Report on the FCC and IC Testing of:
Frontier Smart Technologies Limited

Minuet 2 Module (FS5352) and Minuet 2 Voice Reference Platform (FS6626)

In accordance with FCC 47 CFR Part 15C, ISEDC RSS-247 and ISEDC RSS-GEN (WLAN /BLE)

Prepared for: Frontier Smart Technologies Limited
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UNITED KINGDOM

FCC ID: YYX-FS5352 IC: 11458A-FS5352

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SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Simon Bennett	Innovations Manager	Authorised Signatory	17 September 2019

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, ISEDC RSS-247 and ISEDC RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
George Porter	Test Engineer	Testing	
Graeme Lawler	Test Engineer	Testing	
Connor Lee	Test Engineer	Testing	
Nandhini Mathivanan	Test Engineer	Testing	
Matthew Dawkins	Test Engineer	Testing	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISEDC Accreditation
IC2932B-1 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: 2018, ISEDC RSS-247: Issue 2 (2017-02) and ISEDC RSS-GEN: Issue 5 Amd 1 (2019-03) for the tests detailed in section 1.3.

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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	17 September 2019

Table 1

1.2 Introduction

Applicant	Frontier Smart Technologies Limited
Manufacturer	Frontier Smart Technologies Limited
Model Number(s)	Minuet 2 Module FS5352 Minuet 2 Voice Reference Platform FS6626
Serial Number(s)	RAD113219 - Minuet 2 Module (FS5352) FCC Radiated Test Sample RAD113254 - Minuet 2 Module (FS5352) FCC Radiated Test Sample RAD113255 - Minuet 2 Module (FS5352) Conducted Test Sample RAD113239 - Minuet 2 Module (FS5352) Conducted Test Sample
Hardware Version(s)	Minuet 2 Module: Rev4 Minuet 2 Voice Reference Platform: ES1
Software Version(s)	NS2
Number of Samples Tested	4
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2018 ISEDC RSS-247: Issue 2 (2017-02) ISEDC RSS-GEN: Issue 5 Amd 1 (2019-03)
Order Number Date	FS190532 22-May-2019
Date of Receipt of EUT	11-June-2019, 14-June-2019 and 01-July-2019
Start of Test	11-June-2019
Finish of Test	21-July-2019
Name of Engineer(s)	George Porter, Graeme Lawler, Connor Lee, Matthew Dawkins and Nandhini Mathivanan
Related Document(s)	ANSI C63.10 (2013) 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, ISEDC RSS-247 and ISEDC 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 - 802.11b						
2.1	15.207	-	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.2	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)
2.7	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
Configuration and Mode: 2.4 GHz WLAN - 802.11g						
2.2	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15C	RSS-247	RSS-GEN			
Configuration and Mode: 2.4 GHz WLAN - 802.11n 20 MHz Bandwidth						
2.2	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)
2.7	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
Configuration and Mode: Bluetooth Low Energy						
2.2	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)
2.7	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r01

Table 2

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment)*	Minuet 2 is a module, which when installed in a consumer audio product enables high-quality audio streaming over Wi-Fi, Bluetooth and Ethernet, and can be activated via voice commands. Where appropriate the Minuet 2 module is tested in the Minuet 2 Voice Reference Platform.
Manufacturer:	Frontier Smart Technologies Limited
Model:	Minuet 2 module (FS5352)
Part Number:	Minuet 2 module: HA-FS5352-xxxxxx (where xxxxxxx denotes the customer variant e.g. HA-FS5352-000001)
Hardware Version:	Minuet 2 module: Rev4
Software Version:	NS2
FCC ID (if applicable)	YYX-FS5352
IC ID (if applicable)	11458A-FS5352

Intentional Radiators

Technology	Bluetooth	WLAN 2.4GHz	WLAN 5GHz	N/A	N/A	N/A
Frequency Band (MHz)	2400-2483.5	2402-2482	5150-5350, 5470-5825	N/A	N/A	N/A
Conducted Declared Output Power (dBm)	6.5	16.5	16.5	N/A	N/A	N/A
Antenna Gain (dBi)	2.3	2.3	2.2(5150-5250MHz) 3.5 (5250-5350 MHz) 4.6 (5470-5725 MHz) 3.1 (5725-5825 MHz)	N/A	N/A	N/A
Supported Bandwidth(s) (MHz)	1, 2	20	20,40, 80	N/A	N/A	N/A
Modulation Scheme(s)	GFSK, DQPSK, 8-DPSK	BPSK, QPSK, 16-QAM, 64-QAM	BPSK, QPSK, 16-QAM, 64-QAM	N/A	N/A	N/A
ITU Emission Designator	1M00D, 2M00D	20M00D	20M00D, 40M00D, 80M00D	N/A	N/A	N/A
Bottom Frequency (MHz)	2400	2412	5180	N/A	N/A	N/A
Middle Frequency (MHz)	2441	2437	5500	N/A	N/A	N/A
Top Frequency (MHz)	2480	2472	5825	N/A	N/A	N/A

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	5825 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	2402MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☑	

Class B Digital Device (Use in residential environment only) ☑

AC Power Source

AC supply frequency: 50 or 60 (Hz)	
100 - 240 V	Max current: 0.8 A
Single Phase ☑ Three Phase ☐	

DC Power Source

Nominal voltage: 5 V
Extreme upper voltage: 5.25 V
Extreme lower voltage: 4.75 V
Max current: 2 A

Battery Power Source

Voltage: 11.1 V
End-point voltage: 8.1 V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*
Other ☑ Please detail: Lithium-ion Polymer

Charging

Can the EUT transmit whilst being charged	Yes ☑ No ☐

Temperature

Minimum temperature: 0 °C	Maximum temperature: 70 °C

Antenna Characteristics

Antenna connector ☑ State impedance 50 Ohm
Temporary antenna connector ☐ State impedance N/A Ohm
Integral antenna ☐ Type N/A State Gain N/A dBi
External antenna ☑ Type PCB antenna State impedance 50 Ohm

Ancillaries (if applicable)

Manufacturer: Southstar	Part Number: N12-2128-R0A
Model: SW700M（SW750M)	Country of Origin: China

I hereby declare that the information supplied is correct and complete.

Name: Abdul Wahed Dewan
Position held: Principal RF Engineer
Date: 29/08/2019

1.5 Product Information

1.5.1 Technical Description

Minuet 2 is a module, which when installed in a consumer audio product enables high-quality audio streaming over Wi-Fi, Bluetooth and Ethernet, and can be activated via voice commands. Where appropriate the Minuet 2 module is tested in the Minuet 2 Voice Reference Platform.

1.6 Test Set up Diagrams

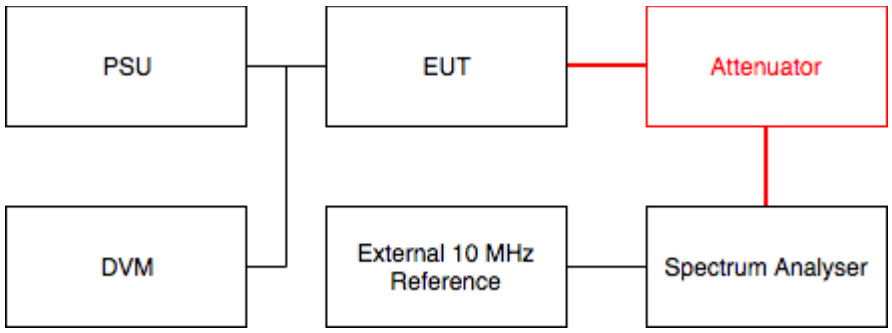
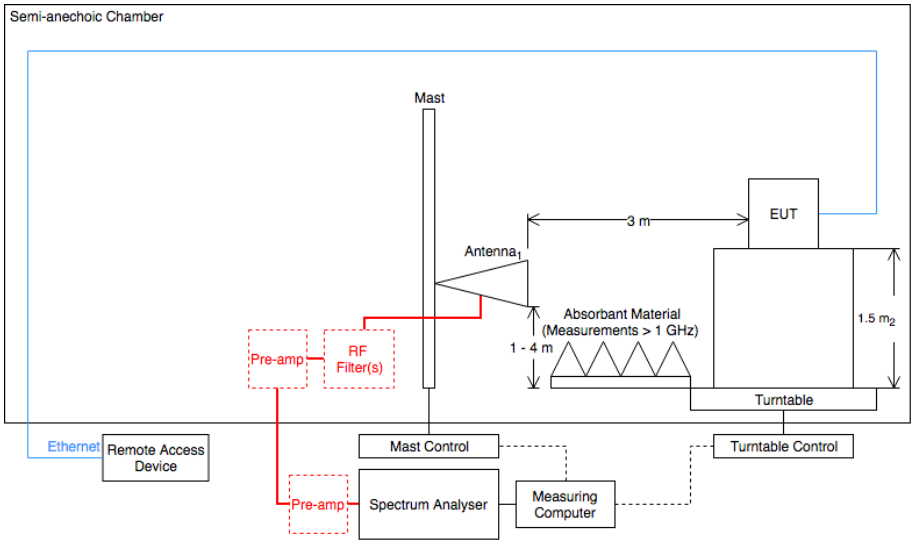


Figure 1 - Conducted Lab Testing



1 Antenna is boresighted for measurements < 1 GHz.
2 Height from the EUT to ground is 0.8 m for measurements < 1 GHz.

Figure 2- Radiated Emissions Test Setup Diagram

1.7 Deviations from the Standard

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

1.8 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
Serial Number: RAD113255			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: RAD113219			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: RAD113254			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: RAD113239			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.9 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 WLAN - 802.11b		
AC Power Line Conducted Emissions	Graeme Lawler	UKAS
Emission Bandwidth	George Porter	UKAS
Maximum Conducted Output Power	George Porter	UKAS
Restricted Band Edges	Connor Lee	UKAS
Authorised Band Edges	Connor Lee and Matthew Dawkins	UKAS
Spurious Radiated Emissions	Graeme Lawler	UKAS
Power Spectral Density	George Porter	UKAS
Configuration and Mode: 2.4 GHz WLAN - 802.11g		
Emission Bandwidth	George Porter	UKAS
Maximum Conducted Output Power	George Porter	UKAS
Restricted Band Edges	Connor Lee	UKAS
Authorised Band Edges	Connor Lee and Matthew Dawkins	UKAS
Power Spectral Density	George Porter	UKAS
Configuration and Mode: 2.4 GHz WLAN - 802.11n 20 MHz Bandwidth		
Emission Bandwidth	George Porter	UKAS
Maximum Conducted Output Power	George Porter	UKAS
Restricted Band Edges	Connor Lee	UKAS
Authorised Band Edges	Connor Lee and Matthew Dawkins	UKAS
Spurious Radiated Emissions	Graeme Lawler	UKAS
Power Spectral Density	George Porter	UKAS
Configuration and Mode: Bluetooth Low Energy		
Restricted Band Edges	Graeme Lawler	UKAS
Maximum Conducted Output Power	Nandhini Mathivanan	UKAS
Power Spectral Density	Nandhini Mathivanan	UKAS
Emission Bandwidth	Nandhini Mathivanan	UKAS
Authorised Band Edges	Graeme Lawler	UKAS
Spurious Radiated Emissions	Graeme Lawler	UKAS

Table 4

Office Address:

Octagon House
Concorde Way, Segensworth North
Fareham, Hampshire, PO15 5RL
United Kingdom

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.207
ISEDC RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113219 - Modification State 0

2.1.3 Date of Test

21-July-2019

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

2.1.5 Environmental Conditions

Ambient Temperature	17.3 °C
Relative Humidity	76.5 %

2.1.6 Test Results

2.4 GHz WLAN - 802.11b

Applied supply voltage: 120V
Applied supply frequency: 60 Hz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.168	41.8	65.1	-23.2	28.2	55.1	26.8
4.907	31.1	56.0	-24.9	23.2	46.0	22.8

Table 5 - Live Line Emissions Results

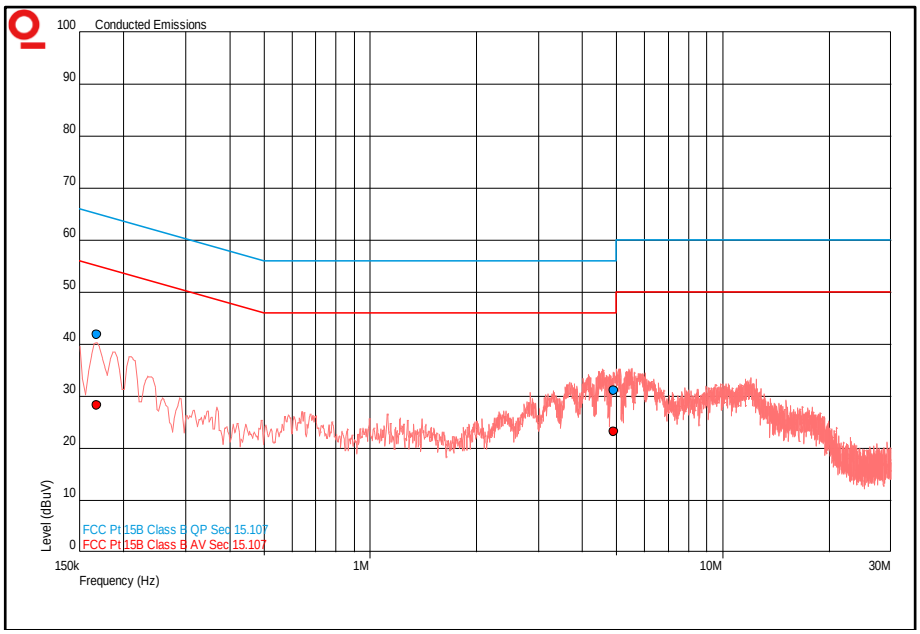


Figure 3 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.658	32.6	56.0	-23.4	24.6	46.0	21.4
4.925	32.3	56.0	-23.7	24.5	46.0	21.5

Table 6 – Neutral Line Emissions Results

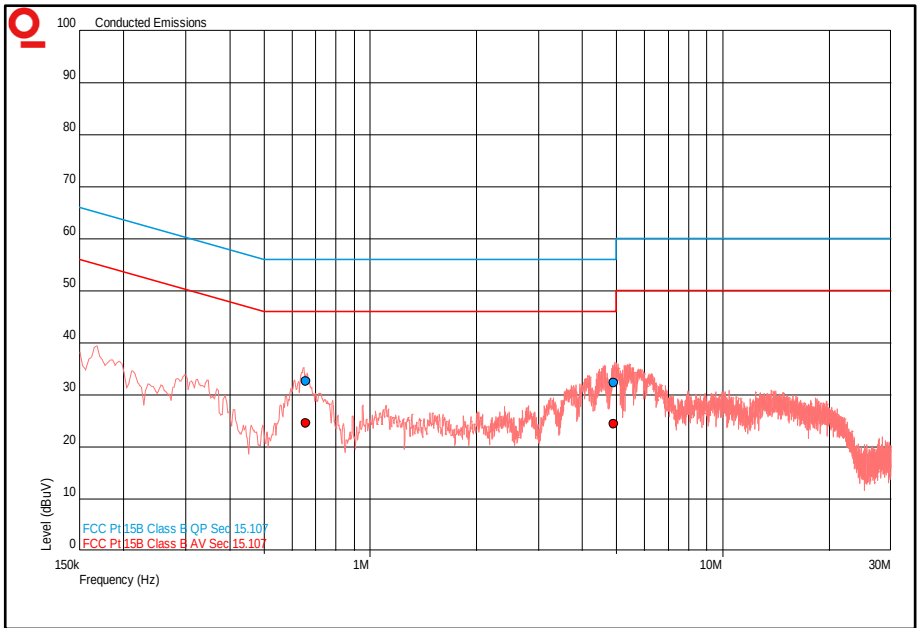


Figure 4 - Neutral Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and ISEDC RSS-GEN Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 7

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Transient Limiter	Hewlett Packard	11947A	15	12	26-Jul-2019
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	20-Nov-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Hygromer	Rotronic	A1	2677	12	20-Feb-2020
Digital Multimeter	Iso-tech	IDM-101	2895	12	04-Oct-2019
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019

Table 8

2.2 Maximum Conducted Output Power

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)
ISEDC RSS-247, Clause 5.4
ISEDC RSS-GEN, Clause 6.12

2.2.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113255 - Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113239 - Modification State 0

2.2.3 Date of Test

24-June-2019 to 18-July-2019

2.2.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.9.1.1.

2.2.5 Environmental Conditions

Ambient Temperature	21.7 - 22.9 °C
Relative Humidity	48.1 - 65.8 %

2.2.6 Test Results

2.4 GHz WLAN - 802.11b

Testing was performed on the Data Rate with the highest conducted output power. This Data Rate was 2 Mbps.

Port	Output Power (dBm)		
	2412 MHz	2437 MHz	2462 MHz
1	14.72	14.70	14.94
2	14.54	14.65	14.88

Table 9

2.4 GHz WLAN - 802.11g

Testing was performed on the Data Rate with the highest conducted output power. This Data Rate was 54 Mbps.

Port	Output Power (dBm)		
	2412 MHz	2437 MHz	2462 MHz
1	14.70	14.72	14.99
2	14.57	14.78	14.47

Table 10

2.4 GHz WLAN - 802.11n 20 MHz Bandwidth

Testing was performed on the Modulation Coding Scheme with the highest conducted output power. This Modulation Coding Scheme was MCS7.

Port	Output Power (dBm)		
	2412 MHz	2437 MHz	2462 MHz
1	14.80	14.81	15.13
2	14.80	14.93	14.47
MIMO – Port 1 + 2	17.75	17.73	17.56

Table 11

Bluetooth Low Energy

Frequency (MHz)	Output Power	
	dBm	mW
2402	6.32	4.285
2440	6.02	3.399
2480	5.56	3.597

Table 12

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

ISEDC RSS-247, Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Dual Power Supply Unit	Hewlett Packard	6253A	271	-	O/P Mon
Power Divider	Weinschel	1506A	603	12	23-Apr-2020
Hygrometer	Rotronic	I-1000	3220	12	13-Sep-2019
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4101	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	22-Oct-2019
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	15-Oct-2019
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-Feb-2020
EXA	Keysight Technologies	N9010B	4968	24	21-Dec-2019
Cable (18 GHz)	Rosenberger	LU7-071-1000	5097	12	04-Oct-2019
Cable (18GHz SMA 1m)	Rosenberger	LU7-071-1000	5164	12	06-Dec-2019
USB Power Sensor	Boonton	RTP5006	5184	12	12-Dec-2019
Attenuator 10 dB 2W	Telegartner	01156A0031	N/S	-	O/P Mon

Table 13

O/P Mon – Output Monitored using calibrated equipment

2.3 Power Spectral Density

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
ISEDC RSS-247, Clause 5.2
ISEDC RSS-GEN, Clause 6.12

2.3.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113239 - Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113255 - Modification State 0

2.3.3 Date of Test

24-June-2019 to 18-July-2019

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.2.

2.3.5 Environmental Conditions

Ambient Temperature	21.7 - 22.9 °C
Relative Humidity	48.1 - 65.8 %

2.3.6 Test Results

2.4 GHz WLAN - 802.11b

Data Rate: 2 Mbps

Antenna Port	Power Spectral Density (dBm/MHz)		
	2412 MHz	2437 MHz	2462 MHz
1	-7.56	-7.60	-7.83
2	-7.93	-7.85	-7.08

Table 14 - Power Spectral Density

2.4 GHz WLAN - 802.11g

Data Rate: 54 Mbps

Antenna Port	Power Spectral Density (dBm/MHz)		
	2412 MHz	2437 MHz	2462 MHz
1	-8.49	-7.98	-8.23
2	-8.05	-7.10	-9.88

Table 15 - Power Spectral Density

2.4 GHz WLAN - 802.11n 20 MHz Bandwidth

Modulation Coding Scheme: MCS7

Antenna Port	Power Spectral Density (dBm/MHz)		
	2412 MHz	2437 MHz	2462 MHz
1	-7.48	-7.80	-6.78
2	-6.96	-7.21	-10.98
MIMO – Port 1 + 2	-7.06	-7.34	-7.54

Table 16 - Power Spectral Density

Bluetooth Low Energy

Modulation/Packet Type: GFSK/DH1

Frequency (MHz)	Power Spectral Density (dBm/MHz)
2440	5.66
2480	5.16
2402	5.94

Table 17 - Power Spectral Density

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISEDC RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Dual Power Supply Unit	Hewlett Packard	6253A	271	-	O/P Mon
Power Divider	Weinschel	1506A	603	12	23-Apr-2020
Hygrometer	Rotronic	I-1000	3220	12	13-Sep-2019
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4101	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	22-Oct-2019
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	15-Oct-2019
RadiPower USB RF power sensor	DARE!! Instruments	RPR3006W	4466	12	10-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-Feb-2020
EXA	Keysight Technologies	N9010B	4968	24	21-Dec-2019
Cable (18 GHz)	Rosenberger	LU7-071-1000	5097	12	04-Oct-2019
USB Power Sensor	Boonton	RTP5006	5184	12	12-Dec-2019
Attenuator 10 dB 2W	Telegartner	01156A0031	N/S	-	O/P Mon

Table 18

O/P Mon – Output Monitored using calibrated equipment

2.4 Emission Bandwidth

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113239 - Modification State 0
Minuet 2 Module (FS5352), S/N: RAD113255 - Modification State 0

2.4.3 Date of Test

24-June-2019 to 18-July-2019

2.4.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.8.1

2.4.5 Environmental Conditions

Ambient Temperature	21.7 - 22.9 °C
Relative Humidity	48.1 - 65.8 %

2.4.6 Test Results

2.4 GHz WLAN - 802.11b

Data Rate: 2 Mbps

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	10.020	13.468
2437	10.140	13.454
2462	10.080	13.417

Table 19 – Antenna Port 1

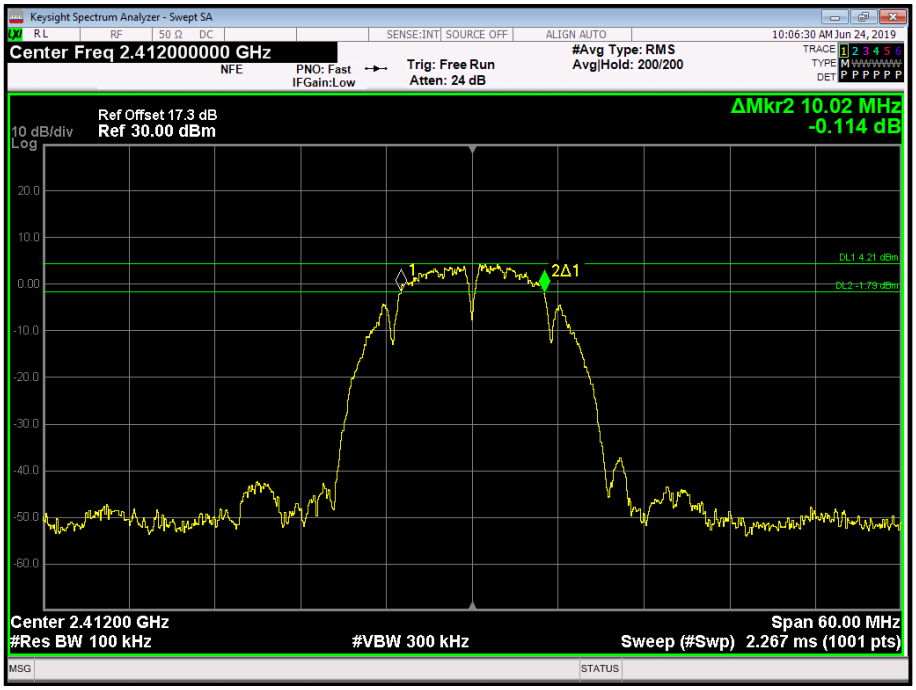


Figure 5 - 2412 MHz – 6 dB Bandwidth – Antenna Port 1

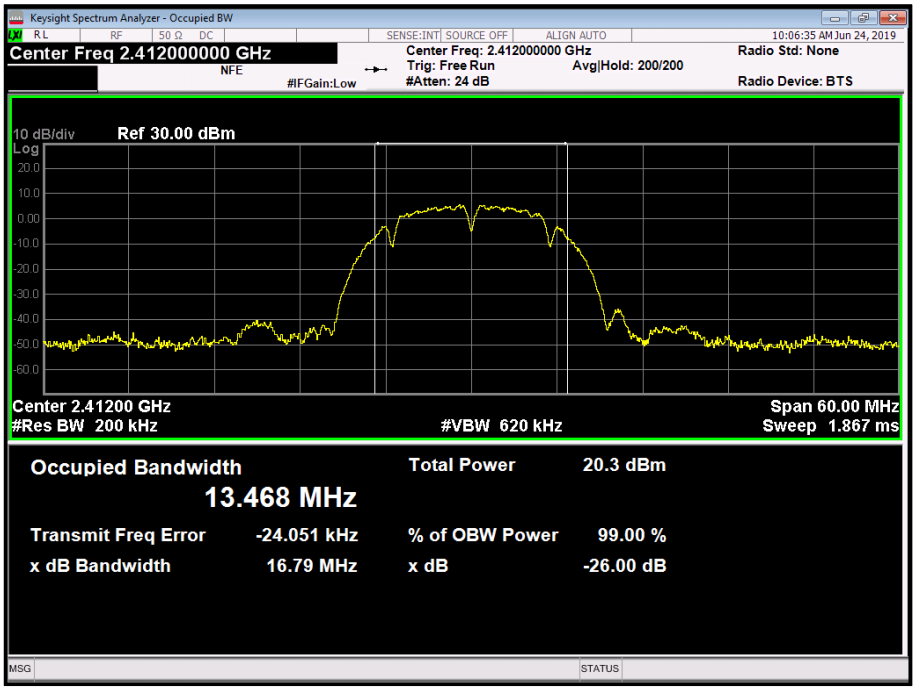


Figure 6 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 1

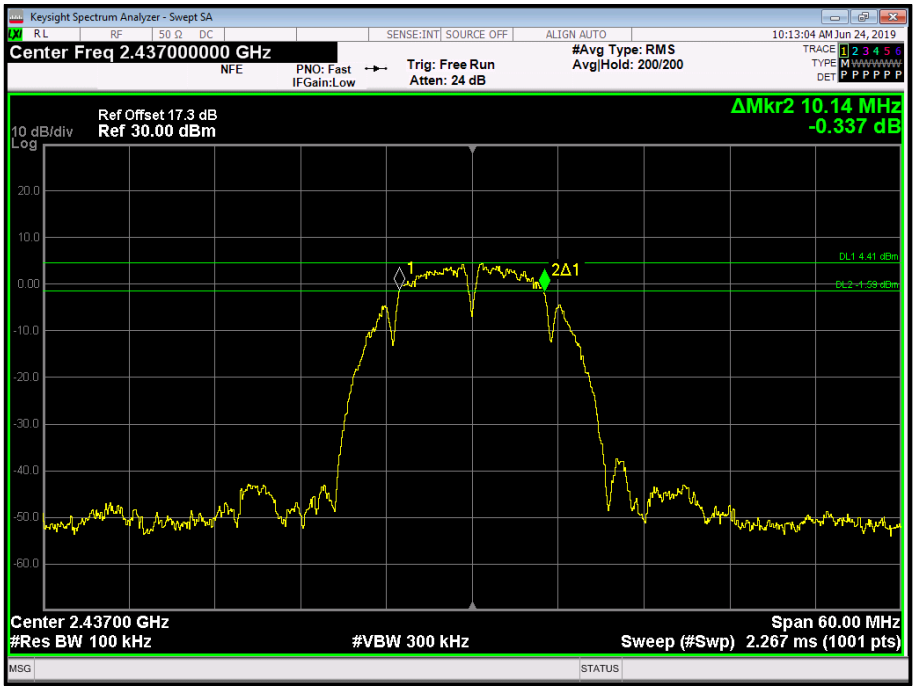


Figure 7 - 2437 MHz – 6 dB Bandwidth – Antenna Port 1

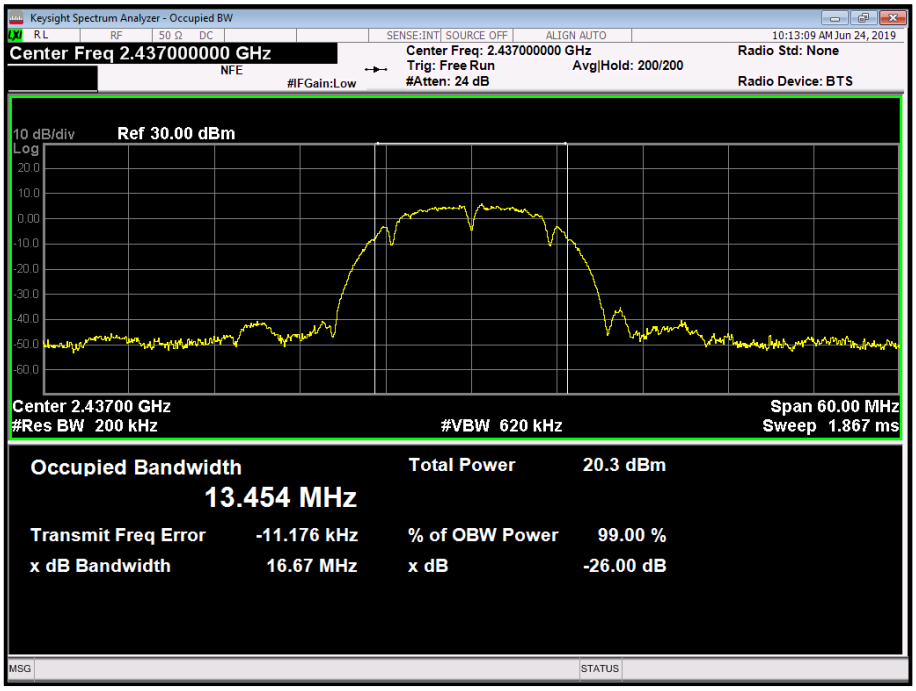


Figure 8 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 1

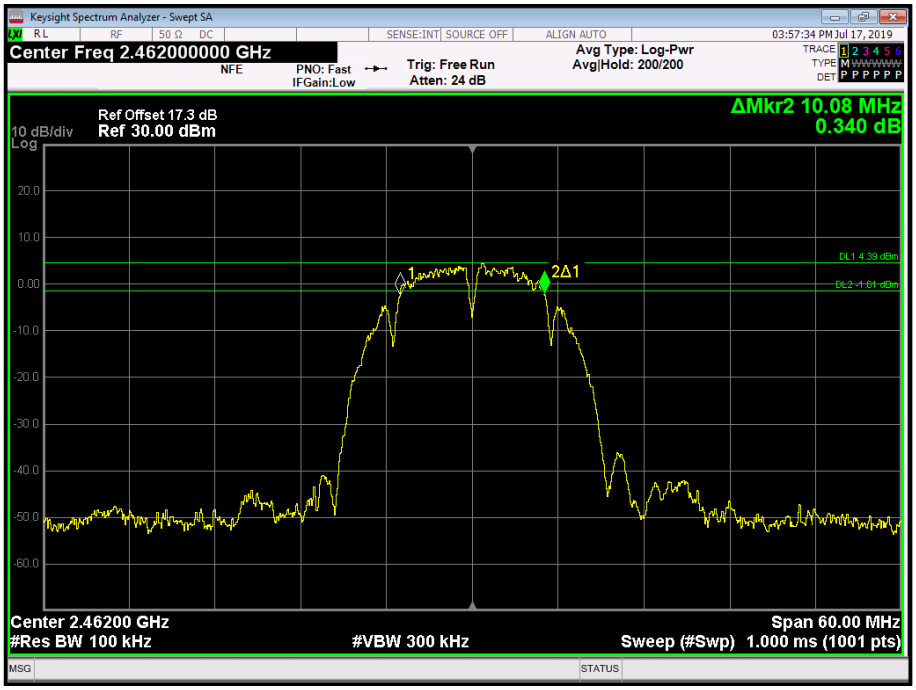


Figure 9 - 2462 MHz – 6 dB Bandwidth – Antenna Port 1

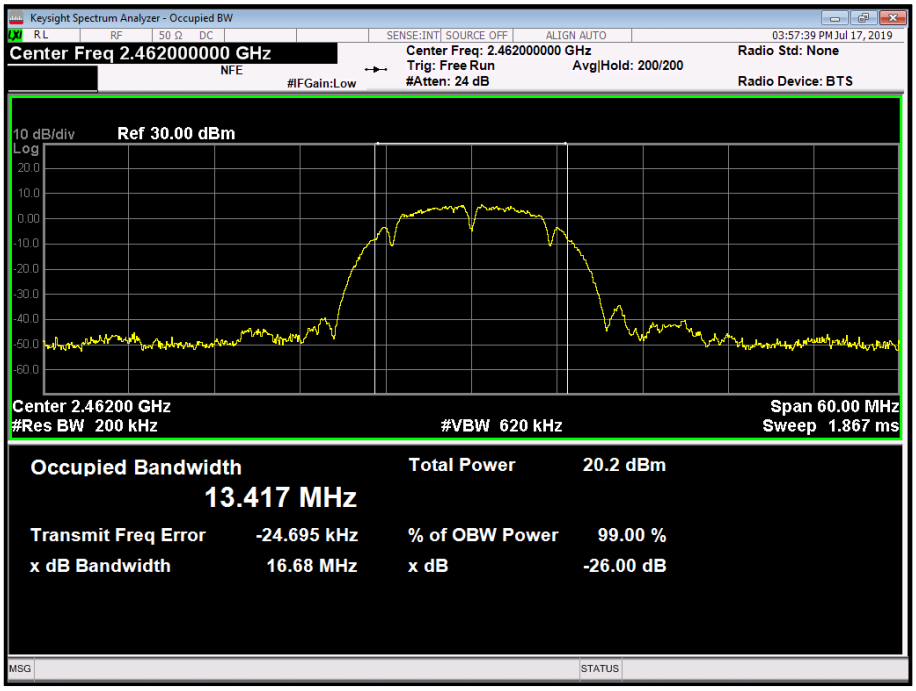


Figure 10 - 2462 MHz - 99% Occupied Bandwidth – Antenna Port 1

2.4 GHz WLAN - 802.11b

Data Rate: 2 Mbps

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	10.020	13.456
2437	10.200	13.429
2462	9.900	13.472

