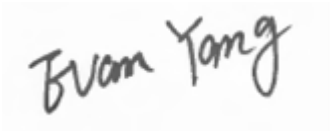
# FCC Radio Test Report

## FCC ID: RWO-RZ040443

**This report concerns: Original Grant**

| | | |
|---|---|---|
| **Project No.** | : | 2111C028 |
| **Equipment** | : | Wireless Headset |
| **Brand Name** | : | RAZER |
| **Test Model** | : | RZ04-0443 |
| **Series Model** | : | RZ04-0443XXXX-XXXX (X can be 0-9 or A-Z) |
| **Applicant** | : | Razer Inc. |
| **Address** | : | 9 Pasteur, Suite 100, Irvine, CA92618, USA |
| **Manufacturer** | : | Razer (Asia-Pacific) Pte.,Ltd. |
| **Address** | : | 1 one-north Crescent, #02-01 Singapore 138538 |
| **Factory** | : | RAZER TECHNOLOGY AND DEVELOPMENT (SHENZHEN) CO., LTD |
| **Address** | : | East Wing, 3rd Floor, Block 2, Phase 1 of Vision Shenzhen Business Park Keji South Road, Hi-Tech Industrial Park, Shenzhen 518057, China |
| **Date of Receipt** | : | Nov. 02, 2021 |
| **Date of Test** | : | Nov. 03, 2021 ~ Dec. 02, 2021 |
| **Issued Date** | : | Jan. 04, 2022 |
| **Report Version** | : | R00 |
| **Test Sample** | : | Sample No.: DG2021110344 for conducted, DG2021110346 for radiated. |
| **Standard(s)** | : | FCC CFR Title 47, Part 15, Subpart C<br>FCC KDB 558074 D01 15.247 Meas Guidance v05r02<br>ANSI C63.10-2013 |

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.



**Prepared by :** Evan Yang

**Approved by** Welly Zhou

TESTING CERT #5123.02

Add: No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

Tel: +86-769-8318-3000

Web: www.newbtl.com

**Declaration**

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**Limitation**

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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## REPORT ISSUED HISTORY

| Report Version | Description | Issued Date |
|---|---|---|
| R00 | Original Issue. | Jan. 04, 2022 |

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

| FCC CFR Title 47, Part 15, Subpart C | | | | |
|---|---|---|---|---|
| **Standard(s) Section** | **Test Item** | **Test Result** | **Judgment** | **Remark** |
| 15.207 | AC Power Line Conducted Emissions | APPENDIX A | PASS | ------ |
| 15.247(d)<br>15.205(a)<br>15.209(a) | Radiated Emission | APPENDIX B<br>APPENDIX C<br>APPENDIX D | PASS | ------ |
| 15.247<br>(a)(1)(iii) | Number of Hopping Frequency | APPENDIX E | PASS | ------ |
| 15.247<br>(a)(1)(iii) | Average Time of Occupancy | APPENDIX F | PASS | ------ |
| 15.247(a)(1) | Hopping Channel Separation | APPENDIX G | PASS | ------ |
| 15.247(a)(1) | Bandwidth | APPENDIX H | PASS | ------ |
| 15.247(a)(1) | Maximum Output Power | APPENDIX I | PASS | ------ |
| 15.247(d) | Conducted Spurious Emission | APPENDIX J | PASS | ------ |
| 15.203 | Antenna Requirement | ------ | PASS | Note(2) |

Note:

(1) “N/A” denotes test is not applicable in this test report

(2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

## 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.
BTL's Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

## 1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

| Test Site | Method | Measurement Frequency Range | U,(dB) |
|---|---|---|---|
| DG-C02 | CISPR | 150kHz ~ 30MHz | 2.60 |

B. Radiated emissions test:

| Test Site | Method | Measurement Frequency Range | U,(dB) |
|---|---|---|---|
| DG-CB01 | CISPR | 9kHz ~ 30MHz | 2.36 |

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U,(dB) |
|---|---|---|---|---|
| DG-CB03 (3m) | CISPR | 30MHz ~ 200MHz | V | 4.36 |
| | | 30MHz ~ 200MHz | H | 3.32 |
| | | 200MHz ~ 1,000MHz | V | 4.08 |
| | | 200MHz ~ 1,000MHz | H | 3.96 |

| Test Site | Method | Measurement Frequency Range | U,(dB) |
|---|---|---|---|
| DG-CB03 (3m) | CISPR | 1GHz ~ 6GHz | 3.80 |
| | | 6GHz ~ 18GHz | 4.82 |

| Test Site | Method | Measurement Frequency Range | U,(dB) |
|---|---|---|---|
| DG-CB03 (1m) | CISPR | 18 ~ 26.5 GHz | 3.62 |
| | | 26.5 ~ 40 GHz | 4.00 |

C. Other Measurement:

| Test Item | Uncertainty |
|---|---|
| Conducted Spurious Emission | ±2.71 dB |
| Hopping Channel Separation | ±53.46 Hz |
| Maximum Output Power | ±0.95 dB |
| Number of Hopping Frequency | ±53.46 Hz |
| Bandwidth | ±3.8 % |
| Temperature | ±0.08 °C |
| Humidity | ±1.5% |

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

## 1.3 TEST ENVIRONMENT CONDITIONS

| Test Item | Temperature | Humidity | Test Voltage | Tested By |
|---|---|---|---|---|
| AC Power Line Conducted Emissions | 23°C | 65% | AC 120V/60Hz | Aries Tang |
| Radiated Emissions-9 kHz to 30 MHz | 25°C | 60% | DC 5V | Sparrow Liu |
| Radiated Emissions-30 MHz to 1000 MHz | 23°C | 41% | DC 5V | Chen Mo |
| Radiated Emissions-Above 1000 MHz | 21~22°C | 43~50% | DC 5V | Jakyri Wen<br>Kwok Guo |
| Number of Hopping Frequency | 25°C | 44% | DC 5V | Longdage Feng |
| Average Time of Occupancy | 25°C | 44% | DC 5V | Longdage Feng |
| Hopping Channel Separation | 25°C | 44% | DC 5V | Longdage Feng |
| Bandwidth | 25°C | 44% | DC 5V | Longdage Feng |
| Maximum Output Power | 25°C | 44% | DC 5V | Longdage Feng |
| Conducted Spurious Emission | 25°C | 44% | DC 5V | Longdage Feng |

# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| Equipment | Wireless Headset |
| Brand Name | RAZER |
| Test Model | RZ04-0443 |
| Series Model | RZ04-0443XXXX-XXXX (X can be 0-9 or A-Z) |
| Model Difference(s) | The system's model name is RZ04-0443XXXX-XXXX ( X:Can be 0-9, A-Z), and the system is contain a Wireless Headset (Model name: RZ04-0443) and USB Wireless Transceiver (Model name:RC30-0378) |
| Power Source | 1# Supplied from USB port.<br>2# Supplied from battery.<br>Model: 553450PN2 |
| Power Rating | 1# DC 5V<br>2# DC 3.7V, 1200mAh, 4.44Wh |
| Operation Frequency | 2402 MHz ~ 2480 MHz |
| Modulation Type | GFSK, π/4-DQPSK, 8-DPSK |
| Bit Rate of Transmitter | 1Mbps, 2Mbps, 3Mbps |
| Max. Peak Output Power | 3Mbps: 10.90 dBm (0.0123 W) |
| Max. Average Output Power | 3Mbps: 9.18 dBm (0.0083 W) |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 00 | 2402 | 27 | 2429 | 54 | 2456 |
| 01 | 2403 | 28 | 2430 | 55 | 2457 |
| 02 | 2404 | 29 | 2431 | 56 | 2458 |
| 03 | 2405 | 30 | 2432 | 57 | 2459 |
| 04 | 2406 | 31 | 2433 | 58 | 2460 |
| 05 | 2407 | 32 | 2434 | 59 | 2461 |
| 06 | 2408 | 33 | 2435 | 60 | 2462 |
| 07 | 2409 | 34 | 2436 | 61 | 2463 |
| 08 | 2410 | 35 | 2437 | 62 | 2464 |
| 09 | 2411 | 36 | 2438 | 63 | 2465 |
| 10 | 2412 | 37 | 2439 | 64 | 2466 |
| 11 | 2413 | 38 | 2440 | 65 | 2467 |
| 12 | 2414 | 39 | 2441 | 66 | 2468 |
| 13 | 2415 | 40 | 2442 | 67 | 2469 |
| 14 | 2416 | 41 | 2443 | 68 | 2470 |
| 15 | 2417 | 42 | 2444 | 69 | 2471 |
| 16 | 2418 | 43 | 2445 | 70 | 2472 |
| 17 | 2419 | 44 | 2446 | 71 | 2473 |
| 18 | 2420 | 45 | 2447 | 72 | 2474 |
| 19 | 2421 | 46 | 2448 | 73 | 2475 |
| 20 | 2422 | 47 | 2449 | 74 | 2476 |
| 21 | 2423 | 48 | 2450 | 75 | 2477 |
| 22 | 2424 | 49 | 2451 | 76 | 2478 |
| 23 | 2425 | 50 | 2452 | 77 | 2479 |
| 24 | 2426 | 51 | 2453 | 78 | 2480 |
| 25 | 2427 | 52 | 2454 | | |
| 26 | 2428 | 53 | 2455 | | |

3. Table for Filed Antenna:

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|---|---|---|---|---|---|
| 1 | Innovation | N/A | PIFI | N/A | 4.29 |

Note: The antenna gain is provided by the manufacturer.

## 2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

| Pretest Mode | Description |
|---|---|
| Mode 1 | TX Mode_1Mbps Channel 00/39/78 |
| Mode 2 | TX Mode_2Mbps Channel 00/39/78 |
| Mode 3 | TX Mode_3Mbps Channel 00/39/78 |
| Mode 4 | TX Mode_3Mbps Channel 00 |

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

| **AC power line conducted emissions test** | |
|---|---|
| Final Test Mode | Description |
| Mode 4 | TX Mode_3Mbps Channel 00 |

| **Radiated emissions test - Below 1GHz** | |
|---|---|
| Final Test Mode | Description |
| Mode 4 | TX Mode_3Mbps Channel 00 |

| **Radiated emissions test - Above 1GHz** | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | TX Mode_1Mbps Channel 00/39/78 |
| Mode 3 | TX Mode_3Mbps Channel 00/39/78 |

| **Maximum Output Power** | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | TX Mode_1Mbps Channel 00/39/78 |
| Mode 2 | TX Mode_2Mbps Channel 00/39/78 |
| Mode 3 | TX Mode_3Mbps Channel 00/39/78 |

| **Other Conducted test** | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | TX Mode_1Mbps Channel 00/39/78 |
| Mode 3 | TX Mode_3Mbps Channel 00/39/78 |

Note:

(1) The measurements for Output Power were tested with DH1/3/5 during 1Mbps, 2Mbps and 3Mbps, the worst case were 1Mbps (DH5) and 3Mbps (DH5), only worst case were documented for other test items except Average Time of Occupancy.

(2) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

(3) This product has the mode of BT AFH, which was considered during testing, but this mode is not the worst case mode, and this report only shows the worst case mode.

(4) For AC power line conducted emissions and radiated spurious emissions below 1 GHz test, the 3Mbps Channel 00 is found to be the worst case and recorded.

(5) The product supports 2.4G Hopping technology and Bluetooth technology at the same time, and the technology used is similar to that of Bluetooth. The chip and fixed frequency software used at the same time are the same. The difference is that when the product does not work with Bluetooth technology, it needs to be used with a dongle. So only tested one of Bluetooth technology and hopping technology.

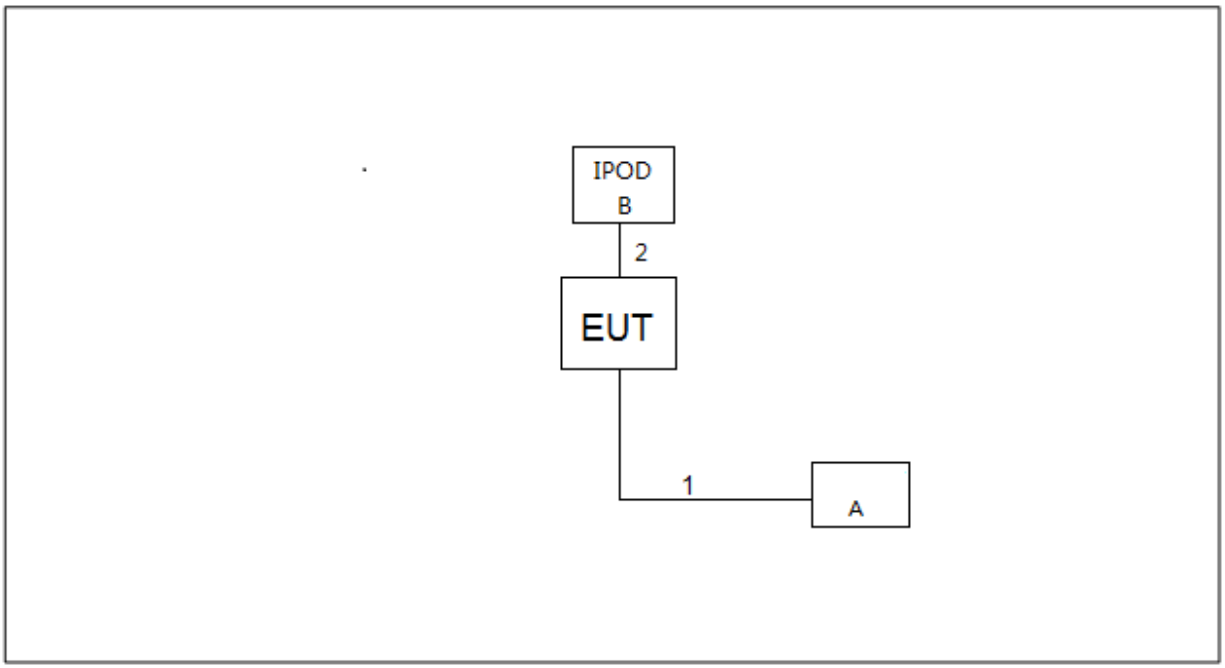
## 2.3 PARAMETERS OF TEST SOFTWARE

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

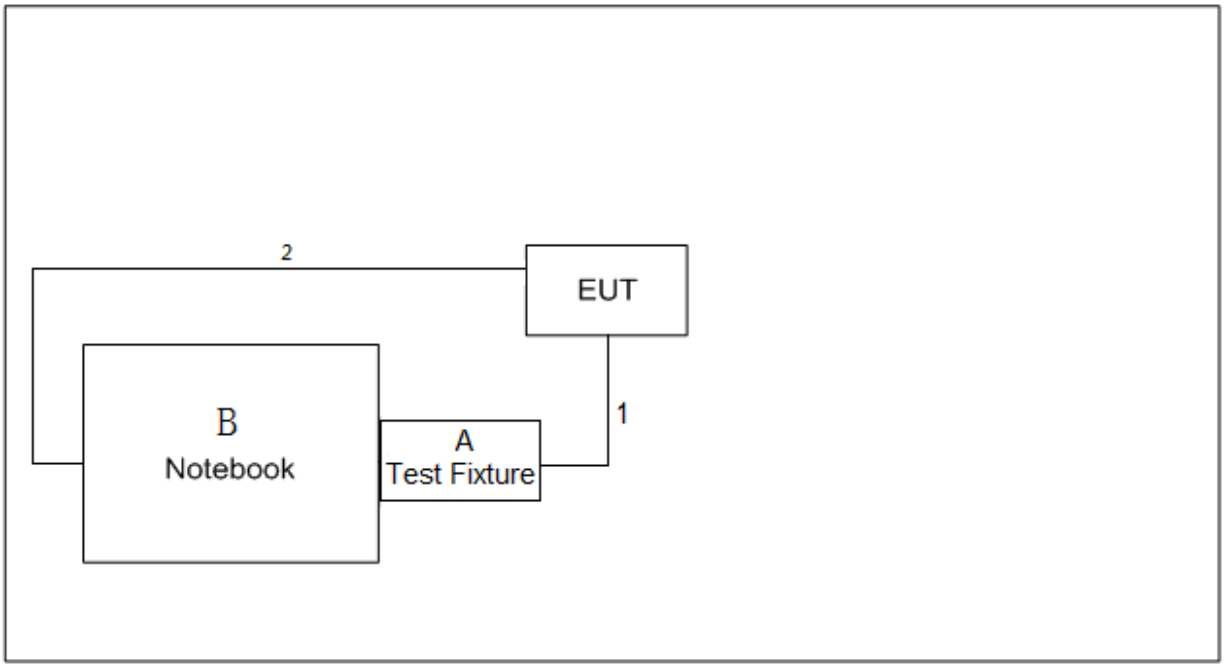
| Test Software Version | AWRDLABV2_V1.0.9.7 | | |
|---|---|---|---|
| Frequency (MHz) | 2402 | 2441 | 2480 |
| 1Mbps | 0X02 | 0X02 | 0X02 |
| 2Mbps | 0X02 | 0X02 | 0X02 |
| 3Mbps | 0X02 | 0X02 | 0X02 |

## 2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

**For AC power line conducted emissions test**




**For Radiated emissions test**



## 2.5 SUPPORT UNITS

**For AC power line conducted emissions test**

| Item | Equipment | Brand | Model No. | Series No. |
|---|---|---|---|---|
| A | Notebook | Lenovo | E40-70 | MP075DW6 |
| B | IPOD | APPLE | A1574 | CCQTJ1N3GGK8 |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|---|---|---|---|---|
| 1 | USB Type-C Cable | NO | NO | 1.2m |
| 2 | Audio Cable | YES | NO | 1.2m |

**For Radiated emissions test**

| Item | Equipment | Brand | Model No. | Series No. |
|---|---|---|---|---|
| A | Test Fixture | N/A | N/A | N/A |
| B | Notebook | Dell | Inspiron 15-7559 | N/A |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|---|---|---|---|---|
| 1 | Data Cable | NO | NO | 0.2m |
| 2 | USB Type-C Cable | NO | NO | 1.2m |

## 3. AC POWER LINE CONDUCTED EMISSIONS

### 3.1 LIMIT

| Frequency of Emission (MHz) | Limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56* | 56 to 46* |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note:

(1) The tighter limit applies at the band edges.
(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

### 3.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

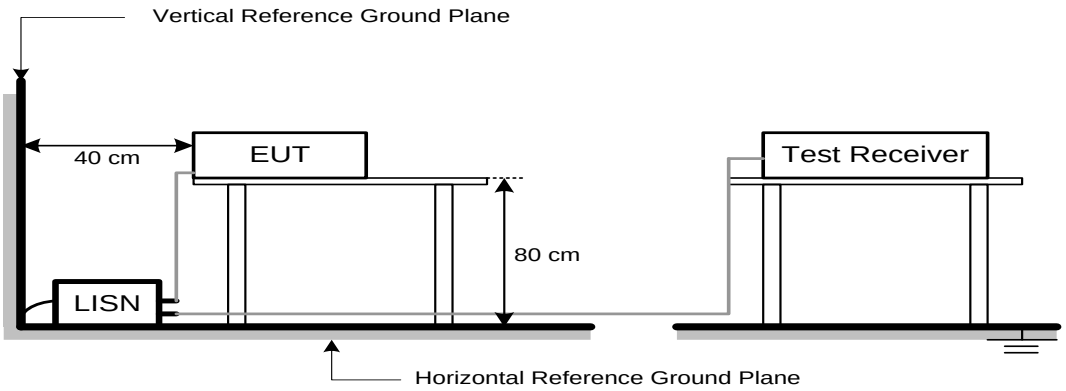
The following table is the setting of the receiver:

| Receiver Parameters | Setting |
|---|---|
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

### 3.3 DEVIATION FROM TEST STANDARD

No deviation.

## 3.4 TEST SETUP




## 3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting data or hopping on mode.

## 3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "*" marked in AVG Mode column of Interference Voltage Measured.
(2) Measuring frequency range from 150 kHz to 30 MHz.

