 | 15 | **COMPLIES** |

| | |
|---|---|
| Test Procedure | The EUT have its hopping function enabled.<br>Use the following spectrum analyser settings:<br>Span = the frequency band of operation<br>RBW ≥ 1% of the span<br>VBW ≥ RBW<br>Sweep = auto<br>Detector function = peak<br>Trace = max hold<br>Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. |
| EUT modification during this test | None |

**Test result 1**

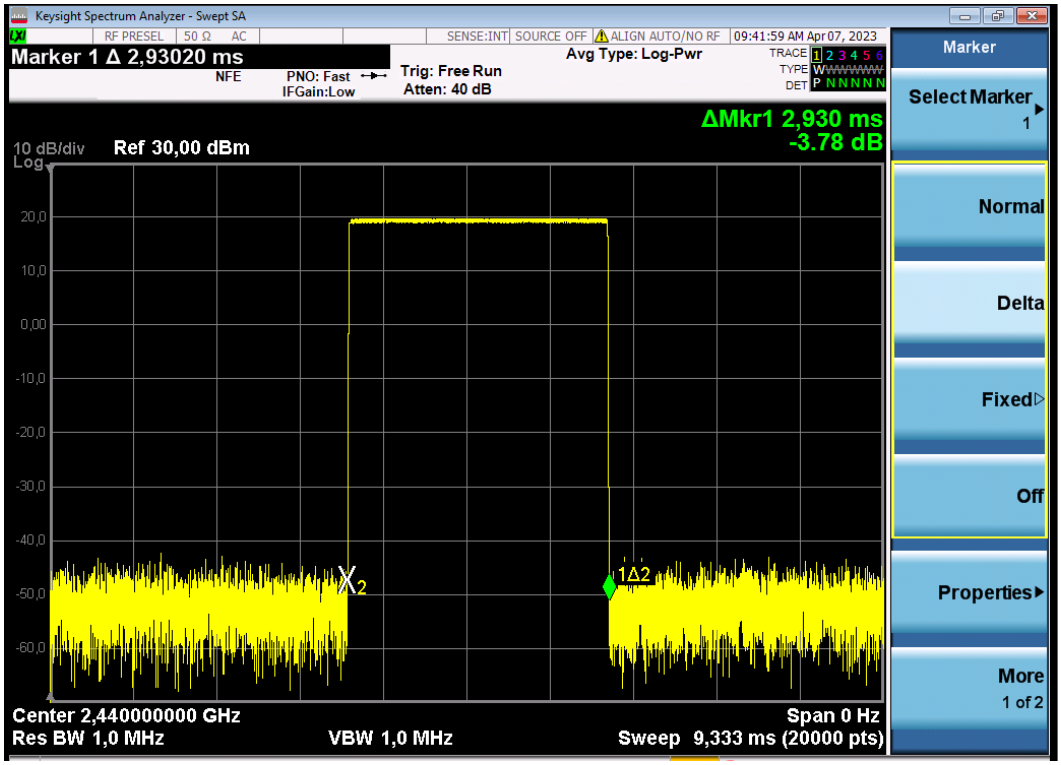


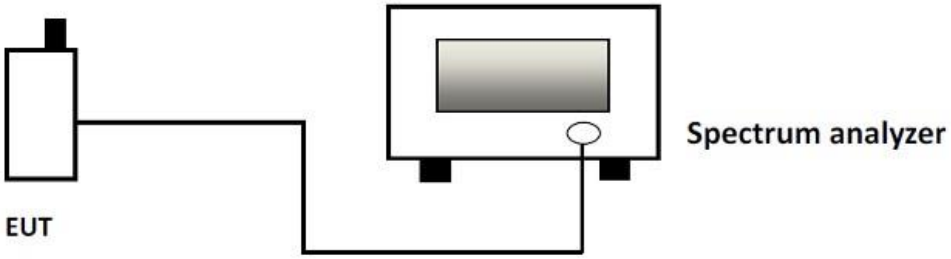
| **Test method:** | **FCC part 15 C - §15.247 (a)(1)(iii)**<br>**Dwell Time**<br>For details see par. 4 of this report | |
|---|---|---|
| Operator | Marco Nicolè | |
| Test Date | 2023-04-07 | |
| Test Temperature | 21 °C | |
| Test Humidity | 31 % | |
| Test Pressure | 1009 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | D.c. input cable | 3.0 |
| Operating conditions | OC07<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed | |
| Test set up |  | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |

| **Packet Type** | **Size** | **N** | **Measured time duration of transmission [ms]** | **Calculation formula** | **Final value** | **RESULT** |
|---|---|---|---|---|---|---|
| DH5 | 339 | 6 | 2.93 | (1600 / 6) * 2.93 < 1 | 0.781< 1 | **COMPLIES** |

| | |
|---|---|
| Test Procedure | The EUT must have its hopping function enabled.<br>Use the following spectrum analyser settings:<br>Span = zero span, centred on a hopping channel<br>RBW ≤ Channel Separation<br>Sweep = as necessary to capture the entire dwell time per hopping channel<br>Detector function = peak<br>Trace = max hold<br>If possible, use the marker-delta function to determine the dwell time. |
| EUT modification during this test | None |

**Spectral Plot**



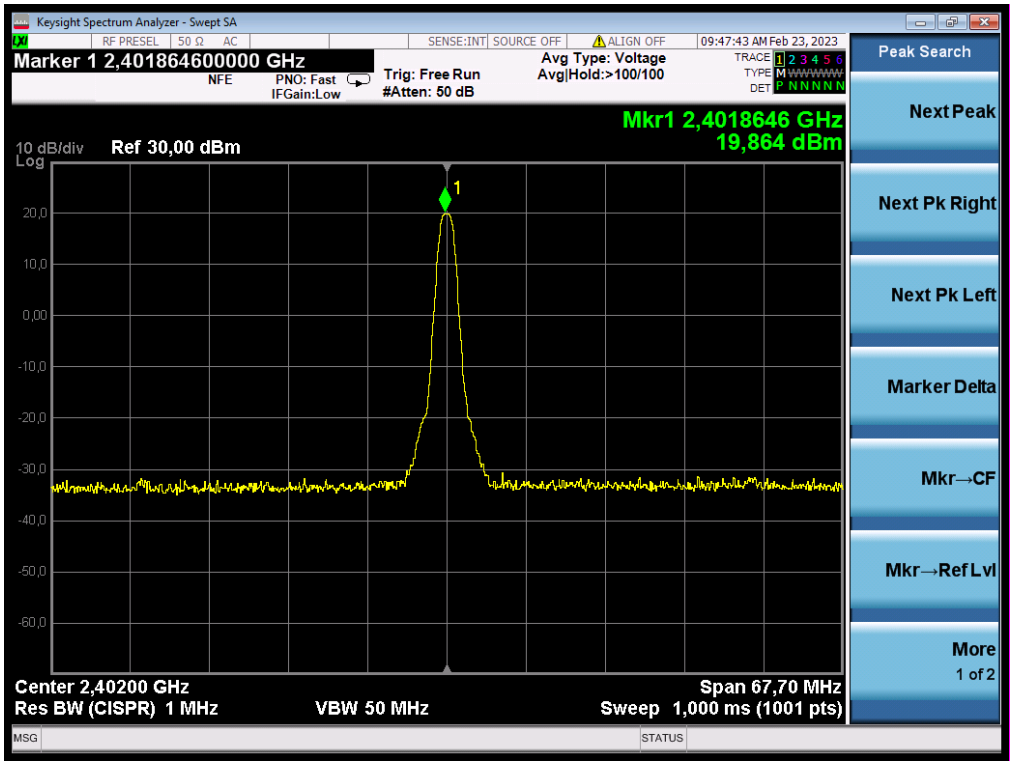
| | | |
|---|---|---|
| **Test method:** | **FCC part 15 C - §15.247 (b)(3)**<br>**Peak Output Power**<br>For details see par. 4 of this report | |
| Operator | Marco Nicolè | |
| Test Date | 2023-02-23 | |
| Test Temperature | 21 °C | |
| Test Humidity | 30 % | |
| Test Pressure | 1001 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | D.c. input cable | 3.0 |
| Operating conditions | TX01; TX02; TX03<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | For systems using digital modulation in the 2400–2483.5 MHz bands:<br>- 1 Watt (for device with channels > 75)<br>- 0.125 Watt (for device with channels < 75) | |
| Test set up |  | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |

**BLUETOOTH CLASSIC**

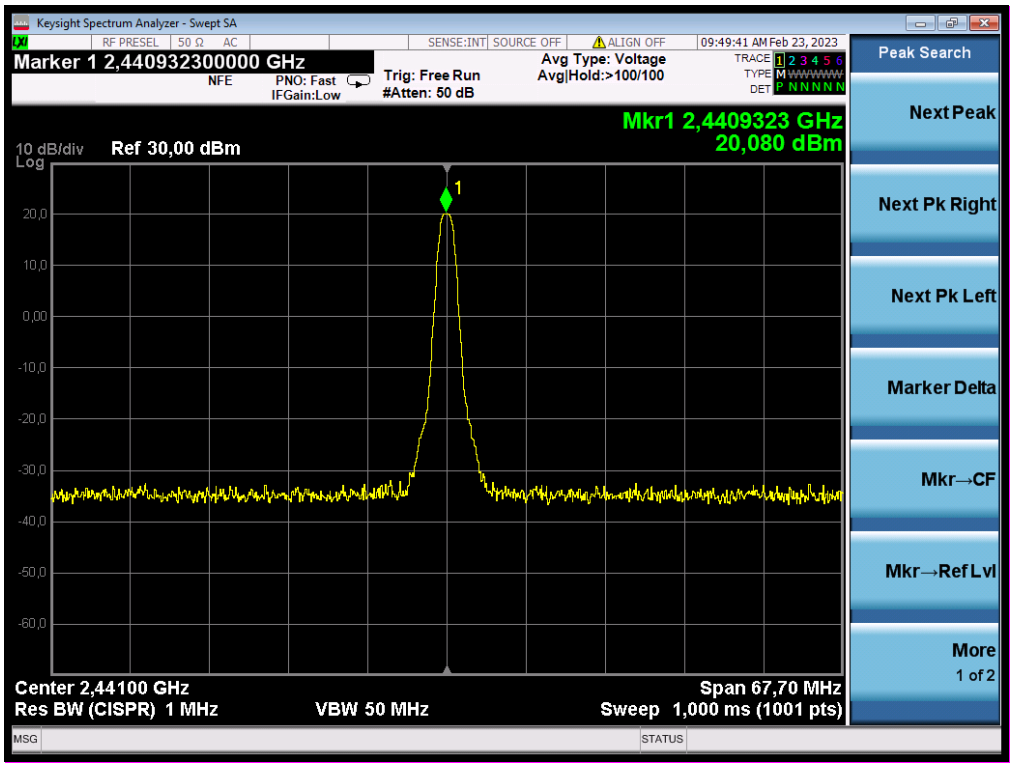
| OPERATING CONDITION | FREQUENCY [MHz] | Peak Power [dBm] | LIMIT [dBm] | LIMIT [W] | RESULT |
|---|---|---|---|---|---|
| TX01 | 2401 | +19.864 | +30 | 1 | **COMPLIES** |
| TX02 | 2440 | +20.080 | +30 | 1 | **COMPLIES** |
| TX03 | 2479 | +19.759 | +30 | 1 | **COMPLIES** |

| | |
|---|---|
| Test Procedure | The measurement will be conducted at three channels:<br>Bluetooth: Low, middle and High,<br>Set the spectrum analyzer as RBW = 1MHz, VBW =50MHz, Span = >10MHz, Sweep=auto<br>Detector = Peak, Trace mode = max hold |
| EUT modification during this test | None |

