# FCC and ISED Test Report

## Apple Inc. Model: A2165

## In accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN (2.4 GHz Bluetooth DTS)

Prepared for: Apple Inc
One Apple Park Way, Cupertino, California
95014, USA

FCC ID: BCGA2615 IC: 579C-A2615

## COMMERCIAL-IN-CONFIDENCE

Document 75952325-10 Issue 01

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| SIGNATURE | | | |
|---|---|---|---|
| Stephen Marshall Digitally signed by Stephen Marshall Date: 2022.02.14 11:43:58 Z | | | |
| **NAME** | **JOB TITLE** | **RESPONSIBLE FOR** | **ISSUE DATE** |
| Steve Marshall | Senior Engineer | Authorised Signatory | 02 February 2022 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|---|---|---|---|
| Testing | Faisal Malyar | 02 February 2022 | |
| Testing | Danial Shafique | 02 February 2022 | |
| Testing | Jaiyanth Balendrarajah | 02 February 2022 | |
| Testing | Liang Tian | 02 February 2022 | |
| Testing | Taha Shafique | 02 February 2022 | |
| Testing | Daniel Cameron | 02 February 2022 | |

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

**EXECUTIVE SUMMARY**

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2020, ISED RSS-247: Issue 2 (02-2017) and ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.




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# Contents

# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of Change | Date of Issue |
|---|---|---|
| 1 | First Issue | 02-February-2022 |

**Table 1**

## 1.2 Introduction

| | |
|---|---|
| Applicant | Apple Inc |
| Manufacturer | Apple Inc |
| Model Number(s) | A2165 |
| Serial Number(s) | P1F4F29DL4 and H617C20363 |
| Hardware Version(s) | REV1.0 |
| Software Version(s) | 21B30220I |
| Number of Samples Tested | 2 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C: 2020<br>ISED RSS-247: Issue 2 (02-2017)<br>ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) |
| Order Number<br>Date | 0540220896<br>25-May-2021 |
| Date of Receipt of EUT | 25- October-2021 |
| Start of Test | 25-October-2021 |
| Finish of Test | 05-January-2022 |
| Name of Engineer(s) | Faisal Malyar, Danial Shafique, Liang Tian, Daniel Cameron, Taha Shafique and Jaiyanth Balendrarajah |
| Related Document(s) | ANSI C63.4 (2014)<br>ANSI C63.10 (2013)<br>KDB 662911 D01 v02r01 |

## 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED RSS-247 and ISED RSS-GEN is shown below.

| Section | Specification Clause | | | Test Description | Result | Comments/Base Standard |
|---|---|---|---|---|---|---|
| | Part 15C | RSS-247 | RSS-GEN | | | |
| Configuration and Mode: 2.4 GHz Bluetooth - DTS | | | | | | |
| - | 15.203 | - | - | Antenna Requirement | N/T | The device complies with the provisions of this section, as it uses permanently attached integral antennas. |
| 2.1 | 15.205 | - | 8.10 | Restricted Band Edges | Pass | |
| 2.2 | 15.247 (a)(2) | 5.2 | 6.7 | Emission Bandwidth | Pass | |
| 2.3 | 15.247 (b) | 5.4 | 6.12 | Maximum Conducted Output Power | Pass | |
| 2.4 | 15.247 (d) and 15.209 | 3.3 and 5.5 | 6.13 and 8.9 | Spurious Radiated Emissions | Pass | |
| 2.5 | 15.247 (d) | 5.5 | - | Authorised Band Edges | Pass | |
| 2.6 | 15.247 (e) | 5.2 | 6.12 | Power Spectral Density | Pass | |

**Table 2**

## 1.4 Product Information

### 1.4.1 Technical Description

The Equipment under test (EUT) was a desktop computer with Bluetooth, Bluetooth Low Energy and 802.11 a/b/g/n/ac/ax capabilities in the 2.4 GHz and 5 GHz bands.

### 1.4.2 Test Set-up

For conducted tests, a conducted test point was provided by the manufacturer via a flex strip and UFL connector and cable. The loss of these test cables were known and compensated for in any conducted measurements.

For tests in SISO operation, conducted tests were performed on the BT Dedicated Core (Core 2) as well as the Core with the highest antenna gain as Core 0 and Core 1 are identical but with unequal antenna gains. The EUT supports TxBF on Core 0 + Core 1.

Bluetooth LE + HDR was assessed as a DTS system. The EUT supports Bluetooth on the following mode of operations across its antenna ports:

BT Dedicated Core (Core 2) – SISO (iPA)
BT Core 0 – SISO (iPA and ePA), TxBF (iPA and ePA)
BT Core 1 – SISO (iPA and ePA), TxBF (iPA and ePA)

For all tests, the EUT was put into a continuous transmit test mode with the manufacturer's test commands via a script running in the EUTs terminal application. The EUT then transmitted the required type of modulation/packet type on a static channel selected within the test script.

All testing was performed with the EUT powered via a 120 V AC, 60 Hz source.

### 1.4.3 Antenna Gain Table

| Antenna Port | Frequency Range (MHz) | Peak Gain (dBi) | Conducted Cable Loss (dB) |
|---|---|---|---|
| BT Dedicated Core (Core 2) | 2400 to 2480 | 1.70 | 1.00 |
| BT Core 0 | 2400 to 2480 | 2.20 | 1.00 |
| BT Core 1 | 2400 to 2480 | 1.40 | 1.00 |

**Table 3**

## 1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

## 1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

| Modification State | Description of Modification still fitted to EUT | Modification Fitted By | Date Modification Fitted |
|---|---|---|---|
| Model: A2165, Serial Number: P1F4F29DL4 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |
| Model: A2165, Serial Number: H617C20363 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

**Table 4**

## 1.7 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

| Test Name | Name of Engineer(s) | Accreditation |
|---|---|---|
| Configuration and Mode: 2.4 GHz Bluetooth - DTS | | |
| Restricted Band Edges | Faisal Malyar, Danial Shafique, Jaiyanth Balendrarajah and Liang Tian | UKAS |
| Emission Bandwidth | Daniel Cameron | UKAS |
| Maximum Conducted Output Power | Daniel Cameron | UKAS |
| Spurious Radiated Emissions | Jaiyanth Balendrarajah and Taha Shafique | UKAS |
| Authorised Band Edges | Faisal Malyar, Danial Shafique, Jaiyanth Balendrarajah and Liang Tian | UKAS |
| Power Spectral Density | Daniel Cameron | UKAS |

**Table 5**

Office Address:

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Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom

# 2 Test Details

## 2.1 Restricted Band Edges

### 2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.2.05
ISED RSS-GEN, Clause 8.10

### 2.1.2 Equipment Under Test and Modification State

A2165, S/N: P1F4F29DL4 - Modification State 0

### 2.1.3 Date of Test

25-October-2021 to 27-October-2021

### 2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5 and 11.12.1.

Plots for average measurements were taken in accordance with ANSI C63.10, clause 11.12.2.5.2.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

### 2.1.5 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 20.4 - 22.8 °C |
| Relative Humidity | 42.4 - 54.9 % |

### 2.1.6 Test Results

2.4 GHz Bluetooth – DTS

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0 | 2390.0 | 52.73 | 40.87 |
| GFSK/DH1 | 2480 | Core 0 | 2483.5 | 53.57 | 41.45 |

**Table 6 - Restricted Band Edge Results**

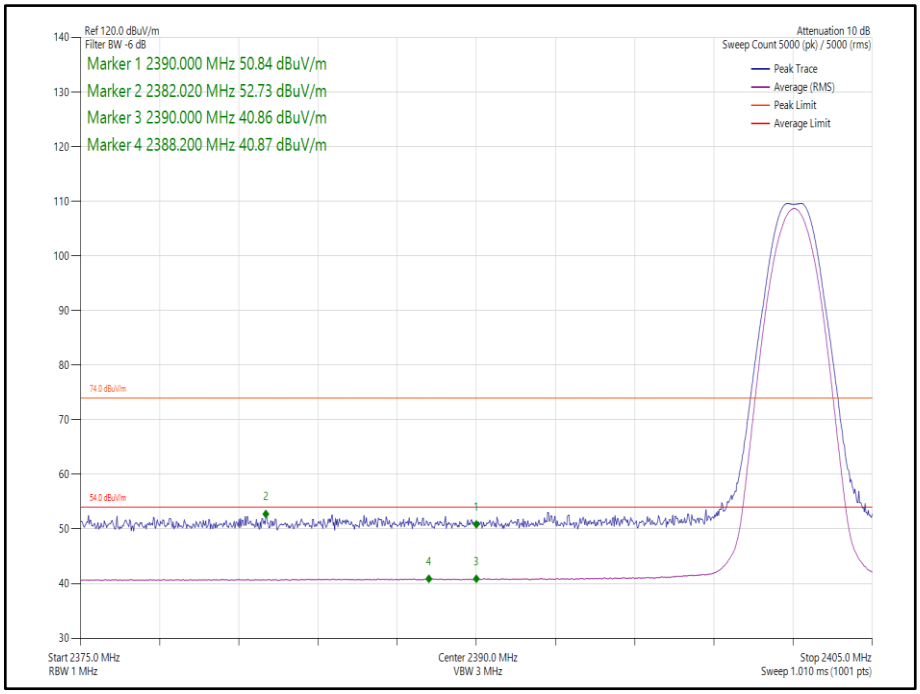


**Figure 1 - Core 0 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

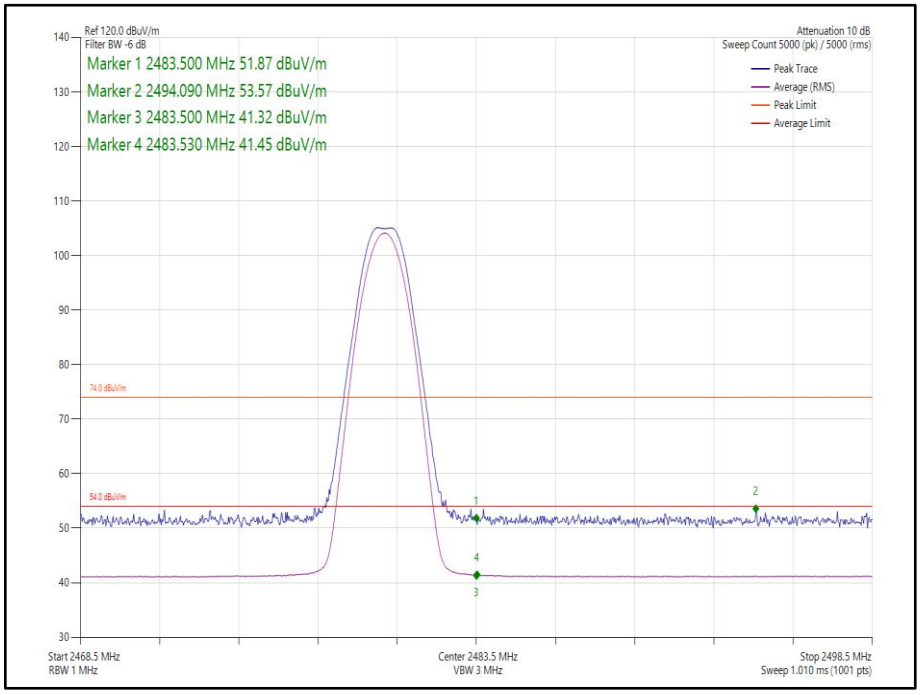


**Figure 2 - Core 0 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

LE1M ePA

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0 | 2390.0 | 53.84 | 41.31 |
| GFSK/DH1 | 2480 | Core 0 | 2483.5 | 53.56 | 42.31 |

**Table 7 - Restricted Band Edge Results**

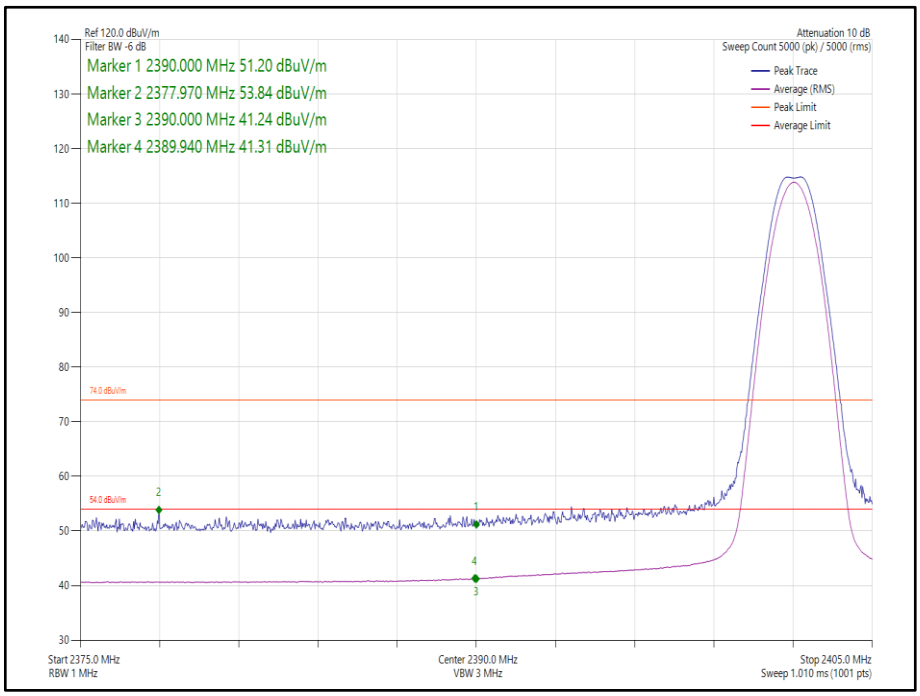


**Figure 3 - Core 0 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

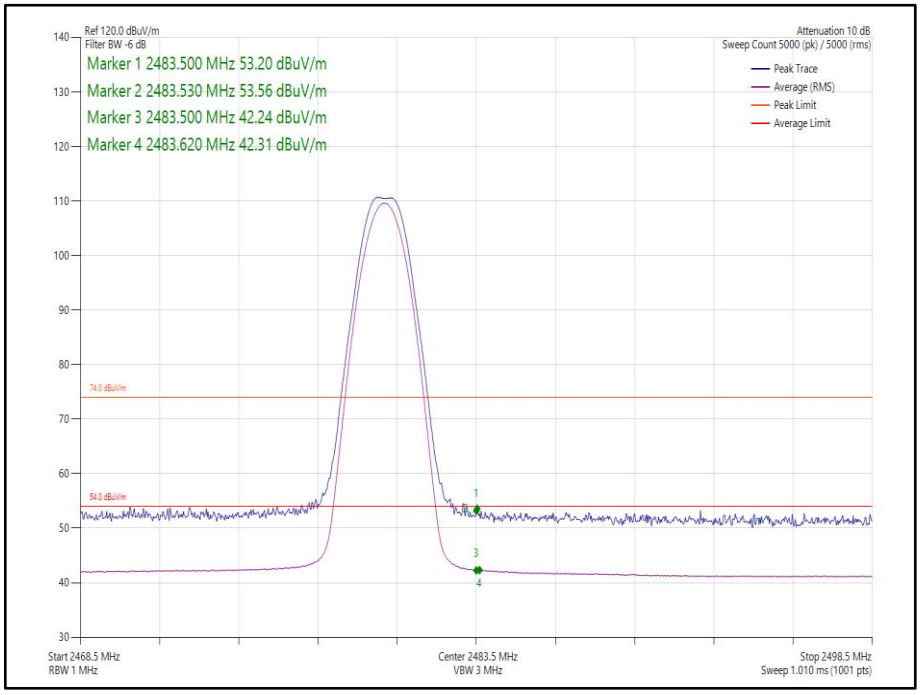


**Figure 4 - Core 0 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

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| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 2 | 2390.0 | 52.63 | 40.83 |
| GFSK/DH1 | 2480 | Core 2 | 2483.5 | 53.42 | 41.8 |

**Table 8 - Restricted Band Edge Results**

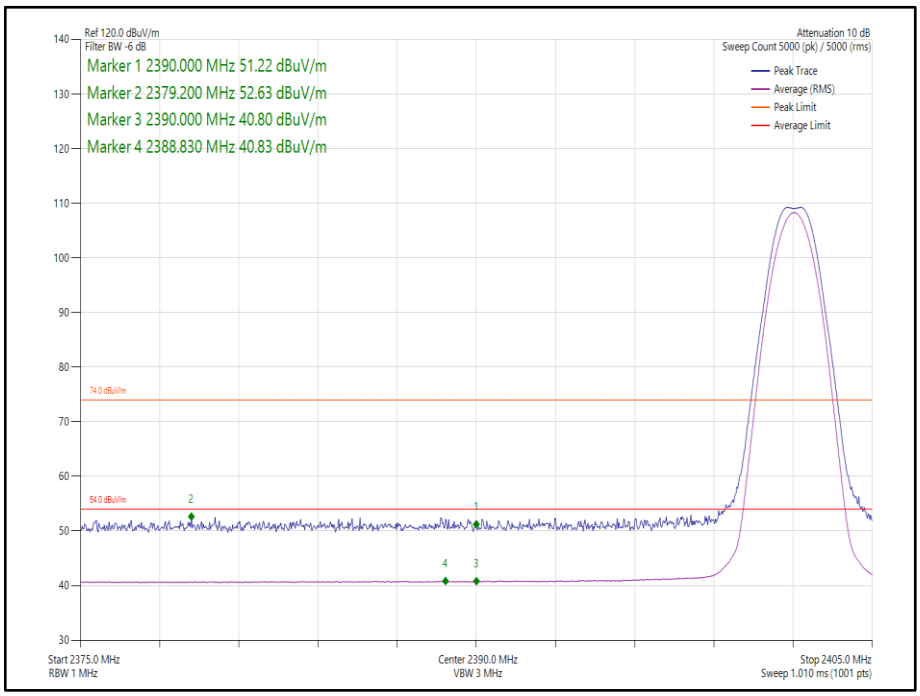


**Figure 5 - Core 2 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

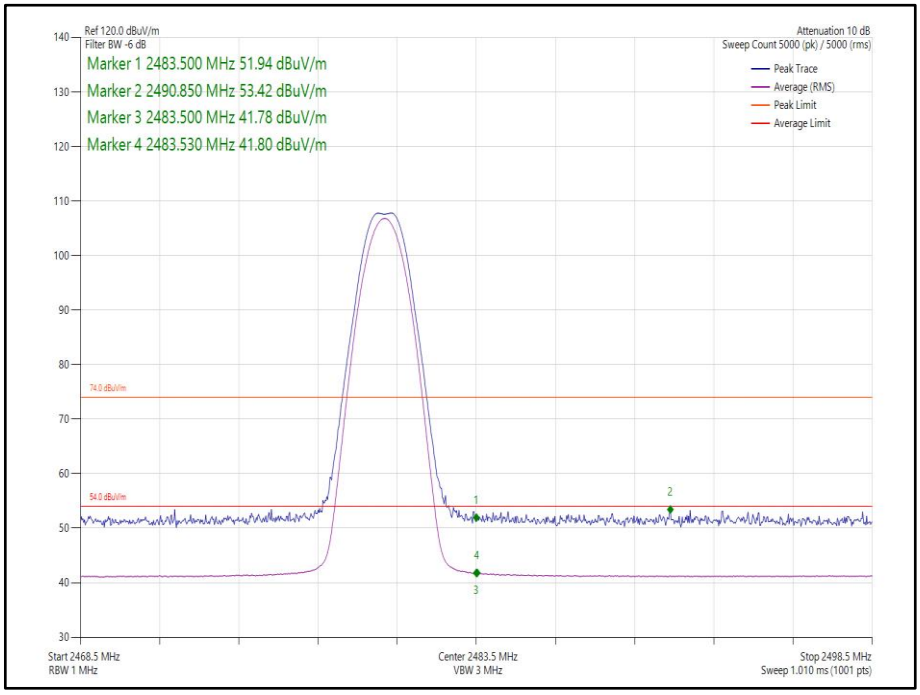


**Figure 6 - Core 2 GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

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| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0-1 | 2390.0 | 52.92 | 40.85 |
| GFSK/DH1 | 2480 | Core 0-1 | 2483.5 | 53.13 | 41.64 |

