FCC Part 15
EMI TEST REPORT

of

E.U.T. : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO

Model No. : WFR-39

FCC ID : BYG-WFR39

for

APPLICANT : SANGEAN ELECTRONICS INC.

ADDRESS : NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 34. LIN 5. DINGFU VIL., LINKOU DIST.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
Tel : (02)26023052 Fax : (02)26010910
http://www.etc.org.tw ; e-mail: emc@etc.org.tw
Report Number : 22-04-RBF-020-01

TEST REPORT CERTIFICATION

Applicant : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

Manufacturer : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

Description of EUT

a) Type of EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO

b) Trade Name : SANGEAN

c) Model No. : WFR-39

d) Power Supply : 1. 5V/2.4A USB Type C
2. Built in Li Ion battery 3.65V/2.6A

e) Frequency Range : 2412~2472MHz

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10-2013, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC

Summary of Tests

Test	Results
Radiated Emission	**Pass**
Conducted Emission	**Pass**
Duty Cycle	**Pass**
Emission Bandwidth	**Pass**
Output Power	**Pass**
100 kHz Bandwidth of Band Edges	**Pass**
Power Density	**Pass**
Out-of-Band Conducted Emission	**Pass**
Radio Frequency Radiation Exposure Requirements	**Pass**

Date Test Item Received	:	*Apr. 18, 2022*
Date Test Campaign Completed	:	*Apr. 28, 2022*
Date of Issue	:	*Jun. 30, 2022*

Test Engineer : Vincent Chang

(Vincent Chang, Engineer)

Approve & Authorized : Kevin Lee

Kevin Lee, Section Manager
EMC Dept. II of TAIWAN TESTING
AND CERTIFICATION CENTER

EMC TESTING DEPARTMENT II
財團法人台灣檢品檢測驗證中心 電磁相容 試驗二部 林口實驗室
Taiwan Testing and Certification Center

Table of Contents Page

1 GENERAL INFORMATION 6

1.1 Product Description 6
1.2 Characteristics of Device 6
1.3 Test Methodology 6
1.4 Test Facility 6

2 PROVISIONS APPLICABLE 7

2.1 Definition 7
2.2 Requirement for Compliance 8
2.3 Restricted Bands of Operation 10
2.4 Labeling Requirement 10
2.5 User Information 11
2.6 Measurement Uncertainty 12

3. SYSTEM TEST CONFIGURATION 13

3.1 Justification 13
3.2 Devices for Tested System 14

4 RADIATED EMISSION MEASUREMENT 15

4.1 Applicable Standard 15
4.2 Measurement Procedure 15
4.3 Measuring Instrument 17
4.4 Radiated Emission Data 18
4.5 Field Strength Calculation 42
4.6 Photos of Radiation Measuring Setup 43

5 CONDUCTED EMISSION MEASUREMENT 46

5.1 Standard Applicable 46
5.2 Measurement Procedure 46
5.3 Conducted Emission Data 47
5.4 Result Data Calculation 52
5.5 Conducted Measurement Equipment 52
5.6 Photos of Conduction Measuring Setup 53

6 ANTENNA REQUIREMENT 54

6.1 Standard Applicable 54
6.2 Antenna Construction and Directional Gain 54

7 DYTY CYCLE 55

7.1 Standard Applicable 55

7.2 Measurement Equipment 55
7.3 Measurement Data 55

8 EMISSION BANDWIDTH MEASUREMENT 60

8.1 Standard Applicable 60
8.2 Measurement Procedure 60
8.3 Measurement Equipment 60
8.4 Measurement Data 61

9 OUTPUT POWER MEASUREMENT 70

9.1 Standard Applicable 70
9.2 Measurement Procedure 70
9.3 Measurement Equipment 70
9.4 Measurement Data 71

10 100 KHZ BANDWIDTH OF BAND EDGES MEASUREMENT 80

10.1 Standard Applicable 80
10.2 Measurement Procedure 80
10.3 Measurement Equipment 80
10.4 Measurement Data 81

11 POWER DENSITY MEASUREMENT 94

11.1 Standard Applicable 94
11.2 Measurement Procedure 94
11.3 Measurement Equipment 94
11.4 Measurement Data 95

12 OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT 104

12.1 Standard Applicable 104
12.2 Measurement Procedure 104
12.3 Measurement Equipment 104
11.4 Measurement Data 105

1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
b) Trade Name : SANGEAN
c) Model No. : WFR-39
d) Power Supply : 1. 5V/2.4A USB Type C
2. Built in Li Ion battery 3.65V/2.6A

1.2 Characteristics of Device

FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO

1.3 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.10-2013. Other required measurements were illustrated in separate sections of this test report for details. For RF test the measurement procedure was refered to FCC KDB 558074 D01 15.247 Meas Guidance v05r02

Software	Version	Note
e3	Version 6.100618f	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.4 Test Facility

Location of the Test site: No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.
Designation Number: TW2628.

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

Except for Class A digital devices, for equpment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency MHz	Quasi Peak dBμV	Average dBμV
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

* Decreases with the logarithm of the frequency

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dBμV/m	Radiated μV/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

(4) Bandwidth Requirement

For direct sequence system, according to 15.247(a)(2), the minimum 6dB bandwidth shall be at least 500 kHz.

(5) Output Power Requirement

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

(7) Power Density Requirement

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

2.3 Restricted Bands of Operation

According to 15.205(a) . Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

2.6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	±3.34dB (Mains)(LISN)
Radiated emissions	9kHz ~ 30MHz	±4.22dB
Radiated emissions	30MHz ~ 1GHz	±4.2dB (30MHz≦f≦300MHz)
		±4.44dB (300MHz＜f≦1GHz)
	Above 1GHz	±4.44dB (1GHz≦f≦18GHz)
		±3.02dB (18GHz≦f≦40GHz)
Conducted Measurement	9kHz ~ 40GHz	±0.88dB (9kHz≦f≦30MHz)
		±0.88dB (30MHz＜f≦1GHz)
		±1.04dB (1GHz≦f≦18GHz)
		±1.2dB (18GHz≦f≦40GHz)
Frequencies Tolerance	9kHz ~ 40GHz	$\pm 4.04\times10^{-8}$
Occupied Bandwidth	9kHz ~ 40GHz	±5%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The test result(s) does not consider the uncertainty of measurement when the test standard(s) and/or test method which refer by the labs has the limit or judgments for the test result(s).

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

802.11b	11Mbps
802.11g	54Mbps
802.11n20	MCS7
802.11n40	MCS7

For conducted and radiated spurious emissions, whichever RF channel is operated, the digital circuits function identically. As the reason, measurement of radiated emissions from digital circuits is only performed with 802.11b channel 7 by transmitting mode.

3.2 Devices for Tested System

EUT & accessories.

Device	Manufacture	Model / FCC ID.	Description
FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO *	SANGEAN ELECTRONICS INC.	WFR-39/ BYG-WFR39	---
USB to Type C Cable	YuanYue	YY-D10-18340	1.0m Unshielded Cable

Remark "*" means equipment under test.

The EUT connected with the following peripheral devices.

Device	Manufacture	Model	Description
ADAPTER	TOPCOM	TC-KPD36WD	Input：100-240Vac , 50/60Hz , 0.6A Output：5Vdc , 3.0A
Earphone	---	---	0.8m Unshielded Cable

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).
For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

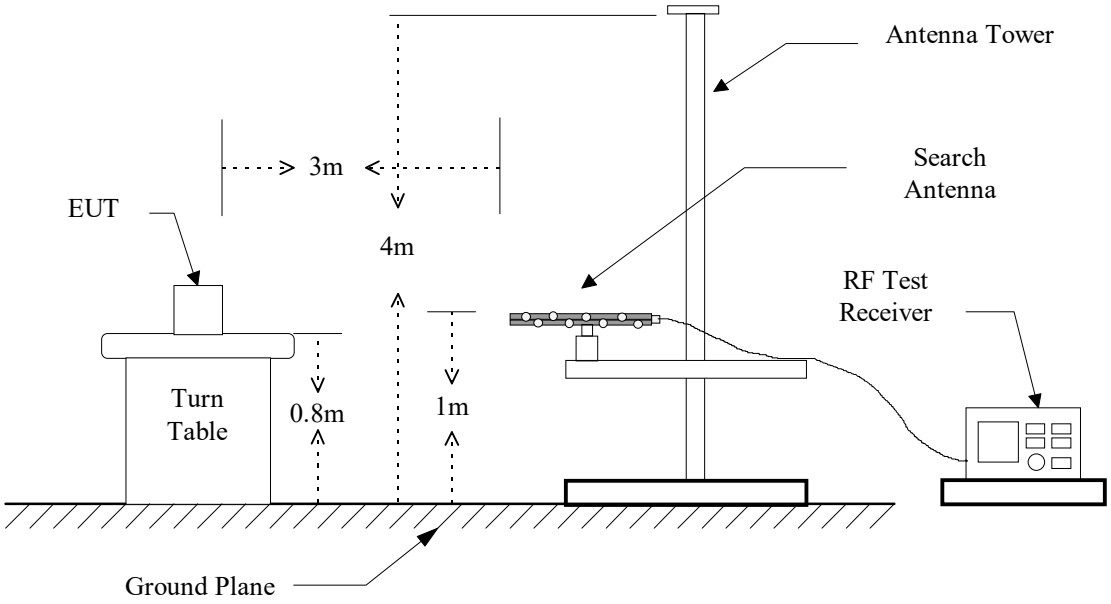
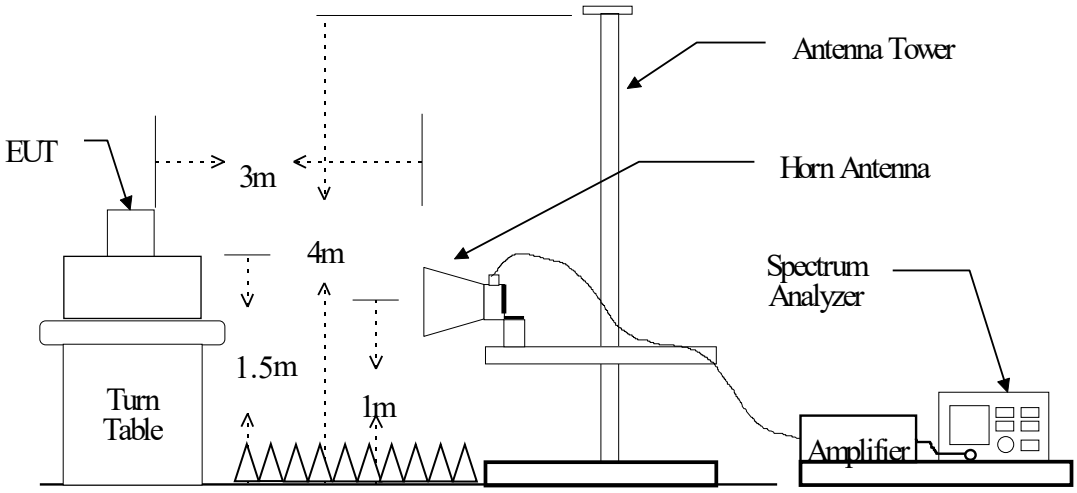


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU40 (13054416-001)	2022/04/21	2023/04/20
Bi-Log Antenna with 5dB Pad (3m)	ETC & JYE BAO	MCTD 2786 & FAT-NM5NF5T3G2W6(13057618-002 & RF-002)	2021/09/10	2022/09/09
Amplifier	HP	8447D (13040711-001)	2021/09/22	2022/09/21
Amplifier	HP	8449B (13052901-001)	2021/09/22	2022/09/21
Horn Antenna	EMCO	3117	2022/04/08	2023/04/07
Horn Antenna	EMCO	3116	2021/08/27	2022/08/26
Amplifier	Keysight	83051A	2021/09/09	2022/09/08

Measuring instrument setup in measured frequency band when specified detector function is used :

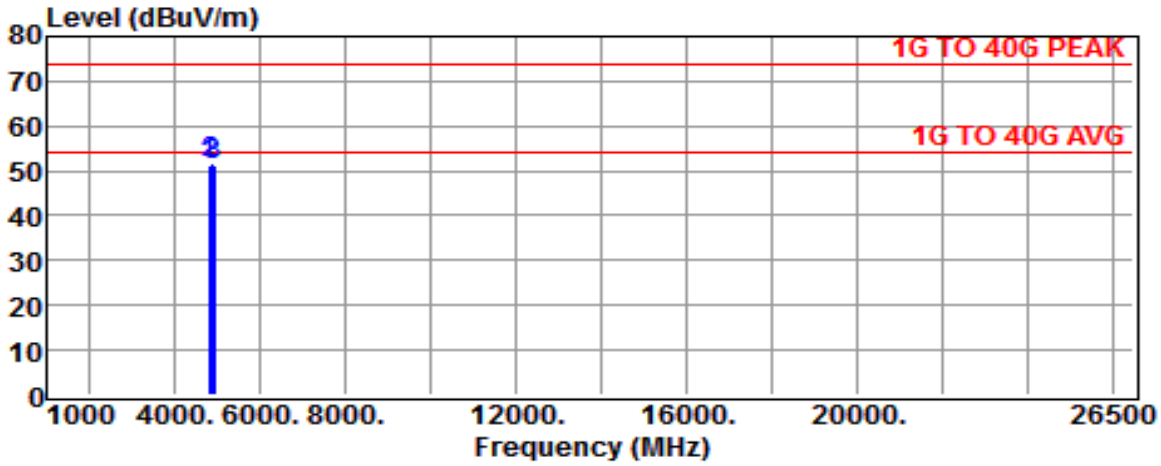
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz or ≥ 1/T (Note 1)

Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

4.4 Radiated Emission Data

4.4.1 RF Portion

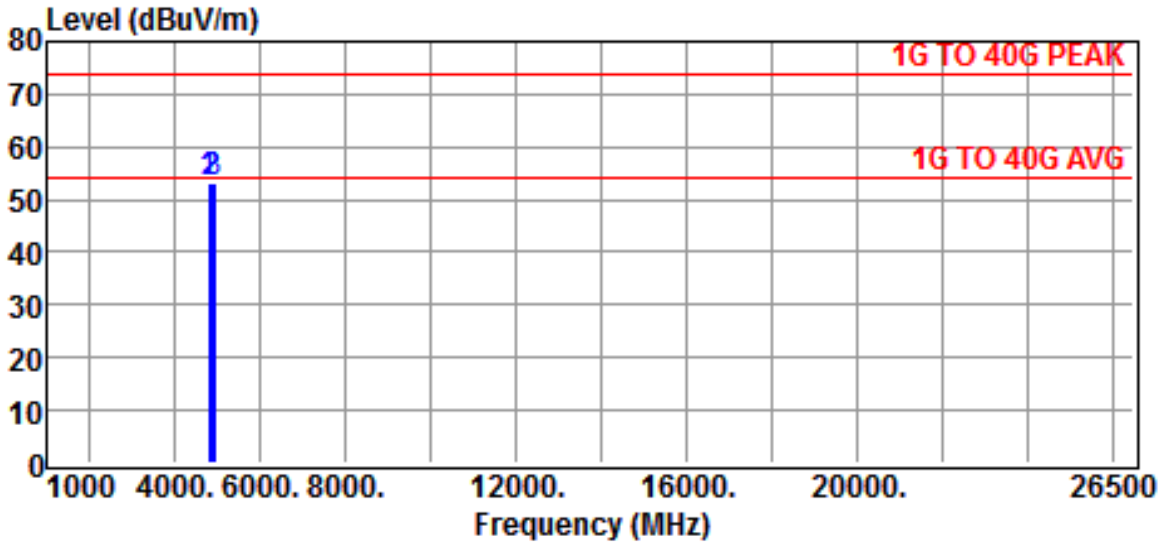
A. 802.11b



Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11B
TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	45.86	5.24	51.10	74.00	-22.90	Peak
*	4882.0000	46.20	5.30	51.50	74.00	-22.50	Peak
	4944.0000	45.86	5.44	51.30	74.00	-22.70	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

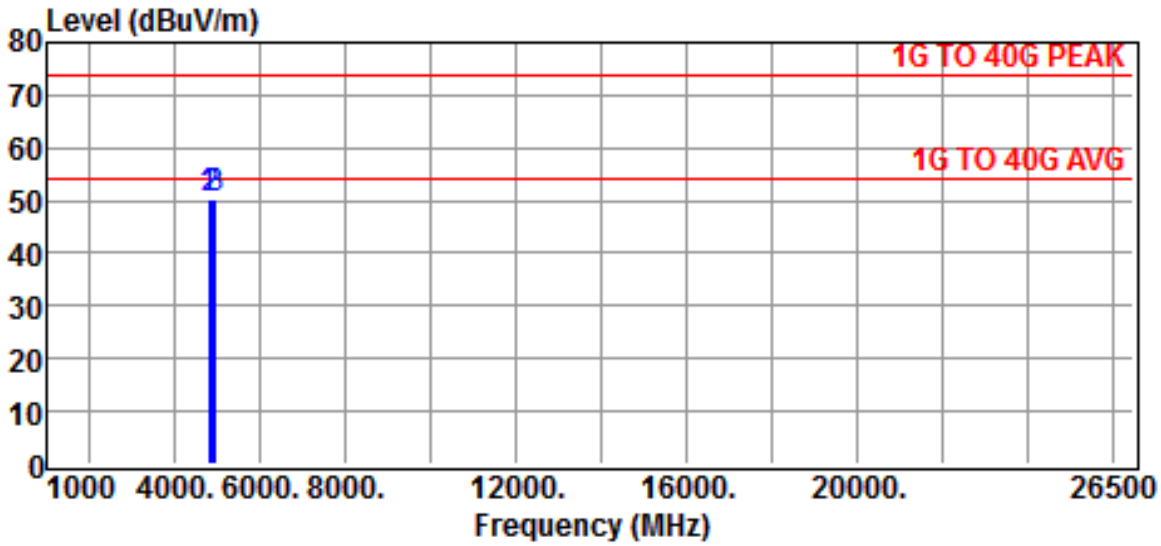


Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11B
TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	47.76	5.24	53.00	74.00	-21.00	Peak
*	4882.0000	48.10	5.30	53.40	74.00	-20.60	Peak
	4944.0000	47.66	5.44	53.10	74.00	-20.90	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

B. 802.11g



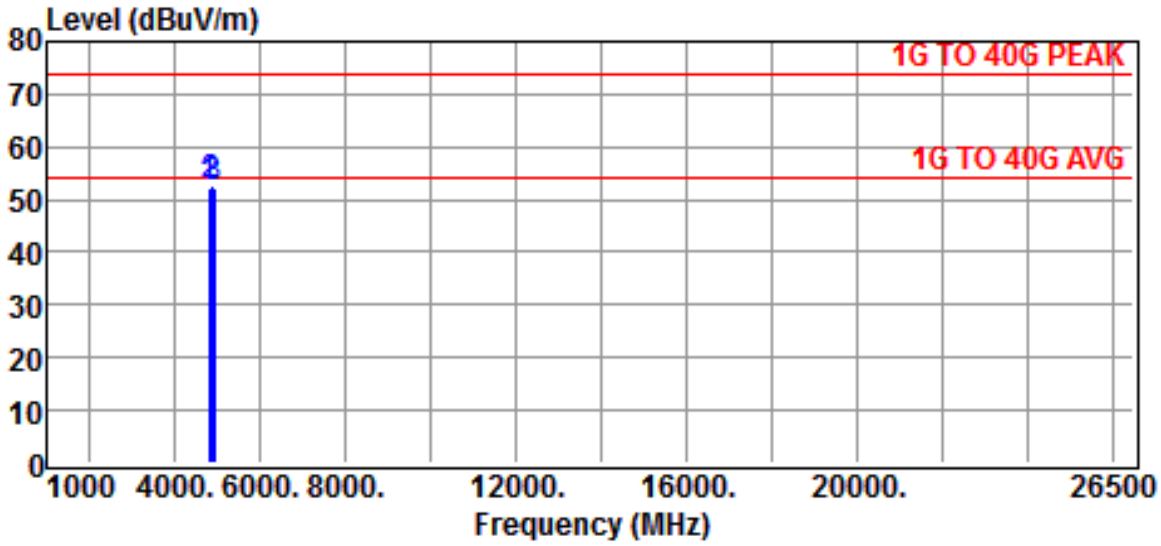
Site	:Chamber#2	Date	:2022-04-28
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:802.11G		

TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	44.96	5.24	50.20	74.00	-23.80	Peak
*	4882.0000	45.10	5.30	50.40	74.00	-23.60	Peak
	4960.0000	44.84	5.46	50.30	74.00	-23.70	Peak

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

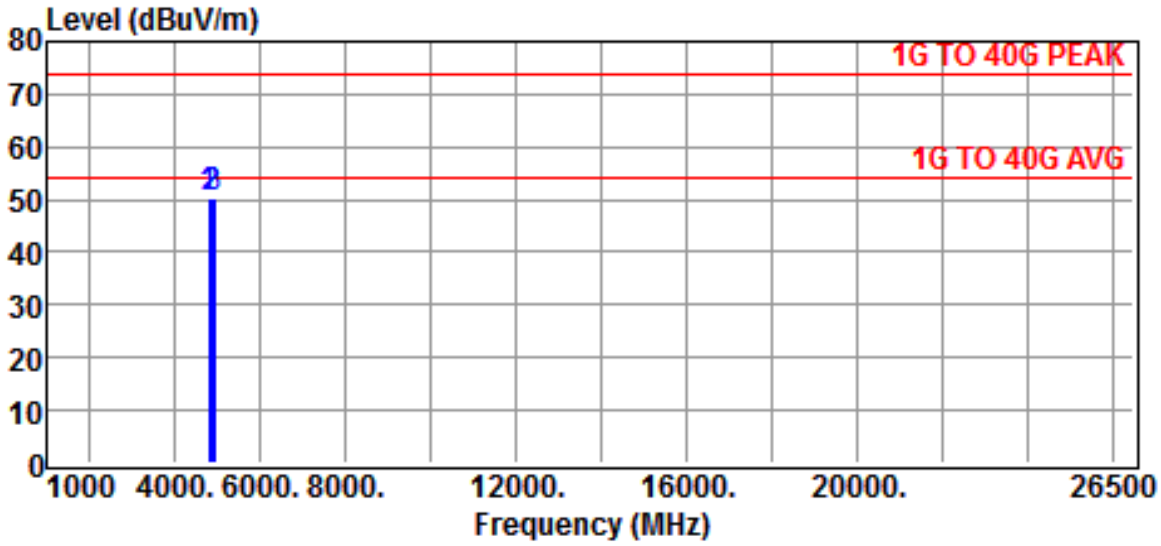


Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11G
TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	46.86	5.24	52.10	74.00	-21.90	Peak
*	4882.0000	47.30	5.30	52.60	74.00	-21.40	Peak
	4944.0000	46.96	5.44	52.40	74.00	-21.60	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

C. 802.11n20



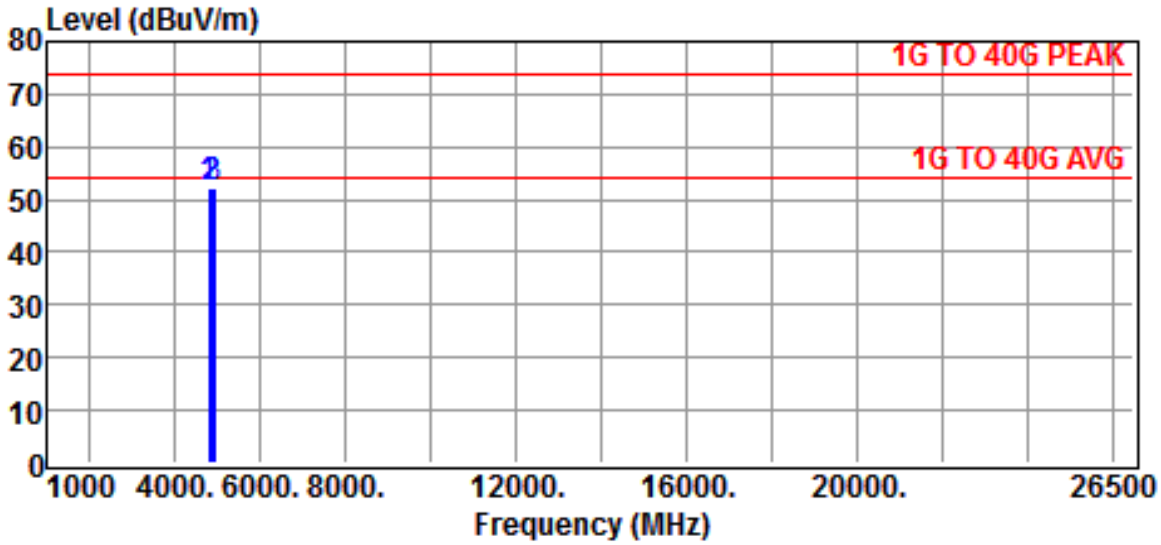
Site	:Chamber#2	Date	:2022-04-28
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:802.11N20		

TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	45.16	5.24	50.40	74.00	-23.60	Peak
*	4882.0000	45.20	5.30	50.50	74.00	-23.50	Peak
	4944.0000	44.76	5.44	50.20	74.00	-23.80	Peak

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

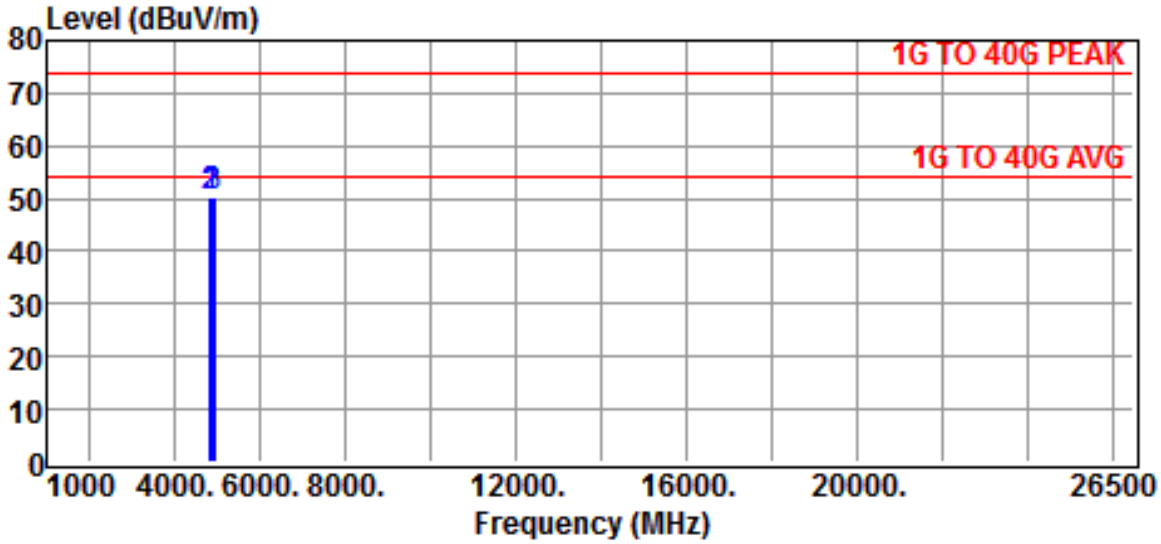


Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N20
TX RX - 2412 / 2442 / 2472MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4824.0000	46.76	5.24	52.00	74.00	-22.00	Peak
*	4882.0000	47.10	5.30	52.40	74.00	-21.60	Peak
	4944.0000	46.76	5.44	52.20	74.00	-21.80	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

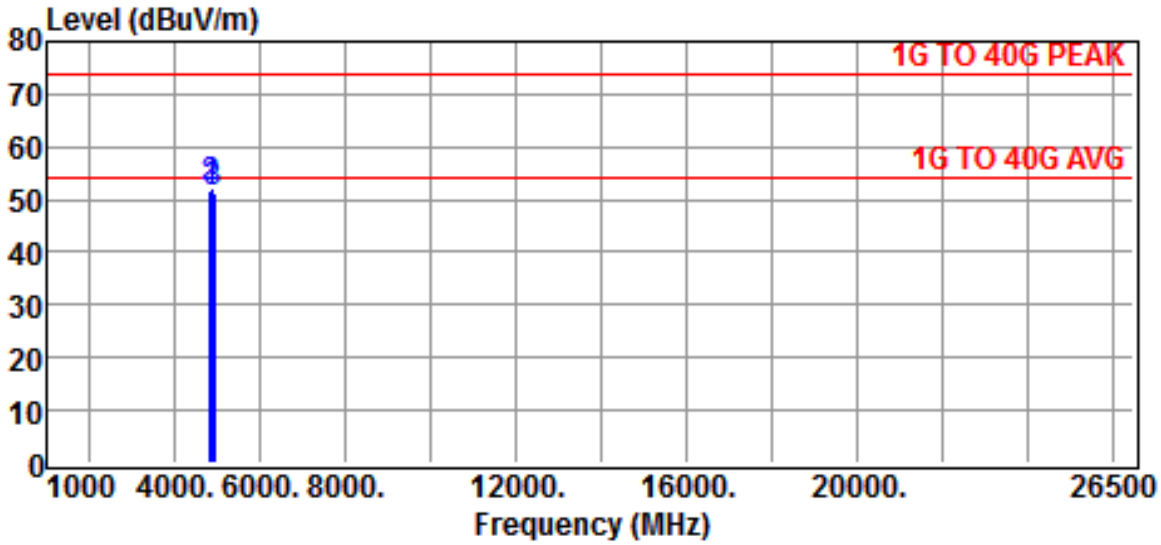
D. 802.11n40



Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N40
TX RX - 2422 / 2442 / 2462MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4844.0000	44.93	5.27	50.20	74.00	-23.80	Peak
*	4882.0000	45.00	5.30	50.30	74.00	-23.70	Peak
	4924.0000	44.72	5.38	50.10	74.00	-23.90	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



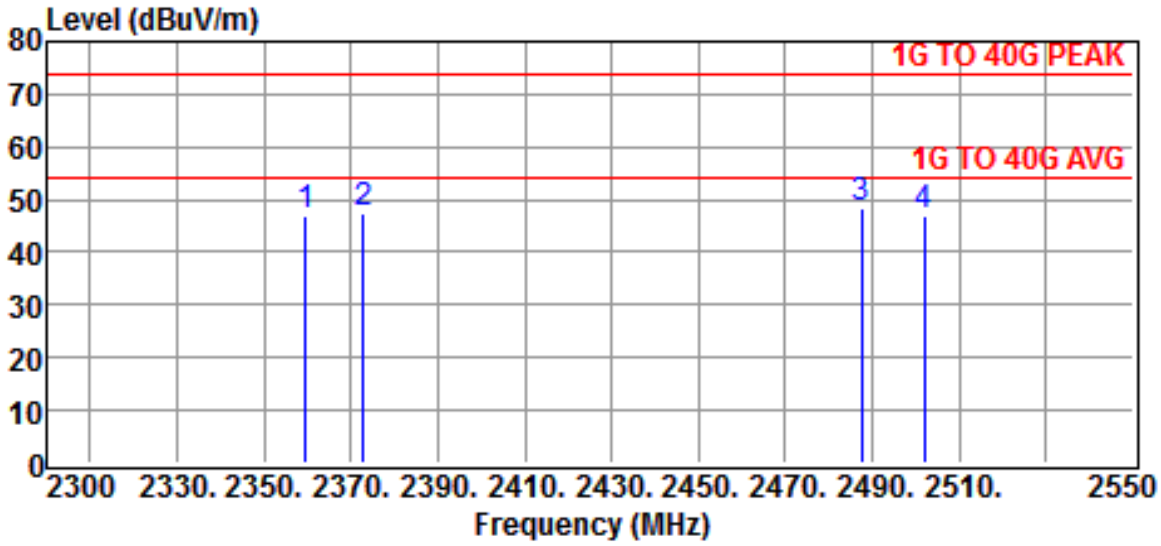
Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N40
TX RX - 2422 / 2442 / 2462MHz

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	4844.0000	46.33	5.27	51.60	74.00	-22.40	Peak
*	4882.0000	46.80	5.30	52.10	74.00	-21.90	Peak
	4924.0000	46.02	5.38	51.40	74.00	-22.60	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

4.4.2 Radiated Eimssion of Restricted bands

A. 802.11b



Site :Chamber#2 Date :2022-04-28

Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL

EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO

Model :WFR-39

Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C

Engineer :Vincent Humi. :68 %

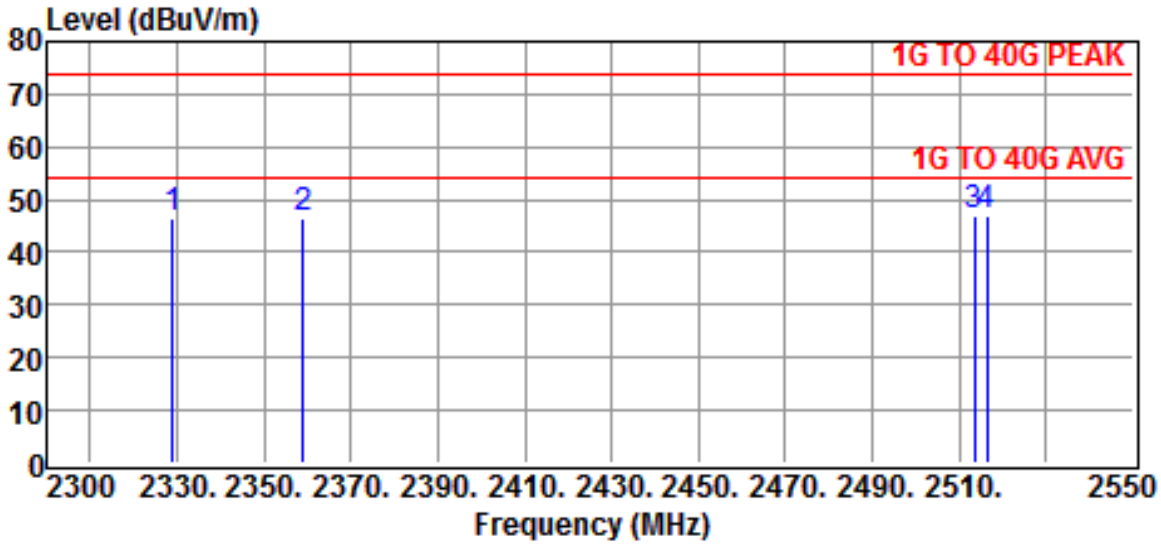
Test Mode :802.11B

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2359.5000	46.85	-0.01	46.84	74.00	-27.16	Peak
	2373.0000	47.47	0.01	47.48	74.00	-26.52	Peak
*	2487.5000	47.96	0.29	48.25	74.00	-25.75	Peak
	2502.0000	46.77	0.29	47.06	74.00	-26.94	Peak