Table 20 – Antenna Port 2

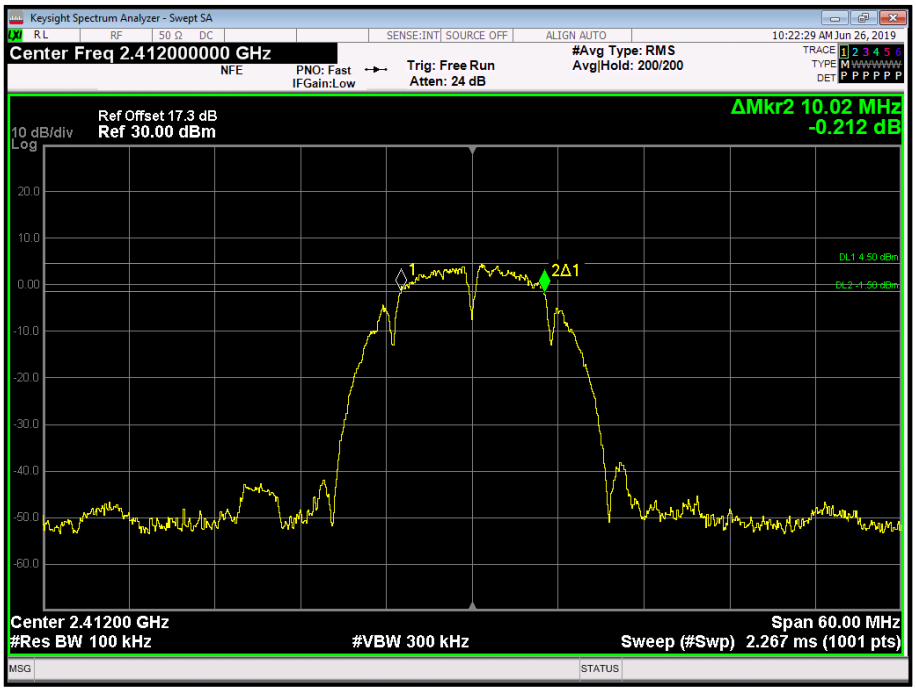


Figure 11 - 2412 MHz – 6 dB Bandwidth – Antenna Port 2

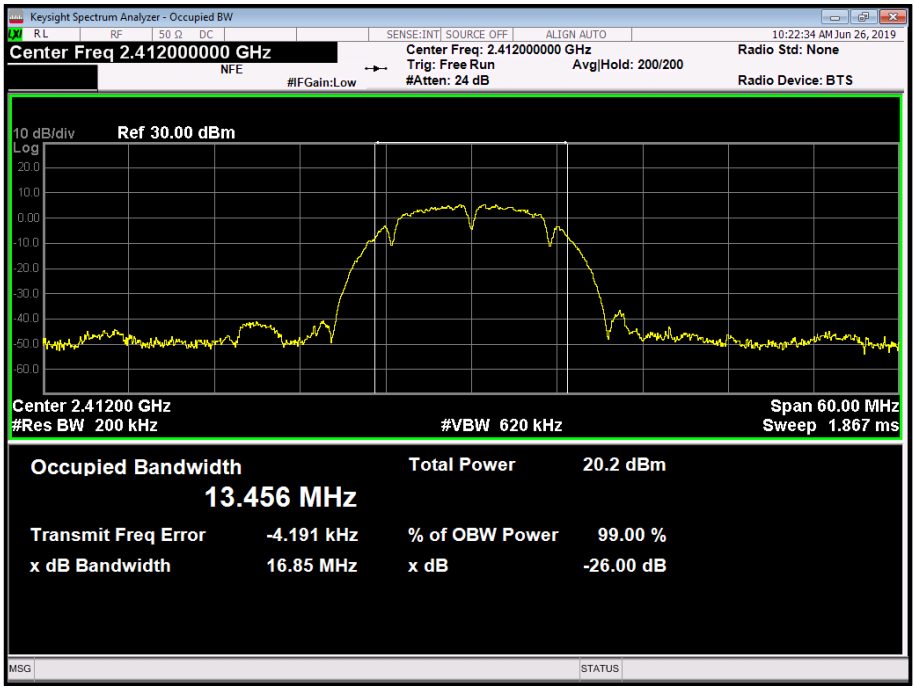


Figure 12 - 2412 MHz – 99% Occupied Bandwidth - Antenna Port 2

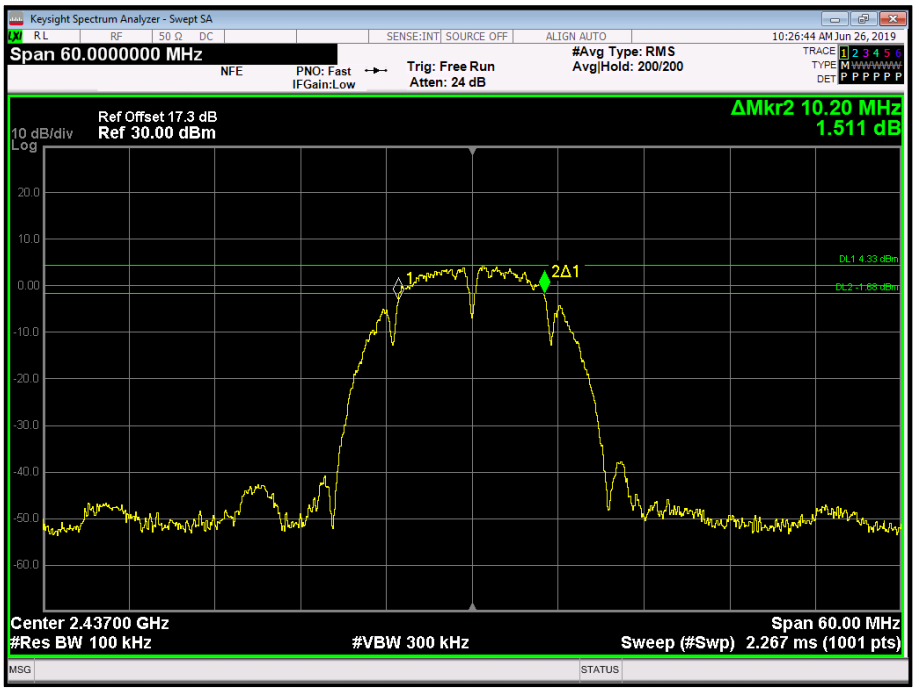


Figure 13 - 2437 MHz – 6 dB Bandwidth – Antenna Port 2

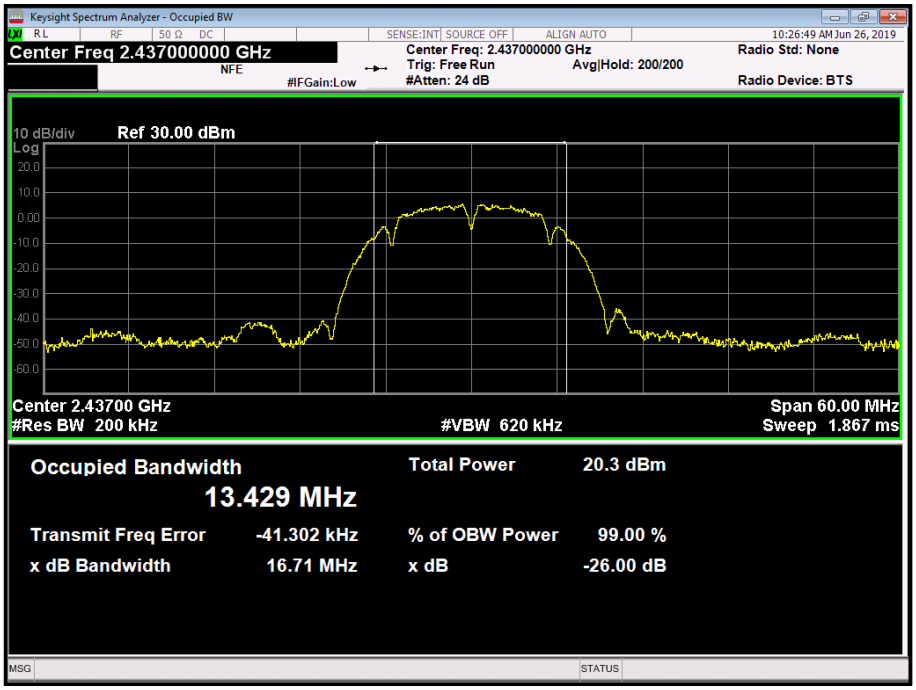


Figure 14 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 2

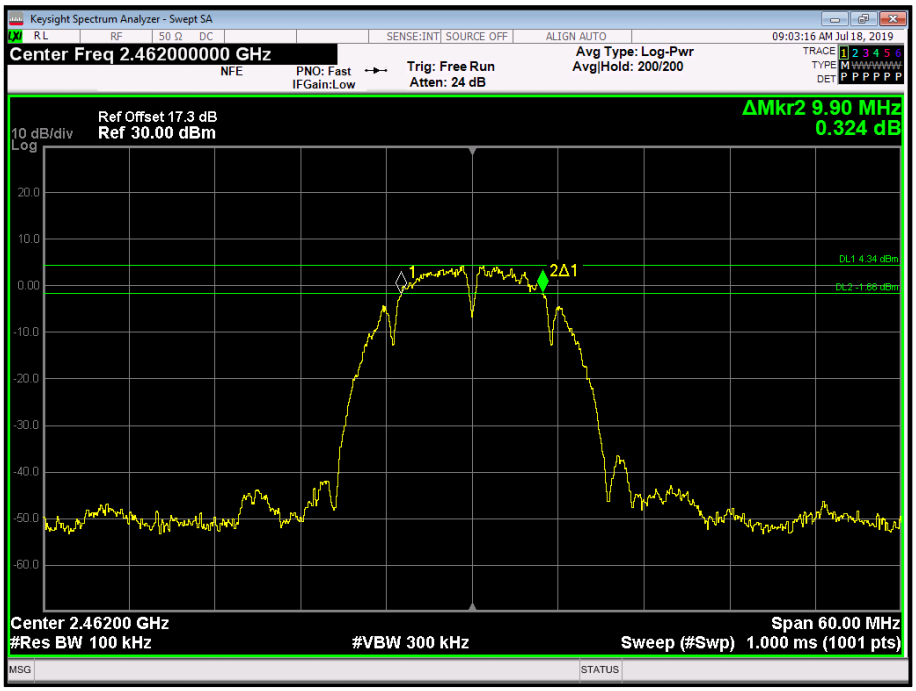


Figure 15 - 2462 MHz – 6 dB Bandwidth – Antenna Port 2

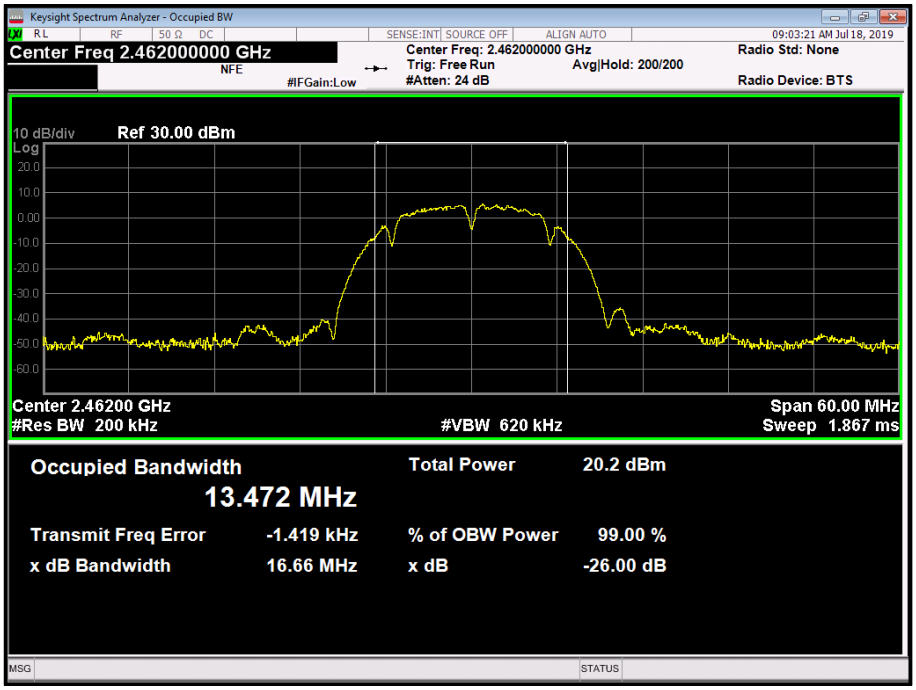


Figure 16 - 2462 MHz - 99% Occupied Bandwidth – Antenna Port 2

2.4 GHz WLAN - 802.11g

Data Rate: 54 Mbps

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	16.560	16.507
2437	16.560	16.522
2462	16.560	16.520

Table 21 – Antenna Port 1

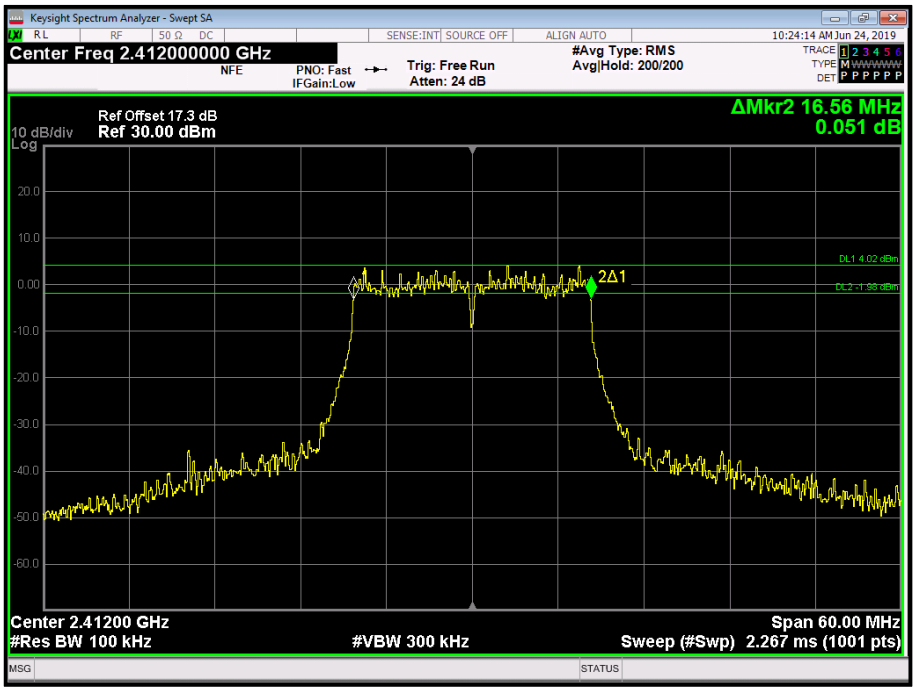


Figure 17 - 2412 MHz – 6 dB Bandwidth – Antenna Port 1

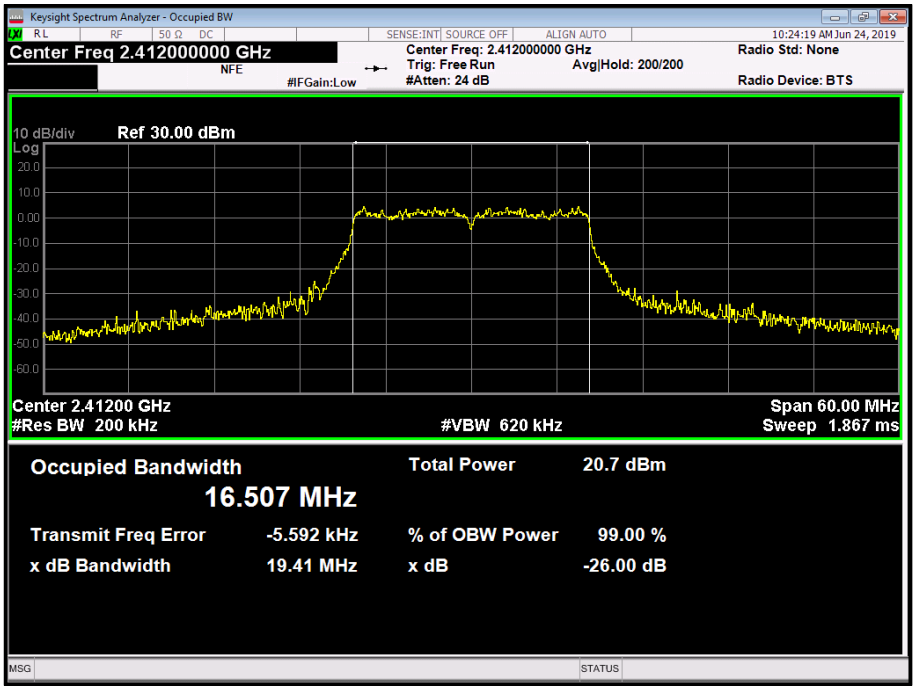


Figure 18 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 1

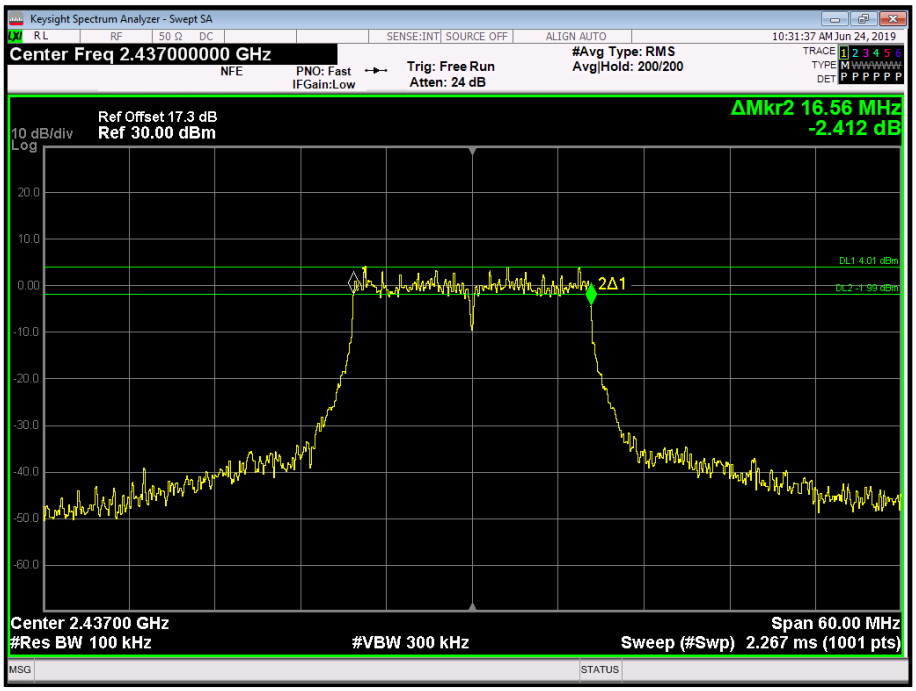


Figure 19 - 2437 MHz – 6 dB Bandwidth – Antenna Port 1

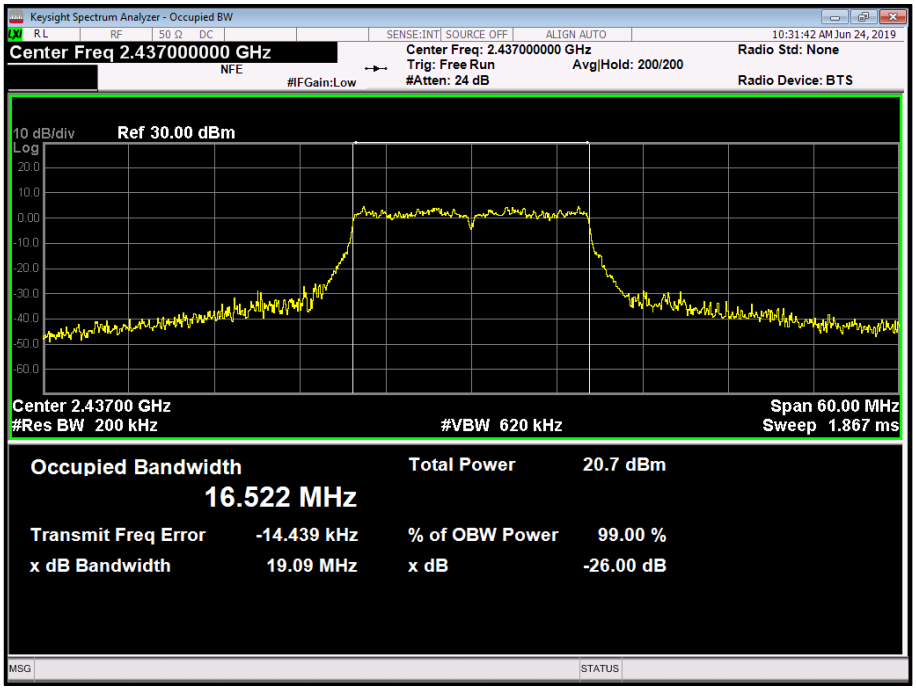


Figure 20 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 1

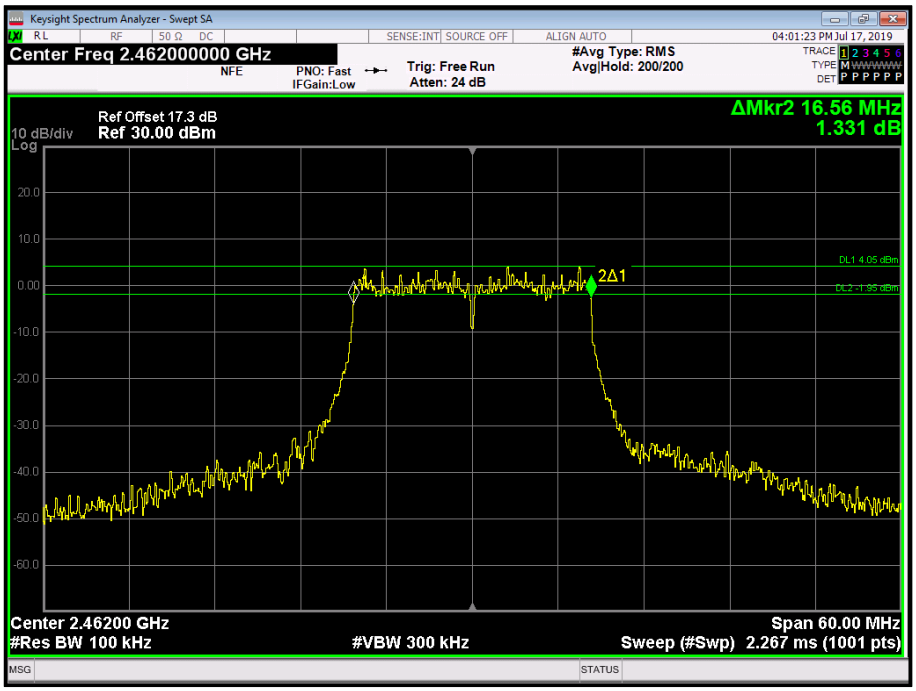


Figure 21 - 2462 MHz – 6 dB Bandwidth – Antenna Port 1

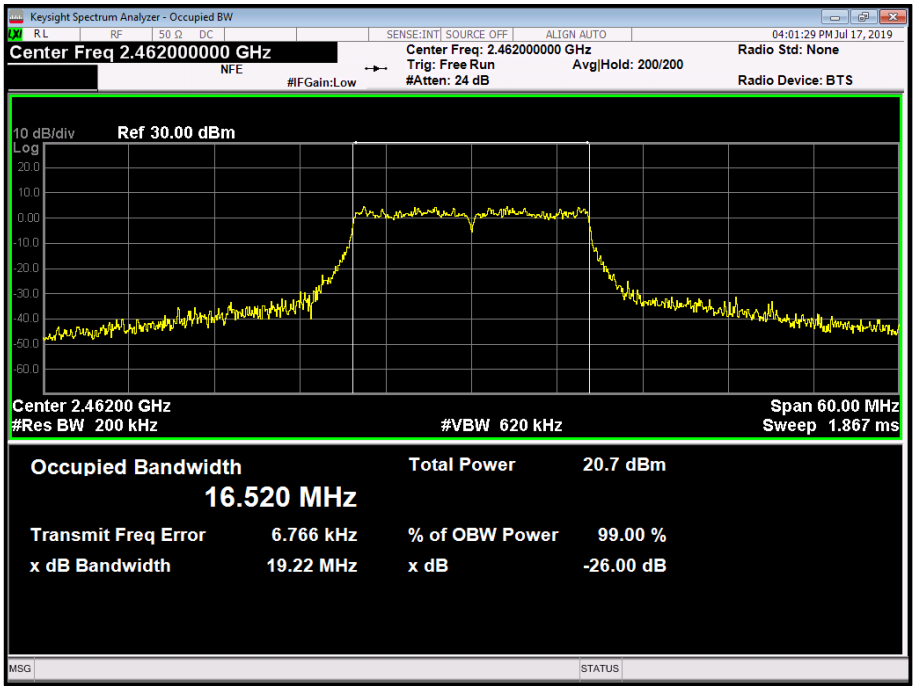


Figure 22 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 1

2.4 GHz WLAN - 802.11g

Data Rate: 54 Mbps

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	16.500	16.534
2437	16.560	16.529
2462	17.640	17.692

