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# Test Report

**Prepared for: Noxgear LLC**

**EUT Name: Wearable Bluetooth Speaker**
**Model: NG-WBS-01**

**FCC ID: 2A3FG-NOX01**
**IC: 27832-NOX01**

**To**

**FCC Part 15.247**
**And**
**ISED RSS-247**

**Date of Issue: 22 November 2021**

| | |
|---|---|
| **On the behalf of the applicant:** | **Noxgear LLC**<br>**966 Proprietors Road**<br>**Worthington, OH 43085** |
| **Attention of:** | **Simon Curran, CEO**<br>**Ph: (614) 806-1477**<br>**Email: simon@noxgear.com** |

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**Project No: p2170013**

**Aaron S. Froehlich**
**Sr RF/EMC Engineer**

**Test Report Revision History**

| Revision | Date | Revised By | Reason for Revision |
|---|---|---|---|
| 1.0 | 22 November 2021 | Aaron S. Froehlich | Original Document |
| | | | |
| | | | |
| | | | |

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## ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**The applicant has been cautioned as to the following**

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

# Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

| Environmental Conditions | | |
|---|---|---|
| **Temperature (ºC)** | **Humidity (%)** | **Pressure (mbar)** |
| 22.0 | 35.4 | 973.4 |

# EUT Description

| | |
|---|---|
| Product Marketing Name (PMN) | Wearable Bluetooth Speaker |
| Hardware Version Identification Number (HVIN) | NG-WBS-01 |
| Firmware Version Identification Number (FVIN) | 1.0.0 |
| Serial Number (SN) | 01 (Radiated), 02 (Antenna Port Conducted) |
| AC Adapter | Model: A2620<br>Input: 100-240V, 0.5A, 50-60 Hz<br>Output: 5V, 2.4A |
| Frequency Range | 2402-2480 MHz |
| Number of Channels | 79 |
| Modulation(s) | GFSK, π/4-DQPSK, 8DPSK |
| Data Rate(s) | 1/2/3 Mbps |
| Antenna | Type: Chip<br>Part Number: 2450AT18D0100E<br>Pk Gain: 1.5 dBi<br>Frequency Range: 2.4-2.5 GHz |

**General Description of EUT and its intended use:**
The EUT is a wearable speaker that receives its audio information via BlueTooth v4.0. The inaccessible internal battery is charged from a standard Micro USB port.

**EUT operation during test:**
A normal production sample was tested for AC Conducted Emissions, while hopping. A test mode sample with chip antenna attached was used for the Radiated Spurious Emissions demonstration. An antenna port conducted sample that has had the chip antenna replaced with a u.fl connector was tested for all other requirements.

Test mode samples were operated via Qualcomm BlueSuite 2.6.11 BlueTest3 application. A SPI to USB interface board was used with a support laptop. The commands utilized and their associated parameters are:

CFG PKT
Test Arguments:
- Packet Type – Values between 3 and 31 corresponding to the data rate desired for test.
- Packet Size – Always set to the maximum value allowable for that packet type.

TXDATA1 – Commands the DUT to transmit on a single frequency with PRBS9 data.
Test Arguments:
- LO Freq: The frequency under test. Values used were 2402, 2441, 2480
- Power (Ext, Int)
  - Ext – External amplification always set to a maximum value of 255
  - Int – Internal amplification, maximum value of 63 for Basic Data Rates, maximum value of 127 for Enhanced data rates

TXDATA2 – Commands the DUT to transmit with hopping active and PRBS9 data..
Test Arguments:
- Country Code [obsolete command] = always 0
- Power (Ext, Int)
  - Ext – External amplification always set to a maximum value of 255
  - Int – Internal amplification, maximum value of 63 for Basic Data Rates, maximum value of 127 for Enhanced data rates

Modes of Operation Tested:

| Data Rate [Name] | Data Rate [Mbps] | Modulation | CFG PKT [Packet Type] | CFG PKT [Packet Size] |
|---|---|---|---|---|
| BDR DM1 | 1 | GFSK | 3 | 17 |
| BDR DM3 | 1 | GFSK | 10 | 121 |
| BDR DH3 | 1 | GFSK | 11 | 183 |
| BDR DM5 | 1 | GFSK | 14 | 224 |
| BDR DH5 | 1 | GFSK | 15 | 339 |
| EDR DM1 | 2 | π/4-DQPSK | 19 | 17 |
| EDR 2-DH3 | 2 | π/4-DQPSK | 26 | 367 |
| EDR 3-DH3 | 3 | 8DPSK | 27 | 552 |
| EDR 2-DH5 | 2 | π/4-DQPSK | 30 | 679 |
| EDR 3-DH5 | 3 | 8DPSK | 31 | 1021 |

BDR = Basic Data Rate
EDR = Enhanced Data Rate

DM# vs DH# - there is no difference in the physical transmission between DM and DH data rates. This is a payload configuration where DM packets have some packet size dedicated for Forward Error Correction. It was further verified that there is no significant difference between these test modes via Duty Cycle, Dwell Time, Bandwidth, and Output Power tests.

**Accessories:**

| Qty | Description | Manufacturer | Model | S/N |
|---|---|---|---|---|
| 1 | Power Port Adapter | Anker | A2620 | AEDPC50B09206235 |
| 1 | MP3 Player mini | Shenzhenshi | M3 | 001 |

**Cables:**

| Qty | Description | Length (M) | Shielding Y/N | Shielded Hood Y/N | Termination |
|---|---|---|---|---|---|
| 1 | Charging cable | 0.91 | Y | Y | Power Power Adapter |

**Modifications:**

none

## 15.203: Antenna Requirement:

| | |
|---|---|
| **X** | The antenna is permanently attached to the EUT |
| | The antenna uses a unique coupling |
| | The EUT must be professionally installed |
| | The antenna requirement does not apply |

# Test Summary

| FCC 15.247 Specification | RSS-247 Specification | Test Name | Pass, Fail, N/A | Comments |
|---|---|---|---|---|
| 15.247(b)(1) | Section 5.4(b) | Output Power | Pass | |
| 15.247(d) | Section 5.5 | Conducted Spurious Emissions | Pass | |
| 15.247(d), 15.209(a), 15.205 | Section 5.5 | Radiated Spurious Emissions | Pass | |
| 15.247(d), 15.209(a), 15.205 | Section 5.5 | Emissions At Band Edges | Pass | |
| 15.247(a)(1) | Sections 5.1(a) | Occupied Bandwidth | Pass | RSS-Gen Section 6.7 99% BW Also Reported |
| 15.247(a) | Section 5.1 (c) | Dwell Time | Pass | |
| 15.247(a) | Section 5.1 (d) | Number of Hopping Channels | Pass | |
| 15.247(a) | Section 5.1 (b) | Channel Separation | Pass | |
| 15.207 | RSS-GEN Section 8.8 | A/C Powerline Conducted Emissions | Pass | |

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

| References | Description |
|---|---|
| CFR47, Part 15, Subpart B | Unintentional Radiators |
| CFR47, Part 15, Subpart C | Intentional Radiators |
| ANSI C63.10-2013 | American National standard for testing Unlicensed Wireless Devices |
| ANSI C63.4-2014 | Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz. |
| ISO/IEC 17025:2005 | General requirements for the Competence of Testing and Calibrations Laboratories |
| KDB 558074 D01 v04 | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247 |

# Occupied Bandwidth

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/08/21

## Test Procedure

The method of ANSI C63.10 Clause 7.8.7, which references Clause 6.9.2 were utilized to measure the 20 dB Occupied Bandwidth. The "n dB down" function of the spectrum analyzer, with n = 20, was used as long as the marker did not settle in a null region. When that was the case the markers were manually configured from the edge of the emission until a value equal to or less than n dB below the peak was used.

The method of clause 6.9.3 was utilized to measure the 99% Occupied Bandwidth.

### Limit 20 dB

None – Other limits are calculated from the 20 dB Occupied Bandwidth.

### Limit 99%

RSS-Gen Section 6.7 requires the 99% Occupied Bandwidth be reported in addition to all other required bandwidths.

The Spectrum Analyzer was set to the following:

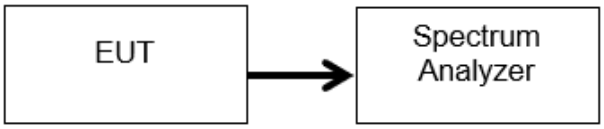
20 dB Occupied Bandwidth

| | |
|---|---|
| Span | Between two times and five times the OBW |
| RBW | 1% to 5% of the OBW |
| VBW | ~3 time RBW |

99% Occupied Bandwidth

| | |
|---|---|
| Span | Between 1.5 times and 5.0 times the OBW |
| RBW | 1% to 5% of the OBW |
| VBW | ~3 time RBW |

## Test Setup

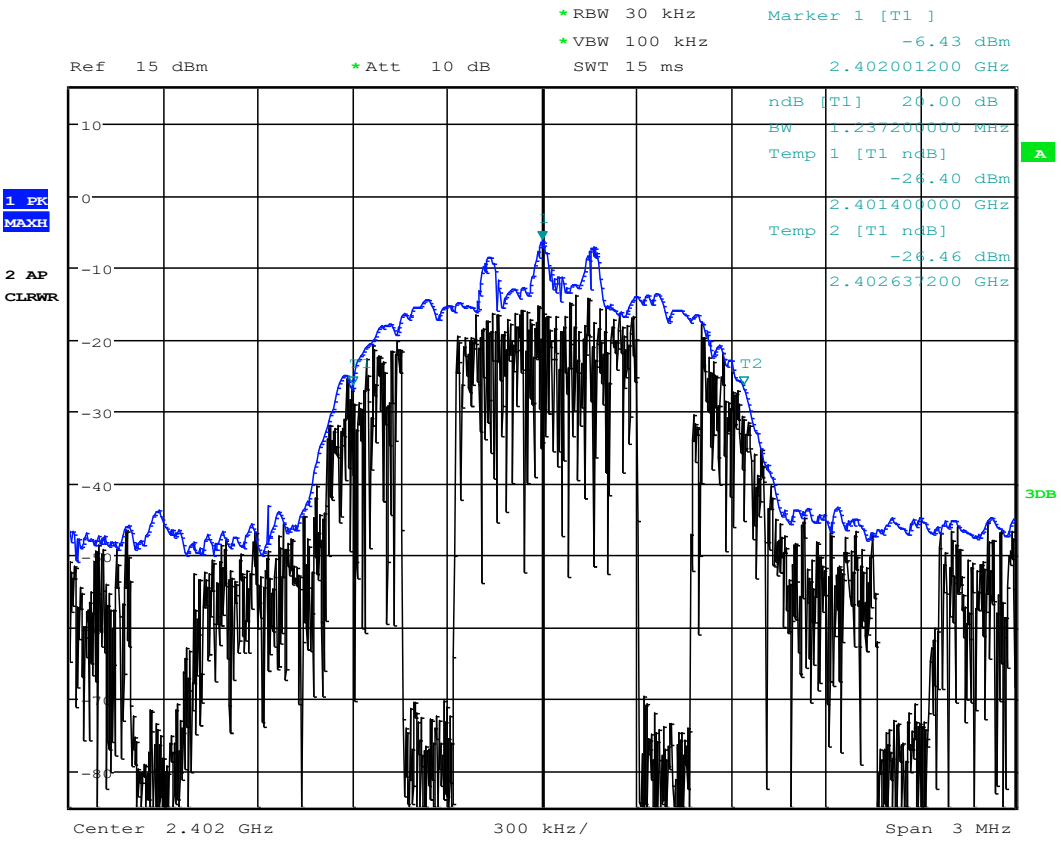


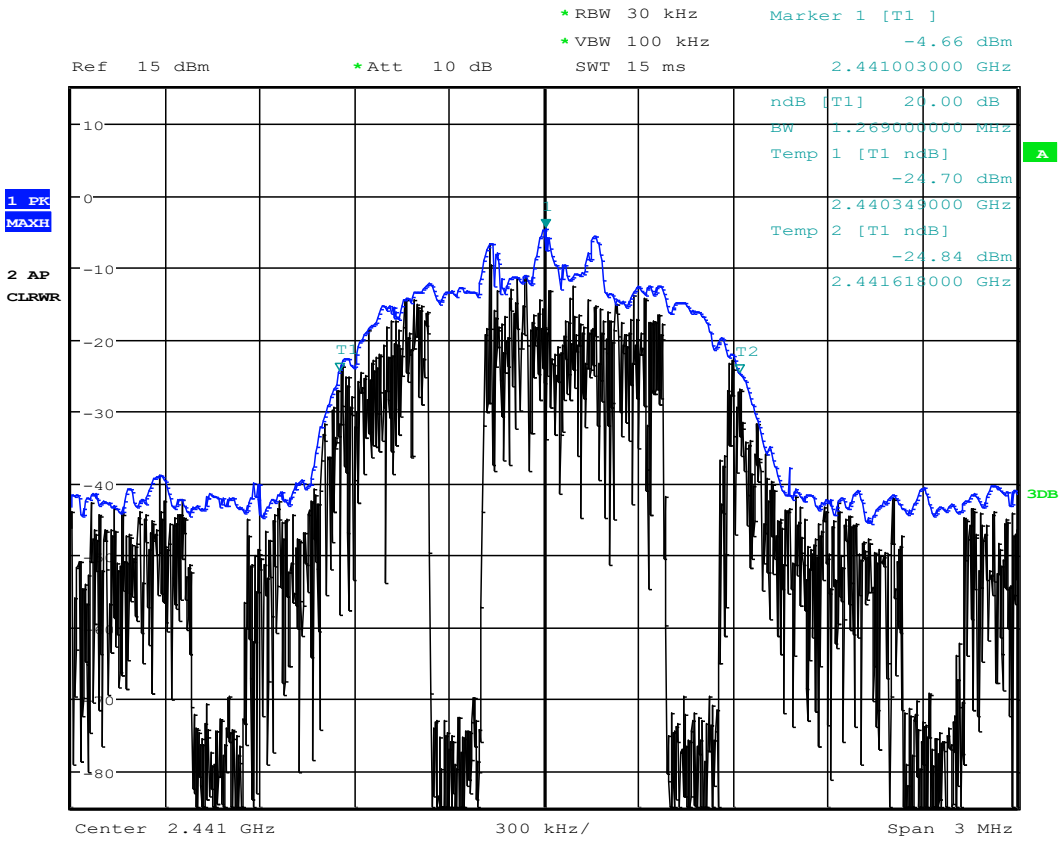
# Test Data

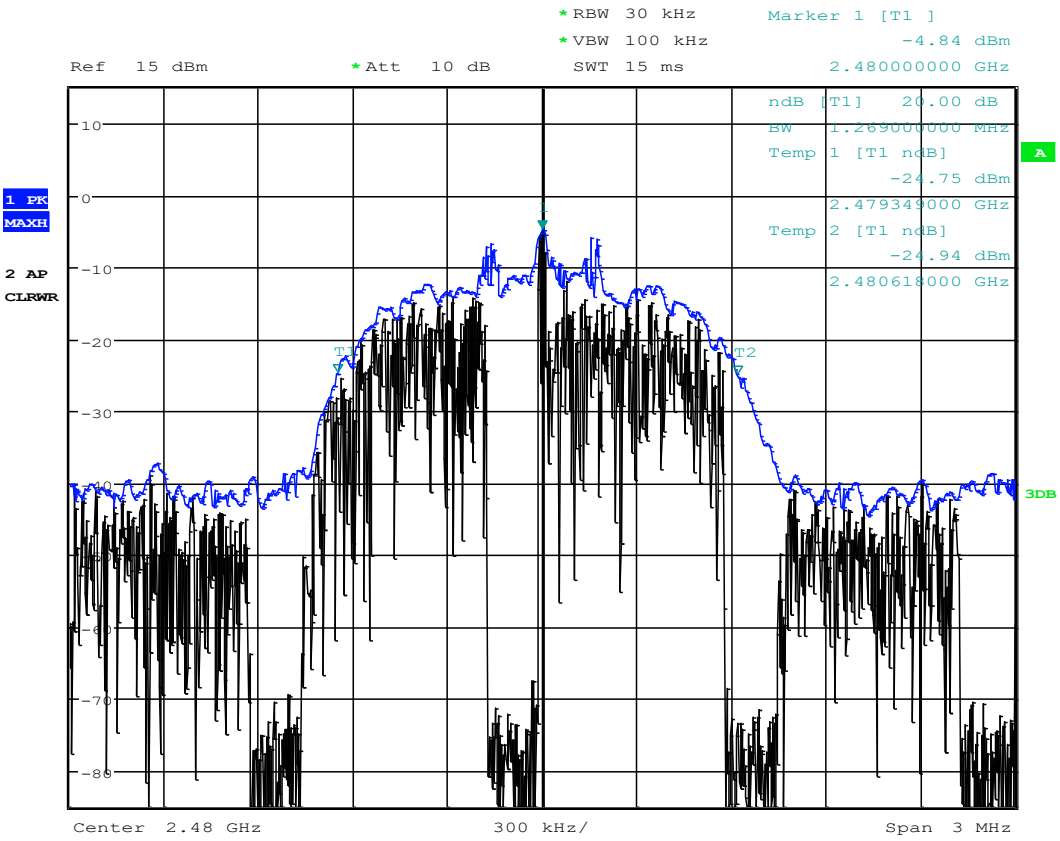
## Tabular Data

| Data Rate | Frequency | 20 dB BW | 99% OBW |
|---|---|---|---|
| | MHz | MHz | MHz |
| BDR DM1 | 2402 | 0.782 | 0.834 |
| BDR DM1 | 2441 | 0.864 | 0.825 |
| BDR DM1 | 2480 | 0.864 | 0.828 |
| BDR DM3 | 2402 | 0.964 | 0.905 |
| BDR DM3 | 2441 | 0.948 | 0.903 |
| BDR DM3 | 2480 | 0.957 | 0.900 |
| BDR DH3 | 2402 | 0.854 | 0.862 |
| BDR DH3 | 2441 | 0.857 | 0.864 |
| BDR DH3 | 2480 | 0.857 | 0.861 |
| BDR DM5 | 2402 | 0.949 | 0.864 |
| BDR DM5 | 2441 | 0.954 | 0.882 |
| BDR DM5 | 2480 | 0.957 | 0.851 |
| BDR DH5 | 2402 | 0.856 | 0.872 |
| BDR DH5 | 2441 | 0.957 | 0.864 |
| BDR DH5 | 2480 | 0.851 | 0.867 |
| EDR DM1 | 2402 | 0.756 | 0.840 |
| EDR DM1 | 2441 | 0.758 | 0.825 |
| EDR DM1 | 2480 | 0.755 | 0.831 |
| EDR 2-DH3 | 2402 | 1.252 | 1.183 |
| EDR 2-DH3 | 2441 | 1.254 | 1.182 |
| EDR 2-DH3 | 2480 | 1.240 | 1.200 |
| EDR 3-DH3 | 2402 | 1.228 | 1.181 |
| EDR 3-DH3 | 2441 | 1.269 | 1.197 |
| EDR 3-DH3 | 2480 | 1.263 | 1.206 |
| EDR 2-DH5 | 2402 | 1.246 | 1.184 |
| EDR 2-DH5 | 2441 | 1.260 | 1.194 |
| EDR 2-DH5 | 2480 | 1.240 | 1.206 |
| EDR 3-DH5 | 2402 | 1.237 | 1.175 |
| EDR 3-DH5 | 2441 | 1.269 | 1.191 |
| EDR 3-DH5 | 2480 | 1.269 | 1.206 |

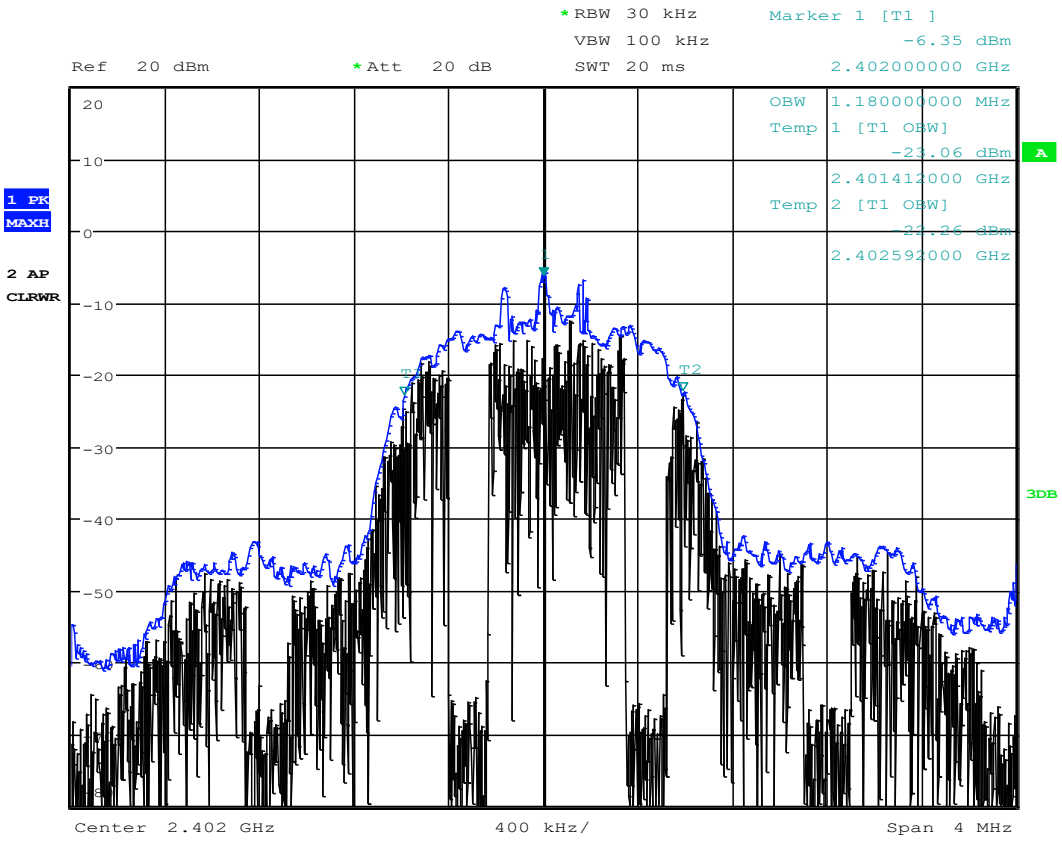
## Sample 20 dB Plots [EDR 3-DH5]

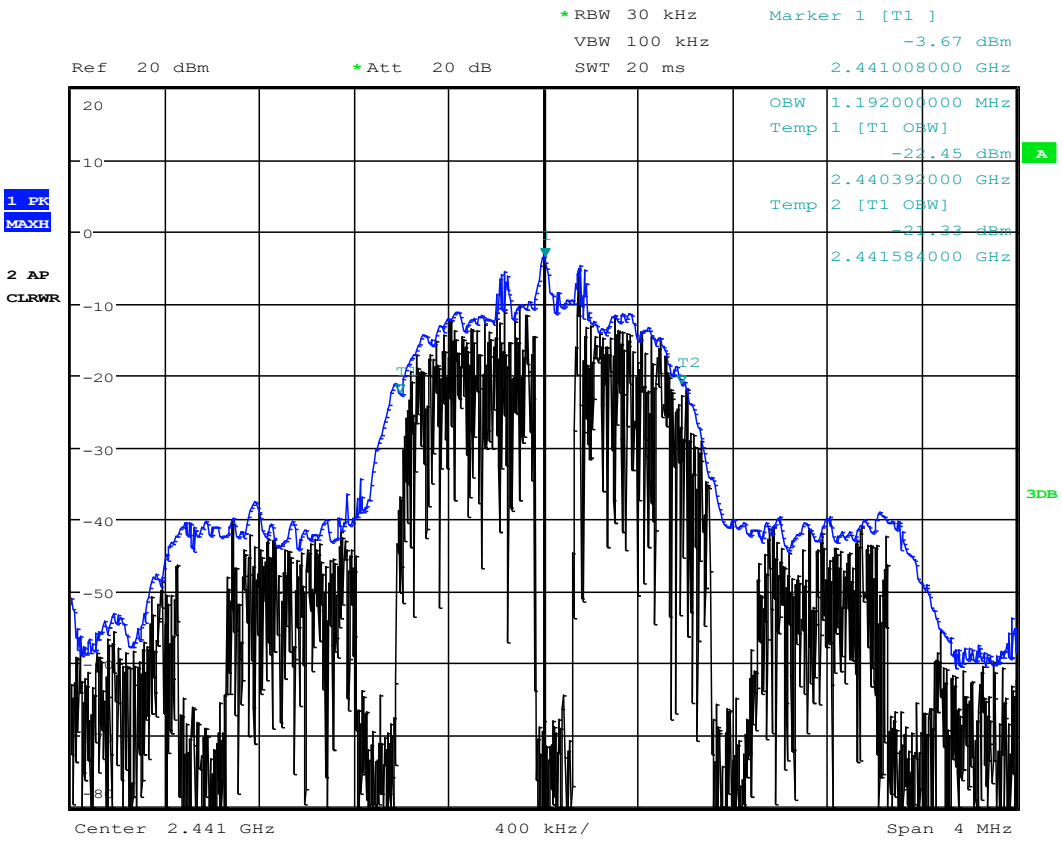


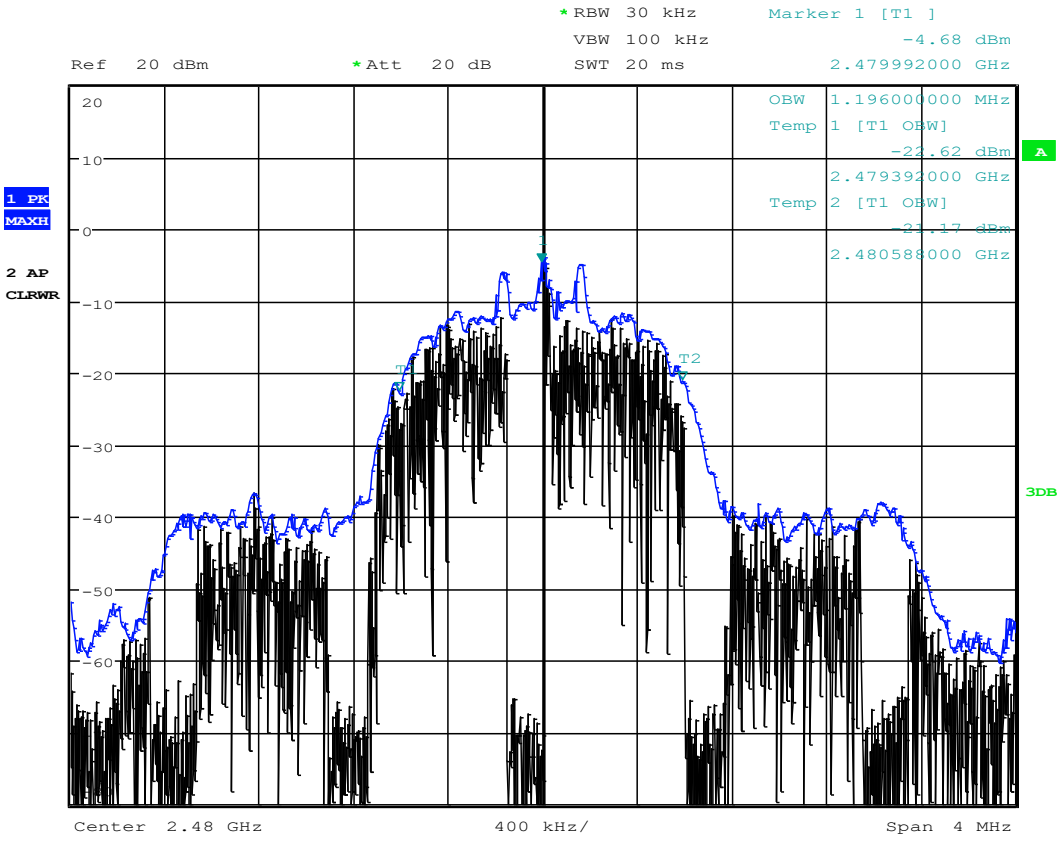




*RBW 30 kHz
*VBW 100 kHz
Ref 15 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-4.84 dBm
2.480000000 GHz
ndB [T1] 20.00 dB
BW 1.269000000 MHz
Temp 1 [T1 ndB]
-24.75 dBm
2.479349000 GHz
Temp 2 [T1 ndB]
-24.94 dBm
2.480618000 GHz
1 PK
MAXH
2 AP
CLRWR
A
3DB
10
0
-10
-20
-30
-70
-80
T1
T2
Center 2.48 GHz
300 kHz/
Span 3 MHz

## Sample 99% Plots [EDR 3-DH5]




*RBW 30 kHz
VBW 100 kHz
Ref 20 dBm
*Att 20 dB
SWT 20 ms
Marker 1 [T1 ]
-4.68 dBm
2.479992000 GHz
OBW 1.196000000 MHz
Temp 1 [T1 OBW]
-22.62 dBm
2.479392000 GHz
Temp 2 [T1 OBW]
-21.17 dBm
2.480588000 GHz
1 PK
MAXH
2 AP
CLRWR
A
3DB
T1
T2
Center 2.48 GHz
400 kHz/
Span 4 MHz

# Output Power

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/08/21

## Test Procedure

The methods of ANSI C63.10 Clause 7.8.5 were utilized to demonstrate compliance of the DUT. All available data rates were tested and reported. The hopping function was disabled for this test; the DUT was tested while operating on a single channel.

### Limit

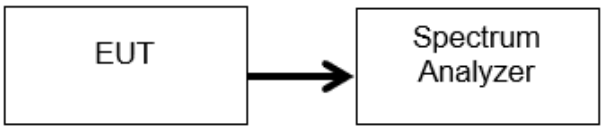
47 CFR 15.247(b)(1) & RSS 247 5.4.b.
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

The Spectrum Analyzer was set to the following:

| | |
|---|---|
| Span | Approximately five times the 20 dB Bandwidth |
| RBW | > 20 dB BW |
| VBW | ≥ RBW |
| Sweep | Auto |
| Detector | Peak |
| Trace Mode | Max Hold |

The RF output power was measured using the spectrum analyzer's marker peak function

## Test Setup



# Test Data

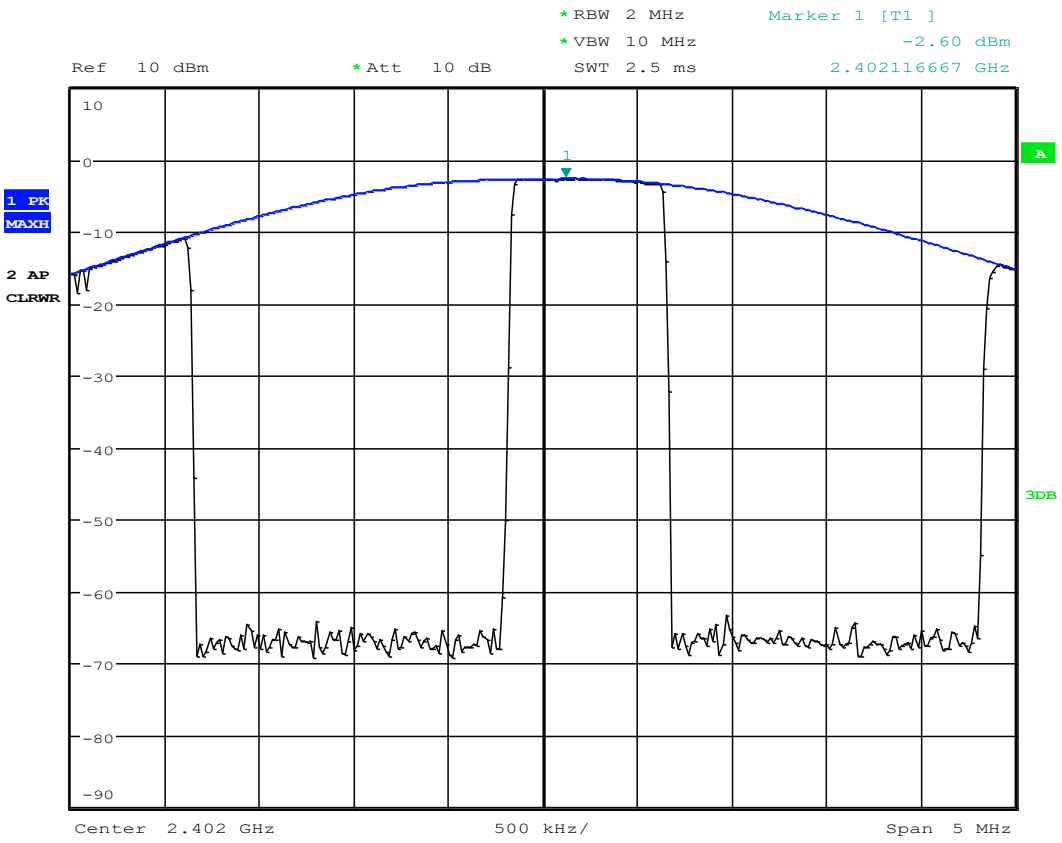
## Tabular Data

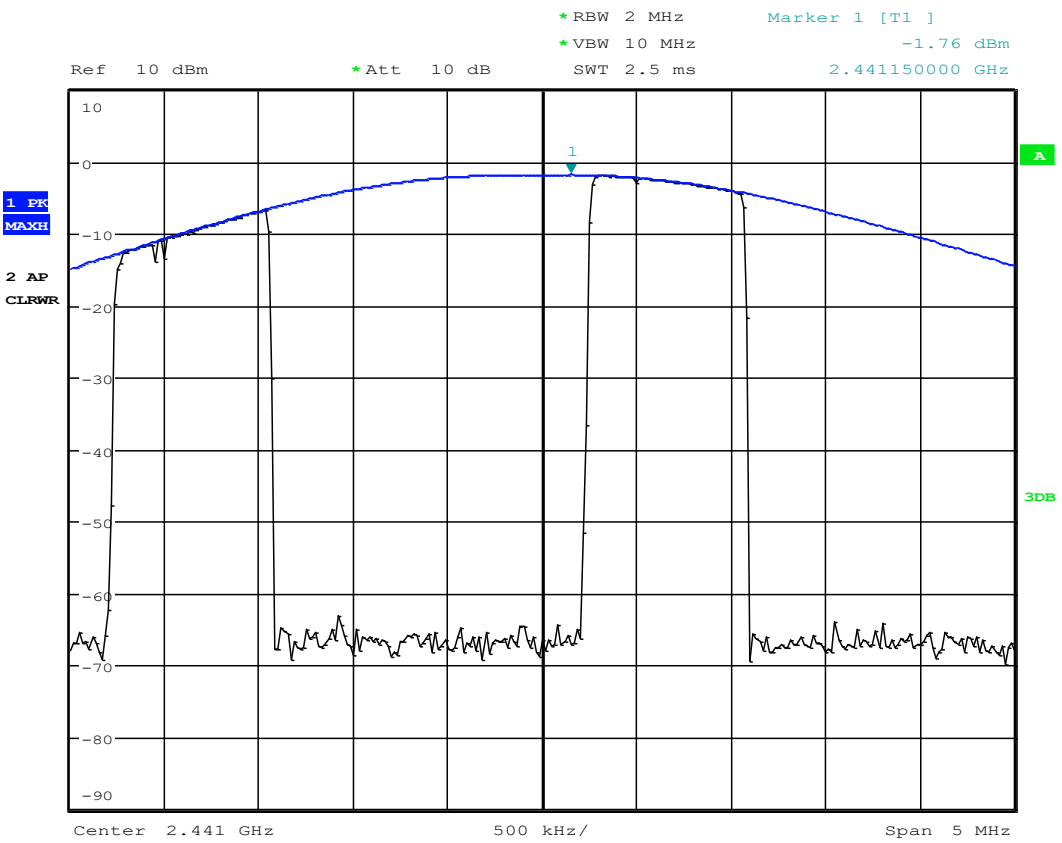
| Data Rate | Frequency | Raw Pk | Atten | Final Pk | Final Pk |
|---|---|---|---|---|---|
| | MHz | dBm | dB | dBm | mW |
| BDR DM1 | 2402 | -2.60 | 1.11 | -1.49 | 0.71 |
| BDR DM1 | 2441 | -1.76 | 1.04 | -0.72 | 0.85 |
| BDR DM1 | 2480 | -2.01 | 1.16 | -0.85 | 0.82 |
| BDR DM3 | 2402 | -2.59 | 1.11 | -1.48 | 0.71 |
| BDR DM3 | 2441 | -1.75 | 1.04 | -0.71 | 0.85 |
| BDR DM3 | 2480 | -2.02 | 1.16 | -0.86 | 0.82 |
| BDR DH3 | 2402 | -2.61 | 1.11 | -1.50 | 0.71 |
| BDR DH3 | 2441 | -1.71 | 1.04 | -0.67 | 0.86 |
| BDR DH3 | 2480 | -2.02 | 1.16 | -0.86 | 0.82 |
| BDR DM5 | 2402 | -2.61 | 1.11 | -1.50 | 0.71 |
| BDR DM5 | 2441 | -1.77 | 1.04 | -0.73 | 0.84 |
| BDR DM5 | 2480 | -2.00 | 1.16 | -0.84 | 0.82 |
| BDR DH5 | 2402 | -2.59 | 1.11 | -1.48 | 0.71 |
| BDR DH5 | 2441 | -1.74 | 1.04 | -0.70 | 0.85 |
| BDR DH5 | 2480 | -2.03 | 1.16 | -0.87 | 0.82 |
| EDR DM1 | 2402 | -4.59 | 1.11 | -3.48 | 0.45 |
| EDR DM1 | 2441 | -3.23 | 1.04 | -2.19 | 0.60 |
| EDR DM1 | 2480 | -3.22 | 1.16 | -2.06 | 0.62 |
| EDR 2-DH3 | 2402 | -3.98 | 1.11 | -2.87 | 0.52 |
| EDR 2-DH3 | 2441 | -2.54 | 1.04 | -1.50 | 0.71 |
| EDR 2-DH3 | 2480 | -2.68 | 1.16 | -1.52 | 0.71 |
| EDR 3-DH3 | 2402 | -3.68 | 1.11 | -2.57 | 0.55 |
| EDR 3-DH3 | 2441 | -2.40 | 1.04 | -1.36 | 0.73 |
| EDR 3-DH3 | 2480 | -2.58 | 1.16 | -1.42 | 0.72 |
| EDR 2-DH5 | 2402 | -3.99 | 1.11 | -2.88 | 0.52 |
| EDR 2-DH5 | 2441 | -2.57 | 1.04 | -1.53 | 0.70 |
| EDR 2-DH5 | 2480 | -2.72 | 1.16 | -1.56 | 0.70 |
| EDR 3-DH5 | 2402 | -3.68 | 1.11 | -2.57 | 0.55 |
| EDR 3-DH5 | 2441 | -2.40 | 1.04 | -1.36 | 0.73 |
| EDR 3-DH5 | 2480 | -2.57 | 1.16 | -1.41 | 0.72 |

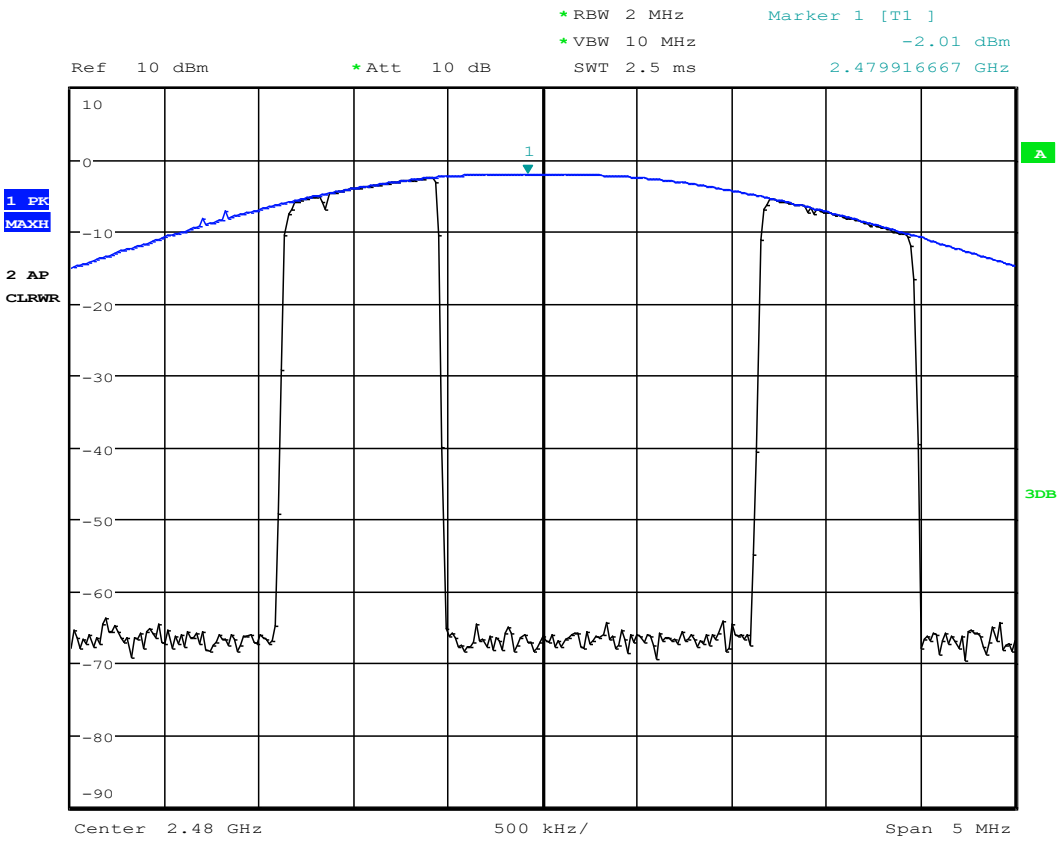
Final Pk = Raw Pk + Atten

Maximum Output Power: -0.67 dBm, 0.86 mW

## Sample Plots [BDR DM1]




*RBW 2 MHz
*VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1 ]
-2.01 dBm
2.479916667 GHz
Ref 10 dBm
*Att 10 dB
1 PK
MAXH
2 AP
CLRWR
A
3DB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.48 GHz
500 kHz/
Span 5 MHz

# Carrier Frequency Separation

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/08/2021

## Test Procedure

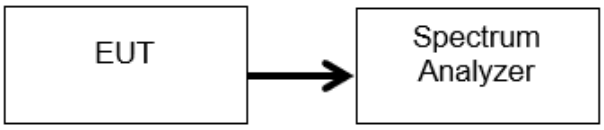
The test methods and settings of ANSI C63.10 Clause 7.8.2 were utilized to demonstrate compliance. The EUT was configured for BDR DM1 data rate during the test. Unmodulated frequency hopping was not possible.

Markers were placed on the channel peak levels and the marker delta function was used to record the frequency separation between two adjacent channels.