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



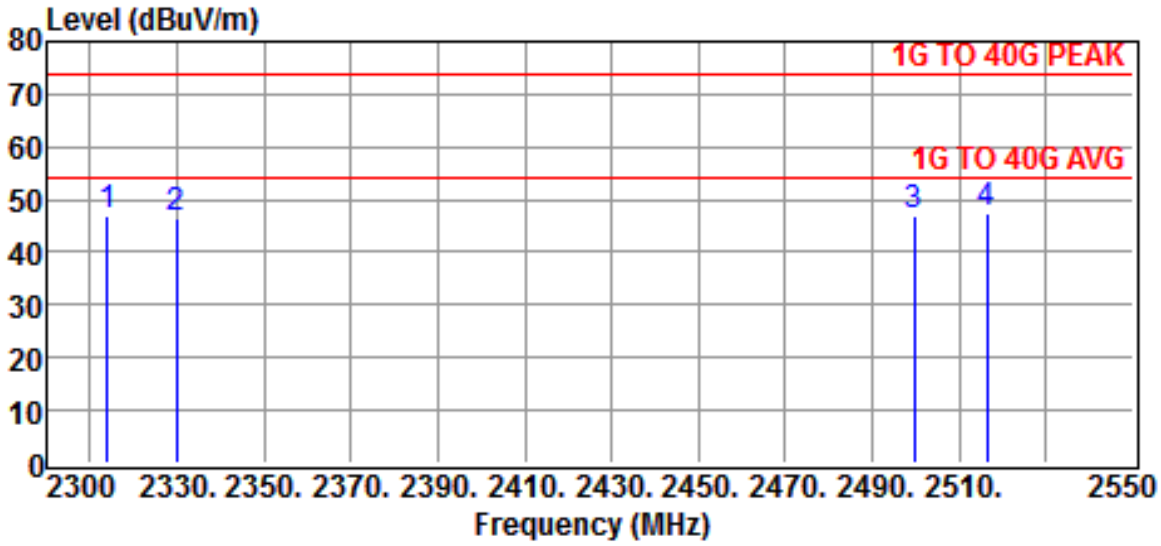
Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11B

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2329.0000	46.33	-0.09	46.24	74.00	-27.76	Peak
	2359.0000	46.50	-0.01	46.49	74.00	-27.51	Peak
*	2513.5000	46.85	0.31	47.16	74.00	-26.84	Peak
	2516.5000	46.67	0.31	46.98	74.00	-27.02	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

B. 802.11g



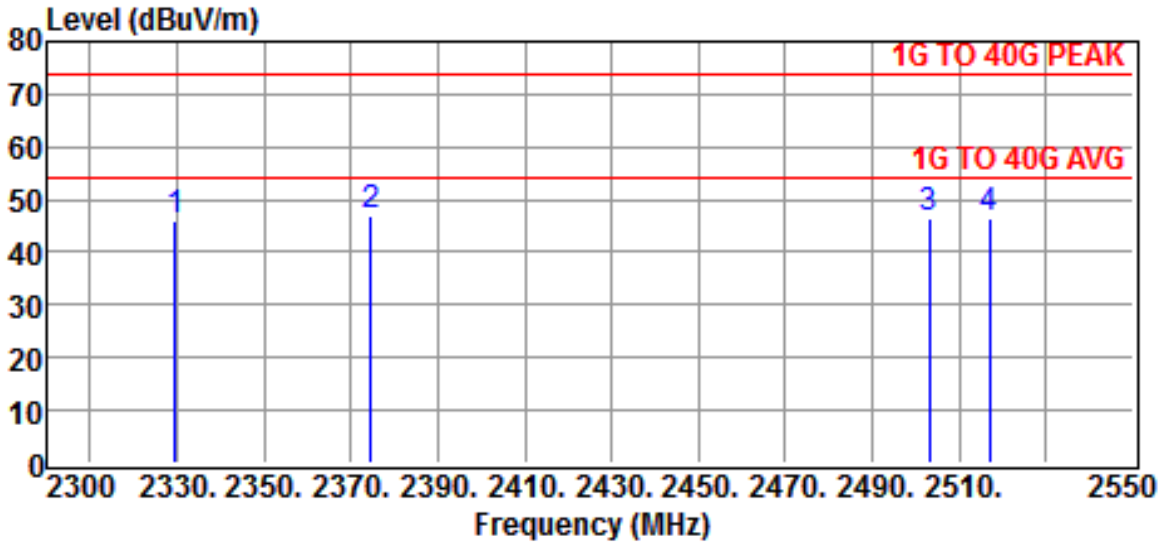
Site	:Chamber#2	Date	:2022-04-28
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:802.11G		

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2314.0000	46.97	-0.14	46.83	74.00	-27.17	Peak
	2330.0000	46.42	-0.09	46.33	74.00	-27.67	Peak
	2499.5000	46.81	0.29	47.10	74.00	-26.90	Peak
*	2516.5000	47.06	0.31	47.37	74.00	-26.63	Peak

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



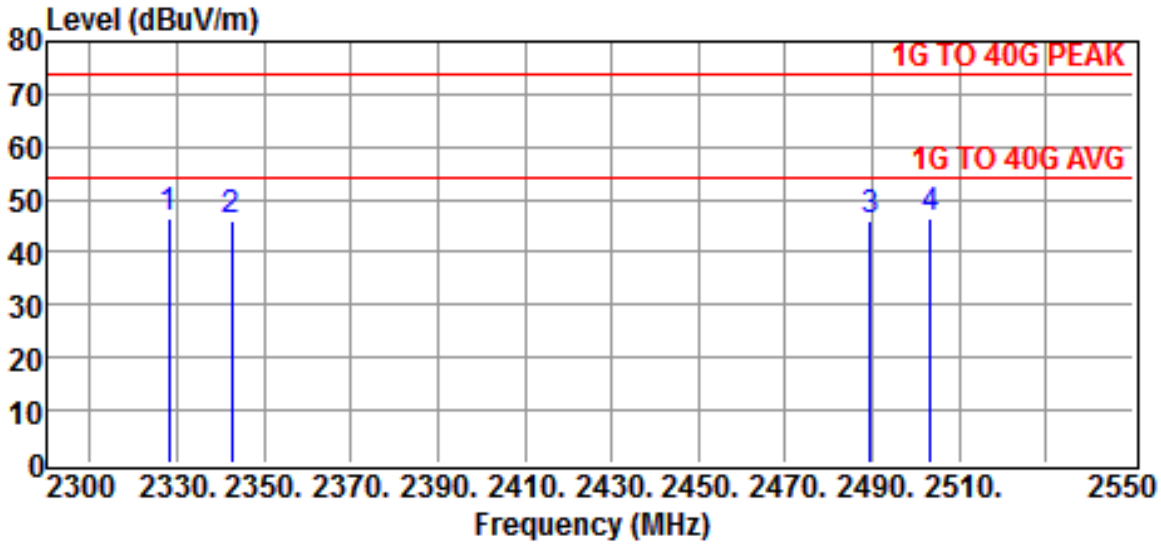
Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11G

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2329.5000	45.98	-0.09	45.89	74.00	-28.11	Peak
*	2374.5000	46.97	0.01	46.98	74.00	-27.02	Peak
	2503.0000	46.02	0.29	46.31	74.00	-27.69	Peak
	2517.0000	46.07	0.31	46.38	74.00	-27.62	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

C. 802.11n20



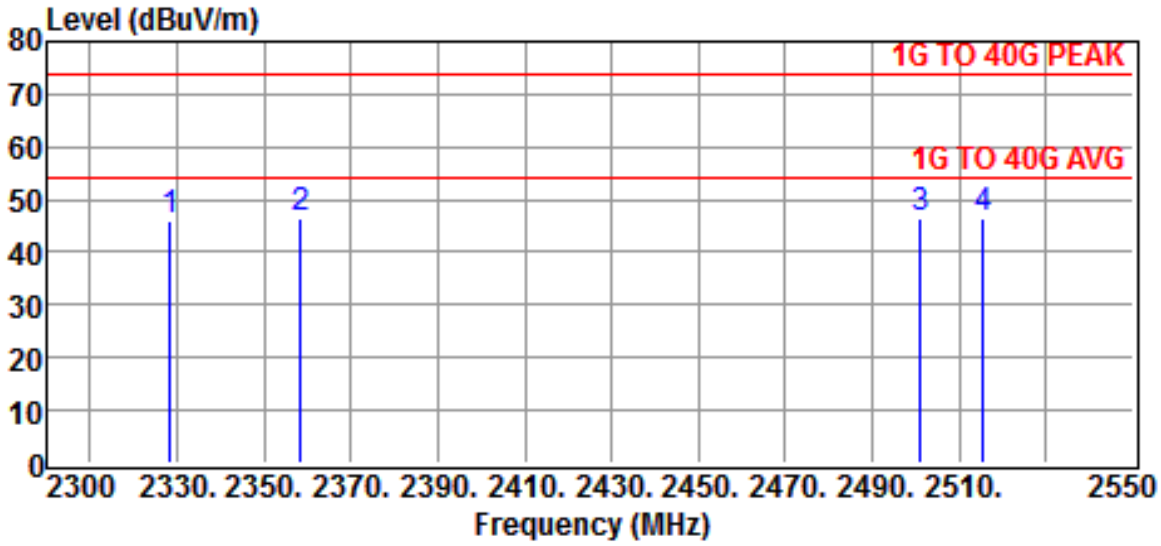
Site	:Chamber#2	Date	:2022-04-28
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:802.11N20		

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
*	2328.2500	46.37	-0.09	46.28	74.00	-27.72	Peak
	2342.5000	45.94	-0.05	45.89	74.00	-28.11	Peak
	2489.5000	45.61	0.30	45.91	74.00	-28.09	Peak
	2503.5000	45.97	0.29	46.26	74.00	-27.74	Peak

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



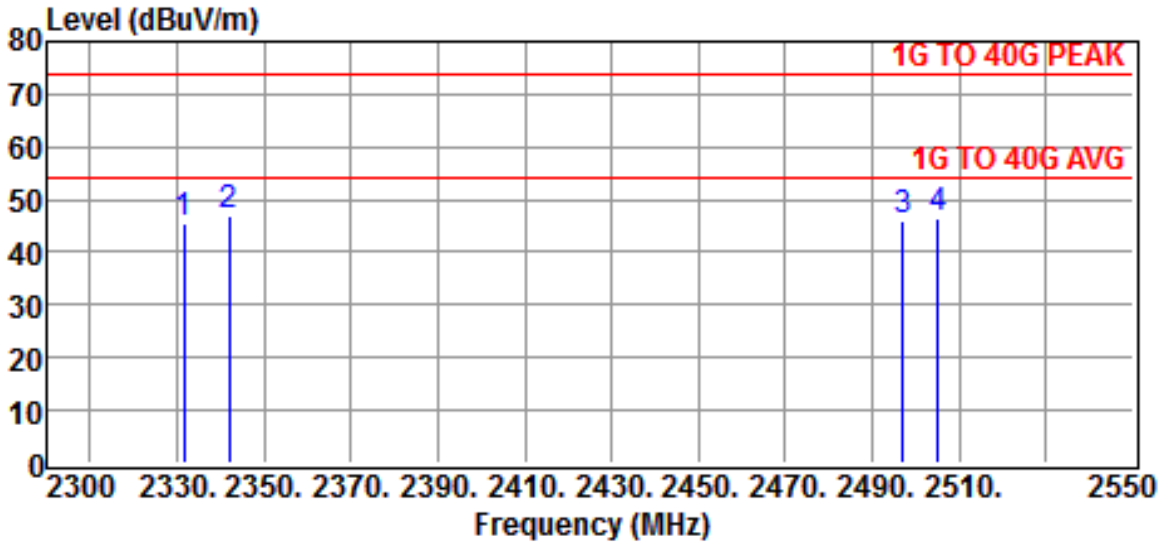
Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N20

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2328.5000	45.97	-0.09	45.88	74.00	-28.12	Peak
	2358.5000	46.37	-0.01	46.36	74.00	-27.64	Peak
	2501.0000	46.10	0.29	46.39	74.00	-27.61	Peak
*	2515.5000	46.16	0.31	46.47	74.00	-27.53	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

D. 802.11n40

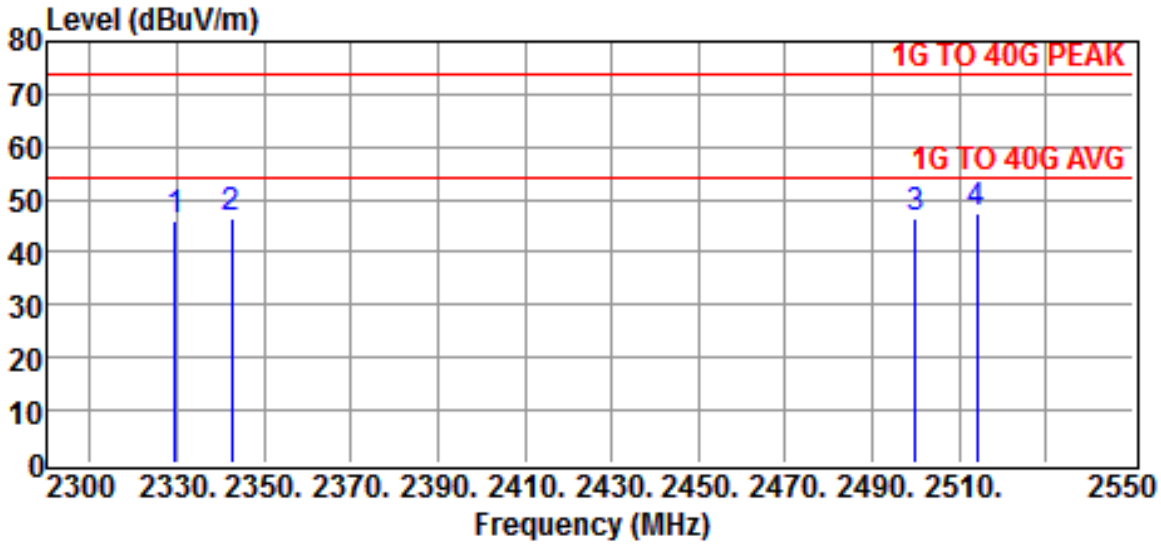


Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N40

OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2331.5000	45.78	-0.09	45.69	74.00	-28.31	Peak
*	2342.0000	46.93	-0.05	46.88	74.00	-27.12	Peak
	2497.0000	45.81	0.30	46.11	74.00	-27.89	Peak
	2505.0000	46.05	0.30	46.35	74.00	-27.65	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



Site :Chamber#2 Date :2022-04-28
Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :802.11N40

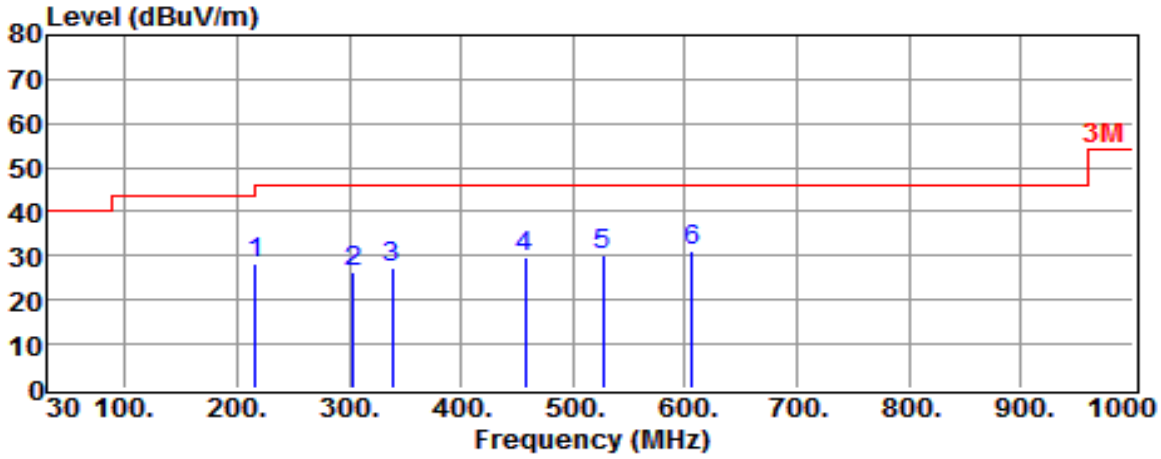
OPERATION MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	2329.5000	46.21	-0.09	46.12	74.00	-27.88	Peak
	2342.5000	46.70	-0.05	46.65	74.00	-27.35	Peak
	2500.0000	46.30	0.29	46.59	74.00	-27.41	Peak
*	2514.0000	46.93	0.31	47.24	74.00	-26.76	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

4.4.3 Other Emission

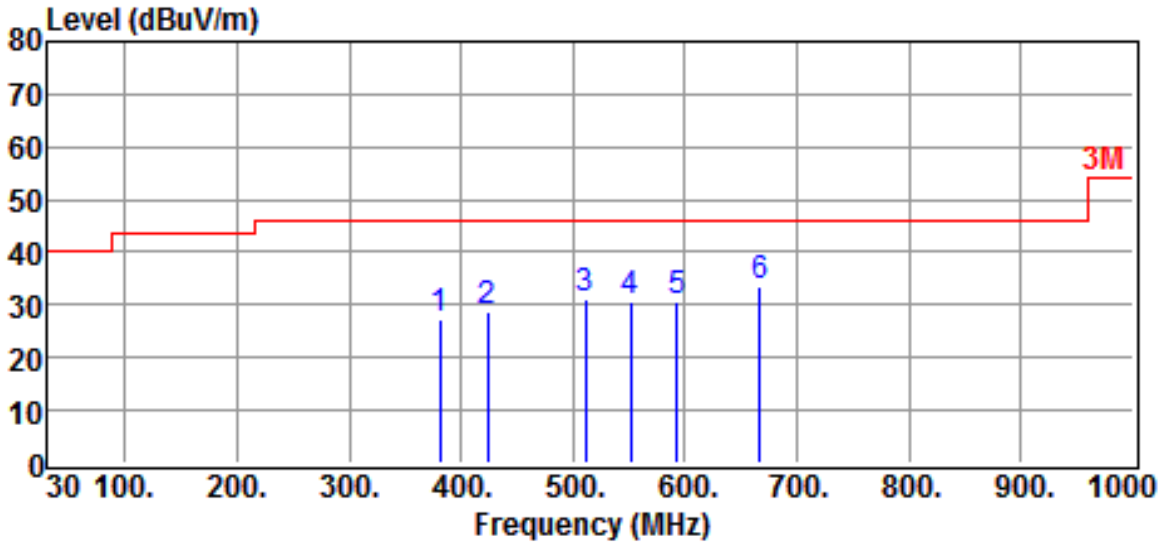
a) Emission frequencies below 1 GHz



Site :Chamber#2 Date :2022-04-19
Limit :3M Ant. Pol. :HORIZONTAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :Battery Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :WIFI MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	216.2400	36.16	-7.74	28.42	46.00	-17.58	QP
	303.5400	30.10	-3.92	26.18	46.00	-19.82	QP
	338.4600	31.13	-3.63	27.50	46.00	-18.50	QP
	456.8000	30.82	-1.29	29.53	46.00	-16.47	QP
	526.6400	30.16	-0.13	30.03	46.00	-15.97	QP
*	606.1800	30.42	0.82	31.24	46.00	-14.76	QP

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

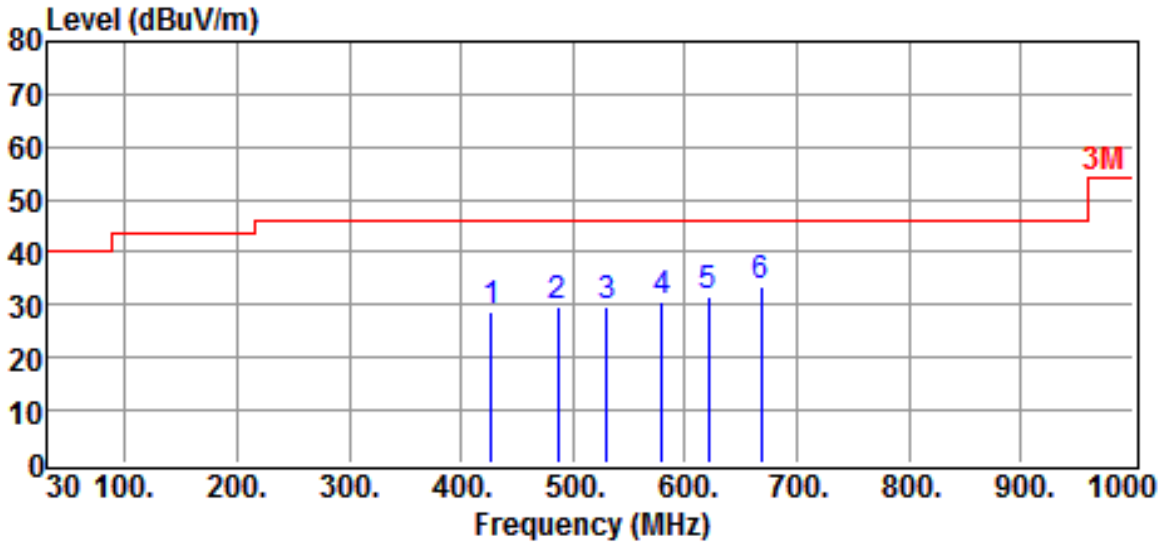


Site	:Chamber#2	Date	:2022-04-19
Limit	:3M	Ant. Pol.	:VERTICAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:Battery	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:WIFI MODE		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	381.1400	29.50	-2.26	27.24	46.00	-18.76	QP
	423.8200	30.29	-1.66	28.63	46.00	-17.37	QP
	511.1200	31.55	-0.40	31.15	46.00	-14.85	QP
	550.8900	30.19	0.29	30.48	46.00	-15.52	QP
	592.6000	30.11	0.75	30.86	46.00	-15.14	QP
*	666.3200	30.34	3.33	33.67	46.00	-12.33	QP

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

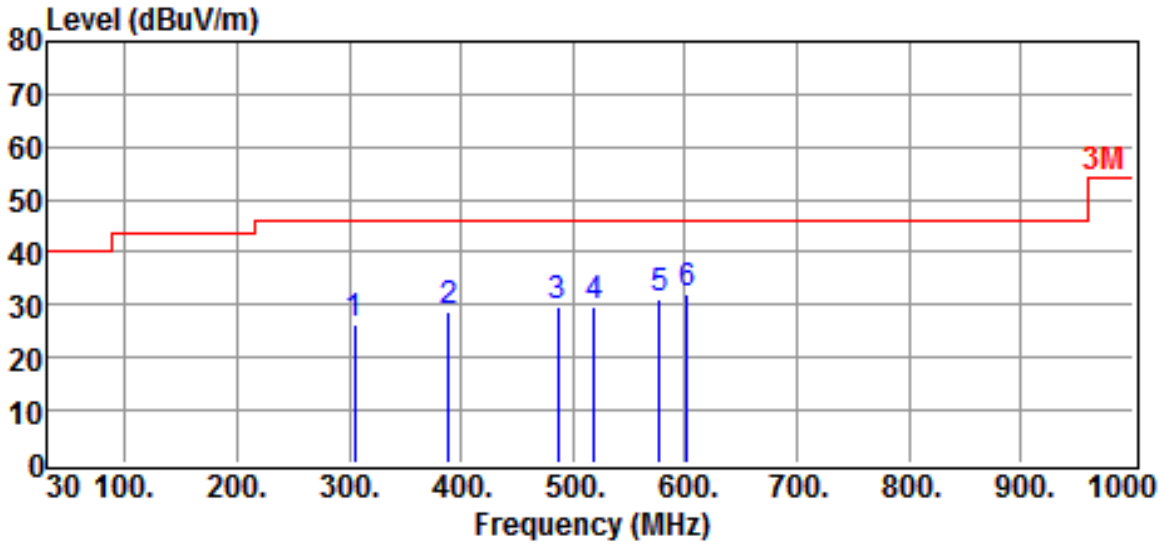


Site	:Chamber#2	Date	:2022-04-19
Limit	:3M	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:Battery	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:FM MODE		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	426.7300	30.38	-1.67	28.71	46.00	-17.29	QP
	485.9000	30.21	-0.65	29.56	46.00	-16.44	QP
	530.5200	29.63	-0.04	29.59	46.00	-16.41	QP
	579.0200	30.38	0.41	30.79	46.00	-15.21	QP
	620.7300	30.49	1.24	31.73	46.00	-14.27	QP
*	668.2600	30.46	3.26	33.72	46.00	-12.28	QP

Note :

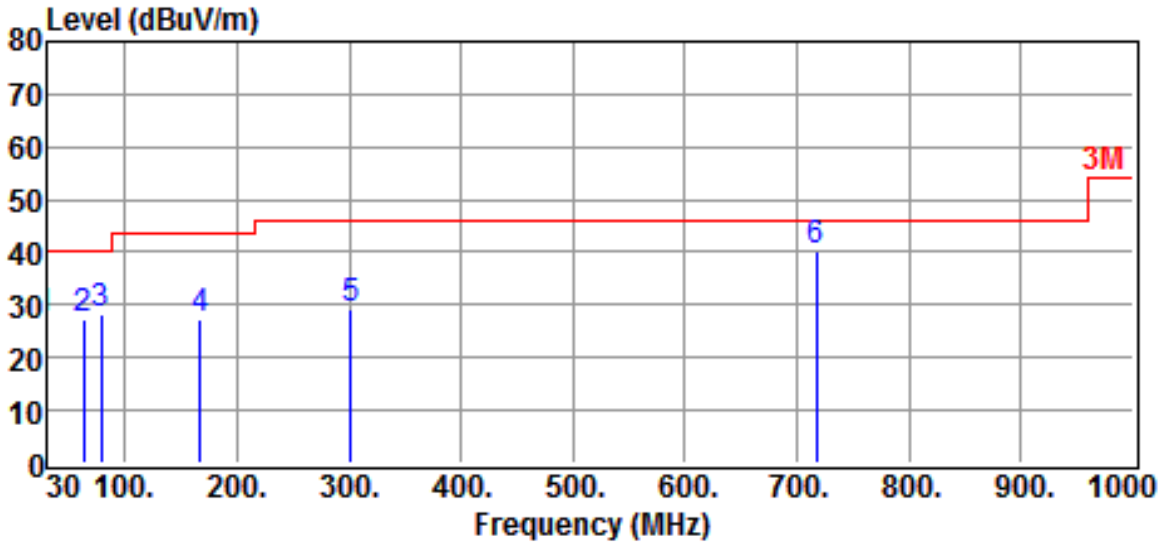
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



Site :Chamber#2 Date :2022-04-19
Limit :3M Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :Battery Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :FM MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	305.4800	30.15	-3.90	26.25	46.00	-19.75	QP
	388.9000	30.83	-2.11	28.72	46.00	-17.28	QP
	485.9000	30.38	-0.65	29.73	46.00	-16.27	QP
	518.8800	29.76	-0.21	29.55	46.00	-16.45	QP
	577.0800	30.77	0.40	31.17	46.00	-14.83	QP
*	602.3000	31.37	0.79	32.16	46.00	-13.84	QP

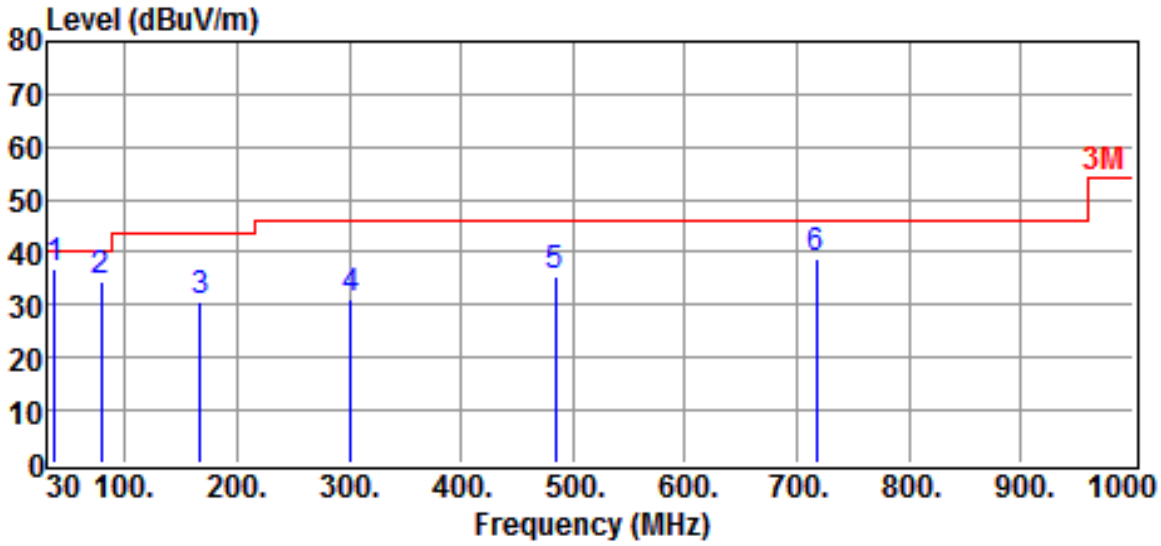
Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



Site :Chamber#2 Date :2022-04-19
Limit :3M Ant. Pol. :HORIZONTAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :CHARGE & WIFI MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	30.0000	29.64	-2.10	27.54	40.00	-12.46	QP
	62.9800	43.40	-16.25	27.15	40.00	-12.85	QP
	78.5000	41.88	-13.63	28.25	40.00	-11.75	QP
	167.7400	36.49	-9.09	27.40	43.50	-16.10	QP
	301.6000	33.10	-3.96	29.14	46.00	-16.86	QP
*	716.7600	36.99	3.05	40.04	46.00	-5.96	QP

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

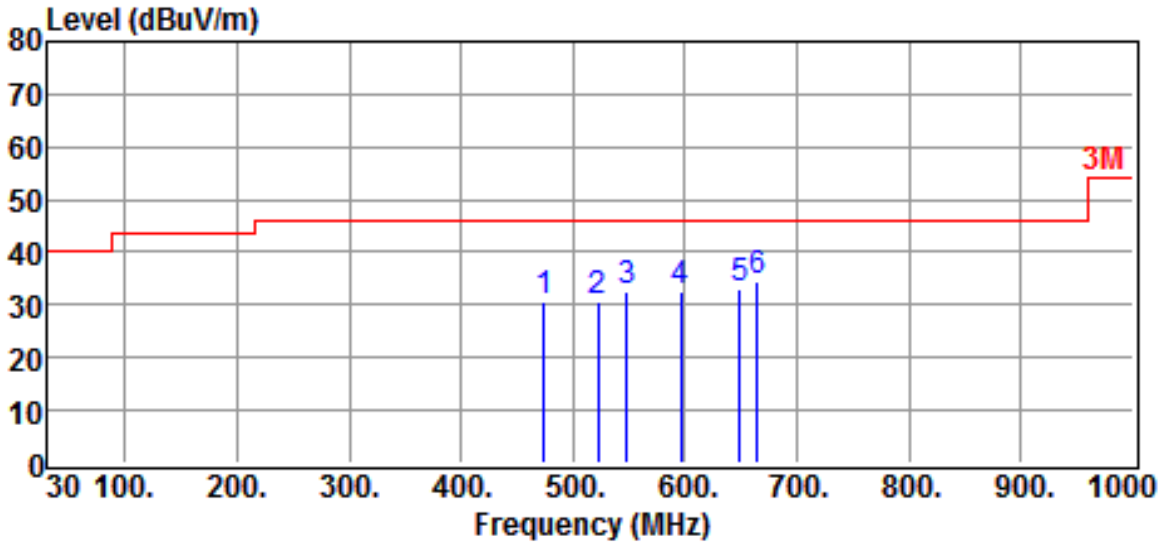


Site	:Chamber#2	Date	:2022-04-19
Limit	:3M	Ant. Pol.	:VERTICAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:CHARGE & WIFI MODE		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
*	37.7600	42.93	-6.14	36.79	40.00	-3.21	QP
	78.5000	47.96	-13.63	34.33	40.00	-5.67	QP
	167.7400	39.92	-9.09	30.83	43.50	-12.67	QP
	301.6000	34.97	-3.96	31.01	46.00	-14.99	QP
	483.9600	36.20	-0.69	35.51	46.00	-10.49	QP
	716.7600	35.91	3.05	38.96	46.00	-7.04	QP

