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

Test Report No.	**: W17DR-D047**
AGR No.	**: A17DA-100**
Applicant	**: AIRSOUND INC.**
Address	**: 208, 75, Techno 1-ro, Yuseong-gu, Daejeon, 34014, Korea**
Manufacturer	**: AIRSOUND INC.**
Address	**: 208, 75, Techno 1-ro, Yuseong-gu, Daejeon, 34014, Korea**
Type of Equipment	**: MYPIN+**
FCC ID.	**: 2AOL5-APR-K170**
Model Name	**: APR-K170**
Serial number	**: N/A**
Total page of Report	**: 87 pages (including this page)**
Date of Incoming	**: December 11, 2017**
Date of issue	**: December 27, 2017**

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: Ki-Hong, Nam / Asst, Chief Engineer
ONETECH Corp.

Approved by: Keun-Young, Choi / Vice President
ONETECH Corp.

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

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 8

3. GENERAL INFORMATION **9**

3.1 PRODUCT DESCRIPTION 9

3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT. 9

4. EUT MODIFICATIONS **9**

5. SYSTEM TEST CONFIGURATION **10**

5.1 JUSTIFICATION 10

5.2 PERIPHERAL EQUIPMENT 10

5.3 MODE OF OPERATION DURING THE TEST 10

5.4 CONFIGURATION OF TEST SYSTEM 10

5.5 ANTENNA REQUIREMENT 10

6. PRELIMINARY TEST **11**

6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS 11

6.2 GENERAL RADIATED EMISSIONS TESTS 11

7. MINIMUM 20 DB BANDWIDTH **12**

7.1 OPERATING ENVIRONMENT 12

7.2 TEST SET-UP 12

7.3 TEST EQUIPMENT USED 12

7.4 TEST DATA FOR 1 MBPS 13

7.5 TEST DATA FOR 2 MBPS 15

7.6 TEST DATA FOR 3 MBPS 17

8. HOPPING FREQUENCY SEPARATION **19**

8.1 OPERATING ENVIRONMENT 19

8.2 TEST SET-UP 19

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

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

8.3 TEST EQUIPMENT USED 19
8.4 TEST DATA FOR 1 MBPS 20
8.5 TEST DATA FOR 2 MBPS 21
8.6 TEST DATA FOR 3 MBPS 22
9. NUMBER OF HOPPING CHANNELS **23**
9.1 OPERATING ENVIRONMENT 23
9.2 TEST SET-UP 23
9.3 TEST EQUIPMENT USED 23
9.4 TEST DATA FOR 1 MBPS 24
9.5 TEST DATA FOR 2 MBPS 27
9.6 TEST DATA FOR 3 MBPS 30
10. TIME OF OCCUPANCY **33**
10.1 OPERATING ENVIRONMENT 33
10.2 TEST SET-UP 33
10.3 TEST EQUIPMENT USED 33
10.4 TEST DATA FOR 1 MBPS 34
10.5 TEST DATA FOR 2 MBPS 37
10.6 TEST DATA FOR 3 MBPS 40
11. MAXIMUM PEAK OUTPUT POWER **43**
11.1 OPERATING ENVIRONMENT 43
11.2 TEST SET-UP 43
11.3 TEST EQUIPMENT USED 43
11.4 TEST DATA FOR 1 MBPS 44
11.5 TEST DATA FOR 2 MBPS 46
11.6 TEST DATA FOR 3 MBPS 48
12. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND **50**
12.1 OPERATING ENVIRONMENT 50
12.2 TEST SET-UP FOR CONDUCTED MEASUREMENT 50
12.3 TEST SET-UP FOR RADIATED MEASUREMENT 50
12.4 TEST EQUIPMENT USED 50
12.5 TEST DATA FOR CONDUCTED EMISSION 51
12.5.1 Test data for 1 Mbps *51*
12.5.2 Test data for 2 Mbps *56*
12.5.3 Test data for 3 Mbps *61*
12.6 TEST DATA FOR TRANSMITTING MODE RADIATED EMISSION 66
12.6.1 Radiated Emission which fall in the Restricted Band *66*

12.6.2 Radiated Emission which fall in the Band Edge *69*
12.6.3 Spurious & Harmonic Radiated Emission above 1 GHz *72*
13. RADIATED EMISSION TEST **75**
13.1 OPERATING ENVIRONMENT 75
13.2 TEST SET-UP 75
13.3 TEST EQUIPMENT USED 75
13.4 TEST DATA FOR 1 MBPS 76
13.4.1 Test data for 30 MHz ~ 1 000 MHz *76*
13.4.2 Test data for Below 30 MHz *79*
13.4.3 Test data for above 1 GHz *79*
13.5 TEST DATA FOR 2 MBPS 80
13.5.1 Test data for 30 MHz ~ 1 000 MHz *80*
13.5.2 Test data for Below 30 MHz *83*
13.5.3 Test data for above 1 GHz *83*
13.6 TEST DATA FOR 3 MBPS 84
13.6.1 Test data for 30 MHz ~ 1 000 MHz *84*
13.6.2 Test data for Below 30 MHz *87*
13.6.3 Test data for above 1 GHz *87*

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

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

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W17DR-D047	December 27, 2017	Initial Issue	All

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

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

1. VERIFICATION OF COMPLIANCE

Applicant	: AIRSOUND INC.
Address	: 208, 75, Techno 1-ro, Yuseong-gu, Daejeon, 34014, Korea
Contact Person	: Yu Kyeom, Kim / Principal Research Engineer
Telephone No.	: +82-42-826-8400
FCC ID	: 2AOL5-APR-K170
Model Name	: APR-K170
Serial Number	: N/A
Date	: December 27, 2017

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

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

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

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

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 (b) (5)	Radio Frequency Exposure Level	Met requirement / 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	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: This test is not performed because the EUT is operated by DC battery.

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.

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

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

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 AIRSOUND INC., Model APR-K170 (referred to as the EUT in this report) is a MYPIN+. Product specification information described herein was obtained from product data sheet or user's manual.

Device Type	MYPIN+	
Operating Frequency	2 402 MHz ~ 2 480 MHz	
RF Output Power	1 Mbps	-1.17 dBm
	2 Mbps	-1.66 dBm
	3 Mbps	-1.56 dBm
Number of Channel	79 Channel	
Modulation Type	GFSK for 1 Mbps, π/4-DQPSK for 2 Mbps, 8-DPSK for 3 Mbps	
Antenna Type	Chip Antenna	
Antenna Gain	0.5 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz	

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

-. None

4. EUT MODIFICATIONS

-. None

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

5. 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	AIRSOUND INC.	APR-K170_V1.1	N/A
BATTERY	N/A	KPL701447	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
APR-K170	AIRSOUND INC.	MYPIN+ (EUT)	Notebook PC
PP11L	DELL	Notebook PC	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, 2 440 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.

5.4 Configuration of Test System

Line Conducted Test: It is not need to test this requirement, because the EUT shall be operated by DC battery.

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

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

5.5 Antenna Requirement

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

Antenna Construction:

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

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
It is not need to test this requirement, because the power of the EUT is supplied by battery.	

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

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

7. MINIMUM 20 dB BANDWIDTH

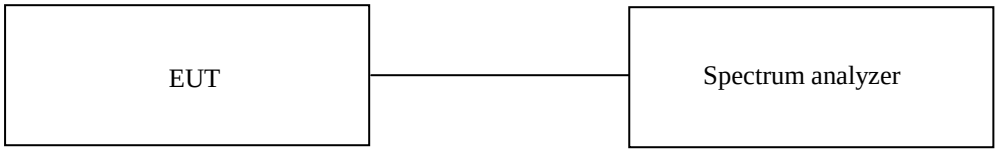
7.1 Operating environment

Temperature : 21.4 ℃

Relative humidity : 45.1 % 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	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

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

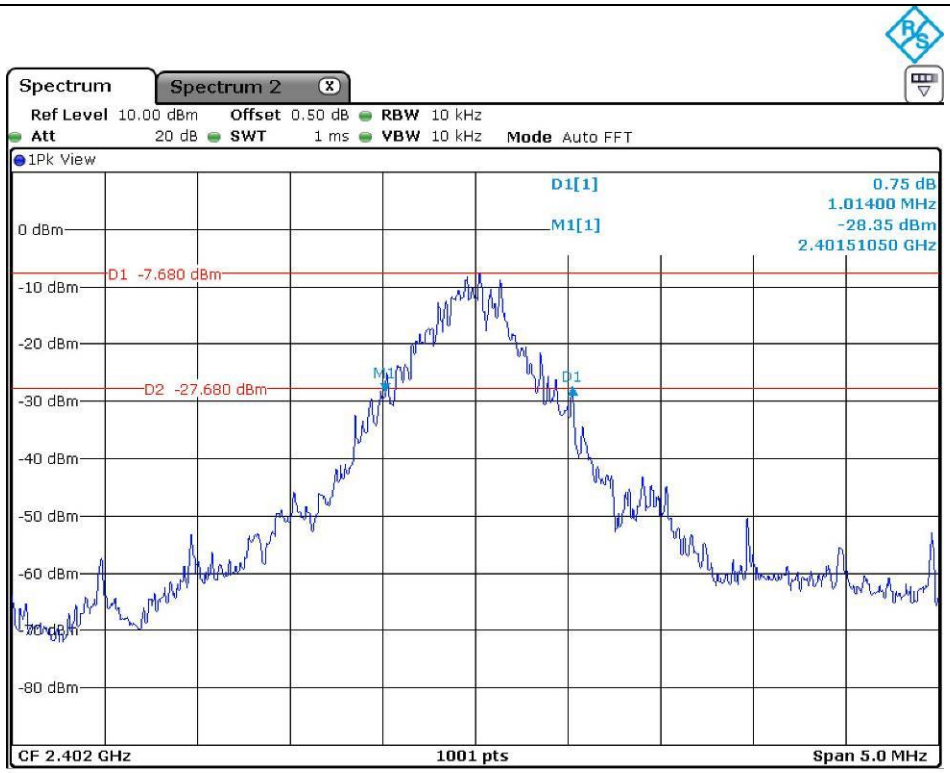
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

