

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-212-RWD-130
Reception No. : 2102000650
Applicant : SynCrown Inc.
Address : #701 Daeryung Techno Town 8th, 96 Gamasan-ro, GeumCheon, Seoul
Manufacturer : SynCrown Inc.
Address : #701 Daeryung Techno Town 8th, 96 Gamasan-ro, GeumCheon, Seoul
Type of Equipment : Mobile Sticker Printer
FCC ID. : 2AEPCPG1
Model Name : PG1
Multiple Model Name : PG1WH, PG1MT, PG1NV, PG1PK, PG1YE, PG1GY, PG1DG, PG1BK, PG1RE, PG1BL
Serial number : N/A
Total page of Report : 84 pages (including this page)
Date of Incoming : June 04, 2020
Date of issue : February 26, 2021

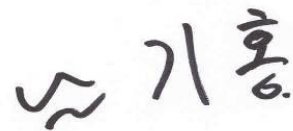
SUMMARY

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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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-212-RWD-130	February 26, 2021	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : SynCrown Inc.
 Address : #701 Daeryung Techno Town 8th, 96 Gamasan-ro, GeumCheon, Seoul
 CONTACT PERSON : Choon Se Lee / CEO
 Telephone No. : +82-2-6331-1000
 FCC ID : 2AEPCPG1
 Model Name : PG1
 Brand Name : Pagee / Thermal Mobile Printer
 Serial Number : N/A
 DATE : February 26, 2021

EQUIPMENT CLASS	<i>DSS – PART 15 SPREAD SPECTRUM TRANSMITTER</i>
KIND OF EQUIPMENT	Mobile Sticker Printer
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
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

-. Site Accreditation:

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 SynCrown Inc., Model PG1 (referred to as the EUT in this report) is an Mobile Sticker Printer. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Mobile Sticker Printer		
Operating Frequency	Bluetooth	2 402 MHz ~ 2 480 MHz	
	Bluetooth LE (1 Mbps)		
RF Output Power	Bluetooth	1 Mbps	4.53 dBm
		2 Mbps	6.52 dBm
		3 Mbps	7.05 dBm
	Bluetooth LE (1 Mbps)	5.17 dBm	
Number of Channel	Bluetooth	79 Channels	
	Bluetooth LE (1 Mbps)	40 Channels	
Modulation Type	Bluetooth	GFSK for 1 Mbps, $\pi/4$ -DQPSK for 2 Mbps, 8-DPSK for 3 Mbps	
	Bluetooth LE (1 Mbps)	GFSK	
Antenna Type	Bluetooth	PCB Antenna	
	Bluetooth LE (1 Mbps)		
Antenna Gain	Bluetooth	3.03 dBi	
	Bluetooth LE (1 Mbps)		
List of each Osc. or crystal Freq.(Freq. $\geq$ 1 MHz)	40 MHz		
Rated Supply Voltage	DC 7.4 V		

Note: Bluetooth and BLE do not operate simultaneously.

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

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
PG1	Basic Model	☒
PG1BL	This model is identical to the basic model except for product color	☐
PG1WH		☐
PG1NV		☐
PG1YE		☐
PG1DG		☐
PG1RE		☐
PG1MT		☐
PG1PK		☐
PG1GY		☐
PG1BK		☐

Note: 1. Applicant consigns only basic model to test. Therefore, this test report just guarantees the units, which have been tested.

2. The Applicant/manufacture is responsible for the compliance of all variants.

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	N/A	N/A	-
RF Module	N/A	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
80XL	Lenovo	Notebook PC	EUT
PA-1450-55LT	Lenovo	AC/DC Adapter	Notebook PC

5.3 Mode of operation during the test

For Bluetooth function testing, software used to control the EUT for staying in continuous transmitting and receiving mode is programmed. The EUT was set at Low Channel (2 402 MHz), Middle Channel (2 441 MHz), and High Channel (2 480 MHz) with each data transfer rate, 1 Mbps, 2 Mbps, and 3 Mbps. To get a maximum radiated 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 test report.

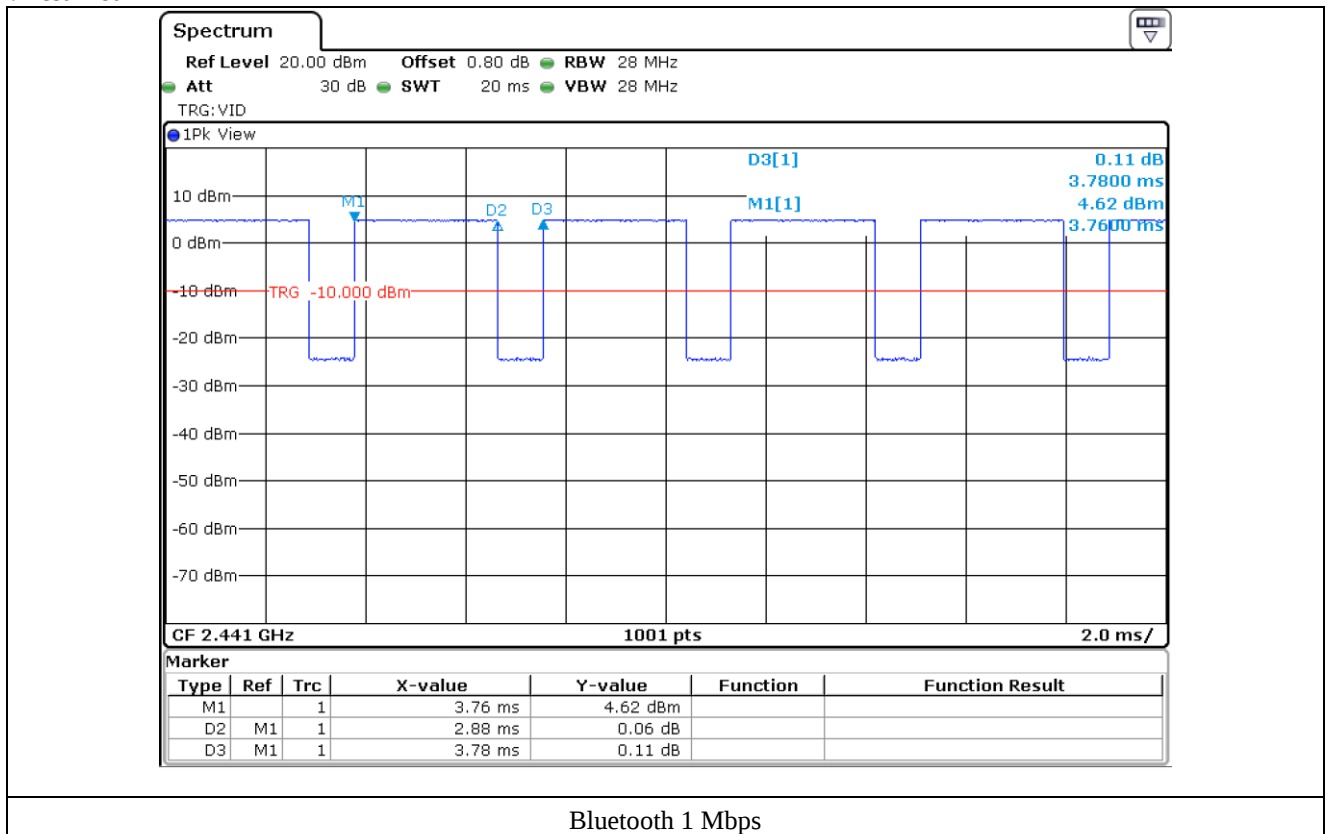
-. Duty Cycle

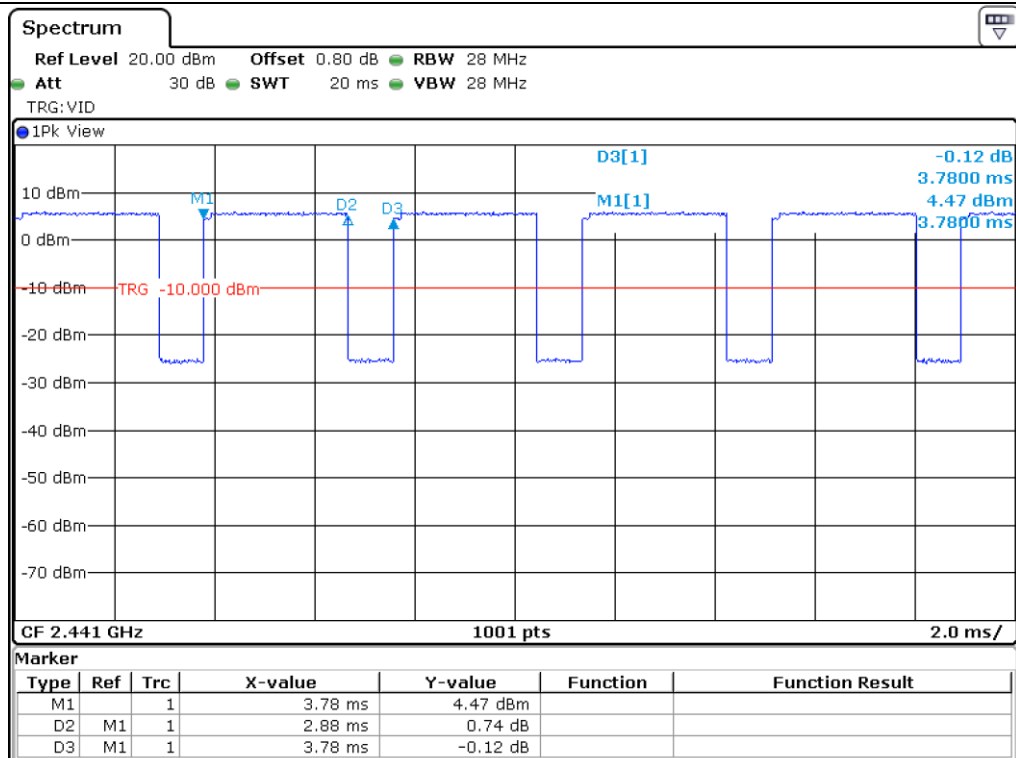
Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth [1 Mbps]	2.88	0.90	76.19	1.18
Bluetooth [2 Mbps]	2.88	0.90	76.19	1.18
Bluetooth [3 Mbps]	2.88	0.92	75.79	1.20

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

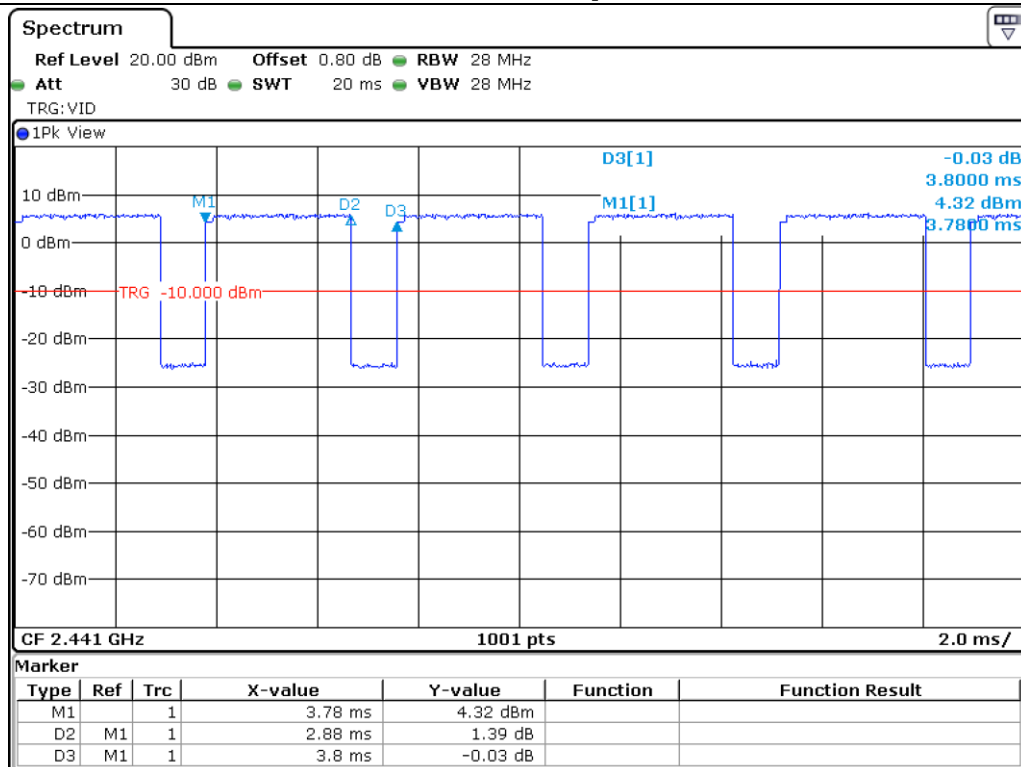
Correction Factor : $10 * \text{Log}(1 / (\text{Duty Cycle} / 100))$

-. Test Plot





Bluetooth 2 Mbps



Bluetooth 3 Mbps

5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in the Charging mode. All supporting equipment 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: The EUT was tested in the Transmitting mode. Preliminary radiated emissions test was conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m 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 as to be attached permanently to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The transmitter antenna of the EUT is a PCB Antenna, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

As This product is only using DC power, AC conducted emission test has not been performed.

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

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

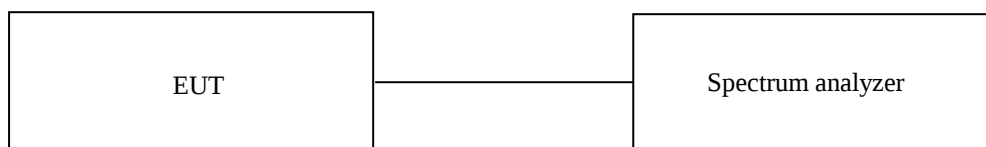
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % 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(1 Mbps), 20 kHz(2 Mbps, 3 Mbps), 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.

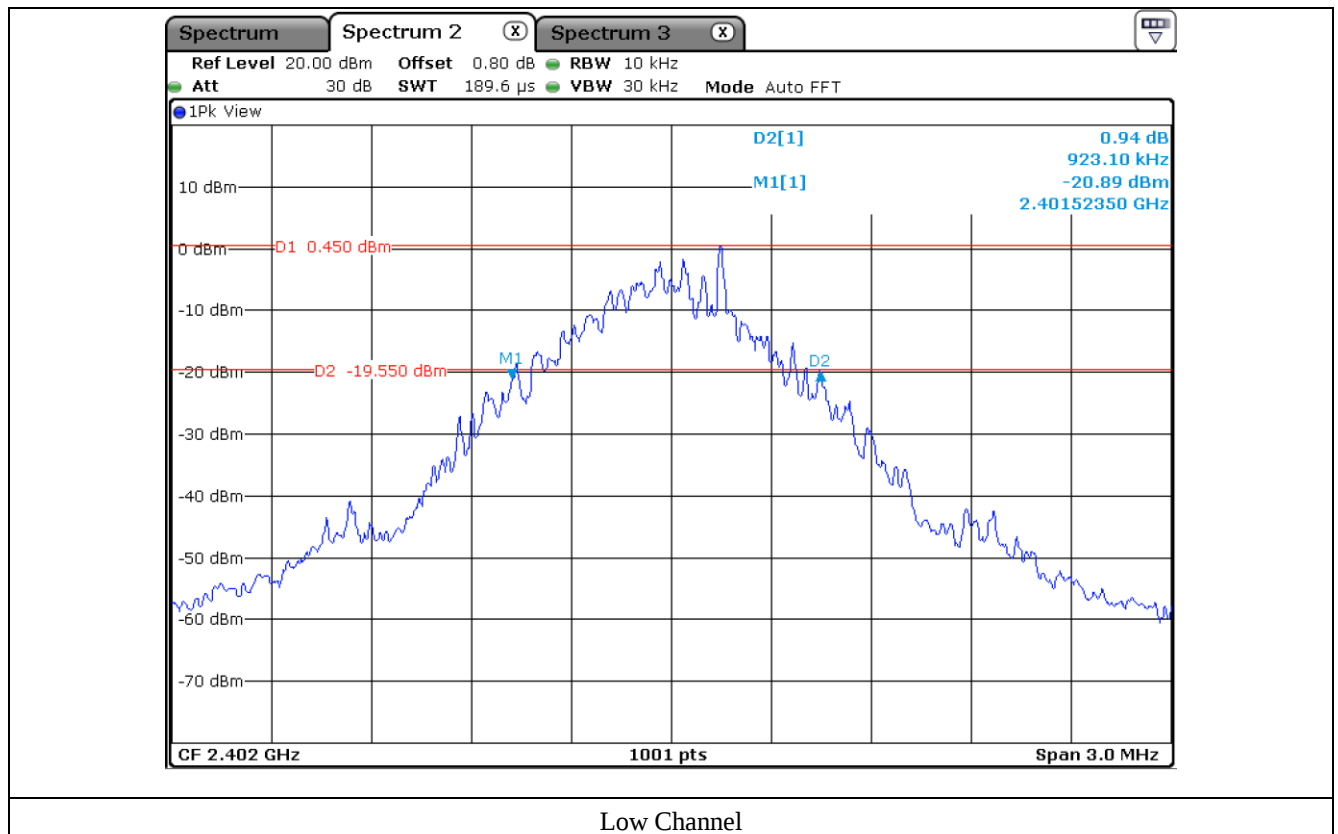


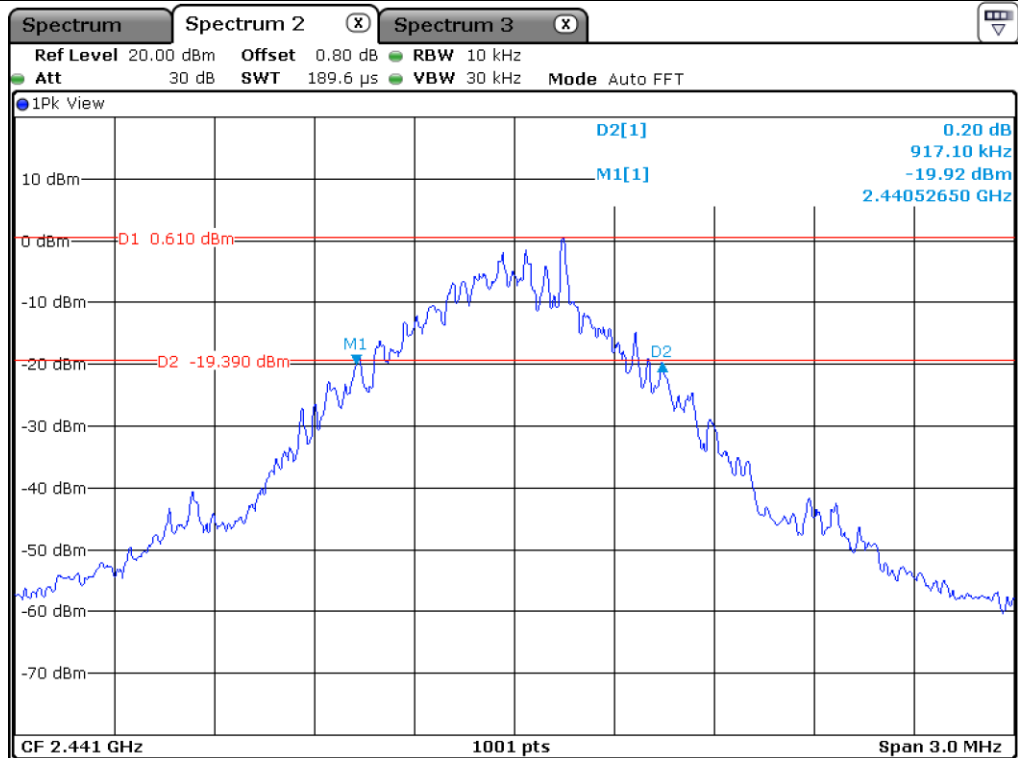
7.3 Test date

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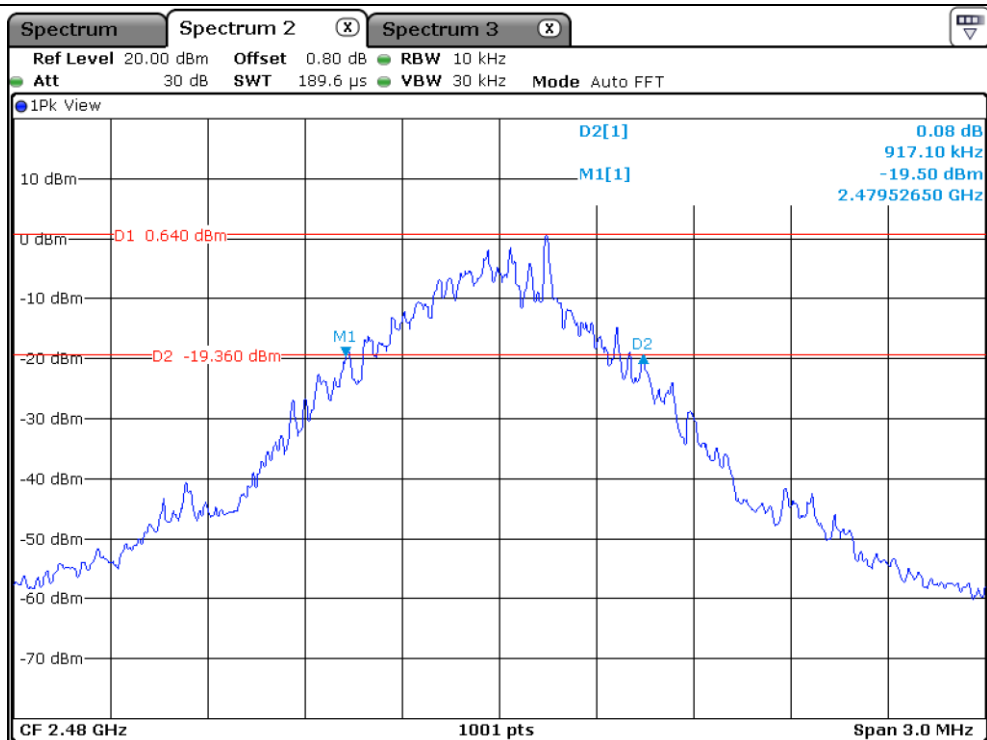
7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402	923.10
Middle	2 441	917.10
High	2 480	917.10





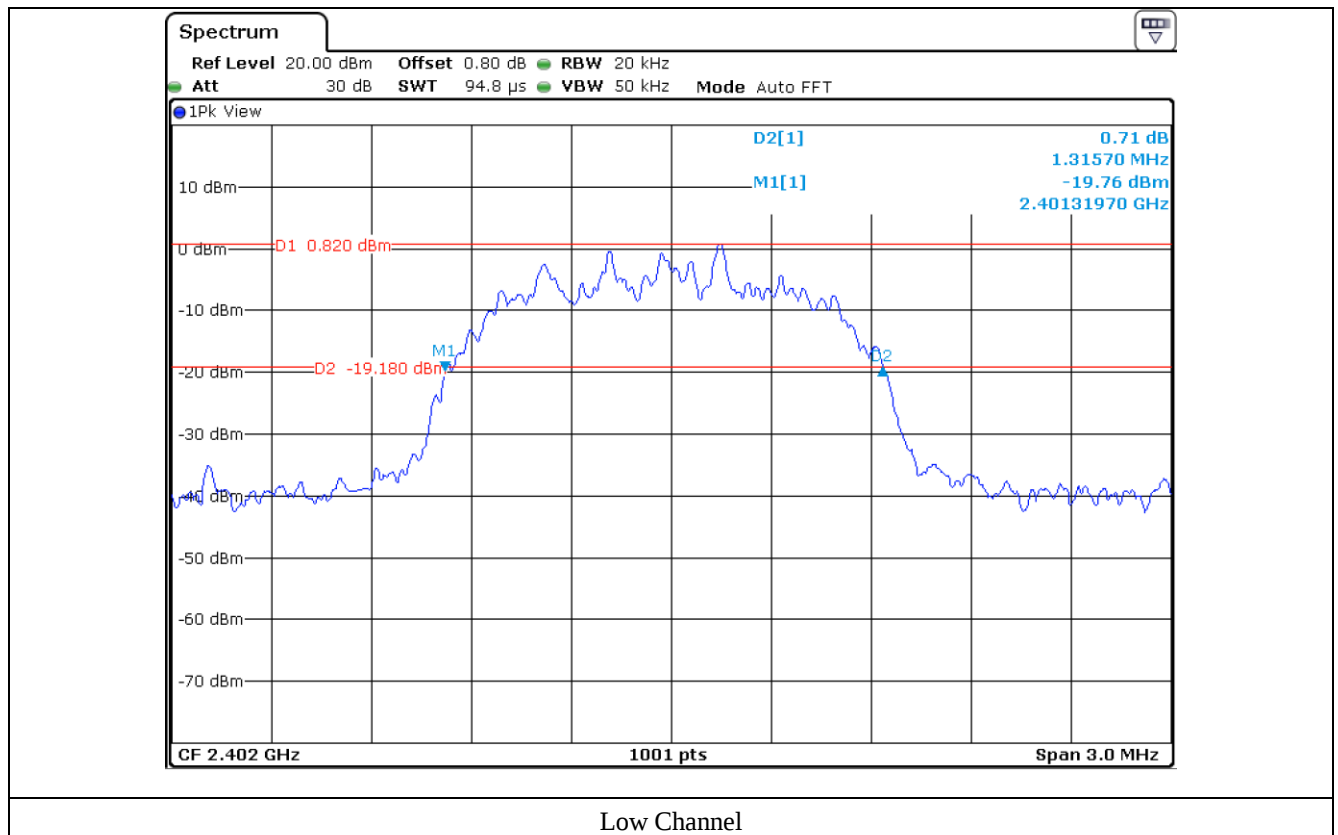
Middle Channel

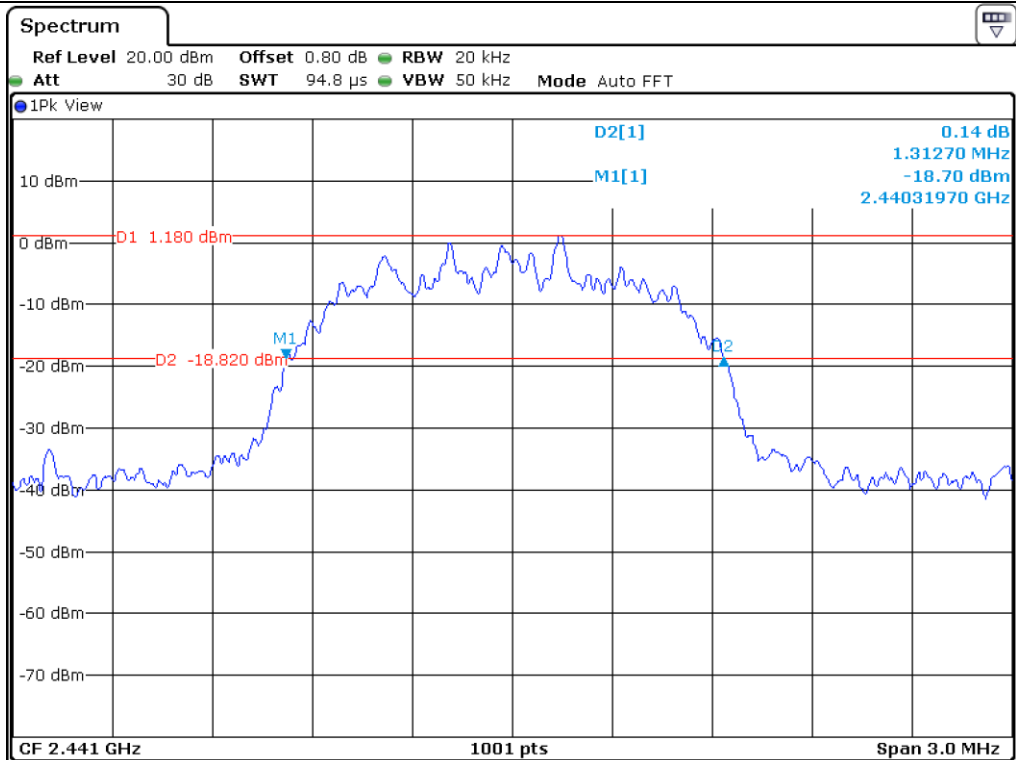


High Channel

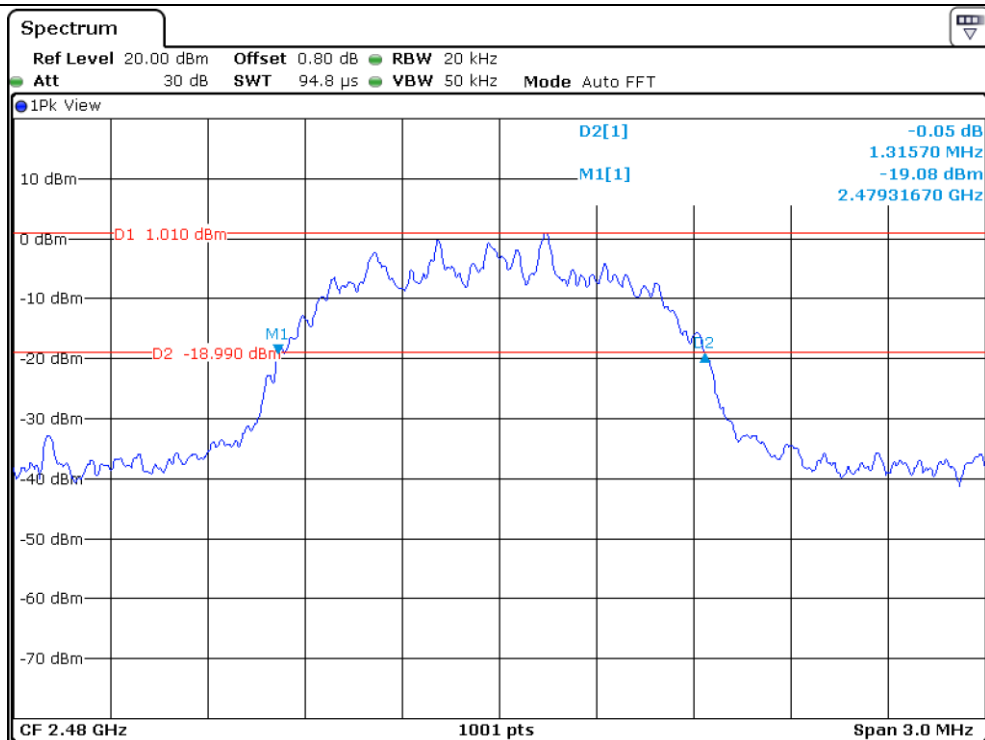
7.5 Test data for 2 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402	1 315.70
Middle	2 441	1 312.70
High	2 480	1 315.70





