**CMC Centro Misure Compatibilità S.r.l.** Via della Fisica 20, 36016 Thiene (VI), Tel./Fax +39 0445 367702 - www.cmclab.it - info@cmclab.it
Accredited by ACCREDIA according to UNI CEI EN ISO/IEC 17025 accreditation n. 0168 L
Independent Testing Laboratory

# TEST REPORT
# Nr. R21232401

## Federal Communication Commission (FCC)

| | |
|---|---|
| **Report Reference No.** ..... : | R21232401 |
| Date of issue: ..... : | 16.11.2021 |
| Total number pages: ..... : | 148 |
| **Applicant´s name** ..... : | Embit S.r.l. |
| Address ..... : | Via Emilia Est, 911 – 41122 Modena (MO) – Italy |
| **Test specification:** | |
| Standards ..... : | FCC Rules & Regulations, Title 47:2020<br>Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247 |
| Non-standard test method ..... : | N/A |
| **Test Report Form No.** ..... : | 15-247_HoppingCMC |
| Test Report Form(s) Originator .. : | CMC Centro Misure Compatibilità S.r.l. |
| Master TRF ..... : | 2021-07 |

**General disclaimer:**

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of CMC Centro Misure Compatibilità S.r.l.

| | |
|---|---|
| **Test item description** ..... : | EMB-LR1302-mPCIe LoRaWAN Gateway Module |
| Trademark ..... : | Embit |
| Manufacturer ..... : | Embit S.r.l. |
| Model / Type reference ..... : | EMB-LR1302-mPCIe-SPI-915 |
| FCC ID ..... : | Z7HEMBLR1302 |
| Rating(s) ..... : | 120 V ~ 60 Hz single-phase |

**Report**

| | | |
|---|---|---|
| Tested by (name + signature) ..... : | C. Panozzo | ..... |
| Approved by (name + signature) ..... : | R. Beghetto | ..... |

# 1 Summary

| | |
|---|---|
| **2 Reference standard** | |
| FCC Rules and Regulation Title 47 part 15:2020 | -- |
| **3 List of attachments** | |
| Attachment 1: Instruments list, measurement uncertainty, judgement of compliance and quality manual references | |
| **4 Deviation(s) from test specification** | |
| None | |
| **5 Testing location** | |
| CMC Centro Misure Compatibilità S.r.l.<br>Via della Fisica, 20 – 36016 Thiene (VI) – Italy<br>Test site facility's FCC registration number: 182474 | |

| ***Revision index*** | ***Date*** | ***Change history*** |
|---|---|---|
| 1.0 | 16.11.2021 | -- |

| Testing and sampling: | |
|---|---|
| Date of receipt of test item | 08.10.2021 |
| Testing start date | 09.10.2021 |
| Testing end date | 12.11.2021 |
| Sampling procedure | Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion.<br>The results relate to the sample as it has been received. |
| Internal identification | Adhesive label with the product number P211144 |

| General remarks: |
|---|
| This report shall not be reproduced, except in full, without the written approval of CMC.<br>The test results presented in this report relate only to the object tested.<br>"(see appended table)": refers to a table appended to the report.<br>Throughout this report a comma is used as the decimal separator. |

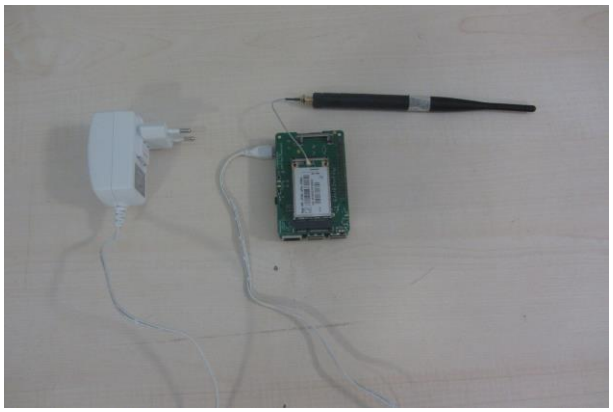
| Possible test case verdicts: | |
|---|---|
| Test case does not apply to the test object: | N/A (Not Applicable) |
| Test object does meet the requirement: | P (Pass) |
| Test object does not meet the requirement: | F (Fail) |
| Test object does not performed: | N/E (Not Executed) |

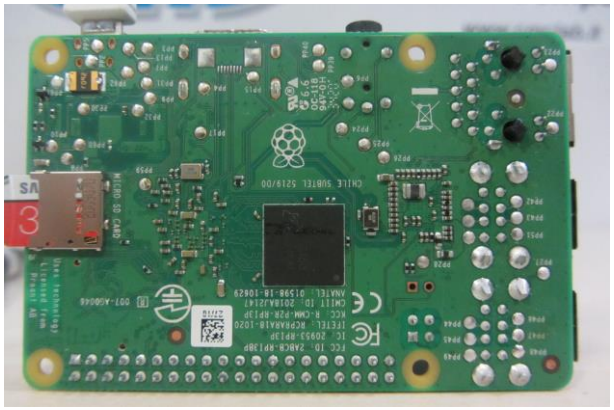
| Definition of symbols used in this test report: |
|---|
| ☒ Indicates that the listed condition, standard or equipment is applicable for this report.<br>☐ Indicates that the listed condition, standard or equipment is not applicable for this report. |

## 6 General description of tested item and testing condition(s)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Description ..... : | EMB-LR1302-mPCIe LoRaWAN Gateway Module | | | | | | |
| Model Number ..... : | EMB-LR1302-mPCIe-SPI-915 | | | | | | |
| FCC ID ..... : | Z7HEMBLR1302 | | | | | | |
| Serial Number ..... : | -- | | | | | | |
| Brand name ..... : | Embit | | | | | | |
| Frequency band ..... : | 902 – 928 MHz | | | | | | |
| Nominal frequencies (LoRa 125 kHz) ..... : | $F_L$: 903,90 MHz | | $F_M$: 904,50 MHz | | $F_H$: 905,30 MHz | | |
| Nominal frequencies (LoRa 500 kHz) ..... : | $F_L$: 923,30 MHz | | $F_M$: 925,00 MHz | | $F_H$: 927,50 MHz | | |
| Test power supply ..... : | | Voltage and Frequency | Reference poles | | | | |
| | | | N | L1 | L2 | L3 | PE |
| | ☒ | AC: 120 V, 60 Hz | ☒ | ☒ | ☐ | ☐ | ☐ |
| | ☐ | AC: | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ | DC: | | | | | ☐ |
| Software version ..... : | v2.0.0 | | | | | | |
| Test configuration ..... : | ☒ | Table top equipment | | | | | |
| | ☐ | Floor standing equipment | | | | | |
| | ☐ | Hand-held equipment | | | | | |
| Type of equipment ..... : | ☒ | Transmitter unit | | | | | |
| | ☒ | Receiver unit | | | | | |
| Type of station ..... : | ☐ | Portable station | | | | | |
| | ☒ | Mobile station | | | | | |
| Operating modes ..... : | No. | Operating mode of test item | | | | | |
| | 1 | EUT in continuous transmission at maximum power | | | | | |

## 6.1 Photos of the test item


0519HB

## 7 Verdict summary section

| FCC Rules & Regulations, Title 47:2020<br>Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247 | | | |
|---|---|---|---|
| **Clause** | **Requirement – Test case** | **Basic standard** | **Verdict** |
| Part 15.247 (a) (1) | Pseudo randomly ordered list of hopping frequencies | -- | **P** |
| Part 15.203 | Antenna requirements | ANSI C63.10 | **P** |
| Part 15.207 | Conducted emissions | ANSI C63.10 | **P** |
| Part 15.209 | Emissions in restricted frequency bands and in unrestricted frequency bands | ANSI C63.10 | **P** |
| Part 15.247 (a) (2) | DTS bandwidth | ANSI C63.10 | |
| Part 15.247 | 20 dB Bandwidth | ANSI C63.10 | **P** |
| Part 15.247 | Channel Separation | ANSI C63.10 | **P** |
| Part 15.247 | Number of Hopping Channel | ANSI C63.10 | **P** |
| Part 15.247 | Time of occupancy | ANSI C63.10 | **P** |
| Part 15.247 | Band edge | ANSI C63.10 | **P** |
| Part 15.209 and 15.247 | Fundamental emission output power | ANSI C63.10 | **P** |
| Part 15.209 and 15.247 | Maximum power spectral density level in the fundamental emission | ANSI C63.10 | **P** |

| Normative references | |
|---|---|
| ***Reference no.*** | ***Description*** |
| FCC Rules and Regulation Title 47 part 15:2020 | -- |
| KDB 558074 D01 15.247 Meas Guidance v05r02 | Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under section 15.247 of the FCC rules |
| ANSI C63.4:2014 | American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz |
| ANSI C63.10:2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |

## 8 Test conditions

### 8.1 General

<table>
<tr><td>Environmental reference conditions.....:</td><td>The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.<br>The climatic conditions during the tests were within the following limits:
<table>
<tr><th>Temperature</th><th>Humidity</th><th>Atmospheric pressure</th></tr>
<tr><td>15 °C – 35 °C</td><td>30 % - 60 %</td><td>800 hPa – 1060 hPa</td></tr>
<tr><td colspan="3">If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.</td></tr>
</table></td></tr>
<tr><td>Measurement uncertainties .....:</td><td>Attachment 1</td></tr>
</table>

# 9 Test results

## 9.1 Antenna requirements

| | | |
|---|---|---|
| Tested by ..... : | C. Panozzo | |
| Test date ..... : | 09.10.2021 | |
| Reference standards ..... : | FCC Rules and Regulation; Titles 47 Part. 15.203 and 15.204 | |
| Test specification ..... : | An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded | |
| Antenna type..... : | ☐ | Integral antenna |
| | ☒ | External antenna |
| Antenna gain..... : | 2 dBi | |
| External R.F. power amplifier ..... : | Not Present | |