**Table 9 - Restricted Band Edge Results**

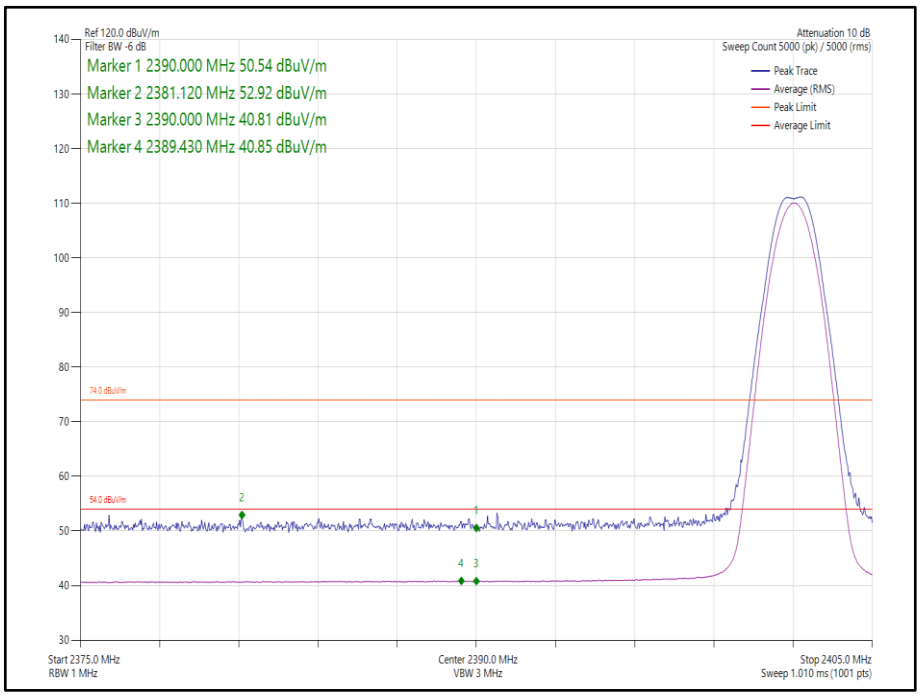


**Figure 7 - Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

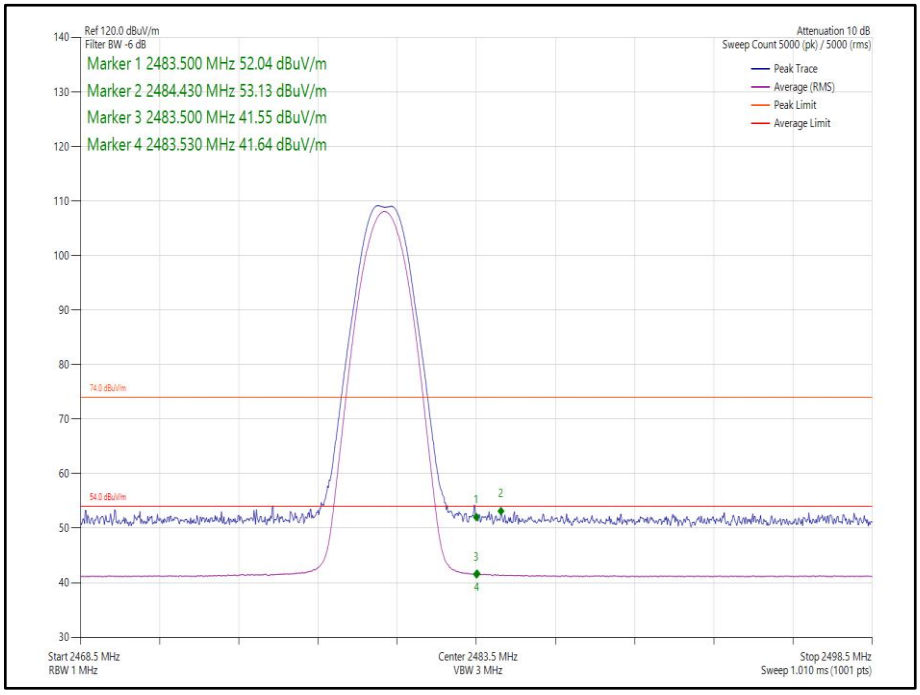


**Figure 8 - Core 0-1 - GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

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| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0-1 | 2390.0 | 53.18 | 41.29 |
| GFSK/DH1 | 2480 | Core 0-1 | 2483.5 | 54.32 | 42.77 |

**Table 10 - Restricted Band Edge Results**

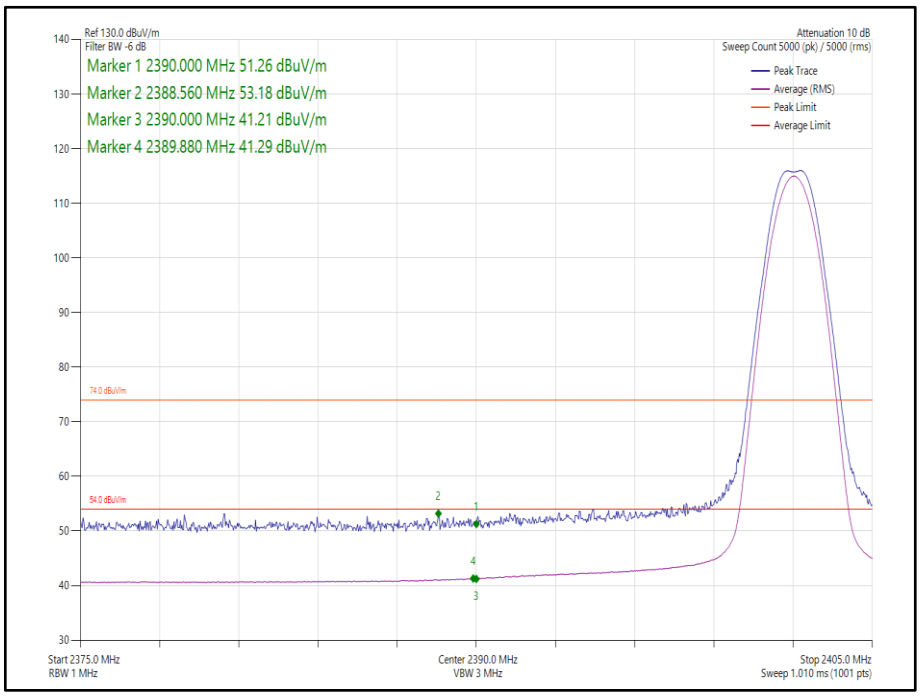


**Figure 9 - Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

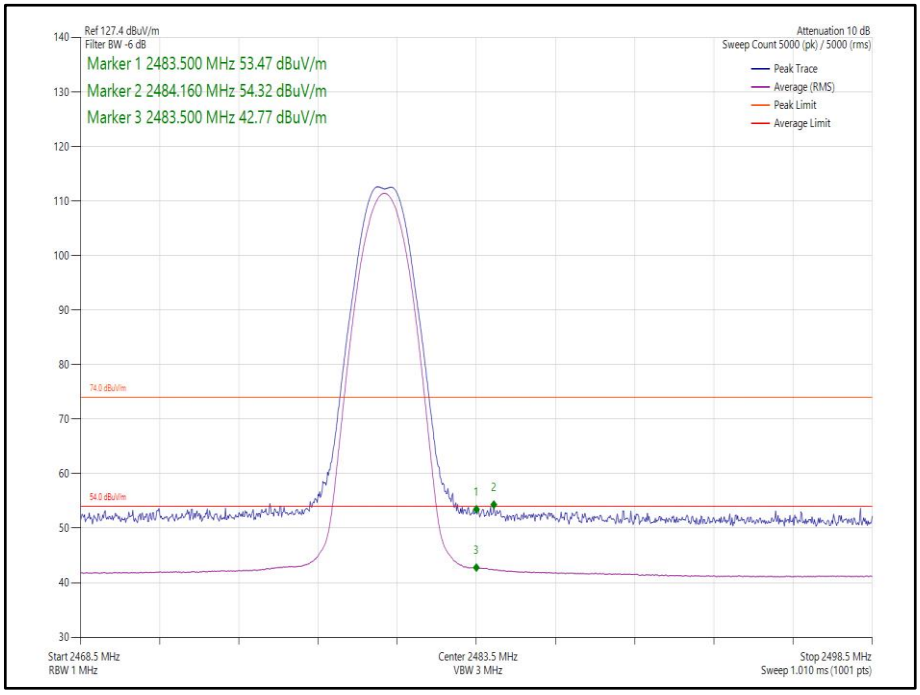


**Figure 10 - Core 0-1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

LE2M iPA

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0 | 2390.0 | 52.69 | 40.91 |
| GFSK/DH1 | 2480 | Core 0 | 2483.5 | 55.97 | 43.67 |

**Table 11 - Restricted Band Edge Results**

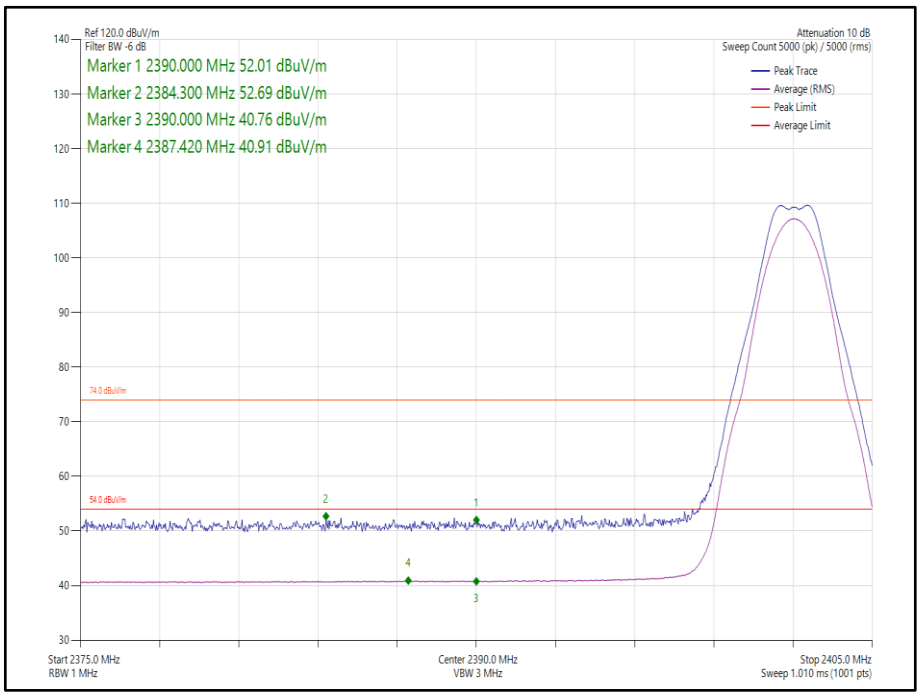


**Figure 11 - Core 0 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

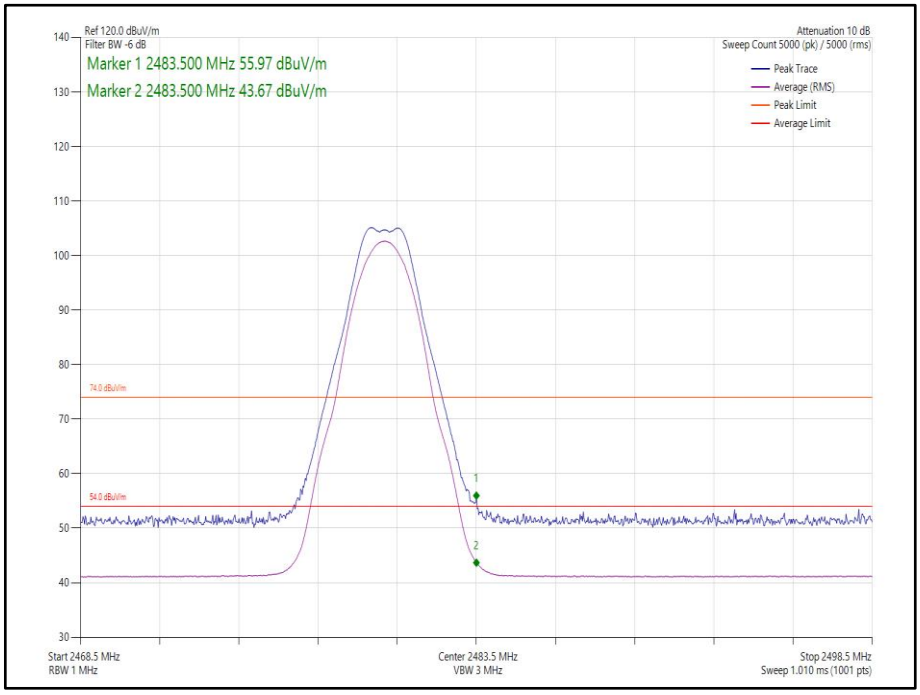


**Figure 12 - Core 0 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

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| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0 | 2390.0 | 52.56 | 41.37 |
| GFSK/DH1 | 2480 | Core 0 | 2483.5 | 56.06 | 44.00 |

**Table 12 - Restricted Band Edge Results**

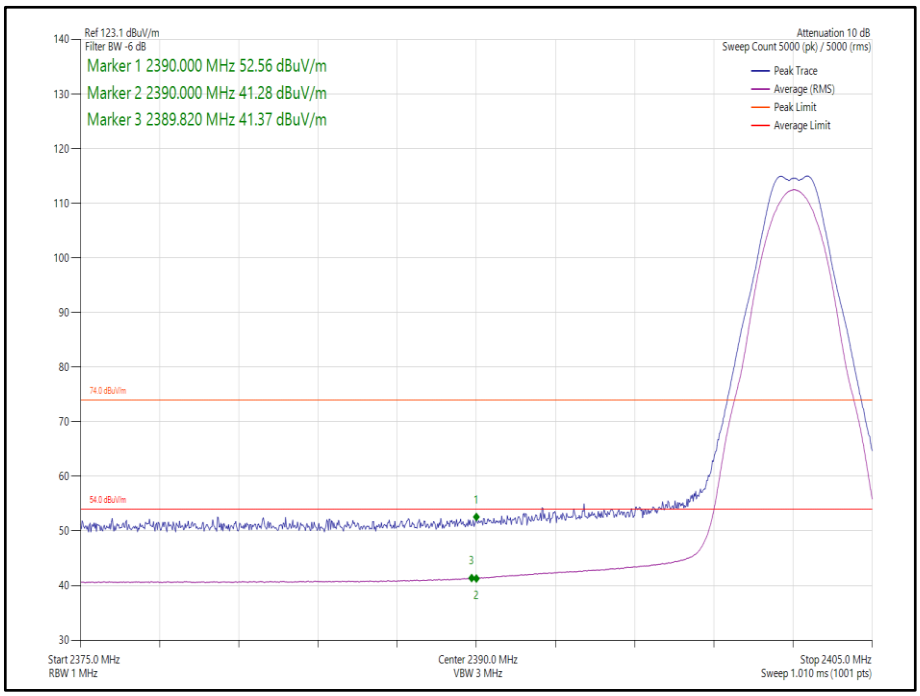


**Figure 13 - Core 0 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

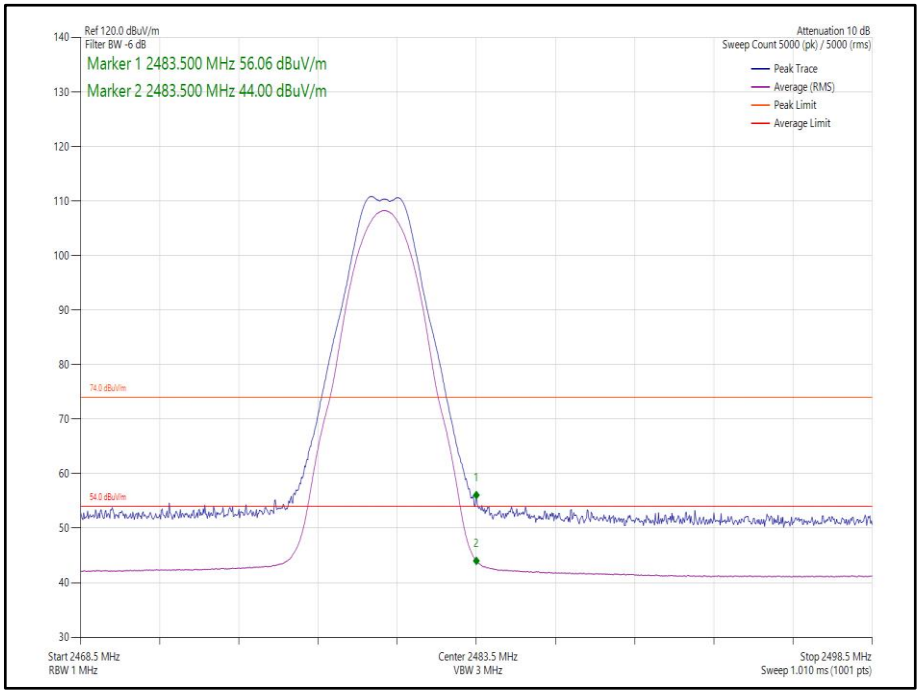


**Figure 14 - Core 0 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

LE2M iPA

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 2 | 2390.0 | 53 | 40.85 |
| GFSK/DH1 | 2480 | Core 2 | 2483.5 | 53.88 | 43.62 |