### Limit

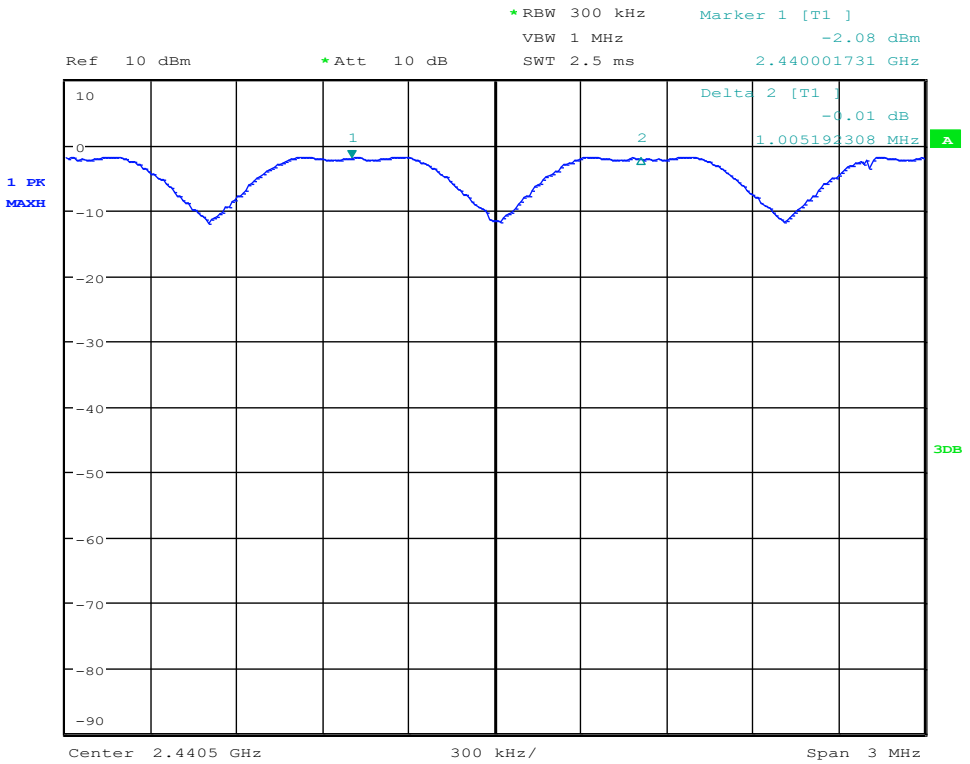
47 CFR 15.247(a)(1) & RSS 247 5.1.b.
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

## Test Setup




## Test Data

| Min 20 dB BW (MHz) | CFS (MHz) | Margin (MHz) | Result |
|---|---|---|---|
| 0.755 | 1.005 | -0.250 | Compliant |



# Number of Hopping Frequencies

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/08/21

## Test Procedure

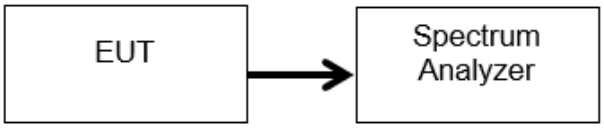
The test methods of ANSI C63.10 Clause 7.8.3 were utilized to demonstrate compliance. The EUT was configured for BDR DM1 with hopping during this test.

The number of frequencies were manually counted.

### Limit

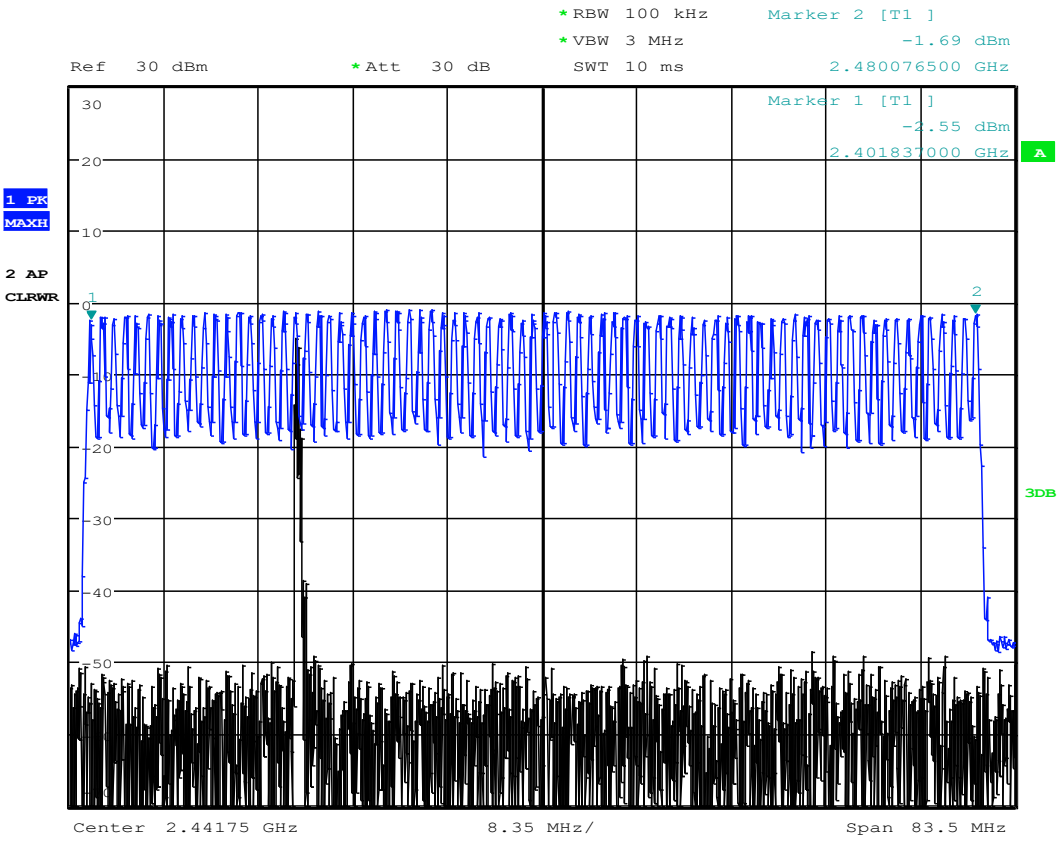
47 CFR 15.247(a)(1)(iii) & RSS 247 5.1.d.
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

## Test Setup




## Test Data

Number of Hopping Frequencies: 79



# Time of Occupancy (Dwell Time)

**Engineer:** Aaron S. Froehlich
**Test Date:** 10/18/21

## Test Procedure

The method of ANSI C63.10 Clause 7.8.4 was used to demonstrate compliance. Two measurements were made for each mode of operation. A short sweep to determine the transmit time per hop, followed by a longer sweep time to count the number of transmissions within the observation period. The number of hops in the longer sweep has been multiplied by the ratio of the requirement period to the sweep time. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

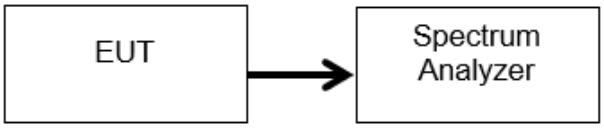
Video Triggering with a negative offset was utilized to allow accurate time domain measurements.

### Limit

47 CFR 15.247(a)(1)(iii)
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

$$Required\ Period = 0.4\ s \bullet 79\ channels = 31.6\ s$$

## Test Setup




## Test Data

### Tabular Data

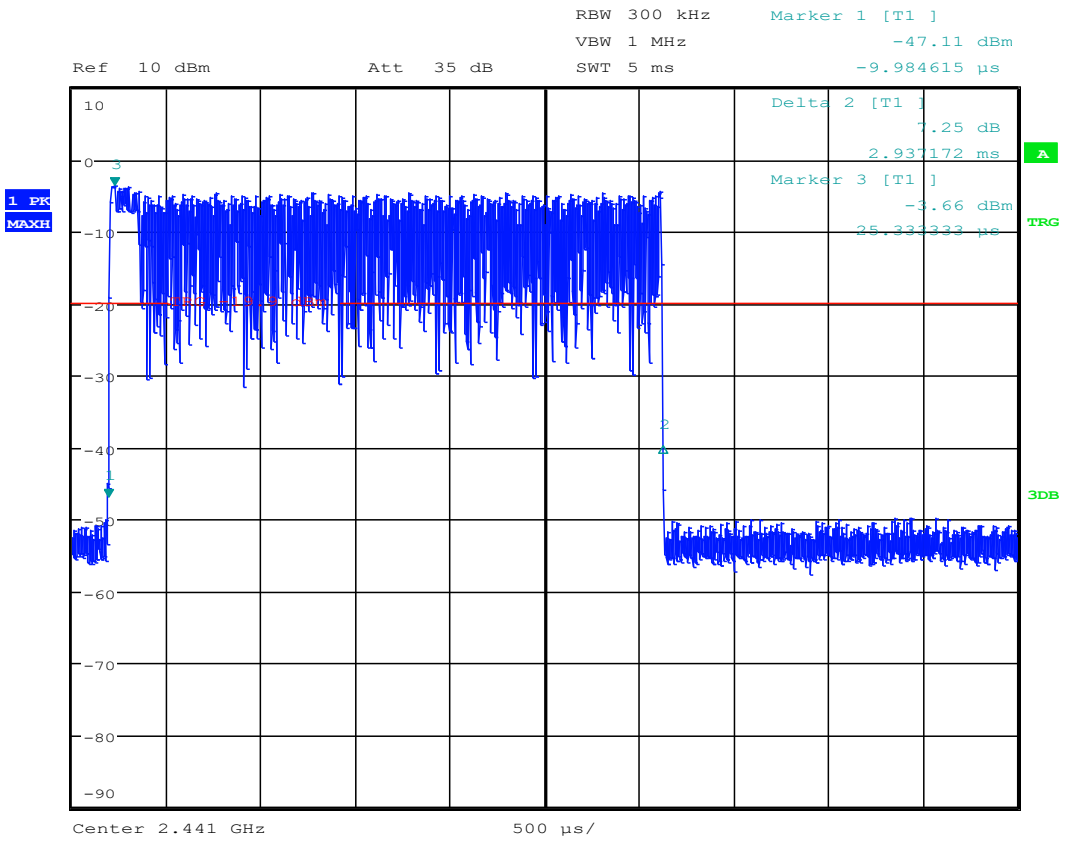
| Rate | Packet Type | Start Time (µS) | Stop Time (µS) | Duration (µS) | Hops Observed | Required Period (S) | Sweep Time (S) | Total Hops | Total Occupancy (mS) | Limit (mS) | Margin (mS) | Result |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BDR | DM1 | -9.9846 | 420.1846 | 430.1692 | 5 | 31.6 | 0.5 | 316 | 135.93 | 400 | -264.07 | Compliant |
| | DM3 | -9.9846 | 1678.197 | 1688.182 | 5 | 31.6 | 1 | 158 | 266.73 | 400 | -133.27 | Compliant |
| | DH3 | -9.9846 | 1678.197 | 1688.182 | 5 | 31.6 | 1 | 158 | 266.73 | 400 | -133.27 | Compliant |
| | DM5 | -9.9846 | 2926.274 | 2936.259 | 7 | 31.6 | 2 | 110.6 | 324.75 | 400 | -75.25 | Compliant |
| | DH5 | -9.9846 | 2926.274 | 2936.259 | 7 | 31.6 | 2 | 110.6 | 324.75 | 400 | -75.25 | Compliant |
| EDR | DM1 | -9.9846 | 413.1333 | 423.1179 | 5 | 31.6 | 0.5 | 316 | 133.71 | 400 | -266.29 | Compliant |
| | 2-DH3 | -9.9846 | 1687.172 | 1697.157 | 5 | 31.6 | 1 | 158 | 268.15 | 400 | -131.85 | Compliant |
| | 3-DH3 | -9.9846 | 1687.172 | 1697.157 | 5 | 31.6 | 1 | 158 | 268.15 | 400 | -131.85 | Compliant |
| | 2-DH5 | -9.9846 | 2937.172 | 2947.157 | 4 | 31.6 | 1 | 126.4 | 372.52 | 400 | -27.48 | Compliant |
| | 3-DH5 | -9.9846 | 2937.172 | 2947.157 | 7 | 31.6 | 2 | 110.6 | 325.96 | 400 | -74.04 | Compliant |

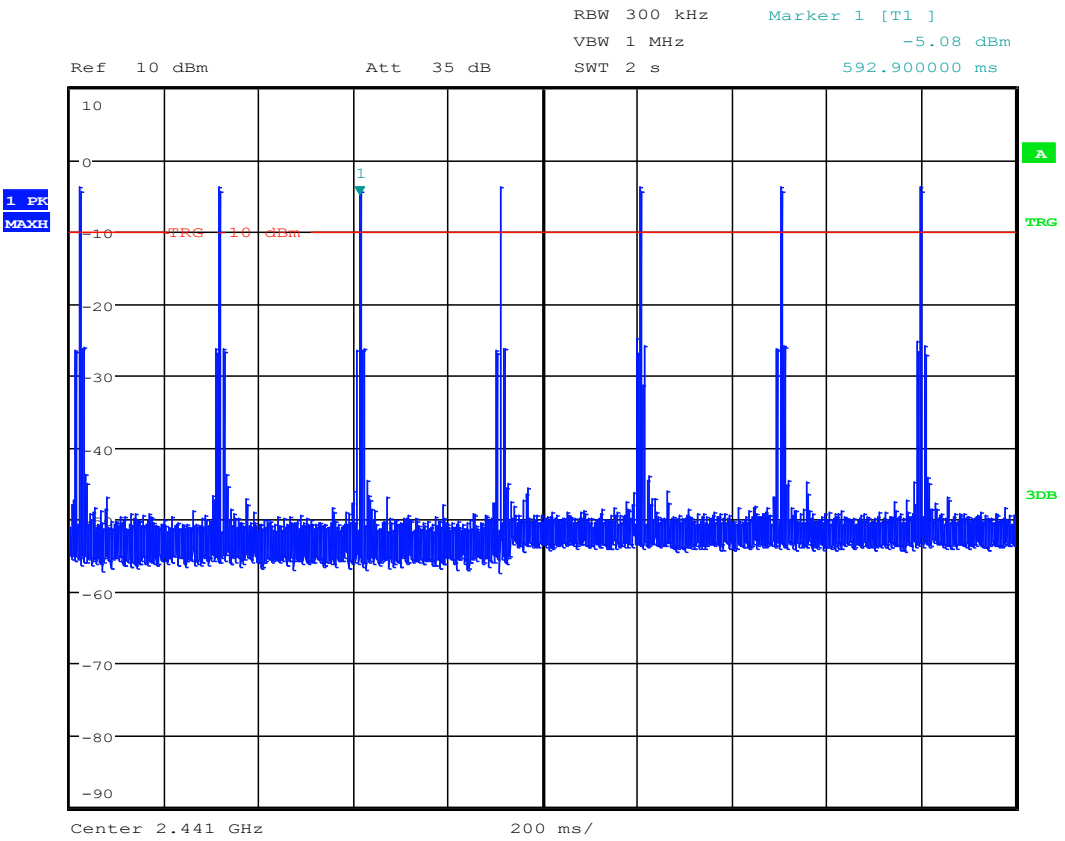
Duration = Stop Time – Start Time

Total Hops = Hops Observed • Required Period / Sweep Time

Total Occupancy = Duration • Total Hops

## Sample Plots [EDR 3-DH5]



# Duty Cycle

**Engineer:** Aaron S. Froehlich
**Test Date:** 10/22/21

## Test Procedure

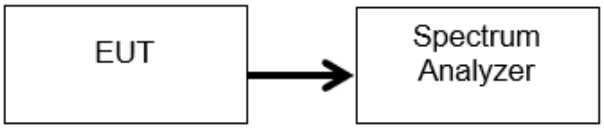
Duty Cycle was measured using the method of ANSI C63.10 Clause 11.6 option b.

### Limit

None – This data has been used to calculate Duty Cycle Correction Factors.

| | |
|---|---|
| Span | Zero Span |
| RBW | RBW ≥ OBW |
| VBW | ≥ RBW |
| Detector | Peak |

## Test Setup

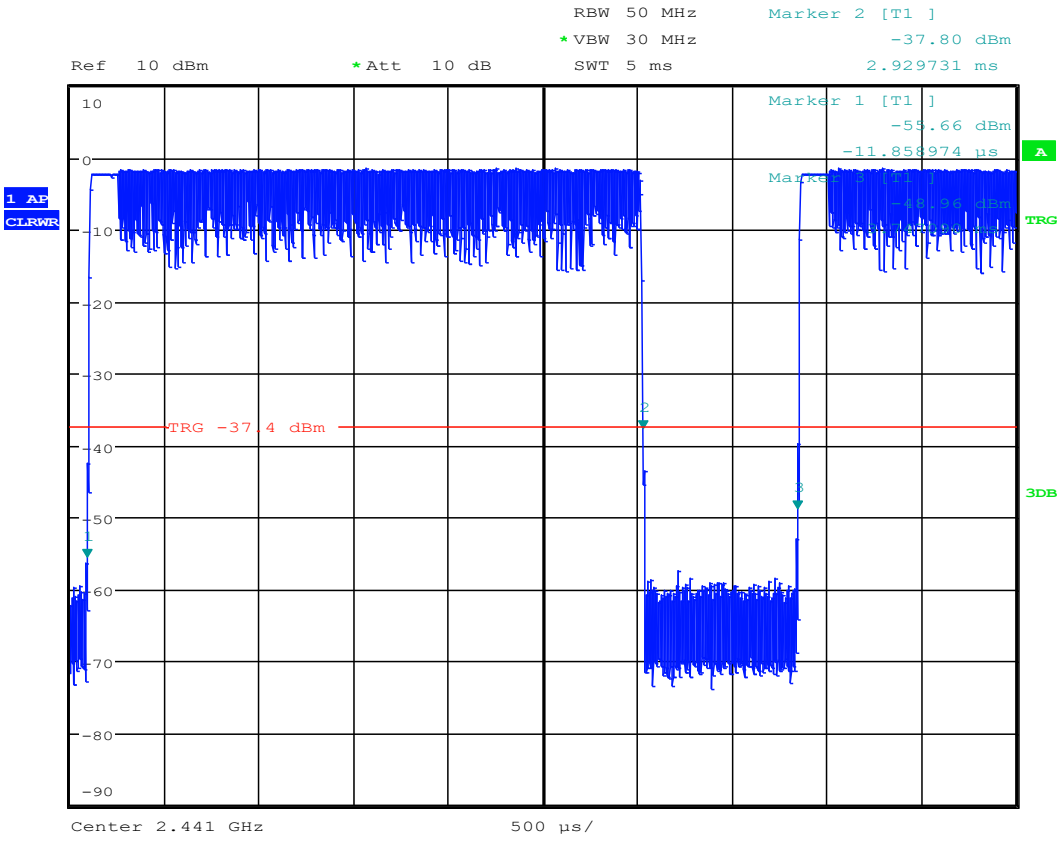



## Test Data

### Tabular Data

| Data Rate | Frequency | Tx On | Tx Off | On Time | Tx On 2 | Period | Duty Cycle |
|---|---|---|---|---|---|---|---|
| | MHz | s | s | s | s | s | % |
| BDR DM1 | 2441 | -11.9E-6 | 413.7E-6 | 425.6E-6 | 1.2E-3 | 1.3E-3 | 34.0% |
| BDR DM3 | 2441 | -11.9E-6 | 1.7E-3 | 1.7E-3 | 2.5E-3 | 2.5E-3 | 67.3% |
| BDR DH3 | 2441 | -11.9E-6 | 1.7E-3 | 1.7E-3 | 2.5E-3 | 2.5E-3 | 67.3% |
| BDR DM5 | 2441 | -11.9E-6 | 2.9E-3 | 2.9E-3 | 3.7E-3 | 3.8E-3 | 78.0% |
| BDR DH5 | 2441 | -11.9E-6 | 2.9E-3 | 2.9E-3 | 3.7E-3 | 3.8E-3 | 78.0% |
| EDR DM1 | 2441 | -11.9E-6 | 405.7E-6 | 417.6E-6 | 1.2E-3 | 1.3E-3 | 33.4% |
| EDR 2-DH3 | 2441 | -11.9E-6 | 1.7E-3 | 1.7E-3 | 2.5E-3 | 2.5E-3 | 67.4% |
| EDR 3-DH3 | 2441 | -11.9E-6 | 1.7E-3 | 1.7E-3 | 2.5E-3 | 2.5E-3 | 67.4% |
| EDR 2-DH5 | 2441 | -11.9E-6 | 2.9E-3 | 2.9E-3 | 3.7E-3 | 3.8E-3 | 78.3% |
| EDR 3-DH5 | 2441 | -11.9E-6 | 2.9E-3 | 2.9E-3 | 3.7E-3 | 3.8E-3 | 78.3% |

## Sample Plot [EDR 2-DH5]



# Emissions at Band Edges

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/01/21

## Test Procedure

Clause 7.8.6 of ANSI C63.10 directs the use of the methods of Clause 6.10 for Band Edge measurements of DSS devices, in both single channel and hopping modes of operation. The relative method of Clause 6.10.4 was used to demonstrate Band Edge Compliance with the 2400-2483.5 MHz Band.

Additionally, the method of Clause 6.10.5.2 was used to demonstrate Restricted-Band Band-Edge for the adjacent 2310-2390 MHz, and 2483.5-2500 MHz bands.

Both measurements were made using antenna port conducted measurements. The Restricted-Band Band-Edge data has been converted into equivalent radiated field strengths using the equation of Clause 11.12.2.2, as a reference level offset (CF). Per Clause 11.12.2.6 a minimum antenna gain (AG) of 2 dBi has been applied. Finally, duty cycle correction factors (DCCF) and worst case cable losses (CL) were also accounted for in the final Reference Level offset. Peak compliance has been demonstrated with a Max Hold on trace 1; Average compliance with an RMS detector averaged over 100 sweeps of Trace 2.

**RB BE Offset Calculations**

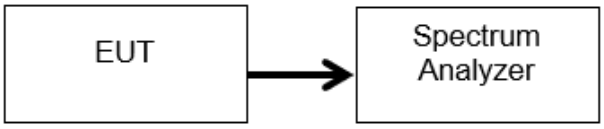
| Data Rate | CF dB | CL dB | DCCF dB | AG dBi | Offset dB |
|---|---|---|---|---|---|
| BDR DM1 | -11.742 | 2.450 | 4.683 | 2.000 | -2.610 |
| BDR DM3 | -11.742 | 2.450 | 1.719 | 2.000 | -5.574 |
| BDR DH3 | -11.742 | 2.450 | 1.719 | 2.000 | -5.574 |
| BDR DM5 | -11.742 | 2.450 | 1.079 | 2.000 | -6.213 |
| BDR DH5 | -11.742 | 2.450 | 1.079 | 2.000 | -6.213 |
| EDR DM1 | -11.742 | 2.450 | 4.765 | 2.000 | -2.527 |
| EDR 2-DH3 | -11.742 | 2.450 | 1.714 | 2.000 | -5.579 |
| EDR 3-DH3 | -11.742 | 2.450 | 1.714 | 2.000 | -5.579 |
| EDR 2-DH5 | -11.742 | 2.450 | 1.065 | 2.000 | -6.228 |
| EDR 3-DH5 | -11.742 | 2.450 | 1.065 | 2.000 | -6.228 |

CF = -20 • Log10(D) + 104.8
Where D = 3 meters
DCCF = 10 •Log10(1/Duty Cycle)
Offset = CF + CL + DCCF + AG

## Limits

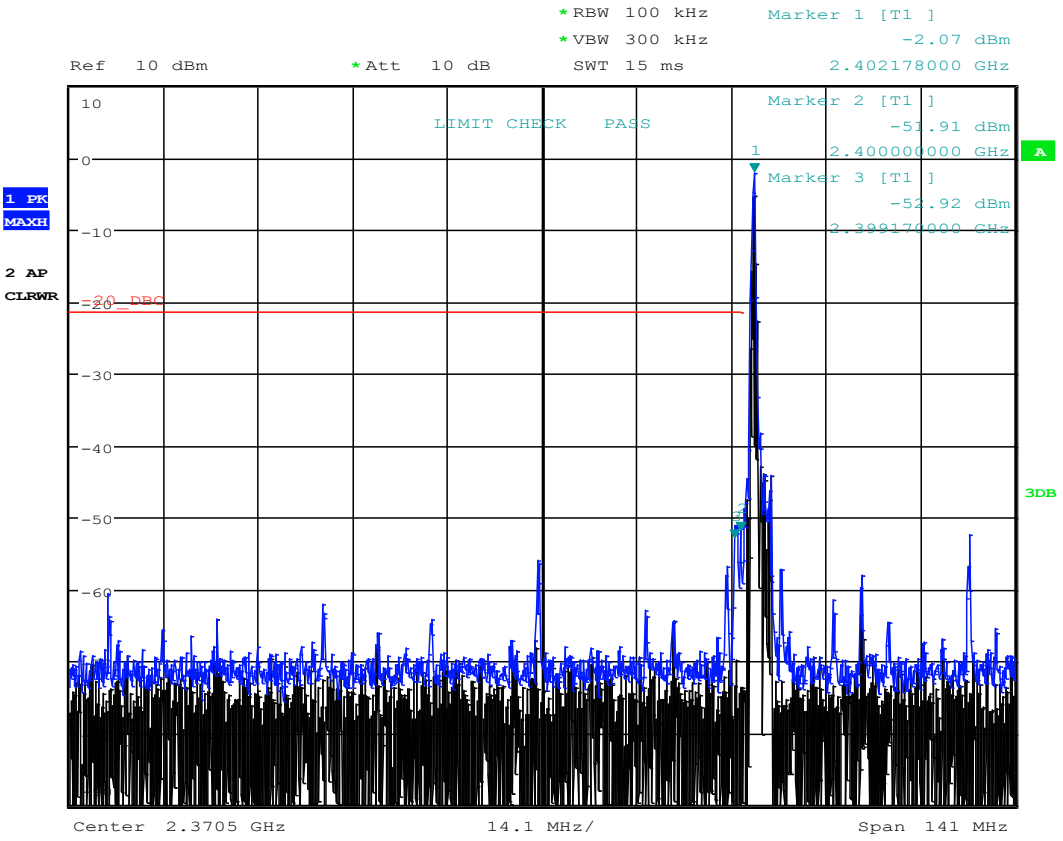
47 CFR 15.247(d) & RSS 247 Section 5.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

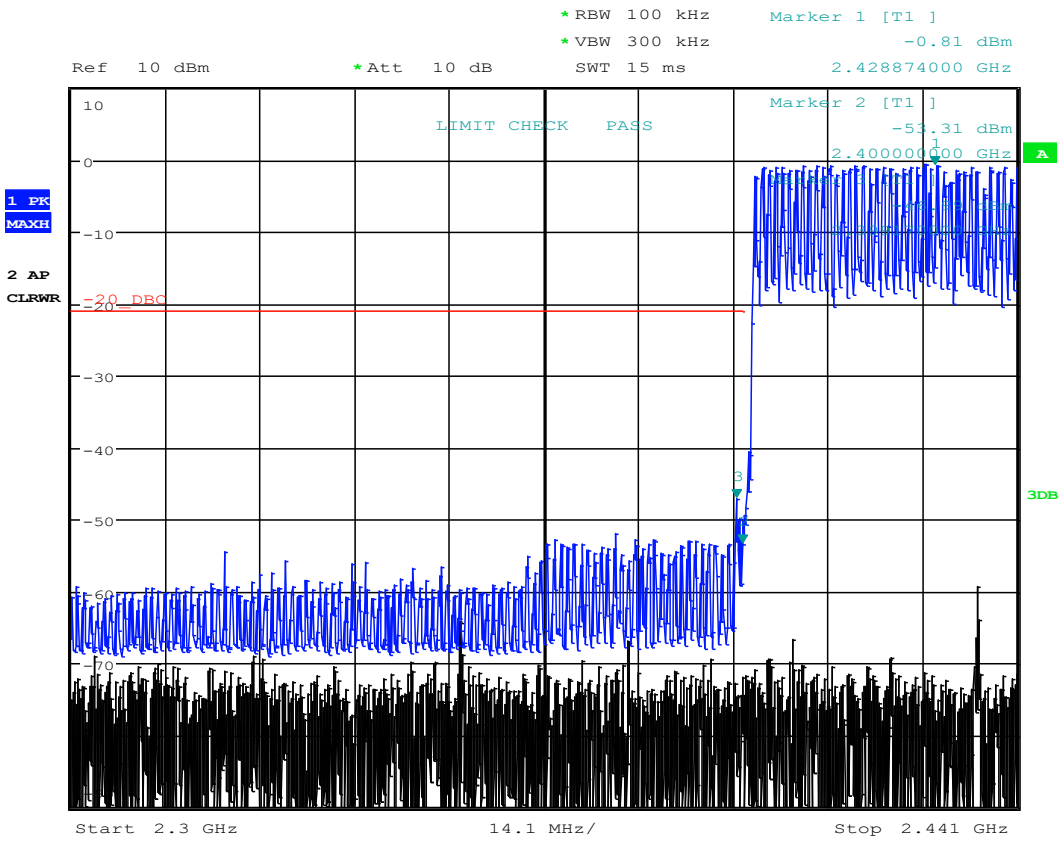
## Test Setup

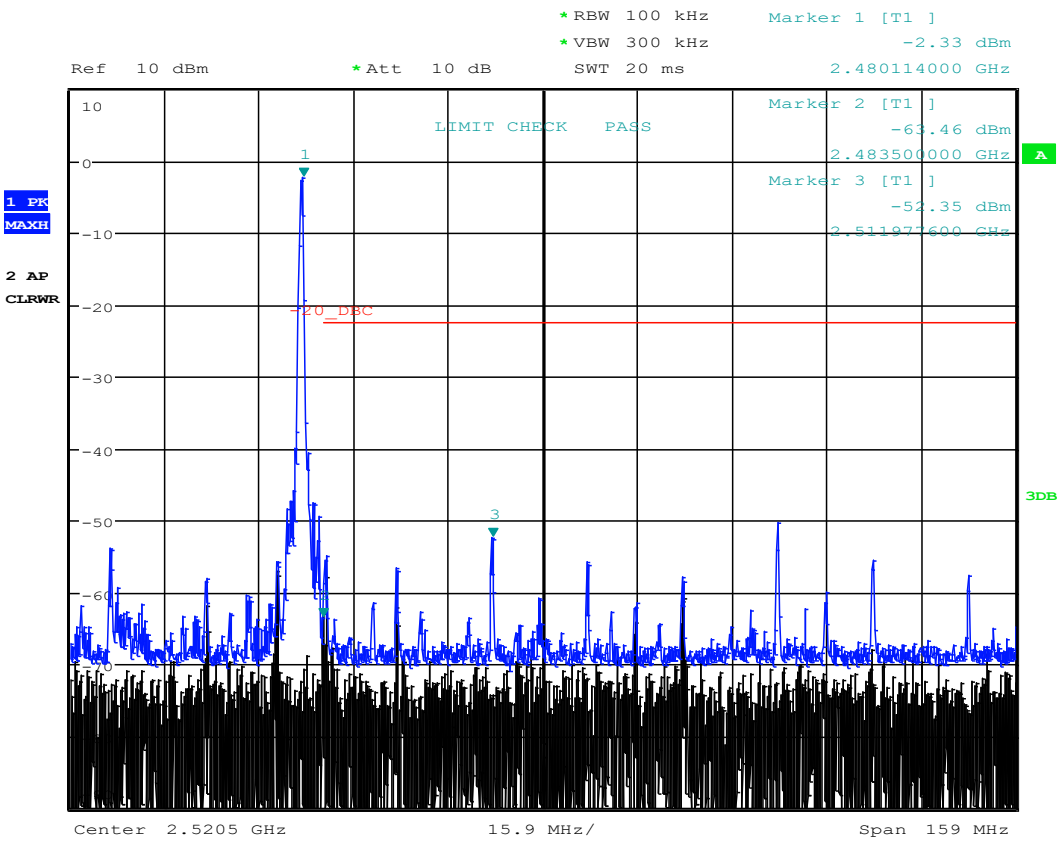


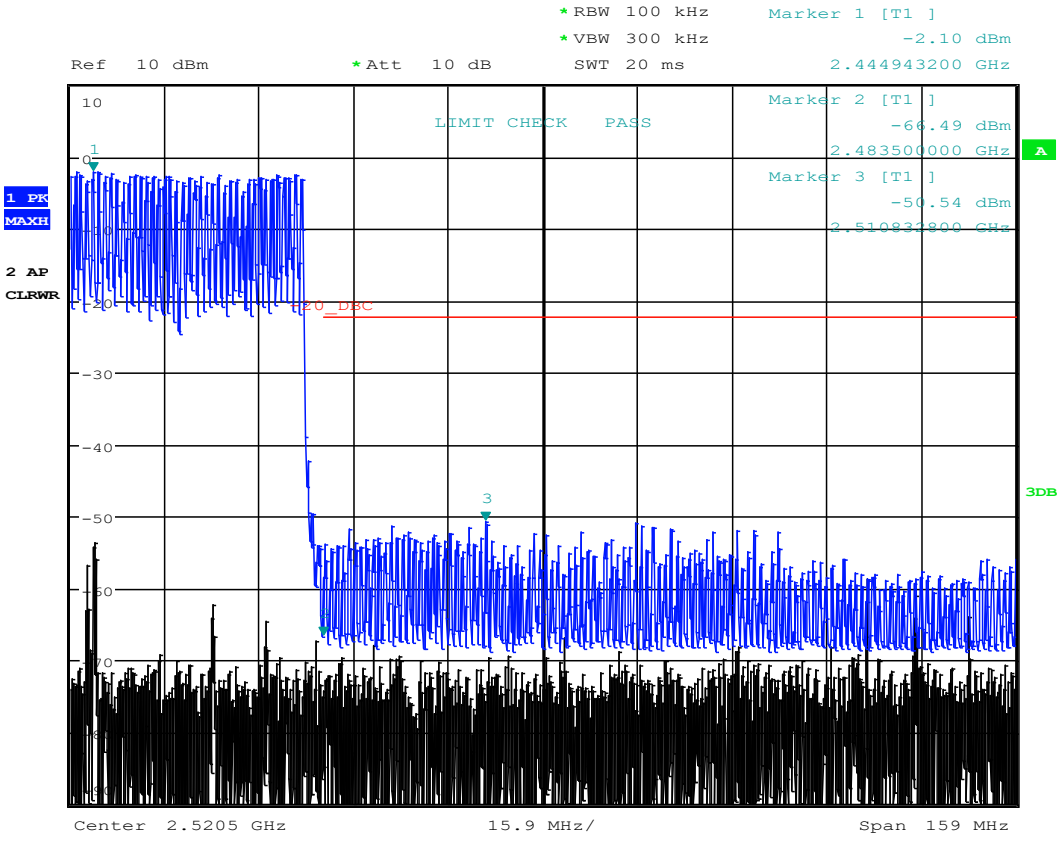
# Band Edge Test Data

## BDR DM1

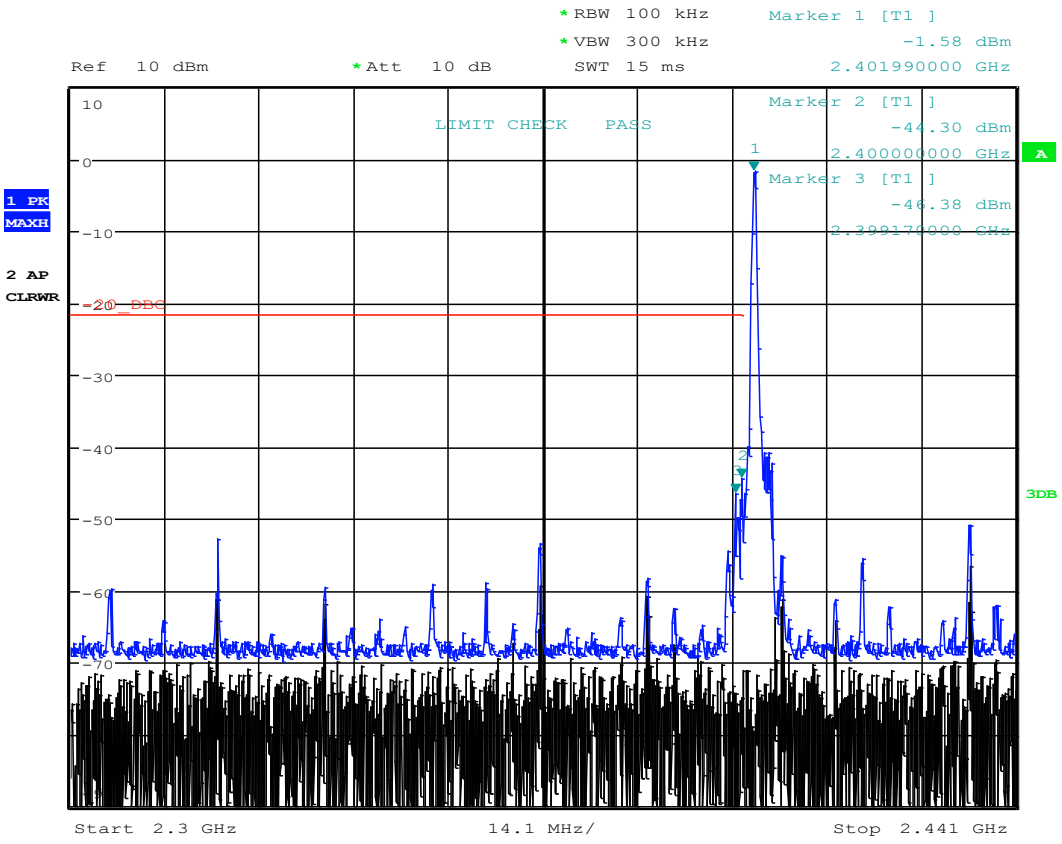


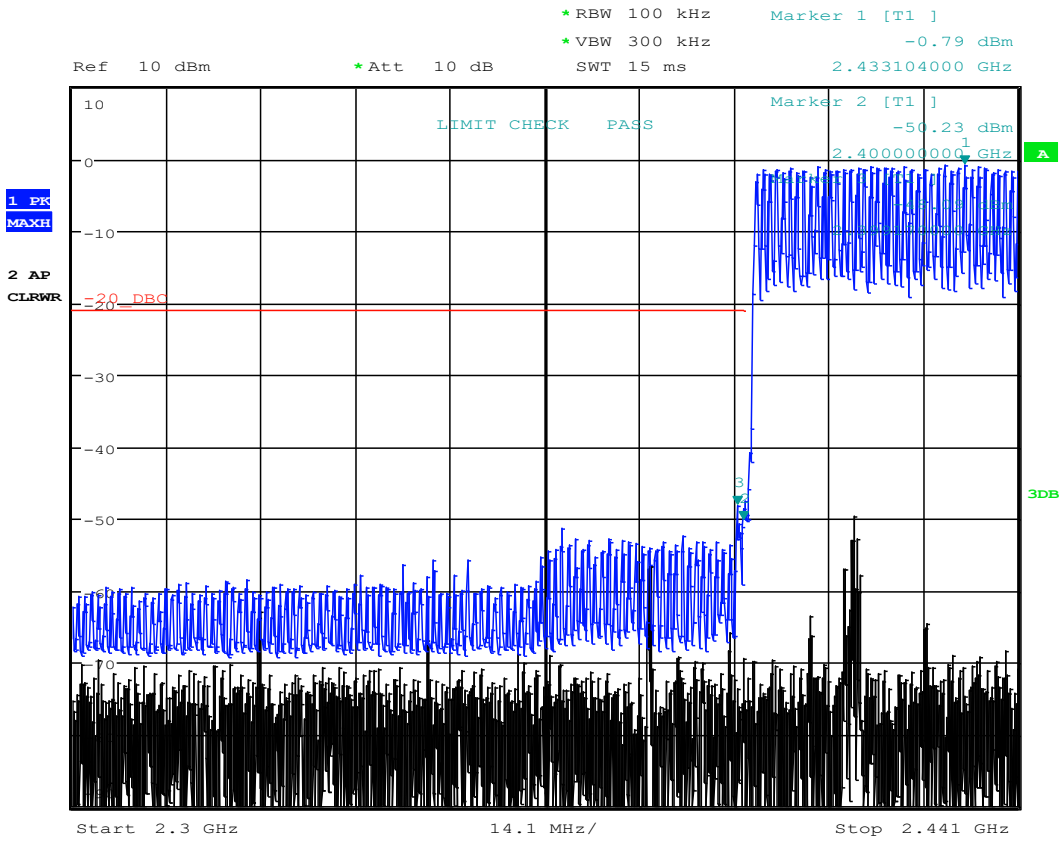



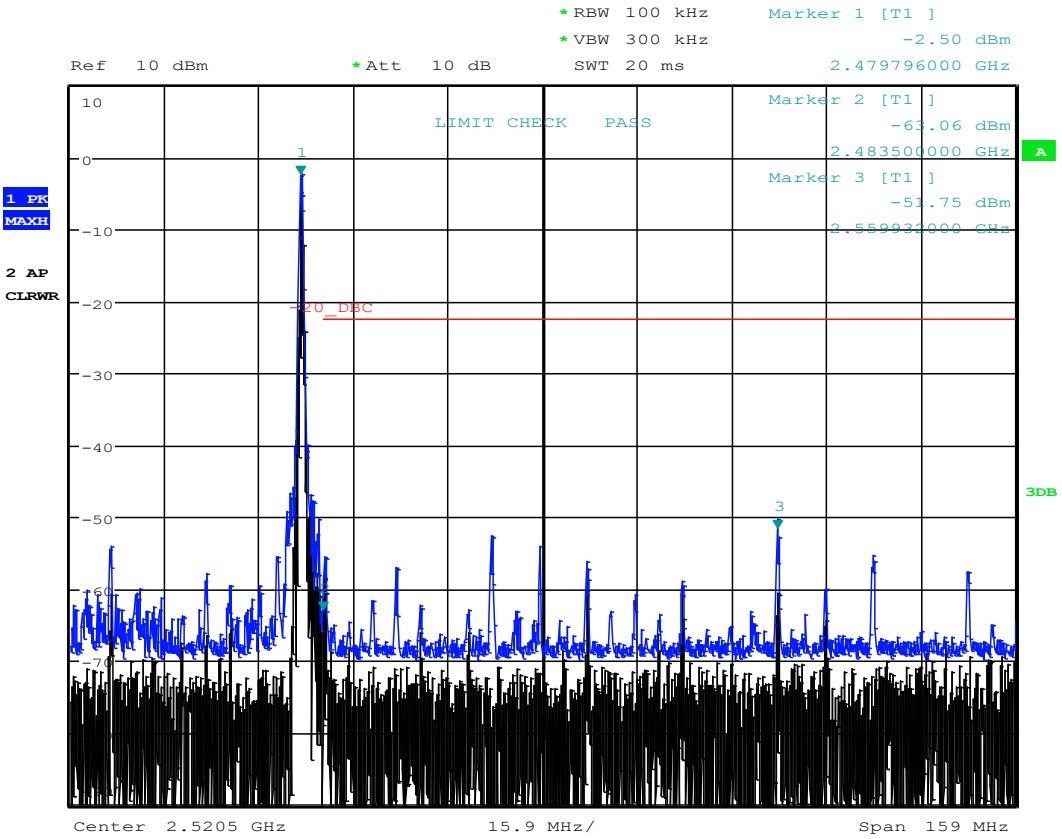

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.33 dBm
2.480114000 GHz
Marker 2 [T1 ]
-63.46 dBm
2.483500000 GHz
Marker 3 [T1 ]
-52.35 dBm
2.511977600 GHz
LIMIT CHECK PASS
-20 DBC
1 PK MAXH
2 AP CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