Middle Channel

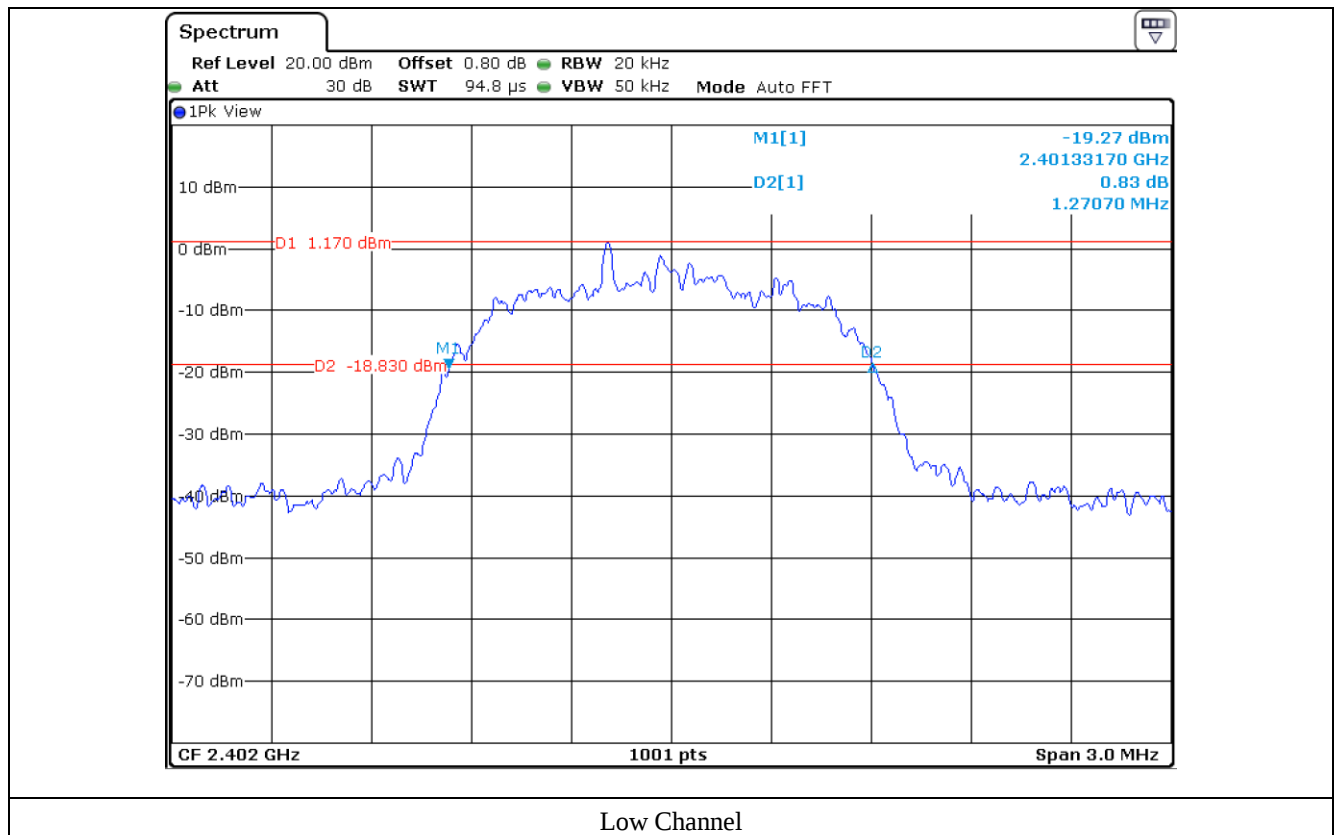


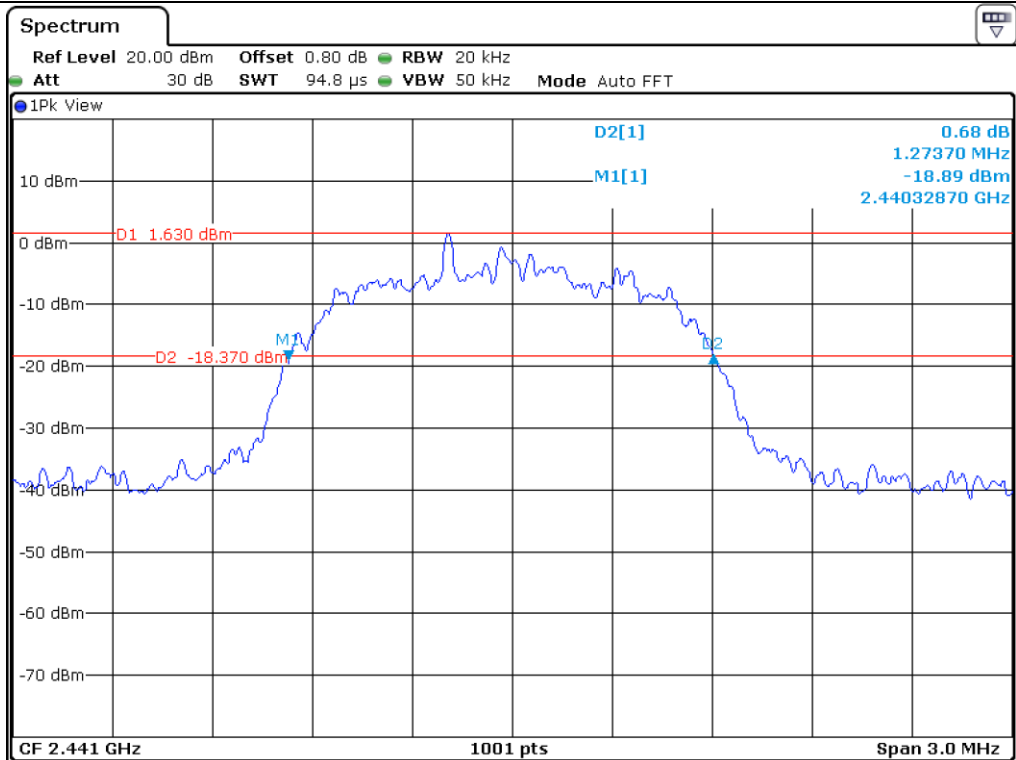
High Channel

7.6 Test data for 3 Mbps

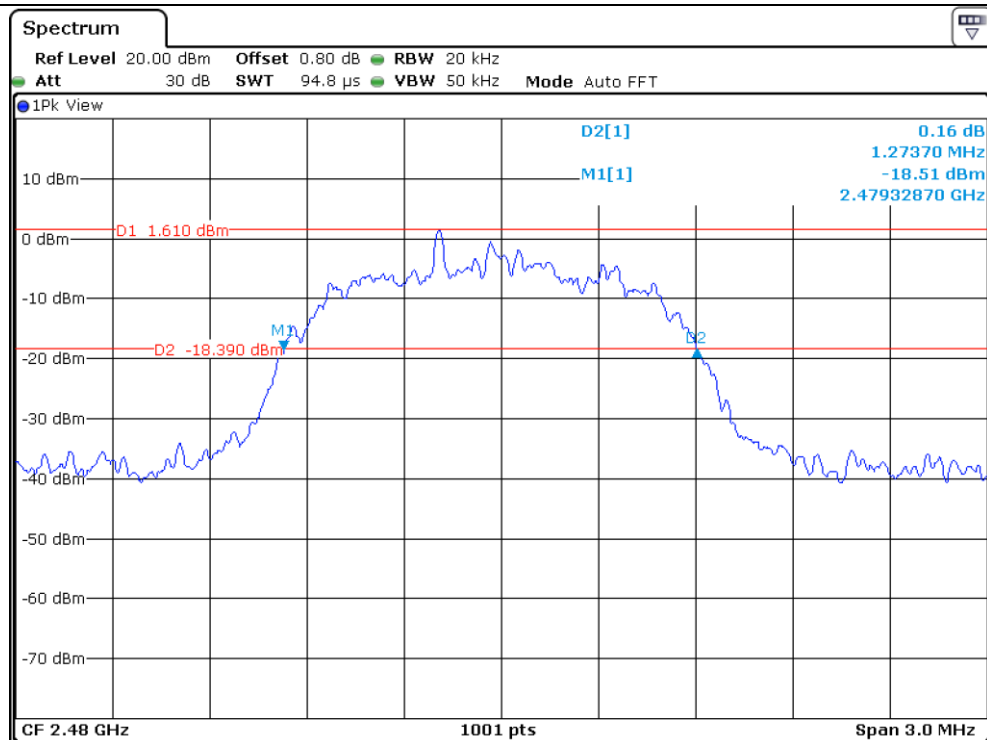
-. Test Date : June 04, 2020 ~ June 10, 2020

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402	1 270.70
Middle	2 441	1 273.70
High	2 480	1 273.70





Middle Channel



High Channel

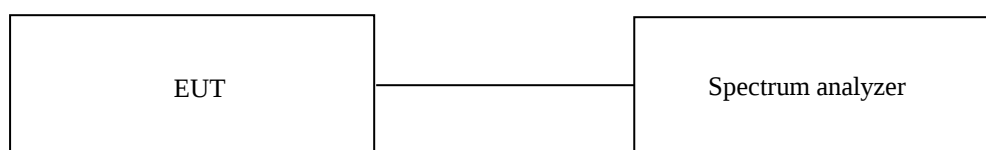
8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % 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 10 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.



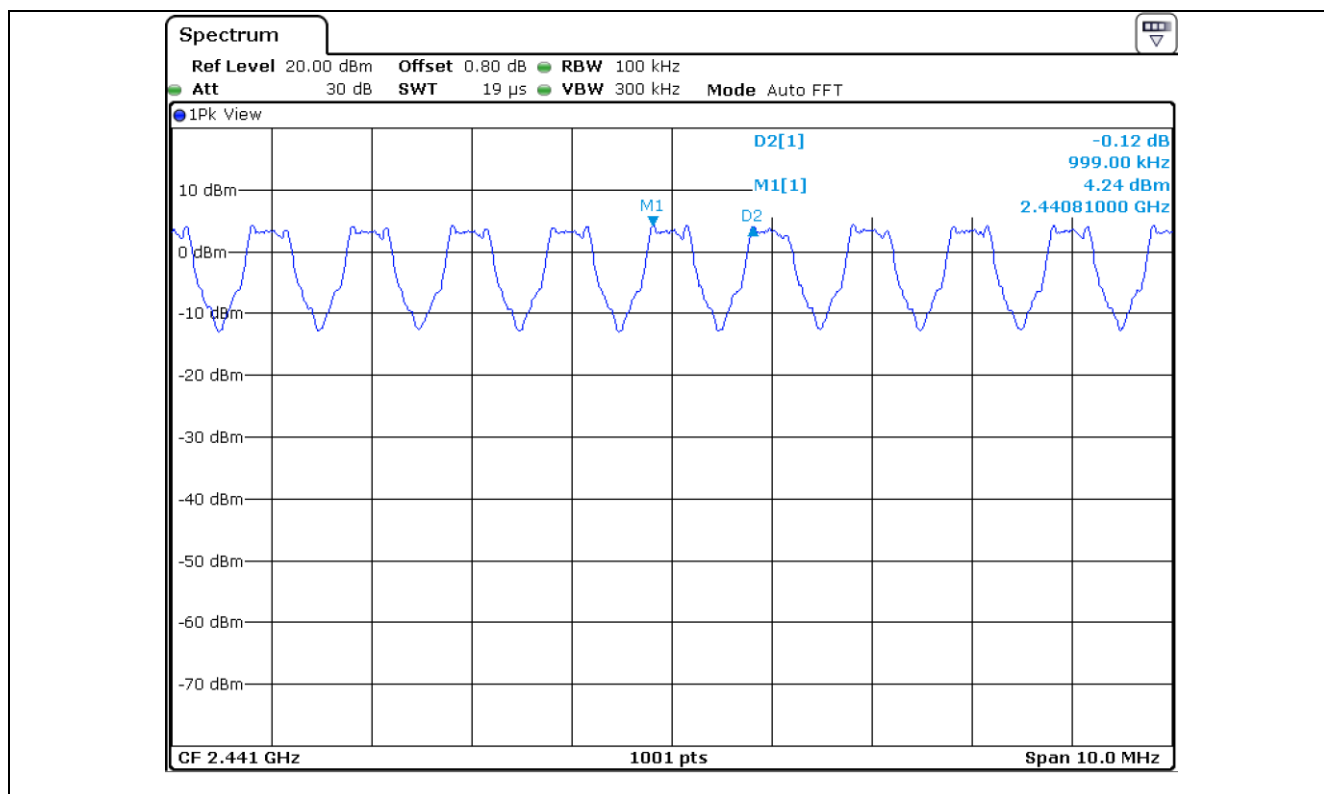
8.3 Test date

June 04, 2020 ~ June 10, 2020

8.4 Test data for 1 Mbps

-. Test Result : Pass

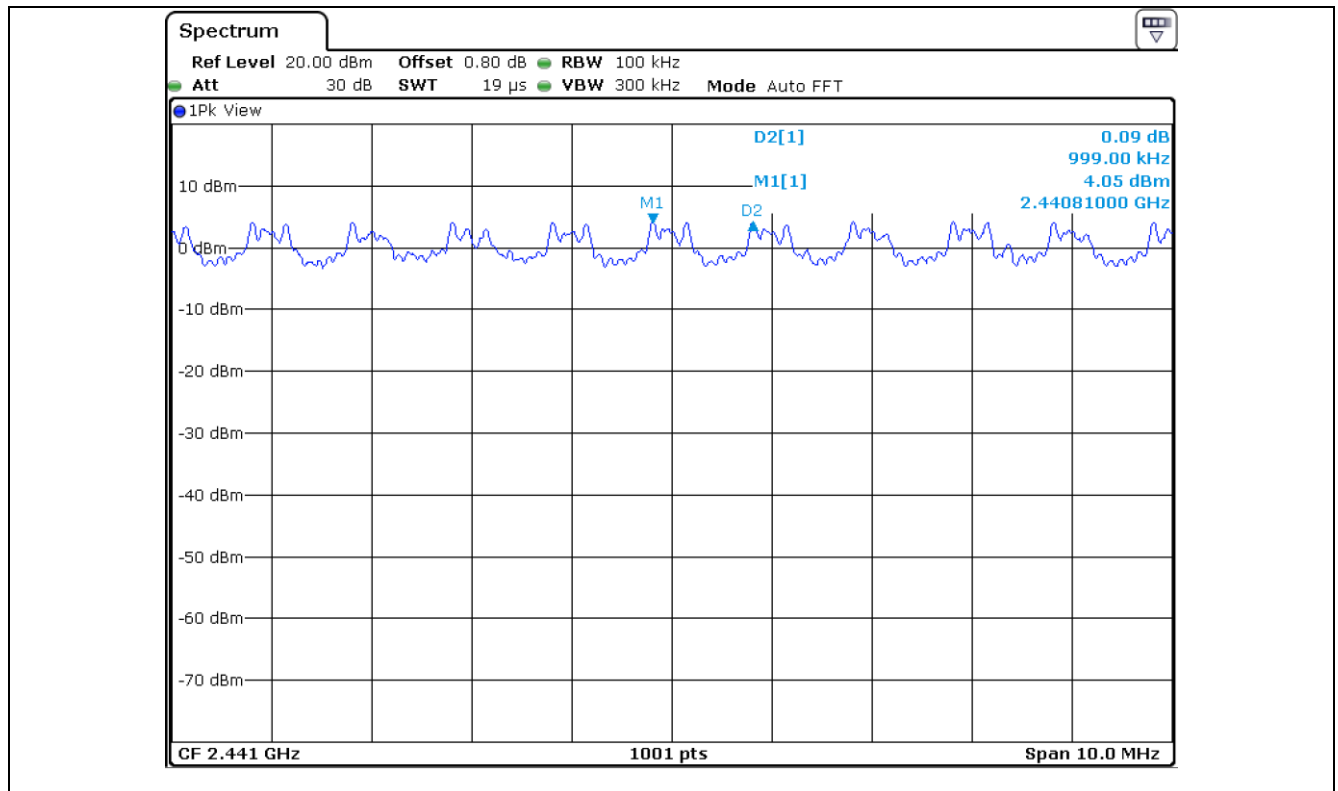
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	616.07	Separated by a minimum 616.07 kHz



8.5 Test data for 2 Mbps

-. Test Result : Pass

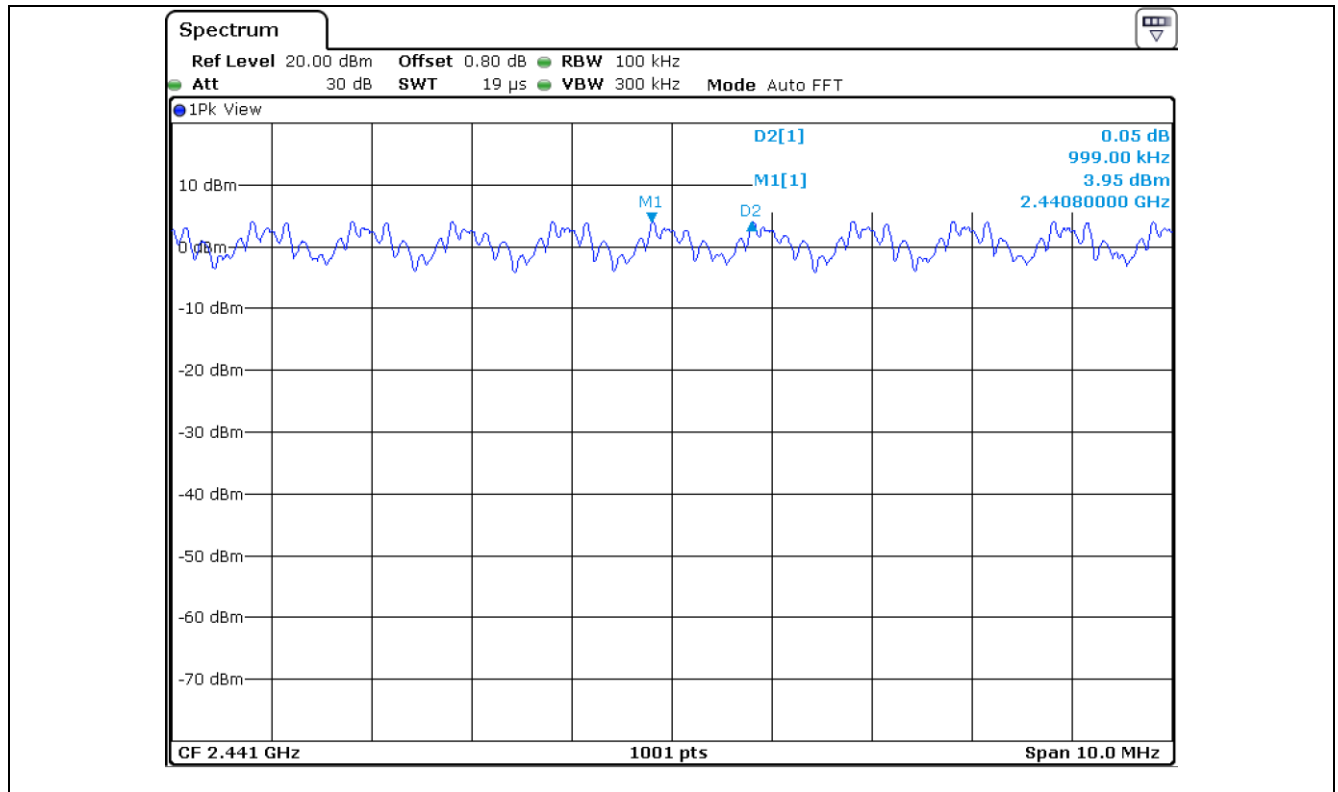
MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	817.20	Separated by a minimum 817.20 kHz



8.6 Test data for 3 Mbps

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	835.13	Separated by a minimum 835.13 kHz



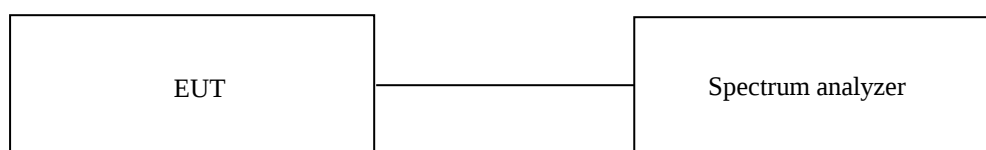
9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % 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 1 MHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