**Table 13 - Restricted Band Edge Results**

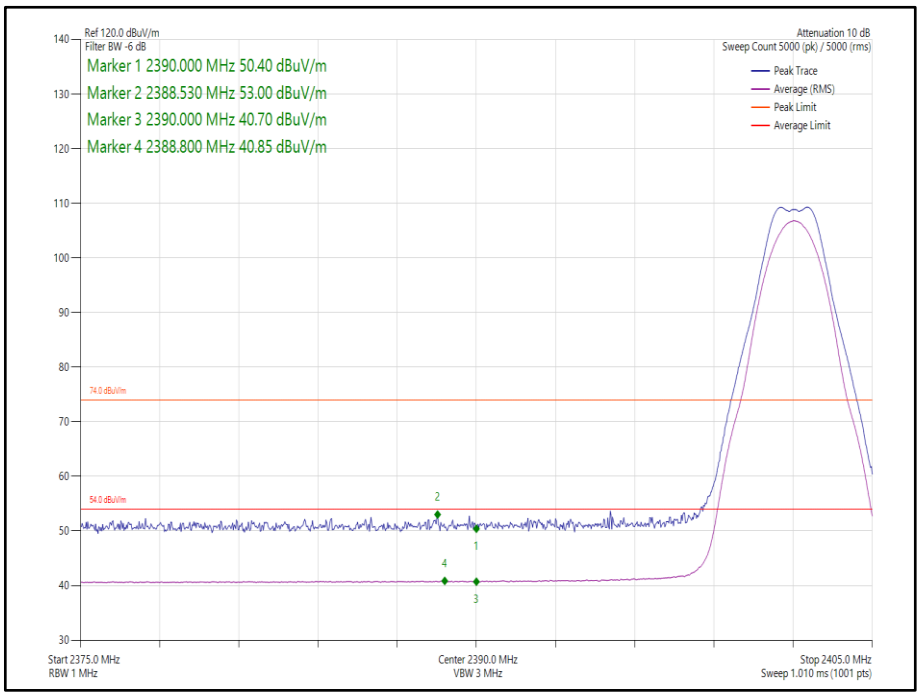


**Figure 15 - Core 2 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

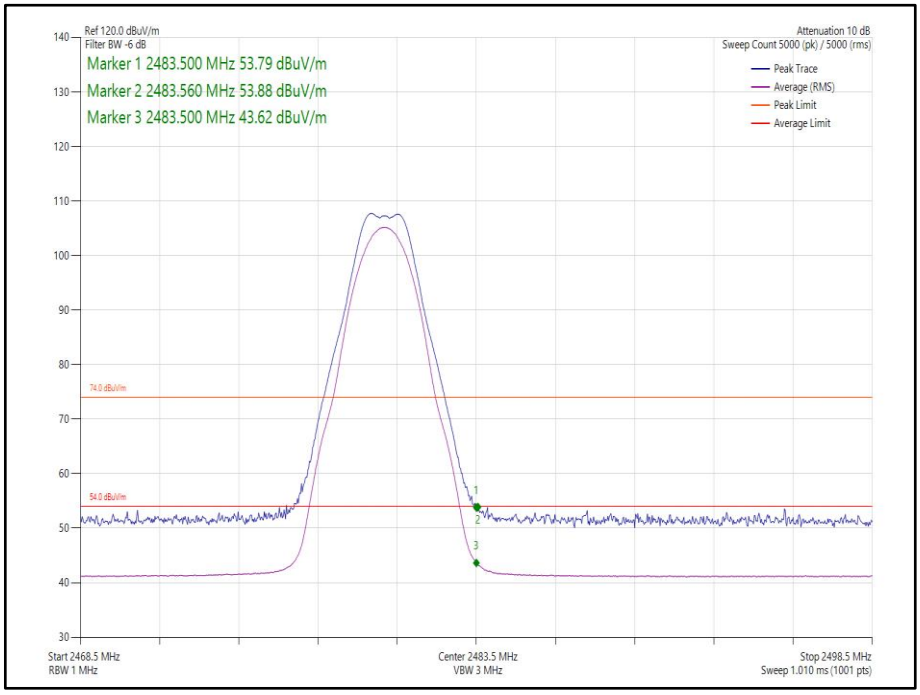


**Figure 16 - Core 2 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

LE2M iPA

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0-1 | 2390.0 | 52.59 | 40.88 |
| GFSK/DH1 | 2480 | Core 0-1 | 2483.5 | 54.8 | 43.75 |

**Table 14 - Restricted Band Edge Results**

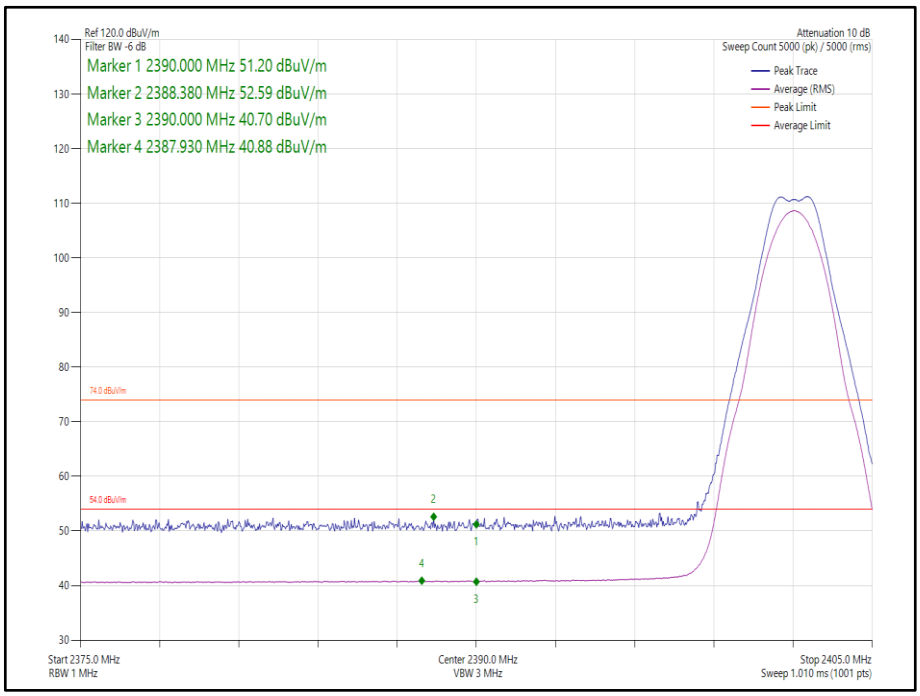


**Figure 17 - Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

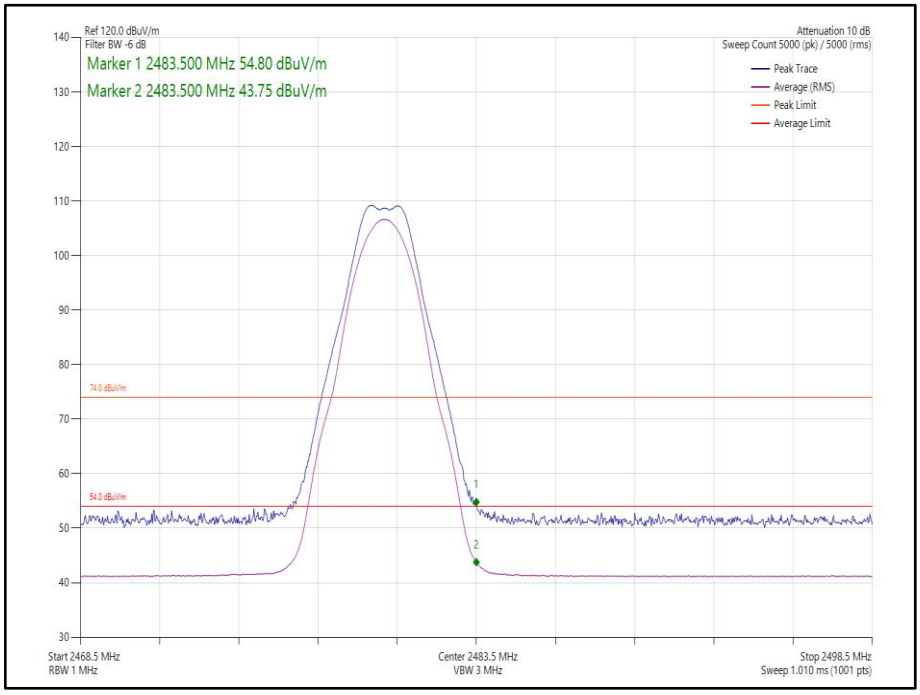


**Figure 18 - Core 0-1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

LE2M ePA

| Modulation | Tx Frequency (MHz) | Core | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|
| GFSK/DH1 | 2402 | Core 0-1 | 2390.0 | 52.51 | 41.39 |
| GFSK/DH1 | 2480 | Core 0-1 | 2483.5 | 55.88 | 45.51 |

**Table 15 - Restricted Band Edge Results**

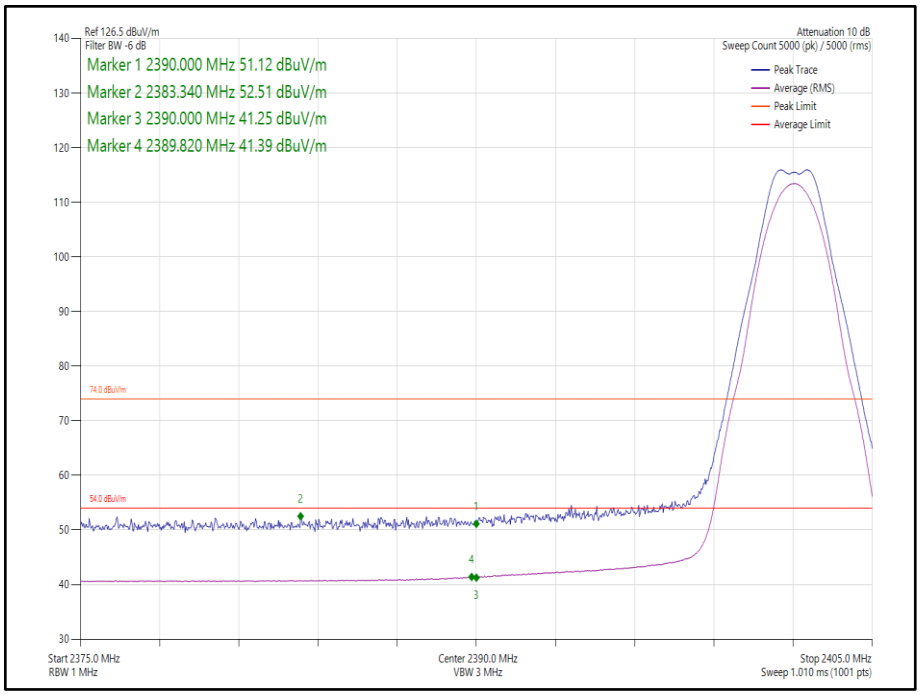


**Figure 19 - Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz**

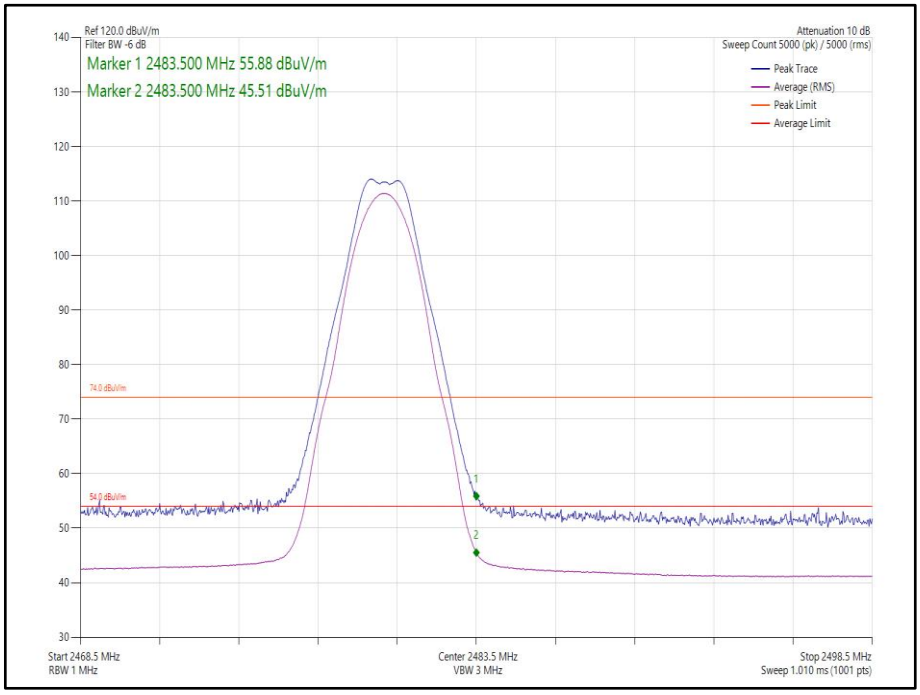


**Figure 20 - Core 0-1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz**

HDR4 ePA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0 | 4DH5 | 2404 | 2390.0 | 54.22 | 42.52 |
| Static | π/4-DQPSK | Core 0 | 4DH5 | 2476 | 2483.5 | 53.44 | 41.54 |

**Table 16 - Restricted Band Edge Results**

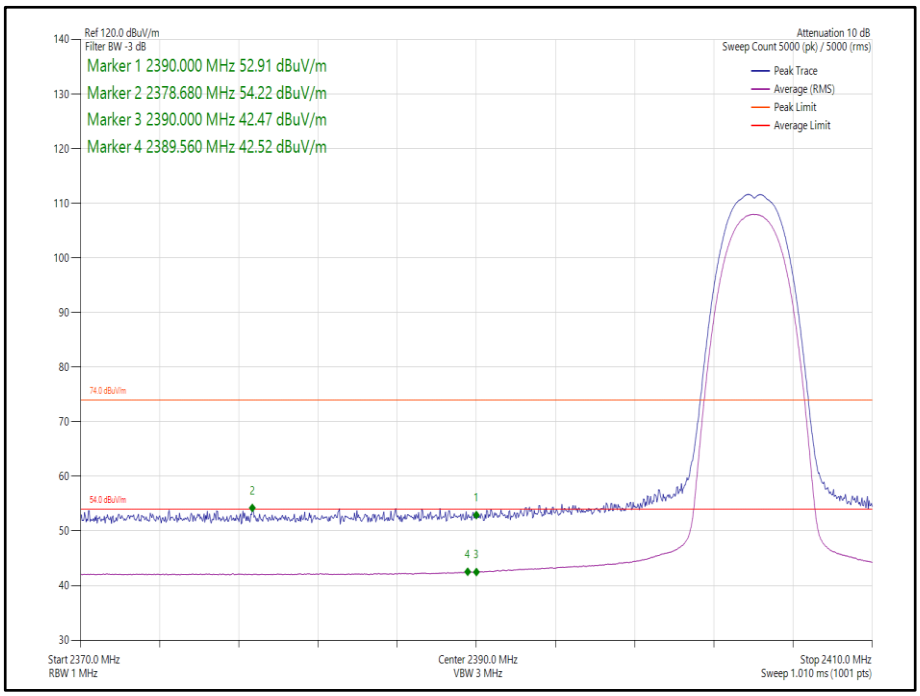


**Figure 21 - Core 0 - Static - π/4-DQPSK/4DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

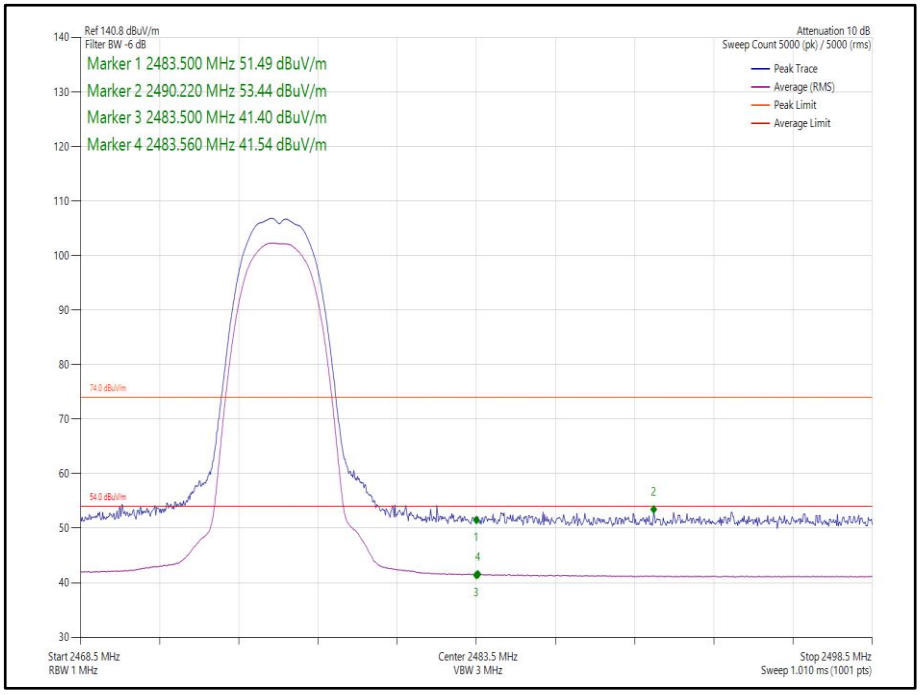


**Figure 22 Core 0 - Static - π/4-DQPSK/4DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR4 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0 | 4DH5 | 2404 | 2390.0 | 54.53 | 42.31 |
| Static | π/4-DQPSK | Core 0 | 4DH5 | 2476 | 2483.5 | 53.25 | 41.27 |

**Table 17 - Restricted Band Edge Results**

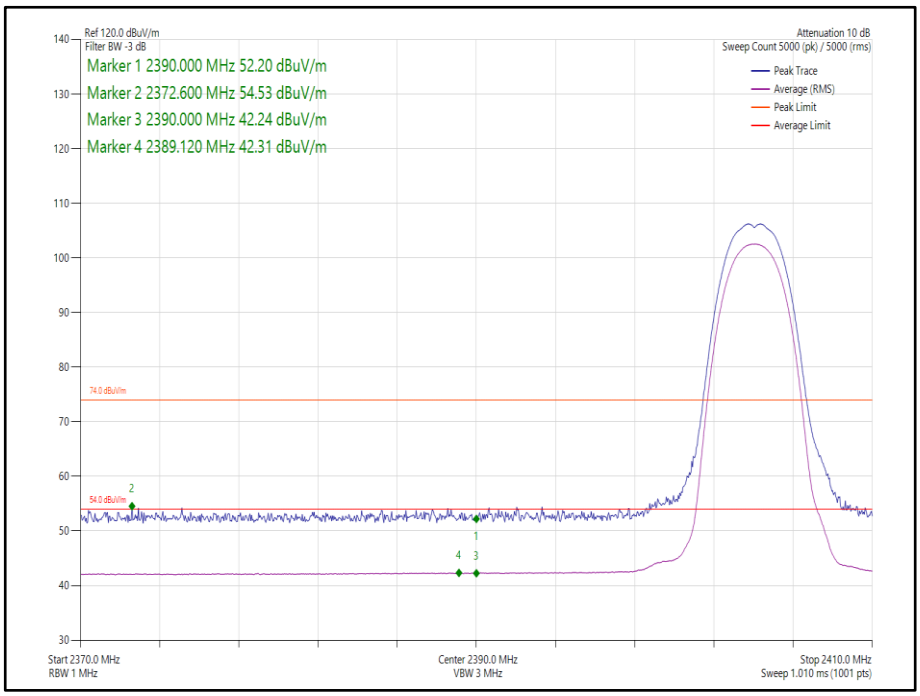


**Figure 23 - Core 0- Static - π/4-DQPSK/4DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

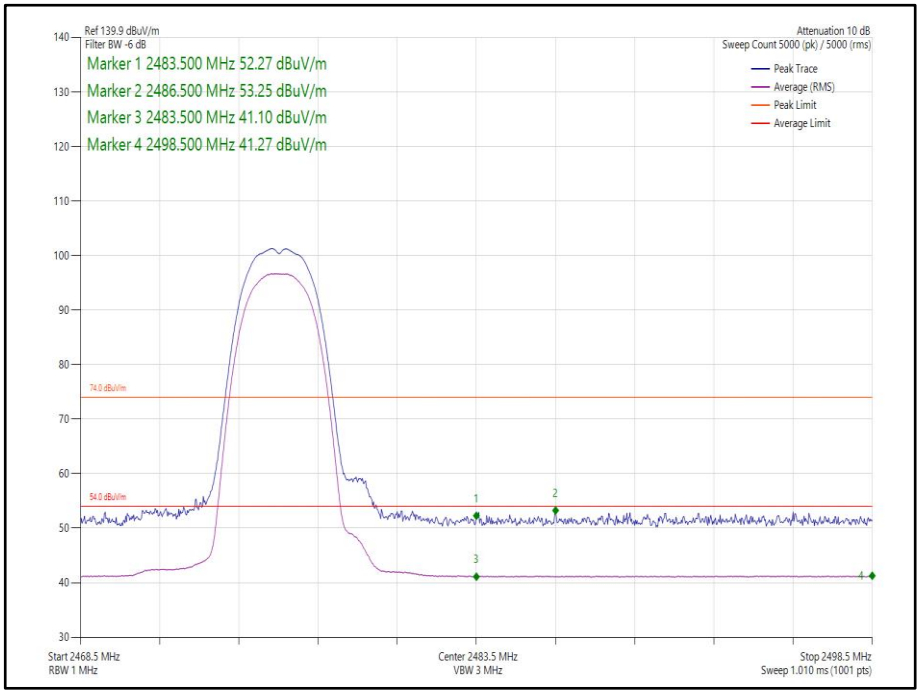


**Figure 24 - Core 0- Static - π/4-DQPSK/4DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR4 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 2 | 4DH5 | 2404 | 2390.0 | 54.33 | 42.3 |
| Static | π/4-DQPSK | Core 2 | 4DH5 | 2476 | 2483.5 | 53.51 | 41.27 |

