

FCC and ISED Test Report

Apple Inc
Model: A2779

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

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



Add value.
Inspire trust.

FCC ID: BCGA2779

IC: 579C-A2779

COMMERCIAL-IN-CONFIDENCE

Document 75955428-04 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	21 November 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
Report Generation	Hollie Marshall	21 November 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.



DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD. No part of this document may be reproduced without the prior written approval of TÜV SÜD. © 2022 TÜV SÜD. This report relates only to the actual item/items tested.

ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

TÜV SÜD
is a trading name of TÜV SÜD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TÜV SÜD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom



Contents

1	Report Summary	2
1.1	Report Modification Record.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results	3
1.4	Product Information	4
1.5	Deviations from the Standard.....	4
1.6	EUT Modification Record	5
1.7	Test Location	6
2	Test Details	7
2.1	Restricted Band Edges.....	7
2.2	Emission Bandwidth	41
2.3	Maximum Conducted Output Power	125
2.4	Spurious Radiated Emissions	143
2.5	Authorised Band Edges	156
2.6	Power Spectral Density.....	173
3	Measurement Uncertainty	183



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	21-November-2022

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2779
Serial Number(s)	JM67M9K770 and NX7LCFL417
Hardware Version(s)	REV 1.0
Software Version(s)	22A31991j
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2020 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	0540246998
Start of Test	09-August-2022
Finish of Test	14-October-2022
Name of Engineer(s)	Ian Hart, Mohammad Malik, Colin Brain, Thomas Biddlecombe, Elliot Callender and James Woods
Related Document(s)	KDB 662911 D01 v02r01 ANSI 63.4 (2014) ANSI C63.10 (2013) ANSI C63.10 (2020)



1.3 Brief Summary of Results

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

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	FCC 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	3.1	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	15.209 and 15.247 (d)	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 was an Apple laptop computer with Bluetooth® and IEEE 802.11 a/b/g/n/ac/ax Wi-Fi capabilities in the 2.4GHz, 5GHz and 6GHz bands.

1.4.2 Test Set-up

For conducted tests, a conducted test point was provided by the manufacturer via a 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 Core 2 Core (BT Core 2) as well as the Core from the main radio with the highest antenna gain as Core 0 and Core 1 are identical but with unequal antenna gains.

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

BT Core 0 (SISO) – iPA HDR/LE and ePA HDR
BT Core 1 (SISO) – iPA HDR/LE and ePA HDR
BT Core 0 + BT Core 1 (TxBF) – iPA HDR/LE and ePA HDR
BT Core 2 (SISO) – iPA HDR/LE

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 Core 0	2400 to 2480	4.78	0.7
BT Core 1	2400 to 2480	4.93	0.7
BT Core 2	2400 to 2480	5.25	0.7

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: A2779, Serial Number: NX7LCFL417			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2779, Serial Number: JM67M9K770			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 4



1.7 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth - DTS		
Emission Bandwidth	Thomas Biddlecombe	UKAS
Maximum Conducted Output Power	Thomas Biddlecombe	UKAS
Power Spectral Density	Thomas Biddlecombe	UKAS

Table 5

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom

TÜV SÜD conducted the following tests at our Concorde Park Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth - DTS		
Restricted Band Edges	Ian Hart, Mohammad Malik and Colin Brain	UKAS
Spurious Radiated Emissions	Elliot Callender, Mohammad Malik and James Woods	UKAS
Authorised Band Edges	Ian Hart, Mohammad Malik and Colin Brain	UKAS

Table 6

Office Address:

TÜV SÜD
Concorde Park
Concorde Way
Fareham
Hampshire
PO15 5FG
United Kingdom



2 Test Details

2.1 Restricted Band Edges

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205
ISED RSS-247, Clause 3.1
ISED RSS-GEN, Clause 8.10

2.1.2 Equipment Under Test and Modification State

A2779, S/N: JM67M9K770 - Modification State 0

2.1.3 Date of Test

09-August-2022 to 11-August-2022

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 4.1.4.2.5. These are shown for information purposes and were used to determine the worst-case measurement point. Final average measurements were then taken in accordance with ANSI C63.10, clause 4.1.4.2.2 to obtain the measurement result recorded in the test results tables.

The following conversion can be applied to convert from dB μ V/m to μ V/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$.

2.1.5 Environmental Conditions

Ambient Temperature	20.9 - 22.5 °C
Relative Humidity	41.7 - 44.8 %

2.1.6 Test Results

2.4 GHz Bluetooth – DTS

Bluetooth LE - LE1M iPA

Modulation	Tx Frequency (MHz)	Core	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
GFSK/DH1	2402	Core 1	2390.0	55.01	42.98
GFSK/DH1	2480	Core 1	2483.5	53.96	42.37

Table 7 - Restricted Band Edge Results

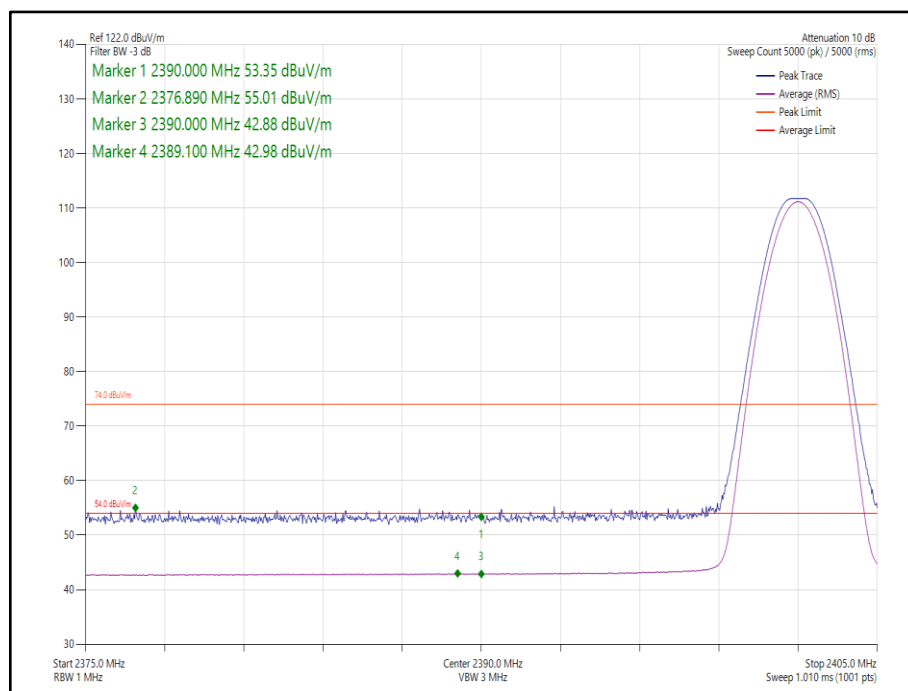


Figure 1 Core 1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

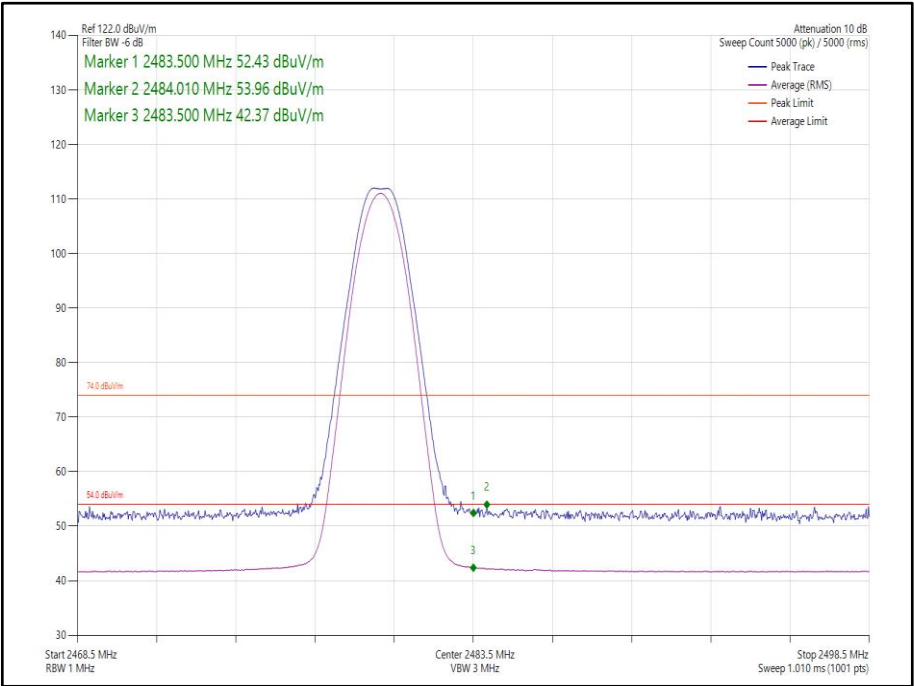


Figure 2 Core 1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz



Bluetooth LE - LE1M 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	54.91	43.11
GFSK/DH1	2480	Core 2	2483.5	54.32	42.72

Table 8 - Restricted Band Edge Results

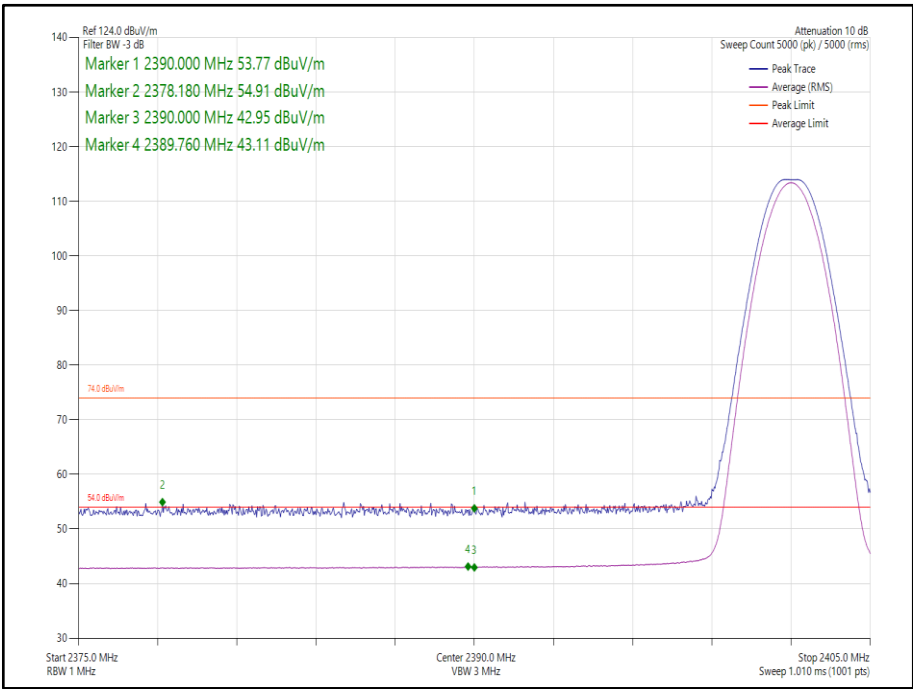


Figure 3 Core 2 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

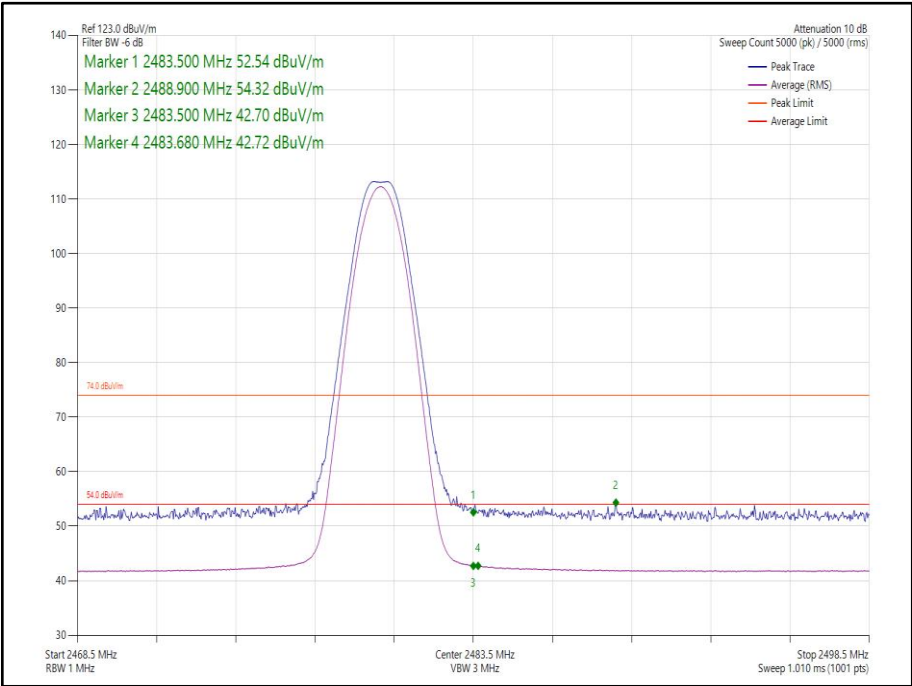


Figure 4 Core 2 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz



Bluetooth LE - LE1M 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	55.27	43.27
GFSK/DH1	2480	Core 0-1	2483.5	55.84	44.2

