

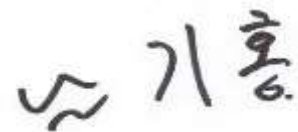
ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-209-RWD-063
Reception No. : 2008003233
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. : A3LWCA732M
Model Name : WCA732M
Serial number : N/A
Total page of Report : 87 pages (including this page)
Date of Incoming : August 20, 2020
Date of issue : September 21, 2020

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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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-209-RWD-063	September 21, 2020	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 : Youngjoong Noh / Principal Engineer
 Telephone No. : +82-31-277-0598
 FCC ID : A3LWCA732M
 Model Name : WCA732M
 Brand Name : 
 Serial Number : N/A
 Date : September 21, 2020

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-4112/ 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

3. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co Ltd, Model WCA732M (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 ~ 5 700 MHz (802.11a/n(HT20)/ac(VHT20))
		5 510 MHz ~ 5 670 MHz (802.11n(HT40)/ac(VHT40))
		5 530 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)

RF OUTPUT POWER	Bluetooth LE	1 Mbps	9.85 dBm
		2 Mbps	9.82 dBm
	Bluetooth	1 Mbps	9.93 dBm
		2 Mbps	9.60 dBm
		3 Mbps	9.67 dBm
	WLAN 2.4 GHz	Antenna 0	18.65 dBm(802.11b)
			15.81 dBm(802.11g)
			15.71 dBm(802.11n_HT20)
			13.39 dBm(802.11n_HT40)
		Antenna 1	18.55 dBm(802.11b)
15.40 dBm(802.11g)			
Multiple Antenna	15.14 dBm(802.11n_HT20)		
	13.25 dBm(802.11n_HT40)		
	18.41 dBm(802.11g)		
		18.21 dBm(802.11n_HT20)	
		16.31 dBm(802.11n_HT40)	

RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	12.21 dBm(802.11a) 11.95 dBm(802.11n_HT20) 10.15 dBm(802.11n_HT40) 9.97 dBm(802.11ac_VHT80)
		Antenna 1	12.42 dBm(802.11a) 12.11 dBm(802.11n_HT20) 10.14 dBm(802.11n_HT40) 9.84 dBm(802.11ac_VHT80)
		Multiple Antenna	15.33 dBm(802.11a) 15.01 dBm(802.11n_HT20) 13.16 dBm(802.11n_HT40) 12.92 dBm(802.11ac_VHT80)
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	13.65 dBm(802.11a) 13.57 dBm(802.11n_HT20) 11.60 dBm(802.11n_HT40) 11.17 dBm(802.11ac_VHT80)
		Antenna 1	12.18 dBm(802.11a) 11.88 dBm(802.11n_HT20) 10.35 dBm(802.11n_HT40) 9.71 dBm(802.11ac_VHT80)
		Multiple Antenna	15.83 dBm(802.11a) 15.64 dBm(802.11n_HT20) 13.81 dBm(802.11n_HT40) 13.51 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 470 MHz ~ 5 725 MHz Band	Antenna 0	14.11 dBm(802.11a) 13.95 dBm(802.11n_HT20) 12.16 dBm(802.11n_HT40) 11.80 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	12.10 dBm(802.11a) 12.27 dBm(802.11n_HT20) 10.69 dBm(802.11n_HT40) 11.65 dBm(802.11ac_VHT80)
		Antenna 1	11.16 dBm(802.11a) 10.89 dBm(802.11n_HT20) 11.38 dBm(802.11n_HT40) 10.95 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	13.12 dBm(802.11a) 13.00 dBm(802.11n_HT20) 10.79 dBm(802.11n_HT40) 12.23 dBm(802.11ac_VHT80)
		Multiple Antenna	15.89 dBm(802.11a) 15.69 dBm(802.11n_HT20) 14.66 dBm(802.11n_HT40) 14.41 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	15.65 dBm(802.11a) 15.66 dBm(802.11n_HT20) 13.75 dBm(802.11n_HT40) 14.96 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 725 MHz ~ 5 850 MHz Band	Antenna 0	13.21 dBm(802.11a) 12.93 dBm(802.11n_HT20) 11.03 dBm(802.11n_HT40) 10.95 dBm(802.11ac_VHT80)
		Antenna 0_Straddle	4.04 dBm(802.11a) 4.66 dBm(802.11n_HT20) -1.44 dBm(802.11n_HT40) -3.22 dBm(802.11ac_VHT80)
		Antenna 1	10.11 dBm(802.11a) 9.58 dBm(802.11n_HT20) 11.07 dBm(802.11n_HT40) 10.91 dBm(802.11ac_VHT80)
		Antenna 1_Straddle	5.07 dBm(802.11a) 5.45 dBm(802.11n_HT20) -1.40 dBm(802.11n_HT40) -2.70 dBm(802.11ac_VHT80)
		Multiple Antenna	14.88 dBm(802.11a) 14.58 dBm(802.11n_HT20) 14.06 dBm(802.11n_HT40) 13.94 dBm(802.11ac_VHT80)
		Multiple Antenna _Straddle	7.60 dBm(802.11a) 8.08 dBm(802.11n_HT20) 1.59 dBm(802.11n_HT40) 0.06 dBm(802.11ac_VHT80)

ANTENNA TYPE	Chip Antenna			
ANTENNA GAIN	Bluetooth LE	0.28 dBi		
	Bluetooth	0.28 dBi		
	WLAN 2.4 GHz	Antenna 0	1.80 dBi	
		Antenna 1	1.83 dBi	
		Multiple Antenna	4.83 dBi	
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	-0.54 dBi	
		Antenna 1	-3.09 dBi	
		Multiple Antenna	1.38 dBi	
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	0.00 dBi	
		Antenna 1	-1.42 dBi	
		Multiple Antenna	2.36 dBi	
	5 470 MHz ~ 5 725 MHz Band	Antenna 0	2.34 dBi	
		Antenna 1	0.37 dBi	
		Multiple Antenna	4.48 dBi	
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	-0.30 dBi	
		Antenna 1	-1.37 dBi	
		Multiple Antenna	2.21 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	WCA732M	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
WCA732M	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

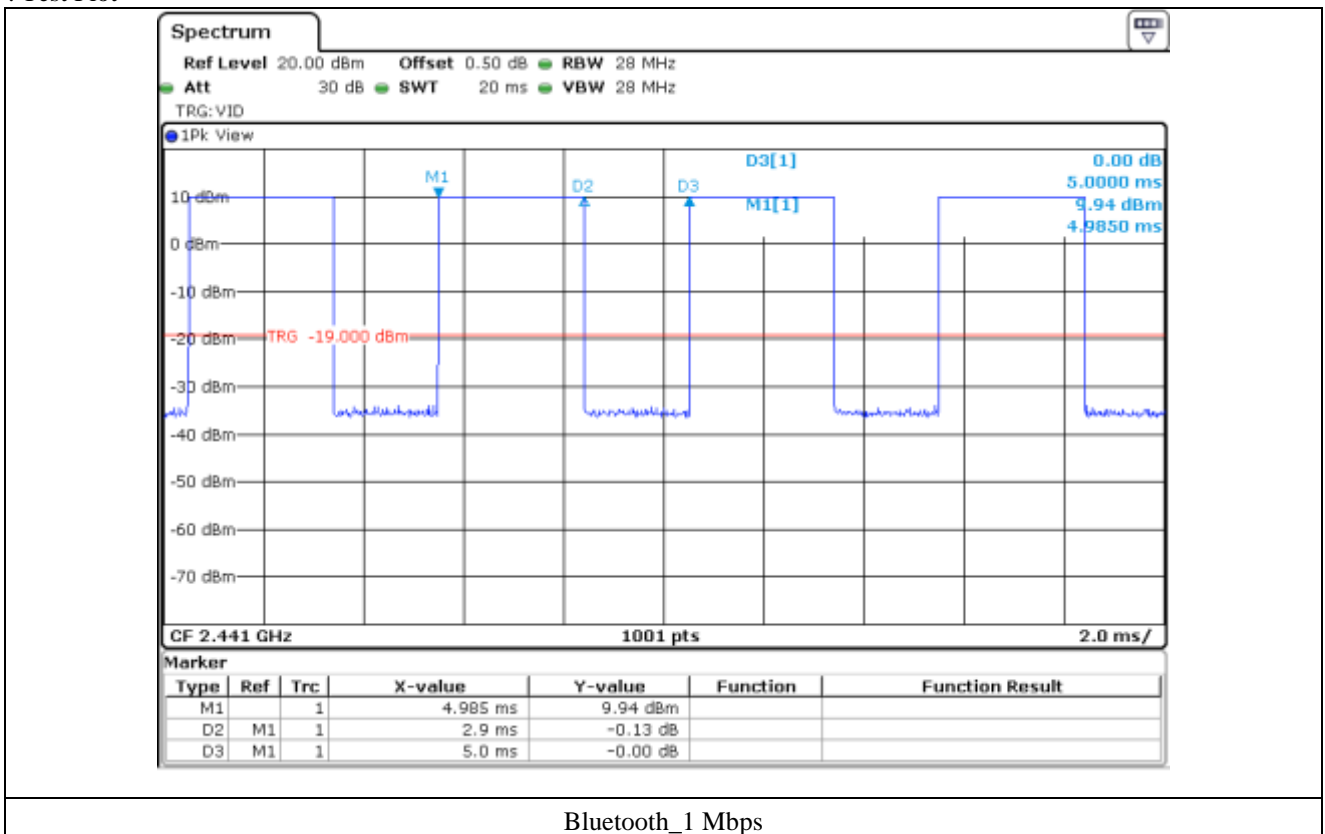
- Duty Cycle

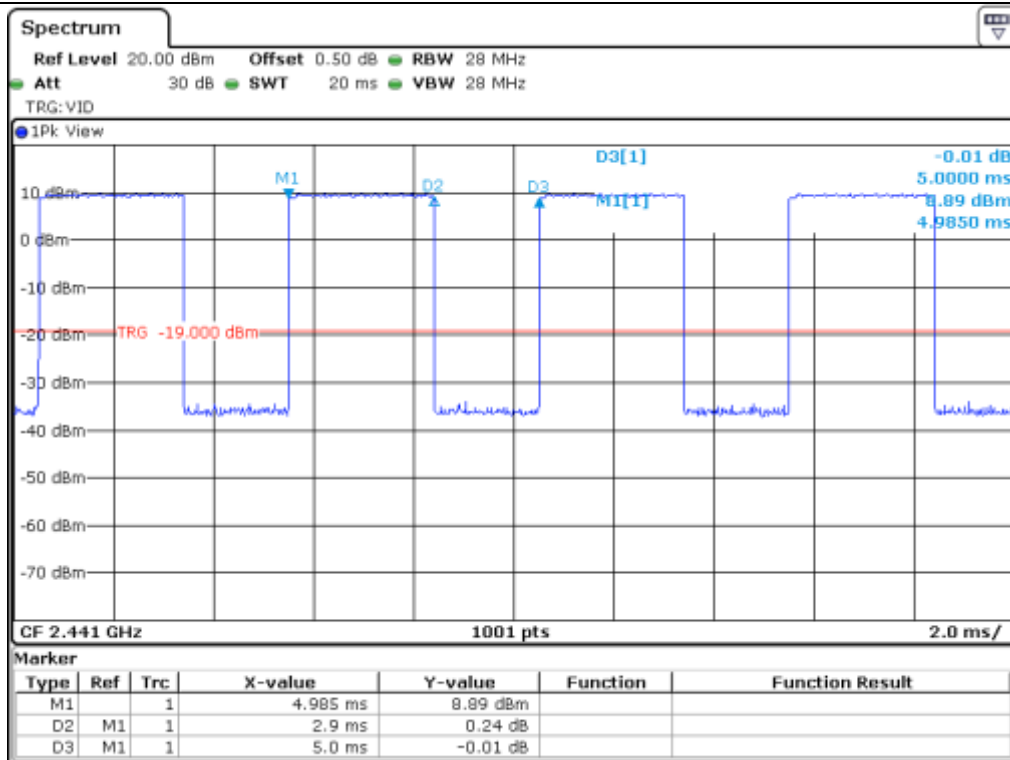
Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth [1 Mbps]	2.90	2.10	58.00	2.37
Bluetooth [2 Mbps]	2.90	2.10	58.00	2.37
Bluetooth [3 Mbps]	2.88	2.12	57.60	2.40

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

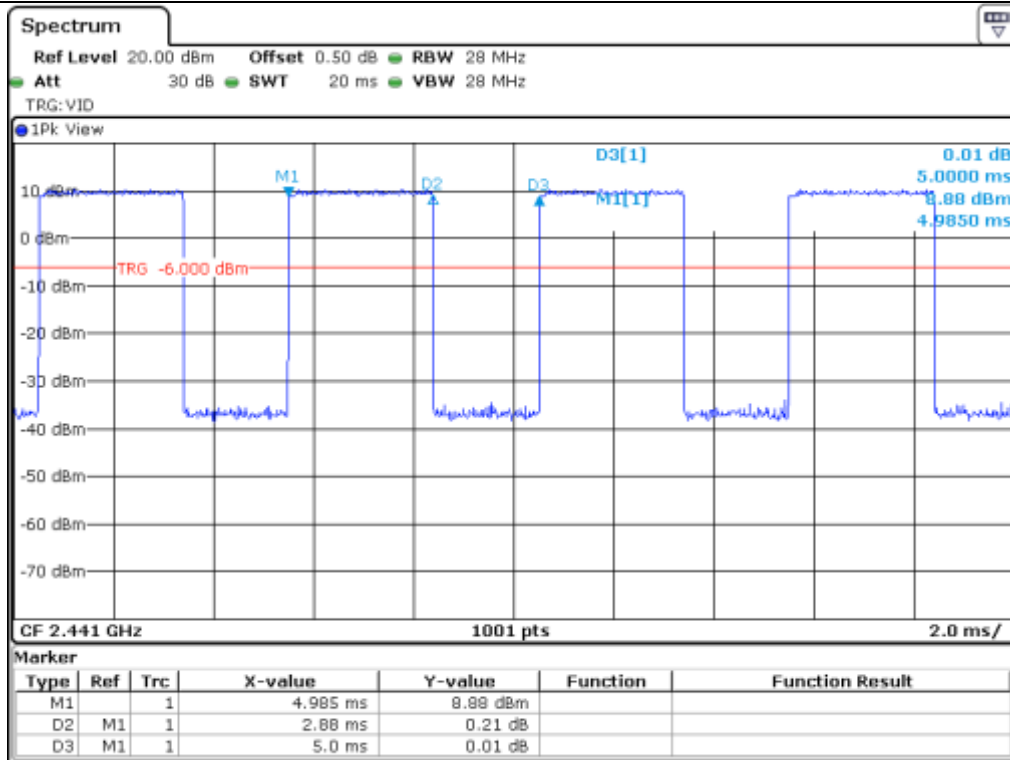
Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

- Test Plot





Bluetooth_2 Mbps



Bluetooth_3 Mbps

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

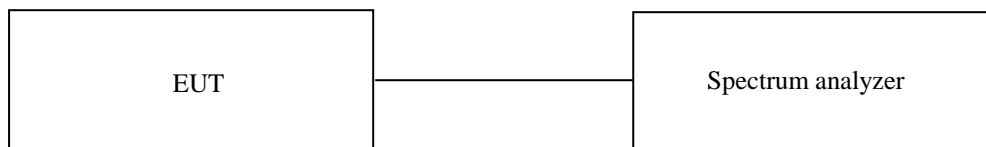
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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 10 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.

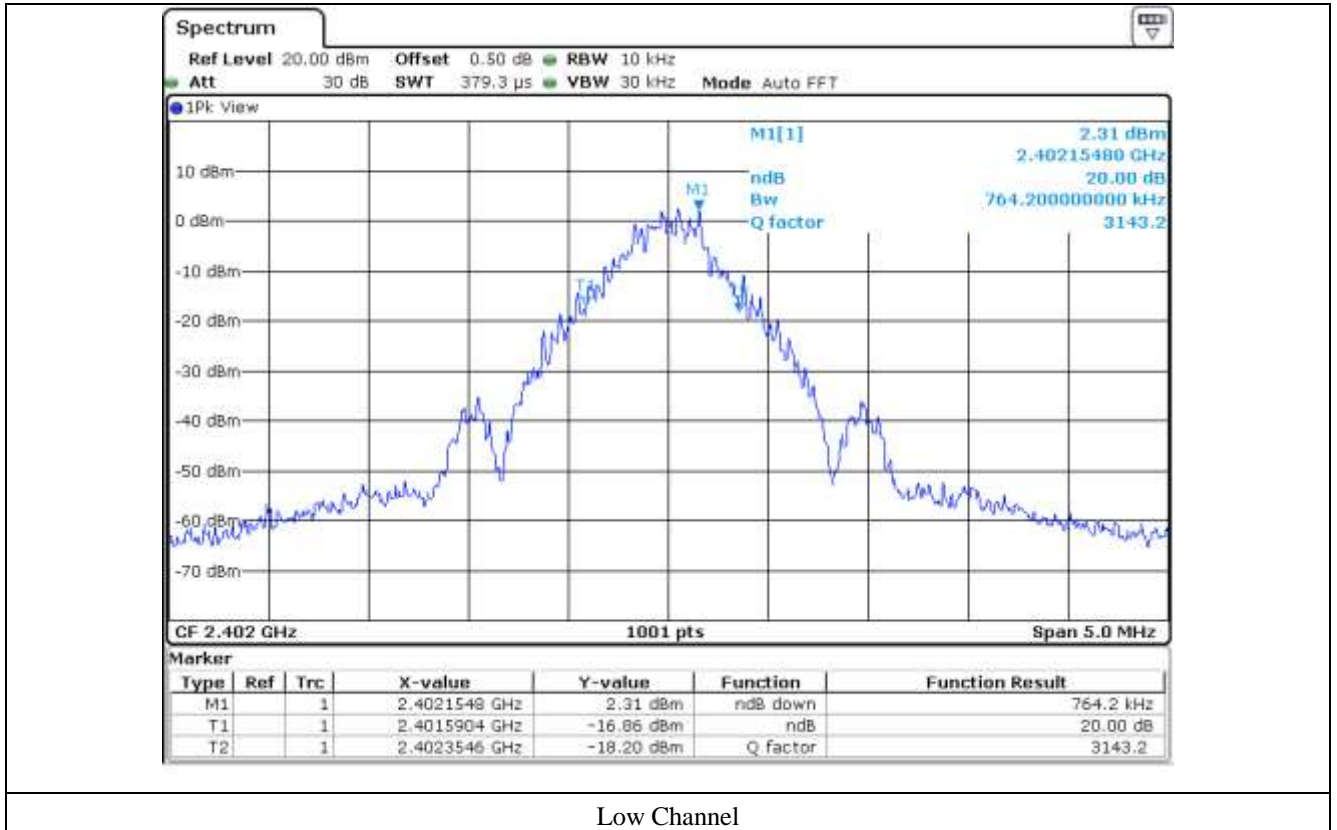


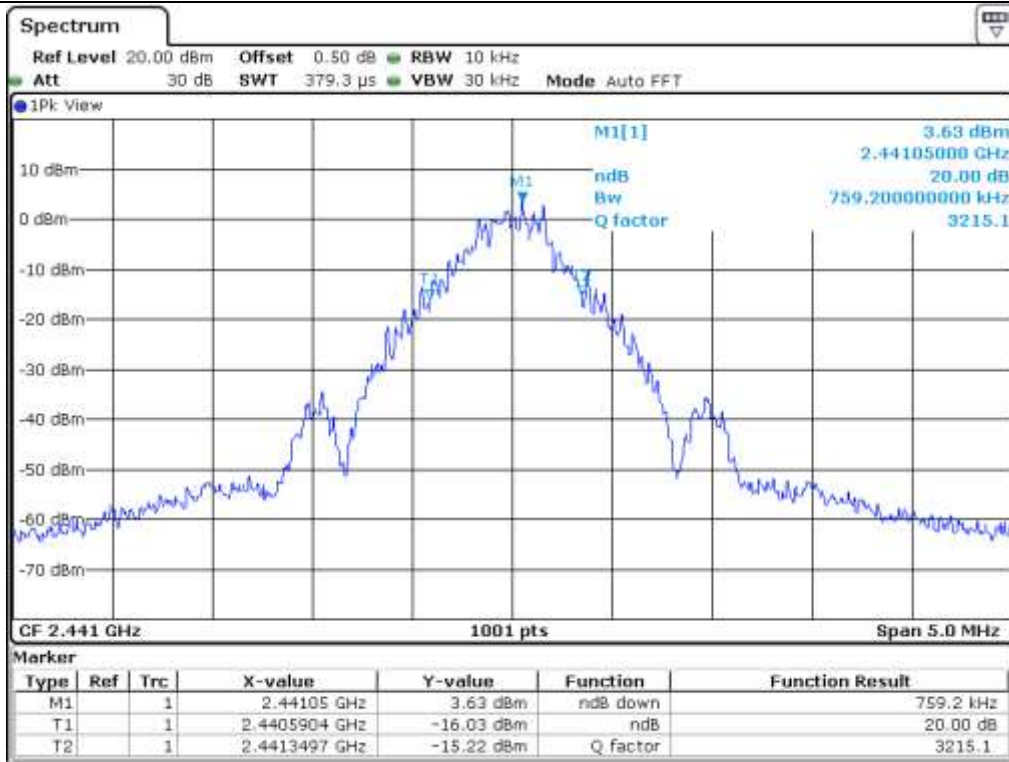
7.3 Test Date

August 21, 2020 ~ September 08, 2020

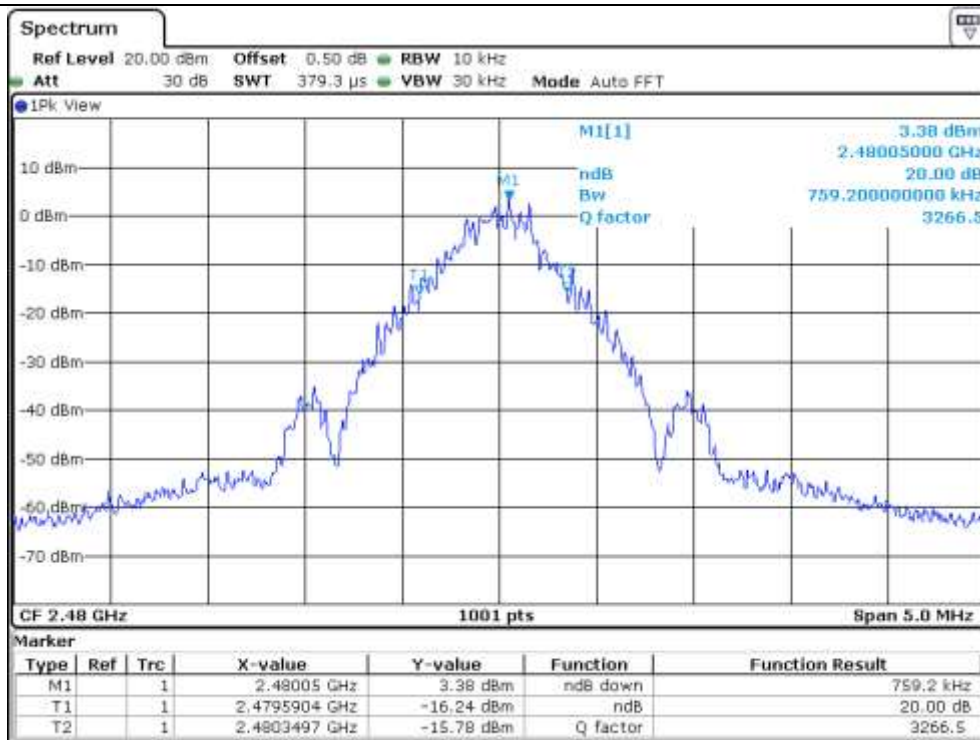
7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	764.20
Middle	2 441.00	759.20
High	2 480.00	759.20