## 4. RADIATED EMISSIONS

### 4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

| Frequency (MHz) | (dBuV/m at 3 m) | |
|---|---|---|
| | Peak | Average |
| Above 1000 | 74 | 54 |

Note:

(1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

## 4.2 TEST PROCEDURE

a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1 GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1 GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

| Spectrum Parameters | Setting |
|---|---|
| Start ~ Stop Frequency | 9 kHz~150 kHz for RBW 200 Hz |
| Start ~ Stop Frequency | 0.15 MHz~30 MHz for RBW 9 kHz |
| Start ~ Stop Frequency | 30 MHz~1000 MHz for RBW 100 kHz |

| Spectrum Parameters | Setting |
|---|---|
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RBW / VBW<br>(Emission in restricted band) | 1 MHz / 3 MHz for PK value<br>1 MHz / 1/T Hz for AVG value |

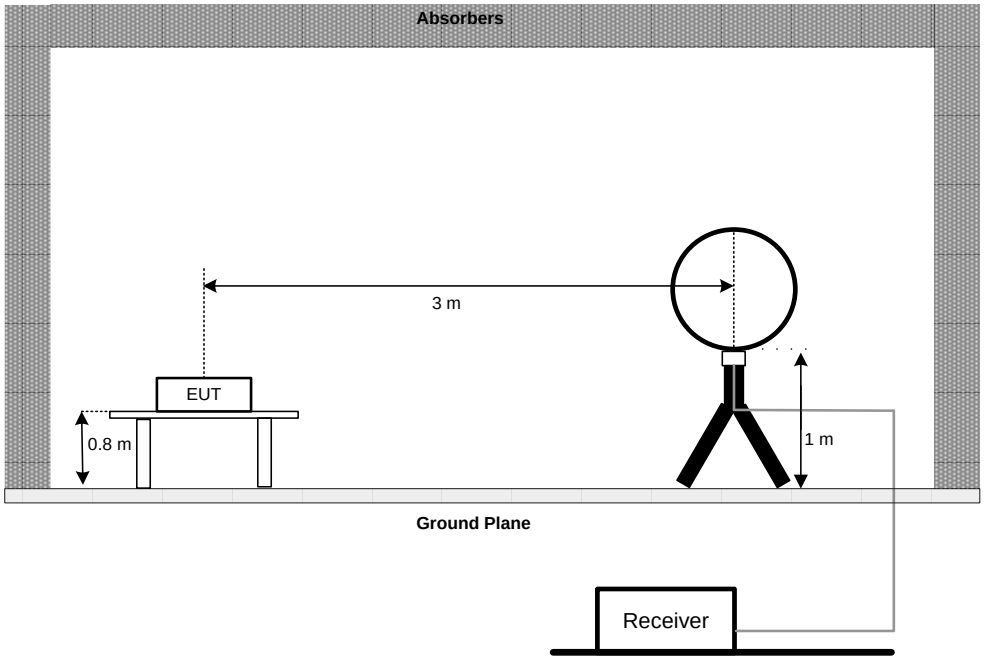
| Spectrum Parameters | Setting |
|---|---|
| Start ~ Stop Frequency | 9 kHz~90 kHz for PK/AVG detector |
| Start ~ Stop Frequency | 90 kHz~110 kHz for QP detector |
| Start ~ Stop Frequency | 110 kHz~490 kHz for PK/AVG detector |
| Start ~ Stop Frequency | 490 kHz~30 MHz for QP detector |
| Start ~ Stop Frequency | 30 MHz~1000 MHz for QP detector |
| Start ~ Stop Frequency | 1 GHz~26.5 GHz for PK/AVG detector |

## 4.3 DEVIATION FROM TEST STANDARD

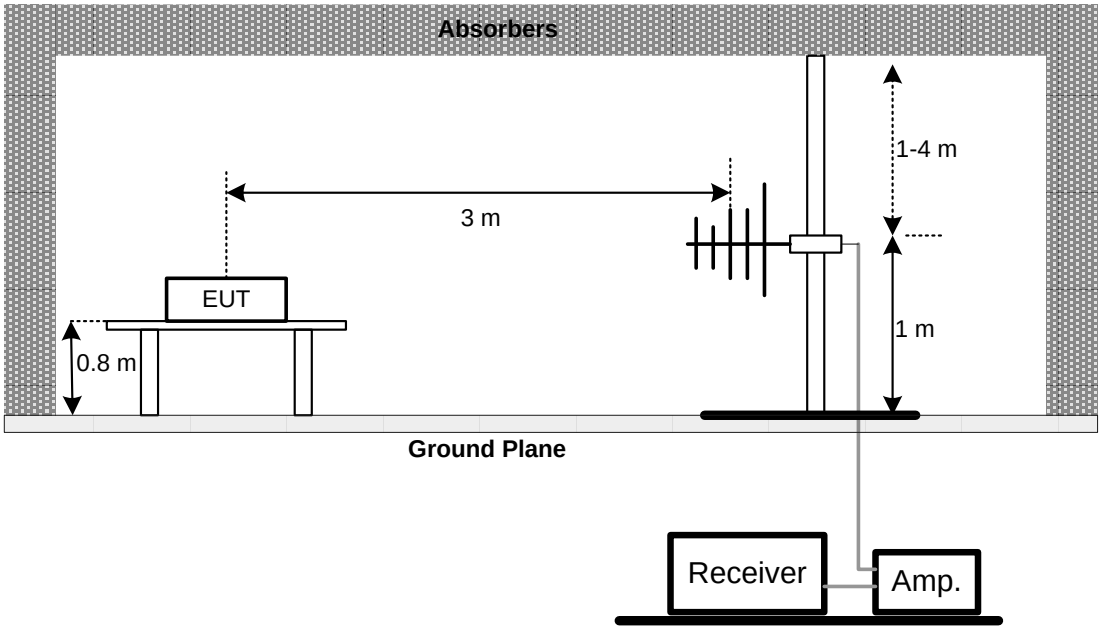
No deviation.

## 4.4 TEST SETUP

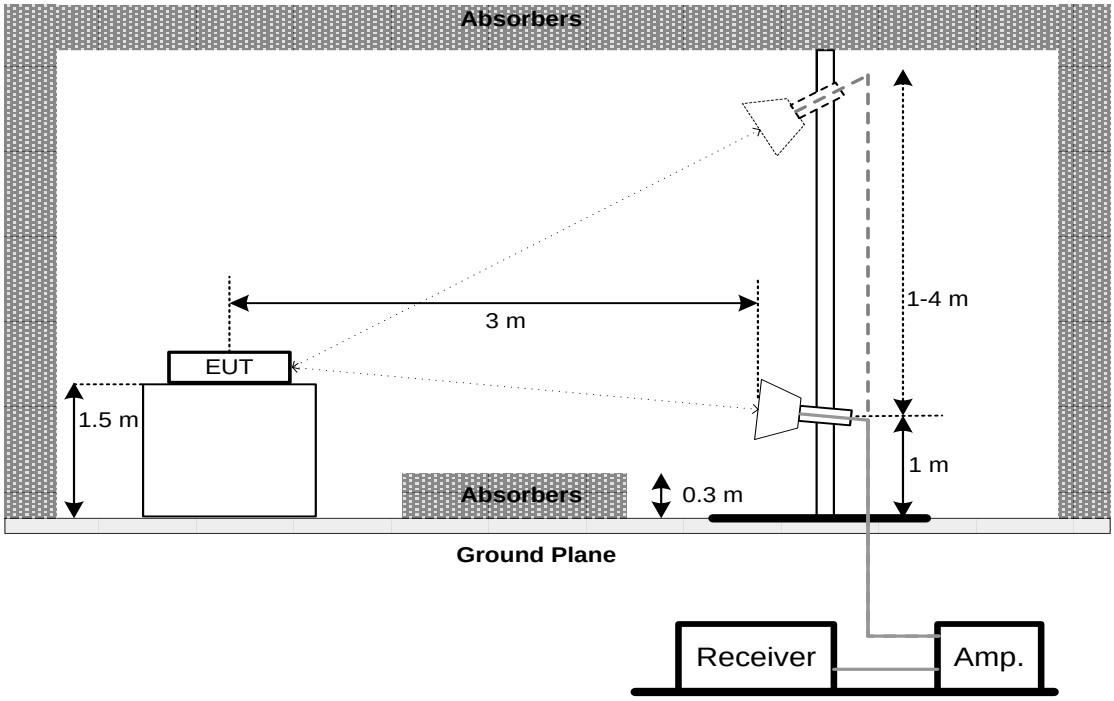
**9 kHz to 30 MHz**




**30 MHz to 1 GHz**



**Above 1 GHz**




## 4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 4.6 TEST RESULTS - 9 kHz TO 30 MHz

Please refer to the APPENDIX B.

Remark:

(1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(2) Limit line = specific limits (dBuV) + distance extrapolation factor.

## 4.7 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

## 4.8 TEST RESULTS - ABOVE 1000 MHz

Please refer to the APPENDIX D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

## 5. NUMBER OF HOPPING FREQUENCY

### 5.1 LIMIT

| Section | Test Item | Limit |
|---|---|---|
| FCC 15.247(a)(1)(iii) | Number of Hopping Frequency | 15 |

### 5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Span Frequency | > Operating Frequency Range |
| RBW | 100 kHz |
| VBW | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP

### 5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 5.6 TEST RESULTS

Please refer to the APPENDIX E.

# 6. AVERAGE TIME OF OCCUPANCY

## 6.1 LIMIT

| Section | Test Item | Limit |
|---|---|---|
| FCC 15.247(a)(1)(iii) | Average Time of Occupancy | 0.4sec |

## 6.2 TEST PROCEDURE

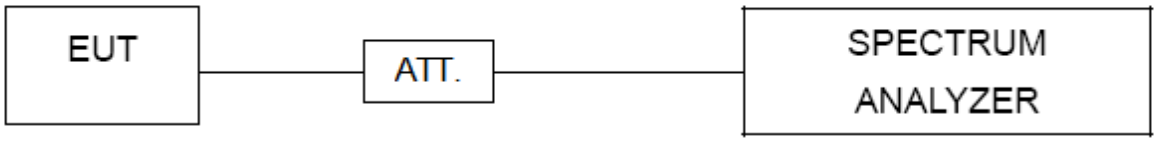
a. Set the EUT for DH1, DH3 and DH5 packet transmitting.
b. Measure the maximum time duration of one single pulse.
c. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.
d. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
e. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.
f. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
g. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Span Frequency | 0 MHz |
| RBW | 1 MHz |
| VBW | 1 MHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | As necessary to capture the entire dwell time per hopping channel |

## 6.3 DEVIATION FROM STANDARD

No deviation.

## 6.4 TEST SETUP




## 6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 6.6 TEST RESULTS

Please refer to the APPENDIX F.

# 7. HOPPING CHANNEL SEPARATION

## 7.1 LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

## 7.2 TEST PROCEDURE

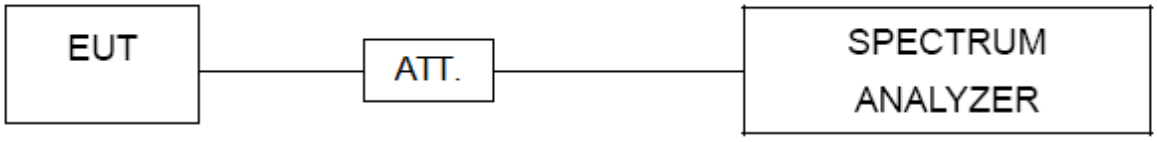
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Span Frequency | Wide enough to capture the peaks of two adjacent channels |
| RBW | 30 kHz |
| VBW | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

## 7.3 DEVIATION FROM STANDARD

No deviation.

## 7.4 TEST SETUP




## 7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 7.6 TEST RESULTS

Please refer to the APPENDIX G.

# 8. BANDWIDTH

## 8.1 LIMIT

| Section | Test Item |
|---|---|
| FCC 15.247(a)(1) | Bandwidth |

## 8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Span Frequency | > Measurement Bandwidth |
| RBW | 30 kHz |
| VBW | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

## 8.3 DEVIATION FROM STANDARD

No deviation.

## 8.4 TEST SETUP

## 8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 8.6 TEST RESULTS

Please refer to the APPENDIX H.

## 9. MAXIMUM OUTPUT POWER

### 9.1 LIMIT

| Section | Test Item | Limit |
|---|---|---|
| FCC 15.247(a)(1) | Maximum Output Power | 0.1250 Watt or 20.97 dBm |

Note: Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 9.2 TEST PROCEDURE

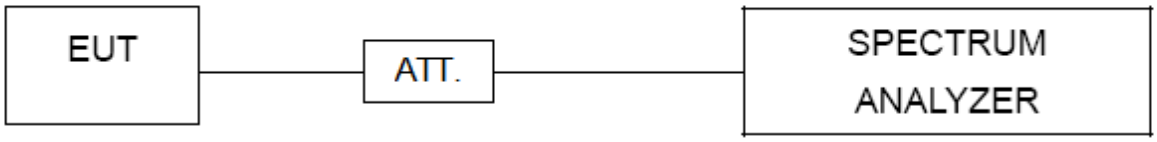
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Span Frequency | Approximately five times the 20 dB bandwidth, centered on a hopping channel. |
| RBW | 3 MHz |
| VBW | 3 MHz |
| Detector | Peak/RMS |
| Trace | Max Hold |
| Sweep Time | Auto |

### 9.3 DEVIATION FROM STANDARD

No deviation.

### 9.4 TEST SETUP




### 9.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 9.6 TEST RESULTS

Please refer to the APPENDIX I.

## 10. CONDUCTED SPURIOUS EMISSION

### 10.1 LIMIT

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 Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

### 10.2 TEST PROCEDURE

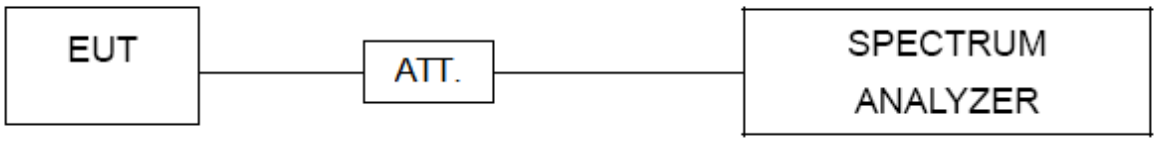
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting |
|---|---|
| Start Frequency | 30 MHz |
| Stop Frequency | 26.5 GHz |
| RBW | 100 kHz |
| VBW | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

### 10.3 DEVIATION FROM STANDARD

No deviation.

### 10.4 TEST SETUP




### 10.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 10.6 TEST RESULTS

Please refer to the APPENDIX J.

## 11. MEASUREMENT INSTRUMENTS LIST

| AC Power Line Conducted Emissions | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | EMI Test Receiver | R&S | ESCI | 100382 | Feb. 28, 2022 |
| 2 | LISN | EMCO | 3816/2 | 52765 | Feb. 27, 2022 |
| 3 | TWO-LINE V-NETWORK | R&S | ENV216 | 101447 | Feb. 27, 2022 |
| 4 | 50Ω Terminator | SHX | TF5-3 | 15041305 | Feb. 27, 2022 |
| 5 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 6 | Cable | N/A | RG223 | 12m | Mar. 09, 2022 |
| 7 | 643 Shield Room | ETS | 6*4*3 | N/A | N/A |

| Radiated Emissions - 9 kHz to 30 MHz | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | MXE EMI Receiver | Keysight | N9038A | MY56400091 | Feb. 27, 2022 |
| 2* | Active Loop Antenna | R&S | HFH2-Z2 | 830749/020 | Aug. 23, 2024 |
| 3 | Cable | N/A | RG 213/U(9kHz~1GHz) | N/A | May 27, 2022 |
| 4 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 5 | 966 Chamber Room | ETS | 9*6*6 | N/A | Jul. 17, 2022 |

| Radiated Emissions - 30 MHz to 1 GHz | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Antenna | Schwarzbeck | VULB9160 | 9160-3232 | Mar. 15, 2022 |
| 2 | Amplifier | HP | 8447D | 2944A08742 | Feb. 28, 2022 |
| 3 | Cable | emci | LMR-400 | N/A | Nov. 30, 2022 |
| 4 | Controller | CT | SC100 | N/A | N/A |
| 5 | Controller | MF | MF-7802 | MF780208416 | N/A |
| 6 | Receiver | Agilent | N9038A | MY52130039 | Mar. 19, 2022 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 8 | 966 Chamber Room | RM | 9*6*6 | N/A | Jul. 24, 2022 |

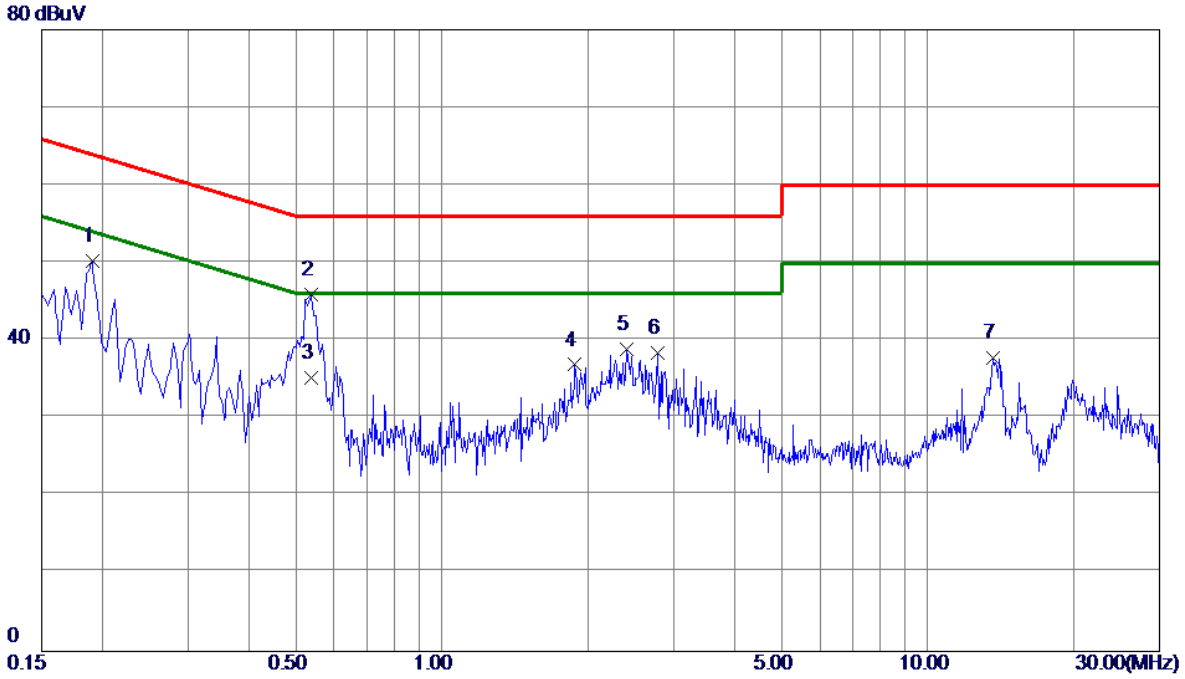
| Radiated Emissions - Above 1 GHz | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Double Ridged Horn Antenna | ARA | DRG-118A | 16554 | Apr. 21, 2022 |
| 2 | Broad-Band Horn Antenna | Schwarzbeck | BBHA 9170 | 9170319 | Jun. 30, 2022 |
| 3 | Amplifier | Agilent | 8449B | 3008A02584 | Jul. 10, 2022 |
| 4 | Controller | CT | SC100 | N/A | N/A |
| 5 | Controller | MF | MF-7802 | MF780208416 | N/A |
| 6 | Receiver | Agilent | N9038A | MY52130039 | Mar. 19, 2022 |
| 7 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480488 | Feb. 28, 2022 |
| 8 | Low Noise Amplifier | CONNPHY | CLN-18G40G-4330 -K | 619413 | Jul. 16, 2022 |
| 9 | Cable | N/A | A81-SMAMSMAM-12.5M | N/A | Oct. 15, 2022 |
| 10 | Cable | Talent microwave | A40-2.92M2.92M-2.5M | N/A | Nov. 30, 2022 |
| 11 | Filter | STI | STI15-9912 | N/A | Jul. 10, 2022 |
| 12 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 13 | 966 Chamber Room | RM | 9*6*6 | N/A | Jul. 24, 2022 |

| Number of Hopping Frequency & Average Time of Occupancy & Hopping Channel Separation & Bandwidth & Maximum Output Power & Conducted Spurious Emission | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP40 | 100185 | Jul. 10, 2022 |
| 2 | Attenuator | WOKEN | 6SM3502 | VAS1214NL | Feb. 07, 2022 |
| 3 | RF Cable | Tongkaichuan | N/A | N/A | N/A |
| 4 | DC Block | Mini | N/A | N/A | N/A |

Remark "N/A" denotes no model name, serial no. or calibration specified.
"*" calibration period of equipment list is three year.
Except * item, all calibration period of equipment list is one year.

# APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

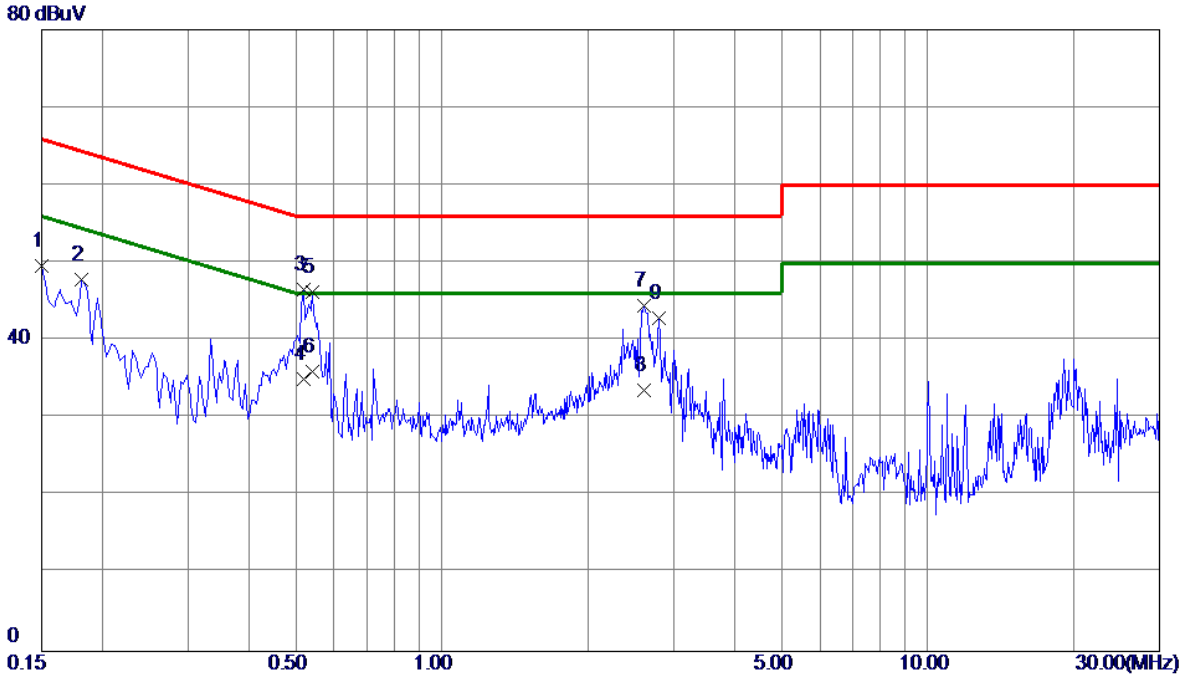
| Test Mode | TX Mode_3Mbps Channel 00 | Phase | Line |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | 0.1905 | 40.38 | 9.81 | 50.19 | 64.01 | -13.82 | Peak | |
| 2 * | 0.5370 | 35.97 | 9.87 | 45.84 | 56.00 | -10.16 | Peak | |
| 3 | 0.5370 | 25.30 | 9.87 | 35.17 | 46.00 | -10.83 | AVG | |
| 4 | 1.8780 | 26.75 | 10.13 | 36.88 | 56.00 | -19.12 | Peak | |
| 5 | 2.4044 | 28.69 | 10.17 | 38.86 | 56.00 | -17.14 | Peak | |
| 6 | 2.7780 | 28.20 | 10.19 | 38.39 | 56.00 | -17.61 | Peak | |
| 7 | 13.6410 | 27.16 | 10.58 | 37.74 | 60.00 | -22.26 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX Mode_3Mbps Channel 00 | Phase | Neutral |
|---|---|---|---|

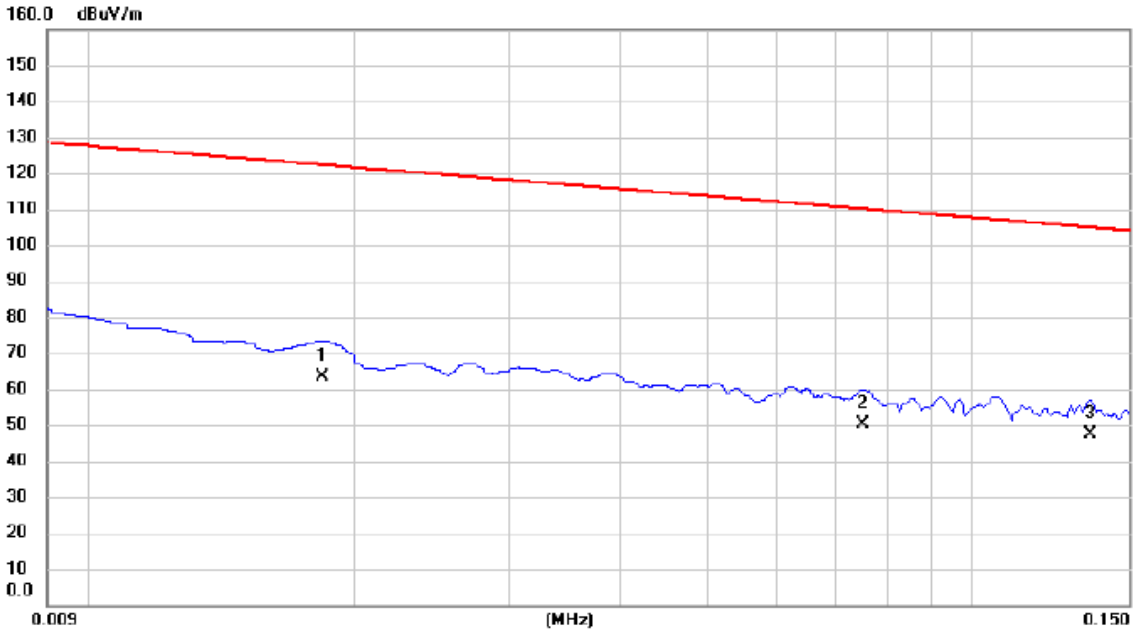



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | 0.1500 | 39.82 | 9.82 | 49.64 | 66.00 | -16.36 | Peak | |
| 2 | 0.1815 | 38.07 | 9.84 | 47.91 | 64.42 | -16.51 | Peak | |
| 3 * | 0.5190 | 36.54 | 9.95 | 46.49 | 56.00 | -9.51 | Peak | |
| 4 | 0.5190 | 25.10 | 9.95 | 35.05 | 46.00 | -10.95 | AVG | |
| 5 | 0.5414 | 36.26 | 9.96 | 46.22 | 56.00 | -9.78 | Peak | |
| 6 | 0.5414 | 26.09 | 9.96 | 36.05 | 46.00 | -9.95 | AVG | |
| 7 | 2.6115 | 34.27 | 10.27 | 44.54 | 56.00 | -11.46 | Peak | |
| 8 | 2.6115 | 23.40 | 10.27 | 33.67 | 46.00 | -12.33 | AVG | |
| 9 | 2.8050 | 32.62 | 10.28 | 42.90 | 56.00 | -13.10 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

# APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Ant 0° |
|---|---|---|---|




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 0.0184 | 48.63 | 14.79 | 63.42 | 122.31 | -58.89 | AVG | | | |
| 2 | | 0.0752 | 36.58 | 13.62 | 50.20 | 110.08 | -59.88 | AVG | | | |
| 3 | * | 0.1360 | 33.79 | 13.70 | 47.49 | 104.94 | -57.45 | AVG | | | |

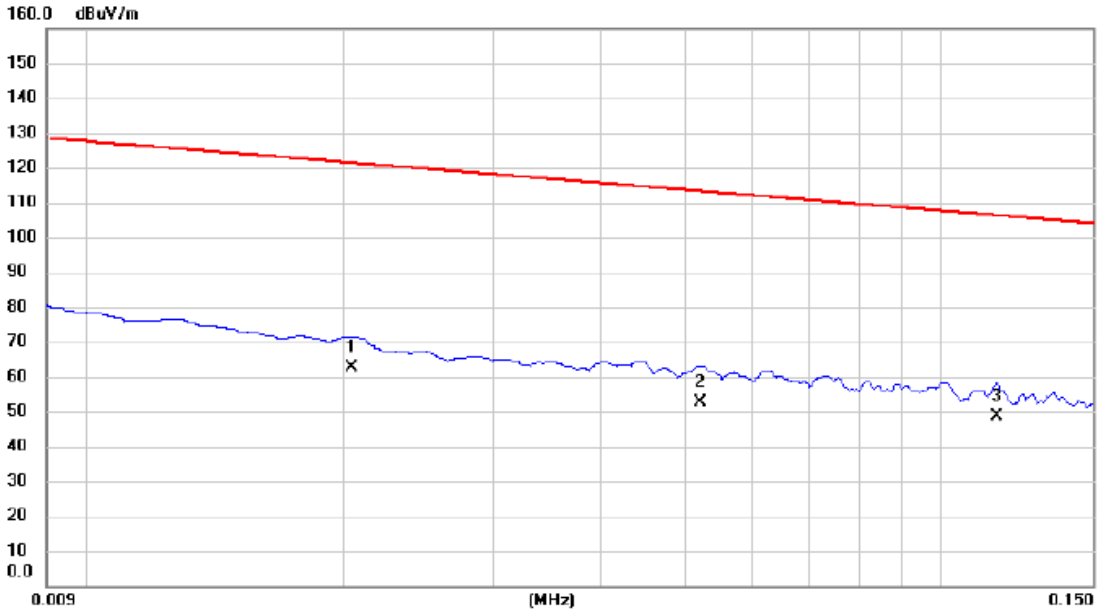
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Ant 0° |
|---|---|---|---|

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 0.4485 | 32.56 | 13.40 | 45.96 | 94.57 | -48.61 | AVG | | | |
| 2 | * | 2.0903 | 40.12 | 12.05 | 52.17 | 69.54 | -17.37 | QP | | | |
| 3 | | 4.4783 | 28.46 | 11.73 | 40.19 | 69.54 | -29.35 | QP | | | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

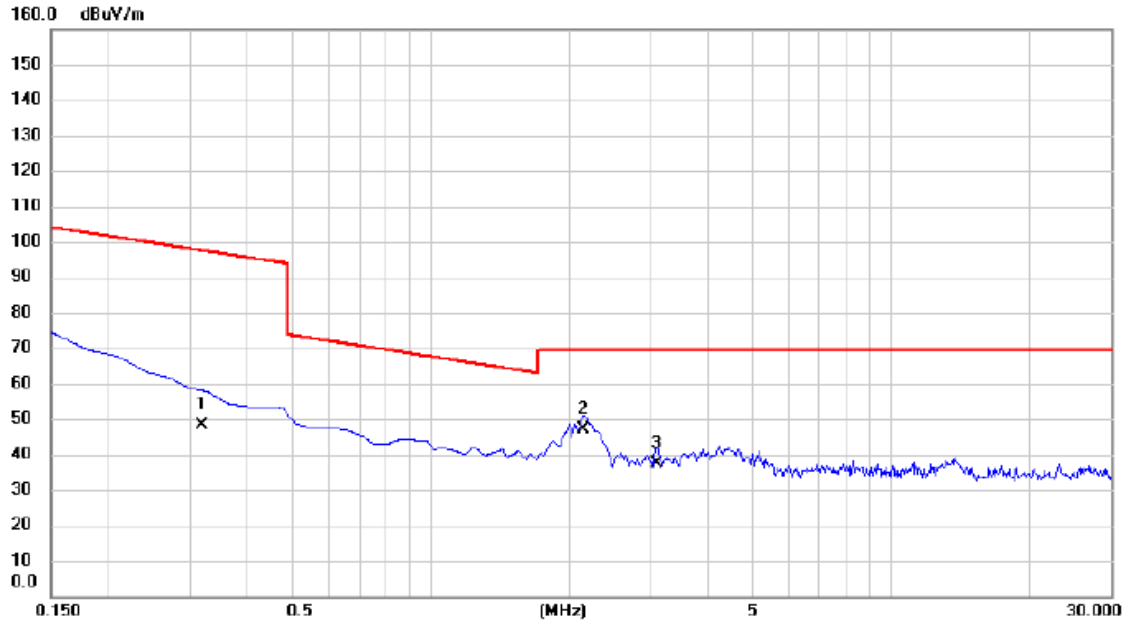
| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Ant 90° |
|---|---|---|---|




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 0.0204 | 48.26 | 14.28 | 62.54 | 121.41 | -58.87 | AVG | | | |
| 2 | | 0.0521 | 39.18 | 13.60 | 52.78 | 113.27 | -60.49 | AVG | | | |
| 3 | * | 0.1160 | 34.85 | 13.72 | 48.57 | 106.32 | -57.75 | AVG | | | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Ant 90° |
|---|---|---|---|

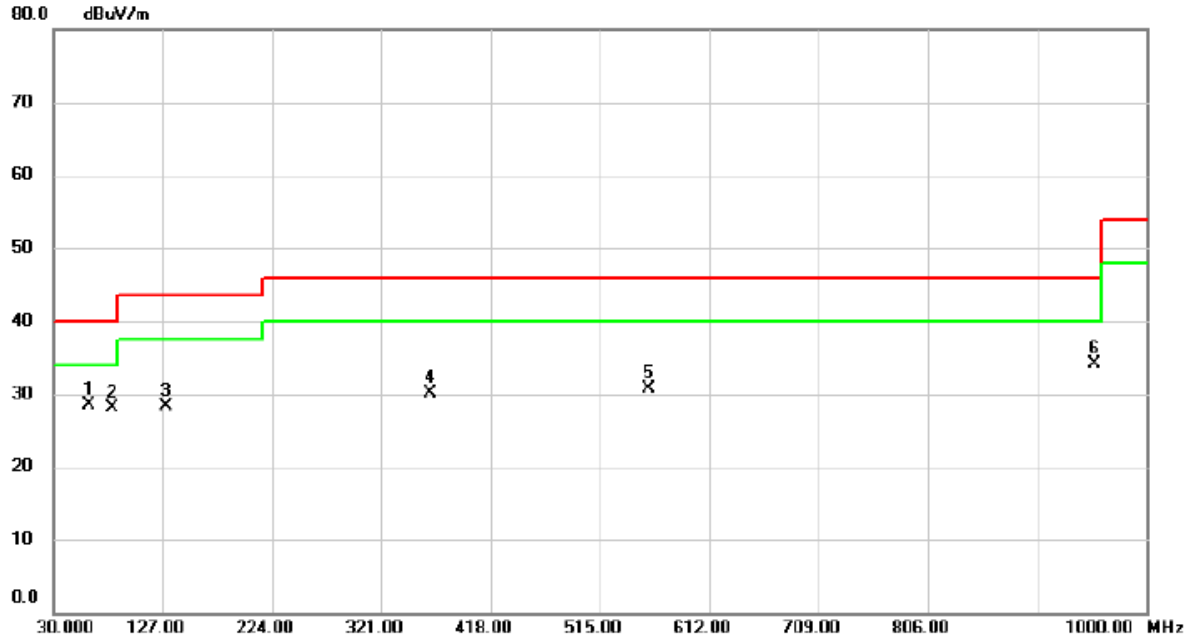



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 0.3183 | 34.86 | 13.54 | 48.40 | 97.55 | -49.15 | AVG | | | |
| 2 | * | 2.1500 | 34.96 | 12.03 | 46.99 | 69.54 | -22.55 | QP | | | |
| 3 | | 3.1052 | 25.87 | 11.71 | 37.58 | 69.54 | -31.96 | QP | | | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

# APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

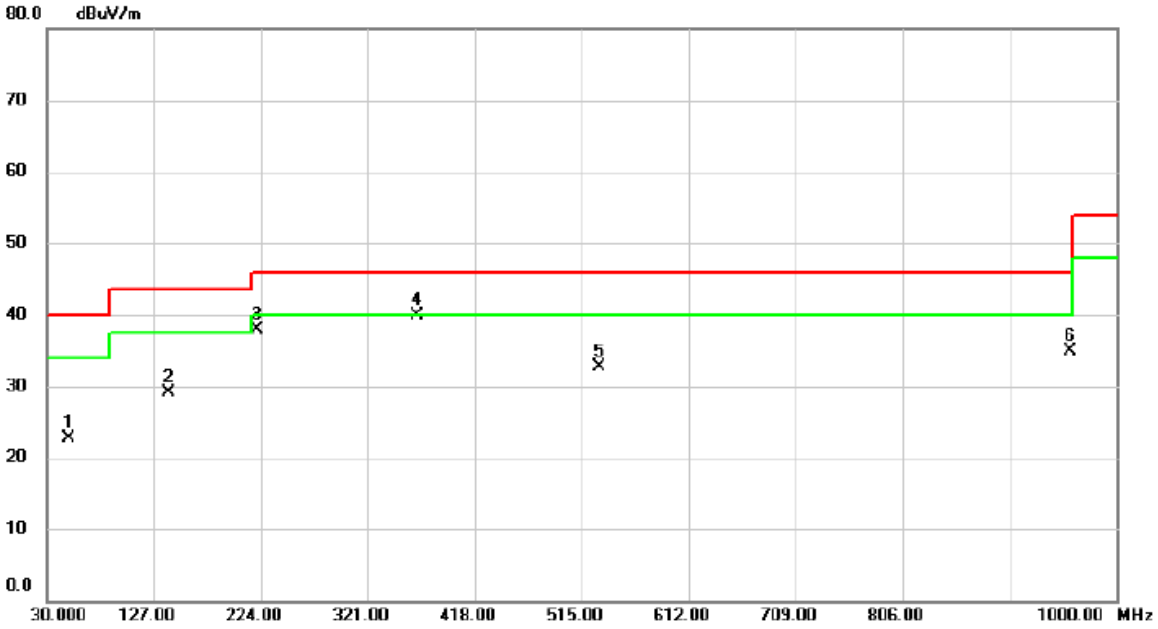
| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Vertical |
|---|---|---|---|




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 61.040 | 43.16 | -14.63 | 28.53 | 40.00 | -11.47 | peak | |
| 2 | | 82.380 | 46.55 | -18.52 | 28.03 | 40.00 | -11.97 | peak | |
| 3 | | 129.910 | 41.76 | -13.41 | 28.35 | 43.50 | -15.15 | peak | |
| 4 | | 363.680 | 39.78 | -9.63 | 30.15 | 46.00 | -15.85 | peak | |
| 5 | | 558.650 | 36.43 | -5.66 | 30.77 | 46.00 | -15.23 | peak | |
| 6 | | 954.410 | 32.25 | 1.81 | 34.06 | 46.00 | -11.94 | peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX Mode_3Mbps Channel 00 | Polarization | Horizontal |
|---|---|---|---|

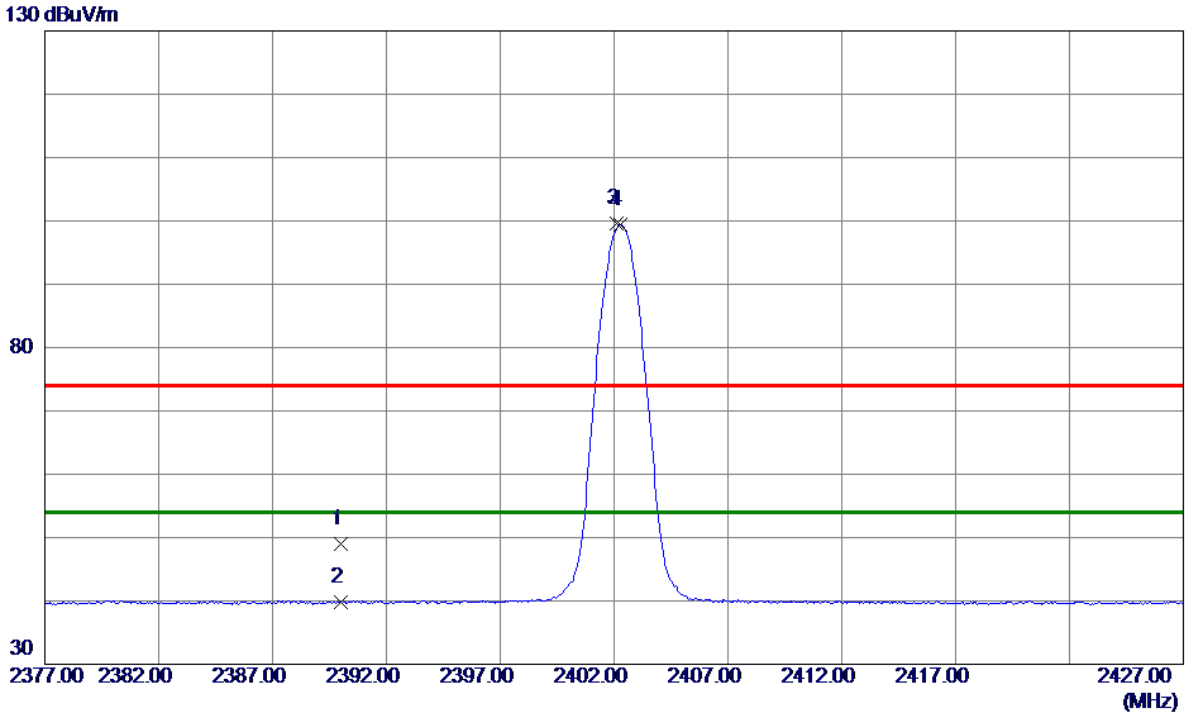



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 50.370 | 36.33 | -13.72 | 22.61 | 40.00 | -17.39 | peak | |
| 2 | | 140.580 | 42.02 | -12.87 | 29.15 | 43.50 | -14.35 | peak | |
| 3 | | 220.120 | 52.63 | -14.80 | 37.83 | 46.00 | -8.17 | peak | |
| 4 | * | 365.620 | 49.47 | -9.59 | 39.88 | 46.00 | -6.12 | peak | |
| 5 | | 531.490 | 38.93 | -6.14 | 32.79 | 46.00 | -13.21 | peak | |
| 6 | | 957.320 | 33.02 | 1.81 | 34.83 | 46.00 | -11.17 | peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

# APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

| Test Mode | TX 2402 MHz _CH00_1Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2390.0000 | 40.65 | 8.31 | 48.96 | 74.00 | -25.04 | Peak | |
| 2 | 2390.0000 | 31.47 | 8.31 | 39.78 | 54.00 | -14.22 | AVG | |
| 3 | 2402.1000 | 91.27 | 8.32 | 99.59 | 74.00 | 25.59 | Peak | No Limit |
| 4 * | 2402.3000 | 91.06 | 8.32 | 99.38 | 54.00 | 45.38 | AVG | No Limit |