Table 9 - Restricted Band Edge Results

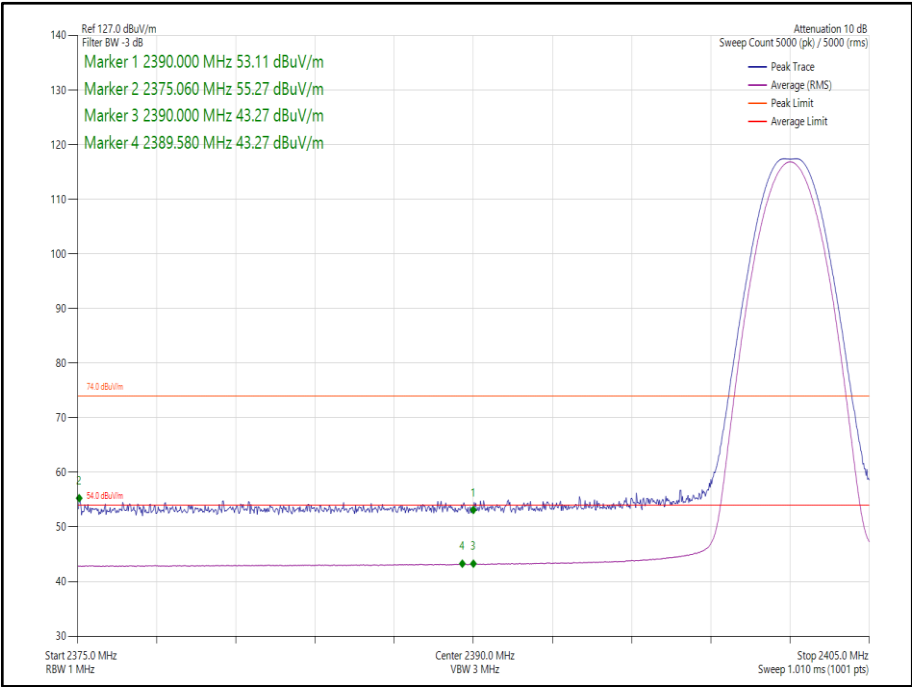


Figure 5 Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

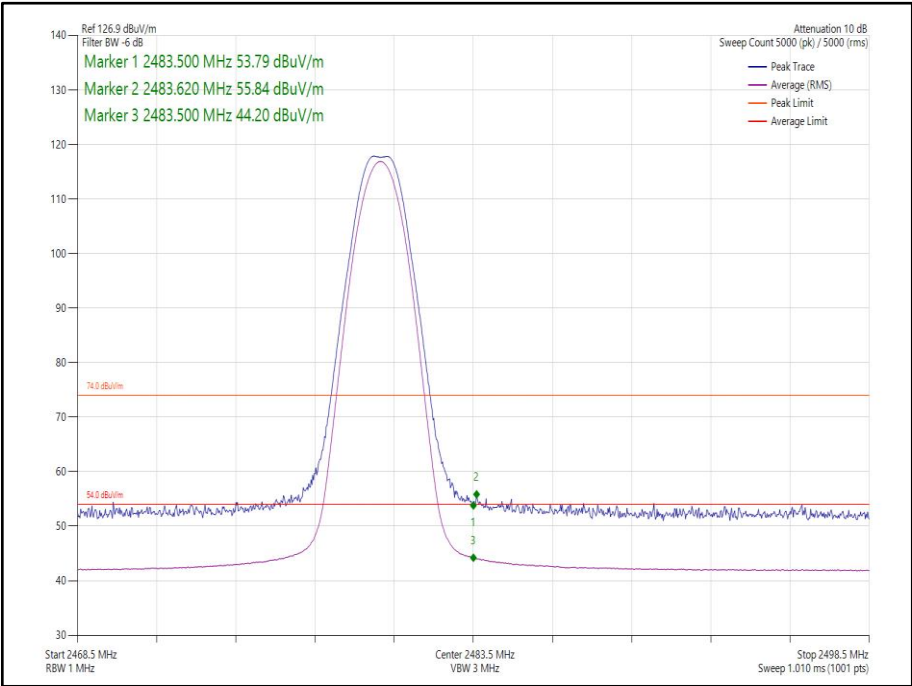


Figure 6 Core 0-1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz



Bluetooth LE – LE2M iPA

Modulation	Tx Frequency (MHz)	Core	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
GFSK/DH1	2402	Core 1	2390.0	55.11	42.97
GFSK/DH1	2480	Core 1	2483.5	58.50	48.67

Table 10 - Restricted Band Edge Results

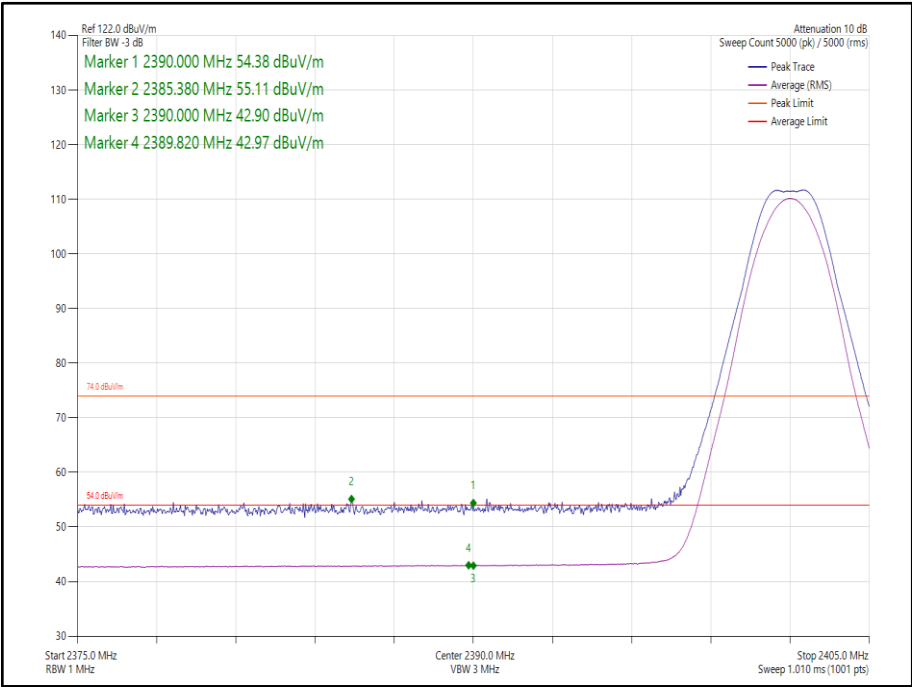


Figure 7 Core 1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

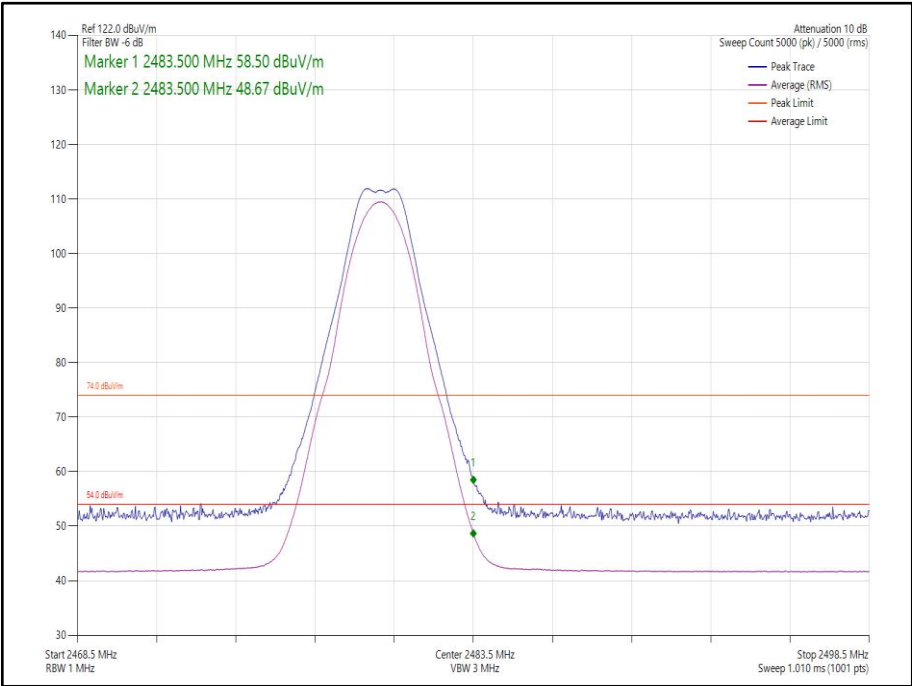


Figure 8 Core 1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz



Bluetooth LE – 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	54.69	43.10
GFSK/DH1	2480	Core 2	2483.5	59.35	50.13

Table 11 - Restricted Band Edge Results

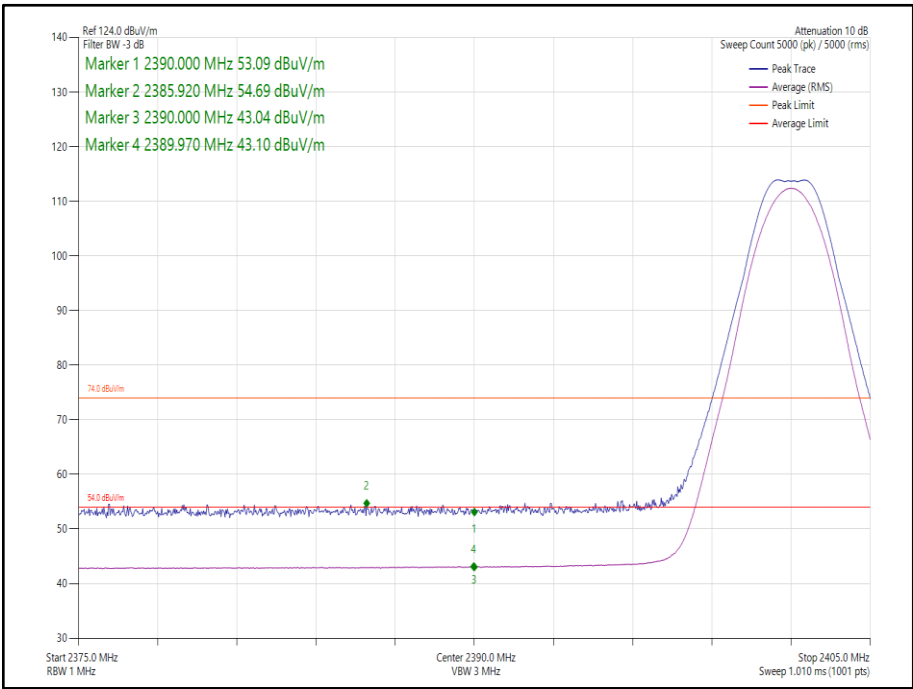


Figure 9 Core 2 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

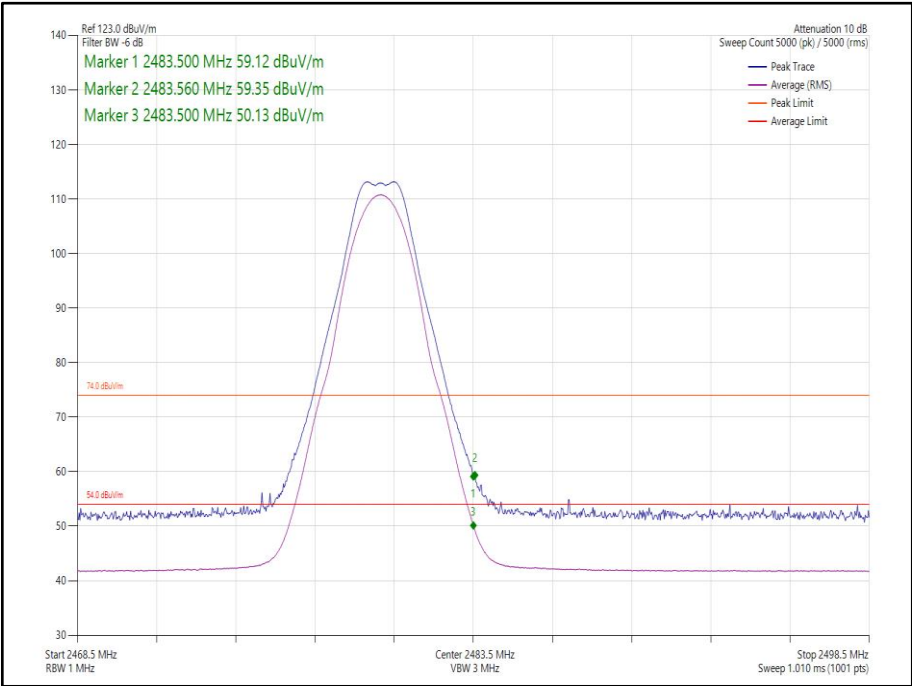


Figure 10 Core 2 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz



Bluetooth LE – 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	55.31	43.27
GFSK/DH1	2480	Core 0-1	2483.5	60.49	51.25

Table 12 - Restricted Band Edge Results

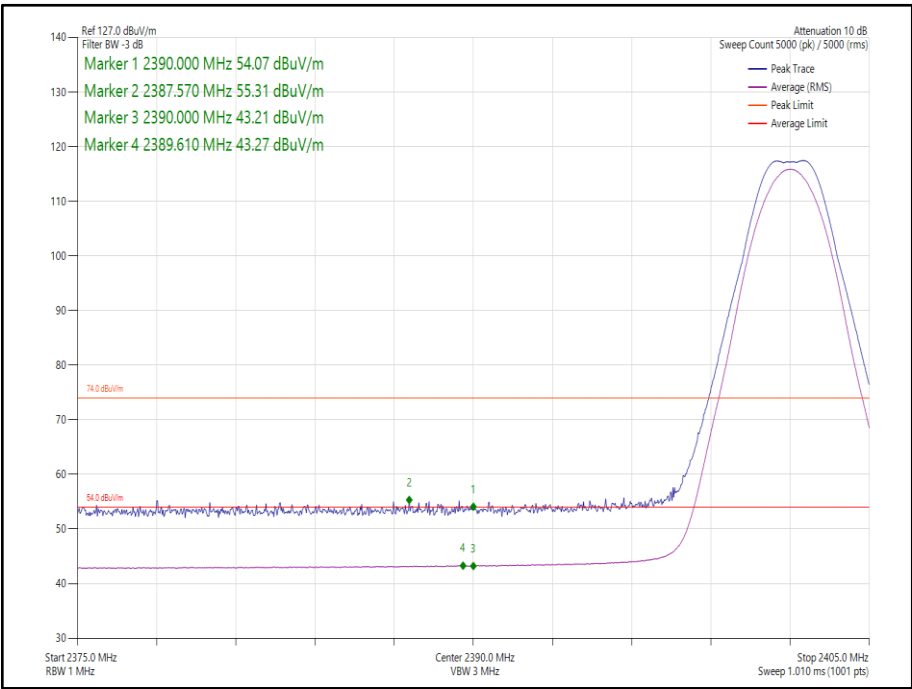


Figure 11 Core 0-1 – GFSK/DH1 - 2402 MHz - Band Edge Frequency 2390.0 MHz

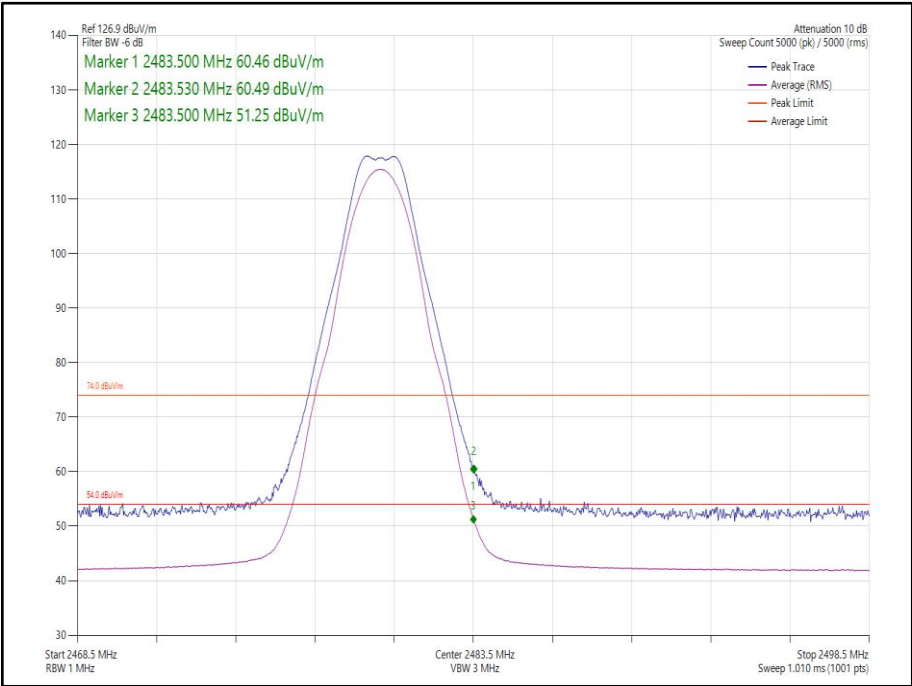


Figure 12 Core 0-1 – GFSK/DH1 - 2480 MHz - Band Edge Frequency 2483.5 MHz

2.4 GHz Bluetooth – HDR4 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 1	4-DH5	2404	2390.0	55.09	42.88
Static	GFSK	Core 1	4-DH5	2478	2483.5	53.87	42.01

