Prüfbericht-Nr.: *Test report no.:*	**CN21NDUV 001**	**Auftrags-Nr.:** *Order no.:*	168332006	Seite 1 von 23 *Page 1 of 23*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2021-08-11	
Auftraggeber: *Client:*	**Shenzhen RAKwireless Technology Co.,Ltd.** Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China			
Prüfgegenstand: *Test item:*	Wi-Fi Module			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	RAK634 (Trademark: RAK)			
Auftrags-Inhalt: *Order content:*	FCC and IC approval			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 2: Section 2.1091		RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 February 2021 RSS-102 Issue 5 February 2021	

Wareneingangsdatum: *Date of sample receipt:*	2021-08-13
Prüfmuster-Nr.: *Test sample no.:*	A003110001
Prüfzeitraum: *Testing period:*	2021-09-08 – 2021-09-15
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass

Please refer to photo documents

geprüft von: *tested by:*	X Alex Lan	**genehmigt von:** *authorized by:*	X Winnie Hou
Datum: *Date:* 2021-10-18	Signed by: Alex Lan	**Ausstellungsdatum:** *Issue date:* 2021-10-18	Signed by: Winnie Hou
Stellung / Position	Senior Project Engineer	**Stellung** / Position	Department Manager

Sonstiges / *Other:*

FCC ID: 2AF6B-RAK634
IC: 25908-RAK634 HVIN: RAK634

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged:*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specifications(s)		*F(ail) = failed a.m. test specifications(s)*	*N/A = not applicable*	*N/T = not tested*

TUV Rheinland (Shenzhen) Co., Ltd. 1601 R&D Room, 1602-1604, 17-18F, Building 7 Site C, Vanke Cloud City Phase I, Xingke First Street, Xili Street, Xili Community, Nanshan District, Shenzhen 518052, P.R. China
Mail: service@de.tuv.com Web: www.tuv.com

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER
RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY
RESULT: Pass

5.1.4 99%DB BANDWIDTH
RESULT: Pass

5.1.5 6DB BANDWIDTH
RESULT: Pass

5.1.6 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH
RESULT: Pass

5.1.7 RADIATED SPURIOUS EMISSION
RESULT: Pass

5.1.8 CONDUCTED EMISSION ON AC MAINS
RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS
RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Conducted Testing

Appendix C: Test Results of Radiated Testing and conducted emission on AC mains

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Registration No.: 694916

IC Registration No.: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (TS8997)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Signal Analyzer	R&S	FSV 40	101441	2022-08-09
OSP	R&S	OSP 150	101017	2021-12-10
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A
Power Meter	R&S	NRP2	107105	2021-12-10
Power Sensor	R&S	NRP-Z81	105677	2022-08-09
Shielding Room 8#	Albatross	SR8	APC17151-SR8	2024-06-22
Unwanted Emission Testing (TS9975)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
EMI Test Receiver	R&S	ESR 7	102021	2022-08-10
Signal Analyzer	R&S	FSV 40	101439	2022-08-09
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2022-08-09
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2022-08-09
Amplifier	R&S	SCU-18F	180070	2022-08-09
Amplifier	R&S	SCU40A	100475	2022-08-09
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2022-08-08
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2022-08-08
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2022-08-08
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2022-09-13
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2024-06-22
Conducted Emission on AC Mains				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cali. until**
EMI Test Receiver	R&S	ESR3	102680	2022-04-25
Artificial Mains Network	R&S	ENV216	101445	2022-04-25
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Test	Parameters	Expanded uncertainty (U_{lab})	Expanded uncertainty (U_{cispr})
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 3.70 dB ± 3.30 dB	± 3.8 dB ± 3.4 dB
Radiated Emission (3m SAC)	Level accuracy (30MHz to 1000MHz)	± 4.52 dB	± 6.3 dB
	Level accuracy (above 1000MHz)	± 4.37 dB	N/A

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B & C of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is IEEE 802.11 b/g/n 2.4GHz 2T2R Wi-Fi Module.
This product has two different configurations, the two configurations are identical except non-radio related Flash chip U2: 16MB and 32MB, and this two Flash chip are pin to pin only the storage space is different.

This module has five different antennas, the details specifications for these antennas as below:

Antenna #	Model	Antenna Gain	Antenna Type	Connector Type
1#	SA05A01RA	5.4dBi for Ant0 5.0dBi for Ant1	PIFA antenna	IPEX Connector
2#	SA03A01RA	5.4dBi for Ant0 5.0dBi for Ant1	PIFA antenna	IPEX Connector
3#	SA05A02RA	5.4dBi for Ant0 5.0dBi for Ant1	PIFA antenna	IPEX Connector
4#	6147F00013	3.0 dBi for Ant0 & Ant1	PCB Layout Antenna	IPEX Connector
5#	K7ABLG2G4ML400	2.0 dBi for Ant0 & Ant1	Fiber Glass Antenna	N-Type Male

Note:
1. When connecting to the module, all antennas listed above need to transfer to an **IPEX connector**.
2. Antennas 1#, 2# and 3# have the same type and similar in-band and out-of-band characteristics, they are considered as equivalent antennas. Thus, the antenna 1# with highest gain was selected to be tested.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Wi-Fi Module
Type Designation	RAK634
Trade Mark	RAK
FCC ID	2AF6B-RAK634
IC	25908-RAK634
HVIN	RAK634
Operating Voltage	3.3VDC (Supplied by socket of PCB borad)

Technical Specification of Wi-Fi 802.11 b/g/n	
Operating Frequency	2412 - 2462 MHz for 802.11b/g/n(HT20) 2422 - 2452 MHz for 802.11n(HT40)
Type of Modulation	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM)
Data Rate	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0 ~ MCS7 for 802.11n
Channel Number	11 channels for 802.11b/g/n(HT20) 7 channels for 802.11n(HT40)
Channel Separation	5 MHz
Number of Antenna:	2

Table 3: RF Channel and Frequency of Wi-Fi 802.11 b/g/n

RF Channel	802.11 b/g/n(HT20)	802.11 n(HT40)
	Frequency (MHz)	Frequency (MHz)
01	**2412**	/
02	2417	/
03	2422	**2422**
04	2427	2427
05	2432	2432
06	**2437**	**2437**
07	2442	2442
08	2447	2447
09	2452	**2452**
10	2457	/
11	**2462**	/

3.3 Independent Operation Modes

The basic operation modes are:

A. On
   1. Wi-Fi transmitting mode
      1) Low Channel
      2) Middle Channel
      3) High Channel

B. On, Wireless connecting mode (Wi-Fi)

C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Block Diagram
- FCC/IC Label and Location Info
- Operation Description
- Photo Document
- Schematics
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.
Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.
According to clause 3.1, all test were applied on model RAK634 with antennas SA05A01RA, 6147F00013, K7ABLG2G4ML400.

Table 4: List of Frequencies under Test, 802.11b/g/n

802.11b/g/n-HT20			
Test Channel	Channel Number	Frequency (MHz)	Remark
Low	1	2412	802.11b: 1Mbps 802.11g: 6Mbps 802.11n-HT20: MCS0
Middle	6	2437	
High	11	2462	
802.11n-HT40			
Test Channel	Channel number	Frequency (MHz)	Remark
Low	3	2422	802.11n-HT40: MCS0
Middle	6	2437	
High	9	2452	

Note: All test modes have been pre-scanning test and only the worst case of test mode.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Mobile Phone	HTC	D626w	N/A
Notebook	Lenovo	ThinkPad T480	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 30MHz)

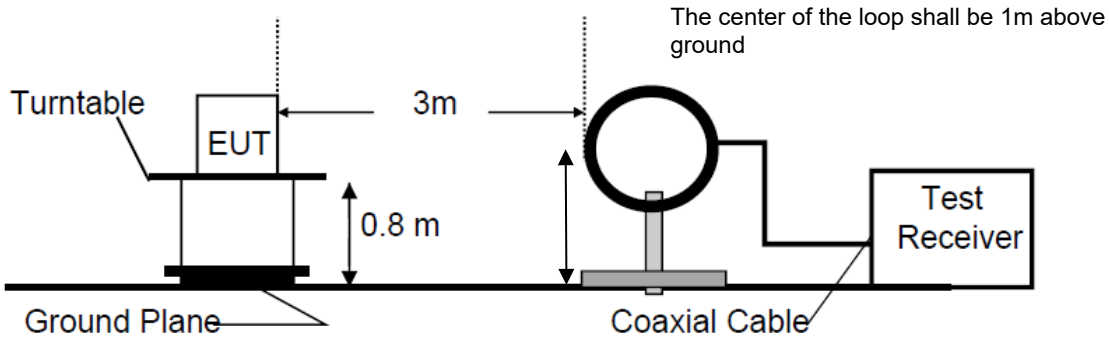


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

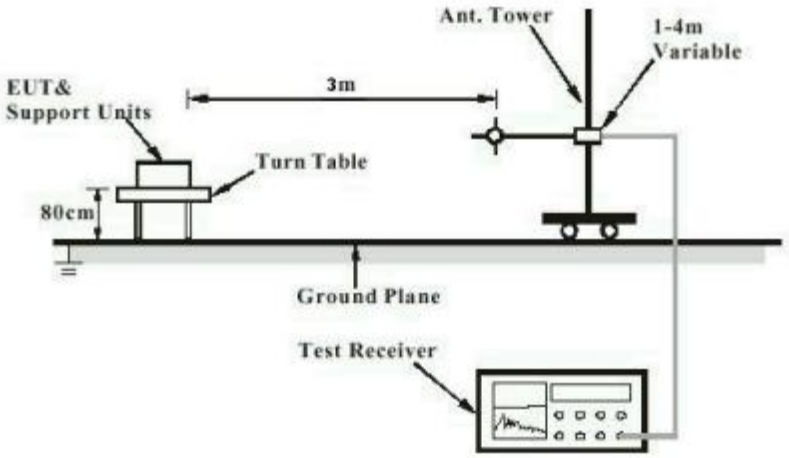


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

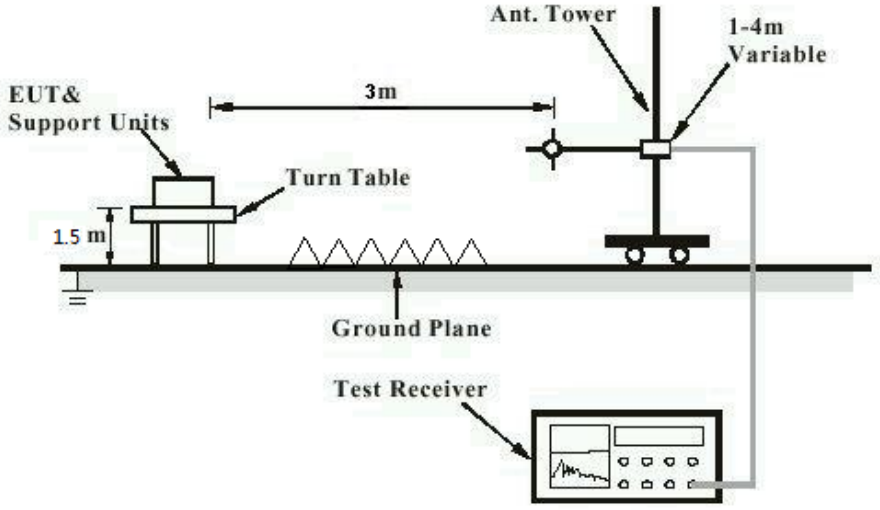


Diagram of Measurement Configuration for Mains Conduction Measurement

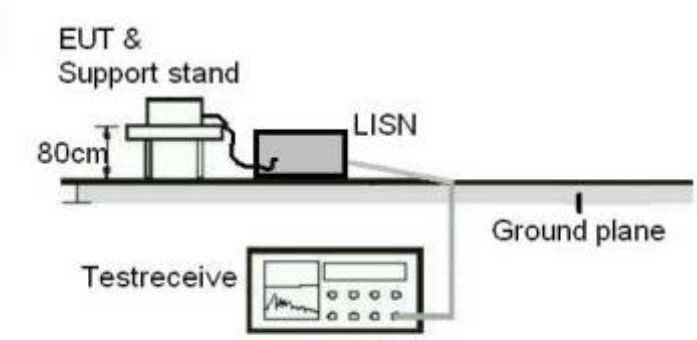
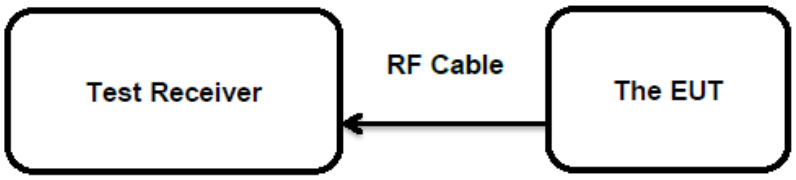


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(b)(4) and Part 15.203
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has two external antenna, the maximum directional gain of antenna is 5.4 dBi and 5.0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Conducted Output Power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(b)(3) RSS-247 Clause 5.4(2)&(4)
Basic standard	:	ANSI C63.10: 2013
Limits	:	< 1 Watt (Maximum Conducted Peak Power) e.i.r.p. <4W
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 6: Test Result of Maximum Conducted Output Power

Test mode	Test channel (MHz)	Ant 0		Ant 1		Ant 0 + Ant 1	
		Maximum Conducted Peak power (dBm)	Maximum Conducted Average power (dBm)	Maximum Conducted Peak power (dBm)	Maximum Conducted Average power (dBm)	Maximum Conducted Peak power (dBm)	Maximum Conducted Average power (dBm)
802.11b	2412	15.3	13.7	15.2	13.1	18.26	16.42
	2437	14.8	13.2	15.4	13.8	18.12	16.52
	2462	14.9	12.9	15.3	13.6	18.11	16.27
802.11g	2412	20.4	13.7	19.9	13.5	23.17	16.61
	2437	20.3	13.2	20.3	13.6	23.31	16.36
	2462	19.1	13.0	19.2	13.4	22.16	16.21
802.11n-HT20	2412	20.8	14.0	20.2	13.9	**23.52**	16.96
	2437	20.5	13.5	20.2	13.9	23.36	16.71
	2462	20.4	13.3	19.9	13.7	23.17	16.51
802.11n-HT40	2422	14.1	8.9	17.7	13.7	16.91	14.94
	2437	18.5	13.7	17.6	13.6	21.08	16.66
	2452	18.3	13.7	17.2	13.6	20.80	16.66

Note: The cable loss is taken into account in results and the e.i.r.p. is 31.74 dBm and them less than 4W (36 dBm).

5.1.3 Conducted Power Spectral Density

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(e) RSS-247 Clause 5.2(2)
Basic standard	:	ANSI C63.10: 2013
Limits	:	8 dBm / 3kHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 7: Test Result of Power Spectral Density

Test mode	Test channel (MHz)	Ant 0	Ant 1	Ant 0 + Ant 1
		Measured Peak Power Spectral Density (dBm/3KHz)	Measured Peak Power Spectral Density (dBm/3KHz)	Measured Peak Power Spectral Density (dBm/3KHz)
802.11b	2412	3.40	2.35	5.91
	2437	2.94	2.51	5.74
	2462	2.91	2.35	5.65
802.11g	2412	-12.97	-12.39	-9.63
	2437	-12.97	-13.32	-10.13
	2462	-13.71	-13.37	-10.53
802.11n-HT20	2412	-12.9	-13.13	-9.57
	2437	-12.52	-11.87	-9.17
	2462	-12.92	-12.66	-9.78
802.11n-HT40	2422	-15.19	-14.9	-12.03
	2437	-15.46	-15.22	-12.33
	2452	-15.49	-15.47	-12.47

Note: The cable loss is taken into account in results.

For the measurement records, refer to the appendix B.

5.1.4 99%dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	RSS-Gen clause 6.7
Basic standard	:	ANSI C63.10: 2013
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Table 8: Test Result of 99% Bandwidth

Test Mode	Frequency (MHz)	Ant0_ 99% Bandwidth (MHz)	Ant1_ 99% Bandwidth (MHz)	Limit (MHz)
802.11b	2412	14.2	14.3	/
	2437	14.2	14.3	
	2462	14.3	14.3	
802.11g	2412	16.6	16.6	
	2437	16.5	16.6	
	2462	16.5	16.6	
802.11n (HT20)	2412	17.6	17.6	
	2437	17.5	17.6	
	2462	17.6	17.6	
802.11n (HT40)	2422	36.25	36.25	
	2437	36.25	36.25	
	2452	36.00	36.00	

For the measurement records, refer to the appendix B.

5.1.5 6dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)(2) RSS-247 Clause 5.2(a)
Basic standard	:	ANSI C63.10: 2013
Limits	:	> 500 KHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 9: Test Result of 6dB Bandwidth

Test Mode	Frequency (MHz)	Ant0_ -6dB Bandwidth (MHz)	Ant1_ -6dB Bandwidth (MHz)	Limit (KHz)
802.11b	2412	9.65	10.15	> 500
	2437	9.65	9.65	
	2462	9.65	9.65	
802.11g	2412	15.20	15.20	
	2437	15.15	15.20	
	2462	15.20	15.20	
802.11n (HT20)	2412	15.20	15.20	
	2437	15.20	15.20	
	2462	15.20	15.20	
802.11n (HT40)	2422	35.15	35.15	
	2437	35.10	35.15	
	2452	32.65	32.65	

For the measurement records, refer to the appendix B.

5.1.6 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	:	ANSI C63.10: 2013
Limits	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

5.1.7 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3 & 5.5
Basic standard	:	ANSI C63.10: 2013
Limits	:	Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Table 4 & Table 5
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2021-09-08 – 2021-09-13
Input voltage	:	DC 3.3V
Operation mode	:	A.1
Test channel	:	Low / Middle / High
Ambient temperature	:	23℃
Relative humidity	:	51 %
Atmospheric pressure	:	101 kPa

Remark:
Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix C.

5.1.8 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207(a) RSS-Gen Clause 8.8
Basic standard	:	ANSI C63.10: 2013
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.207(a) RSS-Gen Table 4
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-09-15
Input voltage	:	AC 120V, 60Hz
Operation mode	:	B
Earthing	:	Not connected
Ambient temperature	:	24 ℃
Relative humidity	:	53 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix C.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT: **Pass**

Test Specification
Test standard : CFR47 FCC Part 2: Section 2.1091
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 v06, section 7
RSS-102 Issue 5 February 2021, section 2.5.2

This module has five different antennas, and the maximum e.r.i.p. configuration be evaluated as below:

➢ **FCC requirements**

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

MPE Calculation Method according to KDB 447498 v06

Power Density: $S_{(mW/cm^2)}= PG/4\pi R^2$ or $EIRP/4\pi R^2$

Where:

S = power density (mW/cm^2)

P = power input to the antenna (mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm)

From the peak RF output power, the minimum mobile separation distance, d=20 cm, as well as the antenna gain, the RF power density can be calculated as below:

$S_{(mW/cm^2)}= PG/4\pi R^2$

a) EUT RF Exposure Evaluation standalone operations

Test Mode	Maximum conducted Power		Antenna Gain (dBi)	Measured e.i.r.p		$S_{(mW/cm^2)}= PG/4\pi R^2$	Limit (mW/cm^2)
	(dBm)	(mW)		(dBm)	(mW)		
2.4GHz Wi-Fi SISO	20.8	120.23	5.4	26.2	416.87	0.083	1.0
2.4GHz Wi-Fi MIMO	23.52	224.91	5.4*	28.94	779.83	0.155	1.0

➢ **IC requirements:** The EUT shall comply with the requirement of RSS-102 section 2.5.2.

Exemption from Routine Evaluation Limits – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

- RF exposure evaluation exempted power: 2.670 W

a) EUT RF Exposure Evaluation standalone operations:

Test Mode	Measured Peak Power		Antenna Gain (dBi)	Measured e.i.r.p (mW)	
	(dBm)	(mW)		(dBm)	(mW)
2.4GHz Wi-Fi SISO	20.8	120.23	5.4	26.2	416.87
2.4GHz Wi-Fi MIMO	23.52	224.91	5.4*	28.94	779.83

The e.i.r.p. is less than the RF exposure evaluation exempted power. So RF exposure evaluation is not required.

"RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons."

* Calculate for MIMO Antenna gain

According to FCC KDB 662911 D01, clause f) 2) f) i):
If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain = 0 dB for $N_{ANT} \leq 4$ for power measurements on IEEE 802.11 devices.

According to FCC KDB 662911 D01, clause f) 2) f) ii):
If antenna gains are not equal, directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

The directional gain calculate as below table:

Ant0 Gain (dBi)	Ant1 Gain (dBi)	directional gain(dBi)
5.4	5.0	5.4
3.0	3.0	3.0
2.0	2.0	2.0

7 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

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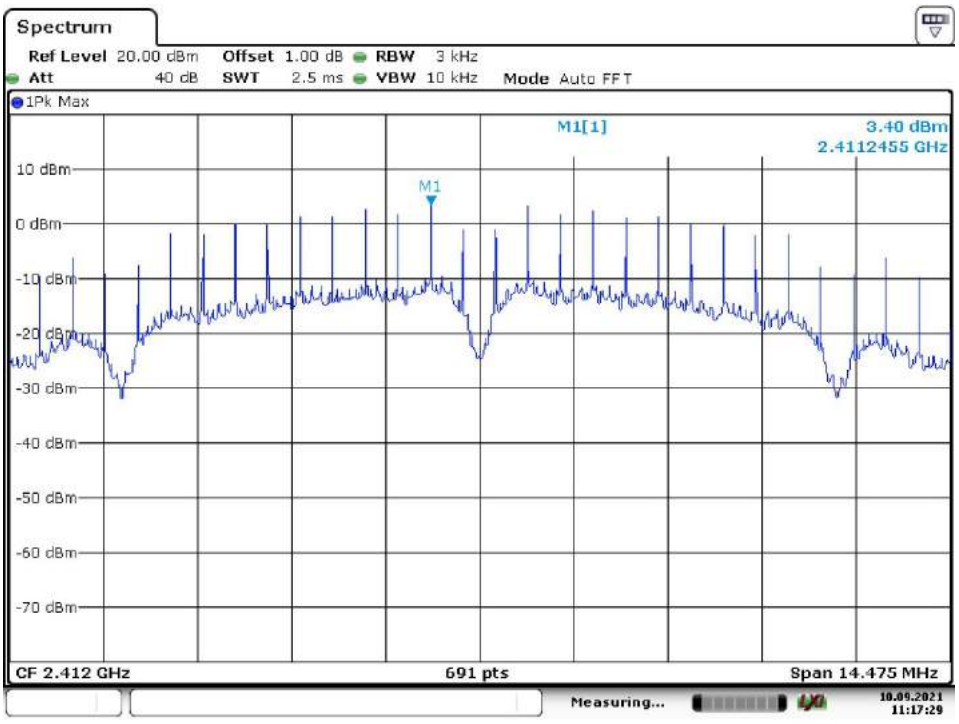
Appendix B.1: Conducted Power Spectral Density

Ant0, Wi-Fi 802.11 b mode, 1 Mbps

Low Channel



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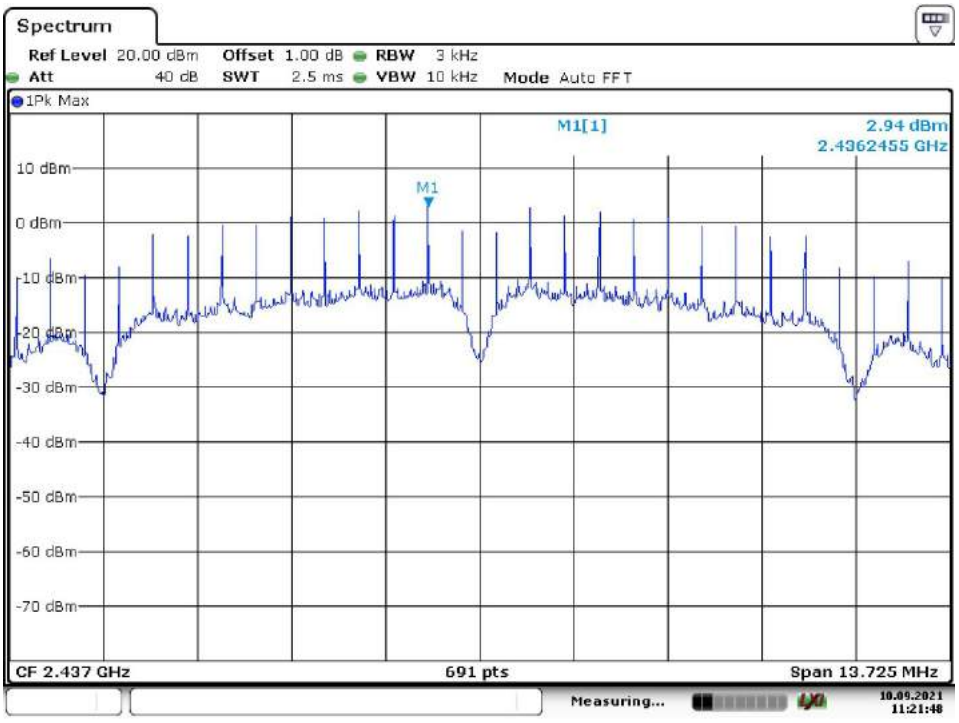
Middle Channel



Date: 10.SEP.2021 11:21:48

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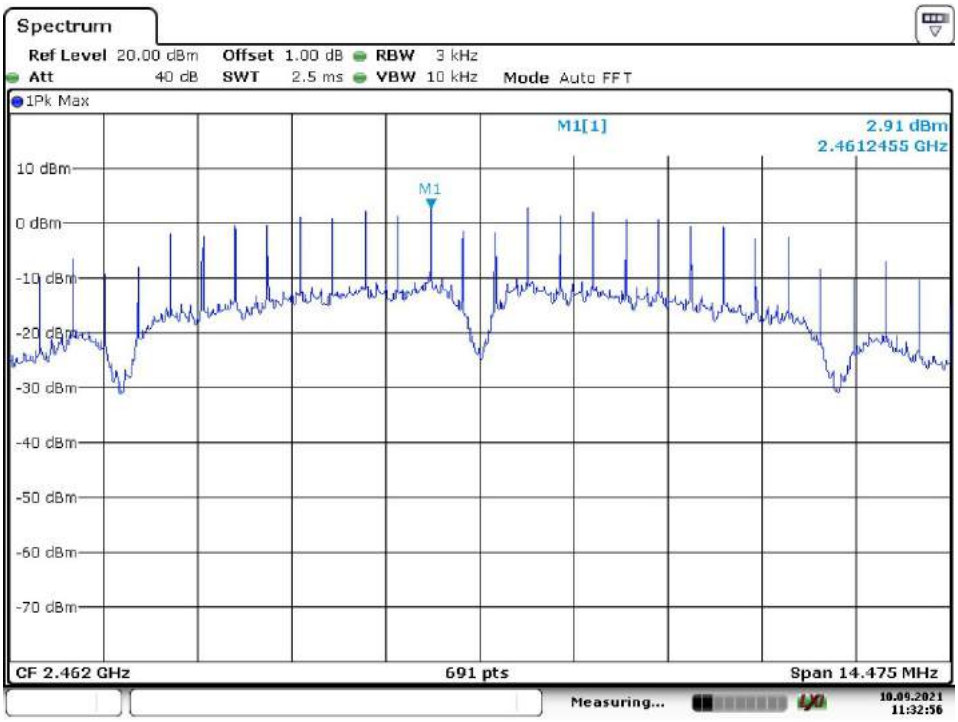

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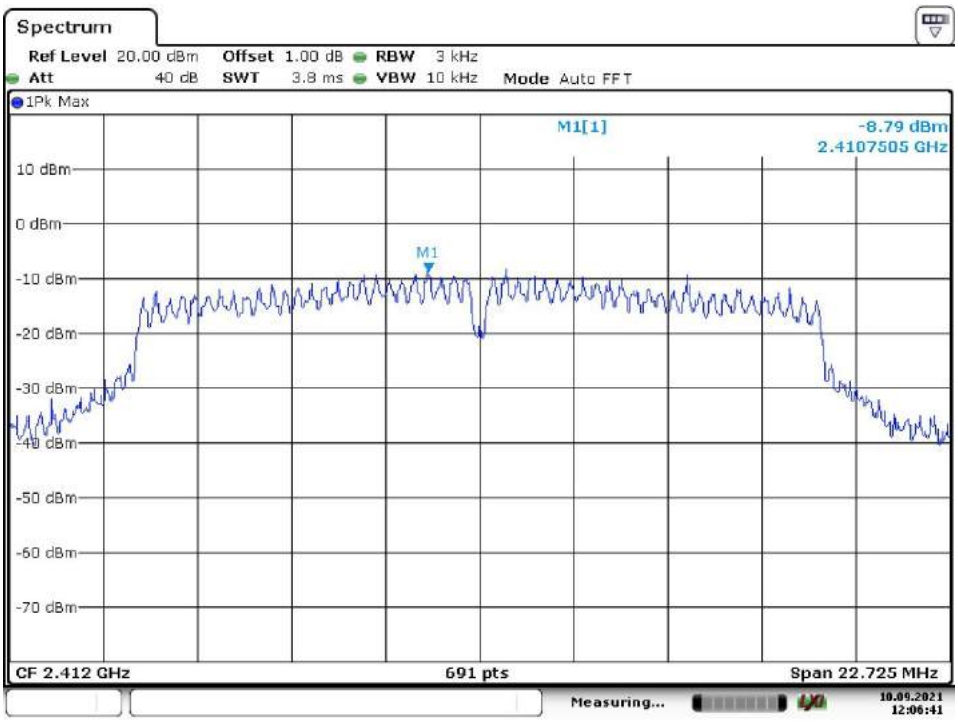
Ant0, Wi-Fi 802.11 g mode, 6 Mbps

Low Channel



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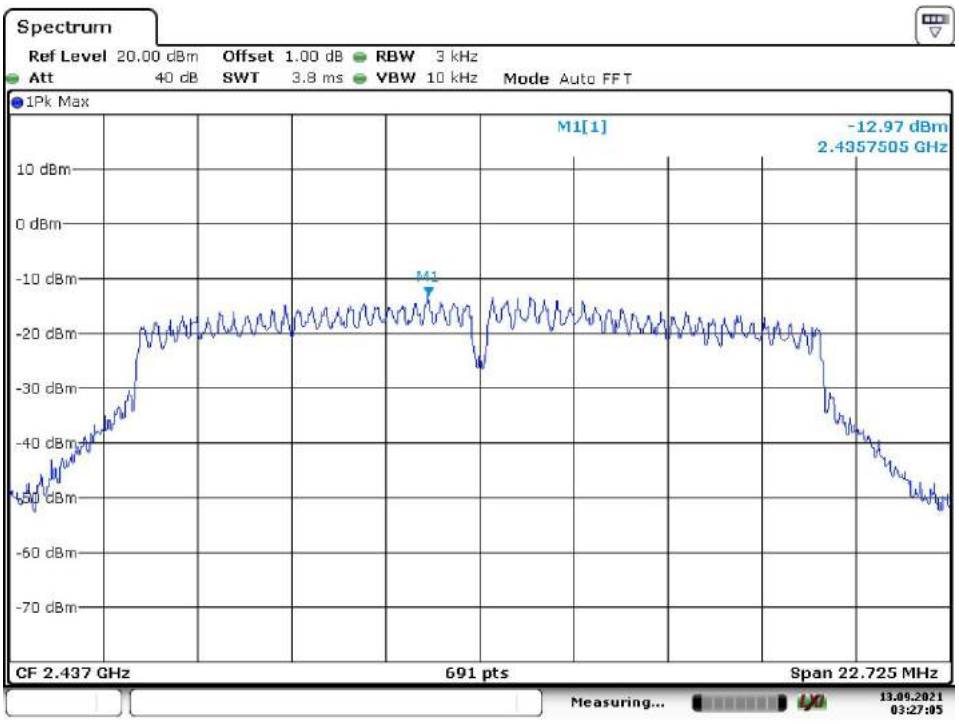

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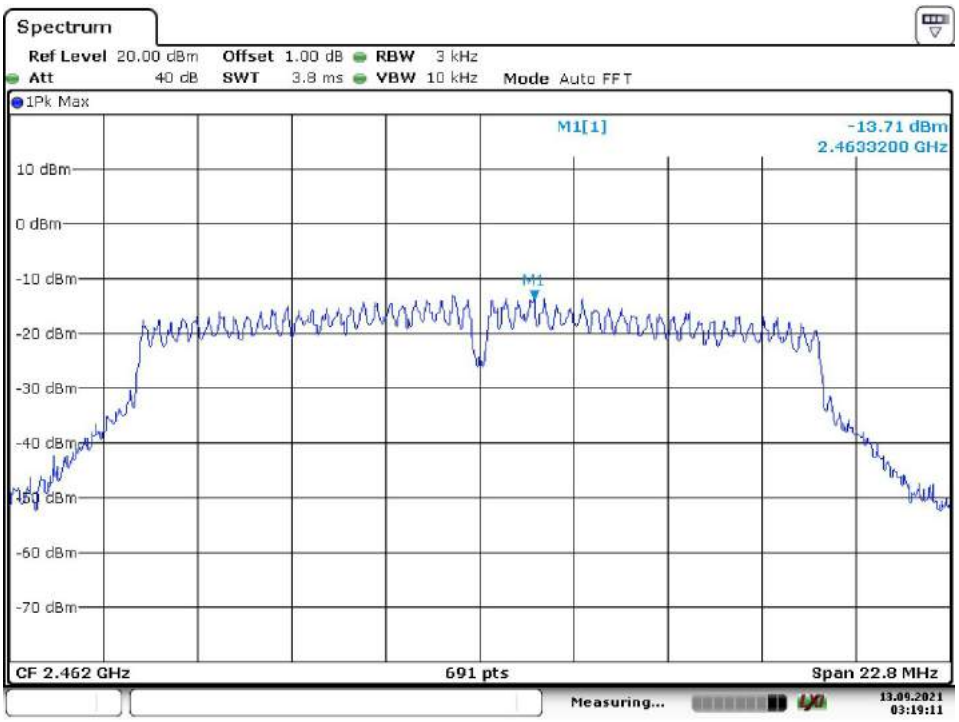

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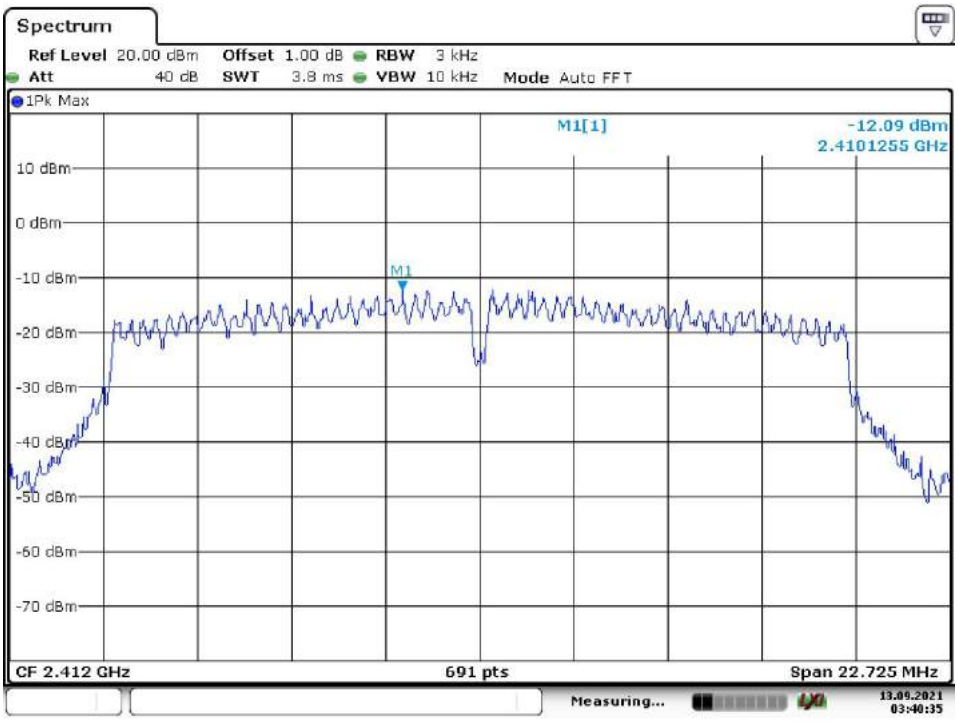
Ant0, Wi-Fi 802.11 n(HT20) mode, MCS0

Low Channel



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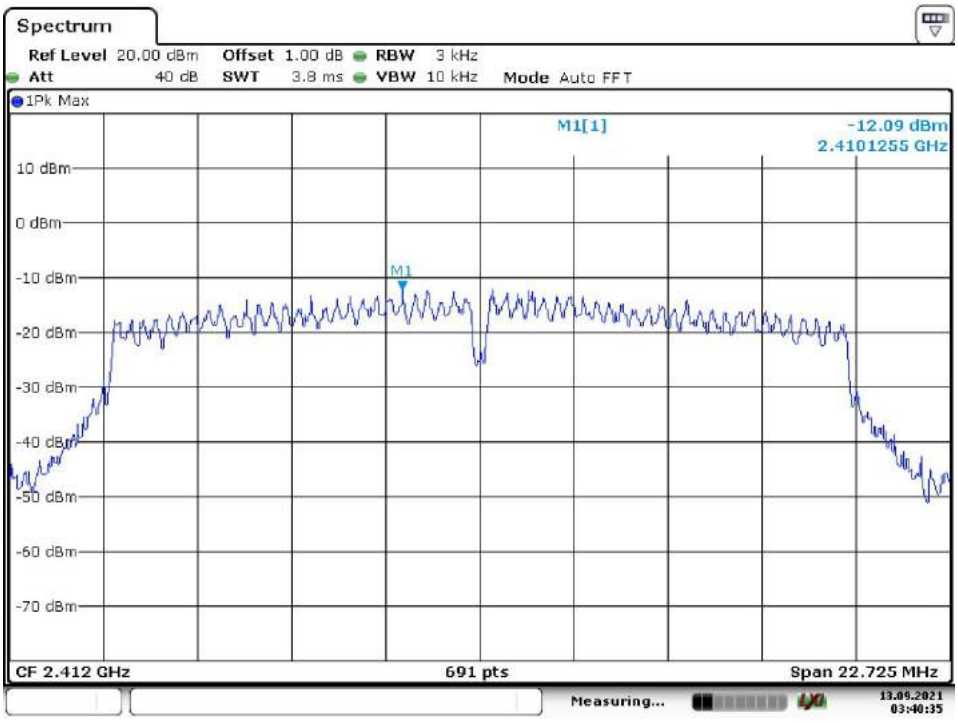
Middle Channel



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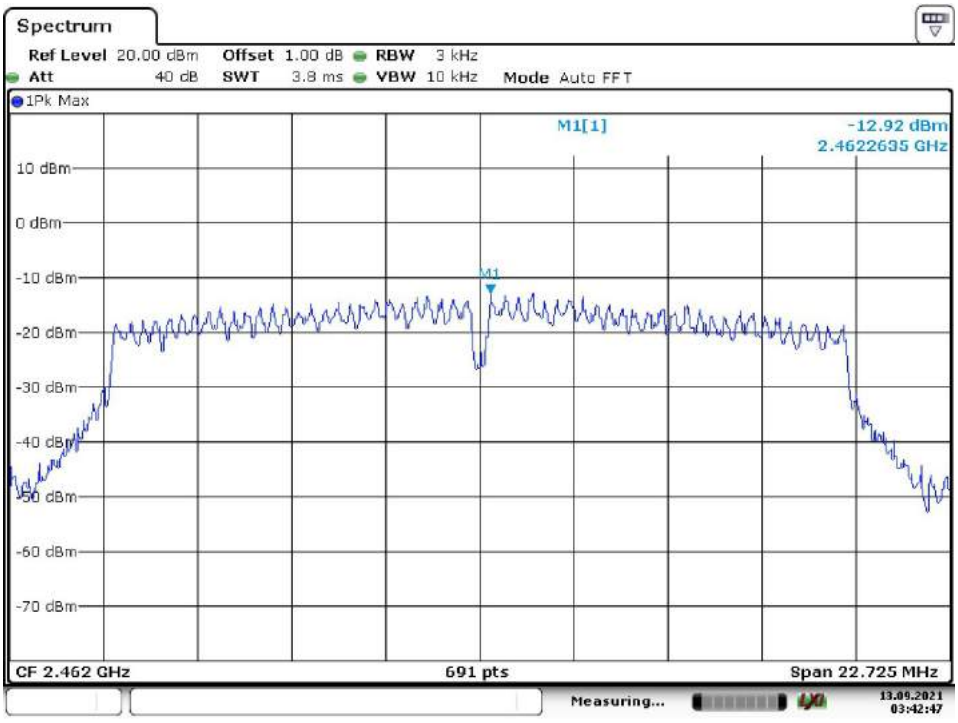

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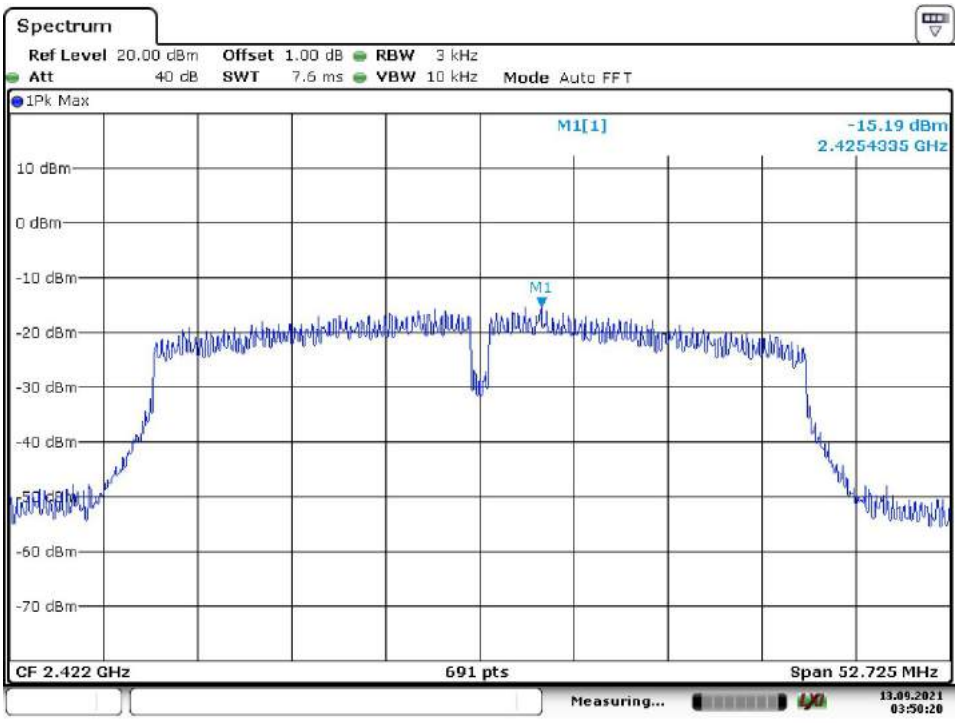
Ant0, Wi-Fi 802.11 n(HT40) mode, MCS0

Low Channel



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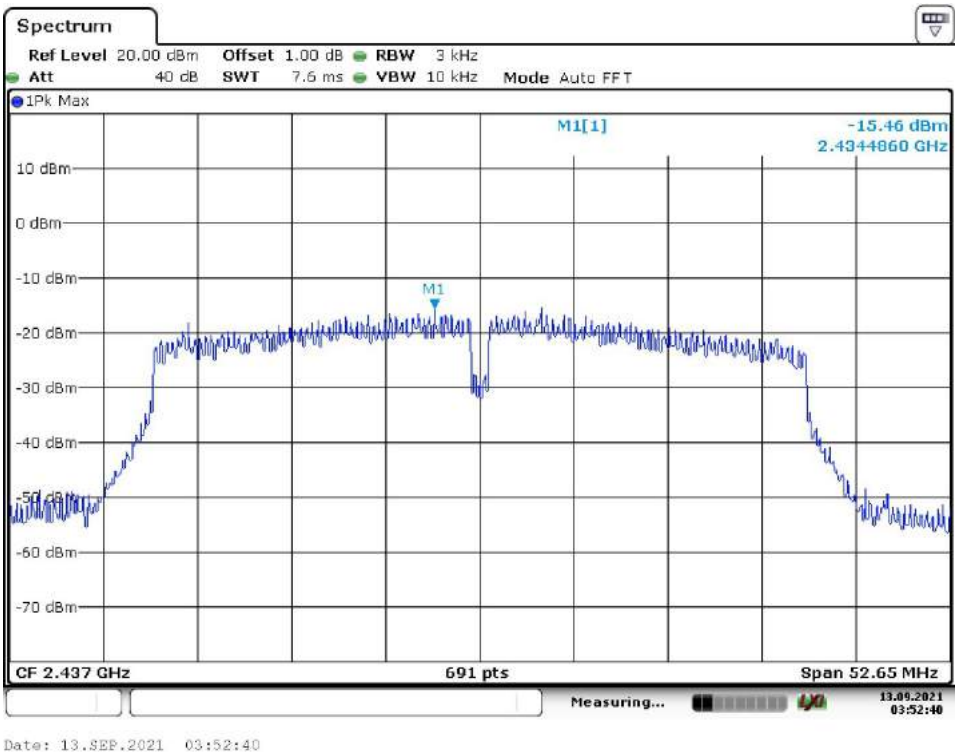

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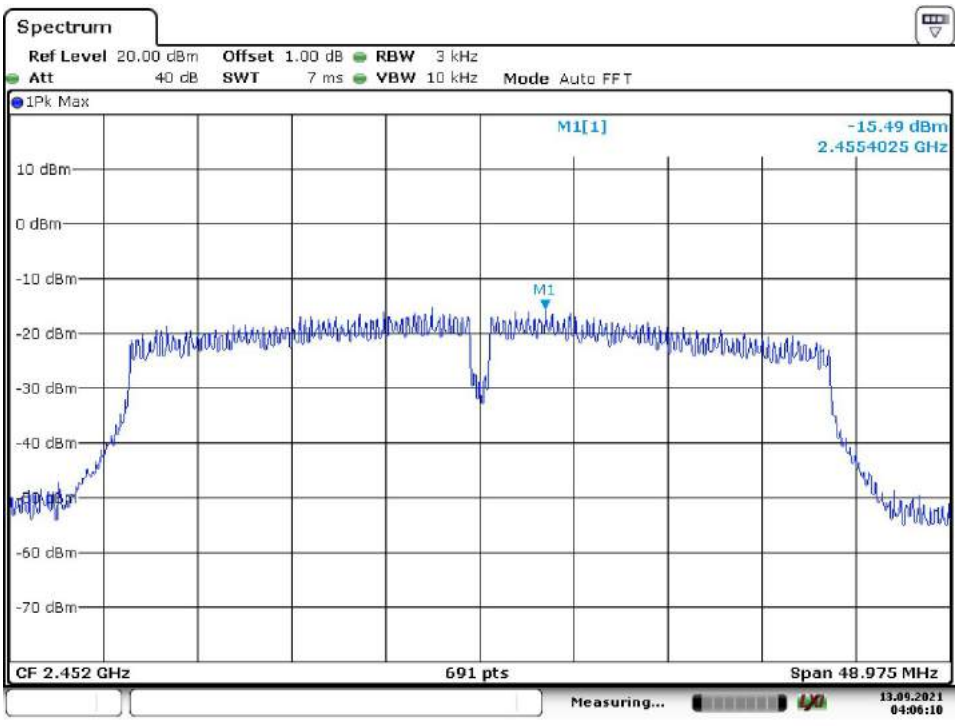
High Channel



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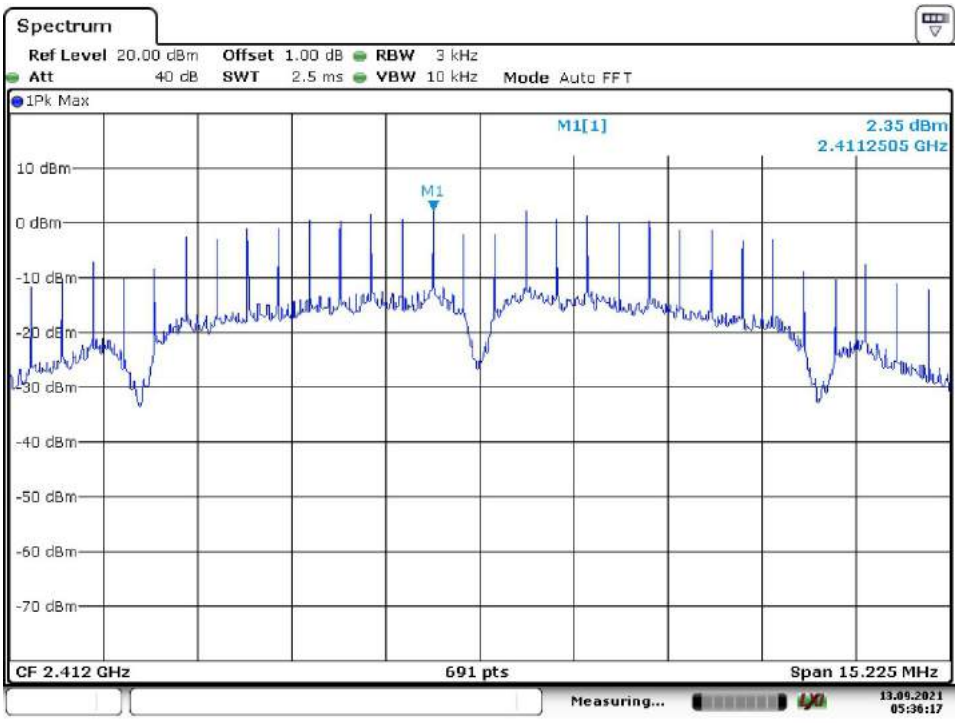
Ant1, Wi-Fi 802.11 b mode, 1 Mbps

Low Channel



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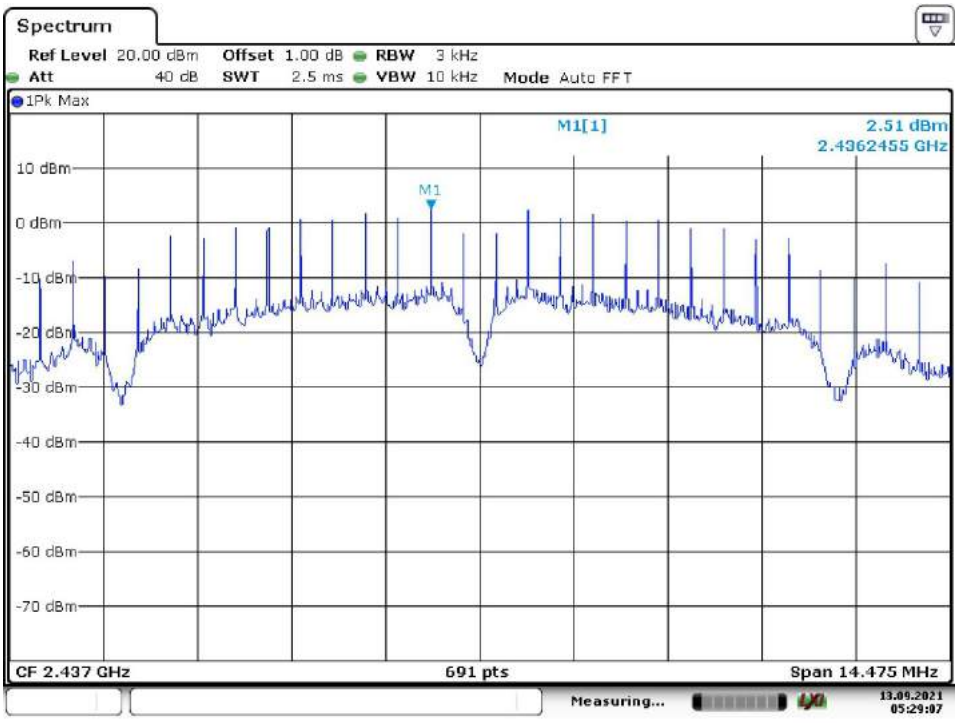
Middle Channel



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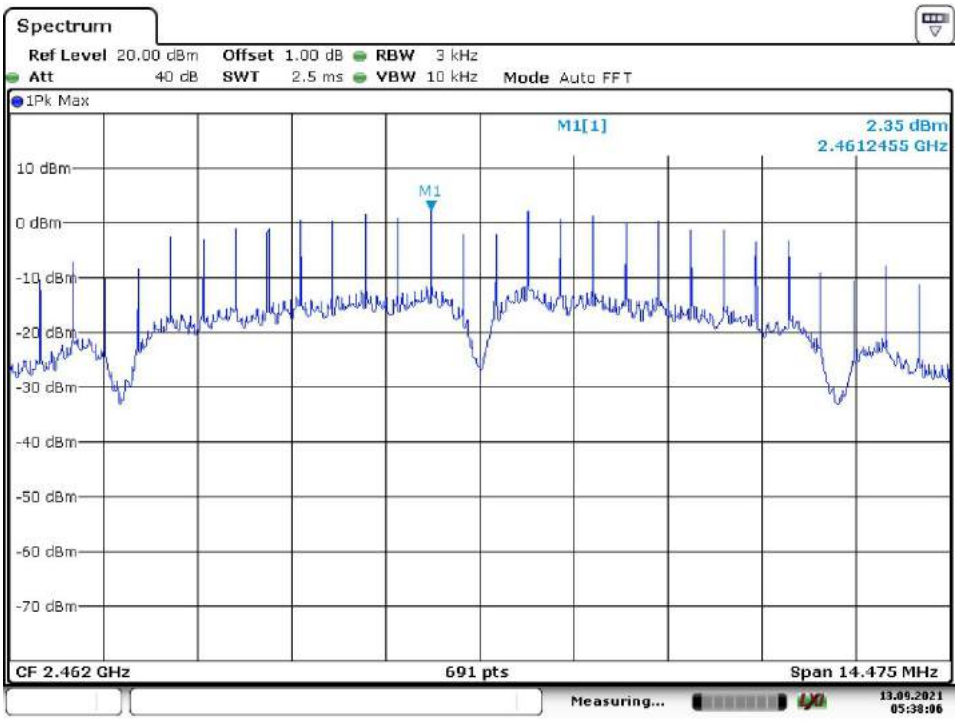
High Channel