Table 22 – Antenna Port 2

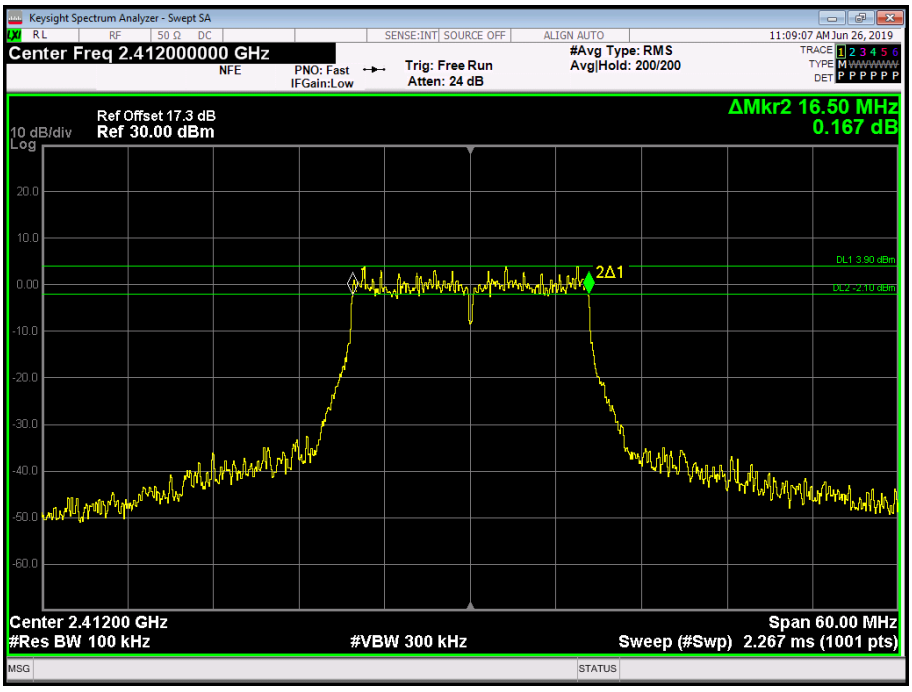


Figure 23 - 2412 MHz – 6 dB Bandwidth – Antenna Port 2

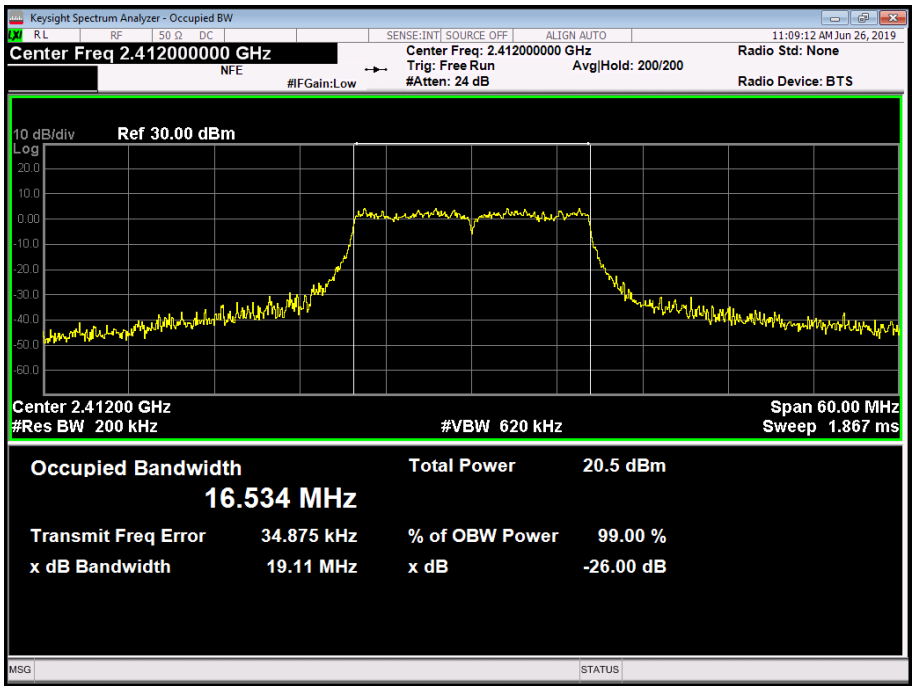


Figure 24 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 2

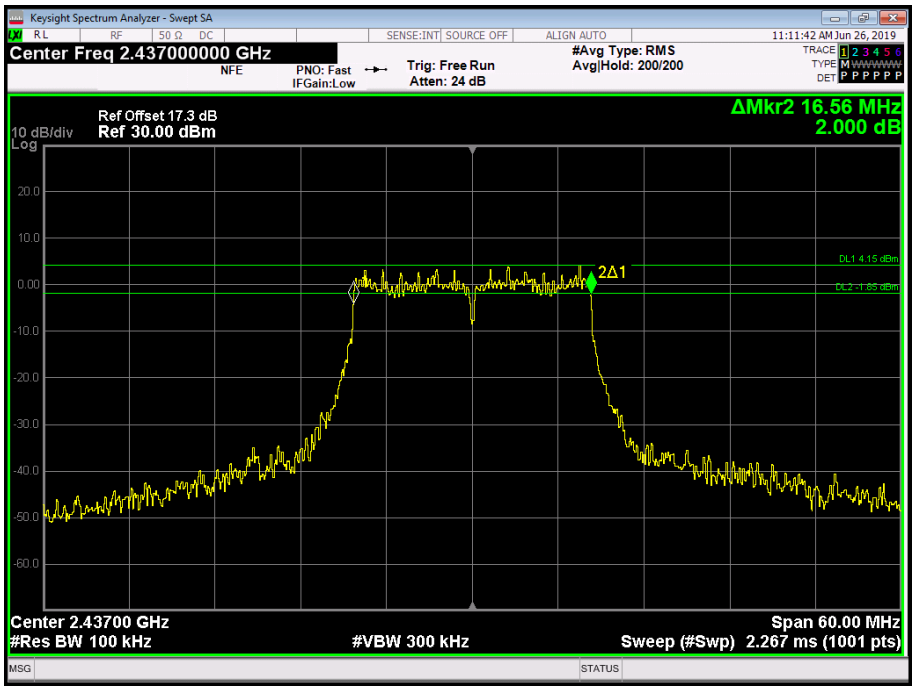


Figure 25 - 2437 MHz – 6 dB Bandwidth – Antenna Port 2

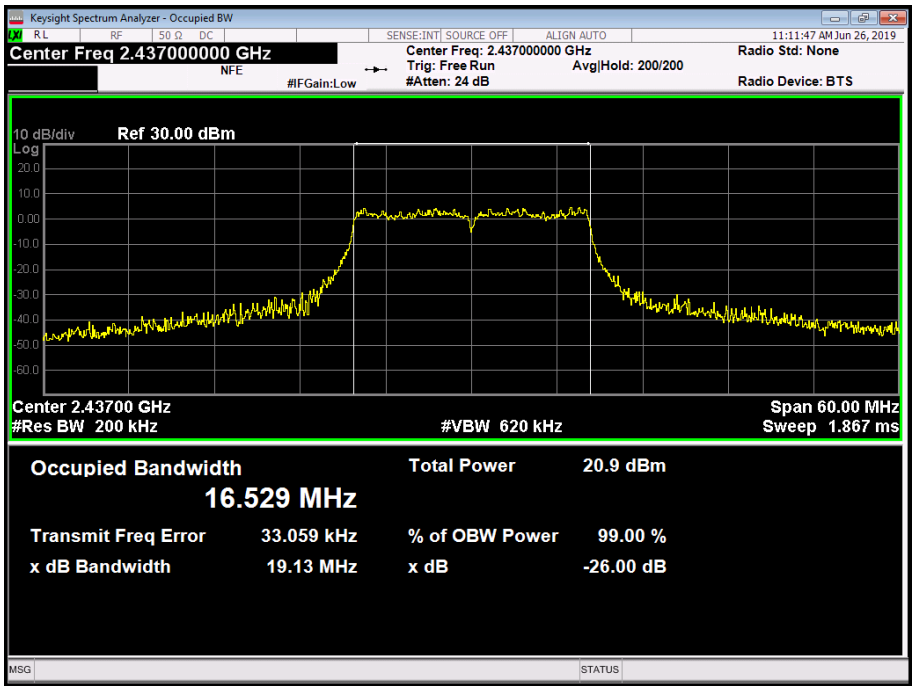


Figure 26 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 2

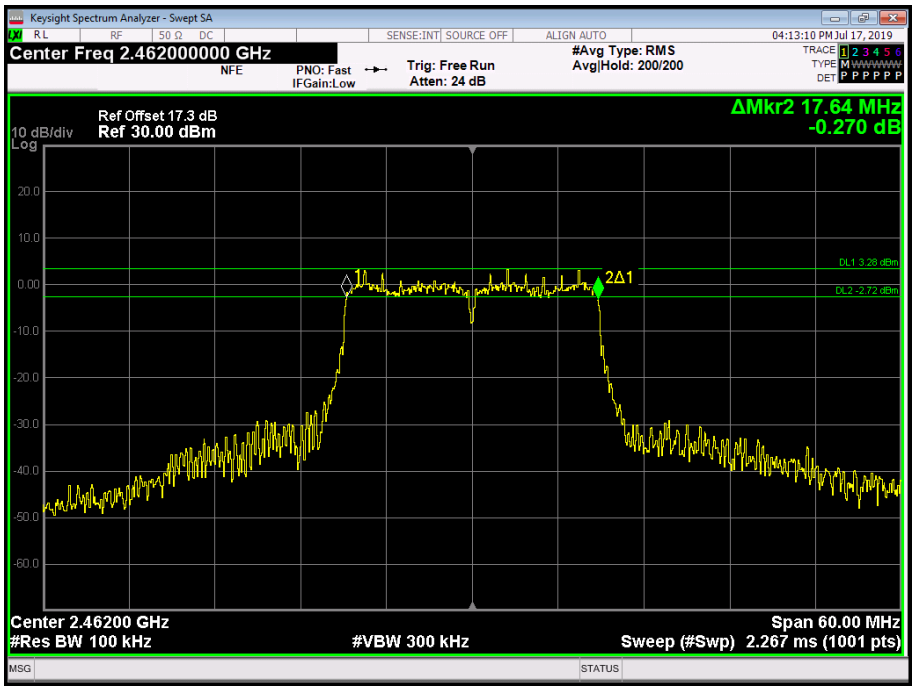


Figure 27 - 2462 MHz – 6 dB Bandwidth – Antenna Port 2

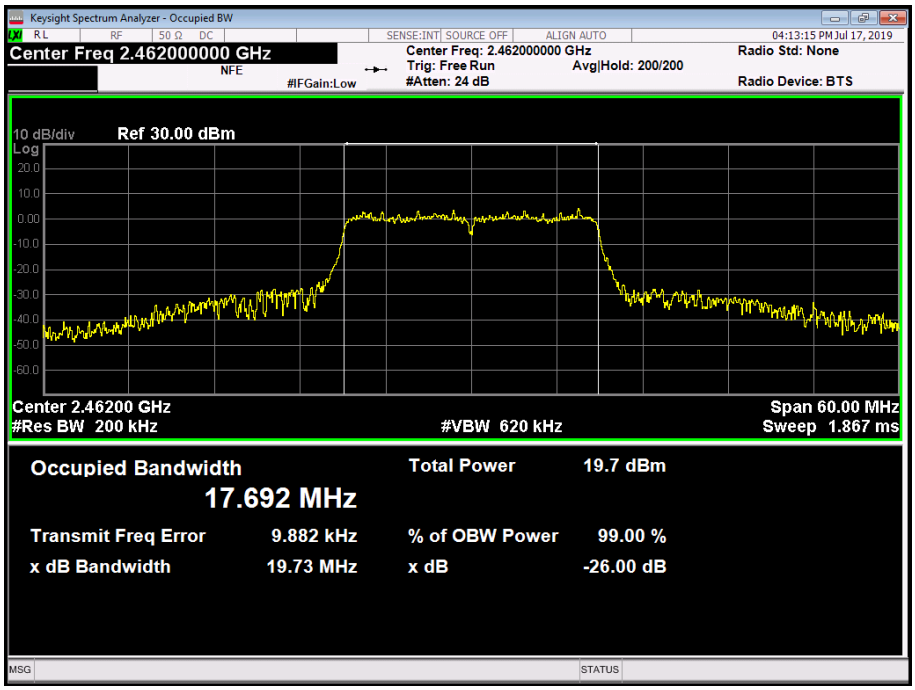


Figure 28 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 2

2.4 GHz WLAN - 802.11n 20 MHz Bandwidth

Modulation Coding Scheme: MCS7

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	17.760	17.681
2437	17.760	17.637
2462	17.700	17.672

Table 23 – Antenna Port 1

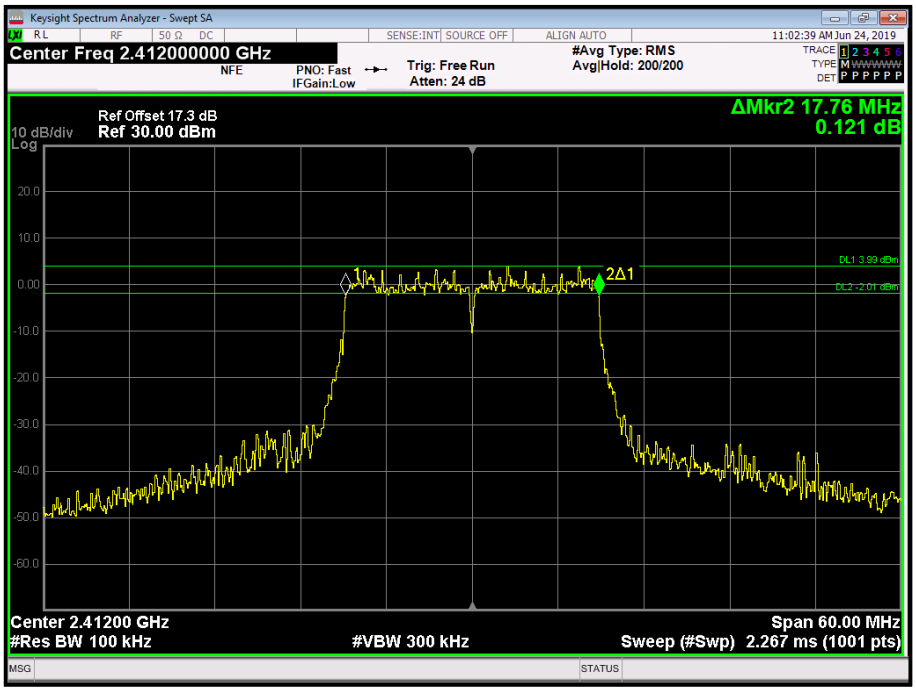


Figure 29 - 2412 MHz – 6 dB Bandwidth – Antenna Port 1

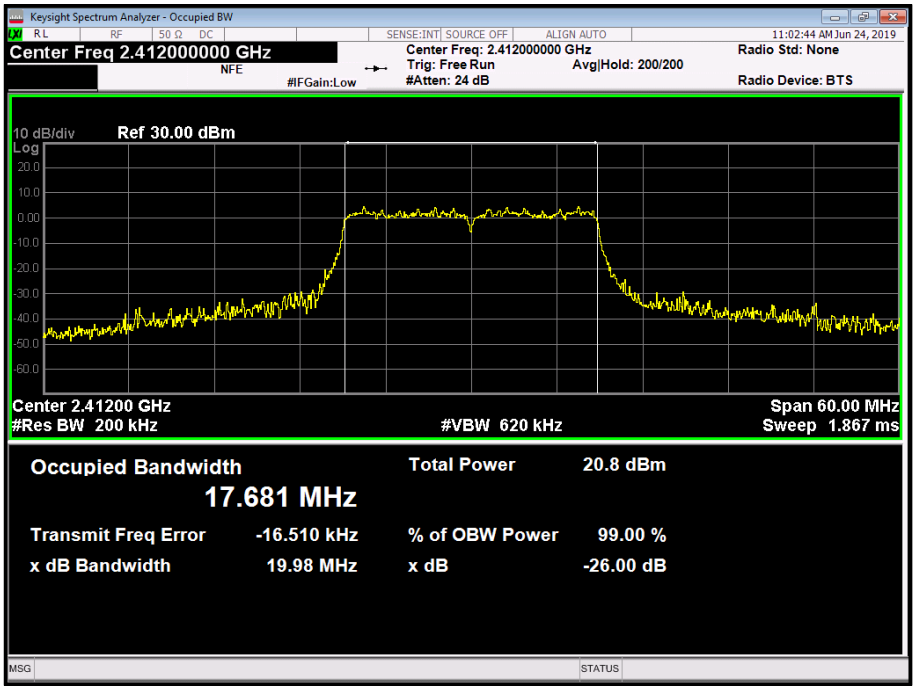


Figure 30 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 1

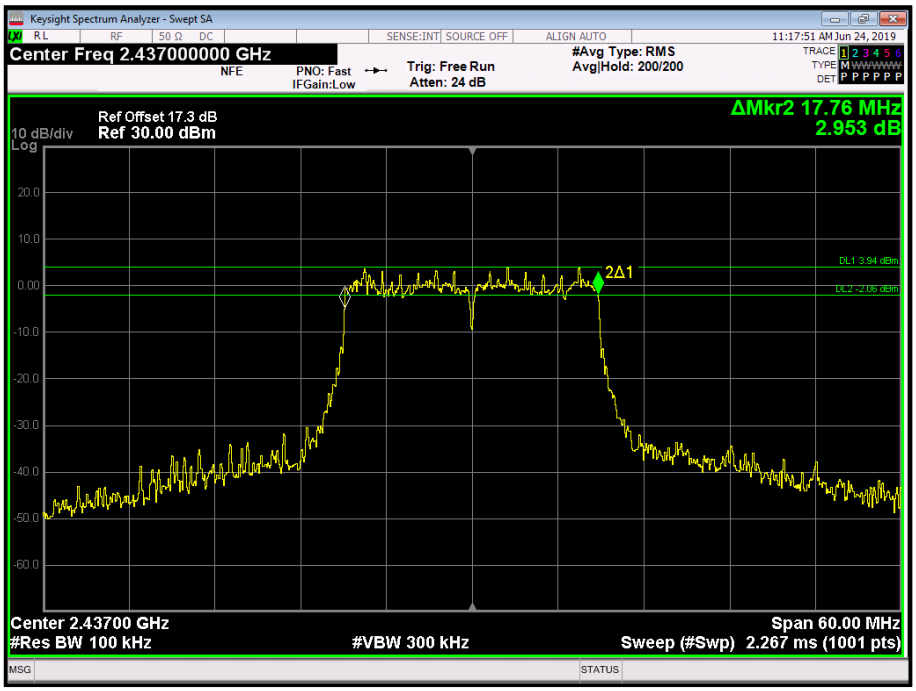


Figure 31 - 2437 MHz – 6 dB Bandwidth – Antenna Port 1

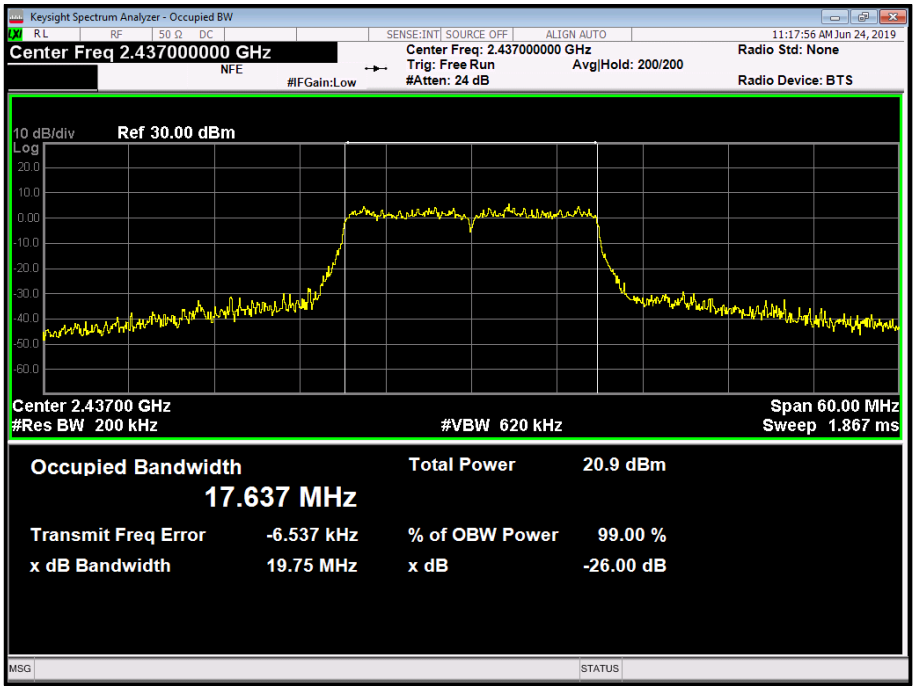


Figure 32 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 1

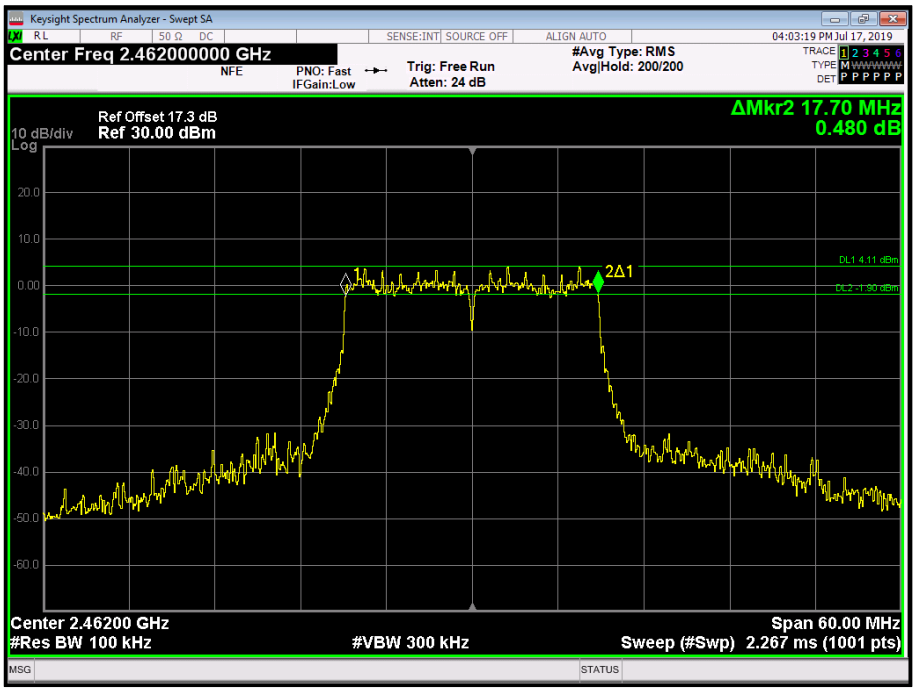


Figure 33 - 2462 MHz – 6 dB Bandwidth – Antenna Port 1

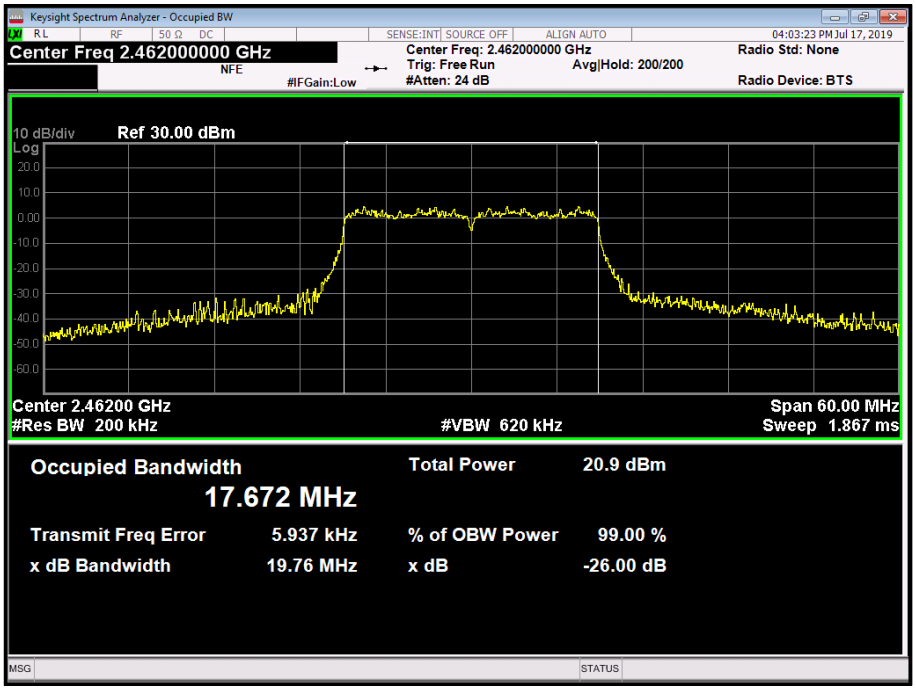


Figure 34 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 1

Modulation Coding Scheme: MCS7

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	17.760	17.684
2437	17.820	17.669
2462	17.640	17.714

Table 24 – Antenna Port 2

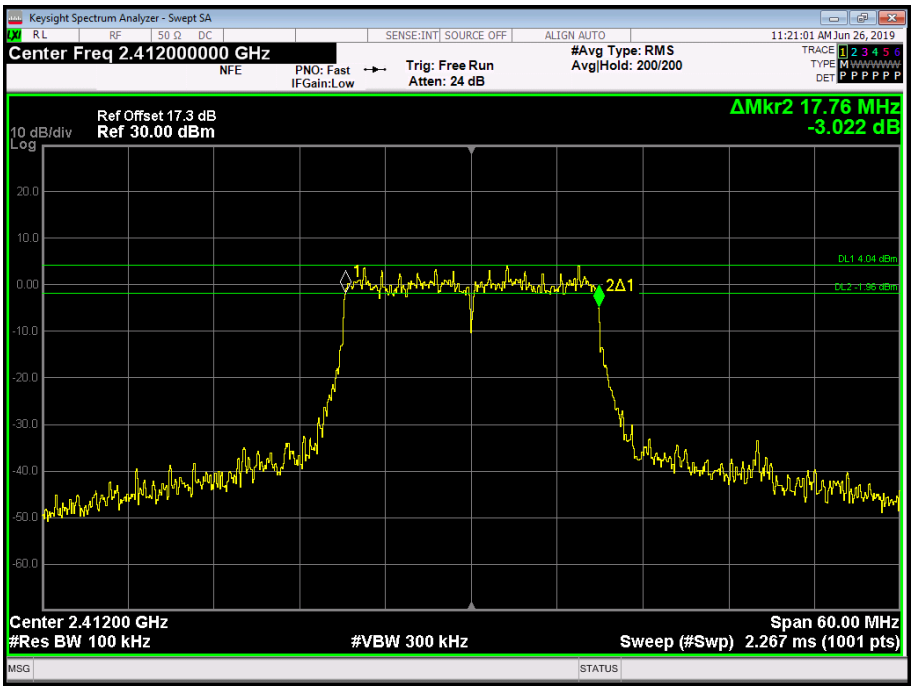


Figure 35 - 2412 MHz – 6 dB Bandwidth – Antenna Port 2

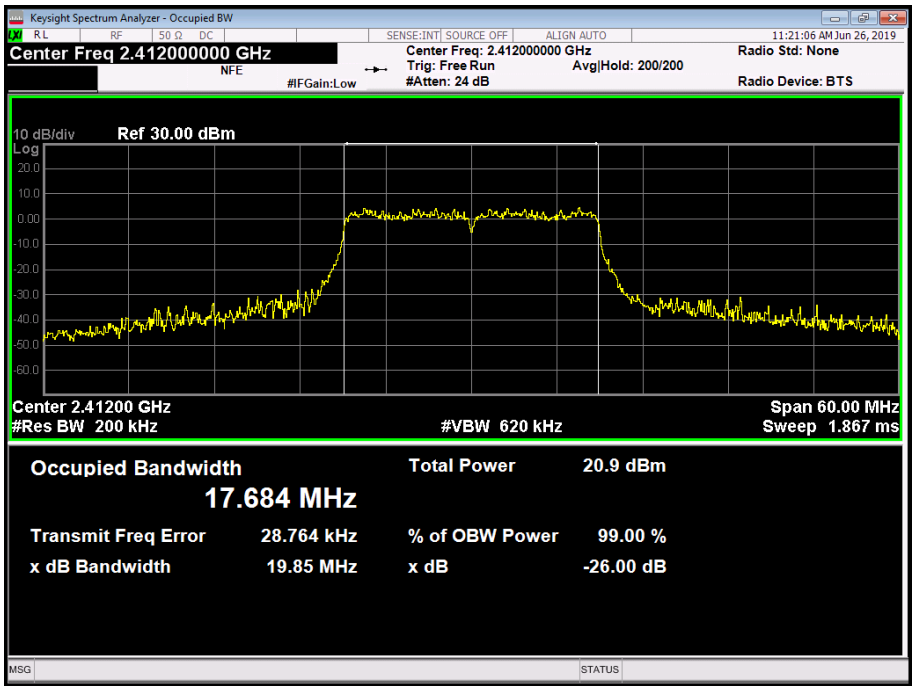


Figure 36 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 2

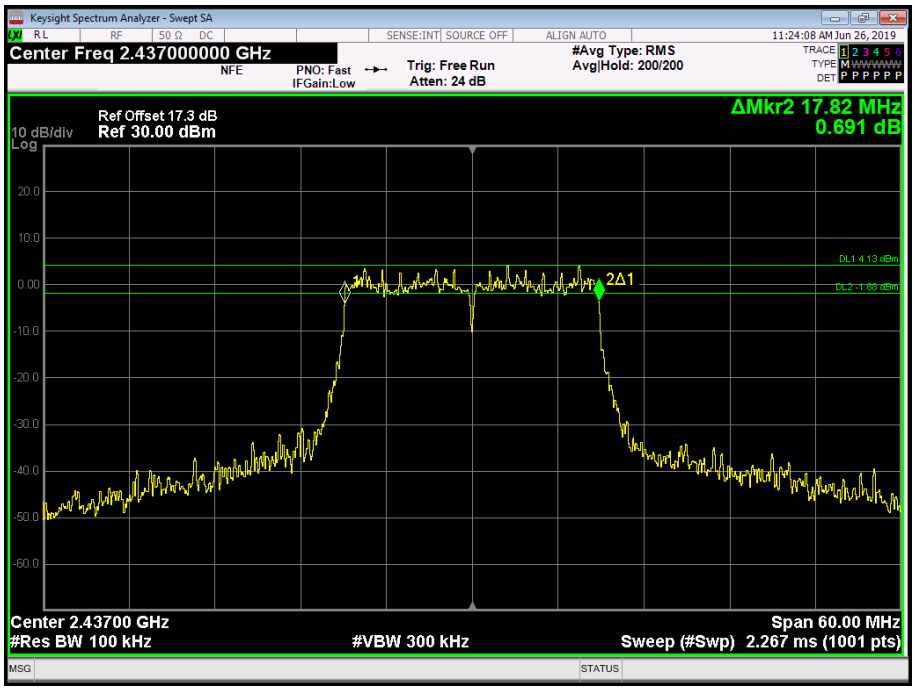


Figure 37 - 2437 MHz – 6 dB Bandwidth – Antenna Port 2

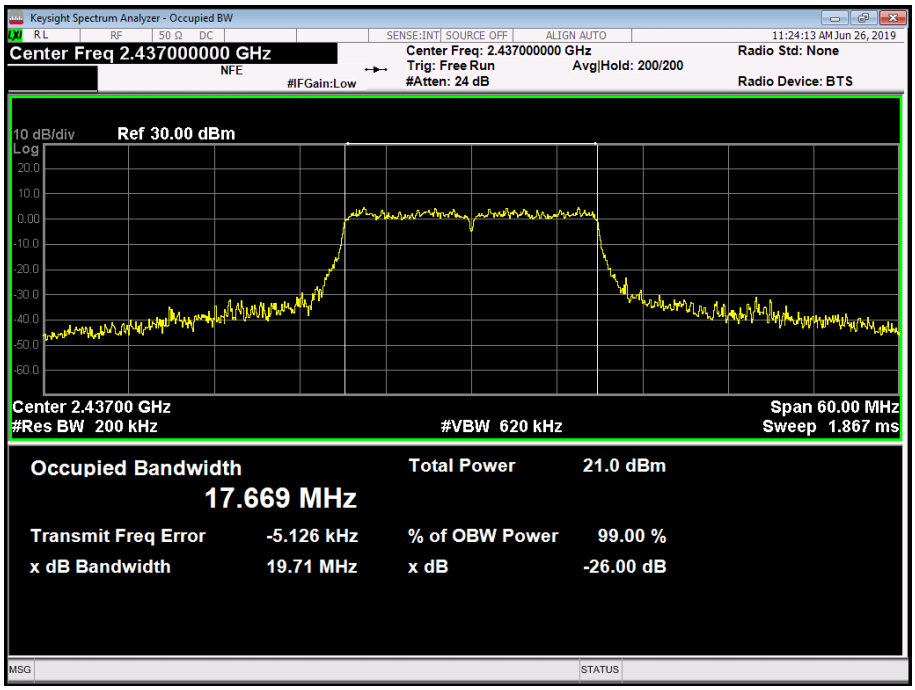


Figure 38 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 2

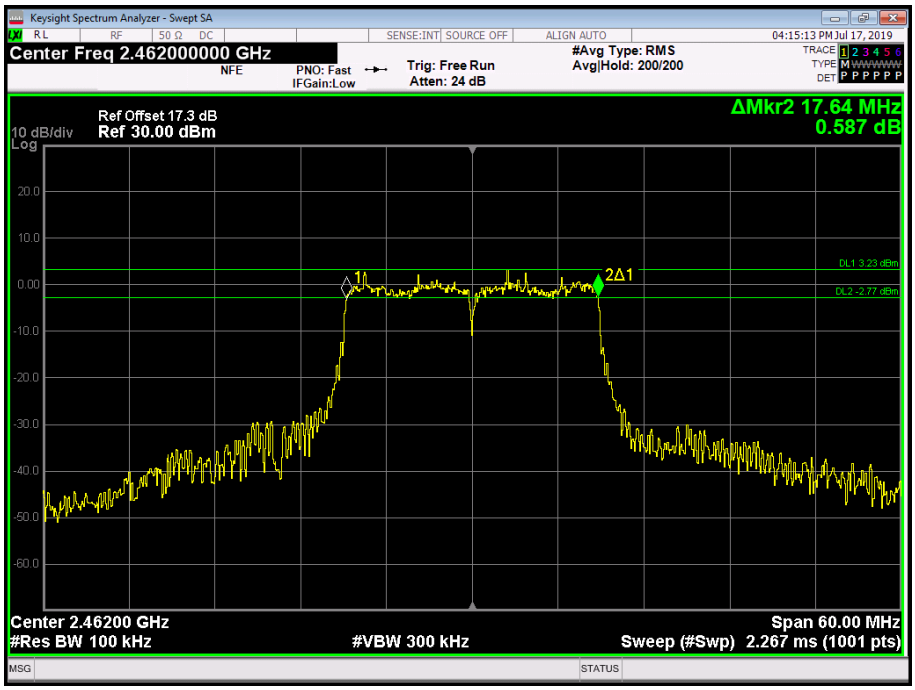


Figure 39 - 2462 MHz – 6 dB Bandwidth – Antenna Port 2

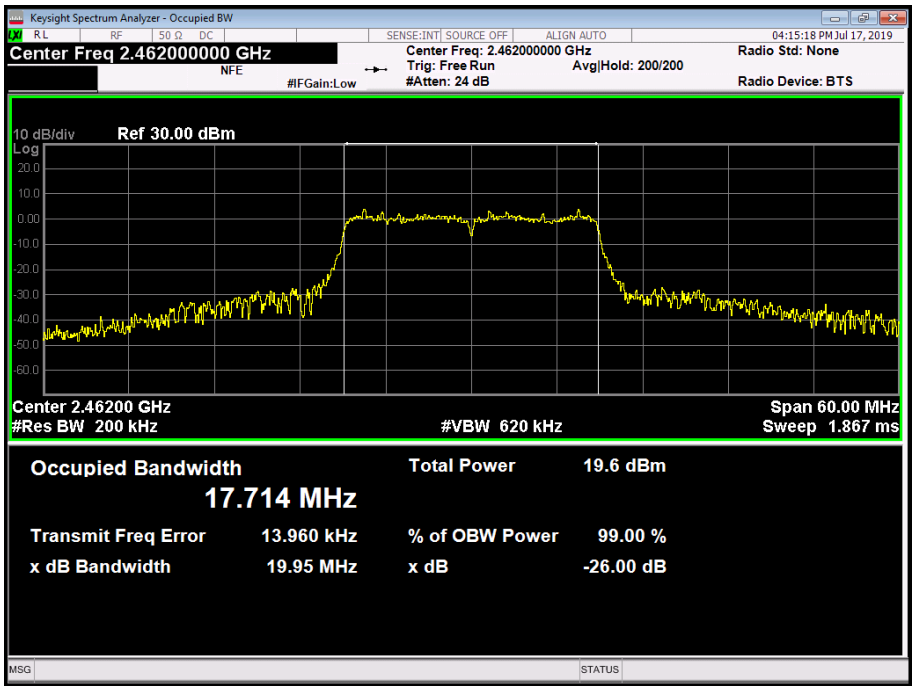


Figure 40 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 2

Modulation Coding Scheme: MCS0 CDD1

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	17.640	17.678
2437	17.640	17.718
2462	17.520	17.649