Table 13 - Restricted Band Edge Results

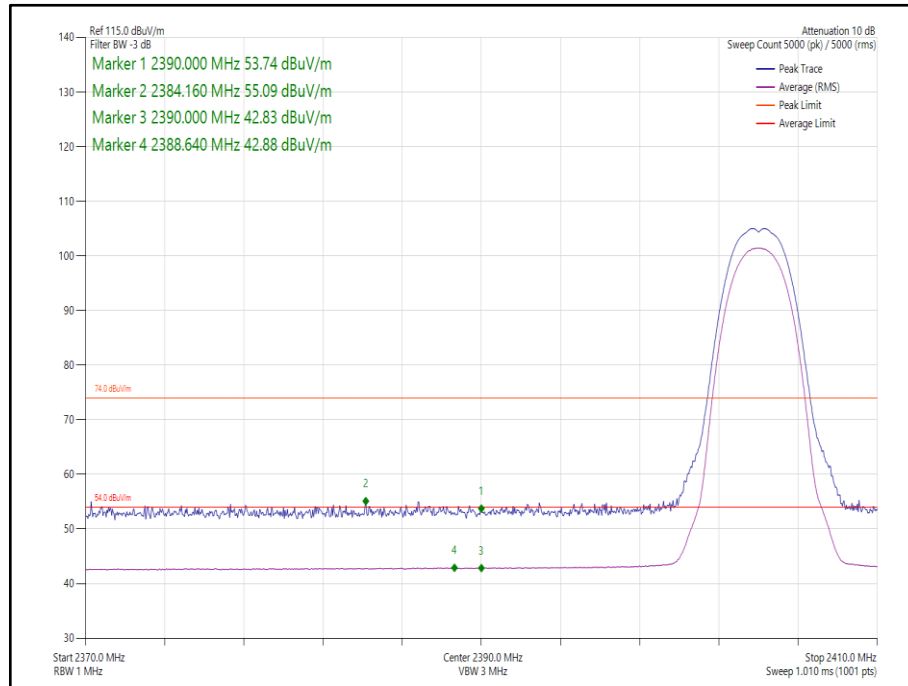


Figure 13 Core 1 - Static - GFSK/4-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

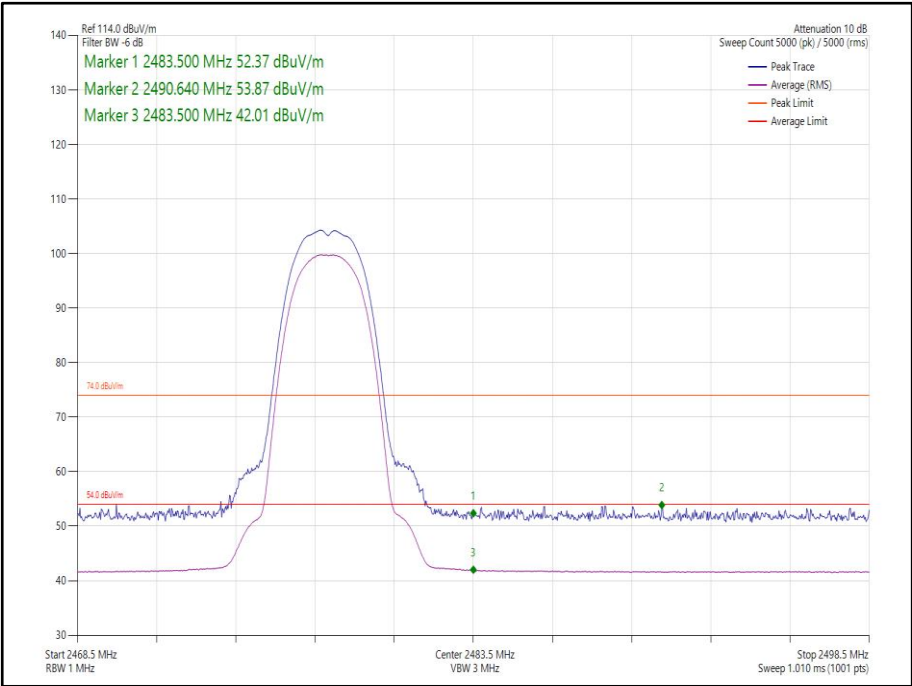


Figure 14 Core 1 - Static - GFSK/4-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz



2.4 GHz Bluetooth – HDR4 ePA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 1	4-DH5	2404	2390.0	55.81	43.90
Static	GFSK	Core 1	4-DH5	2478	2483.5	53.91	42.53

Table 14 - Restricted Band Edge Results

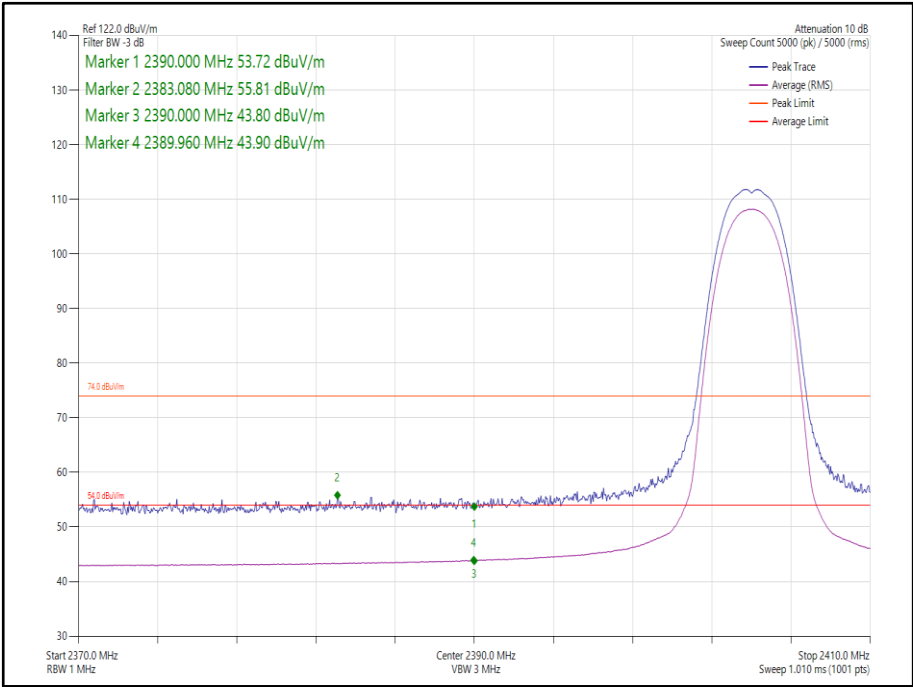
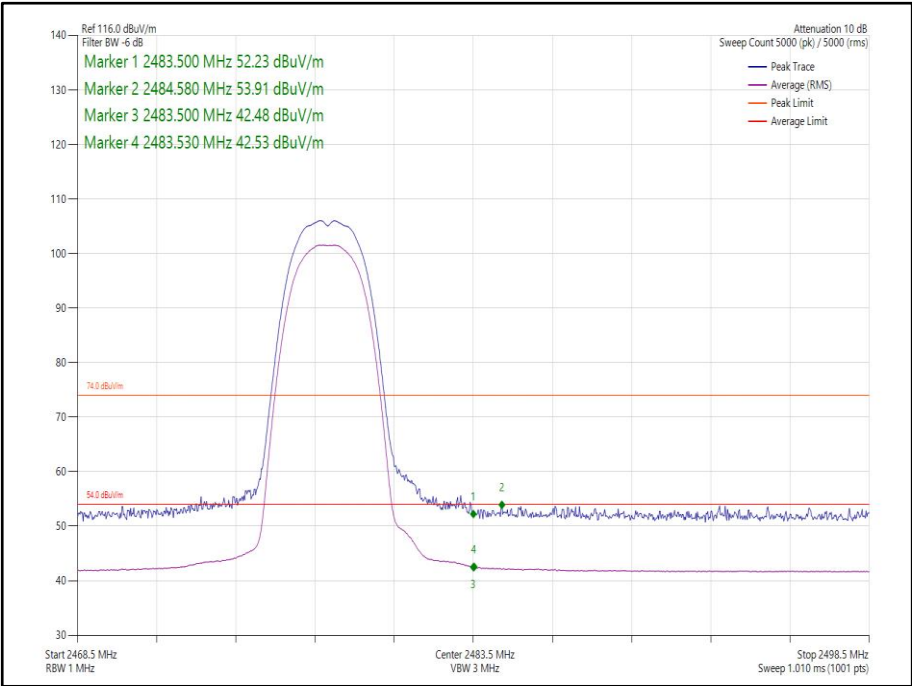


Figure 15 Core 1 - Static - GFSK/4-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz



**Figure 16 Core 1 - Static - GFSK/4-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz**

2.4 GHz Bluetooth – HDR8 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 1	8-DH5	2404	2390.0	54.70	43.03
Static	GFSK	Core 1	8-DH5	2478	2483.5	61.56	50.55

Table 15 - Restricted Band Edge Results

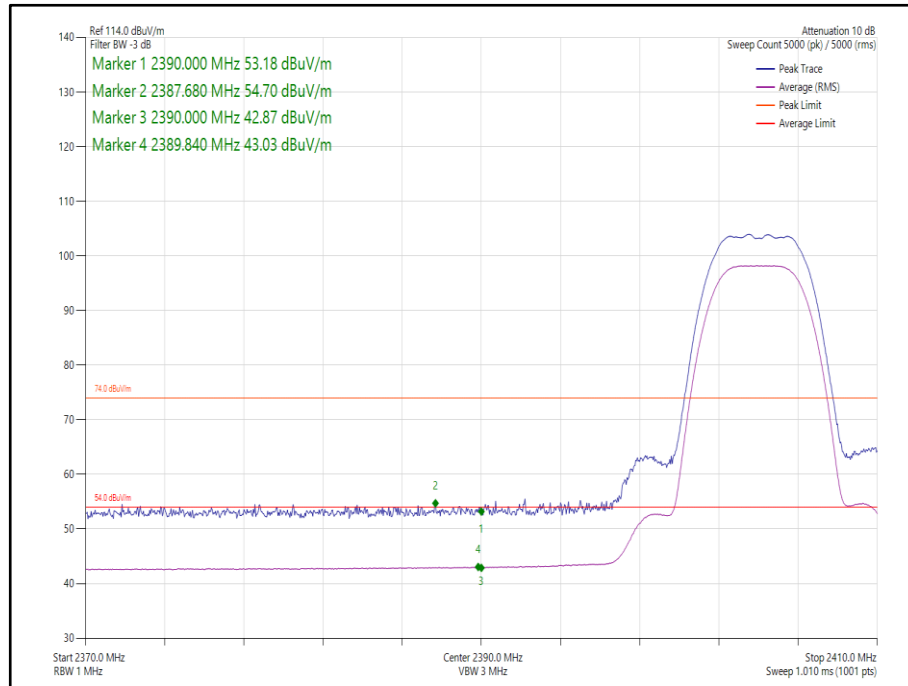


Figure 17 Core 1 - Static - GFSK/8-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

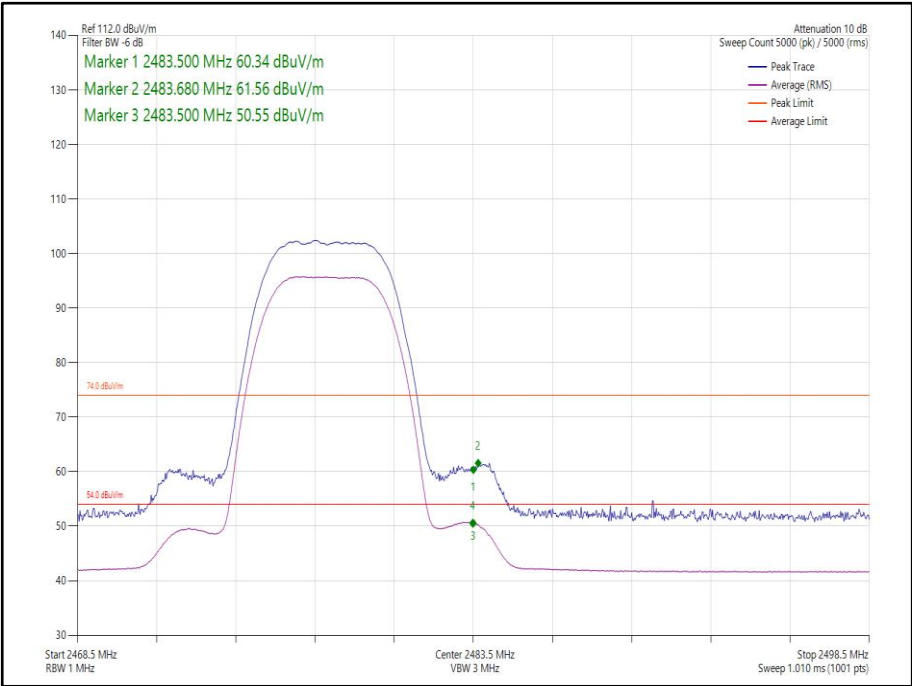


Figure 18 Core 1 - Static - GFSK/8-DH5 - 2478 MHz - Band Edge Frequency 2483.5 MHz

2.4 GHz Bluetooth – HDR8 ePA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 1	8-DH5	2404	2390.0	57.43	45.38
Static	GFSK	Core 1	8-DH5	2478	2483.5	63.21	51.47