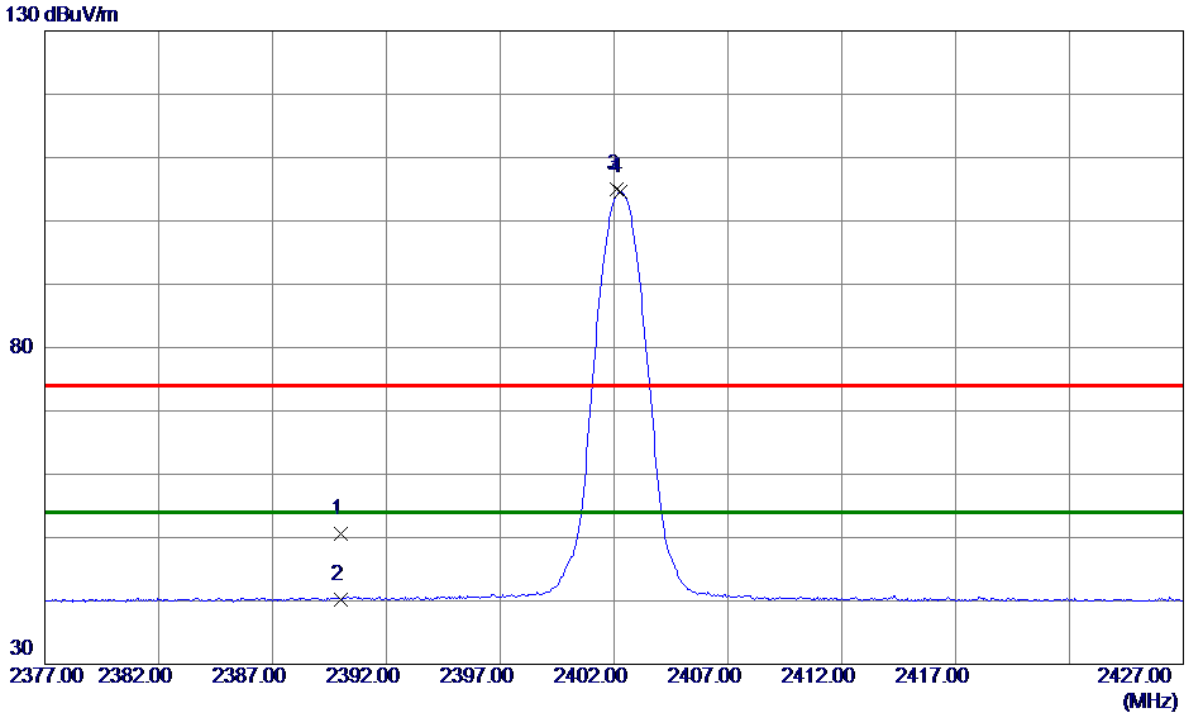
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX 2402 MHz _CH00_1Mbps | Polarization | Vertical |
|---|---|---|---|

| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 7206.0780 | 39.82 | 10.56 | 50.38 | 54.00 | -3.62 | AVG | |
| 2 | 7206.6750 | 46.22 | 10.56 | 56.78 | 74.00 | -17.22 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

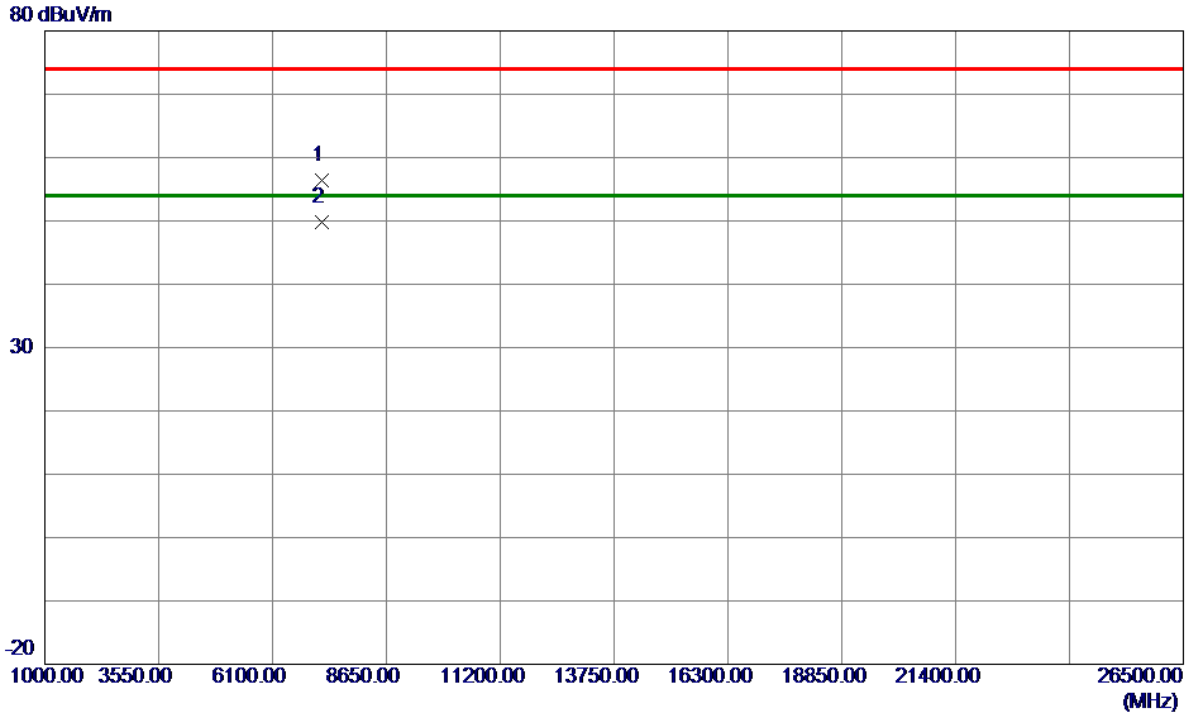
| Test Mode | TX 2402 MHz _CH00_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2390.0000 | 42.26 | 8.31 | 50.57 | 74.00 | -23.43 | Peak | |
| 2 | 2390.0000 | 31.92 | 8.31 | 40.23 | 54.00 | -13.77 | AVG | |
| 3 | 2402.1000 | 96.60 | 8.32 | 104.92 | 74.00 | 30.92 | Peak | No Limit |
| 4 * | 2402.3000 | 96.33 | 8.32 | 104.65 | 54.00 | 50.65 | AVG | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

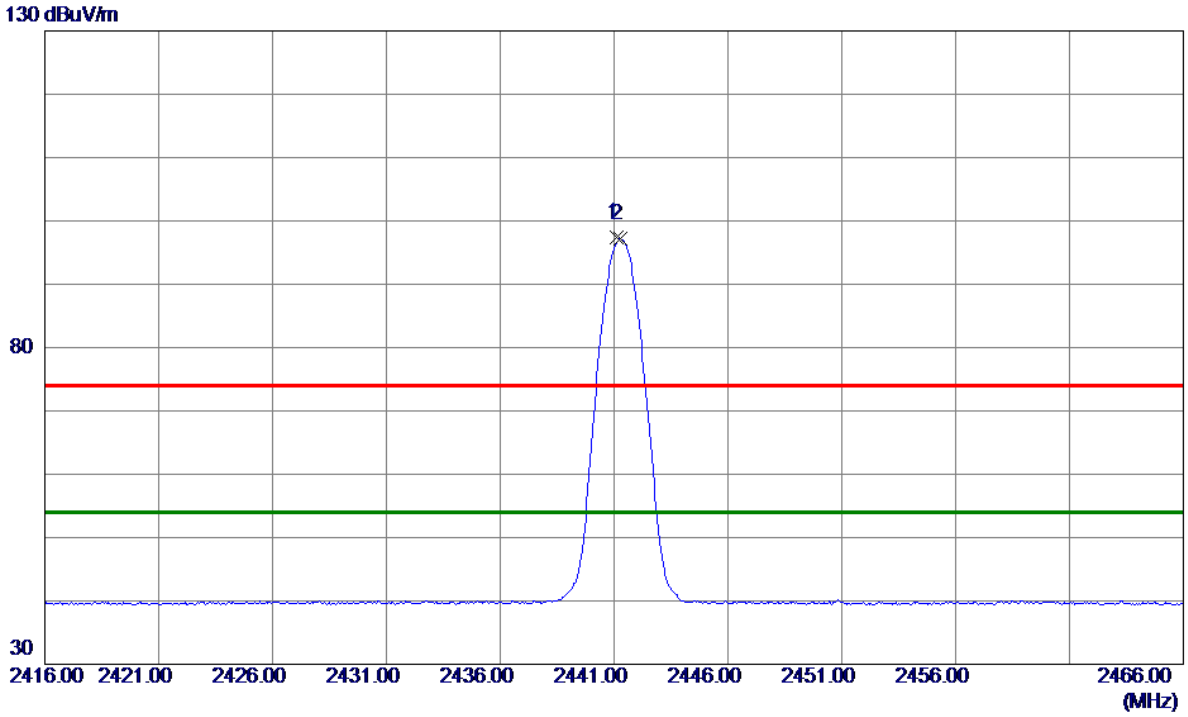
| Test Mode | TX 2402 MHz _CH00_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7205.6650 | 45.82 | 10.56 | 56.38 | 74.00 | -17.62 | Peak | |
| 2 * | 7206.1530 | 39.31 | 10.56 | 49.87 | 54.00 | -4.13 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

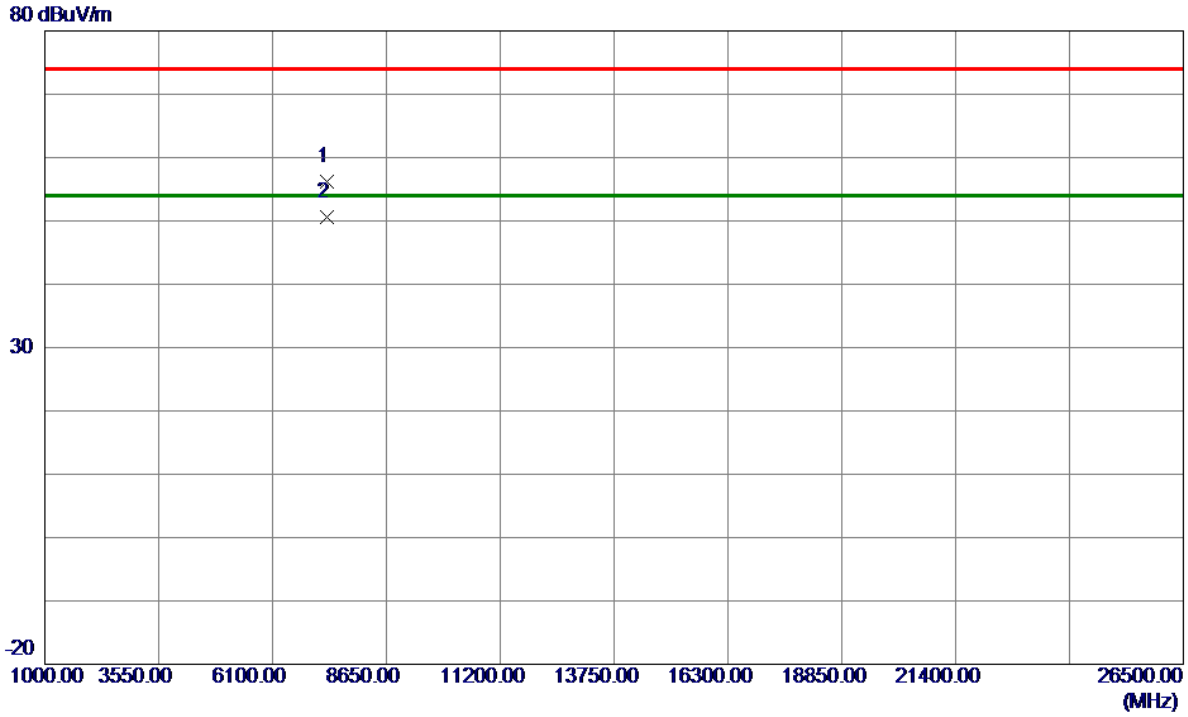
| Test Mode | TX 2441 MHz _CH39_1Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2441.1000 | 88.99 | 8.37 | 97.36 | 74.00 | 23.36 | Peak | No Limit |
| 2 * | 2441.3000 | 88.75 | 8.37 | 97.12 | 54.00 | 43.12 | AVG | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

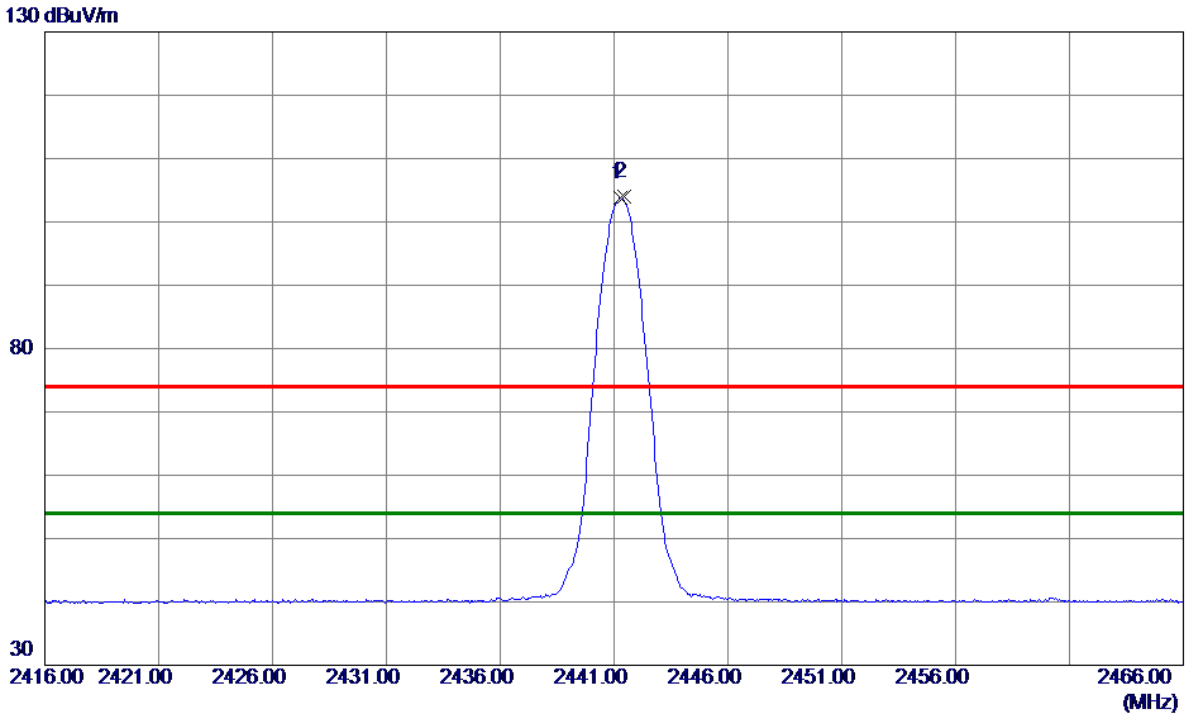
| Test Mode | TX 2441 MHz _CH39_1Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7322.7250 | 45.53 | 10.71 | 56.24 | 74.00 | -17.76 | Peak | |
| 2 * | 7323.1580 | 39.86 | 10.71 | 50.57 | 54.00 | -3.43 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

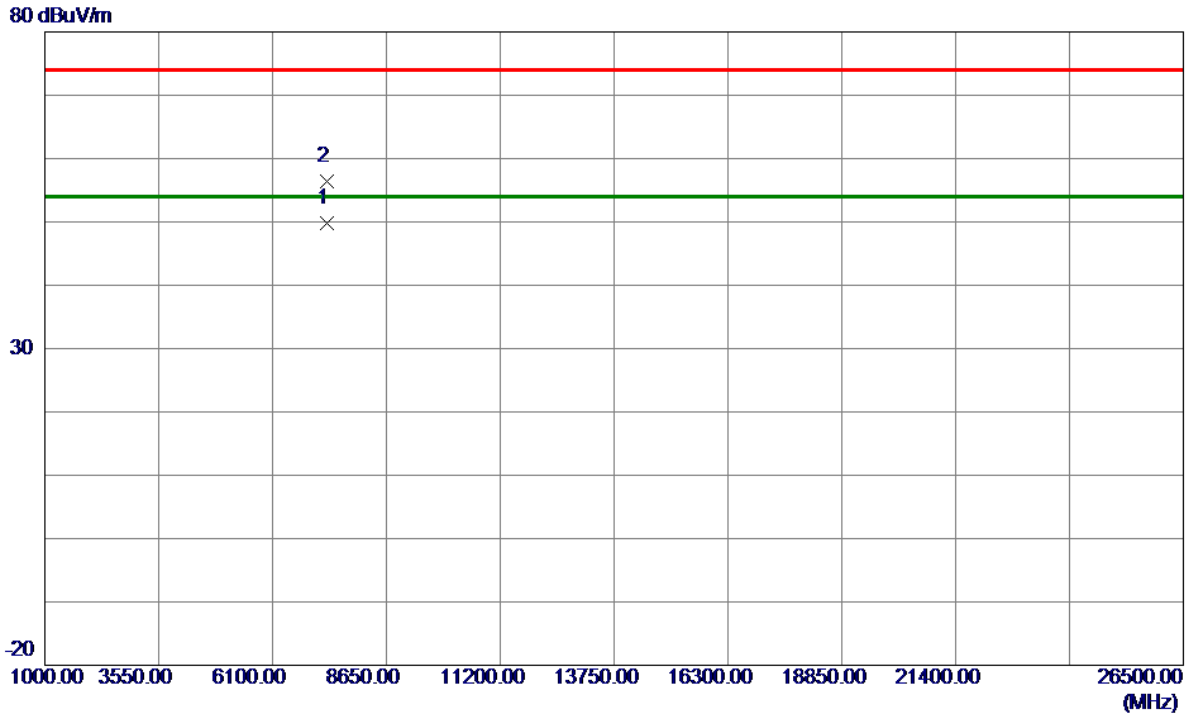
| Test Mode | TX 2441 MHz _CH39_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 2441.3000 | 95.34 | 8.37 | 103.71 | 54.00 | 49.71 | AVG | No Limit |
| 2 | 2441.4500 | 95.60 | 8.37 | 103.97 | 74.00 | 29.97 | Peak | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

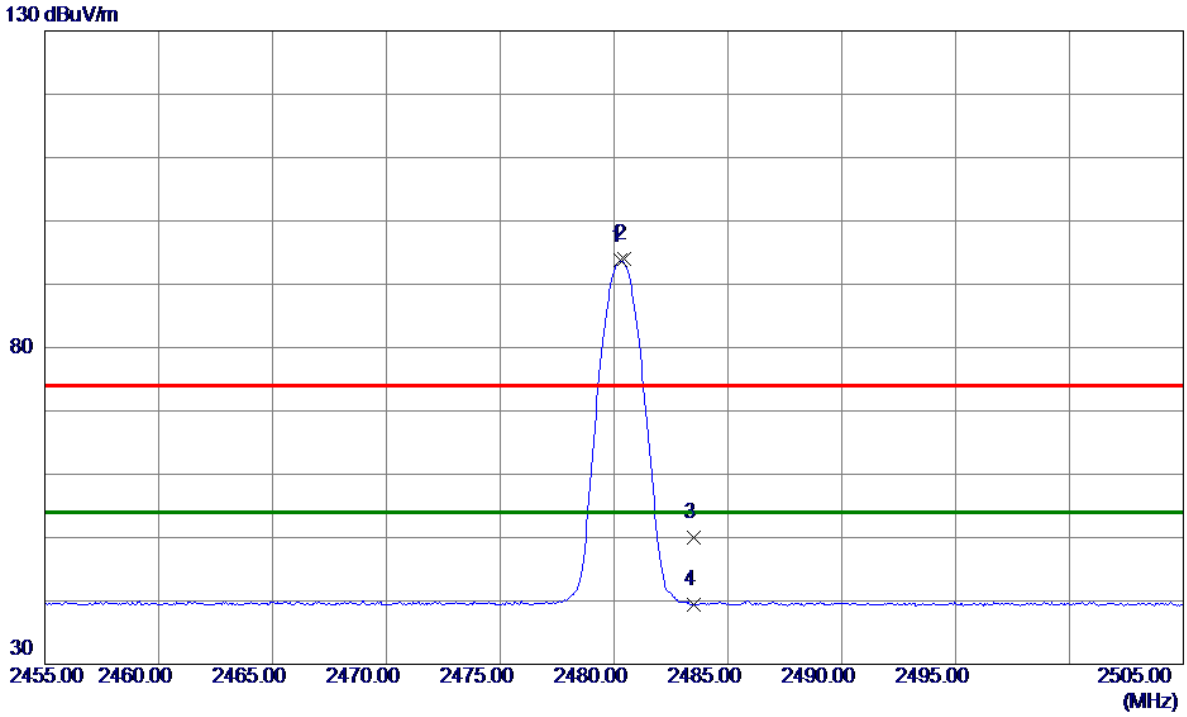
| Test Mode | TX 2441 MHz _CH39_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 7323.1420 | 39.04 | 10.71 | 49.75 | 54.00 | -4.25 | AVG | |
| 2 | 7323.4750 | 45.76 | 10.71 | 56.47 | 74.00 | -17.53 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

