

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

**Test Report No.** : OT-194-RWD-017  
**AGR No.** : A192A-095R  
**Applicant** : BLUECOM Co., Ltd.  
**Address** : 116, Venture-ro, Yeonsu-gu, Incheon, 22013, South Korea  
**Manufacturer** : BLUECOM Co., Ltd.  
**Address** : 116, Venture-ro, Yeonsu-gu, Incheon, 22013, South Korea  
**Type of Equipment** : Bluetooth Earbud  
**FCC ID.** : U3WBCST90  
**Model Name** : BCS-T90  
**Serial number** : N/A  
**Total page of Report** : 81 pages (including this page)  
**Date of Incoming** : March 18, 2019  
**Date of issue** : April 03, 2019

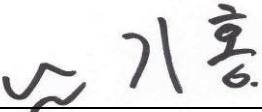
## SUMMARY

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

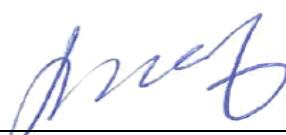
This test report only contains the result of a single test of the sample supplied for the examination.

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

Reviewed by:

  
Ki-Hong, Nam / Chief Engineer  
ONETECH Corp.

Approved by:

  
Keun-Young, Choi / Vice President  
ONETECH Corp.

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**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-194-RWD-017	April 03, 2019	Initial Release	All

## 1. VERIFICATION OF COMPLIANCE

Applicant : BLUECOM Co., Ltd.

Address : 116, Venture-ro, Yeonsu-gu, Incheon, 22013, South Korea

Contact Person : Ki-eok, Park / Principal Engineer

Telephone No. : +82-32-8100-582

FCC ID : U3WBCST90

Model Name : BCS-T90

Brand Name : -

Serial Number : N/A

Date : April 03, 2019

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

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

## 2. TEST SUMMARY

### 2.1 Test items and results

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

### 2.2 Additions, deviations, exclusions from standards

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

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

Original submittal only

### 2.4 Purpose of the test

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

### 2.5 Test Methodology

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

### 2.6 Test Facility

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

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

- Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-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 BLUECOM Co., Ltd., Model BCS-T90 (referred to as the EUT in this report) is a Bluetooth Earbud. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Bluetooth Earbud		
Temperature Range	-10 °C ~ 50 °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, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps	
RF OUTPUT POWER'	Bluetooth LE	9.80 dBm	
	Bluetooth	1 Mbps	9.36 dBm
		2 Mbps	9.20 dBm
		3 Mbps	9.55 dBm
ANTENNA TYPE	FPCB Antenna		
ANTENNA GAIN	3.00 dBi		
List of each Osc. or crystal Freq.(Freq. $\geq$ 1 MHz)	32 MHz		
RATED SUPPLY VOLTAGE	DC 3.6 V		

#### 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	BLUECOM Co., Ltd.	BCS-T90G	N/A
Power Board	BLUECOM Co., Ltd.	N/A	N/A
Touch Board	BLUECOM Co., Ltd.	Stone_FPCB_Touch	N/A
Antenna Board	BLUECOM Co., Ltd.	BCS-T90 FPCB_ANT	N/A
Battery	N/A	GP1458-08N+PCM	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
BCS-T90	BLUECOM Co., Ltd.	Bluetooth Earbud (EUT)	Cradle
BCS-T90C	BLUECOM Co., Ltd.	Cradle	EUT
SU10334-15004	LG Electronics	Adaptor	-

#### - Transmitting Mode

Model	Manufacturer	Description	Connected to
BCS-T90	BLUECOM Co., Ltd.	Bluetooth Earbud (EUT)	Notebook PC
Pavilion	HP	Notebook PC	EUT

### 5.3 Mode of operation during the test

- For Bluetooth function testing, software used to control the EUT for staying in continuous transmitting and receiving mode is programmed. The EUT was set at Low Channel (2 402 MHz), Middle Channel (2 441 MHz), and High Channel (2 480 MHz) with each data transfer rate, 1 Mbps, 2 Mbps, and 3 Mbps. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is "XY" axis, but the worst data was recorded in this test report.
- EUT is PCB with the same structure by the left and right. So, We tested for Right Earset

## 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 FPCB 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)
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

## 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)

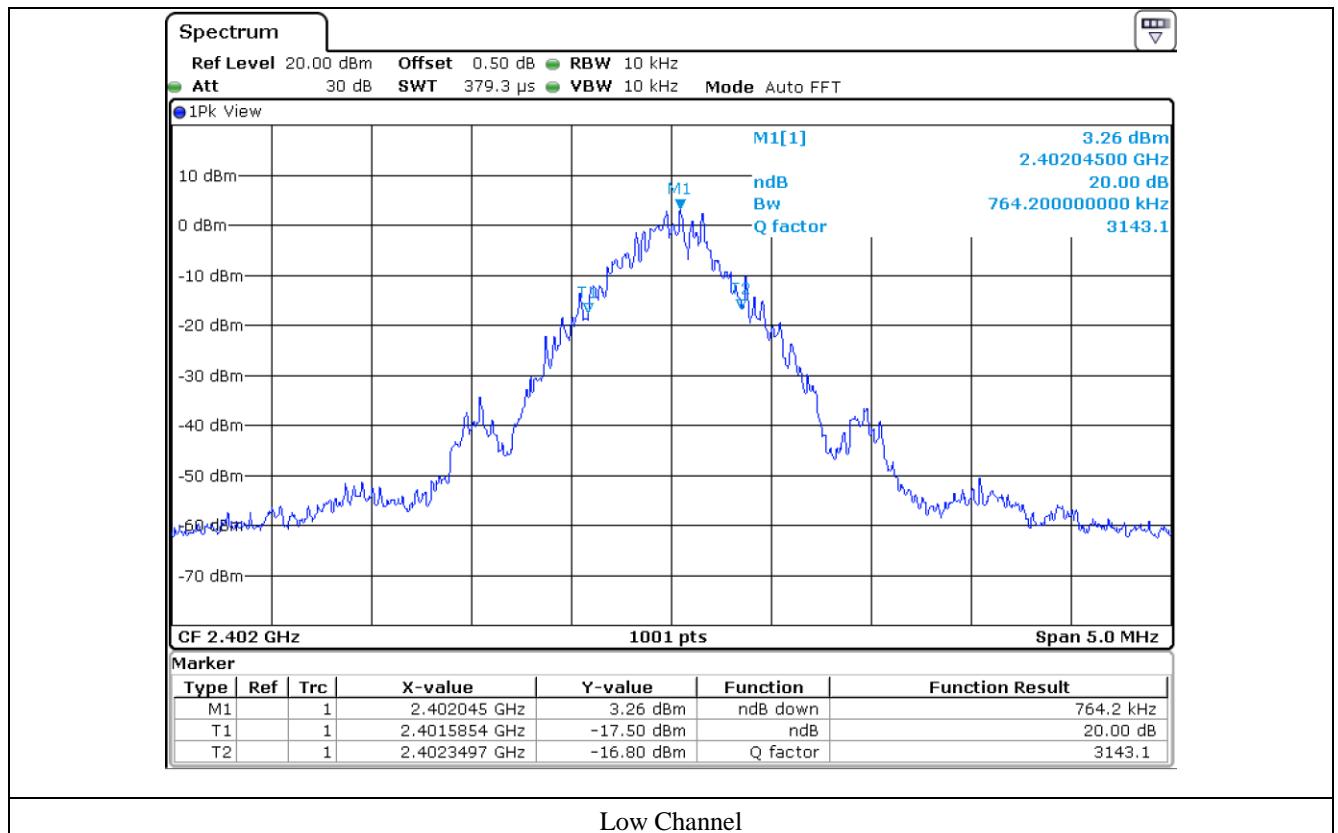
All test equipment used is calibrated on a regular basis.

