TEST REPORT

Report Number: 105146268MPK-002
Project Numbers: G105146268
October 12, 2022

Testing performed on the
Drivecam Event Recorder
Model Number: DC-7000-002

FCC ID: UO3-UN1CXC
IC: 6778A-UN1CXC

to

FCC Part 15 Subpart C (15.247)
ISED RSS-247, Issue 2

For

Lytx, Inc.

Test Performed by:	**Test Authorized by:**
Intertek	Lytx, Inc
1365 Adams Court	9785 Towne Centre Drive
Menlo Park, CA 94025 USA	San Diego, CA 92121 USA

Prepared by: _____ **Date:** October 29, 2022
Juan Alapizco Vega

Reviewed by: _____ **Date:** October 29, 2022
Minh Ly

Report No. 105146268MPK-002	
Equipment Under Test:	Drivecam Event Recorder
Model Number:	DC-7000-002
Applicant:	Lytx, Inc.
Contact:	Stephanie Rydell
Address:	9785 Towne Centre Drive San Diego, CA 92121
Country:	USA
Tel. Number:	(858) 380-3012
Email:	Stephanie.rydell@lytx.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) ISED RSS-247 Issue 2
Date of Test:	August 16, 2022 to October 11, 2022

We attest to the accuracy of this report:

Juan Alapizco Vega
EMC Engineer

Minh Ly
EMC Team Lead

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1.0 Summary of Tests

Test	Reference FCC	Reference Industry Canada	Result
RF Output Power	15.247(b)(3)	RSS-247, 5.4.d)	Complies
6 dB Bandwidth	15.247(a)(2)	RSS-247, 5.2.a)	Complies
Power Density	15.247(e)	RSS-247, 5.2.b)	Complies
Out of Band Antenna Conducted Emission	15.247(d)	RSS-247, 5.5	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-247, 5.5	Complies
AC Line Conducted Emission	15.207	RSS-GEN	Not applicable.
Antenna Requirement	15.203	RSS-GEN	Complies (Internal Antenna)
RF Exposure	15.247(i), 2.1093(d)	RSS-102	Complies

EUT receive date: August 15, 2022

EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

Test start date: August 16, 2022

Test completion date: October 11, 2022

The test results in this report pertain only to the item tested.

2.0 General Information

2.1 Product Description

Lytx, Inc supplied the following description of the EUT:

Dashcam device, with DVR recording and MV-AI triggering

This test report covers only the 2.4GHz WiFi radio.

Information about the WiFi radio is presented below:

The EUT supports a wide range of data rates in the 2.4GHz band:
IEEE 802.11b
IEEE 802.11g
IEEE 802.11n 20MHz

Radio Information	
Applicant	Lytx, Inc.
Model Number	DC-7000-002
FCC Identifier	UO3-UN1CXC
IC Identifier	6778A-UN1CXC
Modulation Technique	DSSS (BPSK, QPSK, CCK), OFDM (BPSK, QPSK, 16QAM, 64QAM)
Rated RF Output	802.11b: 20.1 dBm 802.11g: 17 dBm 802.11n 20MHz: 16.2 dBm
Frequency Range	2412 – 2462 MHz, 802.11b/g/n
Type of modulation	BPSK, QPSK, 16QAM, 64QAM
Number of Channel(s)	11 for 802.11b/g/n
Antenna(s) & Gain	Internal Antenna, Gain: 2.9dBi
Applicant Name & Address	9785 Towne Centre Drive San Diego, CA 92121

The EUT supports the following configurations:

Channel no.	Frequency (MHz)	IEEE 802.11b/g/n HT 20 mode	
1	2412	√	X
2	2417	√	
3	2422	√	
4	2427	√	
5	2432	√	
6	2437	√	X
7	2442	√	
8	2447	√	
9	2452	√	
10	2457	√	
11	2462	√	X

√ = available
X = to be tested

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

2.4 Test Methodology

Antenna conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074 D01 DTS Meas Guidance v05r02), and RSS-247 Issue 2, RSS-GEN Issue 5.

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10: 2013. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions – antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)			
	0.15 MHz – 30MHz	30 – 200 MHz	200 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	4.6	5.1 dB
AC mains conducted emissions	2.1 dB	-	-	-

3.0 System Test Configuration

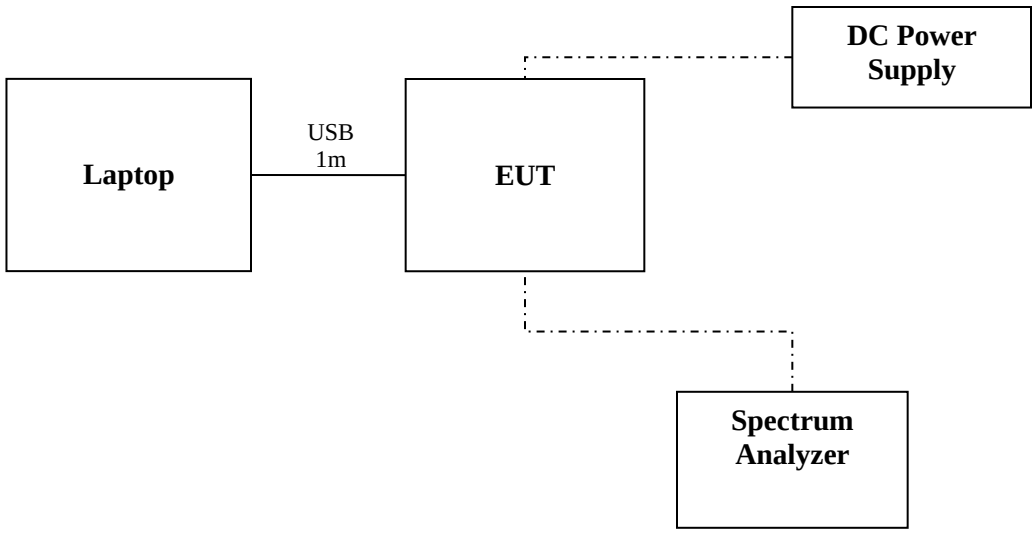
3.1 Support Equipment and description

Description	Manufacturer	Model No./ Part No.
Laptop	Dell	Latitude 5590

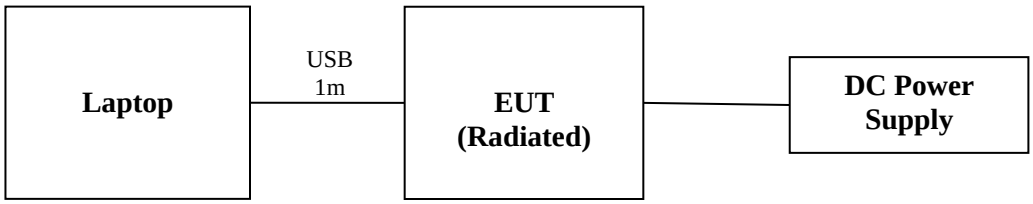
3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	**Manufacturer**	**Model Number**	**Serial Number**
Drivecam Event Recorder (Radiated)	Lytx, Inc.	DC-7000-002	QM40002328
Drivecam Event Recorder (Conducted)	Lytx, Inc.	DC-7000-002	QM40007220

Antenna was removed and co-axial connector was installed for Conducted Measurements.



Antenna was removed and co-axial connector was installed for Conducted Measurements.



S = Shielded **U** = Unshielded	**F** = With Ferrite **M** = Meter

EUT Photos

3.3 Justification

Preliminary testing was performed for all modulation/data rate modes. The worse-case data rate with highest power and widest spectrum were selected for final measurements:

CCK 1 Mbps – for 802.11b
OFDM 6 Mbps – for 802.11g
OFDM MCS0 – for 802.11n

For radiated emission measurements the EUT is placed on a non-conductive table.

Measurements were tested with the worst-case power setting.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Lytx,INC.

3.5 Mode of Operation During Test

During transmitter testing, the transmitter was setup to transmit continuously using the maximum RF power setting provided by the manufacturers via test scripts. The corresponding output power in dBm can be found in section 4.2 of this report.

The table below reflects the RF power setting needed to be compliant with radiated restricted band edge requirements of 15.205 & 15.209.

Channels	802.11b	802.11g	802.11n 20MHz
1 - 11	13	9	8

3.6 Modifications Required for Compliance

No modifications were made by the manufacturer or Intertek to the EUT in order to bring the EUT into compliance.

3.7 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 6-dB Bandwidth and 99% Occupied Bandwidth
FCC Rule: 15.247(a)(2); RSS-247, 5.2.a) and RSS-GEN;

4.1.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

4.1.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter.

For FCC 6dB Channel Bandwidth the Procedure described in the FCC Publication KDB 558074 D01 Meas Guidance v05r02 was used to determine the DTS occupied bandwidth. Section 11.8.1 Option 1 of ANSI 63.10 was used.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Tested By	Test Date
Juan Alapizco Vega	August 15, 20 & 25, 2021

4.1.3 Test Result

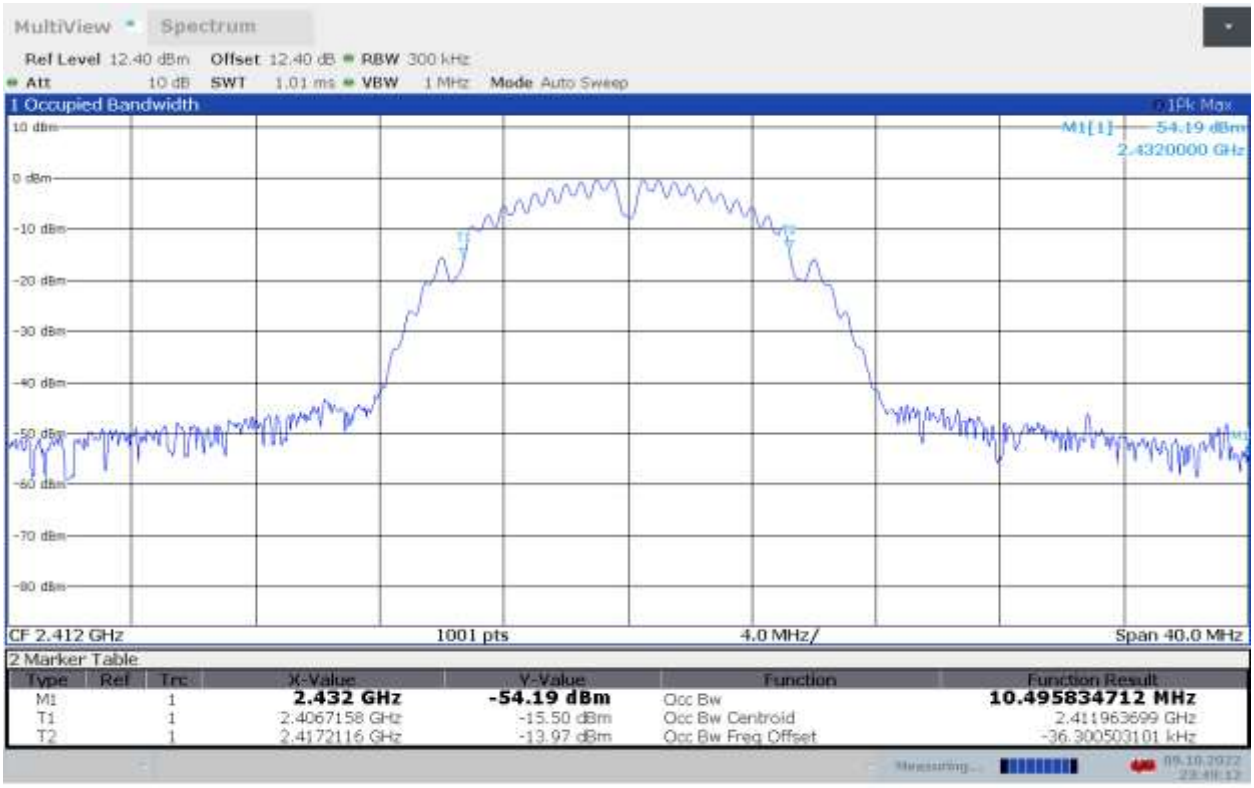
Frequency MHz	Ch.	Frequency MHz	6 dB FCC Bandwidth, MHz	Plot #	99% Bandwidth, MHz	Plot #
802.11b	1	2412	8.062	1.1	10.49	1.4
	6	2437	8.092	1.2	10.499	1.5
	11	2462	7.615	1.3	10.511	1.6
802.11g	1	2412	16.394	1.7	17.828	1.10
	6	2437	16.394	1.8	17.884	1.11
	11	2462	16.362	1.9	17.928	1.12
802.11n 20MHz	1	2412	17.772	1.13	18.813	1.16
	6	2437	17.772	1.14	18.808	1.17
	11	2462	17.802	1.15	18.798	1.18