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

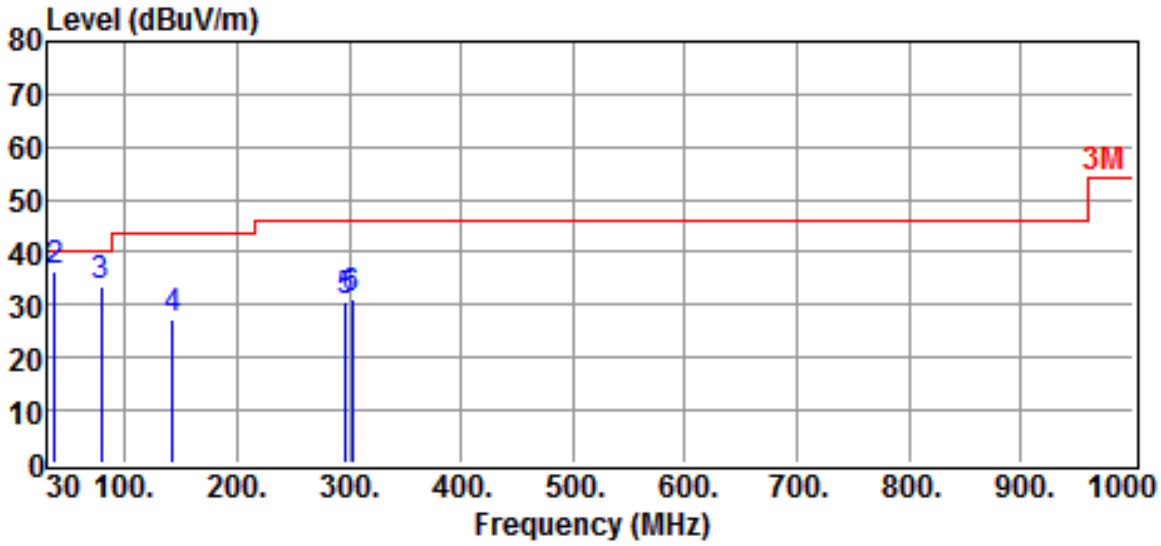


Site	:Chamber#2	Date	:2022-04-19
Limit	:3M	Ant. Pol.	:HORIZONTAL
EUT	: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO		
Model	:WFR-39		
Power Rating	:120V / 60Hz (ADAPTER)	Temp.	:22˚C
Engineer	:Vincent	Humi.	:68 %
Test Mode	:CHARGE & FM MODE		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	474.2600	31.67	-0.96	30.71	46.00	-15.29	QP
	522.7600	30.79	-0.17	30.62	46.00	-15.38	QP
	547.9800	32.19	0.27	32.46	46.00	-13.54	QP
	596.4800	31.83	0.77	32.60	46.00	-13.40	QP
	648.8600	30.60	2.32	32.92	46.00	-13.08	QP
*	664.3800	31.27	3.34	34.61	46.00	-11.39	QP

Note :

1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



Site :Chamber#2 Date :2022-04-19
Limit :3M Ant. Pol. :VERTICAL
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Model :WFR-39
Power Rating :120V / 60Hz (ADAPTER) Temp. :22˚C
Engineer :Vincent Humi. :68 %
Test Mode :CHARGE & FM MODE

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	30.0000	38.16	-2.10	36.06	40.00	-3.94	QP
*	37.7600	42.74	-6.14	36.60	40.00	-3.40	QP
	78.5000	47.13	-13.63	33.50	40.00	-6.50	QP
	142.5200	35.79	-8.33	27.46	43.50	-16.04	QP
	296.7500	34.90	-4.15	30.75	46.00	-15.25	QP
	302.5700	34.90	-3.95	30.95	46.00	-15.05	QP

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor ( )
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

b) Emission frequencies above 1 GHz

According to exploratory test no any obvious emission were detected from above 1 GHz.

c) Emission frequencies below 30MHz (9kHz - 30MHz)

According to exploratory test no any obvious emission were detected from 9kHz to 30MHz. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

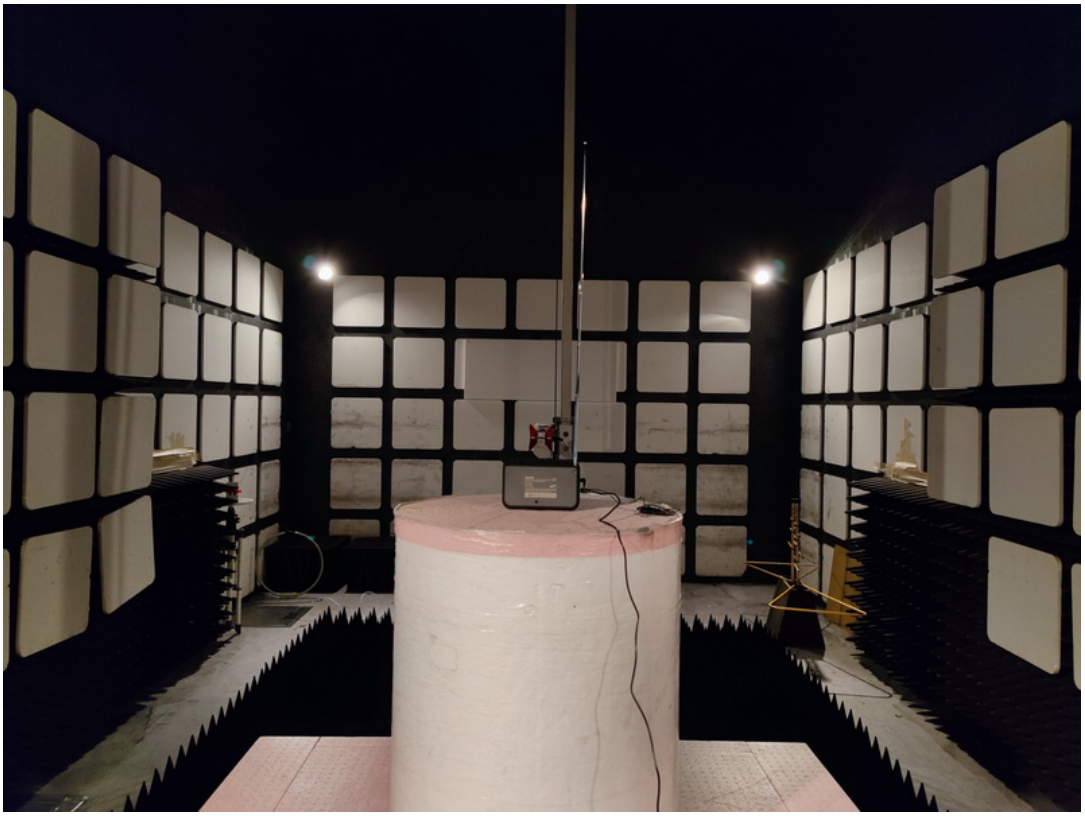
where

Corrected Factor = Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

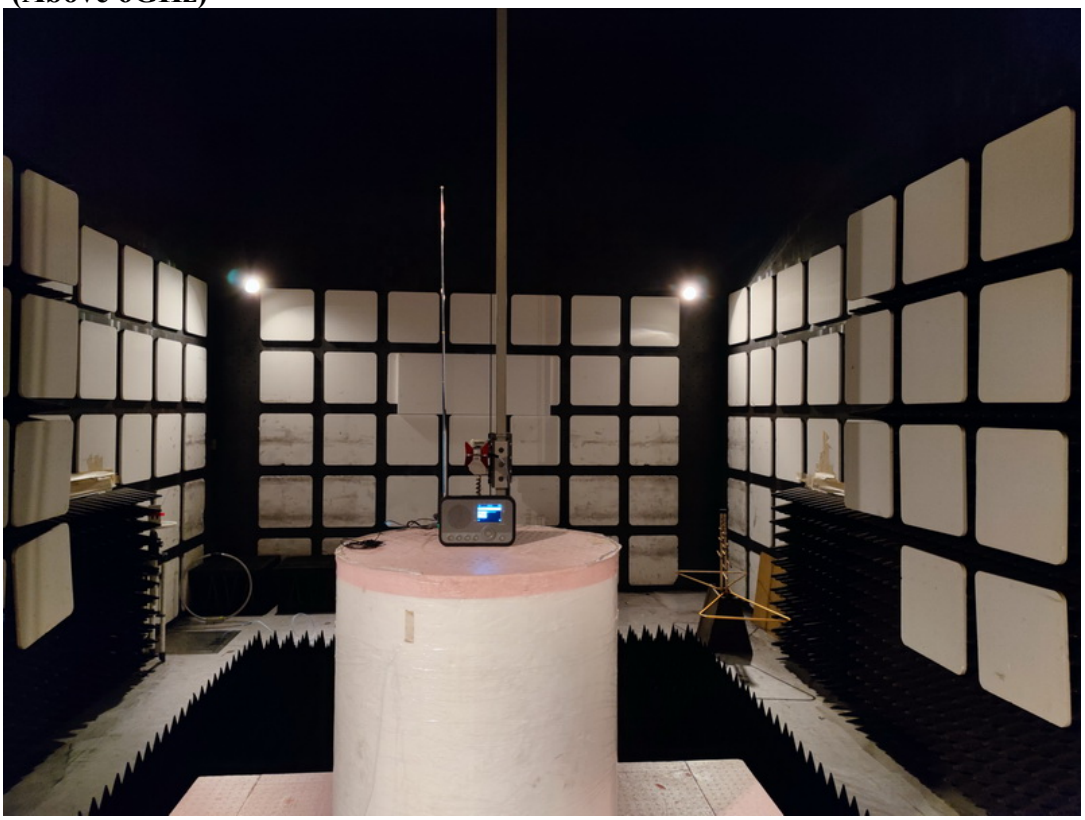
4.6 Photos of Radiation Measuring Setup

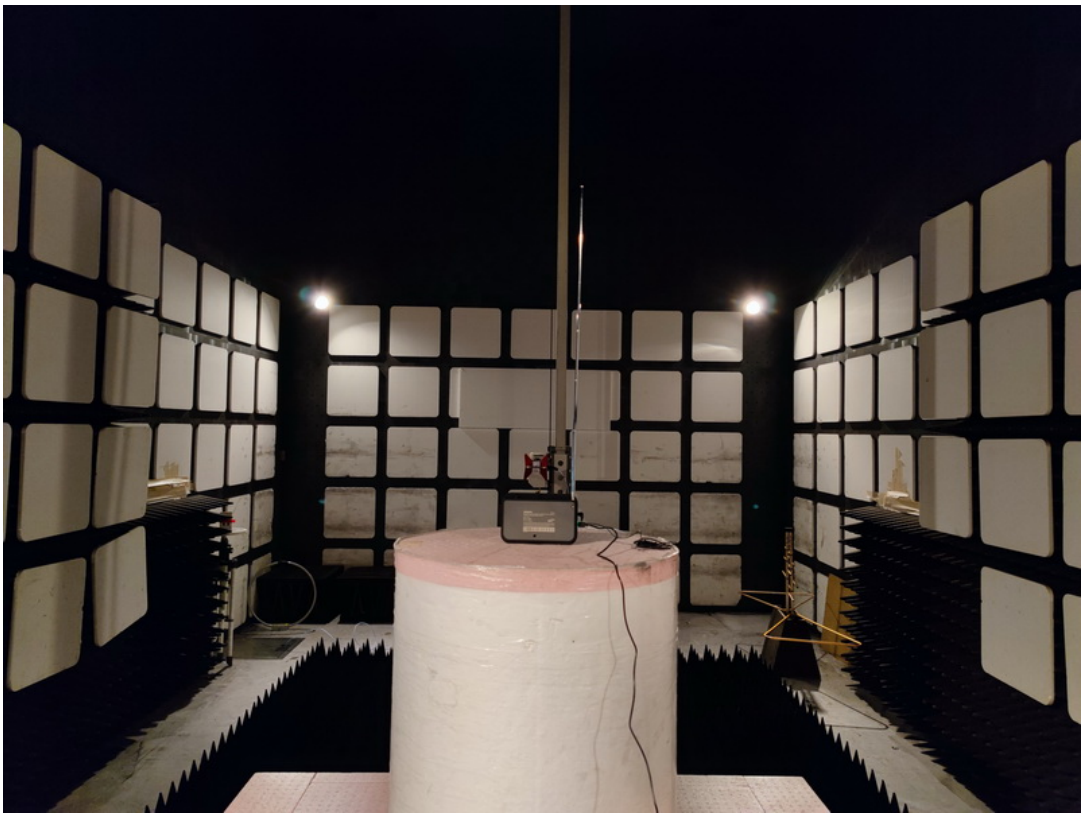
(Below 1GHz)

(1-6GHz)



(Above 6GHz)





5 CONDUCTED EMISSION MEASUREMENT

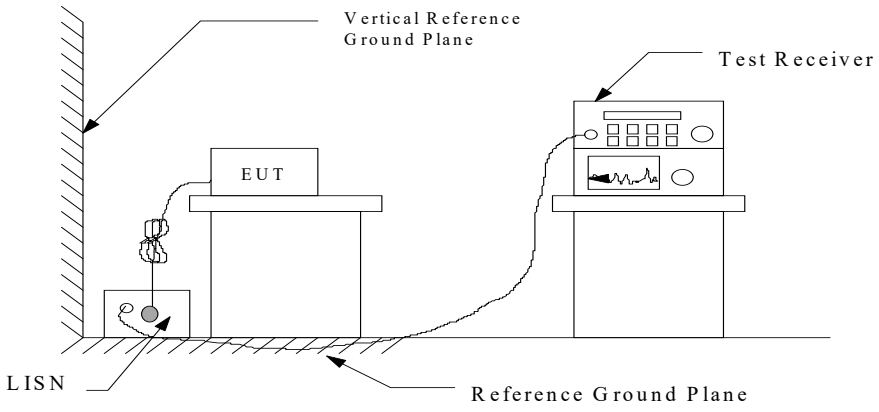
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to §15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

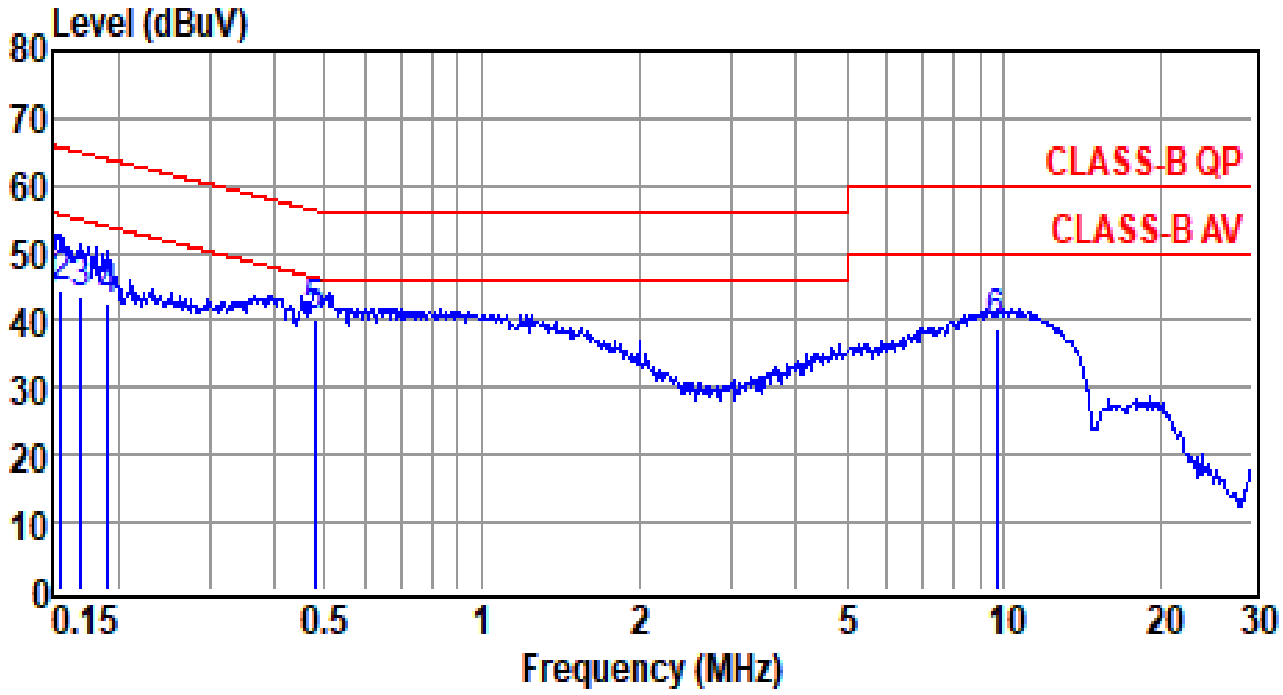
5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



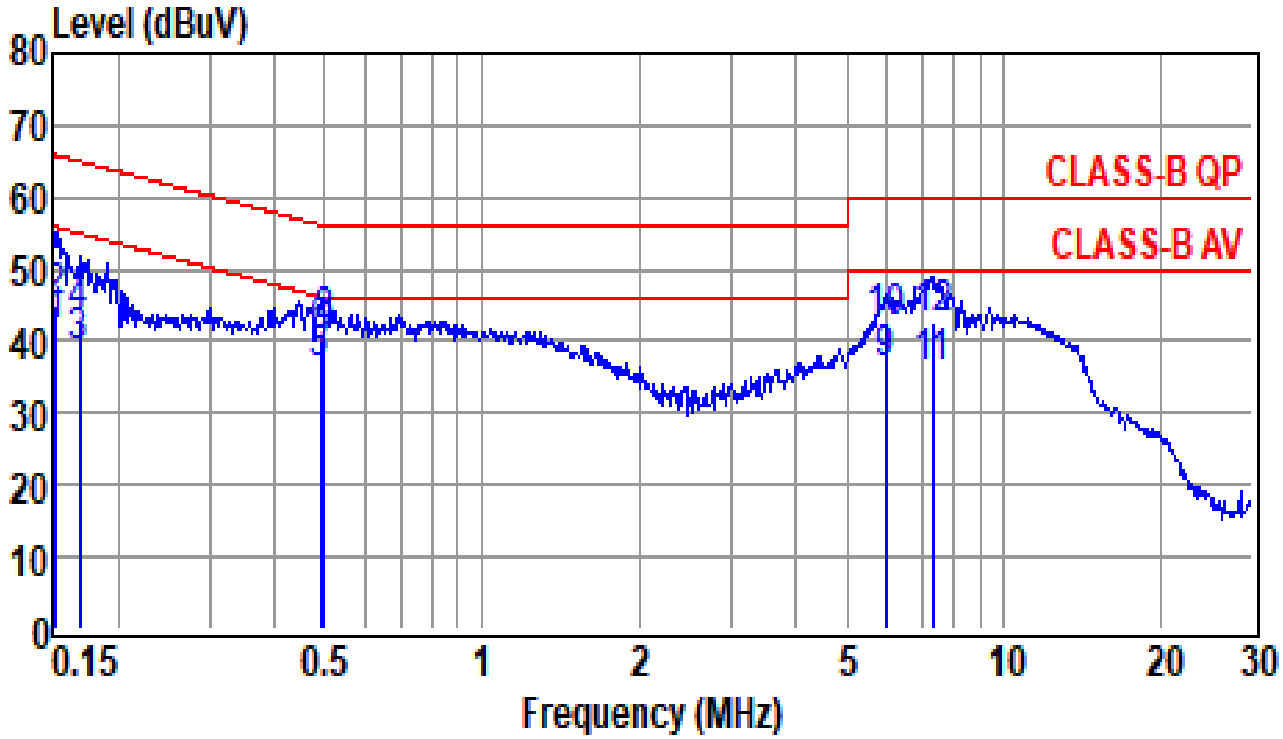
5.3 Conducted Emission Data



Site : conducted #1 Date : 2022-04-19
Condition : CLASS-B QP LISN : NEUTRAL
Tem / Hum : 22 ℃ / 66%
Test Mode : CHARGE & WIFI MODE
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Power Rating : 120V / 60Hz
Engineer : Vincent Model : WFR-39

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
	0.1500	34.22	10.00	44.22	66.00	-21.78	QP
	0.1565	34.45	10.00	44.45	65.65	-21.20	QP
	0.1703	33.38	10.00	43.38	64.94	-21.56	QP
	0.1924	32.79	10.00	42.79	63.93	-21.14	QP
*	0.4787	30.38	10.01	40.39	56.36	-15.97	QP
	9.7050	28.83	10.19	39.02	60.00	-20.98	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level



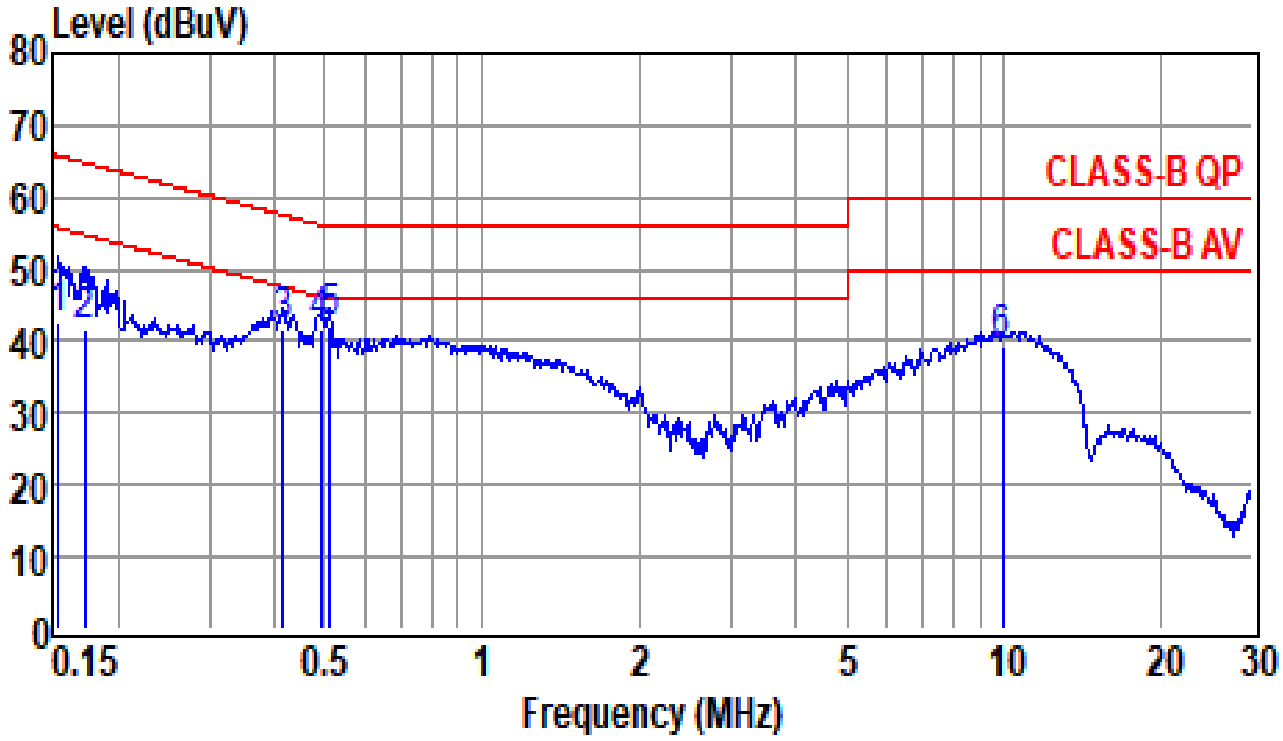
Site : conducted #1 Date : 2022-04-19
Condition : CLASS-B QP LISN : LINE
Tem / Hum : 22 ℃ / 66%
Test Mode : CHARGE & WIFI MODE
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Power Rating : 120V / 60Hz
Engineer : Vincent Model : WFR-39

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
	0.1524	31.90	10.00	41.90	55.87	-13.97	Average
	0.1524	35.17	10.00	45.17	65.87	-20.70	QP
	0.1685	28.87	10.00	38.87	55.03	-16.16	Average
	0.1685	33.20	10.00	43.20	65.03	-21.83	QP
	0.4889	26.32	10.02	36.34	46.19	-9.85	Average
	0.4889	30.23	10.02	40.25	56.19	-15.94	QP
*	0.4994	27.82	10.02	37.84	46.01	-8.17	Average
	0.4994	31.48	10.02	41.50	56.01	-14.51	QP
	5.9290	26.40	10.14	36.54	50.00	-13.46	Average
	5.9290	31.89	10.14	42.03	60.00	-17.97	QP

	7.3290	25.57	10.17	35.74	50.00	-14.26	Average
	7.3290	32.29	10.17	42.46	60.00	-17.54	QP

Note :

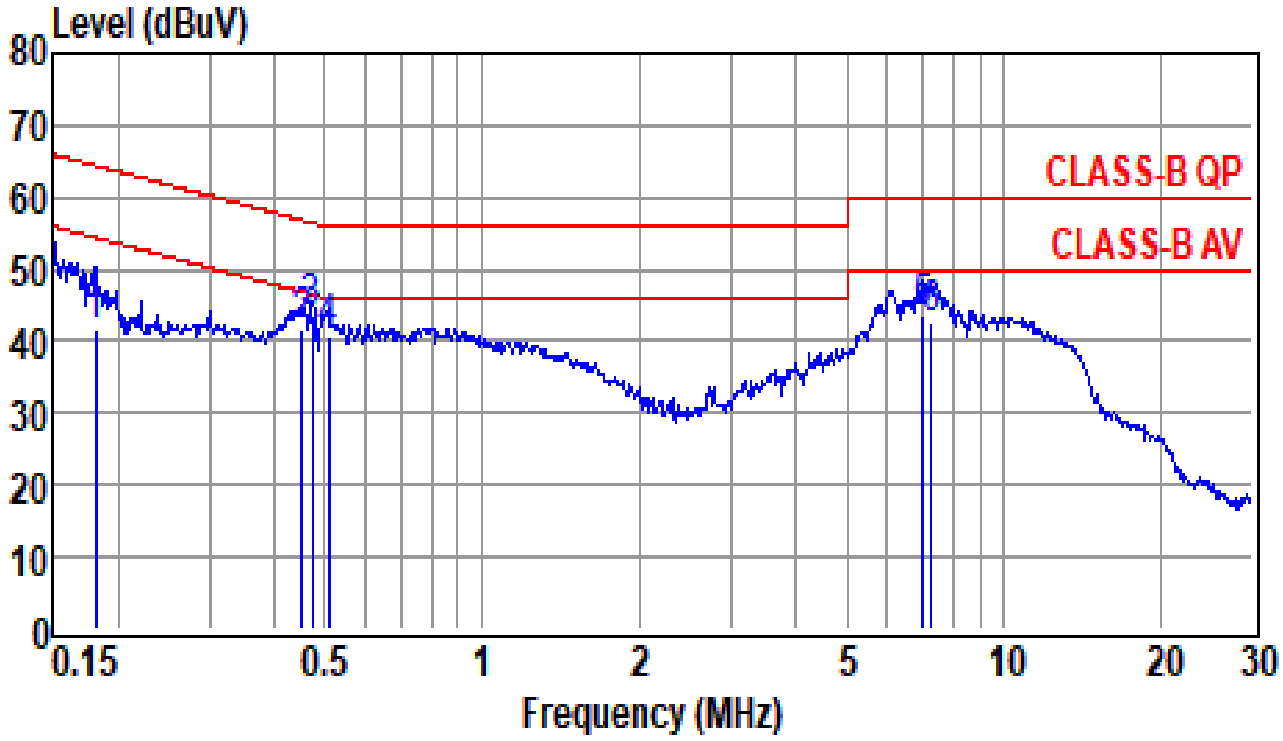
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level



Site : conducted #1 Date : 2022-04-19
Condition : CLASS-B QP LISN : NEUTRAL
Tem / Hum : 22 ℃ / 66%
Test Mode : CHARGE & FM MODE
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Power Rating : 120V / 60Hz
Engineer : Vincent Model : WFR-39

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
	0.1540	32.56	10.00	42.56	65.78	-23.22	QP
	0.1731	31.44	10.00	41.44	64.81	-23.37	QP
	0.4149	31.84	10.01	41.85	57.55	-15.70	QP
	0.4915	31.45	10.01	41.46	56.14	-14.68	QP
*	0.5101	32.33	10.01	42.34	56.00	-13.66	QP
	9.9660	29.10	10.19	39.29	60.00	-20.71	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level



Site : conducted #1 Date : 2022-04-19
Condition : CLASS-B QP LISN : LINE
Tem / Hum : 22 ℃ / 66%
Test Mode : CHARGE & FM MODE
EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO
Power Rating : 120V / 60Hz
Engineer : Vincent Model : WFR-39

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
	0.1815	31.53	10.00	41.53	64.42	-22.89	QP
	0.4516	31.51	10.02	41.53	56.85	-15.32	QP
*	0.4736	33.47	10.02	43.49	56.45	-12.96	QP
	0.5074	30.63	10.02	40.65	56.00	-15.35	QP
	7.0250	33.33	10.15	43.48	60.00	-16.52	QP
	7.2900	32.36	10.17	42.53	60.00	-17.47	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level

5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dB μV is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μV.

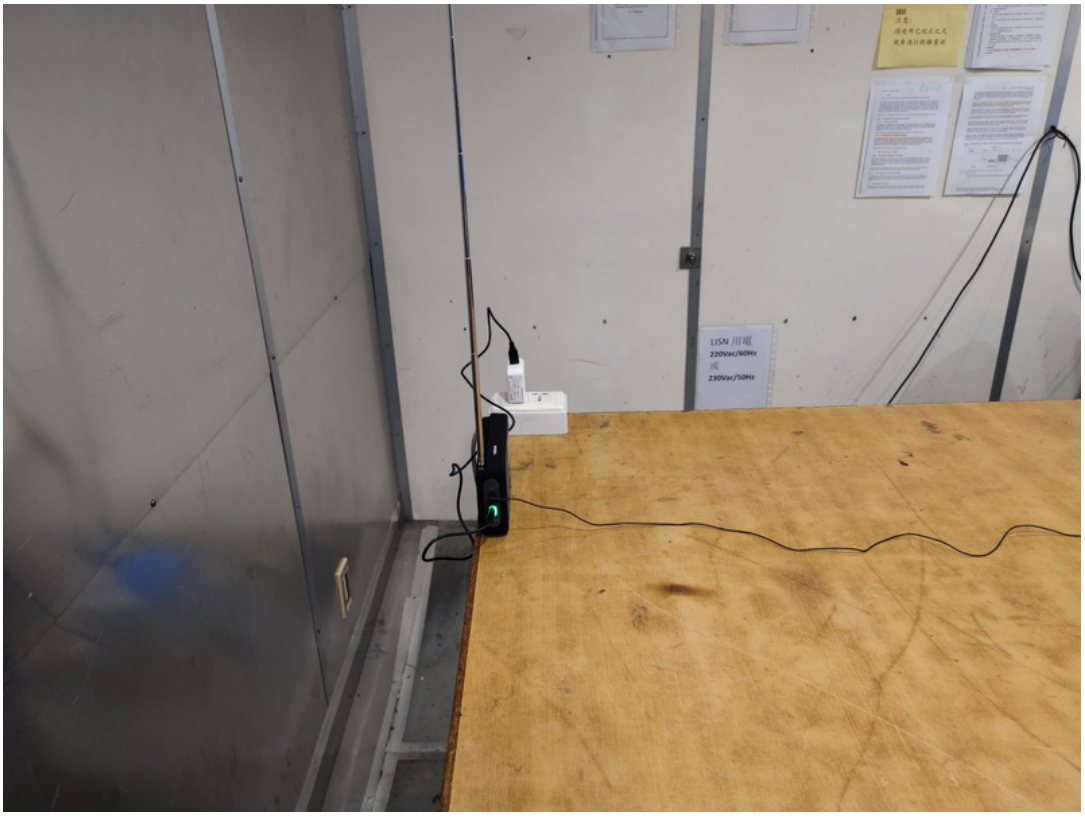
RESULT = 22.5 + 0.1 = 22.6 dB μV
Level in μV = Common Antilogarithm[(22.6 dB μV)/20]
= 13.48 μV

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2021/10/18	2022/10/17
LISN	Narda(PMM)	L2-16B (13035912-001)	2021/5/10	2022/5/9
PLUSE LIMITER (10dB)	Schwarzbeck	VTSD 9561 F-N	2022/04/13	2023/04/12
LISN	Shibasoku	563 (13044902-001)	2021/12/22	2022/12/21

5.6 Photos of Conduction Measuring Setup



6 ANTENNA REQUIREMENT

6.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.2 Antenna Construction and Directional Gain

The antenna is permanently mounted on main PCB (Gain 2.3 dBi), no consideration of replacement.
Please see internal photos and the antenna specifications.

7 DYTY CYCLE

7.1 Standard Applicable

None. Refereency only.

7.2 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

7.3 Measurement Data

Duty Cycle Calculation

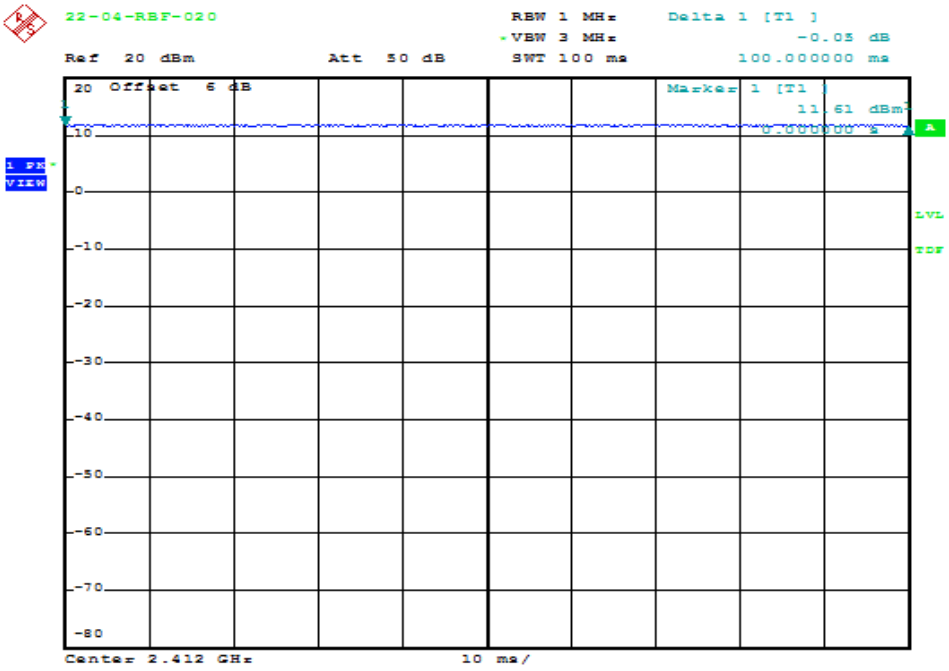
Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

Mode	Period (ms)	Transmission duration (T) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T (kHz)	VBW setting (kHz)
802.11b	100.00	100.00	100.00	0.00	0.010	0.01
802.11g	100.00	100.00	100.00	0	0.010	0.01
802.11n20	100.00	100.00	100.00	0	0.010	0.01
802.11n40	100.00	100.00	100.00	0	0.010	0.01

NOTE : 1. When Duty Cycle > 98% , Duty Cycle Correction Factor not required (0.00 dB).
2. When Duty Cycle > 98% , VBW = 10 Hz .
3. When the Duty Cycle is less than 98%, for the average measurement of the radiated emission test, the VBW setting is >1/T where the T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Refer to the following page for data plots.