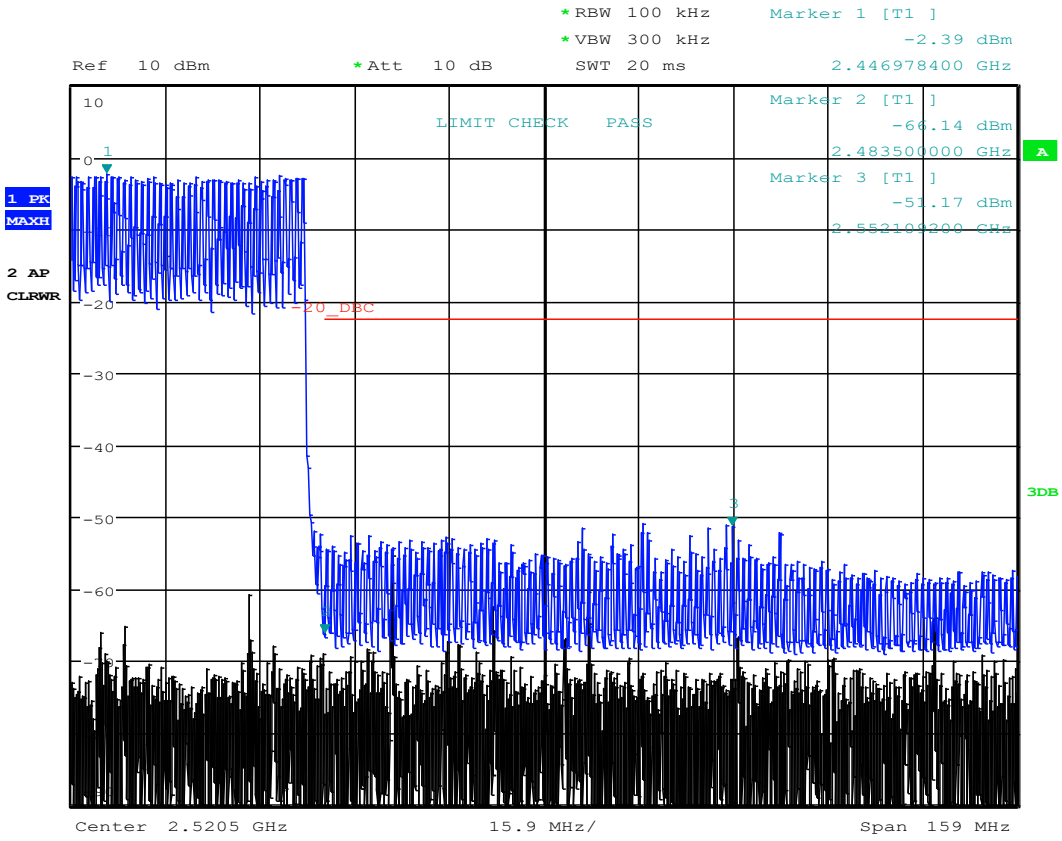

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.10 dBm
2.444943200 GHz
Marker 2 [T1 ]
-66.49 dBm
2.483500000 GHz
Marker 3 [T1 ]
-50.54 dBm
2.510837800 GHz
LIMIT CHECK PASS
-20 DBC
1 PK MAXH
2 AP CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## BDR DM3

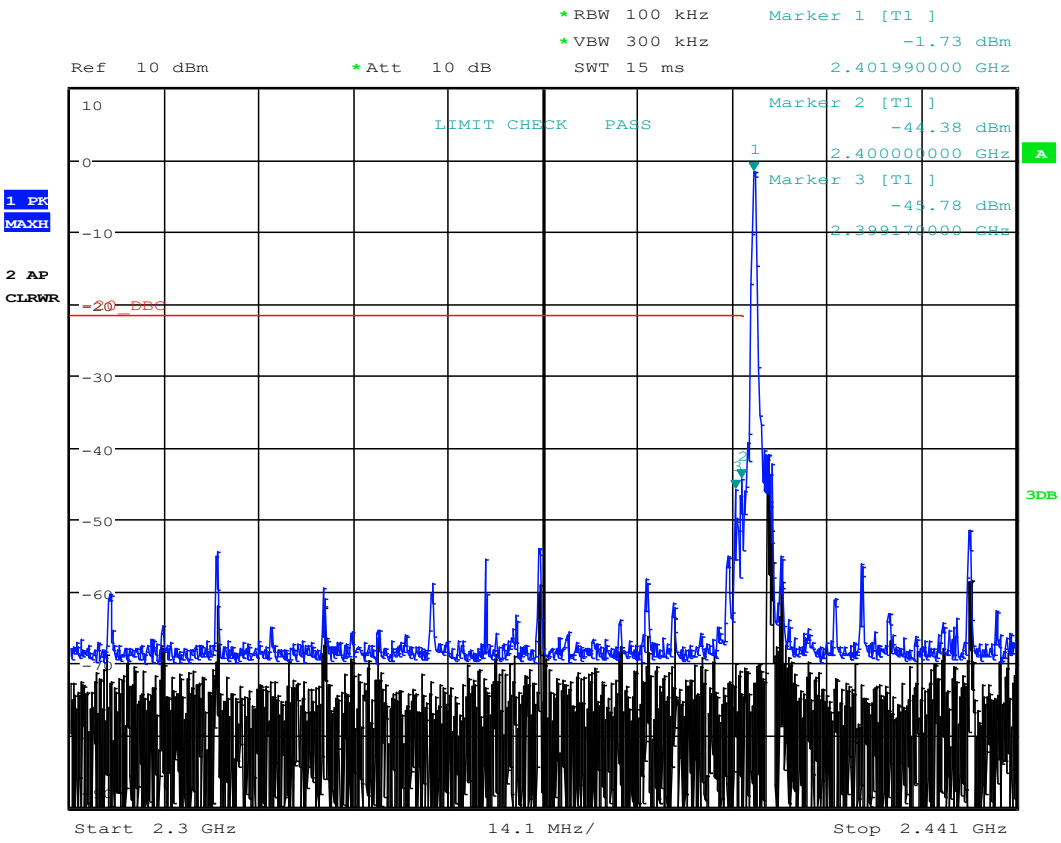

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.58 dBm
2.401990000 GHz
Marker 2 [T1 ]
-44.30 dBm
2.400000000 GHz
Marker 3 [T1 ]
-46.38 dBm
2.399170000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Start 2.3 GHz
14.1 MHz/
Stop 2.441 GHz

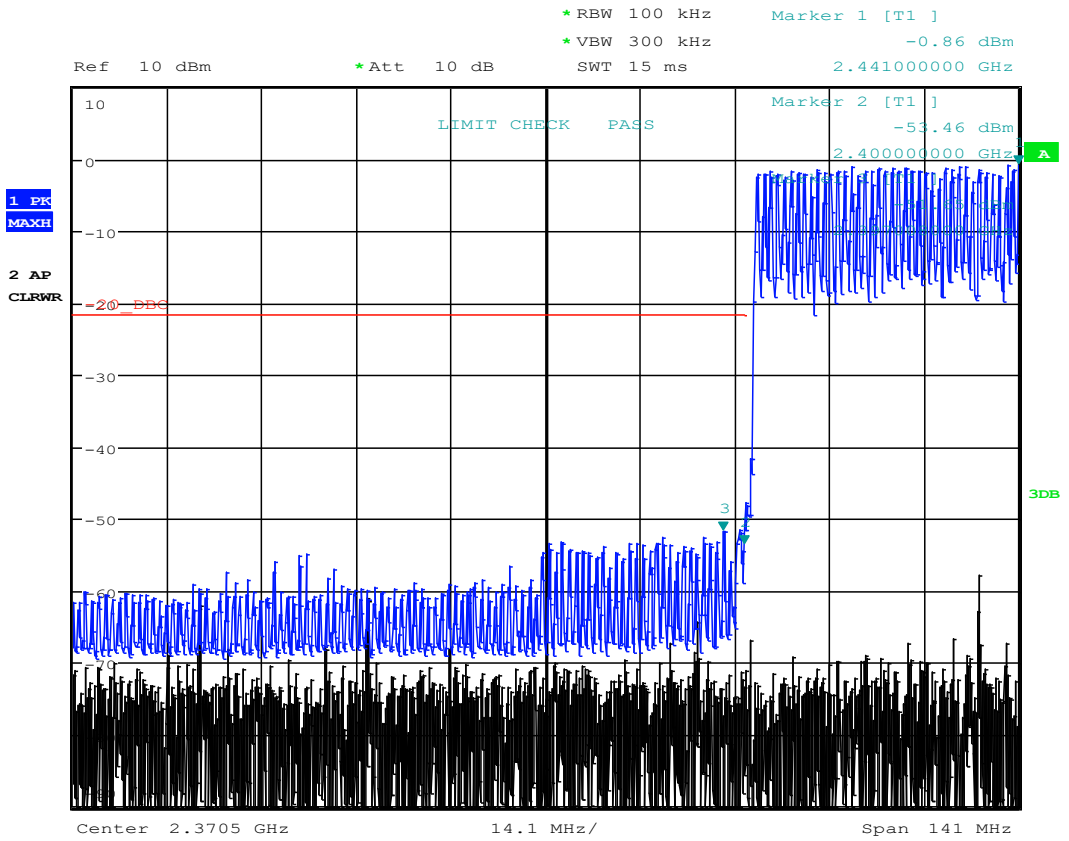

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-0.79 dBm
2.433104000 GHz
Marker 2 [T1 ]
-50.23 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Start 2.3 GHz
14.1 MHz/
Stop 2.441 GHz

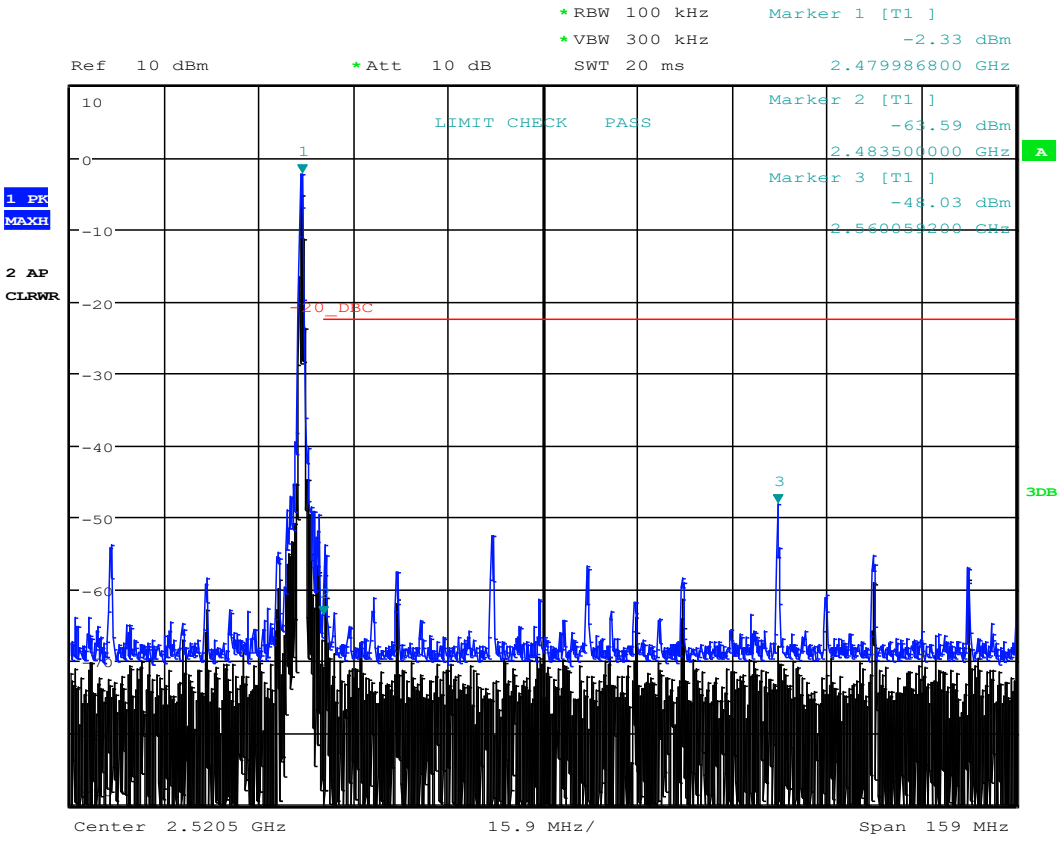

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.50 dBm
2.479796000 GHz
Marker 2 [T1 ]
-63.06 dBm
2.483500000 GHz
Marker 3 [T1 ]
-51.75 dBm
2.559932000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

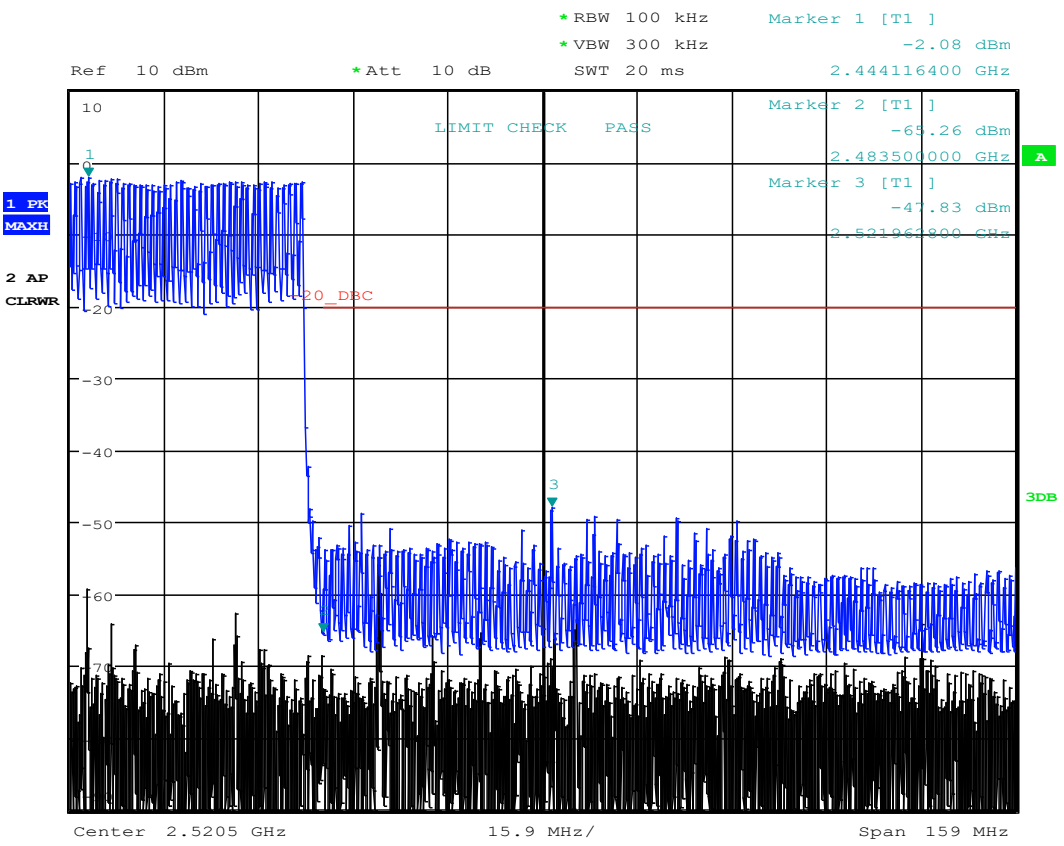

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.39 dBm
2.446978400 GHz
Marker 2 [T1 ]
-66.14 dBm
2.483500000 GHz
Marker 3 [T1 ]
-51.17 dBm
2.552100200 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## BDR DH3

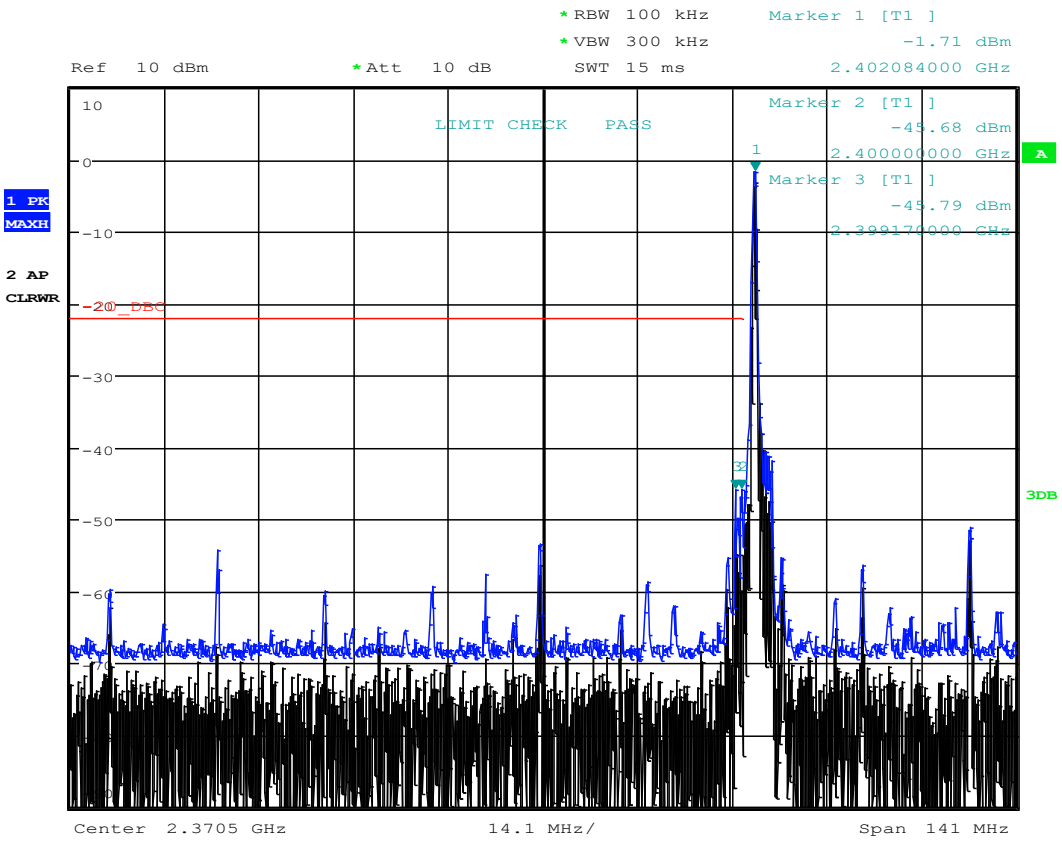

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.73 dBm
2.401990000 GHz
Marker 2 [T1 ]
-44.38 dBm
2.400000000 GHz
Marker 3 [T1 ]
-45.78 dBm
2.399170000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Start 2.3 GHz
14.1 MHz/
Stop 2.441 GHz

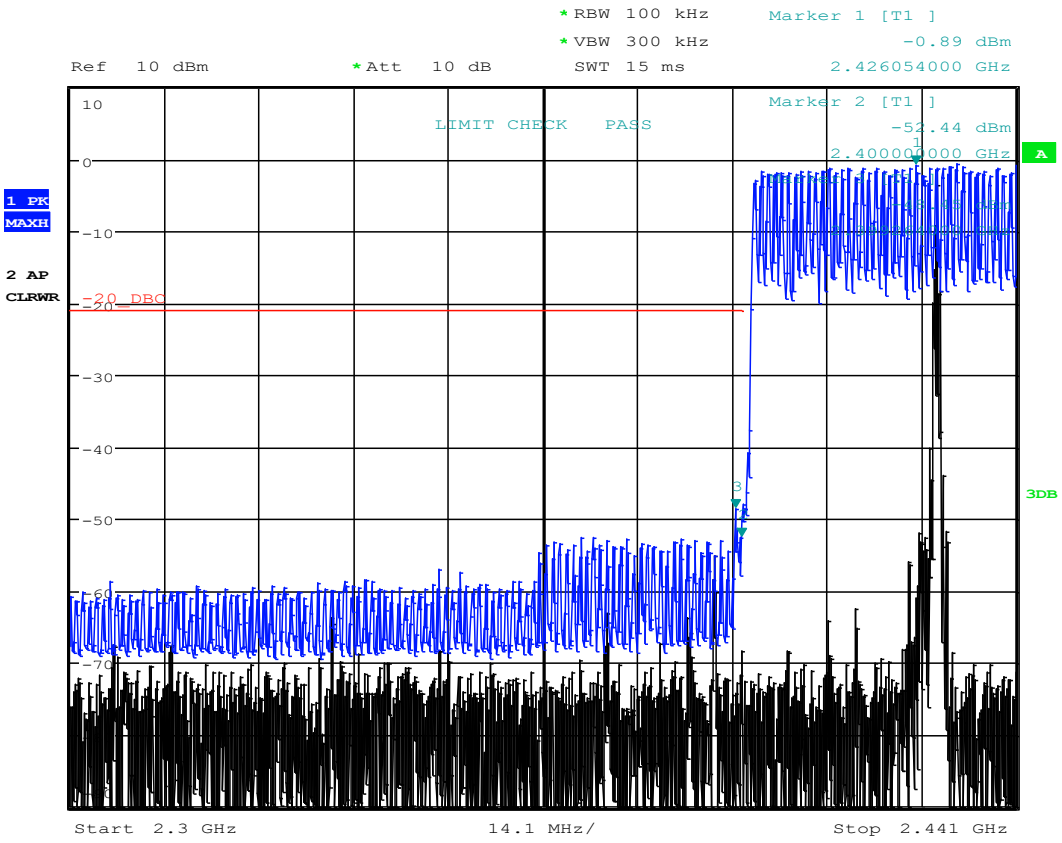

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-0.86 dBm
2.441000000 GHz
Marker 2 [T1 ]
-53.46 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

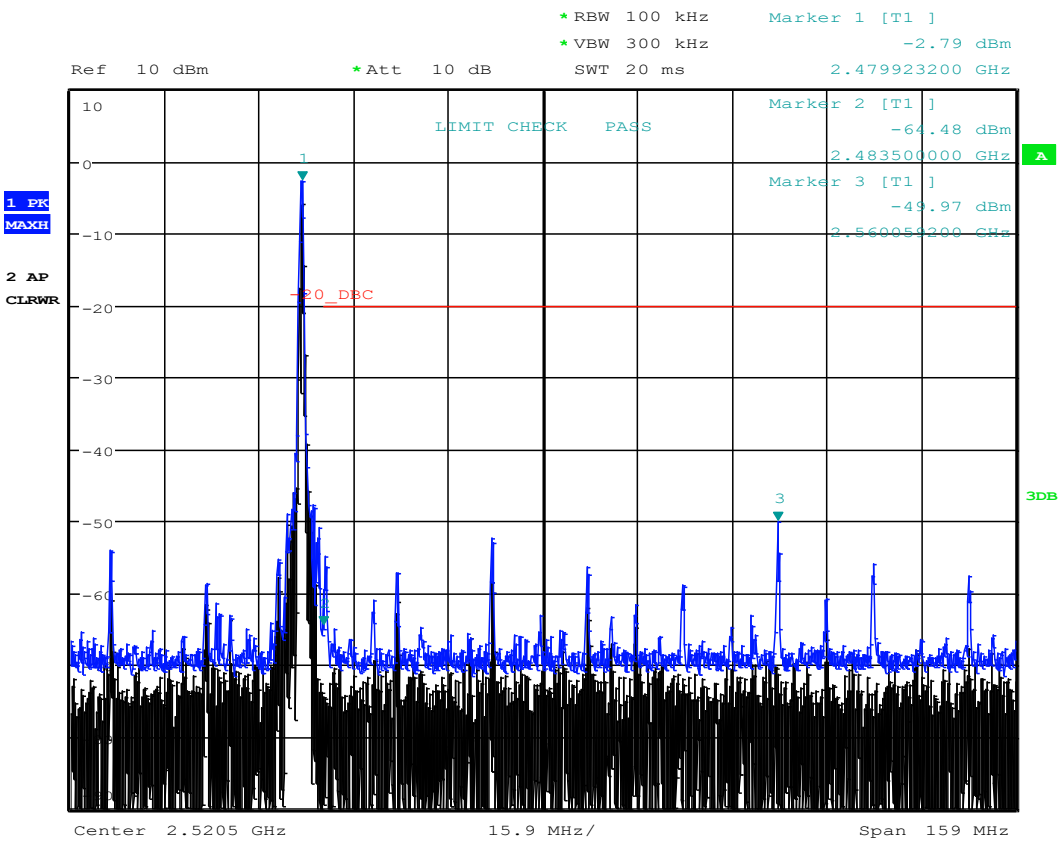

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.33 dBm
2.479986800 GHz
Marker 2 [T1 ]
-63.59 dBm
2.483500000 GHz
Marker 3 [T1 ]
-48.03 dBm
2.560059200 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

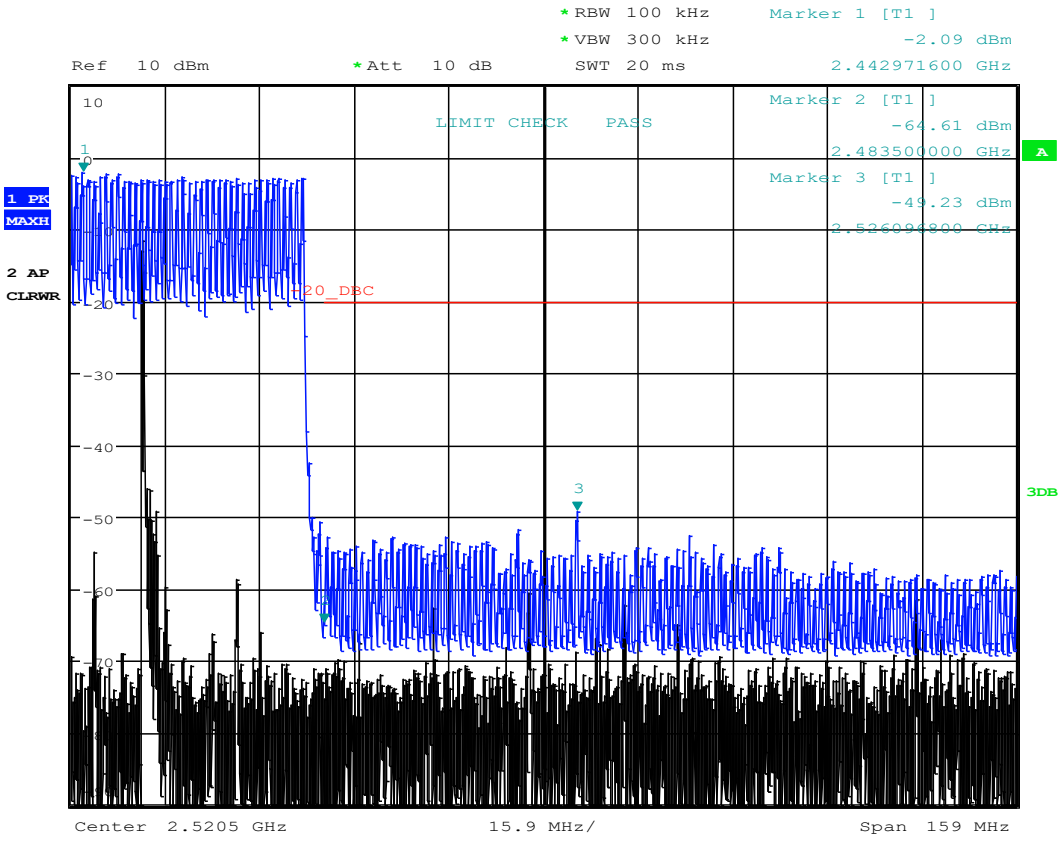

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.08 dBm
2.444116400 GHz
Marker 2 [T1 ]
-65.26 dBm
2.483500000 GHz
Marker 3 [T1 ]
-47.83 dBm
2.521962800 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## BDR DM5

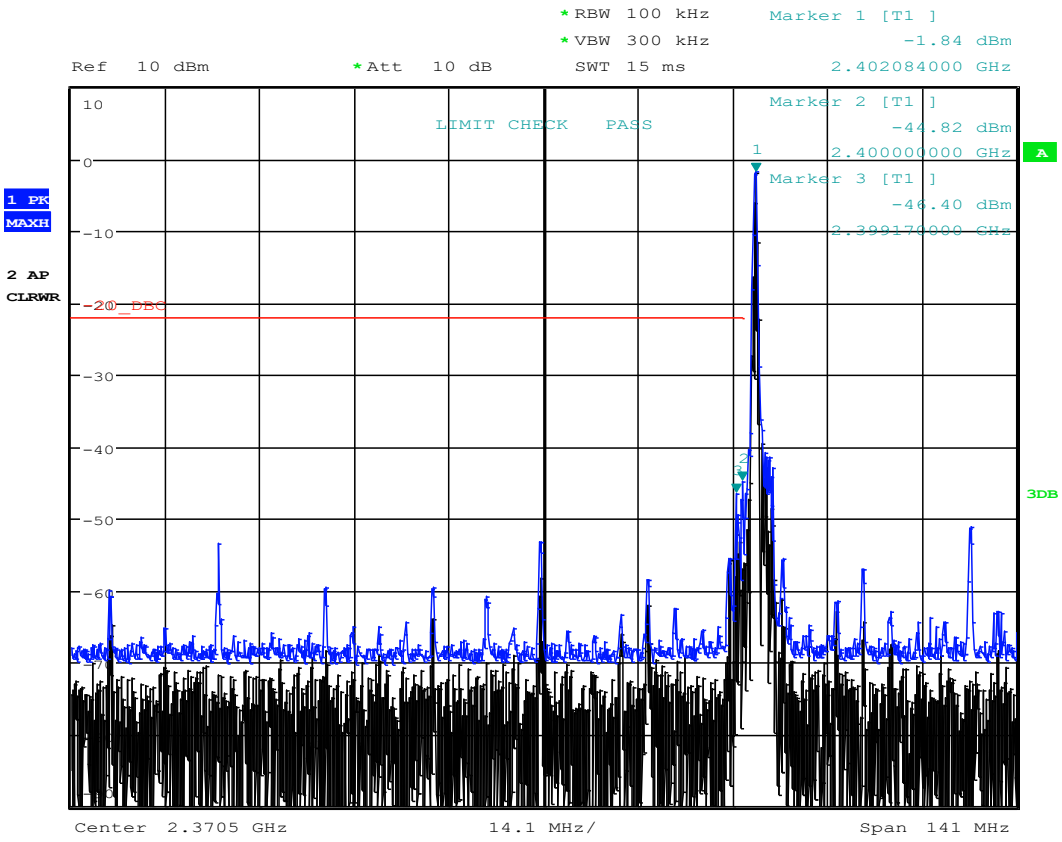

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.71 dBm
2.402084000 GHz
Marker 2 [T1 ]
-45.68 dBm
2.400000000 GHz
Marker 3 [T1 ]
-45.79 dBm
2.399170000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

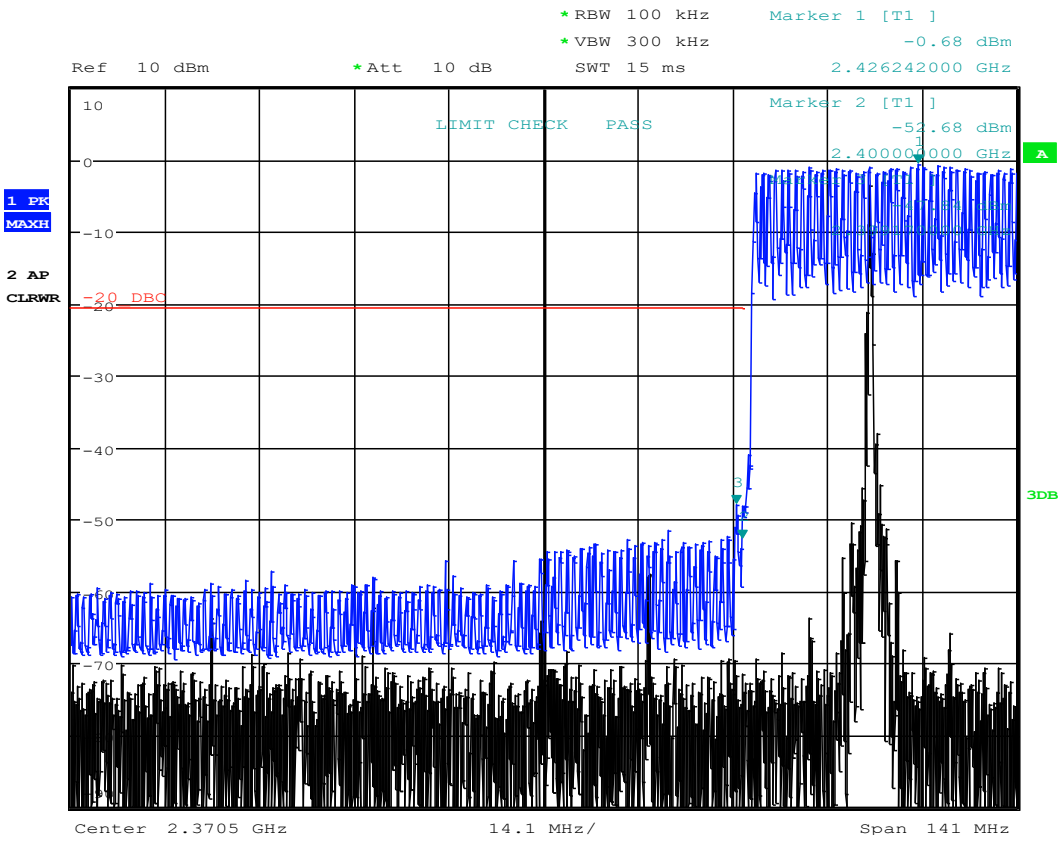

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-0.89 dBm
2.426054000 GHz
Marker 2 [T1 ]
-52.44 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Start 2.3 GHz
14.1 MHz/
Stop 2.441 GHz

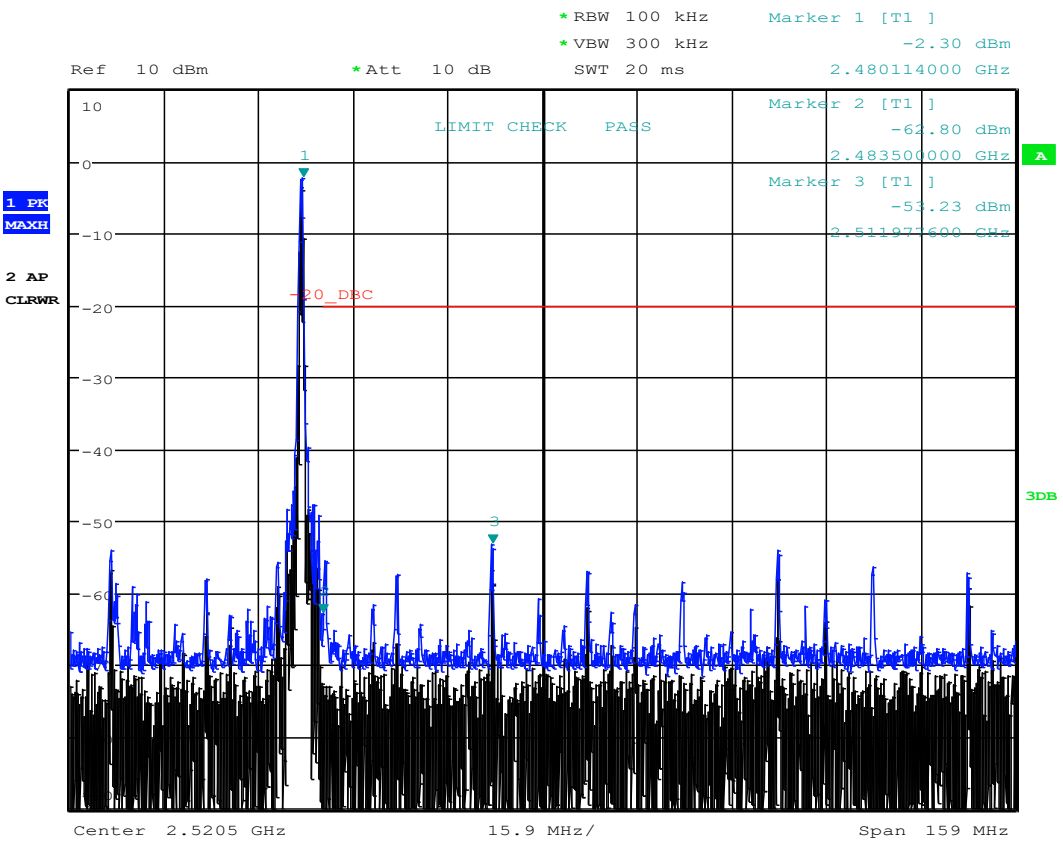

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.79 dBm
2.479923200 GHz
Marker 2 [T1 ]
-64.48 dBm
2.483500000 GHz
Marker 3 [T1 ]
-49.97 dBm
2.560059200 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20_DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

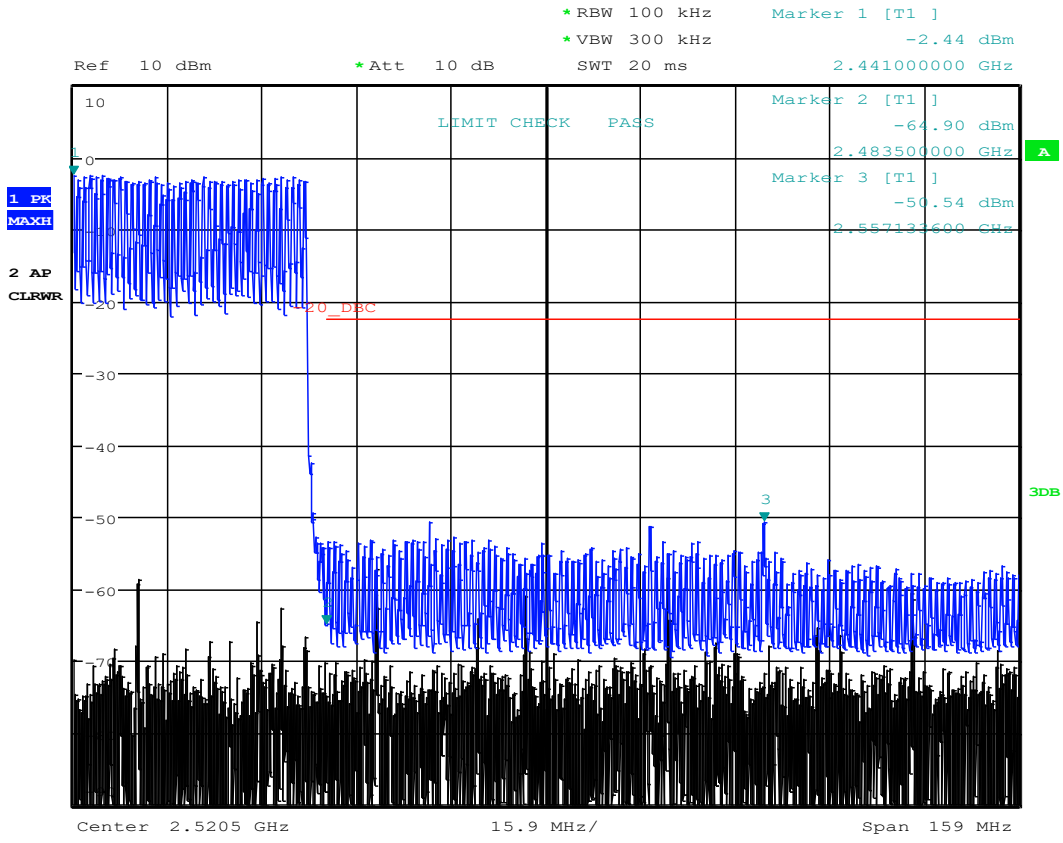

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.09 dBm
2.442971600 GHz
Marker 2 [T1 ]
-64.61 dBm
2.483500000 GHz
Marker 3 [T1 ]
-49.23 dBm
2.526096800 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20_DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## BDR DH5

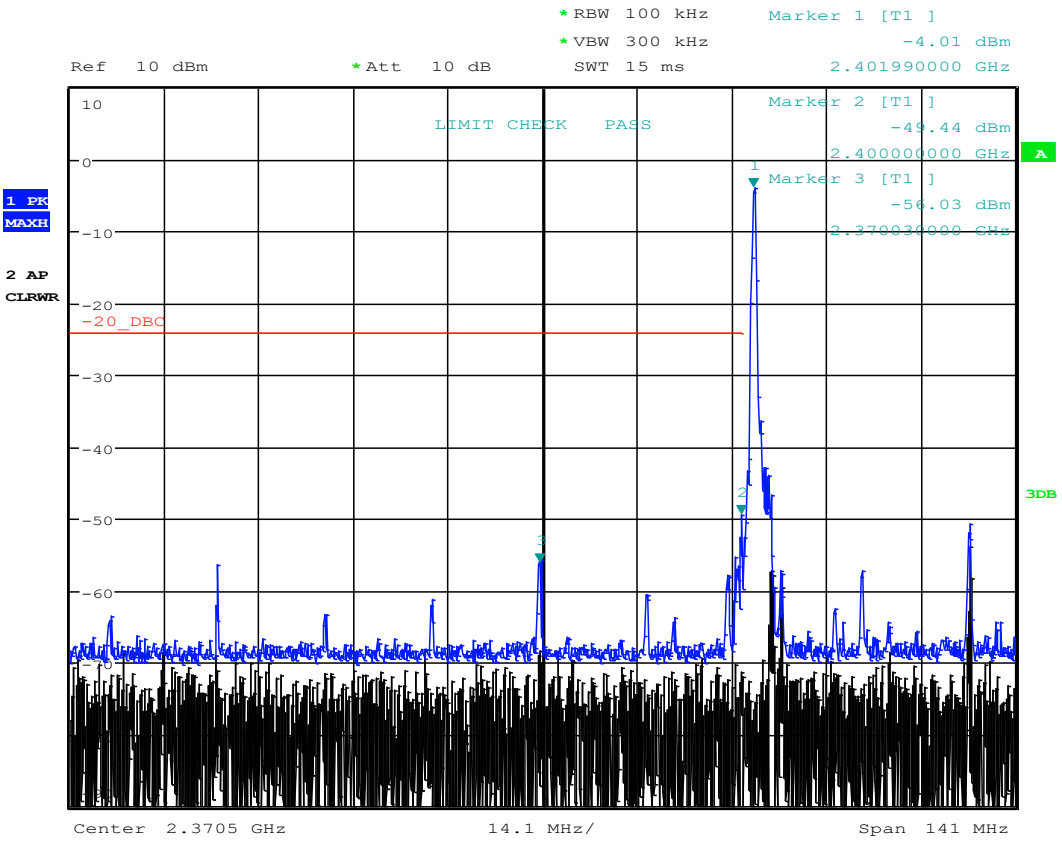

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.84 dBm
2.402084000 GHz
Marker 2 [T1 ]
-44.82 dBm
2.400000000 GHz
Marker 3 [T1 ]
-46.40 dBm
2.399170000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