Plot 1.1 – 6dB Bandwidth (FCC)

Plot 1.2 – 6dB Bandwidth (FCC)

Plot 1 3 – 6dB Bandwidth (FCC)

Plot 1.4 – 99% Bandwidth



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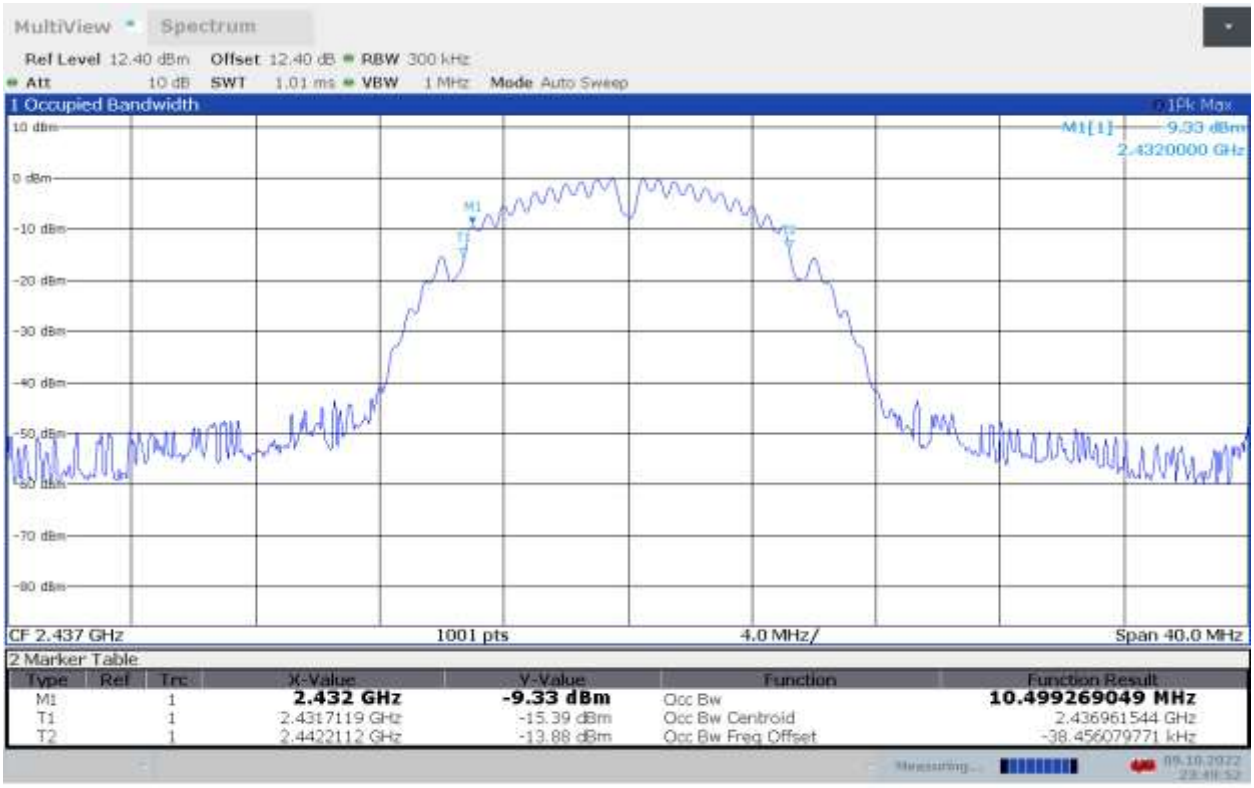
Plot 1.5 – 99% Bandwidth



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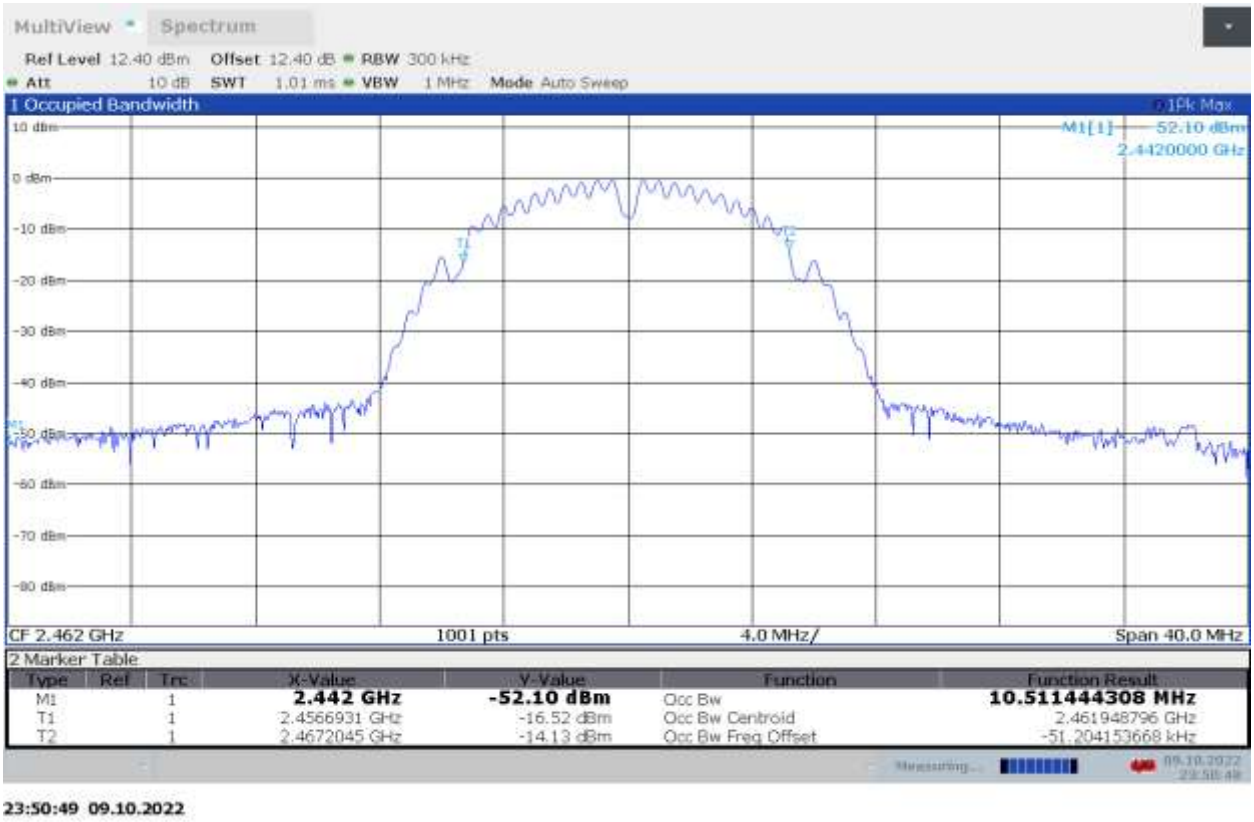
Plot 1.6 – 99% Bandwidth



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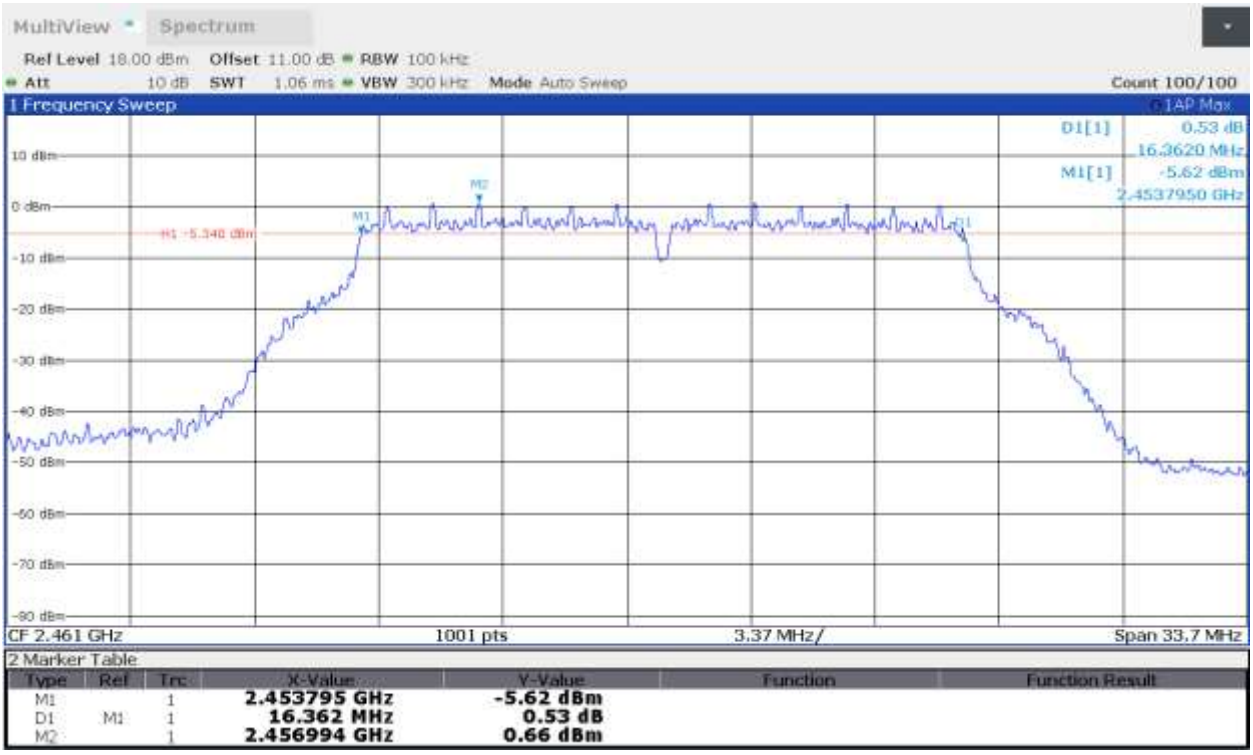
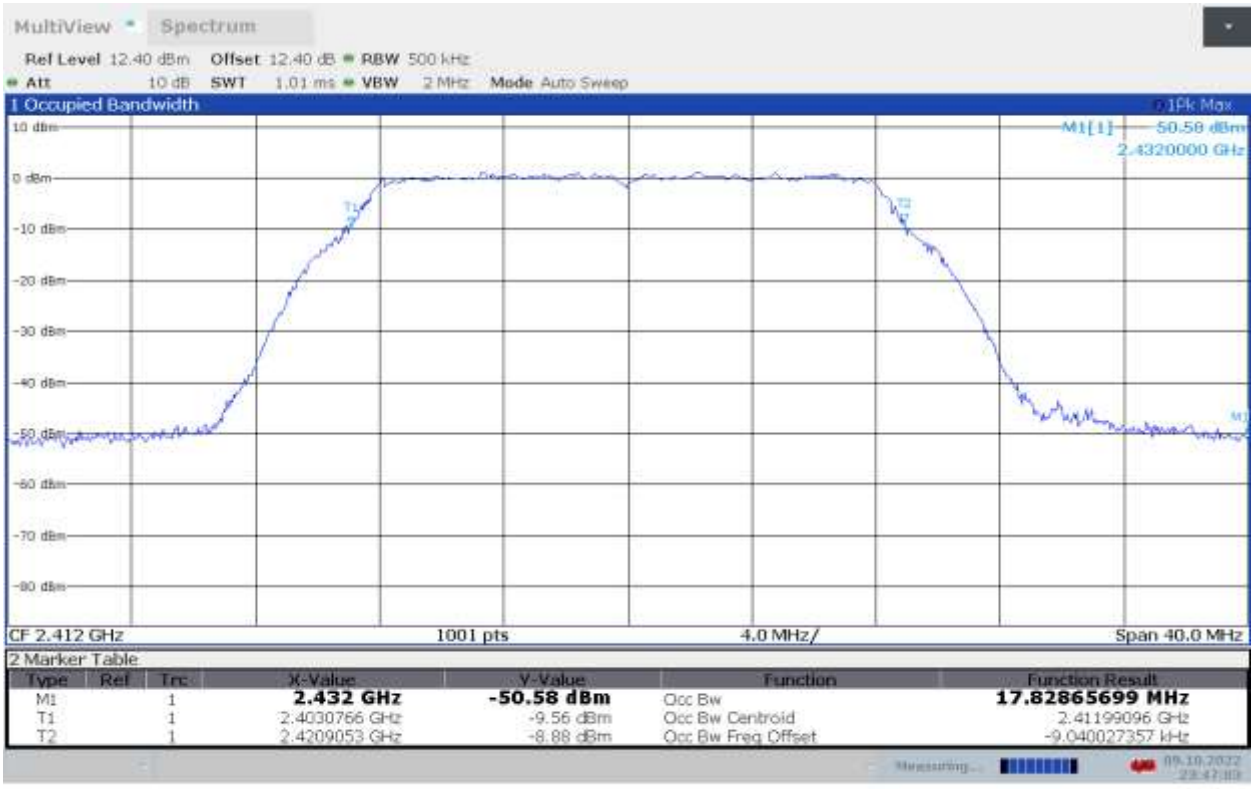
Plot 1.7 – 6dB Bandwidth (FCC)

