RADIO PERFORMANCE TEST REPORT

Test Report No.	**: OT-226-RWD-003**
Reception No.	**: 2204001401**
Applicant	**: EOFLOW Co.,Ltd**
Address	**: Healthcare Innovation Park #2202 Dolma-ro 172 Bundang-gu Seongnam-si Gyeonggi-do 13605, Korea**
Manufacturer	**: EOFLOW Co.,Ltd**
Address	**: Healthcare Innovation Park #2202 Dolma-ro 172 Bundang-gu Seongnam-si Gyeonggi-do 13605, Korea**
Type of Equipment	**: Insulin infusion pump**
FCC ID.	**: 2AUGS-IL100**
Model Name	**: IL100K**
Multiple Model Name	**: N/A**
Serial number	**: N/A**
Total page of Report	**: 76 pages (including this page)**
Date of Incoming	**: May 02, 2022**
Date of issue	**: June 02, 2022**

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.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.

Tested by	Reviewed by	Approved by
/ Soon-Ki, Choi / Engineer	/ Tae-Ho, Kim / General Manager	/ Ki-Hong, Nam / General Manager
ONETECH Corp.	ONETECH Corp.	ONETECH Corp.

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CONTENTS

Page

1. VERIFICATION OF COMPLIANCE 6

2. TEST SUMMARY 7

2.1 Test items and results 7

2.2 Additions, deviations, exclusions from standards 7

2.3 Related Submittal(s) / Grant(s) 7

2.4 Purpose of the test 7

2.5 Test Methodology 7

2.6 Test Facility 7

3. GENERAL INFORMATION 8

3.1 Product Description 8

3.2 Alternative type(s)/model(s); also covered by this test report. 8

4. EUT MODIFICATIONS 8

5. SYSTEM TEST CONFIGURATION 9

5.1 Justification 9

5.2 Peripheral equipment 9

5.3 Mode of operation during the test 9

5.4 Configuration of Test System 12

5.5 Antenna Requirement 12

6. PRELIMINARY TEST 12

6.1 AC Power line Conducted Emissions Tests 12

6.2 General Radiated Emissions Tests 12

7. MINIMUM 20 dB BANDWIDTH 13

7.1 Operating environment 13

7.2 Test set-up 13

7.3 Test Date 13

7.4 Test data for 1 Mbps 14

7.5 Test data for 2 Mbps 16

7.6 Test data for 3 Mbps 18

8. HOPPING FREQUENCY SEPARATION 20

8.1 Operating environment 20

8.2 Test set-up 20

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8.3 Test Date 20
8.4 Test data for 1 Mbps 21
8.5 Test data for 2 Mbps 22
8.6 Test data for 3 Mbps 23
9. NUMBER OF HOPPING CHANNELS **24**
9.1 Operating environment 24
9.2 Test set-up 24
9.3 Test Date 24
9.4 Test data for 1 Mbps 25
9.5 Test data for 2 Mbps 28
9.6 Test data for 3 Mbps 31
10. TIME OF OCCUPANCY **34**
10.1 Operating environment 34
10.2 Test set-up 34
10.3 Test Date 34
10.4 Test data for 1 Mbps 35
10.5 Test data for 2 Mbps 37
10.6 Test data for 3 Mbps 39
11. MAXIMUM PEAK OUTPUT POWER **41**
11.1 Operating environment 41
11.2 Test set-up 41
11.3 Test Date 41
11.4 Test data for 1 Mbps 42
11.5 Test data for 2 Mbps 44
11.6 Test data for 3 Mbps 46
12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND **48**
12.1 Operating environment 48
12.2 Test set-up for conducted measurement 48
12.3 Test set-up for radiated measurement 48
12.4 Test Date 48
12.5 Test data for conducted emission 49
12.5.1 Test data for 1 Mbps *49*
12.5.2 Test data for 2 Mbps *54*
12.5.3 Test data for 3 Mbps *59*
12.6 Test data for Transmitting mode radiated emission 64
12.6.1 Radiated Emission which fall in the Restricted Band *64*

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13. RADIATED EMISSION TEST 70

13.1 Operating environment 70

13.2 Test set-up 70

13.3 Test Date 70

13.4 Test data for 30 MHz ~ 1000 MHz 71

13.5 Test data for Below 30 MHz 72

13.6 Test data for above 1 GHz 72

14. CONDUCTED EMISSION TEST 73

14.1 Operating environment 73

14.2 Test set-up 73

14.3 Test Date 73

14.4 Test data 74

15. LIST OF TEST EQUIPMENT 76

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-226-RWD-003	June 02, 2022	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : EOFLOW Co.,Ltd

Address : Healthcare Innovation Park #2202 Dolma-ro 172 Bundang-gu Seongnam-si Gyeonggi-do 13605, Korea

Contact Person : Junghoon Park / Manager

Telephone No. : +82-31-724-0338

FCC ID : 2AUGS-IL100

Model Name : IL100K

Brand Name : -

Serial Number : N/A

Date : June 02, 2022

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Insulin infusion pump
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.

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2. TEST SUMMARY

2.1 Test items and results

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

2.2 Additions, deviations, exclusions from standards

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

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

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

2.5 Test Methodology

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

2.6 Test Facility

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

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

-. Site Filing:

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

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

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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3. GENERAL INFORMATION

3.1 Product Description

The EOFLOW Co.,Ltd, Model IL100K (referred to as the EUT in this report) is a Insulin infusion pump. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Insulin infusion pump		
Operating Frequency	Bluetooth	2 402 MHz ~ 2 480 MHz	
	Bluetooth LE		
RF Output Power	Bluetooth	1 Mbps	1.50 dBm
		2 Mbps	1.55 dBm
		3 Mbps	-1.17 dBm
	Bluetooth LE	0.96 dBm	
Number of Channel	Bluetooth	79 Channels	
	Bluetooth LE	40 Channels	
Modulation Type	Bluetooth	GFSK for 1 Mbps, π/4-DQPSK for 2 Mbps, 8-DPSK for 3 Mbps	
	Bluetooth LE	GFSK	
Antenna Type	Bluetooth	PCB Antenna	
	Bluetooth LE		
Antenna Gain	Bluetooth	-0.88 dBi	
	Bluetooth LE		
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	100 MHz		
Rated Supply Voltage	DC 3.7 V		

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

-. None

4. EUT MODIFICATIONS

-. None

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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	EOFLOW Co.,Ltd	N/A	N/A
LED Board	EOFLOW Co.,Ltd	N/A	N/A
Display Board	EOFLOW Co.,Ltd	N/A	N/A
Touch Board	EOFLOW Co.,Ltd	N/A	N/A
Battery	GSP Limited	1S1P 553450WG	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
IL100K	EOFLOW Co.,Ltd	Insulin infusion pump (EUT)	
HP Probook	HP	Notebook PC	EUT
PPP009L-E	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	Notebook PC

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, 2 441 MHz, 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

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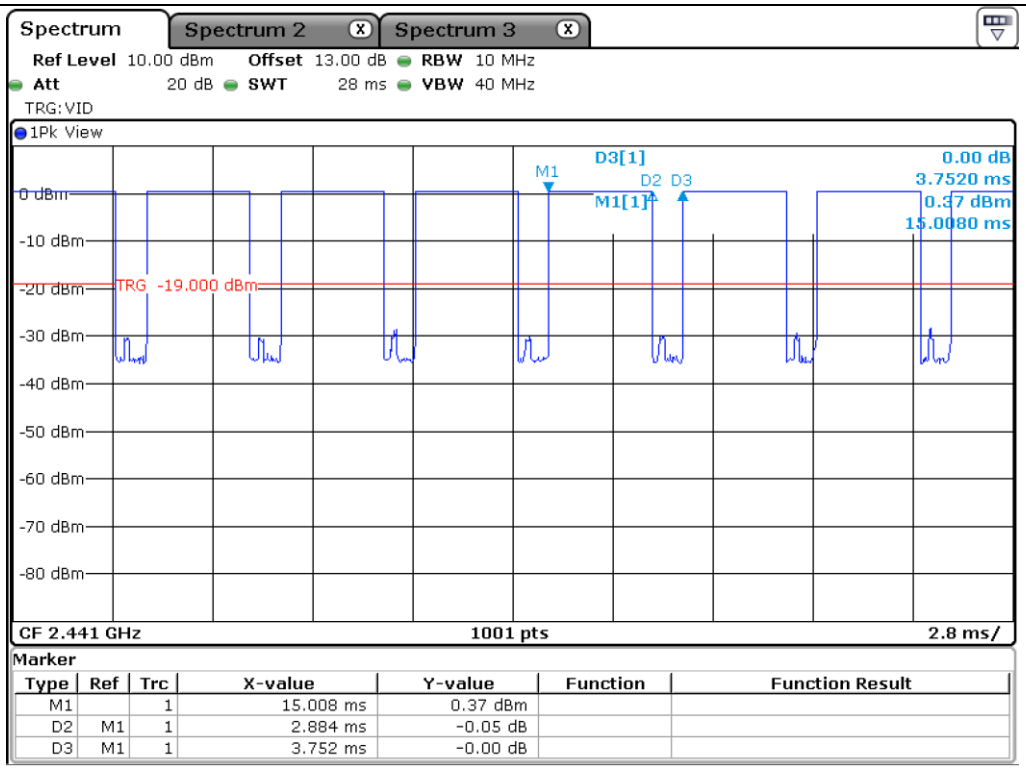
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth [1 Mbps]	2.884	0.868	76.87	1.14
Bluetooth [2 Mbps]	2.882	0.858	77.06	1.13
Bluetooth [3 Mbps]	2.891	0.8575	77.12	1.13

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

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

-. Test Plot



Bluetooth_1 Mbps

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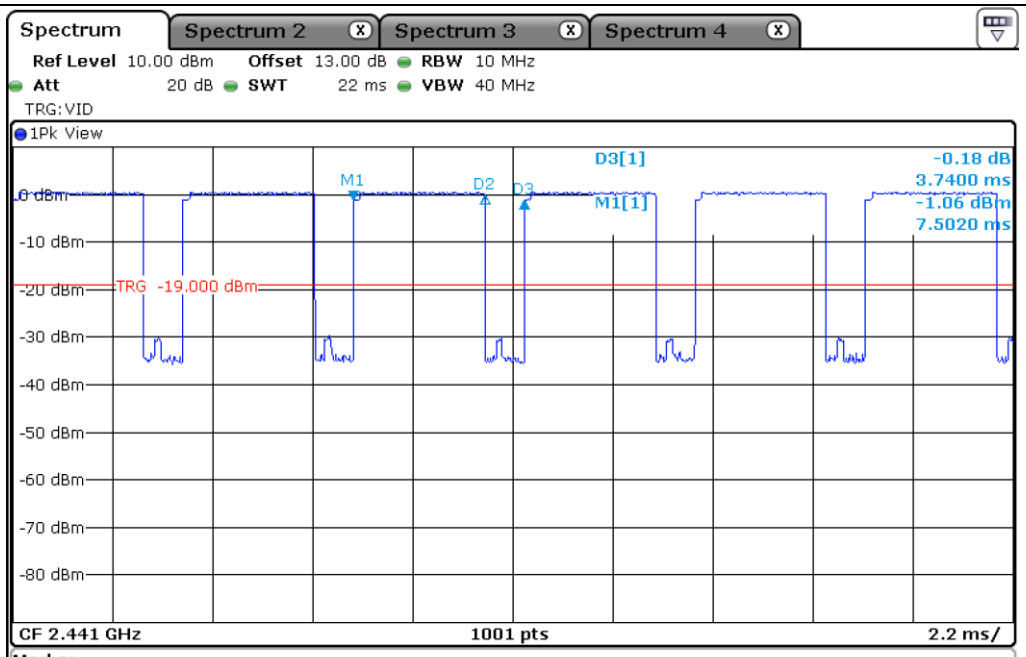
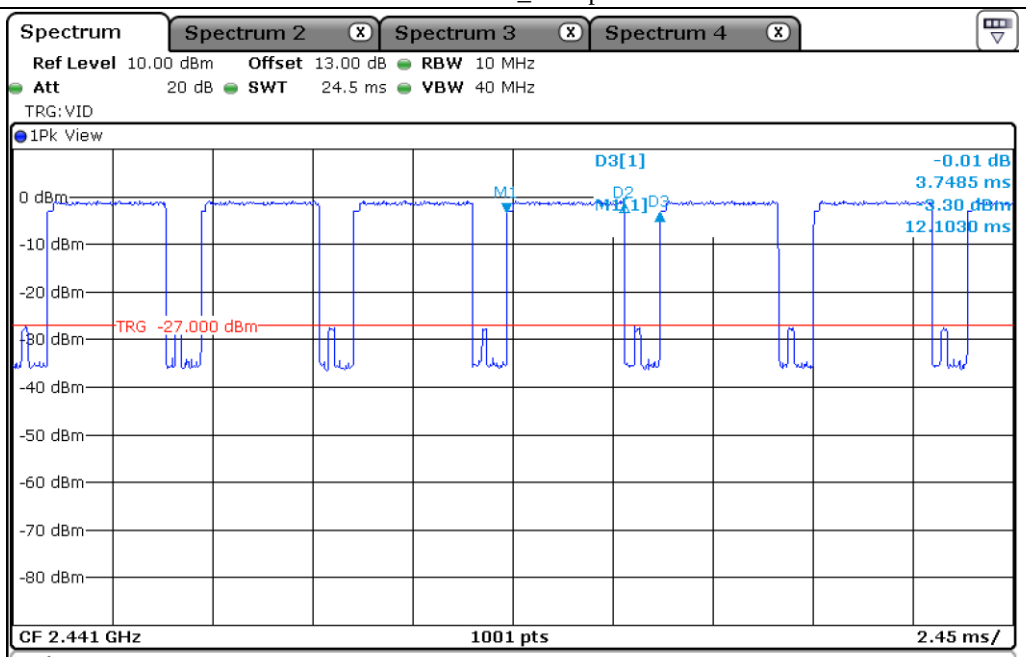


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	7.502 ms	-1.06 dBm		
D2	M1	1	2.882 ms	0.94 dB		
D3	M1	1	3.74 ms	-0.18 dB		

Bluetooth_2 Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	12.103 ms	-3.30 dBm		
D2	M1	1	2.891 ms	1.93 dB		
D3	M1	1	3.7485 ms	-0.01 dB		

Bluetooth_3 Mbps

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5.4 Configuration of Test System

Line Conducted Test: The EUT was tested in the Transmitting 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: 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 PCB 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

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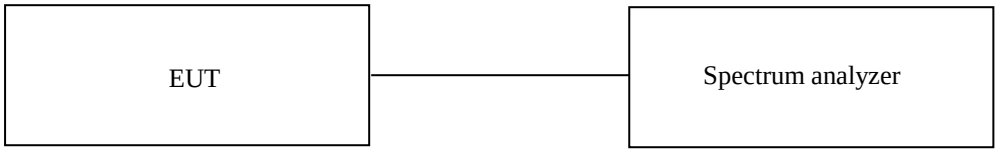
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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

May 02, 2022 ~ May 11, 2022

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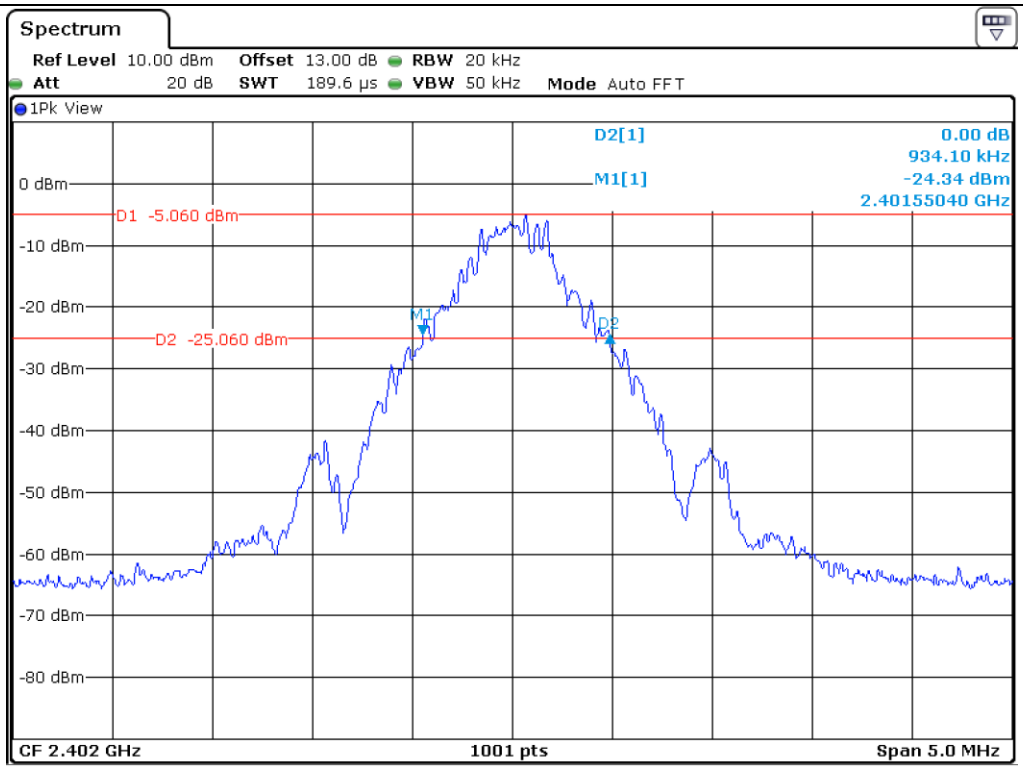
7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	934.10
Middle	2 441.00	934.10
High	2 480.00	934.10



Low Channel

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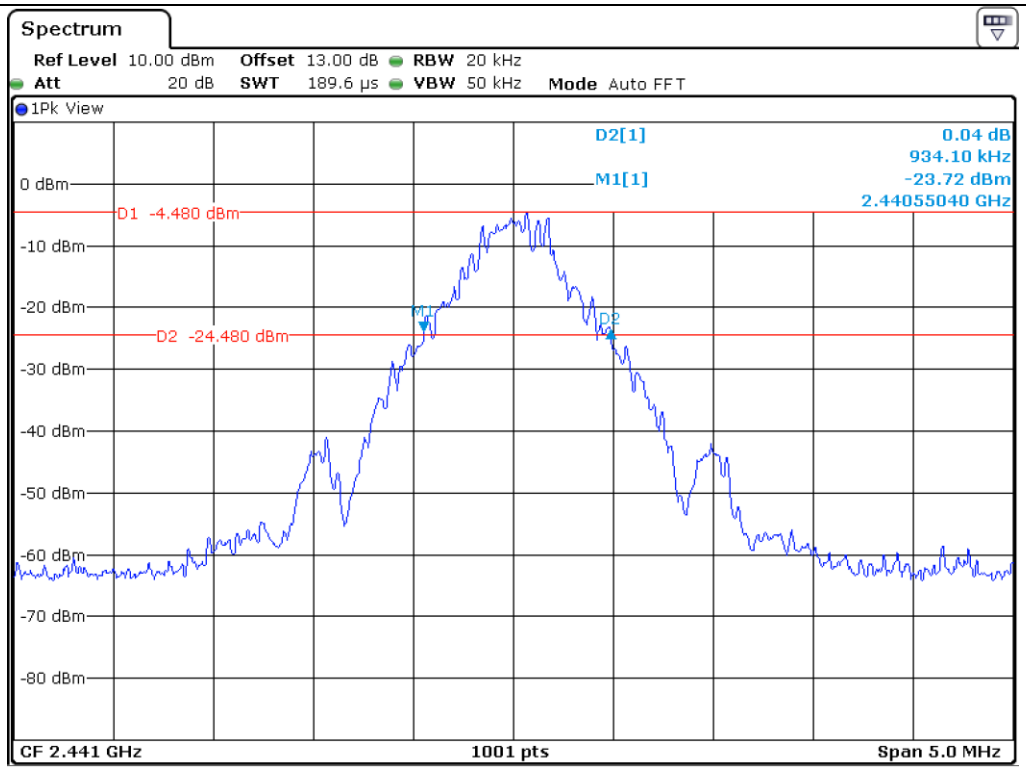
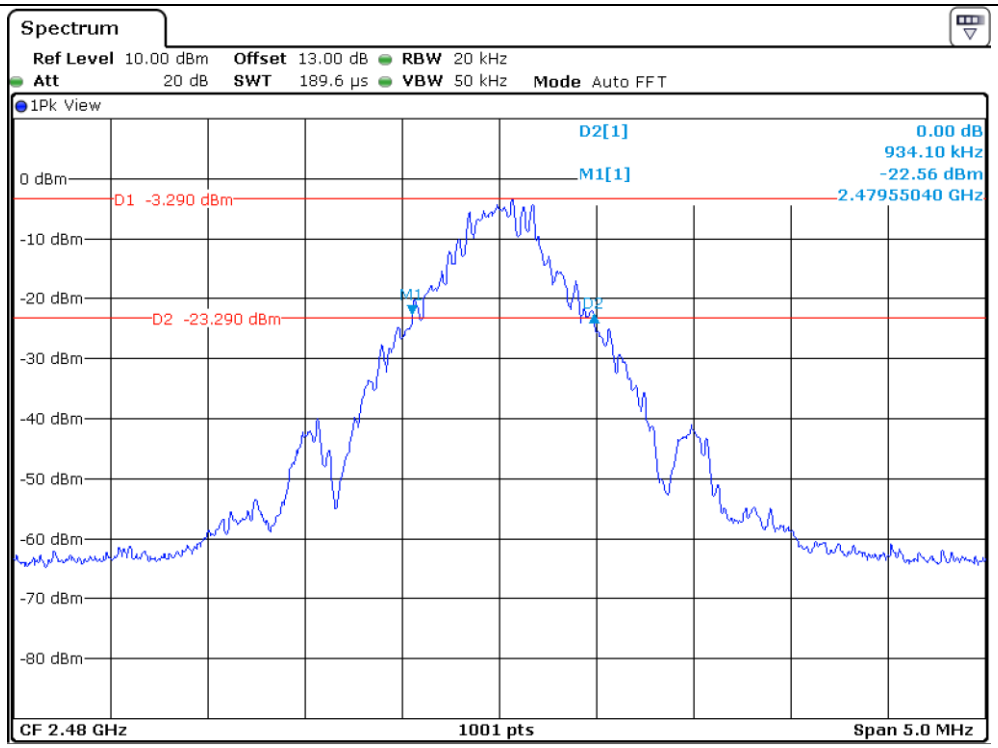


Middle Channel



High Channel

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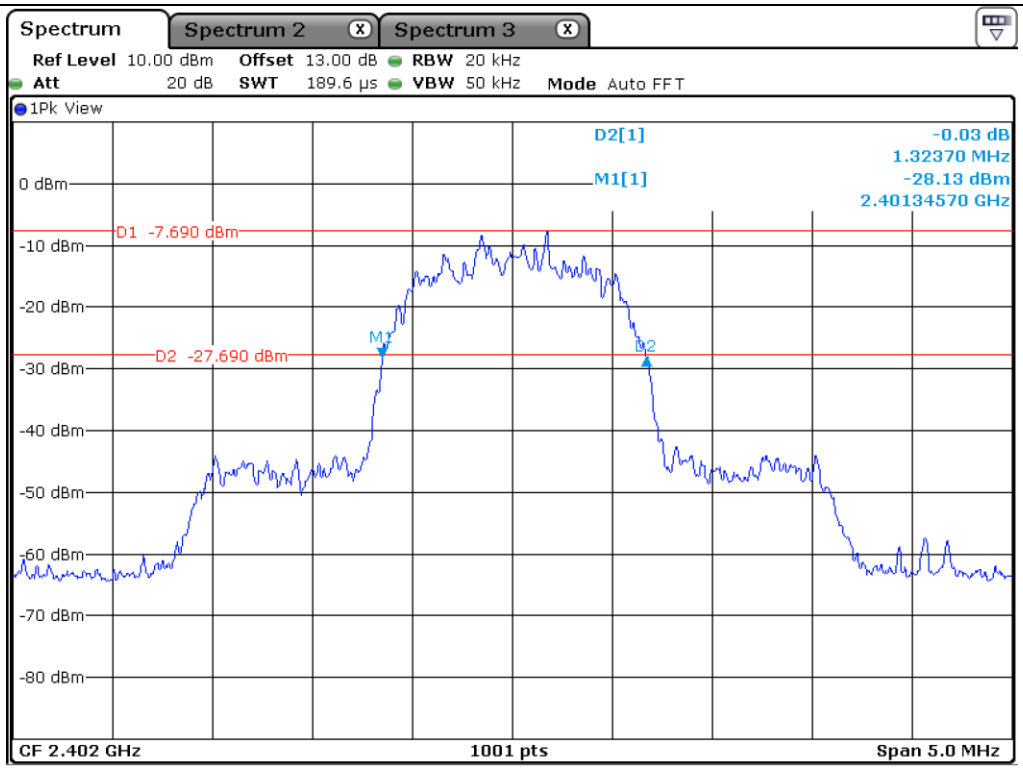
7.5 Test data for 2 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 323.70
Middle	2 441.00	1 323.70
High	2 480.00	1 313.70