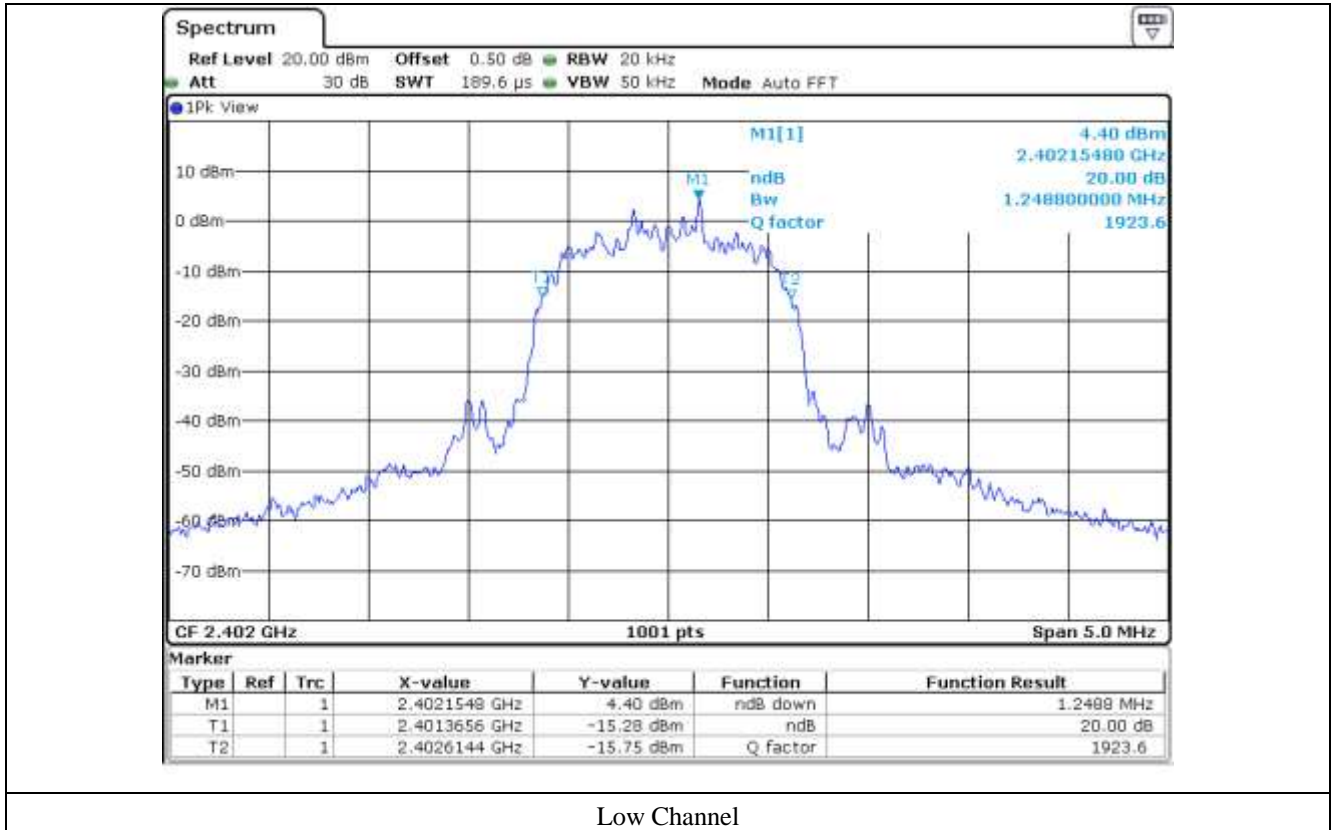
Middle Channel

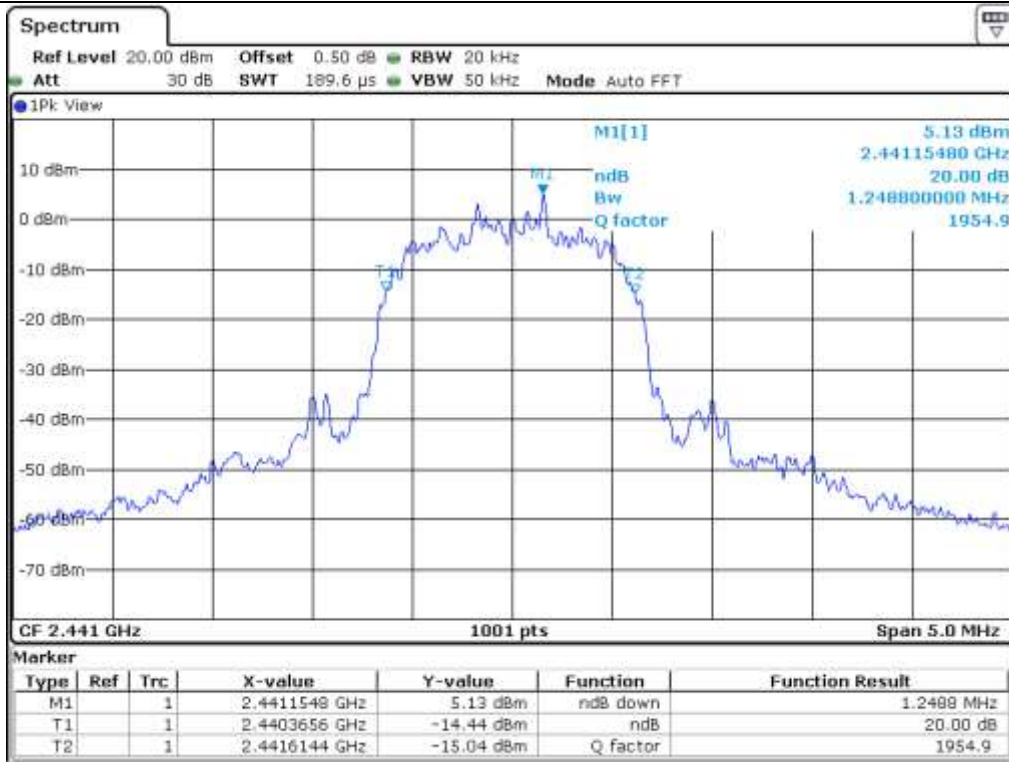


High Channel

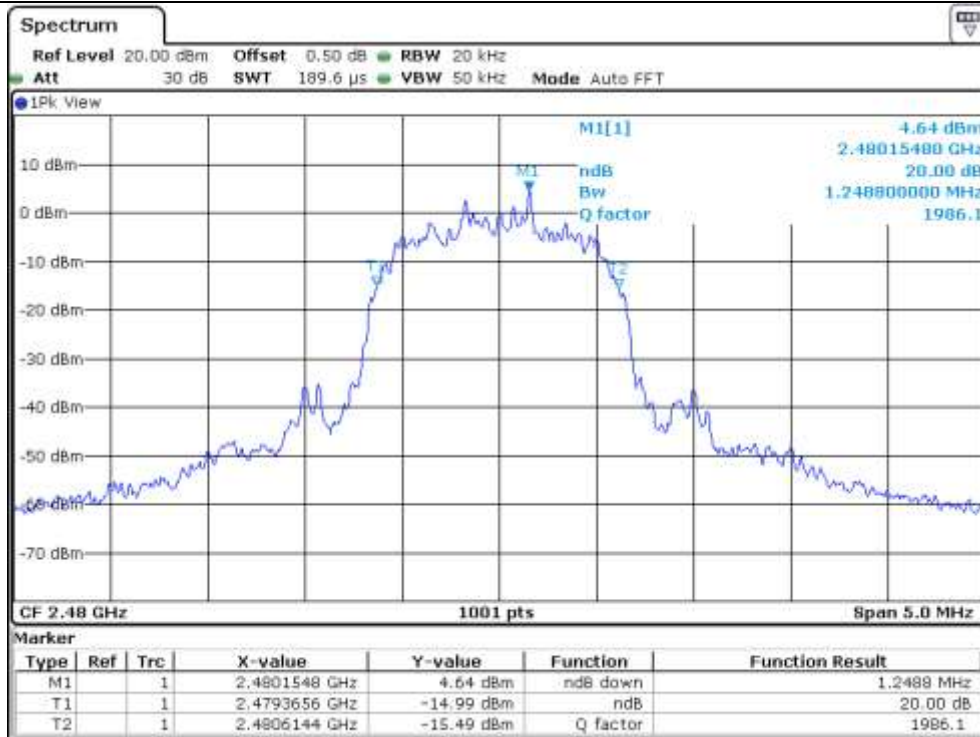
7.5 Test data for 2 Mbps

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





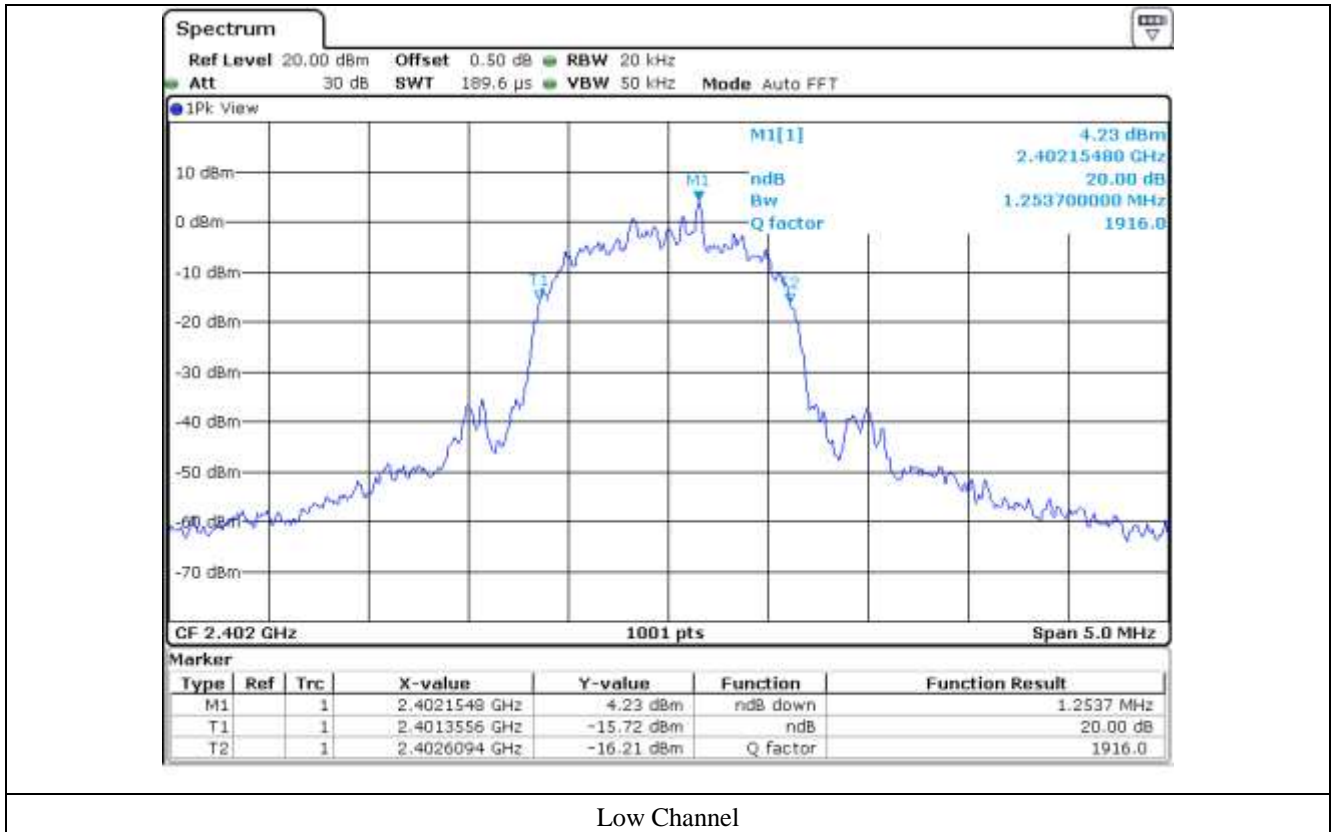
Middle Channel

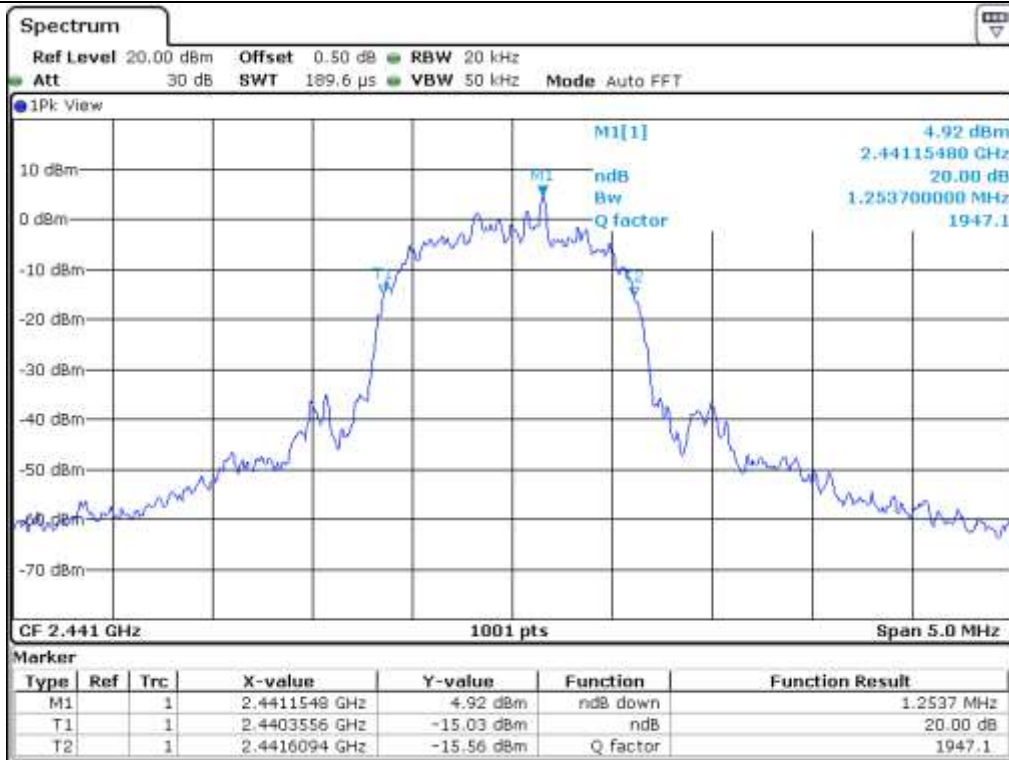


High Channel

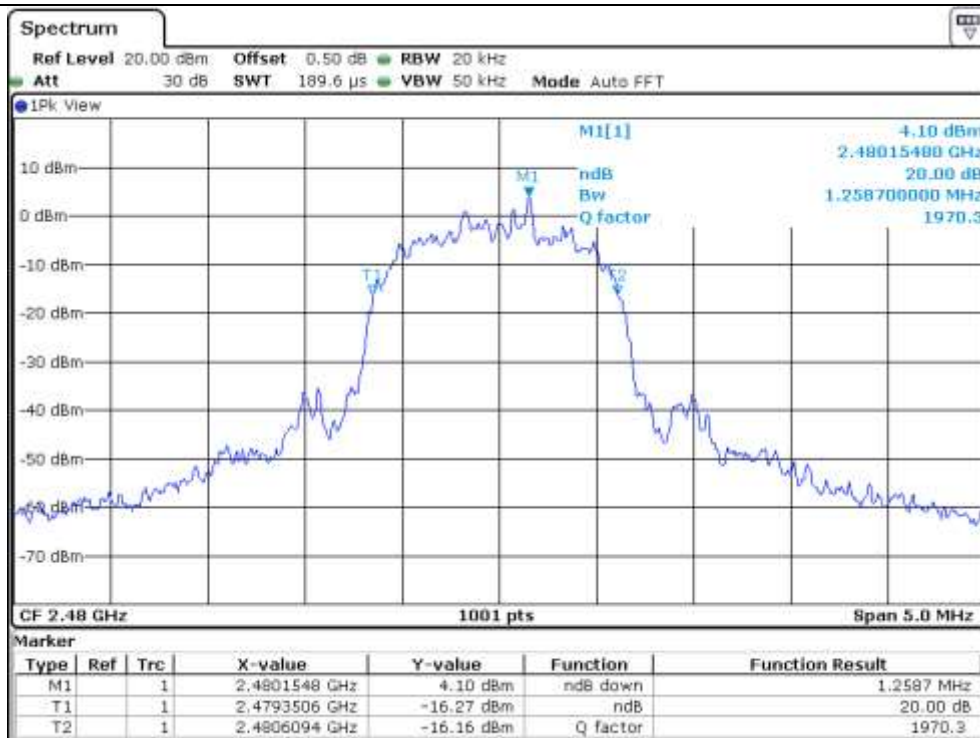
7.6 Test data for 3 Mbps

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





Middle Channel



High Channel

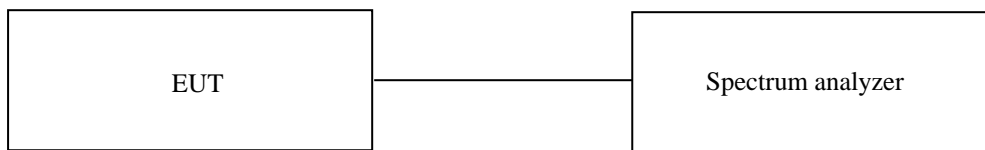
8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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.



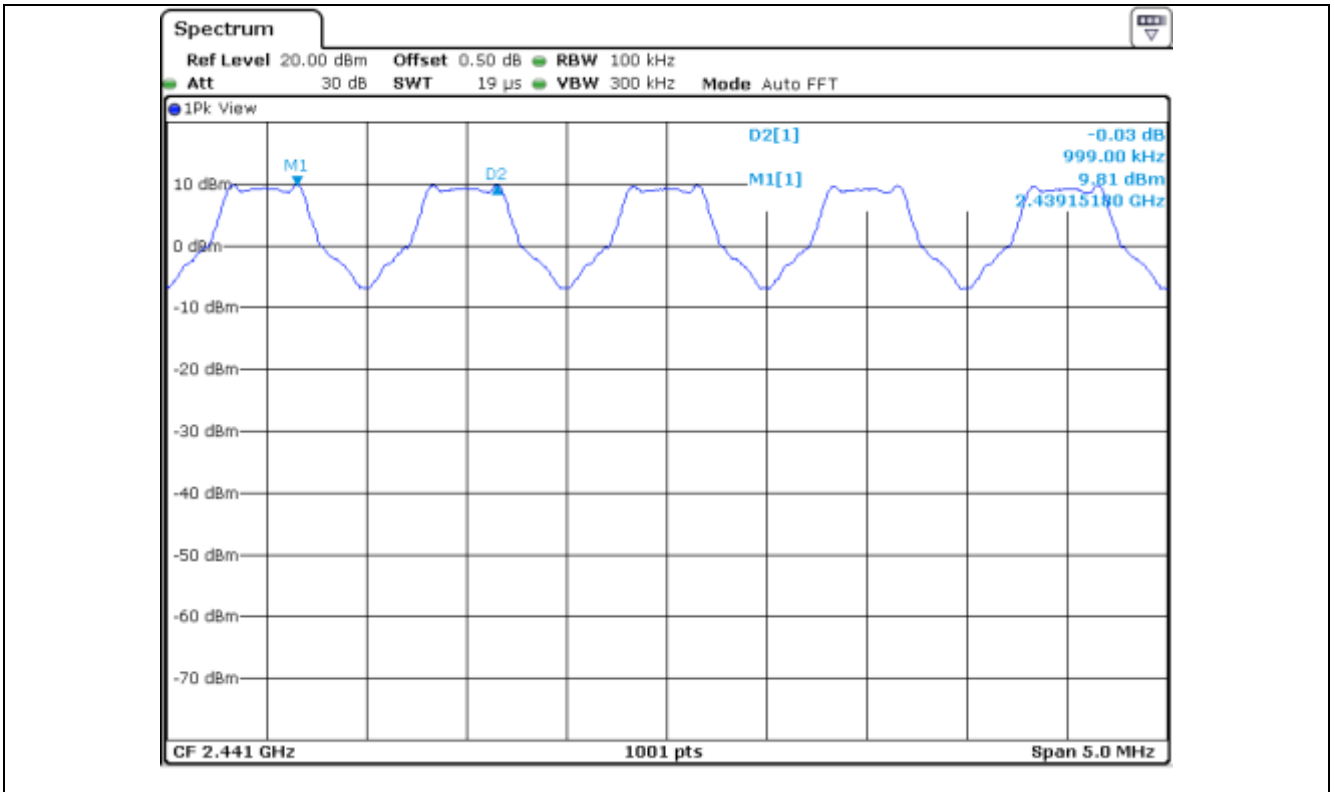
8.3 Test Date

August 21, 2020 ~ September 08, 2020

8.4 Test data for 1 Mbps

-. Test Result : Pass

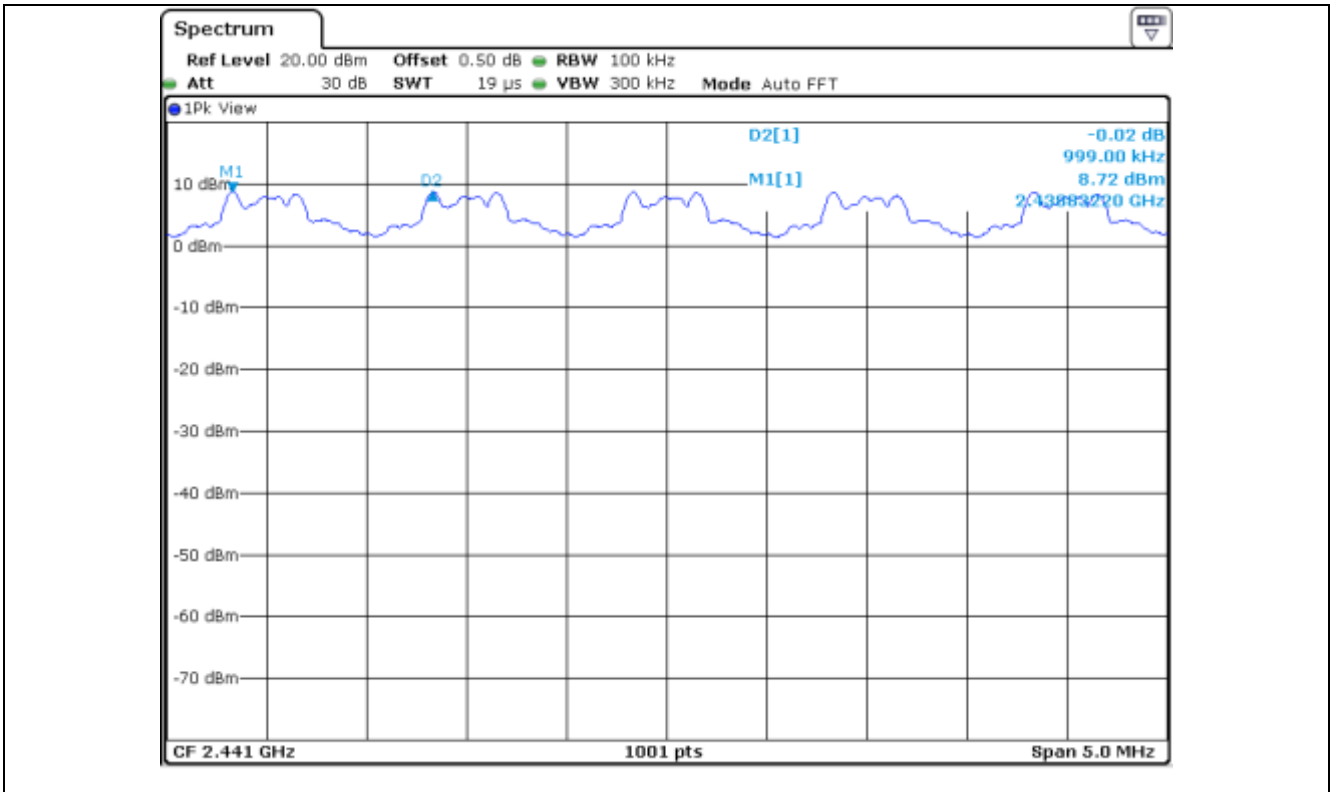
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	506.13	Separated by a minimum of 25 kHz



8.5 Test data for 2 Mbps

-. Test Result : Pass

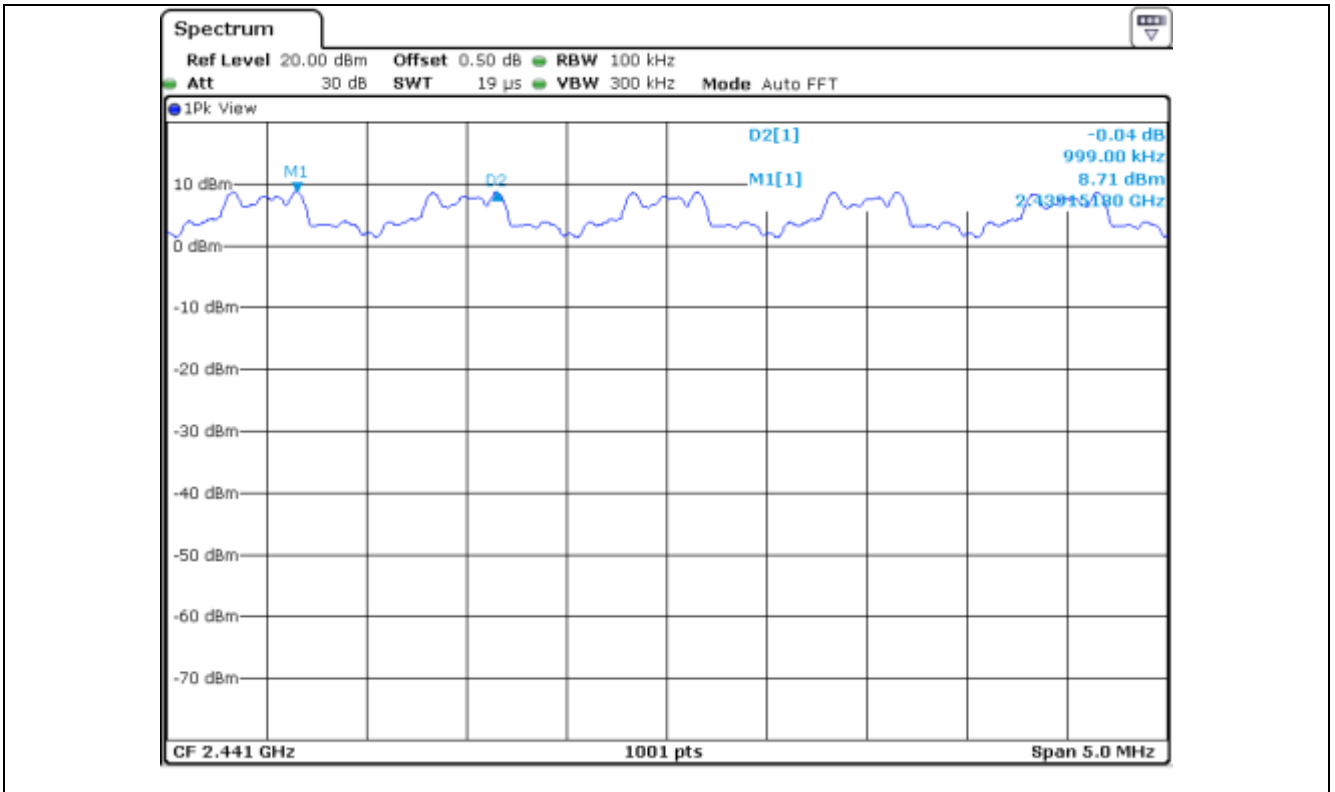
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	832.53	Separated by a minimum of 25 kHz



8.6 Test data for 3 Mbps

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	835.80	Separated by a minimum of 25 kHz



9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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.



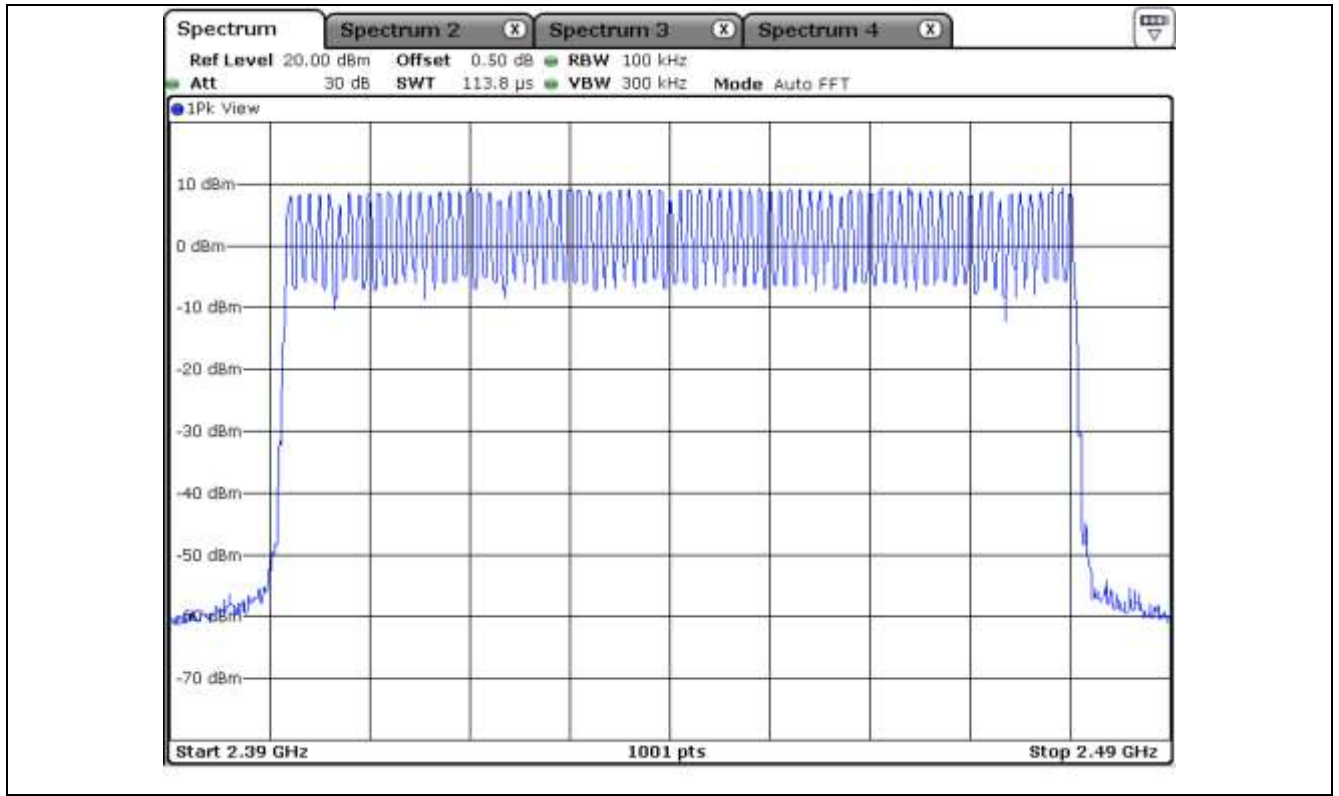
9.3 Test Date

August 21, 2020 ~ September 08, 2020

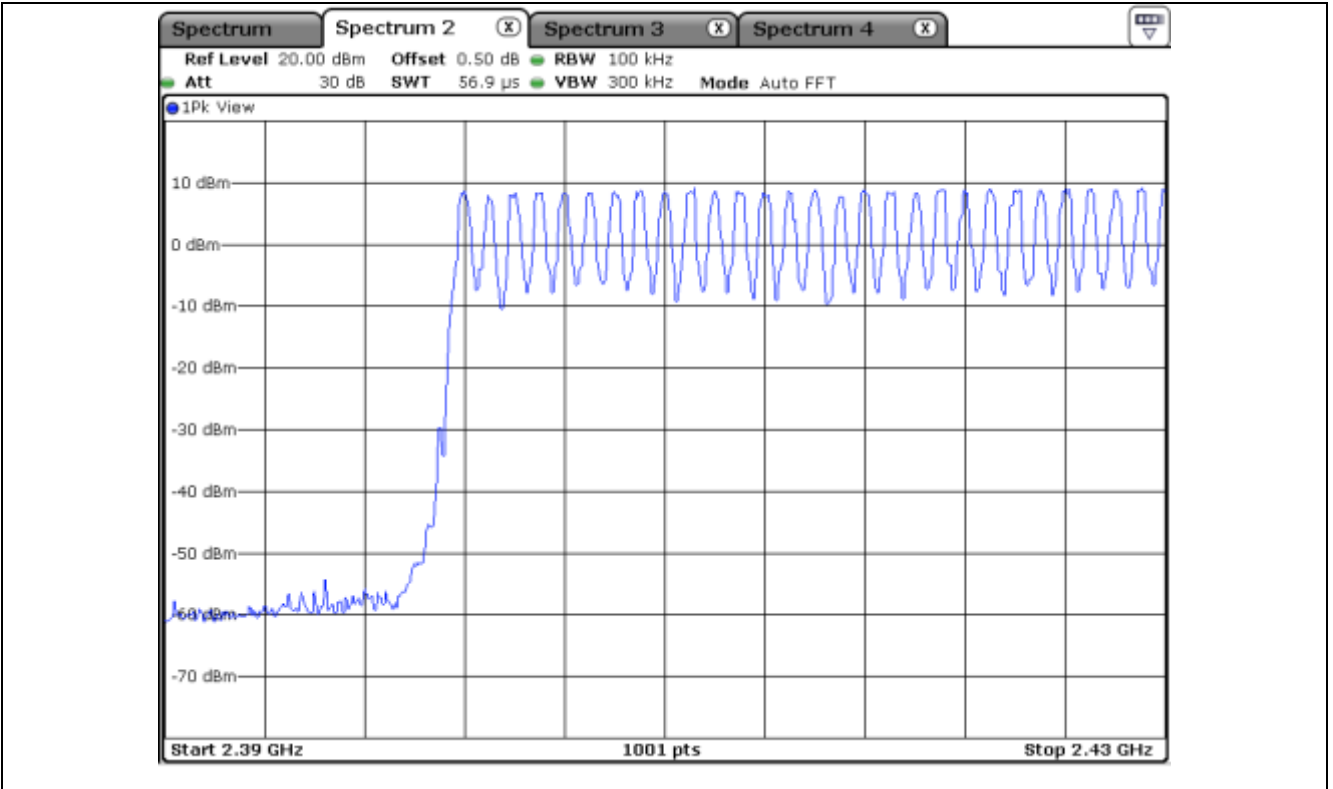
9.4 Test data for 1 Mbps

-. Test Result : Pass

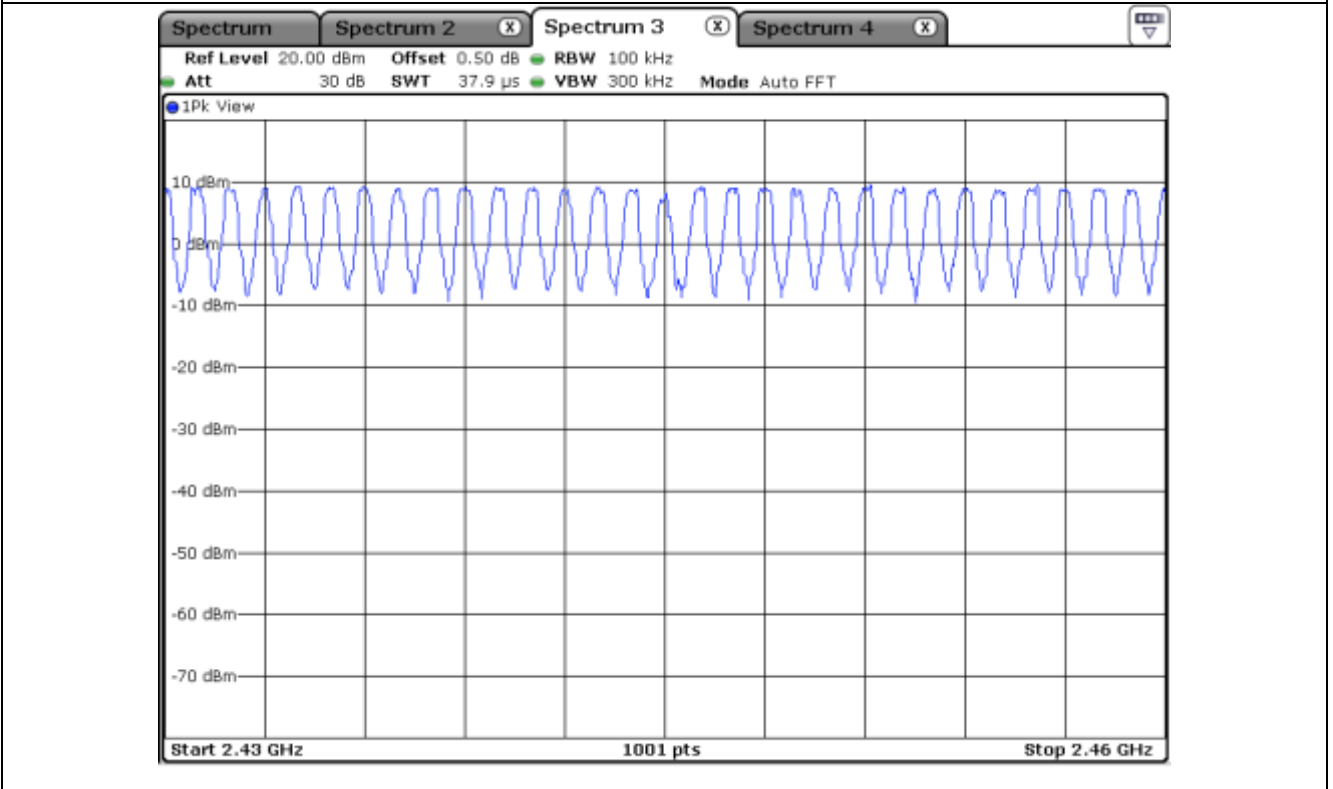
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
1 Mbps	79	Minimum of 15	64



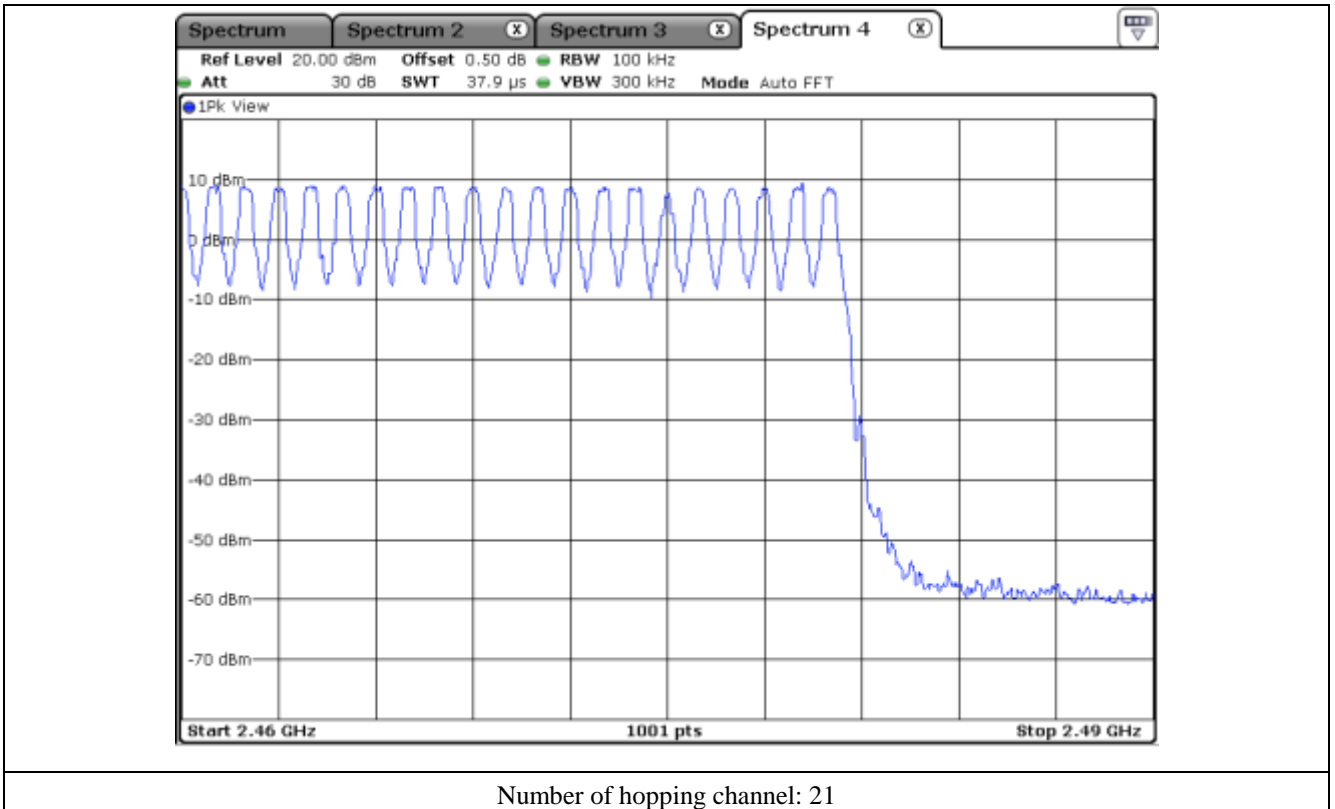
Total number of hopping channel: $28+30+21 = 79$



