FCC and ISED Test Report

Apple Inc
Model: A3389

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

TUV SUD Limited
Digitally signed by TUV SUD Limited
Date: 2024.11.08 15:31:16 Z

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

FCC ID: BCGA3389 IC: 579C-A3389

COMMERCIAL-IN-CONFIDENCE

Document 75961400-90 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	08 November 2024

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	Lauren Walters	08 November 2024	

FCC Accreditation
553713/UK2026 Concorde Park, Fareham Test Laboratory

ISED Accreditation
28798/UK0003 Concorde Park, Fareham Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2023, ISED RSS-247: Issue 3 (2023-08) and ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02) 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	08-November-2024

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
EUT/Sample Identification	Refer to section 1.6
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2023 ISED RSS-247: Issue 3 (2023-08) ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02)
Start of Test	01-October-2024
Finish of Test	21-October-2024
Name of Engineer(s)	Ahmed Al Derdiri, Colin Brain, Jamal Imoro Abubakar, Marius Vasii, Vineeth Nagaraj, David Hill, Elliot Callender, Ian Hart, James Woods and Manohar Thota
Related Document(s)	ANSI C63.10 (2020) 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, 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 WLAN						
-	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	3.3	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2020)
2.2	15.247 (a)(2)	5.2	6.7	Emission Bandwidth	Pass	ANSI C63.10 (2020)
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2020) KDB 662911 D01 v02r01
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2020)
2.5	15.209 and 15.247 (d)	3.3 and 5.5	6.13 and 8.9	Spurious Radiated Emissions	Pass	ANSI C63.10 (2020)
2.6	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10 (2020) KDB 662911 D01 v02r01

Table 2

1.4 Product Information

1.4.1 Technical Description

The equipment under test (EUT) was a desktop computer.

1.4.2 Test Modes

The EUT's 2.4 GHz 802.11 radio supports SISO (Single Input/Single Output) and 2x2 MIMO (Multiple Input/Multiple Output). It supports 802.11b and g for SISO operation and 802.11n and ax at 20 MHz channel bandwidths for SISO and MIMO. 802.11ax multi-user mode supports RU sizes of 26/52/106/242 subcarriers.

The EUT uses different output powers per core dependent on how many cores are used. It uses the same conducted power across all cores in any given mode, but due to the different antenna gains the radiated powers per core differs.

After preliminary investigations were performed, the EUT was therefore tested in the following worst-case modes unless otherwise specified:

SISO Modes (Core 1):

- 802.11b - 1 Mbps
- 802.11g - 12 Mbps
- 802.11n HT20 - MCS2
- 802.11ax HE20 SU - MCS2x1
- 802.11ax HE20 MU RU26/52/106* - MCS2x1

2x2 MIMO Modes (Core 0 + Core 1):

- 802.11n HT20 - CDD - MCS2
- 802.11ax HE20 SU - CDD - MCS2x1
- 802.11ax HE20 MU RU26/52/106* - CDD - MCS2x1

*Note: The RU offset for bottom and middle channels were placed in the lowest position and on the top channel, the offset was placed in the upper most position.

1.4.3 Test Setup

For conducted tests the EUT antennas were disconnected and replaced with U.FL to SMA test cables to enable conducted testing on each core. The loss of these test cables was known and compensated for in any conducted measurements.

For all tests, the EUT was put into a continuous transmit test mode with the chipset manufacturer's test commands. The EUT then transmitted the required type of packeted 802.11 data frames of fixed length, containing the standard headers and with pseudo-random data content, ensuring the measured signals were representative and contained all the symbols at the highest power control level.

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

1.4.4 Antenna Gain Table

Antenna Port	Frequency Range (MHz)	Peak Gain (dBi)	Conducted Cable Loss (dB)
Core 0	2400 to 2480	0.07	0.71
Core 1	2400 to 2480	1.55	0.71

Table 3

1.5 Deviations from the Standard

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

1.6 Identification of the EUT

The table below details identification of the EUT(s) that have been used to carry out the testing within this report.

Model: A3389			
Serial Number	Hardware Version	Software Version	Firmware
LVV0X46J3D	REV1.0	24A62401t	23.30.16
QQHY5J5267	REV1.0	24A62401t	23.30.16
J7CW3WPWFV	REV1.0	24A62401j	23.30.16
MGC29YC7F7	REV1.0	24A62401t	23.30.16

Table 4

1.7 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: A3389, Serial Number: LVV0X46J3D			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3389, Serial Number: QQHY5J5267			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3389, Serial Number: J7CW3WPWFV			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3389, Serial Number: MGC29YC7F7			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 5

1.8 Test Location

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 WLAN		
Restricted Band Edges	Ahmed Al Derdiri, Colin Brain, Jamal Imoro Abubakar, Marius Vasii and Vineeth Nagaraj	UKAS
Emission Bandwidth	David Hill	UKAS
Maximum Conducted Output Power	David Hill	UKAS
Authorised Band Edges	Ahmed Al Derdiri, Colin Brain, Jamal Imoro Abubakar, Marius Vasii and Vineeth Nagaraj	UKAS
Spurious Radiated Emissions	Colin Brain, Elliot Callender, Ian Hart, James Woods and Manohar Thota	UKAS
Power Spectral Density	David Hill	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 3.3
ISED RSS-GEN, Clause 8.10

2.1.2 Equipment Under Test and Modification State

A3389, S/N: LVV0X46J3D - Modification State 0
A3389, S/N: QQHY5J5267 - Modification State 0
A3389, S/N: J7CW3WPWFV - Modification State 0

2.1.3 Date of Test

01-October-2024 to 11-October-2024

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	21.8 - 23.3 °C
Relative Humidity	42.1 - 51.2 %

2.1.6 Test Results

2.4 GHz WLAN

20 MHz Bandwidth - Core 0 (SISO)

Mode	Data Rate/ MCS	Resource Size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBuV/m)
802.11b	1 Mbps	-	-	2412	2390	57.75	48.24
802.11g	24 Mbps	-	-	2412	2390	65.00	51.03
802.11n HT20	MCS 7	-	-	2412	2390	66.41	51.12
802.11ax HE20	MCS 4x1	SU	-	2412	2390	67.15	51.29
802.11ax HE20	MCS 9x1	106	53	2412	2390	67.02	50.37
802.11b	1 Mbps	-	-	2462	2483.5	57.19	44.50
802.11b	1 Mbps	-	-	2467	2483.5	59.45	50.35
802.11b	1 Mbps	-	-	2472	2483.5	56.67	47.88
802.11g	54 Mbps	-	-	2462	2483.5	67.78	49.39
802.11g	54 Mbps	-	-	2467	2483.5	63.07	48.85
802.11g	54 Mbps	-	-	2472	2483.5	59.15	45.82
802.11n HT20	MCS 2	-	-	2462	2483.5	63.34	49.94
802.11n HT20	MCS 4	-	-	2467	2483.5	61.52	49.16
802.11n HT20	MCS 4	-	-	2472	2483.5	59.58	46.06
802.11ax HE20	MCS 4x1	SU	-	2462	2483.5	63.78	50.29
802.11ax HE20	MCS 9x1	106	54	2462	2483.5	64.85	47.12
802.11ax HE20	MCS 2x1	SU	-	2467	2483.5	61.02	48.90
802.11ax HE20	MCS 9x1	106	54	2467	2483.5	59.73	47.37
802.11ax HE20	MCS 2x1	SU	-	2472	2483.5	59.59	45.04
802.11ax HE20	MCS 9x1	52	40	2472	2483.5	69.24	49.40

Table 7 - SISO Restricted Band Edge Results

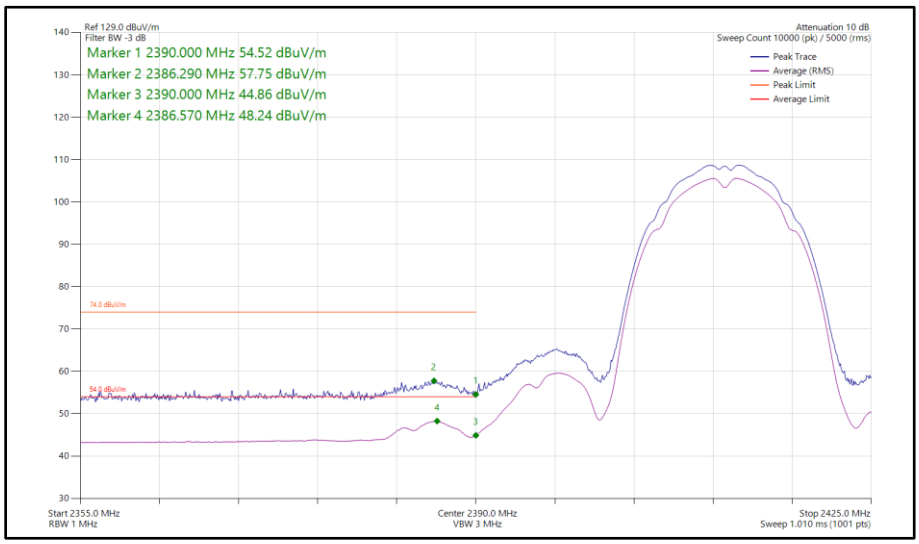

Figure 1 - 802.11b, SISO, Core 0 - 2412 MHz
Band Edge Frequency 2390 MHz

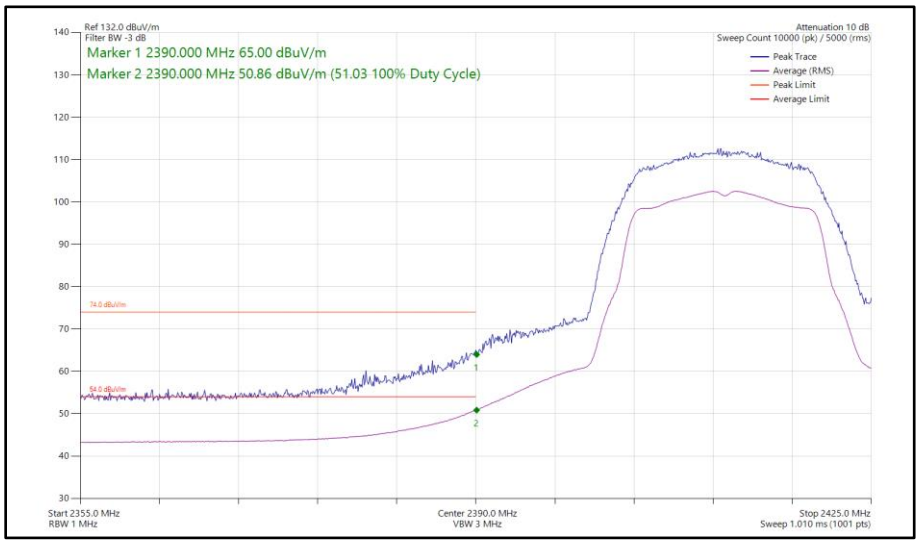

Figure 2 - 802.11g, SISO, Core 0 - 2412 MHz
Band Edge Frequency 2390 MHz

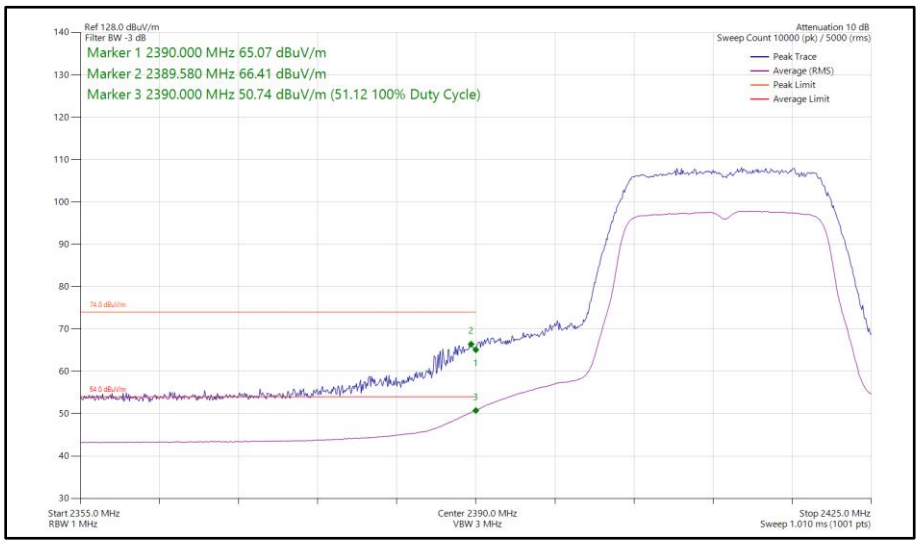

Figure 3 - 802.11n HT20, SISO, Core 0 - 2412 MHz
Band Edge Frequency 2390 MHz

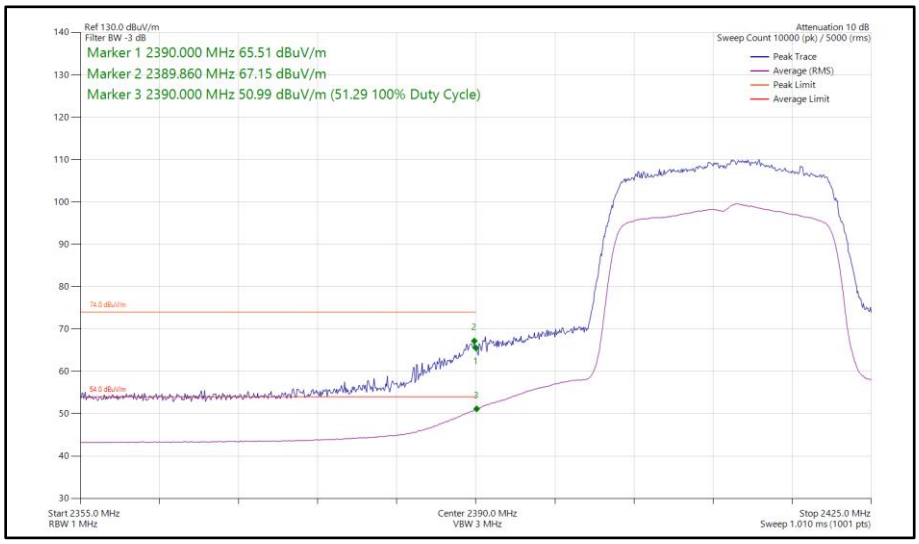

Figure 4 - 802.11ax HE20, SU, SISO, Core 0 - 2412 MHz
Band Edge Frequency 2390 MHz