## 9.2 Conducted emission

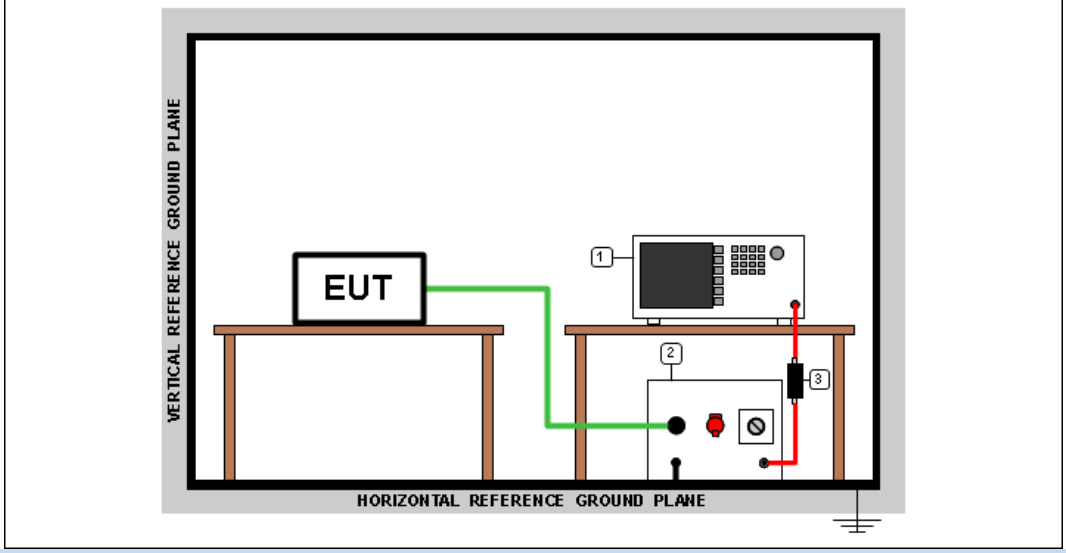
| | | |
|---|---|---|
| Tested by ..... : | C. Panozzo | |
| Test date ..... : | 03.11.2021 | |
| Test location (stand) ..... : | Shielded chamber (CMC A001) | |
| Reference standards ..... : | FCC Rules and Regulation; Titles 47 Part. 15.207<br>ANSI C63.10 cl. 6.2 | |
| Test set-up description ..... : | ☒ | Table top equipment set-up (80 cm above the reference ground plane) |
| | ☐ | Floor standing equipment set-up (insulating material up to 12 mm thick) |
| | ☐ | False floor installation equipment set-up (insulating material up to 34 cm above the reference ground plane) |
| Supplementary Test set-up description ..... : | -- | |
| Test method applied ..... : | ☒ | Artificial mains network, 50 µH/50 Ω LISN |
| | ☐ | Other: |

**Acceptance limits**

| *Frequency range (MHz)* | *dB(µV) Quasi-peak* | *dB(µV) Average* |
|---|---|---|
| 0,15 to 0,50 | 66 to 56 | 56 to 46 |
| 0,5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

**Test setup**

**Mains terminal disturbance for table-top equipment**




| *Test setup PE001_01* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 3 | CMC S010 | Rohde & Schwarz | ESH3-Z2 | Pulse limiter |
| 2 | CMC S200 | Schwarzbeck | NSLK 8128 | V-LISN |
| 1 | CMC S206 | Rohde & Schwarz | ESCI 7 | EMC Receiver 9KHz-7GHz |

**Result – LoRa 125 kHz, spread factor 10**

| *Line* | *Frequency Range (MHz)* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|---|
| N | 0,15 – 30 | G212324A42 | -- | P |
| L1 | 0,15 – 30 | G212324A43 | -- | P |

**Result – LoRa 125 kHz, spread factor 7**

| *Line* | *Frequency Range (MHz)* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|---|
| L1 | 0,15 – 30 | G212324A44 | -- | P |
| N | 0,15 – 30 | G212324A45 | -- | P |

**Result – LoRa 500 kHz, spread factor 12**

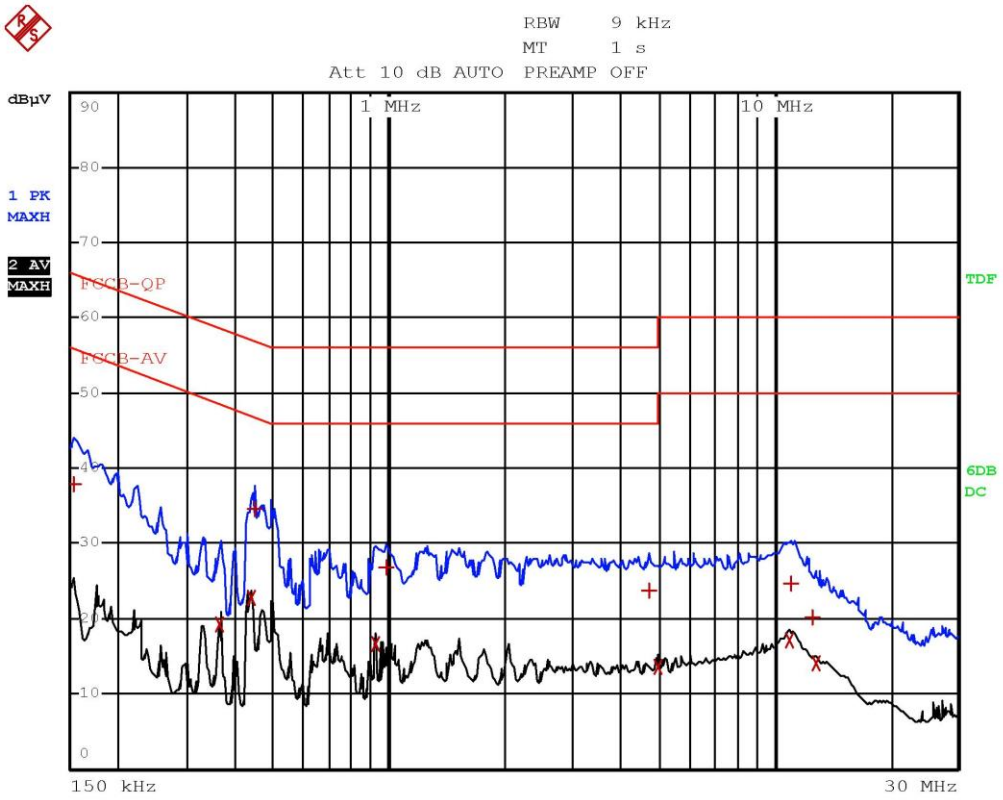
| *Line* | *Frequency Range (MHz)* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|---|
| N | 0,15 – 30 | G212324A46 | -- | P |
| L1 | 0,15 – 30 | G212324A47 | -- | P |

**Result – LoRa 500 kHz, spread factor 7**

| *Line* | *Frequency Range (MHz)* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|---|
| N | 0,15 – 30 | G212324A48 | -- | P |
| L1 | 0,15 – 30 | G212324A49 | -- | P |

*Graphs Legend*
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a X

**Graphs**



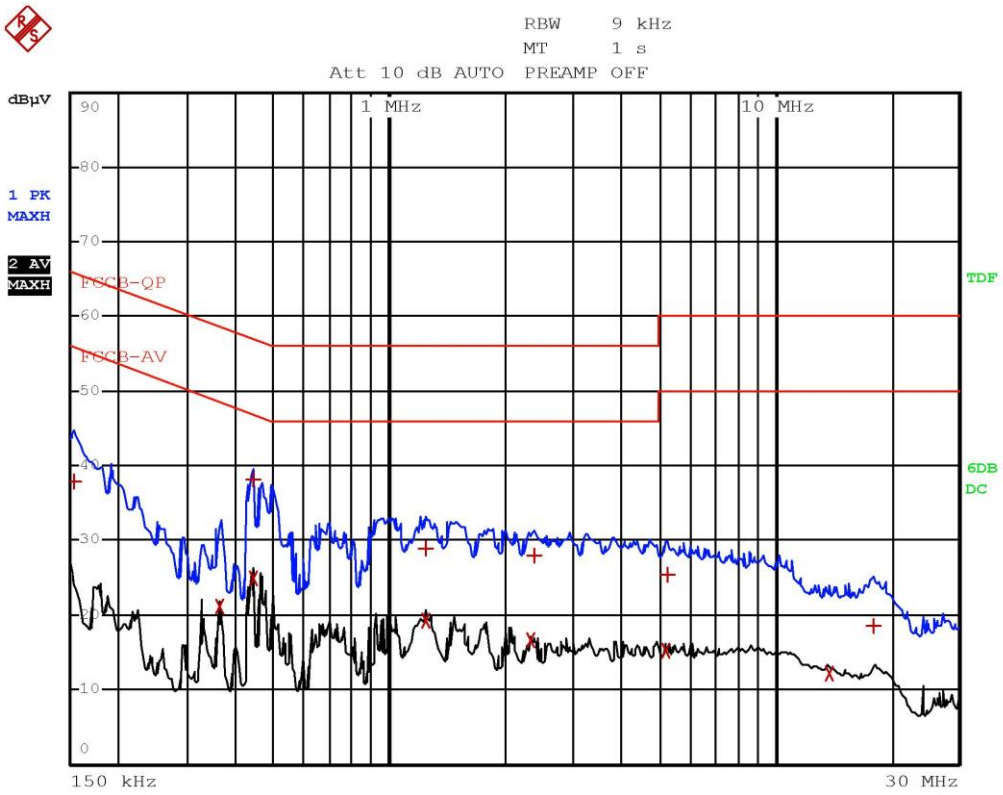

Panozzo 212324A42 Line N In Funzione Hybrid SF10

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 154 kHz | 37.83 | -27.95 |
| 2 Average | 362 kHz | 19.28 | -29.40 |
| 2 Average | 438 kHz | 22.90 | -24.19 |
| 1 Quasi Peak | 446 kHz | 34.51 | -22.43 |
| 2 Average | 922 kHz | 16.70 | -29.29 |
| 1 Quasi Peak | 982 kHz | 26.71 | -29.28 |
| 1 Quasi Peak | 4.75 MHz | 23.66 | -32.33 |
| 2 Average | 4.982 MHz | 13.66 | -32.33 |
| 2 Average | 11.006 MHz | 17.18 | -32.81 |
| 1 Quasi Peak | 11.026 MHz | 24.63 | -35.36 |
| 1 Quasi Peak | 12.594 MHz | 20.25 | -39.74 |
| 2 Average | 12.79 MHz | 14.09 | -35.90 |