Table 16 - Restricted Band Edge Results

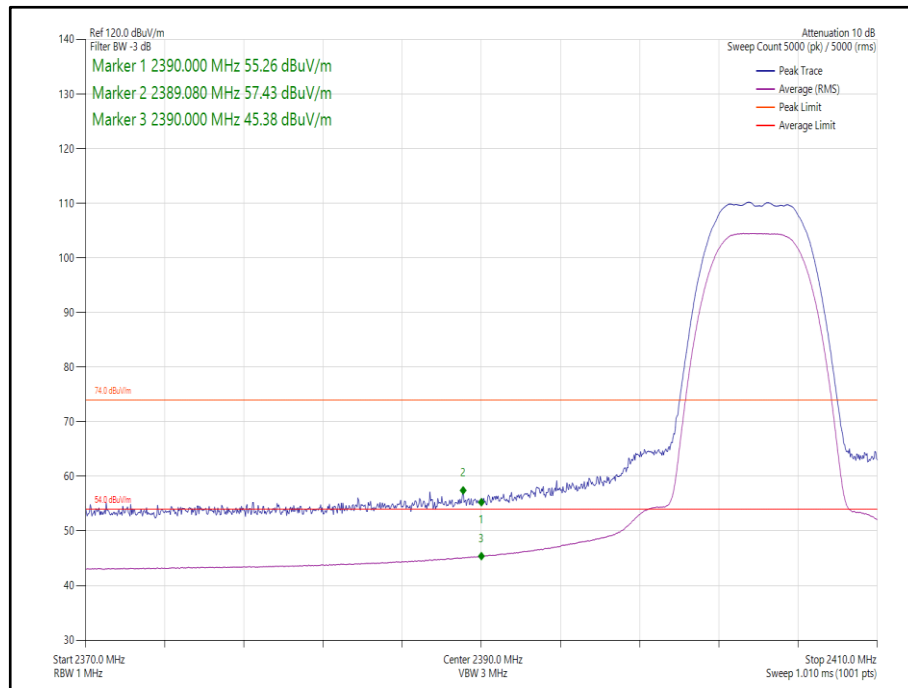


Figure 19 Core 1 - Static - GFSK/8-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

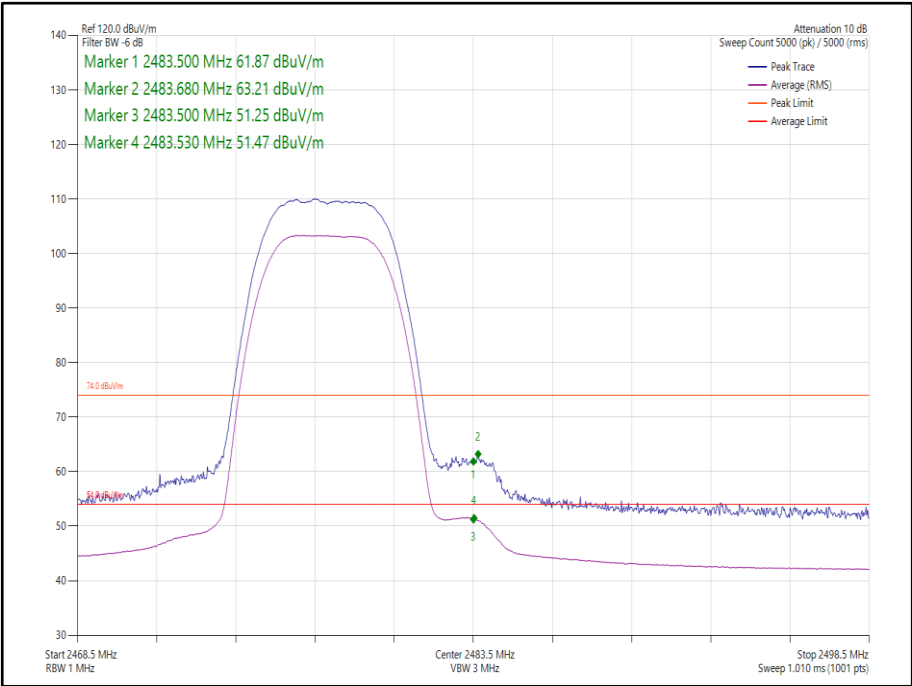


Figure 20 Core 1 - Static - GFSK/8-DH5 - 2478 MHz - Band Edge Frequency 2483.5 MHz

2.4 GHz Bluetooth – HDR4 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 2	4-DH5	2404	2390.0	55.13	42.94
Static	GFSK	Core 2	4-DH5	2478	2483.5	54.14	42.14

Table 17 - Restricted Band Edge Results

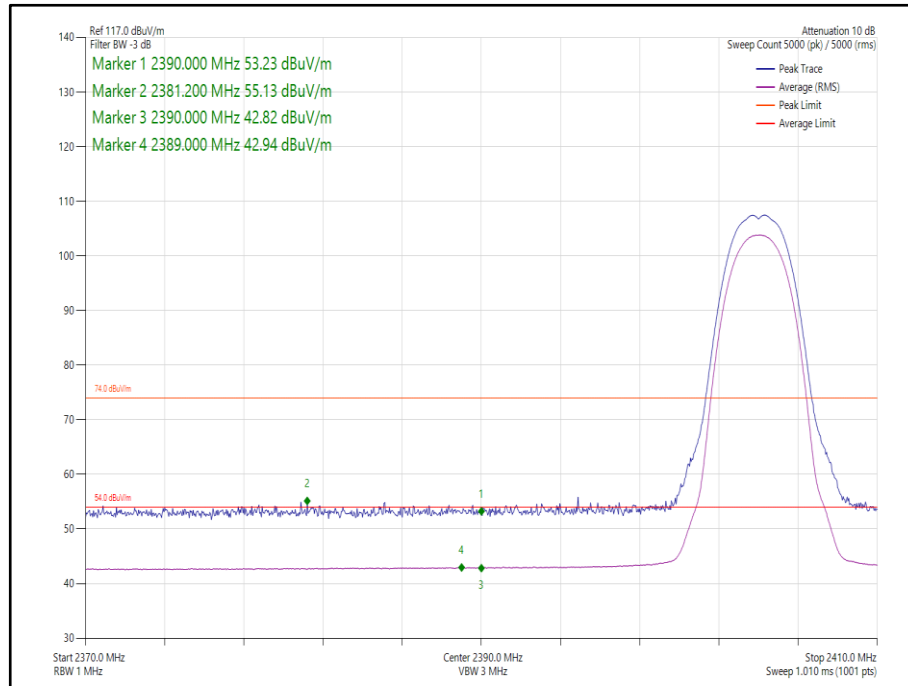


Figure 21 Core 2 - Static - GFSK/4-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

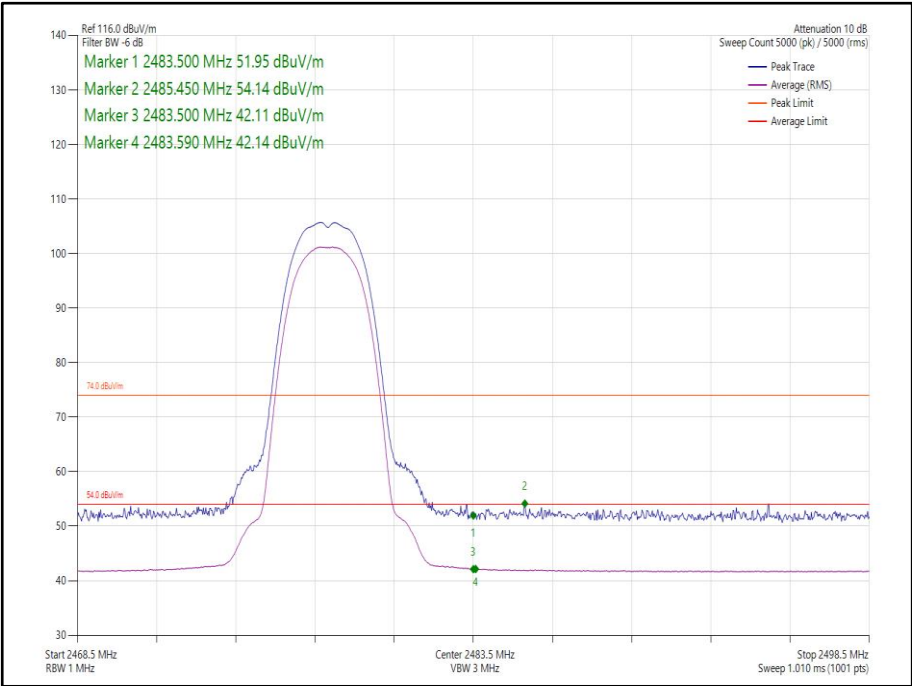


Figure 22 Core 2 - Static - GFSK/4-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz



2.4 GHz Bluetooth – HDR8 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 2	8-DH5	2404	2390.0	55.18	43.23
Static	GFSK	Core 2	8-DH5	2478	2483.5	62.27	51.08

Table 18 - Restricted Band Edge Results

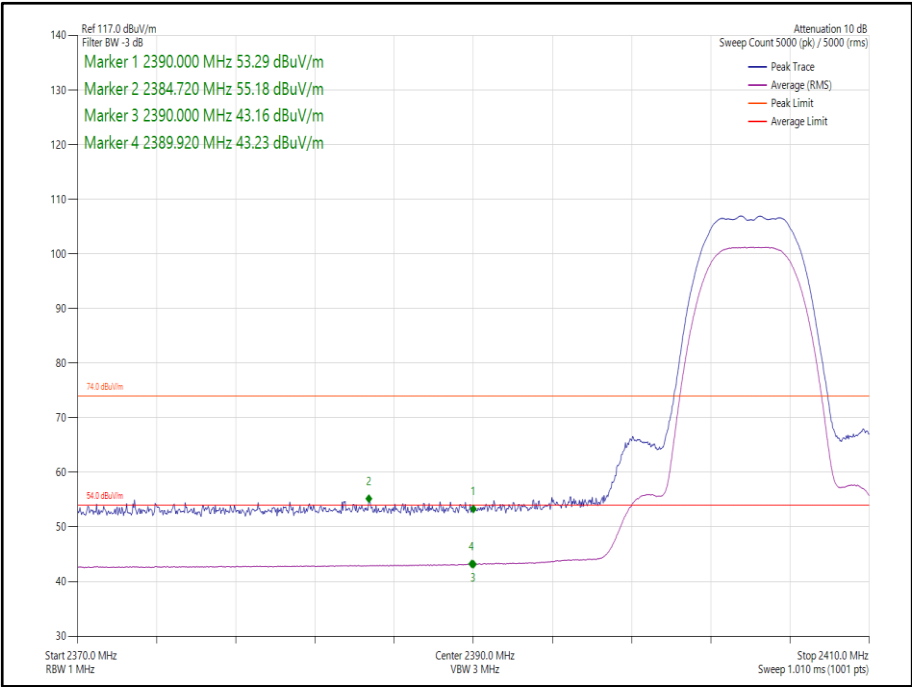


Figure 23 Core 2 - Static - GFSK/8-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

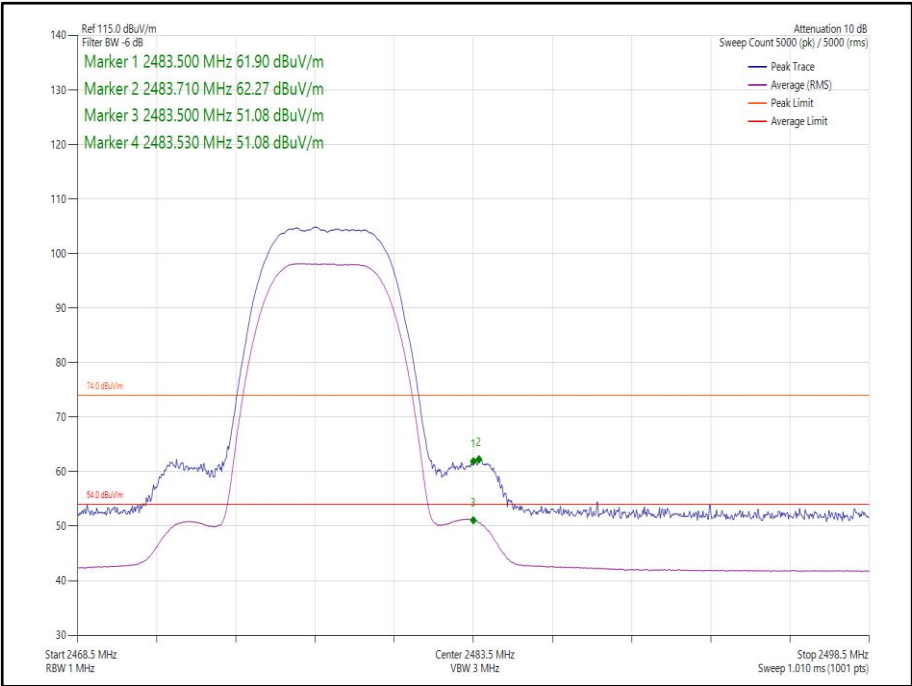


Figure 24 Core 2 - Static - GFSK/8-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz

2.4 GHz Bluetooth – HDR4 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 0-1	4-DH5	2404	2390.0	54.75	42.95
Static	GFSK	Core 0-1	4-DH5	2478	2483.5	53.97	42.45

Table 19 - Restricted Band Edge Results

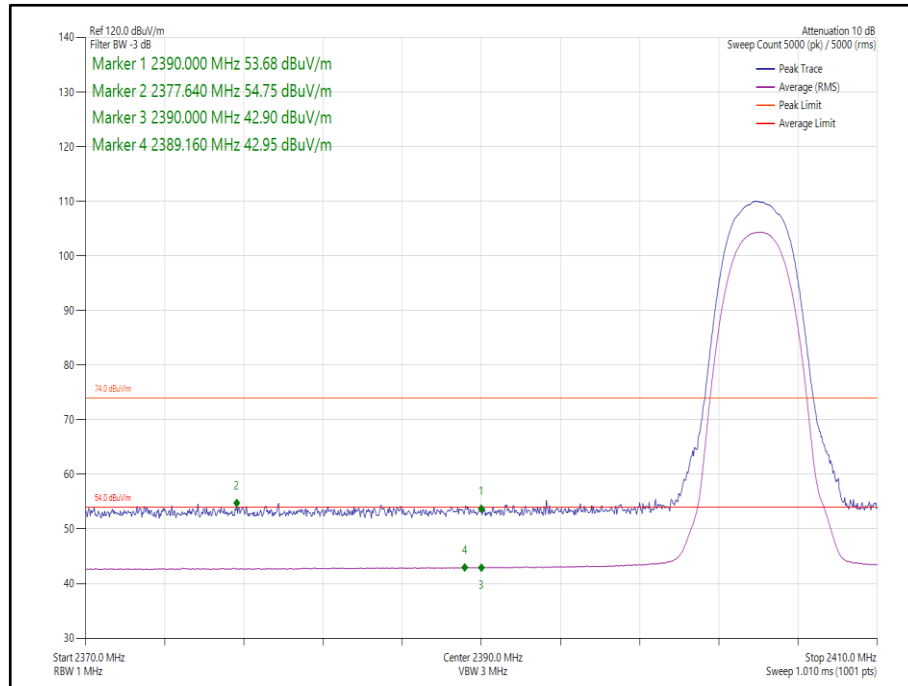


Figure 25 Core 0-1 - Static - GFSK/4-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