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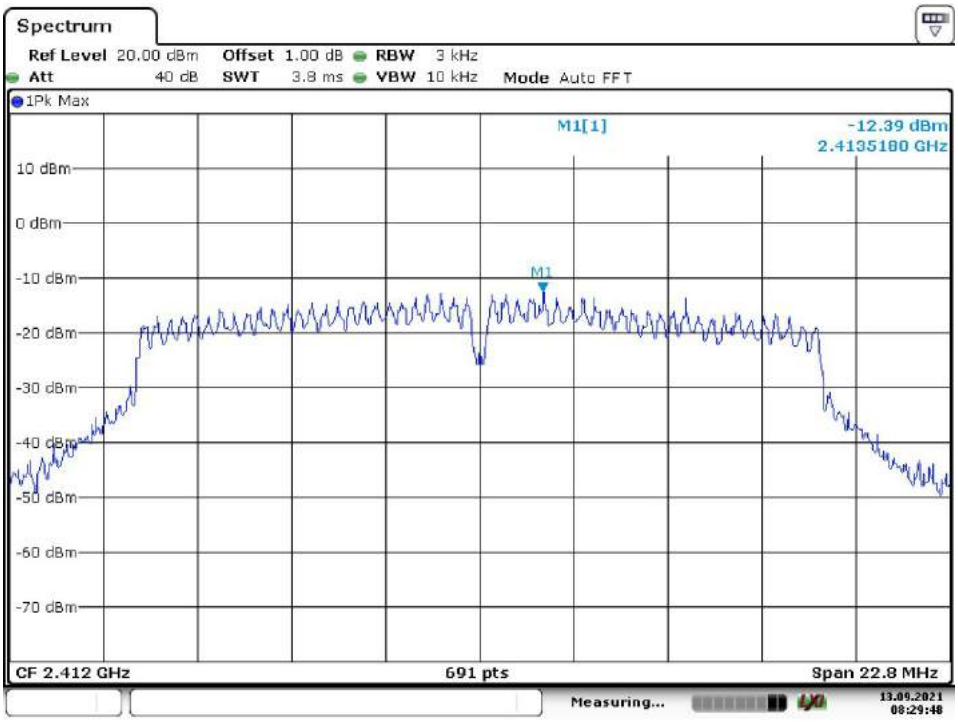
Ant1, Wi-Fi 802.11 g mode, 6 Mbps

Low Channel



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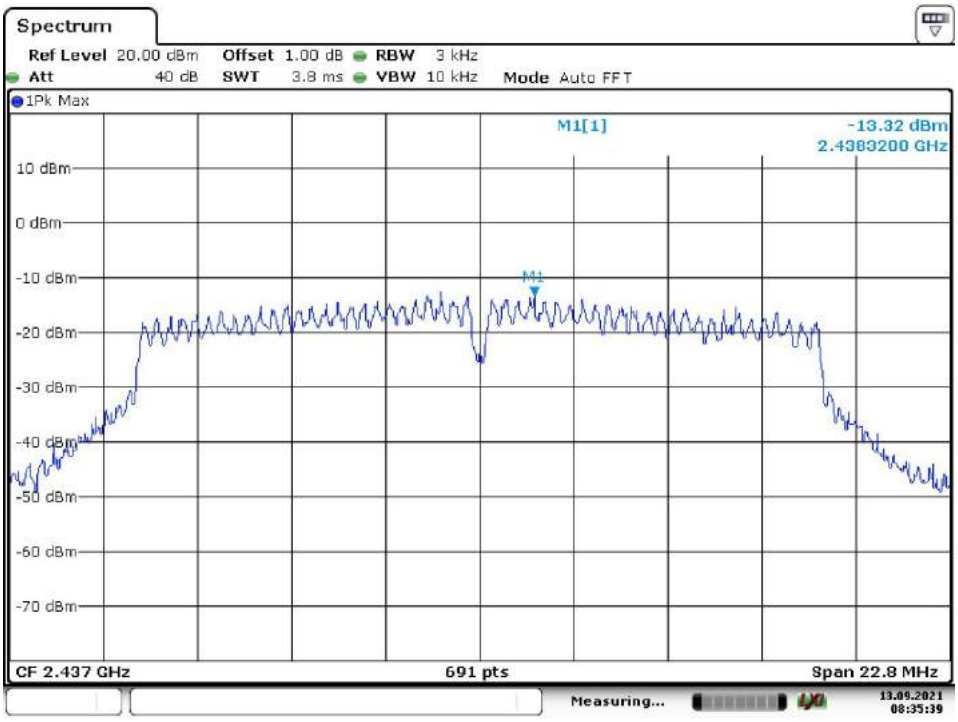
Middle Channel



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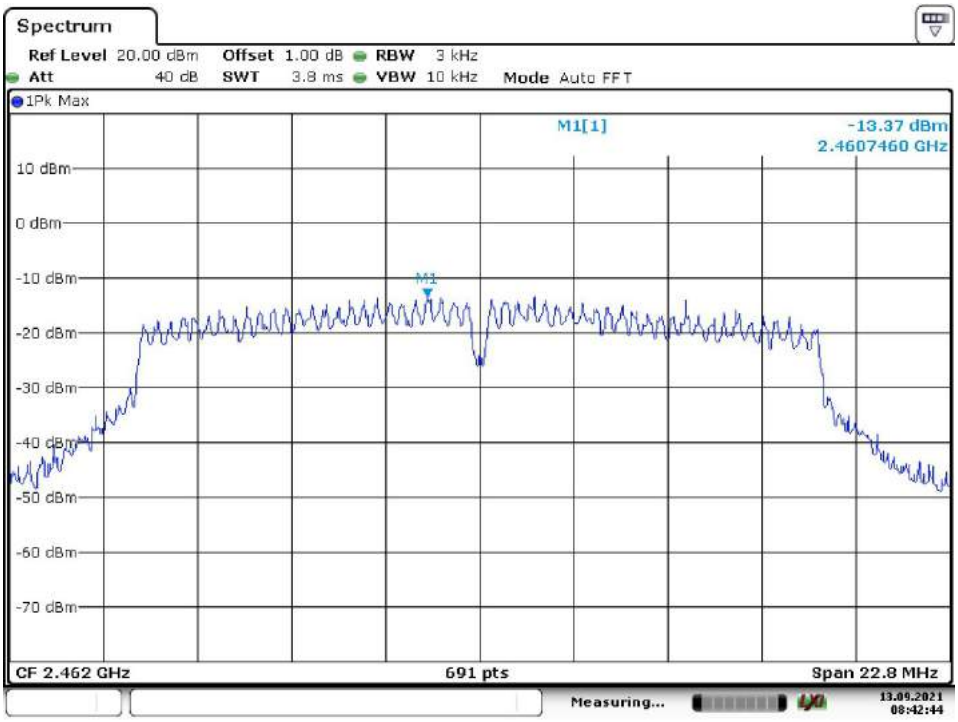
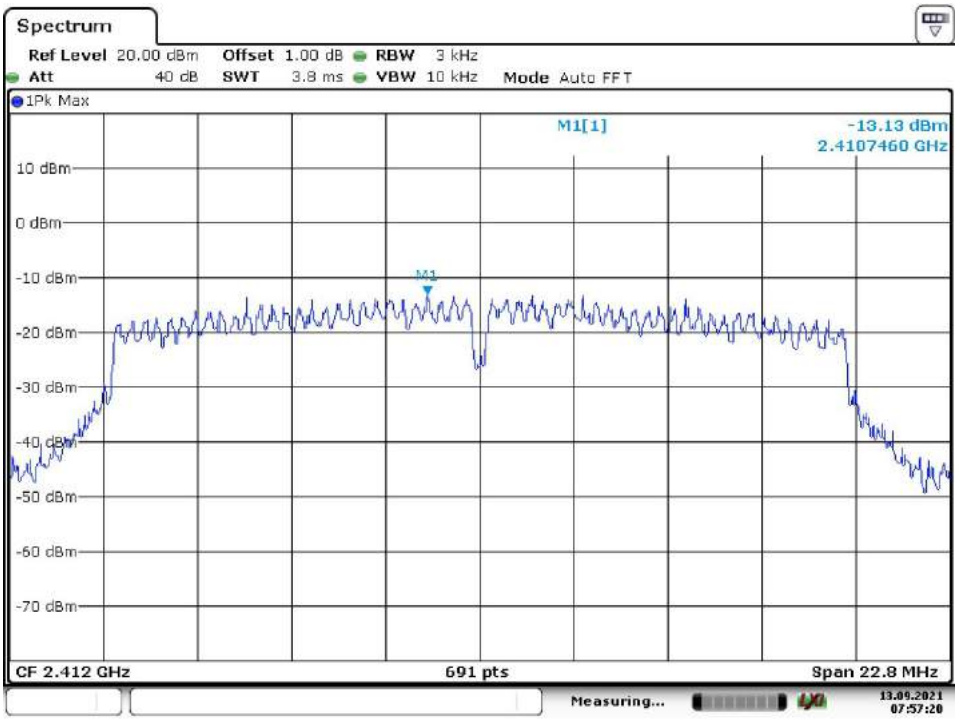
High Channel



Date: 13.SEP.2021 08:42:44

Ant1, Wi-Fi 802.11 n(HT20) mode, MCS0

Low Channel



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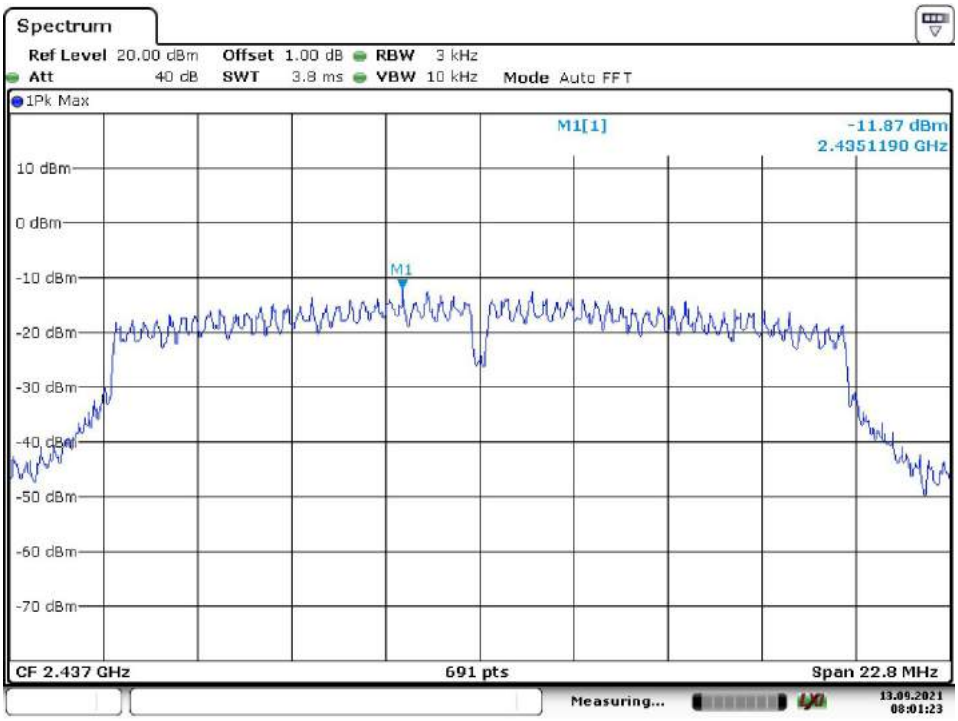
Middle Channel



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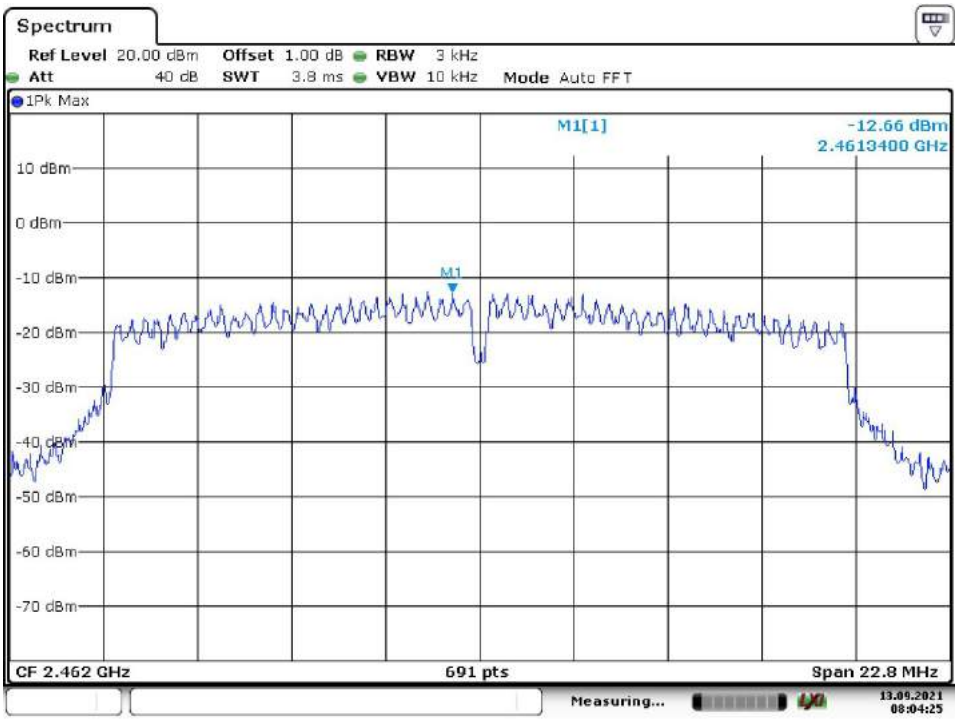
High Channel



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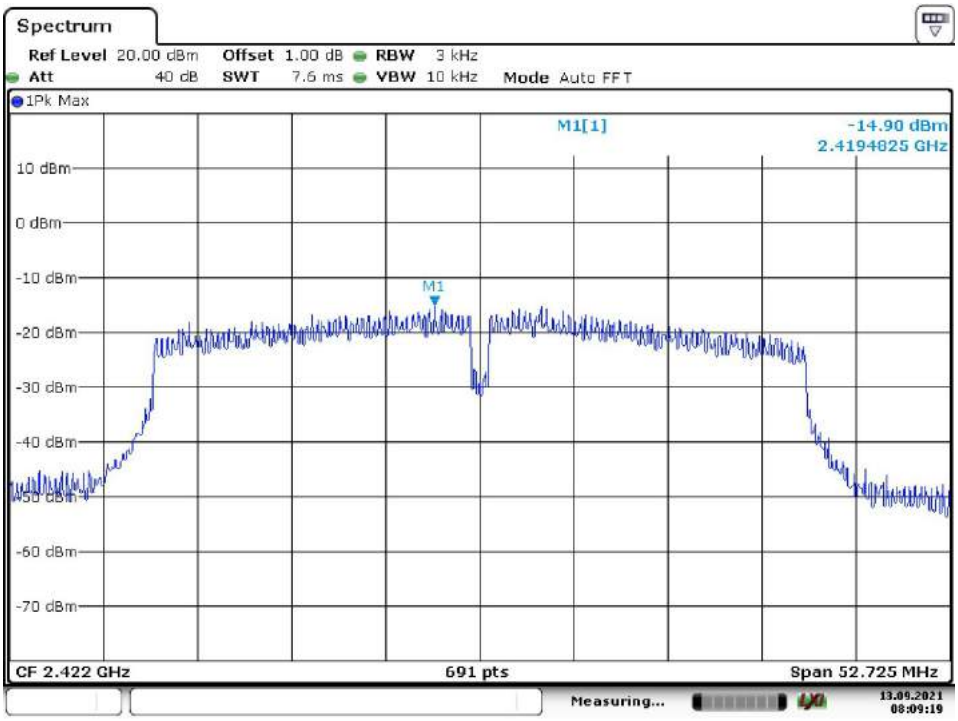
Ant1, Wi-Fi 802.11 n(HT40) mode, MCS0

Low Channel



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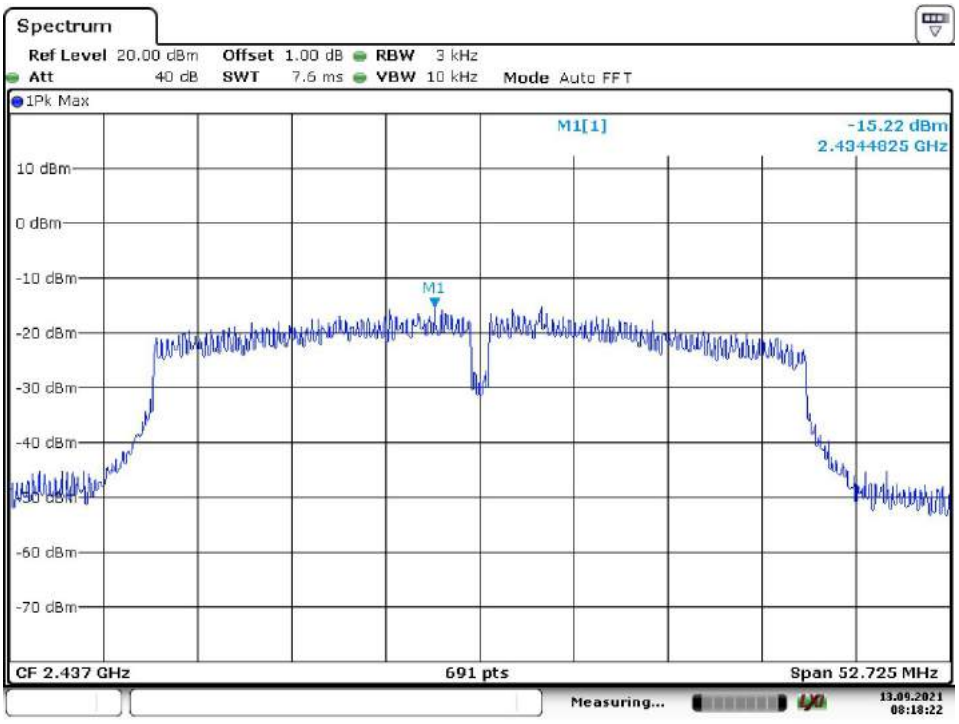
Middle Channel



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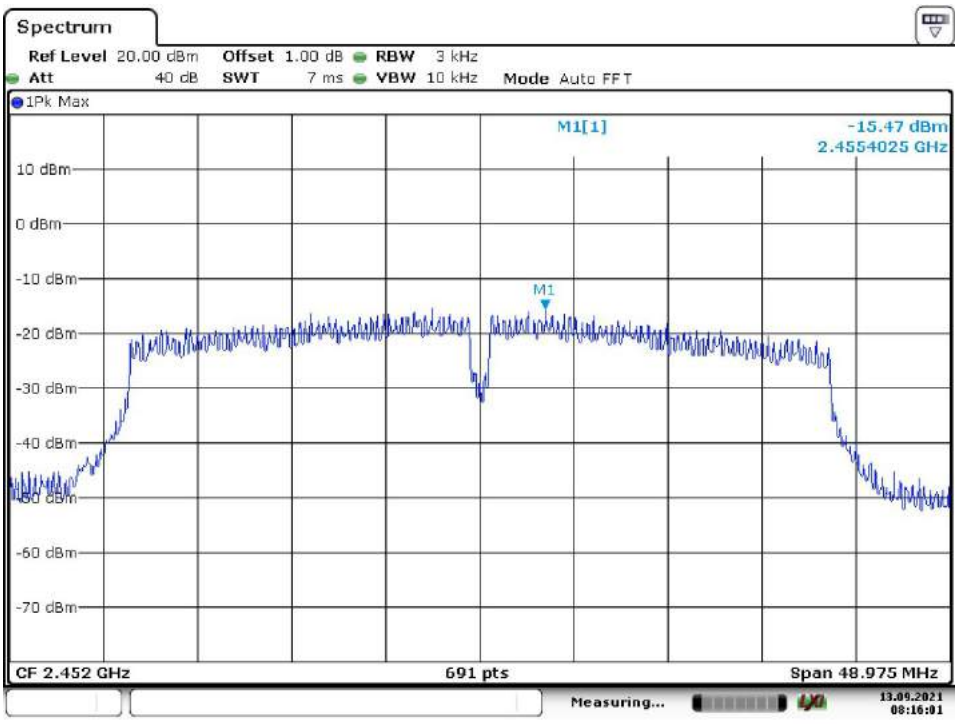
High Channel



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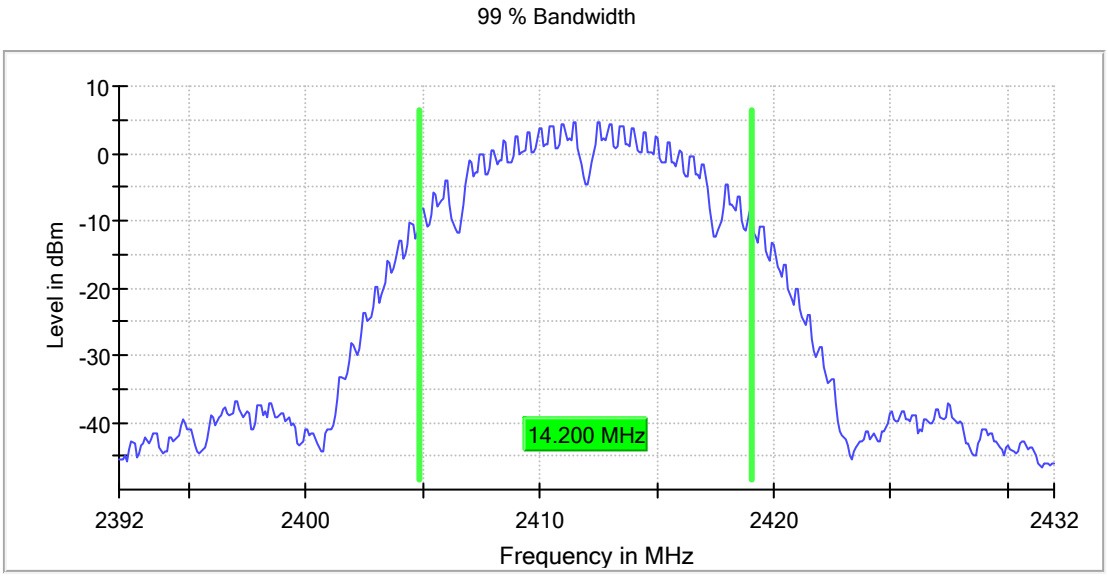
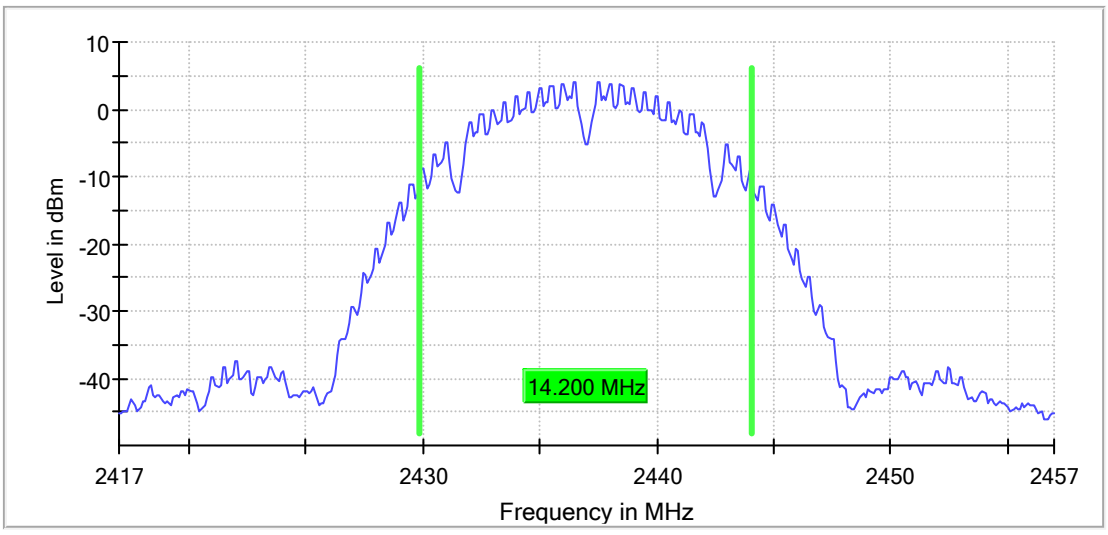
Appendix B.2: 99% Bandwidth

Ant0, Wi-Fi 802.11 b mode, 1 Mbps

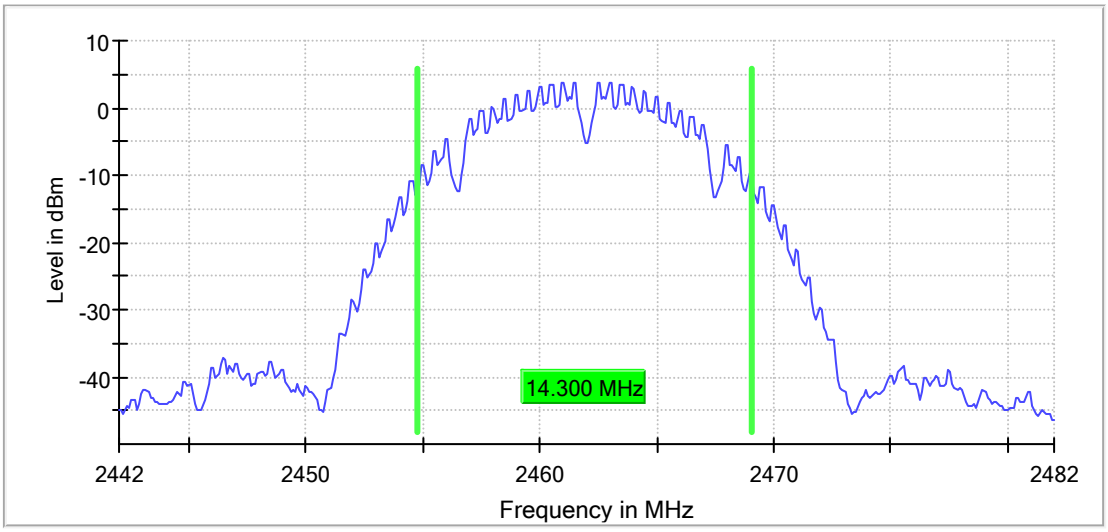
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

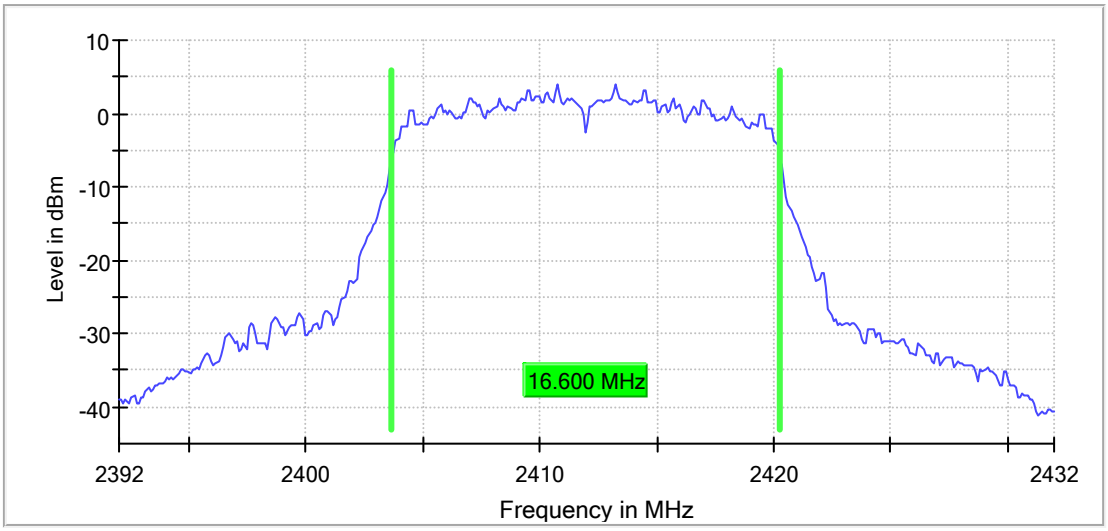


High Channel
RBW=200KHz, VBW=1MHz

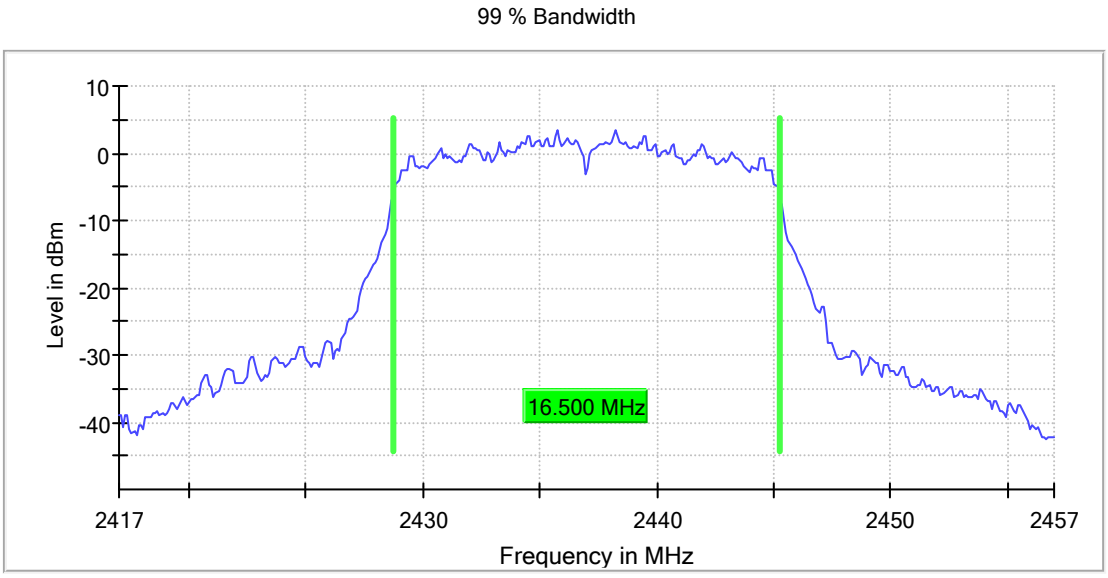


Ant0, Wi-Fi 802.11 g mode, 6 Mbps

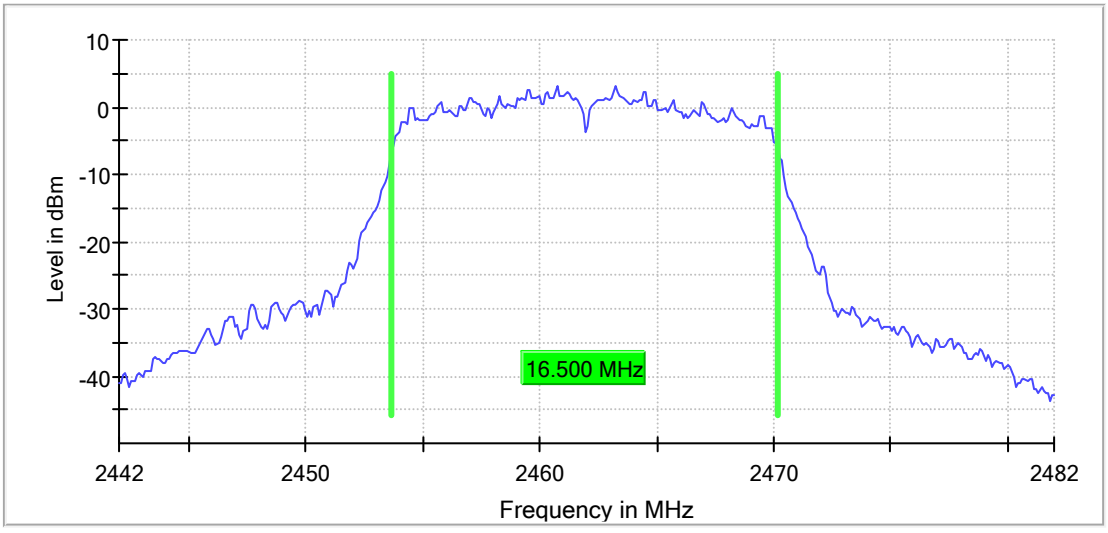
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

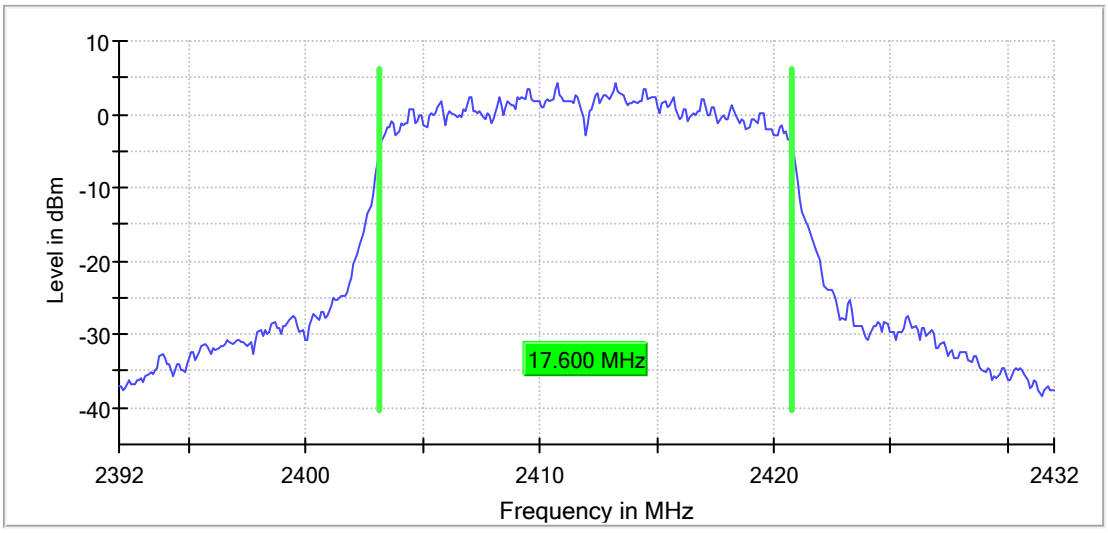


High Channel
RBW=200KHz, VBW=1MHz

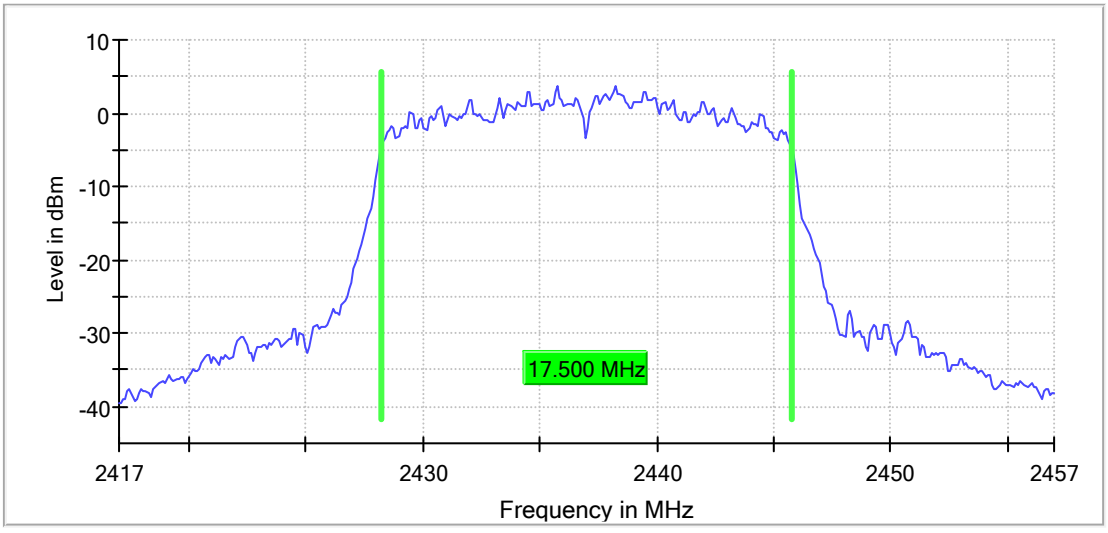


Ant0, Wi-Fi 802.11 n(HT20) mode, MCS0

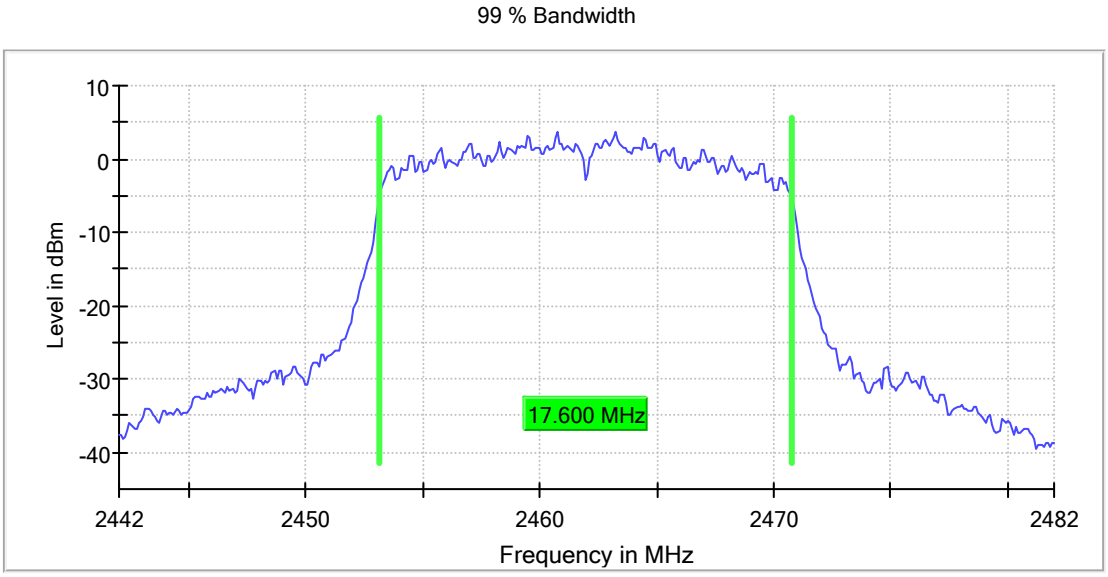
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

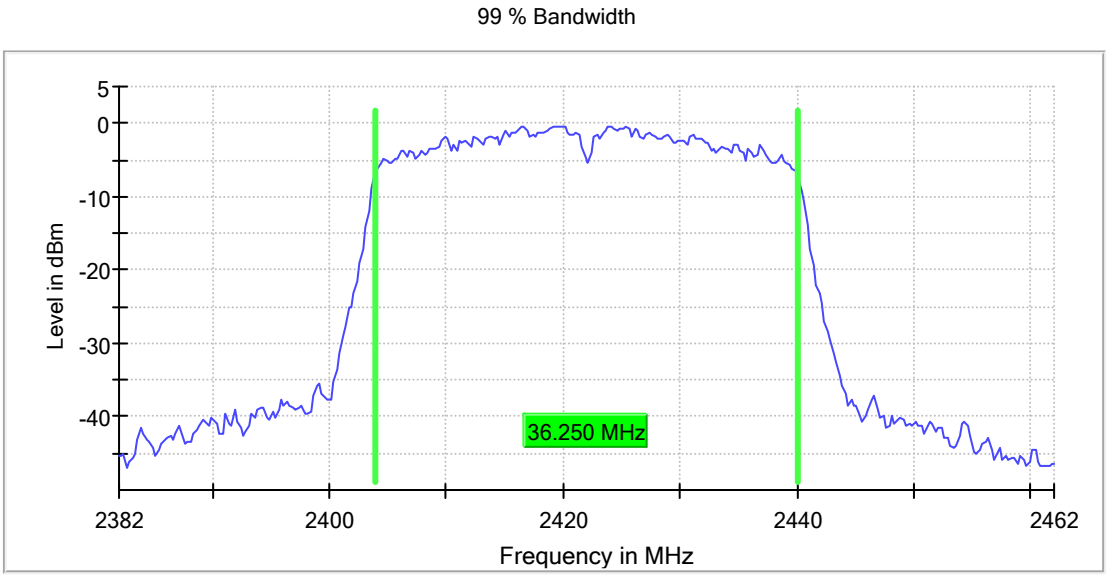


High Channel
RBW=200KHz, VBW=1MHz

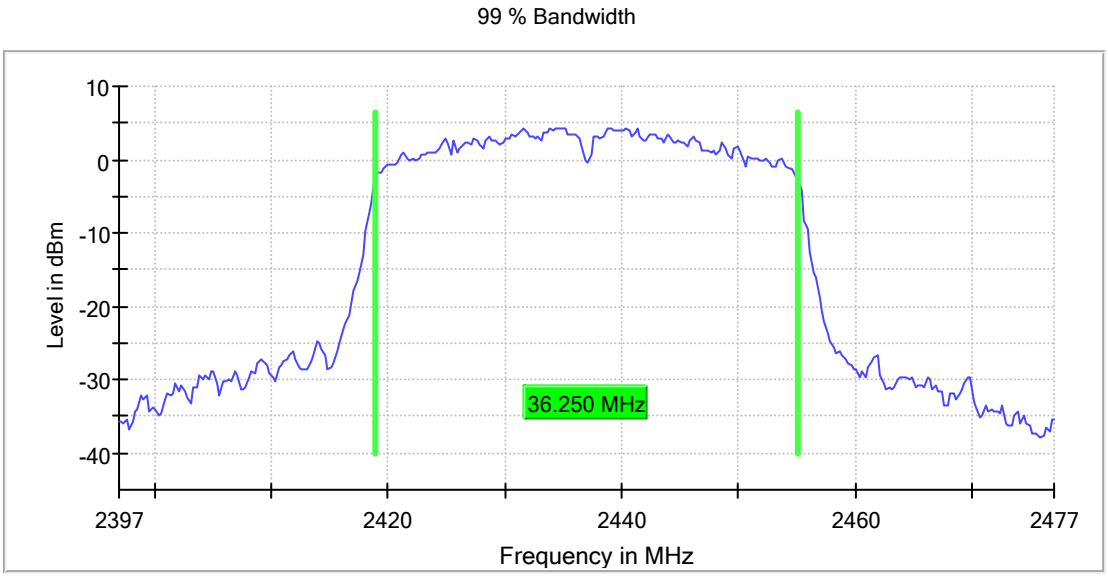


Ant0, Wi-Fi 802.11 n(HT40) mode, MCS0

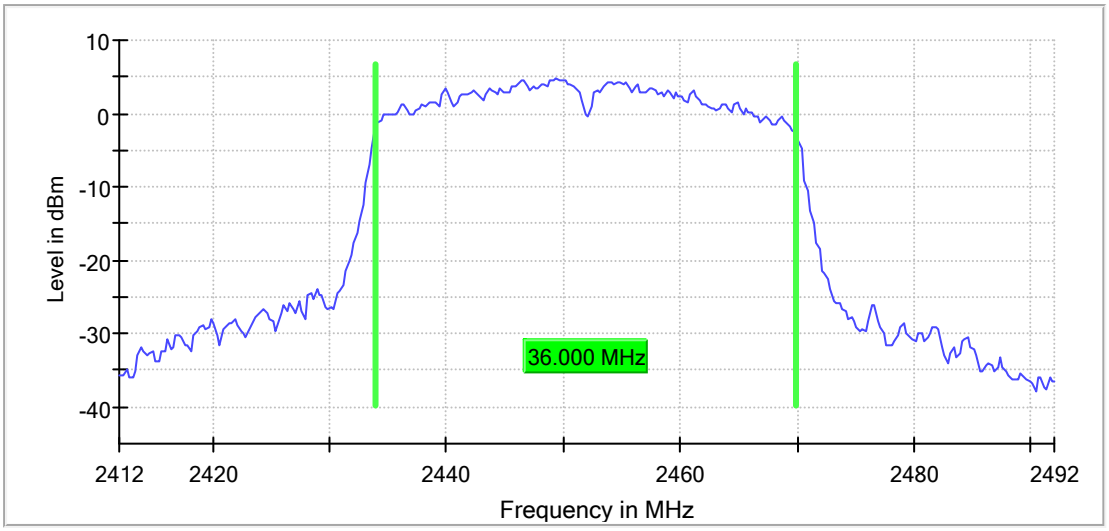
Low Channel
RBW=500KHz, VBW=2MHz



Middle Channel
RBW=500KHz, VBW=2MHz

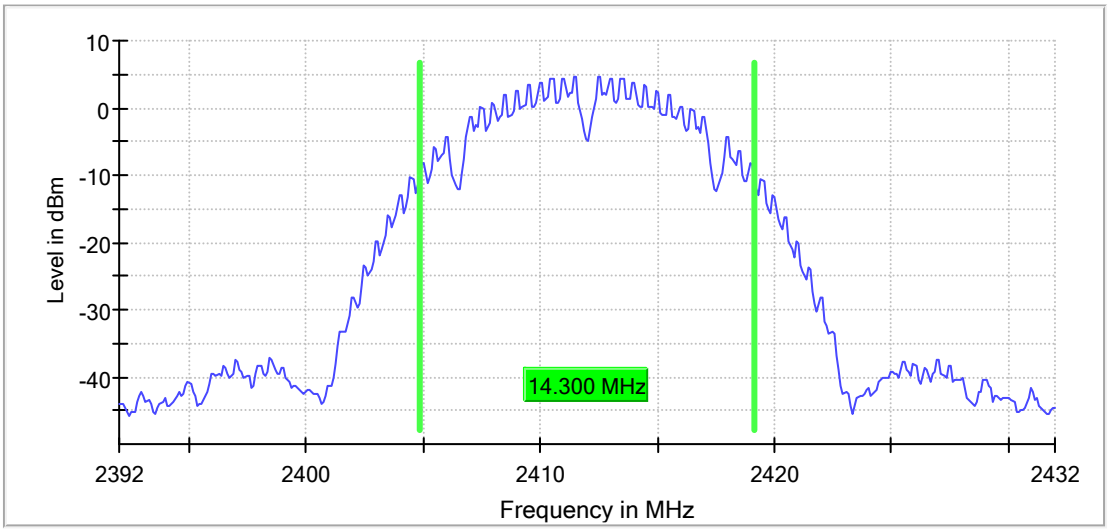


High Channel
RBW=500KHz, VBW=2MHz

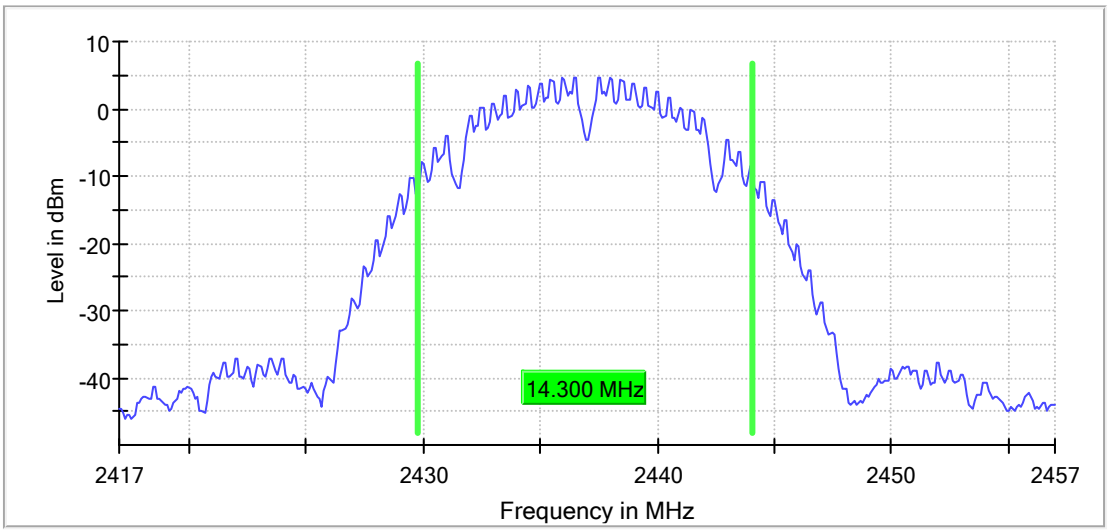


Ant1, Wi-Fi 802.11 b mode, 1 Mbps

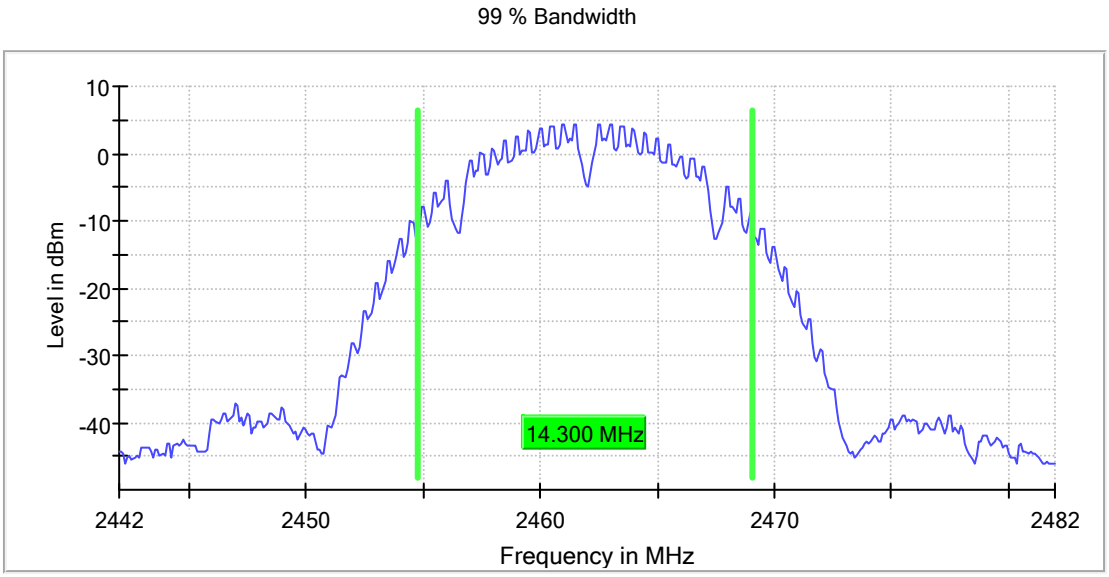
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