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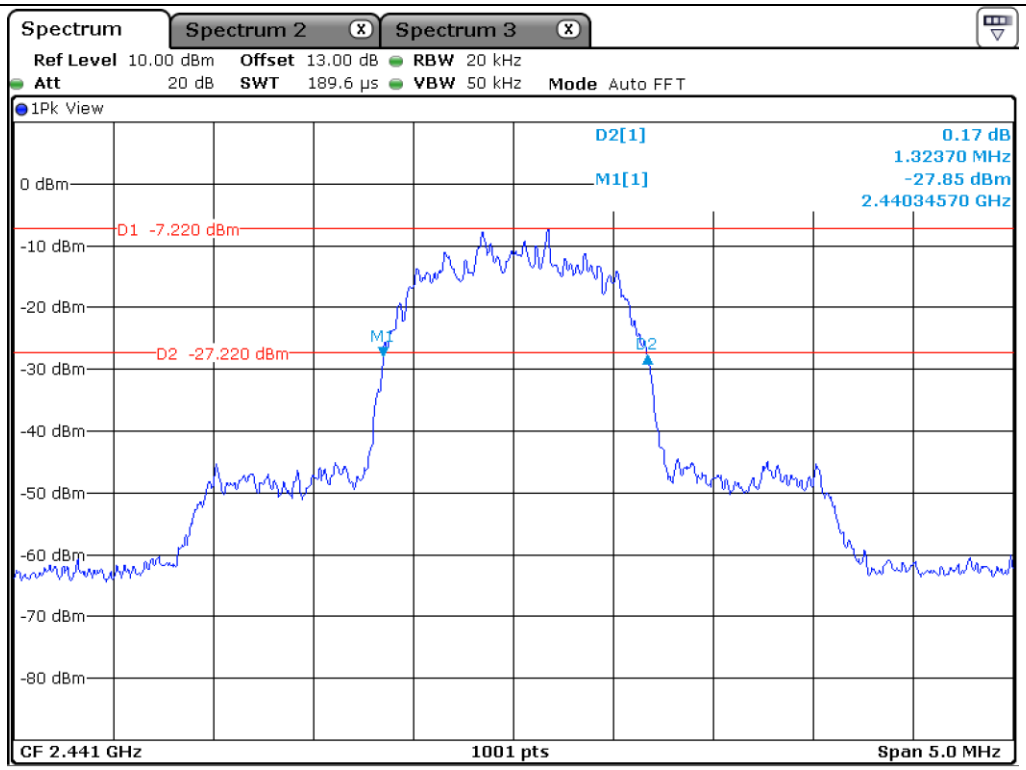
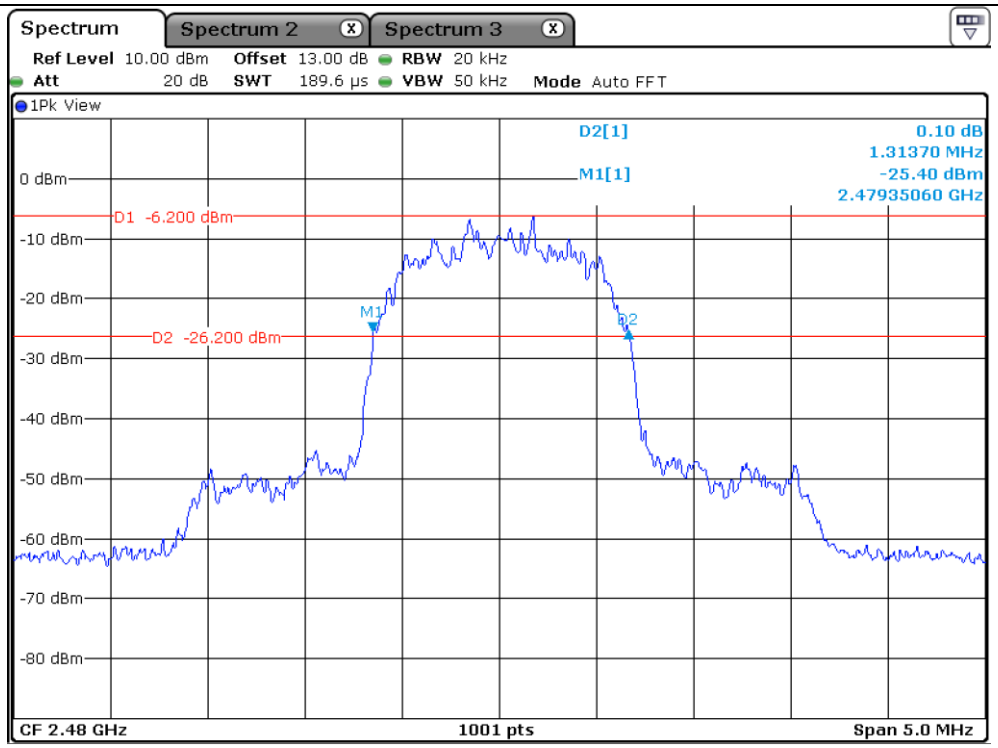


Middle Channel



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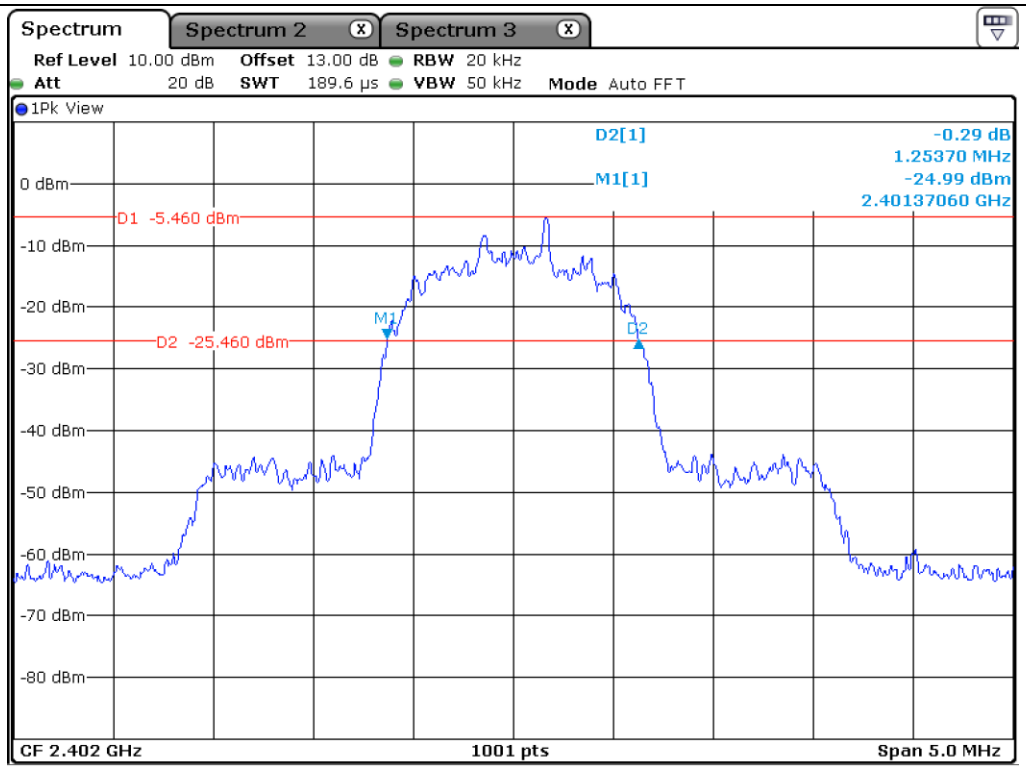
7.6 Test data for 3 Mbps

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 253.70
Middle	2 441.00	1 288.70
High	2 480.00	1 288.70



Low Channel

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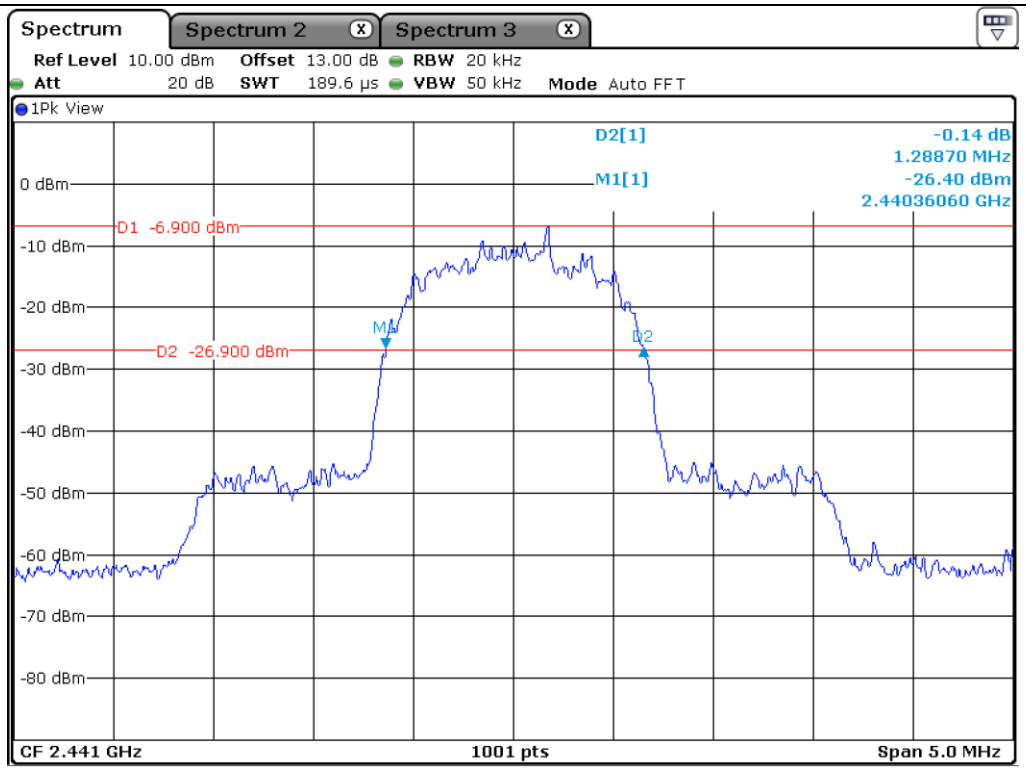
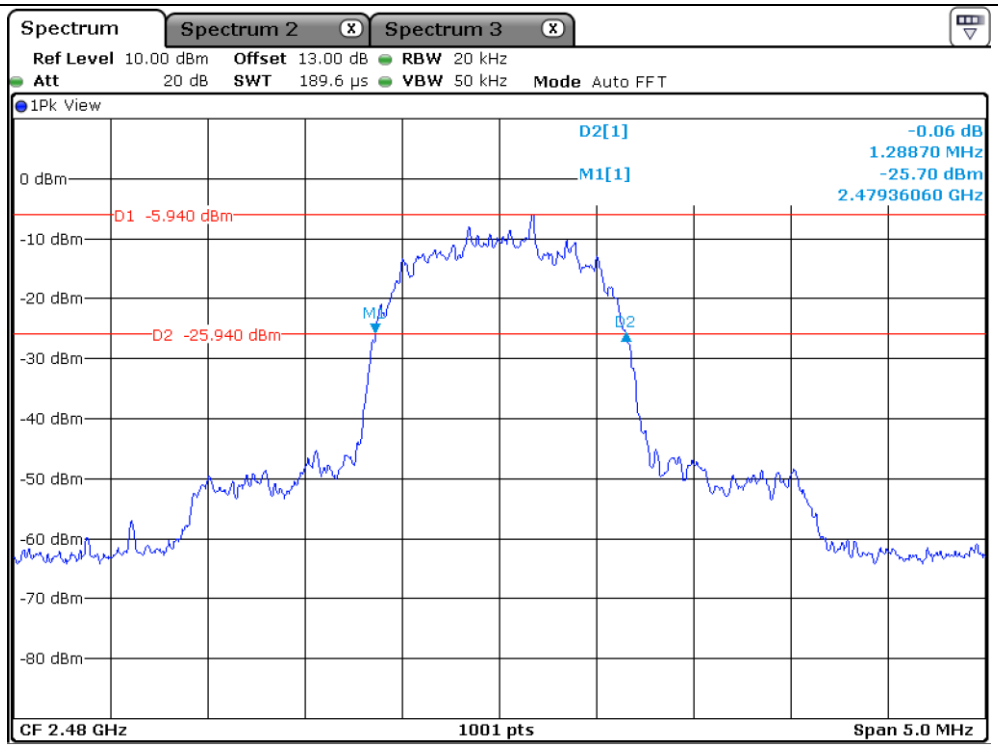


Middle Channel



High Channel

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8. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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

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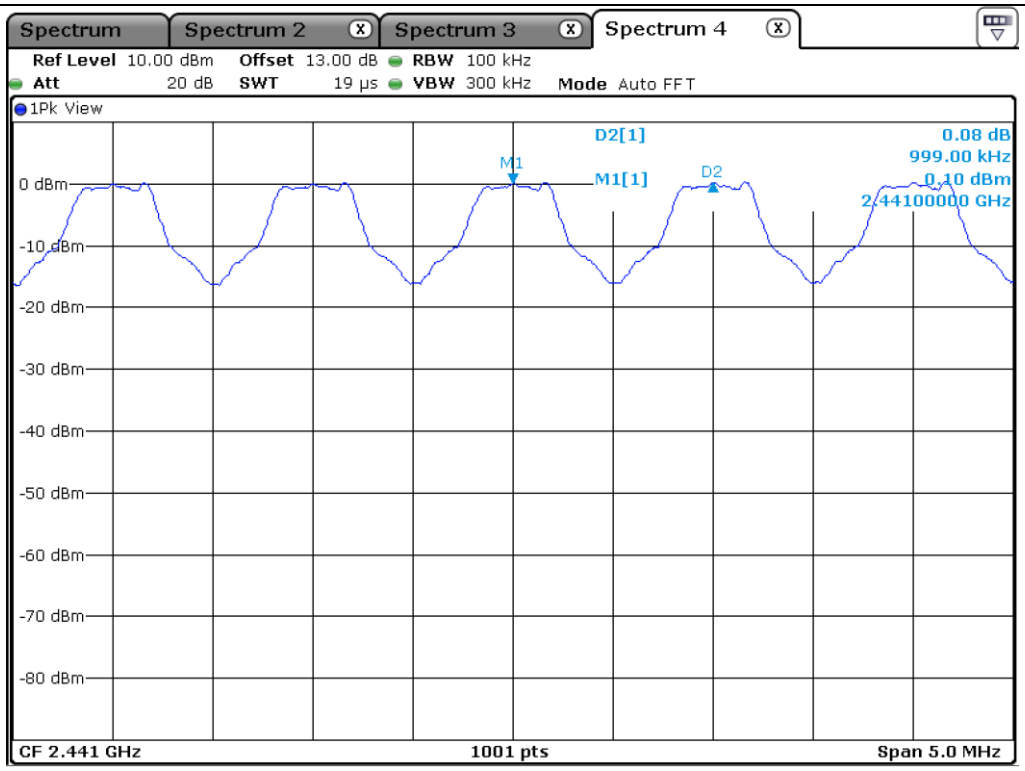
8.4 Test data for 1 Mbps

-. Test Result : Pass

Measured Value (kHz)	Two-third of 20 dB Bandwidth (kHz)	Limit
999.00	622.73	Separated by a minimum of 25 kHz



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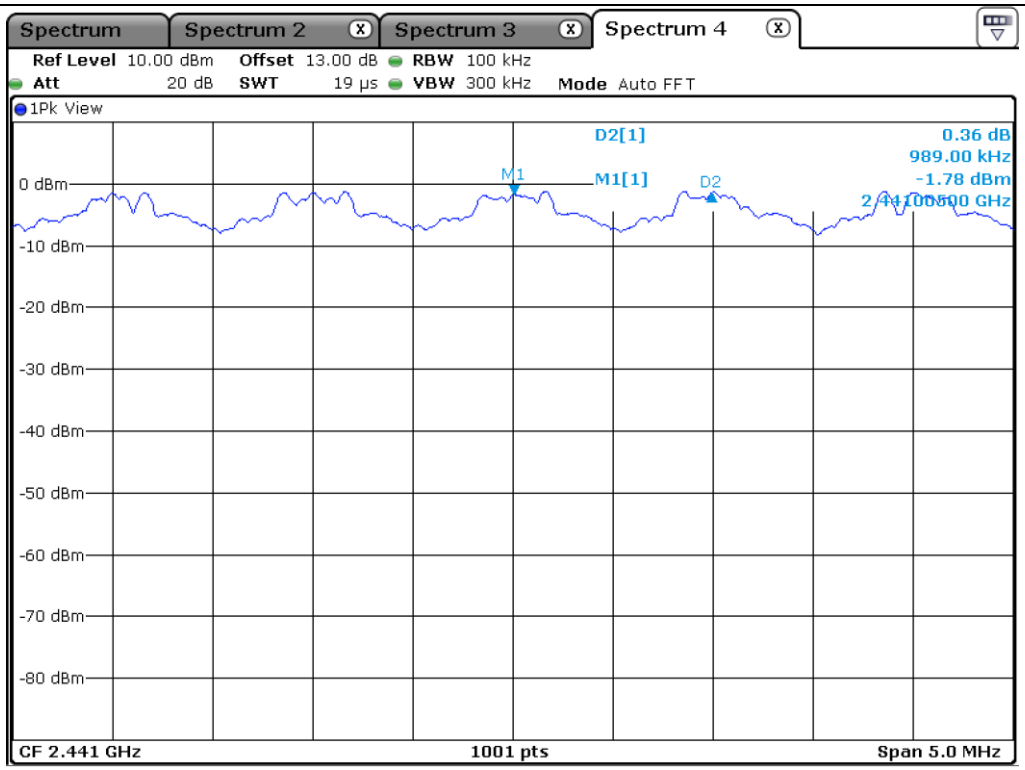
8.5 Test data for 2 Mbps

-. Test Result : Pass

Measured Value (kHz)	Two-third of 20 dB Bandwidth (kHz)	Limit
989.00	882.47	Separated by a minimum of 25 kHz

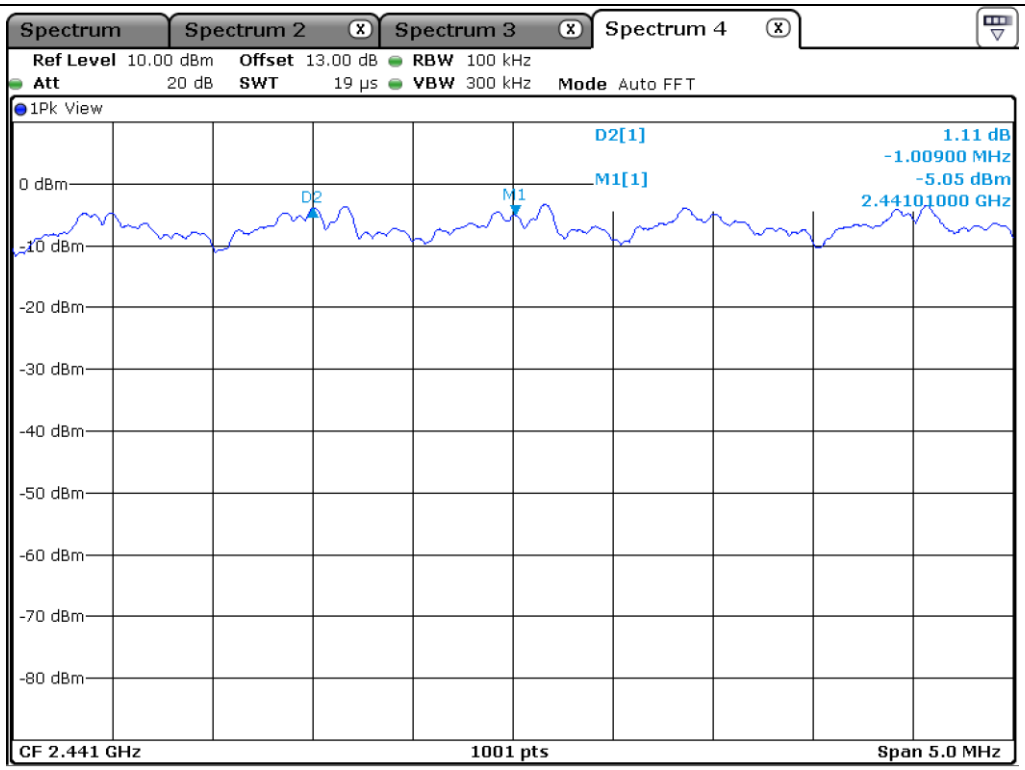


ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

8.6 Test data for 3 Mbps

-. Test Result : Pass

Measured Value (kHz)	Two-third of 20 dB Bandwidth (kHz)	Limit
1 009.00	859.13	Separated by a minimum of 25 kHz



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

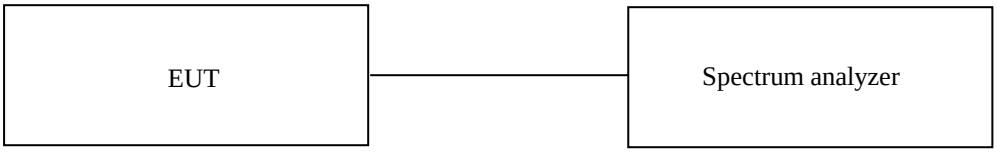
9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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

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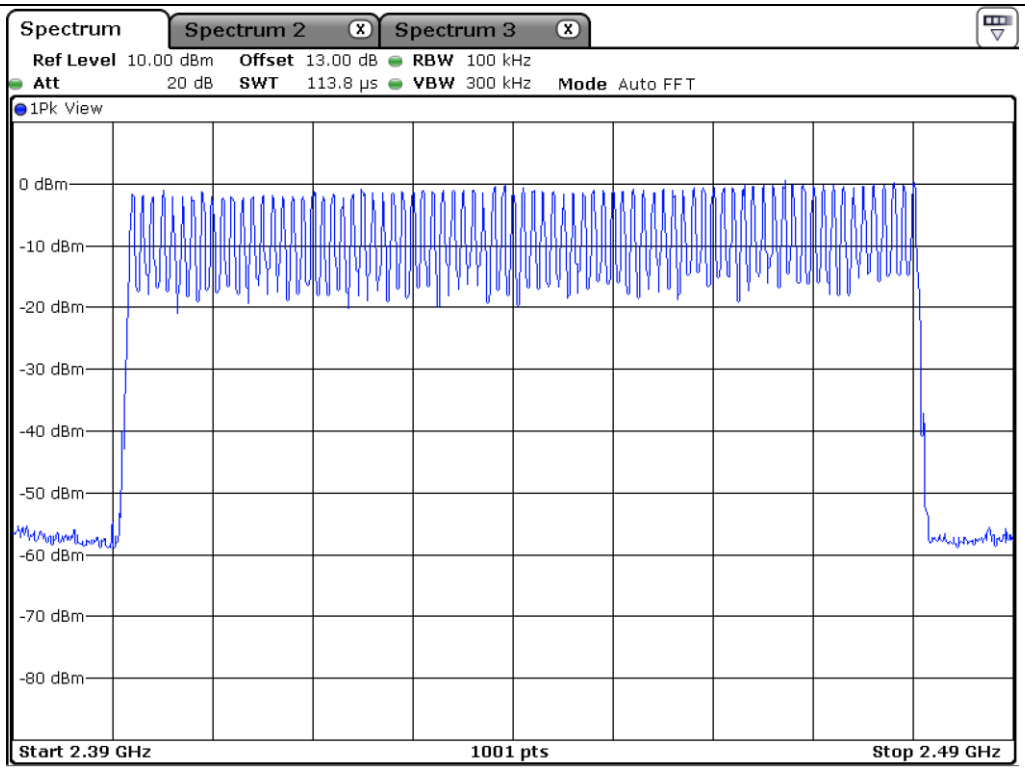
9.4 Test data for 1 Mbps

-. 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

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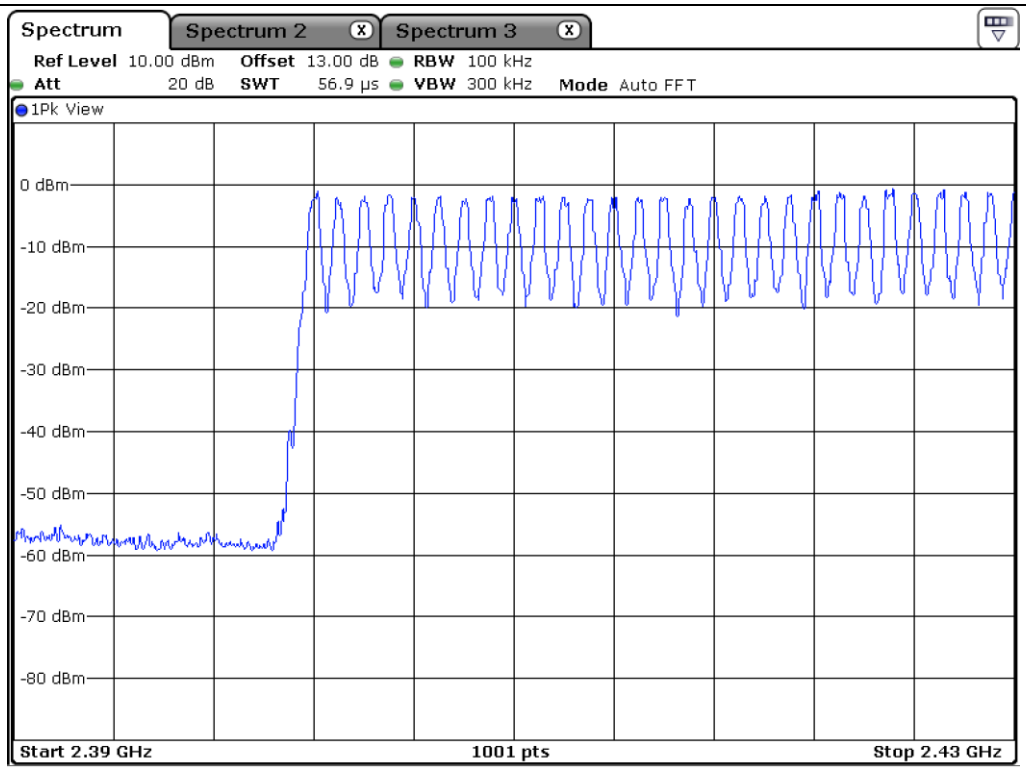
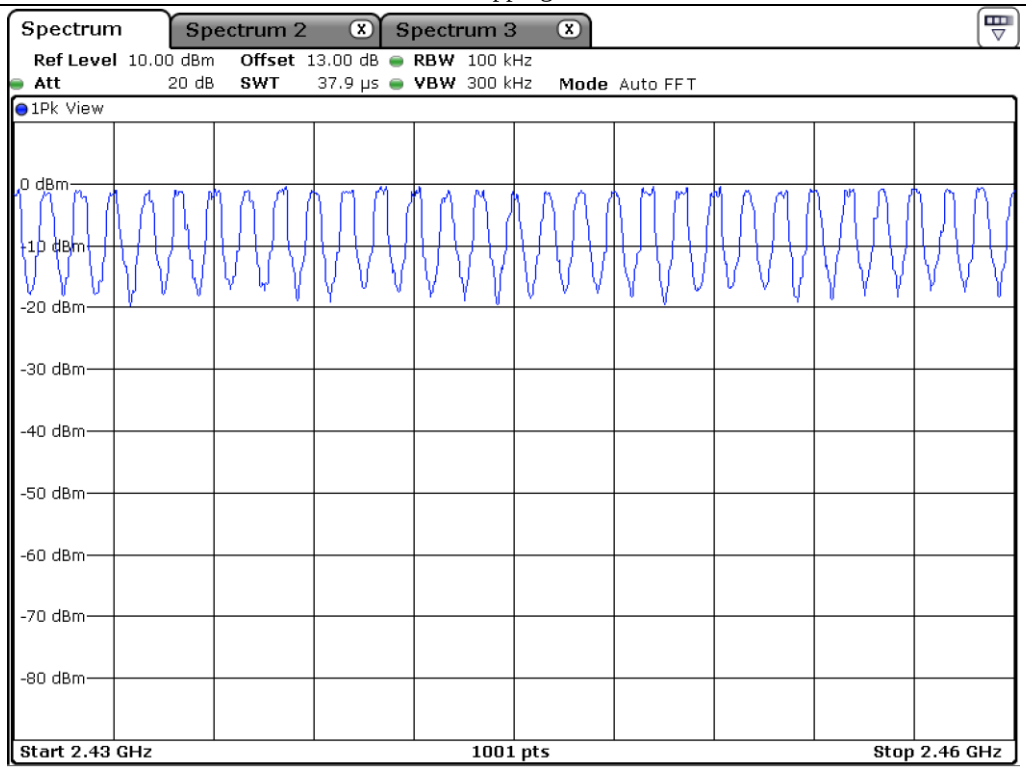