Table 25 – Antenna Port 1

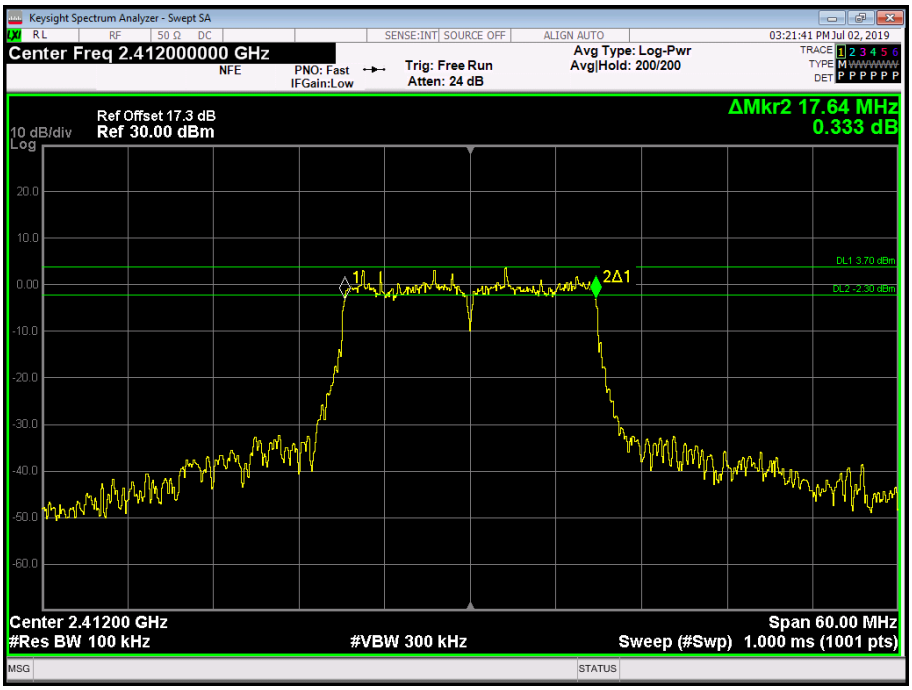


Figure 41 - 2412 MHz – 6 dB Bandwidth – Antenna Port 1

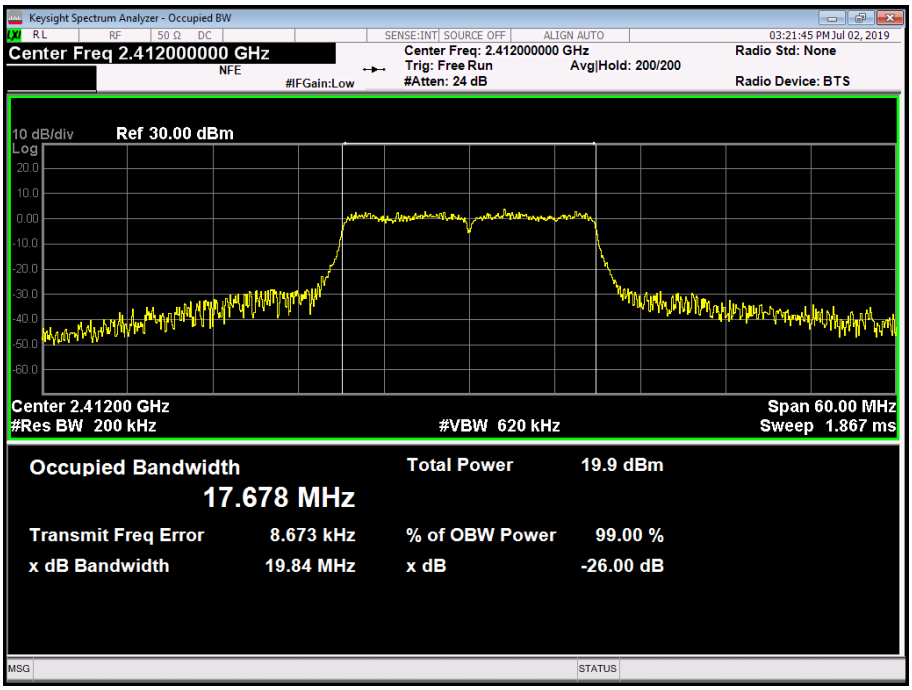


Figure 42 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 1

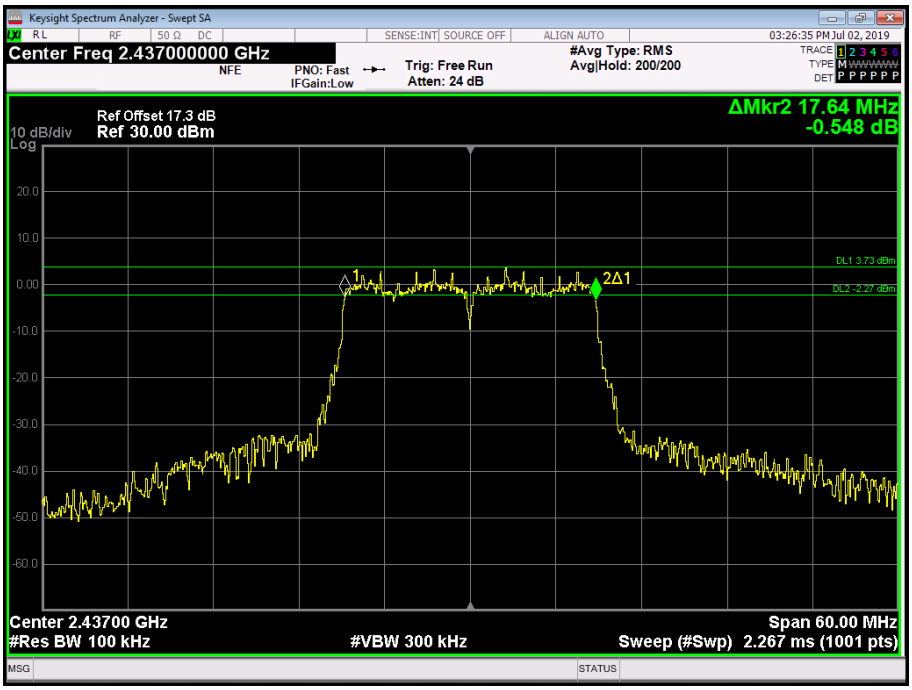


Figure 43 - 2437 MHz – 6 dB Bandwidth – Antenna Port 1

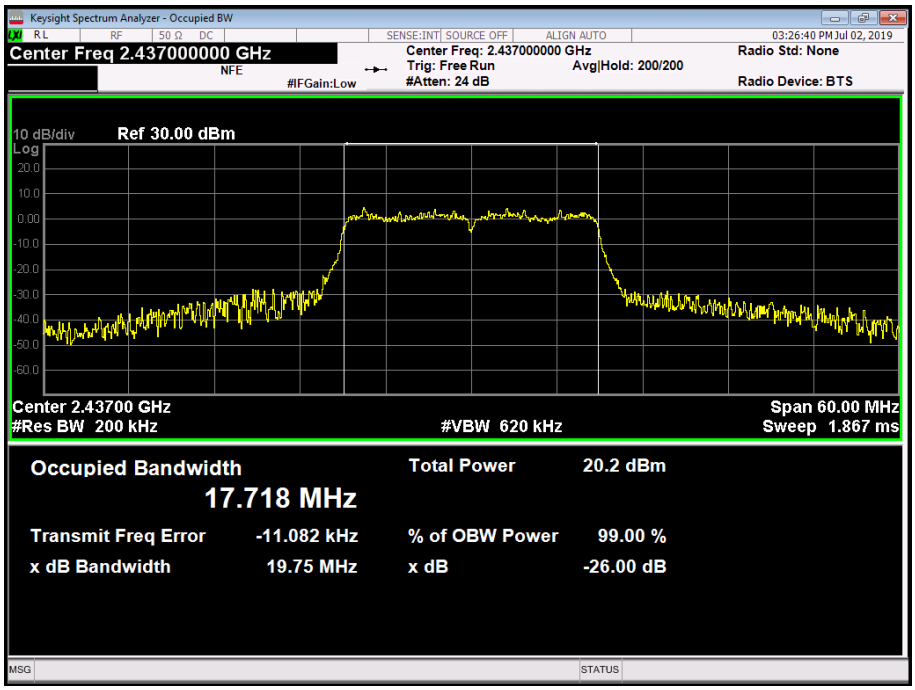


Figure 44 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 1

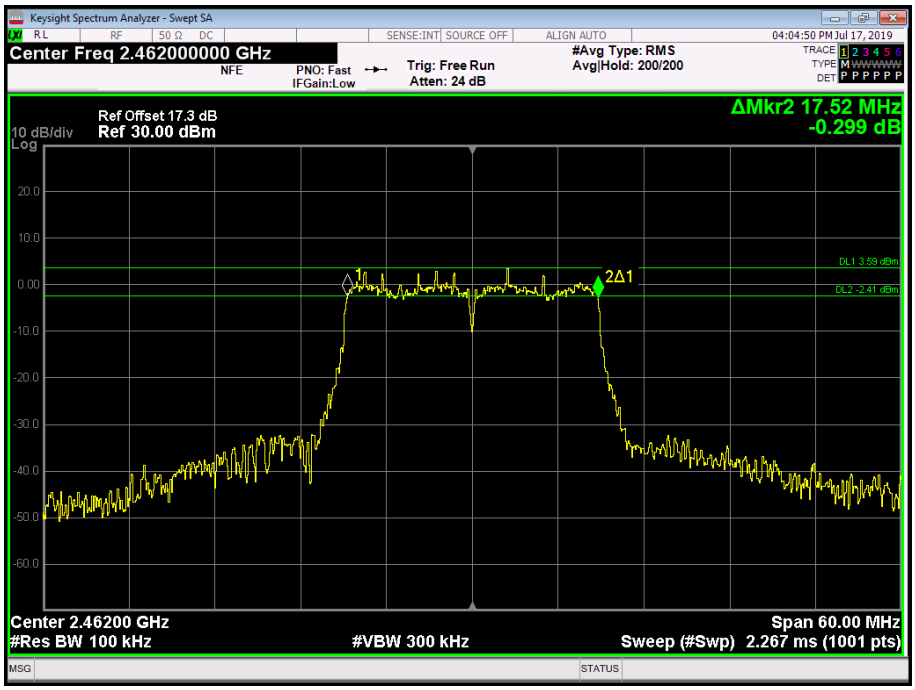


Figure 45 - 2462 MHz – 6 dB Bandwidth – Antenna Port 1

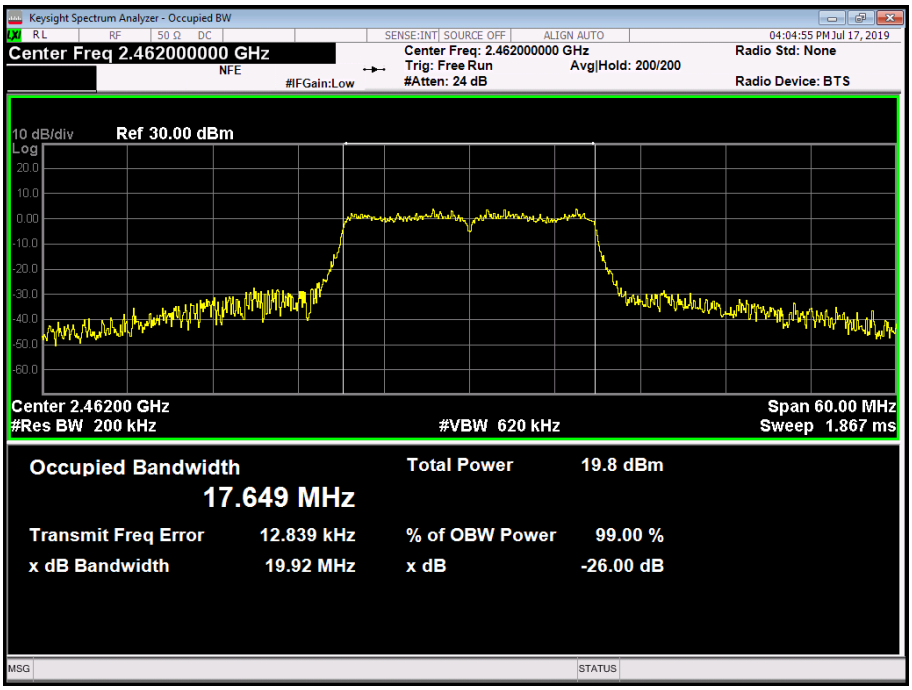


Figure 46 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 1

Modulation Coding Scheme: MCS0 CDD1

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2412	17.640	17.699
2437	17.520	17.694
2462	17.640	17.690

Table 26 – Antenna Port 2

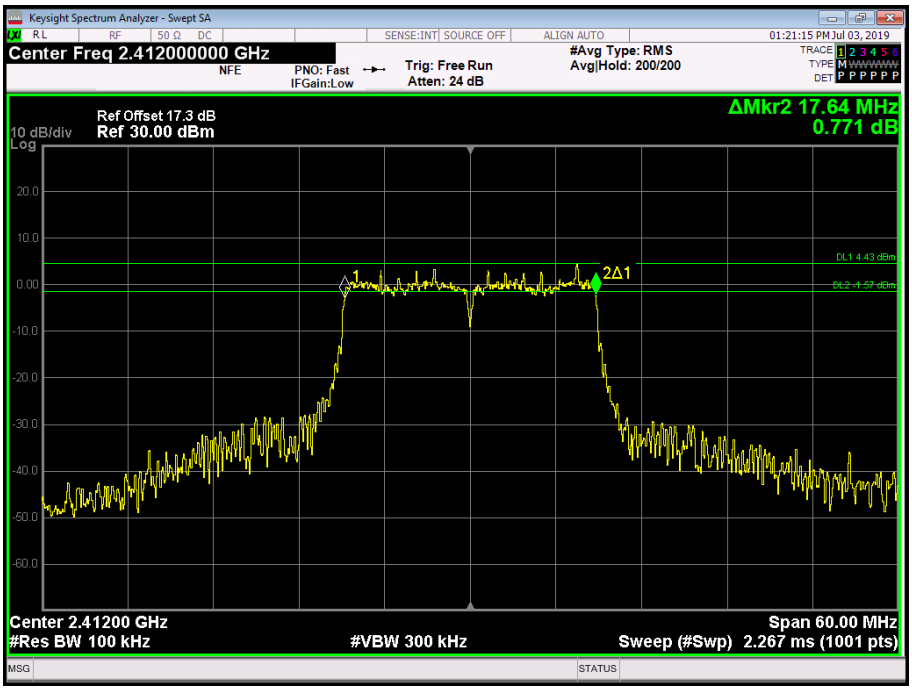


Figure 47 - 2412 MHz – 6 dB Bandwidth – Antenna Port 2

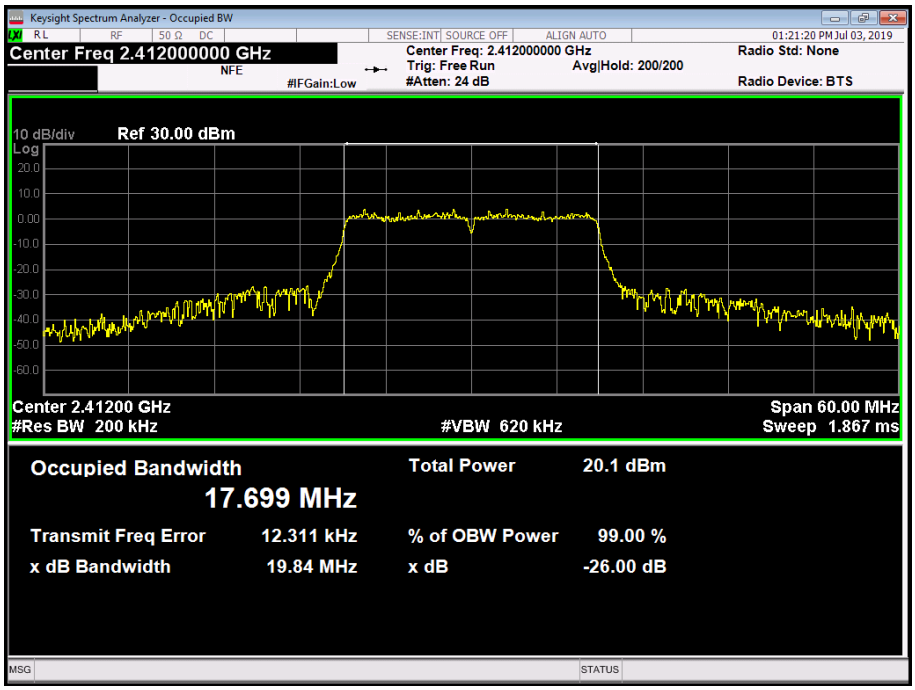


Figure 48 - 2412 MHz – 99% Occupied Bandwidth – Antenna Port 2

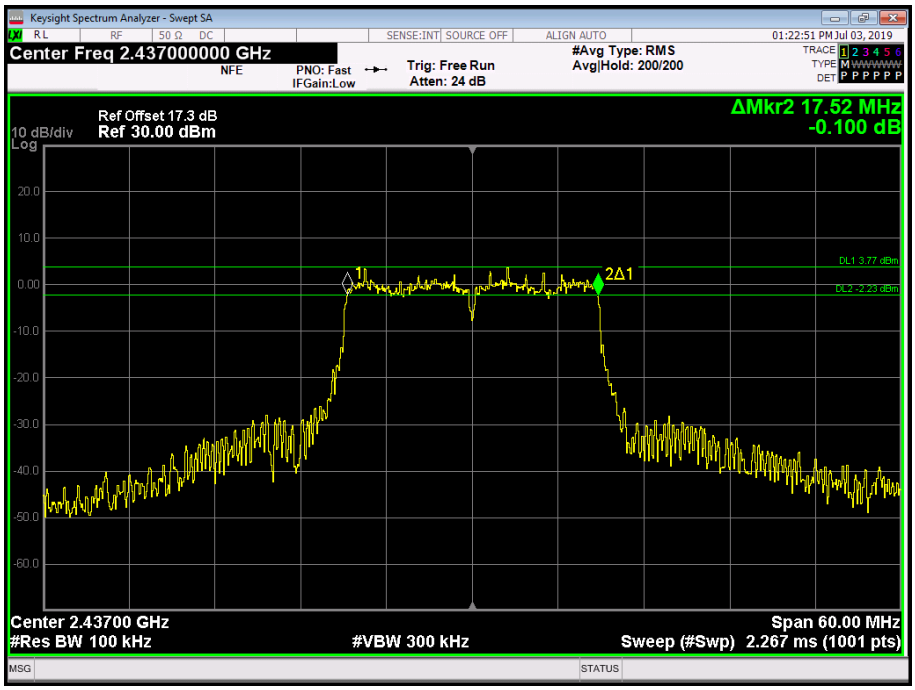


Figure 49 - 2437 MHz – 6 dB Bandwidth – Antenna Port 2

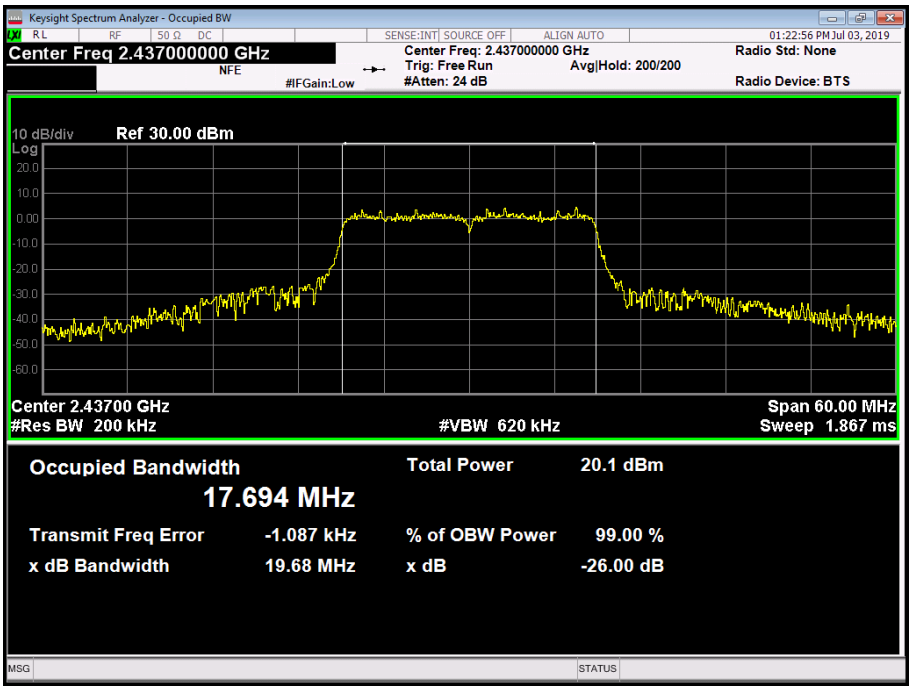


Figure 50 - 2437 MHz – 99% Occupied Bandwidth – Antenna Port 2

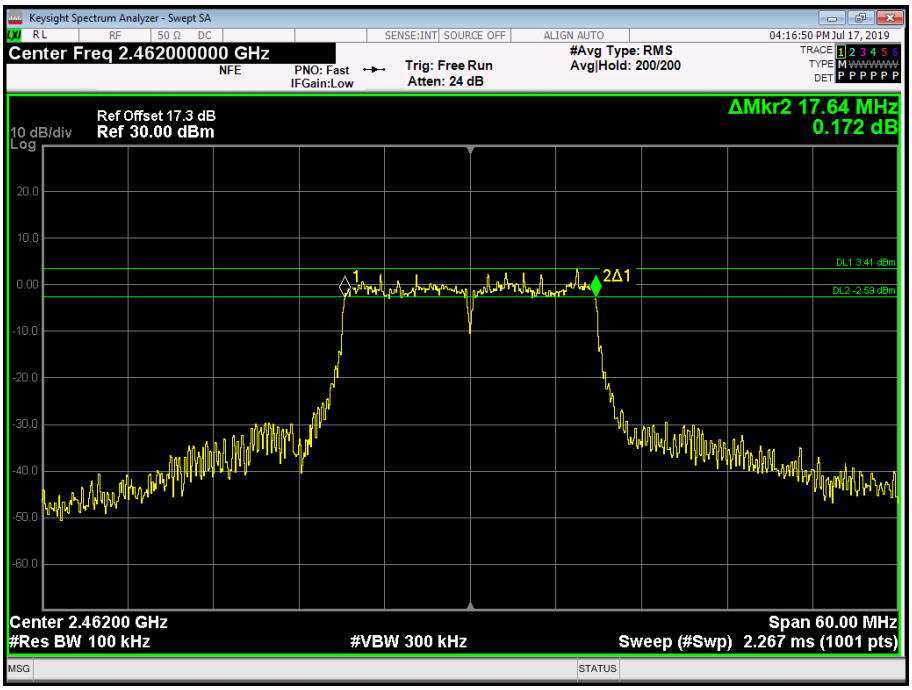


Figure 51 - 2462 MHz – 6 dB Bandwidth – Antenna Port 2

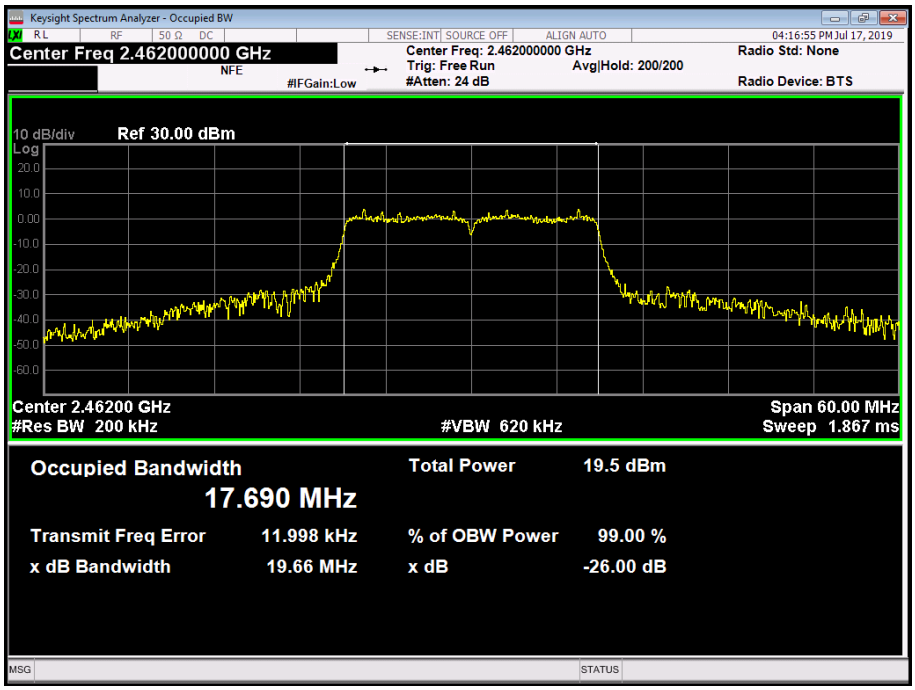


Figure 52 - 2462 MHz – 99% Occupied Bandwidth – Antenna Port 2

Bluetooth Low Energy

Modulation/Packet Type: GFSK/DH1

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz
2402	0.694800	1.045
2440	0.700300	1.044
2480	0.702300	1.045

Table 27

Figure 53 - 2402 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

Figure 54 - 2440 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

Figure 55 - 2480 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

FCC 47 CFR Part 15, Limit Clause 15.247(a)(2) and ISEDC RSS-247, Clause 5.2(a)

The minimum 6 dB Bandwidth shall be at least 500 kHz.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Dual Power Supply Unit	Hewlett Packard	6253A	271	-	O/P Mon
Power Divider	Weinschel	1506A	603	12	23-Apr-2020
Hygrometer	Rotronic	I-1000	3220	12	13-Sep-2019
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4101	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	22-Oct-2019
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	15-Oct-2019
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-Feb-2020
EXA	Keysight Technologies	N9010B	4968	24	21-Dec-2019
Cable (18 GHz)	Rosenberger	LU7-071-1000	5097	12	04-Oct-2019
USB Power Sensor	Boonton	RTP5006	5184	12	12-Dec-2019
Attenuator 10 dB 2W	Telegartner	01156A0031	N/S	-	O/P Mon

Table 28

O/P Mon – Output Monitored using calibrated equipment

2.5 Authorised Band Edges

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d)
ISEDC RSS-247, Clause 5.5

2.5.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113219 - Modification State 0

2.5.3 Date of Test

11-June-2019 to 03 July 2019

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

2.5.5 Environmental Conditions

Ambient Temperature	20.4 - 24.4 °C
Relative Humidity	56.8 - 59.9 %

2.5.6 Test Results

2.4 GHz WLAN - 802.11b

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2412	2400.0	-48.81
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2462	2483.5	-52.72
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2467	2483.5	-49.31
Data Rate with the Highest Power (13 dBm) and Widest Bandwidth	2 Mbps	2472	2483.5	-48.54

Table 29 - Authorised Band Edge Results – Antenna Port 1

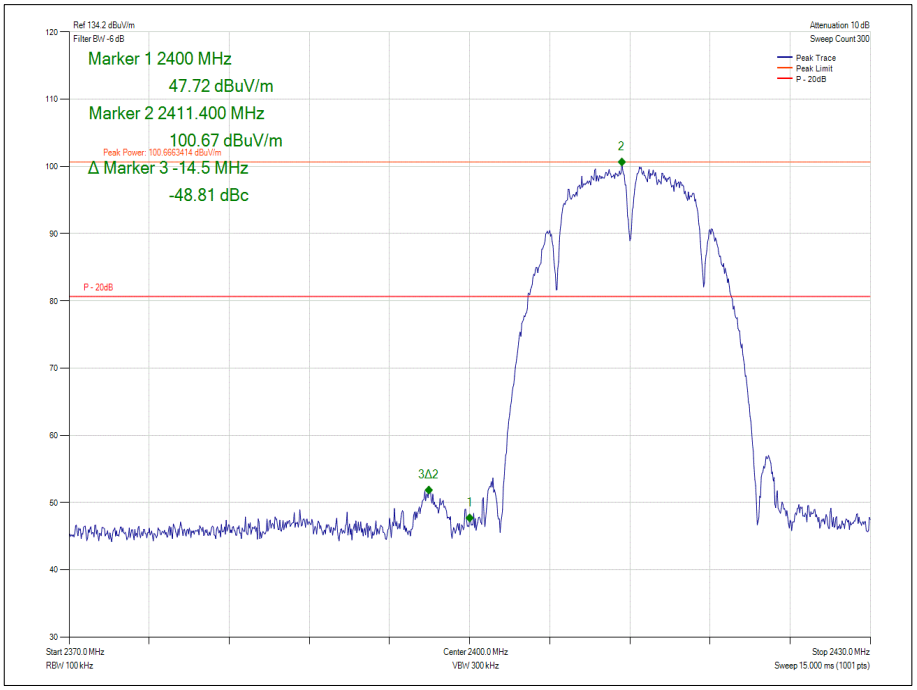


Figure 56 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1

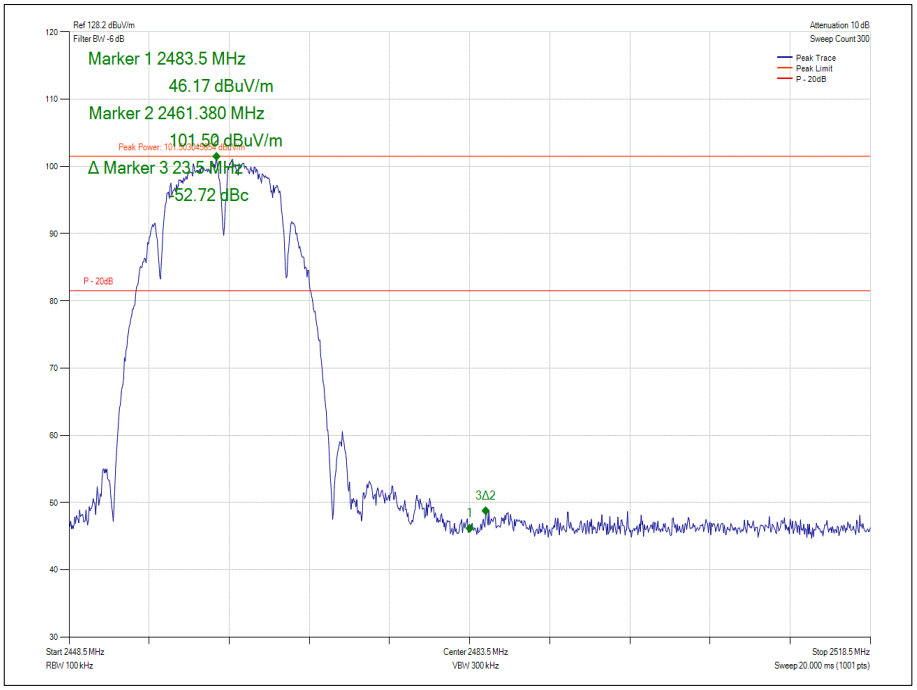


Figure 57 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

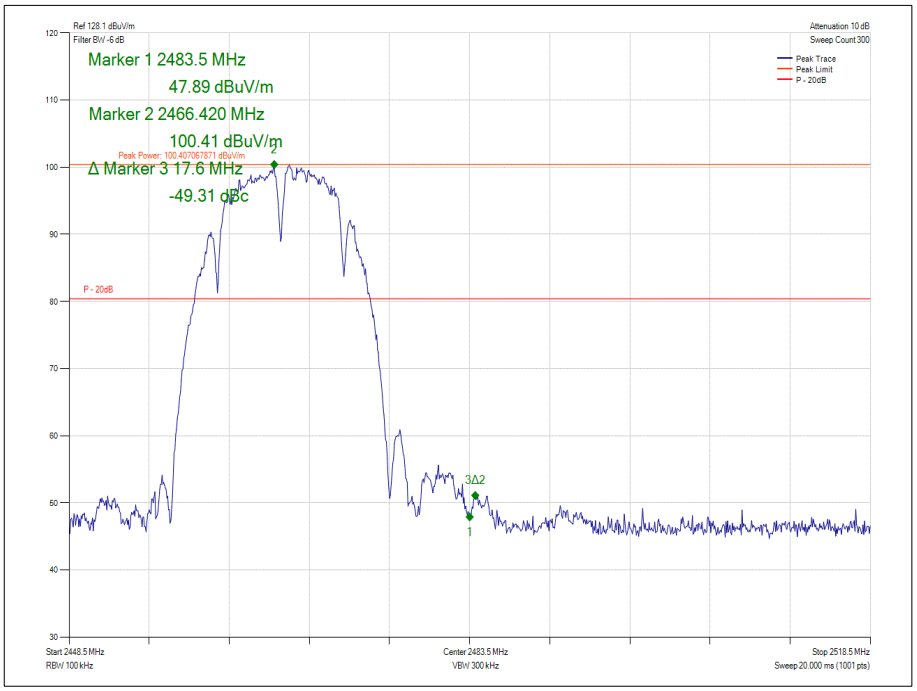


Figure 58 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

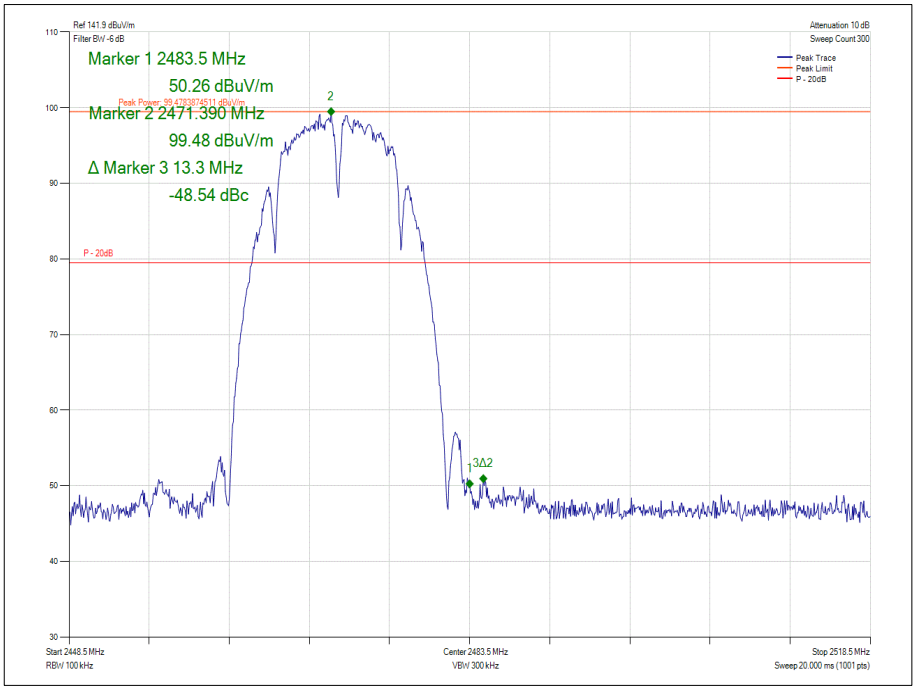


Figure 59 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Data Rate with the Highest Power (15 dBm)	2 Mbps	2412	2400.0	-44.45
Data Rate with the Highest Power (15 dBm)	2 Mbps	2462	2483.5	-48.18
Data Rate with the Highest Power (15 dBm)	2 Mbps	2467	2483.5	-49.97
Data Rate with the Highest Power (13 dBm)	2 Mbps	2472	2483.5	-47.68