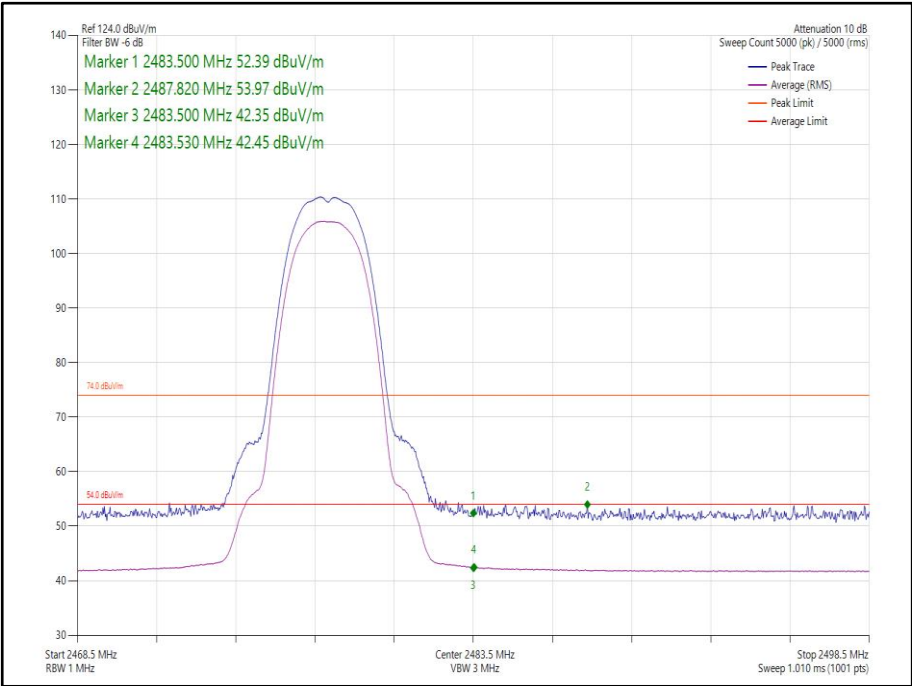


Figure 26 Core 0-1 - Static - GFSK/4-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz



2.4 GHz Bluetooth – HDR4 ePA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 0-1	4-DH5	2404	2390.0	57.29	44.67
Static	GFSK	Core 0-1	4-DH5	2478	2483.5	58.13	47.59

Table 20 - Restricted Band Edge Results

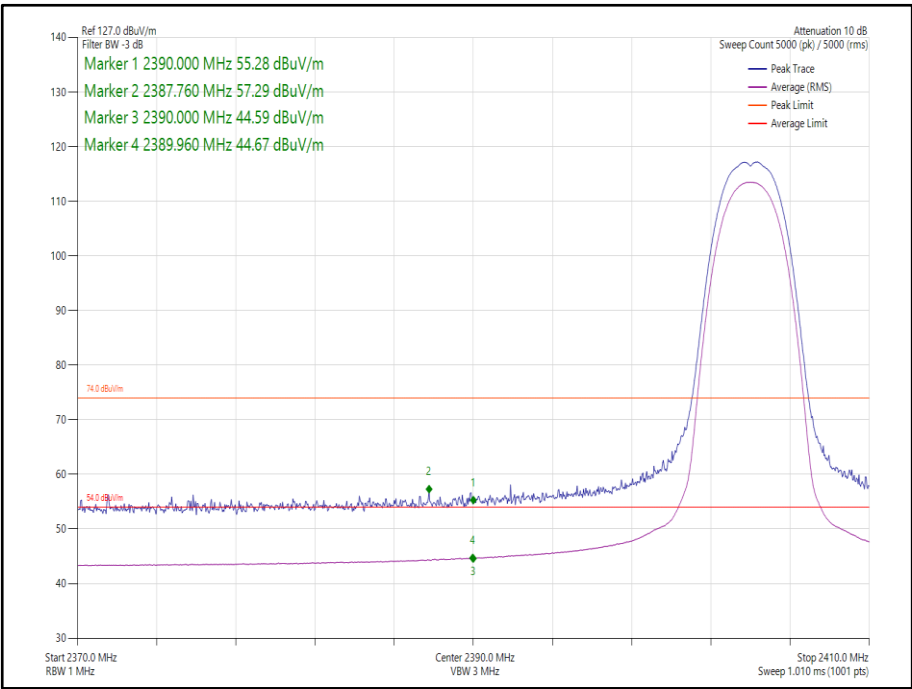


Figure 27 Core 0-1 - Static - GFSK/4-DH5 - 2404 MHz - Band Edge Frequency
2390.0 MHz

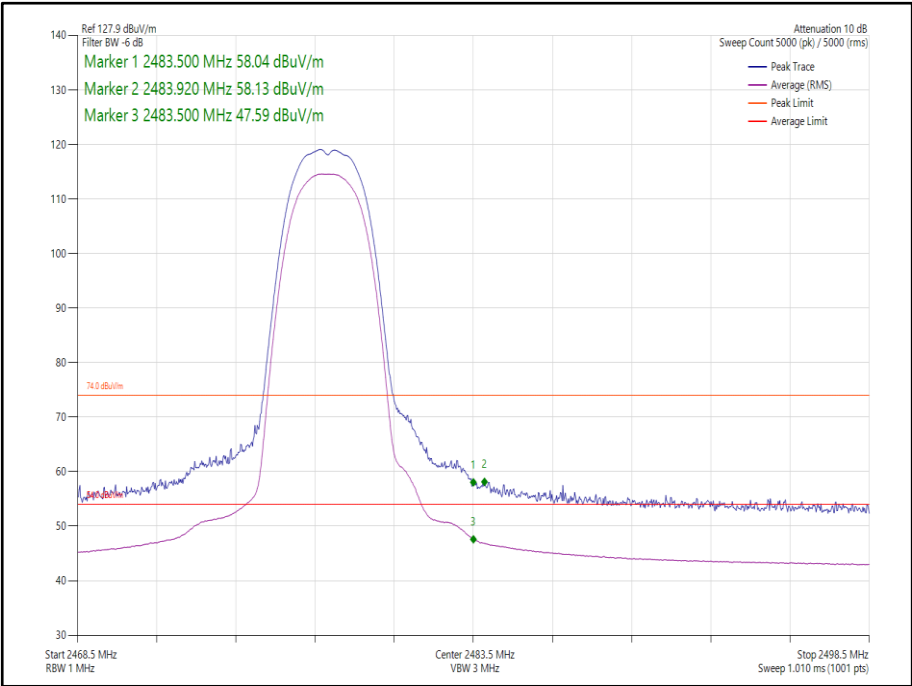


Figure 28 Core 0-1 - Static - GFSK/4-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz

2.4 GHz Bluetooth – HDR8 iPA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 0-1	8-DH5	2404	2390.0	55.68	43.21
Static	GFSK	Core 0-1	8-DH5	2478	2483.5	62.84	51.95

Table 21 - Restricted Band Edge Results

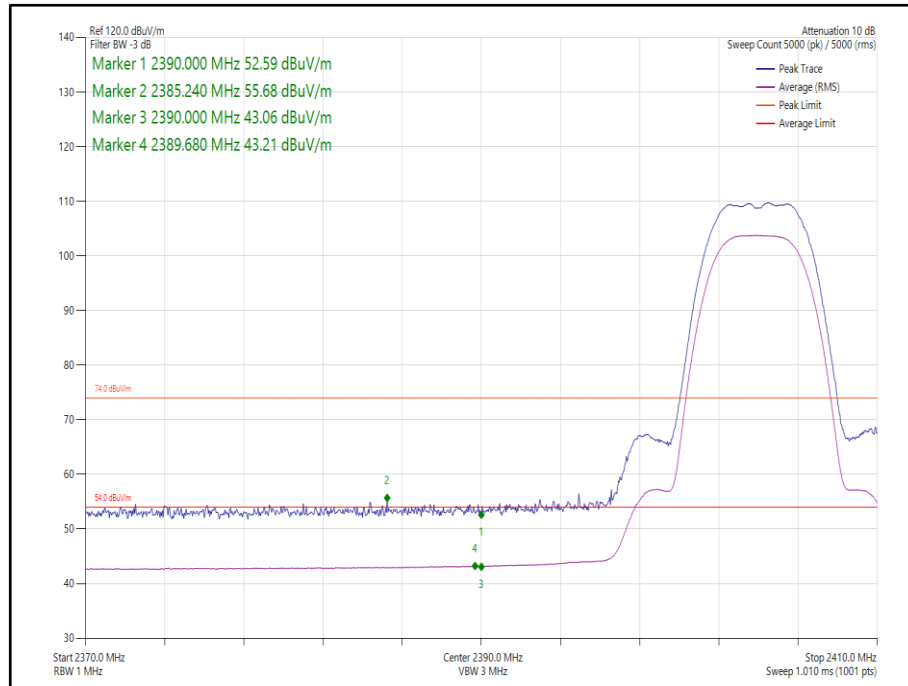


Figure 29 Core 0-1 - Static - GFSK/8-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

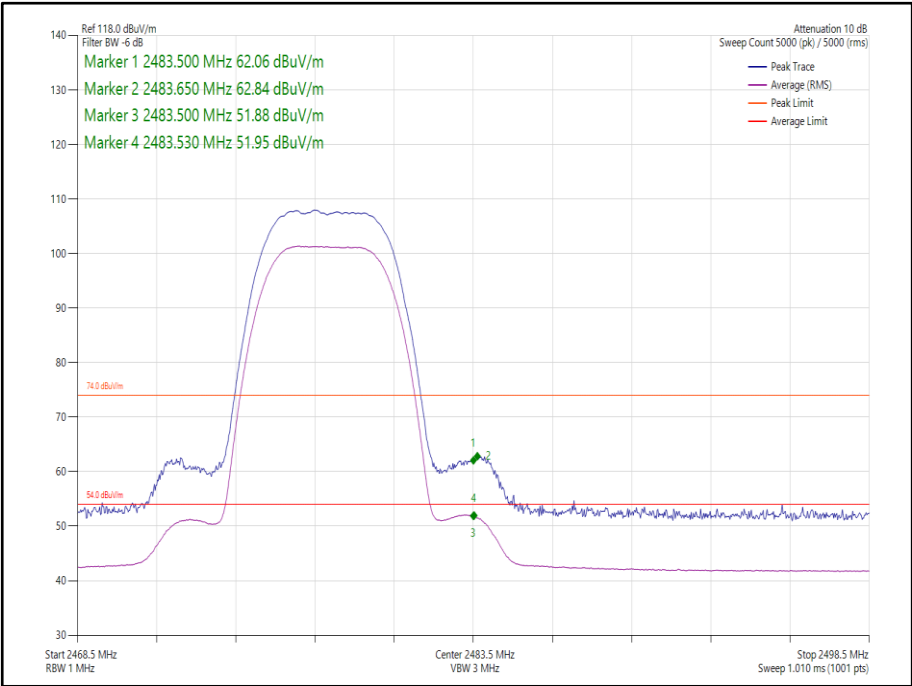


Figure 30 Core 0-1 - Static - GFSK/8-DH5 - 2478 MHz - Band Edge Frequency 2483.5 MHz



2.4 GHz Bluetooth – HDR8 ePA

Mode	Modulation	Core	Packet Type	Tx Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	Core 0-1	8-DH5	2404	2390.0	57.80	46.72
Static	GFSK	Core 0-1	8-DH5	2478	2483.5	62.55	51.59

Table 22 - Restricted Band Edge Results

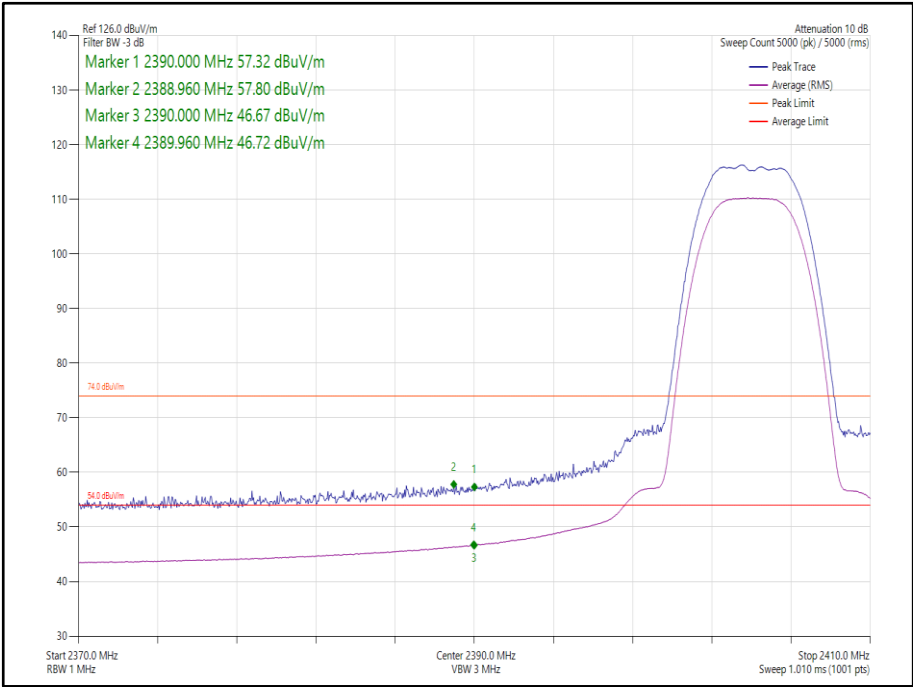


Figure 31 Core 0-1 - Static - GFSK/8-DH5 - 2404 MHz - Band Edge Frequency 2390.0 MHz

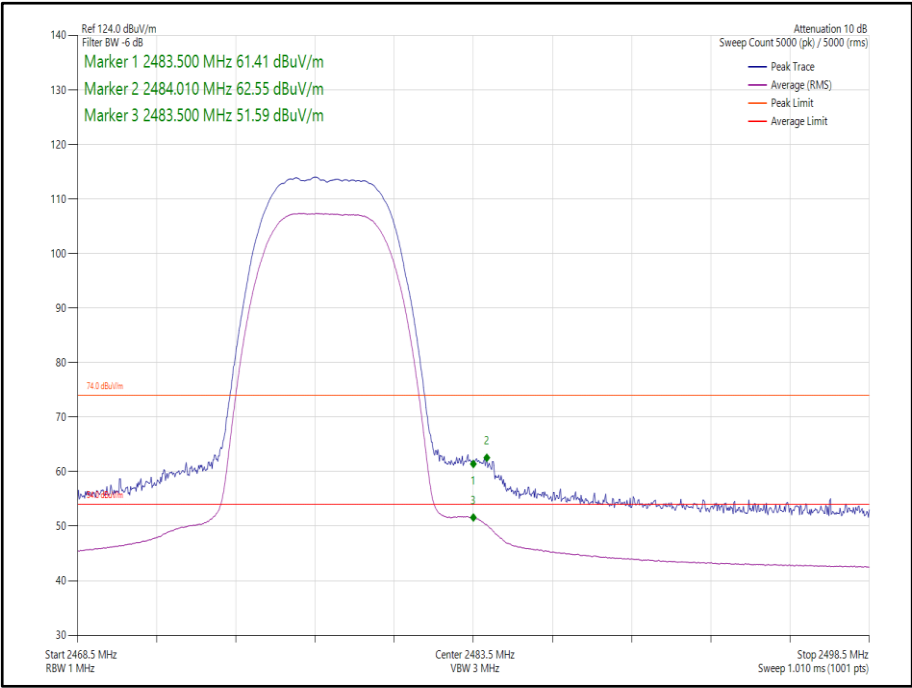


Figure 32 Core 0-1 - Static - GFSK/8-DH5 - 2478 MHz - Band Edge Frequency
2483.5 MHz