**Table 18 - Restricted Band Edge Results**

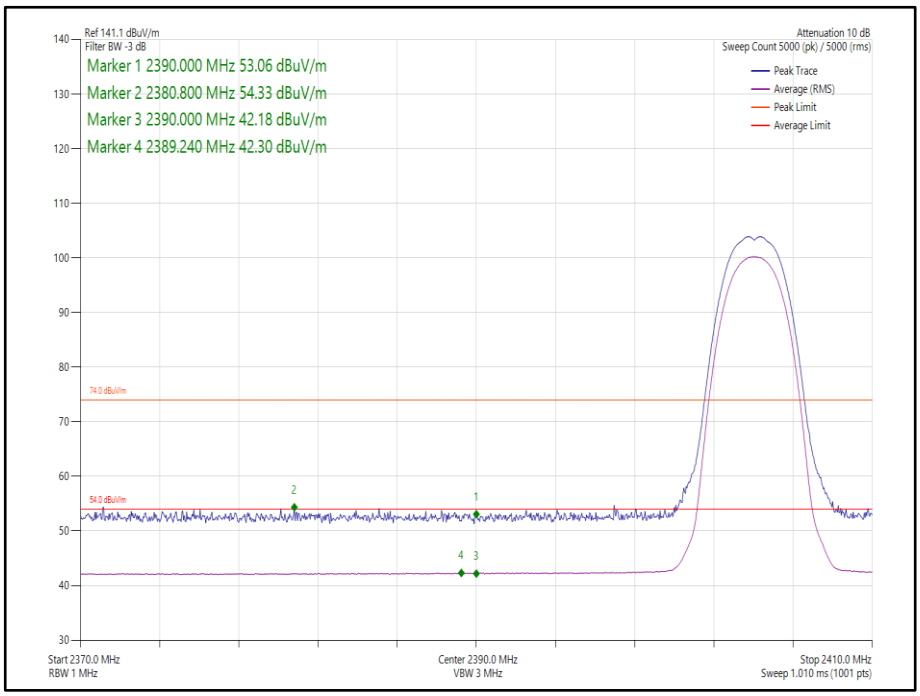


**Figure 25 - Core 2- Static - π/4-DQPSK/4DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

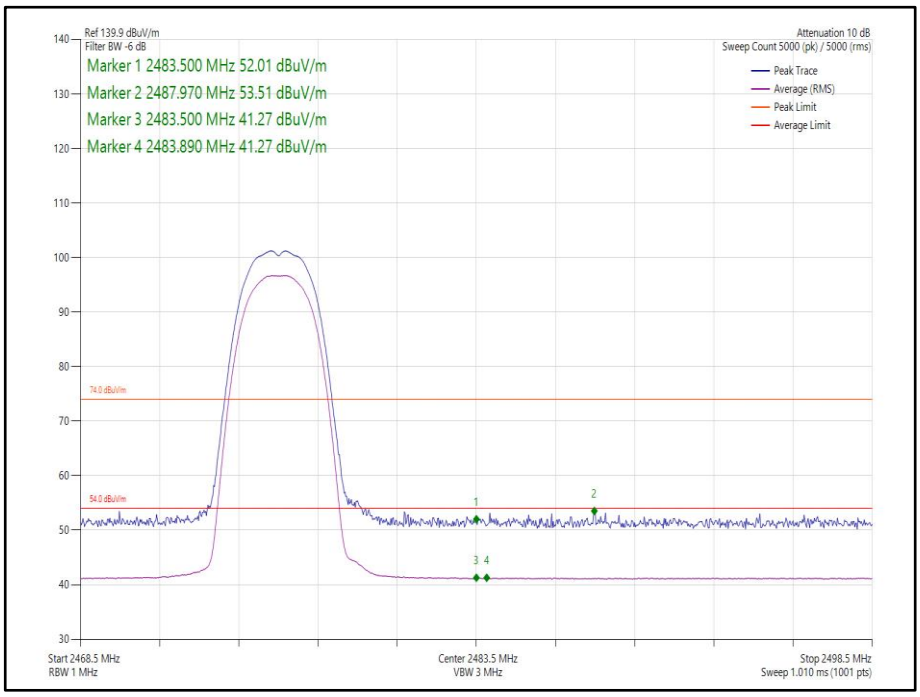


**Figure 26 - Core 2- Static - π/4-DQPSK/4DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR4 ePA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0-1 | 4DH5 | 2404 | 2390.0 | 53.94 | 42.55 |
| Static | π/4-DQPSK | Core 0-1 | 4DH5 | 2476 | 2483.5 | 53.1 | 42.16 |

**Table 19 - Restricted Band Edge Results**

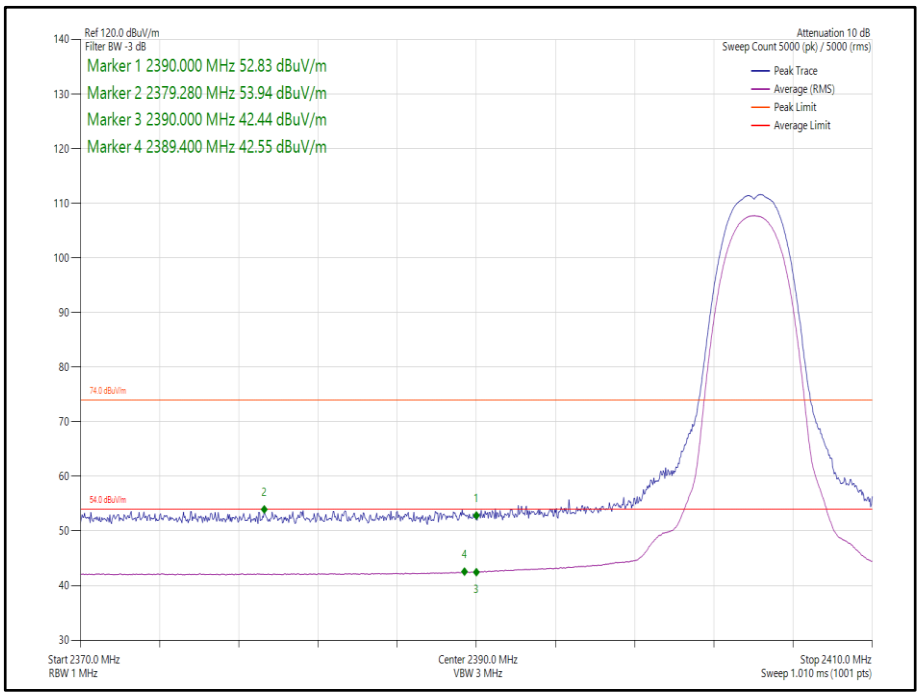


**Figure 27- Core 0-1- Static - π/4-DQPSK/4DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

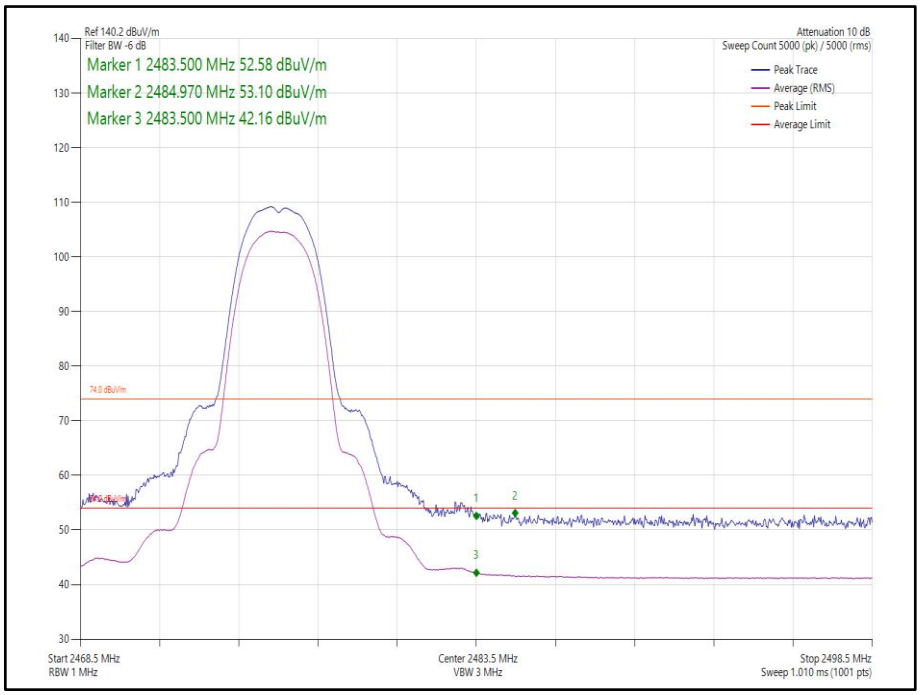


**Figure 28 - Core 0-1- Static - π/4-DQPSK/4DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR4 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0-1 | 4DH5 | 2404 | 2390.0 | 53.88 | 42.31 |
| Static | π/4-DQPSK | Core 0-1 | 4DH5 | 2476 | 2483.5 | 53.22 | 41.3 |

**Table 20 - Restricted Band Edge Results**

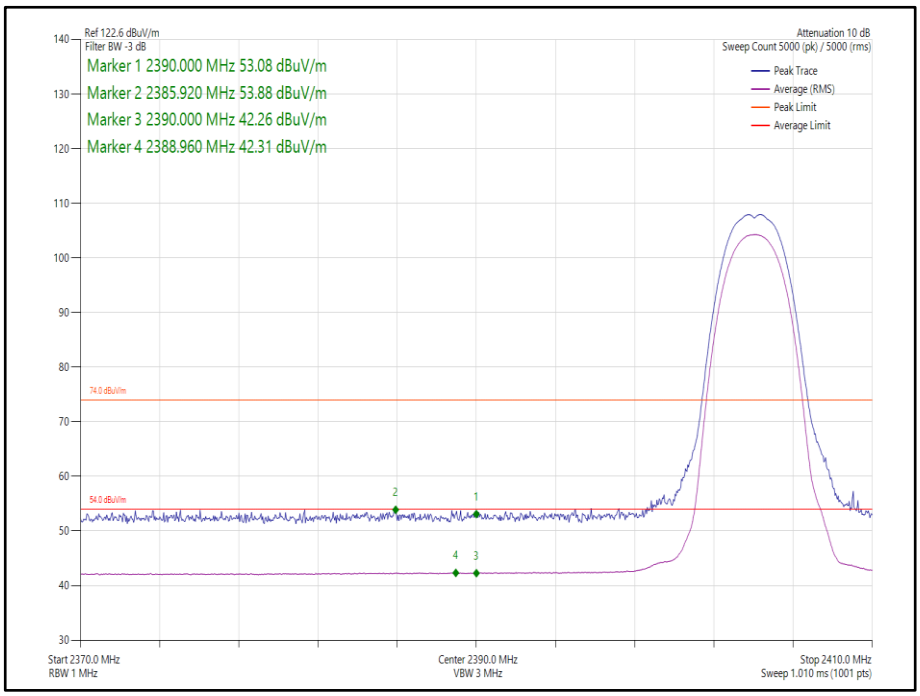


**Figure 29 - Core 0-1- Static - π/4-DQPSK/4DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

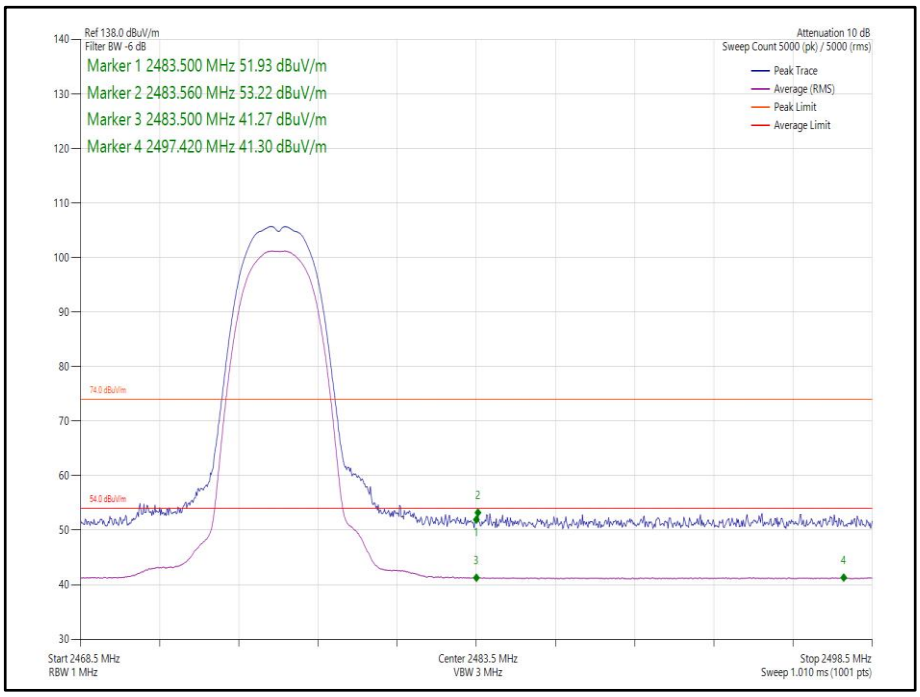


**Figure 30 - Core 0-1- Static - π/4-DQPSK/4DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR8 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0 | 8DH5 | 2404 | 2390.0 | 55.17 | 42.54 |
| Static | π/4-DQPSK | Core 0 | 8DH5 | 2476 | 2483.5 | 53.22 | 41.66 |

**Table 21 - Restricted Band Edge Results**

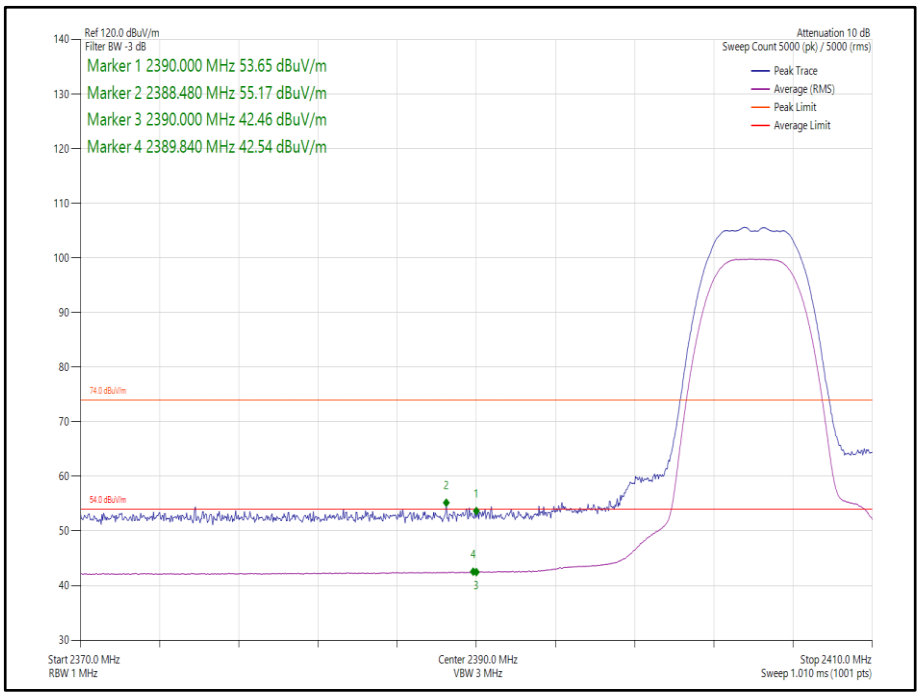


**Figure 31 - Core 0- Static - π/4-DQPSK/8DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

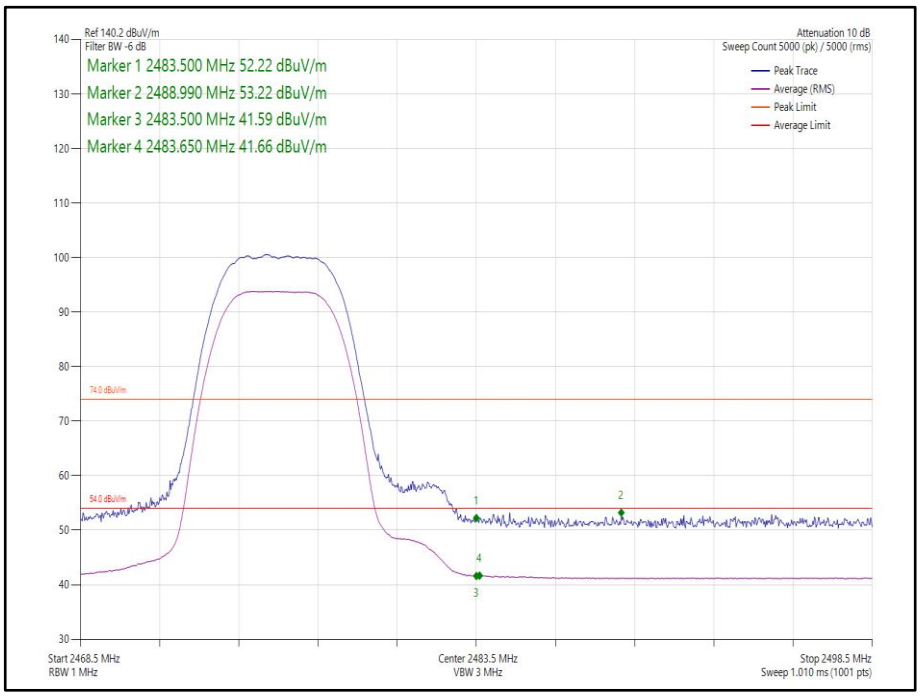


**Figure 32 - Core 0- Static - π/4-DQPSK/8DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR8 ePA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0 | 8DH5 | 2404 | 2390.0 | 54.47 | 42.75 |
| Static | π/4-DQPSK | Core 0 | 8DH5 | 2476 | 2483.5 | 53.26 | 41.52 |