7.4 Test data for 1 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

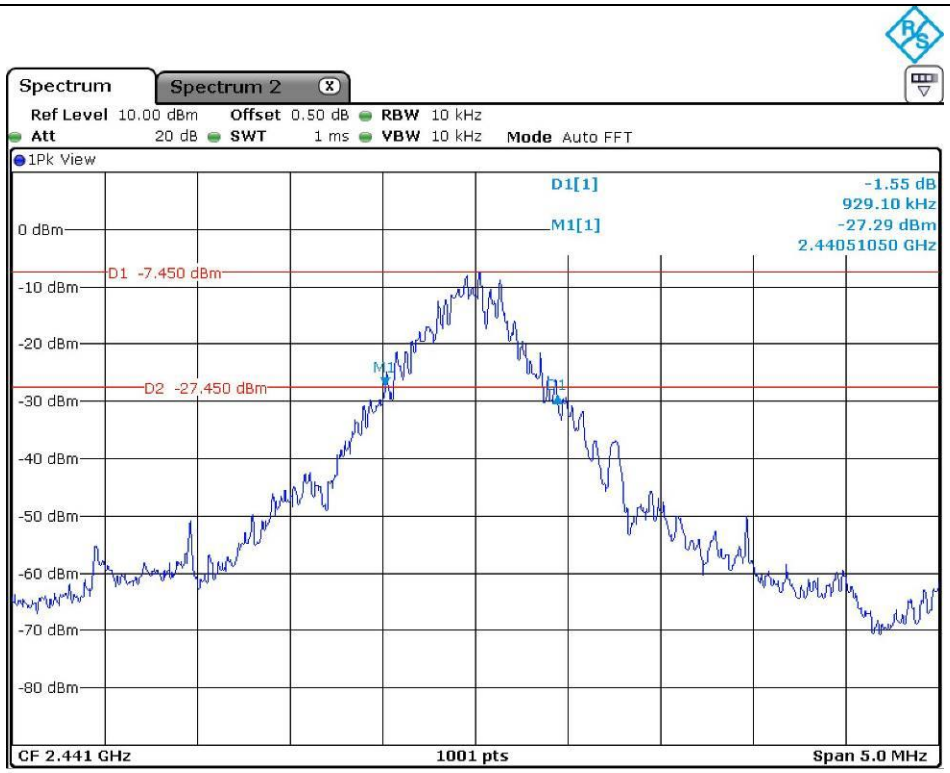
CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 014.00
Middle	2 441.00	929.10
High	2 480.00	929.10

Tested by: Tae-Ho, Kim / Manager

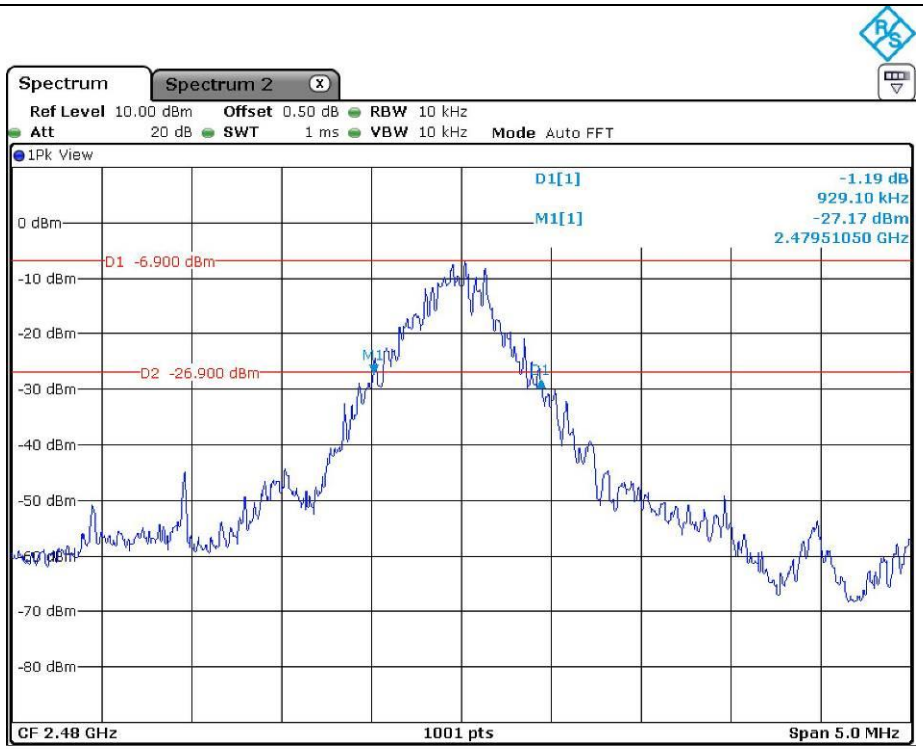


Low Channel

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

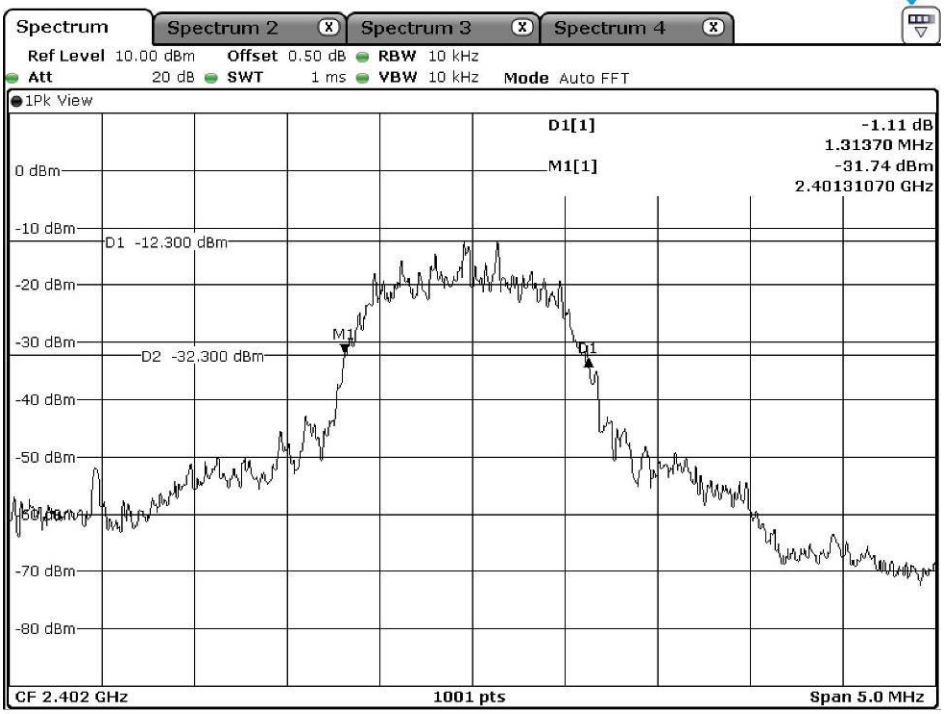
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

7.5 Test data for 2 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

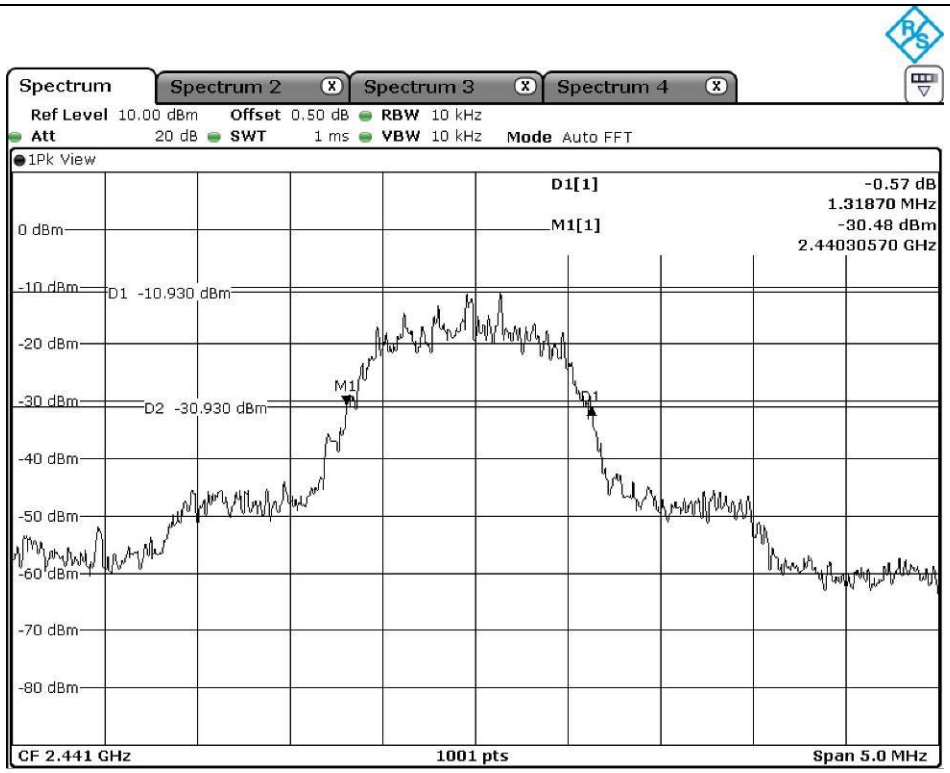
CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 313.70
Middle	2 441.00	1 318.70
High	2 480.00	1 328.70

