

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-215-RWD-098
Reception No. : 2104002159
Applicant : Samsung Electronics Co Ltd
Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States
Manufacturer : Samsung Electronics Co Ltd
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea
Type of Equipment : Wi-Fi/BT Transceiver
FCC ID. : A3LWCA736M
Model Name : WCA736M
Serial number : N/A
Total page of Report : 87 pages (including this page)
Date of Incoming : May 10, 2021
Date of issue : May 28, 2021

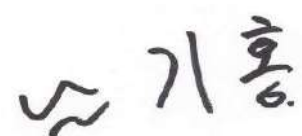
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.





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 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-215-RWD-098	May 28, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronics Co Ltd

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States

Contact Person : Jenni Chun / General Manager

Telephone No. : 973-808-6375

FCC ID : A3LWCA736M

Model Name : WCA736M

Brand Name : 

Serial Number : N/A

Date : May 28, 2021

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Modular Transmitter, Wi-Fi/BT Transceiver
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (1)	Carrier Frequency Separation	Met the Limit / PASS
15.247 (a) (1) (iii)	Minimum Number of Hopping Channels	Met the Limit / PASS
15.247 (a) (1) (iii)	Average Time of Occupancy	Met the Limit / PASS
15.247 (b) (1)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.209	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

3. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co Ltd, Model WCA736M (referred to as the EUT in this report) is a Wi-Fi/BT Transceiver. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Wi-Fi/BT Transceiver	
Temperature Range	-20 °C ~ 50 °C	
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	Bluetooth	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 462 MHz (802.11n(HT40))
	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))
		5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))
		5 210 MHz (802.11ac(VHT80))
	5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz (802.11a/n(HT20)/ac(VHT20))
		5 270 MHz ~ 5 310 MHz (802.11n(HT40)/ac(VHT40))
		5 290 MHz (802.11ac(VHT80))
	5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 720 MHz (802.11a/n(HT20)/ac(VHT20))
		5 510 MHz ~ 5 710 MHz (802.11n(HT40)/ac(VHT40))
		5 530 MHz ~ 5 690 MHz (802.11ac(VHT80))
	5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))
		5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))
		5 775 MHz (802.11ac(VHT80))
MODULATION TYPE	Bluetooth LE	GFSK for 1 Mbps / 2 Mbps
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK)
		802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
	WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)

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RF OUTPUT POWER	Bluetooth LE	1 Mbps	7.65 dBm
		2 Mbps	7.66 dBm
	Bluetooth	1 Mbps	11.69 dBm
		2 Mbps	10.64 dBm
		3 Mbps	10.71 dBm
	WLAN 2.4 GHz	Antenna 0	14.28 dBm(802.11b) 11.84 dBm(802.11g) 12.58 dBm(802.11n_HT20) 9.23 dBm(802.11n_HT40)
		Antenna 1	16.31 dBm(802.11b) 12.87 dBm(802.11g) 13.65 dBm(802.11n_HT20) 10.16 dBm(802.11n_HT40)
		Multiple Antenna	15.40 dBm(802.11g) 16.16 dBm(802.11n_HT20) 12.73 dBm(802.11n_HT40)

RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	9.22 dBm(802.11a) 9.46 dBm(802.11n_HT20) 10.54 dBm(802.11n_HT40) 10.61 dBm(802.11ac_VHT80)
		Antenna 1	10.08 dBm(802.11a) 9.98 dBm(802.11n_HT20) 10.68 dBm(802.11n_HT40) 10.68 dBm(802.11ac_VHT80)
		Multiple Antenna	12.68 dBm(802.11a) 12.74 dBm(802.11n_HT20) 13.62 dBm(802.11n_HT40) 13.66 dBm(802.11ac_VHT80)
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	13.79 dBm(802.11a) 14.24 dBm(802.11n_HT20) 12.55 dBm(802.11n_HT40) 13.25 dBm(802.11ac_VHT80)
		Antenna 1	14.95 dBm(802.11a) 14.74 dBm(802.11n_HT20) 13.16 dBm(802.11n_HT40) 13.58 dBm(802.11ac_VHT80)
		Multiple Antenna	17.37 dBm(802.11a) 17.49 dBm(802.11n_HT20) 15.83 dBm(802.11n_HT40) 16.43 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 470 MHz ~ 5 725 MHz Band	Antenna 0	13.65 dBm(802.11a) 13.31 dBm(802.11n_HT20) 13.37 dBm(802.11n_HT40) 12.65 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	12.73 dBm(802.11a) 11.37 dBm(802.11n_HT20) 11.84 dBm(802.11n_HT40) 11.63 dBm(802.11ac_VHT80)
		Antenna 1	14.69 dBm(802.11a) 14.56 dBm(802.11n_HT20) 14.42 dBm(802.11n_HT40) 14.06 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	11.81 dBm(802.11a) 12.13 dBm(802.11n_HT20) 11.13 dBm(802.11n_HT40) 11.29 dBm(802.11ac_VHT80)
		Multiple Antenna	17.21 dBm(802.11a) 16.99 dBm(802.11n_HT20) 16.94 dBm(802.11n_HT40) 16.42 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	15.30 dBm(802.11a) 14.78 dBm(802.11n_HT20) 14.51 dBm(802.11n_HT40) 14.47 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 725 MHz ~ 5 850 MHz Band	Antenna 0	14.43 dBm(802.11a) 14.48 dBm(802.11n_HT20) 13.14 dBm(802.11n_HT40) 13.26 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	5.02 dBm(802.11a) 4.10 dBm(802.11n_HT20) -0.02 dBm(802.11n_HT40) -3.02 dBm(802.11ac_VHT80)
		Antenna 1	15.15 dBm(802.11a) 15.28 dBm(802.11n_HT20) 14.15 dBm(802.11n_HT40) 14.21 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	3.98 dBm(802.11a) 4.88 dBm(802.11n_HT20) -0.67 dBm(802.11n_HT40) -3.30 dBm(802.11ac_VHT80)
		Multiple Antenna	17.75 dBm(802.11a) 17.91 dBm(802.11n_HT20) 16.68 dBm(802.11n_HT40) 16.77 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	7.54 dBm(802.11a) 7.52 dBm(802.11n_HT20) 2.68 dBm(802.11n_HT40) -0.15 dBm(802.11ac_VHT80)

ANTENNA TYPE	PCB Antenna		
ANTENNA GAIN	Bluetooth LE	1.81 dBi	
	Bluetooth	1.81 dBi	
	WLAN 2.4 GHz	Antenna 0	-1.04 dBi
		Antenna 1	0.45 dBi
		Multiple Antenna	2.78 dBi
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	3.95 dBi
		Antenna 1	2.07 dBi
		Multiple Antenna	6.12 dBi
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	4.91 dBi
		Antenna 1	2.44 dBi
		Multiple Antenna	6.86 dBi
	5 470 MHz ~ 5 725 MHz Band	Antenna 0	6.18 dBi
		Antenna 1	2.23 dBi
		Multiple Antenna	7.65 dBi
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	5.27 dBi
		Antenna 1	2.77 dBi
		Multiple Antenna	7.21 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		40 MHz	

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Samsung Electronics Co Ltd	HDWB-2106SA V1.2	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
WCA736M	Samsung Electronics Co Ltd	Wi-Fi/BT Transceiver (EUT)	
HP Probook	HP	Notebook PC	EUT
PPP009L-E	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 441MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

Channel	Frequency
0	2 402
39	2 441
78	2 480

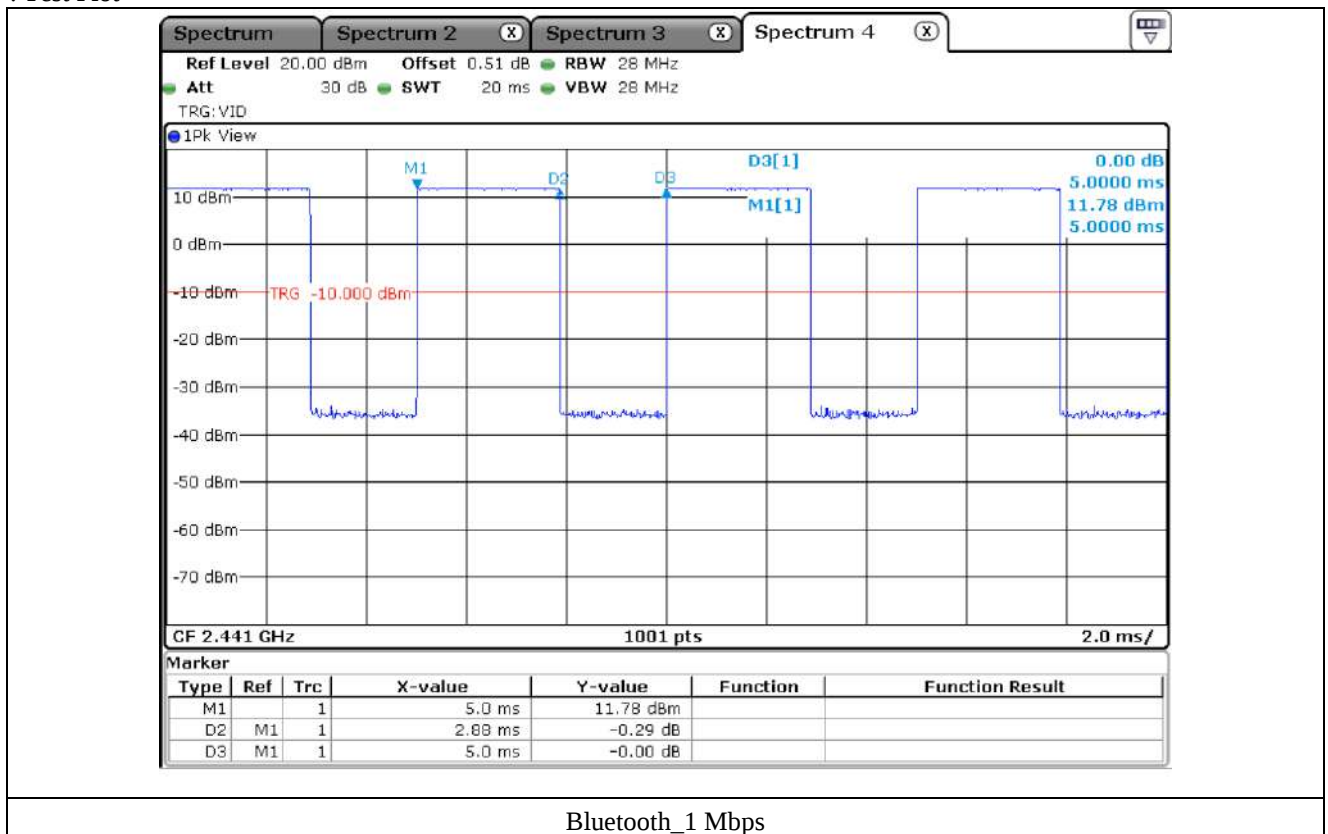
-. Duty Cycle

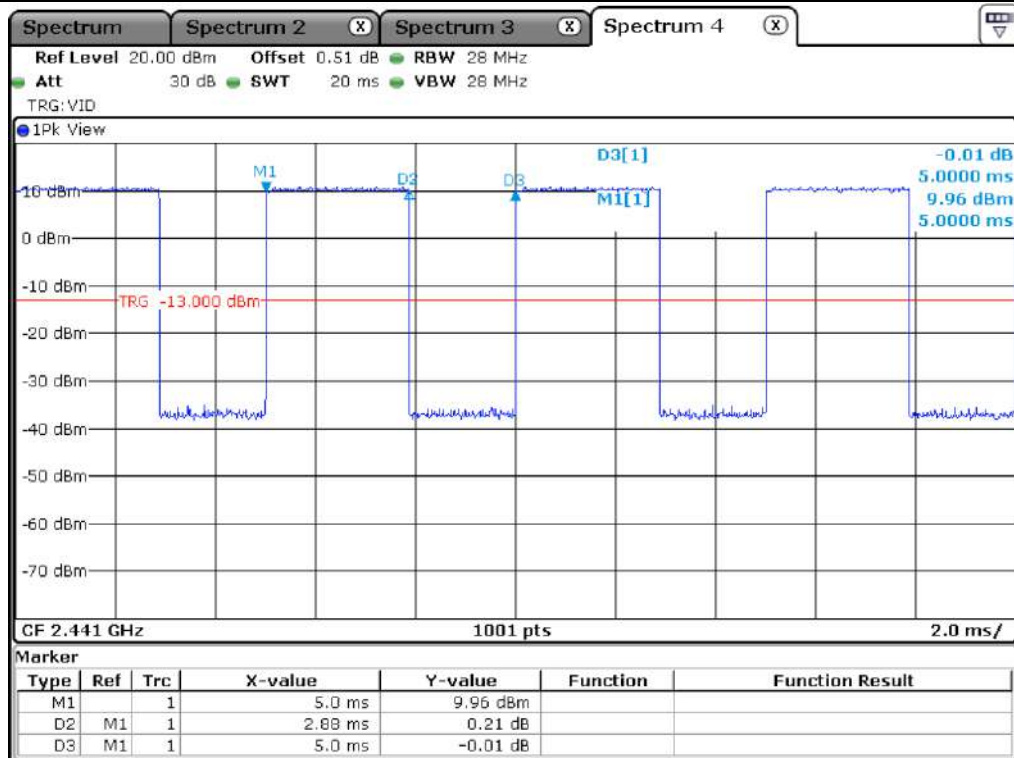
Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth [1 Mbps]	2.88	2.12	57.60	2.40
Bluetooth [2 Mbps]	2.88	2.12	57.60	2.40
Bluetooth [3 Mbps]	2.86	2.14	57.20	2.43

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

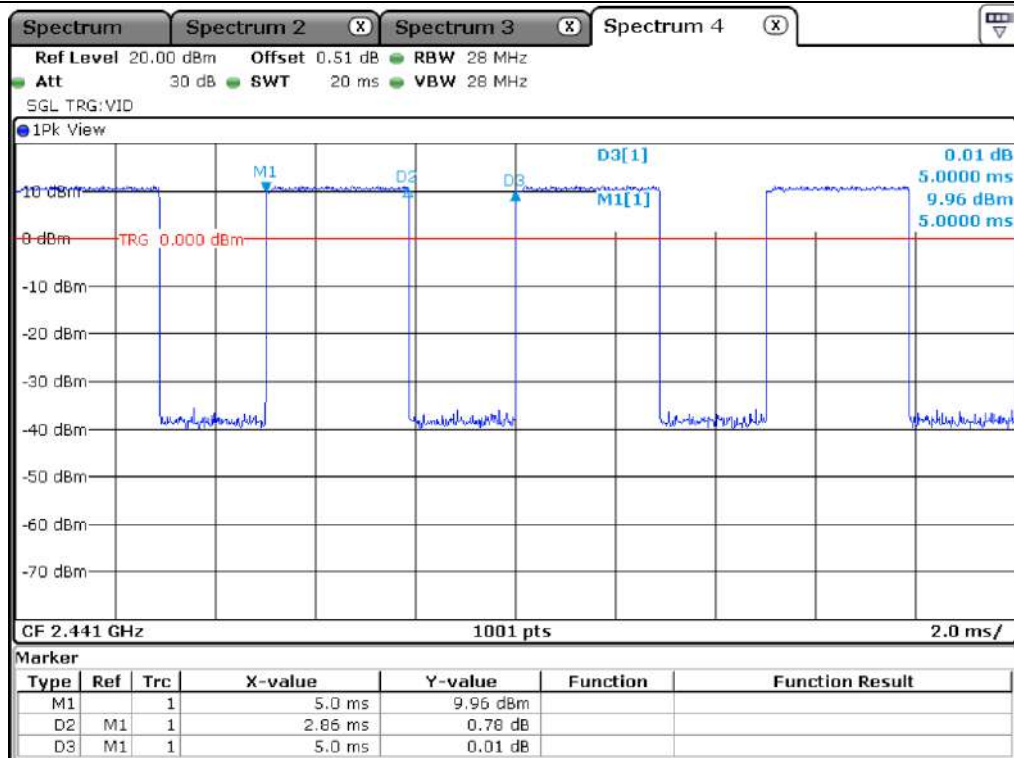
Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

-. Test Plot





Bluetooth_2 Mbps



Bluetooth_3 Mbps

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

5.4 Configuration of Test System

Line Conducted Test: The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 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.

Antenna Construction:

The antenna of the EUT is a Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

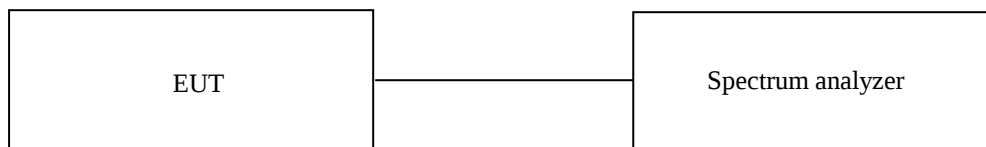
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 20 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.

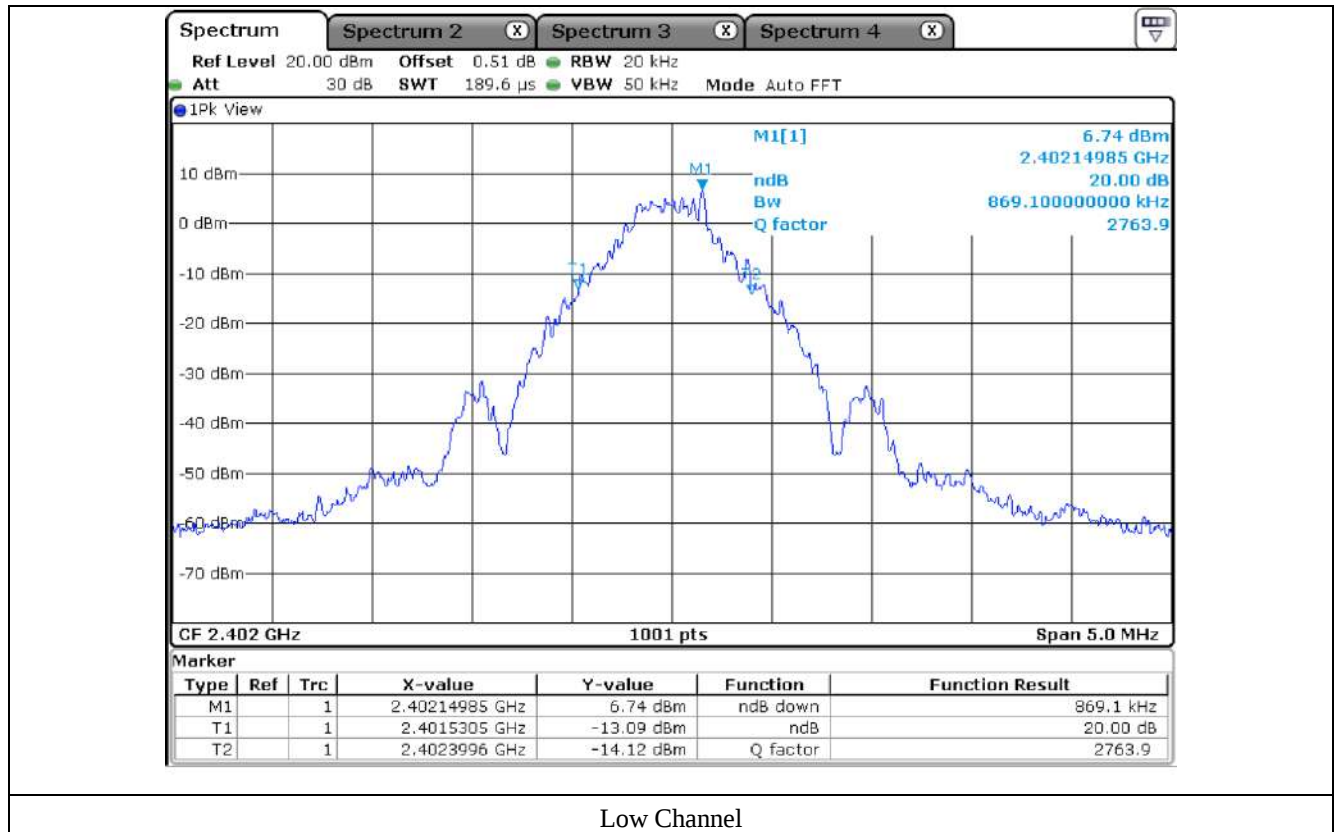


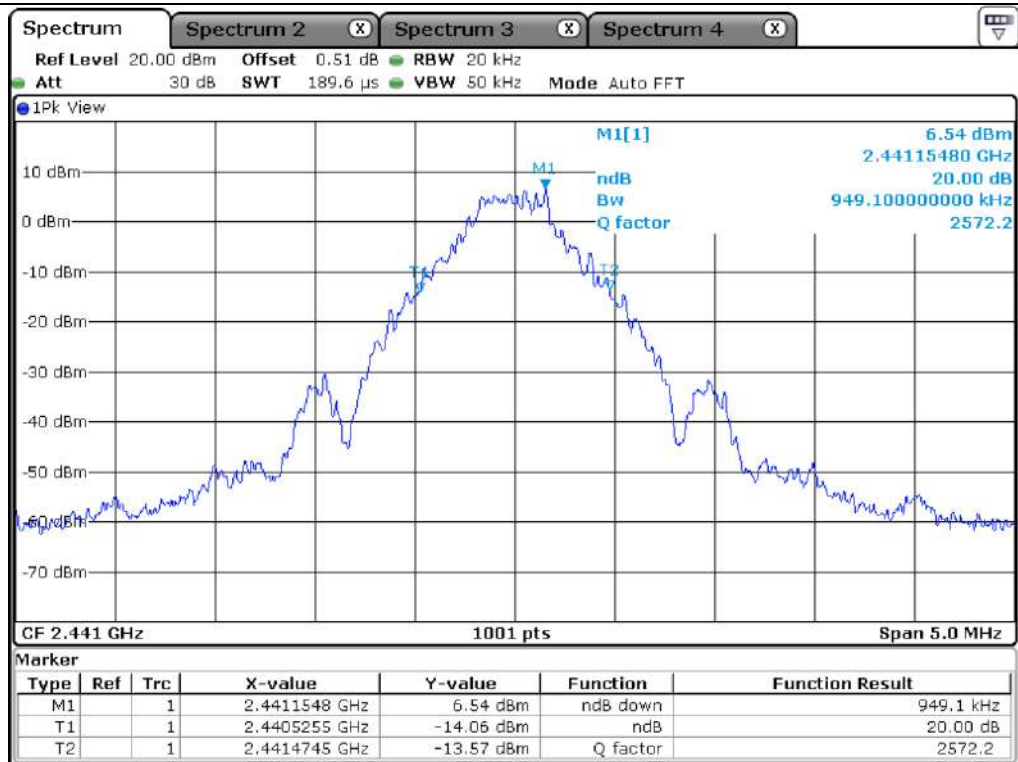
7.3 Test Date

May 10, 2021 ~ May 26, 2021

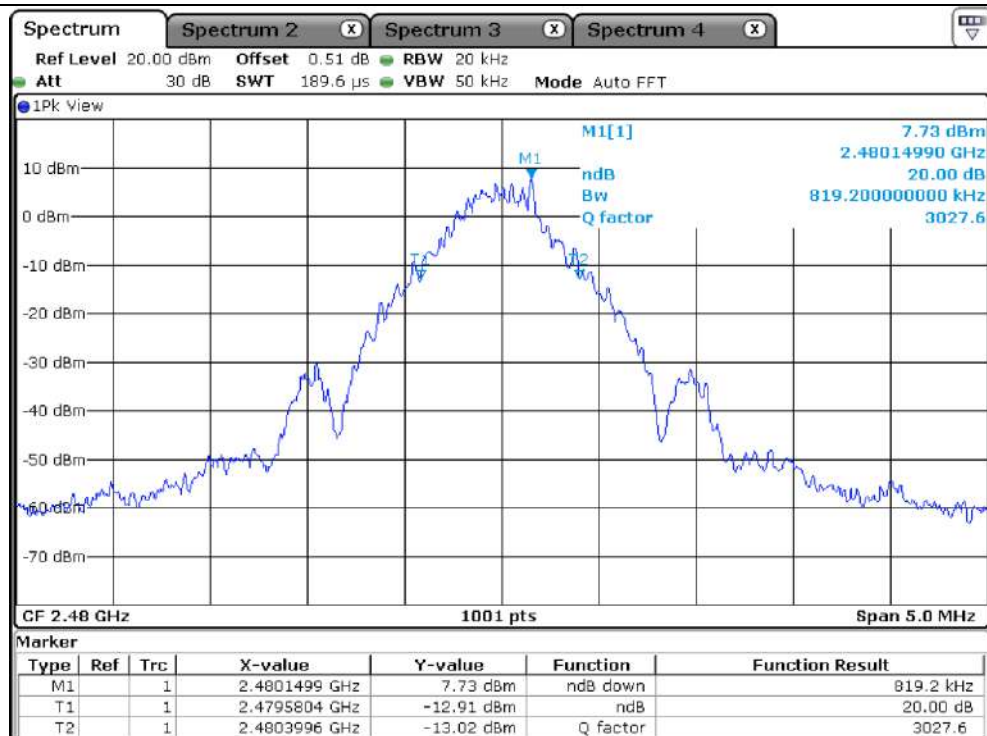
7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	869.10
Middle	2 441.00	949.10
High	2 480.00	819.20





Middle Channel



High Channel

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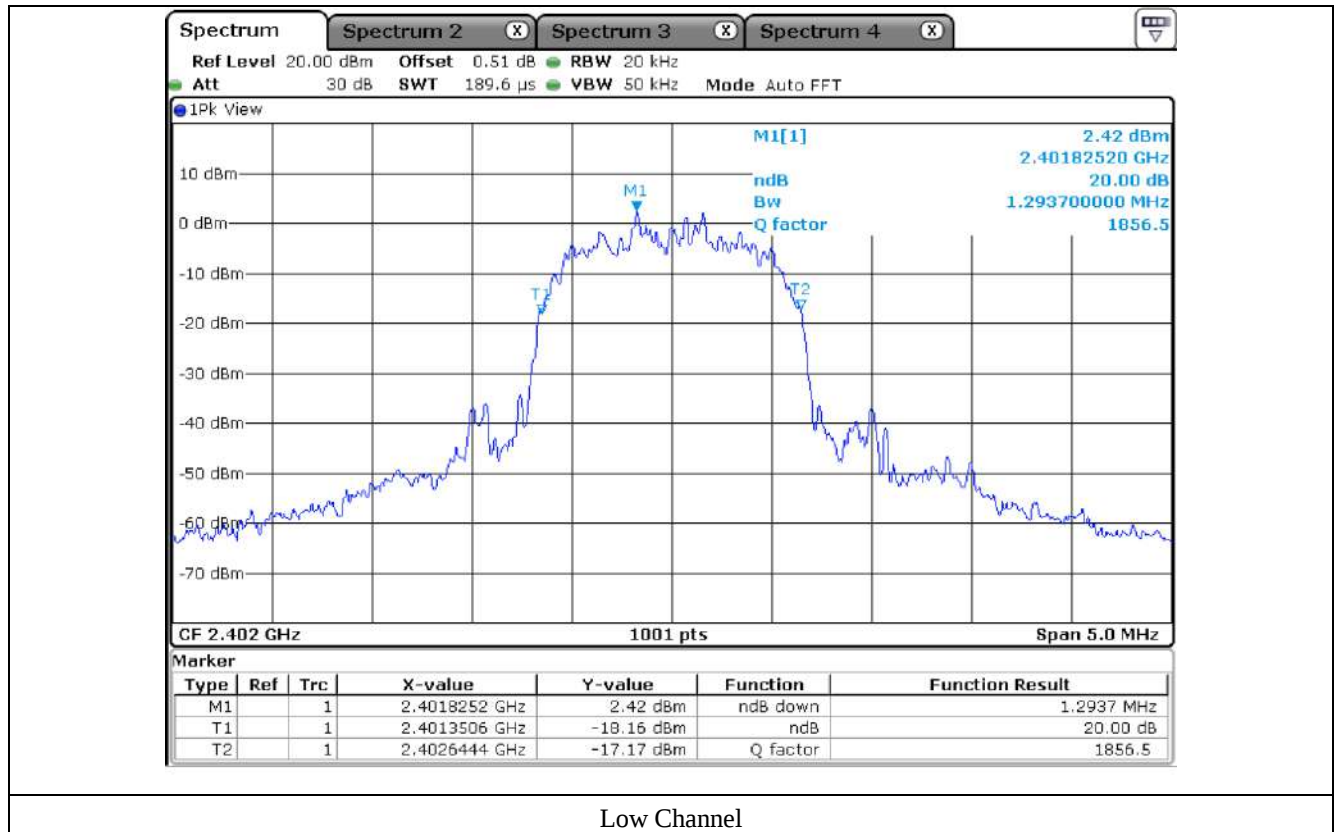
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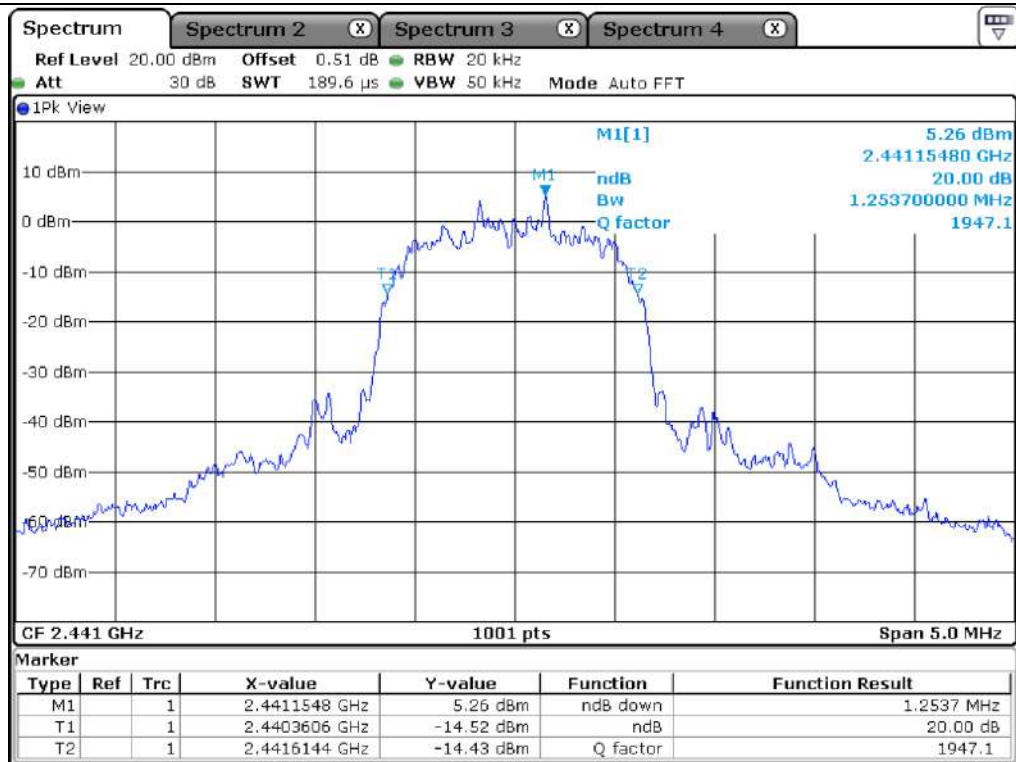
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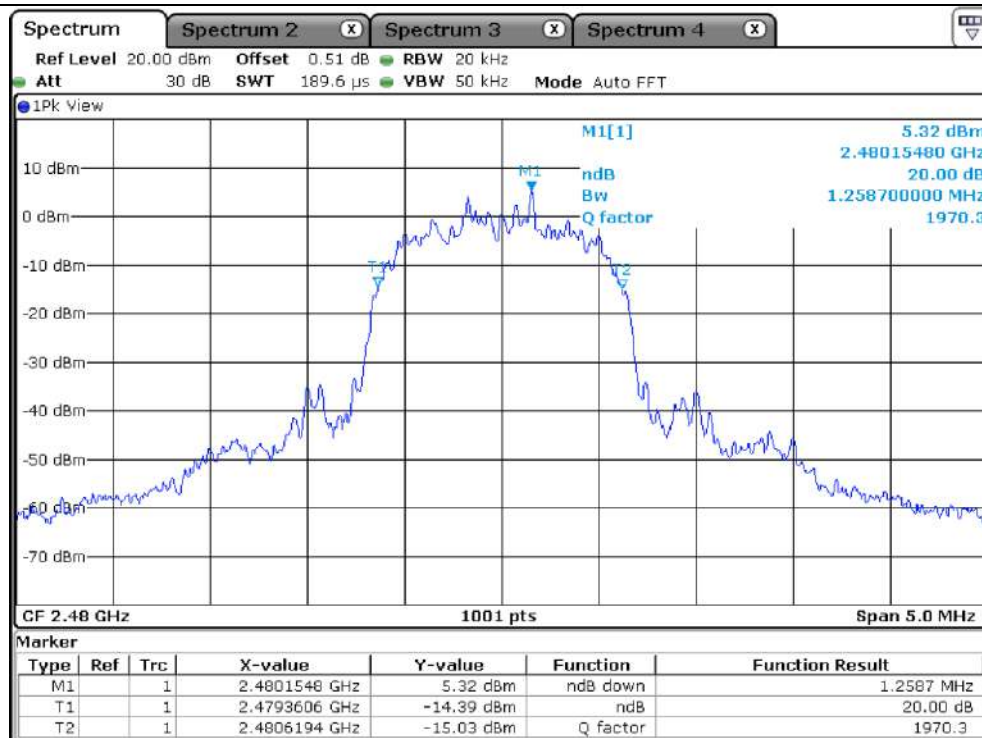
7.5 Test data for 2 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 293.70
Middle	2 441.00	1 253.70
High	2 480.00	1 258.70