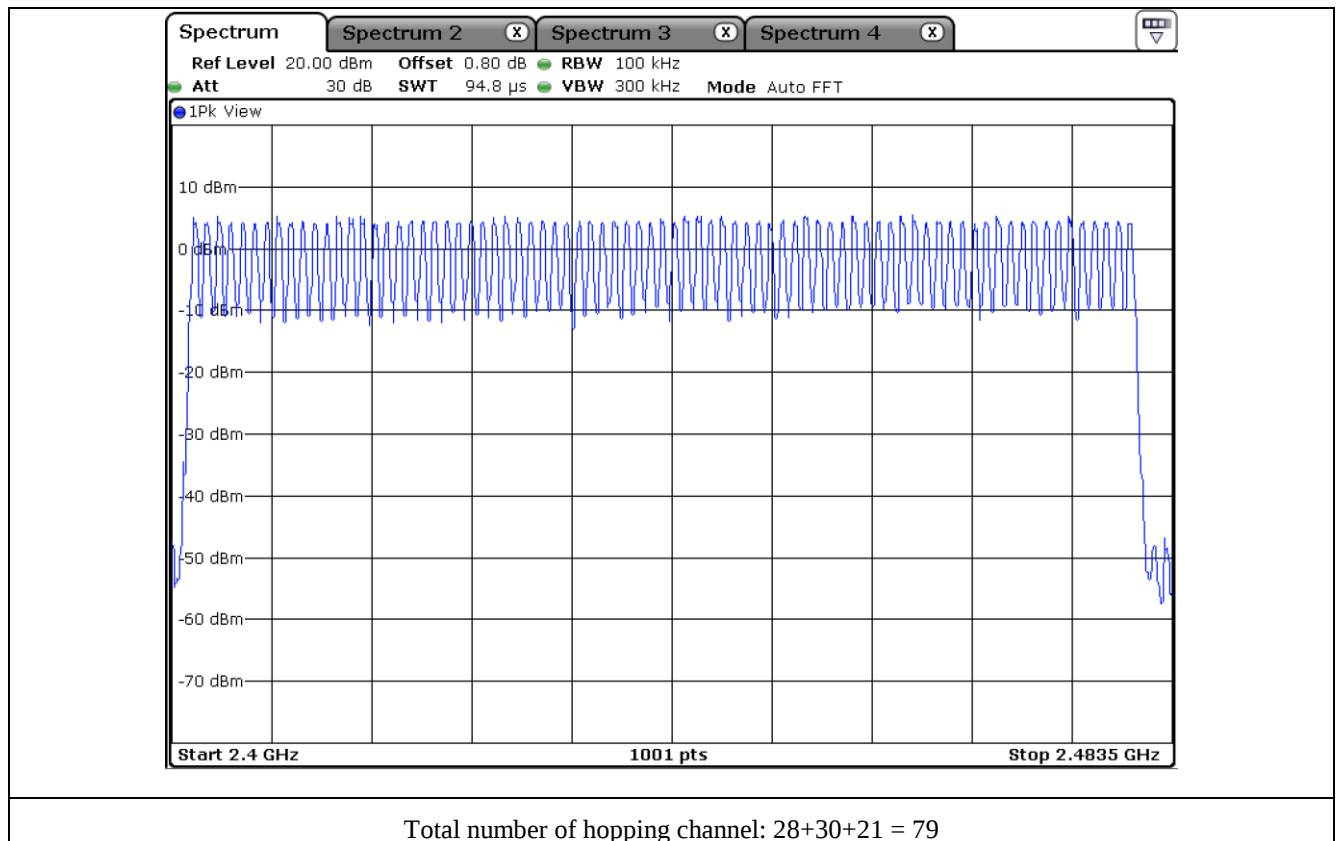
9.3 Test date

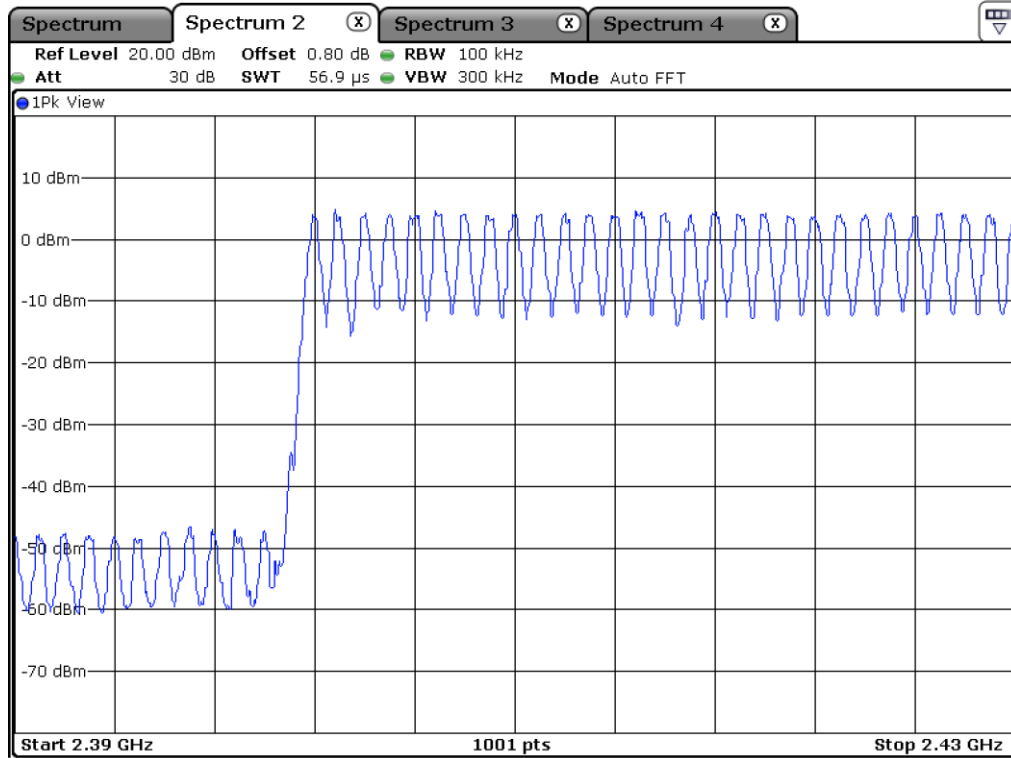
June 04, 2020 ~ June 10, 2020

9.4 Test data for 1 Mbps

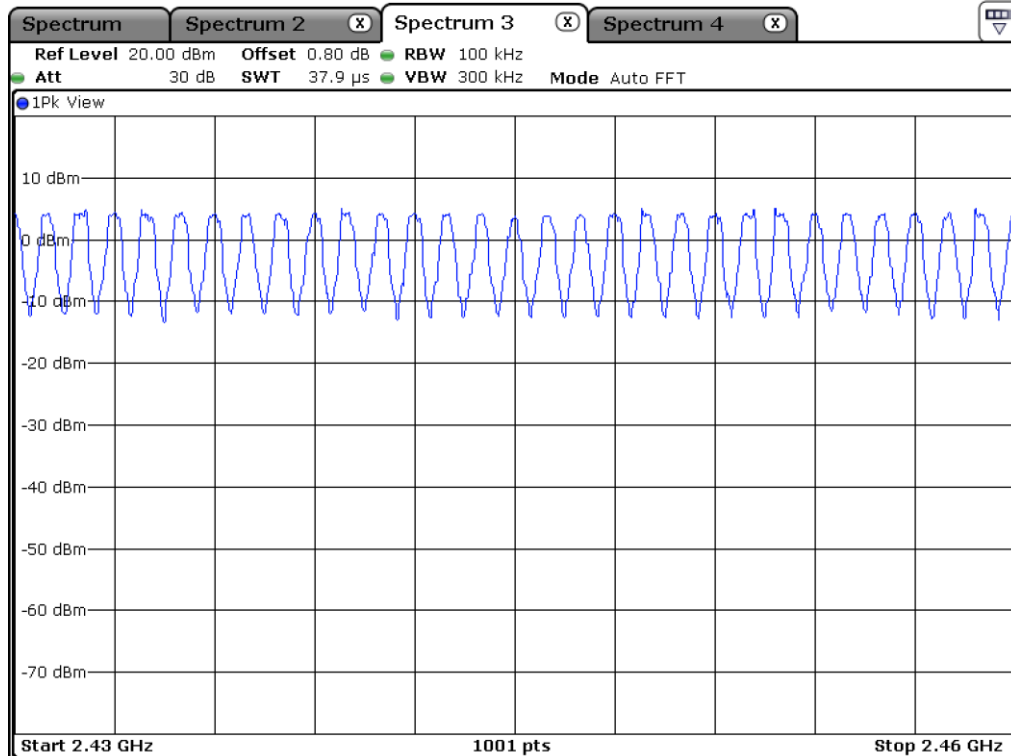
-. Test Result : Pass

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

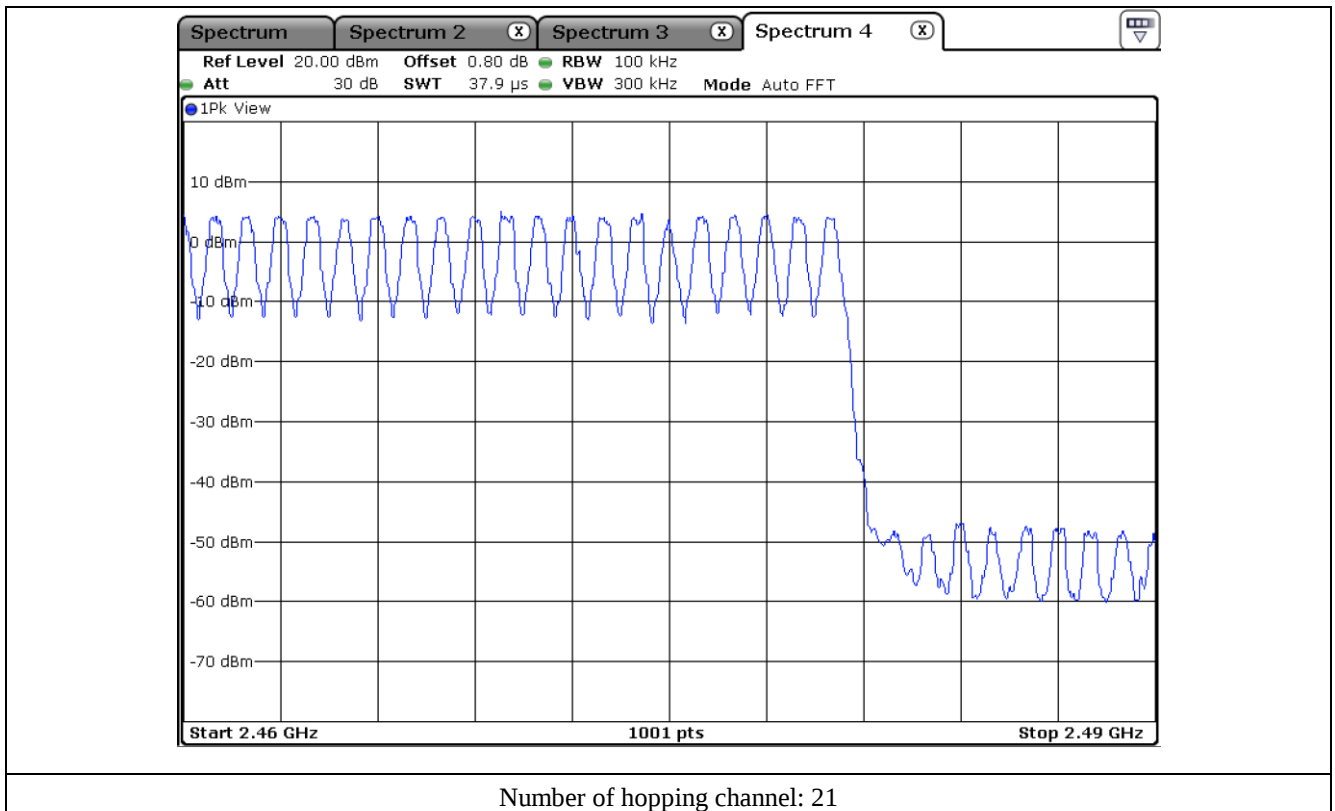




Number of hopping channel: 28



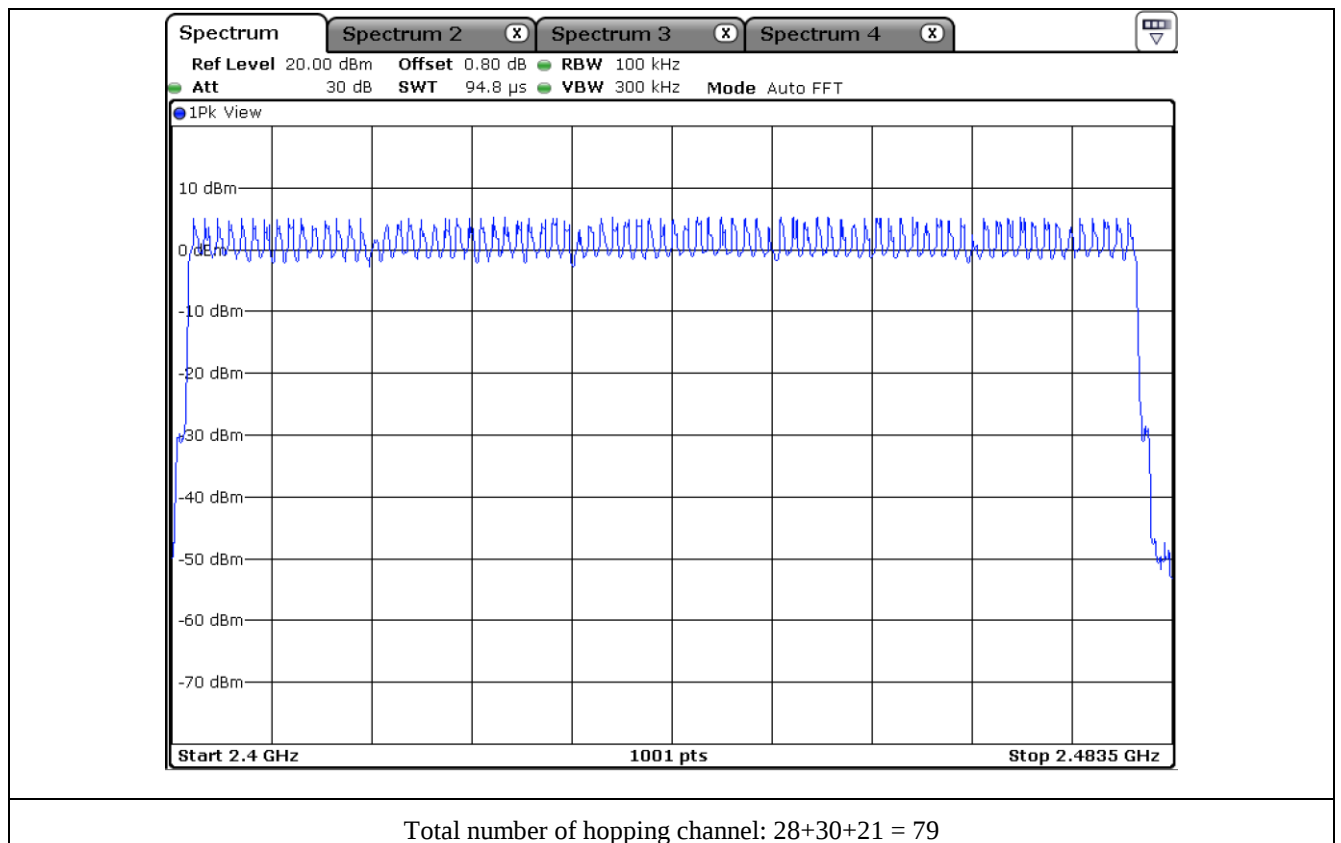
Number of hopping channel: 30

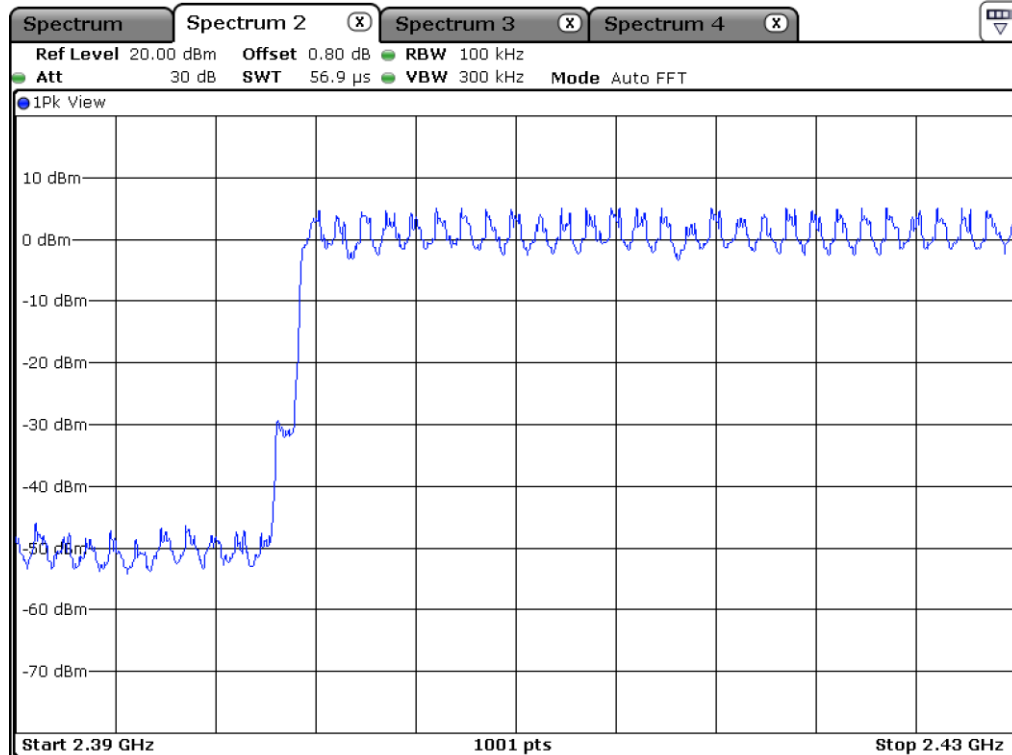


9.5 Test data for 2 Mbps

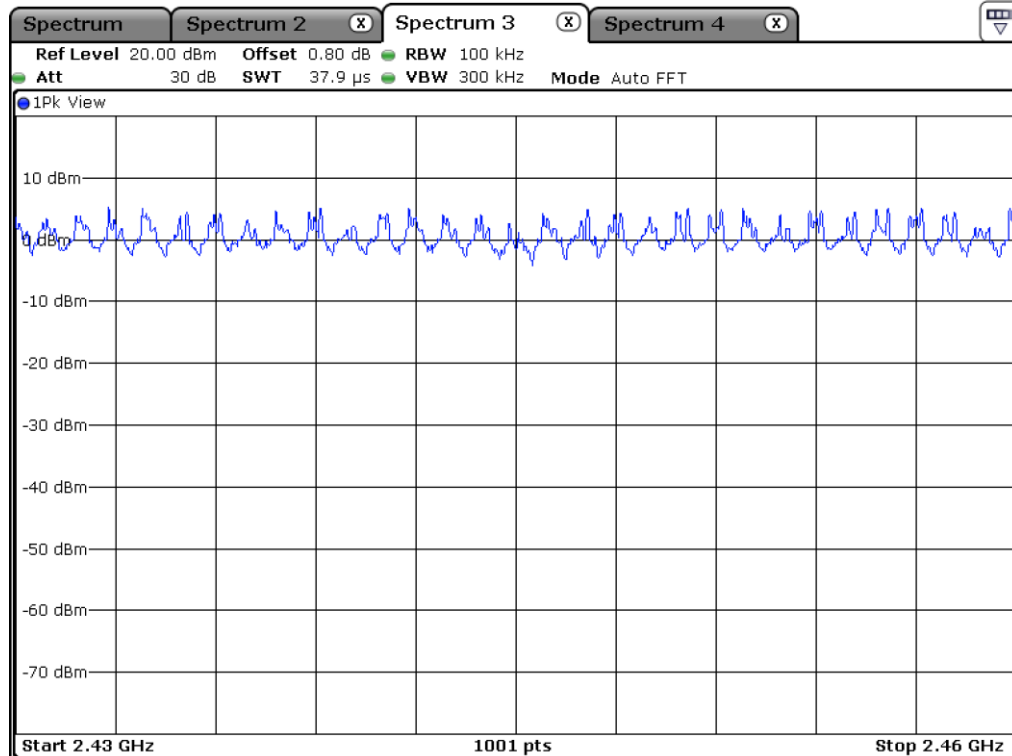
-. Test Result : Pass

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

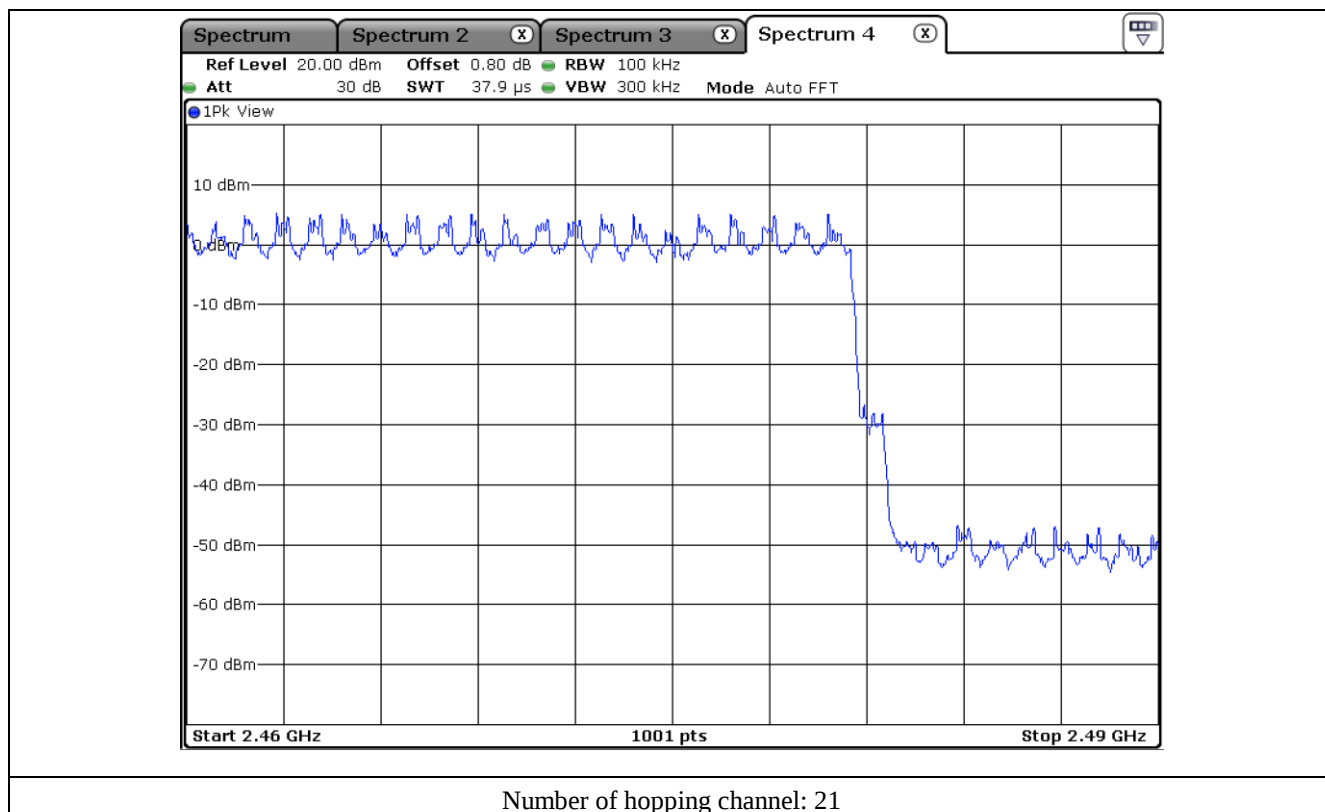




Number of hopping channel: 28



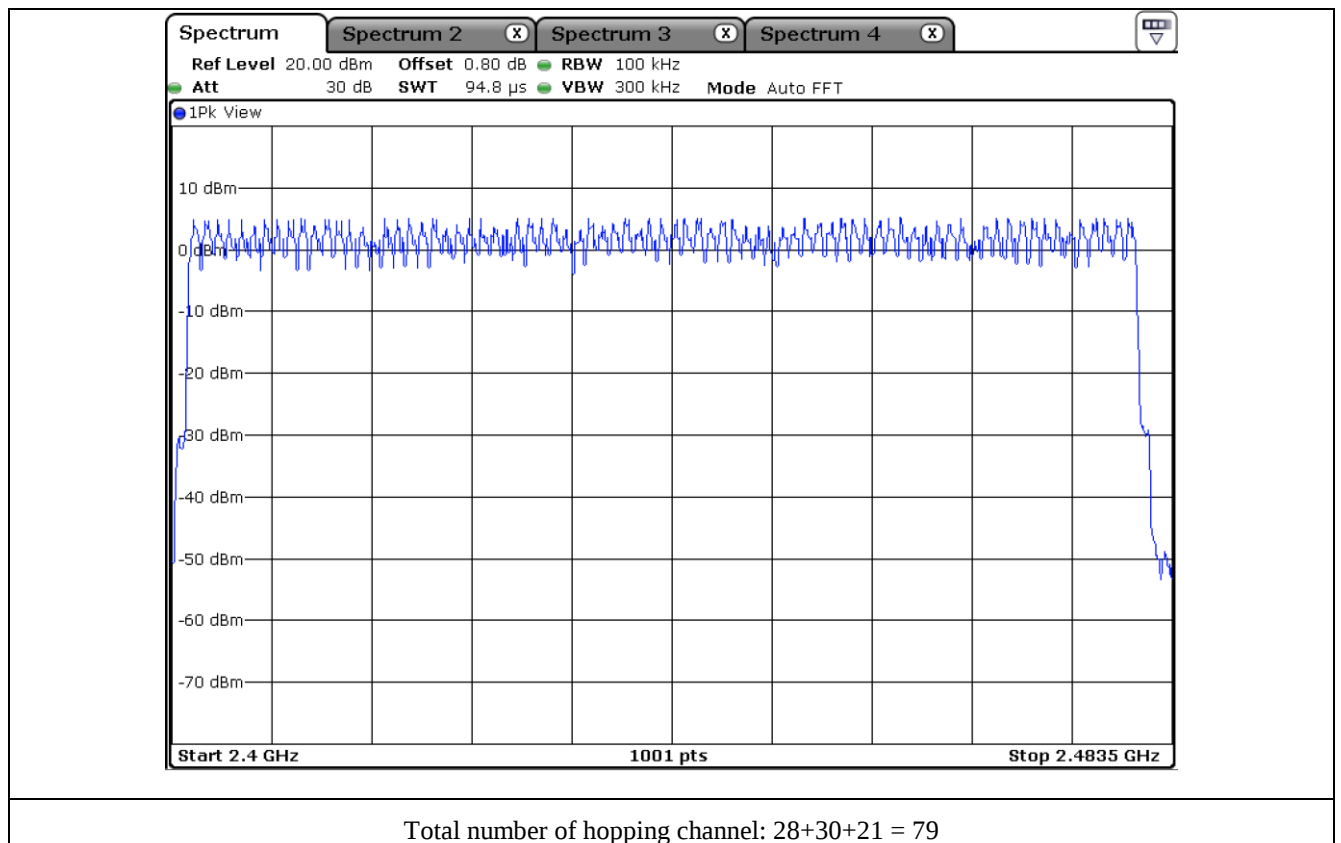
Number of hopping channel: 30

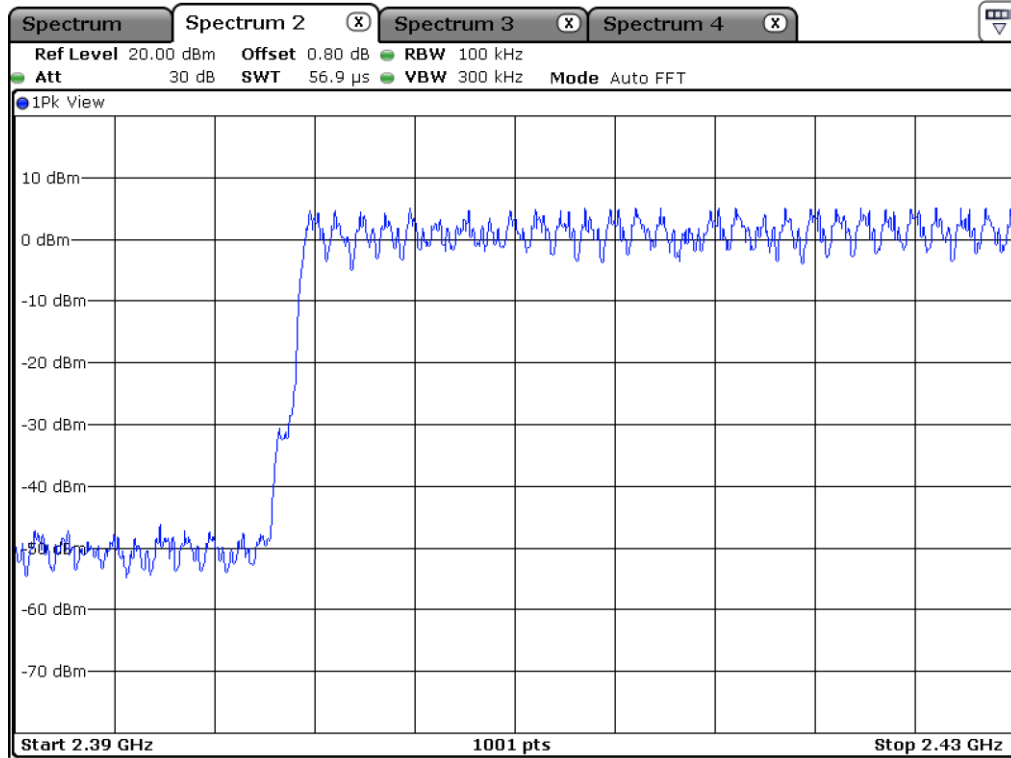


9.6 Test data for 3 Mbps

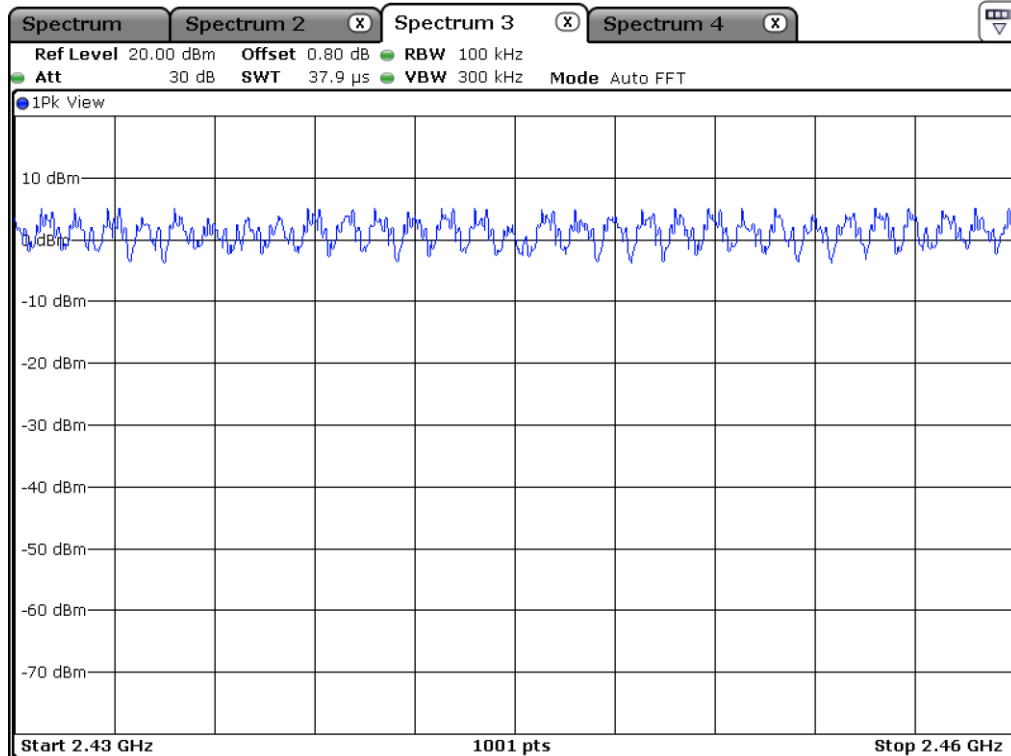
-. Test Result : Pass

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

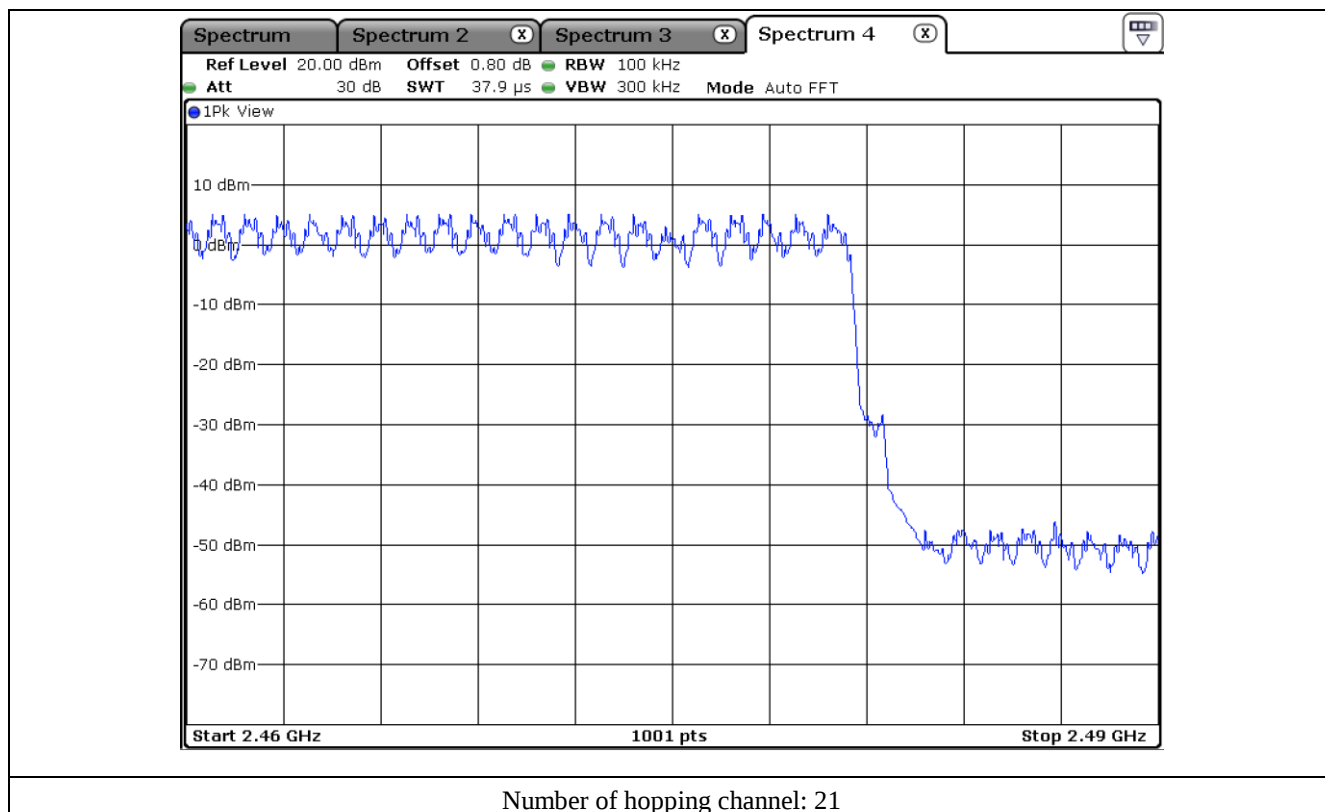




Number of hopping channel: 28



Number of hopping channel: 30



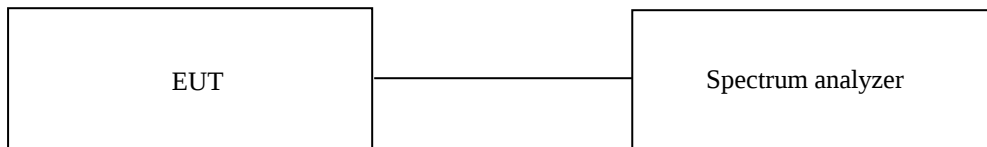
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % 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

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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.

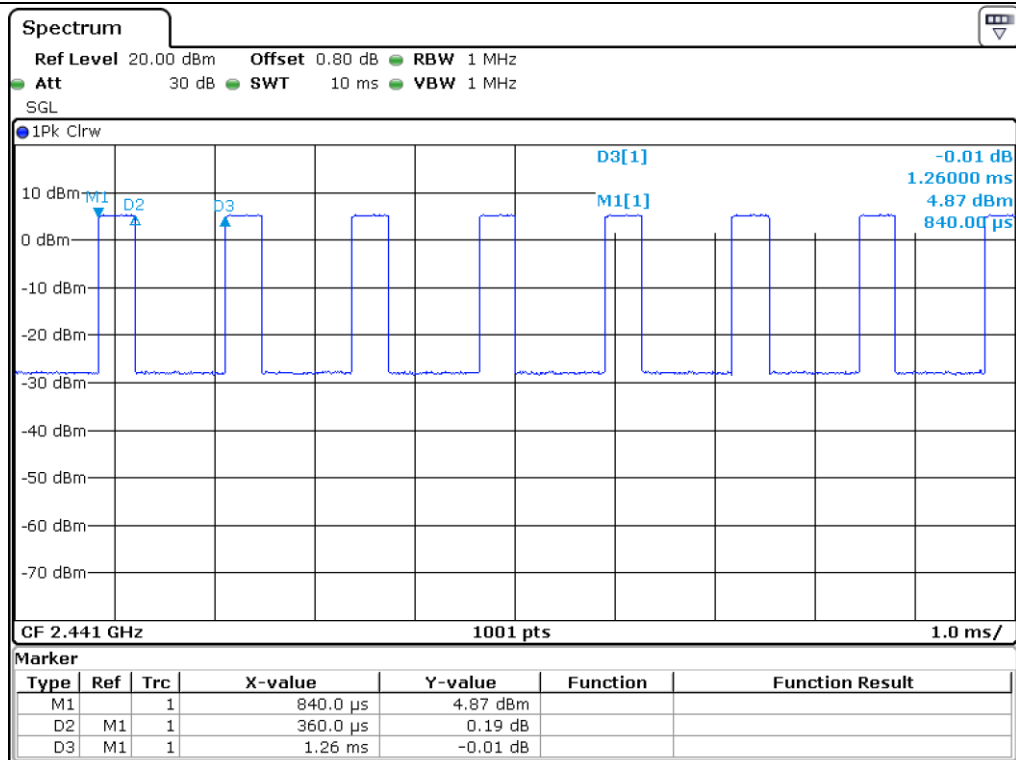
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each channel 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 (s)	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	2.870	3.38	31.60	306.54	400	

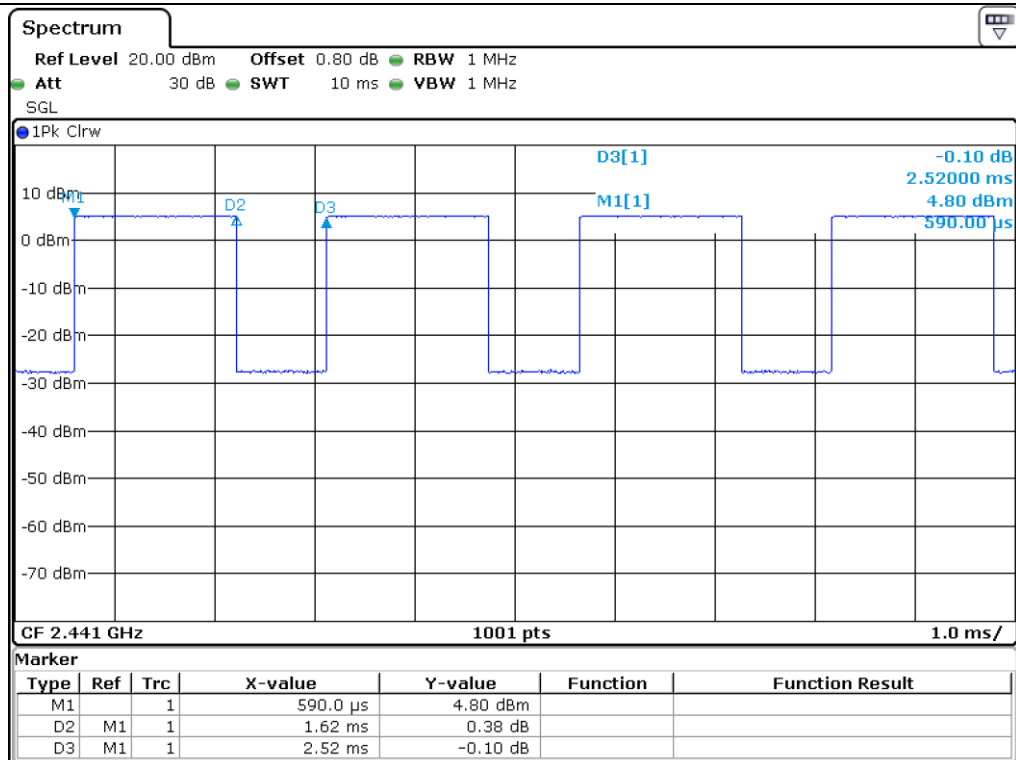
Total dwell time is calculated as following.