Table 30 - Authorised Band Edge Results – Antenna Port 2

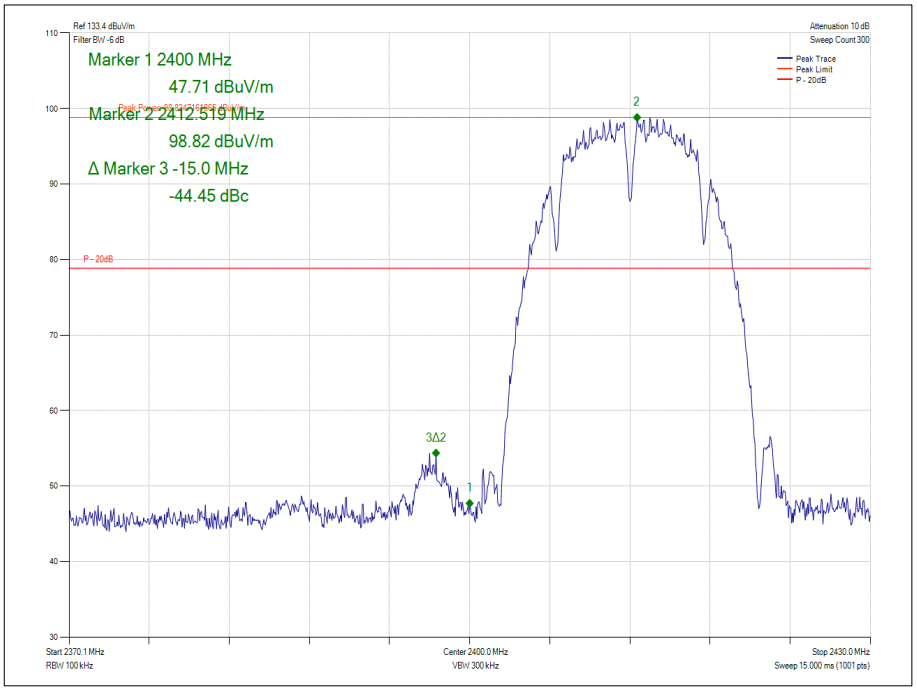


Figure 60 - Data Rate with the Highest Power - 2 Mbps
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 2

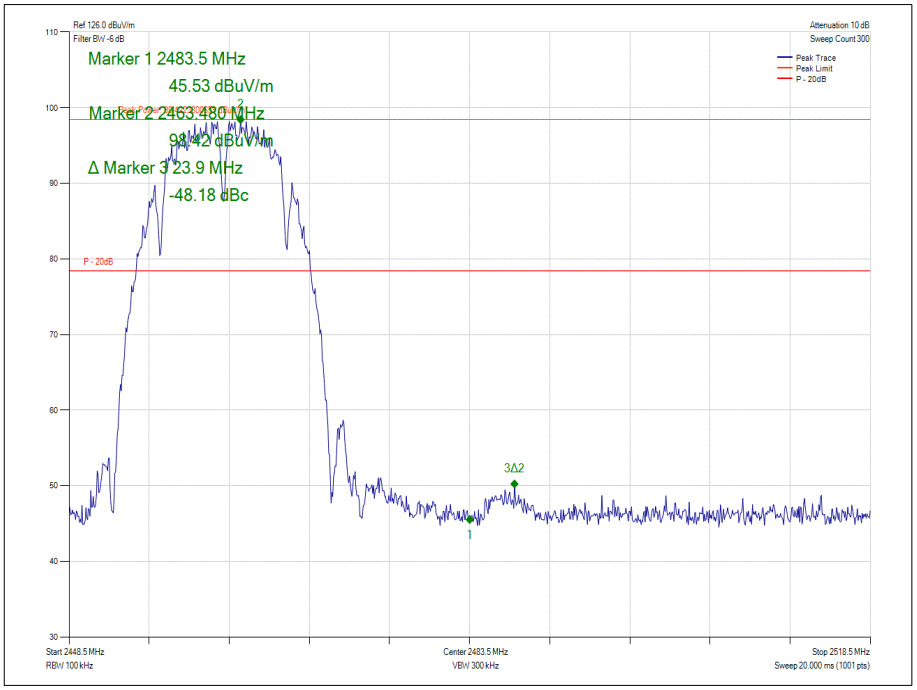


Figure 61 - Data Rate with the Highest Power - 2 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

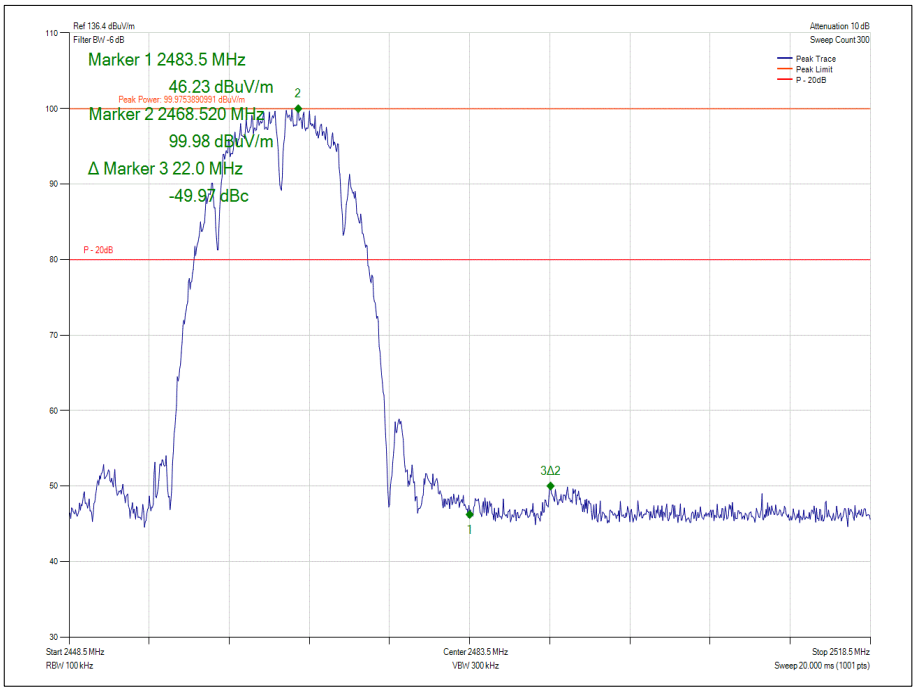


Figure 62 - Data Rate with the Highest Power - 2 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

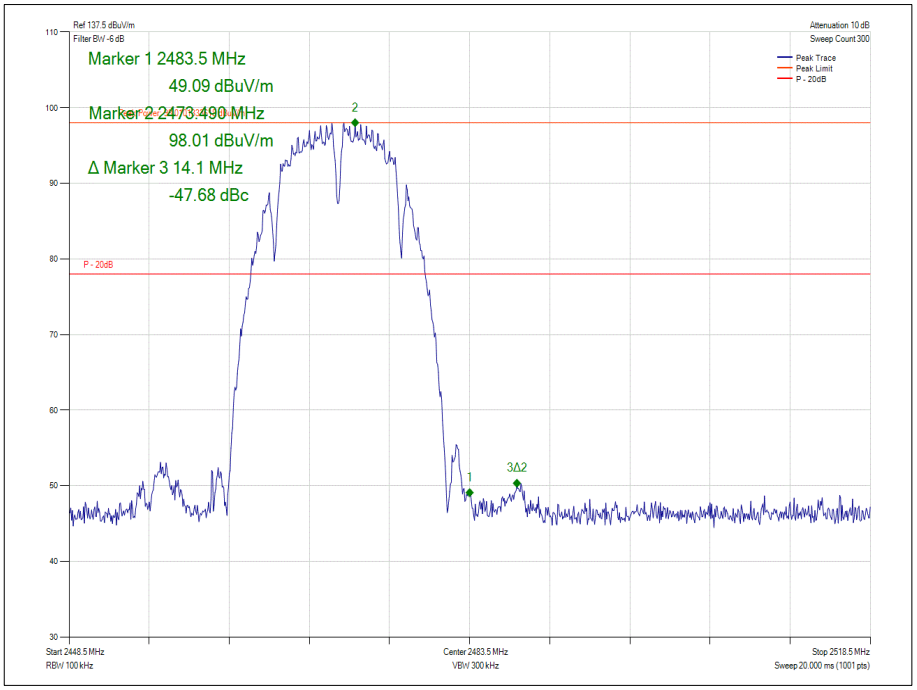


Figure 63 - Data Rate with the Highest Power - 2 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

2.4 GHz WLAN - 802.11g

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Data Rate with the Highest Power (13 dBm)	54 Mbps	2412	2400.0	-38.97
Data Rate with the Highest Power (13 dBm)	54 Mbps	2462	2483.5	-47.30
Data Rate with the Highest Power (11 dBm)	54 Mbps	2467	2483.5	-42.57
Data Rate with the Highest Power (7 dBm)	54 Mbps	2472	2483.5	-39.60
Data Rate with the Widest Bandwidth	9 Mbps	2412	2390	-41.05
Data Rate with the Widest Bandwidth	9 Mbps	2462	2483.5	-46.66
Data Rate with the Widest Bandwidth	9 Mbps	2467	2483.5	-46.32
Data Rate with the Widest Bandwidth	9 Mbps	2472	2483.5	-47.11

Table 31 - Authorised Band Edge Results – Antenna Port 1

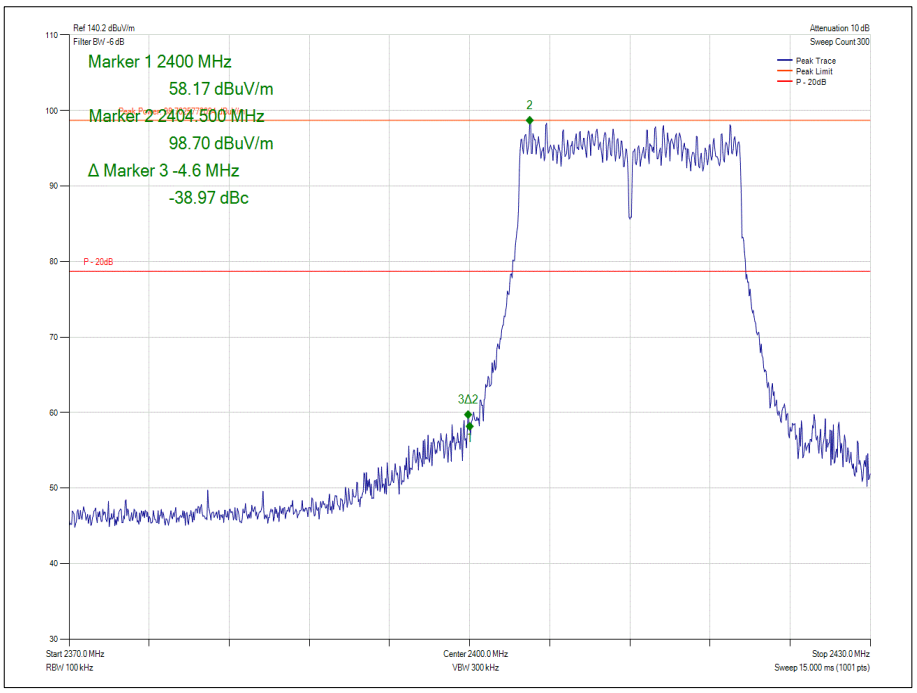


Figure 64 - Data Rate with the Highest Power - 54 Mbps
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1

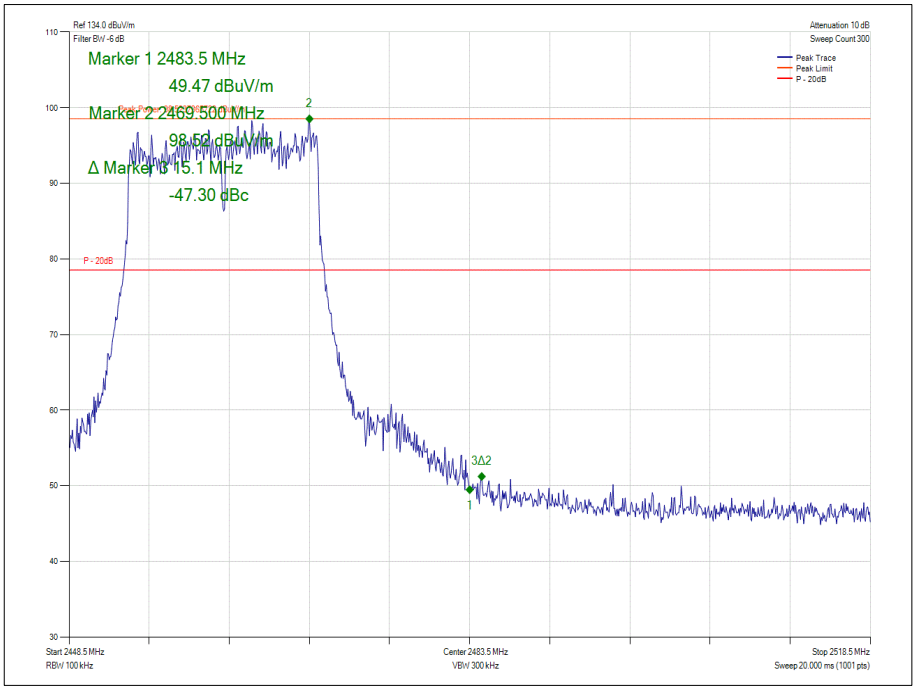


Figure 65 - Data Rate with the Highest Power - 54 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

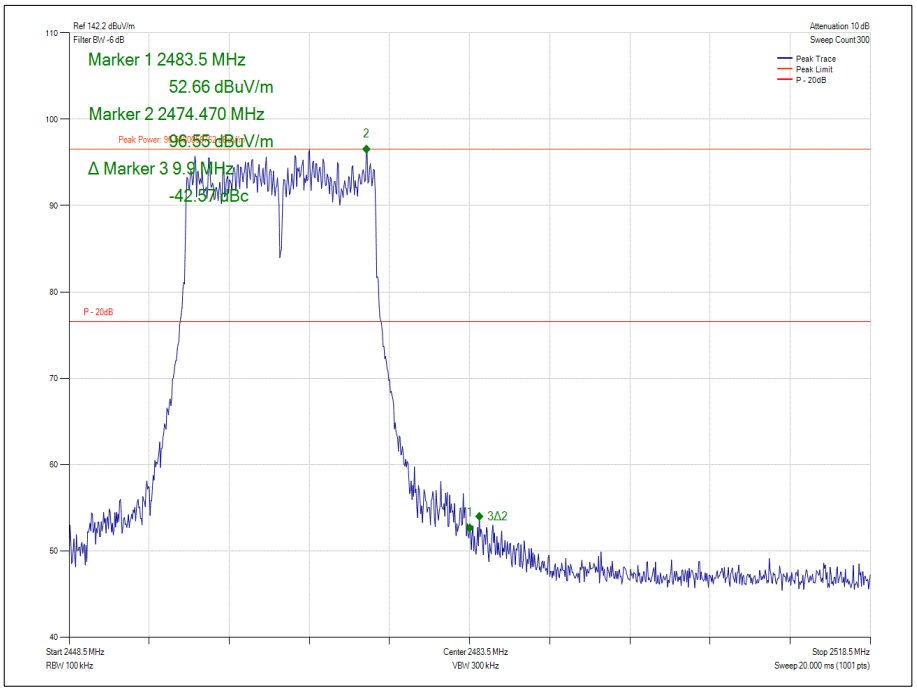


Figure 66 - Data Rate with the Highest Power - 54 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

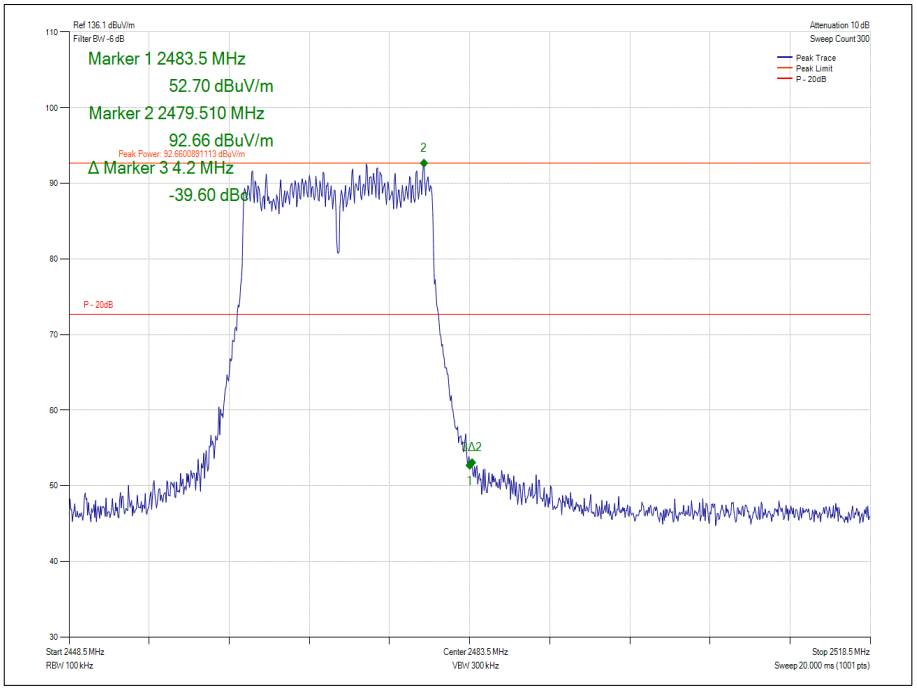


Figure 67 - Data Rate with the Highest Power - 54 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

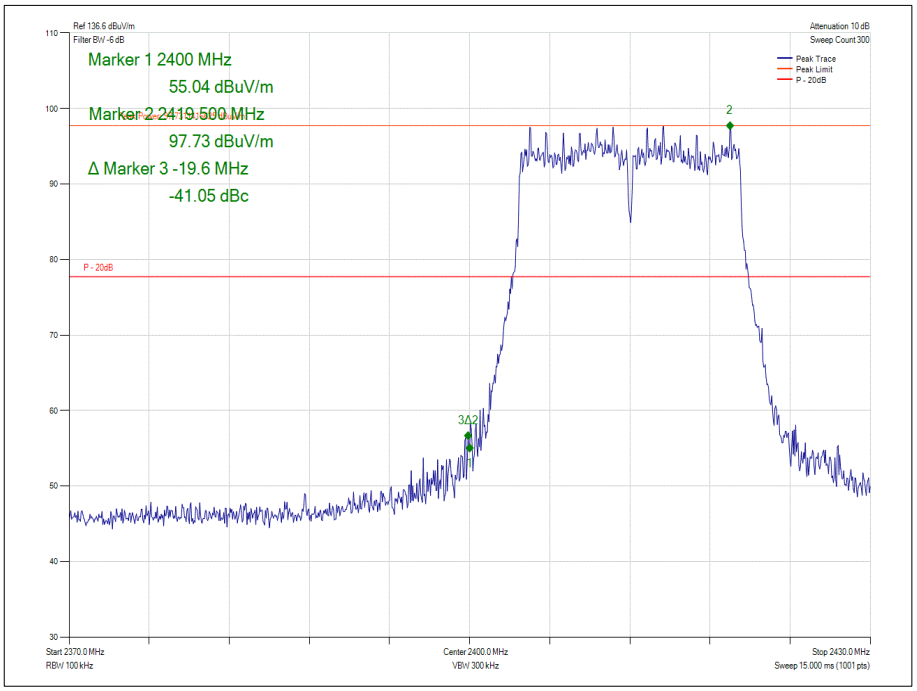


Figure 68 - Data Rate with the Widest Bandwidth - 9 Mbps
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1

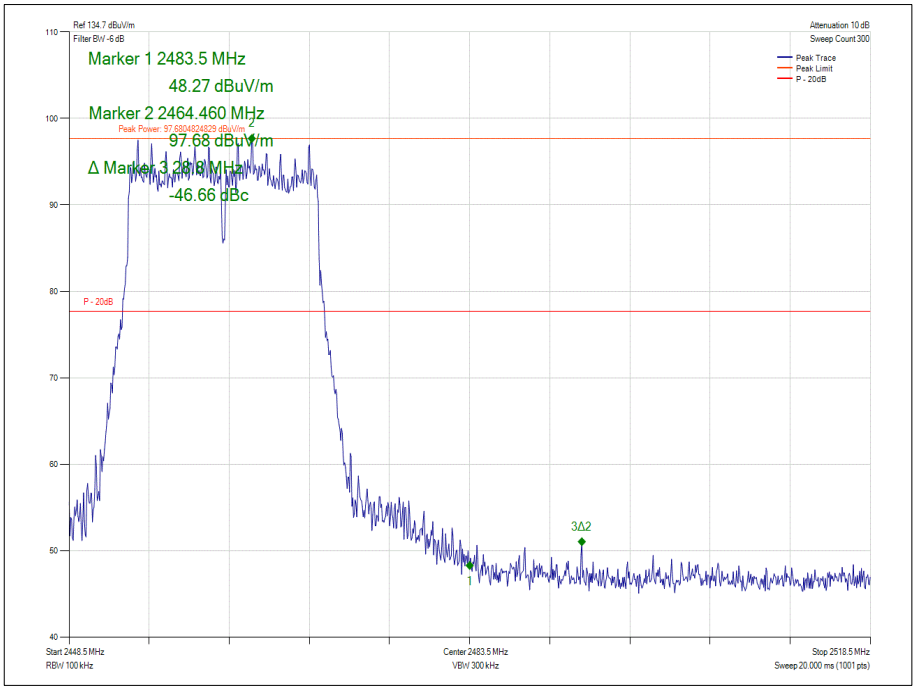


Figure 69 - Data Rate with the Widest Bandwidth - 9 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

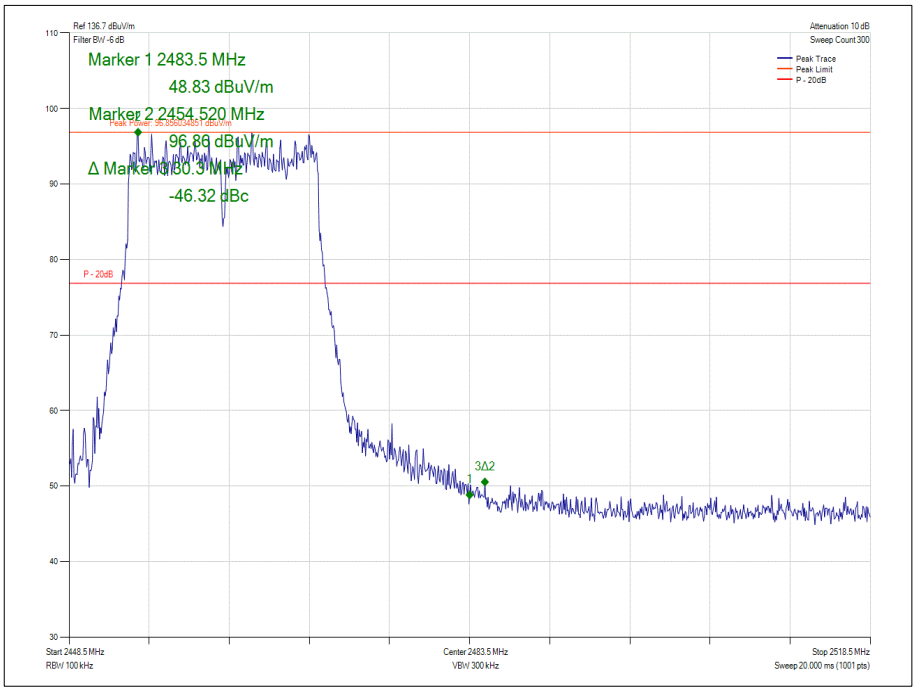


Figure 70 - Data Rate with the Widest Bandwidth - 9 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

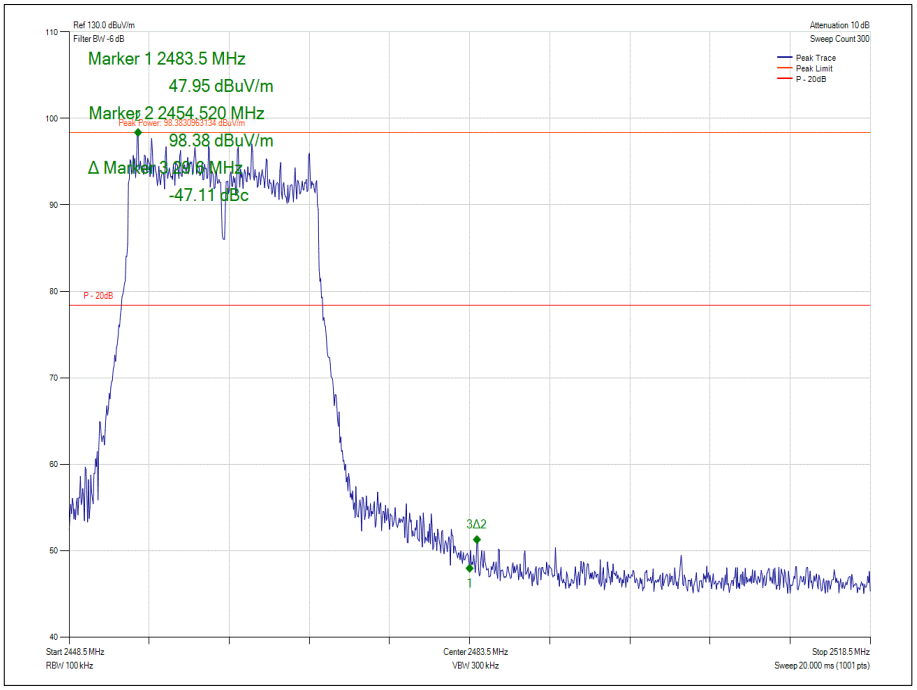


Figure 71 - Data Rate with the Widest Bandwidth - 9 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Data Rate with the Widest Bandwidth	9 Mbps	2412	2400.0	-41.00
Data Rate with the Widest Bandwidth	9 Mbps	2462	2483.5	-44.32
Data Rate with the Widest Bandwidth	9 Mbps	2467	2483.5	-43.16
Data Rate with the Widest Bandwidth	9 Mbps	2462	2483.5	-43.11
Data Rate with the Highest Power	36 Mbps	2412	2400.0	-39.99
Data Rate with the Highest Power (13 dBm)	36 Mbps	2462	2483.5	-44.10
Data Rate with the Highest Power (12 dBm)	36 Mbps	2467	2483.5	-42.48
Data Rate with the Highest Power (9 dBm)	36 Mbps	2472	2483.5	-39.94

Table 32 - Authorised Band Edge Results – Antenna Port 2

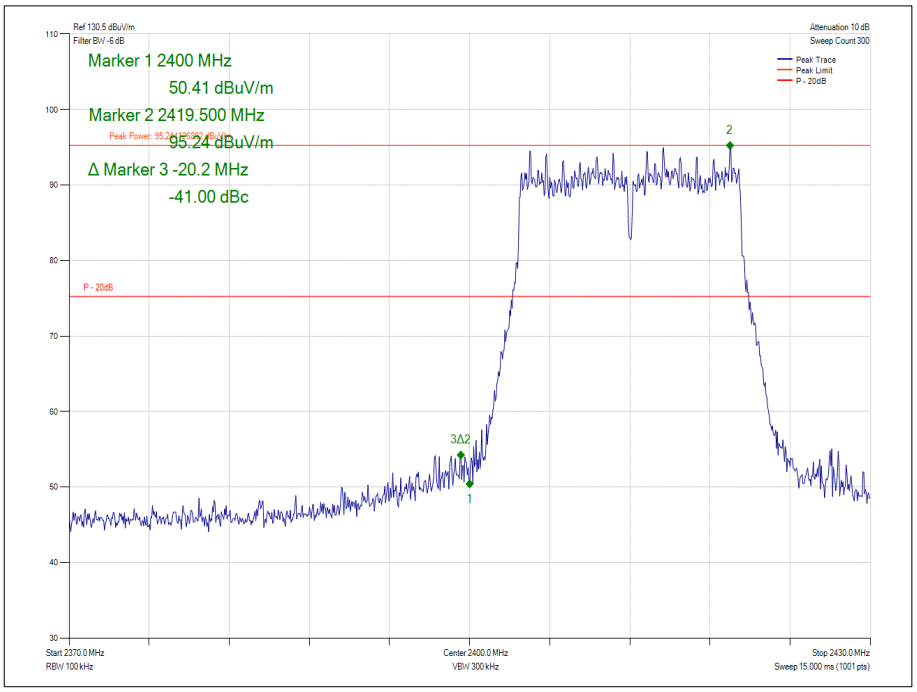


Figure 72 - Data Rate with the Widest Bandwidth - 9 Mbps 2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 2

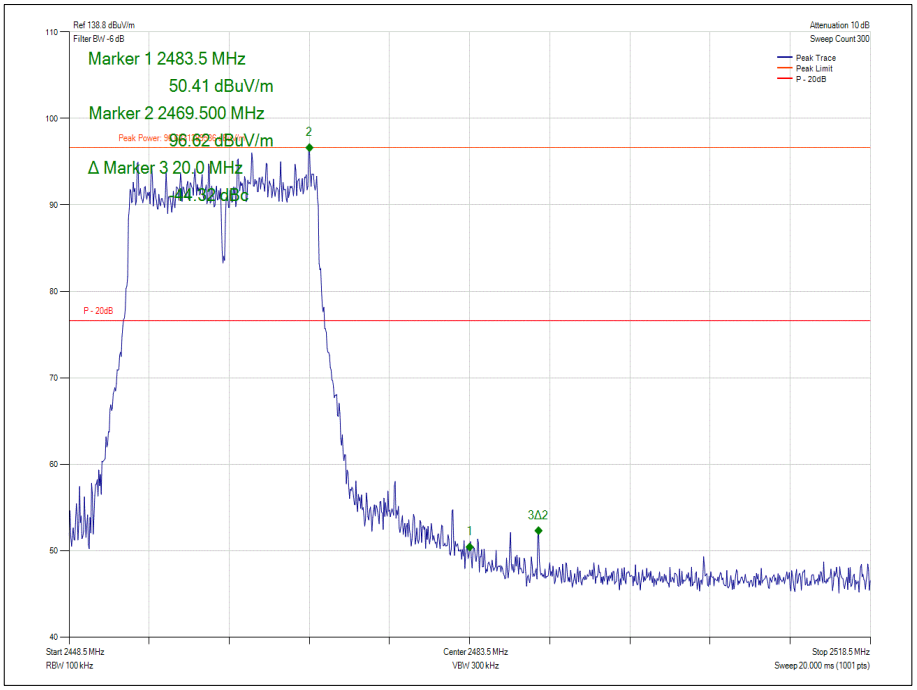


Figure 73 - Data Rate with the Widest Bandwidth - 9 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

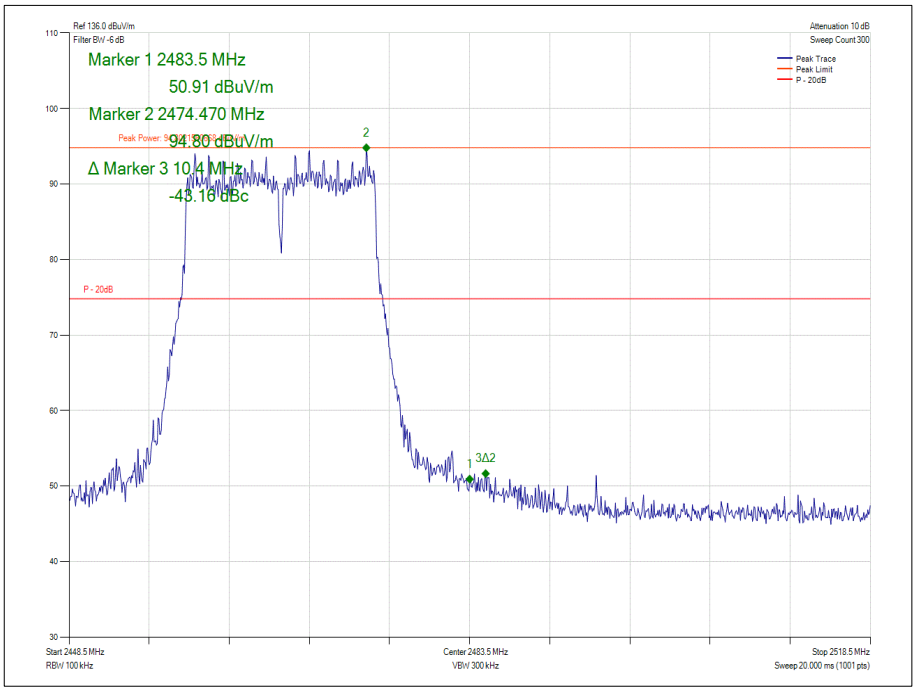


Figure 74 - Data Rate with the Widest Bandwidth - 9 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

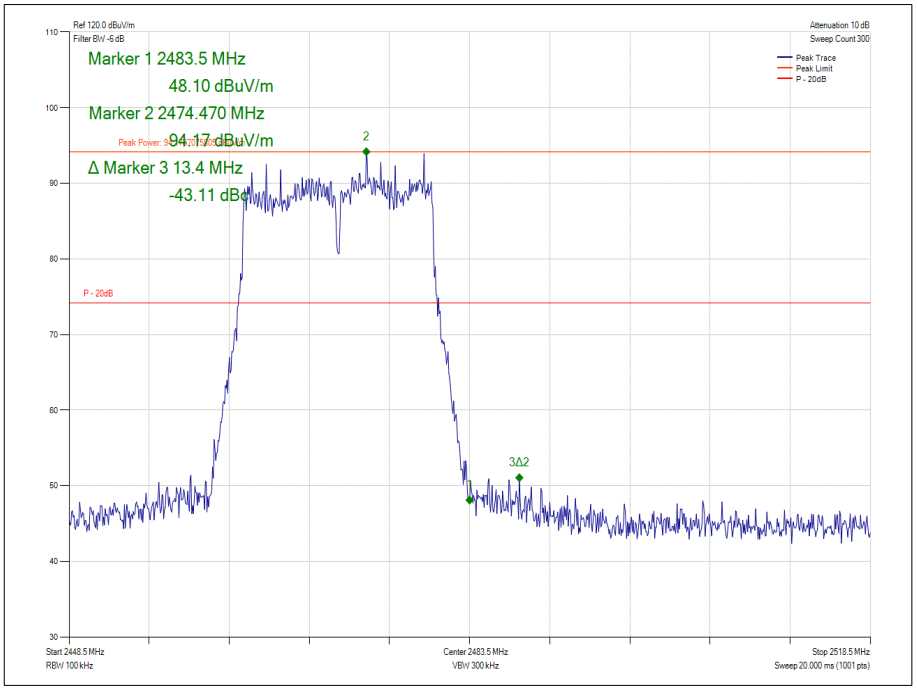


Figure 75 - Data Rate with the Widest Bandwidth - 9 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