Plot 1.8 – 6dB Bandwidth (FCC)

Plot 1.9 – 6dB Bandwidth (FCC)



Plot 1.10 – 99% Bandwidth



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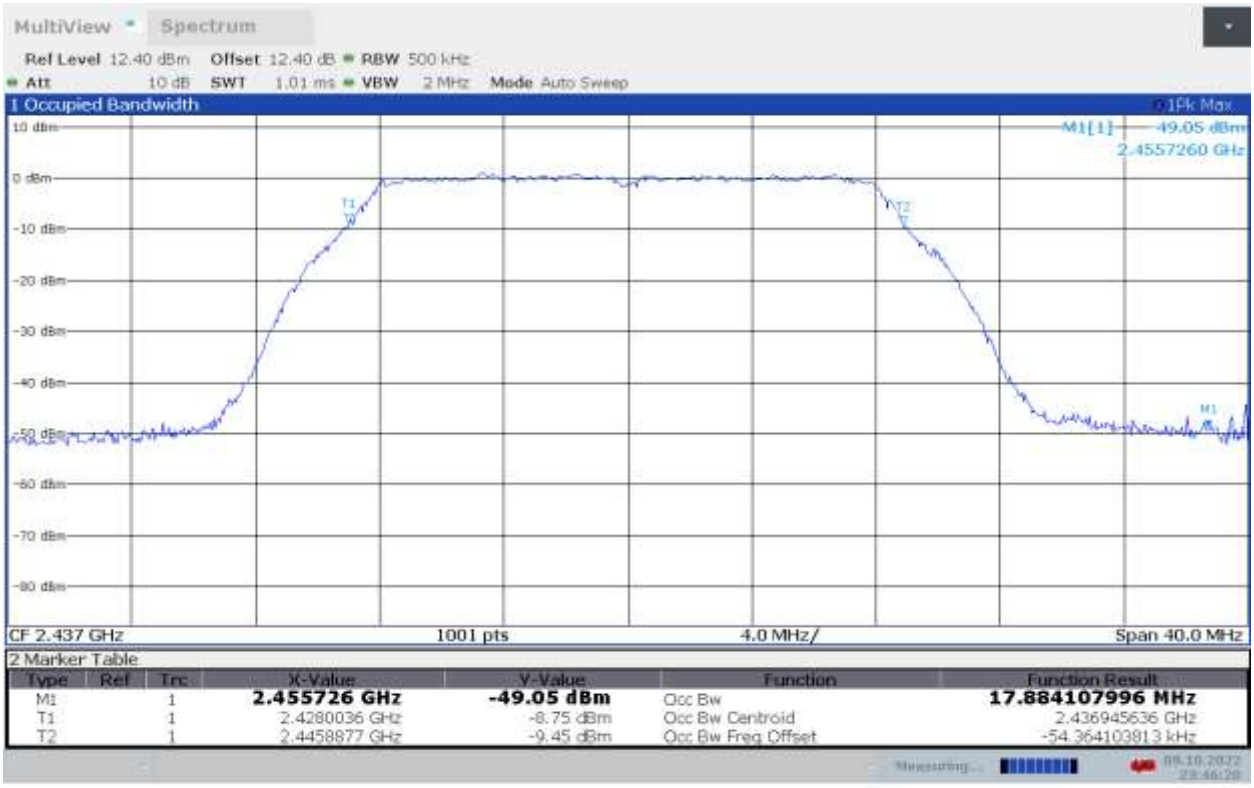
Plot 1.11 – 99% Bandwidth



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Plot 1.12 – 99% Bandwidth

Plot 1.13 – 6dB Bandwidth (FCC)

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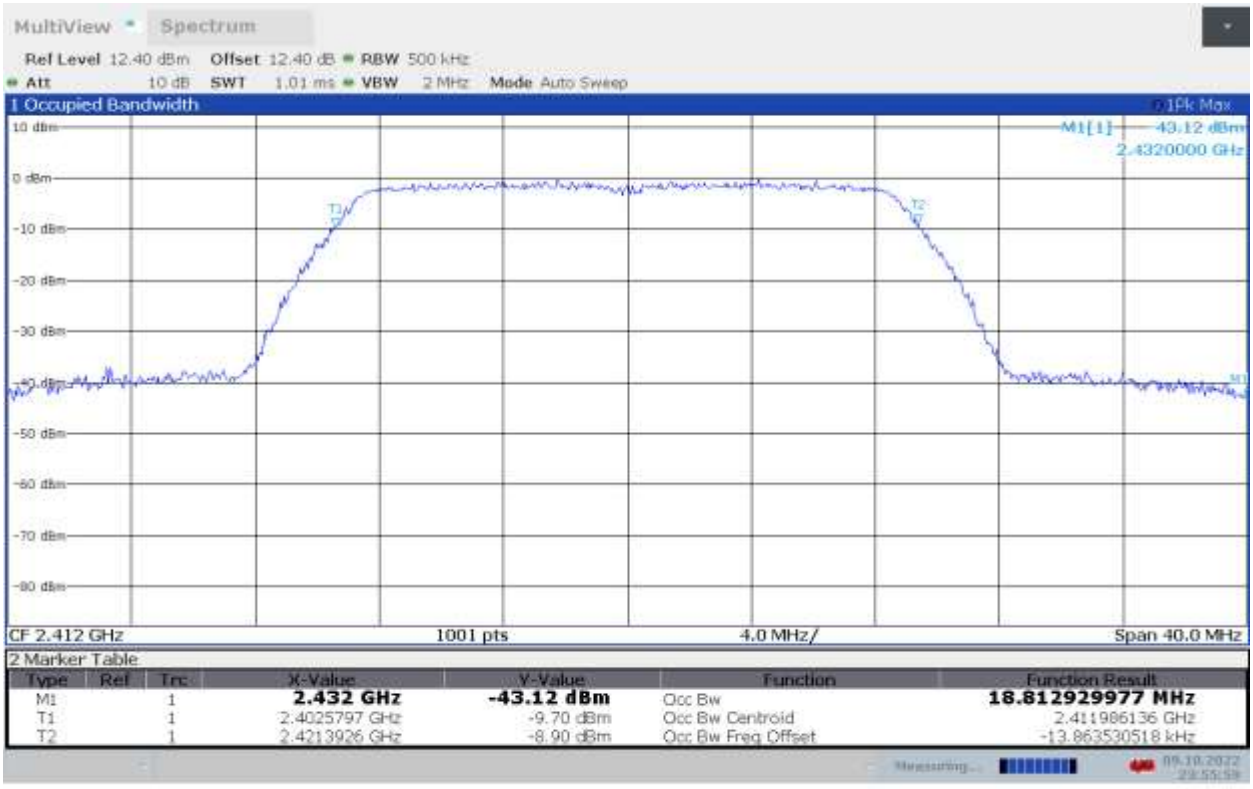
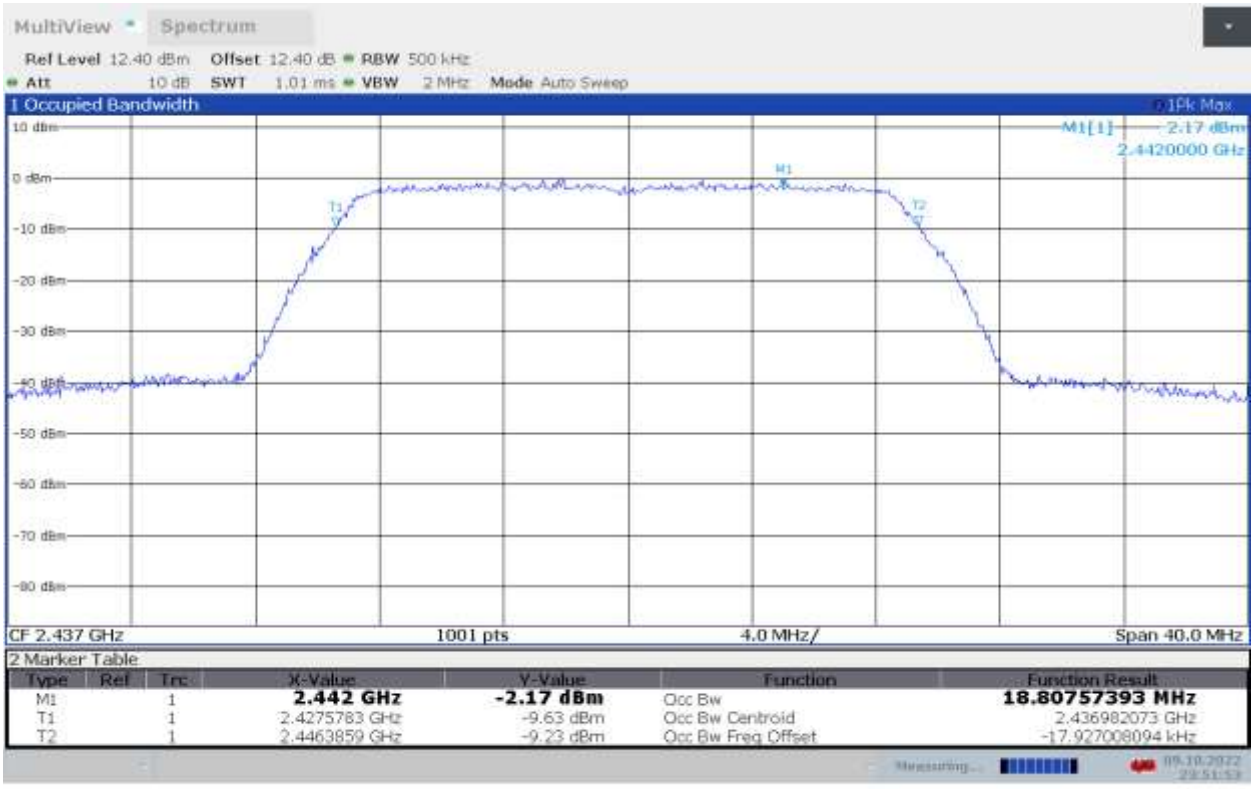
Plot 1.14 – 6dB Bandwidth (FCC)

Plot 1.15 – 6dB Bandwidth (FCC)