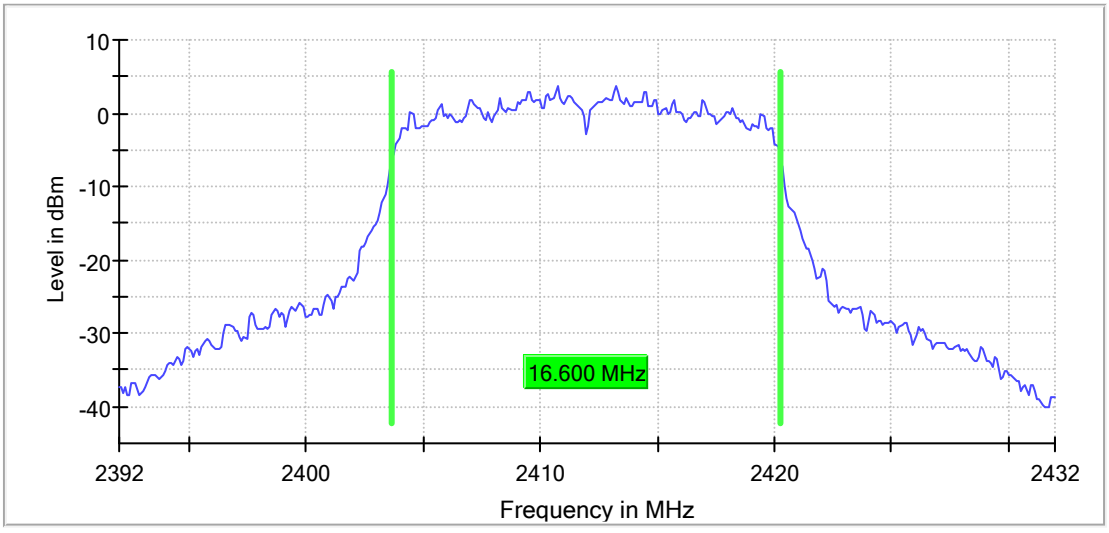


High Channel
RBW=200KHz, VBW=1MHz

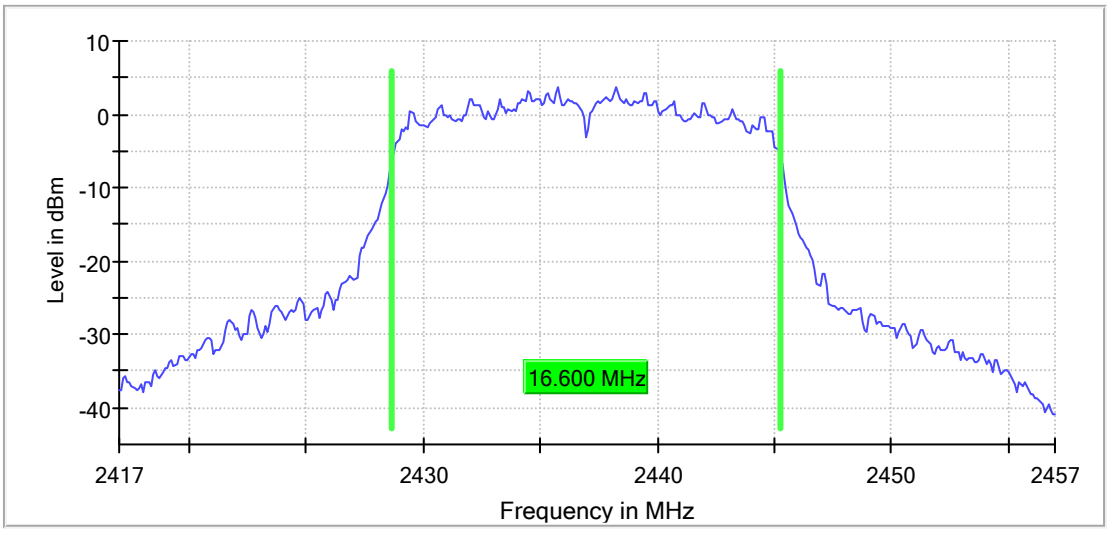


Ant1, Wi-Fi 802.11 g mode, 6 Mbps

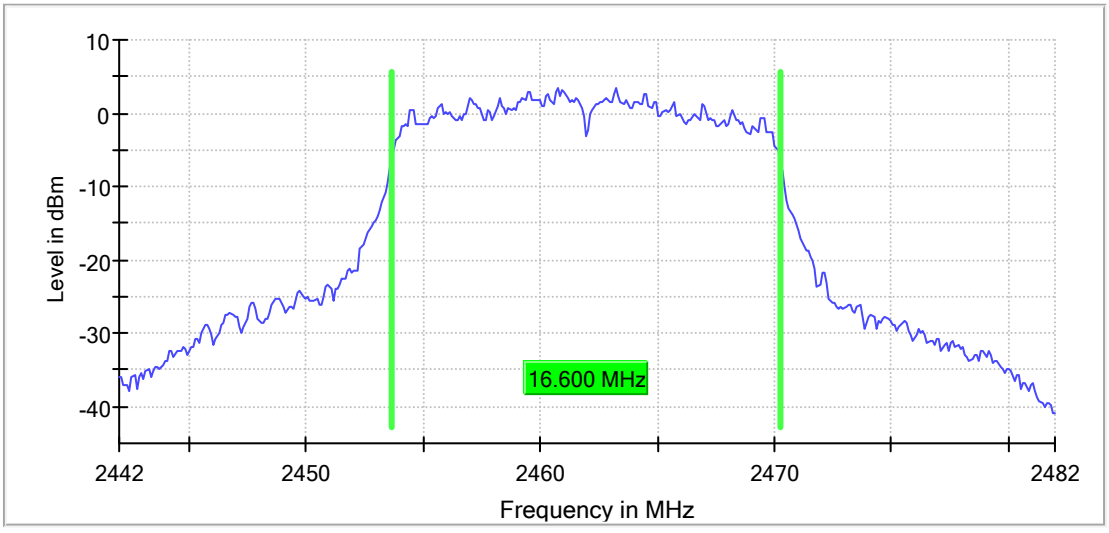
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

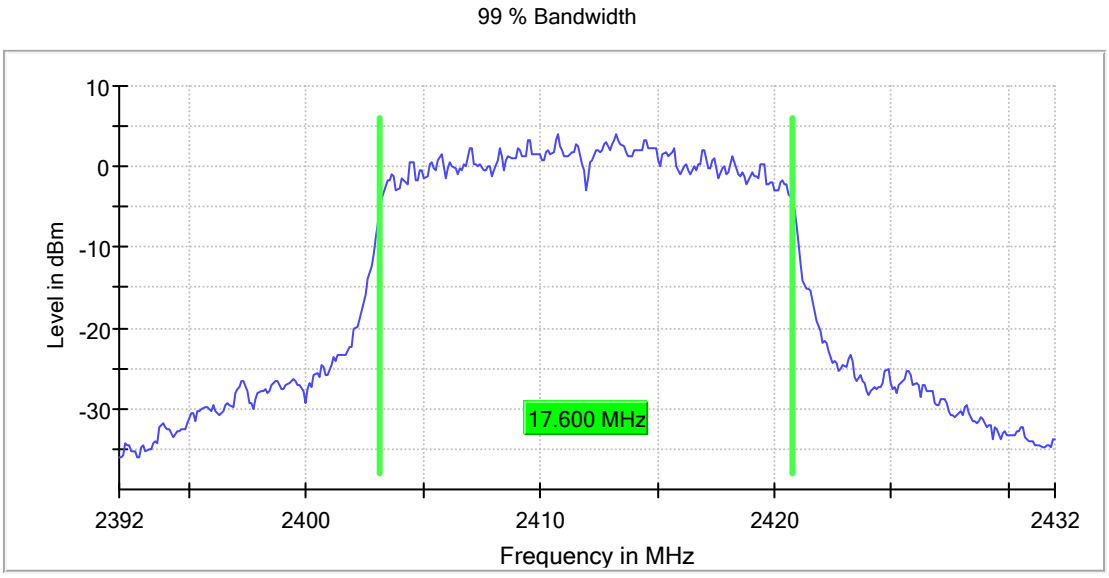


High Channel
RBW=200KHz, VBW=1MHz

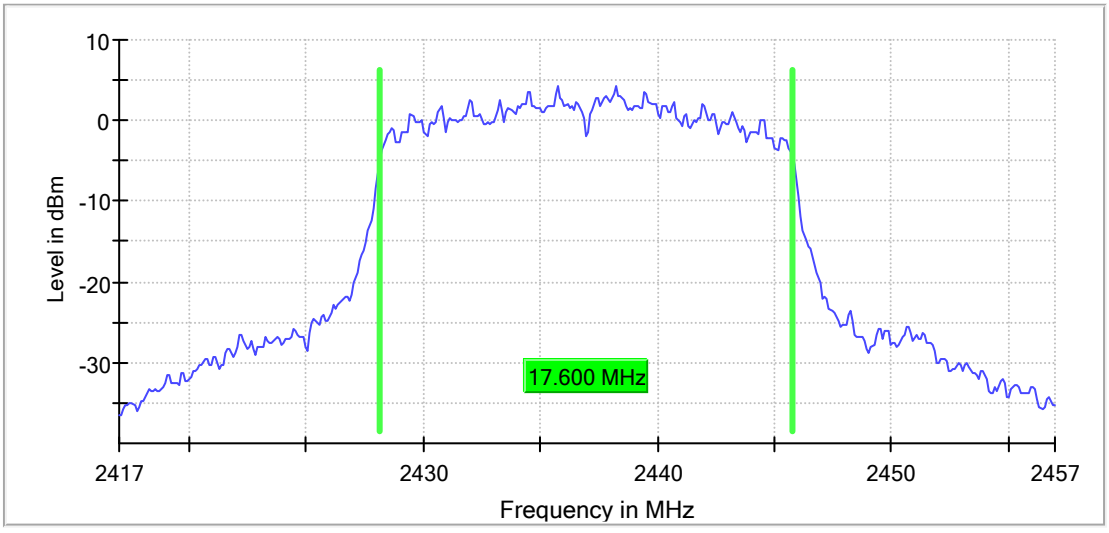


Ant1, Wi-Fi 802.11 n(HT20) mode, MCS0

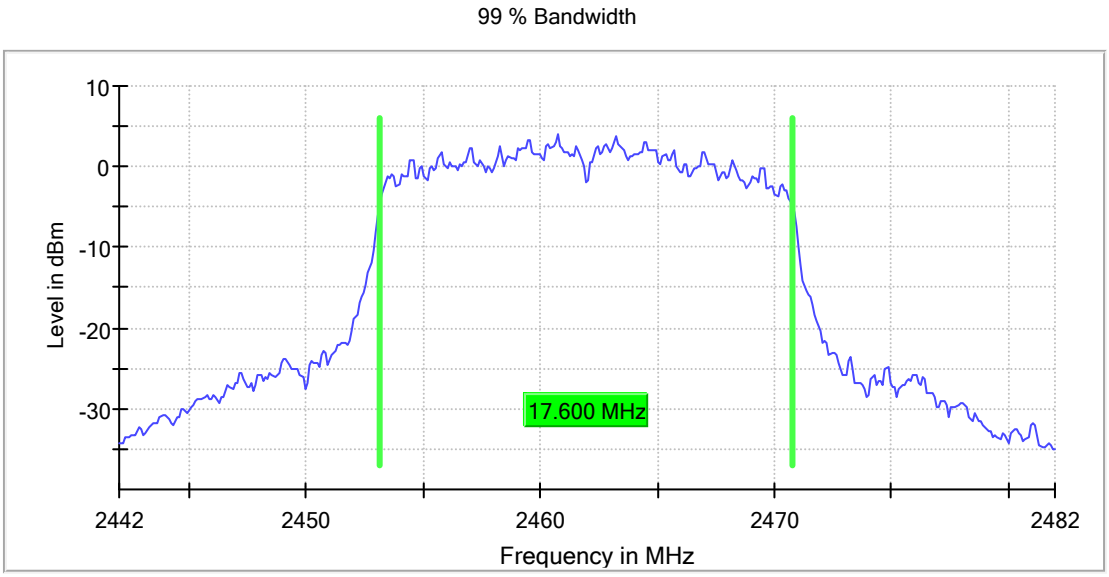
Low Channel
RBW=200KHz, VBW=1MHz



Middle Channel
RBW=200KHz, VBW=1MHz

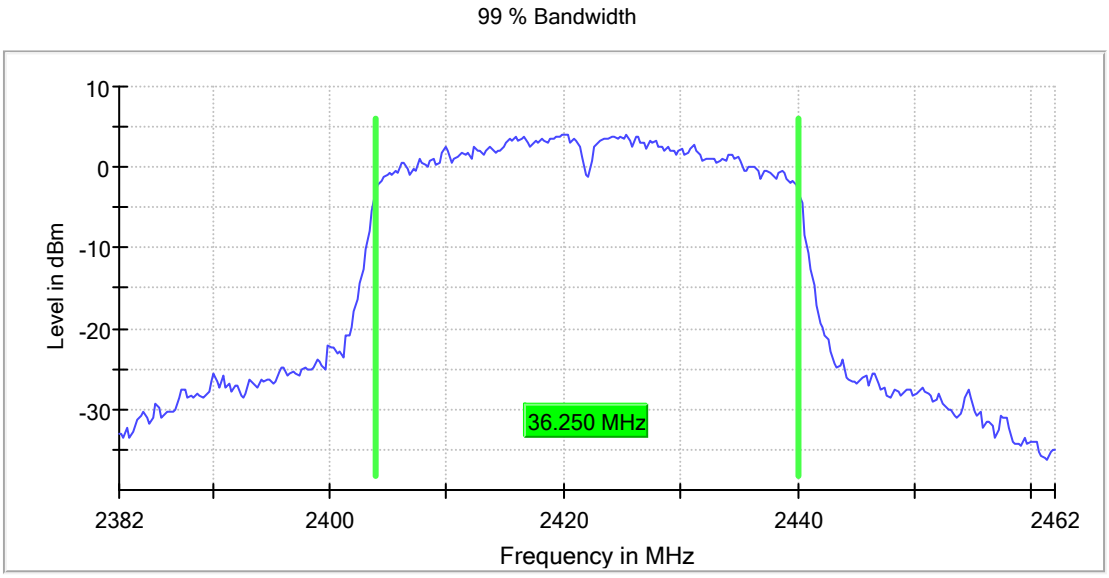


High Channel
RBW=200KHz, VBW=1MHz

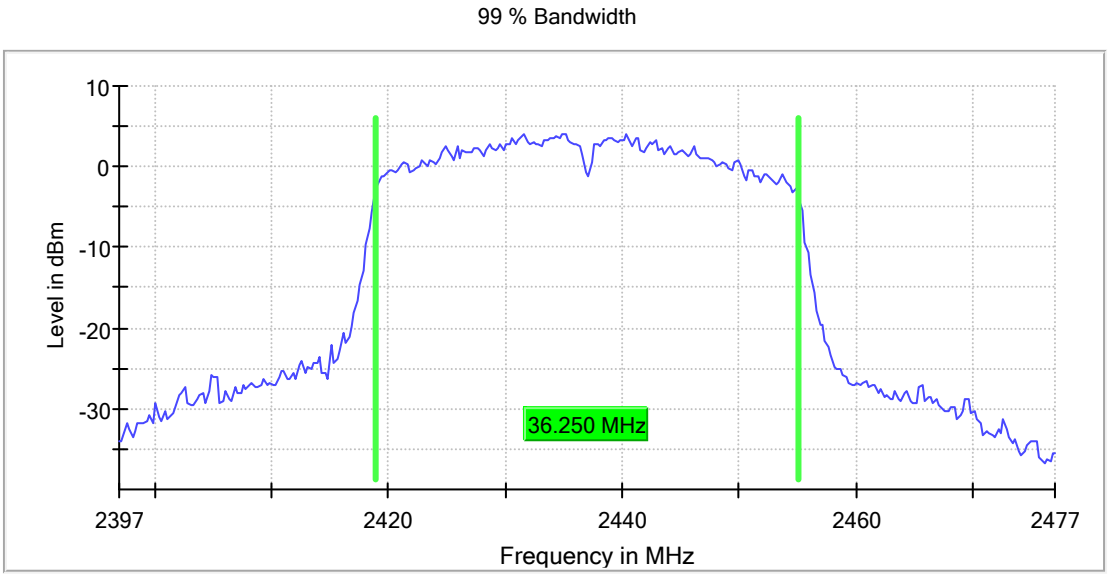


Ant1, Wi-Fi 802.11 n(HT40) mode, MCS0

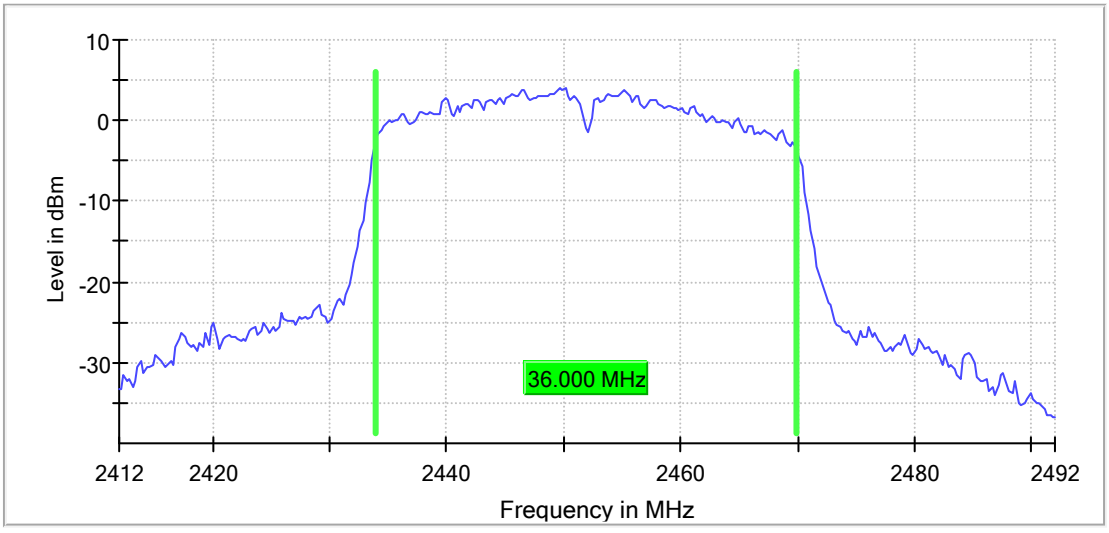
Low Channel
RBW=500KHz, VBW=2MHz



Middle Channel
RBW=500KHz, VBW=2MHz



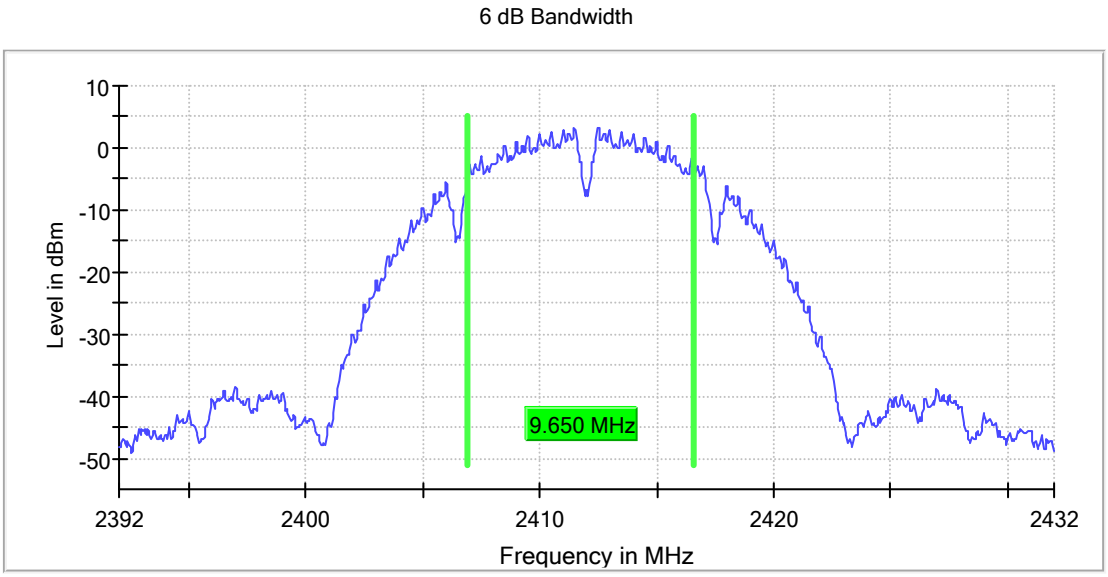
High Channel
RBW=500KHz, VBW=2MHz



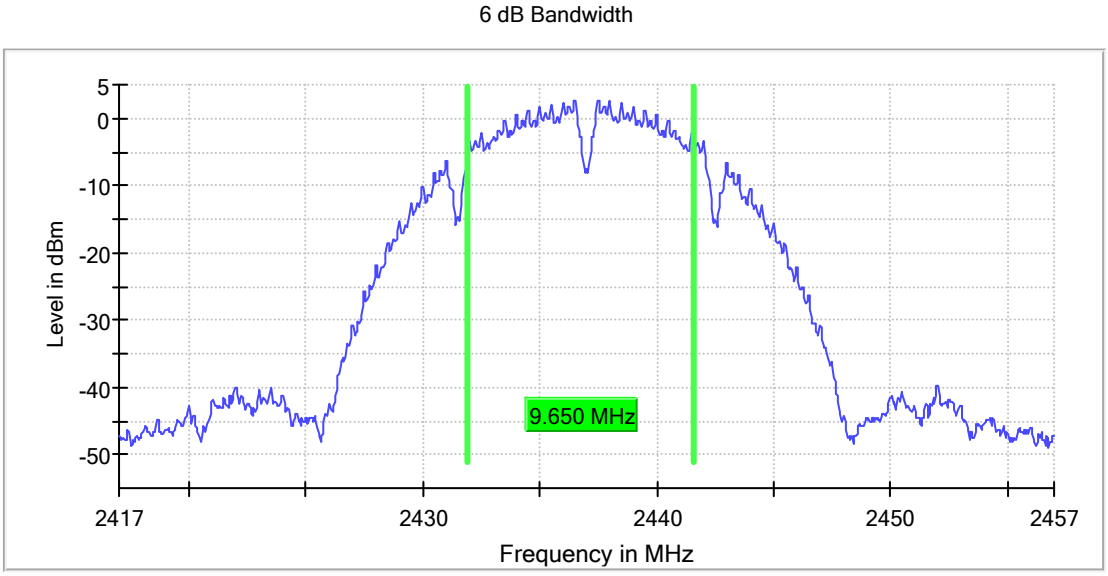
Appendix B.3: 6dB Bandwidth

Ant0, Wi-Fi 802.11 b mode, 1 Mbps

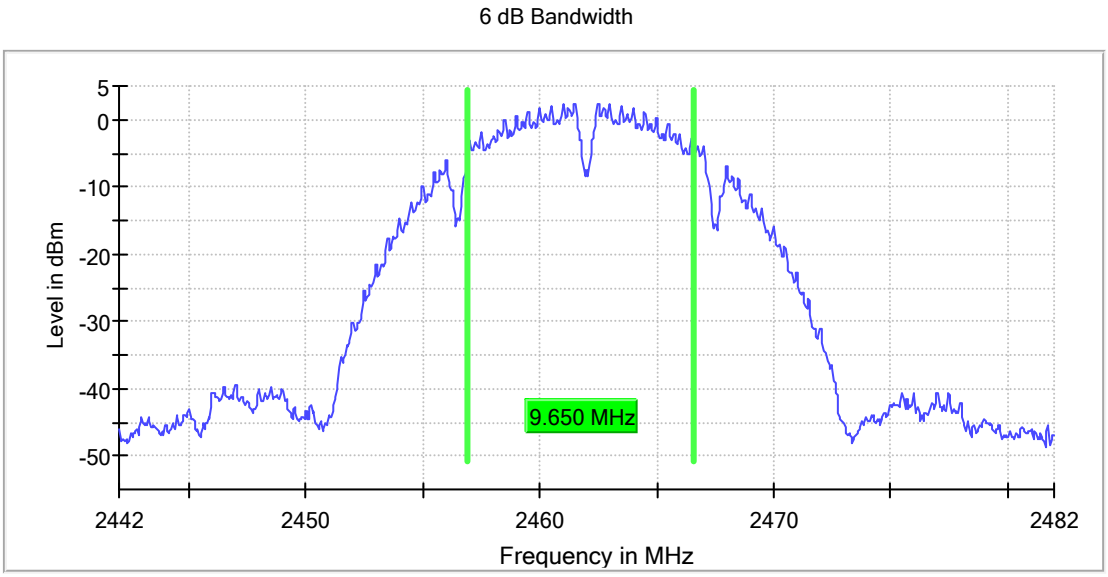
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

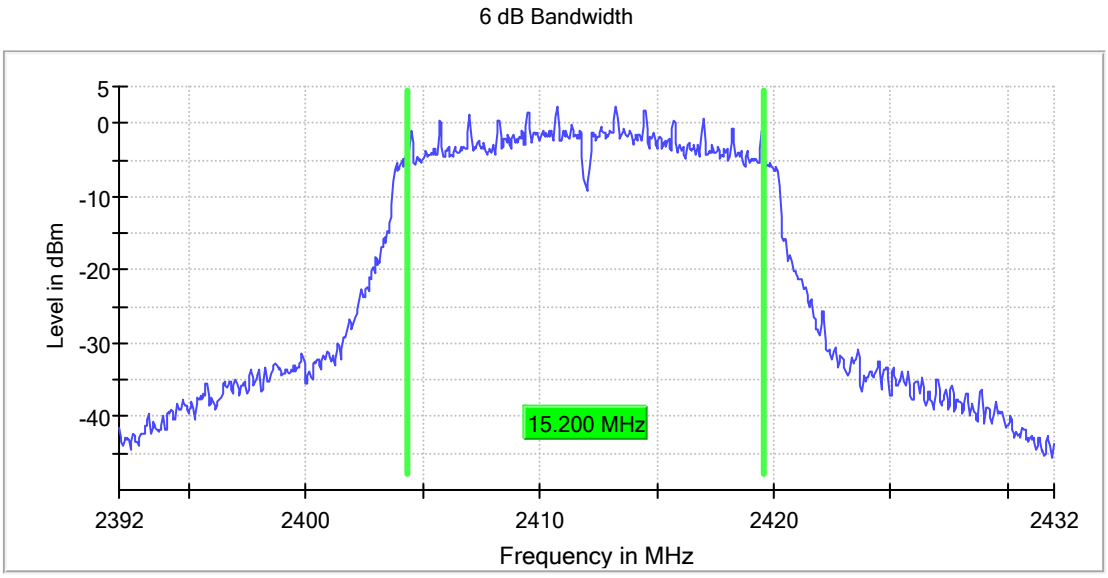


High Channel
RBW=100KHz, VBW=300KHz

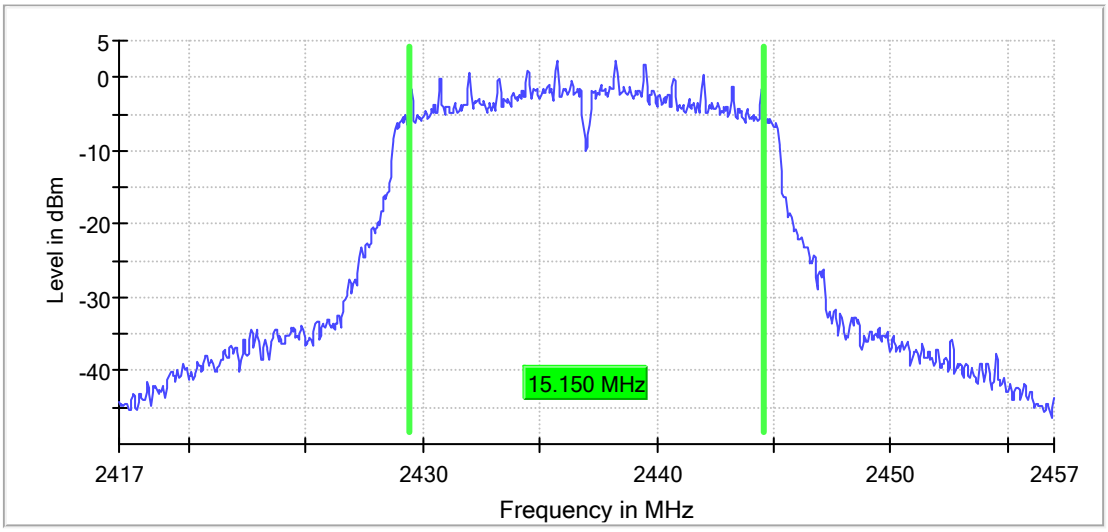


Ant0, Wi-Fi 802.11 g mode, 6 Mbps

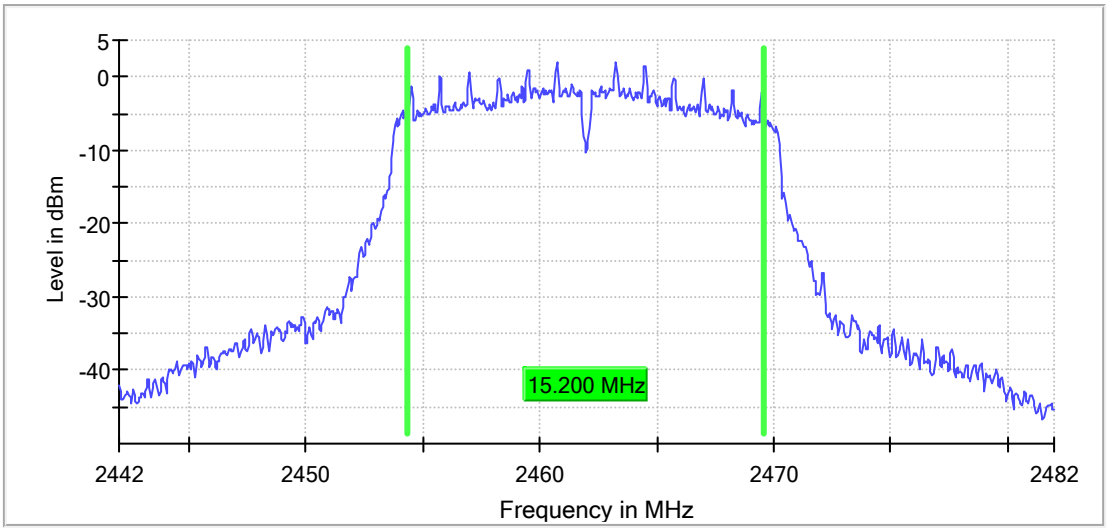
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

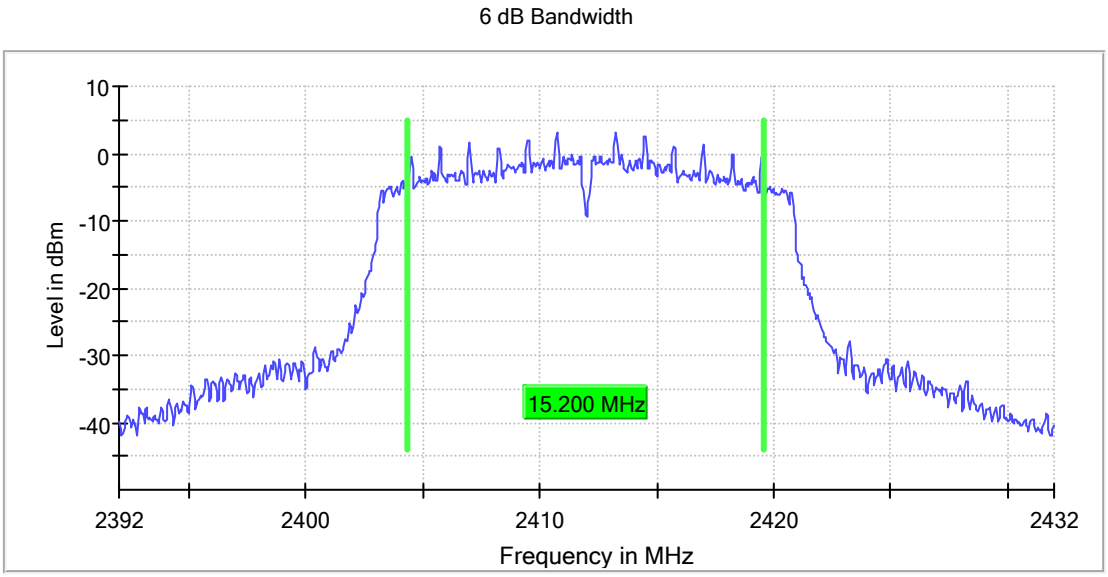


High Channel
RBW=100KHz, VBW=300KHz

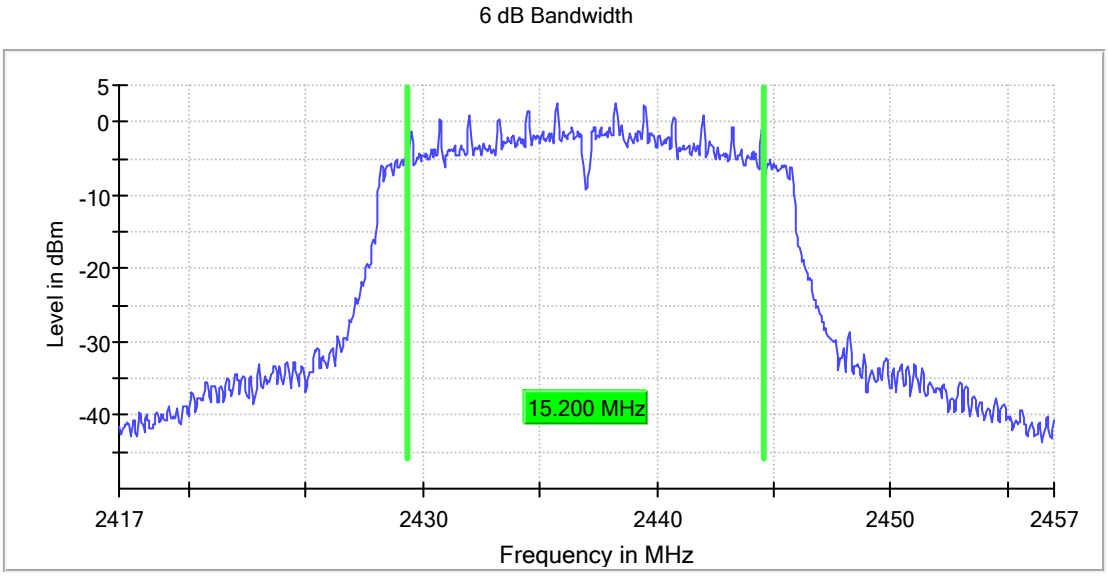


Ant0, Wi-Fi 802.11 n(HT20) mode, MCS0

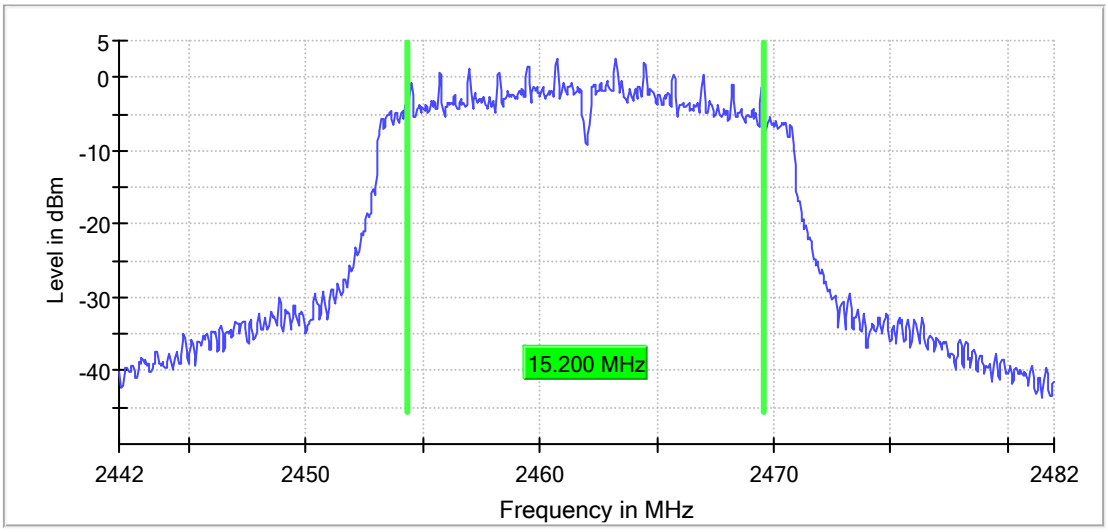
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

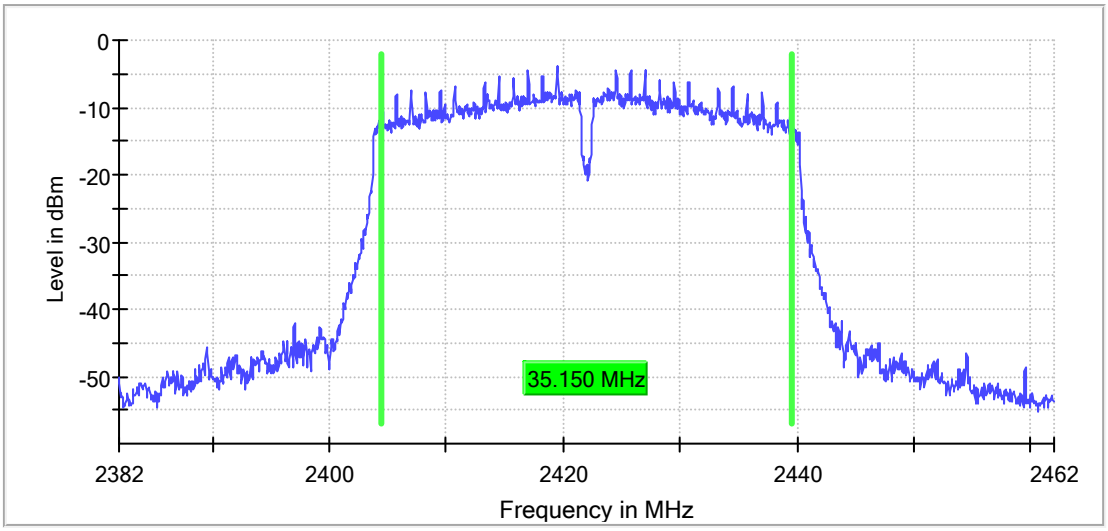


High Channel
RBW=100KHz, VBW=300KHz

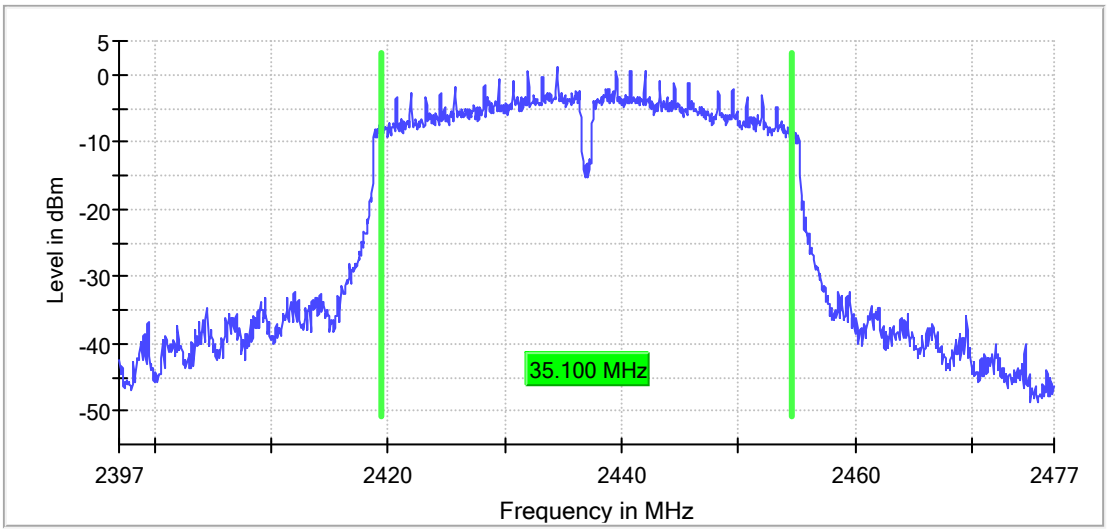


Ant0, Wi-Fi 802.11 n(HT40) mode, MCS0

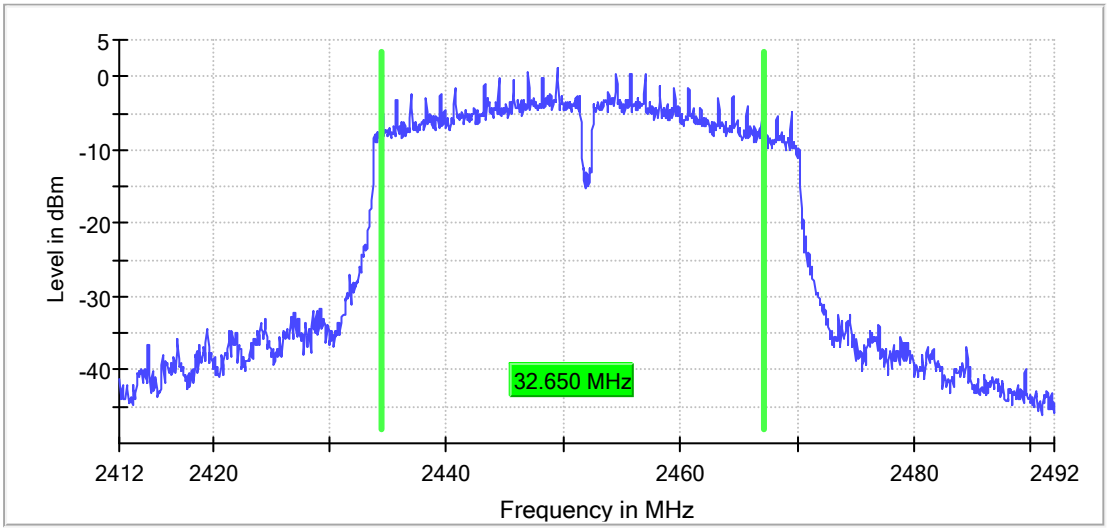
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

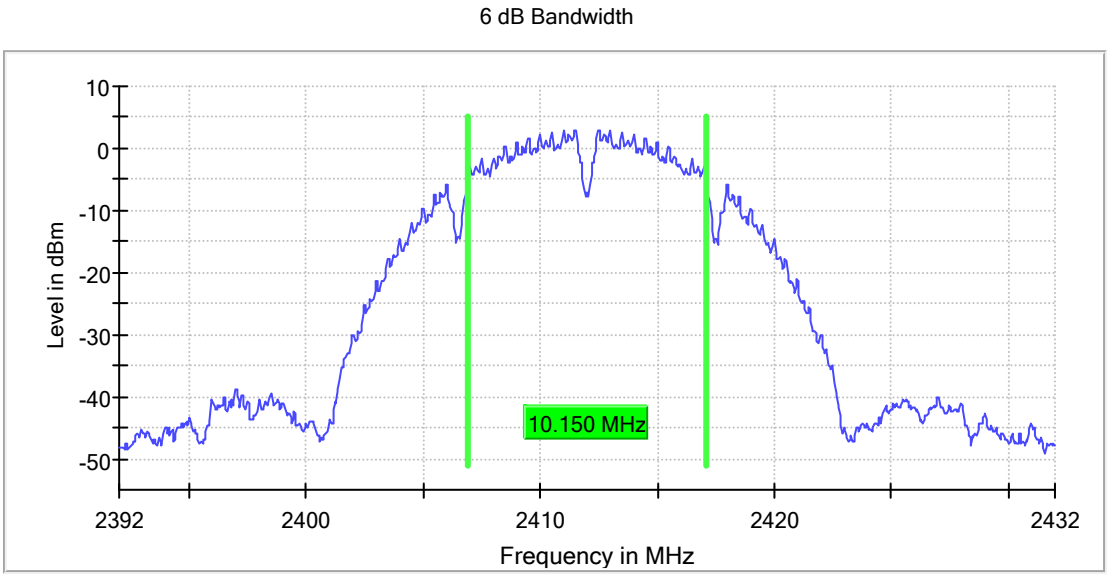


High Channel
RBW=100KHz, VBW=300KHz

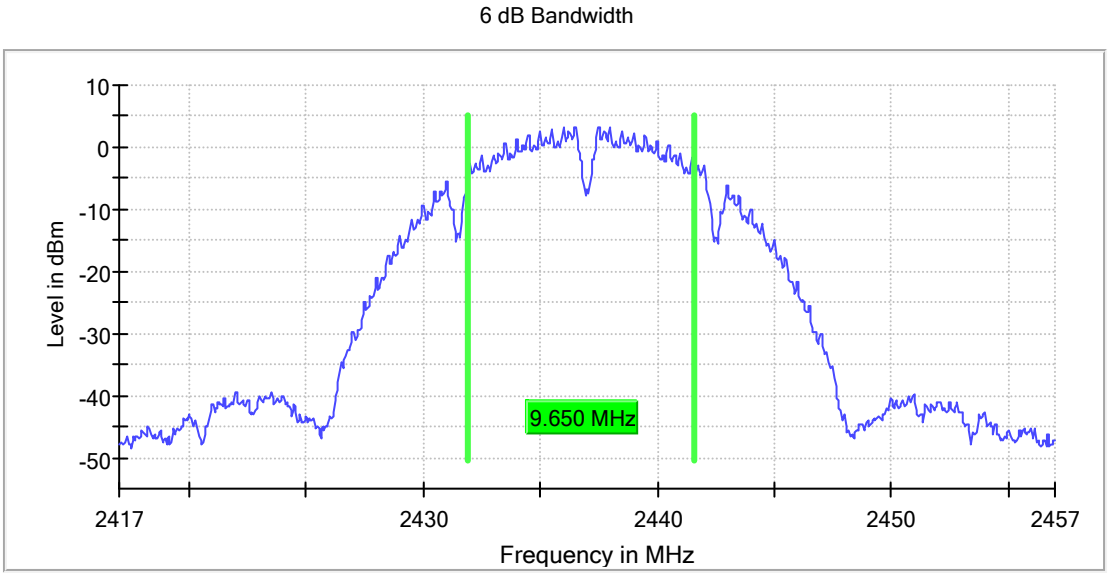


Ant1, Wi-Fi 802.11 b mode, 1 Mbps

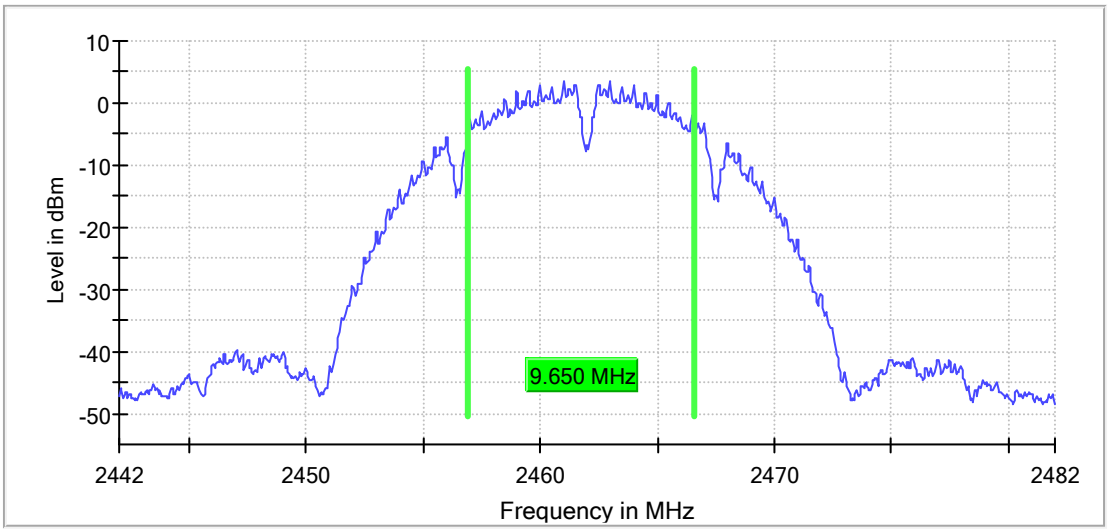
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

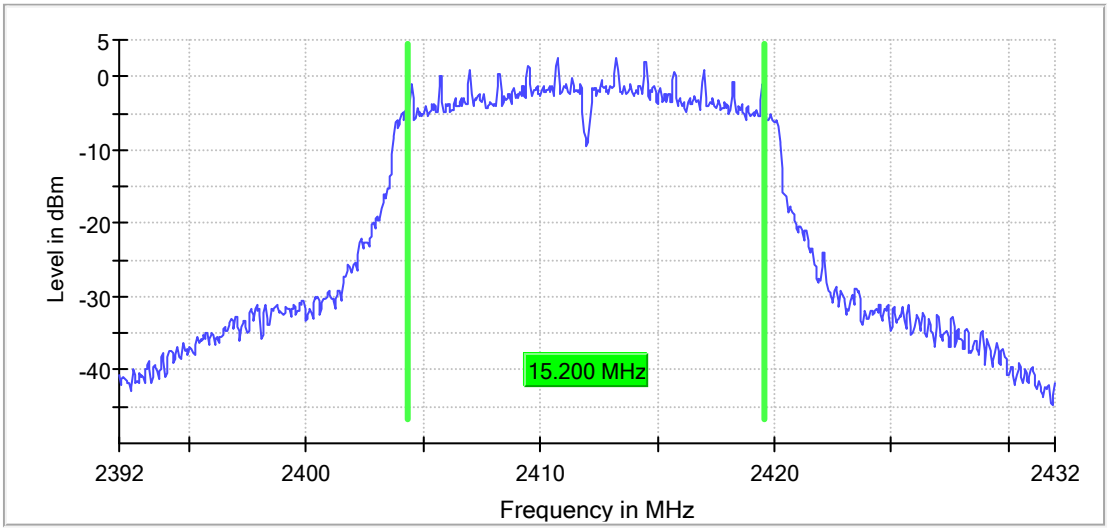


High Channel
RBW=100KHz, VBW=300KHz

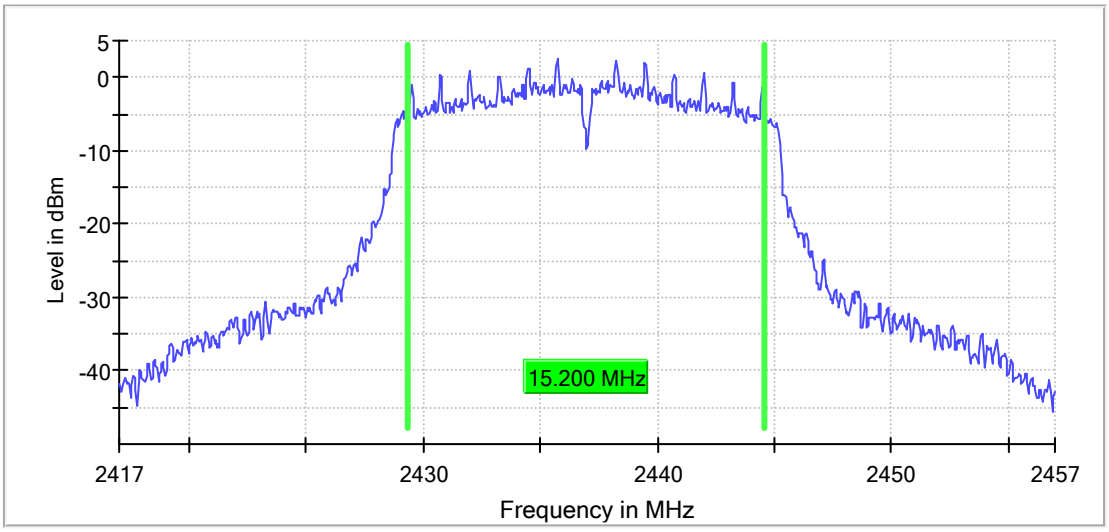


Ant1, Wi-Fi 802.11 g mode, 6 Mbps

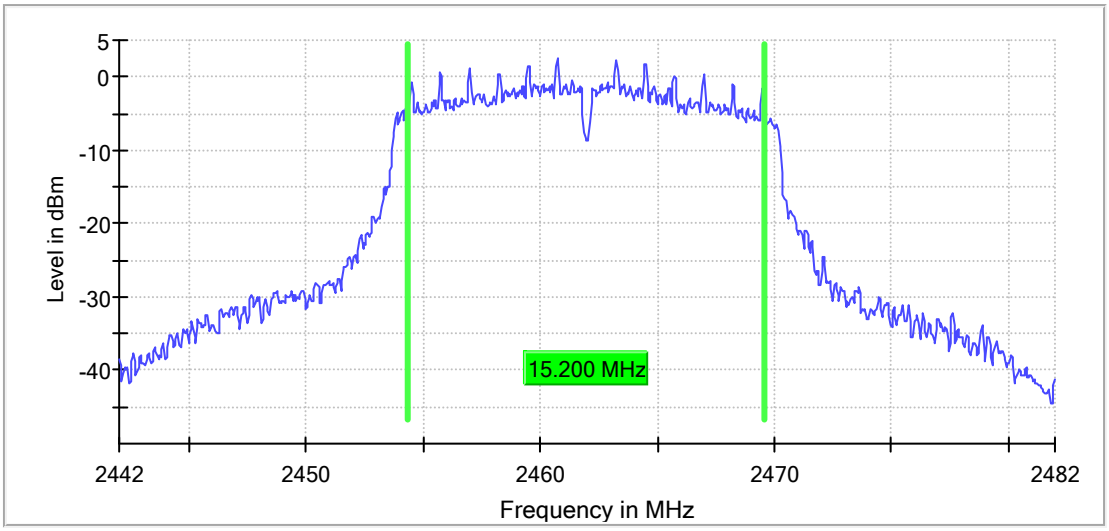
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