Number of hopping channel: 28



Number of hopping channel: 30

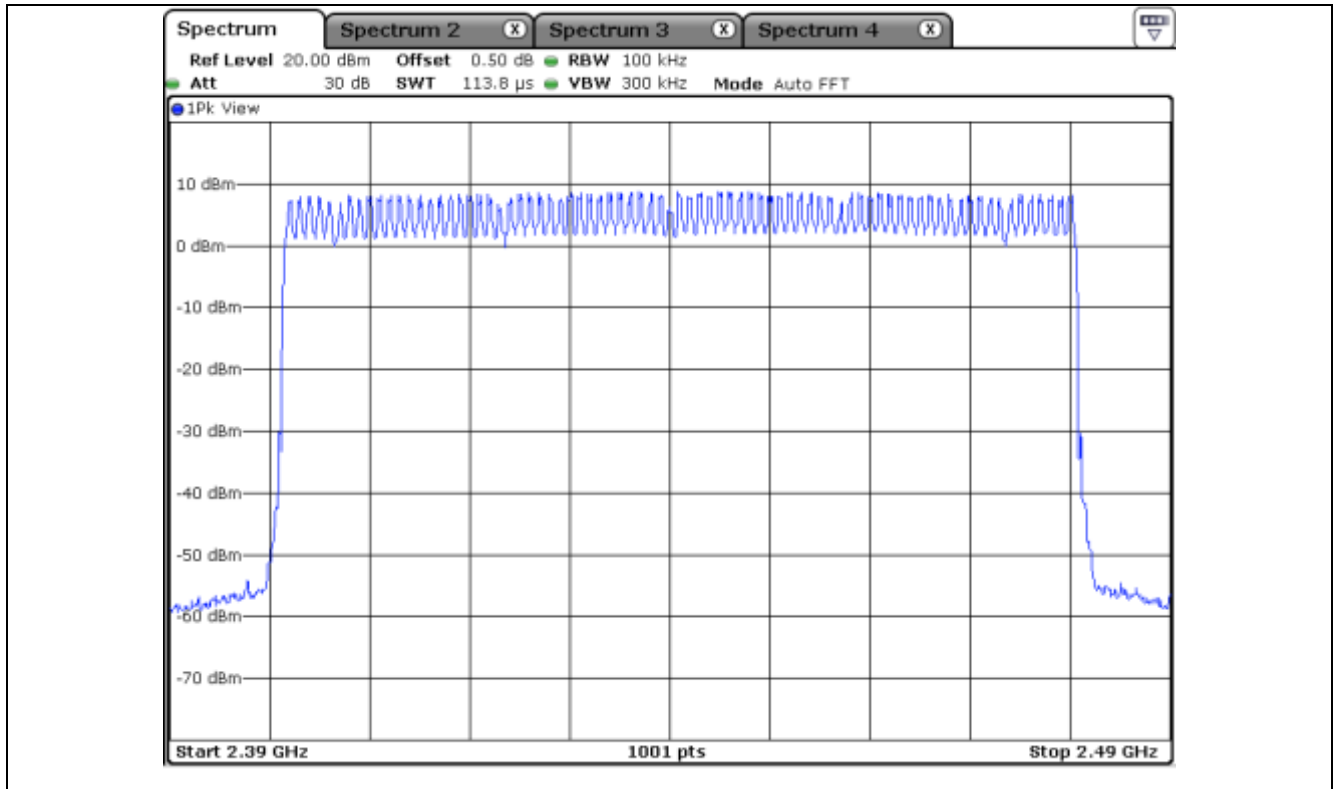


Number of hopping channel: 21

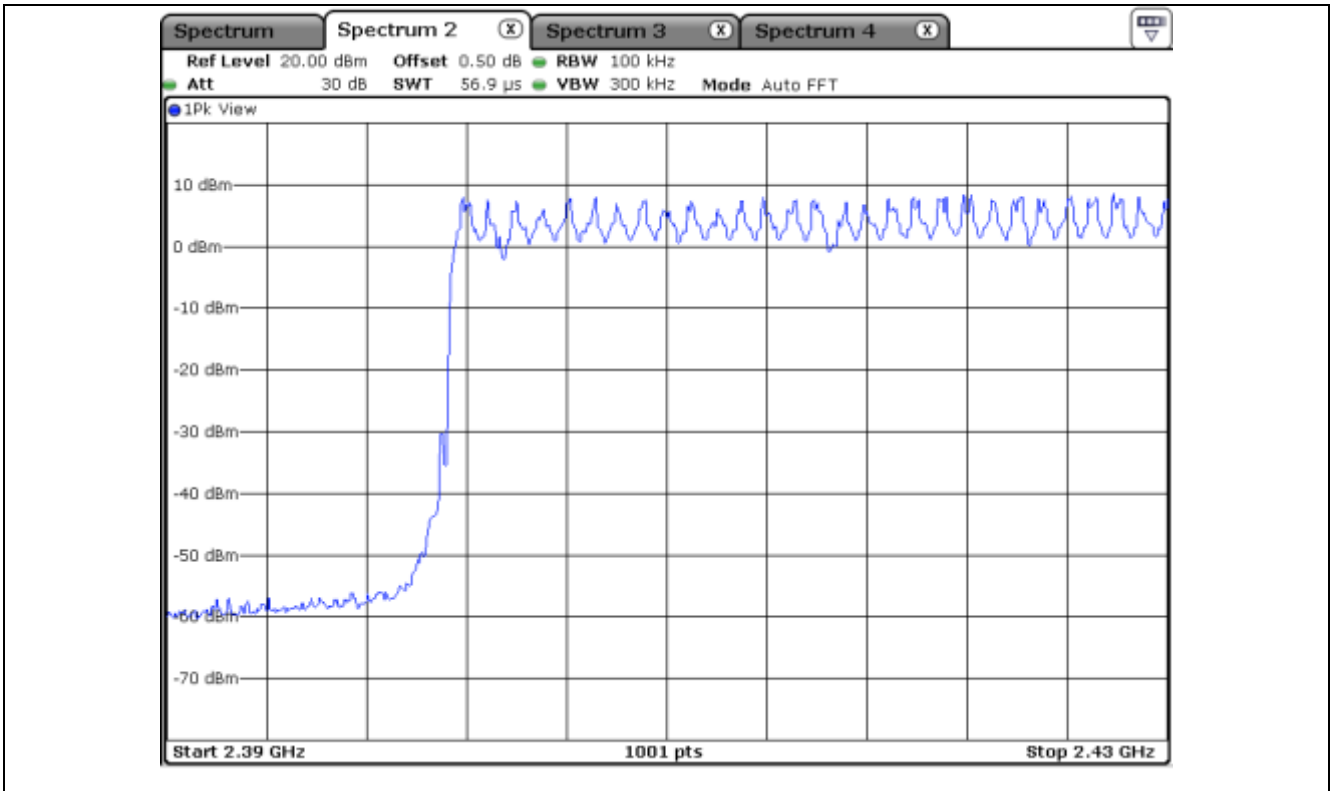
9.5 Test data for 2 Mbps

-. Test Result : Pass

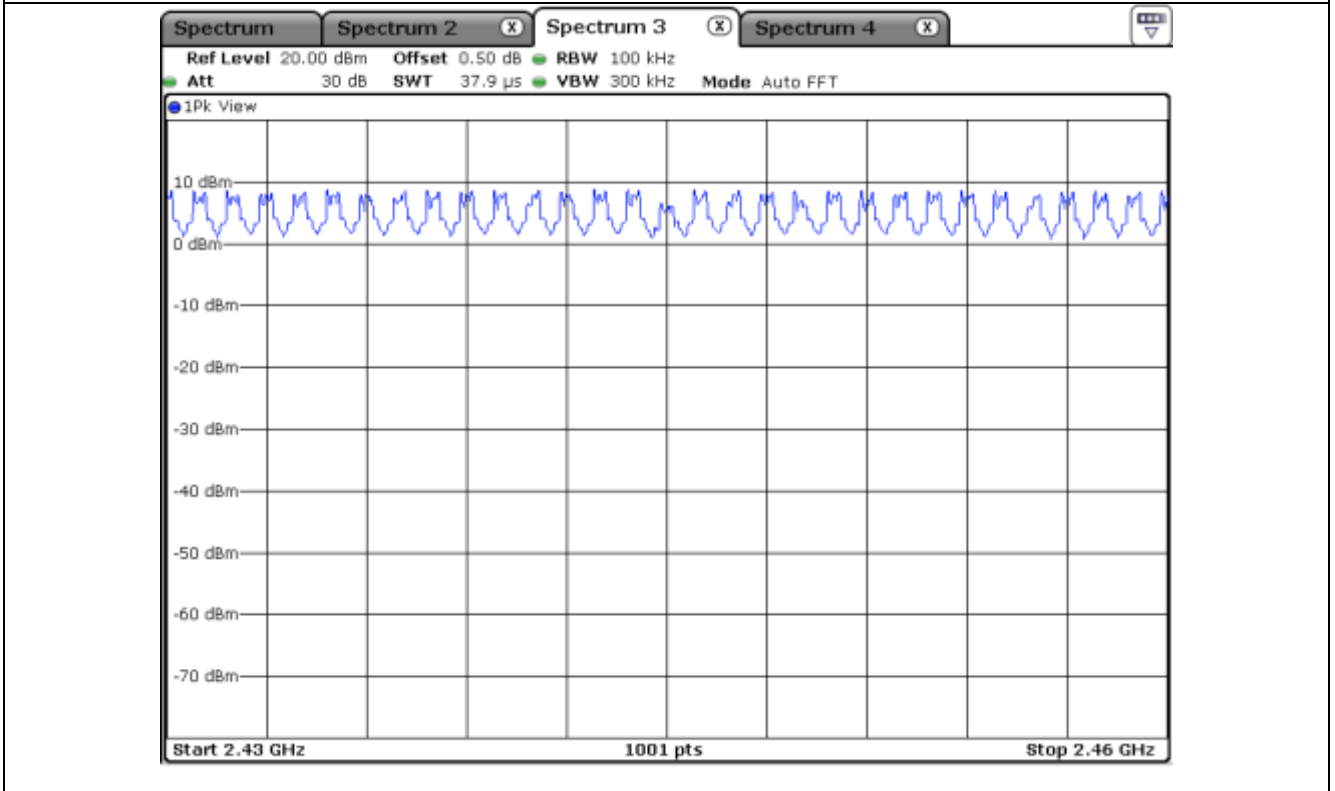
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
2 Mbps	79	Minimum of 15	64



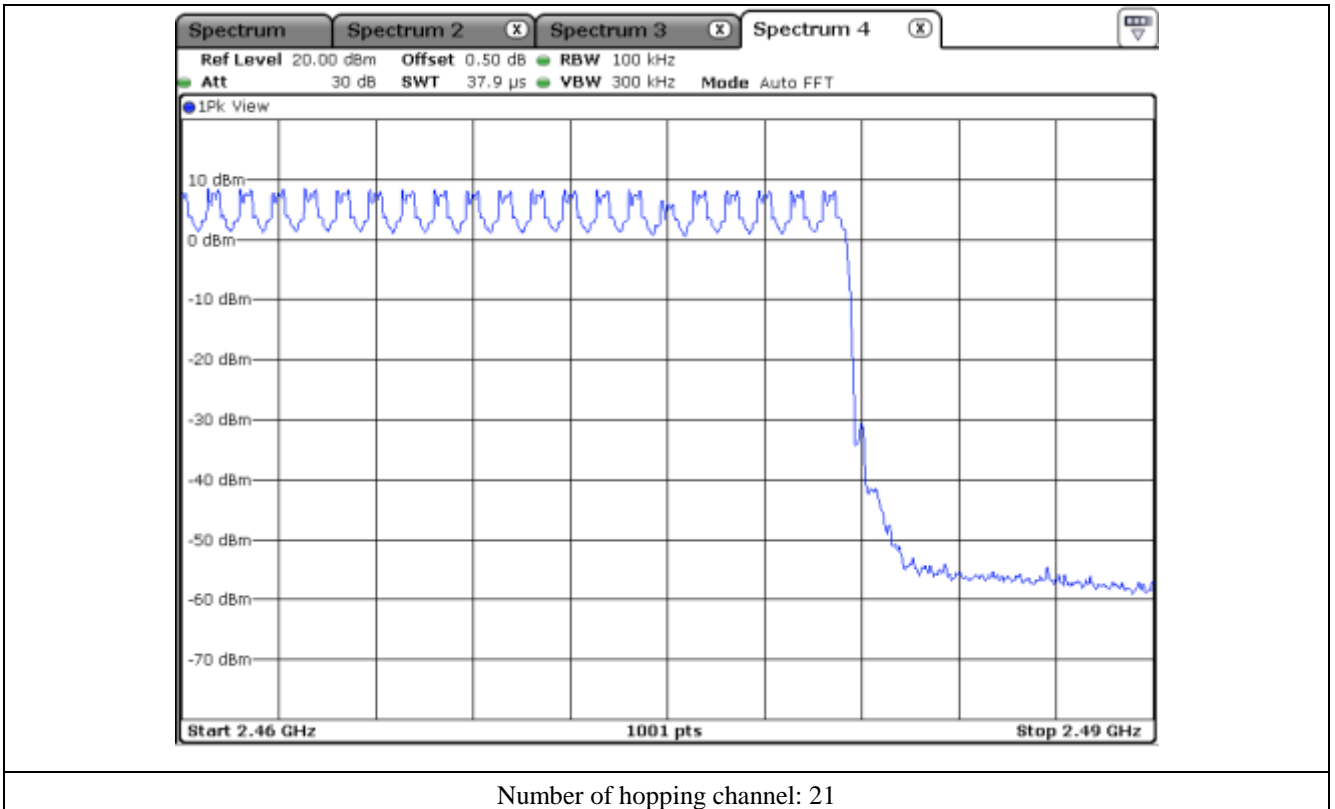
Total number of hopping channel: 28+30+21 = 79



Number of hopping channel: 28



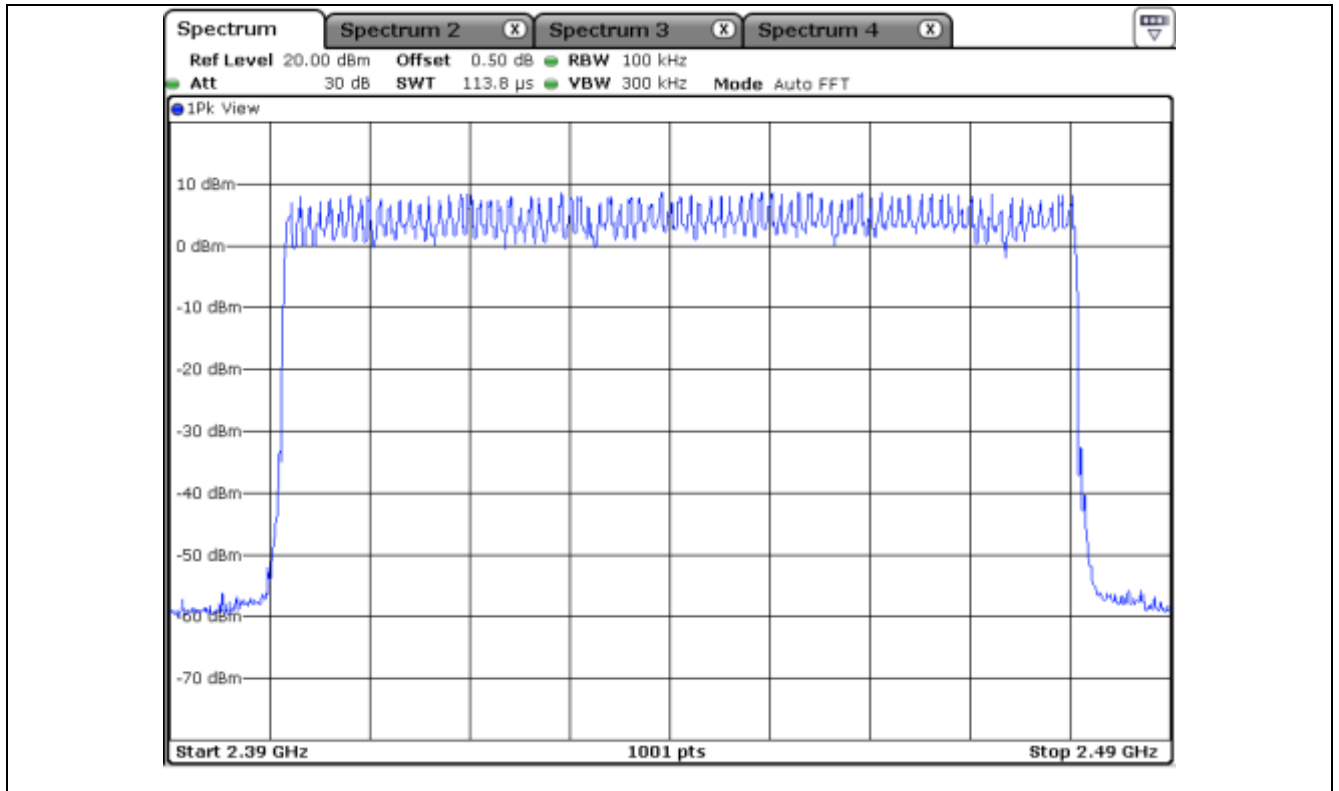
Number of hopping channel: 30



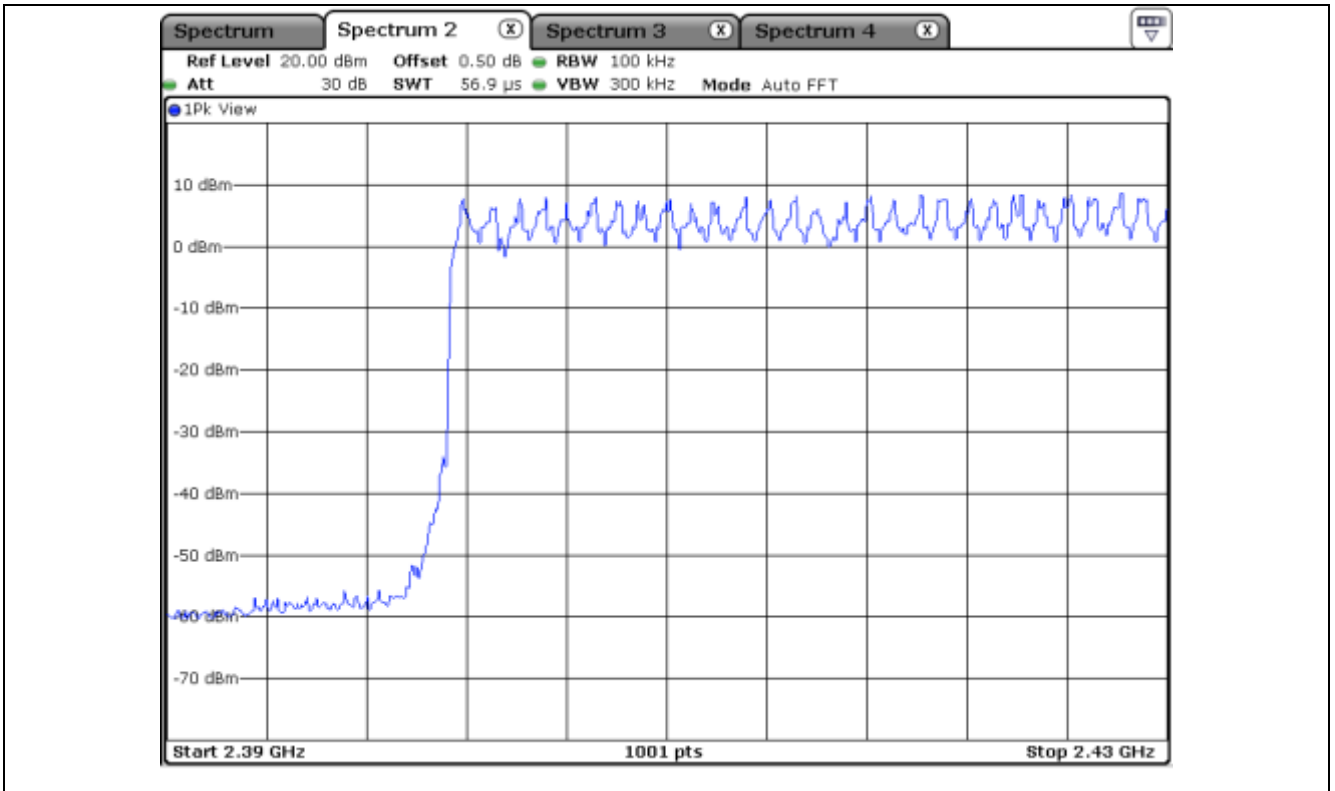
9.6 Test data for 3 Mbps

-. Test Result : Pass

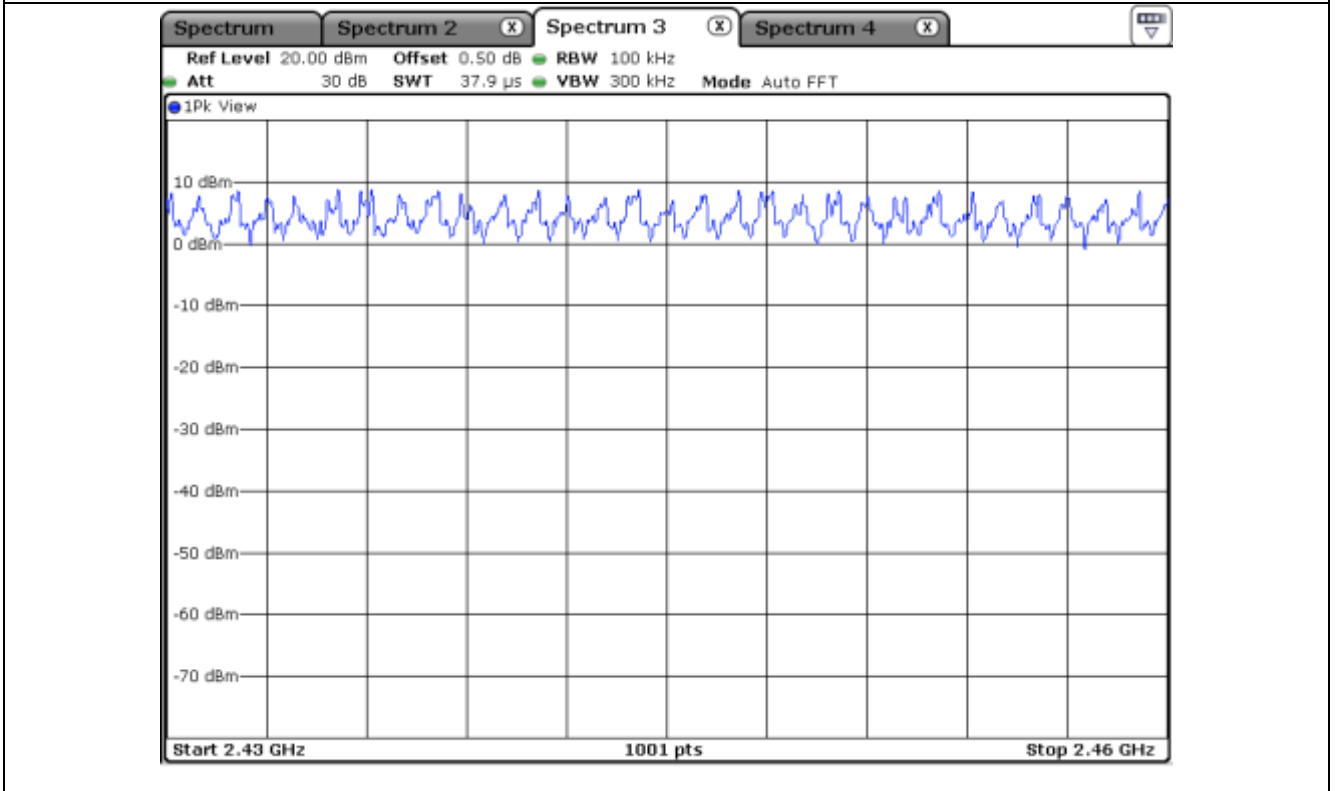
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
3 Mbps	79	Minimum of 15	64



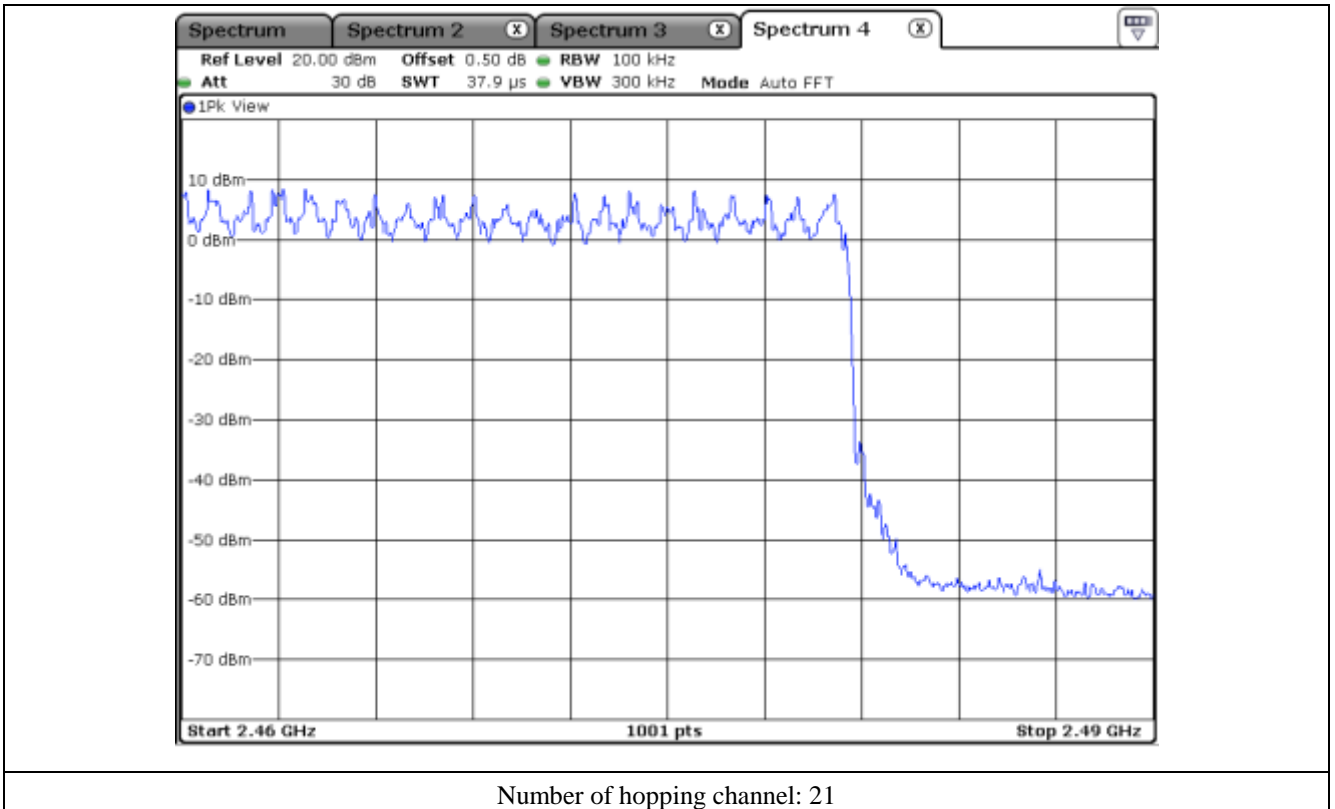
Total number of hopping channel: $28+30+21 = 79$



Number of hopping channel: 28



Number of hopping channel: 30



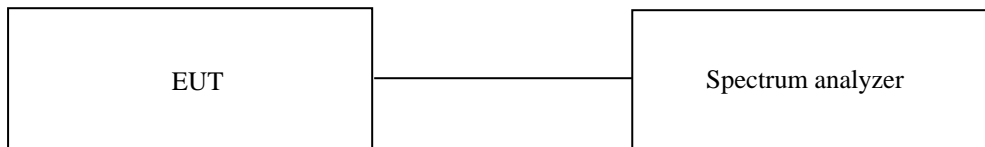
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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

August 21, 2020 ~ September 08, 2020

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 μs with 79 channels.

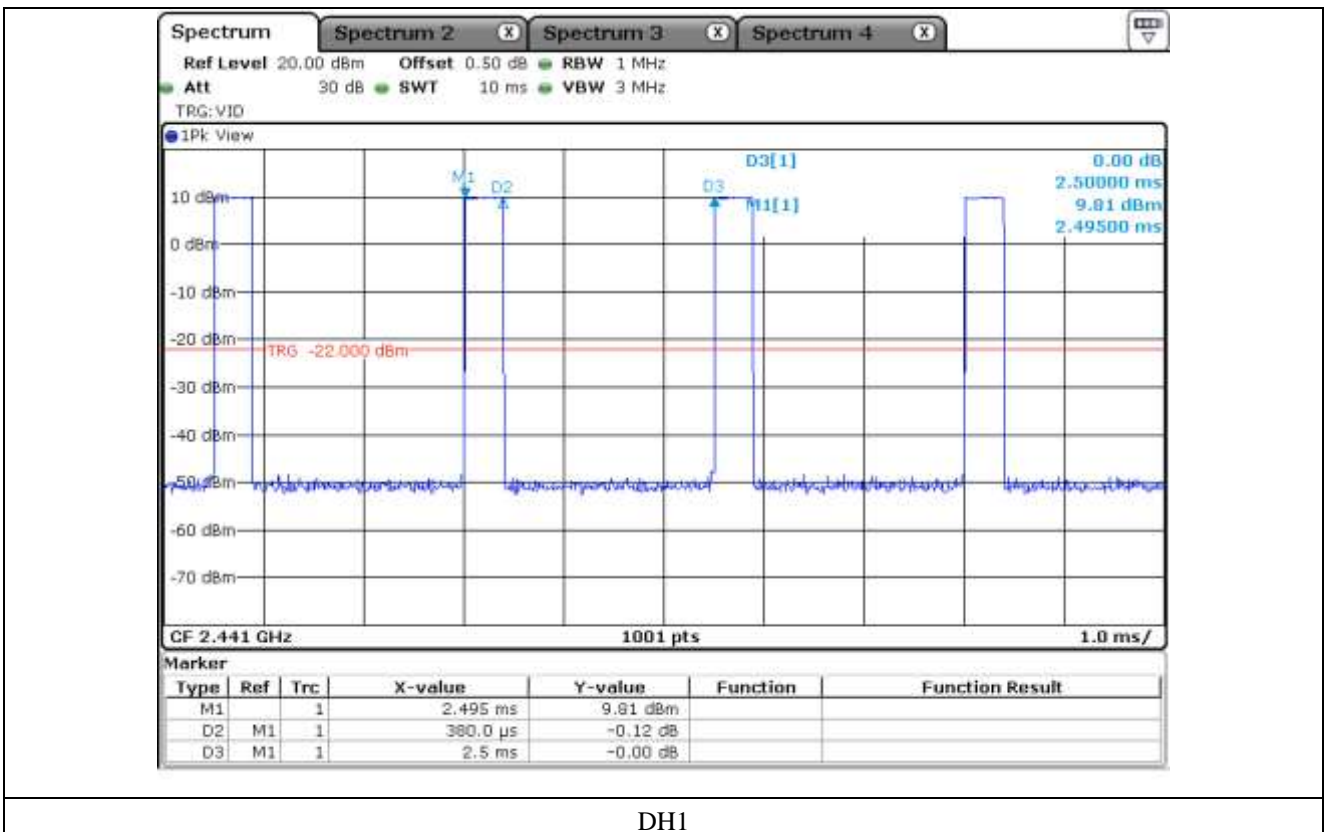
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel 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	1.632	5.06	31.60	260.95	400	
DH5	2.912	3.38	31.60	311.02	400	

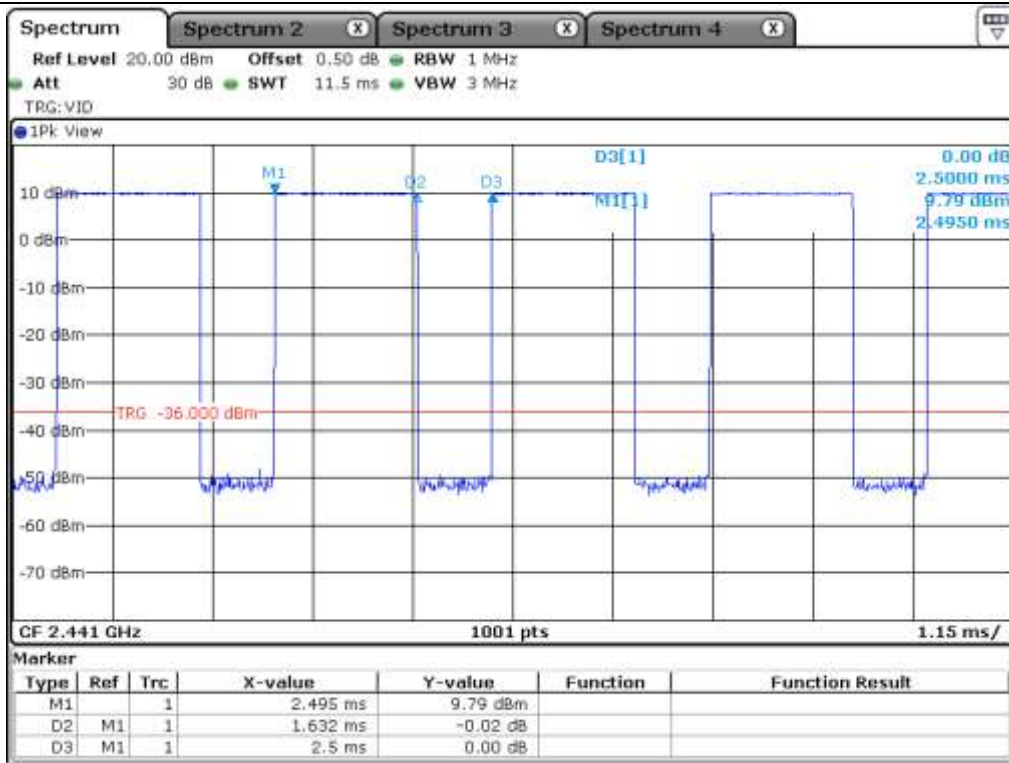
Total dwell time is calculated as following.

$$\text{Total Dwell Time} = \text{Pulse time} * \text{Hops per second with channels} * \text{period time}$$

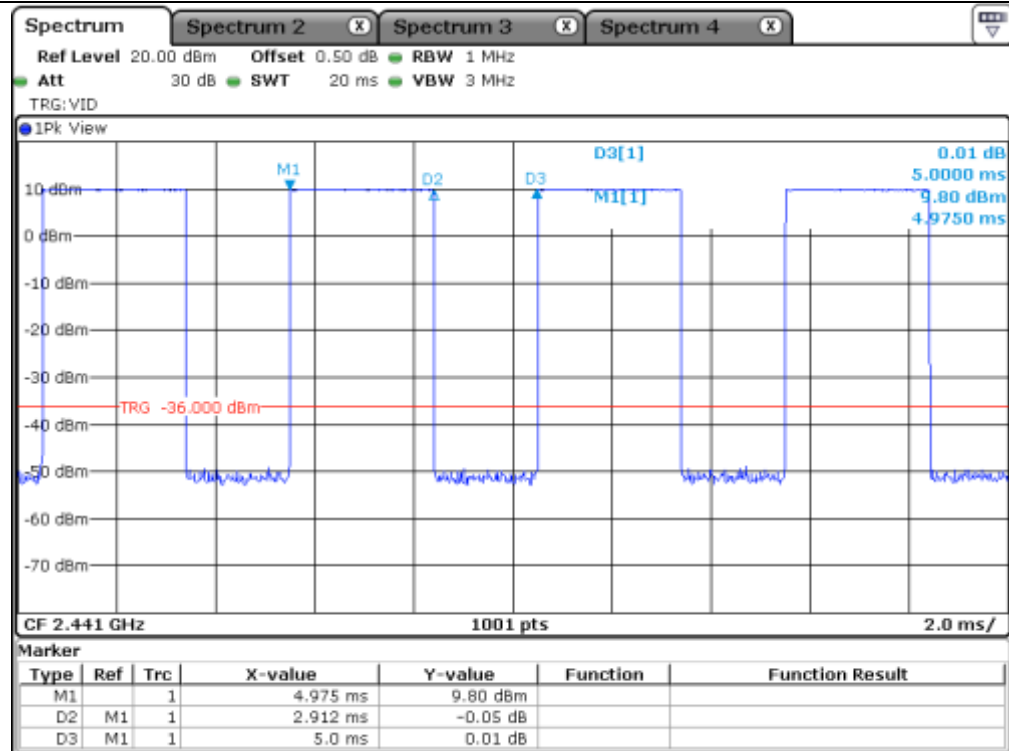
Remark: See next page for an overview sweep performed with peak detector.