Plot 1.16 – 99% Bandwidth



Plot 1.17 – 99% Bandwidth



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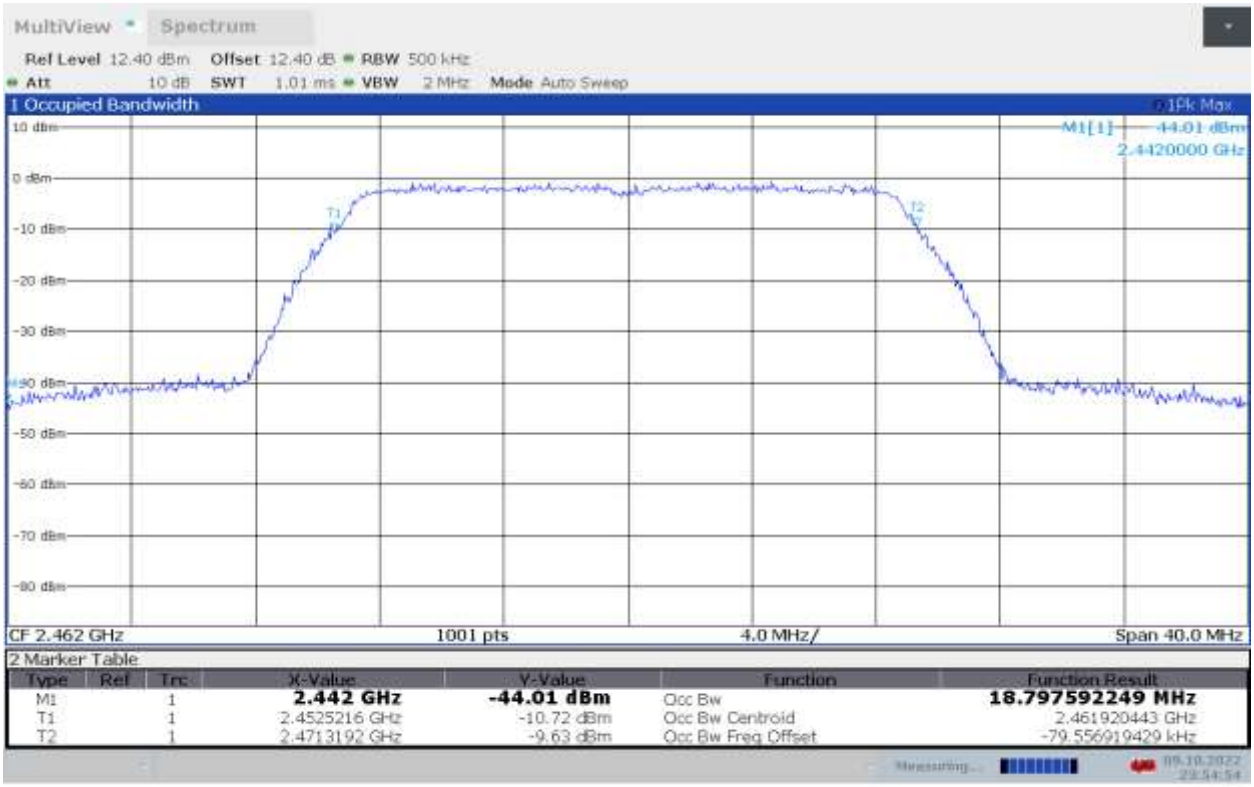
Plot 1.18 – 99% Bandwidth



23:54:54 09.10.2022

4.2 Maximum Conducted Output Power at Antenna Terminals
FCC Rule: 15.247(b)(3); RSS-247, 5.4.d);

4.2.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Maximum Conducted Transmitter Output Power. The offset programmed on the analyzer is corrected to include cable loss, attenuator and duty cycle correction.

The procedure described in FCC Publication KDB 558074 D01 Meas Guidance v05r02 was used. Specifically, 11.9.1.3 PKPM1 Peak power meter method in ANSI 63.10.

The procedure for this method is as follows:

The maximum peak conducted output power may be measured using a broadband peak RF power meter.

The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

Tested By	Test Date
Juan Alapizco Vega	September 20, 2022

4.2.3 Test Result

Refer to the following plots for the test result:

Standard	Data Rate	Channel	Frequency MHz	Conducted Peak Power Ant 1 dBm	Conducted Peak Power Ant 2 dBm	Conducted Peak Power Ant 1 mW	Conducted Peak Power Ant 2 mW
802.11b	1 Mbps	1	2412	16.949	16.979	49.54	49.88
		6	2437	16.849	17.019	48.41	50.35
		11	2462	17.039	17.109	50.58	51.40
802.11g	6 Mbps	1	2412	13.898	14.199	24.54	26.30
		6	2437	13.859	14.048	24.32	25.40
		11	2462	13.998	13.848	25.11	24.26
802.11n 20MHz	MCS0	1	2412	13.038	13.238	20.13	21.08
		6	2437	13.018	13.328	20.04	21.52
		11	2462	13.079	13.008	20.32	19.99

Standard	Data Rate	Channel	Frequency MHz	Conducted Peak Power Sum dBm	Conducted Peak Power Sum mW
802.11n 20MHz	MCS0	1	2412	16.2	41.68
		6	2437	16.2	41.686
		11	2462	16.1	40.73

4.3 Power Spectral Density
FCC: 15.247 (e); RSS-247, 5.2.b);

4.3.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Transmitter Power Density (PSD). The offset programmed on the analyzer is corrected to include cable loss, attenuator.

The procedure described in FCC Publication FCC Publication KDB 558074 D01 Meas Guidance v05r02, specifically section 11.10.2 Method PKPSD (peak PSD) of ANSI 63.10.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the *DTS bandwidth*.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Tested By	Test Date
Juan Alapizco Vega	October 6, 2022

4.3.3 Test Result

Refer to the following plots for the test result:

Standard	Channel	Frequency MHz	PSD Antenna 1 (Peak) dBm	PSD Antenna 2 (Peak) dBm	Plot #
802.11b	1	2412	-8.09	-7.92	3.1
	6	2437	-8.32	-7.14	3.2
	11	2462	-11.55	-7.32	3.3
802.11g	1	2412	-16.07	-11.60	3.4
	6	2437	-16.70	-12.33	3.5
	11	2462	-16.41	-12.33	3.6
802.11n	1	2412	-19.27	-19.85	3.7
	6	2437	-19.30	-20.35	3.8
	11	2462	-18.50	-19.50	3.9

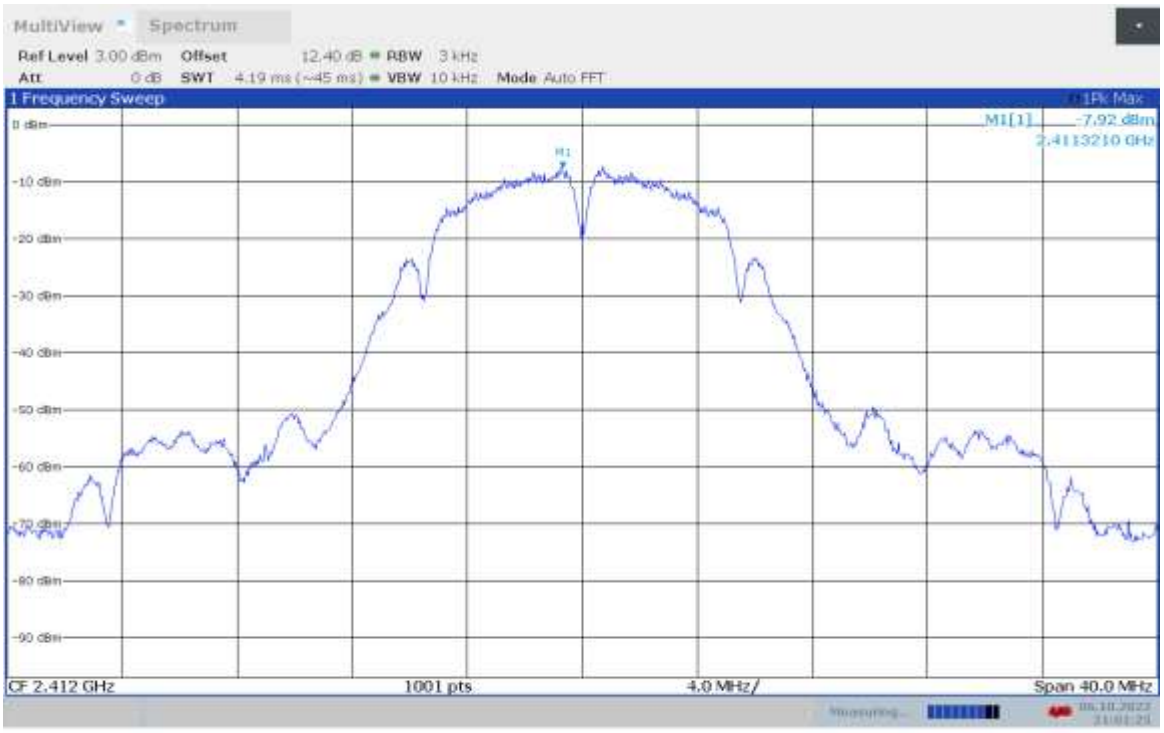
Standard	Channel	Frequency MHz	PSD sum (Peak) dBm	Margin to 8dBm Limit dB
802.11b	1	2412	-5.0	-13
	6	2437	-4.7	-12.7
	11	2462	-5.9	-18.9
802.11g	1	2412	-10.3	-18.3
	6	2437	-11.0	-19.0
	11	2462	-10.9	-18.9
802.11n	1	2412	-16.5	-24.5
	6	2437	-16.8	-24.8
	11	2462	-16.0	-24.0

Plot 3. 1

Antenna 1

18:48:14 06.10.2022

Antenna 2



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Plot 3. 2

Antenna 1

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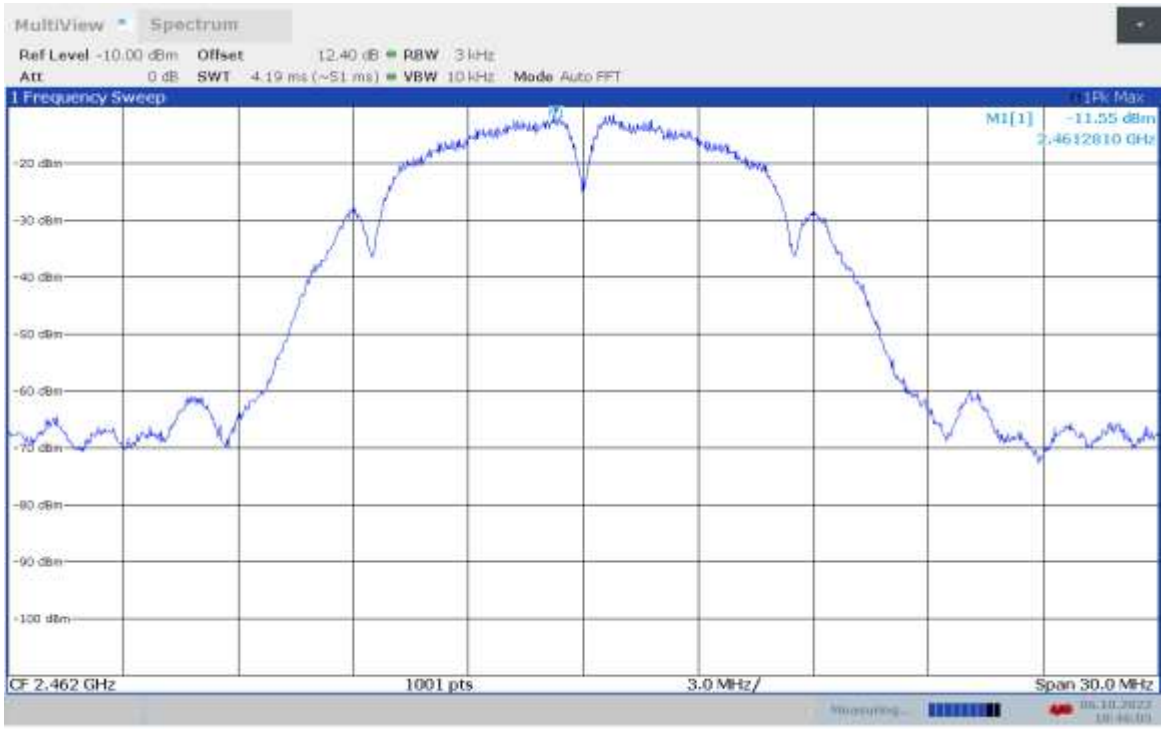
Antenna 2