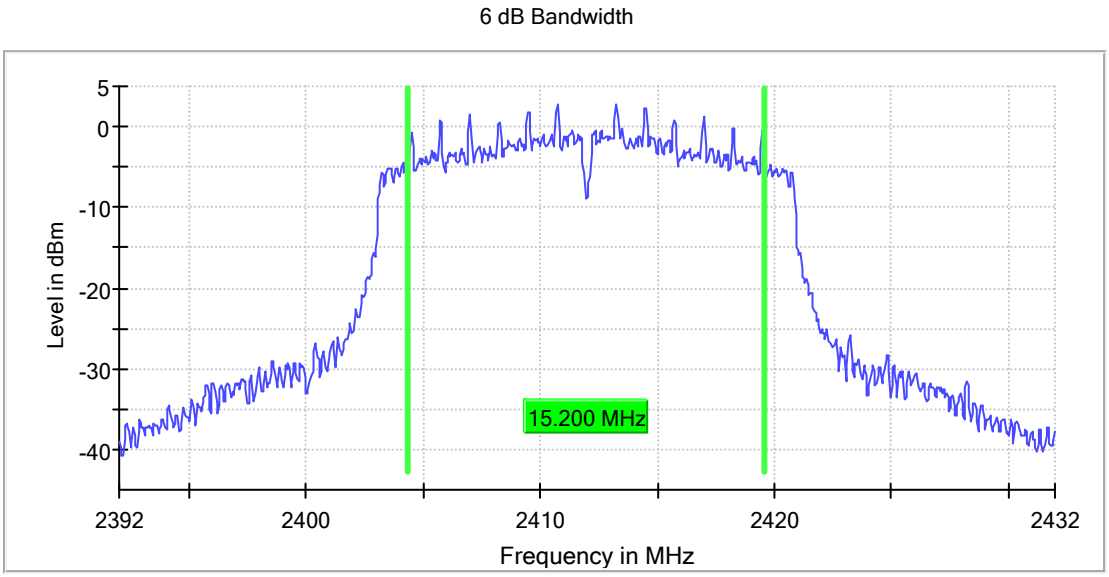


High Channel
RBW=100KHz, VBW=300KHz

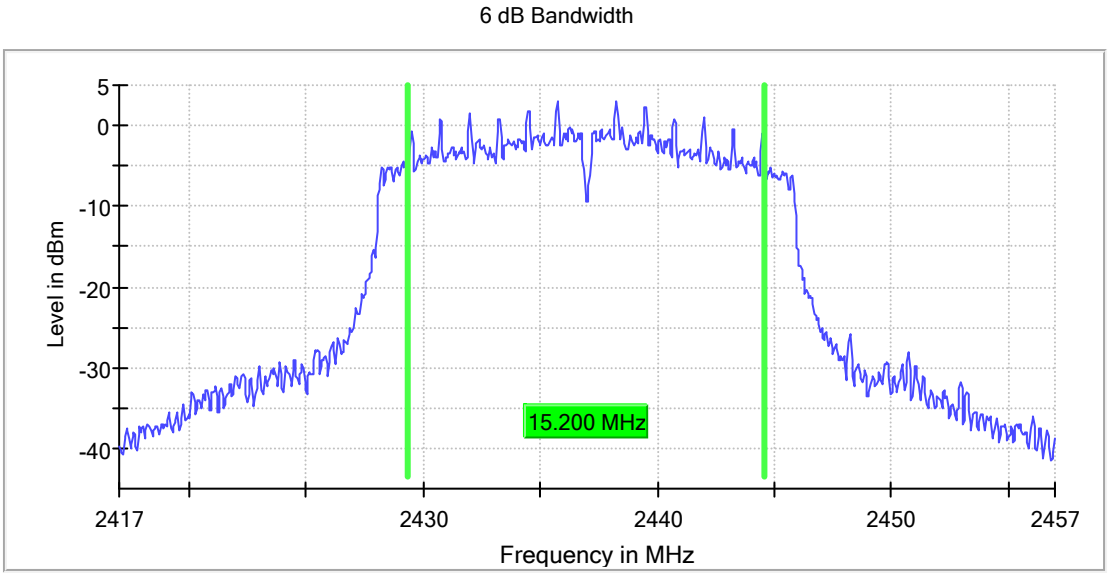


Ant1, Wi-Fi 802.11 n(HT20) mode, MCS0

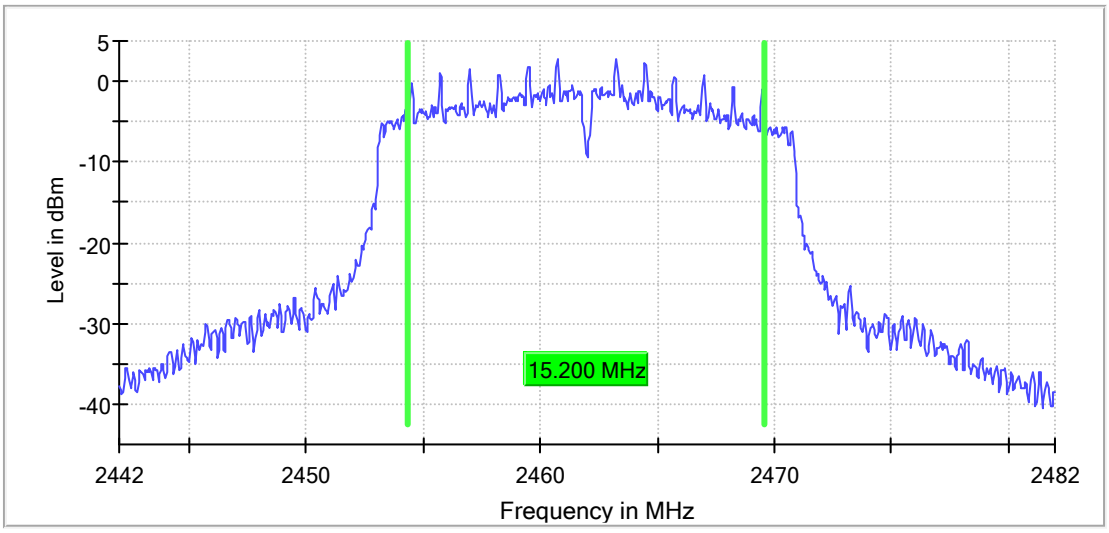
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

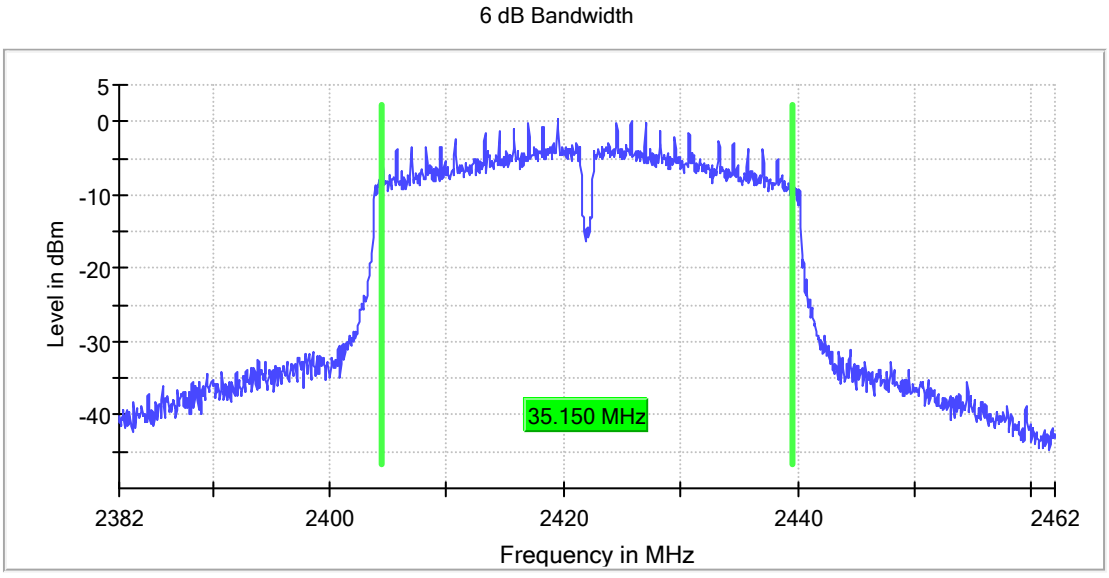


High Channel
RBW=100KHz, VBW=300KHz

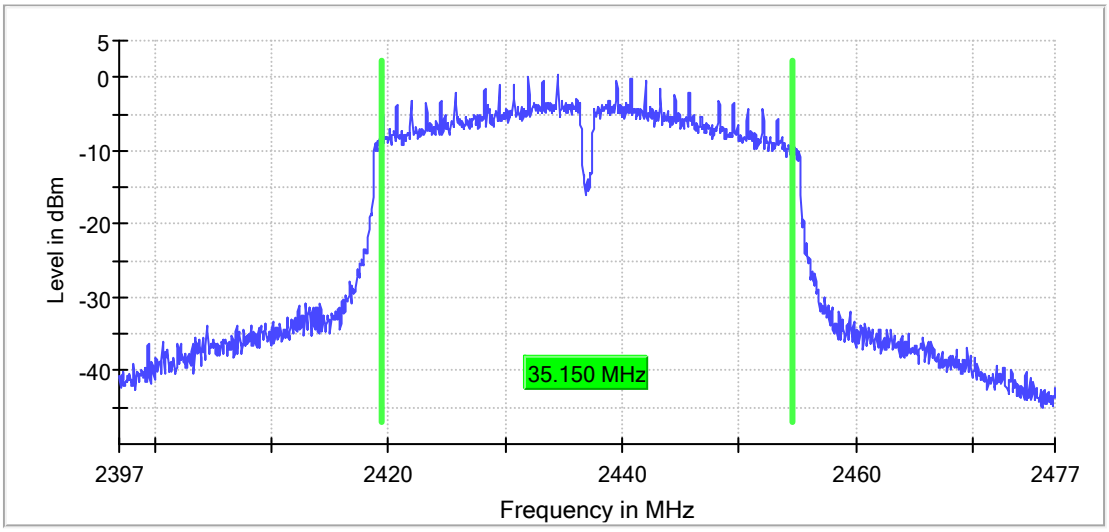


Ant1, Wi-Fi 802.11 n(HT40) mode, MCS0

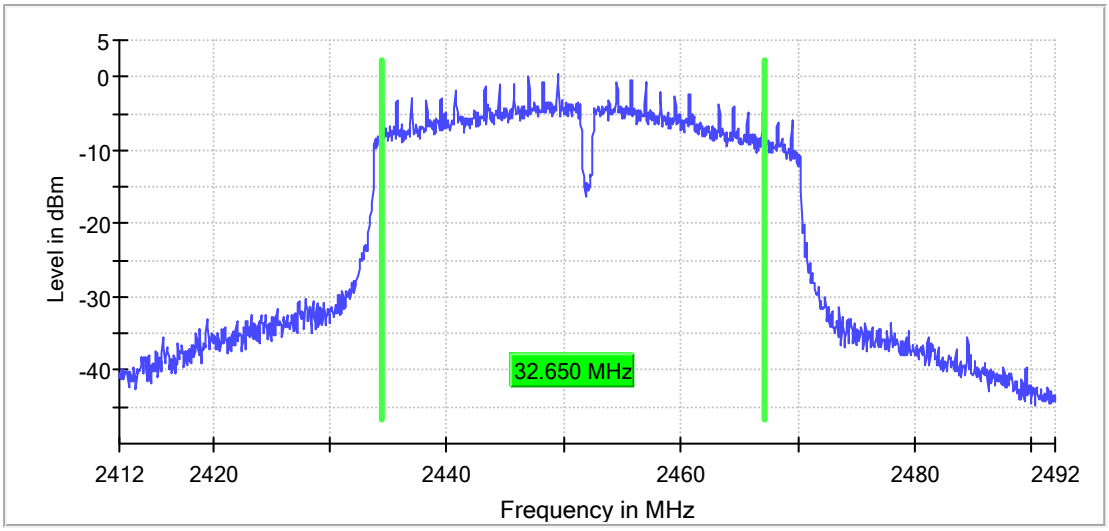
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz

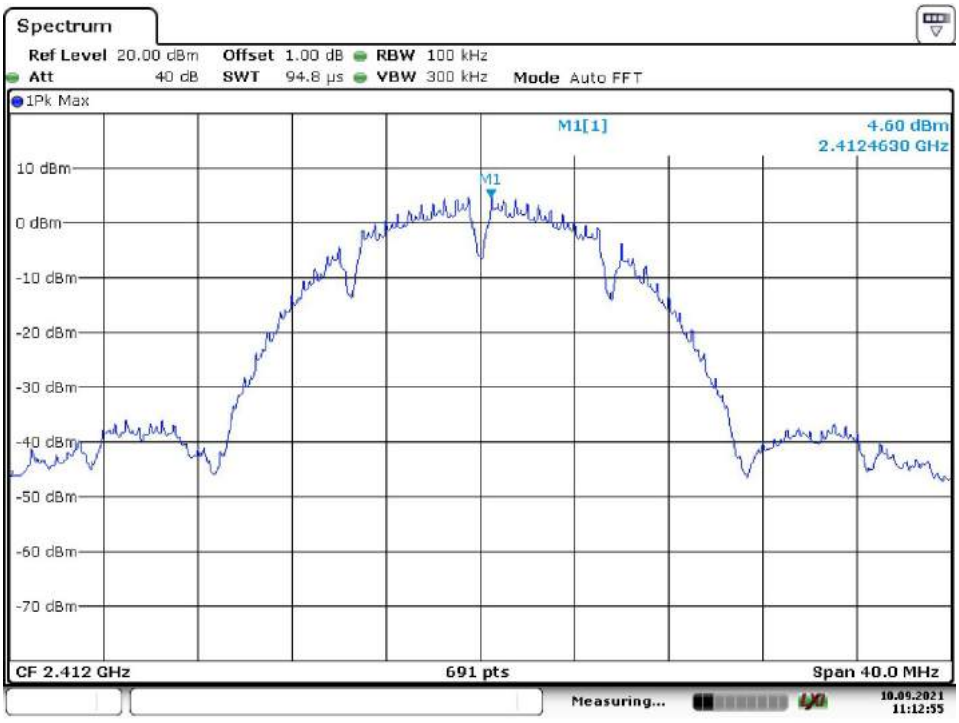


High Channel
RBW=100KHz, VBW=300KHz

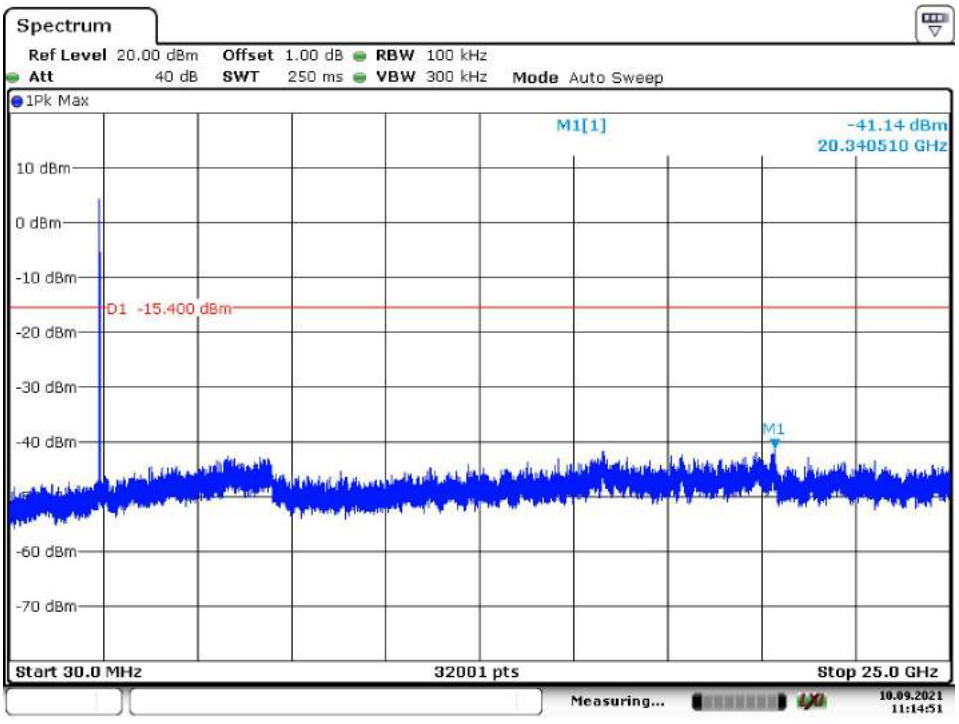


Appendix B.4: Conducted Spurious Emissions Measured in 100 kHz Bandwidth

Ant0, Wi-Fi 802.11 b mode, 1 Mbps
Low Channel

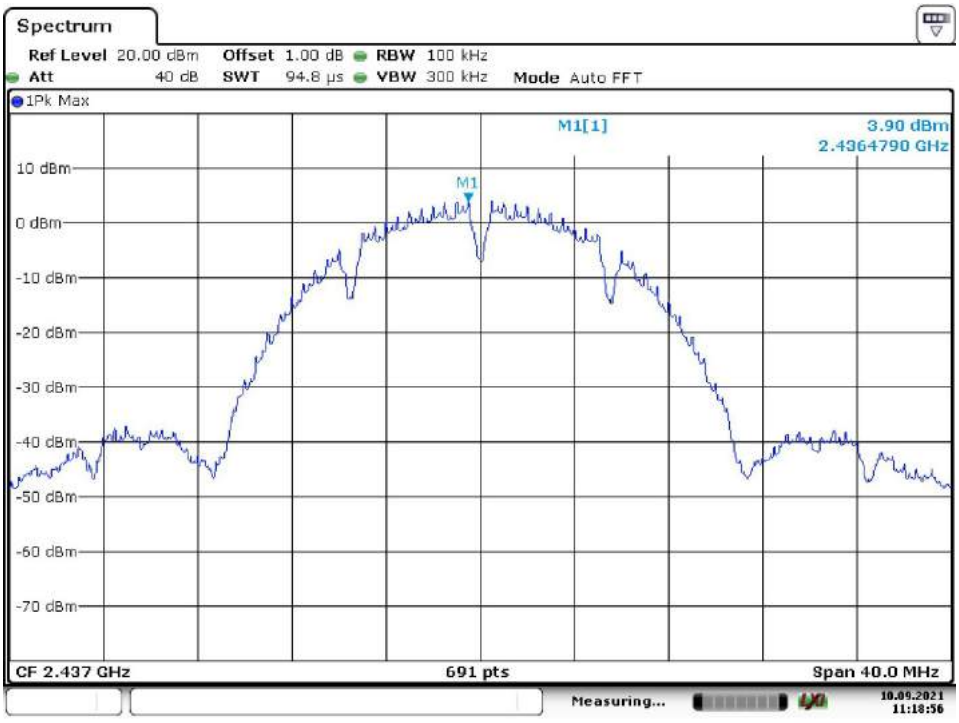


Date: 10.SEP.2021 11:12:55

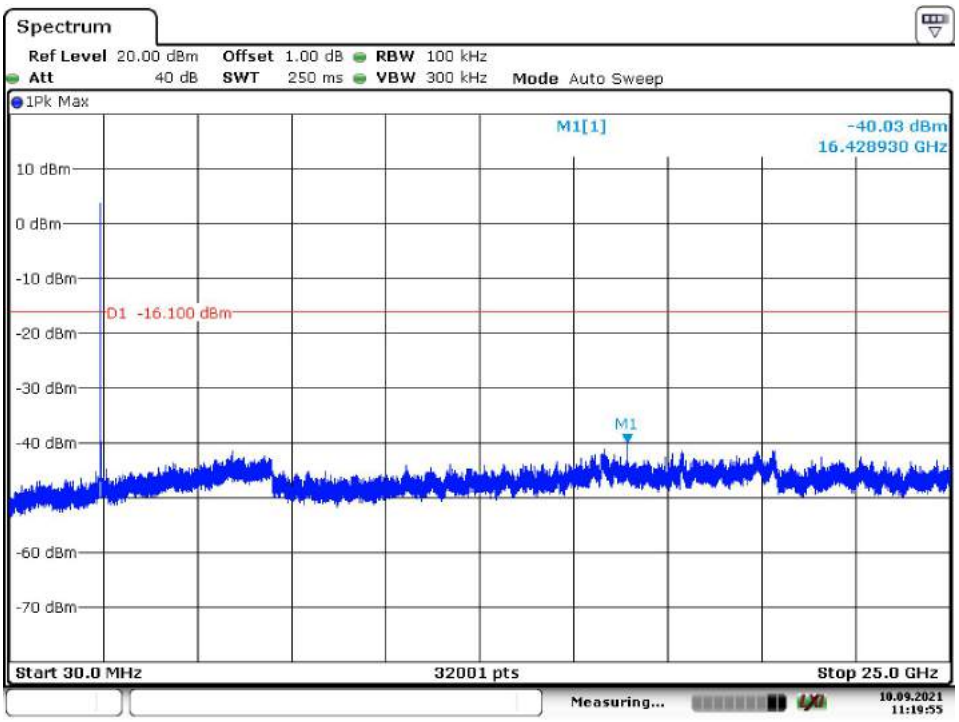


Date: 10.SEP.2021 11:14:51

Middle Channel

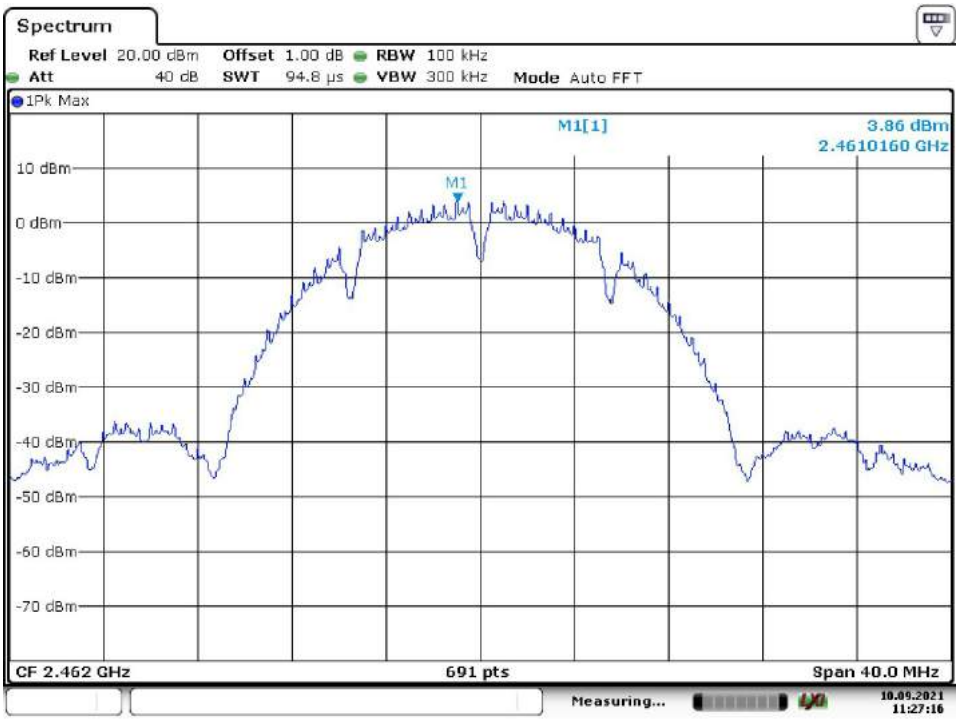


Date: 10.SEP.2021 11:18:56

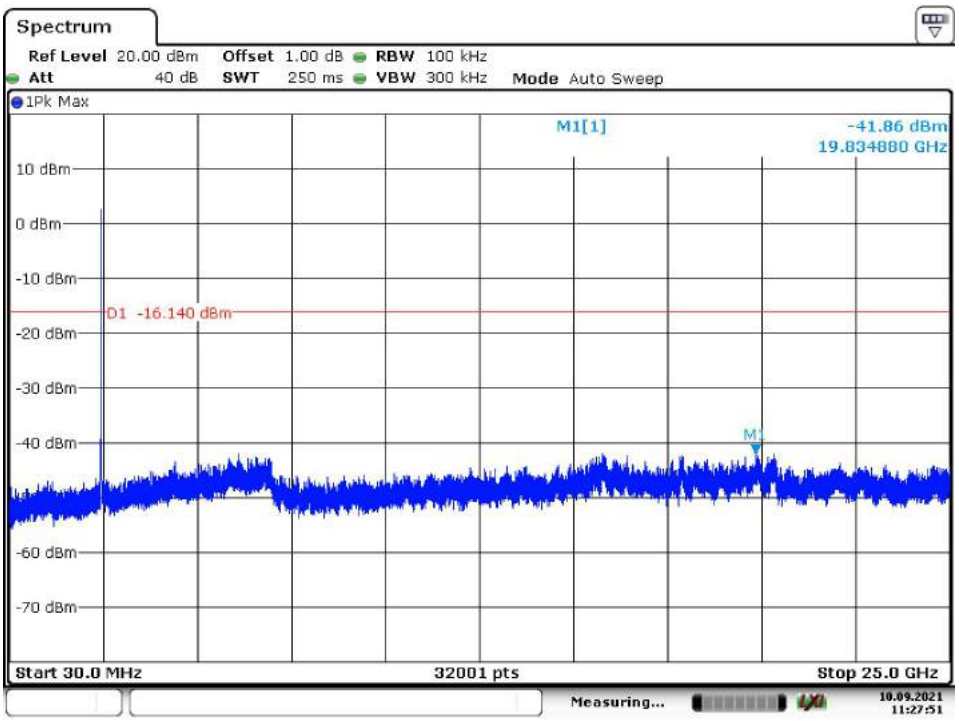


Date: 10.SEP.2021 11:19:55

High Channel

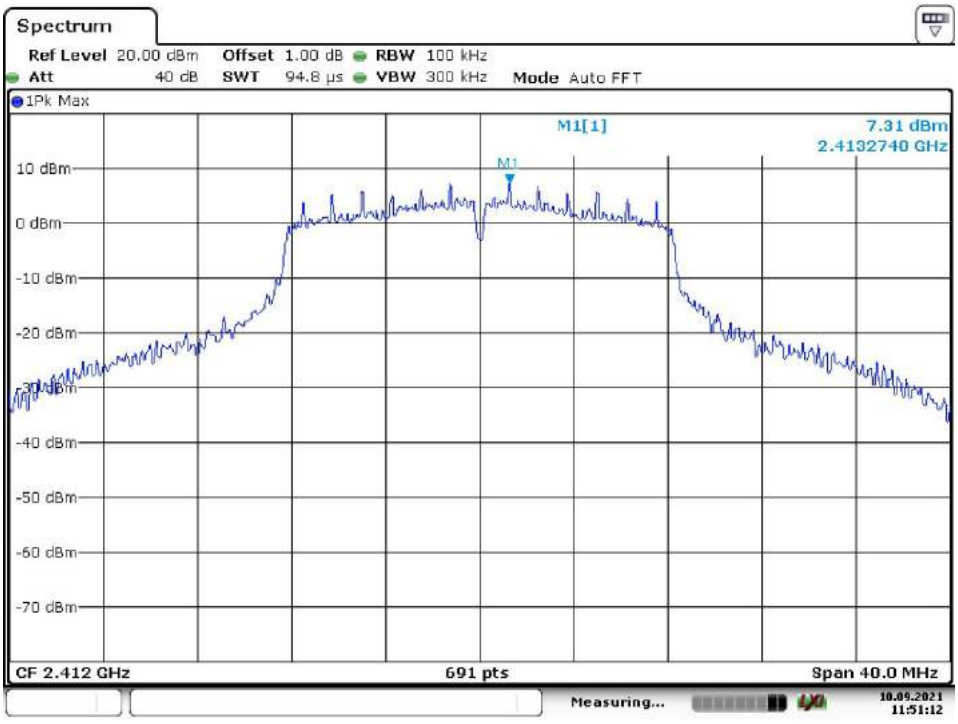


Date: 10.SEP.2021 11:27:16

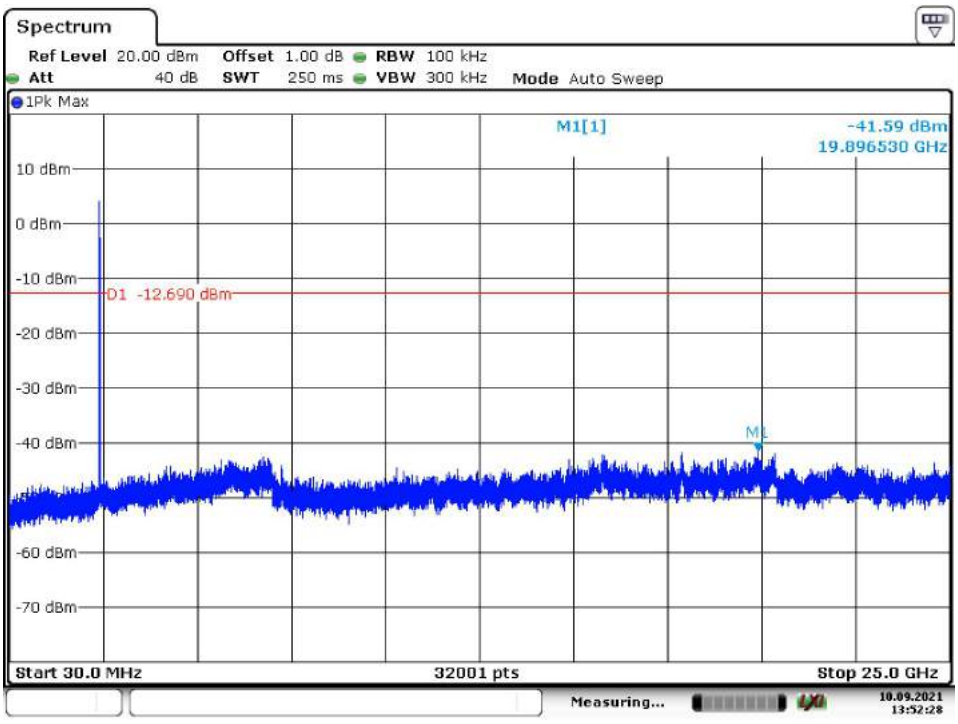


Date: 10.SEP.2021 11:27:51

Ant0, Wi-Fi 802.11 g mode, 6 Mbps
Low Channel

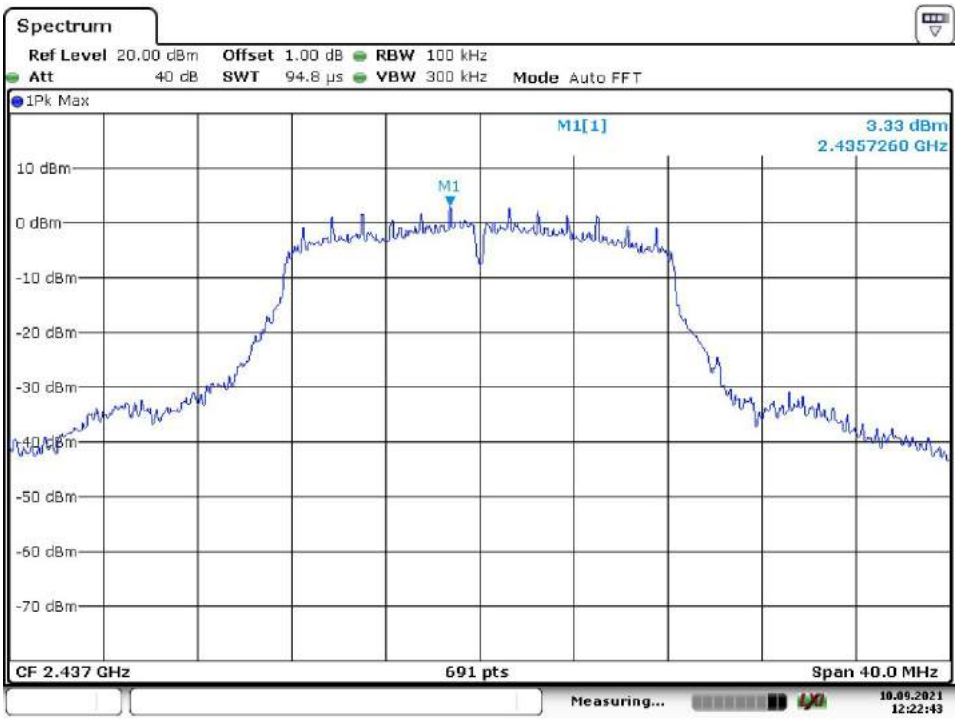


Date: 10.SEP.2021 11:51:12

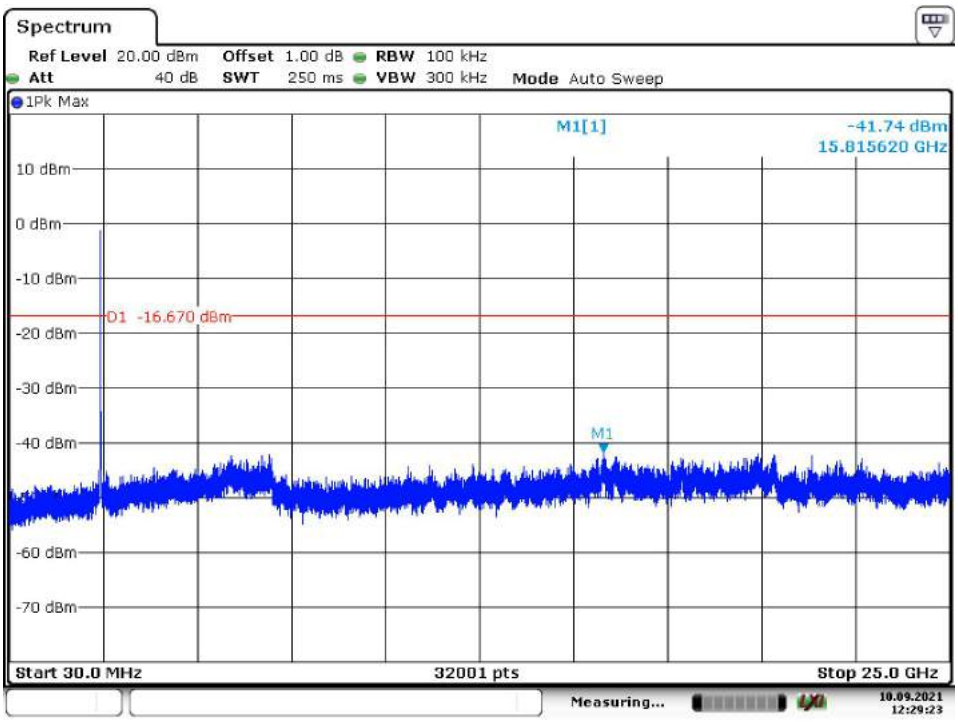


Date: 10.SEP.2021 13:52:28

Middle Channel

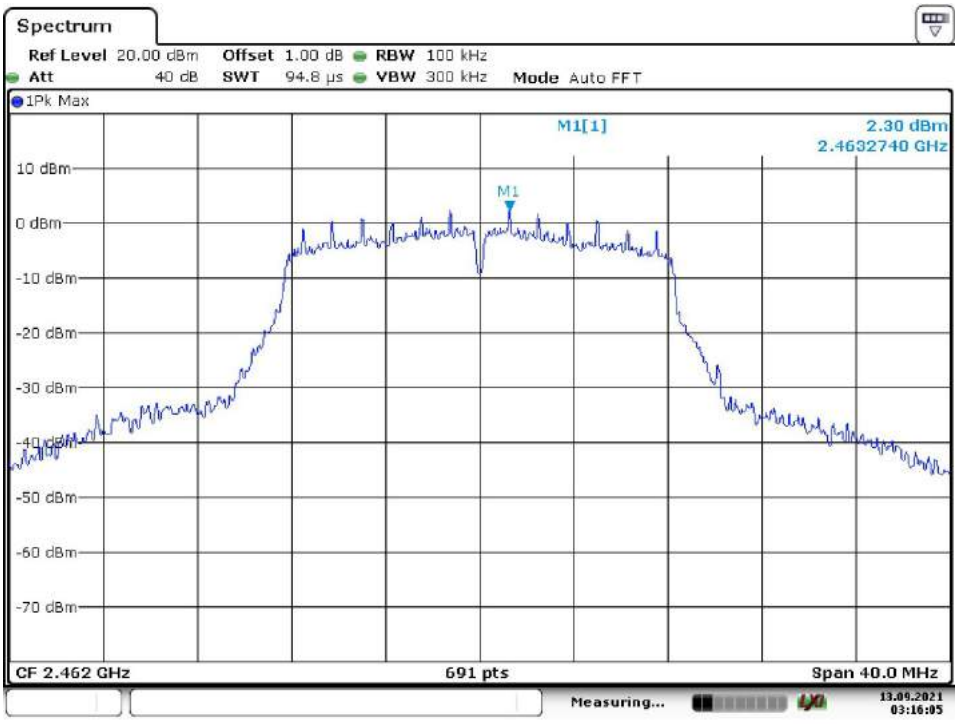


Date: 10.SEP.2021 12:22:44

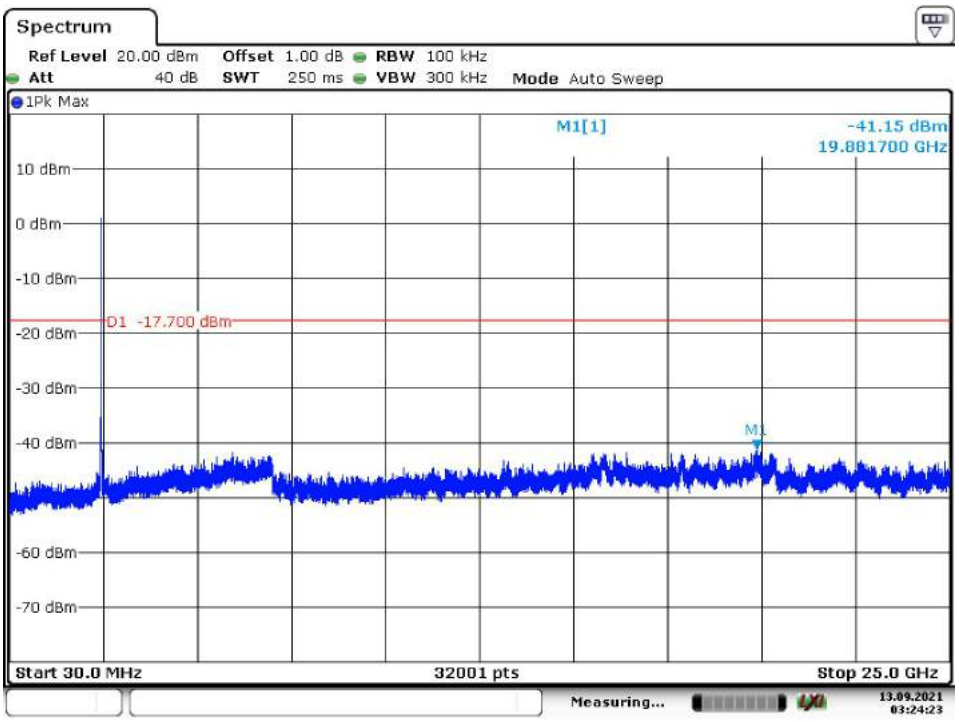


Date: 10.SEP.2021 12:29:23

High Channel

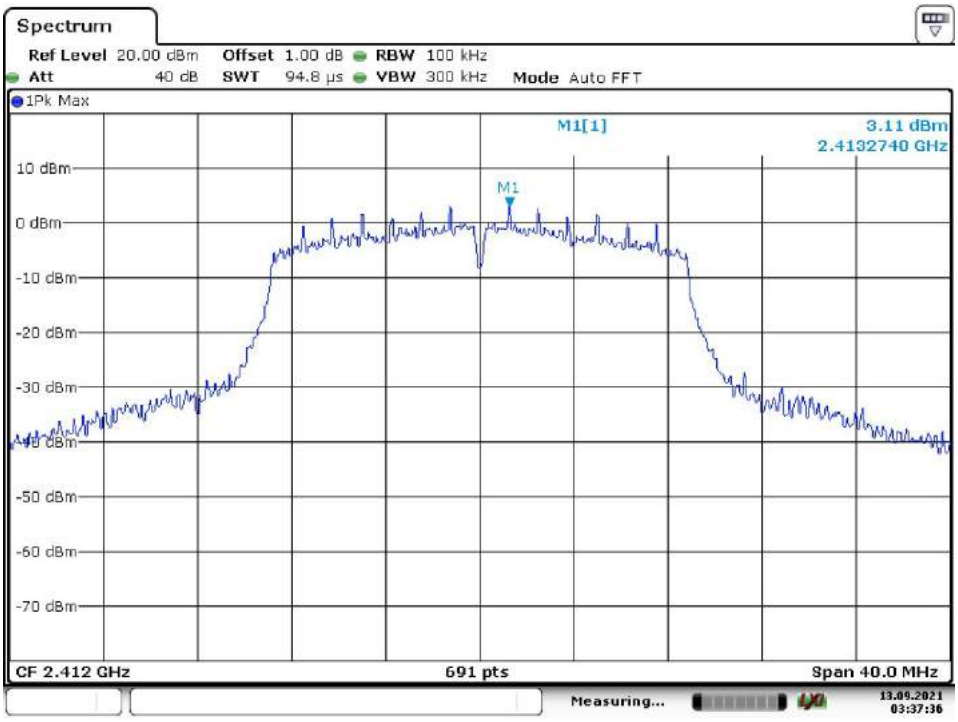


Date: 13.SEP.2021 03:16:06

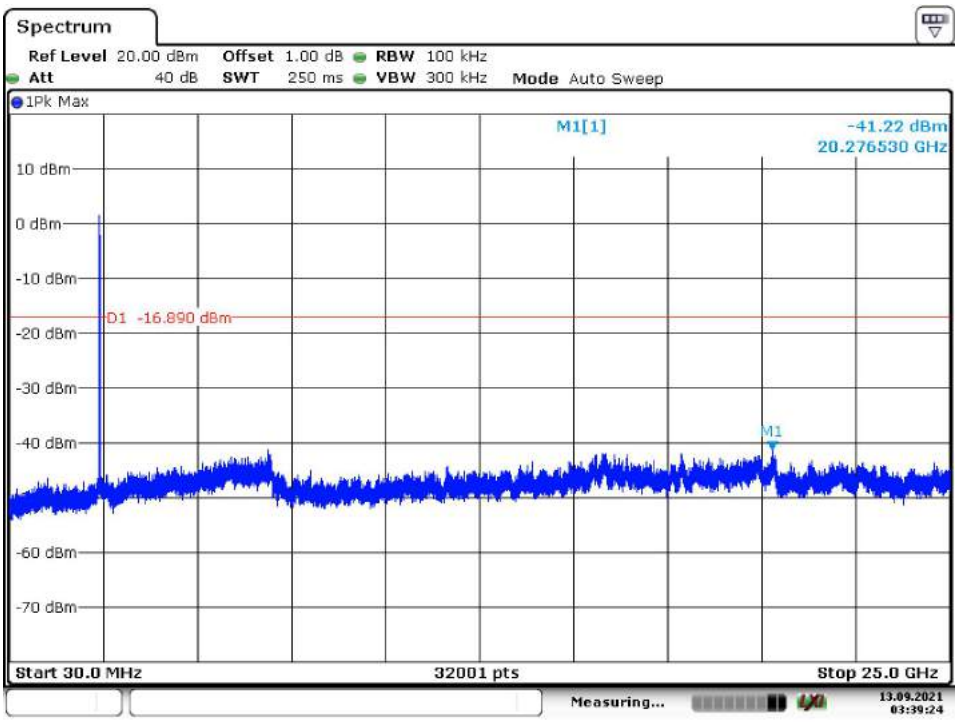


Date: 13.SEP.2021 03:24:23

Ant0, Wi-Fi 802.11 n(HT20) mode, MCS0
Low Channel

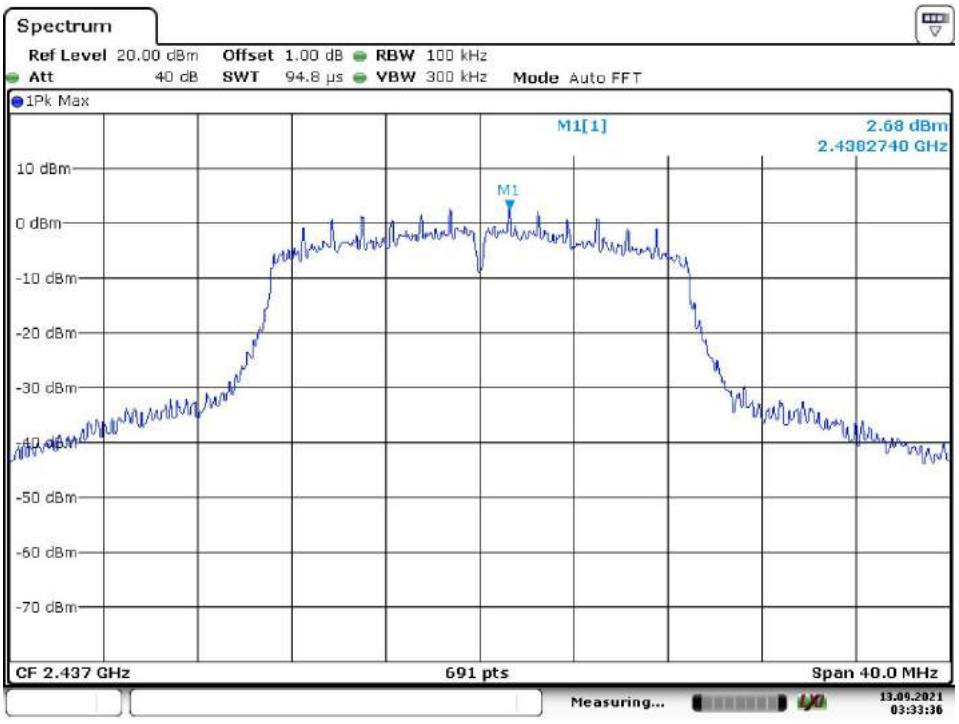


Date: 13.SEP.2021 03:37:36

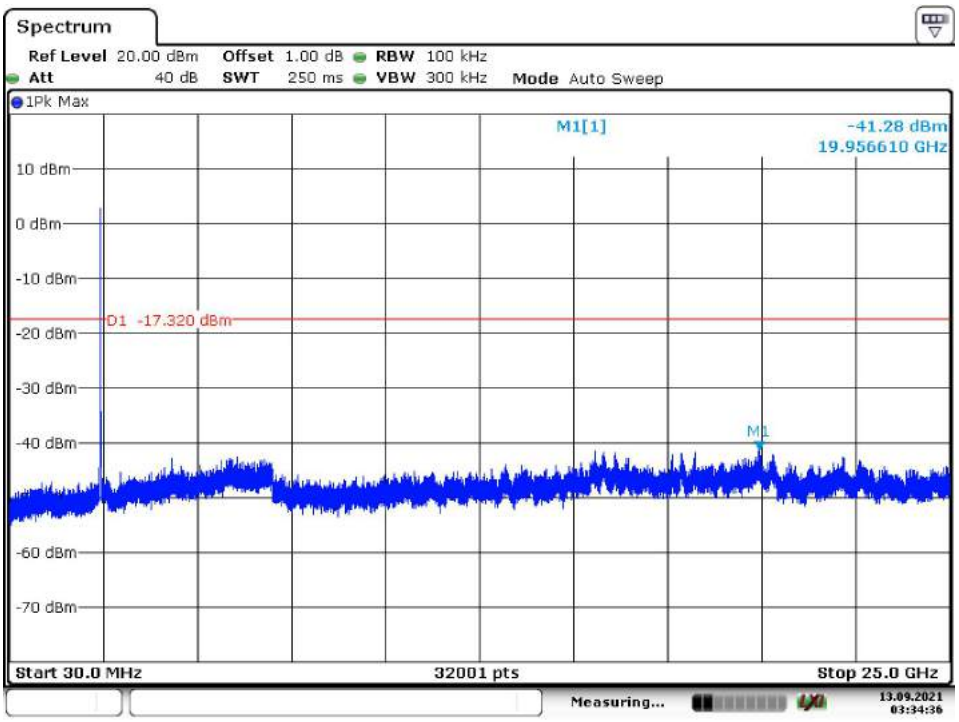


Date: 13.SEP.2021 03:39:25

Middle Channel

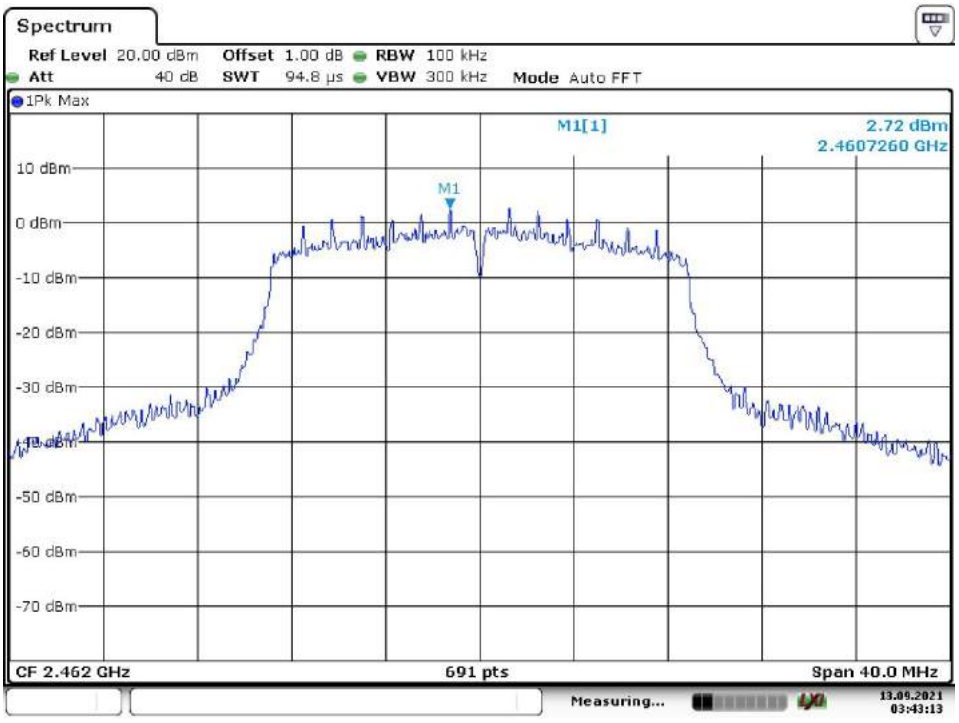


Date: 13.SEP.2021 03:33:36

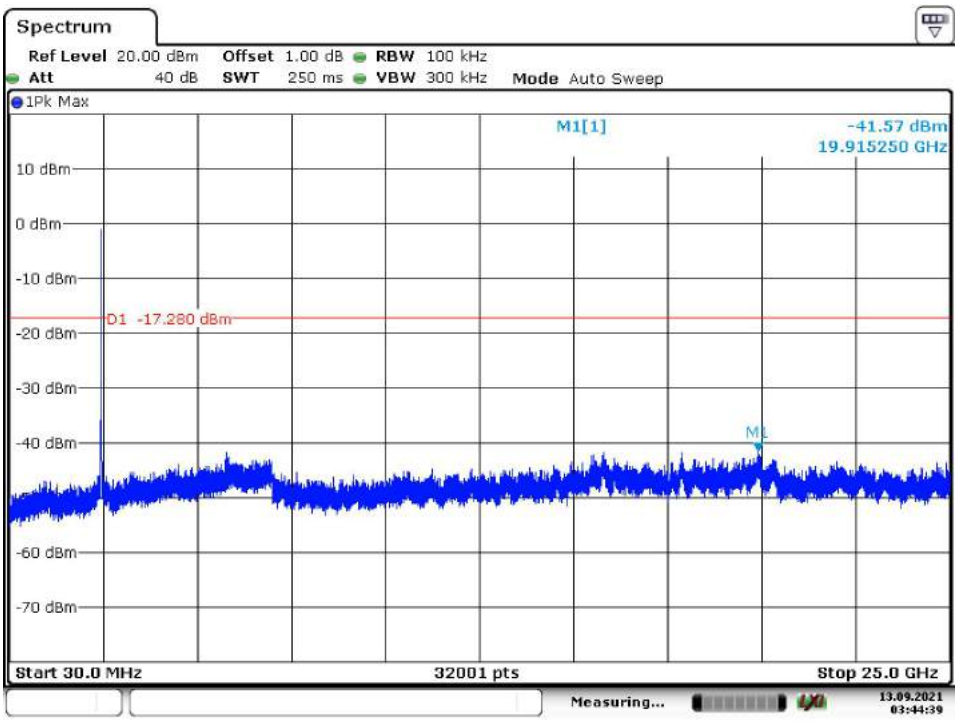


Date: 13.SEP.2021 03:34:36

High Channel

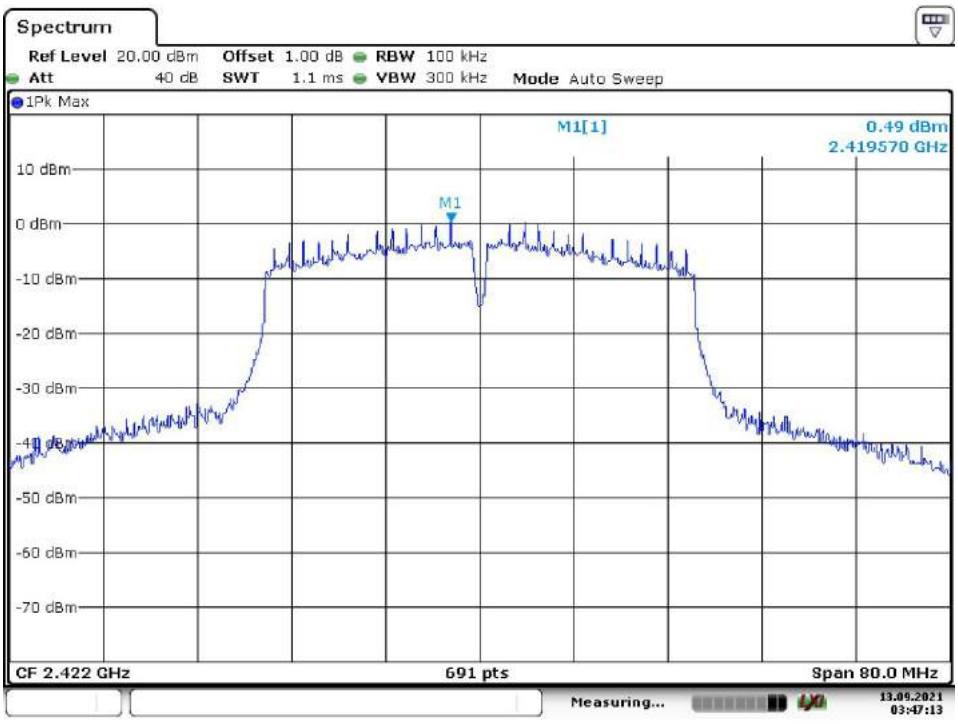


Date: 13.SEP.2021 03:43:13

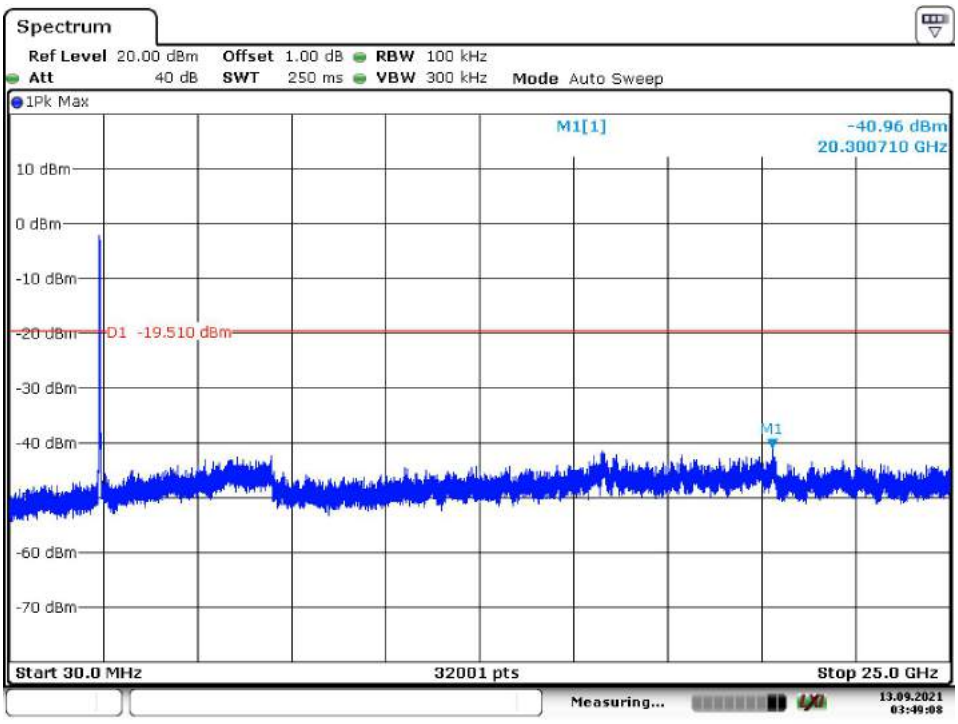


Date: 13.SEP.2021 03:44:39

Ant0, Wi-Fi 802.11 n(HT40) mode, MCS0
Low Channel



Date: 13.SEP.2021 03:47:13



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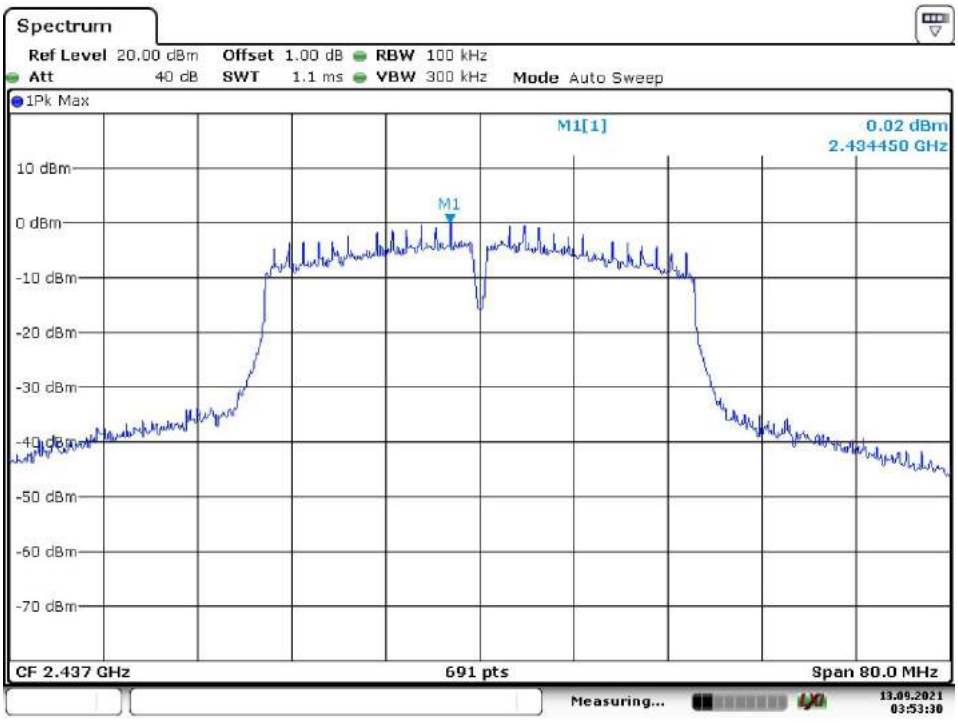
Middle Channel