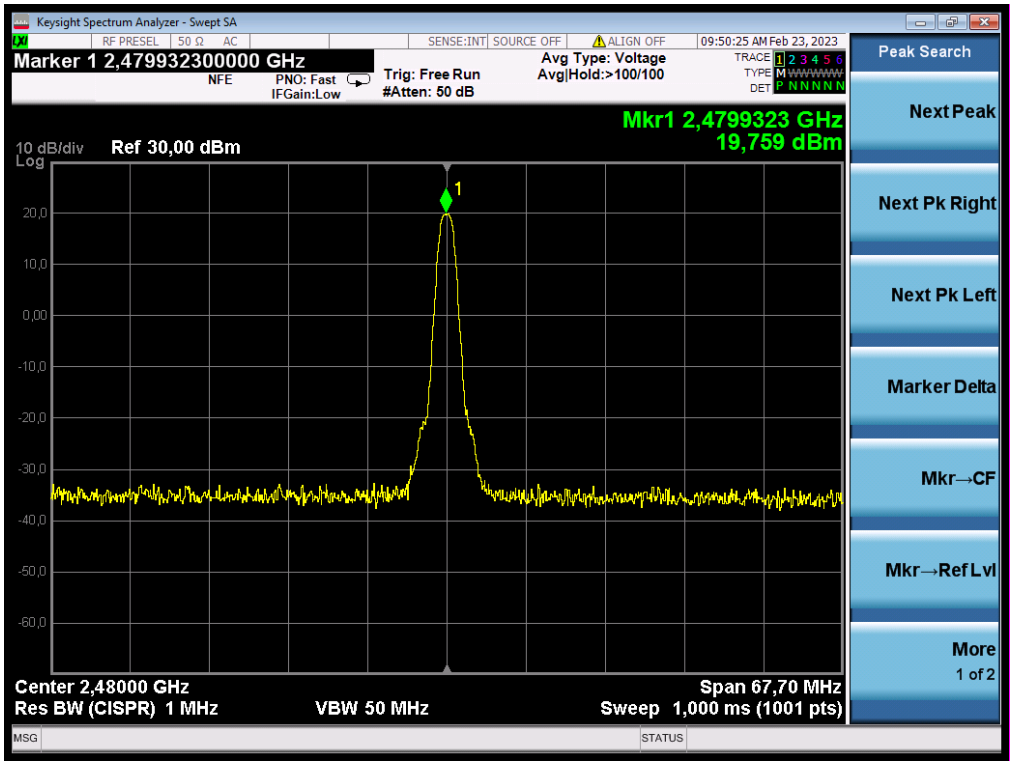
**Test result TX01**

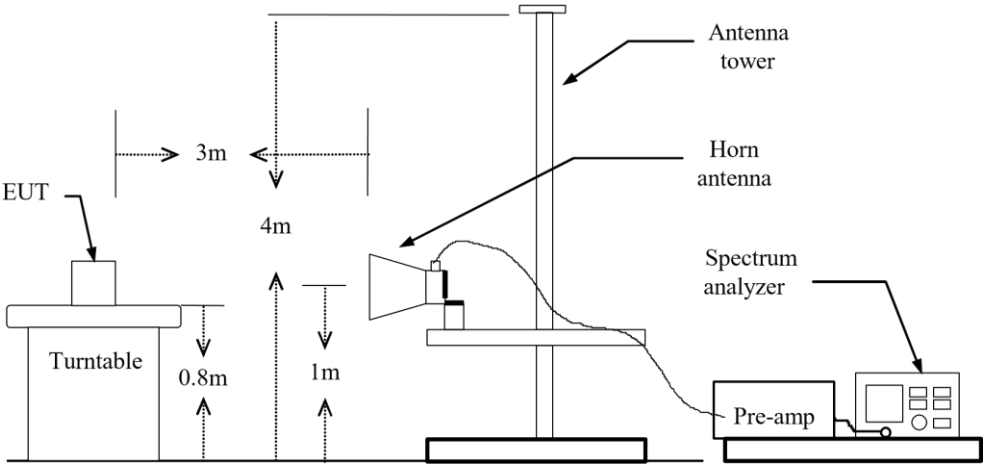



**Test result TX02**

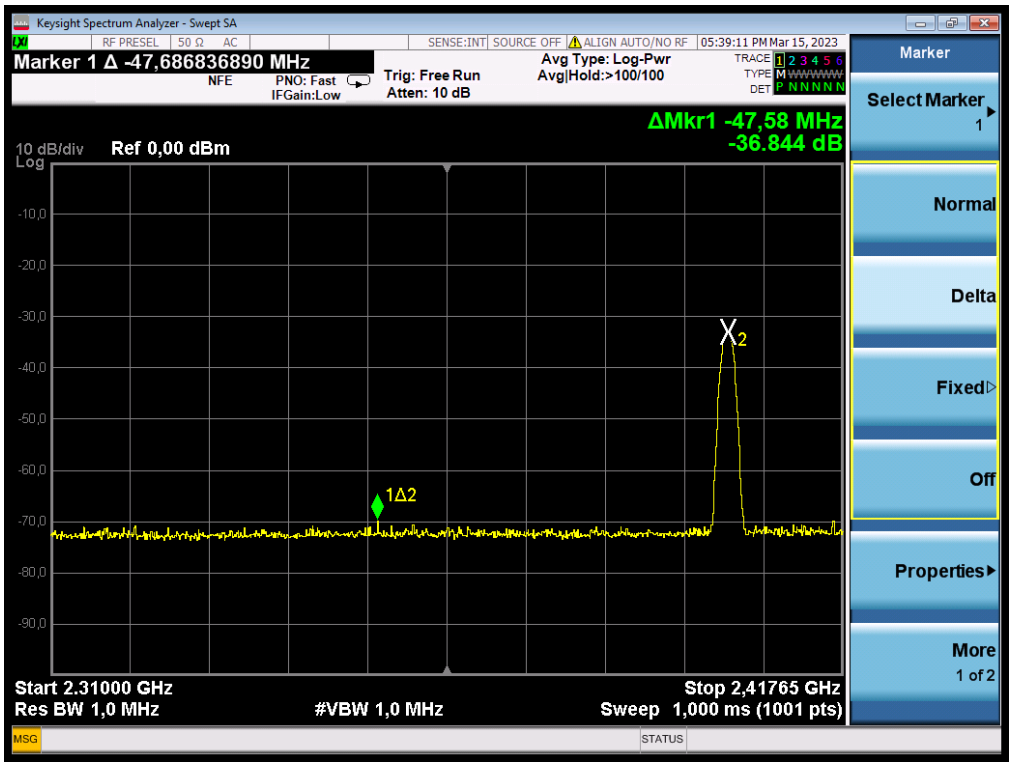


**Test result TX03**

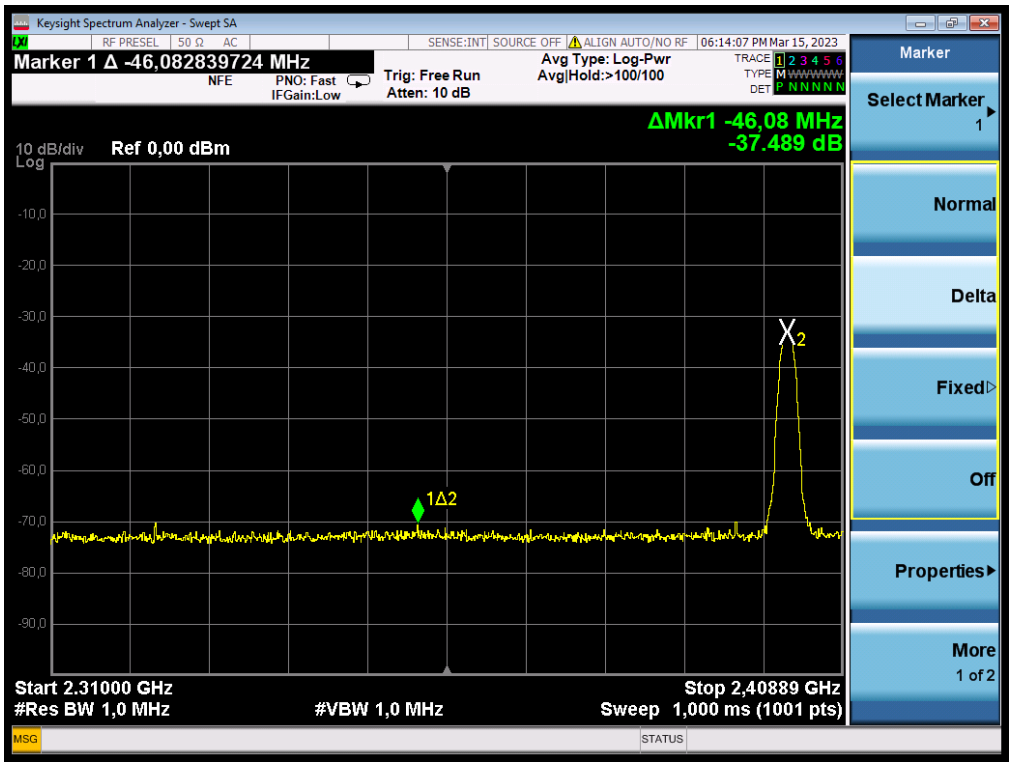


| **Test method:** | **FCC part 15 C - §15.247 (d)**<br>**Band Edge measurement**<br>For details see par. 4 of this report | |
|---|---|---|
| Operator | Marco Nicolè | |
| Test Date | 2023-03-22 | |
| Test Temperature | 22 °C | |
| Test Humidity | 35 % | |
| Test Pressure | 1007 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | a.c. input cable | 3.0 |
| Operating conditions | TX01; TX03<br>See par. 5 of this report | |
| Auxiliary equipment (AE) | See par. 3.5 of this report | |
| Limits | 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.<br>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). | |
| Test set up |  | |
| Measuring distance in the anechoic chamber | 3 m | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |
| Result | **COMPLIES** | |
| Test Procedure | The EUT is placed on a turntable, which is 1.5 m above the ground plane.<br>The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.<br>EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.<br>Set the spectrum analyser in the following setting in order to capture the lower and upper band-edges of the emission:<br>RBW=VBW=1MHz / Sweep=AUTO<br>Repeat the procedures in the other POLARIZATION. | |
| Note | The worst condition between X, Y and Z axis was checked | |
| EUT modification during this test | None | |

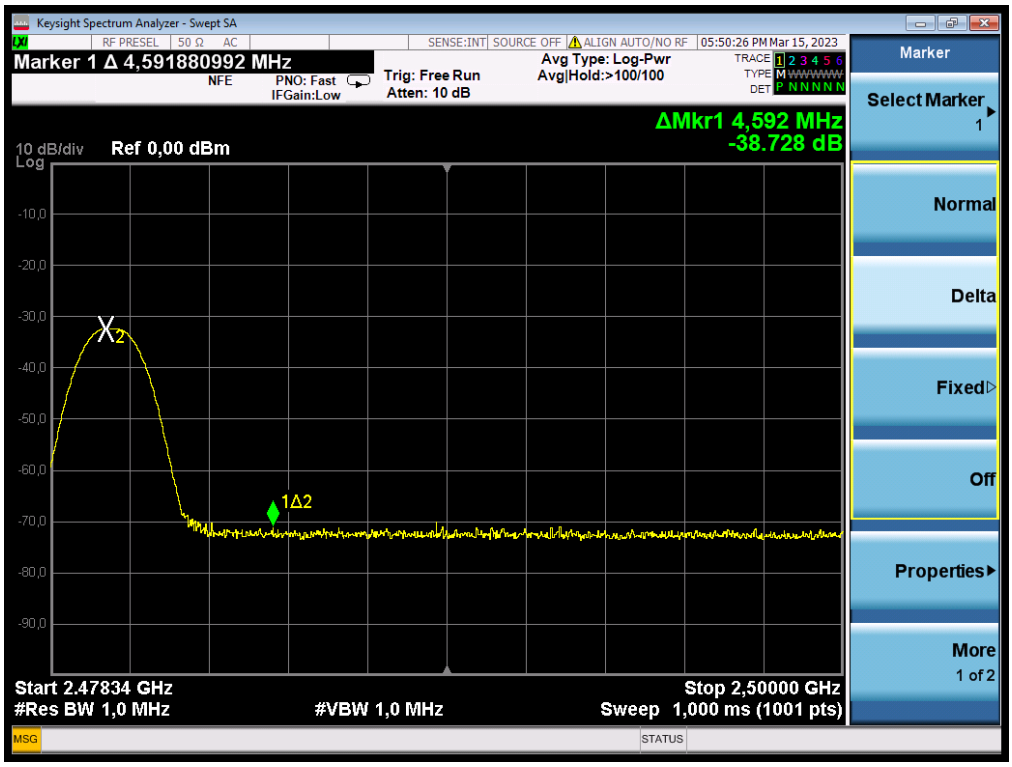
**Test result TX01 – BAND EDGE LEFT SIDE**
**Vertical polarization**



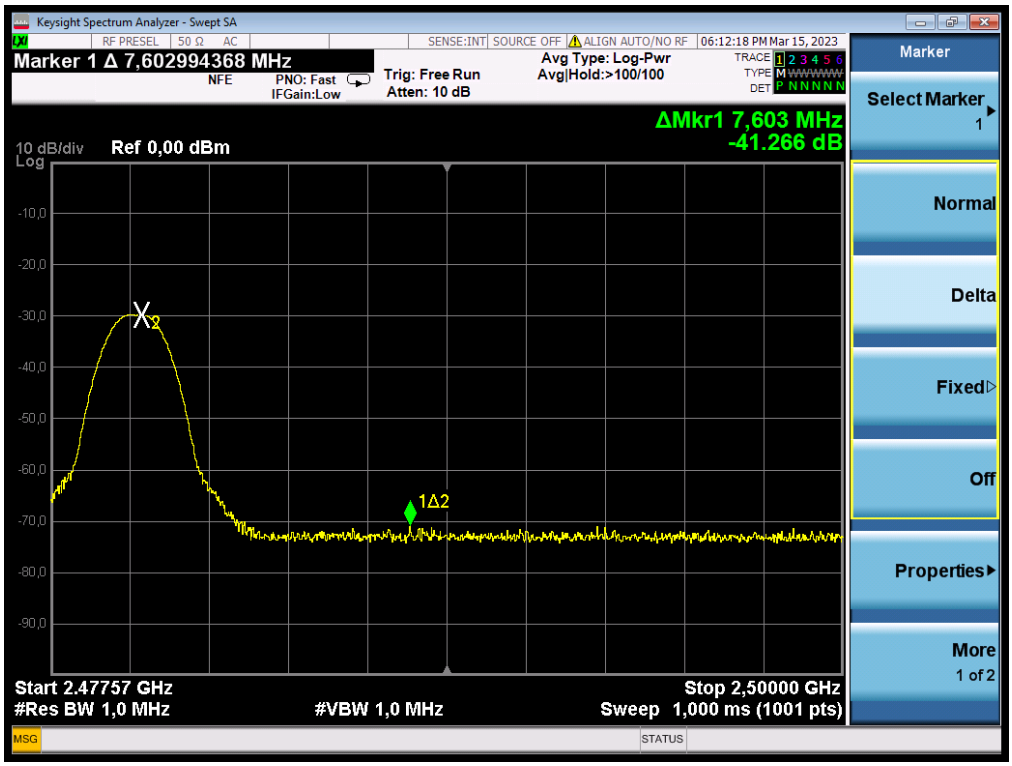

**Test result TX01 – BAND EDGE LEFT SIDE**
**Horizontal polarization**



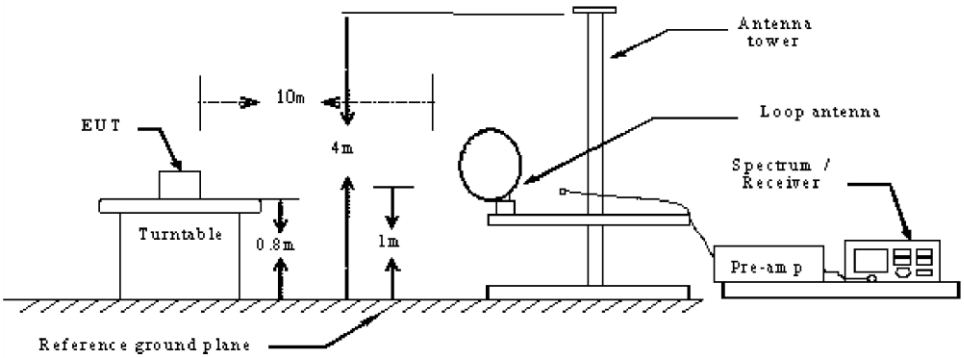
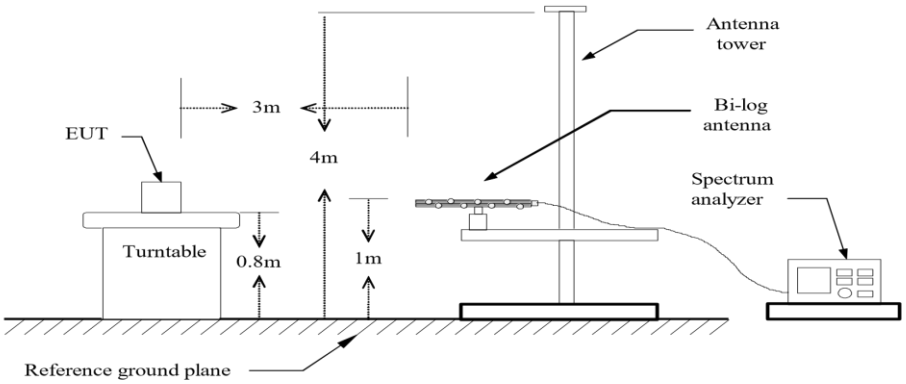
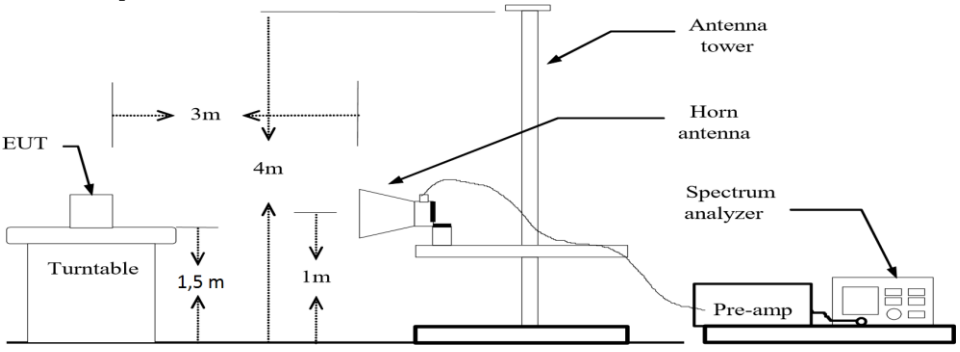
**Test result TX03 – BAND EDGE RIGHT SIDE**
**Vertical polarization**




**Test result TX03 – BAND EDGE RIGHT SIDE**
**Horizontal polarization**

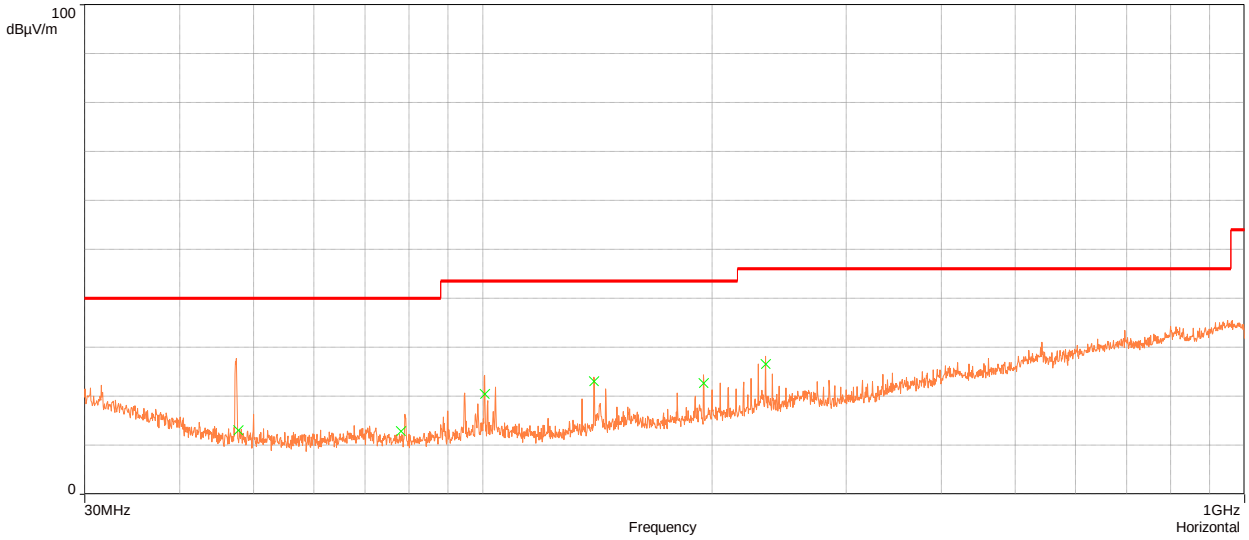


<table>
<tr><td>Test method:</td><td colspan="2">FCC part 15 C - § 15.209<br>Spurious Emission (Radiation)<br>For details see par. 4 of this report</td></tr>
<tr><td>Operator</td><td colspan="2">Marco Nicolè</td></tr>
<tr><td>Test Date</td><td colspan="2">2023-02-23</td></tr>
<tr><td>Test Temperature</td><td colspan="2">23 °C</td></tr>
<tr><td>Test Humidity</td><td colspan="2">35 %</td></tr>
<tr><td>Test Pressure</td><td colspan="2">1009 hPa</td></tr>
<tr><td>EUT Classification</td><td colspan="2">None.</td></tr>
<tr><td rowspan="2">Electrical wiring</td><td>Cable</td><td>Length [m]</td></tr>
<tr><td>d.c. input cable</td><td>1.5</td></tr>
<tr><td>Operating conditions</td><td colspan="2">TX01; TX02; TX03<br><br>See par. 5 of this report</td></tr>
<tr><td>Auxiliary equipment (AE)</td><td colspan="2">See par. 3.5 of this report</td></tr>
<tr><td>Limits</td><td colspan="2">
<table>
<tr><th>Frequency (MHz)</th><th>Limits (dBuV/m)</th><th>Detector</th><th>Measured distance (m)</th></tr>
<tr><td>30~88</td><td>40</td><td>PK</td><td rowspan="4">3</td></tr>
<tr><td>88~216</td><td>43.5</td><td>PK</td></tr>
<tr><td>216-960</td><td>46</td><td>PK</td></tr>
<tr><td>Above 960</td><td>54</td><td>PK</td></tr>
</table>
<table>
<tr><th>Frequency (GHz)</th><th>Limits (dBuV/m)</th><th>Detector</th><th>Measured distance (m)</th></tr>
<tr><td>1 - 40</td><td>54</td><td>AVG</td><td>3</td></tr>
<tr><td>1-40</td><td>74</td><td>PK</td><td>3</td></tr>
</table>
</td></tr>
</table>