21:02:10 06.10.2022

Plot 3. 3

Antenna 1



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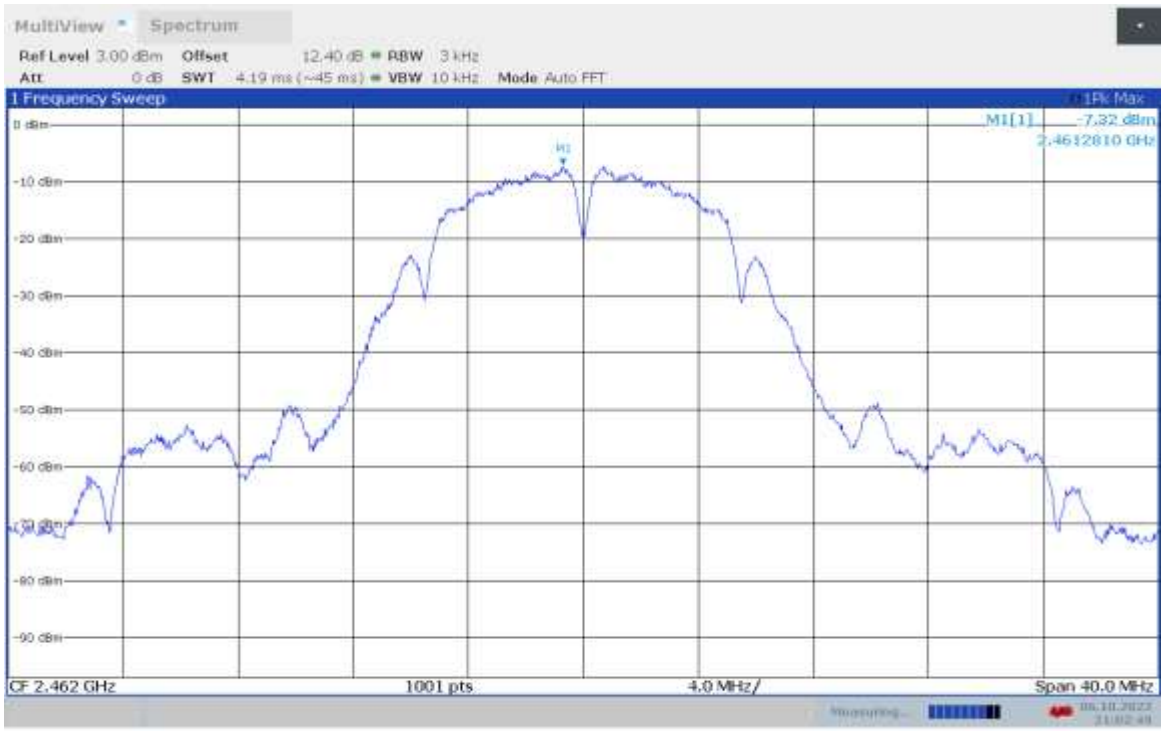
Antenna 2



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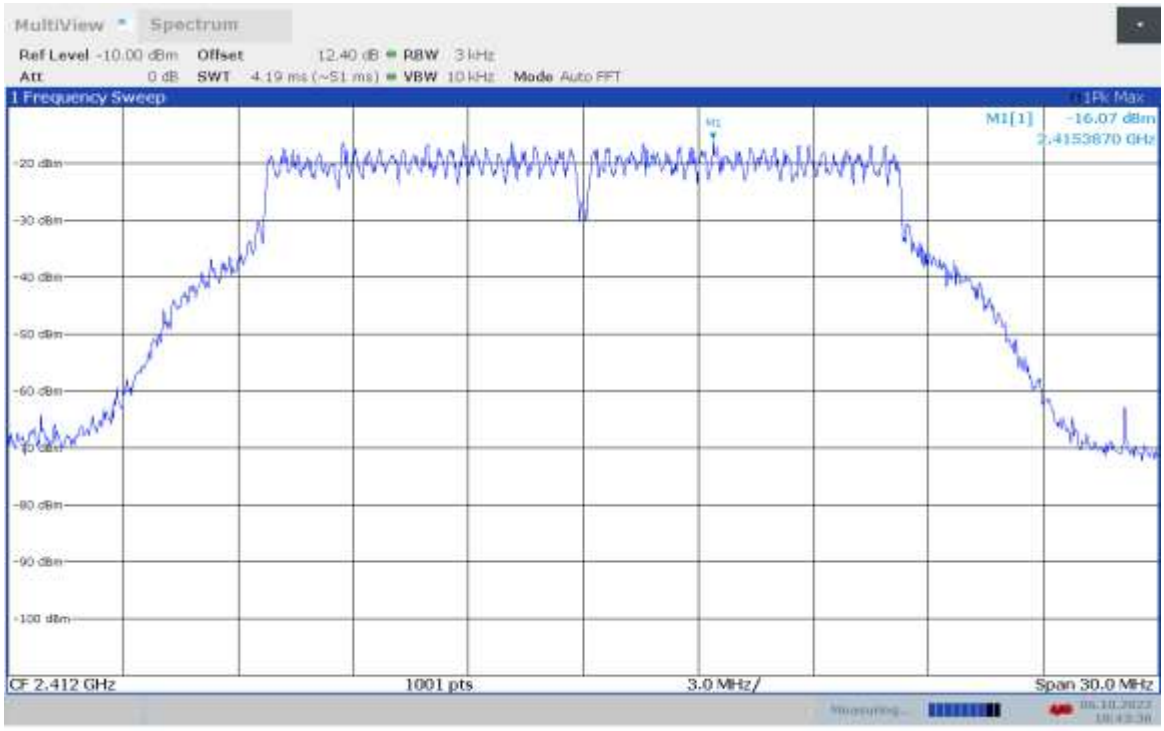
Plot 3. 4

Antenna 1



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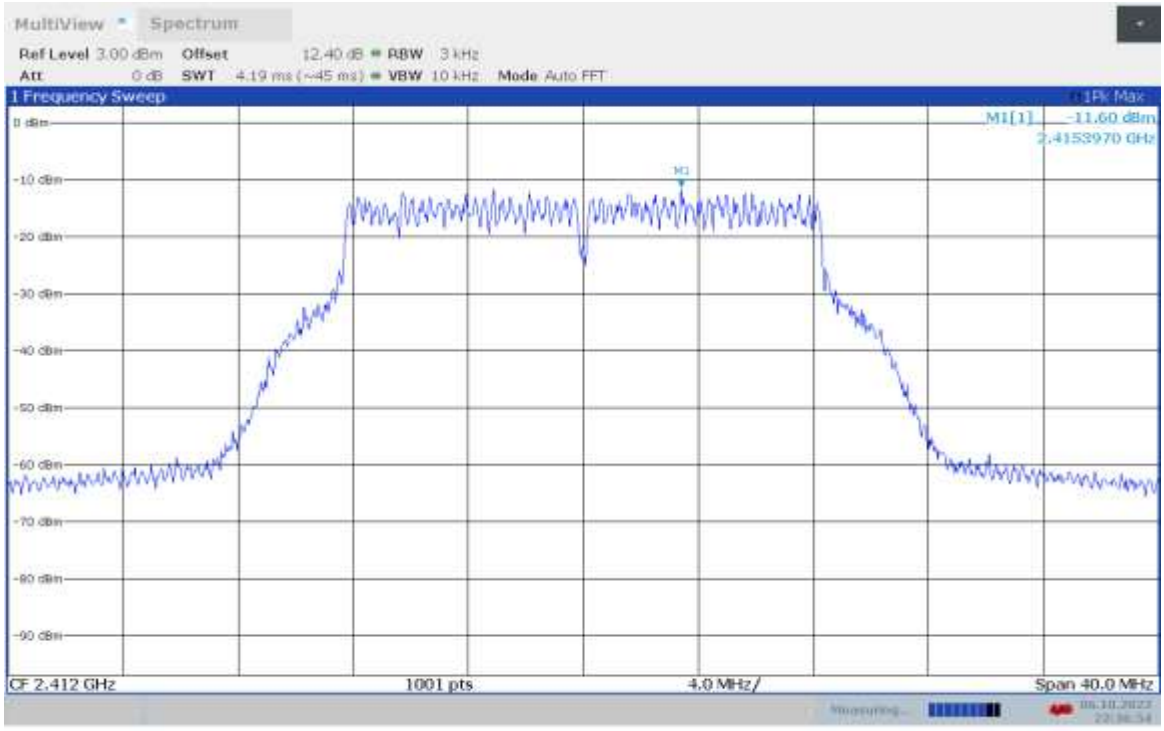
Antenna 2



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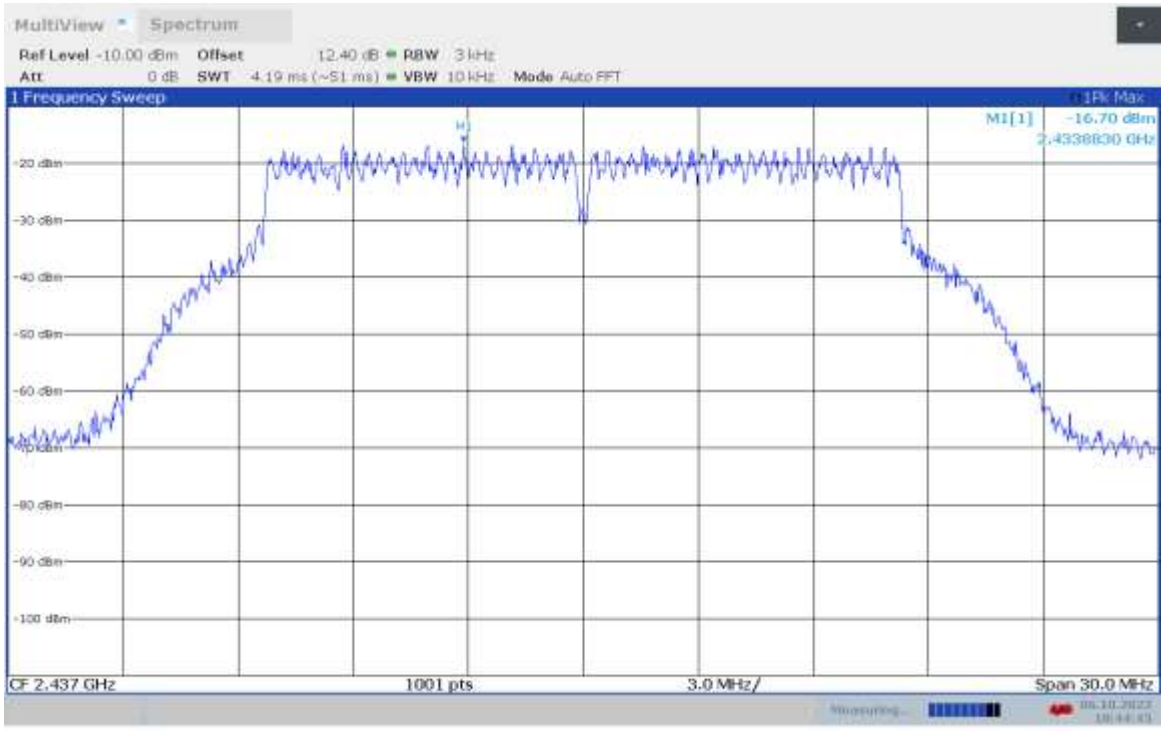
Plot 3. 5