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

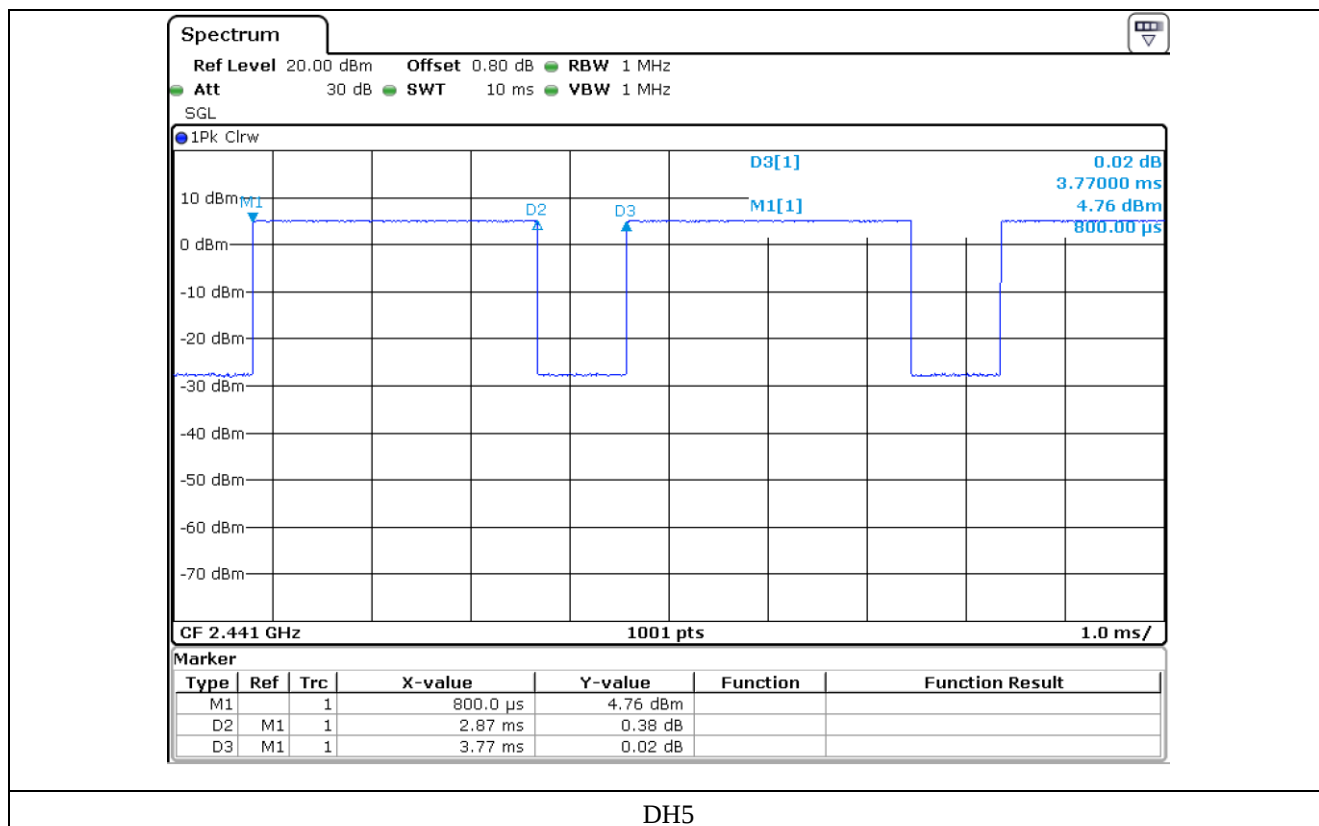
Remark: See next page for an overview sweep performed with peak detector.



DH1



DH3



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.

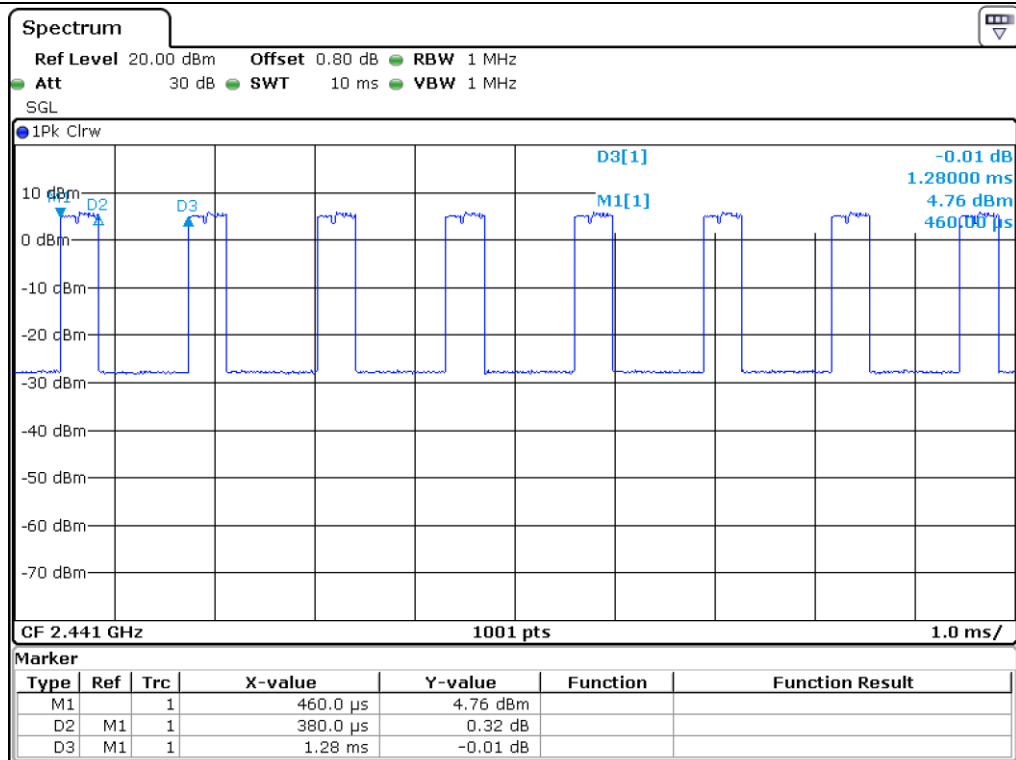
For 2-DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for 2-DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and 2-DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each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

Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (s)	Total Dwell Time (ms)	Limit (ms)	Test Result
2-DH1	0.380	10.13	31.60	121.64	400	PASS
2-DH3	1.640	5.06	31.60	262.23	400	
2-DH5	2.890	3.38	31.60	308.68	400	

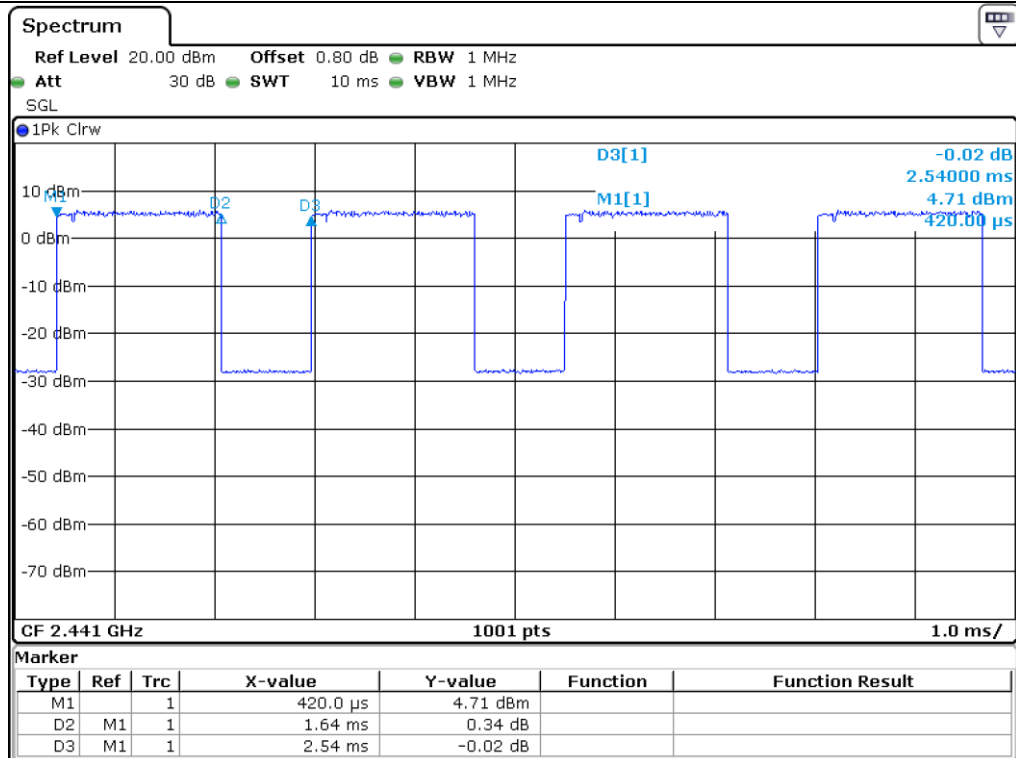
Total dwell time is calculated as following.

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

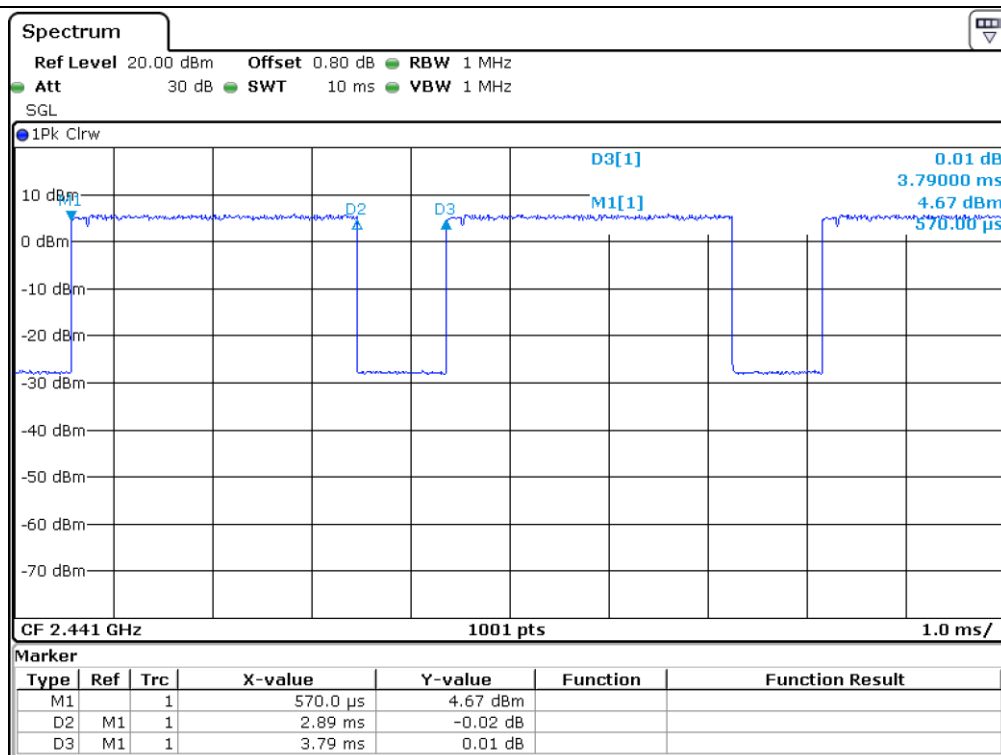
Remark: See next page for an overview sweep performed with peak detector.



2-DH1



2-DH3



2-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.

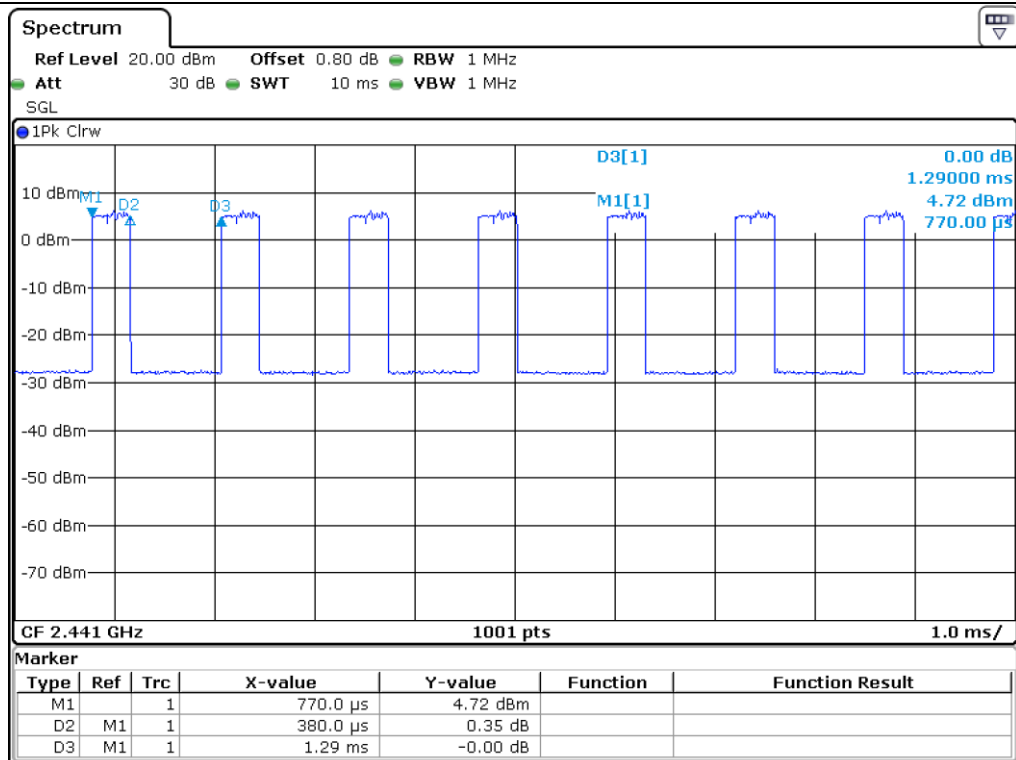
For 3-DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for 3-DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and 3-DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So The EUT has each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

Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (s)	Total Dwell Time (ms)	Limit (ms)	Test Result
3-DH1	0.380	10.13	31.60	121.64	400	PASS
3-DH3	1.640	5.06	31.60	262.23	400	
3-DH5	2.890	3.38	31.60	308.68	400	

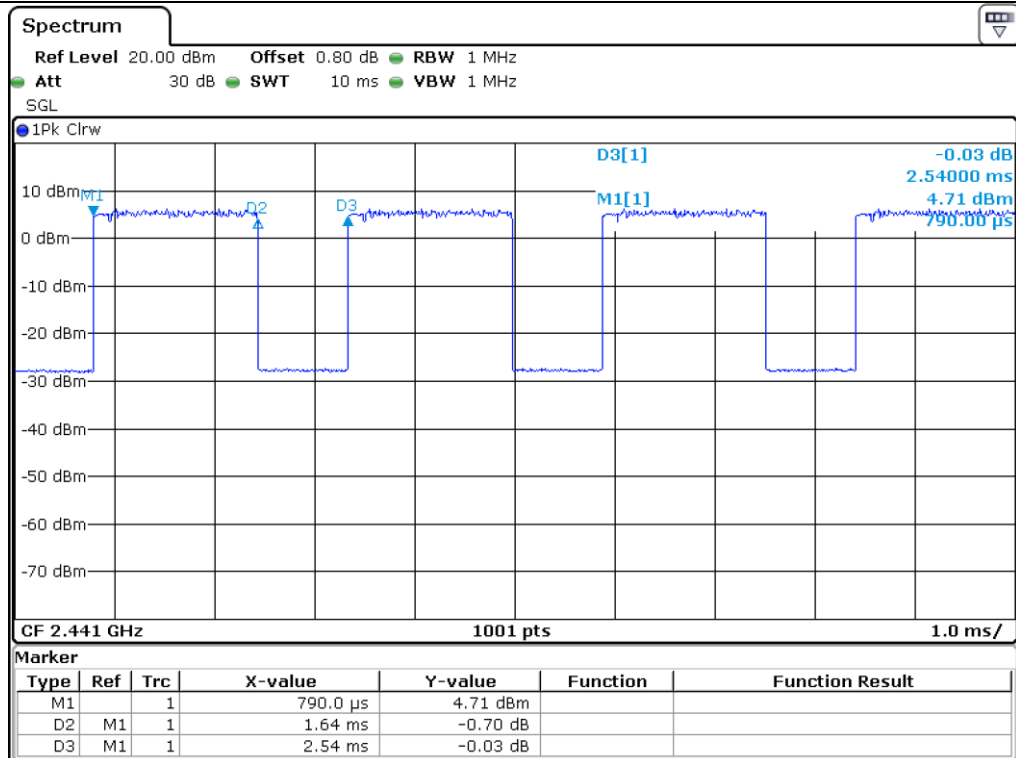
Total dwell time is calculated as following.