Middle Channel



High Channel

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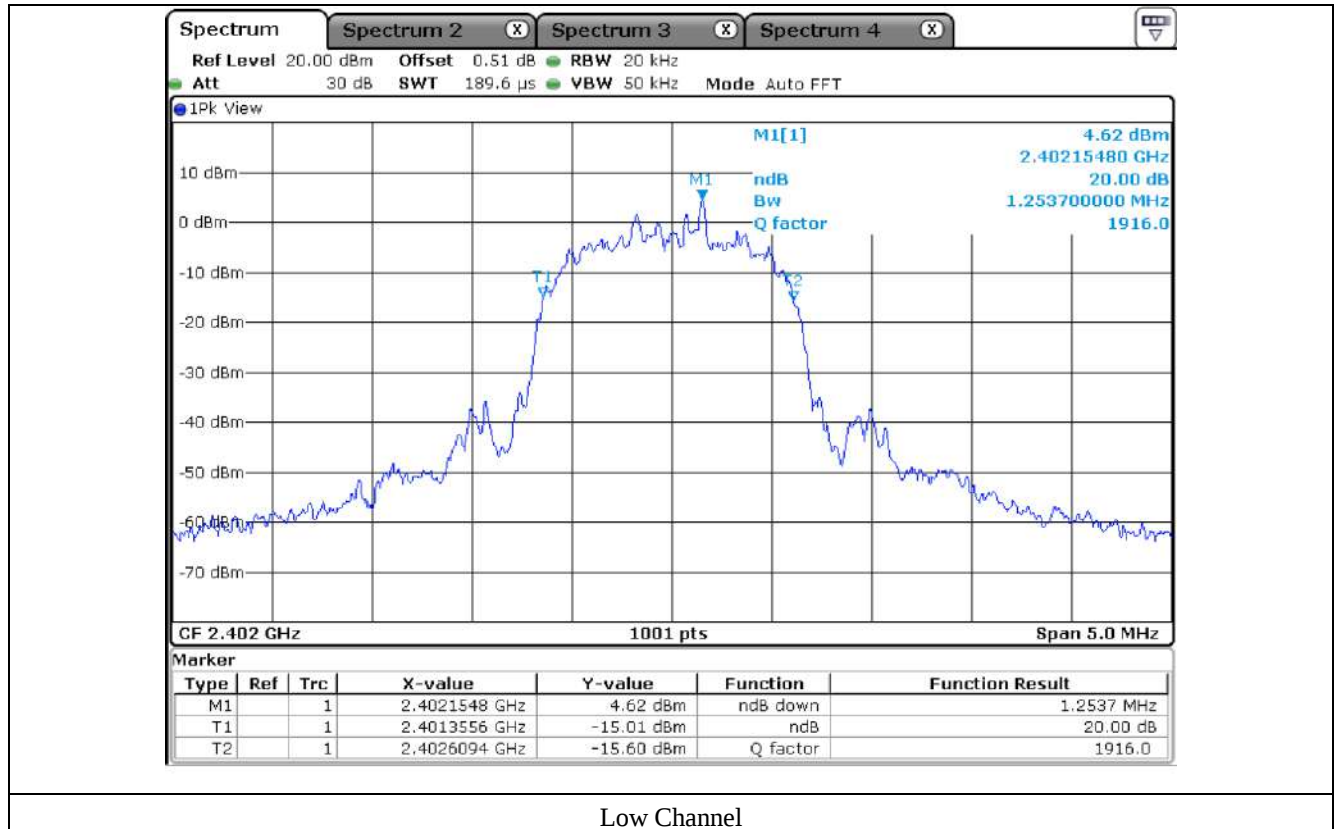
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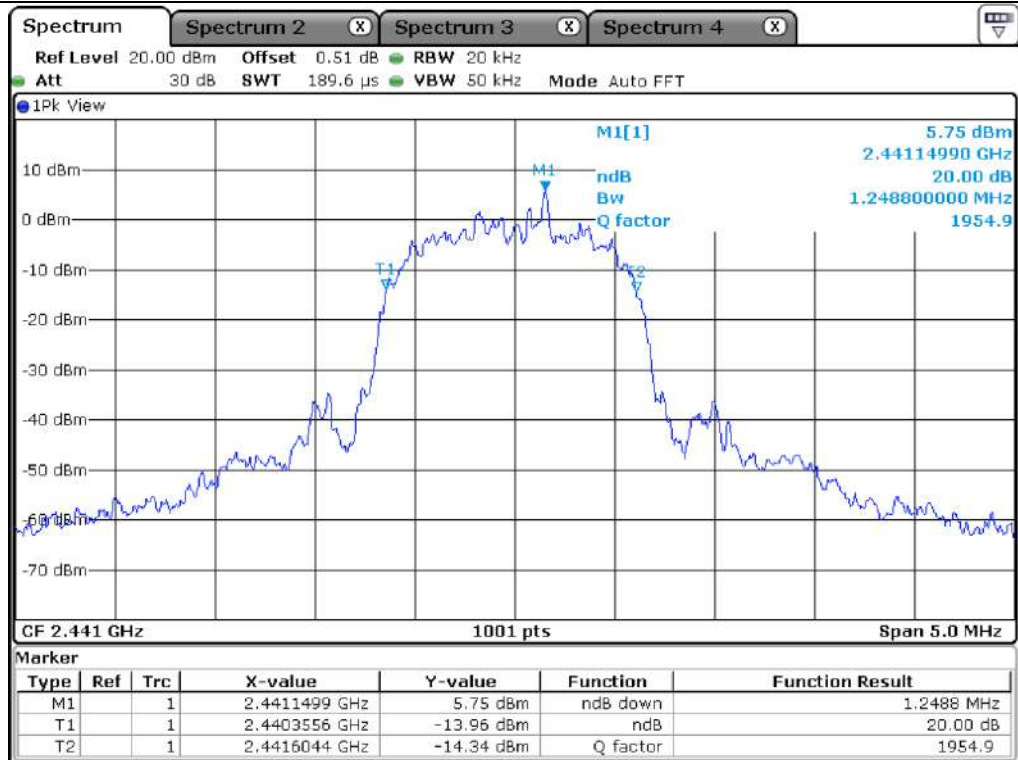
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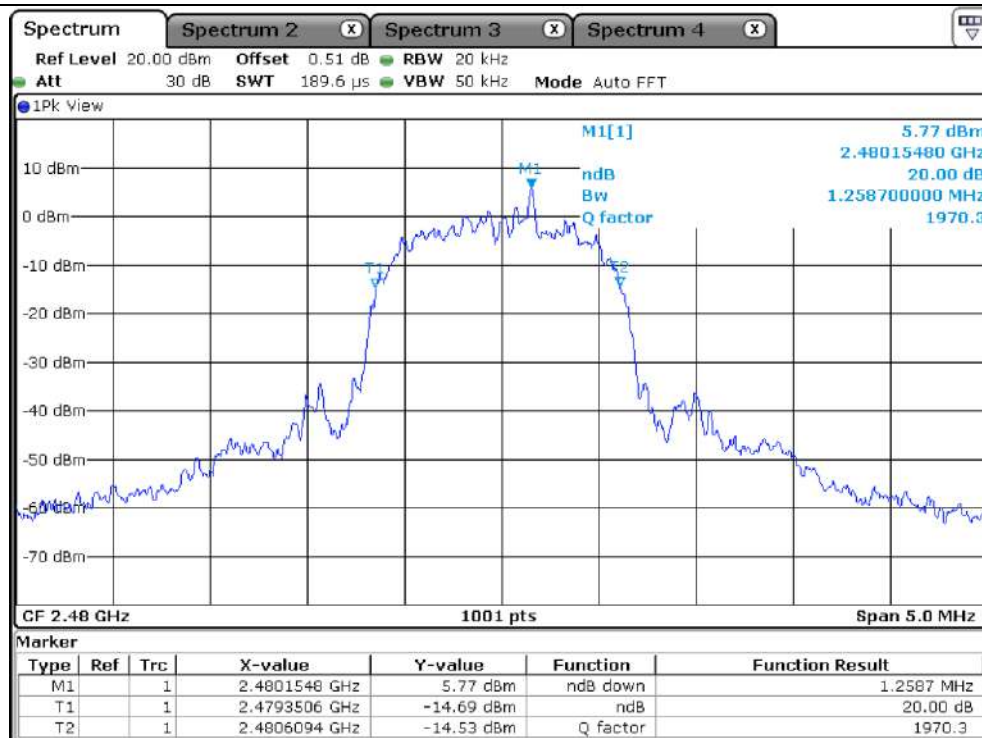
7.6 Test data for 3 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 253.70
Middle	2 441.00	1 248.80
High	2 480.00	1 258.70





Middle Channel



High Channel

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8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 5 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



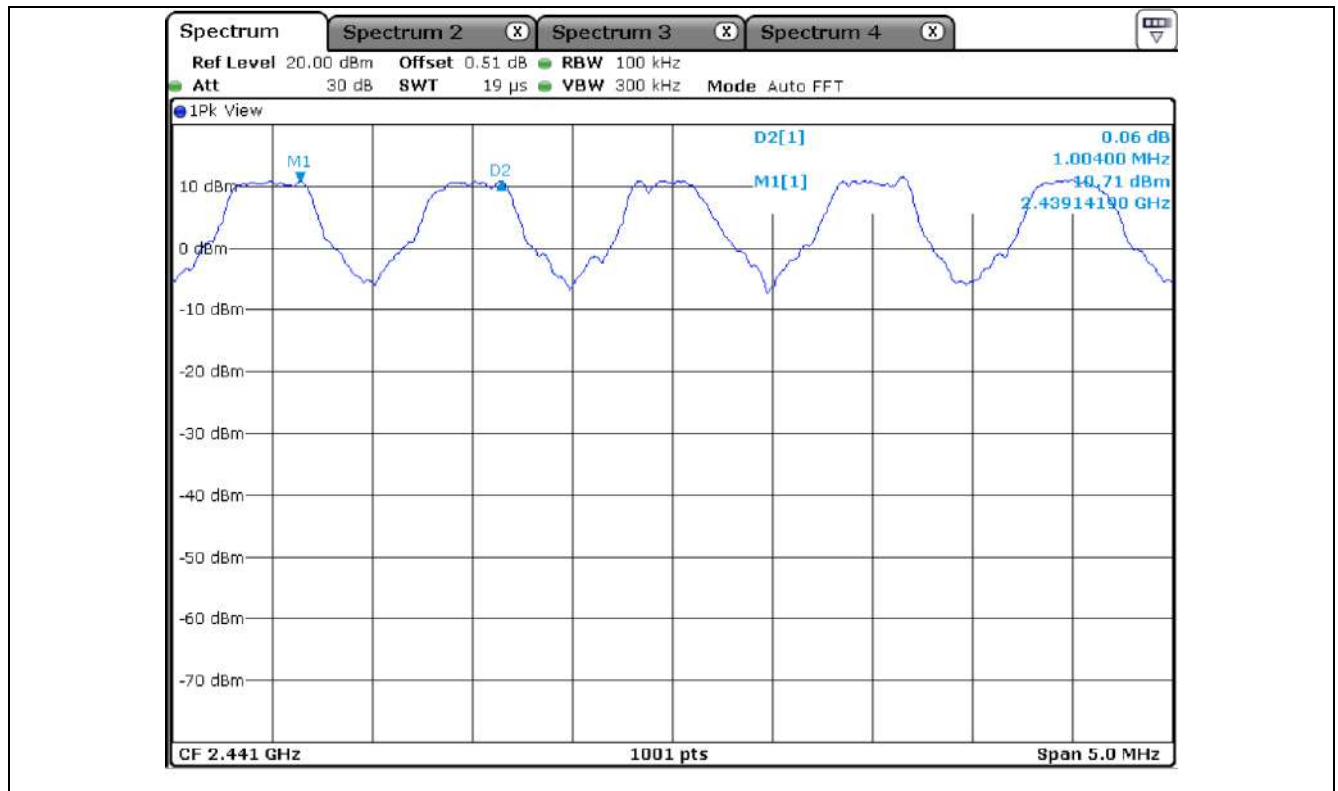
8.3 Test Date

May 10, 2021 ~ May 26, 2021

8.4 Test data for 1 Mbps

-. Test Result : Pass

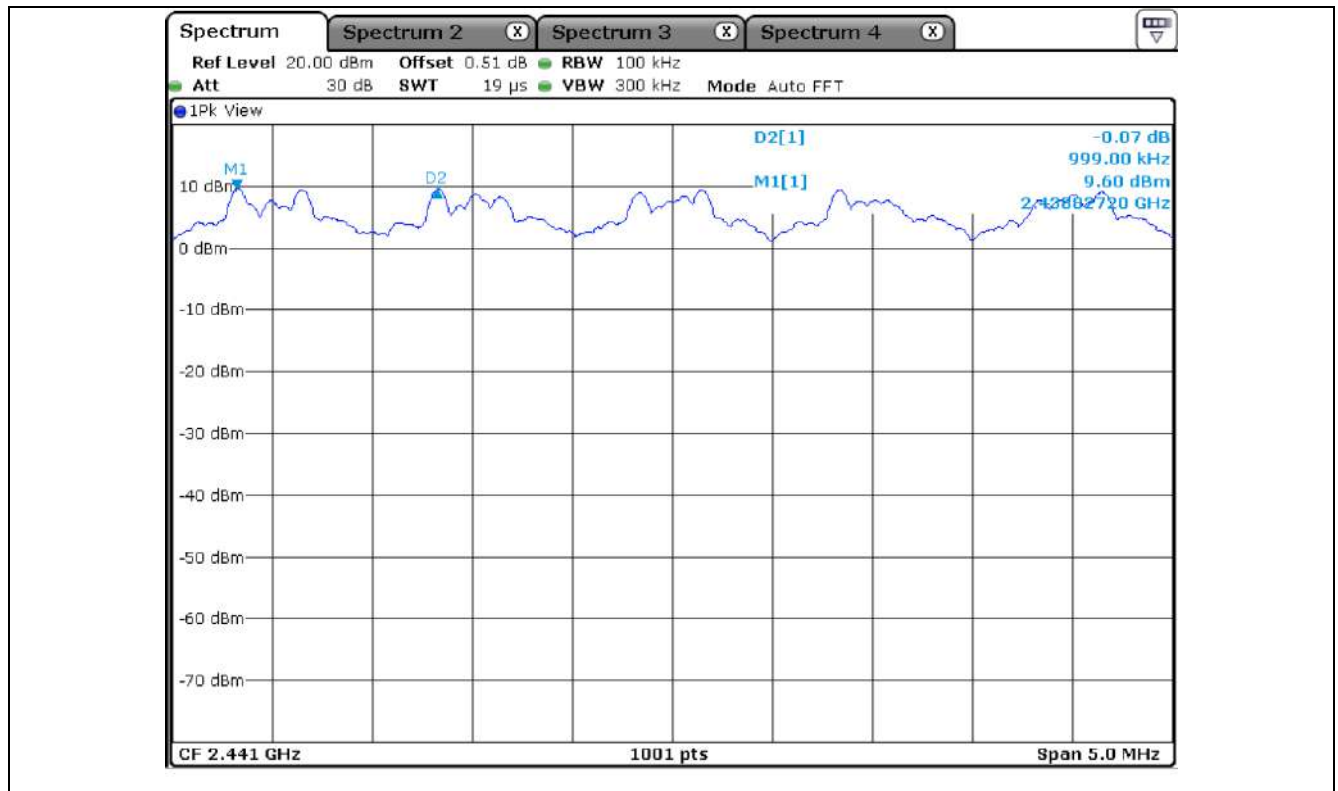
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
1 004.00	632.73	Separated by a minimum of 632.73 kHz



8.5 Test data for 2 Mbps

-. Test Result : Pass

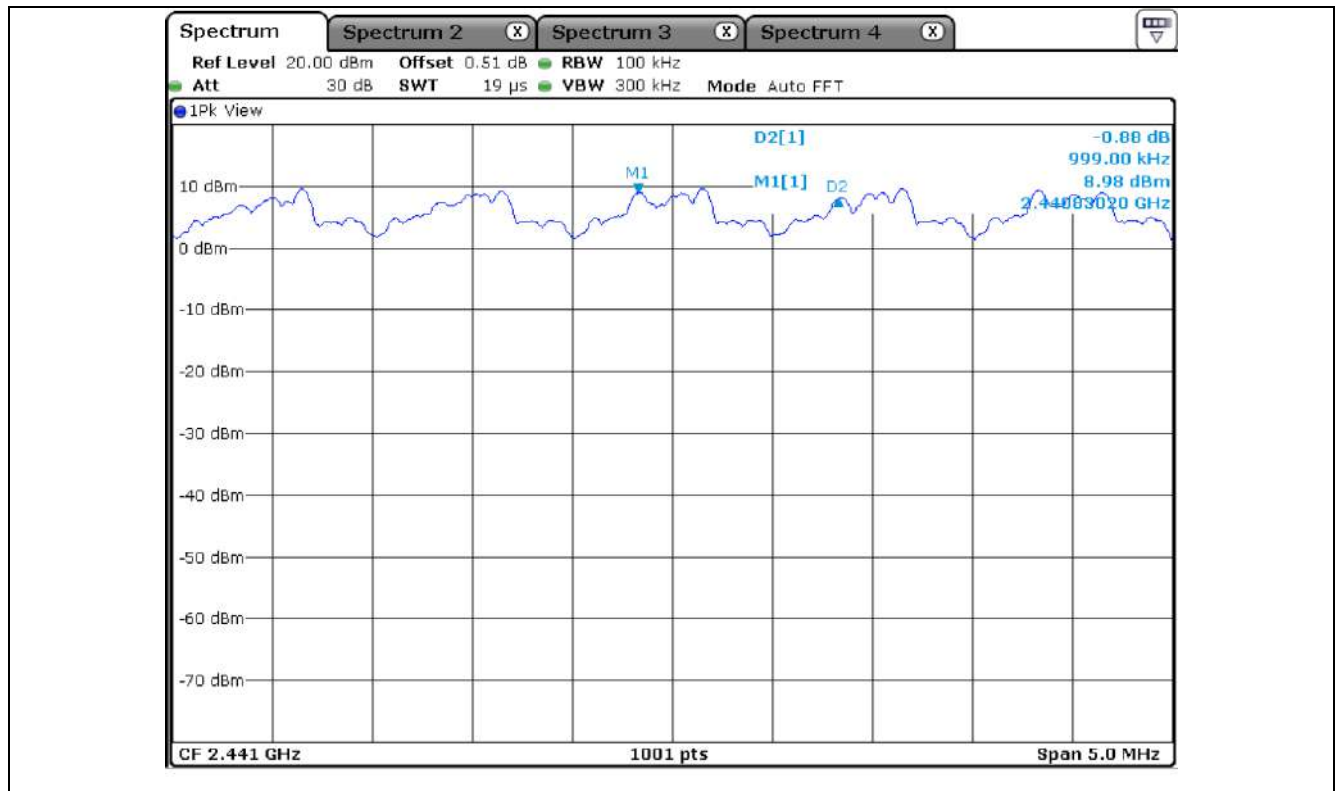
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	835.80	Separated by a minimum of 835.8 kHz



8.6 Test data for 3 Mbps

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	832.53	Separated by a minimum of 832.53 kHz



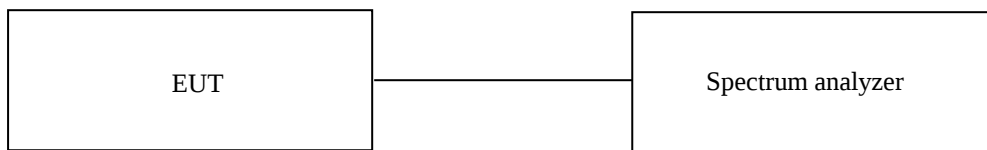
9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 100 MHz and the resolution bandwidth is set to 100 kHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