Number of hopping channel: 28



Number of hopping channel: 30

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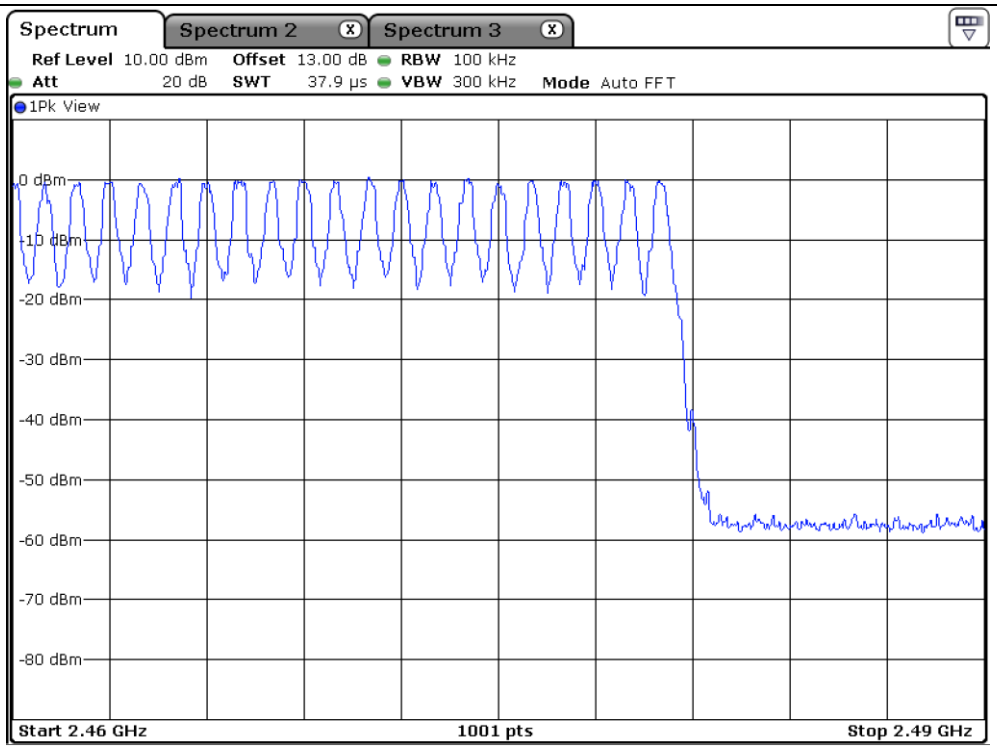

Number of hopping channel: 21

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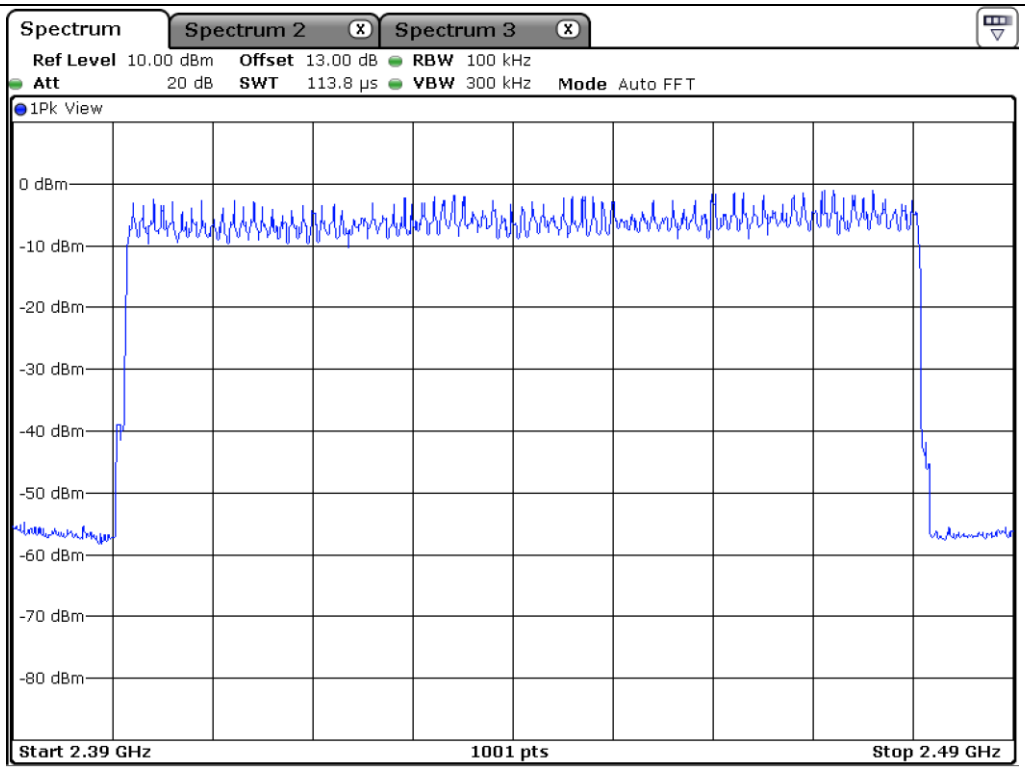
9.5 Test data for 2 Mbps

-. 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

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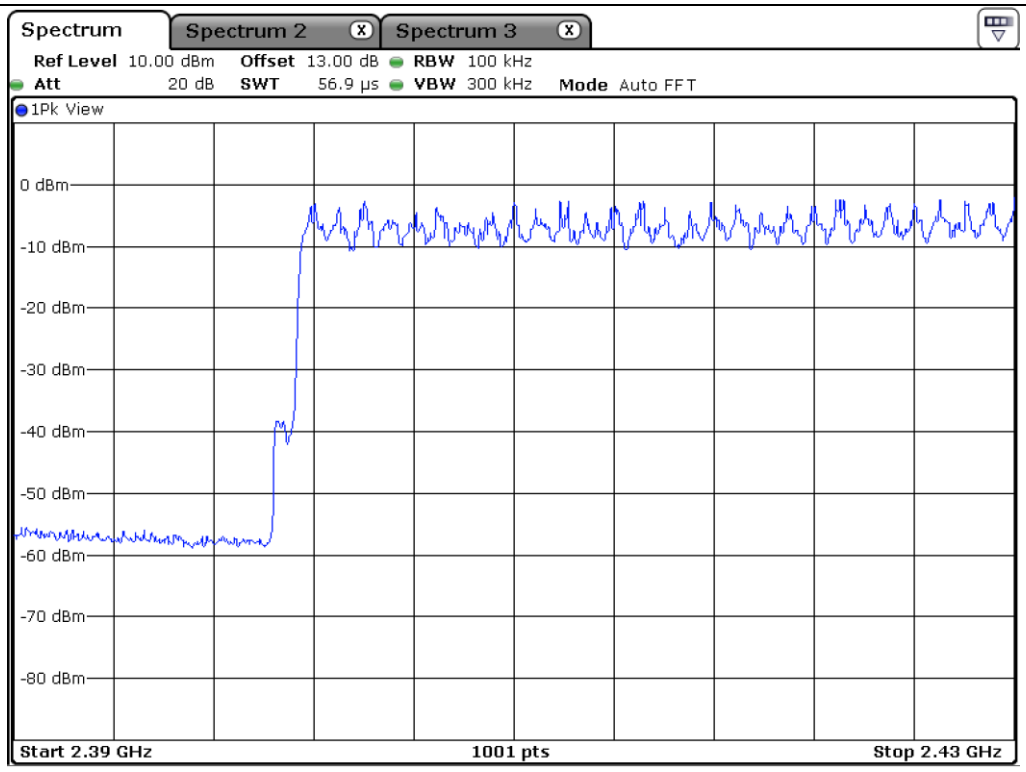
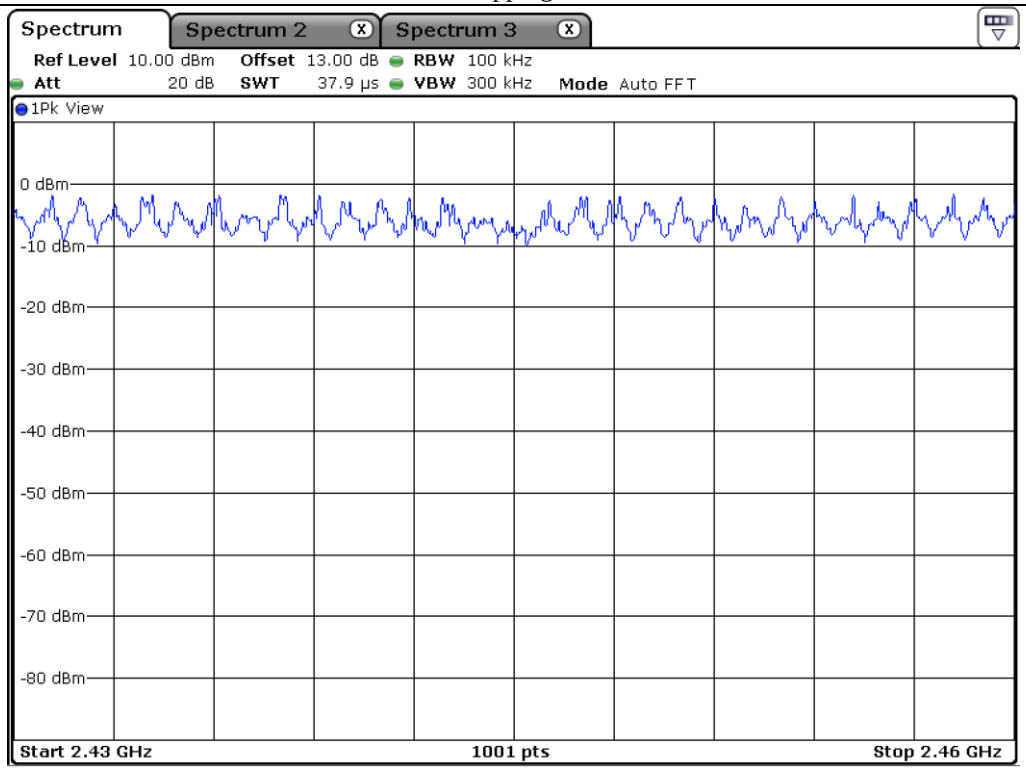
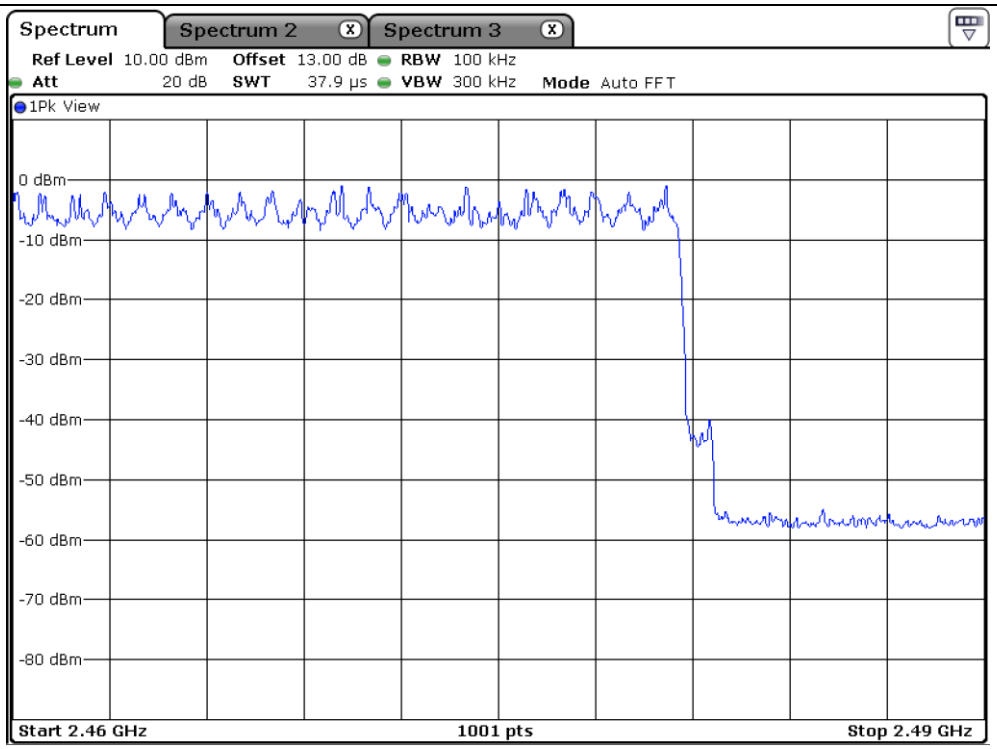


Number of hopping channel: 28



Number of hopping channel: 30

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



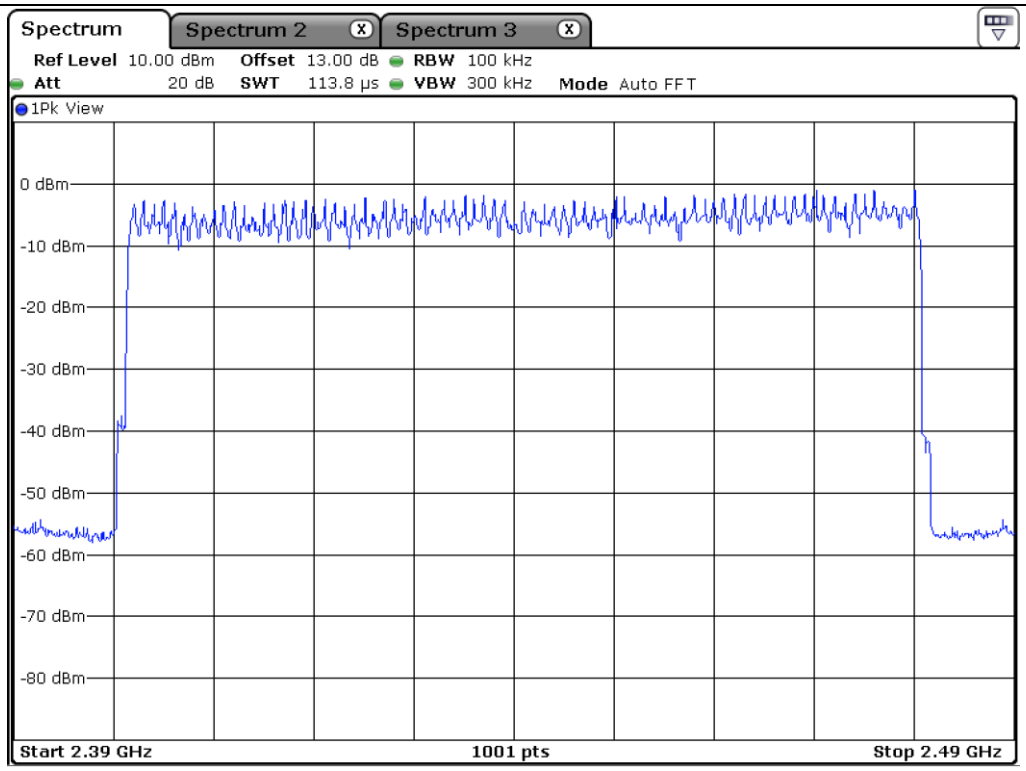
Number of hopping channel: 21

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

9.6 Test data for 3 Mbps

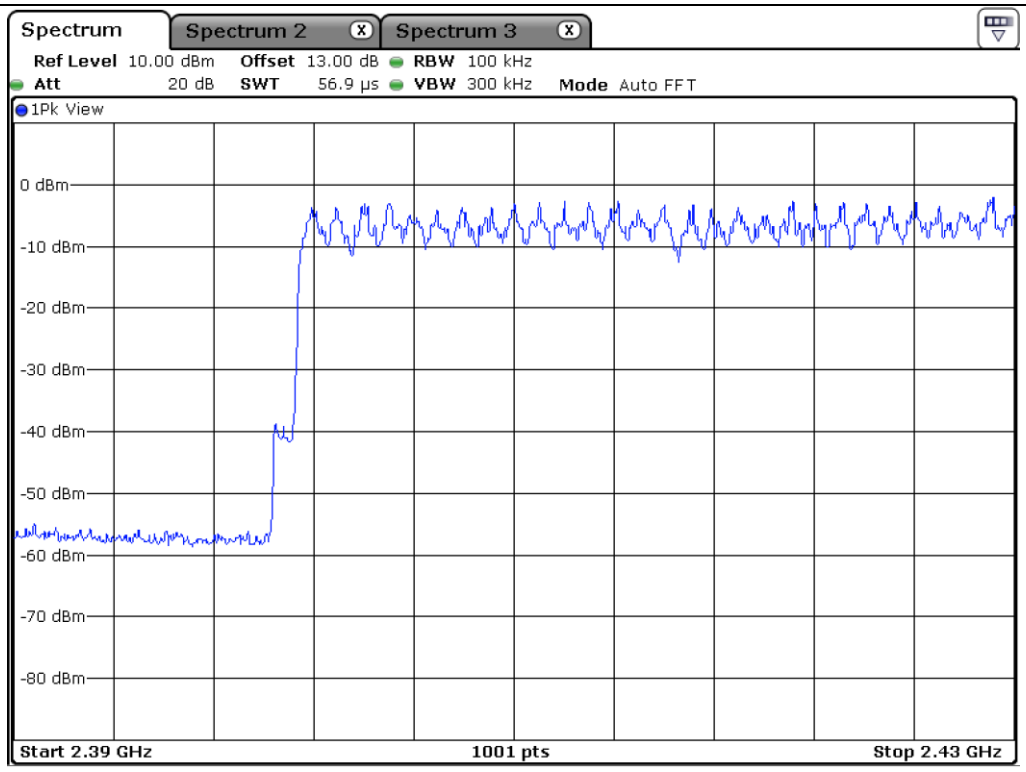
-. Test Result : Pass

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

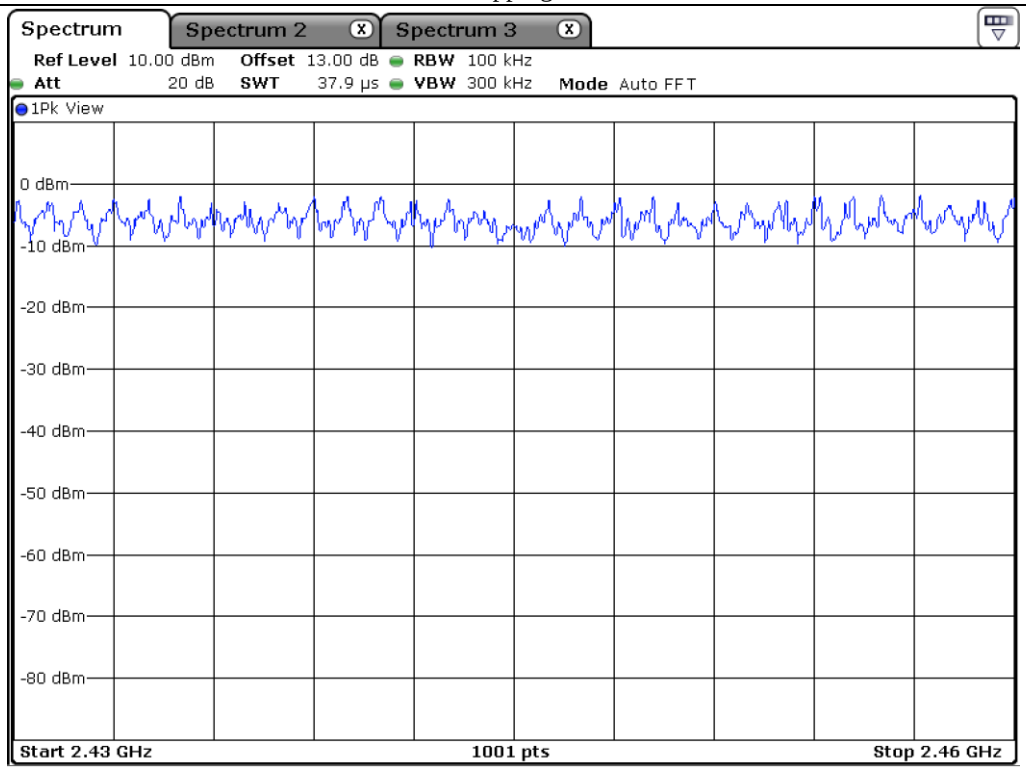


Total number of hopping channel: 28+30+21 = 79

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

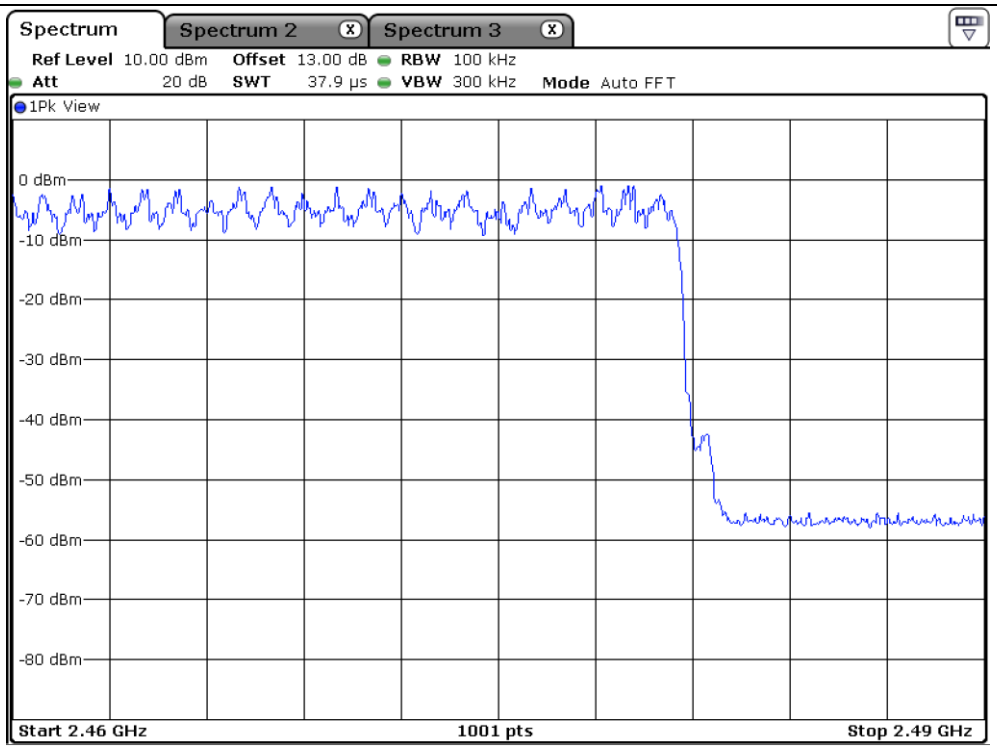


Number of hopping channel: 28



Number of hopping channel: 30

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



Number of hopping channel: 21

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

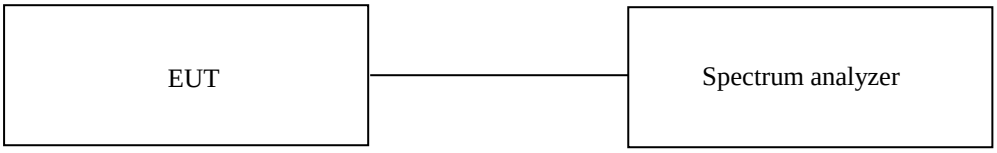
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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 µs with 79 channels.