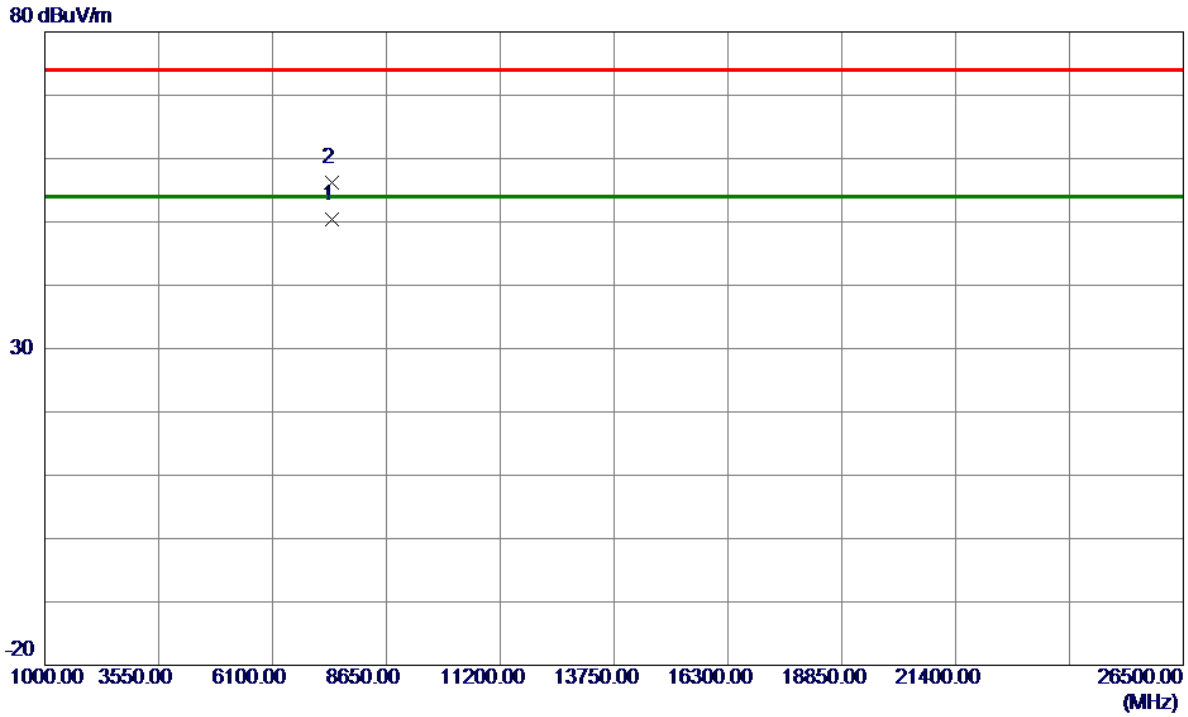
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 2480.3000 | 85.28 | 8.42 | 93.70 | 54.00 | 39.70 | AVG | No Limit |
| 2 | 2480.4500 | 85.54 | 8.42 | 93.96 | 74.00 | 19.96 | Peak | No Limit |
| 3 | 2483.5000 | 41.50 | 8.42 | 49.92 | 74.00 | -24.08 | Peak | |
| 4 | 2483.5000 | 30.97 | 8.42 | 39.39 | 54.00 | -14.61 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

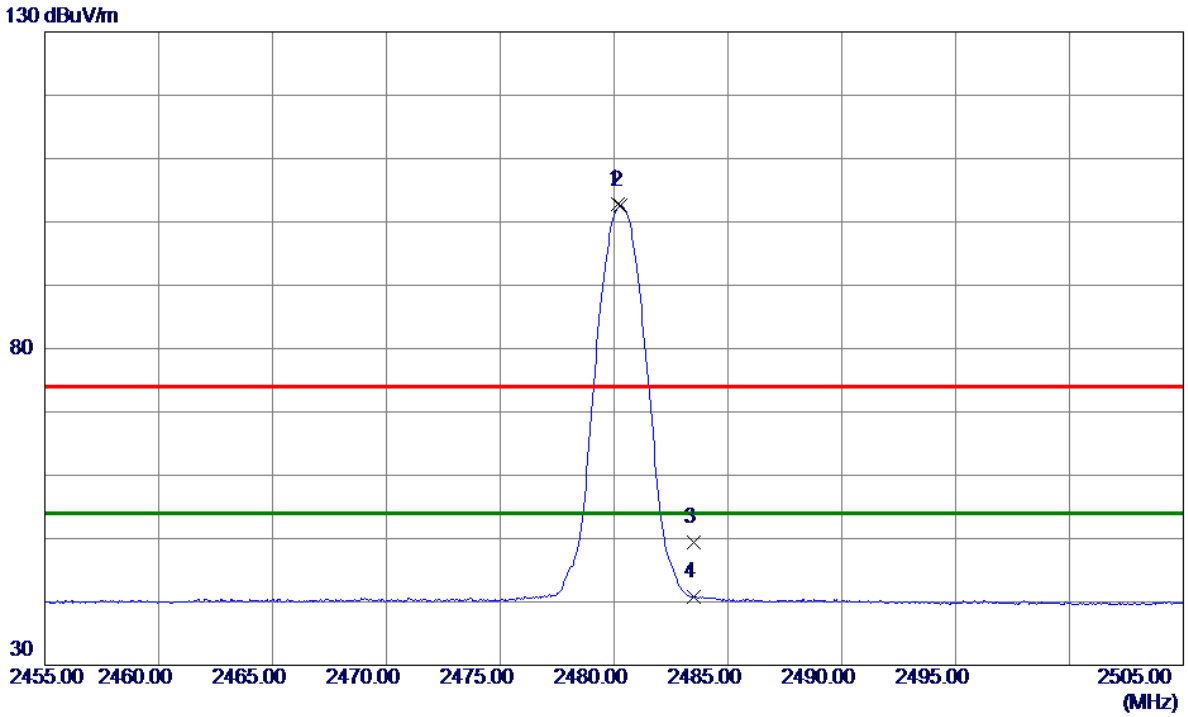
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 7440.0920 | 39.54 | 10.86 | 50.40 | 54.00 | -3.60 | AVG | |
| 2 | 7440.6270 | 45.38 | 10.86 | 56.24 | 74.00 | -17.76 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

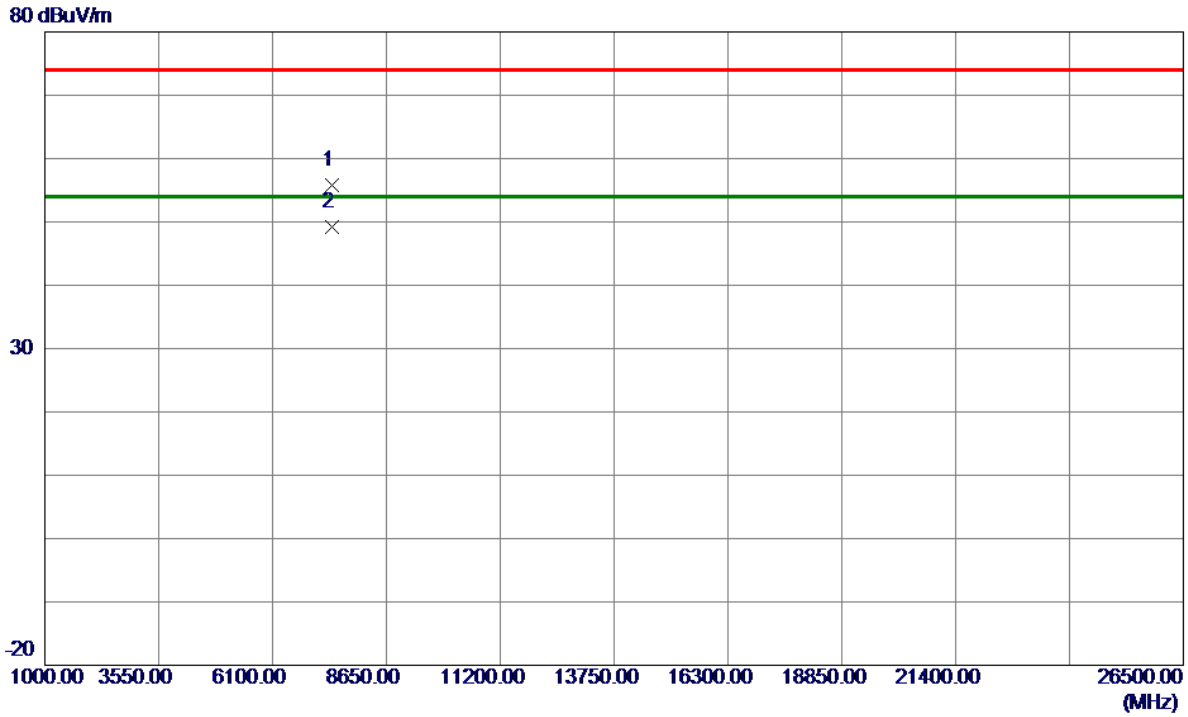
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2480.1500 | 94.41 | 8.42 | 102.83 | 74.00 | 28.83 | Peak | No Limit |
| 2 * | 2480.3000 | 94.14 | 8.42 | 102.56 | 54.00 | 48.56 | AVG | No Limit |
| 3 | 2483.5000 | 40.90 | 8.42 | 49.32 | 74.00 | -24.68 | Peak | |
| 4 | 2483.5000 | 32.46 | 8.42 | 40.88 | 54.00 | -13.12 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

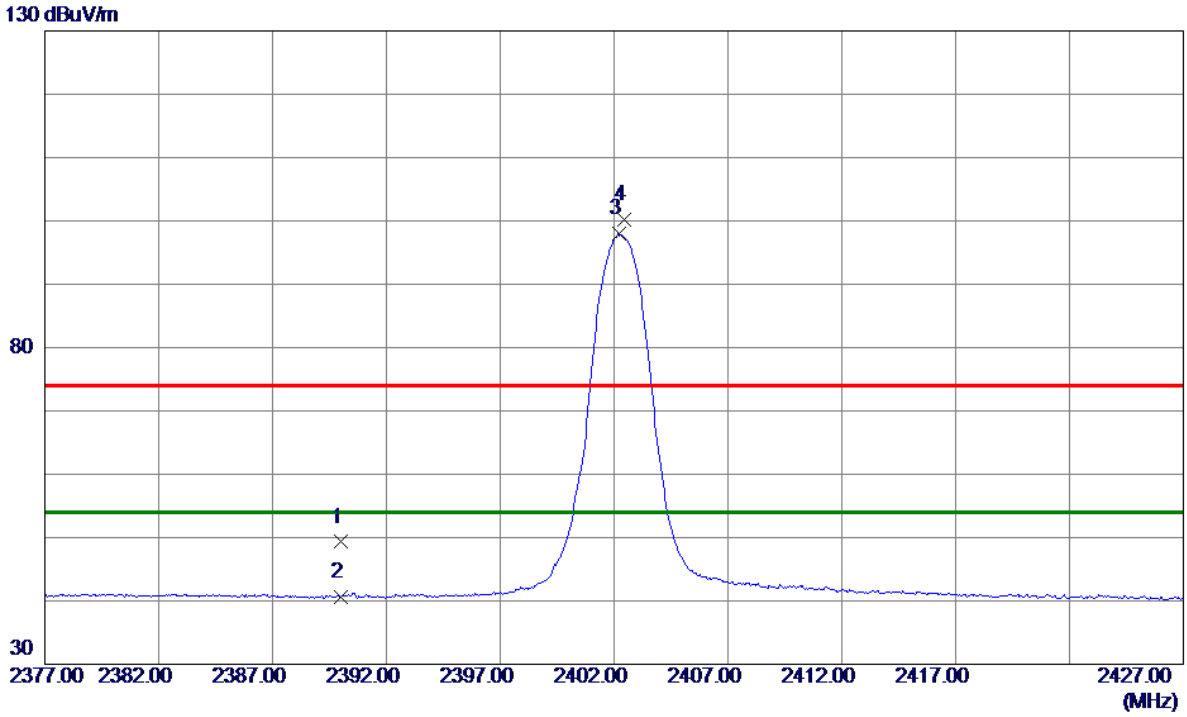
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7439.6850 | 44.97 | 10.86 | 55.83 | 74.00 | -18.17 | Peak | |
| 2 * | 7440.1550 | 38.32 | 10.86 | 49.18 | 54.00 | -4.82 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

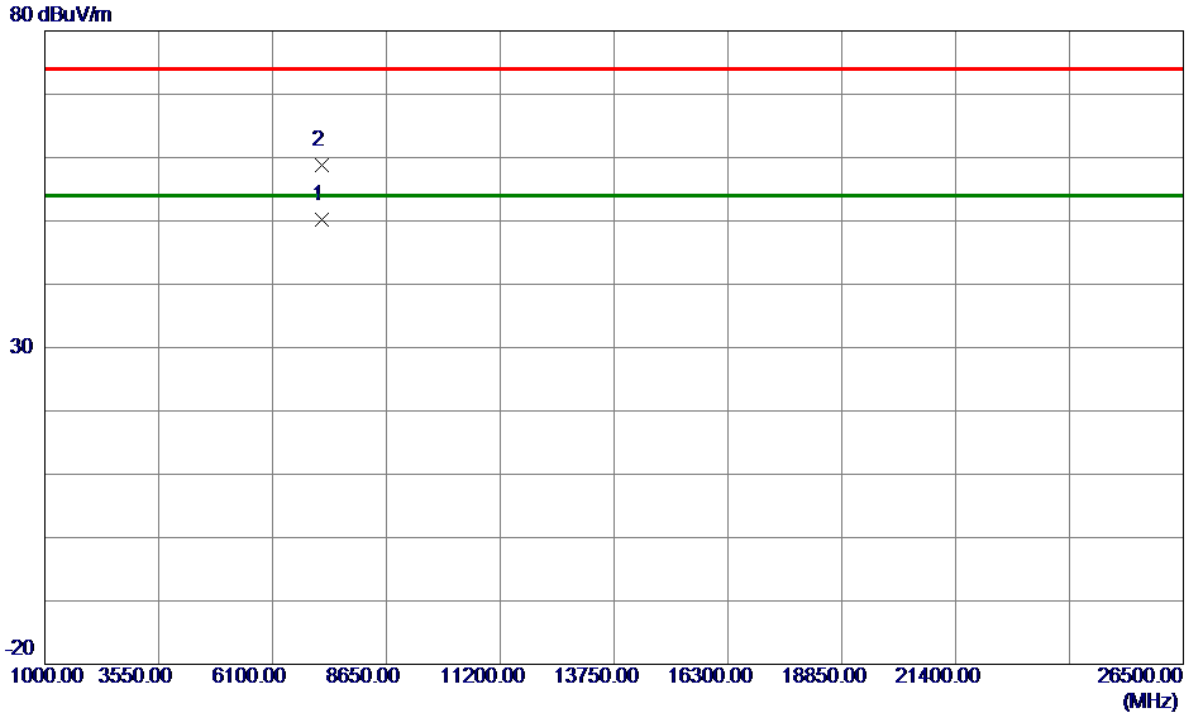
| Test Mode | TX 2402 MHz _CH00_3Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2390.0000 | 40.99 | 8.31 | 49.30 | 74.00 | -24.70 | Peak | |
| 2 | 2390.0000 | 32.27 | 8.31 | 40.58 | 54.00 | -13.42 | AVG | |
| 3 * | 2402.2000 | 89.69 | 8.32 | 98.01 | 54.00 | 44.01 | AVG | No Limit |
| 4 | 2402.4500 | 91.87 | 8.32 | 100.19 | 74.00 | 26.19 | Peak | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

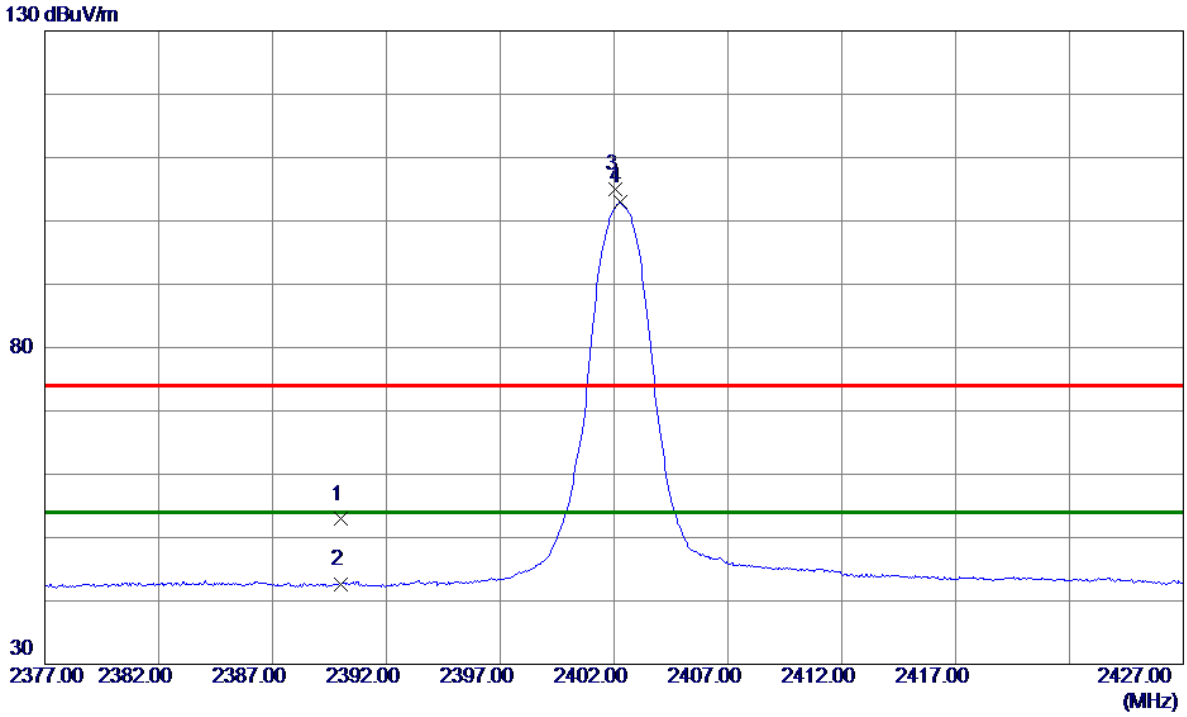
| Test Mode | TX 2402 MHz _CH00_3Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 7206.0970 | 39.57 | 10.56 | 50.13 | 54.00 | -3.87 | AVG | |
| 2 | 7206.1370 | 48.16 | 10.56 | 58.72 | 74.00 | -15.28 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

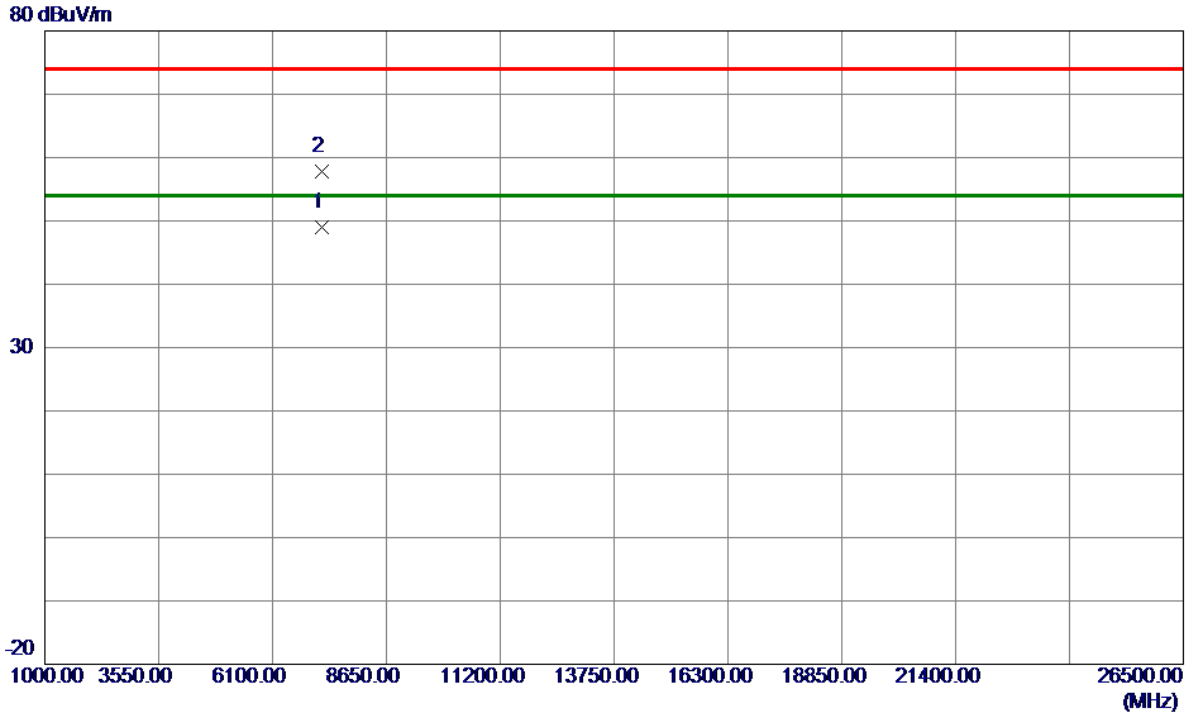
| Test Mode | TX 2402 MHz _CH00_3Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2390.0000 | 44.59 | 8.31 | 52.90 | 74.00 | -21.10 | Peak | |
| 2 | 2390.0000 | 34.33 | 8.31 | 42.64 | 54.00 | -11.36 | AVG | |
| 3 | 2402.0500 | 96.71 | 8.32 | 105.03 | 74.00 | 31.03 | Peak | No Limit |
| 4 * | 2402.2500 | 94.62 | 8.32 | 102.94 | 54.00 | 48.94 | AVG | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