Tested by: Tae-Ho, Kim / Manager

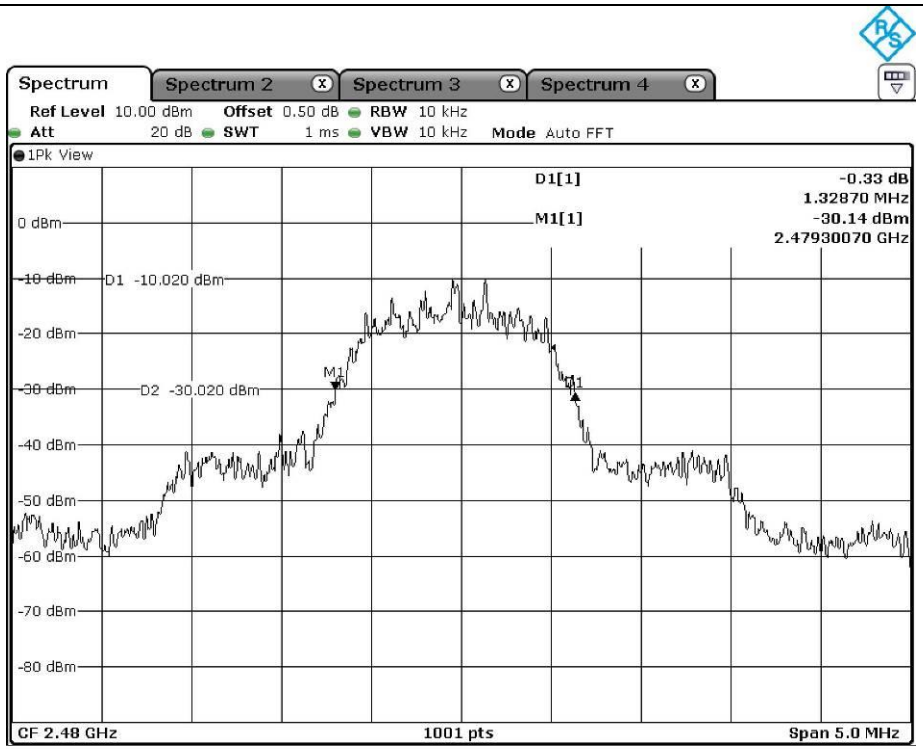


Low Channel

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

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

7.6 Test data for 3 Mbps

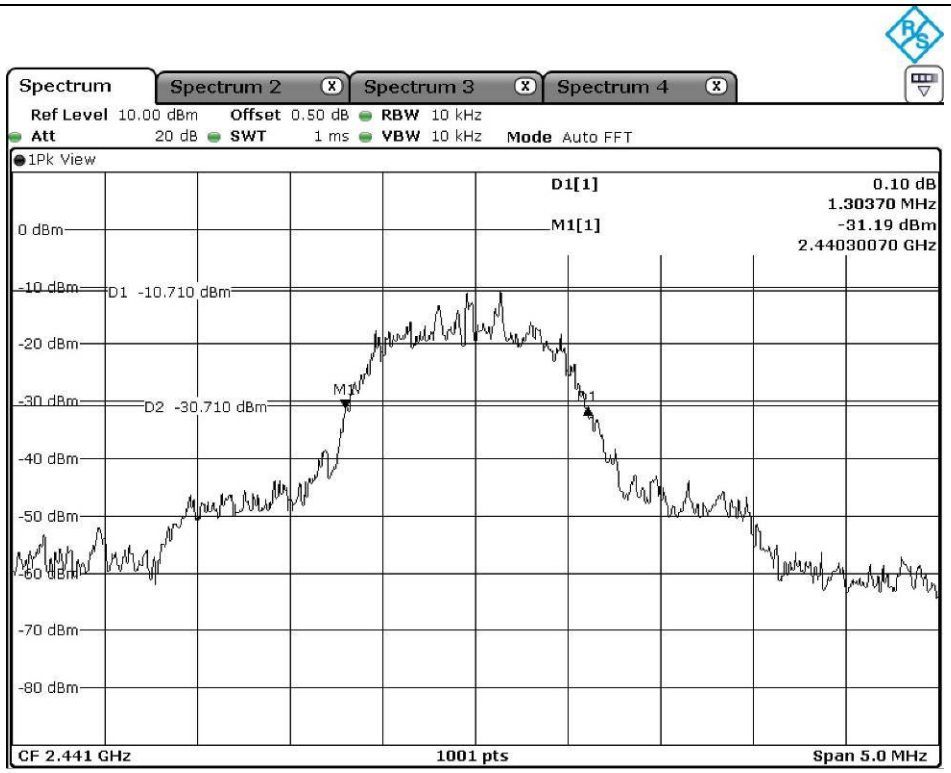
-. Test Date : December 14, 2017 ~ December 18, 2017

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 273.70
Middle	2 441.00	1 303.70
High	2 480.00	1 298.70

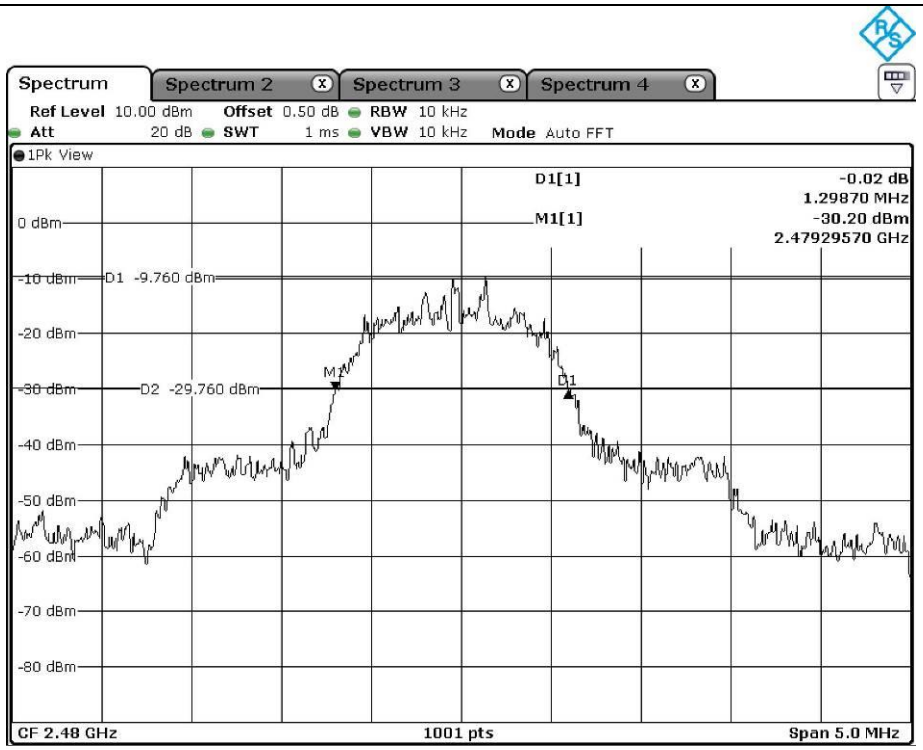
Tested by: Tae-Ho, Kim / Manager

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

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. HOPPING FREQUENCY SEPARATION

8.1 Operating environment

Temperature	:	21.4 ℃
Relative humidity	:	45.1 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 10 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.

8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

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

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

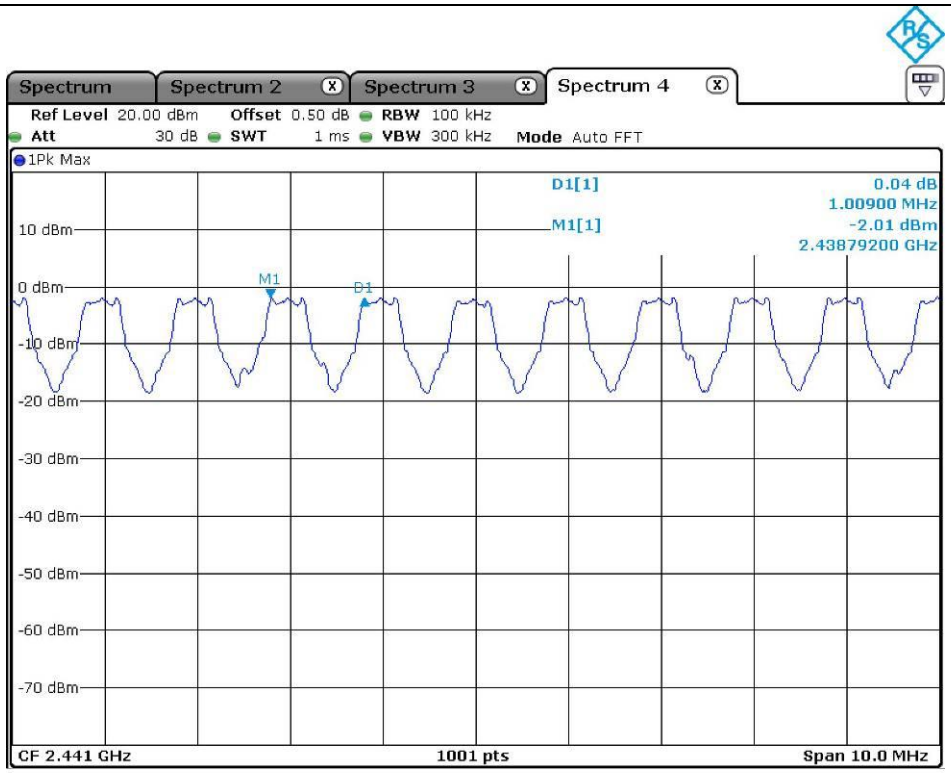
8.4 Test data for 1 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
1 009.00	619.40	Separated by a minimum of 25 kHz

Tested by: Tae-Ho, Kim / 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)

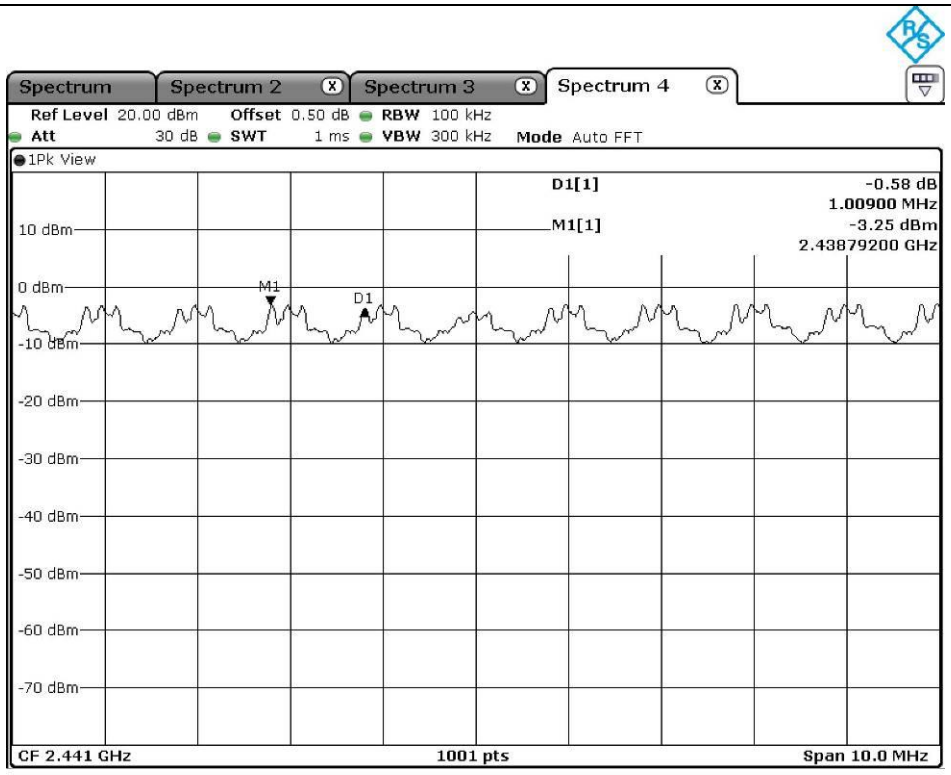
8.5 Test data for 2 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
1 009.00	879.13	Separated by a minimum of 25 kHz

Tested by: Tae-Ho, Kim / 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)