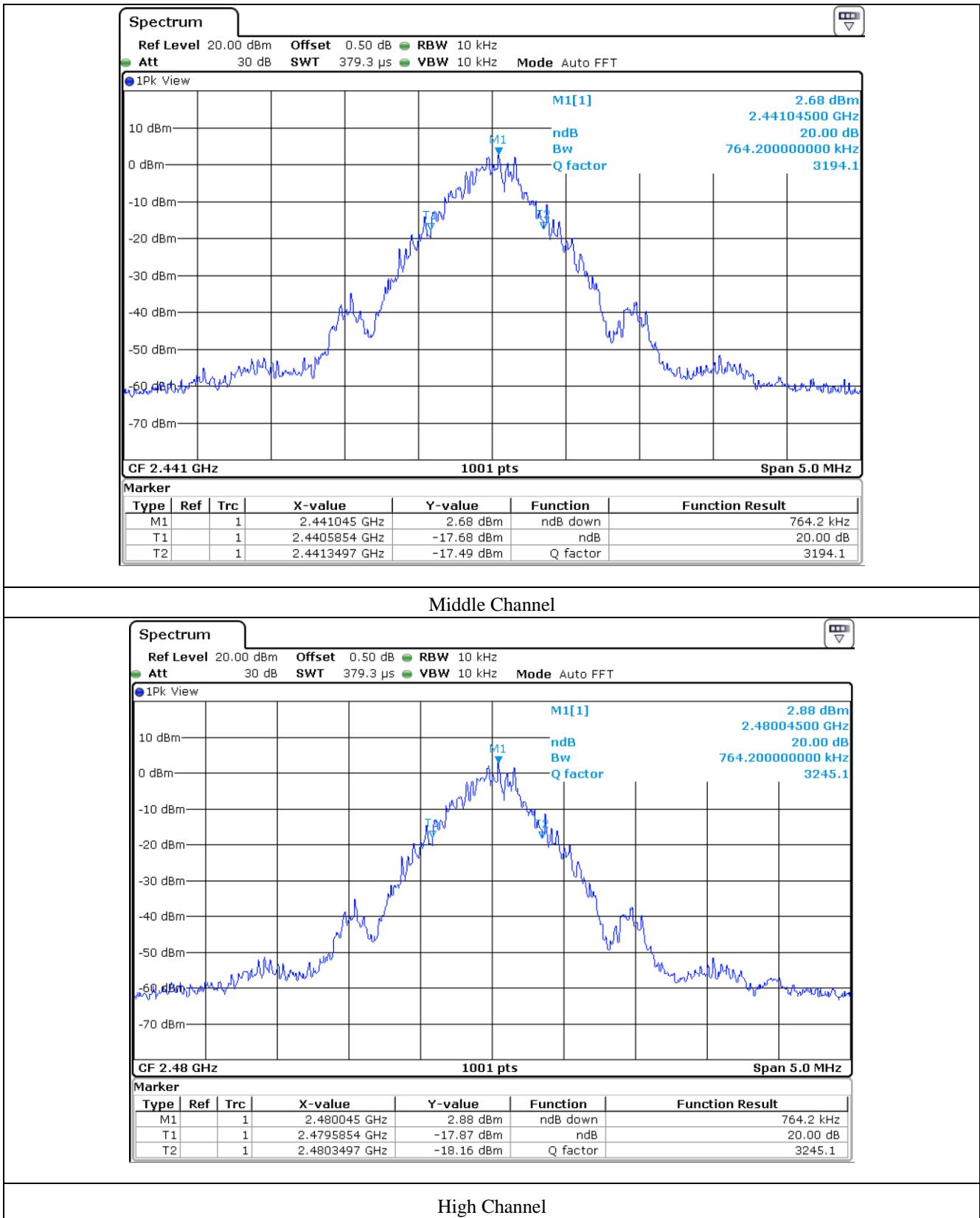
#### 7.4 Test data for 1 Mbps

- Test Date : March 18, 2019

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

Tested by: Hyung-Kwon, Oh / Assistant Manager



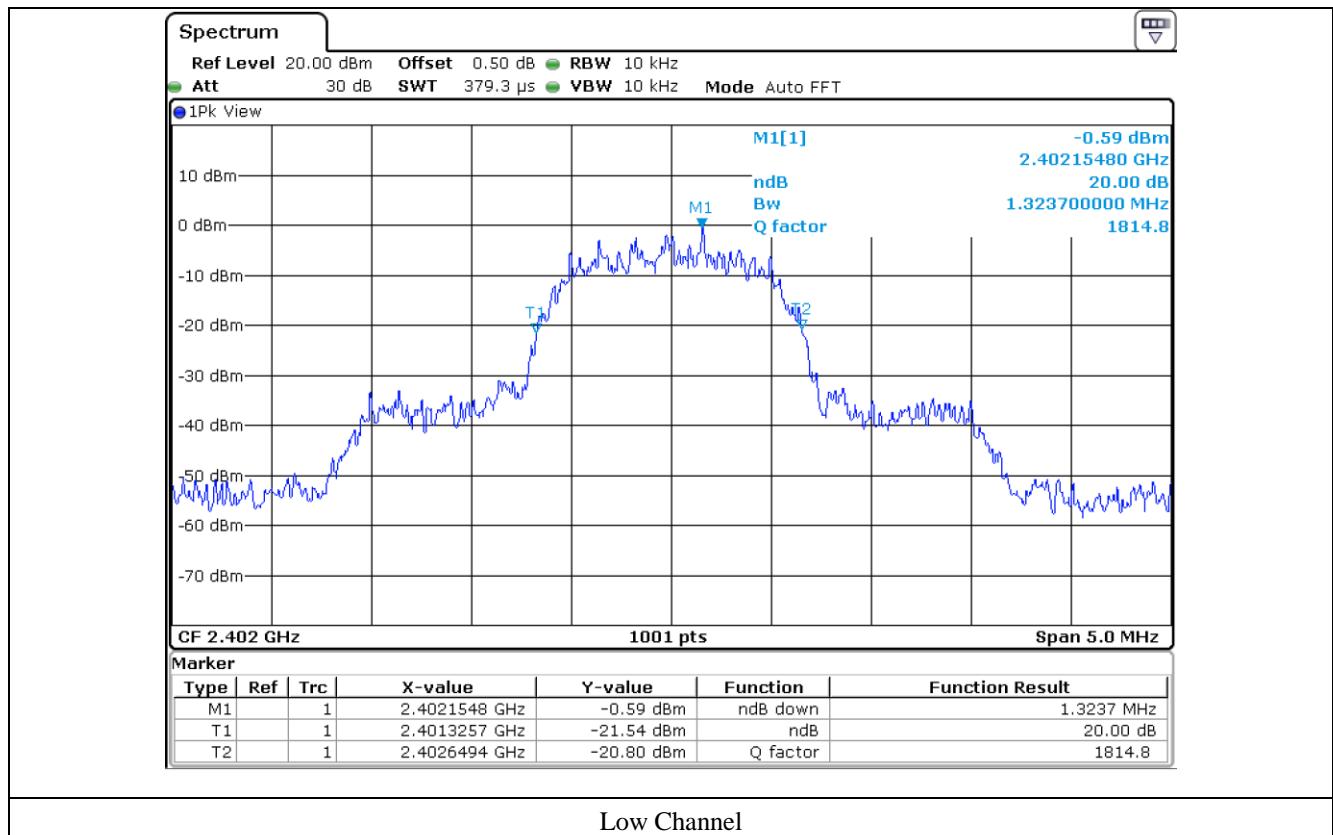