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

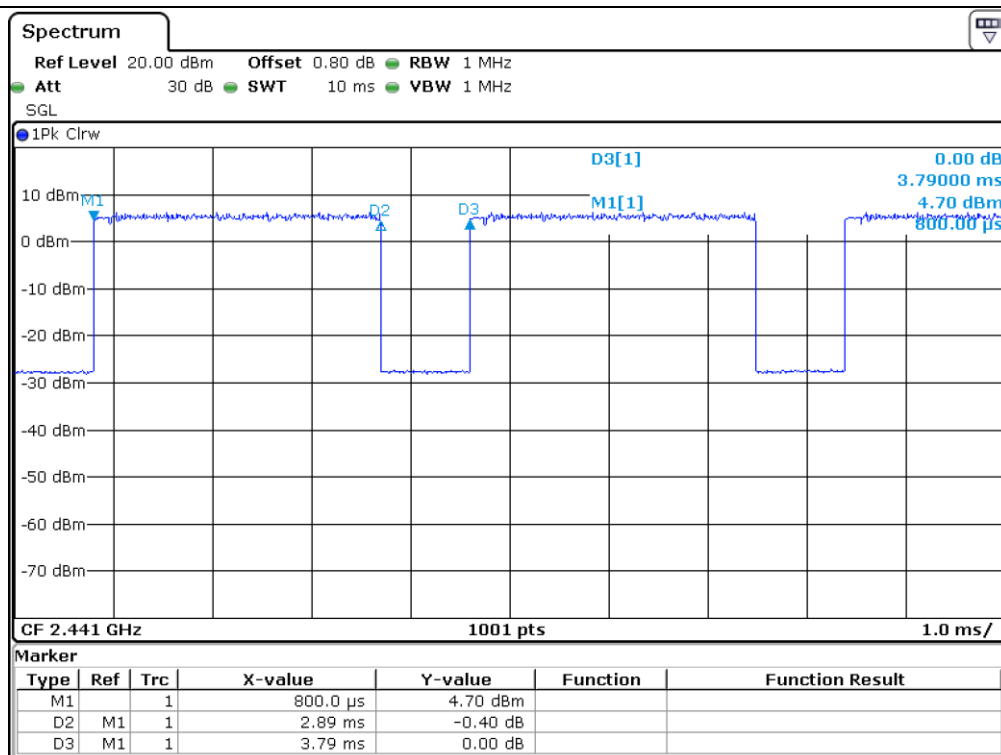
Remark: See next page for an overview sweep performed with peak detector.



3-DH1



3-DH3



3-DH5

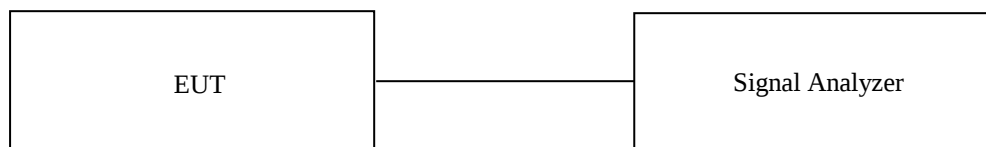
11. MAXIMUM PEAK OUTPUT POWER

11.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % R.H

11.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT.
The EUT was operating in transmit mode at the appropriate center frequency.



11.3 Test date

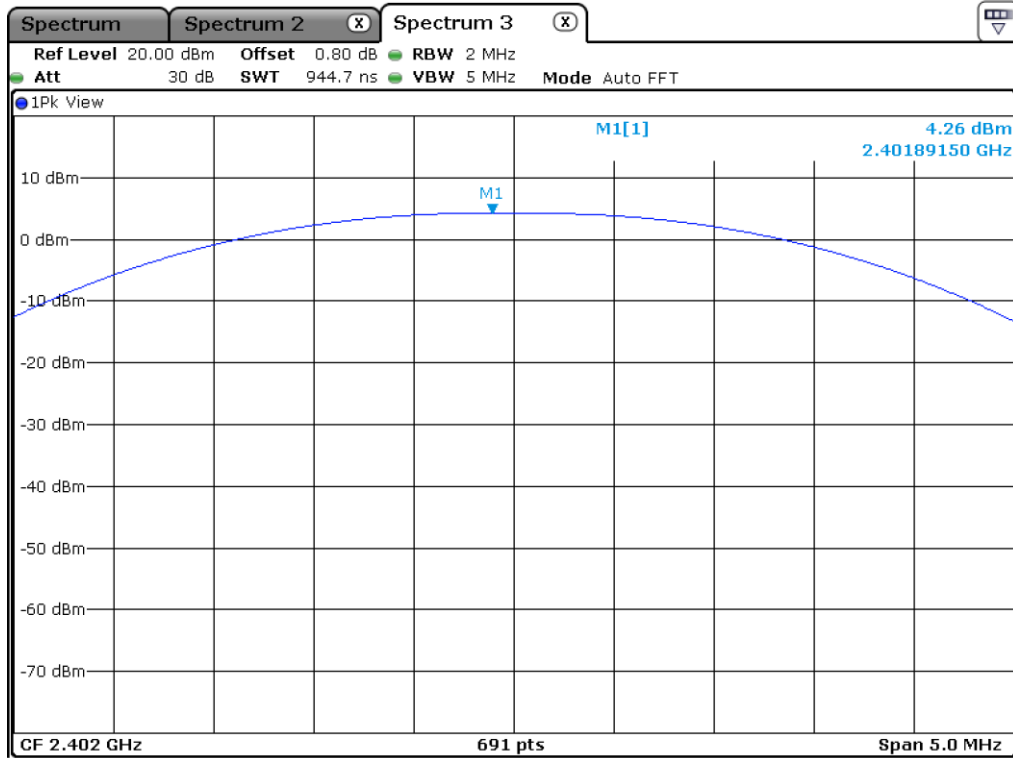
June 04, 2020 ~ June 10, 2020

11.4 Test data for 1 Mbps

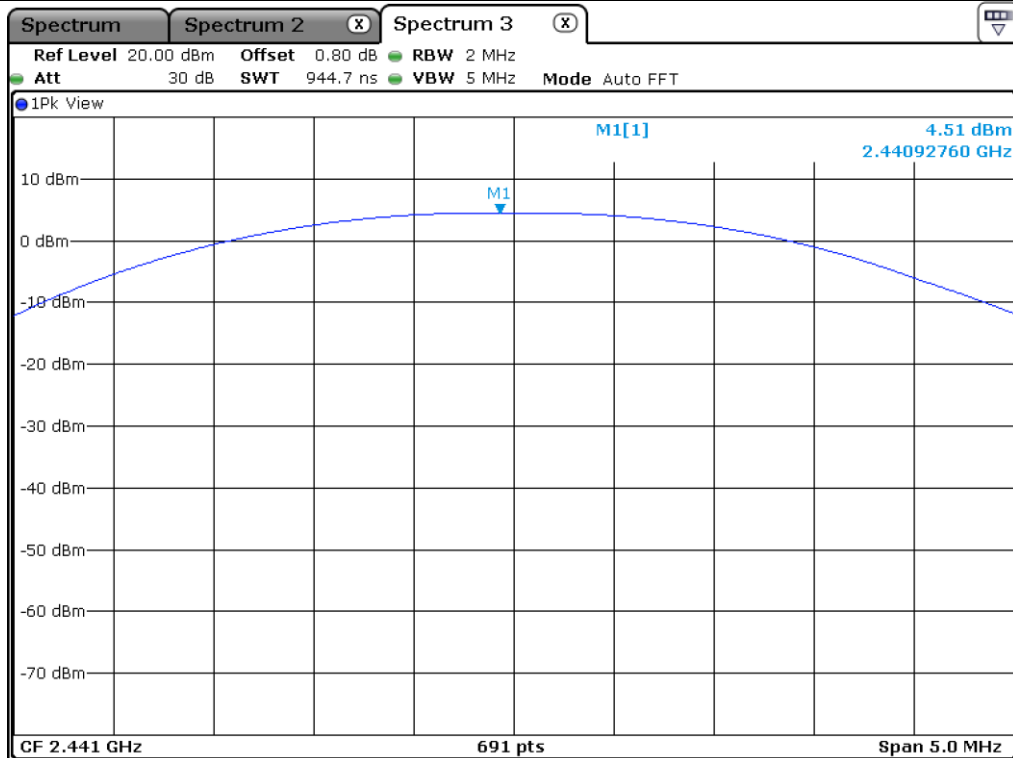
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	4.26	21.00	16.74
MIDDLE	2 441	4.51	21.00	16.49
HIGH	2 480	4.53	21.00	16.47

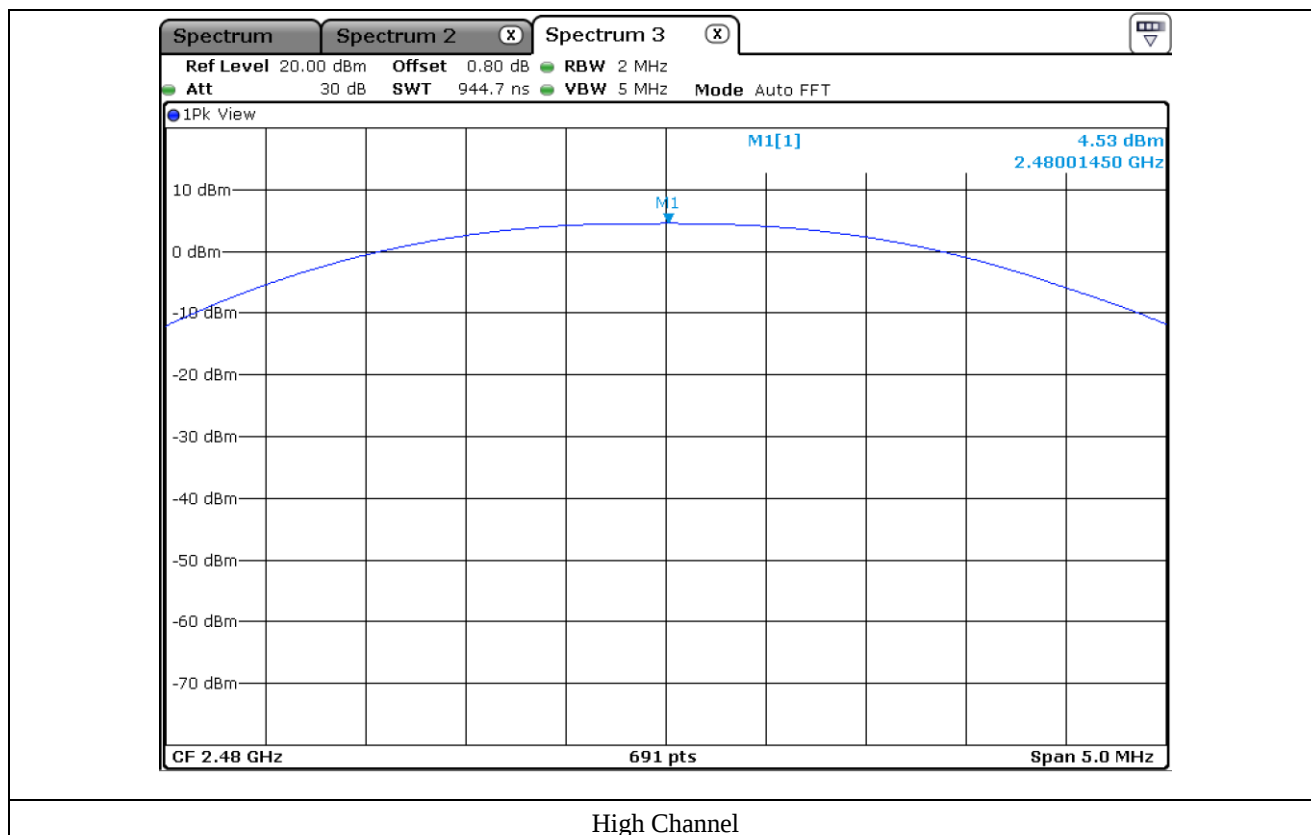
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel

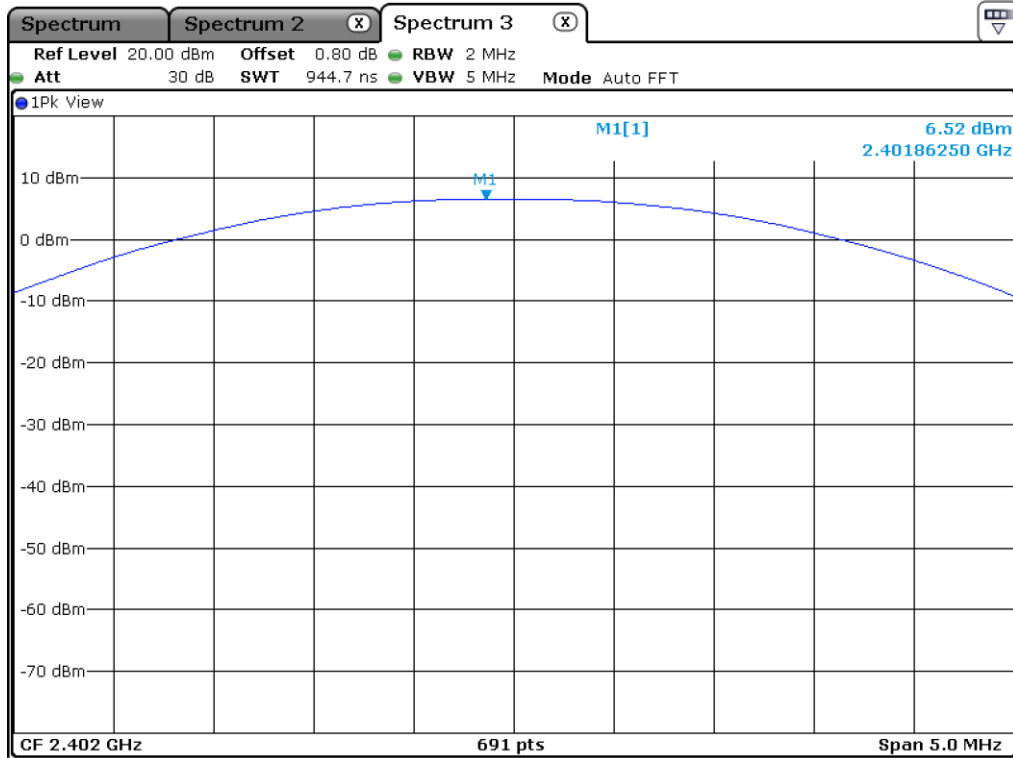


11.5 Test data for 2 Mbps

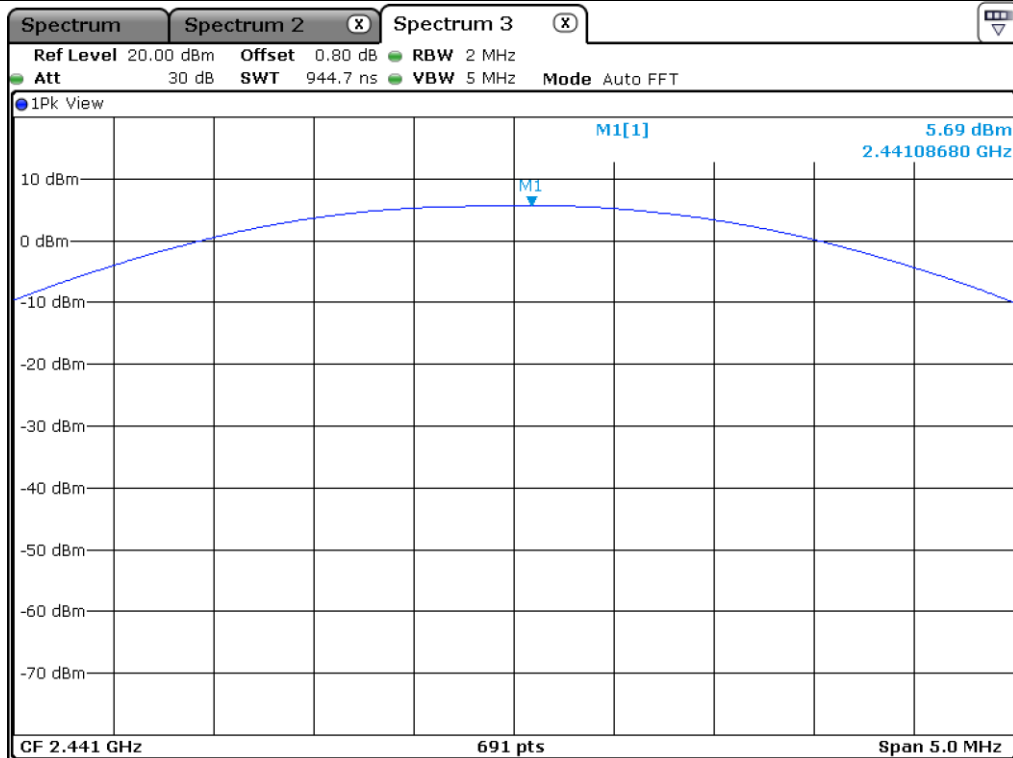
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	6.52	21.00	14.48
MIDDLE	2 441	5.69	21.00	15.31
HIGH	2 480	5.73	21.00	15.27

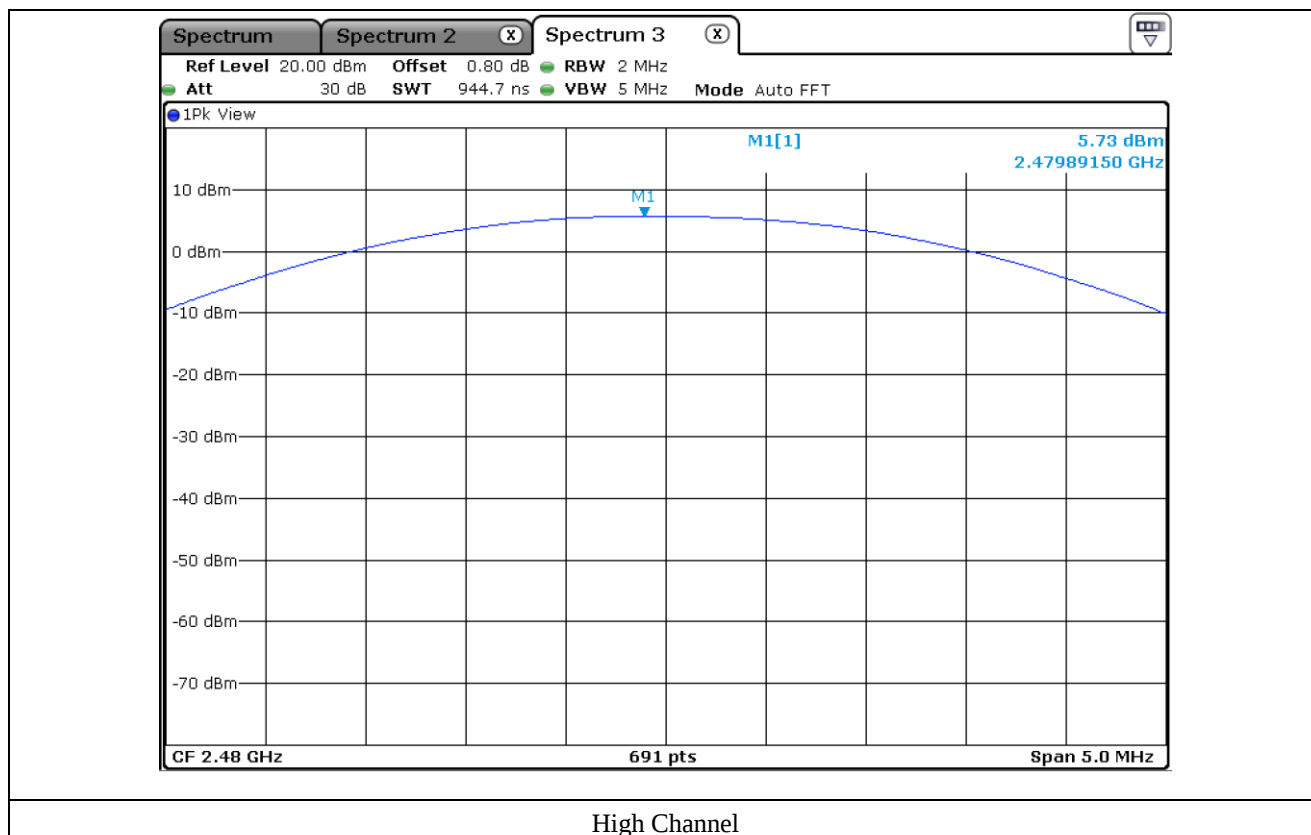
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel

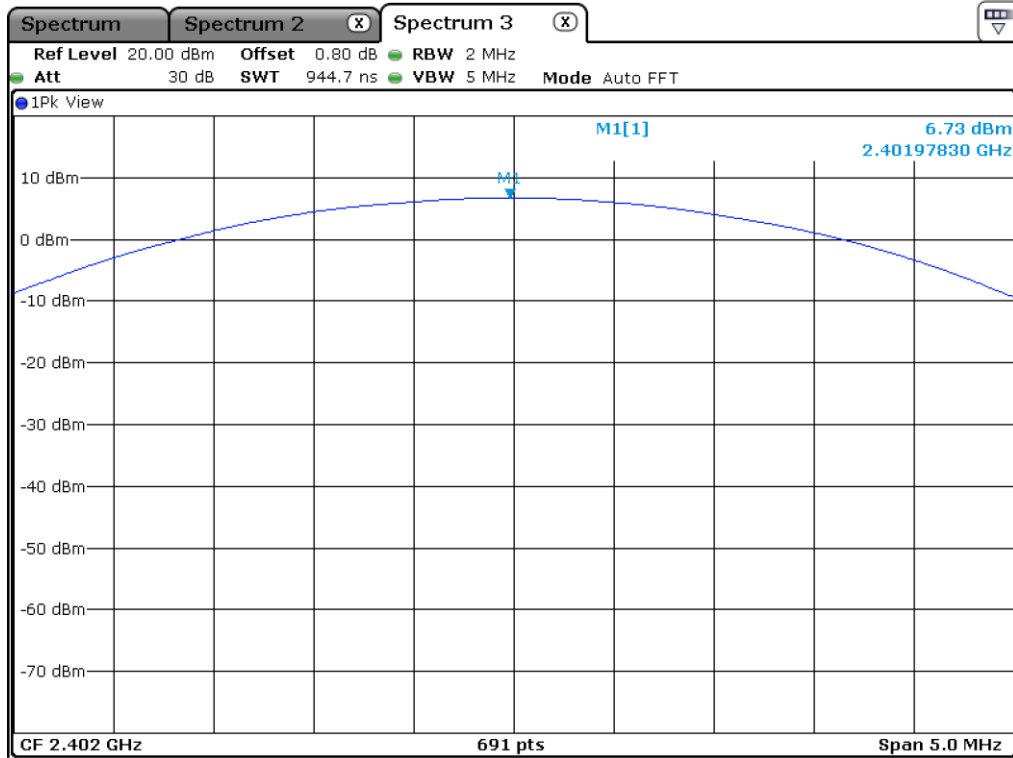


11.6 Test data for 3 Mbps

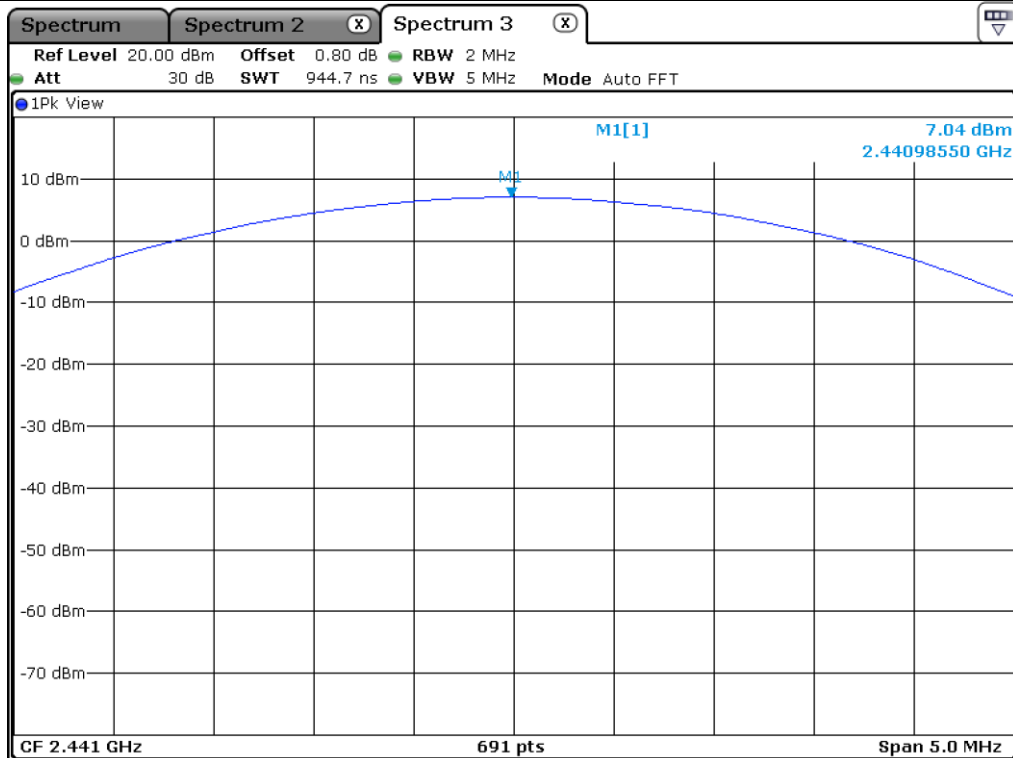
-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402	6.73	21.00	14.27
MIDDLE	2 441	7.04	21.00	13.96
HIGH	2 480	7.05	21.00	13.95

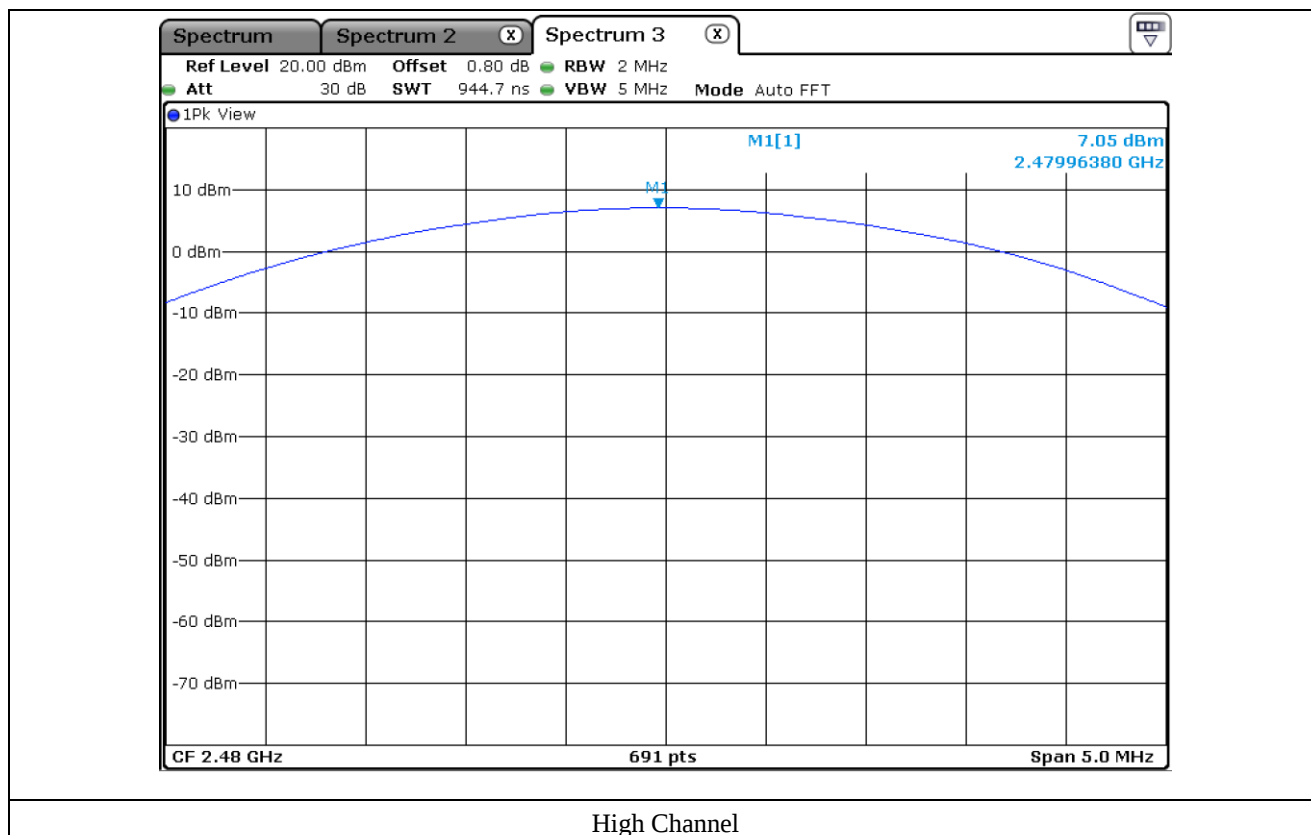
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Low Channel



Middle Channel



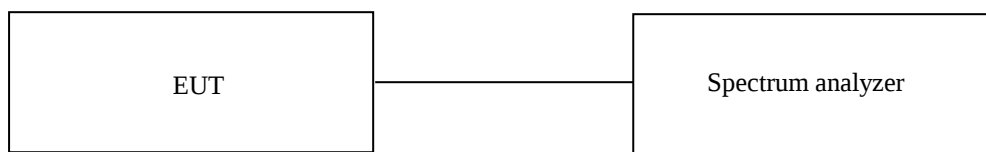
12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % 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, open-field test site. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.