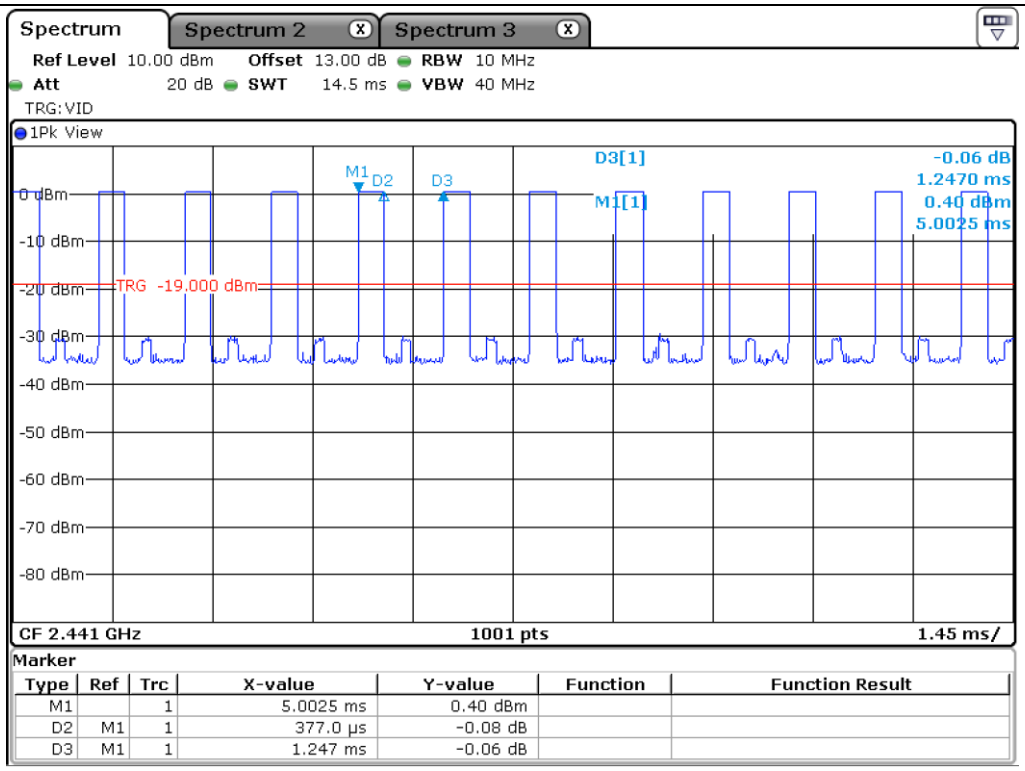
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel 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	0.377	10.13	31.60	120.68	400.00	PASS
DH3	1.634	5.06	31.60	261.27	400.00	
DH5	2.884	3.38	31.60	308.03	400.00	

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

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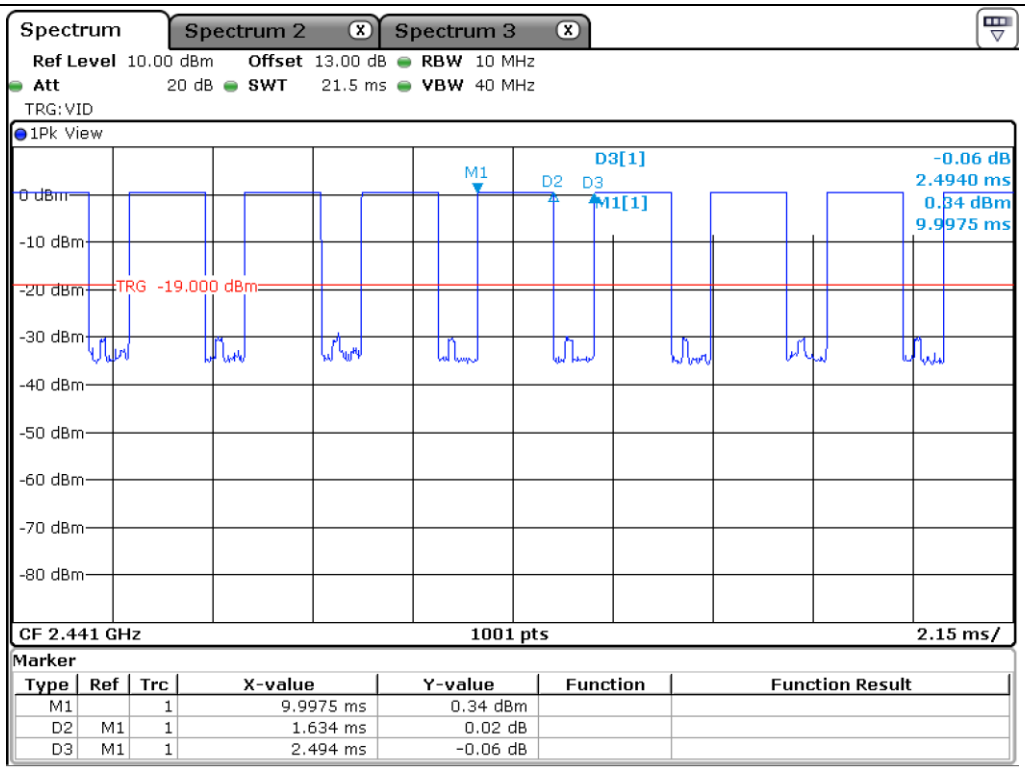
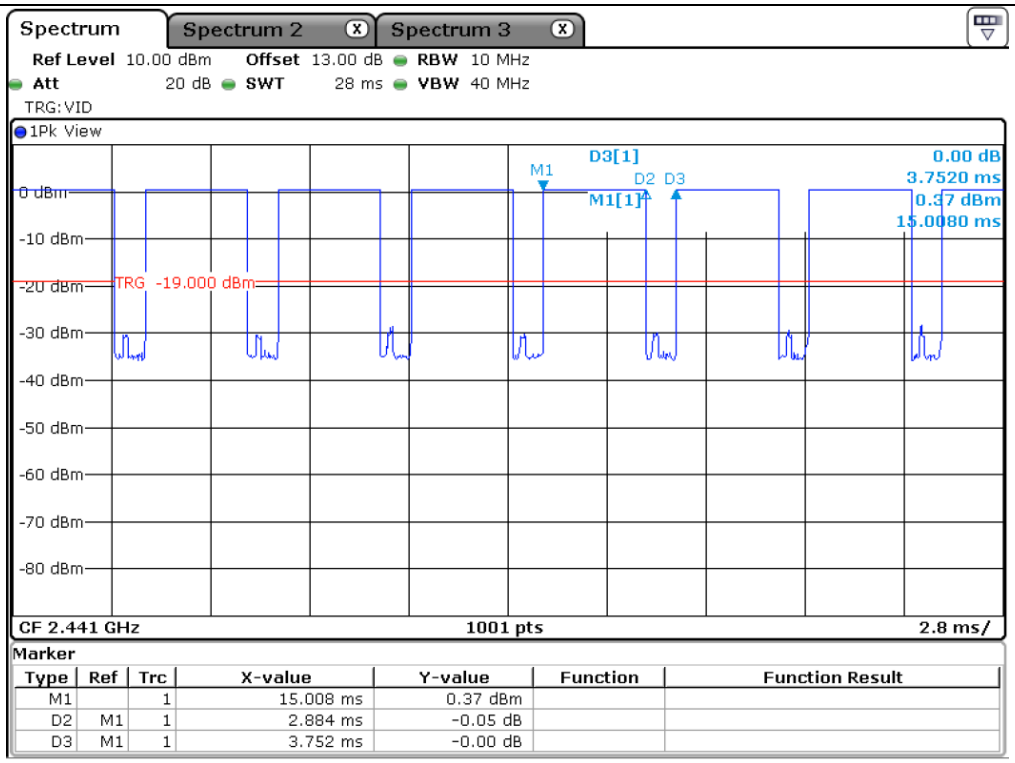


DH3



DH5

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

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.

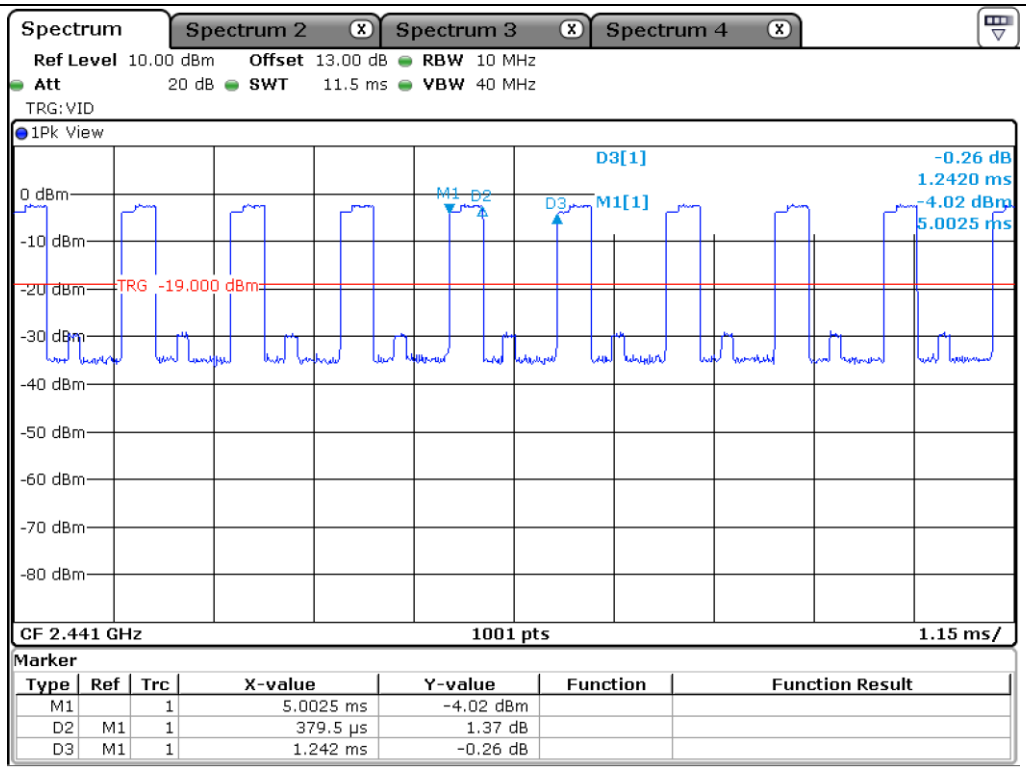
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel 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	0.380	10.13	31.60	121.48	400.00	PASS
DH3	1.632	5.06	31.60	260.95	400.00	
DH5	2.882	3.38	31.60	307.82	400.00	

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

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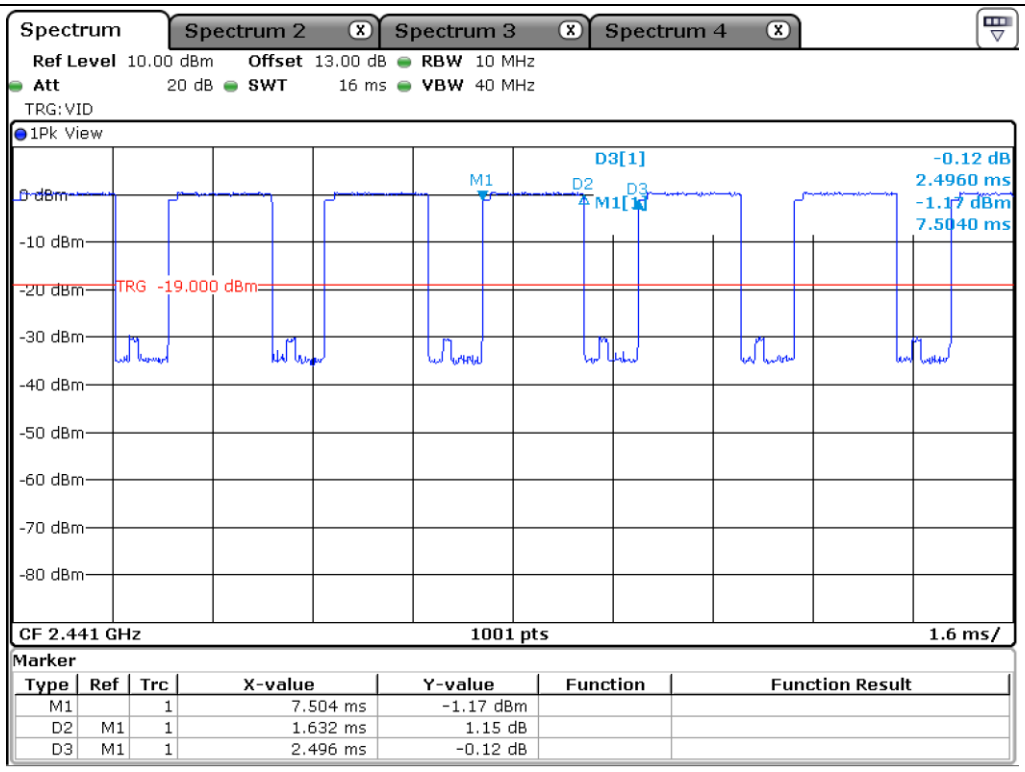
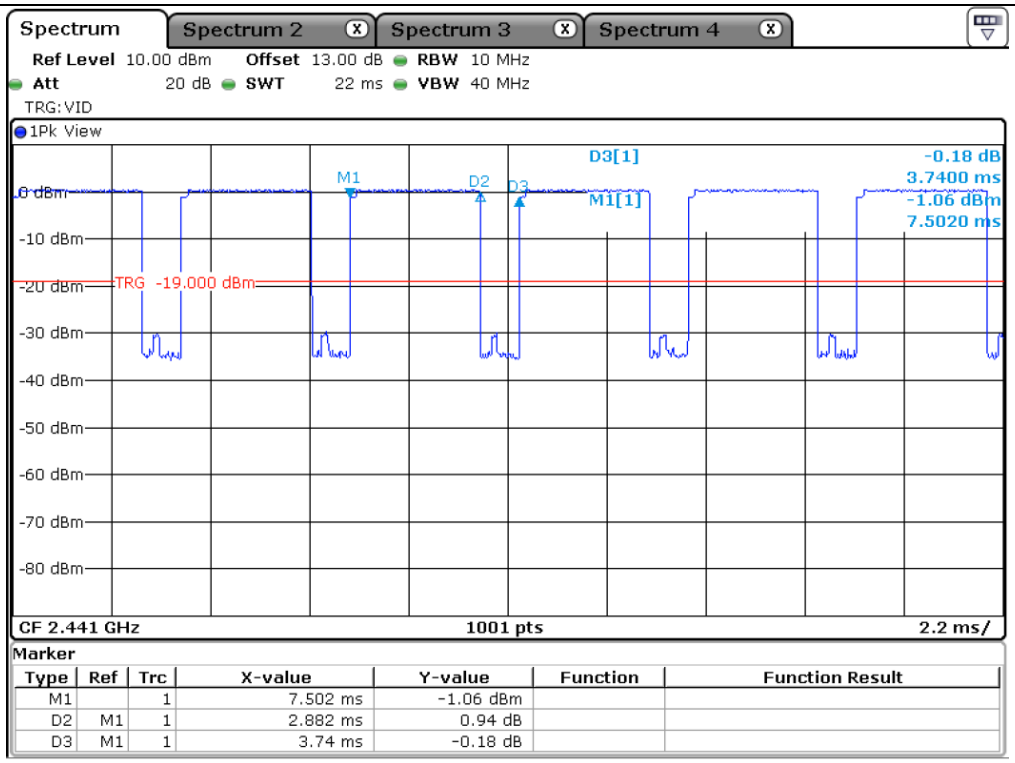

Spectrum
Spectrum 2
Spectrum 3
Spectrum 4
Ref Level 10.00 dBm Offset 13.00 dB RBW 10 MHz
Att 20 dB SWT 16 ms VBW 40 MHz
TRG:VID
1Pk View
D3[1]
-0.12 dB
2.4960 ms
-1.17 dBm
7.5040 ms
M1
D2
D3
M1[1]
0 dBm
-10 dBm
-20 dBm
TRG -19.000 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
1001 pts
1.6 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 7.504 ms -1.17 dBm
D2 M1 1 1.632 ms 1.15 dB
D3 M1 1 2.496 ms -0.12 dB

DH3


Spectrum
Spectrum 2
Spectrum 3
Spectrum 4
Ref Level 10.00 dBm Offset 13.00 dB RBW 10 MHz
Att 20 dB SWT 22 ms VBW 40 MHz
TRG:VID
1Pk View
D3[1]
-0.18 dB
3.7400 ms
-1.06 dBm
7.5020 ms
M1
D2
D3
M1[1]
0 dBm
-10 dBm
-20 dBm
TRG -19.000 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
1001 pts
2.2 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 7.502 ms -1.06 dBm
D2 M1 1 2.882 ms 0.94 dB
D3 M1 1 3.74 ms -0.18 dB

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 µs with 79 channels.

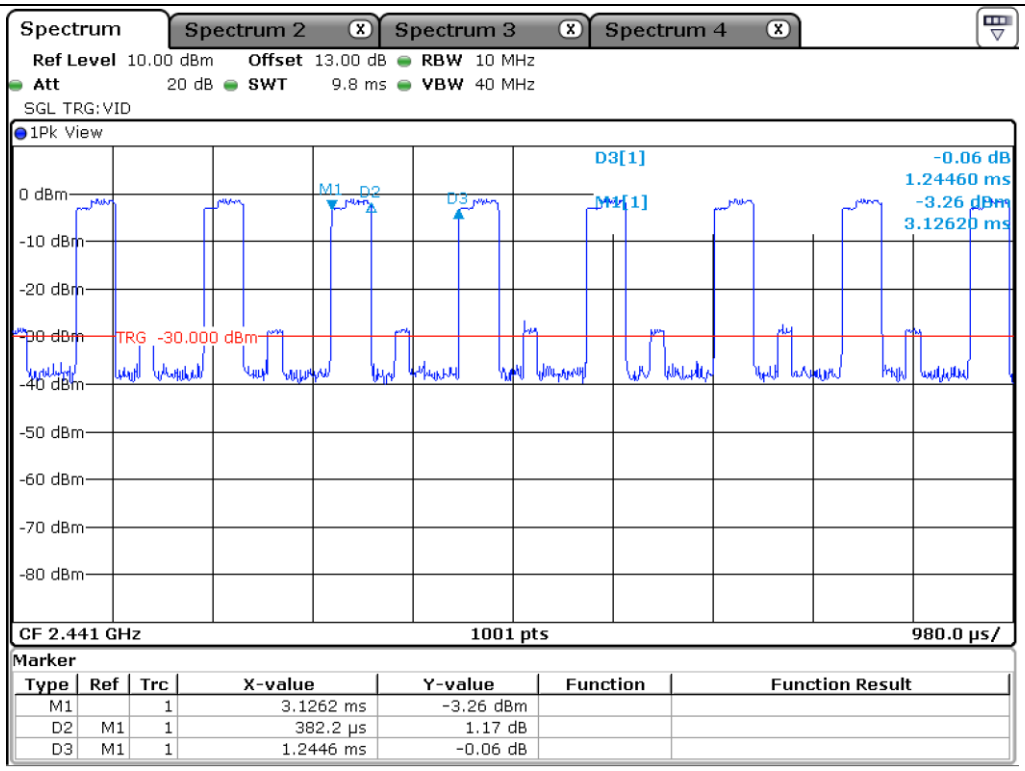
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel 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	0.382	10.13	31.60	122.35	400.00	PASS
DH3	1.642	5.06	31.60	262.47	400.00	
DH5	2.891	3.38	31.60	308.78	400.00	

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

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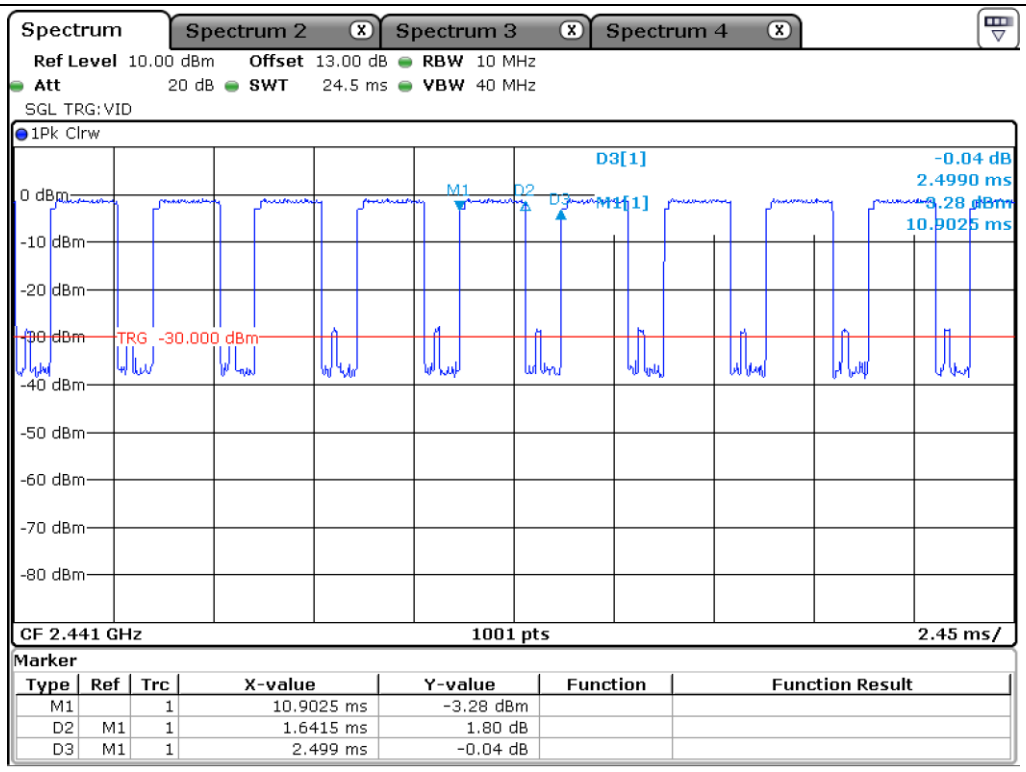
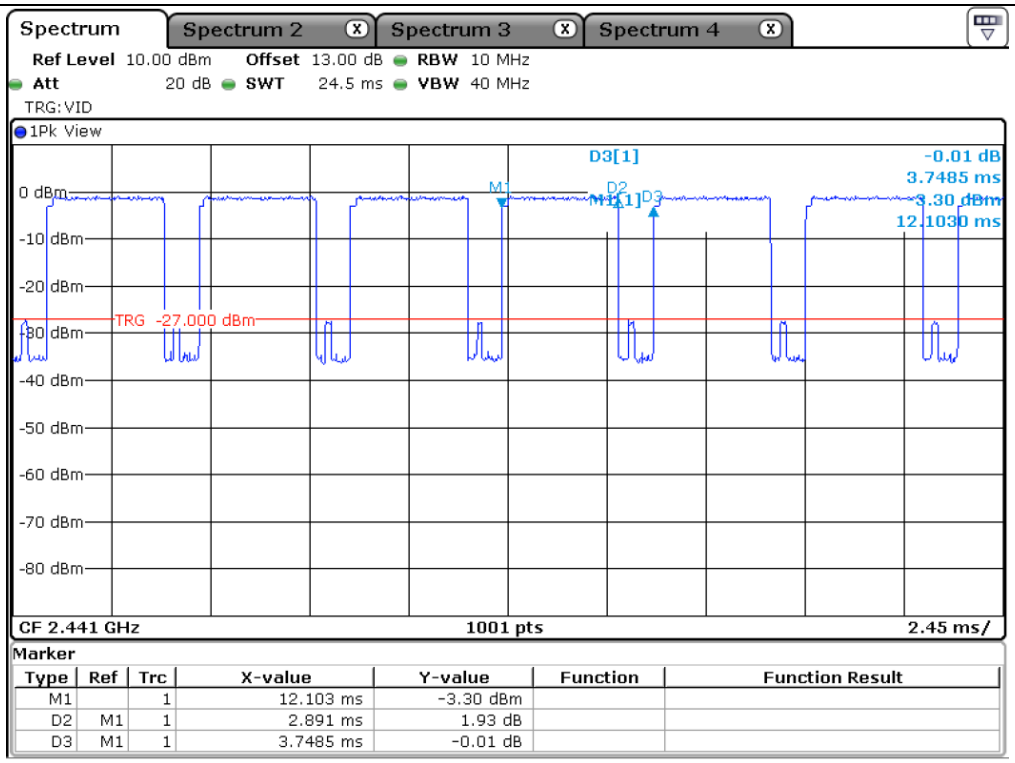


DH3



DH5

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11. MAXIMUM PEAK OUTPUT POWER

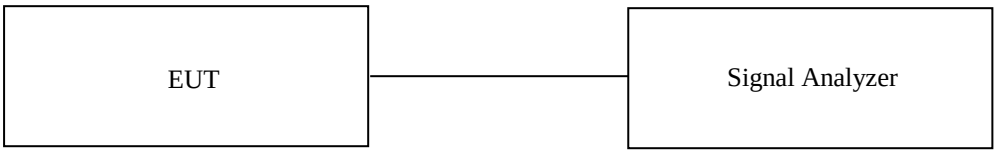
11.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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 ≥ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



11.3 Test Date

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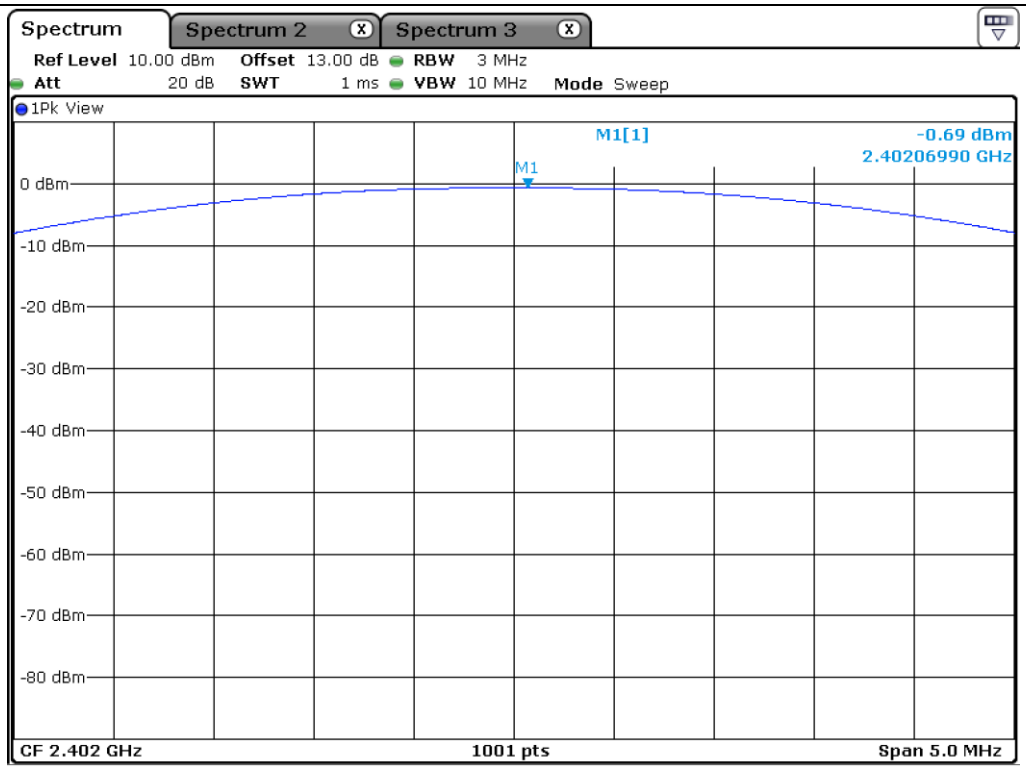
11.4 Test data for 1 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	-0.69	21.00	21.69
MIDDLE	2 441.00	0.33	21.00	20.67
HIGH	2 480.00	1.50	21.00	19.50