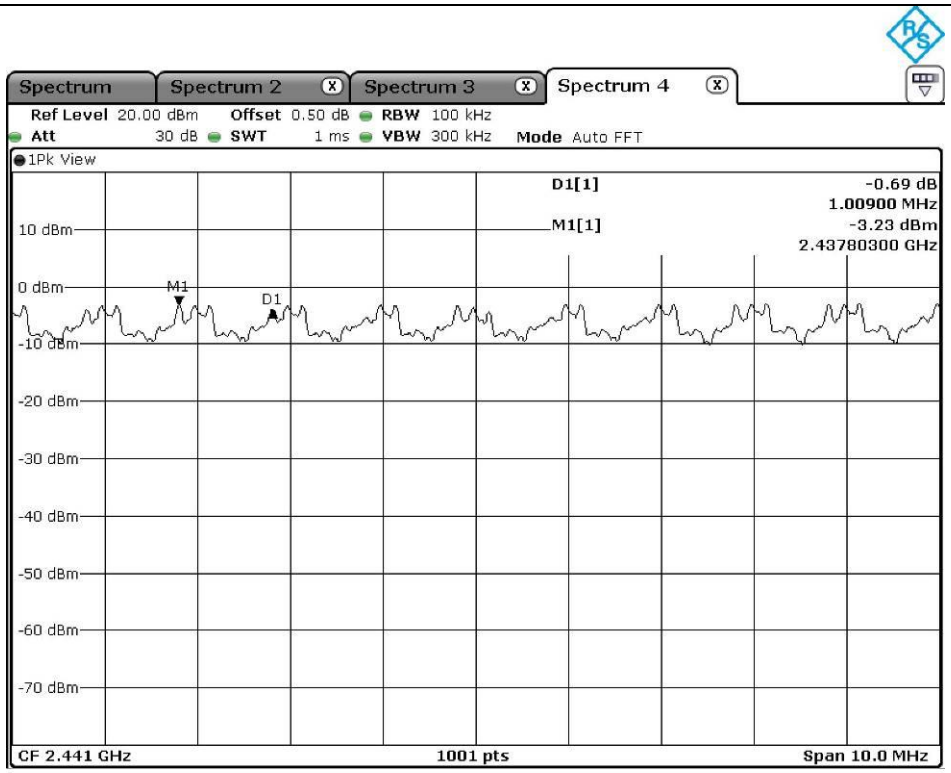
8.6 Test data for 3 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
1 009.00	869.13	Separated by a minimum of 25 kHz

Tested by: Tae-Ho, Kim / 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)

9. NUMBER OF HOPPING CHANNELS

9.1 Operating environment

Temperature	:	21.4 ℃
Relative humidity	:	45.1 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 100 MHz and the resolution bandwidth is set to 1 MHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.

9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

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

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

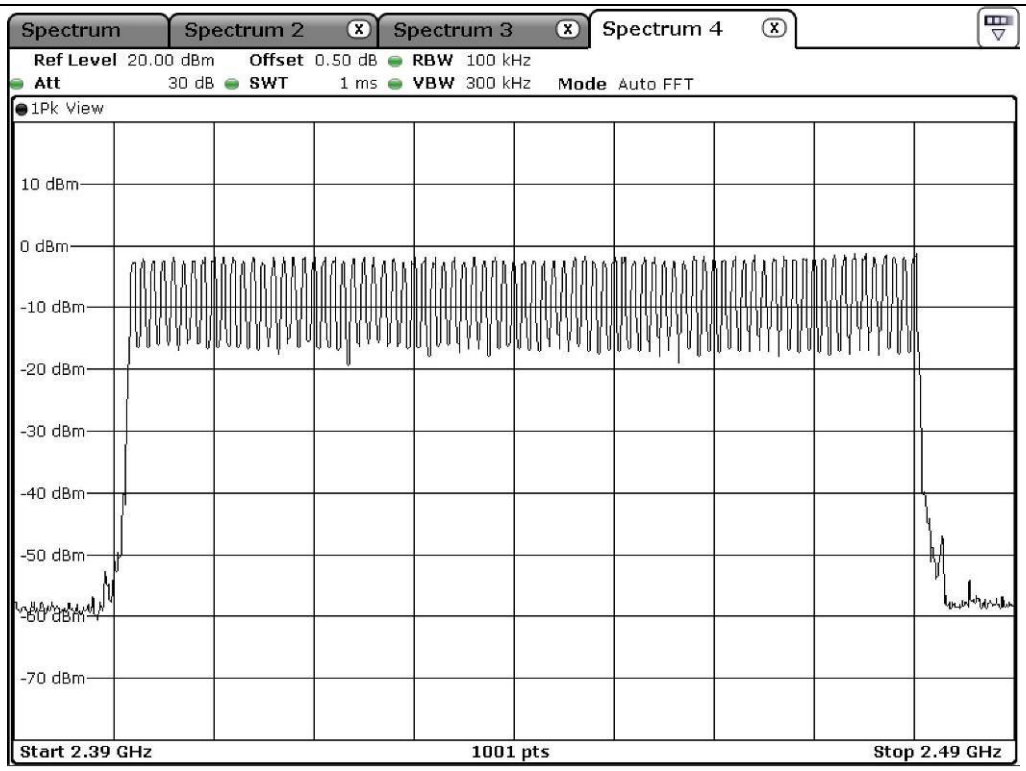
9.4 Test data for 1 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

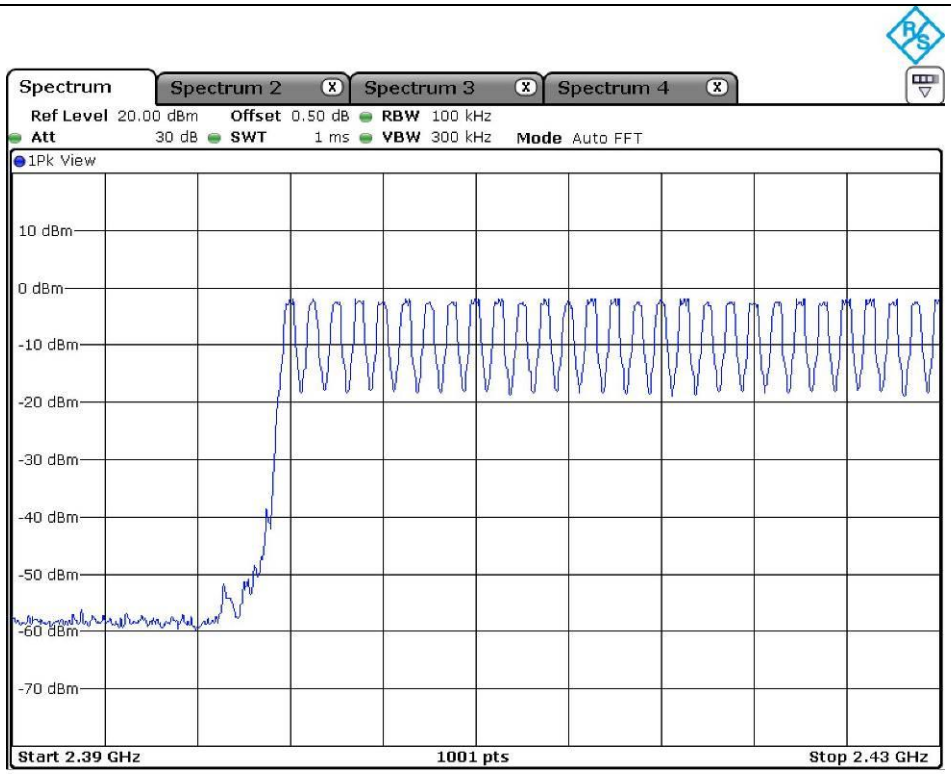
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
1 Mbps	79	Minimum of 15	64

Tested by: Tae-Ho, Kim / Manager

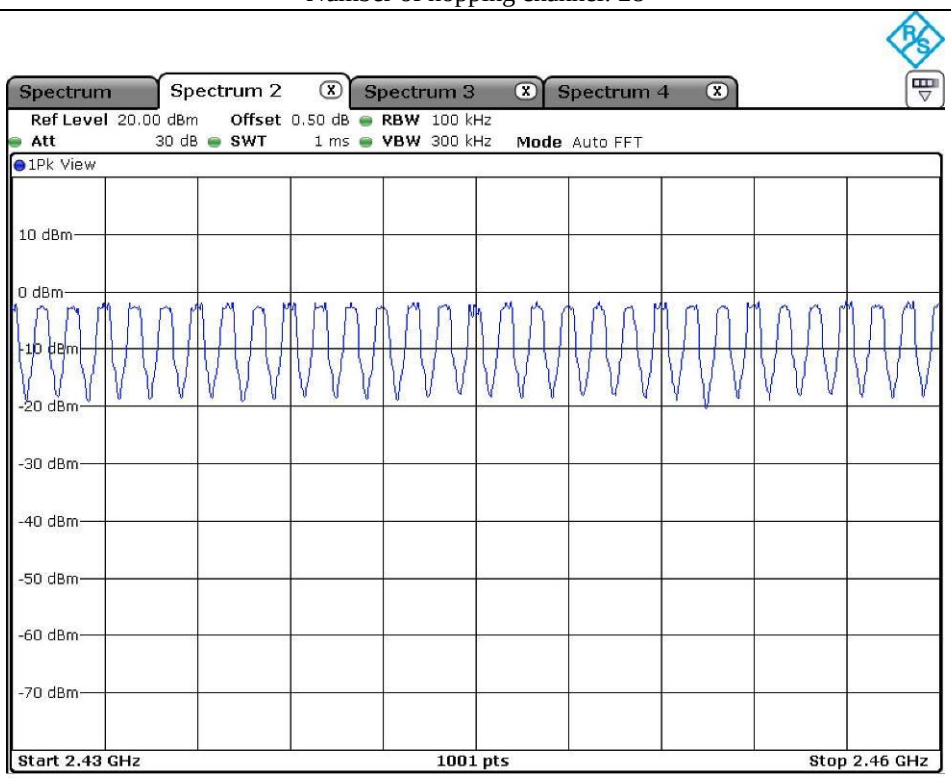


Total number of hopping channel: 28+30+21 = 79

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

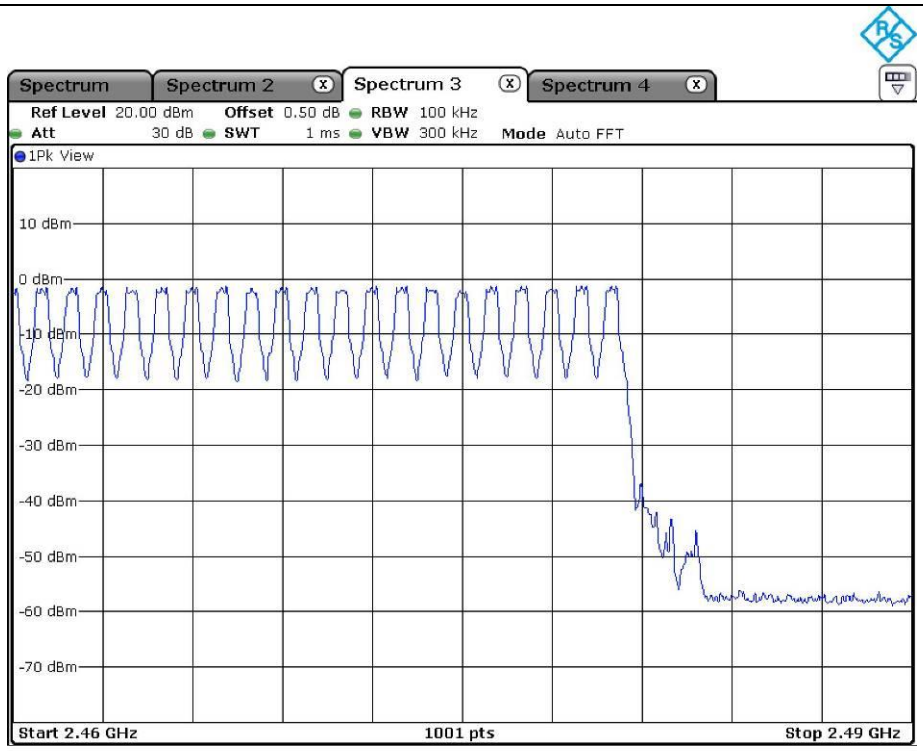


Number of hopping channel: 28



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)

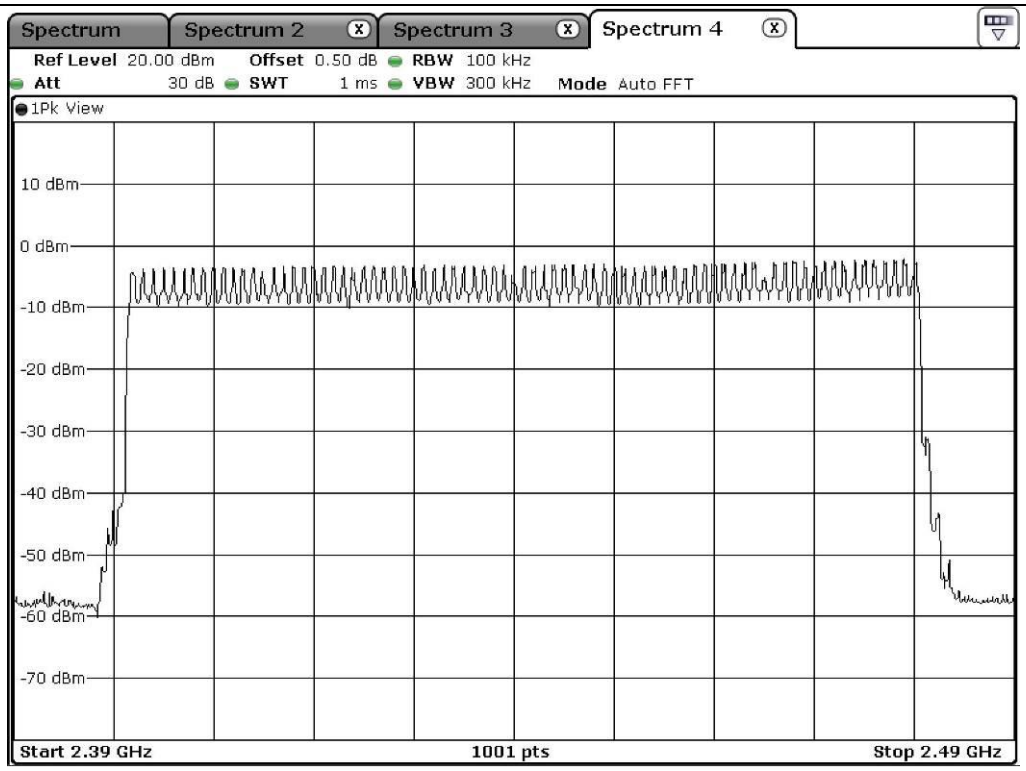
9.5 Test data for 2 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

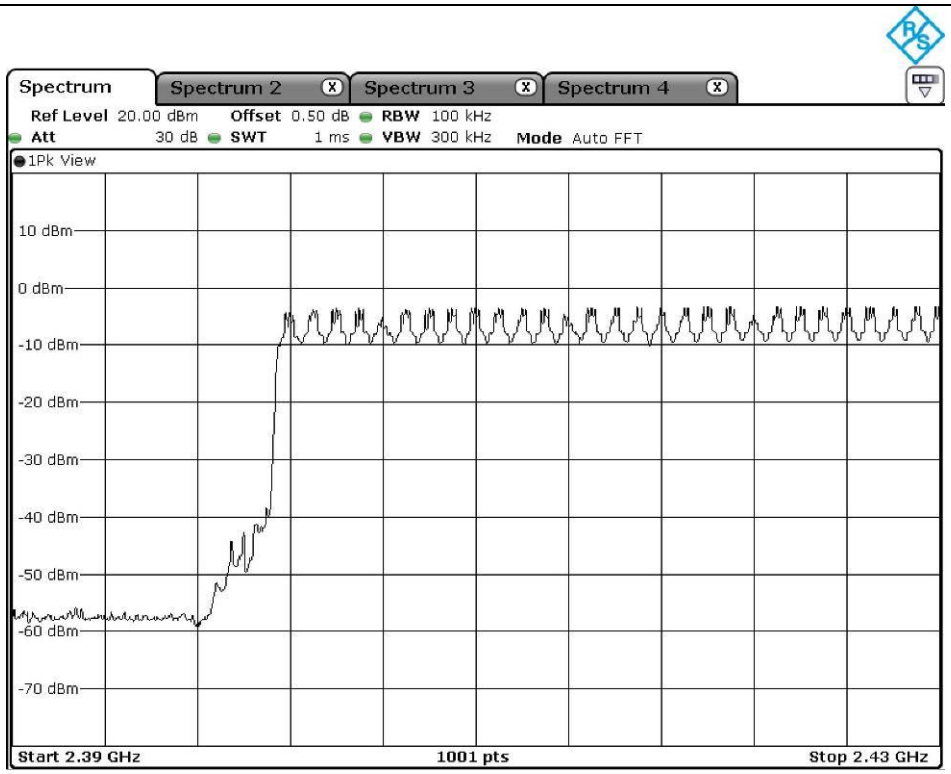
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
2 Mbps	79	Minimum of 15	64

Tested by: Tae-Ho, Kim / Manager

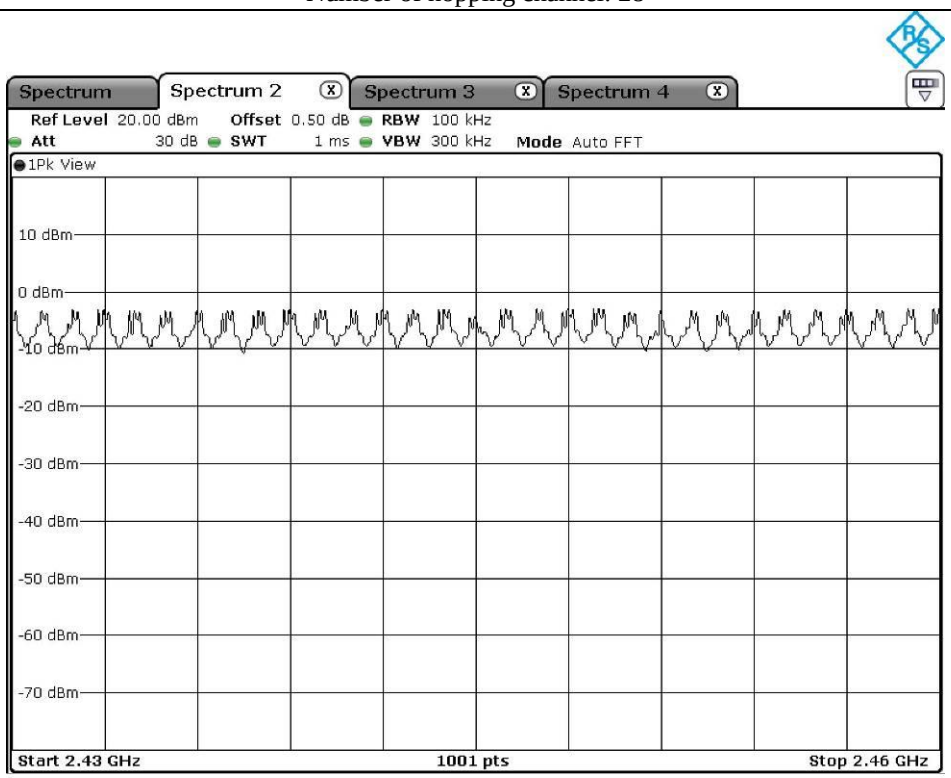


Total number of hopping channel: 28+30+21 = 79

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

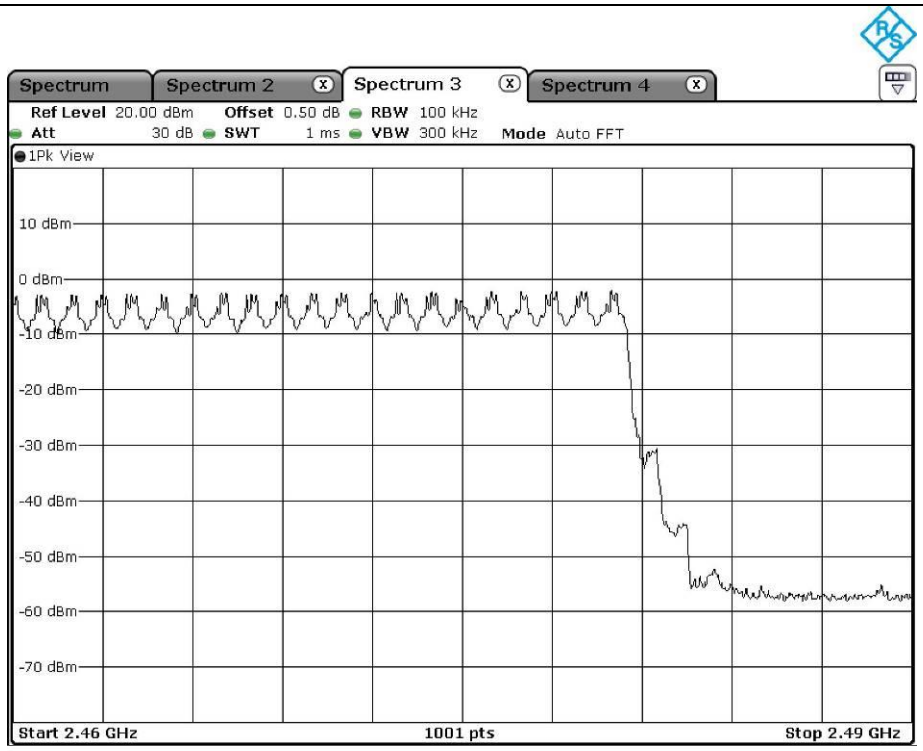


Number of hopping channel: 28



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)

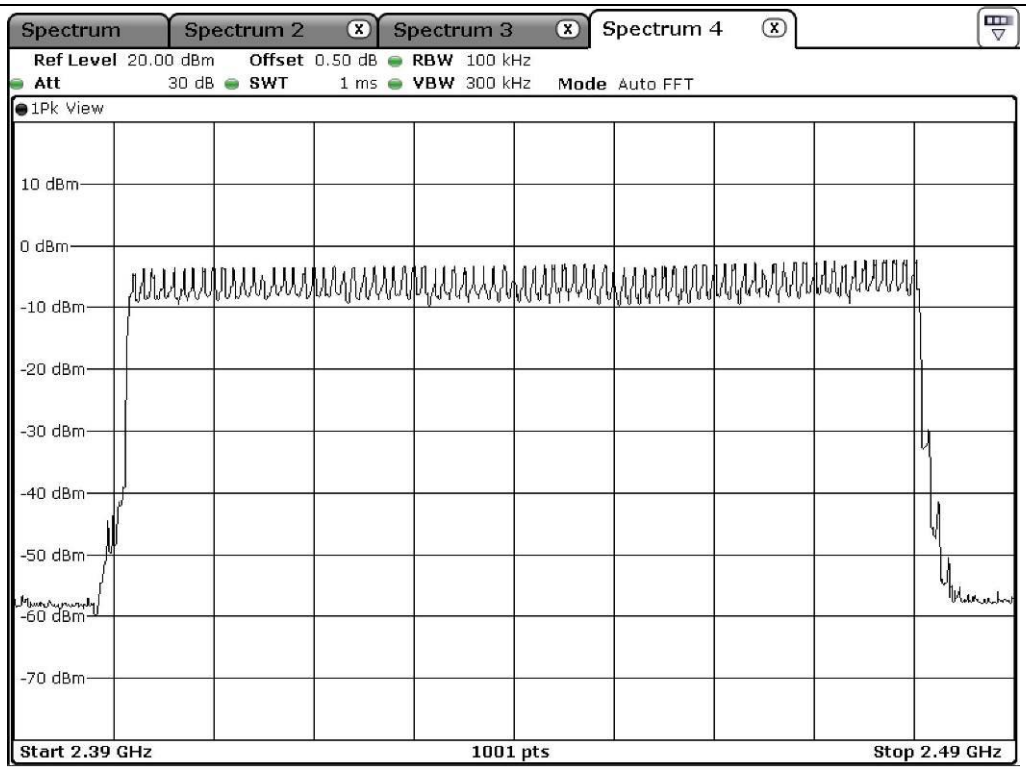
9.6 Test data for 3 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

-. Test Result : Pass

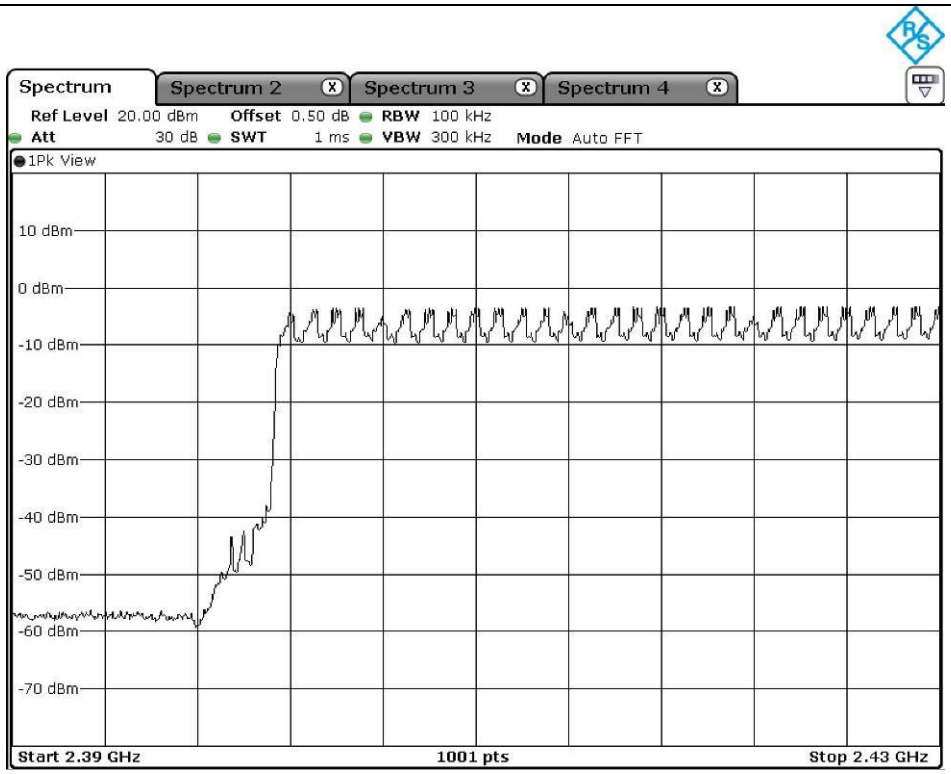
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
3 Mbps	79	Minimum of 15	64

Tested by: Tae-Ho, Kim / Manager

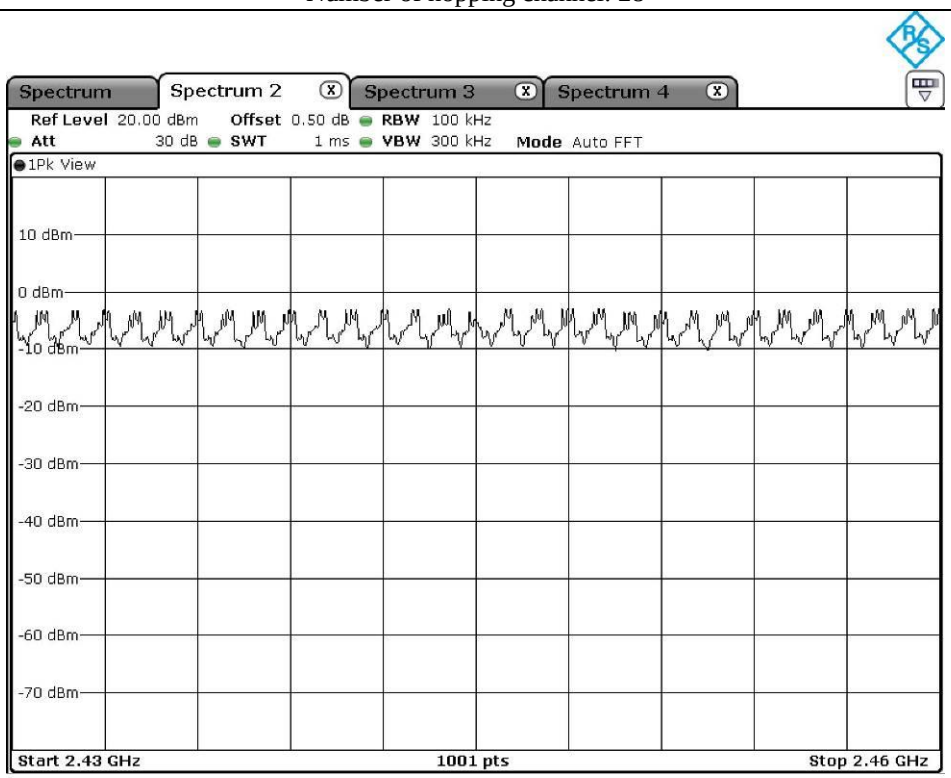


Total number of hopping channel: 28+30+21 = 79

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

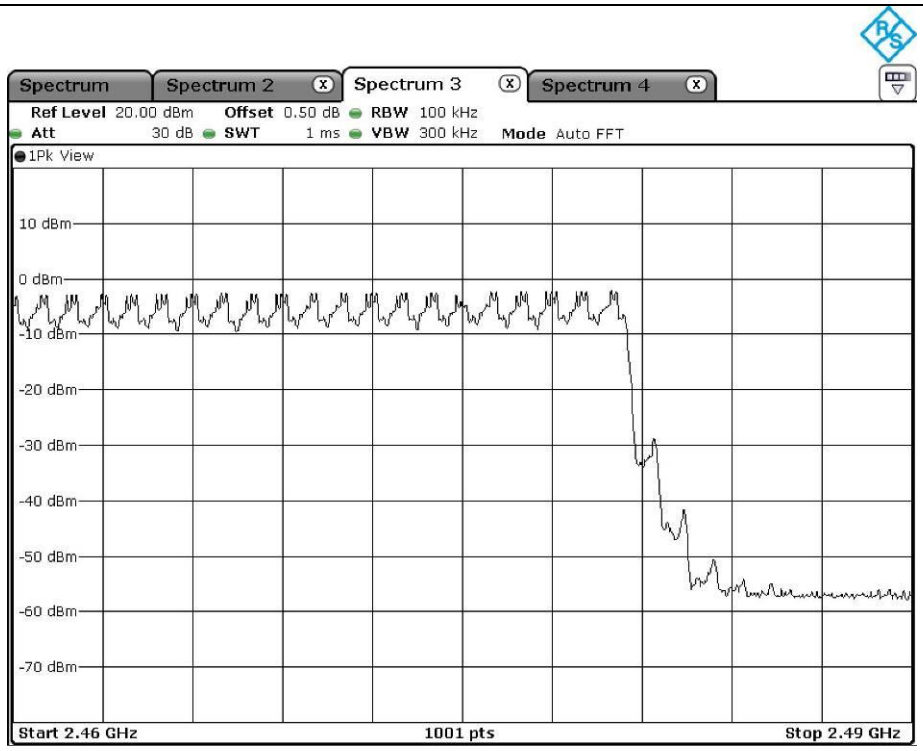


Number of hopping channel: 28



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)

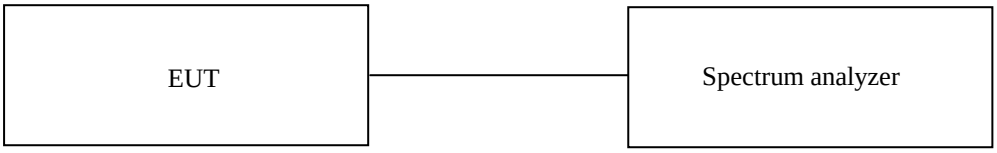
10. TIME OF OCCUPANCY

10.1 Operating environment

Temperature	:	22 ℃
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	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

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

10.4 Test data for 1 Mbps

-. Test Date : December 14, 2017 ~ December 18, 2017

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

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

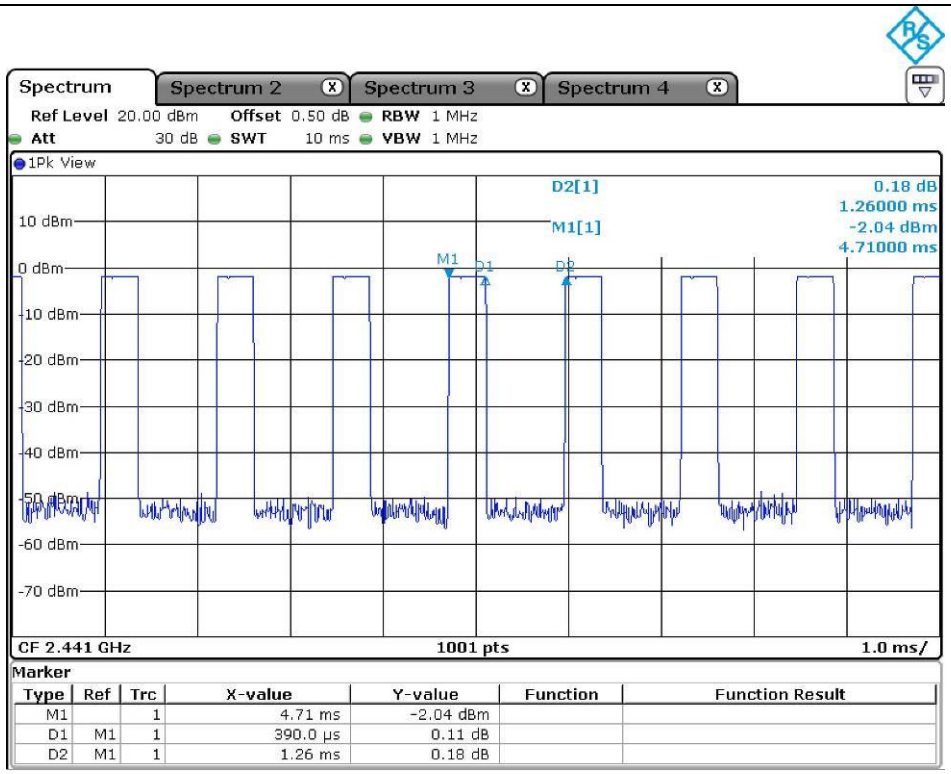
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.390	10.13	31.6	124.84	400	PASS
DH3	1.620	5.06	31.6	259.03	400	
DH5	2.900	3.38	31.6	309.74	400	

Total dwell time is calculated as following.

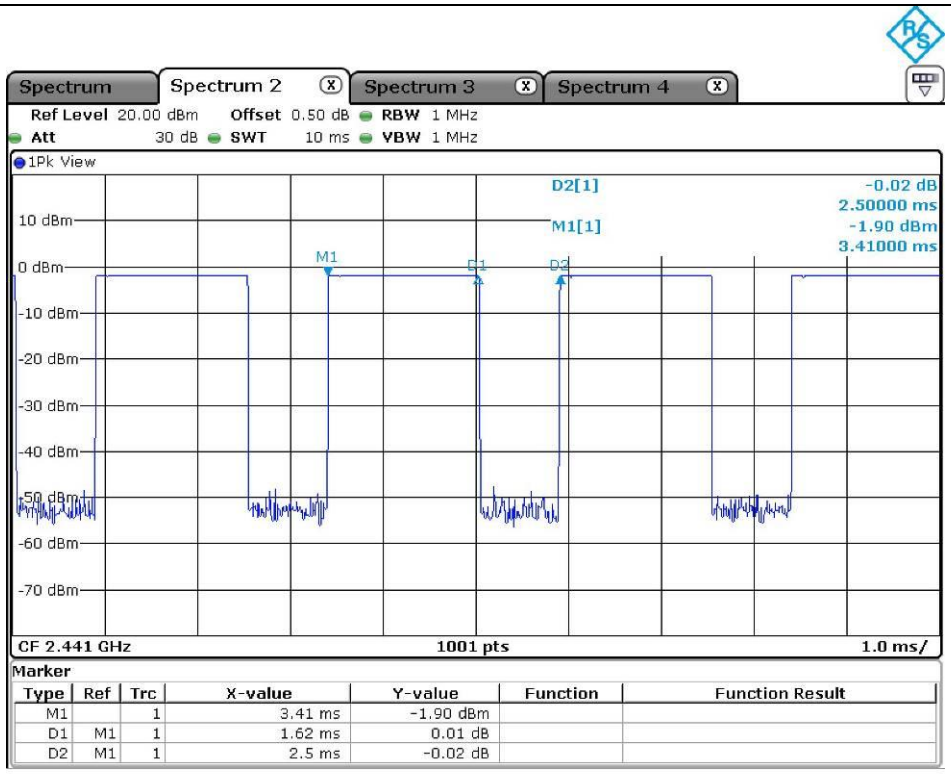
Total Dwell Time = Pulse time * Hops per second with channels * period time

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

Tested by: Tae-Ho, Kim / Manager

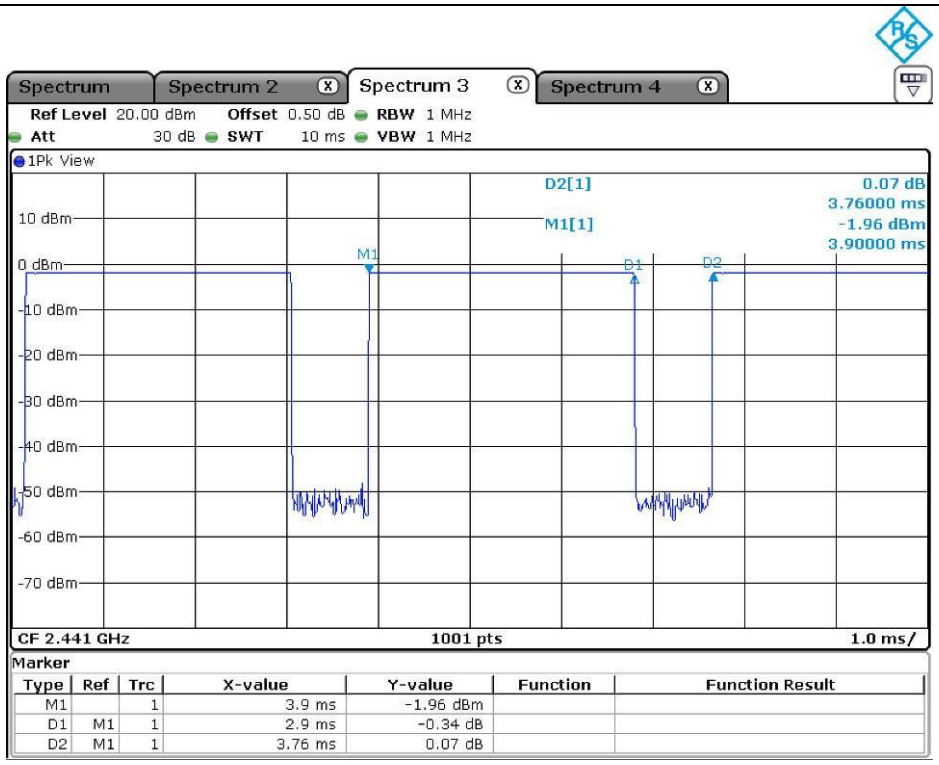


DH1



DH3

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



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 : December 14, 2017 ~ December 18, 2017

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.

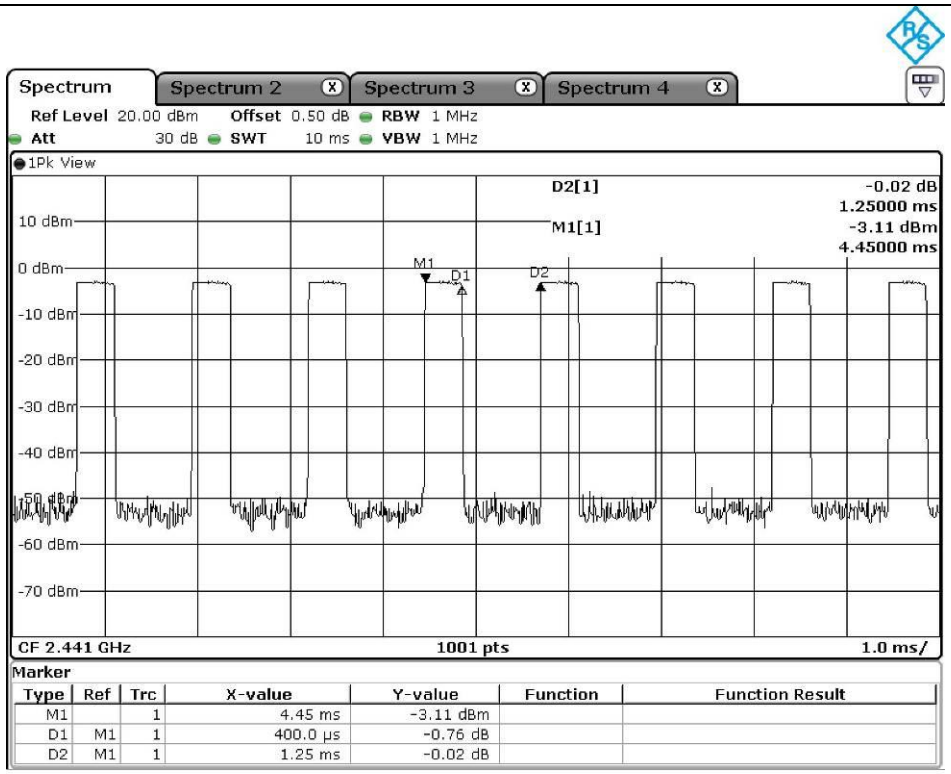
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.400	10.13	31.6	128.04	400	PASS
DH3	1.650	5.06	31.6	263.83	400	
DH5	2.900	3.38	31.6	309.74	400	

Total dwell time is calculated as following.

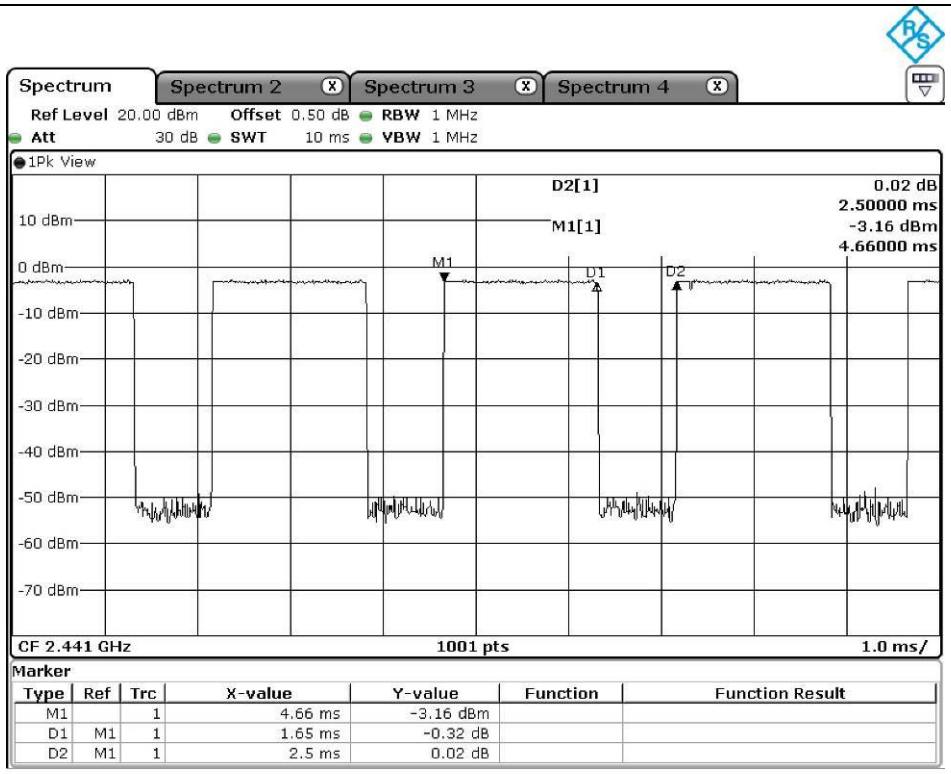
Total Dwell Time = Pulse time * Hops per second with channels * period time

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

Tested by: Tae-Ho, Kim / Manager

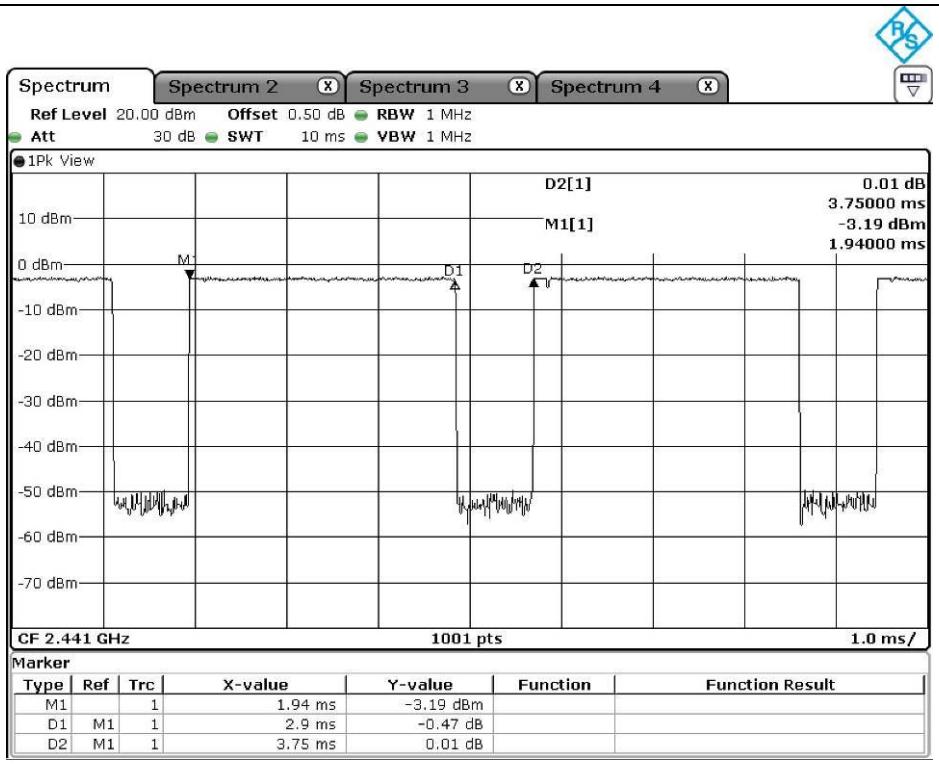


DH1



DH3

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



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 : December 14, 2017 ~ December 18, 2017

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.

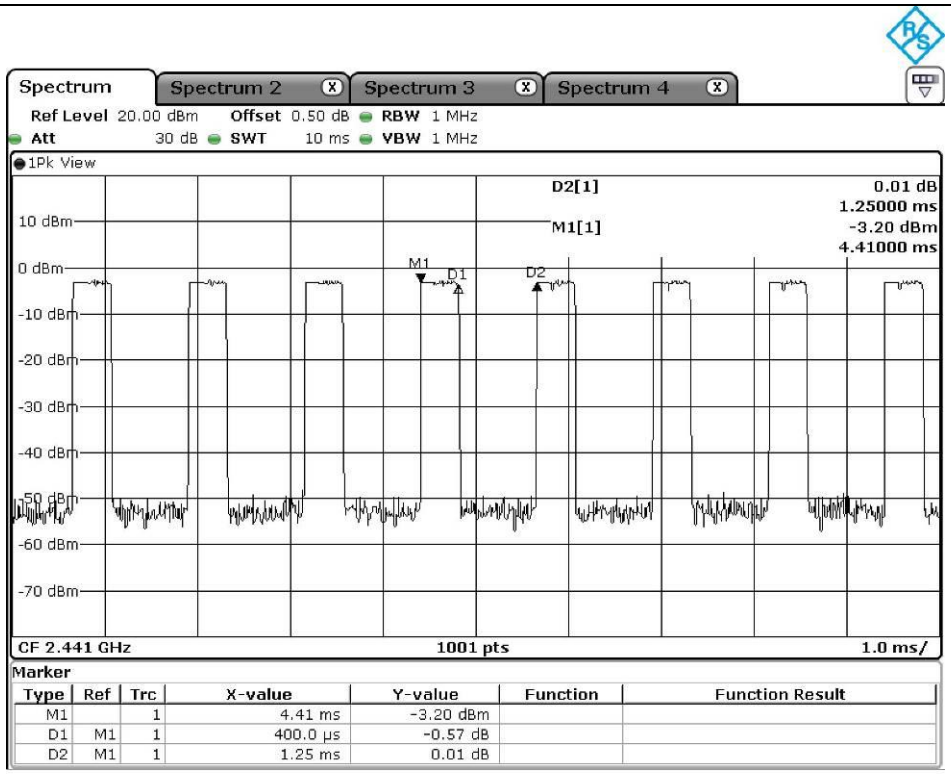
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.400	10.13	31.6	128.04	400	PASS
DH3	1.650	5.06	31.6	263.83	400	
DH5	2.880	3.38	31.6	307.61	400	

Total dwell time is calculated as following.

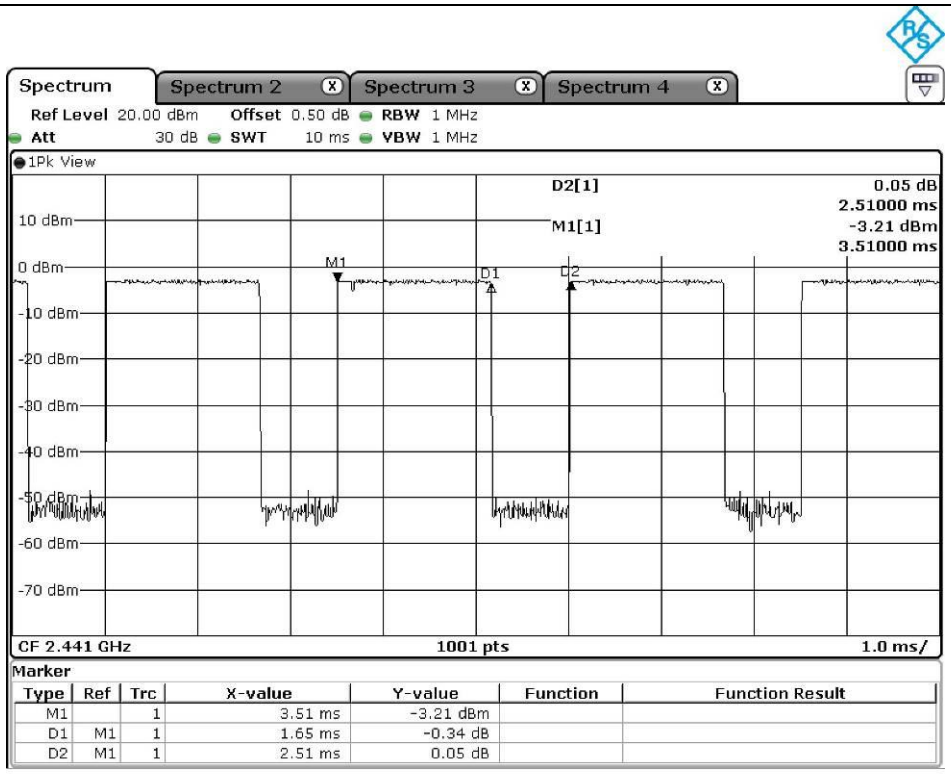
Total Dwell Time = Pulse time * Hops per second with channels * period time

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

Tested by: Tae-Ho, Kim / Manager

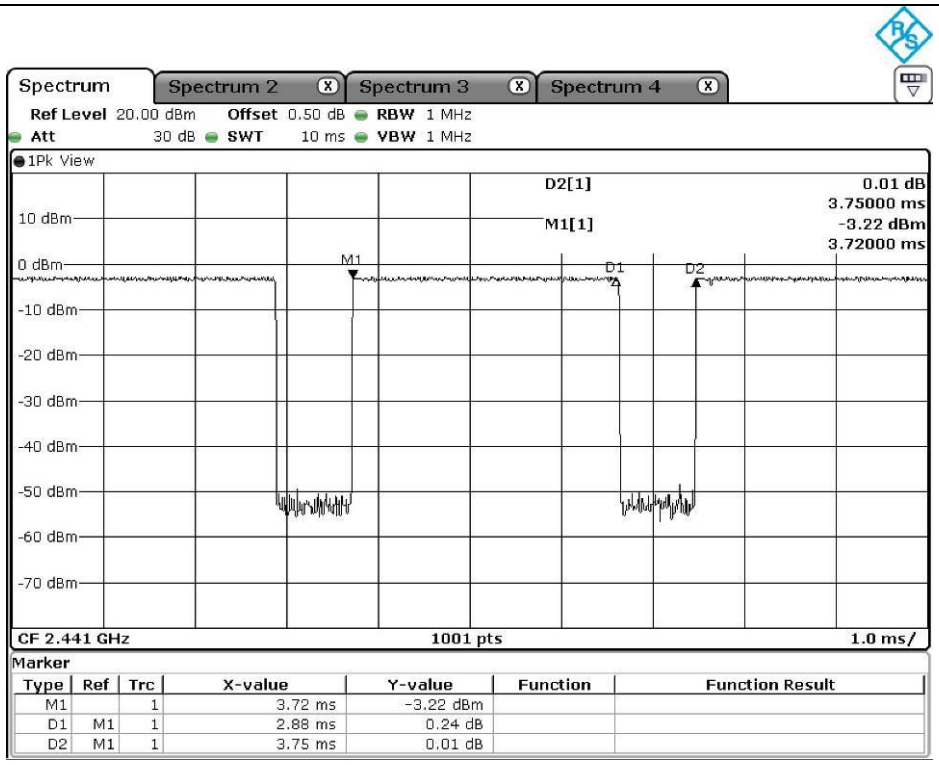


DH1



DH3

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



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)