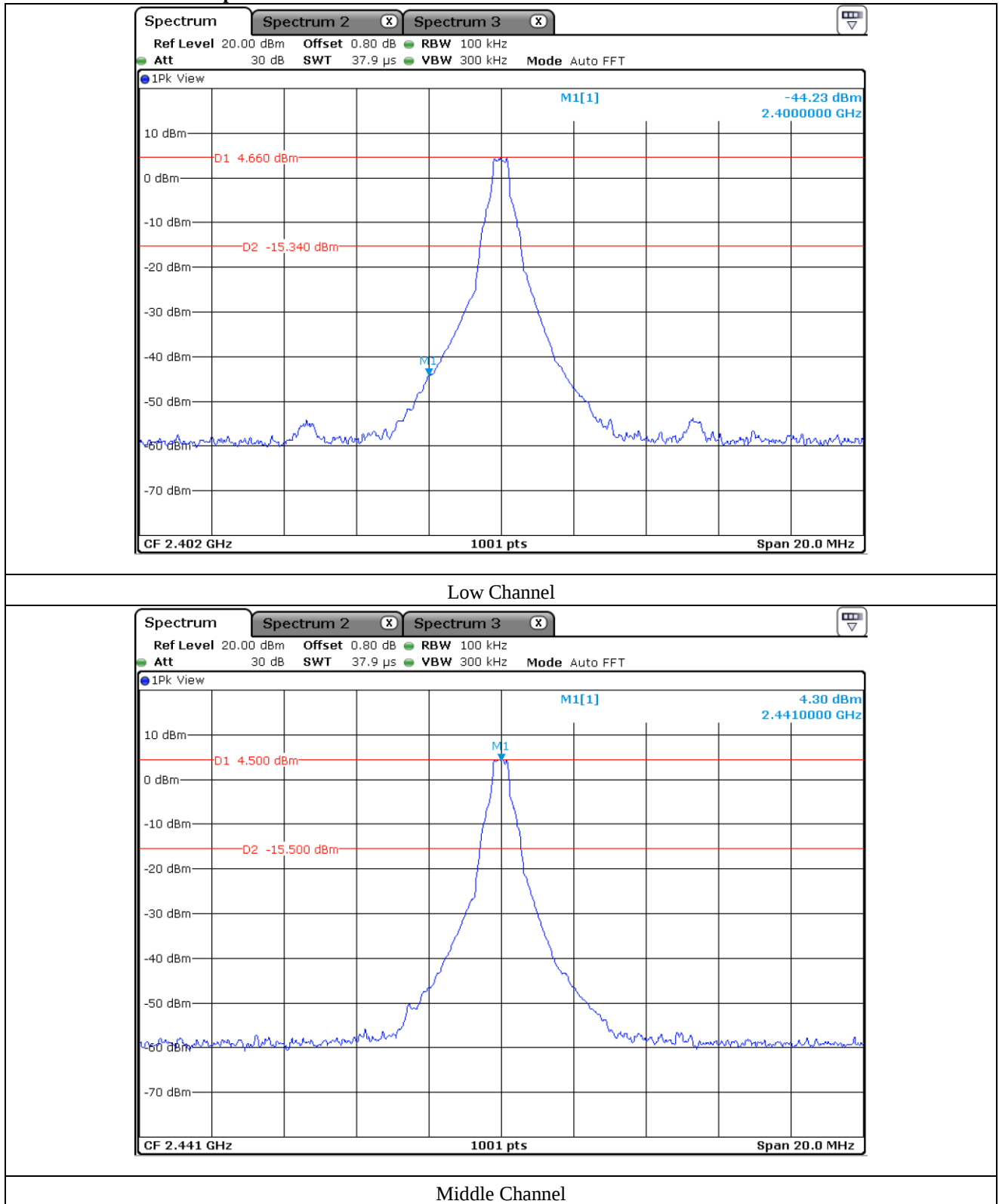
The frequency spectrum from 30 kHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 ms in order to determine the maximum emission levels. This procedure was performed for horizontal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