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



Low Channel

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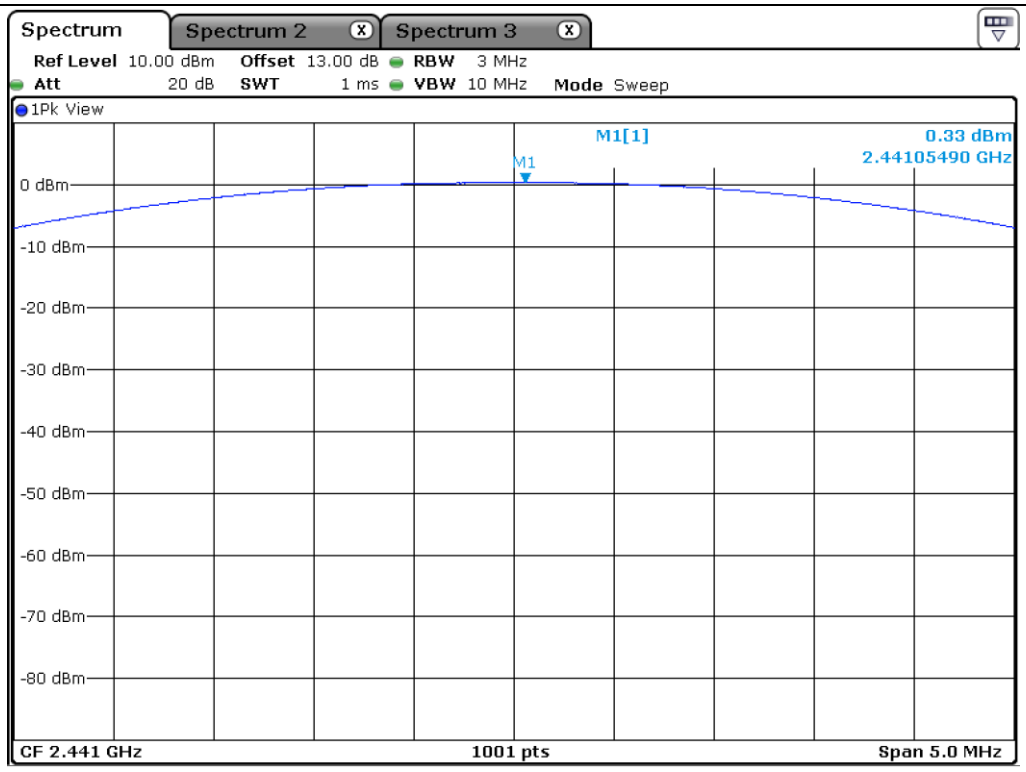
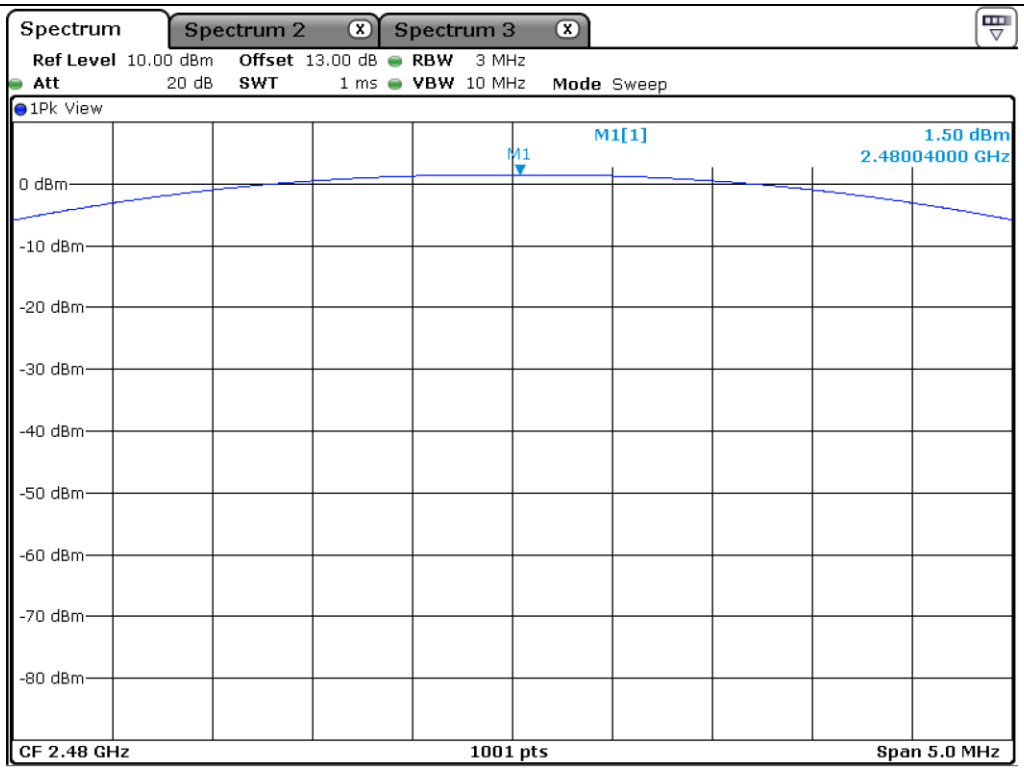


Middle Channel



High Channel

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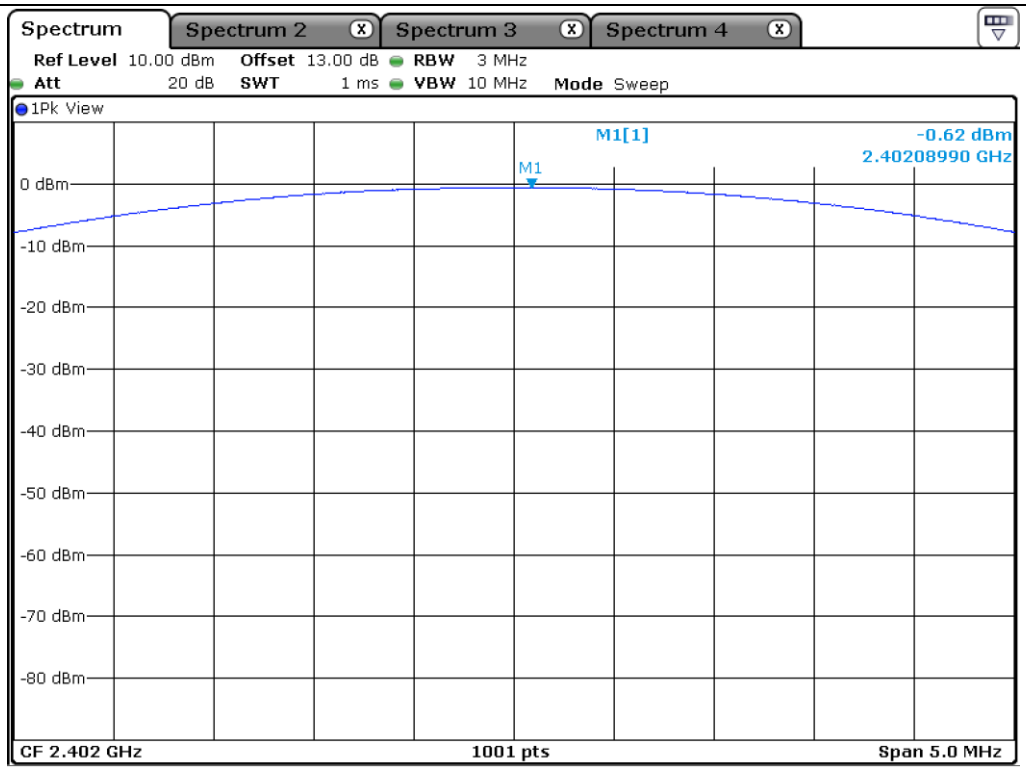
11.5 Test data for 2 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	-0.62	21.00	21.62
MIDDLE	2 441.00	0.40	21.00	20.60
HIGH	2 480.00	1.55	21.00	19.45

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



Low Channel

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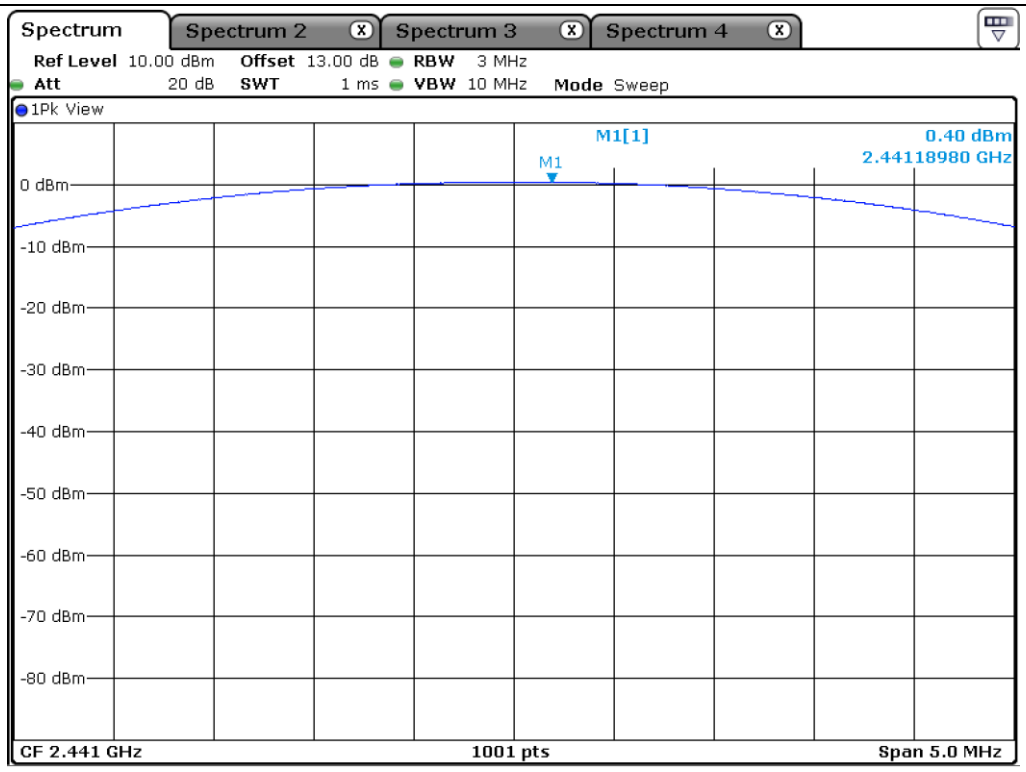
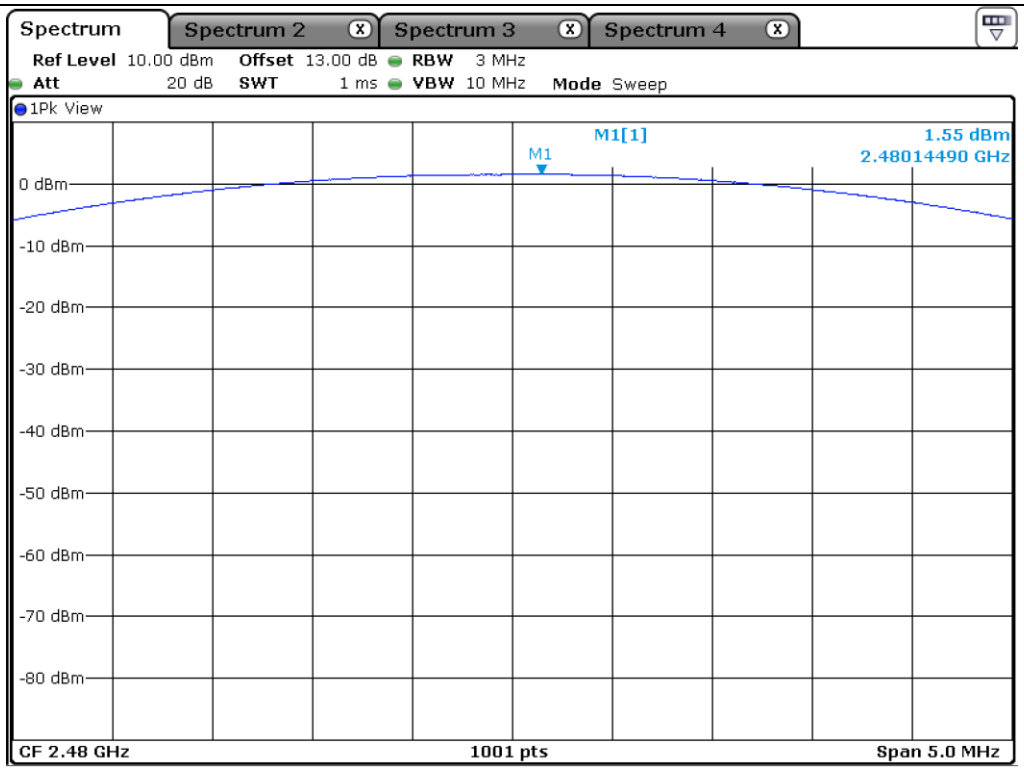


Middle Channel



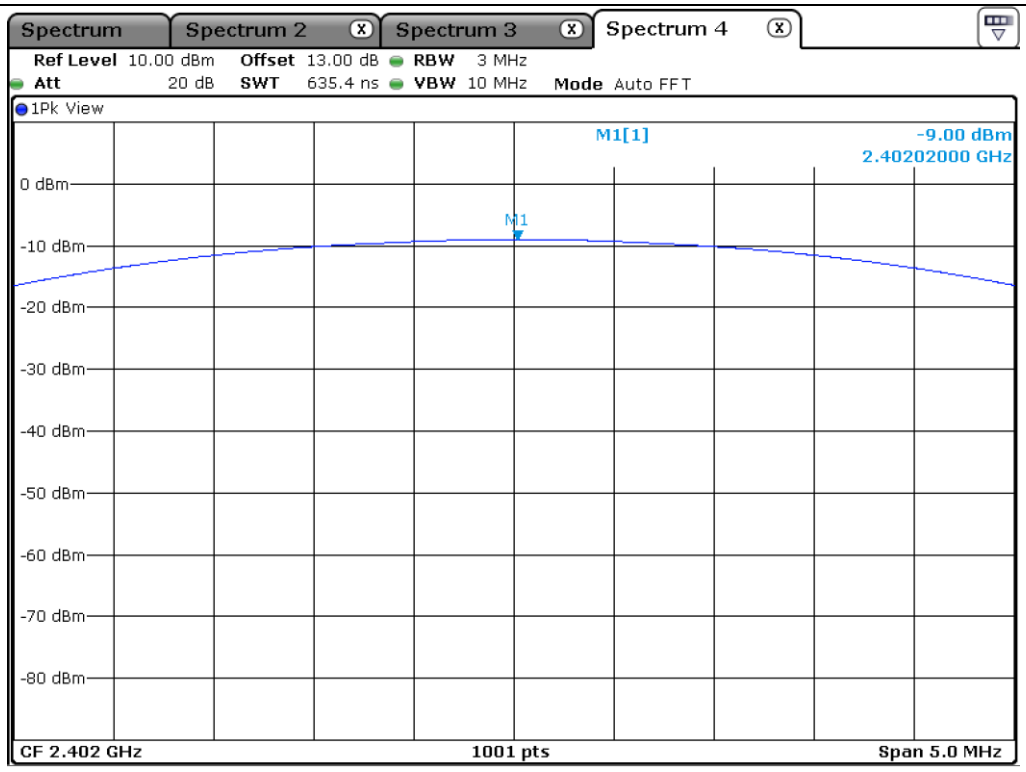
High Channel

11.6 Test data for 3 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	-9.00	21.00	30.00
MIDDLE	2 441.00	-1.17	21.00	22.17
HIGH	2 480.00	-7.00	21.00	28.00

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



Low Channel

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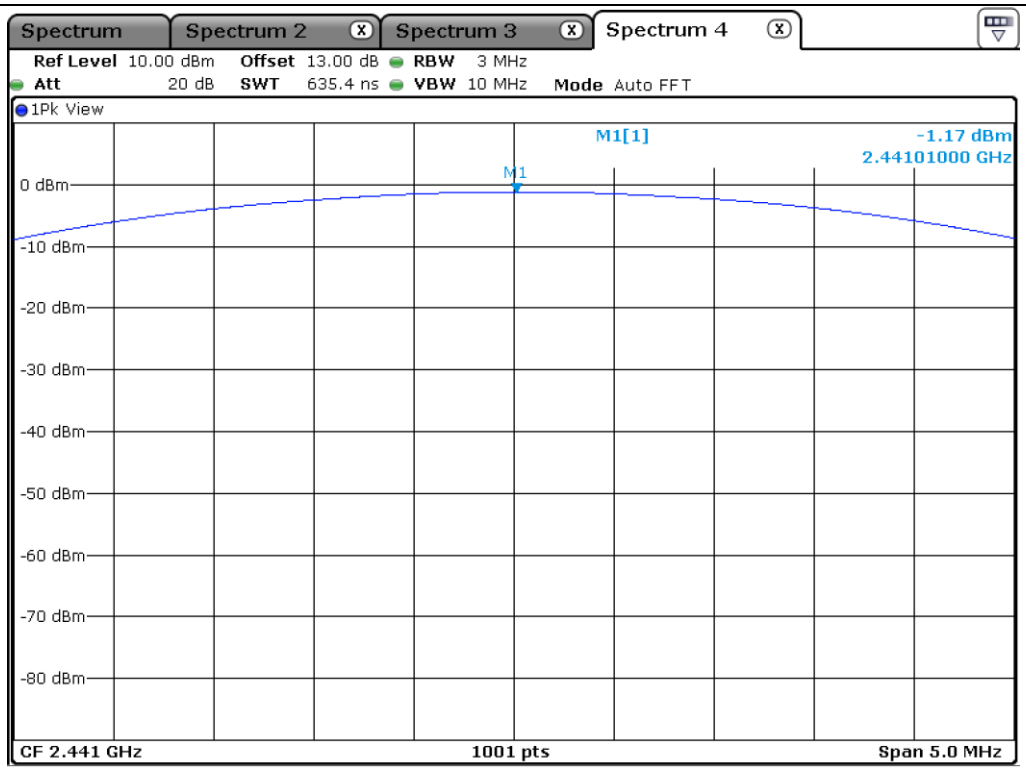
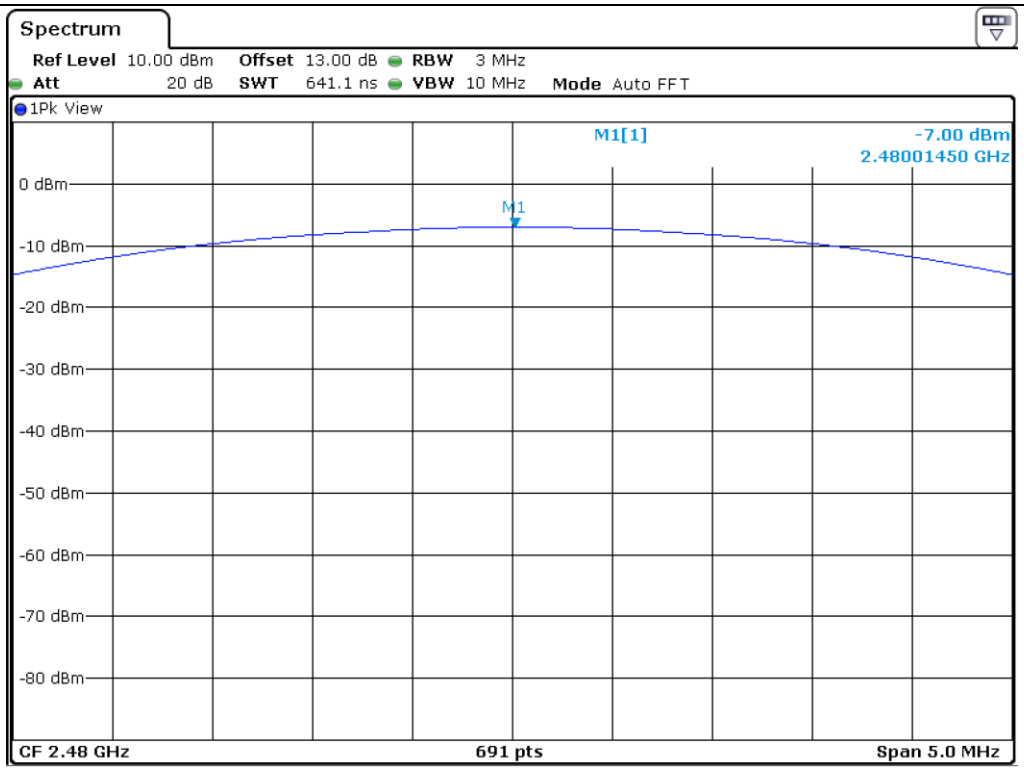


Middle Channel



High Channel

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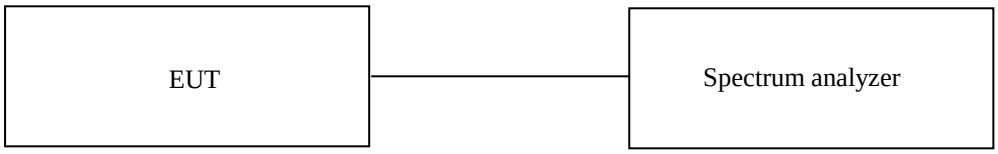
12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

12.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % R.H.

12.2 Test set-up for conducted measurement

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



12.3 Test set-up for radiated measurement

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

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

12.4 Test Date

May 02, 2022 ~ May 11, 2022

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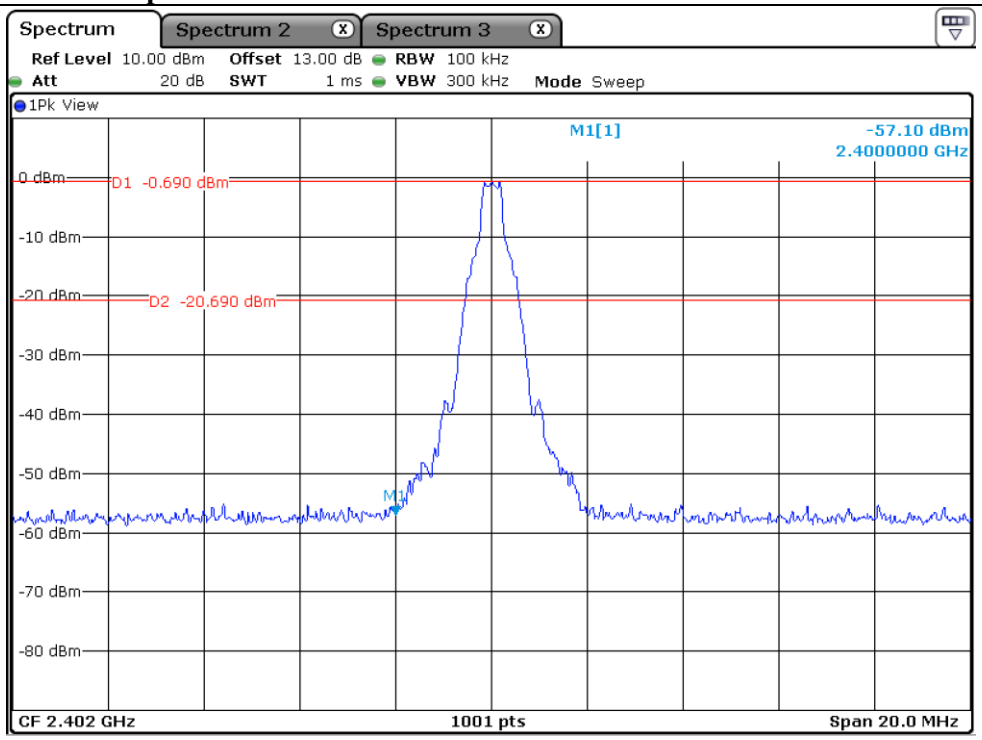
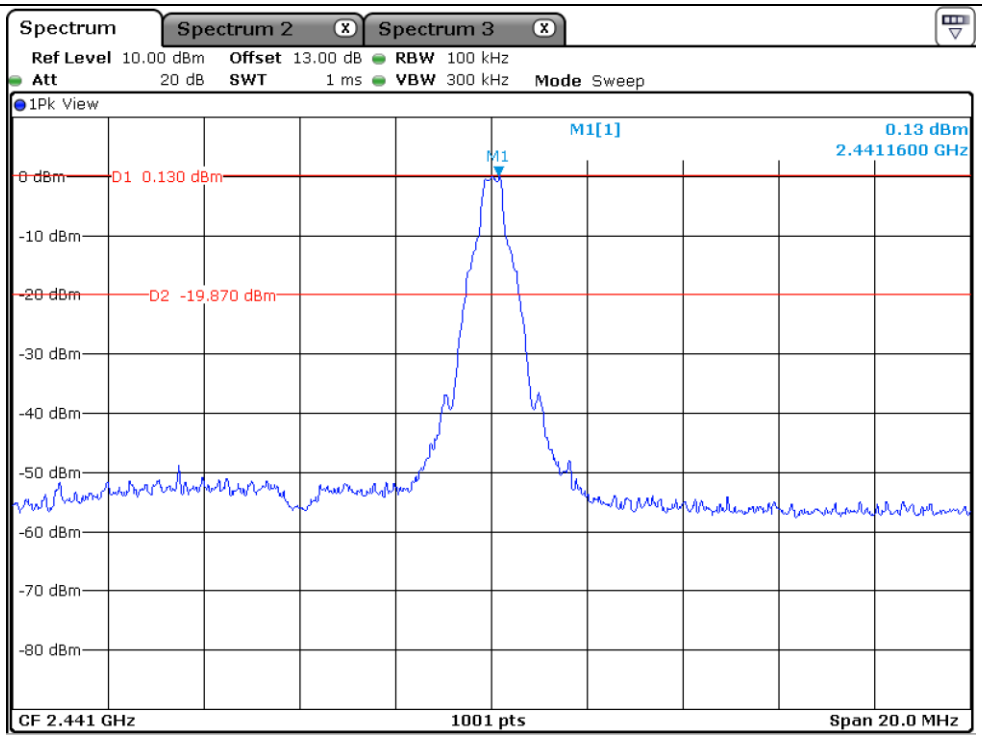
12.5 Test data for conducted emission