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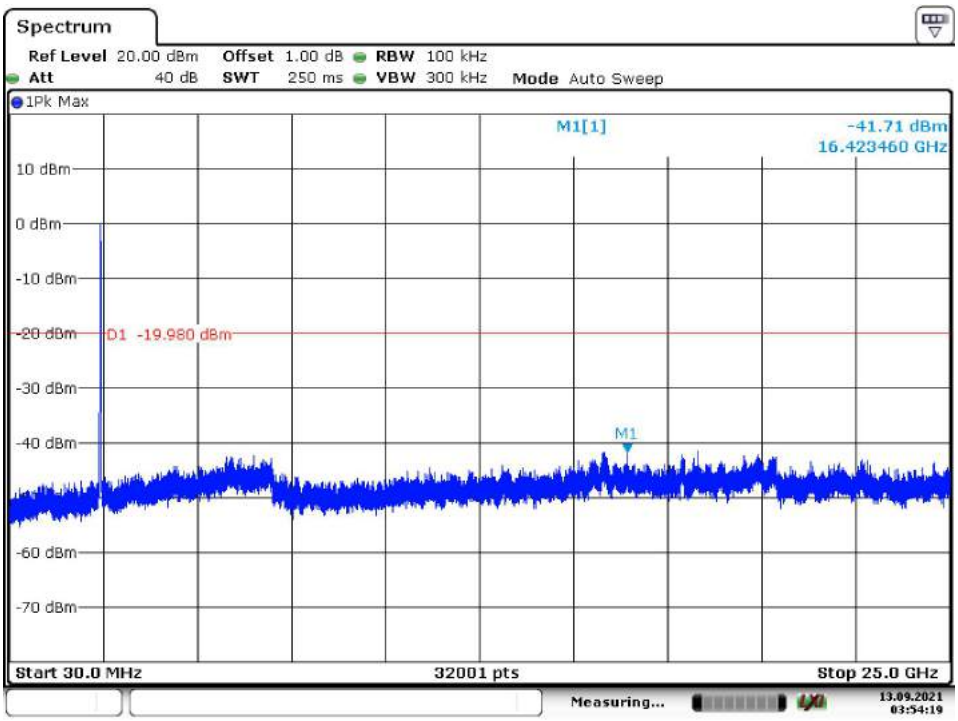
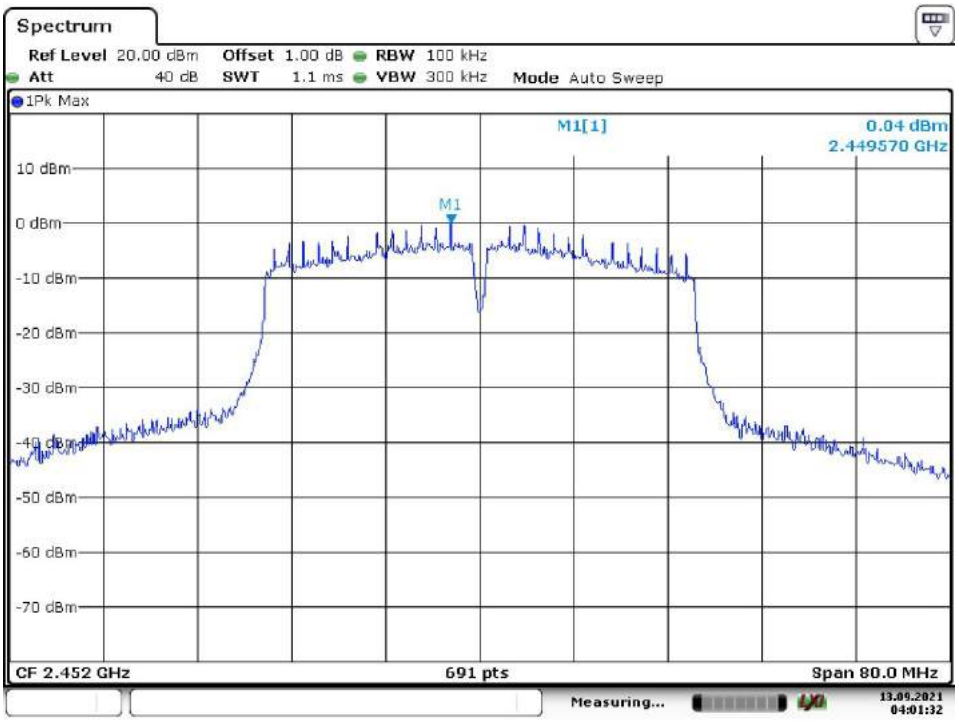


Date: 13.SEP.2021 03:54:20

High Channel



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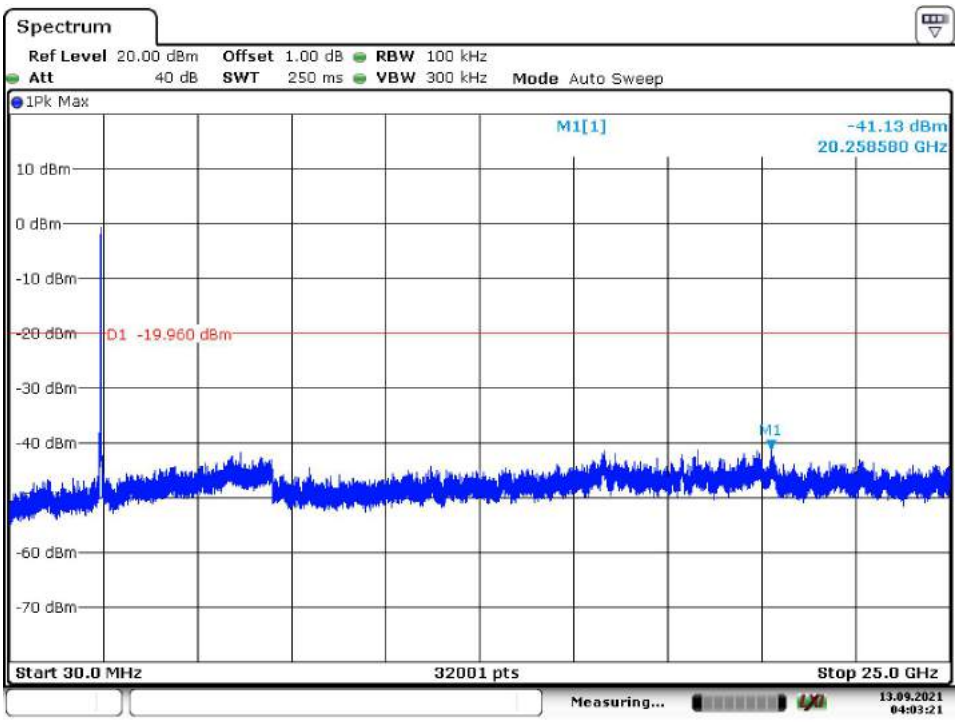

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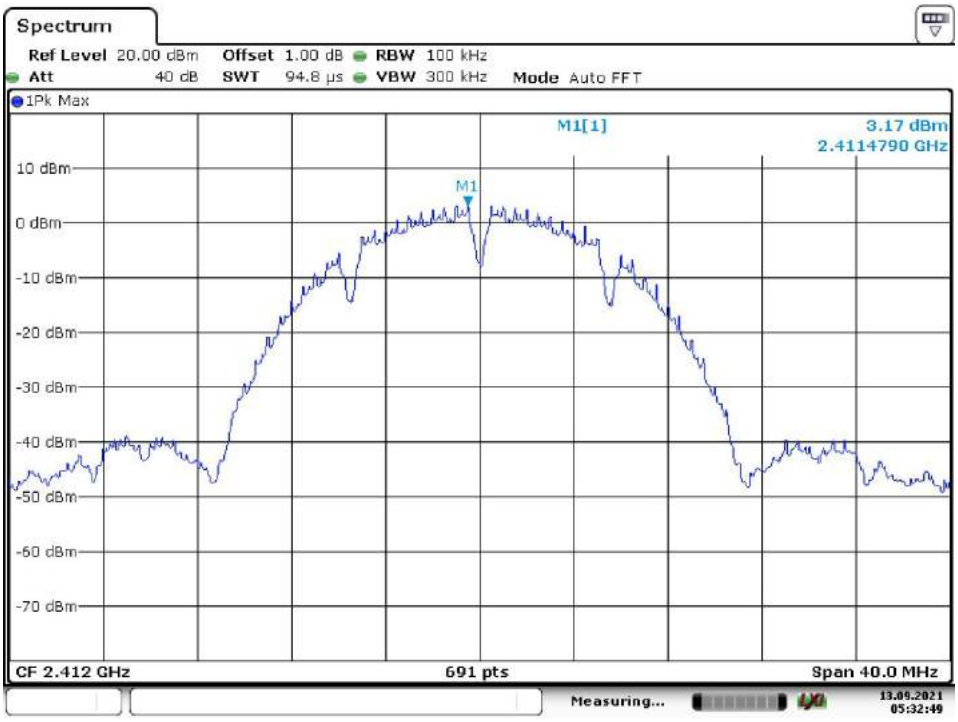
Ant1, Wi-Fi 802.11 b mode, 1 Mbps
Low Channel



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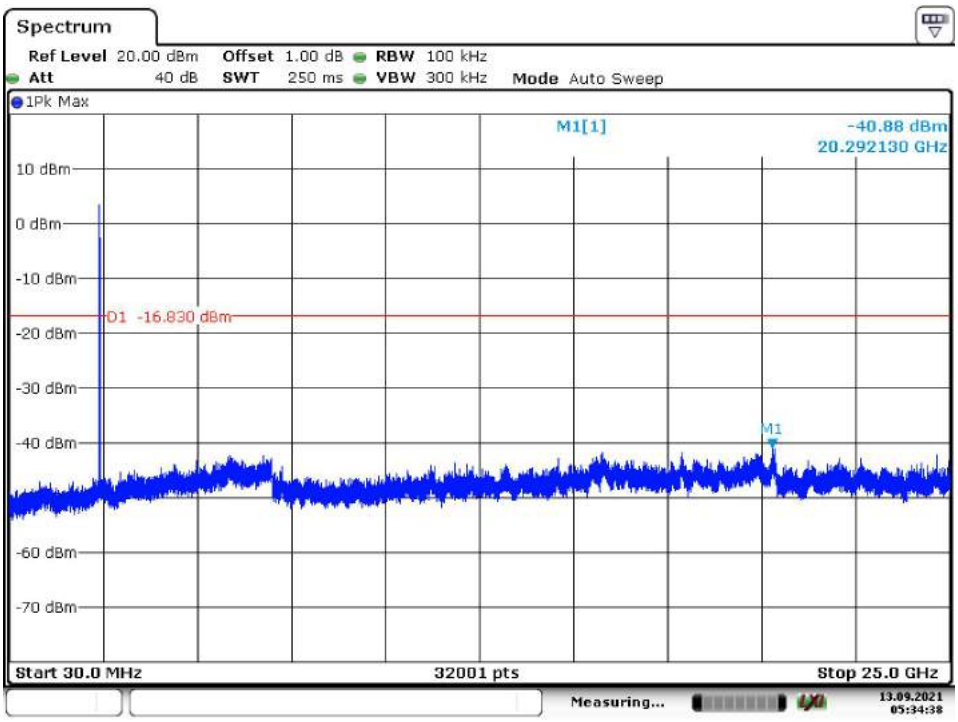

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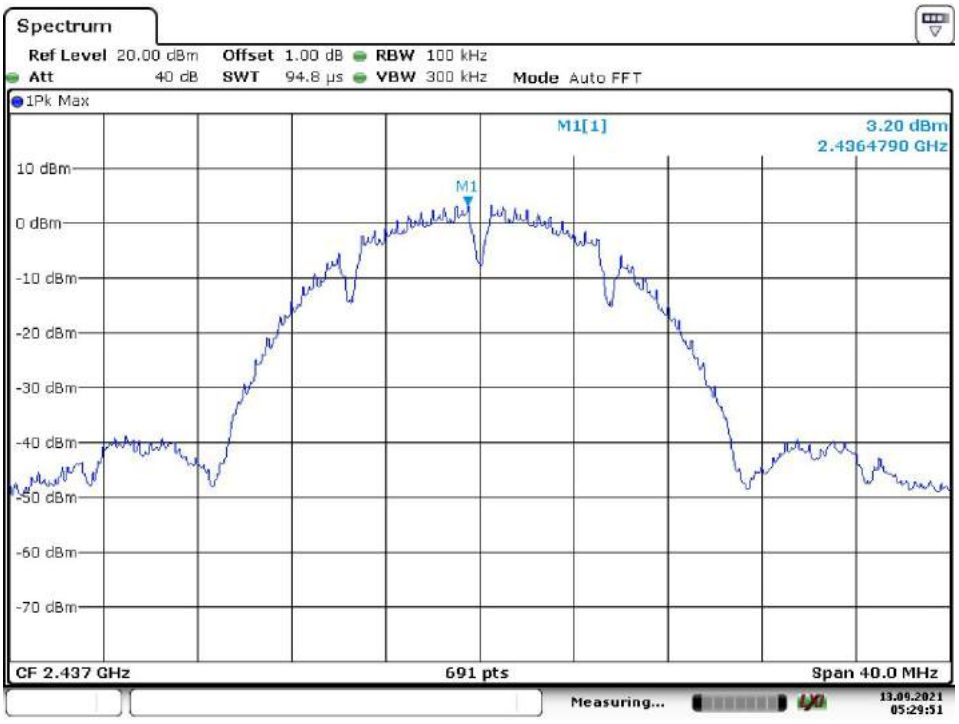
Middle Channel



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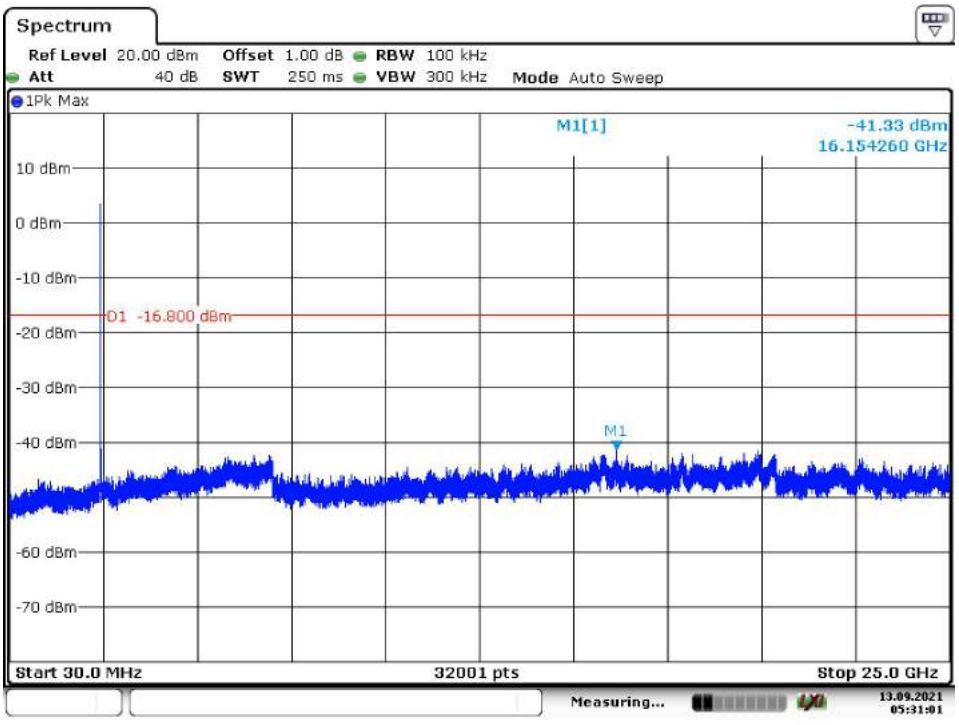

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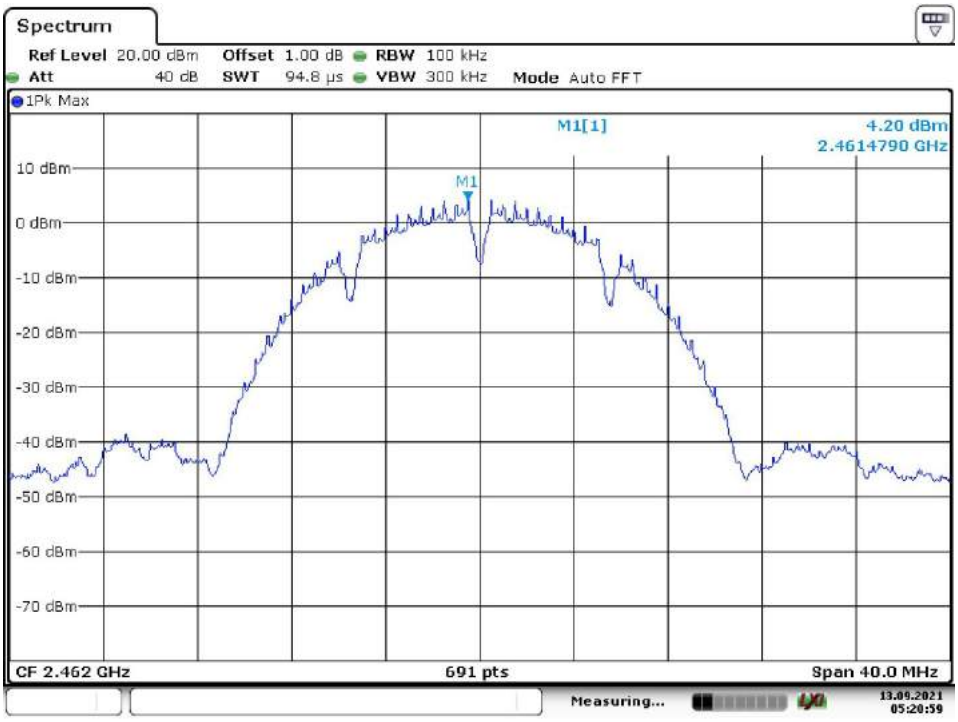
High Channel



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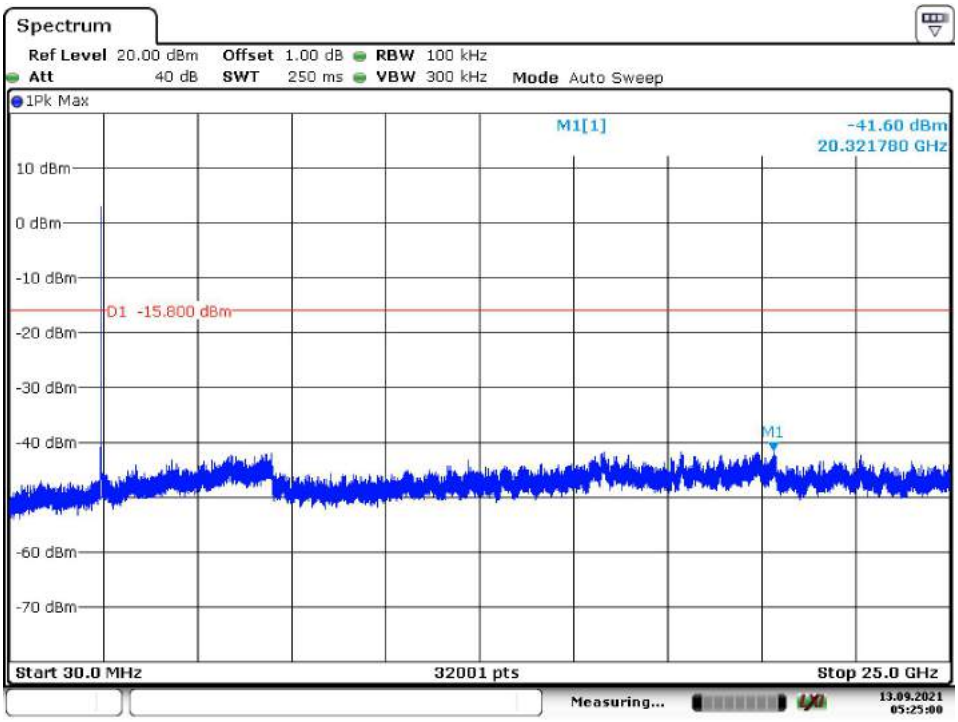
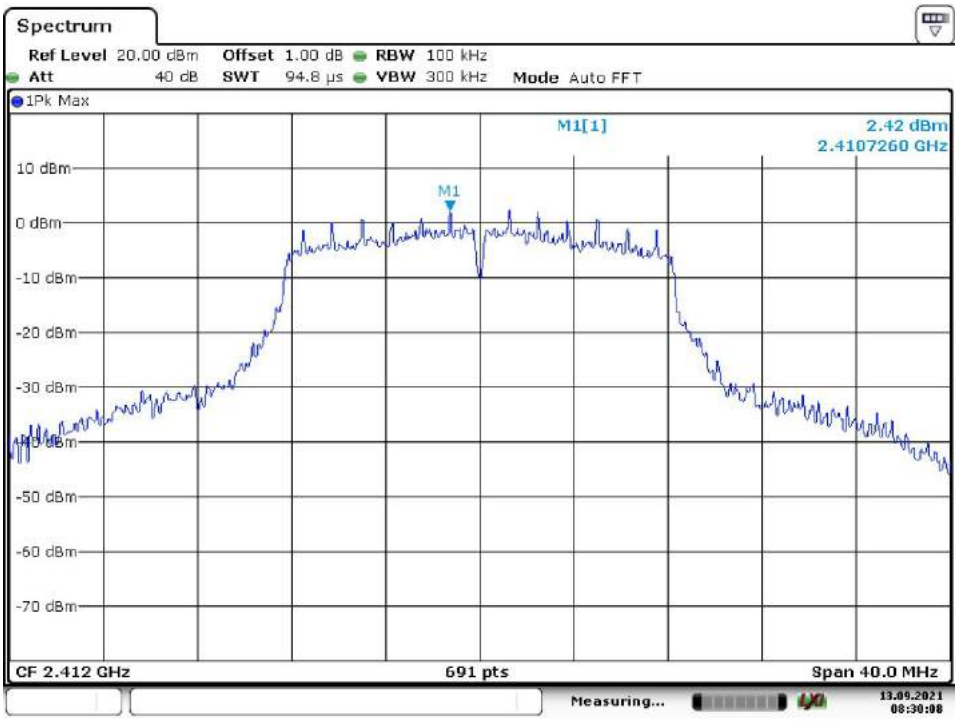
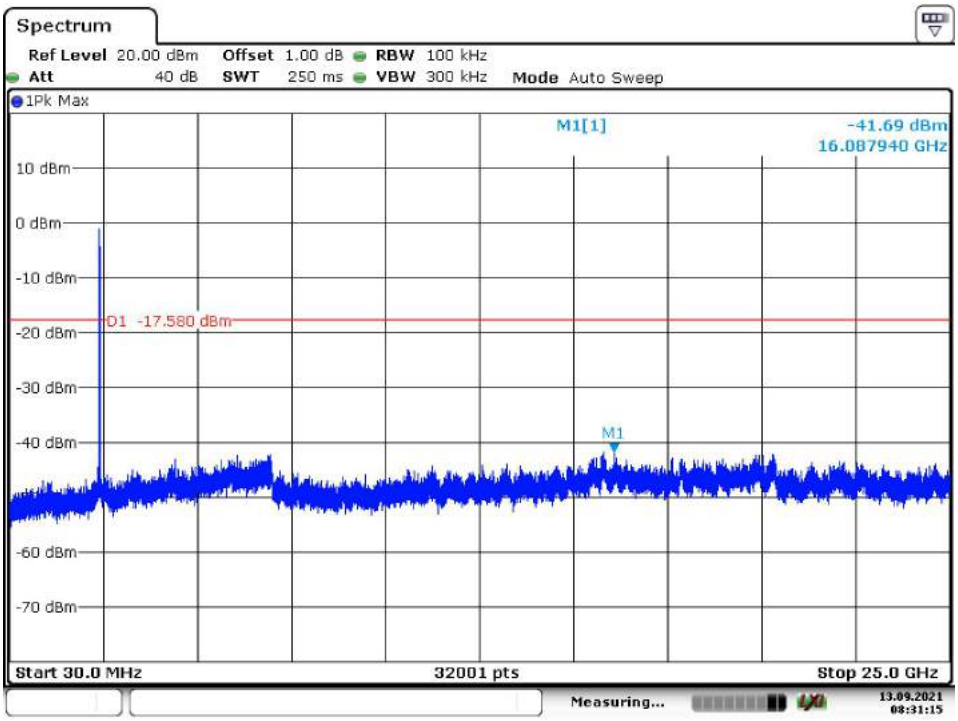


Date: 13.SEP.2021 05:25:00

Ant1, Wi-Fi 802.11 g mode, 6 Mbps
Low Channel

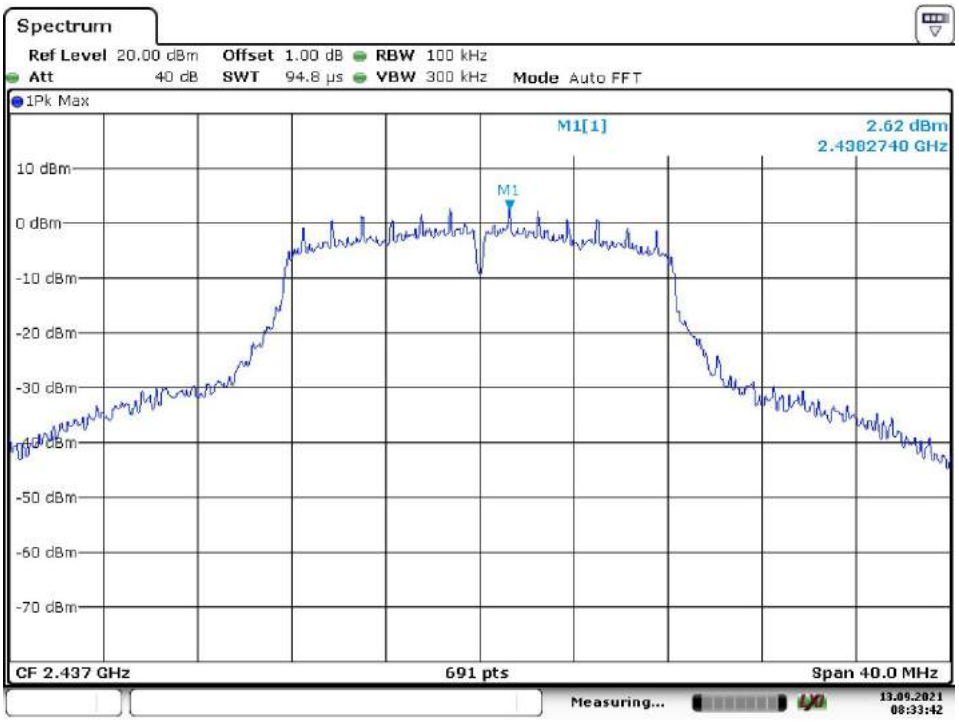


Date: 13.SEP.2021 08:30:08

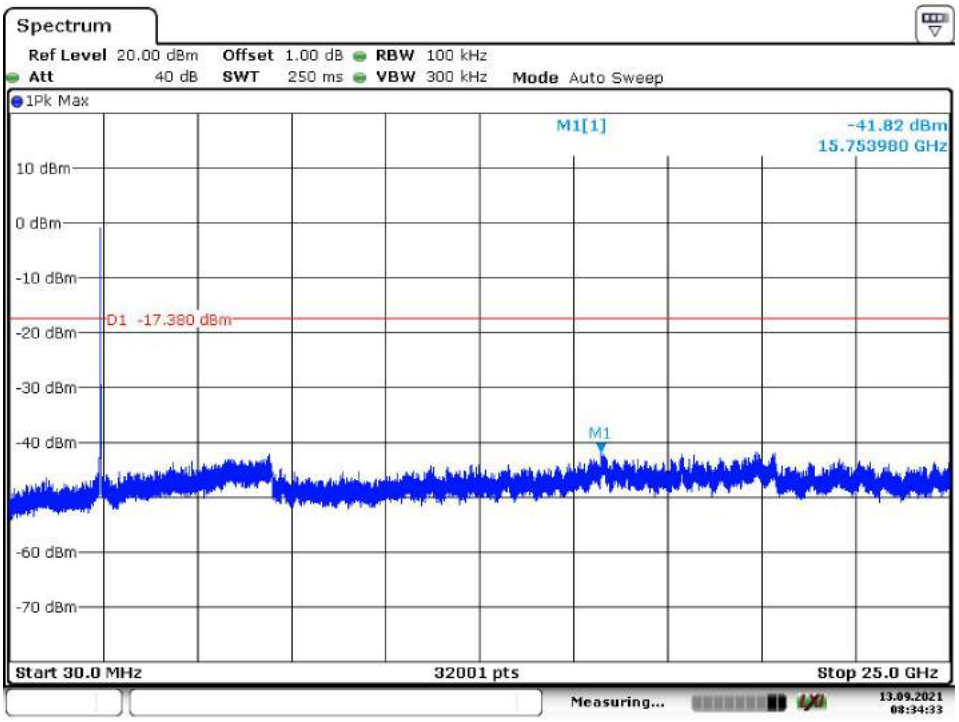


Date: 13.SEP.2021 08:31:15

Middle Channel

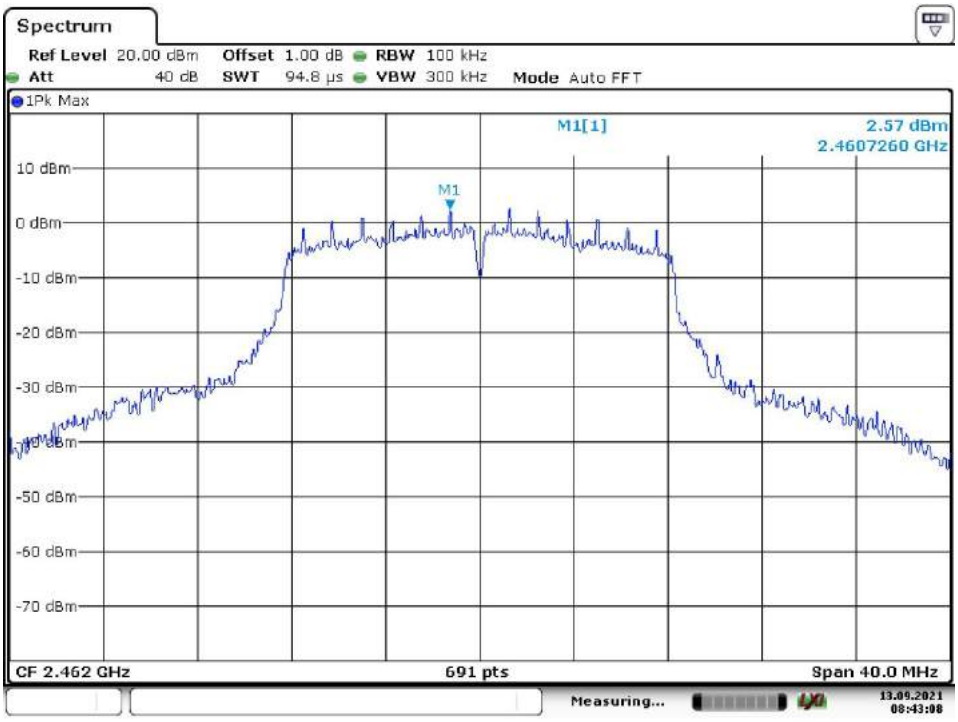


Date: 13.SEP.2021 08:33:42



Date: 13.SEP.2021 08:34:33

High Channel



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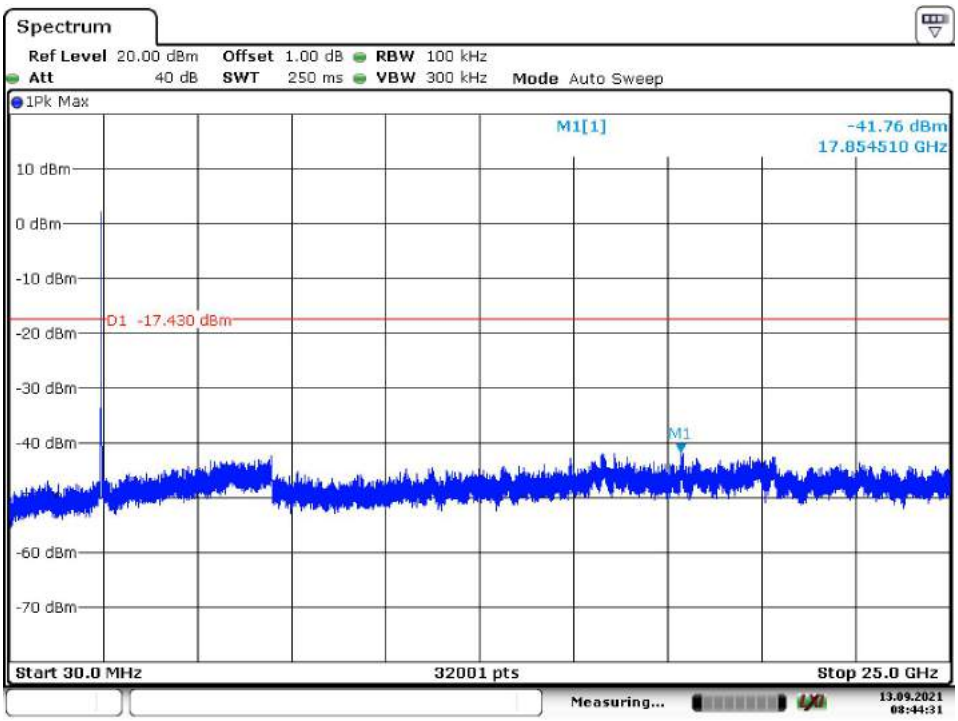
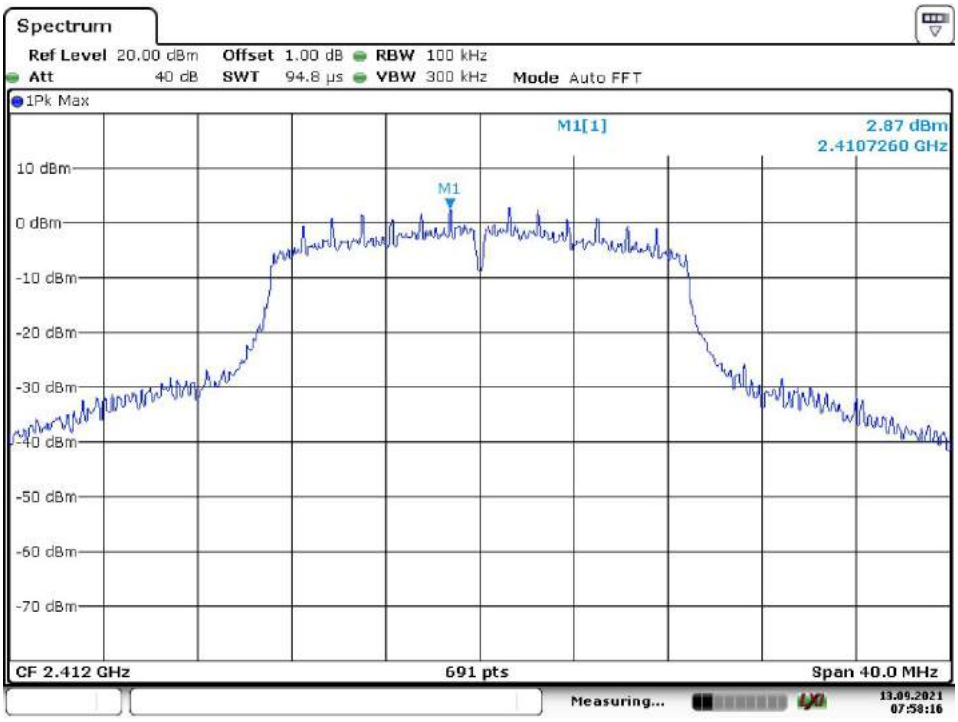
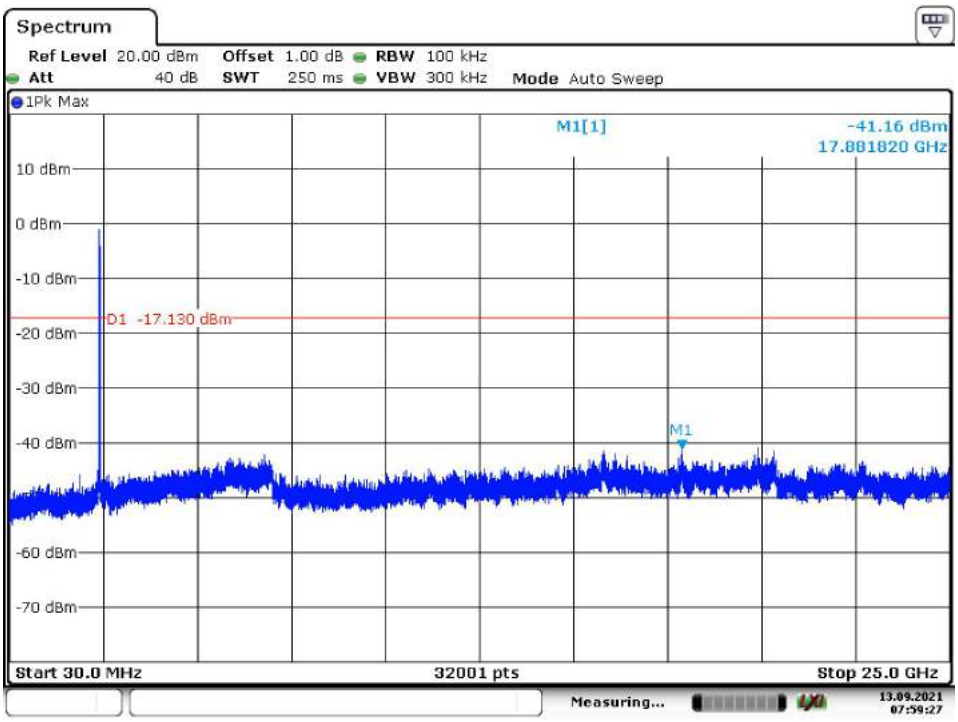


Date: 13.SEP.2021 08:44:31

Ant1, Wi-Fi 802.11 n(HT20) mode, MCS0
Low Channel

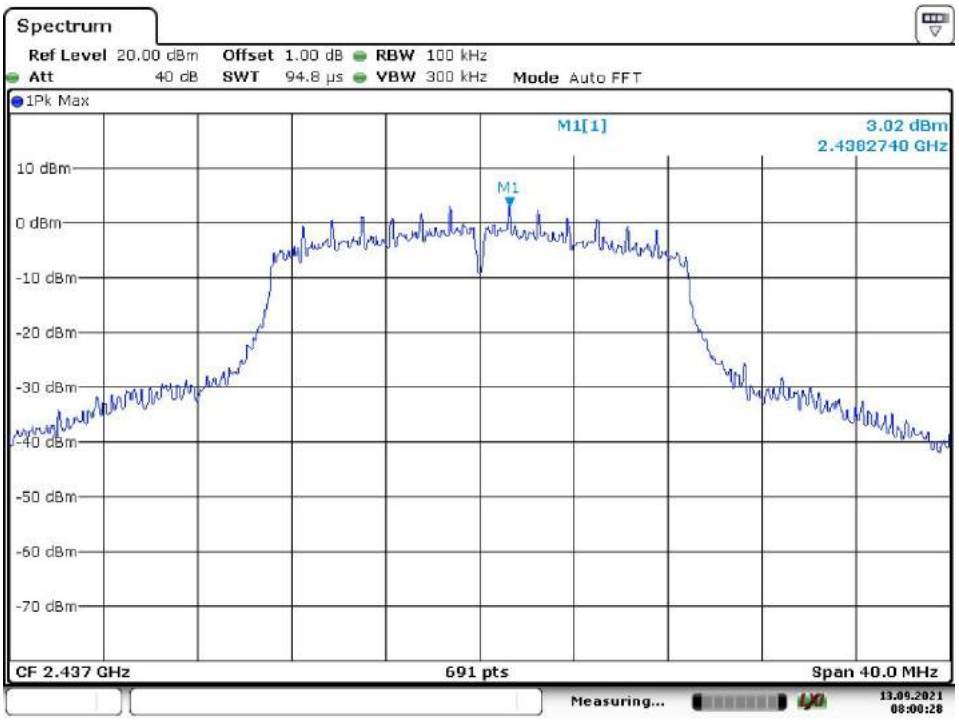


Date: 13.SEP.2021 07:58:17



Date: 13.SEP.2021 07:59:28

Middle Channel



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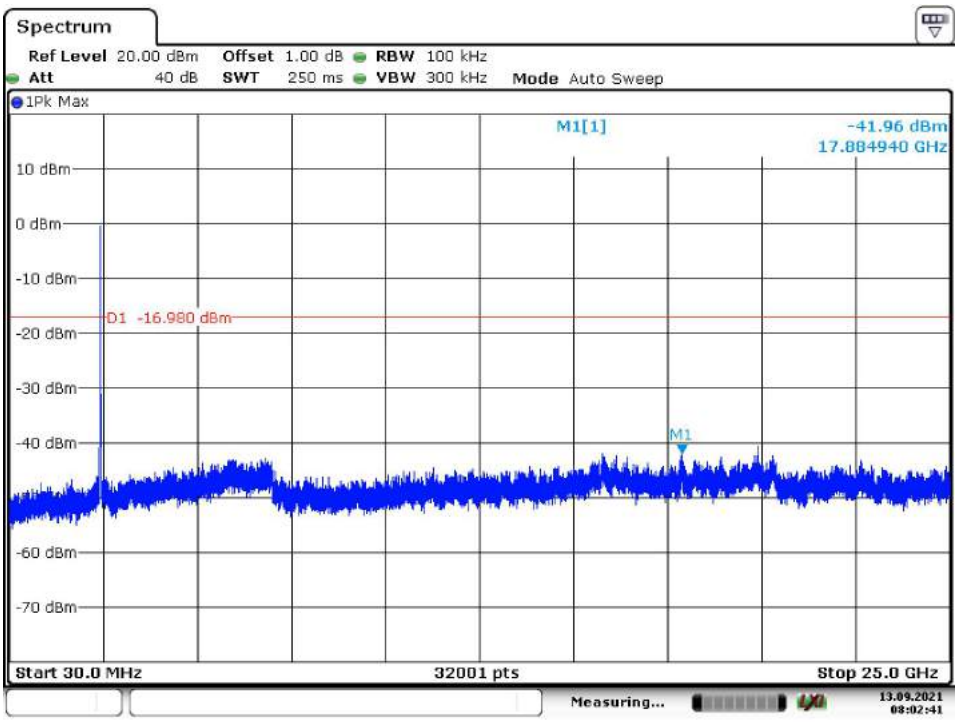
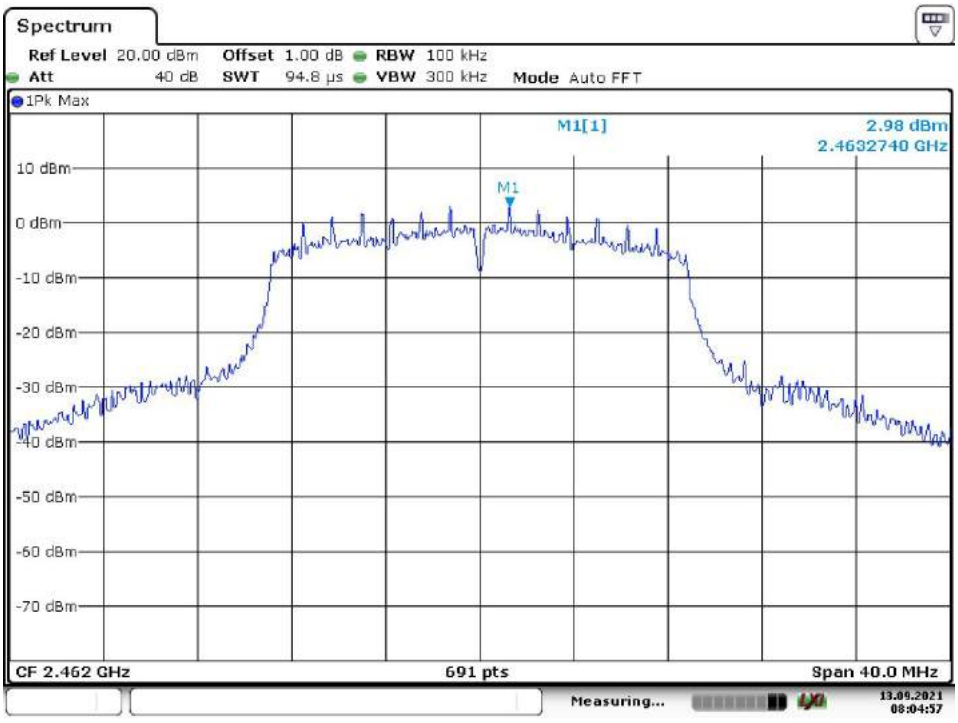