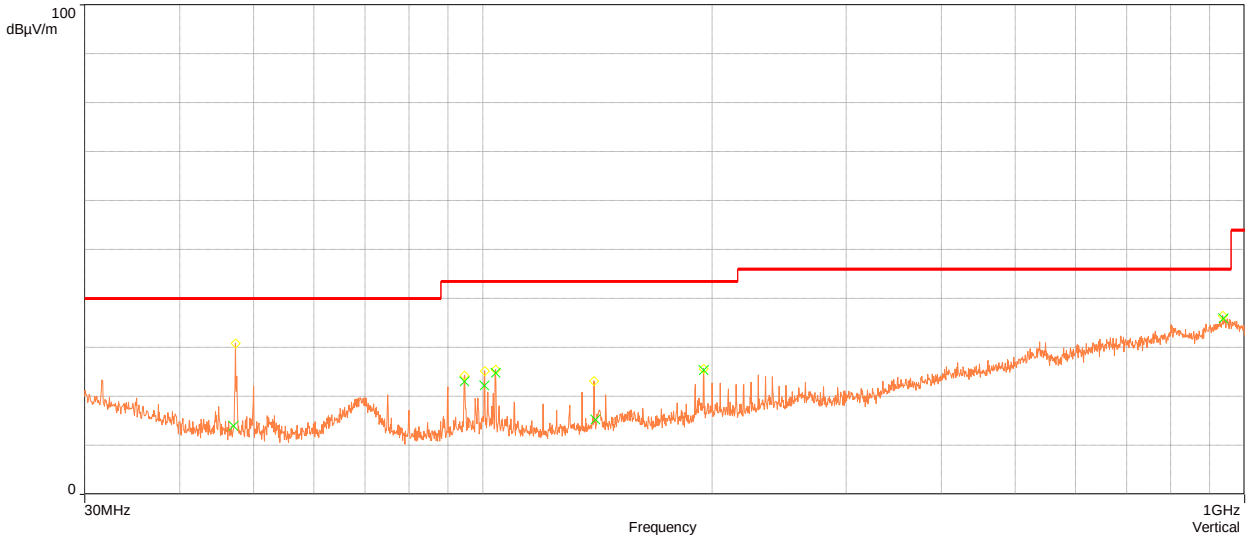
| | |
|---|---|
| Test set up | Radiated Spurious Measurement: below 30MHz<br>  <br>Radiated Spurious Measurement: below 1GHz<br>  <br>Radiated Spurious Measurement: above 1GHz<br>  |
| Frequency range | from 30 MHz up through the 10th harmonic |
| Measuring distance in the anechoic chamber | 3 m |
| Test instrumentations | See Annex B |
| Measurement Uncertainty (k=2) | See Annex F |

| | |
|---|---|
| Test Procedure | **Radiated Emission ( 30 MHz – 1000 MHz) :**<br>The preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements. The measurement is carried out using a spectrum analyser or receiver. The Quasi-peak detector is used and RBW is set to 120kHz .The antenna height and turn table rotation is adjusted until the maximum power value is founded on spectrum analyser or receiver.<br><br>**Radiated Emission (Above 1 GHz) :**<br>The preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements. The measurement is carried out using a spectrum analyser or receiver. The spectrum analyser scans from 1GHz to 25GHz (higher than the 10th harmonic of the carrier). The peak detector is used for Peak limit and RBW is set to 1MHz ,VBW ≥ 3RBW. The peak detector is used for Average limit and RBW is set to 1MHz ,VBW is not smaller than 1/T, T = to the shortest pulse width. The antenna height and turn table rotation is adjusted until the maximum power value is founded on spectrum analyser or receiver. |
| Note | The worst condition between X, Y and Z axis was checked |
| EUT modification during this test | None |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX01**
**Range 30 MHz – 1 GHz**

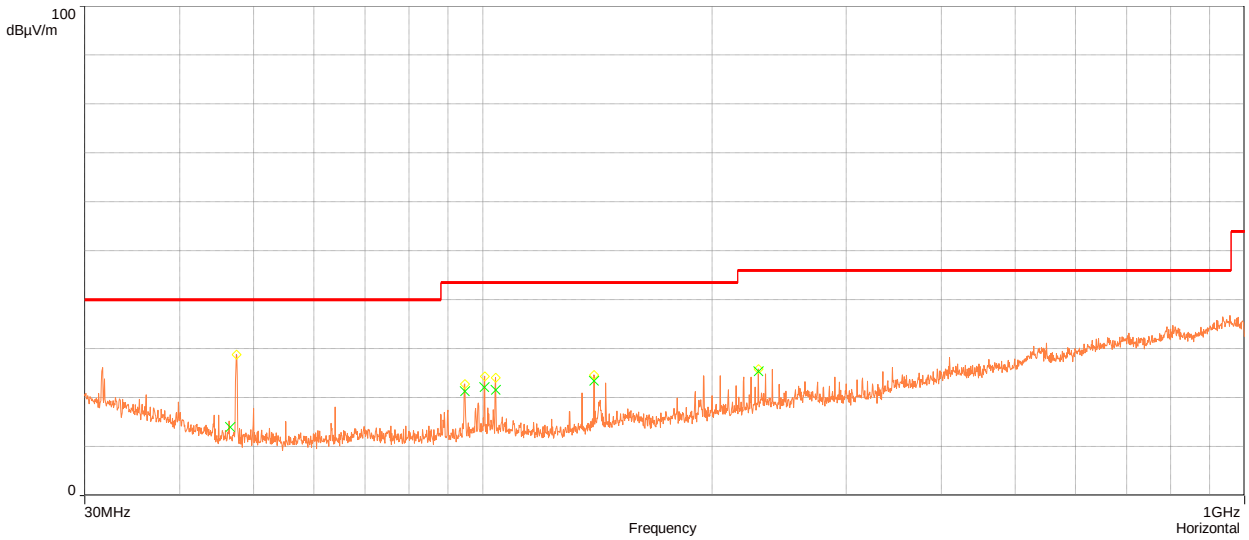



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX01**
**Range 30 MHz – 1 GHz**

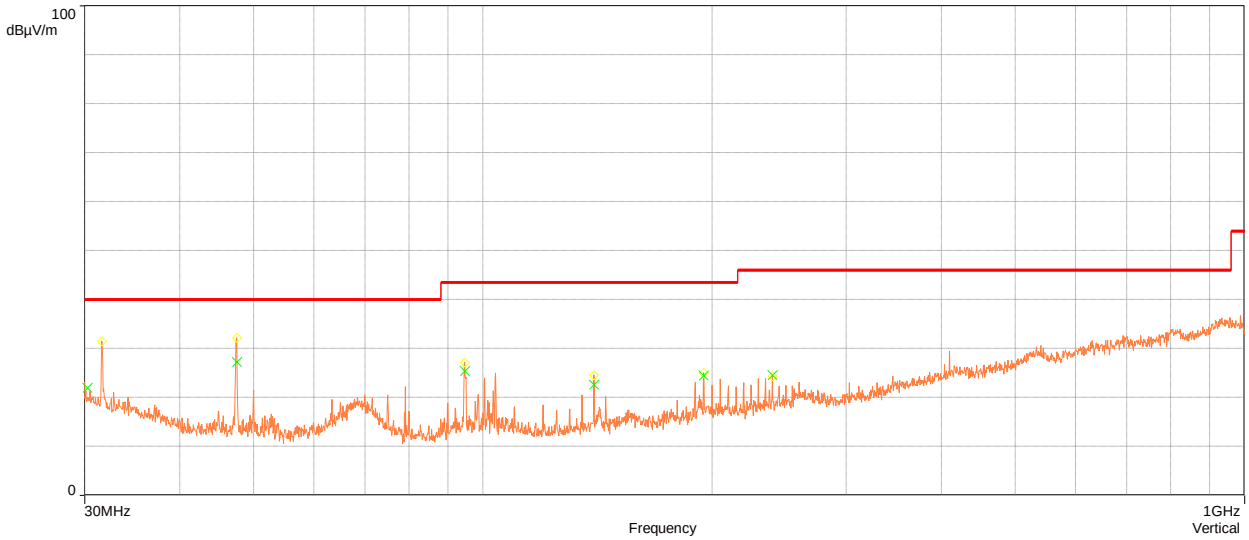


| Frequency (MHz) | SR | Peak (dBµV/m) | QPeak (dBµV/m) | LimQPeak (dBµV/m) | Delta (dB) | Polarization | Height (m) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 47.755 | 1 | 27.70 | 13.09 | 40.00 | -26.91 | Horizontal | 2.67 | 29.90 |
| 78.0155 | 1 | 16.26 | 12.87 | 40.00 | -27.13 | Horizontal | 1.13 | 150.30 |
| 100.535 | 1 | 23.99 | 20.44 | 43.52 | -23.08 | Horizontal | 3.18 | 0.10 |
| 139.975 | 1 | 23.91 | 23.09 | 43.52 | -20.43 | Horizontal | 2.05 | 300.00 |
| 194.9955 | 1 | 24.31 | 22.71 | 43.52 | -20.81 | Horizontal | 1.43 | 210.10 |
| 235.015 | 1 | 28.18 | 26.57 | 46.00 | -19.43 | Horizontal | 1.37 | 300.00 |
| 47.035 | 2 | 30.89 | 14.01 | 40.00 | -25.99 | Vertical | 1.01 | 300.20 |
| 94.5555 | 2 | 24.24 | 23.05 | 43.52 | -20.47 | Vertical | 3.96 | 240.40 |
| 100.455 | 2 | 25.22 | 22.23 | 43.52 | -21.29 | Vertical | 1.98 | 330.30 |
| 103.915 | 2 | 25.46 | 24.81 | 43.52 | -18.71 | Vertical | 2.06 | 359.80 |
| 140.4755 | 2 | 23.19 | 15.31 | 43.52 | -28.21 | Vertical | 1.02 | 240.40 |
| 194.9955 | 2 | 25.69 | 25.42 | 43.52 | -18.10 | Vertical | 1.00 | 29.90 |
| 937.1755 | 2 | 36.51 | 35.97 | 46.00 | -10.03 | Vertical | 2.49 | 180.20 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX02**
**Range 30 MHz – 1 GHz**

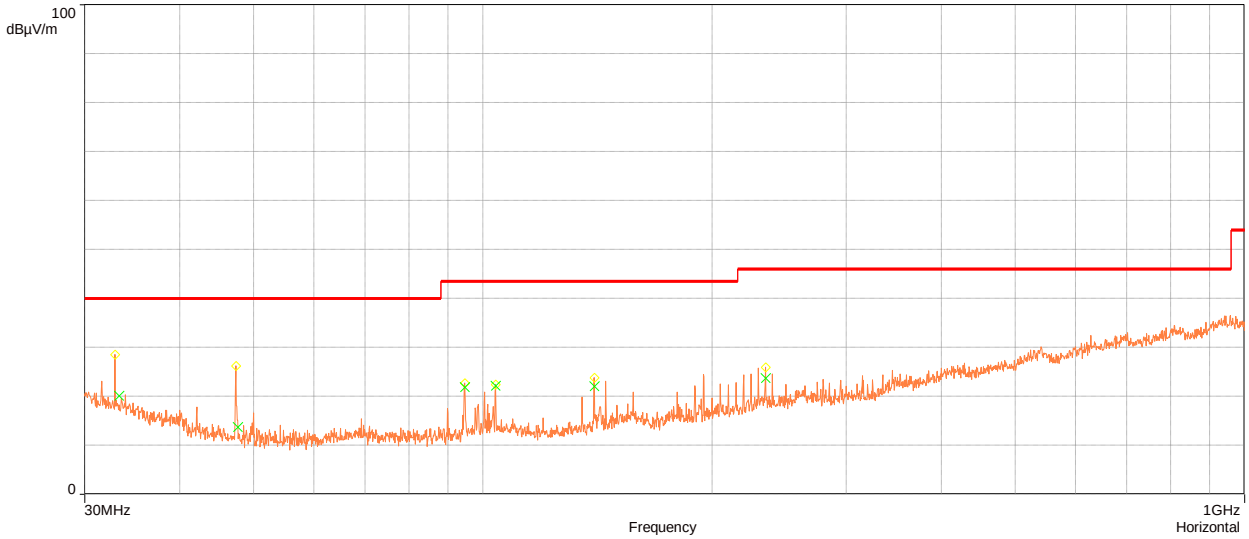



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX02**
**Range 30 MHz – 1 GHz**

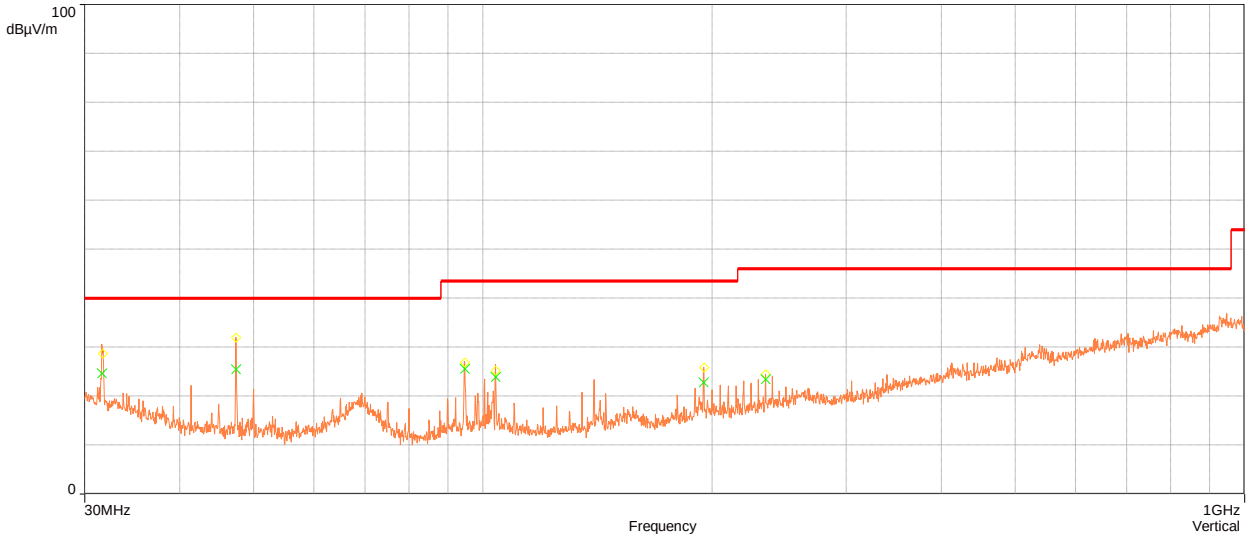


| Frequency (MHz) | SR | Peak (dBµV/m) | QPeak (dBµV/m) | LimQPeak (dBµV/m) | Delta (dB) | Polarization | Height (m) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 46.5555 | 1 | 28.79 | 13.98 | 40.00 | -26.02 | Horizontal | 3.79 | 120.30 |
| 94.6155 | 1 | 22.82 | 21.34 | 43.52 | -22.18 | Horizontal | 3.10 | 240.10 |
| 100.4555 | 1 | 24.39 | 22.14 | 43.52 | -21.38 | Horizontal | 3.27 | 210.10 |
| 103.9555 | 1 | 24.06 | 21.55 | 43.52 | -21.97 | Horizontal | 2.70 | 210.10 |
| 139.9755 | 1 | 24.63 | 23.42 | 43.52 | -20.10 | Horizontal | 1.81 | 300.20 |
| 229.975 | 1 | 25.83 | 25.35 | 46.00 | -20.65 | Horizontal | 1.15 | 300.20 |
| 30.215 | 2 | 31.46 | 21.97 | 40.00 | -18.03 | Vertical | 1.00 | 180.20 |
| 47.515 | 2 | 32.09 | 27.21 | 40.00 | -12.79 | Vertical | 1.15 | 300.30 |
| 94.6155 | 2 | 27.11 | 25.39 | 43.52 | -18.13 | Vertical | 1.16 | 270.40 |
| 139.975 | 2 | 24.54 | 22.59 | 43.52 | -20.93 | Vertical | 1.00 | 270.40 |
| 194.9955 | 2 | 24.97 | 24.49 | 43.52 | -19.03 | Vertical | 1.00 | 210.10 |
| 239.995 | 2 | 24.36 | 24.55 | 46.00 | -21.45 | Vertical | 1.00 | 300.30 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX03**
**Range 30 MHz – 1 GHz**