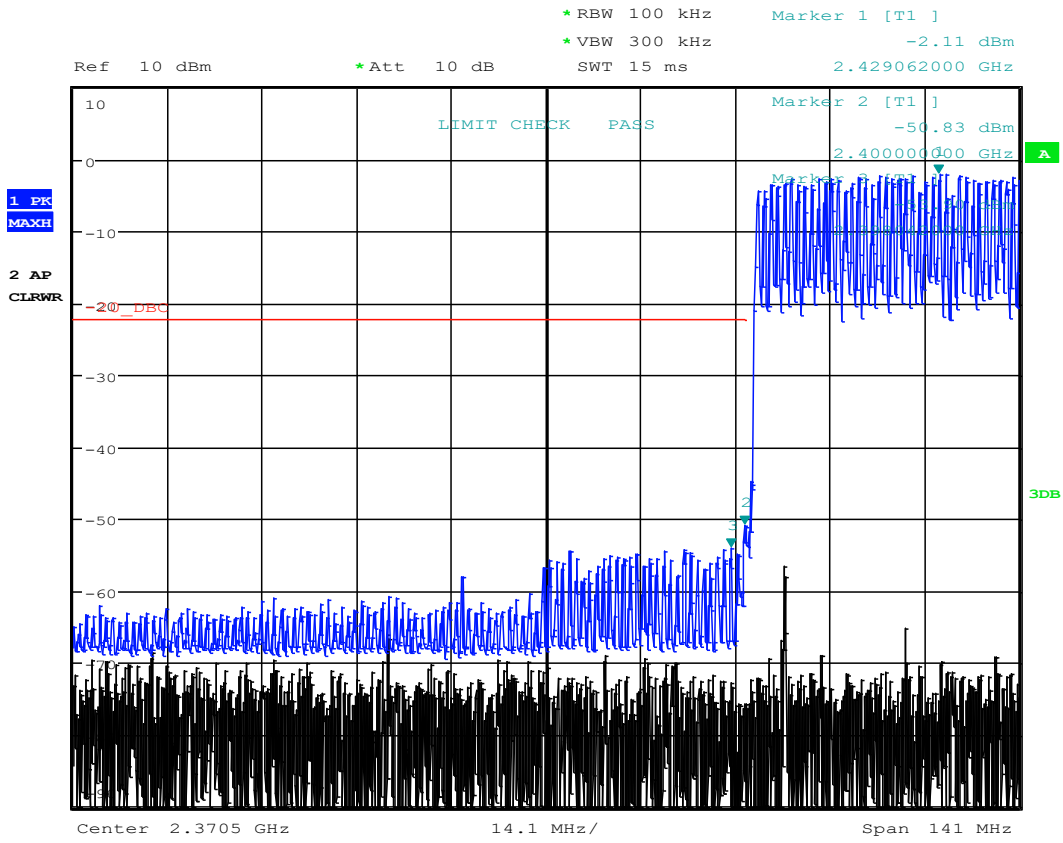

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-0.68 dBm
2.426242000 GHz
Marker 2 [T1 ]
-52.68 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

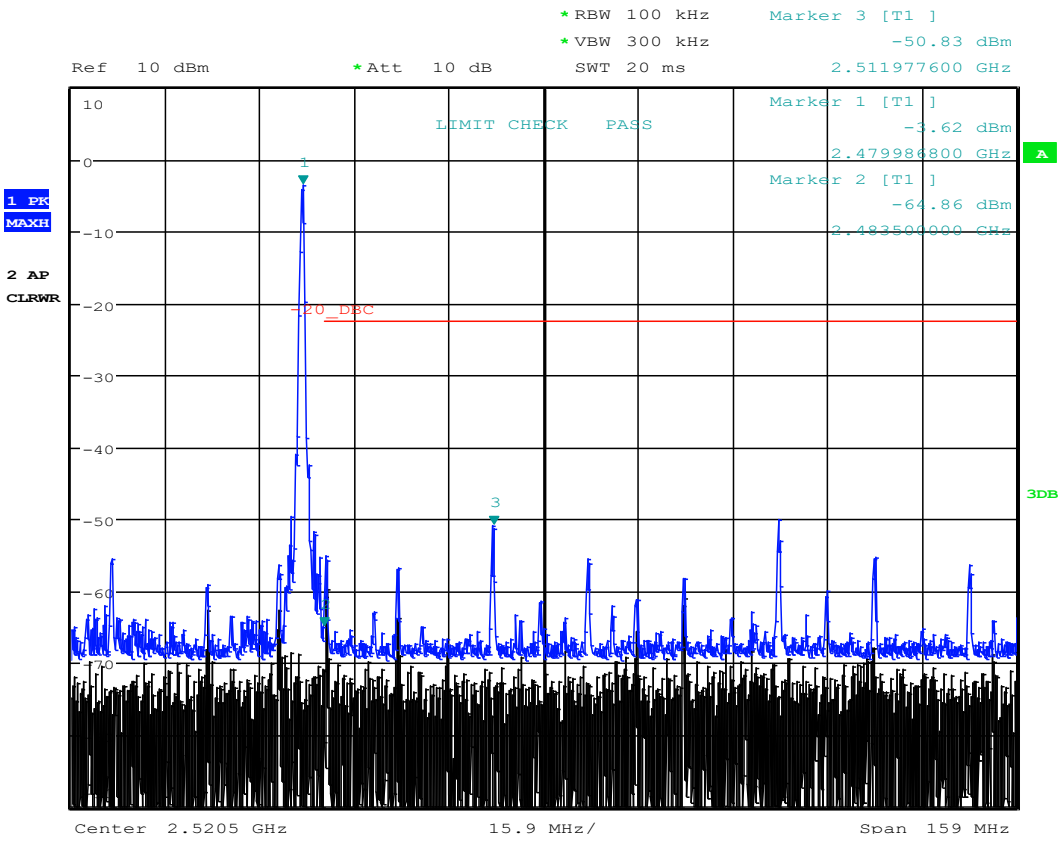

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.30 dBm
2.480114000 GHz
Marker 2 [T1 ]
-62.80 dBm
2.483500000 GHz
Marker 3 [T1 ]
-53.23 dBm
2.511977600 GHz
LIMIT CHECK PASS
-20 DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

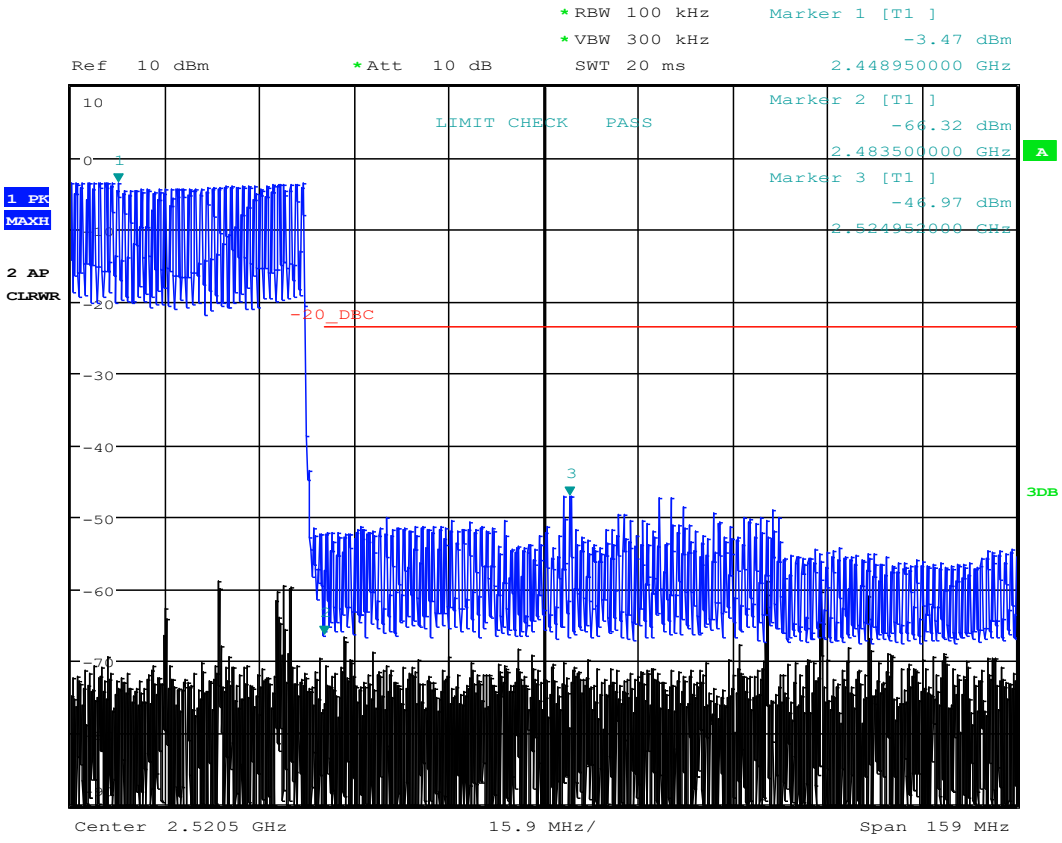

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-2.44 dBm
2.441000000 GHz
Marker 2 [T1 ]
-64.90 dBm
2.483500000 GHz
Marker 3 [T1 ]
-50.54 dBm
2.557137600 GHz
LIMIT CHECK PASS
-20 DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## EDR DM1

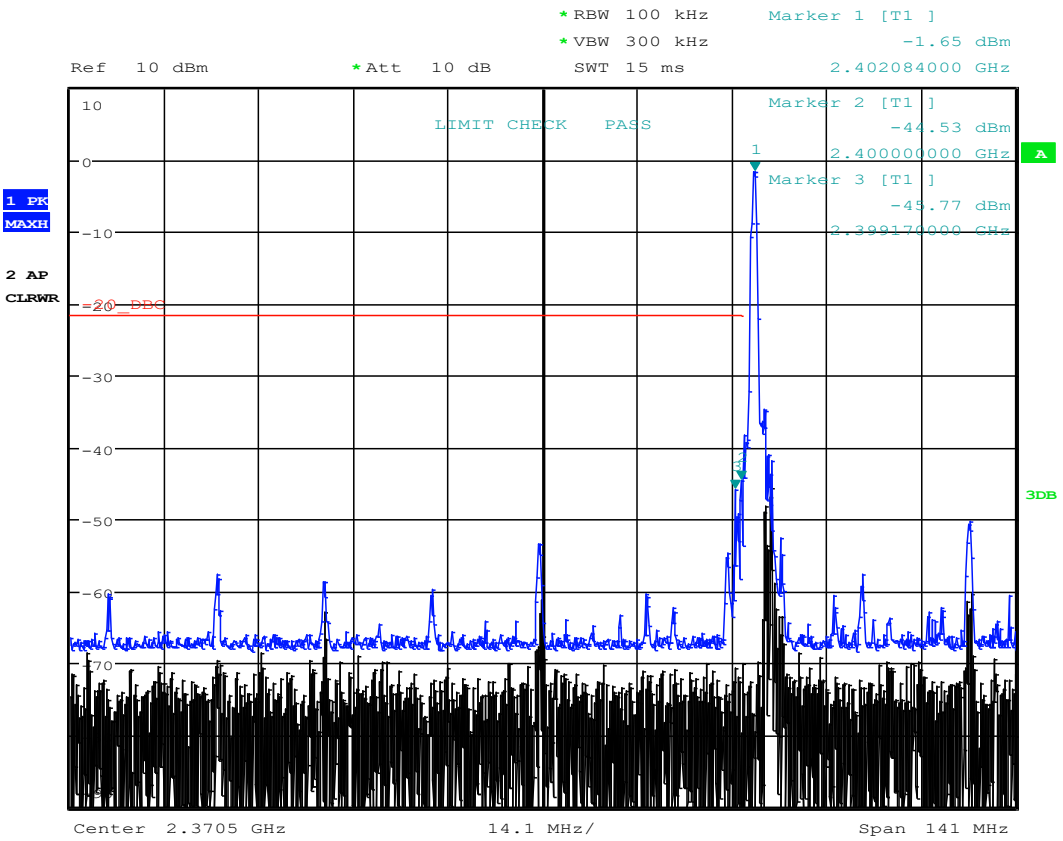

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-4.01 dBm
2.401990000 GHz
Marker 2 [T1 ]
-49.44 dBm
2.400000000 GHz
Marker 3 [T1 ]
-56.03 dBm
2.370930000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20_DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

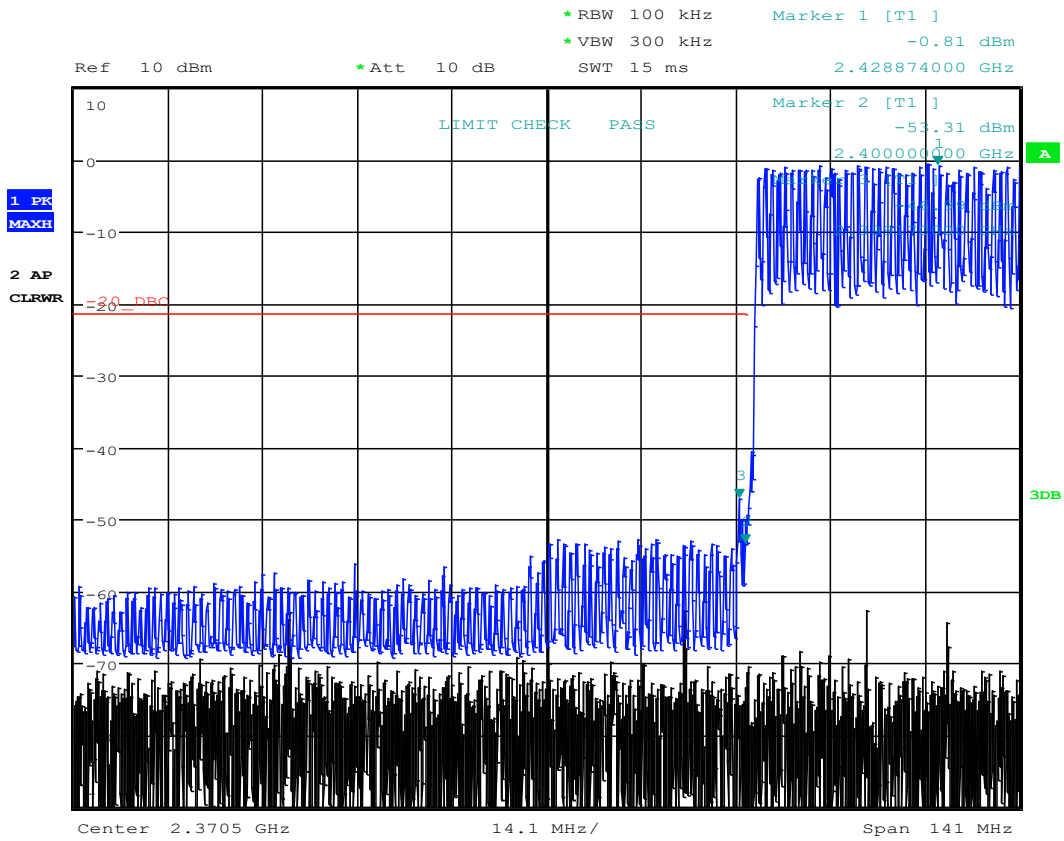

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-2.11 dBm
2.429062000 GHz
Marker 2 [T1 ]
-50.83 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20_DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

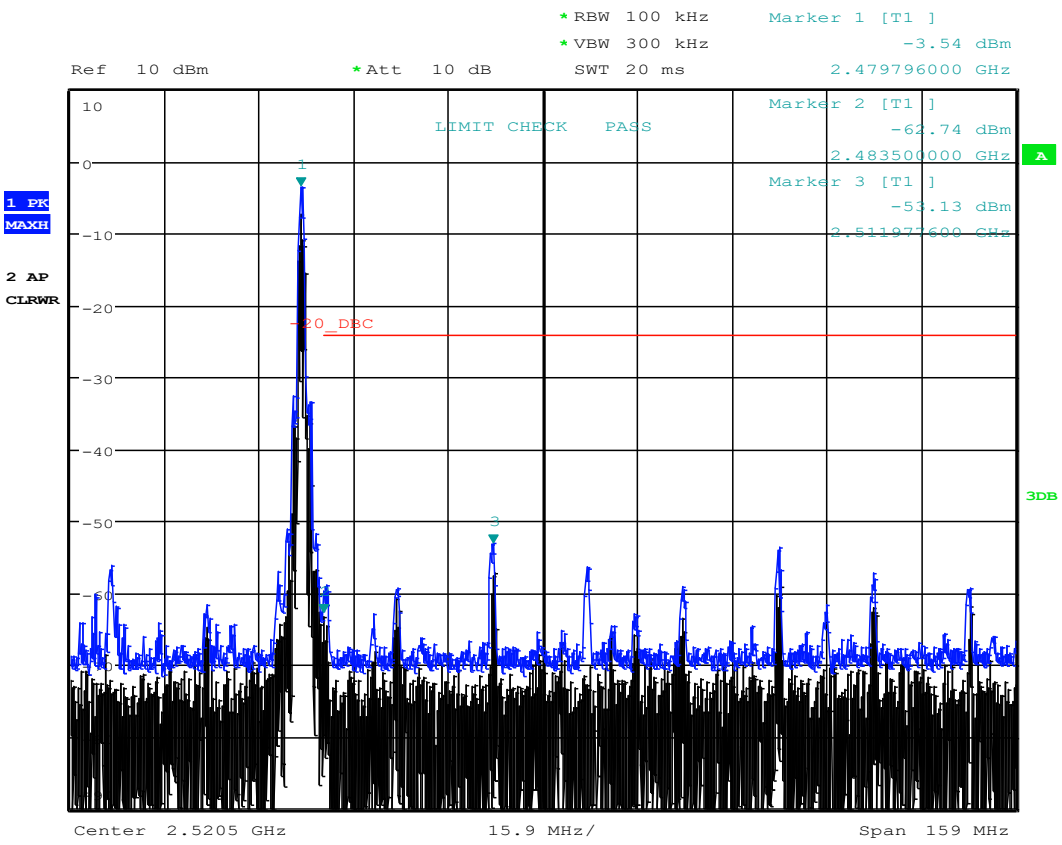

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 3 [T1 ]
-50.83 dBm
2.511977600 GHz
Marker 1 [T1 ]
-3.62 dBm
2.479986800 GHz
Marker 2 [T1 ]
-64.86 dBm
2.483500000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

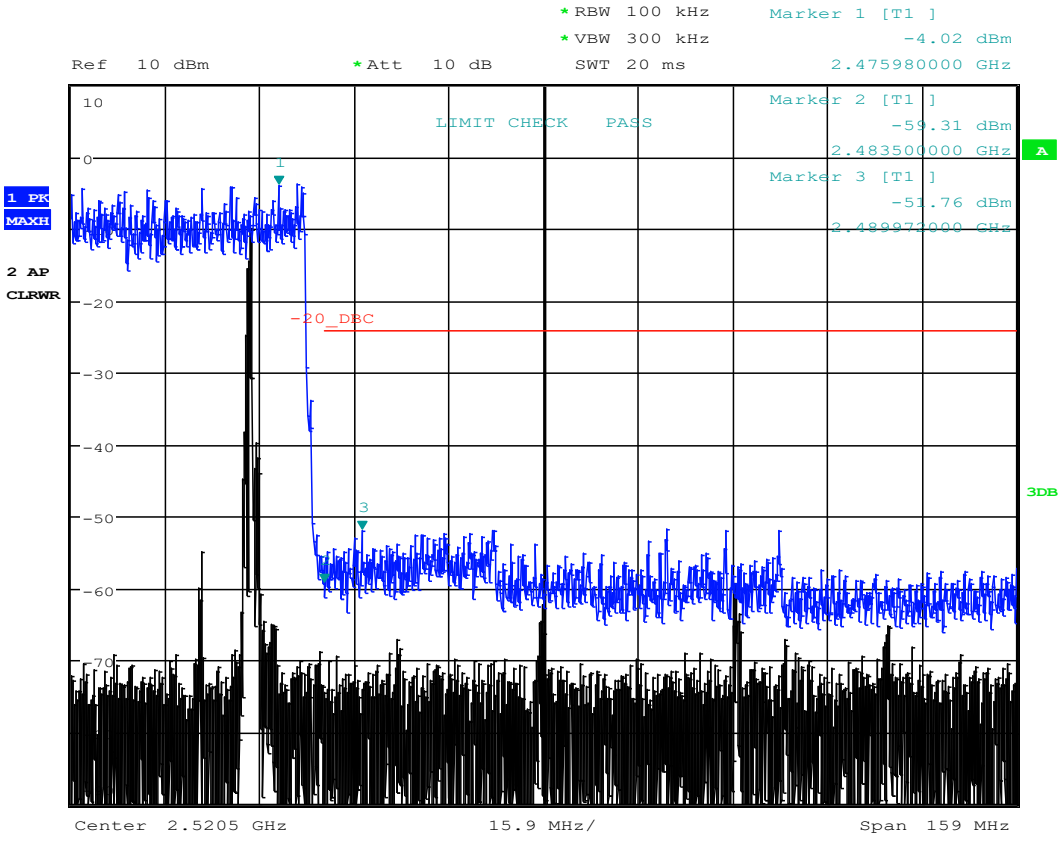

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.47 dBm
2.448950000 GHz
Marker 2 [T1 ]
-66.32 dBm
2.483500000 GHz
Marker 3 [T1 ]
-46.97 dBm
2.524950000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## EDR 2-DH3

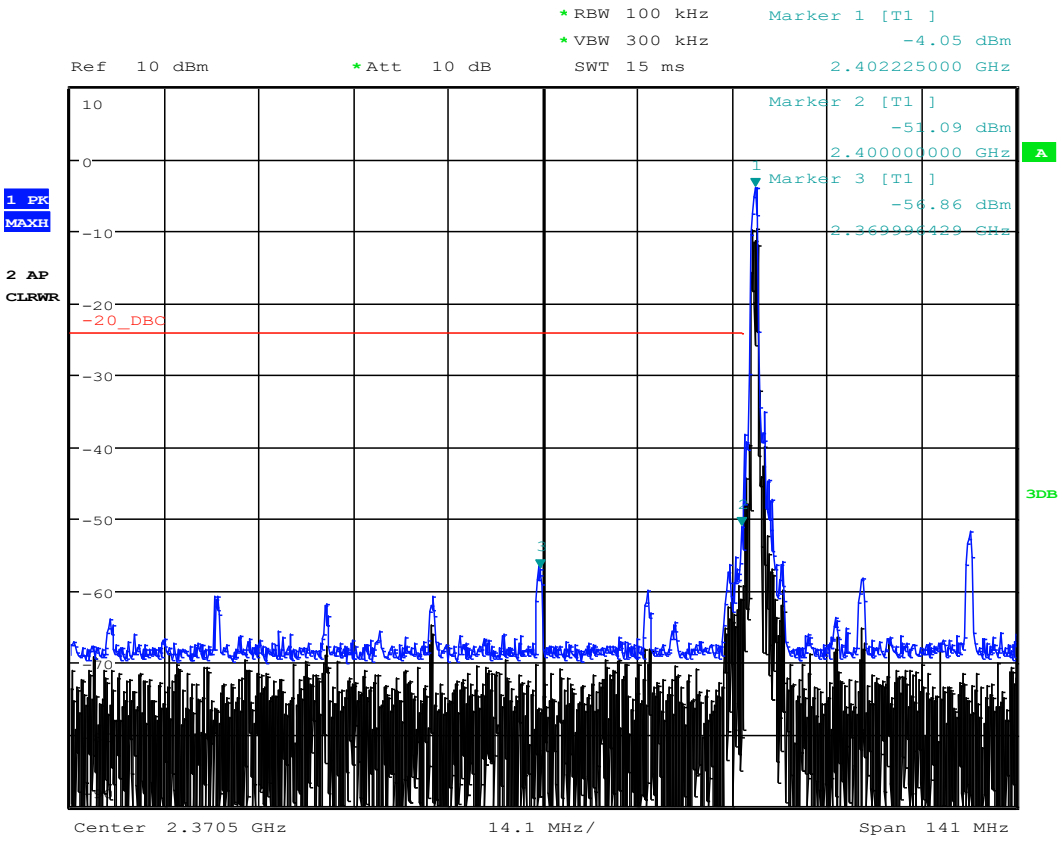

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.65 dBm
2.402084000 GHz
Marker 2 [T1 ]
-44.53 dBm
2.400000000 GHz
Marker 3 [T1 ]
-45.77 dBm
2.399170000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

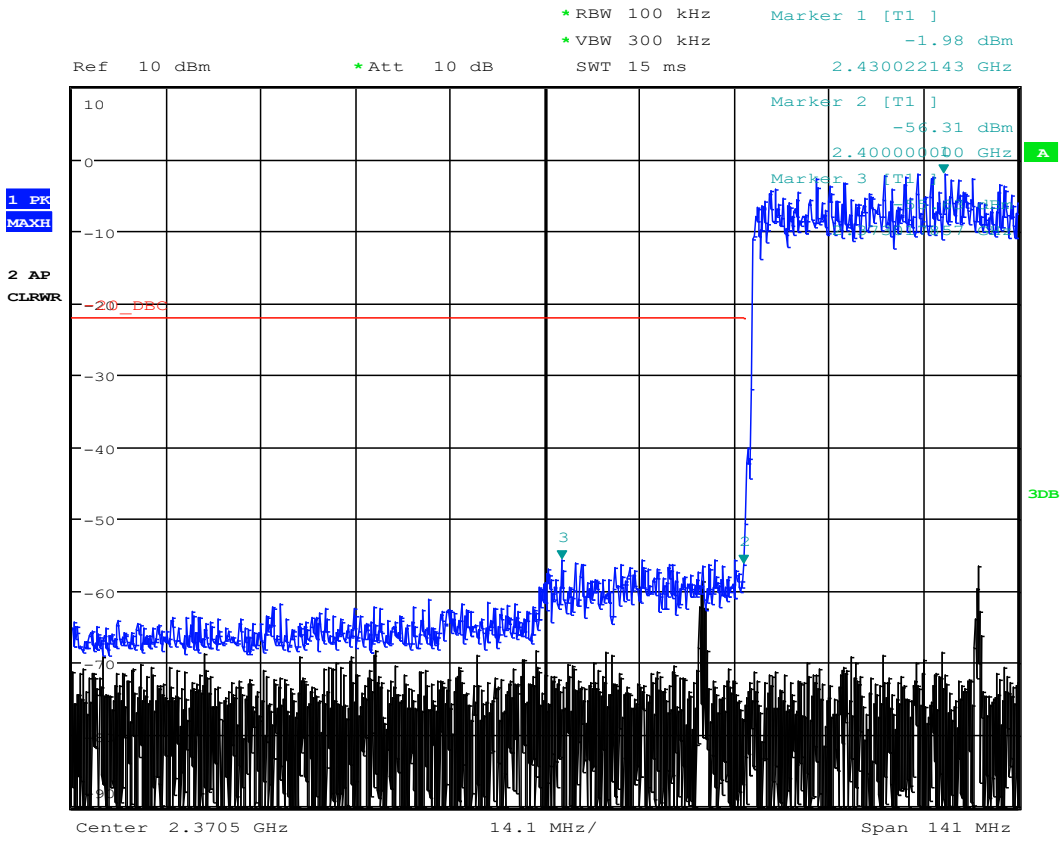

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-0.81 dBm
2.428874000 GHz
Marker 2 [T1 ]
-53.31 dBm
2.400000000 GHz
LIMIT CHECK PASS
1 PK
MAXH
2 AP
CLRWR
-20 DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

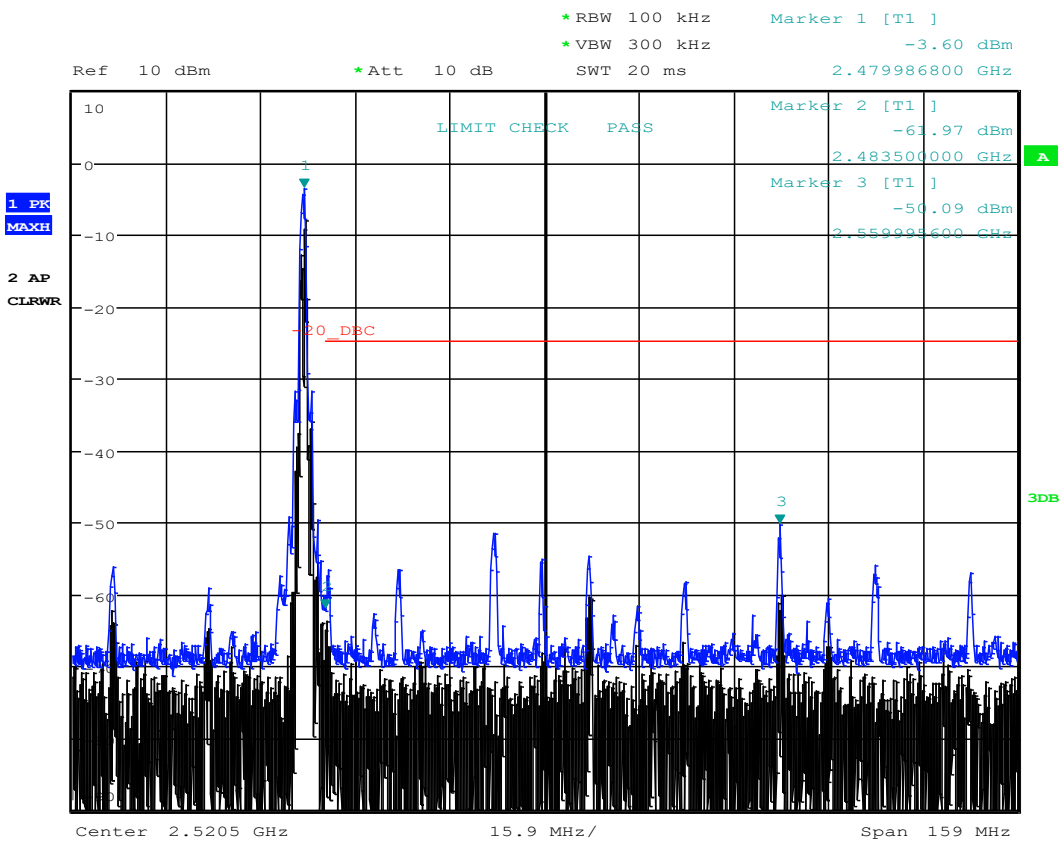

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.54 dBm
2.479796000 GHz
Marker 2 [T1 ]
-62.74 dBm
2.483500000 GHz
Marker 3 [T1 ]
-53.13 dBm
2.511977600 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

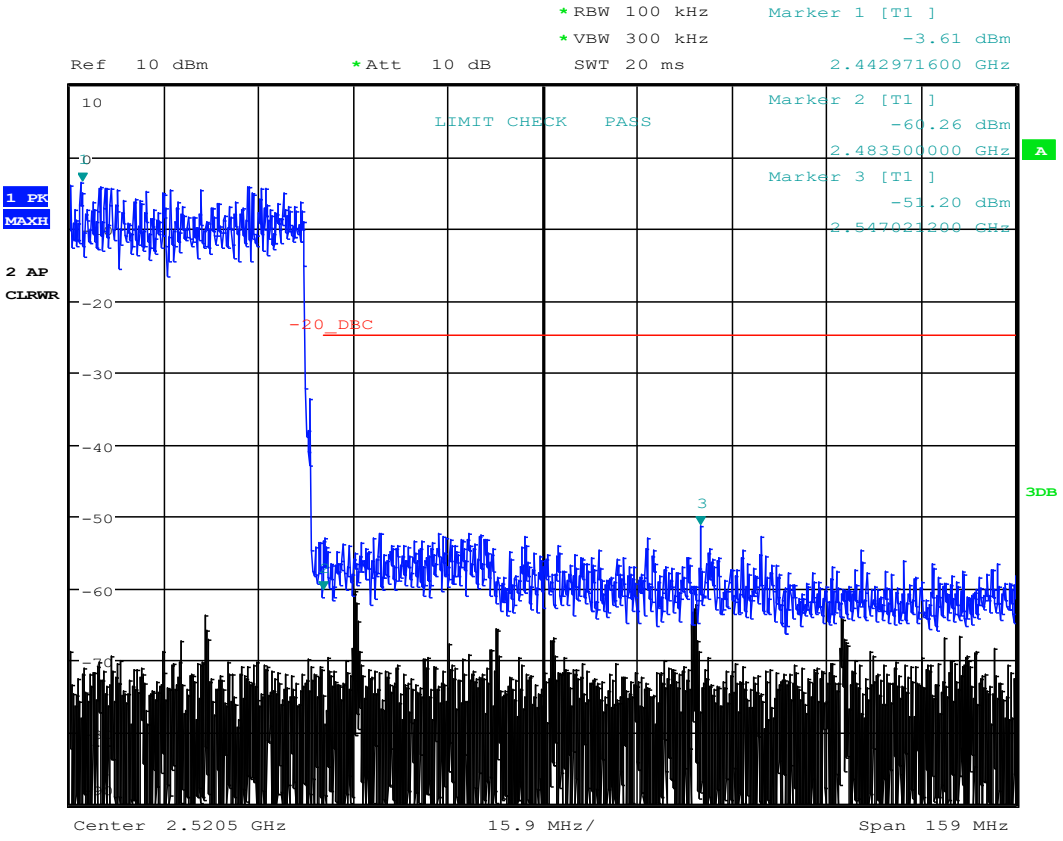

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-4.02 dBm
2.475980000 GHz
Marker 2 [T1 ]
-59.31 dBm
2.483500000 GHz
Marker 3 [T1 ]
-51.76 dBm
2.489972000 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## EDR 3-DH3

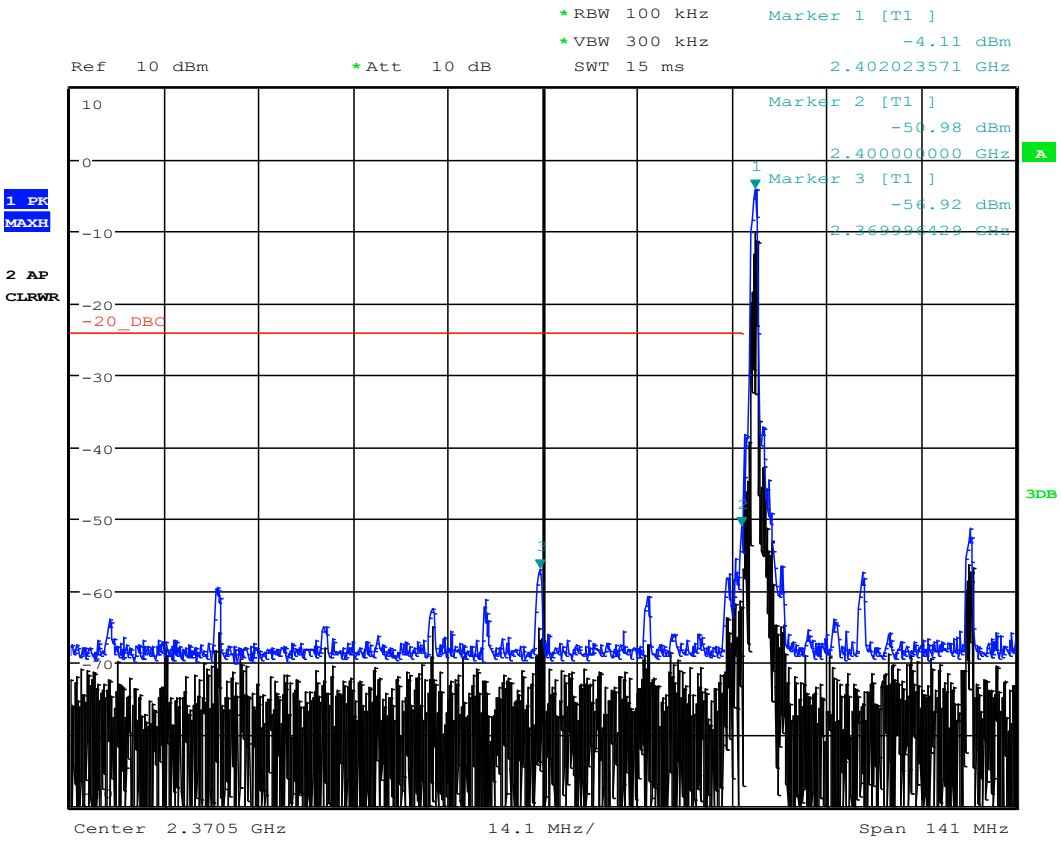

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-4.05 dBm
2.402225000 GHz
Marker 2 [T1 ]
-51.09 dBm
2.400000000 GHz
Marker 3 [T1 ]
-56.86 dBm
2.369994429 GHz
1 PK
MAXH
2 AP
CLRWR
-20_DBC
A
3DB
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

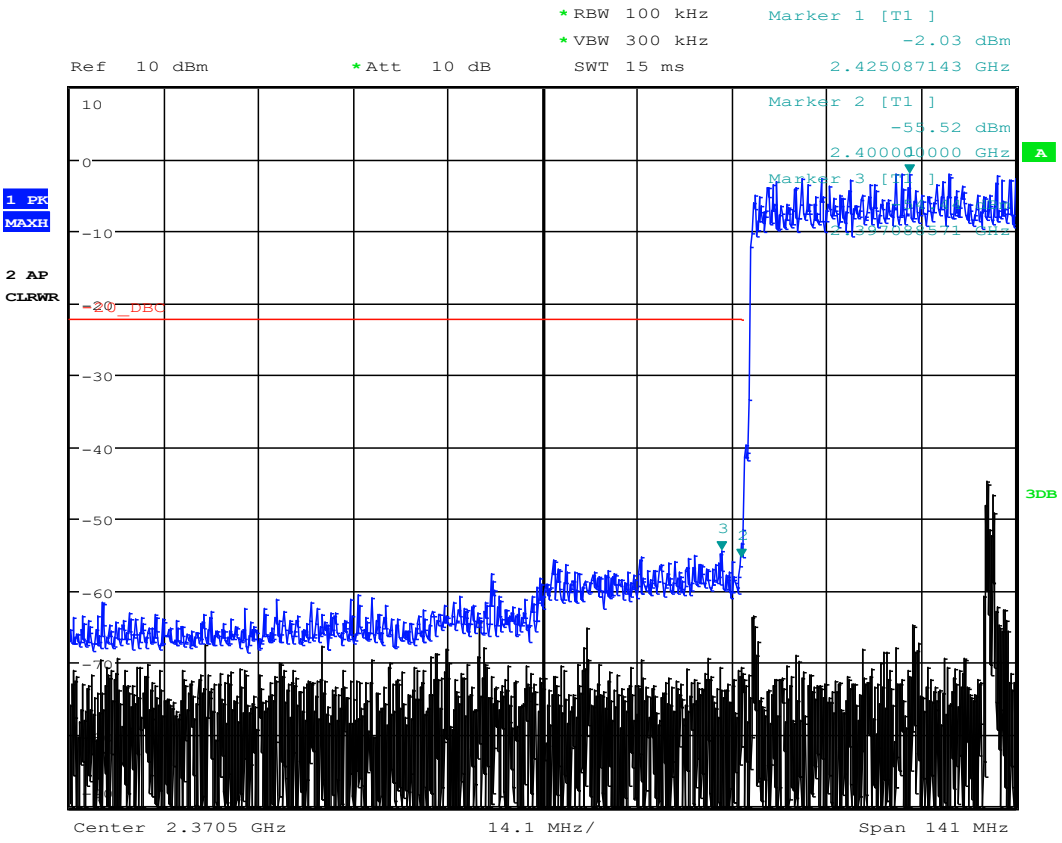

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-1.98 dBm
2.430022143 GHz
Marker 2 [T1 ]
-56.31 dBm
Marker 3 [T1 ]
1 PK
MAXH
2 AP
CLRWR
-20_DBC
A
3DB
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

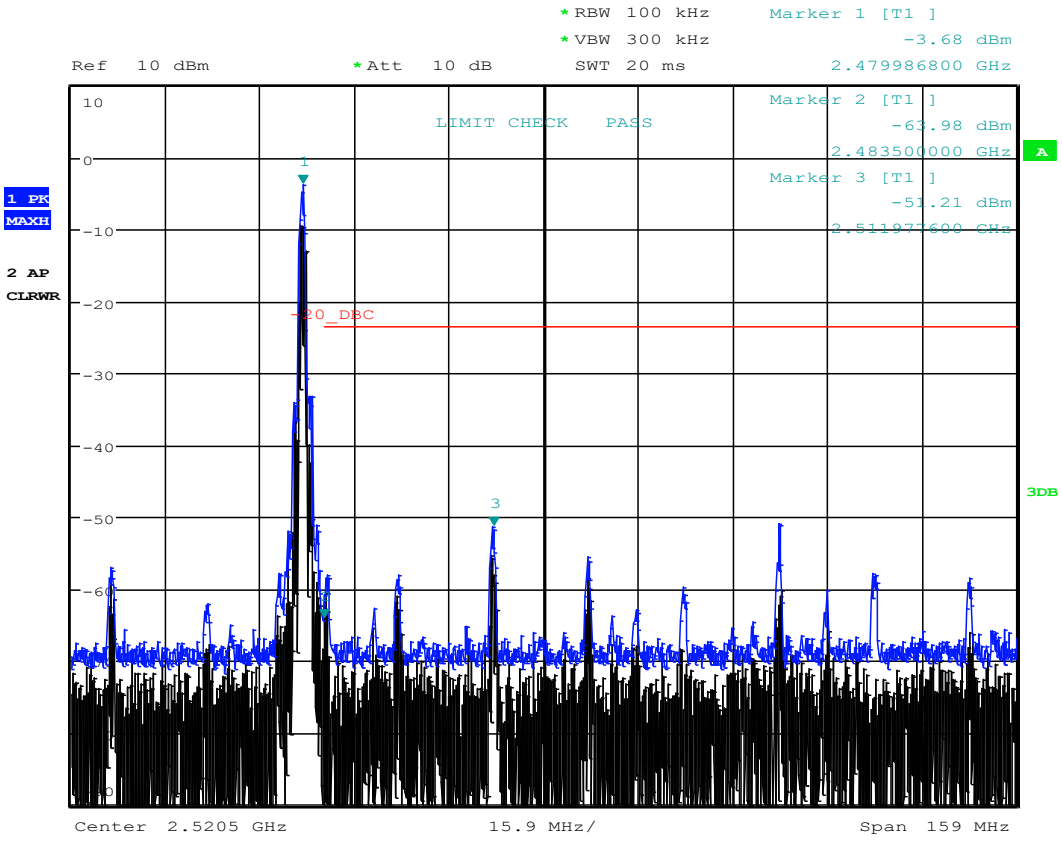

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.60 dBm
2.479986800 GHz
Marker 2 [T1 ]
-61.97 dBm
2.483500000 GHz
Marker 3 [T1 ]
-50.09 dBm
2.559995600 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