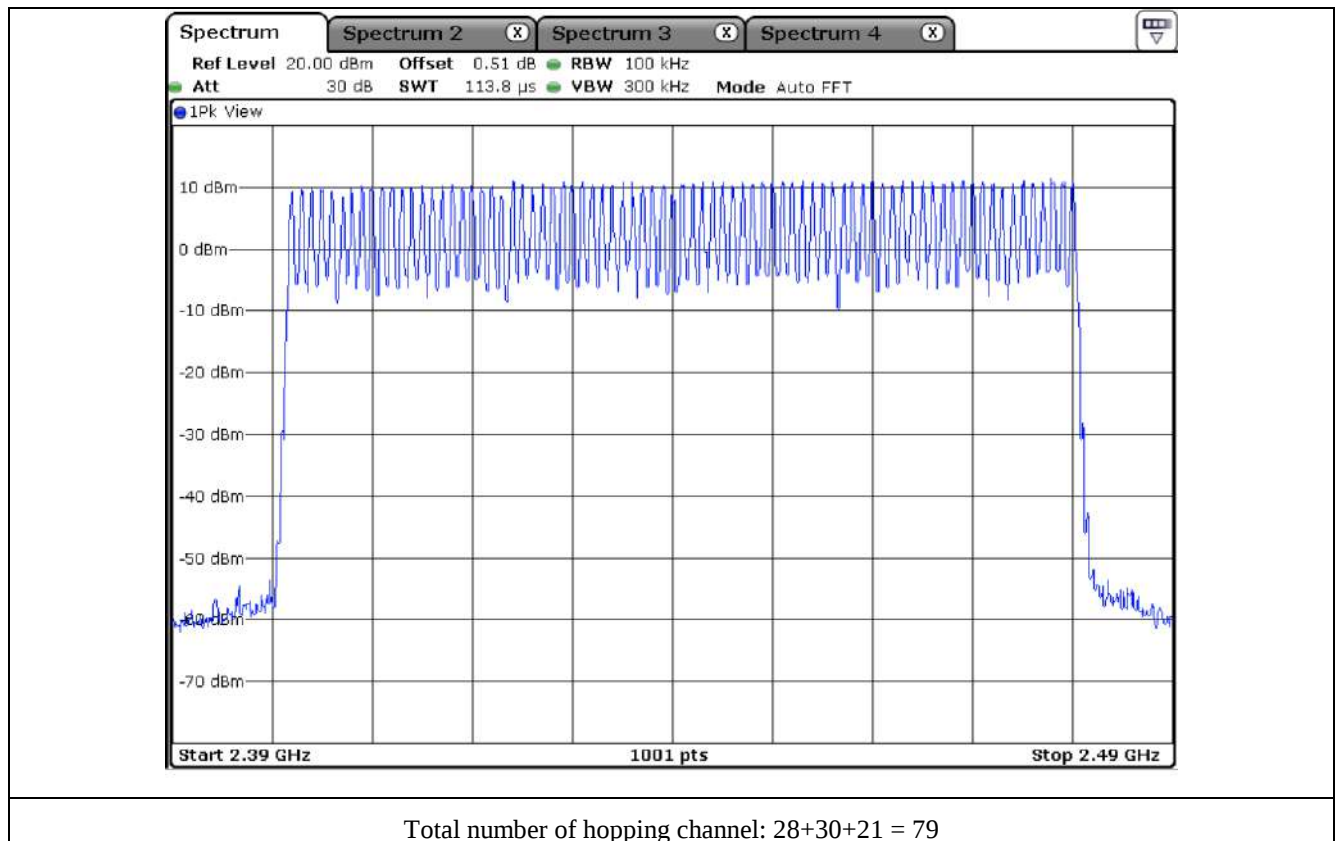
9.3 Test Date

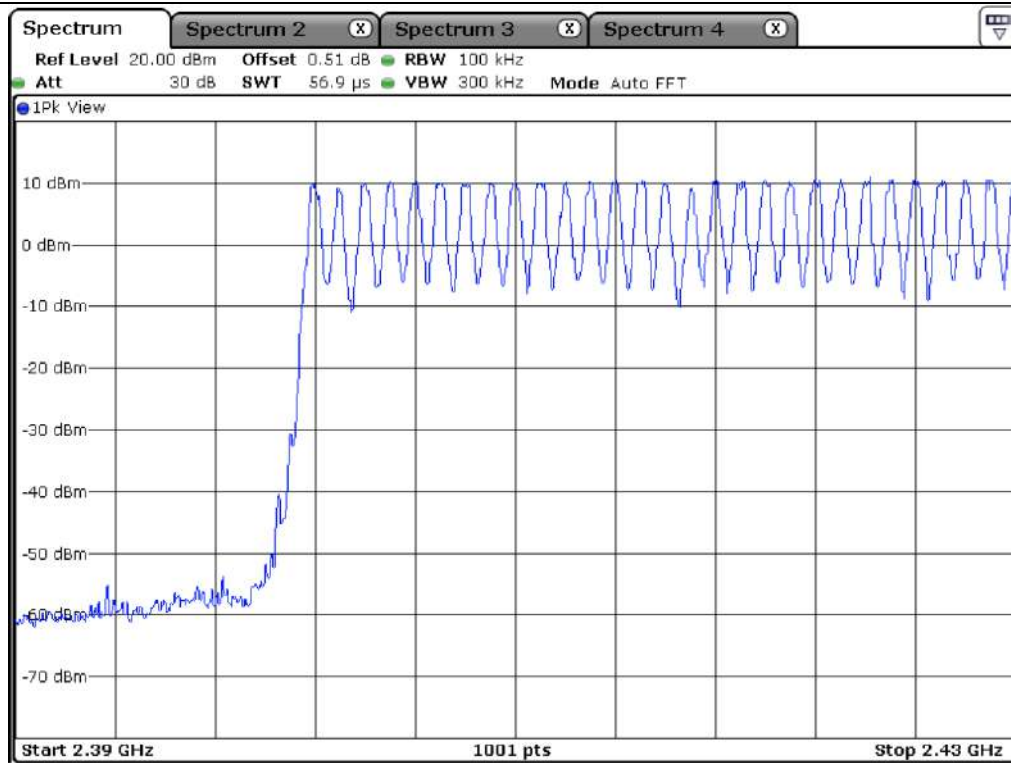
May 10, 2021 ~ May 26, 2021

9.4 Test data for 1 Mbps

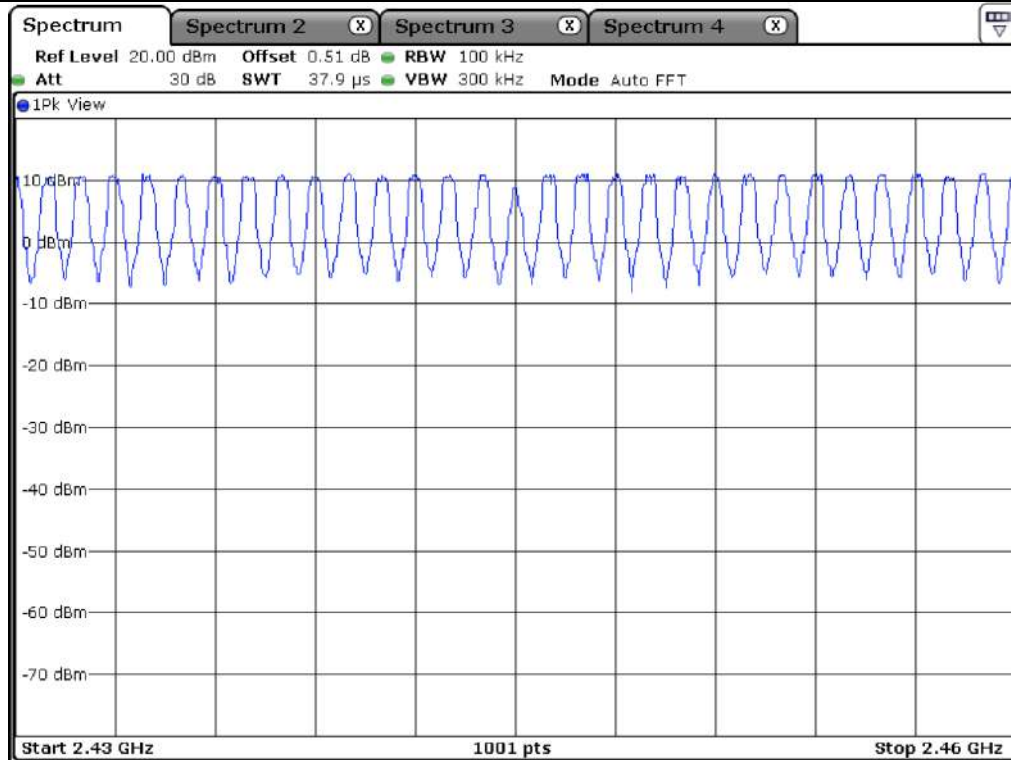
-. Test Result : Pass

Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
1 Mbps	79	Minimum of 15	64

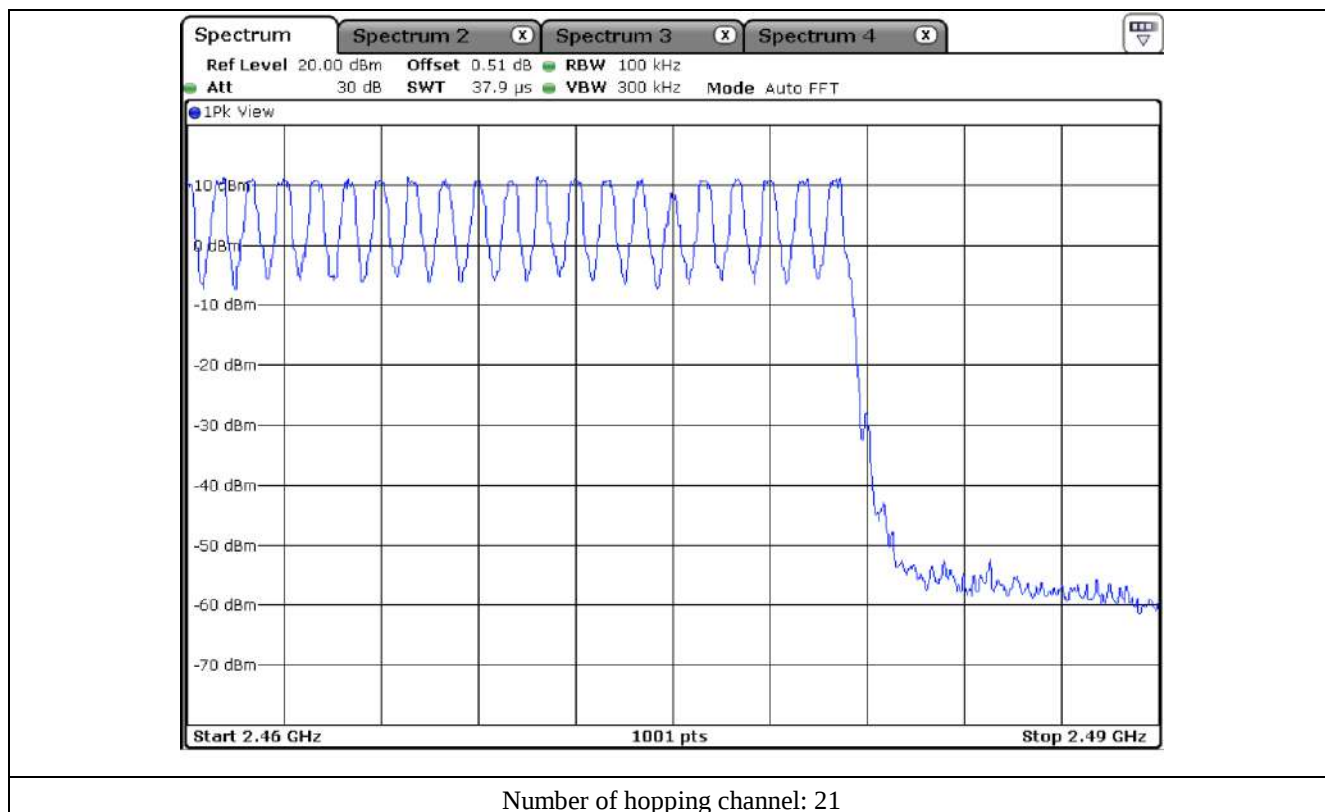




Number of hopping channel: 28



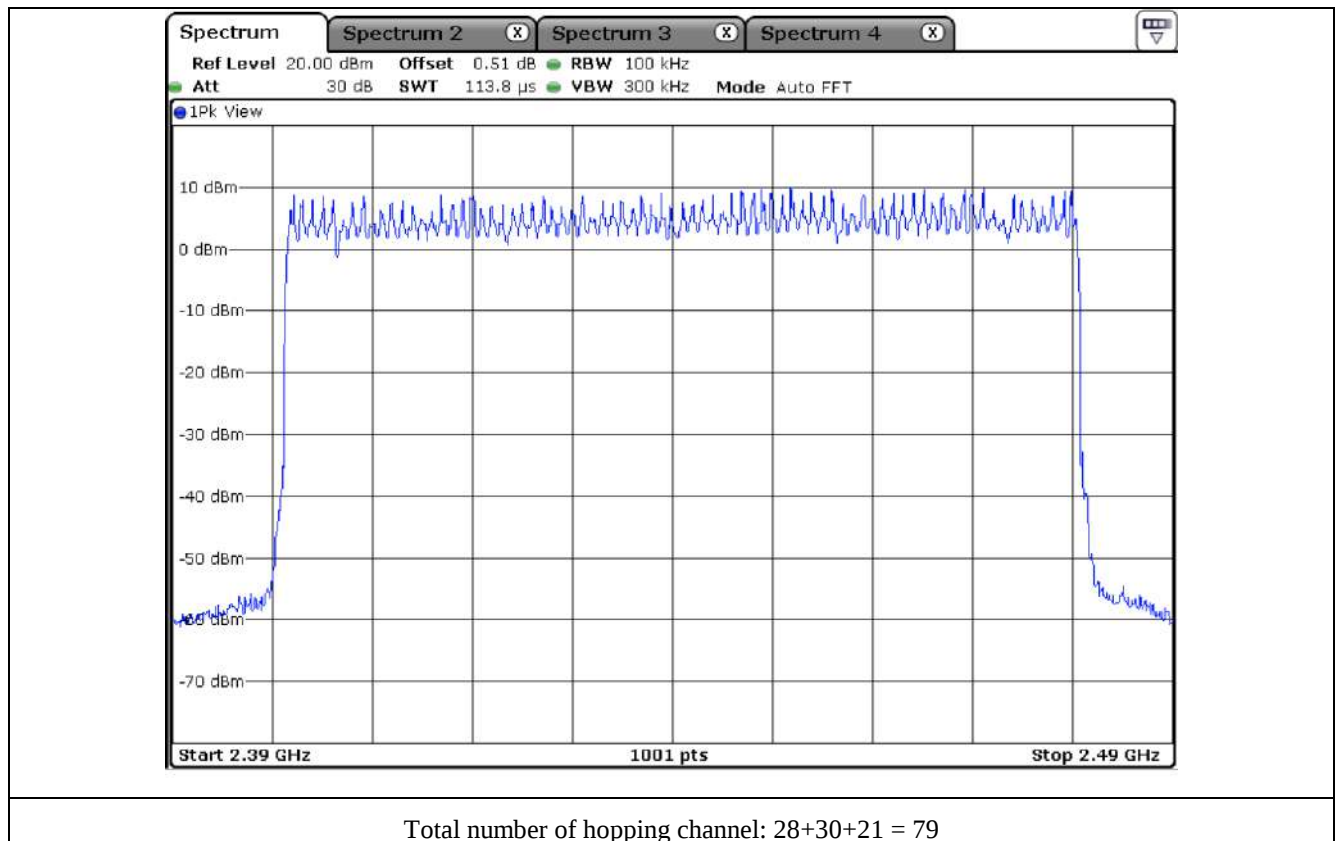
Number of hopping channel: 30

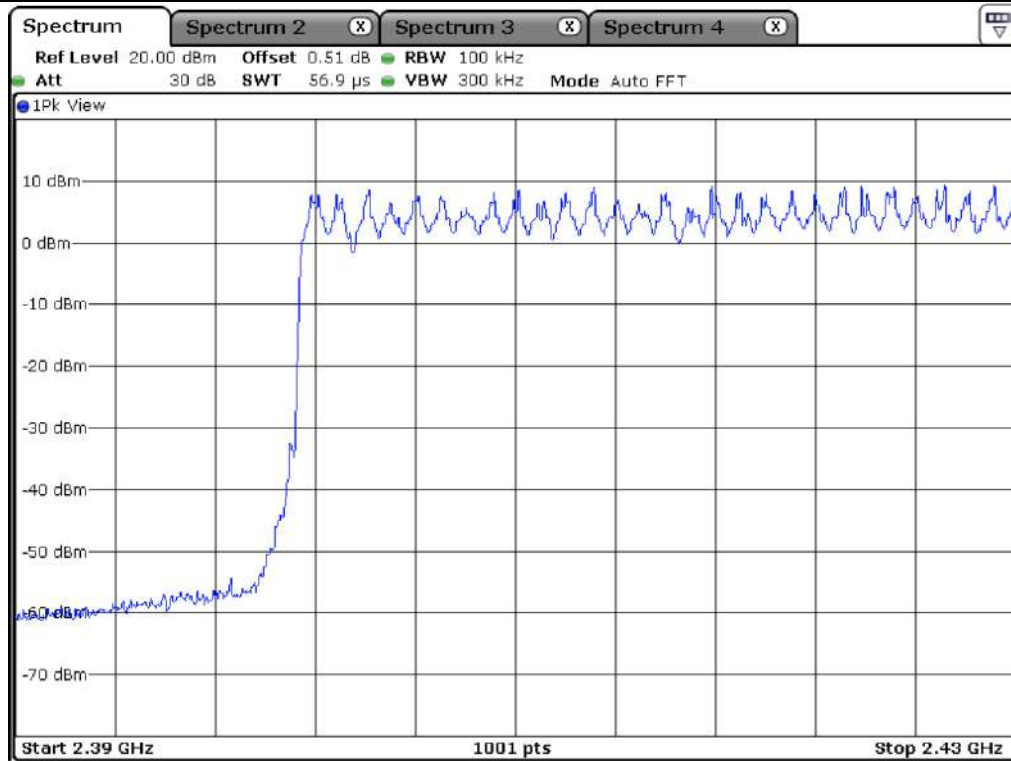


9.5 Test data for 2 Mbps

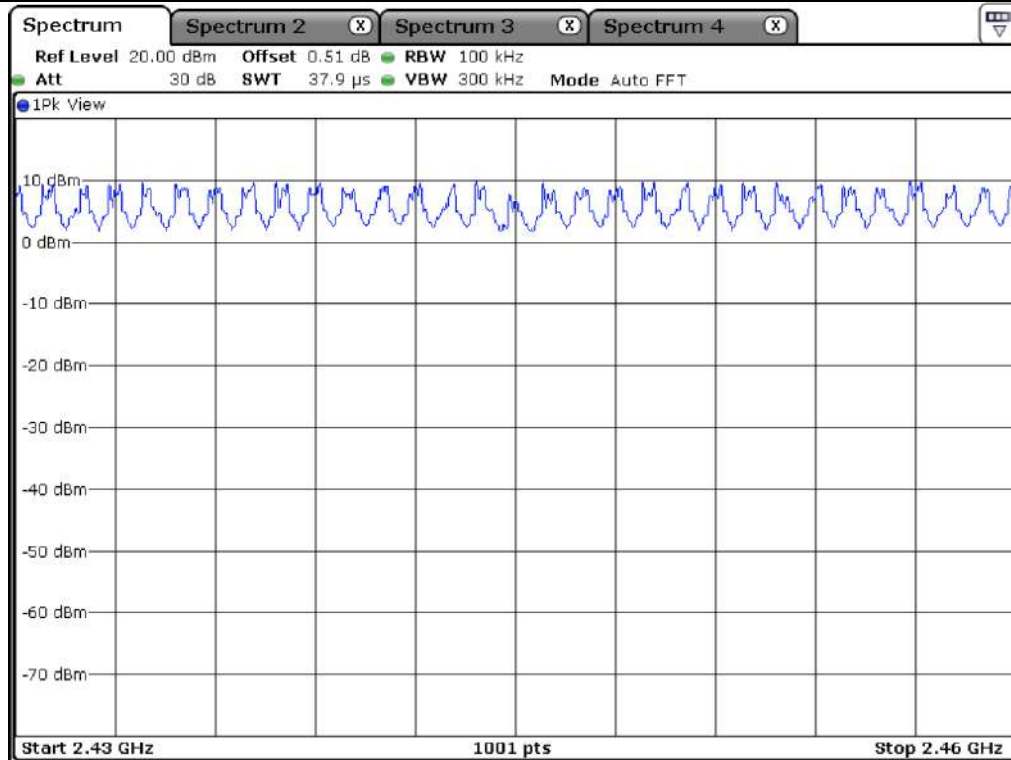
-. Test Result : Pass

Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
2 Mbps	79	Minimum of 15	64

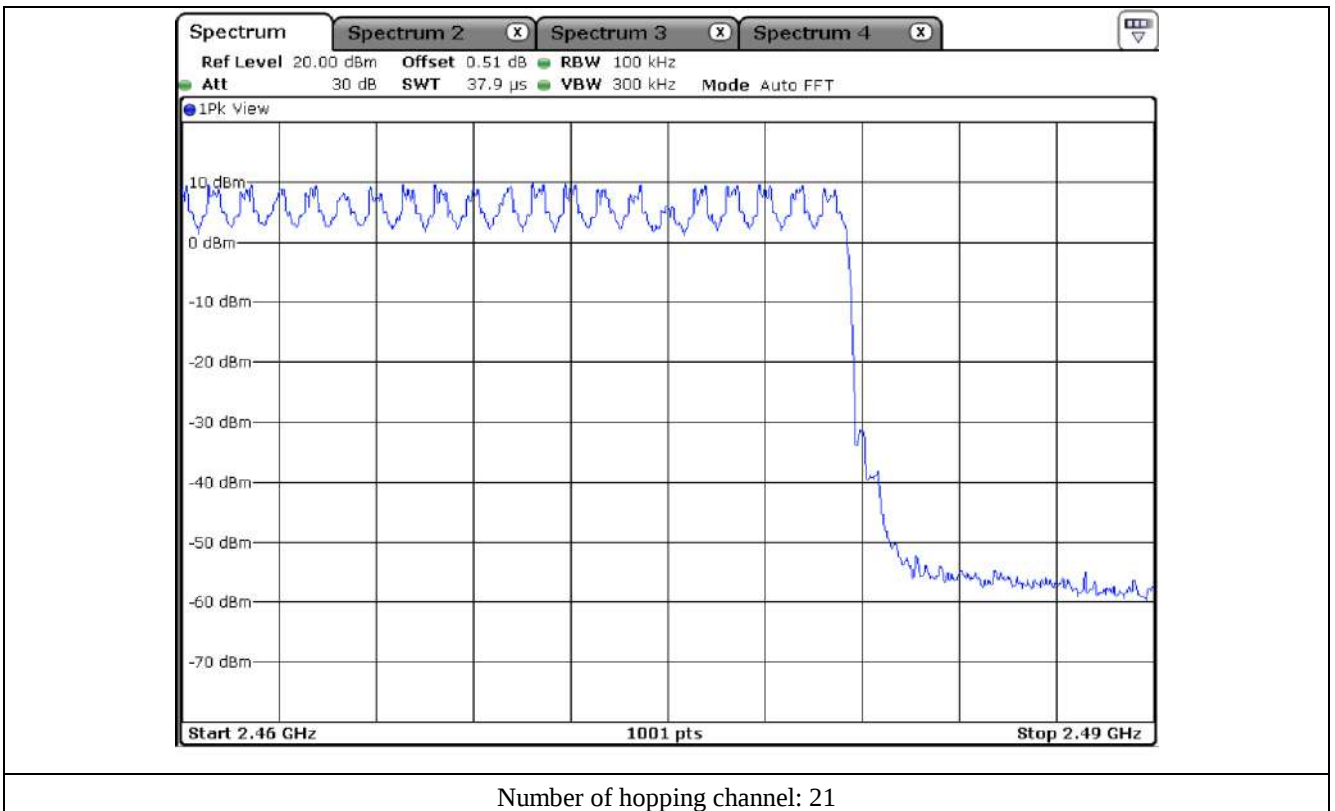




Number of hopping channel: 28



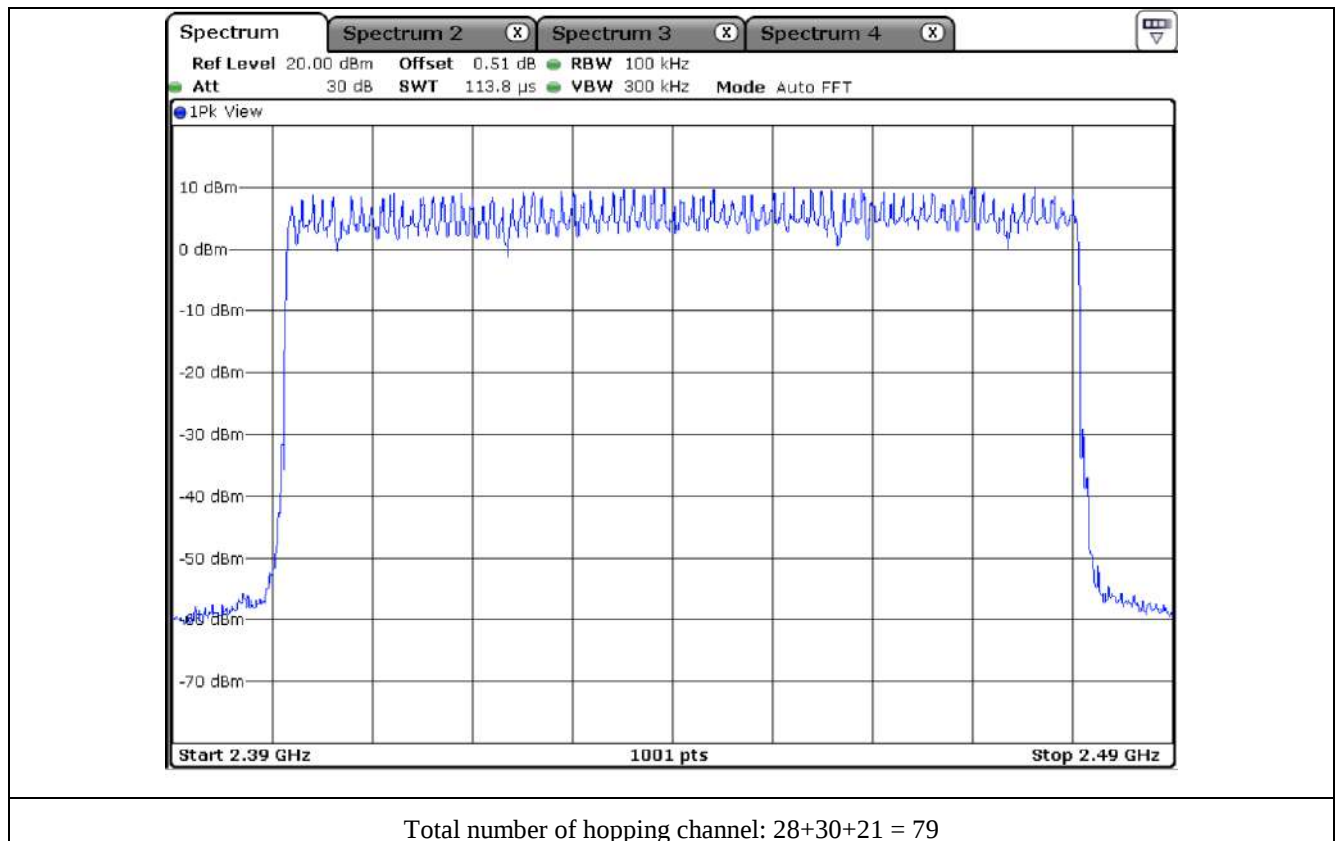
Number of hopping channel: 30

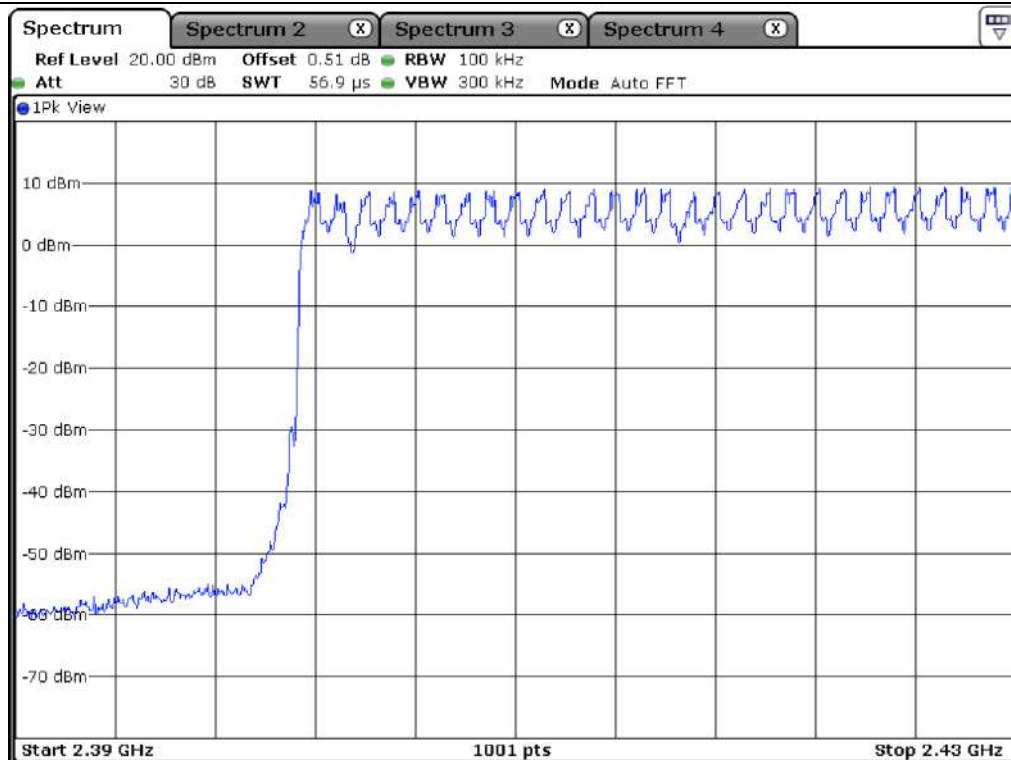


9.6 Test data for 3 Mbps

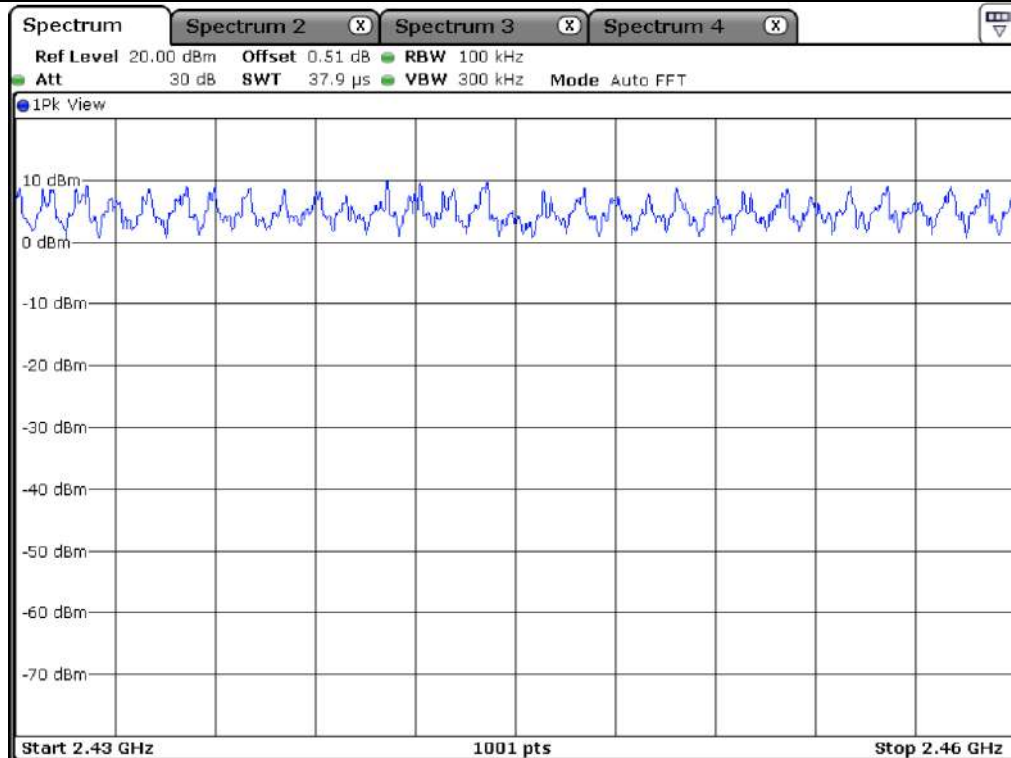
-. Test Result : Pass

Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
3 Mbps	79	Minimum of 15	64

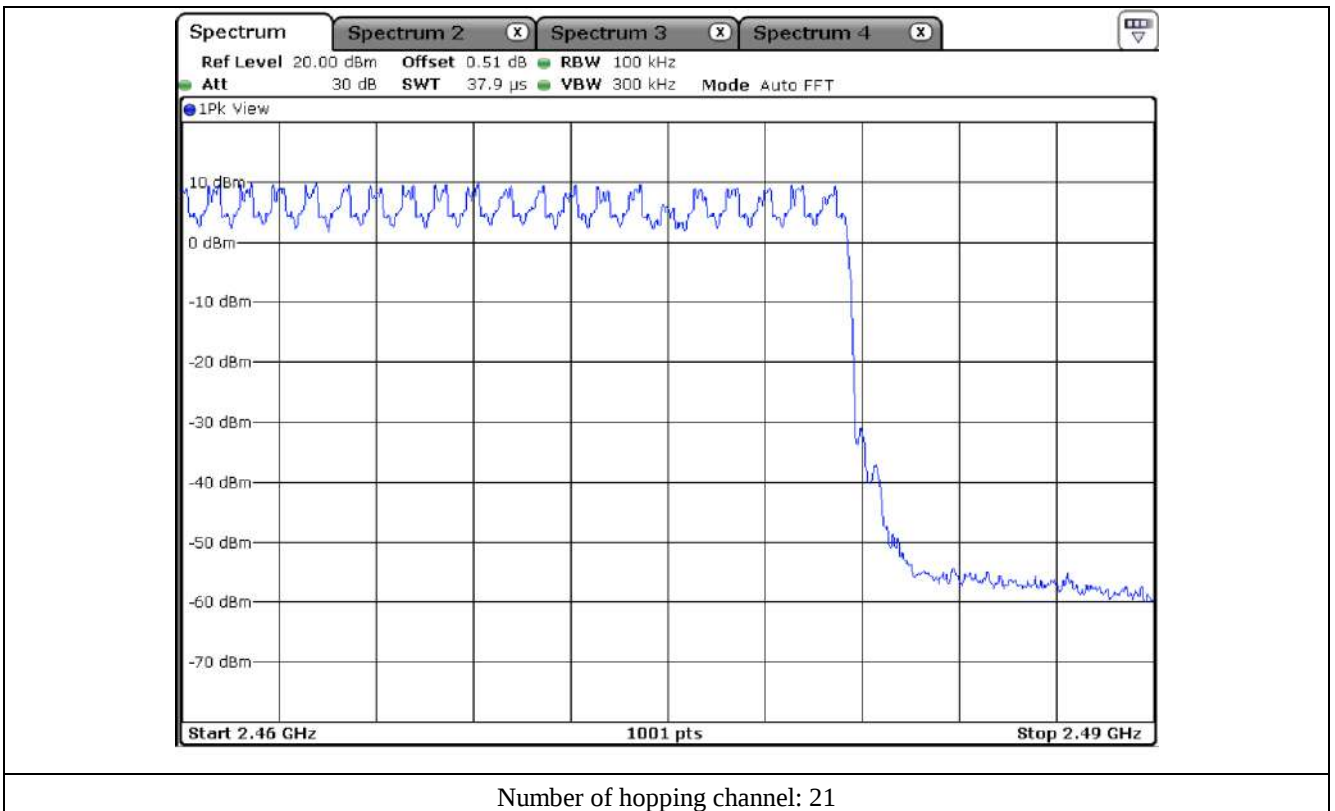




Number of hopping channel: 28



Number of hopping channel: 30



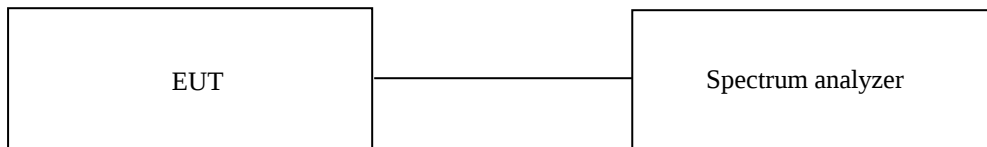
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



10.3 Test Date

May 10, 2021 ~ May 26, 2021

10.4 Test data for 1 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625 μ s with 79 channels.

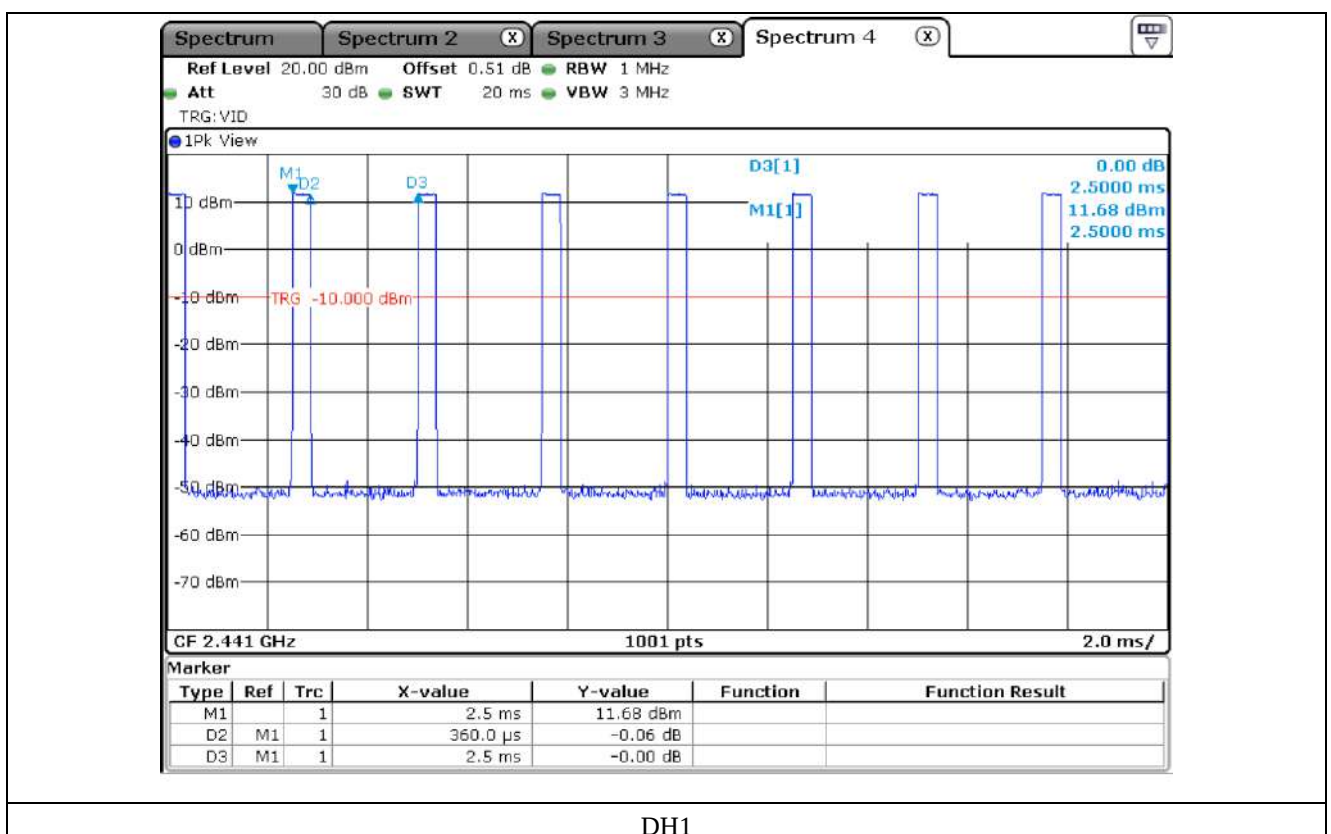
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel for 10.13 times per second ($= 1\ 600/2/79$) for DH1, and 5.06 times ($= 1\ 600/4/79$) for DH3, and 3.38 times ($= 1\ 600/6/79$) for DH5.

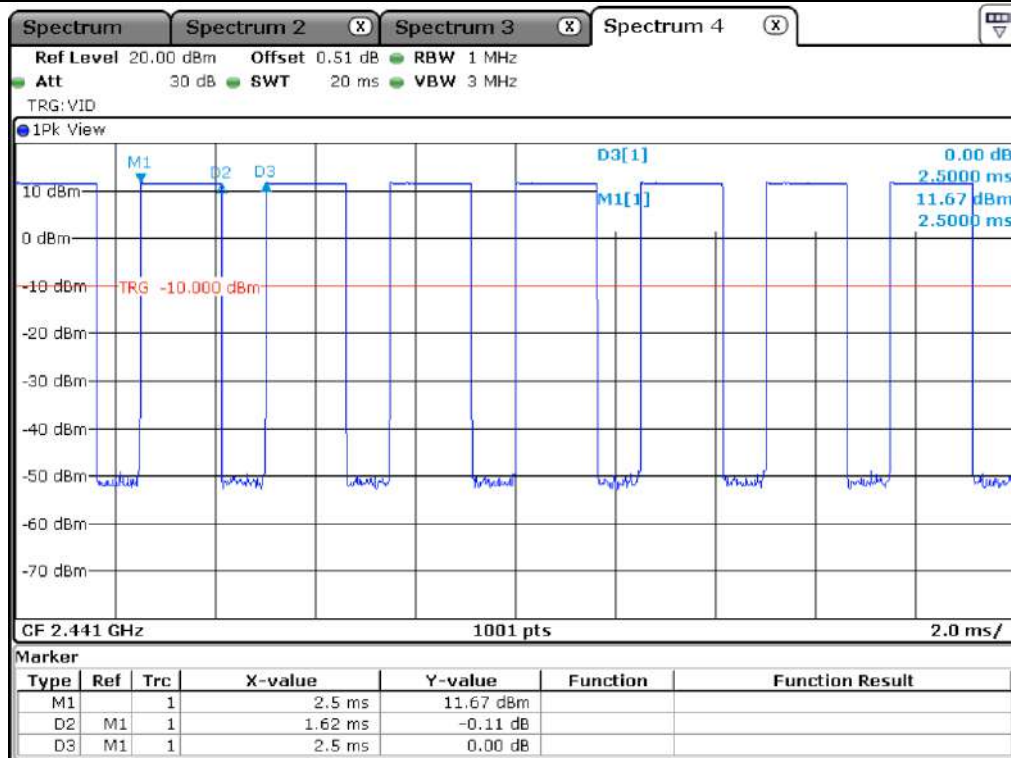
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.360	10.13	31.60	115.24	400	PASS
DH3	1.620	5.06	31.60	259.03	400	
DH5	2.880	3.38	31.60	307.61	400	

Total dwell time is calculated as following.

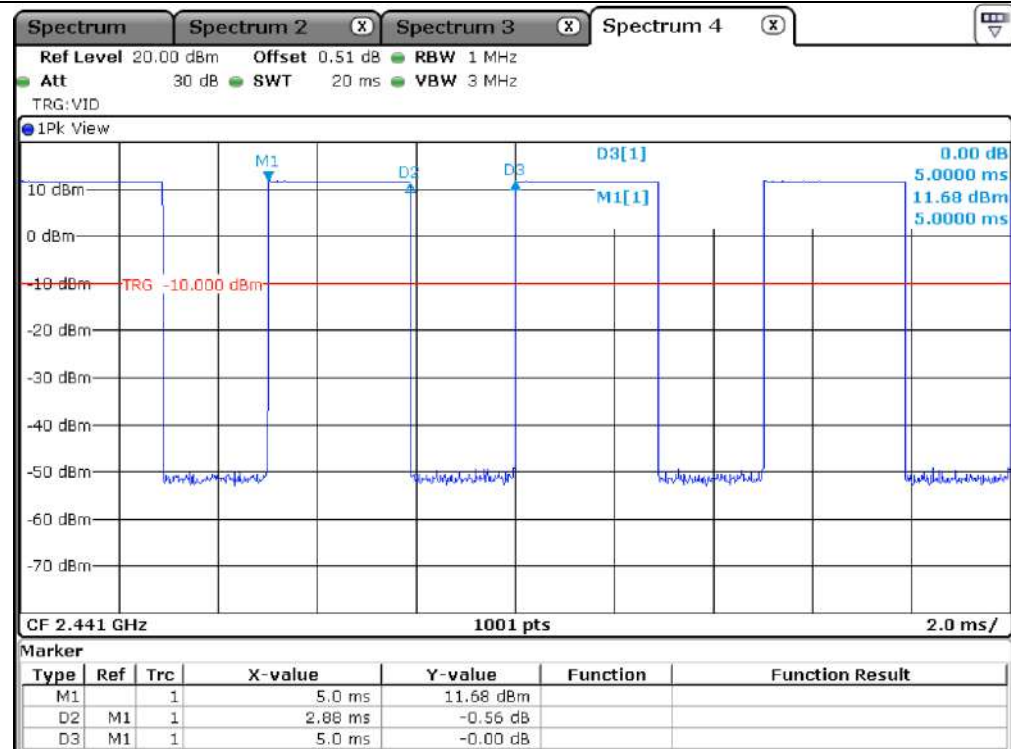
Total Dwell Time = Pulse time * Hops per second with channels * period time

Remark: See next page for an overview sweep performed with peak detector.