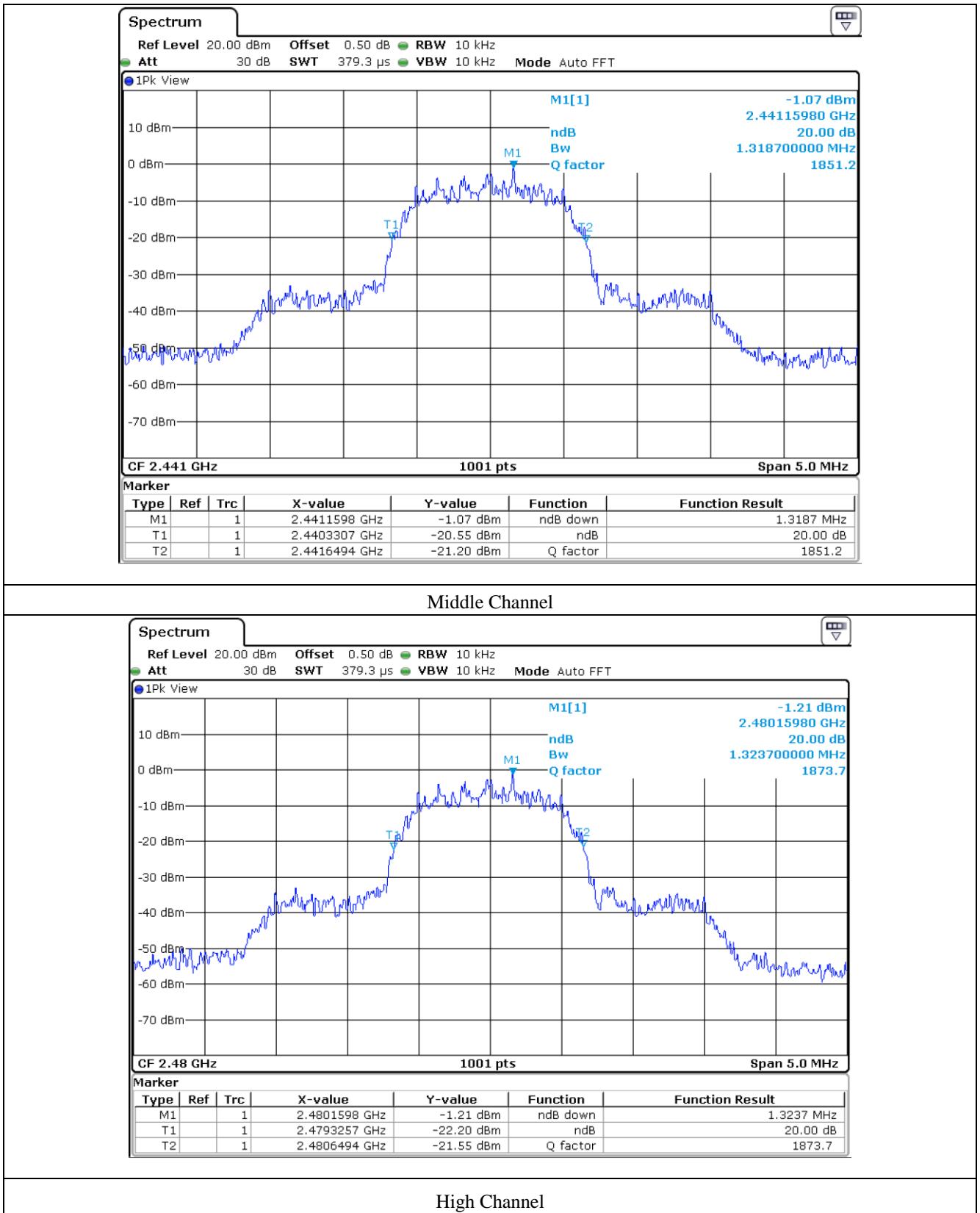
## 7.5 Test data for 2 Mbps

- Test Date : March 18, 2019

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 323.70
Middle	2 441.00	1 318.70
High	2 480.00	1 323.70