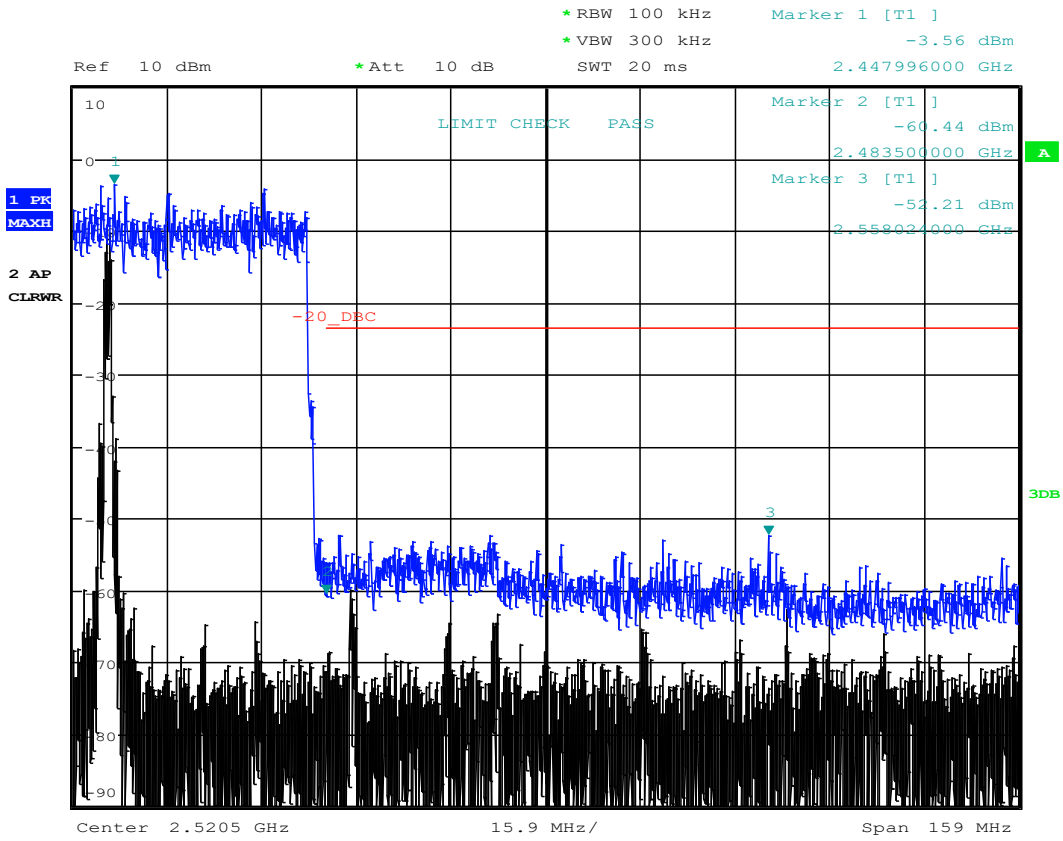

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.61 dBm
2.442971600 GHz
Marker 2 [T1 ]
-60.26 dBm
2.483500000 GHz
Marker 3 [T1 ]
-51.20 dBm
2.547021200 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## EDR 2-DH5

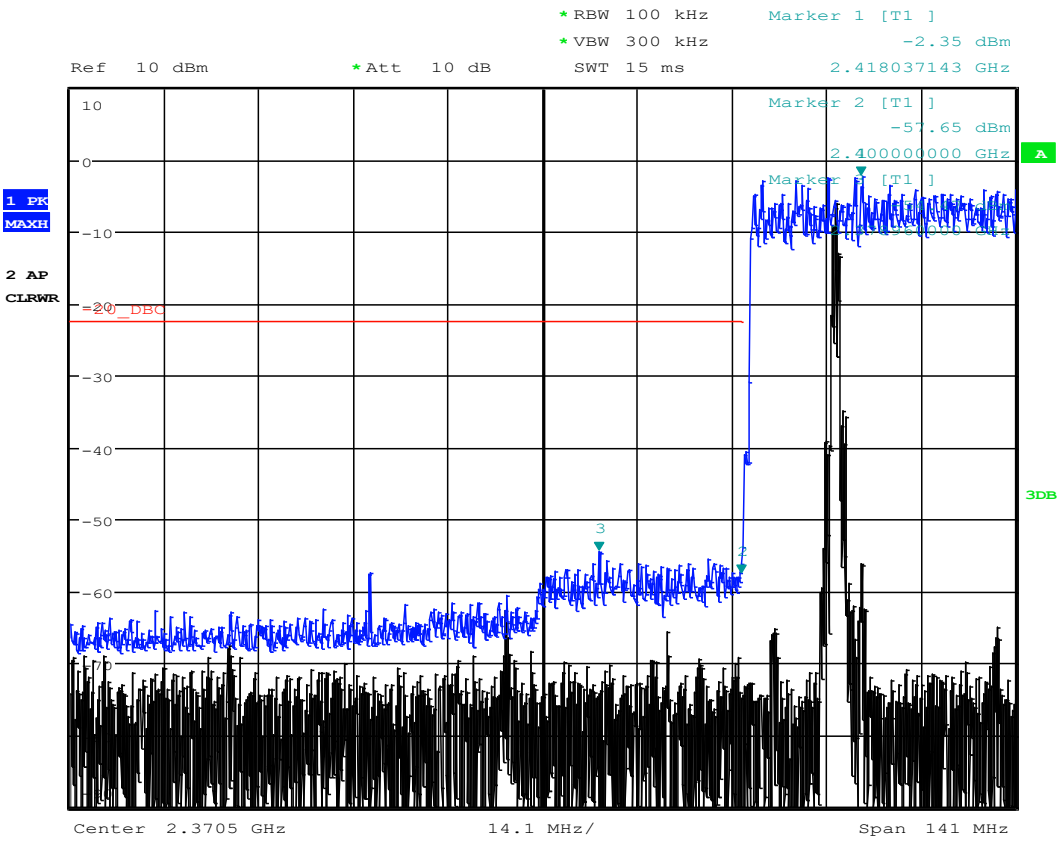

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-4.11 dBm
2.402023571 GHz
Marker 2 [T1 ]
-50.98 dBm
2.400000000 GHz
Marker 3 [T1 ]
-56.92 dBm
2.369996429 GHz
1 PK
MAXH
2 AP
CLRWR
-20_DBC
A
3DB
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

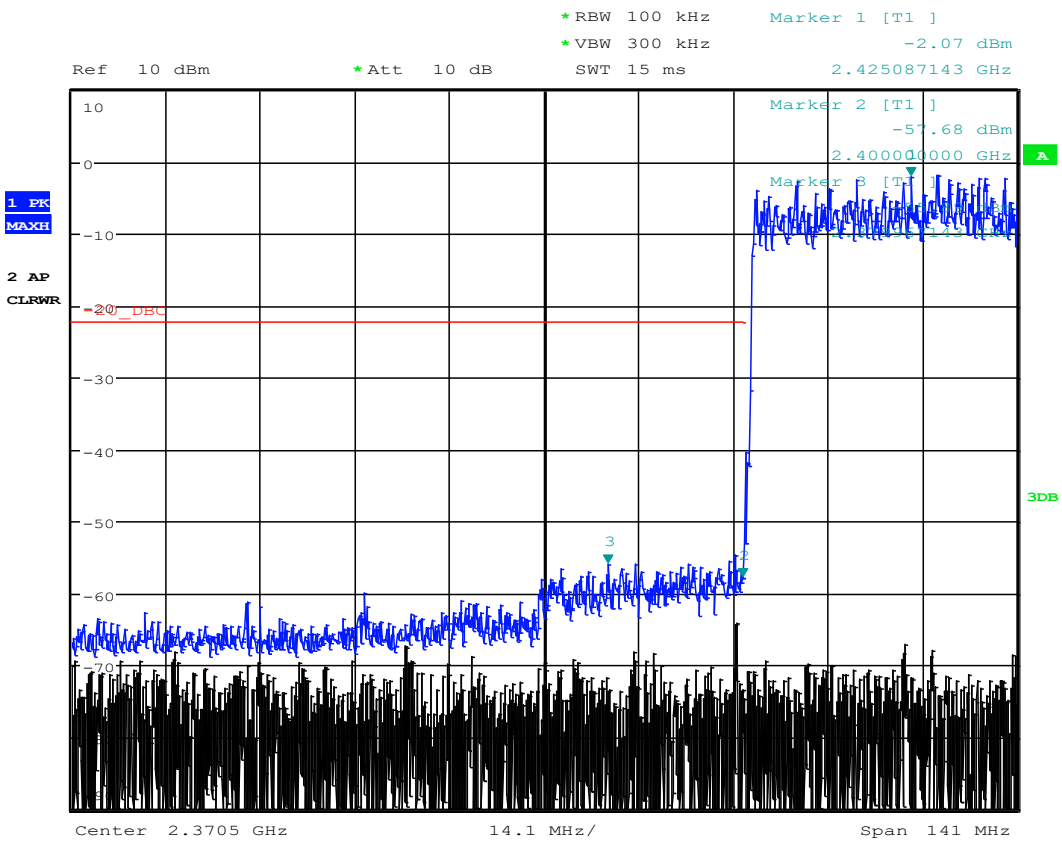

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-2.03 dBm
2.425087143 GHz
Marker 2 [T1 ]
-55.52 dBm
1 PK
MAXH
2 AP
CLRWR
-20_DBC
A
3DB
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

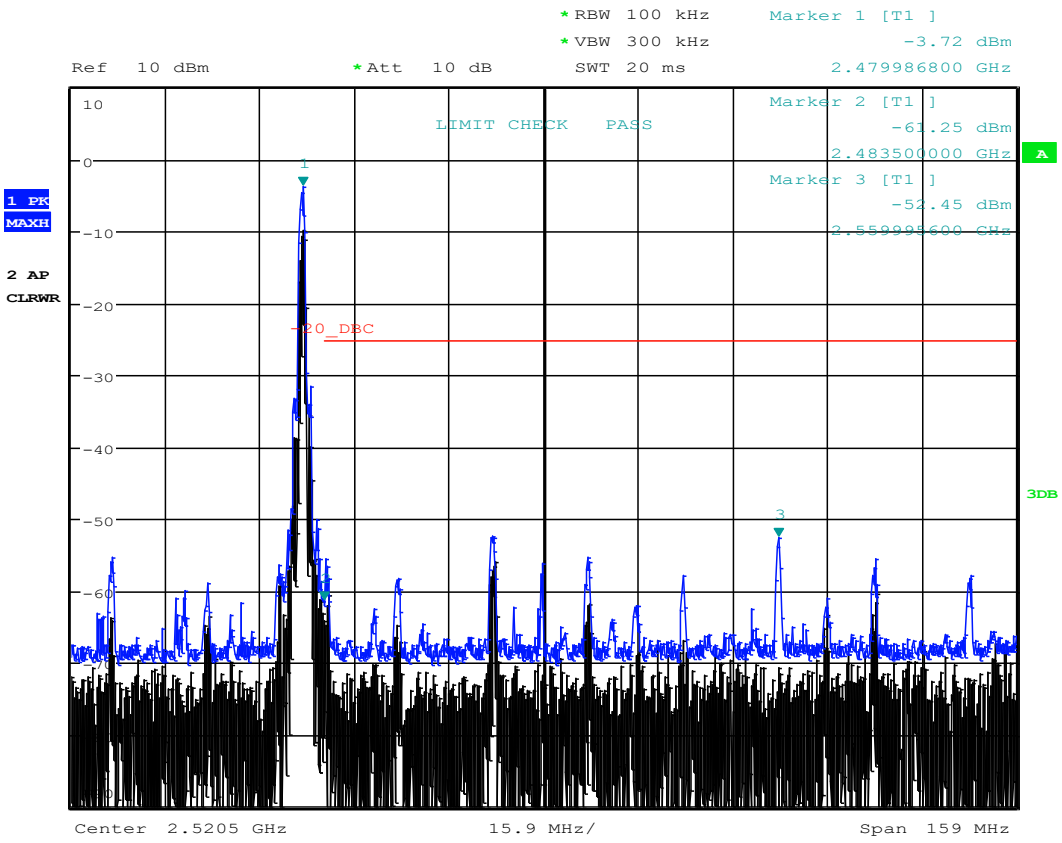

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.68 dBm
2.479986800 GHz
Marker 2 [T1 ]
-63.98 dBm
2.483500000 GHz
Marker 3 [T1 ]
-51.21 dBm
2.511977600 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

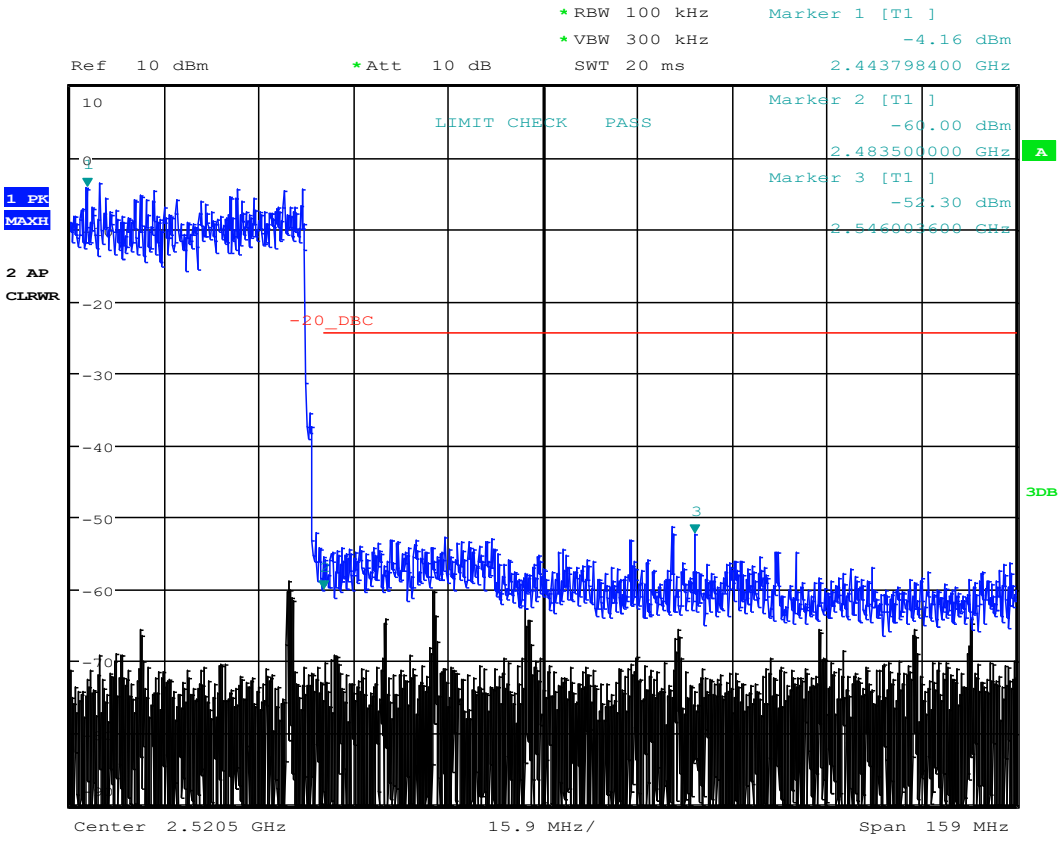

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.56 dBm
2.447996000 GHz
Marker 2 [T1 ]
-60.44 dBm
2.483500000 GHz
Marker 3 [T1 ]
-52.21 dBm
2.558024000 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

## EDR 3-DH5


RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-2.35 dBm
2.418037143 GHz
Marker 2 [T1 ]
-57.65 dBm
2.400000000 GHz
Marker 3 [T1 ]
1 PK
MAXH
2 AP
CLRWR
20_DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

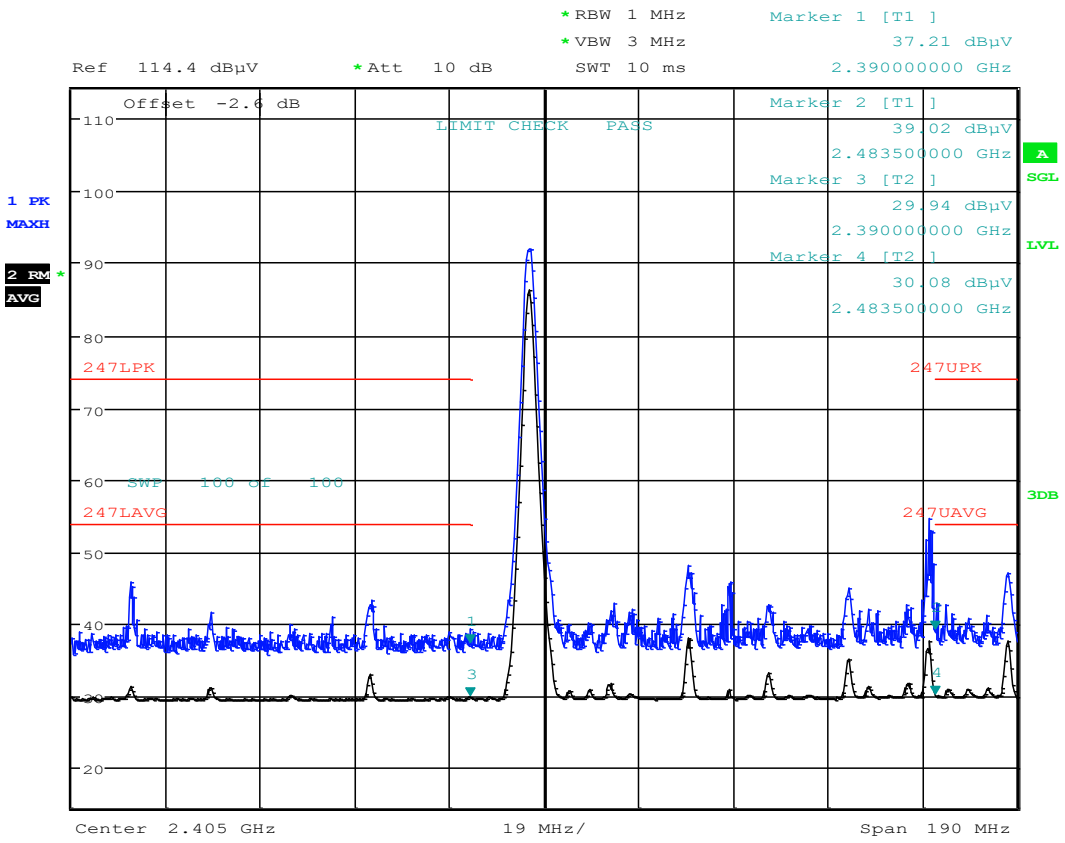

RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 10 dB
SWT 15 ms
Marker 1 [T1 ]
-2.07 dBm
2.425087143 GHz
Marker 2 [T1 ]
-57.68 dBm
2.400000000 GHz
Marker 3 [T1 ]
1 PK
MAXH
2 AP
CLRWR
20_DBC
3DB
A
Center 2.3705 GHz
14.1 MHz/
Span 141 MHz

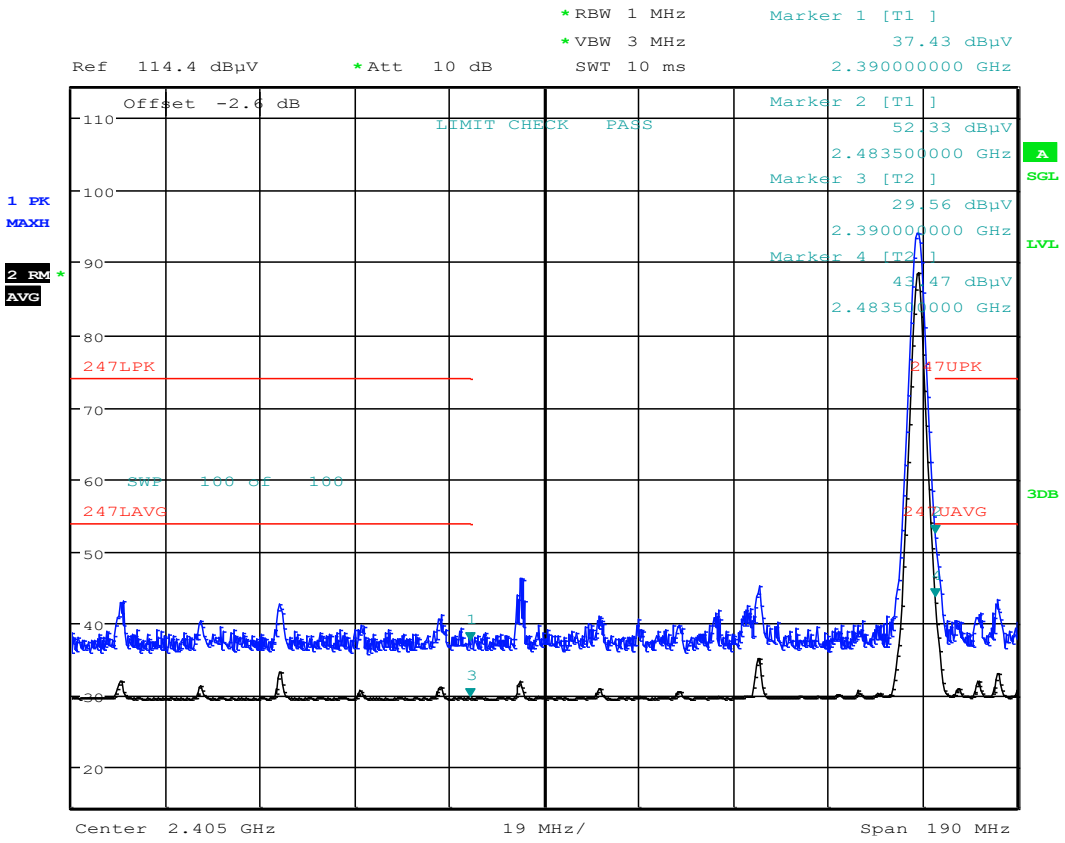

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-3.72 dBm
2.479986800 GHz
Marker 2 [T1 ]
-61.25 dBm
2.483500000 GHz
Marker 3 [T1 ]
-52.45 dBm
2.559998600 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

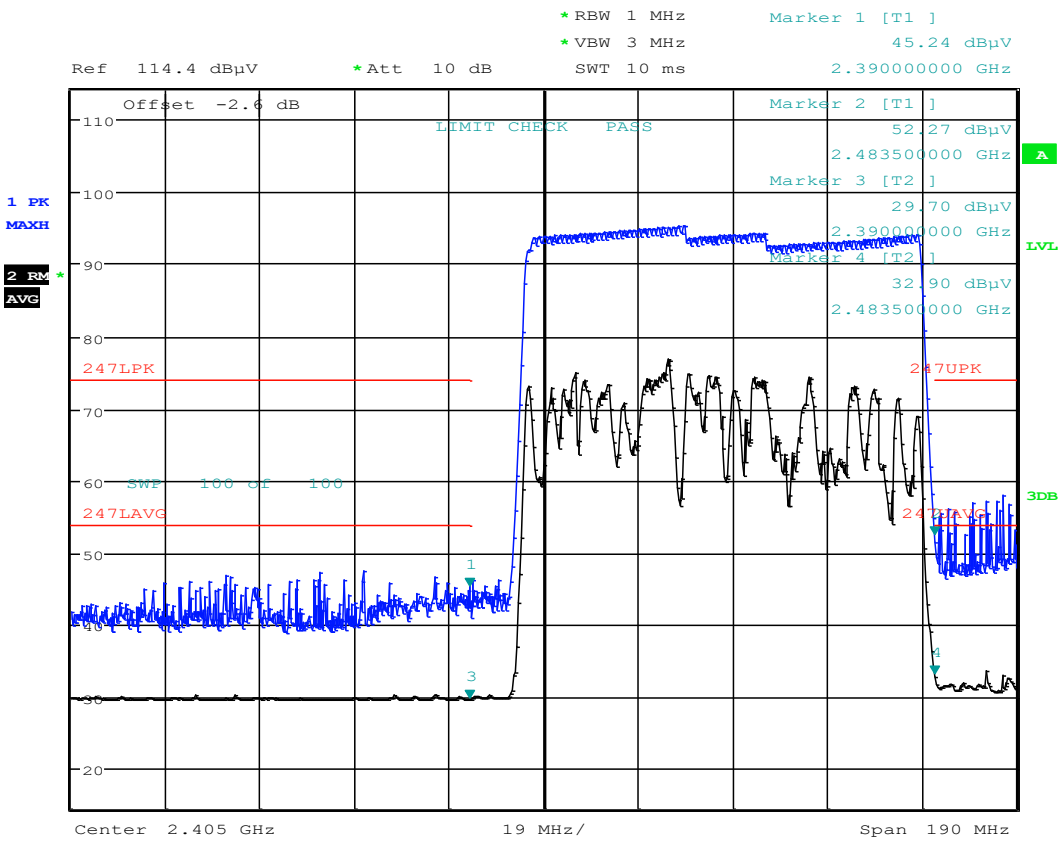

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 20 ms
Marker 1 [T1 ]
-4.16 dBm
2.443798400 GHz
Marker 2 [T1 ]
-60.00 dBm
2.483500000 GHz
Marker 3 [T1 ]
-52.30 dBm
2.546003600 GHz
LIMIT CHECK PASS
-20_DBC
1 PK
MAXH
2 AP
CLRWR
A
3DB
Center 2.5205 GHz
15.9 MHz/
Span 159 MHz

# Restricted-Band Band-Edge Test Data

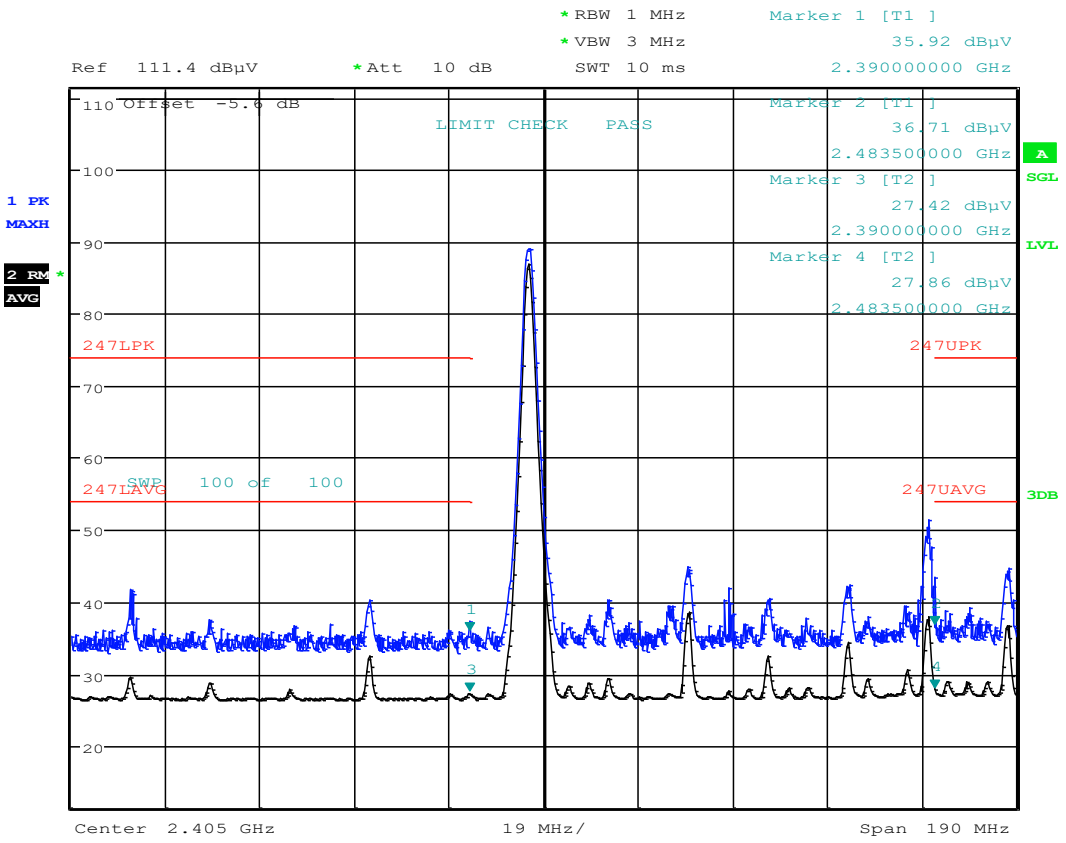
## BDR DM1

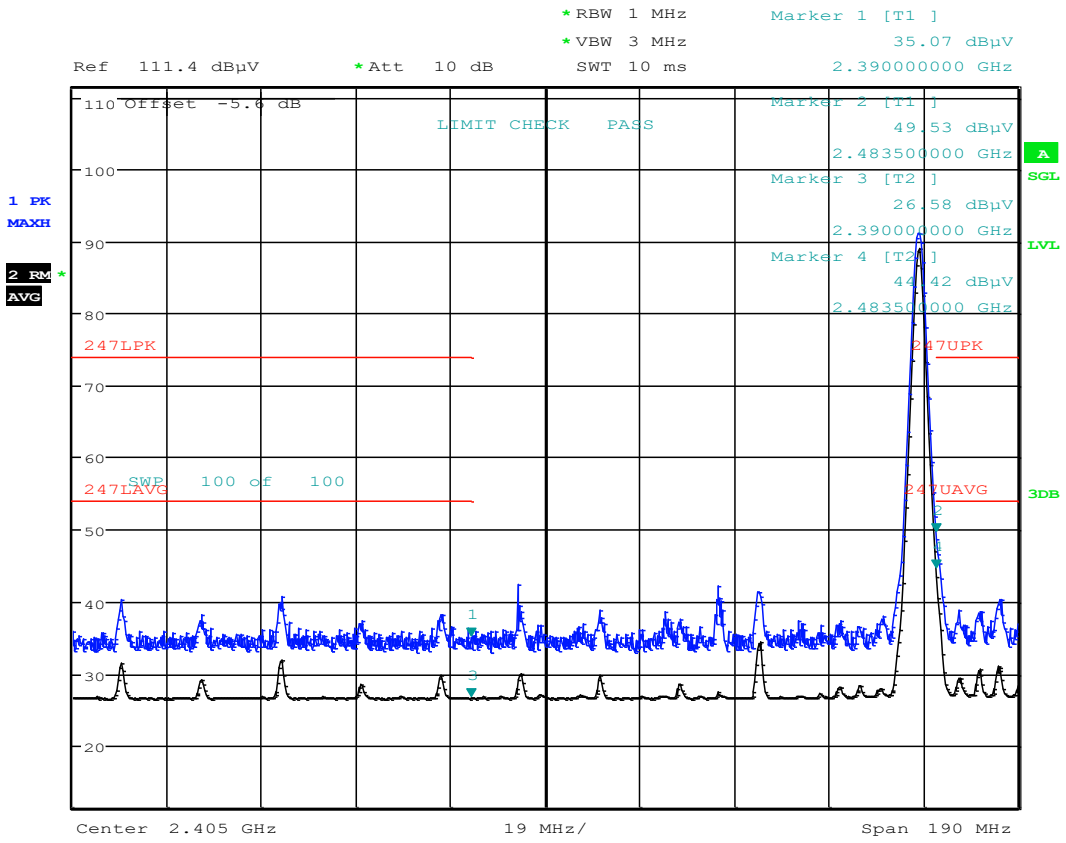


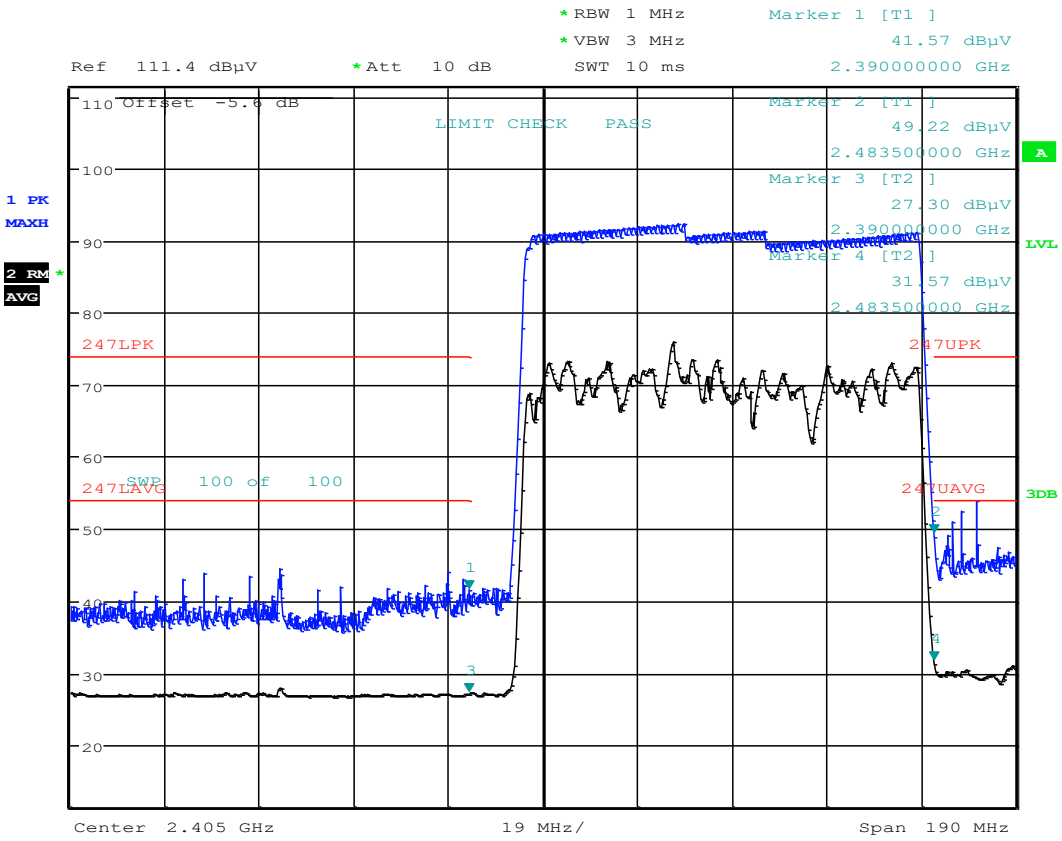




RBW 1 MHz
VBW 3 MHz
SWT 10 ms
Marker 1 [T1 ]
45.24 dBµV
2.390000000 GHz
Ref 114.4 dBµV
Att 10 dB
Offset -2.6 dB
Marker 2 [T1 ]
LIMIT CHECK PASS
52.27 dBµV
2.483500000 GHz
A
Marker 3 [T2 ]
29.70 dBµV
2.390000000 GHz
LVL
Marker 4 [T2 ]
32.90 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
247LPK
247UPK
SWP 100 of 100
247LAVG
3DB
Center 2.405 GHz
19 MHz/
Span 190 MHz

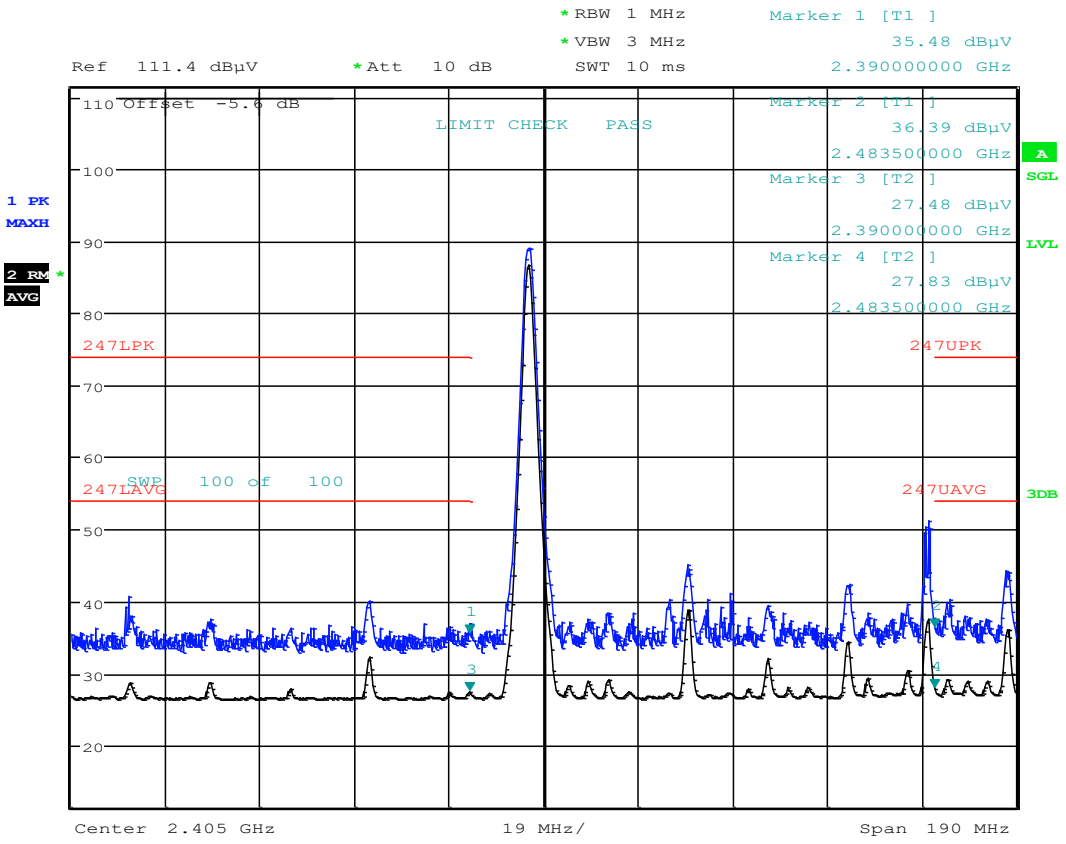
## BDR DM3

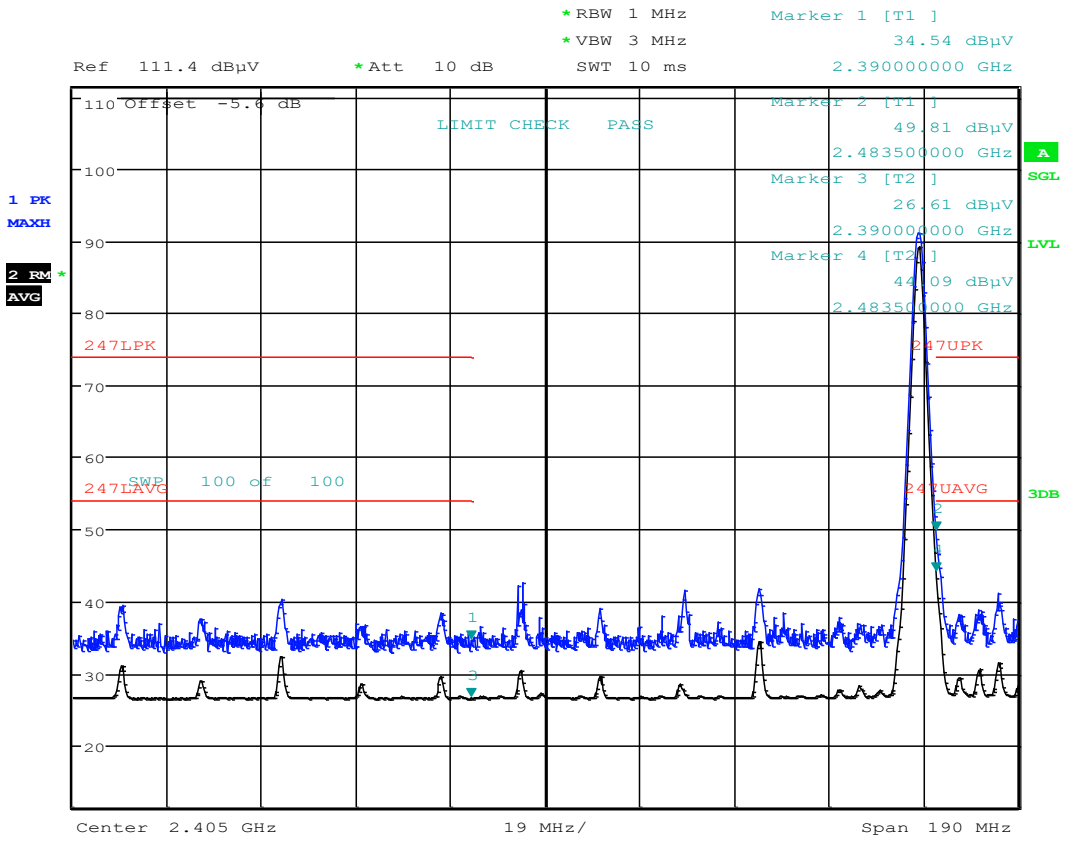

*RBW 1 MHz
*VBW 3 MHz
Ref 111.4 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
35.92 dBµV
2.390000000 GHz
Offset -5.6 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
36.71 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.42 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.86 dBµV
2.483500000 GHz
1 PK MAXH
2 RM AVG
A SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