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 23

ISED RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960*	500

Table 24

*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 14.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
EMI Test Receiver	Rohde & Schwarz	ESW44	5912	12	17-Feb-2023
5m Semi-Anechoic Chamber (Dual-Axis)	Albatross Projects	RF Chamber 14	5958	36	26-Apr-2025
1500W (300V 12A) AC Power Supply	iTech	IT7324	5956	-	O/P Mon
Mast & Turntable Controller	Maturo Gmbh	FCU3.0	5960	-	TU
Tilt Antenna Mast	Maturo Gmbh	BAM4.5-P	5961	-	TU
Turntable	Maturo Gmbh	TT1.5SI	5962	-	TU
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5997	12	06-Jun-2023
Cable (SMA to SMA 6.5m)	Junkosha	MWX221-06500AMSAMS/B	6003	12	07-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	6008	12	06-Jun-2023
Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA9120B	6141	12	21-Jun-2023
SAC Switch Unit	TUV SUD	SSU001	6144	12	07-Jul-2023
Digital Multimeter	Fluke	115	6147	12	16-Jun-2023
Humidity & Temperature meter	R.S Components	1364	6150	12	17-Jun-2023

Table 25

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

A2779, S/N: NX7LCFL417 - Modification State 0

2.2.3 Date of Test

14-October-2022 to 27-October-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	23.6 °C – 23.5 °C
Relative Humidity	50.4 % – 56.9 %



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) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePA $\pi/4$ 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	
2404	-	1.680	-	-	≥ 500.0
2441	-	1.904	-	-	≥ 500.0
2476	-	1.880	-	-	≥ 500.0

Table 26 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)				Limit (kHz)
	A	B	C	D	
2404	-	2.320	-	-	-
2441	-	2.328	-	-	-
2476	-	2.328	-	-	-

Table 27 - 99% Bandwidth Results

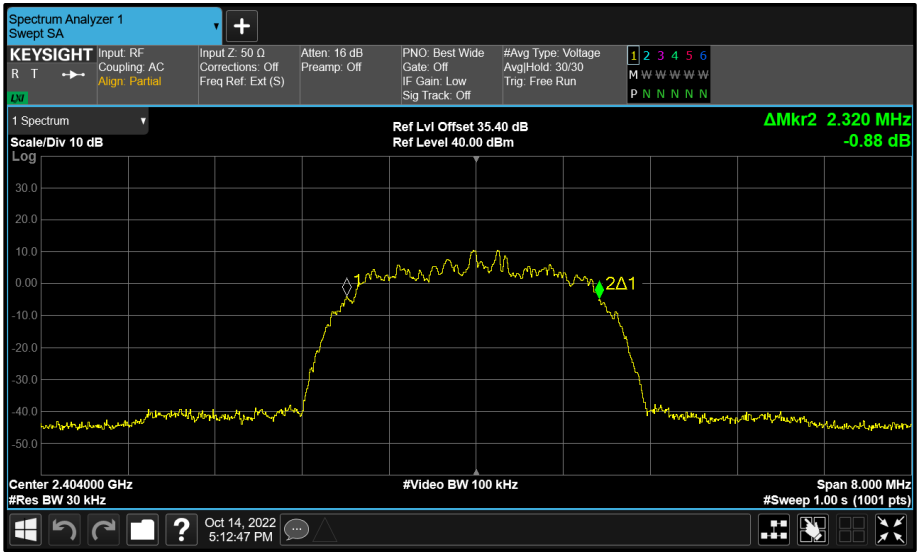


Figure 33 - Core 1 (B) 2404 MHz (CH2) 99% Bandwidth

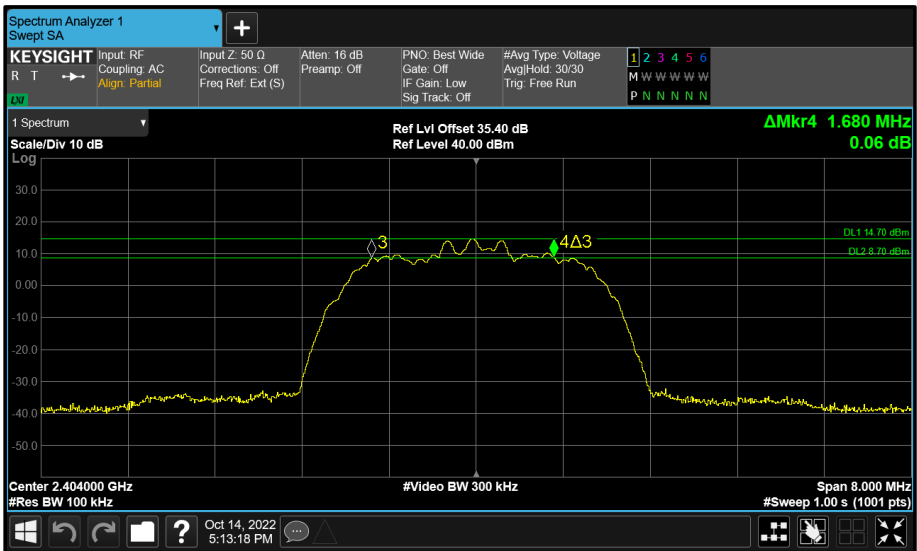


Figure 34 - Core 1 (B) 2404 MHz (CH2) 6 dB Bandwidth

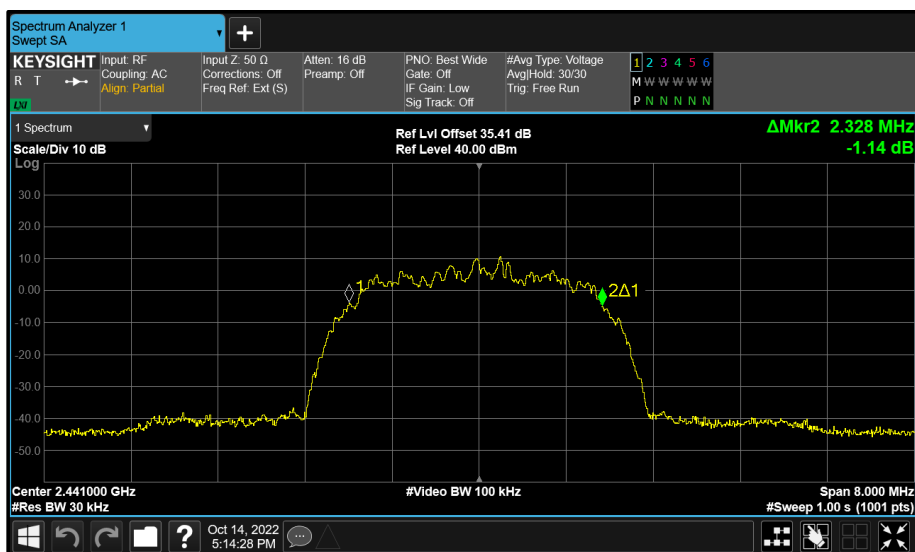


Figure 35 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth

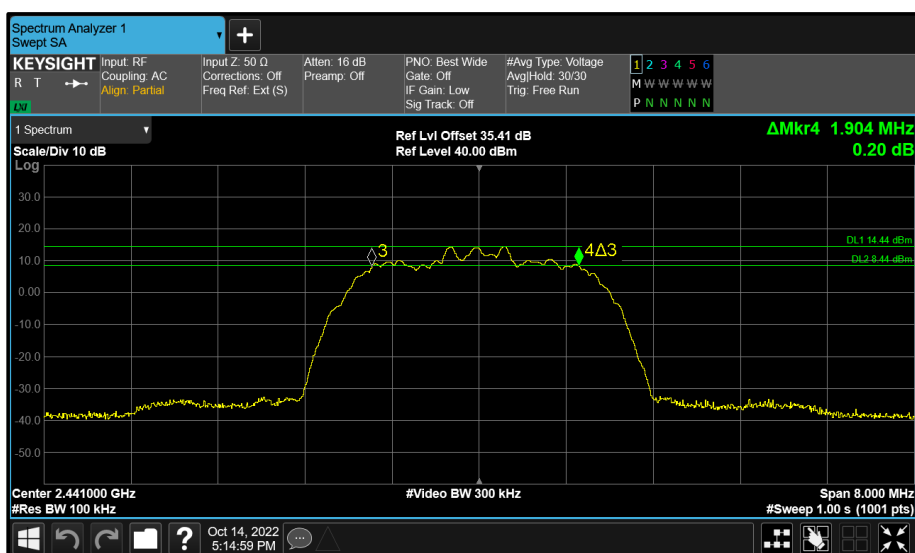


Figure 36 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth

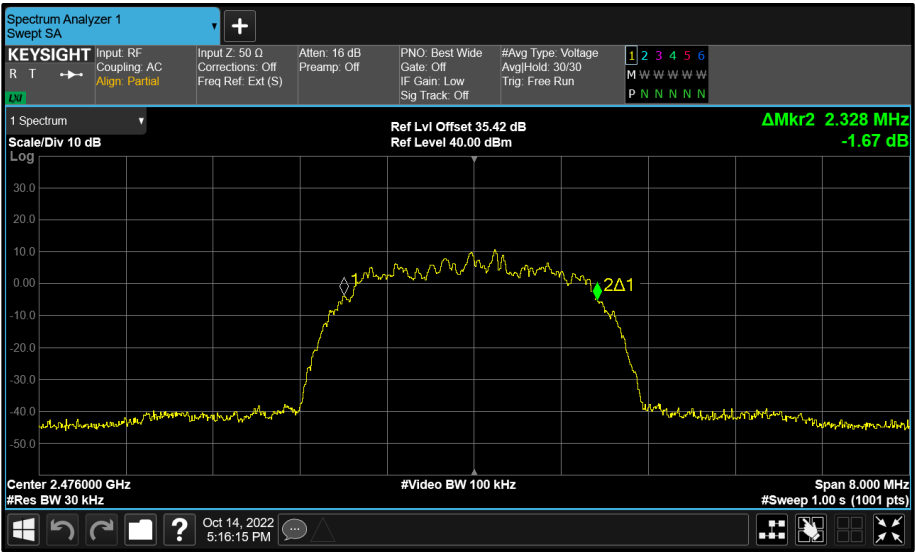


Figure 37 - Core 1 (B) 2476 MHz (CH74) 99% Bandwidth

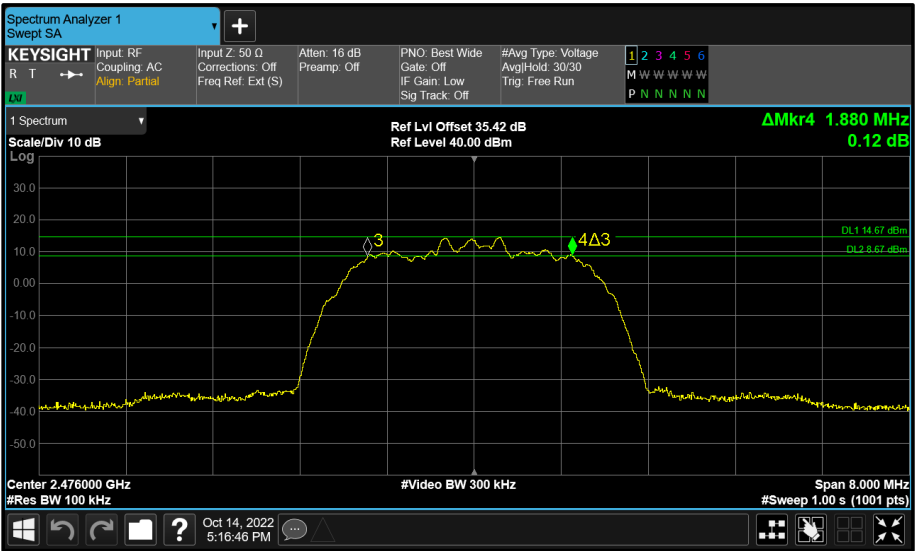


Figure 38 - Core 1 (B) 2476 MHz (CH74) 6 dB Bandwidth



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

DUT Configuration			
Mode:	ePA $\pi/4$ 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	
2404	-	0.660	-	-	≥ 500.0
2441	-	1.020	-	-	≥ 500.0
2476	-	0.975	-	-	≥ 500.0

Table 28 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)				Limit (kHz)
	A	B	C	D	
2404	-	4.620	-	-	-
2441	-	4.635	-	-	-
2476	-	4.635	-	-	-

Table 29 - 99% Bandwidth Results

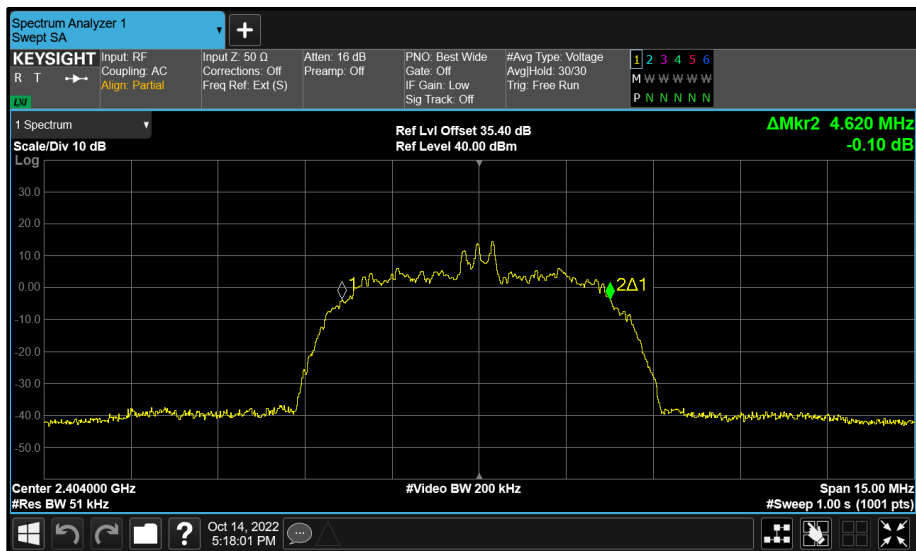


Figure 39 - Core 1 (B) 2404 MHz (CH2) 99% Bandwidth

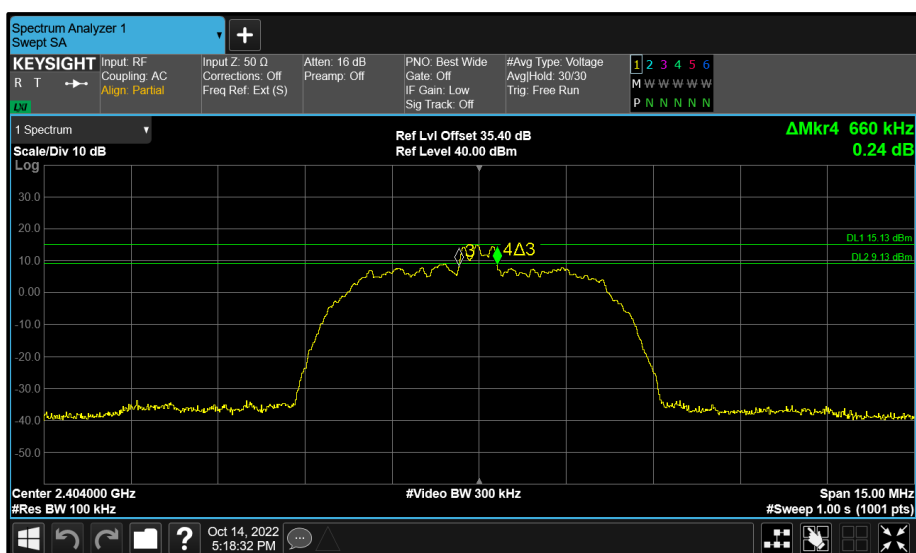


Figure 40 - Core 1 (B) 2404 MHz (CH2) 6 dB Bandwidth

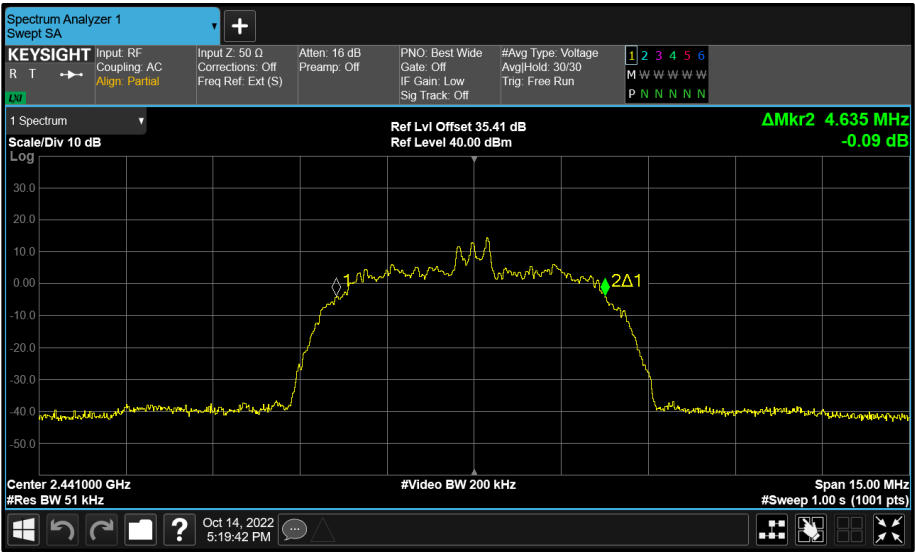


Figure 41 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth

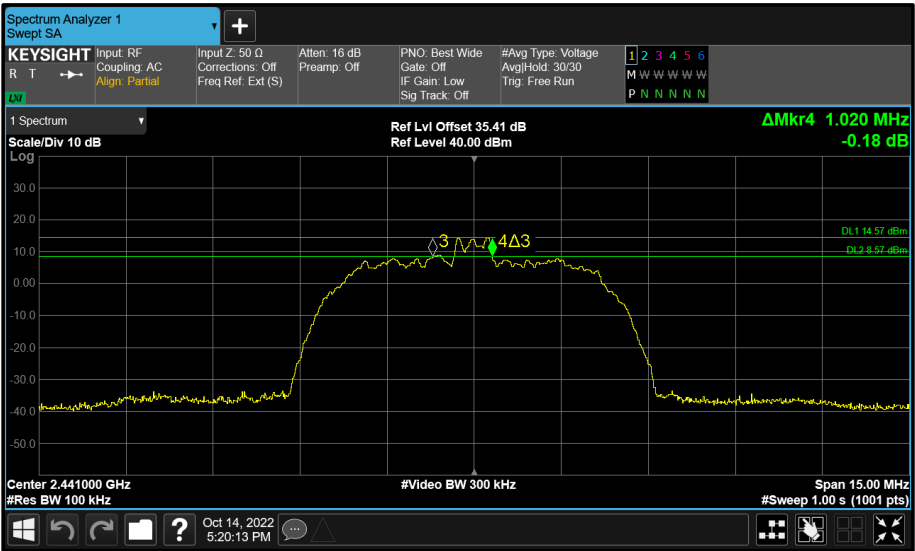


Figure 42 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth

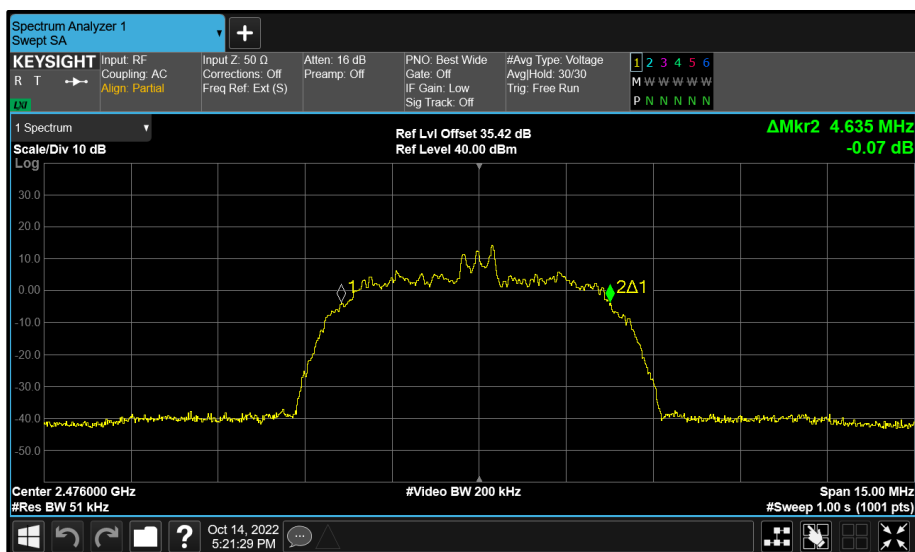


Figure 43 - Core 1 (B) 2476 MHz (CH74) 99% Bandwidth

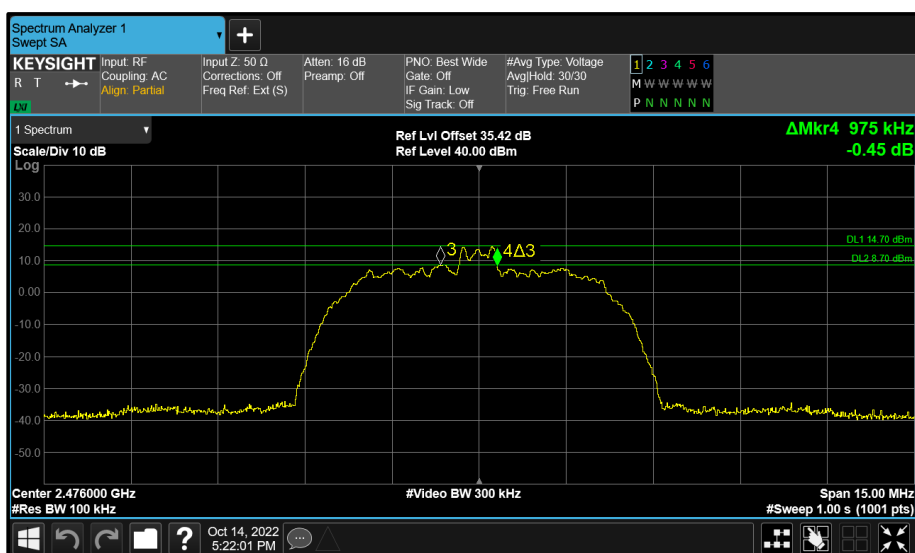


Figure 44 - Core 1 (B) 2476 MHz (CH74) 6 dB Bandwidth



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

DUT Configuration			
Mode:	ePA $\pi/4$ 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	
2404	1.912	1.792	-	-	≥ 500.0
2441	1.872	1.584	-	-	≥ 500.0
2476	1.904	1.904	-	-	≥ 500.0

Table 30 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)				Limit (kHz)
	A	B	C	D	
2404	2.328	2.328	-	-	-
2441	2.328	2.320	-	-	-
2476	2.320	2.328	-	-	-