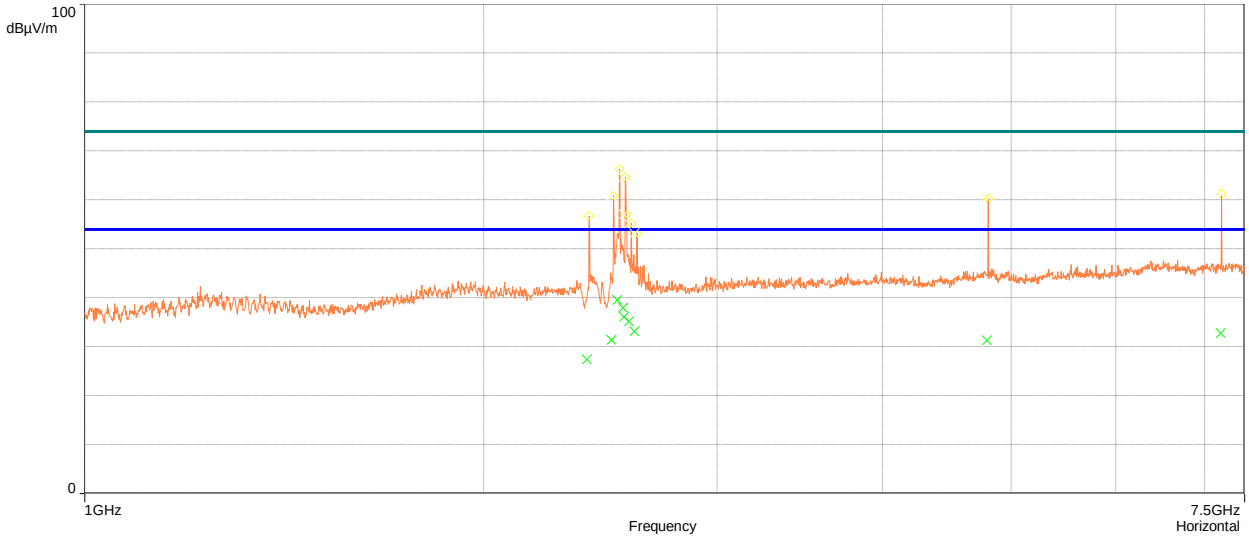



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX03**
**Range 30 MHz – 1 GHz**

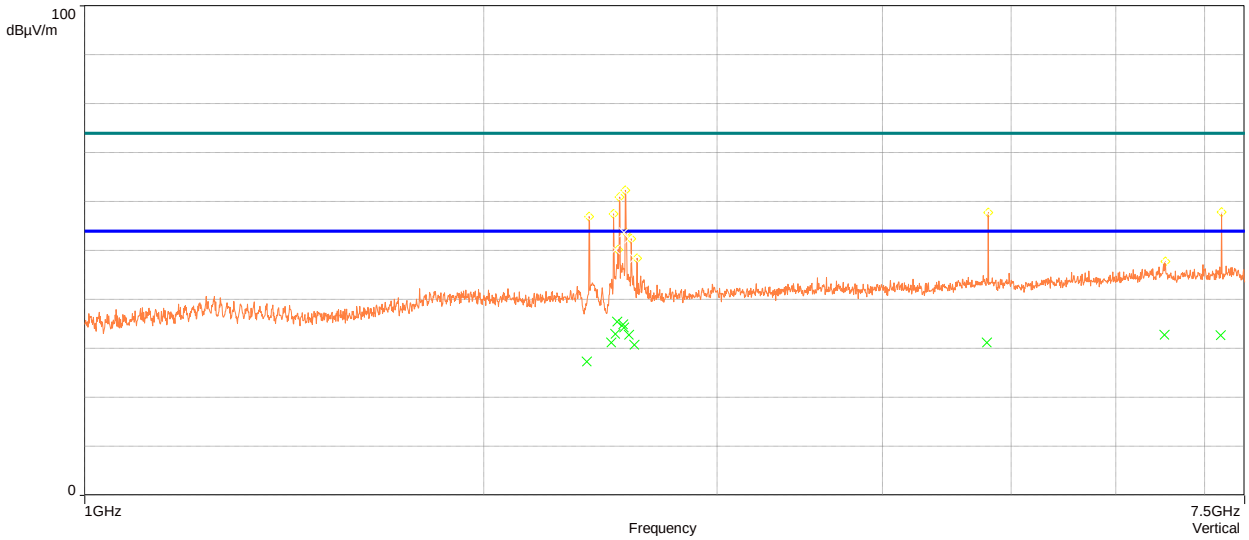


| Frequency (MHz) | SR | Peak (dBµV/m) | QPeak (dBµV/m) | LimQPeak (dBµV/m) | Delta (dB) | Polarization | Height (m) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 33.2755 | 1 | 28.55 | 20.09 | 40.00 | -19.91 | Horizontal | 1.74 | 269.90 |
| 47.6955 | 1 | 26.19 | 13.68 | 40.00 | -26.32 | Horizontal | 2.91 | 180.20 |
| 94.615 | 1 | 22.69 | 21.85 | 43.52 | -21.67 | Horizontal | 3.40 | 359.90 |
| 103.9155 | 1 | 22.37 | 22.18 | 43.52 | -21.34 | Horizontal | 2.69 | 29.90 |
| 140.035 | 1 | 23.80 | 22.02 | 43.52 | -21.50 | Horizontal | 2.23 | 300.40 |
| 235.055 | 1 | 25.96 | 23.69 | 46.00 | -22.31 | Horizontal | 1.38 | 300.40 |
| 31.6 | 2 | 28.71 | 24.60 | 40.00 | -15.40 | Vertical | 1.16 | 89.90 |
| 47.3955 | 2 | 31.91 | 25.43 | 40.00 | -14.57 | Vertical | 1.40 | 359.80 |
| 94.615 | 2 | 26.85 | 25.52 | 43.52 | -18.00 | Vertical | 1.00 | 29.90 |
| 103.9755 | 2 | 25.21 | 23.86 | 43.52 | -19.66 | Vertical | 2.03 | 270.40 |
| 194.9555 | 2 | 25.88 | 22.81 | 43.52 | -20.71 | Vertical | 1.00 | 89.90 |
| 235.0155 | 2 | 24.49 | 23.43 | 46.00 | -22.57 | Vertical | 1.00 | 60.20 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX01**
**Range 1 GHz – 7.5 GHz**

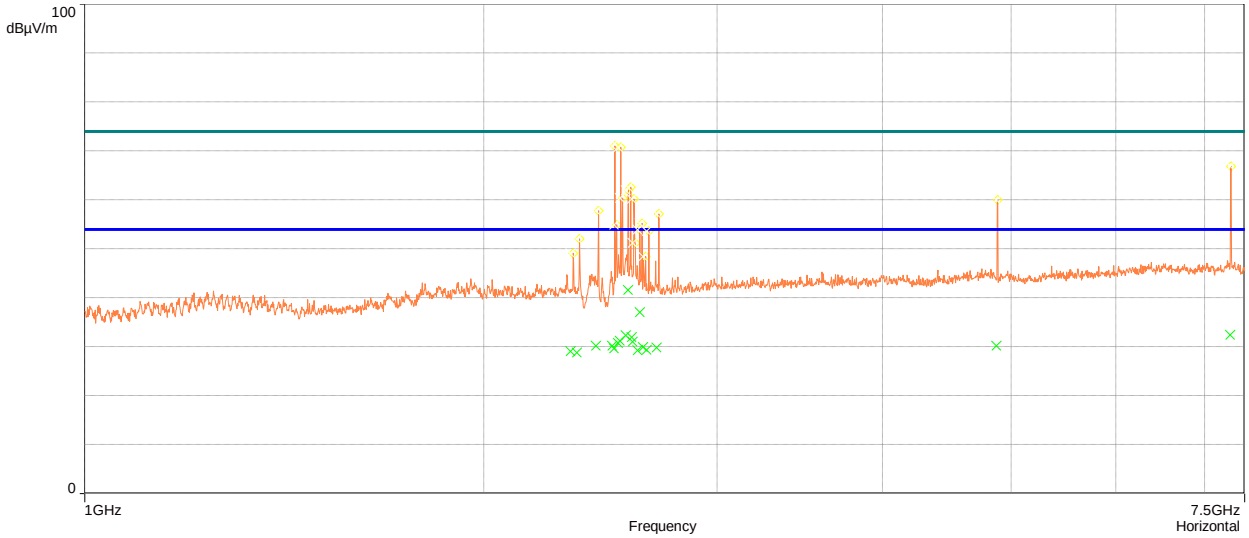



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX01**
**Range 1 GHz – 7.5 GHz**

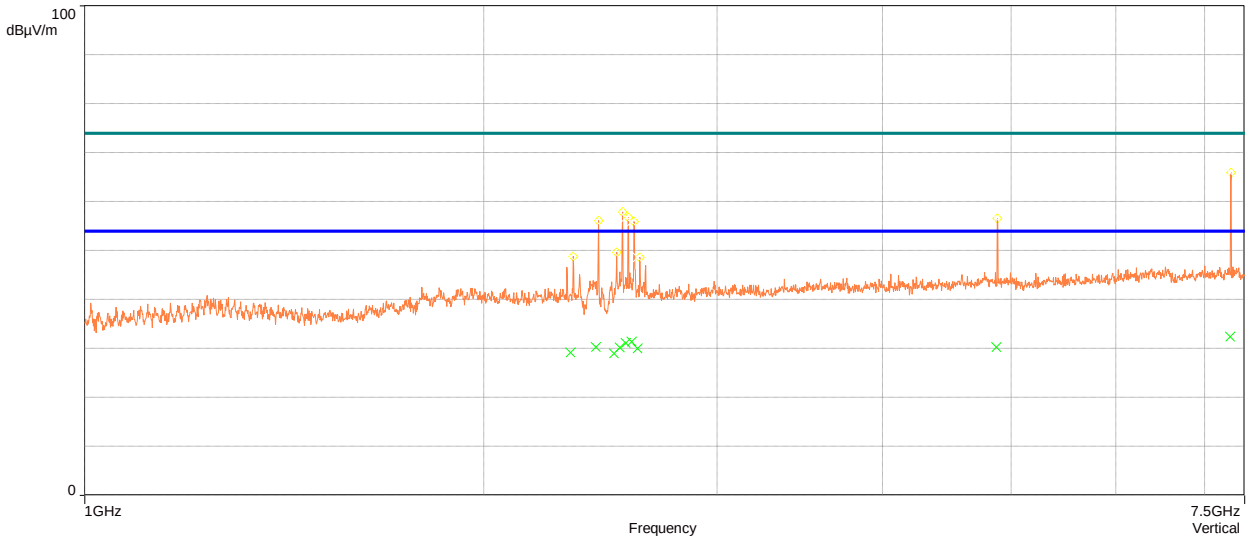


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 2391 | 1 | 56.66 | 74.00 | 46.59 | 27.41 | 54.00 | 26.59 | 330.30 |
| 2495 | 1 | 60.85 | 74.00 | 42.61 | 31.39 | 54.00 | 22.61 | 330.30 |
| 2521 | 1 | 66.27 | 74.00 | 34.46 | 39.54 | 54.00 | 14.46 | 330.30 |
| 2547 | 1 | 64.62 | 74.00 | 36.01 | 37.99 | 54.00 | 16.01 | 330.30 |
| 2551 | 1 | 57.09 | 74.00 | 37.84 | 36.16 | 54.00 | 17.84 | 330.30 |
| 2573 | 1 | 55.21 | 74.00 | 38.78 | 35.22 | 54.00 | 18.78 | 330.30 |
| 2599 | 1 | 53.17 | 74.00 | 40.83 | 33.17 | 54.00 | 20.83 | 330.30 |
| 4793 | 1 | 60.32 | 74.00 | 42.73 | 31.27 | 54.00 | 22.73 | 300.20 |
| 7195.5 | 1 | 61.17 | 74.00 | 41.25 | 32.75 | 54.00 | 21.25 | 240.10 |
| 2391 | 2 | 56.98 | 74.00 | 46.63 | 27.36 | 54.00 | 26.64 | 210.10 |
| 2495 | 2 | 57.55 | 74.00 | 42.83 | 31.17 | 54.00 | 22.83 | 240.10 |
| 2514 | 2 | 50.15 | 74.00 | 41.00 | 32.98 | 54.00 | 21.02 | 180.40 |
| 2521 | 2 | 60.95 | 74.00 | 38.56 | 35.44 | 54.00 | 18.56 | 90.10 |
| 2547 | 2 | 62.36 | 74.00 | 39.08 | 34.92 | 54.00 | 19.08 | 240.10 |
| 2550.5 | 2 | 53.69 | 74.00 | 39.77 | 34.23 | 54.00 | 19.77 | 240.10 |
| 2573.5 | 2 | 52.43 | 74.00 | 41.19 | 32.81 | 54.00 | 21.19 | 210.10 |
| 2599 | 2 | 48.46 | 74.00 | 43.21 | 30.79 | 54.00 | 23.21 | 240.10 |
| 4792.5 | 2 | 57.83 | 74.00 | 42.77 | 31.23 | 54.00 | 22.77 | 120.40 |
| 6525.5 | 2 | 47.80 | 74.00 | 41.17 | 32.83 | 54.00 | 21.17 | 150.30 |
| 7195 | 2 | 57.89 | 74.00 | 41.35 | 32.65 | 54.00 | 21.35 | 359.80 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX02**
**Range 1 GHz – 7.5 GHz**

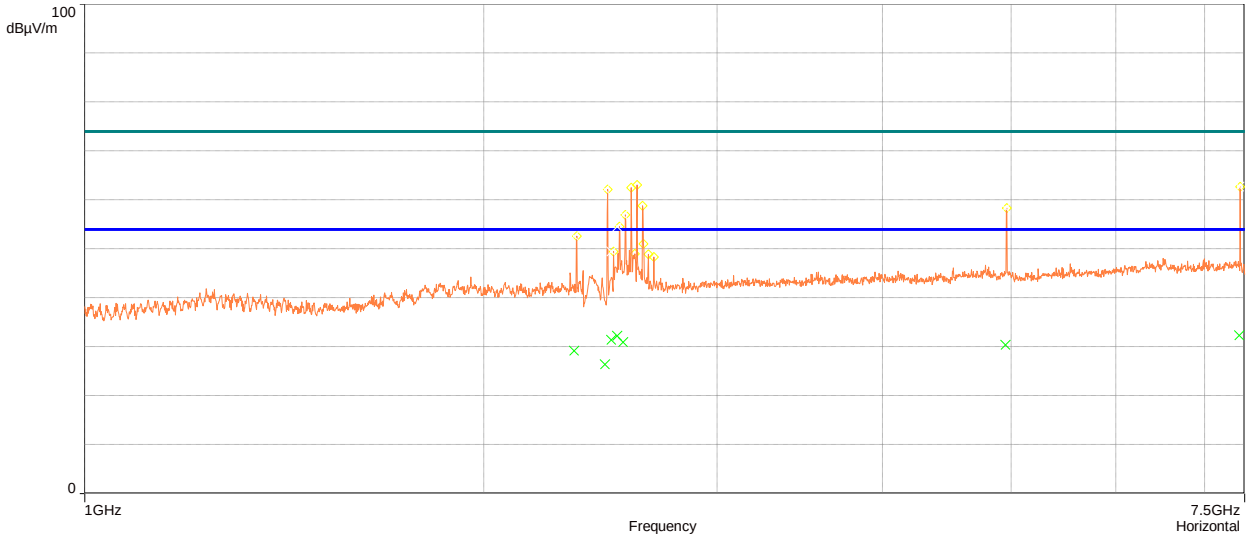



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX02**
**Range 1 GHz – 7.5 GHz**