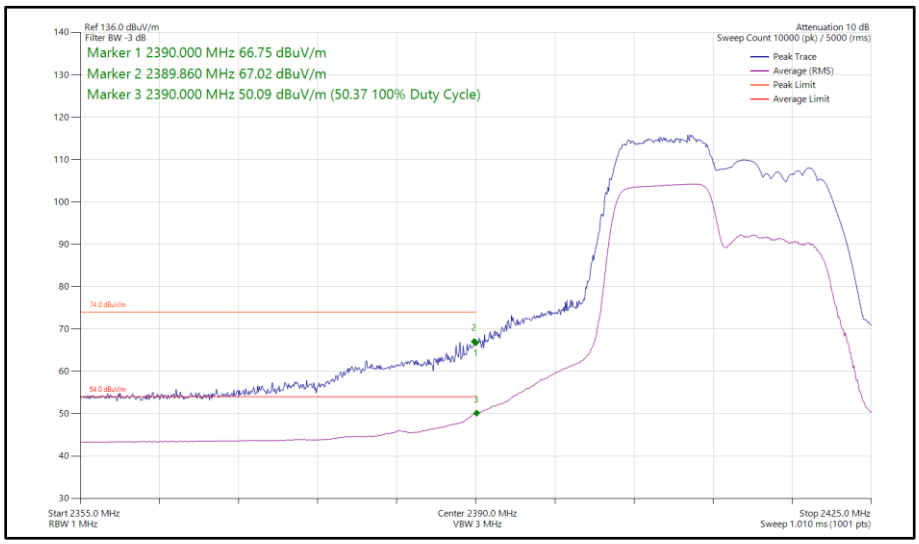

Figure 5 - 802.11ax HE20, RU 106-53, SISO, Core 0 - 2412 MHz Band Edge Frequency 2390 MHz