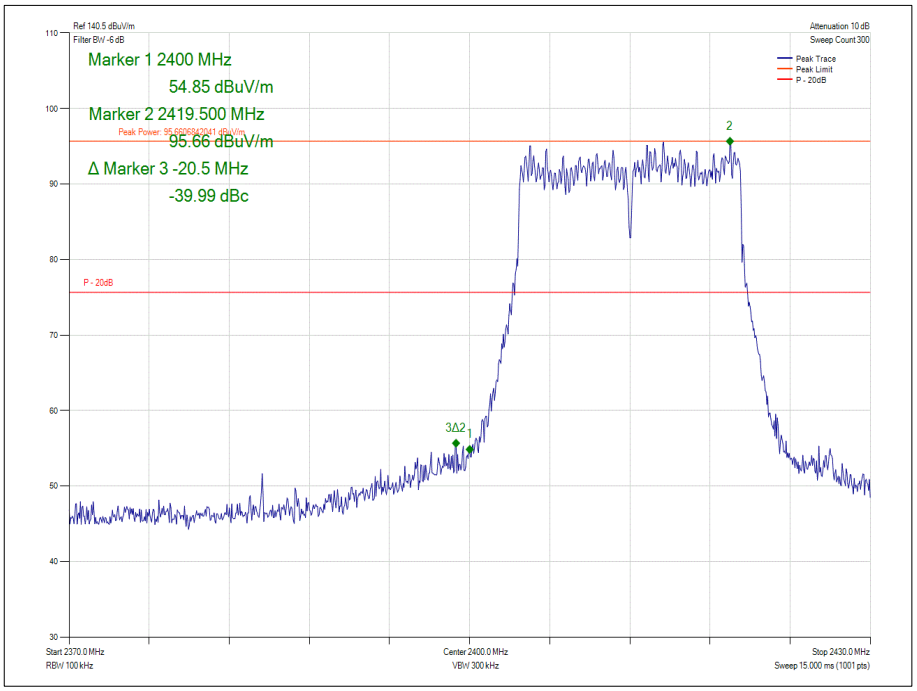


Figure 76 - Data Rate with the Highest Power - 36 Mbps
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 2

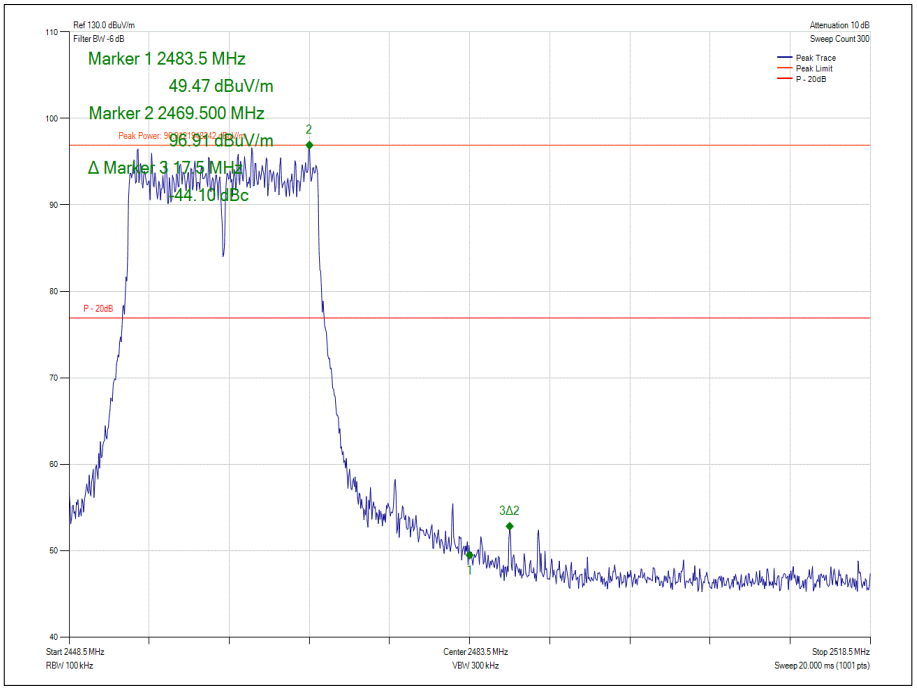


Figure 77 - Data Rate with the Highest Power - 36 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

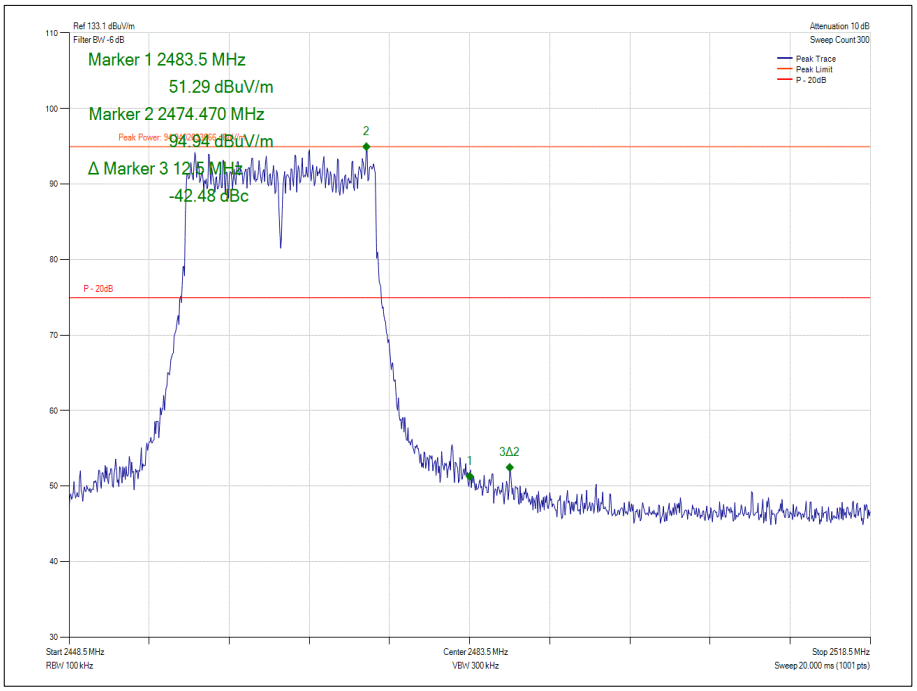


Figure 78 - Data Rate with the Highest Power - 36 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

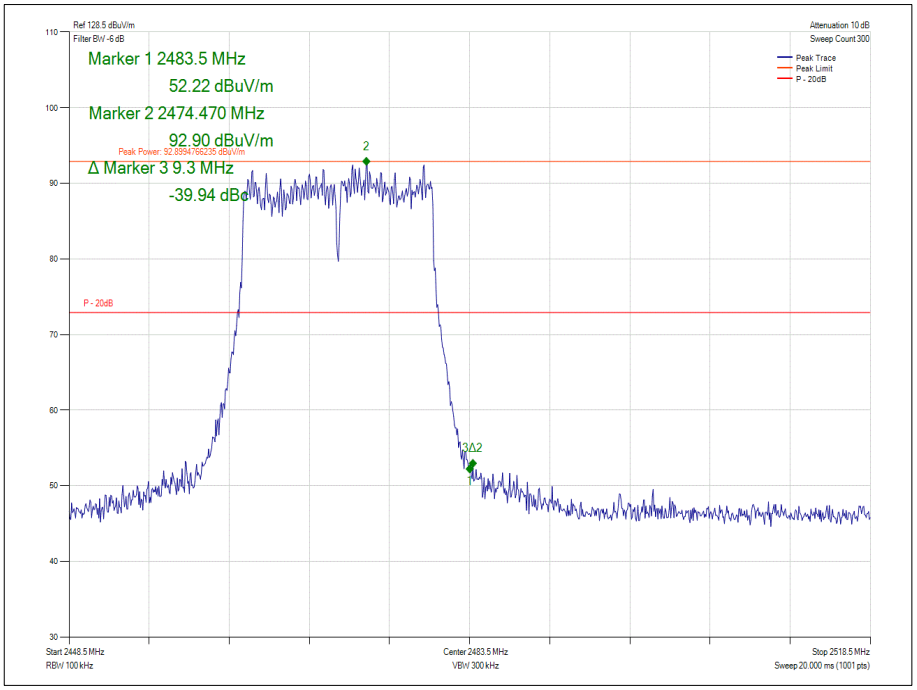


Figure 79 - Data Rate with the Highest Power - 36 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

2.4 GHz WLAN - 802.11n 20 MHz Bandwidth

Mode	MCS	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
MCS with the Highest Power (12 dBm) and Widest Bandwidth	MCS7	2412	2483.5	-38.95
MCS with the Highest Power (12 dBm) and Widest Bandwidth	MCS7	2462	2400.0	-42.45
MCS with the Highest Power (10 dBm) and Widest Bandwidth	MCS7	2467	2483.5	-40.28
MCS with the Highest Power (7 dBm) and Widest Bandwidth	MCS7	2472	2400.0	-38.88

Table 33 - Authorised Band Edge Results – Antenna Port 1

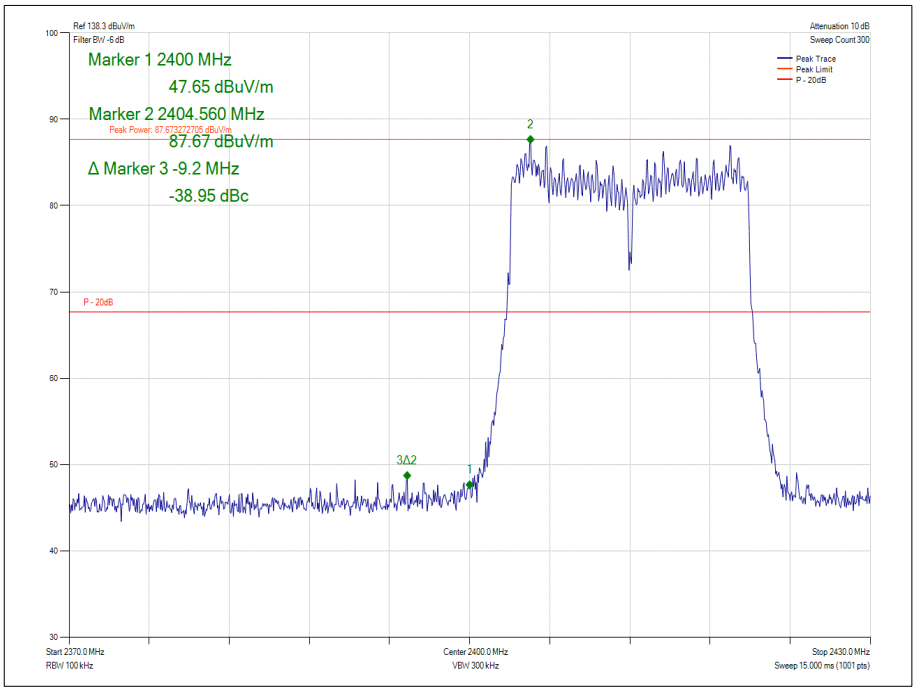


Figure 80 - MCS with the Highest Power and Widest Bandwidth - MCS7 2412 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

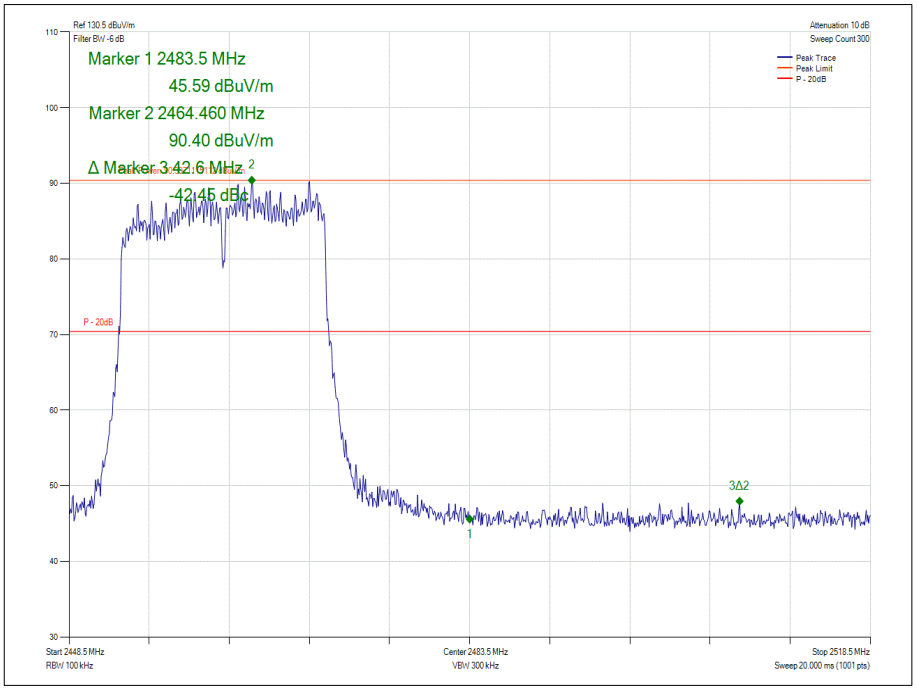


Figure 81 - MCS with the Highest Power and Widest Bandwidth - MCS7 2462 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1

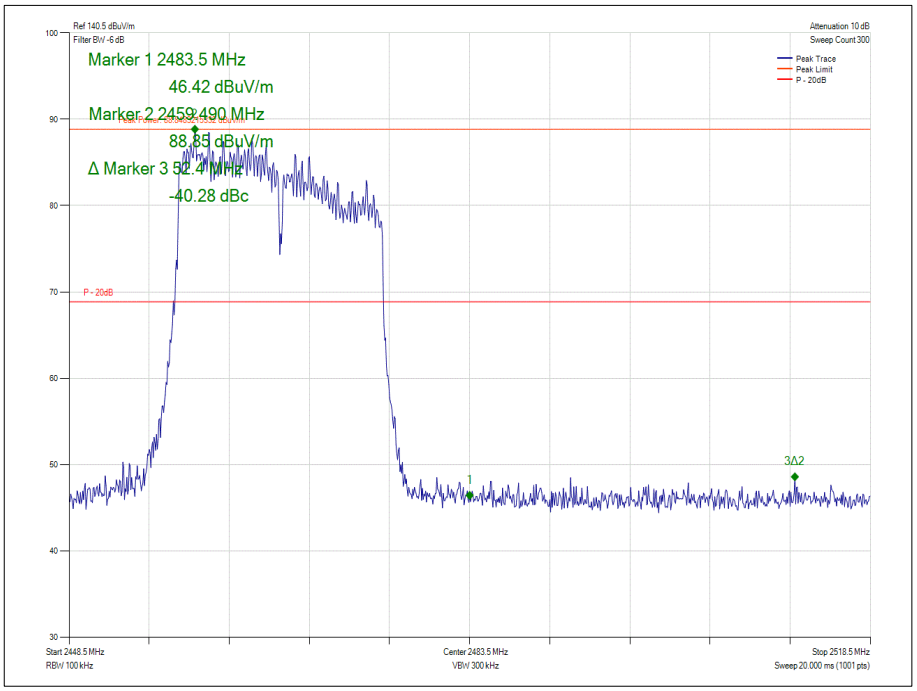


Figure 82 - MCS with the Highest Power and Widest Bandwidth - MCS7 2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

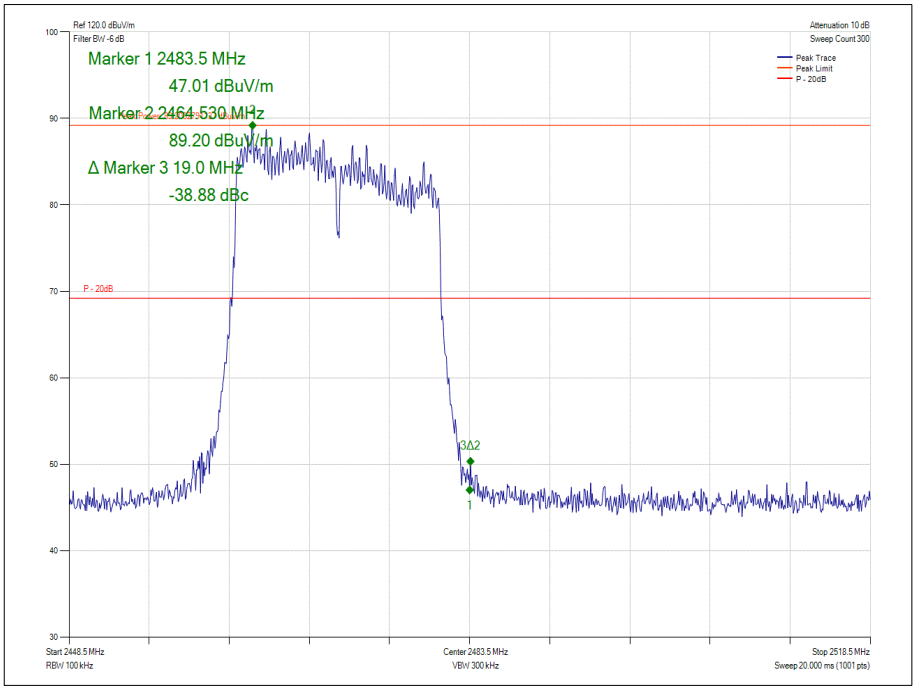


Figure 83 - MCS with the Highest Power and Widest Bandwidth - MCS7 2472 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1

Mode	MCS	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Data Rate/MCS with the Highest Power (12 dBm)	MCS7	2412	2400.0	-38.73
Data Rate/MCS with the Highest Power (12 dBm)	MCS7	2462	2483.5	-43.07
Data Rate/MCS with the Highest Power (10 dBm)	MCS7	2467	2483.5	-39.94
Data Rate/MCS with the Highest Power (7 dBm)	MCS7	2472	2483.5	-36.98
Data Rate/MCS with the Widest Bandwidth	MCS6	2412	2400.0	-33.94
Data Rate/MCS with the Widest Bandwidth	MCS6	2462	2483.5	-40.70
Data Rate/MCS with the Widest Bandwidth	MCS6	2467	2483.5	-40.55
Data Rate/MCS with the Widest Bandwidth	MCS6	2472	2483.5	-36.63

Table 34 - Authorised Band Edge Results – Antenna Port 2

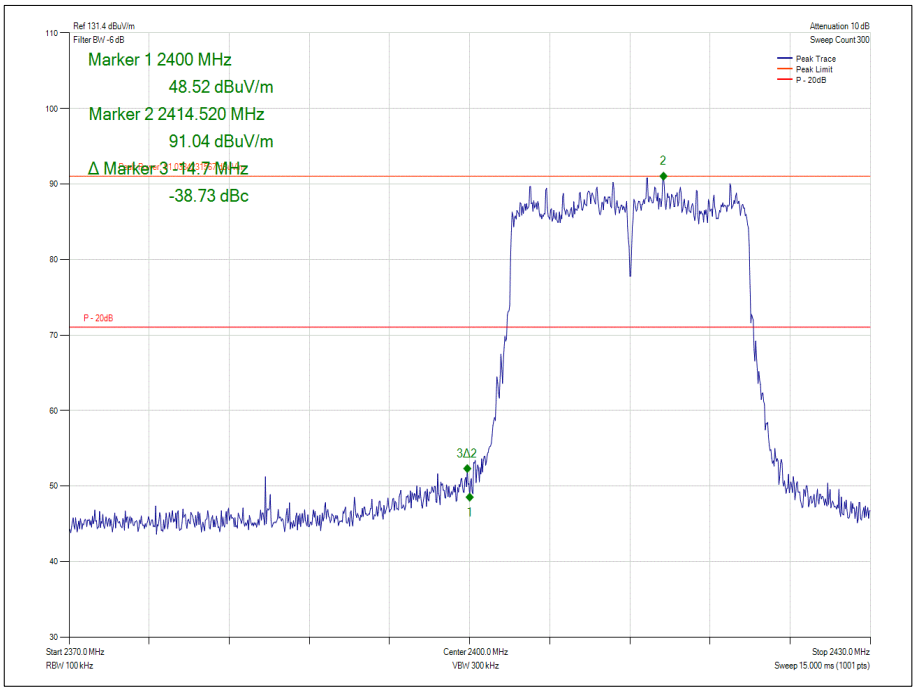


Figure 84 - MCS with the Highest Power - MCS7
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 2

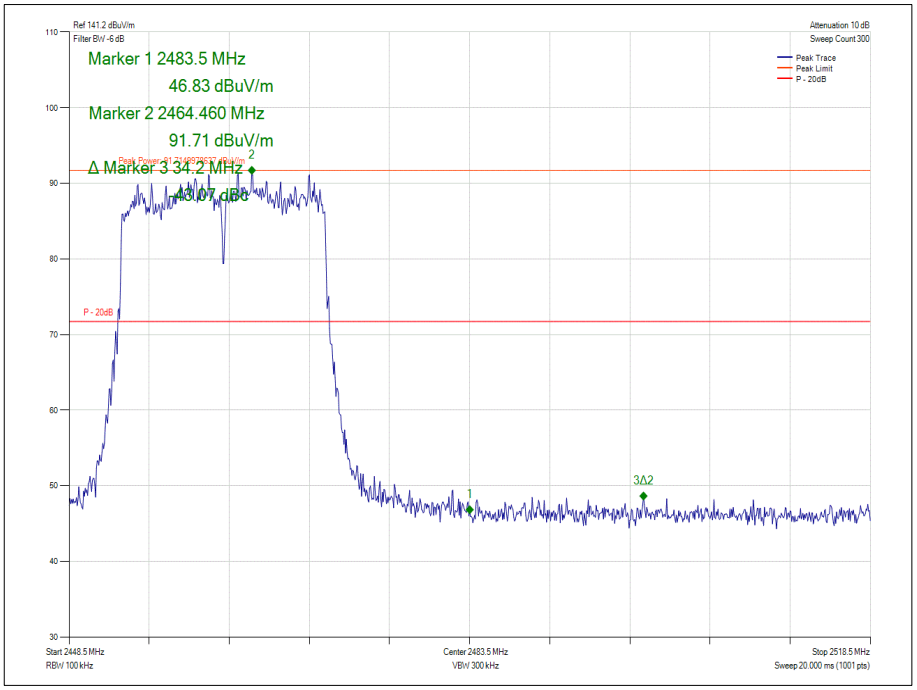


Figure 85 - MCS with the Highest Power - MCS7
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

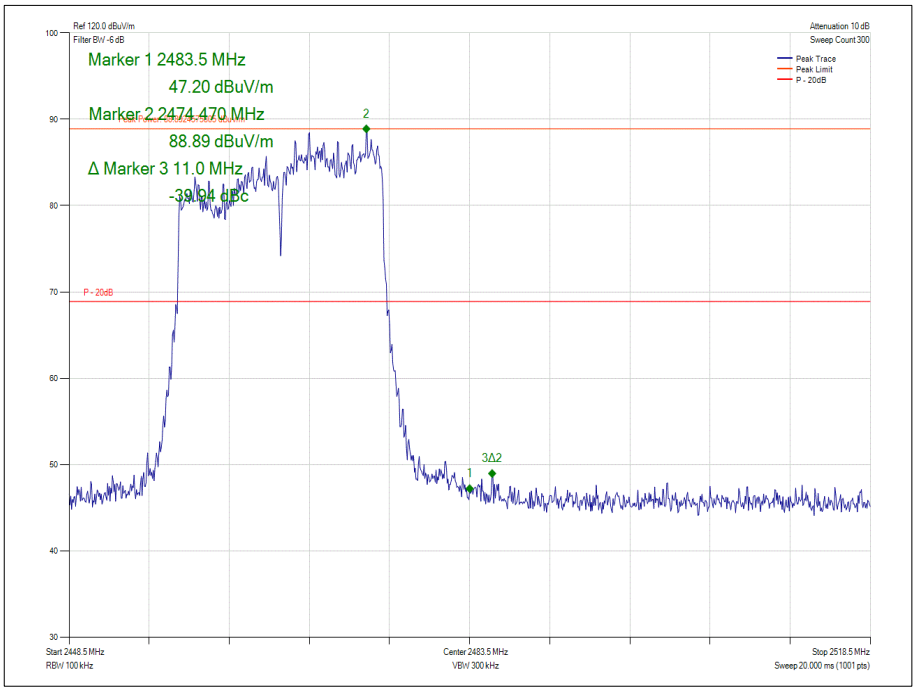


Figure 86 - MCS with the Highest Power - MCS7
2467 MHz - Band Edge Frequency 2483.5 MHz– Antenna Port 2

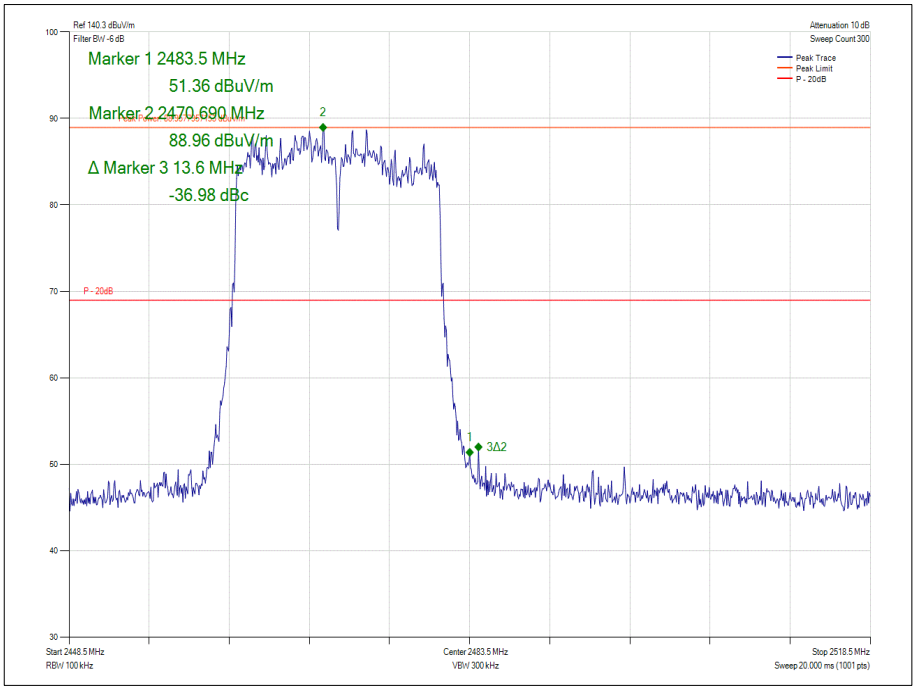


Figure 87 - MCS with the Highest Power - MCS7
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

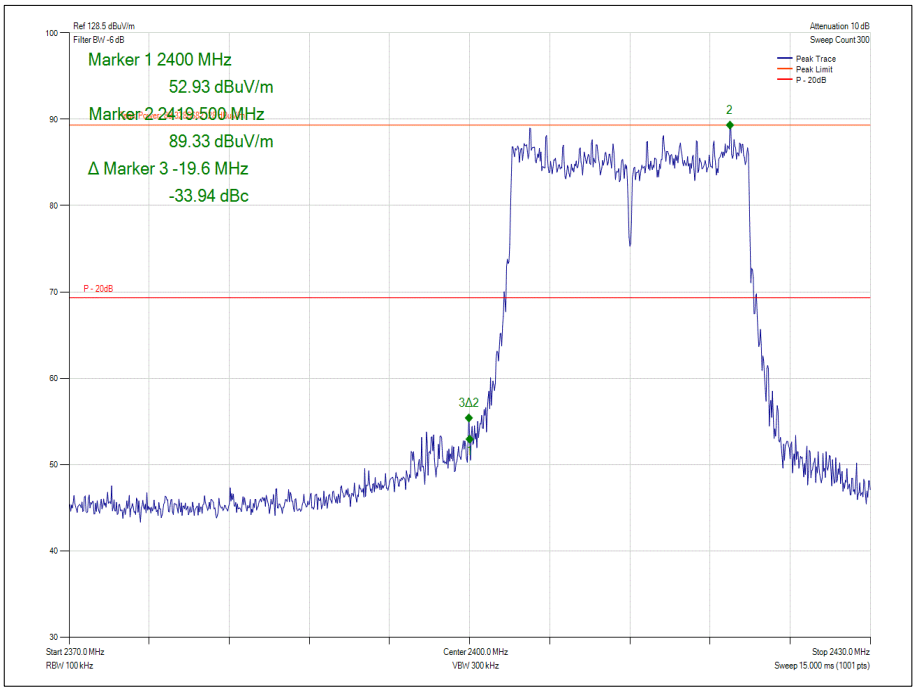


Figure 88 - MCS with the Widest Bandwidth - MCS6
2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 2

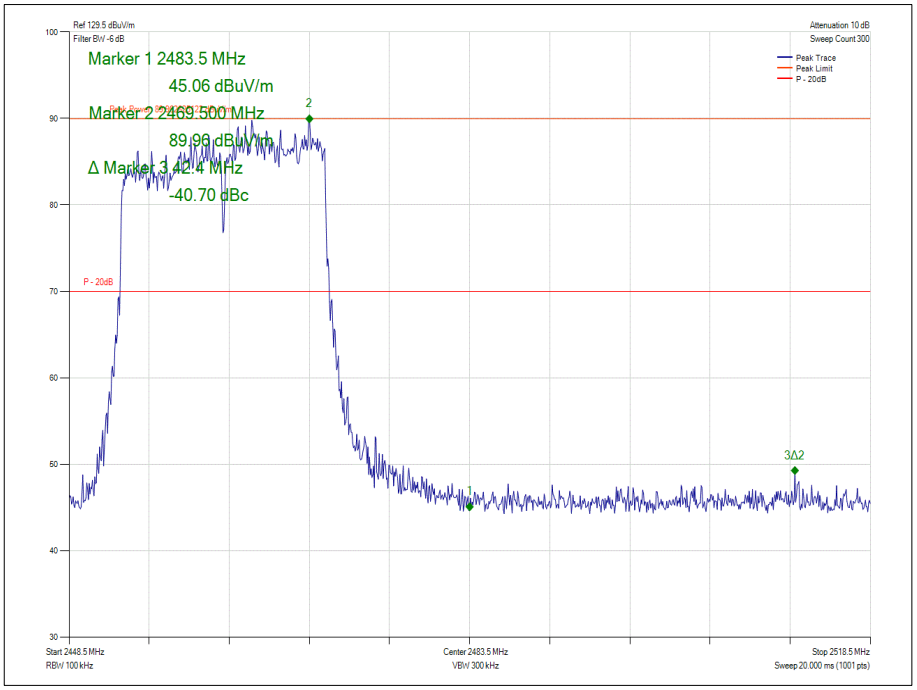


Figure 89 - MCS with the Widest Bandwidth - MCS6
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

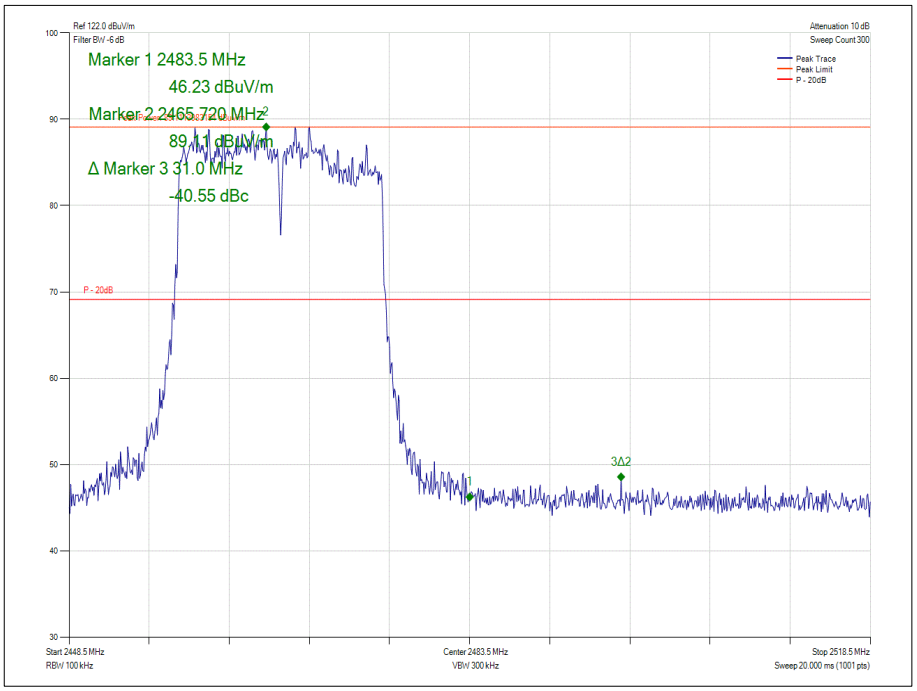


Figure 90 - MCS with the Widest Bandwidth - MCS6
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