DH3



DH5

10.5 Test data for 2 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625 μ s with 79 channels.

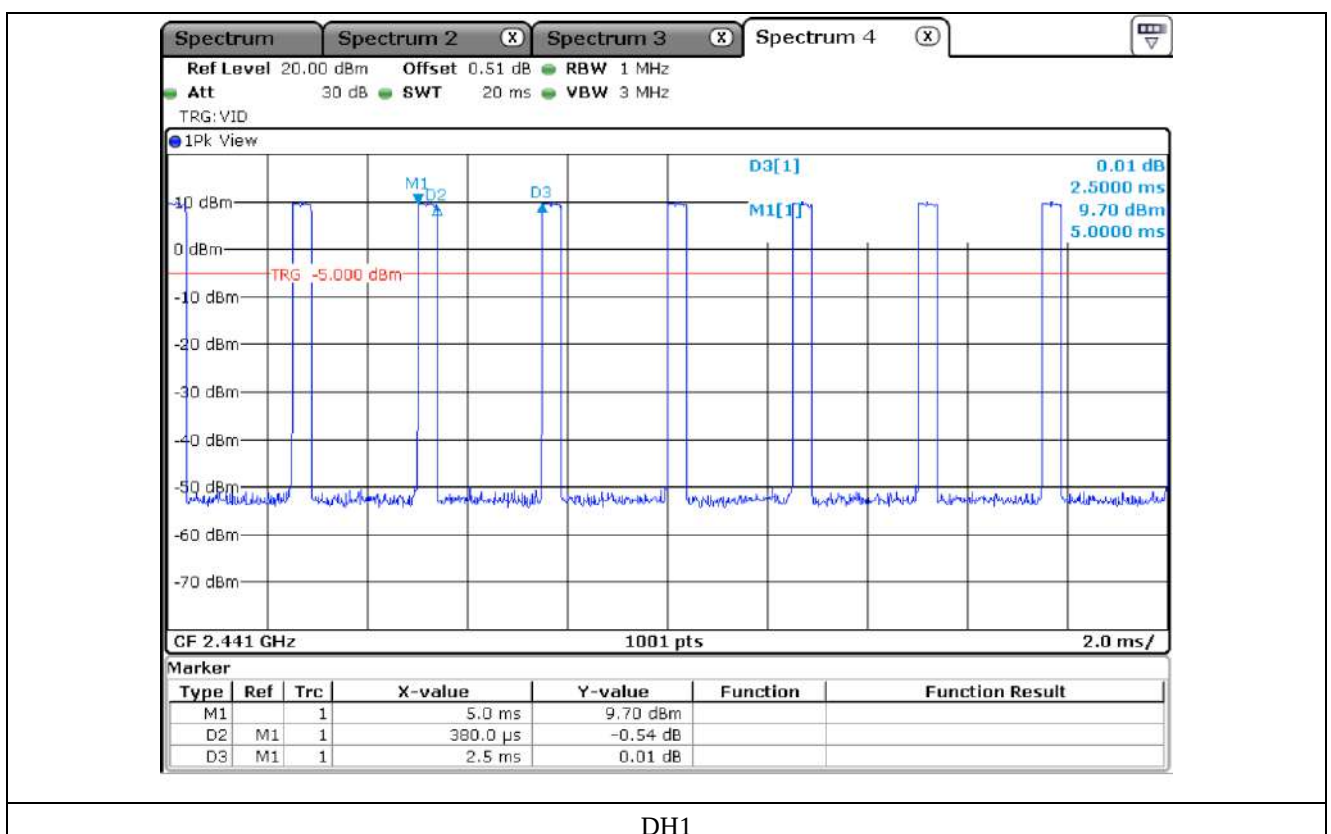
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel for 10.13 times per second ($= 1\ 600/2/79$) for DH1, and 5.06 times ($= 1\ 600/4/79$) for DH3, and 3.38 times ($= 1\ 600/6/79$) for DH5.

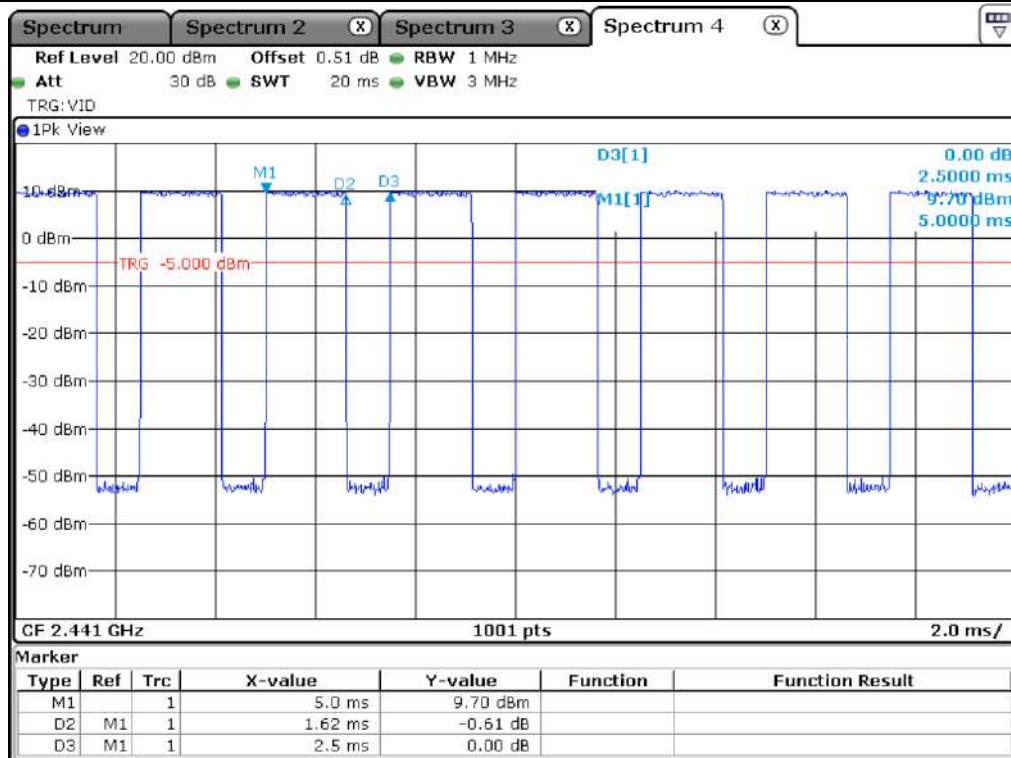
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.380	10.13	31.60	121.64	400	PASS
DH3	1.620	5.06	31.60	259.03	400	
DH5	3.020	3.38	31.60	322.56	400	

Total dwell time is calculated as following.

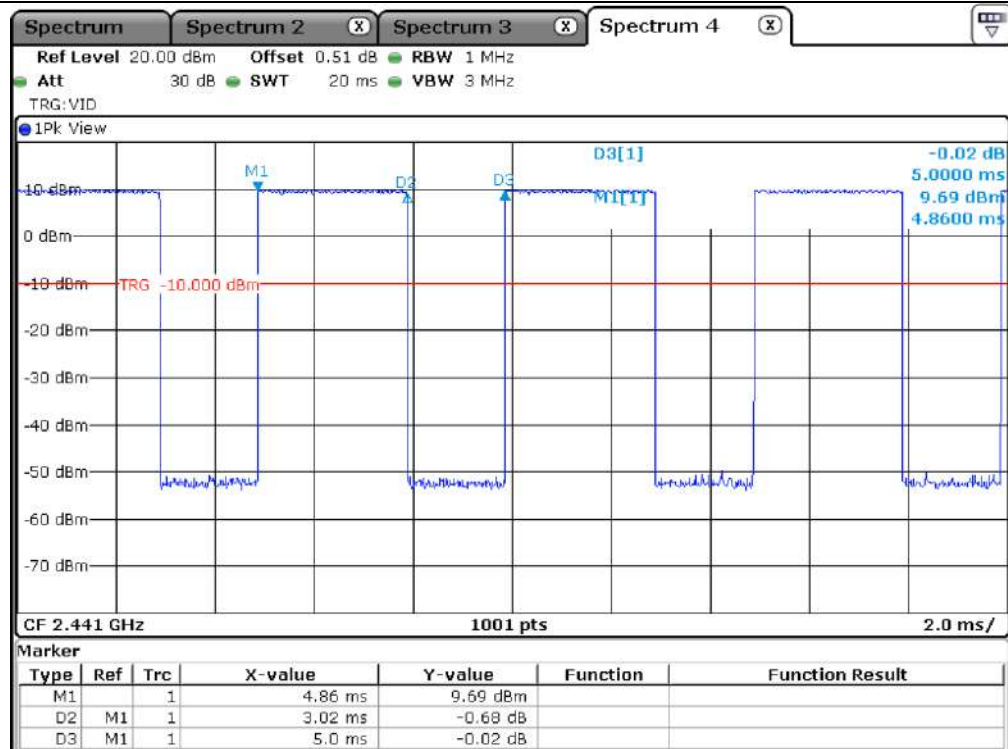
Total Dwell Time = Pulse time * Hops per second with channels * period time

Remark: See next page for an overview sweep performed with peak detector.





DH3



DH5

10.6 Test data for 3 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625 μ s with 79 channels.

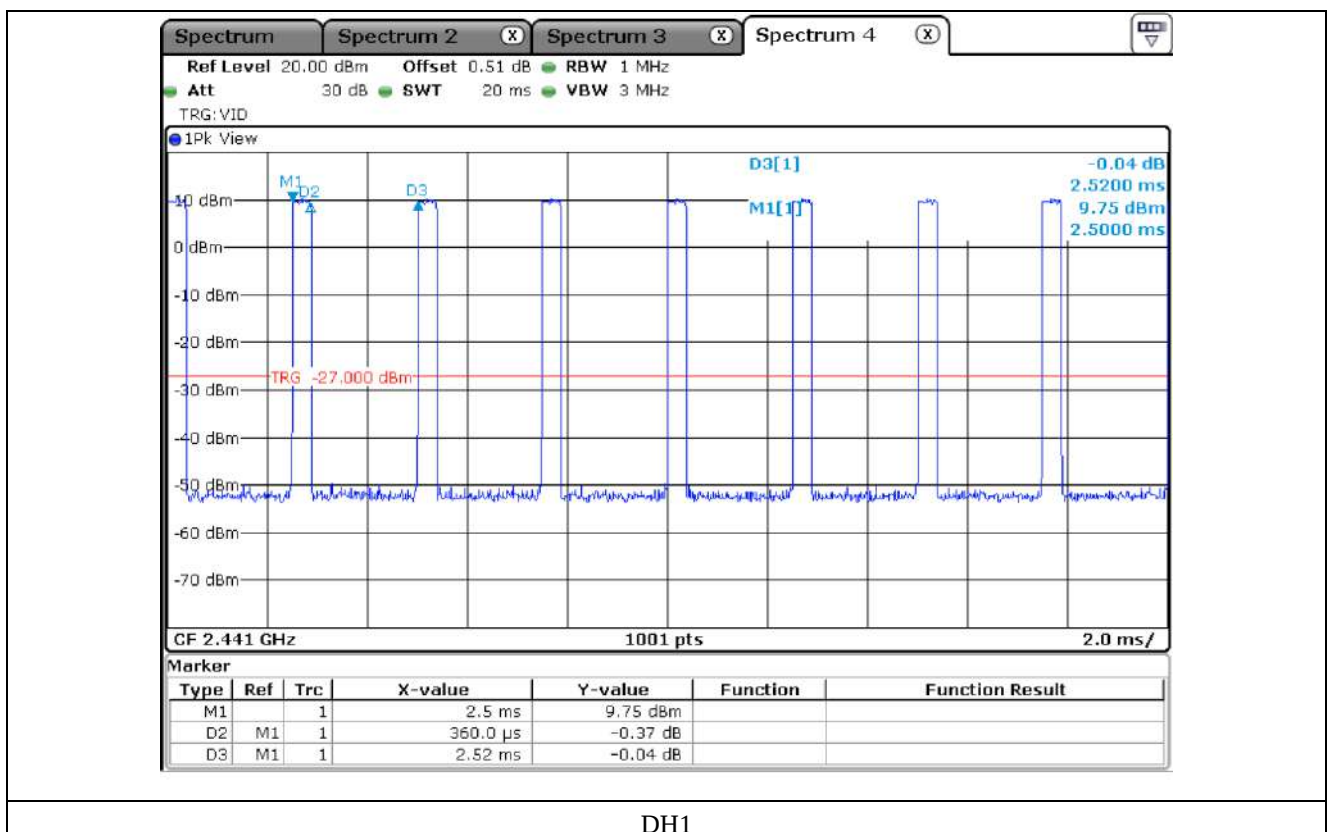
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel for 10.13 times per second ($= 1\,600/2/79$) for DH1, and 5.06 times ($= 1\,600/4/79$) for DH3, and 3.38 times ($= 1\,600/6/79$) for DH5.

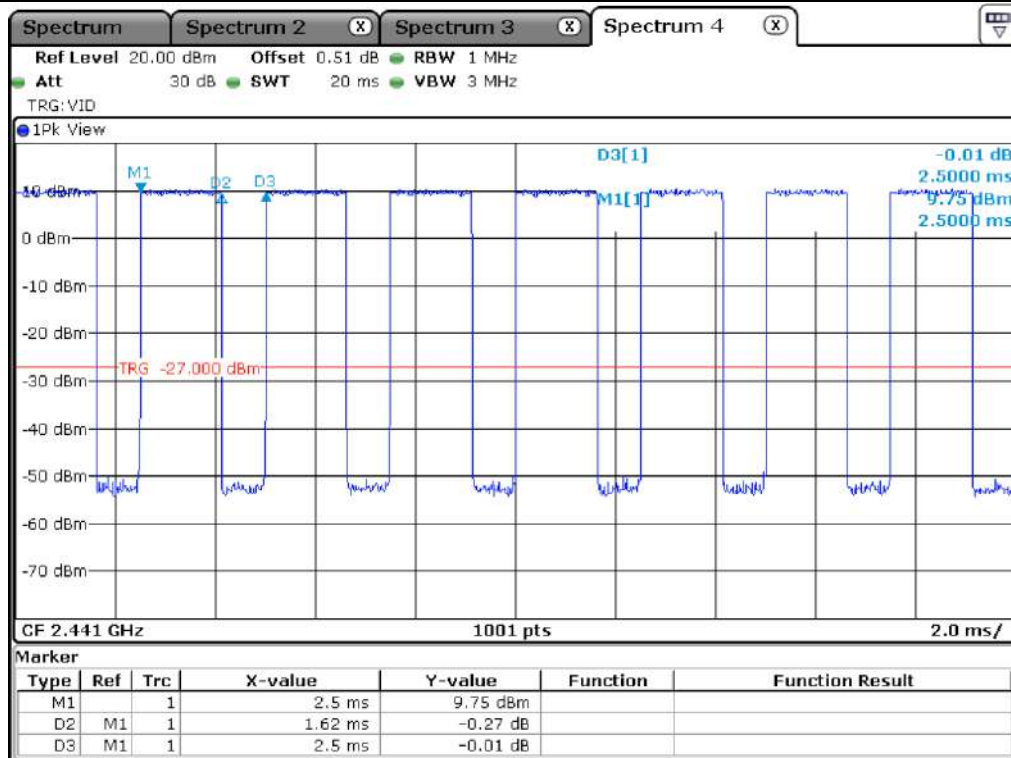
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.360	10.13	31.60	115.24	400	PASS
DH3	1.620	5.06	31.60	259.03	400	
DH5	2.860	3.38	31.60	305.47	400	

Total dwell time is calculated as following.

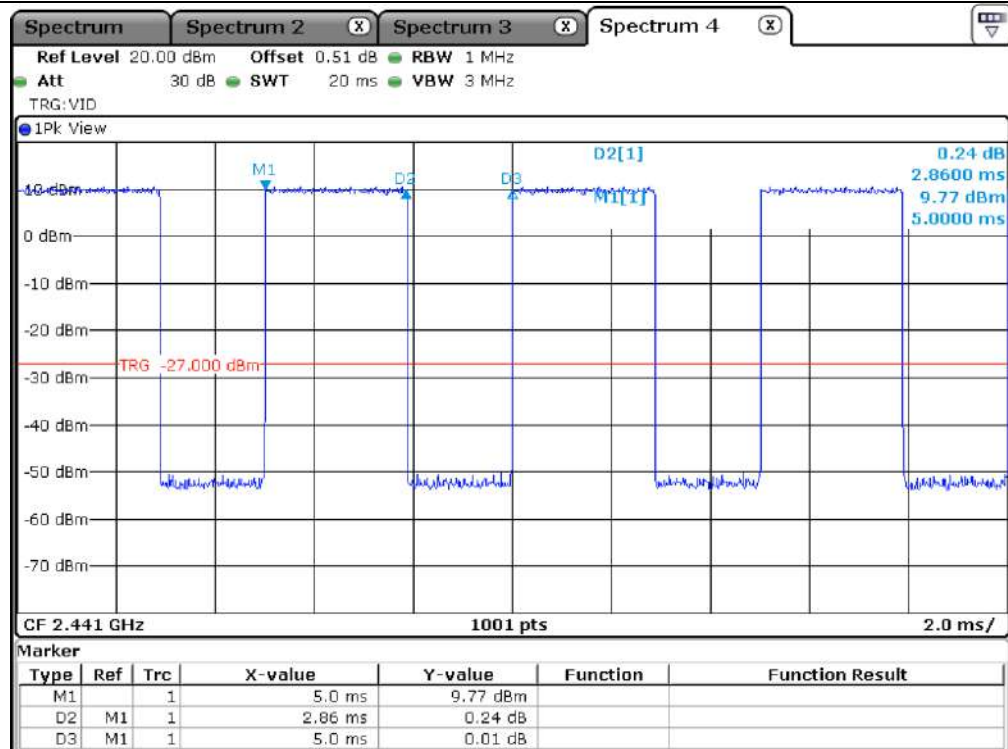
Total Dwell Time = Pulse time * Hops per second with channels * period time

Remark: See next page for an overview sweep performed with peak detector.





DH3



DH5

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11. MAXIMUM PEAK OUTPUT POWER

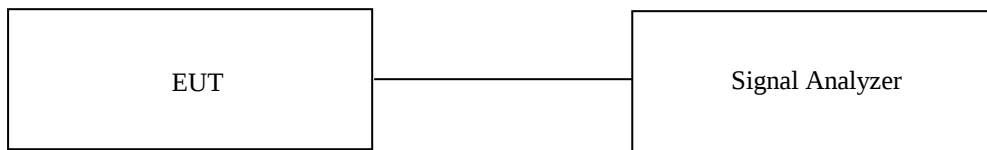
11.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

11.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $\geq$ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



11.3 Test Date

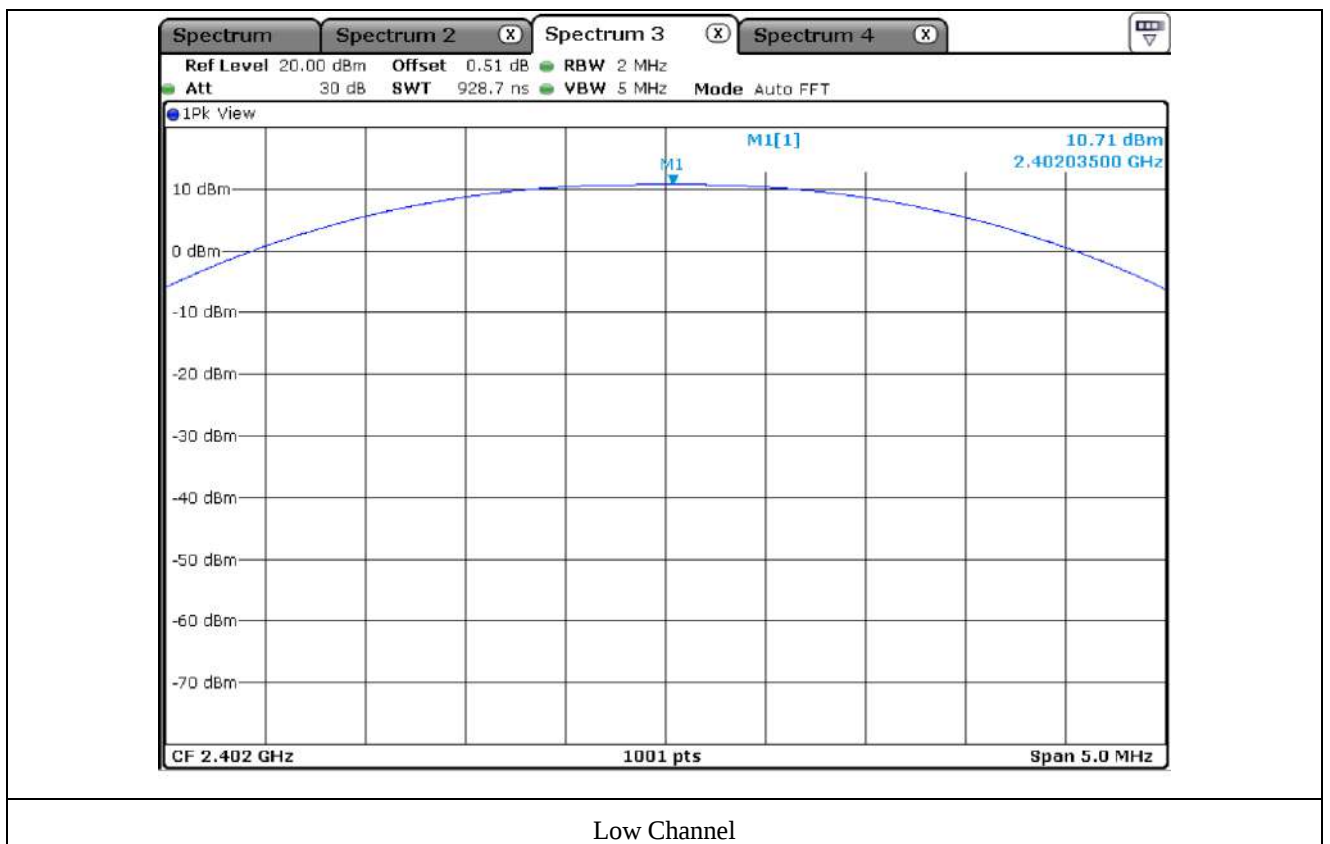
May 10, 2021 ~ May 26, 2021

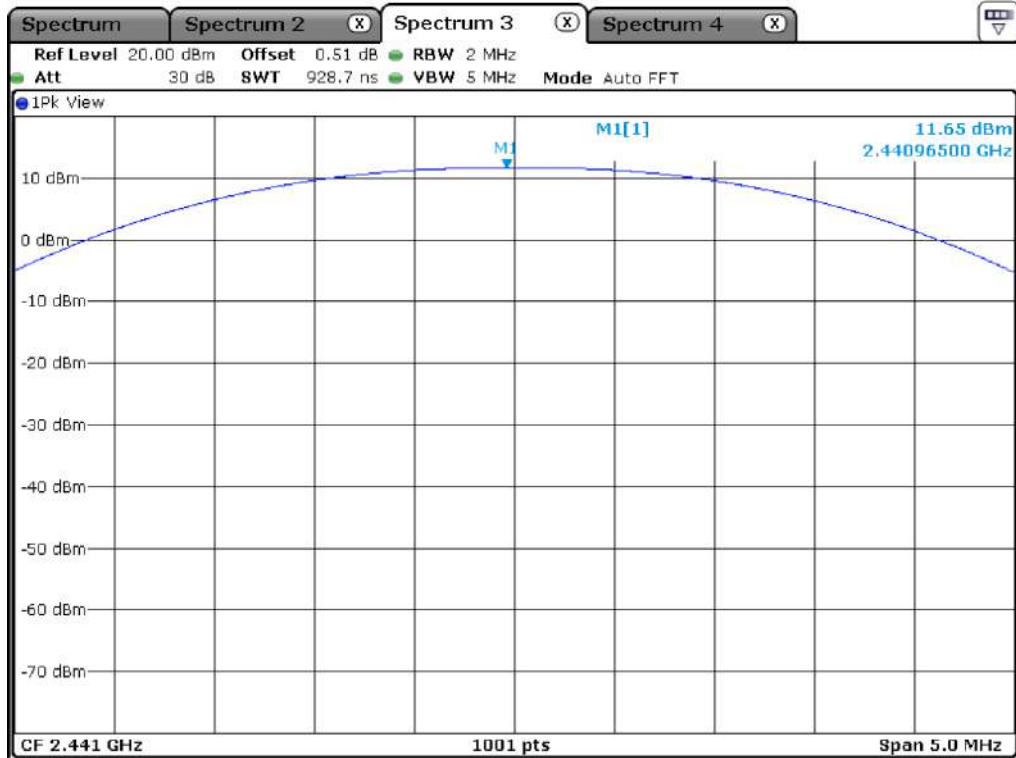
11.4 Test data for 1 Mbps

-. Test Result : Pass

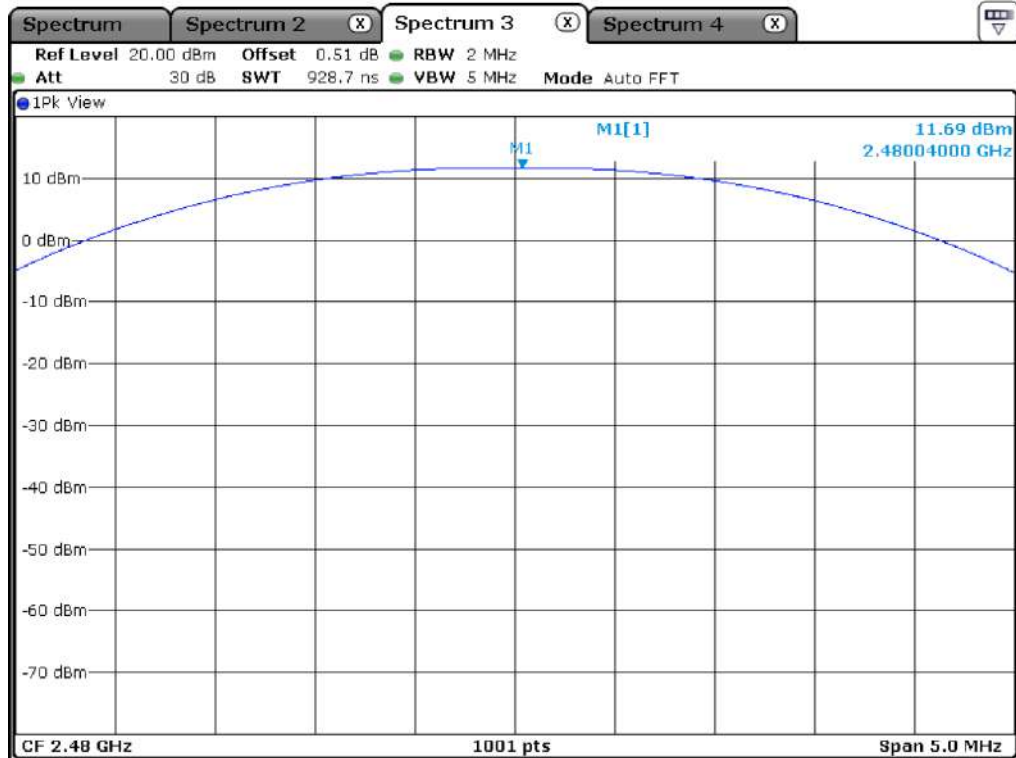
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	10.71	21.00	10.29
MIDDLE	2 441.00	11.65	21.00	9.35
HIGH	2 480.00	11.69	21.00	9.31

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)





Middle Channel



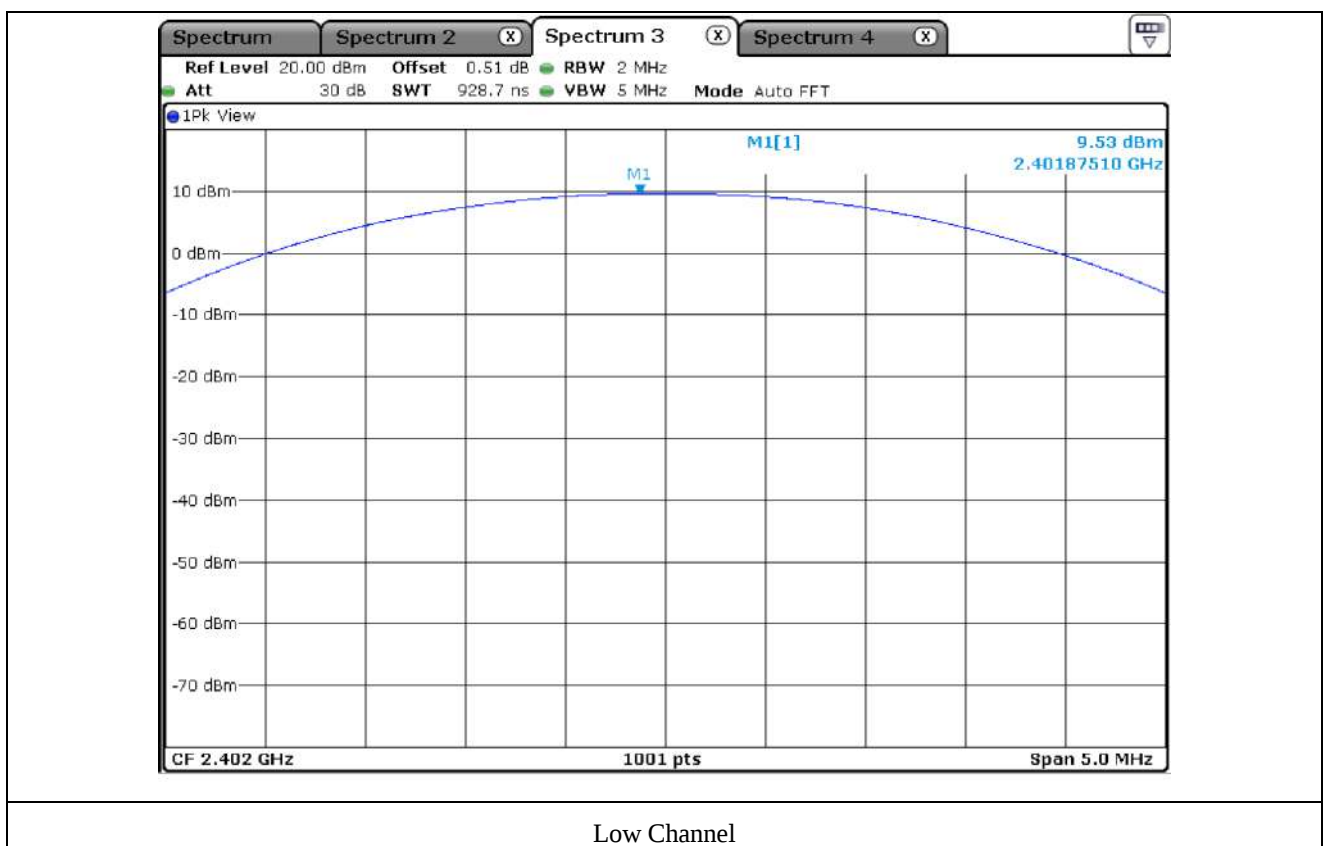
High Channel

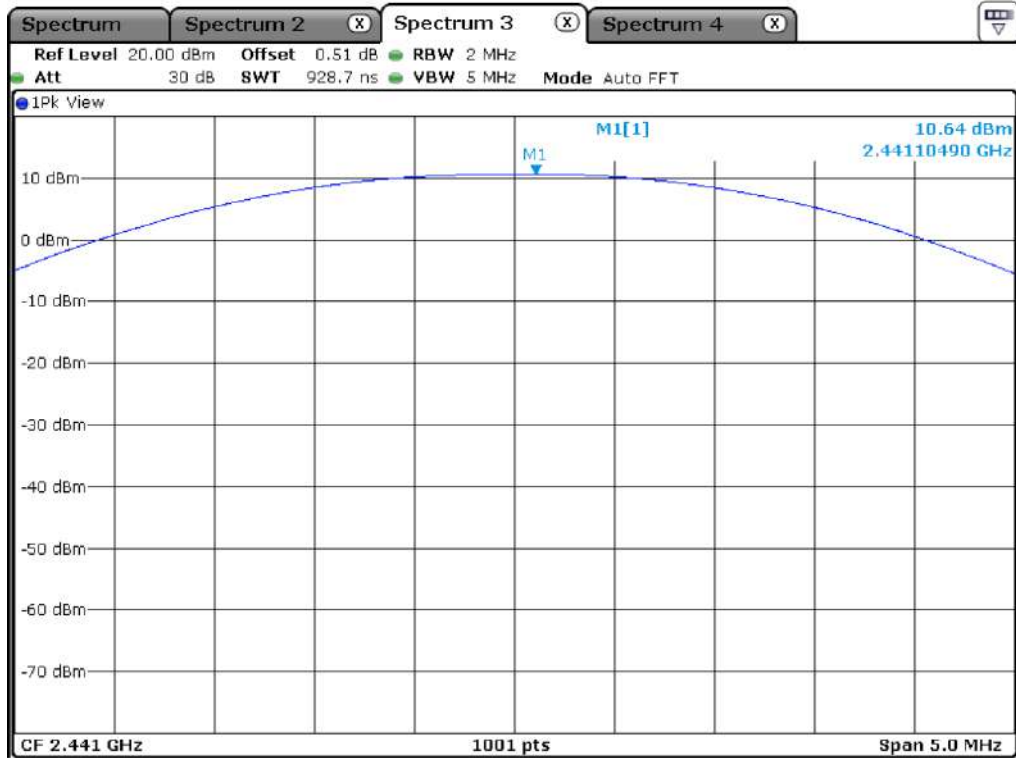
11.5 Test data for 2 Mbps

-. Test Result : Pass

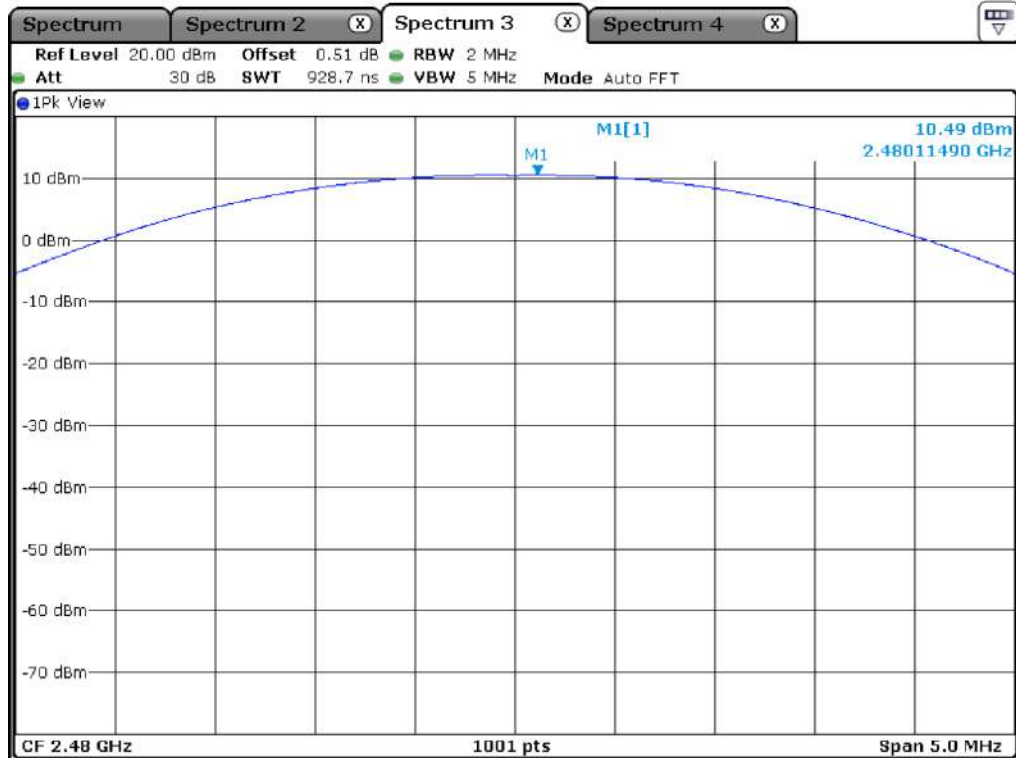
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.53	21.00	11.47
MIDDLE	2 441.00	10.64	21.00	10.36
HIGH	2 480.00	10.49	21.00	10.51

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)





Middle Channel



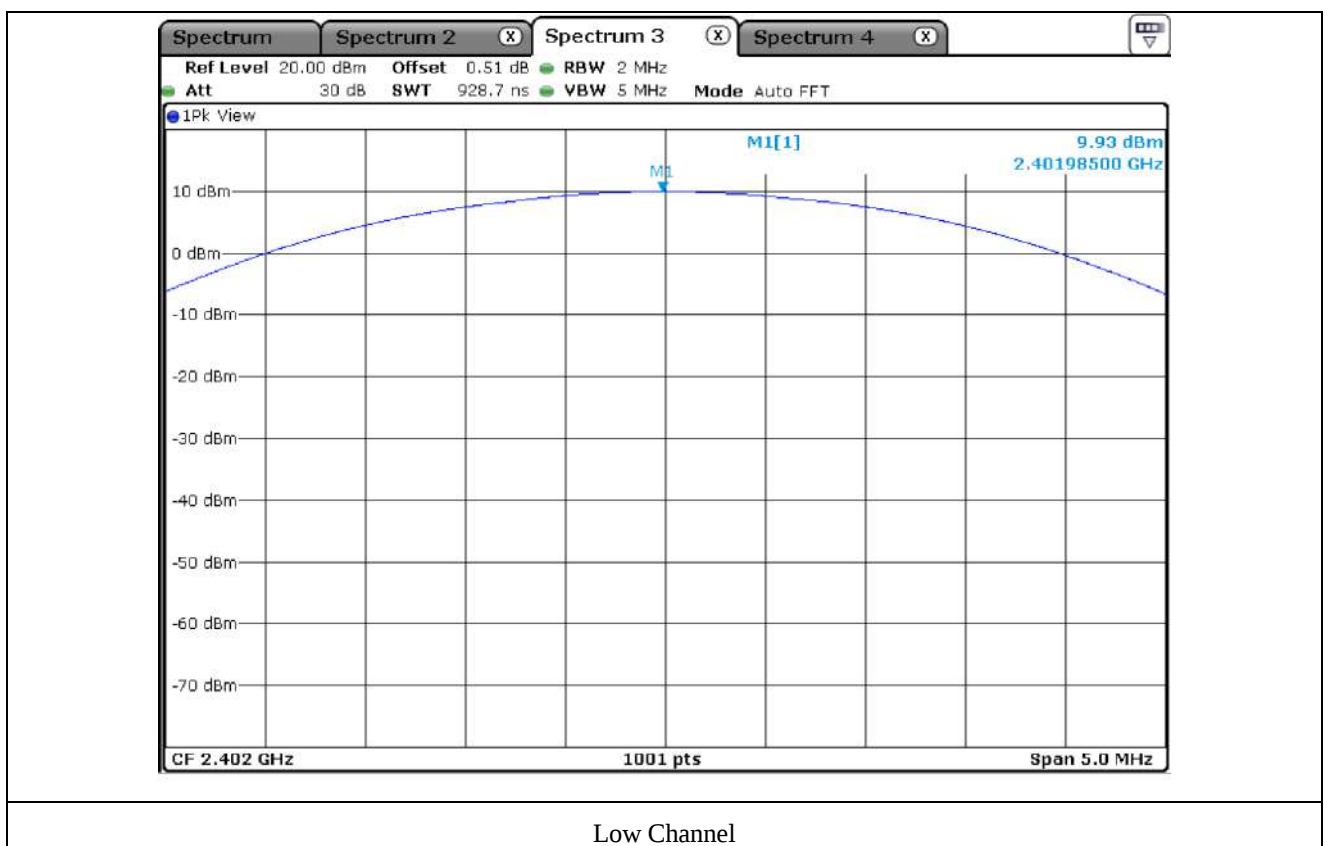
High Channel

11.6 Test data for 3 Mbps

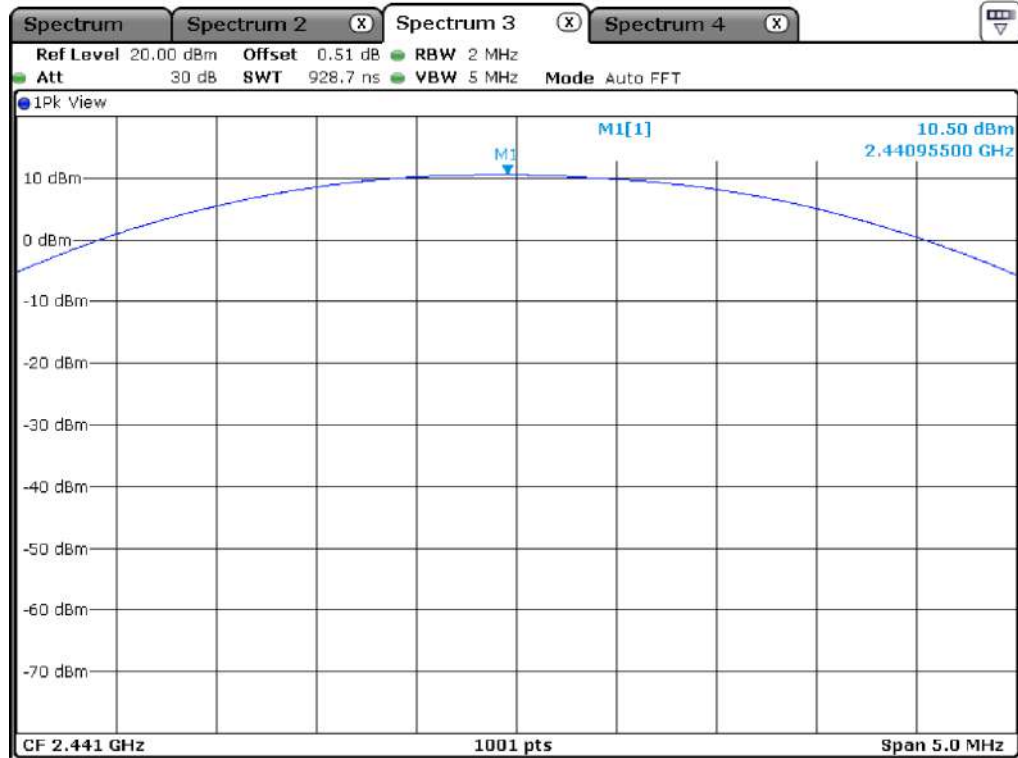
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.93	21.00	11.07
MIDDLE	2 441.00	10.50	21.00	10.50
HIGH	2 480.00	10.71	21.00	10.29

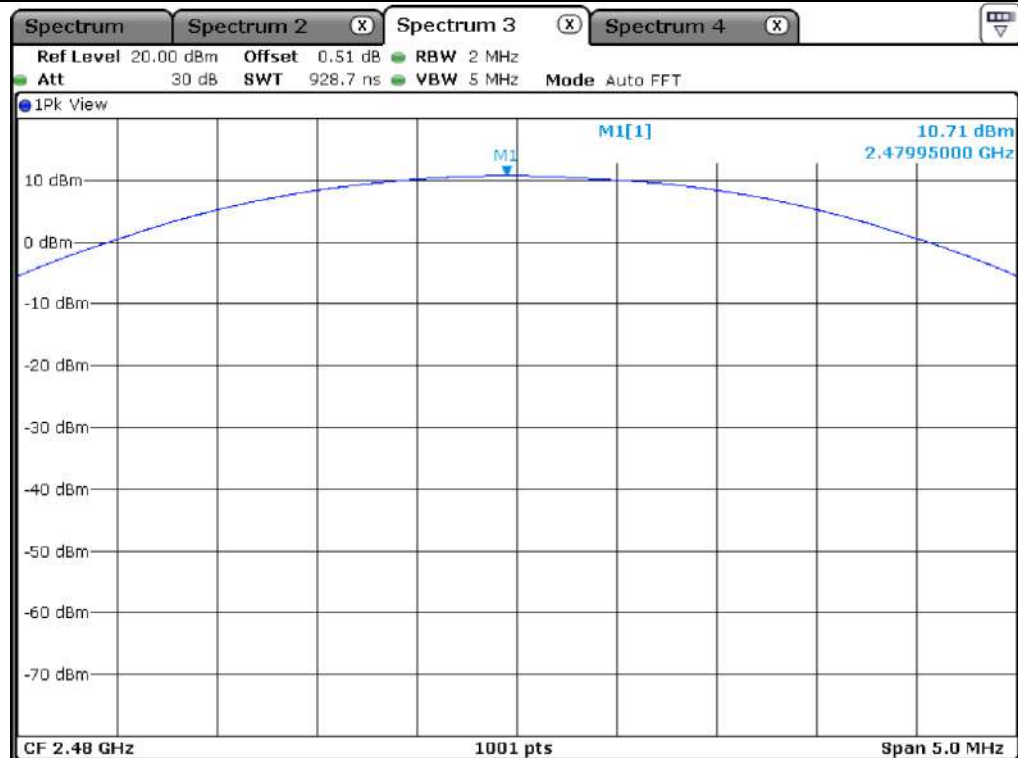
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel



High Channel

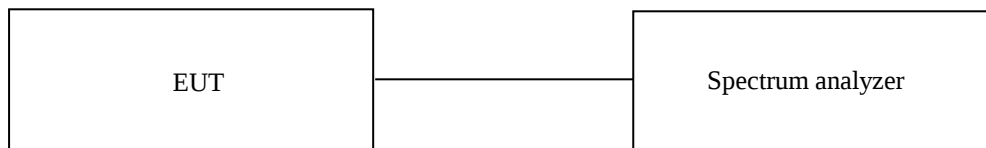
12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

12.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



12.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

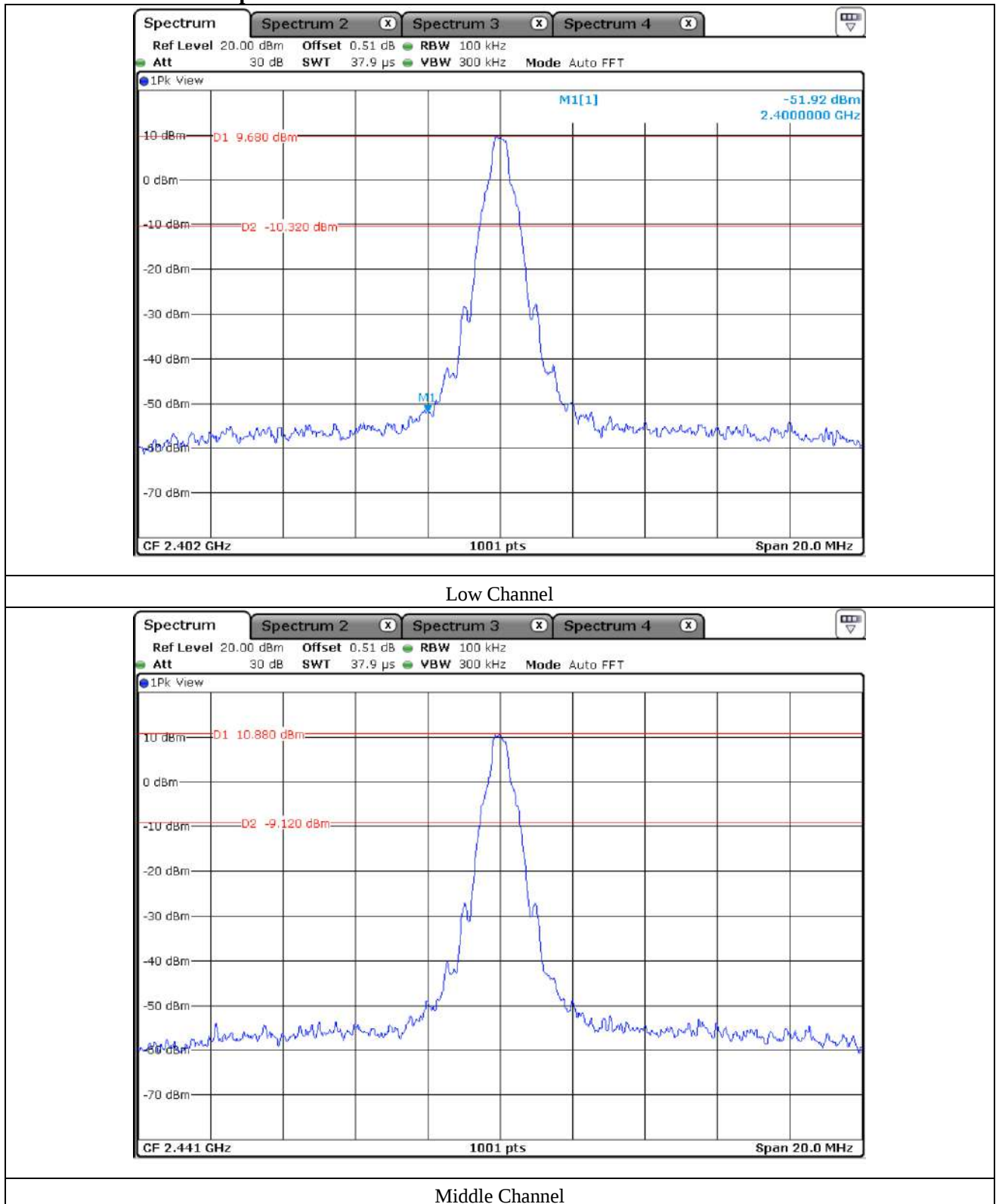
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

12.4 Test Date

May 10, 2021 ~ May 26, 2021

12.5 Test data for conducted emission

12.5.1 Test data for 1 Mbps

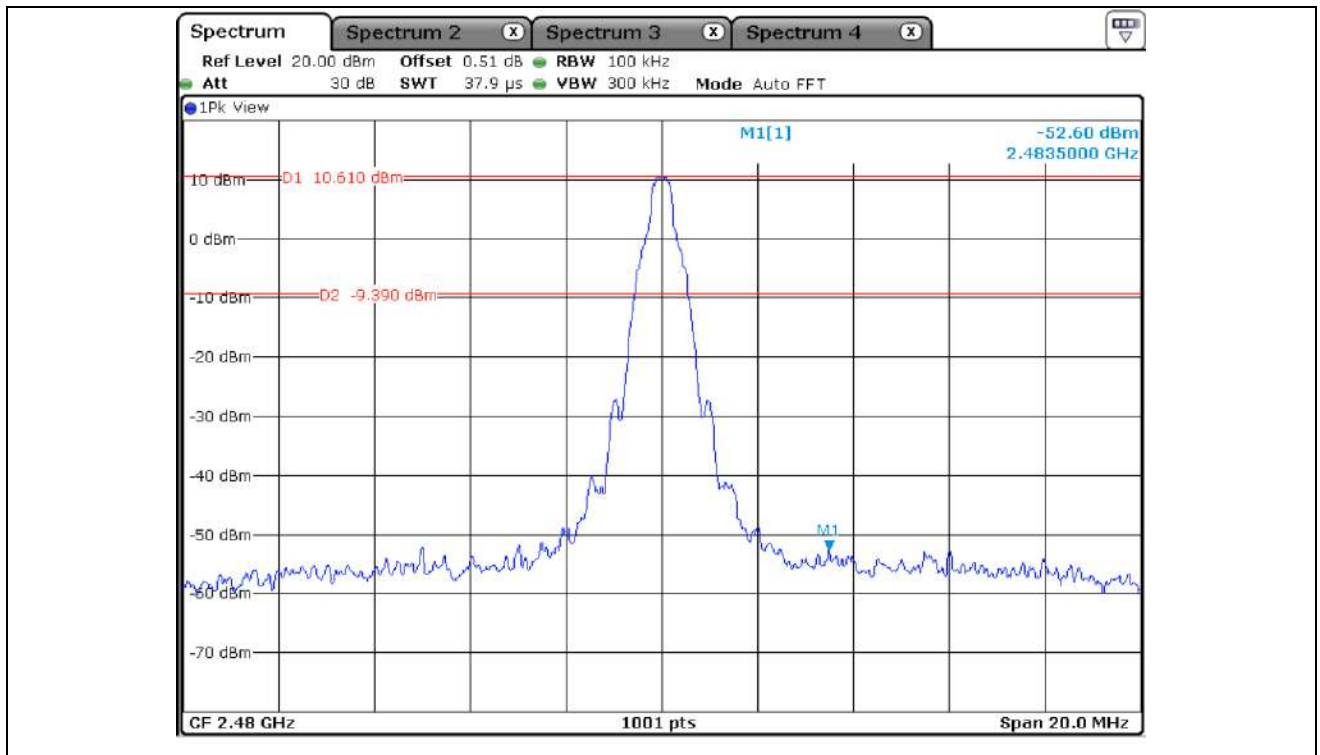


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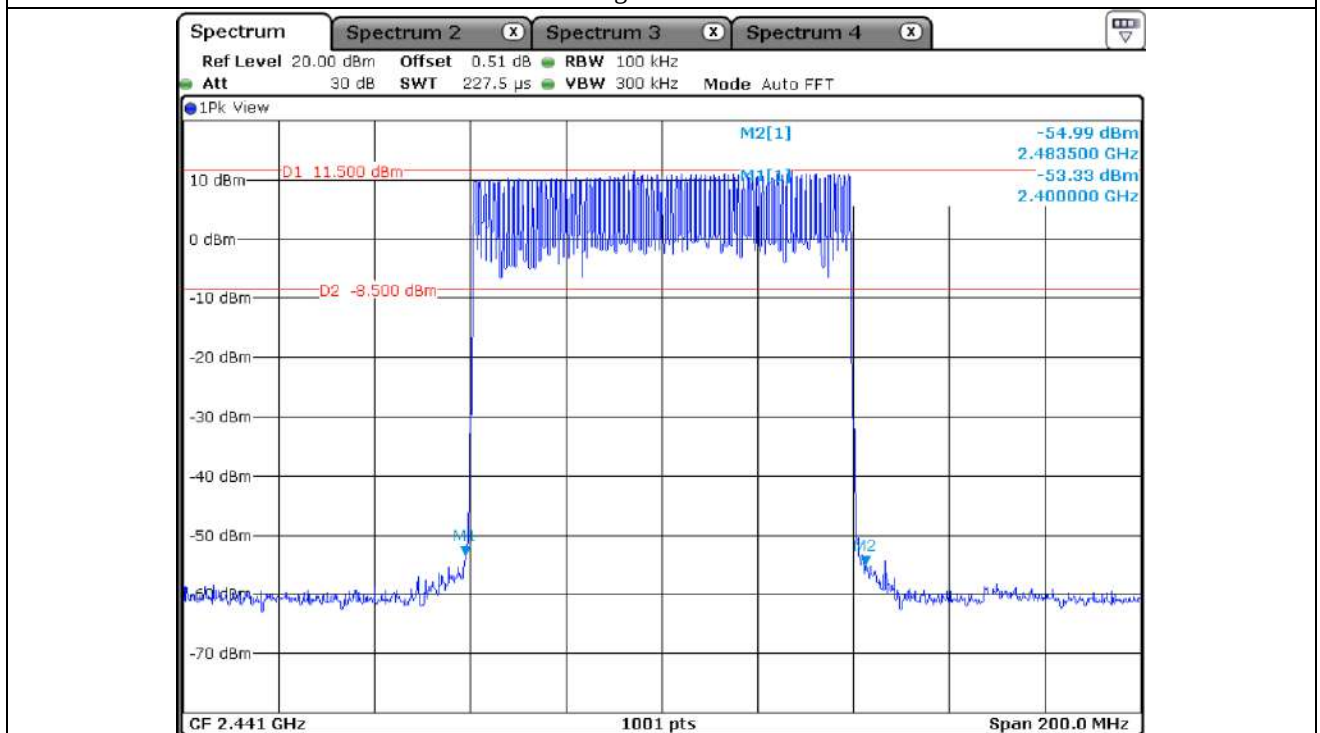
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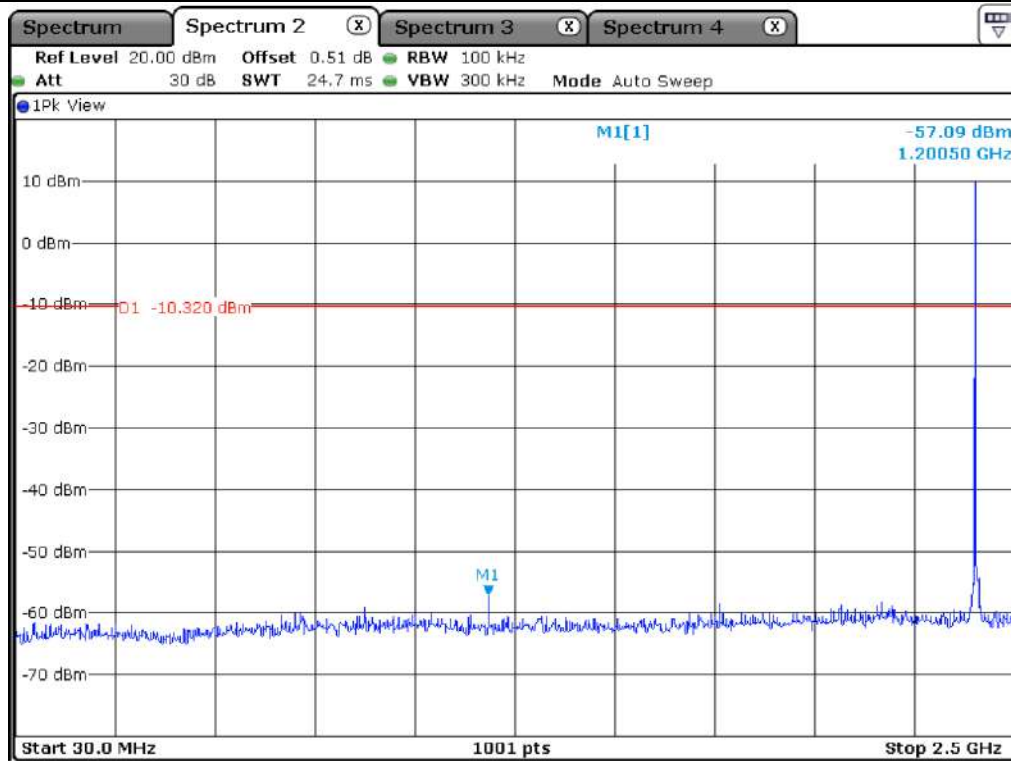
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



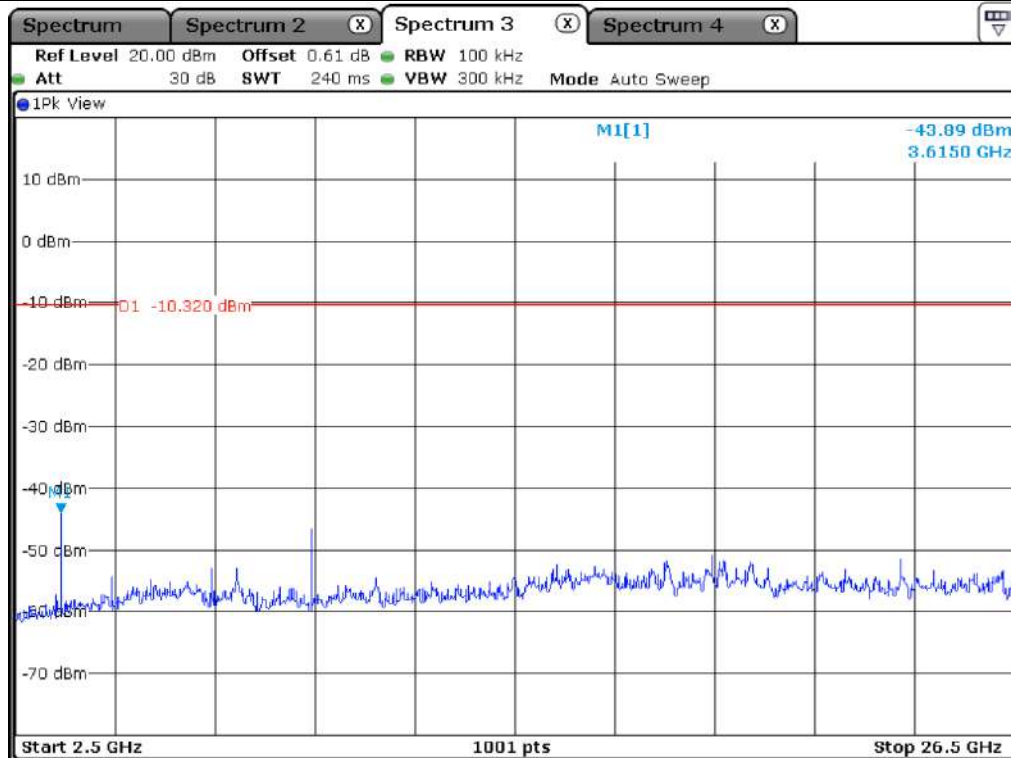
High Channel



Hopping Mode



Low Channel



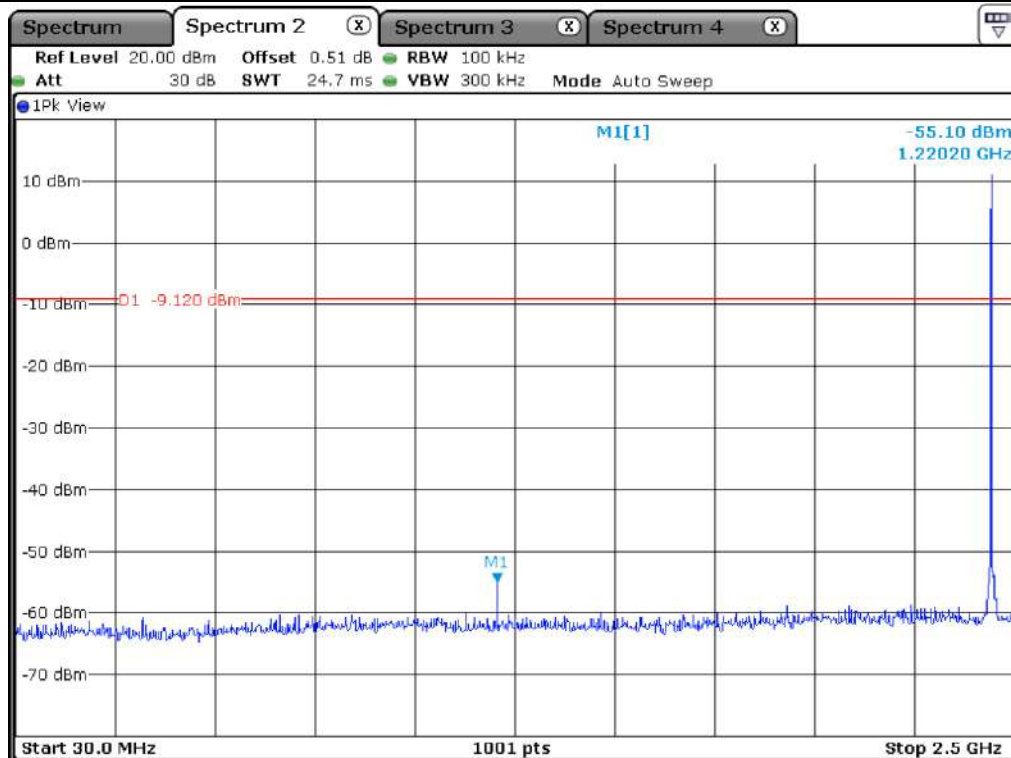
Low Channel

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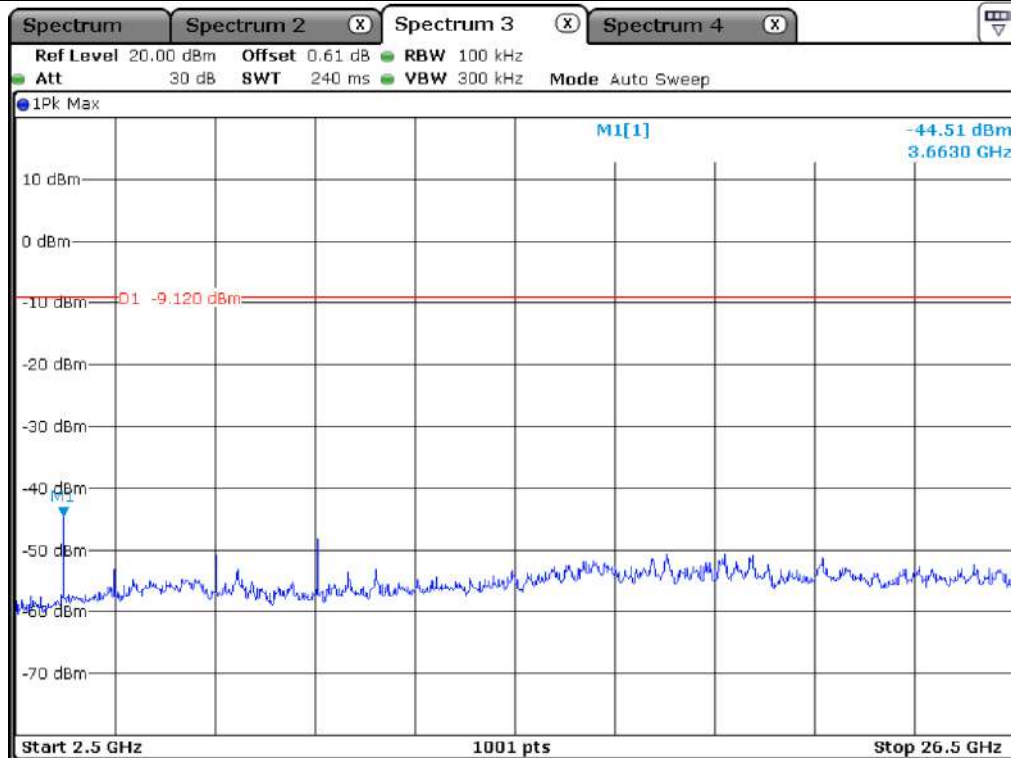
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Middle Channel



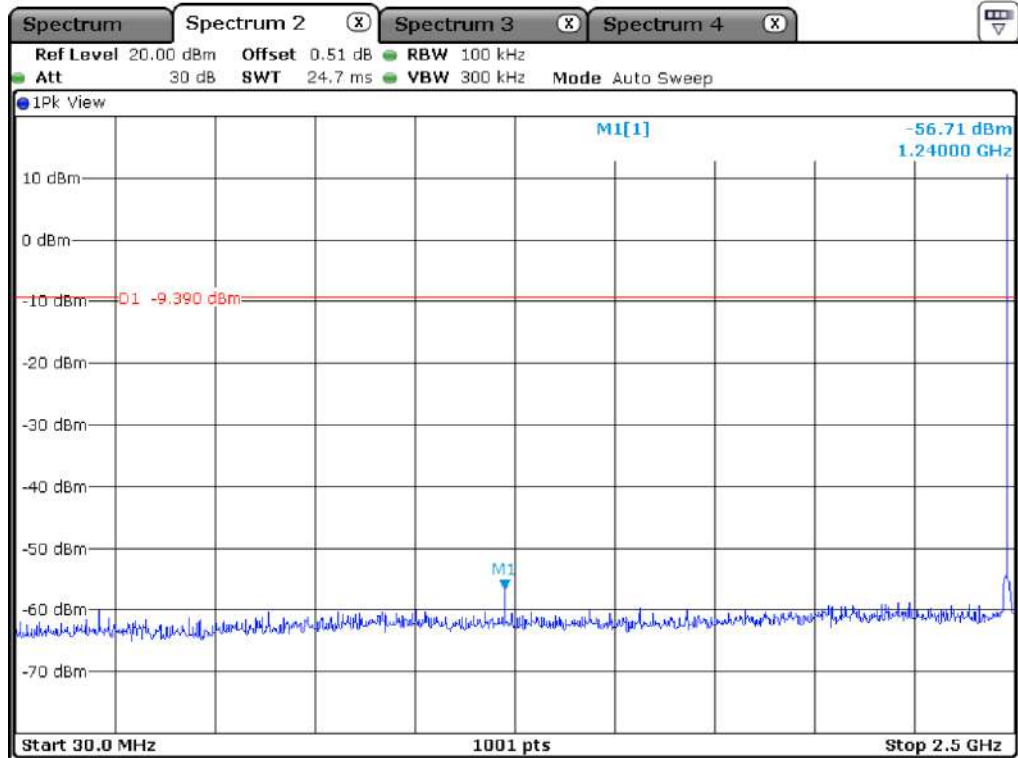
Middle Channel

This Report is not correlated with the authentication of KOLAS

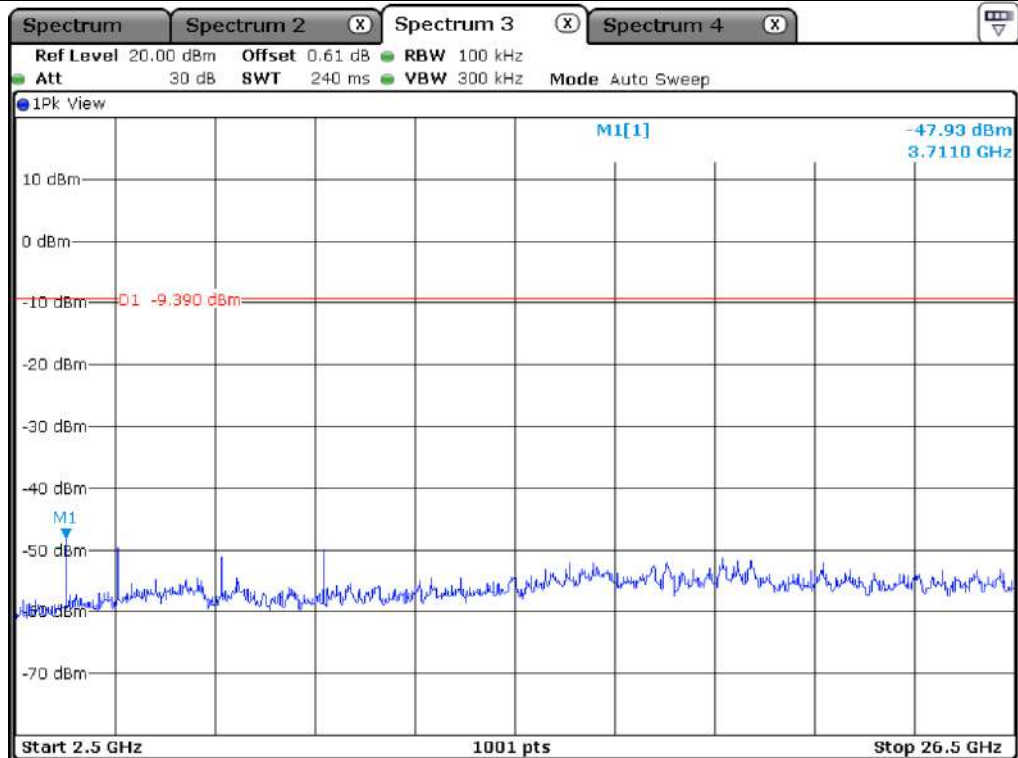
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High Channel



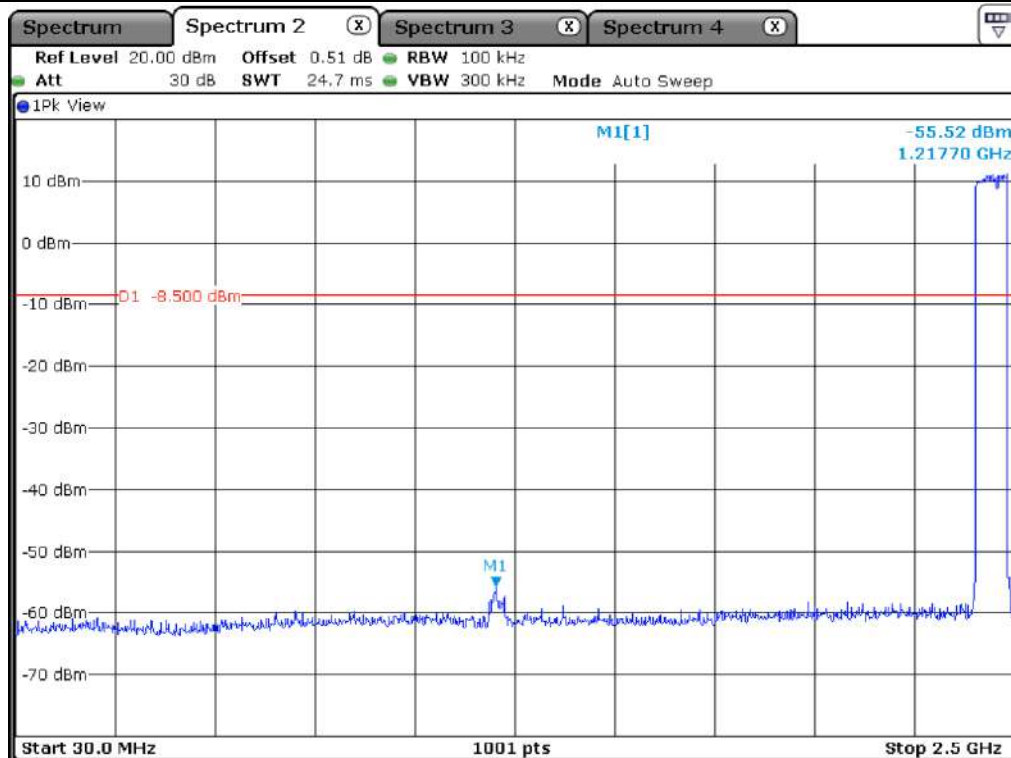
High Channel

This Report is not correlated with the authentication of KOLAS

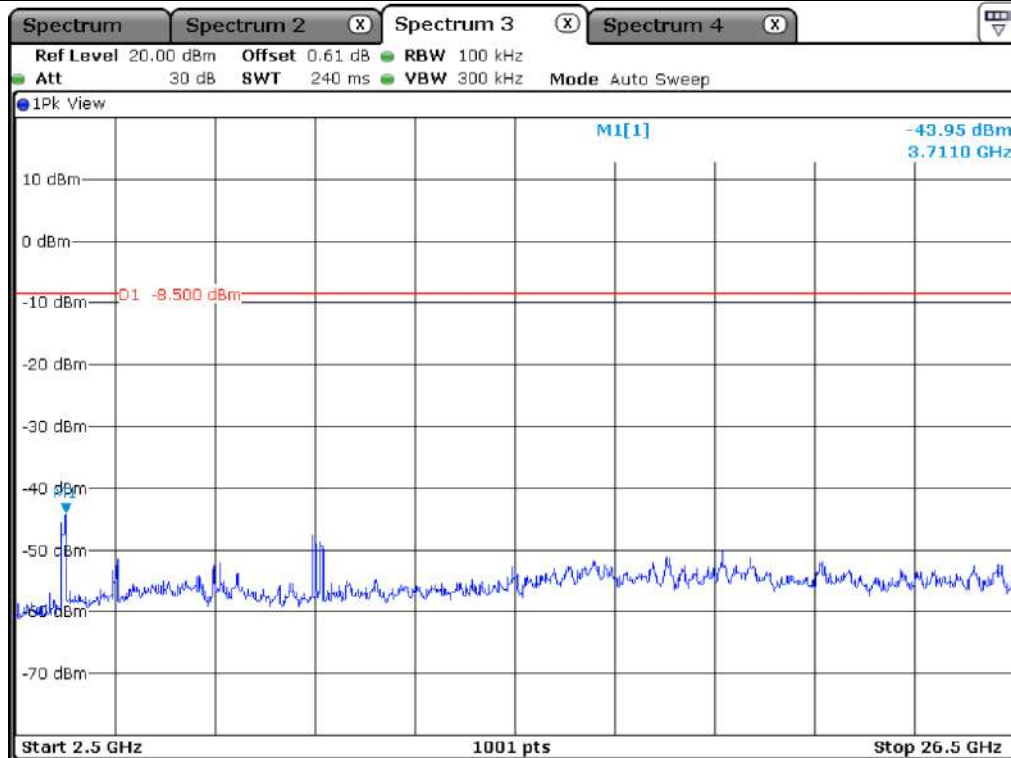
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Hopping Mode



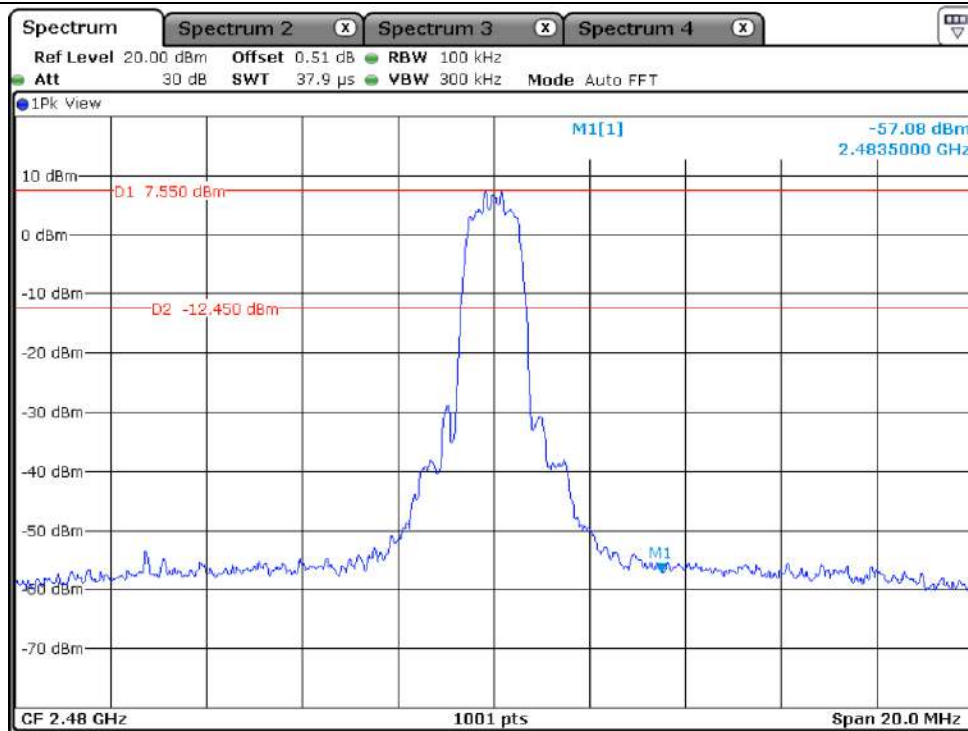
Hopping Mode

This Report is not correlated with the authentication of KOLAS

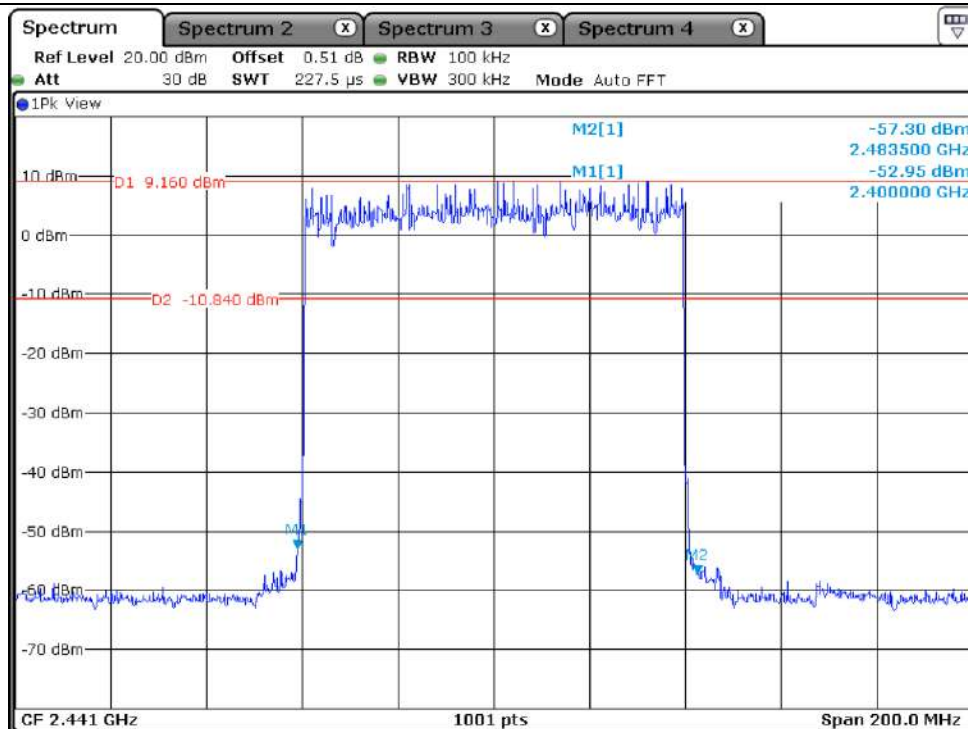
It should not be reproduced except in full, without the written approval of ONETECH Corp.

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High Channel



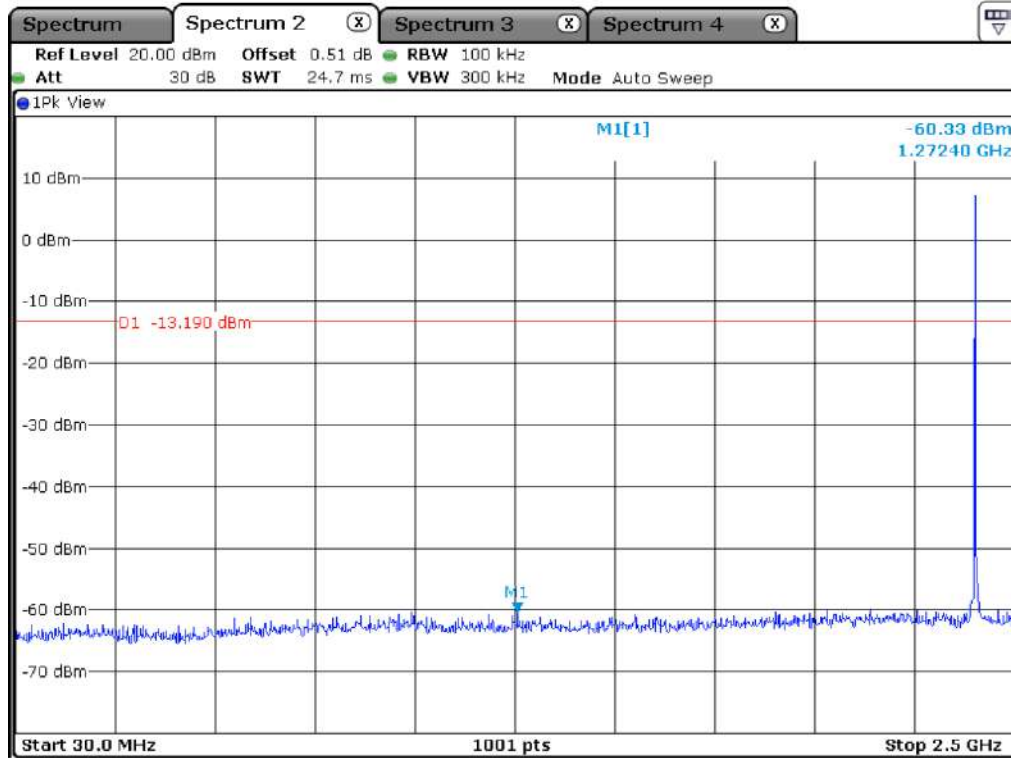
Hopping Mode

This Report is not correlated with the authentication of KOLAS

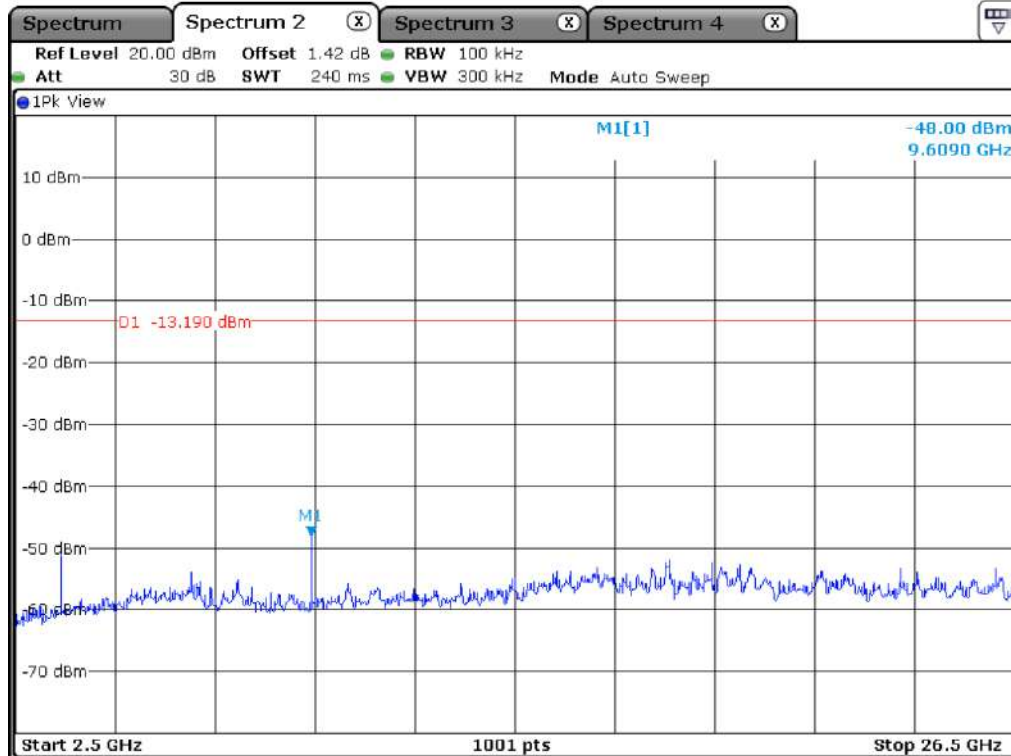
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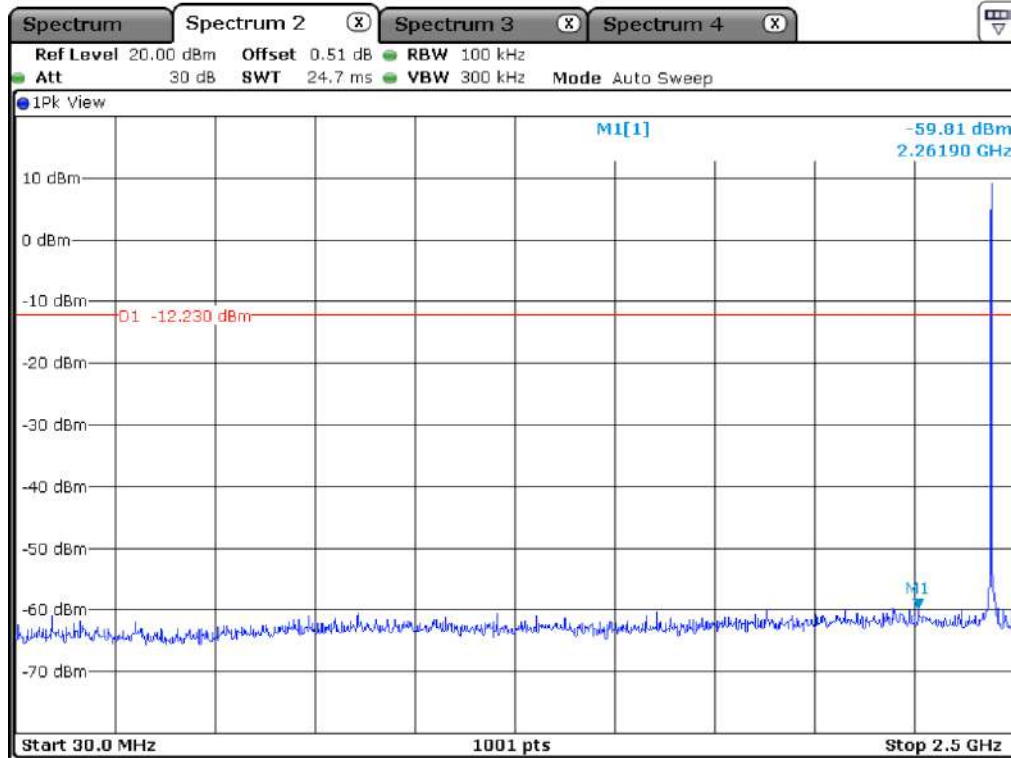
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



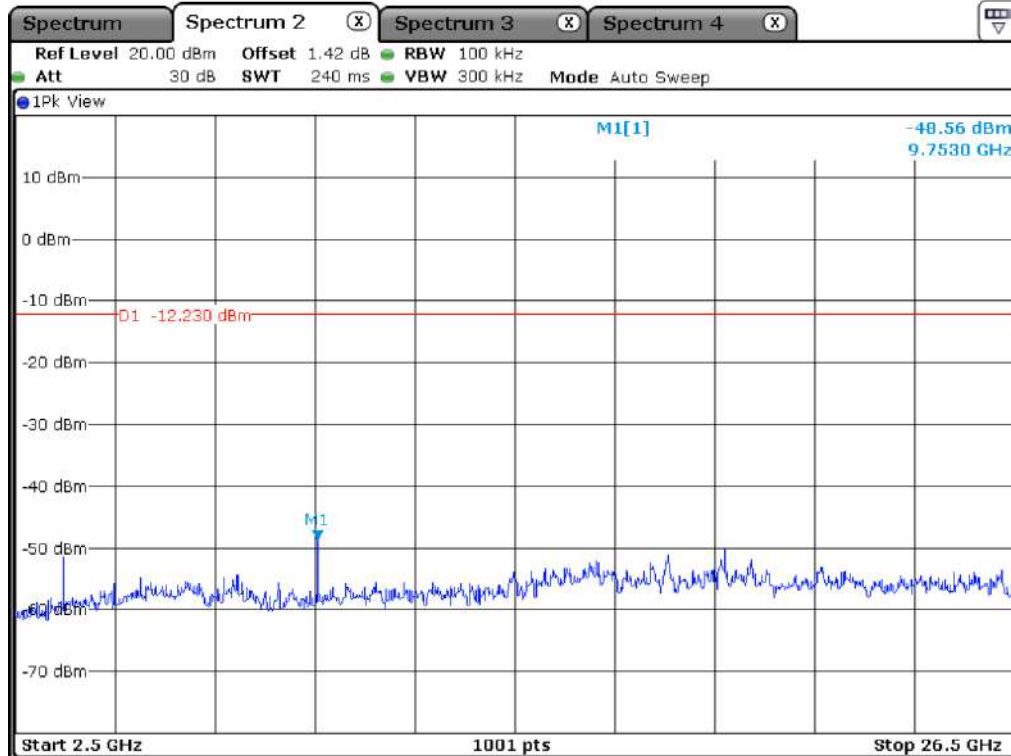
Low Channel



Low Channel



Middle Channel



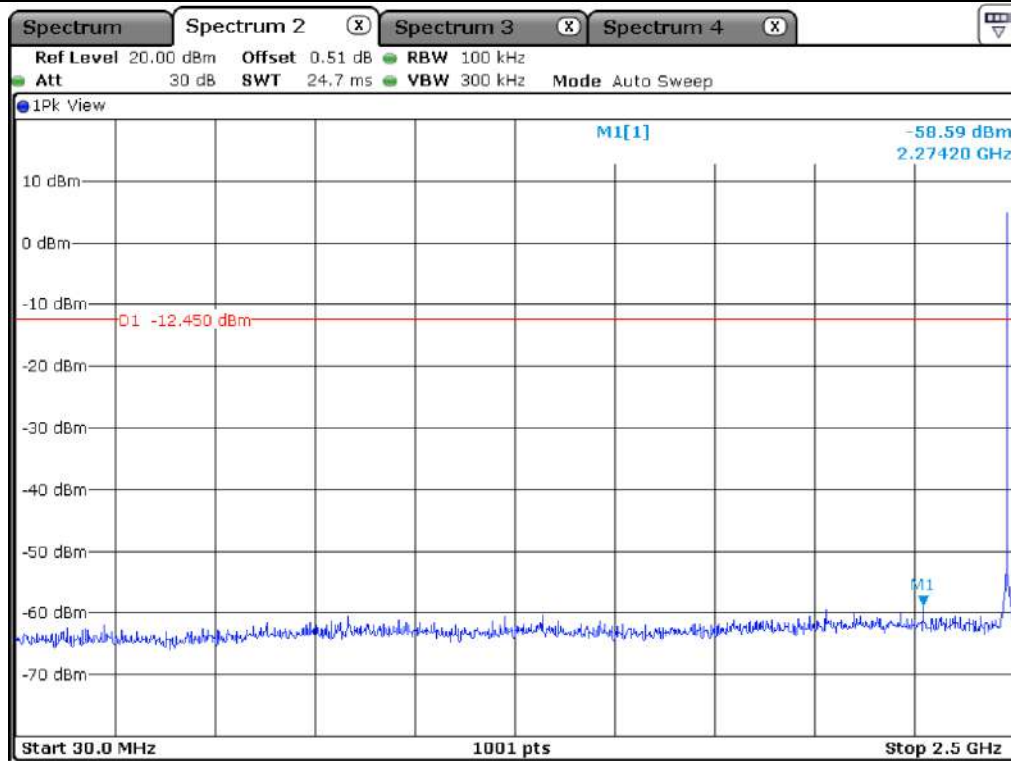
Middle Channel

This Report is not correlated with the authentication of KOLAS

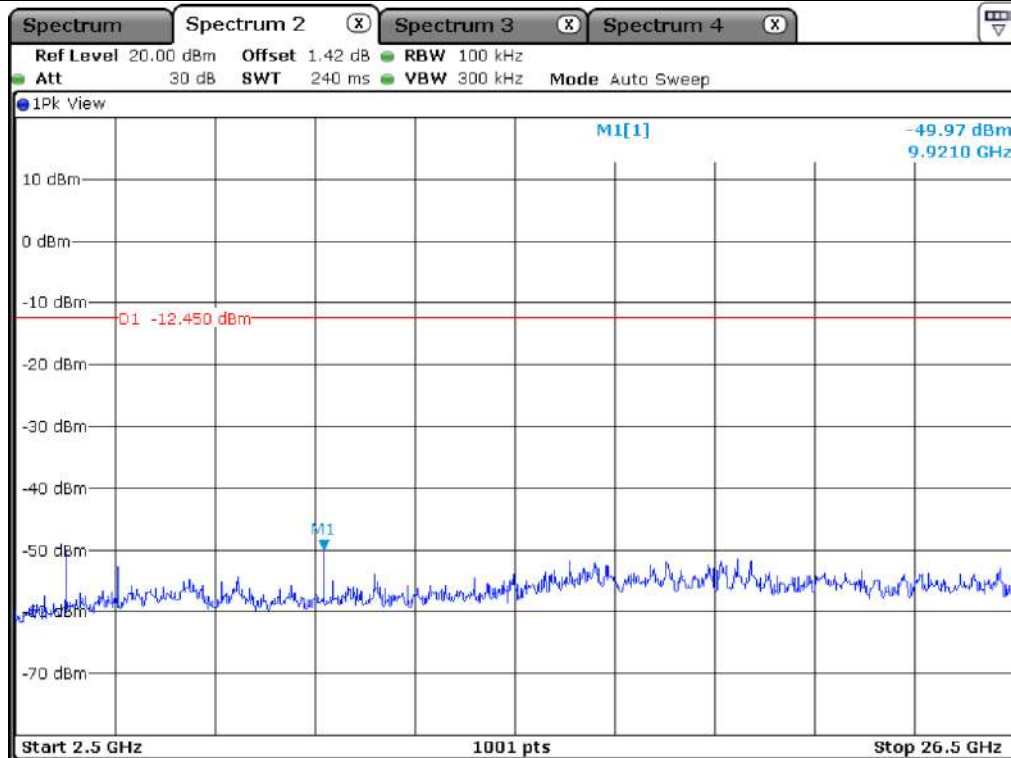
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High Channel



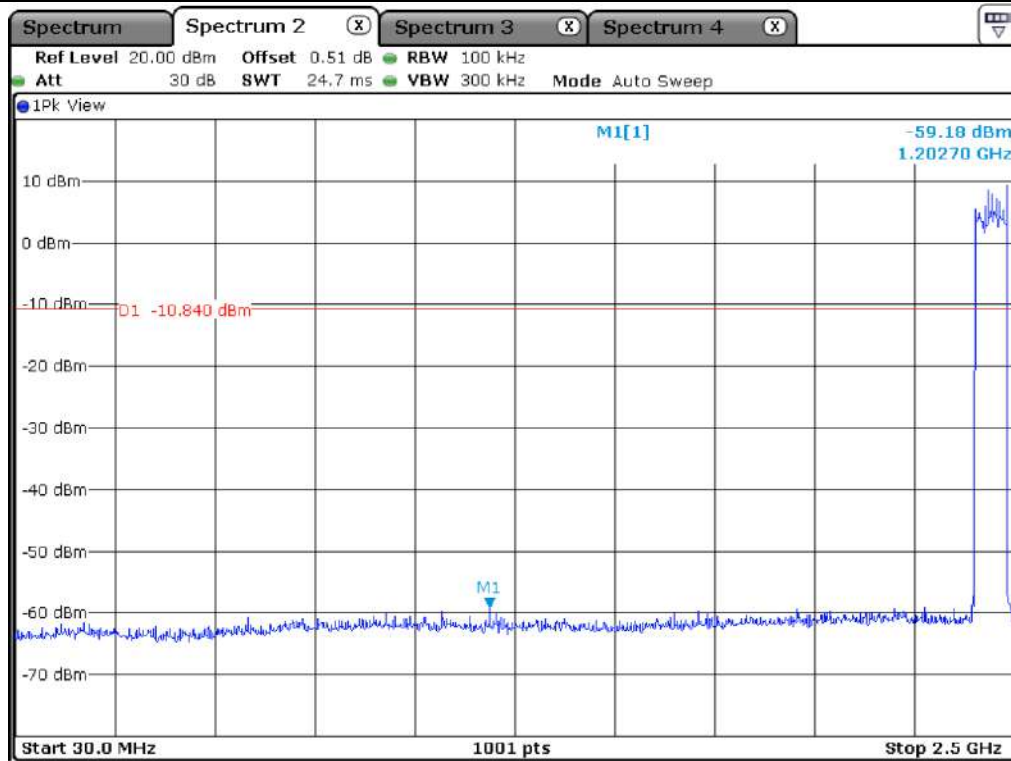
High Channel

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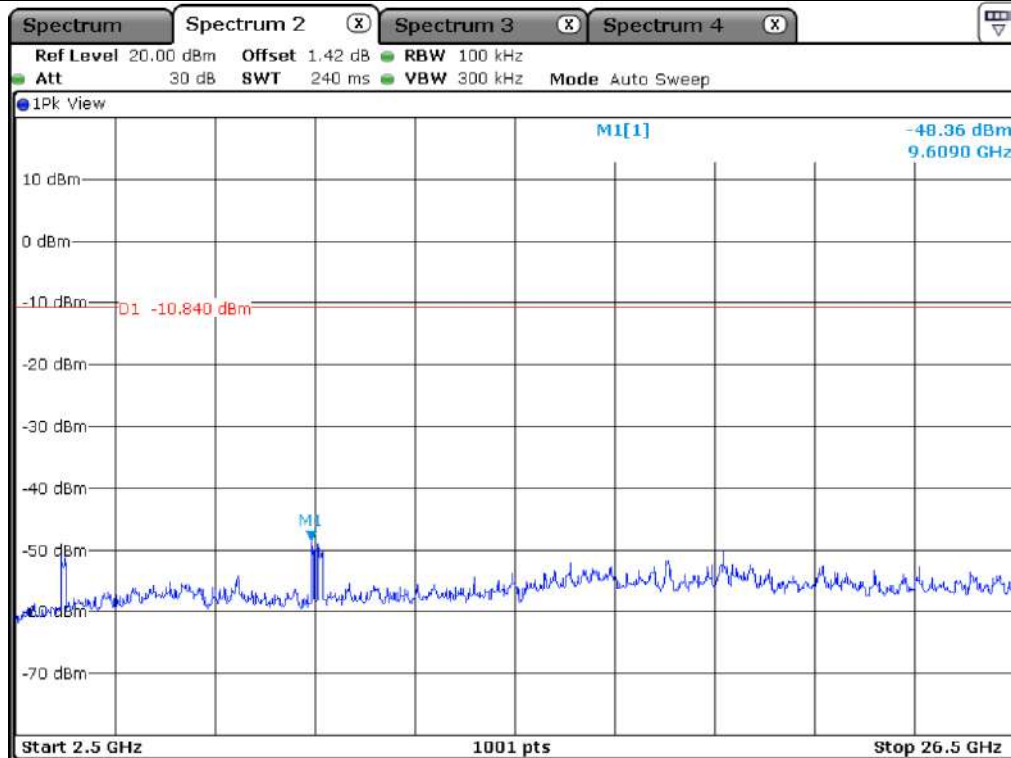
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Hopping Mode