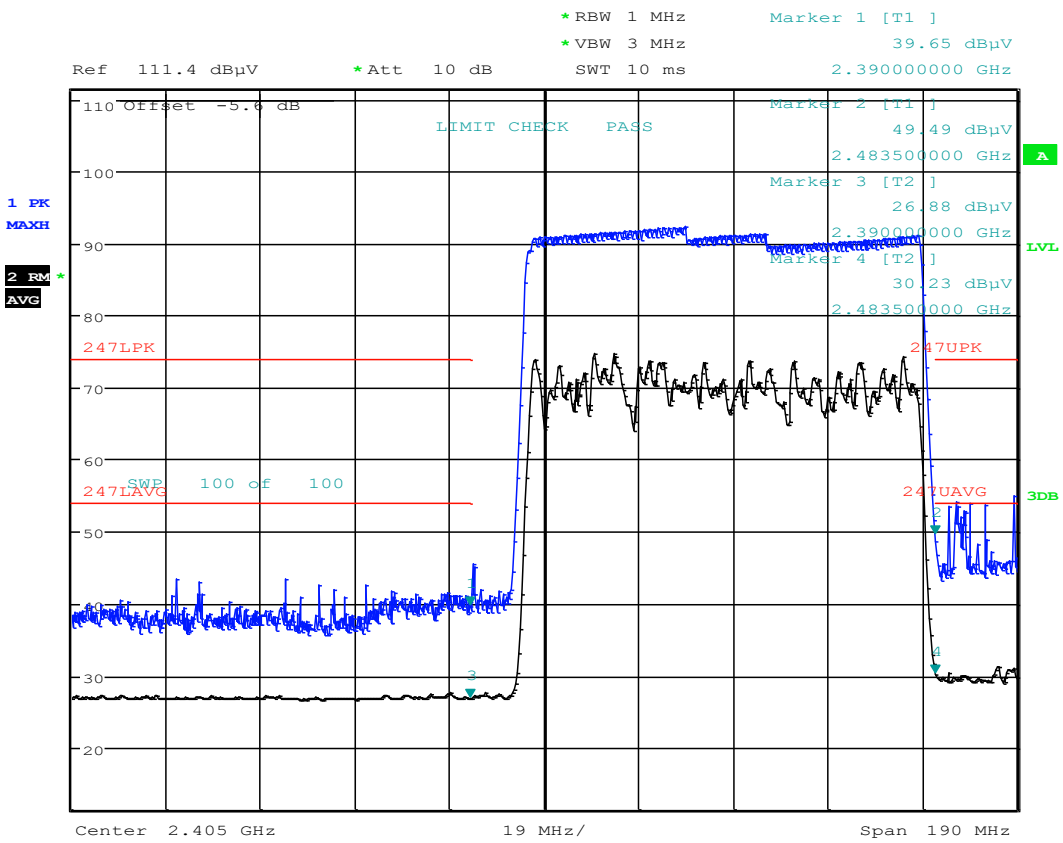

*RBW 1 MHz
*VBW 3 MHz
Ref 111.4 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
35.07 dBµV
2.390000000 GHz
Offset -5.6 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
49.53 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.58 dBµV
2.390000000 GHz
Marker 4 [T2 ]
44.42 dBµV
2.483500000 GHz
1 PK MAXH
2 RM AVG
A SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


RBW 1 MHz
VBW 3 MHz
Ref 111.4 dBµV
Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
41.57 dBµV
2.390000000 GHz
Marker 2 [T1 ]
49.22 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.30 dBµV
2.390000000 GHz
Marker 4 [T2 ]
31.57 dBµV
2.483500000 GHz
Offset -5.6 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
110
100
90
80
70
60
50
40
30
20
Center 2.405 GHz
19 MHz/
Span 190 MHz

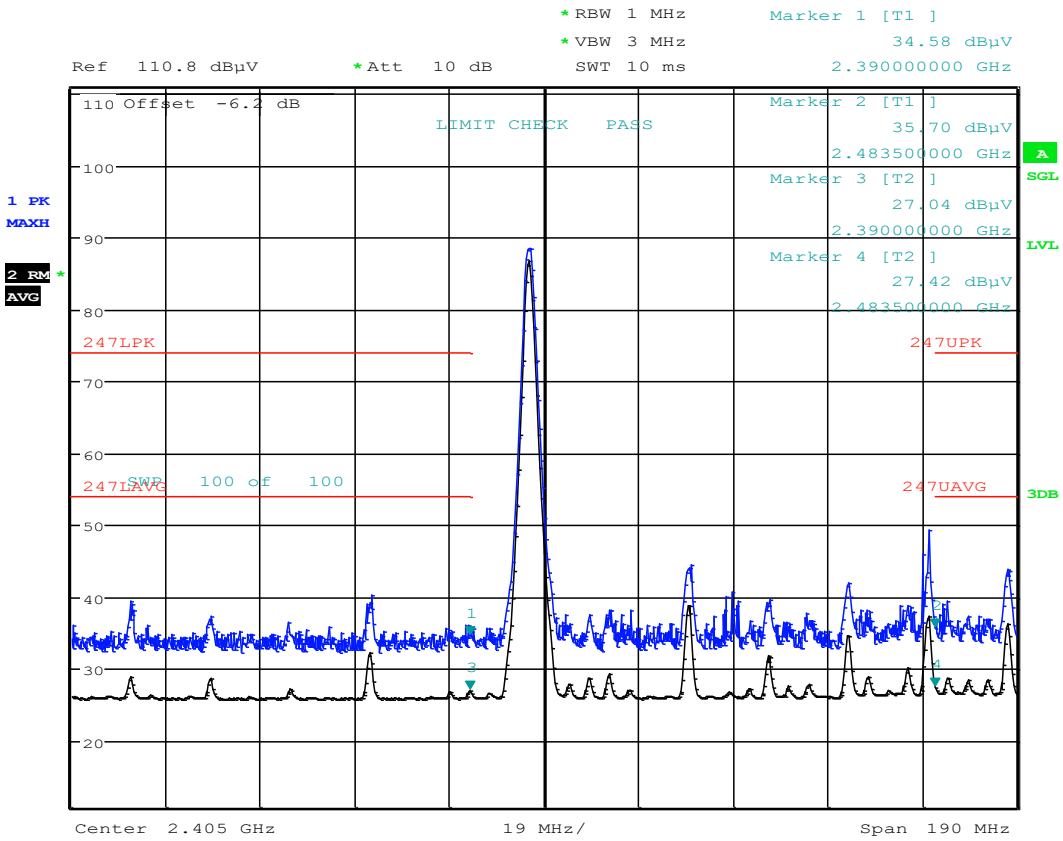
## BDR DH3

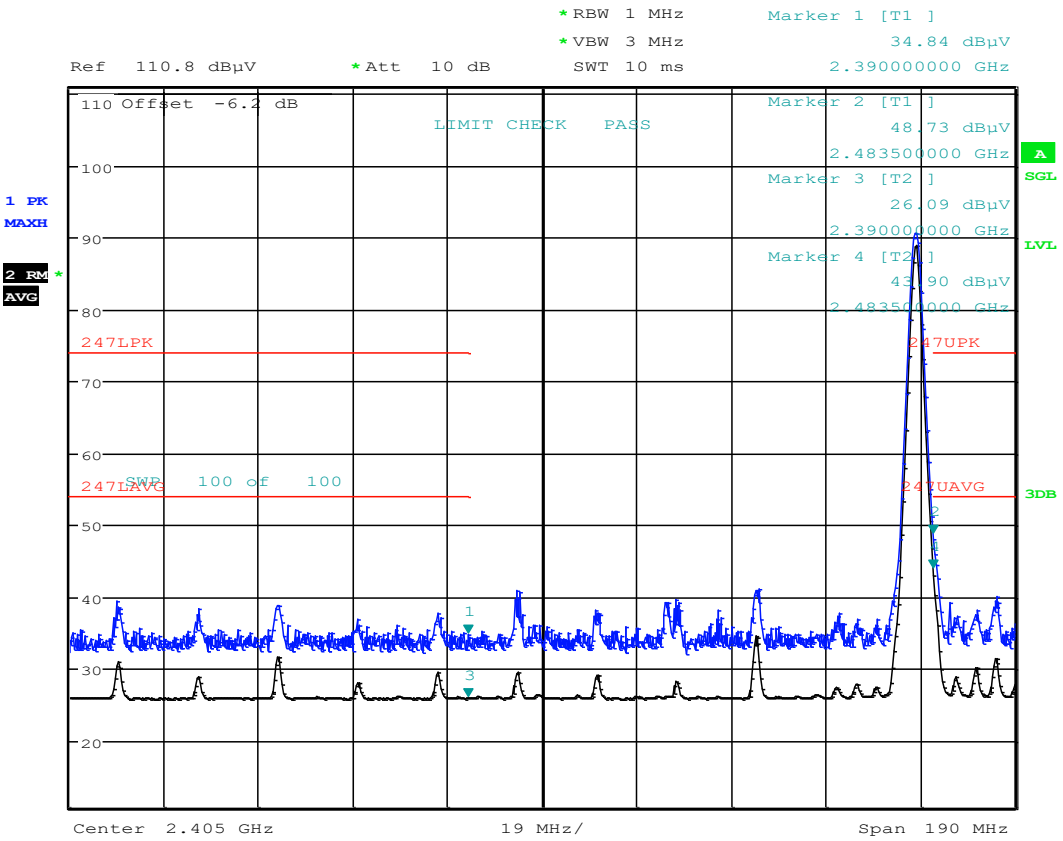

*RBW 1 MHz
*VBW 3 MHz
Ref 111.4 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
35.48 dBµV
2.390000000 GHz
Offset -5.6 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
36.39 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.48 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.83 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

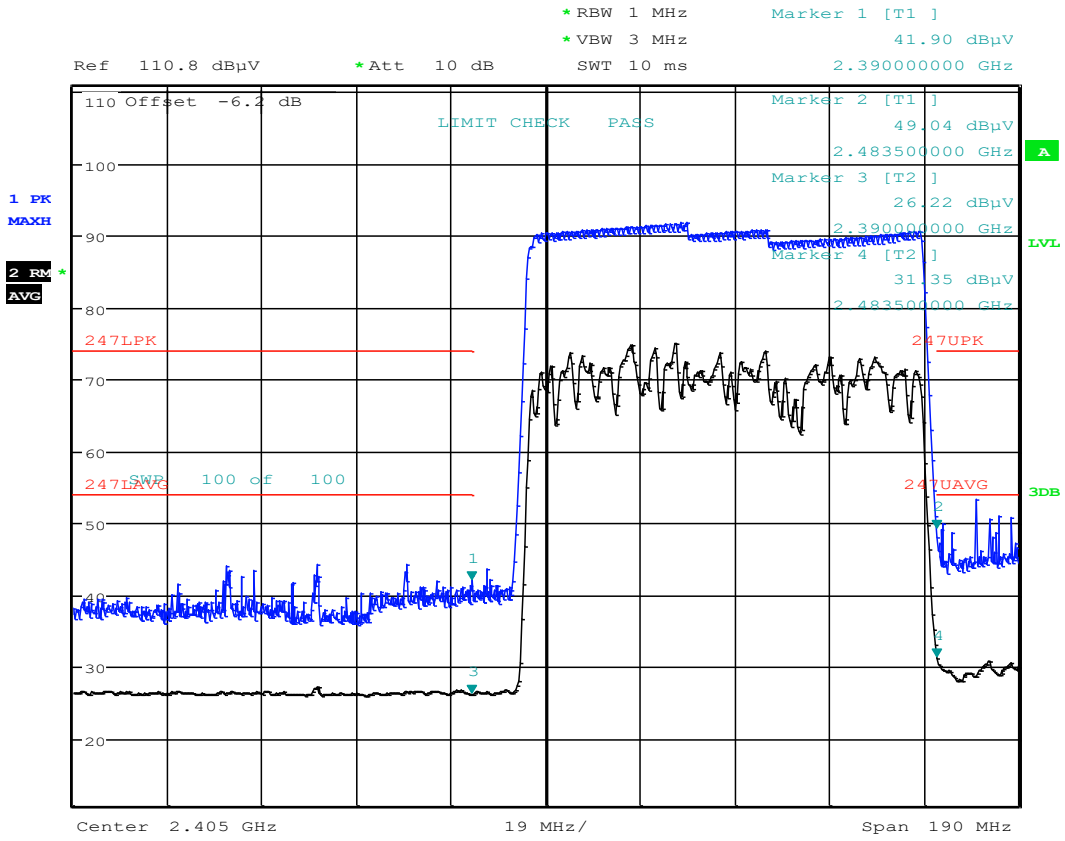

*RBW 1 MHz
*VBW 3 MHz
Ref 111.4 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.54 dBµV
2.390000000 GHz
Offset -5.6 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
49.81 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.61 dBµV
2.390000000 GHz
Marker 4 [T2 ]
44.09 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


RBW 1 MHz
VBW 3 MHz
Ref 111.4 dBµV
Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
39.65 dBµV
2.390000000 GHz
Marker 2 [T1 ]
49.49 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.88 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.23 dBµV
2.483500000 GHz
110 Offset -5.6 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

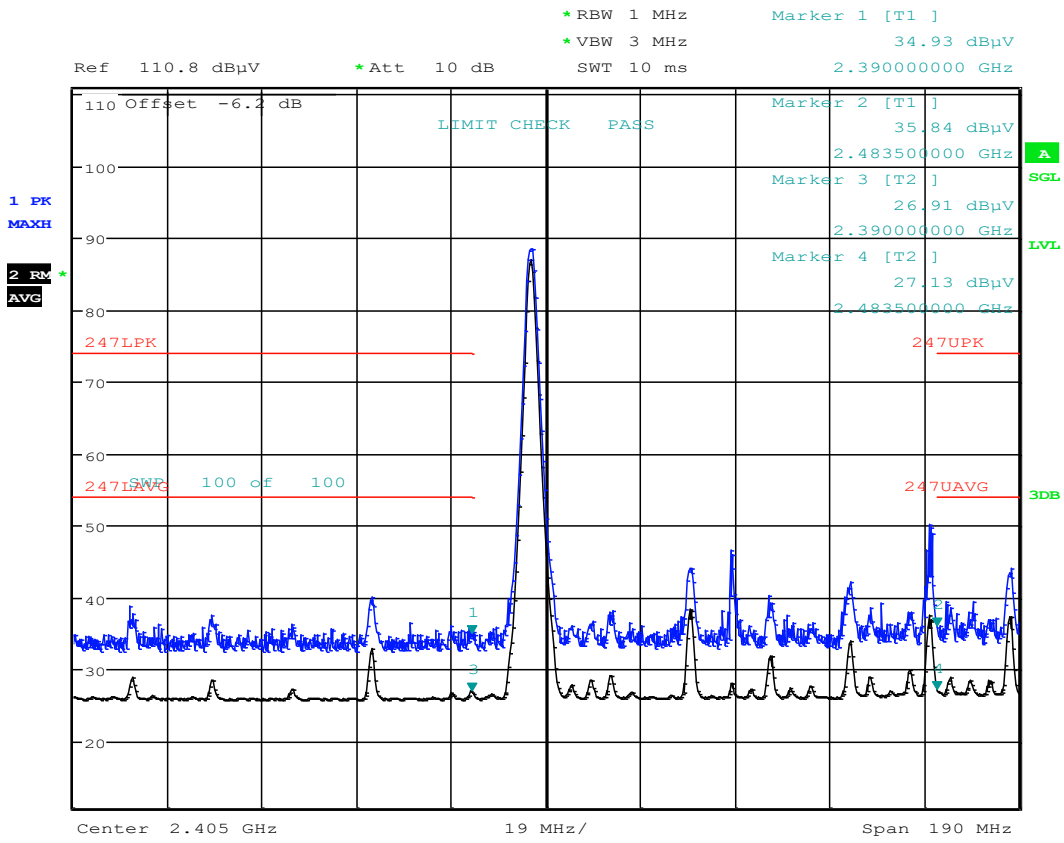
## BDR DM5

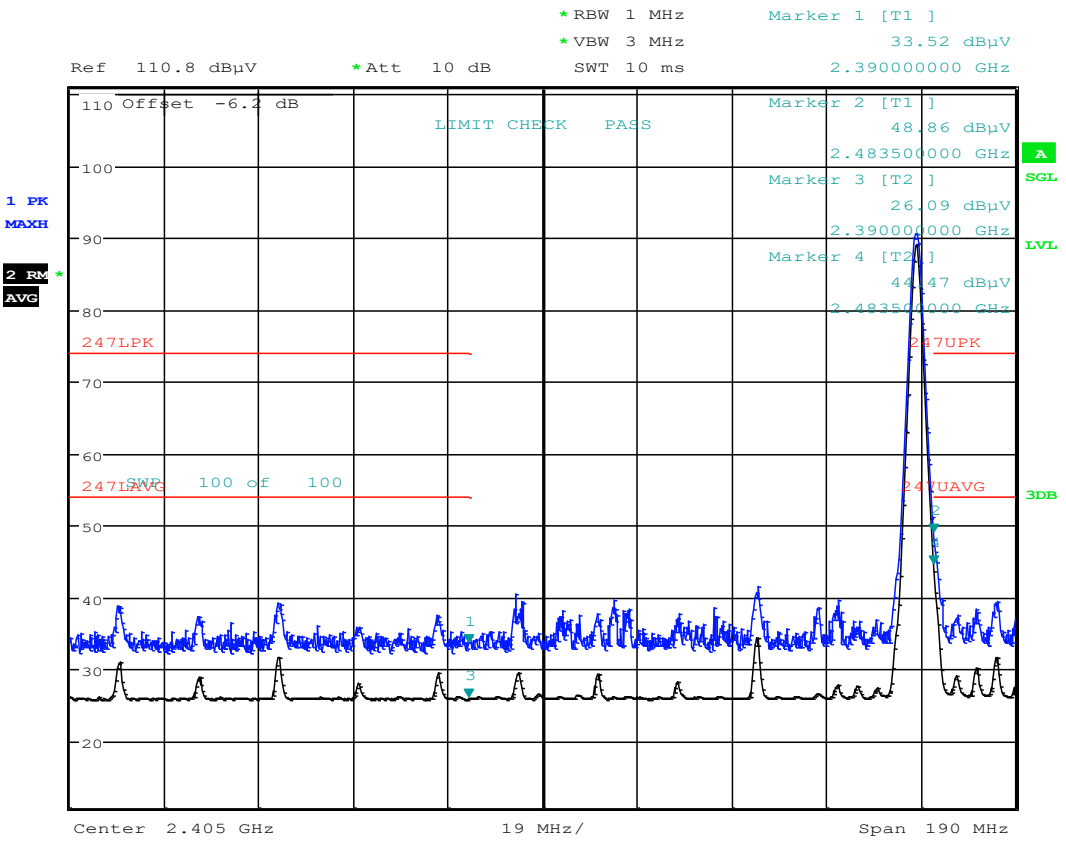

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.58 dBµV
2.390000000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
35.70 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.04 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.42 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

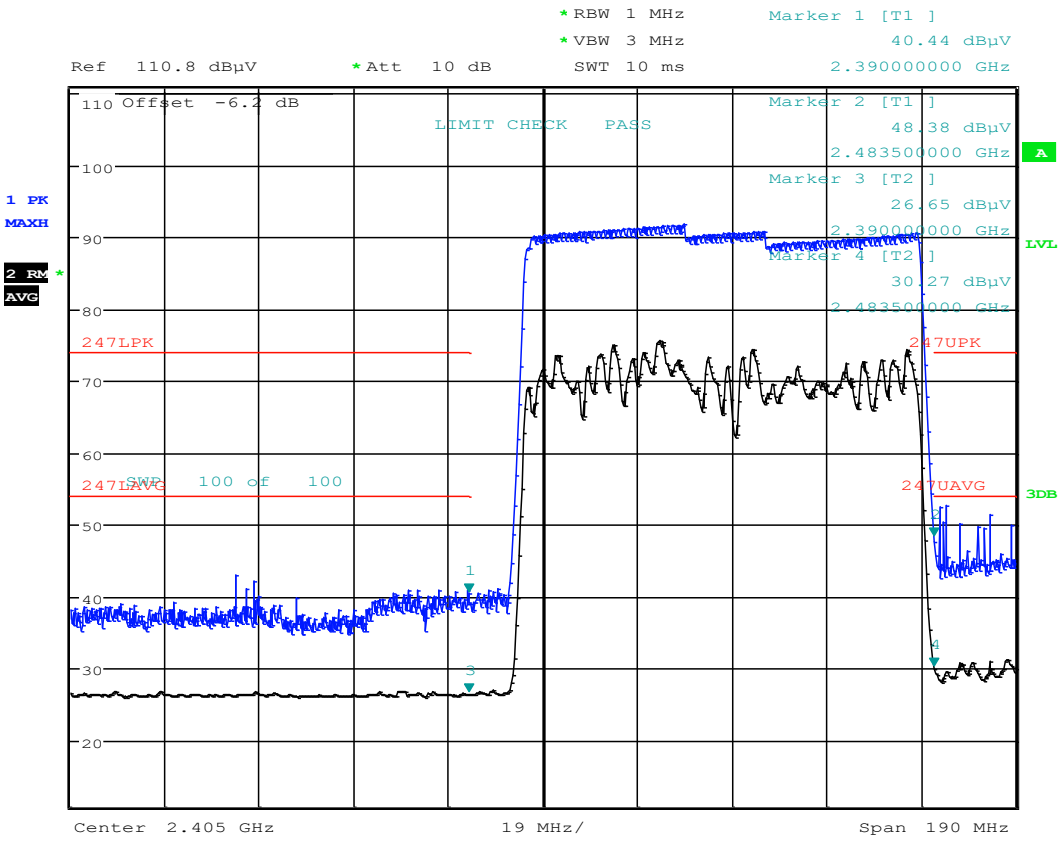

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.84 dBµV
2.390000000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
48.73 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.09 dBµV
2.390000000 GHz
Marker 4 [T2 ]
43.90 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
41.90 dBµV
2.390000000 GHz
Marker 2 [T1 ]
49.04 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.22 dBµV
2.390000000 GHz
Marker 4 [T2 ]
31.35 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM *
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

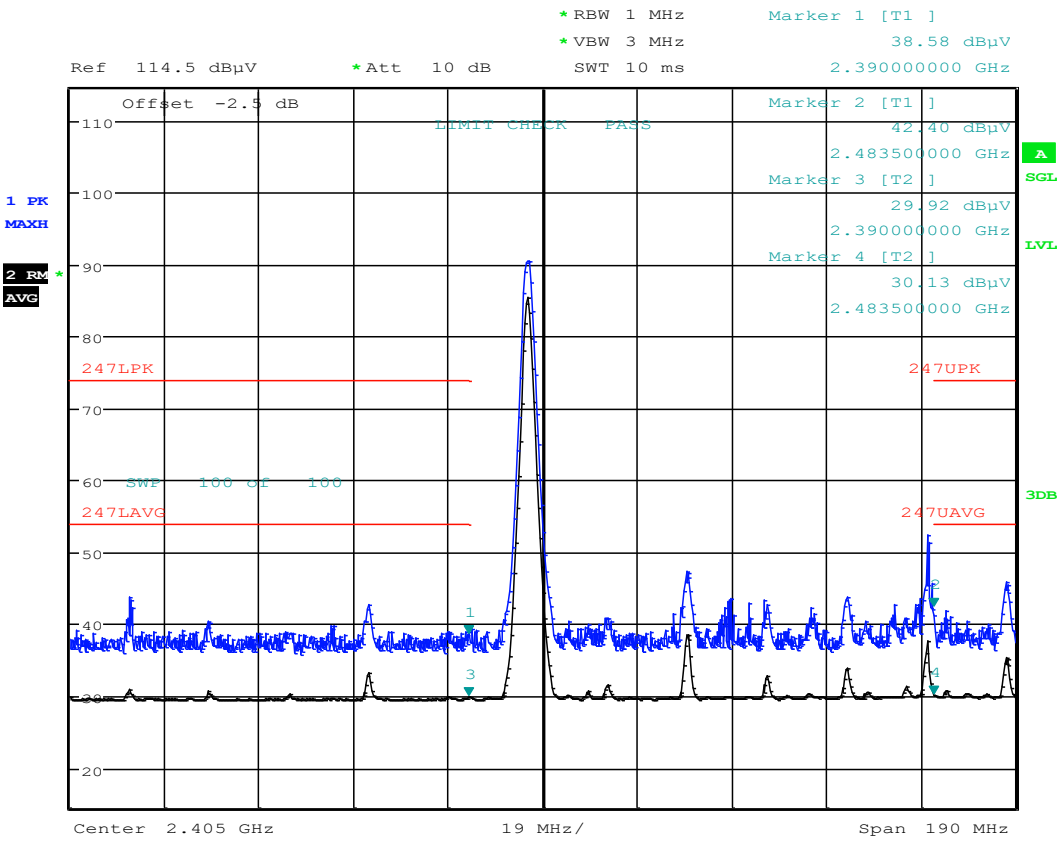
## BDR DH5

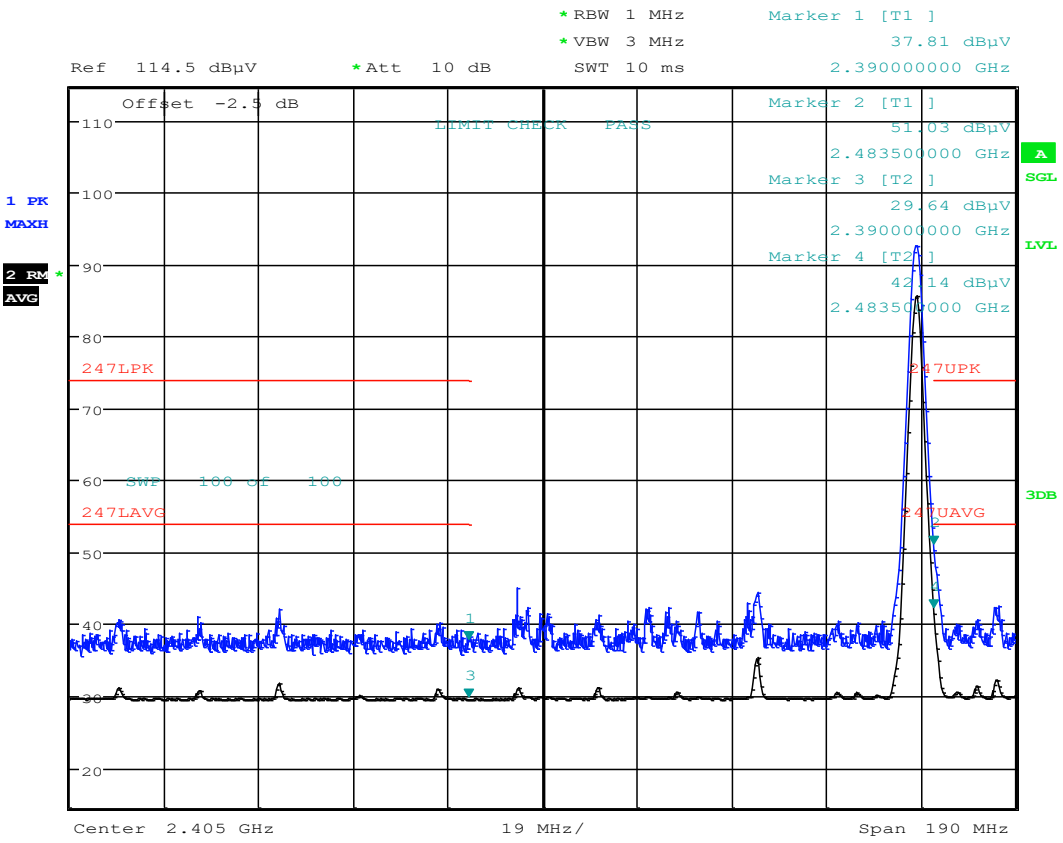

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.93 dBµV
2.390000000 GHz
Marker 2 [T1 ]
35.84 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.91 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.13 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

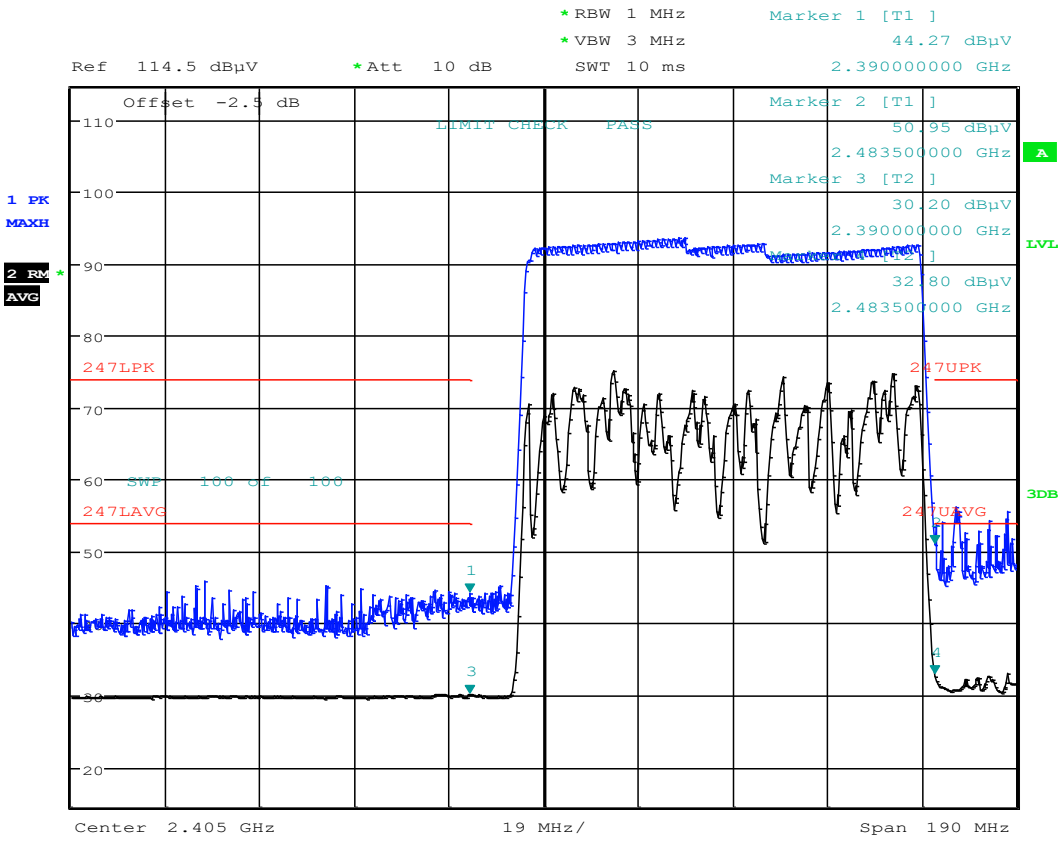

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
33.52 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.86 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.09 dBµV
Marker 4 [T2 ]
44.47 dBµV
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
40.44 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.38 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.65 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.27 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
100
90
80
70
60
50
40
30
20
Center 2.405 GHz
19 MHz/
Span 190 MHz

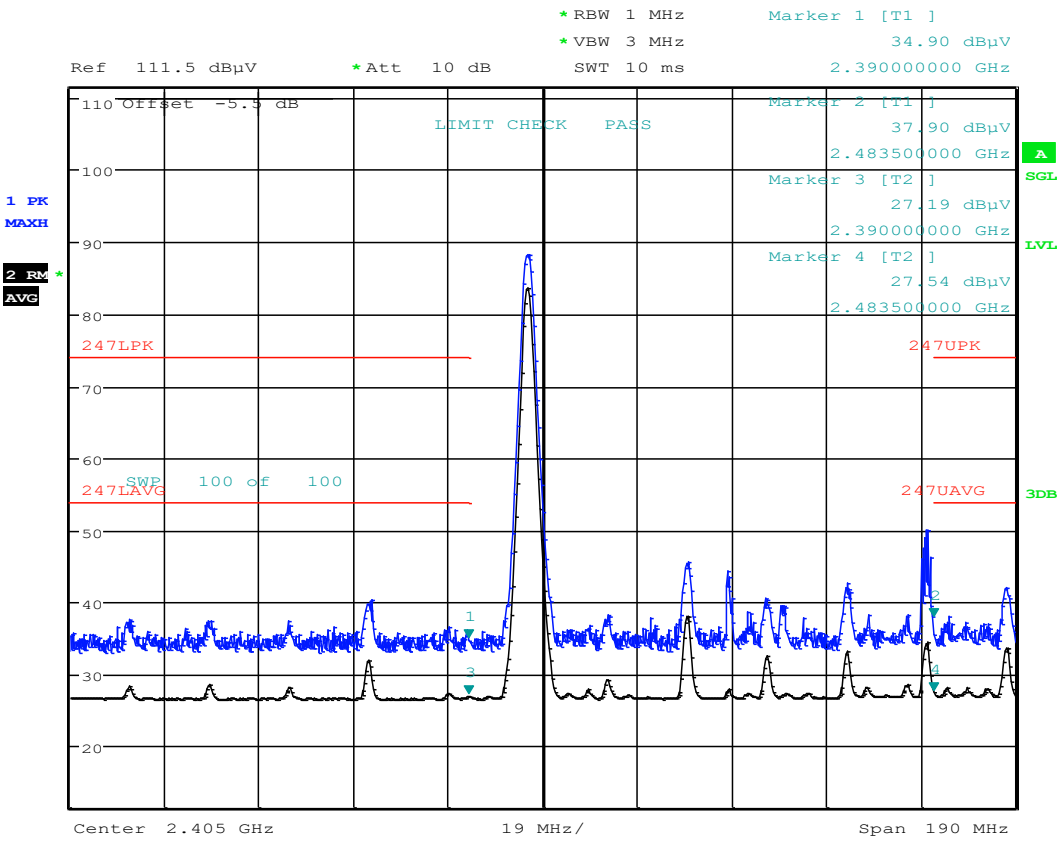
## EDR DM1

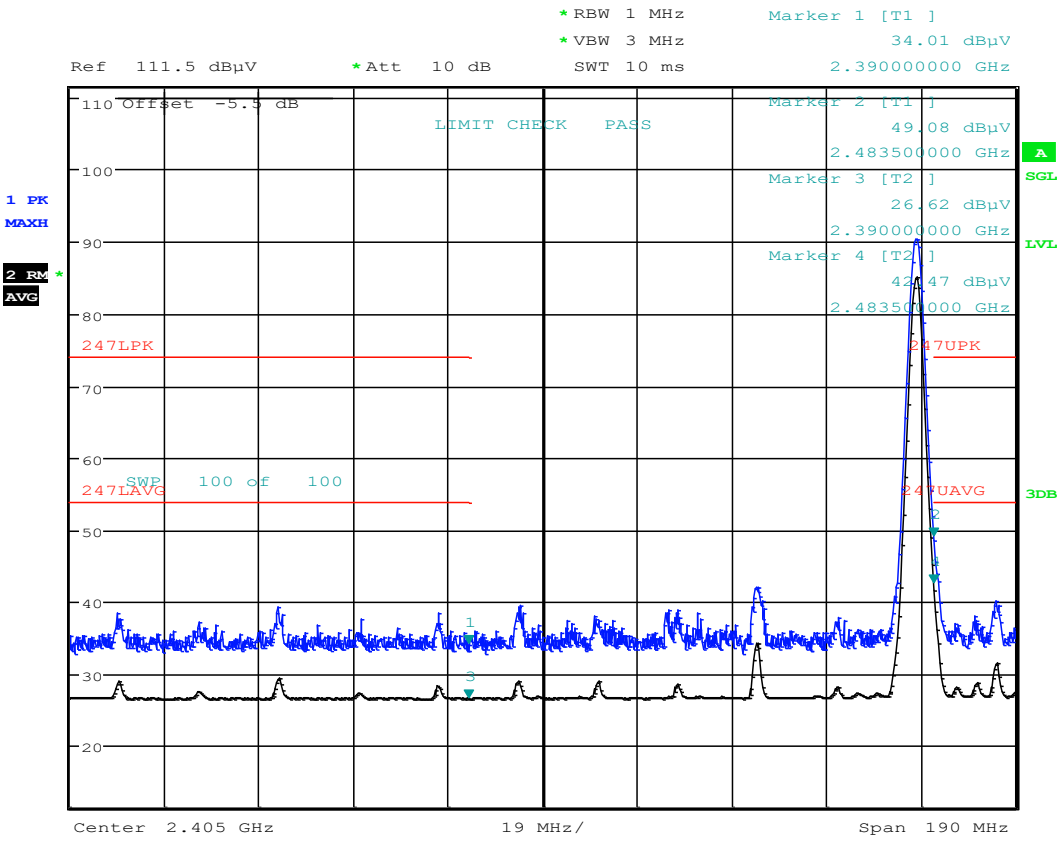

*RBW 1 MHz
*VBW 3 MHz
Ref 114.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
38.58 dBµV
2.390000000 GHz
Offset -2.5 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
42.40 dBµV
2.483500000 GHz
Marker 3 [T2 ]
29.92 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.13 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

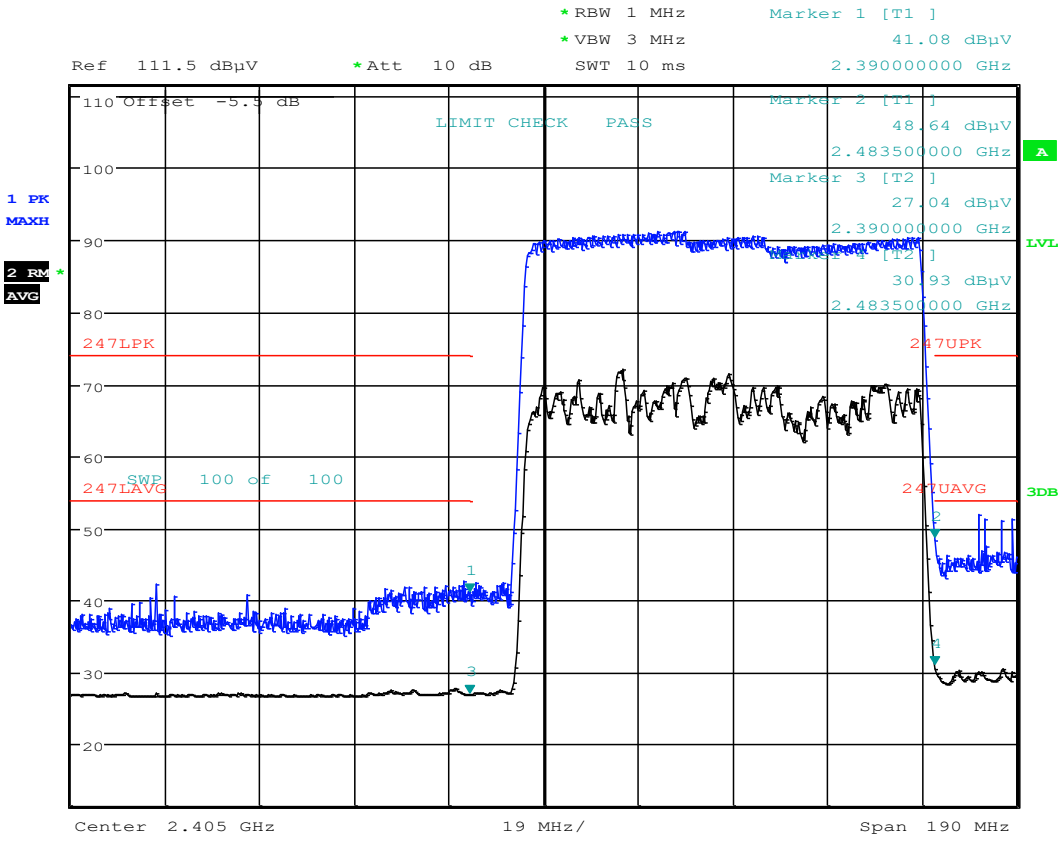

*RBW 1 MHz
*VBW 3 MHz
Ref 114.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
37.81 dBµV
2.390000000 GHz
Offset -2.5 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
51.03 dBµV
2.483500000 GHz
Marker 3 [T2 ]
29.64 dBµV
2.390000000 GHz
Marker 4 [T2 ]
42.14 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 114.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
44.27 dBµV
2.390000000 GHz
Offset -2.5 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
50.95 dBµV
2.483500000 GHz
Marker 3 [T2 ]
30.20 dBµV
2.390000000 GHz
32.80 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
110
100
90
80
70
60
50
40
30
20
Center 2.405 GHz
19 MHz/
Span 190 MHz

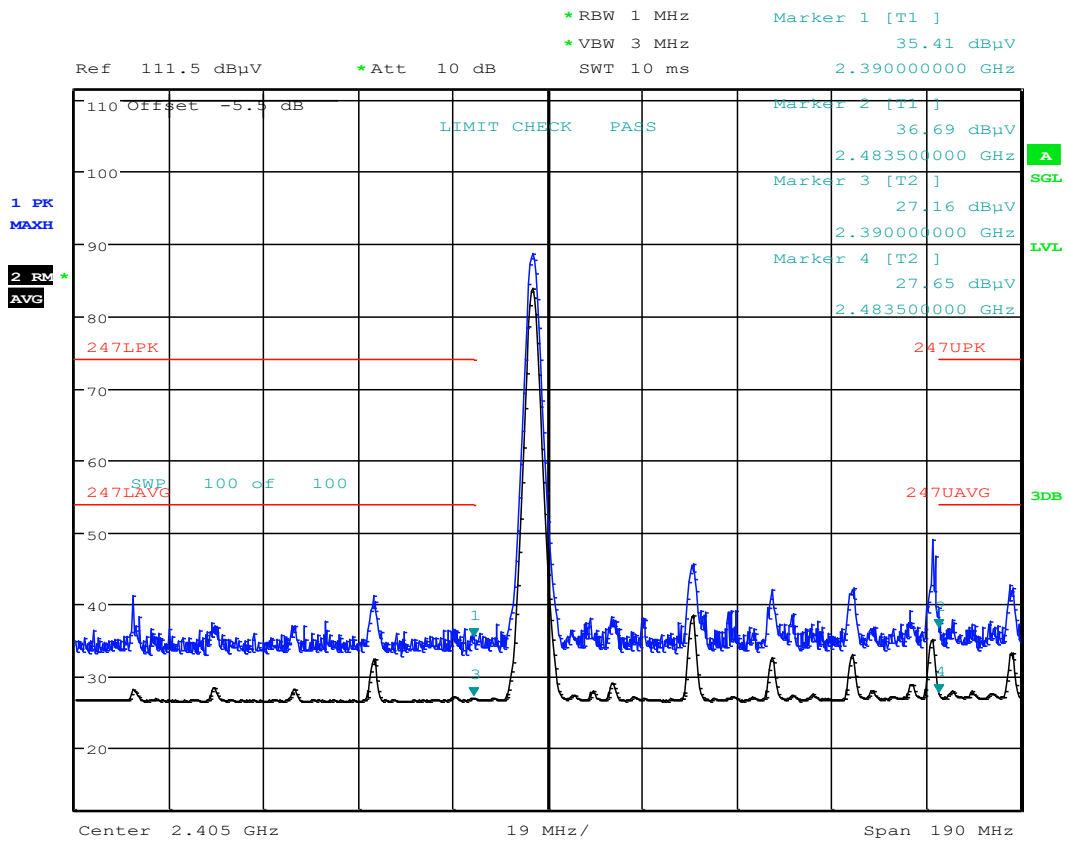
## EDR 2-DH3

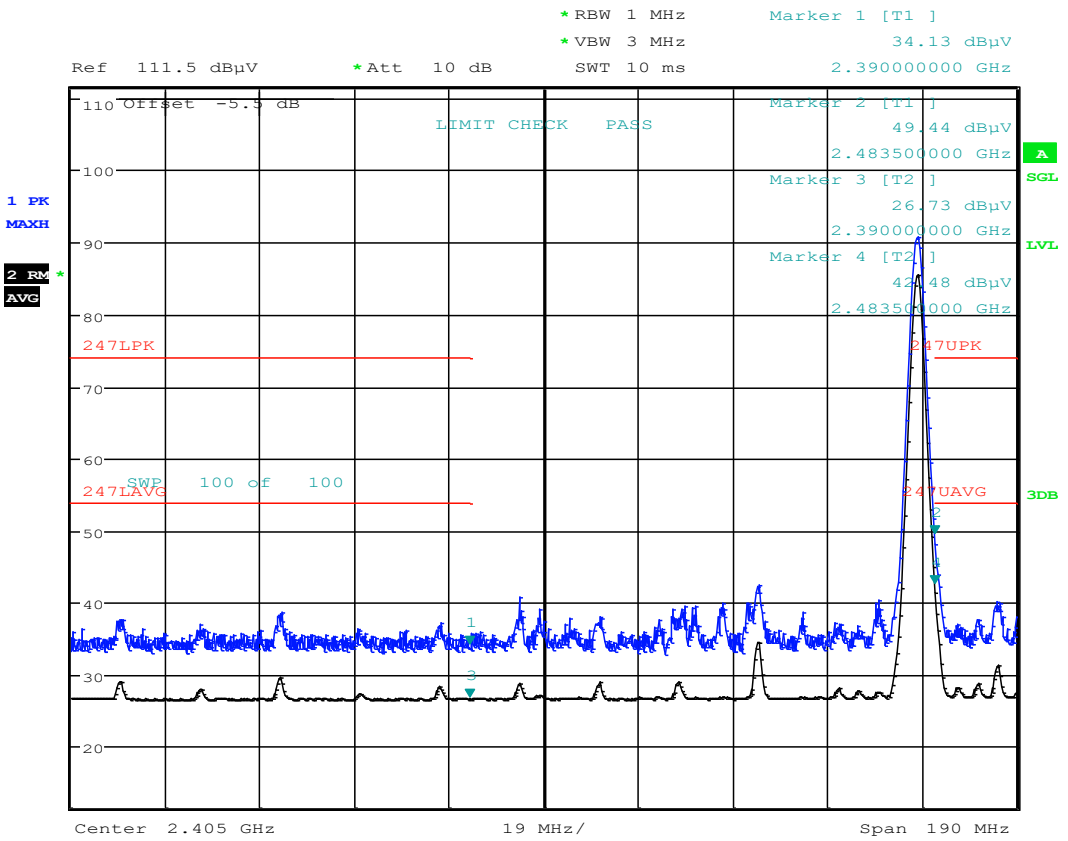

*RBW 1 MHz
*VBW 3 MHz
Ref 111.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.90 dBµV
2.390000000 GHz
Marker 2 [T1 ]
37.90 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.19 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.54 dBµV
2.483500000 GHz
110 Offset -5.5 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