Date: 13.SEP.2021 08:02:42

High Channel



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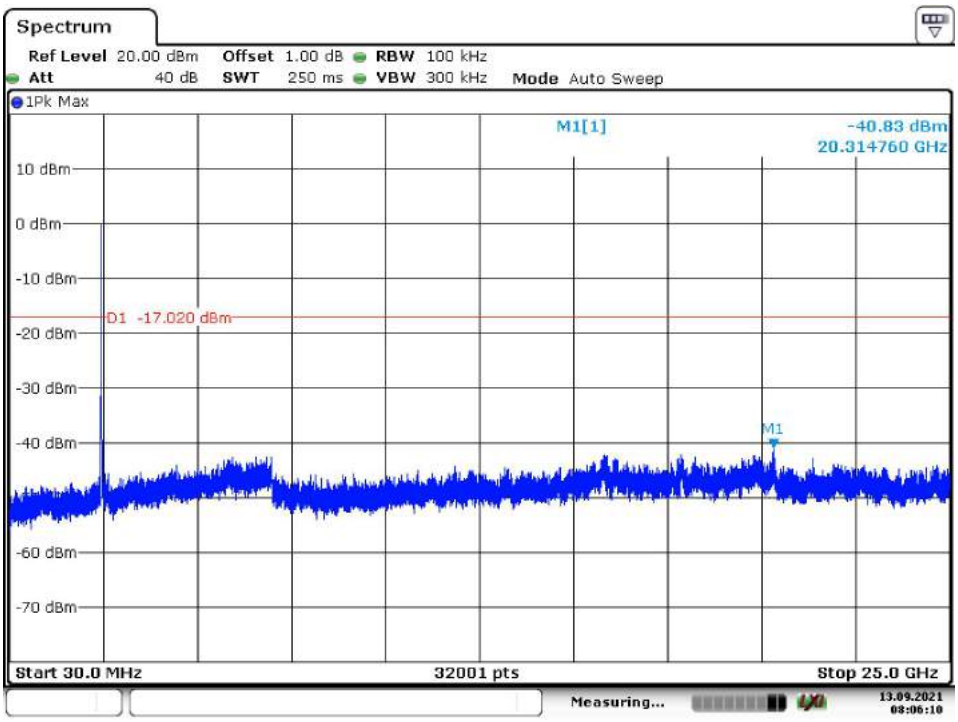
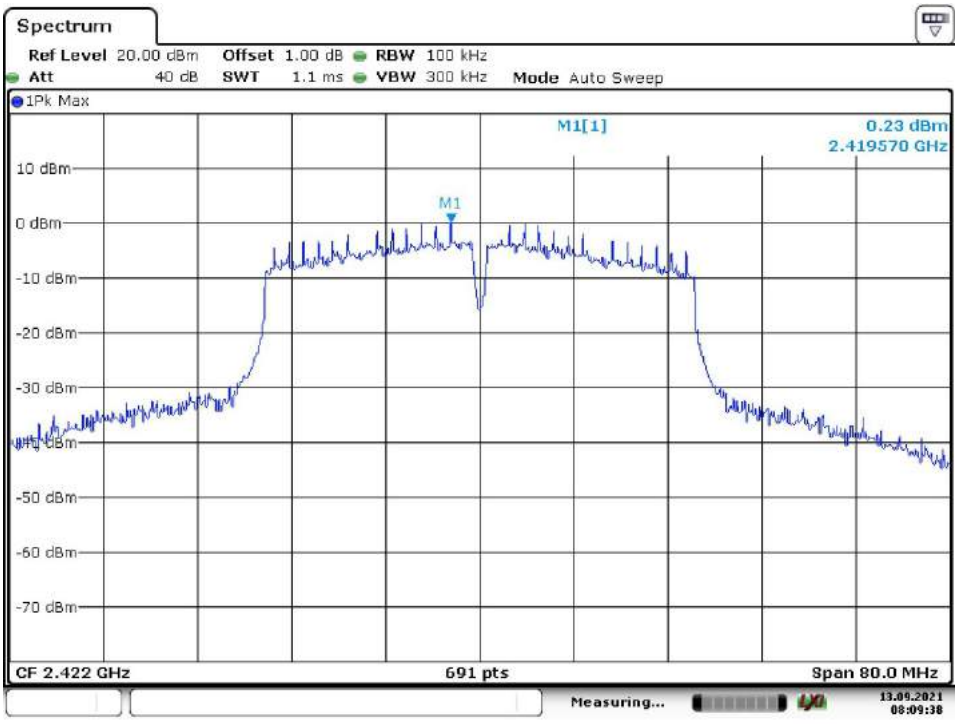
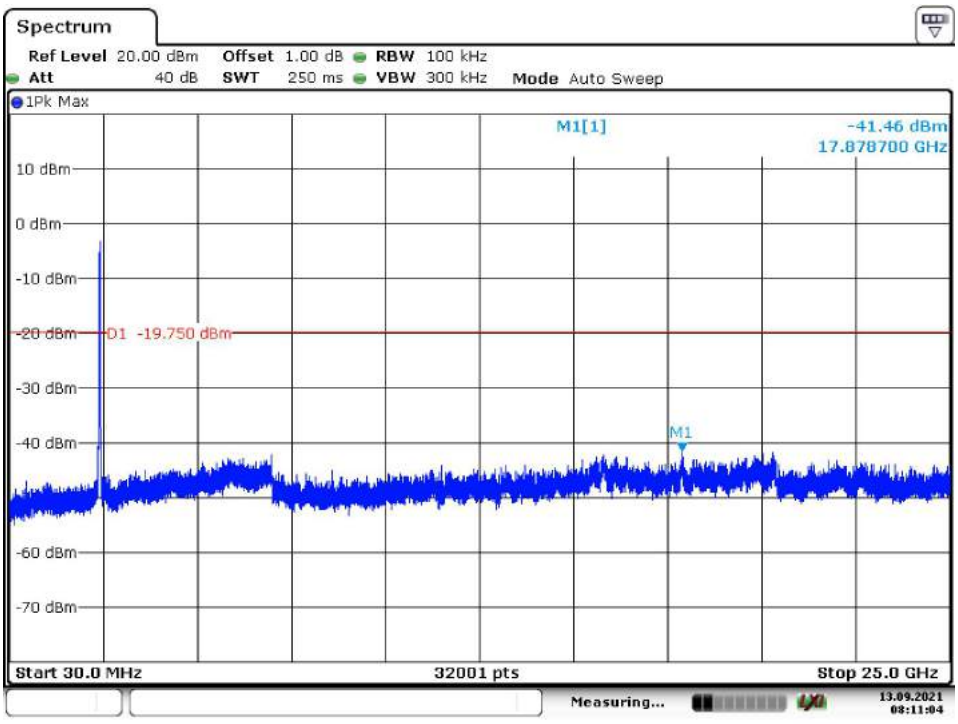


Date: 13.SEP.2021 08:06:11

Ant1, Wi-Fi 802.11 n(HT40) mode, MCS0
Low Channel

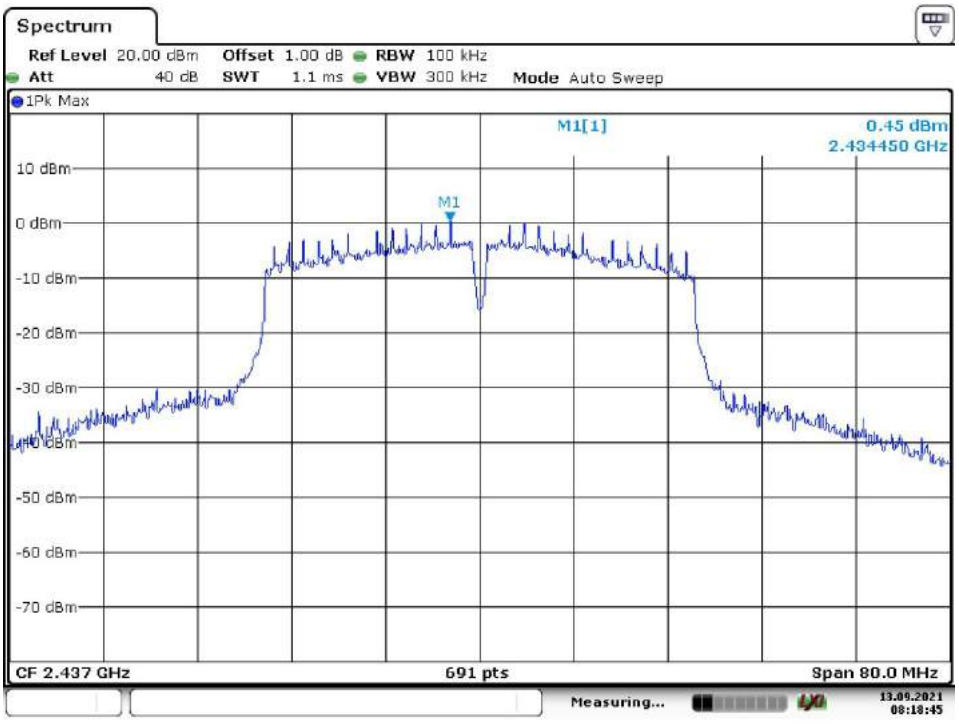


Date: 13.SEP.2021 08:09:38

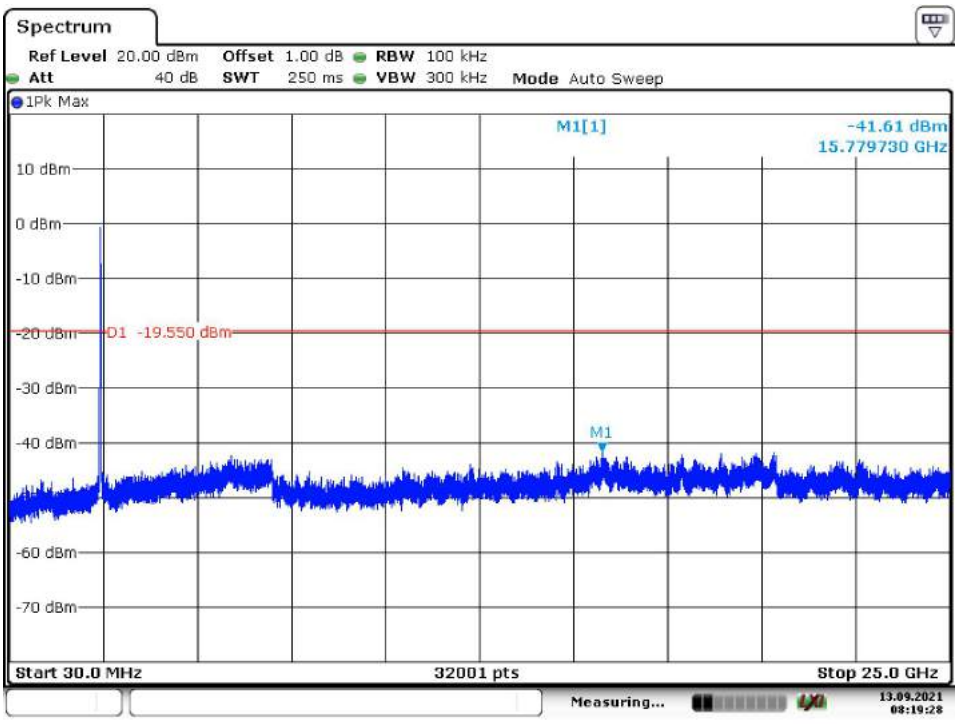


Date: 13.SEP.2021 08:11:04

Middle Channel

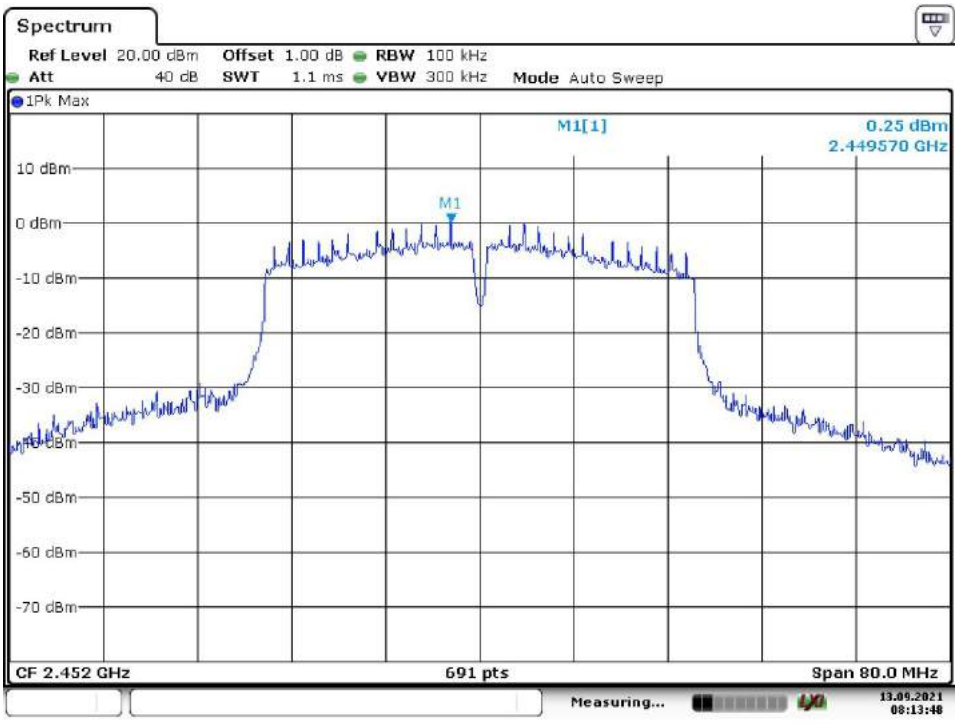


Date: 13.SEP.2021 08:18:45

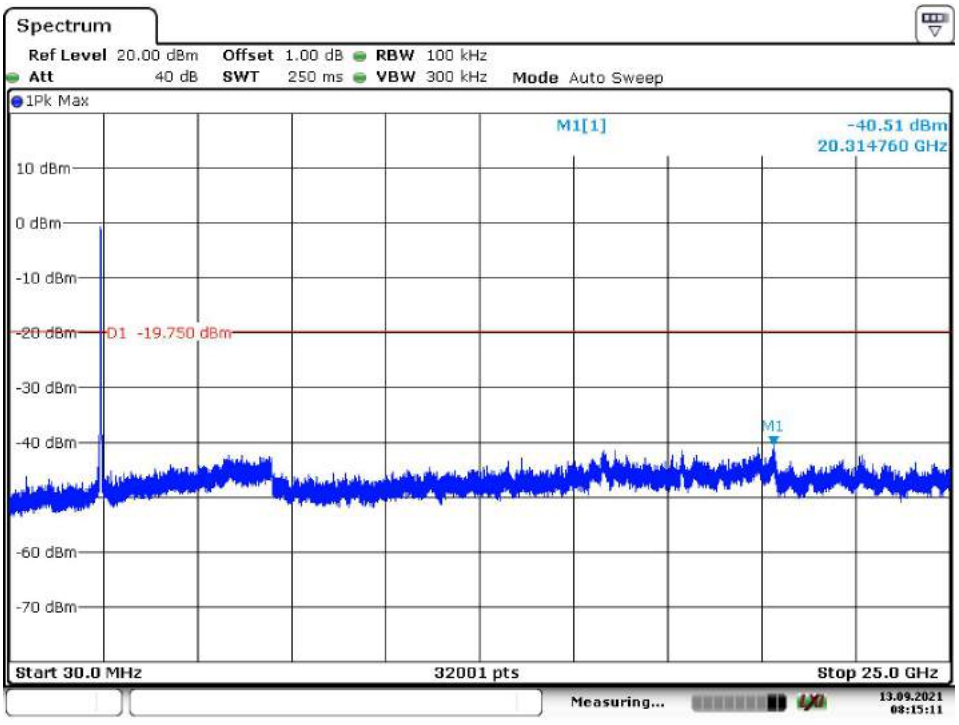


Date: 13.SEP.2021 08:19:28

High Channel



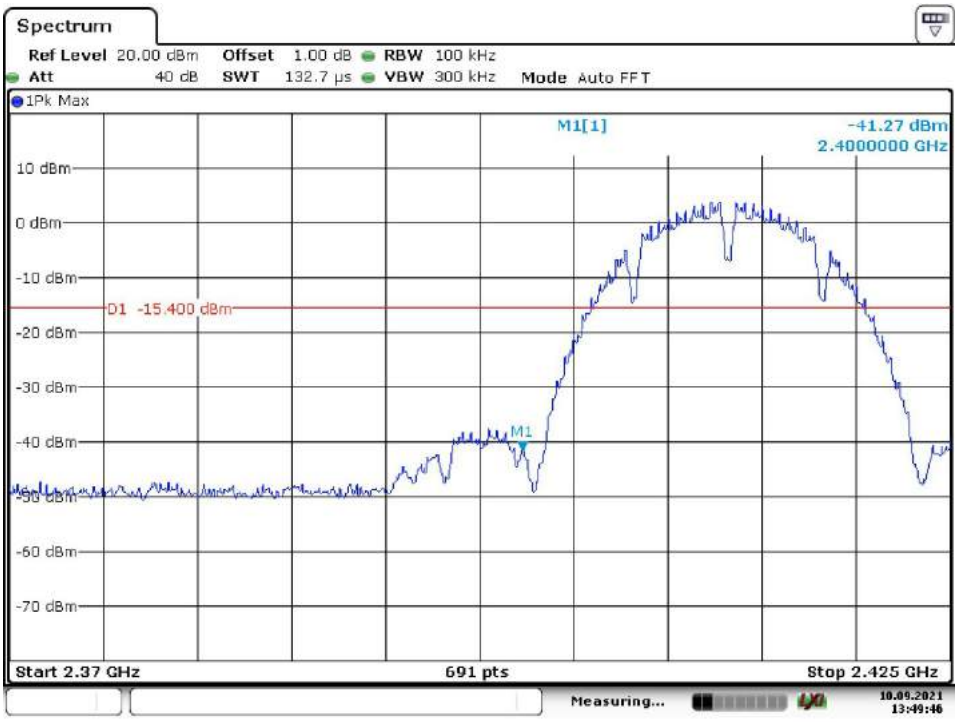
Date: 13.SEP.2021 08:13:48



Date: 13.SEP.2021 08:15:12

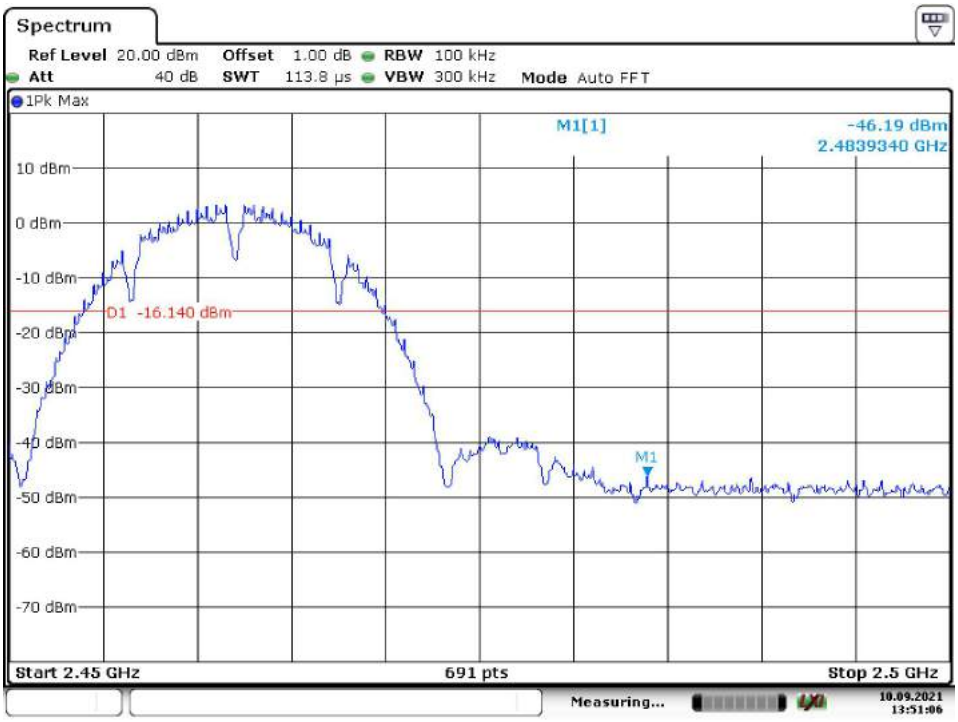
Ant0, Wi-Fi 802.11 b mode, Band Edge

Low Channel



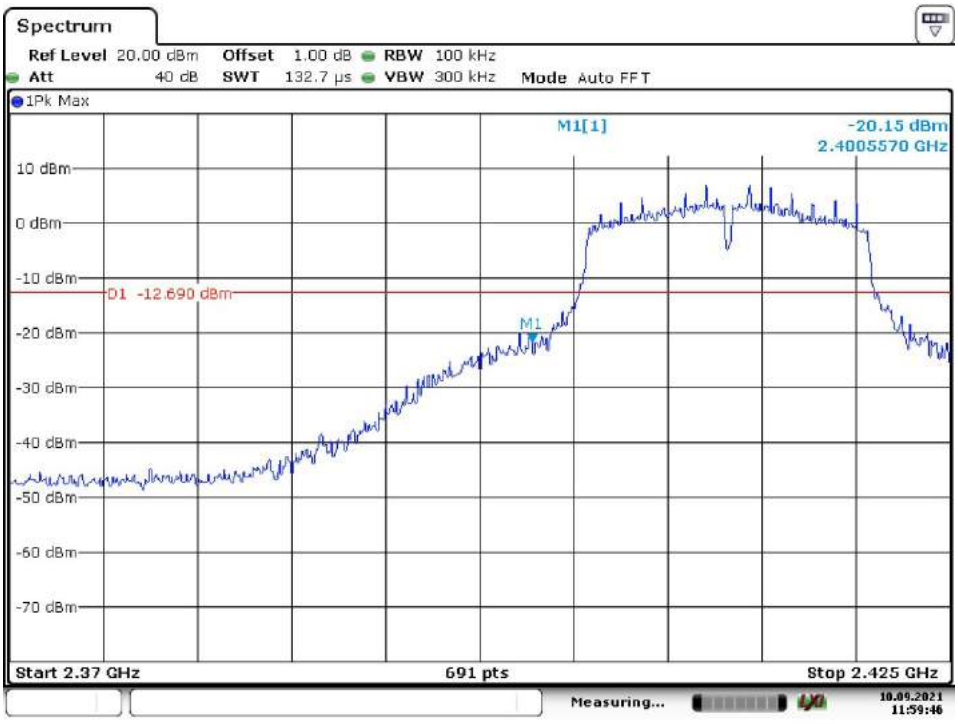
Date: 10.SEP.2021 13:49:47

High Channel



Date: 10.SEP.2021 13:51:06

Ant0, Wi-Fi 802.11 g mode, Band Edge
Low Channel



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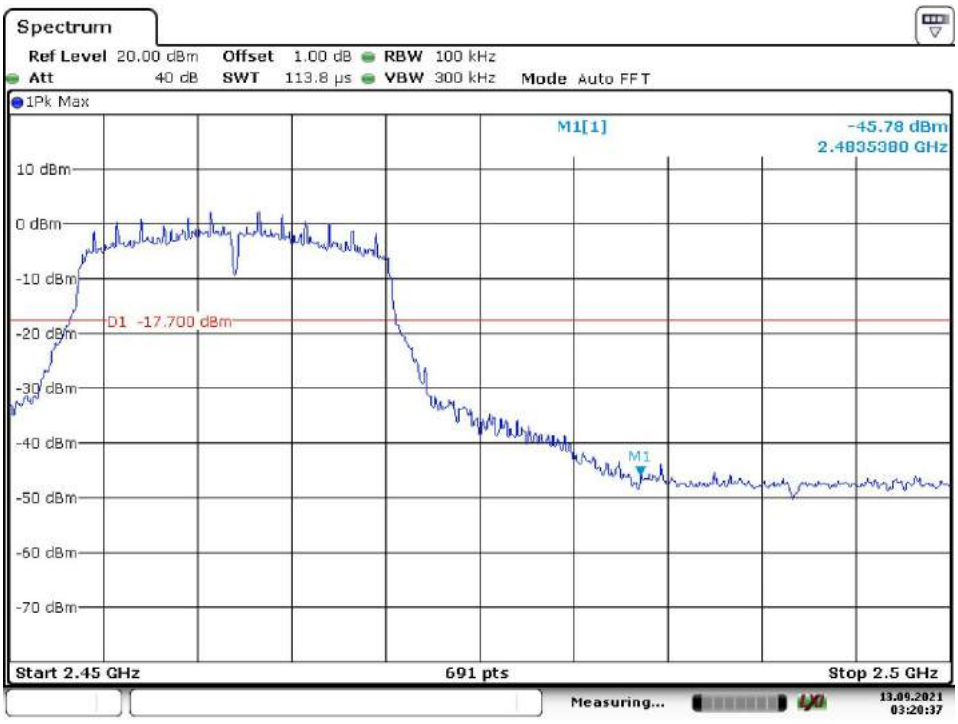
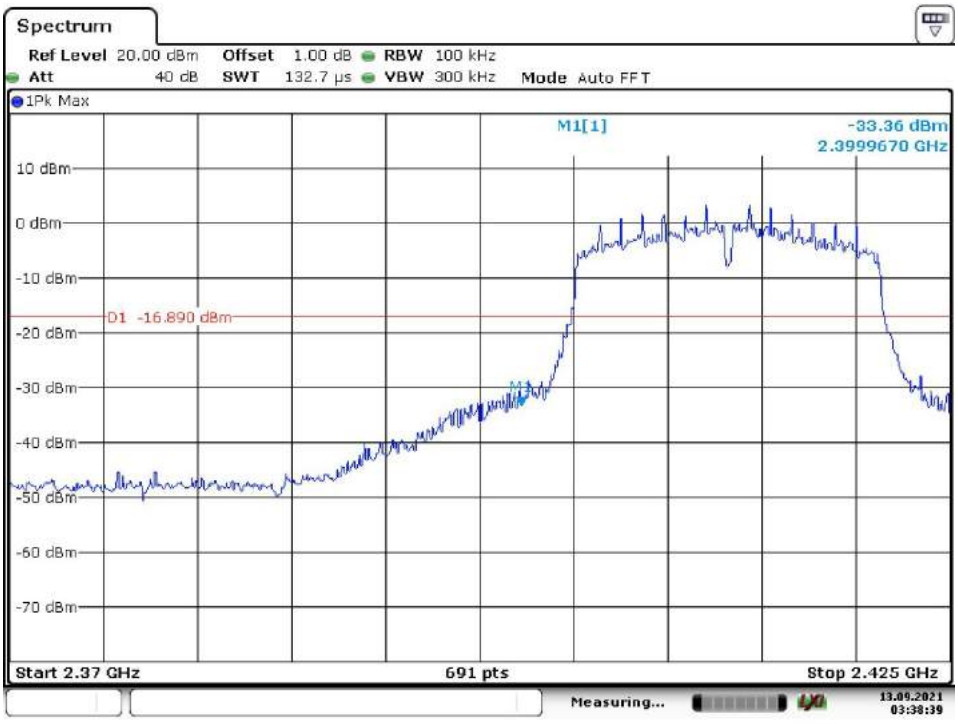
High Channel



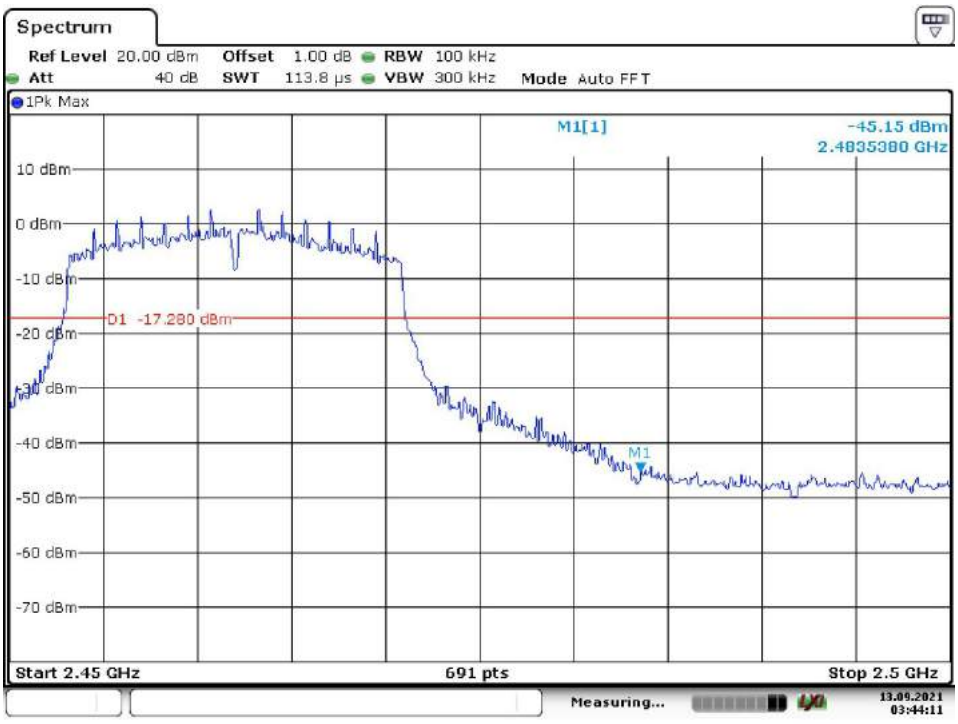
Date: 13.SEP.2021 03:20:37

Ant0, Wi-Fi 802.11 n(HT20) mode, Band Edge
Low Channel



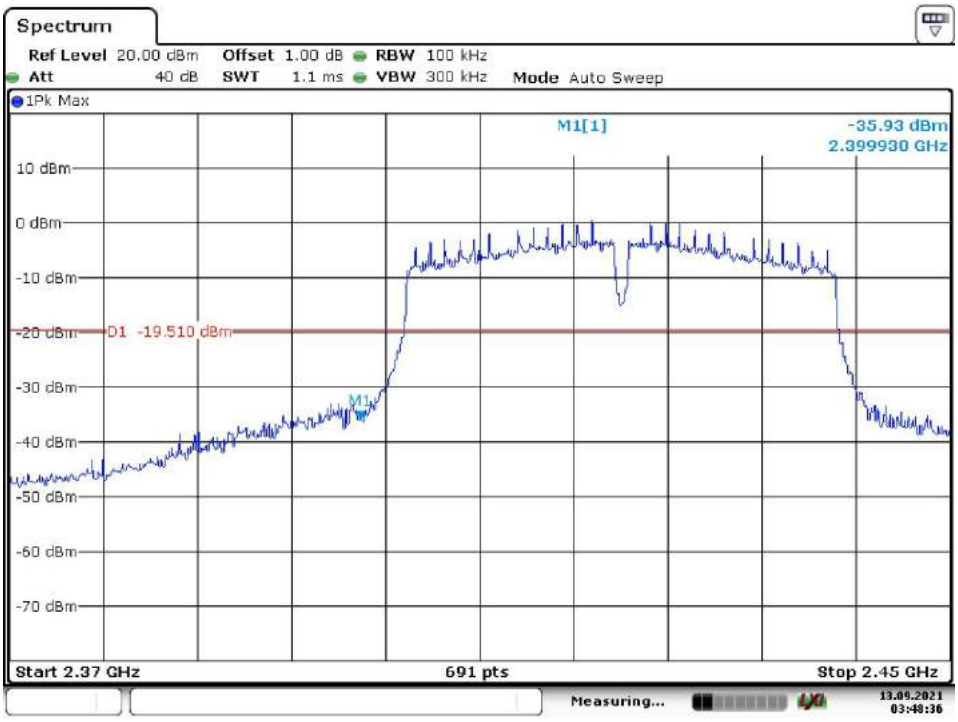
Date: 13.SEP.2021 03:38:39

High Channel



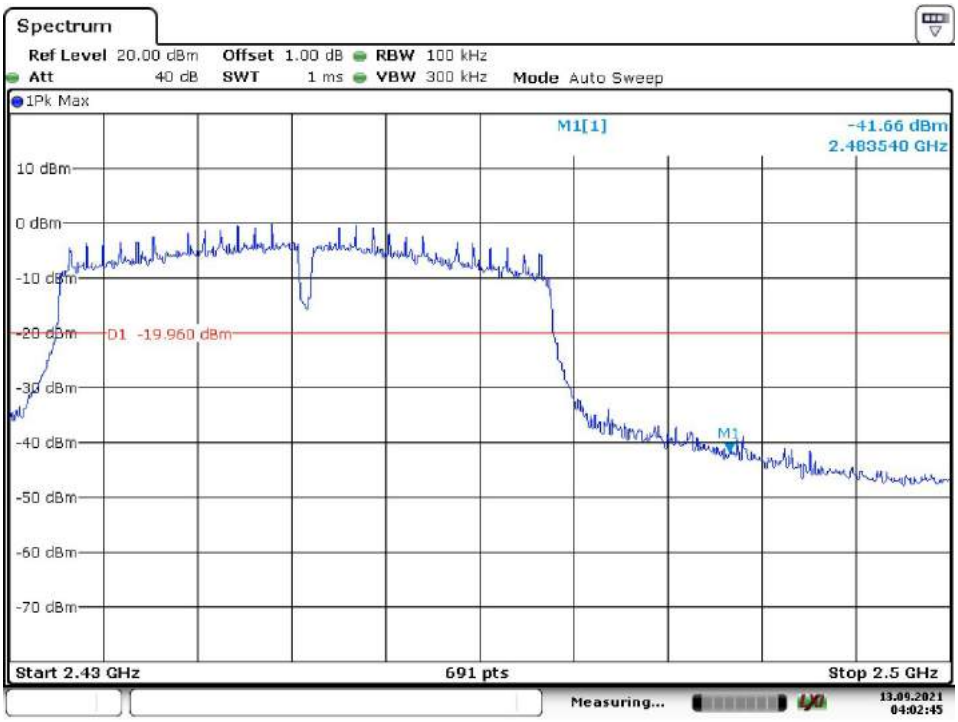
Date: 13.SEP.2021 03:44:11

Ant0, Wi-Fi 802.11 n(HT40) mode, Band Edge
Low Channel



Date: 13.SEP.2021 03:48:37

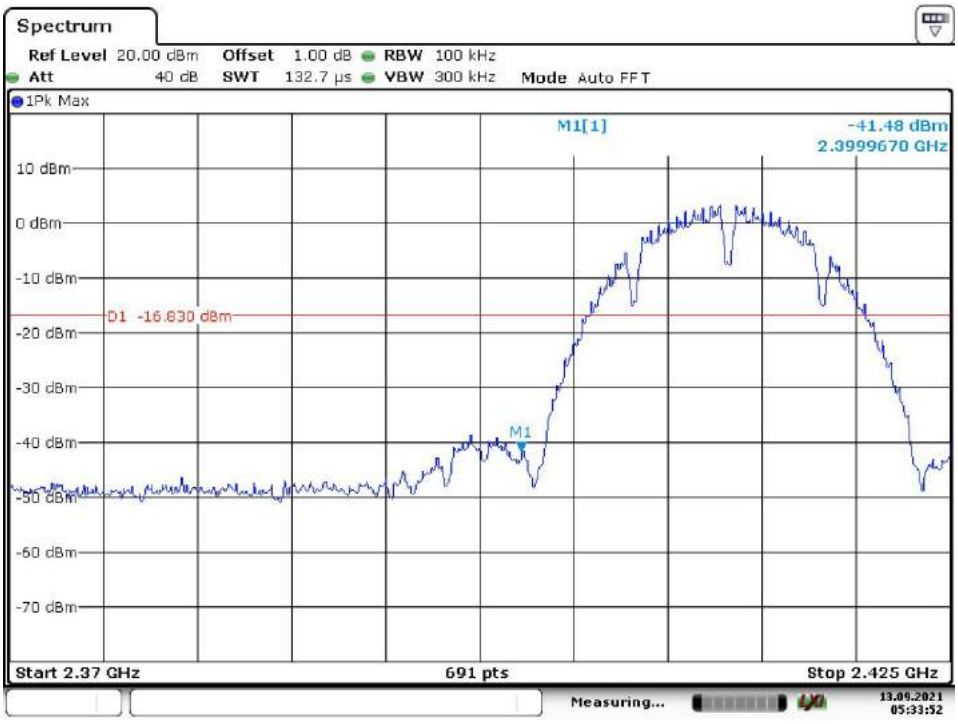
High Channel



Date: 13.SEP.2021 04:02:45

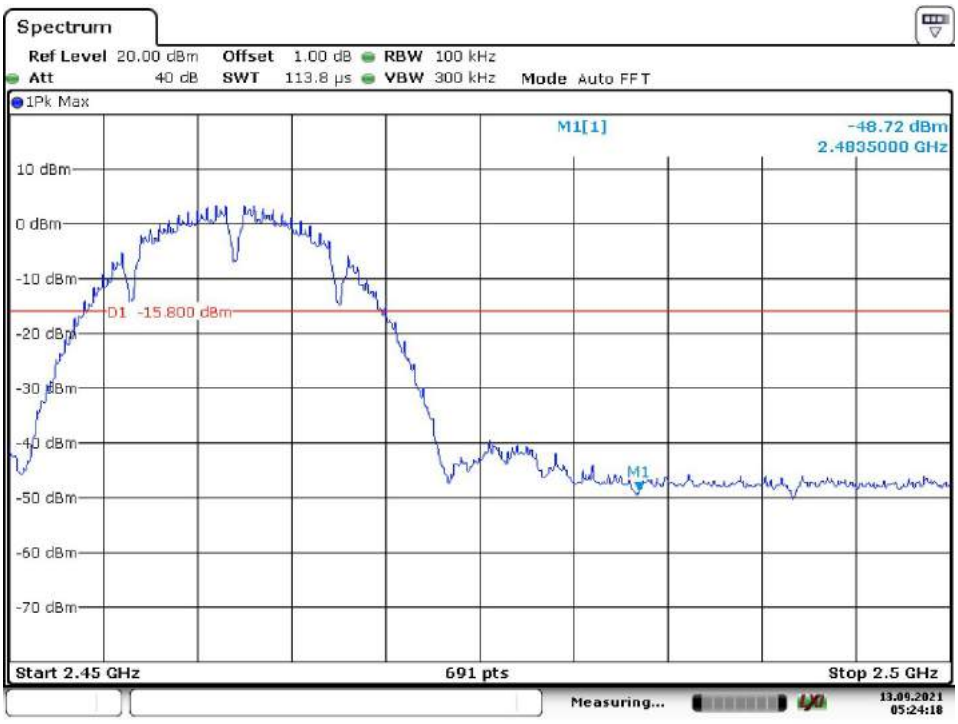
Ant1, Wi-Fi 802.11 b mode, Band Edge

Low Channel



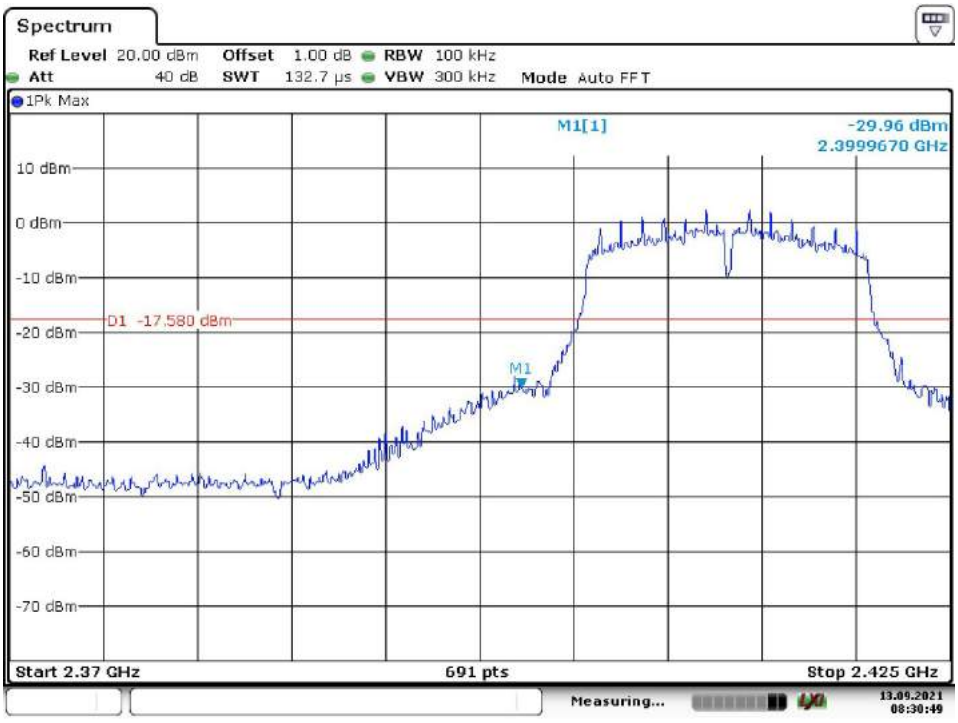
Date: 13.SEP.2021 05:33:52

High Channel



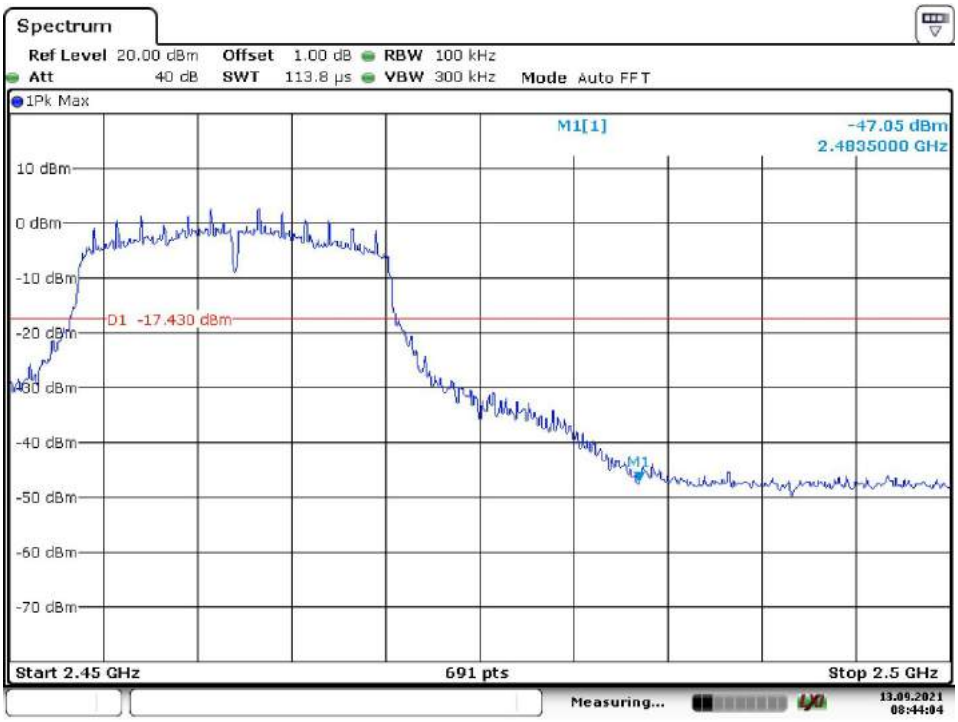
Date: 13.SEP.2021 05:24:18

Ant1, Wi-Fi 802.11 g mode, Band Edge
Low Channel



Date: 13.SEP.2021 08:30:48

High Channel



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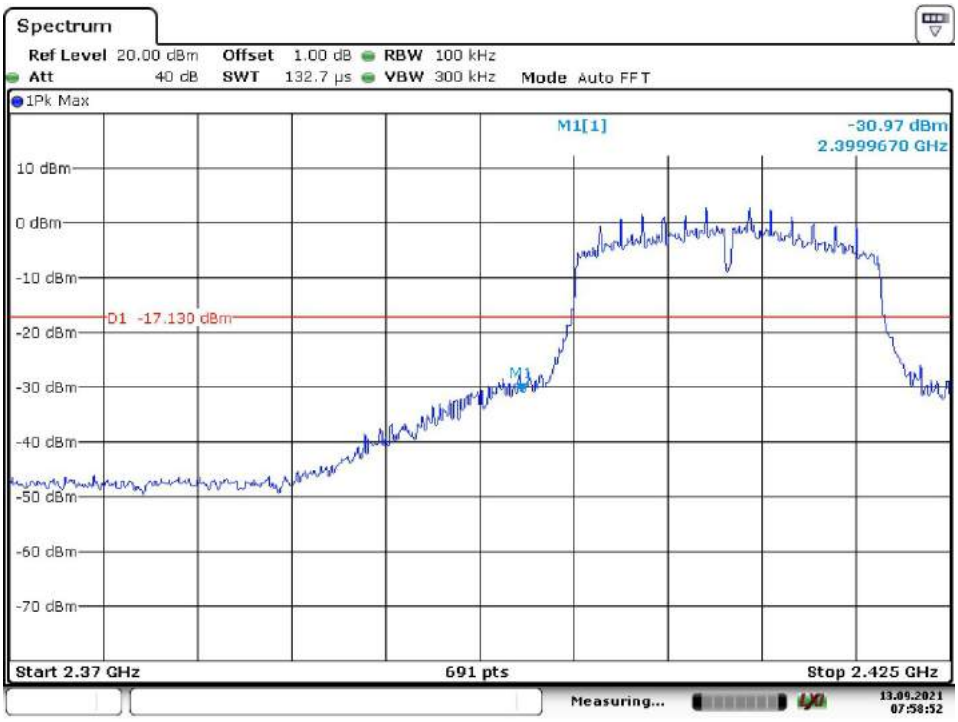
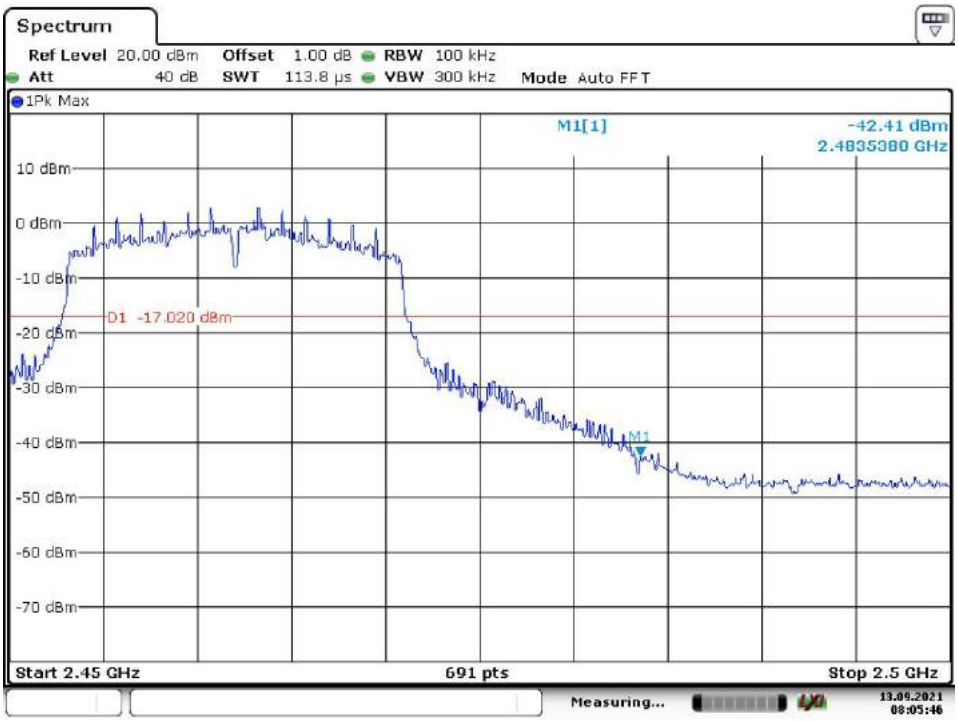
Ant1, Wi-Fi 802.11 n(HT20) mode, Band Edge
Low Channel



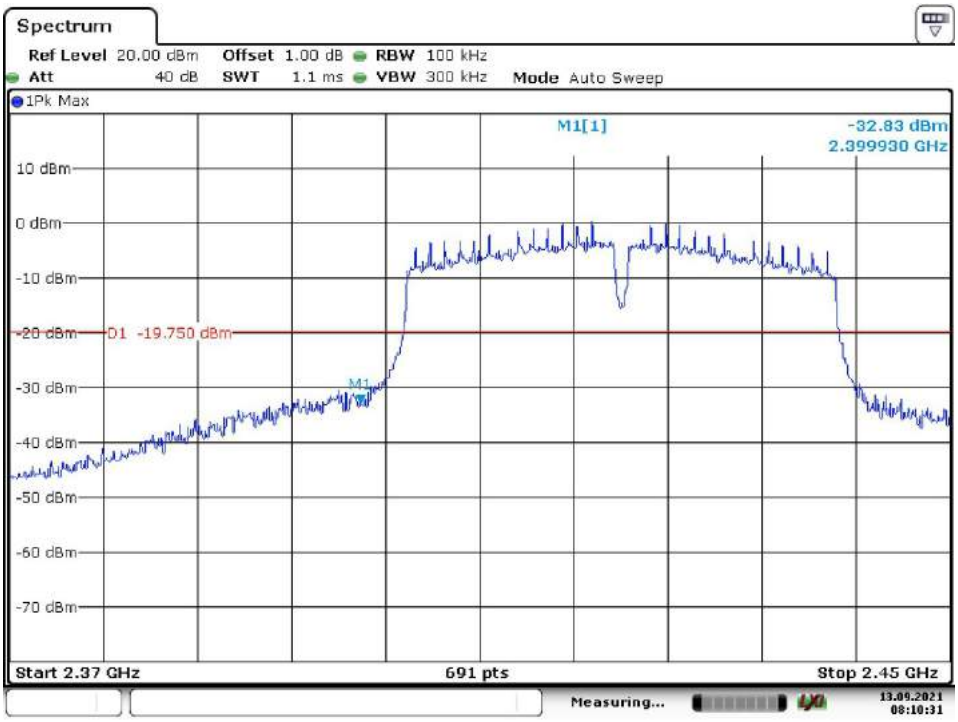
Date: 13.SEP.2021 07:58:53

High Channel



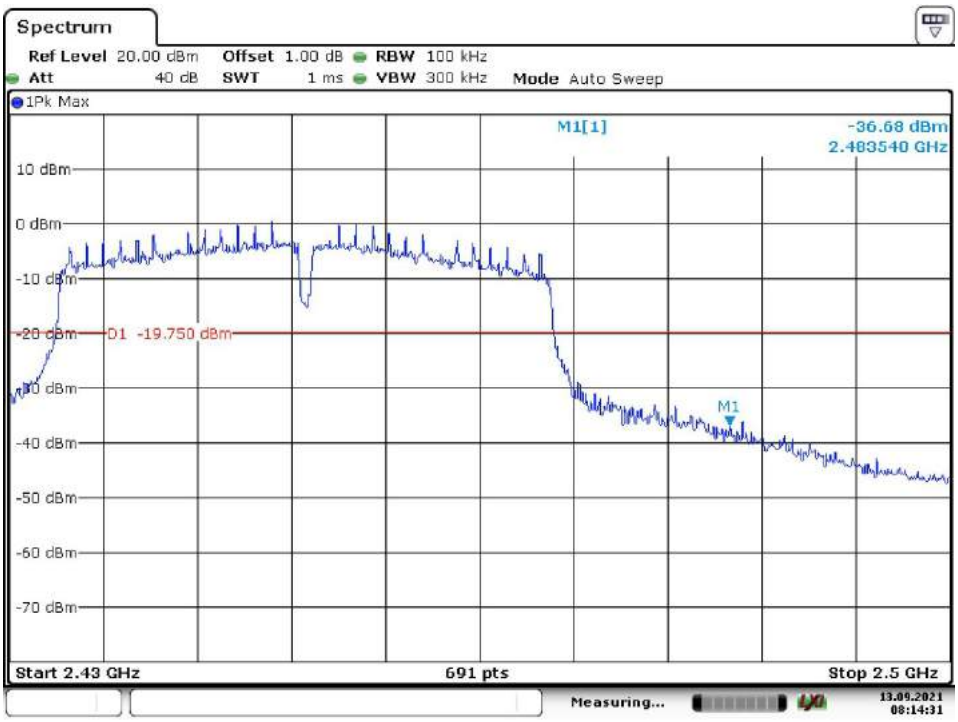
Date: 13.SEP.2021 08:05:46

Ant1, Wi-Fi 802.11 n(HT40) mode, Band Edge
Low Channel



Date: 13.SEP.2021 08:10:31

High Channel



Date: 13.SEP.2021 08:14:31

Appendix C: Test Results of Radiated Testing

APPENDIX C: TEST RESULTS OF RADIATED TESTING 1

APPENDIX C.1: TEST RESULTS OF RADIATED SPURIOUS EMISSIONS 2
Antenna model: SA05A01RA 2
Antenna model: 6147F00013 18
Antenna model: K7ABLG2G4ML400 22

APPENDIX C.2: TEST RESULTS OF RADIATED EMISSIONS IN RESTRICTED BANDS 26

ANTENNA MODEL: SA05A01RA 26
Wi-Fi 802.11 b mode, 1 Mbps 26
Wi-Fi 802.11 g mode, 6 Mbps 30
Wi-Fi 802.11 n(HT20) mode, MCS0 34
Wi-Fi 802.11 n(HT40) mode, MCS0 38

ANTENNA MODEL: 6147F00013 42
Wi-Fi 802.11 n(HT40) mode, MCS0 42

ANTENNA MODEL: K7ABLG2G4ML400 46
Wi-Fi 802.11 n(HT40) mode, MCS0 46

APPENDIX C.3: TEST RESULTS OF CONDUCTED EMISSION ON AC MAINS 50

Note 1: Testing was carried out within frequency range 9 kHz to the tenth harmonics. The measurement results below 30MHz and above 18GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.
Note 2: All test modes (802.11 b/g/n) have been pre-scanning test and only the worst case of test mode (802.11b) for Radiated Spurious Emissions were reported.
Note 3: All different configurations (16MB and 32MB flash) have been pre-scanning test and only the worst case of configurations (16MB) for Radiated Spurious Emissions were reported.