Tested by: Hyung-Kwon, Oh / Assistant Manager



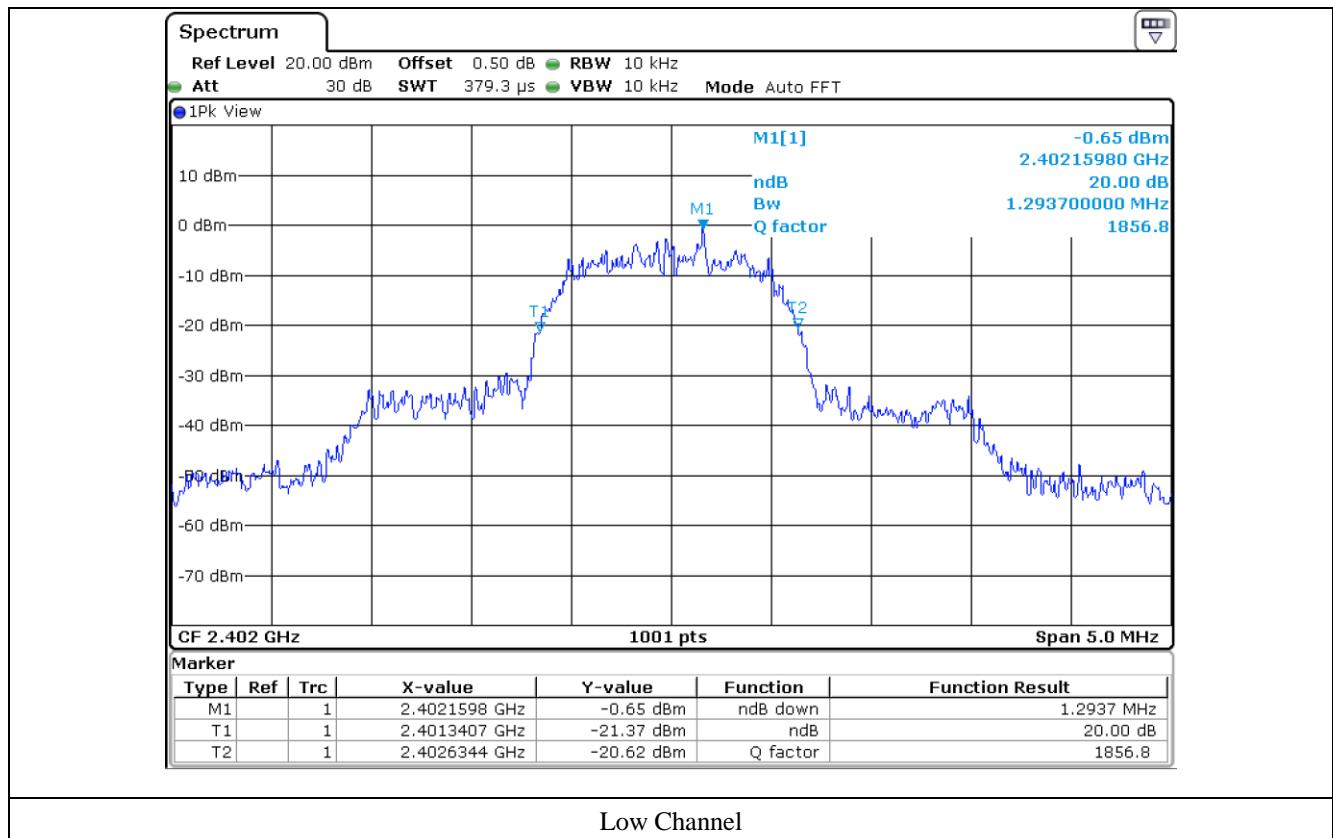


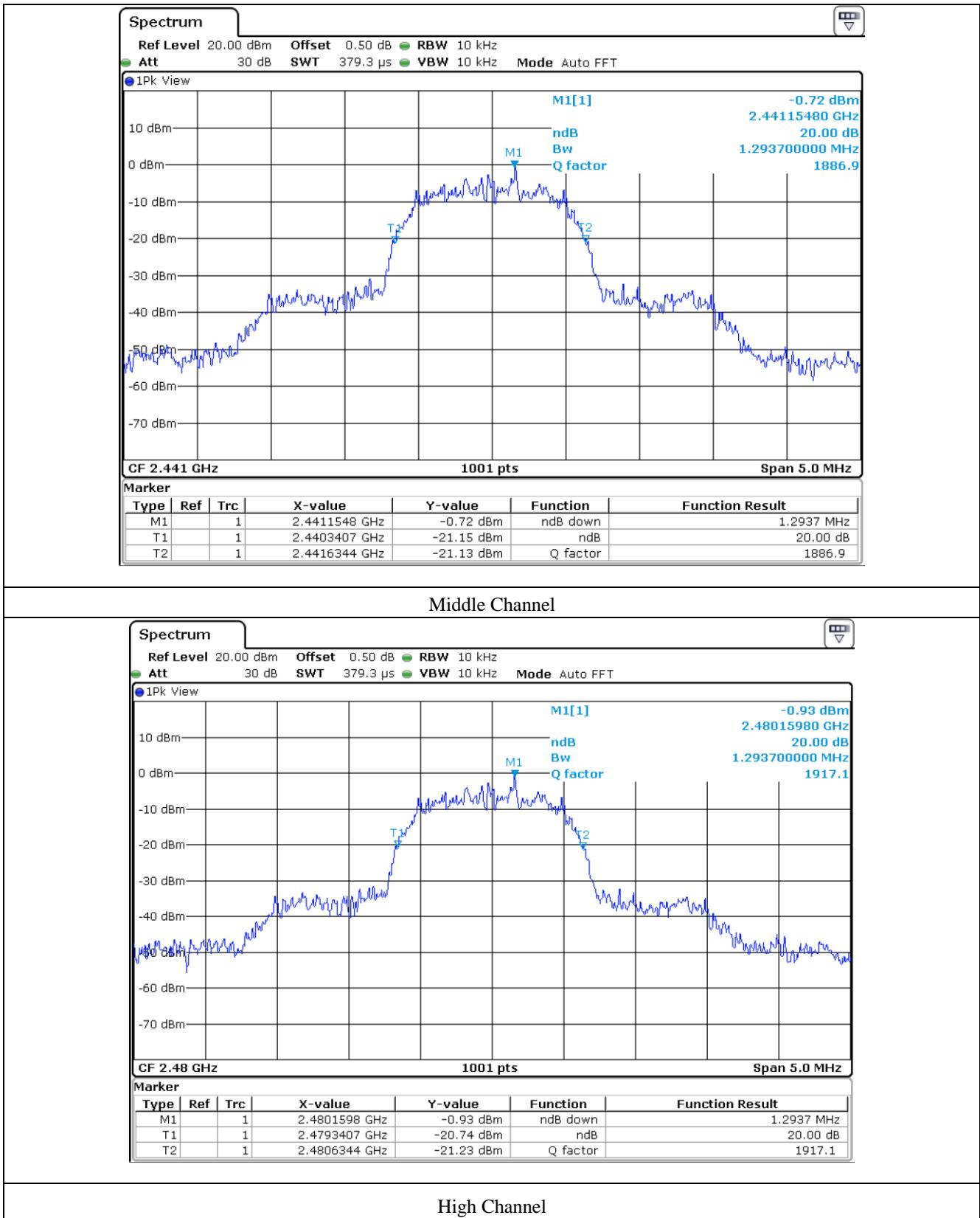
## 7.6 Test data for 3 Mbps

- Test Date : March 18, 2019

CHANNEL	FREQUENCY (MHz)	20 dB Bandwidth (kHz)
Low	2 402.00	1 293.70
Middle	2 441.00	1 293.70
High	2 480.00	1 293.70

Tested by: Hyung-Kwon, Oh / Assistant Manager





## 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)

All test equipment used is calibrated on a regular basis.

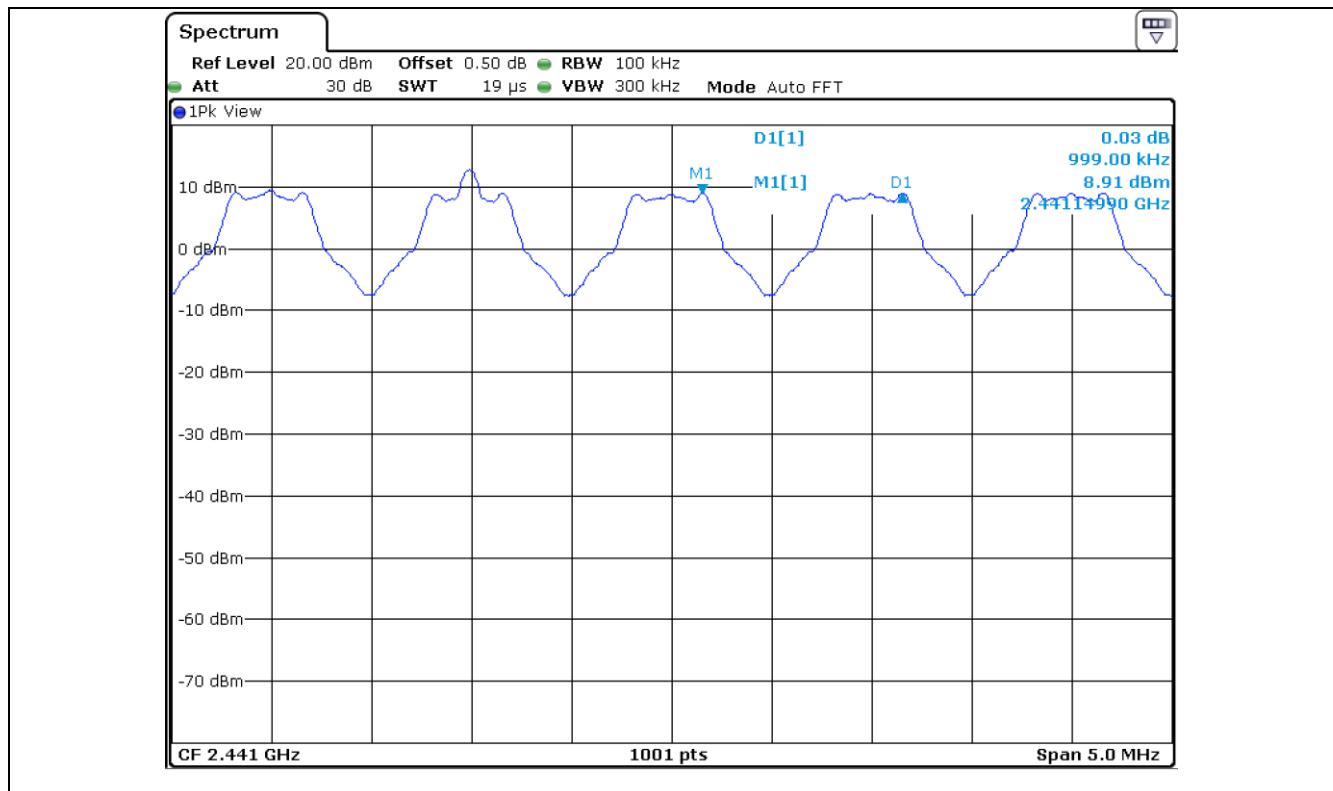
#### 8.4 Test data for 1 Mbps

- Test Date : March 18, 2019

- Test Result : Pass

MEASURED VALUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	509.47	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Assistant Manager