**Table 22 - Restricted Band Edge Results**

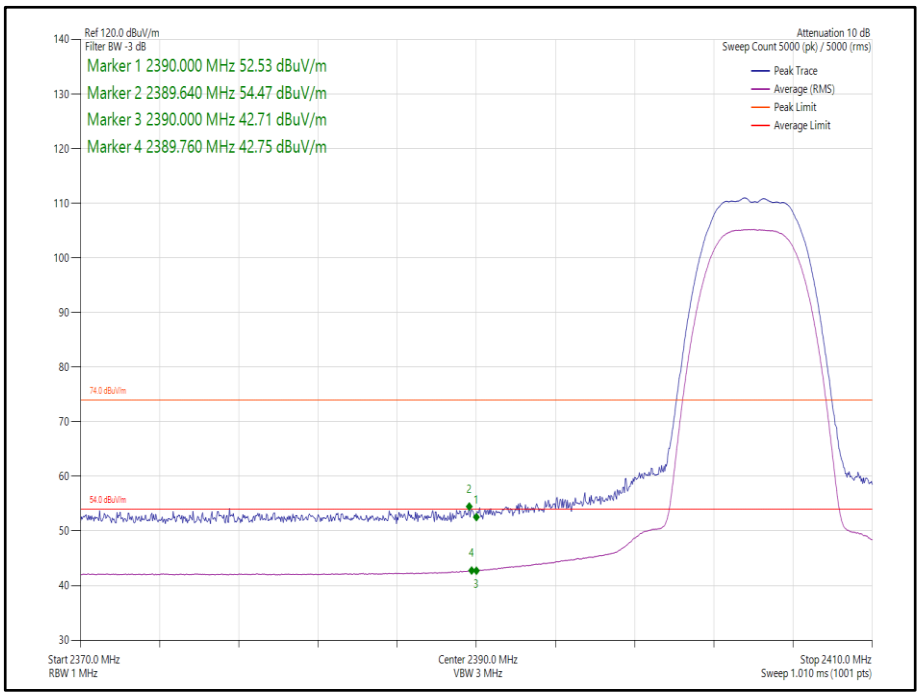


**Figure 33 - Core 0- Static - π/4-DQPSK/8DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

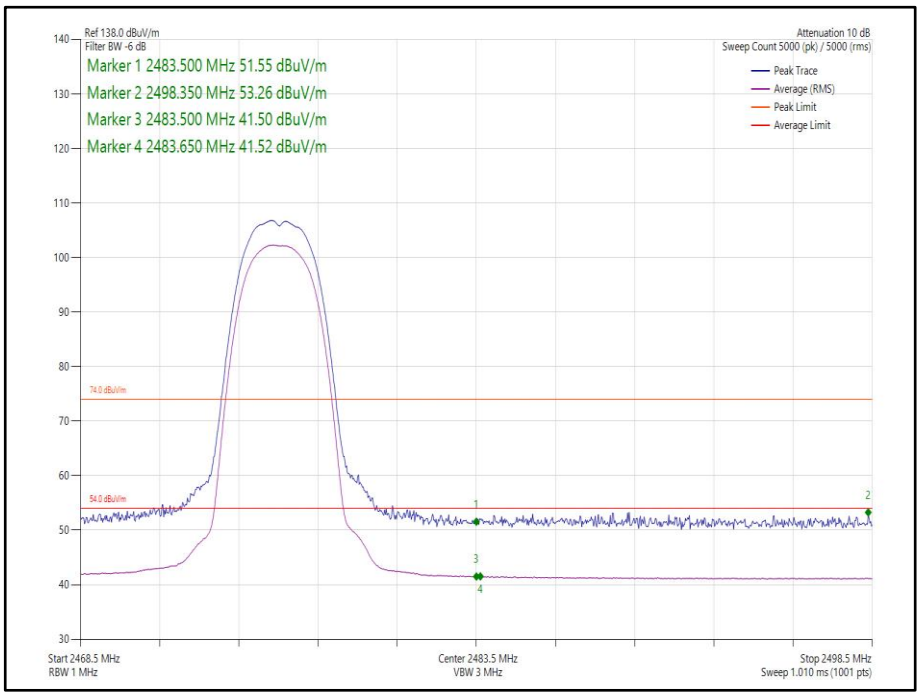


**Figure 34 - Core 0- Static - π/4-DQPSK/8DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR8 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 2 | 8DH5 | 2404 | 2390.0 | 53.95 | 42.39 |
| Static | π/4-DQPSK | Core 2 | 8DH5 | 2476 | 2483.5 | 53.26 | 41.33 |

**Table 23 - Restricted Band Edge Results**

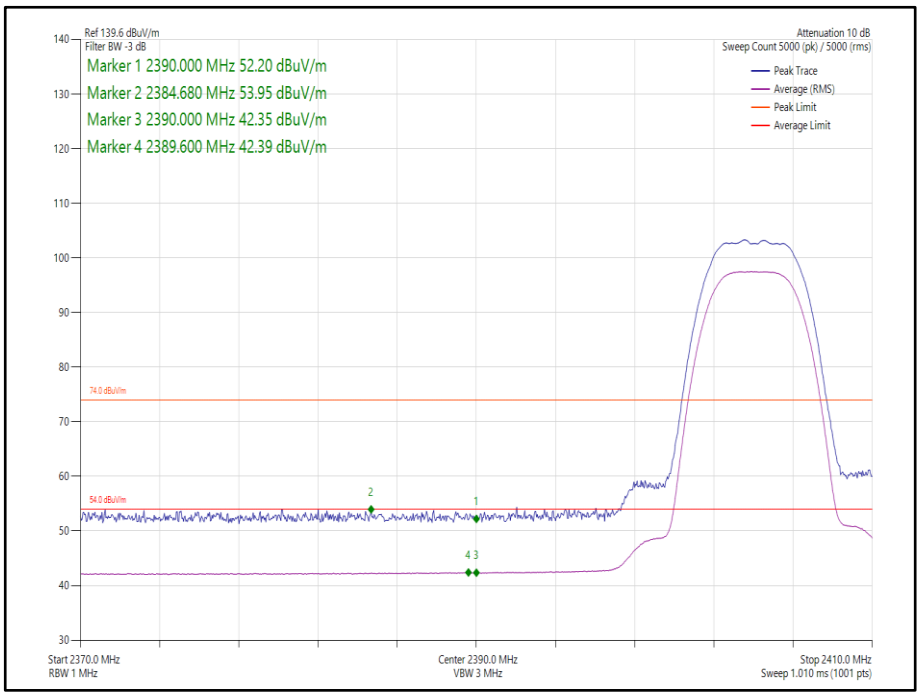


**Figure 35 - Core 2- Static - π/4-DQPSK/8DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

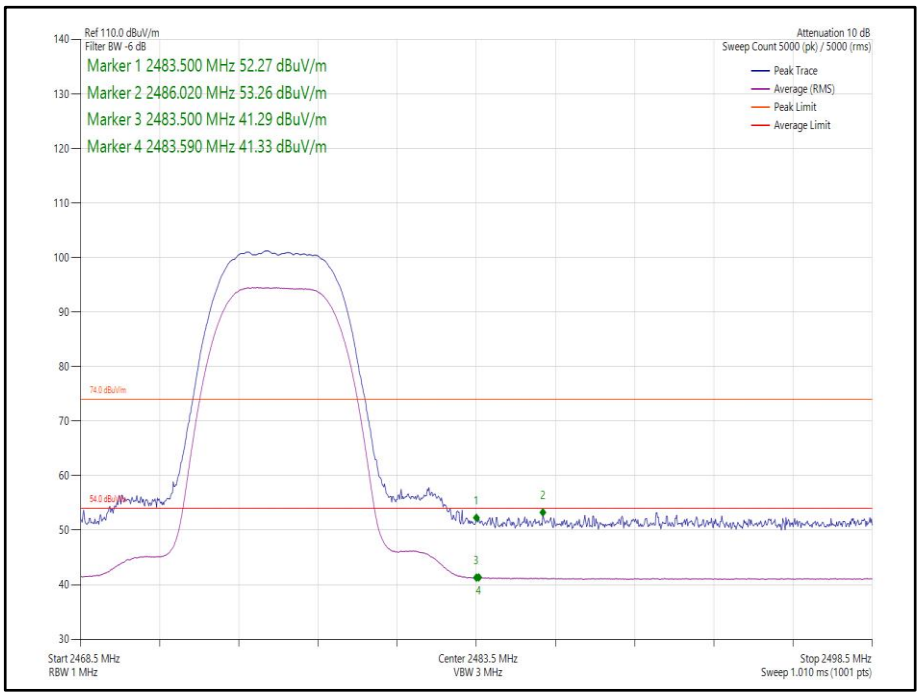


**Figure 36 - Core 2- Static - π/4-DQPSK/8DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR8 iPA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0-1 | 8DH5 | 2404 | 2390.0 | 54.27 | 42.53 |
| Static | π/4-DQPSK | Core 0-1 | 8DH5 | 2476 | 2483.5 | 53.69 | 41.77 |

**Table 24 - Restricted Band Edge Results**

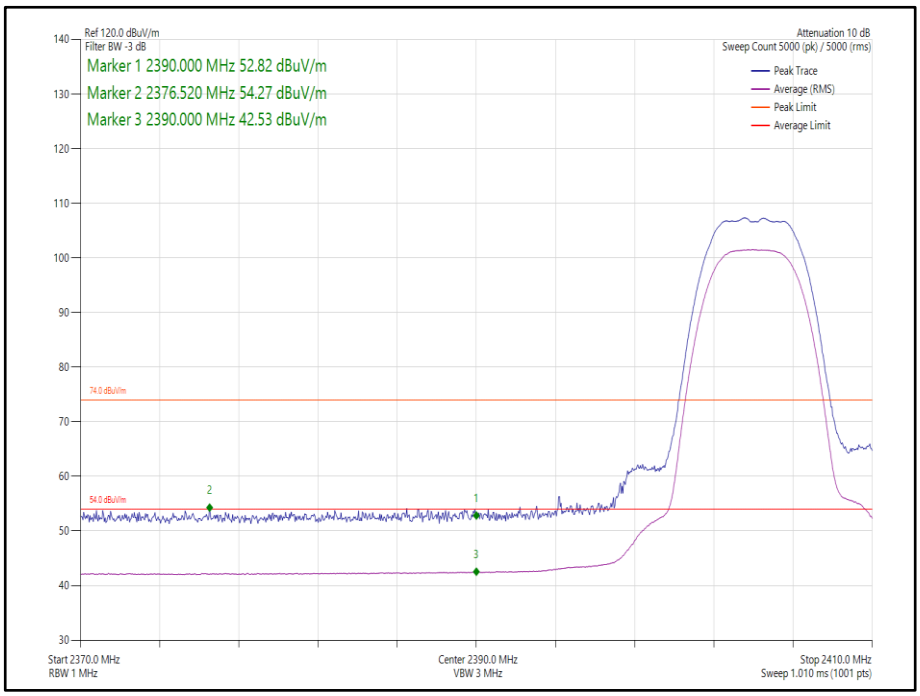


**Figure 37 - Core 0-1- Static - π/4-DQPSK/8DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

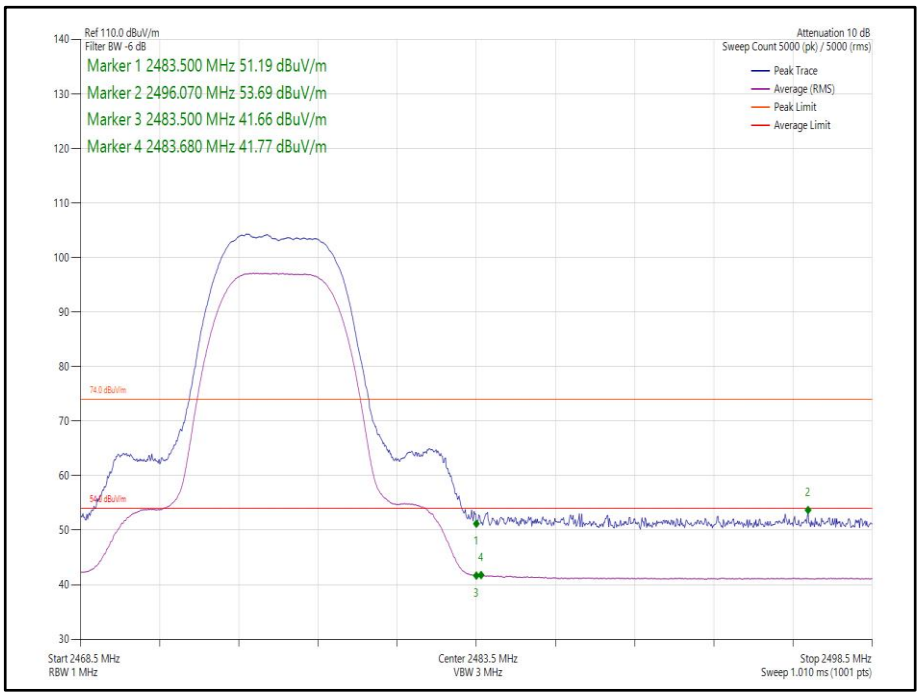


**Figure 38 - Core 0-1- Static - π/4-DQPSK/8DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

HDR8 ePA

| Mode | Modulation | Core | Packet Type | Tx Frequency (MHz) | Band Edge Frequency (MHz) | Peak Level (dBµV/m) | Average Level (dBµV/m) |
|---|---|---|---|---|---|---|---|
| Static | π/4-DQPSK | Core 0-1 | 8DH5 | 2404 | 2390.0 | 54.26 | 42.8 |
| Static | π/4-DQPSK | Core 0-1 | 8DH5 | 2476 | 2483.5 | 53.54 | 42.35 |

**Table 25 - Restricted Band Edge Results**

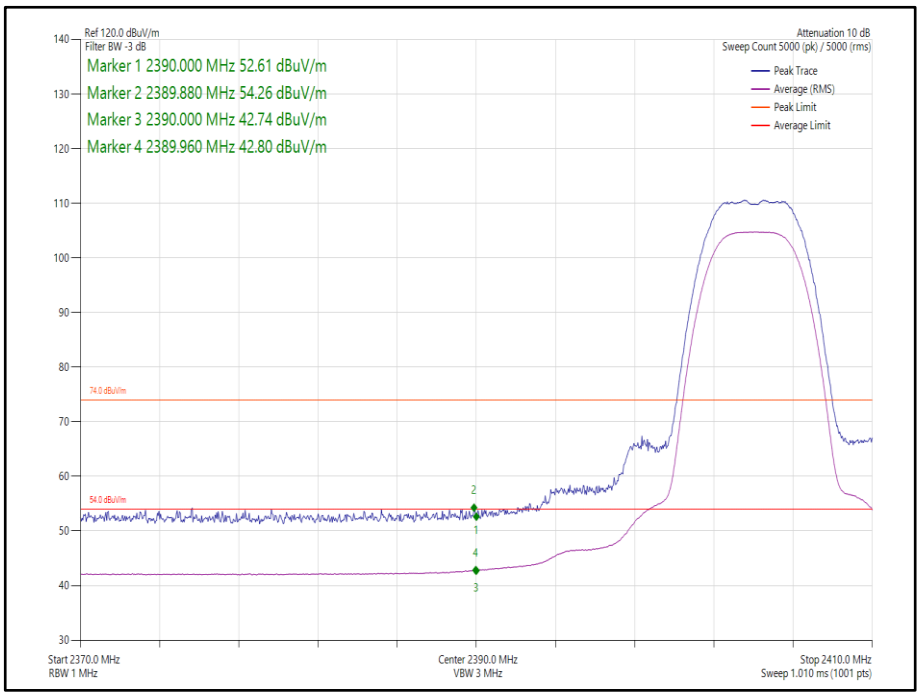


**Figure 39 - Core 0-1- Static - π/4-DQPSK/8DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz**

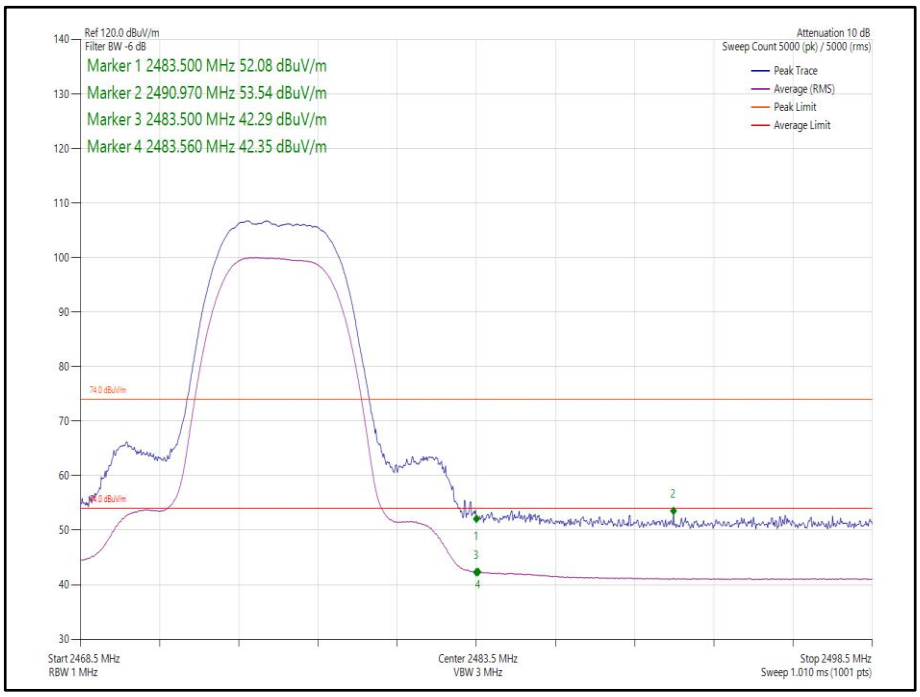


**Figure 40 - Core 0-1- Static - π/4-DQPSK/8DH5 - 2476 MHz - Band Edge Frequency 2483.5 MHz**

FCC 47 CFR Part 15, Limit Clause 15.209

| Frequency (MHz) | Field Strength (µV/m at 3 m) |
|---|---|
| 30 to 88 | 100 |
| 88 to 216 | 150 |
| 216 to 960 | 200 |
| Above 960 | 500 |

**Table 26**

ISED RSS-GEN, Limit Clause 8.9

| Frequency (MHz) | Field Strength (µV/m at 3 m) |
|---|---|
| 30 to 88 | 100 |
| 88 to 216 | 150 |
| 216 to 960 | 200 |
| Above 960* | 500 |

**Table 27**

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

### 2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Expires |
|---|---|---|---|---|---|
| Multimeter | Iso-tech | IDM101 | 2421 | 12 | 28-Oct-2021 |
| EMI Test Receiver | Rohde & Schwarz | ESW44 | 5084 | 12 | 08-Mar-2022 |
| Emissions Software | TUV SUD | EmX V2.1.11 | 5125 | - | Software |
| Screened Room (11) | Rainford | Rainford | 5136 | 36 | 01-Nov-2021 |
| Mast | Maturo | TAM 4.0-P | 5158 | - | TU |
| Mast and Turntable Controller | Maturo | Maturo NCD | 5159 | - | TU |
| Turntable | Maturo | TT 15WF | 5160 | - | TU |
| Horn Antenna (1-10GHz) | Schwarzbeck | BBHA 9120 B | 5215 | 12 | 01-Apr-2022 |
| 2m SMA Cable | Junkosha | MWX221-02000AMSAMS/A | 5518 | 12 | 09-Apr-2022 |
| 8m N Type Cable | Junkosha | MWX221-08000NMSNMS/B | 5522 | 12 | 24-Mar-2022 |
| Thermo-Hygro-Barometer | PCE Instruments | PCE-THB 40 | 5604 | 12 | 22-Sep-2022 |

**Table 28**

TU - Traceability Unscheduled

## 2.2 Emission Bandwidth

### 2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.7

### 2.2.2 Equipment Under Test and Modification State

A2165, S/N: H617C20363 - Modification State 0

### 2.2.3 Date of Test

14-December-2021 to 05-January-2022

### 2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.8.1 for 6 dB BW and 6.9.3 for 99% occupied bandwidth measurements.