Panozzo 212324A42 Line N In Funzione Hybrid SF10



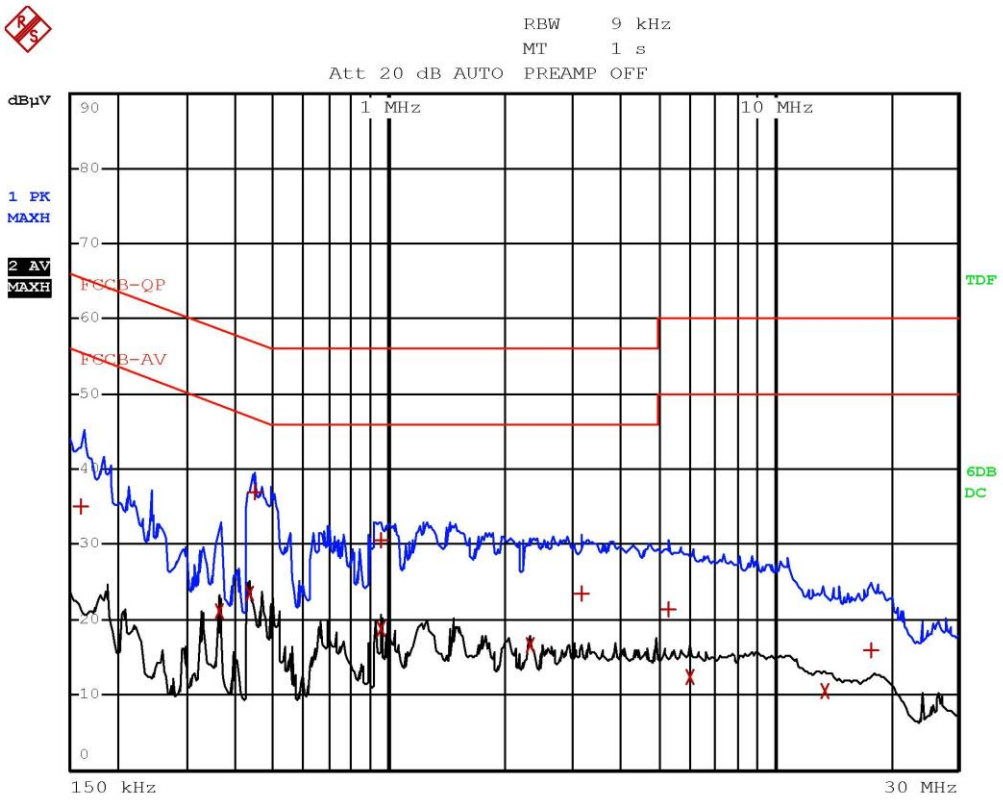

Panozzo 212324A43 Line L In Funzione Hybrid SF10

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 154 kHz | 37.90 | -27.88 |
| 2 Average | 362 kHz | 21.24 | -27.43 |
| 1 Quasi Peak | 442 kHz | 38.06 | -18.96 |
| 2 Average | 442 kHz | 24.97 | -22.05 |
| 1 Quasi Peak | 1.242 MHz | 29.05 | -26.95 |
| 2 Average | 1.242 MHz | 19.20 | -26.79 |
| 2 Average | 2.334 MHz | 16.72 | -29.27 |
| 1 Quasi Peak | 2.37 MHz | 27.93 | -28.06 |
| 2 Average | 5.198 MHz | 15.15 | -34.84 |
| 1 Quasi Peak | 5.274 MHz | 25.49 | -34.50 |
| 2 Average | 13.778 MHz | 12.20 | -37.79 |
| 1 Quasi Peak | 18.038 MHz | 18.46 | -41.53 |

Panozzo 212324A43 Line L In Funzione Hybrid SF10



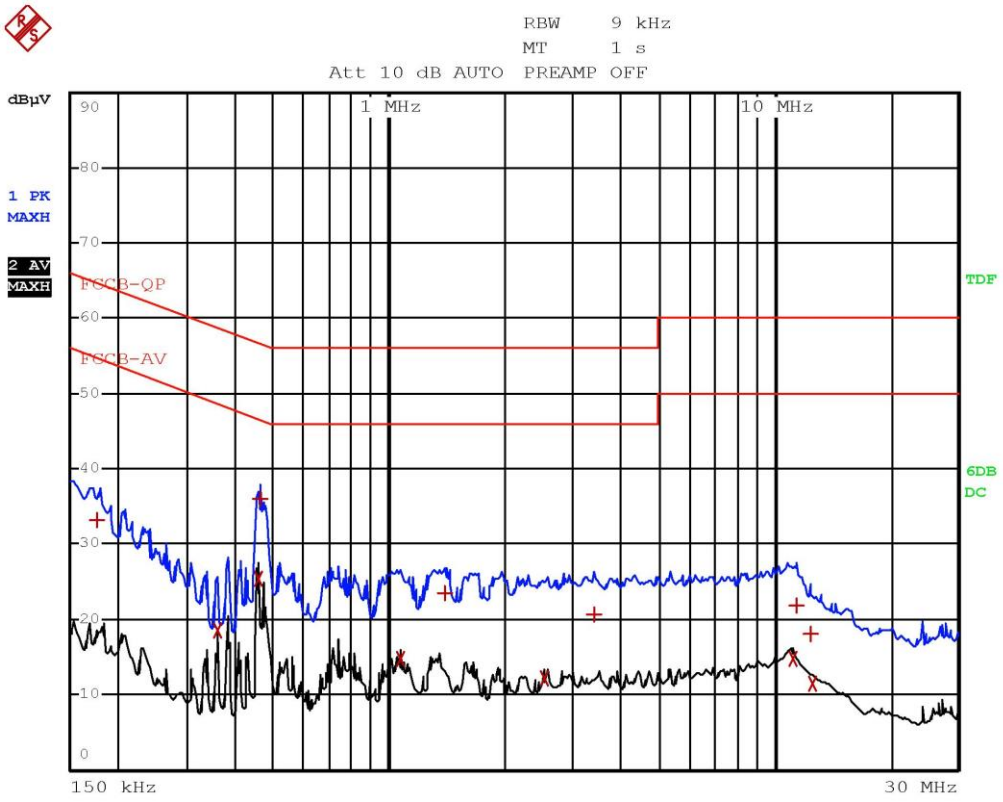

Panozzo 212324A44 Line L In Funzione Hybrid SF7

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 162 kHz | 35.01 | -30.34 |
| 2 Average | 362 kHz | 21.19 | -27.48 |
| 2 Average | 434 kHz | 23.54 | -23.62 |
| 1 Quasi Peak | 446 kHz | 36.91 | -20.03 |
| 1 Quasi Peak | 958 kHz | 30.65 | -25.34 |
| 2 Average | 958 kHz | 18.68 | -27.31 |
| 2 Average | 2.33 MHz | 16.55 | -29.44 |
| 1 Quasi Peak | 3.166 MHz | 23.53 | -32.46 |
| 1 Quasi Peak | 5.318 MHz | 21.43 | -38.56 |
| 2 Average | 6.034 MHz | 12.50 | -37.49 |
| 2 Average | 13.558 MHz | 10.44 | -39.56 |
| 1 Quasi Peak | 17.886 MHz | 16.00 | -43.99 |

Panozzo 212324A44 Line L In Funzione Hybrid SF7



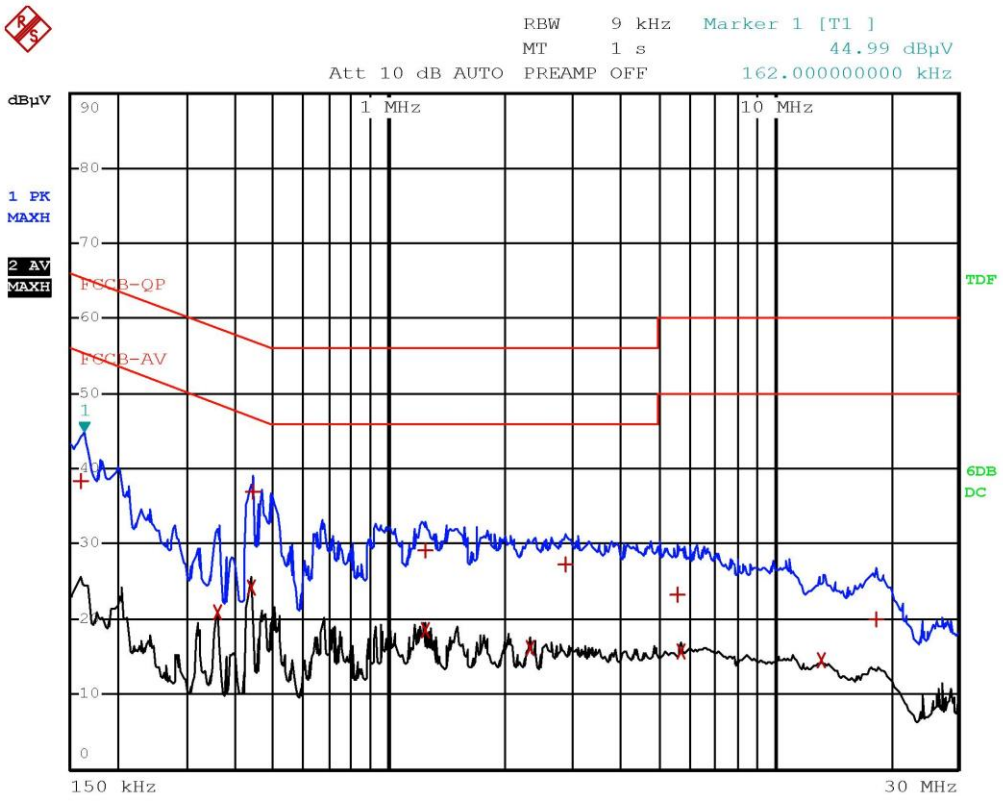

Panozzo 212324A45 Line N In Funzione Hybrid SF7

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 178 kHz | 33.21 | -31.35 |
| 2 Average | 358 kHz | 18.55 | -30.22 |
| 2 Average | 458 kHz | 25.39 | -21.33 |
| 1 Quasi Peak | 462 kHz | 36.11 | -20.54 |
| 2 Average | 1.07 MHz | 14.79 | -31.20 |
| 1 Quasi Peak | 1.406 MHz | 23.56 | -32.43 |
| 2 Average | 2.546 MHz | 12.13 | -33.86 |
| 1 Quasi Peak | 3.422 MHz | 20.61 | -35.38 |
| 2 Average | 11.182 MHz | 14.70 | -35.29 |
| 1 Quasi Peak | 11.422 MHz | 21.82 | -38.17 |
| 1 Quasi Peak | 12.486 MHz | 18.06 | -41.93 |
| 2 Average | 12.634 MHz | 11.45 | -38.54 |