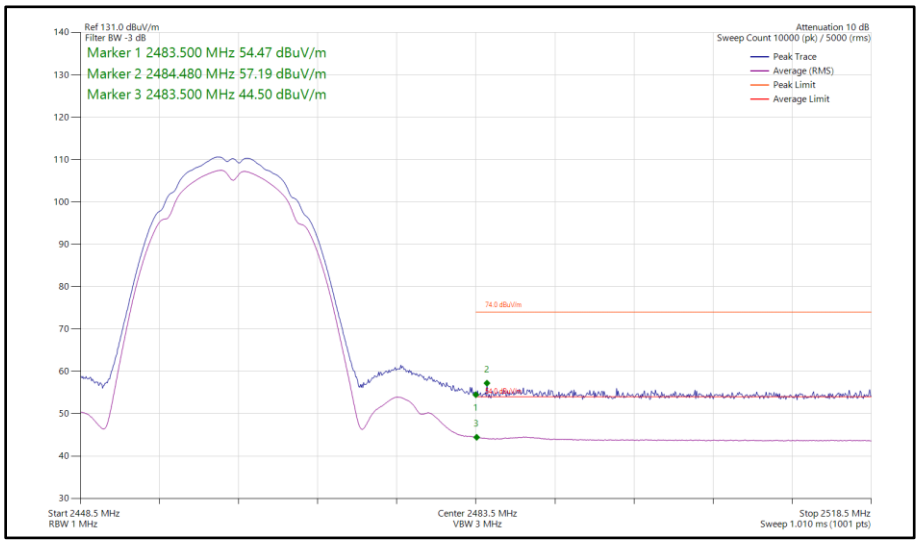

Figure 6 - 802.11b, SISO, Core 0 - 2462 MHz Band Edge Frequency 2483.5 MHz

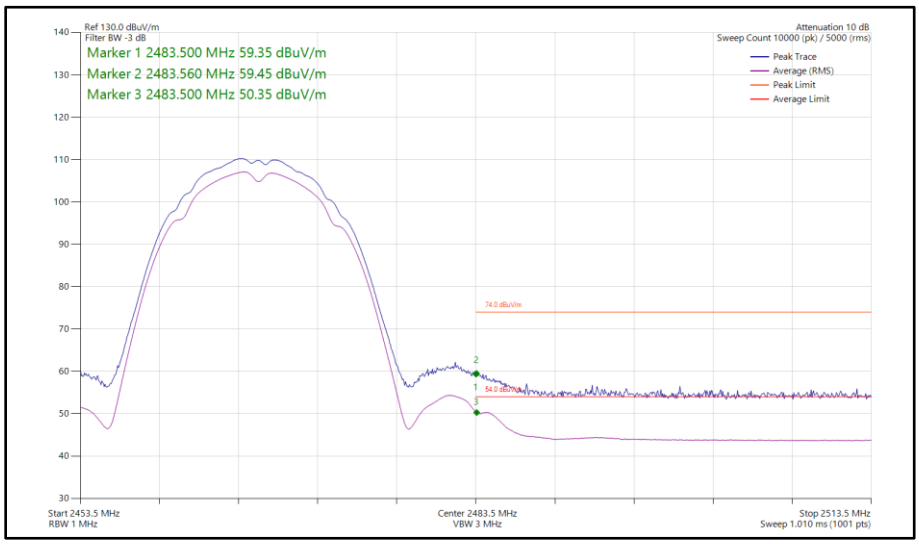

Figure 7 - 802.11b, SISO, Core 0 - 2467 MHz
Band Edge Frequency 2483.5 MHz

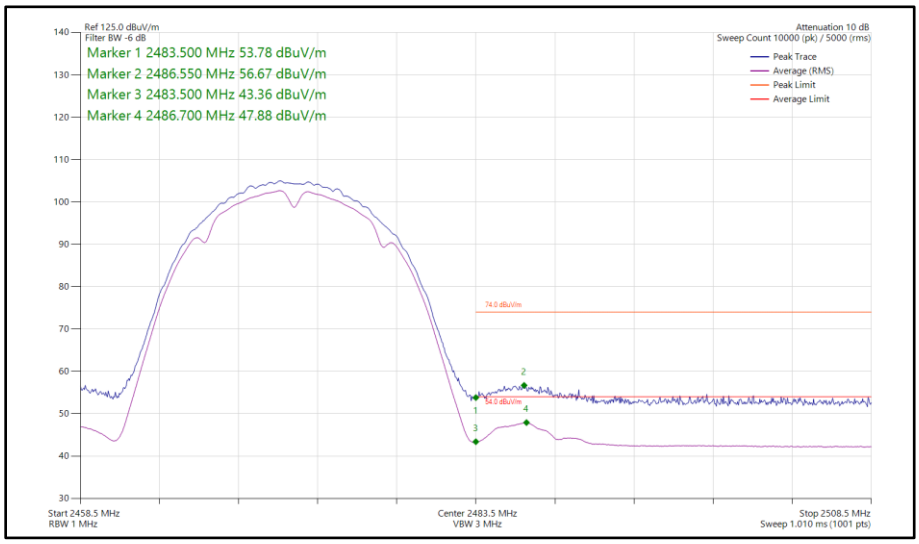

Figure 8 - 802.11b, SISO, Core 0 - 2472 MHz
Band Edge Frequency 2483.5 MHz

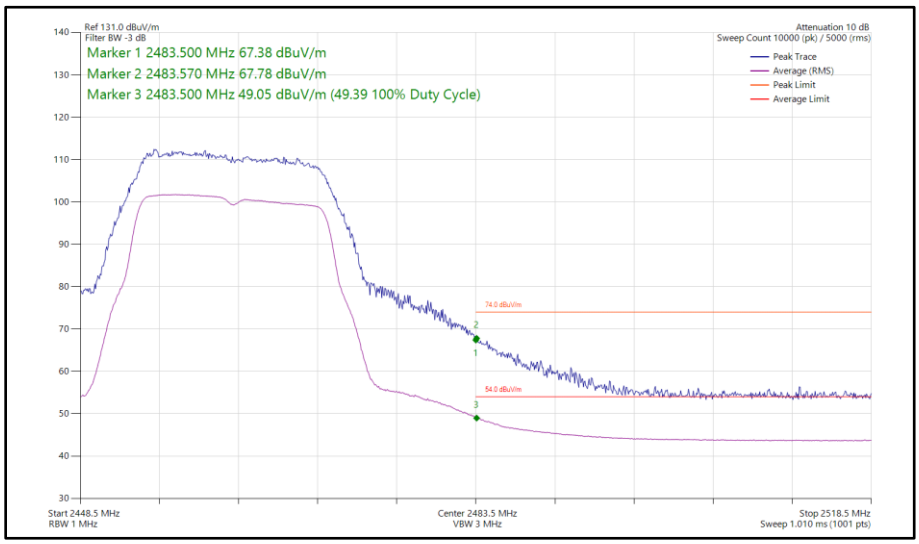

Figure 9 - 802.11g, SISO, Core 0 - 2462 MHz
Band Edge Frequency 2483.5 MHz

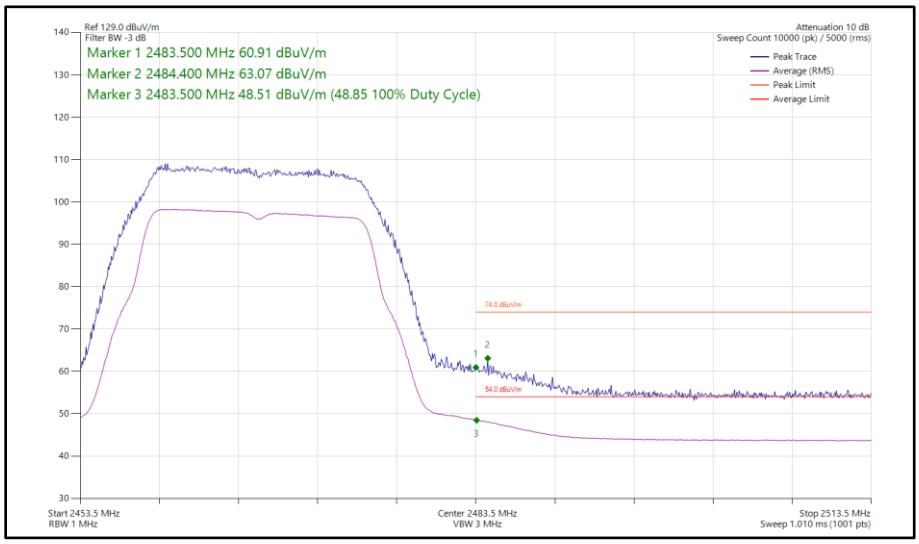

Figure 10 - 802.11g, SISO, Core 0 - 2467 MHz
Band Edge Frequency 2483.5 MHz

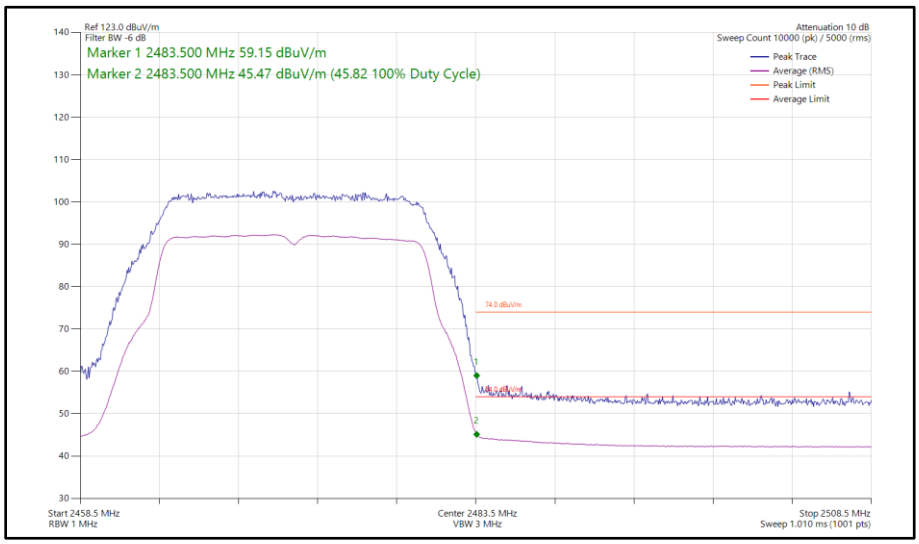

Figure 11 - 802.11g, SISO, Core 0 - 2472 MHz
Band Edge Frequency 2483.5 MHz

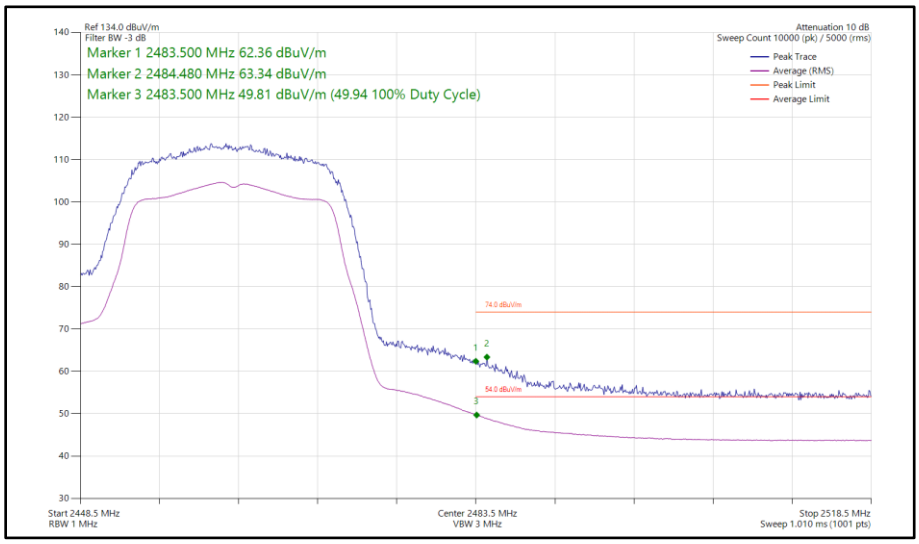

Figure 12 - 802.11n HT20, SISO, Core 0 - 2462 MHz
Band Edge Frequency 2483.5 MHz

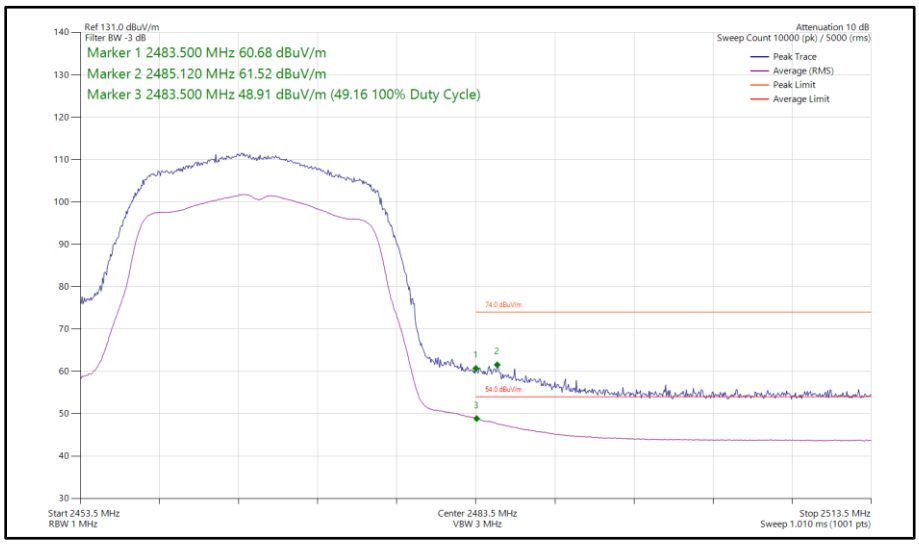

Figure 13 - 802.11n HT20, SISO, Core 0 - 2467 MHz
Band Edge Frequency 2483.5 MHz

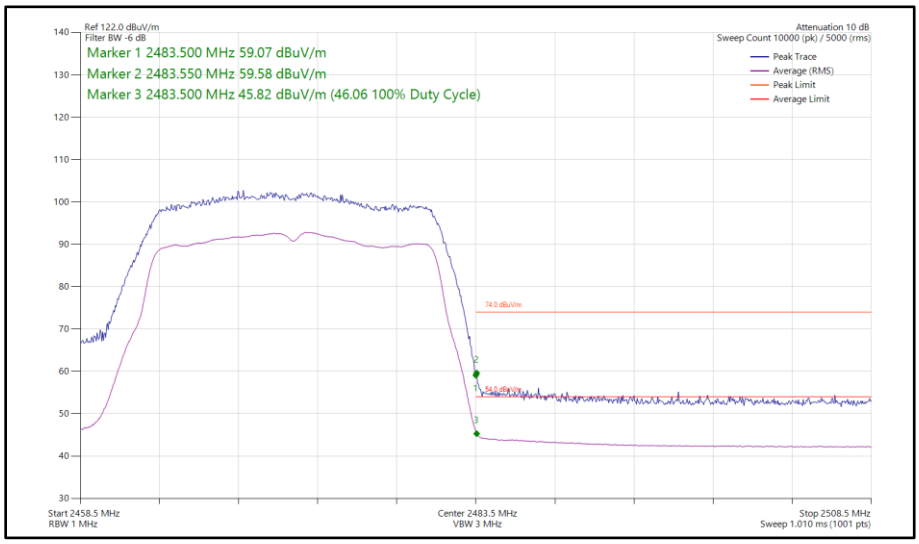

Figure 14 - 802.11n HT20, SISO, Core 0 - 2472 MHz
Band Edge Frequency 2483.5 MHz

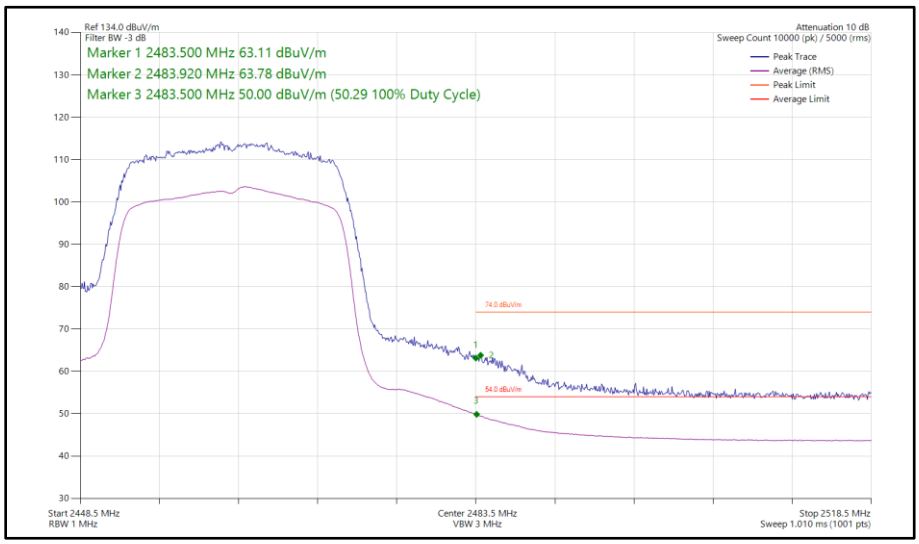

Figure 15 - 802.11ax HE20, SU, SISO, Core 0 - 2462 MHz Band Edge Frequency 2483.5 MHz

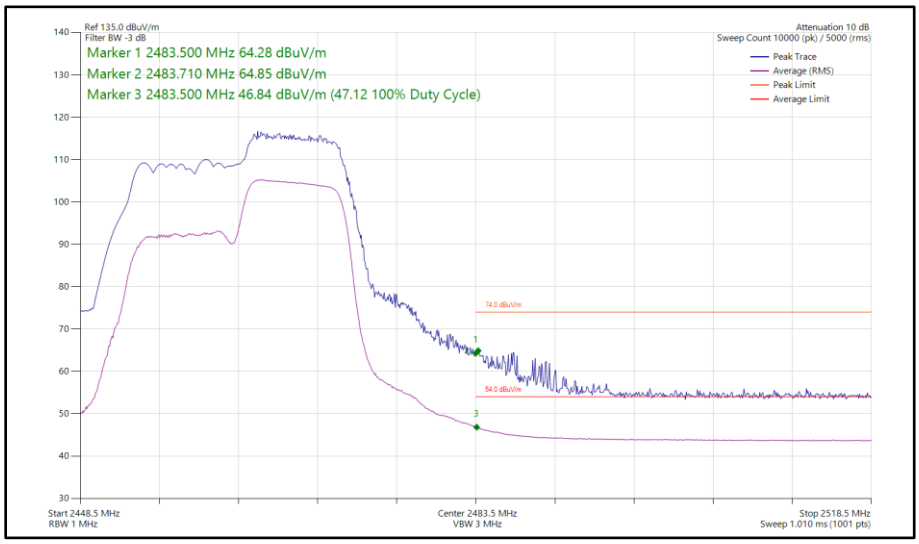

Figure 16 - 802.11ax HE20, RU 106-54, SISO, Core 0 - 2462 MHz Band Edge Frequency 2483.5 MHz

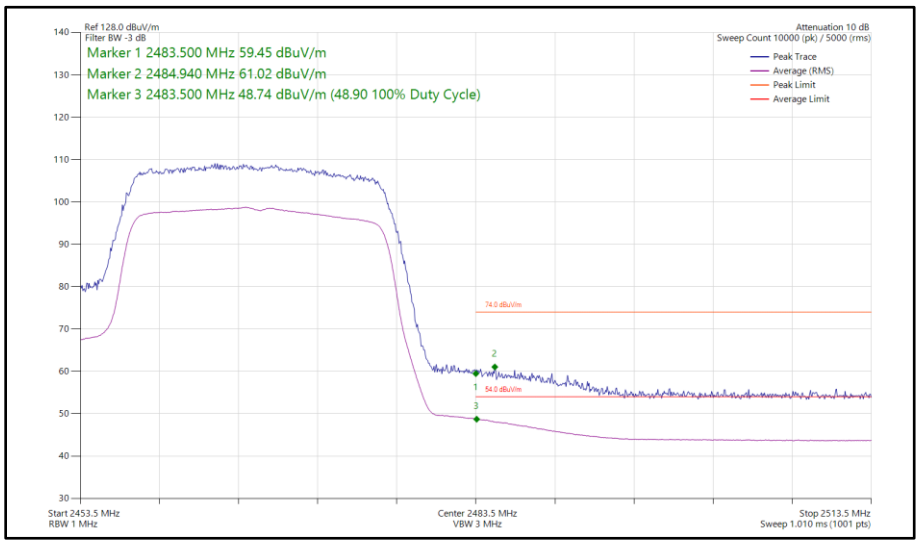

Figure 17 - 802.11ax HE20, SU, SISO, Core 0 - 2467 MHz
Band Edge Frequency 2483.5 MHz

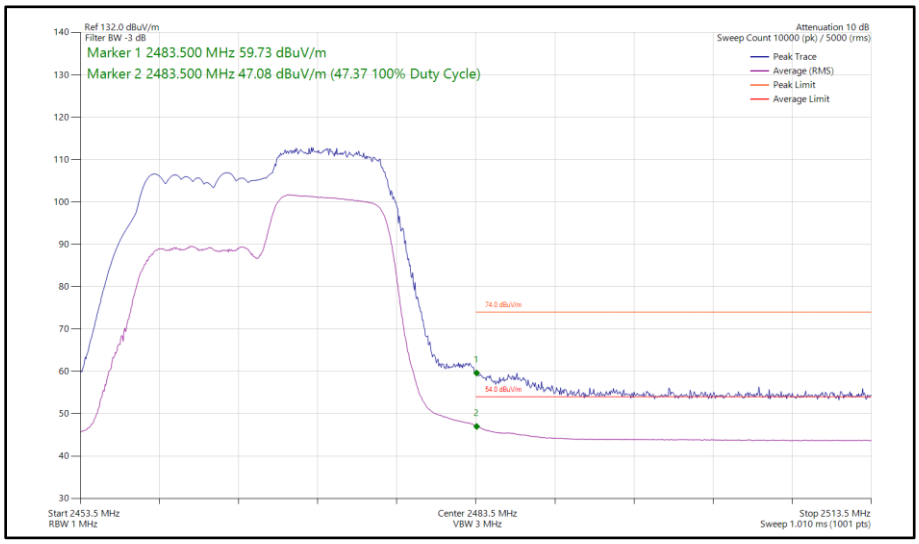

Figure 18 - 802.11ax HE20, RU 106-54, SISO, Core 0 - 2467 MHz
Band Edge Frequency 2483.5 MHz

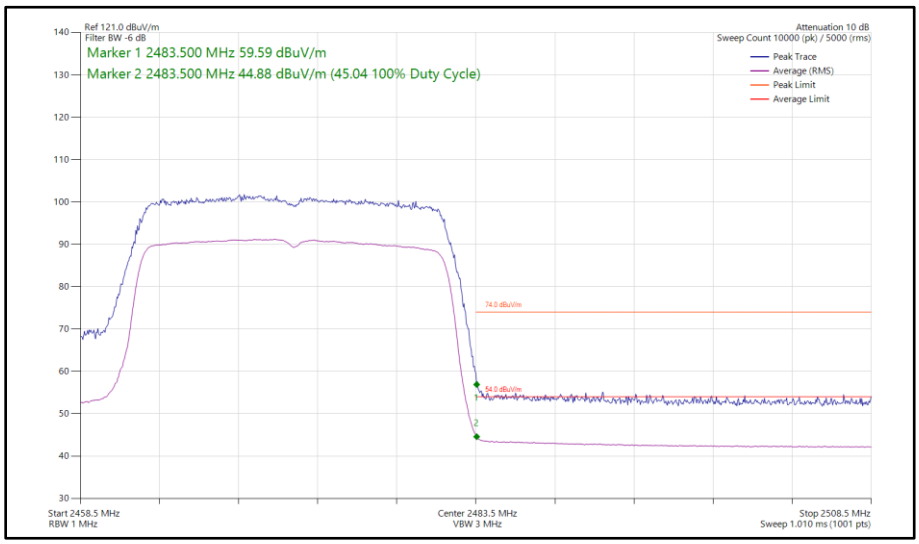

Figure 19 - 802.11ax HE20, SU, SISO, Core 0 - 2472 MHz Band Edge Frequency 2483.5 MHz

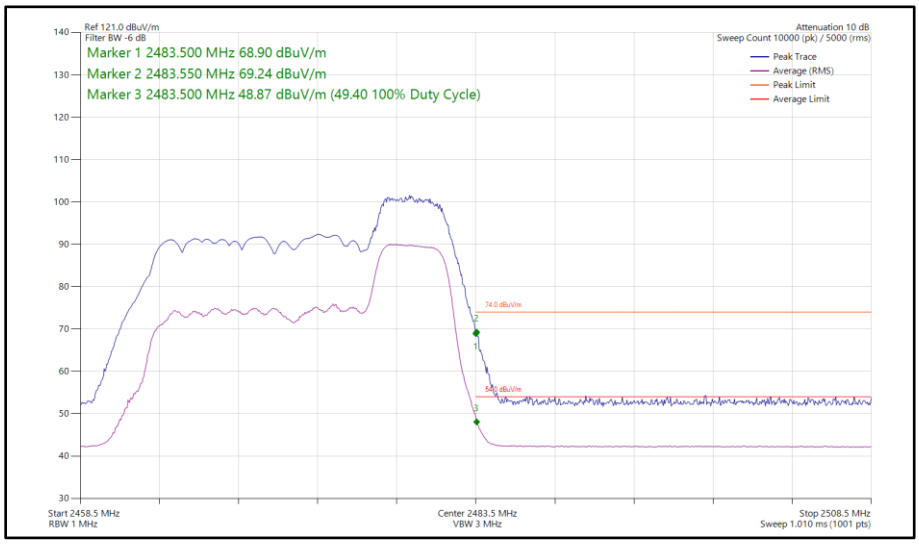

Figure 20 - 802.11ax HE20, RU 52-40, SISO, Core 0 - 2472 MHz Band Edge Frequency 2483.5 MHz

20 MHz Bandwidth - Core 1 (SISO)

Mode	Data Rate/ MCS	Resource Size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBuV/m)
802.11b	1 Mbps	-	-	2412	2390	57.99	48.25
802.11g	54 Mbps	-	-	2412	2390	66.14	51.28
802.11n HT20	MCS 7	-	-	2412	2390	63.62	48.70
802.11ax HE20	MCS 2x1	SU	-	2412	2390	63.42	49.95
802.11ax HE20	MCS 9x1	106	53	2412	2390	66.30	49.95
802.11b	1 Mbps	-	-	2462	2483.5	56.72	45.03
802.11b	1 Mbps	-	-	2467	2483.5	58.74	49.63
802.11b	1 Mbps	-	-	2472	2483.5	56.05	46.75
802.11g	12 Mbps	-	-	2462	2483.5	61.65	48.34
802.11g	12 Mbps	-	-	2467	2483.5	59.58	47.72
802.11g	12 Mbps	-	-	2472	2483.5	57.02	45.43
802.11n HT20	MCS 7	-	-	2462	2483.5	68.01	48.24
802.11n HT20	MCS 4	-	-	2467	2483.5	58.82	47.67
802.11n HT20	MCS 2	-	-	2472	2483.5	59.62	45.58
802.11ax HE20	MCS 9x1	SU	-	2462	2483.5	67.08	48.98
802.11ax HE20	MCS 9x1	106	54	2462	2483.5	62.87	46.08
802.11ax HE20	MCS 9x1	SU	-	2467	2483.5	59.18	47.84
802.11ax HE20	MCS 9x1	106	54	2467	2483.5	58.42	46.94
802.11ax HE20	MCS 9x1	SU	-	2472	2483.5	57.17	44.78
802.11ax HE20	MCS 9x1	26	8	2472	2483.5	69.33	48.39