DH1



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 μs with 79 channels.

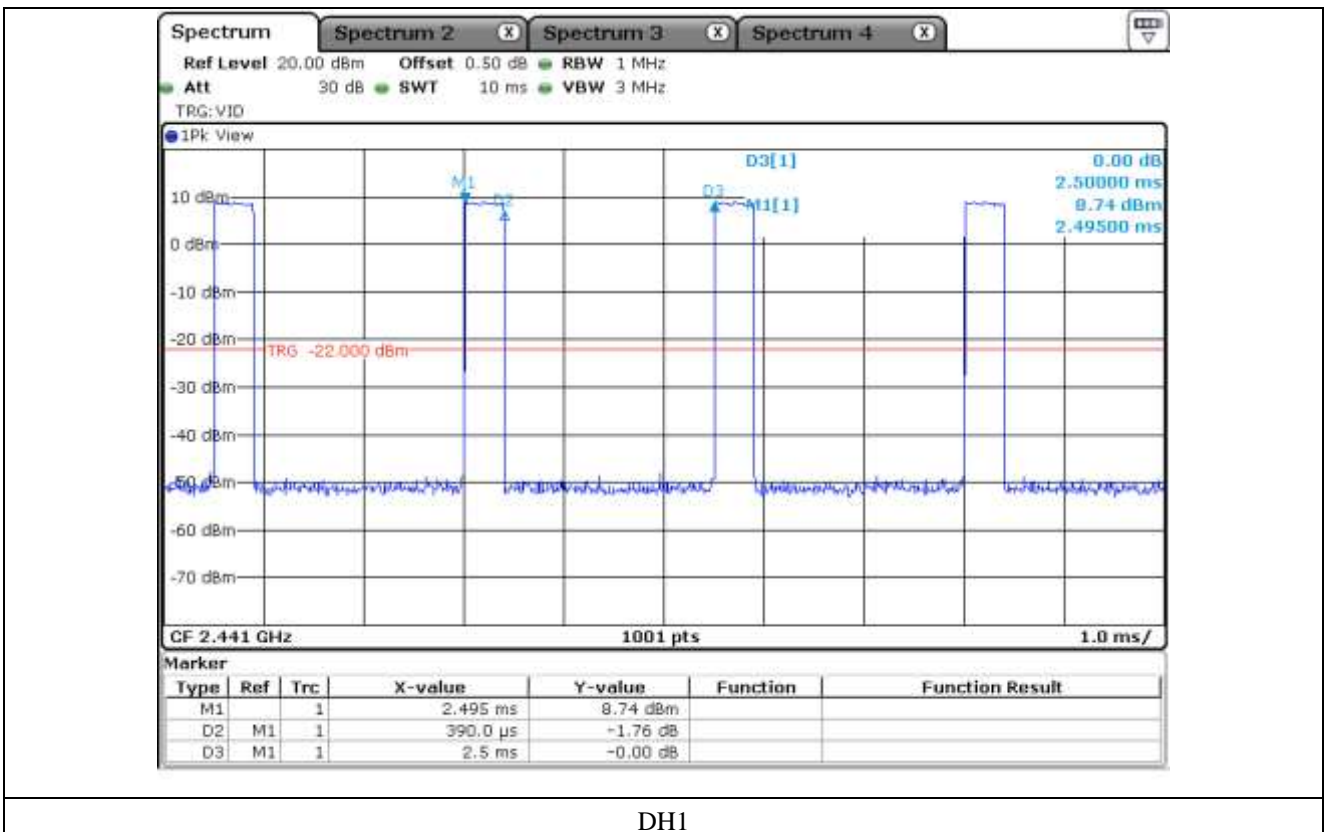
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel 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.

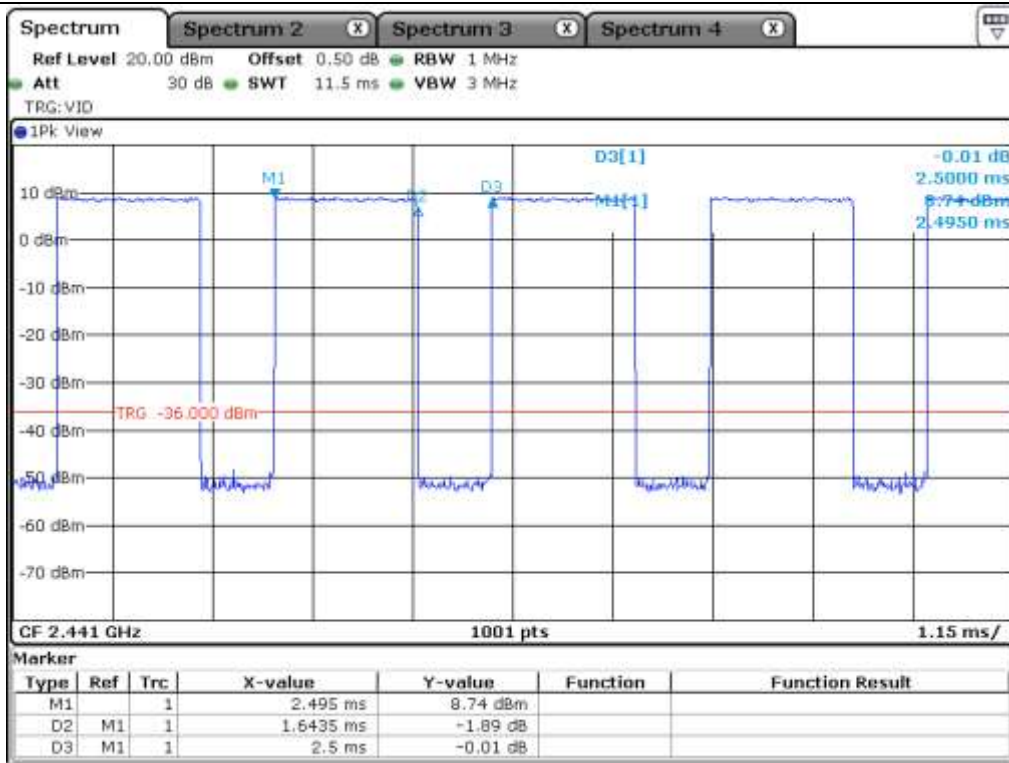
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.390	10.13	31.60	124.84	400	PASS
DH3	1.644	5.06	31.60	262.87	400	
DH5	2.912	3.38	31.60	311.02	400	

Total dwell time is calculated as following.

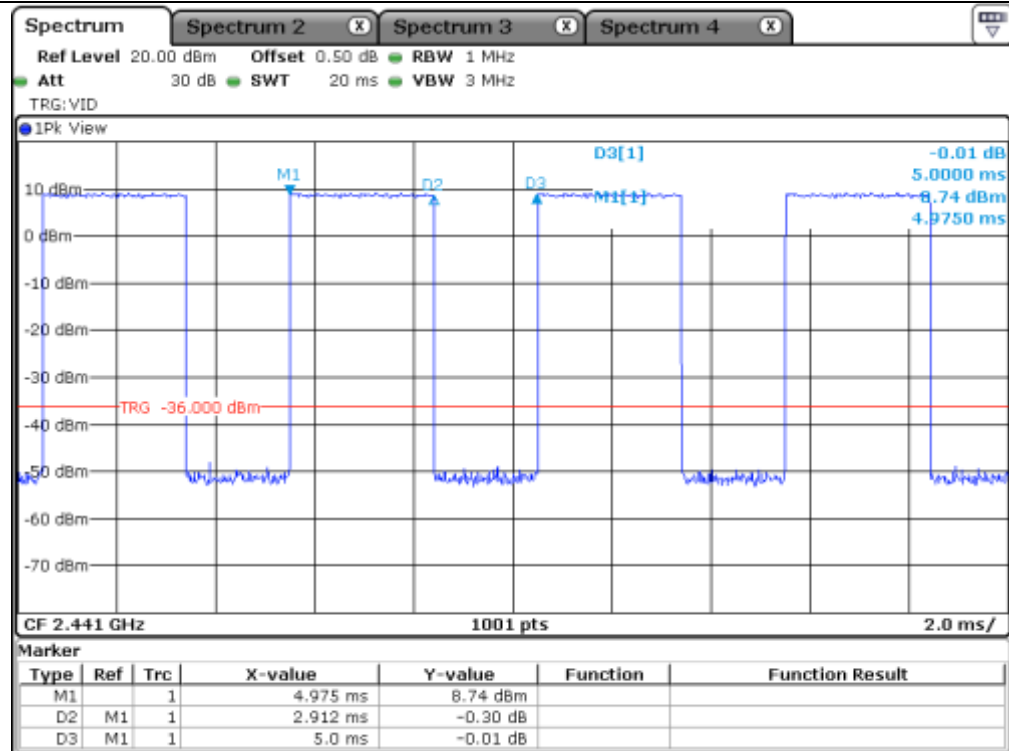
$$\text{Total Dwell Time} = \text{Pulse time} * \text{Hops per second with channels} * \text{period time}$$

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.

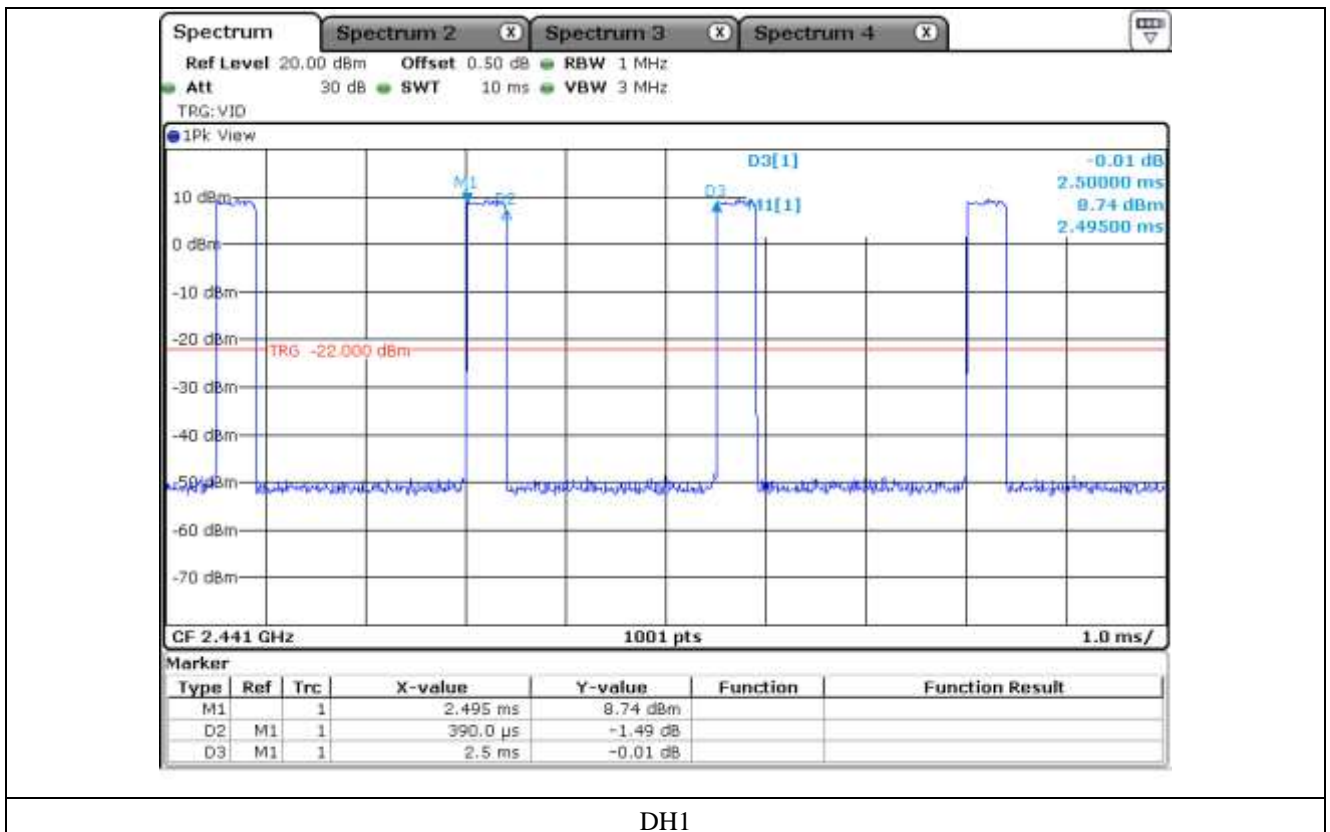
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel 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.

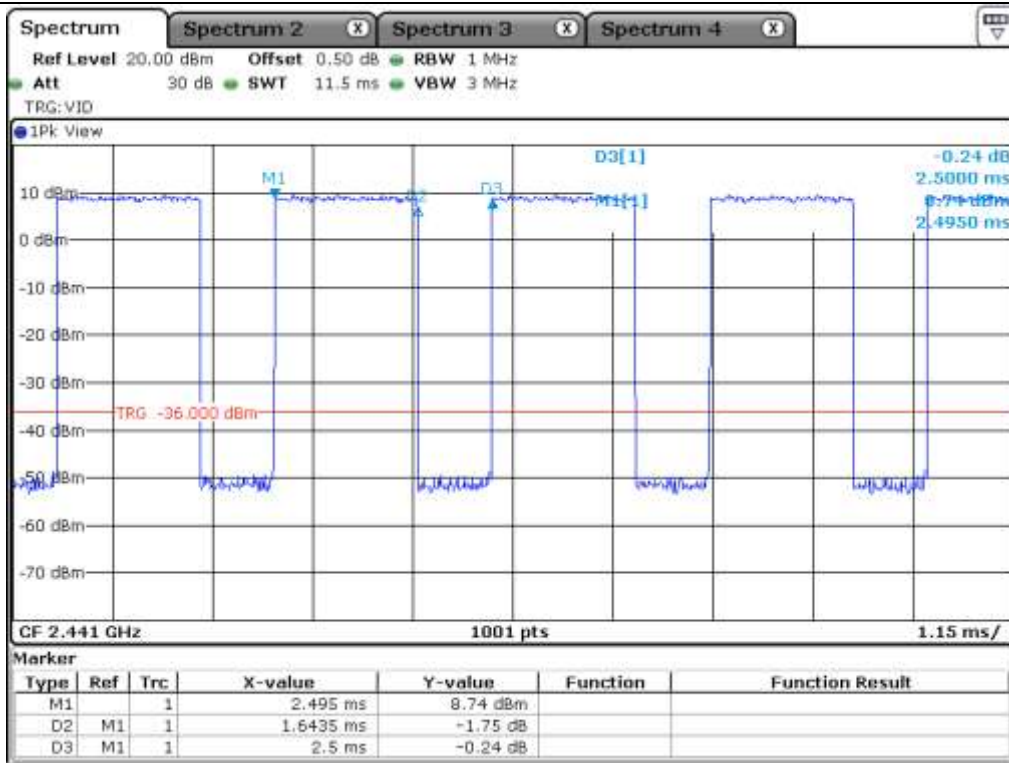
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.390	10.13	31.60	124.84	400	PASS
DH3	1.644	5.06	31.60	262.87	400	
DH5	2.892	3.38	31.60	308.89	400	

Total dwell time is calculated as following.

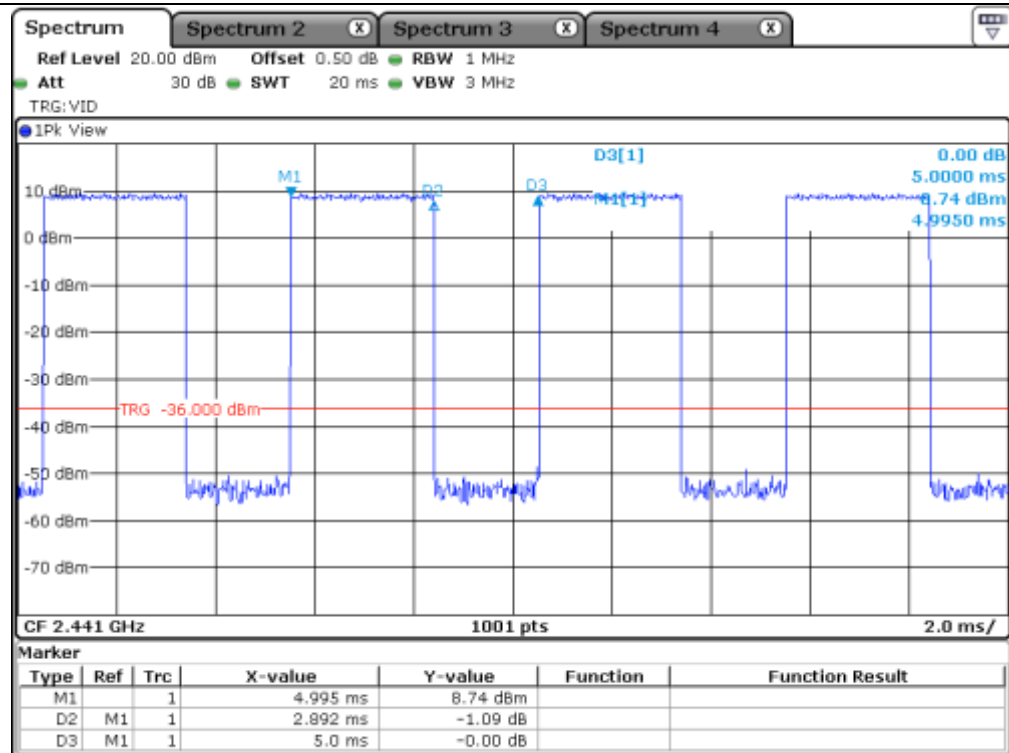
$$\text{Total Dwell Time} = \text{Pulse time} * \text{Hops per second with channels} * \text{period time}$$

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





DH3



DH5

11. MAXIMUM PEAK OUTPUT POWER

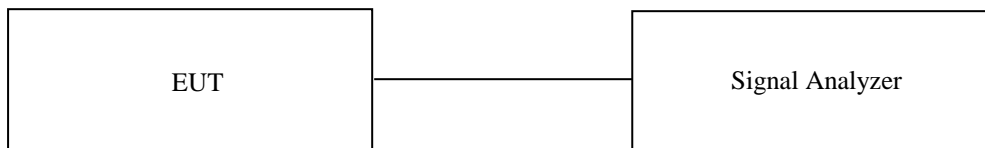
11.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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

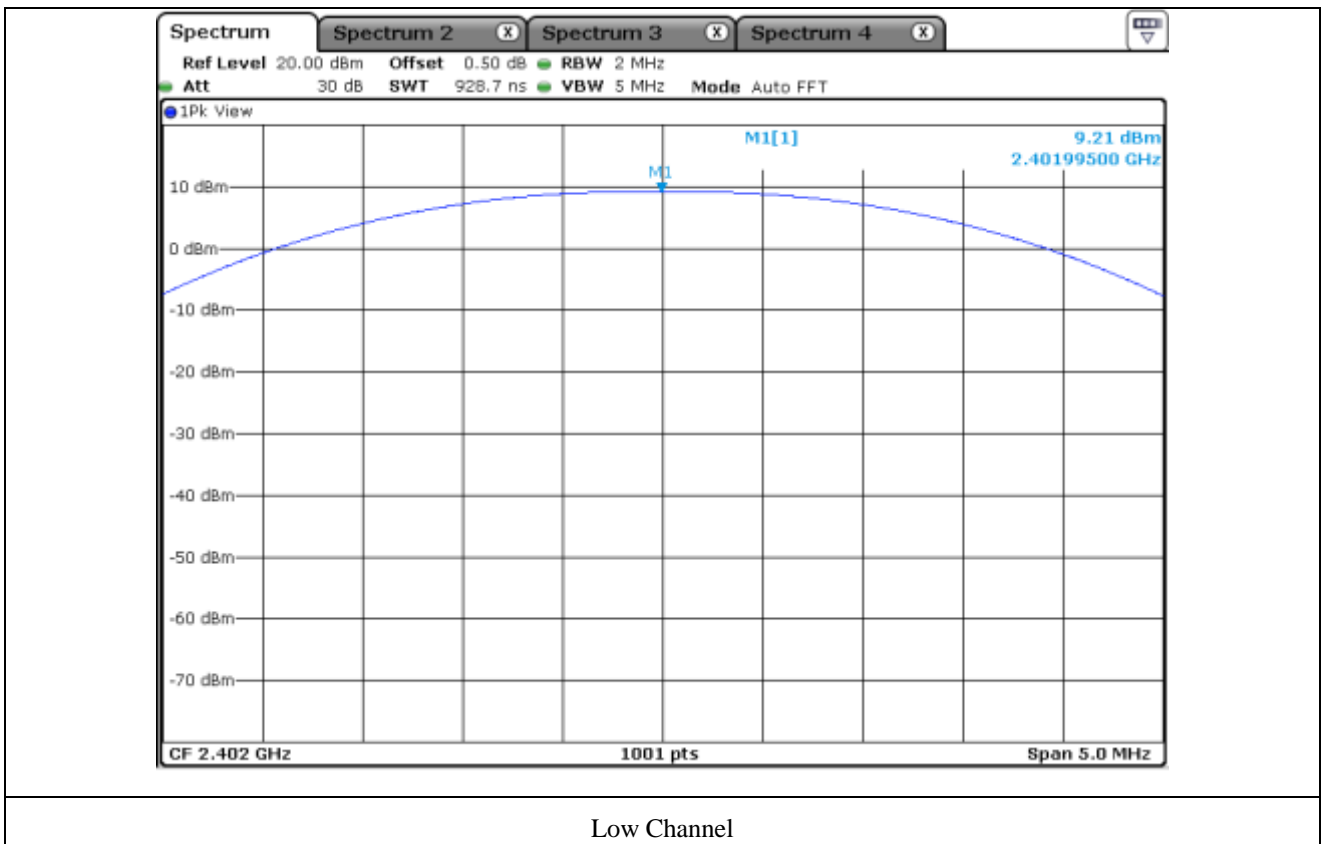
August 21, 2020 ~ September 08, 2020

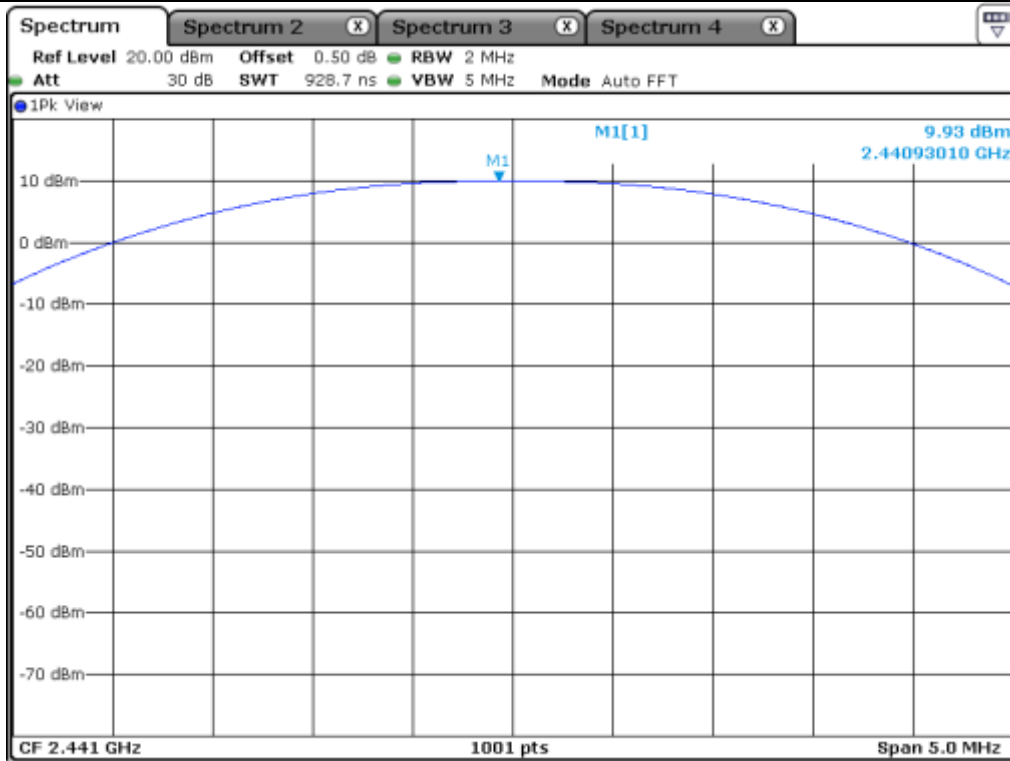
11.4 Test data for 1 Mbps

-. Test Result : Pass

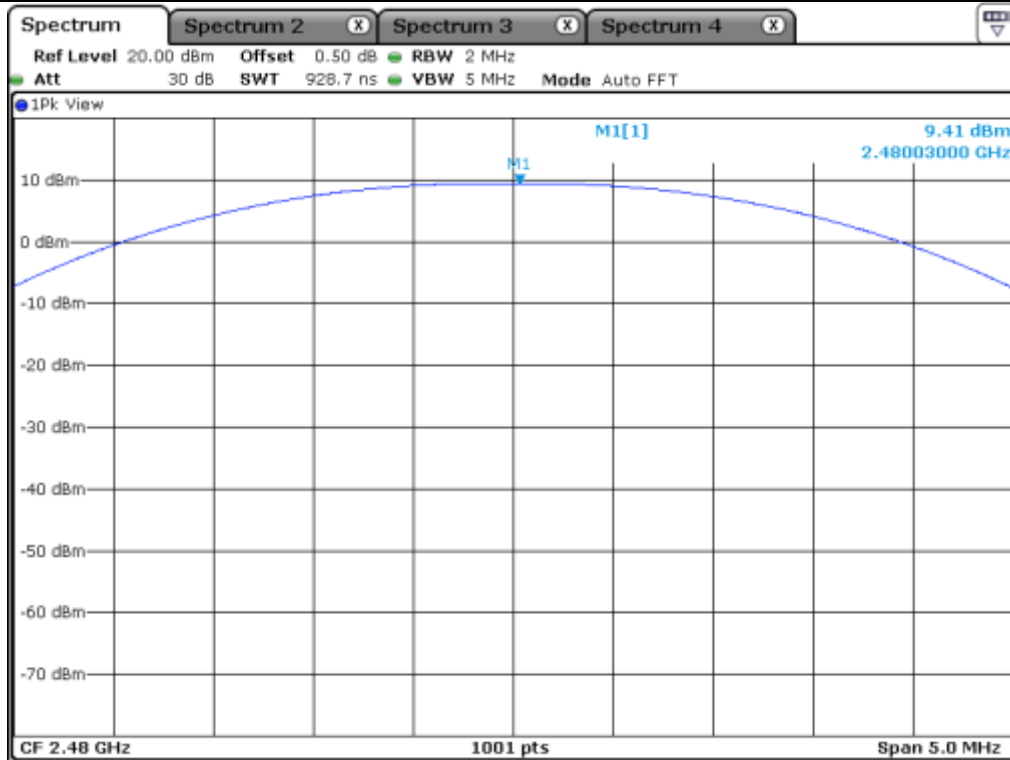
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.21	21.00	11.79
MIDDLE	2 441.00	9.93	21.00	11.07
HIGH	2 480.00	9.41	21.00	11.59

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





Middle Channel



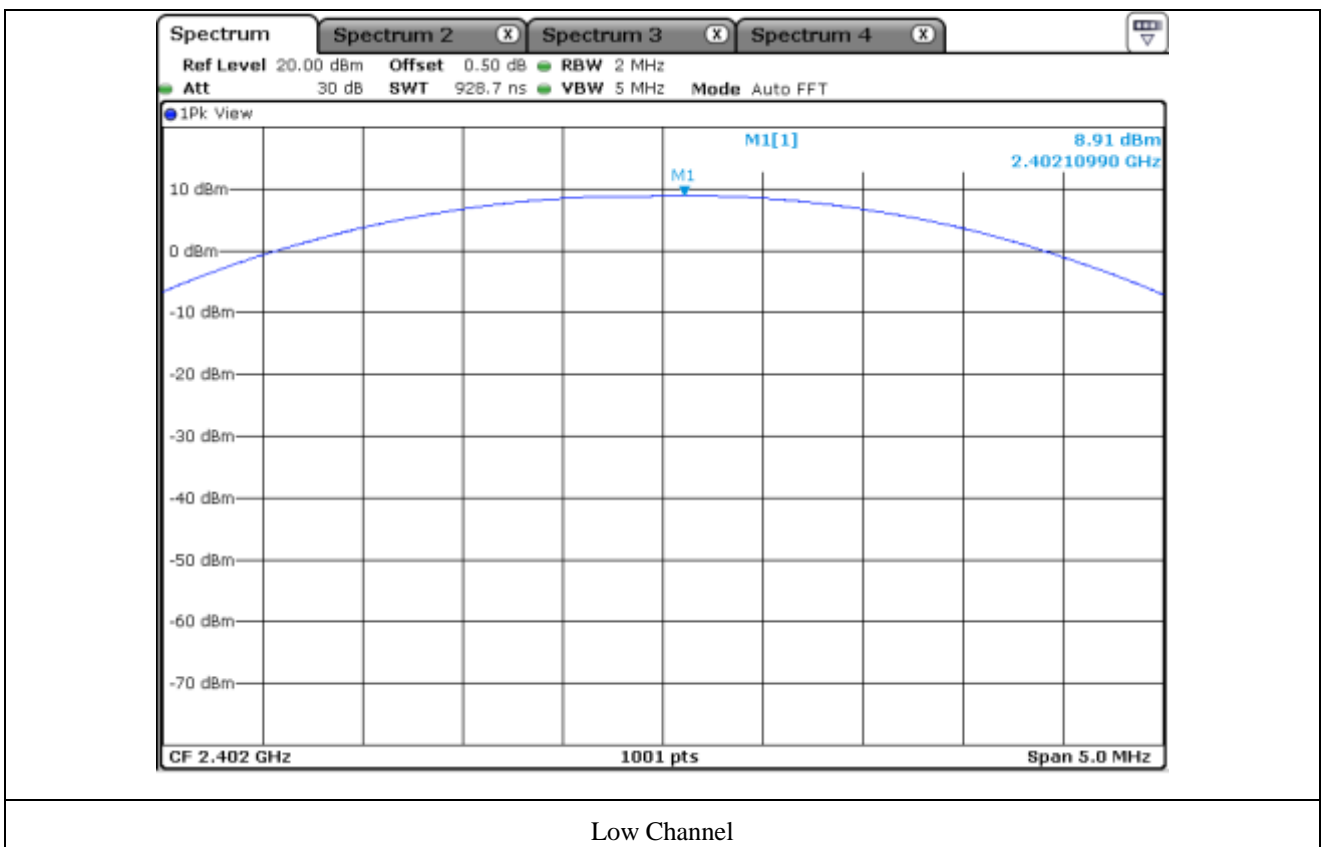
High Channel

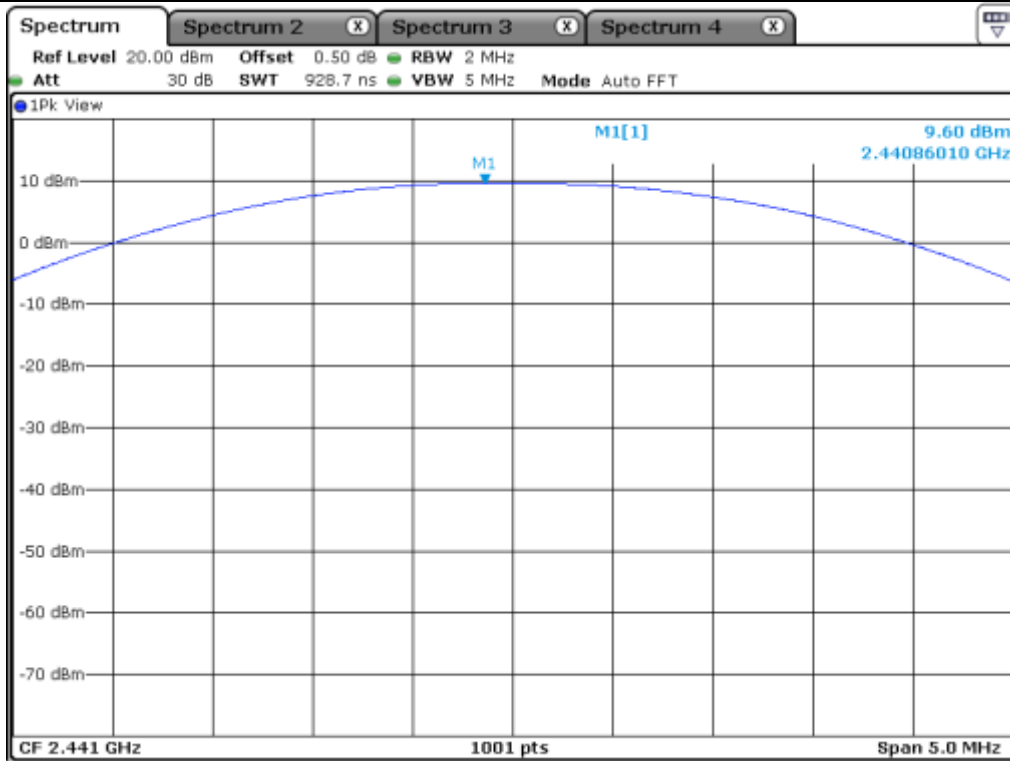
11.5 Test data for 2 Mbps

-. Test Result : Pass

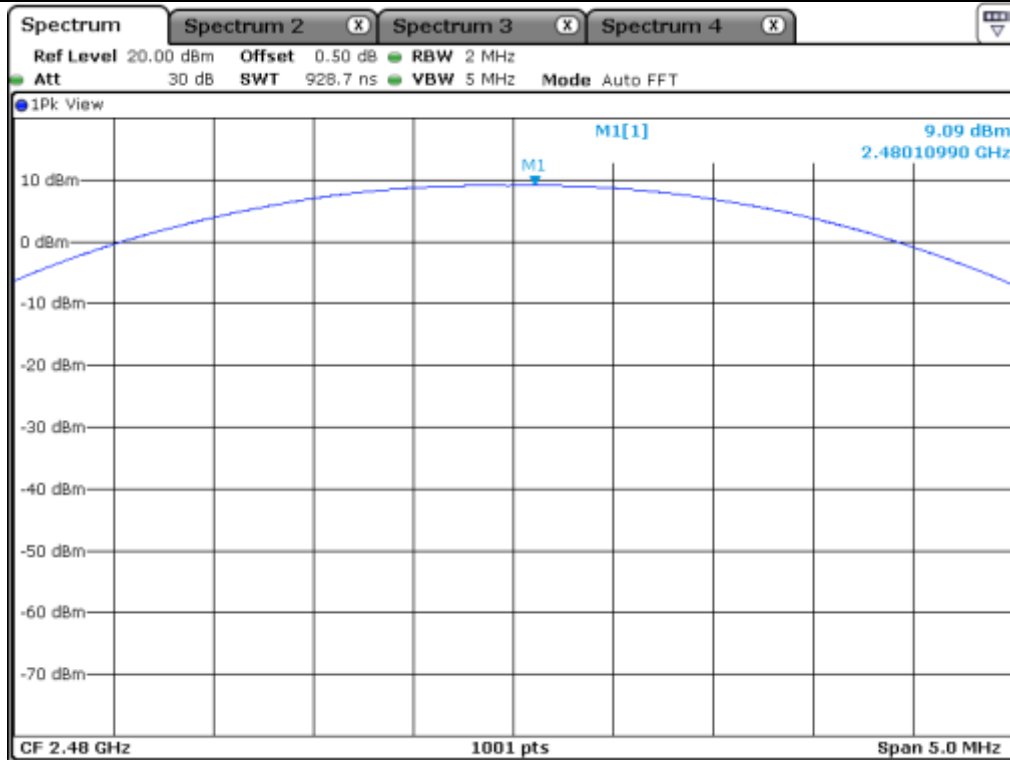
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	8.91	21.00	12.09
MIDDLE	2 441.00	9.60	21.00	11.40
HIGH	2 480.00	9.09	21.00	11.91