802.11b



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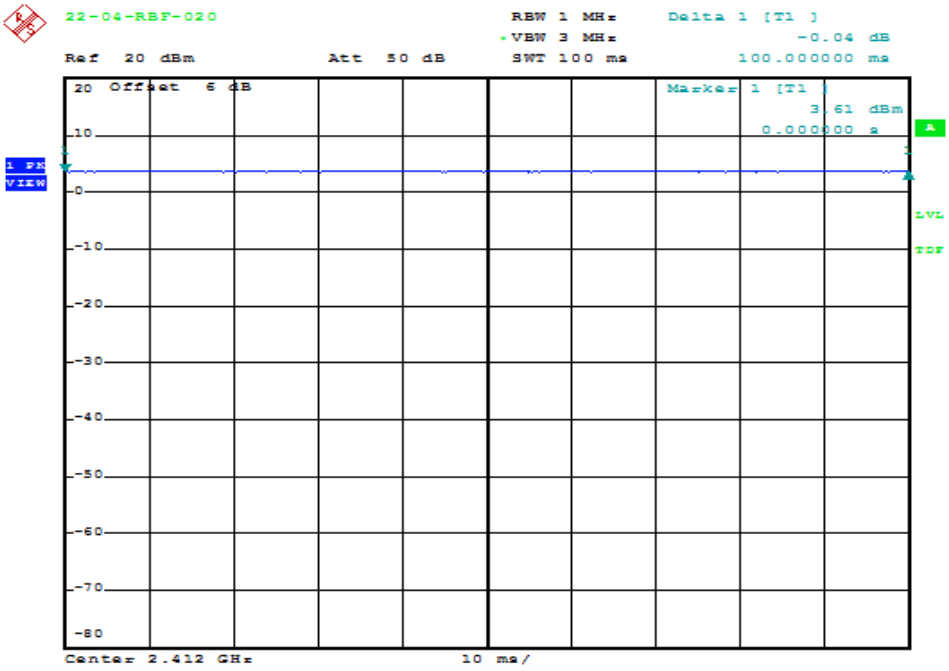
802.11g



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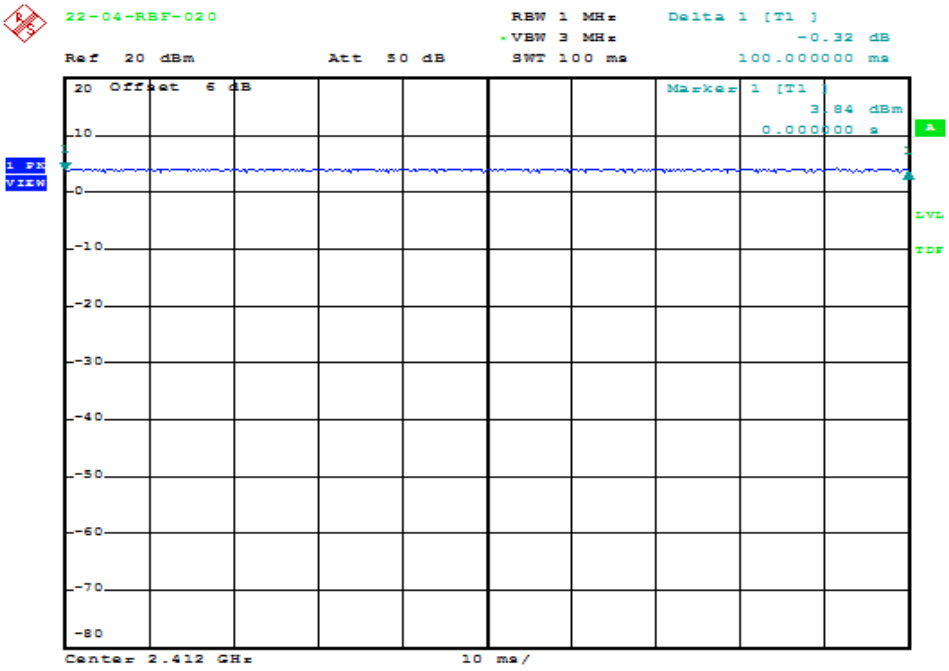
802.11n20



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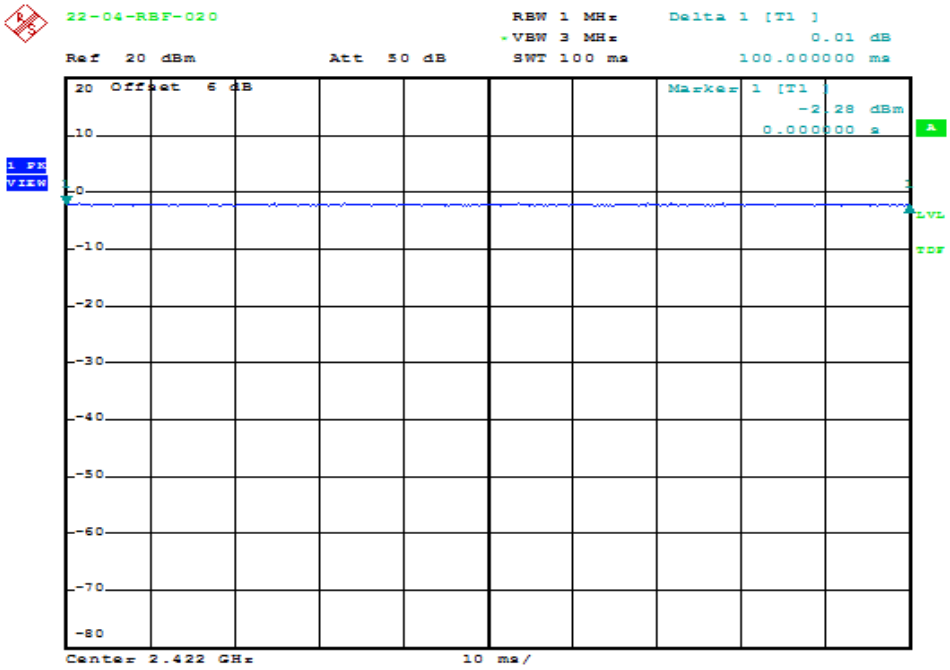

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8 EMISSION BANDWIDTH MEASUREMENT

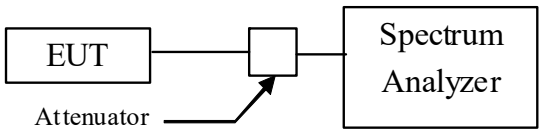
8.1 Standard Applicable

According to 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value. The settings of spectrum analyzer is as followings.
   1) Set RBW = 100 kHz.
   2) Set the video bandwidth (VBW) ≥ 3 x RBW.
   3) Detector = Peak.
   4) Trace mode = max hold.
   5) Sweep = auto couple.
   6) Allow the trace to stabilize.
   7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
3. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.



8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

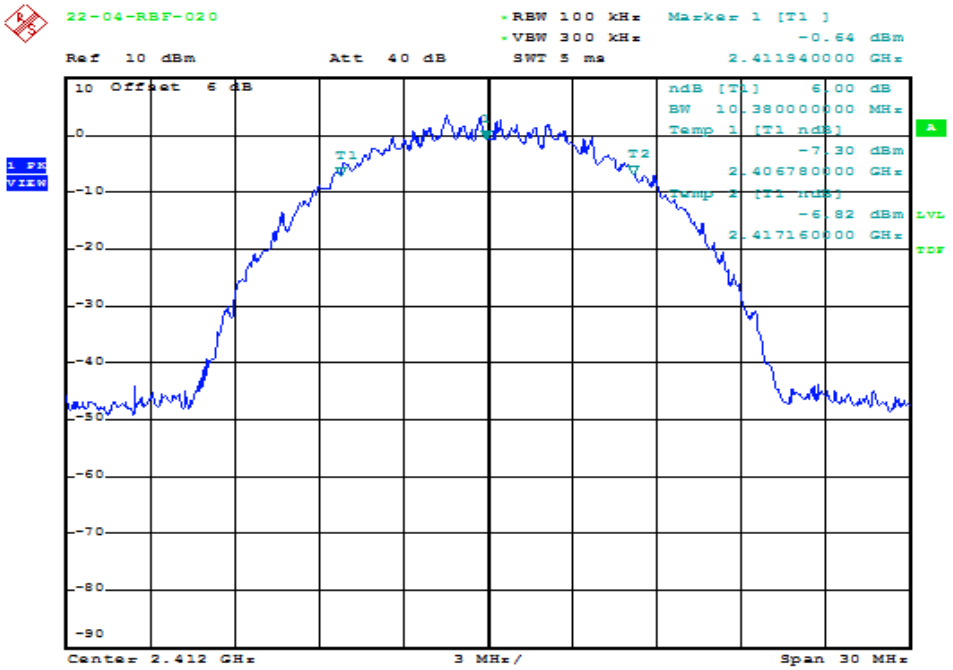
8.4 Measurement Data

Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

Wireless Standards	Carrier Frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)
802.11b	2412	---	10.380	≧500
	2442	---	10.020	≧500
	2472	---	10.380	≧500
802.11g	2412	---	16.740	≧500
	2442	---	16.740	≧500
	2472	---	16.680	≧500
802.11n20	2412	---	18.060	≧500
	2442	---	18.060	≧500
	2472	---	18.060	≧500
802.11n40	2422	---	36.960	≧500
	2442	---	36.960	≧500
	2462	---	36.960	≧500

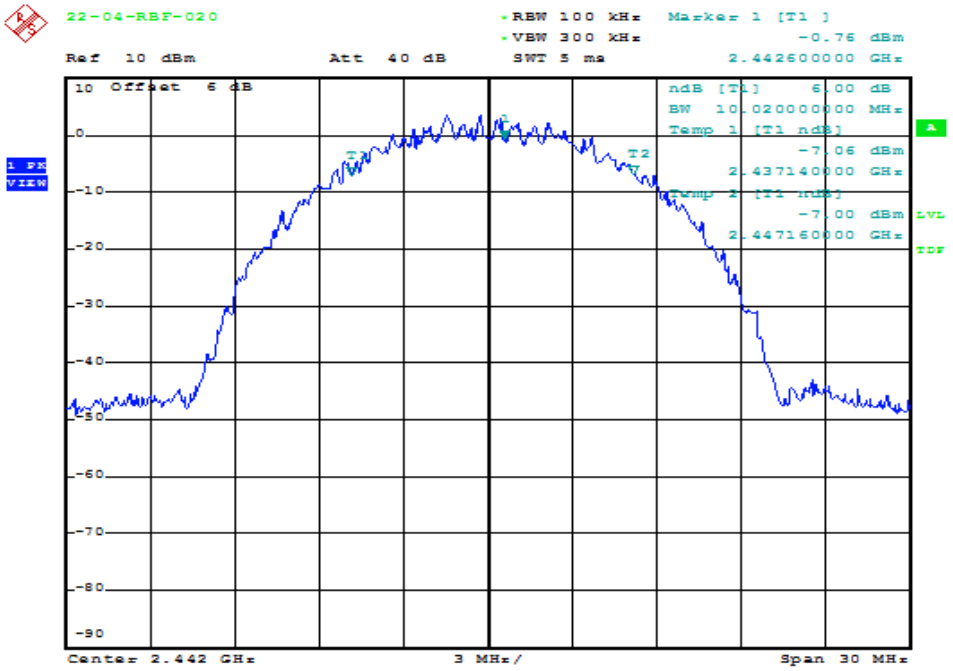
Note: Remark "---" Means not applicable for this device.

802.11b / Channel Low



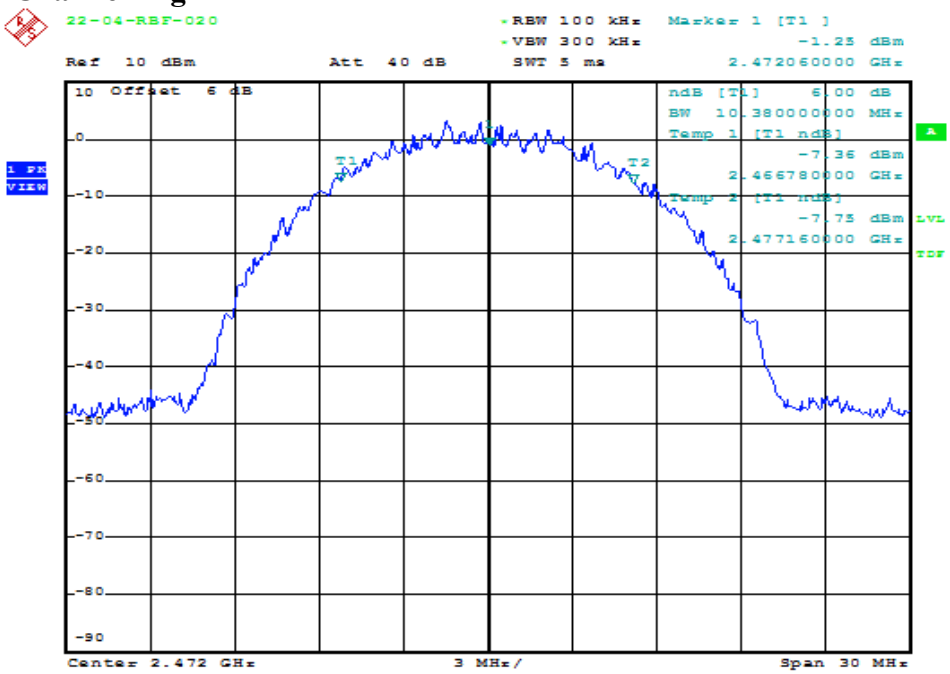
Date: 26.APR.2022 08:38:53

802.11b / Channel Mid



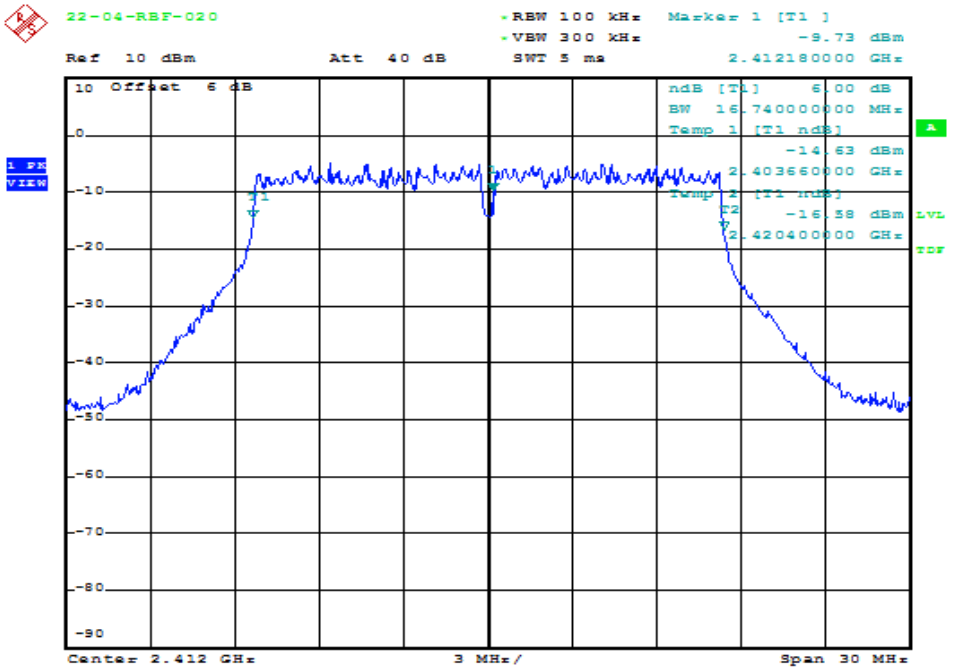
Date: 26.APR.2022 08:41:37

802.11b / Channel High

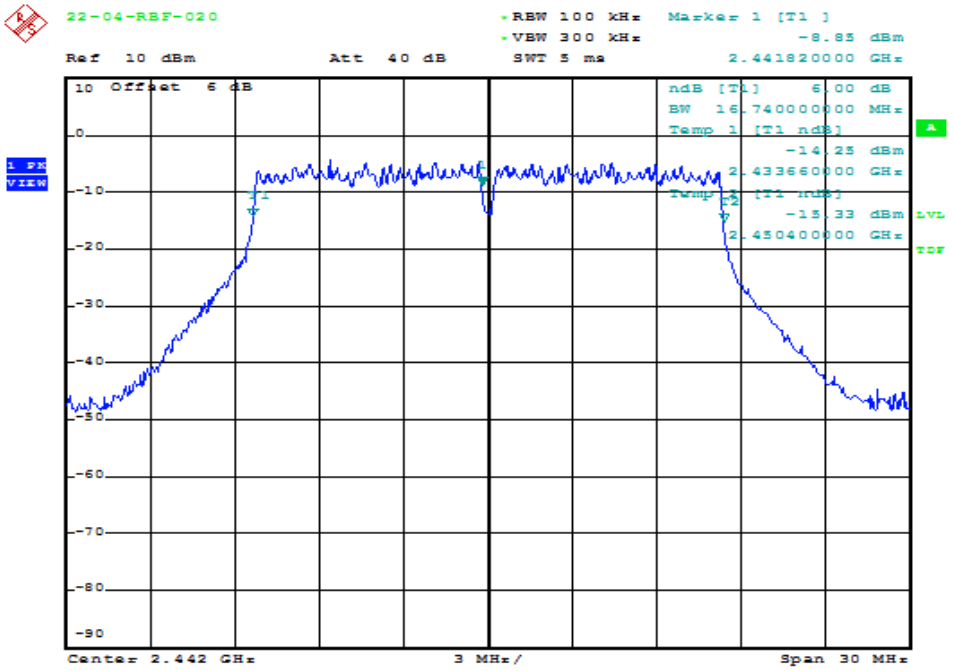


Date: 26.APR.2022 08:46:03

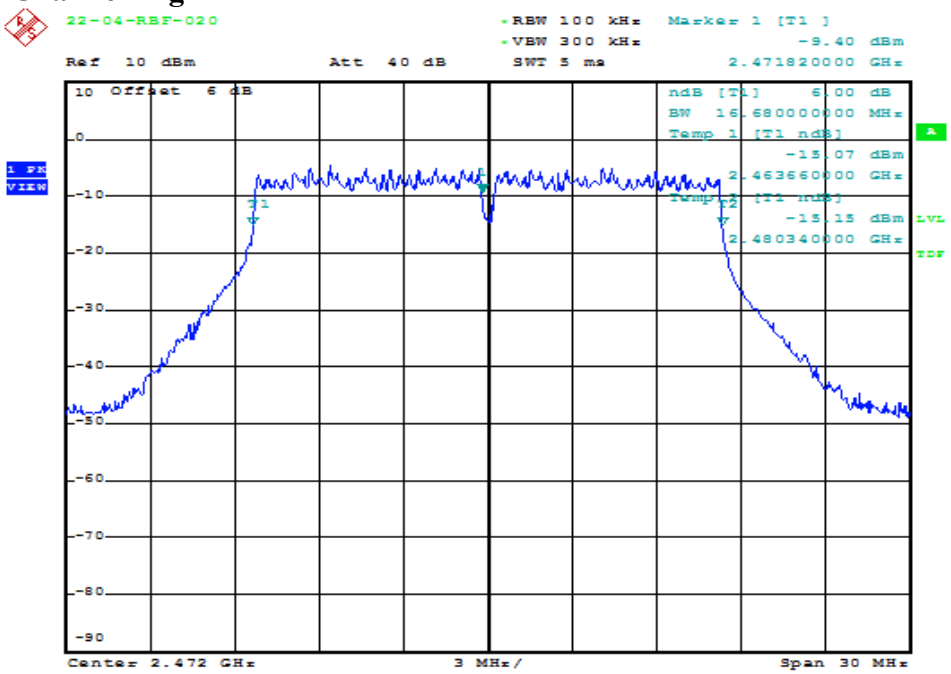
802.11g / Channel Low



802.11g / Channel Mid

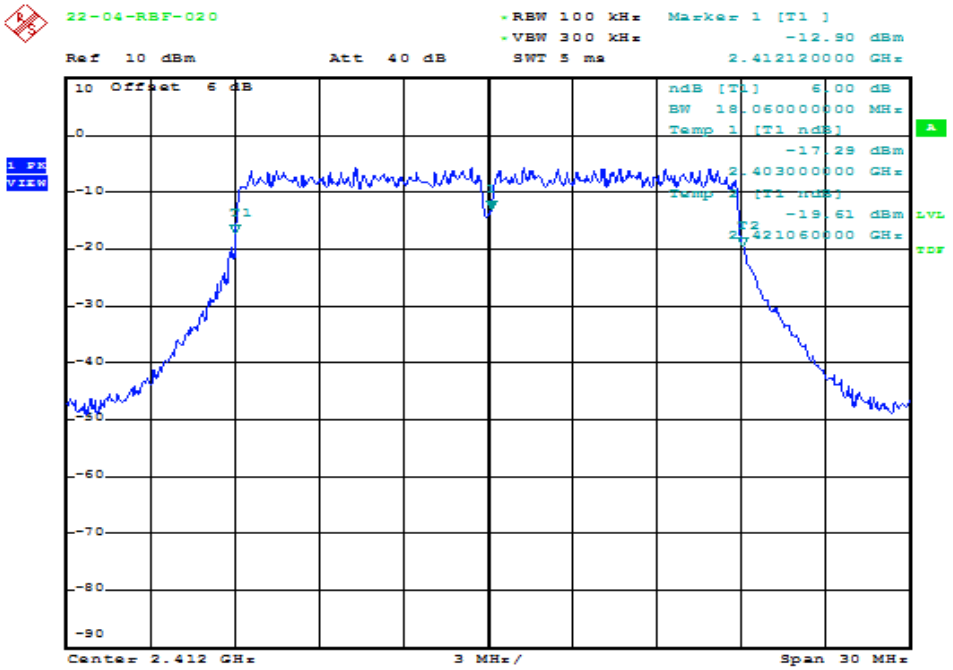


802.11g / Channel High



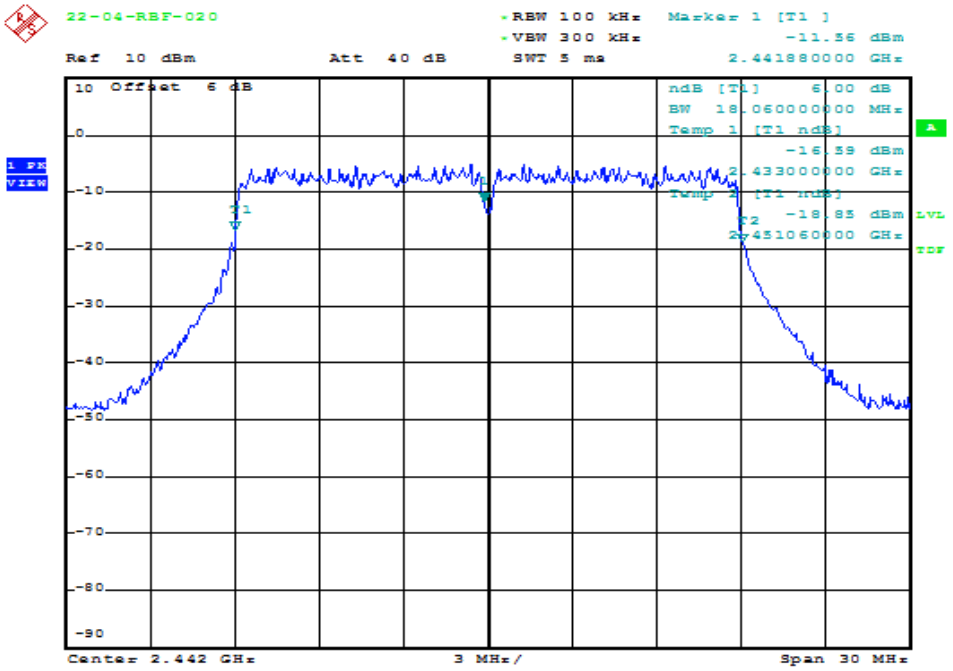
Date: 26.APR.2022 09:09:58

802.11n HT-20/ Channel Low



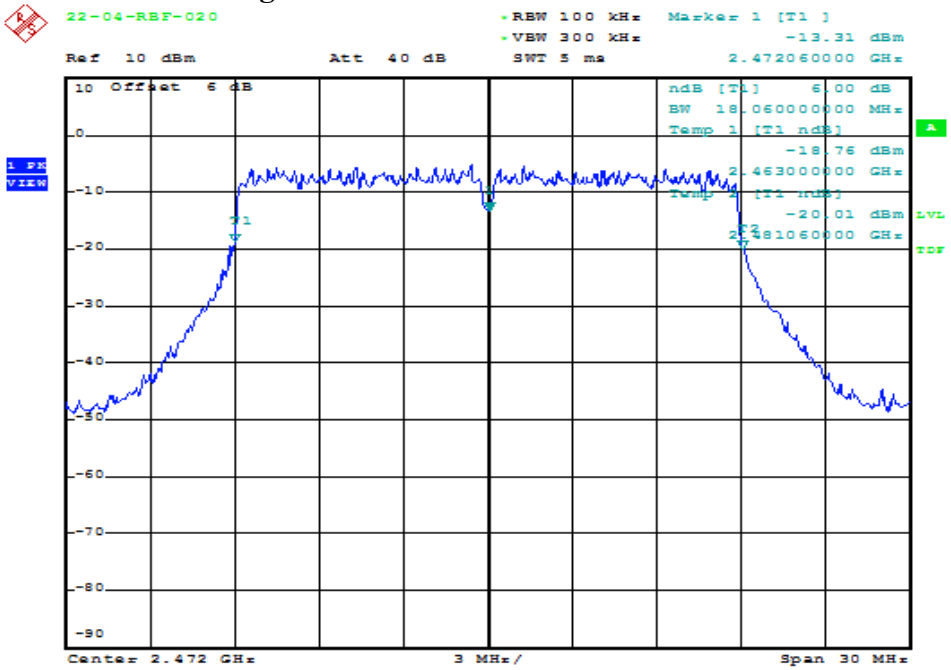
Date: 26.APR.2022 09:13:24

802.11n HT-20/ Channel Mid



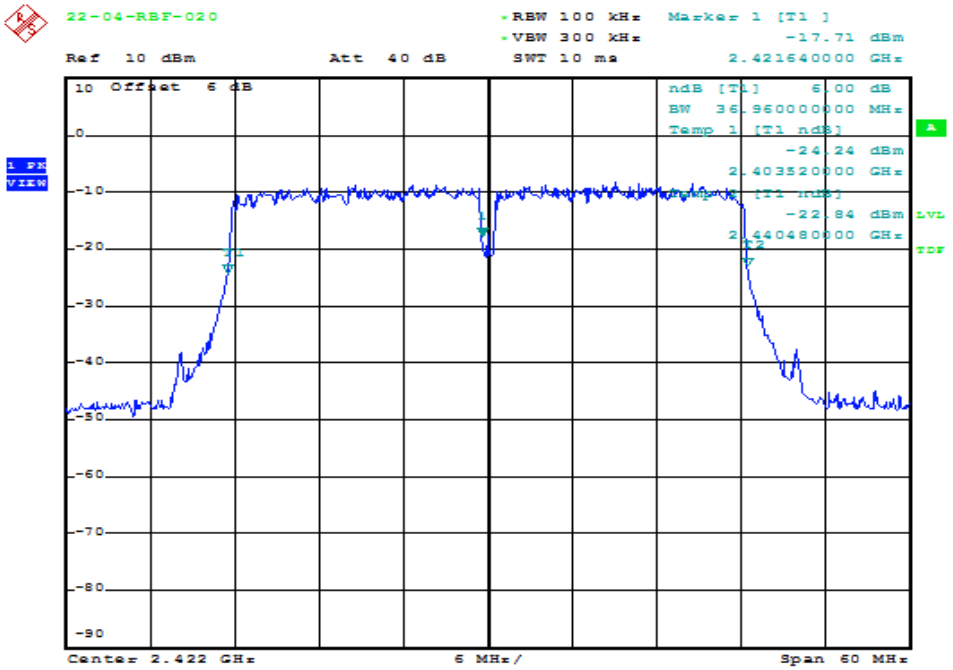
Date: 26.APR.2022 09:15:52

802.11n HT-20/ Channel High



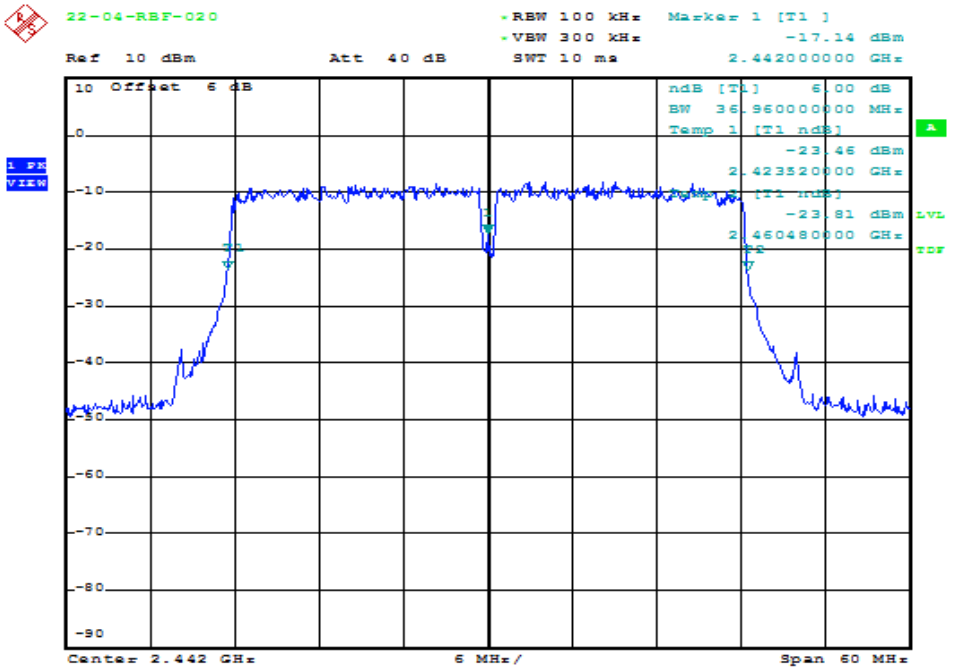
Date: 26.APR.2022 09:20:20

802.11n HT-40/ Channel Low



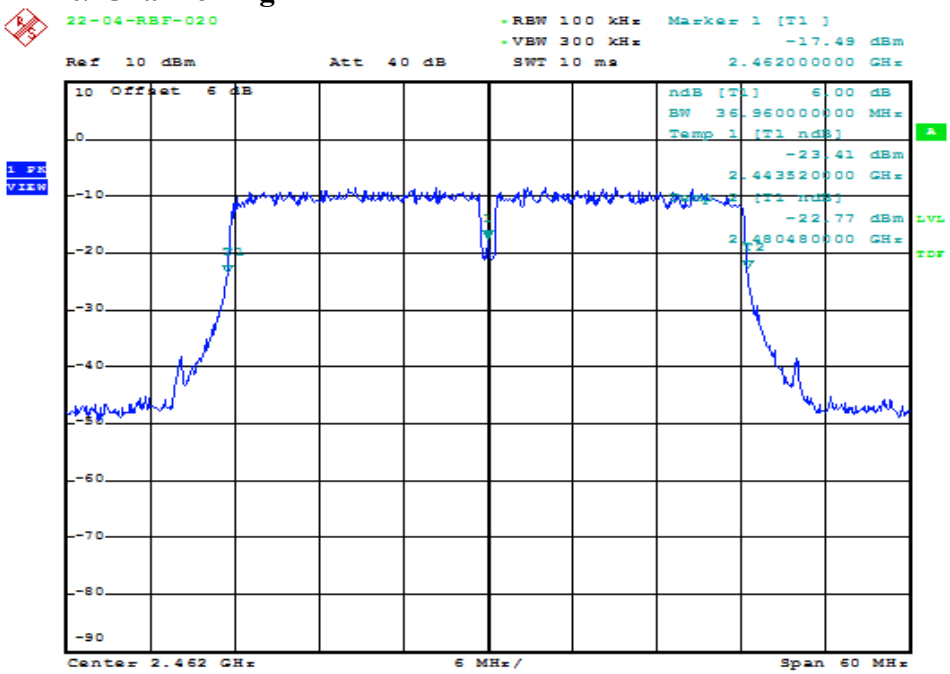
Date: 26.APR.2022 09:24:43

802.11n HT-40/ Channel Mid



Date: 26.APR.2022 09:27:06

802.11n HT-40/ Channel High



Date: 26.APR.2022 09:31:39

9 OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

According to 15.247(b), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

If transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

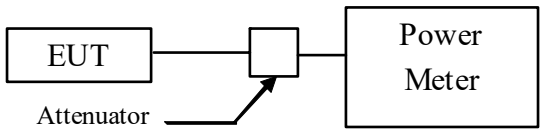
9.2 Measurement Procedure

Measurement Procedure:

9.1.2 PKPM1 Peak power meter method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable.
3. Record the readings on the instrument and add a compensat factor of the attenuator.
4. Repeat above procedures until all frequencies measured were complete.

Figure 5: Output power and measurement configuration.