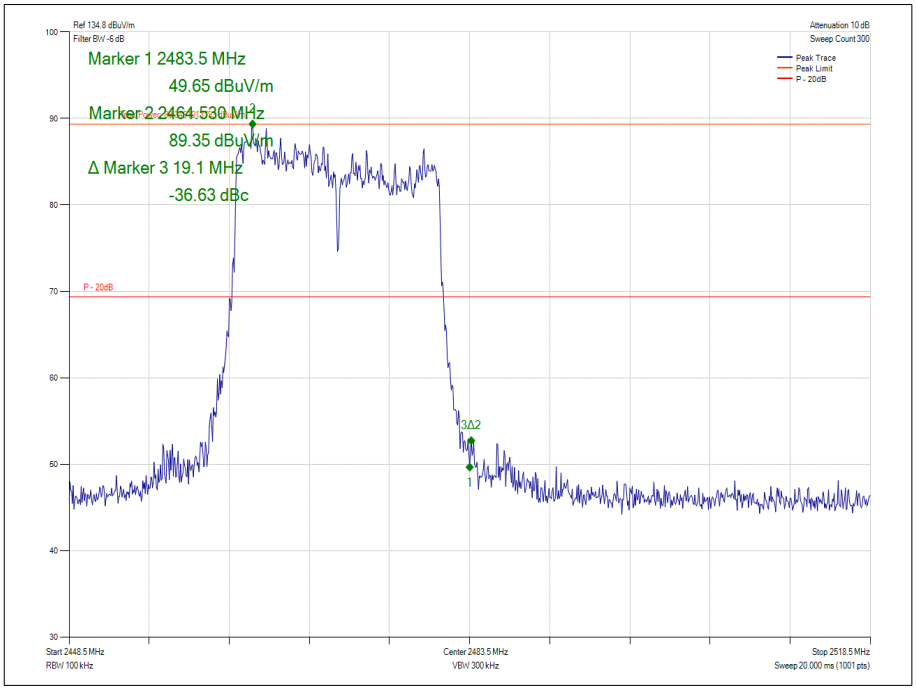


Figure 91 - MCS with the Widest Bandwidth - MCS6
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

Mode	MCS	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
MCS with the Highest Power and Widest Bandwidth	MCS0	2412	2400.0	-36.56
MCS with the Highest Power and Widest Bandwidth	MCS0	2462	2483.5	-43.77
MCS with the Highest Power and Widest Bandwidth	MCS0	2467	2483.5	-41.68
MCS with the Highest Power and Widest Bandwidth	MCS0	2472	2483.5	-38.98

Table 35 - Authorised Band Edge Results – Antenna Port 1+2 MIMO

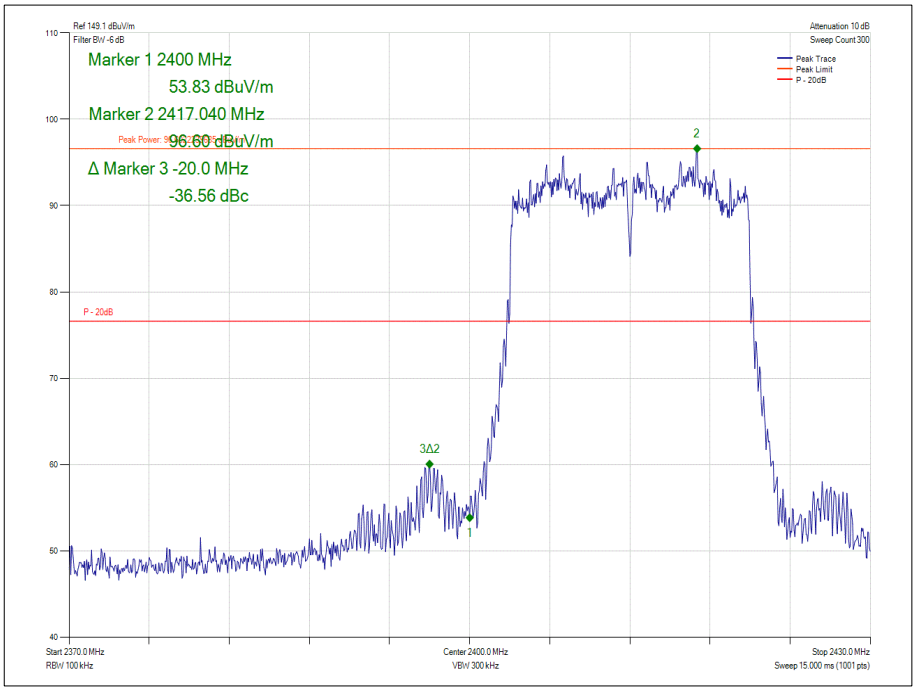


Figure 92 - MCS with the Highest Power and Widest Bandwidth - MCS0 2412 MHz - Band Edge Frequency 2400 MHz – Antenna Port 1+2 MIMO

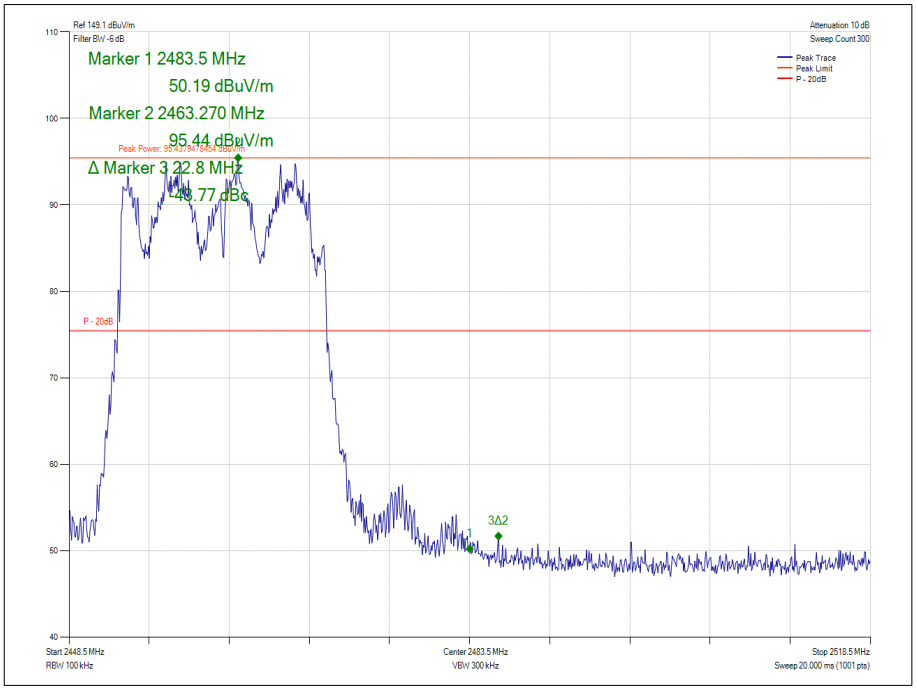


Figure 93 - MCS with the Highest Power and Widest Bandwidth - MCS0 2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1+2 MIMO

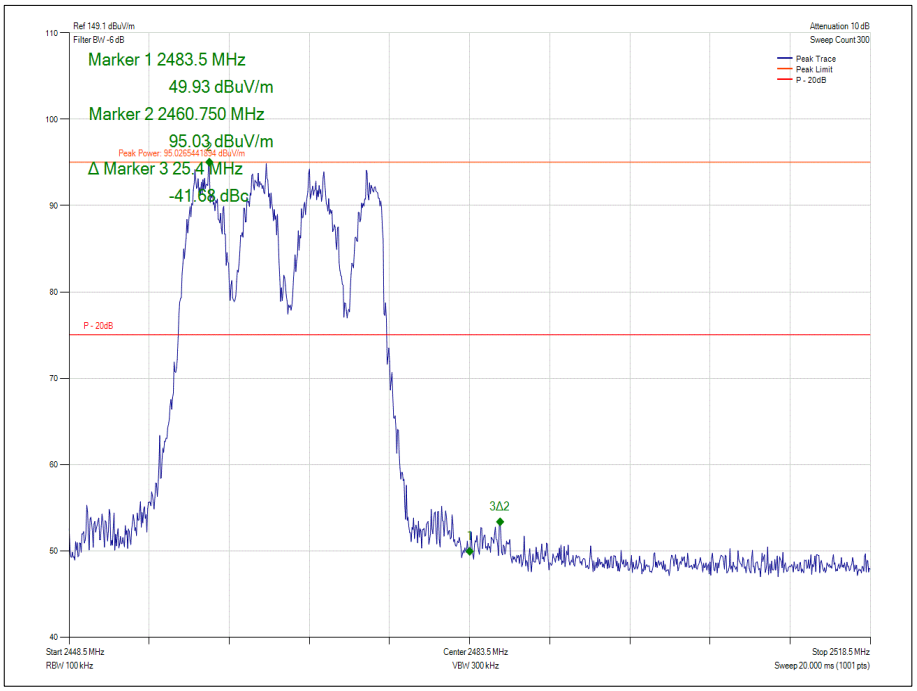


Figure 94 - MCS with the Highest Power and Widest Bandwidth - MCS0 2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1+2 MIMO

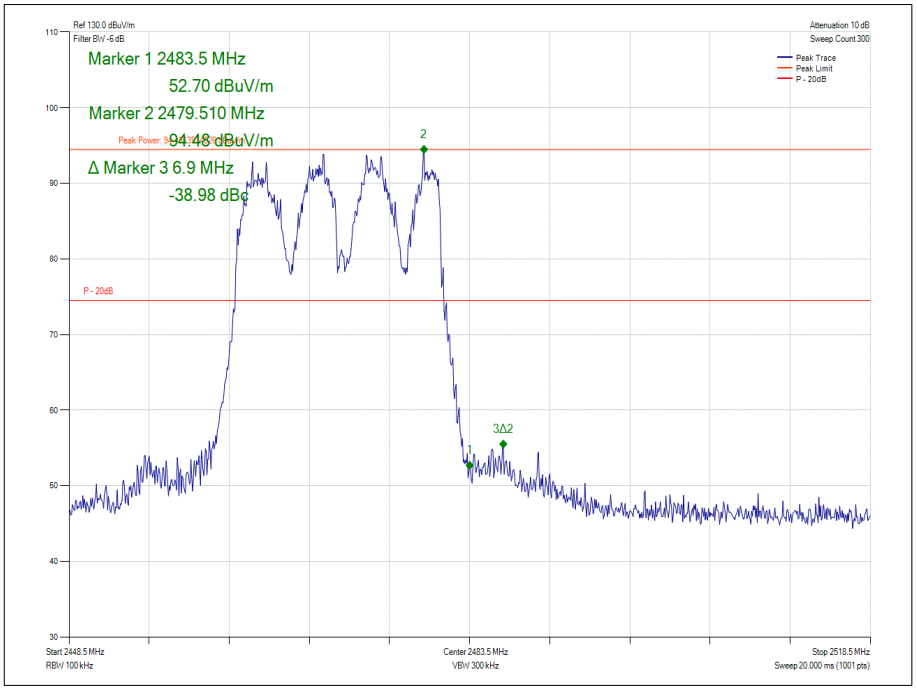


Figure 95 - MCS with the Highest Power and Widest Bandwidth - MCS0 2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1+2 MIMO

Bluetooth Low Energy

Modulation/Packet Type	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
GFSK/DH1	2402	2400.0	-56.36
GFSK/DH1	2480	2483.5	-56.96

Table 36 - Authorised Band Edge Results

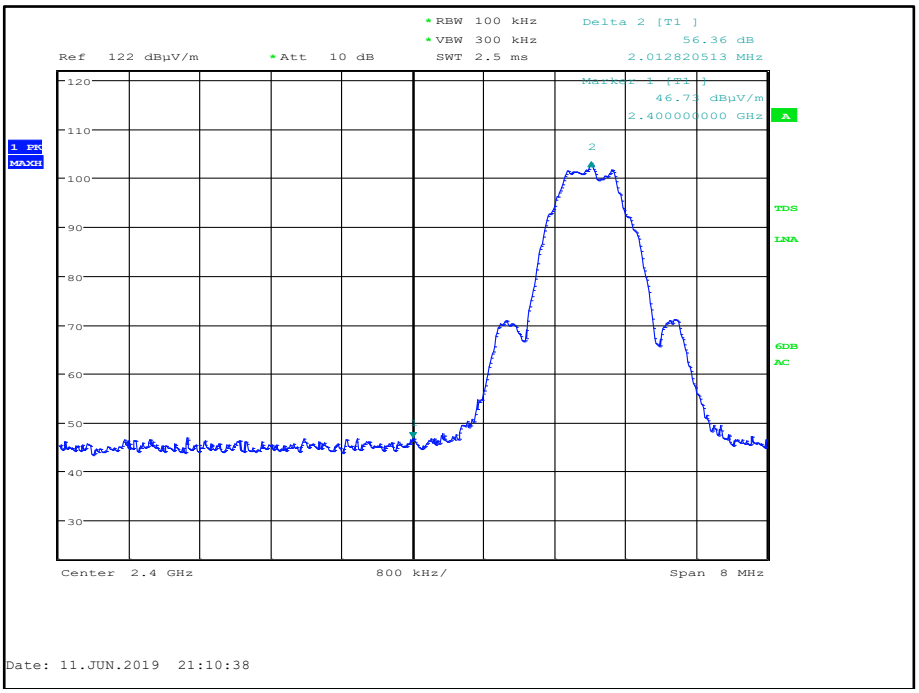


Figure 96- GFSK/DH1- 2402 MHz - Band Edge Frequency 2400 MHz

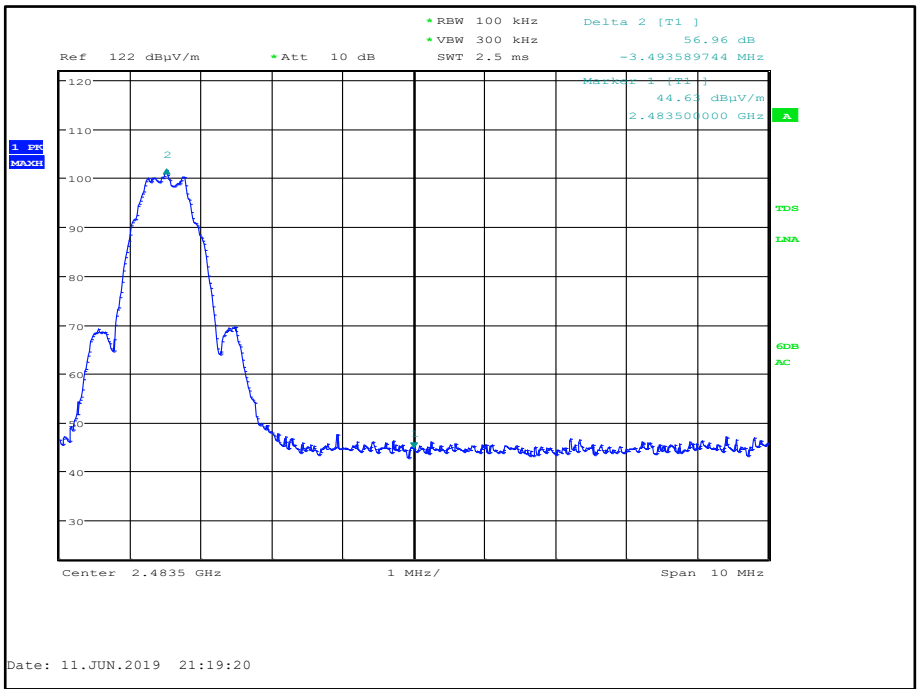


Figure 97 - GFSK/DH1 – 2480 MHz - Band Edge Frequency 2483.5 MHz

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

ISEDC RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2677	12	20-Feb-2020
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019
Cable (18 GHz)	Rosenberger	LU7-071-2000	5109	12	05-Oct-2019
EmX Software	TUV SUD	EmX	5125	-	Software

Table 37

TU - Traceability Unscheduled

2.6 Restricted Band Edges

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205
ISEDC RSS-GEN, Clause 8.10

2.6.2 Equipment Under Test and Modification State

Minuet 2 Module (FS5352), S/N: RAD113219 - Modification State 0

2.6.3 Date of Test

11-June-2019 to 03-July-2019

2.6.4 Test Method

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

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3. 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 dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.6.5 Environmental Conditions

Ambient Temperature	20.4 - 22.4 °C
Relative Humidity	56.8 - 59.9 %

2.6.6 Test Results

2.4 GHz WLAN - 802.11b

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2412	2390	61.05	48.75
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2462	2483.5	60.67	48.65
Data Rate with the Highest Power (15 dBm) and Widest Bandwidth	2 Mbps	2467	2483.5	60.22	50.89
Data Rate with the Highest Power (13 dBm) and Widest Bandwidth	2 Mbps	2472	2483.5	61.76	50.50

Table 38 - Restricted Band Edge Results – Antenna Port 1

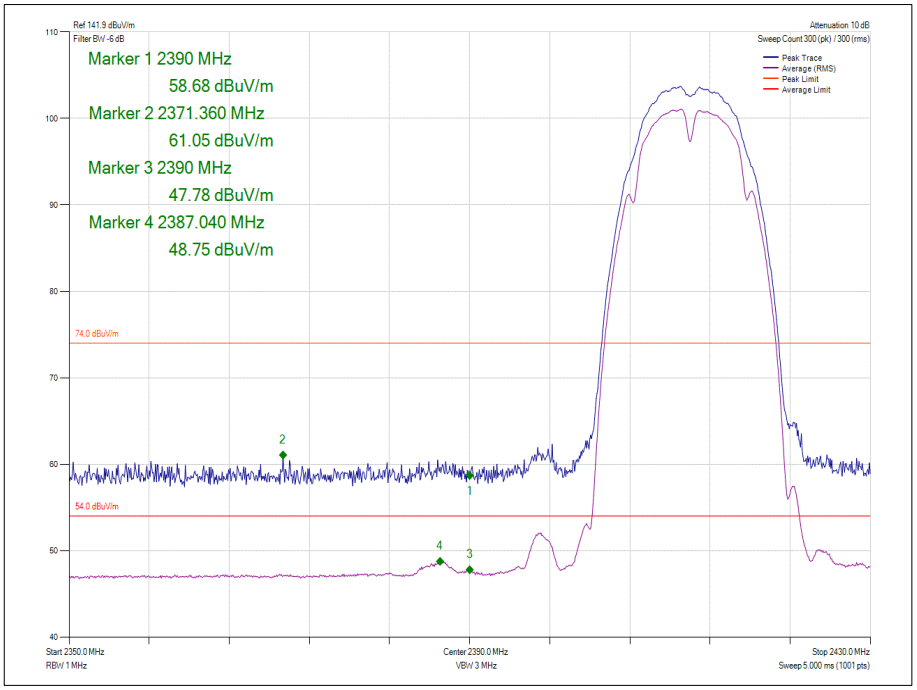


Figure 98 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 1

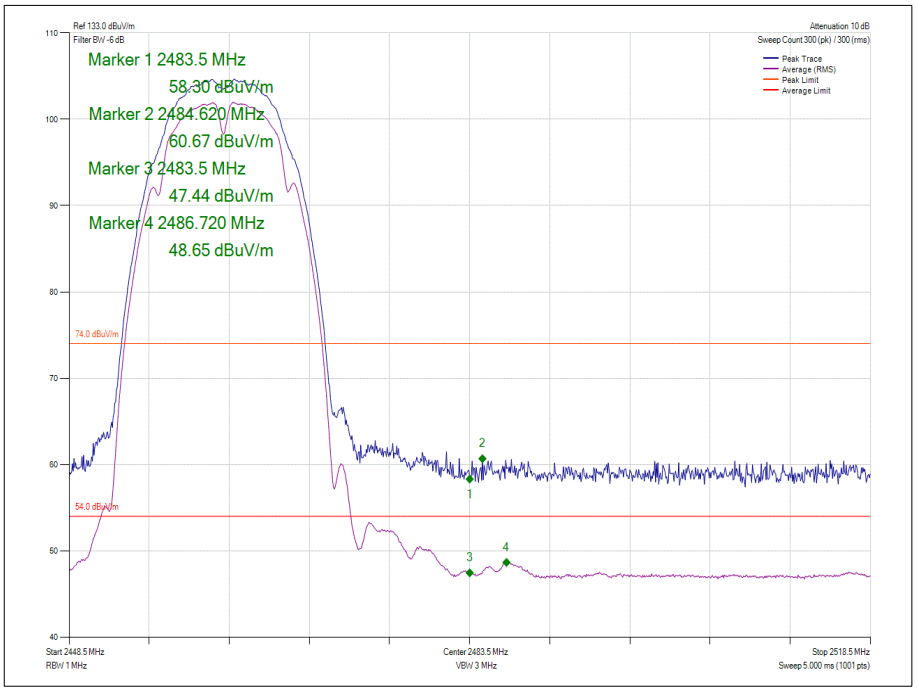


Figure 99 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

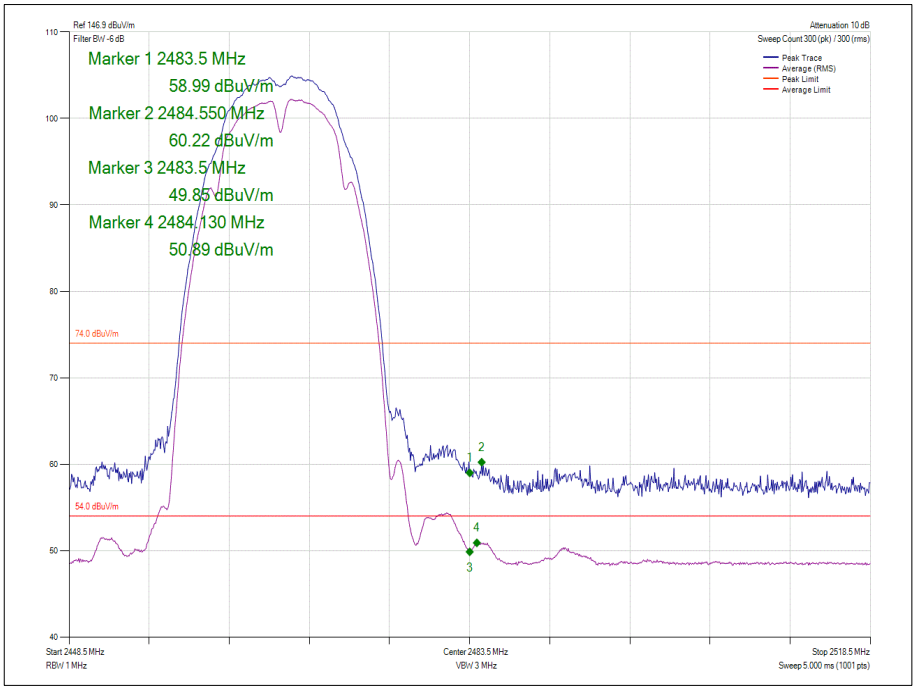


Figure 100 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

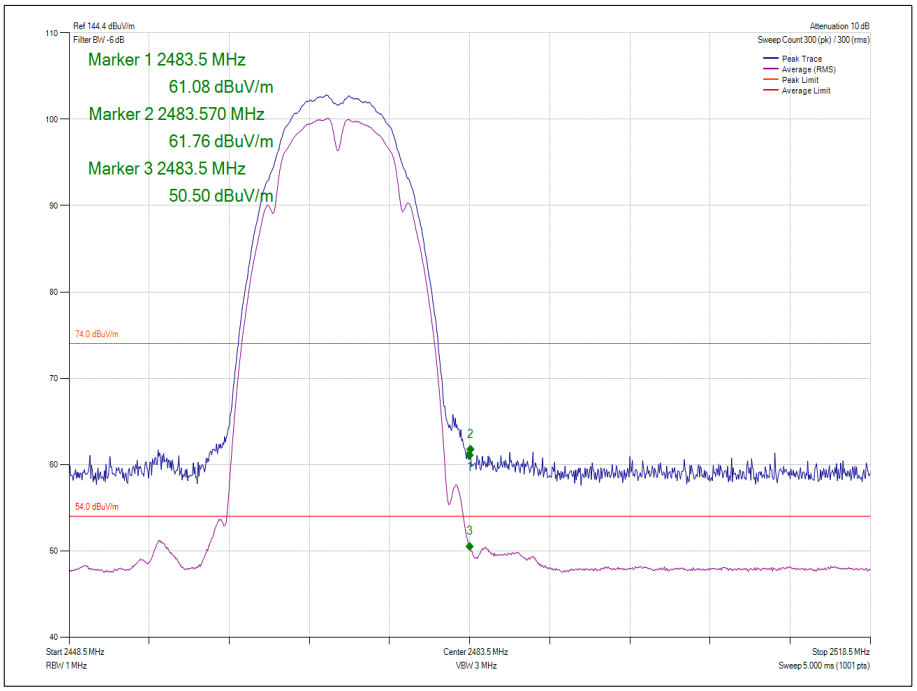


Figure 101 - Data Rate with the Highest Power and Widest Bandwidth - 2 Mbps 2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Data Rate with the Highest Power (15 dBm)	1 Mbps	2412 MHz	2390	58.57	48.59
Data Rate with the Highest Power (15 dBm)	1 Mbps	2462 MHz	2483.5	59.08	49.83
Data Rate with the Highest Power (15 dBm)	1 Mbps	2467 MHz	2483.5	59.91	49.82
Data Rate with the Highest Power (13 dBm)	1 Mbps	2472 MHz	2483.5	59.75	50.28

Table 39 - Restricted Band Edge Results – Antenna Port 2

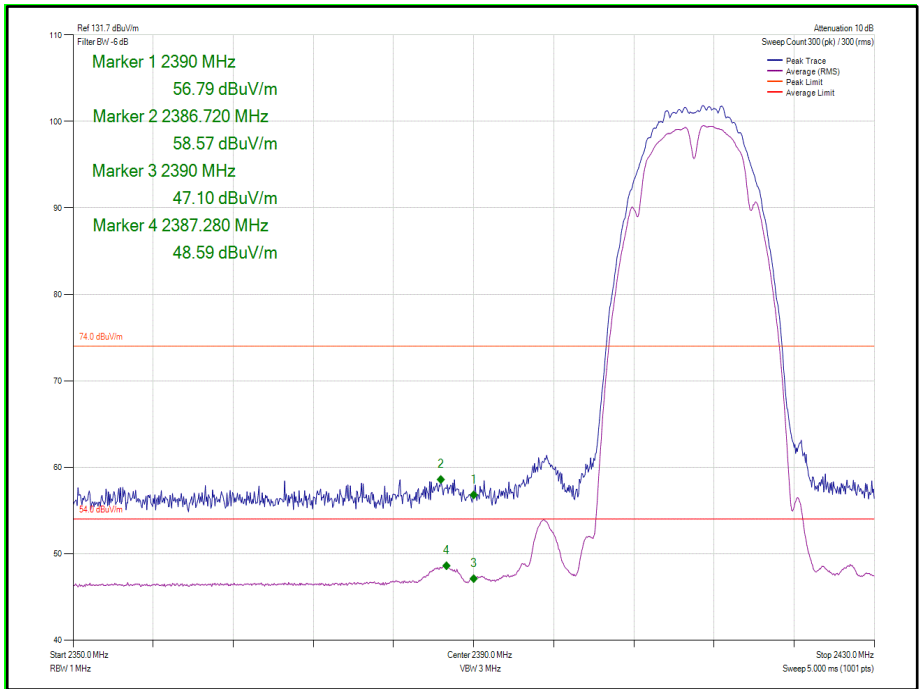


Figure 102 - Data Rate with the Highest Power - 1 Mbps
2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 2

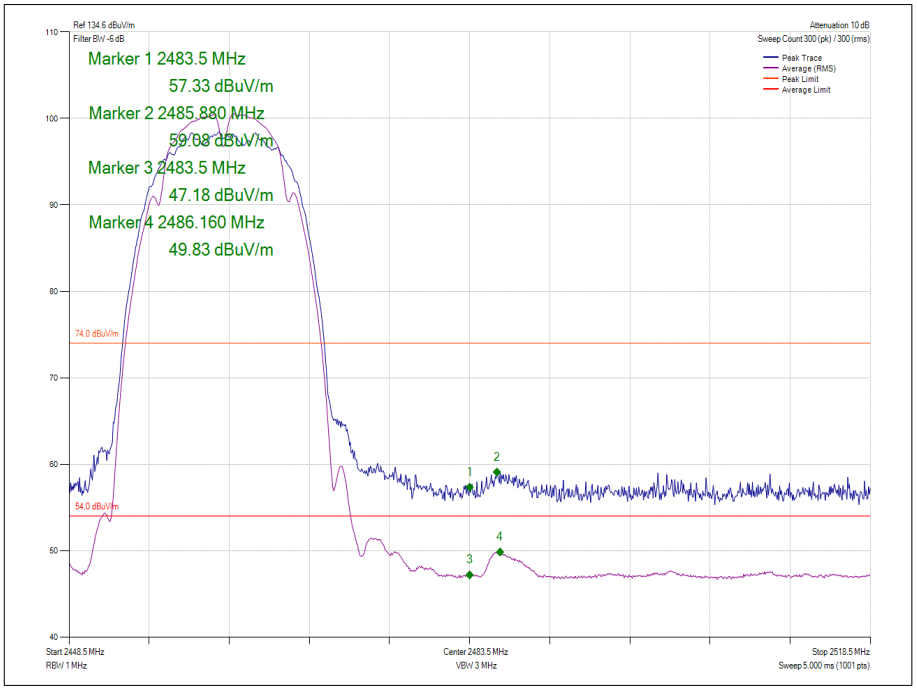


Figure 103 - Data Rate with the Highest Power - 1 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

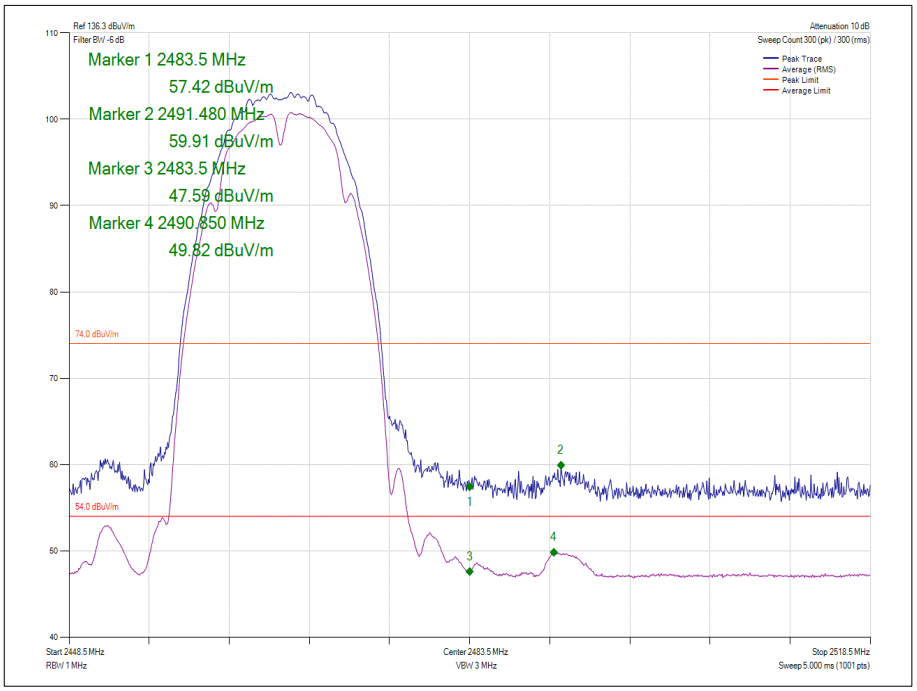


Figure 104 - Data Rate with the Highest Power - 1 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

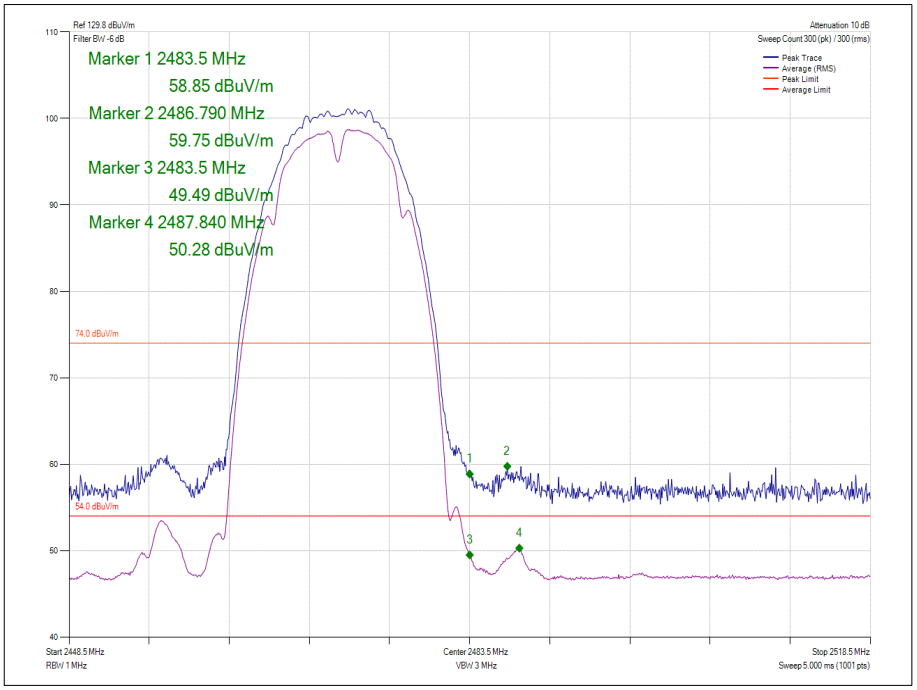


Figure 105 - Data Rate with the Highest Power - 1 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