### 2.2.5 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 21.4 – 22.2 °C |
| Relative Humidity | 26.1 - 50.8 % |

### 2.2.6 Test Results

2.4 GHz Bluetooth - DTS

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (a)(2)<br>RSS-247 5.2 a) | Test Method(s): | C63.10 6.9.3<br>C63.10 11.8.1 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | ePA π/4 DQPSK (4-DH5) | Duty Cycle (%): | - |
| Antenna Configuration: | SISO | DCCF (dB): | - |
| Active Port(s): | A (Core 0) | Peak Antenna Gain (dBi): | - |

| Test Frequency (MHz) | 6 dB Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 1.896 | - | - | - | 1.896 | ≥500.0 |
| 2441 | 1.904 | - | - | - | 1.904 | ≥500.0 |
| 2476 | 1.904 | - | - | - | 1.904 | ≥500.0 |

**Table 29 - 6 dB Bandwidth Results**

| Test Frequency (MHz) | 99% Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 2.328 | - | - | - | 2.328 | - |
| 2441 | 2.328 | - | - | - | 2.328 | - |
| 2476 | 2.328 | - | - | - | 2.328 | - |

**Table 30 - 99% Bandwidth Results**

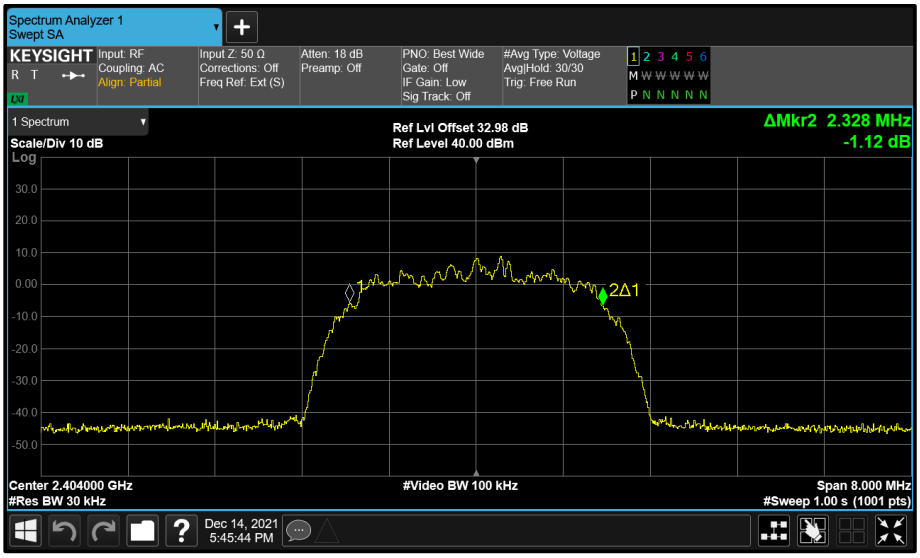


**Figure 41 - Core 0 (A) 2404 MHz (CH2) 99% Bandwidth**

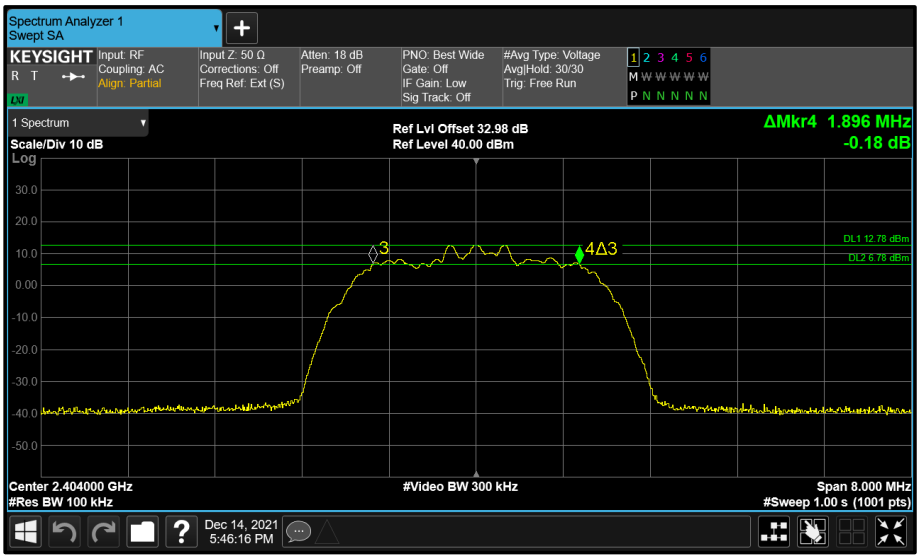


**Figure 42 - Core 0 (A) 2404 MHz (CH2) 6 dB Bandwidth**

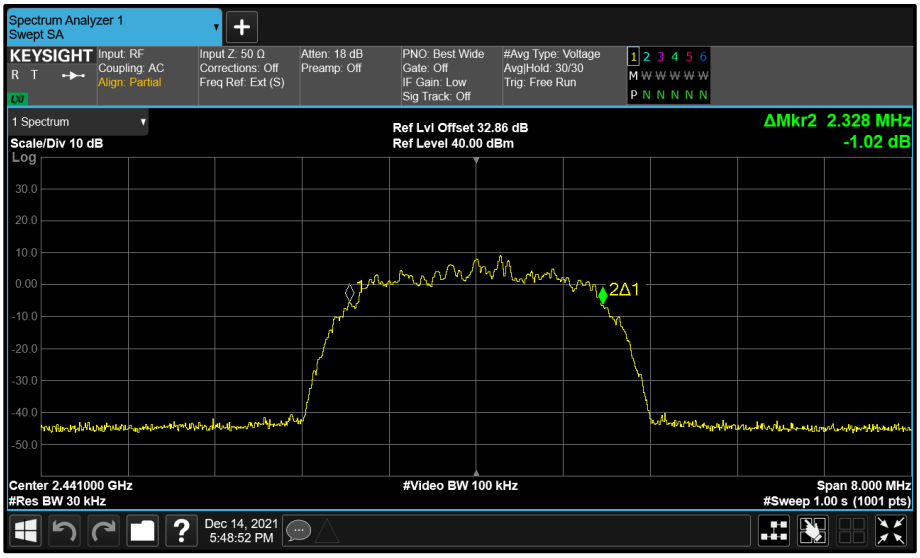


**Figure 43 - Core 0 (A) 2441 MHz (CH39) 99% Bandwidth**

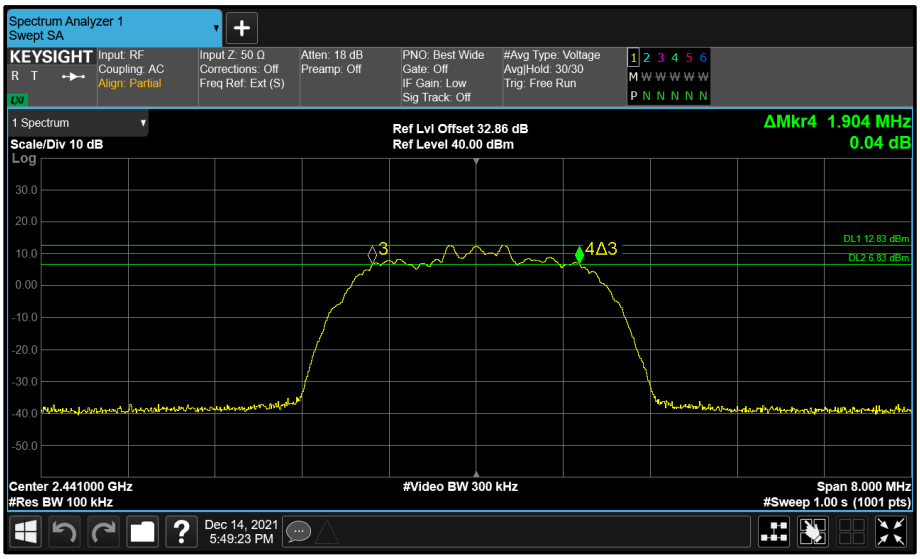


**Figure 44 - Core 0 (A) 2441 MHz (CH39) 6 dB Bandwidth**

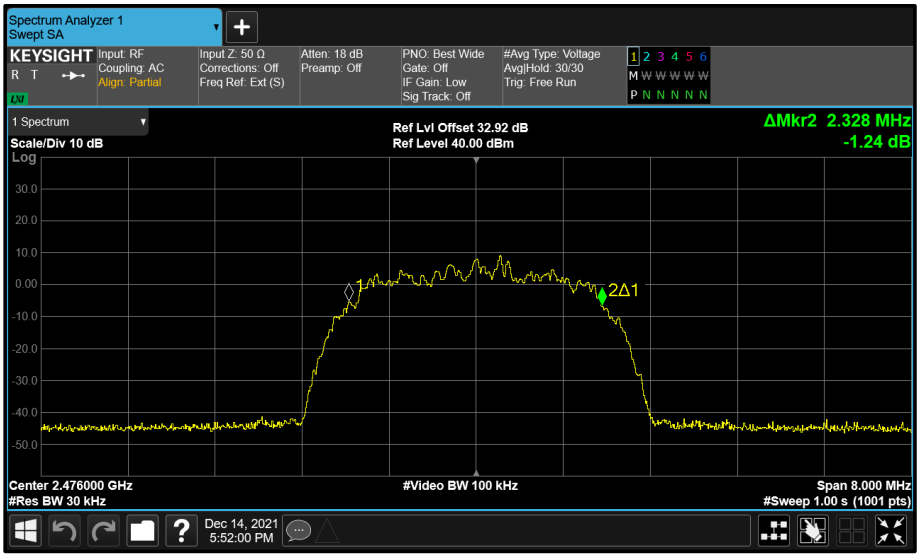


**Figure 45 - Core 0 (A) 2476 MHz (CH74) 99% Bandwidth**

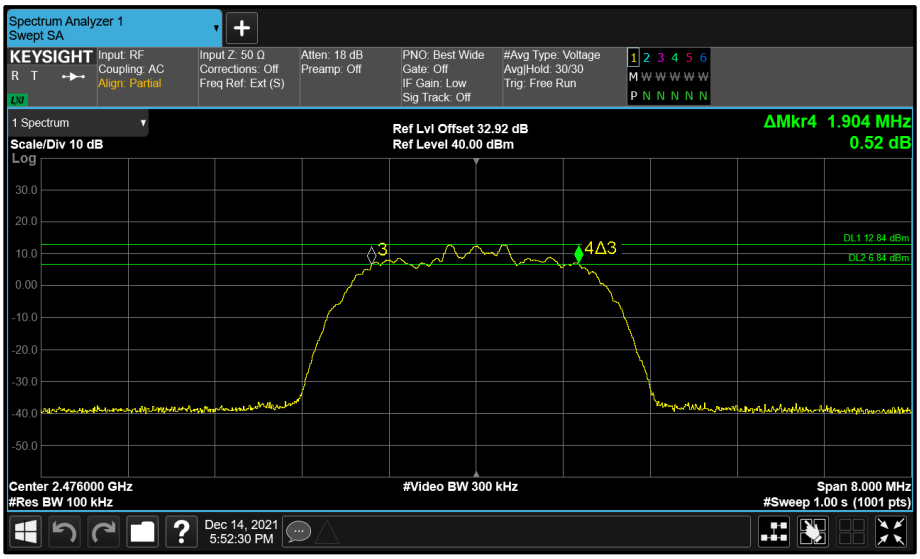


**Figure 46 - Core 0 (A) 2476 MHz (CH74) 6 dB Bandwidth**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (a)(2)<br>RSS-247 5.2 a) | Test Method(s): | C63.10 6.9.3<br>C63.10 11.8.1 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | ePA π/4 DQPSK (8-DH5) | Duty Cycle (%): | - |
| Antenna Configuration: | SISO | DCCF (dB): | - |
| Active Port(s): | A (Core 0) | Peak Antenna Gain (dBi): | - |

| Test Frequency (MHz) | 6 dB Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 1.020 | - | - | - | 1.020 | ≥500.0 |
| 2441 | 1.005 | - | - | - | 1.005 | ≥500.0 |
| 2476 | 1.020 | - | - | - | 1.020 | ≥500.0 |

**Table 31 - 6 dB Bandwidth Results**

| Test Frequency (MHz) | 99% Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 4.440 | - | - | - | 4.440 | - |
| 2441 | 4.425 | - | - | - | 4.425 | - |
| 2476 | 4.425 | - | - | - | 4.425 | - |

**Table 32 - 99% Bandwidth Results**

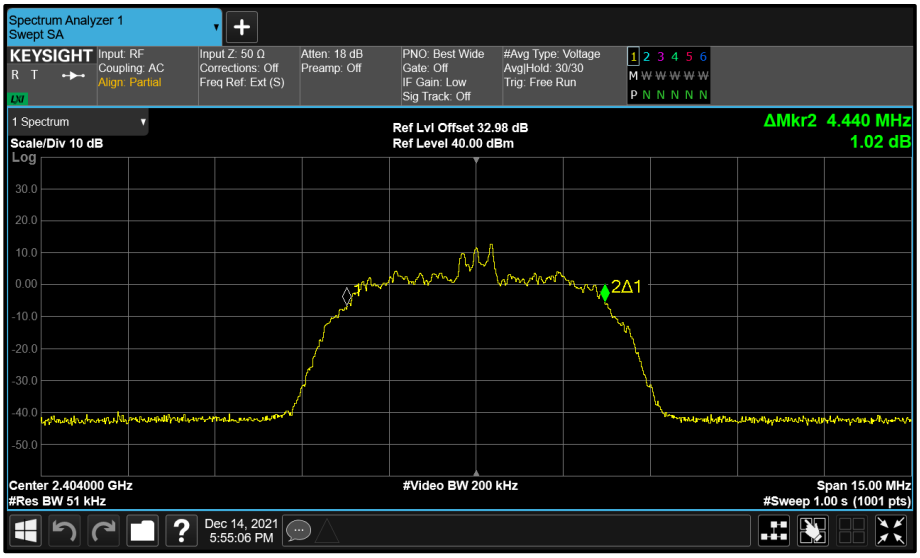


**Figure 47 - Core 0 (A) 2404 MHz (CH2) 99% Bandwidth**

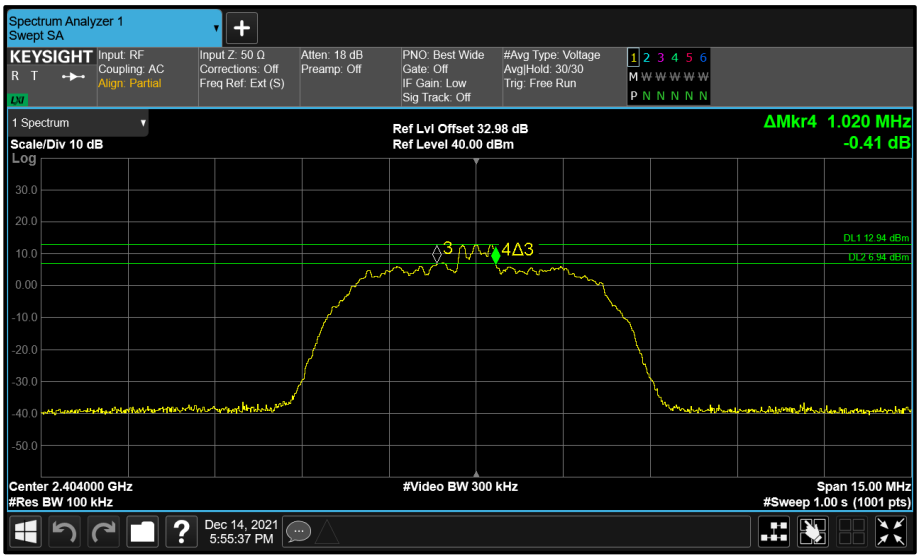


**Figure 48 - Core 0 (A) 2404 MHz (CH2) 6 dB Bandwidth**

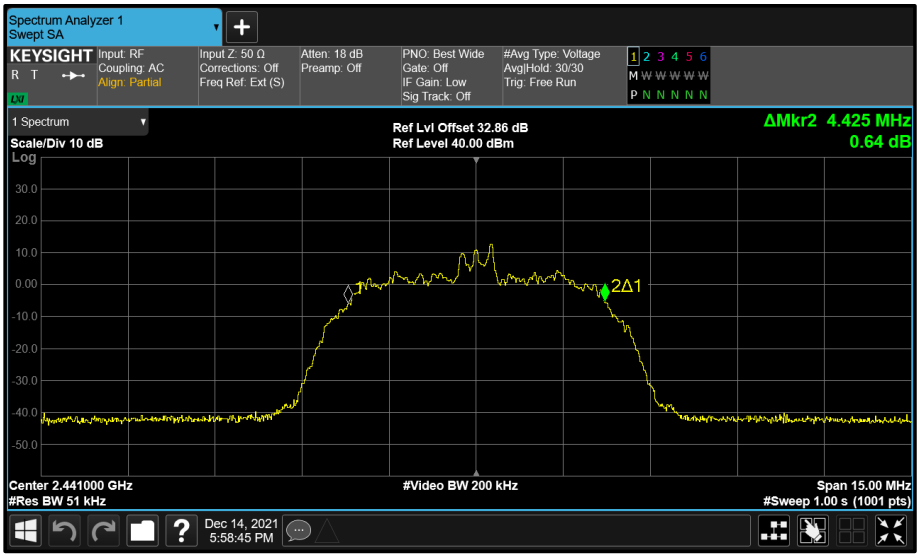


**Figure 49 - Core 0 (A) 2441 MHz (CH39) 99% Bandwidth**

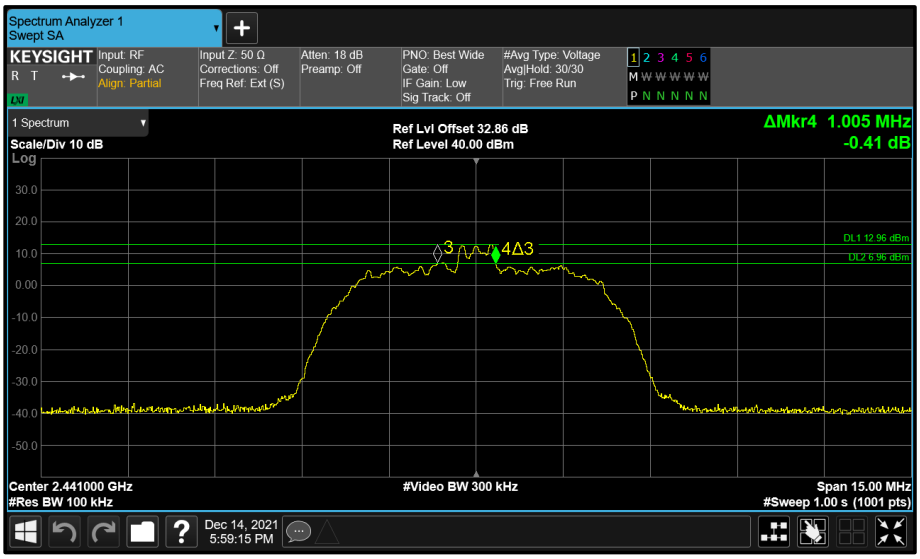


**Figure 50 - Core 0 (A) 2441 MHz (CH39) 6 dB Bandwidth**

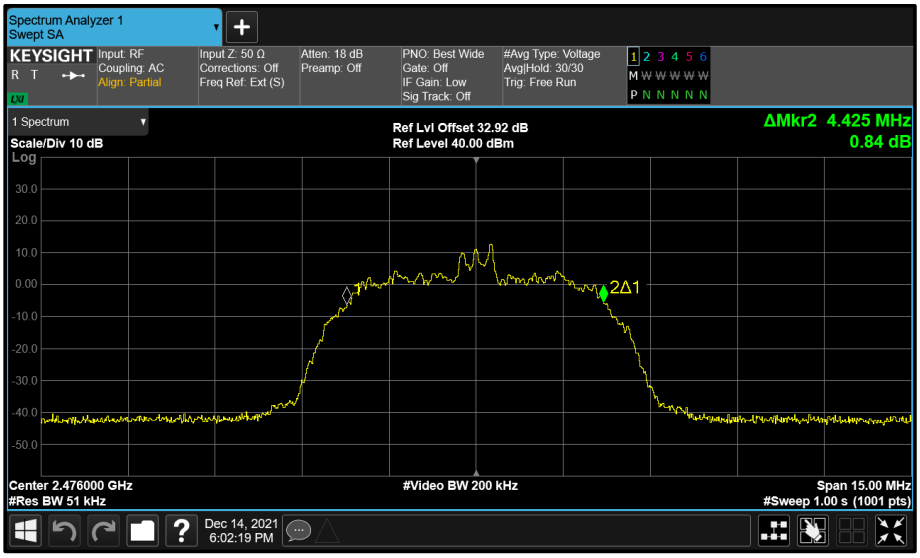


**Figure 51 - Core 0 (A) 2476 MHz (CH74) 99% Bandwidth**

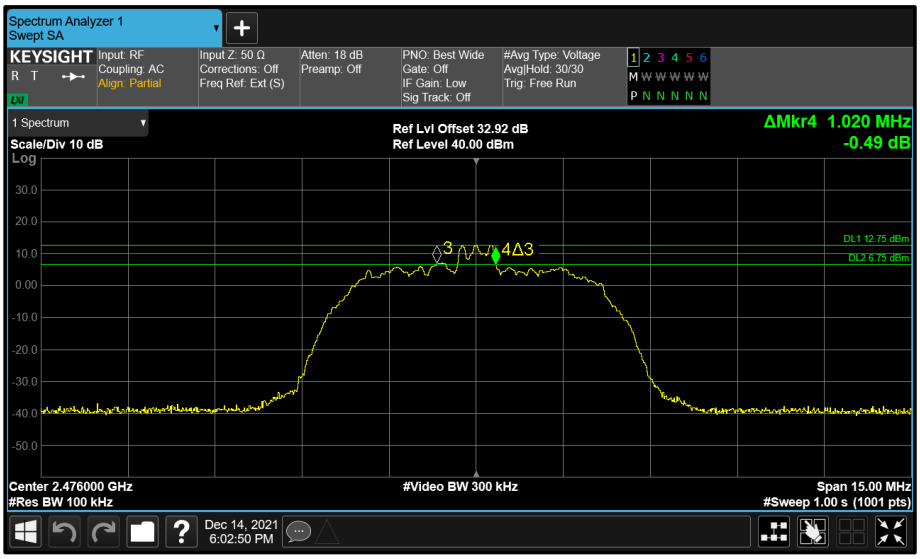


**Figure 52 - Core 0 (A) 2476 MHz (CH74) 6 dB Bandwidth**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (a)(2)<br>RSS-247 5.2 a) | Test Method(s): | C63.10 6.9.3<br>C63.10 11.8.1 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | ePA π/4 DQPSK (4-DH5) | Duty Cycle (%): | - |
| Antenna Configuration: | SISO | DCCF (dB): | - |
| Active Port(s): | B (Core 1) | Peak Antenna Gain (dBi): | - |