9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

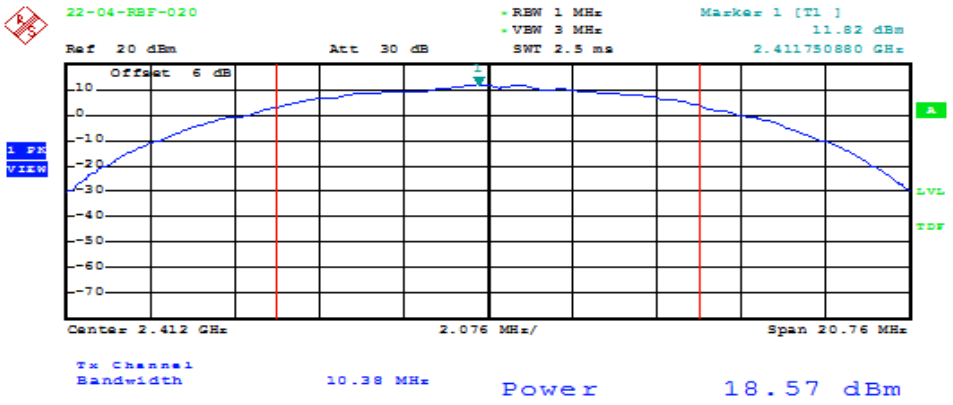
9.4 Measurement Data

Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

Wireless Standards	Carrier Frequency (MHz)	Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
802.11b	2412	2.30	18.57	71.945	30
	2442	2.30	18.67	73.621	30
	2472	2.30	18.17	65.615	30
802.11g	2412	2.30	16.53	44.978	30
	2442	2.30	16.81	47.973	30
	2472	2.30	16.41	43.752	30
802.11n20	2412	2.30	16.14	41.115	30
	2442	2.30	16.46	44.259	30
	2472	2.30	16.07	40.458	30
802.11n40	2422	2.30	16.38	43.451	30
	2442	2.30	16.46	44.259	30
	2462	2.30	16.29	42.560	30

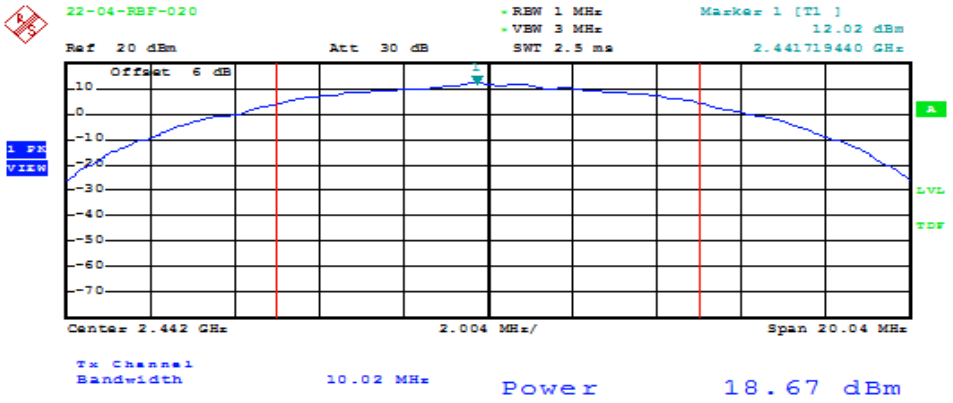
NOTE : 1. Remark "---" Means not applicable for this device.
2. If transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Mode: 802.11b/ Channel Low



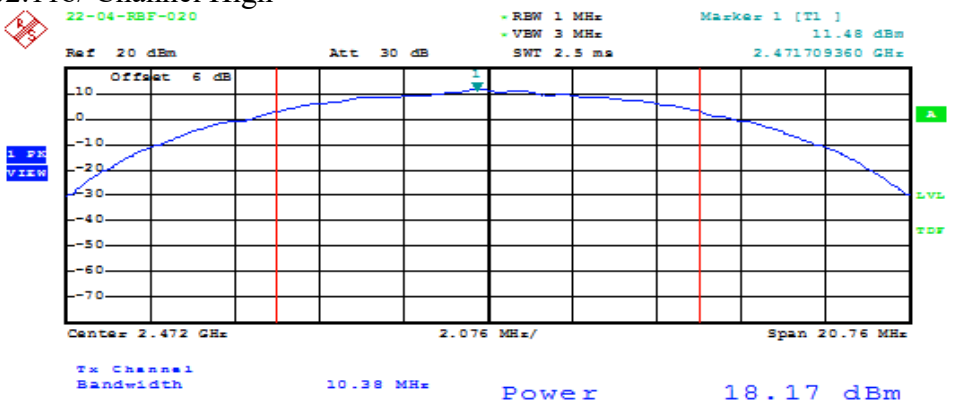
Date: 26.APR.2022 08:39:21

Mode: 802.11b/ Channel Middle



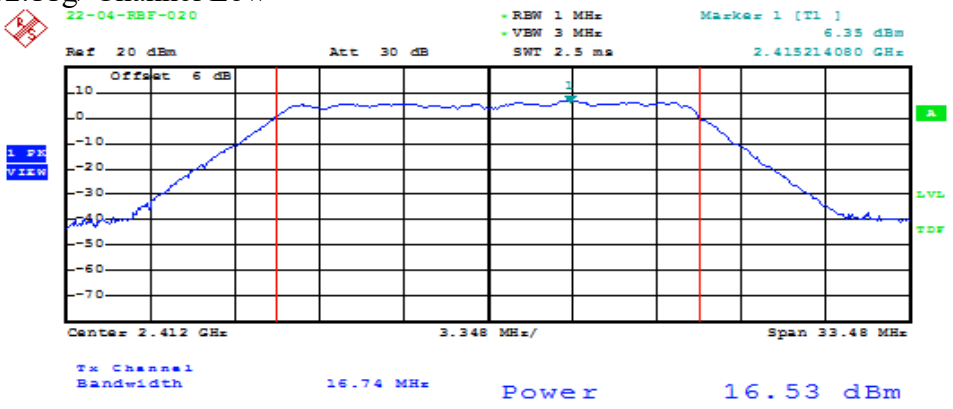
Date: 26.APR.2022 08:42:00

Mode: 802.11b/ Channel High



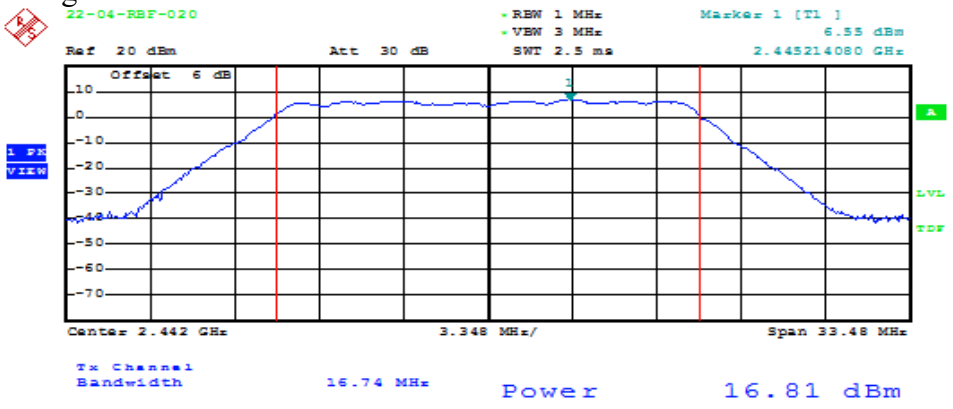
Date: 26.APR.2022 08:46:38

Mode: 802.11g/ Channel Low



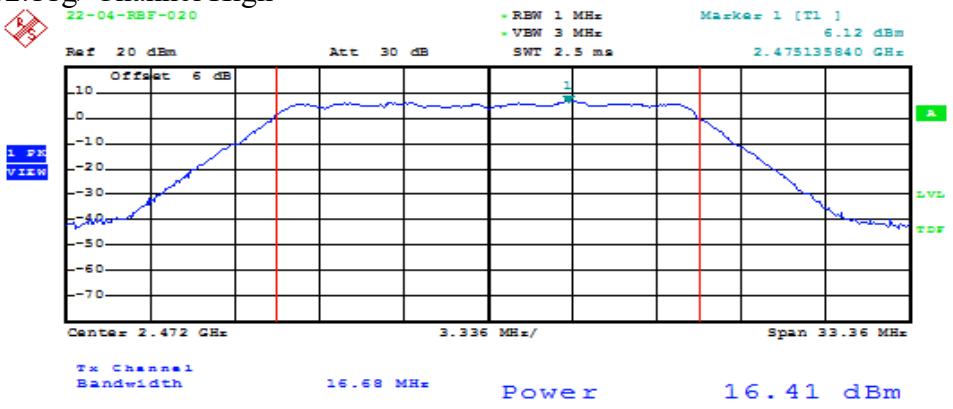
Date: 26.APR.2022 09:03:48

Mode: 802.11g/ Channel Middle



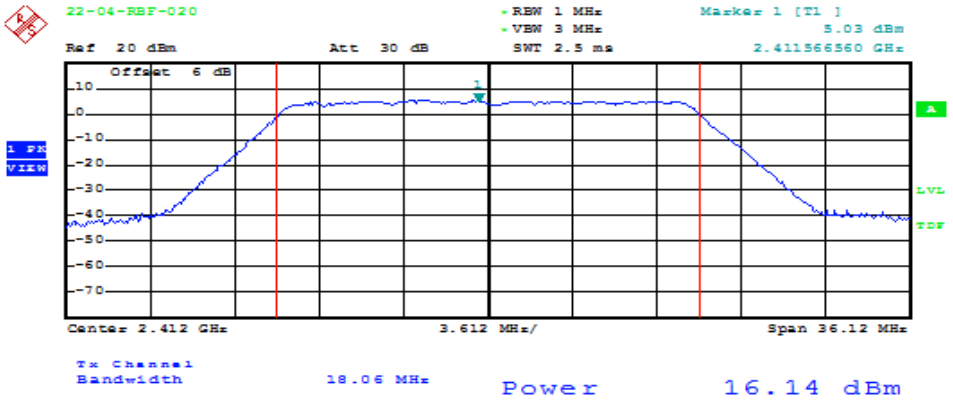
Date: 26.APR.2022 09:06:01

Mode: 802.11g/ Channel High



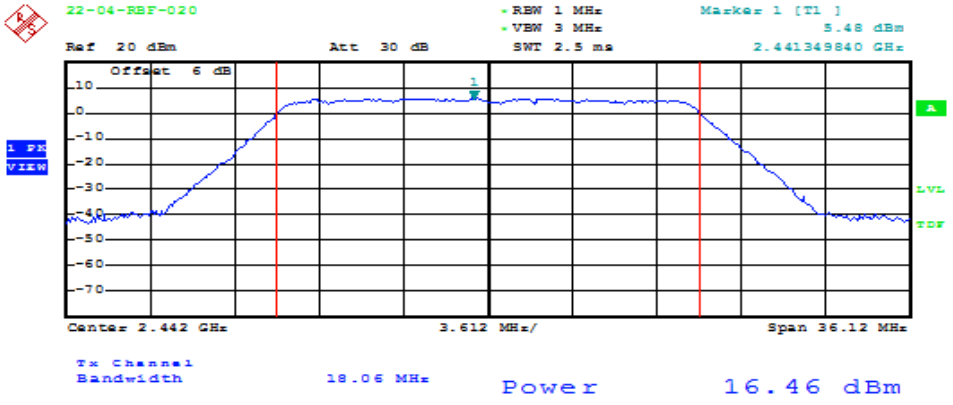
Date: 26.APR.2022 09:10:27

Mode: 802.11n20/ Channel Low



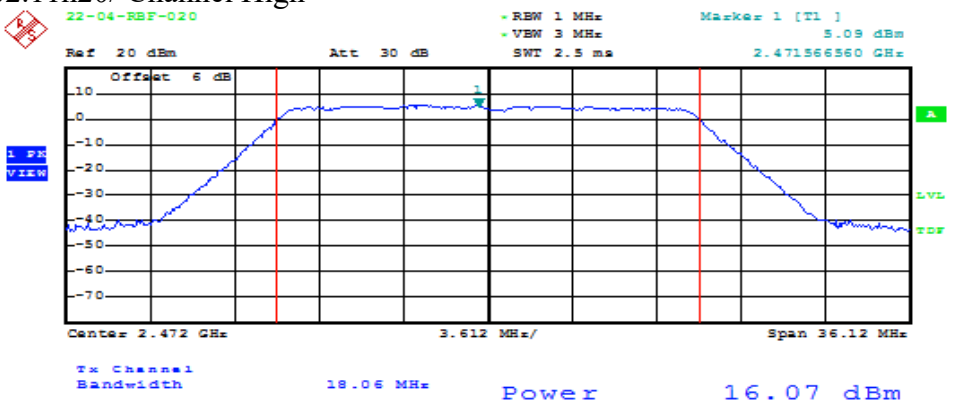
Date: 26.APR.2022 09:13:51

Mode: 802.11n20/ Channel Middle



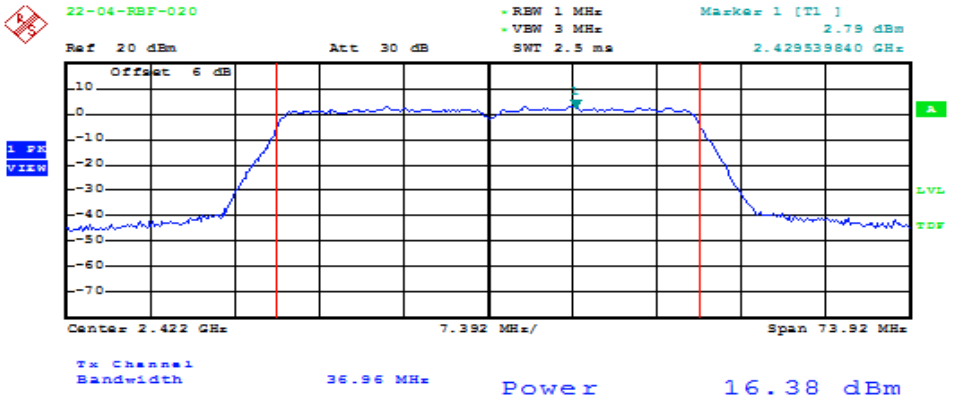
Date: 26.APR.2022 09:16:18

Mode: 802.11n20/ Channel High



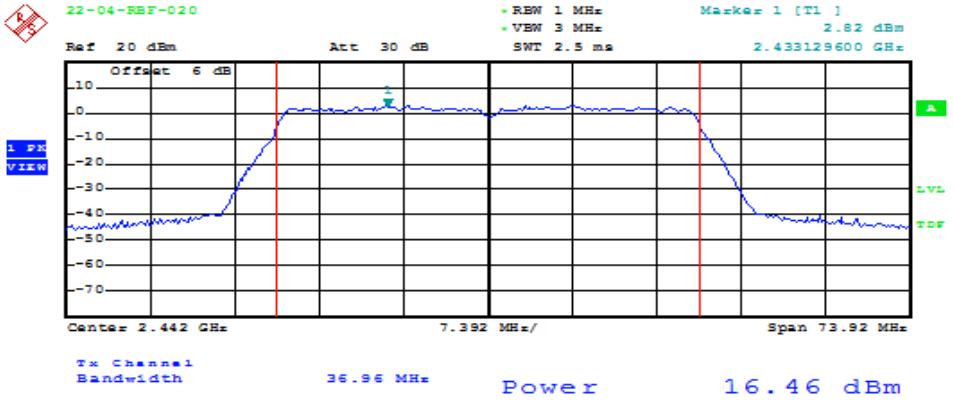
Date: 26.APR.2022 09:20:43

Mode: 802.11n40/ Channel Low



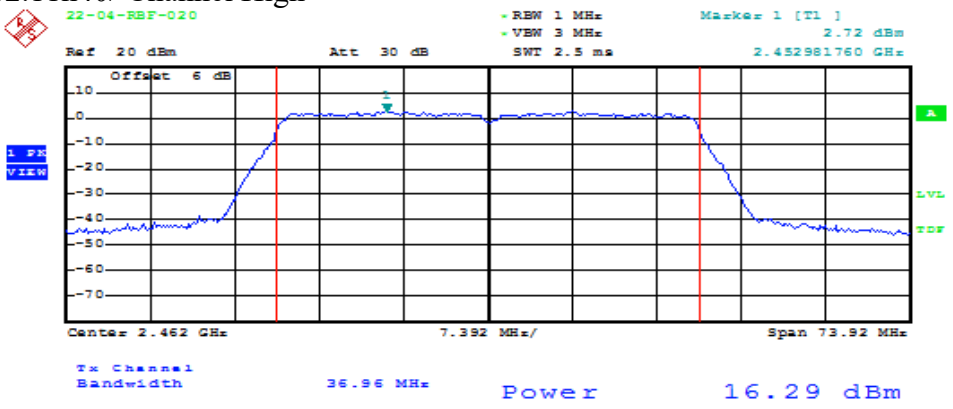
Date: 26.APR.2022 09:25:10

Mode: 802.11n40/ Channel Middle



Date: 26.APR.2022 09:27:31

Mode: 802.11n40/ Channel High



Date: 26.APR.2022 09:32:03

10 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

10.1 Standard Applicable

According to 15.247(d), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

10.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW of spectrum analyzer to 100kHz and VBW ≥ [3 × RBW] with a convenient frequency span including 100kHz bandwidth from band edge.
   (Detector = peak. / Sweep time = auto. / Trace mode = max hold.)
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

10.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

10.4 Measurement Data

Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

A. 802.11b

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

B. 802.11g

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

C. 802.11n20

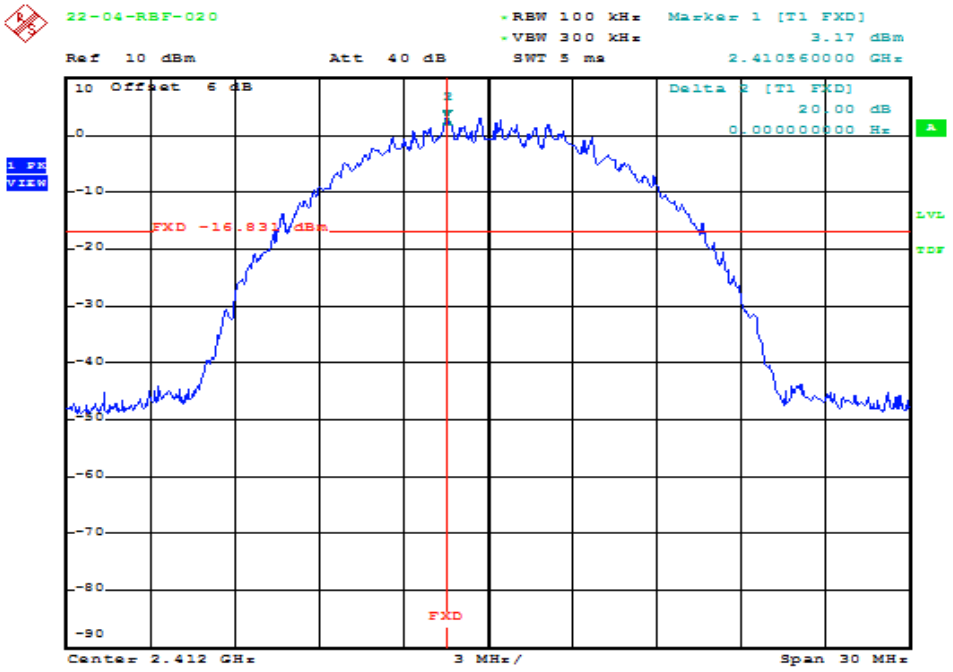
a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

D. 802.11n40

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

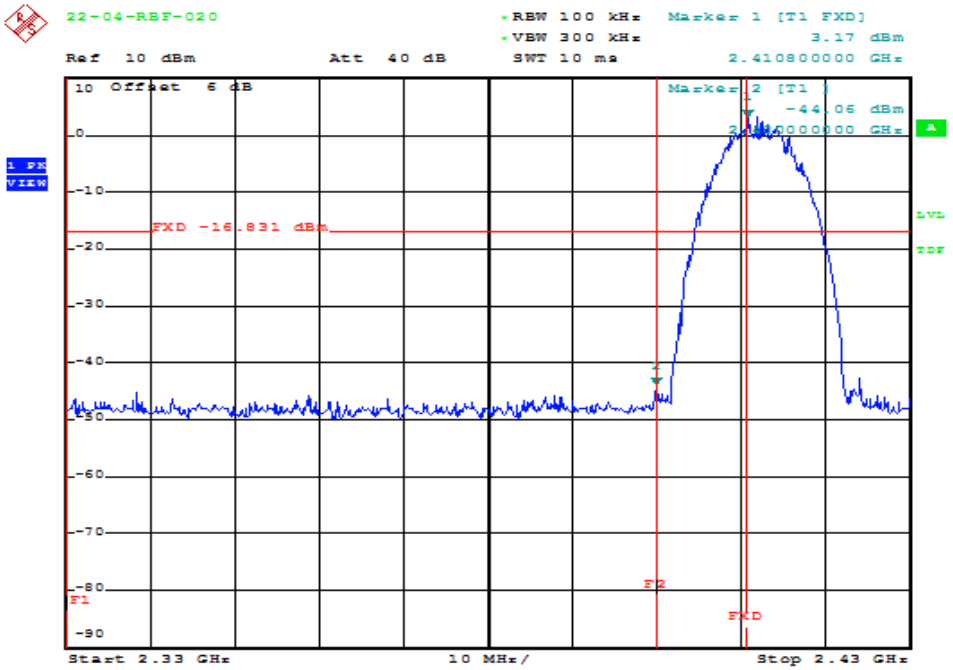
Mode: 802.11b/ Channel Low

100kHz PSD Reference Level



Date: 26.APR.2022 08:39:52

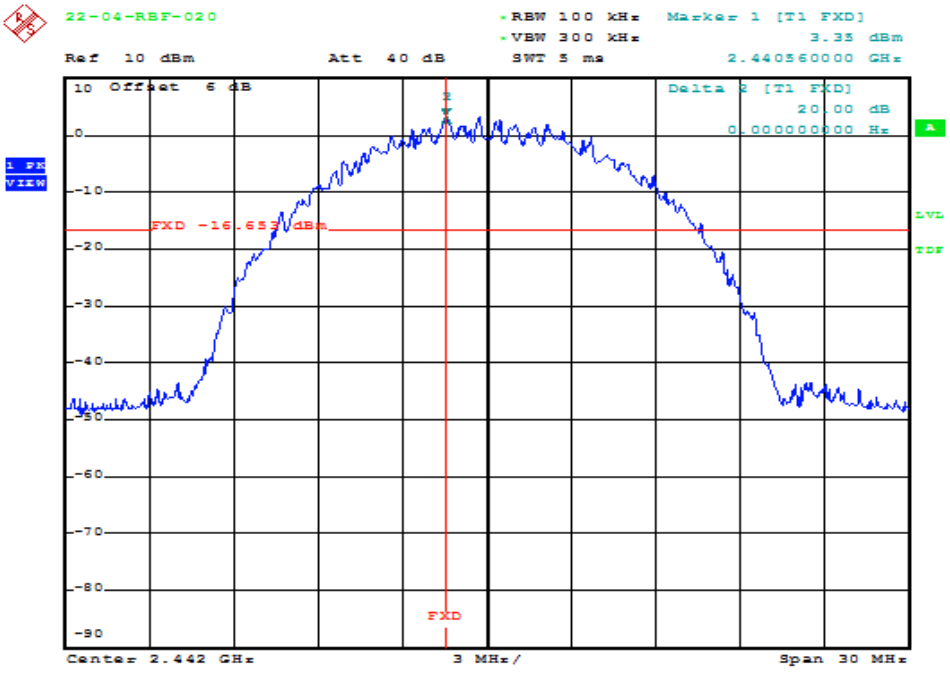
Channel Plot



Date: 26.APR.2022 08:40:02

Mode: 802.11b/ Channel Middle

100kHz PSD Reference Level

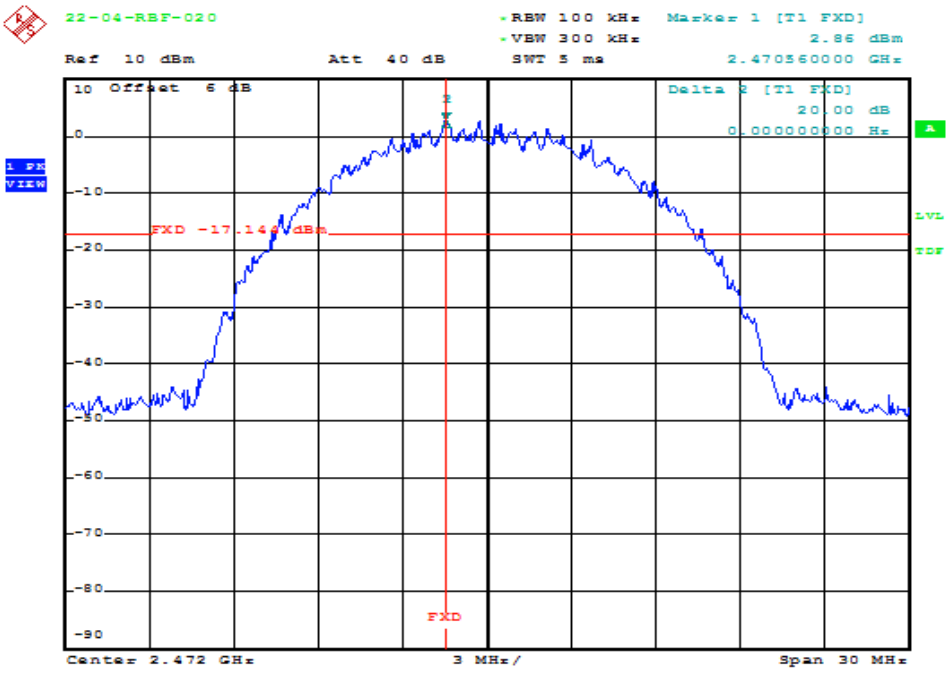


Channel Plot

Not Applicable

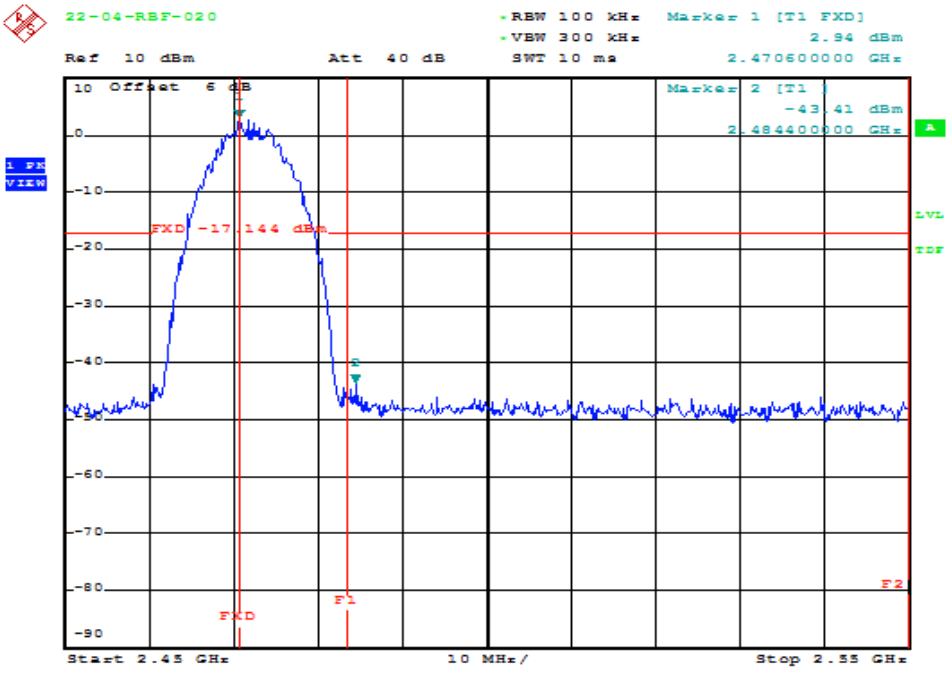
Mode: 802.11b/ Channel High

100kHz PSD Reference Level



Date: 26.APR.2022 08:47:27

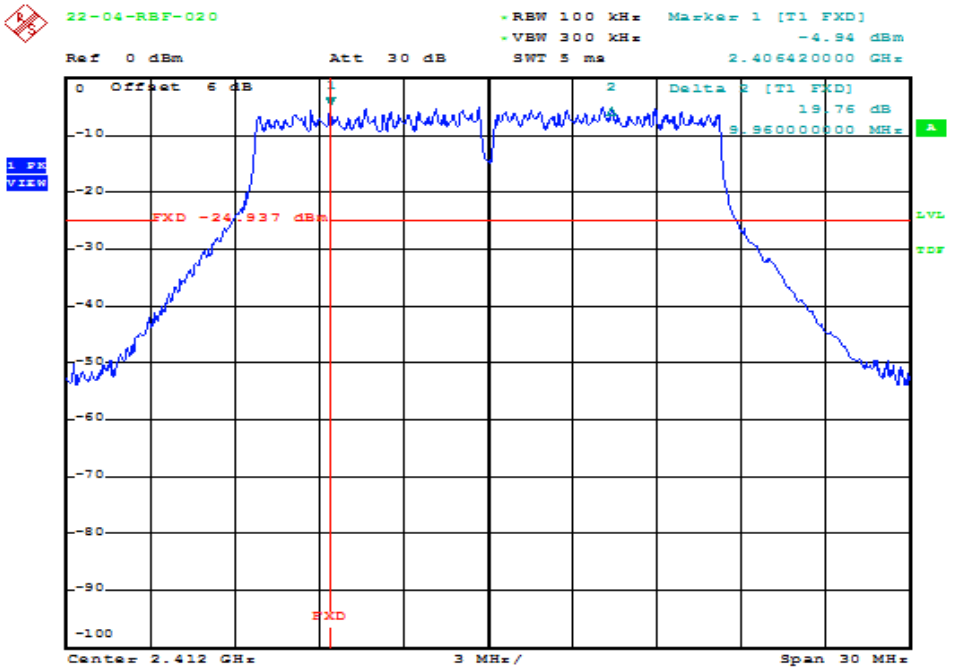
Channel Plot



Date: 26.APR.2022 08:47:37

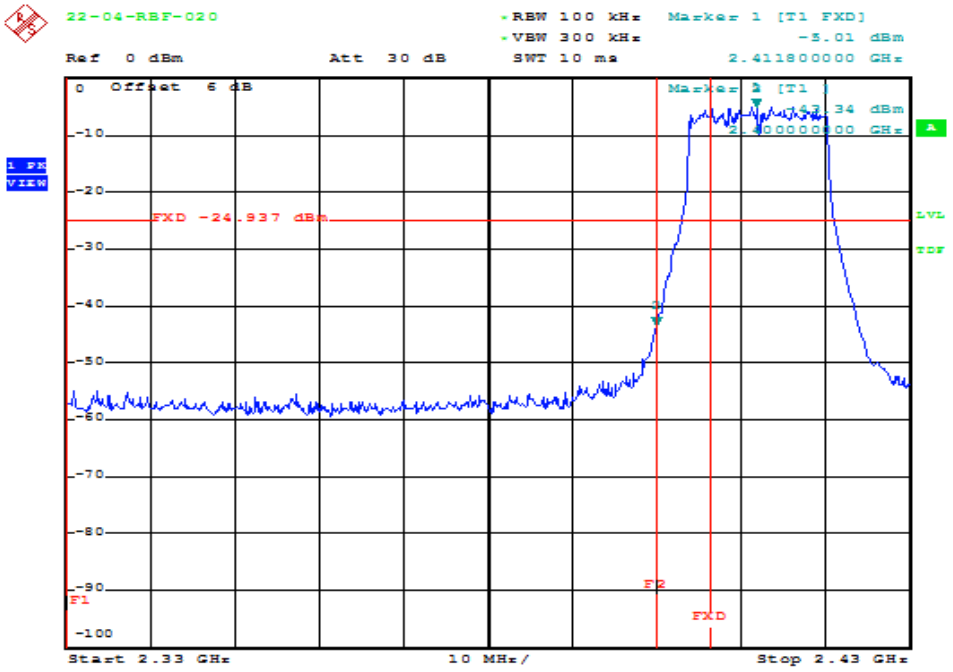
Mode: 802.11g/ Channel Low

100kHz PSD Reference Level



Date: 26.APR.2022 09:04:21

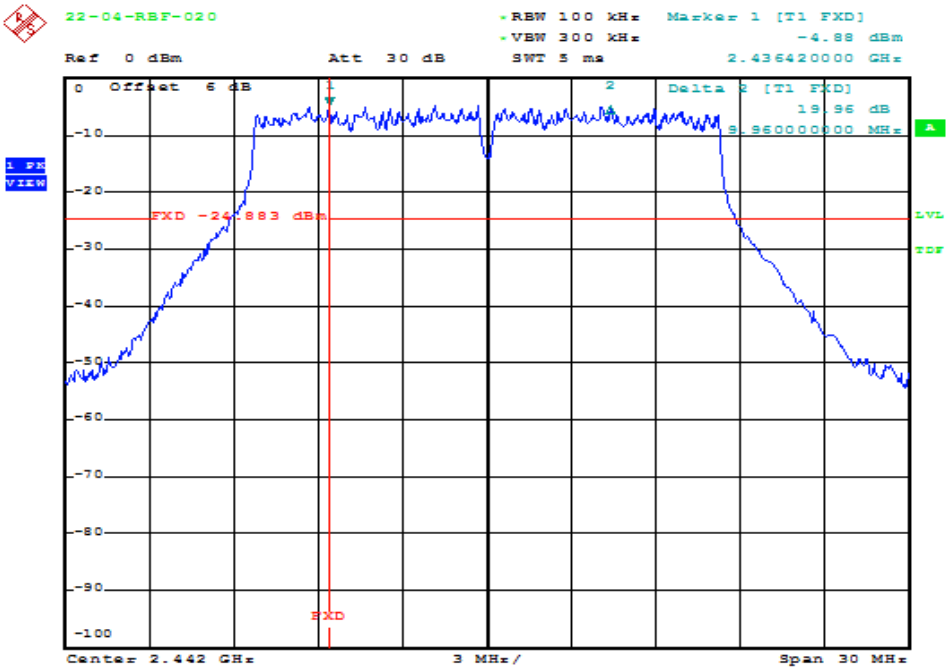
Channel Plot



Date: 26.APR.2022 09:04:31

Mode: 802.11g/ Channel Middle

100kHz PSD Reference Level

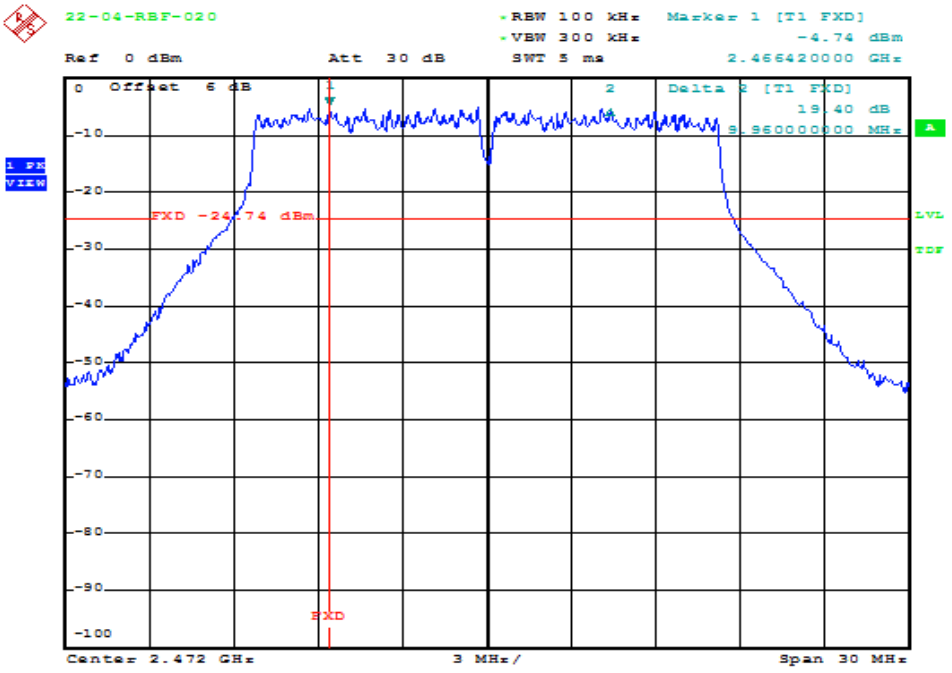


Channel Plot

Not Applicable

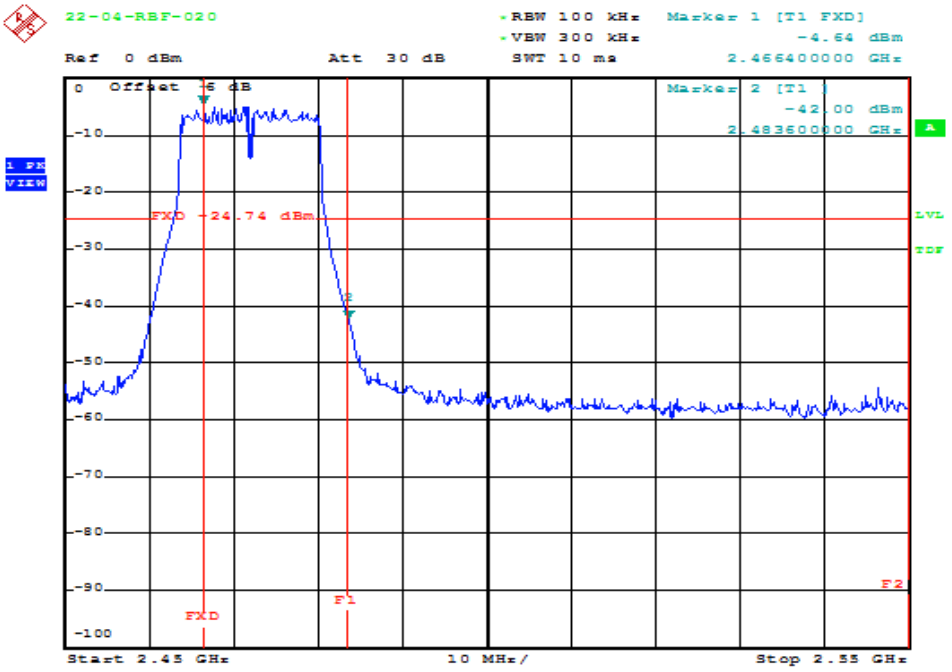
Mode: 802.11g/ Channel High

100kHz PSD Reference Level



Date: 26.APR.2022 09:10:57

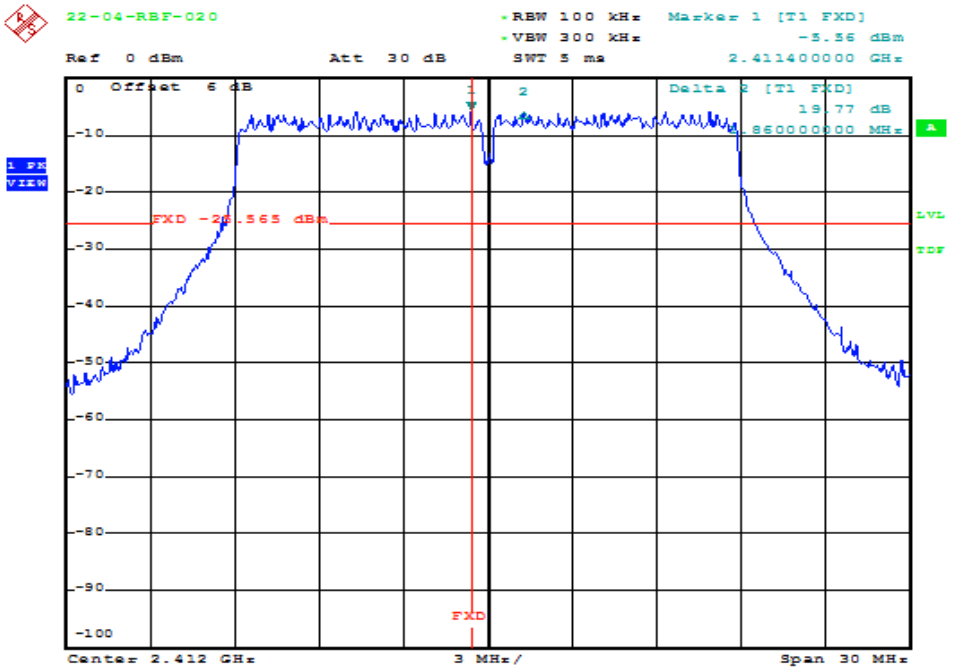
Channel Plot



Date: 26.APR.2022 09:11:07

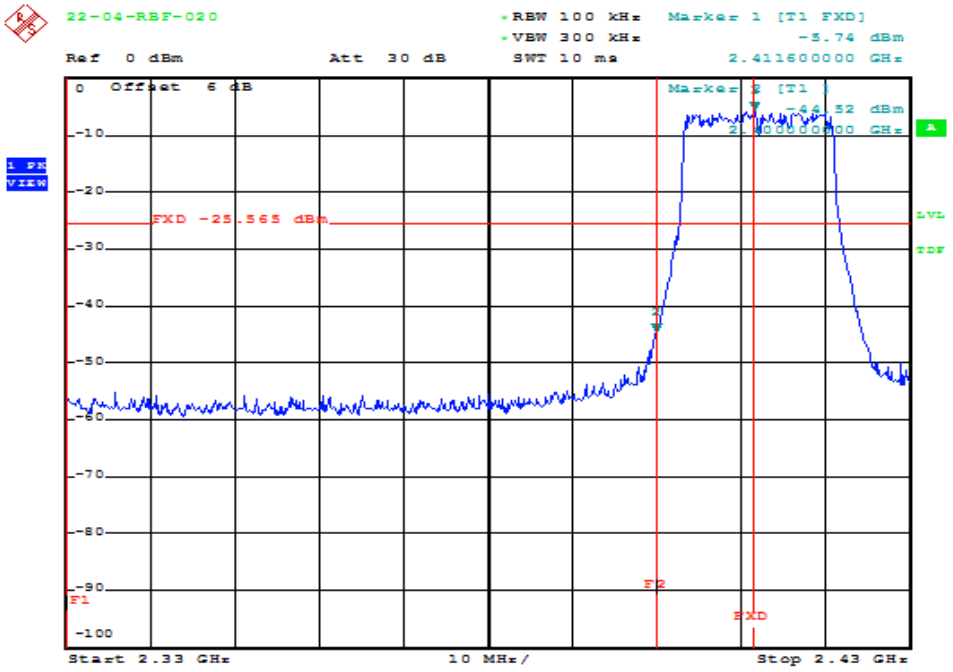
Mode: 802.11n20/ Channel Low

100kHz PSD Reference Level



Date: 26.APR.2022 09:14:21

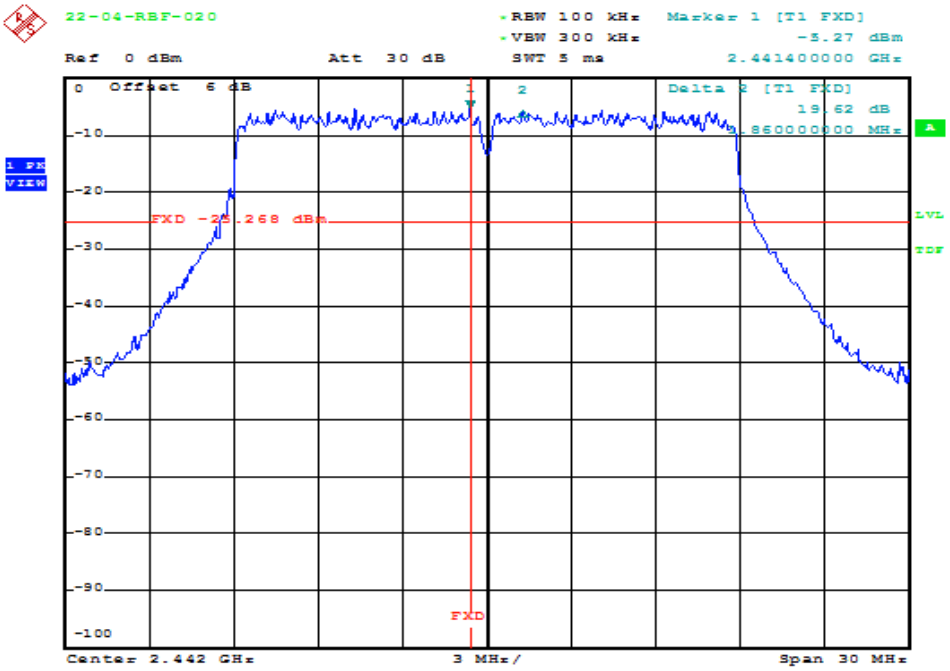
Channel Plot



Date: 26.APR.2022 09:14:31

Mode: 802.11n20/ Channel Middle

100kHz PSD Reference Level



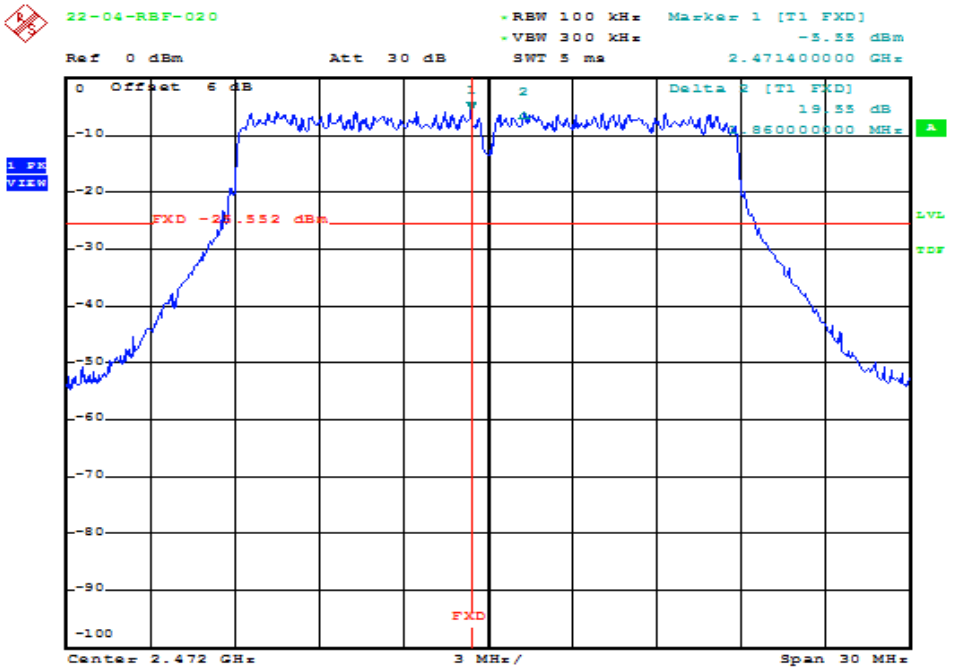
Date: 26.APR.2022 09:16:48

Channel Plot

Not Applicable

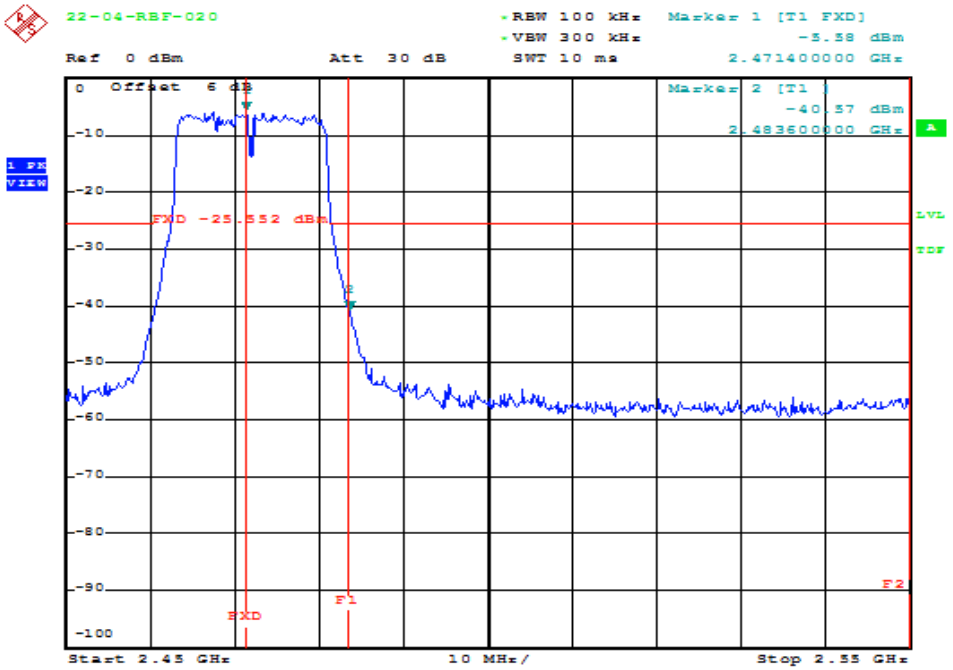
Mode: 802.11n20/ Channel High

100kHz PSD Reference Level



Date: 26.APR.2022 09:21:22

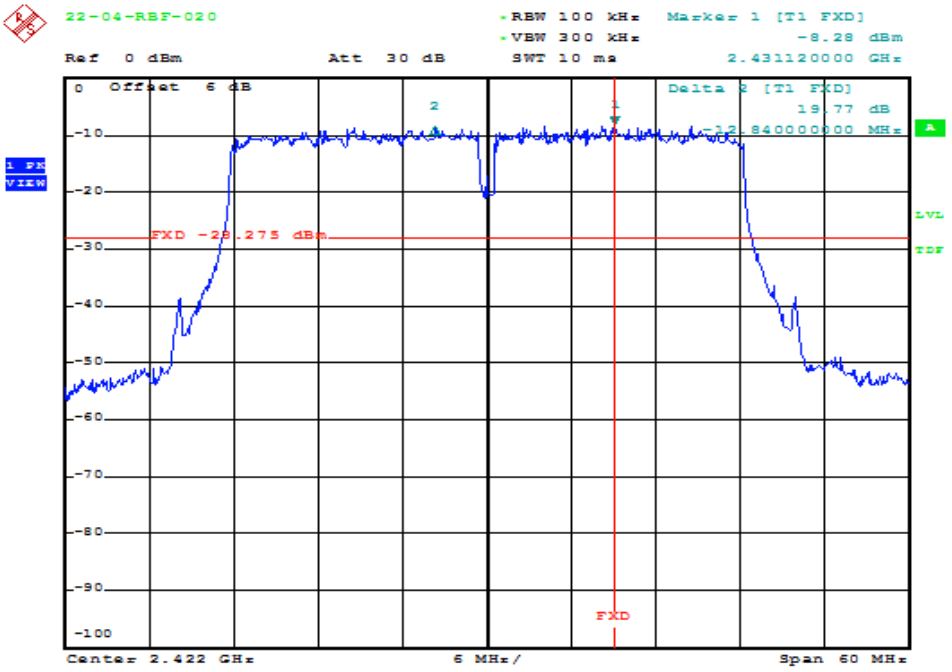
Channel Plot



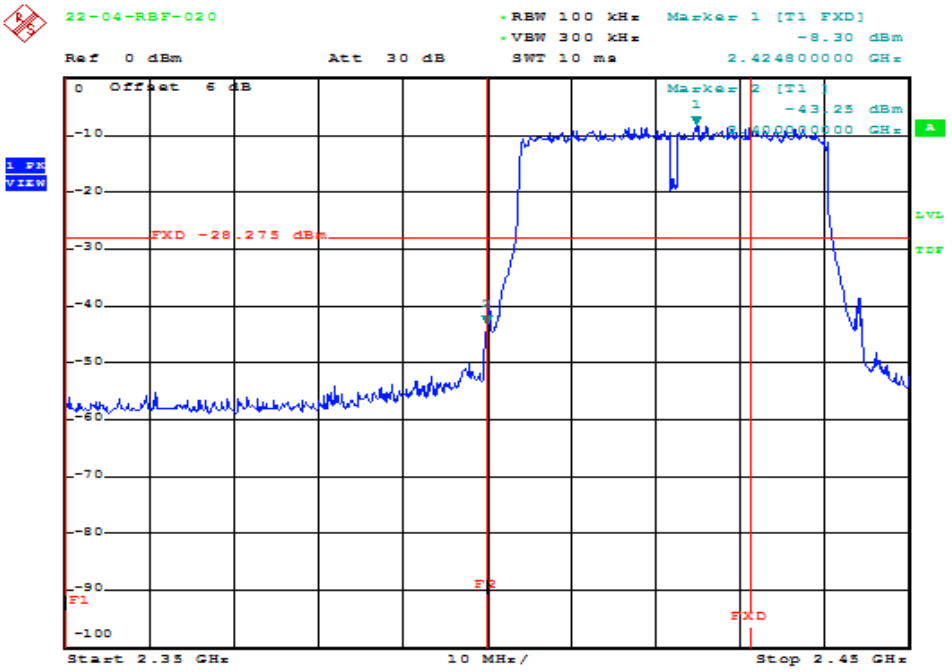
Date: 26.APR.2022 09:21:32

Mode: 802.11n40/ Channel Low

100kHz PSD Reference Level

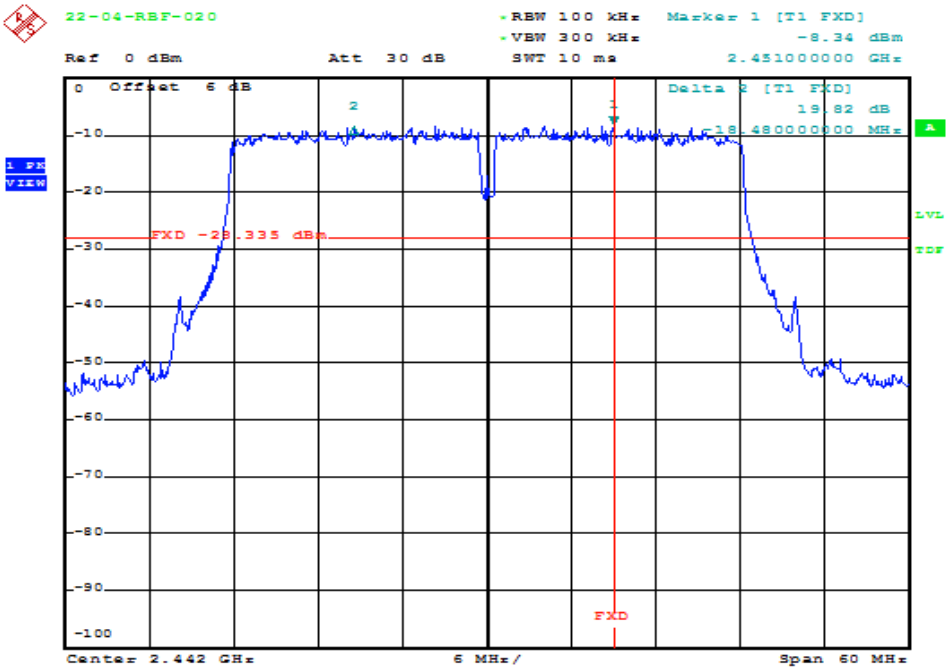


Channel Plot



Mode: 802.11n40/ Channel Middle

100kHz PSD Reference Level

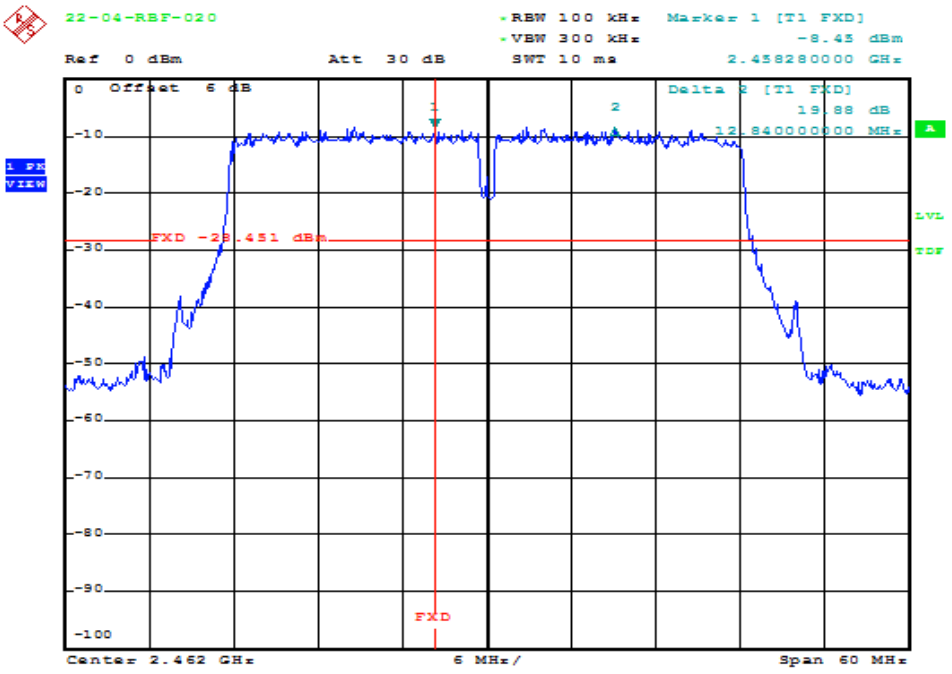


Channel Plot

Not Applicable

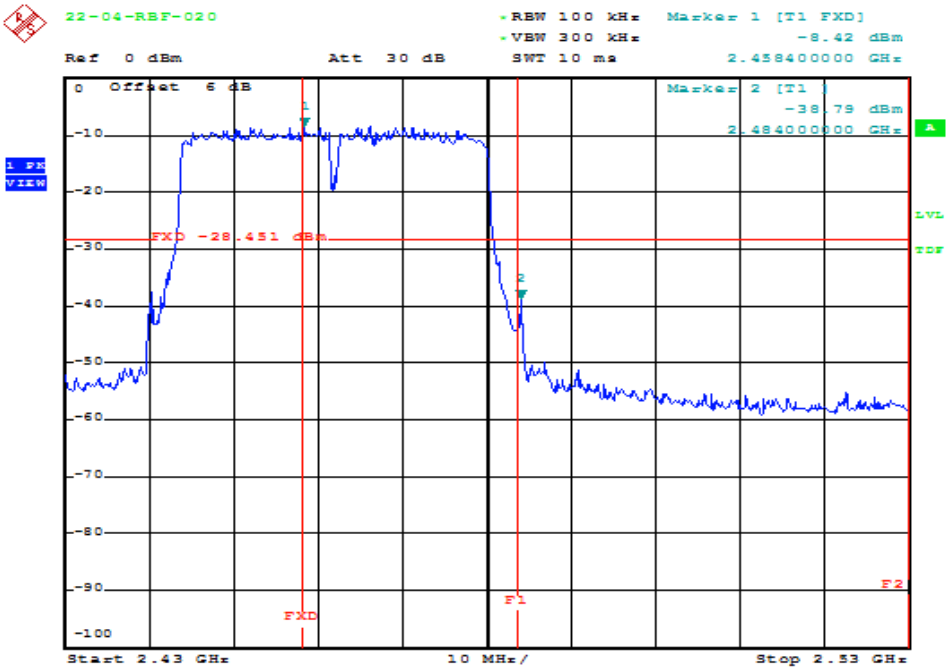
Mode: 802.11n40/ Channel High

100kHz PSD Reference Level



Date: 26.APR.2022 09:32:43

Channel Plot



Date: 26.APR.2022 09:32:53

11 POWER DENSITY MEASUREMENT

11.1 Standard Applicable

According to 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Measurement Procedure

Measurement Method: PKPSD

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
6. Set the VBW ≥ 3 x RBW.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
13. Repeat above procedures until all measured frequencies were complete.

11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

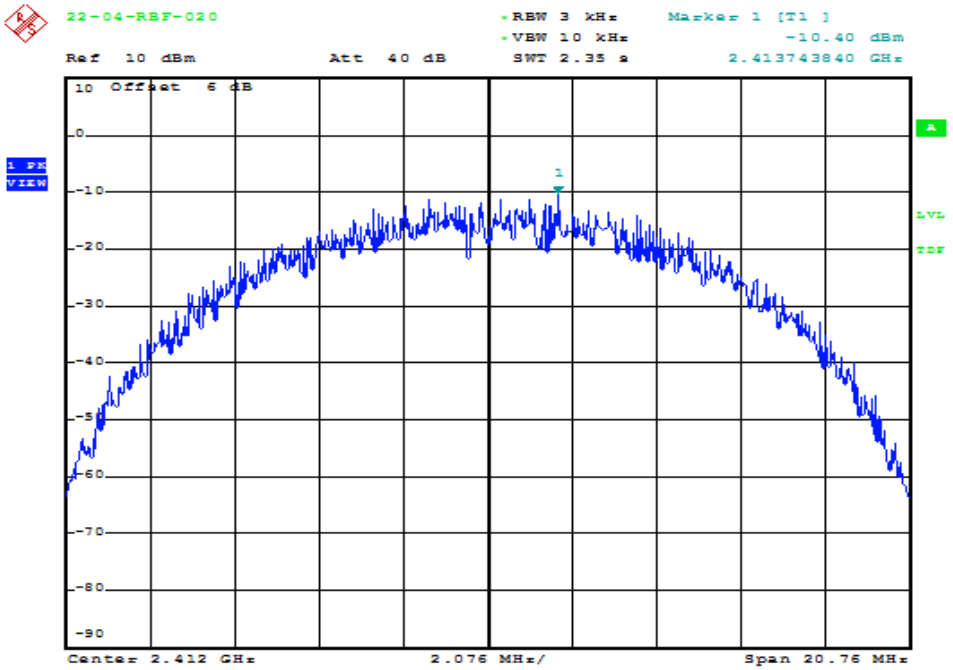
11.4 Measurement Data

Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

Wireless Standards	Carrier Frequency (MHz)	Antenna Gain (dBi)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	2412	2.30	-10.40	8
	2442	2.30	-10.28	8
	2472	2.30	-10.82	8
802.11g	2412	2.30	-18.82	8
	2442	2.30	-18.61	8
	2472	2.30	-18.99	8
802.11n20	2412	2.30	-19.57	8
	2442	2.30	-19.15	8
	2472	2.30	-19.46	8
802.11n40	2422	2.30	-20.90	8
	2442	2.30	-20.77	8
	2462	2.30	-20.84	8

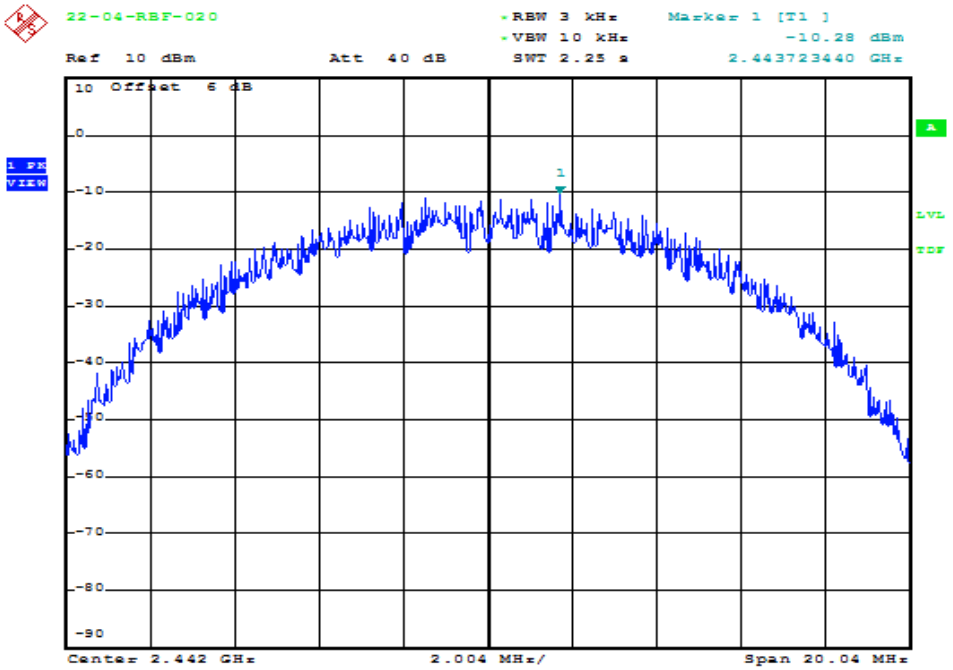
NOTE : 1. Remark "---" Means not applicable for this device.
2. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

802.11b / Channel Low



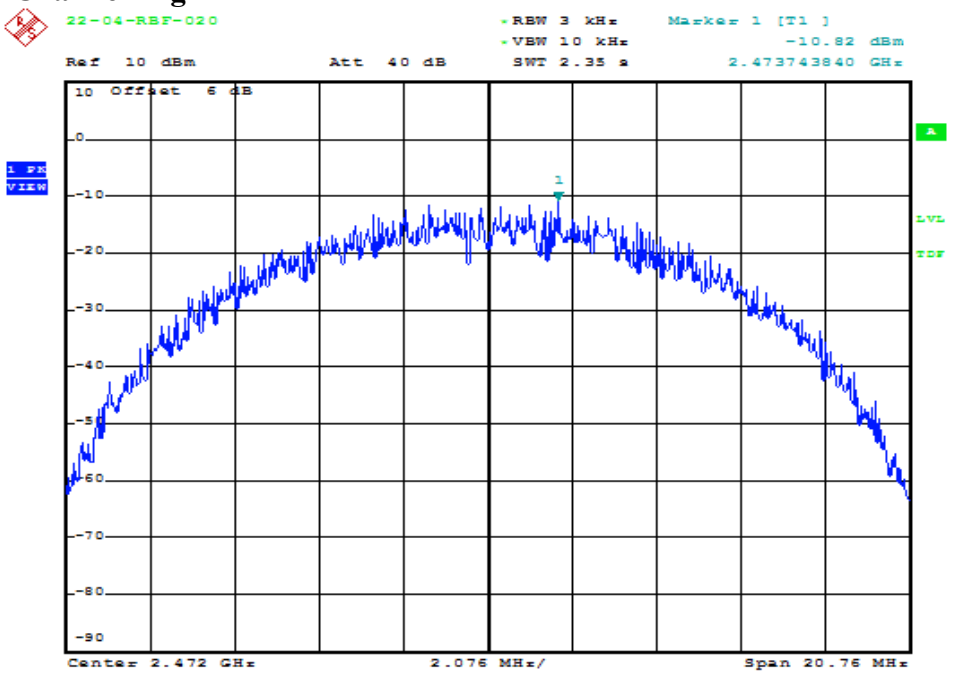
Date: 26.APR.2022 08:39:40

802.11b / Channel Mid



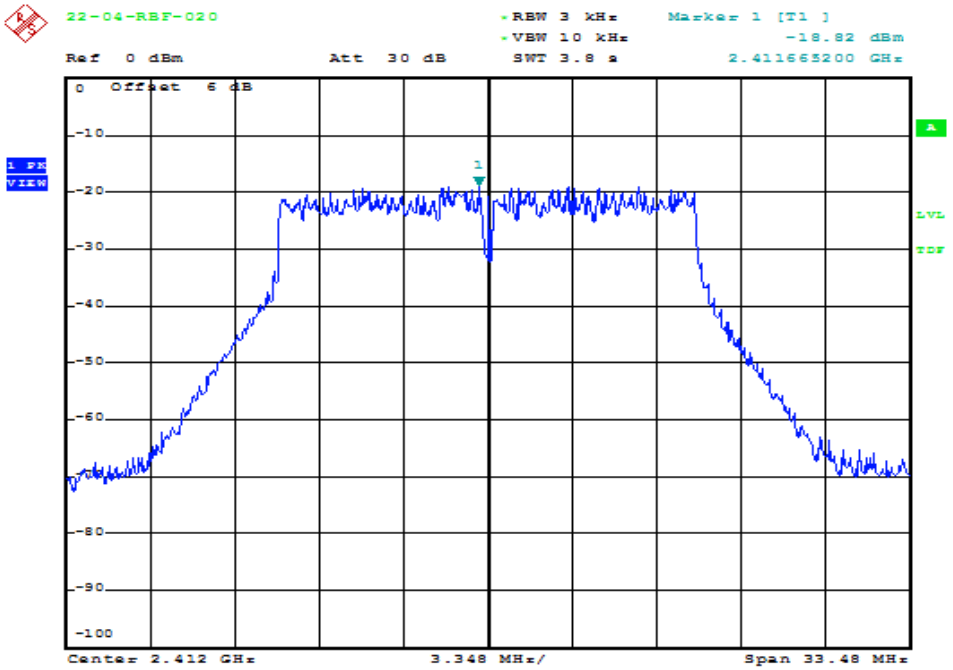
Date: 26.APR.2022 08:42:18

802.11b / Channel High



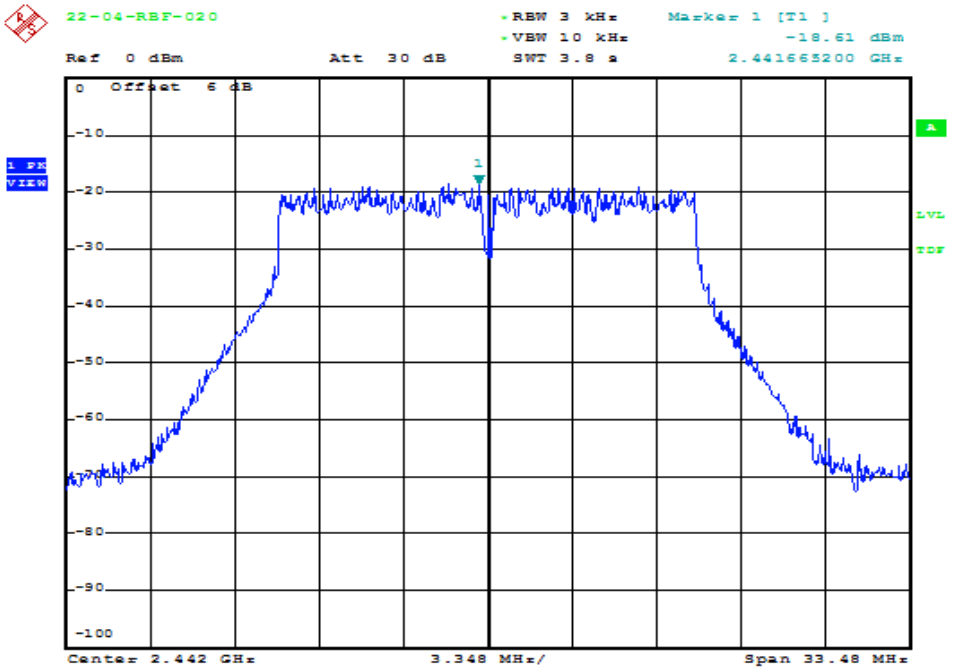
Date: 26.APR.2022 08:47:05

802.11g / Channel Low



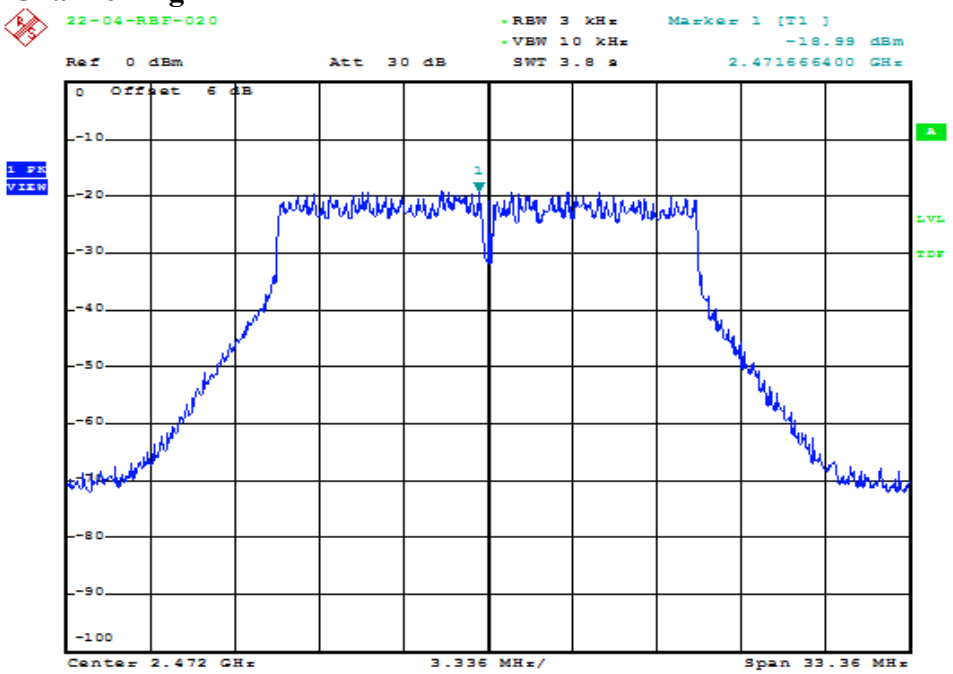
Date: 26.APR.2022 09:04:06

802.11g / Channel Mid



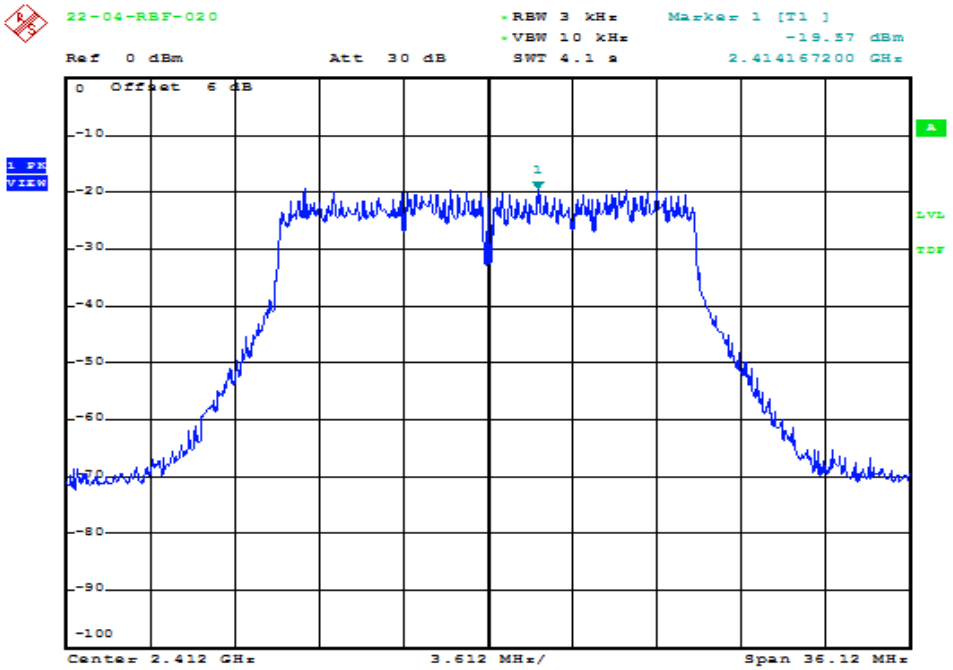
Date: 26.APR.2022 09:06:20

802.11g / Channel High



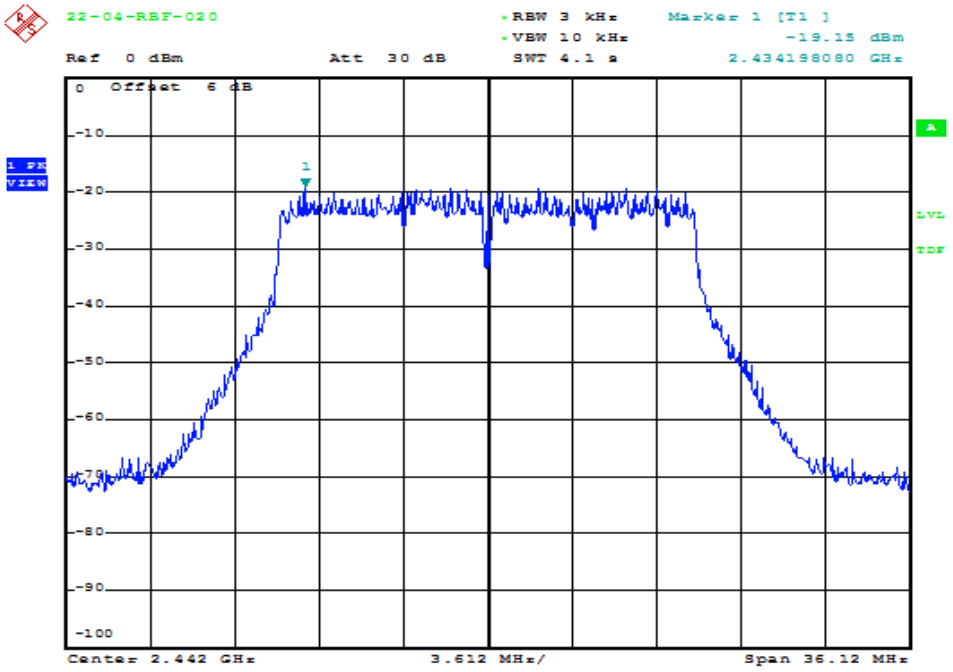
Date: 26.APR.2022 09:10:44

802.11n20/Channel Low



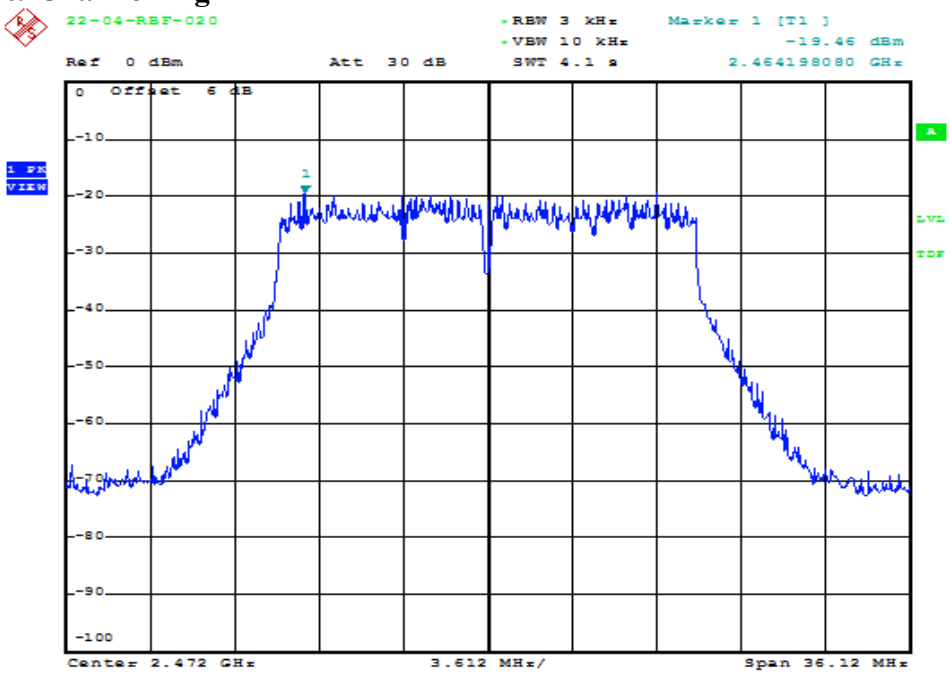
Date: 26.APR.2022 09:14:09

802.11n20/ Channel Mid



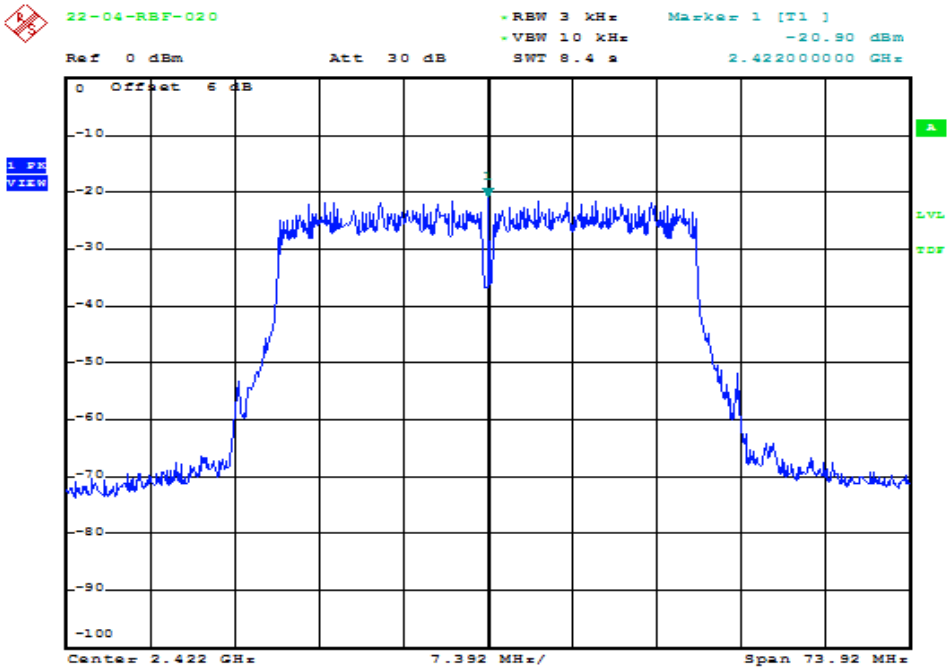
Date: 26.APR.2022 09:16:36

802.11n20/ Channel High



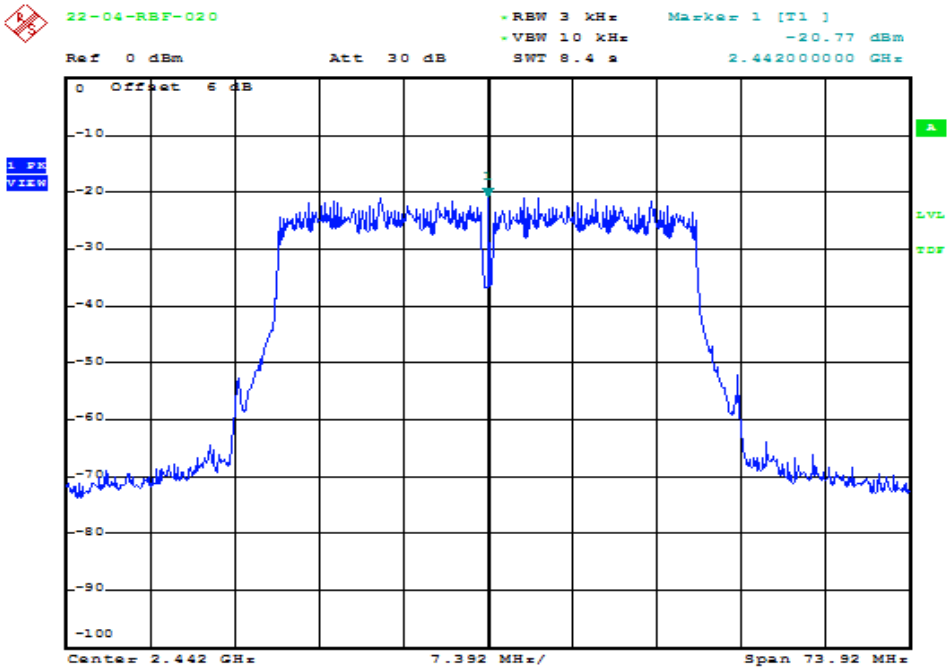
Date: 26.APR.2022 09:21:09

802.11n40/ Channel Low



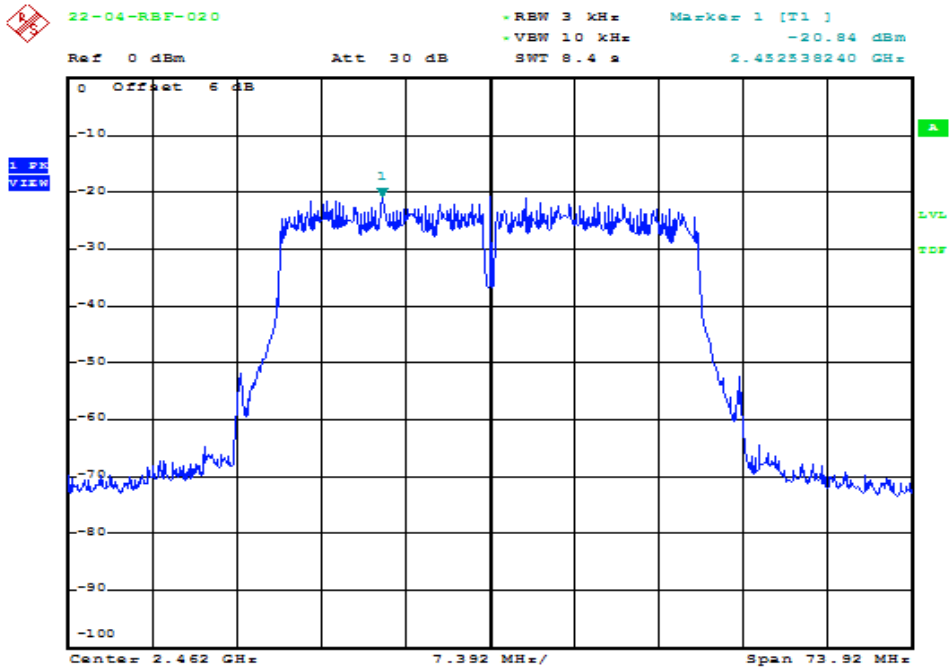
Date: 26.APR.2022 09:25:37

802.11n40 /Channel Mid



Date: 26.APR.2022 09:28:01

802.11n40/ Channel High



Date: 26.APR.2022 09:32:30

12 OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT

12.1 Standard Applicable

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

12.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold.
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

12.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/	2021/10/28	2022/10/27

11.4 Measurement Data

Test Data: 2022/04/26 Temp: 23 °C Hum: 66 %

A. 802.11b

Mode: Channel Low, Mid, High

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

B. 802.11g

Mode: Channel Low, Mid, High

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

C. 802.11n20

Mode: Channel Low, Mid, High

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

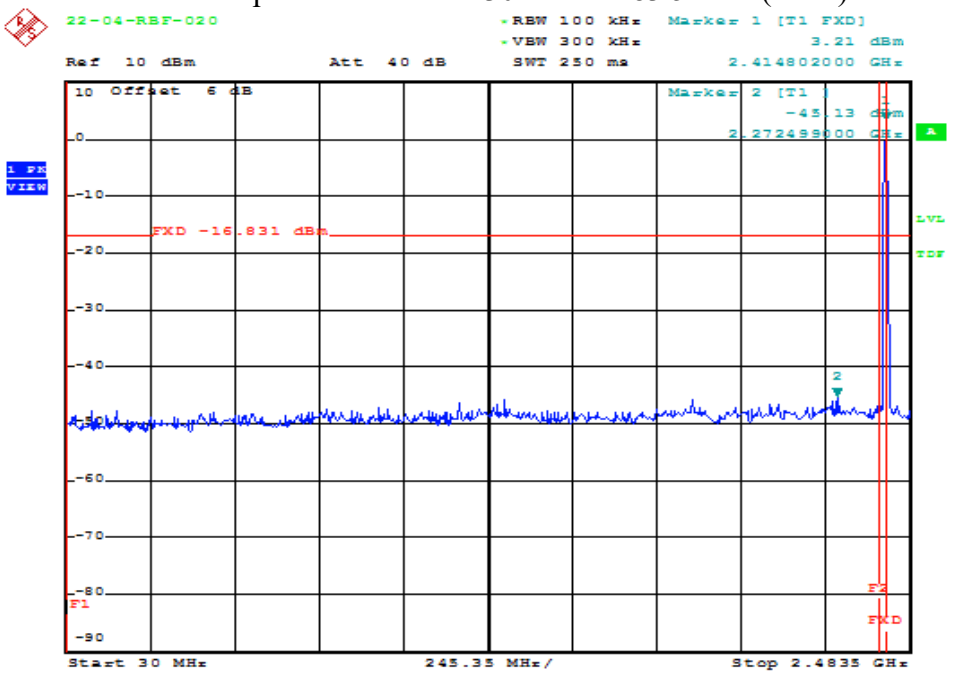
D. 802.11n0

Mode: Channel Low, Mid, High

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

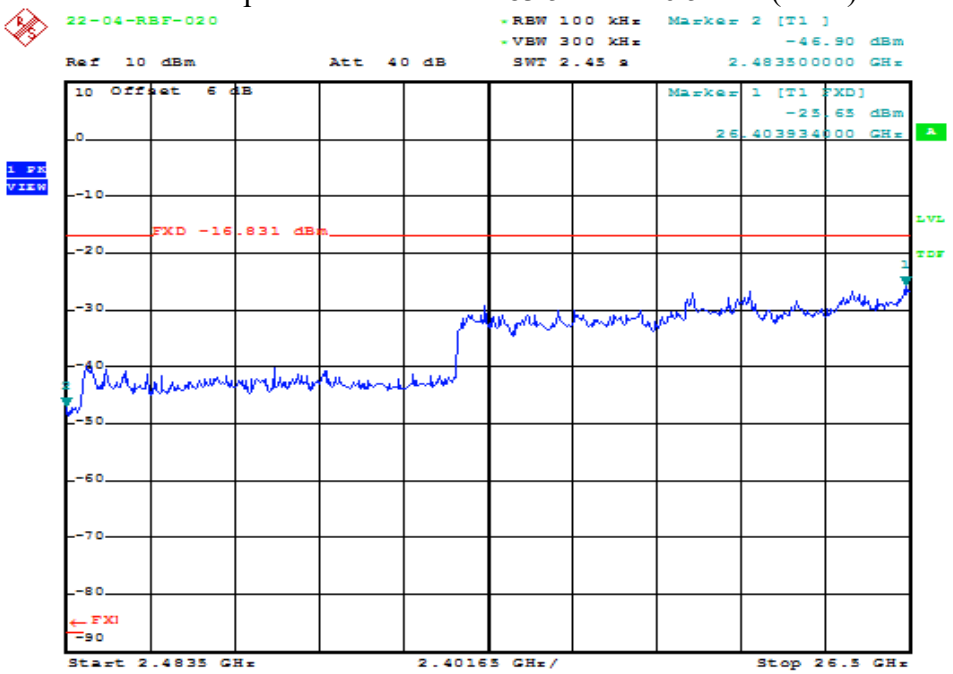
Mode: 802.11b/ Channel Low

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 08:40:13

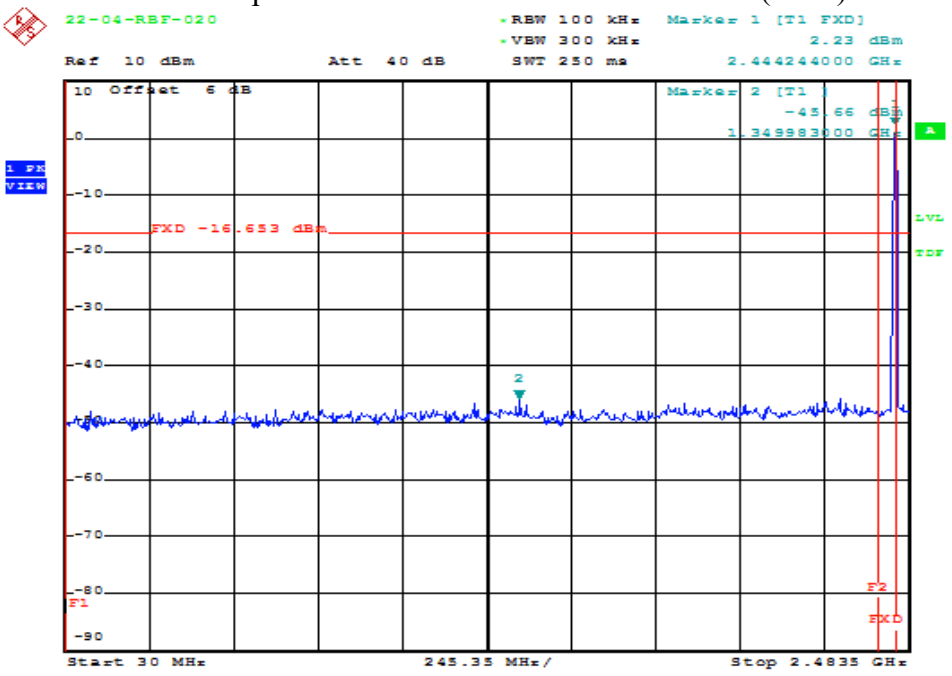
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 08:40:29

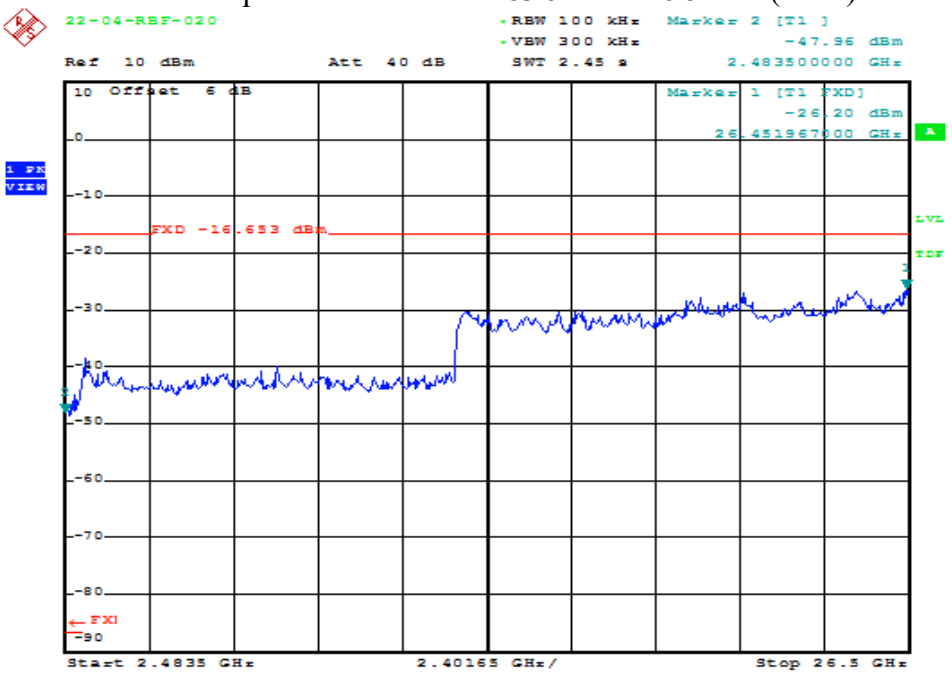
Mode: 802.11b/ Channel Middle

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 08:42:42

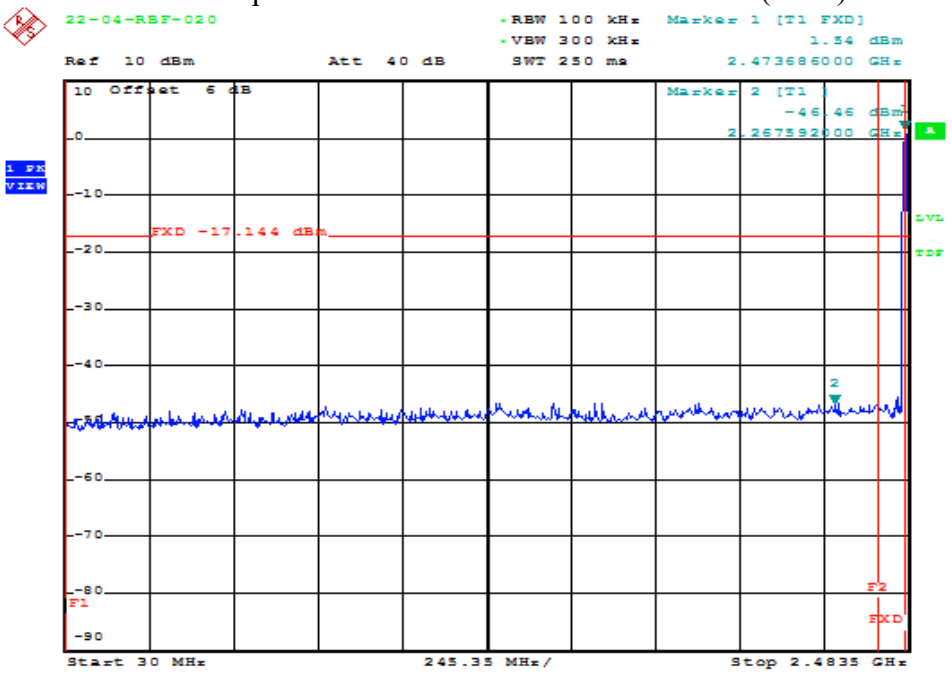
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 08:42:58

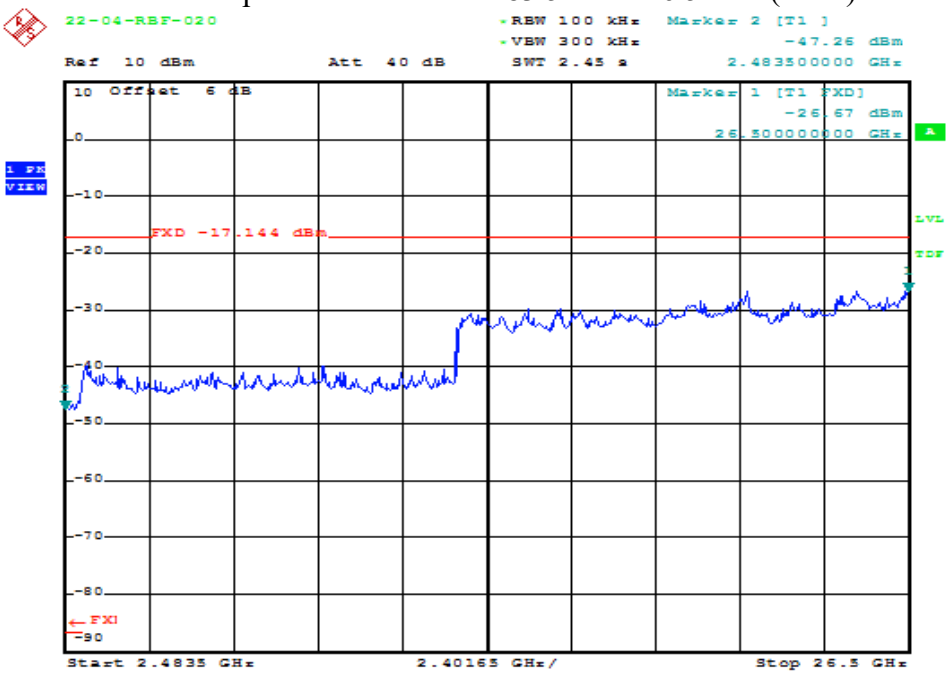
Mode: 802.11b/ Channel High

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 08:47:48

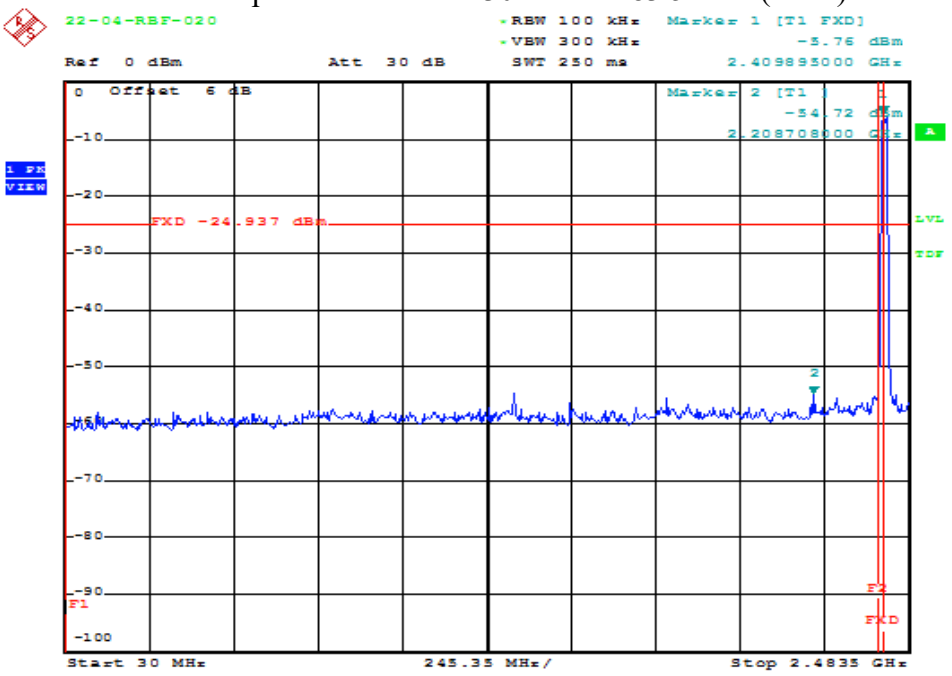
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 08:48:04

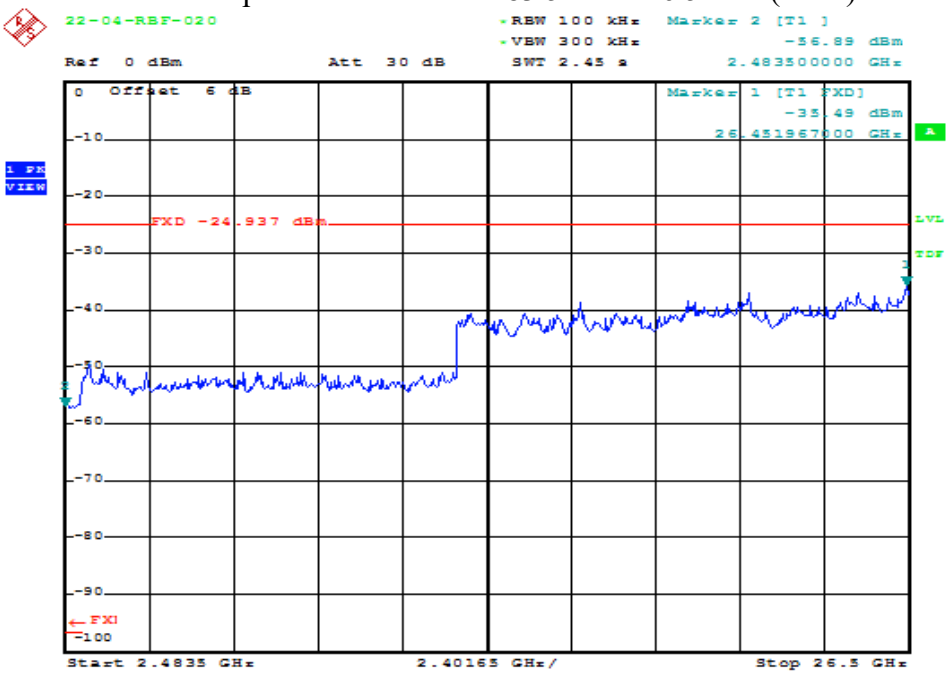
Mode: 802.11g/ Channel Low

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:04:45

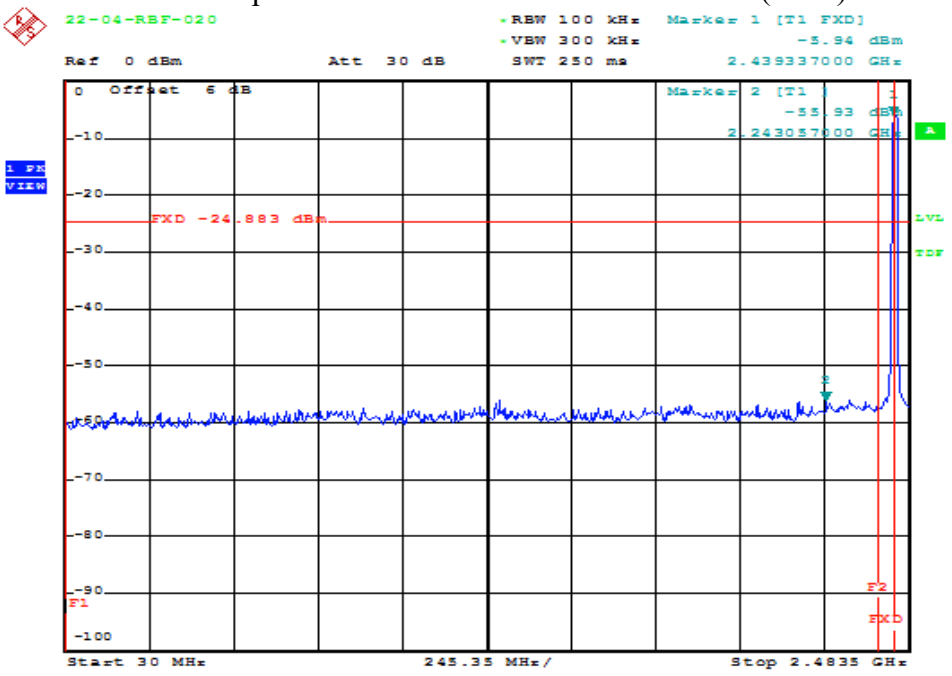
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:05:03