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





Middle Channel



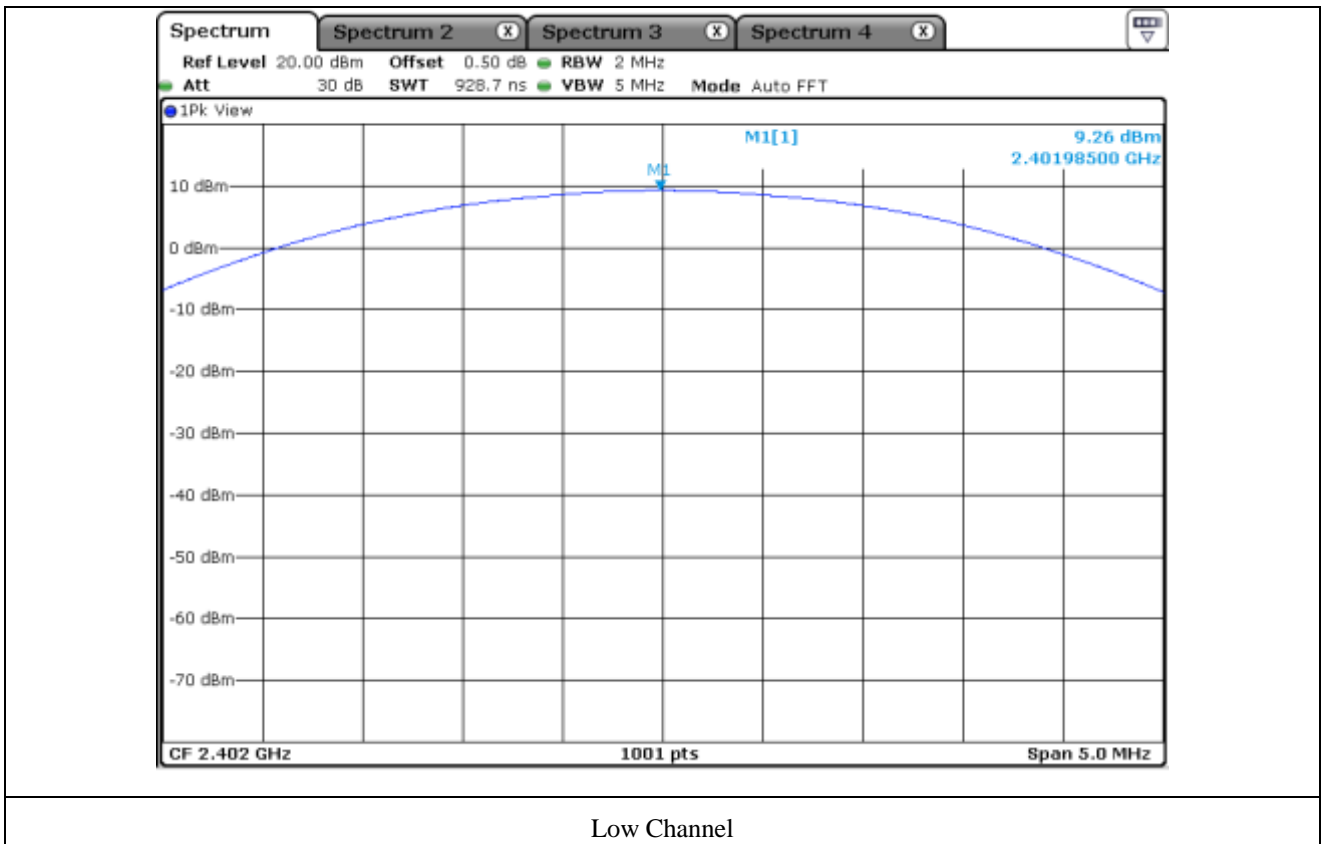
High Channel

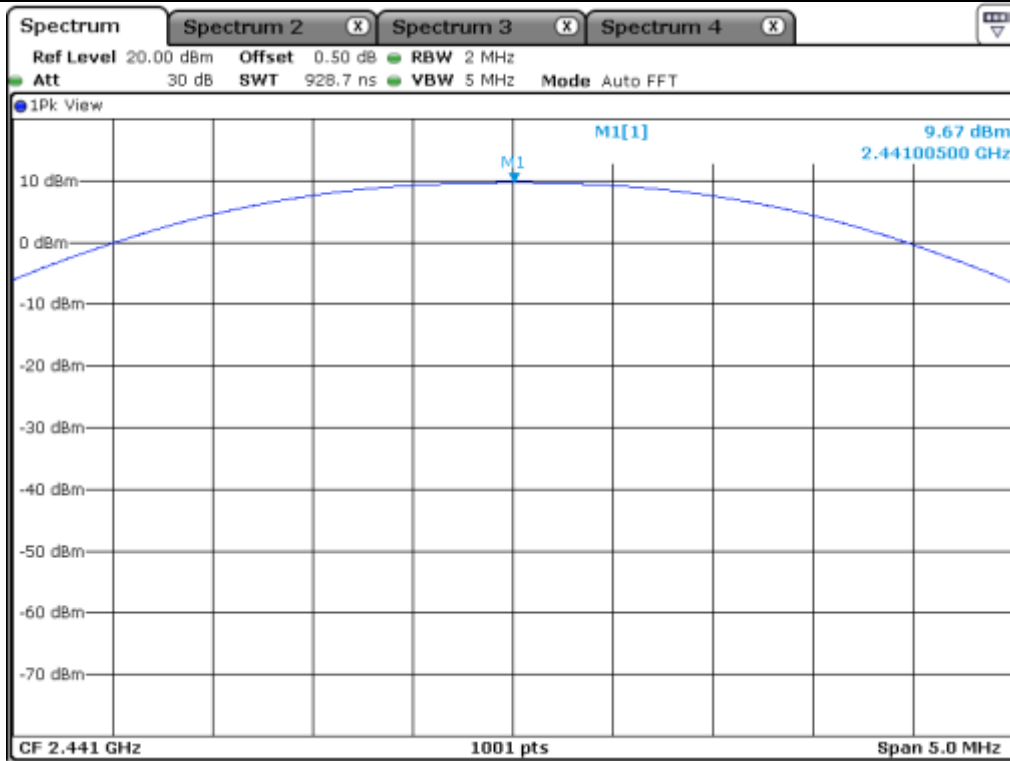
11.6 Test data for 3 Mbps

-. Test Result : Pass

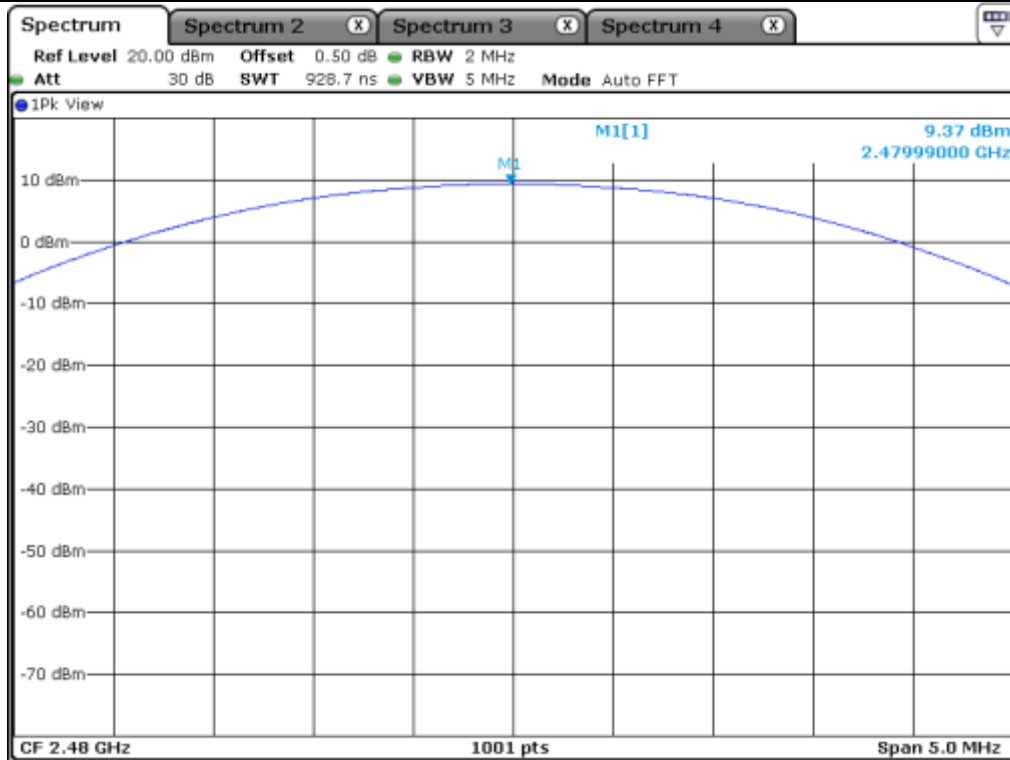
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.26	21.00	11.74
MIDDLE	2 441.00	9.67	21.00	11.33
HIGH	2 480.00	9.37	21.00	11.63

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





Middle Channel



High Channel

12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature : 23 °C
 Relative humidity : 41 % 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.

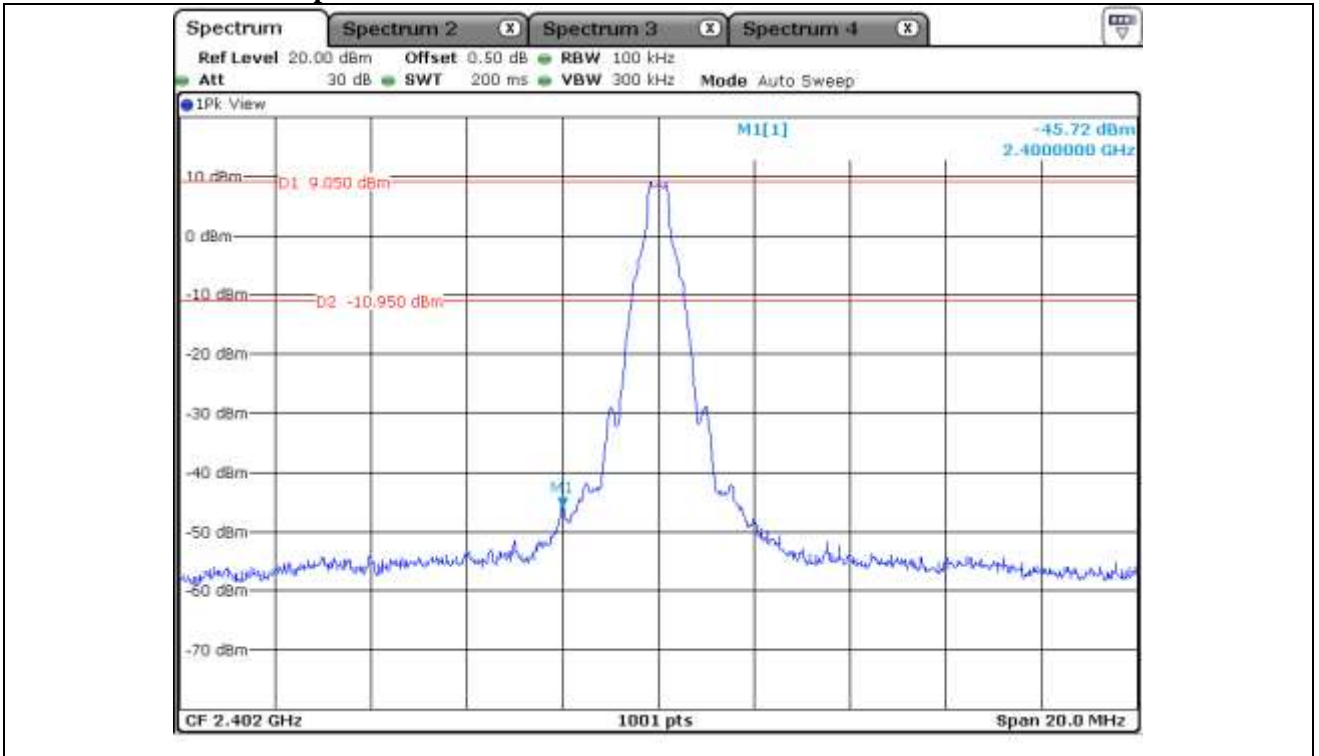
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