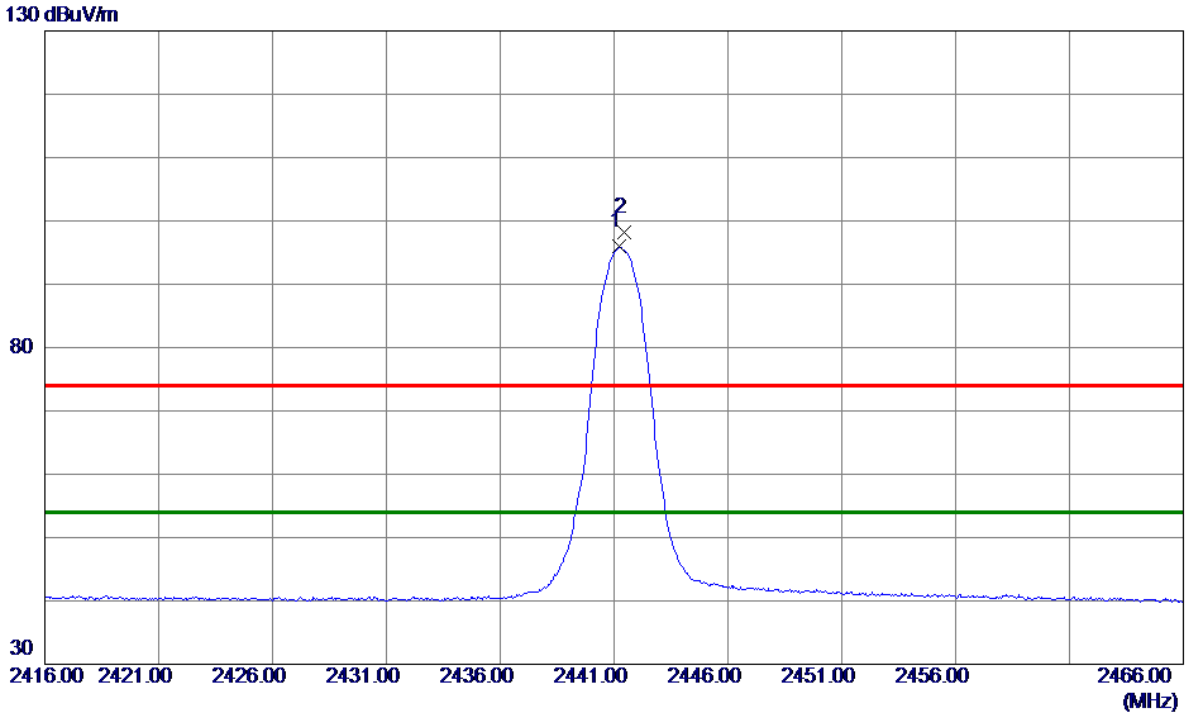
| Test Mode | TX 2402 MHz _CH00_3Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 7206.1950 | 38.40 | 10.56 | 48.96 | 54.00 | -5.04 | AVG | |
| 2 | 7206.6150 | 47.23 | 10.56 | 57.79 | 74.00 | -16.21 | Peak | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 2441.2000 | 87.60 | 8.37 | 95.97 | 54.00 | 41.97 | AVG | No Limit |
| 2 | 2441.4500 | 89.74 | 8.37 | 98.11 | 74.00 | 24.11 | Peak | No Limit |

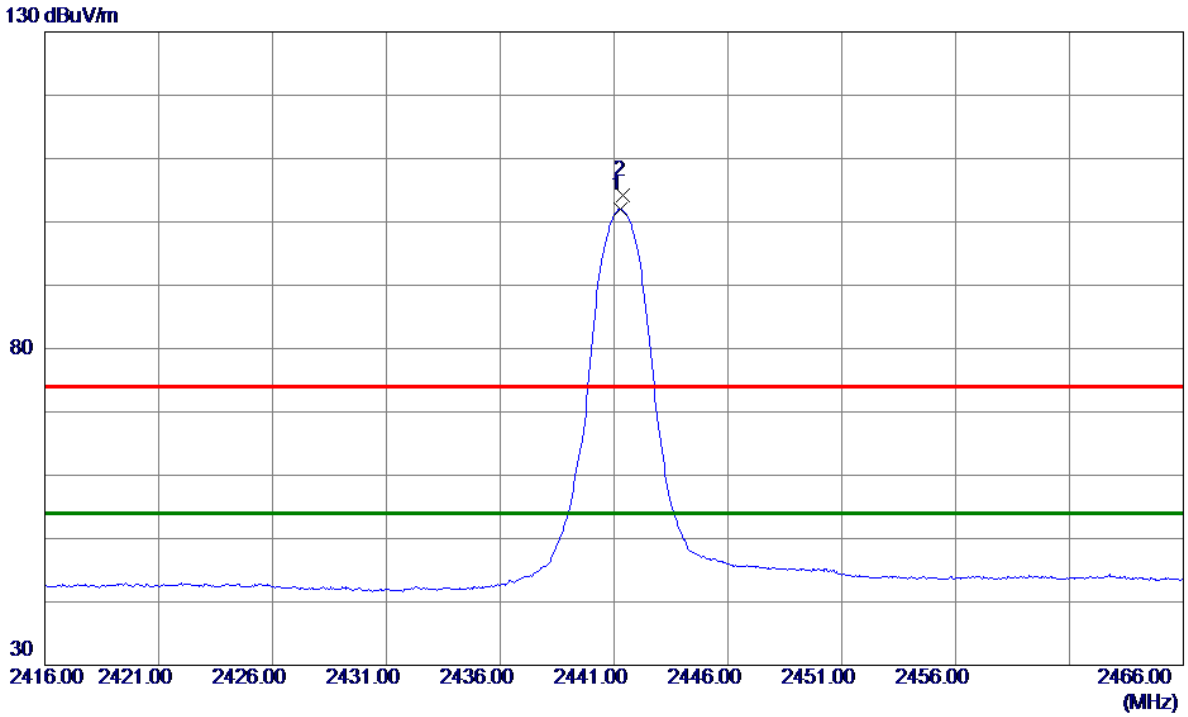
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Vertical |
|---|---|---|---|

| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7323.0850 | 47.62 | 10.71 | 58.33 | 74.00 | -15.67 | Peak | |
| 2 * | 7323.0950 | 39.70 | 10.71 | 50.41 | 54.00 | -3.59 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

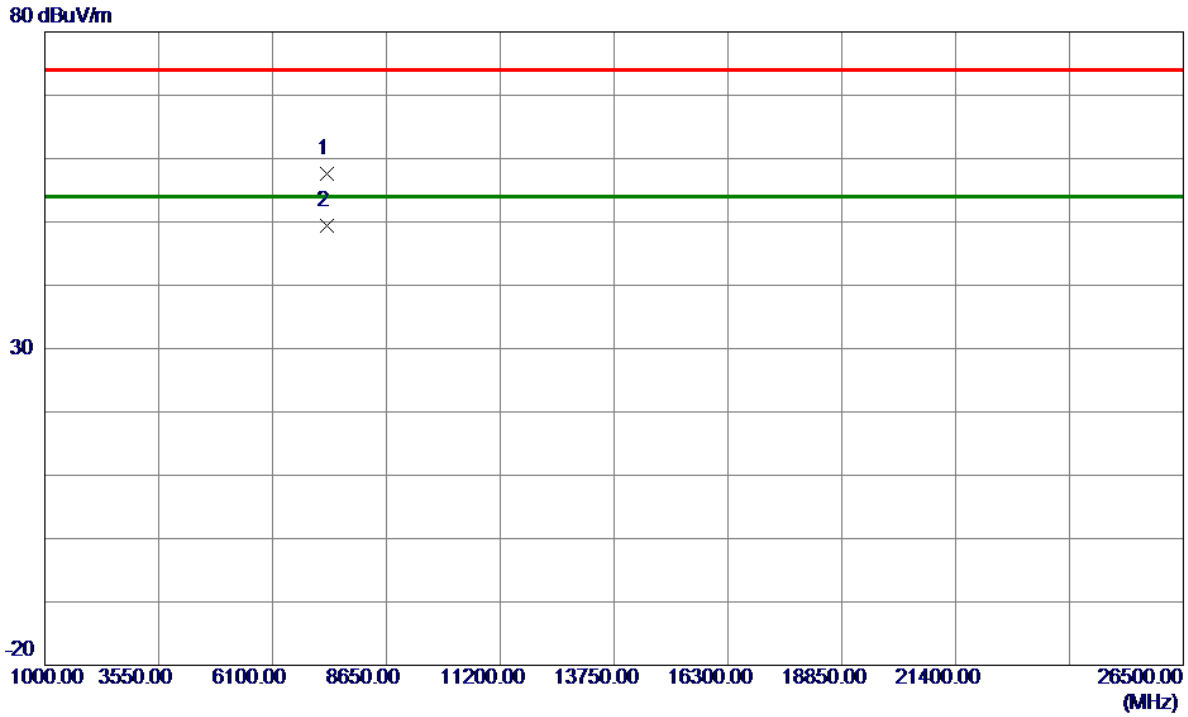
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 2441.3000 | 93.69 | 8.37 | 102.06 | 54.00 | 48.06 | AVG | No Limit |
| 2 | 2441.4000 | 95.79 | 8.37 | 104.16 | 74.00 | 30.16 | Peak | No Limit |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

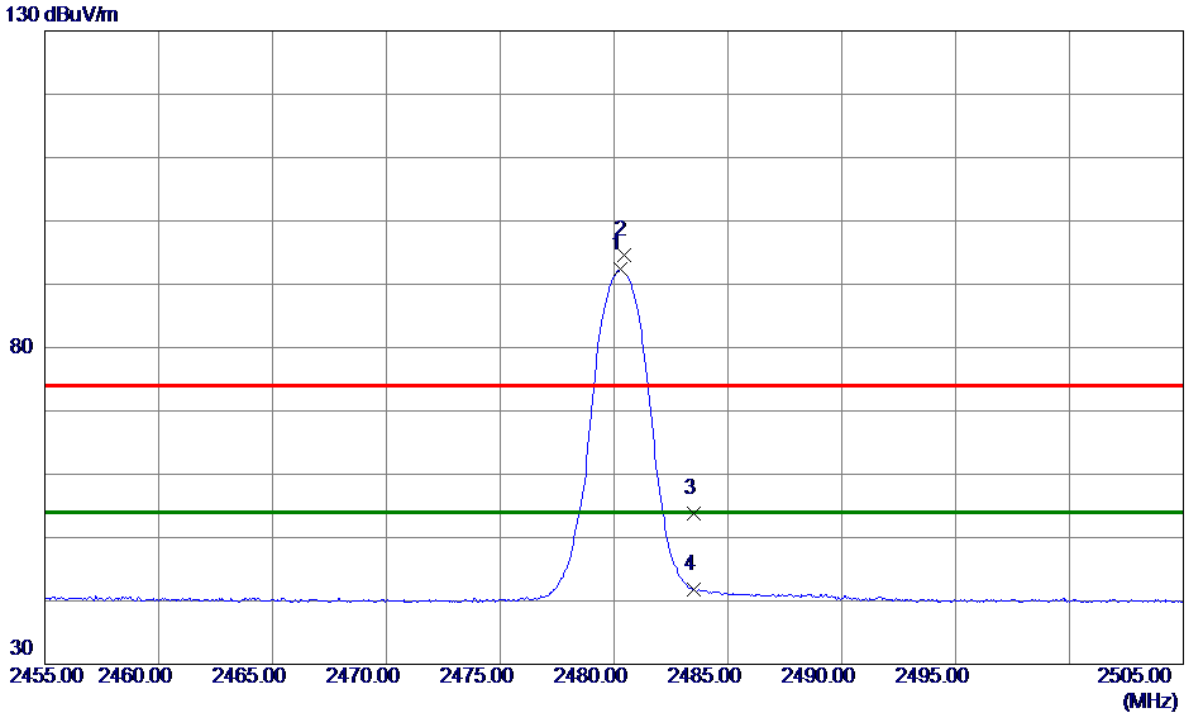
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7322.5870 | 46.81 | 10.71 | 57.52 | 74.00 | -16.48 | Peak | |
| 2 * | 7323.1880 | 38.75 | 10.71 | 49.46 | 54.00 | -4.54 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

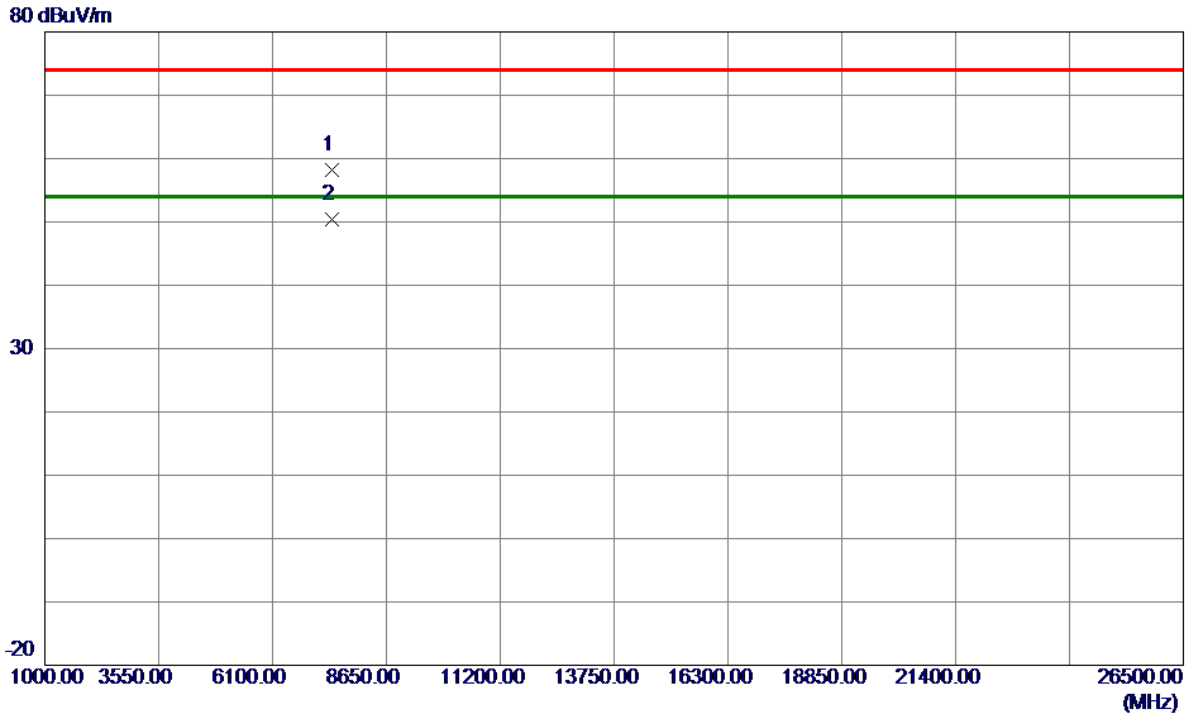
| Test Mode | TX 2480 MHz _CH78_3Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 2480.3000 | 83.96 | 8.42 | 92.38 | 54.00 | 38.38 | AVG | No Limit |
| 2 | 2480.4500 | 86.10 | 8.42 | 94.52 | 74.00 | 20.52 | Peak | No Limit |
| 3 | 2483.5000 | 45.33 | 8.42 | 53.75 | 74.00 | -20.25 | Peak | |
| 4 | 2483.5000 | 33.35 | 8.42 | 41.77 | 54.00 | -12.23 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

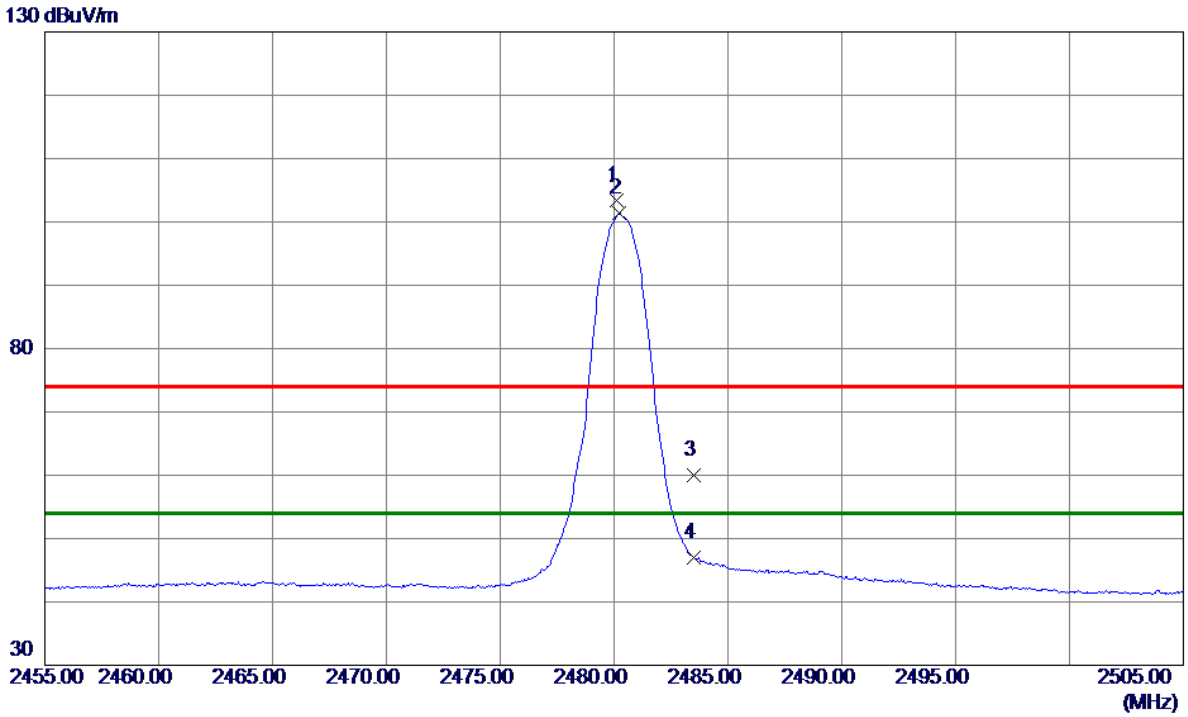
| Test Mode | TX 2480 MHz _CH78_3Mbps | Polarization | Vertical |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7440.0830 | 47.27 | 10.86 | 58.13 | 74.00 | -15.87 | Peak | |
| 2 * | 7440.1350 | 39.49 | 10.86 | 50.35 | 54.00 | -3.65 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX 2480 MHz _CH78_3Mbps | Polarization | Horizontal |
|---|---|---|---|




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 2480.1000 | 95.00 | 8.42 | 103.42 | 74.00 | 29.42 | Peak | No Limit |
| 2 * | 2480.2000 | 92.98 | 8.42 | 101.40 | 54.00 | 47.40 | AVG | No Limit |
| 3 | 2483.5000 | 51.54 | 8.42 | 59.96 | 74.00 | -14.04 | Peak | |
| 4 | 2483.5000 | 38.52 | 8.42 | 46.94 | 54.00 | -7.06 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

| Test Mode | TX 2480 MHz _CH78_3Mbps | Polarization | Horizontal |
|---|---|---|---|

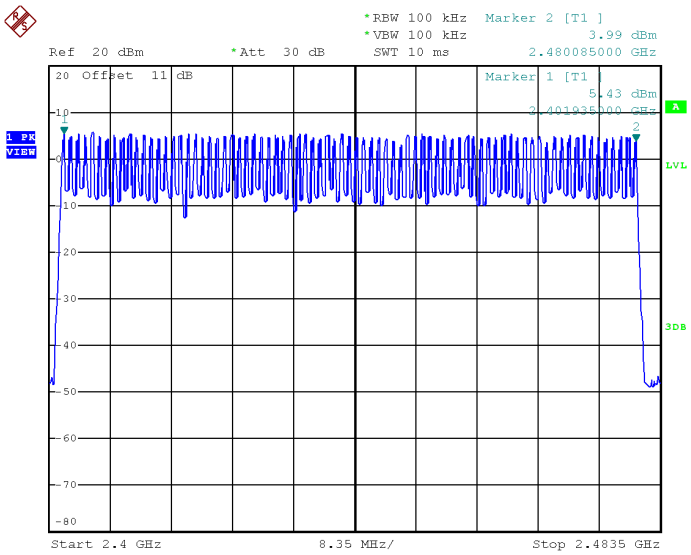
| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 7440.0120 | 46.77 | 10.86 | 57.63 | 74.00 | -16.37 | Peak | |
| 2 * | 7440.1600 | 38.31 | 10.86 | 49.17 | 54.00 | -4.83 | AVG | |

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

# APPENDIX E - NUMBER OF HOPPING FREQUENCY

| Test Mode: | TX Mode_1Mbps |
|---|---|

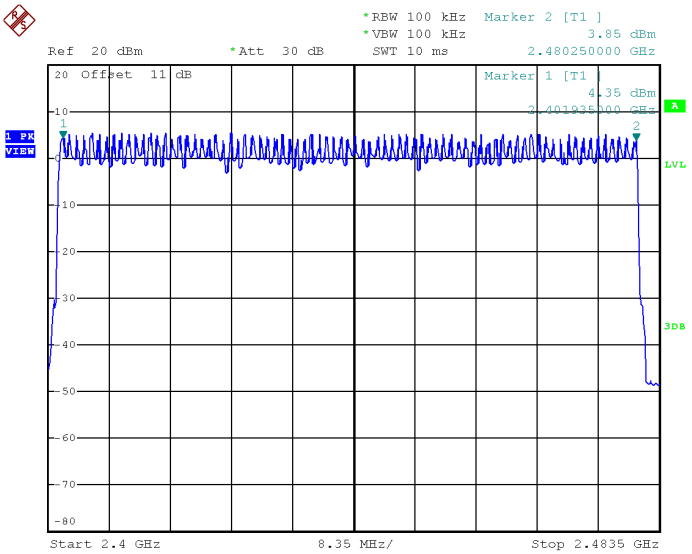
| Test Mode | Hopping Mode_1Mbps | Limit | Test Result |
|---|---|---|---|
| Number of Hopping Frequency | 79 | 15 | Pass |




Date: 8.NOV.2021 15:35:20

| Test Mode: | TX Mode_3Mbps |
|---|---|

| Test Mode | Hopping Mode_3Mbps | Limit | Test Result |
|---|---|---|---|
| Number of Hopping Frequency | 79 | 15 | Pass |