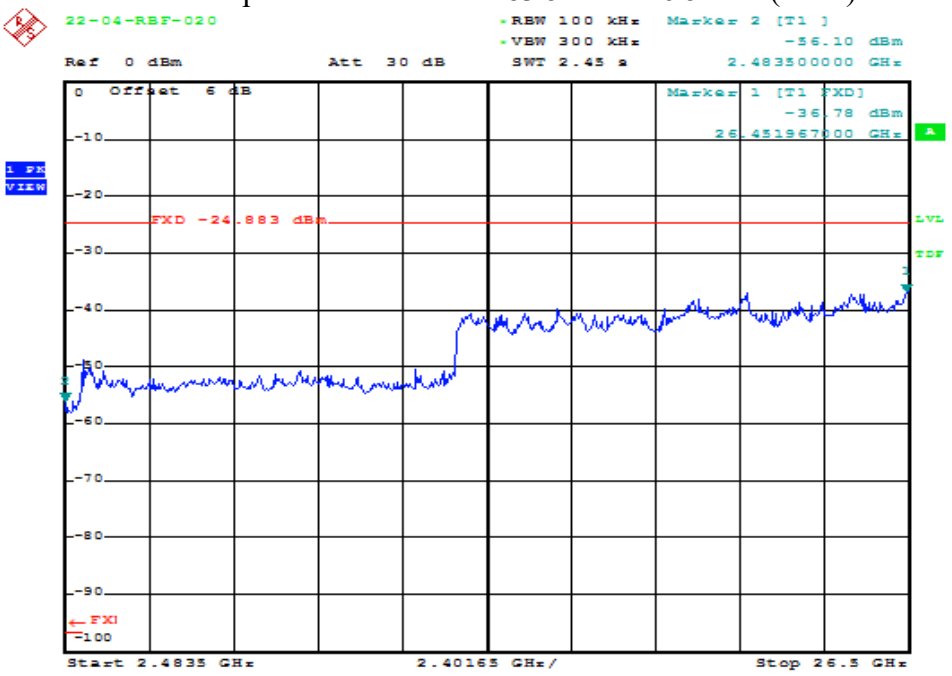
Mode: 802.11g/ Channel Middle

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:06:43

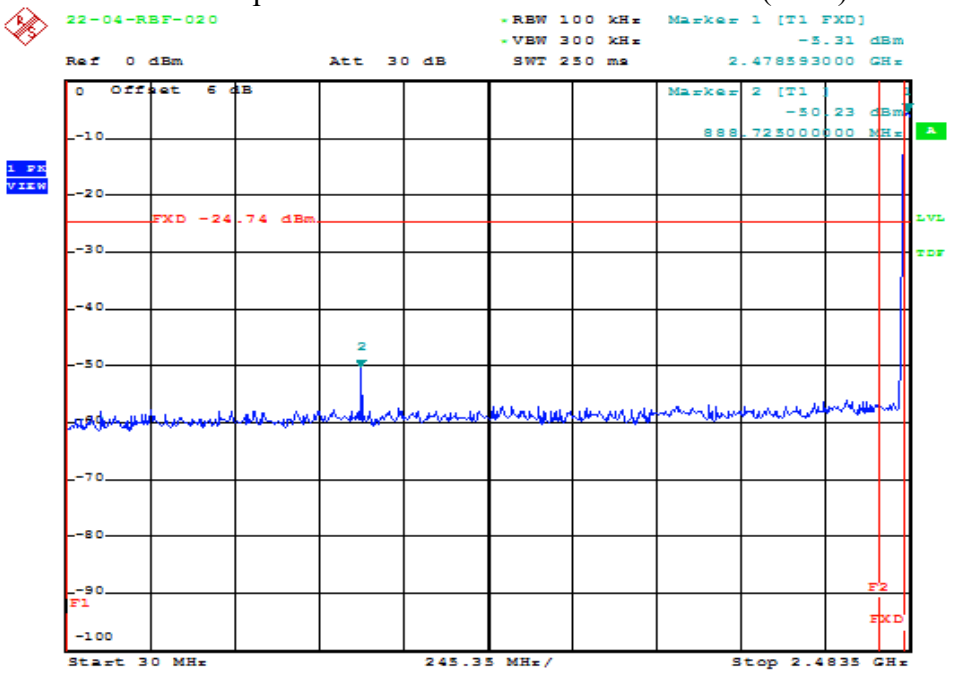
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:07:02

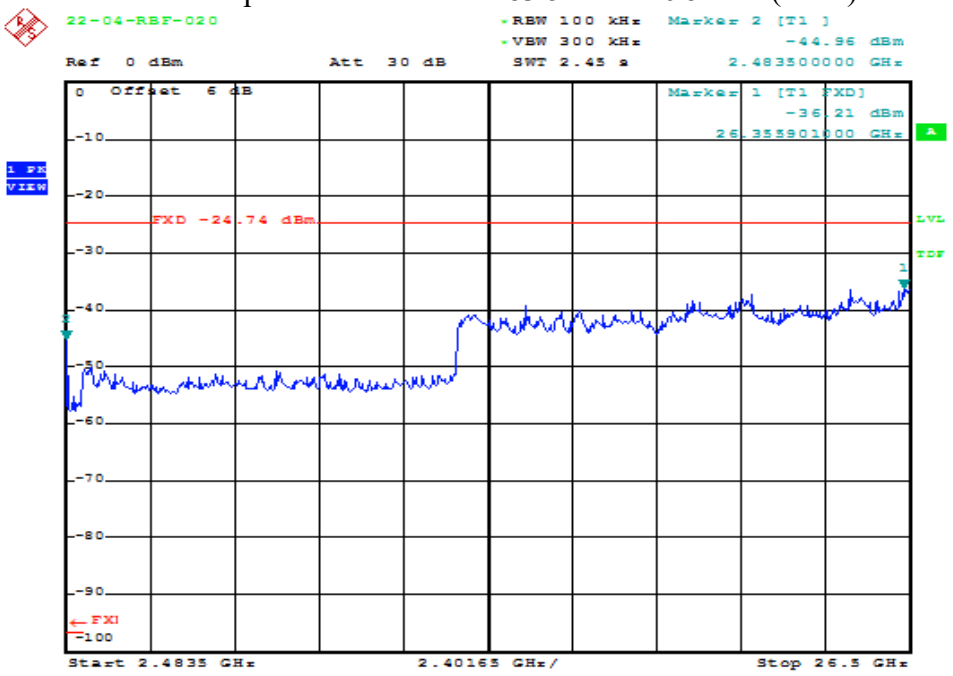
Mode: 802.11g/ Channel High

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:11:21

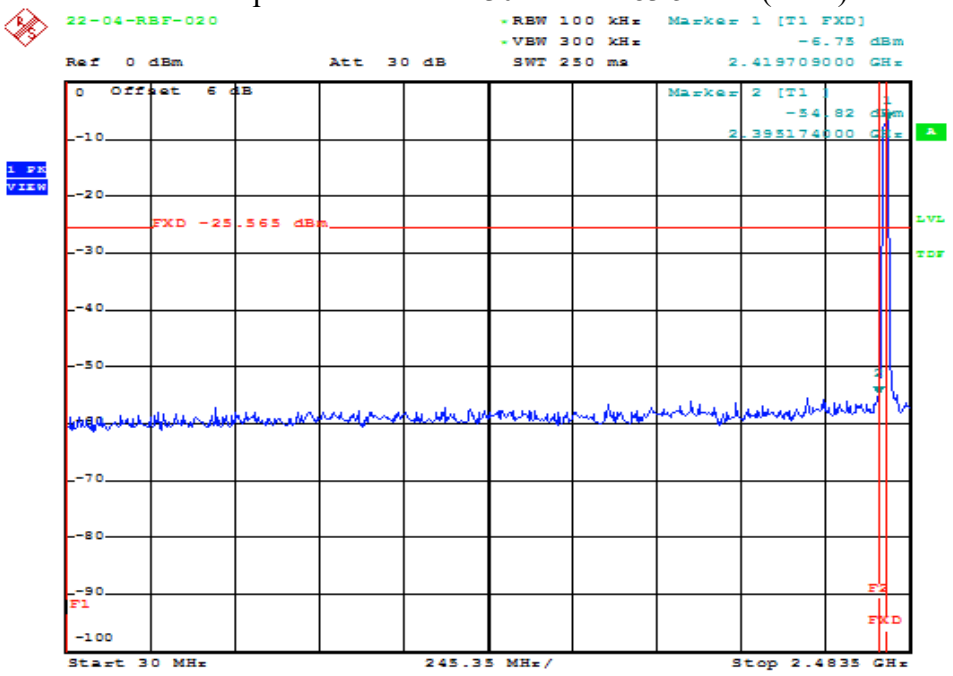
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:11:37

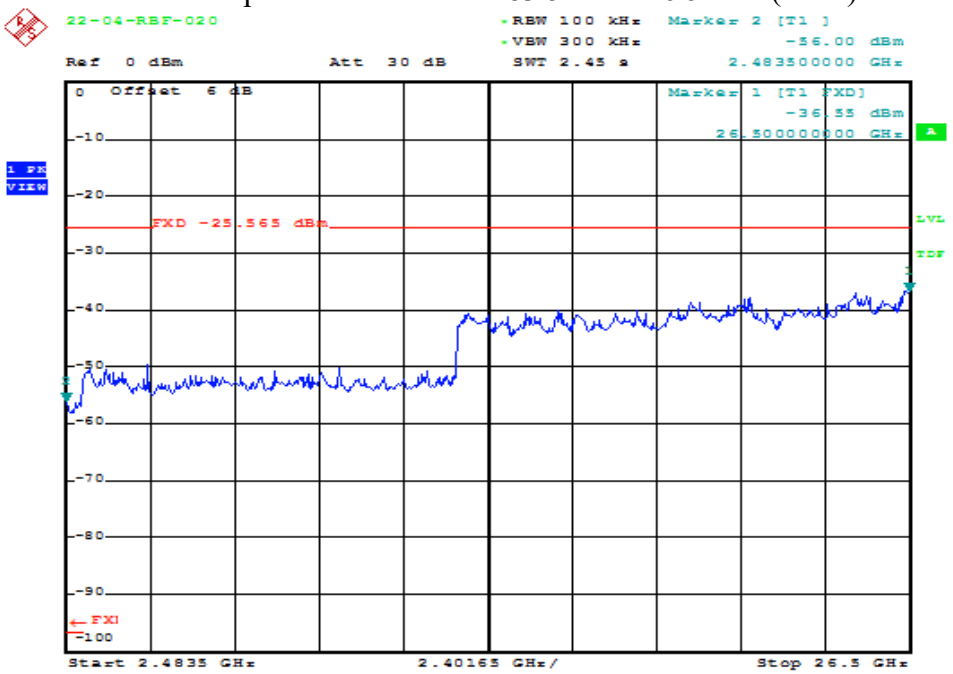
Mode: 802.11n20/ Channel Low

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:14:42

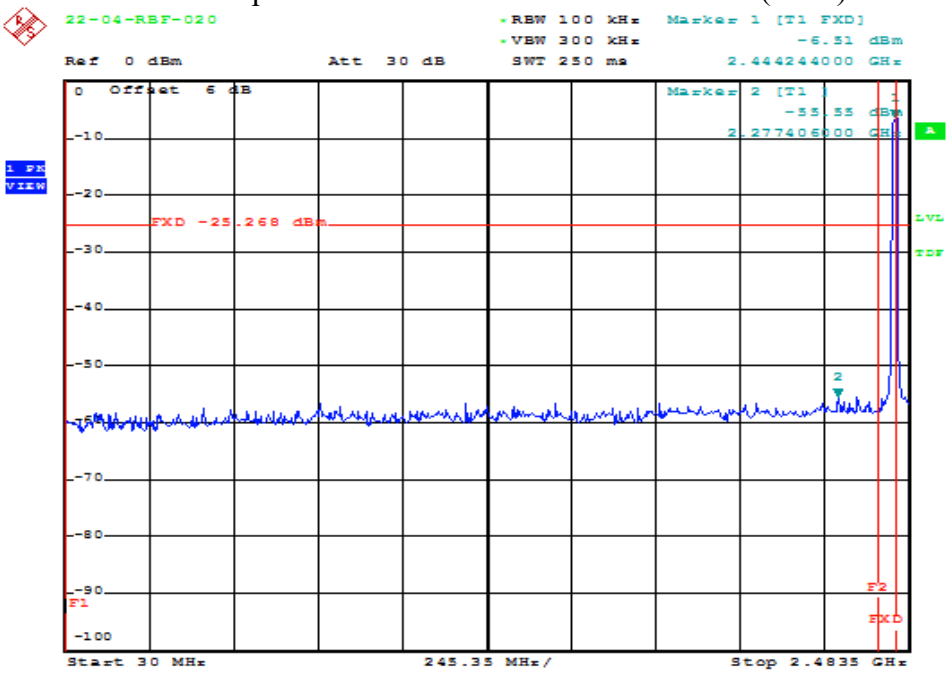
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:15:03

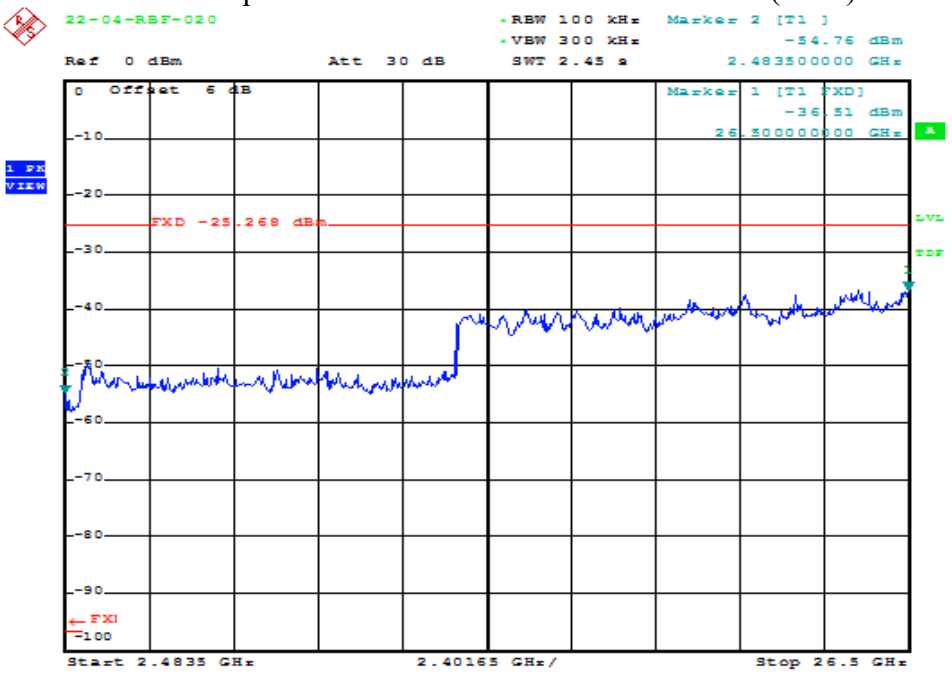
Mode: 802.11n20/ Channel Middle

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:16:59

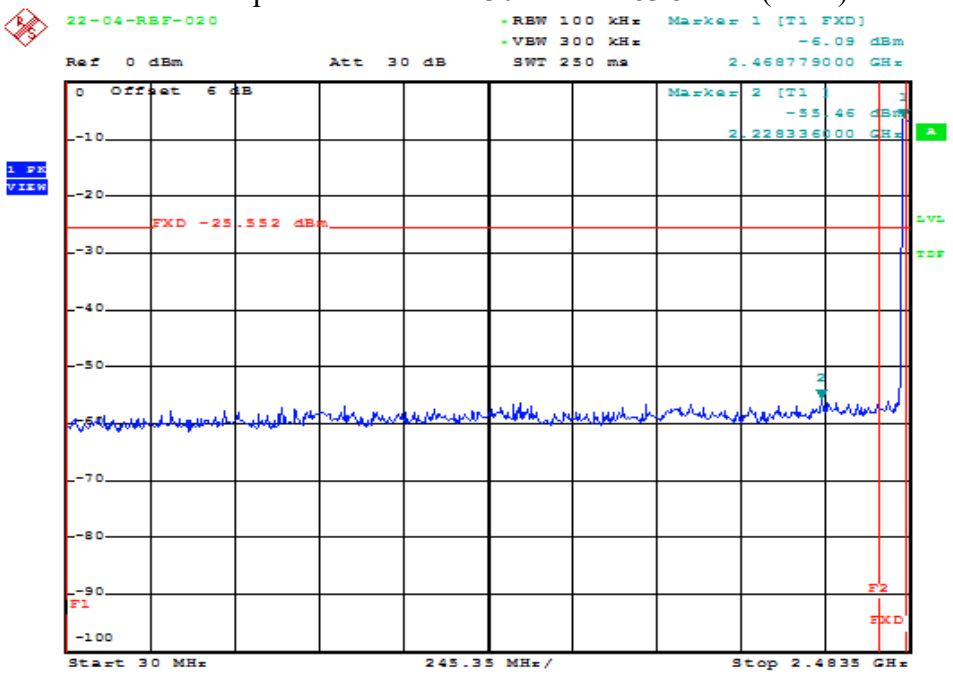
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:17:18

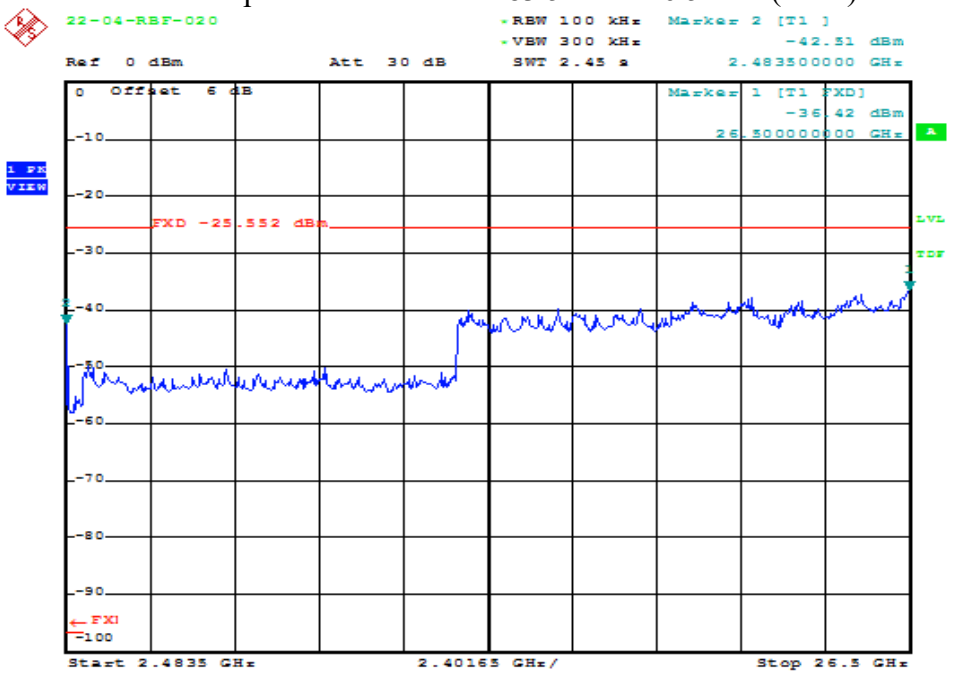
Mode: 802.11n20/ Channel High

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:21:44

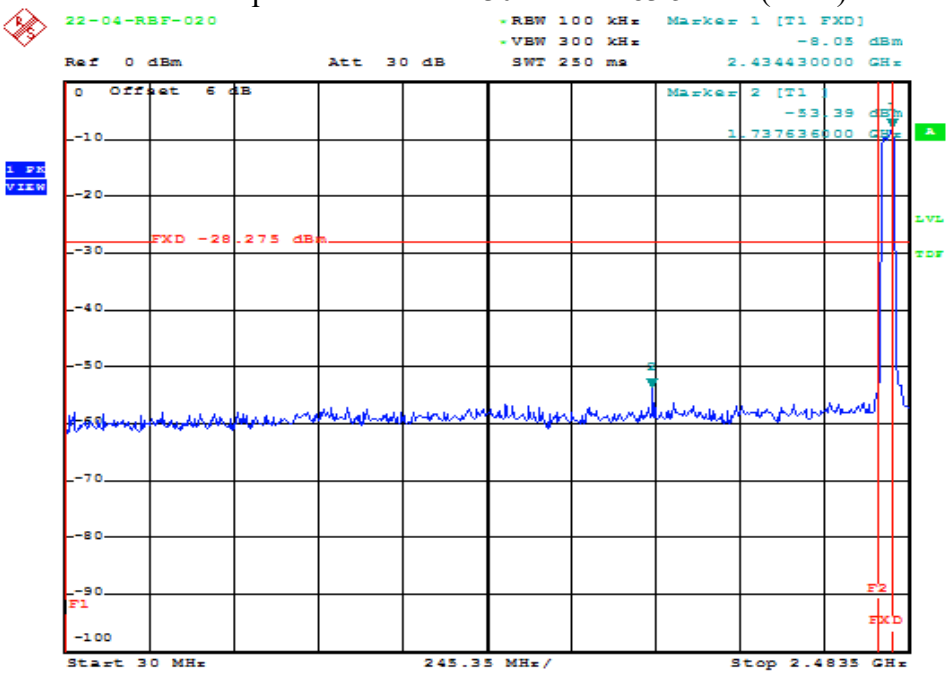
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:22:01

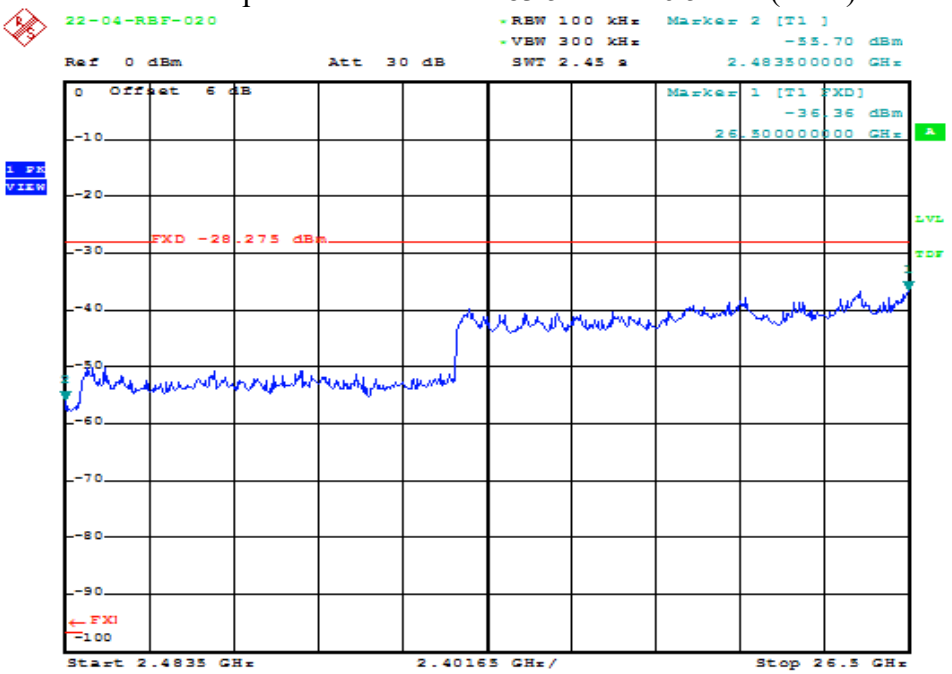
Mode: 802.11n40/ Channel Low

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:26:10

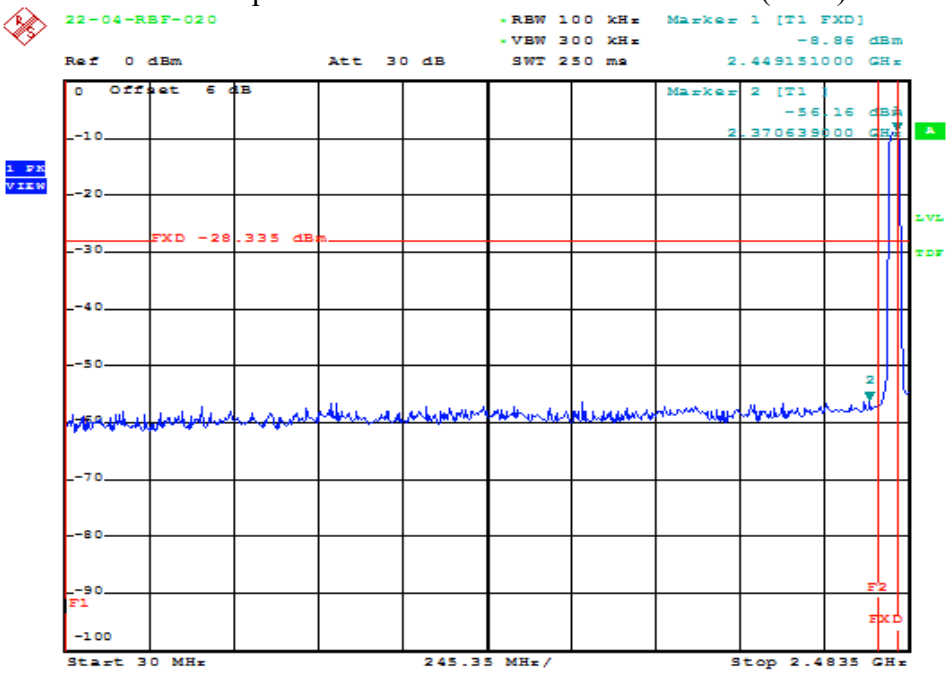
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:26:27

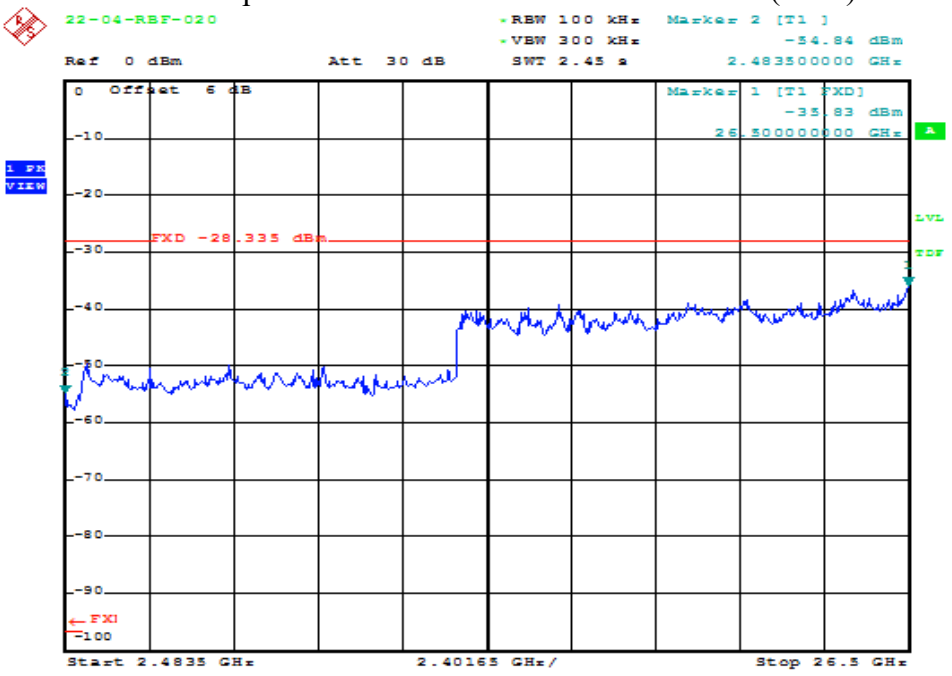
Mode: 802.11n40/ Channel Middle

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:28:25

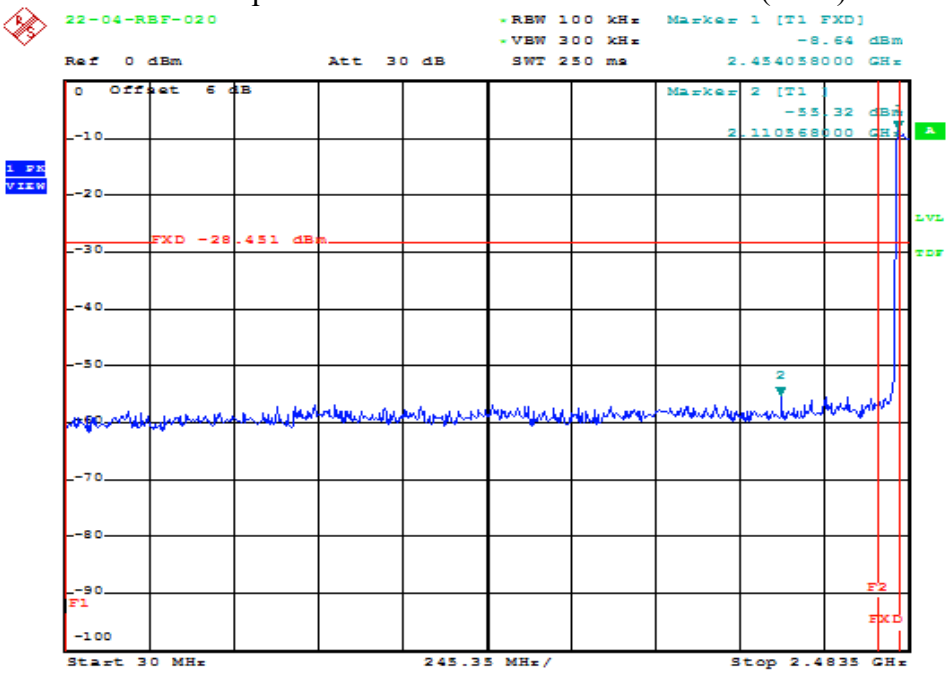
Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:28:41

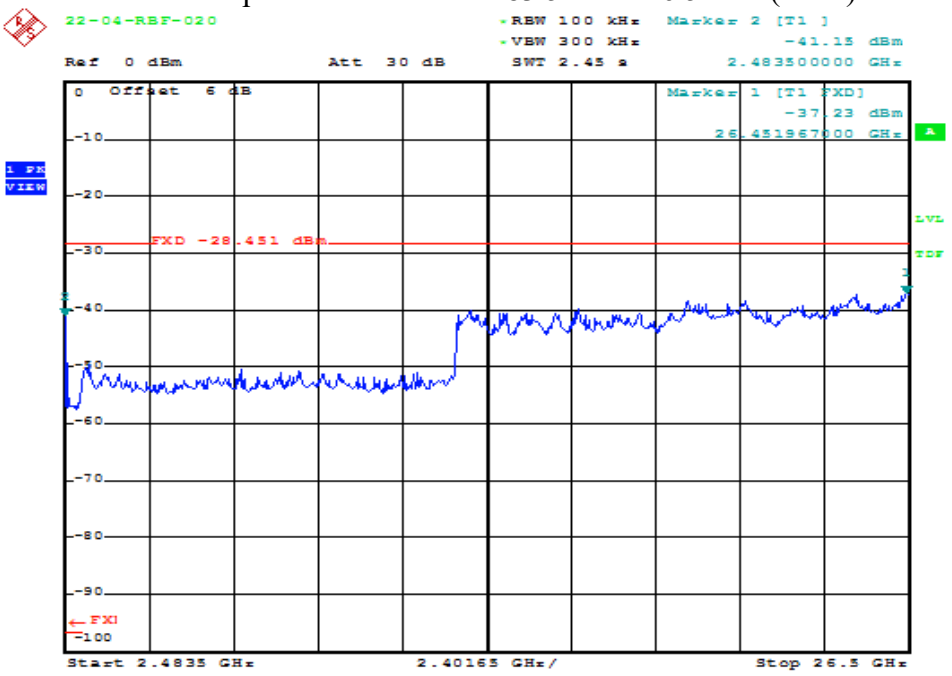
Mode: 802.11n40/ Channel High

Spurious Emission 30MHz~2483.5MHz (OUT)



Date: 26.APR.2022 09:33:07

Spurious Emission 2483.5MHz~26.5GHz (OUT)



Date: 26.APR.2022 09:33:25