12.4 Test Date

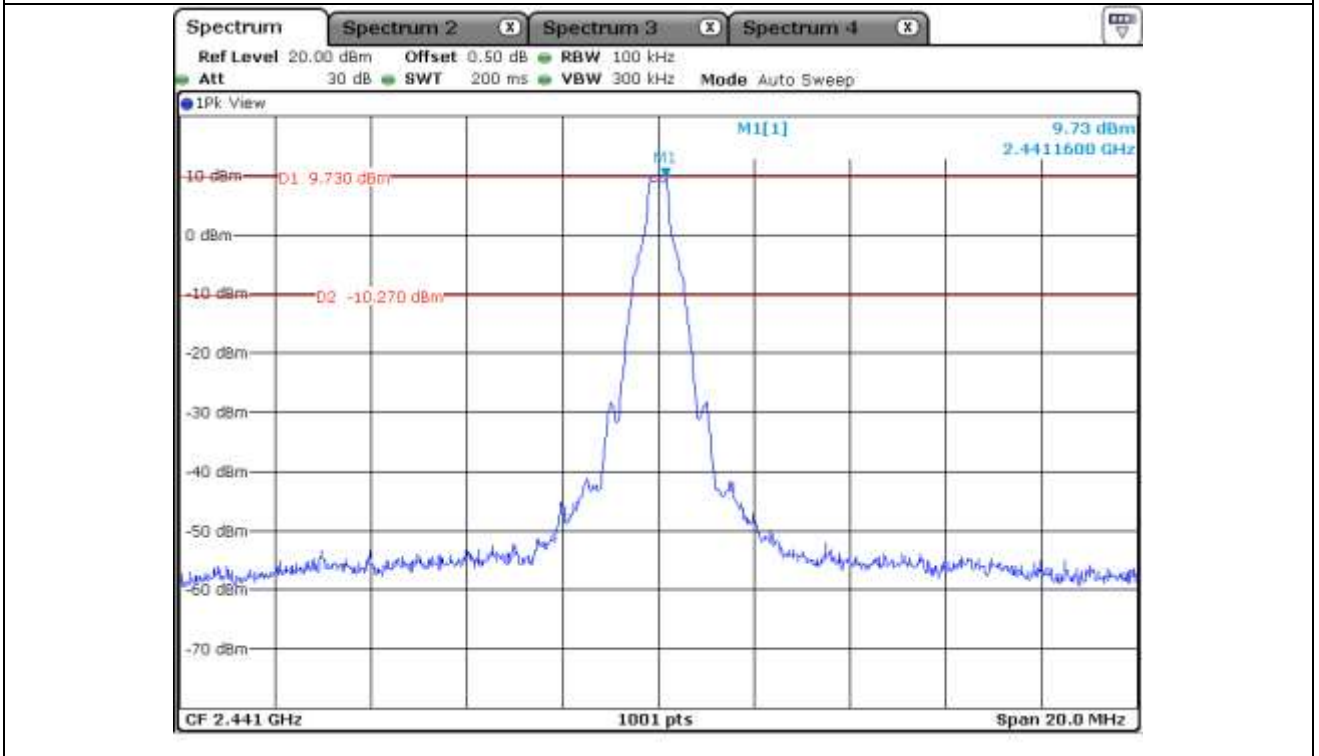
August 21, 2020 ~ September 08, 2020

12.5 Test data for conducted emission

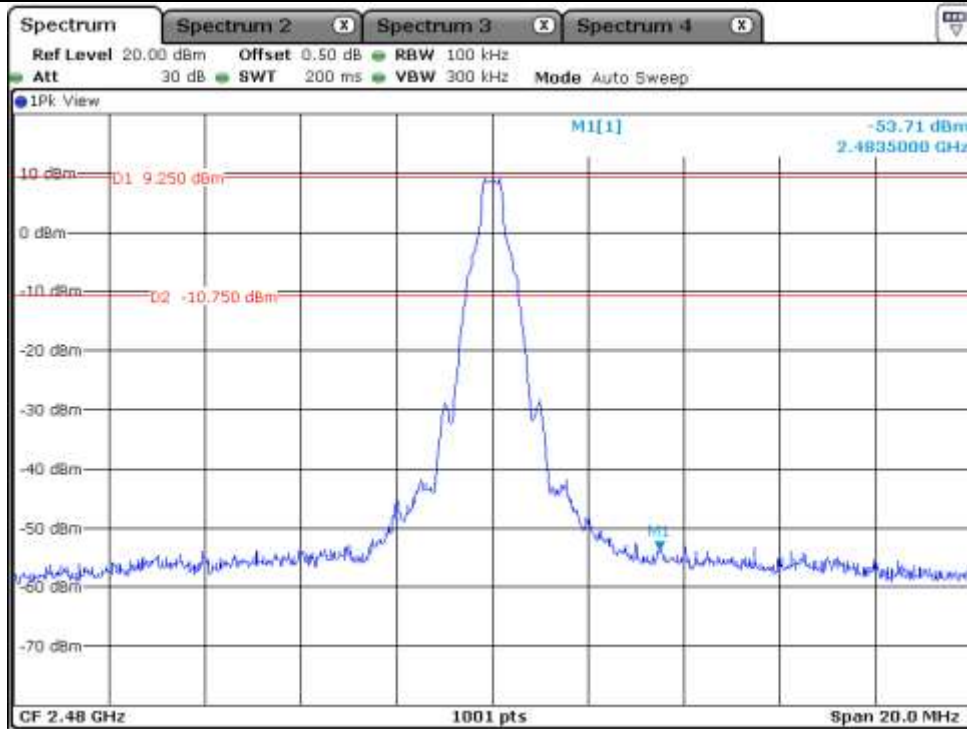
12.5.1 Test data for 1 Mbps



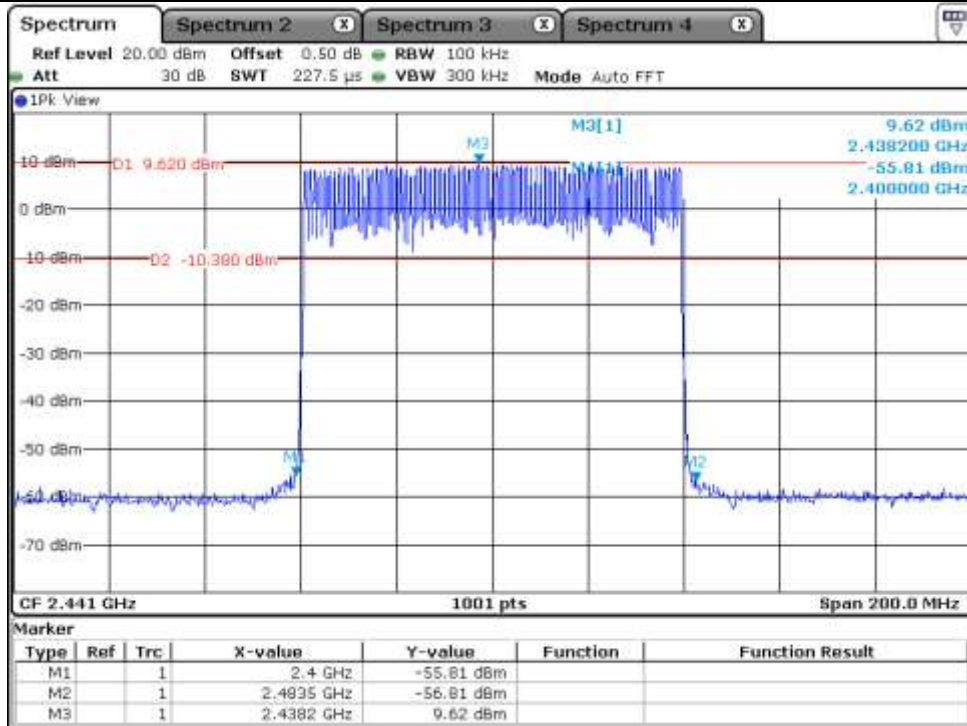
Low Channel



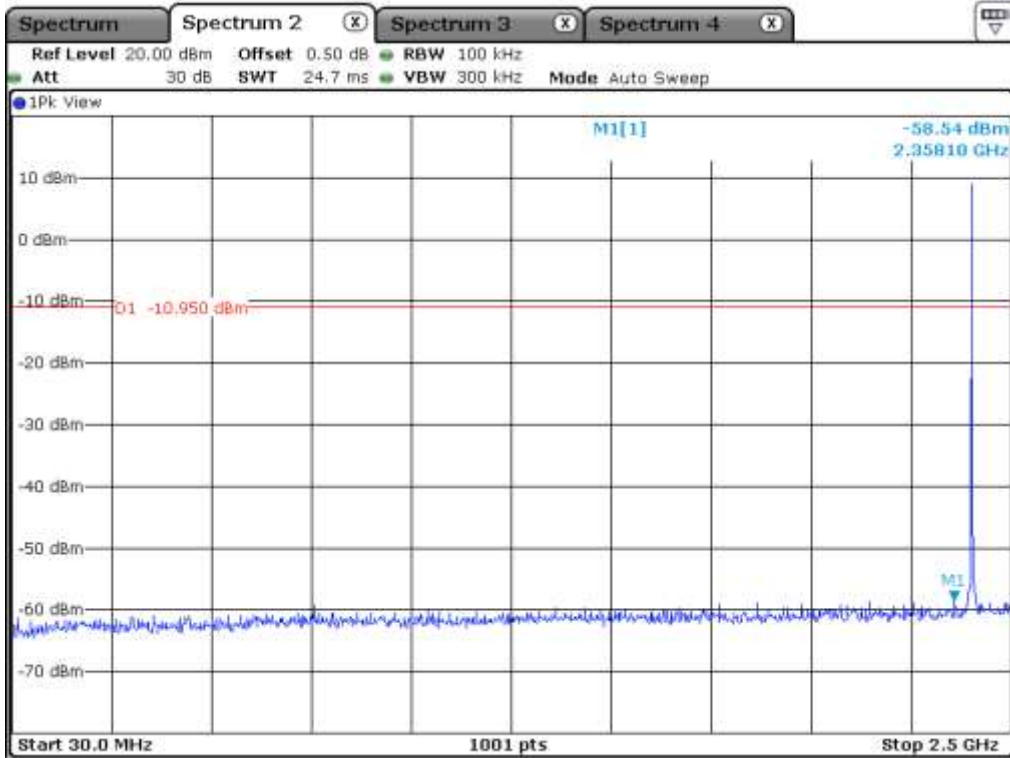
Middle Channel



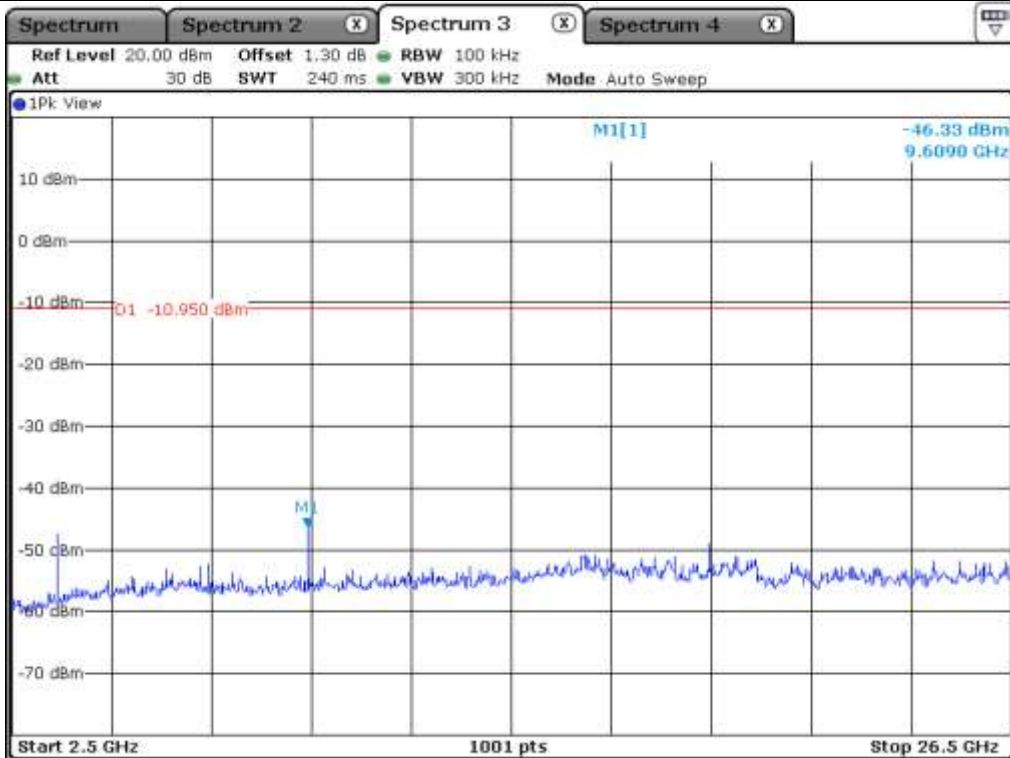
High Channel



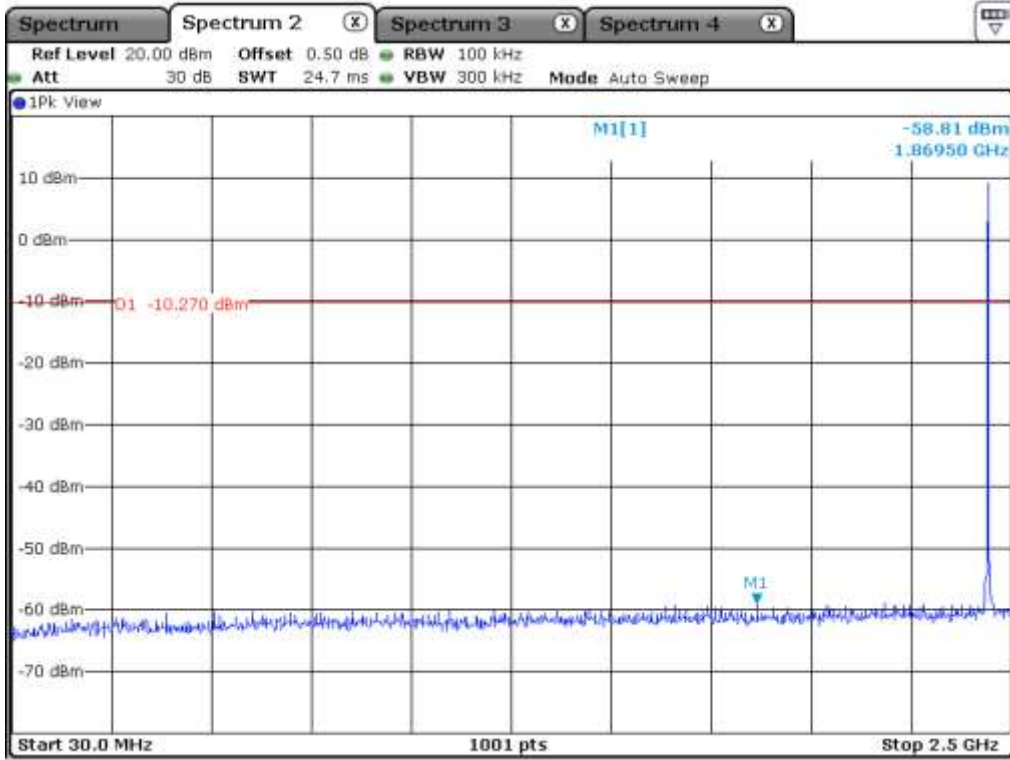
Hopping Mode



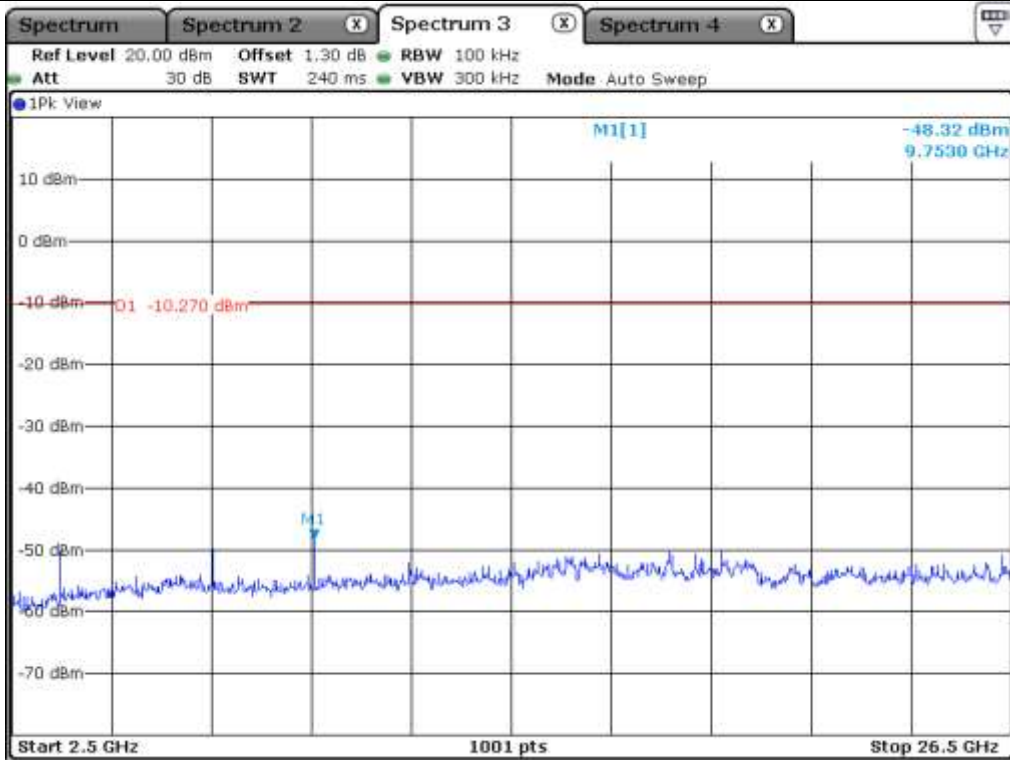
Low Channel



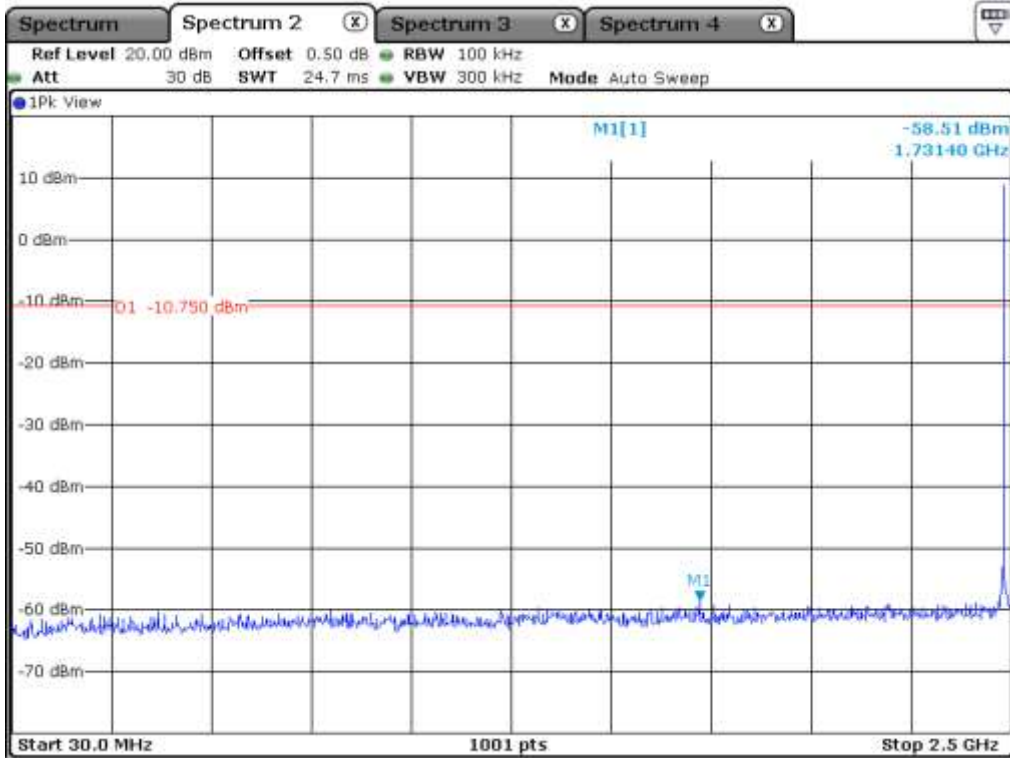
Low Channel



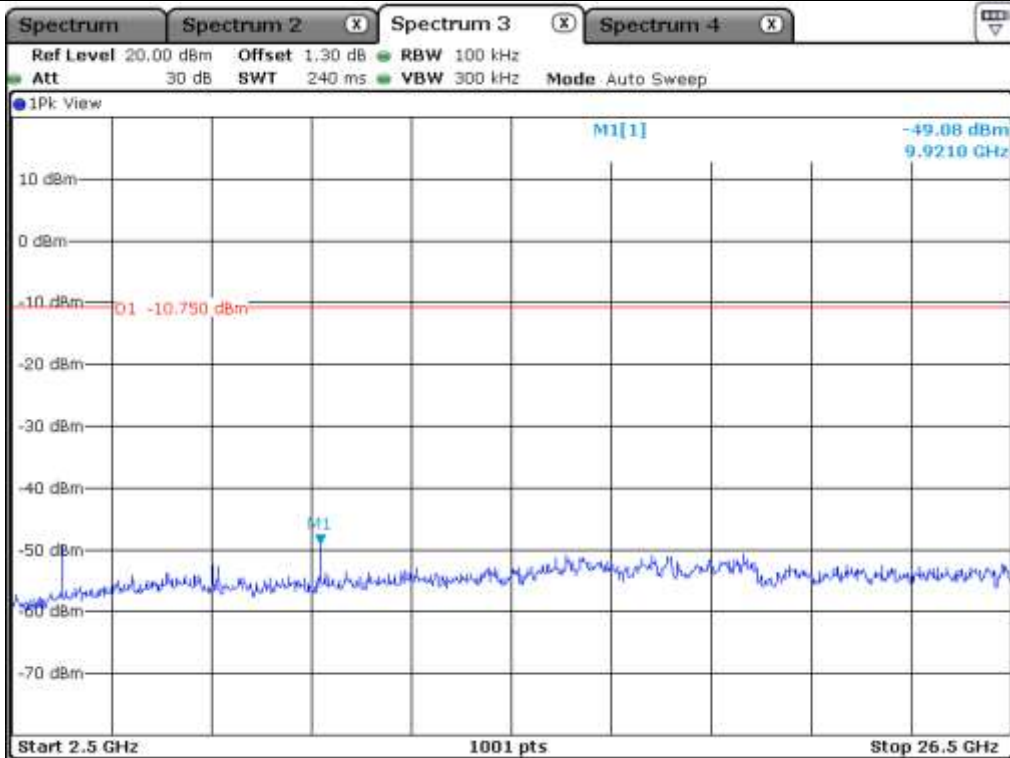
Middle Channel



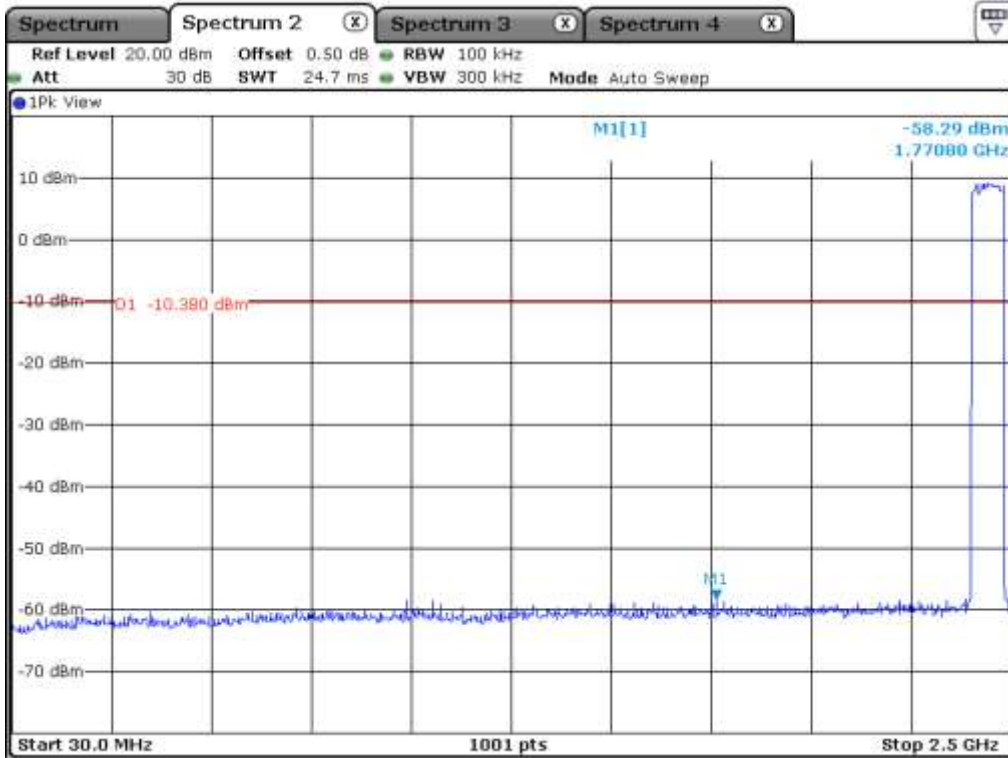
Middle Channel



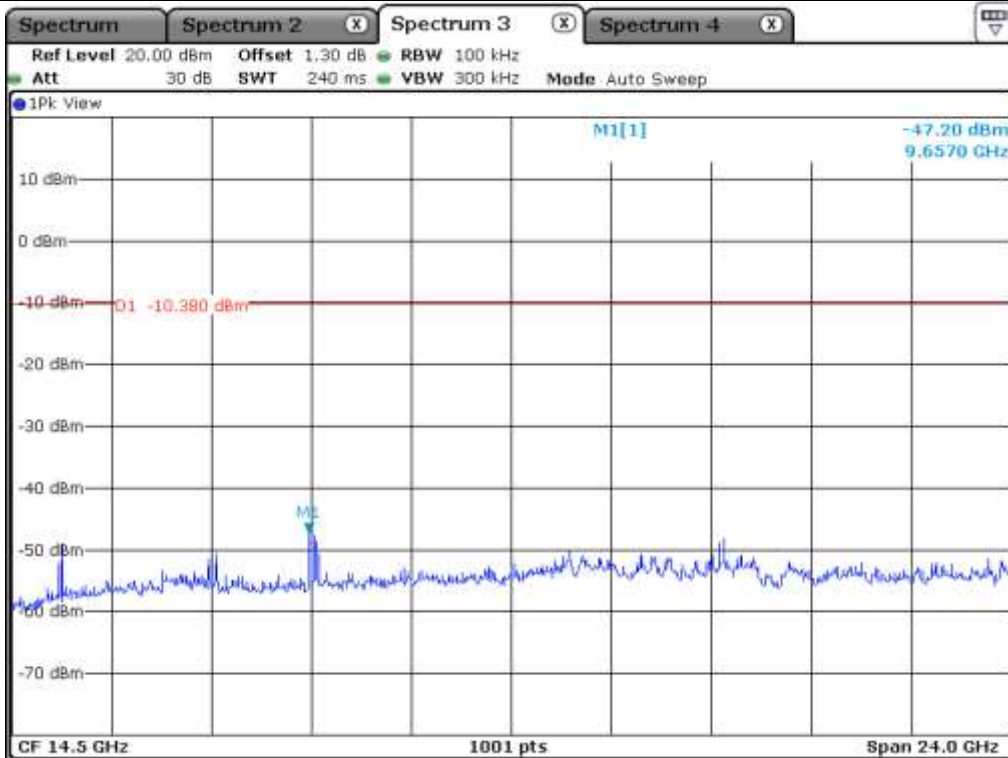
High Channel



High Channel

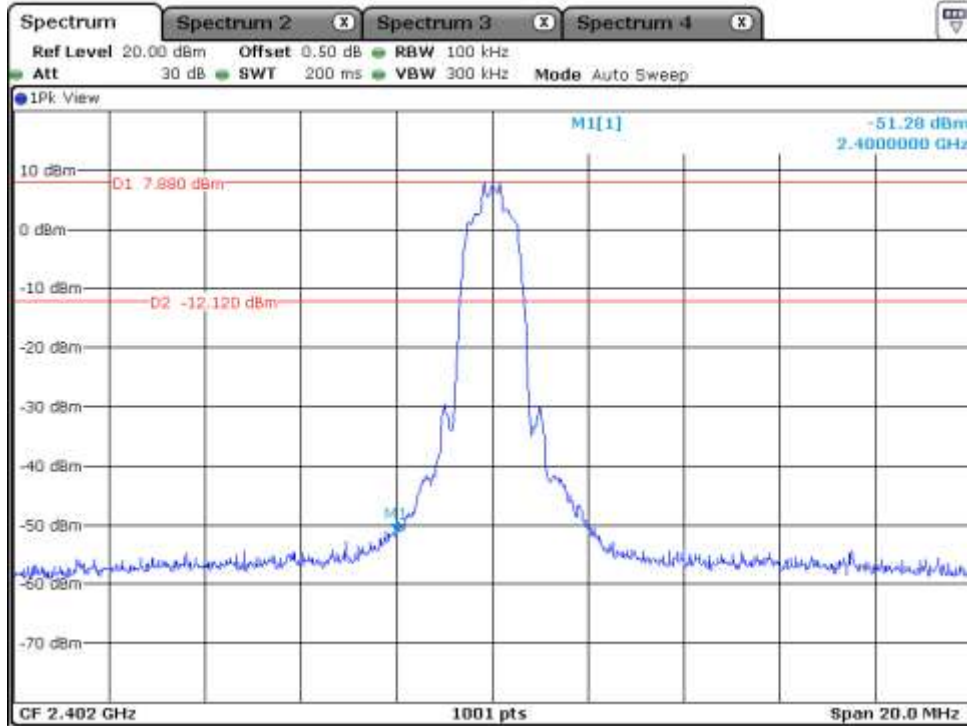


Hopping Mode

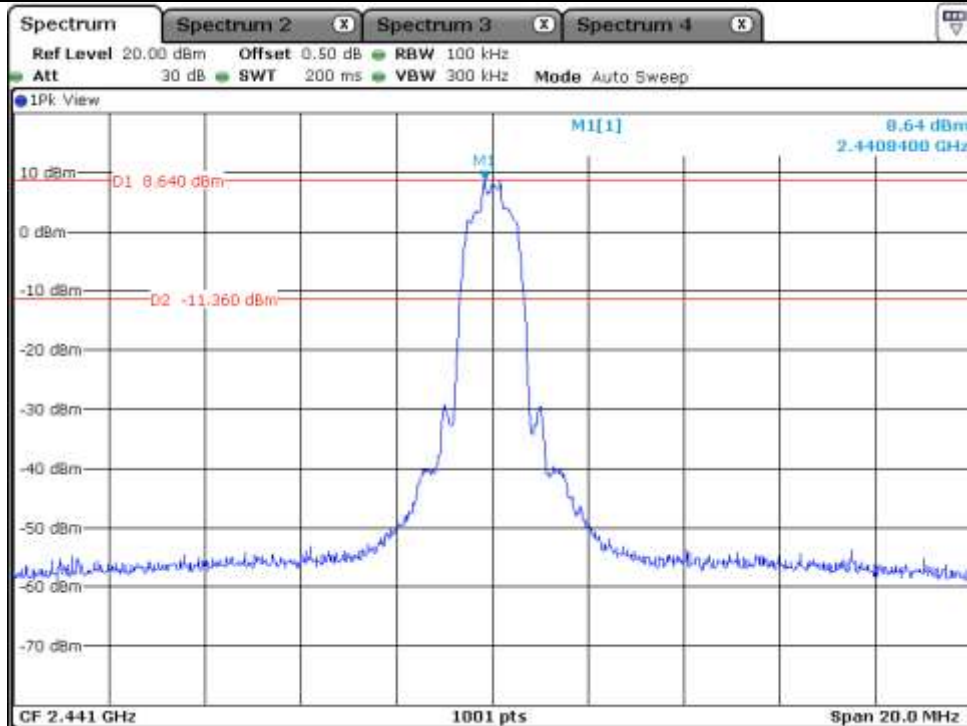


Hopping Mode

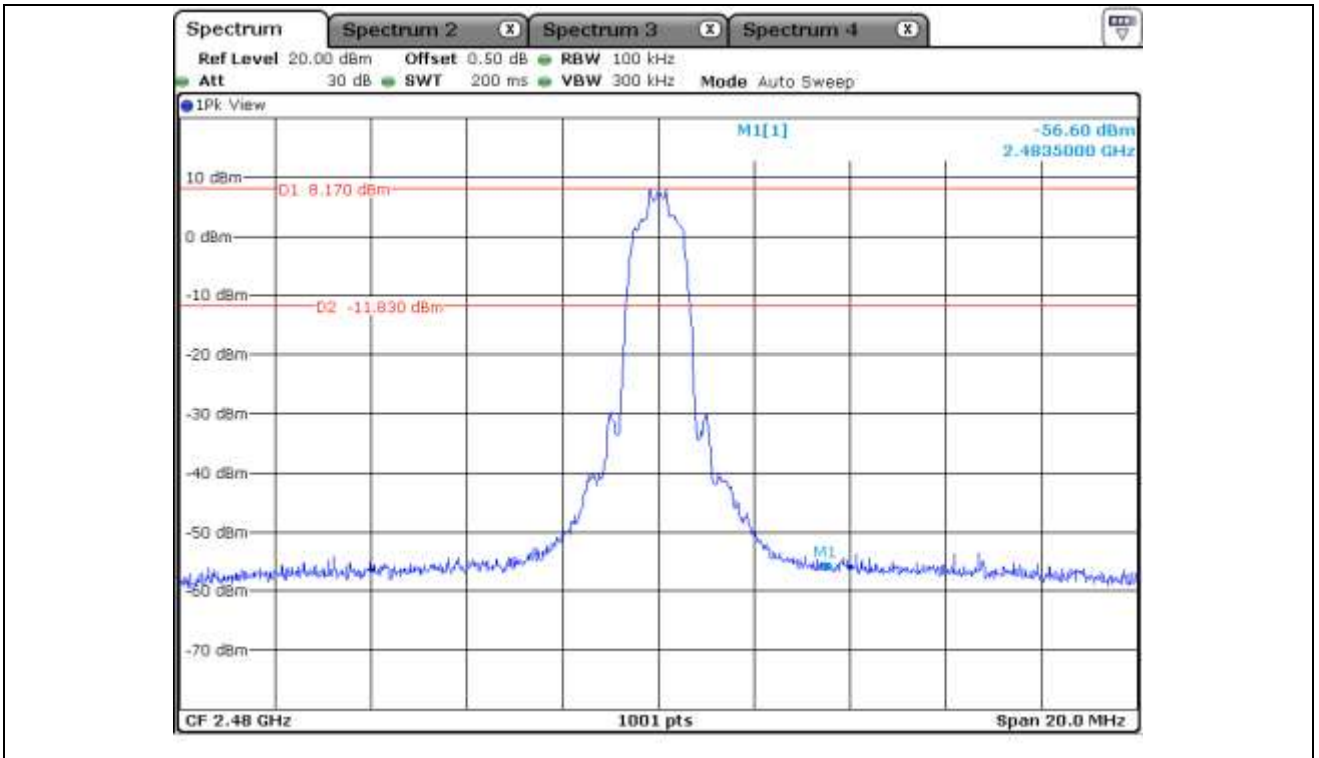
12.5.2 Test data for 2 Mbps



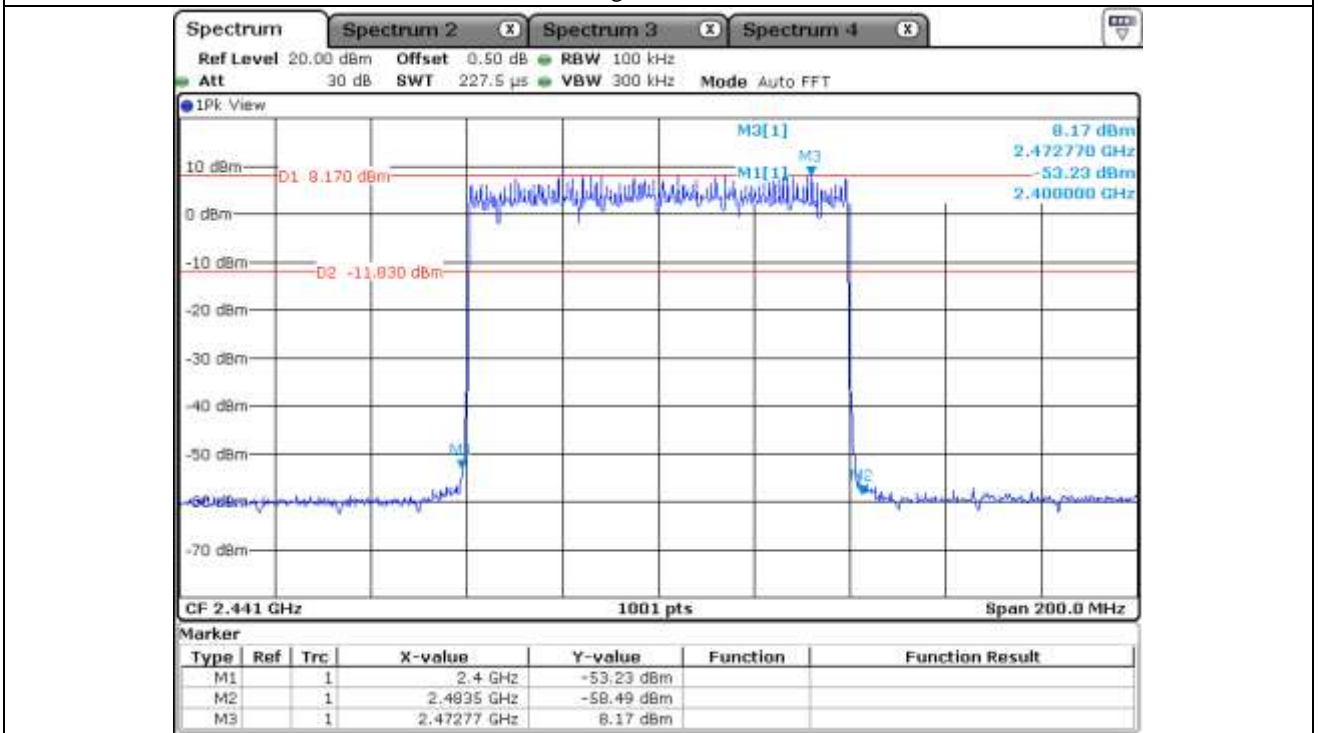
Low Channel



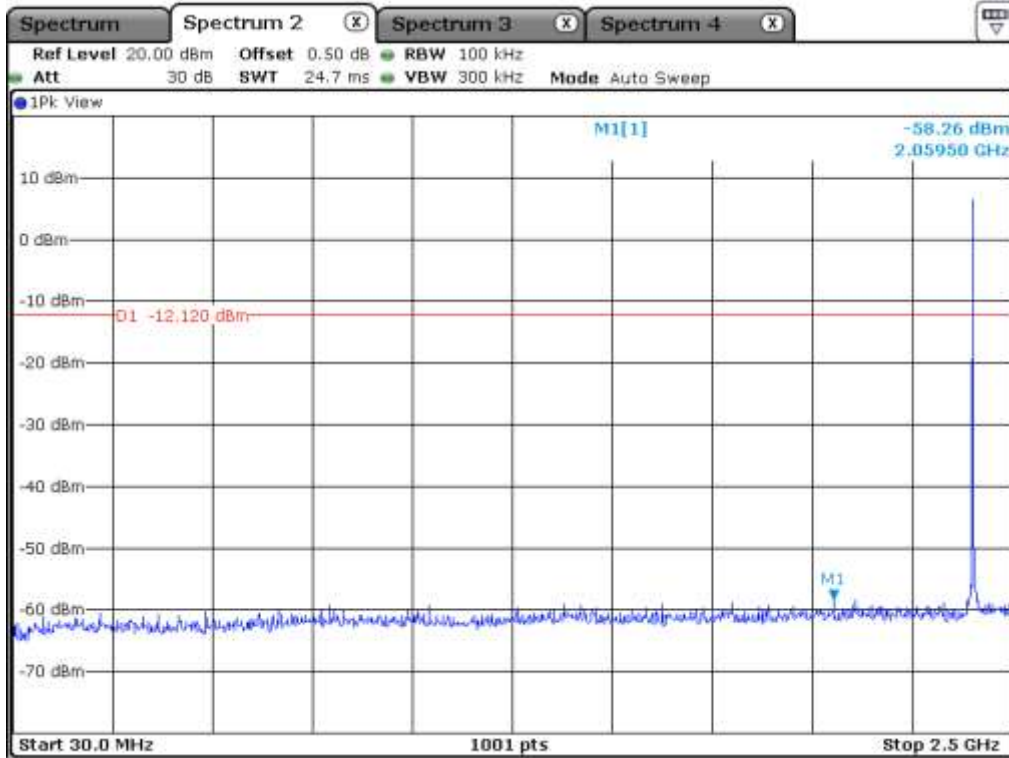
Middle Channel



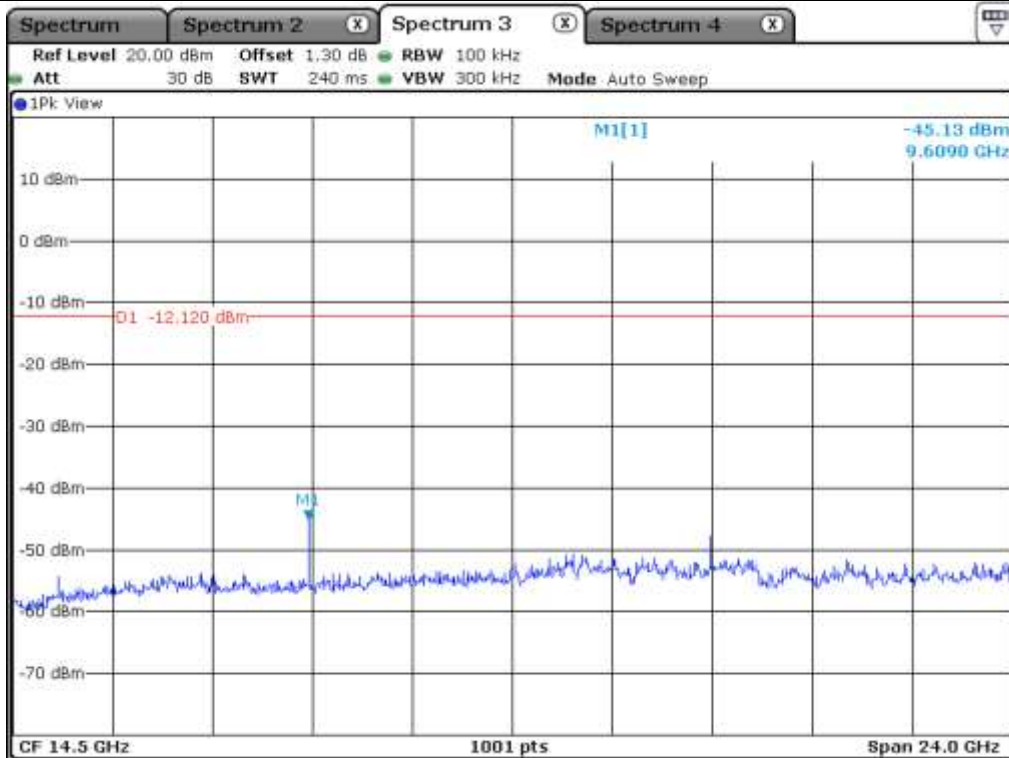
High Channel



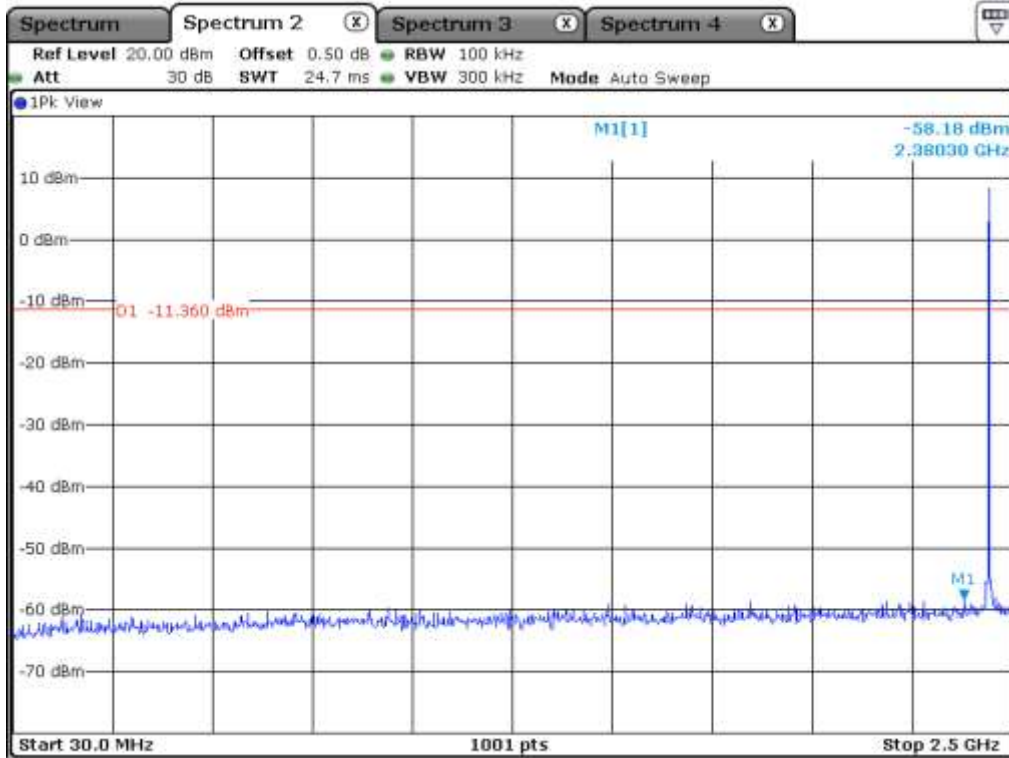
Hopping Mode



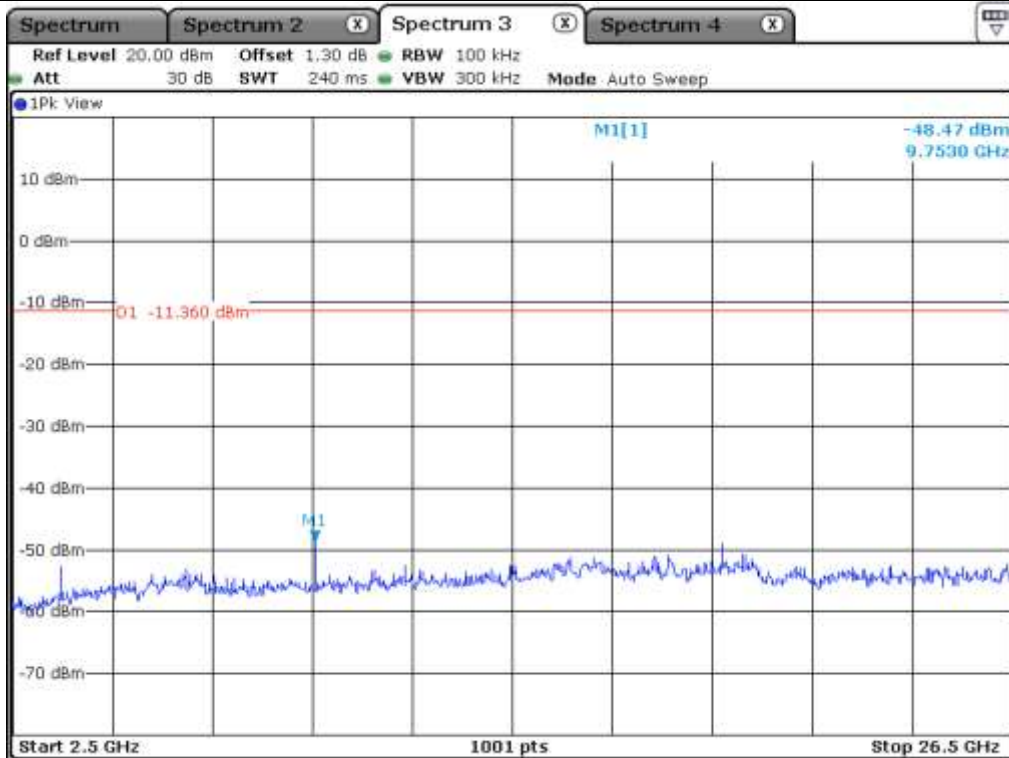
Low Channel



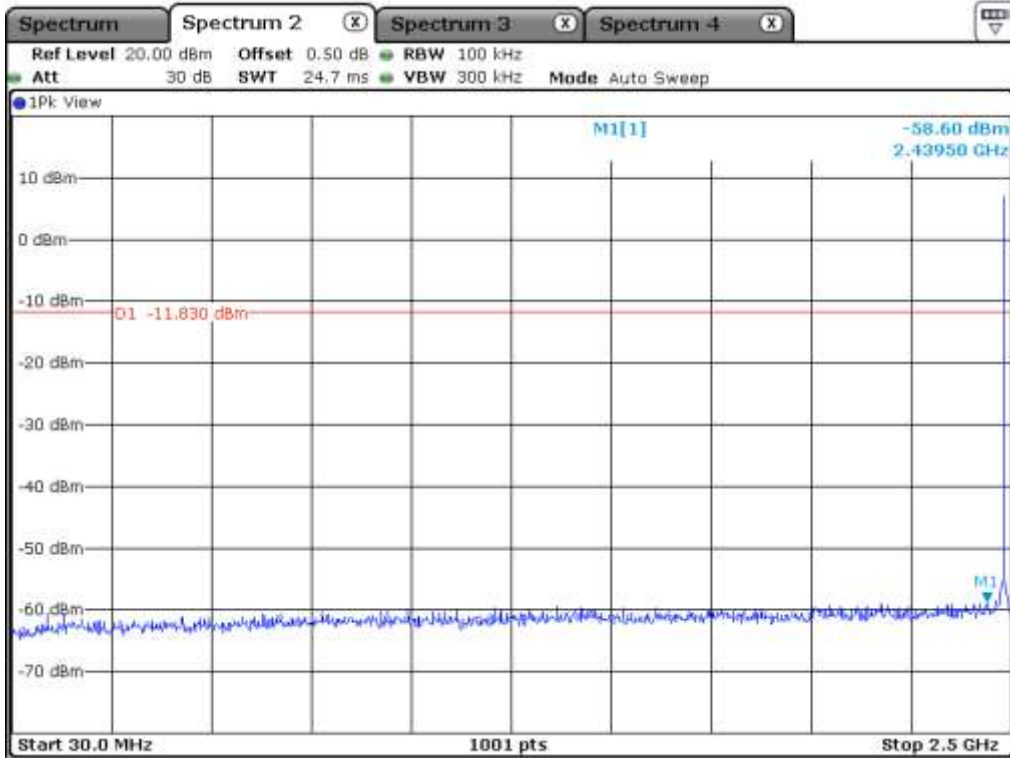
Low Channel



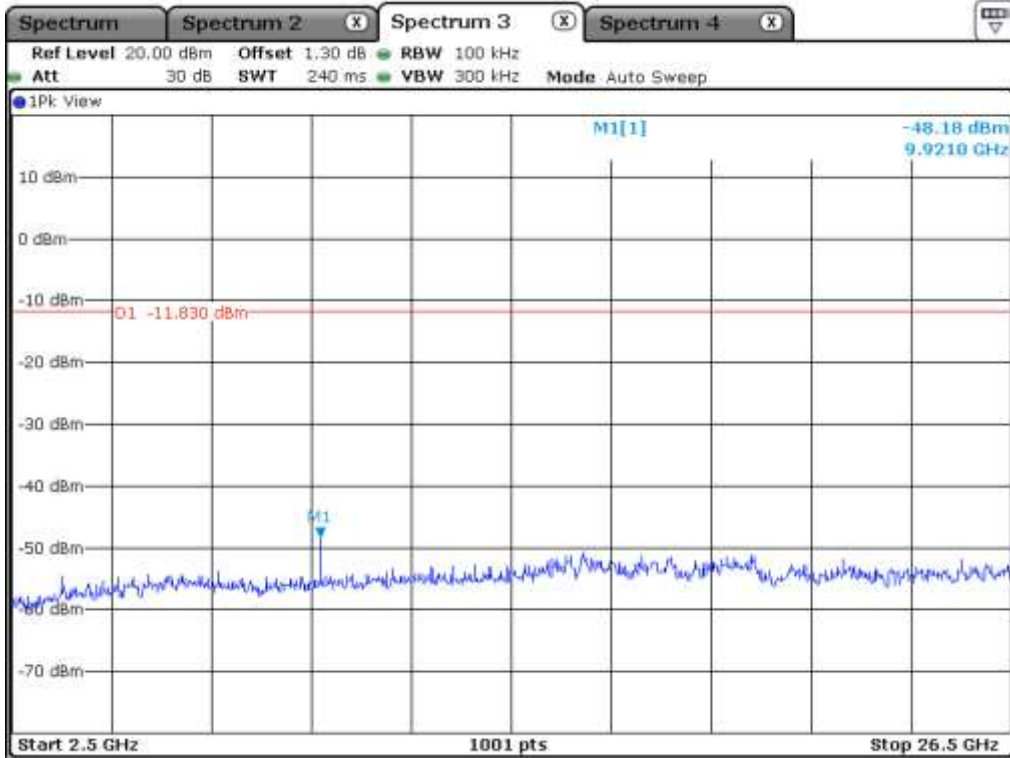
Middle Channel



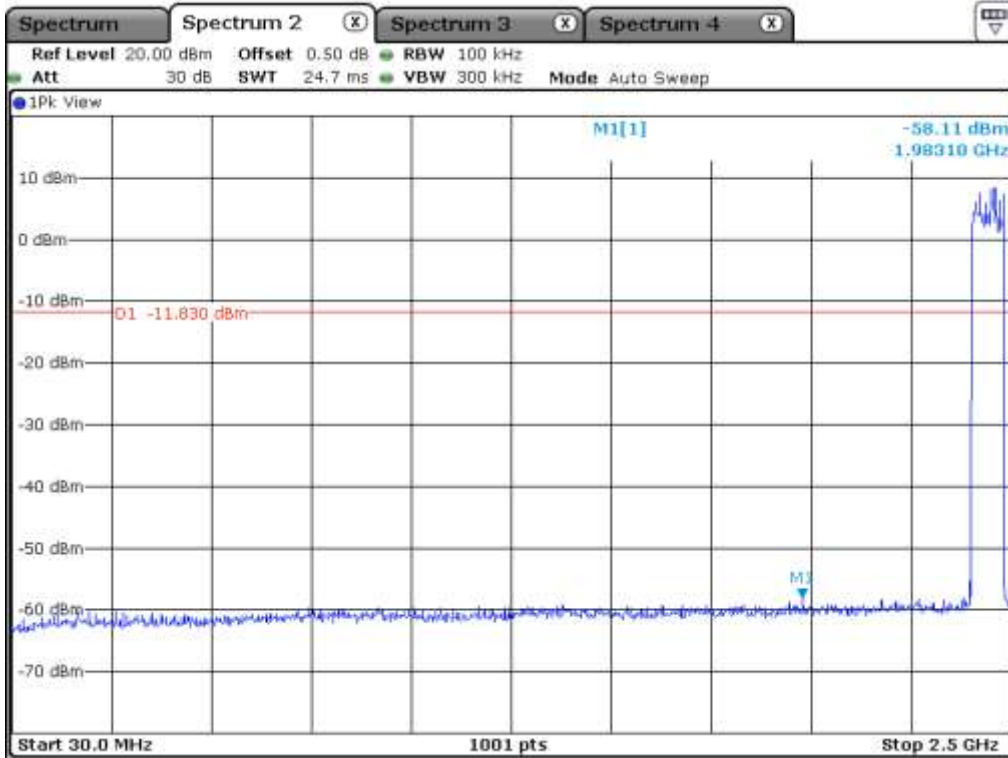
Middle Channel