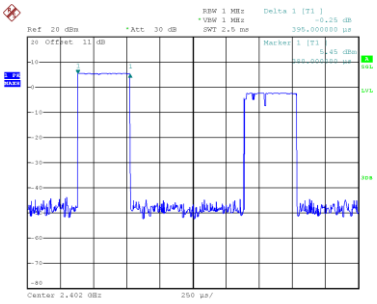

Date: 8.NOV.2021 16:53:19

# APPENDIX F - AVERAGE TIME OF OCCUPANCY

| Test Mode | Hopping Mode_1Mbps |
|---|---|

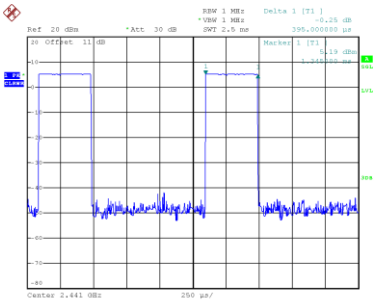
| Data Packet | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (s) | Limits (s) | Test Result |
|---|---|---|---|---|---|
| DH1 | 2402 | 0.3950 | 0.1264 | 0.4000 | Pass |
| DH3 | 2402 | 1.6600 | 0.2656 | 0.4000 | Pass |
| DH5 | 2402 | 2.9200 | 0.3115 | 0.4000 | Pass |
| DH1 | 2441 | 0.3950 | 0.1264 | 0.4000 | Pass |
| DH3 | 2441 | 1.6600 | 0.2656 | 0.4000 | Pass |
| DH5 | 2441 | 2.9200 | 0.3115 | 0.4000 | Pass |
| DH1 | 2480 | 0.3950 | 0.1264 | 0.4000 | Pass |
| DH3 | 2480 | 1.6600 | 0.2656 | 0.4000 | Pass |
| DH5 | 2480 | 2.9200 | 0.3115 | 0.4000 | Pass |

## CH00-DH1



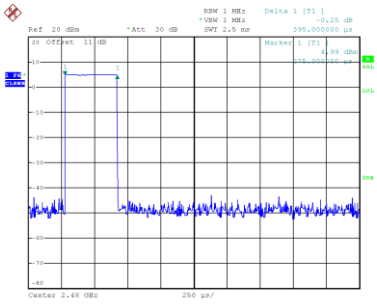
Date: 8.NOV.2021 15:30:02

## CH39-DH1



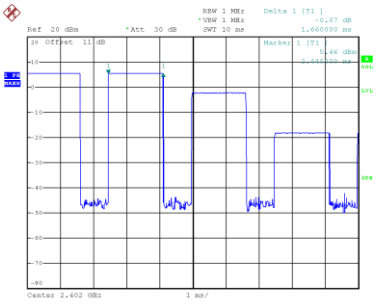
Date: 8.NOV.2021 15:30:05

## CH78-DH1



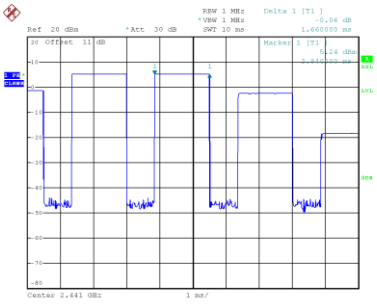
Date: 8.NOV.2021 15:30:09

## CH00-DH3



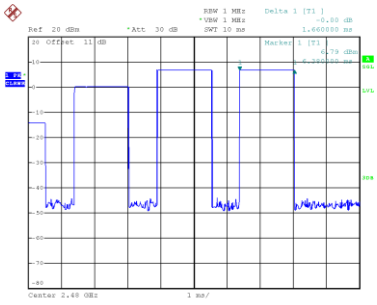
Date: 8.NOV.2021 15:37:12

## CH39-DH3



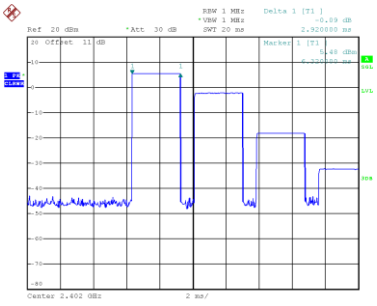
Date: 8.NOV.2021 15:37:17

## CH78-DH3



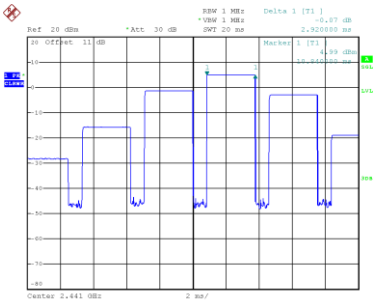
Date: 8.NOV.2021 15:37:44

## CH00-DH5



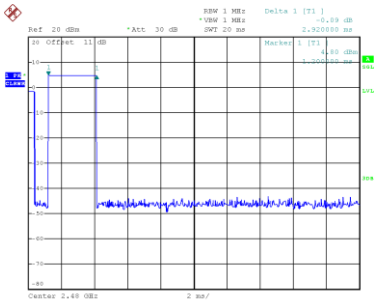
Date: 8.NOV.2021 15:40:03

## CH39-DH5



Date: 8.NOV.2021 16:46:31

## CH78-DH5

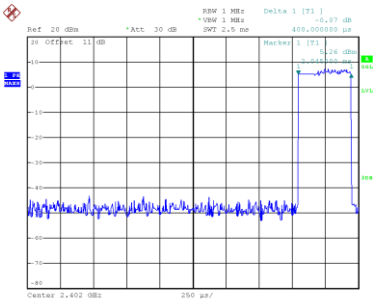


Date: 8.NOV.2021 16:46:40

| Test Mode | Hopping Mode_3Mbps |
|---|---|

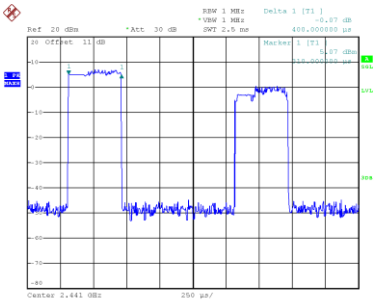
| Data Packet | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (s) | Limits (s) | Test Result |
|---|---|---|---|---|---|
| 3DH1 | 2402 | 0.4000 | 0.1280 | 0.4000 | Pass |
| 3DH3 | 2402 | 1.6600 | 0.2656 | 0.4000 | Pass |
| 3DH5 | 2402 | 2.8800 | 0.3072 | 0.4000 | Pass |
| 3DH1 | 2441 | 0.4000 | 0.1280 | 0.4000 | Pass |
| 3DH3 | 2441 | 1.6600 | 0.2656 | 0.4000 | Pass |
| 3DH5 | 2441 | 2.9200 | 0.3115 | 0.4000 | Pass |
| 3DH1 | 2480 | 0.4000 | 0.1280 | 0.4000 | Pass |
| 3DH3 | 2480 | 1.6600 | 0.2656 | 0.4000 | Pass |
| 3DH5 | 2480 | 2.9200 | 0.3115 | 0.4000 | Pass |

## CH00-3DH1



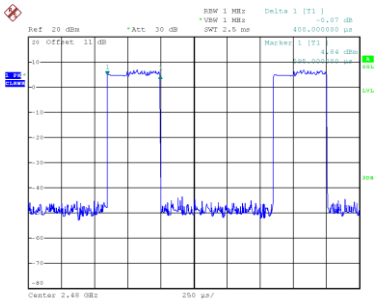
Date: 8.NOV.2021 16:47:40

## CH39-3DH1



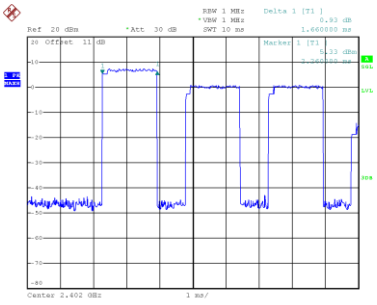
Date: 8.NOV.2021 16:48:15

## CH78-3DH1



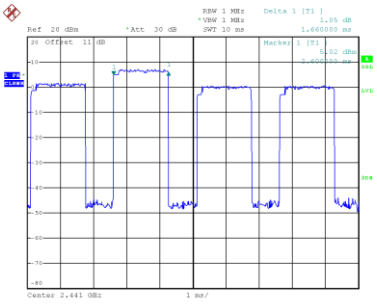
Date: 8.NOV.2021 16:47:49

## CH00-3DH3



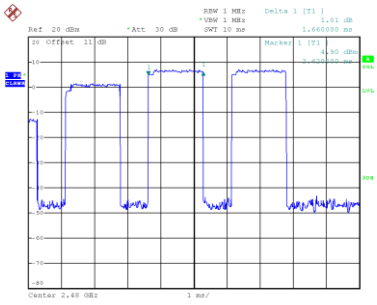
Date: 8.NOV.2021 16:57:33

## CH39-3DH3



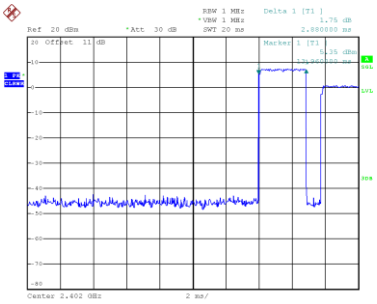
Date: 8.NOV.2021 16:57:45

## CH78-3DH3



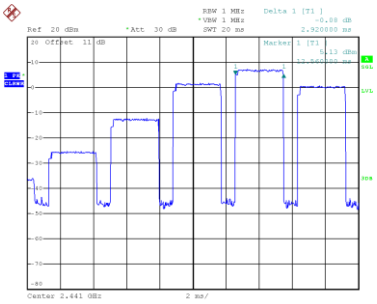
Date: 8.NOV.2021 16:57:50

## CH00-3DH5



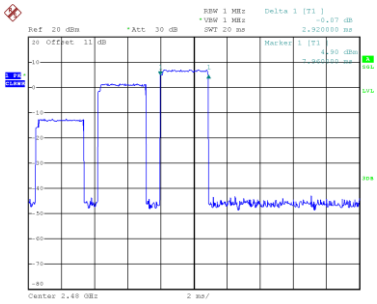
Date: 8.NOV.2021 16:58:45

## CH39-3DH5



Date: 8.NOV.2021 16:58:49

## CH78-3DH5



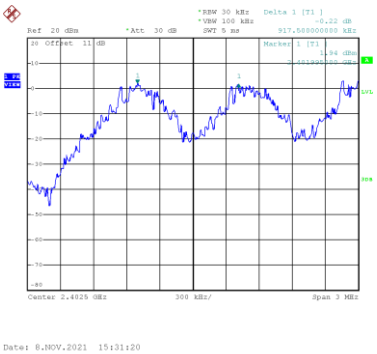
Date: 8.NOV.2021 16:58:53

# APPENDIX G - HOPPING CHANNEL SEPARATION

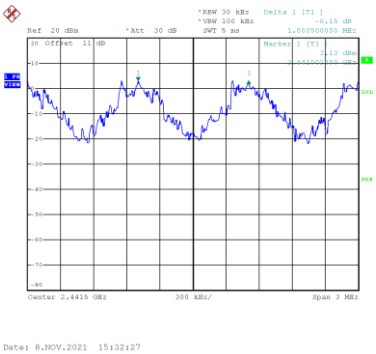
| Test Mode | Hopping Mode_1Mbps |
|---|---|

| Channel | Frequency (MHz) | Channel Separation (MHz) | 2/3 of 20 dB Bandwidth (MHz) | Test Result |
|---|---|---|---|---|
| 00 | 2402 | 0.918 | 0.679 | Pass |
| 39 | 2441 | 1.001 | 0.623 | Pass |
| 78 | 2480 | 1.145 | 0.607 | Pass |

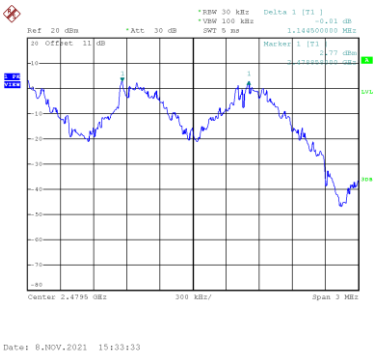
**CH00**



**CH39**



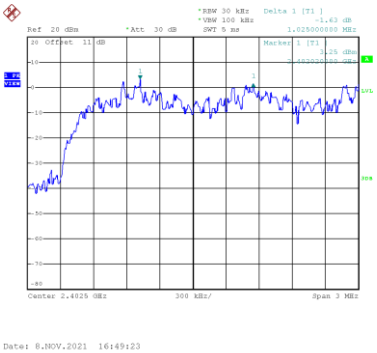
**CH78**



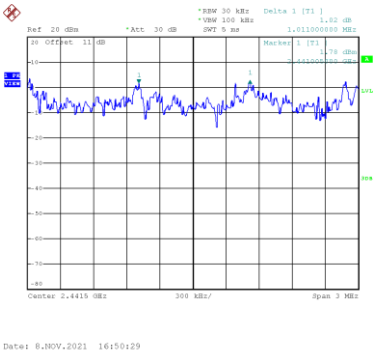
| Test Mode | Hopping Mode_3Mbps |
|---|---|

| Channel | Frequency (MHz) | Channel Separation (MHz) | 2/3 of 20 dB Bandwidth (MHz) | Test Result |
|---|---|---|---|---|
| 00 | 2402 | 1.025 | 0.839 | Pass |
| 39 | 2441 | 1.011 | 0.841 | Pass |
| 78 | 2480 | 0.996 | 0.838 | Pass |

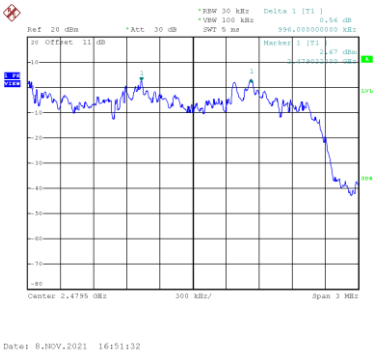
**CH00**



**CH39**



**CH78**

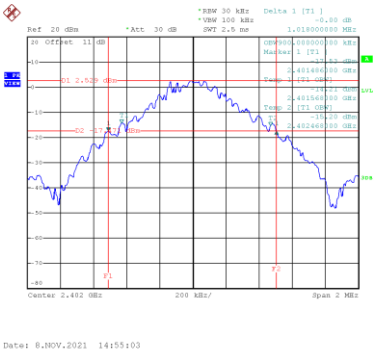


# APPENDIX H - BANDWIDTH

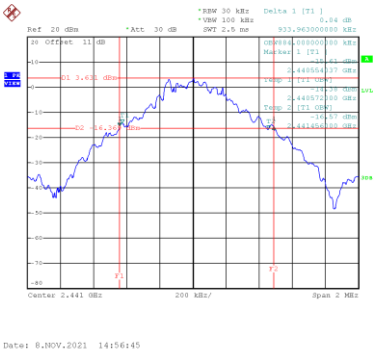
| Test Mode | TX Mode _1Mbps |
|---|---|

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) | 99 % Occupied Bandwidth (MHz) |
|---|---|---|---|
| 00 | 2402 | 1.018 | 0.900 |
| 39 | 2441 | 0.934 | 0.884 |
| 78 | 2480 | 0.910 | 0.884 |

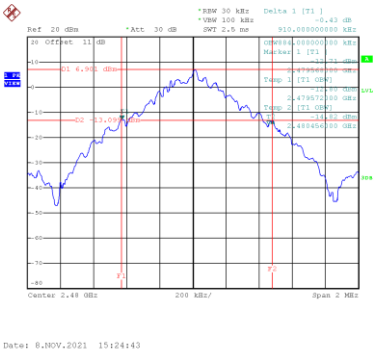
**CH00**



**CH39**



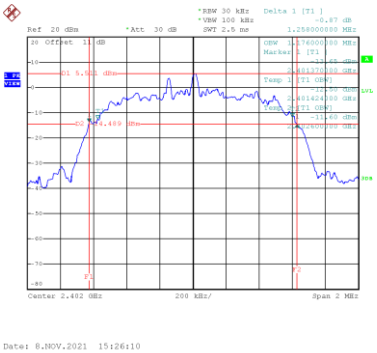
**CH78**



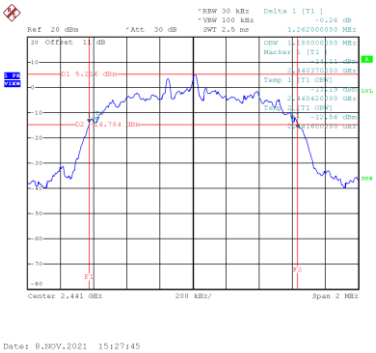
| Test Mode | TX Mode _3Mbps |
|---|---|

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) | 99 % Occupied Bandwidth (MHz) |
|---|---|---|---|
| 00 | 2402 | 1.258 | 1.176 |
| 39 | 2441 | 1.262 | 1.180 |
| 78 | 2480 | 1.257 | 1.184 |

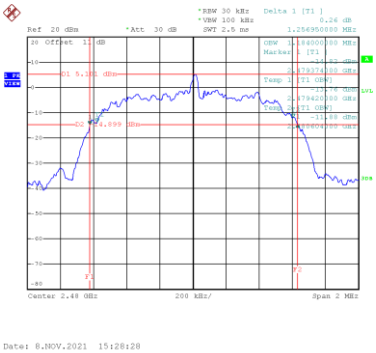
**CH00**



**CH39**



**CH78**



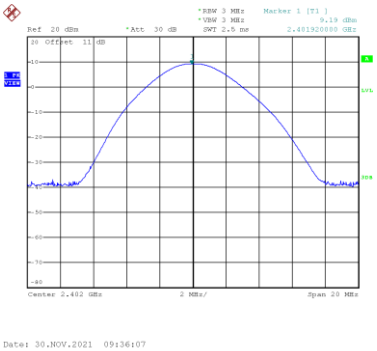
# APPENDIX I - MAXIMUM OUTPUT POWER

| Test Mode | TX Mode _1Mbps |
|---|---|

| Channel | Frequency (MHz) | Peak Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 9.19 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 9.00 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 8.89 | 20.97 | 0.1250 | Pass |

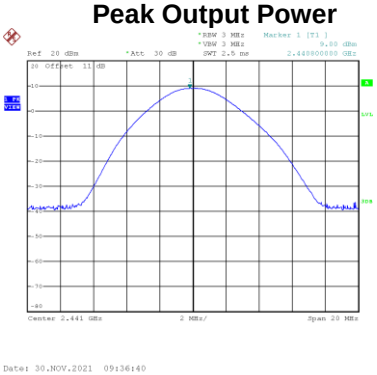
| Channel | Frequency (MHz) | Average Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 9.10 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 8.89 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 8.76 | 20.97 | 0.1250 | Pass |

**CH00**

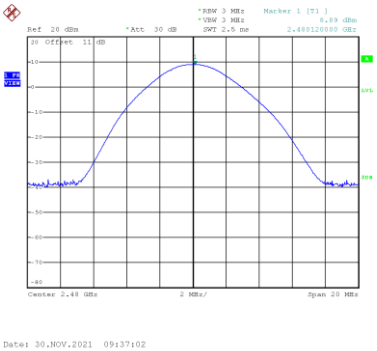


**CH39**

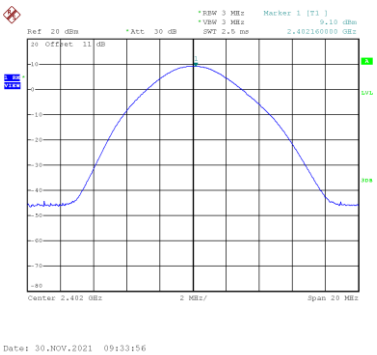
**Peak Output Power**

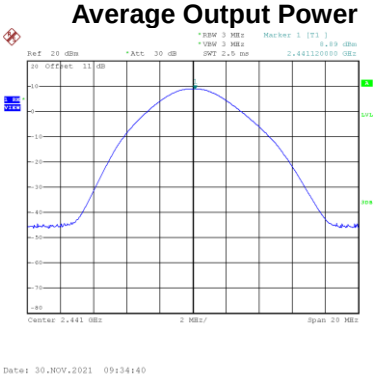


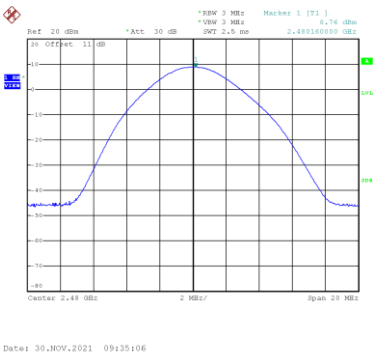
**CH78**



**Average Output Power**





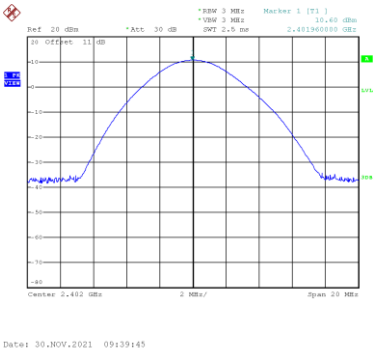


| Test Mode | TX Mode _2Mbps |
|---|---|

| Channel | Frequency (MHz) | Peak Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 10.60 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 10.45 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 10.39 | 20.97 | 0.1250 | Pass |