| Test Frequency (MHz) | 6 dB Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | - | 1.904 | - | - | 1.904 | ≥500.0 |
| 2441 | - | 1.904 | - | - | 1.904 | ≥500.0 |
| 2476 | - | 1.904 | - | - | 1.904 | ≥500.0 |

**Table 33 - 6 dB Bandwidth Results**

| Test Frequency (MHz) | 99% Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | - | 2.336 | - | - | 2.336 | - |
| 2441 | - | 2.328 | - | - | 2.328 | - |
| 2476 | - | 2.328 | - | - | 2.328 | - |

**Table 34 - 99% Bandwidth Results**

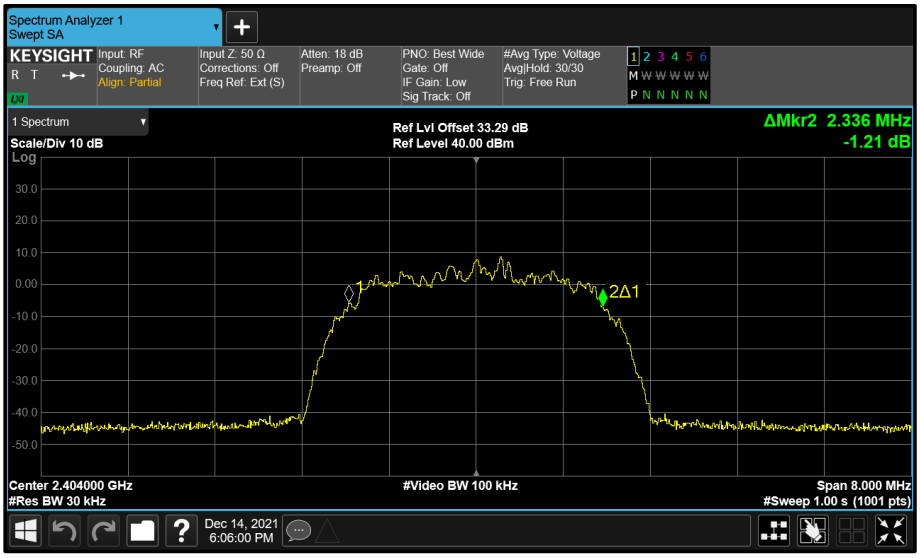


**Figure 53 - Core 1 (B) 2404 MHz (CH2) 99% Bandwidth**

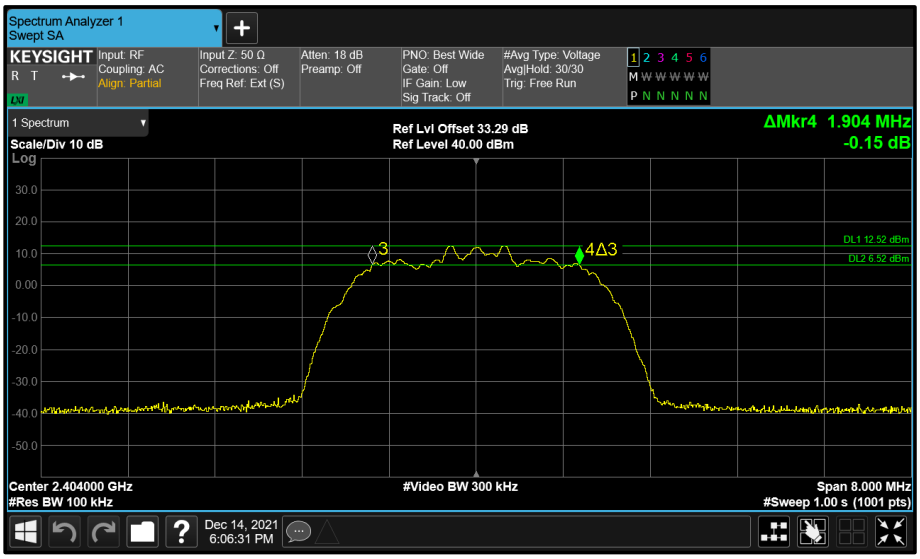


**Figure 54 - Core 1 (B) 2404 MHz (CH2) 6 dB Bandwidth**

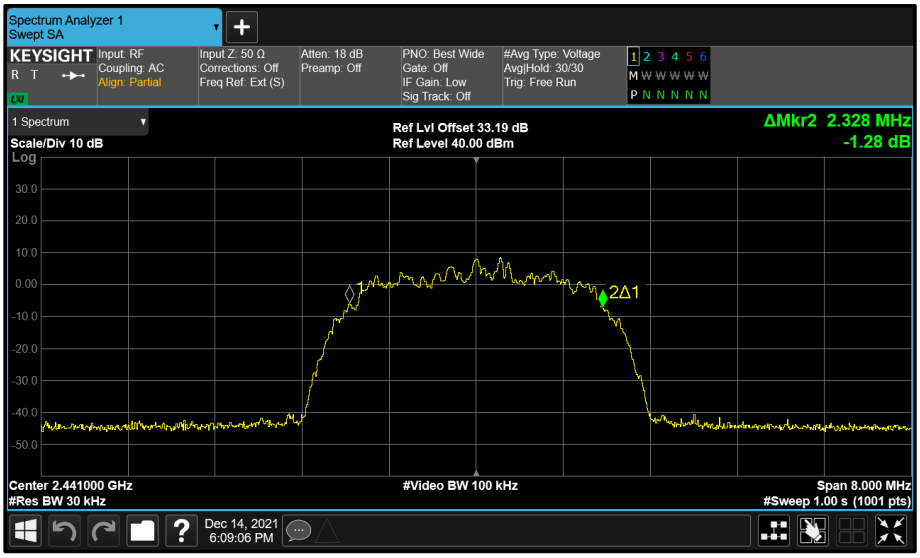


**Figure 55 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth**

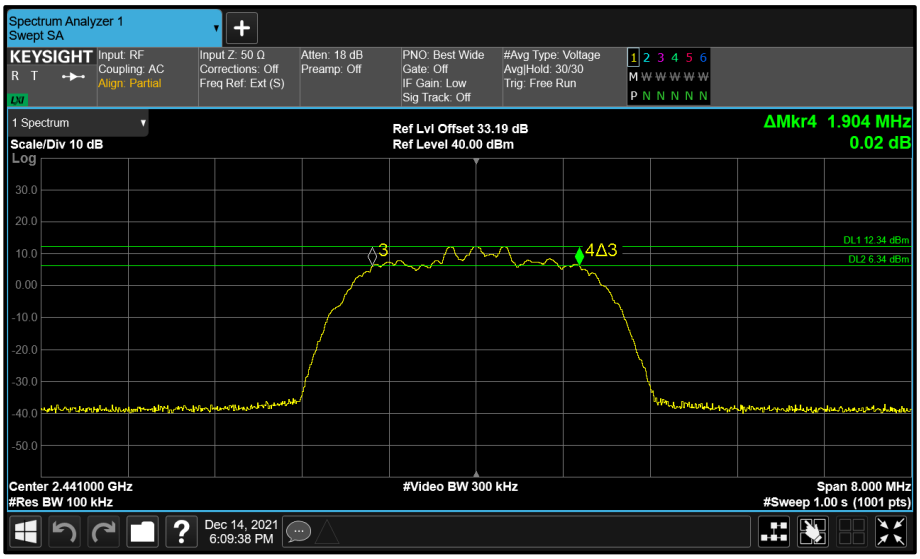


**Figure 56 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth**

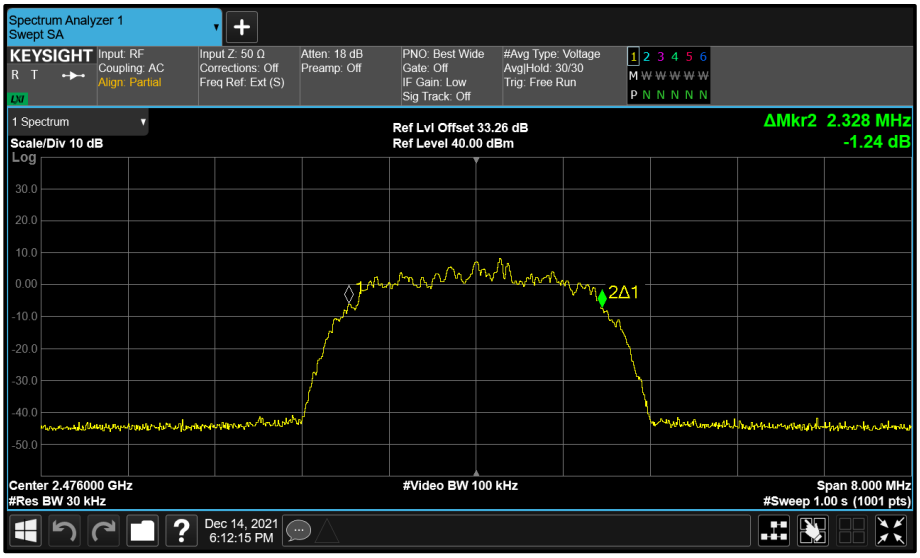


**Figure 57 - Core 1 (B) 2476 MHz (CH74) 99% Bandwidth**

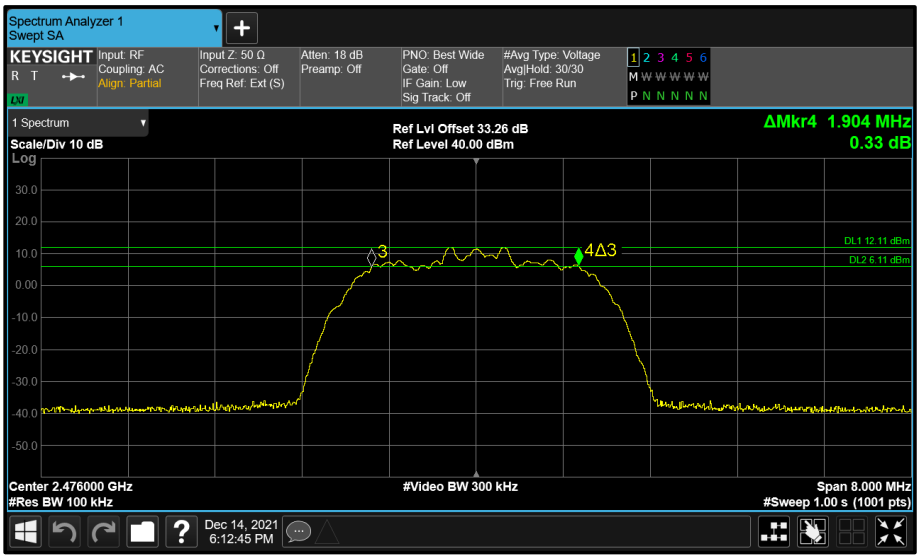


**Figure 58 - Core 1 (B) 2476 MHz (CH74) 6 dB Bandwidth**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (a)(2)<br>RSS-247 5.2 a) | Test Method(s): | C63.10 6.9.3<br>C63.10 11.8.1 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | ePA π/4 DQPSK (8-DH5) | Duty Cycle (%): | - |
| Antenna Configuration: | SISO | DCCF (dB): | - |
| Active Port(s): | B (Core 1) | Peak Antenna Gain (dBi): | - |

| Test Frequency (MHz) | 6 dB Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | - | 1.020 | - | - | 1.020 | ≥500.0 |
| 2441 | - | 1.020 | - | - | 1.020 | ≥500.0 |
| 2476 | - | 1.020 | - | - | 1.020 | ≥500.0 |

**Table 35 - 6 dB Bandwidth Results**

| Test Frequency (MHz) | 99% Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | - | 4.440 | - | - | 4.440 | - |
| 2441 | - | 4.425 | - | - | 4.425 | - |
| 2476 | - | 4.455 | - | - | 4.455 | - |