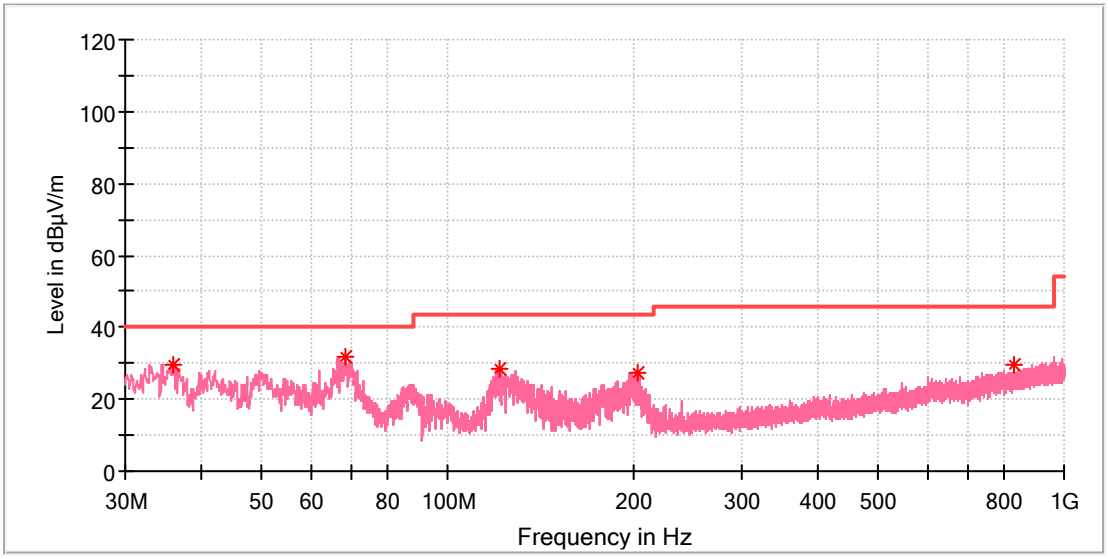
Appendix C.1: Test Results of Radiated Spurious Emissions

Antenna model: SA05A01RA

30MHz - 1GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

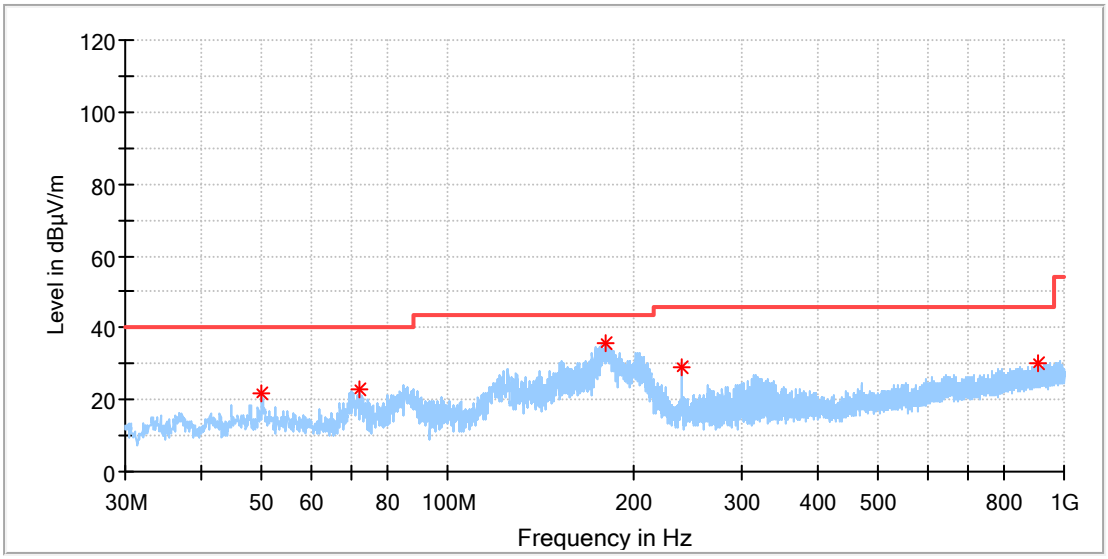


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.868500	29.73	40.00	10.27	100.0	V	129.0	-21.6
68.363500	31.79	40.00	8.21	100.0	V	19.0	-21.3
121.131500	28.25	43.50	15.25	100.0	V	231.0	-20.9
202.708500	27.49	43.50	16.01	100.0	V	347.0	-18.9
828.795000	29.31	46.00	16.69	100.0	V	0.0	-5.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

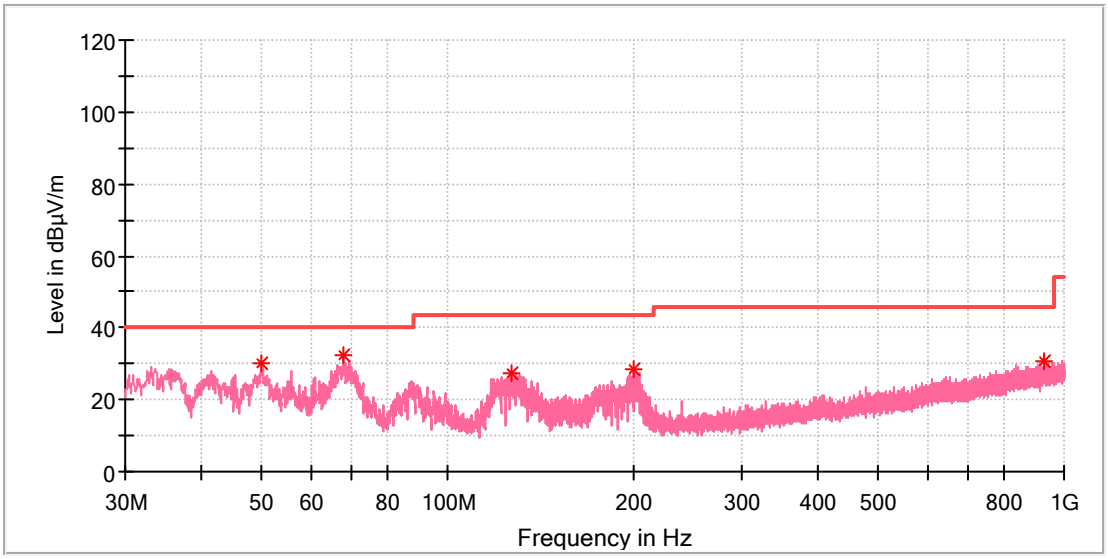


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
50.030500	21.95	40.00	18.05	100.0	H	157.0	-18.3
71.855500	23.14	40.00	16.86	100.0	H	203.0	-22.4
180.350000	35.67	43.50	7.83	100.0	H	140.0	-20.5
240.005000	28.78	46.00	17.22	100.0	H	303.0	-17.7
904.843000	30.33	46.00	15.67	100.0	H	107.0	-5.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

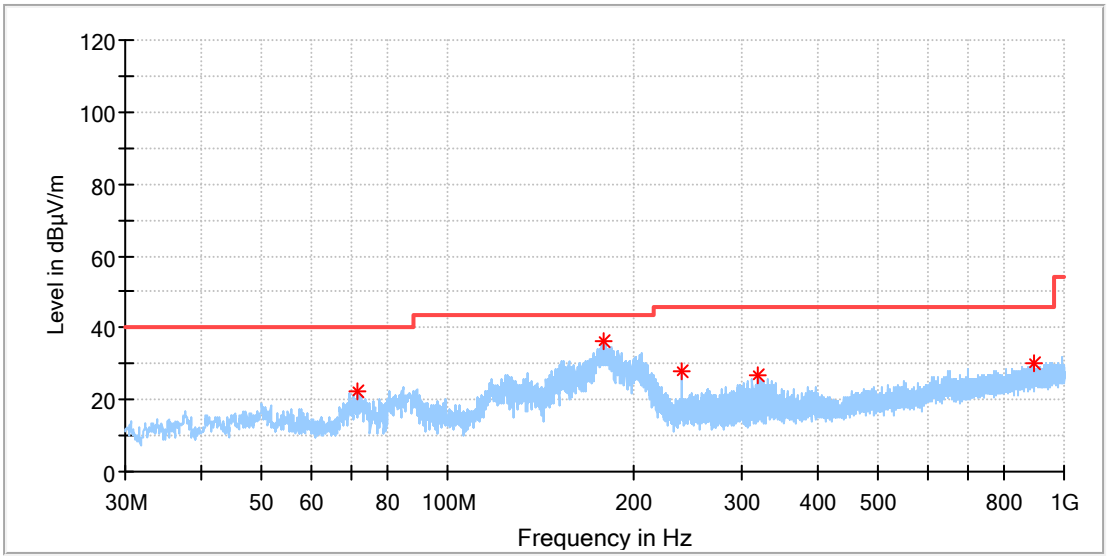


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
49.982000	29.91	40.00	10.09	100.0	V	279.0	-18.3
67.781500	32.13	40.00	7.87	100.0	V	4.0	-21.1
126.612000	27.61	43.50	15.89	100.0	V	222.0	-21.5
199.992500	28.23	43.50	15.27	100.0	V	332.0	-19.0
927.589500	30.55	46.00	15.45	100.0	V	92.0	-4.7

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



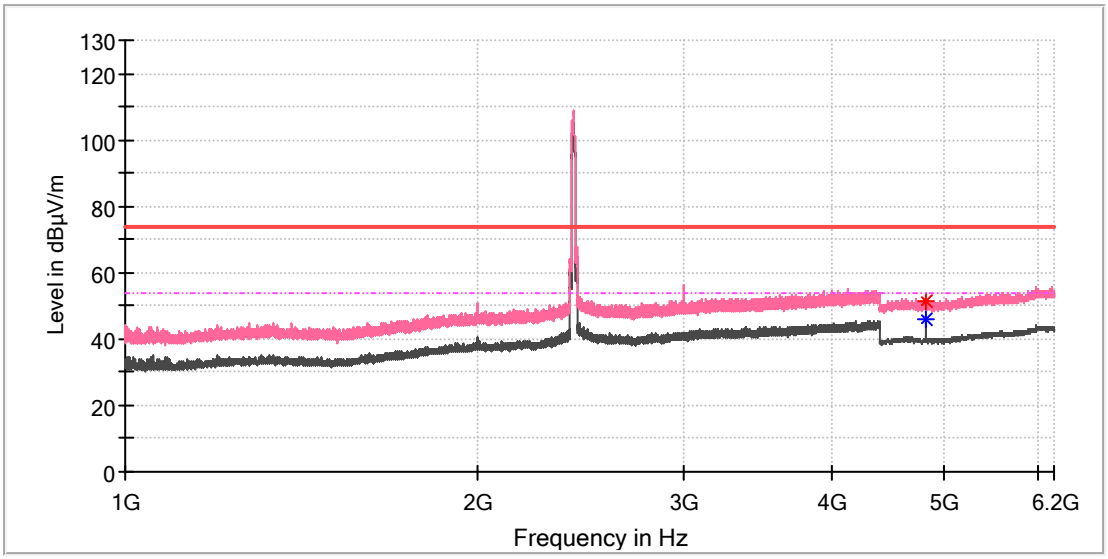
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
71.613000	22.30	40.00	17.70	100.0	H	182.0	-22.4
179.622500	36.34	43.50	7.16	100.0	H	154.0	-20.6
240.005000	27.93	46.00	18.07	100.0	H	300.0	-17.7
318.429500	26.82	46.00	19.18	100.0	H	261.0	-15.8
897.083000	30.19	46.00	15.81	100.0	H	77.0	-5.0

1GHz - 6.2GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

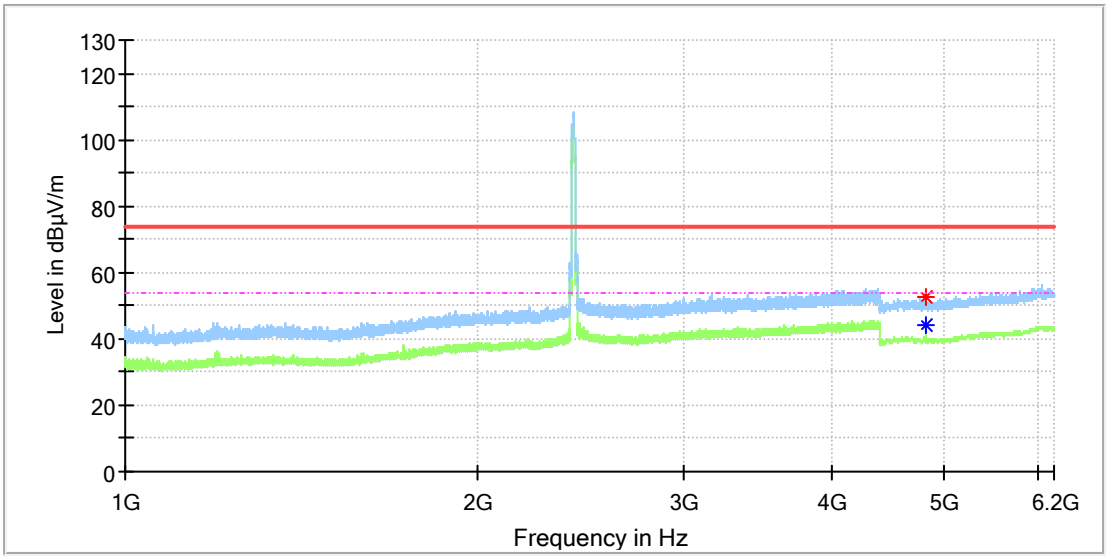


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4823.500000	51.70	---	74.00	22.30	100.0	V	259.0	11.8
4824.000000	---	45.69	54.00	8.32	100.0	V	251.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

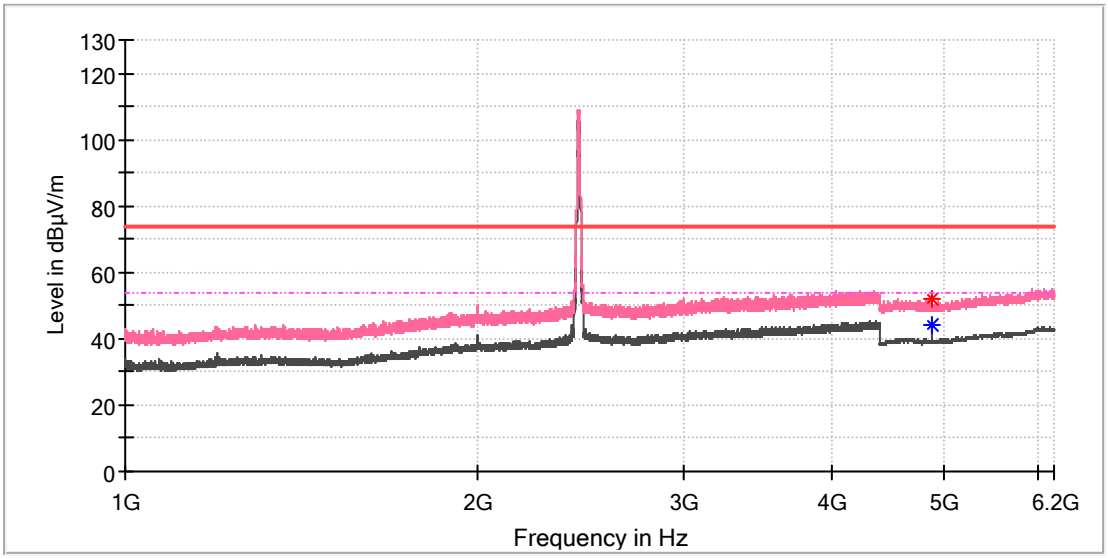


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4821.500000	52.37	---	74.00	21.63	100.0	H	20.0	11.8
4824.000000	---	43.96	54.00	10.04	100.0	H	294.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch6
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

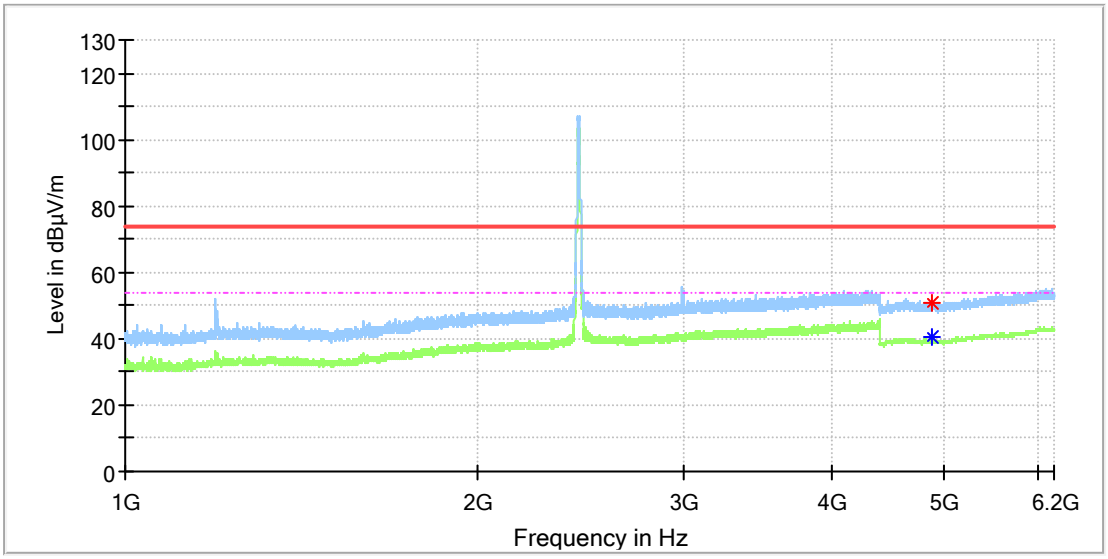


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4874.000000	51.84	---	74.00	22.16	100.0	V	262.0	11.8
4874.000000	---	44.05	54.00	9.95	100.0	V	262.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch6
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

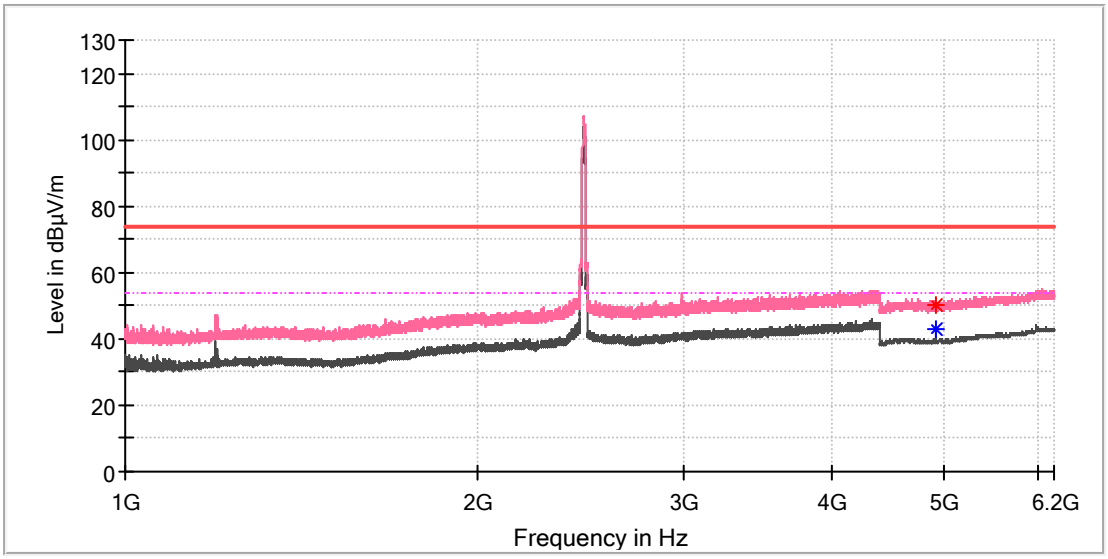


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4874.000000	---	40.50	54.00	13.50	100.0	H	77.0	11.8
4878.000000	50.78	---	74.00	23.22	100.0	H	285.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

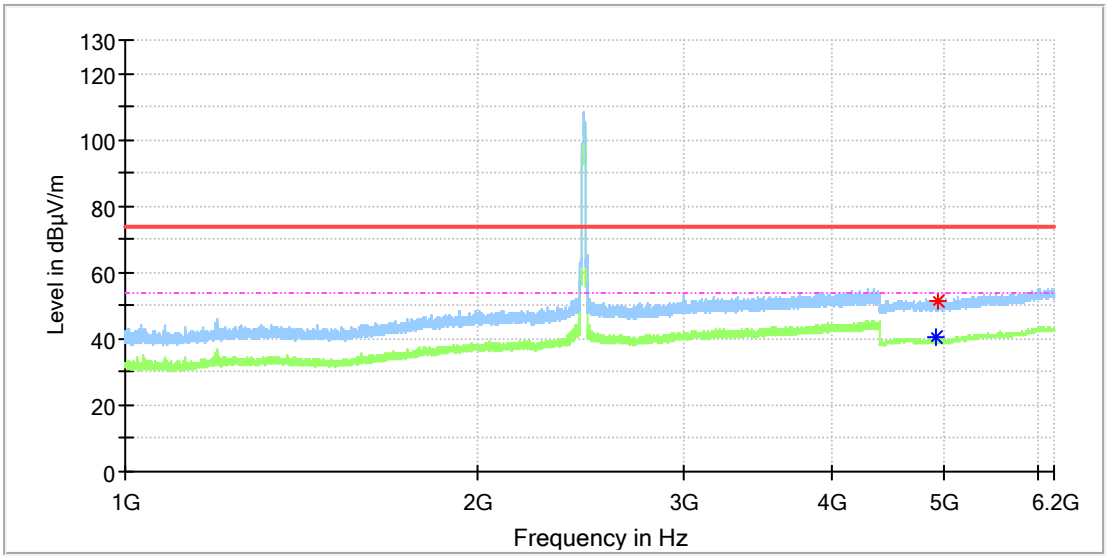


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4923.500000	50.24	---	74.00	23.76	100.0	V	74.0	11.8
4924.000000	---	43.07	54.00	10.93	100.0	V	257.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



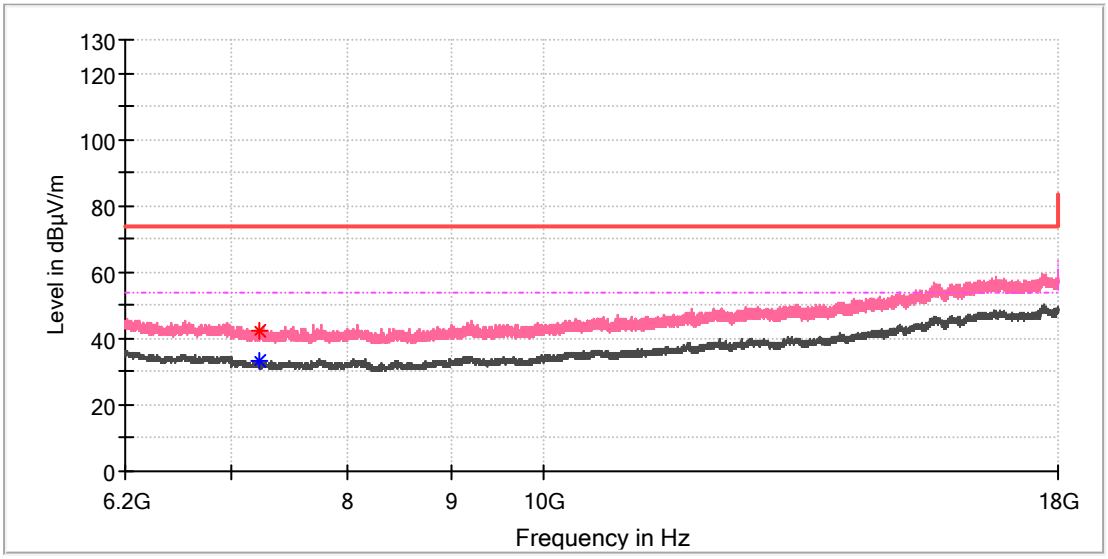
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4923.500000	---	40.69	54.00	13.31	100.0	H	16.0	11.8
4939.500000	51.47	---	74.00	22.53	100.0	H	29.0	11.8

6.2GHz - 18GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

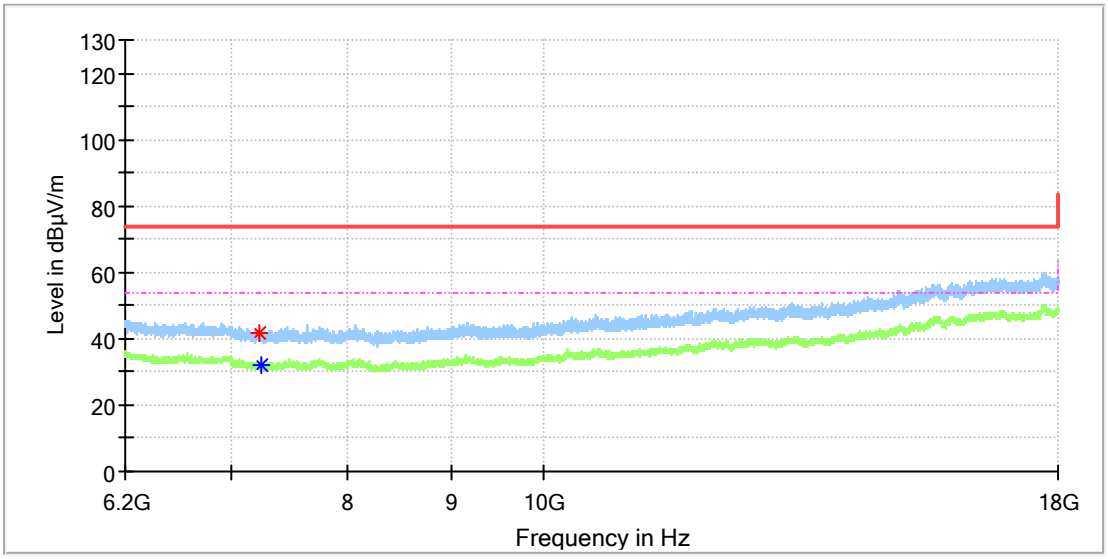


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7234.466667	42.32	---	74.00	31.68	100.0	V	37.0	8.6
7234.958333	---	33.45	54.00	20.55	100.0	V	191.0	8.6

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

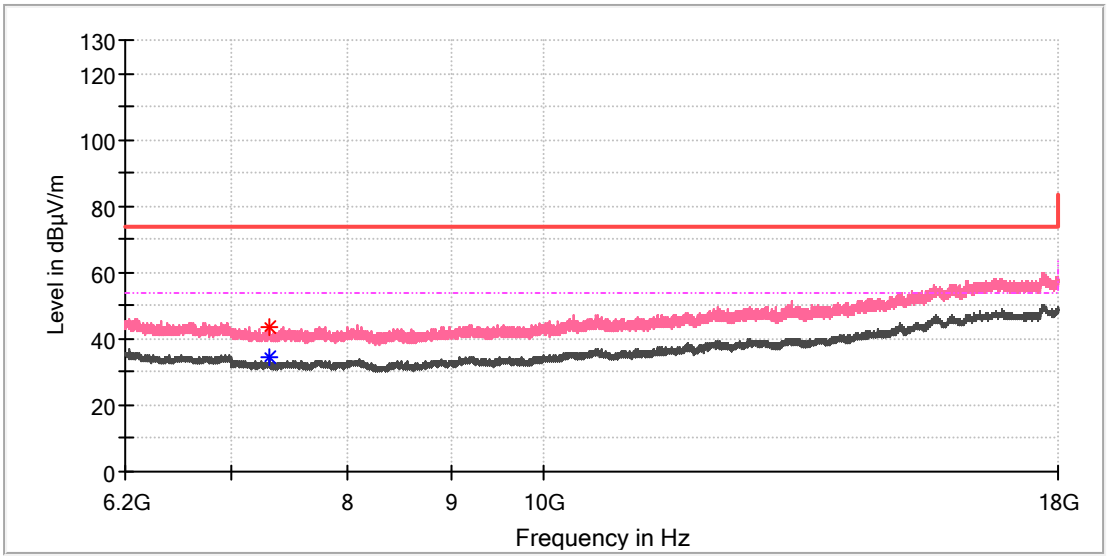


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7230.533333	41.49	---	74.00	32.51	100.0	H	142.0	8.6
7245.775000	---	32.21	54.00	21.79	100.0	H	295.0	8.6

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch6
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

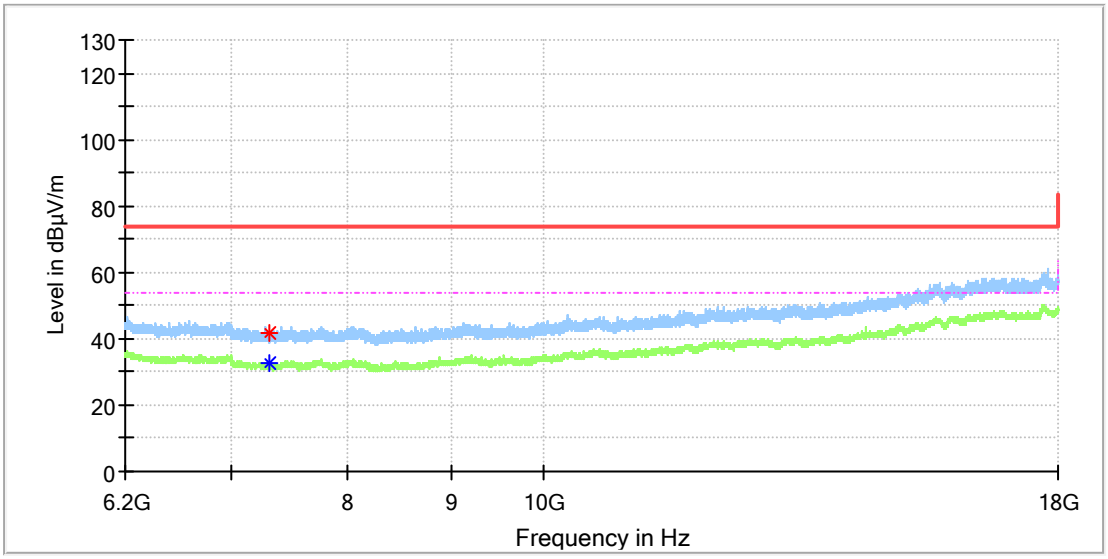


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7308.708333	43.29	---	74.00	30.71	100.0	V	48.0	8.2
7311.166667	---	34.72	54.00	19.28	100.0	V	48.0	8.2

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch6
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

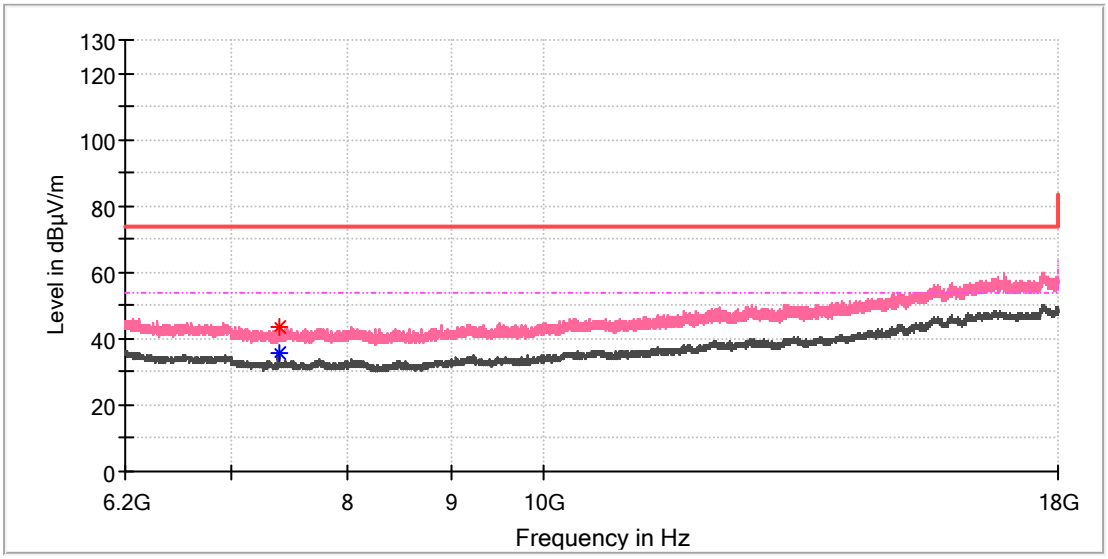


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7305.266667	---	32.42	54.00	21.58	100.0	H	354.0	8.3
7311.658333	41.67	---	74.00	32.33	100.0	H	249.0	8.2

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

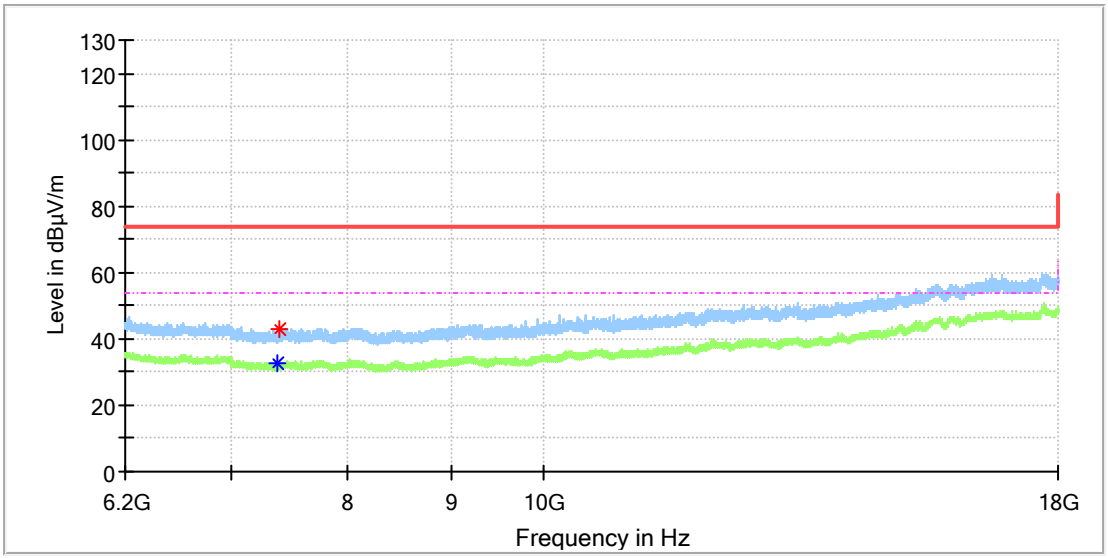


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7387.375000	43.69	---	74.00	30.31	100.0	V	51.0	8.2
7387.375000	---	35.44	54.00	18.56	100.0	V	51.0	8.2

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

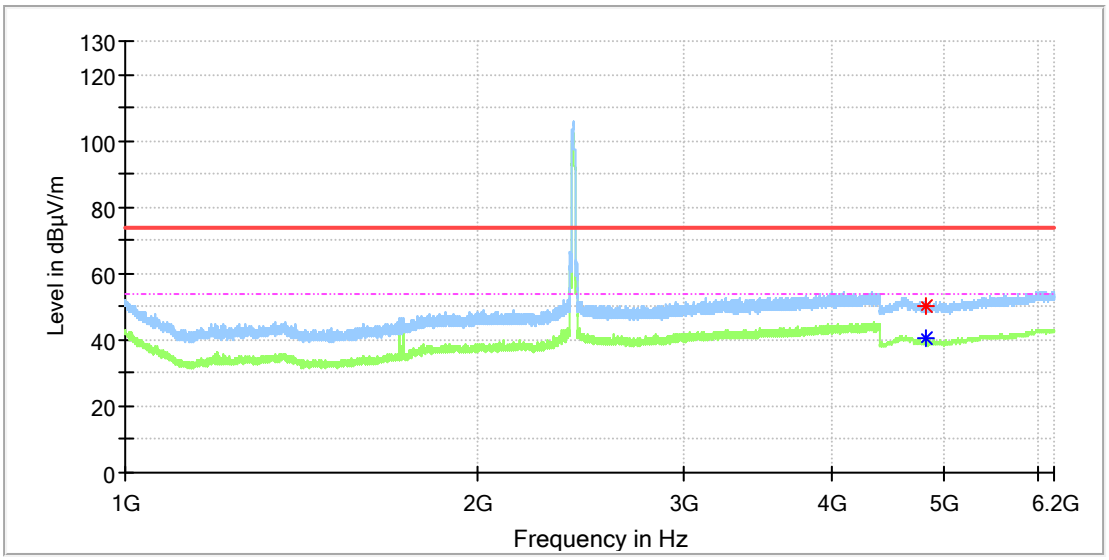
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7385.408333	---	32.46	54.00	21.54	100.0	H	241.0	8.2
7392.783333	42.67	---	74.00	31.33	100.0	H	116.0	8.3

Antenna model: 6147F00013

Wi-Fi 802.11 b mode, 1 Mbps
1GHz - 6.2GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

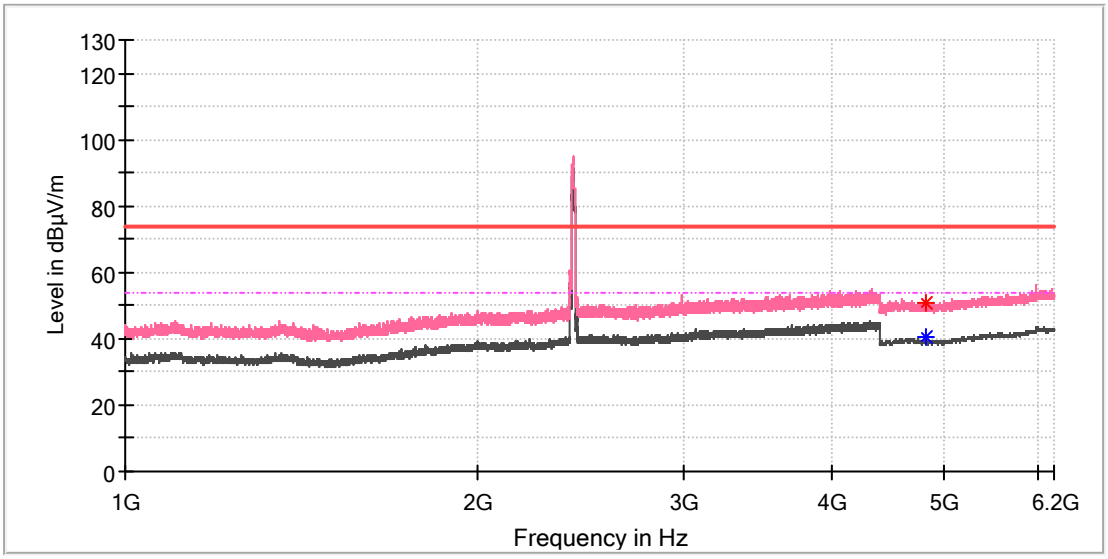


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4823.000000	50.48	---	74.00	23.52	100.0	H	307.0	11.8
4824.000000	---	40.62	54.00	13.38	100.0	H	82.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



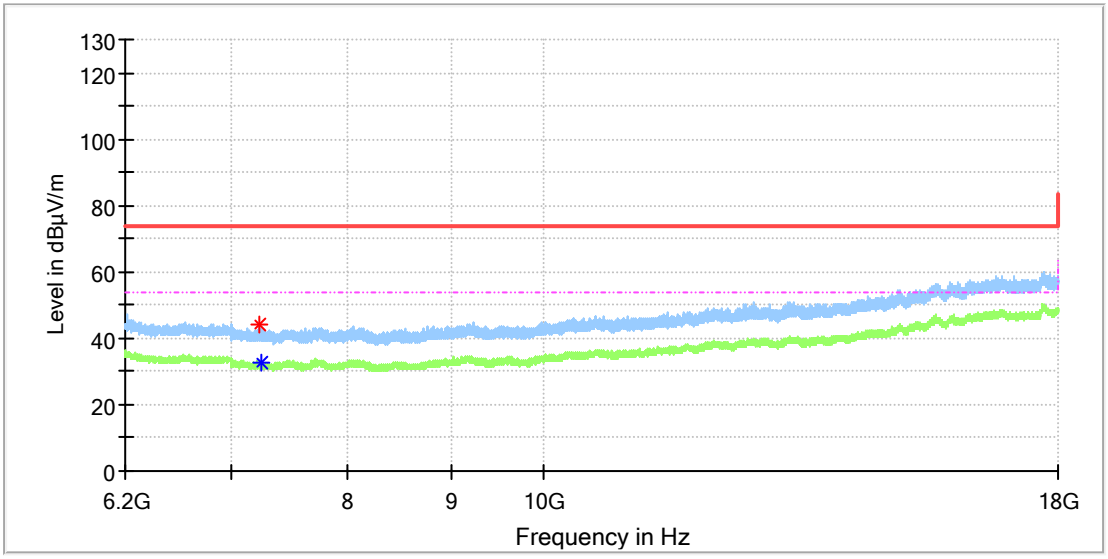
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4822.500000	50.77	---	74.00	23.23	100.0	V	311.0	11.8
4824.000000	---	40.59	54.00	13.41	100.0	V	229.0	11.8

6.2GHz - 18GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

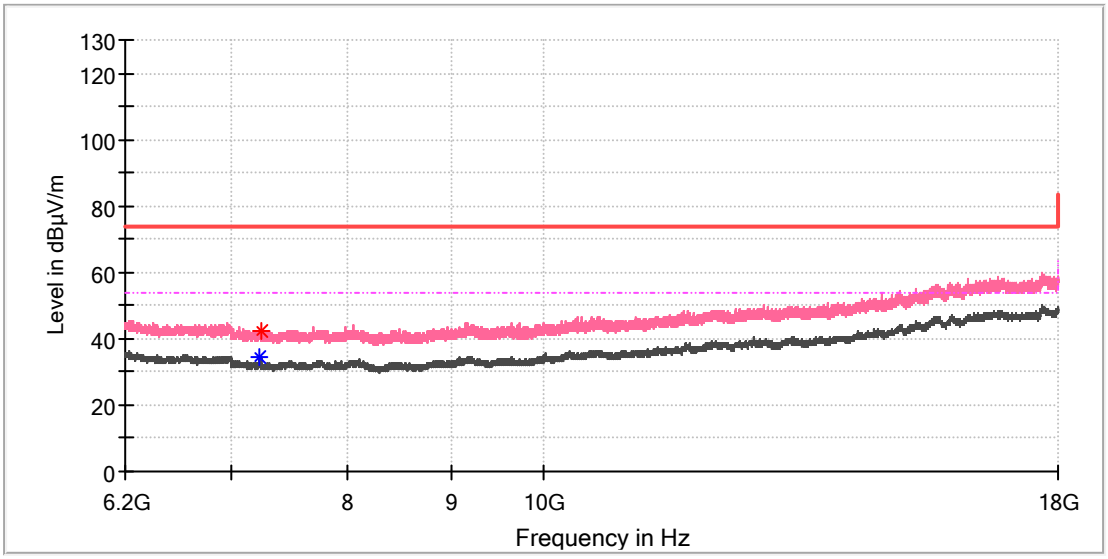


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7225.616667	44.15	---	74.00	29.85	100.0	H	47.0	8.7
7241.350000	---	32.59	54.00	21.41	100.0	H	174.0	8.6

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

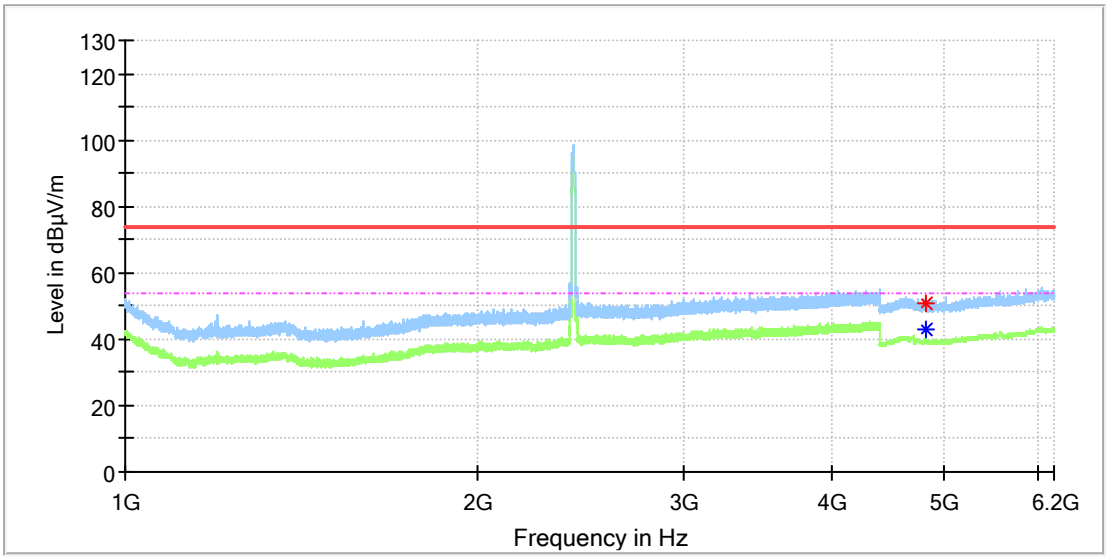
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7232.991667	---	34.45	54.00	19.55	100.0	V	336.0	8.6
7237.416667	42.30	---	74.00	31.70	100.0	V	336.0	8.6

Antenna model: K7ABLG2G4ML400

Wi-Fi 802.11 b mode, 1 Mbps
1GHz - 6.2GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

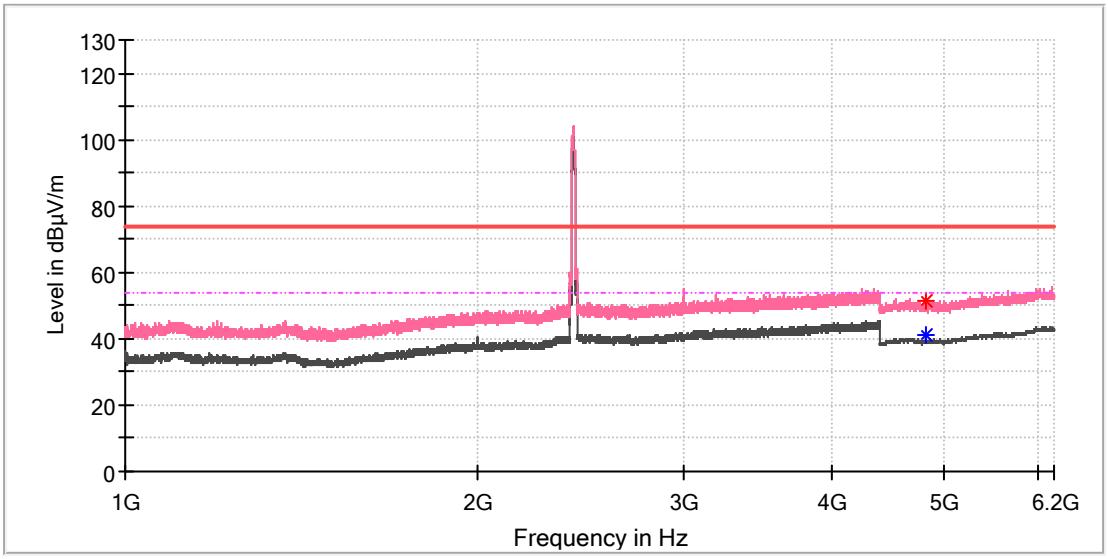


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4823.500000	51.01	---	74.00	22.99	100.0	H	70.0	11.8
4824.000000	---	42.97	54.00	11.03	100.0	H	84.0	11.8

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



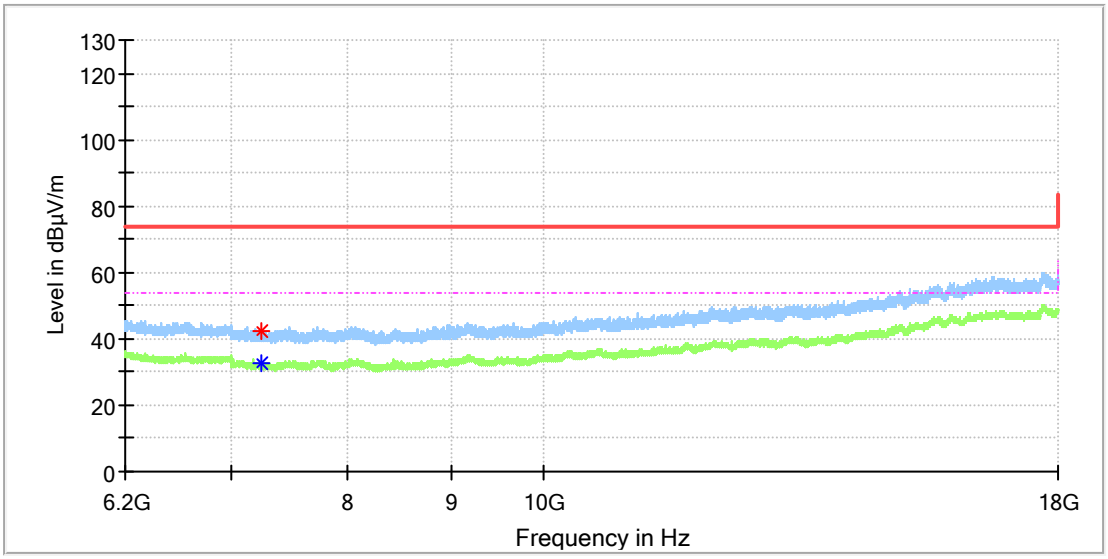
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4820.000000	51.25	---	74.00	22.75	100.0	V	84.0	11.8
4824.000000	---	41.36	54.00	12.64	100.0	V	71.0	11.8

6.2GHz - 18GHz

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

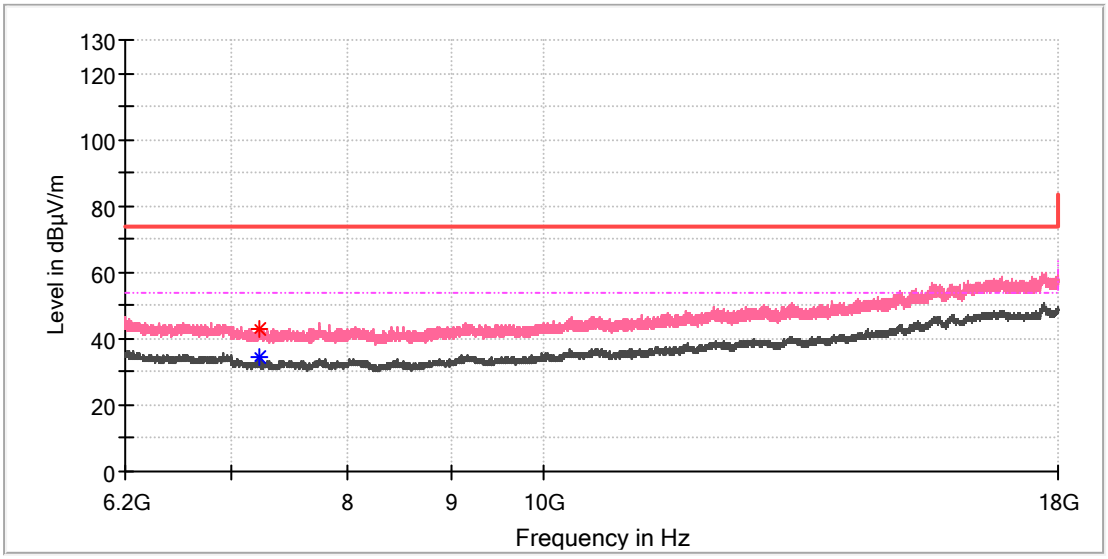


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7235.450000	42.34	---	74.00	31.66	100.0	H	174.0	8.6
7241.841667	---	32.68	54.00	21.32	100.0	H	102.0	8.6

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

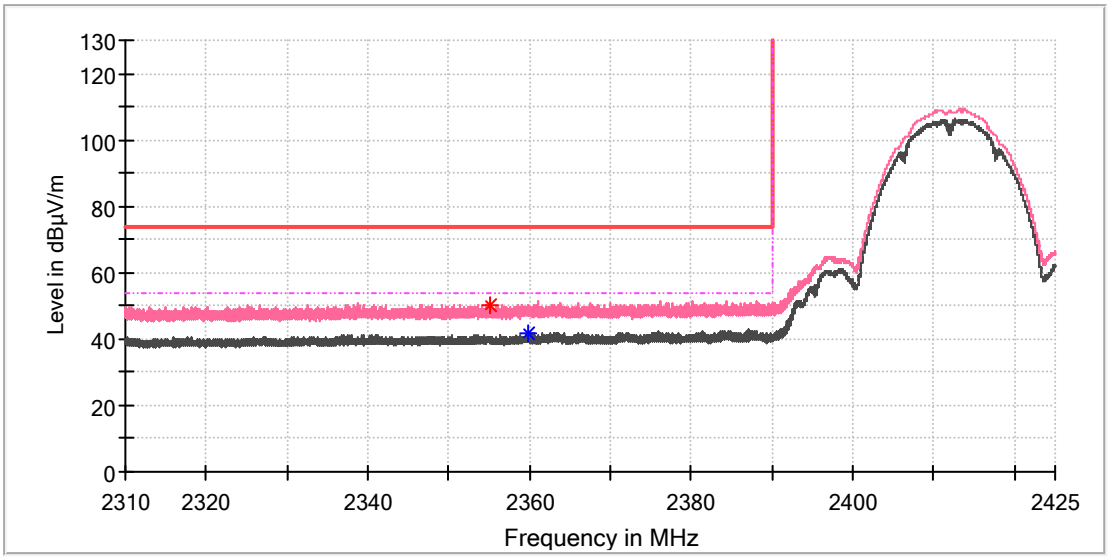
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7234.466667	42.96	---	74.00	31.04	100.0	V	311.0	8.6
7234.466667	---	34.45	54.00	19.55	100.0	V	311.0	8.6

Appendix C.2: Test Results of Radiated Emissions in Restricted Bands

Antenna model: SA05A01RA
Wi-Fi 802.11 b mode, 1 Mbps
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

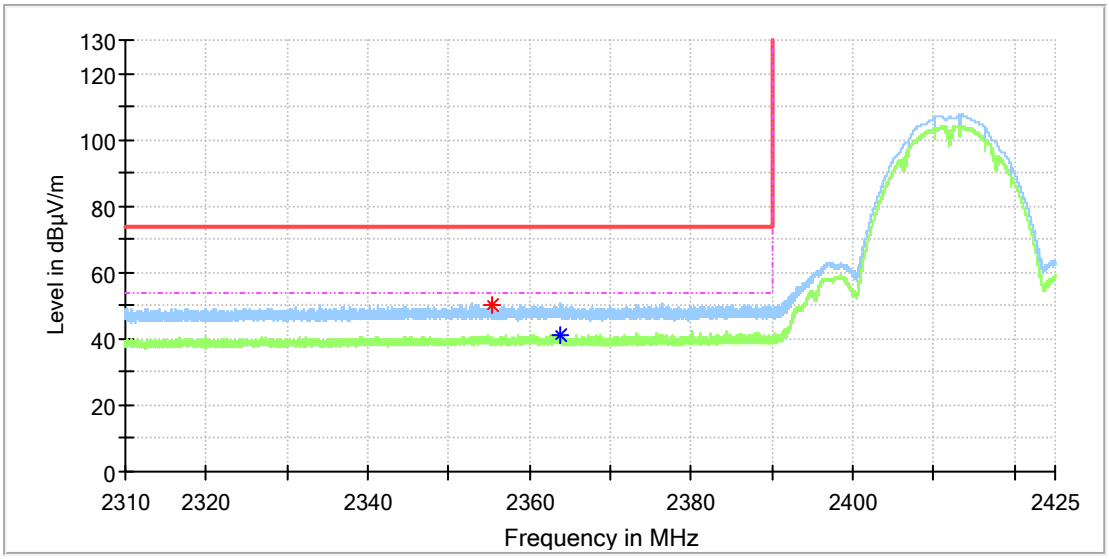


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2354.993750	50.05	---	74.00	23.95	100.0	V	0.0	6.9
2359.875500	---	41.82	54.00	12.18	100.0	V	205.0	6.9

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



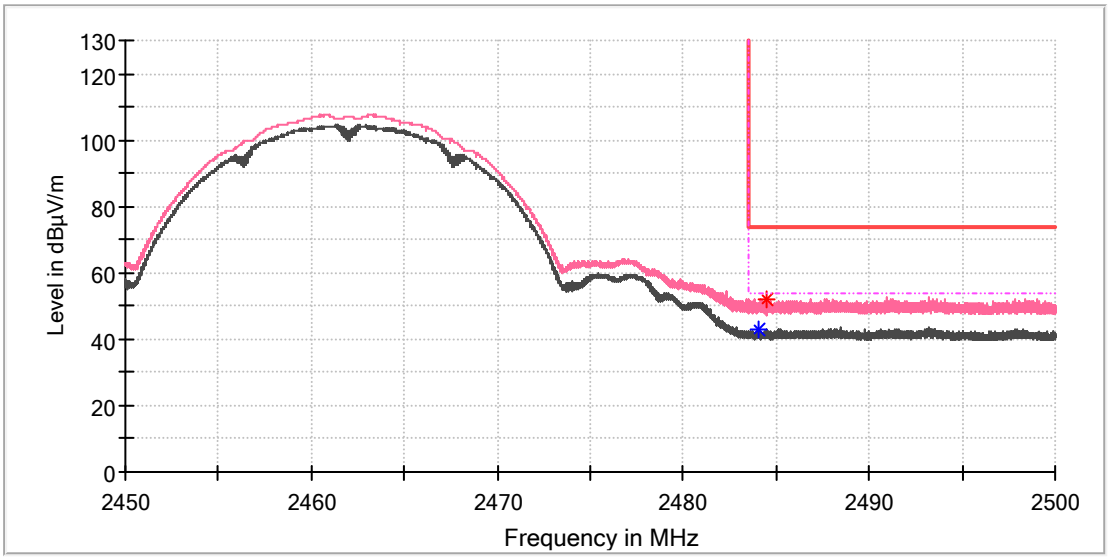
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2355.442250	50.32	---	74.00	23.68	100.0	H	288.0	6.9
2363.728000	---	41.28	54.00	12.72	100.0	H	111.0	6.9

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

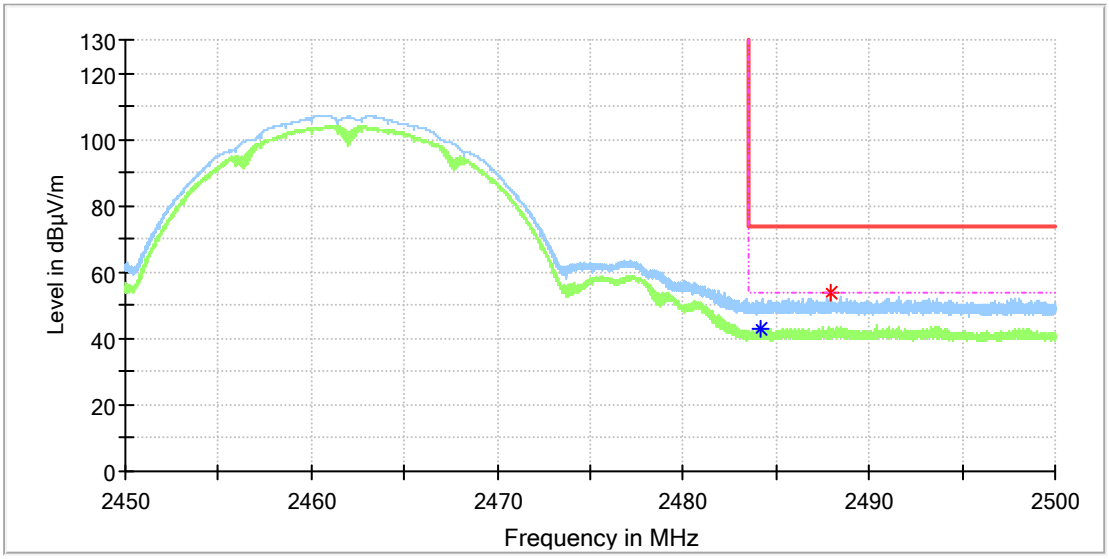


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.067500	---	42.81	54.00	11.19	100.0	V	185.0	7.4
2484.430000	51.82	---	74.00	22.18	100.0	V	286.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11b_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



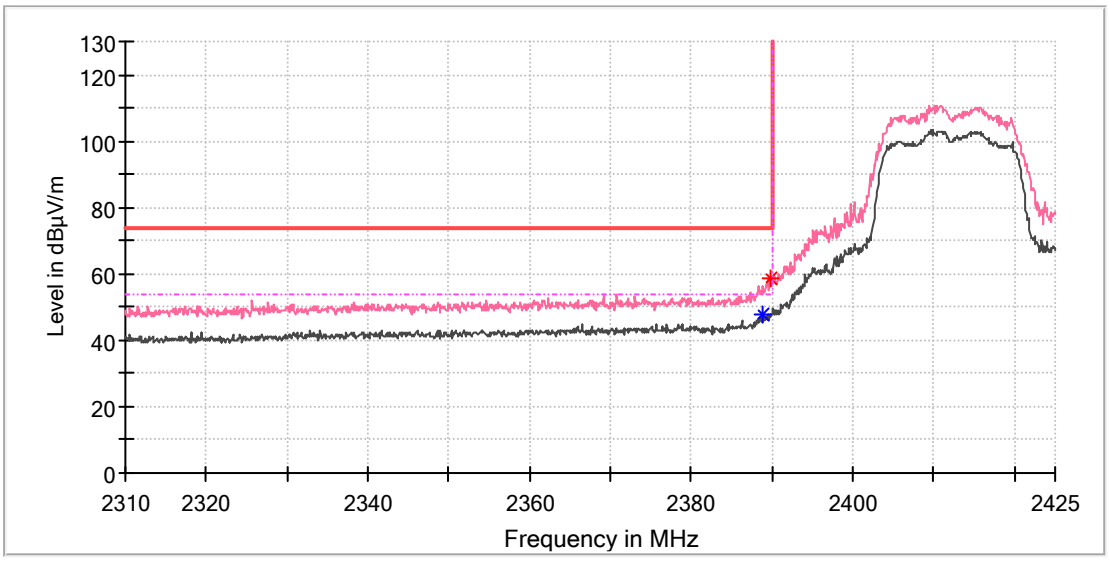
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.110000	---	42.80	54.00	11.20	100.0	H	118.0	7.4
2487.945000	54.07	---	74.00	19.93	100.0	H	96.0	7.4

Wi-Fi 802.11 g mode, 6 Mbps
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11g_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

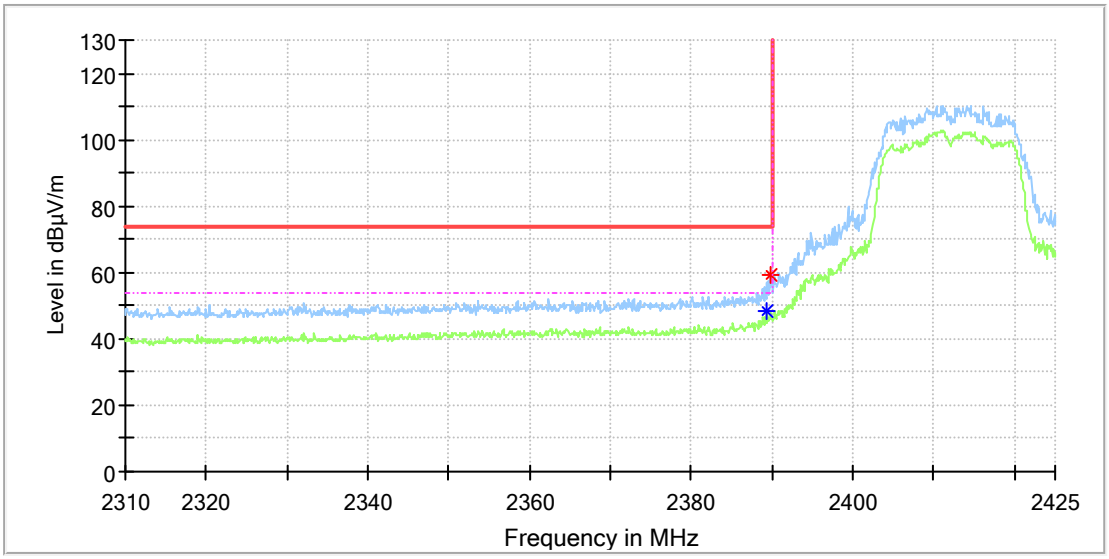


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.900000	---	47.51	54.00	6.49	100.0	V	346.0	7.0
2389.700000	58.95	---	74.00	15.05	100.0	V	2.0	7.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11g_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



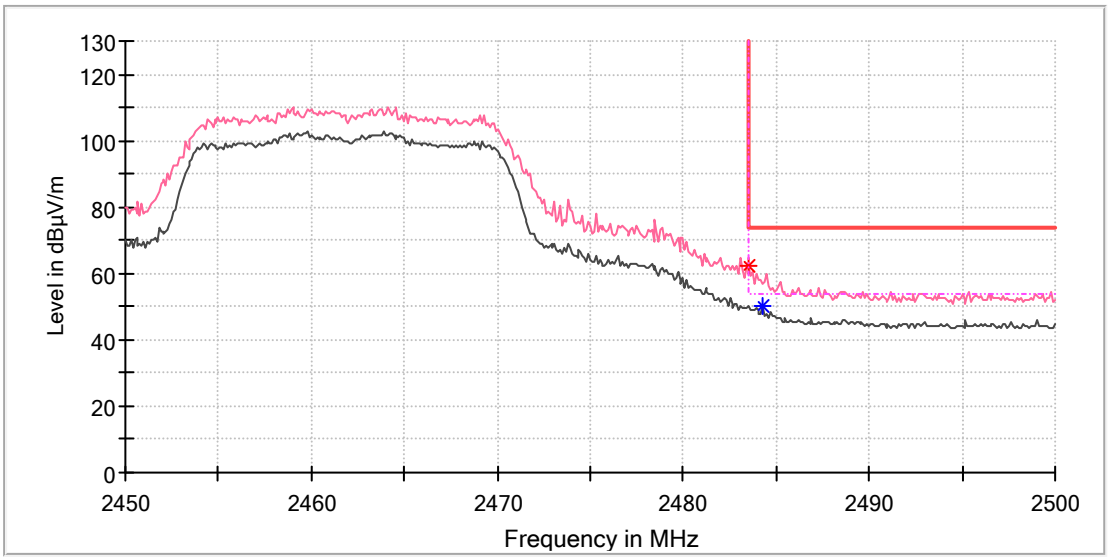
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.400000	---	48.24	54.00	5.76	100.0	H	0.0	7.0
2389.800000	59.29	---	74.00	14.71	100.0	H	0.0	7.0

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11g_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

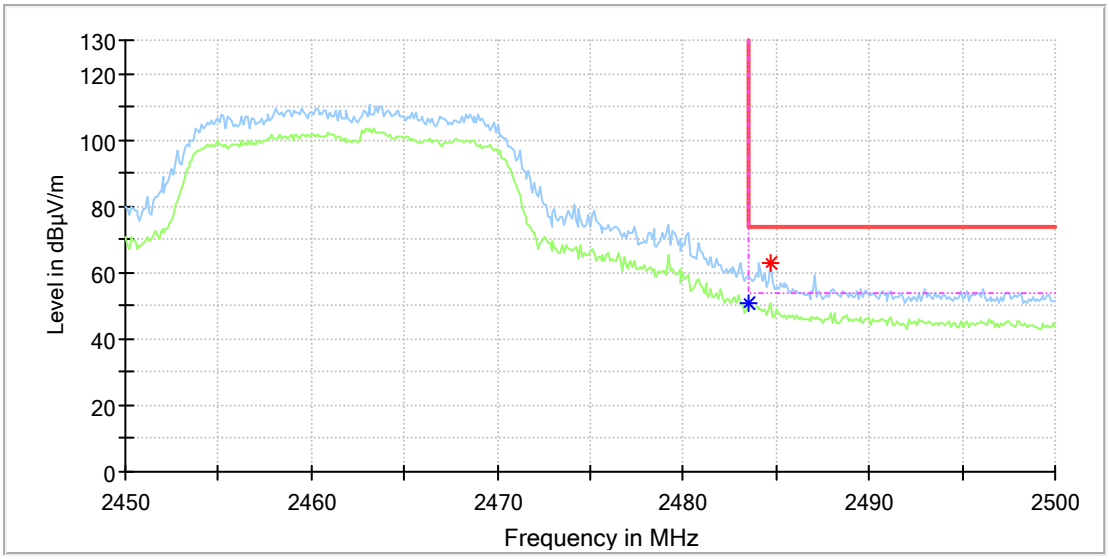


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	62.05	---	74.00	11.95	100.0	V	213.0	7.4
2484.300000	---	50.31	54.00	3.69	100.0	V	63.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11g_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



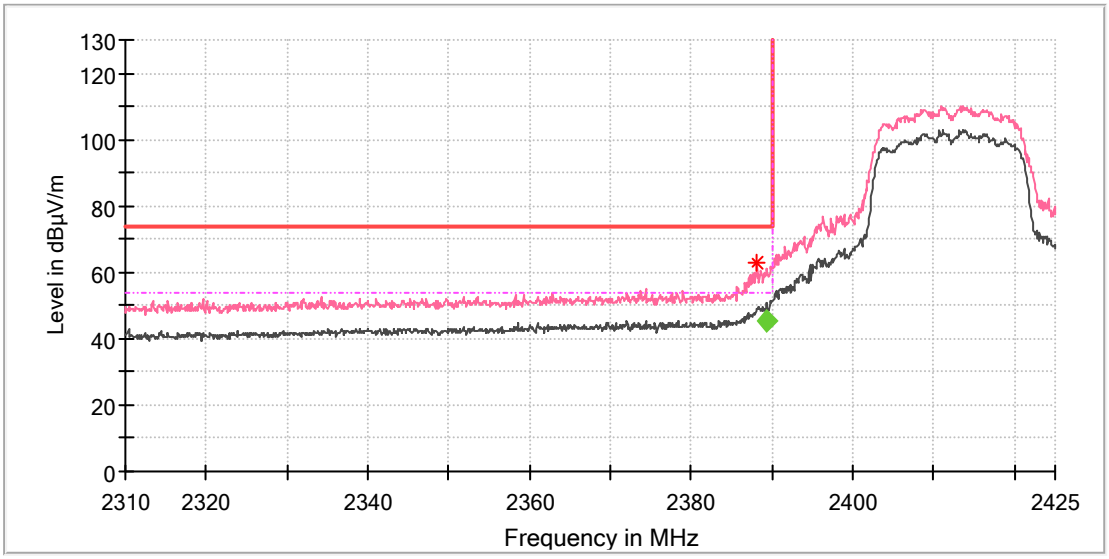
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.500000	---	50.89	54.00	3.11	100.0	H	111.0	7.4
2484.700000	63.07	---	74.00	10.93	100.0	H	132.0	7.4

Wi-Fi 802.11 n(HT20) mode, MCS0
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n20_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

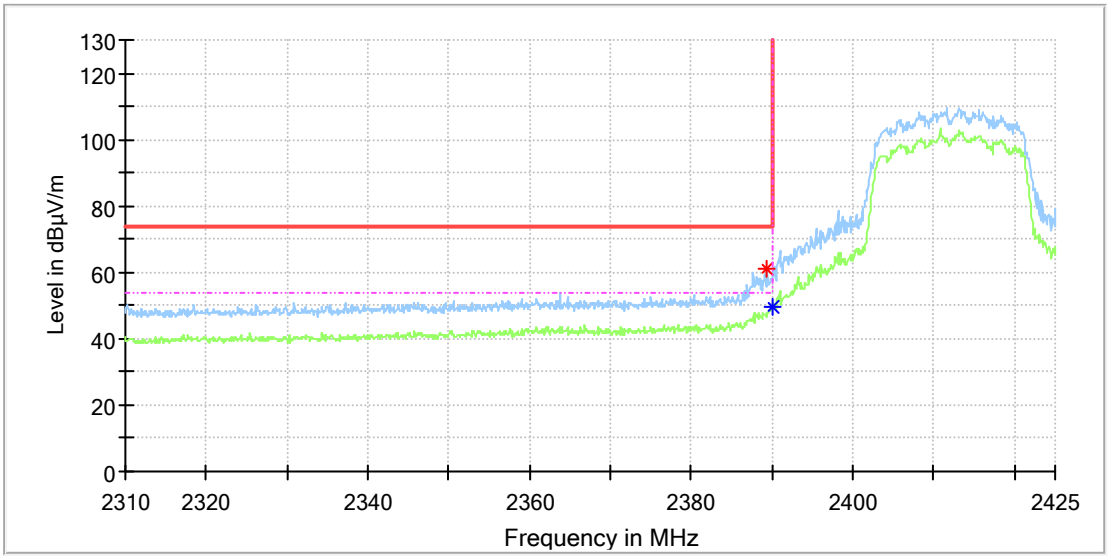


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.100000	62.80	---	74.00	11.20	100.0	V	337.0	7.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n20_Ch1
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



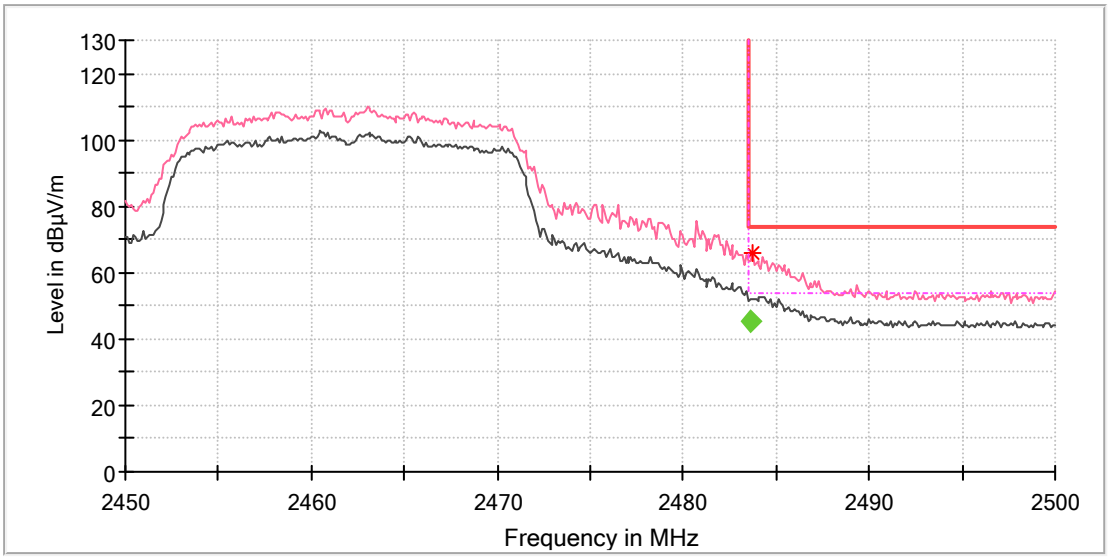
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.400000	61.07	---	74.00	12.93	100.0	H	102.0	7.0
2390.000000	---	49.78	54.00	4.22	100.0	H	102.0	7.0

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n20_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

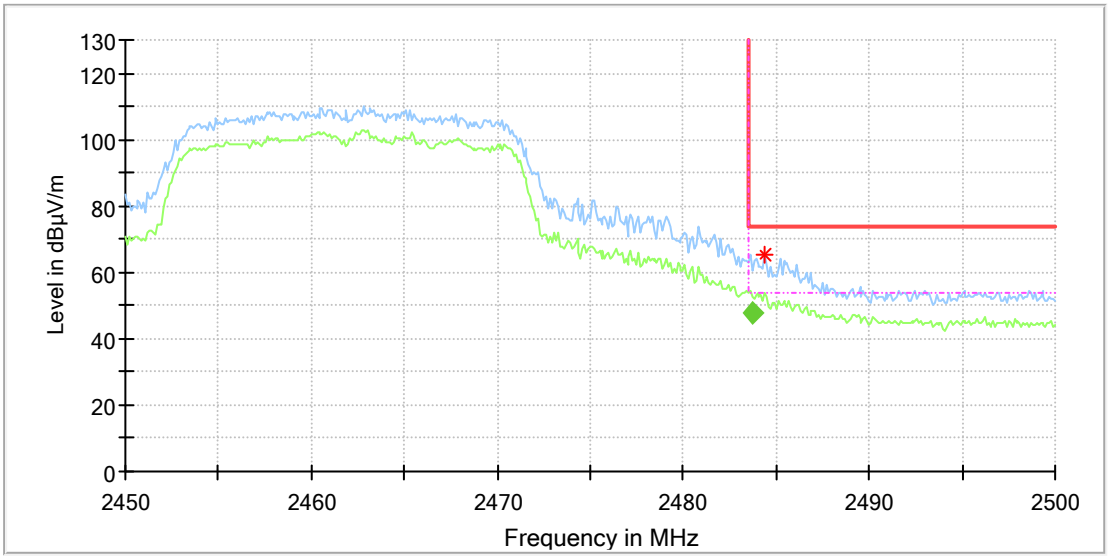


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.700000	66.09	---	74.00	7.91	100.0	V	233.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n20_Ch11
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



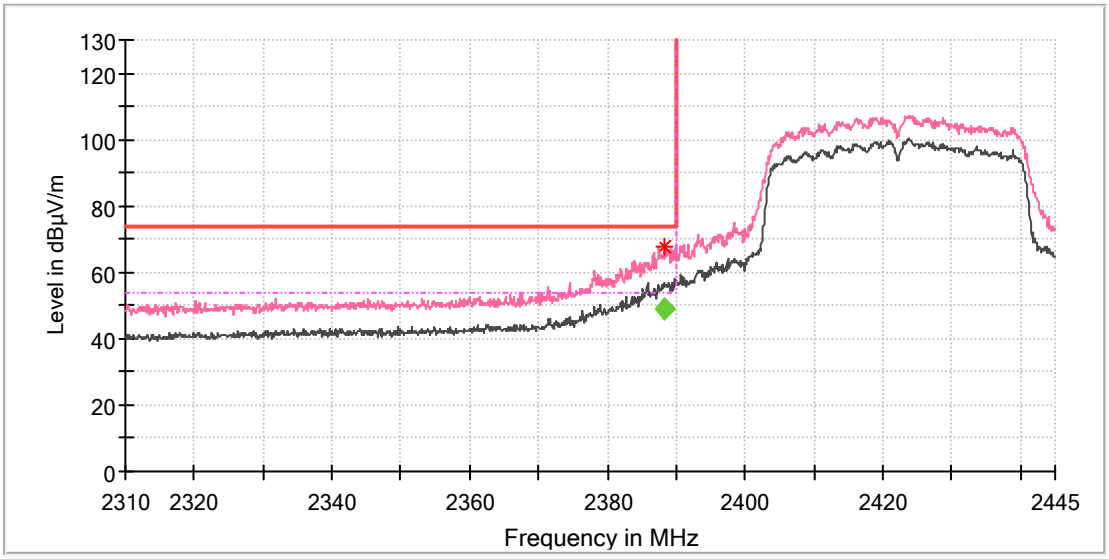
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.400000	65.09	---	74.00	8.91	100.0	H	120.0	7.4

Wi-Fi 802.11 n(HT40) mode, MCS0
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

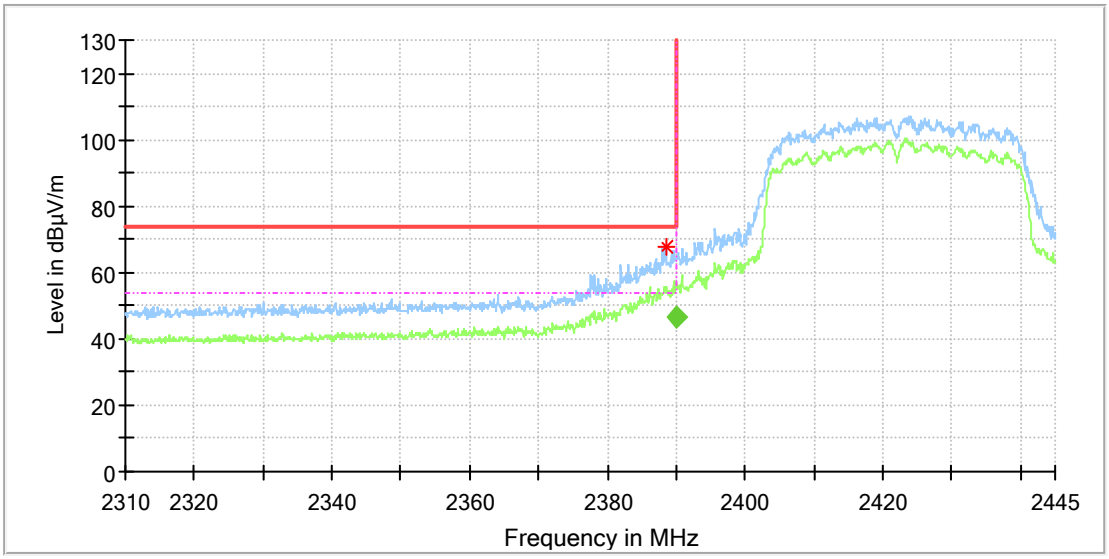


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.400000	67.96	---	74.00	6.04	100.0	V	3.0	7.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



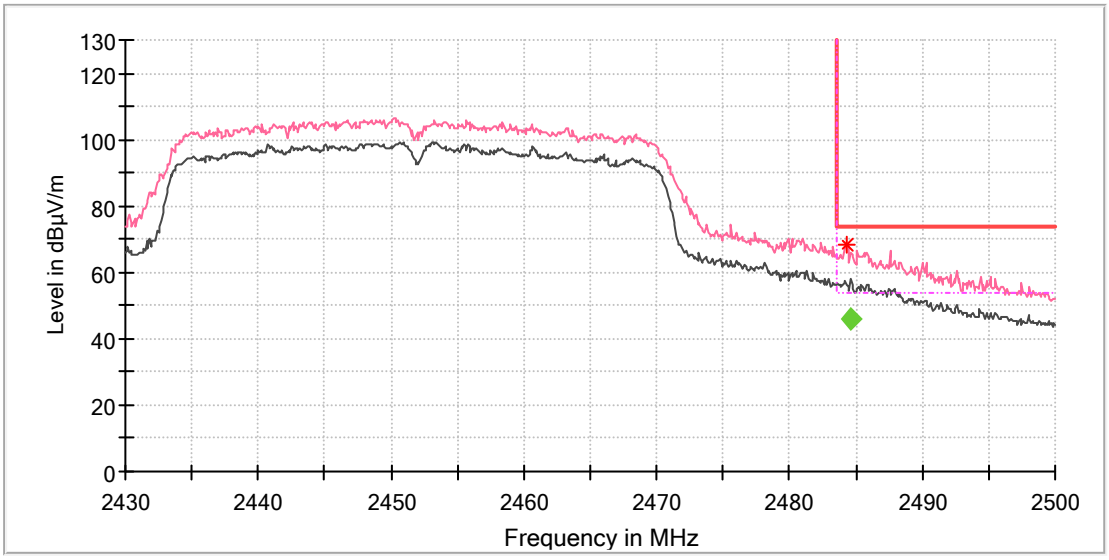
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.500000	67.67	---	74.00	6.33	100.0	H	0.0	7.0

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

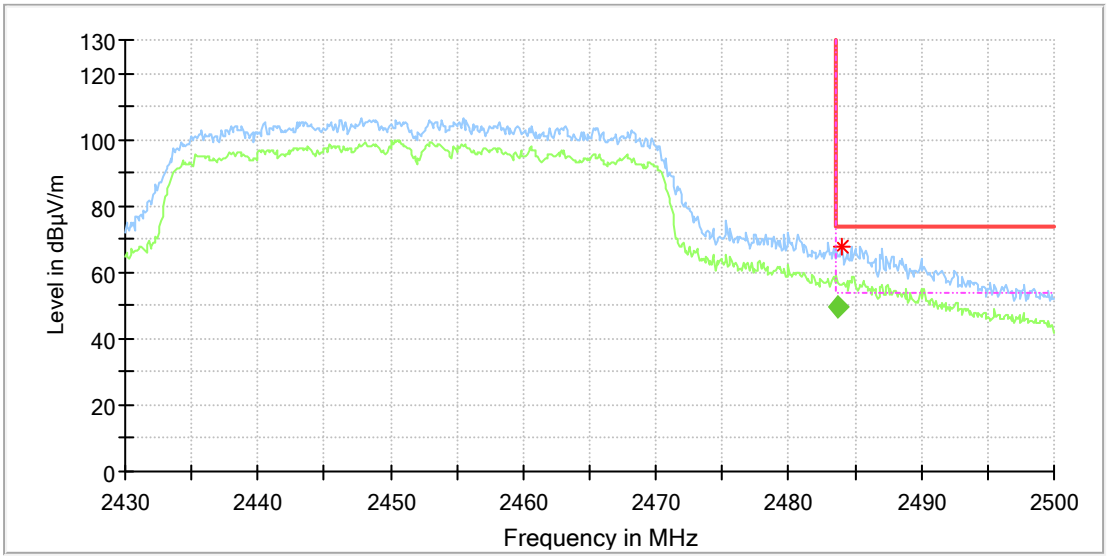


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.300000	68.49	---	74.00	5.51	100.0	V	71.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.000000	67.80	---	74.00	6.20	100.0	H	128.0	7.4

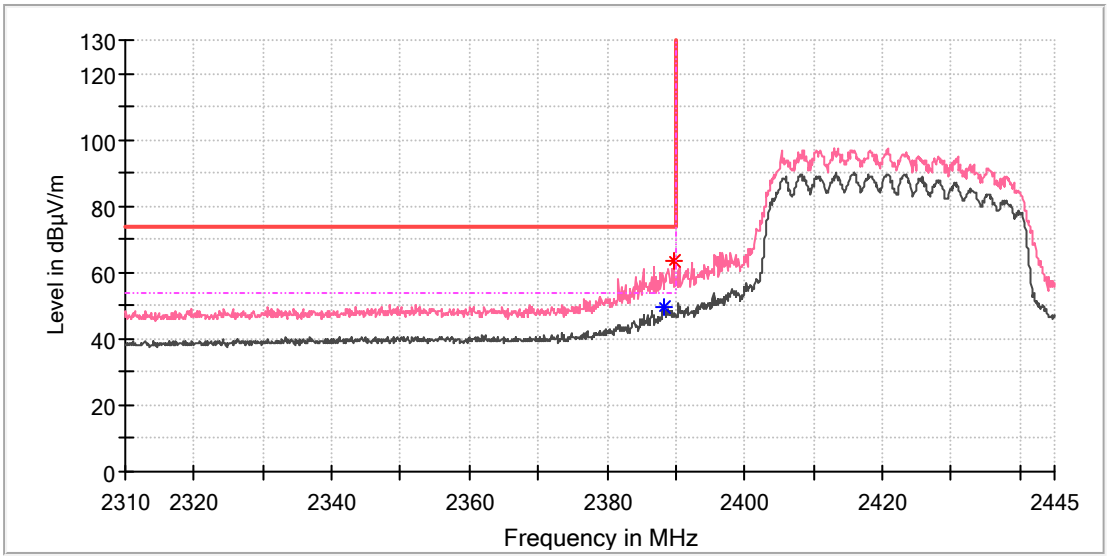
Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.772900	49.37	54.00	4.63	100.0	H	97.0	7.4

Antenna model: 6147F00013
Wi-Fi 802.11 n(HT40) mode, MCS0
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

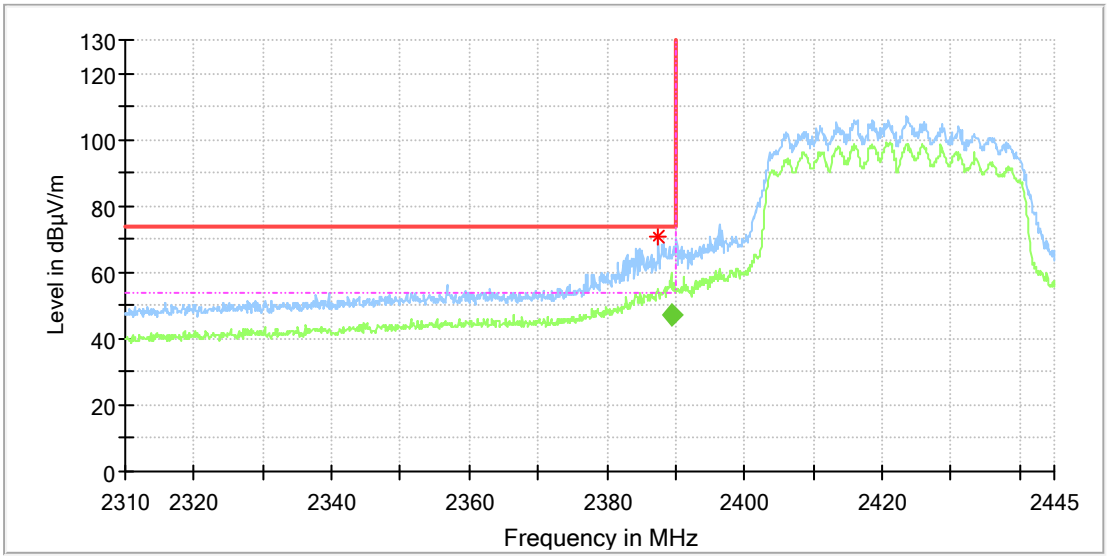


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.200000	---	49.53	54.00	4.47	100.0	V	277.0	7.0
2389.700000	63.45	---	74.00	10.55	100.0	V	0.0	7.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2387.500000	70.88	---	74.00	3.12	100.0	H	40.0	7.0

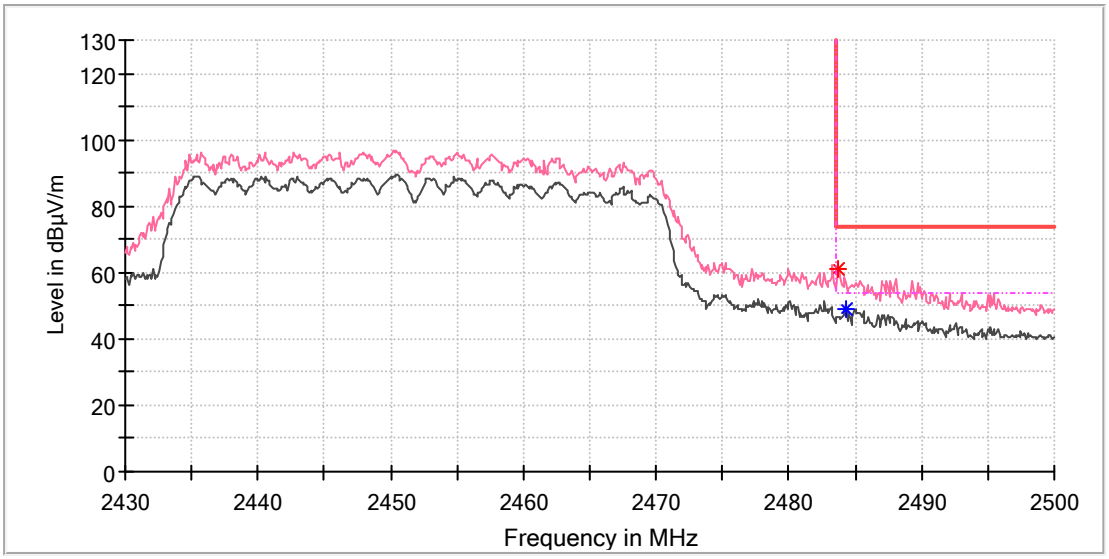
Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.467500	47.08	54.00	6.92	100.0	H	18.0	7.0

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

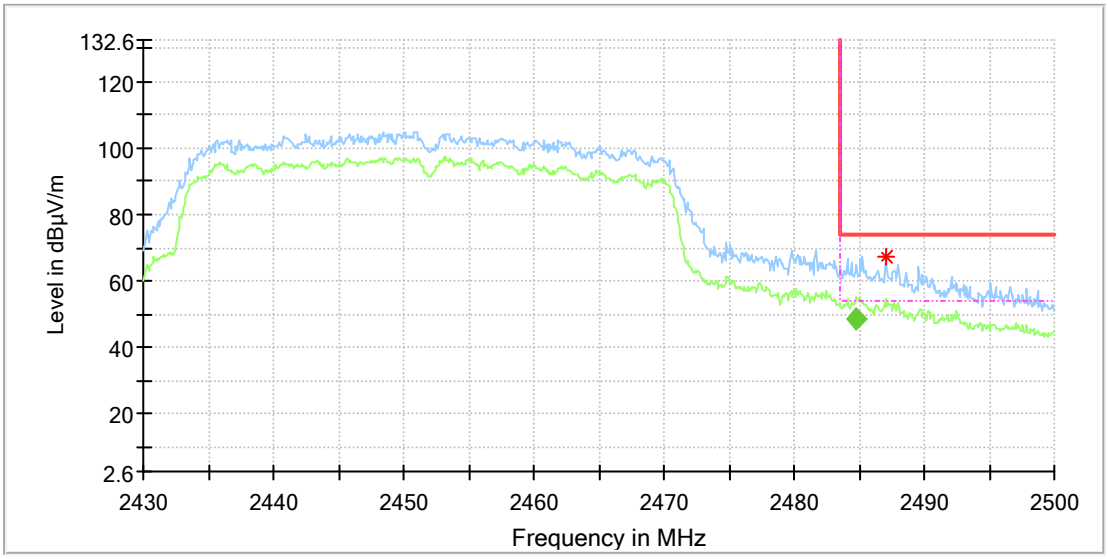


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.700000	61.27	---	74.00	12.73	100.0	V	190.0	7.4
2484.300000	---	48.93	54.00	5.07	100.0	V	180.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2487.000000	67.01	---	74.00	6.99	100.0	H	106.0	7.4

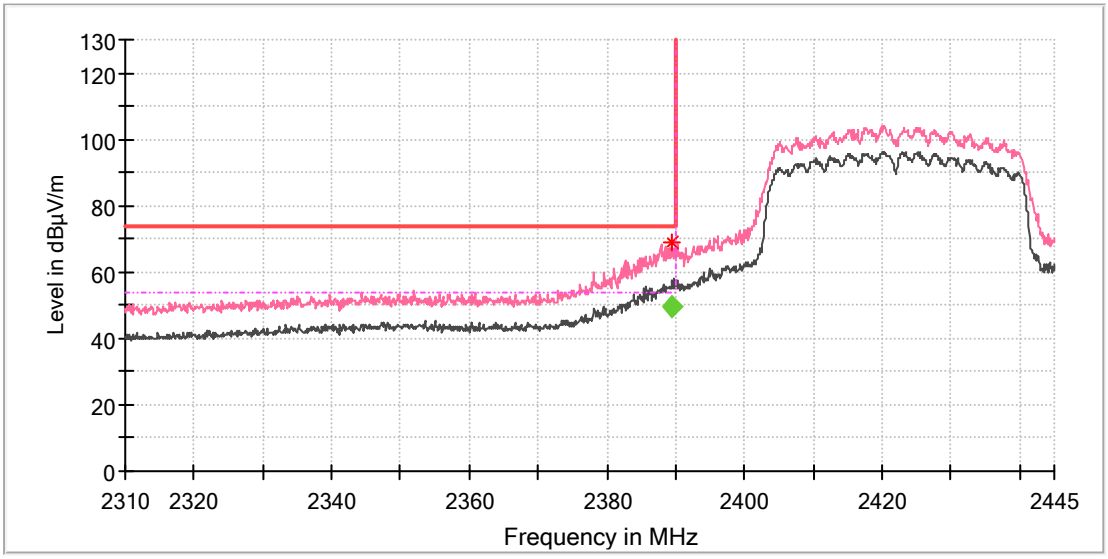
Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.782400	48.60	54.00	5.40	100.0	H	110.0	7.4

Antenna model: K7ABLG2G4ML400
Wi-Fi 802.11 n(HT40) mode, MCS0
Low channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

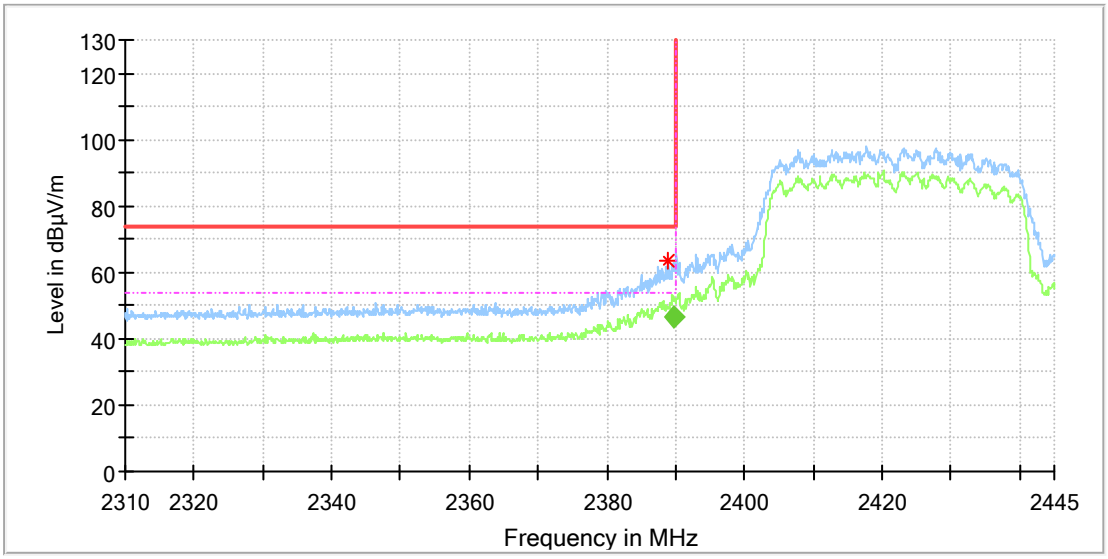
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.400000	68.97	---	74.00	5.03	100.0	V	117.0	7.0

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.558400	49.28	54.00	4.72	105.0	V	115.0	7.0

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch3
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.900000	63.34	---	74.00	10.66	100.0	H	5.0	7.0

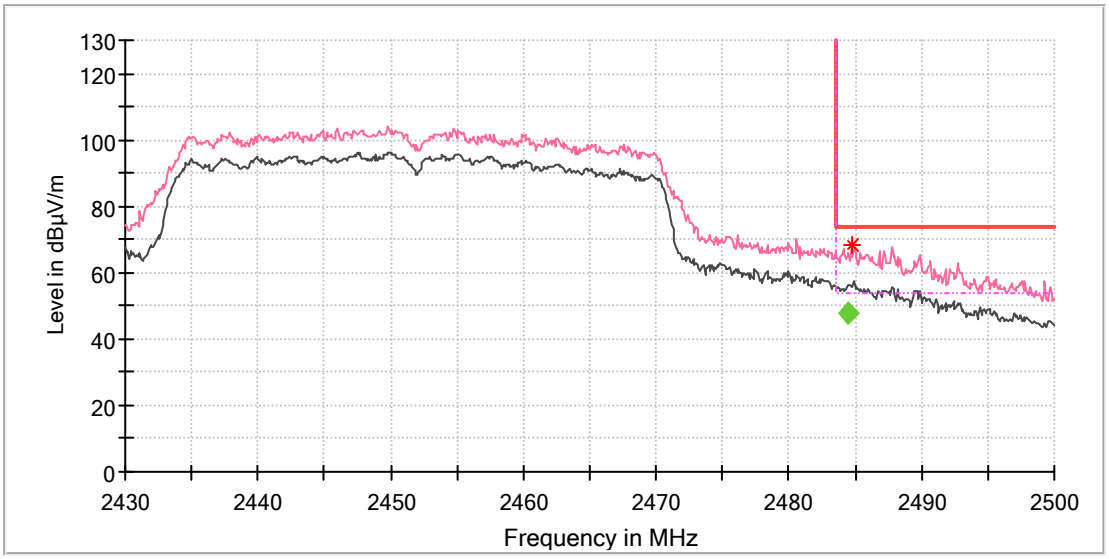
Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.747850	46.53	54.00	7.47	100.0	H	79.0	7.0

High channel

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

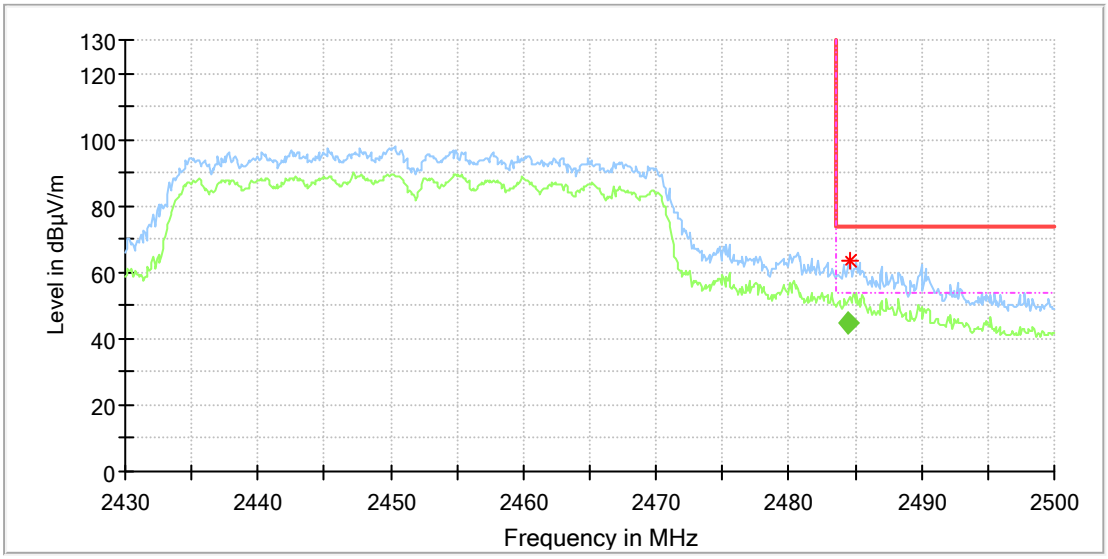
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.700000	68.27	---	74.00	5.73	100.0	V	89.0	7.4

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.400150	47.79	54.00	6.21	100.0	V	341.0	7.4

EUT Information

EUT Name:	WIFI Module
Model:	RAK634
Test Mode:	WIFI 2.4G_11n40_Ch9
Test Voltage::	DC 3.3V
Remark:	Temp 23 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.600000	63.73	---	74.00	10.27	100.0	H	89.0	7.4

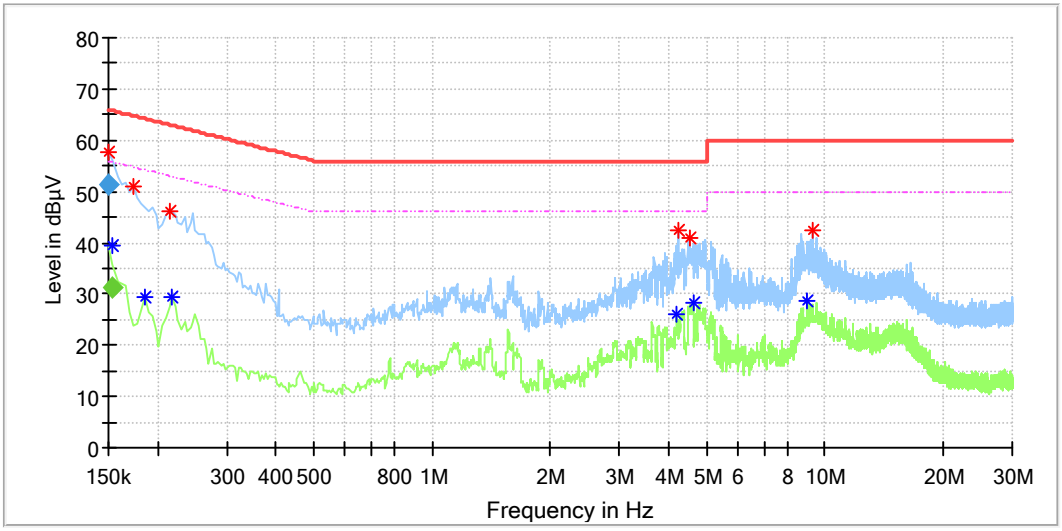
Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2484.442900	44.77	54.00	9.23	100.0	H	102.0	7.4

Appendix C.3: Test Results of Conducted Emission on AC Mains

EUT Information

EUT Name:	WIFI module
Model:	RAK634
Test mode:	ON, normal working
Test Voltage:	AC 120V/60Hz
Test By:	Steve Lan
Review By:	Gary Chen
Remark:	SR2



Critical_Freqs

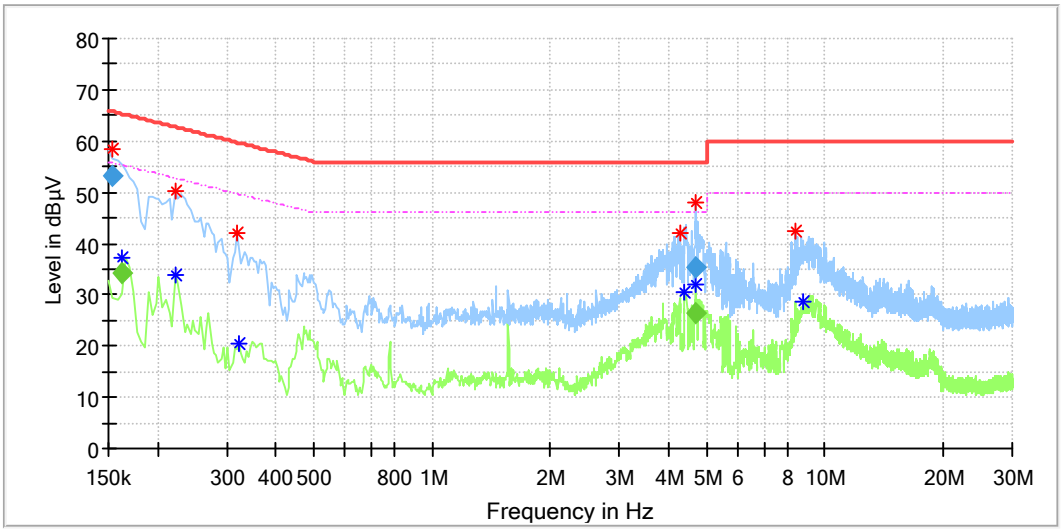
Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	57.85	---	66.00	8.15	L1	9.9
0.154000	---	39.44	56.00	16.56	L1	9.9
0.174000	50.95	---	64.77	13.81	L1	9.9
0.186000	---	29.50	54.21	24.71	L1	9.9
0.214000	46.24	---	63.05	16.81	L1	9.9
0.218000	---	29.48	52.90	23.41	L1	9.9
4.206000	---	26.11	46.00	19.89	L1	10.2
4.230000	42.42	---	56.00	13.58	L1	10.2
4.530000	41.02	---	56.00	14.98	L1	10.2
4.626000	---	28.23	46.00	17.77	L1	10.2
8.974000	---	28.78	50.00	21.22	L1	10.3
9.282000	42.49	---	60.00	17.51	L1	10.3

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	51.37	---	66.00	14.63	1000.0	9.000	L1	9.9
0.154000	---	31.11	55.78	24.67	1000.0	9.000	L1	9.9

EUT Information

EUT Name:	WIFI module
Model:	RAK634
Test mode:	ON, normal working
Test Voltage:	AC 120V/60Hz
Test By:	Steve Lan
Review By:	Gary Chen
Remark:	SR2



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.154000	58.28	---	66.00	7.72	N	9.8
0.161500	---	37.13	55.16	18.02	N	9.8
0.222000	---	33.77	52.74	18.97	N	9.8
0.222000	50.10	---	62.74	12.64	N	9.8
0.318000	42.07	---	59.76	17.68	N	9.8
0.322000	---	20.41	49.66	29.24	N	9.8
4.262000	42.11	---	56.00	13.89	N	9.9
4.386000	---	30.35	46.00	15.65	N	9.9
4.669500	47.93	---	56.00	8.07	N	9.9
4.681500	---	32.17	46.00	13.83	N	9.9
8.458000	42.27	---	60.00	17.73	N	10.0
8.778000	---	28.47	50.00	21.53	N	10.0

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154000	53.39	---	65.78	12.40	1000.0	9.000	N	9.8
0.161500	---	34.24	55.39	21.14	1000.0	9.000	N	9.8
4.669500	35.32	---	56.00	20.68	1000.0	9.000	N	9.9
4.681500	---	26.55	46.00	19.45	1000.0	9.000	N	9.9