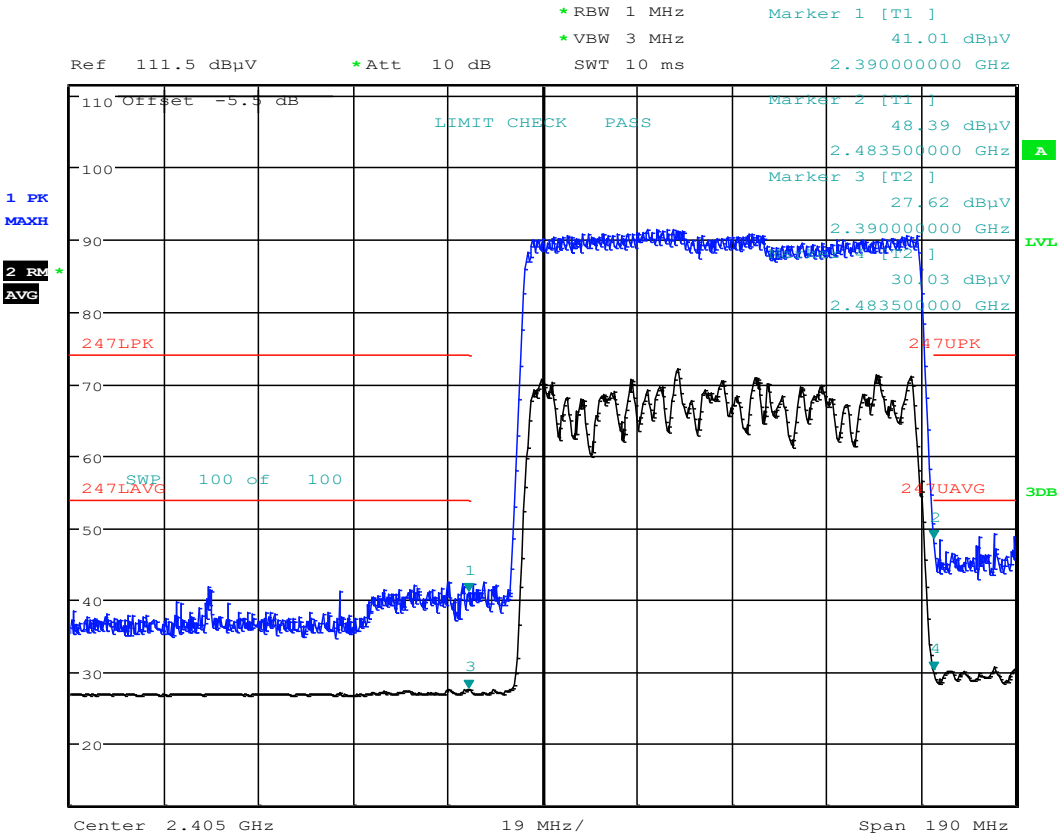

*RBW 1 MHz
*VBW 3 MHz
Ref 111.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.01 dBµV
2.390000000 GHz
Marker 2 [T1 ]
49.08 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.62 dBµV
2.390000000 GHz
Marker 4 [T2 ]
42.47 dBµV
110 Offset -5.5 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 111.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
41.08 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.64 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.04 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.93 dBµV
2.483500000 GHz
110 Offset -5.5 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

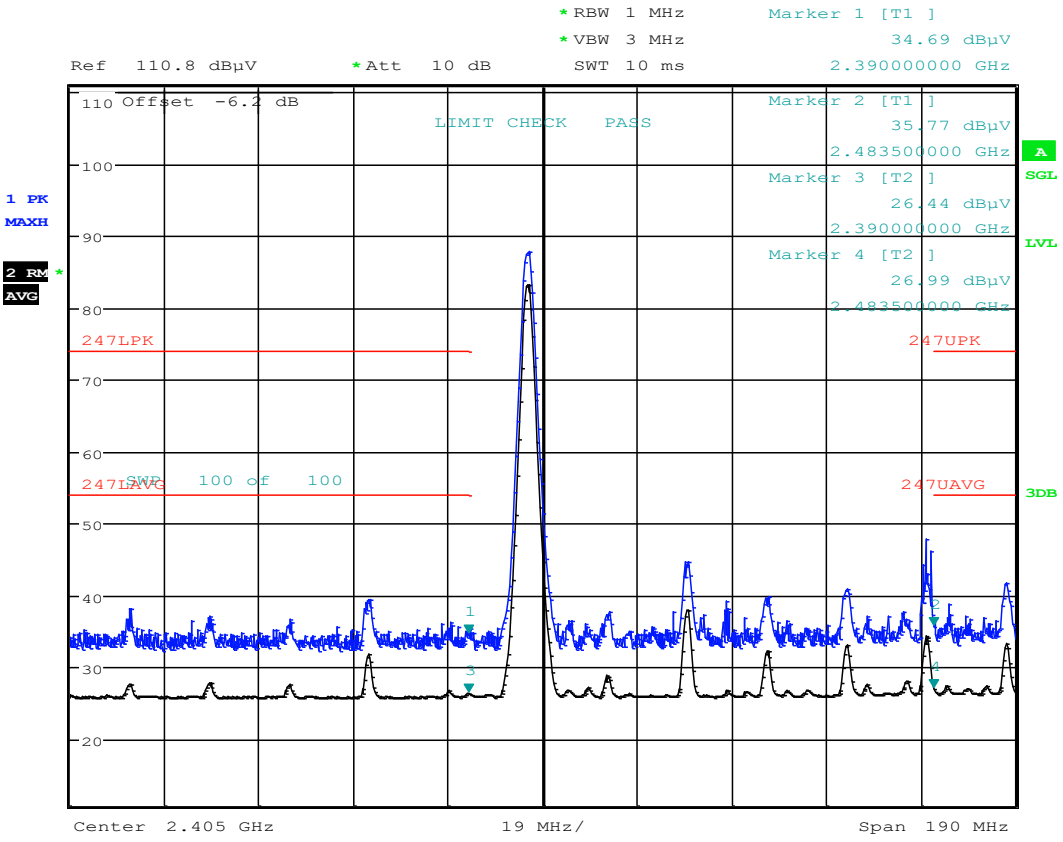
## EDR 3-DH3

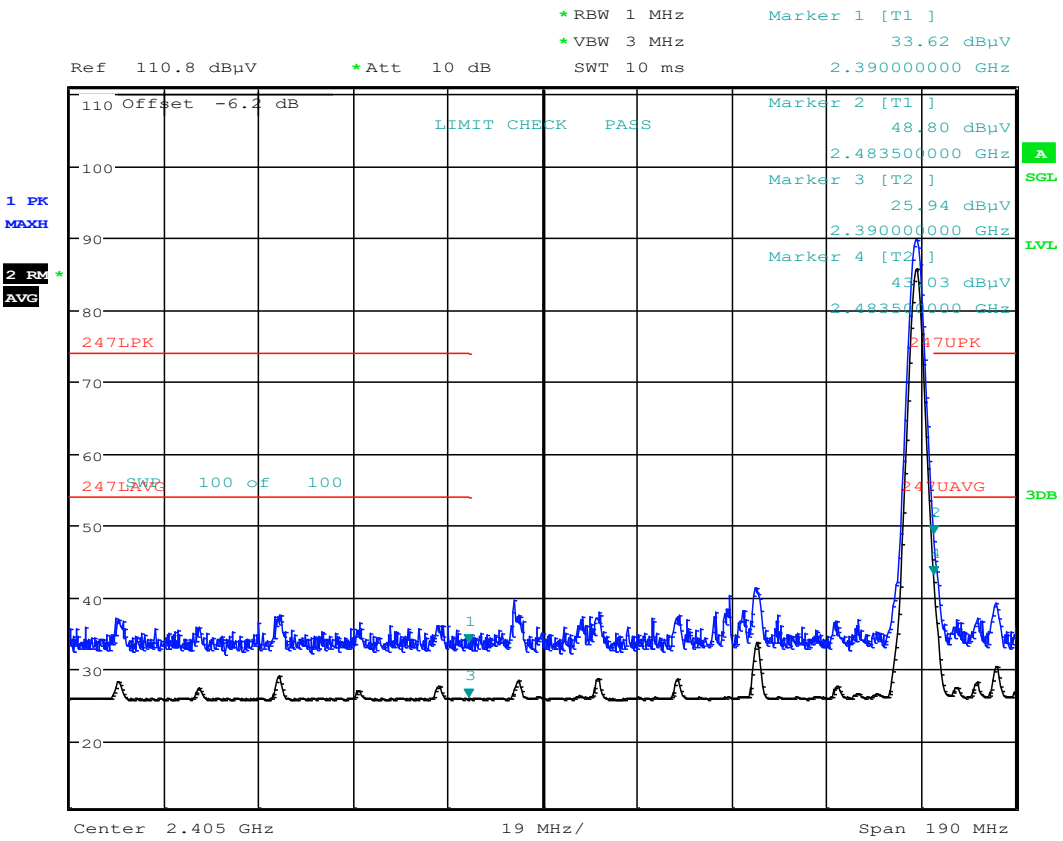

*RBW 1 MHz
*VBW 3 MHz
Ref 111.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
35.41 dBµV
2.390000000 GHz
Offset -5.5 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
36.69 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.16 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.65 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
SWP 100 of 100
247LAVG
247UAVG
Center 2.405 GHz
19 MHz/
Span 190 MHz

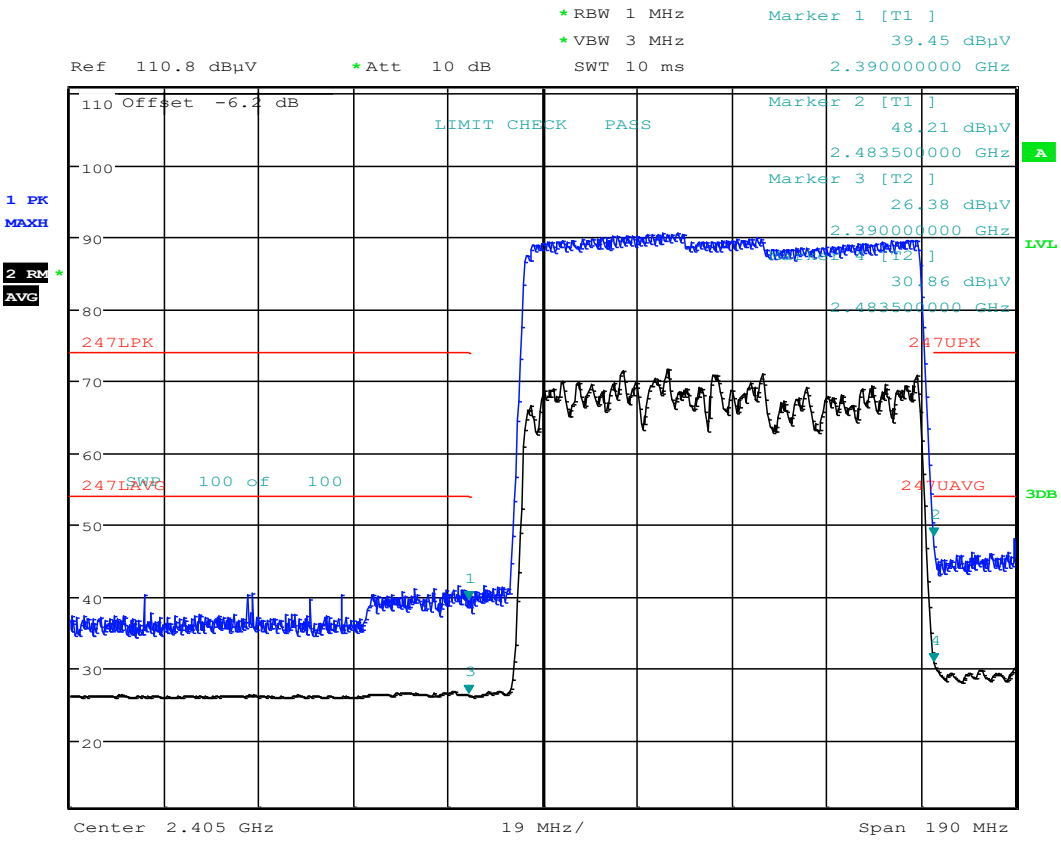

*RBW 1 MHz
*VBW 3 MHz
Ref 111.5 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.13 dBµV
2.390000000 GHz
Offset -5.5 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
49.44 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.73 dBµV
2.390000000 GHz
Marker 4 [T2 ]
42.48 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
SWP 100 of 100
247LAVG
247UAVG
Center 2.405 GHz
19 MHz/
Span 190 MHz


RBW 1 MHz
VBW 3 MHz
Ref 111.5 dBµV
Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
41.01 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.39 dBµV
2.483500000 GHz
Marker 3 [T2 ]
27.62 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.03 dBµV
2.483500000 GHz
Offset -5.5 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
110
100
90
80
70
60
50
40
30
20
Center 2.405 GHz
19 MHz/
Span 190 MHz

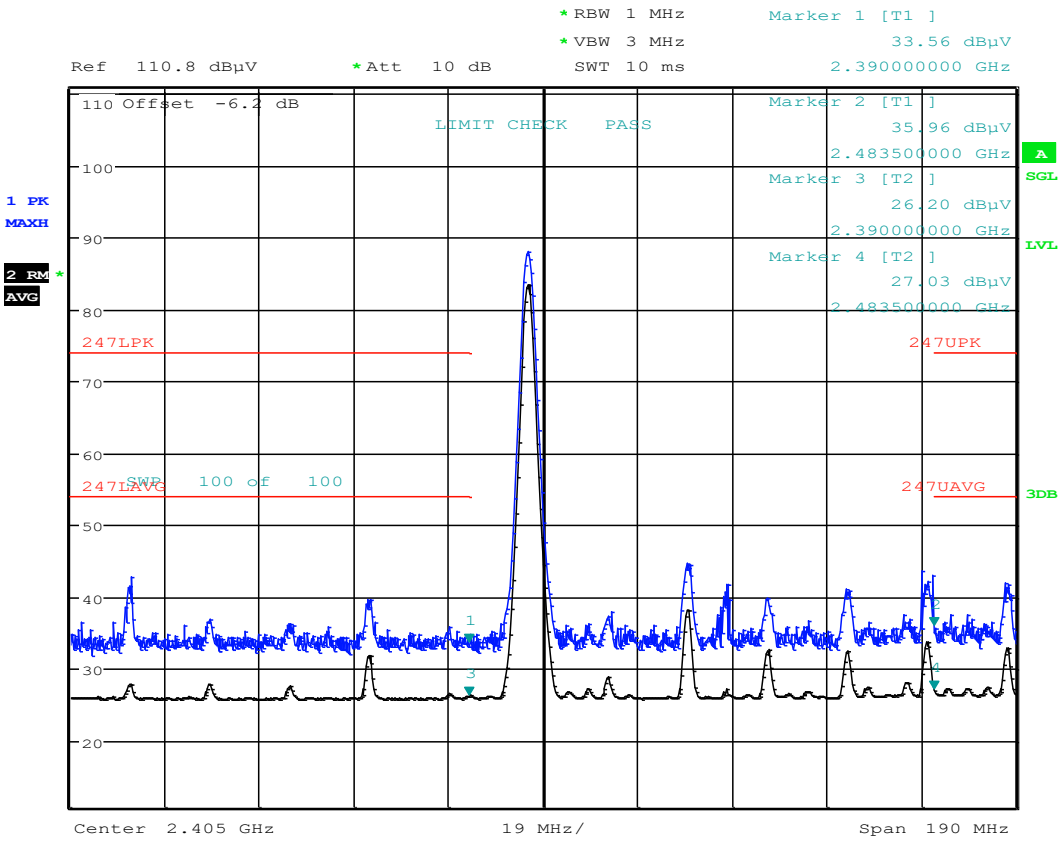
## EDR 2-DH5

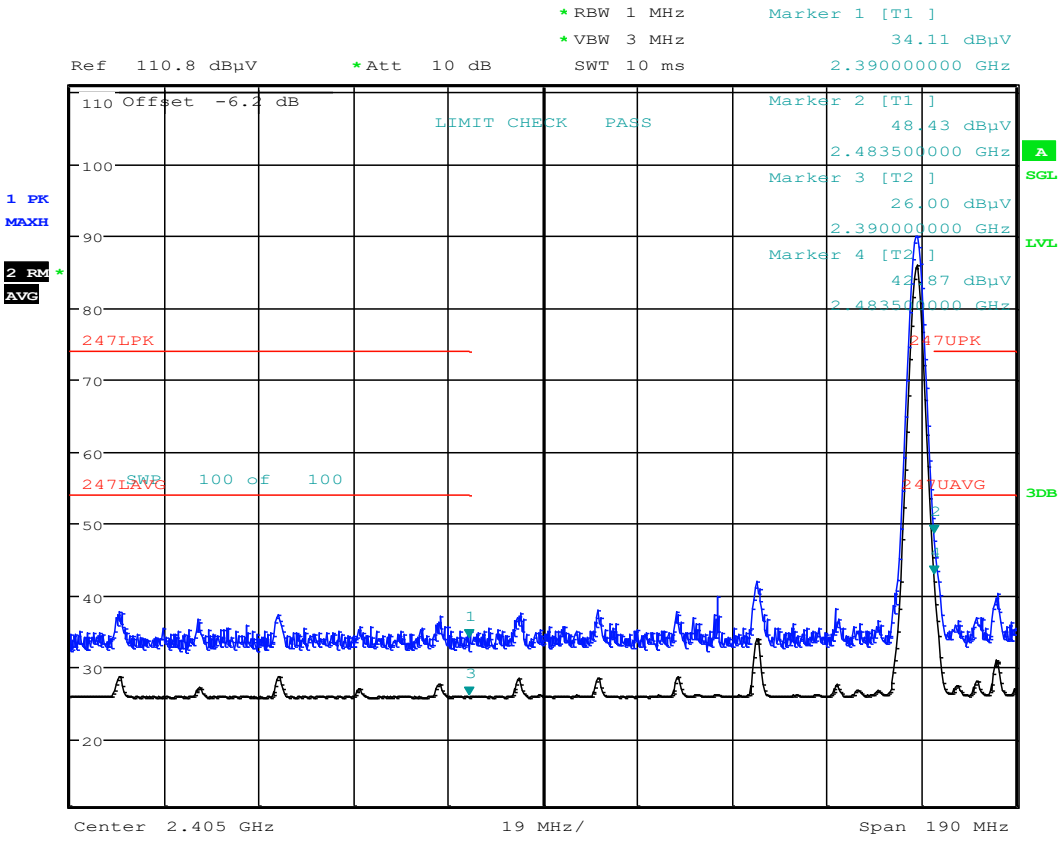

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.69 dBµV
2.390000000 GHz
Offset -6.2 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
35.77 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.44 dBµV
2.390000000 GHz
Marker 4 [T2 ]
26.99 dBµV
2.483500000 GHz
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

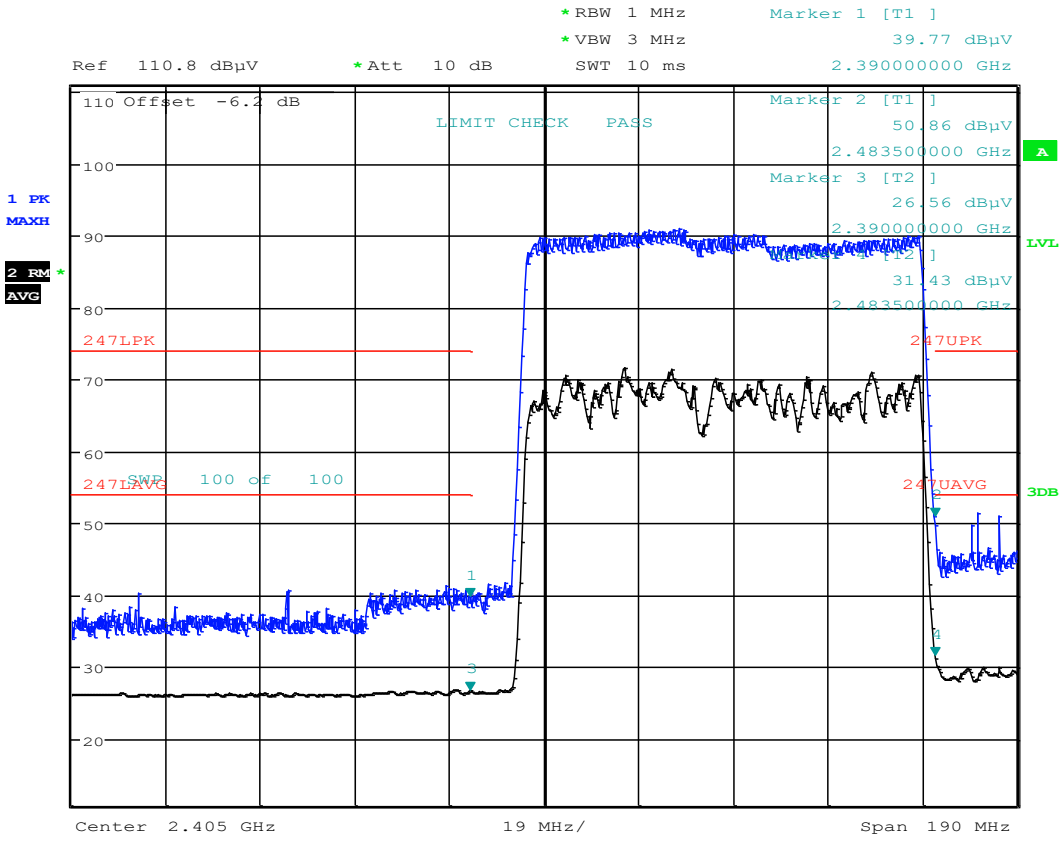

*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
33.62 dBµV
2.390000000 GHz
Offset -6.2 dB
LIMIT CHECK PASS
Marker 2 [T1 ]
48.80 dBµV
2.483500000 GHz
Marker 3 [T2 ]
25.94 dBµV
2.390000000 GHz
Marker 4 [T2 ]
43.03 dBµV
1 PK
MAXH
2 RM
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


RBW 1 MHz
VBW 3 MHz
Ref 110.8 dBµV
Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
39.45 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.21 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.38 dBµV
2.390000000 GHz
Marker 4 [T2 ]
30.86 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

## EDR 3-DH5


*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
33.56 dBµV
2.390000000 GHz
Marker 2 [T1 ]
35.96 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.20 dBµV
2.390000000 GHz
Marker 4 [T2 ]
27.03 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
34.11 dBµV
2.390000000 GHz
Marker 2 [T1 ]
48.43 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.00 dBµV
2.390000000 GHz
Marker 4 [T2 ]
42.87 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM *
AVG
A
SGL
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz


*RBW 1 MHz
*VBW 3 MHz
Ref 110.8 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1 ]
39.77 dBµV
2.390000000 GHz
Marker 2 [T1 ]
50.86 dBµV
2.483500000 GHz
Marker 3 [T2 ]
26.56 dBµV
2.390000000 GHz
Marker 4 [T2 ]
31.43 dBµV
2.483500000 GHz
110 Offset -6.2 dB
LIMIT CHECK PASS
1 PK
MAXH
2 RM
AVG
A
LVL
3DB
247LPK
247UPK
247LAVG
247UAVG
SWP 100 of 100
Center 2.405 GHz
19 MHz/
Span 190 MHz

# Conducted Spurious Emissions

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/09/21

## Test Procedure

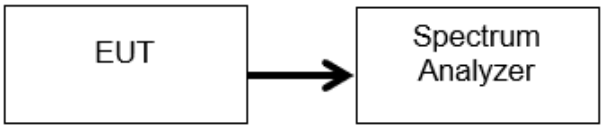
Conducted Spurious Emissions has been measured using the methods of ANSI C63.10 clause 7.8.8. The antenna port was connected to a spectrum analyzer and the range of 30 MHz to 10 times the operating frequency was scanned with a resolution bandwidth of 100 kHz, video bandwidth pf 300 kHz and a coupled sweep time. The frequency range was subdivided into 17 evenly spaced subranges with 30001 sweep points per subrange.

Per ANSI C63.10 Clause 5.6.2.2 b) the mode with the highest output power for each modulation family has been tested and reported.

### Limits

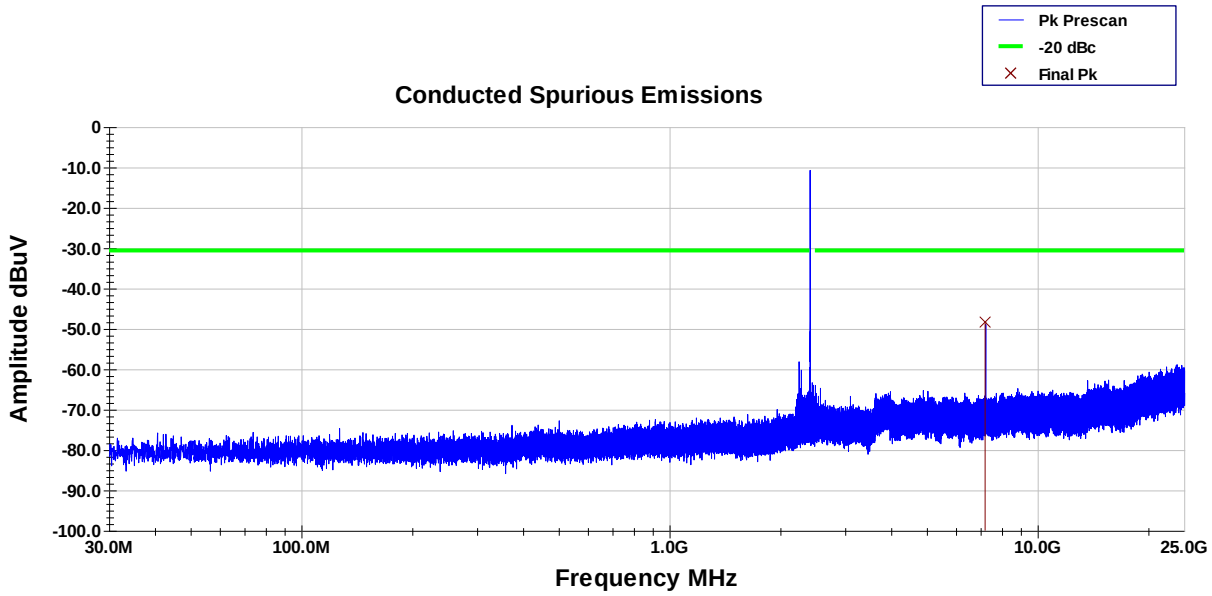
47 CFR 15.247(d) & RSS 247 Section 5.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

## Test Setup



## BDR DH3

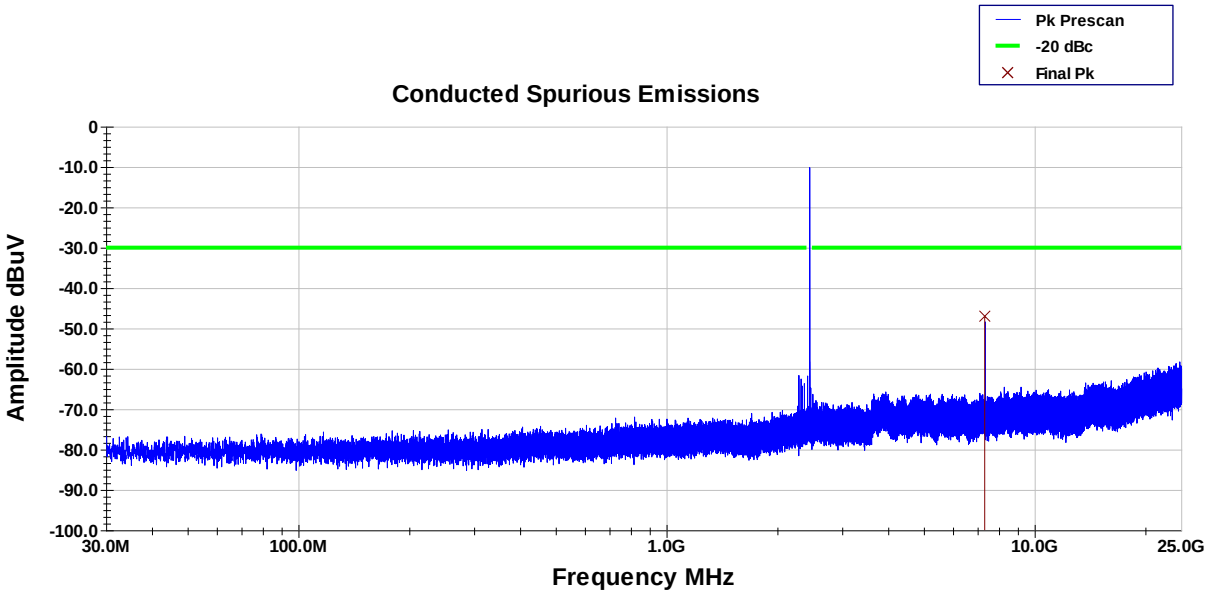
2402 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2055 GHz | -50.597 | -48.213 | 2.384 | -30.612 | -17.601 |

Final = Raw + Path Loss

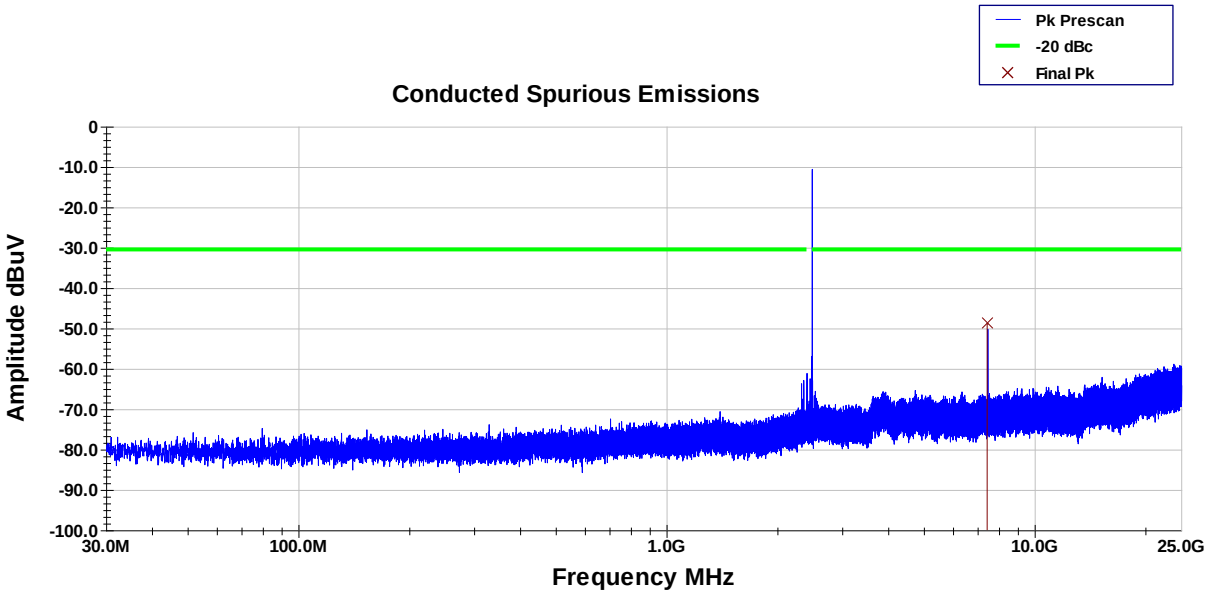
2441 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.3225 GHz | -49.574 | 2.419 | -47.155 | -30.033 | -17.122 |

Final = Raw + Path Loss

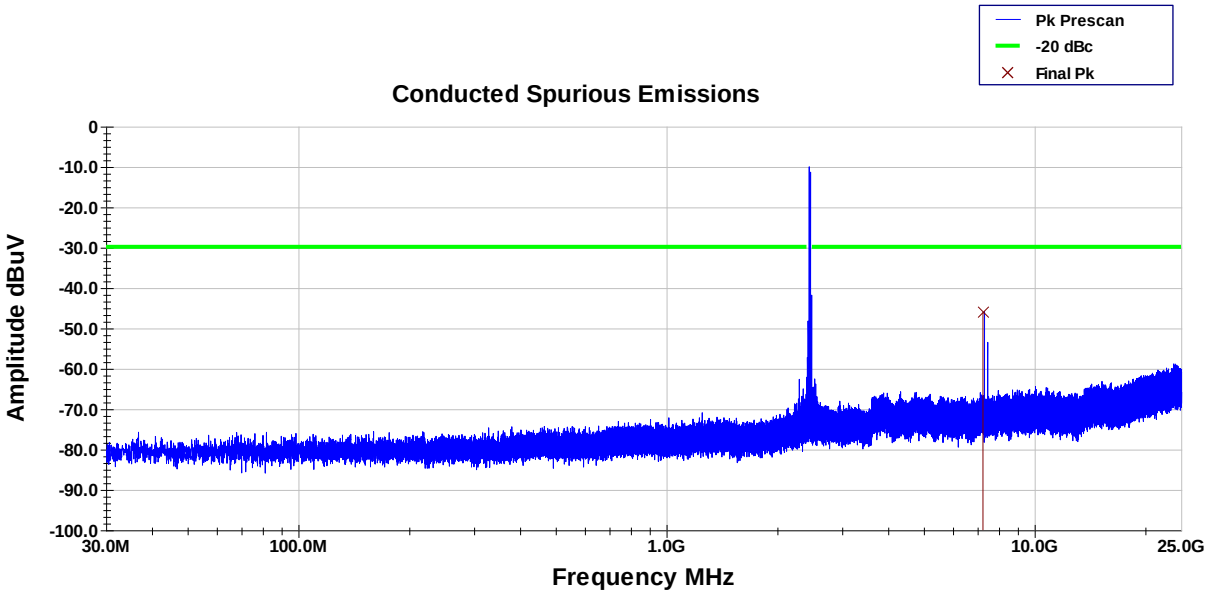
2480 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.4395 GHz | -51.234 | 2.458 | -48.776 | -30.465 | -18.311 |

Final = Raw + Path Loss

Hopping

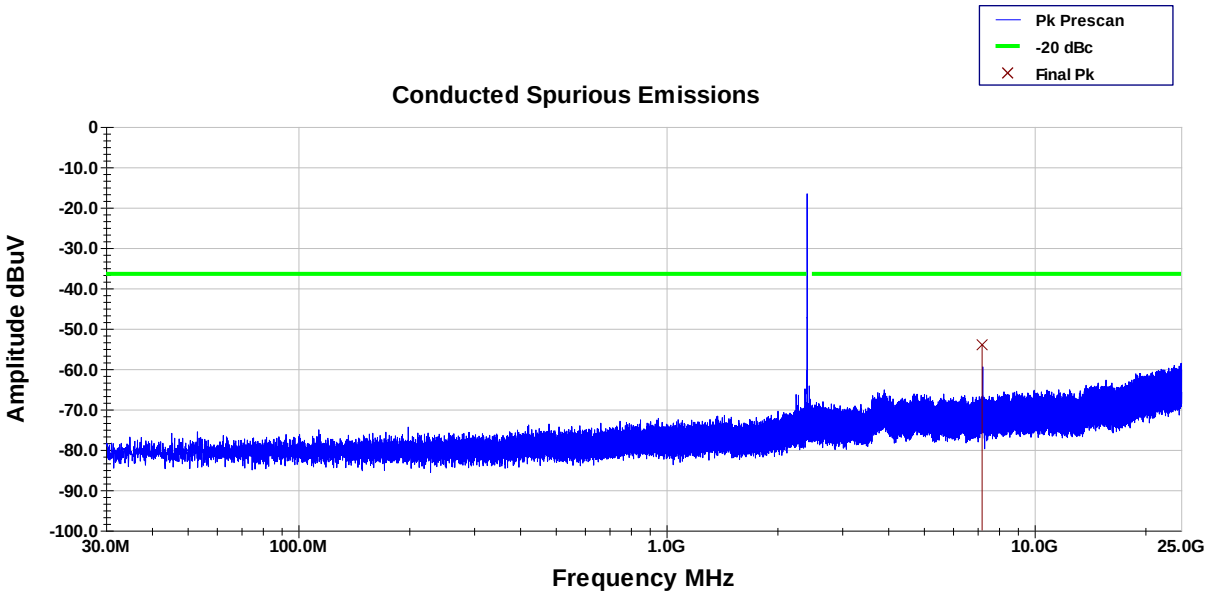



| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2455 GHz | -48.457 | 2.425 | -46.032 | -29.841 | -16.191 |

Final = Raw + Path Loss

## EDR 2-DH3

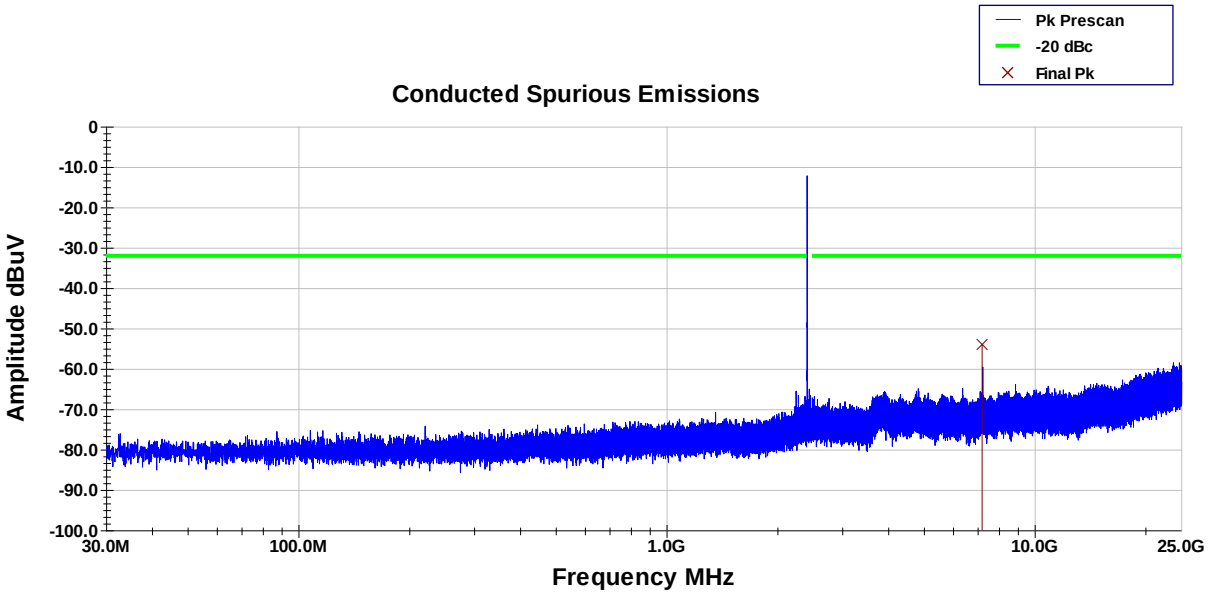
2402 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.206 GHz | -56.338 | 2.385 | -53.953 | -36.441 | -17.512 |

Final = Raw + Path Loss

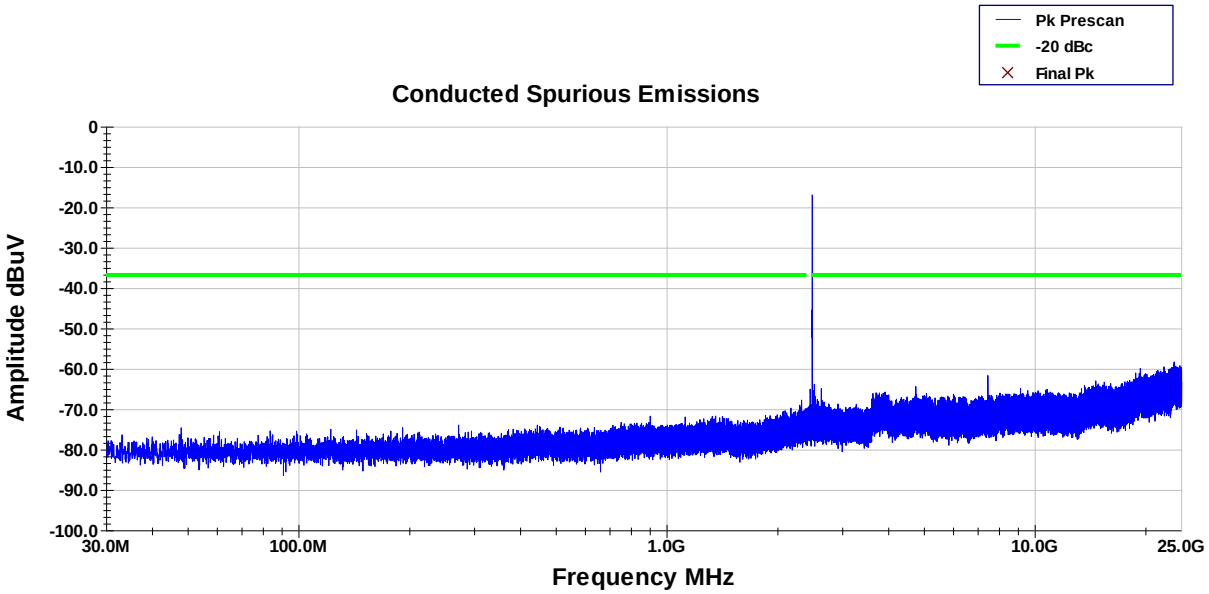
2441 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2061 GHz | -56.344 | 2.385 | -53.959 | -32.071 | -21.888 |