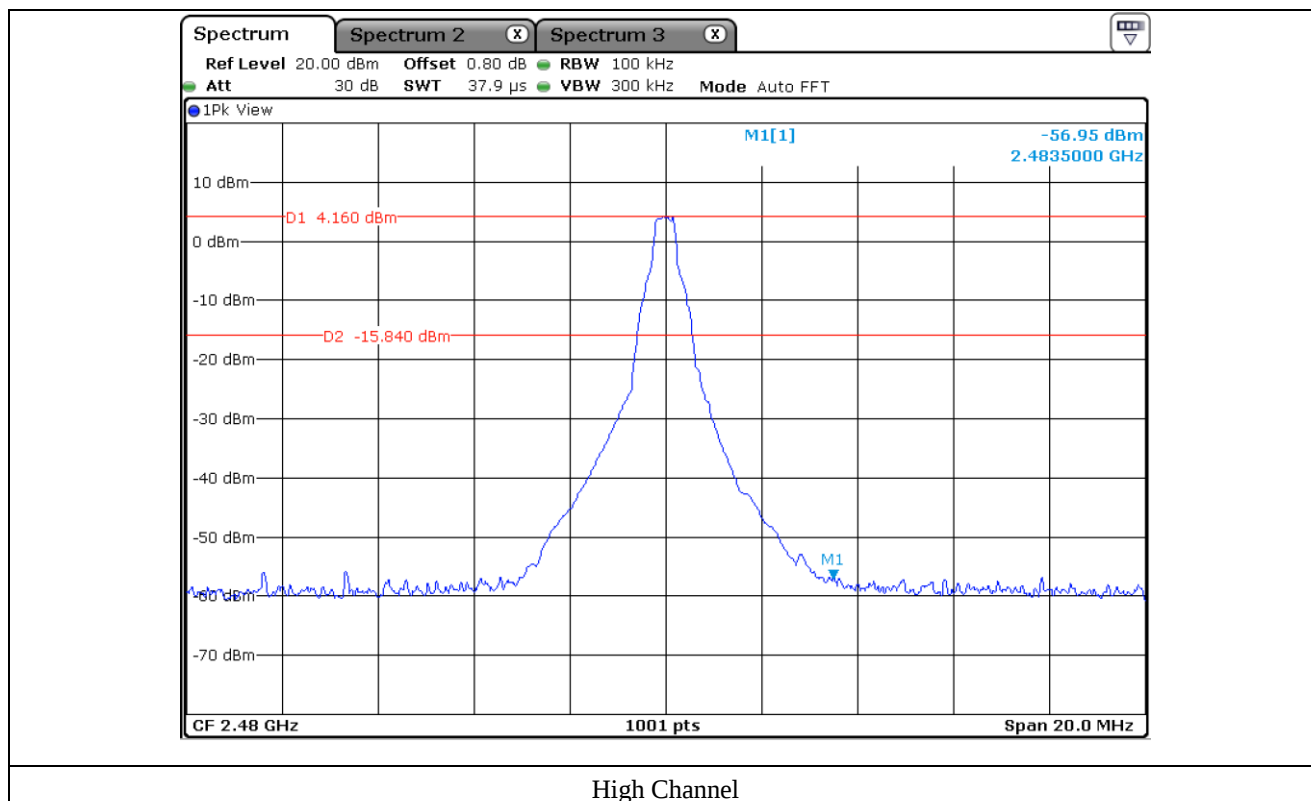
12.4 Test date

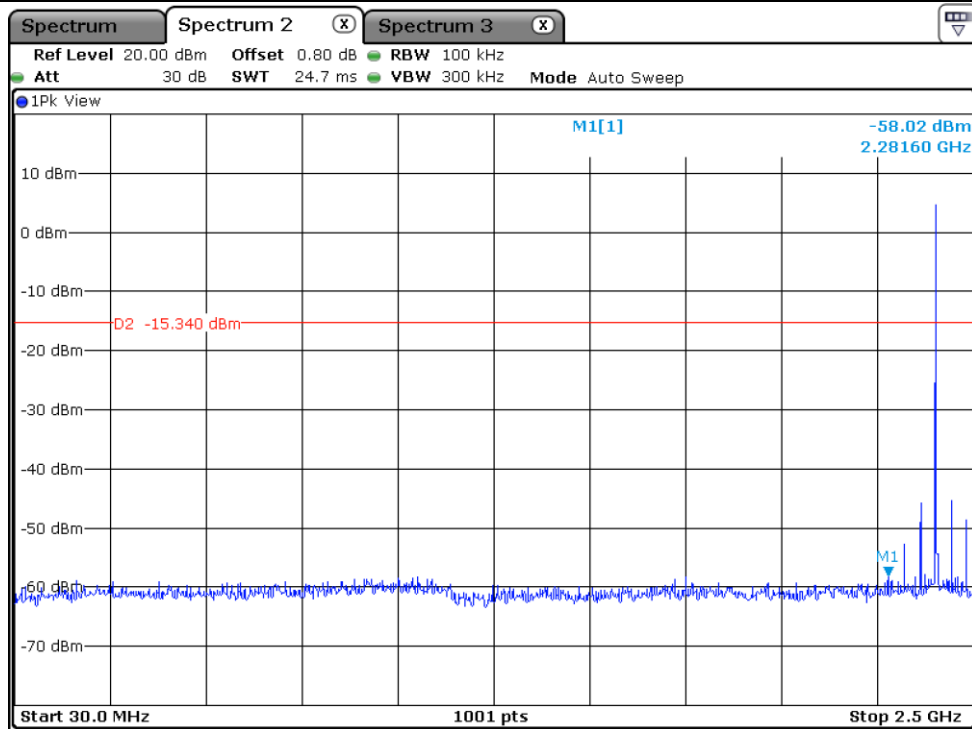
June 04, 2020 ~ June 10, 2020

12.5 Test data for conducted emission

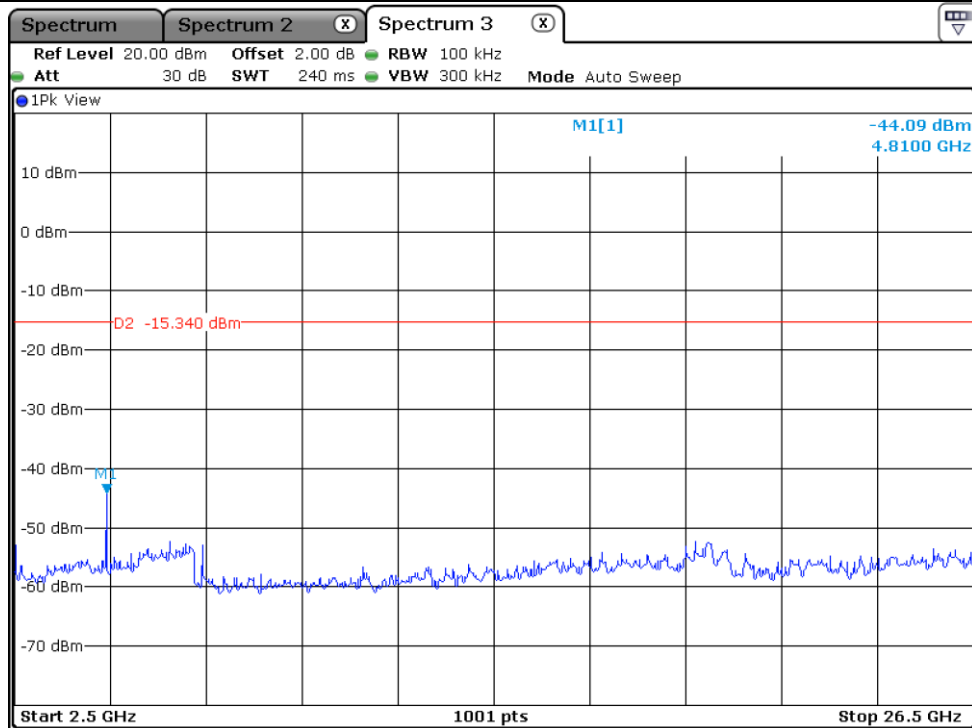
12.5.1 Test data for 1 Mbps



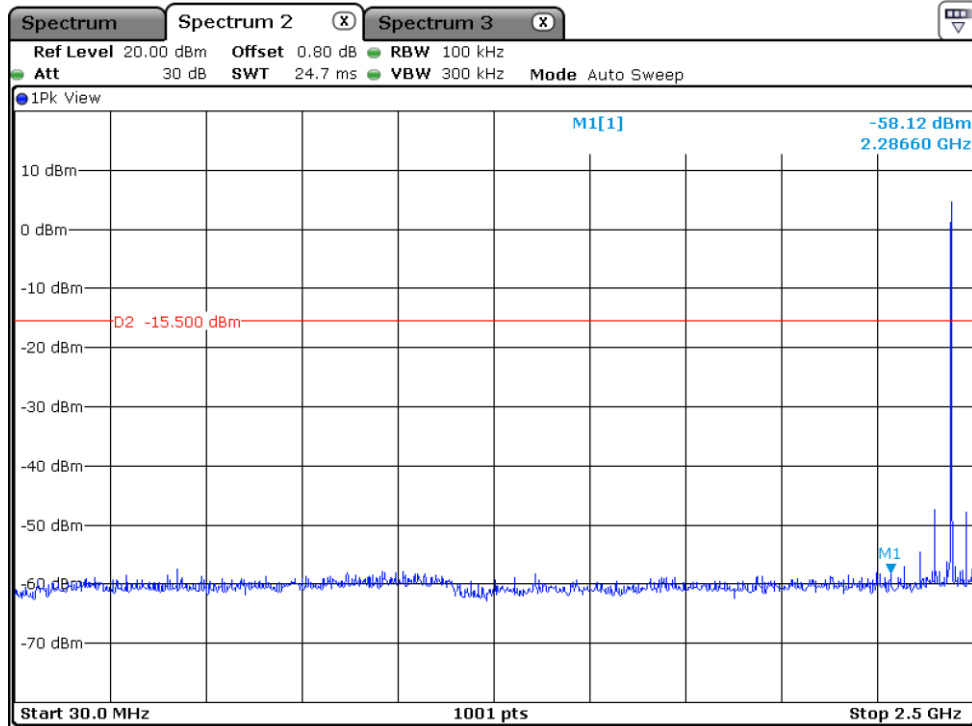




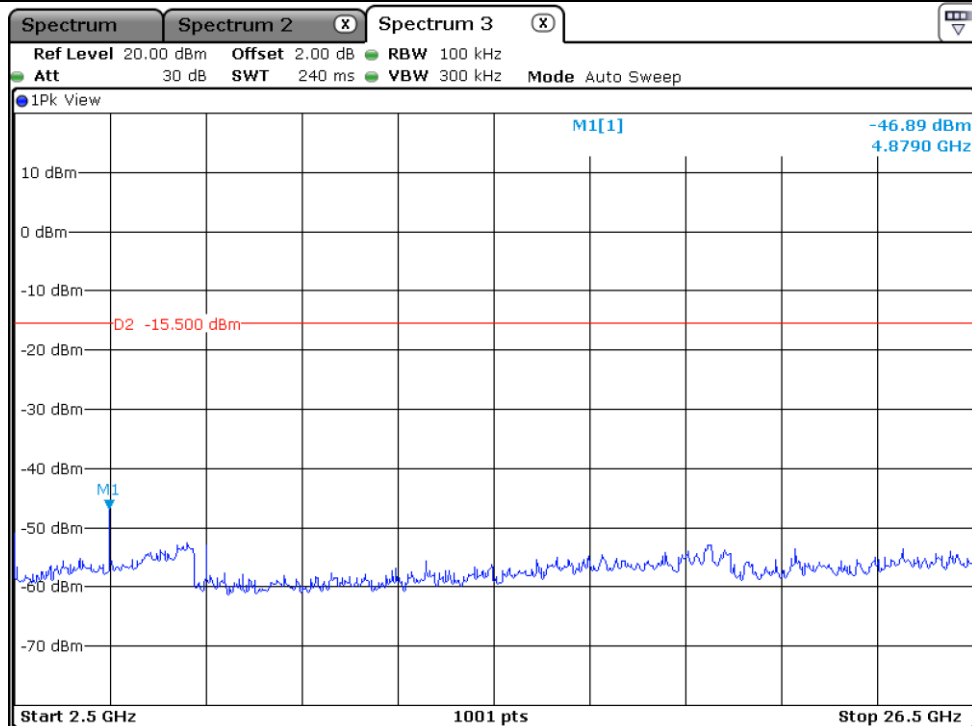
Low Channel



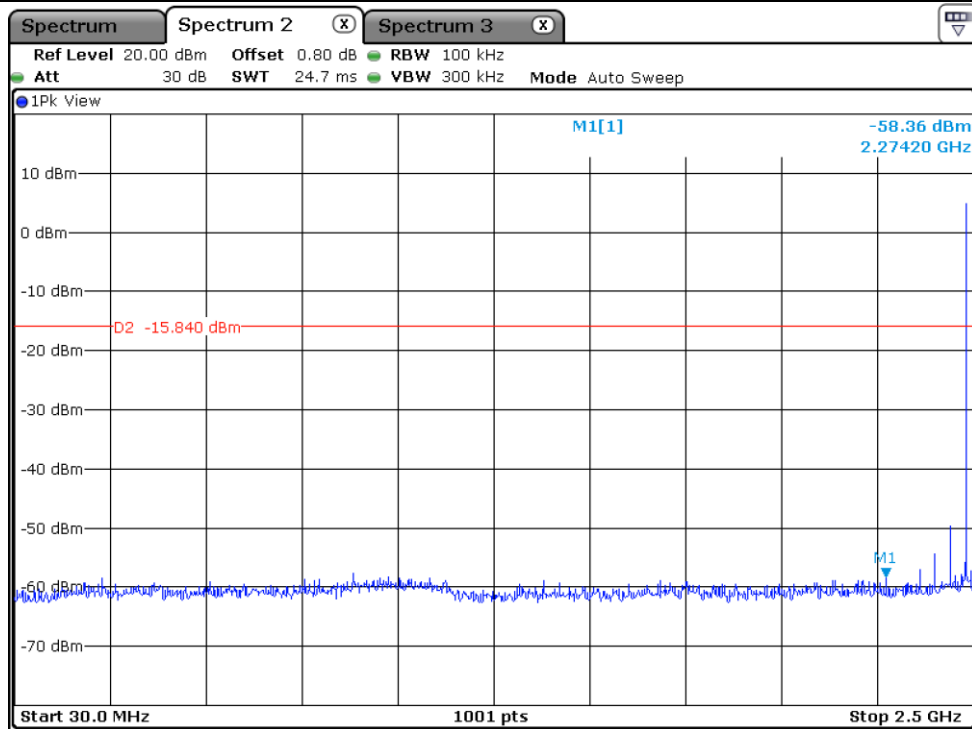
Low Channel



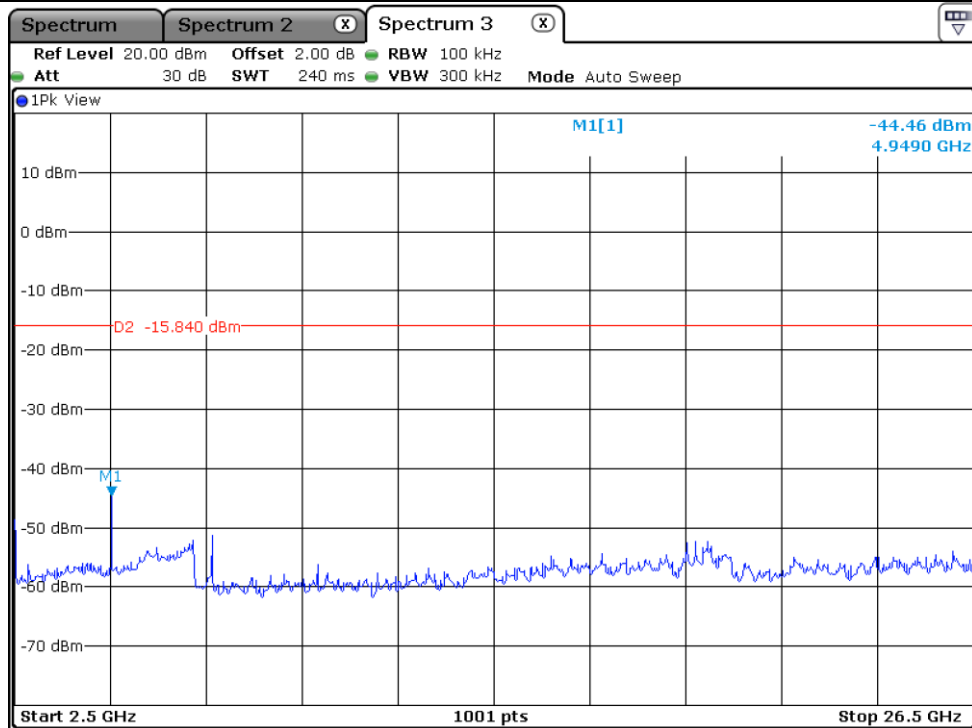
Middle Channel



Middle Channel

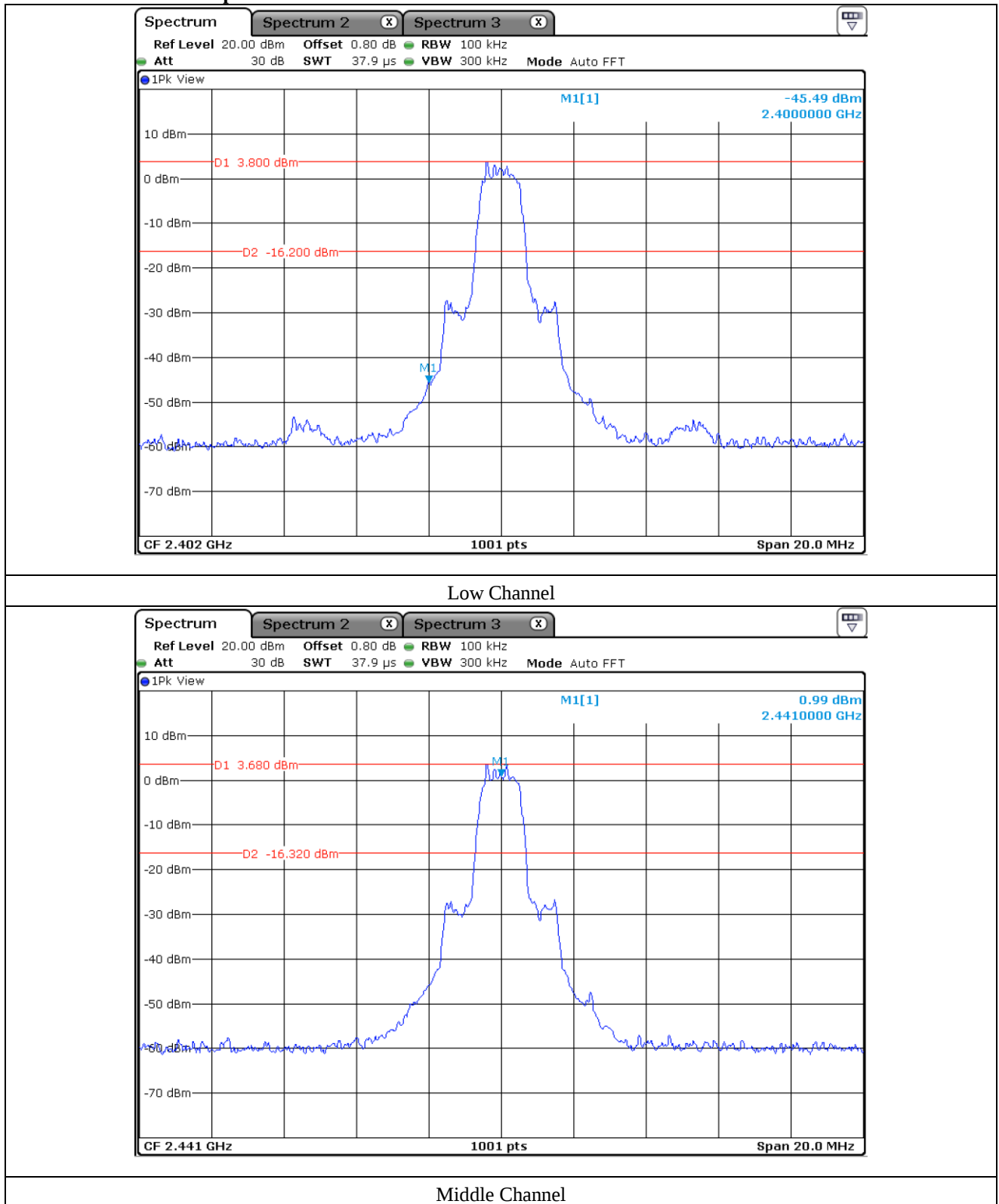


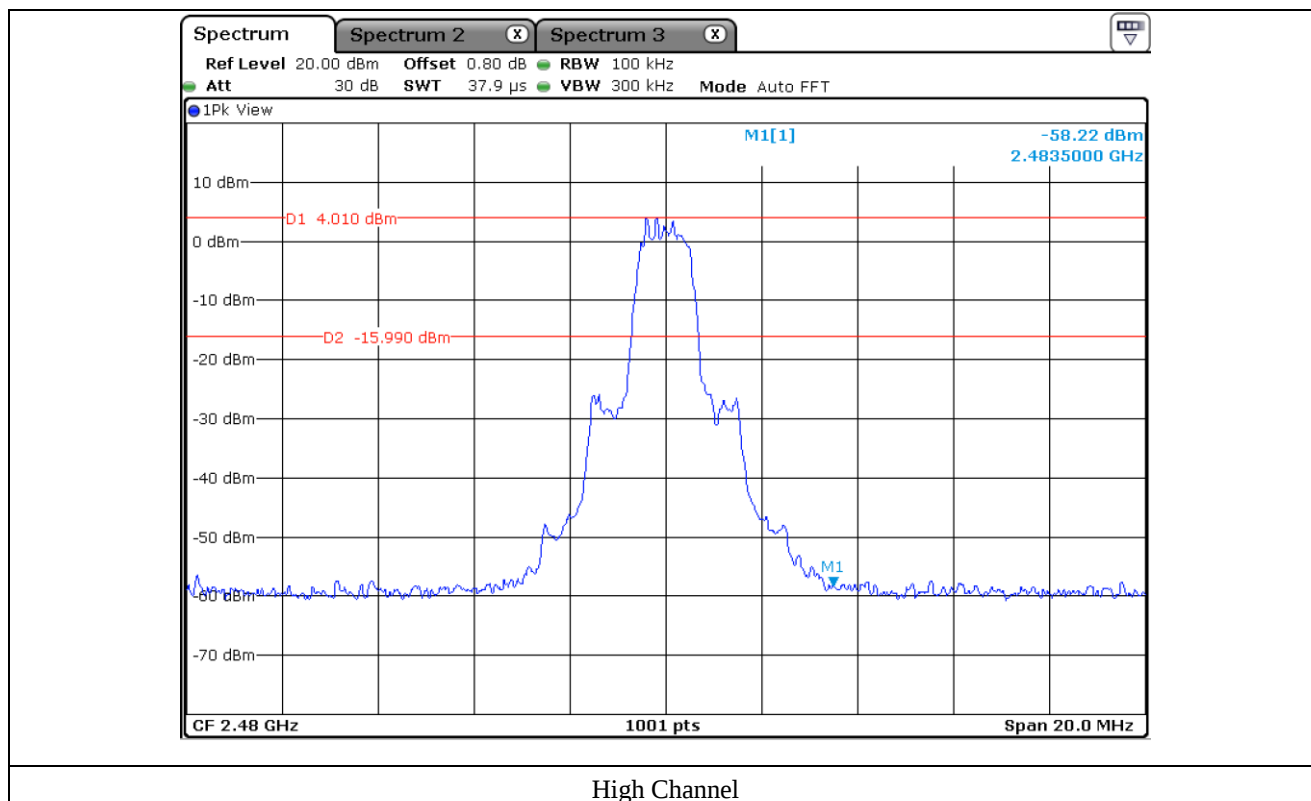
High Channel

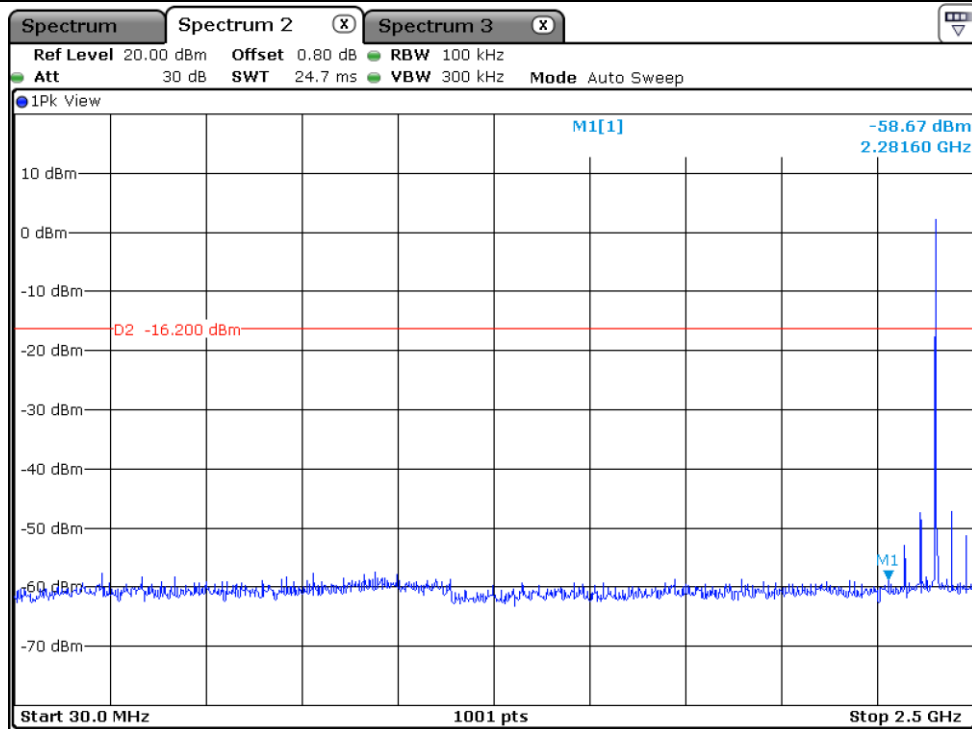


High Channel

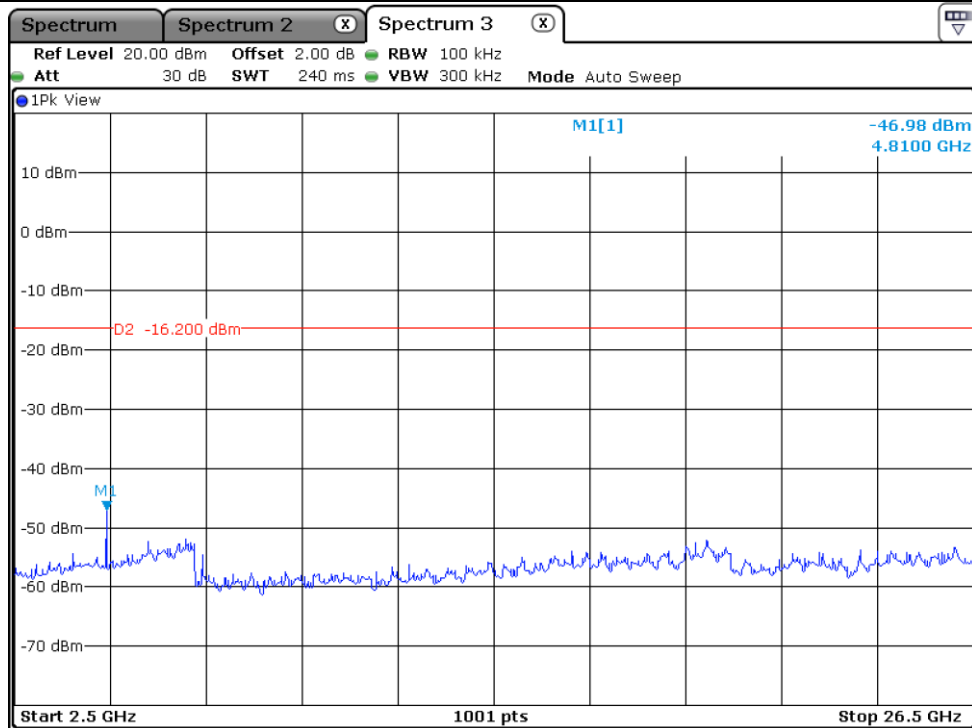
12.5.2 Test data for 2 Mbps



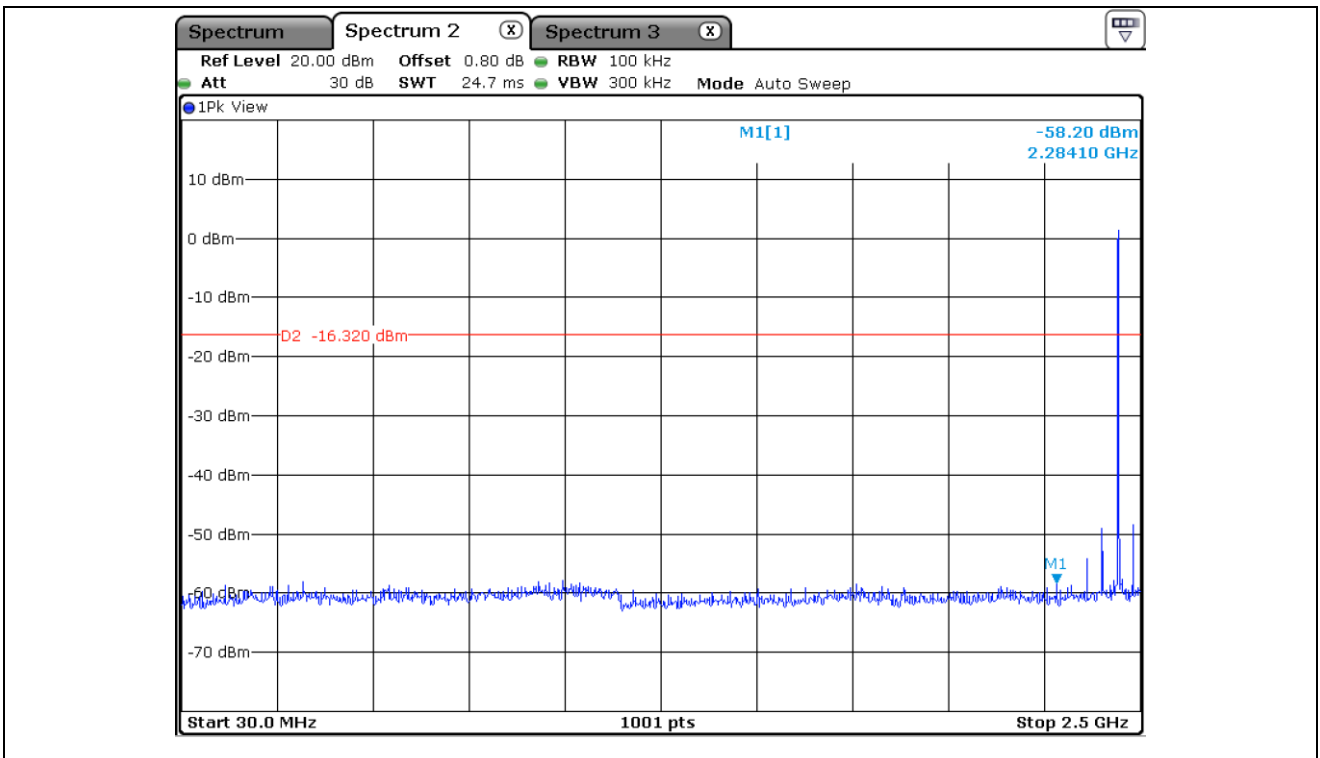




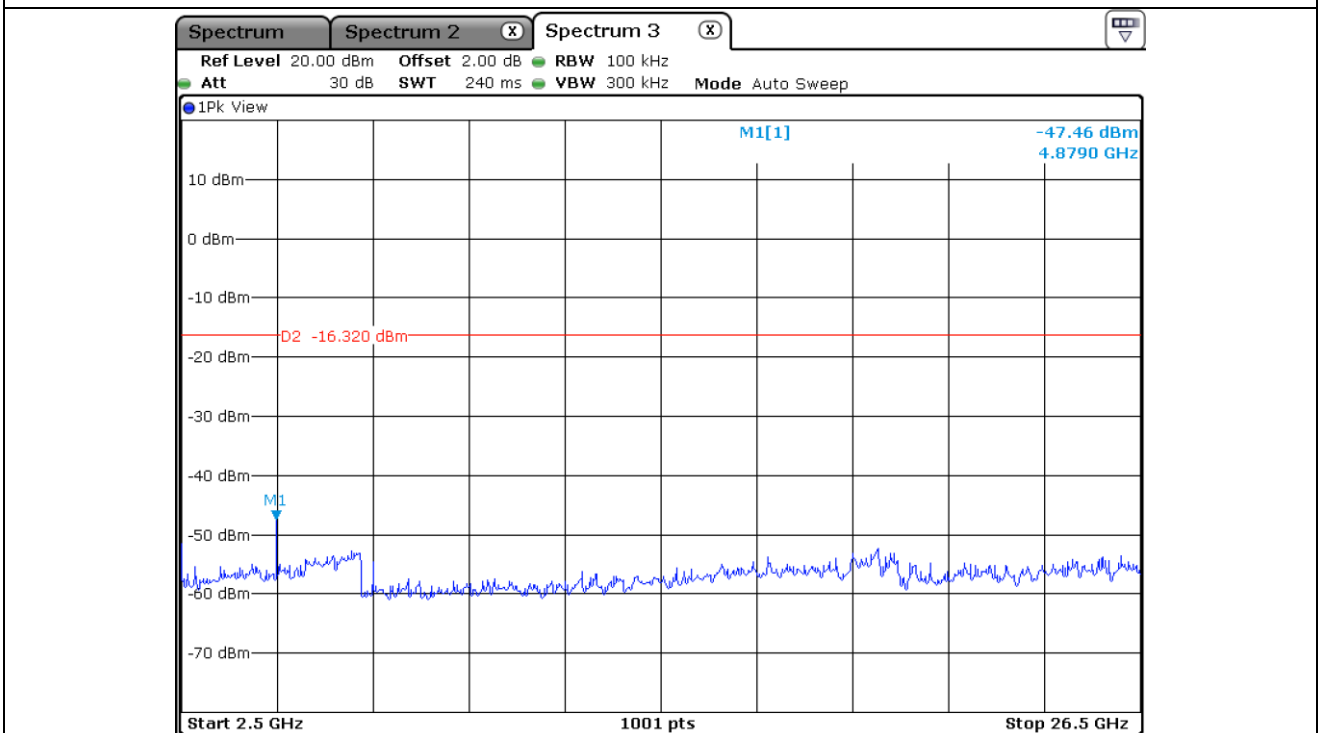
Low Channel



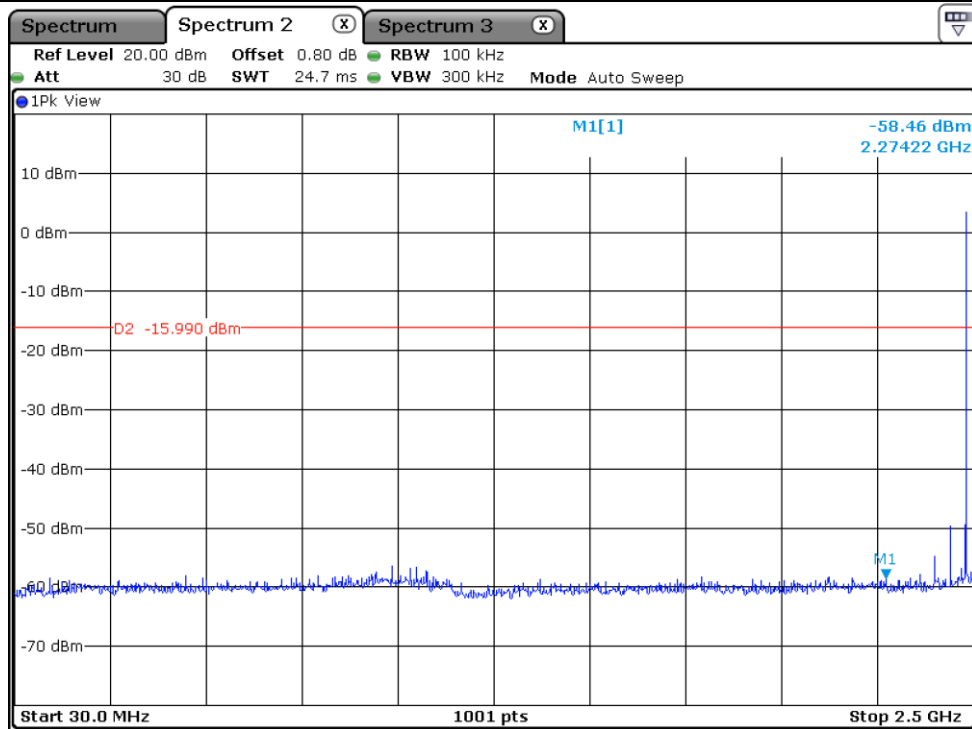
Low Channel



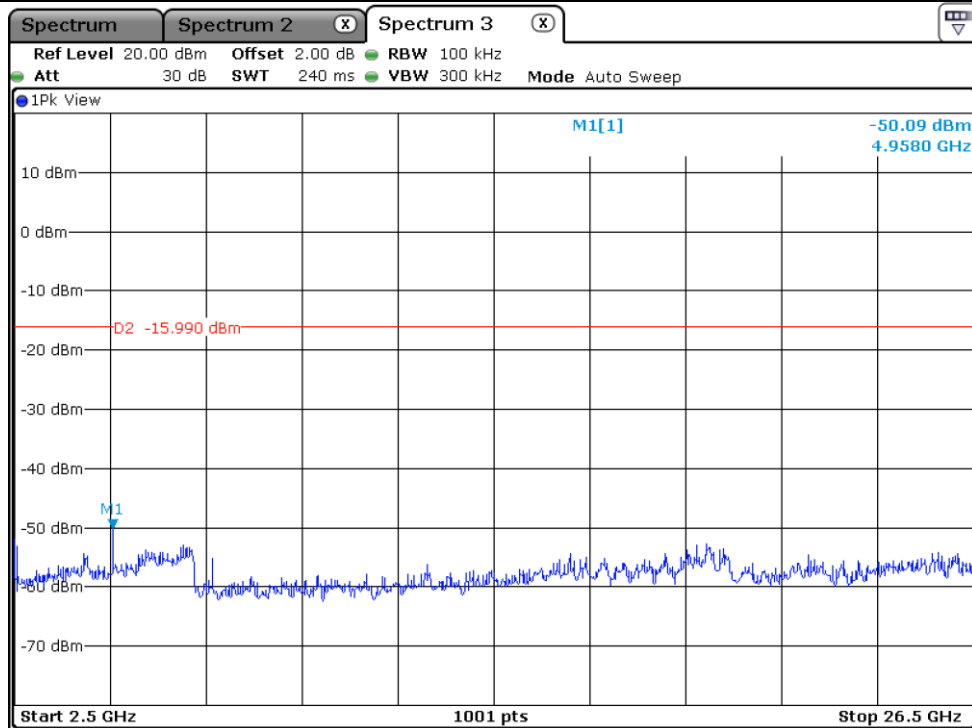
Middle Channel



Middle Channel

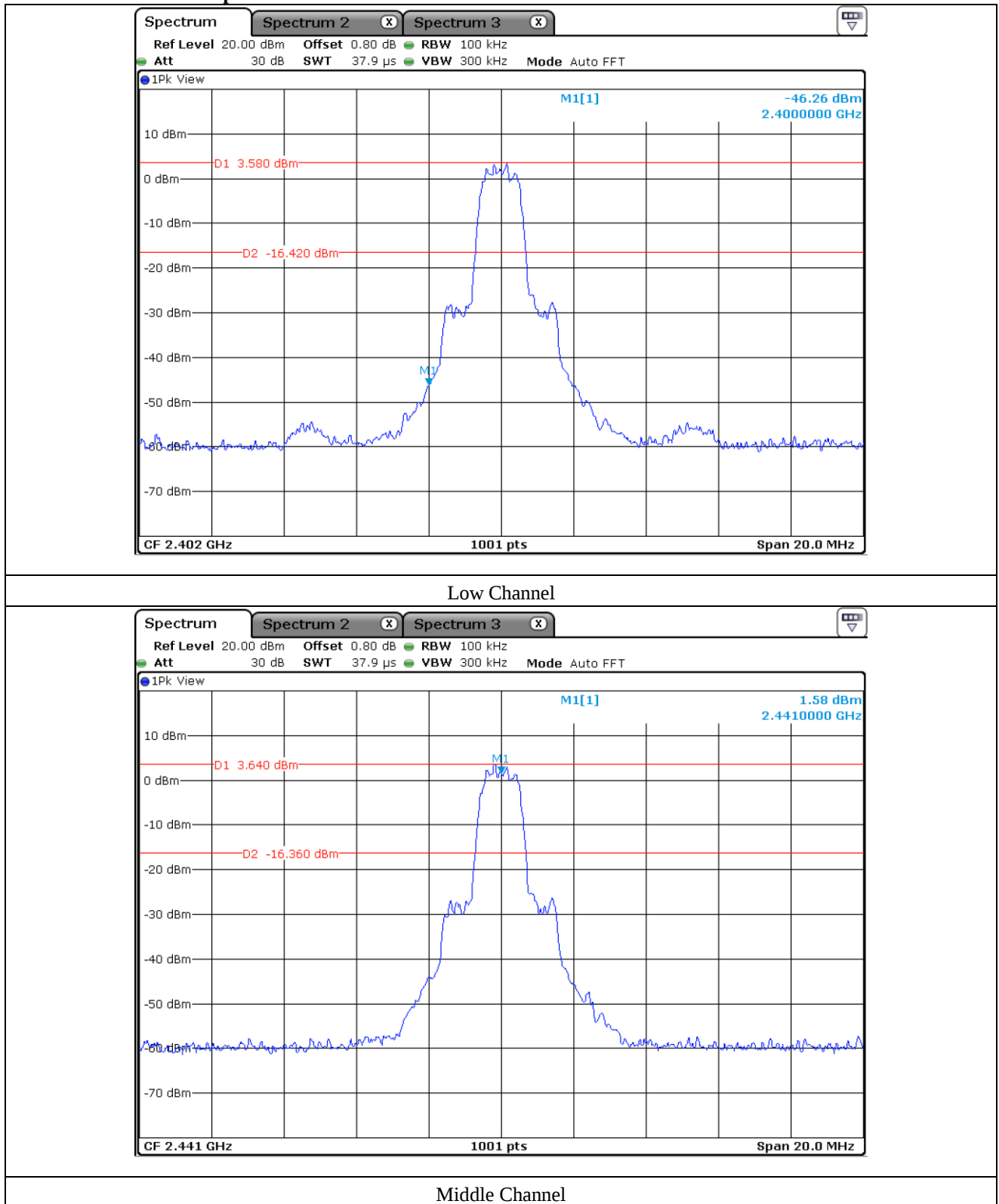


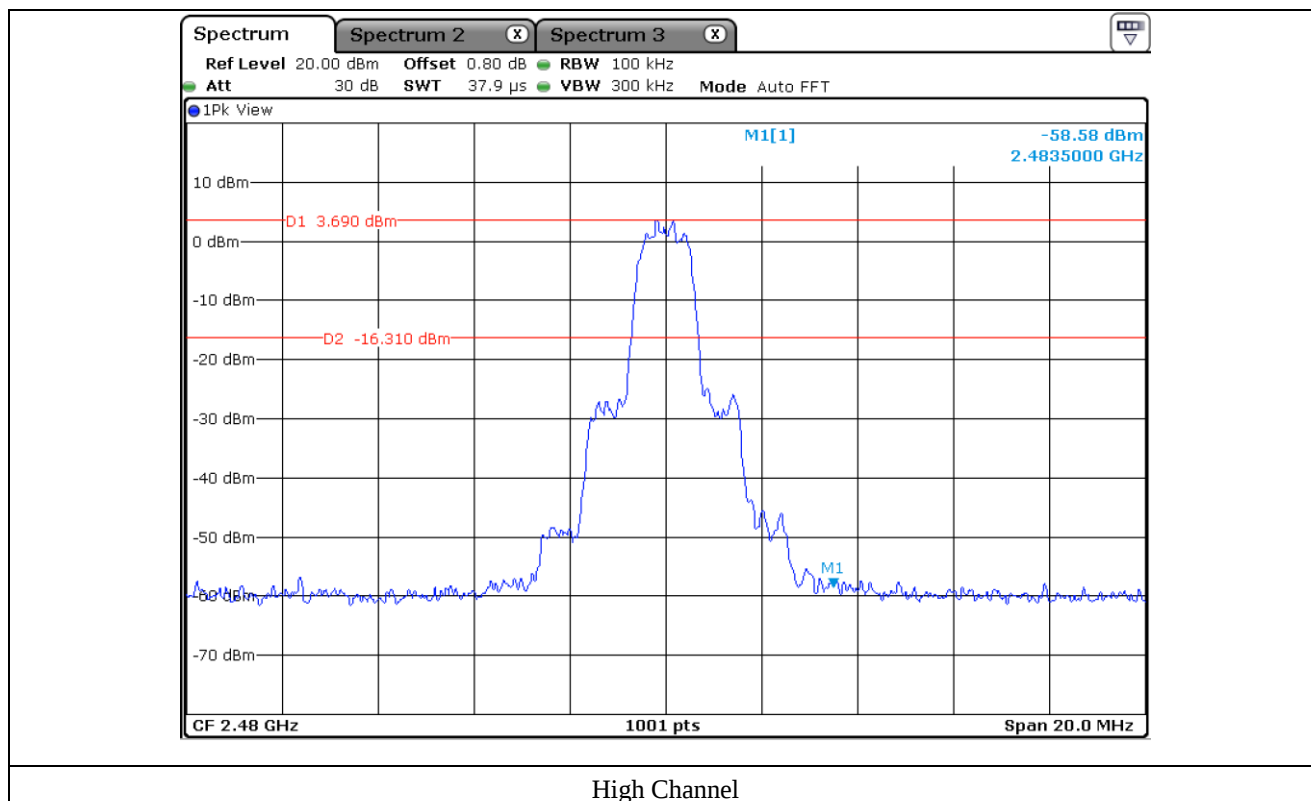
High Channel

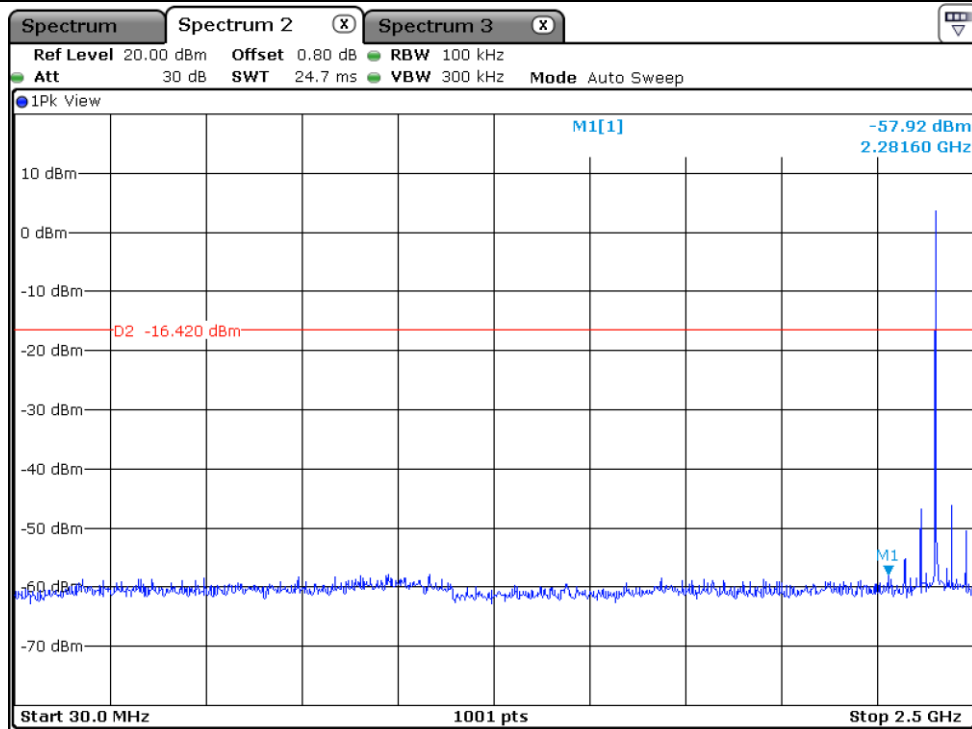


High Channel

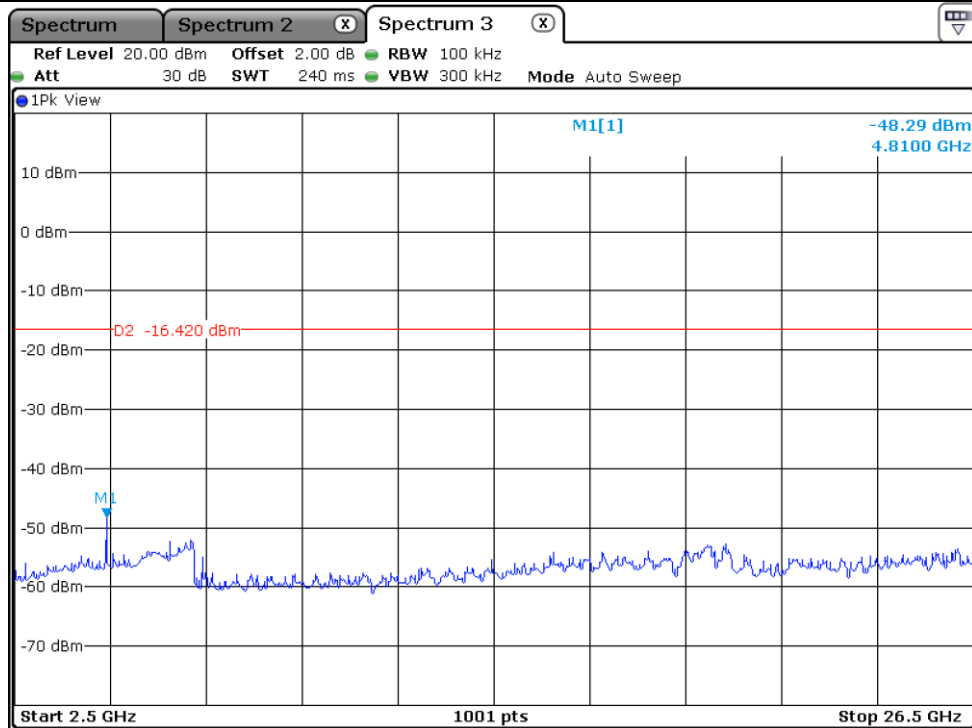
12.5.3 Test data for 3 Mbps



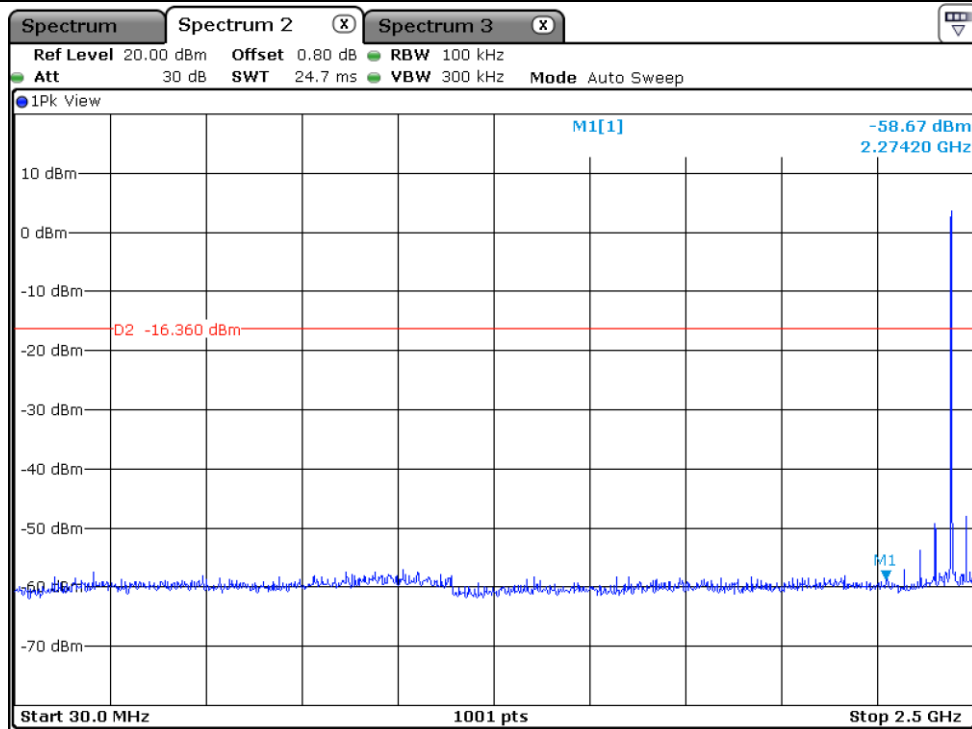




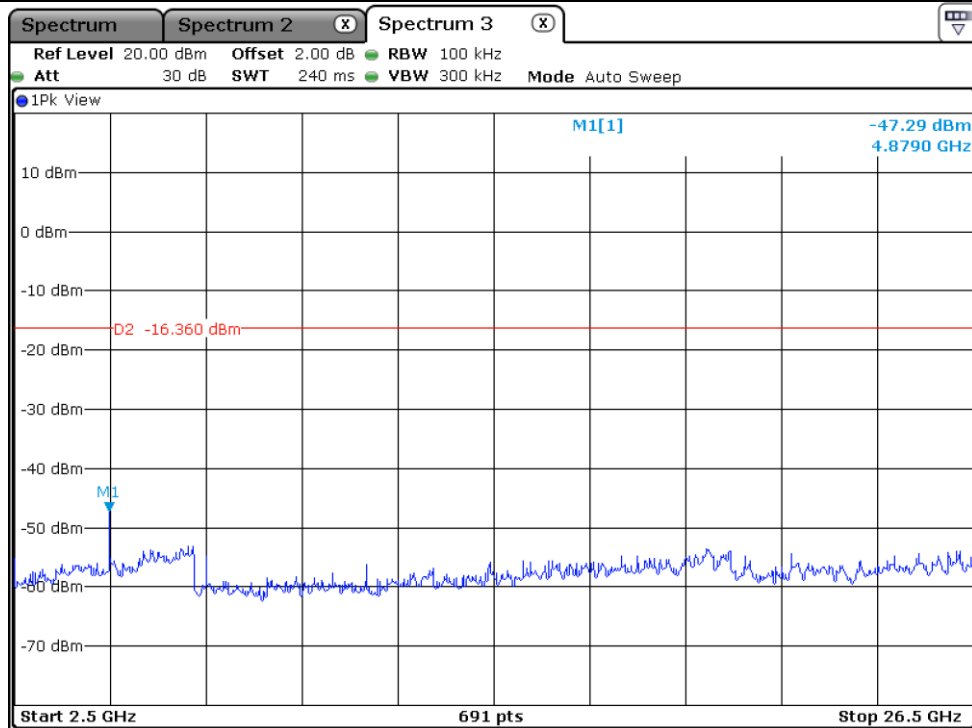
Low Channel



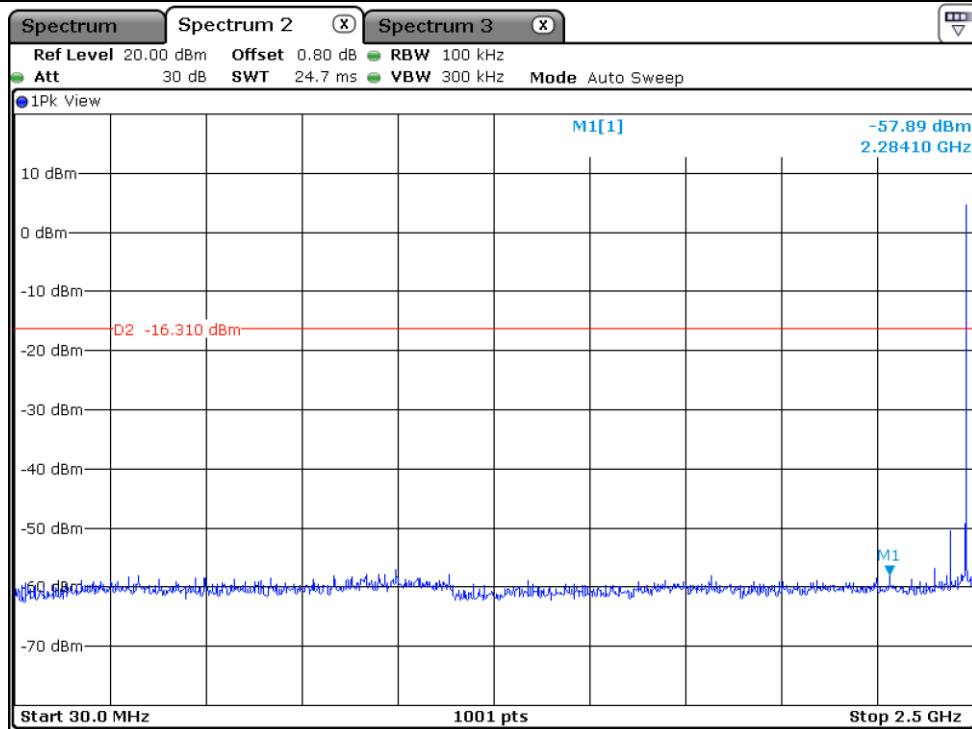
Low Channel



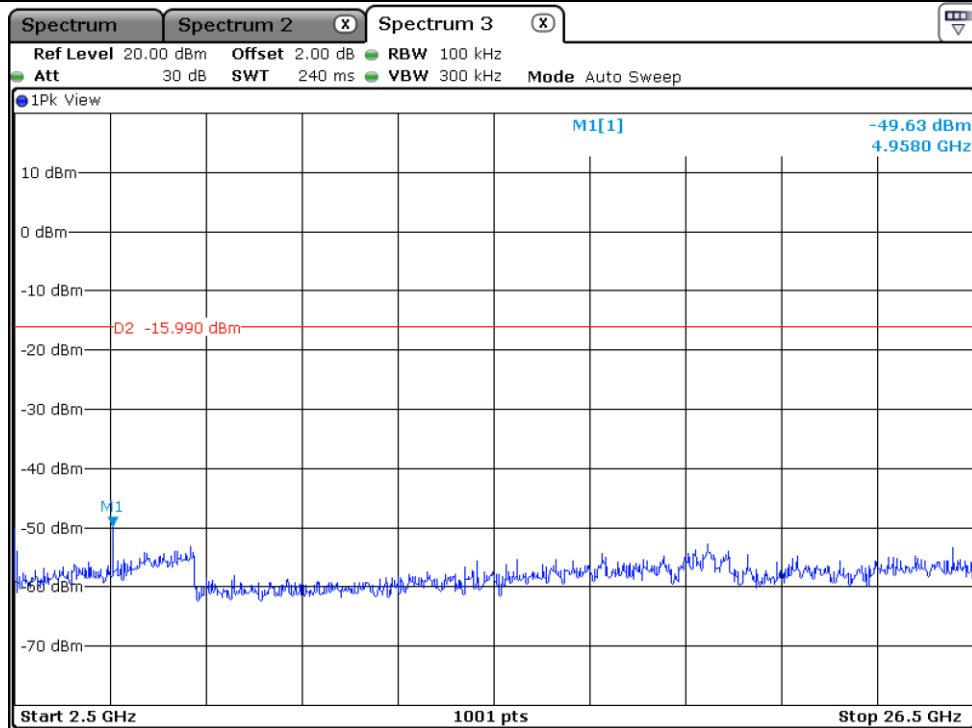
Middle Channel



Middle Channel



High Channel



High Channel

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 for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Measurement distance : 3 m
- . Operating Condition : Highest Output Power Transmitting Mode(Low Channel and High Channel)
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 362.31	14.37	Peak	H	27.60	2.91	-	-	44.88	74.00	29.12
2 361.99	5.28	Average	H				1.18	36.97	54.00	17.03
2 345.13	14.78	Peak	V				-	45.29	74.00	28.71
2 361.83	6.10	Average	V				1.18	37.79	54.00	16.21
Test Data for High Channel										
2 486.82	13.90	Peak	H	27.50	3.02	-	-	44.42	74.00	29.58
2 497.98	4.83	Average	H				1.18	36.53	54.00	17.47
2 483.72	14.23	Peak	V				-	44.75	74.00	29.25
2 491.42	4.97	Average	V				1.18	36.67	54.00	17.33

Tabulated test data for Restricted Band

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

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

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

12.6.1.2 Test data for 2 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Measurement distance : 3 m
- . Operating Condition : Highest Output Power Transmitting Mode(Low Channel and High Channel)
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 328.26	14.35	Peak	H	27.60	2.91	-	-	44.86	74.00	29.14
2 361.91	5.77	Average	H				1.18	37.46	54.00	16.54
2 357.75	14.64	Peak	V				-	45.15	74.00	28.85
2 339.69	5.80	Average	V				1.18	37.49	54.00	16.51
Test Data for High Channel										
2 484.12	14.83	Peak	H	27.50	3.02	-	-	45.35	74.00	28.65
2 491.82	4.48	Average	H				1.18	36.18	54.00	17.82
2 493.65	14.43	Peak	V				-	44.95	74.00	29.05
2 483.51	4.95	Average	V				1.18	36.65	54.00	17.35

Tabulated test data for Restricted Band

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

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

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

12.6.1.3 Test data for 3 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Measurement distance : 3 m
- . Operating Condition : Highest Output Power Transmitting Mode(Low Channel and High Channel)
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 374.62	14.57	Peak	H	27.60	2.91	-	-	45.08	74.00	28.92
2 361.99	5.57	Average	H				1.20	37.28	54.00	16.72
2 334.18	14.67	Peak	V				-	45.18	74.00	28.82
2 361.91	5.77	Average	V				1.20	37.48	54.00	16.52
Test Data for High Channel										
2 488.21	14.94	Peak	H	27.50	3.02	-	-	45.46	74.00	28.54
2 491.34	4.90	Average	H				1.20	36.62	54.00	17.38
2 498.74	15.00	Peak	V				-	45.52	74.00	28.48
2 492.20	4.98	Average	V				1.20	36.70	54.00	17.30

Tabulated test data for Restricted Band

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

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

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

12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

12.6.2.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating Condition : Highest Output Power Transmitting Mode
- . Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	16.64	Peak	H	31.20	4.65	-	-	52.49	74.00	21.51
	6.38	Average	H				1.18	43.41	54.00	10.59
	16.66	Peak	V				-	52.51	74.00	21.49
	6.18	Average	V				1.18	43.21	54.00	10.79
Test Data for Middle Channel										
4 882.00	16.74	Peak	H	31.40	4.72	-	-	52.86	74.00	21.14
	6.44	Average	H				1.18	43.74	54.00	10.26
	16.29	Peak	V				-	52.41	74.00	21.59
	6.29	Average	V				1.18	43.59	54.00	10.41
Test Data for High Channel										
4 960.00	16.69	Peak	H	31.70	4.86	-	-	53.25	74.00	20.75
	6.47	Average	H				1.18	44.21	54.00	9.79
	16.98	Peak	V				-	53.54	74.00	20.46
	6.66	Average	V				1.18	44.40	54.00	9.60

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

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

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

12.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Detector : Peak Mode(Peak), Average Mode(RMS)
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating Condition : Highest Output Power Transmitting Mode
- Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	16.76	Peak	H	31.20	4.65	-	-	52.61	74.00	21.39
	6.58	Average	H				1.18	43.61	54.00	10.39
	16.58	Peak	V				-	52.43	74.00	21.57
	6.25	Average	V				1.18	43.28	54.00	10.72
Test Data for Middle Channel										