Table 8 - SISO Restricted Band Edge Results

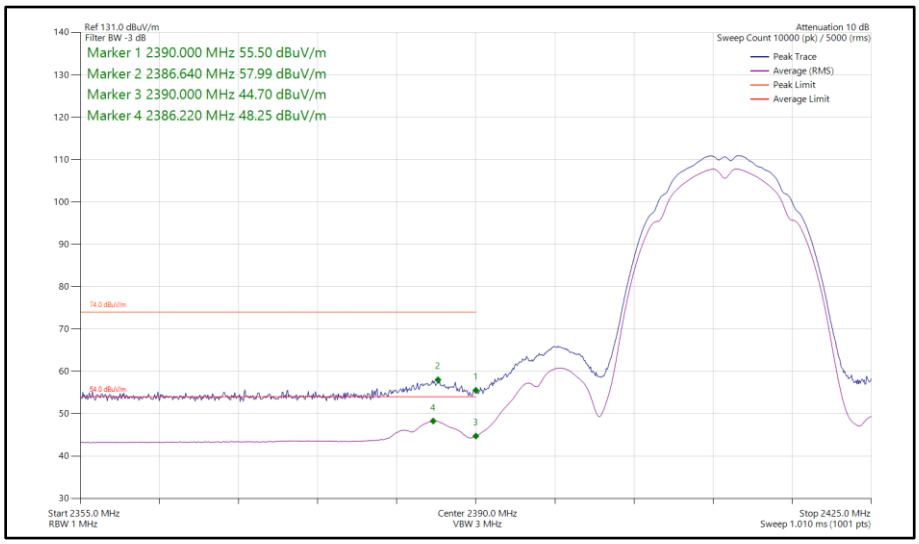

Figure 21 - 802.11b, SISO, Core 1 - 2412 MHz
Band Edge Frequency 2390 MHz

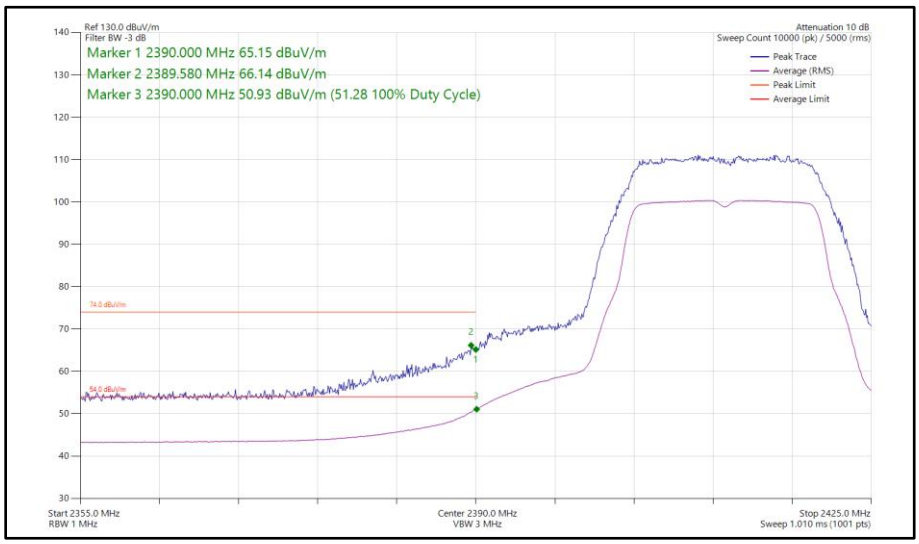

Figure 22 - 802.11g, SISO, Core 1 - 2412 MHz
Band Edge Frequency 2390 MHz

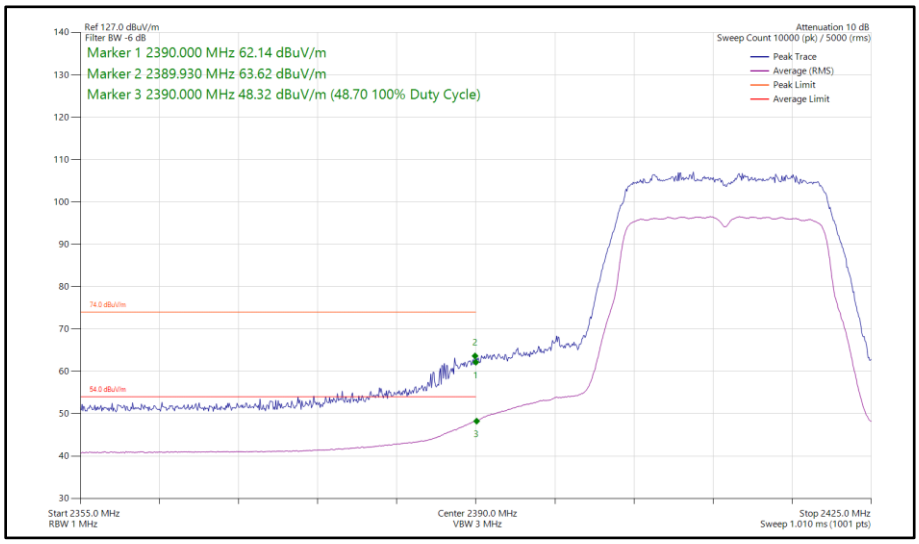

Figure 23 - 802.11n HT20, SISO, Core 1 - 2412 MHz
Band Edge Frequency 2390 MHz

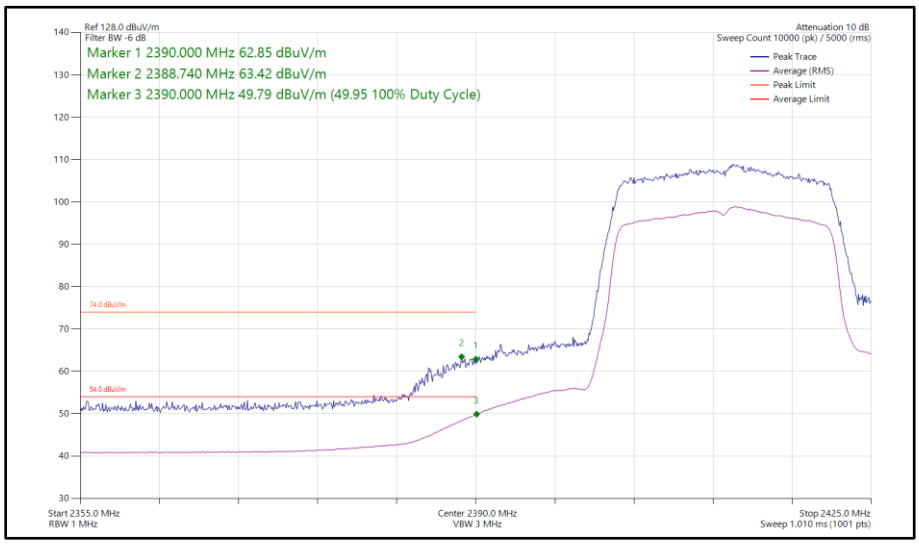

Figure 24 - 802.11ax HE20, SU, SISO, Core 1 - 2412 MHz
Band Edge Frequency 2390 MHz

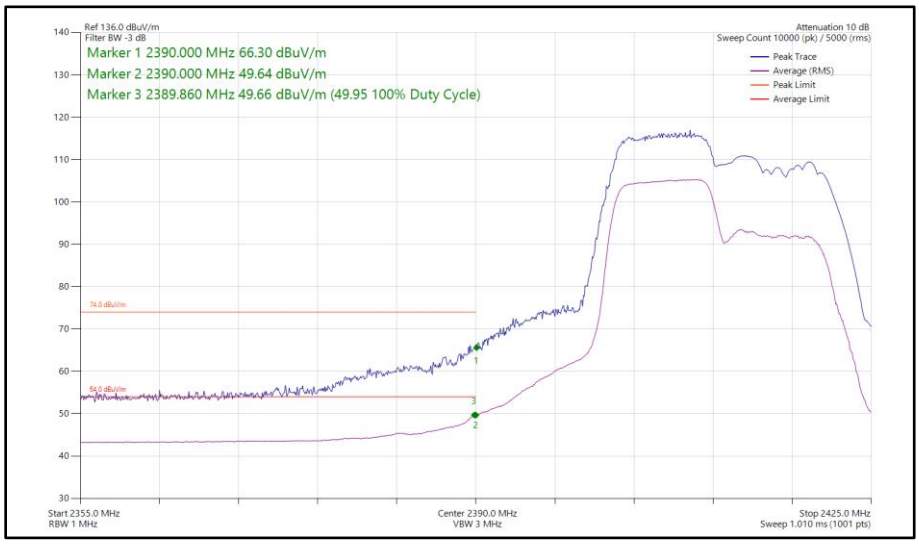

Figure 25 - 802.11ax HE20, RU 106-53, SISO, Core 1 - 2412 MHz
Band Edge Frequency 2390 MHz