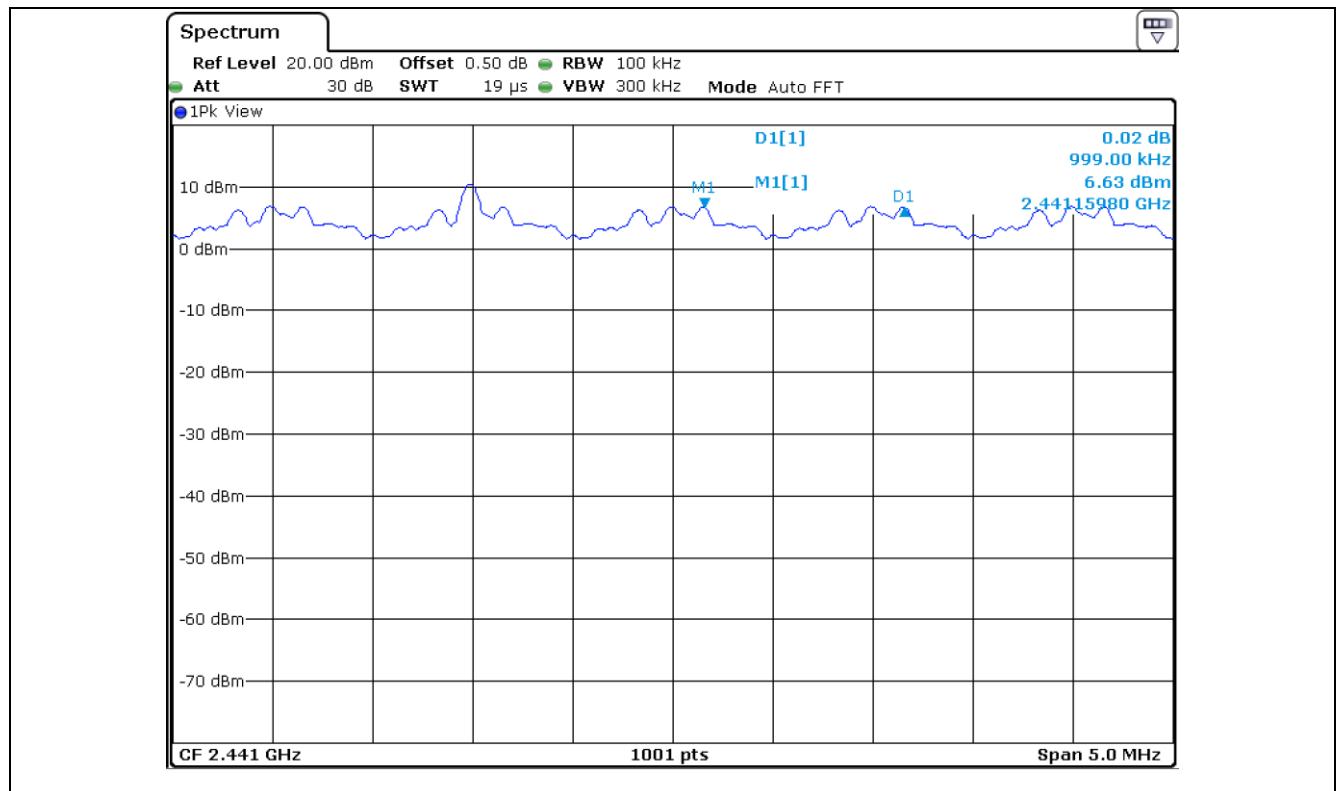
### 8.5 Test data for 2 Mbps

- . Test Date : March 18, 2019

- . Test Result : Pass

MEASURED VLAUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	882.47	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Assistant Manager



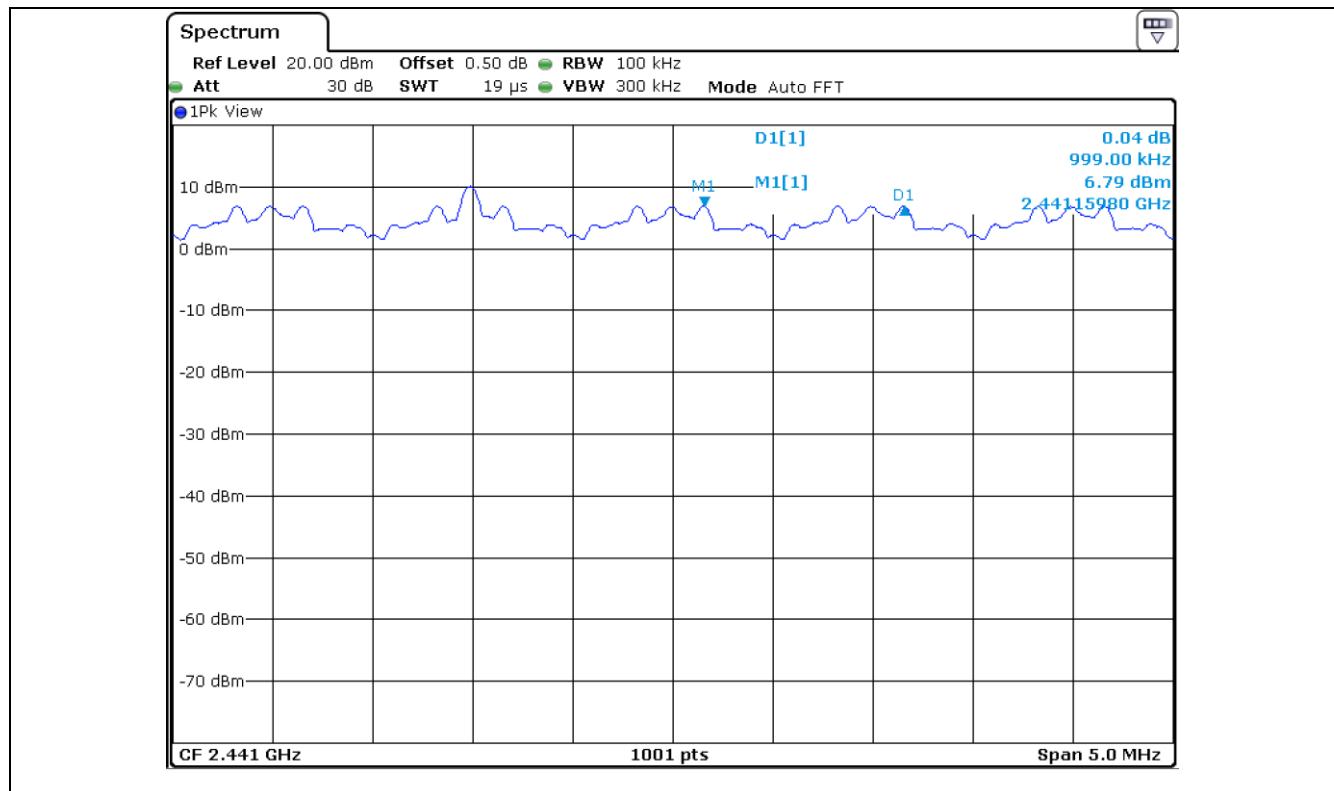
### 8.6 Test data for 3 Mbps

- Test Date : March 18, 2019

- Test Result : Pass

MEASURED VALUE (kHz)	Two-third of 20 dB Bandwidth (kHz)	LIMIT
999.00	862.47	Separated by a minimum of 25 kHz