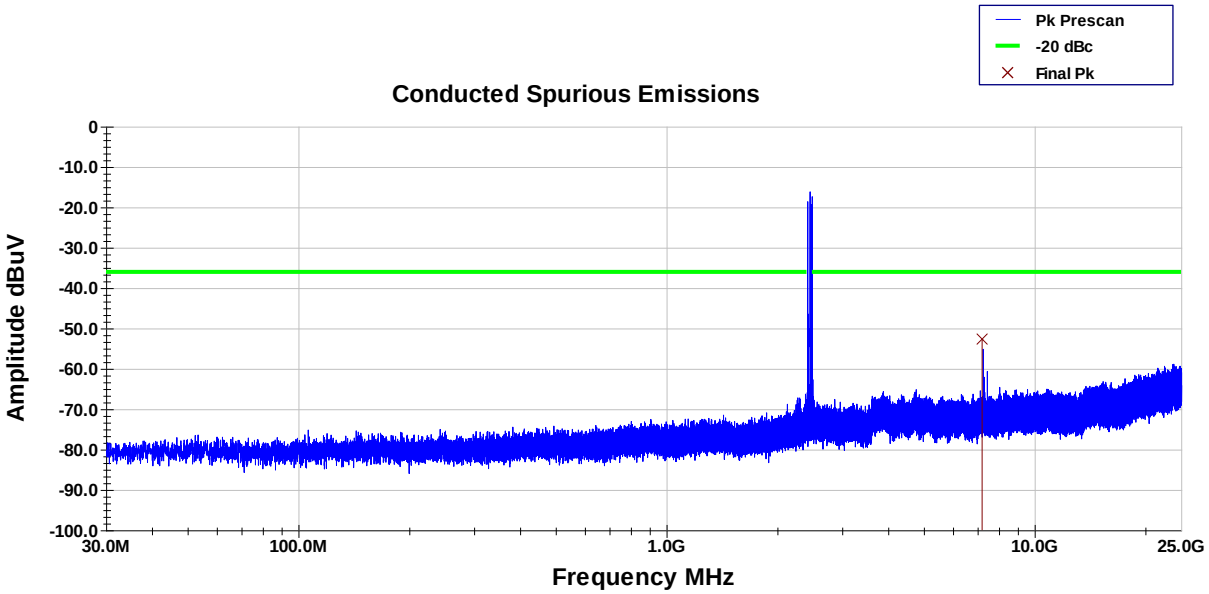
Final = Raw + Path Loss

2480 MHz




Spurious Levels > 20 dB below limit, no final data taken

Hopping

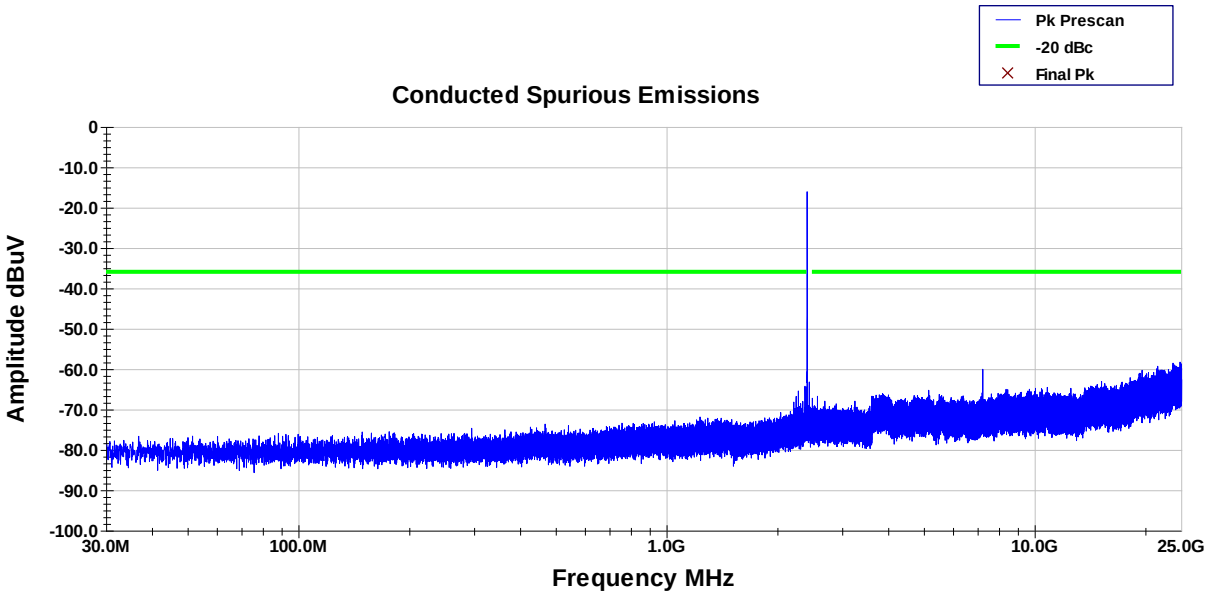



| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2065 GHz | -55.097 | 2.386 | -52.711 | -36.035 | -16.676 |

Final = Raw + Path Loss

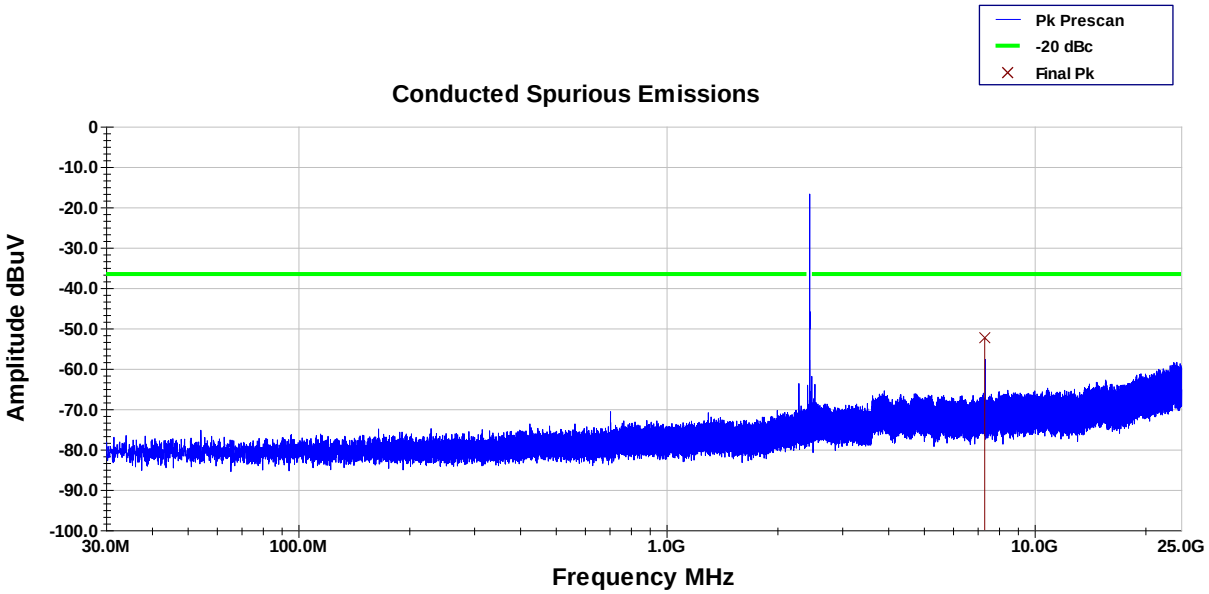
## EDR 3-DH3

2402 MHz




Spurious Levels > 20 dB below limit, no final data taken

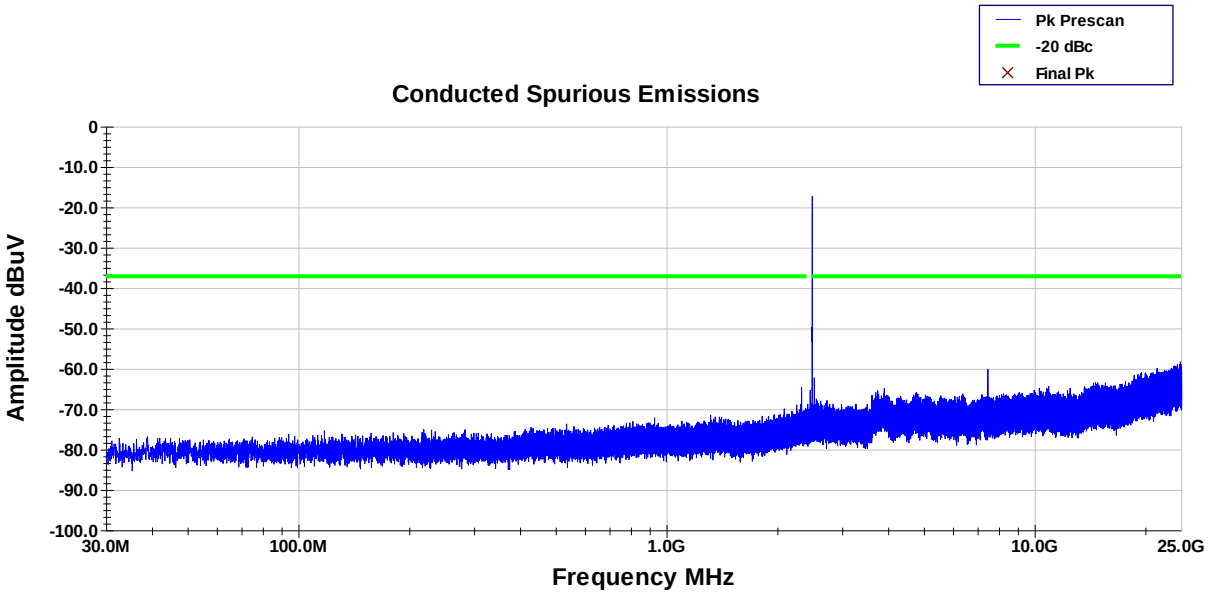
2441 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.3235 GHz | -54.903 | 2.415 | -52.488 | -36.581 | -15.907 |

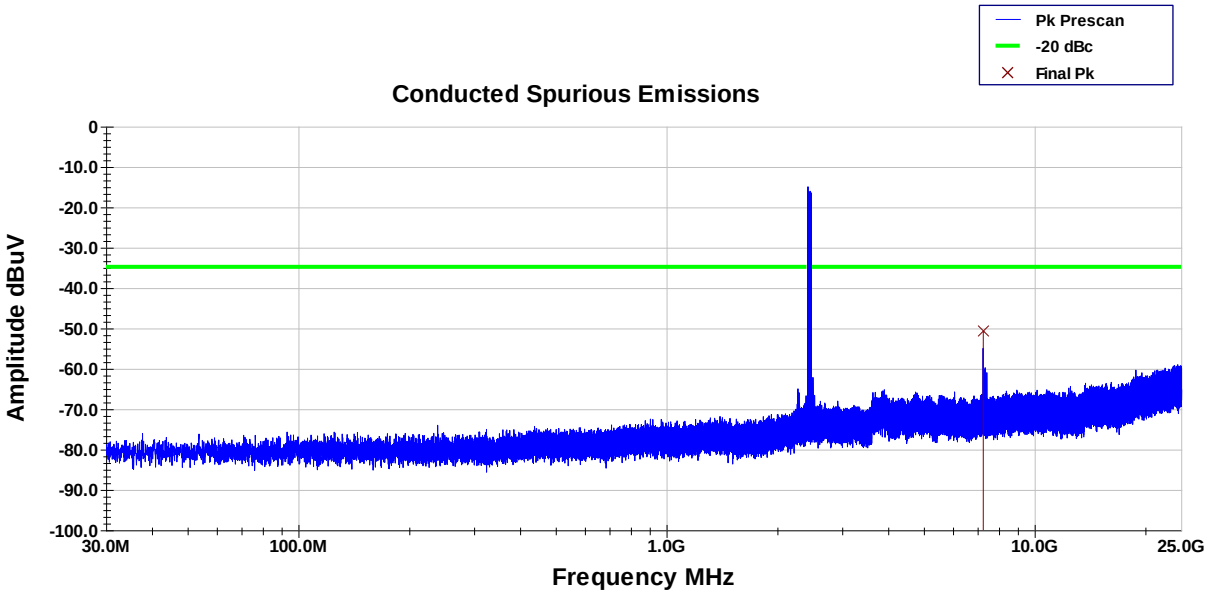
Final = Raw + Path Loss

2480 MHz




Spurious Levels > 20 dB below limit, no final data taken

Hopping

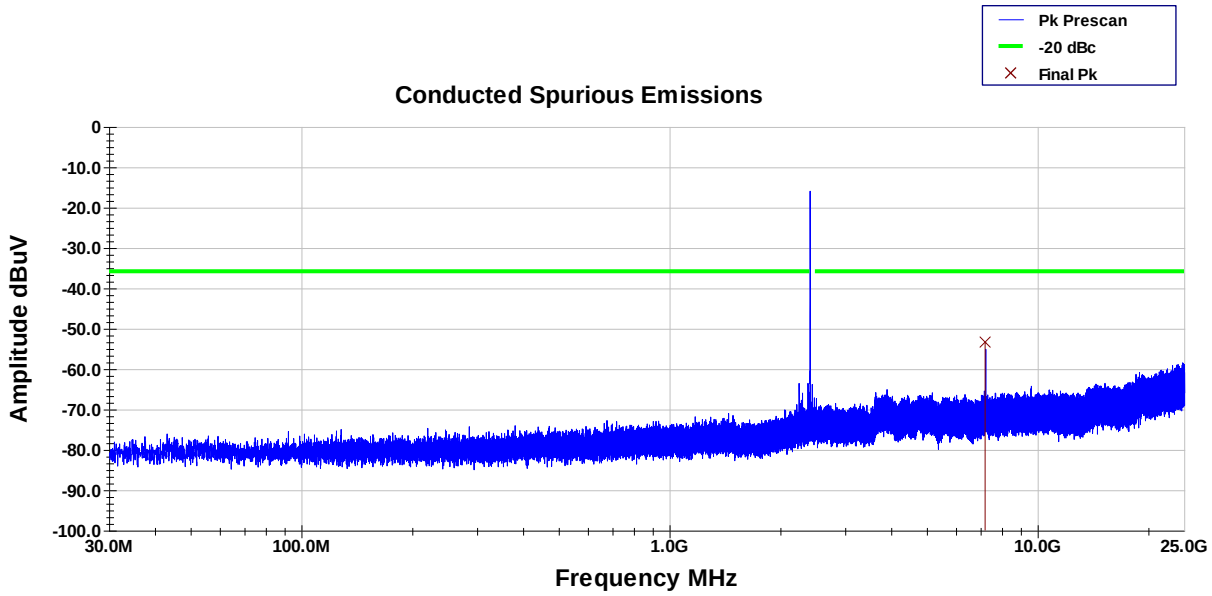



| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.257 GHz | -53.171 | 2.421 | -50.75 | -34.785 | -15.965 |

Final = Raw + Path Loss

## EDR 3-DH5

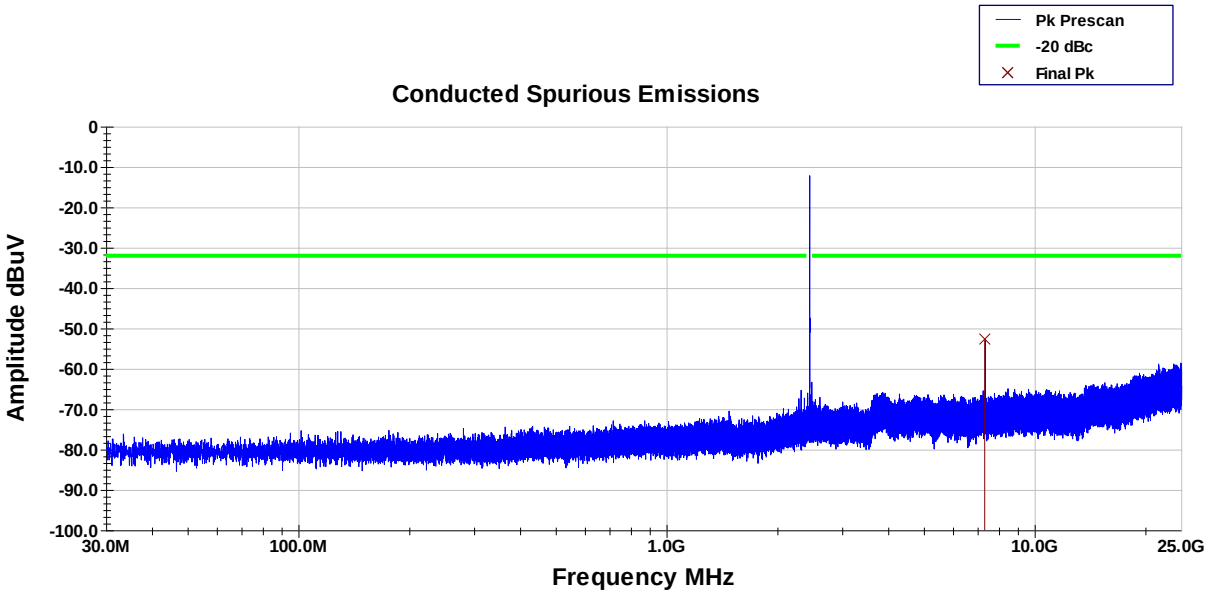
2402 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2065 GHz | -55.785 | 2.386 | -53.399 | -35.802 | -17.597 |

Final = Raw + Path Loss

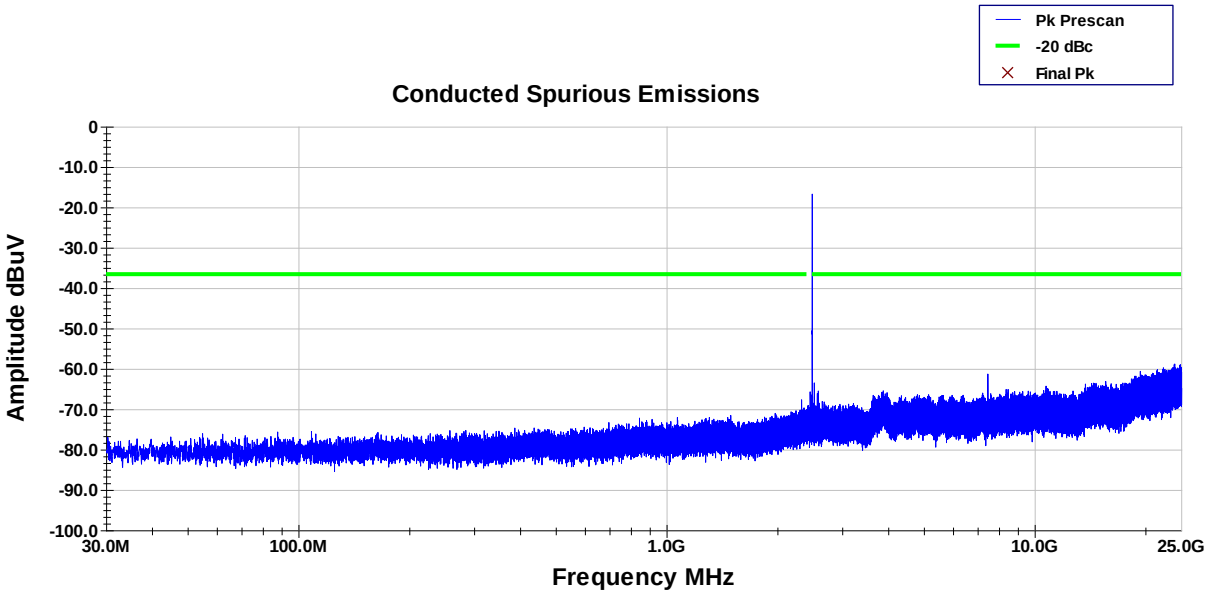
2441 MHz




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.3225 GHz | -55.25 | 2.419 | -52.831 | -32.038 | -20.793 |

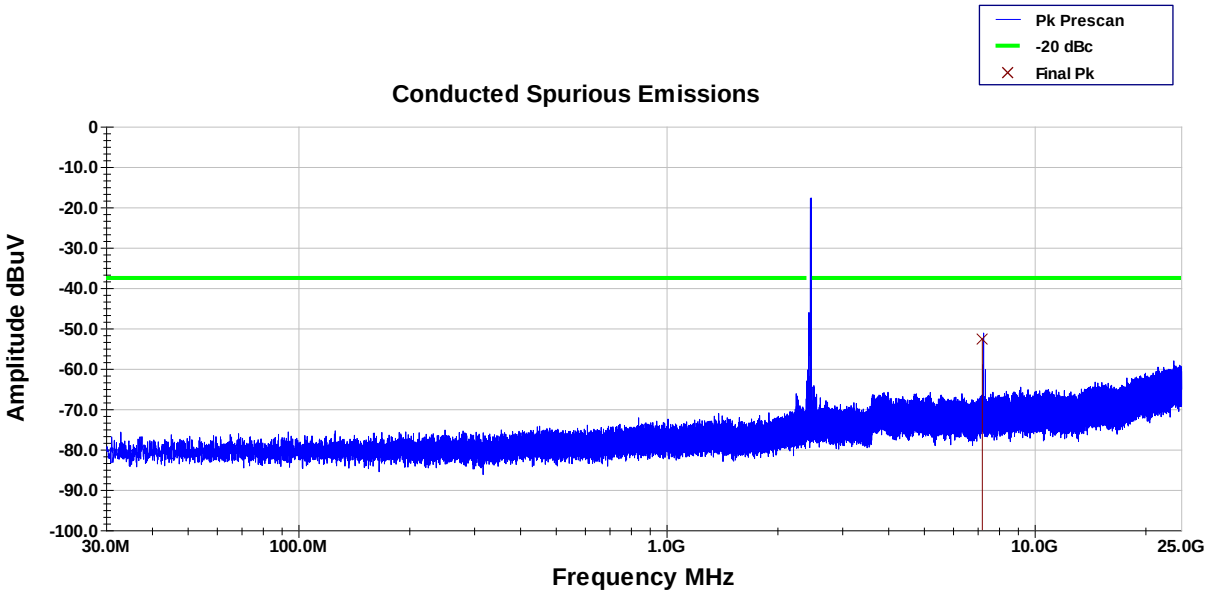
Final = Raw + Path Loss

2480 MHz




Spurious Levels > 20 dB below limit, no final data taken

Hopping




| Frequency | Raw Pk dBm | Path Loss dB | Final Pk dBm | Limit dBm | Pk Margin dB |
|---|---|---|---|---|---|
| 7.2178 GHz | -55.191 | 2.417 | -52.774 | -37.552 | -15.222 |

Final = Raw + Path Loss

# Radiated Spurious Emissions

**Engineer:** Aaron S. Froehlich
**Test Date:** 11/15/21

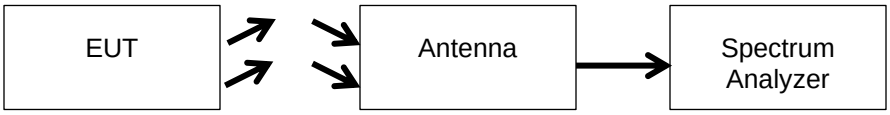
## Test Procedure: 30-1000 MHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation, as well as frequency hopping, at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

All emissions from 30 MHz to 1 GHz were examined.
Measured Level includes antenna and receiver cable correction factors.
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz
VBW = 300 KHz
Detector – Quasi Peak

### Test Setup

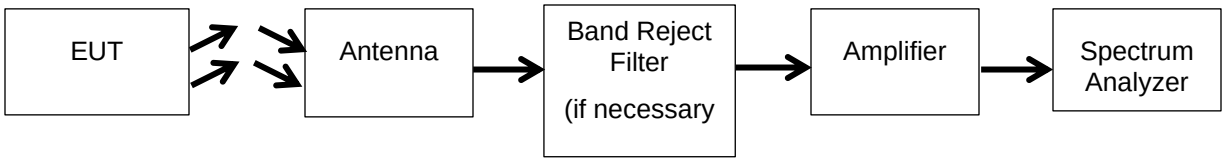



## Test Procedure: ≥ 1 GHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

RBW = 1 MHz
VBW = 3 MHz
Detector – Peak

### Test Setup




Worst Case Emission:

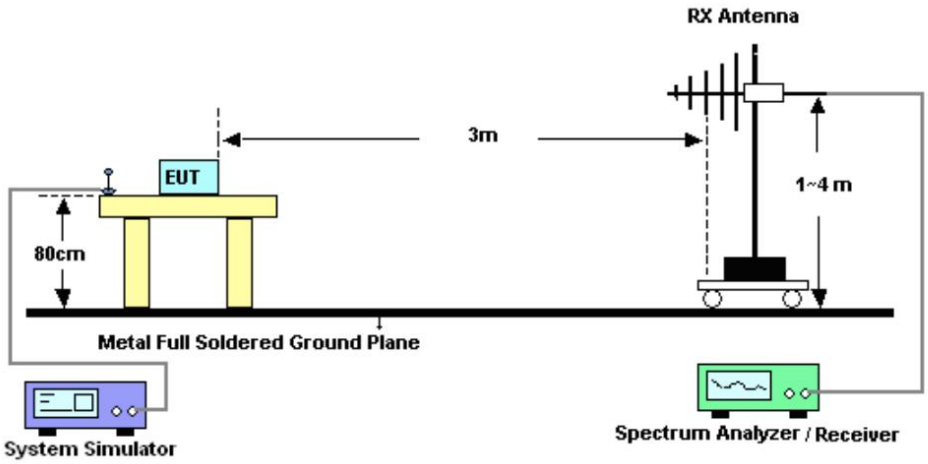
| Data Rate | Tx Freq MHz | Frequency MHz | Azimuth deg | Height cm | Raw Pk dBuV | Raw Avg dBuV | Correction dB | Final Pk dBuV/m | Pk Limit dBuV/m | Peak Margin dB | Final Avg dBuV/m | Avg Limit dBuV/m | Avg Margin dB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BDR DH3 | 2480 | 7439.442 | 83 | 258 | 59.09 | 49.95 | 2.427 | 61.517 | 74 | -12.483 | 52.378 | 54 | -1.622 |

Final = Raw + Correction
Margin = Final - Limit

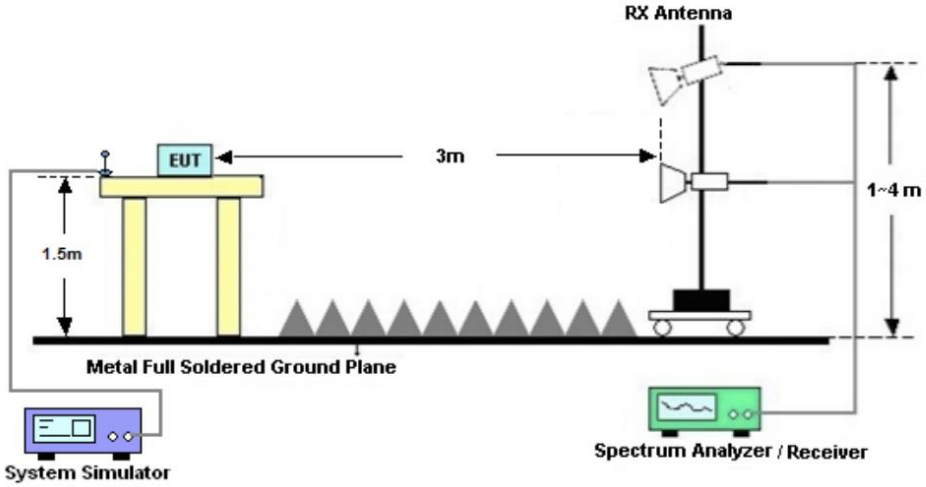
**See Annex A for full test data**

# Chamber Setup Diagrams

**For radiated emissions from 30MHz to 1GHz**




**For radiated emissions above 1GHz**



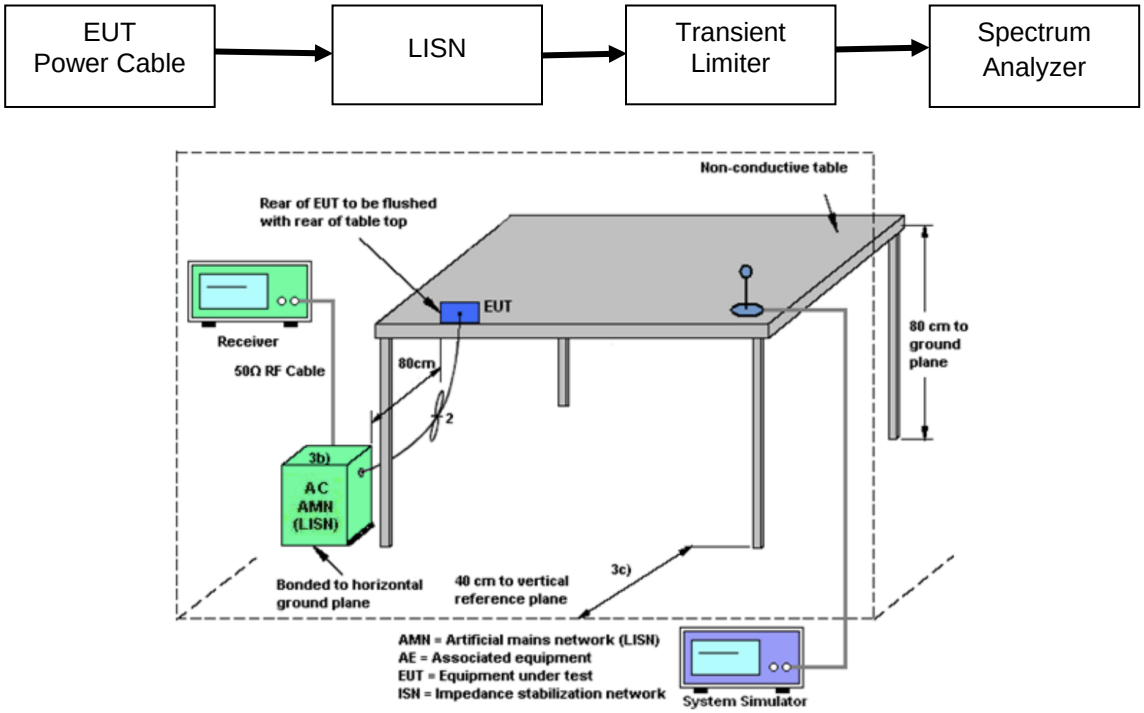
# A/C Powerline Conducted Emission

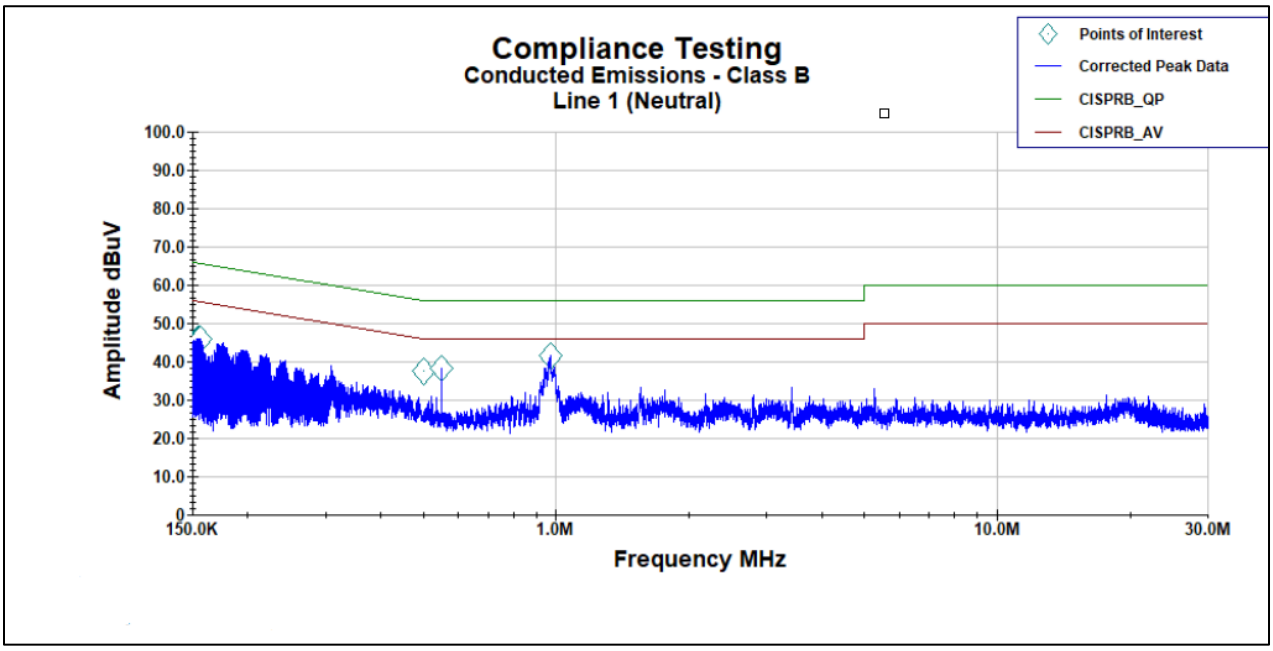
**Engineer:** Afzal Fazal
**Test Date:** 10/21/2021

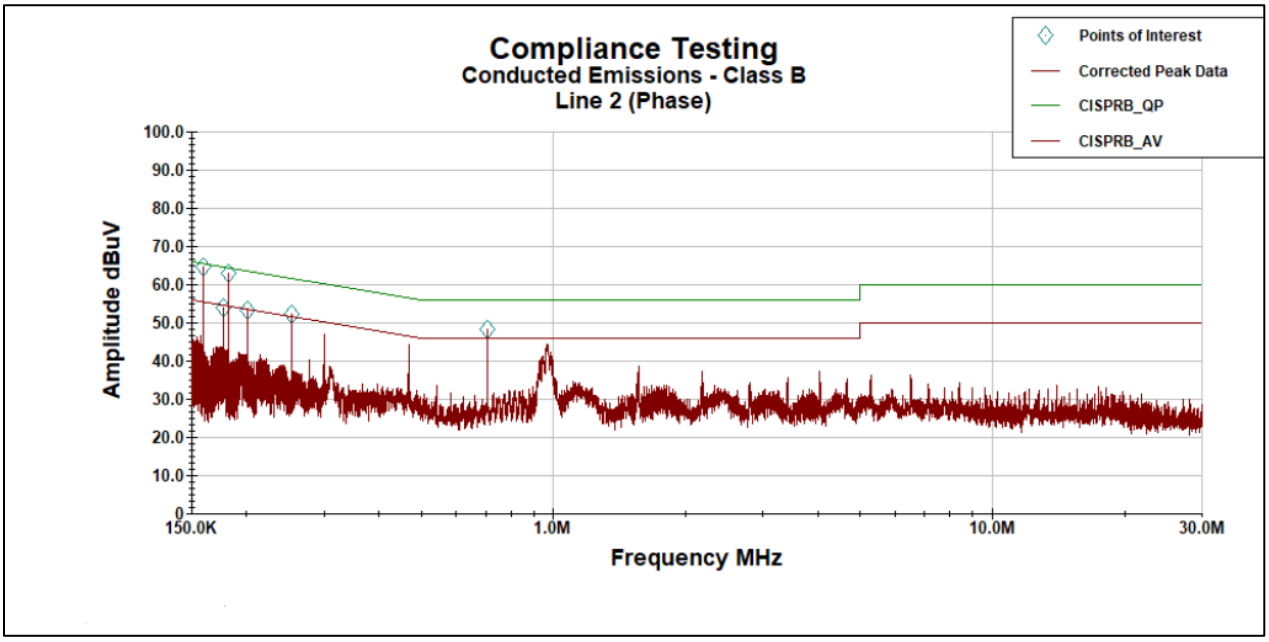
## Test Procedure

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

## Test Setup




Compliance Testing
Conducted Emissions - Class B
Line 1 (Neutral)
Points of Interest
Corrected Peak Data
CISPRB_QP
CISPRB_AV
Amplitude dBuV
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
150.0K
1.0M
10.0M
30.0M
Frequency MHz


Compliance Testing
Conducted Emissions - Class B
Line 2 (Phase)
Points of Interest
Corrected Peak Data
CISPRB_QP
CISPRB_AV
Amplitude dBuV
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
150.0K
1.0M
10.0M
30.0M
Frequency MHz

**Line 1 Neutral QP Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | Avg Margin (dB) |
|---|---|---|---|---|---|---|---|
| 153.23 kHz | 31.32 | 0.407 | 0.02 | 10.2 | 41.947 | 65.908 | -23.961 |
| 154.23 kHz | 31.56 | 0.403 | 0.02 | 10.2 | 42.183 | 65.879 | -23.696 |
| 155.15 kHz | 28.97 | 0.399 | 0.02 | 10.2 | 39.589 | 65.853 | -26.263 |
| 481.9 kHz | 10.83 | 0.114 | 0.03 | 10.1 | 21.074 | 56.517 | -35.444 |
| 555.27 kHz | 11.42 | 0.1 | 0.03 | 10.1 | 21.65 | 56 | -34.35 |
| 970.61 kHz | 28.98 | 0.09 | 0.04 | 10.1 | 39.21 | 56 | -16.79 |

**Line 1 Neutral Avg Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | Avg Margin (dB) |
|---|---|---|---|---|---|---|---|
| 153.23 kHz | 11.48 | 0.41 | 0.02 | 10.2 | 22.11 | 55.908 | -33.798 |
| 154.23 kHz | 12.72 | 0.4 | 0.02 | 10.2 | 23.343 | 55.879 | -32.536 |
| 155.15 kHz | 13.33 | 0.4 | 0.02 | 10.2 | 23.953 | 55.853 | -31.9 |
| 481.9 kHz | 1.69 | 0.11 | 0.03 | 10.1 | 11.93 | 46.517 | -34.587 |
| 555.27 kHz | 6.37 | 0.1 | 0.03 | 10.1 | 16.597 | 46 | -29.403 |
| 970.61 kHz | 21.22 | 0.09 | 0.04 | 10.1 | 31.453 | 46 | -14.547 |

**Line 2 Phase QP Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | QP Margin (dB) |
|---|---|---|---|---|---|---|---|
| 150.53 kHz | 30.81 | 0.44 | 0.02 | 10.2 | 41.468 | 65.985 | -24.517 |
| 175.67 kHz | 30.51 | 0.34 | 0.02 | 10.1 | 40.973 | 65.267 | -24.294 |
| 194.87 kHz | 28.97 | 0.29 | 0.02 | 10.1 | 39.38 | 64.718 | -25.338 |
| 198.28 kHz | 28.51 | 0.28 | 0.02 | 10.1 | 38.913 | 64.621 | -25.707 |
| 242.55 kHz | 24.47 | 0.21 | 0.022 | 10.1 | 34.804 | 63.356 | -28.552 |
| 703.65 kHz | 14.77 | 0.07 | 0.035 | 10.1 | 24.975 | 56 | -31.025 |

**Line 2 Phase Avg Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | QP Margin (dB) |
|---|---|---|---|---|---|---|---|
| 150.53 kHz | 12.25 | 0.44 | 0.02 | 10.2 | 22.905 | 55.985 | -33.08 |
| 175.67 kHz | 14.67 | 0.34 | 0.02 | 10.1 | 25.133 | 55.267 | -30.134 |
| 194.87 kHz | 13.11 | 0.29 | 0.02 | 10.1 | 23.517 | 54.718 | -31.201 |
| 198.28 kHz | 11.62 | 0.28 | 0.02 | 10.1 | 22.023 | 54.621 | -32.597 |
| 242.55 kHz | 11.12 | 0.21 | 0.022 | 10.1 | 21.457 | 53.356 | -31.898 |
| 703.65 kHz | 8.56 | 0.07 | 0.035 | 10.1 | 18.765 | 46 | -27.235 |

## Test Equipment Utilized

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| Preamplifier | Eravant | S BB-0115034018-2F2F-E3 | i00591 | Verified on: 10/17/21 | |
| Transient Limiter | Com-Power | LIT-153 | i00123 | Verified on: 10/21/21 | |
| Bi-Log antenna | Chase | CBL6111C | i00267 | 8/28/20 | 8/28/22 |
| Humidity / Temp Meter* | Newport | IBTHX-W-5 | i00282 | 8/28/20 | 8/28/21* |
| EMI Analyzer | Agilent | E7405A | i00379 | 12/29/20 | 12/29/21 |
| 3 Meter Semi-Anechoic Chamber | Panashield | 3 Meter Semi-Anechoic Chamber | i00428 | 7/17/20 | 7/17/23 |
| LISN | Com-Power | LI-125A | i00447 | 4/28/20 | 4/28/22 |
| LISN | Com-Power | LI-125A | i00449 | 4/28/20 | 4/28/22 |
| Horn Antenna | ARA | DRG-118/A | i00271 | 8/3/20 | 8/3/22 |
| EMI Analyzer | Rohde & Schwarz | FSU 26 | i00501 | 5/19/21 | 5/19/22 |
| EMI Receiver | Keysight | N9038A | i00552 | 1/12/21 | 1/12/22 |

*Calibration extended with the approval of Quality Manager.

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

# Measurement Uncertainty

Measurement Uncertainty ($U_{lab}$) for Compliance Testing is listed in the table below.

| Measurement | $U_{lab}$ |
|---|---|
| Radio Frequency | ± 3.3 x $10^{-8}$ |
| RF Power, conducted | ± 1.5 dB |
| RF Power Density, conducted | ± 1.0 dB |
| Conducted Emissions | ± 1.8 dB |
| Radiated Emissions | ± 4.5 dB |
| Temperature | ± 1.5 deg C |
| Humidity | ± 4.3 % |
| DC voltage | ± 0.20 VDC |
| AC Voltage | ± 1.2 VAC |

The reported expanded uncertainty +/- $U_{lab}$(dB) has been estimated at a 95% confidence level (k=2)

$U_{lab}$ is less than or equal to $U_{ETSI}$ therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit