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

Test Report No.	**: OT-203-RWD-031**
AGR No.	**: A201A-176**
Applicant	**: Canon Electronic Business Machines (H.K.) Co., Ltd.**
Address	**: 17/F., Tower One, Ever Gain Plaza, 82-100 Container Port Road, Kwai Chung, New Territories, Hong Kong**
Manufacturer	**: Canon Electronic Business Machines (H.K.) Co., Ltd.**
Address	**: 17/F., Tower One, Ever Gain Plaza, 82-100 Container Port Road, Kwai Chung, New Territories, Hong Kong**
Type of Equipment	**: Instant Camera Printer**
FCC ID.	**: Y7J-PP2002**
Model Name	**: PP2002**
Serial number	**: N/A**
Total page of Report	**: 79 pages (including this page)**
Date of Incoming	**: January 09, 2020**
Date of issue	**: March 11, 2020**

SUMMARY

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

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

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

Reviewed by: Tae-Ho, Kim / Senior Manager
ONETECH Corp.

Approved by: Ki-Hong, Nam / General Manager
ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-203-RWD-031	March 11, 2020	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : Canon Electronic Business Machines (H.K.) Co., Ltd.
Address : 17/F., Tower One, Ever Gain Plaza, 82-100 Container Port Road, Kwai Chung, New Territories, Hong Kong
Contact Person : Chi Tat, Leung / R&D Director
Telephone No. : 852-2305-8400
FCC ID : Y7J-PP2002
Model Name : PP2002
Brand Name : Canon
Serial Number : N/A
Date : March 11, 2020

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Instant Camera 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 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

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

2. TEST SUMMARY

2.1 Test items and results

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

2.2 Additions, deviations, exclusions from standards

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

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

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

2.5 Test Methodology

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

2.6 Test Facility

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

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

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry 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 Canon Electronic Business Machines (H.K.) Co., Ltd., Model PP2002 (referred to as the EUT in this report) is a Instant Camera Printer. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Instant Camera Printer		
Temperature Range	5 °C ~ 40 °C		
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
MODULATION TYPE	Bluetooth LE	GFSK	
	Bluetooth	GFSK for 1Mbps, π/4-DQPSK for 2Mbps, 8-DPSK for 3Mbps	
RF OUTPUT POWER	Bluetooth LE	1.55 dBm	
	Bluetooth	1 Mbps	3.02 dBm
		2 Mbps	1.76 dBm
		3 Mbps	2.32 dBm
ANTENNA TYPE	Chip Antenna		
ANTENNA GAIN	1.80 dBi		
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz , 24 MHz		

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

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

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

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Canon Electronic Business Machines (H.K.) Co., Ltd.	PLUTO A PLUS MAIN V1.0	N/A
Key Board	Canon Electronic Business Machines (H.K.) Co., Ltd.	PLUTO A PLUS KEY V1.0	N/A
LED Board	Canon Electronic Business Machines (H.K.) Co., Ltd.	PLUTO A PLUS LED V1.0	N/A
Camera Board	Canon Electronic Business Machines (H.K.) Co., Ltd.	PLUTO A PLUS CAMERA V1.0	N/A
Camera Module	N/A	N/A	N/A
Battery	EVE Energy Co., Ltd	P0929-LF	N/A
Speaker	N/A	N/A	N/A
Motor Module	N/A	N/A	N/A

5.2 Peripheral equipment

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

-. Charging Mode

Model	Manufacturer	Description	Connected to
PP2002	Canon Electronic Business Machines (H.K.) Co., Ltd.	Instant Camera Printer (EUT)	-
EP-TA20KWK	Dongguan City Yingju Electronics Co., Ltd	Adaptor	EUT

-. Transmitting Mode

Model	Manufacturer	Description	Connected to
PP2002	Canon Electronic Business Machines (H.K.) Co., Ltd.	Instant Camera Printer (EUT)	-
HP Probook	HP	Notebook PC	EUT
PPP009C	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	Notebook PC
TC-3000C	TESCOM	BLUETOOTH TESTER	EUT

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 “XZ” axis, but the worst data was recorded in this report.

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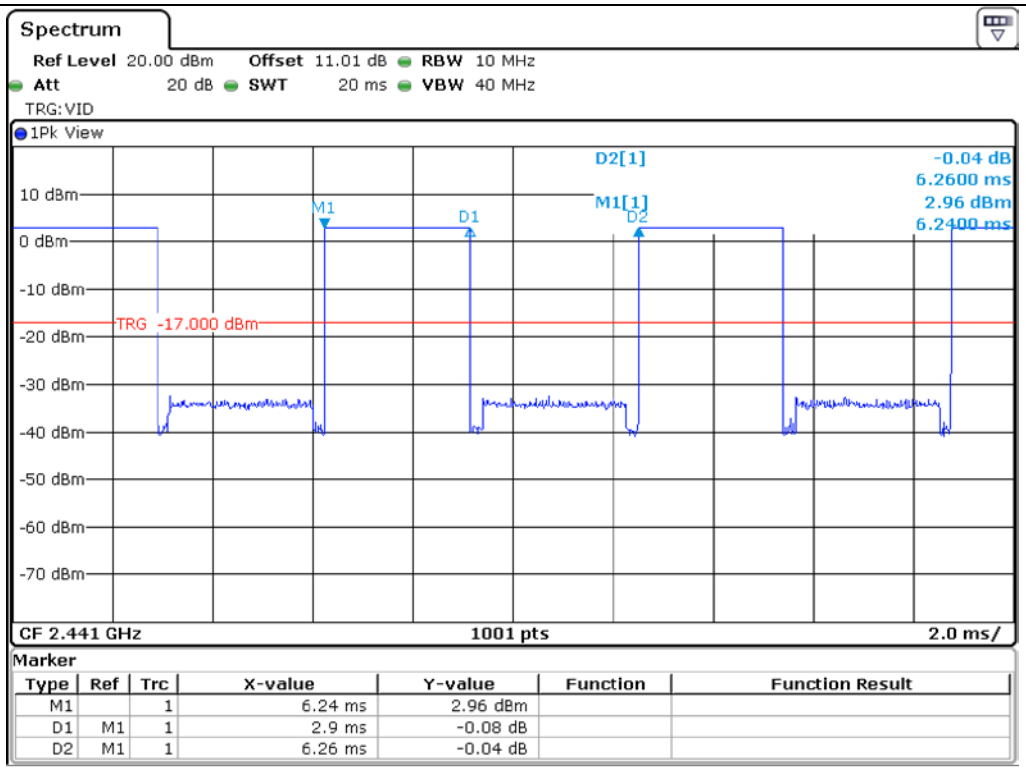
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth [1 Mbps]	2.90	3.36	46.33	3.34
Bluetooth [2 Mbps]	2.88	3.38	46.01	3.37
Bluetooth [3 Mbps]	2.90	3.36	46.33	3.34

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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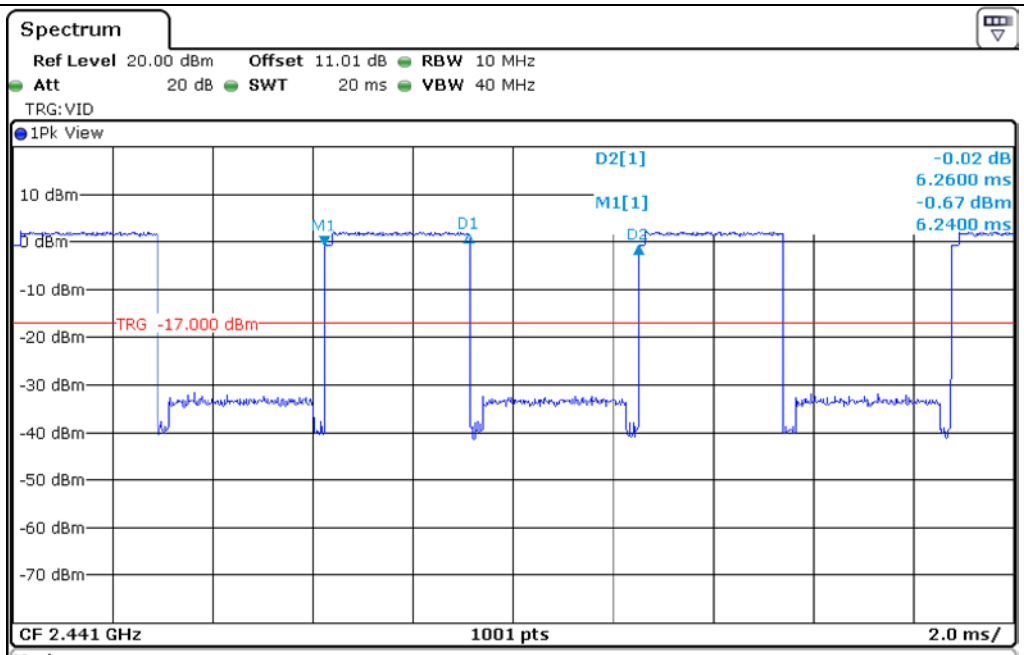
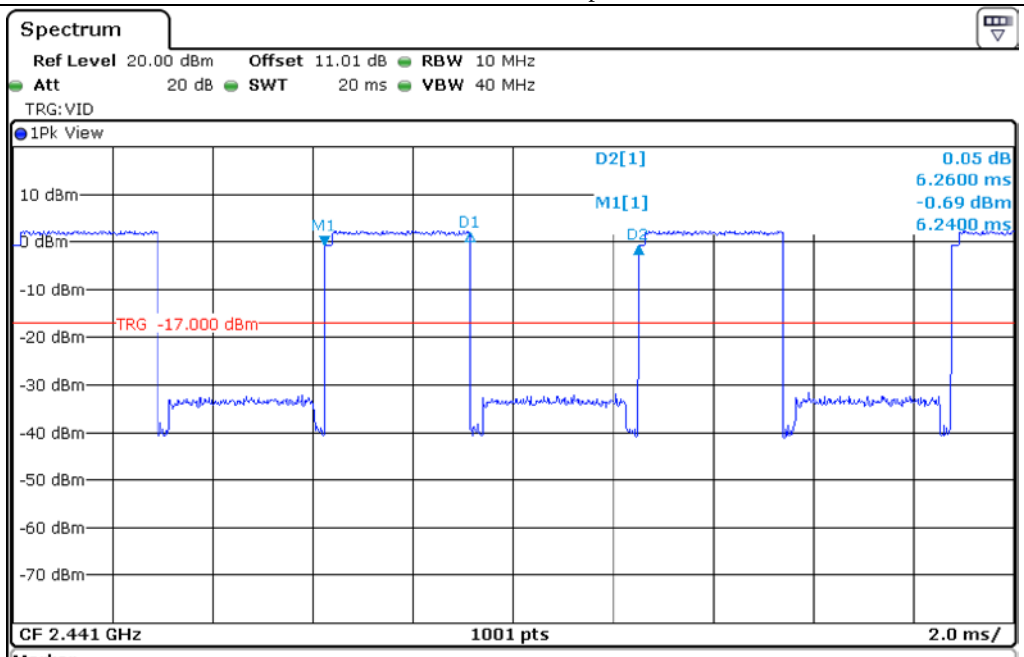


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	6.24 ms	-0.67 dBm		
D1	M1	1	2.88 ms	2.38 dB		
D2	M1	1	6.26 ms	-0.02 dB		

Bluetooth_2 Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	6.24 ms	-0.69 dBm		
D1	M1	1	2.9 ms	2.52 dB		
D2	M1	1	6.26 ms	0.05 dB		

Bluetooth_3 Mbps

5.4 Configuration of Test System

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

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

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

5.5 Antenna Requirement

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

Antenna Construction:

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

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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)
Charging 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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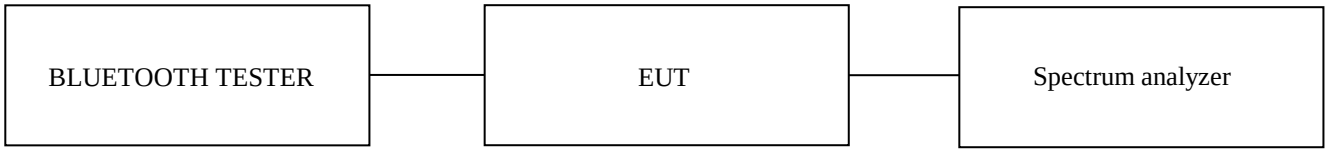
7. MINIMUM 20 dB BANDWIDTH

7.1 Operating environment

Temperature	:	23 °C
Relative humidity	:	45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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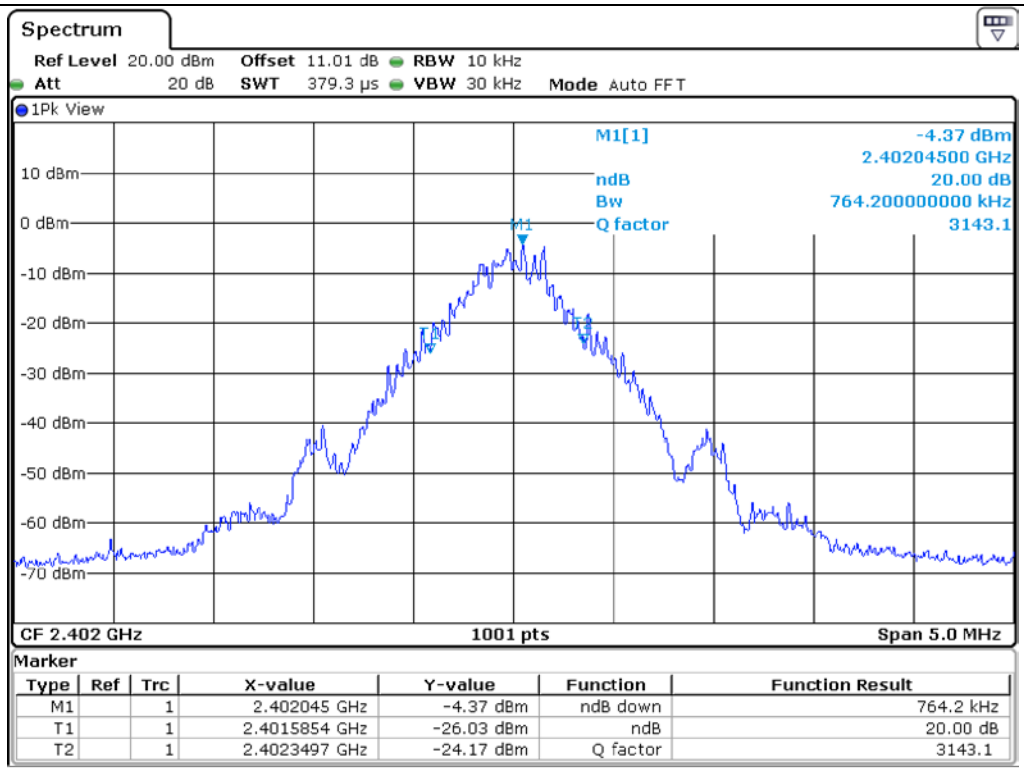
7.4 Test data for 1 Mbps

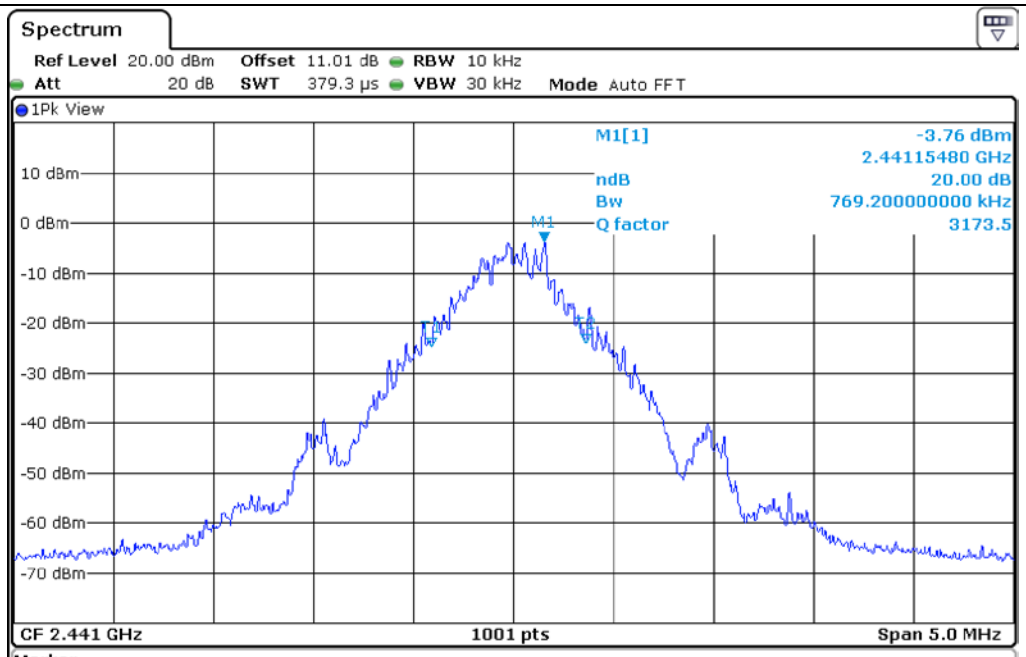
-. Test Date : January 10, 2020 ~ January 14, 2020

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	764.20
Middle	2 441.00	769.20
High	2 480.00	769.20

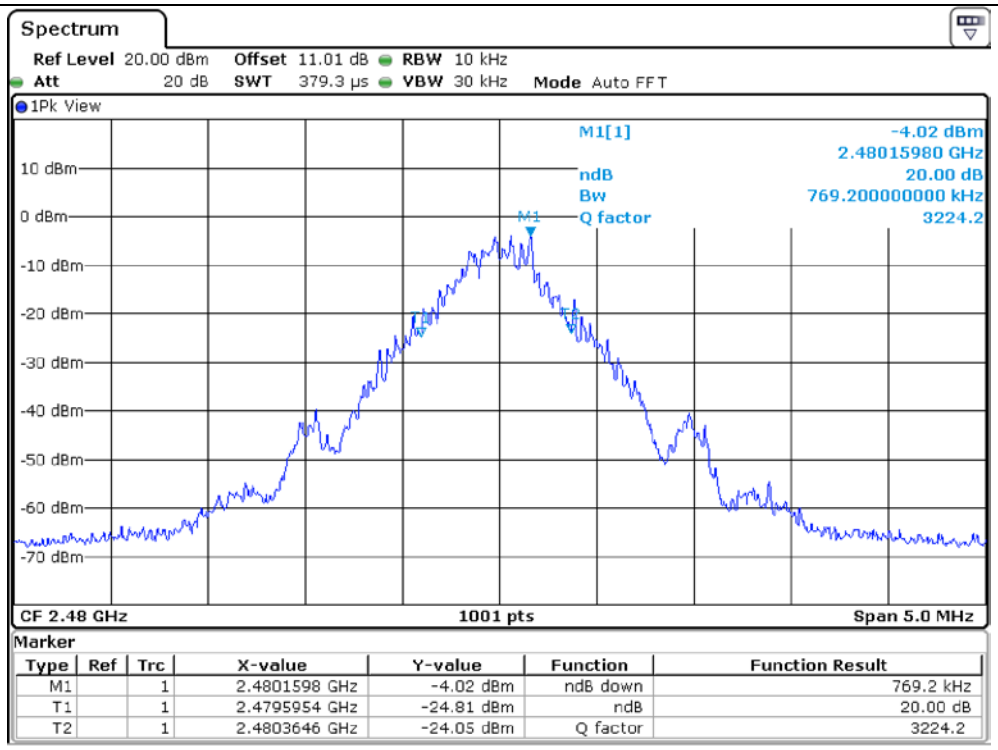
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



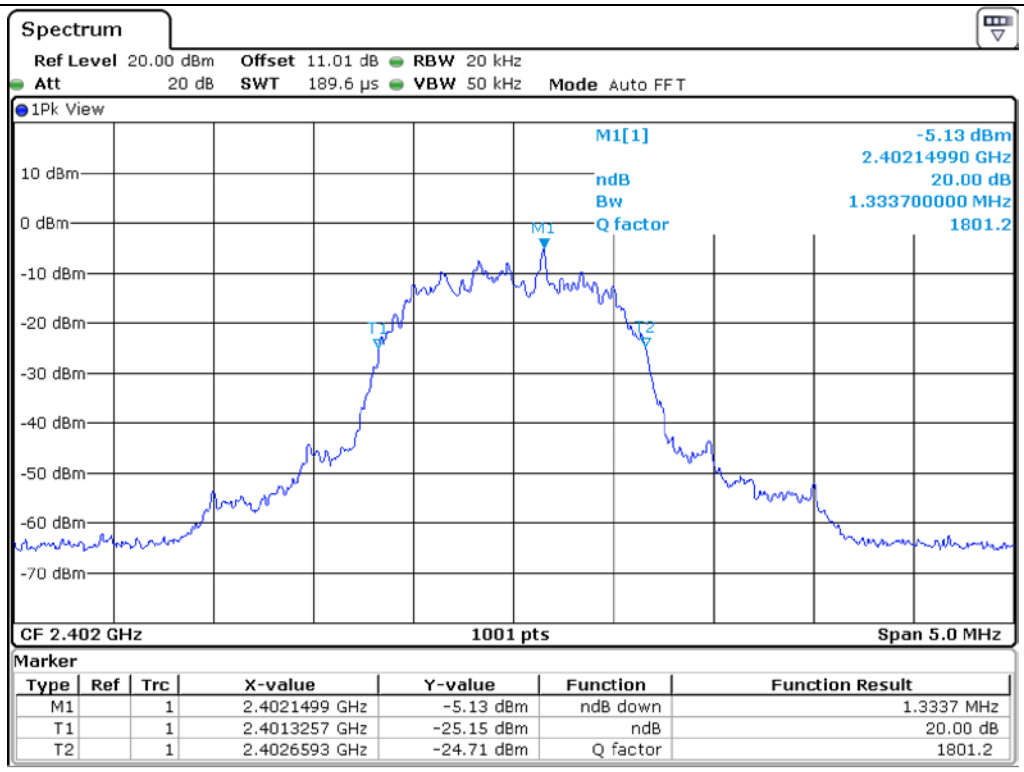
High Channel

7.5 Test data for 2 Mbps

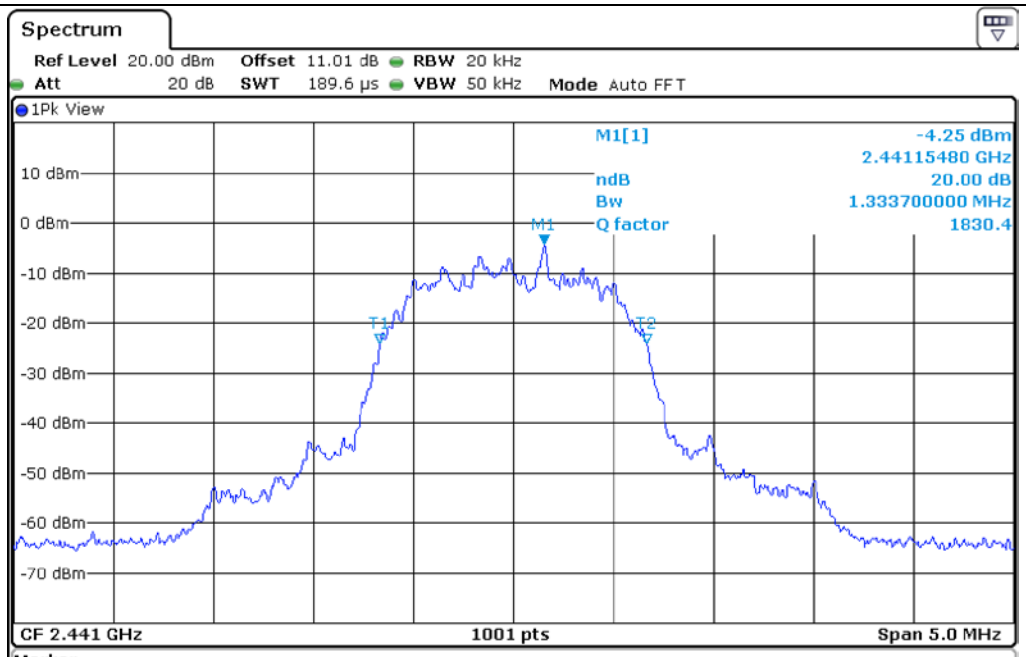
-. Test Date : January 10, 2020 ~ January 14, 2020

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 333.70
Middle	2 441.00	1 333.70
High	2 480.00	1 333.70

Tested by: Hyung-Kwon, Oh / Manager



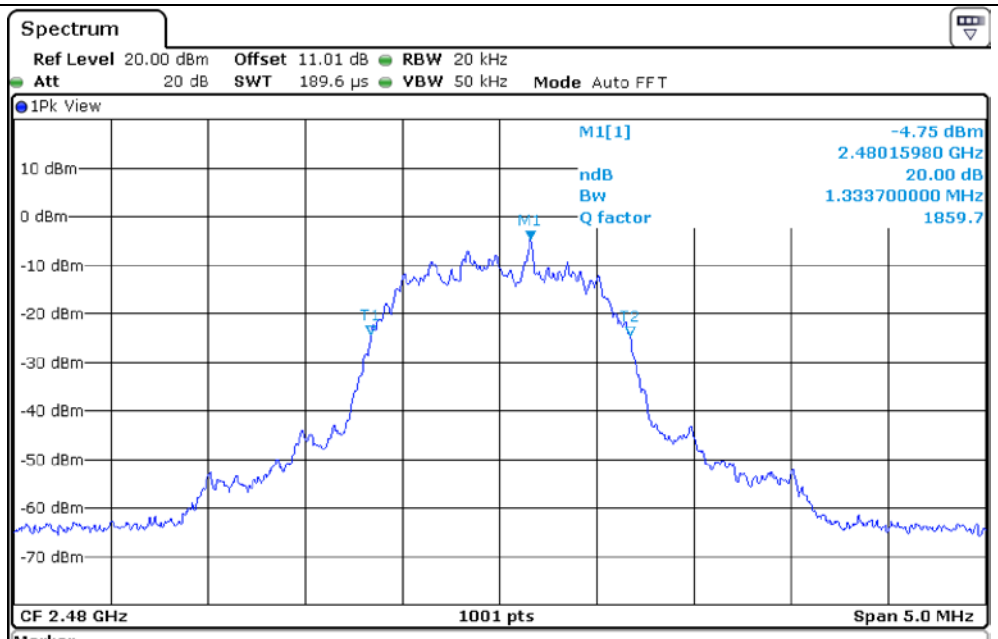
Low Channel



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4411548 GHz	-4.25 dBm	ndB down	1.3337 MHz
T1		1	2.4403307 GHz	-24.00 dBm	ndB	20.00 dB
T2		1	2.4416643 GHz	-24.02 dBm	Q factor	1830.4

Middle Channel



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Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4801598 GHz	-4.75 dBm	ndB down	1.3337 MHz
T1		1	2.4793357 GHz	-24.18 dBm	ndB	20.00 dB
T2		1	2.4806693 GHz	-24.63 dBm	Q factor	1859.7

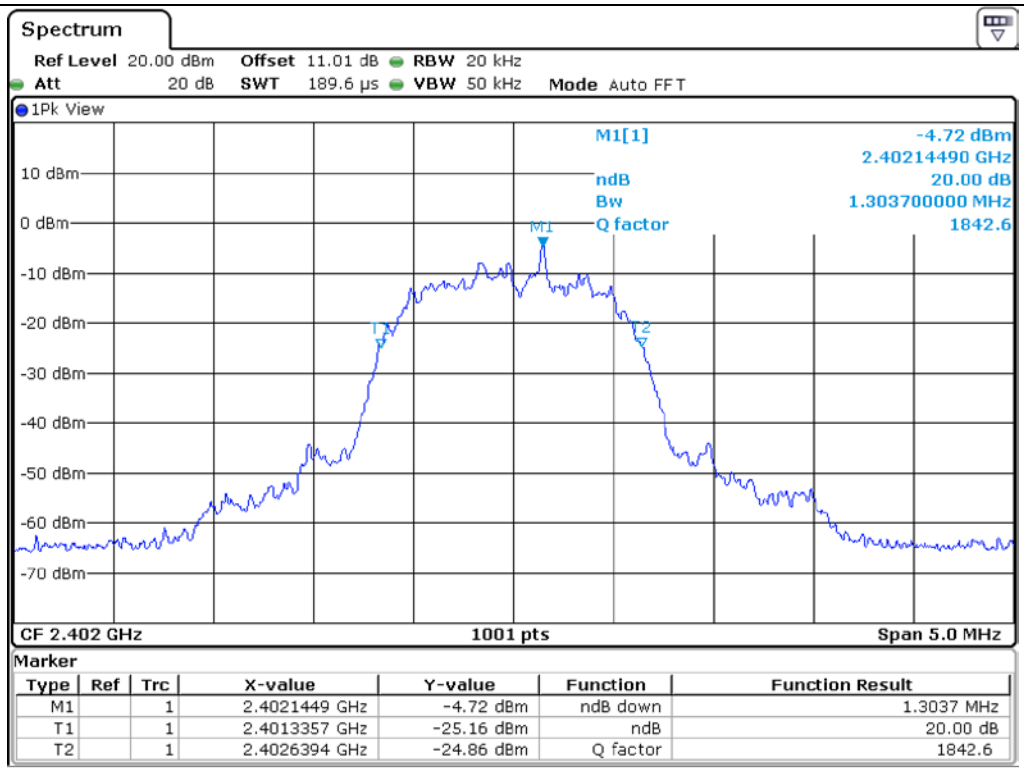
High Channel

7.6 Test data for 3 Mbps

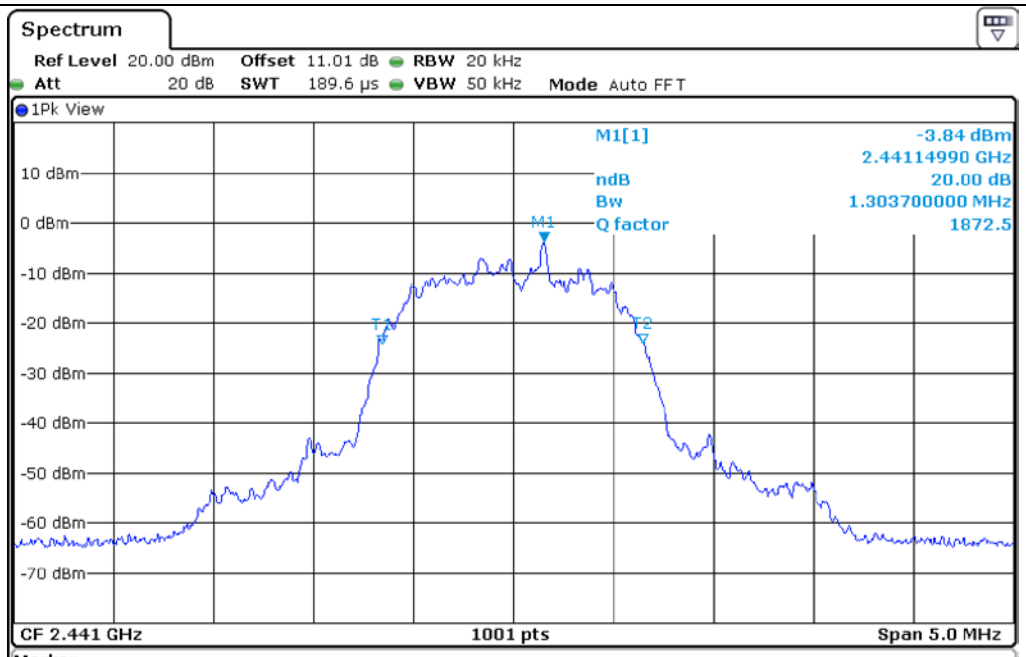
-. Test Date : January 10, 2020 ~ January 14, 2020

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 303.70
Middle	2 441.00	1 303.70
High	2 480.00	1 303.70

Tested by: Hyung-Kwon, Oh / Manager



Low Channel



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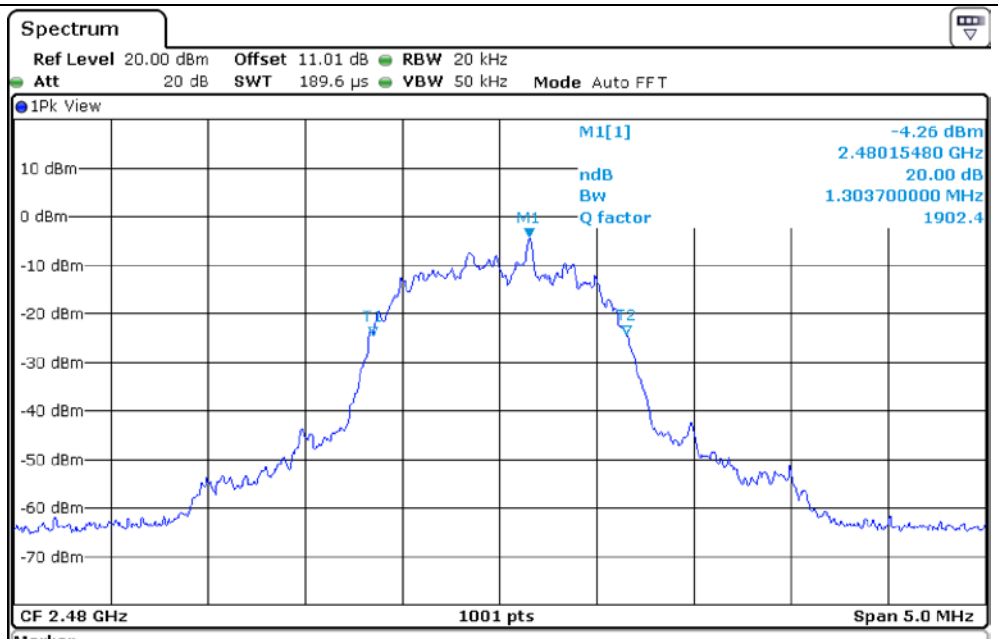
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4411499 GHz	-3.84 dBm	ndB down	1.3037 MHz
T1		1	2.4403407 GHz	-24.21 dBm	ndB	20.00 dB
T2		1	2.4416444 GHz	-23.95 dBm	Q factor	1872.5

Middle Channel



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4801548 GHz	-4.26 dBm	ndB down	1.3037 MHz
T1		1	2.4793457 GHz	-24.68 dBm	ndB	20.00 dB
T2		1	2.4806494 GHz	-24.42 dBm	Q factor	1902.4

High Channel

8. HOPPING FREQUENCY SEPARATION

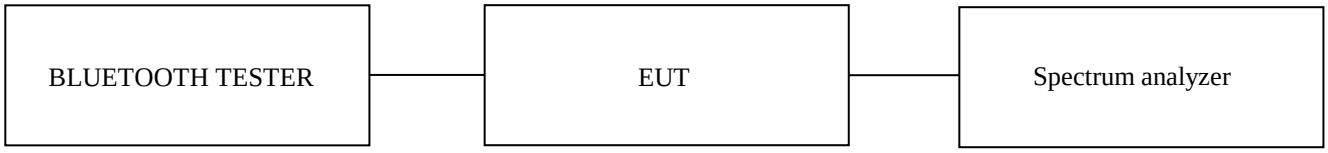
8.1 Operating environment

Temperature : 23 °C

Relative humidity : 45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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

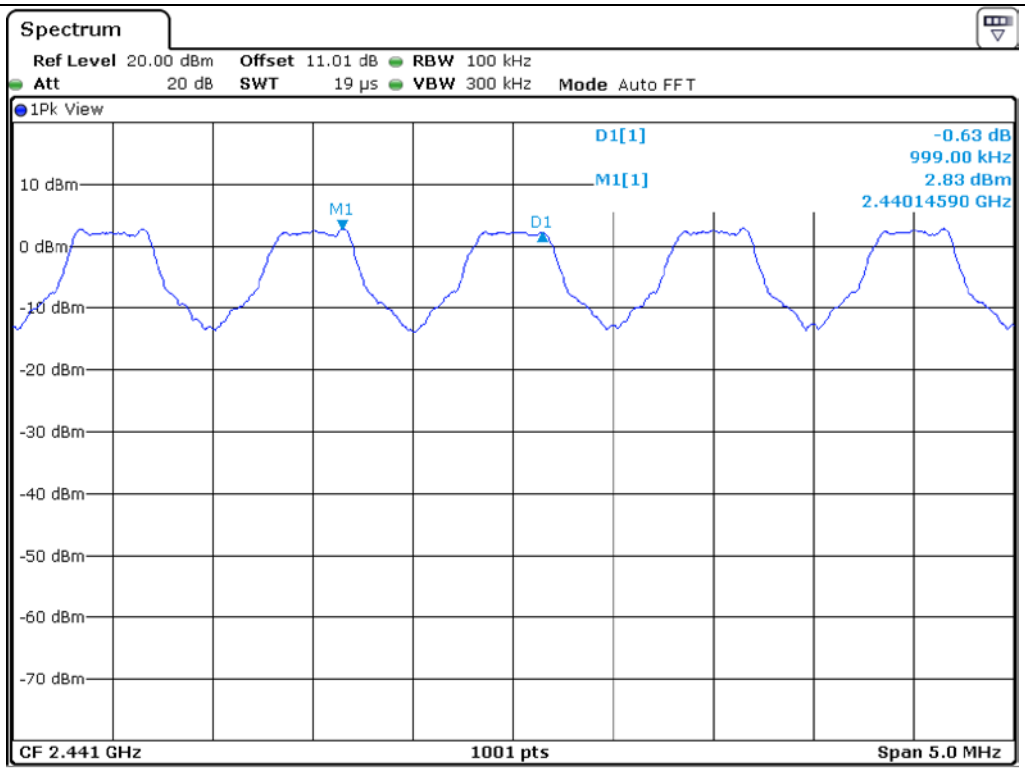
8.4 Test data for 1 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	769.20	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Manager



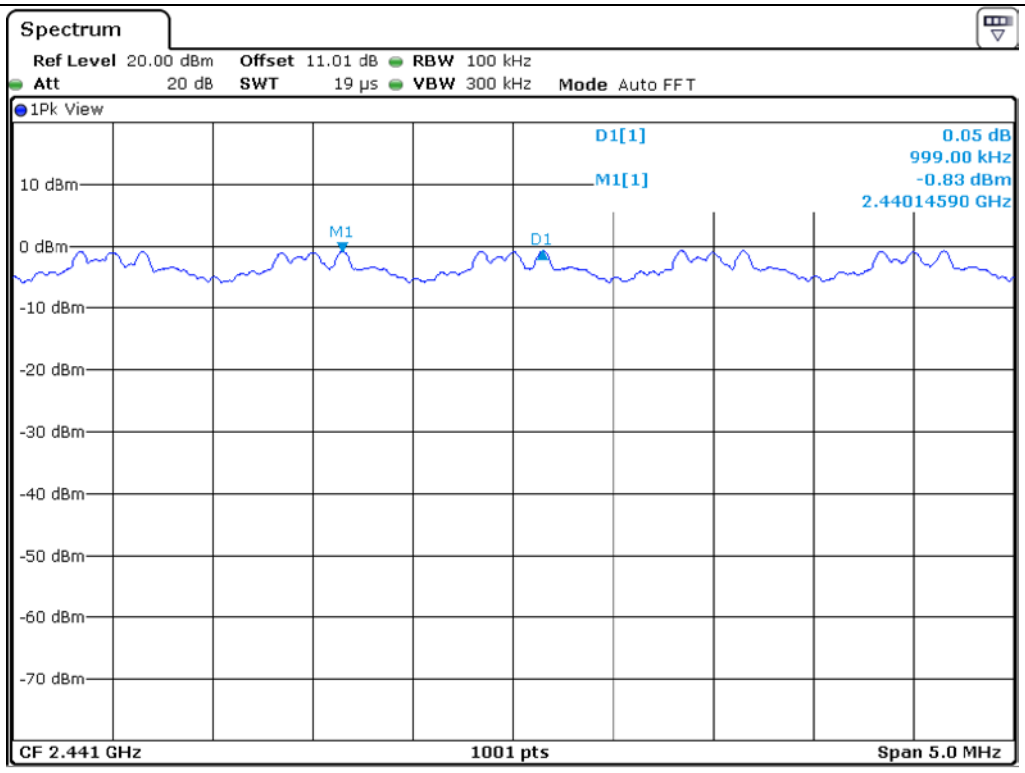
8.5 Test data for 2 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	1 333.70	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Manager



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

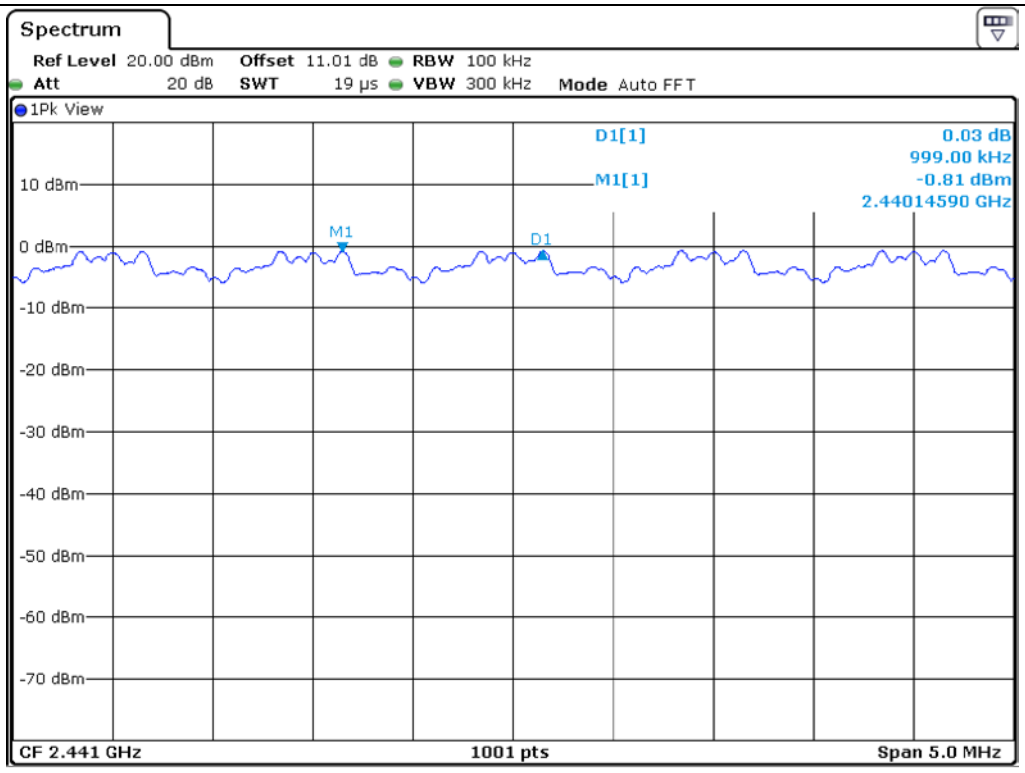
8.6 Test data for 3 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	1 303.70	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Manager



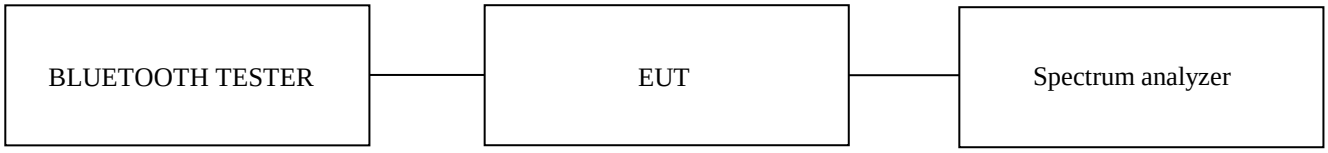
9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature	:	23 °C
Relative humidity	:	45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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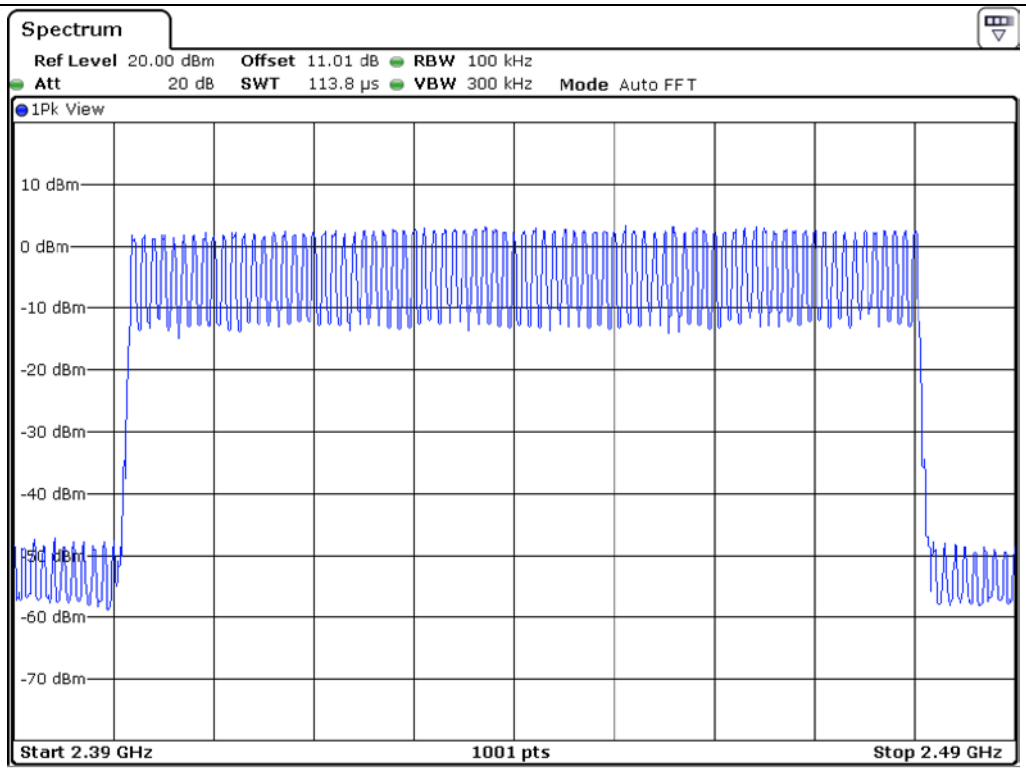
9.4 Test data for 1 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

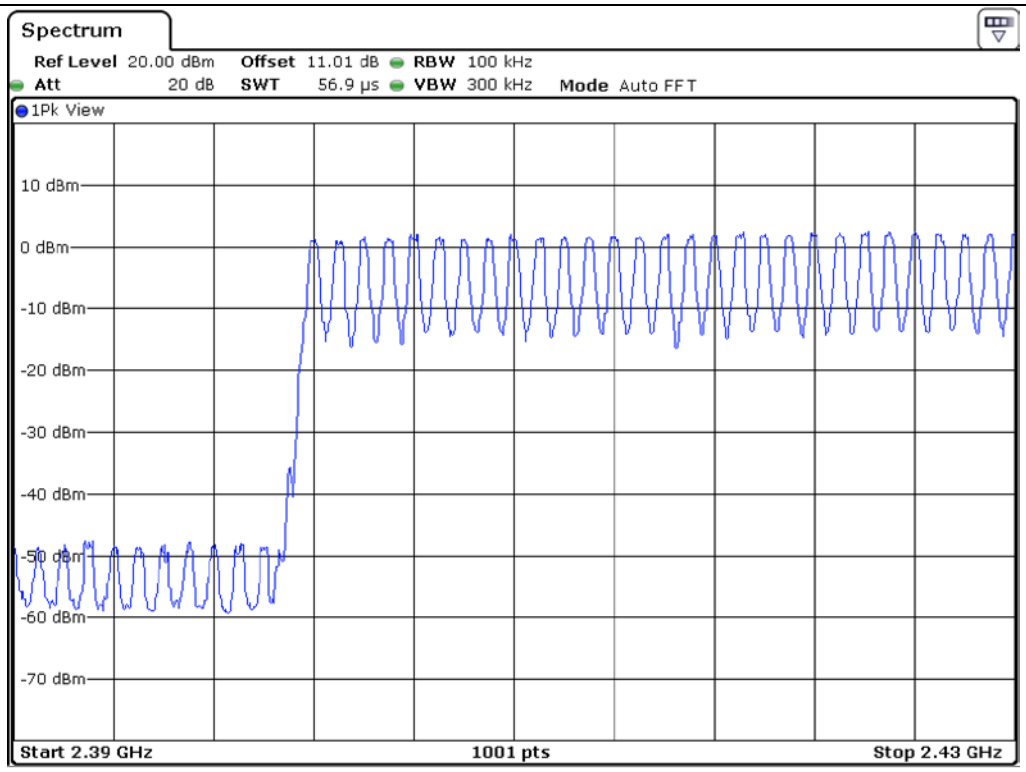
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
1 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Manager

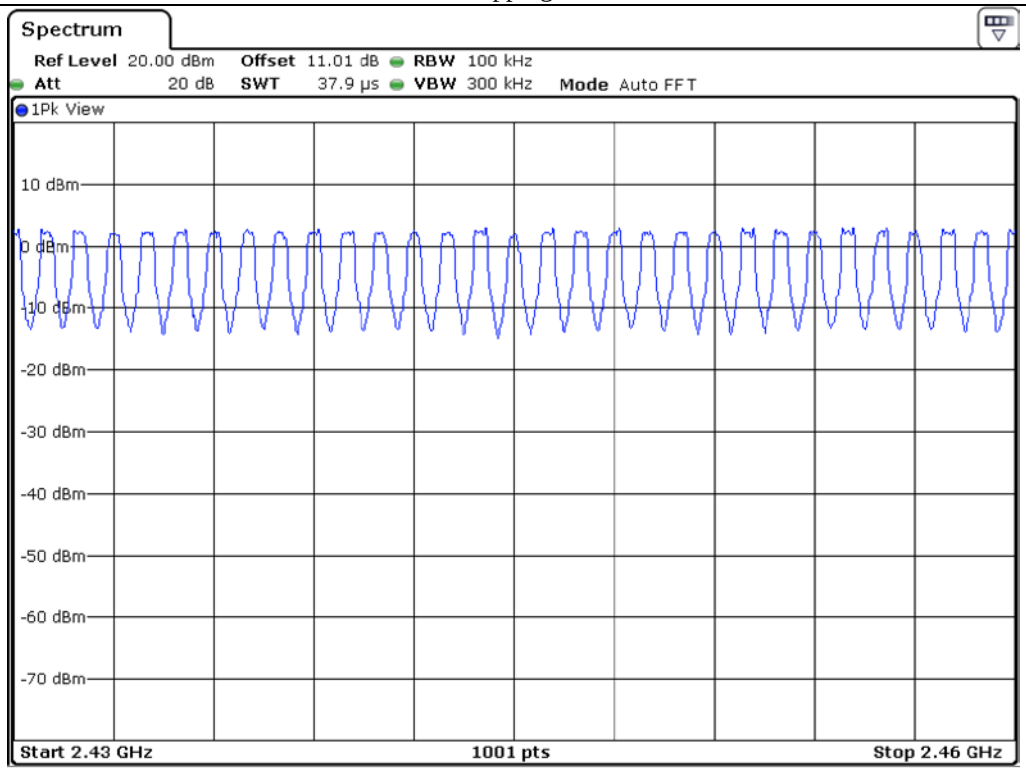


Total number of hopping channel: 28+30+21 = 79

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

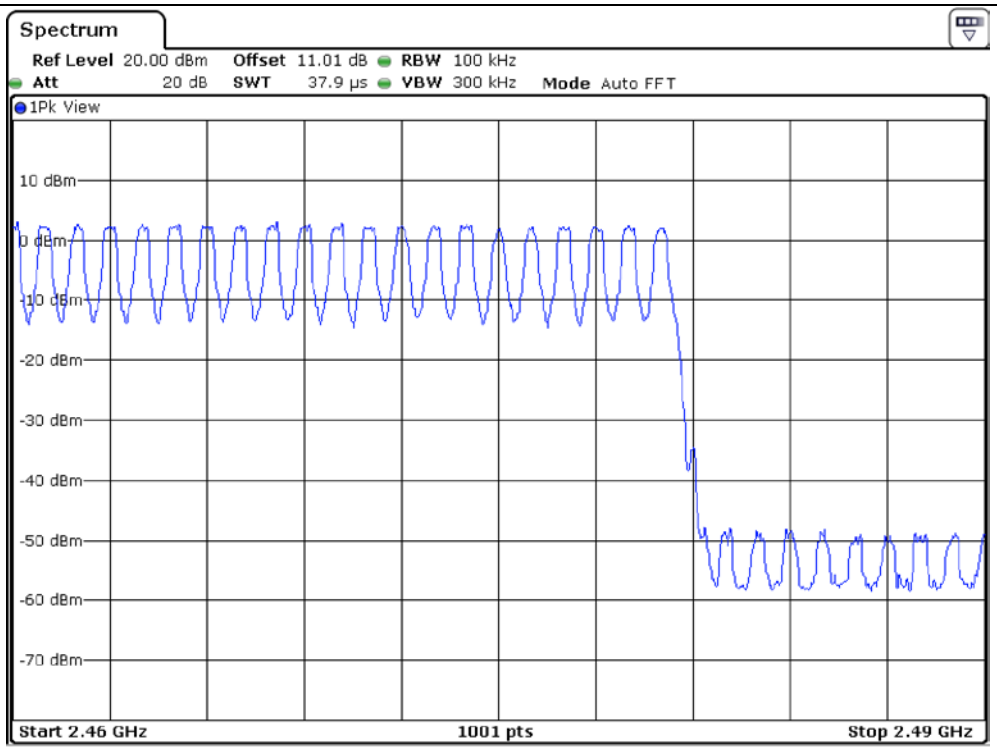


Number of hopping channel: 28



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)

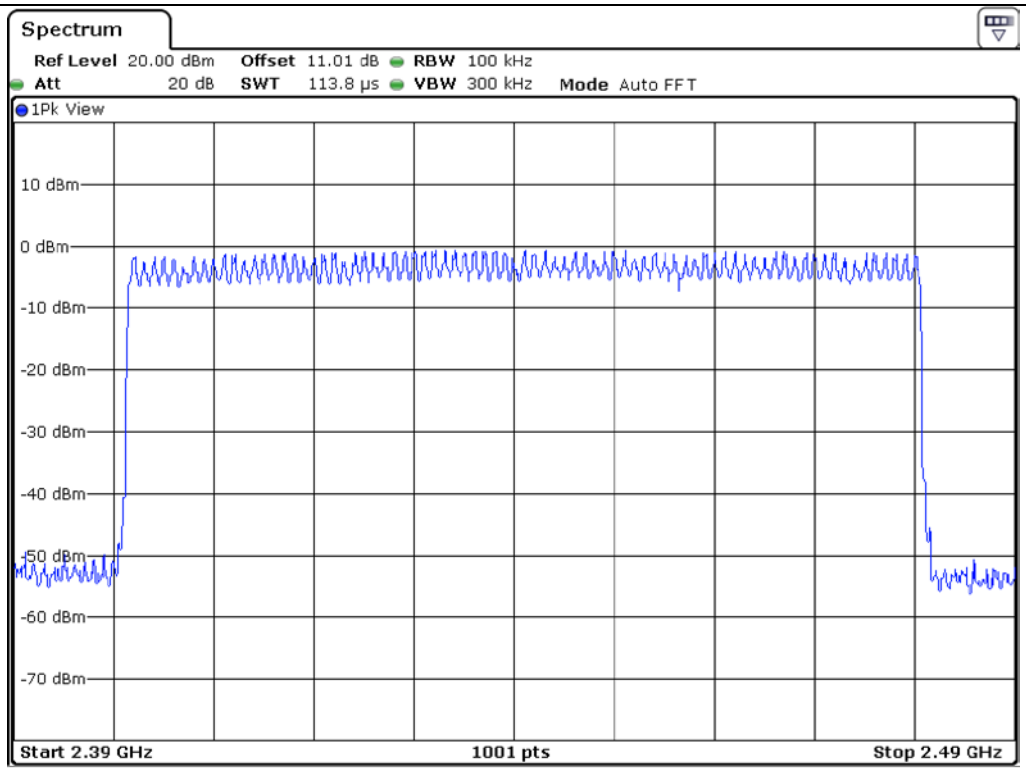
9.5 Test data for 2 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

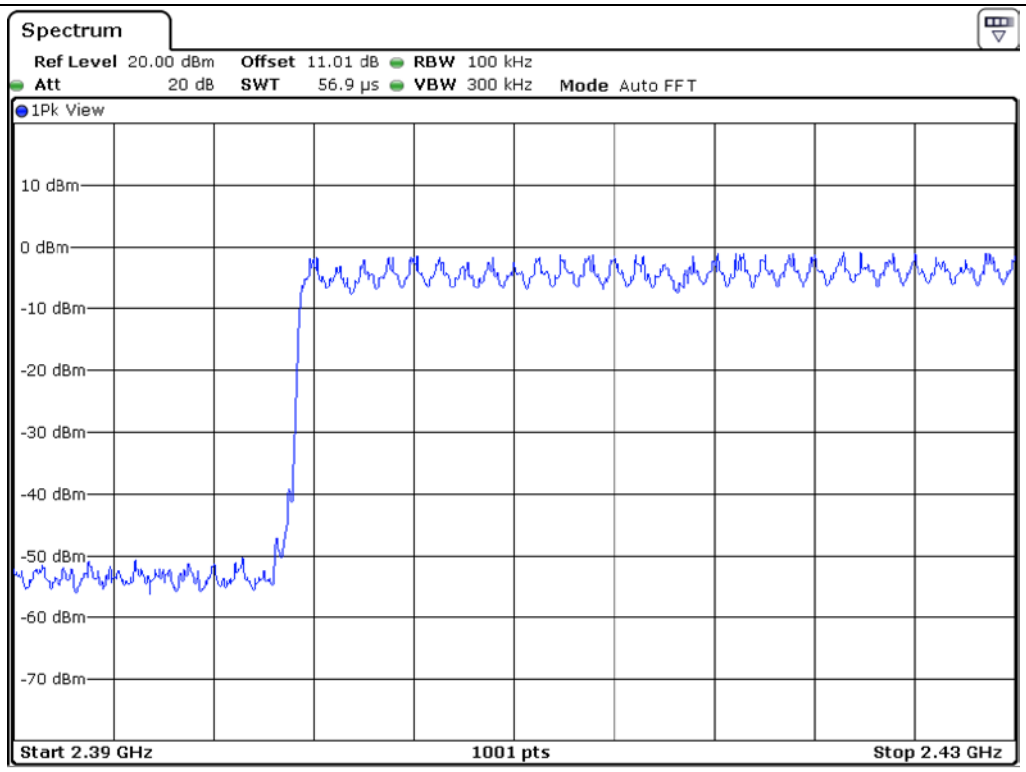
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
2 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Manager

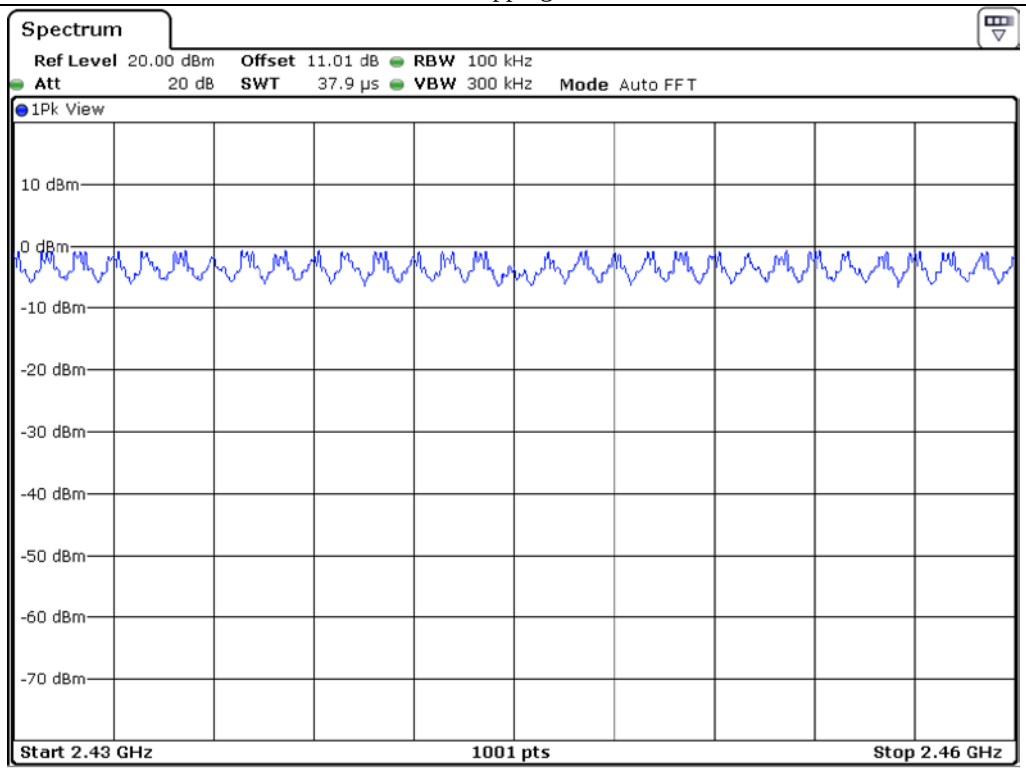


Total number of hopping channel: 28+30+21 = 79

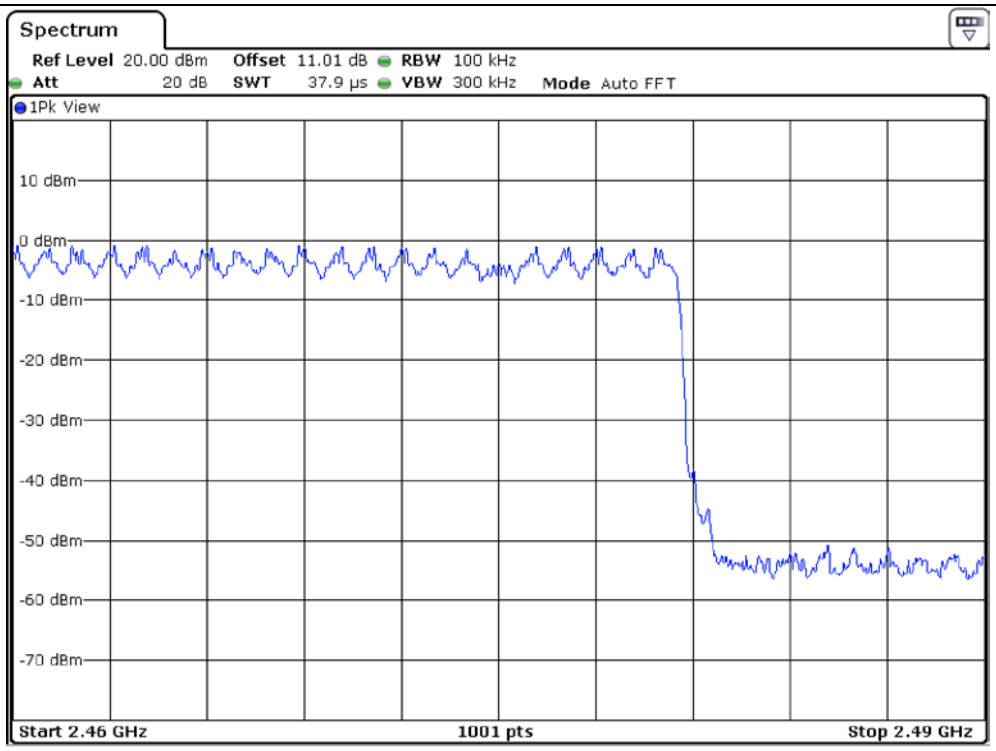
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



Number of hopping channel: 28



Number of hopping channel: 30



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)

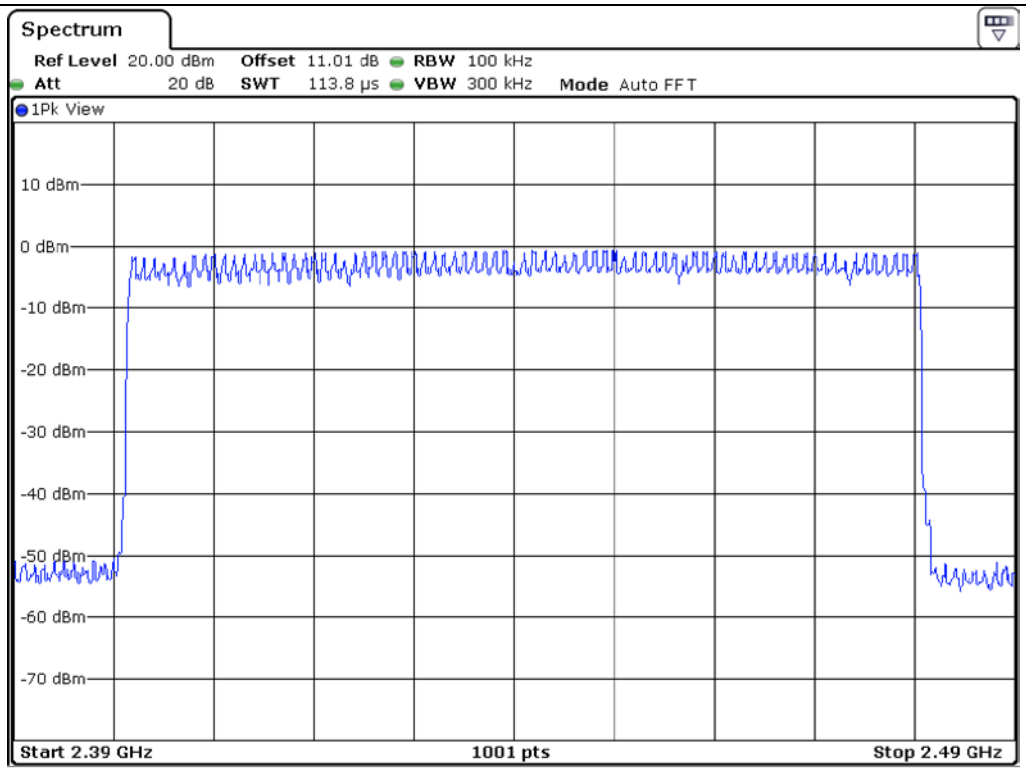
9.6 Test data for 3 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

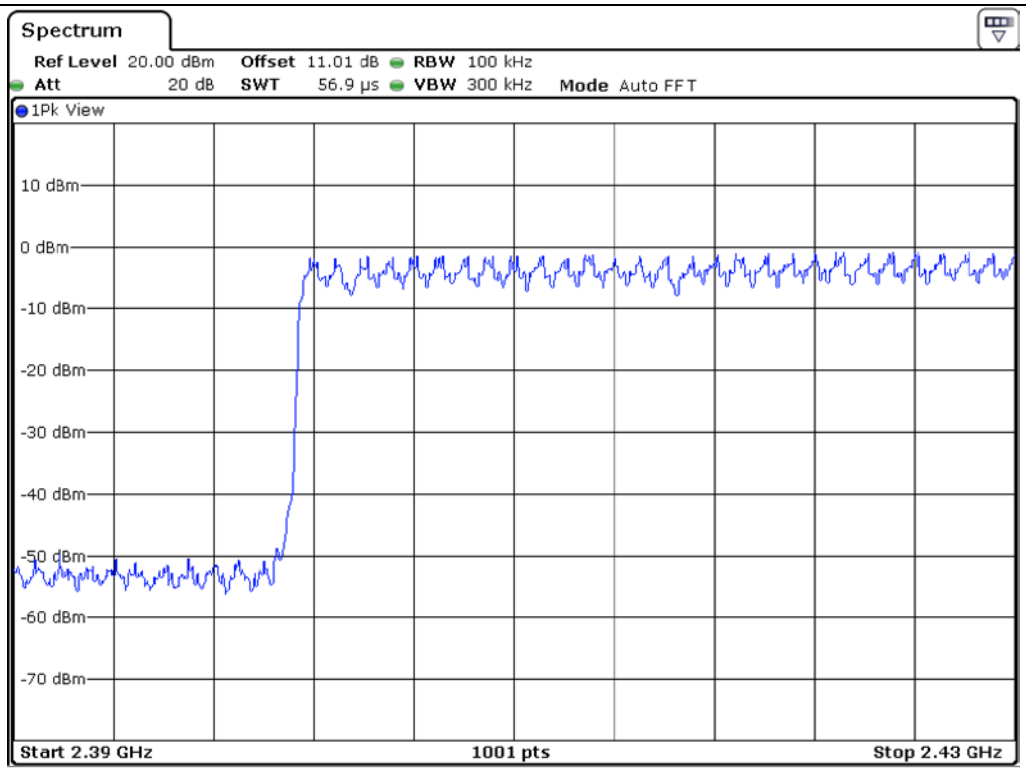
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
3 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Manager

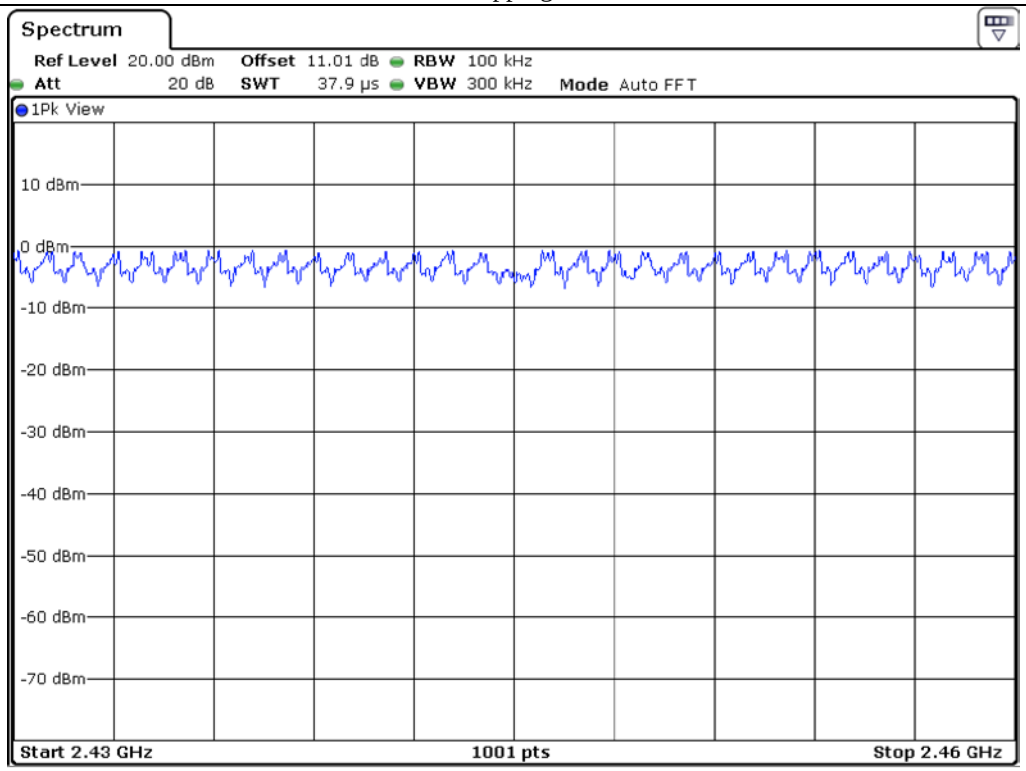


Total number of hopping channel: 28+30+21 = 79

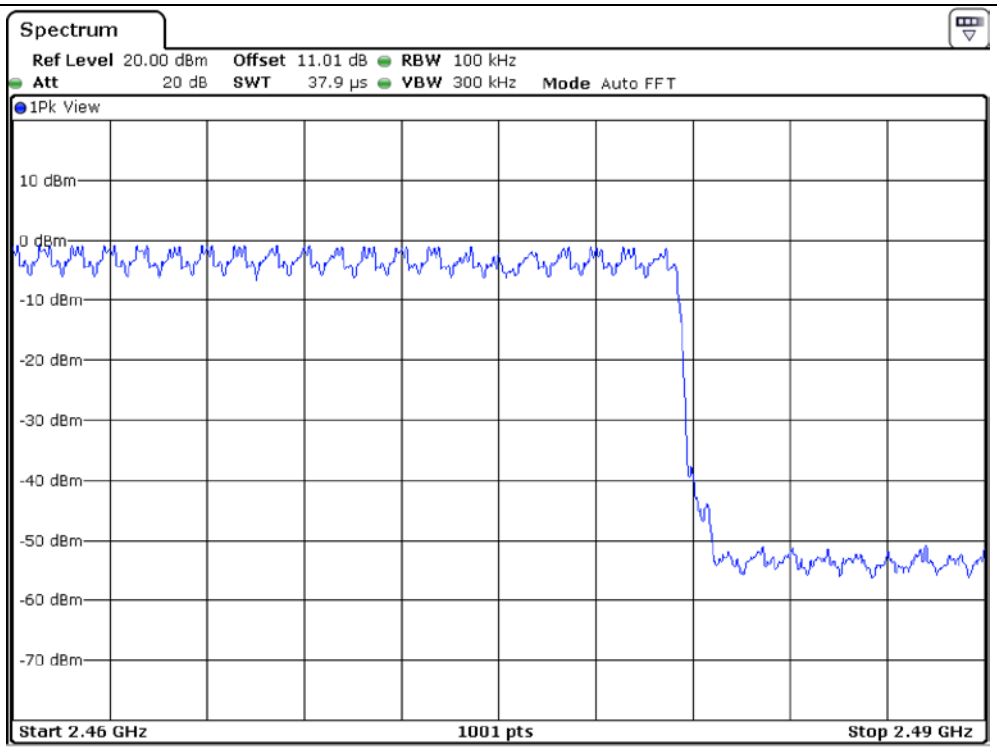
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



Number of hopping channel: 28



Number of hopping channel: 30



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)

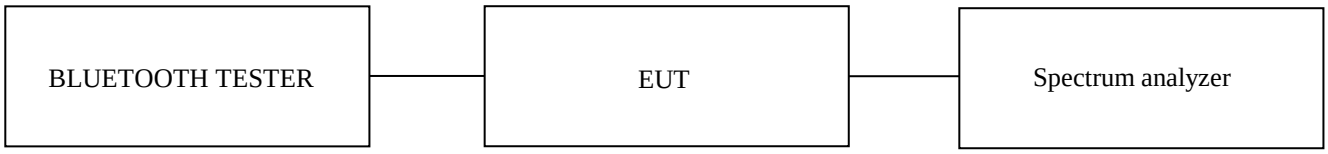
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature	:	23 °C
Relative humidity	:	45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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10.4 Test data for 1 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

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

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

Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.380	10.13	31.60	121.64	400.00	PASS
DH3	1.640	5.06	31.60	262.23	400.00	
DH5	2.910	3.38	31.60	310.81	400.00	

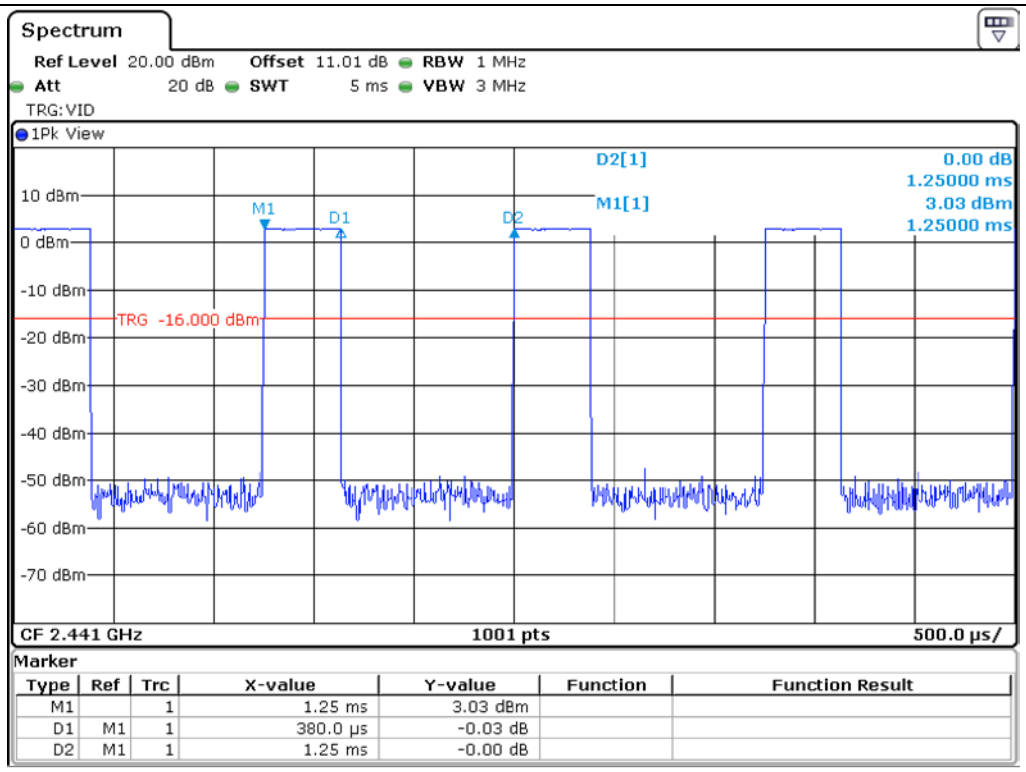
Total dwell time is calculated as following.

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

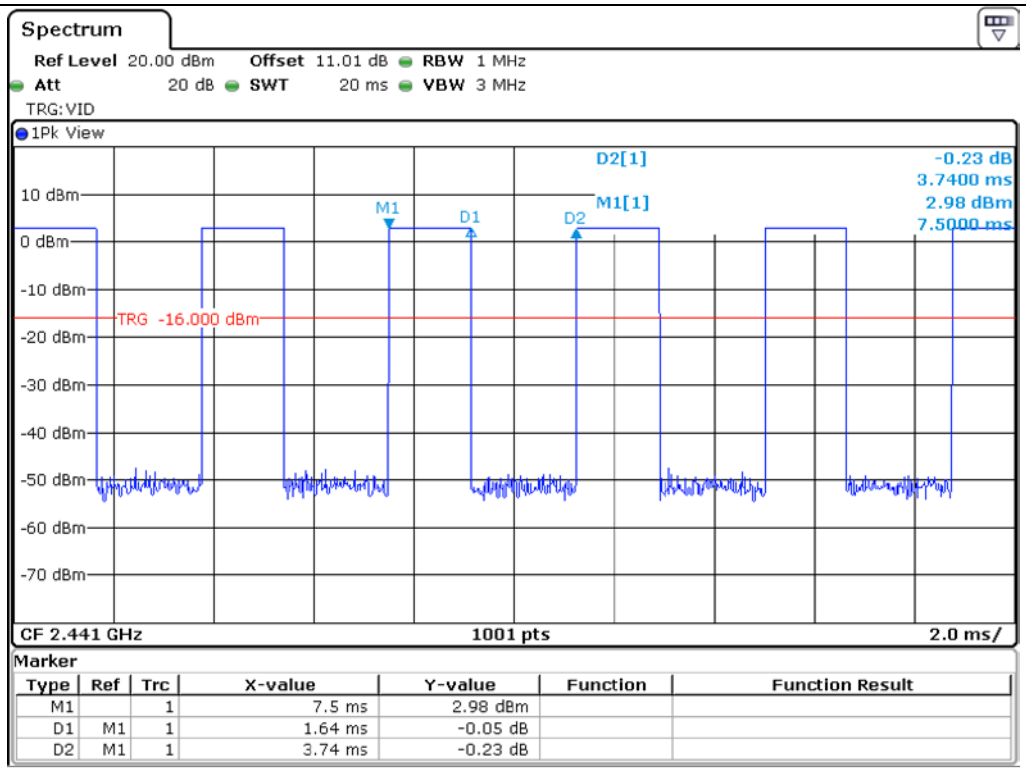
Remark: See next page for an overview sweep performed with peak detector.

Tested by: Hyung-Kwon, Oh / Manager

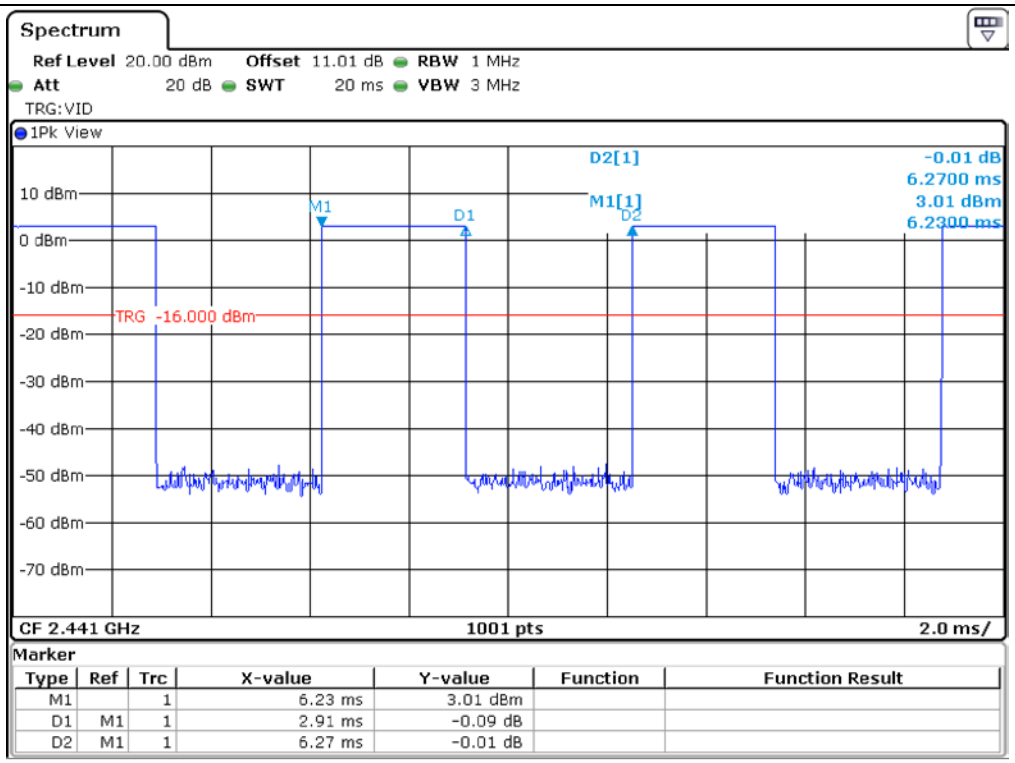
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 5 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] 0.00 dB
1.25000 ms
M1[1] 3.03 dBm
1.25000 ms
M1
D1
D2
TRG -16.000 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
1001 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 1.25 ms 3.03 dBm
D1 M1 1 380.0 µs -0.03 dB
D2 M1 1 1.25 ms -0.00 dB

DH1


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 20 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] -0.23 dB
3.7400 ms
M1[1] 2.98 dBm
7.5000 ms
M1
D1
D2
TRG -16.000 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
1001 pts
2.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 7.5 ms 2.98 dBm
D1 M1 1 1.64 ms -0.05 dB
D2 M1 1 3.74 ms -0.23 dB

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

-. Test Date : January 10, 2020 ~ January 14, 2020

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	0.385	10.13	31.60	123.24	400.00	PASS
DH3	1.640	5.06	31.60	262.23	400.00	
DH5	2.880	3.38	31.60	307.61	400.00	

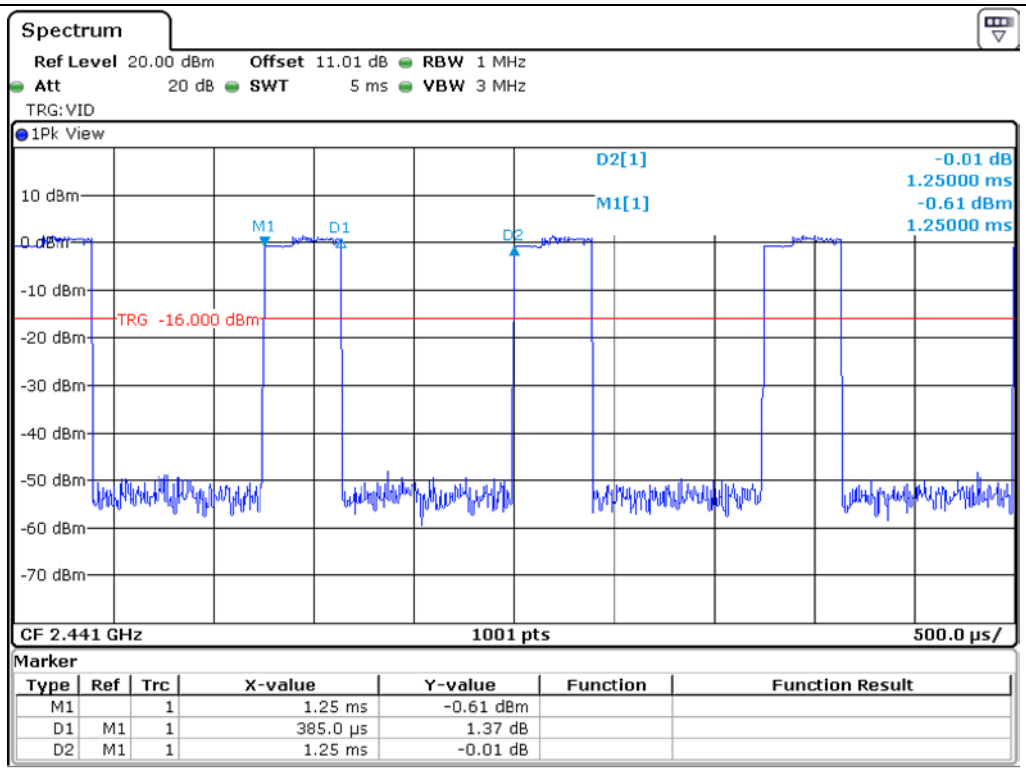
Total dwell time is calculated as following.

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

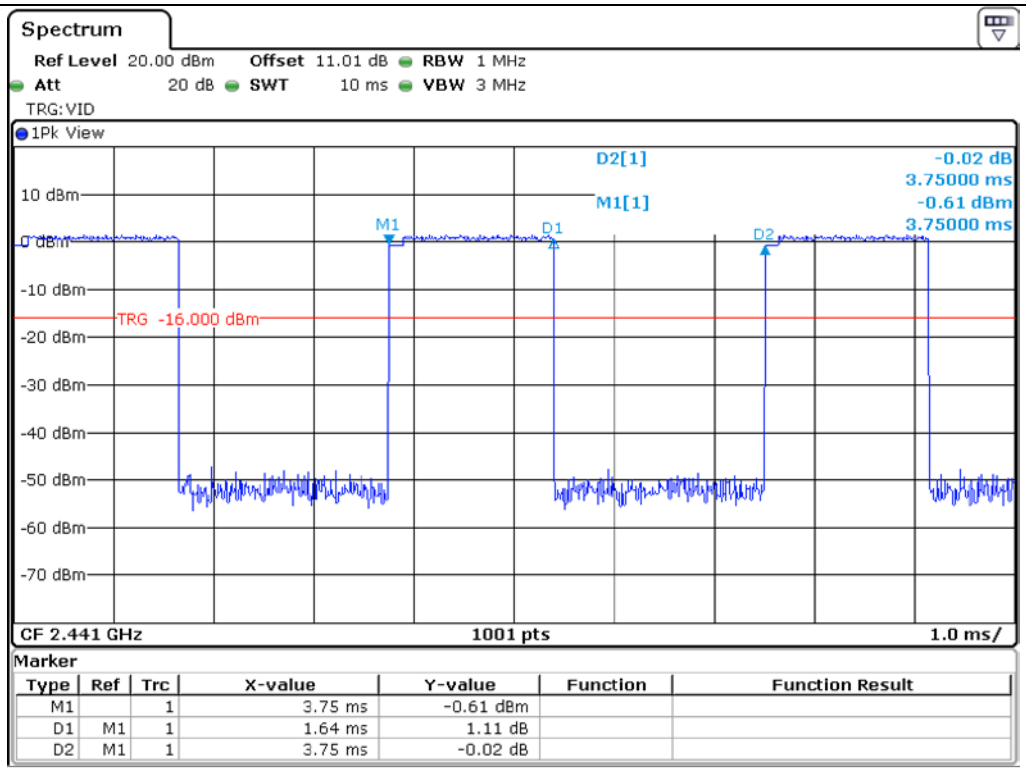
Remark: See next page for an overview sweep performed with peak detector.

Tested by: Hyung-Kwon, Oh / Manager

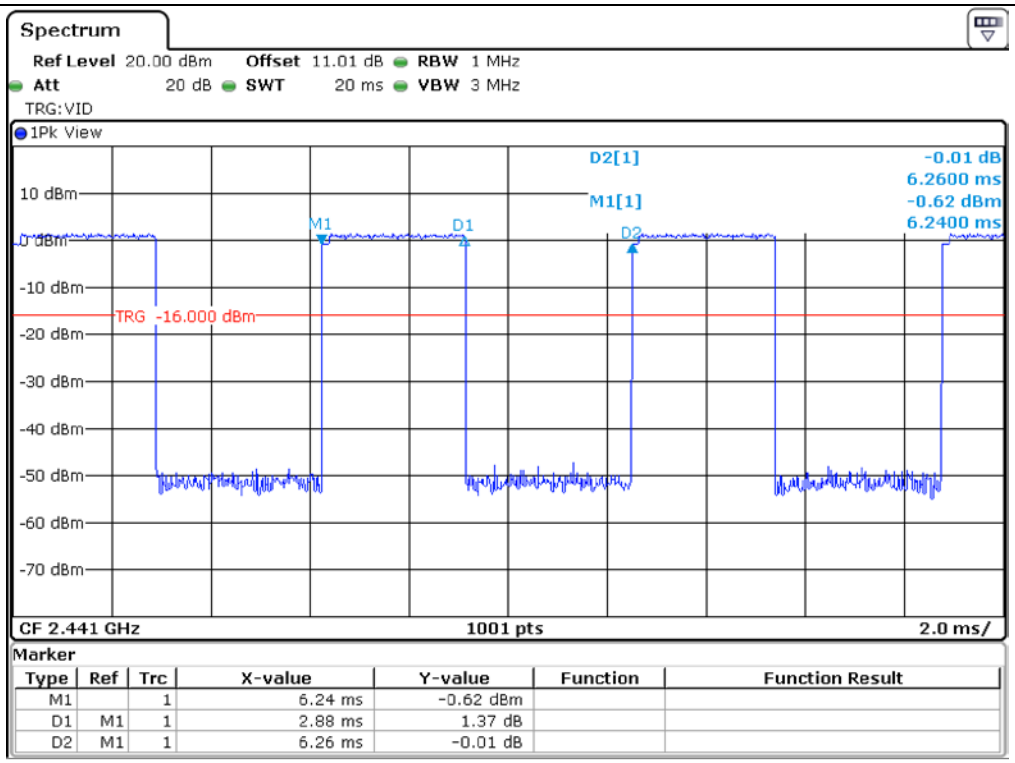
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 5 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] -0.01 dB
1.25000 ms
M1[1] -0.61 dBm
1.25000 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
TRG -16.000 dBm
M1
D1
D2
CF 2.441 GHz
1001 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 1.25 ms -0.61 dBm
D1 M1 1 385.0 µs 1.37 dB
D2 M1 1 1.25 ms -0.01 dB

DH1


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] -0.02 dB
3.75000 ms
M1[1] -0.61 dBm
3.75000 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
TRG -16.000 dBm
M1
D1
D2
CF 2.441 GHz
1001 pts
1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 3.75 ms -0.61 dBm
D1 M1 1 1.64 ms 1.11 dB
D2 M1 1 3.75 ms -0.02 dB

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)

10.6 Test data for 3 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

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	0.385	10.13	31.60	123.24	400.00	PASS
DH3	1.640	5.06	31.60	262.23	400.00	
DH5	2.880	3.38	31.60	307.61	400.00	

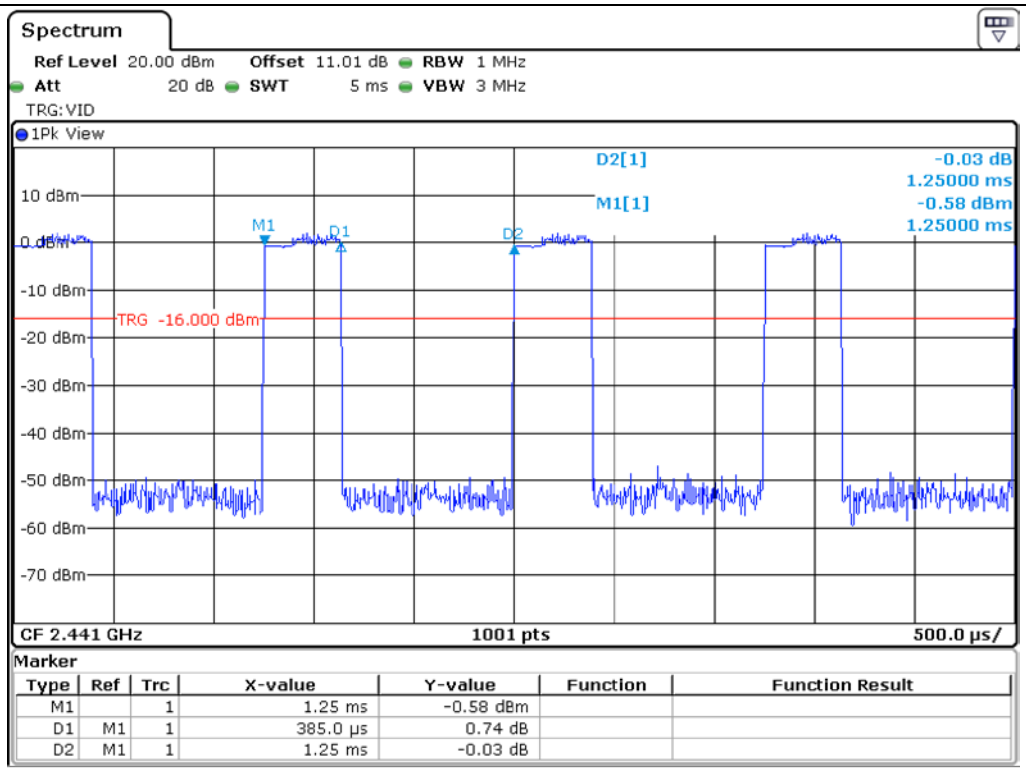
Total dwell time is calculated as following.

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

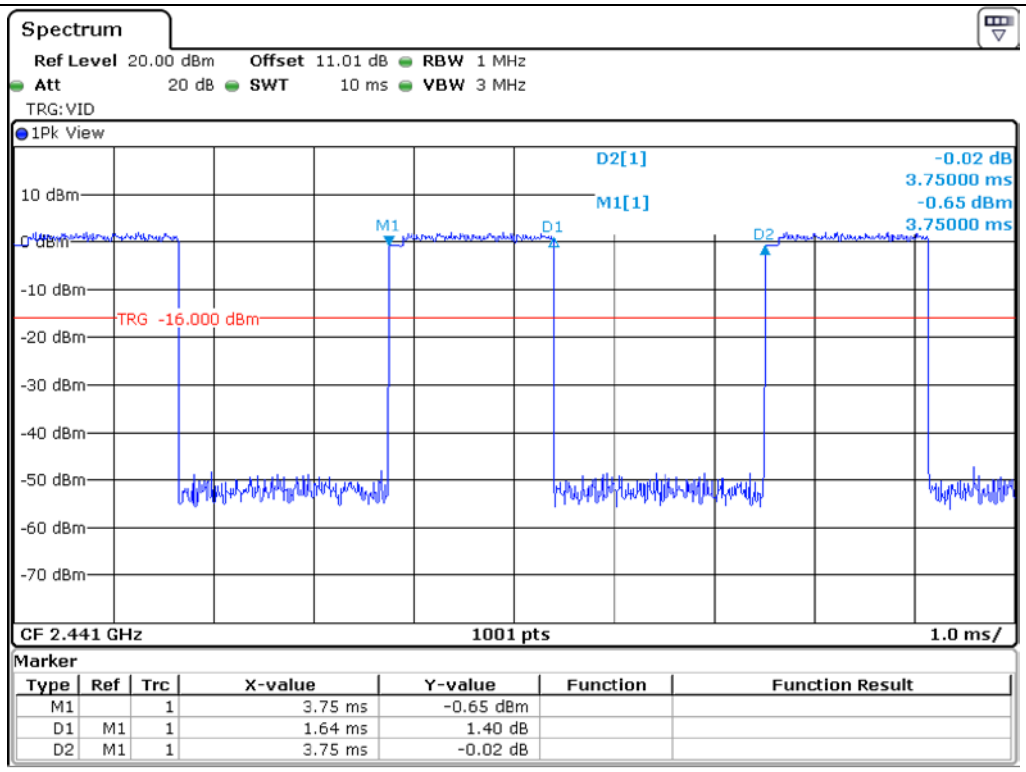
Remark: See next page for an overview sweep performed with peak detector.

Tested by: Hyung-Kwon, Oh / Manager

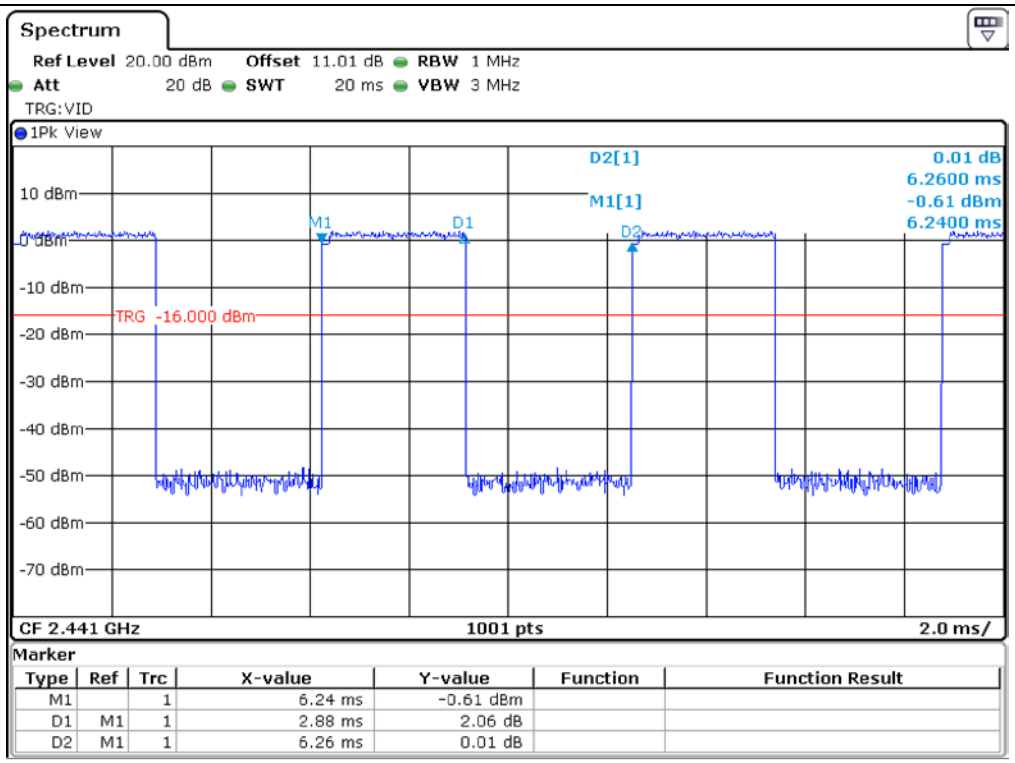
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 5 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] -0.03 dB
1.25000 ms
M1[1] -0.58 dBm
1.25000 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
D2
TRG -16.000 dBm
CF 2.441 GHz
1001 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 1.25 ms -0.58 dBm
D1 M1 1 385.0 µs 0.74 dB
D2 M1 1 1.25 ms -0.03 dB

DH1


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] -0.02 dB
3.75000 ms
M1[1] -0.65 dBm
3.75000 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
D2
TRG -16.000 dBm
CF 2.441 GHz
1001 pts
1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 3.75 ms -0.65 dBm
D1 M1 1 1.64 ms 1.40 dB
D2 M1 1 3.75 ms -0.02 dB

DH3


Spectrum
Ref Level 20.00 dBm Offset 11.01 dB RBW 1 MHz
Att 20 dB SWT 20 ms VBW 3 MHz
TRG:VID
1Pk View
D2[1] 0.01 dB
6.2600 ms
M1[1] -0.61 dBm
6.2400 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
TRG -16.000 dBm
M1
D1
D2
CF 2.441 GHz
1001 pts
2.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 6.24 ms -0.61 dBm
D1 M1 1 2.88 ms 2.06 dB
D2 M1 1 6.26 ms 0.01 dB

DH5

11. MAXIMUM PEAK OUTPUT POWER

11.1 Operating environment

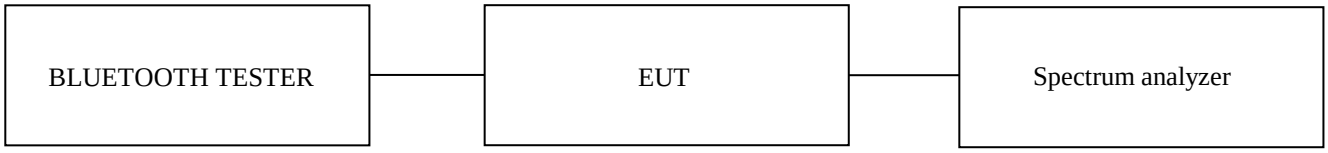
Temperature : 23 °C

Relative humidity : 45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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11.4 Test data for 1 Mbps

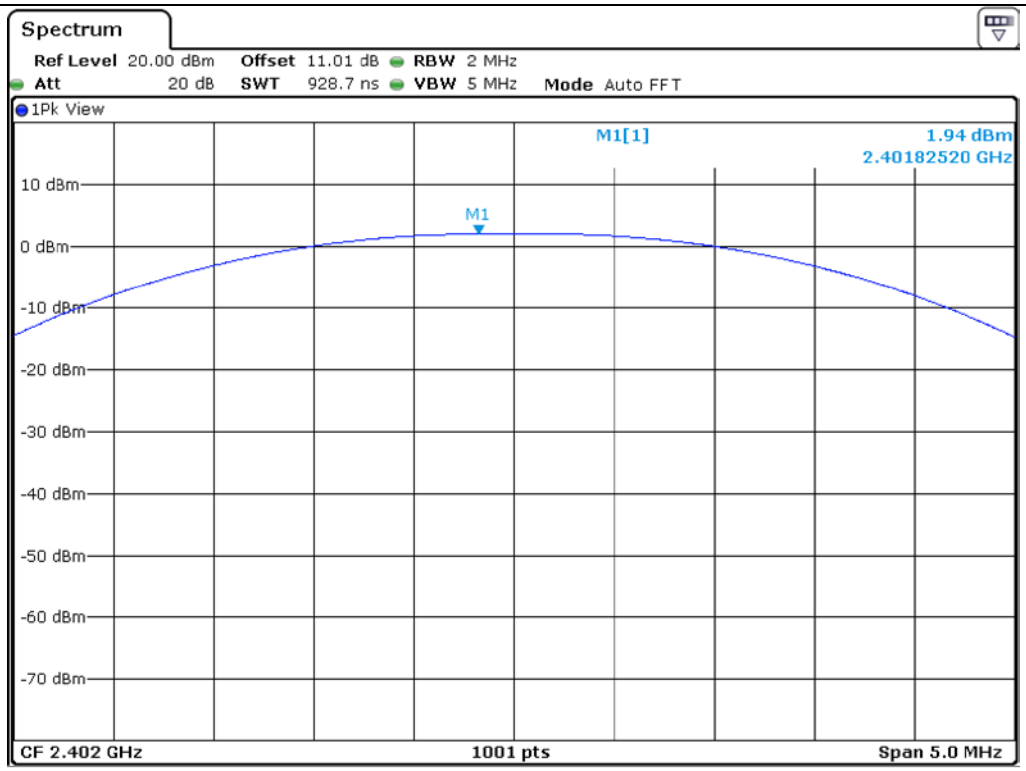
-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	1.94	21.00	19.06
MIDDLE	2 441.00	3.02	21.00	17.98
HIGH	2 480.00	2.82	21.00	18.18

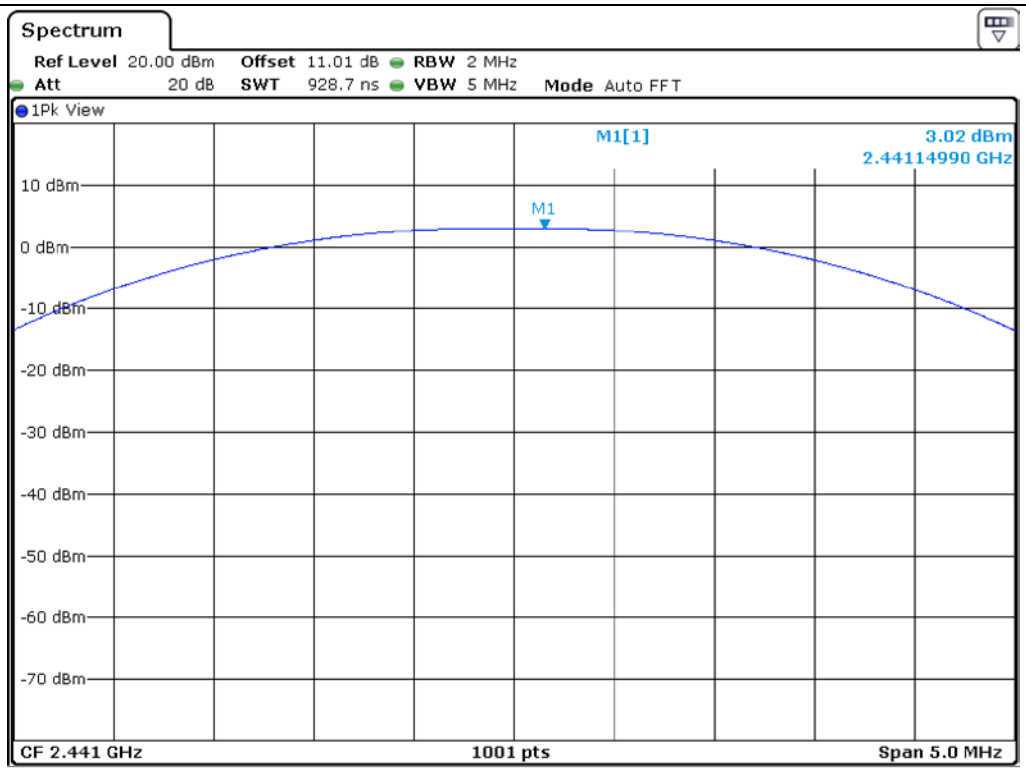
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Hyung-Kwon, Oh / Manager

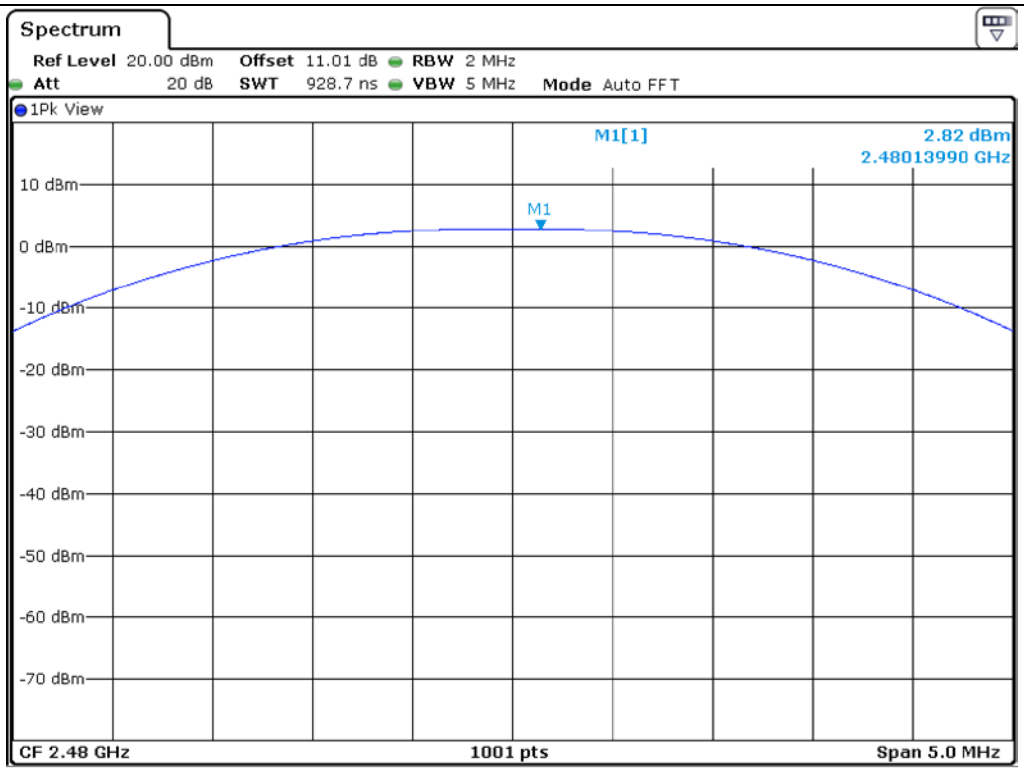


Low Channel

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



High Channel

11.5 Test data for 2 Mbps

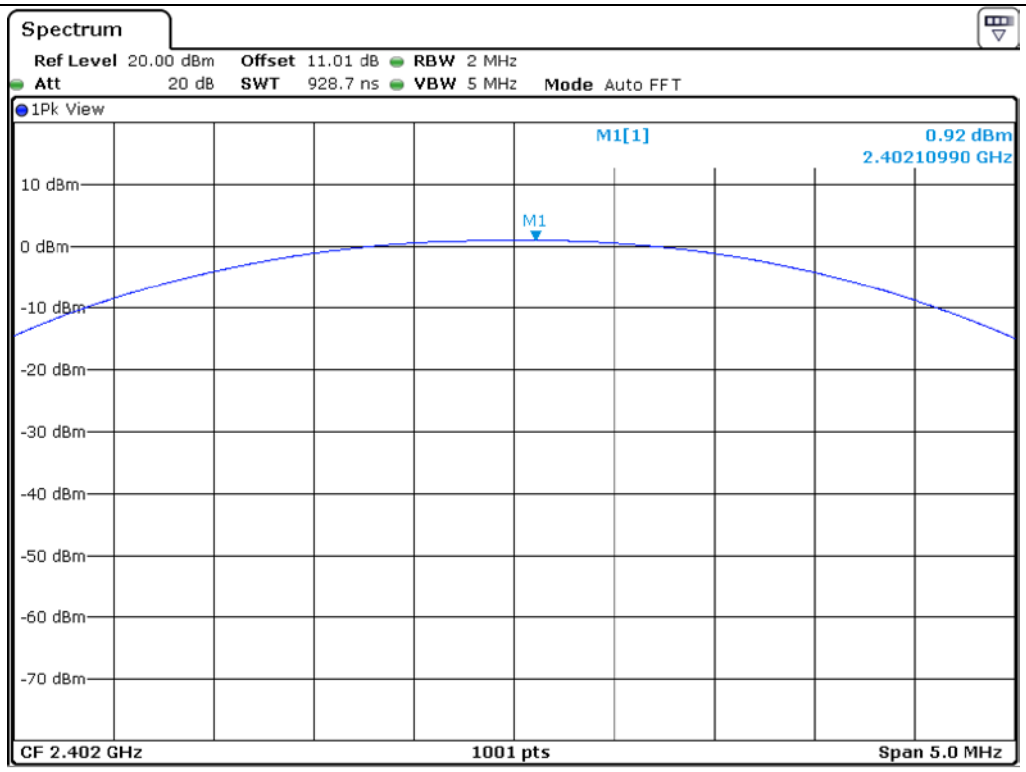
-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	0.92	21.00	20.08
MIDDLE	2 441.00	1.76	21.00	19.24
HIGH	2 480.00	1.30	21.00	19.70

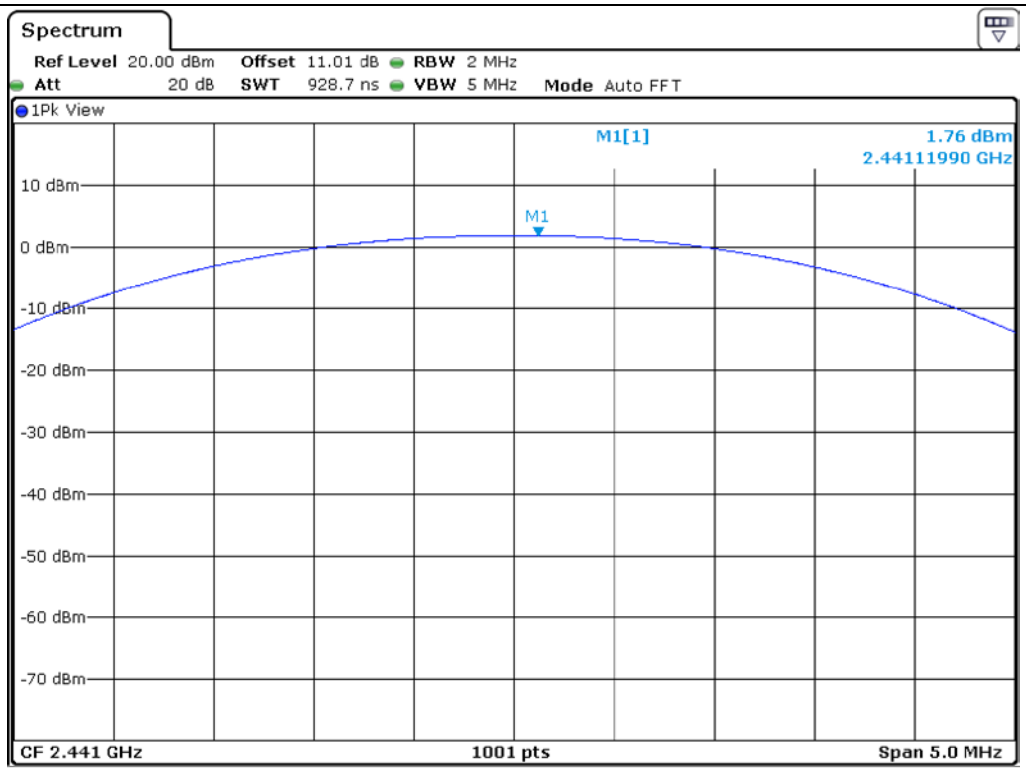
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Hyung-Kwon, Oh / Manager

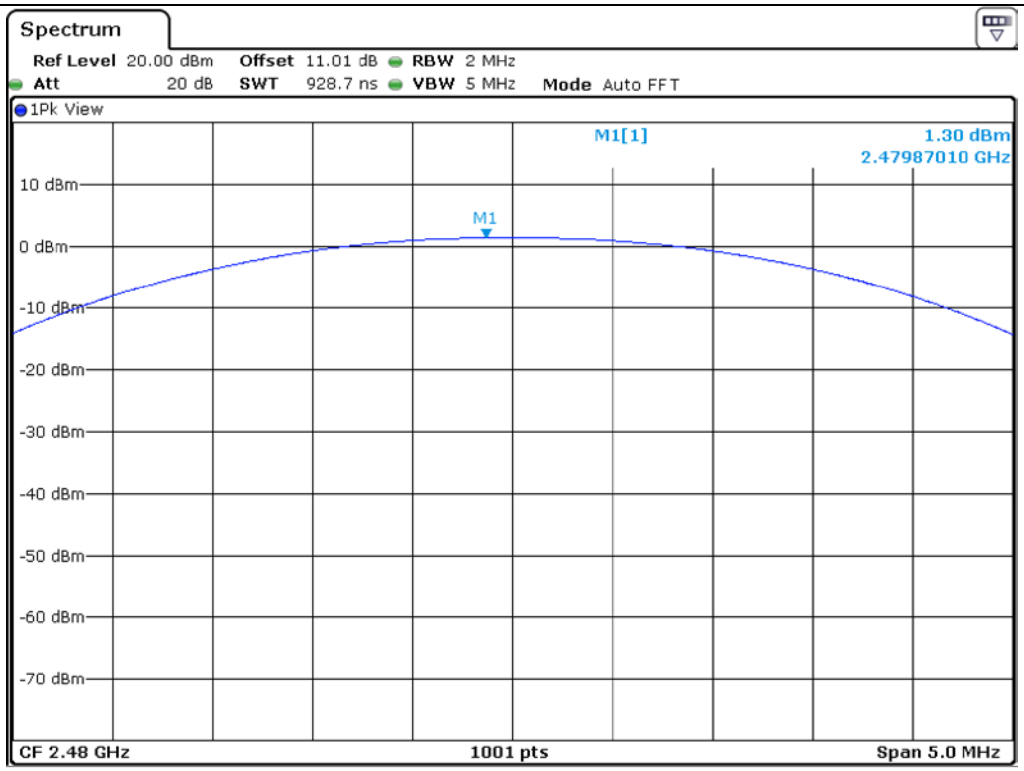


Low Channel

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



High Channel

11.6 Test data for 3 Mbps

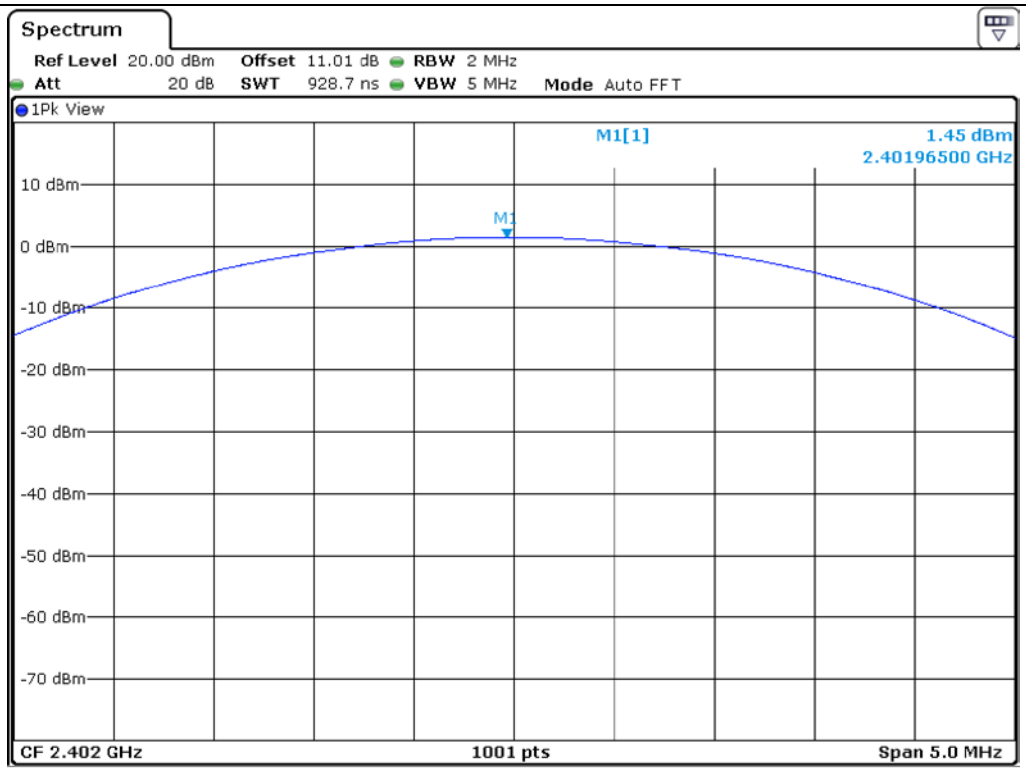
-. Test Date : January 10, 2020 ~ January 14, 2020

-. Test Result : Pass

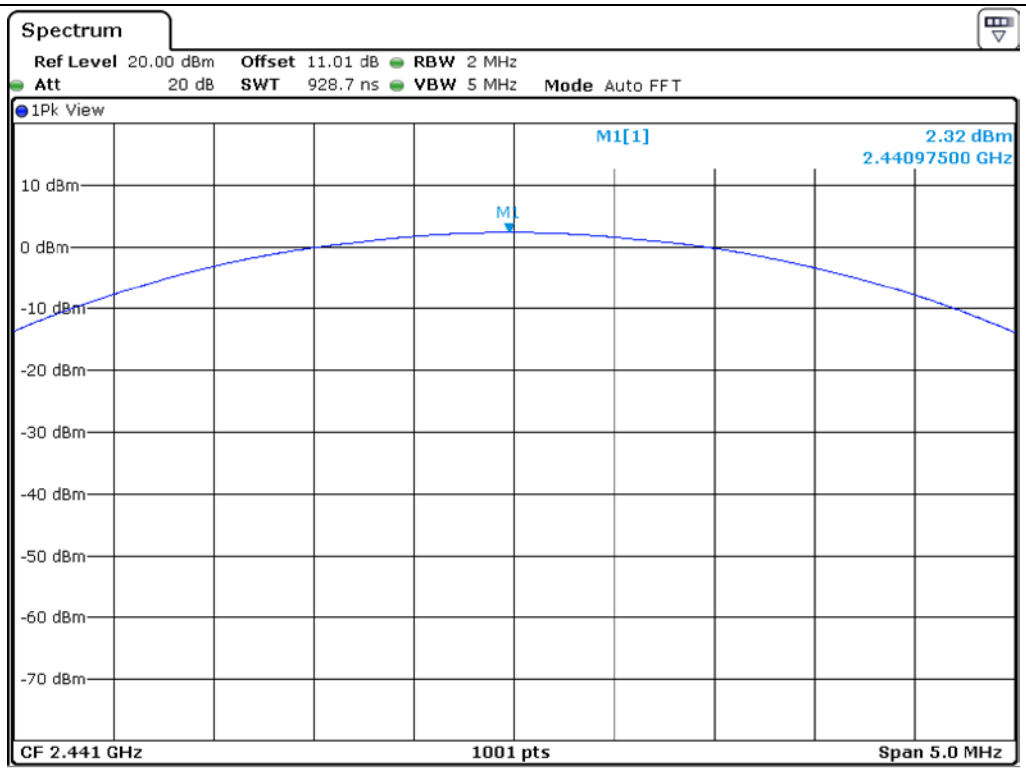
CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	1.45	21.00	19.55
MIDDLE	2 441.00	2.32	21.00	18.68
HIGH	2 480.00	2.01	21.00	18.99

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

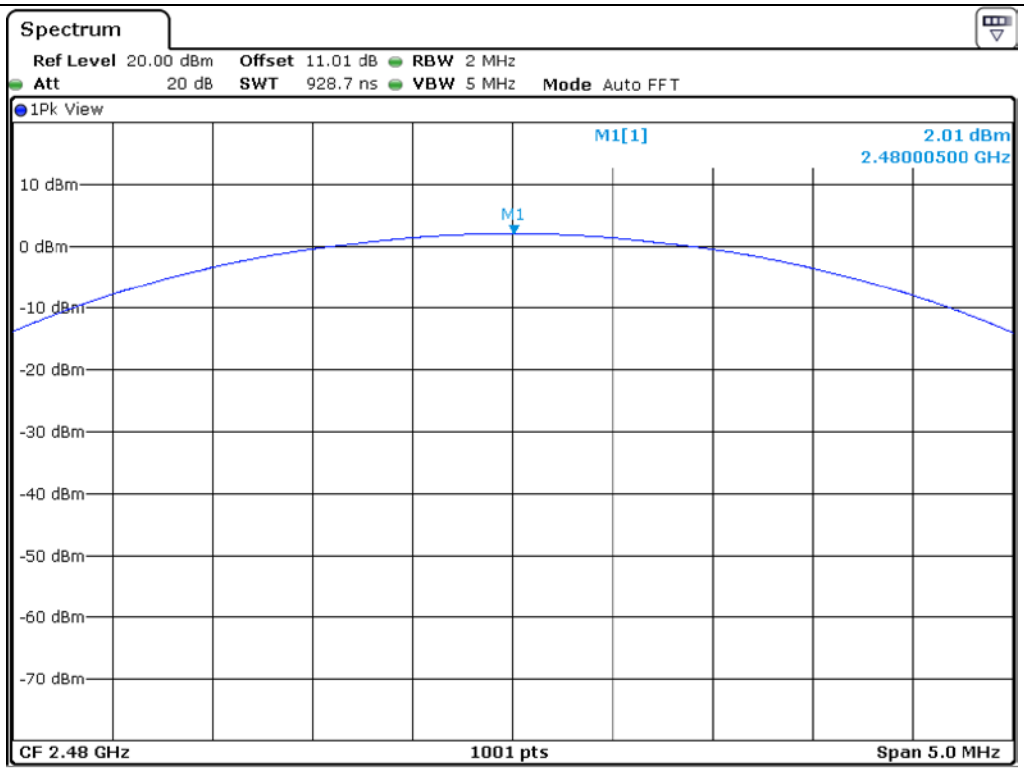
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

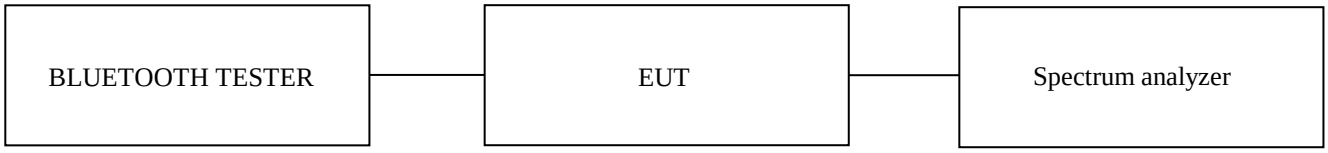
12.1 Operating environment

Temperature : 23 °C

Relative humidity : 45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)
■ -	ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (1Y)
■	SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 24, 2019(1Y)
■ -	DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
■ -	MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 16, 2019(1Y)

All test equipment used is calibrated on a regular basis.

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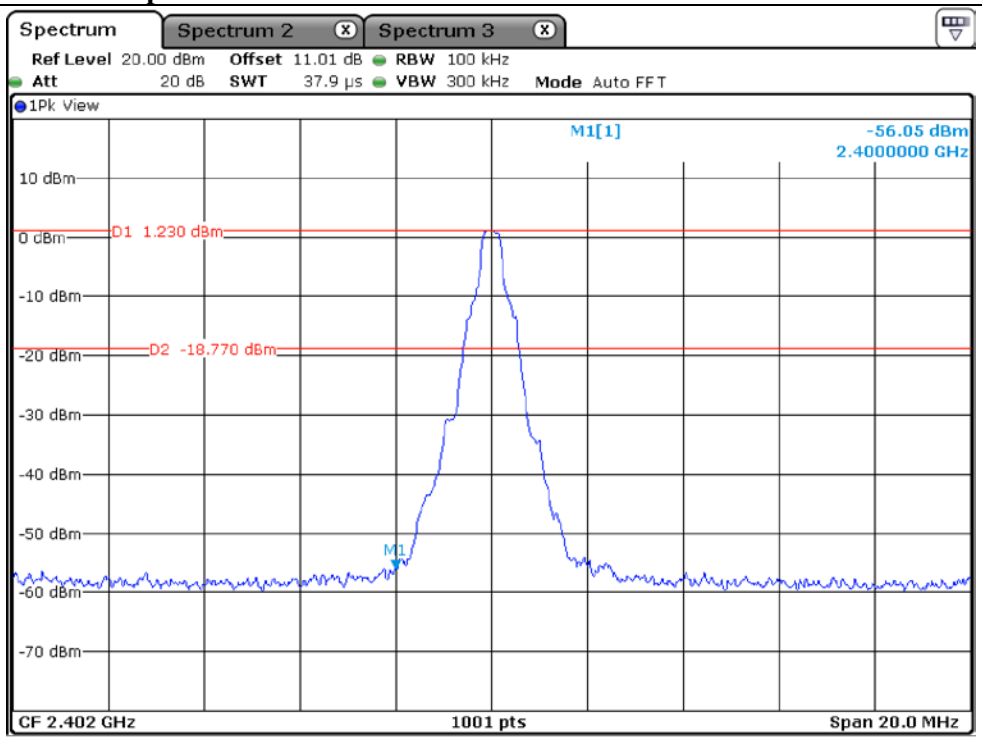
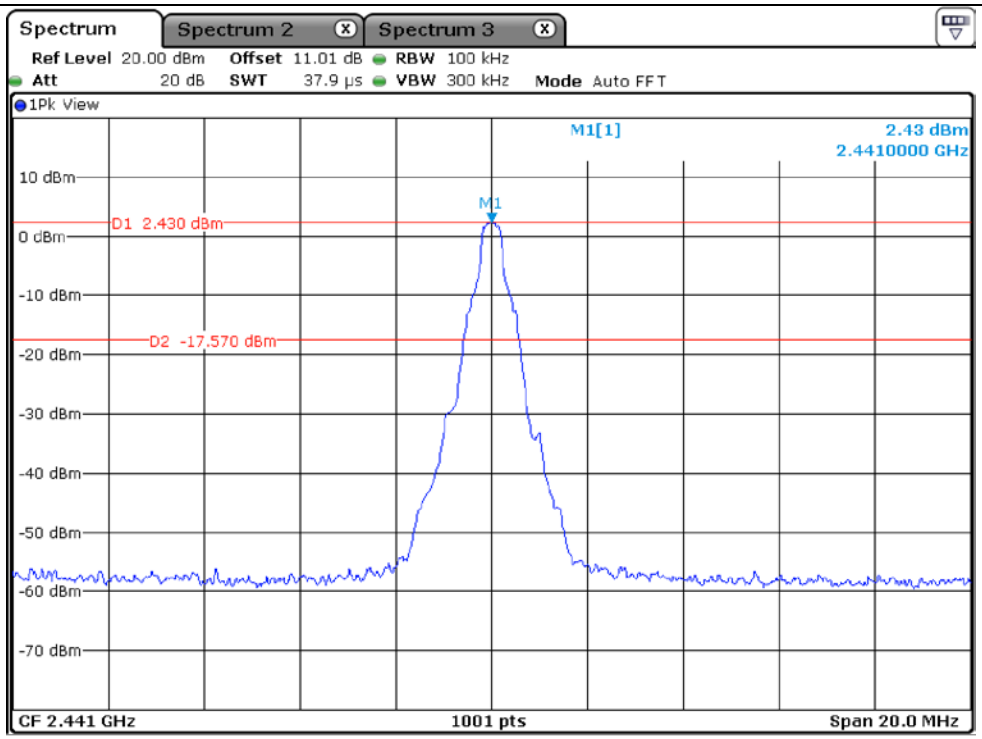
12.5 Test data for conducted emission

12.5.1 Test data for 1 Mbps

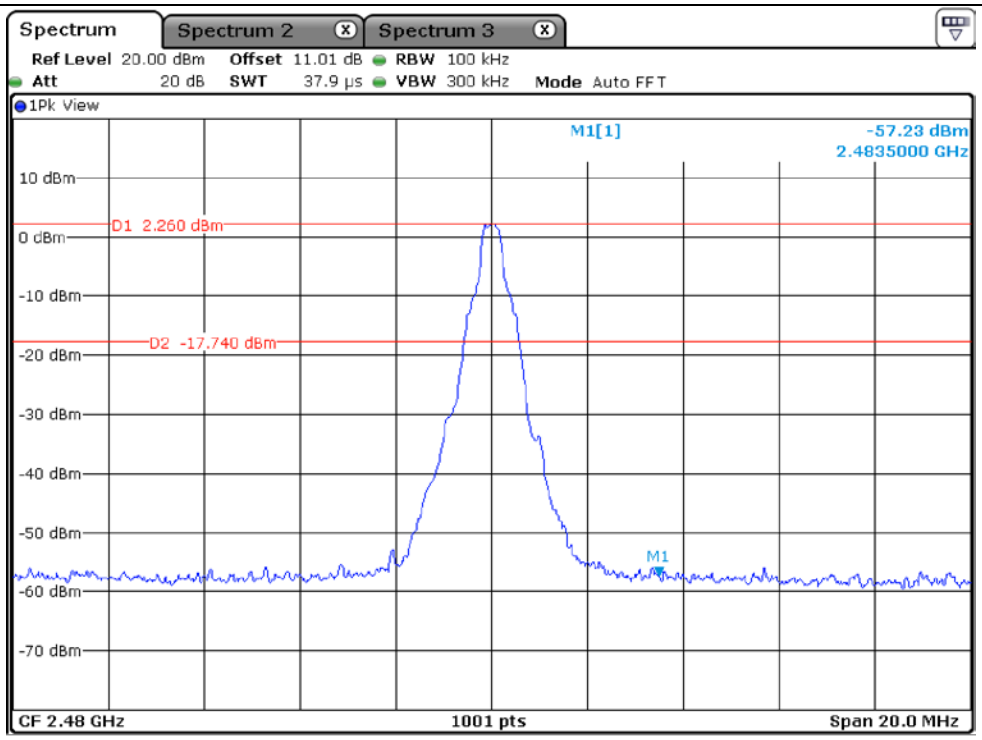


Low Channel

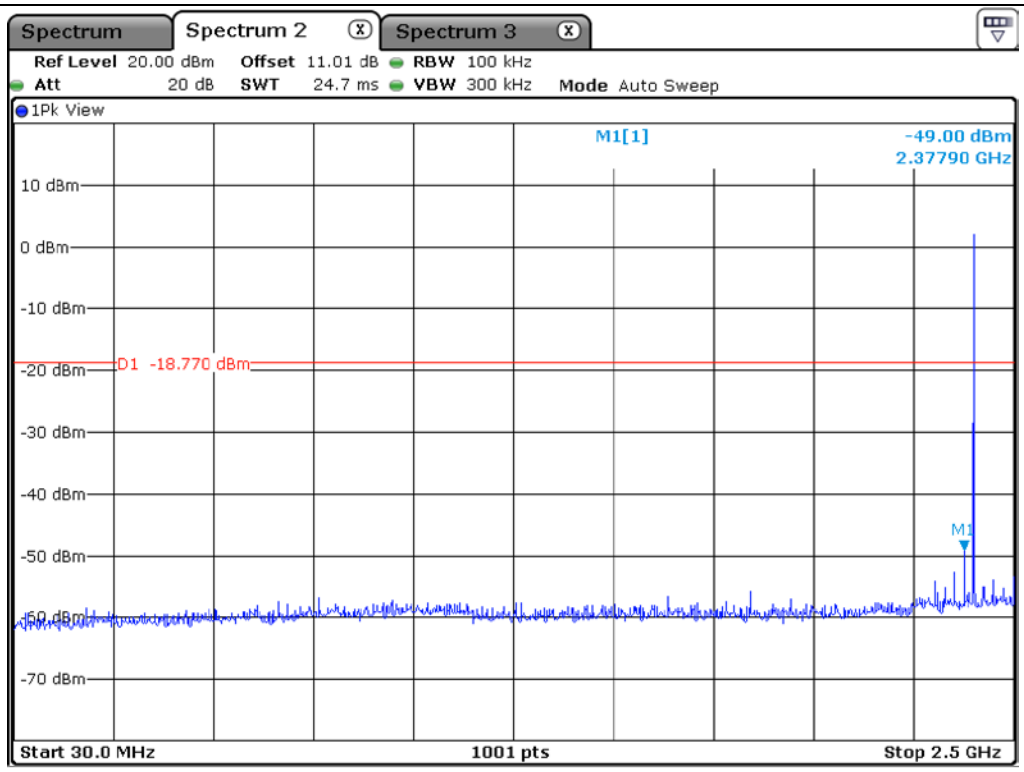


Middle Channel

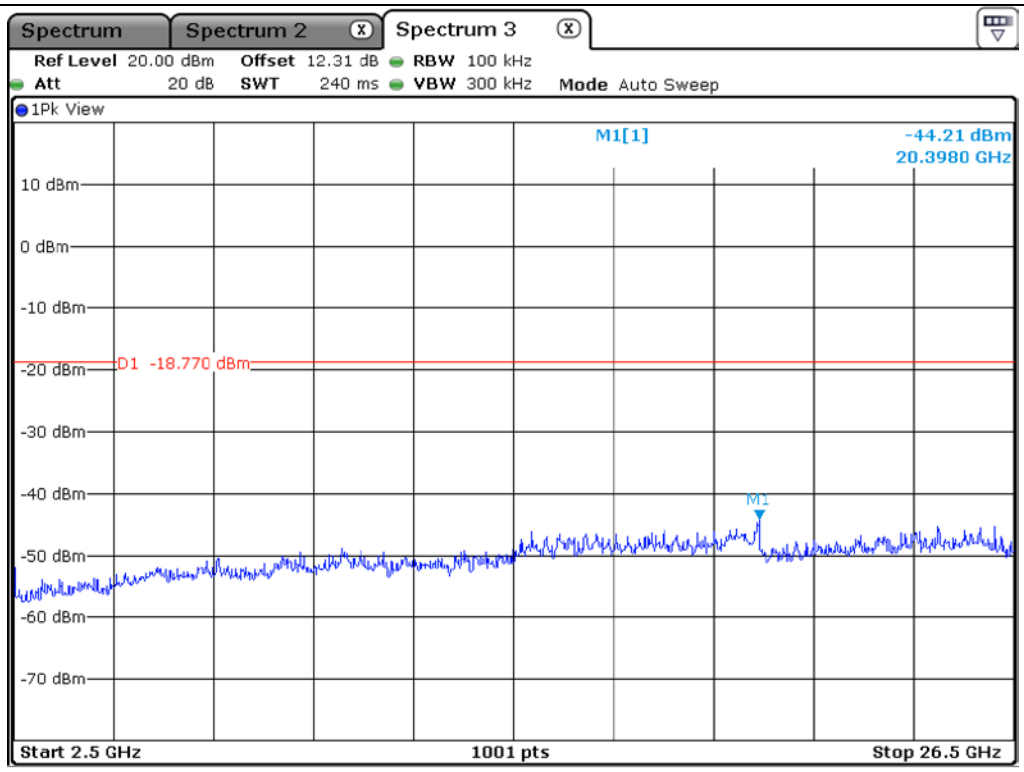
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