12.5.1 Test data for 1 Mbps

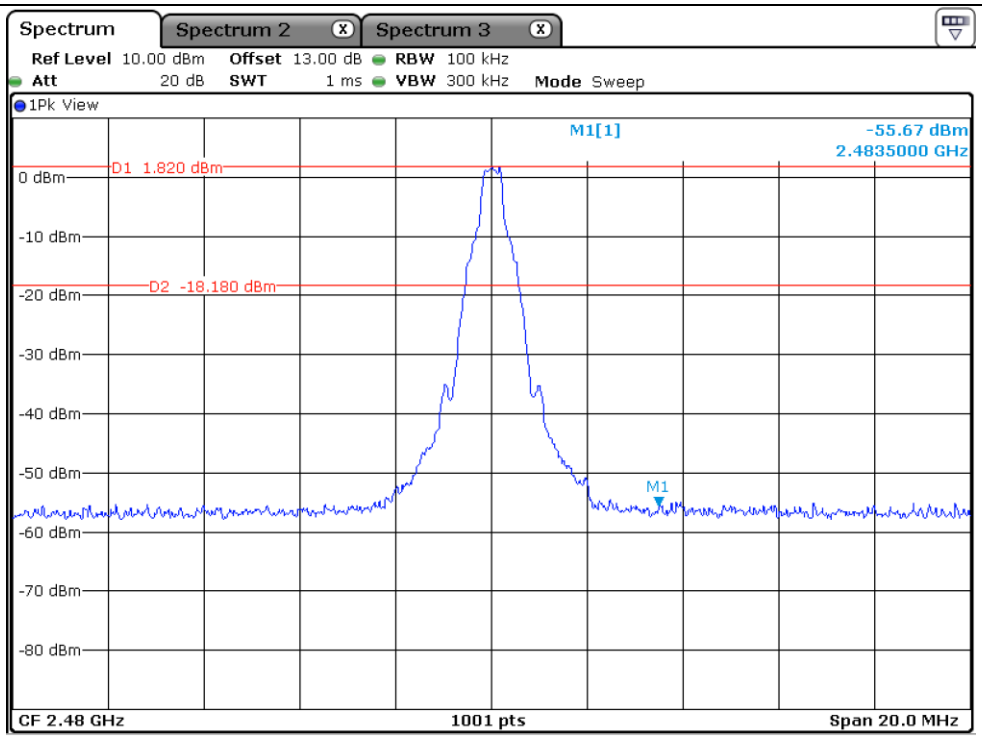


Low Channel



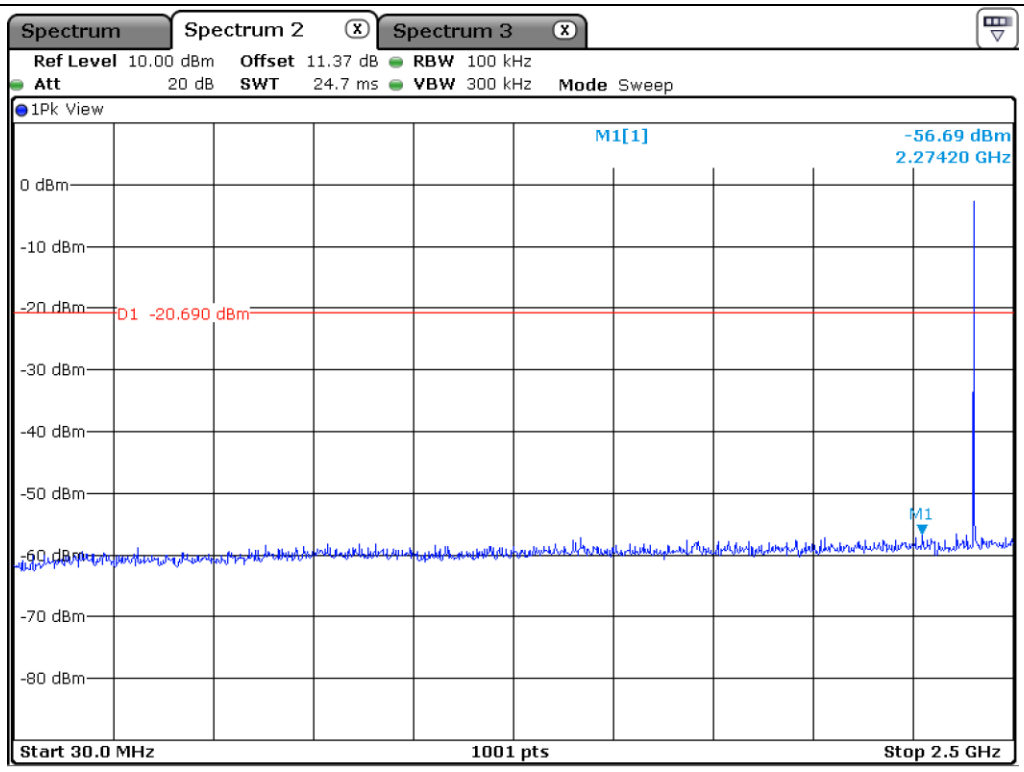
Middle Channel

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

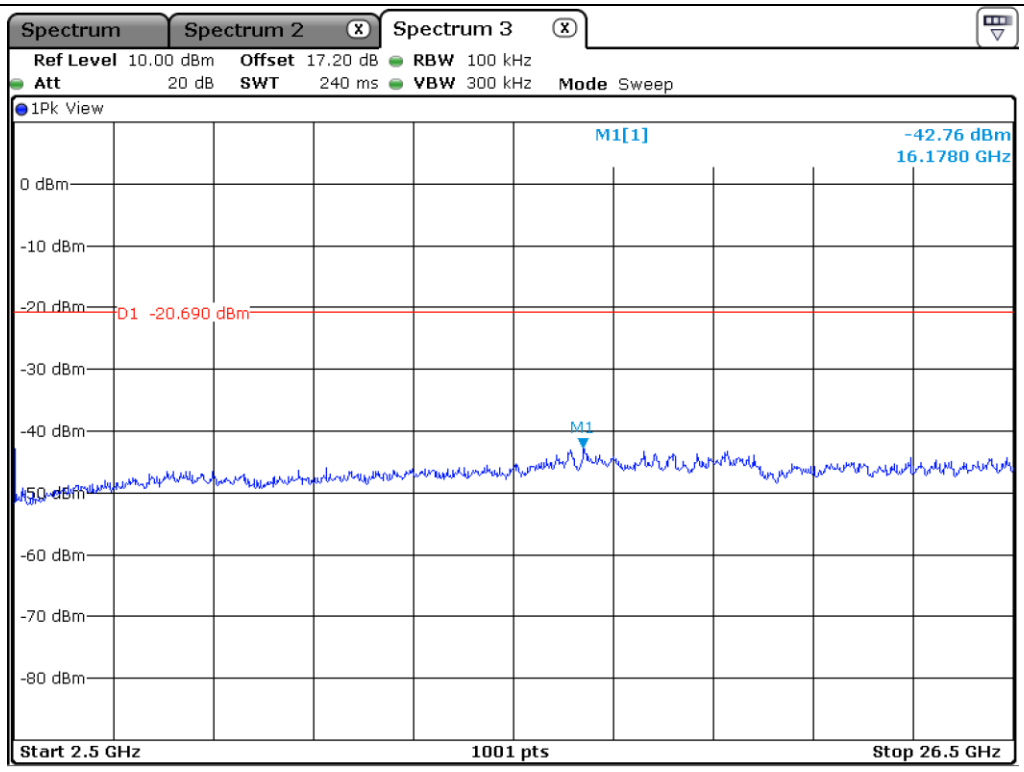


High Channel

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

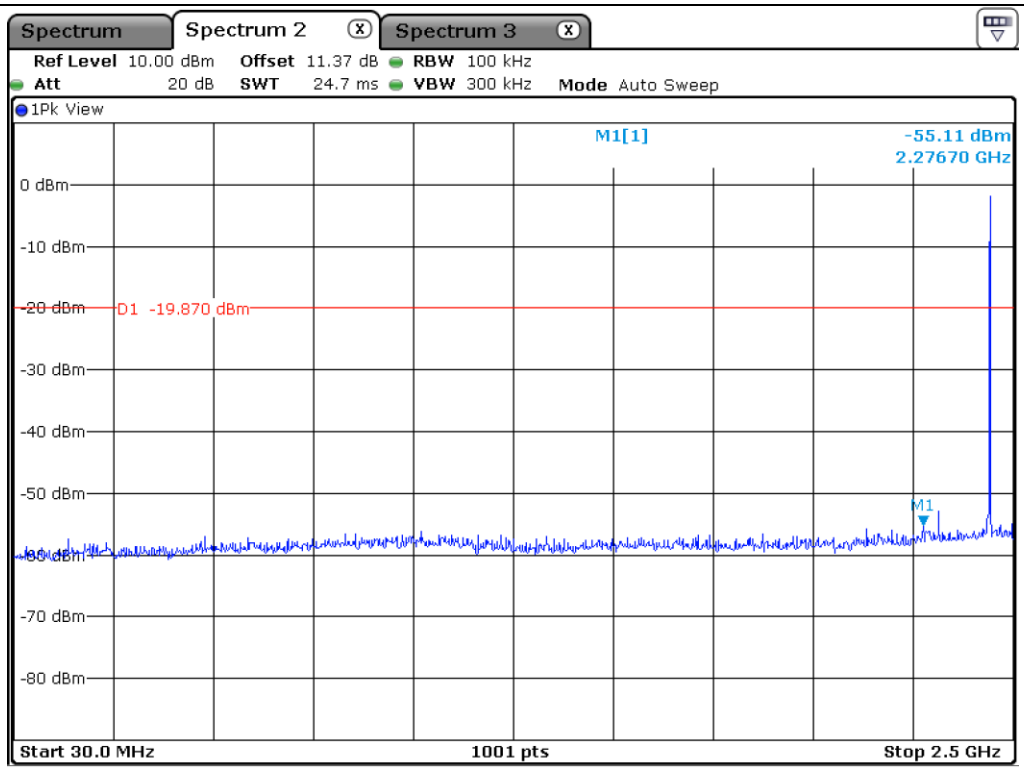


Low Channel

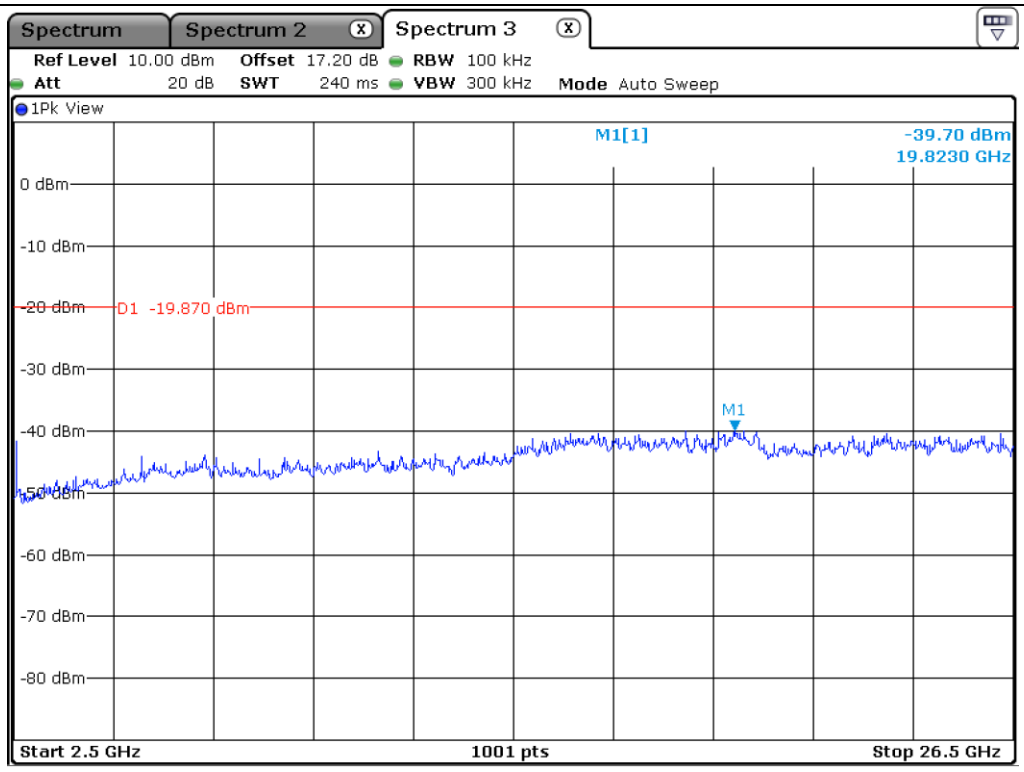


Low Channel

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

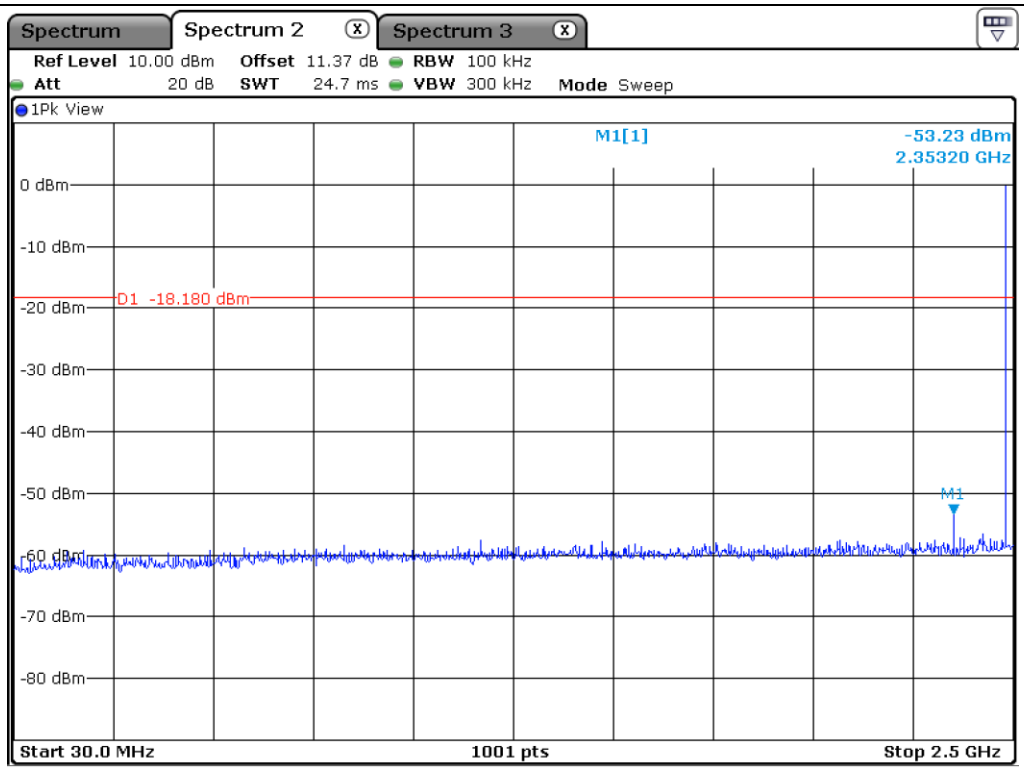


Middle Channel

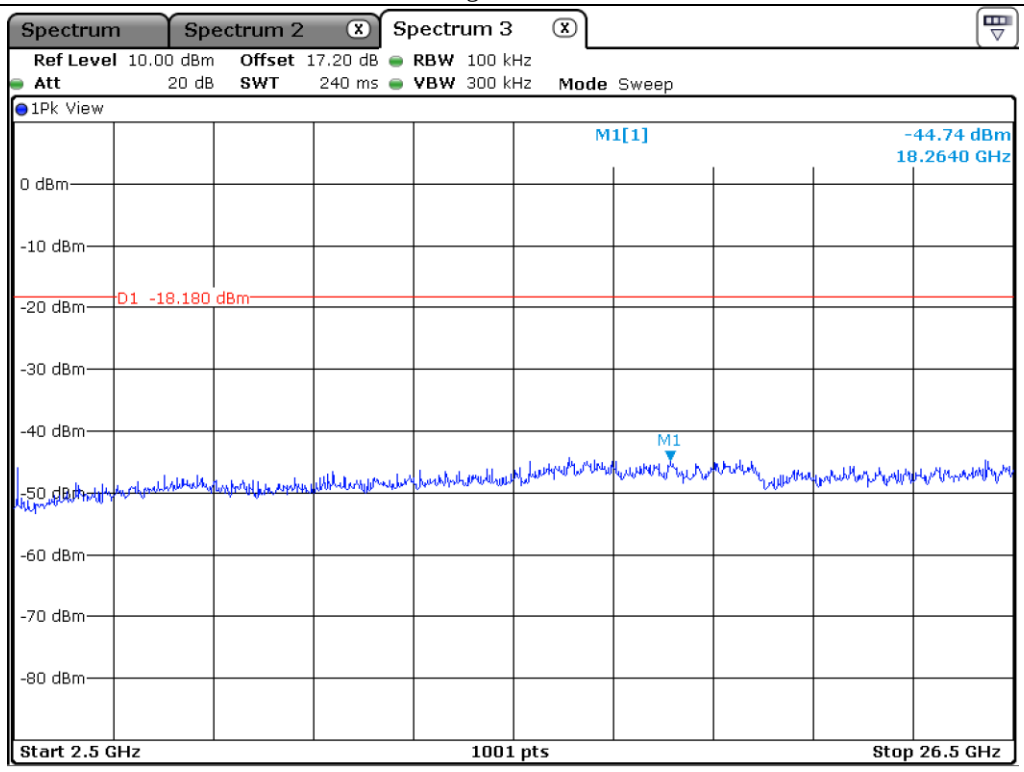


Middle Channel

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



High Channel



High Channel

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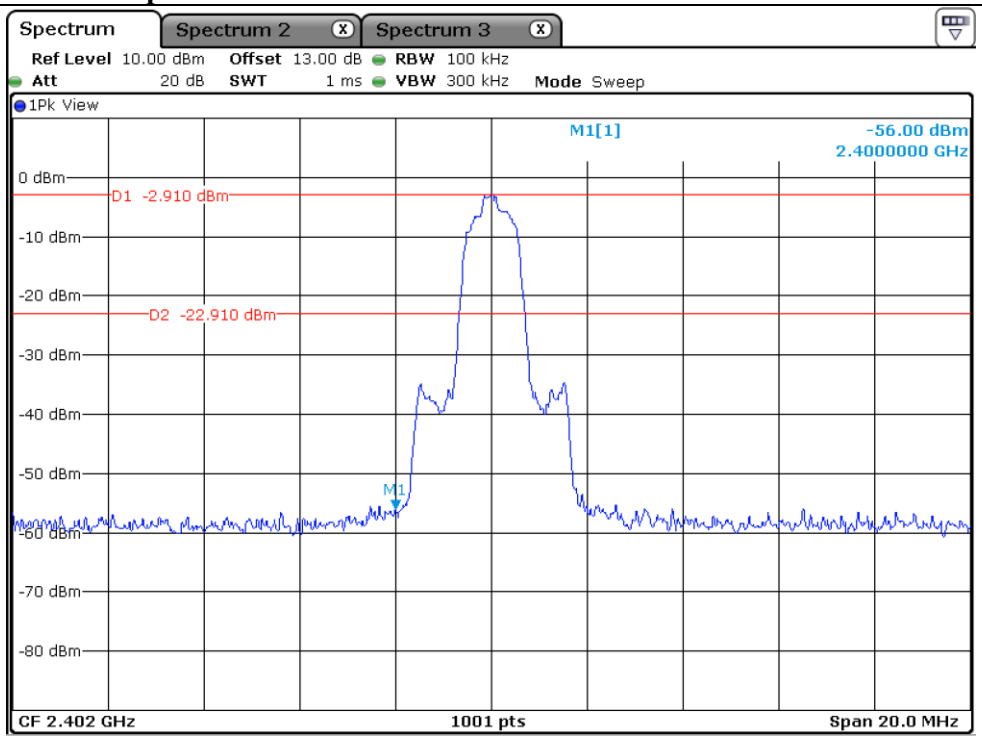
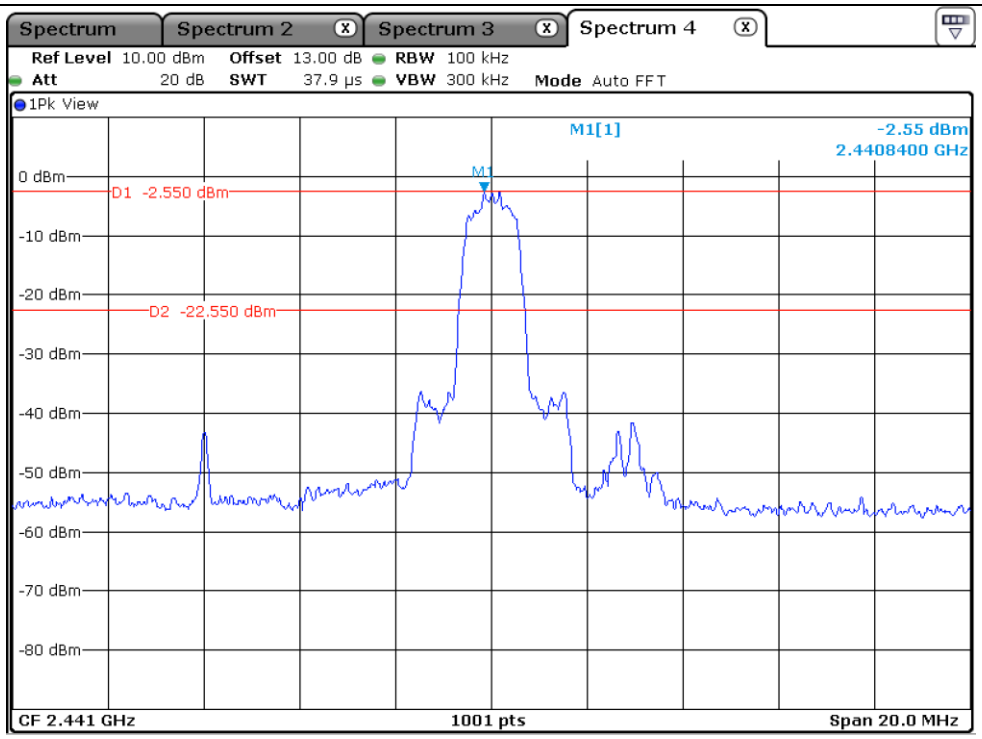
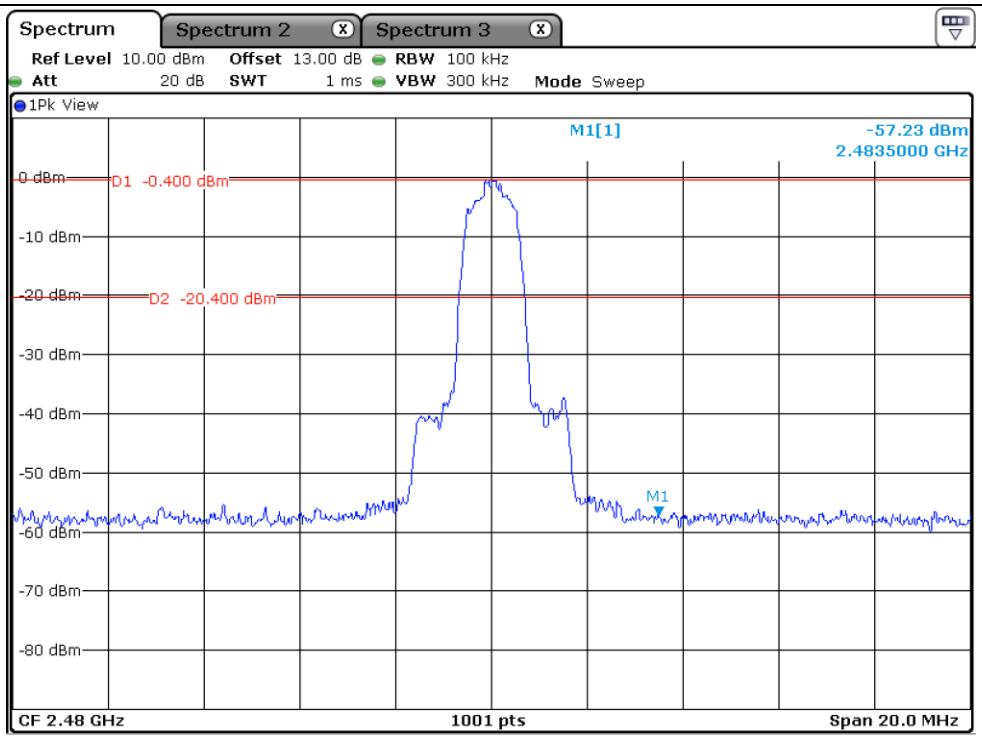
12.5.2 Test data for 2 Mbps



Low Channel

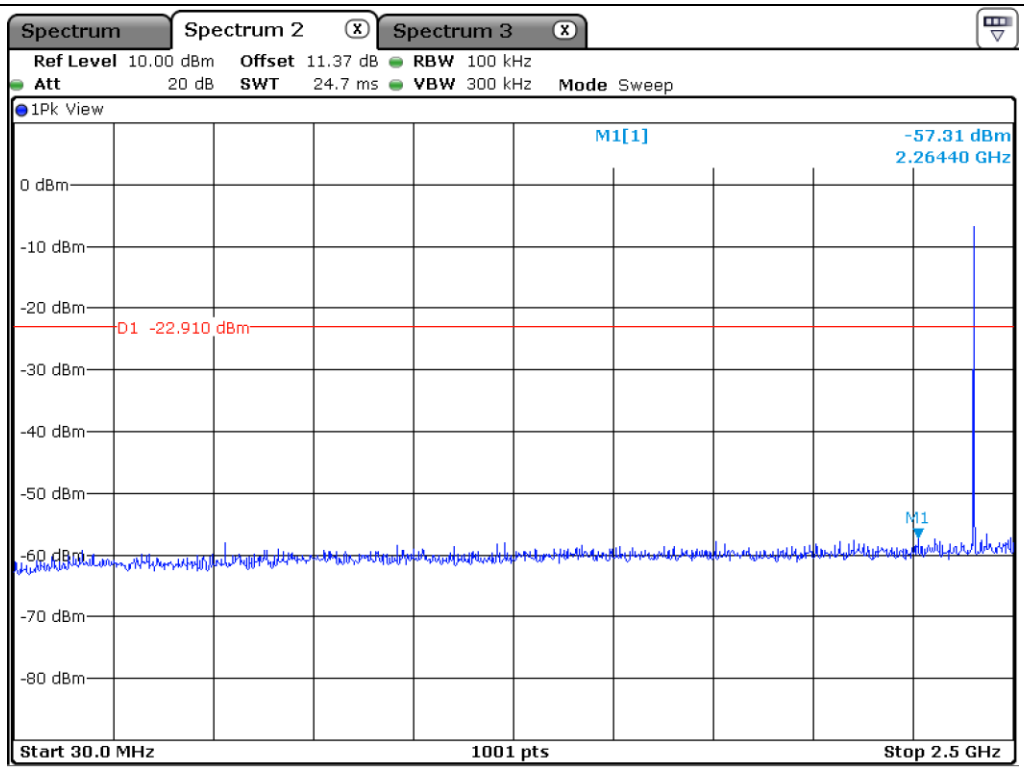


Middle Channel

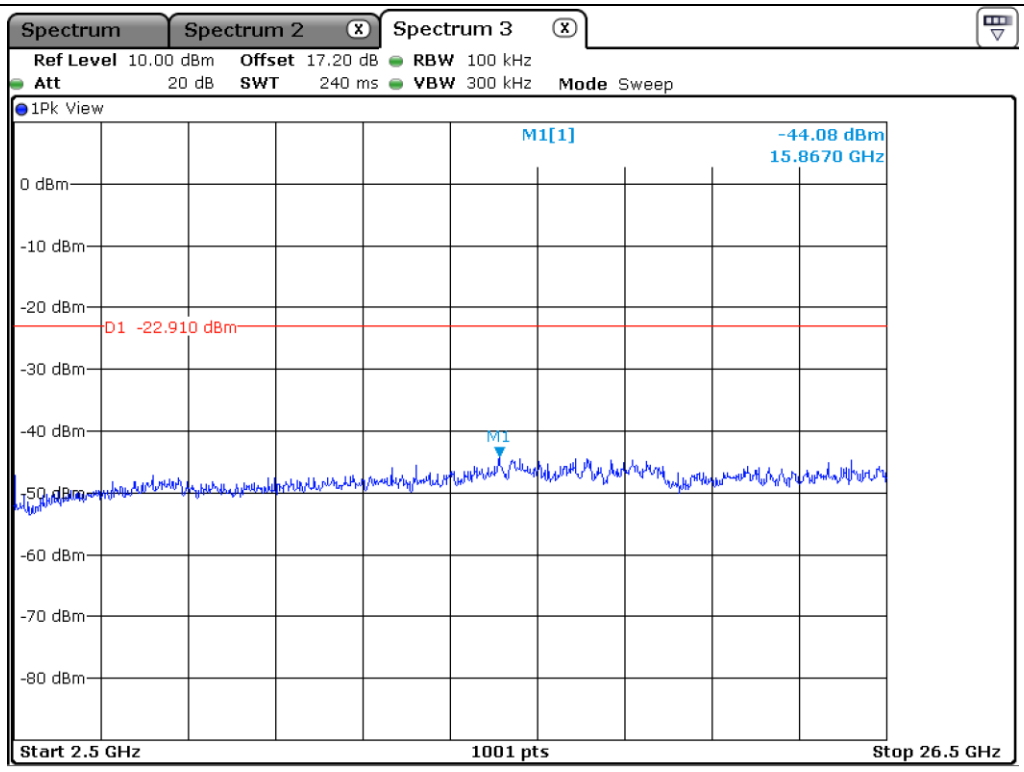


High Channel

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

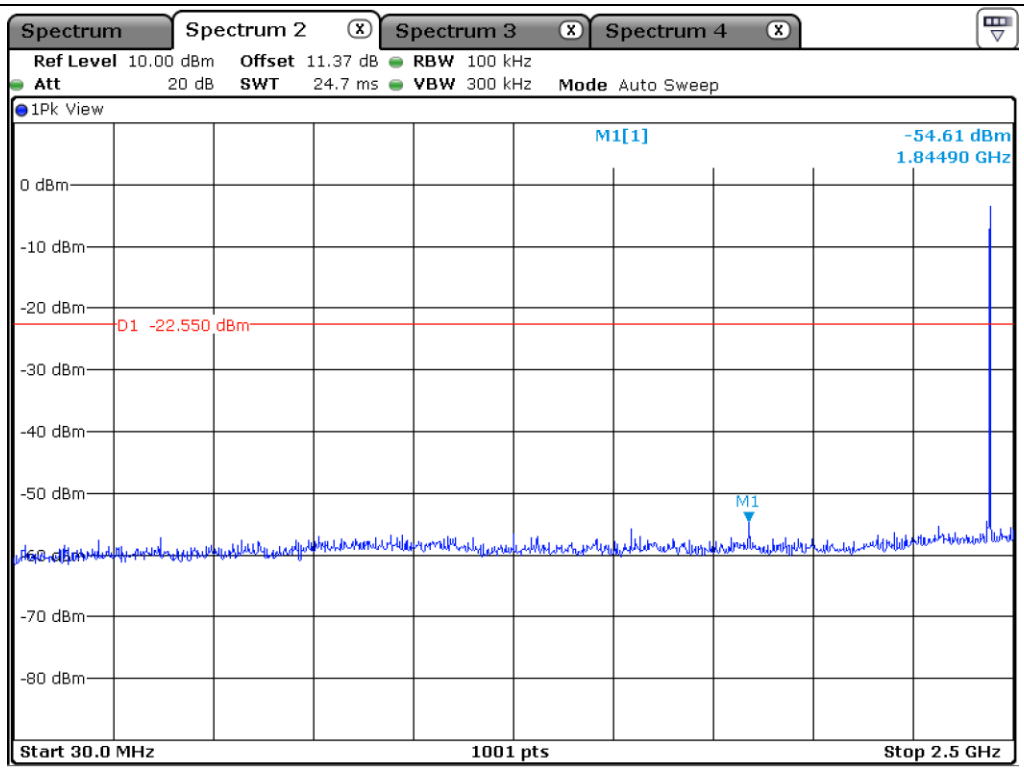


Low Channel

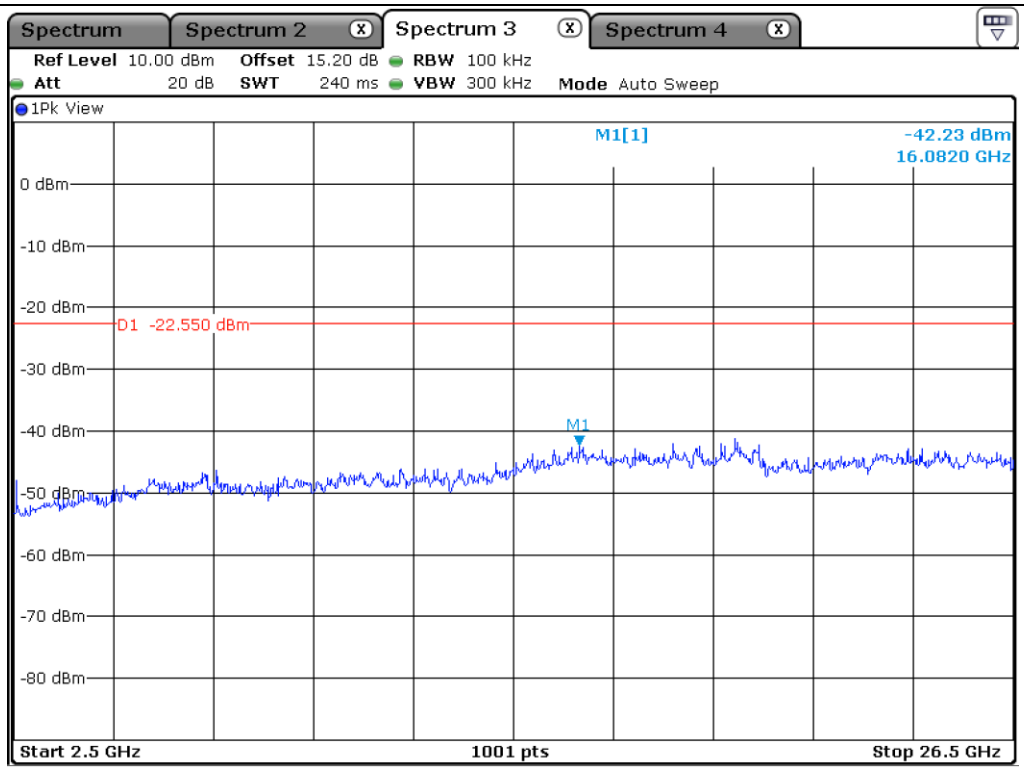


Low Channel

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

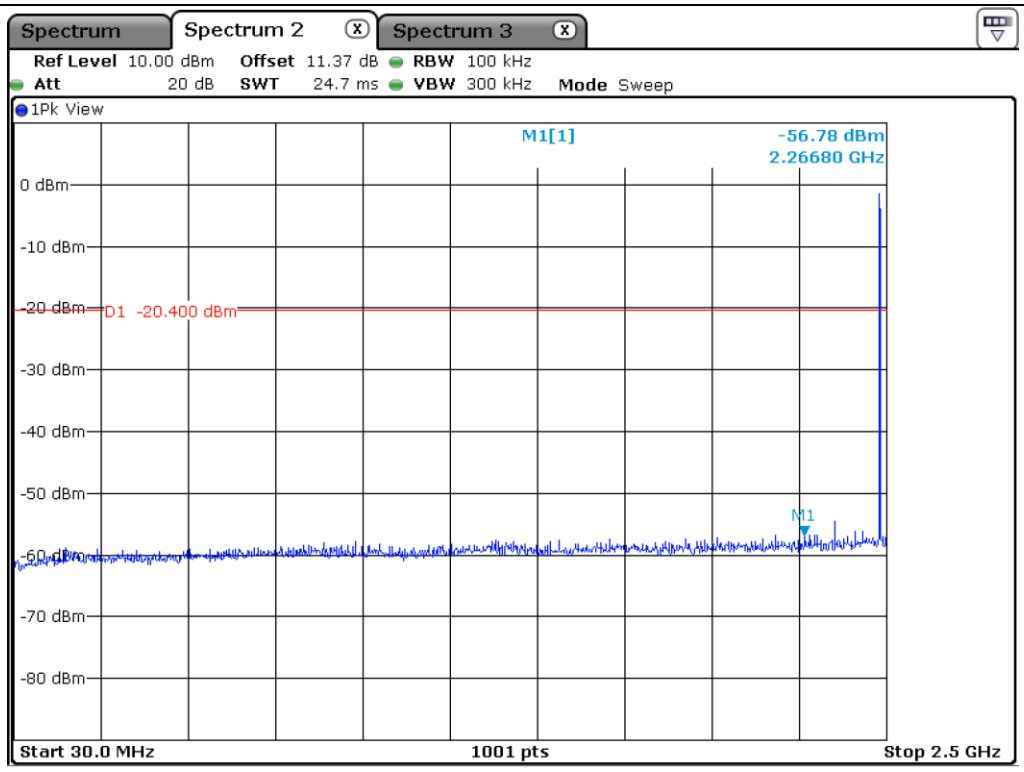


Middle Channel

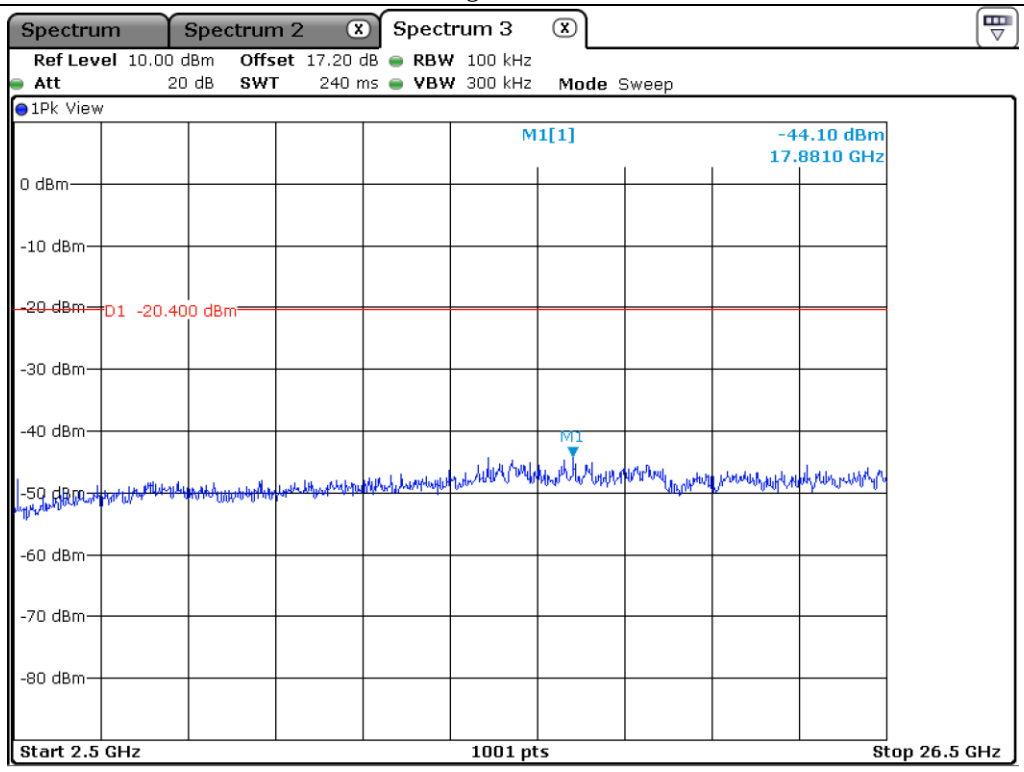


Middle Channel

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



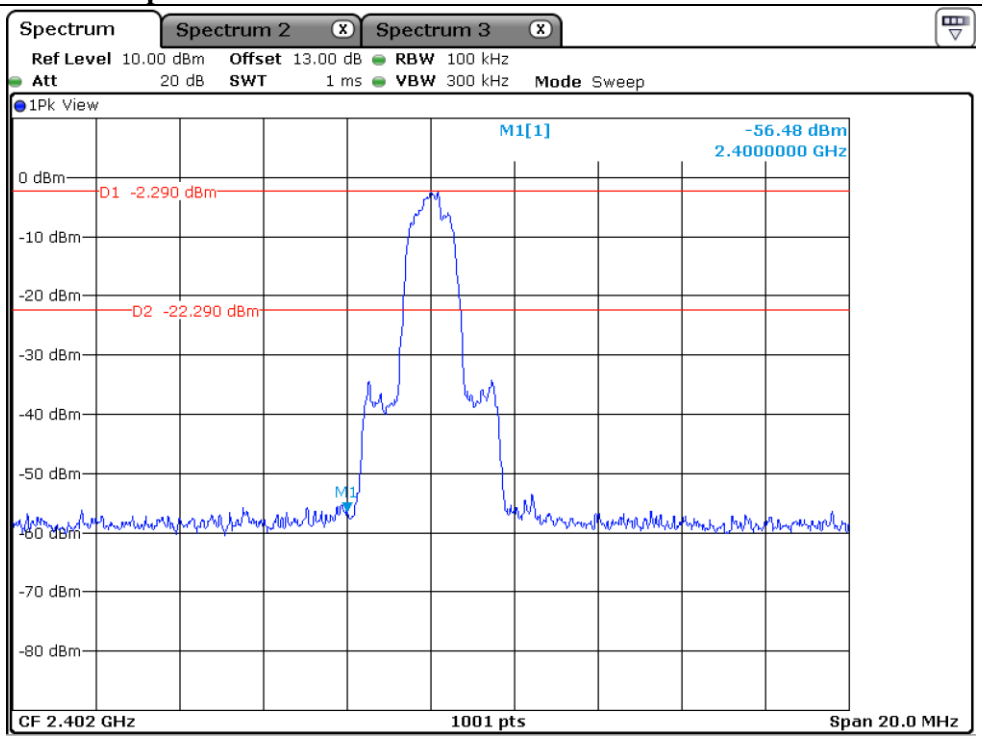
High Channel



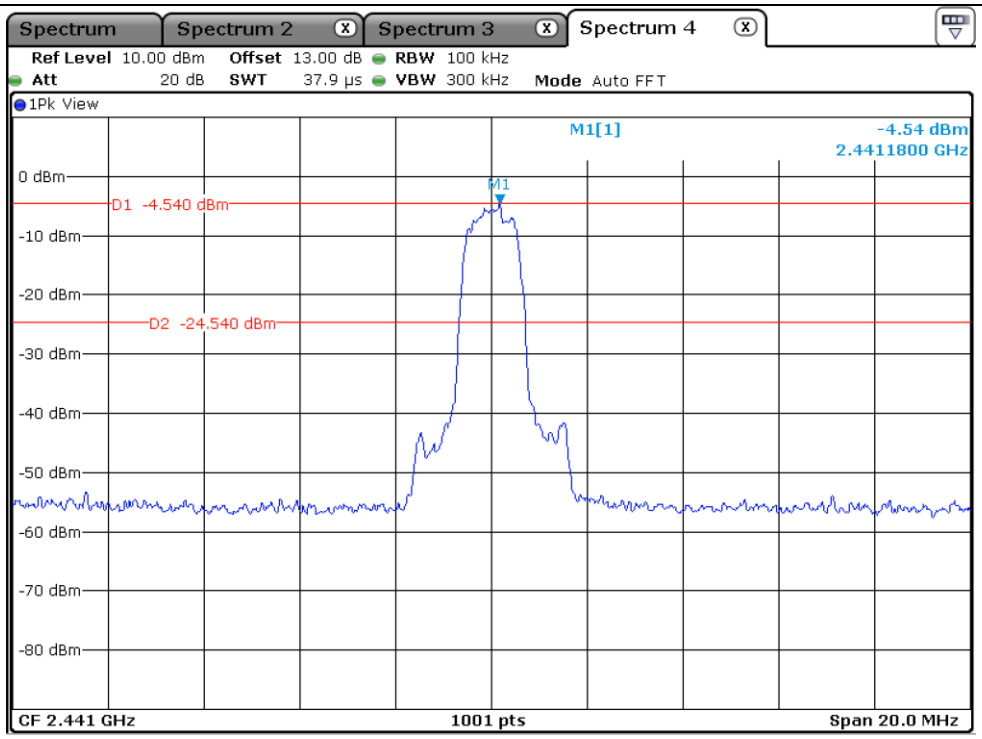
High Channel

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

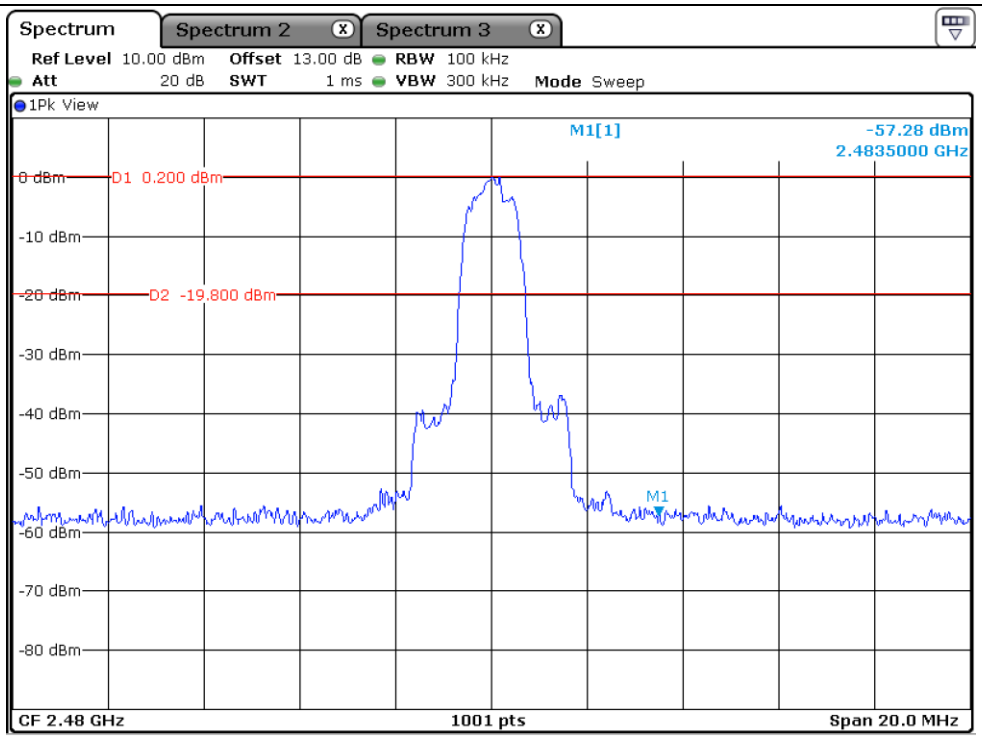
12.5.3 Test data for 3 Mbps



Low Channel

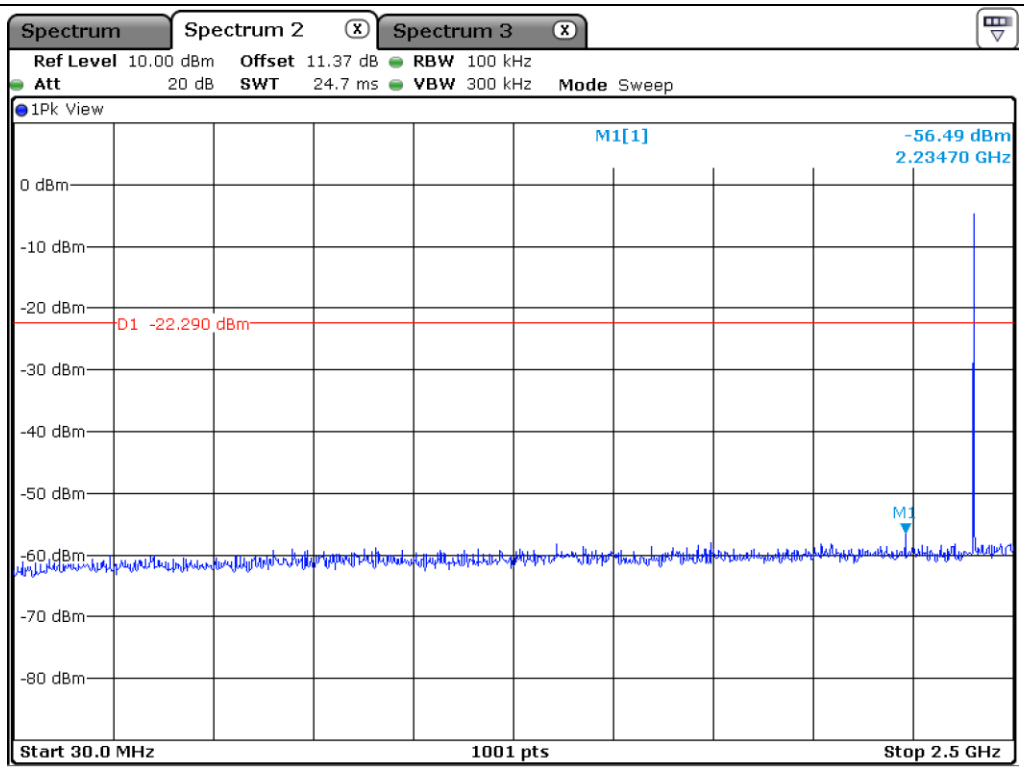


Middle Channel

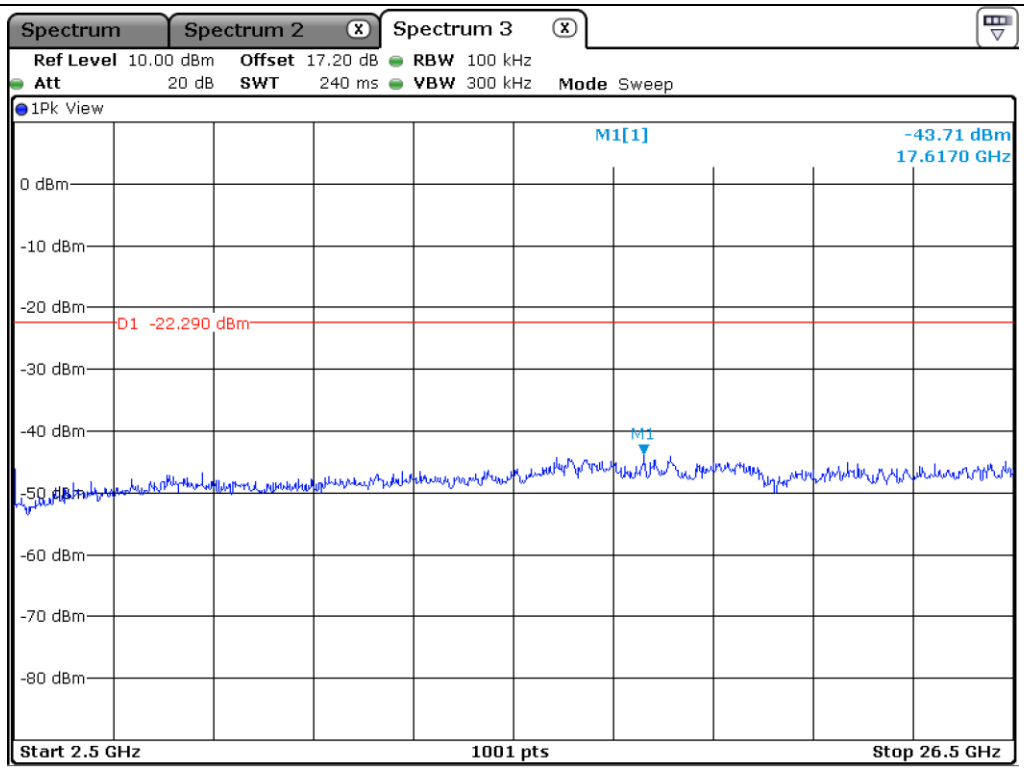


High Channel

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

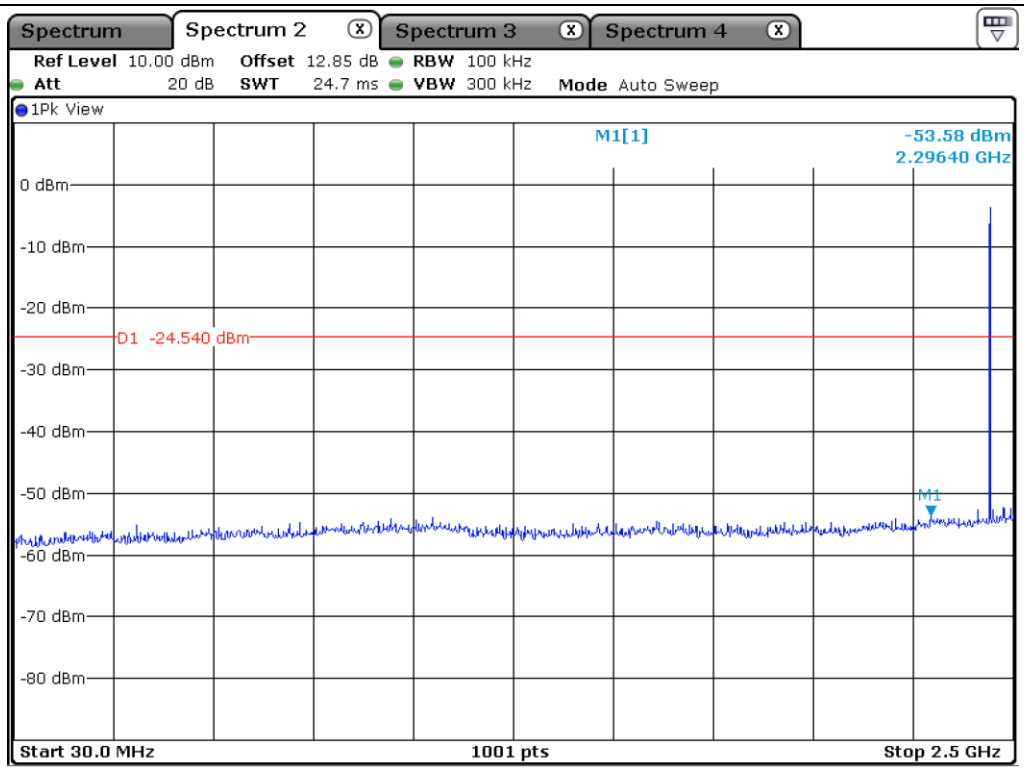


Low Channel

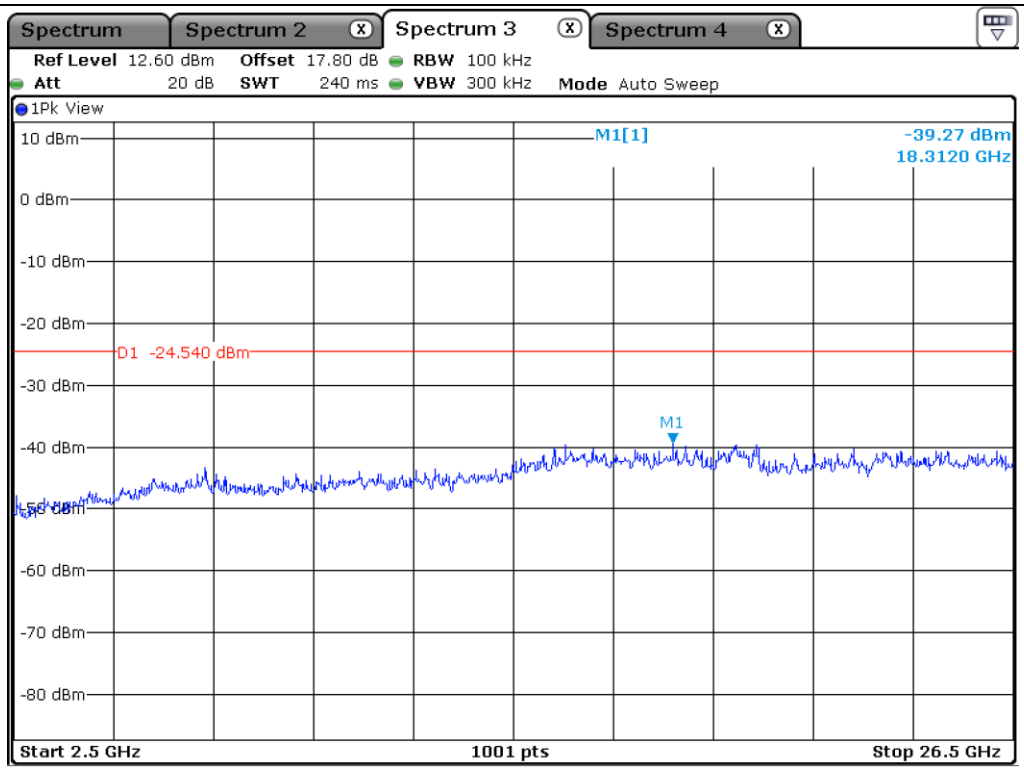


Low Channel

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

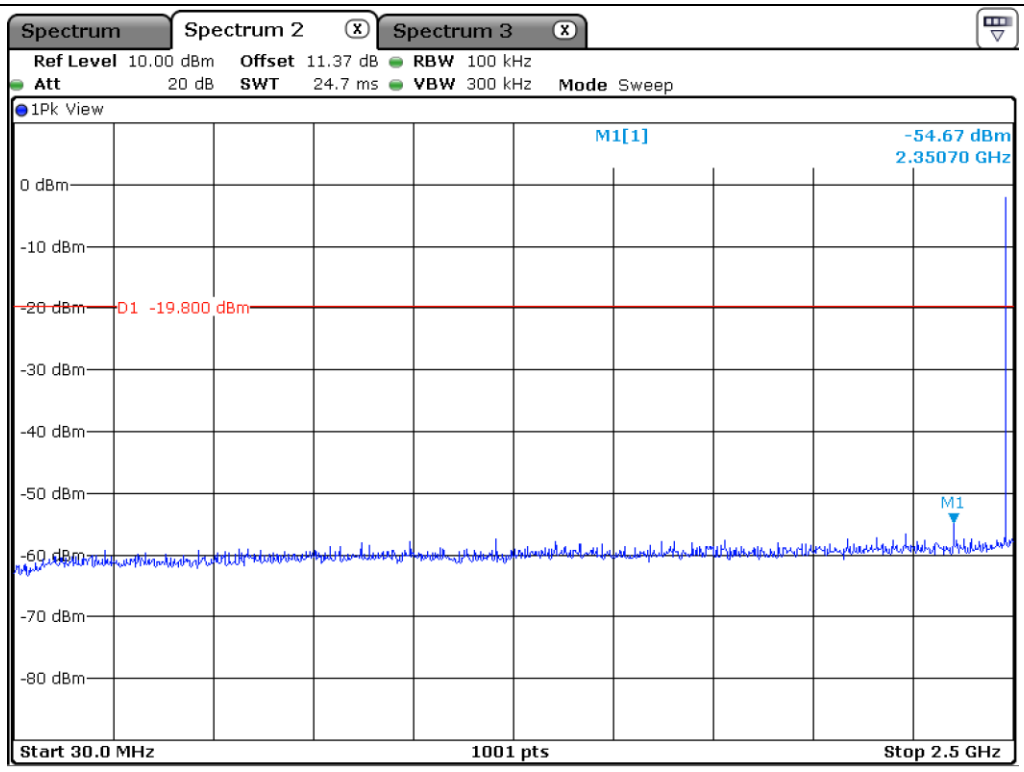


Middle Channel

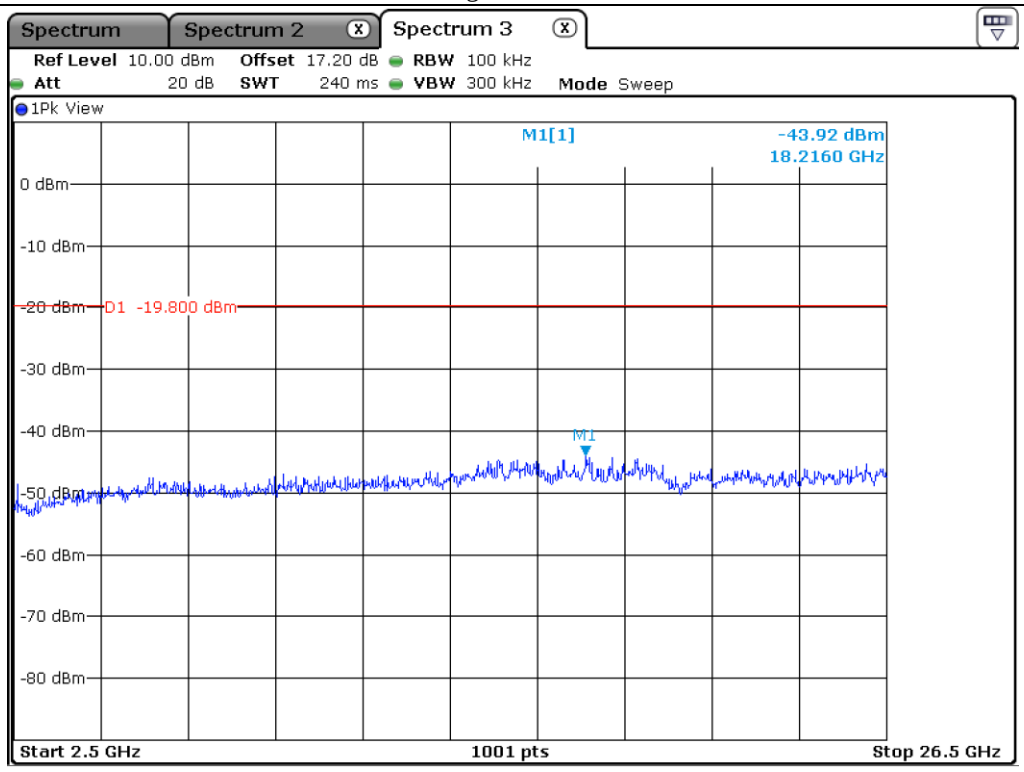


Middle Channel

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



High Channel



High Channel

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

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 : 76.87 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 344.03	56.46	Peak	H	28.50	6.80	45.14	-	46.62	74.00	27.38
2 335.58	44.46	Average	H	28.50	6.80	45.14	1.14	35.76	54.00	18.24
2 320.21	53.74	Peak	V	28.50	6.80	45.14	-	43.90	74.00	30.10
2 337.38	42.00	Average	V	28.50	6.80	45.14	1.14	33.30	54.00	20.70
Test Data for High Channel										
2 483.79	54.88	Peak	H	28.80	7.00	45.79	-	44.89	74.00	29.11
2 483.69	42.53	Average	H	28.80	7.00	45.79	1.14	33.68	54.00	20.32
2 488.72	54.27	Peak	V	28.80	7.00	45.79	-	44.28	74.00	29.72
2 489.62	42.27	Average	V	28.80	7.00	45.79	1.14	33.42	54.00	20.58

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – Amp Gain

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 : 77.06 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 337.56	53.66	Peak	H	28.50	6.80	45.14	-	43.82	74.00	30.18
2 366.96	42.02	Average	H	28.50	6.80	45.14	1.13	33.31	54.00	20.69
2 339.27	53.94	Peak	V	28.50	6.80	45.14	-	44.10	74.00	29.90
2 333.33	42.24	Average	V	28.50	6.80	45.14	1.13	33.53	54.00	20.47
Test Data for High Channel										
2 483.53	54.99	Peak	H	28.80	7.00	45.79	-	45.00	74.00	29.00
2 483.57	42.73	Average	H	28.80	7.00	45.79	1.13	33.87	54.00	20.13
2 487.38	53.68	Peak	V	28.80	7.00	45.79	-	43.69	74.00	30.31
2 493.12	42.06	Average	V	28.80	7.00	45.79	1.13	33.20	54.00	20.80

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – Amp Gain

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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 : 77.12 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel										
2 387.64	53.20	Peak	H	28.50	6.80	45.14	-	43.36	74.00	30.64
2 331.62	41.93	Average	H	28.50	6.80	45.14	1.13	33.22	54.00	20.78
2 338.37	53.45	Peak	V	28.50	6.80	45.14	-	43.61	74.00	30.39
2 349.25	42.25	Average	V	28.50	6.80	45.14	1.13	33.54	54.00	20.46
Test Data for High Channel										
2 483.51	55.59	Peak	H	28.80	7.00	45.79	-	45.60	74.00	28.40
2 483.65	42.70	Average	H	28.80	7.00	45.79	1.13	33.84	54.00	20.16
2 495.24	53.20	Peak	V	28.80	7.00	45.79	-	43.21	74.00	30.79
2 486.72	42.14	Average	V	28.80	7.00	45.79	1.13	33.28	54.00	20.72

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor – Amp Gain

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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 : 76.87 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	51.65	Peak	H	31.30	9.00	45.03	-	46.92	74.00	27.08
4 804.00	40.32	Average	H	31.30	9.00	45.03	1.14	36.73	54.00	17.27
4 804.00	51.86	Peak	V	31.30	9.00	45.03	-	47.13	74.00	26.87
4 804.00	40.42	Average	V	31.30	9.00	45.03	1.14	36.83	54.00	17.17
Test Data for Middle Channel										
4 882.00	51.62	Peak	H	31.30	9.20	45.03	-	47.09	74.00	26.91
4 882.00	40.34	Average	H	31.30	9.20	45.03	1.14	36.95	54.00	17.05
4 882.00	51.51	Peak	V	31.30	9.20	45.03	-	46.98	74.00	27.02
4 882.00	40.59	Average	V	31.30	9.20	45.03	1.14	37.20	54.00	16.80
Test Data for High Channel										
4 960.00	51.76	Peak	H	31.50	9.30	45.03	-	47.53	74.00	26.47
4 960.00	40.29	Average	H	31.50	9.30	45.03	1.14	37.20	54.00	16.80
4 960.00	52.22	Peak	V	31.50	9.30	45.03	-	47.99	74.00	26.01
4 960.00	41.62	Average	V	31.50	9.30	45.03	1.14	38.53	54.00	15.47

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor - Amp Gain

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 : 77.06 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	52.59	Peak	H	31.30	9.00	45.03	-	47.86	74.00	26.14
4 804.00	40.31	Average	H	31.30	9.00	45.03	1.13	36.71	54.00	17.29
4 804.00	52.00	Peak	V	31.30	9.00	45.03	-	47.27	74.00	26.73
4 804.00	40.42	Average	V	31.30	9.00	45.03	1.13	36.82	54.00	17.18
Test Data for Middle Channel										
4 882.00	51.41	Peak	H	31.30	9.20	45.03	-	46.88	74.00	27.12
4 882.00	40.32	Average	H	31.30	9.20	45.03	1.13	36.92	54.00	17.08
4 882.00	51.99	Peak	V	31.30	9.20	45.03	-	47.46	74.00	26.54
4 882.00	40.37	Average	V	31.30	9.20	45.03	1.13	36.97	54.00	17.03
Test Data for High Channel										
4 960.00	51.27	Peak	H	31.50	9.30	45.03	-	47.04	74.00	26.96
4 960.00	40.07	Average	H	31.50	9.30	45.03	1.13	36.97	54.00	17.03
4 960.00	51.66	Peak	V	31.50	9.30	45.03	-	47.43	74.00	26.57
4 960.00	40.33	Average	V	31.50	9.30	45.03	1.13	37.23	54.00	16.77