Table 31 - 99% Bandwidth Results

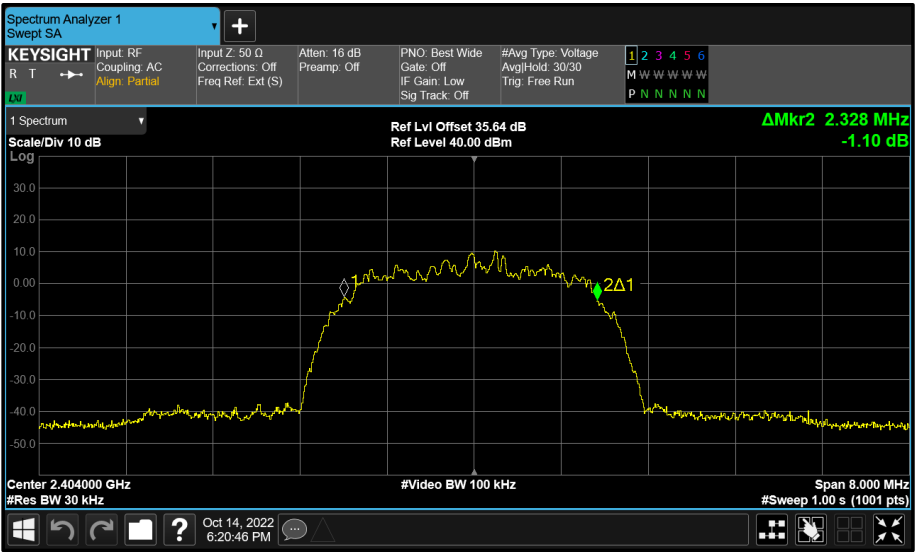


Figure 45 - Core 0 (A) 2404 MHz (CH2) 99% Bandwidth

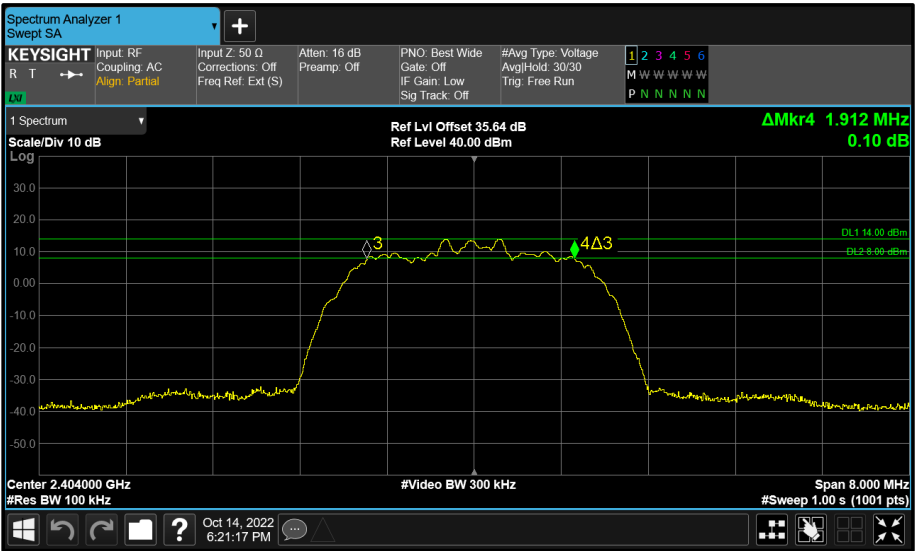


Figure 46 - Core 0 (A) 2404 MHz (CH2) 6 dB Bandwidth



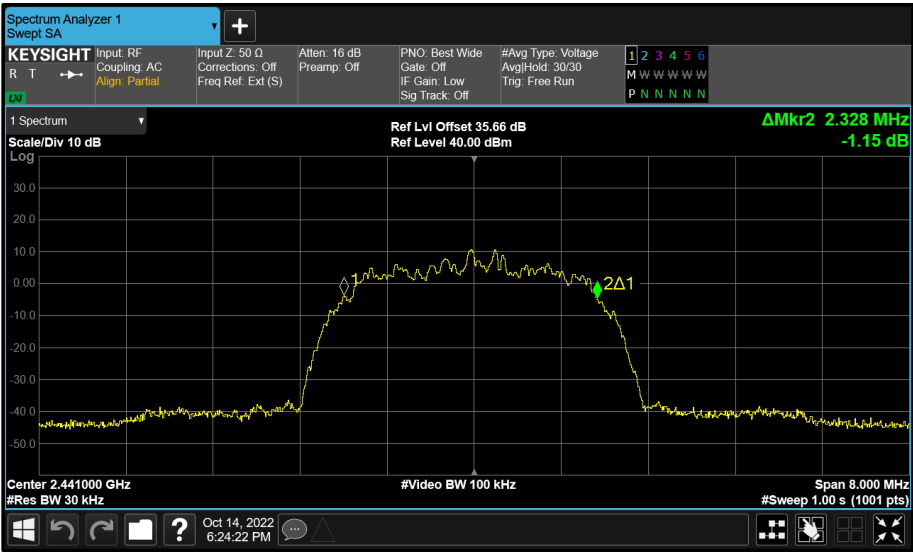


Figure 49 - Core 0 (A) 2441 MHz (CH39) 99% Bandwidth

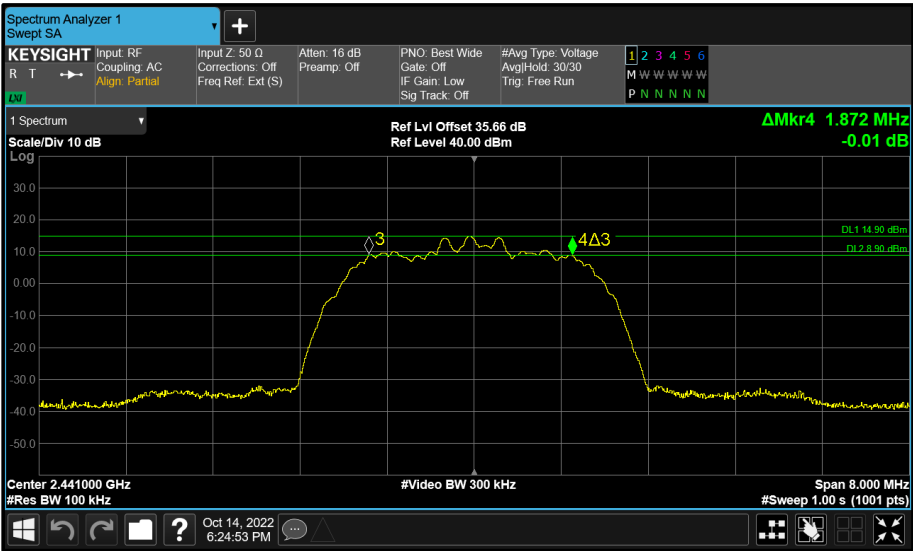


Figure 50 - Core 0 (A) 2441 MHz (CH39) 6 dB Bandwidth

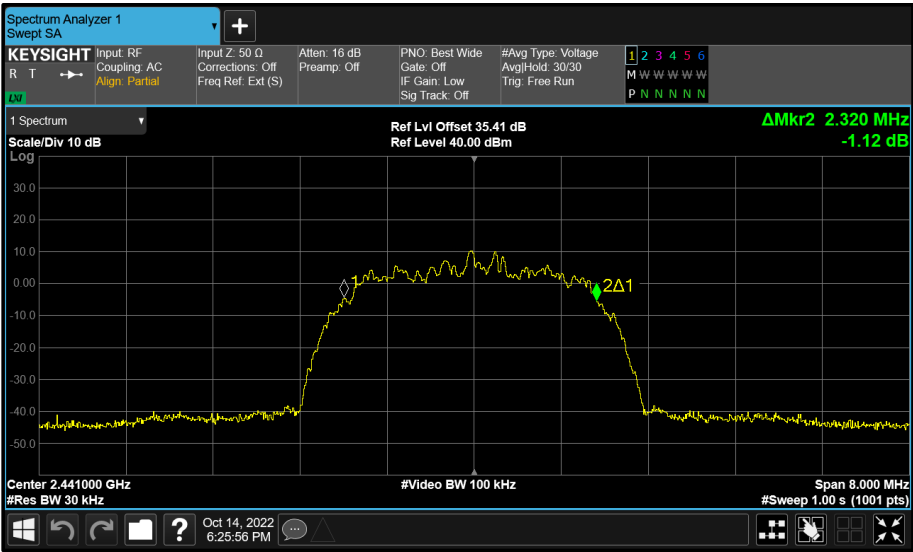


Figure 51 - Core 1 (B) 2441 MHz (CH39) 99% Bandwidth

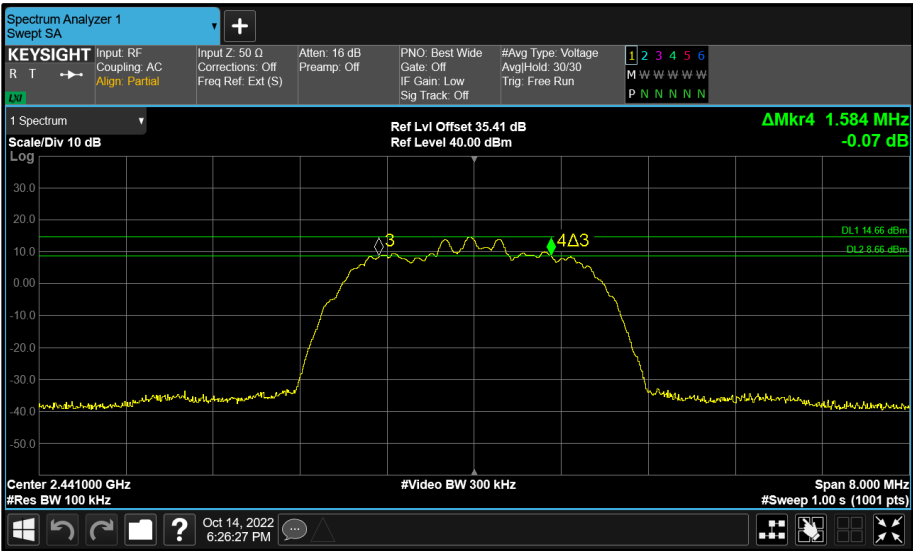


Figure 52 - Core 1 (B) 2441 MHz (CH39) 6 dB Bandwidth

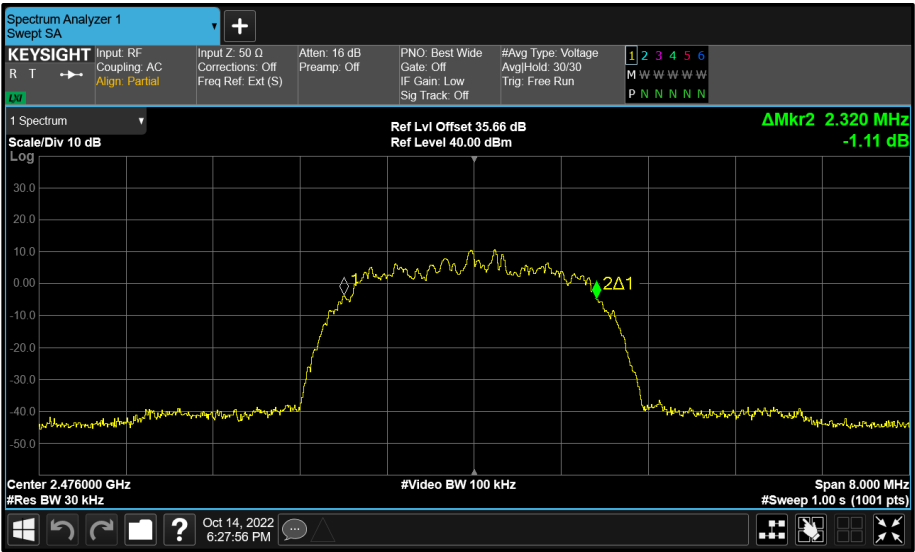


Figure 53 - Core 0 (A) 2476 MHz (CH74) 99% Bandwidth

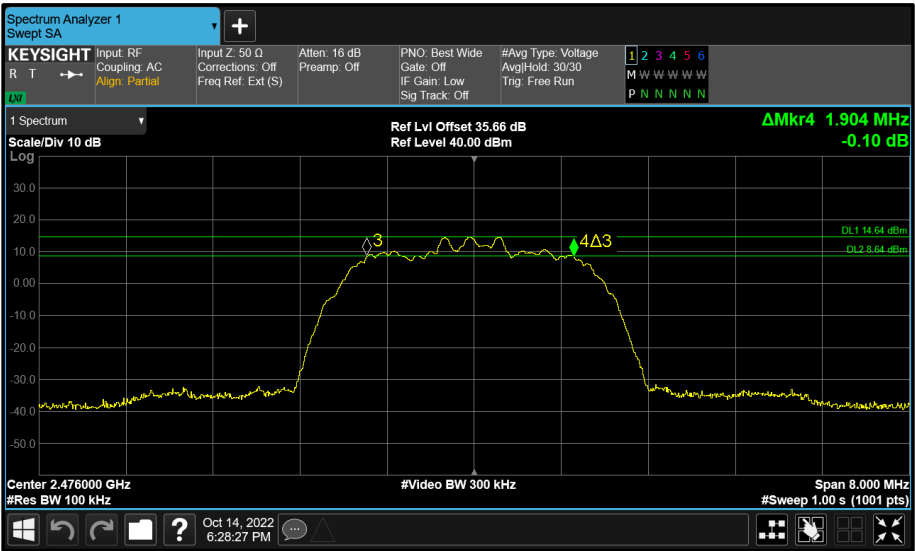


Figure 54 - Core 0 (A) 2476 MHz (CH74) 6 dB Bandwidth

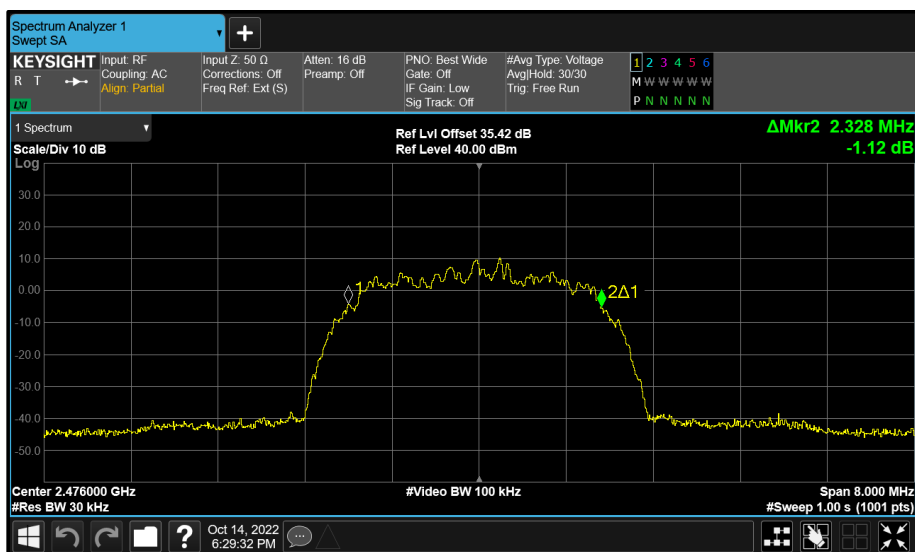


Figure 55 - Core 1 (B) 2476 MHz (CH74) 99% Bandwidth

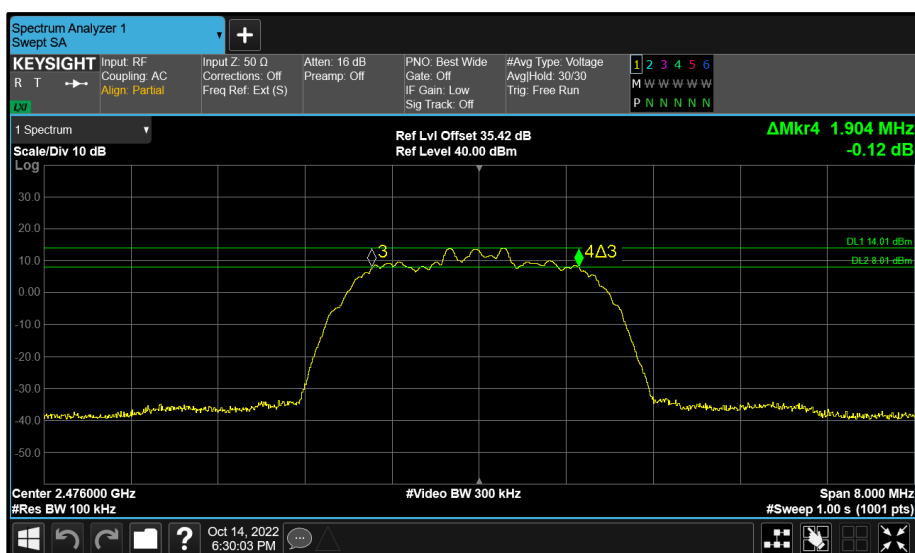


Figure 56 - Core 1 (B) 2476 MHz (CH74) 6 dB Bandwidth



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

DUT Configuration			
Mode:	ePA $\pi/4$ DQPSK (8-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	
2404	0.660	0.660	-	-	≥ 500.0
2441	0.675	0.660	-	-	≥ 500.0
2476	0.675	0.990	-	-	≥ 500.0

Table 32 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)				Limit (kHz)
	A	B	C	D	
2404	4.620	4.620	-	-	-
2441	4.635	4.635	-	-	-
2476	4.635	4.635	-	-	-

Table 33 - 99% Bandwidth Results

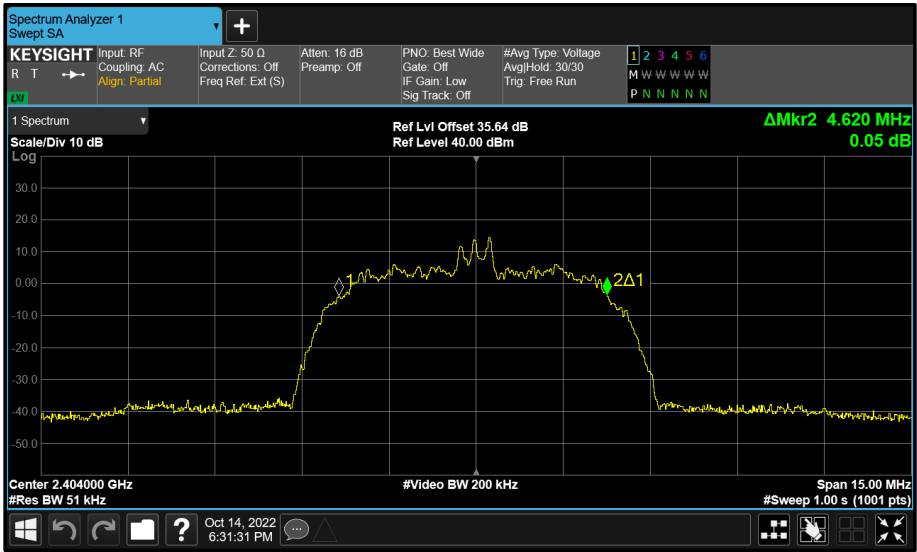


Figure 57 - Core 0 (A) 2404 MHz (CH2) 99% Bandwidth

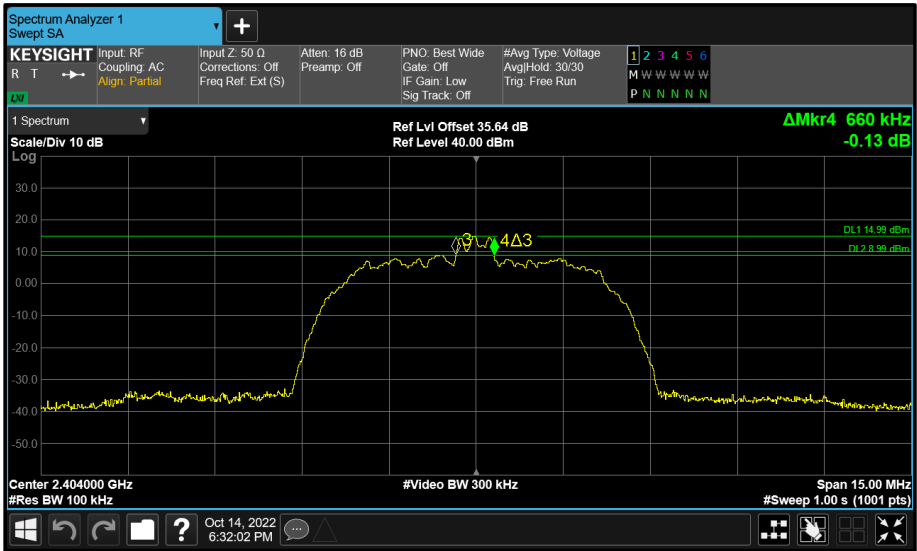


Figure 58 - Core 0 (A) 2404 MHz (CH2) 6 dB Bandwidth