**Table 36 - 99% Bandwidth Results**

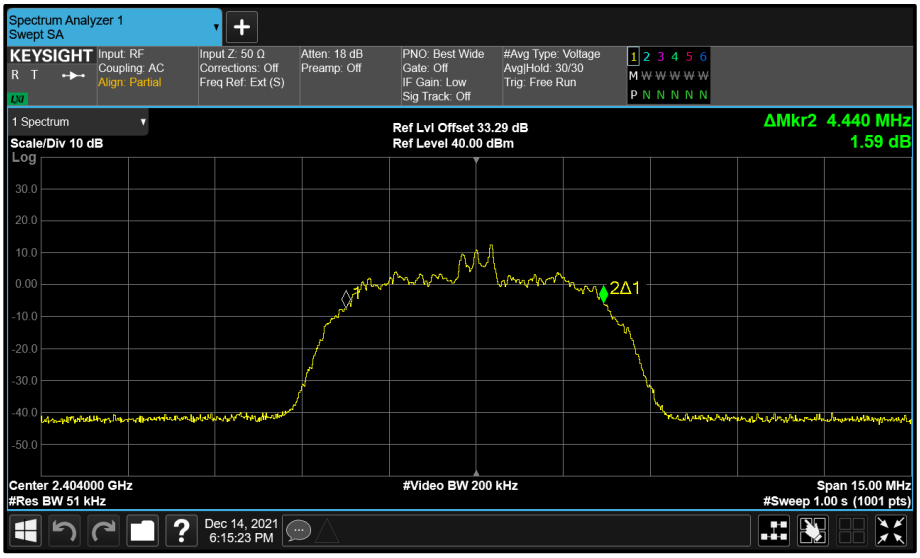


**Figure 59 - Core 1 (B) 2404 MHz (CH2) 99% Bandwidth**

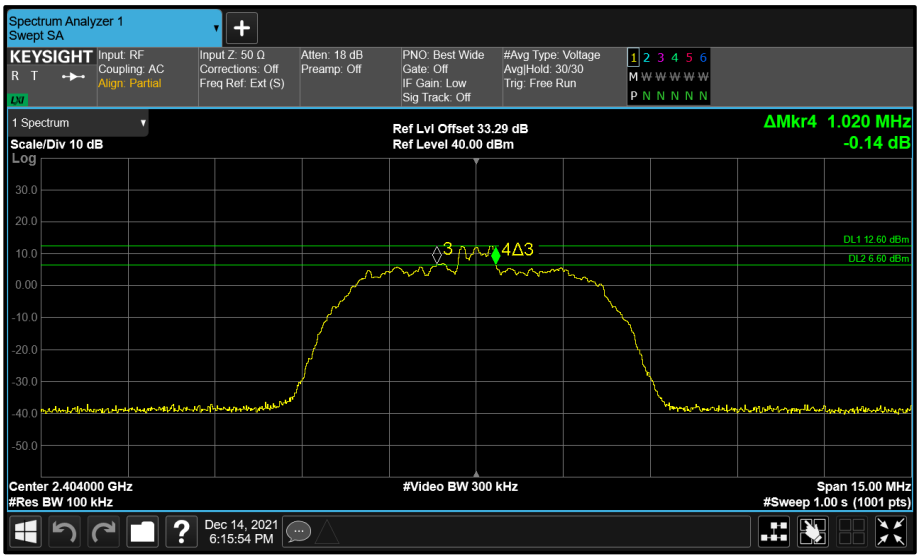


**Figure 60 - Core 1 (B) 2404 MHz (CH2) 6 dB Bandwidth**

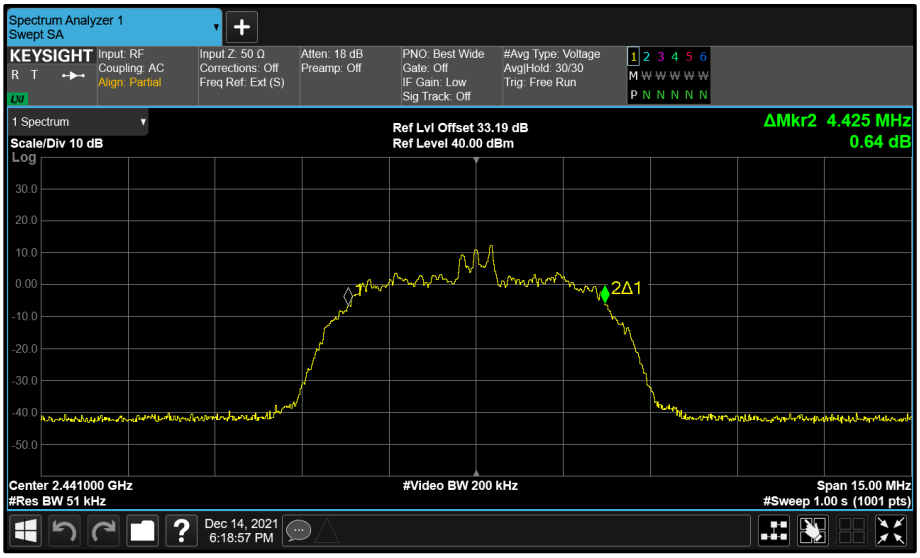


**Figure 61 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth**

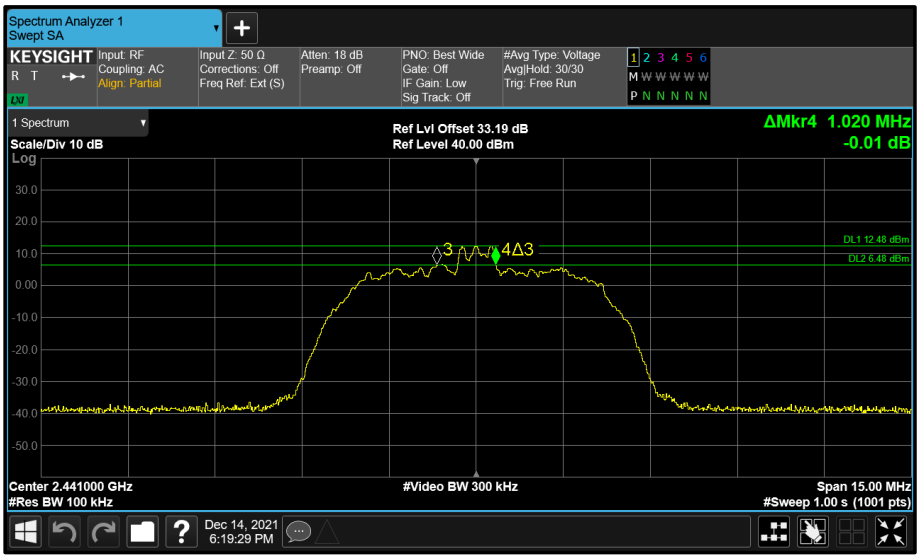


**Figure 62 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth**

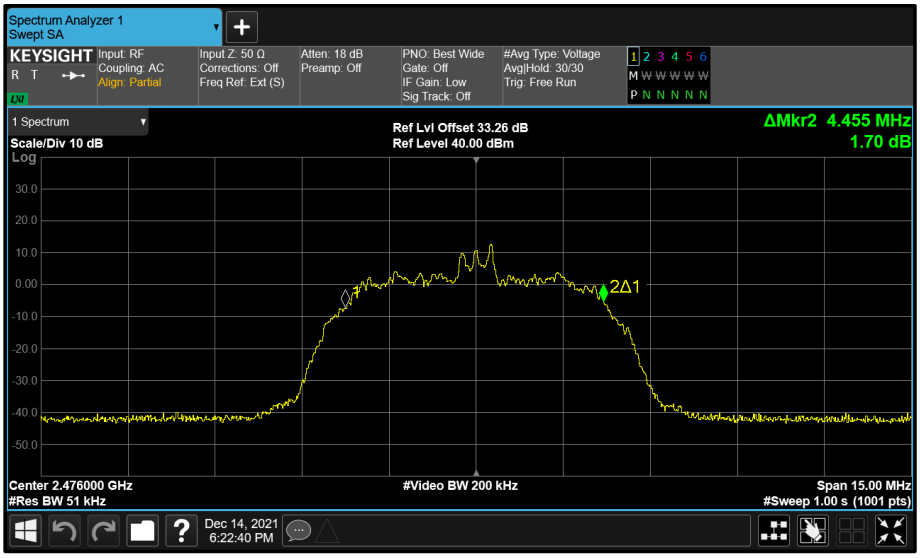


**Figure 63 - Core 1 (B) 2476 MHz (CH74) 99% Bandwidth**

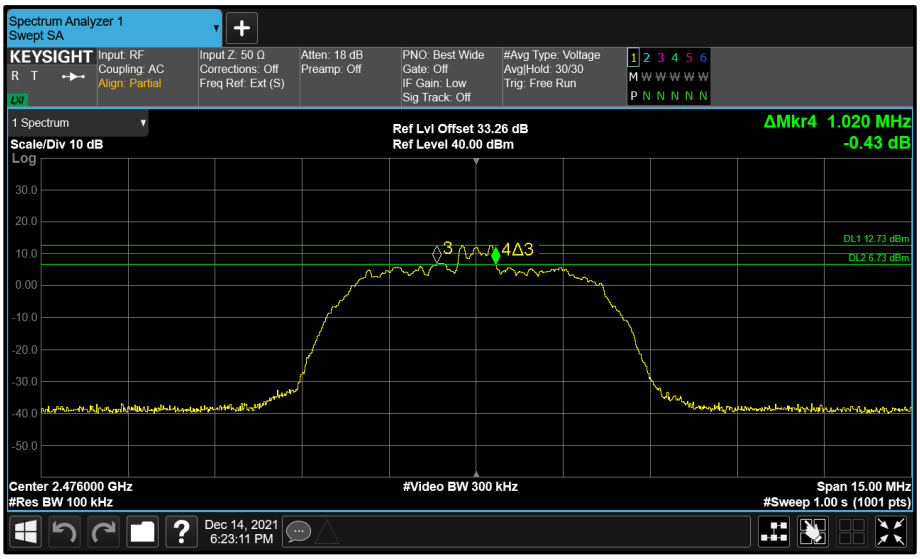


**Figure 64 - Core 1 (B) 2476 MHz (CH74) 6 dB Bandwidth**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (a)(2)<br>RSS-247 5.2 a) | Test Method(s): | C63.10 6.9.3<br>C63.10 11.8.1 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | ePA π/4 DQPSK (4-DH5) | Duty Cycle (%): | - |
| Antenna Configuration: | Beamforming | DCCF (dB): | - |
| Active Port(s): | A+B (Core 0 + Core 1) | Peak Antenna Gain (dBi): | - |

| Test Frequency (MHz) | 6 dB Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 1.896 | 1.896 | - | - | 1.896 | ≥500.0 |
| 2441 | 1.880 | 1.896 | - | - | 1.880 | ≥500.0 |
| 2476 | 1.896 | 1.896 | - | - | 1.896 | ≥500.0 |

**Table 37 - 6 dB Bandwidth Results**

| Test Frequency (MHz) | 99% Bandwidth (MHz) | | | | | Limit (kHz) |
|---|---|---|---|---|---|---|
| | A | B | C | D | Minimum | |
| 2404 | 2.328 | 2.336 | - | - | 2.328 | - |
| 2441 | 2.328 | 2.336 | - | - | 2.328 | - |
| 2476 | 2.328 | 2.328 | - | - | 2.328 | - |

**Table 38 - 99% Bandwidth Results**

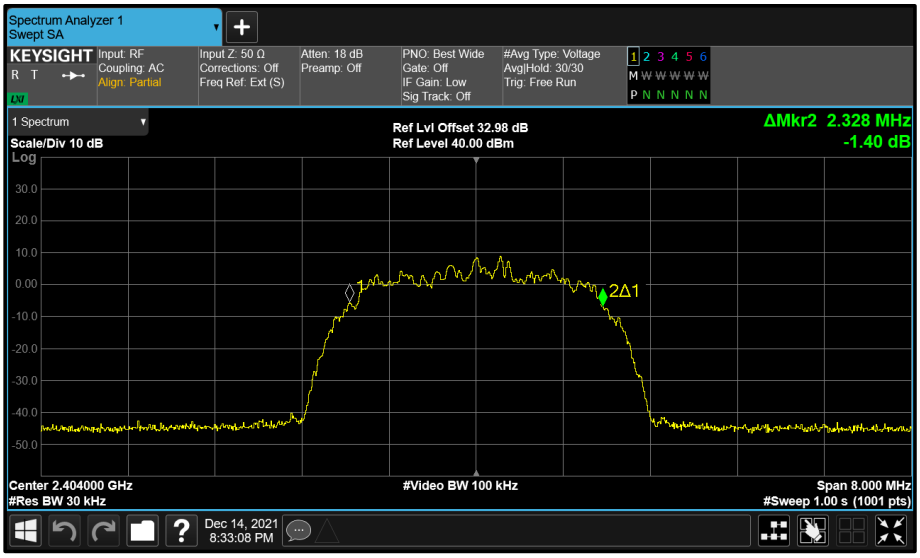


**Figure 65 - Core 0 (A) 2404 MHz (CH2) 99% Bandwidth**

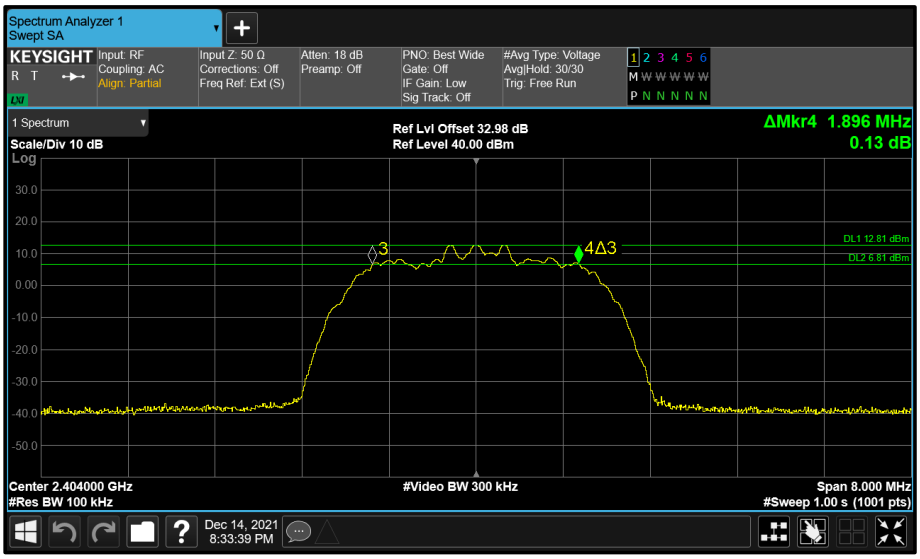


**Figure 66 - Core 0 (A) 2404 MHz (CH2) 6 dB Bandwidth**

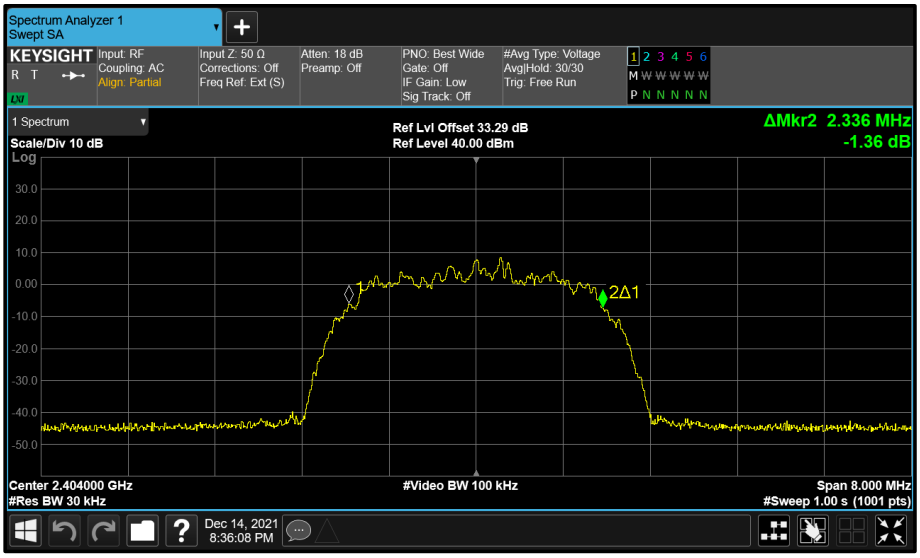


**Figure 67 - Core 1 (B) 2404 MHz (CH2) 99% Bandwidth**

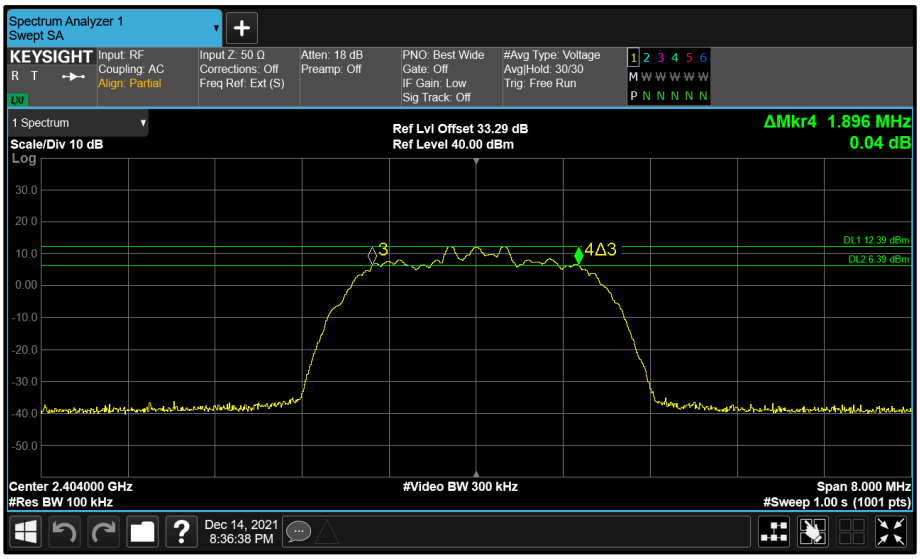


**Figure 68 - Core 1 (B) 2404 MHz (CH2) 6 dB Bandwidth**

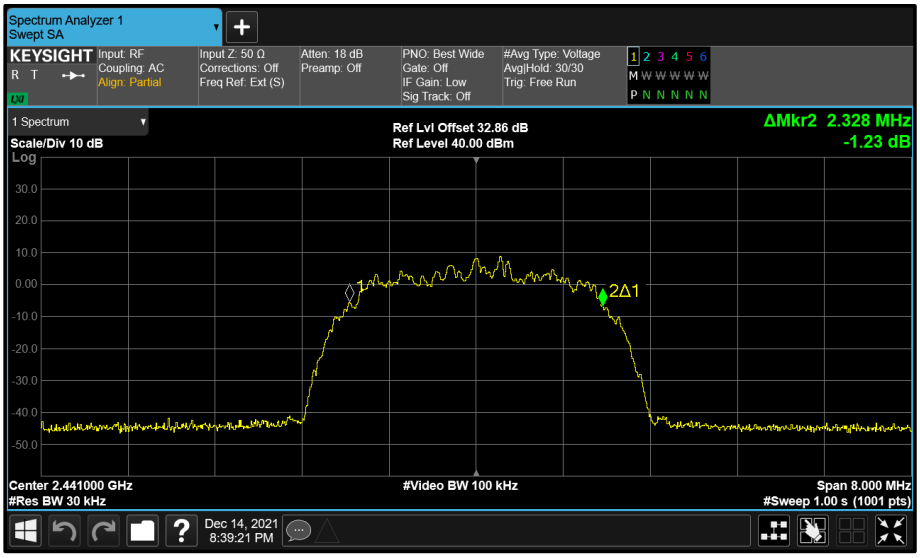


**Figure 69 - Core 0 (A) 2441 MHz (CH39) 99% Bandwidth**

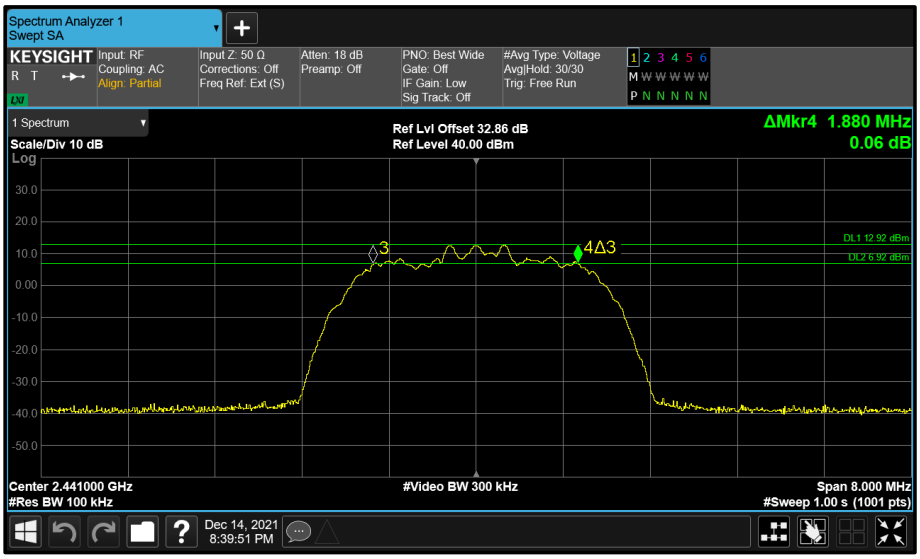


**Figure 70 - Core 0 (A) 2441 MHz (CH39) 6 dB Bandwidth**

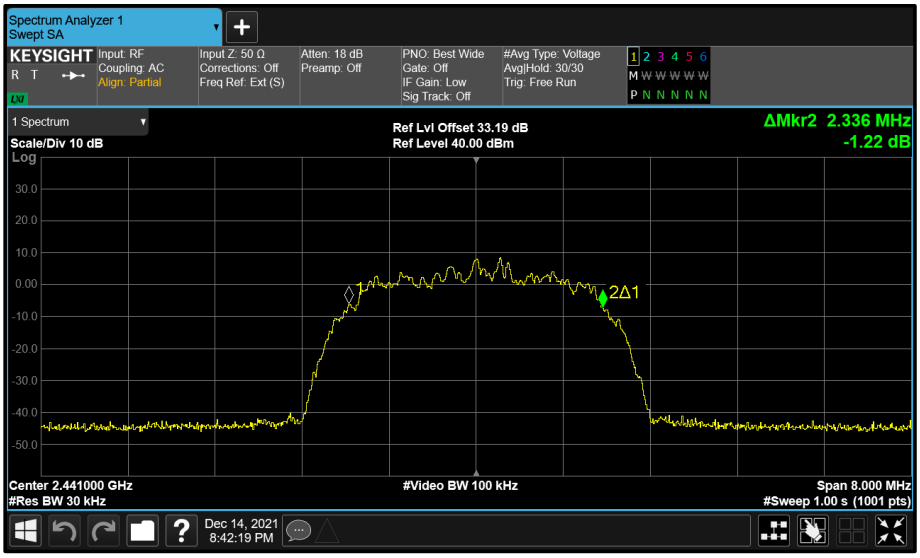


**Figure 71 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth**

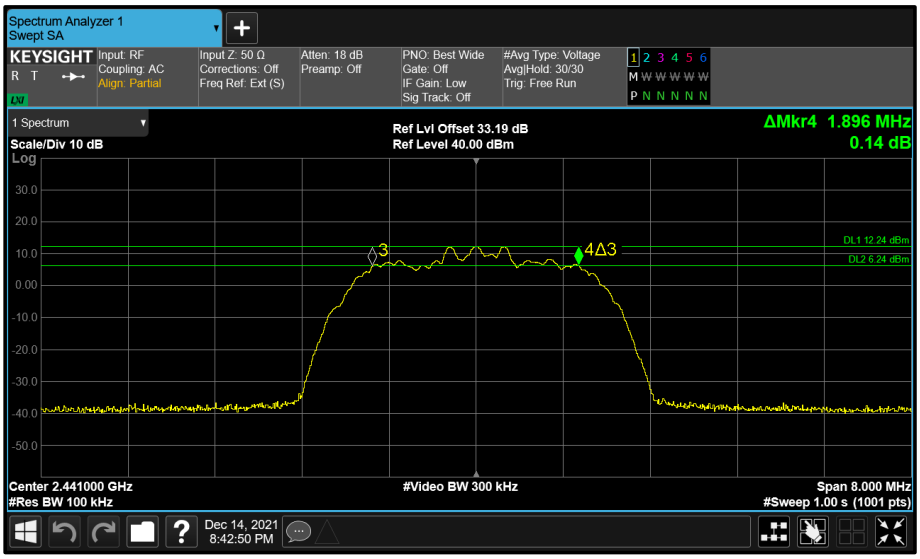


**Figure 72 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth**