Prüfbericht-Nr.: *Test report No.:*	**60386707 001**	**Auftrags-Nr.:** *Order No.:*	168266601	Seite 1 von 24 *Page 1 of 24*
Kunden-Referenz-Nr.: *Client reference No.:*	N/A	**Auftragsdatum:** *Order date:*	20.05.2019	
Auftraggeber: *Client:*	**LEEDARSON LIGHTING CO., LTD.** Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R. China			
Prüfgegenstand: *Test item:*	LA02301 WI-FI and Bluetooth SMART (BLE) Combo Module			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	LA02301 (Trademark: LEEDARSON)			
Auftrags-Inhalt: *Order content:*	FCC & 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 2: Section 2.1091		RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 March 2019 RSS-102 Issue 5 March 2015	

Wareneingangsdatum: *Date of receipt:*	26.05.2020	Please refer to photo documents
Prüfmuster-Nr.: *Test sample No.:*	A002832993 001~004	
Prüfzeitraum: *Testing period:*	08.06.2020 - 28.06.2020	
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd. Testing Center	
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüfergebnis*: *Test result*:*	Pass	

geprüft von / *tested by:*

Alex Lan

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
13.07.2020	Alex Lan / Senior Project Engineer	

kontrolliert von / *reviewed by:*

Winnie Hou

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
13.07.2020	Winnie Hou / Technical Certifier	

Sonstiges / *Other:*

FCC ID: 2AB2Q-LA02301
IC: 10256A-LA02301; HVIN: LA02301

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*

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 MAXIMUM PEAK 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

Contents

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. Testing Center

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				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
Wireless Connectivity Tester	Rohde & Schwarz	CMW270	101375	2020-08-30
Signal Analyzer	Rohde & Schwarz	FSV 40	101441	2020-08-30
Vector Signal Generator	Rohde & Schwarz	SMBV100A	263301	2020-08-30
Signal Generator	Rohde & Schwarz	SMB100A	115186	2020-08-30
OSP	Rohde & Schwarz	OSP 150	101017	2020-12-20
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
Test Software	Rohde & Schwarz	WMS32 (V10.40.10)	N/A	N/A
Power Meter	Rohde & Schwarz	NRP2	107105	2020-12-20
Wideband Power Sensor	Rohde & Schwarz	NRP-Z81	105350	2020-12-20
Unwanted Emission Testing				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
Signal Generator	Rohde & Schwarz	SMB100A	180840	2020-08-30
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	165339	2020-08-30
Signal Analyzer	Rohde & Schwarz	FSV 40	101440	2020-08-30
System Controller Interface	Rohde & Schwarz	SCI-100	S10010036	N/A
Filterbank	Rohde & Schwarz	CDMA	100751	2020-08-30
Filterbank	Rohde & Schwarz	GSM	100811	2020-08-30
OSP	Rohde & Schwarz	OSP 120	102041	N/A
OSP	Rohde & Schwarz	OSP 150	101385	N/A
Pre-amplifier	Rohde & Schwarz	SCU08F1	08320030	2020-08-30
Amplifier	Rohde & Schwarz	SCU-18F	180079	2020-08-30
Amplifier	Rohde & Schwarz	SCU40A	100450	2020-09-03
Trilog Broadband Antenna (30 MHz - 1 GHz)	Schwarzbeck	VULB9162	192	2020-09-02
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218719	2020-09-02
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18312	2020-09-02
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19066	2020-09-02
Biconical Broadband	Schwarzbeck	VUBA 9117	357	2020-09-02

Antenna (30 MHz - 1 GHz)				

Conducted Emissions				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
EMI Test Receiver	R&S	ESR3	102428	2020-08-19
Artificial Mains Network	R&S	ENV216	102333	2020-08-19

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.

Item		Extended Uncertainty
Conducted Emission		± 2.74 dB
Radiated Emission (30-1000MHz)	Field strength (dBμV/m)	4.27dB
Radiated Emission (above 1000MHz)	Field strength (dBμV/m)	4.46dB
Radio Spectrum		± 1.5 dB

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. Testing Center Test facility located at East of F/1, F/2 - F/4, Building 1, Cybio Technology Building, No. 6 Langshan No. 2 Road, North Hi-tech Industry Park, Nanshan District, Shenzhen, P.R. China, P. R. 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 a LA02301 WI-FI and Bluetooth SMART (BLE) Combo Module, it supports Wi-Fi 802.11 b/g/n and Bluetooth Low Energy wireless technology.

Wi-Fi and Bluetooth Low Energy share one antenna and can't transmitting simultaneously.

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	LA02301 WI-FI and Bluetooth SMART (BLE) Combo Module
Type Designation	LA02301
Trade Mark	LEEDARSON
FCC ID	2AB2Q-LA02301
IC	10256A-LA02301
HVIN	LA02301
Operating Voltage	DC 5V via USB interface
Testing Voltage	DC 5V via USB interface
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
Antenna Type	Integral Antenna
Gain	4 dBi
Technical Specification of Bluetooth Low Energy	
Operating Frequency	2402 – 2480 MHz
Bluetooth Core Version	4.2
Channel Number	40 channels
Channel separation	2MHz
Modulation	GFSK
Antenna Type	Integral Antenna
Antenna Gain	4 dBi

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**	/

Test frequencies are lowest channel: 2412 MHz, middle channel: 2437 MHz and highest channel: 2462 MHz for 802.11b/g/n(HT20)

Test frequencies are lowest channel: 2422 MHz, middle channel: 2437 MHz and highest channel: 2452 MHz for 802.11n(HT40)

Table 4: RF Channel and Frequency of Bluetooth Low Energy

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
00	**2402.00**	10	2422.00	20	2442.00	30	2462.00
01	2404.00	11	2424.00	21	2444.00	31	2464.00
02	2406.00	12	2426.00	22	2446.00	32	2466.00
03	2408.00	13	2428.00	23	2448.00	33	2468.00
04	2410.00	14	2430.00	24	2450.00	34	2470.00
05	2412.00	15	2432.00	25	2452.00	35	2472.00
06	2414.00	16	2434.00	26	2454.00	36	2474.00
07	2416.00	17	2436.00	27	2456.00	37	2476.00
08	2418.00	18	2438.00	28	2458.00	38	2478.00
09	2420.00	**19**	**2440.00**	29	2460.00	**39**	**2480.00**

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Wi-Fi 802.11 b/g/n wireless transmitting
    1. Low channel
    2. Middle channel
    3. High channel

B. On, Bluetooth Low Energy wireless transmitting
    4. Low channel
    5. Middle channel
    6. High channel

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.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Notebook	Lenovo	ThinkPad X260	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 1GHz)

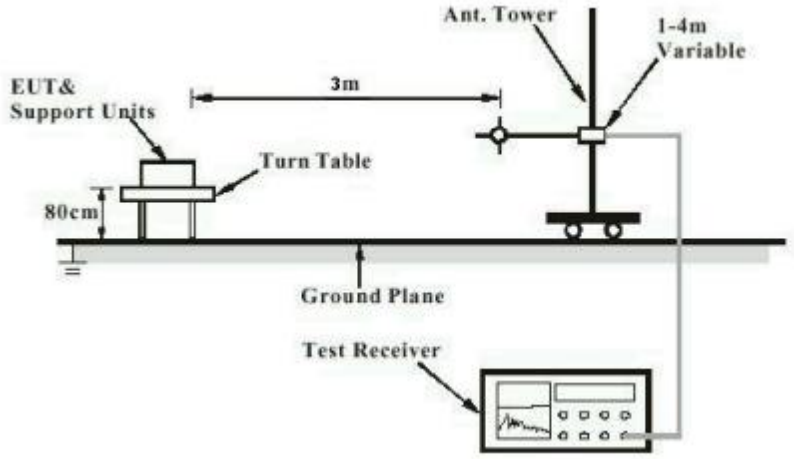


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

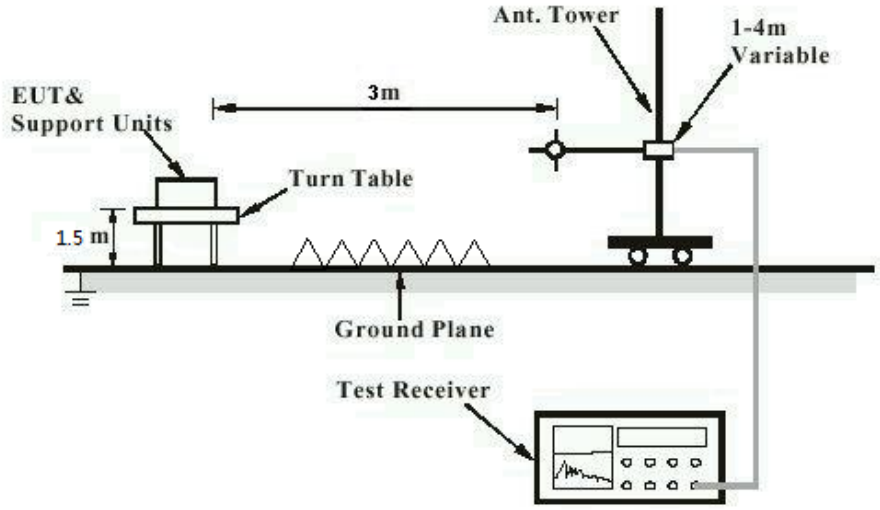


Diagram of Measurement Configuration for Mains Conduction Measurement

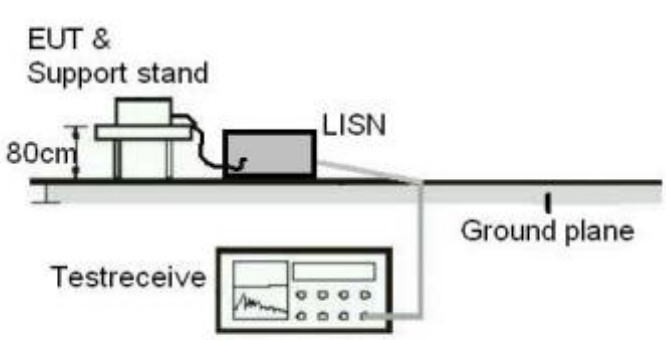
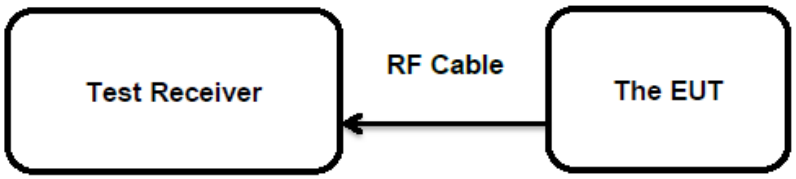


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 an internal antenna, the directional gain of antenna is 4 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 Peak 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	:	21.06.2020 - 28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
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 Peak Conducted Output Power, Wi-Fi 802.11 b/g/n

Mode	802.11b			802.11g		
Data Rate	1Mbps			6Mbps		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Peak. Power (dBm)	20.6	20.6	20.7	21.2	21.1	20.1
Avg. Power (dBm)	19.8	19.3	19.4	18.7	18.7	16.9
Mode	802.11n HT20			802.11n HT40		
Data Rate	MCS0 6.5Mbps			MCS0 13.5Mbps		
Channel	1	6	11	3	6	9
Frequency(MHz)	2412	2437	2462	2422	2437	2452
Peak. Power (dBm)	20.6	21.6	19.4	16.4	20.3	13.8
Avg. Power (dBm)	17.6	19.2	15.8	14.5	18.7	11.5

Table 7: Test Result of Maximum Peak Conducted Output Power, Bluetooth Low Energy

Mode	Bluetooth Low Energy		
Channel	1	19	39
Frequency (MHz)	2402	2440	2480
Peak. Power (dBm)	7.64	8.53	8.93
Avg. Power (dBm)	5.61	6.42	6.81

Note: The cable loss is taken into account in results and the e.i.r.p. is 5.78 dBm 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	:	08.06.2020 – 28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 8: Test Result of Power Spectral Density

Test Mode	Data Rate	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/3KHz)
802.11b	1 Mbps	2412	-7.24
		2437	-7.41
		2462	-7.03
802.11g	6 Mbps	2412	-11.21
		2437	-13.25
		2462	-9.92
802.11n (HT20)	MCS0	2412	-10.85
		2437	-12.80
		2462	-10.12
802.11n (HT40)	MCS0	2422	-10.60
		2437	-14.06
		2452	-9.95
Bluetooth Low Energy	1 Mbps	2402	-10.01
		2440	-8.89
		2480	-8.54
Maximum Measured Value			-7.03

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	:	28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Table 9: Test Result of 99% Bandwidth

Test Mode	Data Rate	Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)
802.11b	1 Mbps	2412	13.200	/
		2437	13.100	
		2462	13.200	
802.11g	6 Mbps	2412	16.500	
		2437	16.500	
		2462	16.500	
802.11n (HT20)	MCS0	2412	17.400	
		2437	17.400	
		2462	17.400	
802.11n (HT40)	MCS0	2422	36.500	
		2437	36.500	
		2452	36.500	
Bluetooth Low Energy	1 Mbps	2402	1.005	
		2440	1.005	
		2480	1.005	
Minimum Measured Value			1.005	

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	:	08.06.2020 – 28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For details refer to following test result.

Table 10: Test Result of 6dB Bandwidth

Test Mode	Data Rate	Frequency (MHz)	-6dB Bandwidth (MHz)	Limit (kHz)
802.11b	1 Mbps	2412	10.15	> 500
		2437	10.15	
		2462	10.15	
802.11g	6 Mbps	2412	16.45	
		2437	16.45	
		2462	16.45	
802.11n (HT20)	MCS0	2412	17.40	
		2437	17.40	
		2462	17.40	
802.11n (HT40)	MCS0	2422	36.45	
		2437	36.45	
		2452	36.45	
Bluetooth Low Energy	1 Mbps	2402	0.69	
		2440	0.67	
		2480	0.67	
Minimum Measured Value			0.67	

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	:	30dB (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	:	08.06.2020 – 28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
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	:	08.06.2020 – 28.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, B
Test channel	:	Low / Middle / High
Ambient temperature	:	23℃
Relative humidity	:	48%
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	:	08.06.2020
Input voltage	:	DC 5V
Operation mode	:	A, 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
FCC KDB Publication 865664 D02 v01r02
OET Bulletin 65 (Edition 97-01)
RSS-102 Issue 5 March 2019

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 OET Bulletin 65

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)

The nominal maximum conducted output power specified:
802.11b/g/n: 22.00 dBm
BLuetooth Low Energy: 9.00 dBm

From the peak RF output power, the minimum mobile separation distance, d=20 cm, as well as the antenna gain (4.0 dBi 802.11b/g/n and Bluetooth Low Energy), the RF power density can be calculated as below:

For 802.11b/g/n: $\mathbf{S_{(mW/cm^2)}= PG/4\pi R^2 =}$ 0.079 mW/cm^2

For BLuetooth Low Energy: $\mathbf{S_{(mW/cm^2)}= PG/4\pi R^2 =}$ 0.004 mW/cm^2

Limits for Maximum Permissible Exposure (MPE) according to FCC Part 1.1310: 1.0 mW/cm2

➢ **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 $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

- RF exposure evaluation exempted power for2.4G DTS: 2.676 W

The nominal maximum conducted output power specified:

802.11b/g/n: 22.00 dBm

BLuetooth Low Energy: 9.00 dBm

Antenna Gain: 4.0 dBi 802.11b/g/n and Bluetooth Low Energy

The Max. e.i.r.p. for 802.11b/g/n: 26.0dBm = 0.398 W

The Max. e.i.r.p. for BLuetooth Low Energy: 13.0dBm = 0.020 W

Both e.i.r.p. for the 802.11b/g/n and BLuetooth Low Energy are 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."

7 Photographs of the Test Set-Up

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

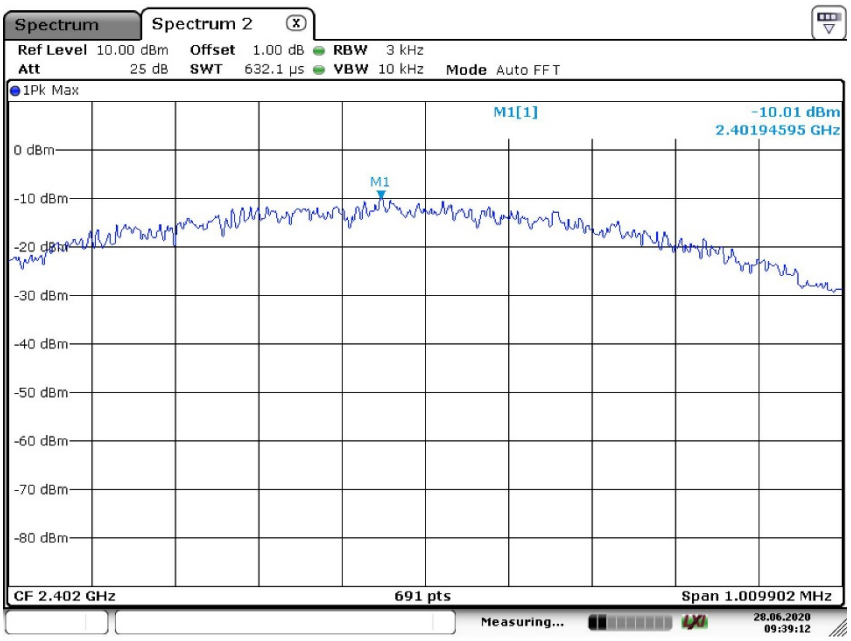
8 List of Tables

Appendix B: Test Results of Conducted Testing

Appendix B.1: Conducted Power Spectral Density

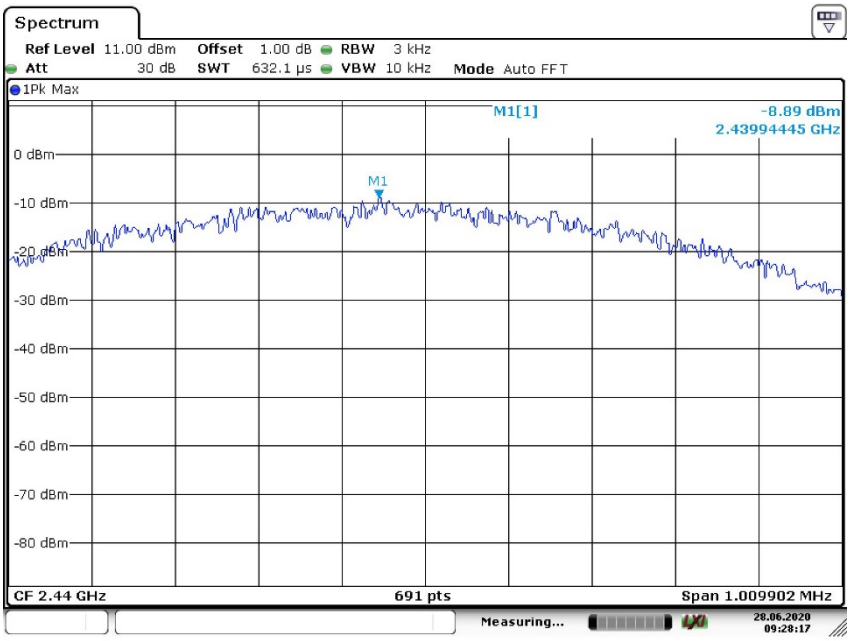
Bluetooth Low Energy

Low Channel



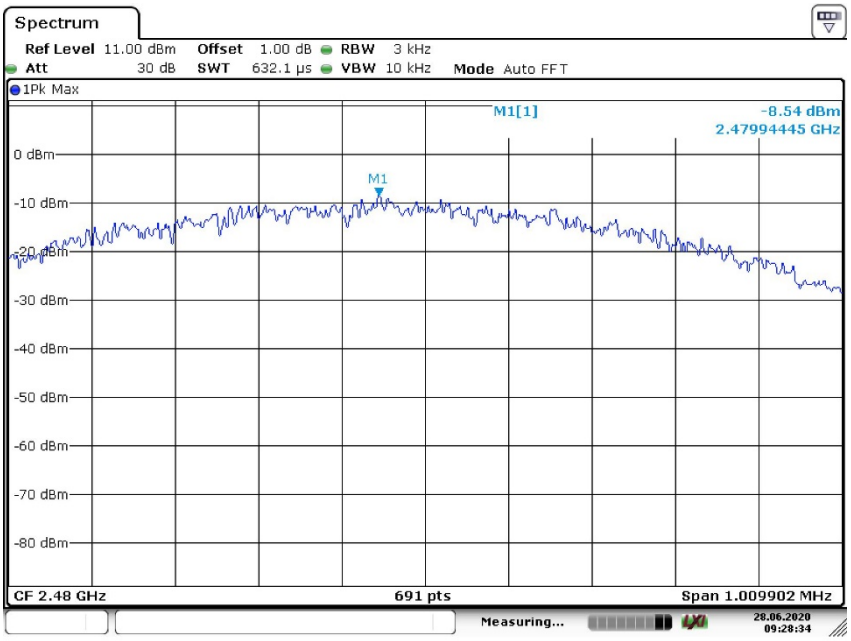
Date: 28.JUN.2020 09:39:13

Middle Channel



Date: 28.JUN.2020 09:28:18

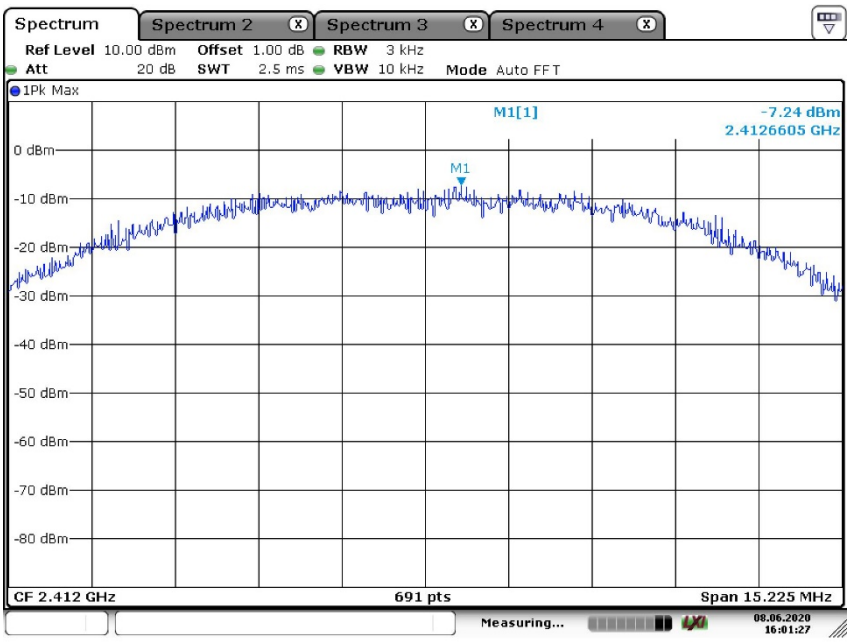
High Channel



Date: 28.JUN.2020 09:28:34

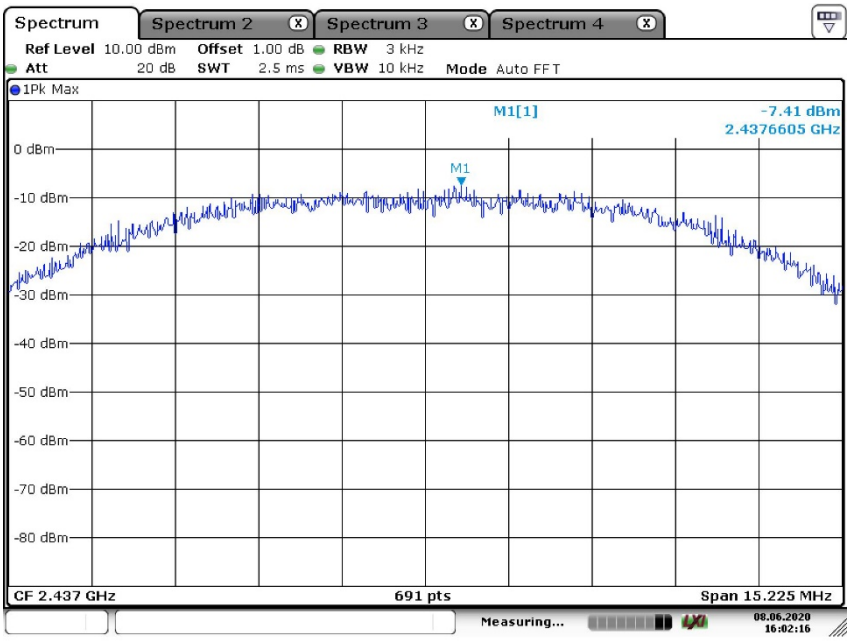
Wi-Fi 802.11 b mode, 1 Mbps

Low Channel



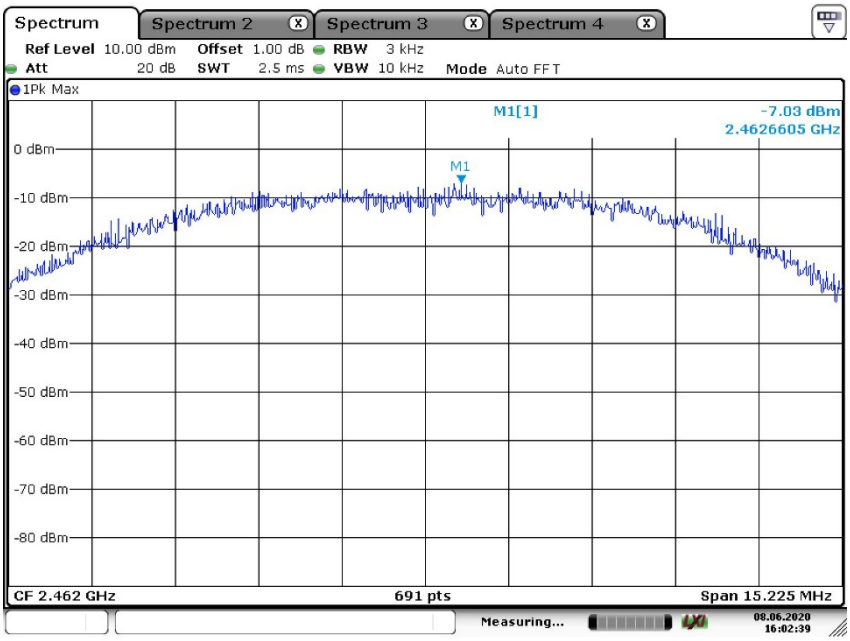
Date: 8.JUN.2020 16:01:27

Middle Channel



Date: 8.JUN.2020 16:02:17

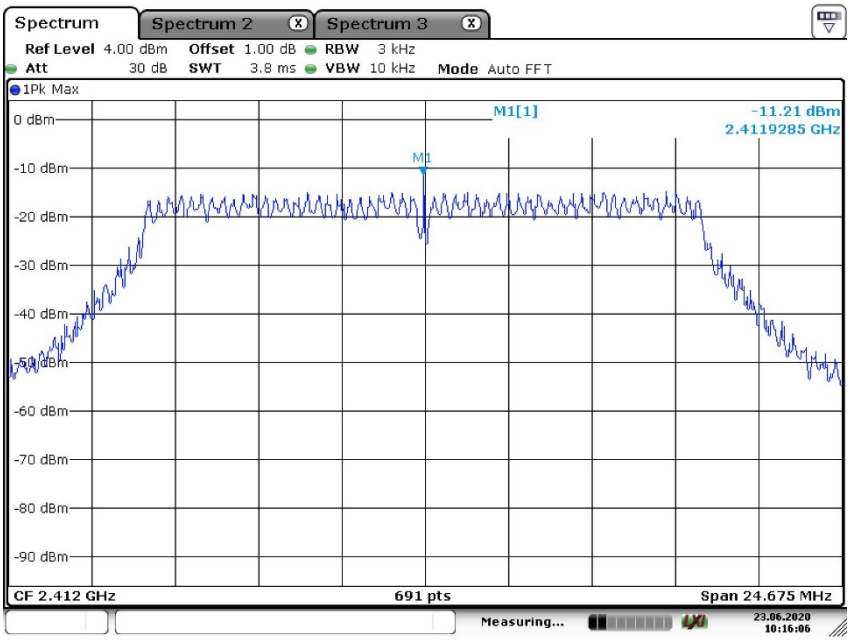
High Channel



Date: 8.JUN.2020 16:02:40

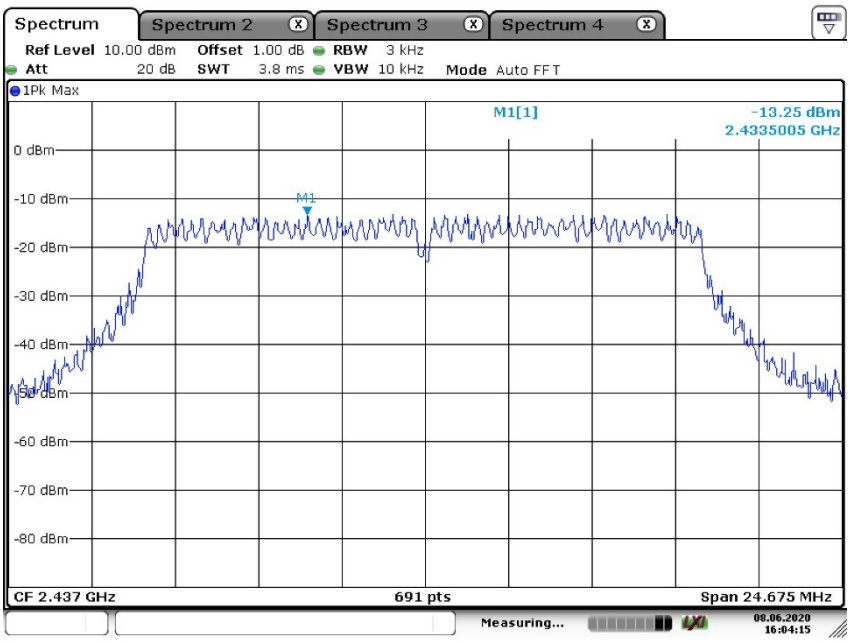
Wi-Fi 802.11 g mode, 6 Mbps

Low Channel



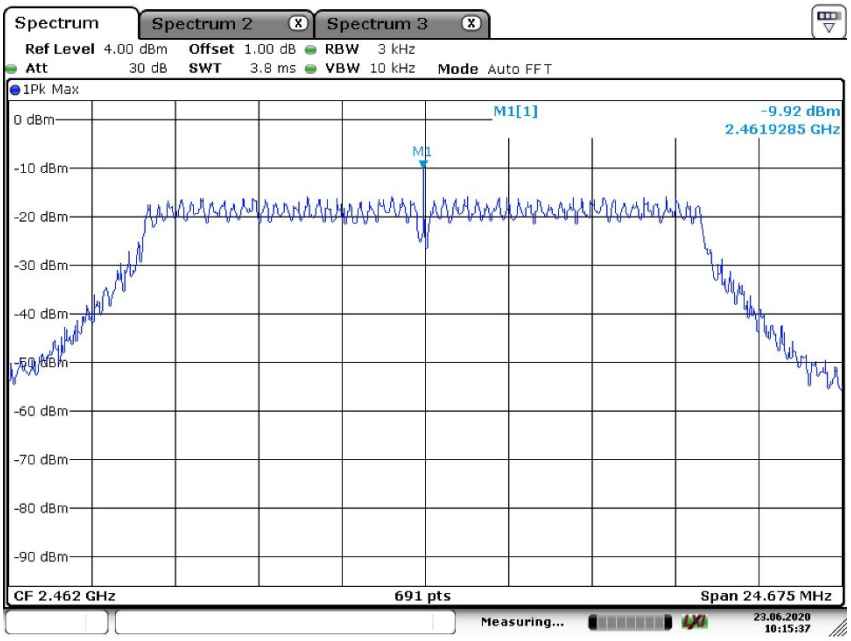
Date: 23.JUN.2020 10:16:07

Middle Channel



Date: 8.JUN.2020 16:04:15

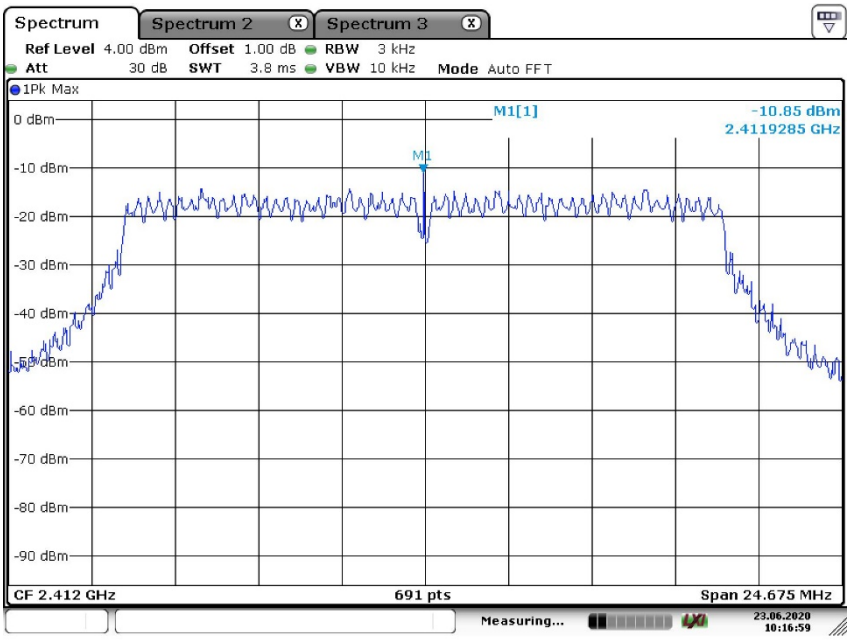
High Channel



Date: 23.JUN.2020 10:15:37

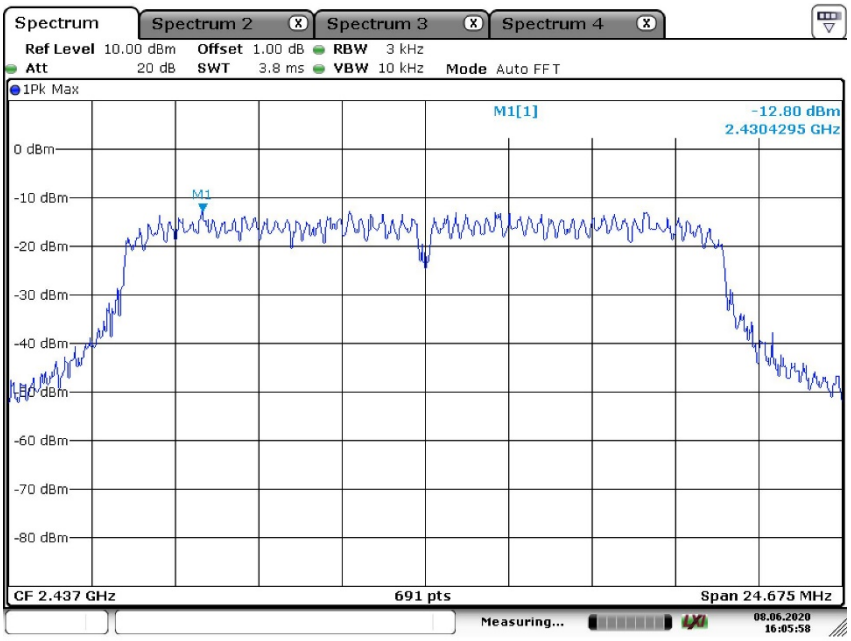
Wi-Fi 802.11 n(HT20) mode, MCS0

Low Channel



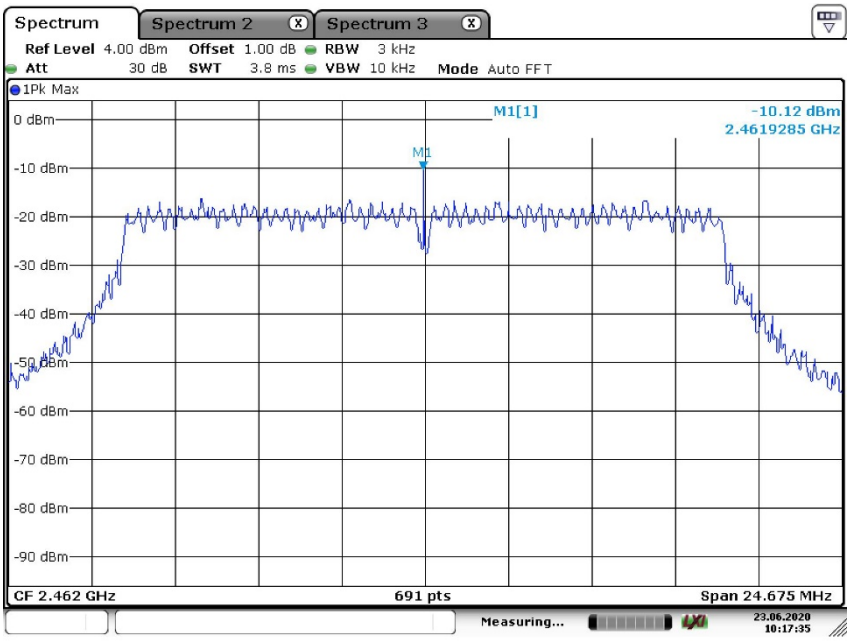
Date: 23.JUN.2020 10:17:00

Middle Channel



Date: 8.JUN.2020 16:05:59

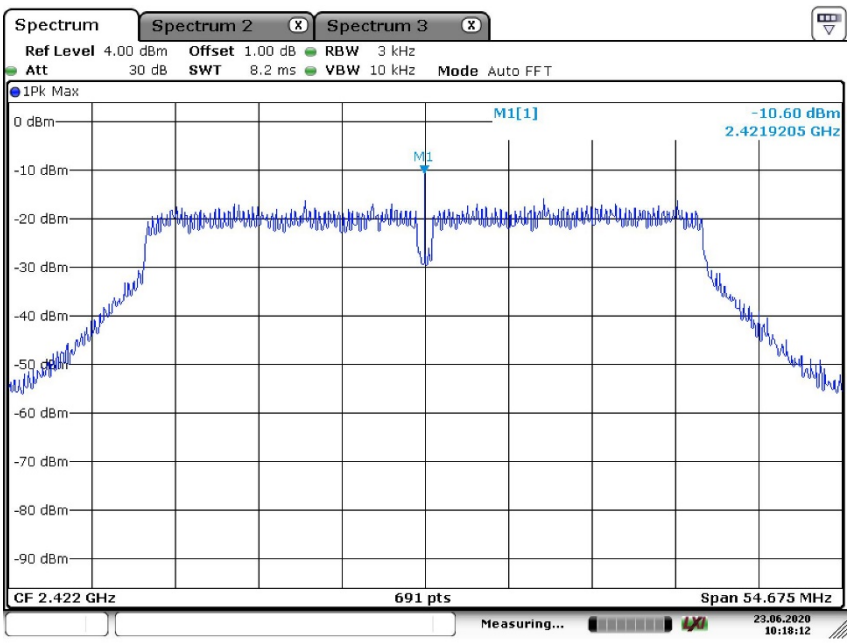
High Channel



Date: 23.JUN.2020 10:17:36

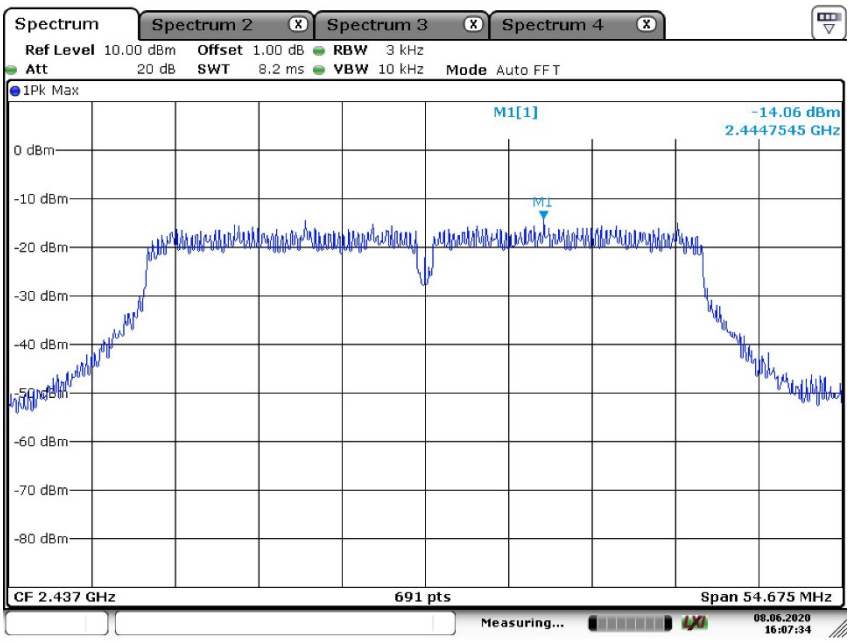
Wi-Fi 802.11 n(HT40) mode, MCS0

Low Channel



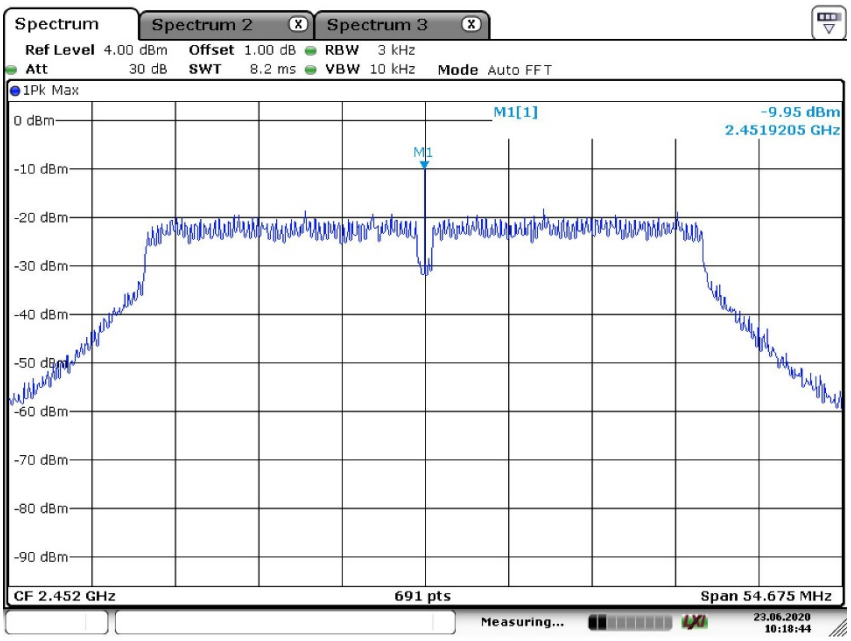
Date: 23.JUN.2020 10:18:13

Middle Channel



Date: 8.JUN.2020 16:07:34

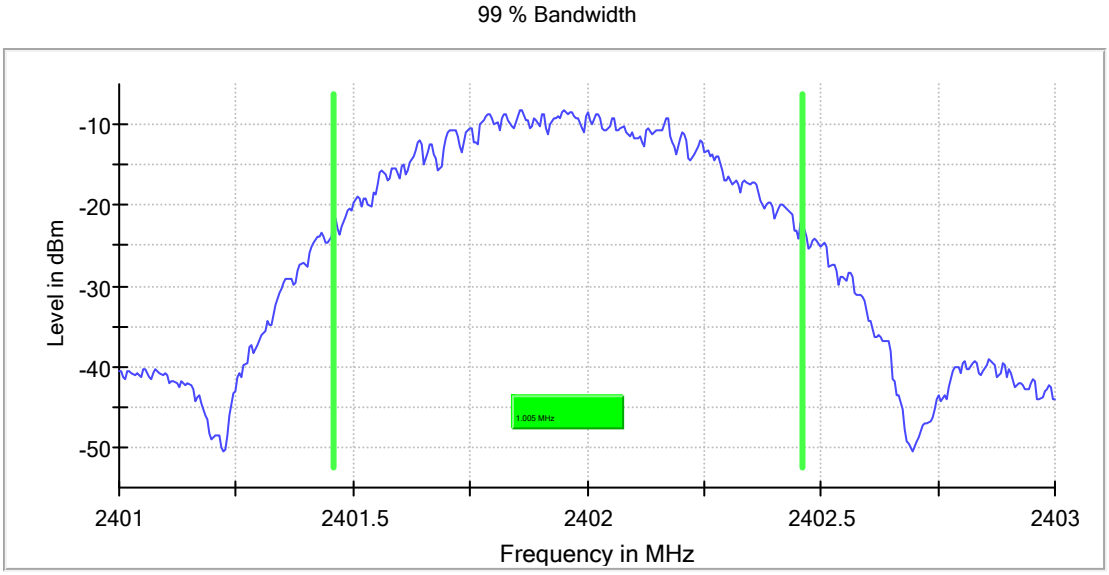
High Channel