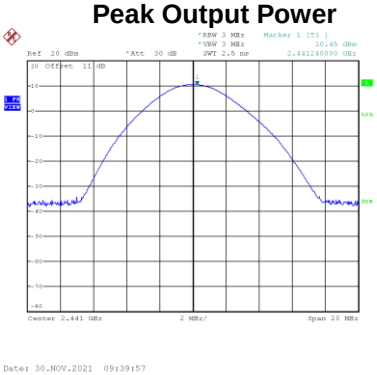
| Channel | Frequency (MHz) | Average Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 9.17 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 9.05 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 8.92 | 20.97 | 0.1250 | Pass |

**CH00**

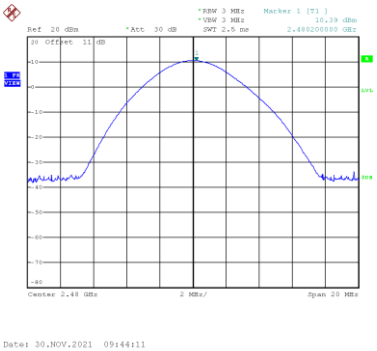


**CH39**

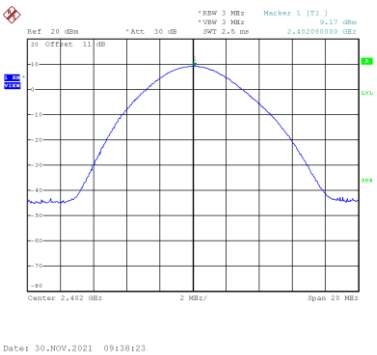
**Peak Output Power**

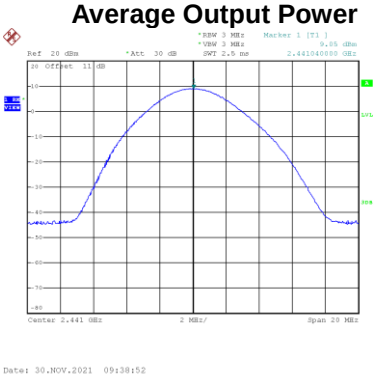


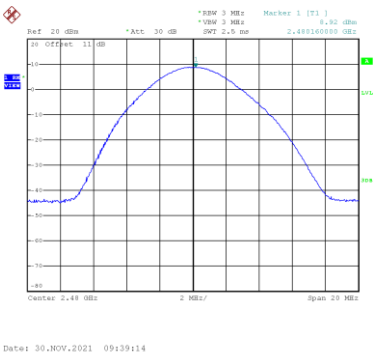
**CH78**



**Average Output Power**





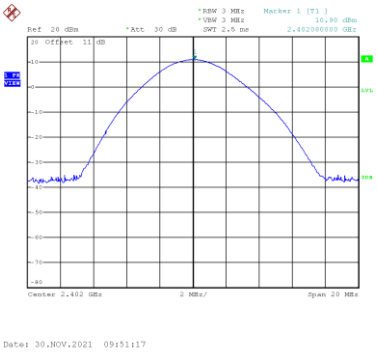


| Test Mode | TX Mode _3Mbps |
|---|---|

| Channel | Frequency (MHz) | Peak Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 10.90 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 10.70 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 10.66 | 20.97 | 0.1250 | Pass |

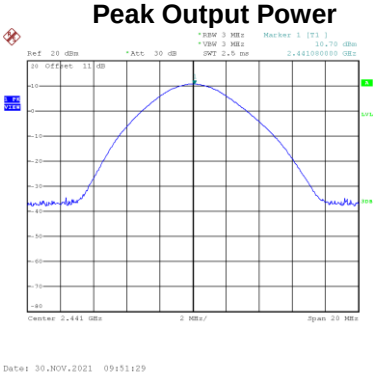
| Channel | Frequency (MHz) | Average Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 00 | 2402 | 9.18 | 20.97 | 0.1250 | Pass |
| 39 | 2441 | 9.06 | 20.97 | 0.1250 | Pass |
| 78 | 2480 | 8.92 | 20.97 | 0.1250 | Pass |

**CH00**

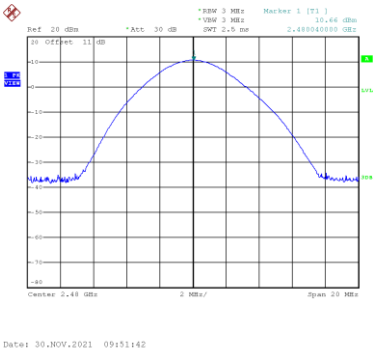


**CH39**

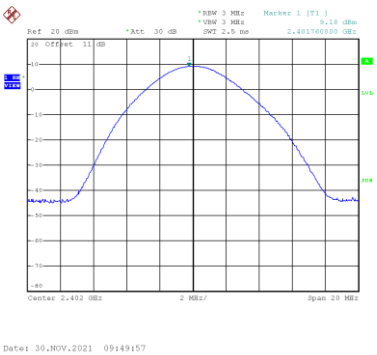
**Peak Output Power**

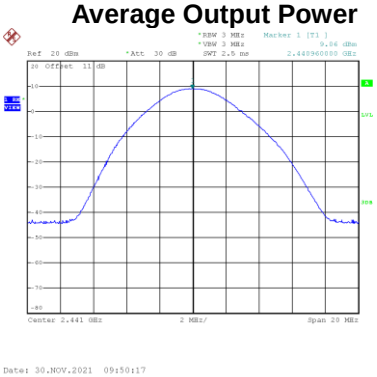


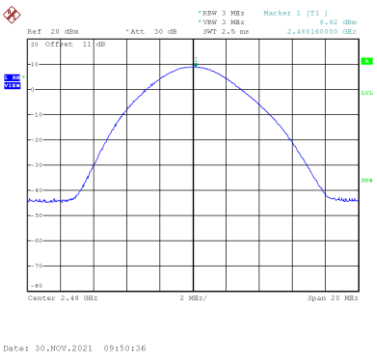
**CH78**



**Average Output Power**



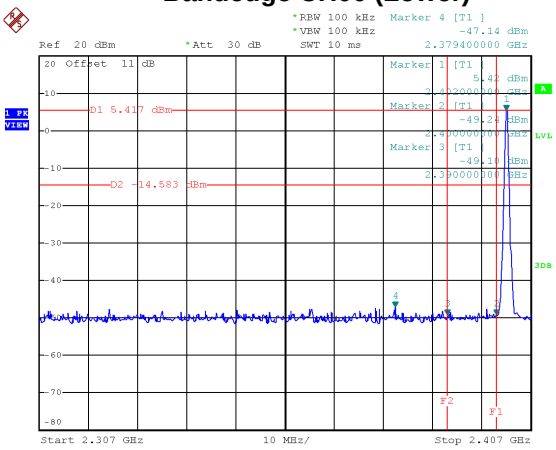




# APPENDIX J - CONDUCTED SPURIOUS EMISSION

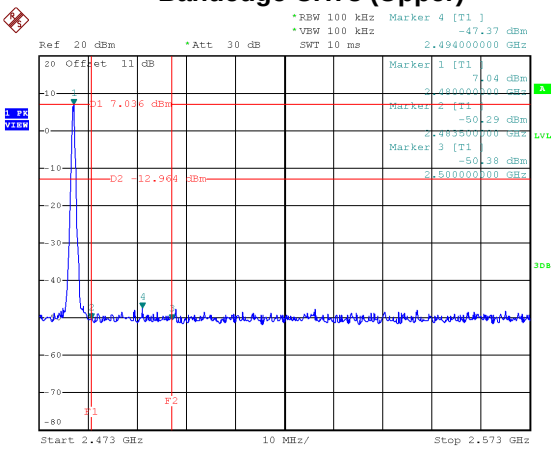
| Test Mode | TX Mode _1Mbps |
|---|---|

## Bandedge CH00 (Lower)



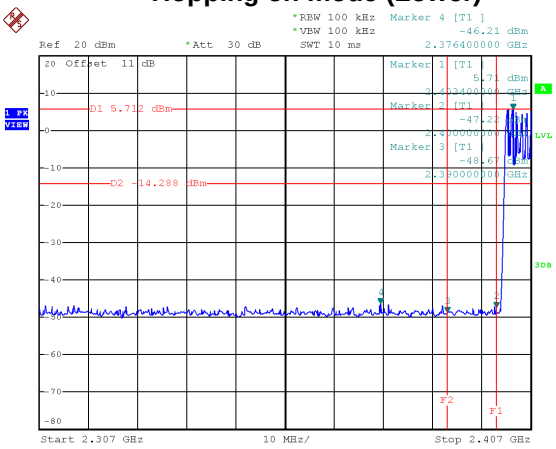

Date: 8.NOV.2021 14:54:41

## Bandedge CH78 (Upper)



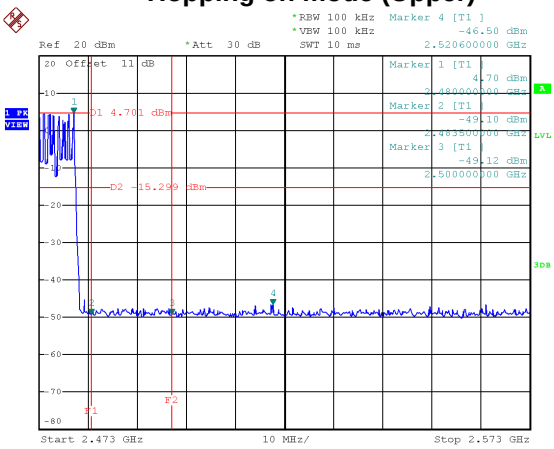

Date: 8.NOV.2021 15:24:20

## Hopping on mode (Lower)



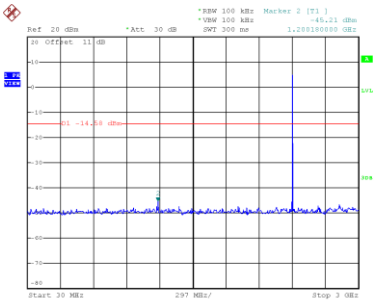

Date: 8.NOV.2021 15:35:54

## Hopping on mode (Upper)

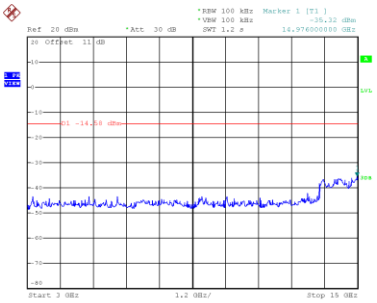



Date: 8.NOV.2021 15:36:28

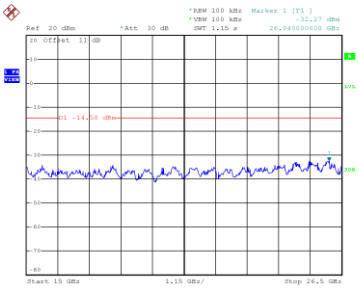
## CH00 – 10th Harmonic of the fundamental frequency



Date: 8.NOV.2021 14:55:16

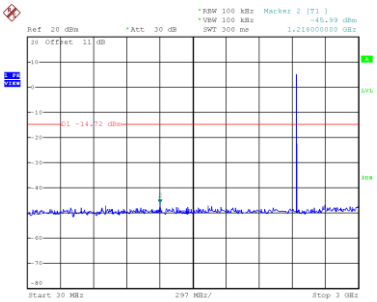


Date: 8.NOV.2021 14:55:23

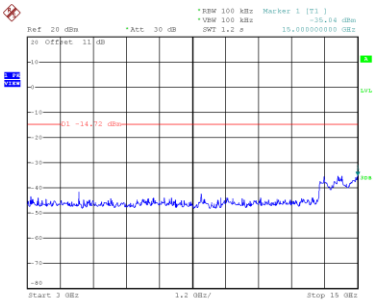


Date: 8.NOV.2021 14:55:30

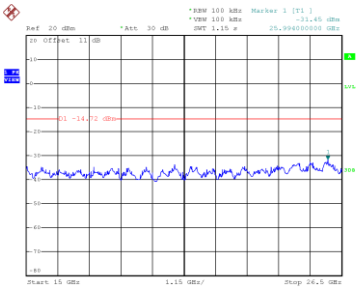
## CH39 – 10th Harmonic of the fundamental frequency



Date: 8.NOV.2021 14:56:09

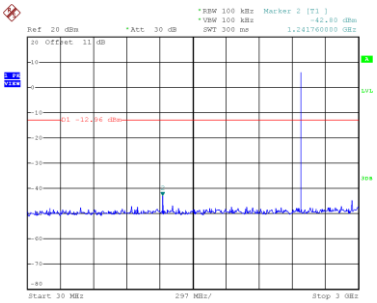


Date: 8.NOV.2021 14:56:16

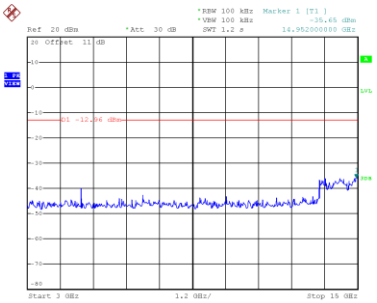


Date: 8.NOV.2021 14:56:23

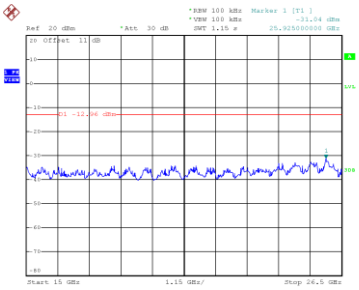
## CH78 – 10th Harmonic of the fundamental frequency



Date: 8.NOV.2021 15:24:56



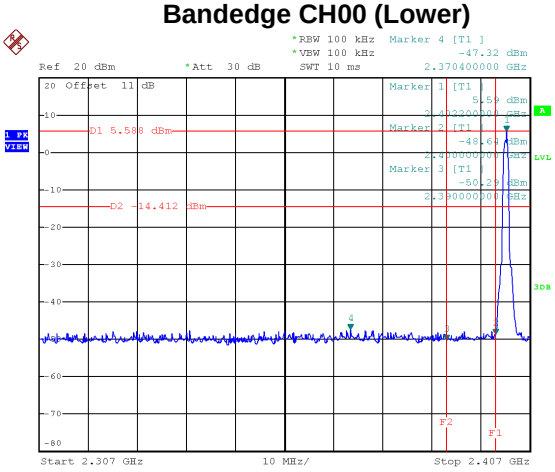
Date: 8.NOV.2021 15:25:03



Date: 8.NOV.2021 15:25:10

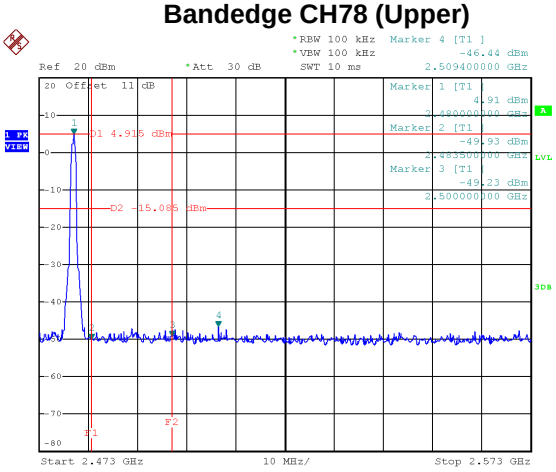
| Test Mode | TX Mode _3Mbps |
|---|---|

## Bandedge CH00 (Lower)



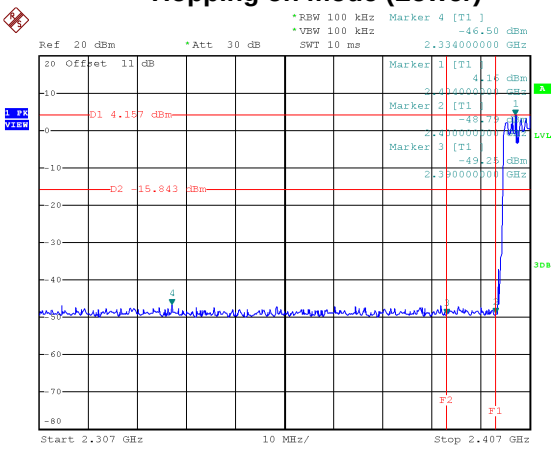

Date: 8.NOV.2021 15:25:53

## Bandedge CH78 (Upper)



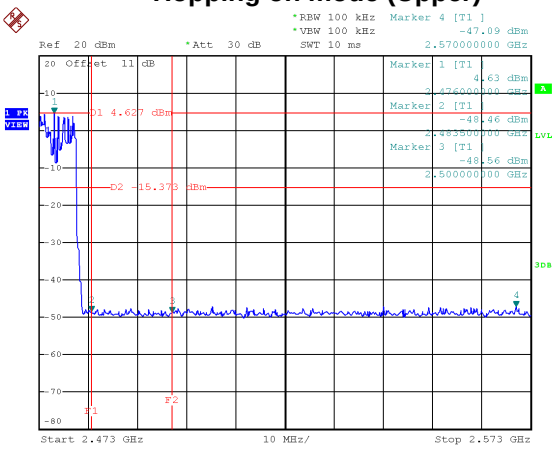

Date: 8.NOV.2021 15:28:12

## Hopping on mode (Lower)



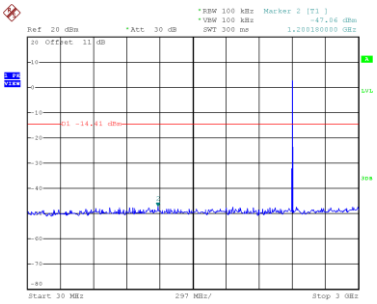

Date: 8.NOV.2021 16:53:53

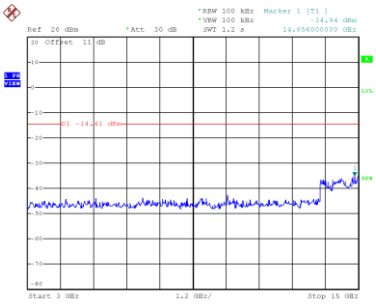
## Hopping on mode (Upper)

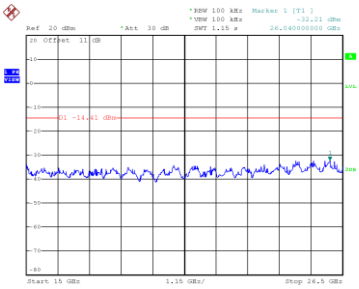



Date: 8.NOV.2021 16:55:10

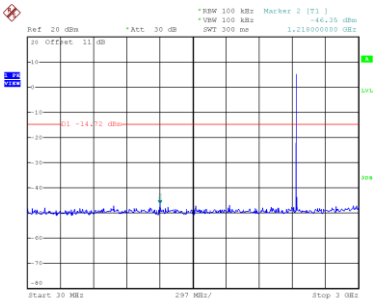
## CH00 – 10th Harmonic of the fundamental frequency

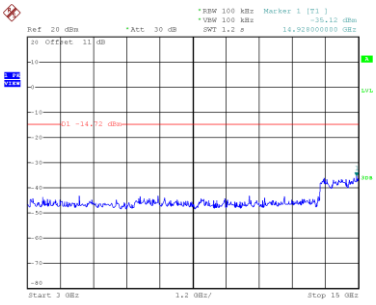


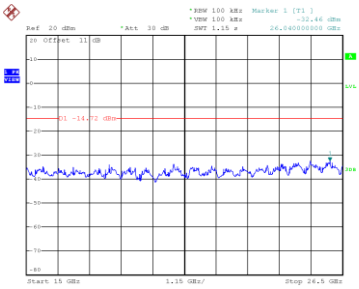




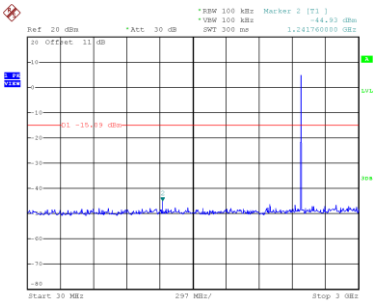
## CH39 – 10th Harmonic of the fundamental frequency

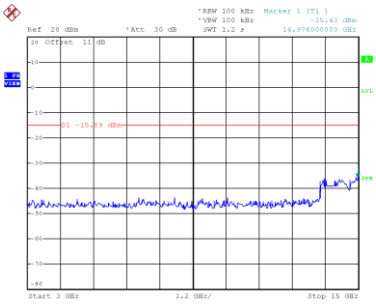


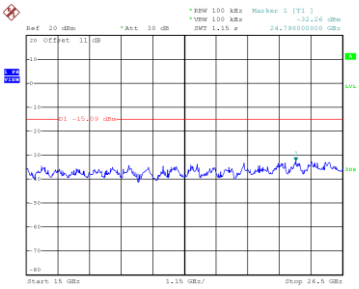




## CH78 – 10th Harmonic of the fundamental frequency







# APPENDIX K - DECLARATION FOR BLUETOOTH DEVICE

**1. Output power and channel separation of a Bluetooth device in the different operating modes:**

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

**2. Frequency range of a Bluetooth device:**

Hereby we declare that the maximum frequency of this device is: 2402 - 2480MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

**3. Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:**

Bluetooth units which want to communicate with other units must be organised in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

**4. Example of a hopping sequence in data mode:**

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67, 56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06, 01, 51, 03, 55, 05, 04

**5. Equally average use of frequencies in data mode and behaviour for short transmissions:**

The generation of the hopping sequence in connection mode depends essentially on two input values:
a) LAP/UAP of the master of the connection.
b) Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire.
LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR- operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:
The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.
The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

**6. Receiver input bandwidth and behaviour for repeated single or multiple packets:**

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.
Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.
Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

**End of Test Report**