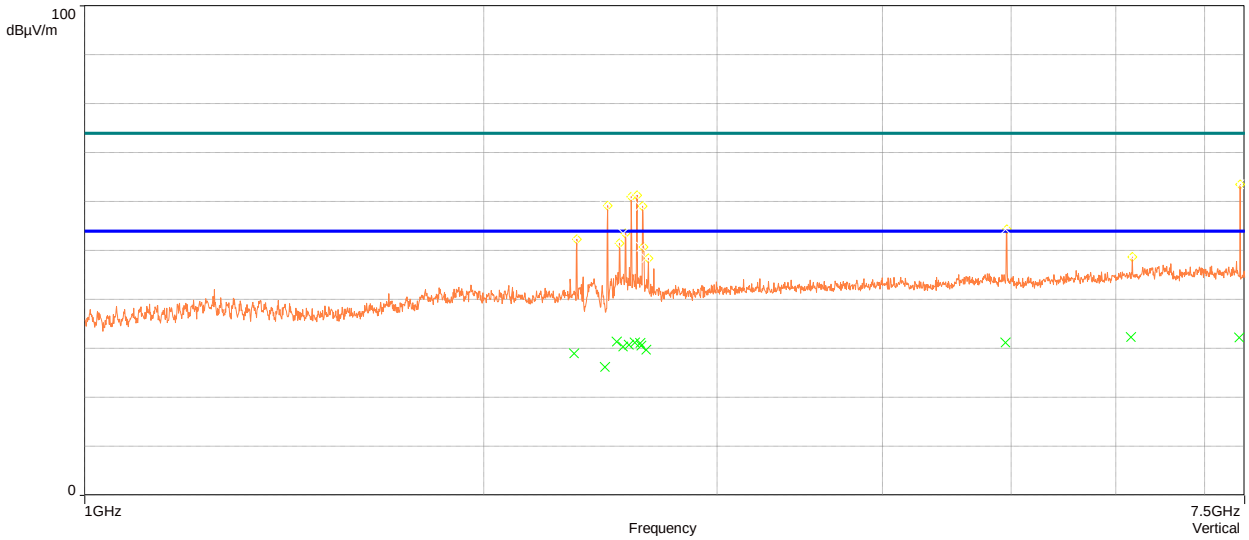


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 2326 | 1 | 49.10 | 74.00 | 44.93 | 29.07 | 54.00 | 24.93 | 300.40 |
| 2351.5 | 1 | 52.07 | 74.00 | 45.16 | 28.84 | 54.00 | 25.16 | 359.80 |
| 2430 | 1 | 57.82 | 74.00 | 43.83 | 30.17 | 54.00 | 23.83 | 330.10 |
| 2500 | 1 | 71.07 | 74.00 | 43.84 | 30.16 | 54.00 | 23.84 | 330.10 |
| 2508 | 1 | 54.96 | 74.00 | 44.35 | 29.65 | 54.00 | 24.35 | 330.10 |
| 2526 | 1 | 70.79 | 74.00 | 43.25 | 30.75 | 54.00 | 23.25 | 180.20 |
| 2534 | 1 | 60.36 | 74.00 | 42.82 | 31.18 | 54.00 | 22.82 | 330.10 |
| 2560 | 1 | 61.99 | 74.00 | 41.69 | 32.31 | 54.00 | 21.69 | 330.10 |
| 2570.5 | 1 | 62.59 | 74.00 | 32.46 | 41.54 | 54.00 | 12.46 | 60.20 |
| 2585.5 | 1 | 60.19 | 74.00 | 42.08 | 31.92 | 54.00 | 22.08 | 330.10 |
| 2590.5 | 1 | 51.22 | 74.00 | 42.95 | 31.05 | 54.00 | 22.95 | 330.10 |
| 2612 | 1 | 53.90 | 74.00 | 44.76 | 29.24 | 54.00 | 24.76 | 210.20 |
| 2623 | 1 | 55.16 | 74.00 | 36.94 | 37.06 | 54.00 | 16.94 | 359.80 |
| 2638 | 1 | 48.45 | 74.00 | 44.08 | 29.92 | 54.00 | 24.08 | 330.10 |
| 2654 | 1 | 53.57 | 74.00 | 44.60 | 29.40 | 54.00 | 24.60 | 300.40 |
| 2700.5 | 1 | 57.12 | 74.00 | 44.14 | 29.86 | 54.00 | 24.14 | 60.20 |
| 4871.5 | 1 | 60.02 | 74.00 | 43.82 | 30.18 | 54.00 | 23.82 | 300.40 |
| 7312.5 | 1 | 66.86 | 74.00 | 41.62 | 32.38 | 54.00 | 21.62 | 240.20 |
| 2326 | 2 | 48.83 | 74.00 | 44.83 | 29.17 | 54.00 | 24.83 | 210.20 |
| 2430 | 2 | 56.11 | 74.00 | 43.72 | 30.28 | 54.00 | 23.72 | 90.20 |
| 2508.5 | 2 | 49.66 | 74.00 | 45.02 | 28.98 | 54.00 | 25.02 | 240.30 |
| 2534 | 2 | 57.84 | 74.00 | 43.78 | 30.22 | 54.00 | 23.78 | 240.30 |
| 2560 | 2 | 56.75 | 74.00 | 42.86 | 31.14 | 54.00 | 22.86 | 240.30 |
| 2586 | 2 | 55.97 | 74.00 | 42.57 | 31.43 | 54.00 | 22.57 | 210.20 |
| 2612 | 2 | 48.58 | 74.00 | 44.02 | 29.98 | 54.00 | 24.02 | 240.30 |
| 4871 | 2 | 56.60 | 74.00 | 43.70 | 30.30 | 54.00 | 23.70 | 120.30 |
| 7311.5 | 2 | 65.94 | 74.00 | 41.55 | 32.45 | 54.00 | 21.55 | 359.90 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX03**
**Range 1 GHz – 7.5 GHz**

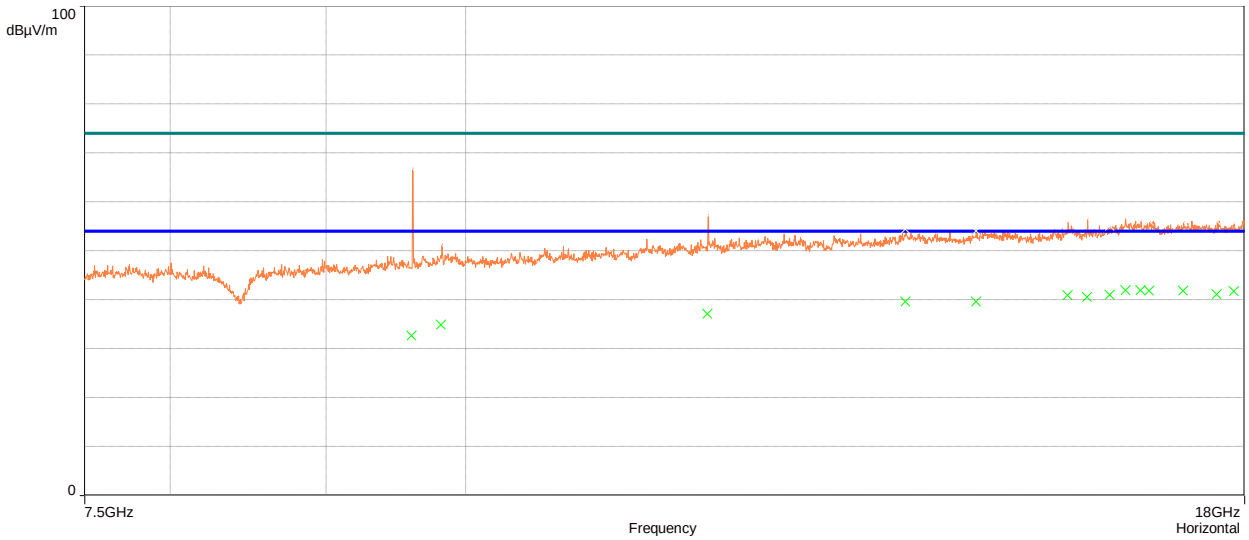



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX03**
**Range 1 GHz – 7.5 GHz**

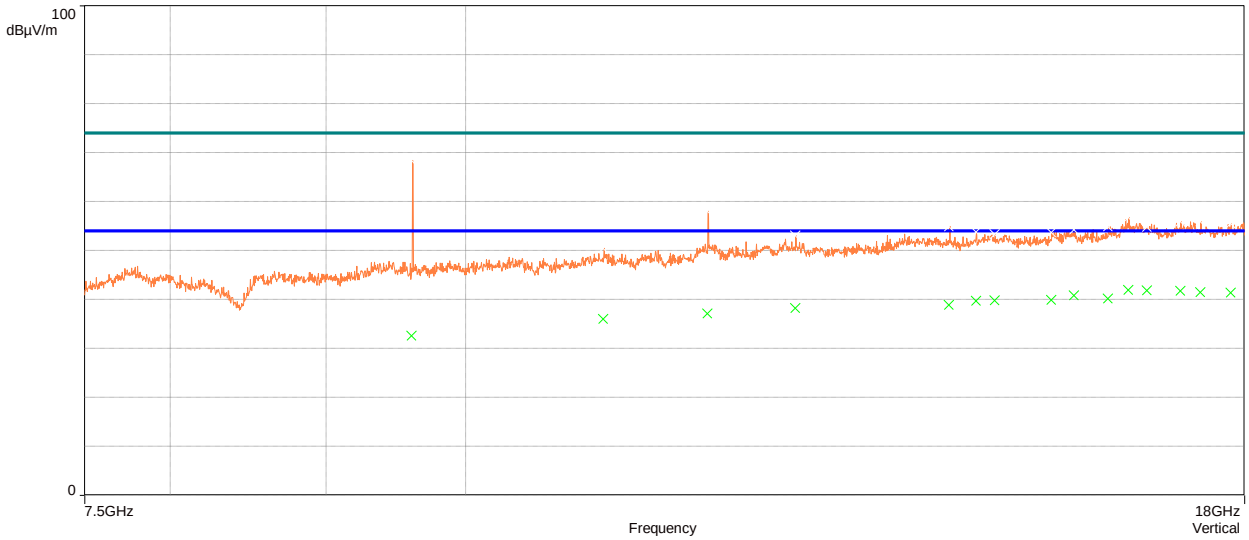


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 2339 | 1 | 52.56 | 74.00 | 44.81 | 29.18 | 54.00 | 24.82 | 300.30 |
| 2469 | 1 | 62.09 | 74.00 | 47.63 | 26.37 | 54.00 | 27.63 | 330.30 |
| 2495.5 | 1 | 49.41 | 74.00 | 42.62 | 31.38 | 54.00 | 22.62 | 330.30 |
| 2521 | 1 | 54.54 | 74.00 | 41.79 | 32.21 | 54.00 | 21.79 | 330.30 |
| 2547 | 1 | 56.98 | 74.00 | 43.04 | 30.96 | 54.00 | 23.04 | 330.30 |
| 4949.5 | 1 | 58.30 | 74.00 | 43.62 | 30.38 | 54.00 | 23.62 | 330.30 |
| 7428.5 | 1 | 62.71 | 74.00 | 41.70 | 32.30 | 54.00 | 21.70 | 240.20 |
| 2339 | 2 | 52.35 | 74.00 | 44.97 | 29.03 | 54.00 | 24.97 | 90.10 |
| 2469 | 2 | 59.20 | 74.00 | 47.82 | 26.18 | 54.00 | 27.82 | 270.30 |
| 2520.5 | 2 | 51.52 | 74.00 | 42.65 | 31.35 | 54.00 | 22.65 | 240.20 |
| 2547 | 2 | 53.50 | 74.00 | 43.64 | 30.36 | 54.00 | 23.64 | 240.20 |
| 2573 | 2 | 61.04 | 74.00 | 43.28 | 30.72 | 54.00 | 23.28 | 210.20 |
| 2599.5 | 2 | 61.31 | 74.00 | 42.76 | 31.24 | 54.00 | 22.76 | 240.20 |
| 2625 | 2 | 59.07 | 74.00 | 42.90 | 31.10 | 54.00 | 22.90 | 240.20 |
| 2629 | 2 | 50.71 | 74.00 | 43.43 | 30.57 | 54.00 | 23.43 | 210.20 |
| 2651.5 | 2 | 48.40 | 74.00 | 44.23 | 29.77 | 54.00 | 24.23 | 270.30 |
| 4949 | 2 | 54.31 | 74.00 | 42.79 | 31.21 | 54.00 | 22.79 | 90.10 |
| 6157 | 2 | 48.75 | 74.00 | 41.72 | 32.28 | 54.00 | 21.72 | 359.90 |
| 7429.5 | 2 | 63.48 | 74.00 | 41.75 | 32.25 | 54.00 | 21.75 | 270.30 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX01**
**Range 7.5 GHz – 18 GHz**

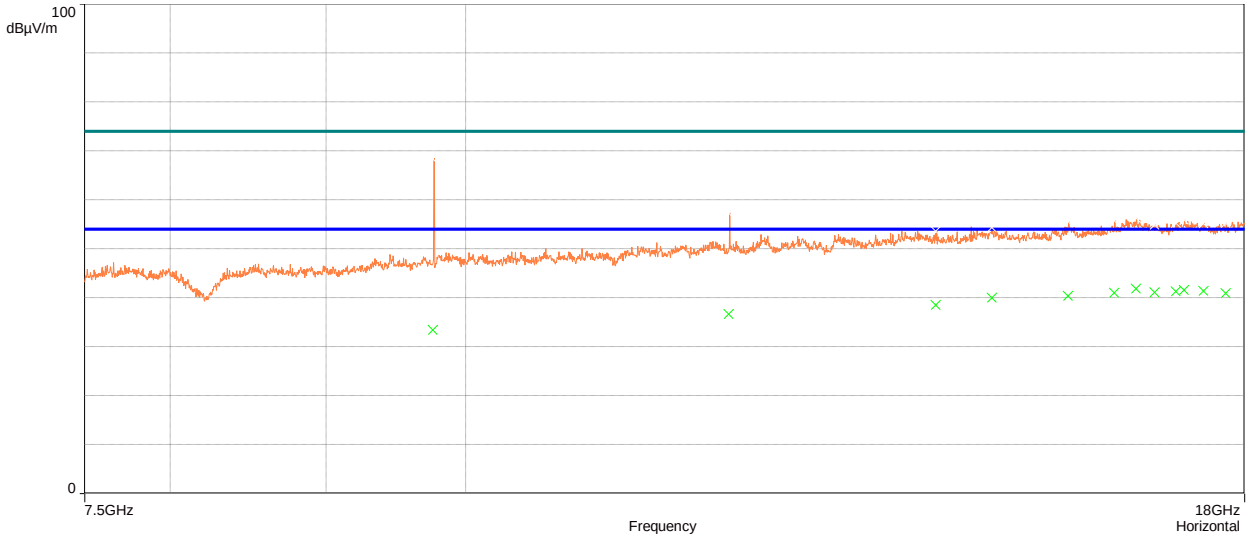



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX01**
**Range 7.5 GHz – 18 GHz**

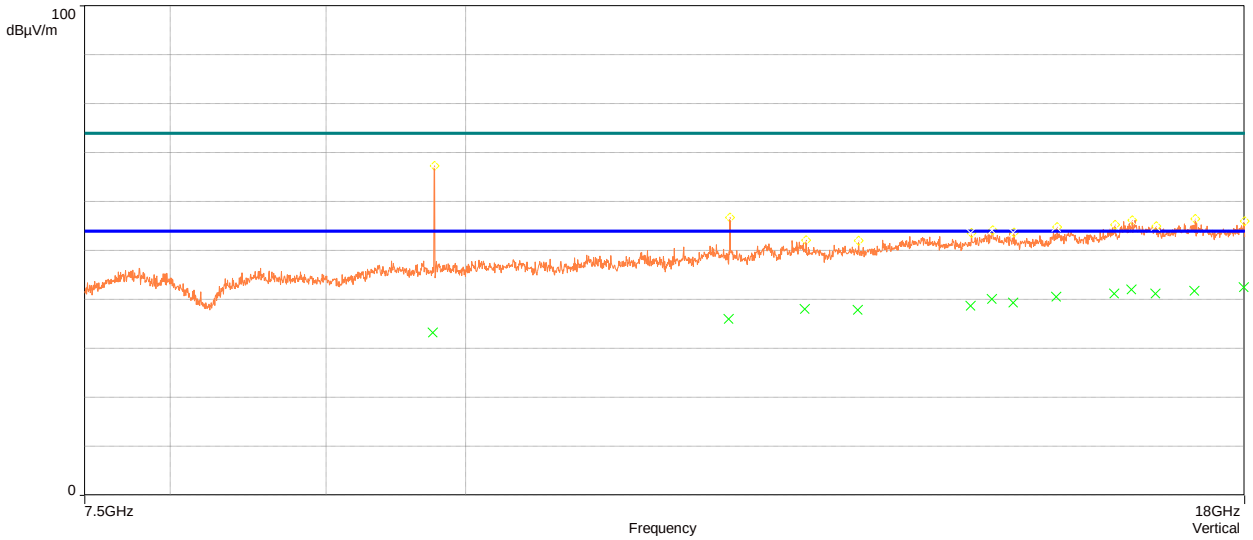


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 9597.5 | 1 | 66.91 | 74.00 | 41.28 | 32.72 | 54.00 | 21.28 | 330.30 |
| 9812 | 1 | 51.36 | 74.00 | 39.07 | 34.93 | 54.00 | 19.07 | 180.20 |
| 11998.5 | 1 | 57.45 | 74.00 | 36.90 | 37.10 | 54.00 | 16.90 | 330.30 |
| 13933 | 1 | 54.49 | 74.00 | 34.38 | 39.62 | 54.00 | 14.38 | 150.30 |
| 14698 | 1 | 54.06 | 74.00 | 34.37 | 39.63 | 54.00 | 14.37 | 30.00 |
| 15745.5 | 1 | 56.15 | 74.00 | 33.07 | 40.93 | 54.00 | 13.07 | 270.40 |
| 15979.5 | 1 | 56.71 | 74.00 | 33.48 | 40.52 | 54.00 | 13.48 | 270.40 |
| 16255.5 | 1 | 55.11 | 74.00 | 32.97 | 41.03 | 54.00 | 12.97 | 240.30 |
| 16449.5 | 1 | 56.75 | 74.00 | 32.05 | 41.95 | 54.00 | 12.05 | 240.30 |
| 16637.5 | 1 | 56.29 | 74.00 | 32.08 | 41.92 | 54.00 | 12.08 | 150.30 |
| 16745 | 1 | 56.16 | 74.00 | 32.16 | 41.84 | 54.00 | 12.16 | 89.90 |
| 17185 | 1 | 56.03 | 74.00 | 32.13 | 41.87 | 54.00 | 12.13 | 300.20 |
| 17623.5 | 1 | 56.15 | 74.00 | 32.93 | 41.08 | 54.00 | 12.92 | 30.00 |
| 17852.5 | 1 | 55.82 | 74.00 | 32.20 | 41.80 | 54.00 | 12.20 | 359.90 |
| 9597.5 | 2 | 68.48 | 74.00 | 41.39 | 32.61 | 54.00 | 21.39 | 240.30 |
| 11092 | 2 | 50.47 | 74.00 | 37.99 | 36.00 | 54.00 | 18.00 | 120.20 |
| 11999.5 | 2 | 58.08 | 74.00 | 36.90 | 37.10 | 54.00 | 16.90 | 210.20 |
| 12821.5 | 2 | 53.09 | 74.00 | 35.71 | 38.29 | 54.00 | 15.71 | 330.30 |
| 14400 | 2 | 54.87 | 74.00 | 35.07 | 38.93 | 54.00 | 15.07 | 359.90 |
| 14696 | 2 | 53.80 | 74.00 | 34.29 | 39.71 | 54.00 | 14.29 | 270.00 |
| 14903.5 | 2 | 53.31 | 74.00 | 34.14 | 39.85 | 54.00 | 14.15 | 359.90 |
| 15555 | 2 | 53.75 | 74.00 | 34.06 | 39.94 | 54.00 | 14.06 | 120.20 |
| 15825.5 | 2 | 54.28 | 74.00 | 33.15 | 40.85 | 54.00 | 13.15 | 60.30 |
| 16233 | 2 | 54.94 | 74.00 | 33.77 | 40.23 | 54.00 | 13.77 | 180.00 |
| 16485 | 2 | 56.73 | 74.00 | 32.07 | 41.92 | 54.00 | 12.08 | 29.90 |
| 16718 | 2 | 54.82 | 74.00 | 32.12 | 41.88 | 54.00 | 12.12 | 330.30 |
| 17148.5 | 2 | 55.92 | 74.00 | 32.27 | 41.73 | 54.00 | 12.27 | 29.90 |
| 17410 | 2 | 55.91 | 74.00 | 32.49 | 41.51 | 54.00 | 12.49 | 270.00 |
| 17809 | 2 | 55.58 | 74.00 | 32.64 | 41.36 | 54.00 | 12.64 | 180.00 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX02**
**Range 7.5 GHz – 18 GHz**

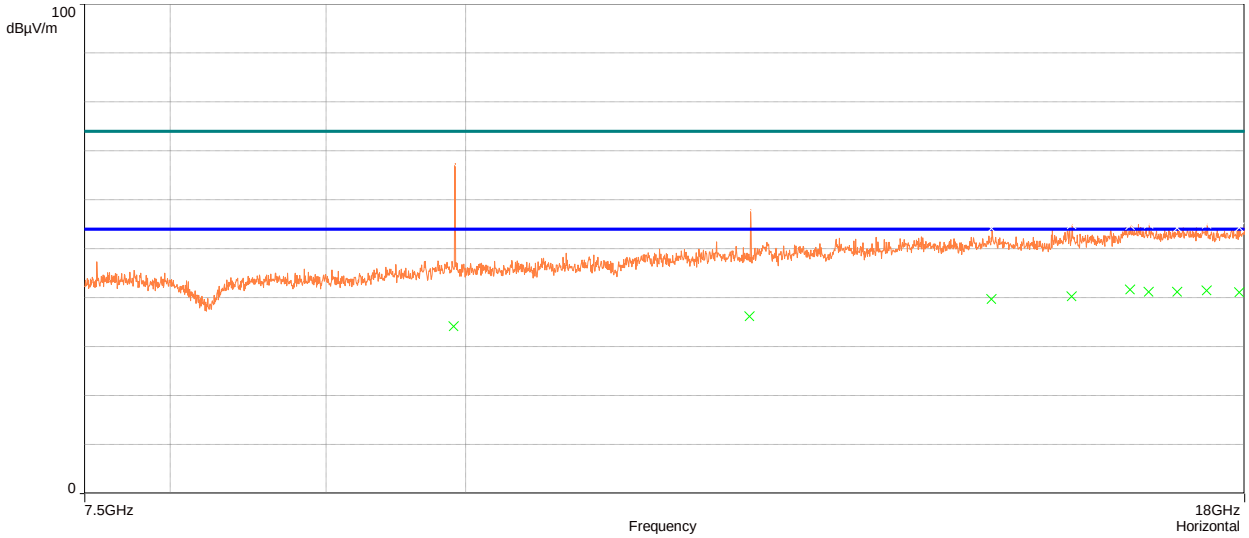



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX02**
**Range 7.5 GHz – 18 GHz**

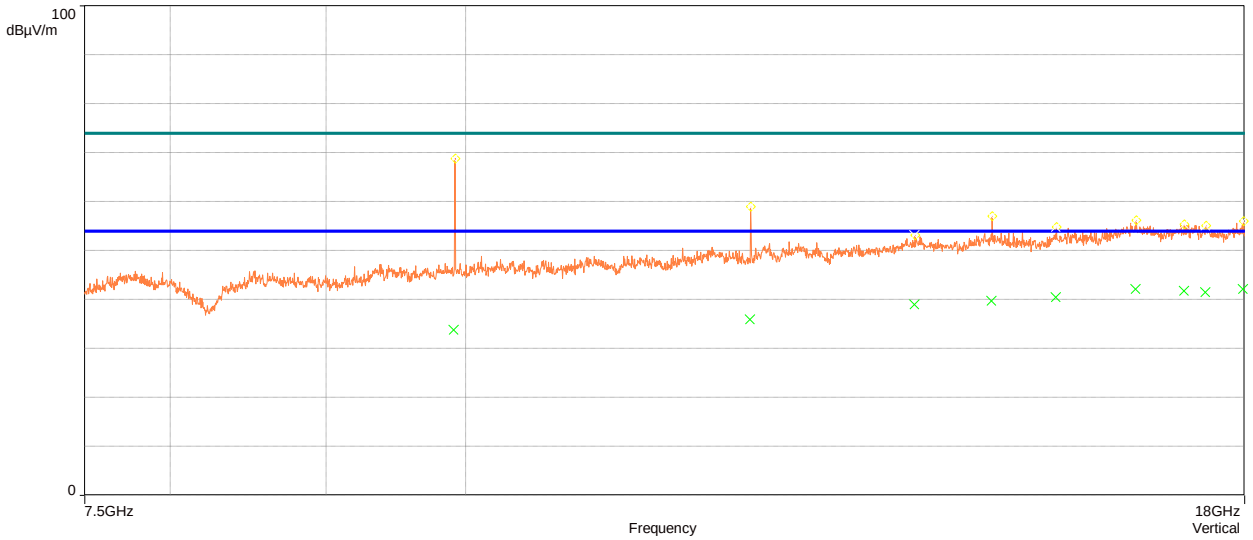


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 9753.5 | 1 | 68.42 | 74.00 | 40.58 | 33.42 | 54.00 | 20.58 | 359.90 |
| 12195 | 1 | 57.35 | 74.00 | 37.36 | 36.64 | 54.00 | 17.36 | 60.00 |
| 14257.5 | 1 | 53.64 | 74.00 | 35.49 | 38.51 | 54.00 | 15.49 | 330.30 |
| 14874 | 1 | 54.40 | 74.00 | 34.00 | 40.00 | 54.00 | 14.00 | 90.10 |
| 15751.5 | 1 | 55.54 | 74.00 | 33.62 | 40.38 | 54.00 | 13.62 | 300.20 |
| 16314.5 | 1 | 55.72 | 74.00 | 33.00 | 41.00 | 54.00 | 13.00 | 120.20 |
| 16582.5 | 1 | 56.28 | 74.00 | 32.17 | 41.83 | 54.00 | 12.17 | 120.20 |
| 16817.5 | 1 | 54.96 | 74.00 | 32.89 | 41.11 | 54.00 | 12.89 | 300.20 |
| 17089 | 1 | 55.33 | 74.00 | 32.73 | 41.27 | 54.00 | 12.73 | 210.10 |
| 17196.5 | 1 | 55.90 | 74.00 | 32.37 | 41.60 | 54.00 | 12.40 | 120.20 |
| 17450 | 1 | 55.15 | 74.00 | 32.61 | 41.39 | 54.00 | 12.61 | 240.10 |
| 17744 | 1 | 55.27 | 74.00 | 33.03 | 40.97 | 54.00 | 13.03 | 270.30 |
| 9753.5 | 2 | 67.36 | 74.00 | 40.79 | 33.21 | 54.00 | 20.79 | 90.10 |
| 12193 | 2 | 56.76 | 74.00 | 38.02 | 35.98 | 54.00 | 18.02 | 90.10 |
| 12915.5 | 2 | 52.10 | 74.00 | 35.91 | 38.09 | 54.00 | 15.91 | 29.90 |
| 13440.5 | 2 | 52.00 | 74.00 | 36.16 | 37.83 | 54.00 | 16.17 | 180.30 |
| 14634.5 | 2 | 53.59 | 74.00 | 35.25 | 38.75 | 54.00 | 15.25 | 90.10 |
| 14875 | 2 | 54.17 | 74.00 | 33.87 | 40.13 | 54.00 | 13.87 | 150.30 |
| 15116 | 2 | 53.74 | 74.00 | 34.62 | 39.38 | 54.00 | 14.62 | 330.30 |
| 15614 | 2 | 54.84 | 74.00 | 33.44 | 40.56 | 54.00 | 13.44 | 359.70 |
| 16311.5 | 2 | 55.25 | 74.00 | 32.75 | 41.25 | 54.00 | 12.75 | 330.30 |
| 16526.5 | 2 | 56.24 | 74.00 | 31.99 | 42.01 | 54.00 | 11.99 | 240.30 |
| 16829.5 | 2 | 55.04 | 74.00 | 32.76 | 41.24 | 54.00 | 12.76 | 270.30 |
| 17329.5 | 2 | 56.52 | 74.00 | 32.26 | 41.74 | 54.00 | 12.26 | 150.30 |
| 17988.5 | 2 | 56.04 | 74.00 | 31.53 | 42.47 | 54.00 | 11.53 | 180.30 |

**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX03**
**Range 7.5 GHz – 18 GHz**

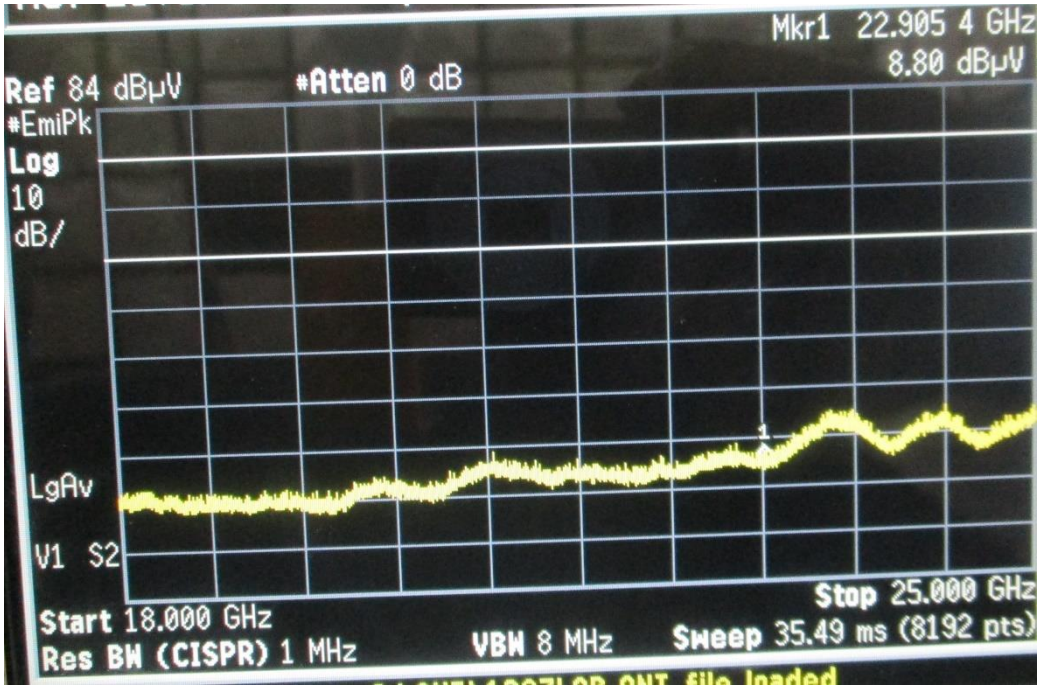



**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX03**
**Range 7.5 GHz – 18 GHz**

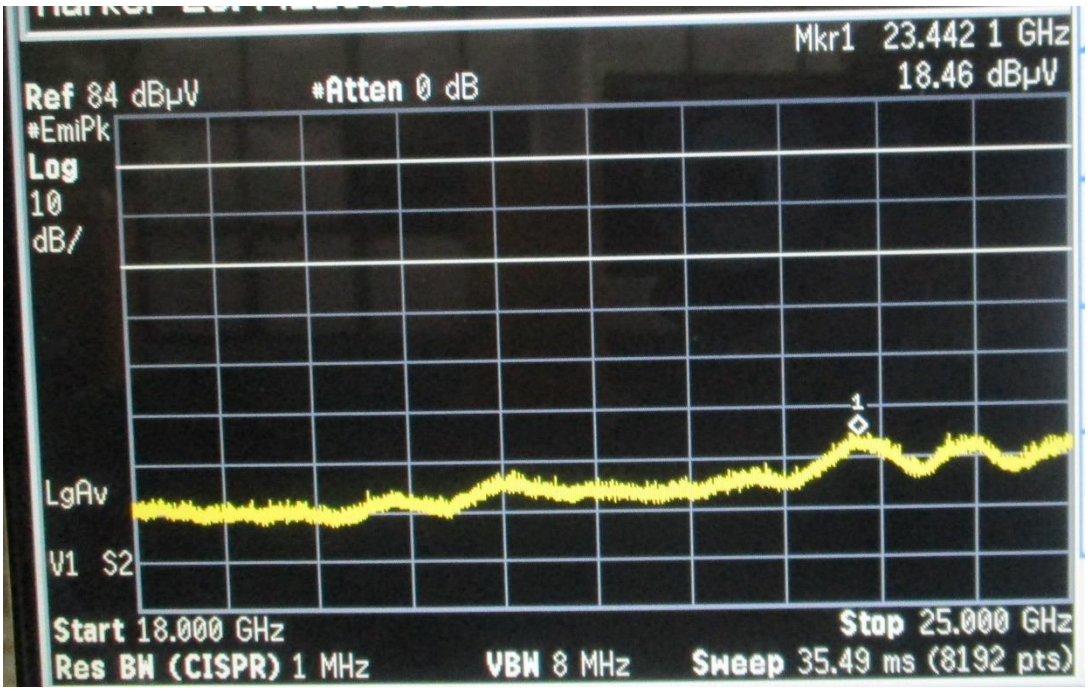


| Frequency (MHz) | SR | Peak (dBµV/m) | LimPeak (dBµV/m) | Delta (dB) | CISPR AVG (dBµV/m) | Lim AVG (dBµV/m) | Delta AVG (dB) | Angle (deg) |
|---|---|---|---|---|---|---|---|---|
| 9908.5 | 1 | 67.46 | 74.00 | 39.83 | 34.17 | 54.00 | 19.83 | 359.90 |
| 12388 | 1 | 58.02 | 74.00 | 37.76 | 36.24 | 54.00 | 17.76 | 359.90 |
| 14868 | 1 | 54.19 | 74.00 | 34.25 | 39.75 | 54.00 | 14.25 | 359.90 |
| 15795 | 1 | 55.00 | 74.00 | 33.72 | 40.28 | 54.00 | 13.72 | 359.90 |
| 16510.5 | 1 | 54.85 | 74.00 | 32.29 | 41.71 | 54.00 | 12.29 | 359.90 |
| 16740.5 | 1 | 55.13 | 74.00 | 32.78 | 41.22 | 54.00 | 12.78 | 359.90 |
| 17106 | 1 | 54.26 | 74.00 | 32.80 | 41.20 | 54.00 | 12.80 | 359.90 |
| 17489.5 | 1 | 55.09 | 74.00 | 32.52 | 41.48 | 54.00 | 12.52 | 359.90 |
| 17925.5 | 1 | 54.38 | 74.00 | 32.87 | 41.13 | 54.00 | 12.87 | 359.90 |
| 9908.5 | 2 | 68.84 | 74.00 | 40.23 | 33.77 | 54.00 | 20.23 | 60.30 |
| 12389.5 | 2 | 58.99 | 74.00 | 38.07 | 35.93 | 54.00 | 18.07 | 60.30 |
| 14027.5 | 2 | 53.18 | 74.00 | 34.98 | 39.02 | 54.00 | 14.98 | 90.20 |
| 14868 | 2 | 57.06 | 74.00 | 34.30 | 39.70 | 54.00 | 14.30 | 60.30 |
| 15608 | 2 | 54.86 | 74.00 | 33.57 | 40.43 | 54.00 | 13.57 | 150.30 |
| 16575.5 | 2 | 56.22 | 74.00 | 31.87 | 42.13 | 54.00 | 11.87 | 180.30 |
| 17191 | 2 | 55.38 | 74.00 | 32.20 | 41.80 | 54.00 | 12.20 | 180.30 |
| 17472.5 | 2 | 55.13 | 74.00 | 32.55 | 41.45 | 54.00 | 12.55 | 150.30 |
| 17976 | 2 | 56.03 | 74.00 | 31.83 | 42.17 | 54.00 | 11.83 | 120.30 |

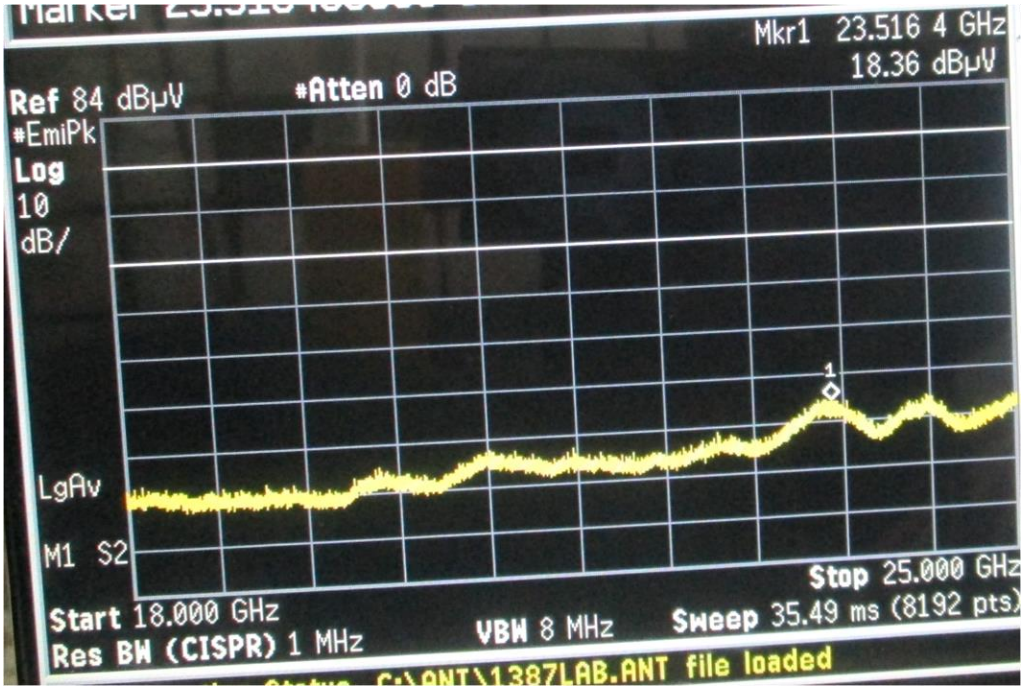
**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX01**
**Range 18 GHz – 25 GHz**



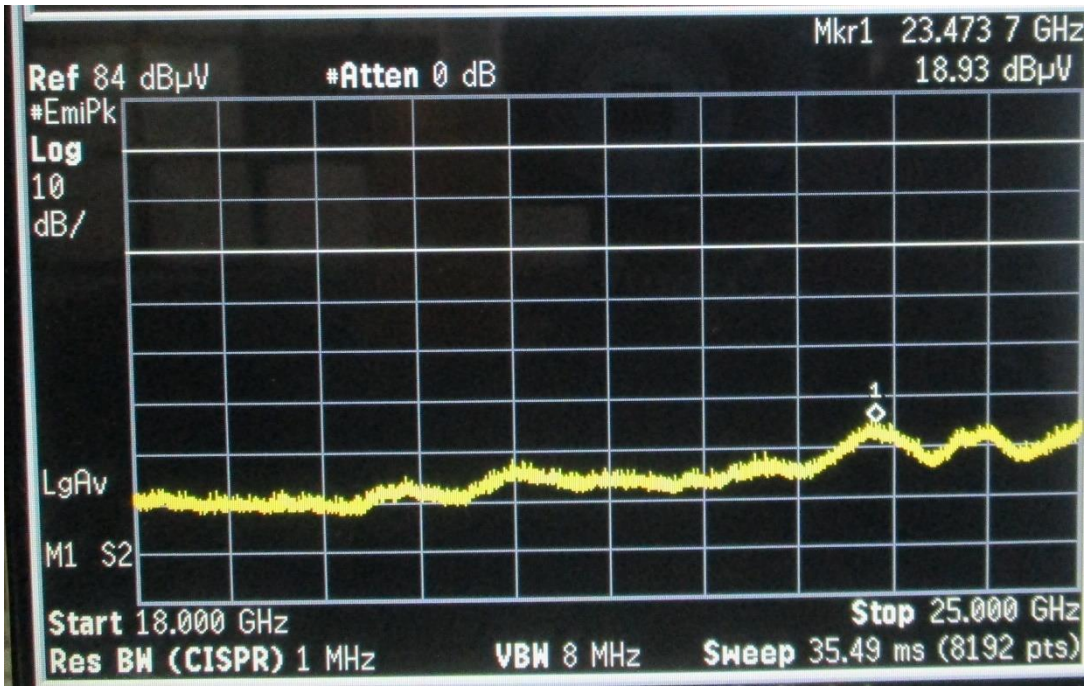

**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX01**
**Range 18 GHz – 25 GHz**



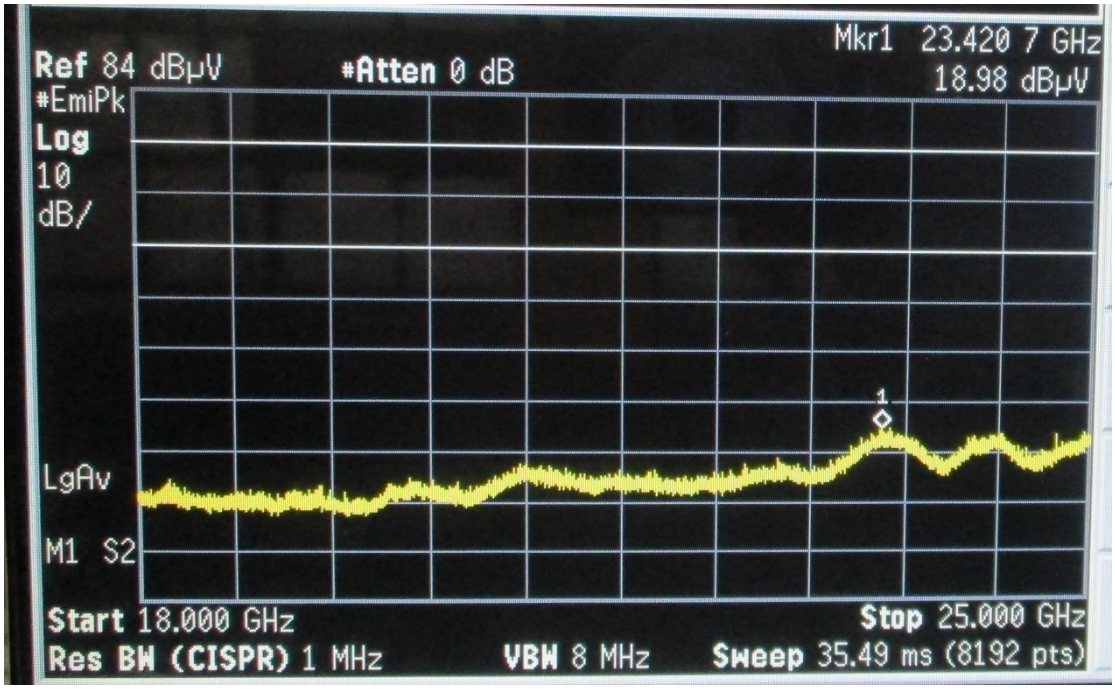
**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX02**
**Range 18 GHz – 25 GHz**



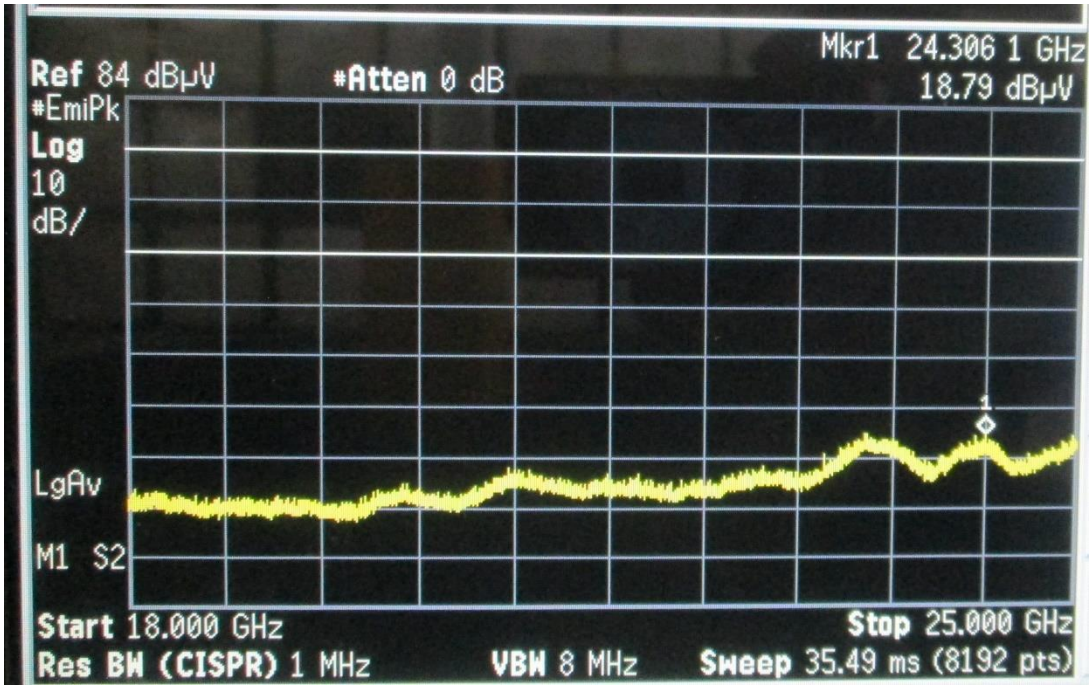

**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX02**
**Range 18 GHz – 25 GHz**



**BLUETOOTH CLASSIC**
**Horizontal polarization**
**TX03**
**Range 18 GHz – 25 GHz**




**BLUETOOTH CLASSIC**
**Vertical polarization**
**TX03**
**Range 18 GHz – 25 GHz**

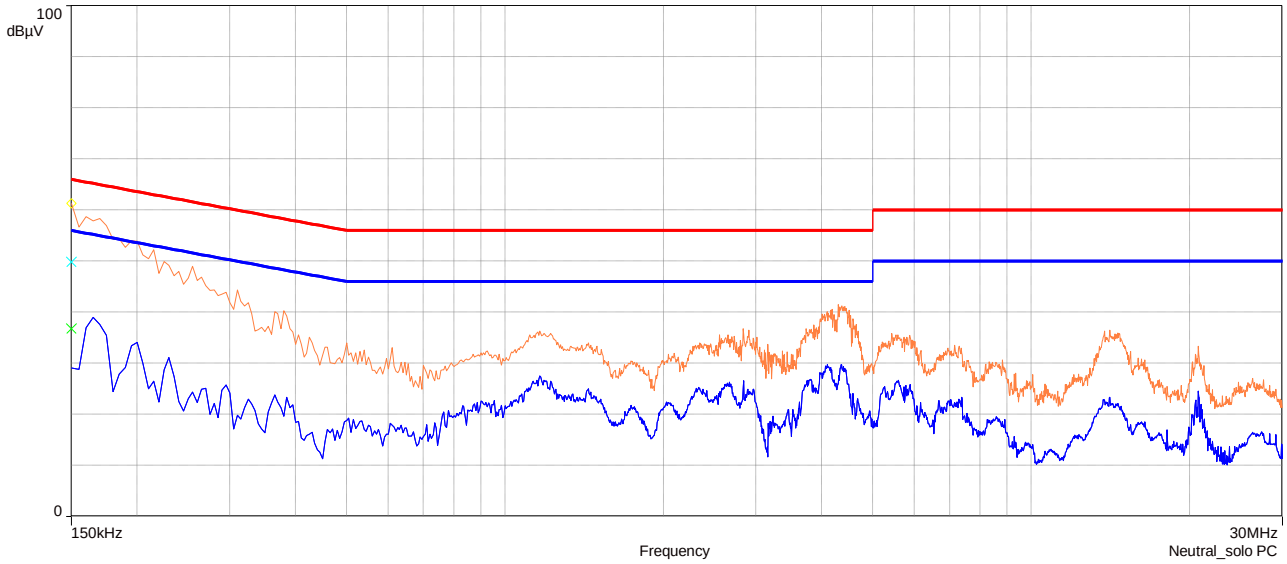


| | | |
|---|---|---|
| **Test method:** | **FCC part 15 C - § 15.207**<br>**Standard test method for ac power-line conducted emissions from unlicensed wireless devices**<br>For details see par. 4 of this report | |
| Operator | Marco Nicolè | |
| Test Date | 2023-04-12 | |
| Test Temperature | 21 °C | |
| Test Humidity | 32 % | |
| Test Pressure | 996 hPa | |
| Electrical wiring | *Cable* | *Length [m]* |
| | USB cable | 0.2 |
| | Ac input cable (power supply of laptop) | 1.3 |
| Operating conditions | OC09<br>See par. 6 of this report | |
| Additional information | None | |
| Auxiliary equipment (AE) | See par. 3.4 of this report | |
| Frequency range | 150 kHz ÷ 30 MHz | |
| Test set up | ☐ Floor standing set up<br>☒ Table top set up | |
| Test method | The EUT is placed on the table, which is 0.8 m above ground plane. According to the requirements in Section 13.1.3 of ANSI C63.4 Conducted emission from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average detector modes | |
| Port | A.C. Input - LISN measurements | |
| Test instrumentations | See Annex B | |
| Measurement Uncertainty (k=2) | See Annex F | |
| EUT modification during this test | None | |
| Result | **COMPLIES** | |
| Note | The measure was performed to understand which is the contribution of the device under test when it is connect to the laptop. So, for first was measure only the laptop, and then the laptop with the headphone connected to the USB port. | |

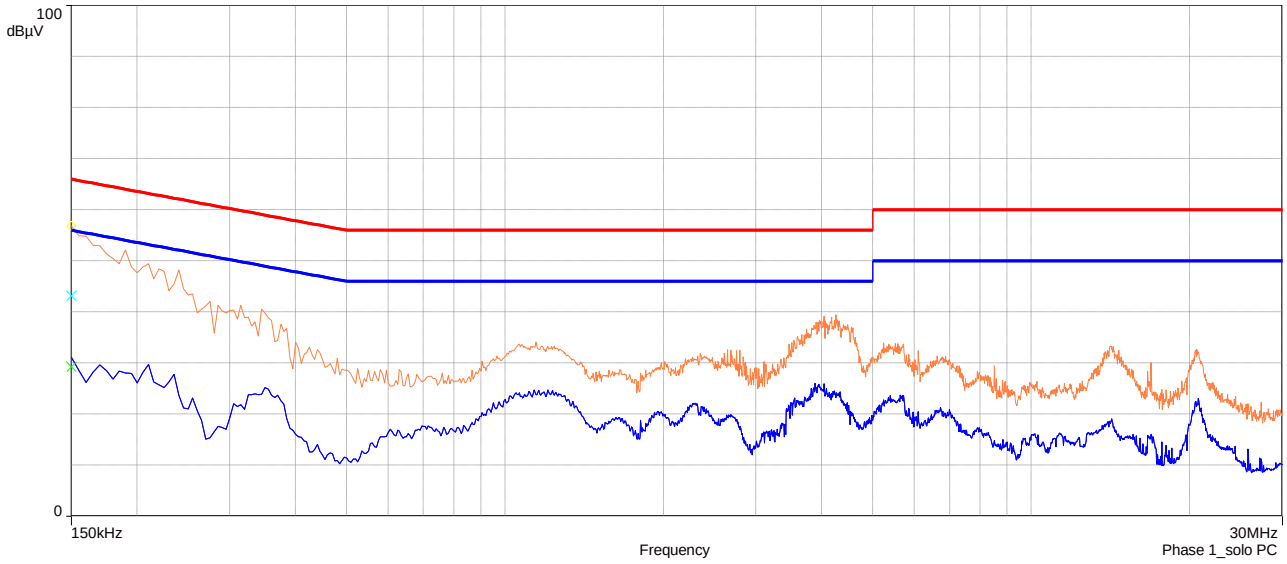
## TEST GRAPHS AND MEASUREMENTS

All traces have been acquired with PK Peak detector (orange trace) and AVG Average detector (blue trace)
If PK trace exceeds QP Quasi-Peak limit, QP measurements are performed at discrete frequencies where the limit is exceeded. Measurement time for QP measurements is 15 s.
If the general level of the disturbance is not steady, also the AVG disturbance voltage level is observed for 15 s per frequency; results are reported in a specific table below the graph.

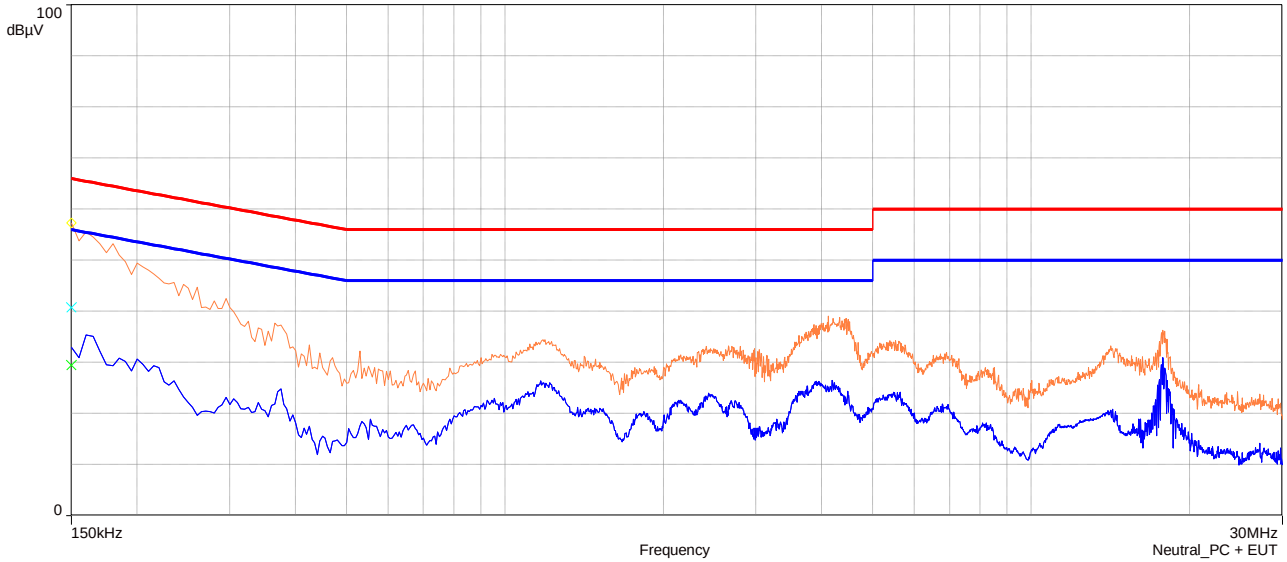
**Measurement 01**
**A.C. Input - LISN measurements**
**Line:** Neutral
**Operating Condition:** Groundnoise (EUT not connected, AE02 on)



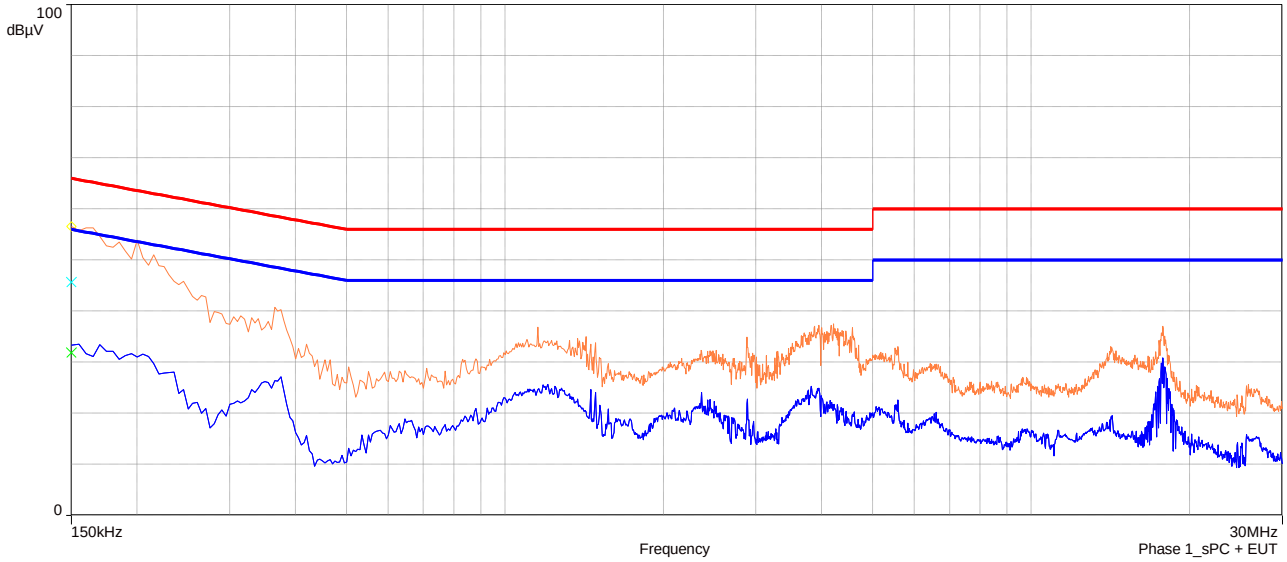

**Measurement 02**
**A.C. Input - LISN measurements**
**Line:** Phase 1
**Operating Condition:** Groundnoise (EUT not connected, AE02 on)



**Measurement 03**
**A.C. Input - LISN measurements**
**Line:** Neutral
**Operating Condition:** OC09




**Measurement 04**
**A.C. Input - LISN measurements**
**Line:** Phase 1
**Operating Condition:** OC09




| Frequency (MHz) | SR | AVG (dBµV) | QPeak (dBµV) | Lim AVG (dBµV) | Lim QPeak (dBµV) | AVG Margin (dB) | QPeak Margin (dB) | Line |
|---|---|---|---|---|---|---|---|---|
| 0.15 | 1 | 36.73 | 49.83 | 56.00 | 66.00 | -19.27 | -16.17 | Neutral |
| 0.15 | 2 | 29.24 | 43.19 | 56.00 | 66.00 | -26.76 | -22.81 | Phase 1 |
| 0.15 | 3 | 29.41 | 40.79 | 56.00 | 66.00 | -26.59 | -25.21 | Neutral |
| 0.15 | 4 | 31.86 | 45.69 | 56.00 | 66.00 | -24.14 | -20.31 | Phase 1 |

## 7 EUT MODIFICATIONS

None.

## Annex B Test instrumentations

FCC Part15

| Description | Manufacturer | Model | Identifier | Cal data | Cal due |
|---|---|---|---|---|---|
| EMI Receiver - PSA Spectrum Analyzer | Agilent Technologies | E4446A | 740/LAB<br>Rapporto 5817 | 2022-08-09 | 2023-08-09 |
| Antenna - Horn Antenna 18 GHz ÷ 40 GHz | ETS-LINDGREN | 3116 | 779/LAB<br>Rapporto 5178 | 2020-11-03 | 2023-11-03 |
| Antenna - BiConiLog Antenna 30MHz÷ 6 GHz | ETS-LINDGREN | 3142E | 1508/LAB<br>Rapporto 5222 | 2020-12-18 | 2023-12-18 |
| Pre-Amplifier 18 GHz ÷ 40 GHz | Spin Electronics | PRE-1840-35 | 759/LAB<br>Rapporto 5325 | 2021-03-25 | 2023-03-25 |
| RF Cable - set of RF cables 769/LAB + 791/LAB + 938/LAB + Pre-Amplifier 758/LAB with cables | | | 803/LAB<br>Rapporto 5661 | 2022-04-06 | 2023-04-06 |
| RF cable - set of RF cables (760/LAB + 804/LAB + 805/LAB) | | | 806/LAB<br>Rapporto 5662 | 2022-04-06 | 2023-04-06 |
| Antenna - Horn Antenna 1 GHz ÷ 18 GHz | ETS-LINDGREN | 3117 | 778/LAB<br>Rapporto 5177 | 2020-11-03 | 2023-11-03 |
| LISN 32A | ROHDE&SCHWARZ | ESH2-Z5 | 033L/CS<br>Rapporto 5765 | 2022-07-14 | 2023-07-14 |
| Software BAT-EMC | Nexio | BAT-EMC | 1910/LAB | -- | -- |
| RF Cable - N-N 5m | INTERCOND | M17/74 RG 213 | 225/LAB<br>Rapporto 5818 | 2022-08-31 | 2023-08-31 |

## Annex B Test instrumentations

| | | | | | |
|---|---|---|---|---|---|
| RF Cable - N-N 1,8m | Siva Cables Italy | RG 58A/U | 243/LAB<br>Rapporto 5819 | 2022-08-31 | 2023-08-31 |
| Filter PB | G. De PAOLI | BPF.0.15-30MHz | 268/LAB<br>Rapporto 5820 | 2022-08-31 | 2023-08-31 |
| Pulse Limiter ESH3-Z2 | ROHDE&SCHWARZ Gmbh | ESH3-Z2 | 528/LAB<br>Rapporto 5821 | 2022-08-31 | 2023-08-31 |
| EMI Receiver - MXE | Keysight Technologies | N9038A | 1444/LAB<br>Rapporto 5985 | 2023-03-01 | 2024-02-29 |
| RF cable - set of RF cables (771/LAB + 791/LAB + 937/LAB) | | | 802/LAB<br>Rapporto 5990 | 2023-01-27 | 2024-01-27 |
| EMI Receiver | ROHDE&SCHWARZ | ESHS10 9kHz...30MHz | 030L/CS<br>Rapporto 5687 | 2022-05-19 | 2023-05-19 |

## Annex D Auxiliary instrumentations

| *Application* | *Description* | *Manufacturer* | *Model* | *Identifier* | *Cal. data* | *Cal. due* |
|---|---|---|---|---|---|---|
| Monitoring of environmental conditions | Climatic Sensor (pri site) - 739/LAB Emission Anec | HW group | HWg-STE | 1299/LAB | 2022-07-25 | 2023-07-25 |
| Monitoring of environmental conditions | Climatic Sensor (pri site) - 051L/CS Shielded Cham | HW group | HWg-STE | 1300/LAB | 2022-07-25 | 2023-07-25 |
| Monitoring of environmental conditions | Pressure Transducer | COMET | T7410 | 1530/LAB | 2021-10-14 | 2023-10-14 |
| Distance monitoring | Metro Laser | Leica | DISTO A2 | 1094/LAB | 2021-11-11 | 2023-11-11 |

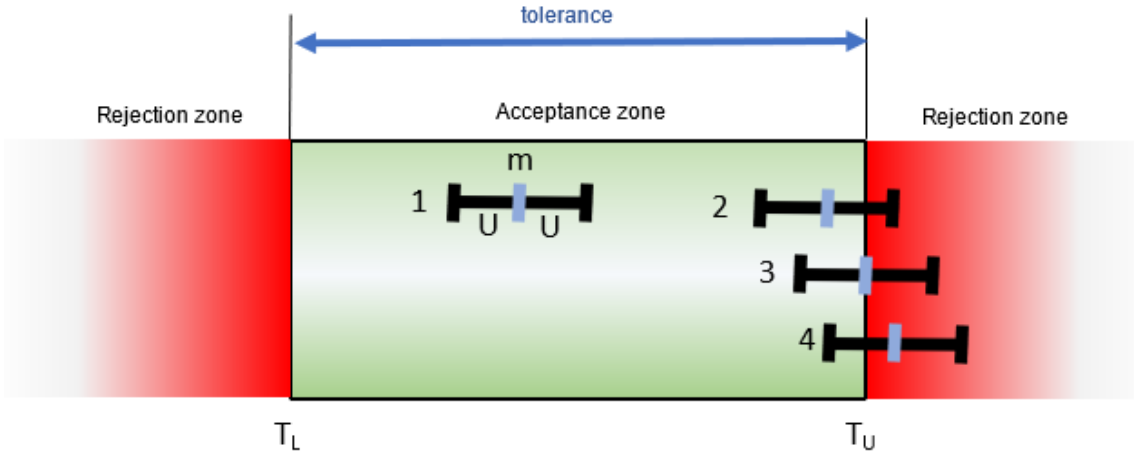
# Annex F Compliance Decision Rule and measurements uncertainty

## F1: Decision Rule

- A decision rule defines the role of uncertainty in assessing the conformity of measured values with respect to specification limits.
- The Kiwa Creiven decision rule uses the “simple acceptance” method minimizing the “supplier risk” (type 1 risk or alpha risk), that is the risk of refusing a compliant product.
- The probability distribution of the measurement uncertainty is assumed to be Gaussian,

**Nomenclature**

- m: measured value
- P: probability of correct acceptation, (1-P: probability of refusing a compliant product)
- Tu: upper tolerance limit
- TL: lower tolerance limit
- Tolerance: interval of width equal to Tu - TL




| Case | Decision Rule | Note |
|---|---|---|
| Case 1, 2, 3 | Measurement complies with specifications | • **$T_L \leq m \leq Tu$**; the probability **P** of correct acceptation is: 50% **≤ P ≤** 100% |
| Case 4 | Measurement NOT complies with specifications | • **m>Tu (**or **m<$T_L$**)**:** the probability **P** of correct acceptation is lower than 50% |

Note about qualitative tests: The uncertainty balance is applicable only to tests whose result is numerical. For the qualitative tests, are verified the tolerance and repeatability of the quantities that stimulate the EUT. Tolerances and repeatability of these quantities are part of the instrumentation calibration.

In accordance with:

- IEC Guide 115 Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector
- ILAC-G8 Guidelines on the Reporting of Compliance with Specification
- JGCM guide 106

## Annex F Compliance Decision Rule and measurements uncertainty

### F.2 Measurements uncertainty

| **Frequency Readout – Conducted Test** | *Uncertainty (k=2)* |
|---|---|
| Test Uncertainty [kHz] | 10.3 |
| **Frequency Readout – Radiated Test** | |
| Test Uncertainty [kHz] | 10.6 |
| **Effective radiated power ERP (30 MHz to 1000 MHz)** | |
| Test Uncertainty [dB] | 6.4 |
| **Effective radiated power EIRP (above 1 GHz)** | |
| Test Uncertainty [dB] | 6.6 |
| **Radiated receiver blocking tests (above 1 GHz)** | |
| Test Uncertainty [dB] | 4.9 |
| **Conducted spurious emissions** | |
| Test Uncertainty [dB] | 3.3 |
| **Radiated spurious emissions** | |
| Test Uncertainty [dB] | 5.8 |
| **Channel power** | |
| Test Uncertainty [dB] | 2.6 |
| **Adjacent channel power** | |
| Test Uncertainty [dB] | 2.2 |
| **RF Output power (EIRP)** | |
| Test Uncertainty [dB] | 2.3 |
| **Occupied Channel Bandwidth** | |
| Test Uncertainty [Hz] | [span/600] |