Hopping Mode

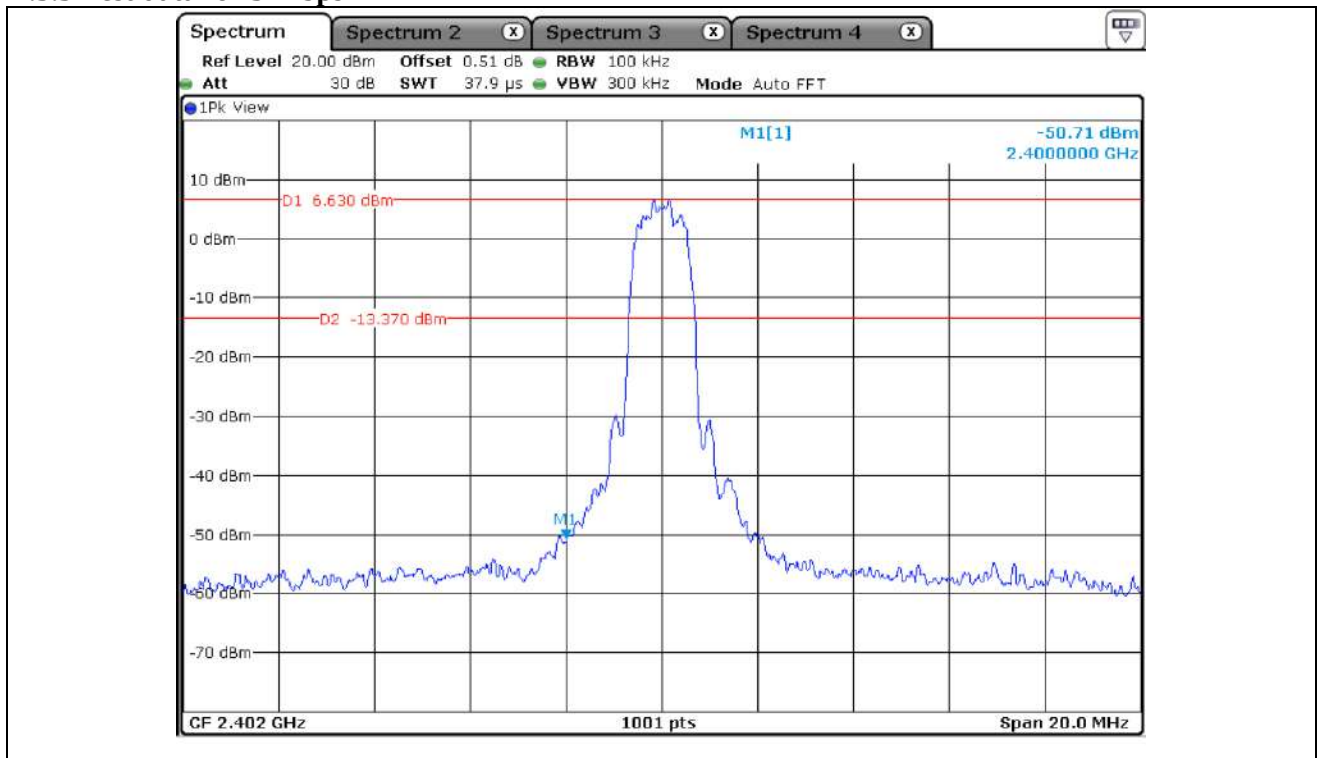
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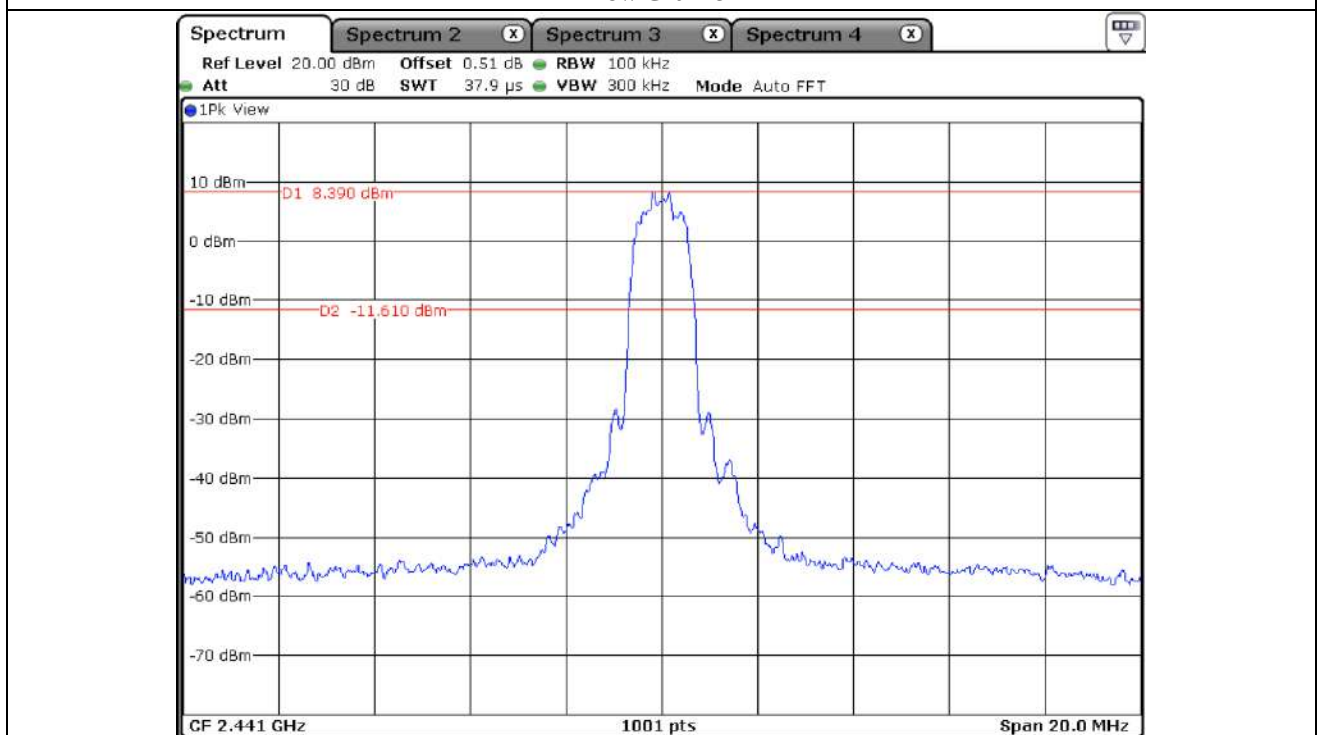
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12.5.3 Test data for 3 Mbps



Low Channel



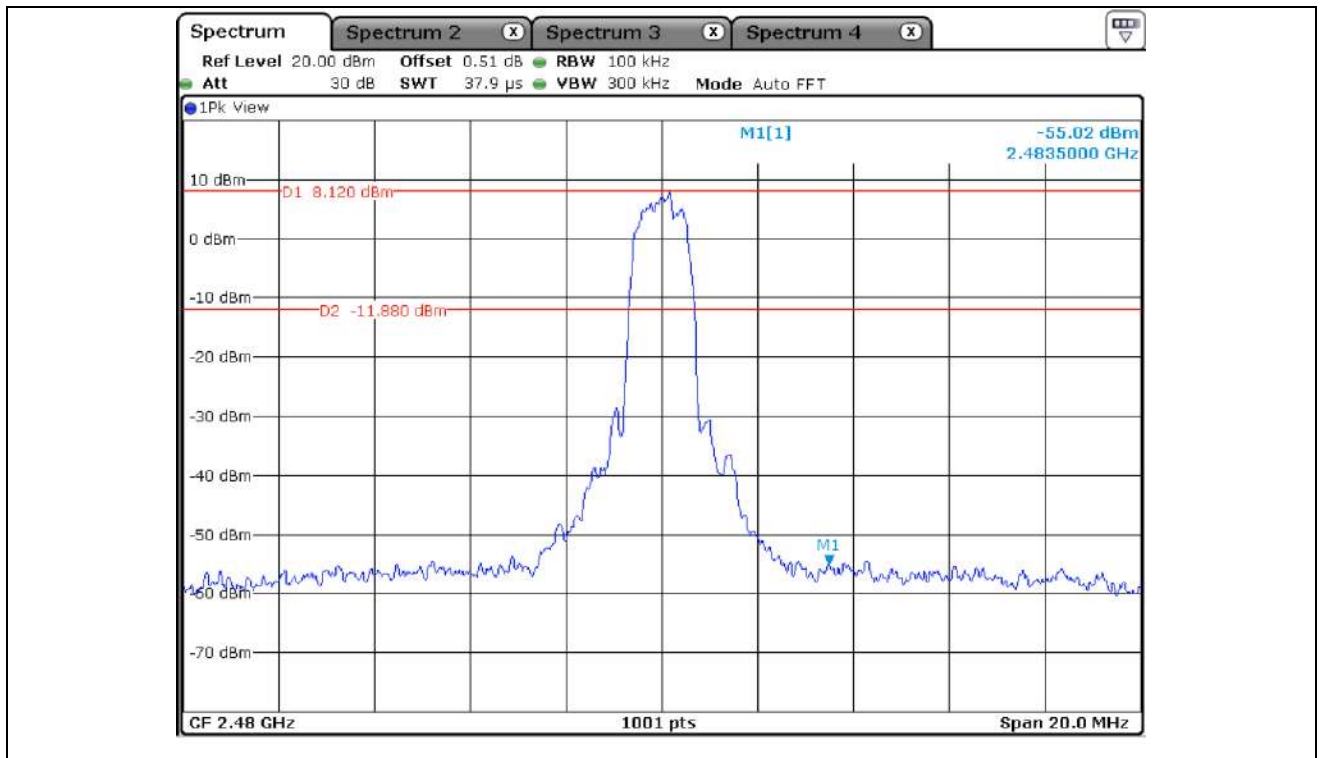
Middle Channel

This Report is not correlated with the authentication of KOLAS

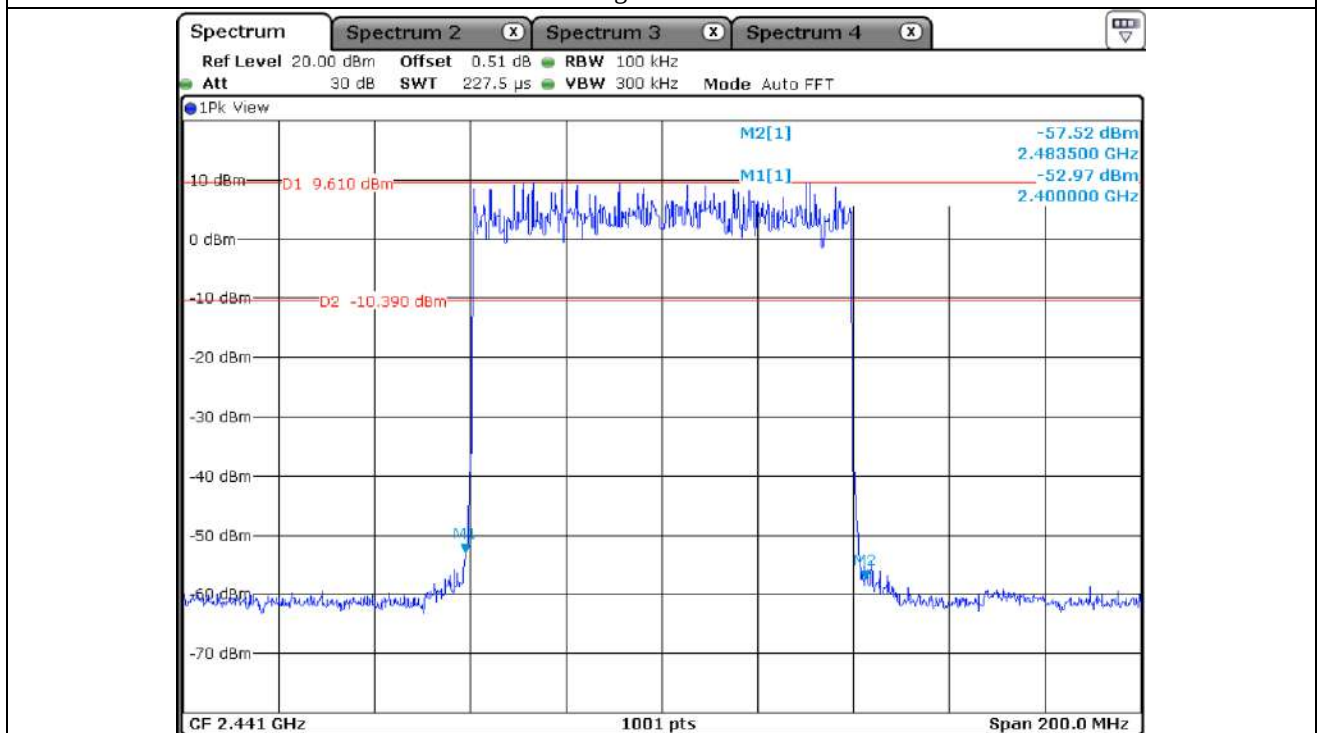
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High Channel



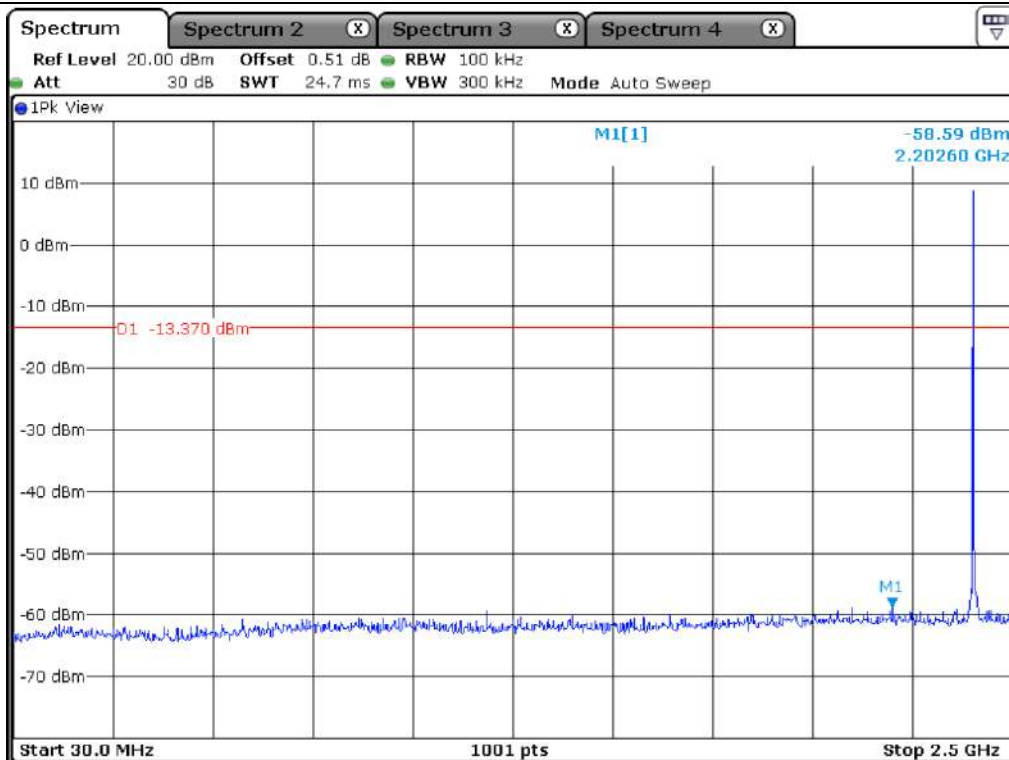
Hopping Mode

This Report is not correlated with the authentication of KOLAS

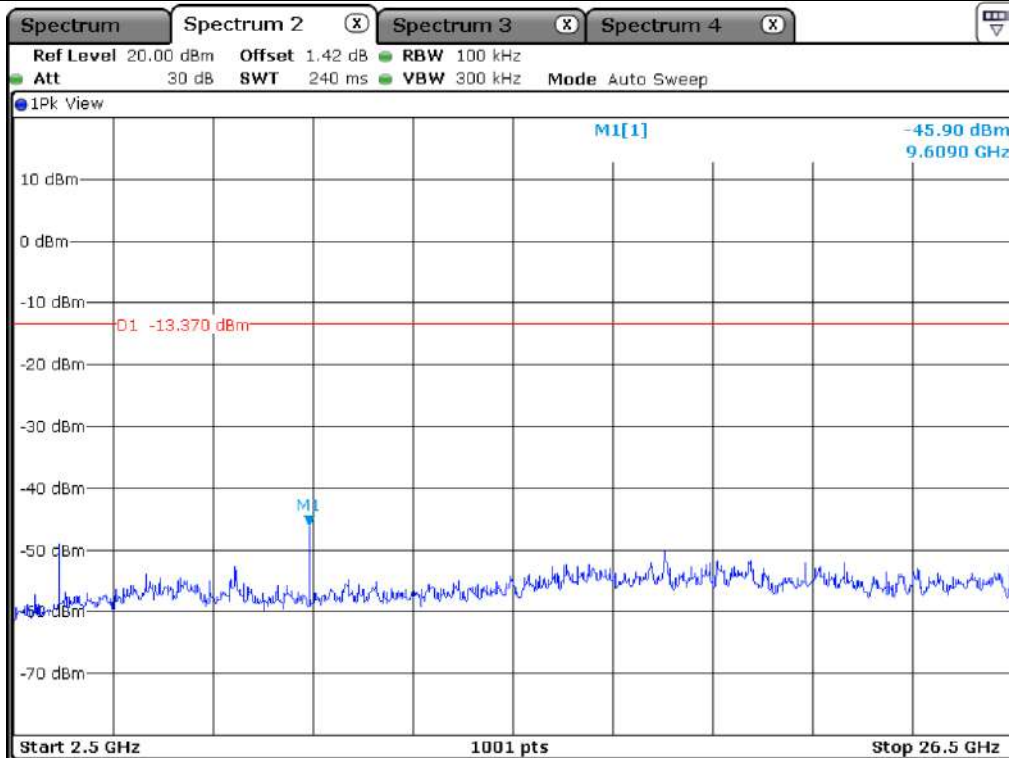
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Low Channel



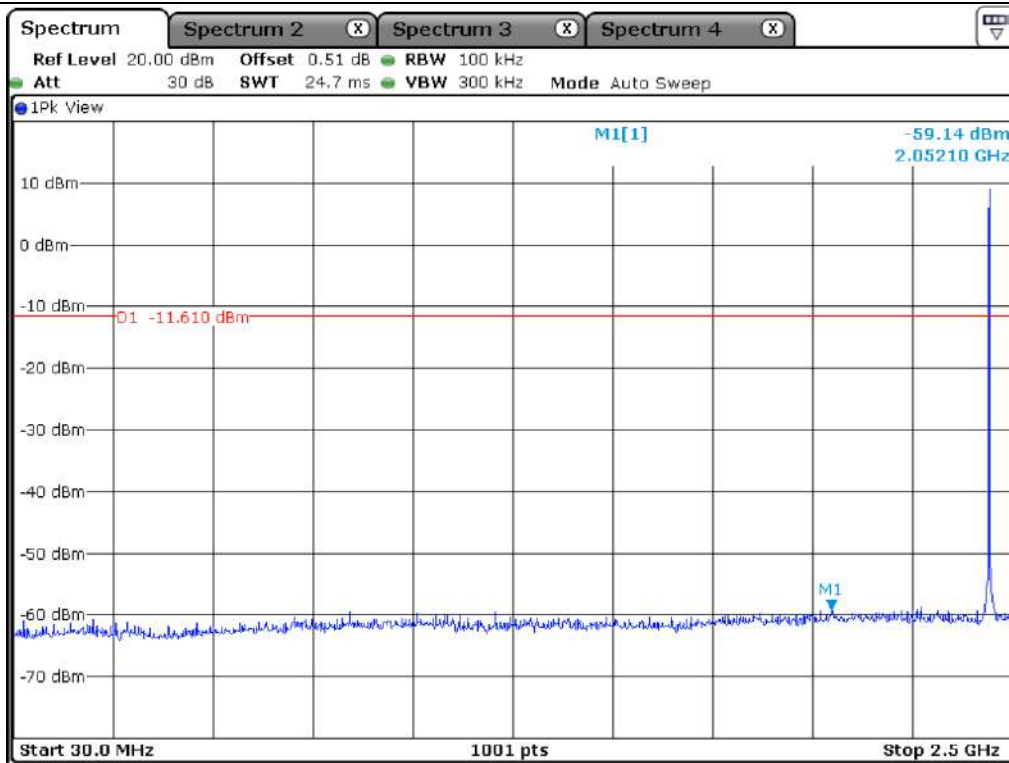
Low Channel

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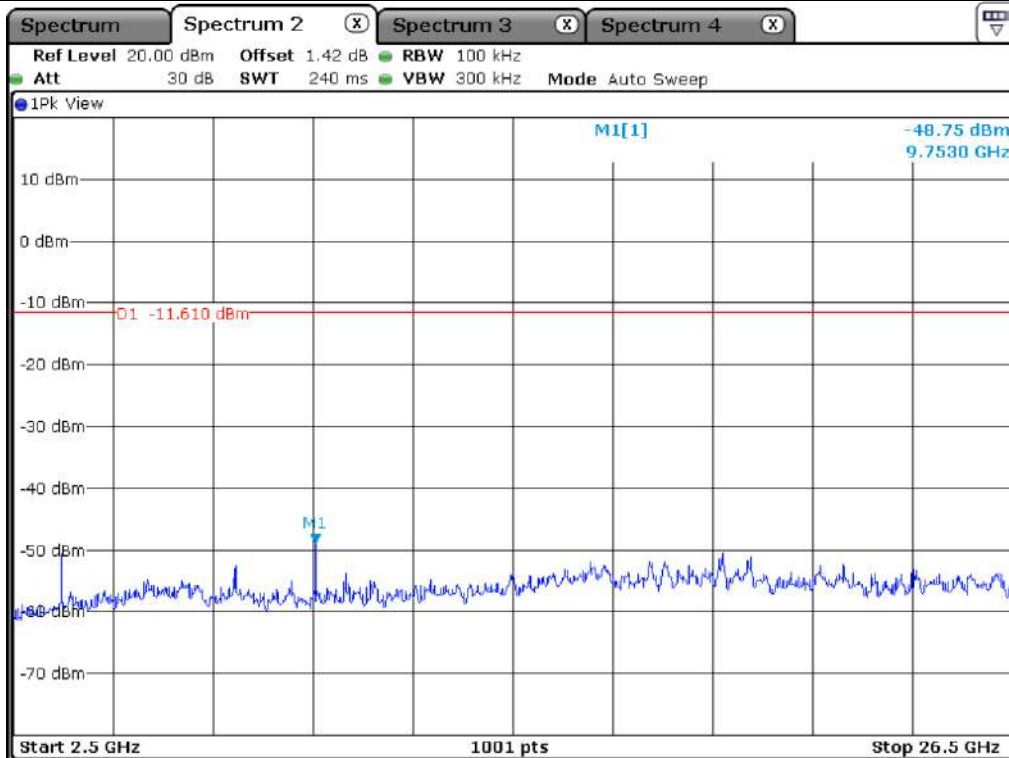
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Middle Channel



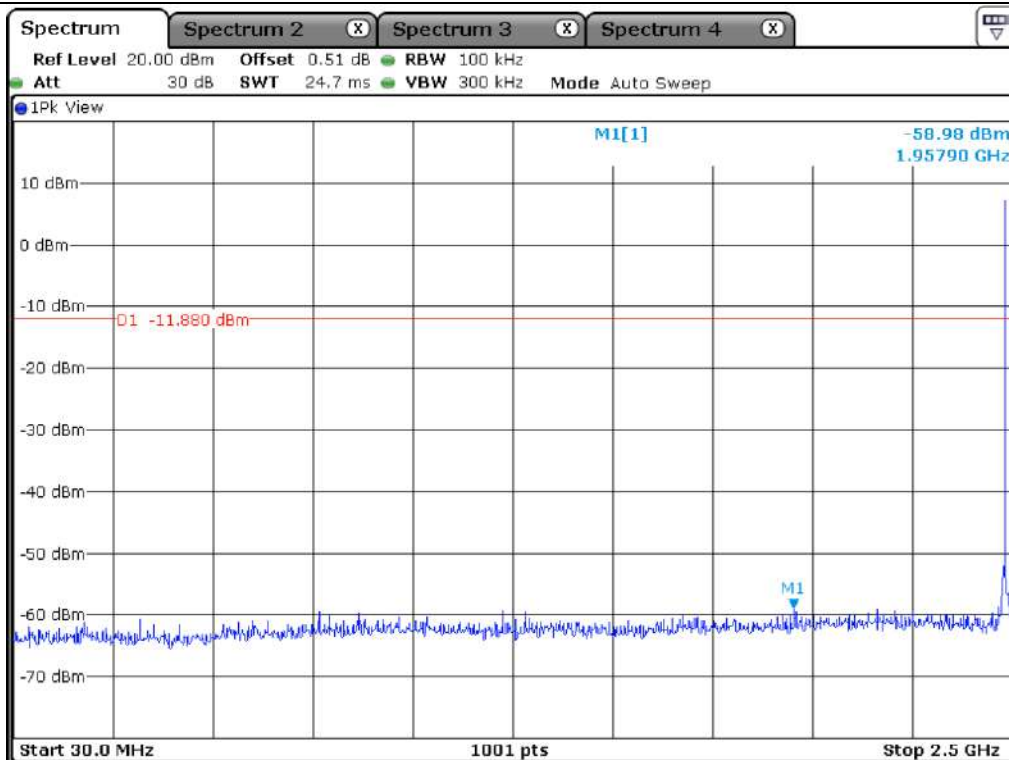
Middle Channel

This Report is not correlated with the authentication of KOLAS

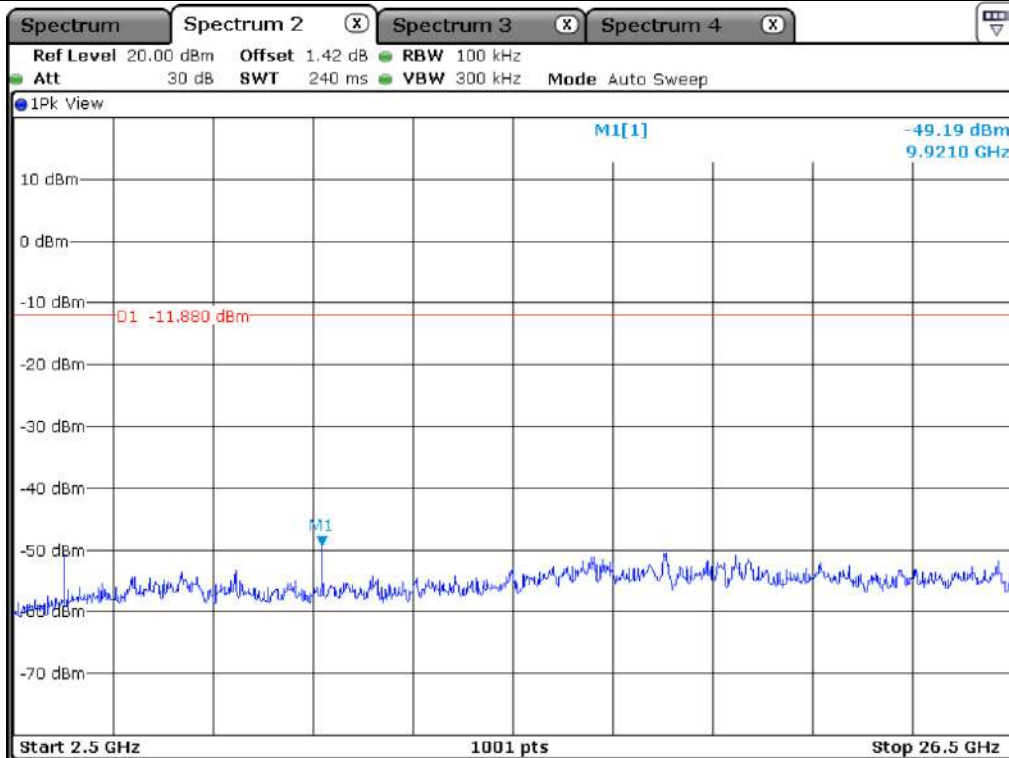
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High Channel



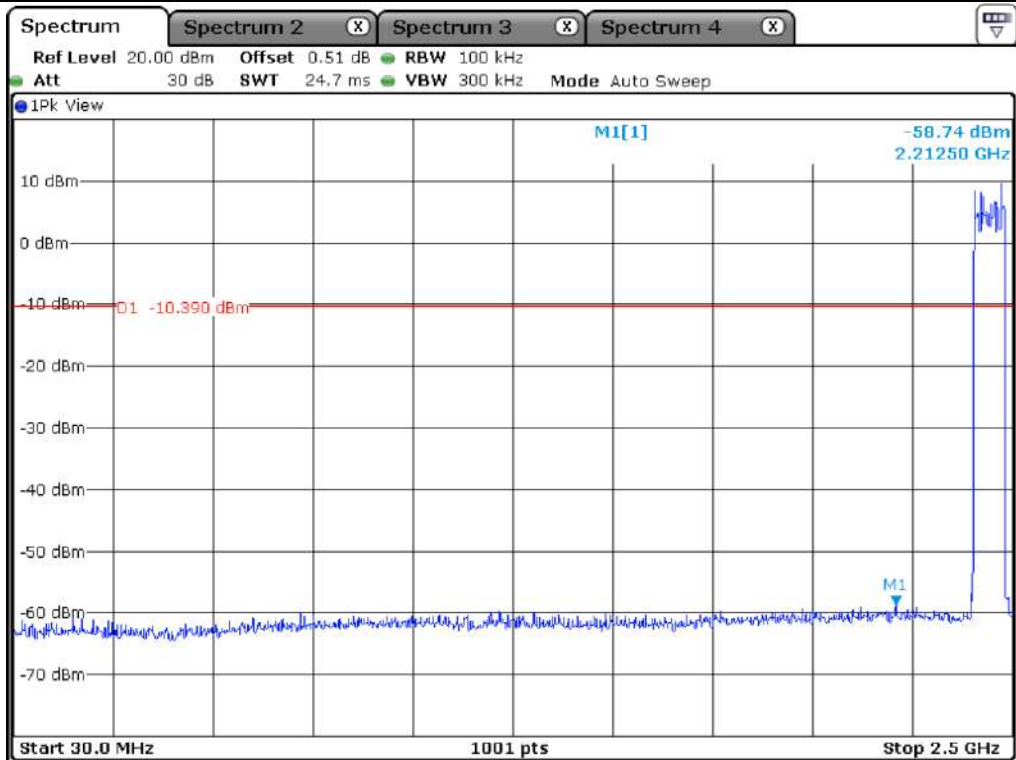
High Channel

This Report is not correlated with the authentication of KOLAS

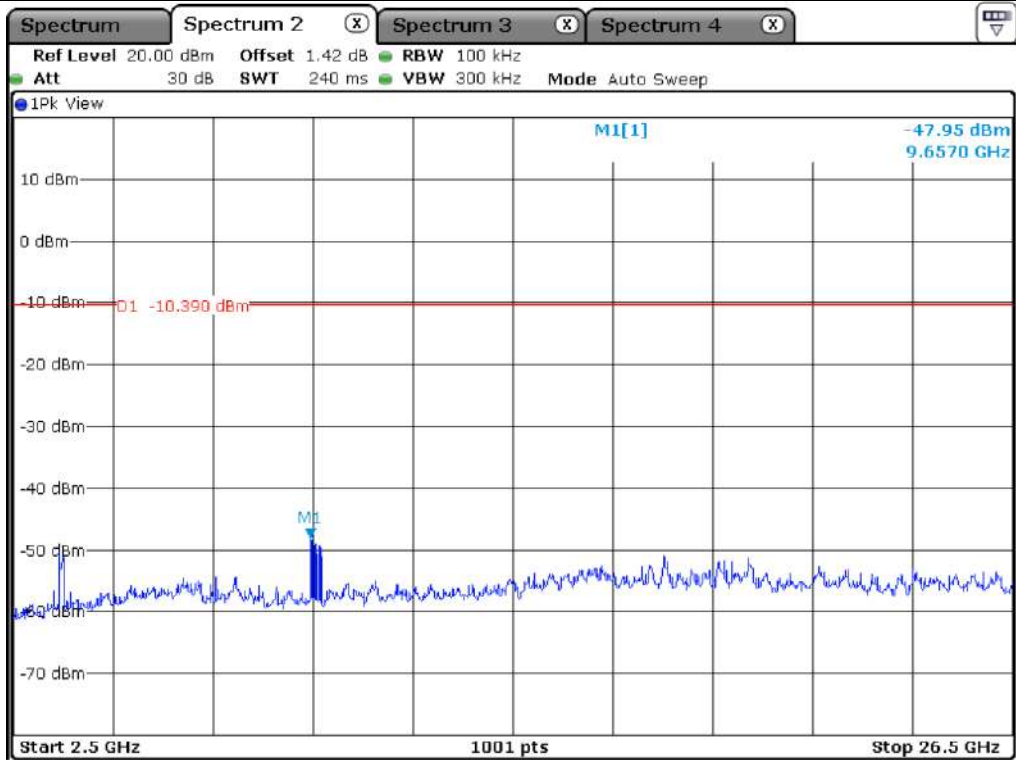
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Hopping Mode



Hopping Mode

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12.6 Test data for Transmitting mode radiated emission

12.6.1 Radiated Emission which fall in the Restricted Band

12.6.1.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 57.60 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 368.040	48.53	Peak	H	27.60	7.23	-	41.90	41.46	74.00	32.54
2 336.830	39.55	Average	H	27.60	7.23	2.40	41.90	34.88	54.00	19.12
2 345.360	47.95	Peak	V	27.60	7.23	-	41.90	40.88	74.00	33.12
2 351.220	39.03	Average	V	27.60	7.23	2.40	41.90	34.36	54.00	19.64
Test Data for High Channel										
2 486.137	62.54	Peak	H	27.40	7.35	-	41.70	55.59	74.00	18.41
2 483.500	50.43	Average	H	27.40	7.35	2.40	41.70	45.88	54.00	8.12
2 483.500	61.58	Peak	V	27.40	7.35	-	41.70	54.63	74.00	19.37
2 483.500	50.12	Average	V	27.40	7.35	2.40	41.70	45.57	54.00	8.43

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

12.6.1.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 57.60 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 385.686	49.66	Peak	H	27.60	7.23	-	41.90	42.59	74.00	31.41
2 339.360	39.83	Average	H	27.60	7.23	2.40	41.90	35.16	54.00	18.84
2 351.653	49.51	Peak	V	27.60	7.23	-	41.90	42.44	74.00	31.56
2 334.551	39.16	Average	V	27.60	7.23	2.40	41.90	34.49	54.00	19.51
Test Data for High Channel										
2 483.500	67.82	Peak	H	27.40	7.35	-	41.70	60.87	74.00	13.13
2 483.500	54.85	Average	H	27.40	7.35	2.40	41.70	50.30	54.00	3.70
2 483.500	67.35	Peak	V	27.40	7.35	-	41.70	60.40	74.00	13.60
2 483.500	54.15	Average	V	27.40	7.35	2.40	41.70	49.60	54.00	4.40

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

12.6.1.3 Test data for 3 Mbps

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 57.20 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 330.082	49.14	Peak	H	27.60	7.23	-	41.90	42.07	74.00	31.93
2 338.030	39.77	Average	H	27.60	7.23	2.43	41.90	35.13	54.00	18.87
2 341.510	48.96	Peak	V	27.60	7.23	-	41.90	41.89	74.00	32.11
2 339.330	39.61	Average	V	27.60	7.23	2.43	41.90	34.97	54.00	19.03
Test Data for High Channel										
2 483.500	67.46	Peak	H	27.40	7.35	-	41.70	60.51	74.00	13.49
2 483.500	54.91	Average	H	27.40	7.35	2.43	41.70	50.39	54.00	3.61
2 483.500	66.89	Peak	V	27.40	7.35	-	41.70	59.94	74.00	14.06
2 483.500	54.31	Average	V	27.40	7.35	2.43	41.70	49.79	54.00	4.21

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

12.6.2.1 Test data for 1 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 57.60 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.000	45.10	Peak	H	31.20	9.48	-	41.30	44.48	74.00	29.52
4 804.000	35.21	Average	H	31.20	9.48	2.40	41.30	36.99	54.00	17.01
4 804.000	45.15	Peak	V	31.20	9.48	-	41.30	44.53	74.00	29.47
4 804.000	35.11	Average	V	31.20	9.48	2.40	41.30	36.89	54.00	17.11
Test Data for Middle Channel										
4 882.000	45.34	Peak	H	31.20	9.56	-	41.30	44.80	74.00	29.20
4 882.000	35.19	Average	H	31.20	9.56	2.40	41.30	37.05	54.00	16.95
4 882.000	45.31	Peak	V	31.20	9.56	-	41.30	44.77	74.00	29.23
4 882.000	35.18	Average	V	31.20	9.56	2.40	41.30	37.04	54.00	16.96
Test Data for High Channel										
4 960.000	45.19	Peak	H	31.30	9.61	-	41.50	44.60	74.00	29.40
4 960.000	35.32	Average	H	31.30	9.61	2.40	41.50	37.13	54.00	16.87
4 960.000	45.28	Peak	V	31.30	9.61	-	41.50	44.69	74.00	29.31
4 960.000	35.11	Average	V	31.30	9.61	2.40	41.50	36.92	54.00	17.08

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

12.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 57.60 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.000	45.61	Peak	H	31.20	9.48	-	41.30	44.99	74.00	29.01
4 804.000	35.34	Average	H	31.20	9.48	2.40	41.30	37.12	54.00	16.88
4 804.000	45.41	Peak	V	31.20	9.48	-	41.30	44.79	74.00	29.21
4 804.000	35.28	Average	V	31.20	9.48	2.40	41.30	37.06	54.00	16.94
Test Data for Middle Channel										
4 882.000	45.38	Peak	H	31.20	9.56	-	41.30	44.84	74.00	29.16
4 882.000	35.31	Average	H	31.20	9.56	2.40	41.30	37.17	54.00	16.83
4 882.000	45.29	Peak	V	31.20	9.56	-	41.30	44.75	74.00	29.25
4 882.000	35.28	Average	V	31.20	9.56	2.40	41.30	37.14	54.00	16.86
Test Data for High Channel										
4 960.000	45.16	Peak	H	31.30	9.61	-	41.50	44.57	74.00	29.43
4 960.000	35.33	Average	H	31.30	9.61	2.40	41.50	37.14	54.00	16.86
4 960.000	45.36	Peak	V	31.30	9.61	-	41.50	44.77	74.00	29.23
4 960.000	35.19	Average	V	31.30	9.61	2.40	41.50	37.00	54.00	17.00

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

12.6.2.3 Test data for 3 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 57.20 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	AMP Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.000	45.19	Peak	H	31.20	9.48	-	41.30	44.57	74.00	29.43
4 804.000	35.33	Average	H	31.20	9.48	2.43	41.30	37.14	54.00	16.86
4 804.000	45.23	Peak	V	31.20	9.48	-	41.30	44.61	74.00	29.39
4 804.000	35.16	Average	V	31.20	9.48	2.43	41.30	36.97	54.00	17.03
Test Data for Middle Channel										
4 882.000	45.28	Peak	H	31.20	9.56	-	41.30	44.74	74.00	29.26
4 882.000	35.29	Average	H	31.20	9.56	2.43	41.30	37.18	54.00	16.82
4 882.000	45.16	Peak	V	31.20	9.56	-	41.30	44.62	74.00	29.38
4 882.000	35.22	Average	V	31.20	9.56	2.43	41.30	37.11	54.00	16.89
Test Data for High Channel										
4 960.000	45.36	Peak	H	31.30	9.61	-	41.50	44.77	74.00	29.23
4 960.000	35.18	Average	H	31.30	9.61	2.43	41.50	37.02	54.00	16.98
4 960.000	45.19	Peak	V	31.30	9.61	-	41.50	44.60	74.00	29.40
4 960.000	35.16	Average	V	31.30	9.61	2.43	41.50	37.00	54.00	17.00

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Factor} + \text{Correction Factor}$$

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

13.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

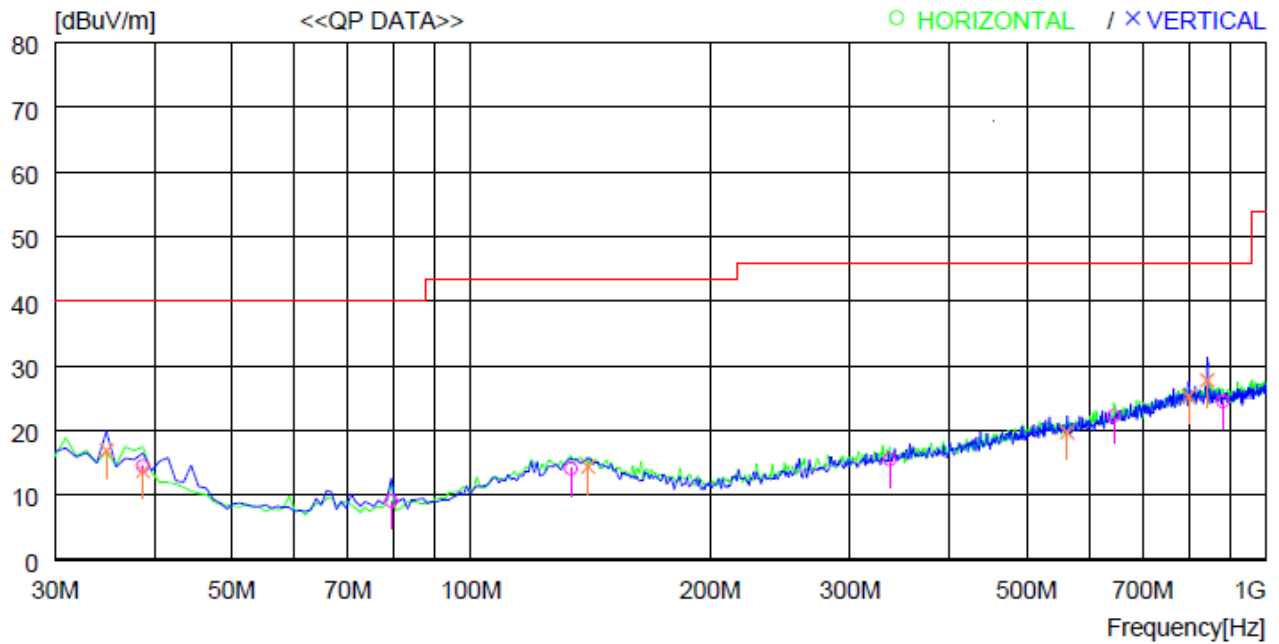
13.3 Test Date

May 10, 2021 ~ May 26, 2021

13.4 Test data for 30 MHz ~ 1 000 MHz

13.4.1 Test data for Bluetooth Mode

- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	38.730	28.1	17.7	0.7	32.0	14.5	40.0	25.5	300	38
2	79.470	27.2	12.9	1.0	32.0	9.1	40.0	30.9	100	0
3	133.790	25.6	19.2	1.3	32.0	14.1	43.5	29.4	200	358
4	336.520	25.7	19.6	2.2	32.0	15.5	46.0	30.5	300	38
5	644.007	26.7	24.8	3.2	32.4	22.3	46.0	23.7	200	9
6	882.619	25.1	27.3	3.9	31.8	24.5	46.0	21.5	200	359
----- Vertical -----										
7	34.850	29.1	19.2	0.6	32.0	16.9	40.0	23.1	400	359
8	38.730	27.3	17.7	0.7	32.0	13.7	40.0	26.3	400	69
9	140.580	25.6	19.4	1.4	32.0	14.4	43.5	29.1	300	181
10	562.529	25.4	23.8	2.9	32.4	19.7	46.0	26.3	300	181
11	799.202	26.1	27.1	4.1	32.0	25.3	46.0	20.7	400	359
12	843.821	28.5	27.2	4.0	31.9	27.8	46.0	18.2	400	359

13.4.2 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz + WLAN 5 GHz)

Humidity Level : 44 % R.H.

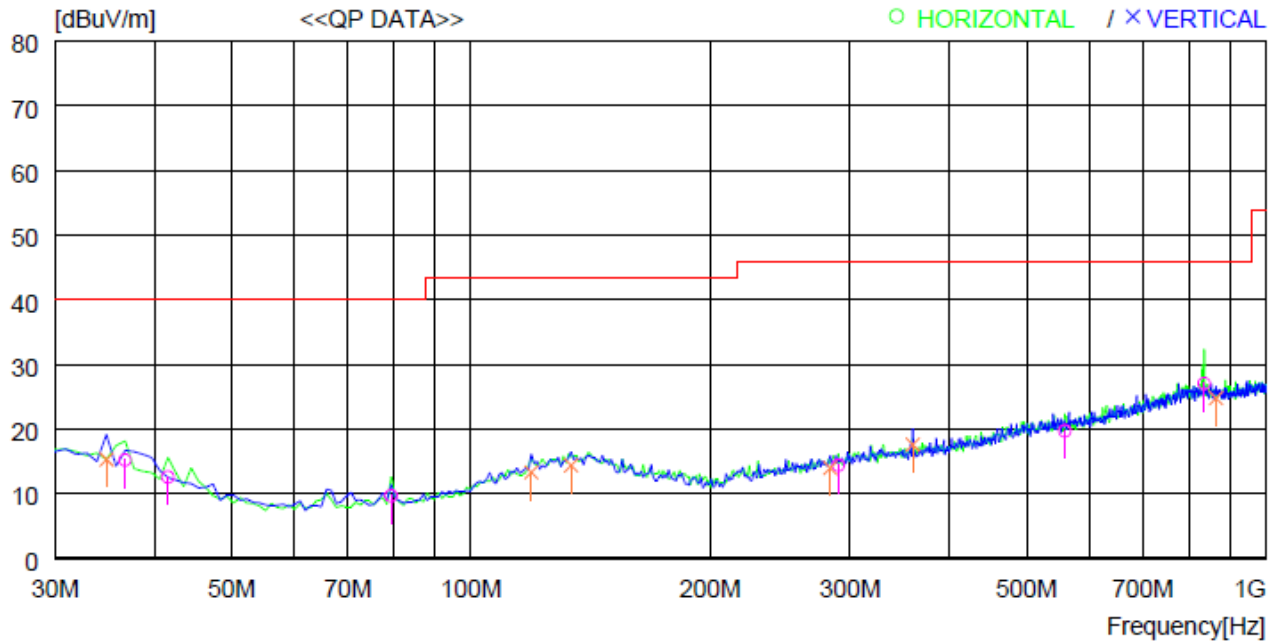
Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	36.790	28.2	18.4	0.6	32.0	15.2	40.0	24.8	200	293
2	41.640	27.4	16.5	0.7	32.0	12.6	40.0	27.4	400	9
3	79.470	27.8	12.9	1.0	32.0	9.7	40.0	30.3	400	125
4	289.960	25.6	18.8	2.0	32.0	14.4	46.0	31.6	300	3
5	558.649	25.5	23.7	2.9	32.4	19.7	46.0	26.3	200	0
6	836.061	27.8	27.2	4.0	31.9	27.1	46.0	18.9	300	114
----- Vertical -----										
7	34.850	27.5	19.2	0.6	32.0	15.3	40.0	24.7	400	0
8	119.240	25.6	18.5	1.2	32.0	13.3	43.5	30.2	300	359
9	133.790	25.9	19.2	1.3	32.0	14.4	43.5	29.1	400	0
10	283.170	25.4	18.6	2.0	32.0	14.0	46.0	32.0	100	0
11	359.800	27.6	19.9	2.2	32.1	17.6	46.0	28.4	400	0
12	865.160	25.3	27.3	4.0	31.8	24.8	46.0	21.2	200	278

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13.5 Test data for Below 30 MHz

- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.								

13.6 Test data for above 1 GHz

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.								

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 22 °C
Relative humidity : 44 % R.H.

14.2 Test set-up

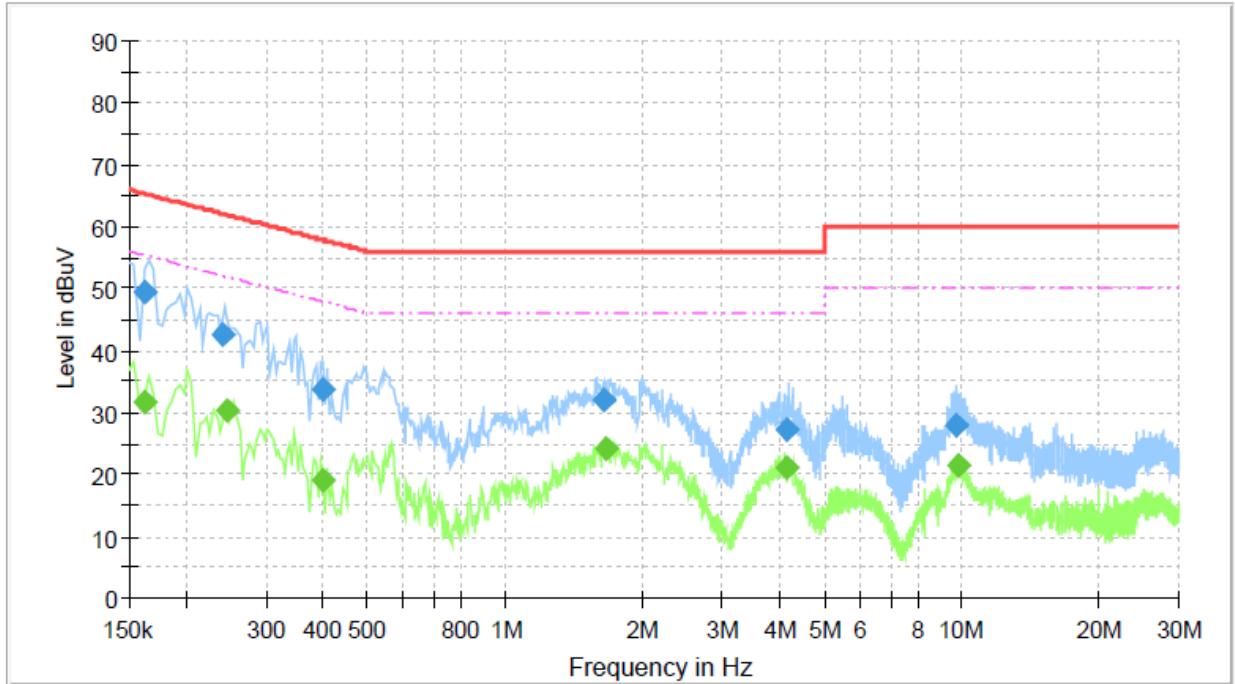
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a $50\ \Omega$ / $50\ \mu\text{H}$ + $5\ \Omega$ Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

14.3 Test Date

May 10, 2021 ~ May 26, 2021

14.4 Test data for Bluetooth

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : LIVE LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.164	27.38	---	56.00	28.62	3000.0	9.0	L1	10.05
9.793	28.09	---	60.00	31.91	3000.0	9.0	L1	10.32
1.645	32.09	---	56.00	23.91	3000.0	9.0	L1	10.00
0.398	33.63	---	57.91	24.28	3000.0	9.0	L1	9.93
0.242	42.70	---	62.04	19.35	3000.0	9.0	L1	9.93
0.161	49.48	---	65.39	15.91	3000.0	9.0	L1	9.92
0.161	---	31.67	55.39	23.71	3000.0	9.0	L1	9.92
0.246	---	30.44	51.91	21.47	3000.0	9.0	L1	9.93
0.399	---	19.15	47.89	28.74	3000.0	9.0	L1	9.93
1.673	---	24.14	46.00	21.86	3000.0	9.0	L1	10.00
4.164	---	21.03	46.00	24.97	3000.0	9.0	L1	10.05
9.804	---	21.35	50.00	28.65	3000.0	9.0	L1	10.32

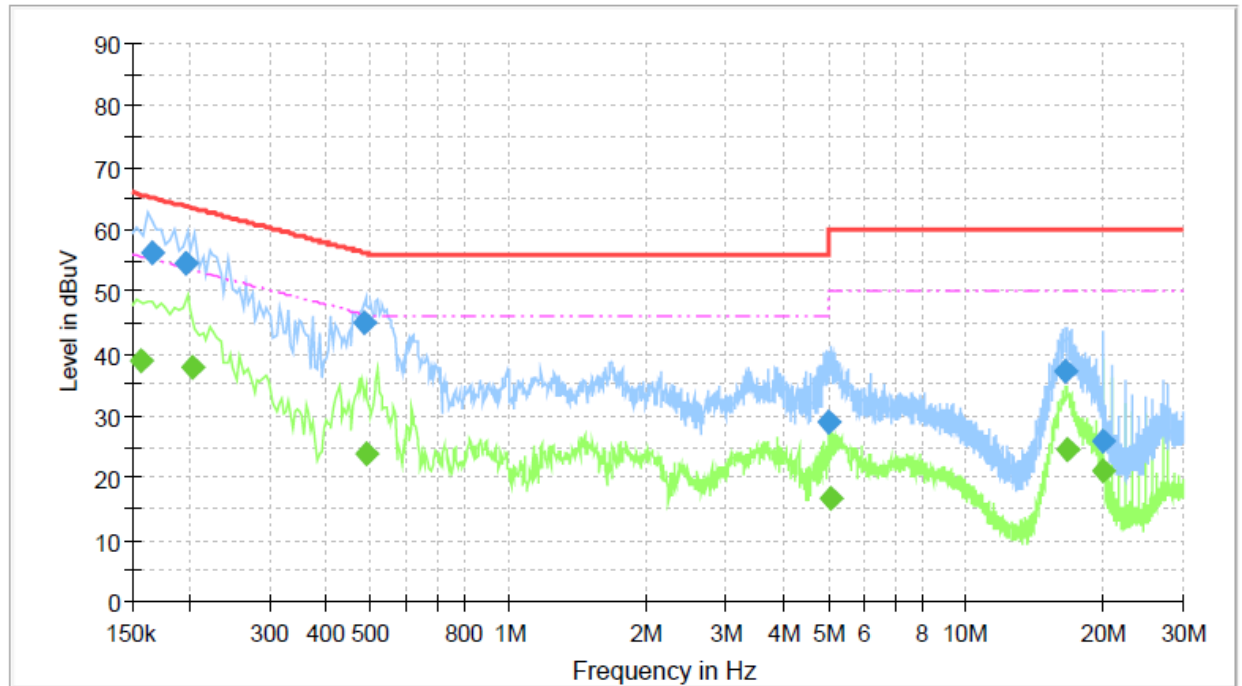
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-. Tested Line : NEUTRAL LINE



Final Result

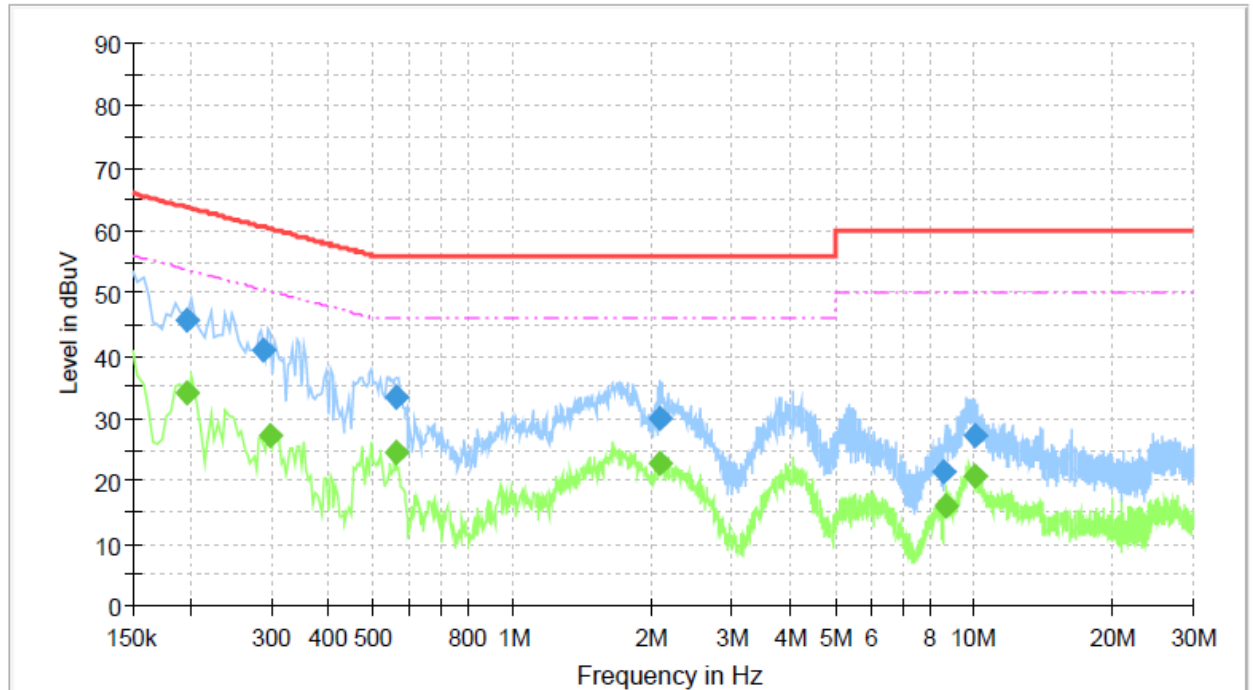
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
19.957	25.83	---	60.00	34.17	3000.0	9.0	N	10.78
5.012	29.05	---	60.00	30.96	3000.0	9.0	N	10.09
16.541	37.23	---	60.00	22.77	3000.0	9.0	N	10.67
0.485	45.10	---	56.25	11.15	3000.0	9.0	N	9.94
0.198	54.66	---	63.72	9.05	3000.0	9.0	N	9.94
0.167	56.33	---	65.13	8.80	3000.0	9.0	N	9.94
0.157	---	38.78	55.60	16.82	3000.0	9.0	N	9.94
0.203	---	37.76	53.51	15.75	3000.0	9.0	N	9.94
0.491	---	23.78	46.15	22.38	3000.0	9.0	N	9.94
5.076	---	16.56	50.00	33.44	3000.0	9.0	N	10.10
16.653	---	24.69	50.00	25.31	3000.0	9.0	N	10.68
19.957	---	20.99	50.00	29.01	3000.0	9.0	N	10.78

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

14.5 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz + WLAN 5 GHz)

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : LIVE LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
8.627	21.59	---	60.00	38.41	3000.0	9.0	L1	10.26
10.077	27.13	---	60.00	32.87	3000.0	9.0	L1	10.33
2.081	30.14	---	56.00	25.86	3000.0	9.0	L1	10.02
0.560	33.32	---	56.00	22.68	3000.0	9.0	L1	9.94
0.290	40.88	---	60.54	19.66	3000.0	9.0	L1	9.93
0.198	45.57	---	63.72	18.14	3000.0	9.0	L1	9.92
0.198	---	34.02	53.72	19.70	3000.0	9.0	L1	9.92
0.298	---	27.19	50.31	23.12	3000.0	9.0	L1	9.93
0.560	---	24.49	46.00	21.51	3000.0	9.0	L1	9.94
2.089	---	22.93	46.00	23.07	3000.0	9.0	L1	10.02
8.731	---	16.18	50.00	33.82	3000.0	9.0	L1	10.26
10.045	---	20.87	50.00	29.13	3000.0	9.0	L1	10.33

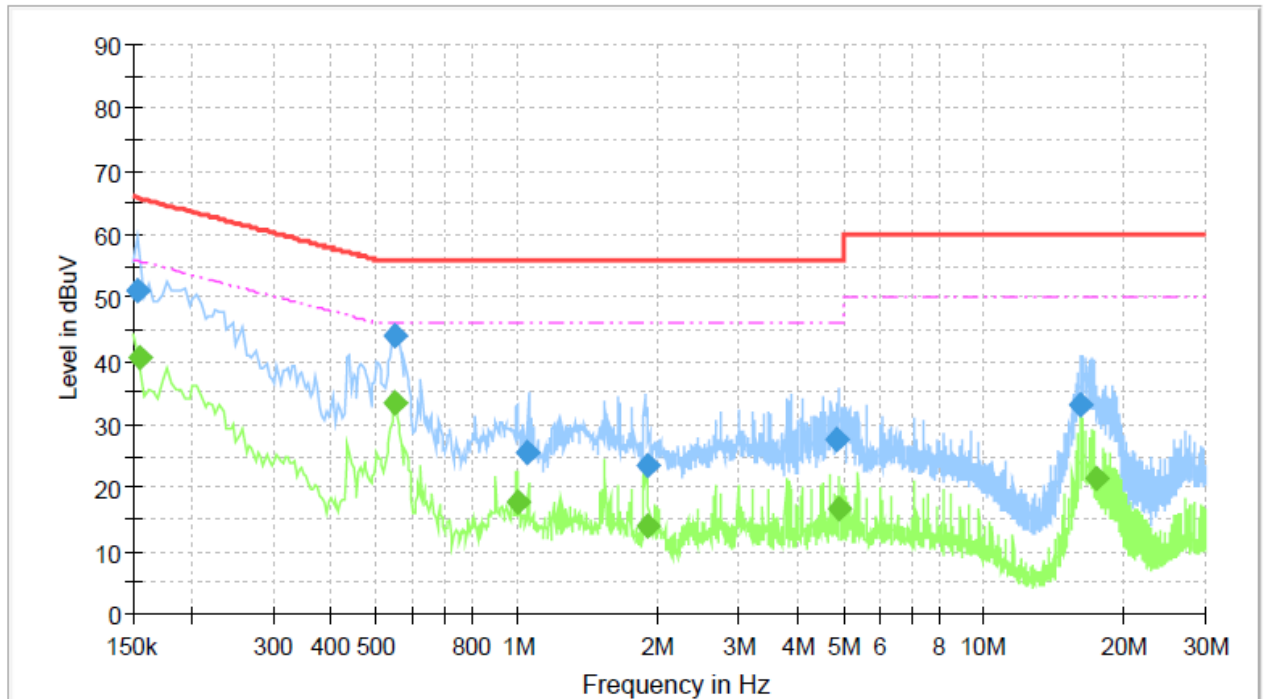
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-. Tested Line : NEUTRAL LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
1.899	23.39	---	56.00	32.61	3000.0	9.0	N	10.02
1.051	25.56	---	56.00	30.44	3000.0	9.0	N	9.99
4.865	27.45	---	56.00	28.55	3000.0	9.0	N	10.09
16.212	33.21	---	60.00	26.79	3000.0	9.0	N	10.66
0.545	43.82	---	56.00	12.18	3000.0	9.0	N	9.95
0.154	51.29	---	65.78	14.49	3000.0	9.0	N	9.94
0.155	---	40.41	55.75	15.34	3000.0	9.0	N	9.94
0.545	---	33.43	46.00	12.57	3000.0	9.0	N	9.95
1.000	---	17.58	46.00	28.42	3000.0	9.0	N	9.99
1.903	---	13.85	46.00	32.15	3000.0	9.0	N	10.02
4.877	---	16.59	46.00	29.41	3000.0	9.0	N	10.09
17.444	---	21.50	50.00	28.50	3000.0	9.0	N	10.70

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

15. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102177	Apr. 16, 2021 (1Y)
FSW43	Rohde & Schwarz	Signal Analyzer	104544	Jul. 15, 2020 (1Y)
ESW 44	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 23, 2021 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2020 (1Y)
PAM-118A	Com-Power	Pre-Amplifier	18040081	Oct. 12, 2020 (1Y)
PAM-840A	Com-Power	Pre-Amplifier	461339	Oct. 16, 2020 (1Y)
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2020 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Feb. 27, 2020 (2Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2021(1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Feb. 08, 2021 (1Y)
ESR3	Rohde & Schwarz	EMI TEST RECEIVER	102602	Mar. 15, 2021 (1Y)
NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 15, 2021 (1Y)
ESH3Z2	Rohde & Schwarz	PULSE LIMITER	357.8810.52	Mar. 15, 2021 (1Y)

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