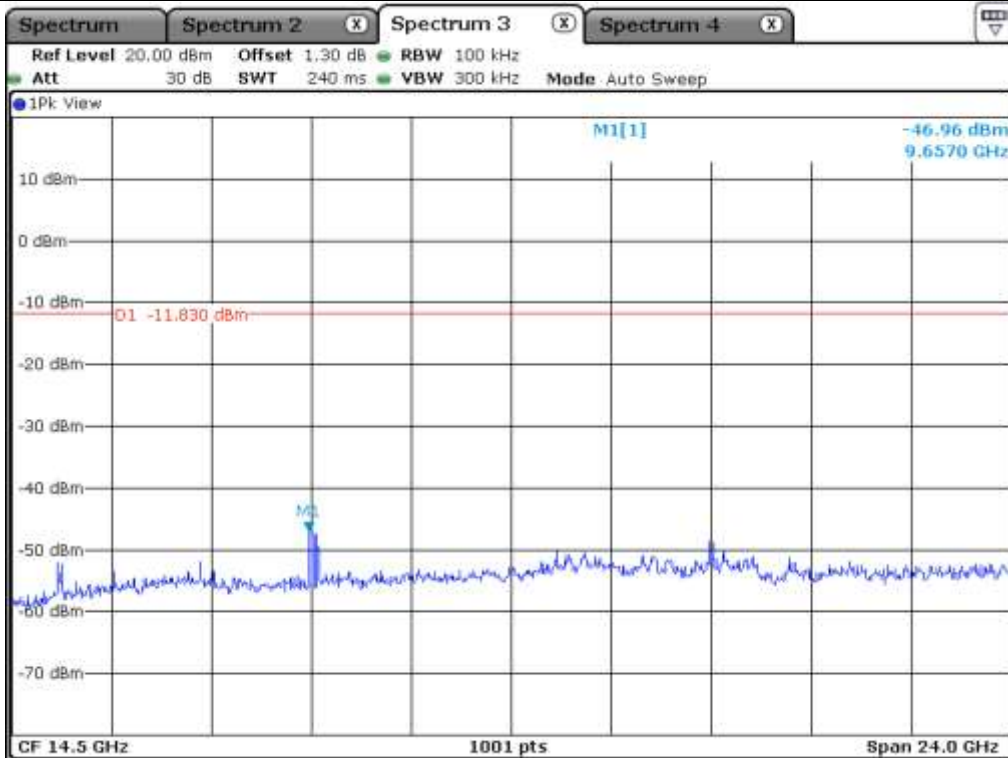
High Channel



High Channel

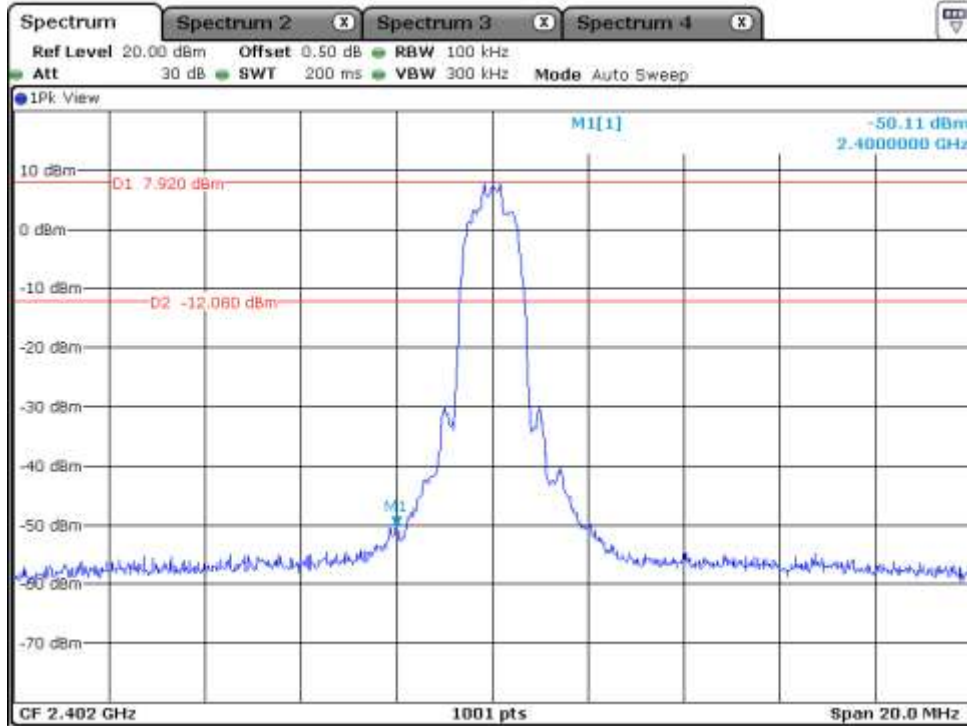


Hopping Mode

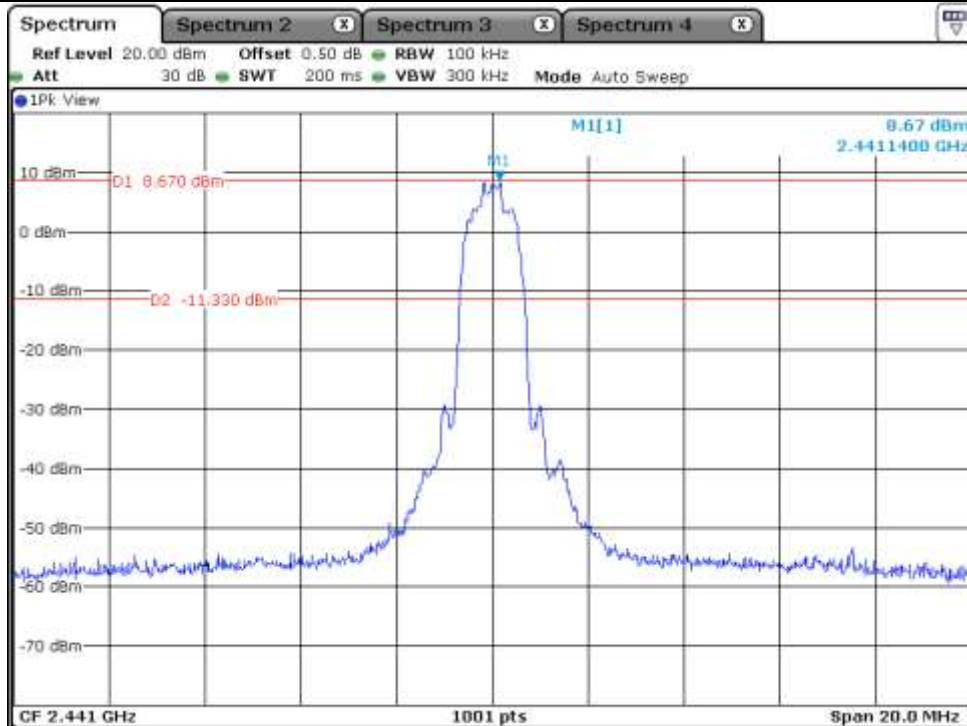


Hopping Mode

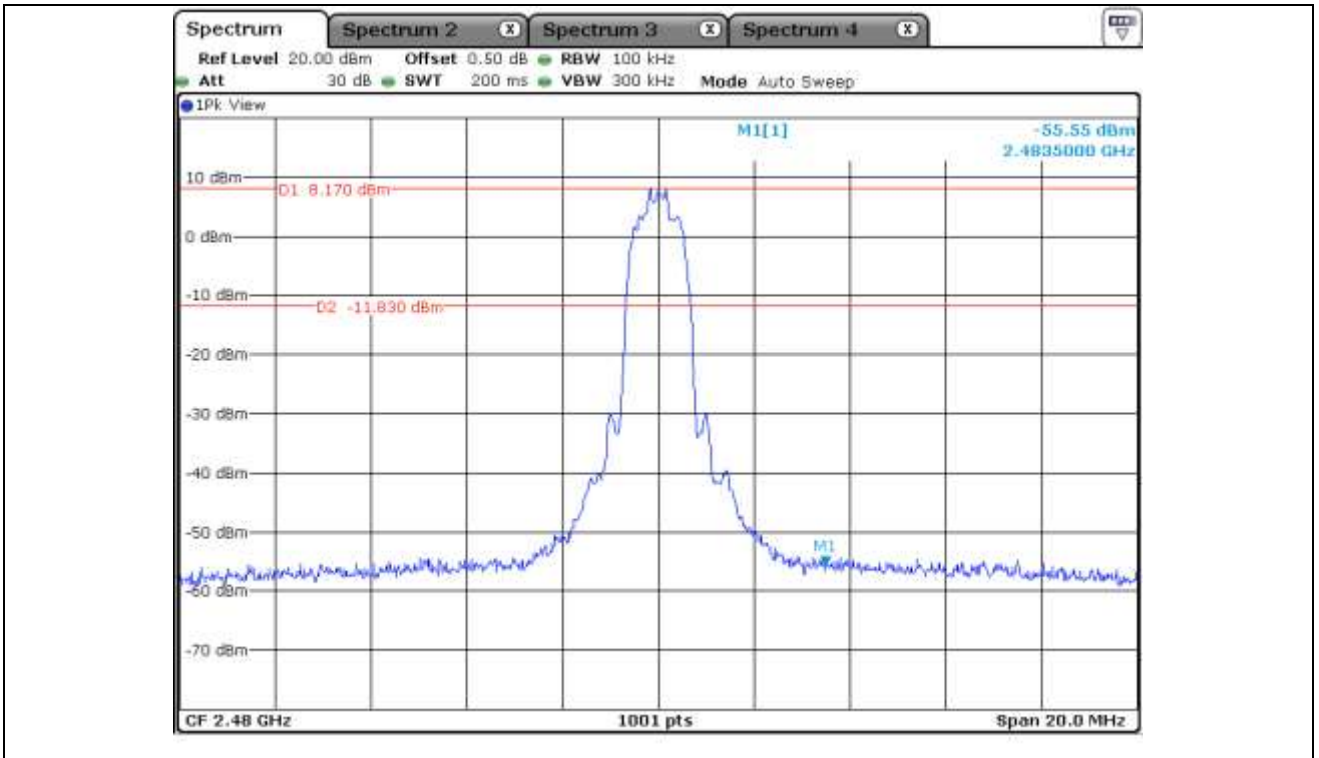
12.5.3 Test data for 3 Mbps



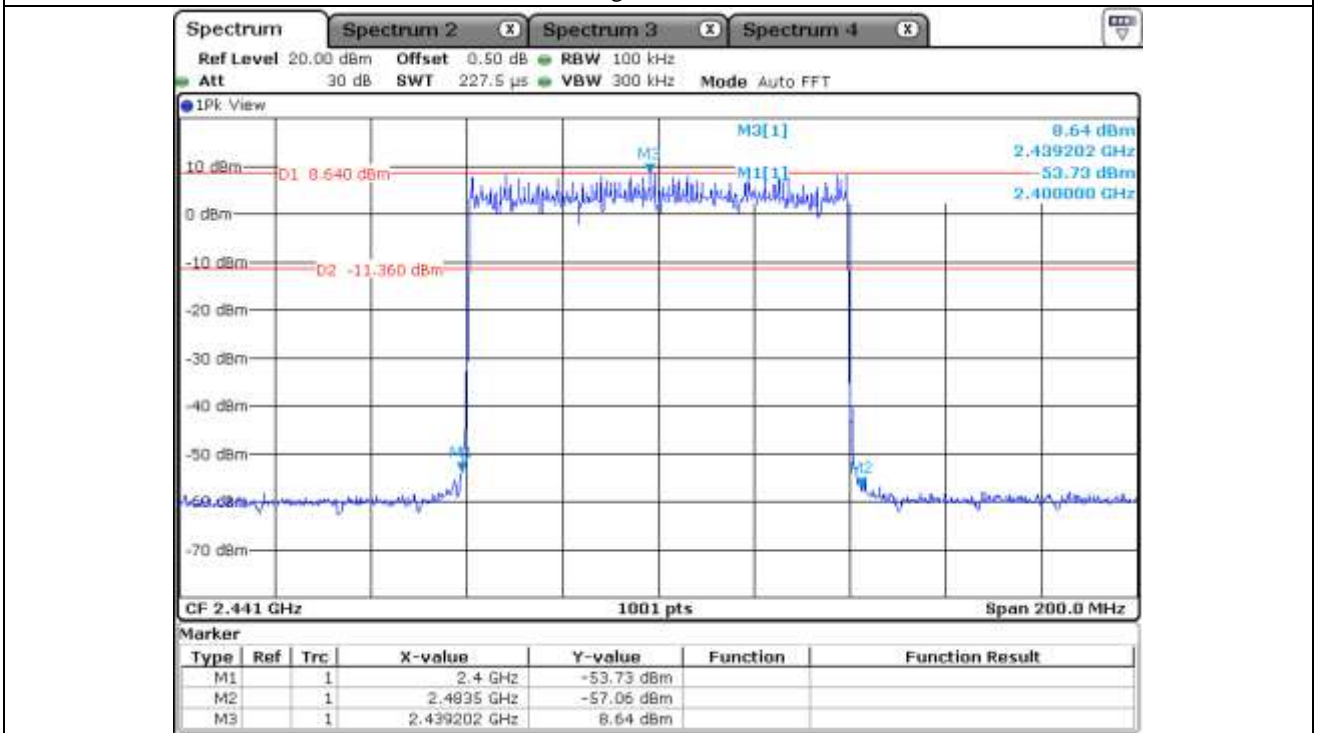
Low Channel



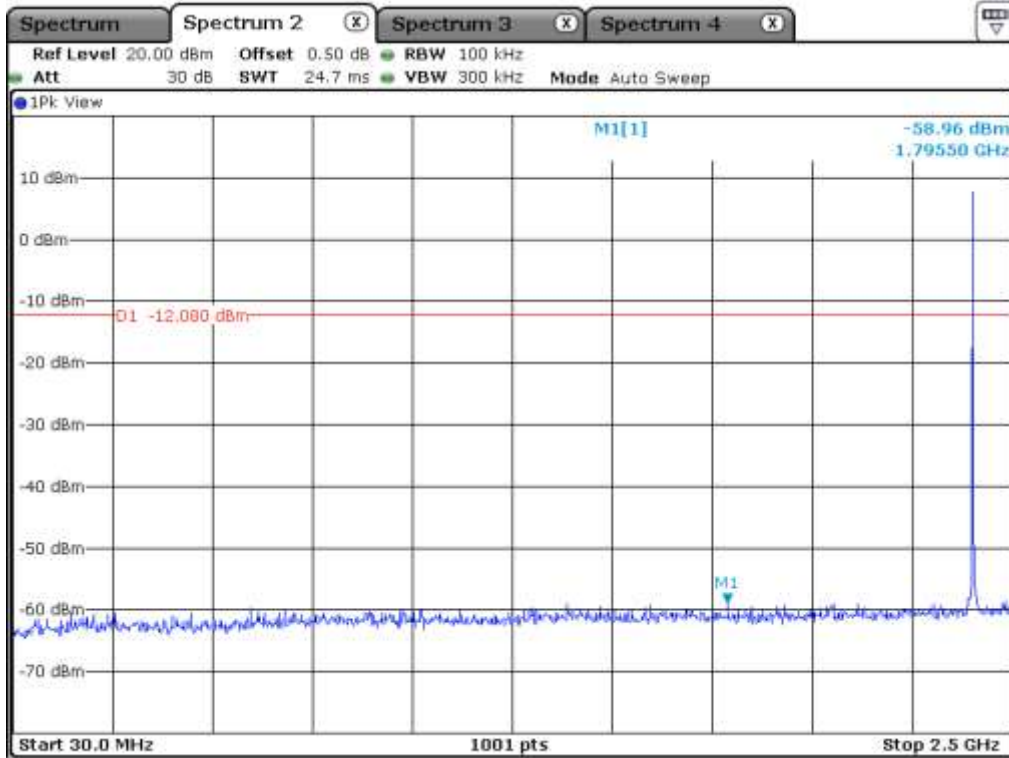
Middle Channel



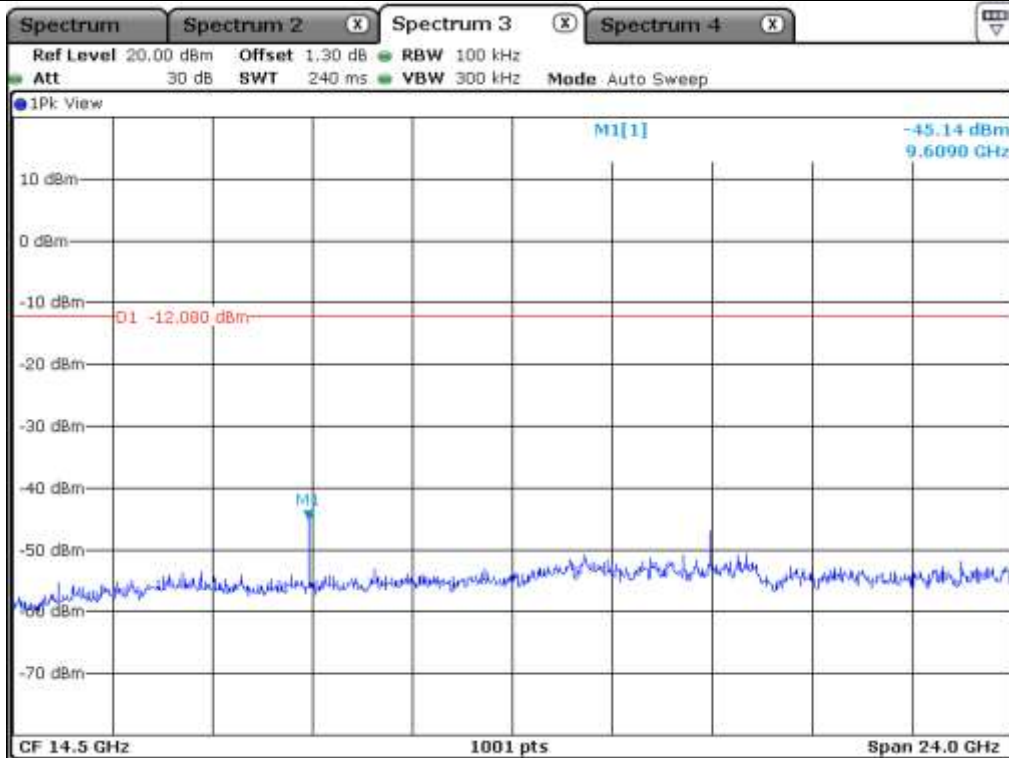
High Channel



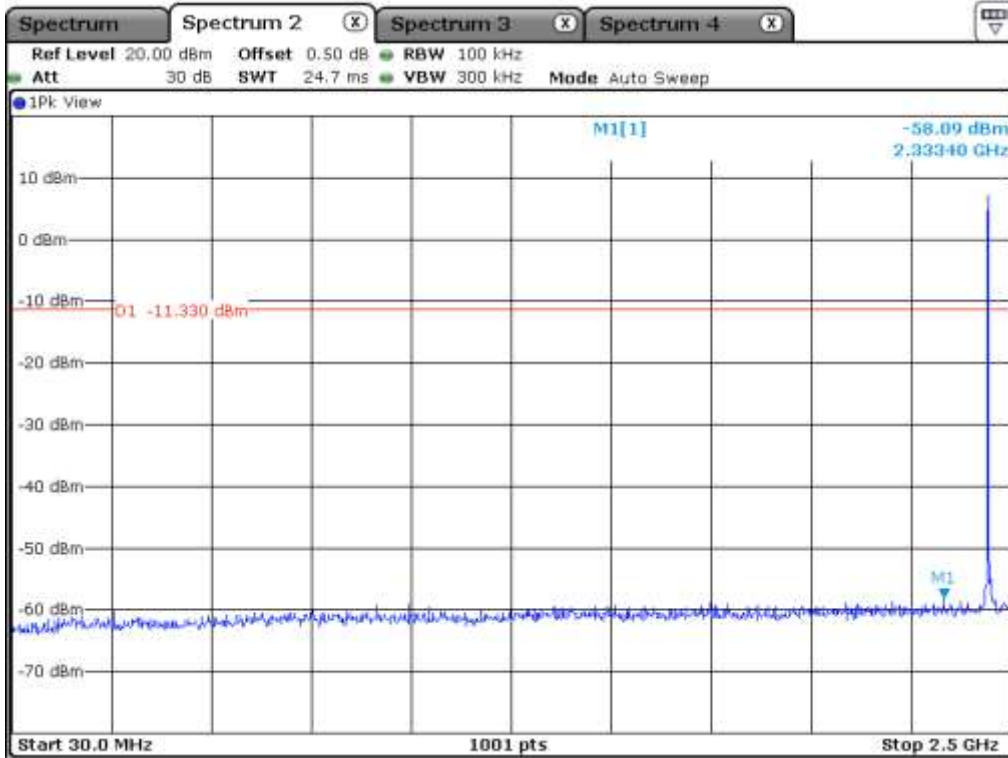
Hopping Mode



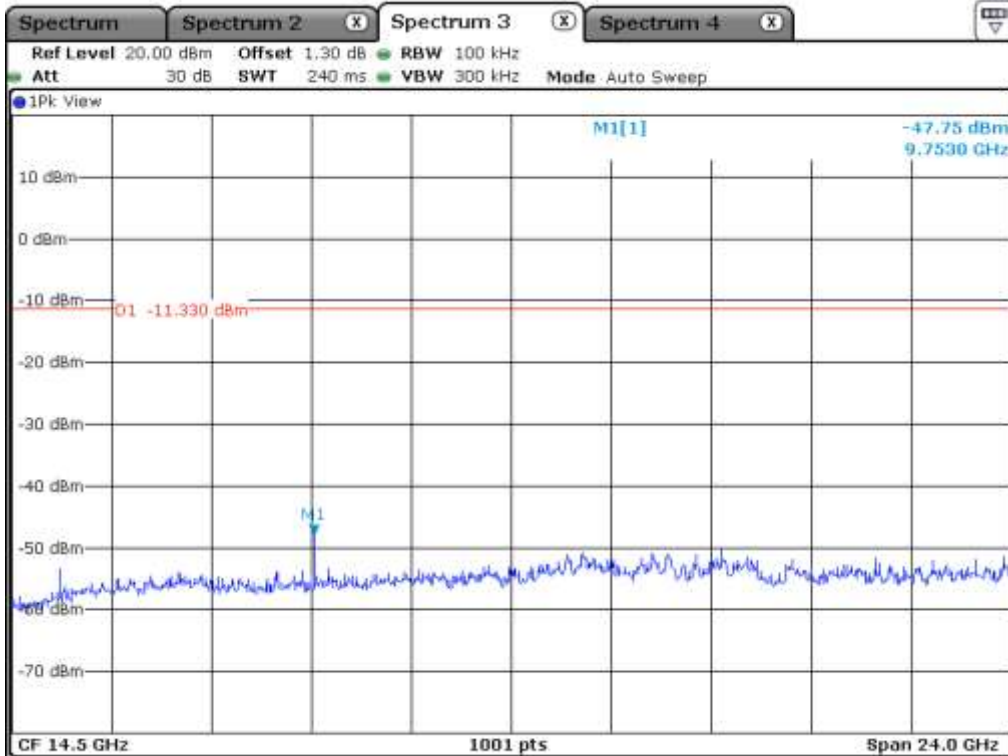
Low Channel



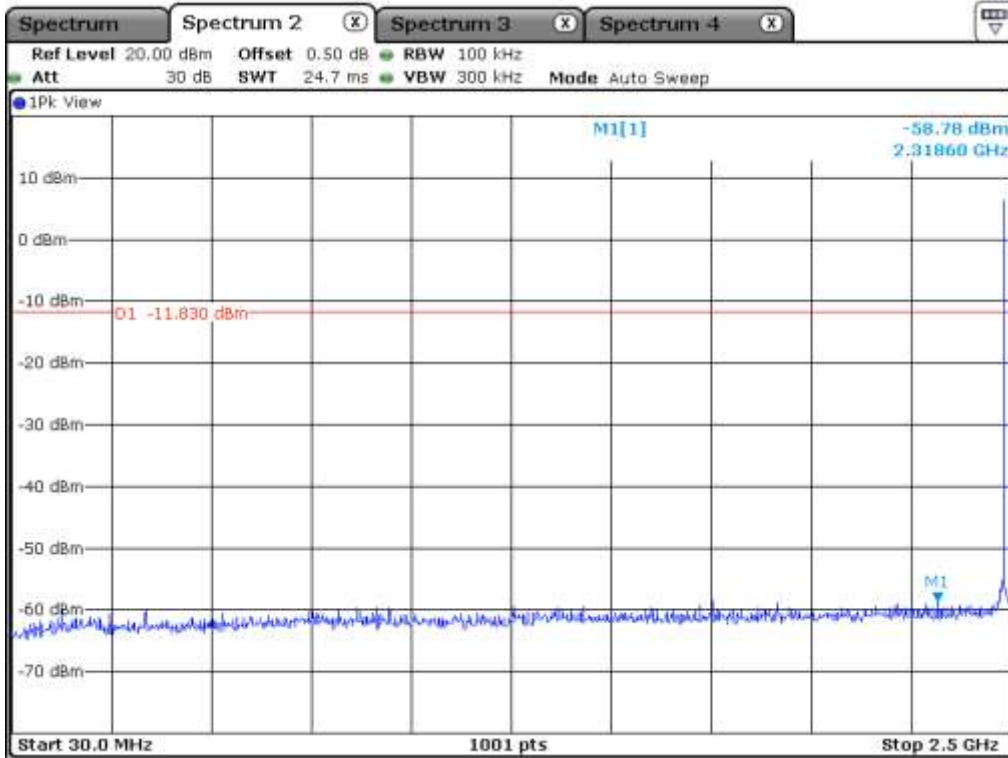
Low Channel



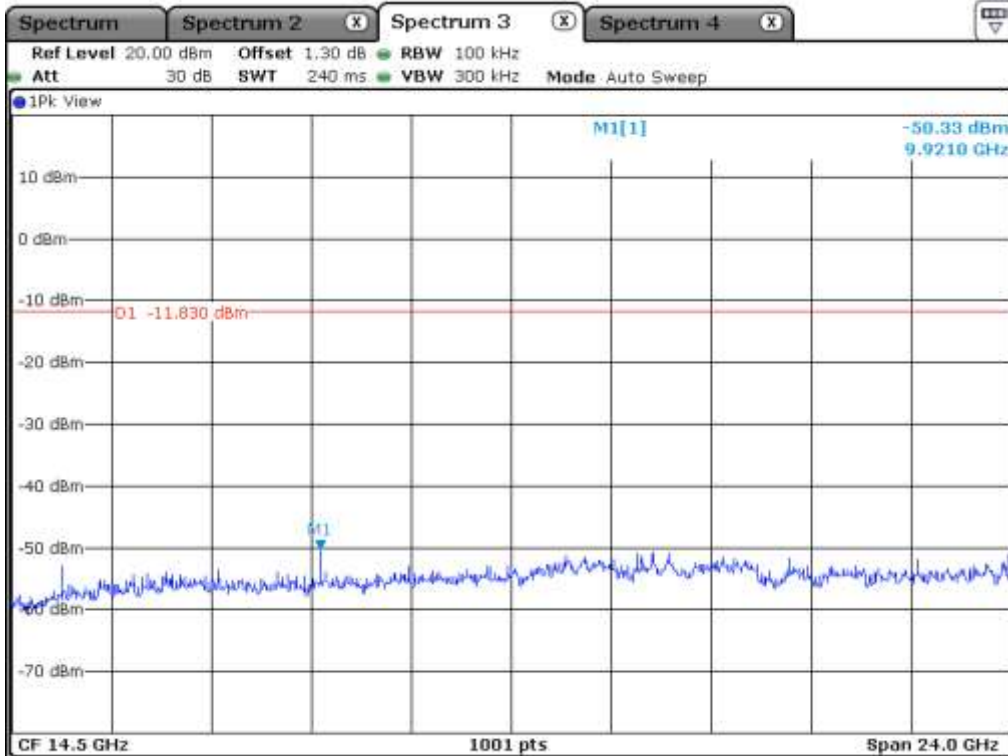
Middle Channel



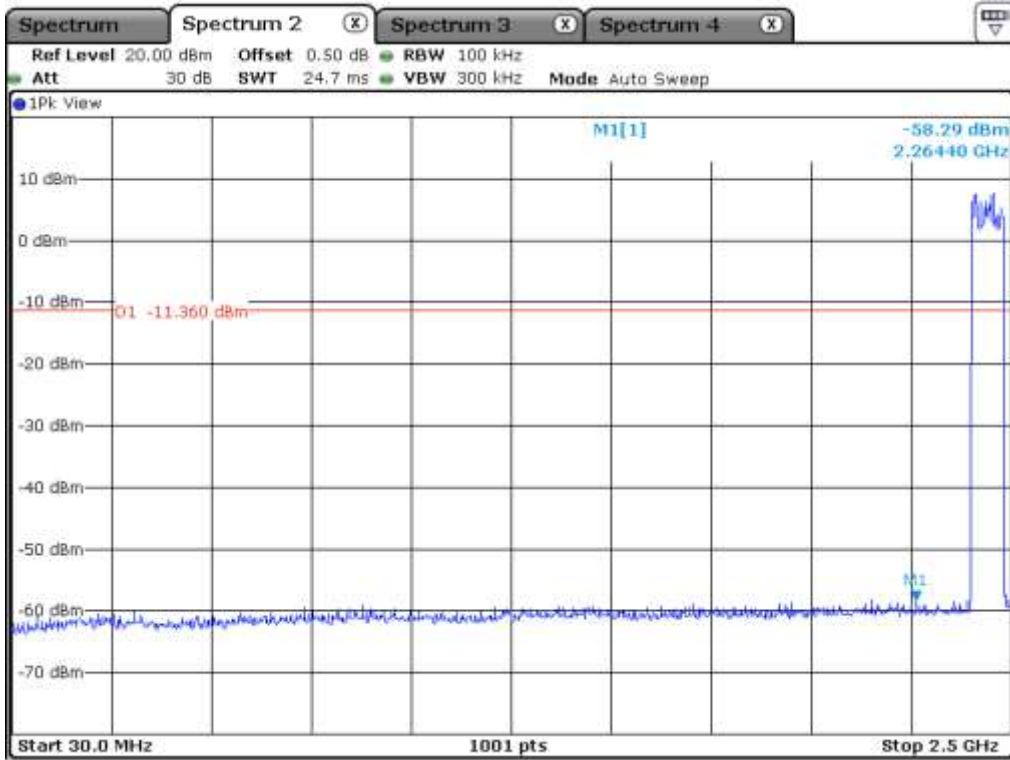
Middle Channel



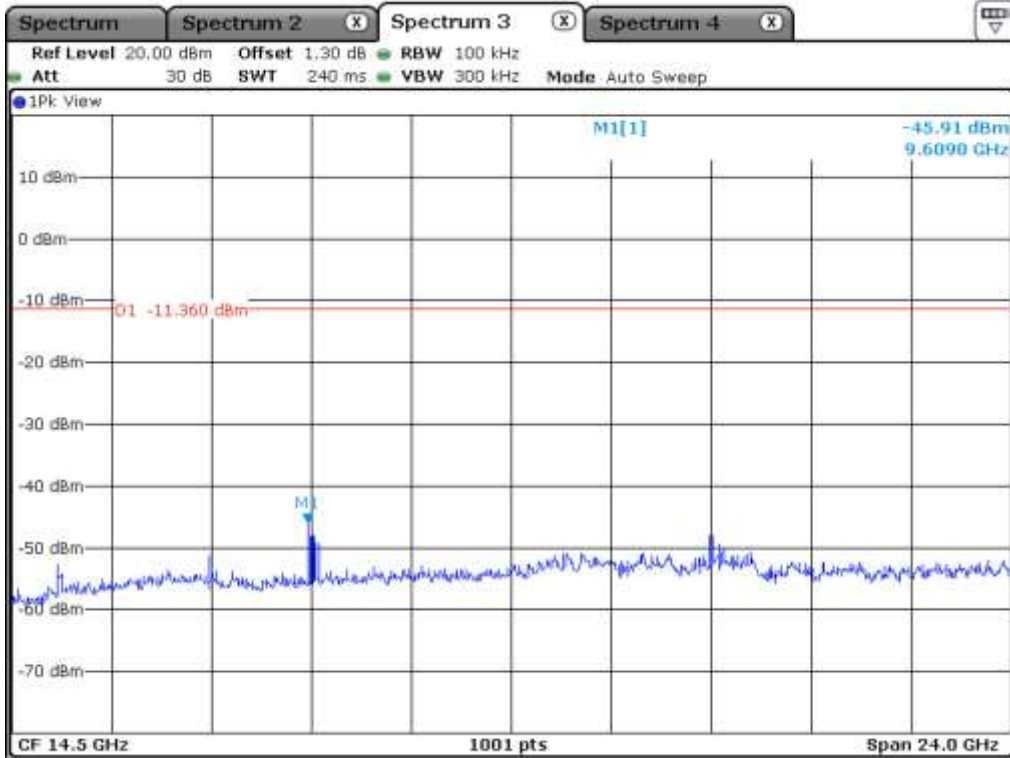
High Channel



High Channel



Hopping Mode



Hopping Mode

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 : 58.00 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 347.191	16.11	Peak	H	26.90	3.07	-	46.08	74.00	27.92
2 339.650	6.10	Average	H	26.90	3.07	2.37	38.44	54.00	15.56
2 349.063	15.88	Peak	V	26.90	3.07	-	45.85	74.00	28.15
2 342.045	7.36	Average	V	26.90	3.07	2.37	39.70	54.00	14.30
Test Data for High Channel									
2 486.143	20.24	Peak	H	26.60	3.16	-	50.00	74.00	24.00
2 483.508	8.80	Average	H	26.60	3.16	2.37	40.93	54.00	13.07
2 498.370	16.14	Peak	V	26.60	3.16	-	45.90	74.00	28.10
2 483.799	6.56	Average	V	26.60	3.16	2.37	38.69	54.00	15.31