4 882.00	16.64	Peak	H	31.40	4.72	-	-	52.76	74.00	21.24
	6.21	Average	H				1.18	43.51	54.00	10.49
	16.61	Peak	V				-	52.73	74.00	21.27
	6.38	Average	V				1.18	43.68	54.00	10.32
Test Data for High Channel										
4 960.00	16.53	Peak	H	31.70	4.86	-	-	53.09	74.00	20.91
	6.42	Average	H				1.18	44.16	54.00	9.84
	16.78	Peak	V				-	53.34	74.00	20.66
	6.78	Average	V				1.18	44.52	54.00	9.48

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

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

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

12.6.2.3 Test data for 3 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Detector : Peak Mode(Peak), Average Mode(RMS)
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating Condition : Highest Output Power Transmitting Mode
- Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	C.F (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	16.02	Peak	H	31.20	4.65	-	-	51.87	74.00	22.13
	6.09	Average	H				1.20	43.14	54.00	10.86
	16.06	Peak	V				-	51.91	74.00	22.09
	6.69	Average	V				1.20	43.74	54.00	10.26
Test Data for Middle Channel										
4 882.00	16.10	Peak	H	31.40	4.72	-	-	52.22	74.00	21.78
	6.76	Average	H				1.20	44.08	54.00	9.92
	16.37	Peak	V				-	52.49	74.00	21.51
	6.45	Average	V				1.20	43.77	54.00	10.23
Test Data for High Channel										
4 960.00	16.92	Peak	H	31.70	4.86	-	-	53.48	74.00	20.52
	6.69	Average	H				1.20	44.45	54.00	9.55
	16.93	Peak	V				-	53.49	74.00	20.51
	6.73	Average	V				1.20	44.49	54.00	9.51

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

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

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

12.6.3 Spurious Radiated Emission

12.6.3.1 Test Data for 30 MHz ~ 1 GHz

Humidity Level : 48 % R.H.

Temperature: 24 °C

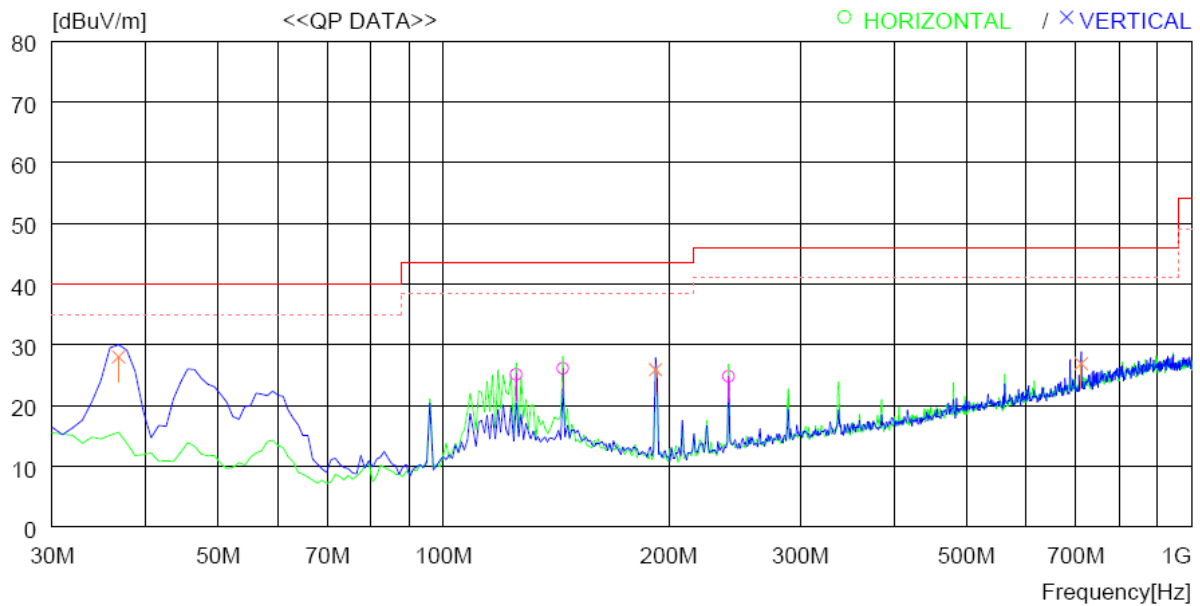
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Mobile Sticker Printer

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

Operating mode : Transmitting mode



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	125.060	37.6	18.8	1.4	32.7	25.1	43.5	18.4	200	0
2	144.460	38.3	19.1	1.4	32.7	26.1	43.5	17.4	200	278
3	240.490	38.1	17.4	1.9	32.6	24.8	46.0	21.2	100	359
----- Vertical -----										
4	36.790	41.3	18.5	0.9	32.7	28.0	40.0	12.0	100	130
5	191.990	40.8	16.0	1.7	32.6	25.9	43.5	17.6	100	0
6	711.905	30.5	25.8	3.5	32.9	26.9	46.0	19.1	100	0

12.6.3.2 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
- Operating mode : Transmitting mode
- Result : PASSED

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)
Not sufficient to state emissions were not detected, emissions detected were 20 dB below the limit								

12.6.3.3 Test Data for above 1 GHz

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode
- Result : PASSED

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)
Not sufficient to state emissions were not detected, emissions detected were 20 dB below the limit								

13. CONDUCTED EMISSION TEST

13.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % R.H.

13.2 Test set-up

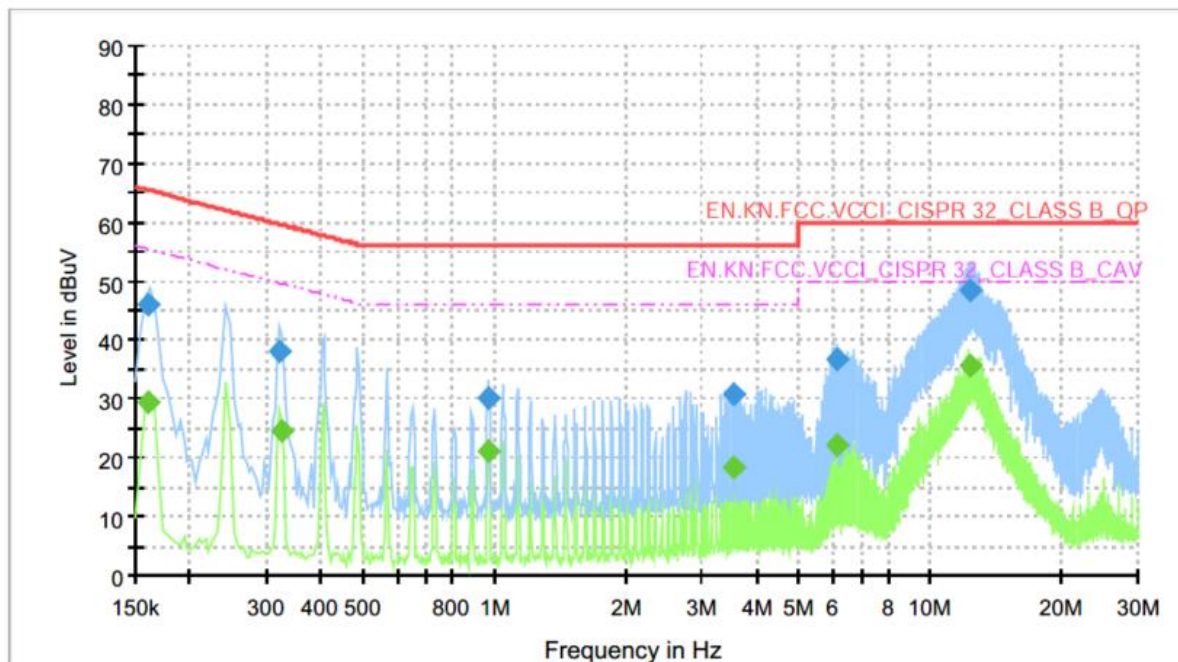
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

13.3 Test Date

June 04, 2020 ~ June 10, 2020

13.4 Test data

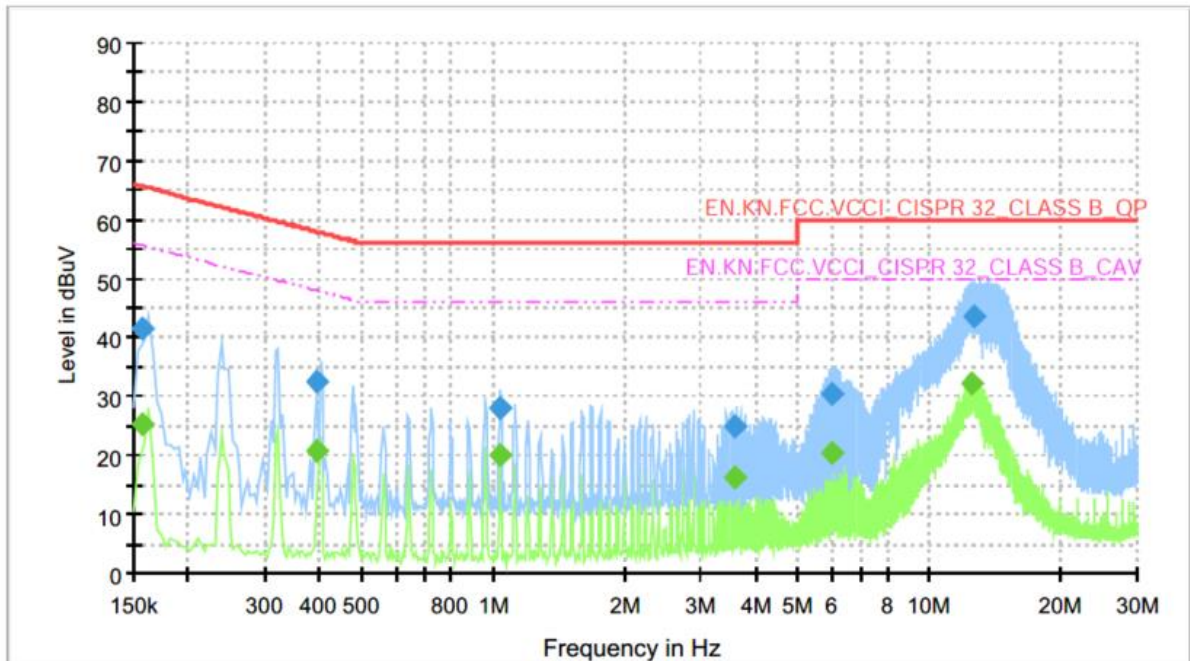
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- mode : Charging mode
- Tested Line : HOT LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.161	---	29.54	55.39	25.85	3000.0	9.0	L1	9.93
0.161	46.18	---	65.39	19.20	3000.0	9.0	L1	9.93
0.321	38.06	---	59.68	21.62	3000.0	9.0	L1	9.93
0.325	---	24.62	49.57	24.96	3000.0	9.0	L1	9.93
0.963	30.11	---	56.00	25.89	3000.0	9.0	L1	9.99
0.967	---	21.11	46.00	24.89	3000.0	9.0	L1	9.99
3.537	---	18.29	46.00	27.71	3000.0	9.0	L1	10.05
3.541	30.71	---	56.00	25.29	3000.0	9.0	L1	10.05
6.106	---	22.26	50.00	27.74	3000.0	9.0	L1	10.13
6.114	36.78	---	60.00	23.22	3000.0	9.0	L1	10.13
12.309	48.62	---	60.00	11.38	3000.0	9.0	L1	10.39
12.357	---	35.48	50.00	14.52	3000.0	9.0	L1	10.39

-. Tested Line : NEUTRAL LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.157	---	25.24	55.60	30.36	3000.0	9.0	N	9.94
0.157	41.48	---	65.60	24.12	3000.0	9.0	N	9.94
0.396	---	20.83	47.94	27.11	3000.0	9.0	N	9.94
0.396	32.52	---	57.94	25.42	3000.0	9.0	N	9.94
1.034	---	19.93	46.00	26.07	3000.0	9.0	N	9.99
1.038	28.09	---	56.00	27.91	3000.0	9.0	N	9.99
3.584	---	16.23	46.00	29.77	3000.0	9.0	N	10.07
3.596	24.90	---	56.00	31.10	3000.0	9.0	N	10.07
5.964	---	20.45	50.00	29.55	3000.0	9.0	N	10.16
6.000	30.59	---	60.00	29.41	3000.0	9.0	N	10.16
12.511	---	32.16	50.00	17.84	3000.0	9.0	N	10.49
12.631	43.75	---	60.00	16.25	3000.0	9.0	N	10.49

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. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101199	Feb. 08, 2021 (1Y)
310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 16, 2020 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 20, 2020 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifier	102266	Jul. 15, 2020 (1Y)
MA240	HD GmbH	Antenna Master	N/A	N/A
HD100	HD GmbH	Position Controller	N/A	N/A
DS420S	HD GmbH	Turn Table	N/A	N/A
FMZB 1513	Schwarzbeck	LOOP ANTENNA	1513-235	Mar. 24, 2020 (2Y)
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 23, 2020 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	9120D-1349	Nov. 20, 2020 (1Y)
SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Feb. 08, 2021 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	102602	Mar. 17, 2020 (1Y)
ESH3Z2	Rohde & Schwarz	PULSE LIMITER	357.8810.52	Mar. 16, 2020 (1Y)
NSLK8126	Schwarzbeck	LISN	8126404	Mar. 16, 2020 (1Y)
3825/2	EMCO	AMN	9109-1869	Mar. 16, 2020 (1Y)