2.4 GHz WLAN - 802.11g

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Data Rate with the Highest Power (13 dBm)	54 Mbps	2412	2390	66.79	48.61
Data Rate with the Highest Power (13 dBm)	54 Mbps	2462	2483.5	69.72	50.75
Data Rate with the Highest Power (11 dBm)	54 Mbps	2467	2483.5	72.44	51.50
Data Rate with the Highest Power (7 dBm)	54 Mbps	2472	2483.5	73.04	50.61
Data Rate with the Widest Bandwidth	9 Mbps	2412	2390	63.63	47.92
Data Rate with the Widest Bandwidth	9 Mbps	2462	2483.5	65.83	49.42
Data Rate with the Widest Bandwidth	9 Mbps	2467	2483.5	67.47	50.22
Data Rate with the Widest Bandwidth	9 Mbps	2472	2483.5	65.45	50.12

Table 40 - Restricted Band Edge Results – Antenna Port 1

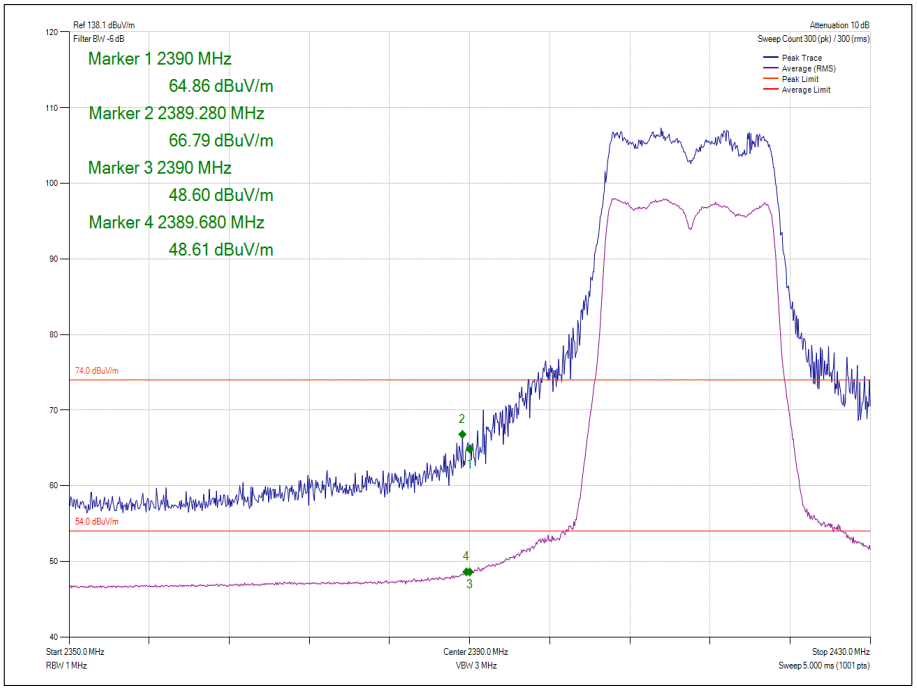


Figure 106 - Data Rate with the Highest Power - 54 Mbps 2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 1

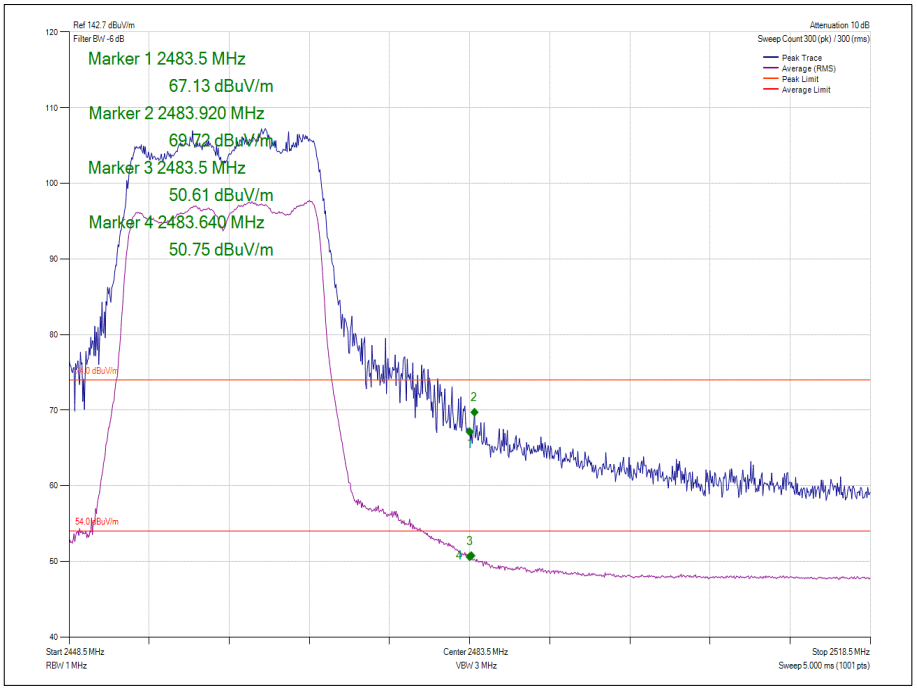


Figure 107 - Data Rate with the Highest Power - 54 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

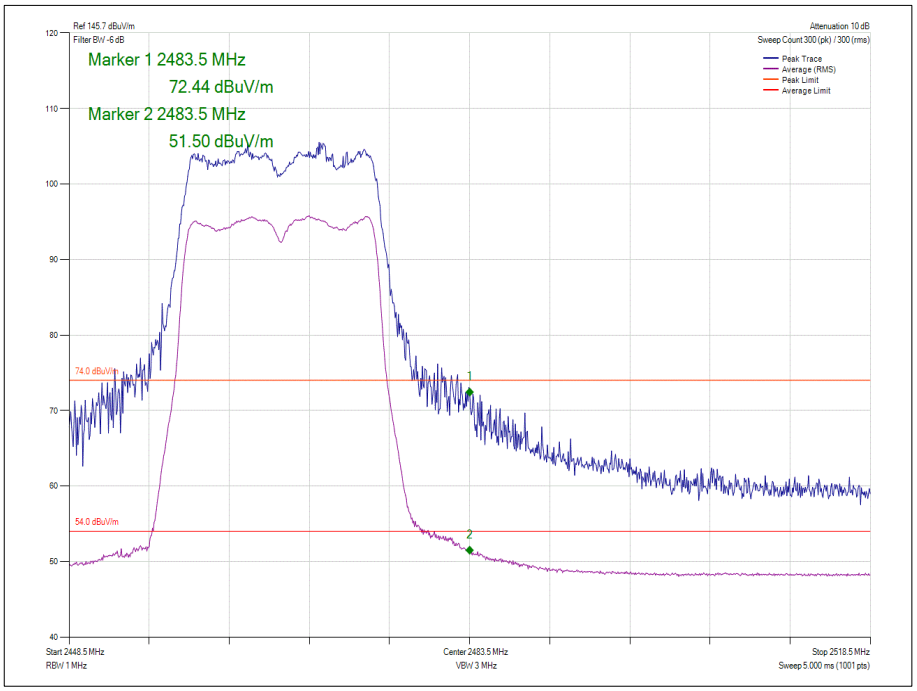


Figure 108 - Data Rate with the Highest Power - 54 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

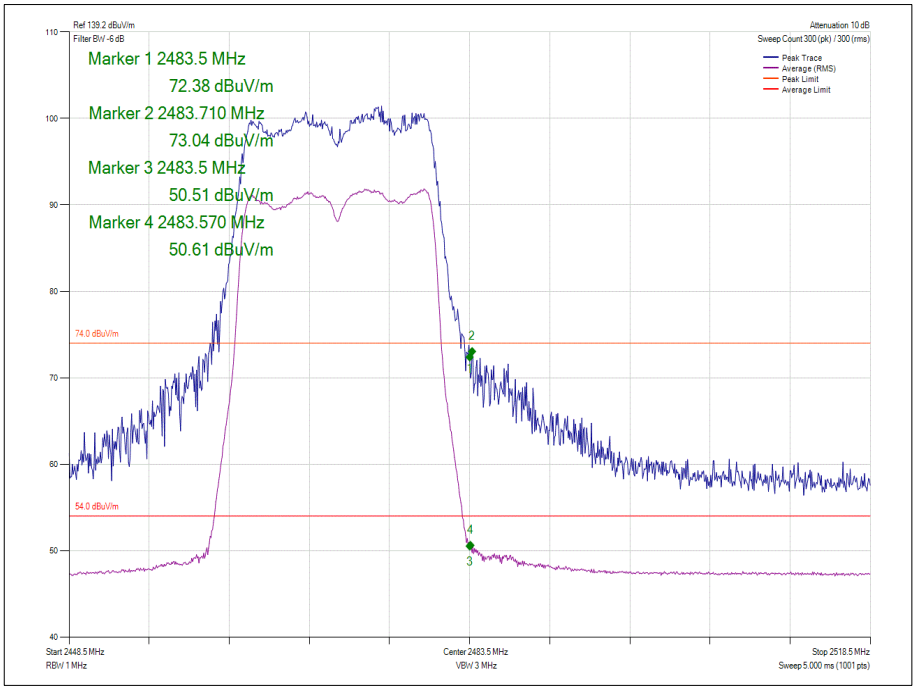


Figure 109 - Data Rate with the Highest Power - 54 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

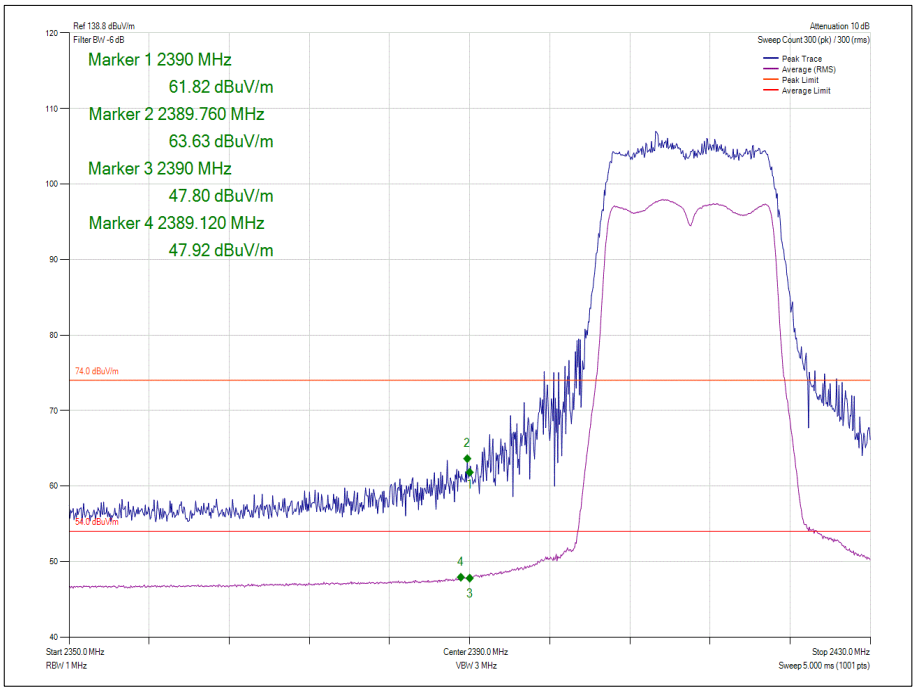


Figure 110 - Data Rate with the Widest Bandwidth - 9 Mbps
2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 1

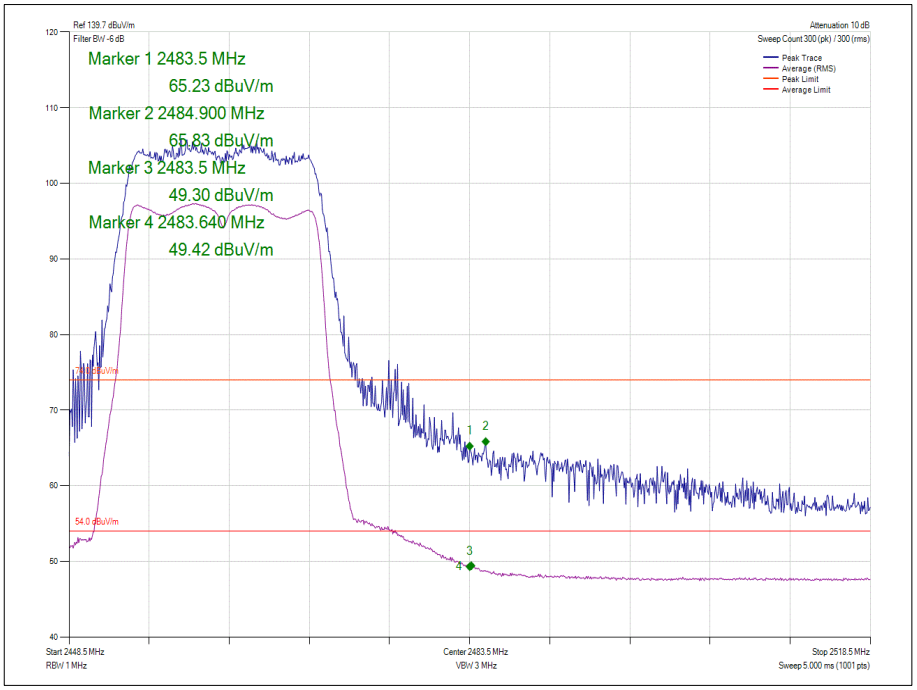


Figure 111 - Data Rate with the Widest Bandwidth - 9 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

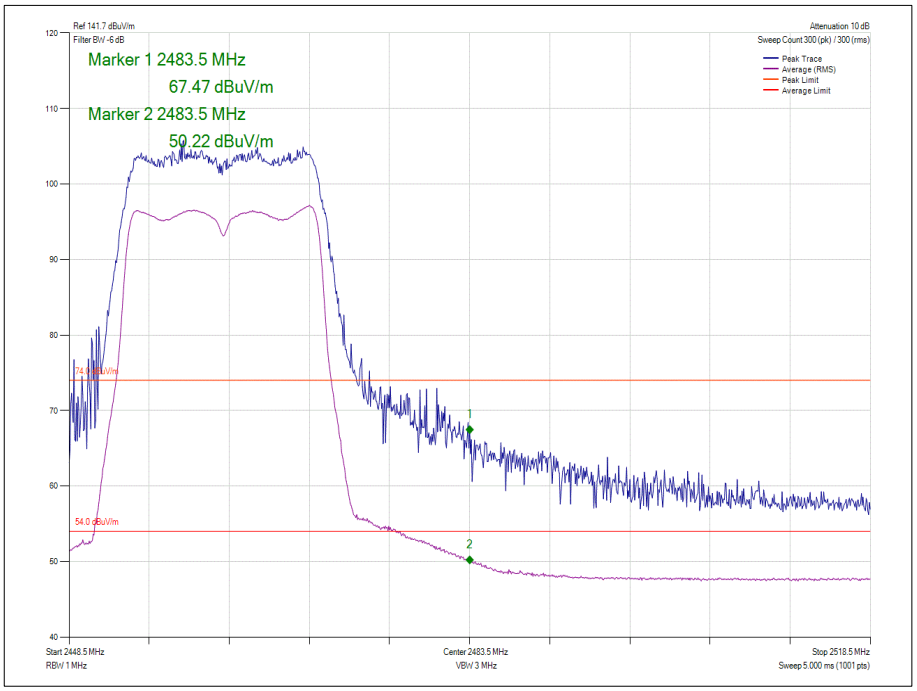


Figure 112 - Data Rate with the Widest Bandwidth - 9 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

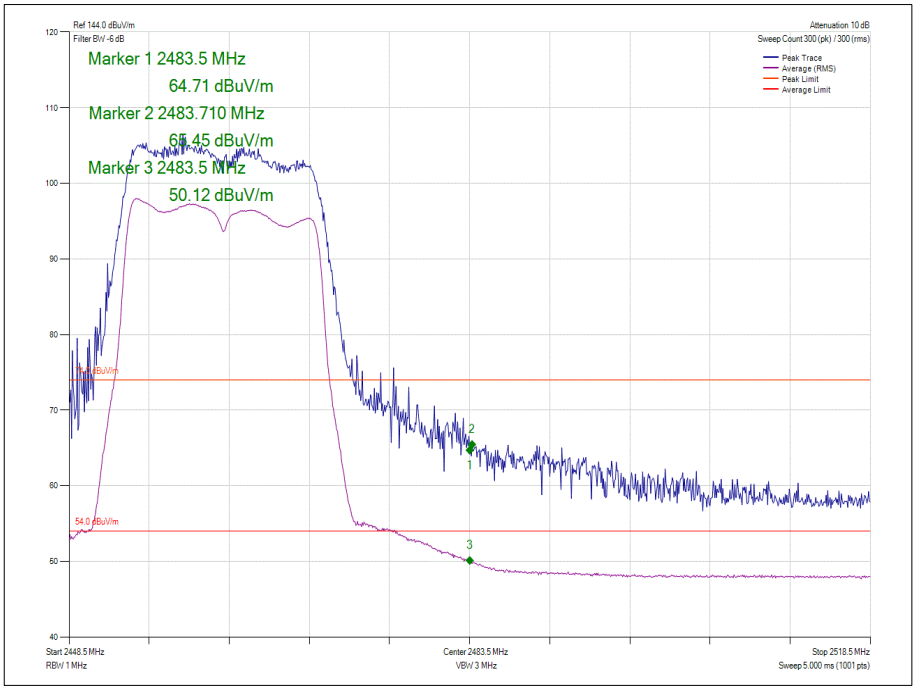


Figure 113 - Data Rate with the Widest Bandwidth - 9 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 1

Mode	Data Rate	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Data Rate with the Highest Power (13 dBm)	36 Mbps	2412	2390	63.38	48.41
Data Rate with the Highest Power (13 dBm)	36 Mbps	2462	2483.5	68.27	50.55
Data Rate with the Highest Power (12 dBm)	36 Mbps	2467	2483.5	70.07	51.05
Data Rate with the Highest Power (9 dBm)	36 Mbps	2472	2483.5	71.62	51.44
Data Rate with the Widest Bandwidth	9 Mbps	2412	2390	64.75	48.29
Data Rate with the Widest Bandwidth	9 Mbps	2462	2483.5	63.48	48.94
Data Rate with the Widest Bandwidth	9 Mbps	2467	2483.5	68.29	49.80
Data Rate with the Widest Bandwidth	9 Mbps	2472	2483.5	72.74	52.12

Table 41 - Restricted Band Edge Results – Antenna Port 2

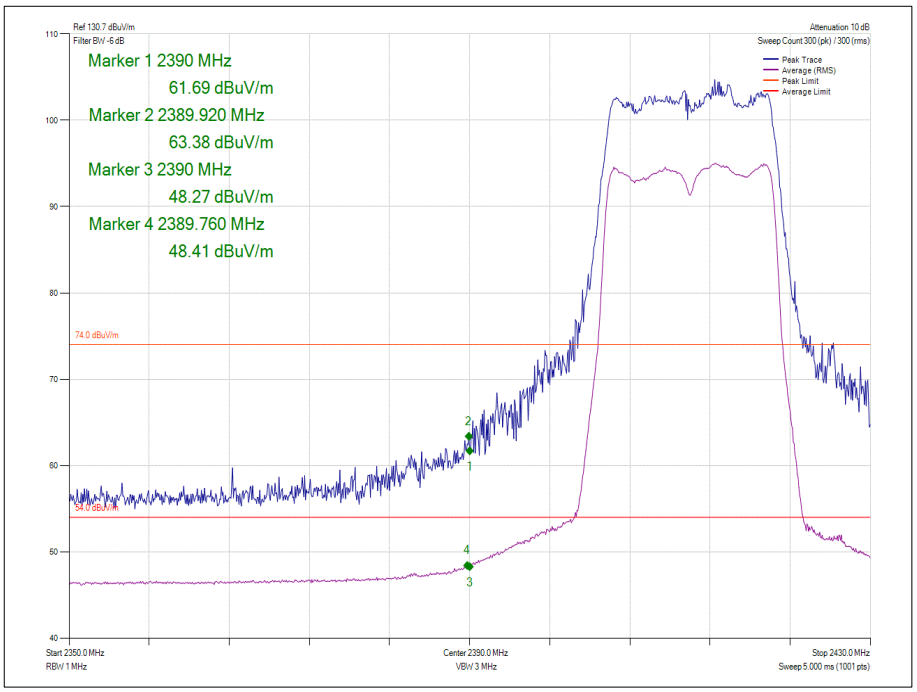


Figure 114 - Data Rate with the Highest Power - 36 Mbps 2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 2

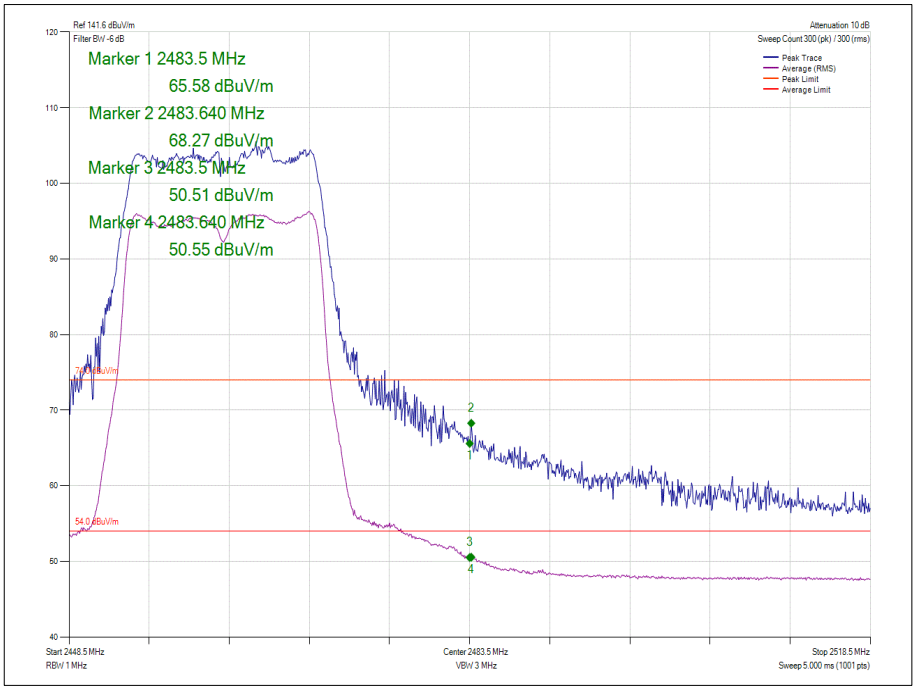


Figure 115 - Data Rate with the Highest Power - 36 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

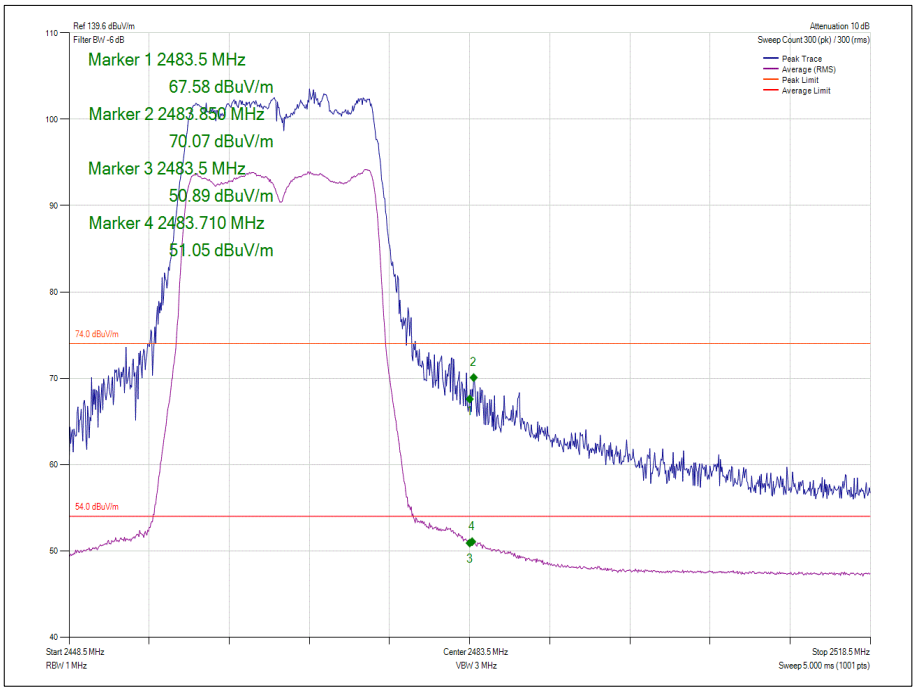


Figure 116 - Data Rate with the Highest Power - 36 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

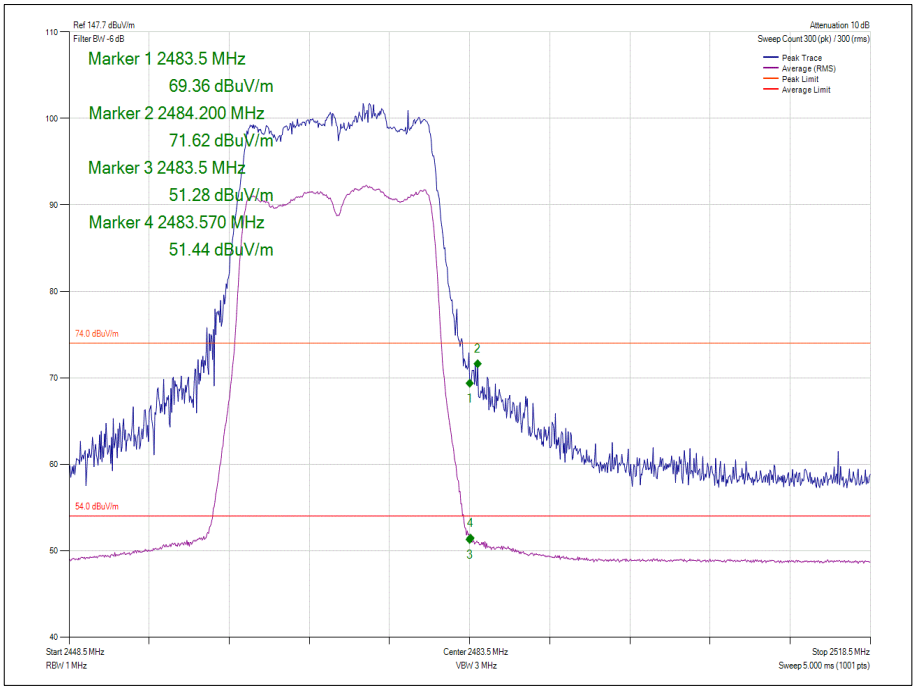


Figure 117 - Data Rate with the Highest Power - 36 Mbps
2472 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

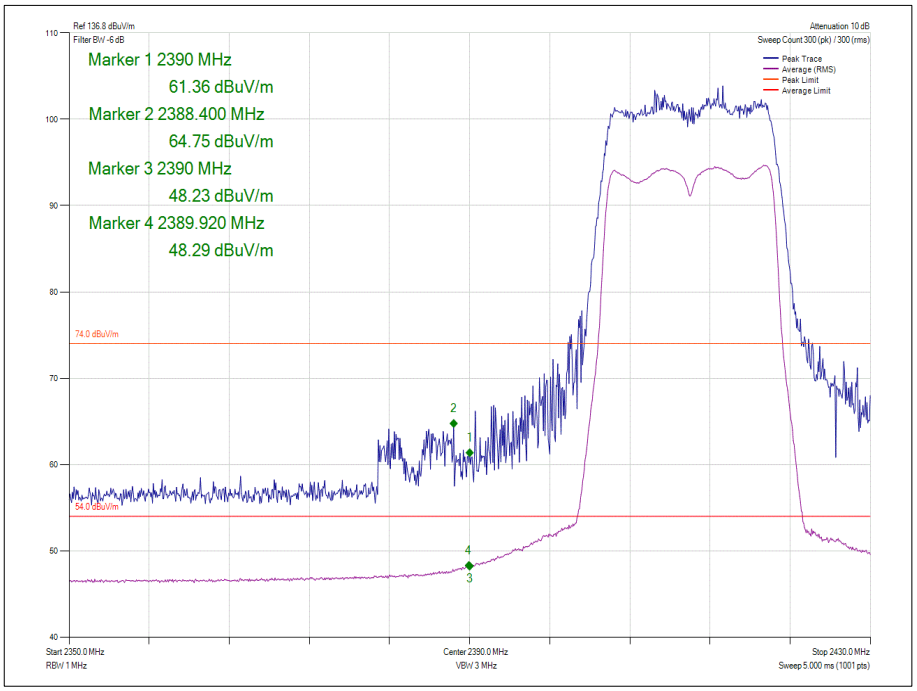


Figure 118 - Data Rate with the Widest Bandwidth - 9 Mbps
2412 MHz - Band Edge Frequency 2390 MHz – Antenna Port 2

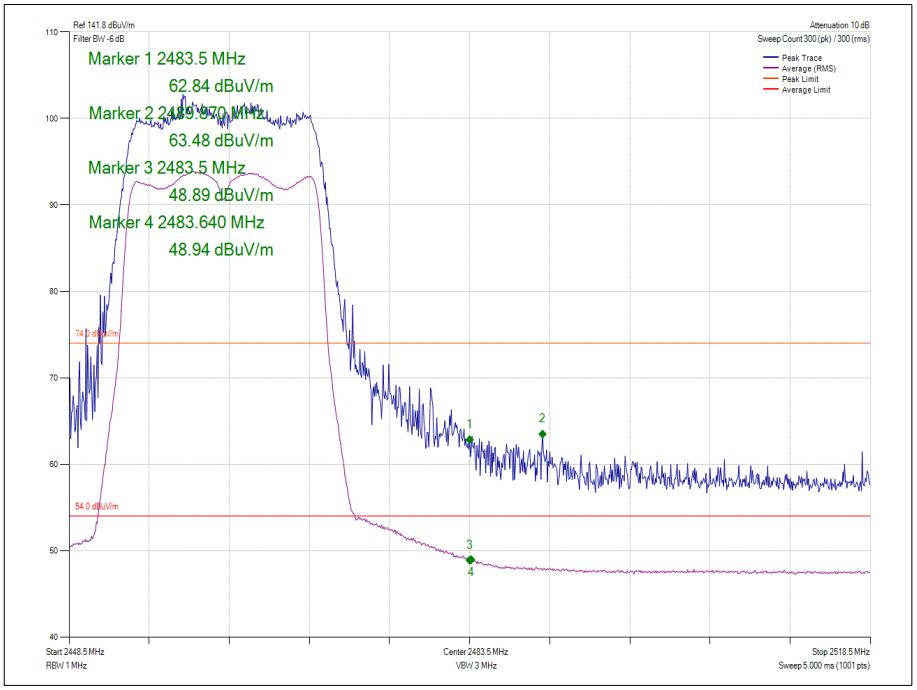


Figure 119 - Data Rate with the Widest Bandwidth - 9 Mbps
2462 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2

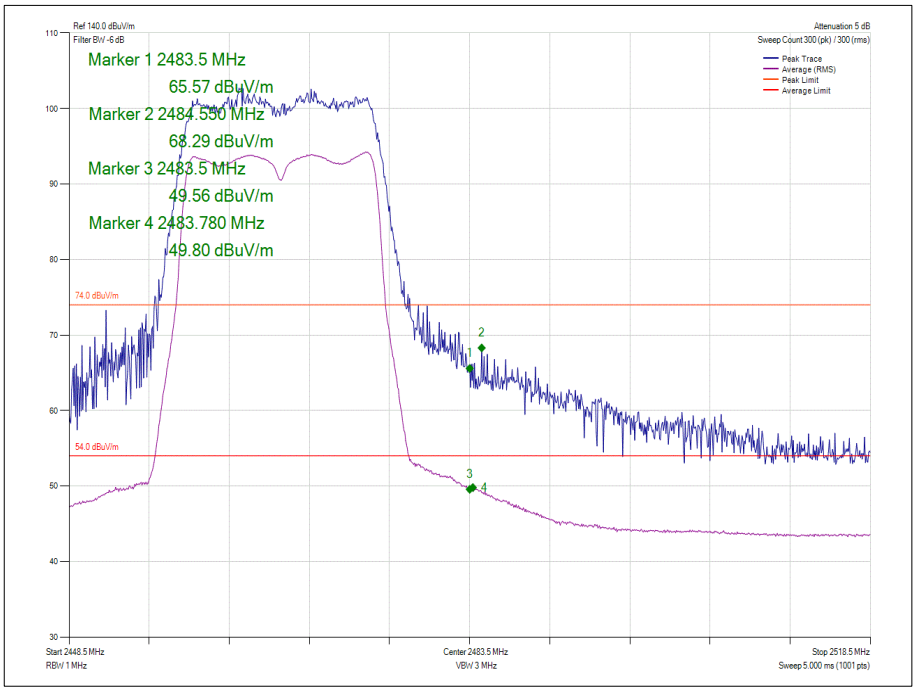


Figure 120 - Data Rate with the Widest Bandwidth - 9 Mbps
2467 MHz - Band Edge Frequency 2483.5 MHz – Antenna Port 2