Panozzo 212324A45 Line N In Funzione Hybrid SF7



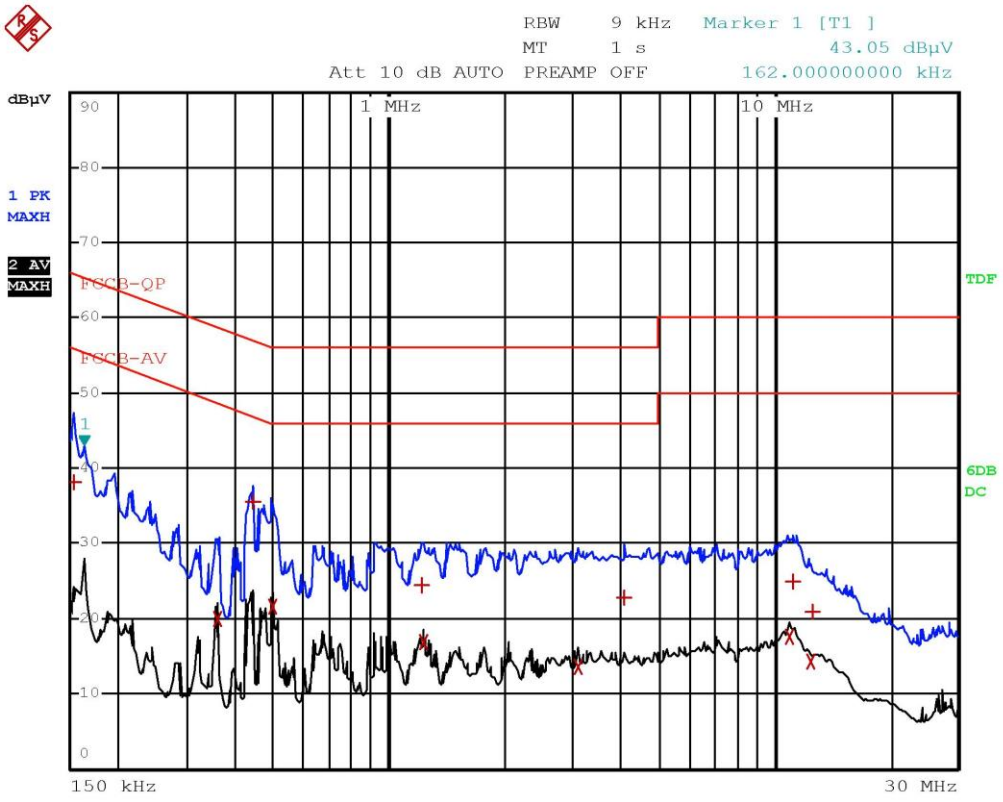

Panozzo 212324A46 Line N DTS SF12

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 162 kHz | 38.50 | -26.85 |
| 2 Average | 358 kHz | 20.93 | -27.84 |
| 2 Average | 438 kHz | 24.26 | -22.83 |
| 1 Quasi Peak | 442 kHz | 36.90 | -20.11 |
| 1 Quasi Peak | 1.246 MHz | 29.16 | -26.83 |
| 2 Average | 1.246 MHz | 18.54 | -27.45 |
| 2 Average | 2.33 MHz | 16.17 | -29.82 |
| 1 Quasi Peak | 2.89 MHz | 27.25 | -28.74 |
| 1 Quasi Peak | 5.618 MHz | 23.22 | -36.78 |
| 2 Average | 5.746 MHz | 15.74 | -34.25 |
| 2 Average | 13.238 MHz | 14.43 | -35.56 |
| 1 Quasi Peak | 18.33 MHz | 19.93 | -40.07 |

Panozzo 212324A46 Line N DTS SF12



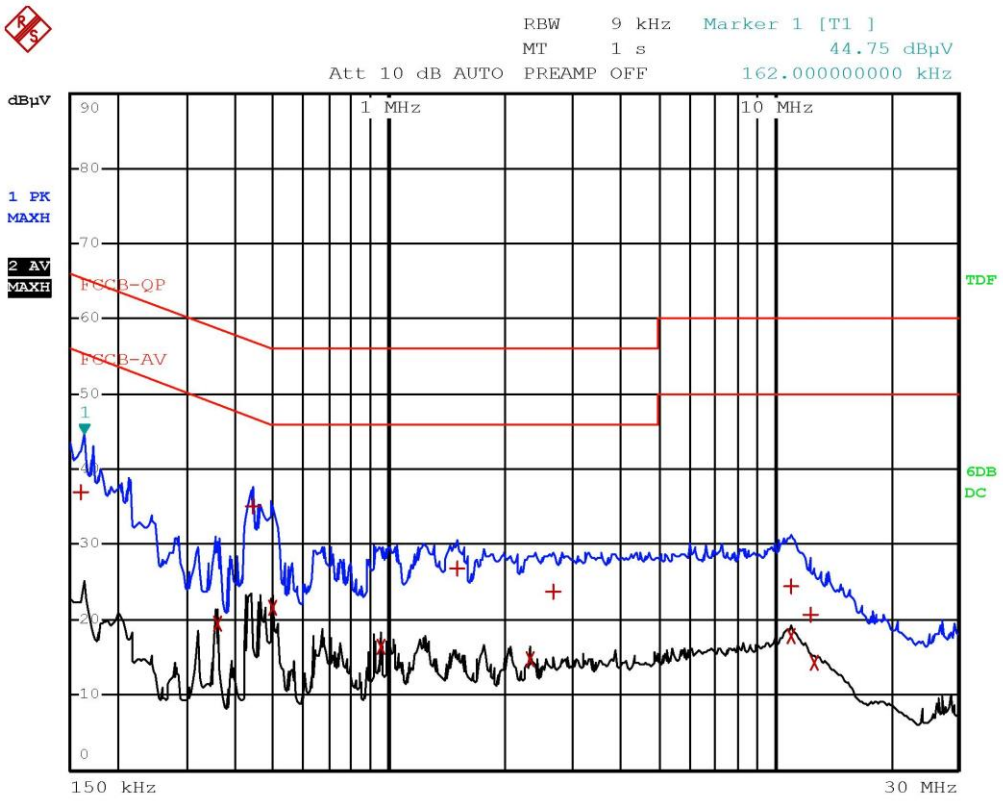

Panozzo 212324A47 Line L DTS SF12

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 154 kHz | 38.14 | -27.63 |
| 2 Average | 358 kHz | 19.91 | -28.85 |
| 1 Quasi Peak | 442 kHz | 35.58 | -21.44 |
| 2 Average | 498 kHz | 21.63 | -24.40 |
| 1 Quasi Peak | 1.218 MHz | 24.50 | -31.49 |
| 2 Average | 1.238 MHz | 16.79 | -29.20 |
| 2 Average | 3.11 MHz | 13.69 | -32.30 |
| 1 Quasi Peak | 4.07 MHz | 22.81 | -33.18 |
| 2 Average | 10.958 MHz | 17.51 | -32.48 |
| 1 Quasi Peak | 11.218 MHz | 24.88 | -35.11 |
| 2 Average | 12.482 MHz | 14.30 | -35.69 |
| 1 Quasi Peak | 12.586 MHz | 20.80 | -39.19 |

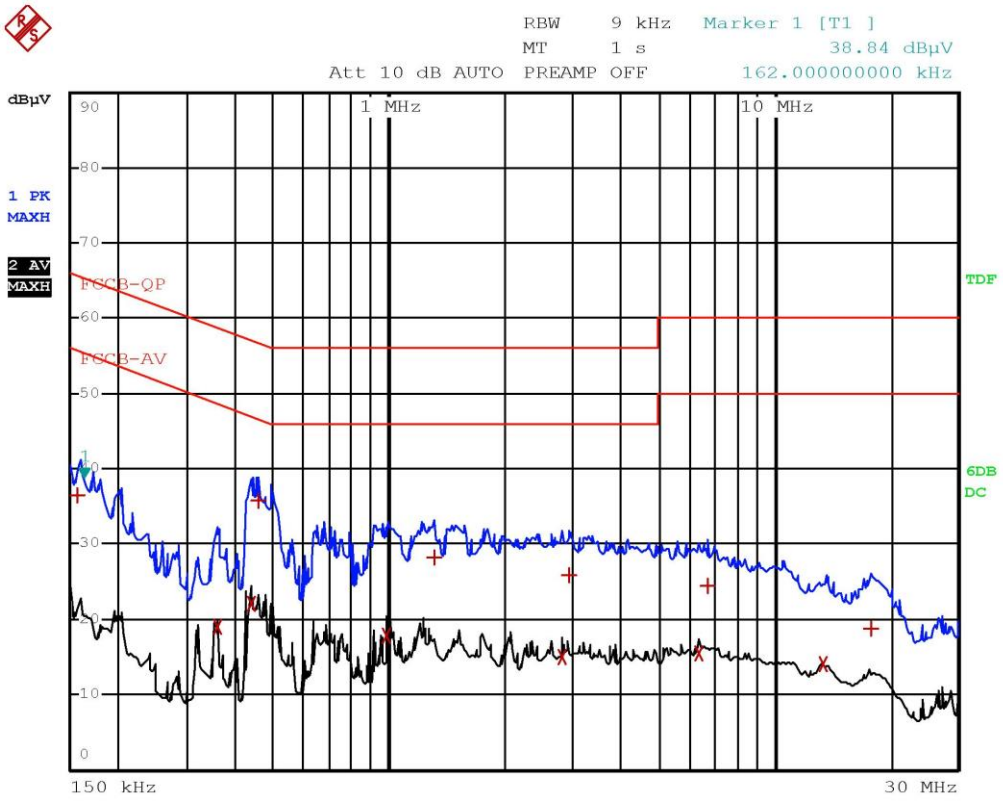
Panozzo 212324A47 Line L DTS SF12




Panozzo 212324A48 Line L DTS SF07

| EDIT PEAK LIST (Final Measurement Results) | | | |
|---|---|---|---|
| Trace1: | FCCB-QP | | |
| Trace2: | FCCB-AV | | |
| Trace3: | --- | | |
| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
| 1 Quasi Peak | 162 kHz | 36.89 | -28.46 |
| 2 Average | 358 kHz | 19.44 | -29.32 |
| 1 Quasi Peak | 442 kHz | 35.05 | -21.97 |
| 2 Average | 498 kHz | 21.57 | -24.45 |
| 2 Average | 958 kHz | 16.37 | -29.62 |
| 1 Quasi Peak | 1.506 MHz | 26.78 | -29.21 |
| 2 Average | 2.326 MHz | 14.72 | -31.27 |
| 1 Quasi Peak | 2.686 MHz | 23.74 | -32.25 |
| 1 Quasi Peak | 11.042 MHz | 24.48 | -35.51 |
| 2 Average | 11.13 MHz | 17.72 | -32.27 |
| 1 Quasi Peak | 12.418 MHz | 20.67 | -39.32 |
| 2 Average | 12.71 MHz | 14.38 | -35.61 |