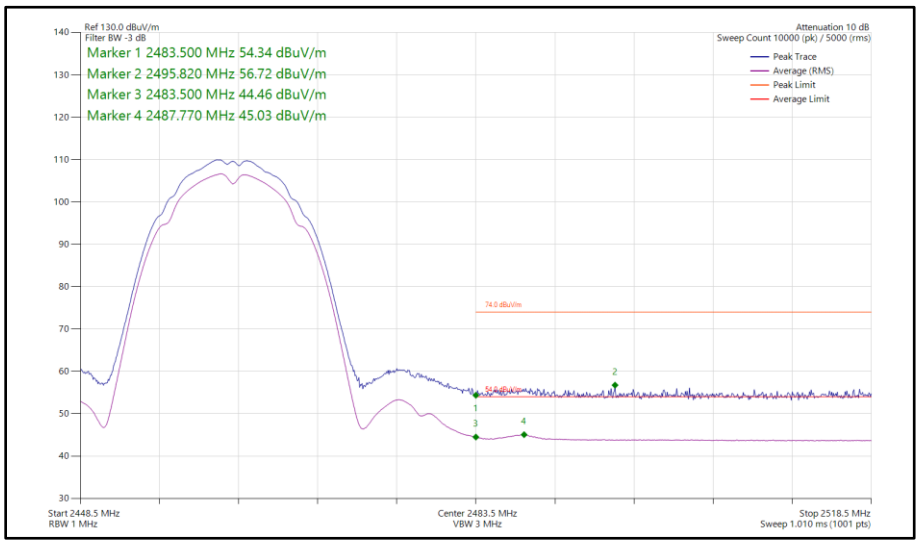

Figure 26 - 802.11b, SISO, Core 1 - 2462 MHz
Band Edge Frequency 2483.5 MHz

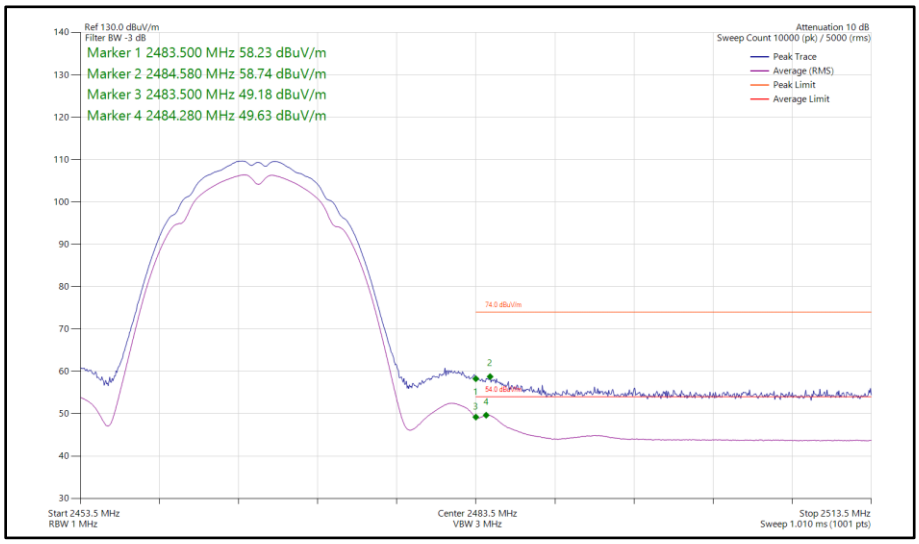

Figure 27 - 802.11b, SISO, Core 1 - 2467 MHz
Band Edge Frequency 2483.5 MHz

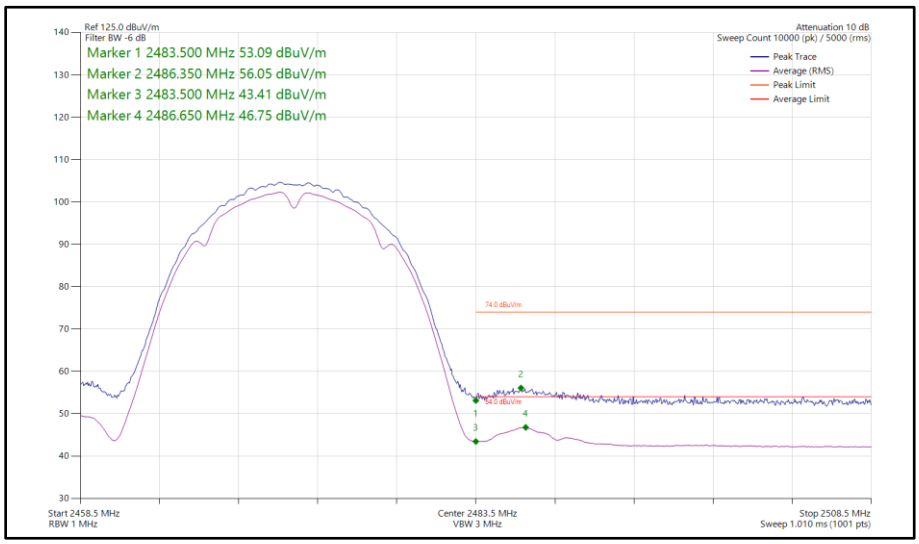

Figure 28 - 802.11b, SISO, Core 1 - 2472 MHz
Band Edge Frequency 2483.5 MHz

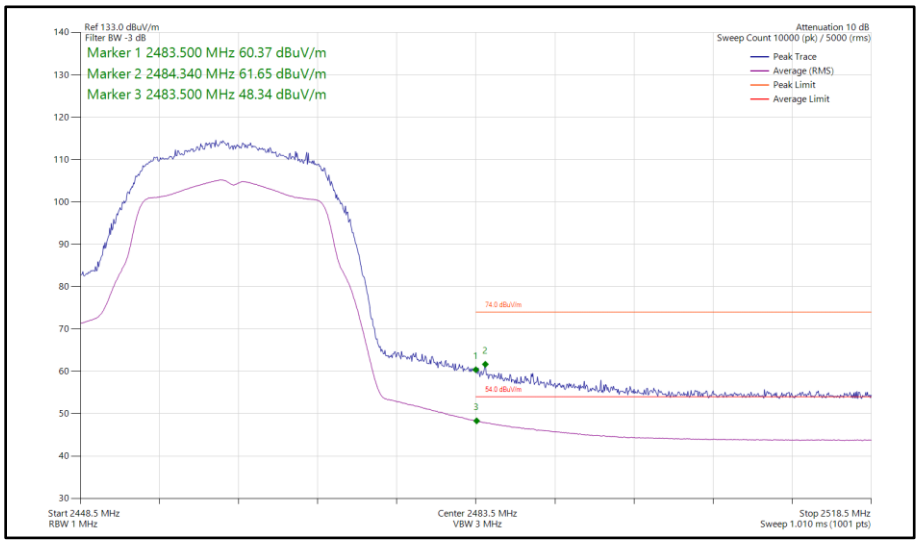

Figure 29 - 802.11g, SISO, Core 1 - 2462 MHz
Band Edge Frequency 2483.5 MHz

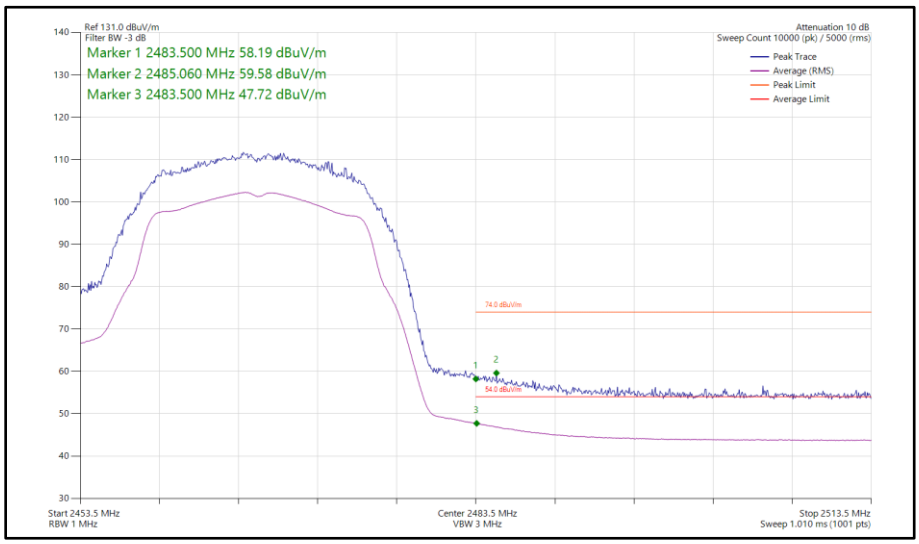

Figure 30 - 802.11g, SISO, Core 1 - 2467 MHz
Band Edge Frequency 2483.5 MHz

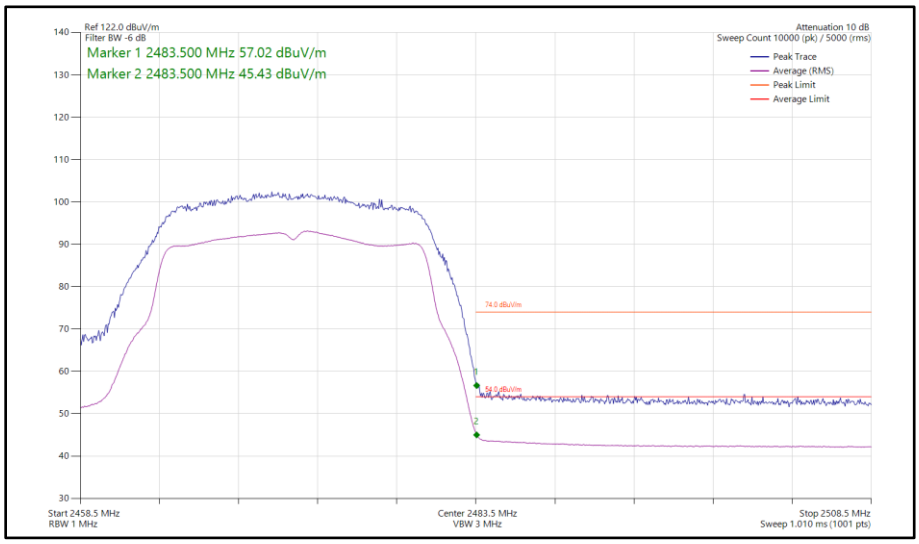

Figure 31 - 802.11g, SISO, Core 1 - 2472 MHz
Band Edge Frequency 2483.5 MHz

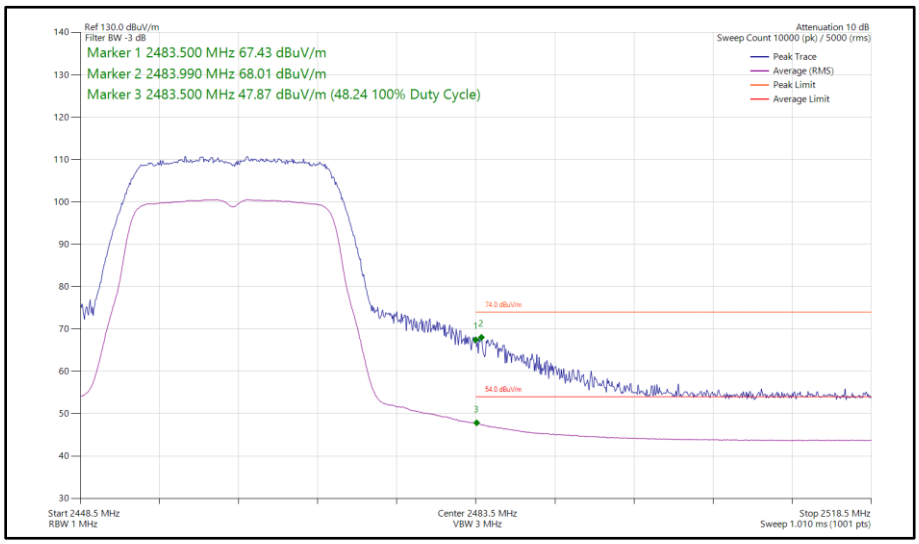

Figure 32 - 802.11n HT20, SISO, Core 1 - 2462 MHz
Band Edge Frequency 2483.5 MHz

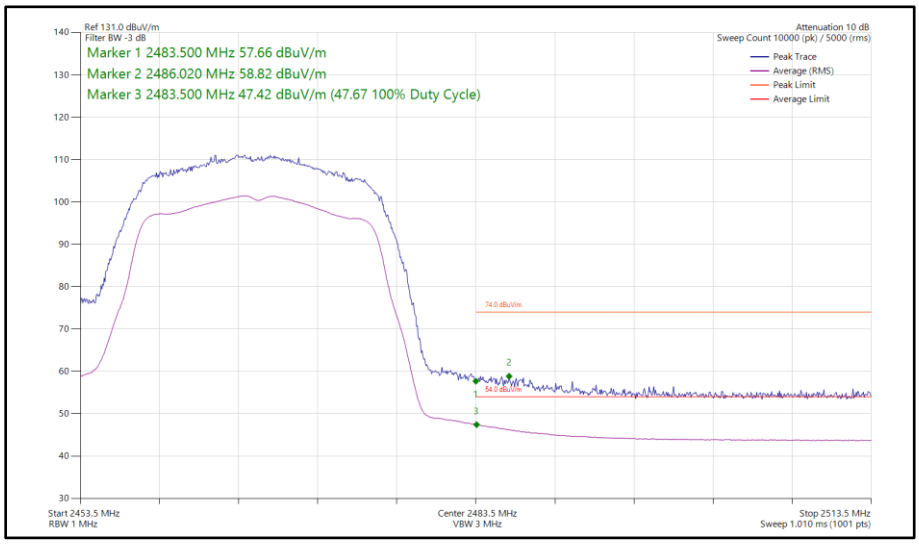

Figure 33 - 802.11n HT20, SISO, Core 1 - 2467 MHz
Band Edge Frequency 2483.5 MHz

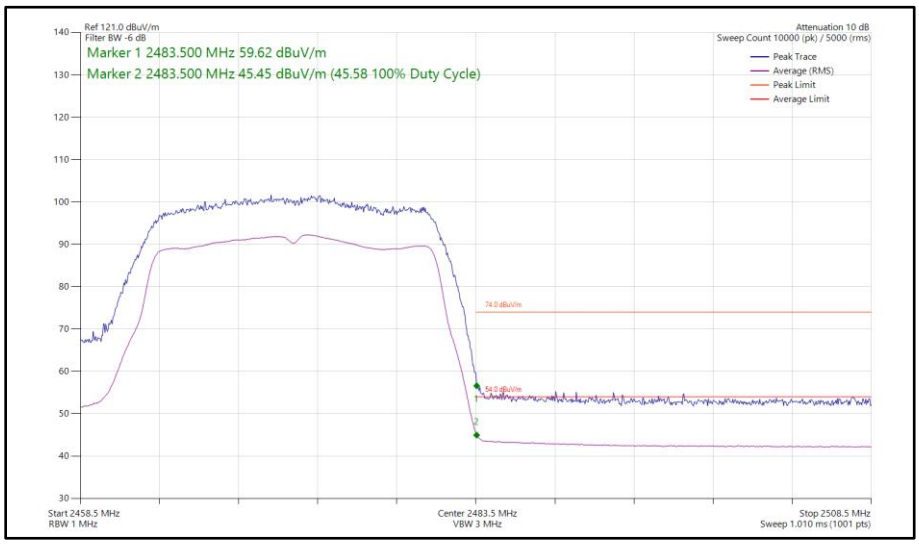

Figure 34 - 802.11n HT20, SISO, Core 1 - 2472 MHz
Band Edge Frequency 2483.5 MHz

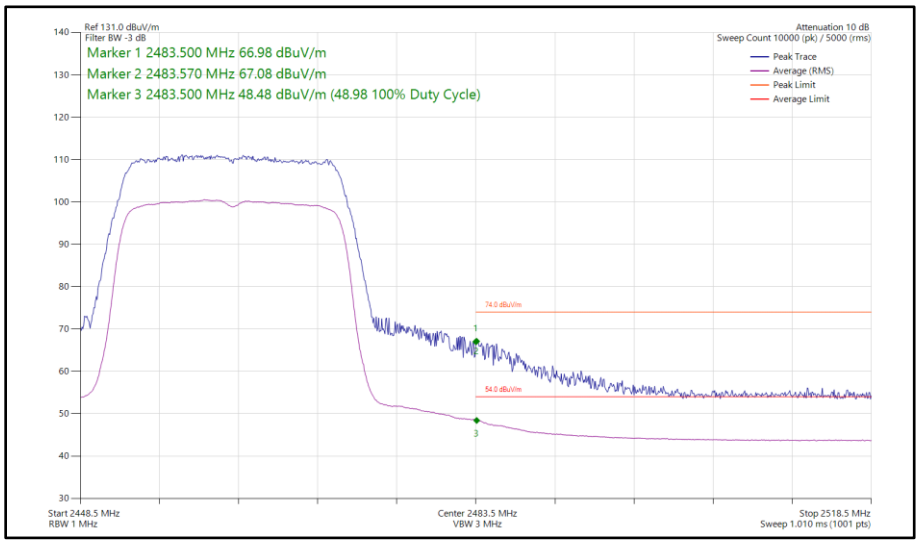

Figure 35 - 802.11ax HE20, SU, SISO, Core 1 - 2462 MHz
Band Edge Frequency 2483.5 MHz

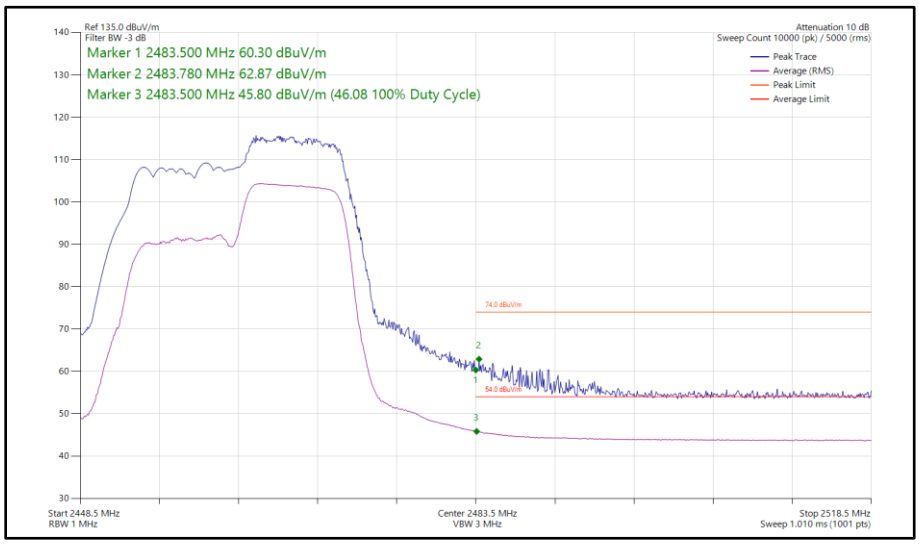

Figure 36 - 802.11ax HE20, RU 106-54, SISO, Core 1 - 2462 MHz Band Edge Frequency 2483.5 MHz

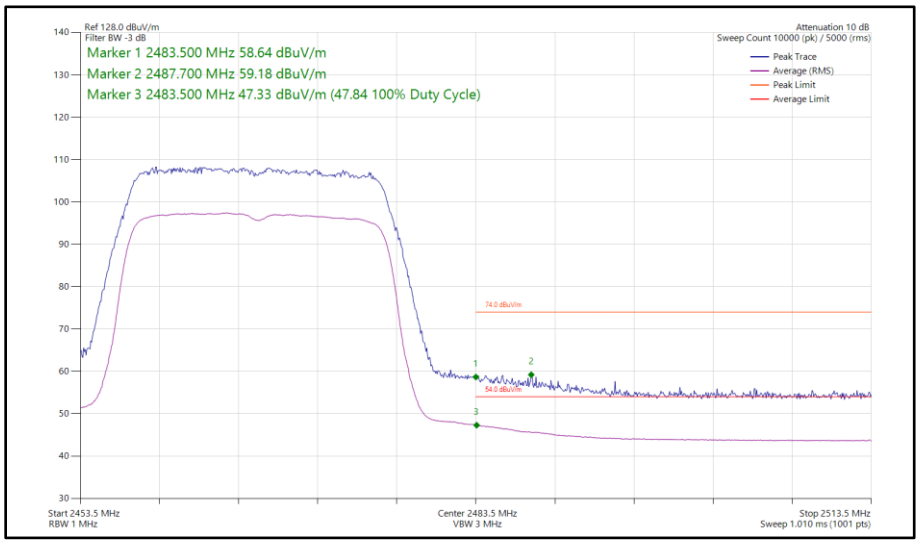

Figure 37 - 802.11ax HE20, SU, SISO, Core 1 - 2467 MHz Band Edge Frequency 2483.5 MHz

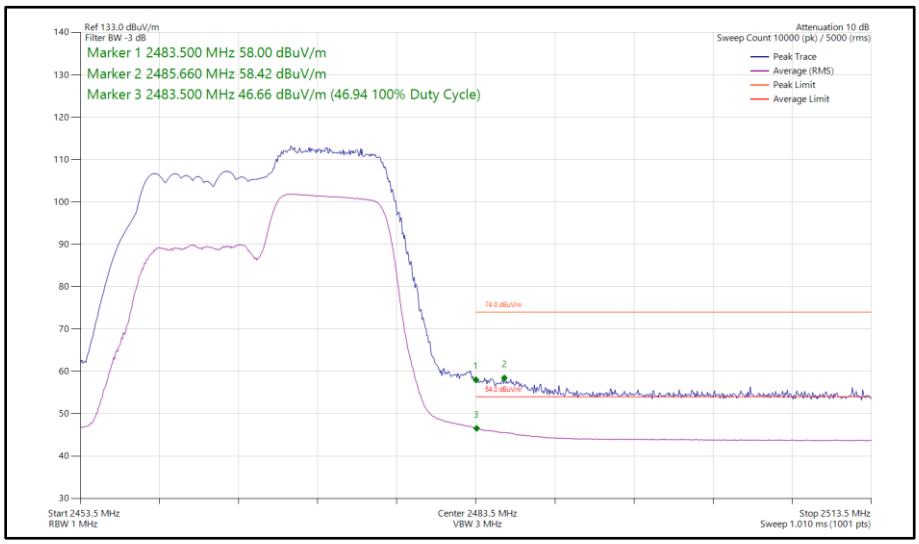

Figure 38 - 802.11ax HE20, RU 106-54, SISO, Core 1 - 2467 MHz Band Edge Frequency 2483.5 MHz

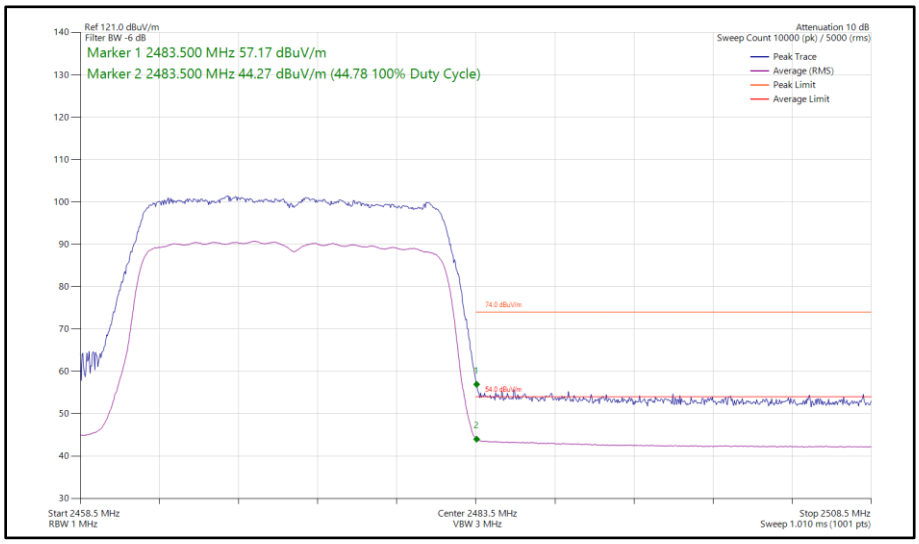

Figure 39 - 802.11ax HE20, SU, SISO, Core 1 - 2472 MHz Band Edge Frequency 2483.5 MHz

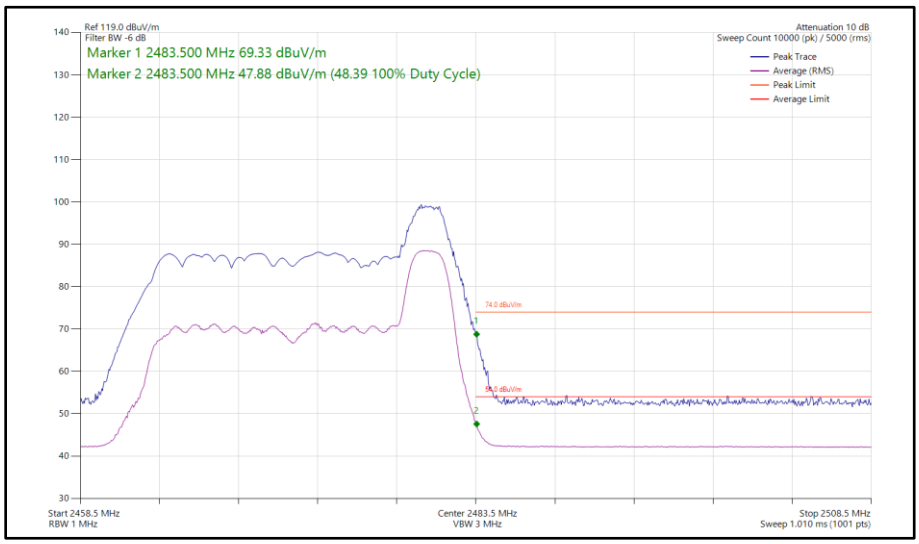

Figure 40 - 802.11ax HE20, RU 26-8, SISO, Core 1 - 2472 MHz Band Edge Frequency 2483.5 MHz

20 MHz Bandwidth - Core 0 - Core 1 (CDD)

Mode	Data Rate/ MCS	Resource Size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBuV/m)
802.11n HT20	MCS 4	-	-	2412	2390	66.80	51.50
802.11ax HE20	MCS 2x1	SU	-	2412	2390	64.85	51.15
802.11ax HE20	MCS 9x1	106	53	2412	2390	65.81	49.82
802.11n HT20	MCS 2	-	-	2462	2483.5	60.55	48.62
802.11n HT20	MCS 2	-	-	2467	2483.5	60.94	49.60
802.11n HT20	MCS 4	-	-	2472	2483.5	59.43	46.46
802.11ax HE20	MCS 9x1	SU	-	2462	2483.5	63.13	49.11
802.11ax HE20	MCS 9x1	106	54	2462	2483.5	63.43	46.74
802.11ax HE20	MCS 2x1	SU	-	2467	2483.5	60.54	49.43
802.11ax HE20	MCS 9x1	106	54	2467	2483.5	60.38	47.51
802.11ax HE20	MCS 4x1	SU	-	2472	2483.5	60.53	46.21
802.11ax HE20	MCS 9x1	52	40	2472	2483.5	68.51	47.75

Table 9 - CDD Restricted Band Edge Results

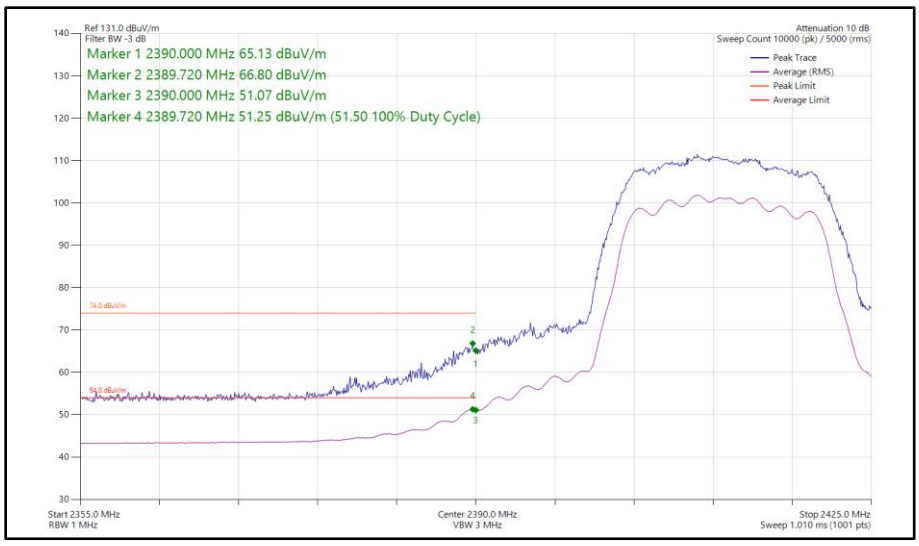

Figure 41 - 802.11n HT20, CDD, Core 0 - Core 1 - 2412 MHz Band Edge Frequency 2390 MHz

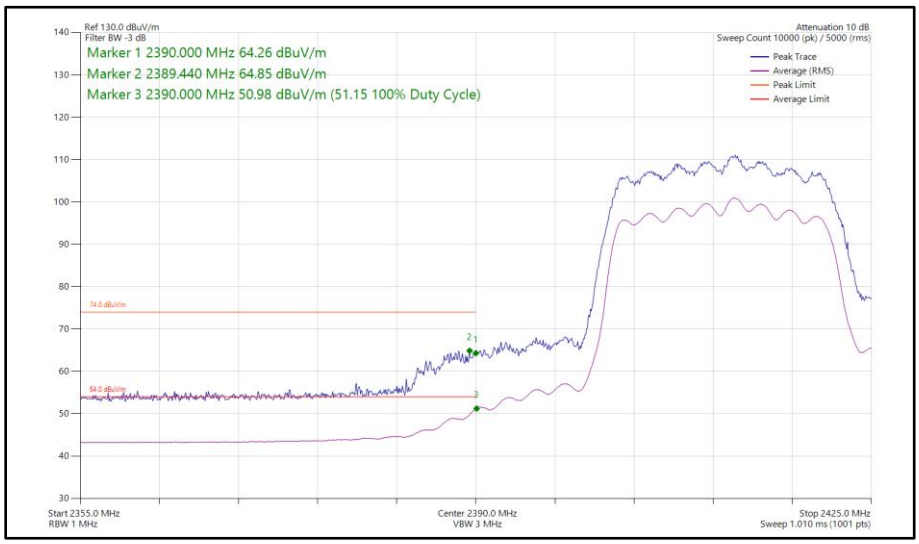

Figure 42 - 802.11ax HE20, SU, CDD, Core 0 - Core 1 - 2412 MHz Band Edge Frequency 2390 MHz

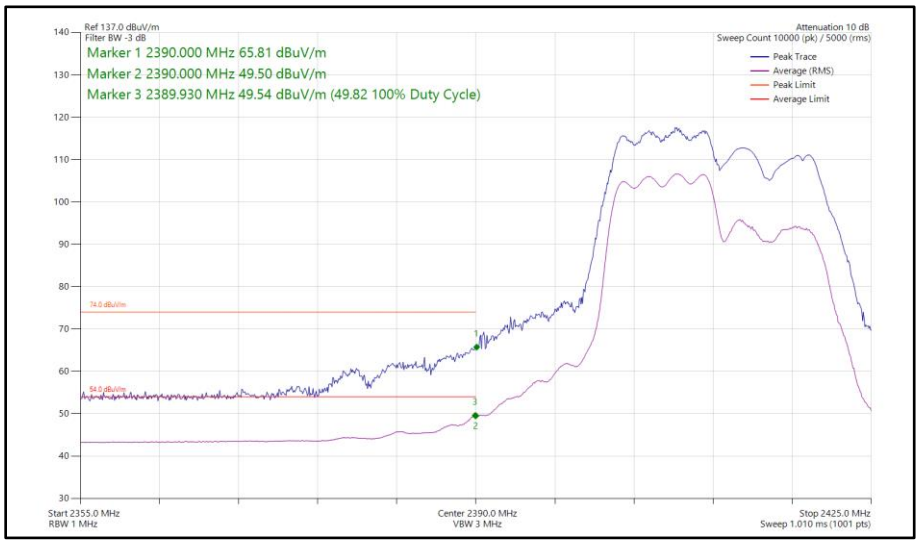

Figure 43 - 802.11ax HE20, RU 106-53, CDD, Core 0 - Core 1 - 2412 MHz Band Edge Frequency 2390 MHz

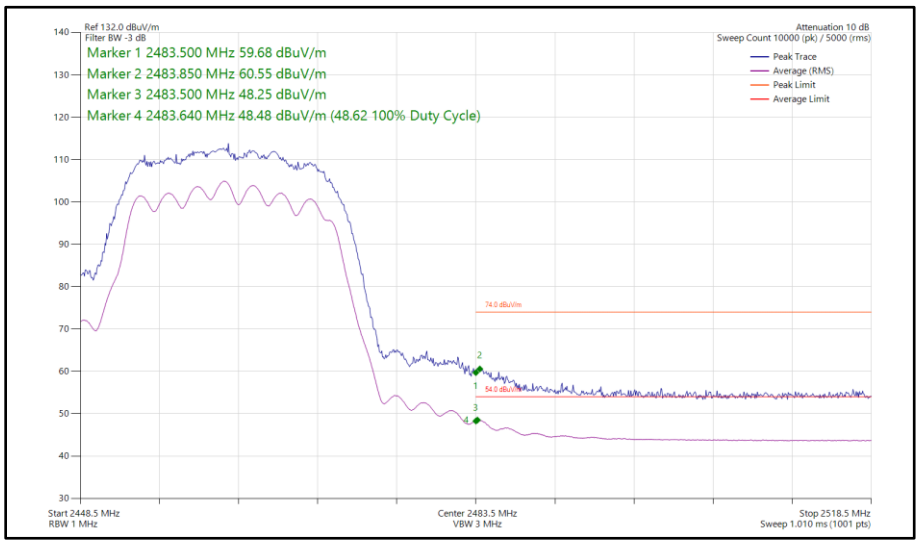

Figure 44 - 802.11n HT20, CDD, Core 0 - Core 1 - 2462 MHz Band Edge Frequency 2483.5 MHz

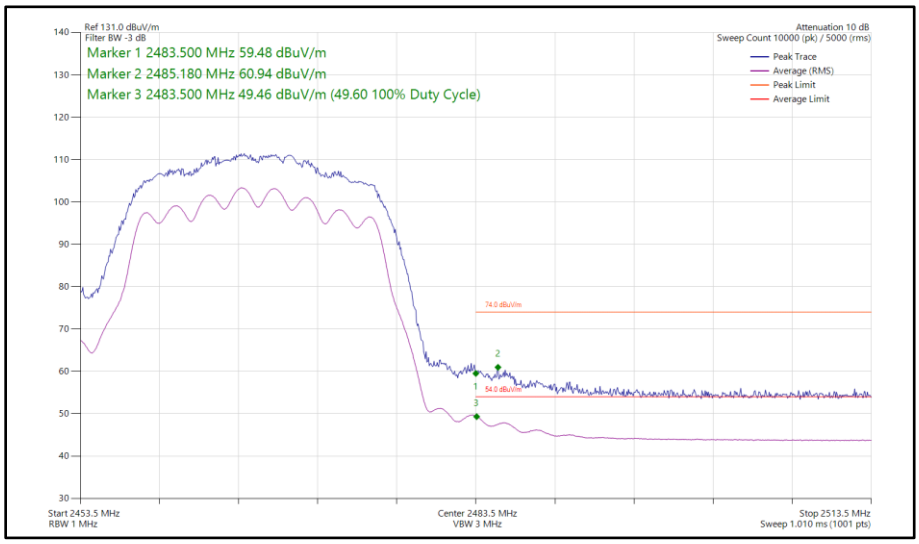

Figure 45 - 802.11n HT20, CDD, Core 0 - Core 1 - 2467 MHz Band Edge Frequency 2483.5 MHz