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor - Amp Gain

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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 : 77.12 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.00	51.95	Peak	H	31.30	9.00	45.03	-	47.22	74.00	26.78
4 804.00	40.31	Average	H	31.30	9.00	45.03	1.13	36.71	54.00	17.29
4 804.00	51.67	Peak	V	31.30	9.00	45.03	-	46.94	74.00	27.06
4 804.00	40.30	Average	V	31.30	9.00	45.03	1.13	36.70	54.00	17.30
Test Data for Middle Channel										
4 882.00	51.48	Peak	H	31.30	9.20	45.03	-	46.95	74.00	27.05
4 882.00	40.44	Average	H	31.30	9.20	45.03	1.13	37.04	54.00	16.96
4 882.00	51.25	Peak	V	31.30	9.20	45.03	-	46.72	74.00	27.28
4 882.00	40.55	Average	V	31.30	9.20	45.03	1.13	37.15	54.00	16.85
Test Data for High Channel										
4 960.00	51.37	Peak	H	31.50	9.30	45.03	-	47.14	74.00	26.86
4 960.00	40.10	Average	H	31.50	9.30	45.03	1.13	37.00	54.00	17.00
4 960.00	51.42	Peak	V	31.50	9.30	45.03	-	47.19	74.00	26.81
4 960.00	40.38	Average	V	31.50	9.30	45.03	1.13	37.28	54.00	16.72

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor - Amp Gain

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13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % R.H.

13.2 Test set-up

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

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

13.3 Test Date

May 02, 2022 ~ May 11, 2022

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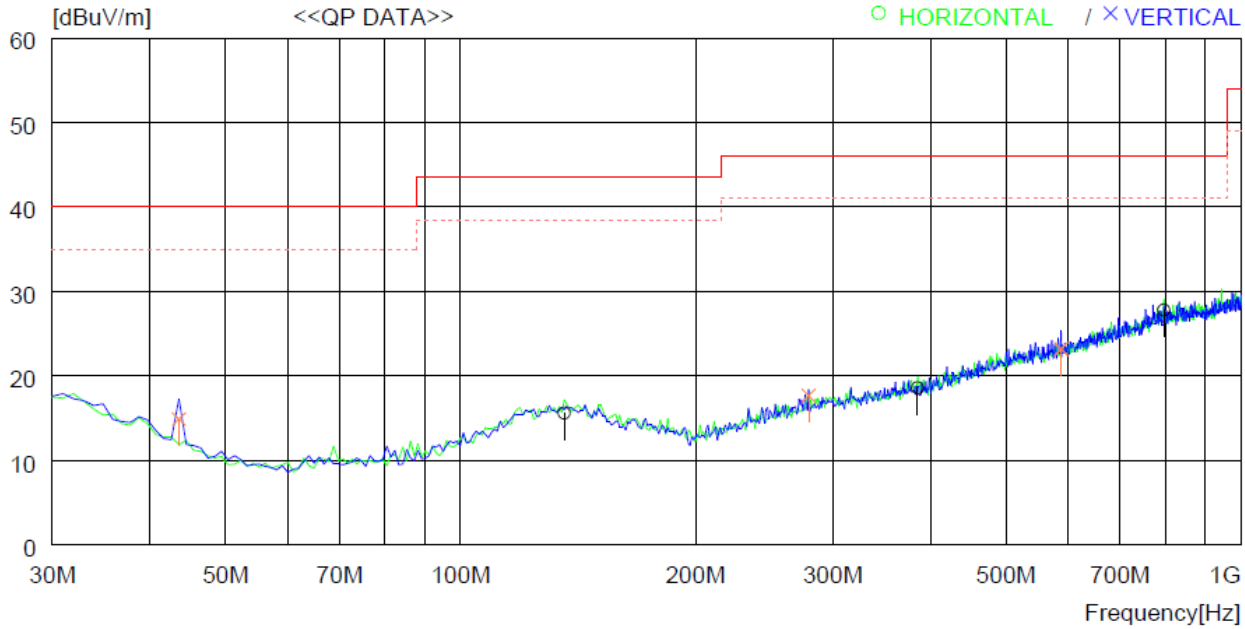
13.4 Test data for 30 MHz ~ 1000 MHz

-. 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	135.730	26.5	19.1	2.1	32.1	15.6	43.5	27.9	300	359
2	385.020	27.0	20.4	3.4	32.2	18.6	46.0	27.4	100	359
3	796.292	28.3	26.9	4.9	32.3	27.8	46.0	18.2	200	100
----- Vertical ------										
4	43.580	30.2	15.4	1.3	32.0	14.9	40.0	25.1	100	0
5	279.290	28.5	18.5	2.9	32.2	17.7	46.0	28.3	100	0
6	587.748	27.4	24.0	4.2	32.4	23.2	46.0	22.8	100	232

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13.5 Test data for Below 30 MHz

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

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

13.6 Test data for above 1 GHz

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

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

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14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature	:	22 °C
Relative humidity	:	46 % 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 μH + 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

May 02, 2022 ~ May 11, 2022

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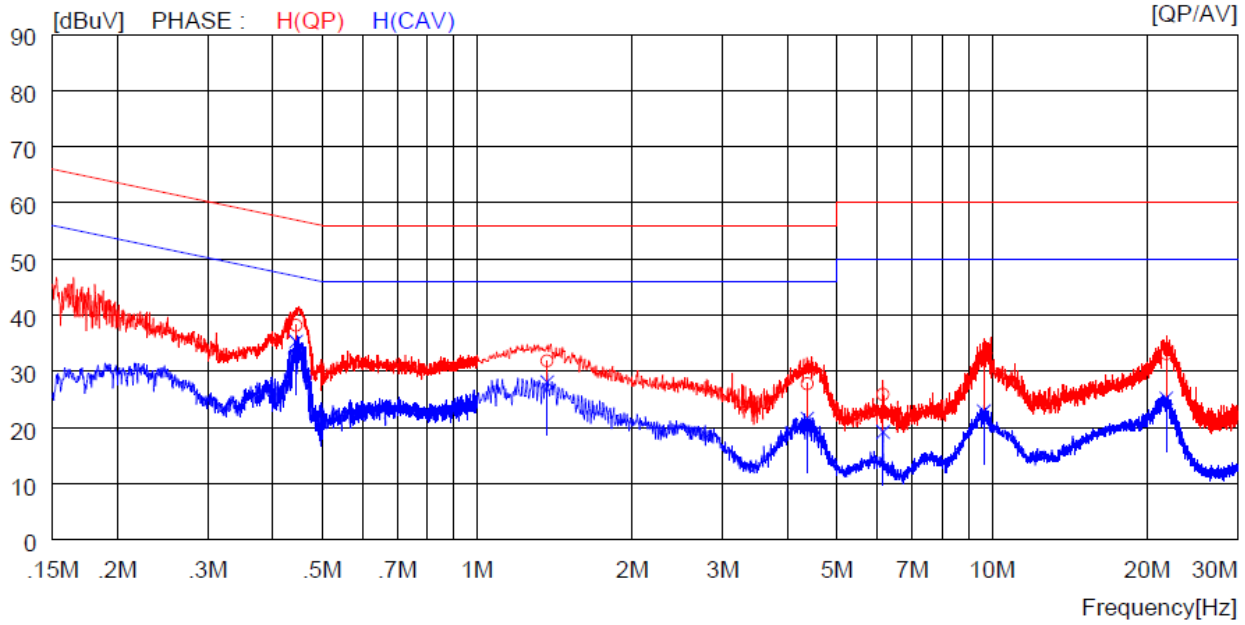
14.4 Test data

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.44500	28.3	----	9.9	38.2	----	57.0	----	18.8	----	H(QP)
2	1.36800	21.8	----	10.1	31.9	----	56.0	----	24.1	----	H(QP)
3	4.38000	17.7	----	10.1	27.8	----	56.0	----	28.2	----	H(QP)
4	6.14500	15.8	----	10.1	25.9	----	60.0	----	34.1	----	H(QP)
5	9.64000	22.4	----	10.3	32.7	----	60.0	----	27.3	----	H(QP)
6	21.80000	22.5	----	10.6	33.1	----	60.0	----	26.9	----	H(QP)
7	0.44500	----	25.4	9.9	----	35.3	----	47.0	----	11.7	H(CAV)
8	1.36800	----	18.0	10.1	----	28.1	----	46.0	----	17.9	H(CAV)
9	4.38000	----	11.5	10.1	----	21.6	----	46.0	----	24.4	H(CAV)
10	6.14500	----	9.1	10.1	----	19.2	----	50.0	----	30.8	H(CAV)
11	9.64000	----	12.6	10.3	----	22.9	----	50.0	----	27.1	H(CAV)
12	21.80000	----	14.6	10.6	----	25.2	----	50.0	----	24.8	H(CAV)

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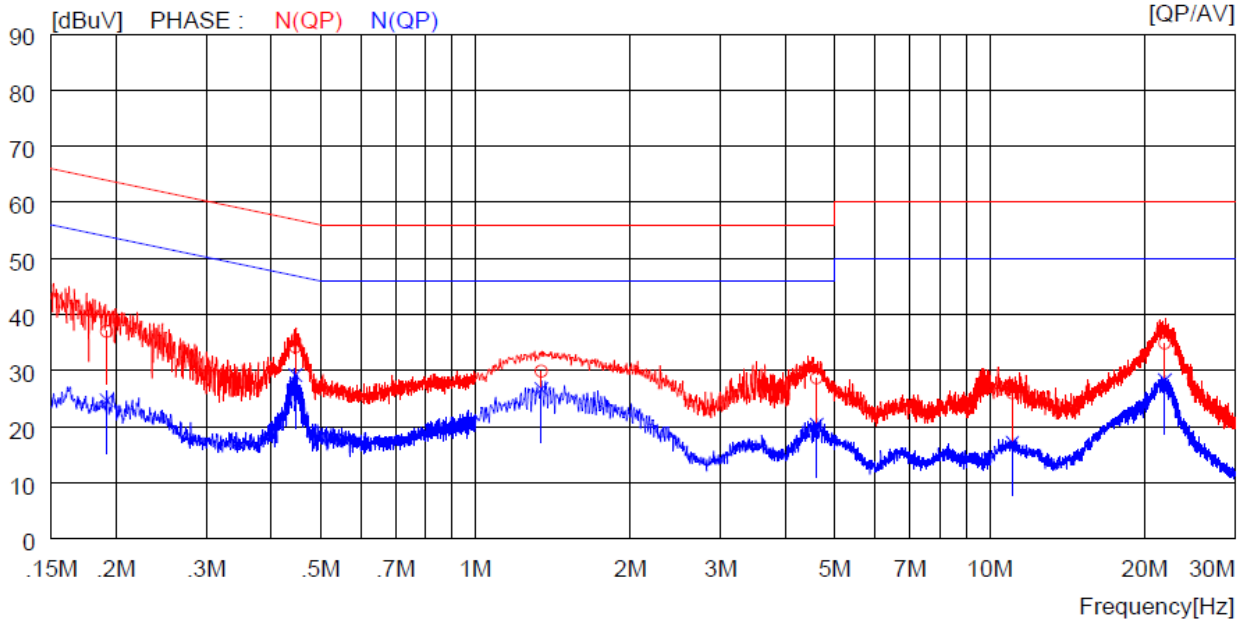
-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.19200	27.1	----	9.9	37.0	----	63.9	----	26.9	----	N(QP)
2	0.44700	24.3	----	9.9	34.2	----	56.9	----	22.7	----	N(QP)
3	1.34400	19.9	----	10.0	29.9	----	56.0	----	26.1	----	N(QP)
4	4.60800	18.6	----	10.1	28.7	----	56.0	----	27.3	----	N(QP)
5	11.08000	15.7	----	10.3	26.0	----	60.0	----	34.0	----	N(QP)
6	21.92000	24.3	----	10.6	34.9	----	60.0	----	25.1	----	N(QP)
7	0.19200	----	14.8	9.9	----	24.7	----	53.9	----	29.2	N(CAV)
8	0.44700	----	19.3	9.9	----	29.2	----	46.9	----	17.7	N(CAV)
9	1.34400	----	16.7	10.0	----	26.7	----	46.0	----	19.3	N(CAV)
10	4.60800	----	10.3	10.1	----	20.4	----	46.0	----	25.6	N(CAV)
11	11.08000	----	6.9	10.3	----	17.2	----	50.0	----	32.8	N(CAV)
12	21.92000	----	17.7	10.6	----	28.3	----	50.0	----	21.7	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.

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15. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 14, 2021 (1Y)
ESR7	Rohde & Schwarz	EMI Test Receiver	102190	Oct. 12, 2021 (1Y)
ESH3-Z2	Rohde & Schwarz	PULSE LIMITER	100655	Mar. 14, 2022 (1Y)
NSLK8126	Schwarzbeck	AMN	8128216	Mar. 14, 2022 (1Y)
310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 15, 2022 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 14, 2021 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Jan. 18, 2022 (1Y)
DT2000-2t	Innco Systems GmbH	Turn Table	N/A	N/A
CO3000	Innco Systems GmbH	Controller	1026/40960617/P	N/A
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652/43100318/P	N/A
HLP-2008	TDK RF Solutions	Hybrid Antenna	131316	Mar. 07, 2022 (2Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 06, 2022(1Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2021 (1Y)
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2022(2Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 18, 2022 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC POWER SUPPLY	5071069	Jan. 03, 2022 (1Y)

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