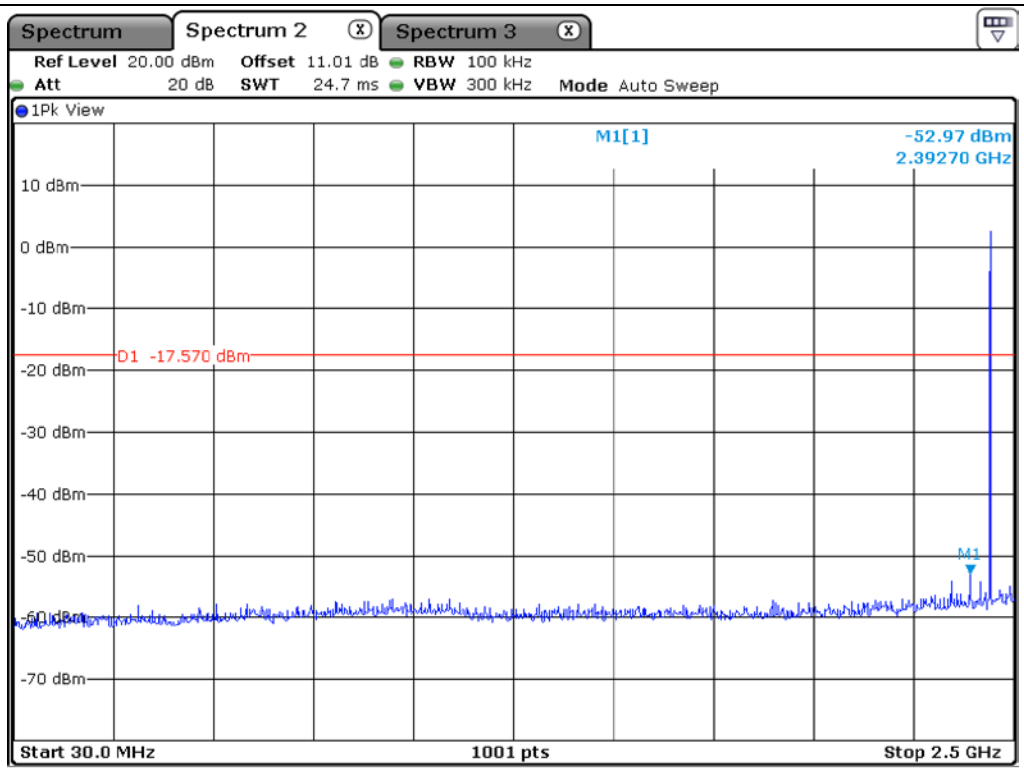
High Channel



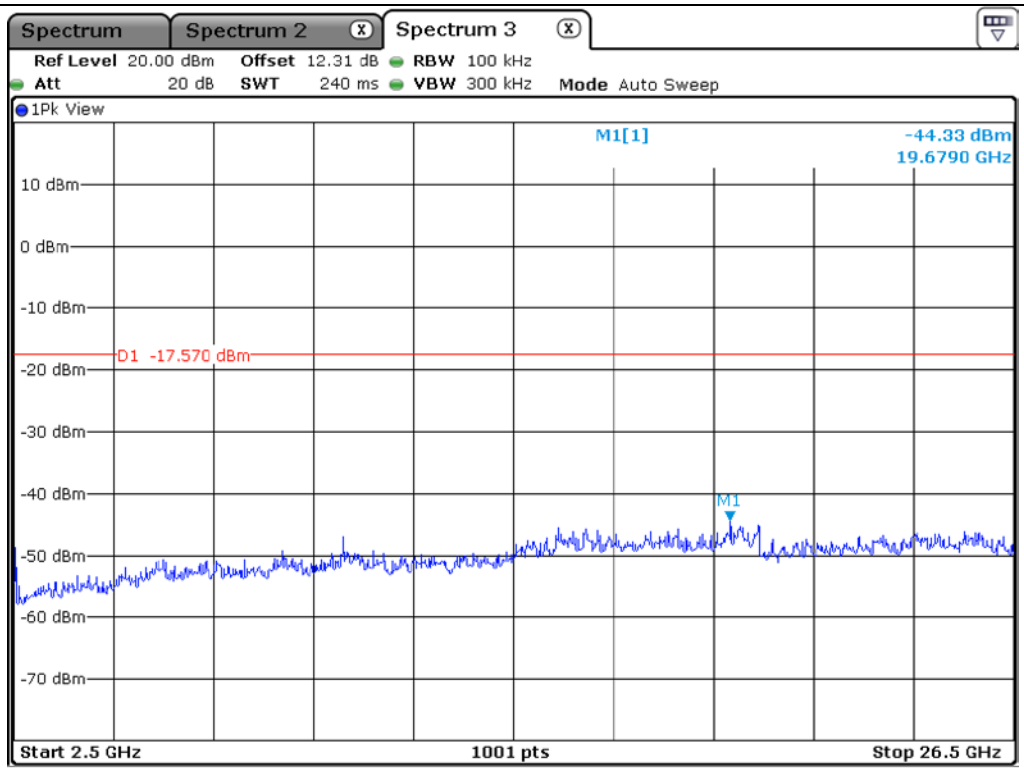
Low Channel



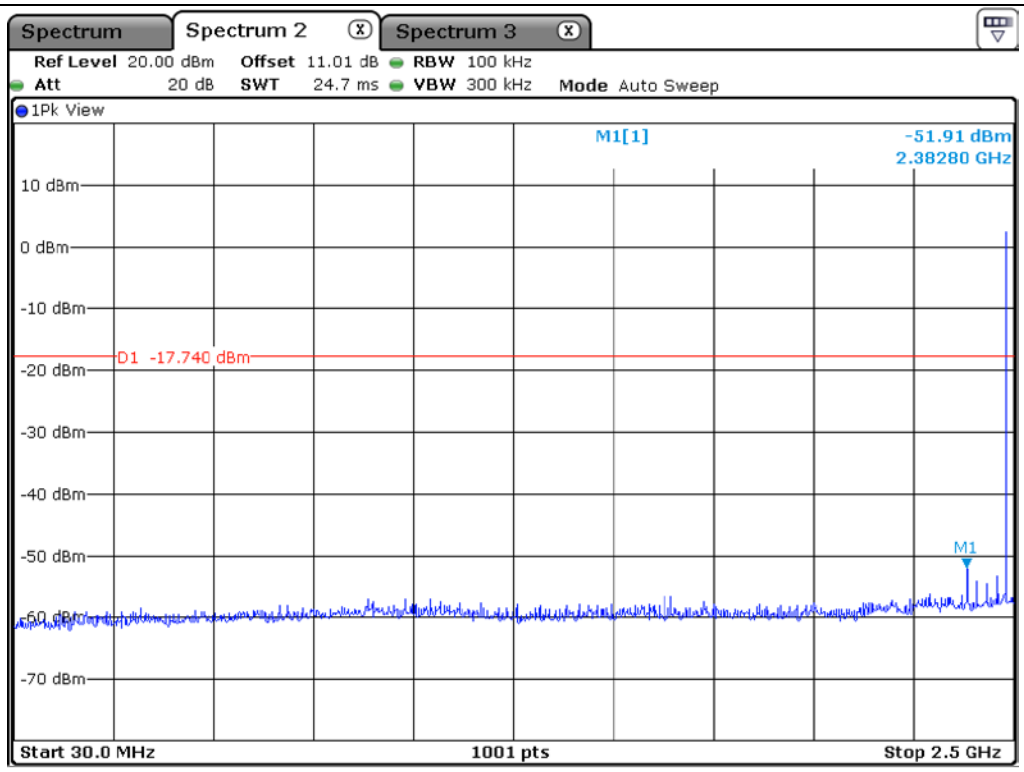
Low Channel



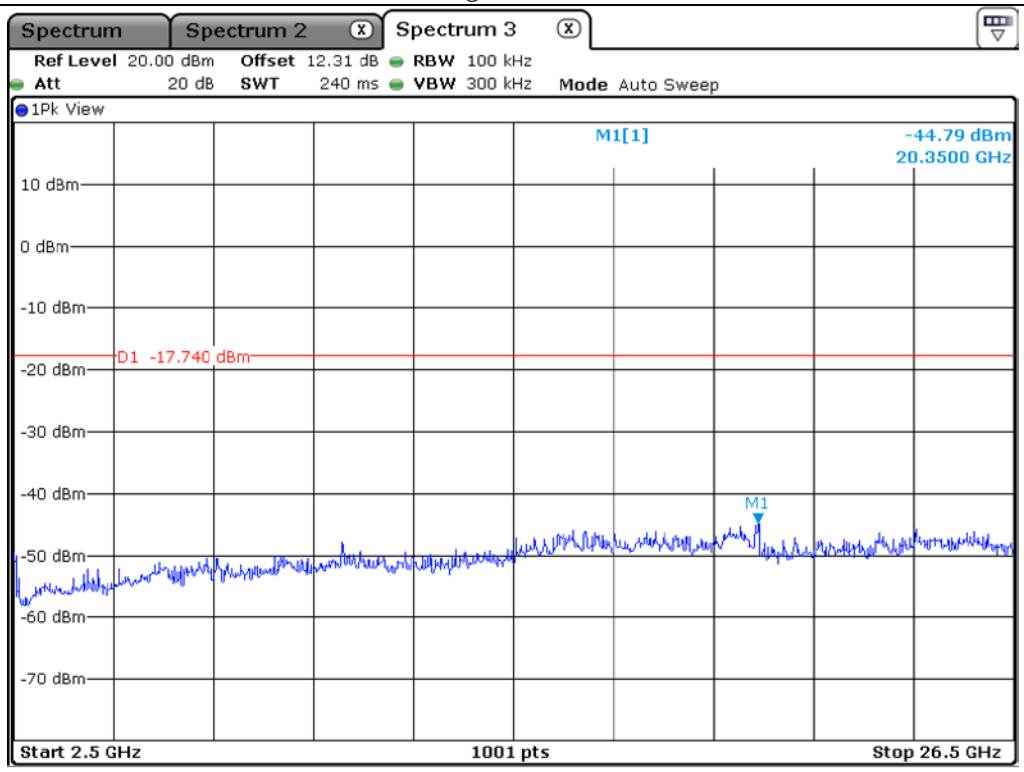
Middle Channel



Middle Channel

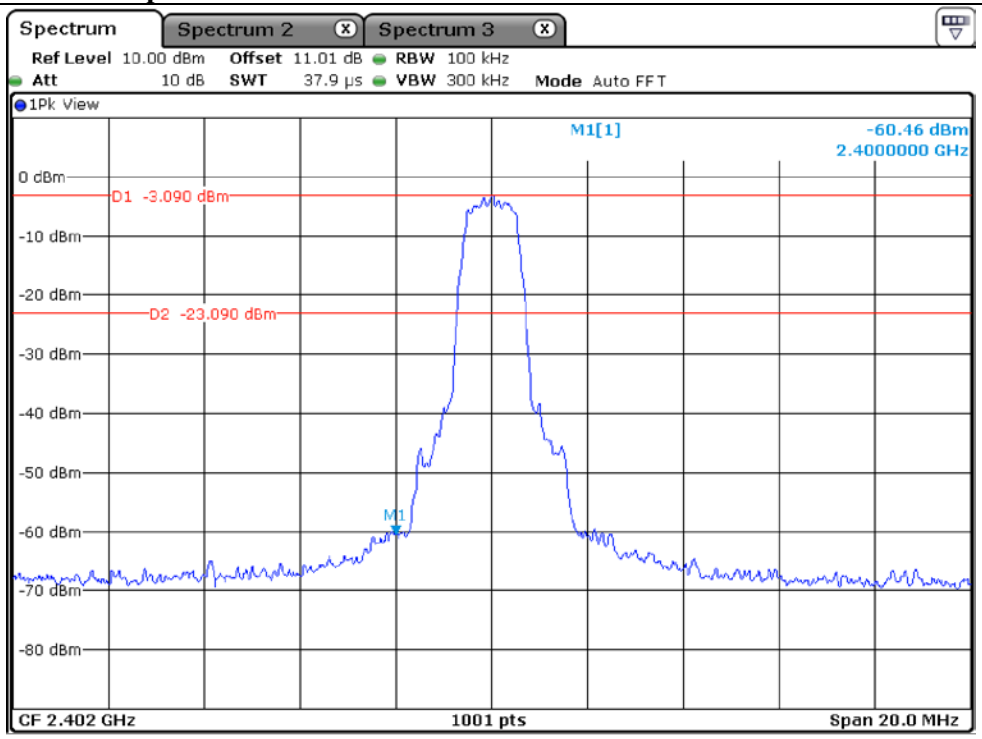


High Channel

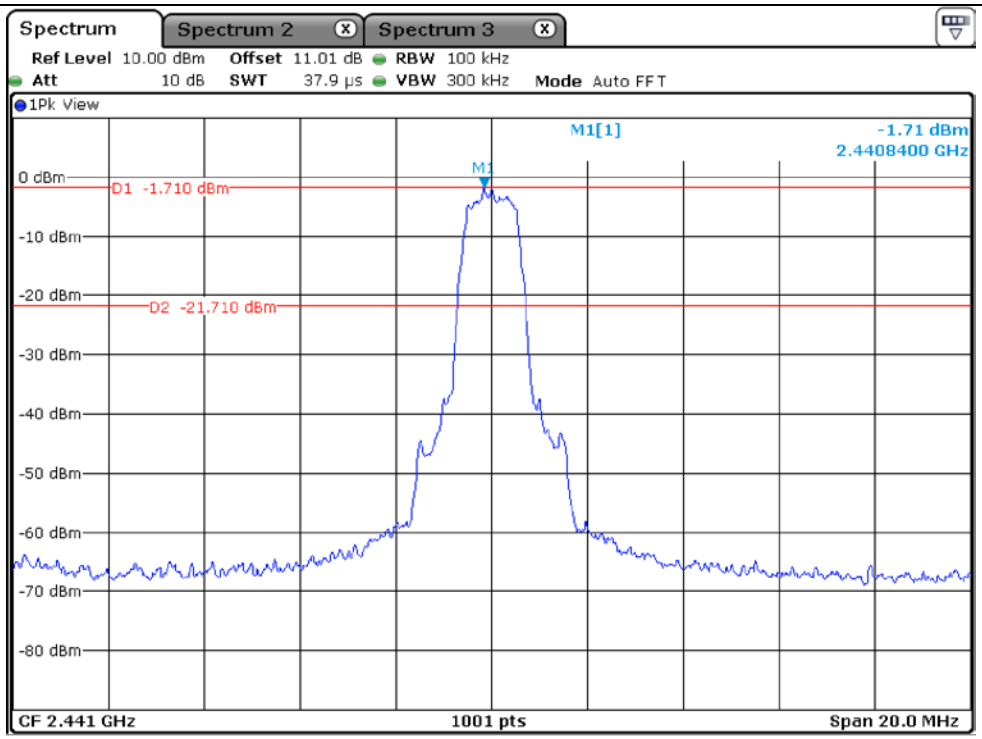


High Channel

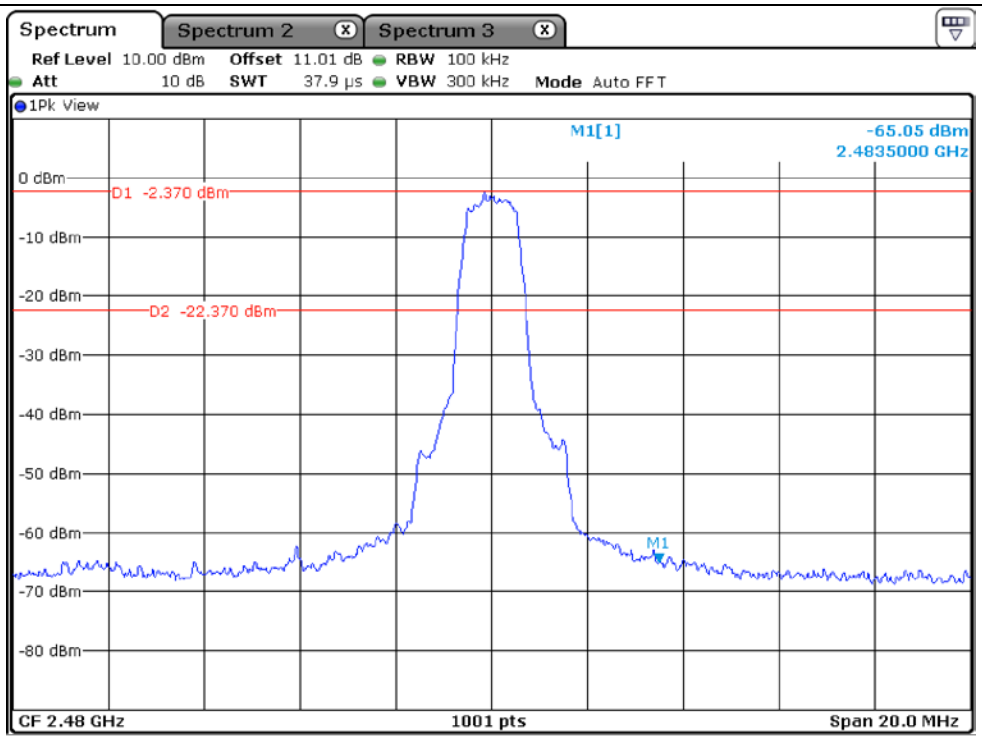
12.5.2 Test data for 2 Mbps



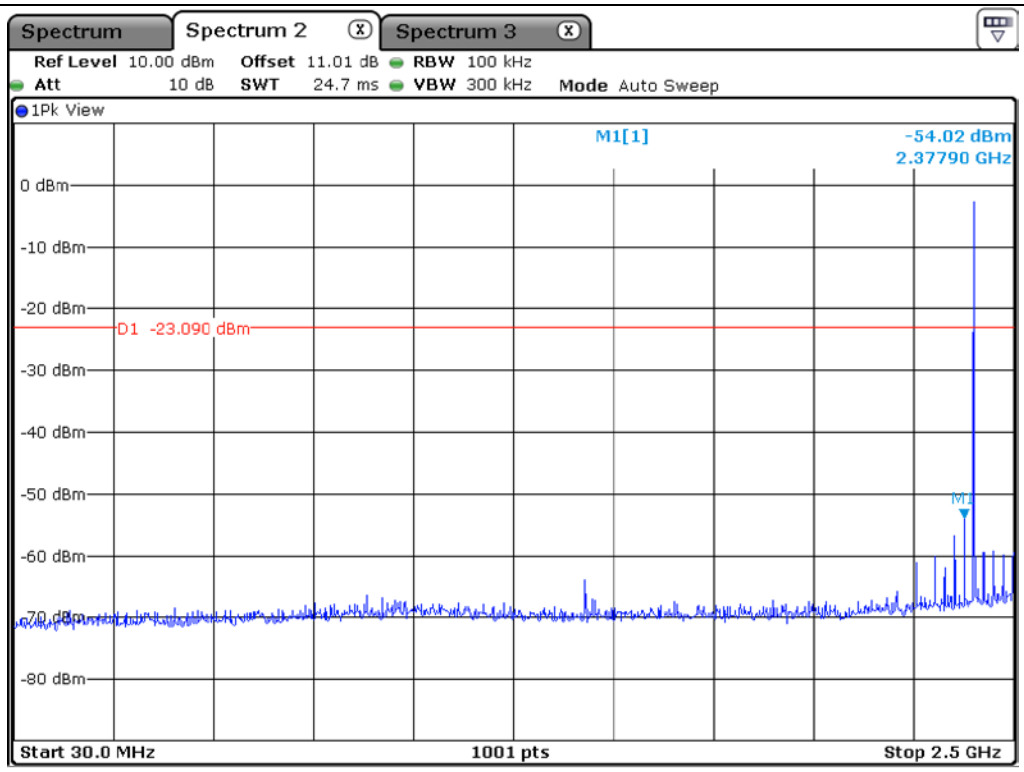
Low Channel



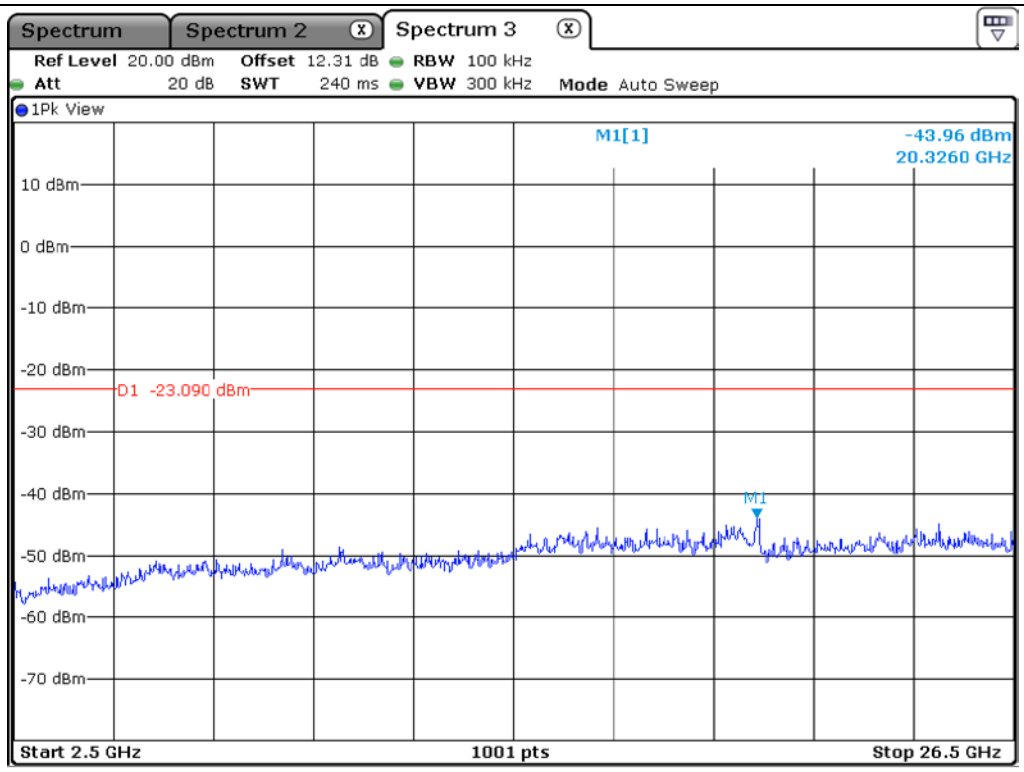
Middle Channel



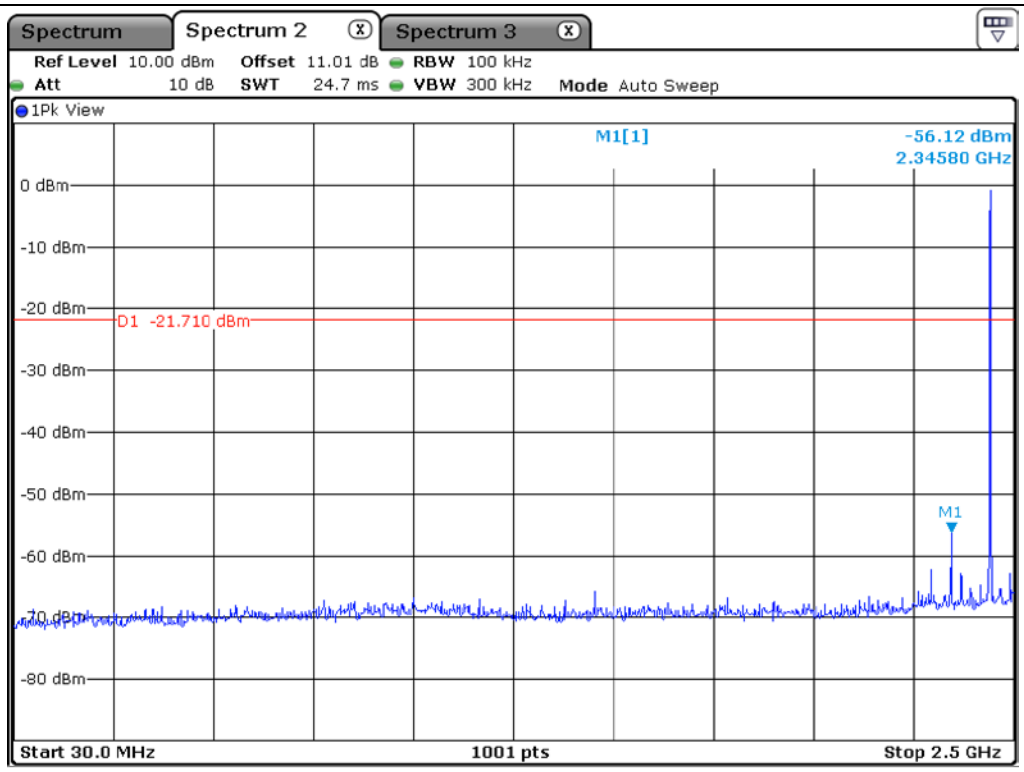
High Channel



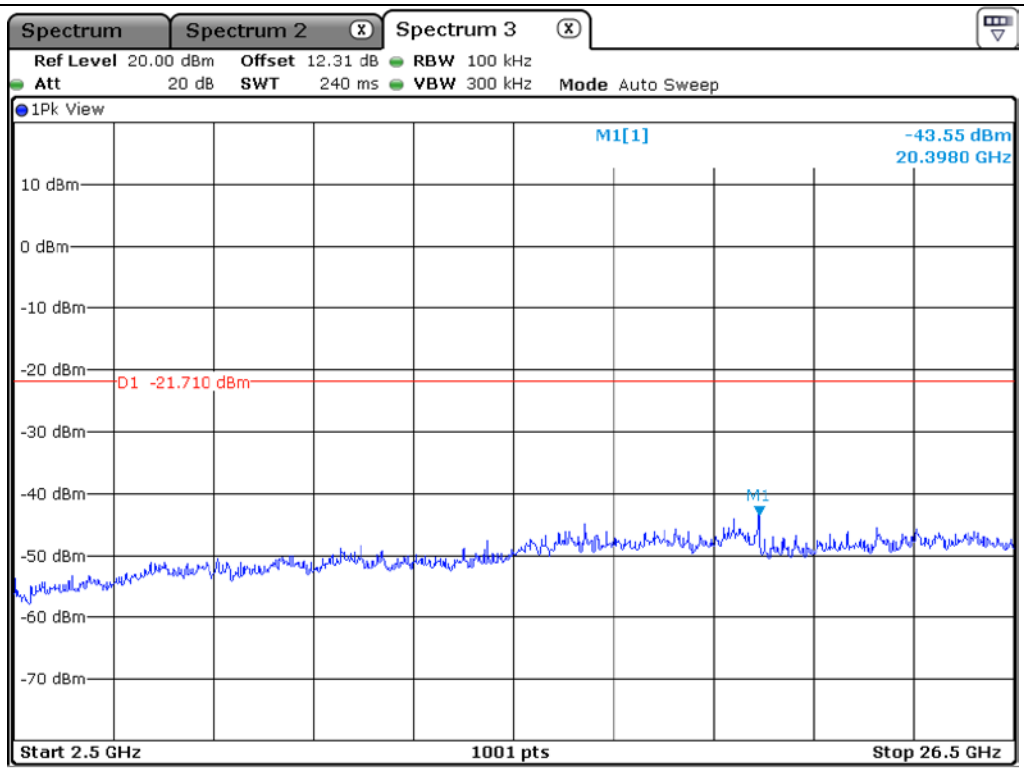
Low Channel



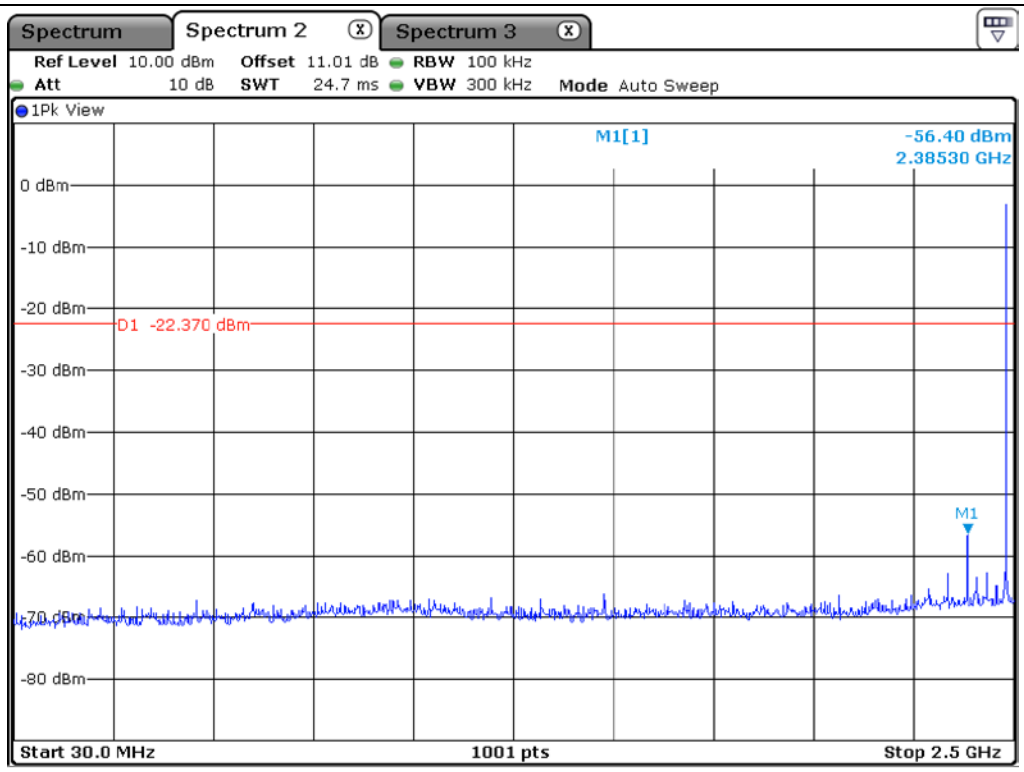
Low Channel



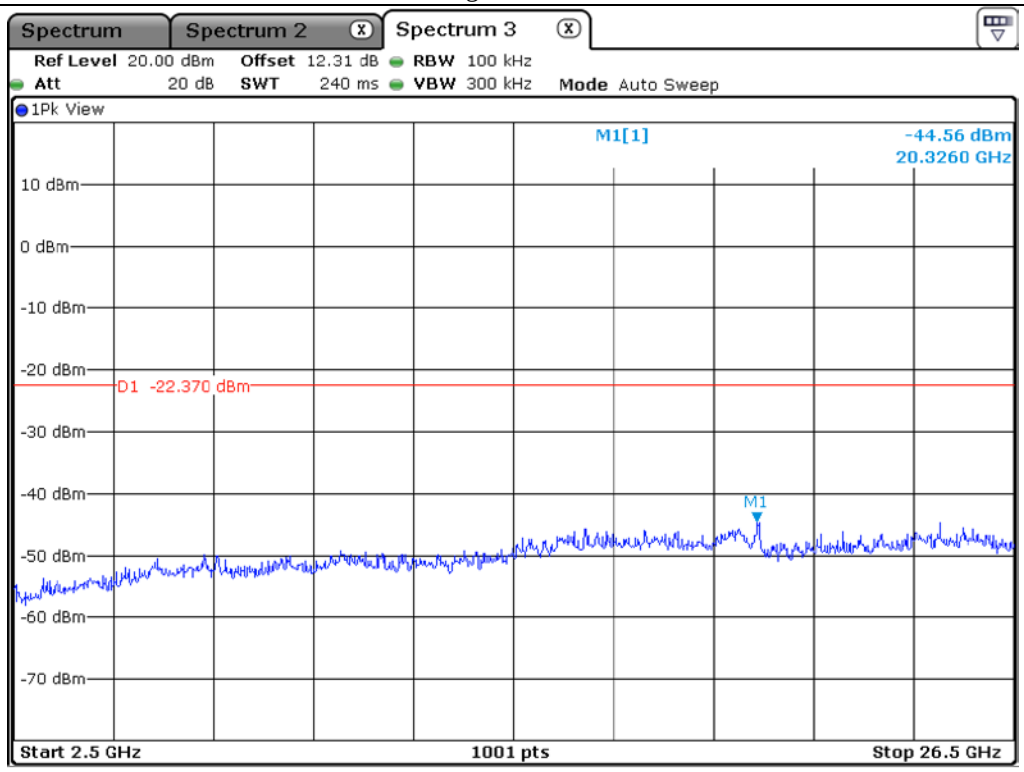
Middle Channel



Middle Channel

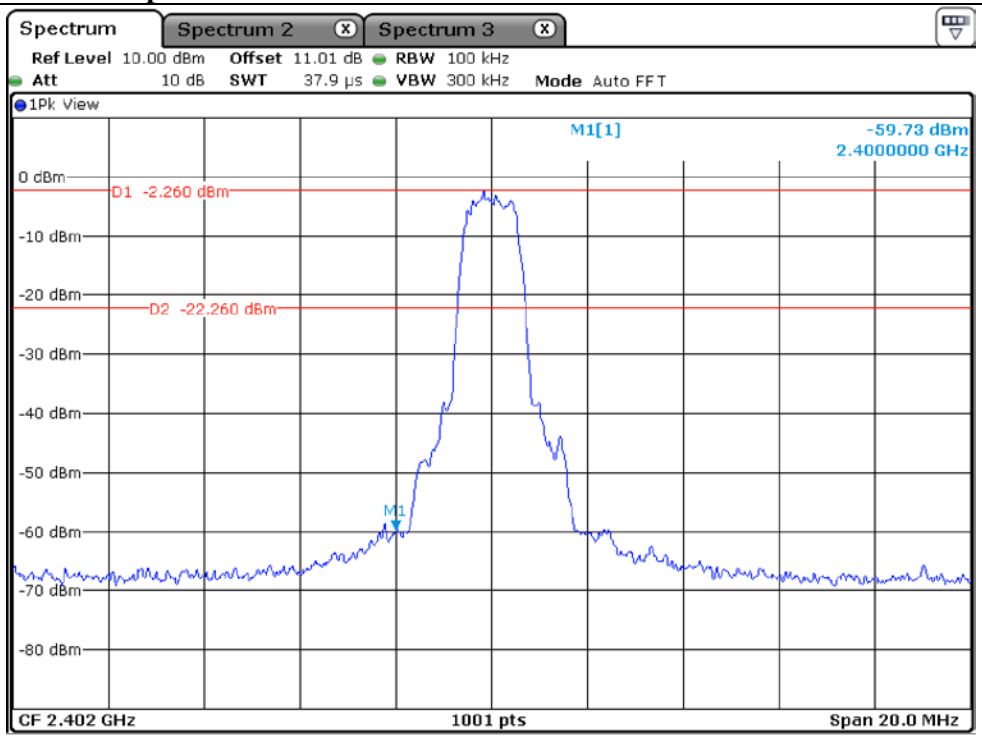


High Channel

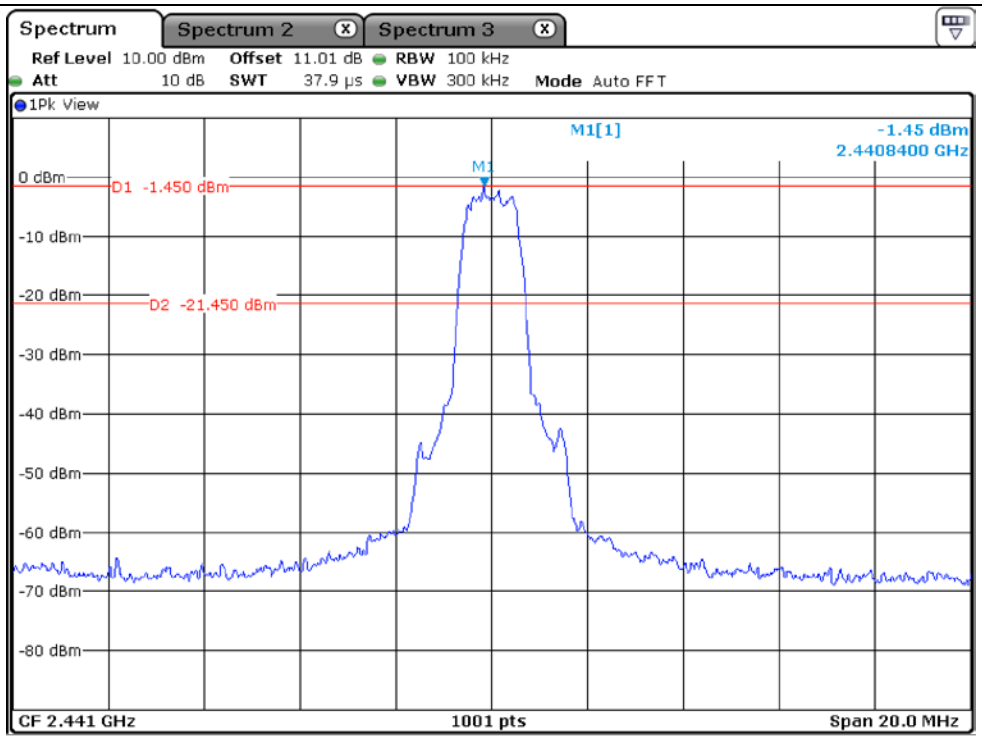


High Channel

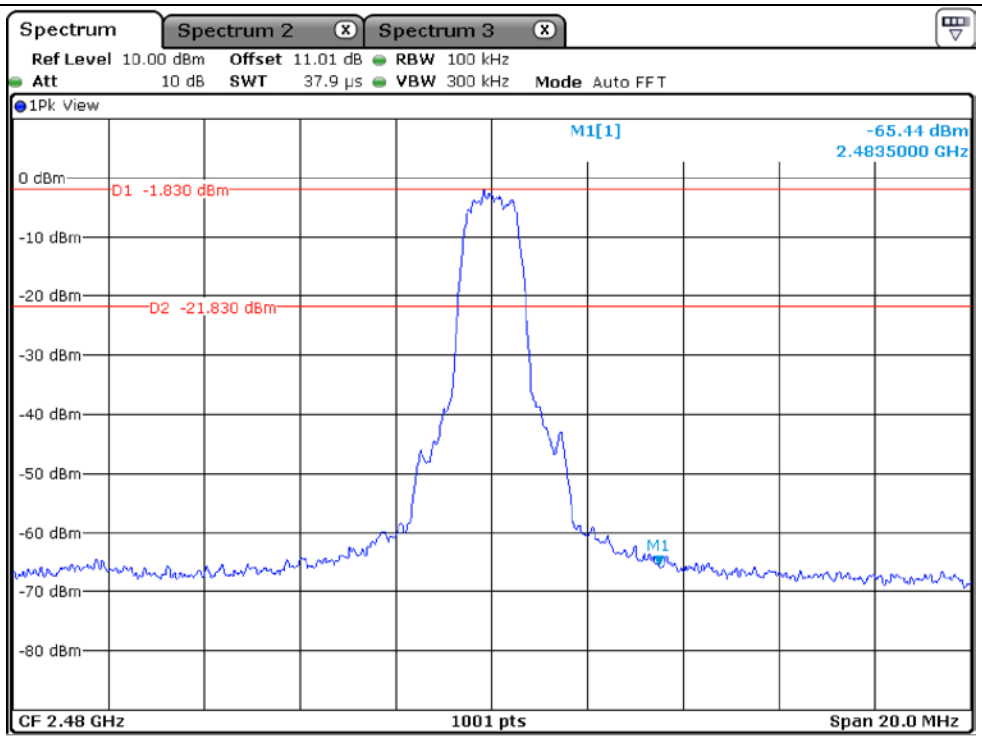
12.5.3 Test data for 3 Mbps



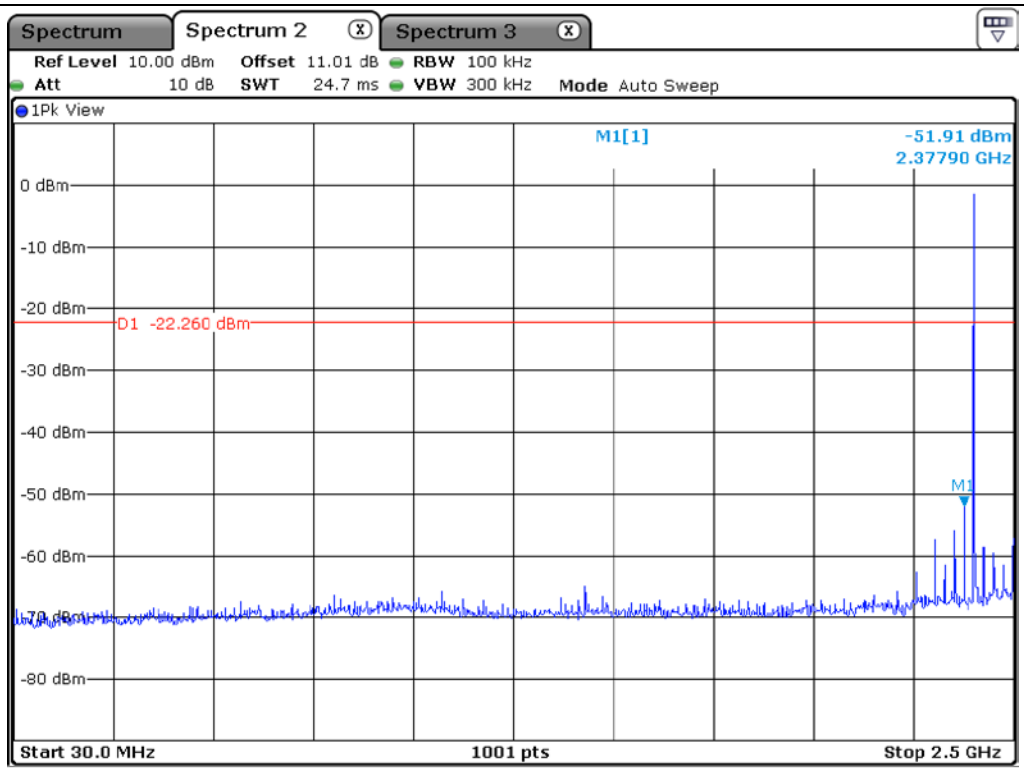
Low Channel



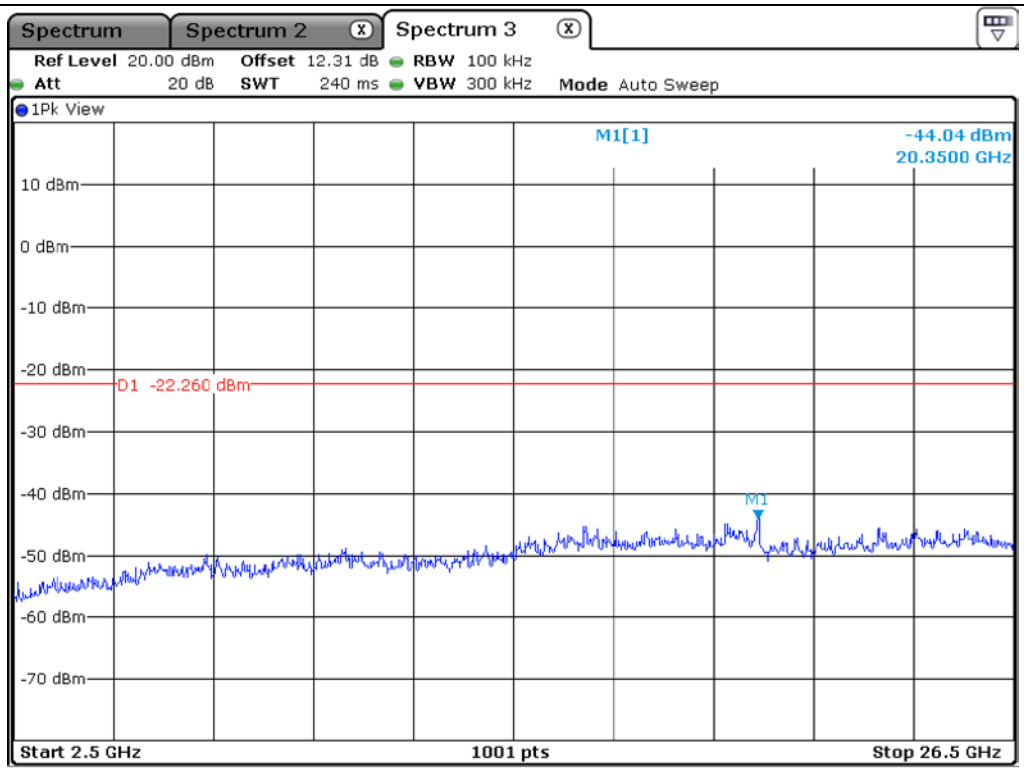
Middle Channel



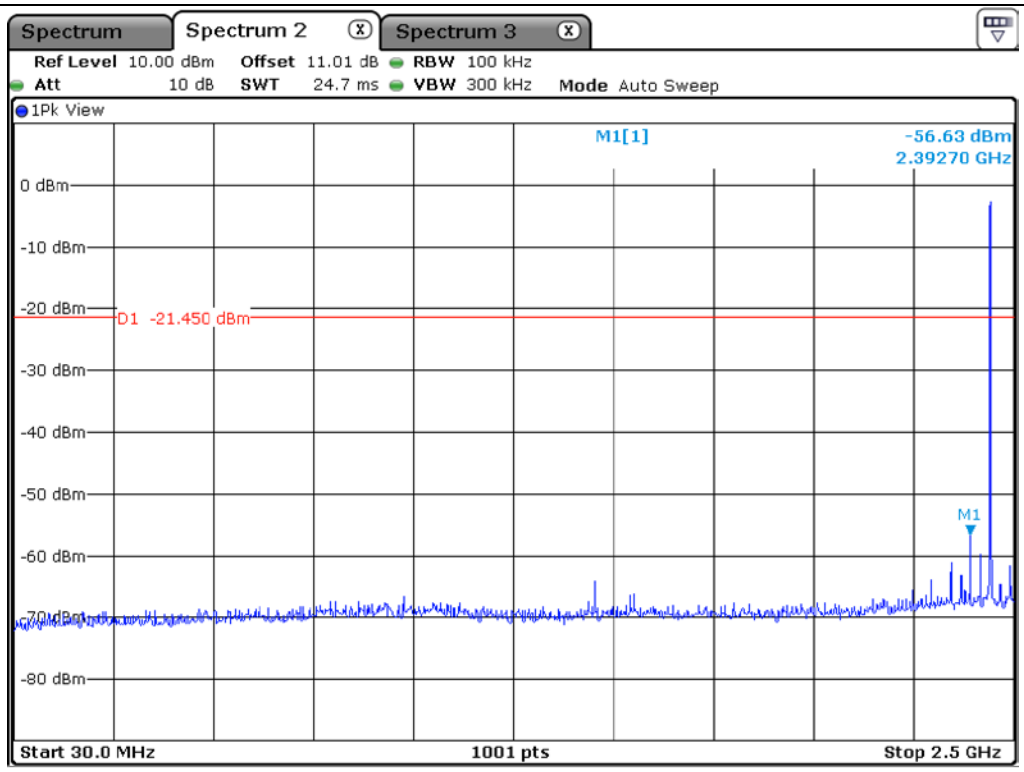
High Channel



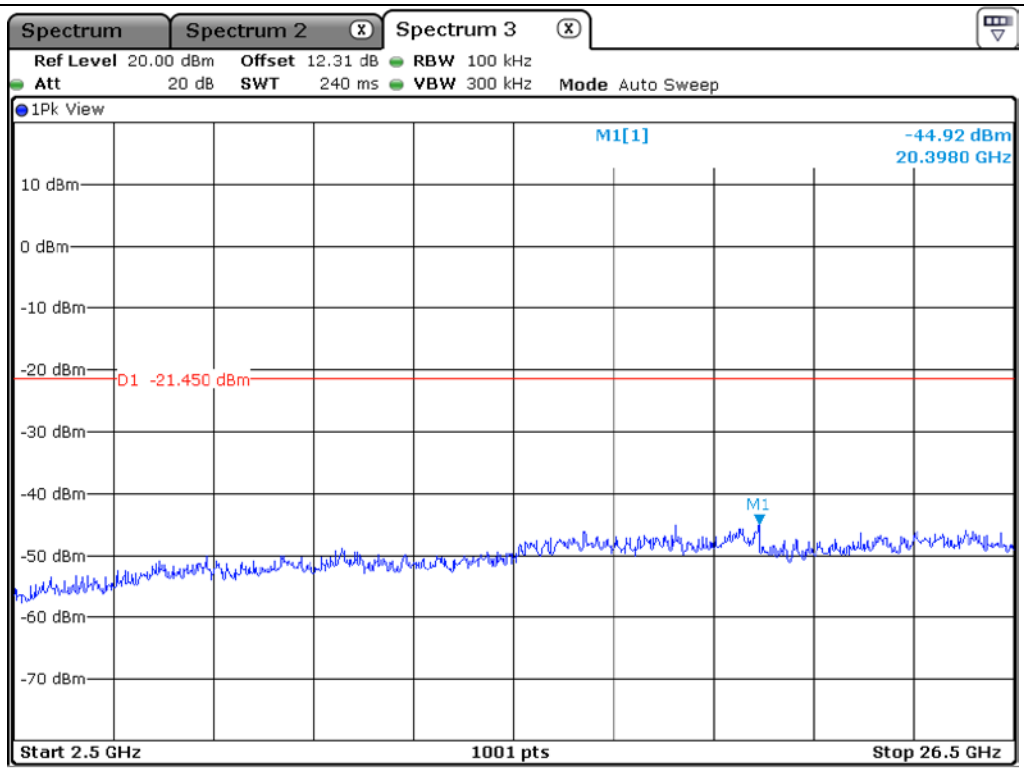
Low Channel



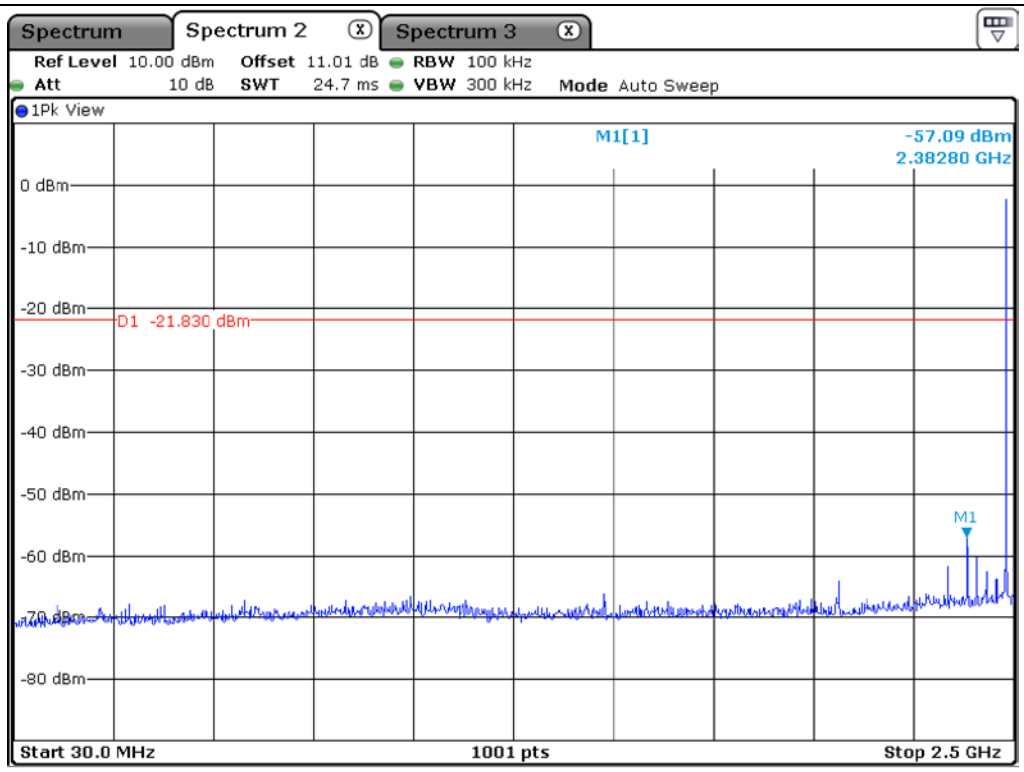
Low Channel



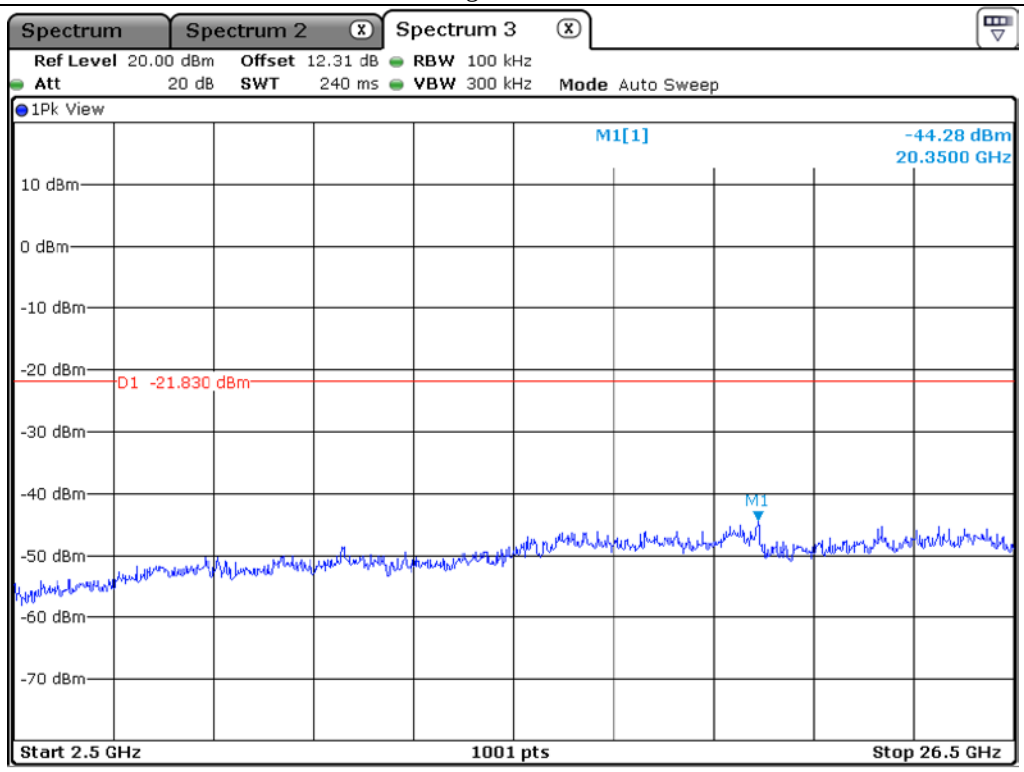
Middle Channel



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

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.33 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 378.611	24.66	Peak	H	26.90	3.07	-	54.63	74.00	19.37
2 377.972	12.78	Average	H			3.34	46.09	54.00	7.91
2 354.955	23.66	Peak	V			-	53.63	74.00	20.37
2 340.569	12.49	Average	V			3.34	45.80	54.00	8.20
Test Data for High Channel									
2 493.225	25.70	Peak	H	26.60	3.16	-	55.46	74.00	18.54
2 486.458	13.18	Average	H			3.34	46.28	54.00	7.72
2 487.803	25.25	Peak	V			-	55.01	74.00	18.99
2 499.125	13.43	Average	V			3.34	46.53	54.00	7.47

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

12.6.1.2 Test data for 2 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.01 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 385.486	24.30	Peak	H	26.90	3.07	-	54.27	74.00	19.73
2 362.055	12.19	Average	H			3.37	45.53	54.00	8.47
2 360.312	25.34	Peak	V			-	55.31	74.00	18.69
2 328.511	12.30	Average	V			3.37	45.64	54.00	8.36
Test Data for High Channel									
2 498.955	25.10	Peak	H	26.60	3.16	-	54.86	74.00	19.14
2 484.424	13.41	Average	H			3.37	46.54	54.00	7.46
2 483.577	25.36	Peak	V			-	55.12	74.00	18.88
2 498.826	13.16	Average	V			3.37	46.29	54.00	7.71

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

12.6.1.3 Test data for 3 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.33 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 379.092	24.33	Peak	H	26.90	3.07	-	54.30	74.00	19.70
2 315.233	12.50	Average	H			3.34	45.81	54.00	8.19
2 378.055	24.70	Peak	V			-	54.67	74.00	19.33
2 321.880	12.47	Average	V			3.34	45.78	54.00	8.22
Test Data for High Channel									
2 486.612	25.40	Peak	H	26.60	3.16	-	55.16	74.00	18.84
2 498.727	13.36	Average	H			3.34	46.46	54.00	7.54
2 495.099	25.41	Peak	V			-	55.17	74.00	18.83
2 495.190	13.20	Average	V			3.34	46.30	54.00	7.70

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

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12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

12.6.2.1 Test data for 1 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.33 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	22.60	Peak	H	28.20	4.85	-	55.65	74.00	18.35
4 804.000	10.33	Average	H			3.34	46.72	54.00	7.28
4 804.000	22.51	Peak	V			-	55.56	74.00	18.44
4 804.000	10.60	Average	V			3.34	46.99	54.00	7.01
Test Data for Middle Channel									
4 882.000	22.42	Peak	H	28.30	4.91	-	55.63	74.00	18.37
4 882.000	10.80	Average	H			3.34	47.35	54.00	6.65
4 882.000	22.88	Peak	V			-	56.09	74.00	17.91
4 882.000	10.63	Average	V			3.34	47.18	54.00	6.82
Test Data for High Channel									
4 960.000	22.80	Peak	H	28.60	5.04	-	56.44	74.00	17.56
4 960.000	11.73	Average	H			3.34	48.71	54.00	5.29
4 960.000	22.84	Peak	V			-	56.48	74.00	17.52
4 960.000	11.65	Average	V			3.34	48.63	54.00	5.37

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

12.6.2.2 Test data for 2 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.01 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	22.20	Peak	H	28.20	4.85	-	55.25	74.00	18.75
4 804.000	10.42	Average	H			3.37	46.84	54.00	7.16
4 804.000	22.82	Peak	V			-	55.87	74.00	18.13
4 804.000	10.96	Average	V			3.37	47.38	54.00	6.62
Test Data for Middle Channel									
4 882.000	22.17	Peak	H	28.30	4.91	-	55.38	74.00	18.62
4 882.000	10.21	Average	H			3.37	46.79	54.00	7.21
4 882.000	22.27	Peak	V			-	55.48	74.00	18.52
4 882.000	10.42	Average	V			3.37	47.00	54.00	7.00
Test Data for High Channel									
4 960.000	22.67	Peak	H	28.60	5.04	-	56.31	74.00	17.69
4 960.000	10.64	Average	H			3.37	47.65	54.00	6.35
4 960.000	22.81	Peak	V			-	56.45	74.00	17.55
4 960.000	10.76	Average	V			3.37	47.77	54.00	6.23

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

12.6.2.3 Test data for 3 Mbps

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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 : 46.33 %

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	C.F (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 804.000	22.35	Peak	H	28.20	4.85	-	55.40	74.00	18.60