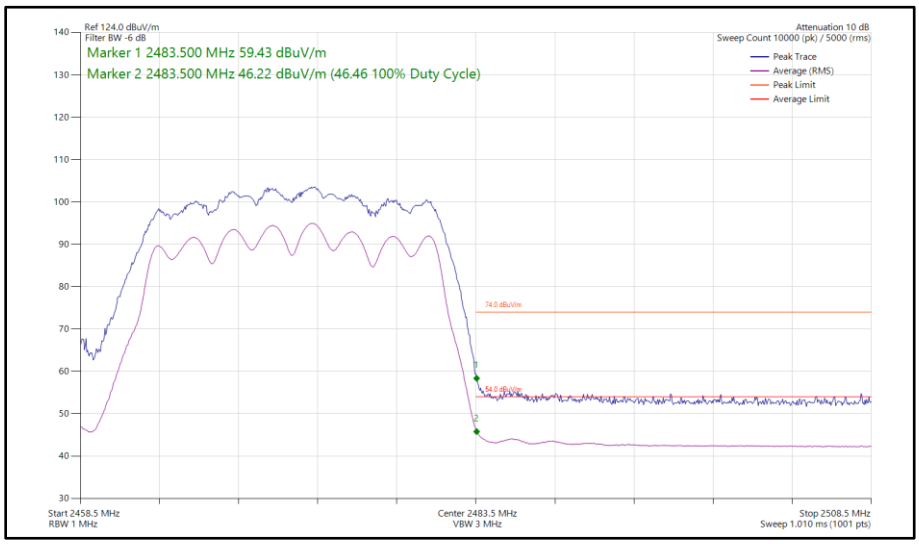

Figure 46 - 802.11n HT20, CDD, Core 0 - Core 1 - 2472 MHz Band Edge Frequency 2483.5 MHz

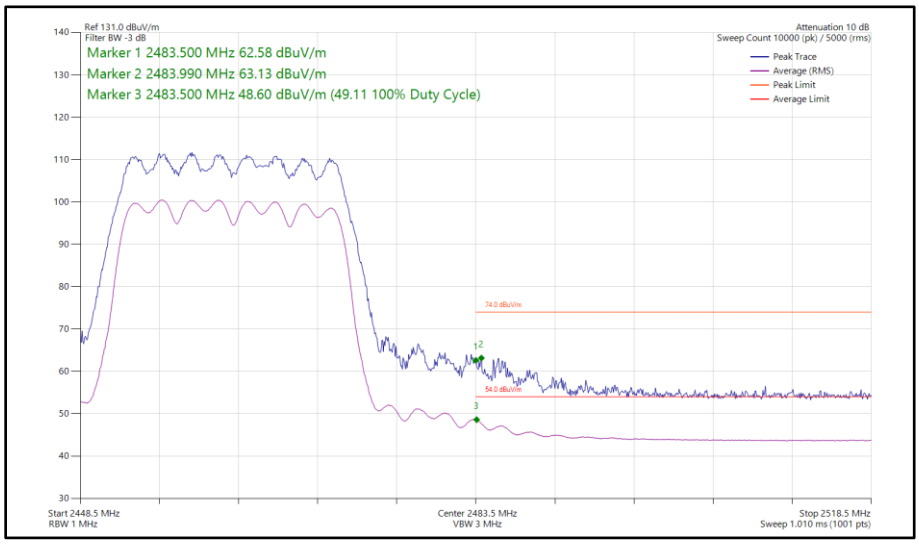

Figure 47 - 802.11ax HE20, SU, CDD, Core 0 - Core 1 - 2462 MHz Band Edge Frequency 2483.5 MHz

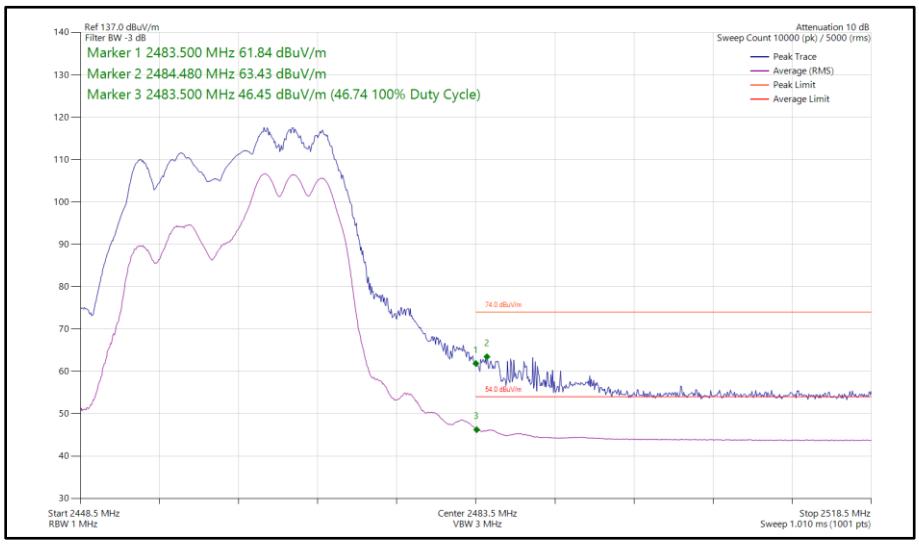

Figure 48 - 802.11ax HE20, RU 106-54, CDD, Core 0 - Core 1 - 2462 MHz Band Edge Frequency 2483.5 MHz

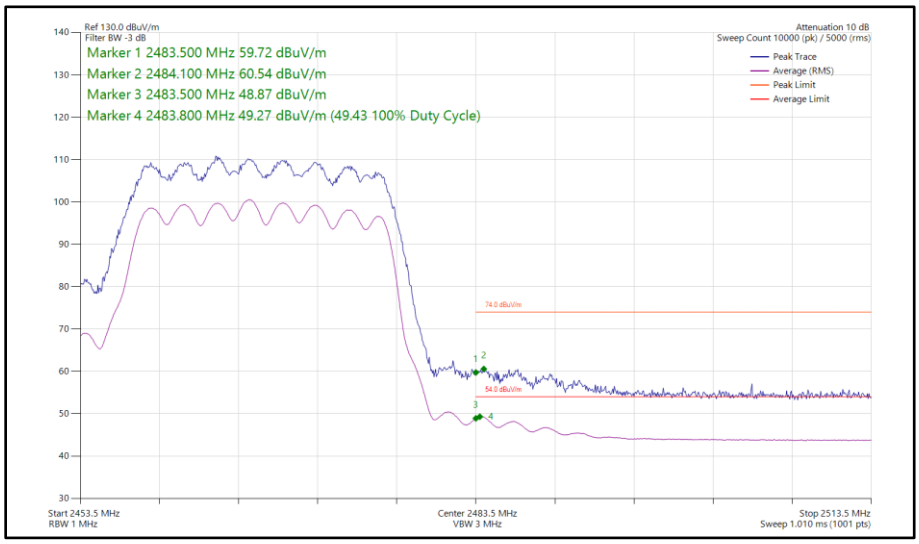

Figure 49 - 802.11ax HE20, SU, CDD, Core 0 - Core 1 - 2467 MHz Band Edge Frequency 2483.5 MHz

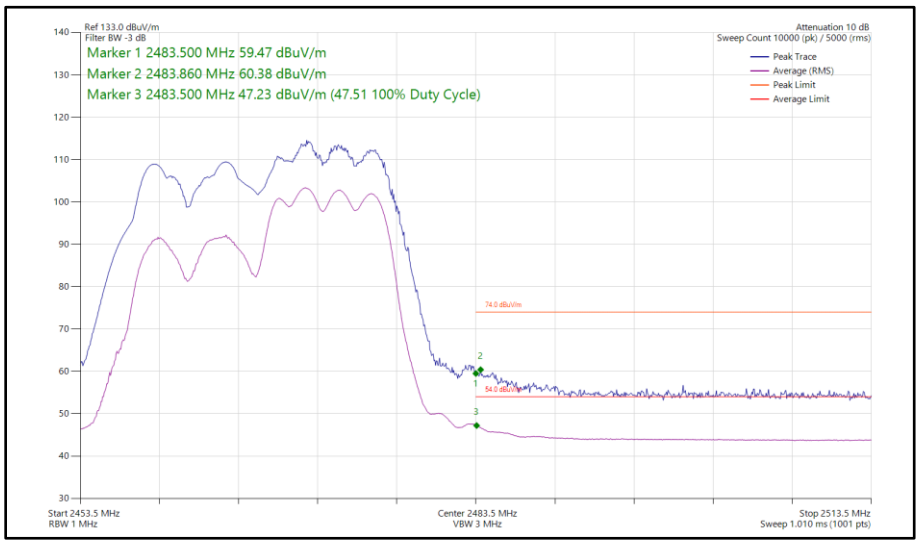

Figure 50 - 802.11ax HE20, RU 106-54, CDD, Core 0 - Core 1 - 2467 MHz Band Edge Frequency 2483.5 MHz

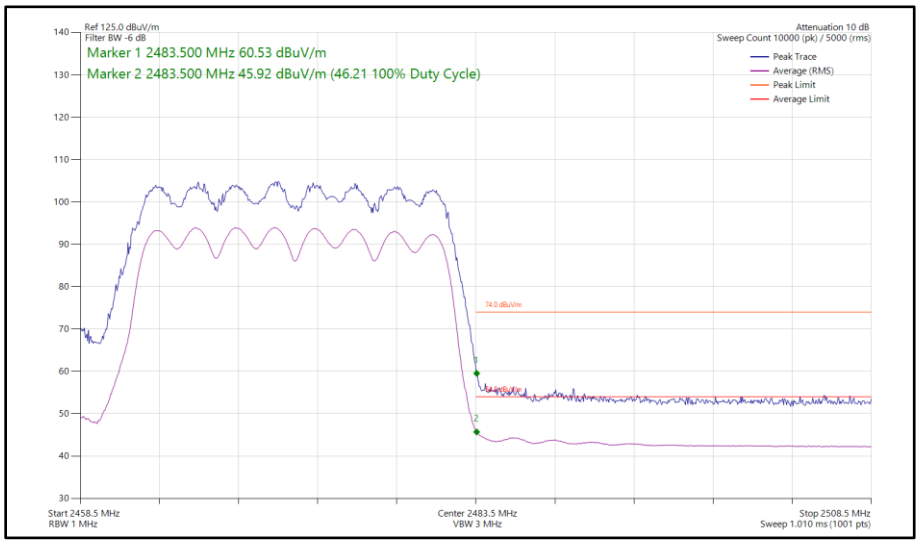

Figure 51 - 802.11ax HE20, SU, CDD, Core 0 - Core 1 - 2472 MHz Band Edge Frequency 2483.5 MHz

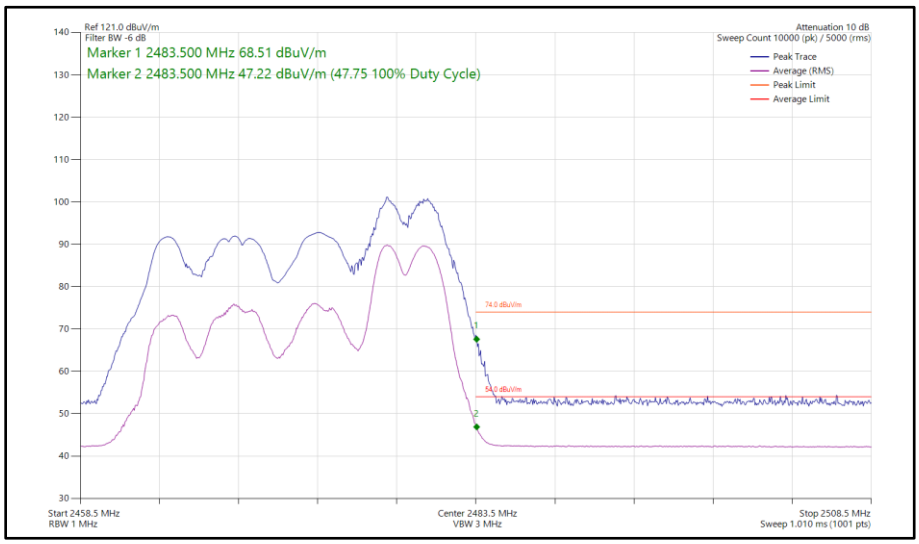

Figure 52 - 802.11ax HE20, RU 52-40, CDD, Core 0 - Core 1 - 2472 MHz Band Edge Frequency 2483.5 MHz

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 10

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 11

*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 and RF Chamber 17.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Expiry Date
Cable (18 GHz)	Rosenberger	LU7-071-1000	5102	12	21-Nov-2024
Emissions Software	TUV SUD	EmX V3.4.2	5125	-	Software
Test Receiver	Rohde & Schwarz	ESW44	5379	12	12-Dec-2024
Test Receiver	Rohde & Schwarz	ESW44	5914	12	24-May-2025
1500W (300V 12A) AC Power Supply	iTech	IT7324	5956	-	O/P Mon
5m Semi-Anechoic Chamber (Dual-Axis)	Albatross Projects	RF Chamber 14	5958	36	26-Apr-2025
Compact Antenna Mast	Maturo Gmbh	CAM4.0-P	5959	-	TU
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	6007	12	20-May-2025
Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA9120B	6141	12	05-May-2025
Digital Multimeter	Fluke	115	6145	12	06-Jun-2025
Humidity & Temperature meter	R.S Components	1364	6149	12	12-Aug-2025
SAC Switch Unit	TUV SUD	TUV_SSU_001	6190	12	22-Dec-2024
SAC Switch Unit	TUV SUD	TUV_SSU_004 PLC	6349	12	07-May-2025
Horn Antenna (1–10.5 GHz)	Schwarzbeck	BBHA 9120 B	6457	12	05-May-2025
AC Power Supply	iTech	IT7324	6657	-	O/P Mon
3m Semi-Anechoic Chamber	Albatross Projects	RF Chamber 17	6658	36	28-Jan-2026
Mast and Turntable Controller	Maturo Gmbh	FCU3.0	6659	-	TU
Tilt Antenna Mast	Maturo Gmbh	BAM4.5-P	6660	-	TU
Turntable	Maturo Gmbh	TT1.5SI	6661	-	TU
1m Cable	Junkosha	MWX241-01000AMSAMS/B	6741	12	01-Feb-2025
8m Cable	Junkosha	MWX221-08000AMSAMS/B	6748	12	01-Feb-2025
8M SMA Cable	Junkosha	MWX221-08000AMSAMS/B	6834	12	14-Aug-2025

Table 12

TU - Traceability Unscheduled
O/P Mon - Output Monitored using calibrated equipment

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

A3389, S/N: MGC29YC7F7 - Modification State 0

2.2.3 Date of Test

19-October-2024

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	21.5 °C
Relative Humidity	58.9 %

2.2.6 Test Results

2.4 GHz WLAN

SISO

Protocol	6 dB Bandwidth (MHz)	
	Minimum	Maximum
802.11b	8.640	9.120
802.11g	15.240	16.500
802.11n HT20	15.240	17.460
802.11ax HE20 SU	18.420	19.140

Table 13 - 6 dB Bandwidth Summary Results - SISO

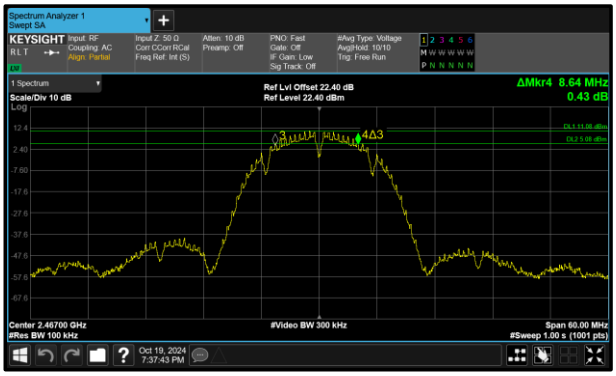

Figure 53 - 802.11b Minimum 6 dB EBW

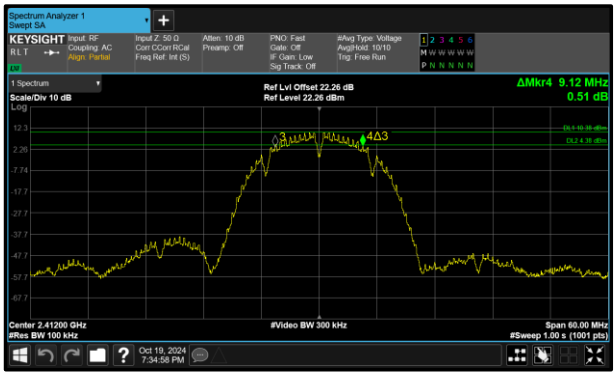

Figure 54 - 802.11b Maximum 6 dB EBW

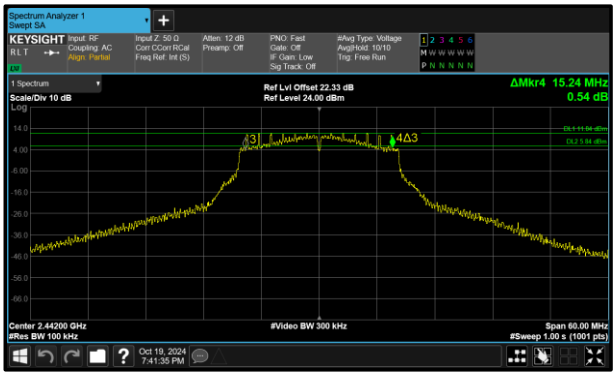

Figure 55 - 802.11g Minimum 6 dB EBW

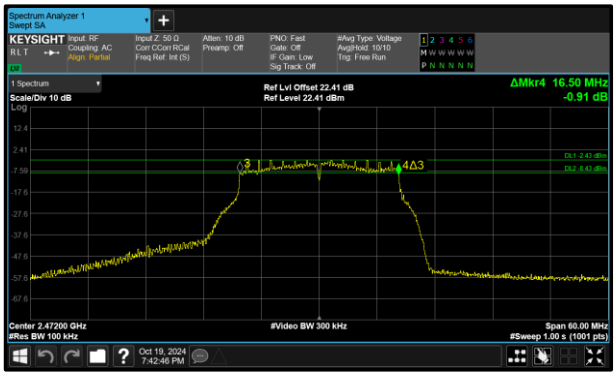

Figure 56 - 802.11g Maximum 6 dB EBW

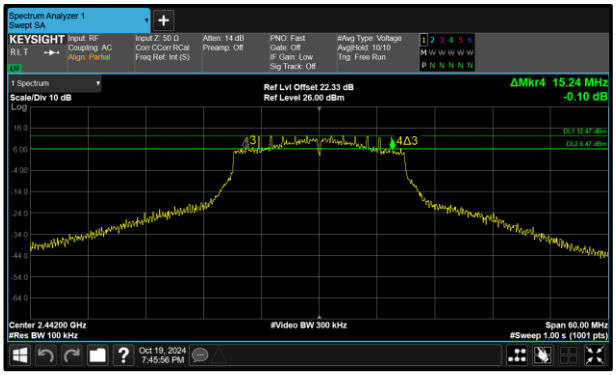

Figure 57 - 802.11n HT20 Minimum 6 dB EBW

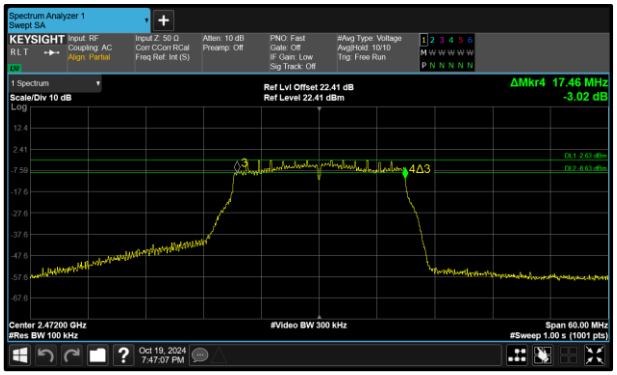

Figure 58 - 802.11n HT20 Maximum 6 dB EBW

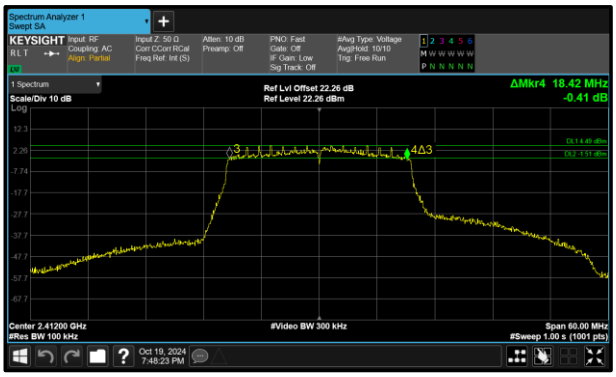

Figure 59 - 802.11ax HE20 SU Minimum 6 dB EBW

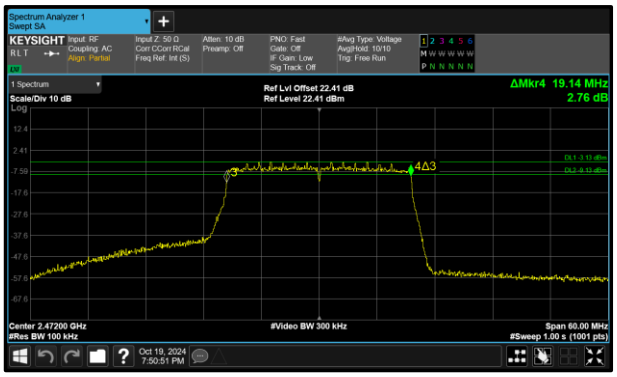

Figure 60 - 802.11ax HE20 SU Maximum 6 dB EBW

Protocol	99% Bandwidth (MHz)	
	Minimum	Maximum
802.11b	12.960	12.960
802.11g	16.440	16.620
802.11n HT20	17.580	17.700
802.11ax HE20 SU	18.960	19.020

Table 14 - 99% Bandwidth Summary Results - SISO

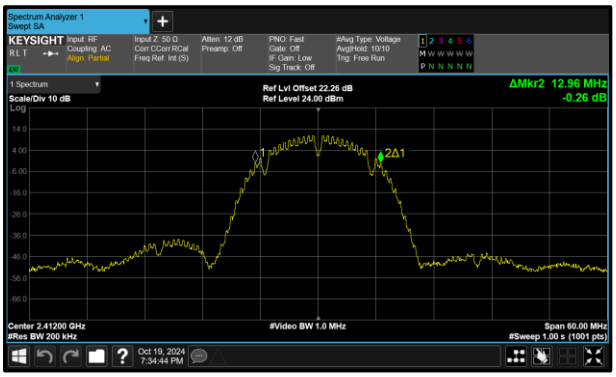

Figure 61 - 802.11b Minimum 99% OBW

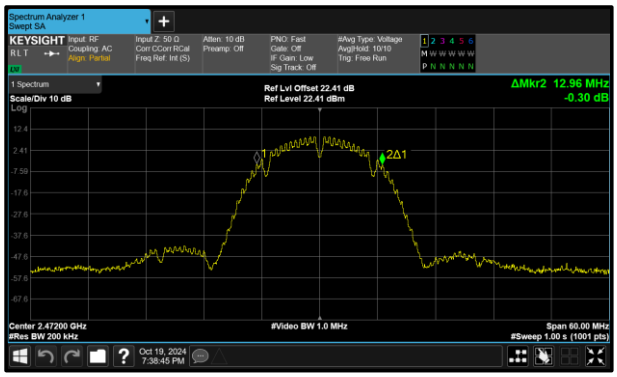

Figure 62 - 802.11b Maximum 99% OBW

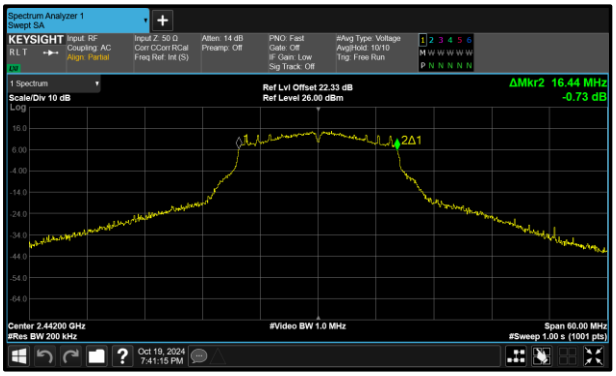

Figure 63 - 802.11g Minimum 99% OBW

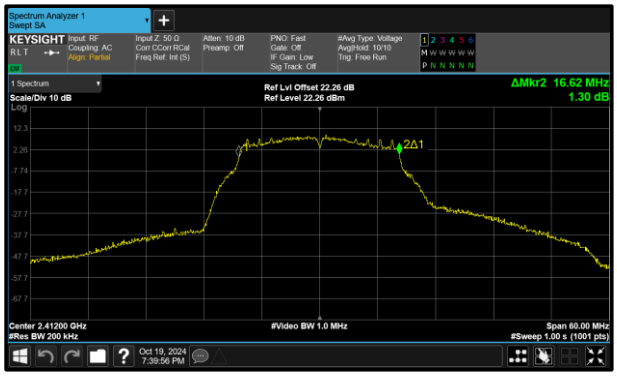

Figure 64 - 802.11g Maximum 99% OBW

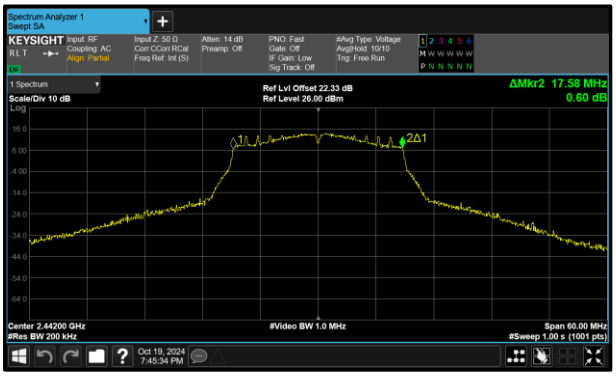

Figure 65 - 802.11n HT20 Minimum 99% OBW

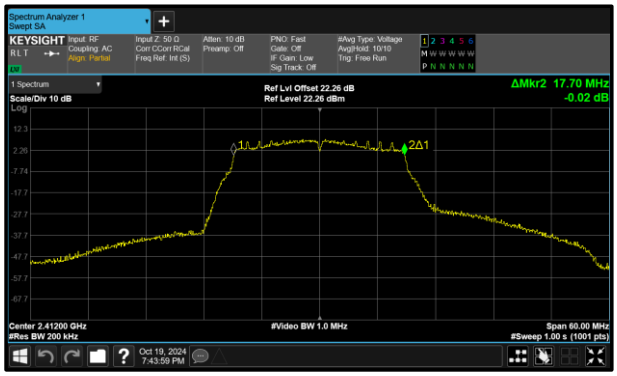

Figure 66 - 802.11n HT20 Maximum 99% OBW

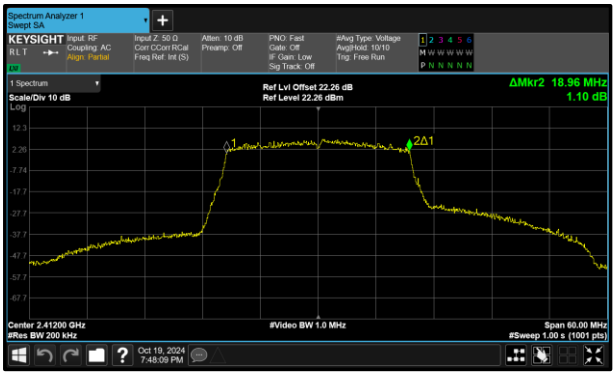

Figure 67 - 802.11ax HE20 SU Minimum 99% OBW

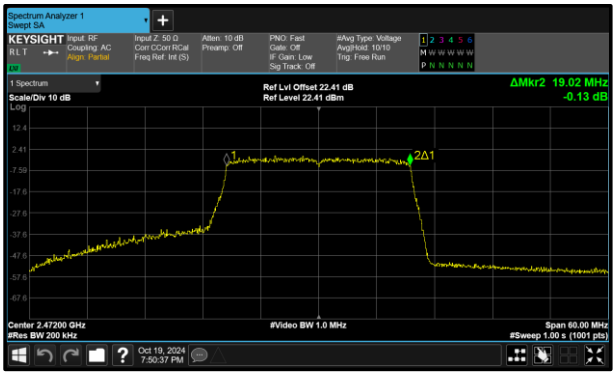

Figure 68 - 802.11ax HE20 SU Maximum 99% OBW