Antenna 1



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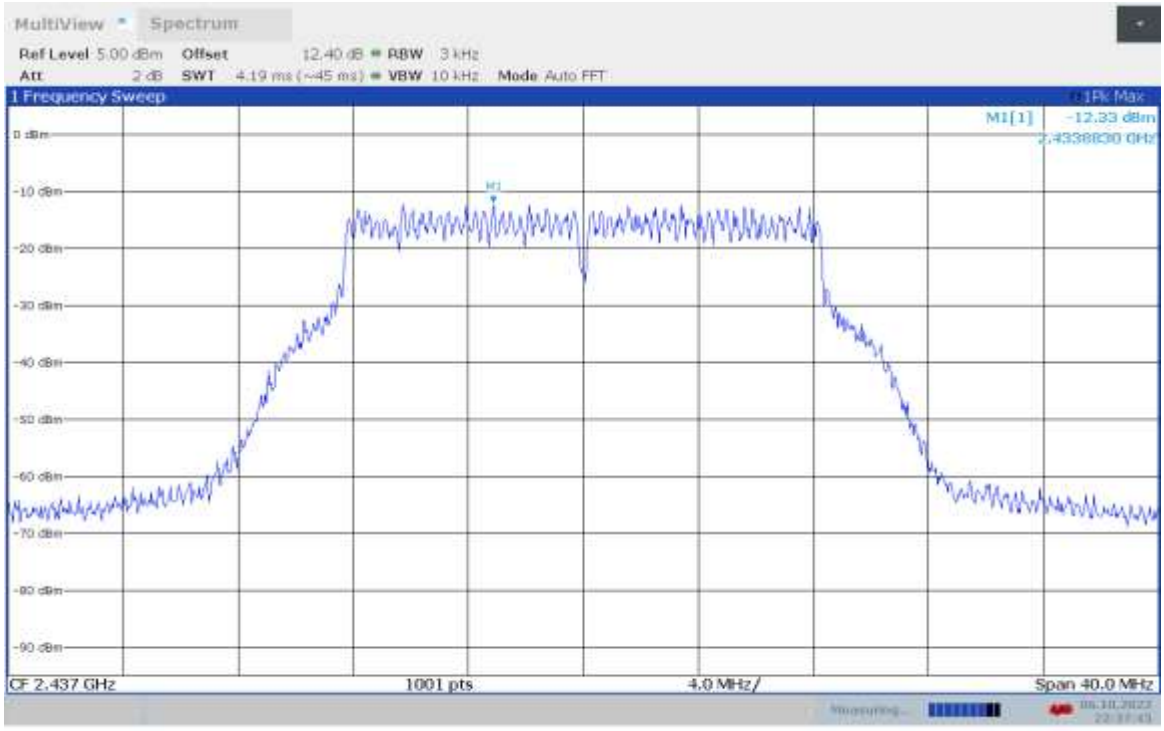
Antenna 2



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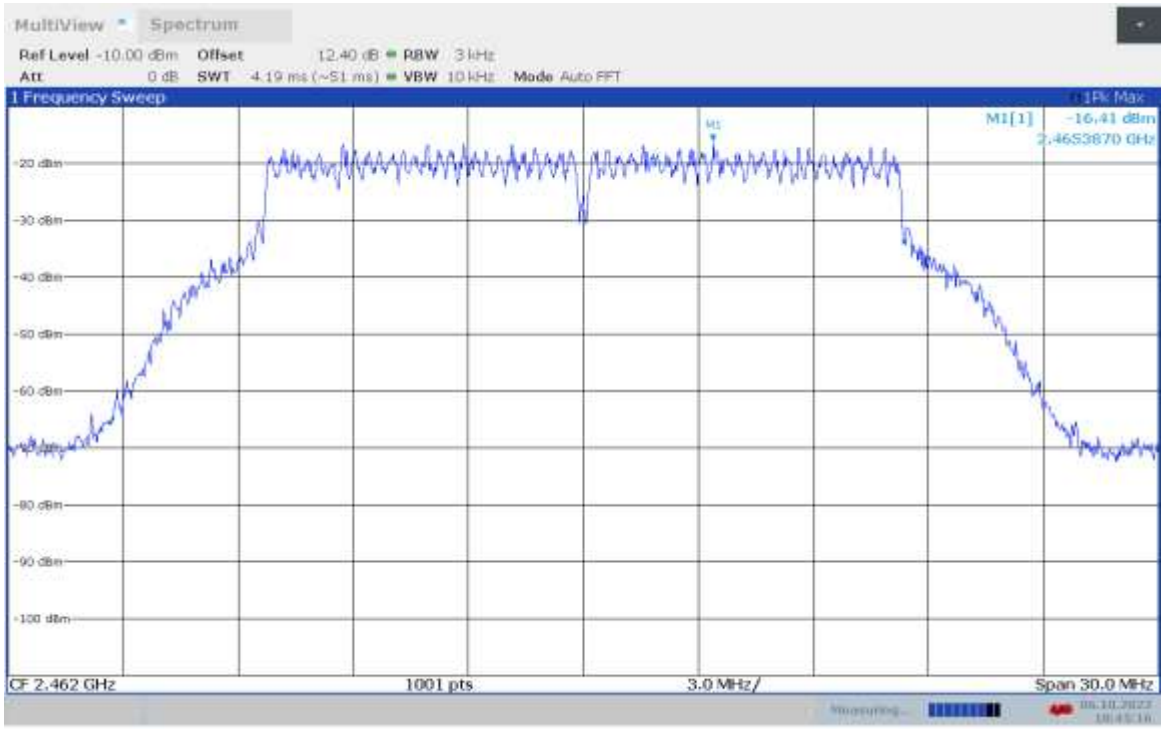
Plot 3. 6
Antenna 1



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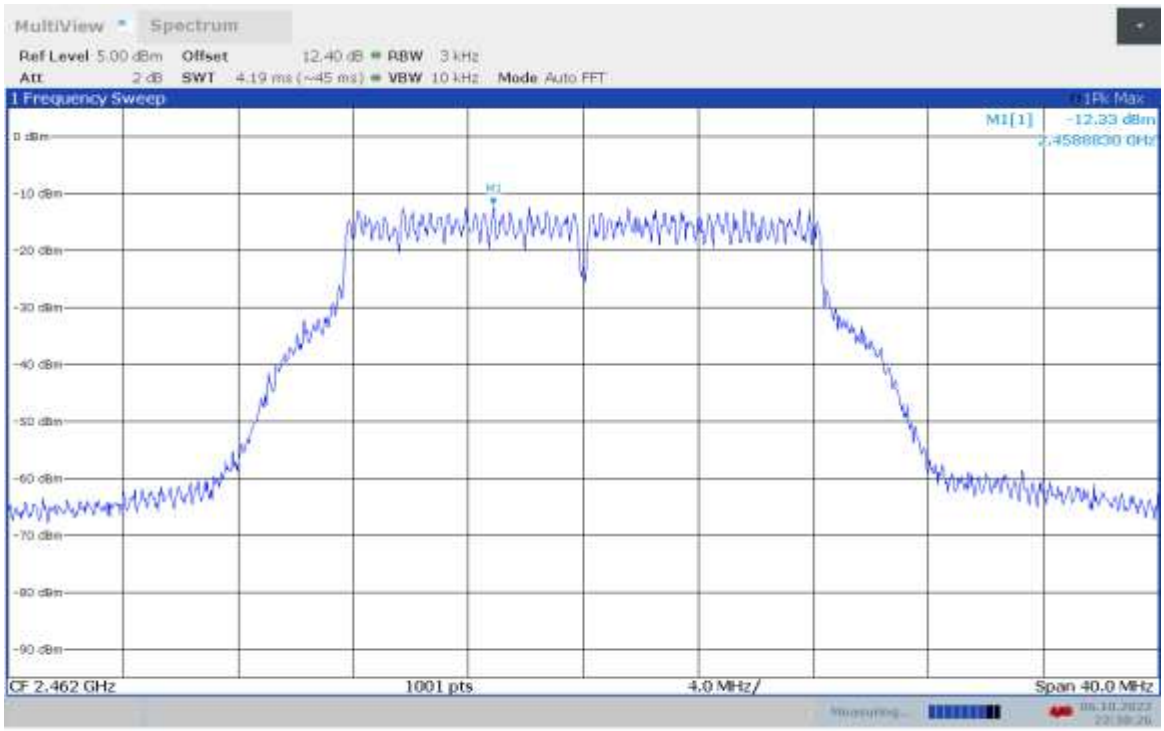

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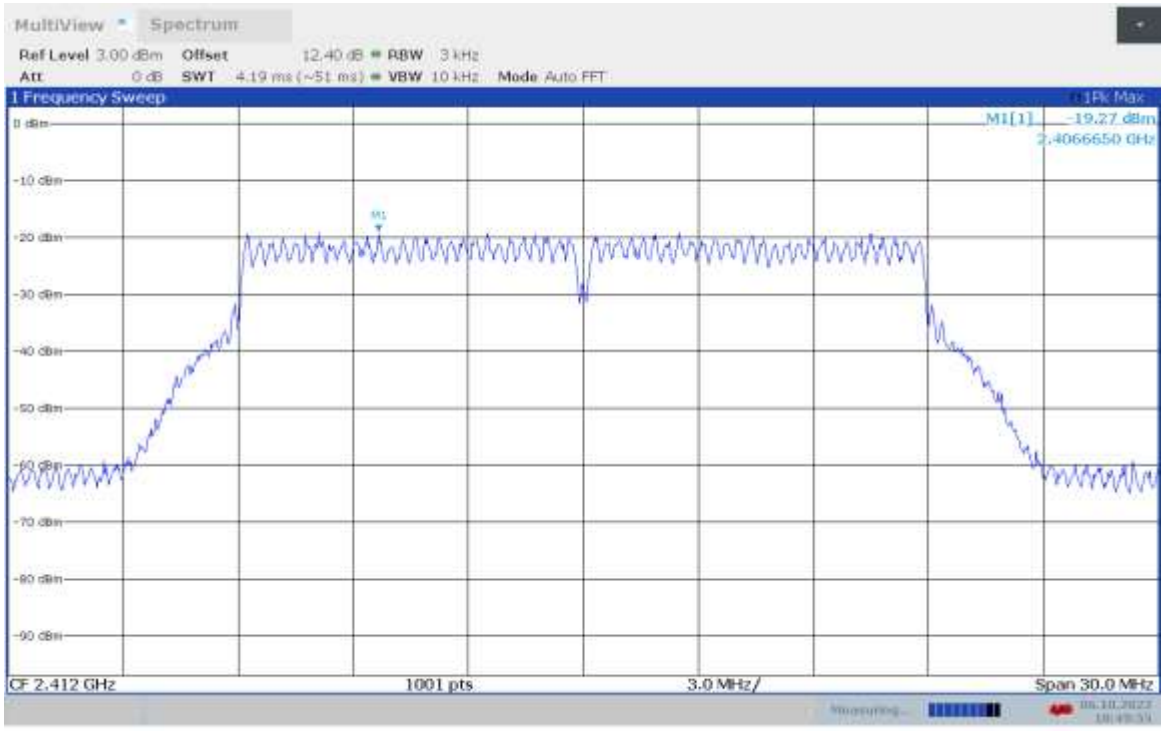
Plot 3. 7

Antenna 1



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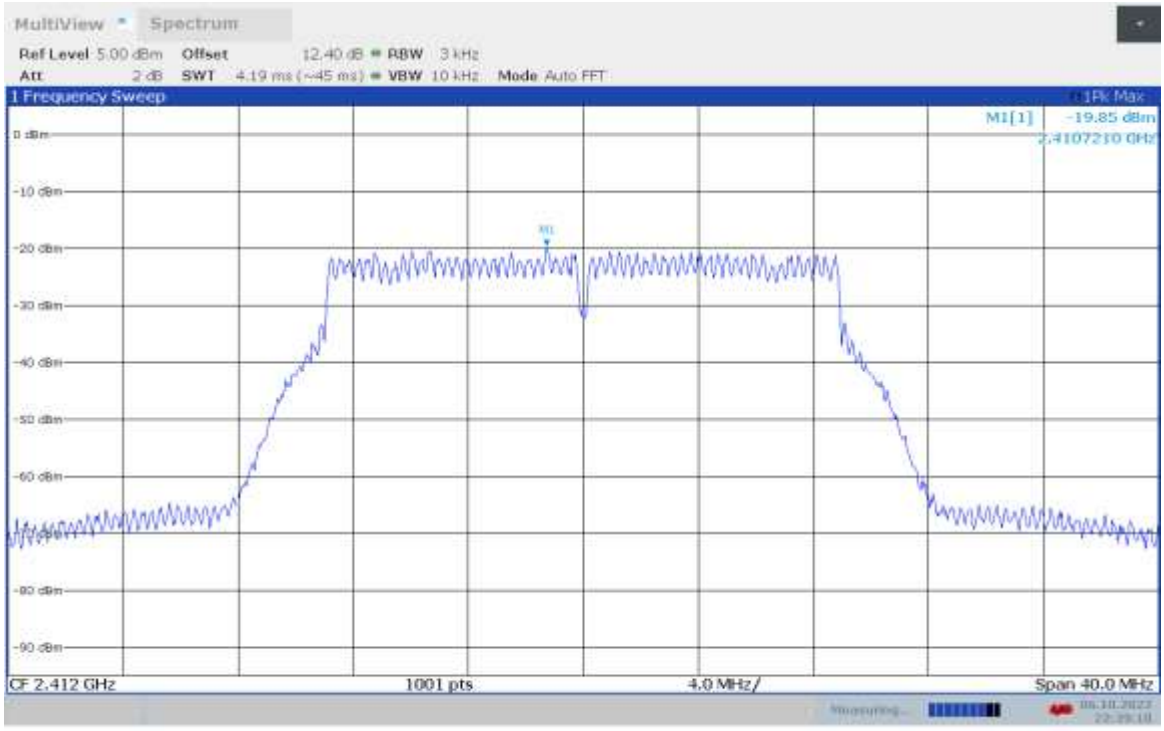
Antenna 2



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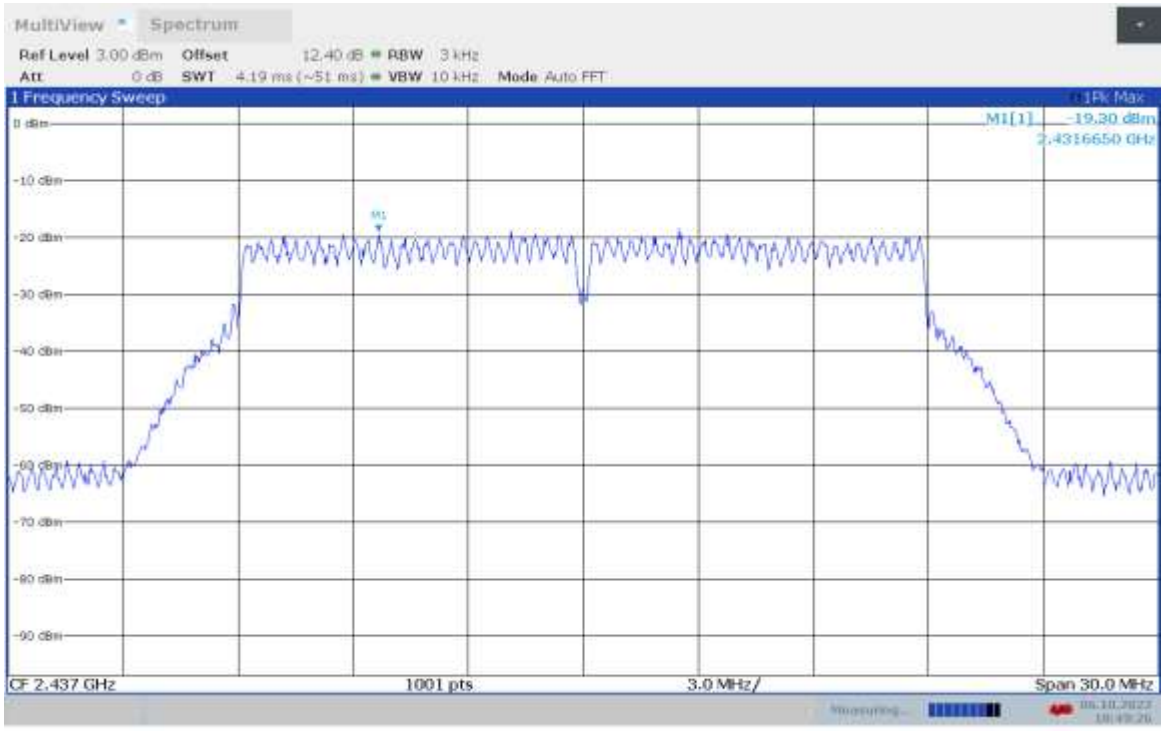
Plot 3. 8

Antenna 1



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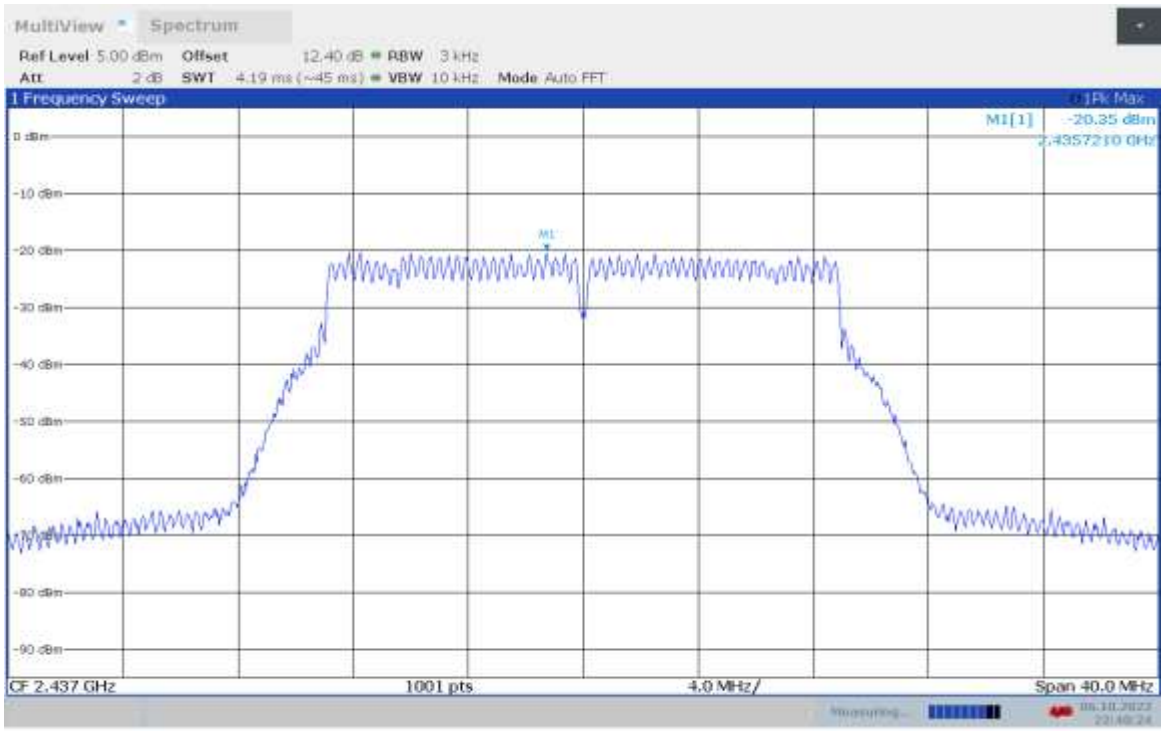

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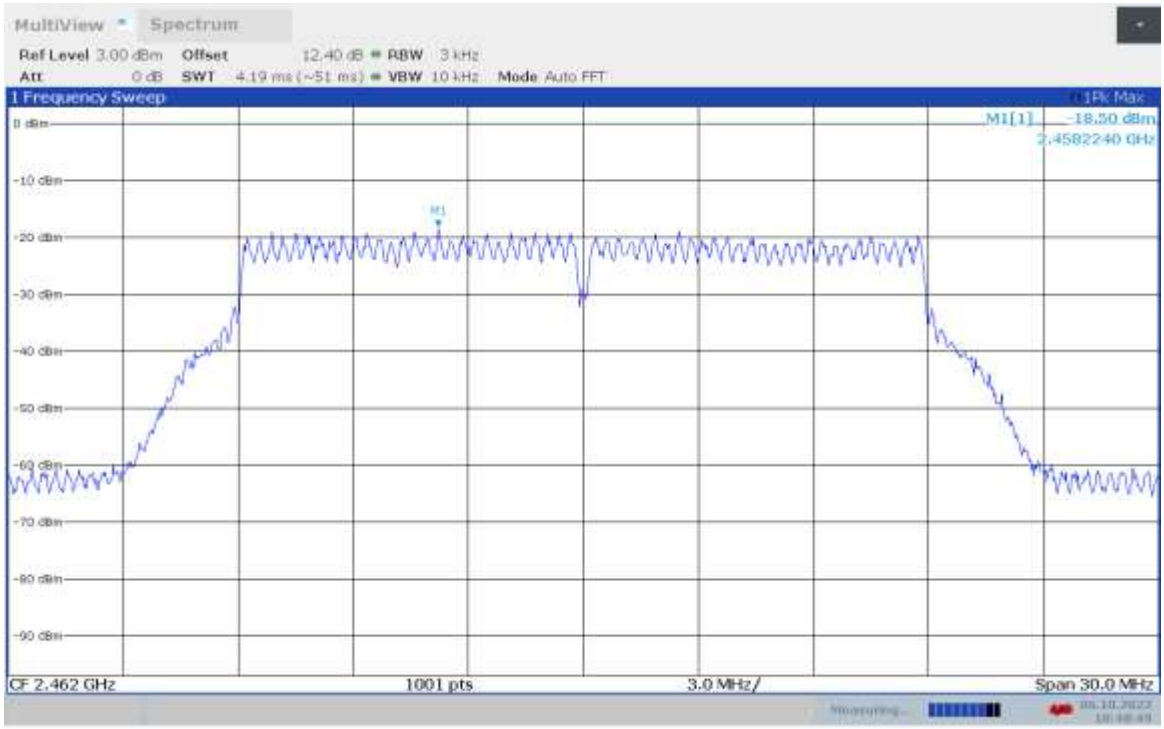
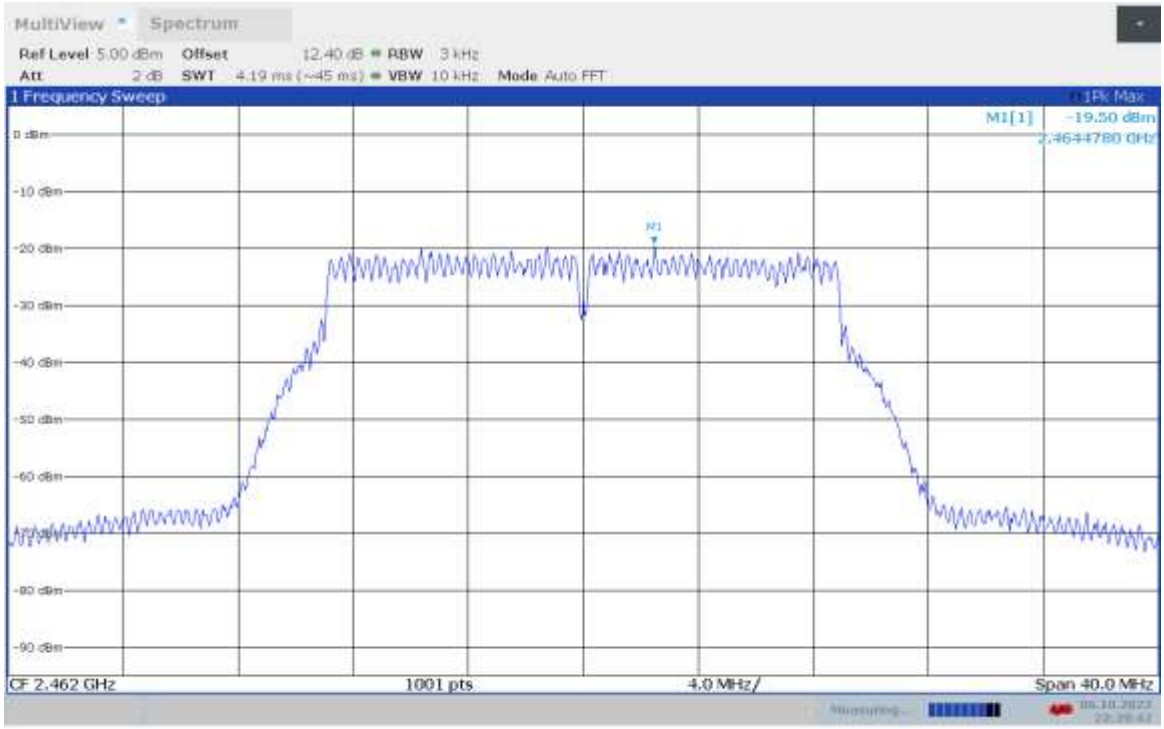
Plot 3. 9

Antenna 1



18:48:49 06.10.2022

Antenna 2



22:39:42 06.10.2022

4.4 Out-of-Band Conducted Emissions
FCC: 15.247(d); RSS-247, 5.5;

4.4.1 Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

4.4.2 Procedure

The procedure described in FCC Publication KDB 558074 D01 Meas Guidance v05r02, specifically section 11.11 DTS Emissions in non-restricted frequency bands of ANSI 63.10.

A spectrum analyzer was connected to the antenna port of the transmitter.