Tested by: Hyung-Kwon, Oh / Assistant Manager



## 9. NUMBER OF HOPPING CHANNELS

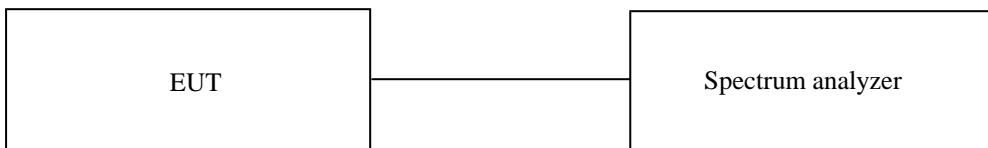
### 9.1 Operating environment

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)

All test equipment used is calibrated on a regular basis.

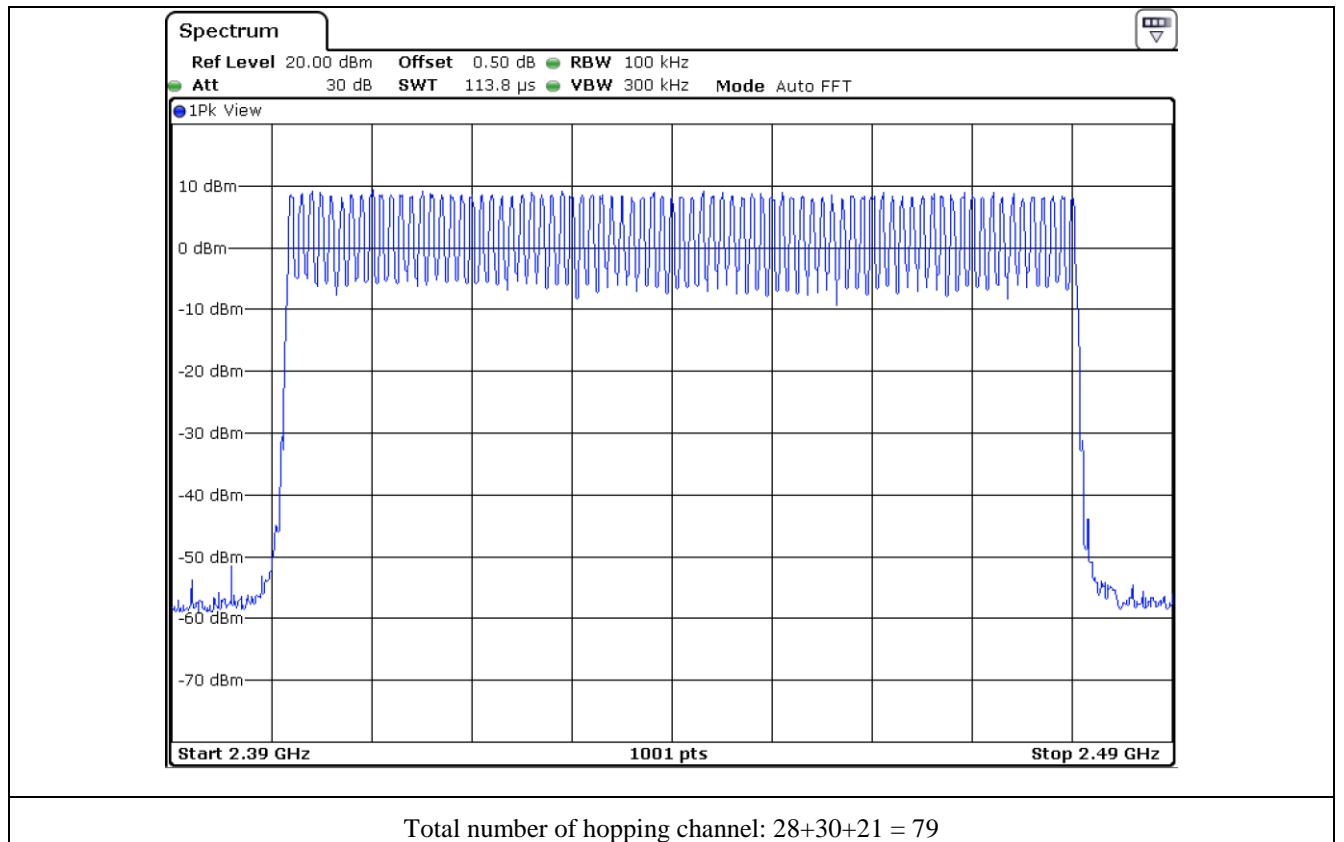
#### 9.4 Test data for 1 Mbps

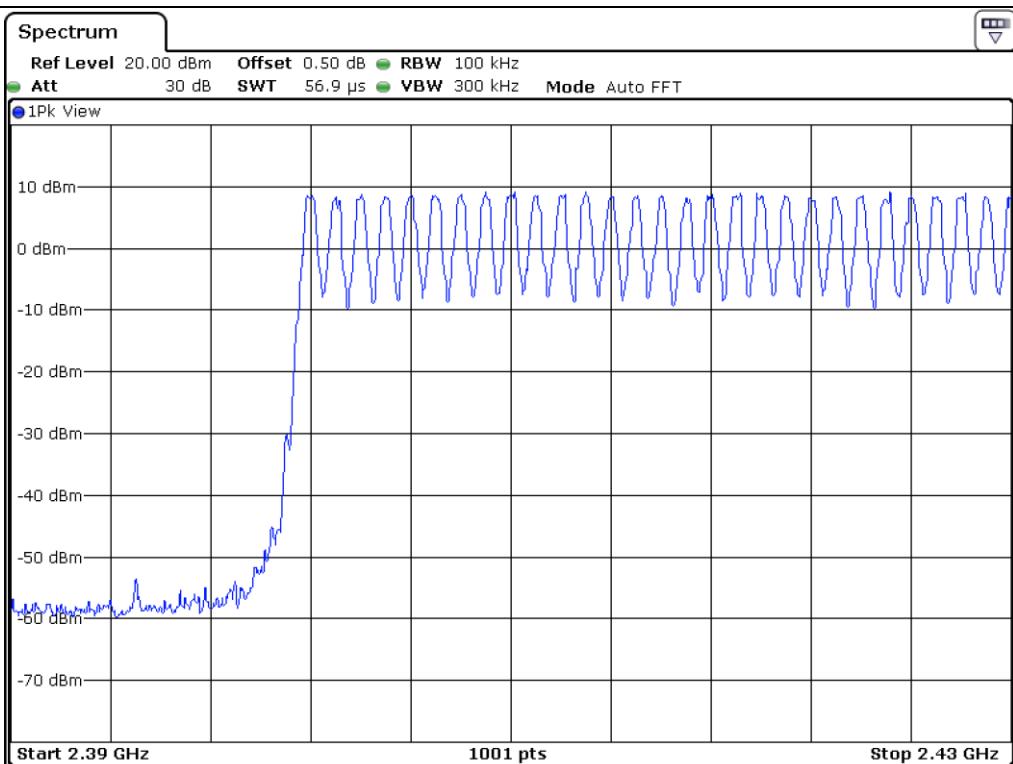
- Test Date : March 18, 2019

- Test Result : Pass

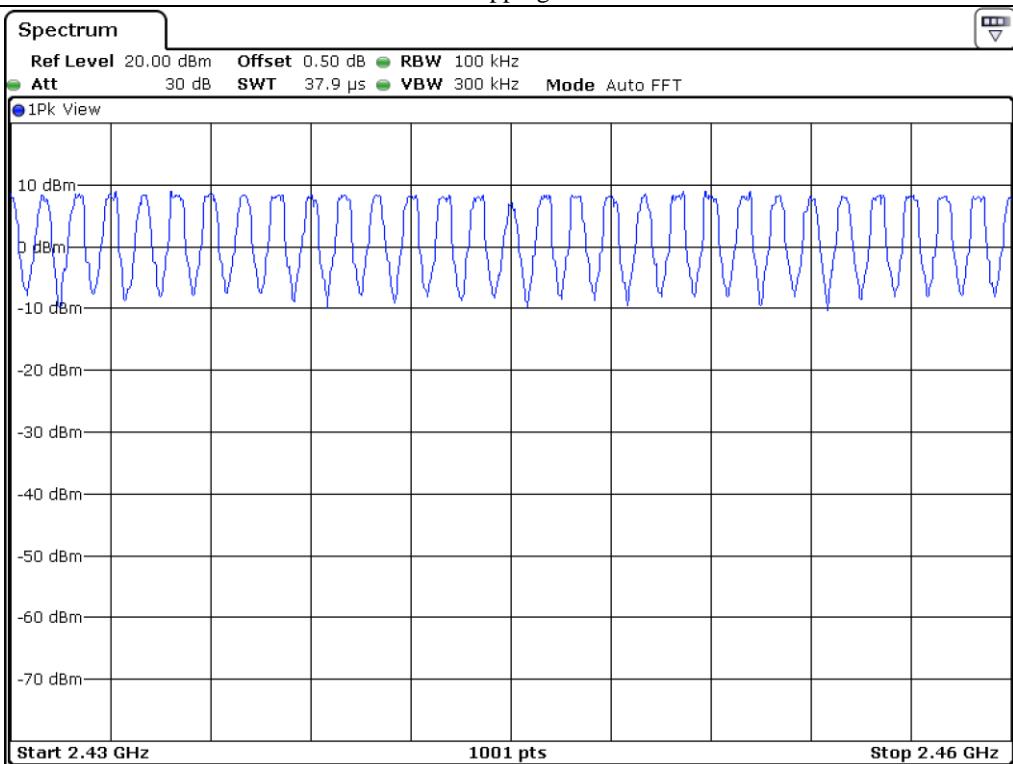
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
1 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Assistant Manager