4 804.000	10.70	Average	H			3.34	47.09	54.00	6.91
4 804.000	22.85	Peak	V			-	55.90	74.00	18.10
4 804.000	10.48	Average	V			3.34	46.87	54.00	7.13
Test Data for Middle Channel									
4 882.000	22.31	Peak	H	28.30	4.91	-	55.52	74.00	18.48
4 882.000	10.14	Average	H			3.34	46.69	54.00	7.31
4 882.000	22.08	Peak	V			-	55.29	74.00	18.71
4 882.000	10.07	Average	V			3.34	46.62	54.00	7.38
Test Data for High Channel									
4 960.000	22.31	Peak	H	28.60	5.04	-	55.95	74.00	18.05
4 960.000	10.95	Average	H			3.34	47.93	54.00	6.07
4 960.000	22.30	Peak	V			-	55.94	74.00	18.06
4 960.000	10.67	Average	V			3.34	47.65	54.00	6.35

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

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13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 23 °C

Relative humidity : 45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	TC-3000C	TESCOM	BLUETOOTH TESTER	3000C000634	Mar. 11, 2019 (1Y)
■ -	ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (1Y)
■	SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 24, 2019(1Y)
■ -	DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
■ -	MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 16, 2019(1Y)

All test equipment used is calibrated on a regular basis.

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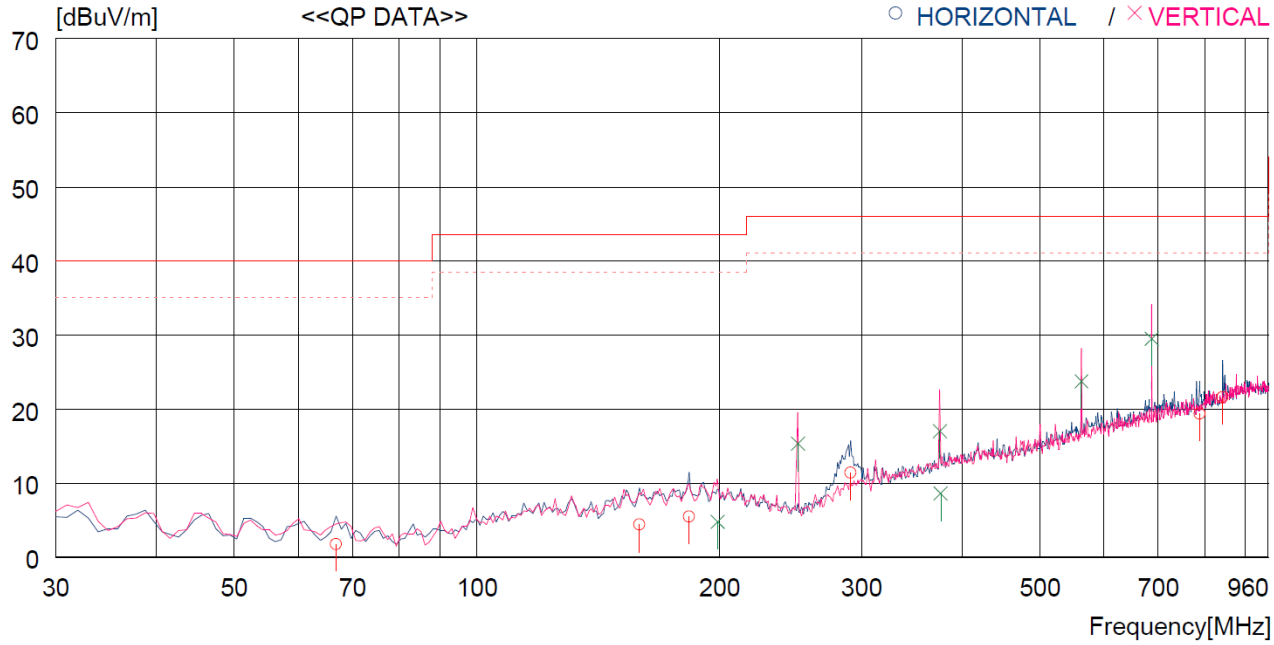
13.4 Test data for 30 MHz ~ 960 MHz

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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	66.860	23.3	10.3	0.7	32.5	1.8	40.0	38.2	100	206
2	159.010	26.8	8.9	1.2	32.5	4.4	43.5	39.1	200	359
3	183.260	26.6	10.1	1.3	32.5	5.5	43.5	38.0	200	0
4	290.930	28.7	13.6	1.6	32.5	11.4	46.0	34.6	100	0
5	788.532	27.7	21.9	2.1	32.3	19.4	46.0	26.6	200	143
6	842.851	28.7	22.6	2.4	32.1	21.6	46.0	24.4	100	200
----- Vertical ------										
7	198.780	25.4	10.6	1.3	32.5	4.8	43.5	38.7	100	359
8	250.190	33.3	12.9	1.5	32.4	15.3	46.0	30.7	200	259
9	375.320	32.2	15.4	1.9	32.5	17.0	46.0	29.0	200	180
10	376.290	23.8	15.4	1.9	32.5	8.6	46.0	37.4	100	359
11	562.529	34.4	19.6	2.3	32.6	23.7	46.0	22.3	100	261
12	687.655	38.9	20.7	2.5	32.6	29.5	46.0	16.5	200	82

Tested by: Hyung-Kwon, Oh / Manager

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13.5 Test data for Below 30 MHz

-. Test Date : January 10, 2020 ~ January 14, 2020

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

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

13.6 Test data for above 1 GHz

-. Test Date : January 10, 2020 ~ January 14, 2020

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

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Hyung-Kwon, Oh / Manager

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C

Relative humidity : 45 % 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 equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2018 (1Y)
□ -	ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Mar. 29, 2018 (1Y)
□ -	NSLK8128	Schwarzbeck	AMN	8128-216	Mar. 29, 2018 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 04, 2018 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Apr. 11, 2018 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Mar. 28, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

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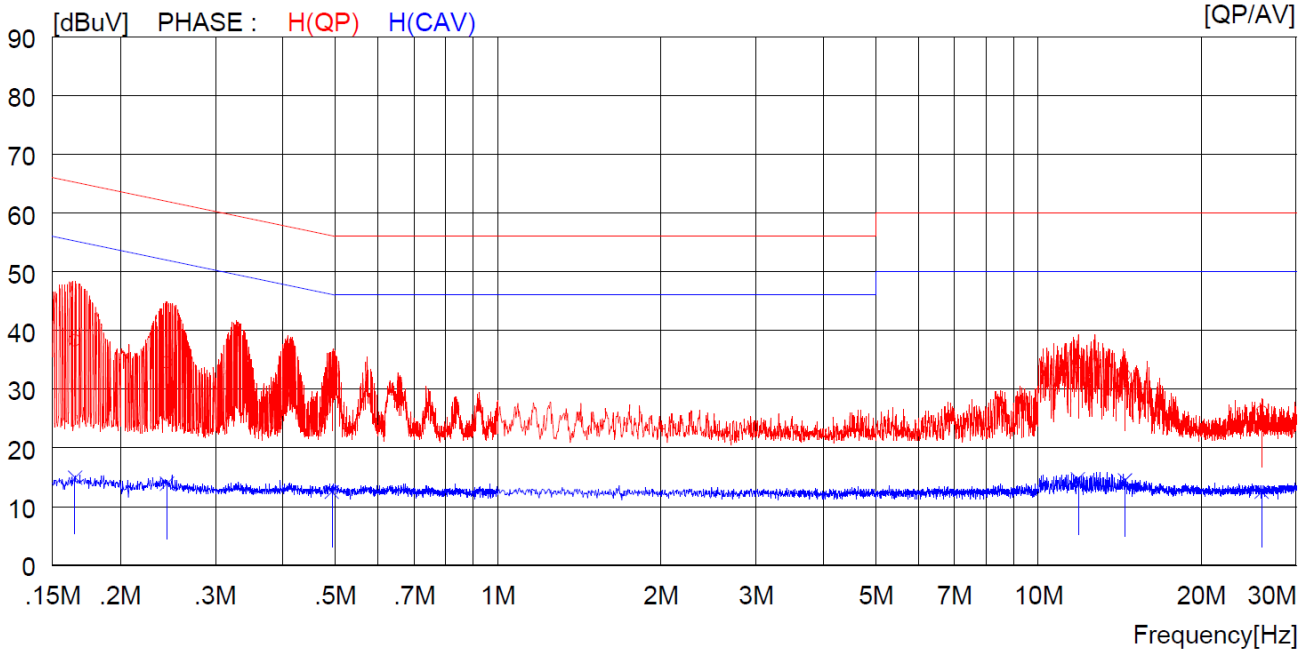
14.4 Test data

-. Test Date : January 10, 2020 ~ January 14, 2020

-. 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	0.16500	28.2	----	10.1	38.3	----	65.2	----	26.9	----	H(QP)
2	0.24400	24.5	----	10.1	34.6	----	62.0	----	27.4	----	H(QP)
3	0.49300	22.3	----	10.1	32.4	----	56.1	----	23.7	----	H(QP)
4	11.84000	24.2	----	10.3	34.5	----	60.0	----	25.5	----	H(QP)
5	14.45000	22.0	----	10.4	32.4	----	60.0	----	27.6	----	H(QP)
6	25.90000	15.8	----	10.4	26.2	----	60.0	----	33.8	----	H(QP)
7	0.16500	----	4.8	10.1	----	14.9	----	55.2	----	40.3	H(CAV)
8	0.24400	----	3.8	10.1	----	13.9	----	52.0	----	38.1	H(CAV)
9	0.49300	----	2.4	10.1	----	12.5	----	46.1	----	33.6	H(CAV)
10	11.84000	----	4.4	10.3	----	14.7	----	50.0	----	35.3	H(CAV)
11	14.45000	----	4.1	10.4	----	14.5	----	50.0	----	35.5	H(CAV)
12	25.90000	----	2.1	10.4	----	12.5	----	50.0	----	37.5	H(CAV)

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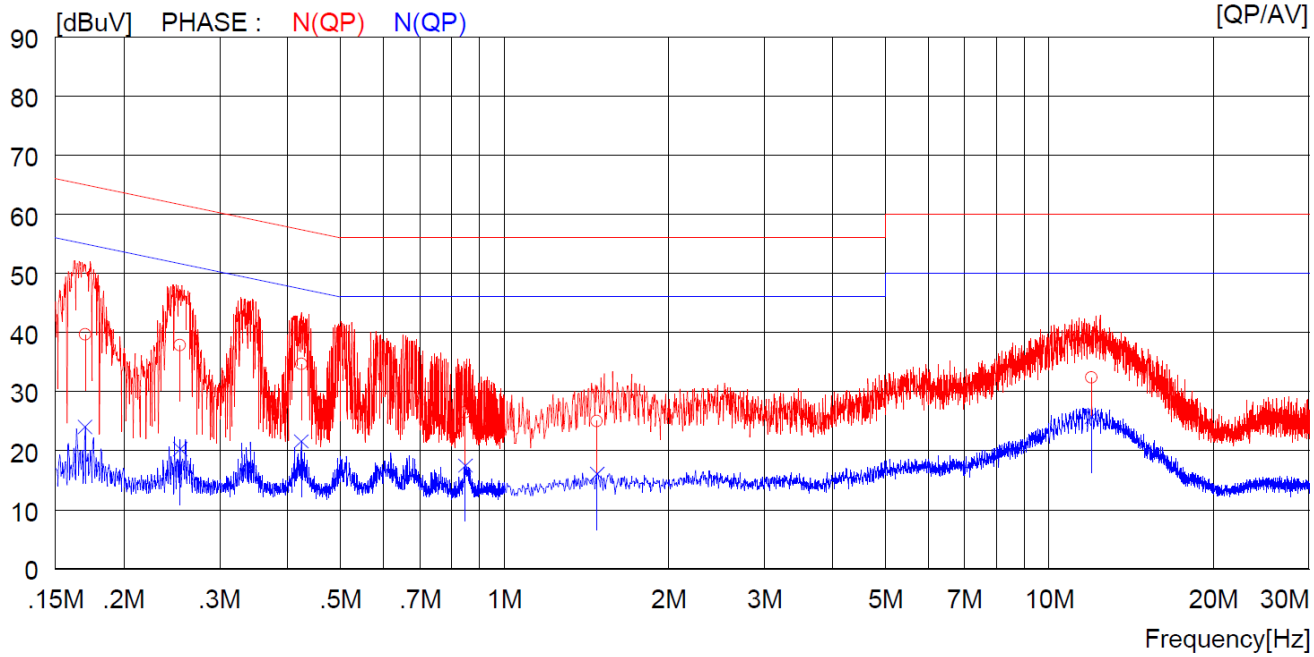
-. Tested Line : NEUTRAL LINE



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	0.17000	29.6	----	10.1	39.7	----	65.0	----	25.3	----	N(QP)
2	0.25400	27.8	----	10.1	37.9	----	61.6	----	23.7	----	N(QP)
3	0.42400	24.6	----	10.1	34.7	----	57.4	----	22.7	----	N(QP)
4	0.84800	16.4	----	10.1	26.5	----	56.0	----	29.5	----	N(QP)
5	1.48000	14.9	----	10.1	25.0	----	56.0	----	31.0	----	N(QP)
6	11.97000	22.1	----	10.3	32.4	----	60.0	----	27.6	----	N(QP)
7	0.17000	----	13.9	10.1	----	24.0	----	55.0	----	31.0	N(CAV)
8	0.25400	----	10.2	10.1	----	20.3	----	51.6	----	31.3	N(CAV)
9	0.42400	----	11.5	10.1	----	21.6	----	47.4	----	25.8	N(CAV)
10	0.84800	----	7.4	10.1	----	17.5	----	46.0	----	28.5	N(CAV)
11	1.48000	----	6.0	10.1	----	16.1	----	46.0	----	29.9	N(CAV)
12	11.97000	----	15.4	10.3	----	25.7	----	50.0	----	24.3	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.

Tested by: Hyung-Kwon, Oh / Manager

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