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 3 x RBW.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

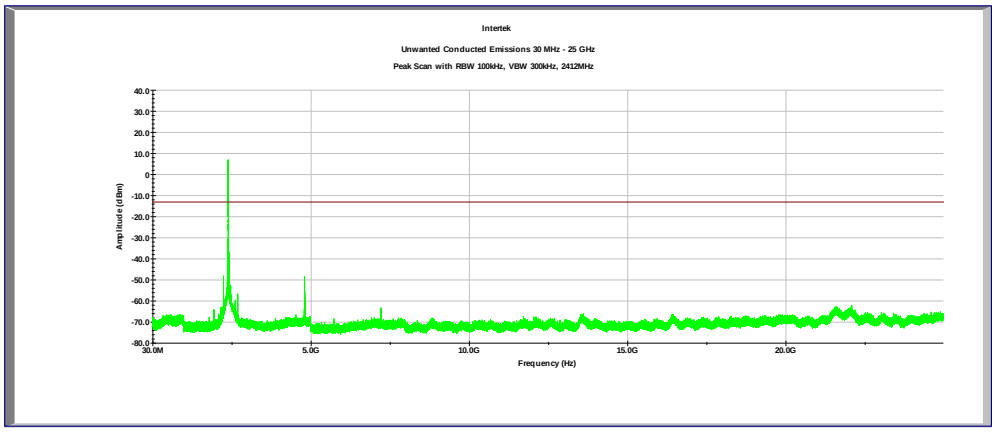
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

4.4.3 Test Result

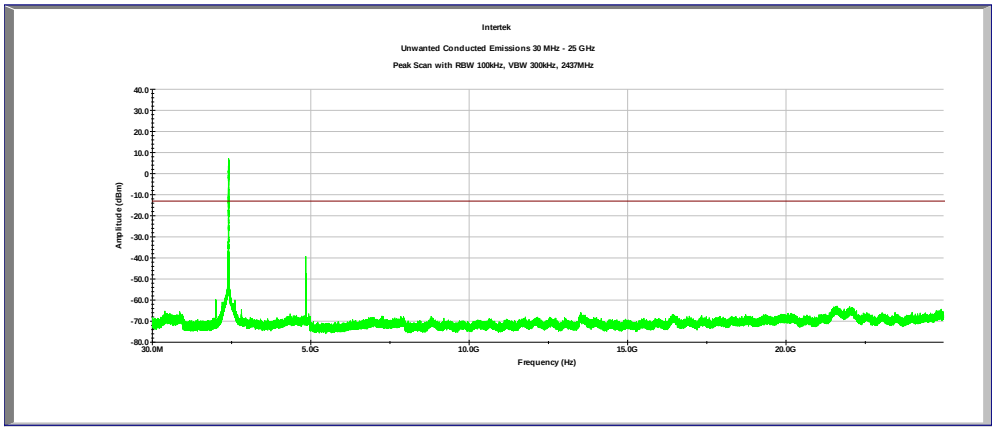
Refer to the following plots 4.1 – 4.9 for unwanted conducted emissions. The plot shows -20dB attenuation limit line.

Tested By	Test Date
Juan Alapizco Vega	August 16-October 11, 2022

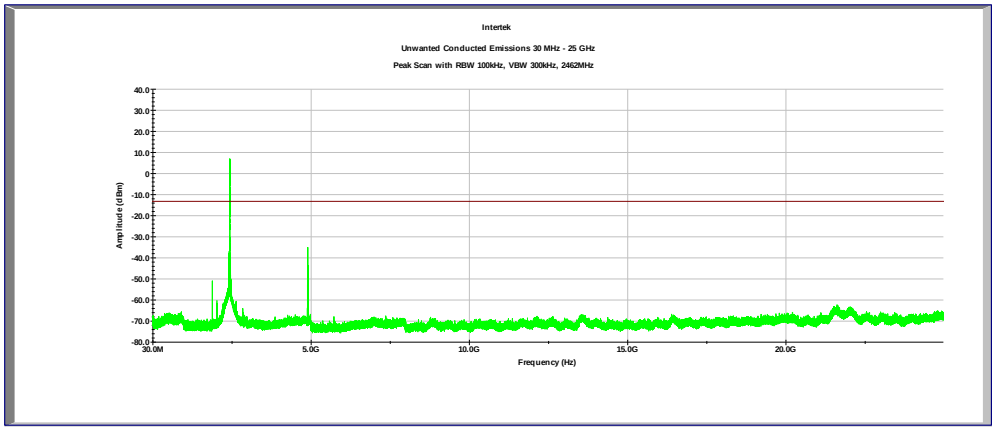
Plot 4.1
Tx @ 2412MHz 802.11b



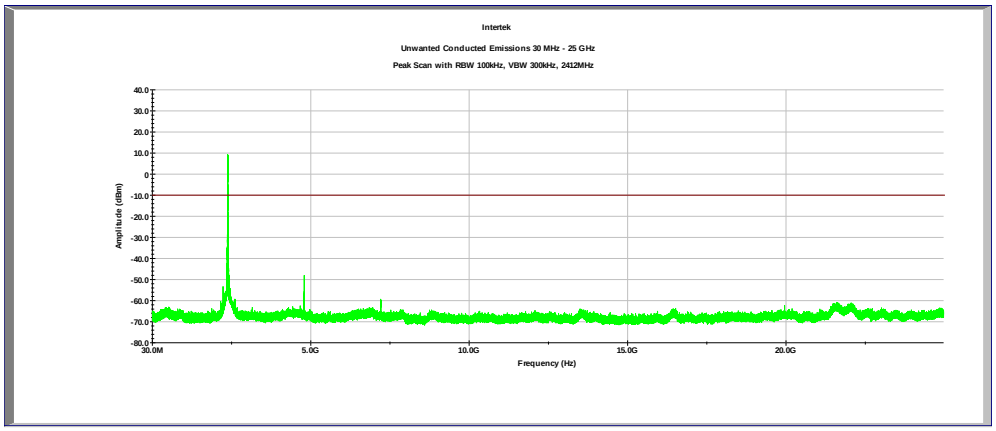
Plot 4.2
Tx @ 2437MHz 802.11b



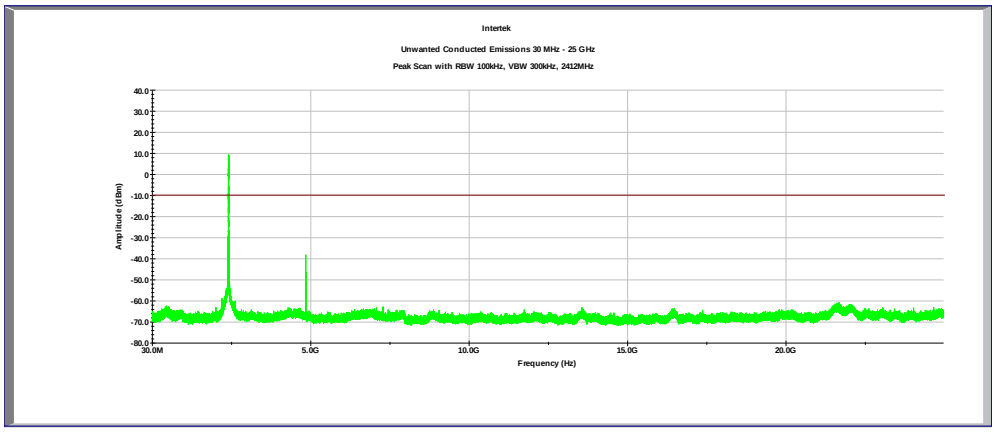
Plot 4.3
Tx @ 2462MHz 802.11b



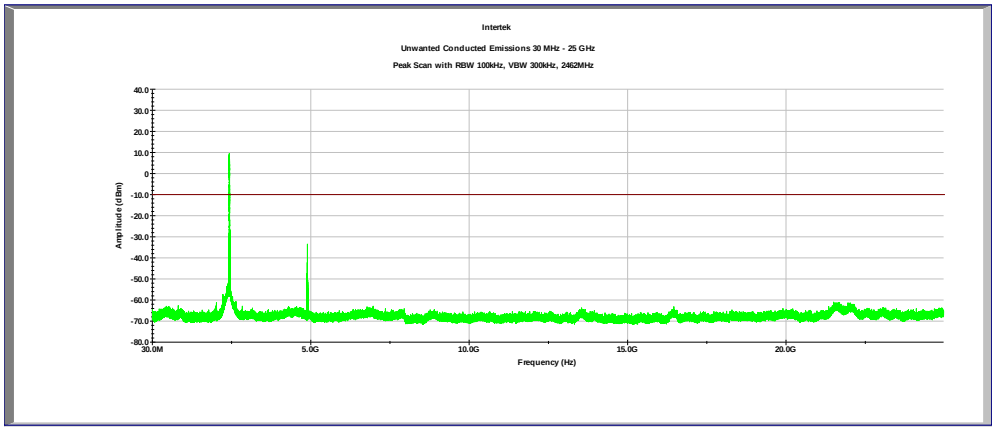
Plot 4.1(b)
Tx @ 2412MHz 802.11b second antenna



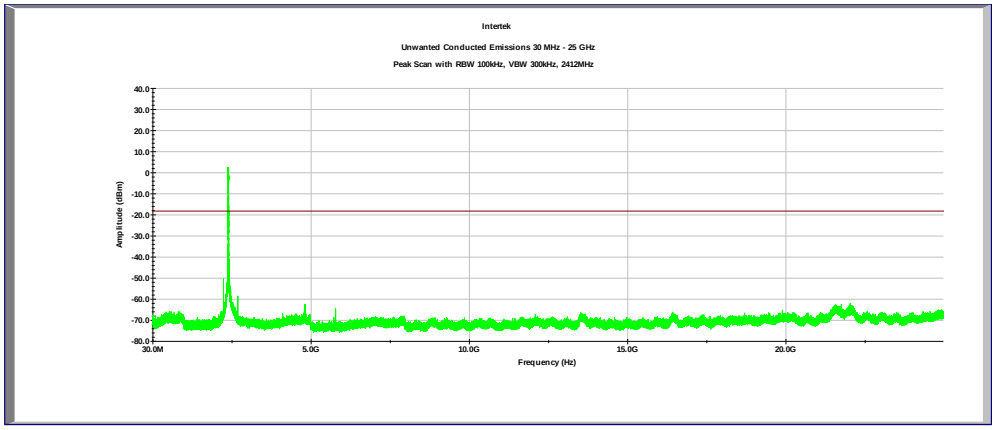
Plot 4.2(b)
Tx @ 2437MHz 802.11b second antenna



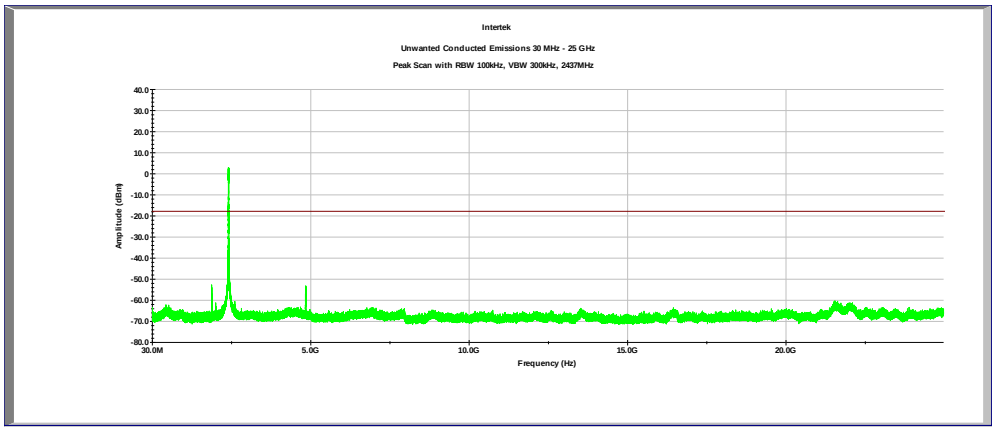
Plot 4.3(b)
Tx @ 2462MHz 802.11b second antenna



Plot 4.4
Tx @ 2412MHz 802.11g



Plot 4.5
Tx @ 2437MHz 802.11g



Plot 4.6
Tx @ 2462MHz 802.11g