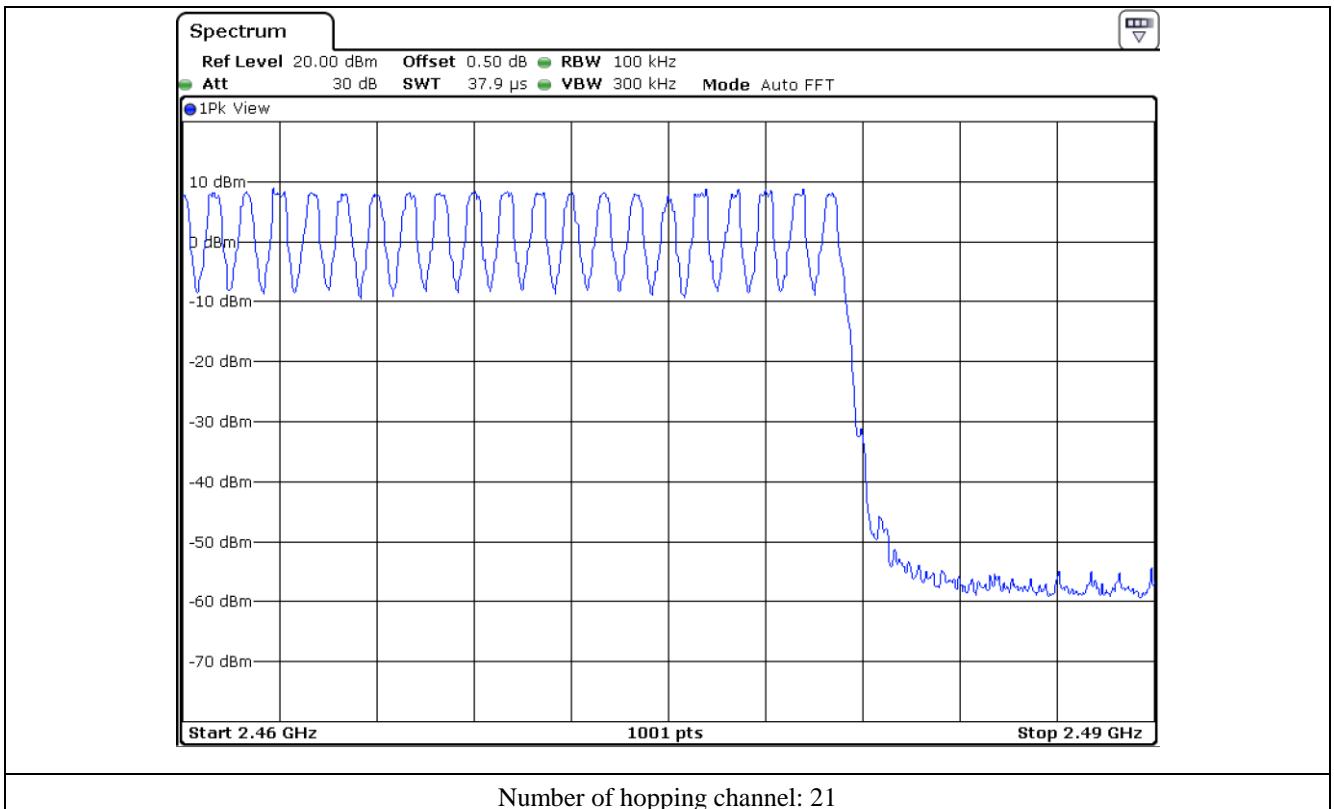




Number of hopping channel: 28



Number of hopping channel: 30



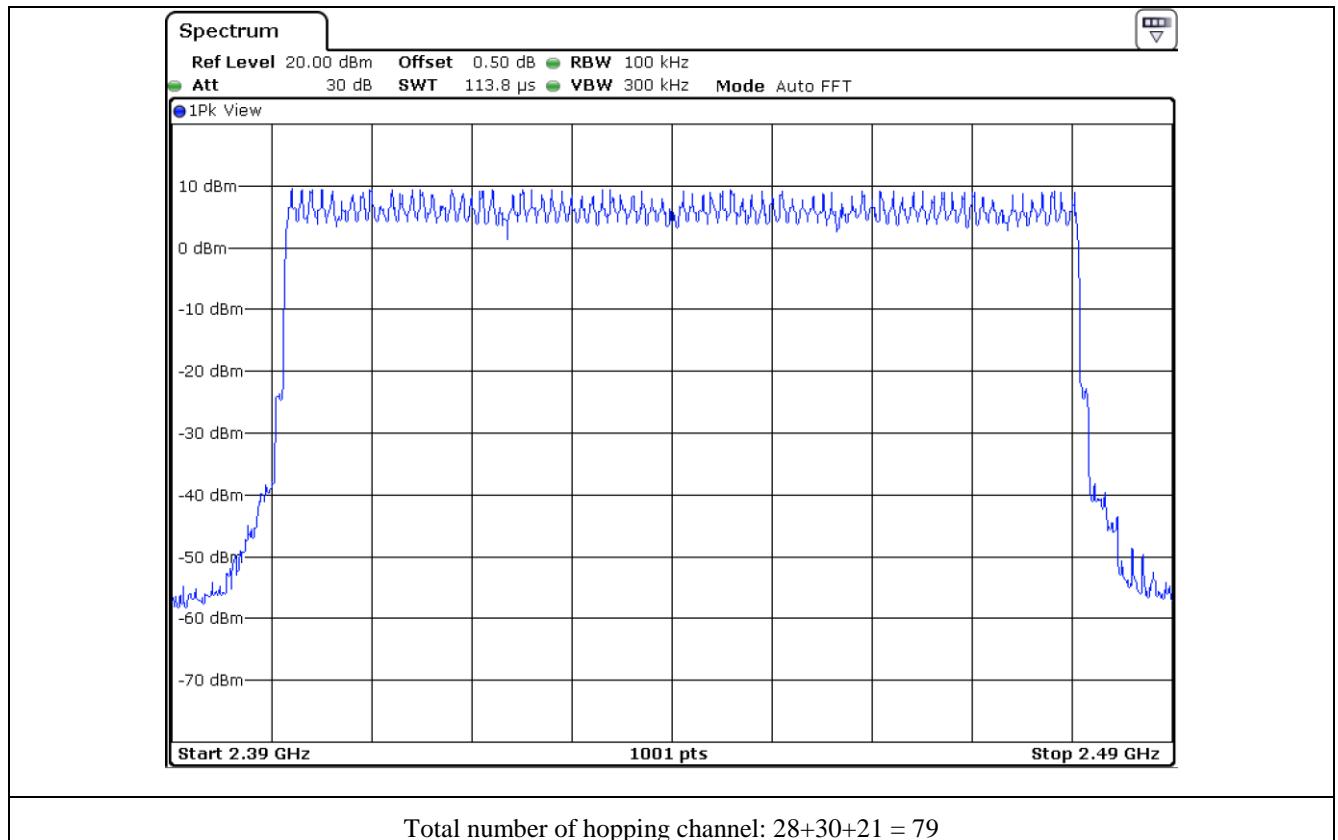
### 9.5 Test data for 2 Mbps

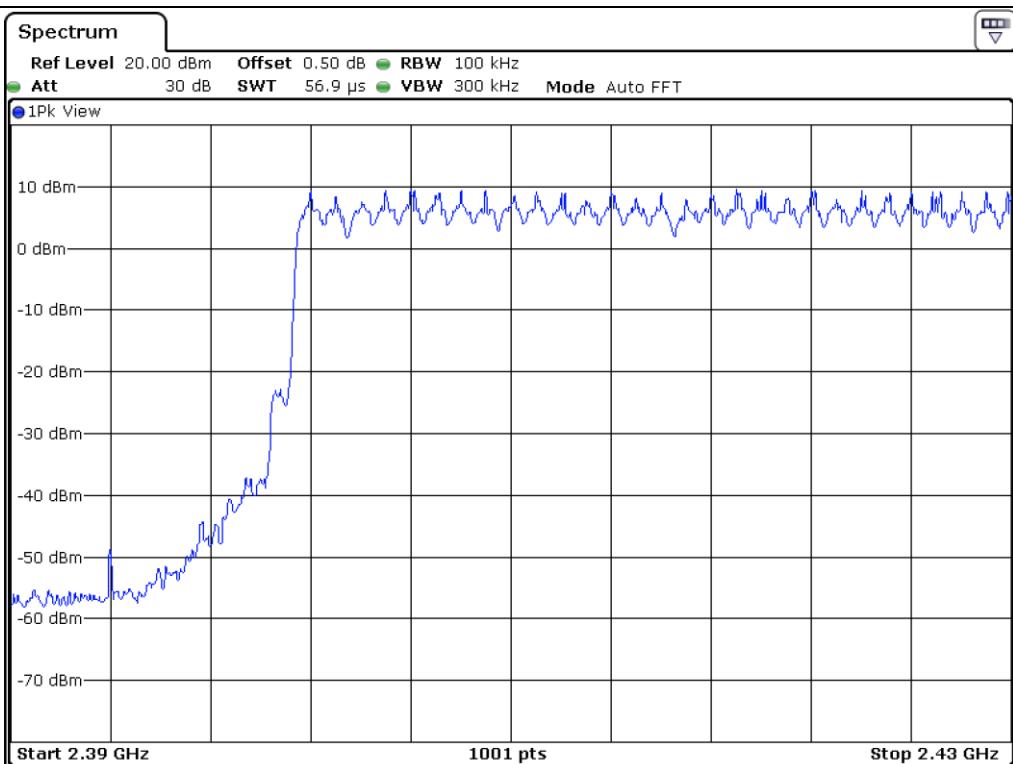