Panozzo 212324A48 Line L DTS SF07




Panozzo 212324A49 Line N DTS SF07

EDIT PEAK LIST (Final Measurement Results)

| | |
|---|---|
| Trace1: | FCCB-QP |
| Trace2: | FCCB-AV |
| Trace3: | --- |

| TRACE | FREQUENCY | LEVEL dBµV | DELTA LIMIT dB |
|---|---|---|---|
| 1 Quasi Peak | 158 kHz | 36.57 | -28.99 |
| 2 Average | 358 kHz | 19.00 | -29.77 |
| 2 Average | 438 kHz | 22.01 | -25.08 |
| 1 Quasi Peak | 458 kHz | 35.90 | -20.82 |
| 2 Average | 990 kHz | 17.88 | -28.11 |
| 1 Quasi Peak | 1.318 MHz | 28.29 | -27.70 |
| 2 Average | 2.826 MHz | 15.01 | -30.98 |
| 1 Quasi Peak | 2.942 MHz | 25.76 | -30.23 |
| 2 Average | 6.374 MHz | 15.57 | -34.42 |
| 1 Quasi Peak | 6.698 MHz | 24.46 | -35.53 |
| 2 Average | 13.422 MHz | 13.96 | -36.03 |
| 1 Quasi Peak | 17.806 MHz | 18.83 | -41.16 |

Panozzo 212324A49 Line N  DTS SF07

### 9.3 Emissions in restricted frequency bands and in unrestricted frequency bands

| | | |
|---|---|---|
| Tested by ..... : | C. Panozzo | |
| Test date ..... : | 22.10.2021 | |
| Test location (stand) ..... : | Semi-anechoic chamber (CMC A070) | |
| Reference standards ..... : | FCC Rules and Regulation; Titles 47 Part. 15.209<br>ANSI C63.10 cl. 6.3, 6.4, 6.5 and 6.6 | |
| Test set-up description ..... : | ☒ | Table top equipment set-up (80 cm above the reference ground plane) |
| | ☐ | Floor standing equipment set-up (insulating material up to 12 mm thick) |
| | ☐ | False floor installation equipment set-up (insulating material up to 34 cm above the reference ground plane) |
| Supplementary test set-up description ..... : | -- | |
| Test method applied ..... : | SAC with measurement distance [m]:<br>10 m for frequencies below 1 GHz<br>3 m for frequencies above 1 GHz | |
| Supplementary information..... : | -- | |

**Acceptance limits**

| ***Acceptance limits for emissions in restricted frequency bands (f < 1000 MHz)*** | | |
|---|---|---|
| *Frequency range (MHz)* | *Test distance (m)* | *Limits [dB(µV/m)]* |
| 0,009 to 0,490 | 300 | 48,5 to 13,8 |
| 0,490 to 1,705 | 30 | 33,8 to 22,9 |
| 1,705 to 30 | 30 | 29,5 |
| 30 to 88 | 3 | 40 |
| 88 to 216 | 3 | 43,5 |
| 216 to 960 | 3 | 46,0 |
| 960 to 1000 | 3 | 54 |

**Remarks:** The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz and 110–490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector. The results have been extrapolated to the specified distance using an extrapolation factor

| ***Acceptance limits for emissions in restricted frequency bands (f ≥ 1000 MHz)*** | | | |
|---|---|---|---|
| *Frequency (MHz)* | *Test distance (m)* | *AV limits [dB(µV/m)]* | *Peak limits [dB(µV/m)]* |
| > 1000 | 3 | 54 | 74 |

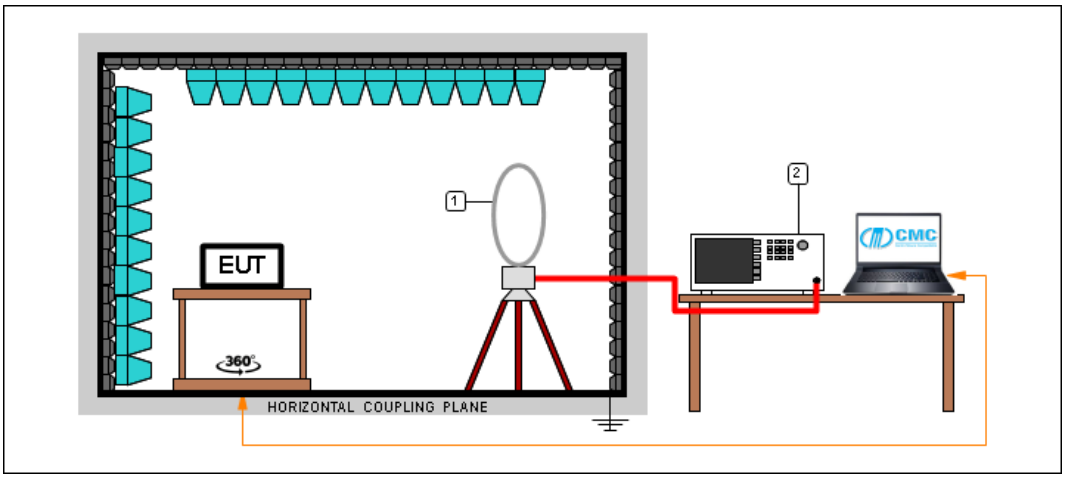
The restricted frequency bands are listed in the following table

| *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 |
| 13,36 – 13,41 | | | |

| ***Acceptance limits for emissions in non-restricted frequency bands*** |
|---|
| 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. |

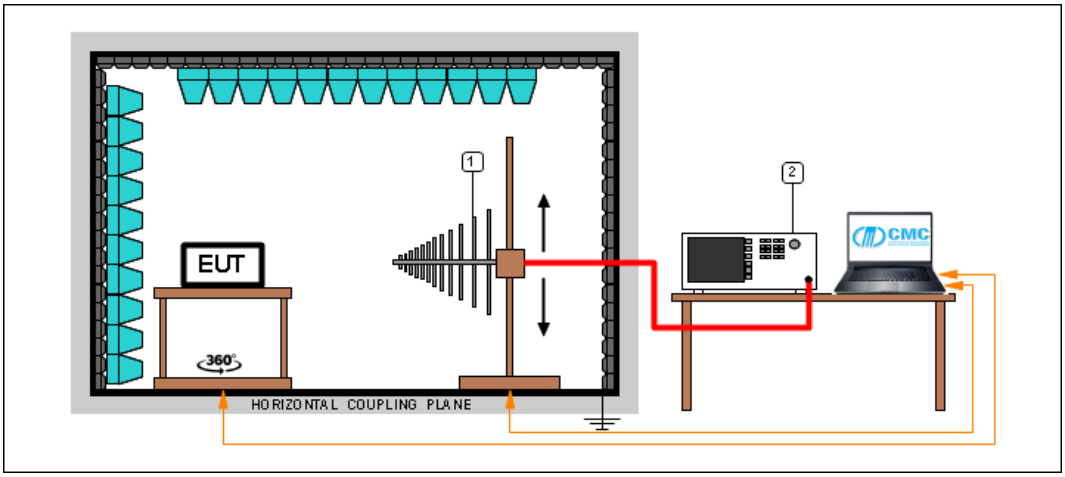
**Test setup**

**Frequency ≤ 30 MHz**




| *Test setup PE004_01* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 2 | CMC S353 | Rohde & Schwarz | ESW26 | EMI Test Receiver 1 Hz - 26.5 GHz |
| 1 | CMC S127 | Schaffner | HLA6120 | Loop Antenna 9kHz - 30MHz |

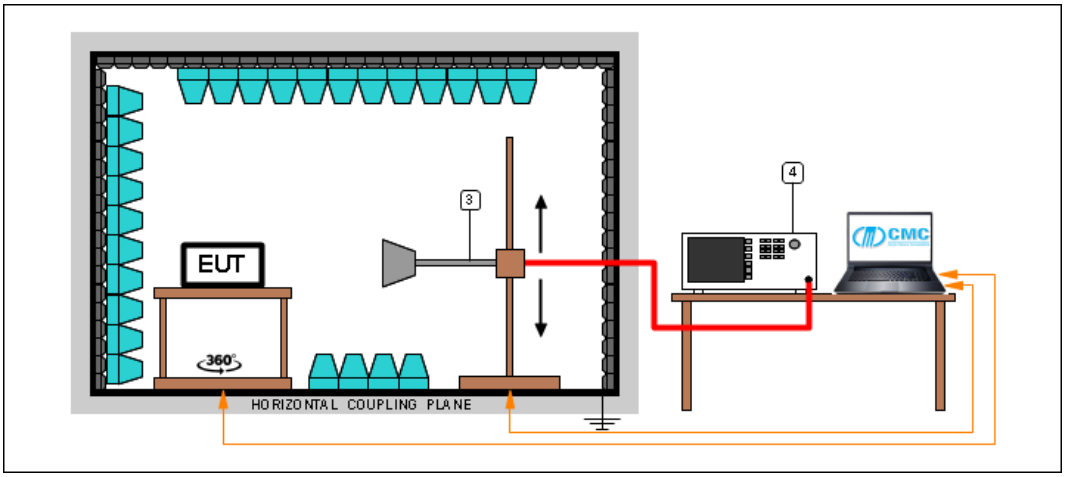
**Frequency ≤ 1 GHz**




| *Test setup PE004_02* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 2 | CMC S353 | Rohde & Schwarz | ESW26 | EMI Test Receiver 1 Hz - 26.5 GHz |
| 1 | CMC S271 | Schwarzbeck | BBA 9106 + VHBB 9124 | Broadband Antenna |

| *Test setup PE004_03* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 2 | CMC S353 | Rohde & Schwarz | ESW26 | EMI Test Receiver 1 Hz - 26.5 GHz |
| 1 | CMC S287 | Schwarzbeck | VUSLP 9111B | Broadband Antenna |

**Frequency > 1 GHz**




| *Test setup PE004_04* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 4 | CMC S353 | Rohde & Schwarz | ESW26 | EMI Test Receiver 1 Hz - 26.5 GHz |
| 3 | CMC S108 | Emco | 3115 | Waveguide antenna |

| *Test setup PE004_05* | | | | |
|---|---|---|---|---|
| *Nr.* | *Id. Number* | *Manufacturer* | *Model* | *Description* |
| 4 | CMC S353 | Rohde & Schwarz | ESW26 | EMI Test Receiver 1 Hz - 26.5 GHz |
| 3 | CMC S290 | Schwarzbeck | BBHA 9170 | Horn Antenna (15-40 GHz) |

**Result – LoRa 125 kHz, spread factor 10**

| *Transmission channel (MHz)* | *Polarization* | *Frequency Range (MHz)* | *Graphs* | *Result* |
|---|---|---|---|---|
| 903,90 | V | 1000 – 9500 | G21232421 | P |
| 903,90 | H | 1000 – 9500 | G21232422 | P |
| 904,50 | H | 1000 – 9500 | G21232423 | P |
| 904,50 | V | 1000 – 9500 | G21232424 | P |
| 905,30 | V | 1000 – 9500 | G21232425 | P |
| 905,30 | H | 1000 – 9500 | G21232426 | P |
| 903,90 | H | 300 – 1000 | G21232445 | P |
| 903,90 | V | 300 – 1000 | G21232446 | P |
| 904,50 | V | 300 – 1000 | G21232447 | P |
| 904,50 | H | 300 – 1000 | G21232448 | P |
| 905,30 | H | 300 – 1000 | G21232449 | P |
| 905,30 | V | 300 – 1000 | G21232450 | P |
| Worst case | V | 30 – 300 | G212324A50 | P |
| Worst case | H | 30 – 300 | G212324A51 | P |

**Remarks:** EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels.
Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 40log(test distance/10) based on the measuring distance provided by the standard.
Measurements at frequencies higher than 30 MHz and lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 20log(test distance/10) based on the measuring distance provided by the standard.
Peaks above the limits are caused by the nominal transmitting frequencies

**Result – LoRa 125 kHz, spread factor 7**

| *Transmission channel (MHz)* | *Polarization* | *Frequency Range (MHz)* | *Graphs* | *Result* |
|---|---|---|---|---|
| 903,90 | V | 1000 – 9500 | G21232415 | P |
| 903,90 | H | 1000 – 9500 | G21232416 | P |
| 904,50 | H | 1000 – 9500 | G21232417 | P |
| 904,50 | V | 1000 – 9500 | G21232418 | P |
| 905,30 | V | 1000 – 9500 | G21232419 | P |
| 905,30 | H | 1000 – 9500 | G21232420 | P |
| 903,90 | V | 300 – 1000 | G21232439 | P |
| 903,90 | H | 300 – 1000 | G21232440 | P |
| 904,50 | H | 300 – 1000 | G21232441 | P |
| 904,50 | V | 300 – 1000 | G21232442 | P |
| 905,30 | V | 300 – 1000 | G21232443 | P |
| 905,30 | H | 300 – 1000 | G21232444 | P |
| Worst case | H | 30 – 300 | G212324A52 | P |
| Worst case | V | 30 – 300 | G212324A53 | P |

**Remarks:** EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels.
Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 40log(test distance/10) based on the measuring distance provided by the standard.
Measurements at frequencies higher than 30 MHz and lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 20log(test distance/10) based on the measuring distance provided by the standard.
Peaks above the limits are caused by the nominal transmitting frequencies

**Result – LoRa 500 kHz, spread factor 12**

| *Transmission channel (MHz)* | *Polarization* | *Frequency Range (MHz)* | *Graphs* | *Result* |
|---|---|---|---|---|
| 923,30 | V | 1000 – 10000 | G21232409 | P |
| 923,30 | H | 1000 – 10000 | G21232410 | P |
| 925,00 | H | 1000 – 10000 | G21232411 | P |
| 925,00 | V | 1000 – 10000 | G21232412 | P |
| 927,50 | V | 1000 – 10000 | G21232413 | P |
| 927,50 | H | 1000 – 10000 | G21232414 | P |
| 923,30 | H | 300 – 1000 | G21232433 | P |
| 923,30 | V | 300 – 1000 | G21232434 | P |
| 925,00 | V | 300 – 1000 | G21232435 | P |
| 925,00 | H | 300 – 1000 | G21232436 | P |
| 927,50 | H | 300 – 1000 | G21232437 | P |
| 927,50 | V | 300 – 1000 | G21232438 | P |
| Worst case | H | 30 – 300 | G212324A56 | P |
| Worst case | V | 30 – 300 | G212324A57 | P |

**Remarks:** EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels.
Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 40log(test distance/10) based on the measuring distance provided by the standard.
Measurements at frequencies higher than 30 MHz and lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 20log(test distance/10) based on the measuring distance provided by the standard.
Peaks above the limits are caused by the nominal transmitting frequencies

**Result – LoRa 500 kHz, spread factor 7**

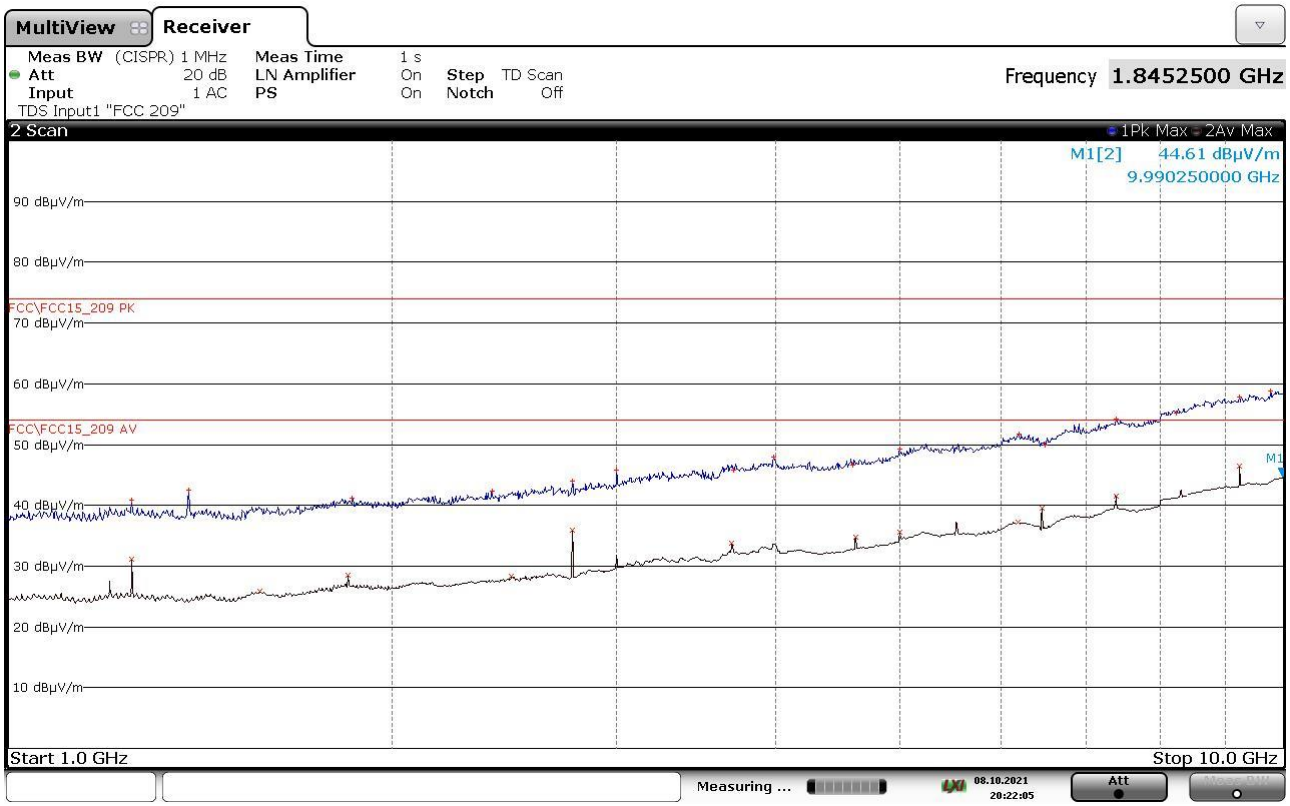
| *Transmission channel (MHz)* | *Polarization* | *Frequency Range (MHz)* | *Graphs* | *Result* |
|---|---|---|---|---|
| 923,30 | H | 1000 – 10000 | G21232403 | P |
| 923,30 | V | 1000 – 10000 | G21232404 | P |
| 925,00 | V | 1000 – 10000 | G21232405 | P |
| 925,00 | H | 1000 – 10000 | G21232406 | P |
| 927,50 | H | 1000 – 10000 | G21232407 | P |
| 927,50 | V | 1000 – 10000 | G21232408 | P |
| 923,30 | V | 300 – 1000 | G21232427 | P |
| 923,30 | H | 300 – 1000 | G21232428 | P |
| 925,00 | H | 300 – 1000 | G21232429 | P |
| 925,00 | V | 300 – 1000 | G21232430 | P |
| 927,50 | V | 300 – 1000 | G21232431 | P |
| 927,50 | H | 300 – 1000 | G21232432 | P |
| Worst case | V | 30 – 300 | G212324A54 | P |
| Worst case | H | 30 – 300 | G212324A55 | P |

**Remarks:** EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels.
Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 40log(test distance/10) based on the measuring distance provided by the standard.
Measurements at frequencies higher than 30 MHz and lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor 20log(test distance/10) based on the measuring distance provided by the standard.
Peaks above the limits are caused by the nominal transmitting frequencies

*Graphs Legend*
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a X

## Graphs

Panozzo 21232403 Ant Horiz EUT Vert In Funzione Fmin




FINAL RESULT TABLE

MAX PEAK

| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1250000000 | +40,86 | -33,12 |
| 1384250000 | +42,54 | -31,44 |
| 1861000000 | +41,19 | -32,79 |
| 2393750000 | +42,36 | -31,62 |
| 2770000000 | +43,94 | -30,04 |
| 2998500000 | +45,77 | -28,21 |
| 3706000000 | +45,84 | -28,14 |
| 3981000000 | +47,89 | -26,09 |

AVERAGE

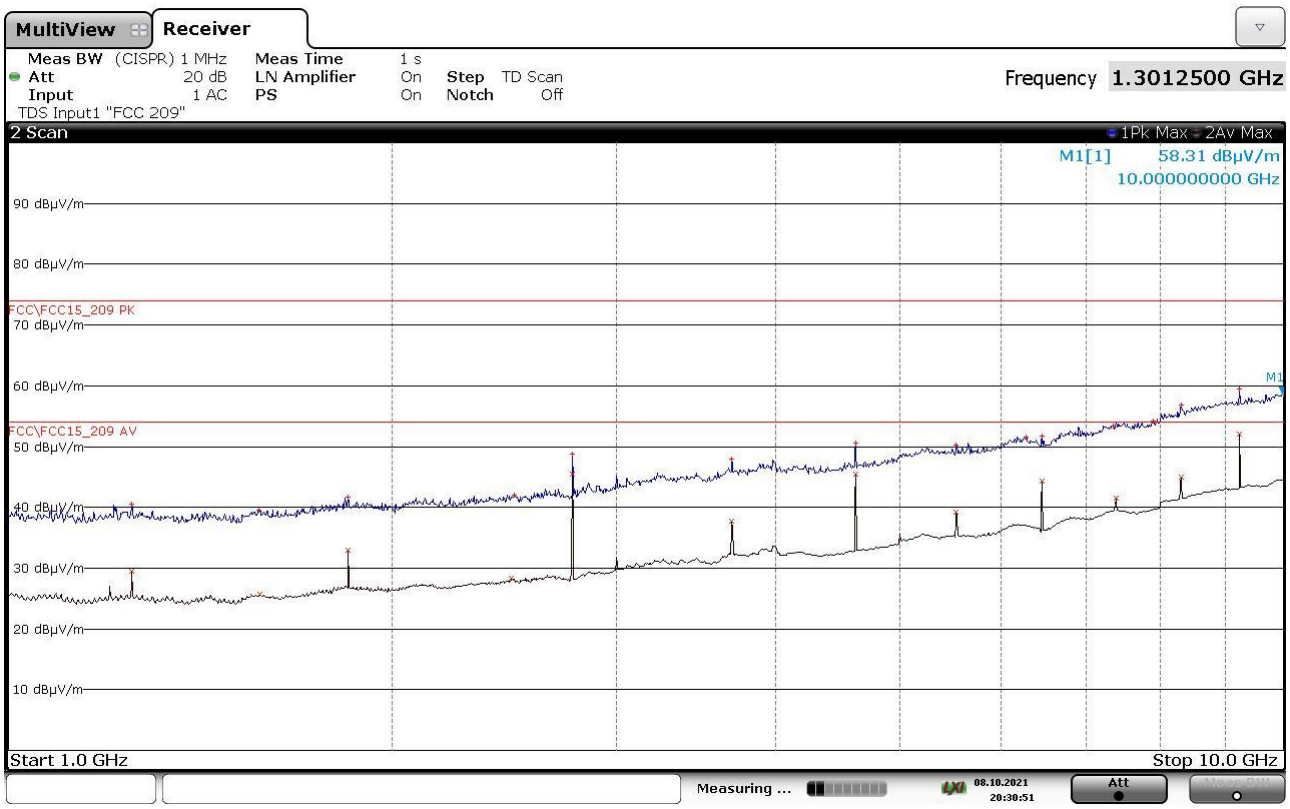
| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1250000000 | +31,16 | -22,82 |
| 1574500000 | +25,86 | -28,12 |
| 1846500000 | +28,42 | -25,56 |
| 2481500000 | +28,26 | -25,72 |
| 2770000000 | +35,84 | -18,14 |
| 3693250000 | +33,72 | -20,26 |

21232403_2

| FINAL RESULT TABLE | | | | | |
|---|---|---|---|---|---|
| MAX PEAK | | | AVERAGE | | |
| Freq Hz | Lev dBuV/m | Margin dB | Freq Hz | Lev dBuV/m | Margin dB |
| 4591500000 | +46,69 | -27,29 | 4616500000 | +34,82 | -19,16 |
| 4998500000 | +49,27 | -24,71 | 4999750000 | +35,57 | -18,41 |
| 6199500000 | +51,67 | -22,31 | 6187250000 | +37,25 | -16,73 |
| 6505000000 | +49,94 | -24,04 | 6463000000 | +39,56 | -14,42 |
| 7394000000 | +54,15 | -19,83 | 7386500000 | +41,48 | -12,50 |
| 8233750000 | +55,23 | -18,75 | 9233000000 | +46,53 | -7,45 |
| 9233000000 | +57,82 | -16,16 | | | |
| 9771750000 | +58,76 | -15,22 | | | |

21232403_2

Panozzo 21232404 Ant Vert EUT Vert In Funzione Fmin

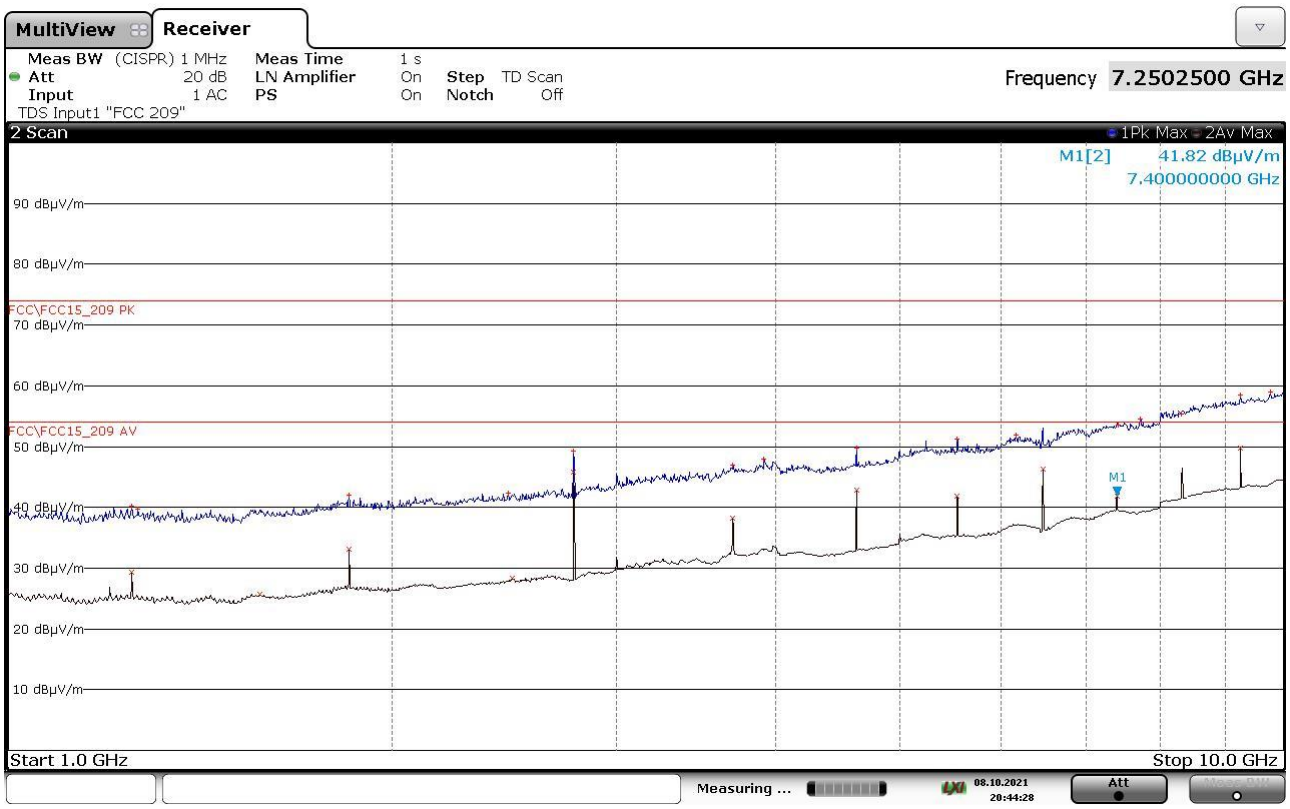



FINAL RESULT TABLE

| MAX PEAK | | | AVERAGE | | |
|---|---|---|---|---|---|
| Freq Hz | Lev dBuV/m | Margin dB | Freq Hz | Lev dBuV/m | Margin dB |
| 1250250000 | +40,55 | -33,43 | 1250000000 | +29,45 | -24,53 |
| 1570500000 | +39,50 | -34,48 | 1575000000 | +25,70 | -28,28 |
| 1846750000 | +41,68 | -32,30 | 1846500000 | +32,96 | -21,02 |
| 2493250000 | +42,01 | -31,97 | 2481500000 | +28,26 | -25,72 |
| 2770000000 | +48,79 | -25,19 | 2770000000 | +45,49 | -8,49 |
| 3693500000 | +47,89 | -26,09 | 3693250000 | +37,78 | -16,20 |
| 4616500000 | +50,65 | -23,33 | 4616500000 | +45,44 | -8,54 |
| 5539500000 | +50,18 | -23,80 | 5539750000 | +39,24 | -14,74 |
| 6287250000 | +51,64 | -22,34 | 6463000000 | +44,32 | -9,66 |
| 6463250000 | +51,78 | -22,20 | 7386500000 | +41,50 | -12,48 |
| 7355250000 | +53,31 | -20,67 | 8309750000 | +45,02 | -8,96 |
| 7901000000 | +54,17 | -19,81 | 9233000000 | +52,11 | -1,87 |
| 8309750000 | +56,78 | -17,20 | | | |
| 9233000000 | +59,54 | -14,44 | | | |

21232404_2

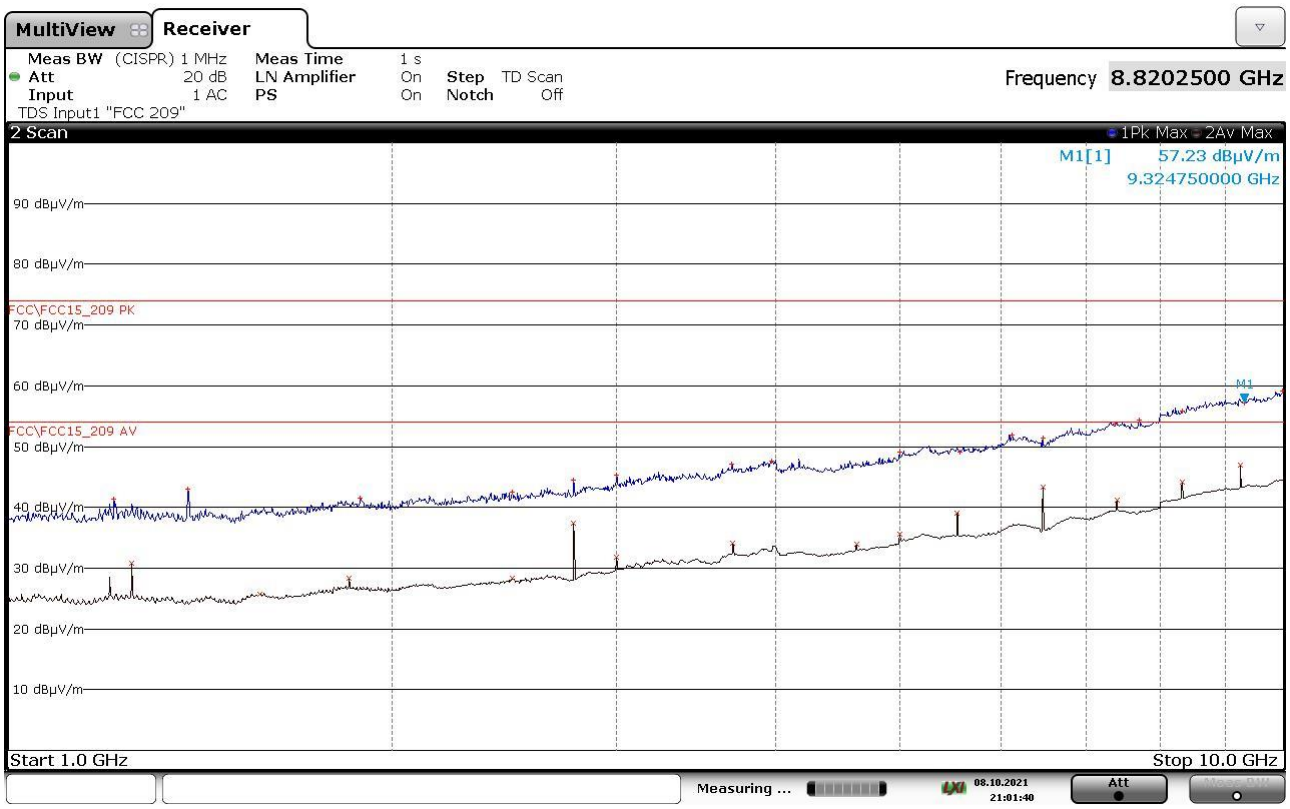
Panozzo 21232405 Ant Vert EUT Vert In Funzione Fmed




| FINAL RESULT TABLE | | | | | |
|---|---|---|---|---|---|
| MAX PEAK | | | AVERAGE | | |
| Freq Hz | Lev dBuV/m | Margin dB | Freq Hz | Lev dBuV/m | Margin dB |
| 1250000000 | +40,24 | -33,74 | 1250000000 | +29,36 | -24,62 |
| 1263000000 | +39,78 | -34,20 | 1574250000 | +25,68 | -28,30 |
| 1850000000 | +42,05 | -31,93 | 1850000000 | +33,15 | -20,83 |
| 2465750000 | +42,34 | -31,64 | 2482000000 | +28,27 | -25,71 |
| 2775000000 | +49,28 | -24,70 | 2775000000 | +45,74 | -8,24 |
| 3700000000 | +46,95 | -27,03 | 3700000000 | +38,27 | -15,71 |
| 3914250000 | +48,01 | -25,97 | 4625000000 | +42,86 | -11,12 |
| 4625000000 | +49,68 | -24,30 | 5550000000 | +41,77 | -12,21 |
| 5550000000 | +51,18 | -22,80 | 6475000000 | +46,30 | -7,68 |
| 6166000000 | +51,85 | -22,13 | 7400000000 | +41,82 | -12,16 |
| 7420000000 | +53,53 | -20,45 | 9250000000 | +49,69 | -4,29 |
| 7726000000 | +54,49 | -19,49 | | | |
| 8311750000 | +55,29 | -18,69 | | | |
| 9250000000 | +58,51 | -15,47 | | | |
| 9771750000 | +58,95 | -15,03 | | | |

21232405_2

Panozzo 21232406 Ant Horiz EUT Vert In Funzione Emed




FINAL RESULT TABLE

MAX PEAK

| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1209750000 | +41,41 | -32,57 |
| 1383000000 | +43,05 | -30,93 |
| 1887750000 | +41,44 | -32,54 |
| 2483250000 | +42,46 | -31,52 |
| 2775000000 | +44,42 | -29,56 |
| 2999500000 | +45,36 | -28,62 |
| 3694000000 | +47,17 | -26,81 |
| 3966000000 | +47,61 | -26,37 |

AVERAGE

| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1250000000 | +30,73 | -23,25 |
| 1575500000 | +25,78 | -28,20 |
| 1850000000 | +28,41 | -25,57 |
| 2481750000 | +28,28 | -25,70 |
| 2775000000 | +37,36 | -16,62 |
| 2998250000 | +31,83 | -22,15 |
| 3700000000 | +34,05 | -19,93 |

21232406_2

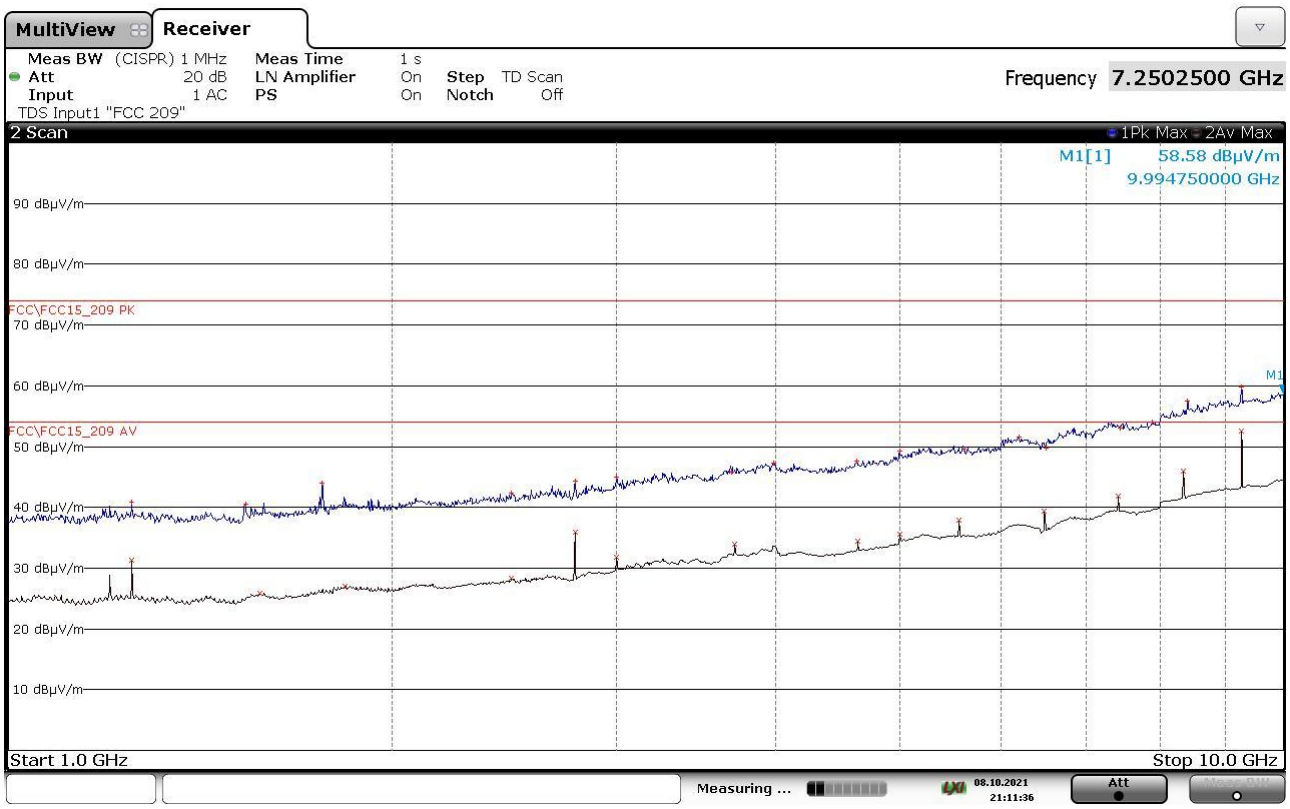
| FINAL RESULT TABLE | | | | | |
|---|---|---|---|---|---|
| MAX PEAK | | | AVERAGE | | |
| Freq Hz | Lev dBuV/m | Margin dB | Freq Hz | Lev dBuV/m | Margin dB |
| 4999250000 | +49,02 | -24,96 | 4625000000 | +33,98 | -20,00 |
| 5579500000 | +49,07 | -24,91 | 4999750000 | +35,58 | -18,40 |
| 6126250000 | +51,92 | -22,06 | 5550000000 | +39,11 | -14,87 |
| 6475000000 | +51,36 | -22,62 | 6475000000 | +43,28 | -10,70 |
| 7381750000 | +53,74 | -20,24 | 7400000000 | +41,25 | -12,73 |
| 7705250000 | +54,33 | -19,65 | 8325000000 | +44,23 | -9,75 |
| 8325000000 | +55,87 | -18,11 | 9250000000 | +46,95 | -7,03 |
| 9324750000 | +57,23 | -16,75 | | | |

21232406_2

| FINAL RESULT TABLE | | | | | |
|---|---|---|---|---|---|
| MAX PEAK | | | AVERAGE | | |
| Freq Hz | Lev dBuV/m | Margin dB | Freq Hz | Lev dBuV/m | Margin dB |
| 9988250000 | +59,11 | -14,87 | | | |

21232406_2

Panozzo 21232407 Ant Horiz EUT Vert In Funzione Fmax




FINAL RESULT TABLE

MAX PEAK

| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1249750000 | +40,88 | -33,10 |
| 1534250000 | +40,50 | -33,48 |
| 1763000000 | +44,00 | -29,98 |
| 2480000000 | +42,32 | -31,66 |
| 2782500000 | +44,38 | -29,60 |
| 2999250000 | +44,93 | -29,05 |
| 3692250000 | +45,78 | -28,20 |
| 3979500000 | +47,34 | -26,64 |

AVERAGE

| Freq Hz | Lev dBuV/m | Margin dB |
|---|---|---|
| 1250000000 | +31,22 | -22,76 |
| 1574750000 | +25,85 | -28,13 |
| 1837750000 | +27,05 | -26,93 |
| 2481500000 | +28,26 | -25,72 |
| 2782500000 | +35,94 | -18,04 |
| 2998250000 | +31,81 | -22,17 |
| 3710000000 | +33,88 | -20,10 |

21232407_2