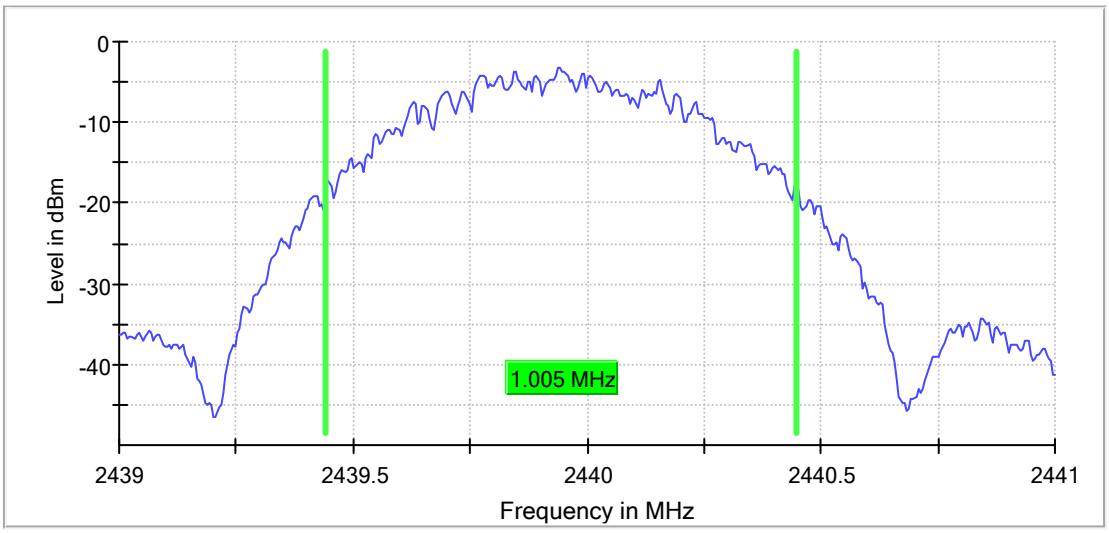
Appendix B.2: 99% Bandwidth

Bluetooth Low Energy

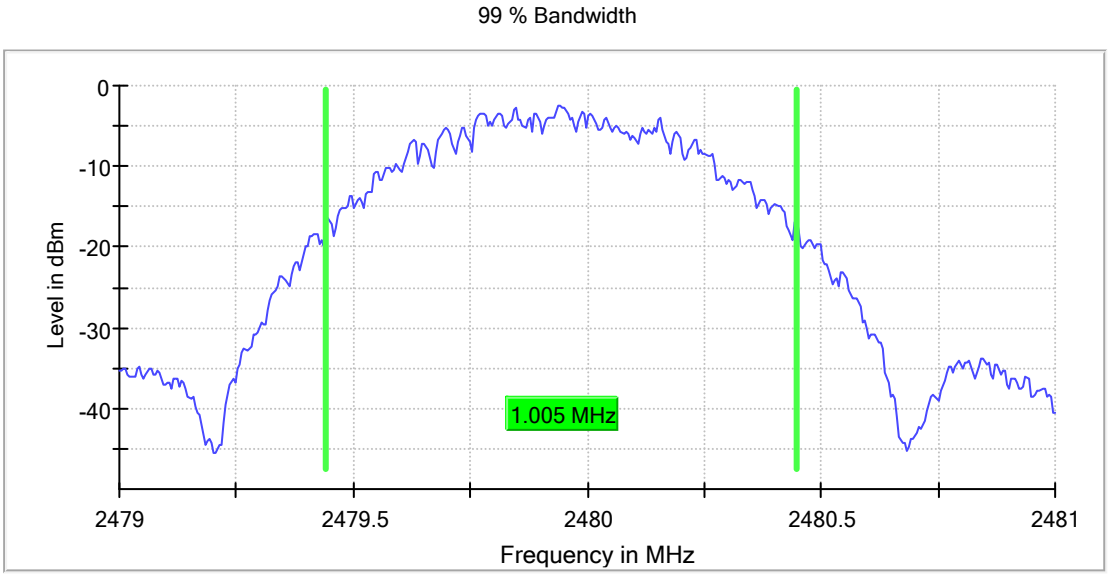
Low Channel
RBW=30KHz, VBW=100KHz



Middle Channel
RBW=30KHz, VBW=100KHz

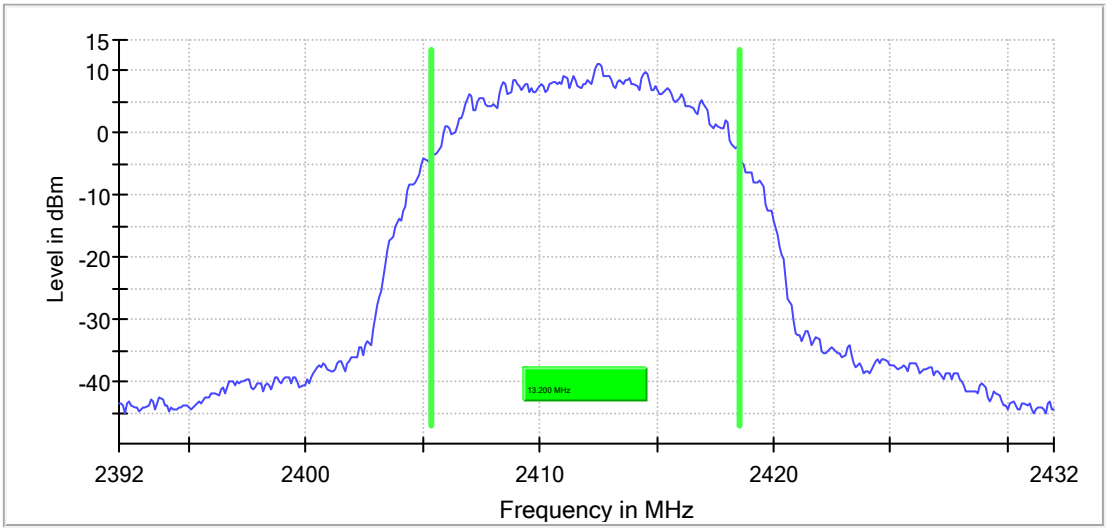


High Channel
RBW=30KHz, VBW=100KHz



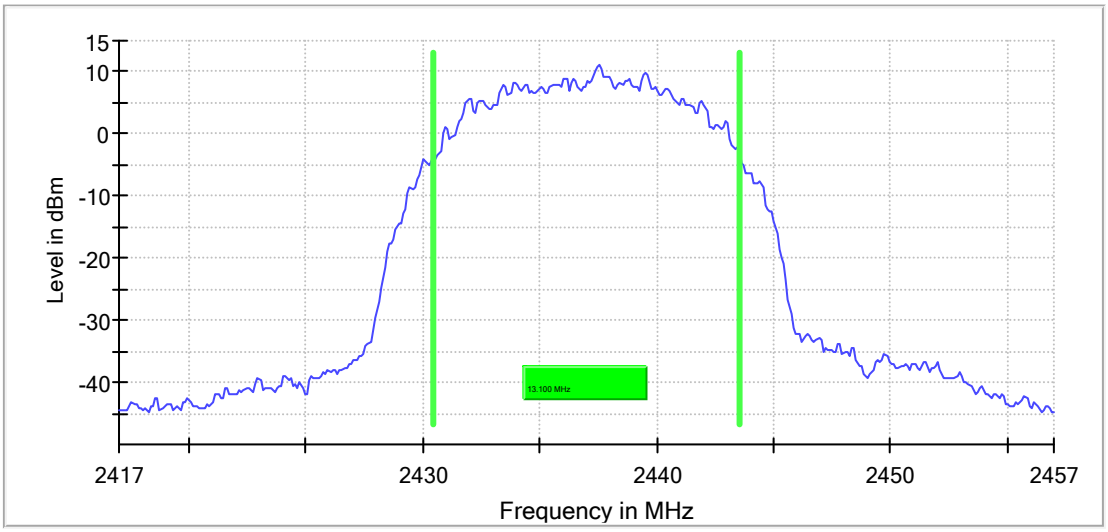
Wi-Fi 802.11 b mode, 1 Mbps

Low Channel
RBW=300KHz, VBW=1MHz



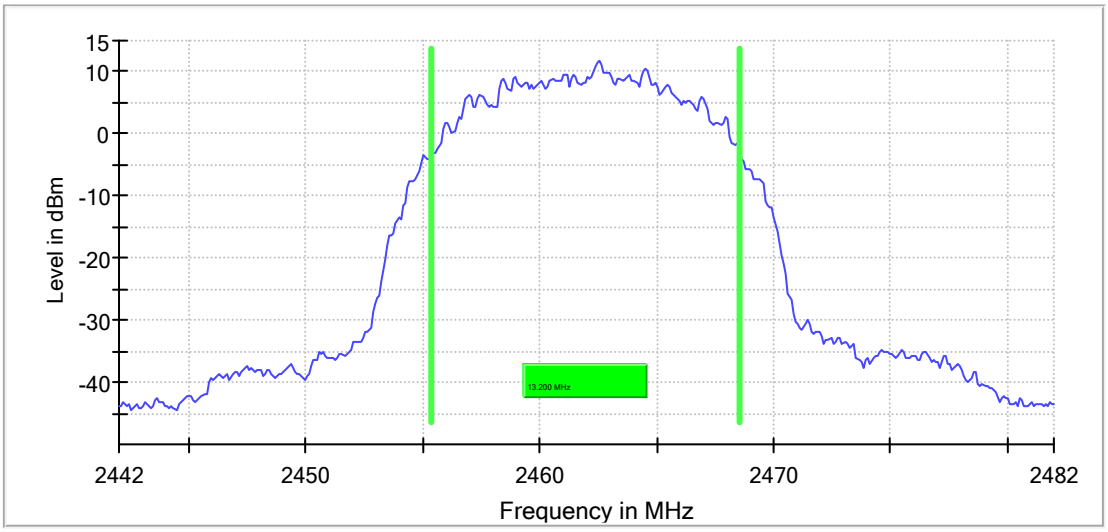
Middle Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth



High Channel
RBW=300KHz, VBW=1MHz

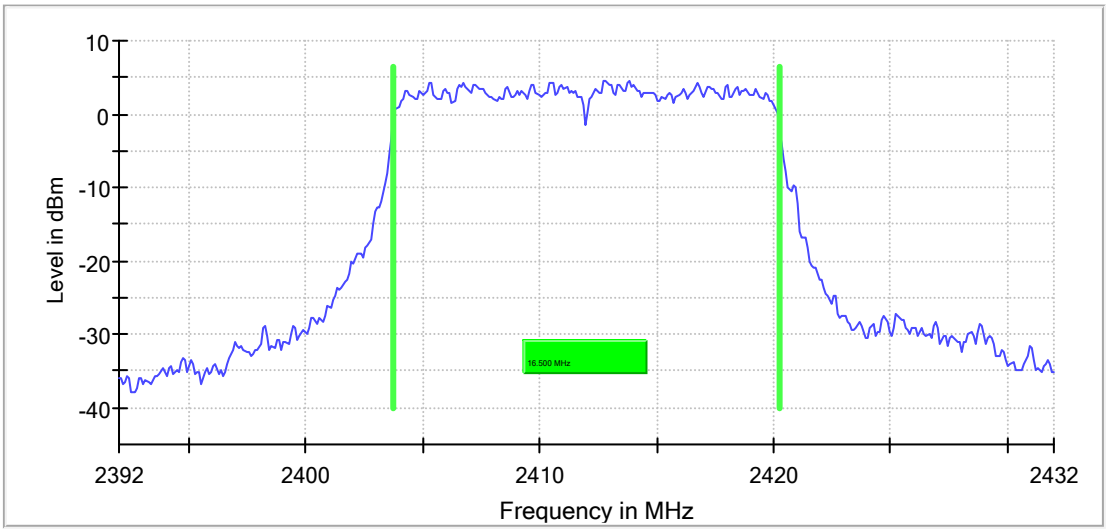
99 % Bandwidth



Wi-Fi 802.11 g mode, 6 Mbps

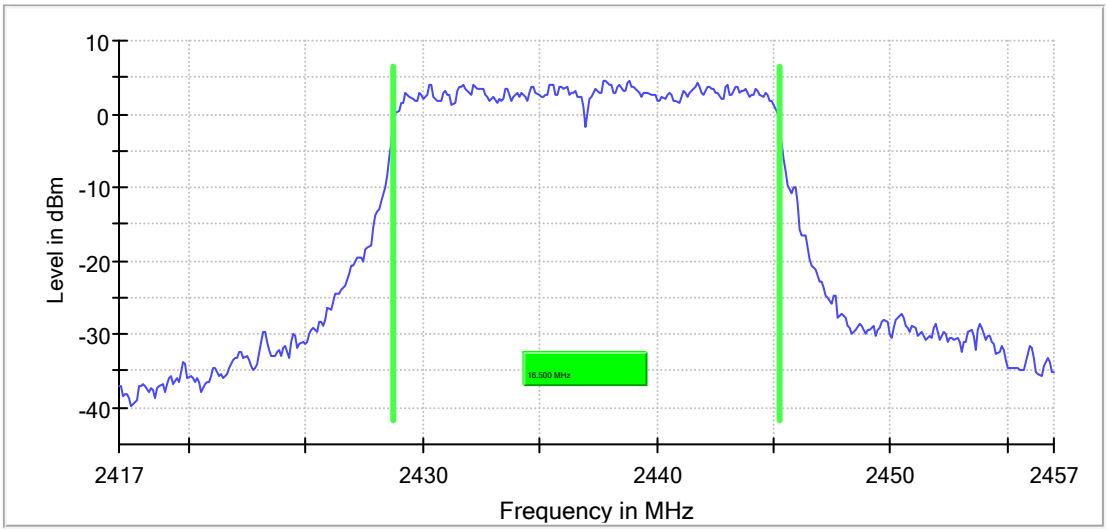
Low Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth



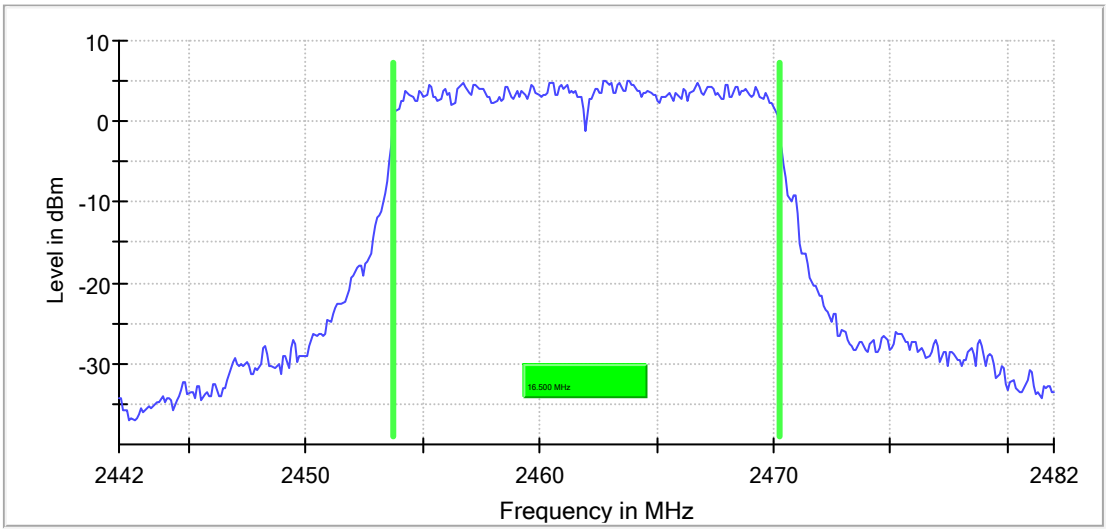
Middle Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth



High Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth



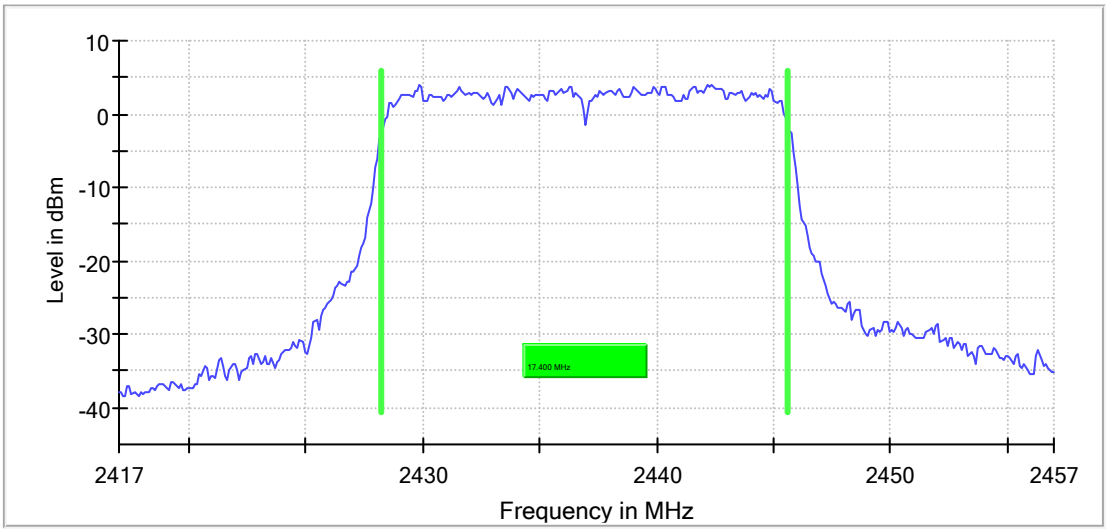
Wi-Fi 802.11 n(HT20) mode, MCS0

Low Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth

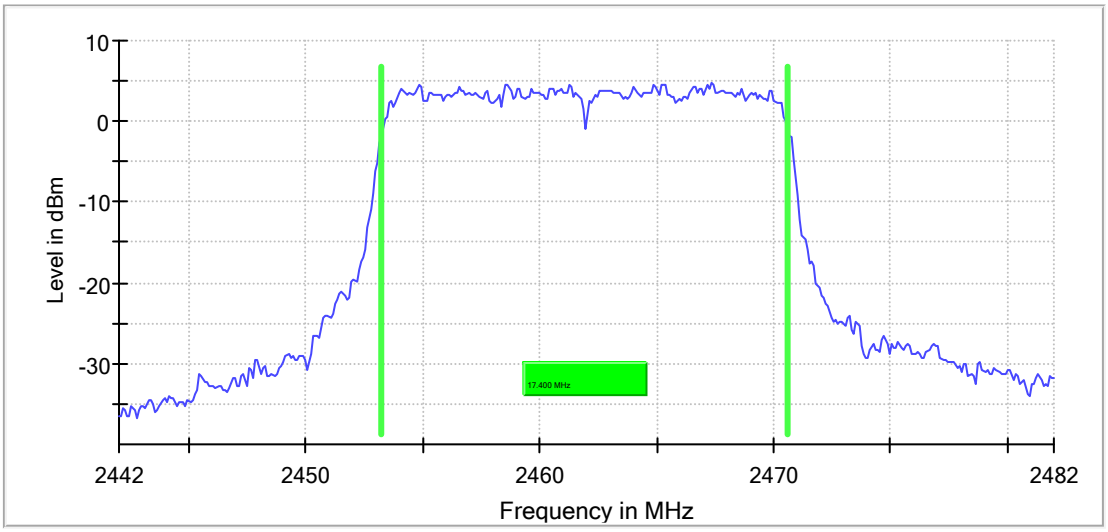
Middle Channel
RBW=300KHz, VBW=1MHz

99 % Bandwidth



High Channel
RBW=300KHz, VBW=1MHz

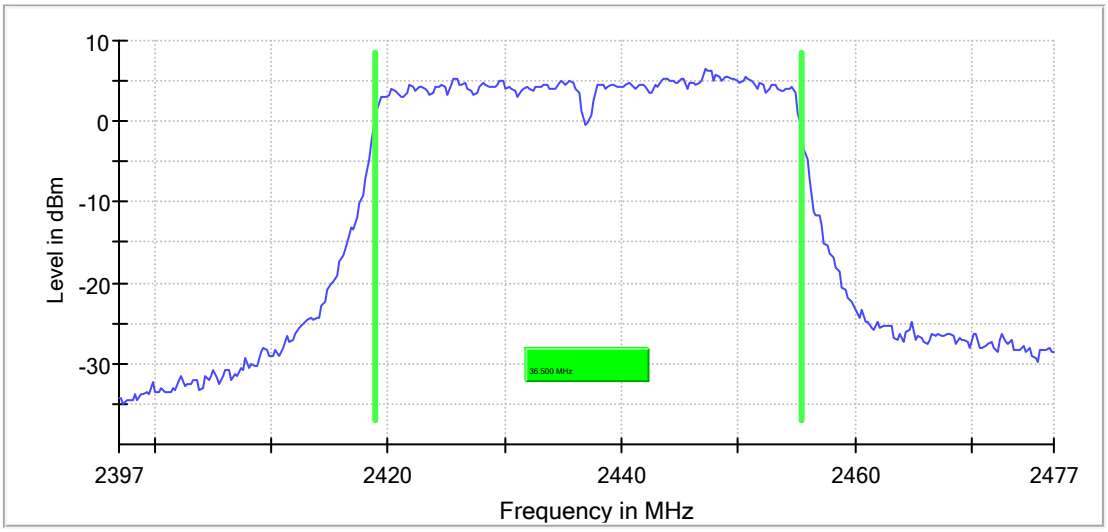
99 % Bandwidth



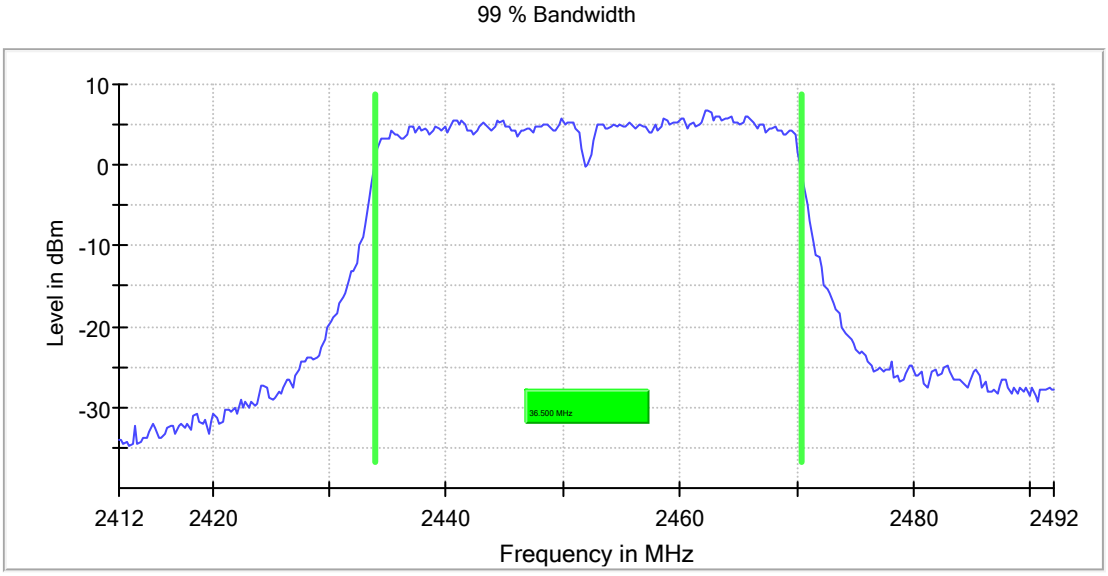
Wi-Fi 802.11 n(HT40) mode, MCS0

Low Channel
RBW=500KHz, VBW=2MHz

Middle Channel
RBW=500KHz, VBW=2MHz



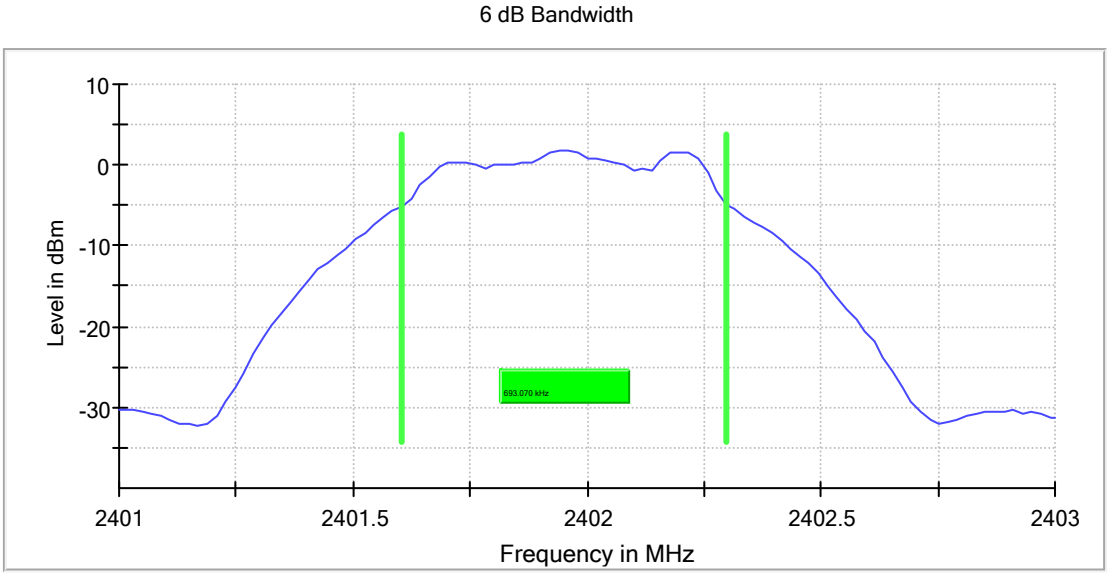
High Channel
RBW=500KHz, VBW=2MHz



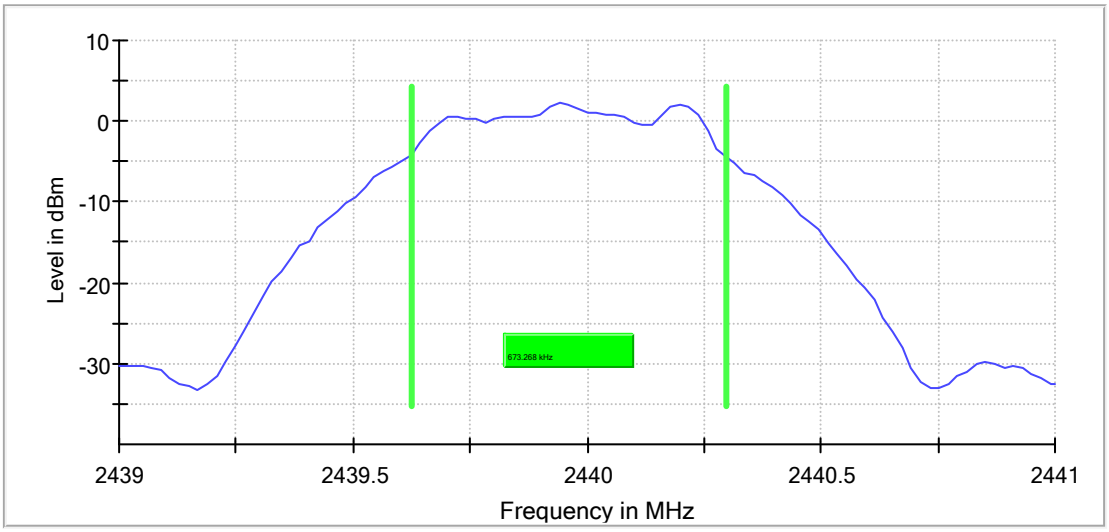
Appendix B.3: 6dB Bandwidth

Bluetooth Low Energy

Low Channel
RBW=100KHz, VBW=300KHz

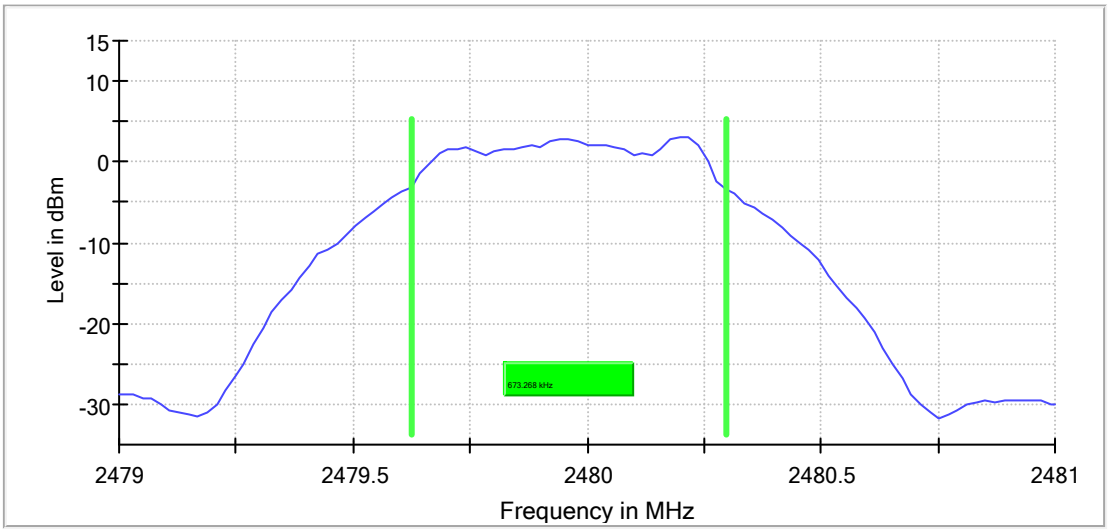


Middle Channel
RBW=100KHz, VBW=300KHz



High Channel
RBW=100KHz, VBW=300KHz

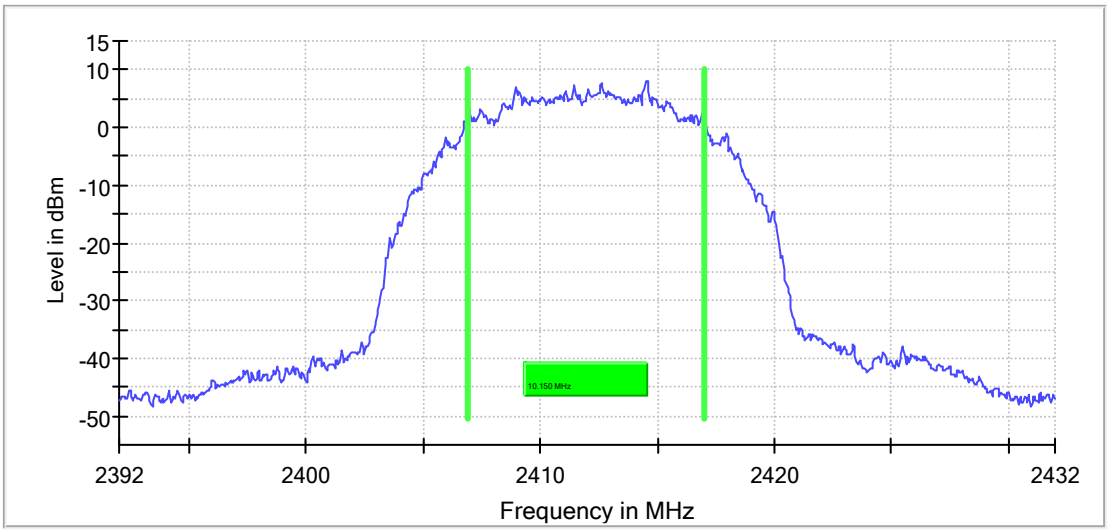
6 dB Bandwidth



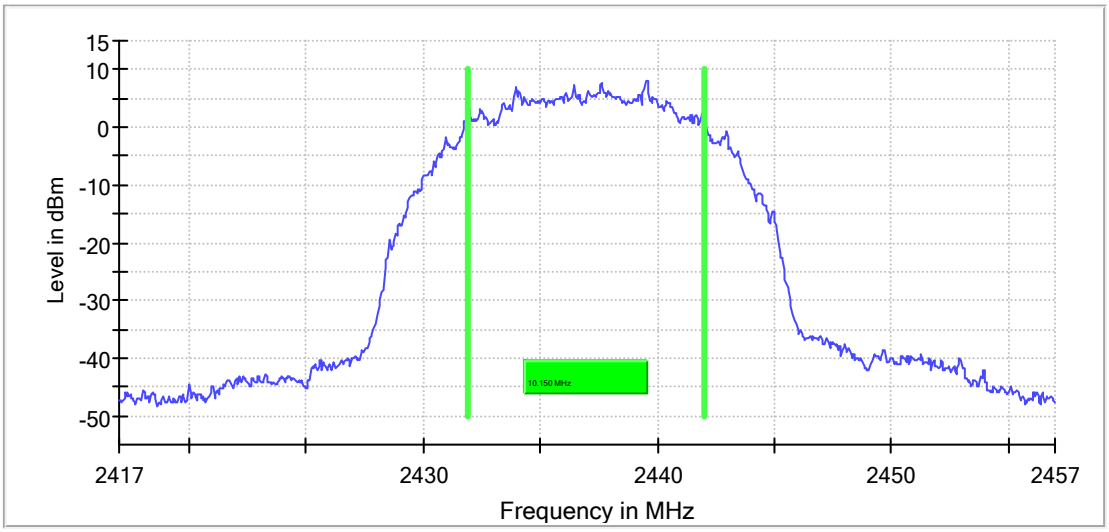
Wi-Fi 802.11 b mode, 1 Mbps

Low Channel
RBW=100KHz, VBW=300KHz

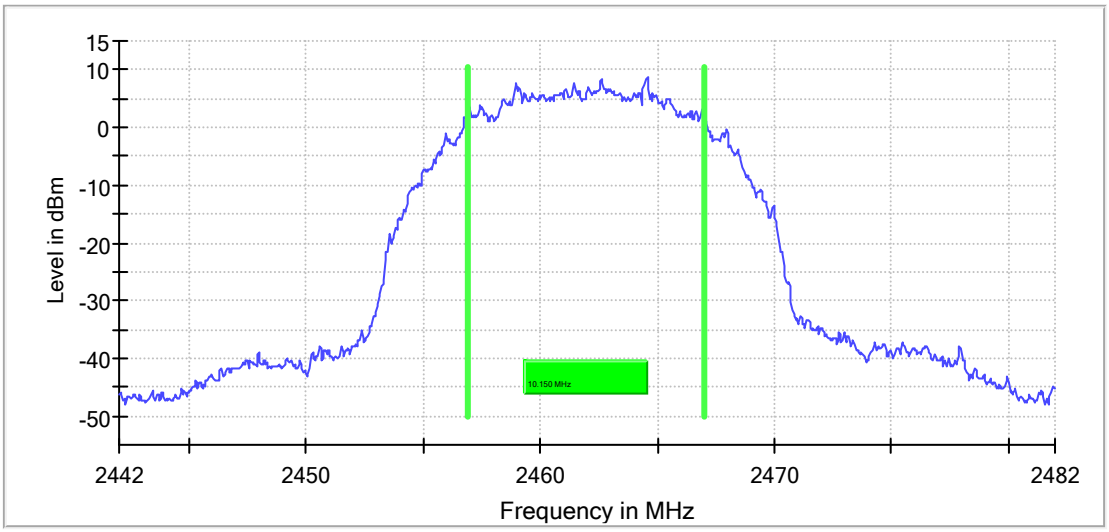
6 dB Bandwidth



Middle Channel
RBW=100KHz, VBW=300KHz



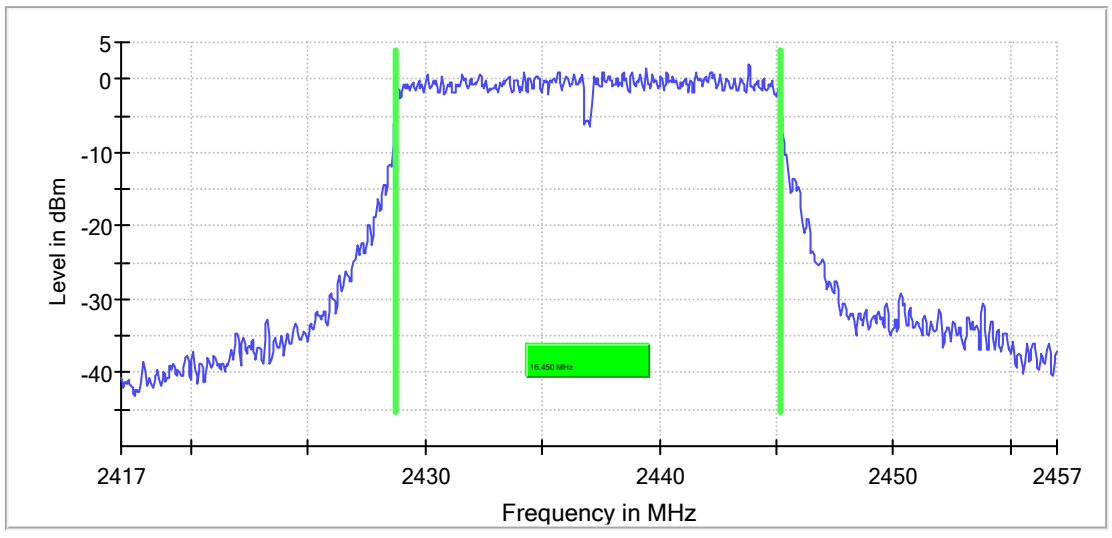
High Channel
RBW=100KHz, VBW=300KHz



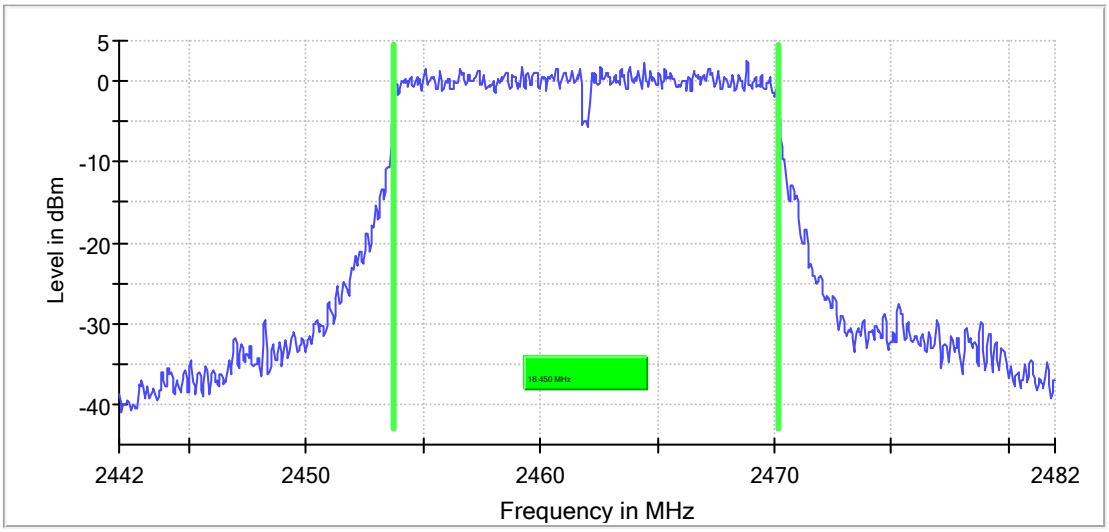
Wi-Fi 802.11 g mode, 6 Mbps

Low Channel
RBW=100KHz, VBW=300KHz

Middle Channel
RBW=100KHz, VBW=300KHz

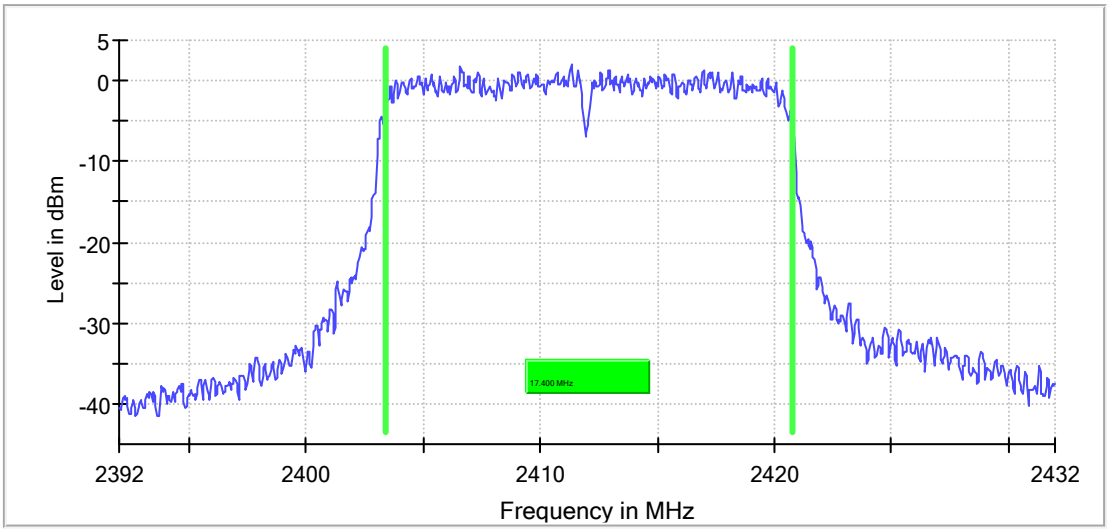


High Channel
RBW=100KHz, VBW=300KHz

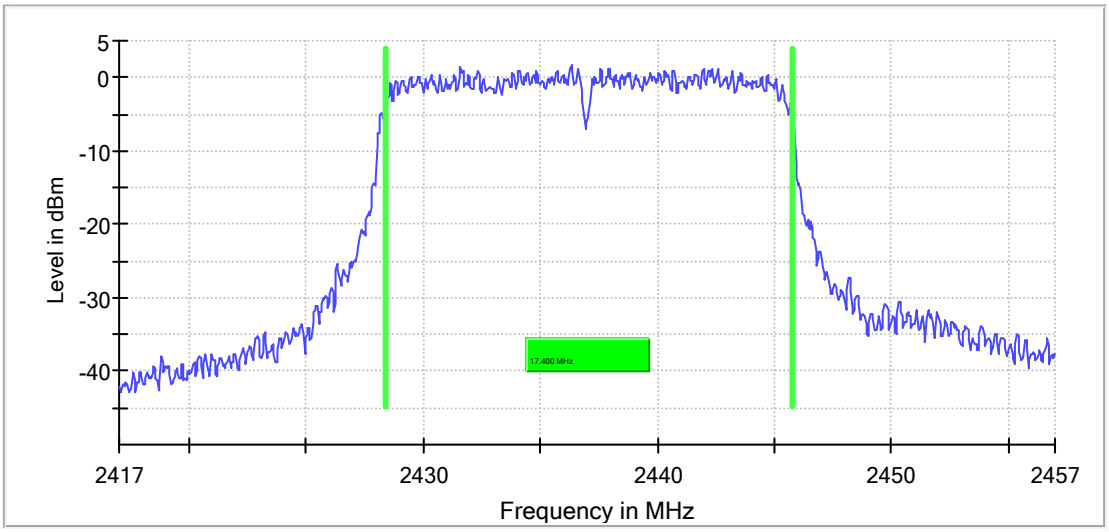


Wi-Fi 802.11 n(HT20) mode, MCS0

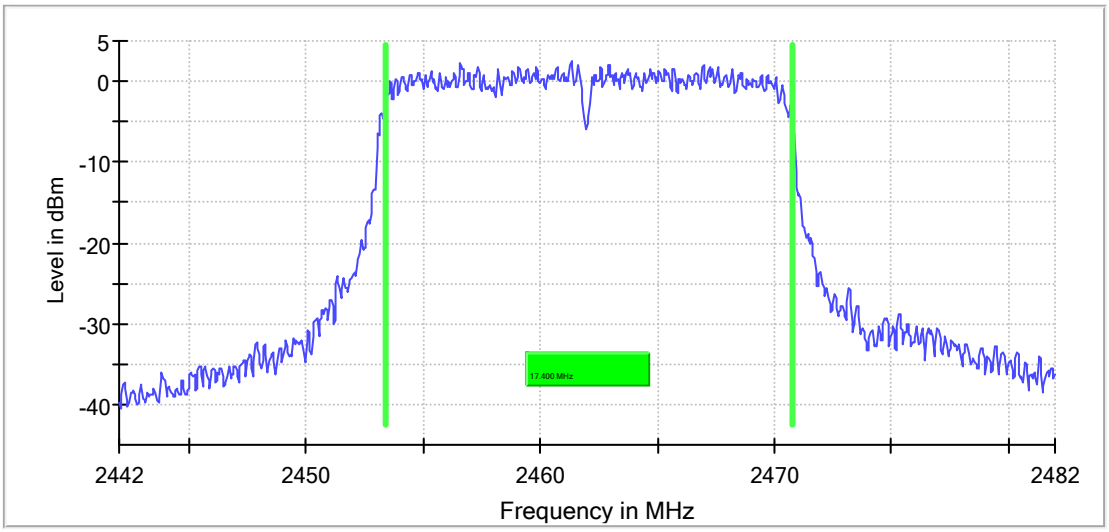
Low Channel
RBW=100KHz, VBW=300KHz



Middle Channel
RBW=100KHz, VBW=300KHz



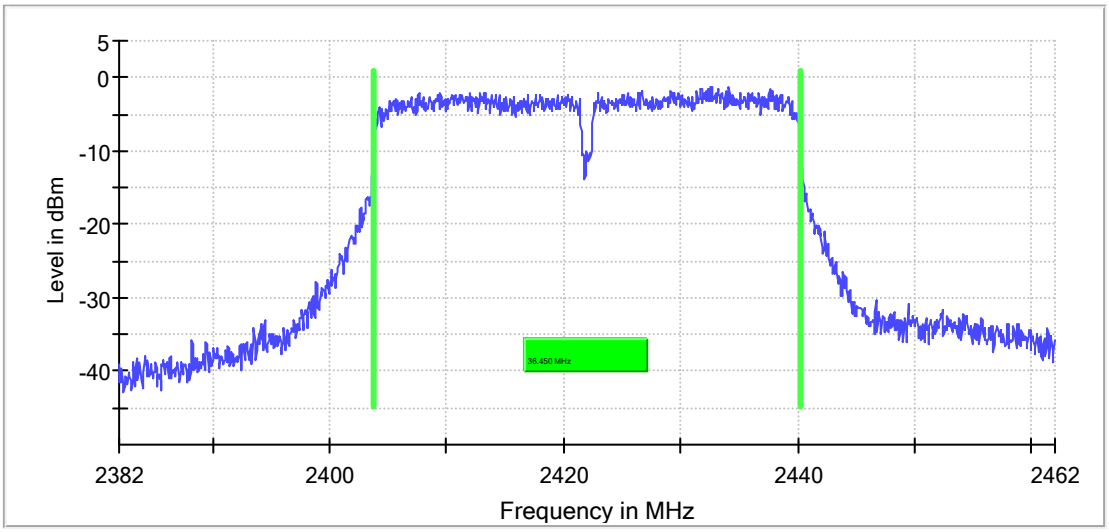
High Channel
RBW=100KHz, VBW=300KHz



Wi-Fi 802.11 n(HT40) mode, MCS0

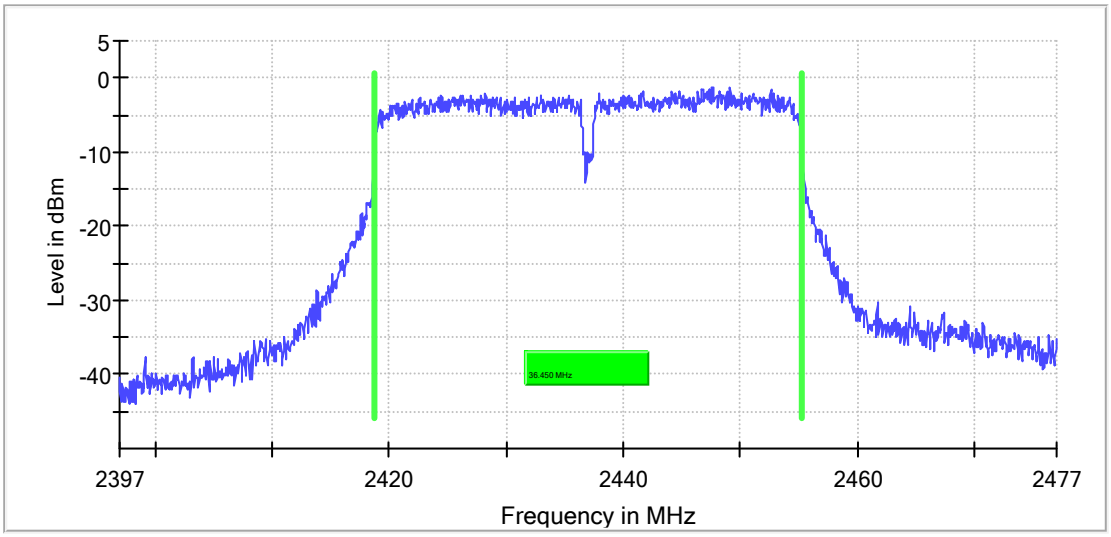
Low Channel
RBW=100KHz, VBW=300KHz

6 dB Bandwidth

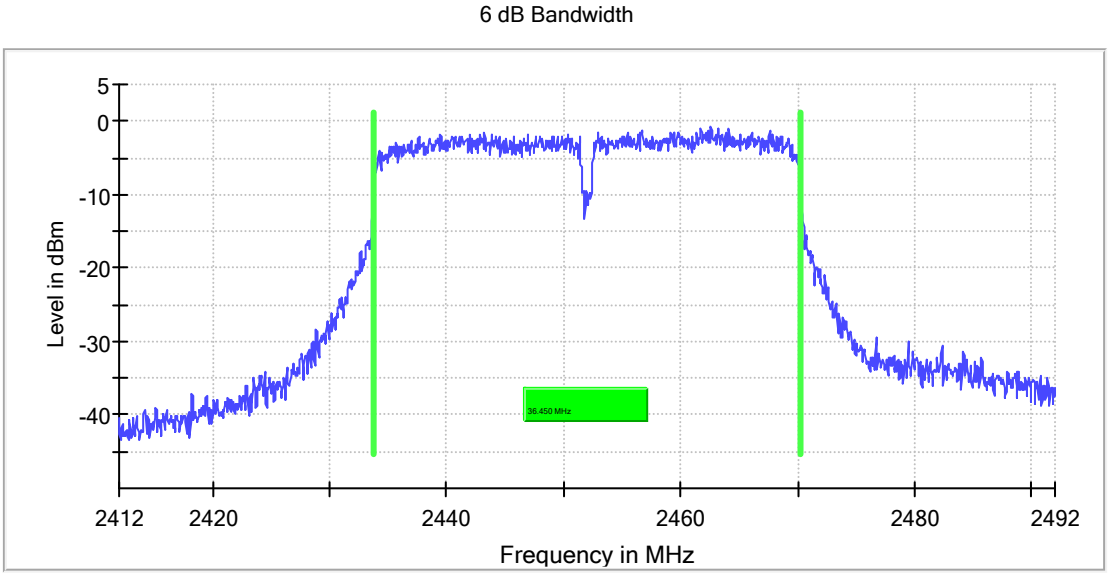


Middle Channel
RBW=100KHz, VBW=300KHz

6 dB Bandwidth



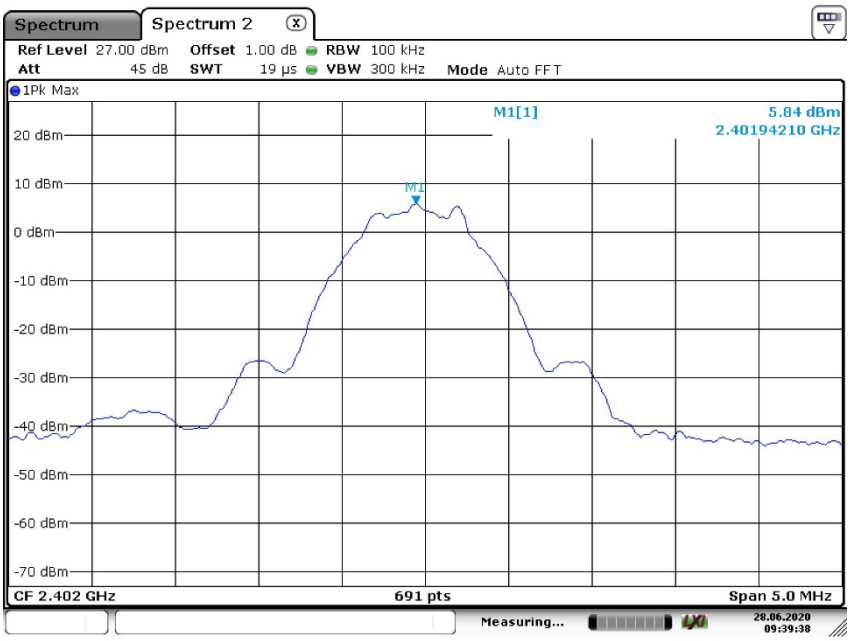
High Channel
RBW=100KHz, VBW=300KHz



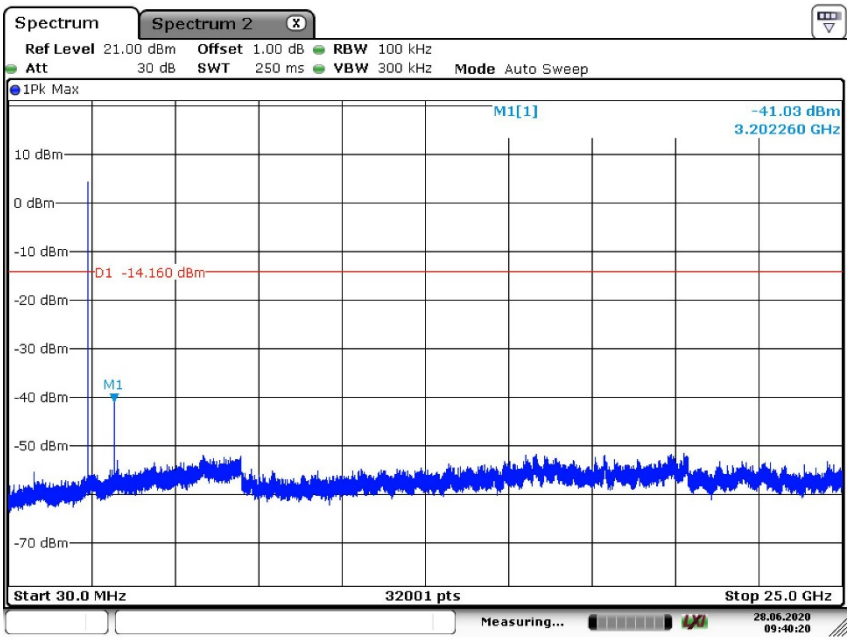
Appendix B.4: Conducted Spurious Emissions Measured in 100 kHz Bandwidth

Bluetooth Low Energy

Low Channel

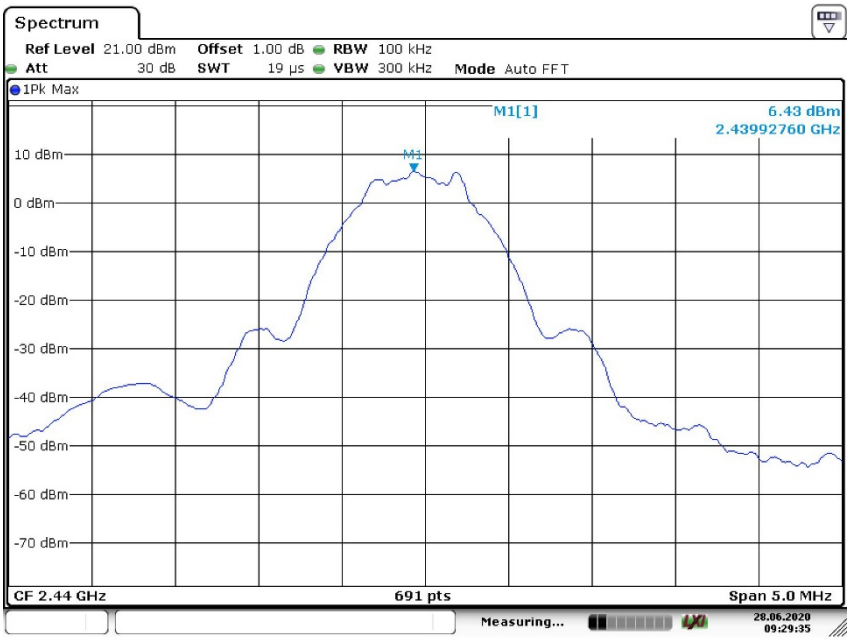


Date: 28.JUN.2020 09:39:39

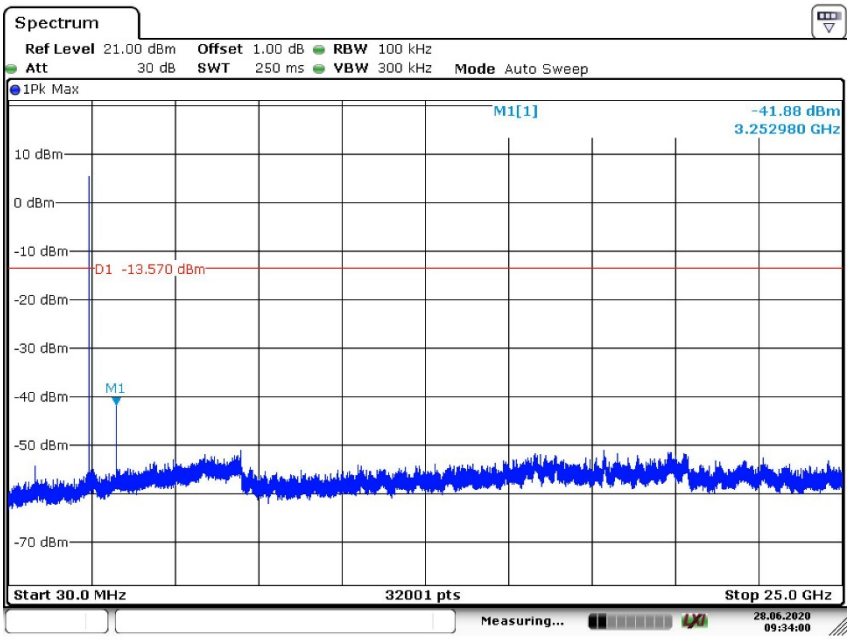


Date: 28.JUN.2020 09:40:21

Middle Channel

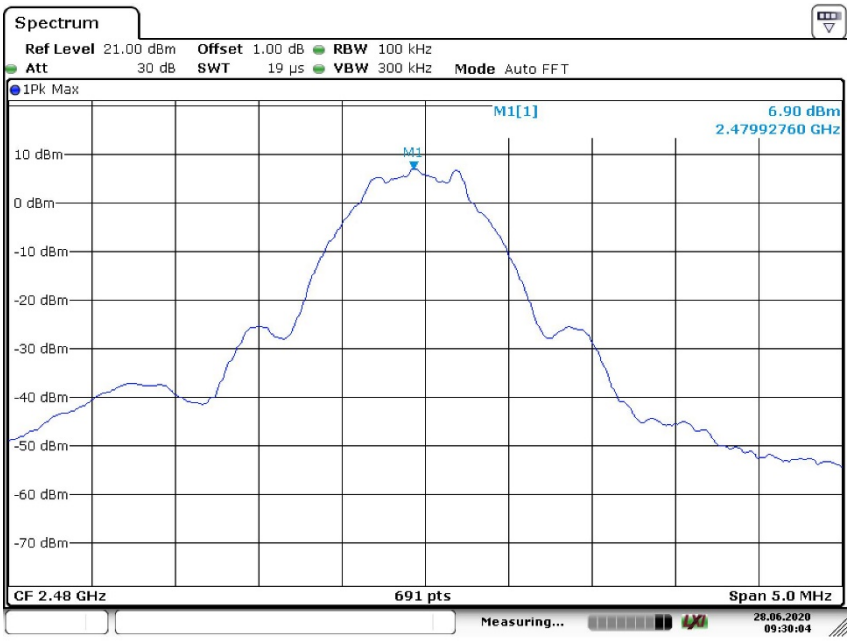


Date: 28.JUN.2020 09:29:35

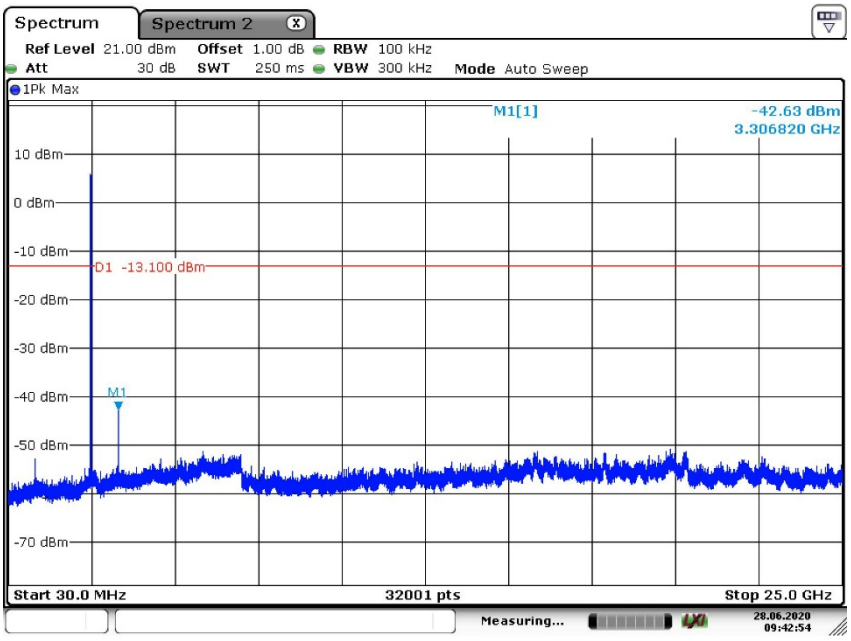


Date: 28.JUN.2020 09:34:01

High Channel

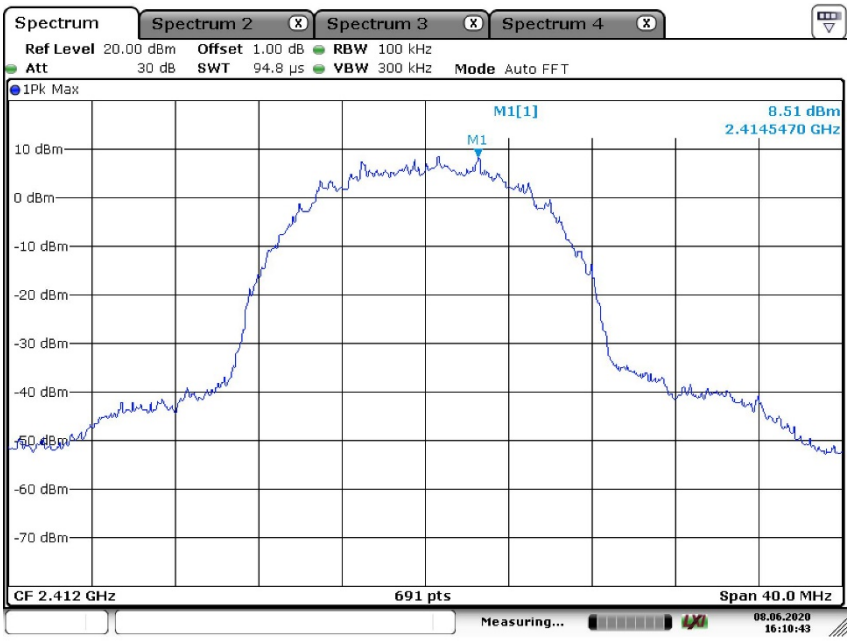


Date: 28.JUN.2020 09:30:04

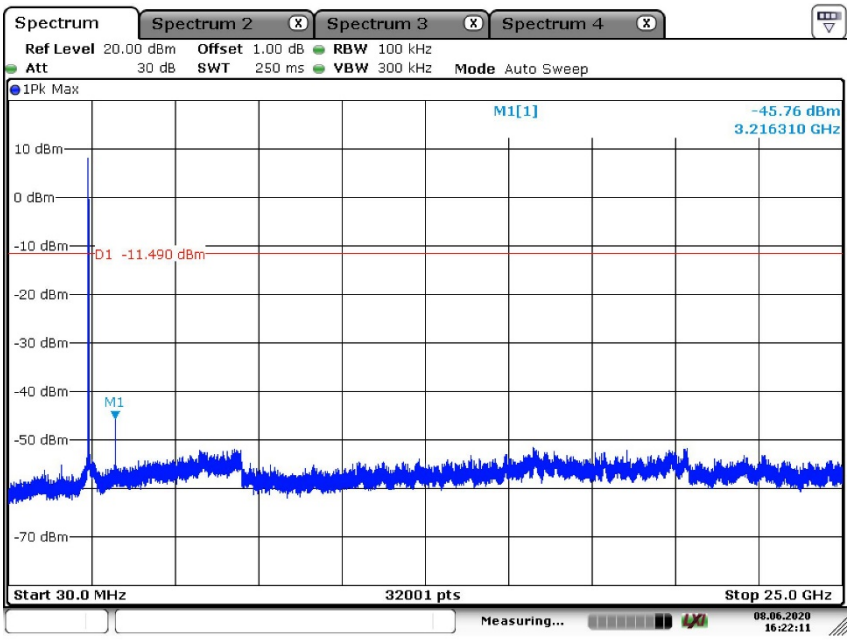


Date: 28.JUN.2020 09:42:54

Wi-Fi 802.11 b mode, 1 Mbps
Low Channel

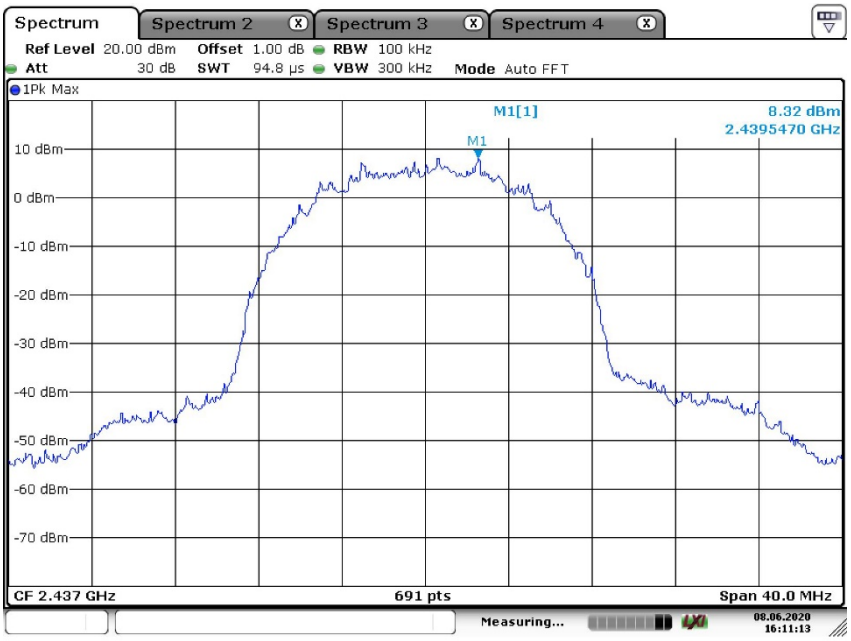


Date: 8.JUN.2020 16:10:43

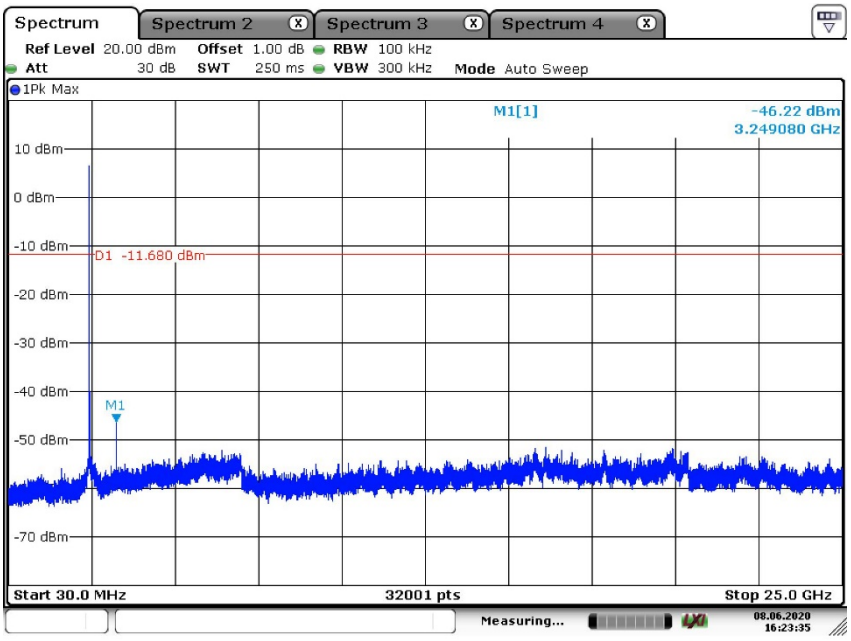


Date: 8.JUN.2020 16:22:11

Middle Channel

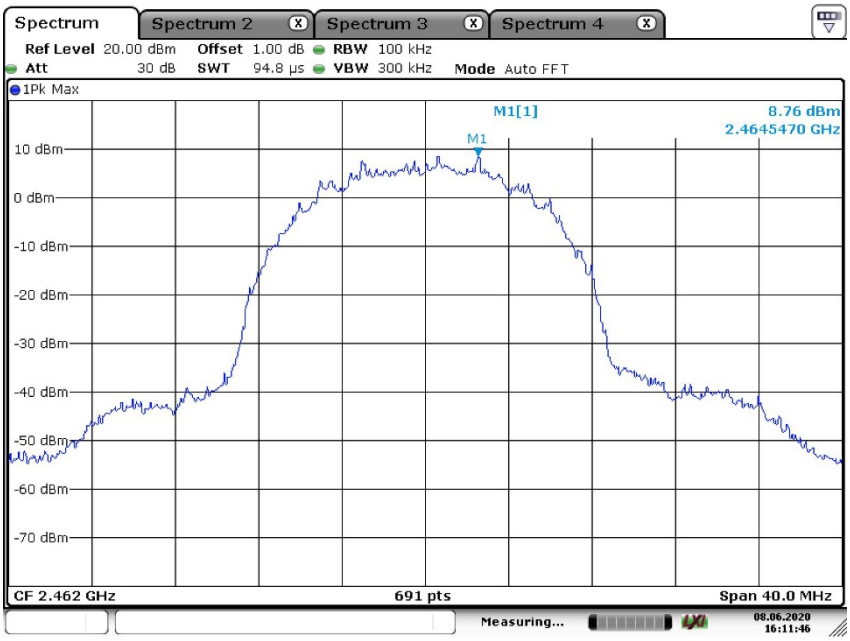


Date: 8.JUN.2020 16:11:13



Date: 8.JUN.2020 16:23:36

High Channel



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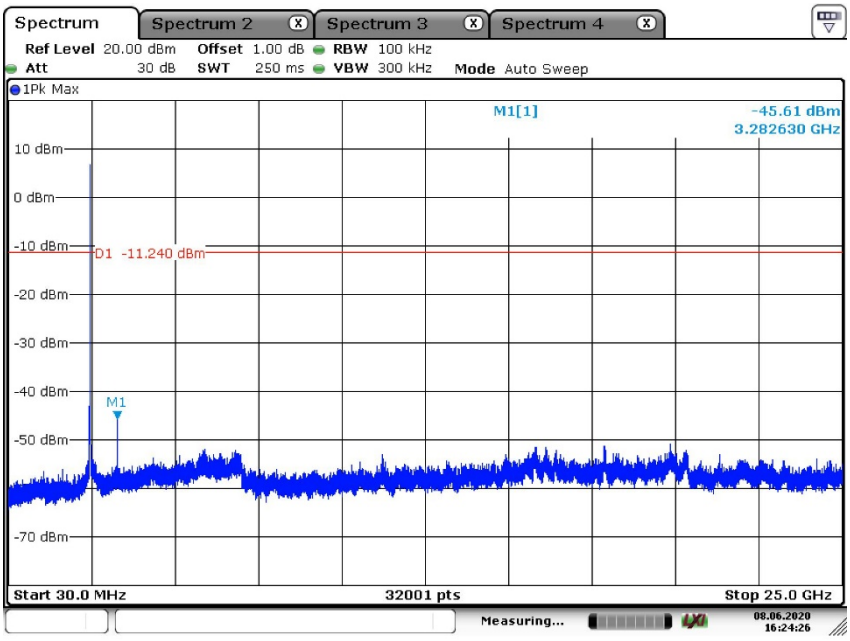
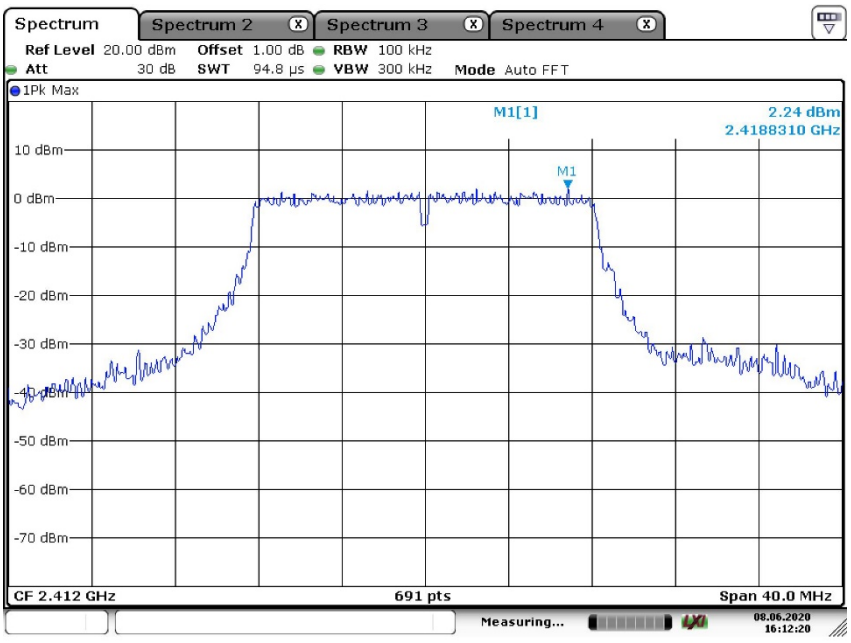
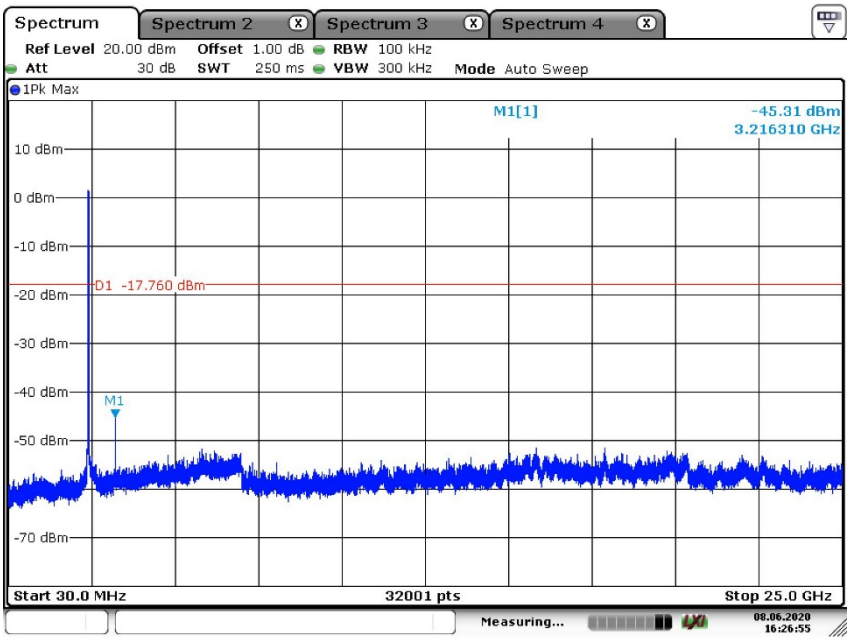


Date: 8.JUN.2020 16:24:27

Wi-Fi 802.11 g mode, 6 Mbps
Low Channel

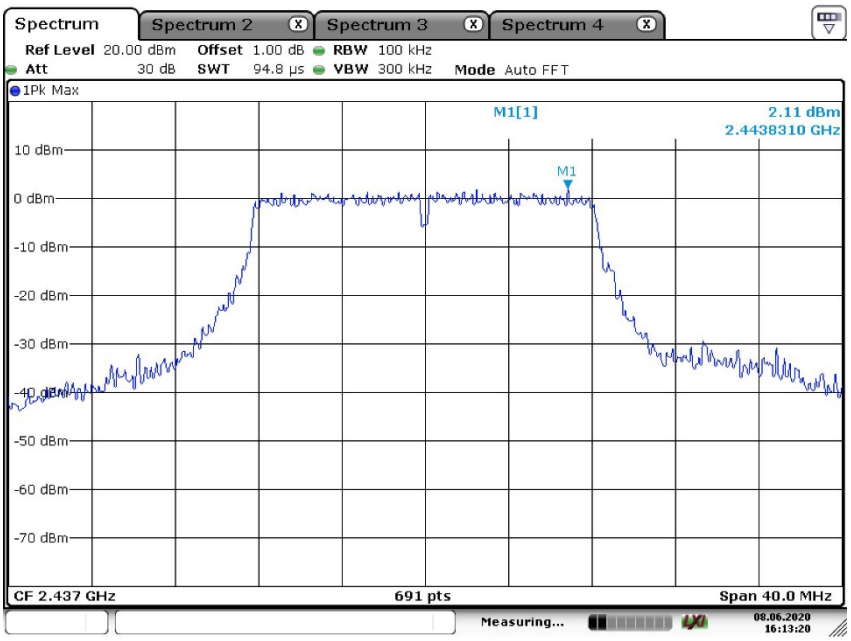


Date: 8.JUN.2020 16:12:21

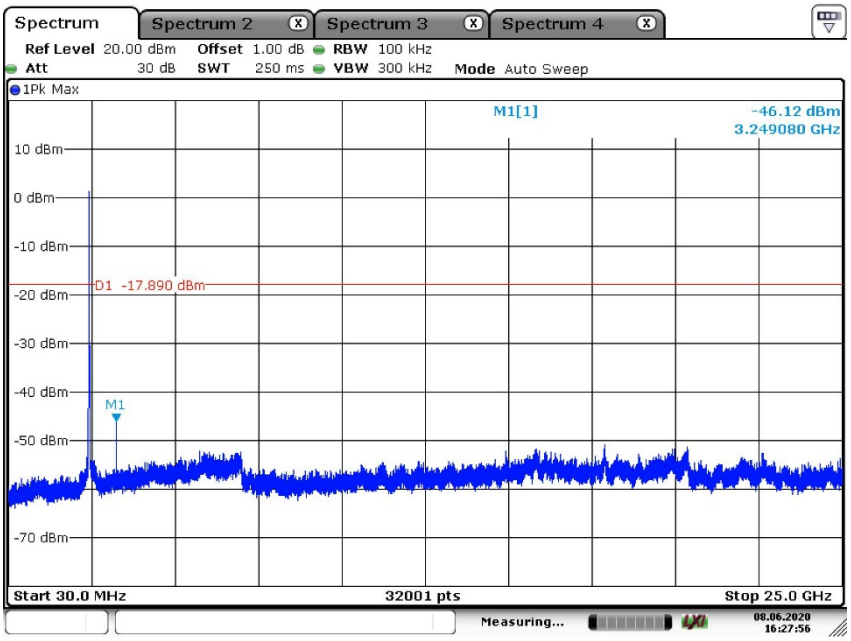


Date: 8.JUN.2020 16:26:56

Middle Channel

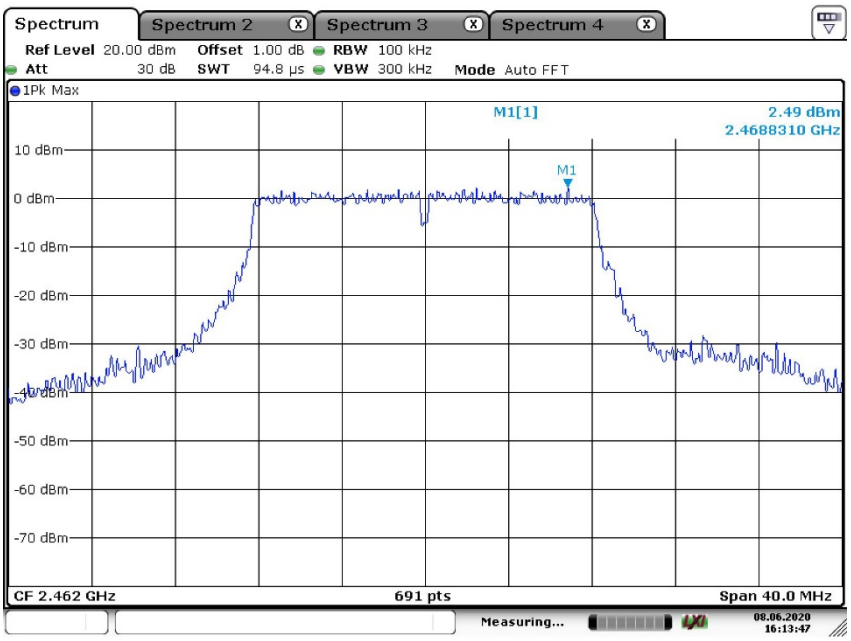


Date: 8.JUN.2020 16:13:21



Date: 8.JUN.2020 16:27:57

High Channel



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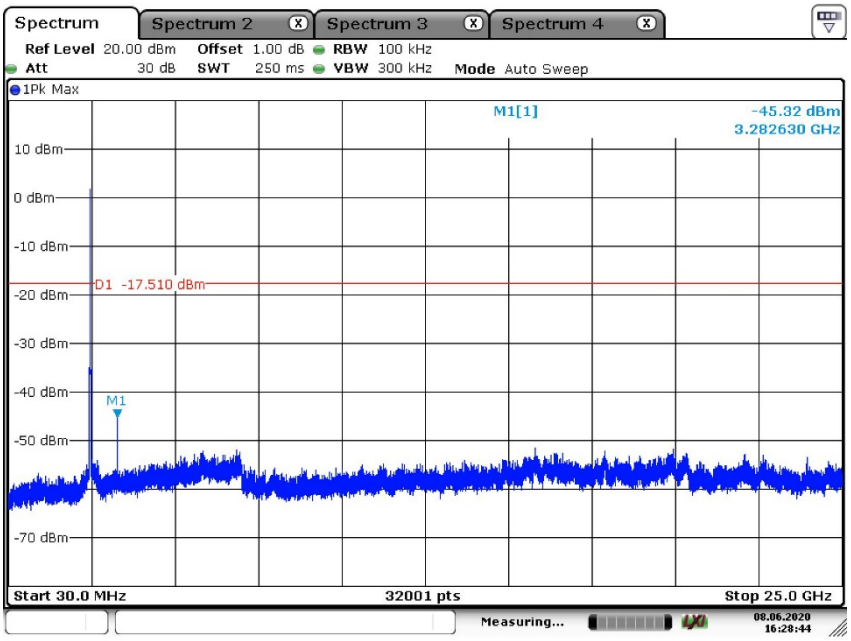

Date: 8.JUN.2020 16:28:45