Tabulated test data for Restricted Band

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

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

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

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 : 58.00 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 347.081	17.25	Peak	H	26.90	3.07	-	47.22	74.00	26.78
2 341.535	5.33	Average	H	26.90	3.07	2.37	37.67	54.00	16.33
2 343.601	18.57	Peak	V	26.90	3.07	-	48.54	74.00	25.46
2 337.816	4.71	Average	V	26.90	3.07	2.37	37.05	54.00	16.95
Test Data for High Channel									
2 485.867	21.04	Peak	H	26.60	3.16	-	50.80	74.00	23.20
2 483.727	10.50	Average	H	26.60	3.16	2.37	42.63	54.00	11.37
2 497.528	16.42	Peak	V	26.60	3.16	-	46.18	74.00	27.82
2 492.503	6.70	Average	V	26.60	3.16	2.37	38.83	54.00	15.17

Tabulated test data for Restricted Band

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

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

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

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 : 57.60 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 344.287	16.52	Peak	H	26.90	3.07	-	46.49	74.00	27.51
2 339.570	5.56	Average	H	26.90	3.07	2.40	37.93	54.00	16.07
2 343.319	17.57	Peak	V	26.90	3.07	-	47.54	74.00	26.46
2 338.554	6.62	Average	V	26.90	3.07	2.40	38.99	54.00	15.01
Test Data for High Channel									
2 483.524	17.14	Peak	H	26.60	3.16	-	46.90	74.00	27.10
2 483.968	10.51	Average	H	26.60	3.16	2.40	42.67	54.00	11.33
2 491.001	16.94	Peak	V	26.60	3.16	-	46.70	74.00	27.30
2 491.037	5.73	Average	V	26.60	3.16	2.40	37.89	54.00	16.11

Tabulated test data for Restricted Band

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

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

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

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 : 58.00 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.44	Peak	H	28.20	4.85	-	51.49	74.00	22.51
4 804.000	7.18	Average	H	28.20	4.85	2.37	42.60	54.00	11.40
4 804.000	17.46	Peak	V	28.20	4.85	-	50.51	74.00	23.49
4 804.000	6.36	Average	V	28.20	4.85	2.37	41.78	54.00	12.22
Test Data for Middle Channel									
4 882.000	18.31	Peak	H	28.30	4.91	-	51.52	74.00	22.48
4 882.000	6.81	Average	H	28.30	4.91	2.37	42.39	54.00	11.61
4 882.000	17.49	Peak	V	28.30	4.91	-	50.70	74.00	23.30
4 882.000	6.25	Average	V	28.30	4.91	2.37	41.83	54.00	12.17
Test Data for High Channel									
4 960.000	18.35	Peak	H	28.60	5.04	-	51.99	74.00	22.01
4 960.000	7.04	Average	H	28.60	5.04	2.37	43.05	54.00	10.95
4 960.000	18.35	Peak	V	28.60	5.04	-	51.99	74.00	22.01
4 960.000	6.93	Average	V	28.60	5.04	2.37	42.94	54.00	11.06

Tabulated test data for Restricted Band

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

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

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

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 : 58.00 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.94	Peak	H	28.20	4.85	-	51.99	74.00	22.01
4 804.000	7.14	Average	H	28.20	4.85	2.37	42.56	54.00	11.44
4 804.000	18.19	Peak	V	28.20	4.85	-	51.24	74.00	22.76
4 804.000	7.36	Average	V	28.20	4.85	2.37	42.78	54.00	11.22
Test Data for Middle Channel									
4 882.000	18.05	Peak	H	28.30	4.91	-	51.26	74.00	22.74
4 882.000	7.19	Average	H	28.30	4.91	2.37	42.77	54.00	11.23
4 882.000	18.35	Peak	V	28.30	4.91	-	51.56	74.00	22.44
4 882.000	7.68	Average	V	28.30	4.91	2.37	43.26	54.00	10.74
Test Data for High Channel									
4 960.000	18.11	Peak	H	28.60	5.04	-	51.75	74.00	22.25
4 960.000	7.03	Average	H	28.60	5.04	2.37	43.04	54.00	10.96
4 960.000	18.20	Peak	V	28.60	5.04	-	51.84	74.00	22.16
4 960.000	7.58	Average	V	28.60	5.04	2.37	43.59	54.00	10.41

Tabulated test data for Restricted Band

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

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

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

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 : 57.60 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	18.48	Peak	H	28.20	4.85	-	51.53	74.00	22.47
4 804.000	6.93	Average	H	28.20	4.85	2.40	42.38	54.00	11.62
4 804.000	18.03	Peak	V	28.20	4.85	-	51.08	74.00	22.92
4 804.000	7.36	Average	V	28.20	4.85	2.40	42.81	54.00	11.19
Test Data for Middle Channel									
4 882.000	18.40	Peak	H	28.30	4.91	-	51.61	74.00	22.39
4 882.000	7.85	Average	H	28.30	4.91	2.40	43.46	54.00	10.54
4 882.000	17.94	Peak	V	28.30	4.91	-	51.15	74.00	22.85
4 882.000	7.17	Average	V	28.30	4.91	2.40	42.78	54.00	11.22
Test Data for High Channel									
4 960.000	18.56	Peak	H	28.60	5.04	-	52.20	74.00	21.80
4 960.000	7.85	Average	H	28.60	5.04	2.40	43.89	54.00	10.11
4 960.000	18.07	Peak	V	28.60	5.04	-	51.71	74.00	22.29
4 960.000	7.31	Average	V	28.60	5.04	2.40	43.35	54.00	10.65

Tabulated test data for Restricted Band

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

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

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

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % 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.

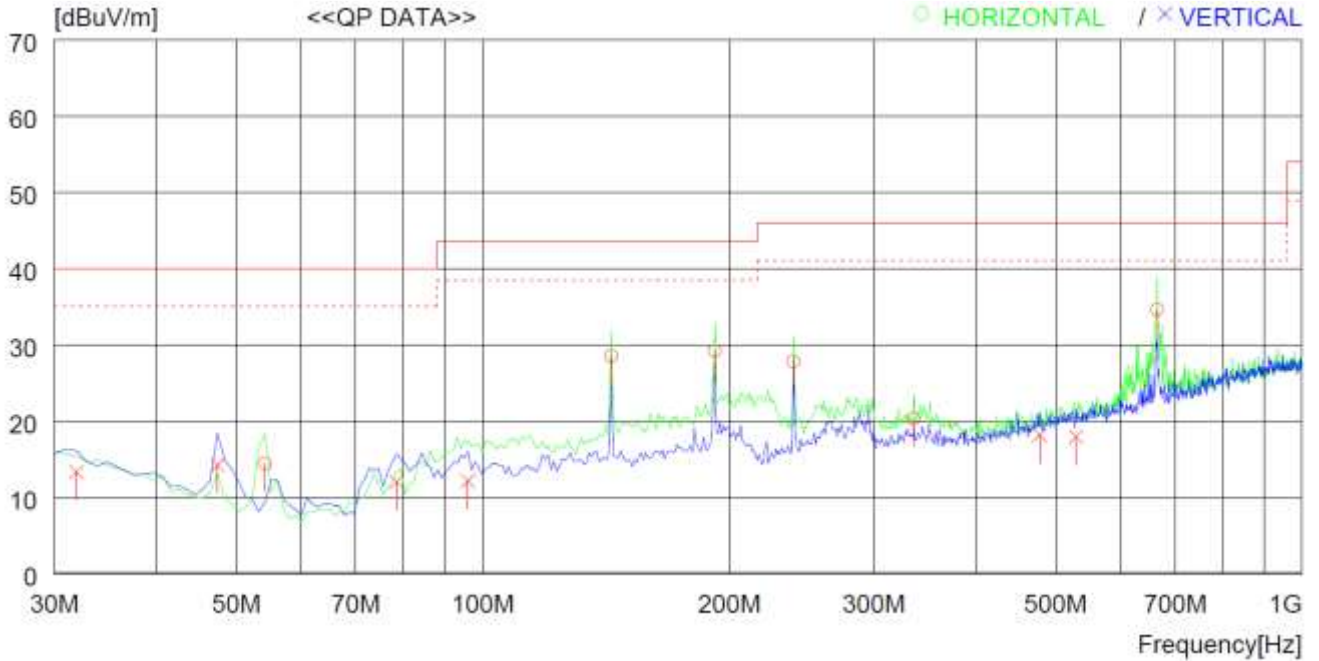
13.3 Test Date

August 21, 2020 ~ September 08, 2020

13.4 Test data for 30 MHz ~ 960 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 [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	54.250	36.9	9.6	0.6	32.7	14.4	40.0	25.6	400	20
2	143.490	49.0	11.1	1.1	32.7	28.5	43.5	15.0	400	166
3	191.990	47.7	12.8	1.3	32.6	29.2	43.5	14.3	400	341
4	239.520	48.3	10.6	1.5	32.6	27.8	46.0	18.2	400	352
5	335.550	36.6	14.6	1.8	32.7	20.3	46.0	25.7	400	352
6	665.346	44.4	20.6	2.5	32.9	34.6	46.0	11.4	400	333
----- Vertical -----										
7	31.940	34.5	10.9	0.5	32.6	13.3	40.0	26.7	400	356
8	47.460	36.2	10.1	0.6	32.7	14.2	40.0	25.8	400	5
9	78.500	36.0	7.9	0.8	32.7	12.0	40.0	28.0	400	10
10	95.960	35.1	8.8	0.9	32.7	12.1	43.5	31.4	400	37
11	478.141	31.4	17.5	2.1	32.9	18.1	46.0	27.9	400	88
12	529.550	30.2	18.4	2.2	32.9	17.9	46.0	28.1	400	178

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

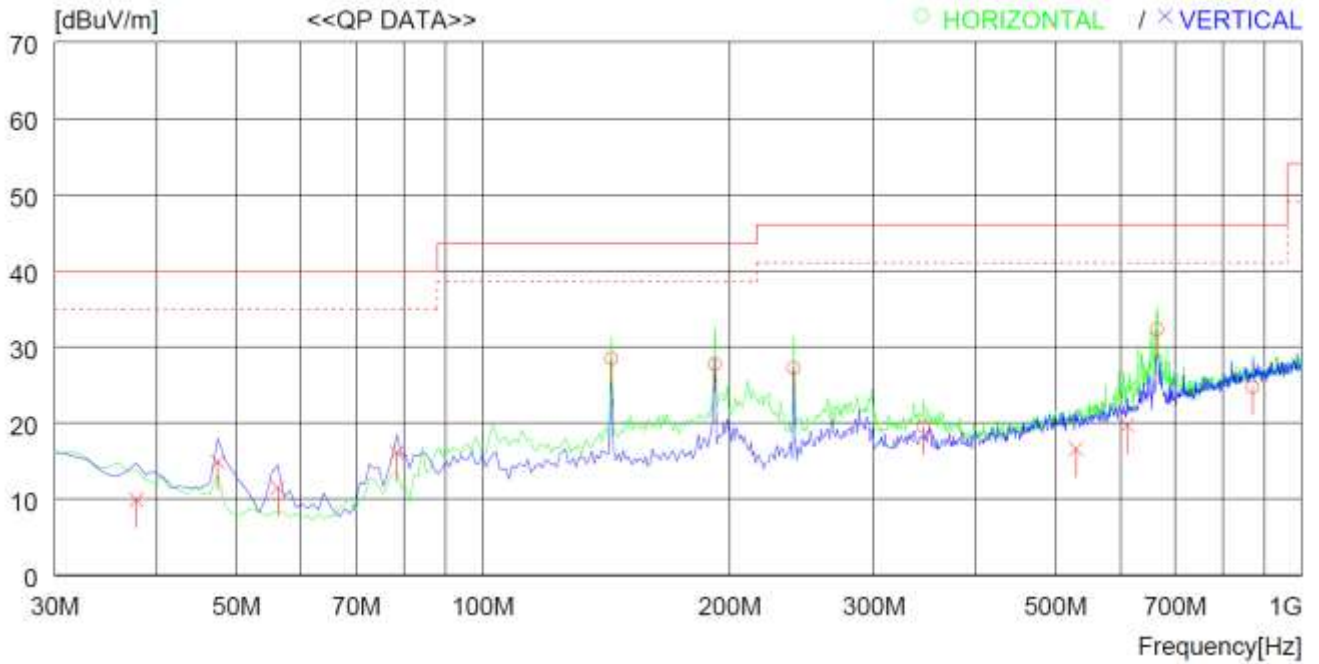
Humidity Level : 41 % R.H. Temperature: 23 °C

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 [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	143.490	48.9	11.1	1.1	32.7	28.4	43.5	15.1	400	355
2	191.990	46.2	12.8	1.3	32.6	27.7	43.5	15.8	400	355
3	239.520	47.7	10.6	1.5	32.6	27.2	46.0	18.8	400	25
4	345.250	35.5	14.9	1.8	32.7	19.5	46.0	26.5	400	350
5	665.346	42.1	20.6	2.5	32.9	32.3	46.0	13.7	400	355
6	870.010	31.4	22.9	2.6	32.2	24.7	46.0	21.3	400	34
----- Vertical -----										
7	37.760	31.2	10.9	0.5	32.7	9.9	40.0	30.1	400	37
8	47.460	36.9	10.1	0.6	32.7	14.9	40.0	25.1	400	335
9	56.190	34.0	9.5	0.7	32.7	11.5	40.0	28.5	400	3
10	78.500	40.1	7.9	0.8	32.7	16.1	40.0	23.9	400	3
11	529.550	28.9	18.4	2.2	32.9	16.6	46.0	29.4	400	193
12	611.998	30.3	20.0	2.4	33.0	19.7	46.0	26.3	400	265

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)
It was not observed any emissions from the EUT.								

13.6 Test data for above 1 GHz

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10 Hz for 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)
It was not observed any emissions from the EUT.								

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

14.2 Test set-up

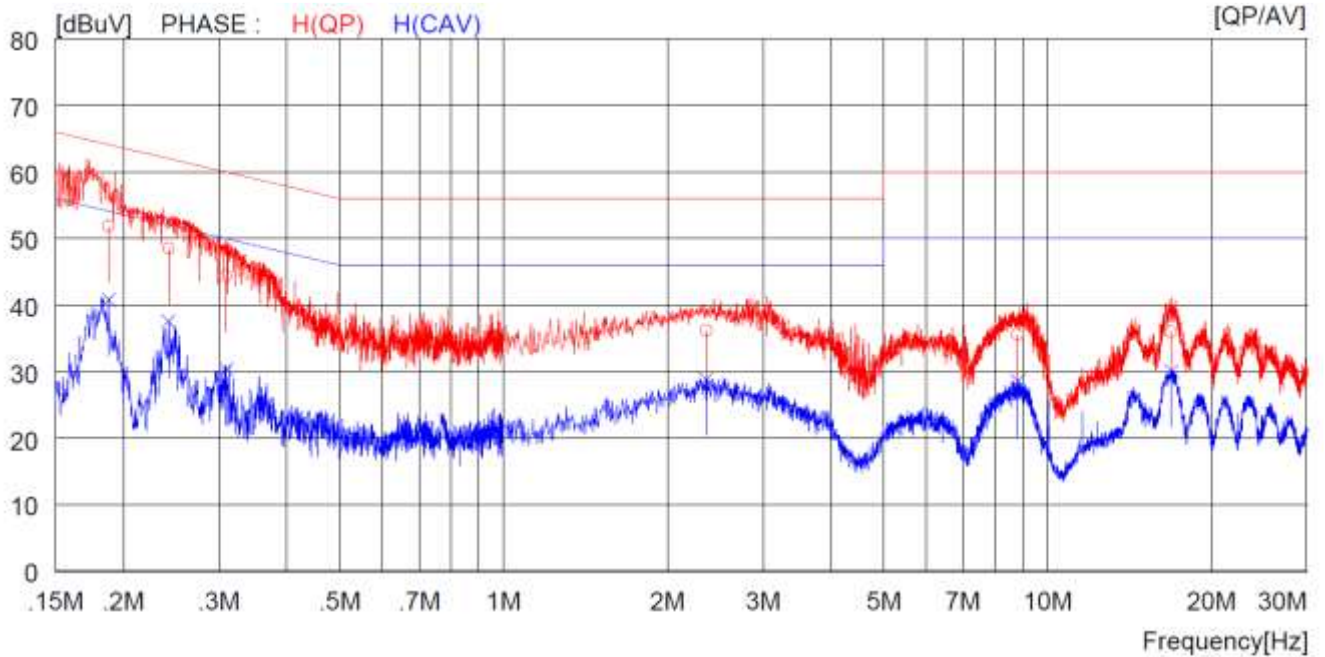
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

14.3 Test Date

August 21, 2020 ~ September 08, 2020

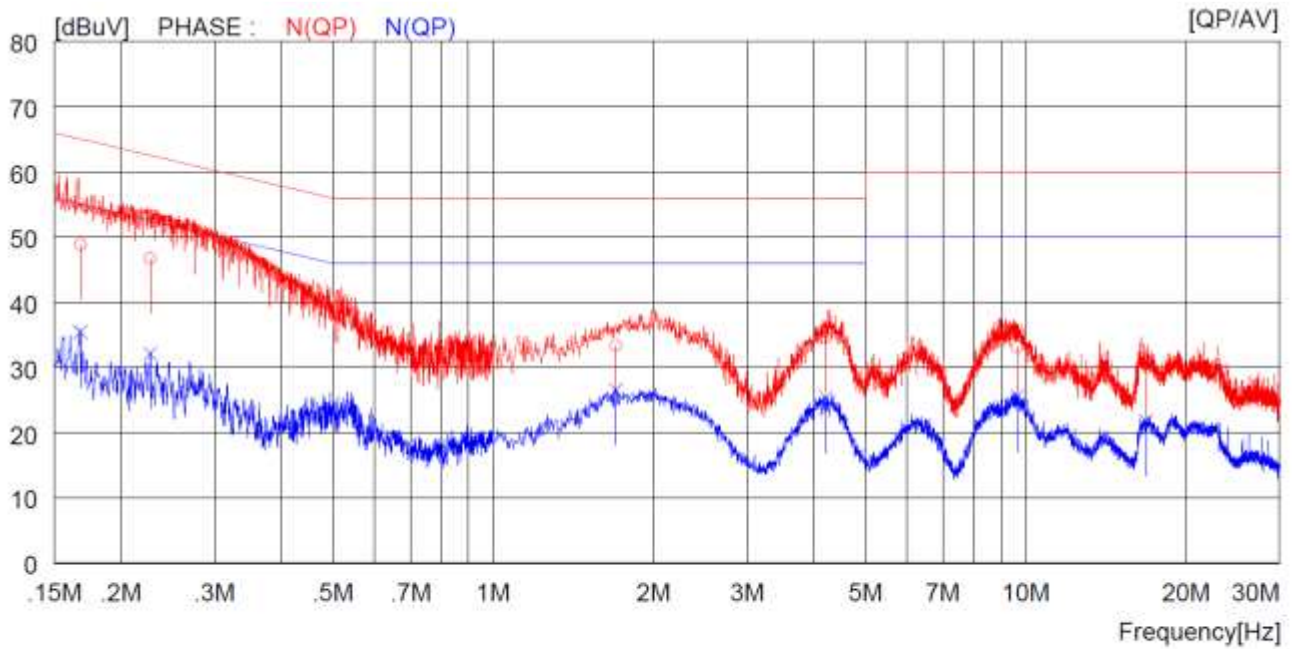
14.4 Test data for Bluetooth

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



NO	FREQ	READING		C.FACTOR	RESULT		LIMIT	MARGIN	PHASE		
		QP	AV		QP	AV				QP	AV
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]			
1	0.18800	41.8	---	10.0	51.8	---	64.1	---	12.3	H(QP)	
2	0.24200	38.6	---	9.9	48.5	---	62.0	---	13.5	H(QP)	
3	0.30900	34.4	---	9.9	44.3	---	60.0	---	15.7	H(QP)	
4	2.36000	26.1	---	10.1	36.2	---	56.0	---	19.8	H(QP)	
5	8.82000	25.4	---	10.2	35.6	---	60.0	---	24.4	H(QP)	
6	16.90000	25.7	---	10.3	36.0	---	60.0	---	24.0	H(QP)	
7	0.18800	---	30.8	10.0	---	40.8	---	54.1	---	13.3	H(CAV)
8	0.24200	---	27.6	9.9	---	37.5	---	52.0	---	14.5	H(CAV)
9	0.30900	---	20.4	9.9	---	30.3	---	50.0	---	19.7	H(CAV)
10	2.36000	---	18.7	10.1	---	28.8	---	46.0	---	17.2	H(CAV)
11	8.82000	---	18.3	10.2	---	28.5	---	50.0	---	21.5	H(CAV)
12	16.90000	---	19.8	10.3	---	30.1	---	50.0	---	19.9	H(CAV)

- Tested Line : NEUTRAL LINE



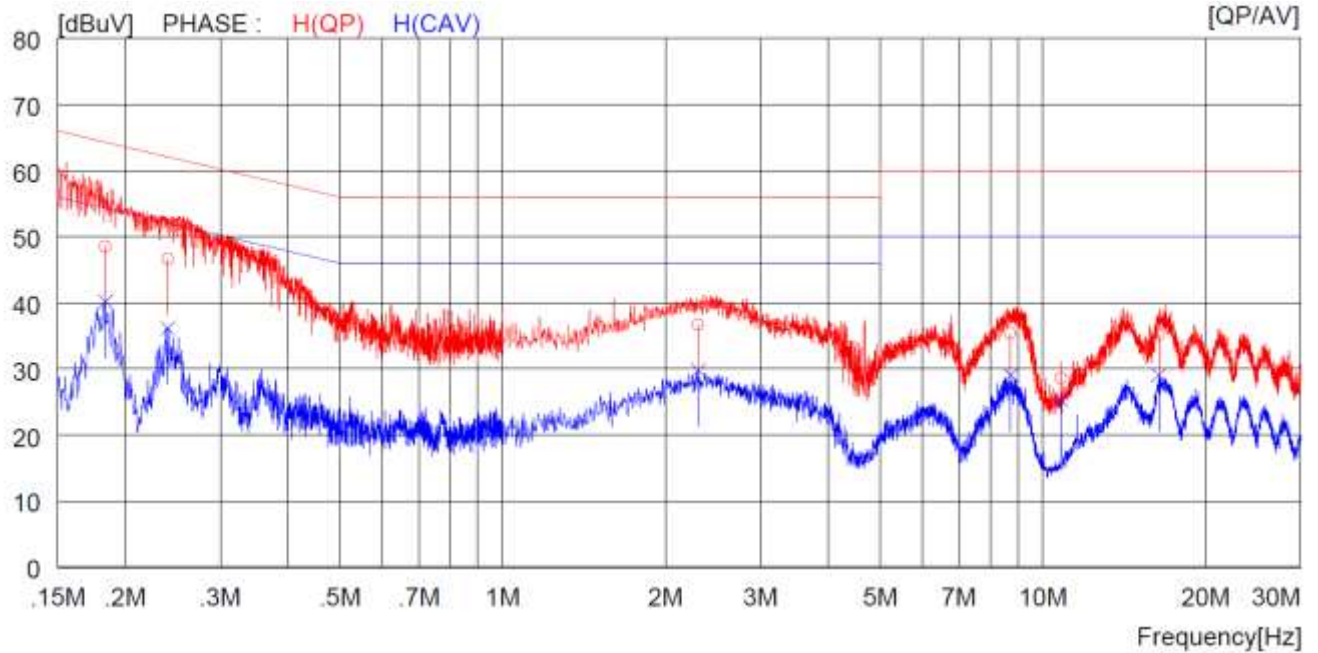
NO	FREQ QP	READING		C.FACTOR		RESULT		LIMIT	MARGIN	PHASE	
		AV		QP	AV	QP	AV				
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16800	38.8	---	10.0	48.8	---	65.1	---	16.3	---	N(QP)
2	0.22700	36.8	---	9.9	46.7	---	62.6	---	15.9	---	N(QP)
3	1.70000	23.3	---	10.1	33.4	---	56.0	---	22.6	---	N(QP)
4	4.21600	24.4	---	10.1	34.5	---	56.0	---	21.5	---	N(QP)
5	9.65000	22.9	---	10.2	33.1	---	60.0	---	26.9	---	N(QP)
6	16.83000	20.6	---	10.3	30.9	---	60.0	---	29.1	---	N(QP)
7	0.16800	---	25.4	10.0	---	35.4	---	55.1	---	19.7	N(CAV)
8	0.22700	---	22.2	9.9	---	32.1	---	52.6	---	20.5	N(CAV)
9	1.70000	---	16.4	10.1	---	26.5	---	46.0	---	19.5	N(CAV)
10	4.21600	---	15.2	10.1	---	25.3	---	46.0	---	20.7	N(CAV)
11	9.65000	---	15.3	10.2	---	25.5	---	50.0	---	24.5	N(CAV)
12	16.83000	---	11.5	10.3	---	21.8	---	50.0	---	28.2	N(CAV)

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.

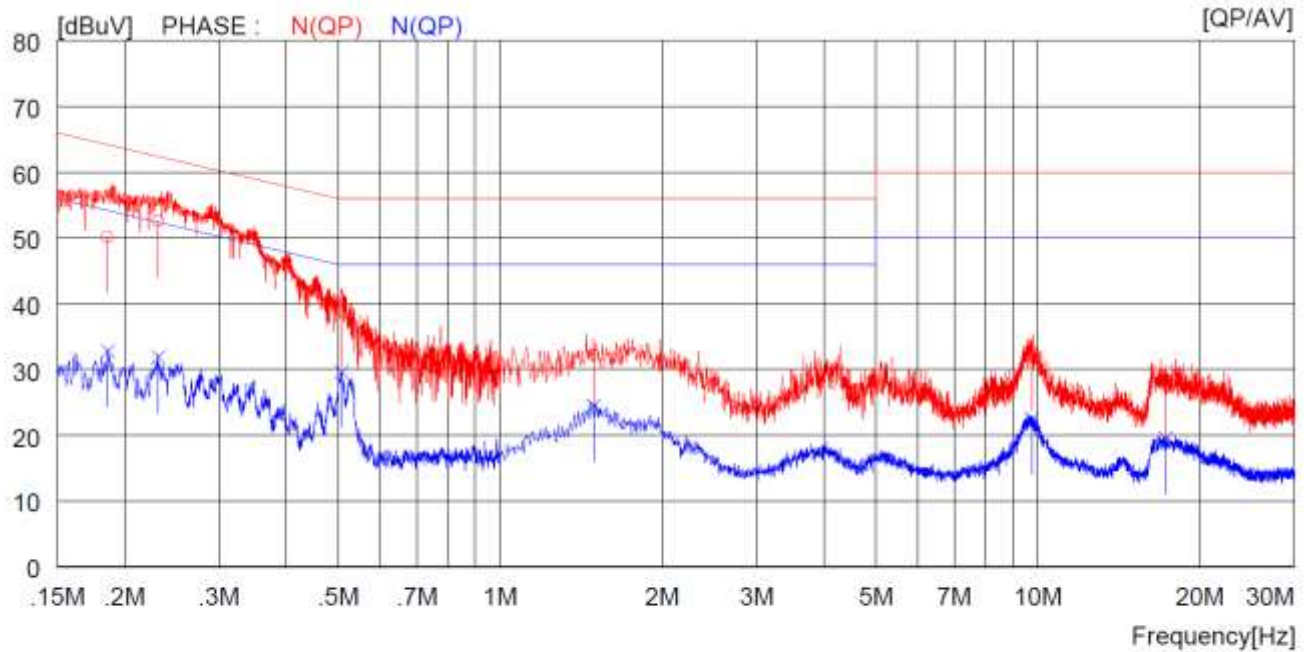
14.5 Test data for Intermodulation Mode(Bluetooth + WLAN 2.4 GHz + WLAN 5 GHz)

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



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.18400	38.5	---	10.0	48.5	---	64.3	---	15.8	---	---	---	H(QP)
2	0.24000	36.7	---	9.9	46.6	---	62.1	---	15.5	---	---	---	H(QP)
3	2.30400	26.6	---	10.1	36.7	---	56.0	---	19.3	---	---	---	H(QP)
4	8.71000	25.2	---	10.2	35.4	---	60.0	---	24.6	---	---	---	H(QP)
5	10.82000	18.4	---	10.2	28.6	---	60.0	---	31.4	---	---	---	H(QP)
6	16.40000	24.8	---	10.3	35.1	---	60.0	---	24.9	---	---	---	H(QP)
7	0.18400	---	30.1	10.0	---	40.1	---	54.3	---	14.2	---	---	H(CAV)
8	0.24000	---	26.2	9.9	---	36.1	---	52.1	---	16.0	---	---	H(CAV)
9	2.30400	---	19.7	10.1	---	29.8	---	46.0	---	16.2	---	---	H(CAV)
10	8.71000	---	18.8	10.2	---	29.0	---	50.0	---	21.0	---	---	H(CAV)
11	10.82000	---	15.1	10.2	---	25.3	---	50.0	---	24.7	---	---	H(CAV)
12	16.40000	---	18.7	10.3	---	29.0	---	50.0	---	21.0	---	---	H(CAV)

- Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.18600	40.1	----	10.0	50.1	----	64.2	----	14.1	----	N (QP)
2	0.23100	42.6	----	9.9	52.5	----	62.4	----	9.9	----	N (QP)
3	0.50700	28.8	----	10.0	38.8	----	56.0	----	17.2	----	N (QP)
4	1.49200	22.0	----	10.1	32.1	----	56.0	----	23.9	----	N (QP)
5	9.75500	21.9	----	10.2	32.1	----	60.0	----	27.9	----	N (QP)
6	17.32000	17.3	----	10.3	27.6	----	60.0	----	32.4	----	N (QP)
7	0.18600	----	22.8	10.0	----	32.8	----	54.2	----	21.4	N (CAV)
8	0.23100	----	22.0	9.9	----	31.9	----	52.4	----	20.5	N (CAV)
9	0.50700	----	19.6	10.0	----	29.6	----	46.0	----	16.4	N (CAV)
10	1.49200	----	14.4	10.1	----	24.5	----	46.0	----	21.5	N (CAV)
11	9.75500	----	12.3	10.2	----	22.5	----	50.0	----	27.5	N (CAV)
12	17.32000	----	9.3	10.3	----	19.6	----	50.0	----	30.4	N (CAV)

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. 20, 2020 (1Y)
ESW	Rohde & Schwarz	EMI Test Receiver	101851	Mar. 27, 2020 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 16, 2020 (1Y)
BBV 9718 B	Schwarzbeck	Broadband Preamplifier	00009	Mar. 16, 2020 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Feb. 20, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (1Y)
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)
BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020(1Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2019 (1Y)
NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 16, 2020 (1Y)
3825/2	EMCO	AMN	9109-1869	Mar. 16, 2020 (1Y)