- Test Date : March 18, 2019

- Test Result : Pass

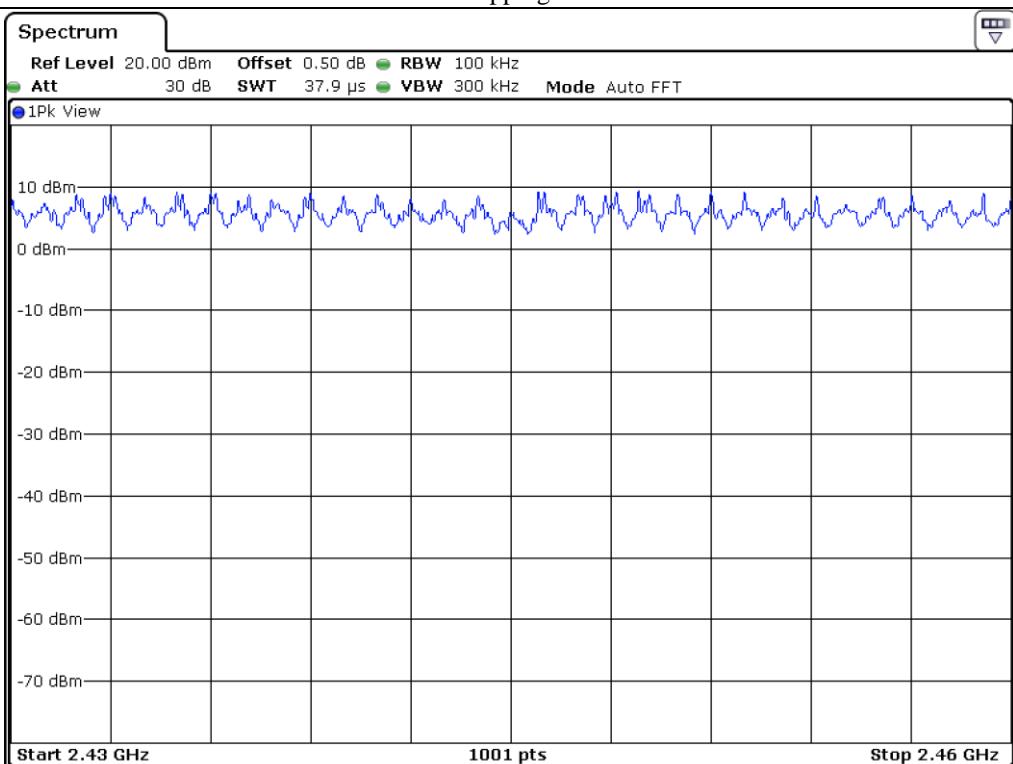
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
2 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Assistant Manager

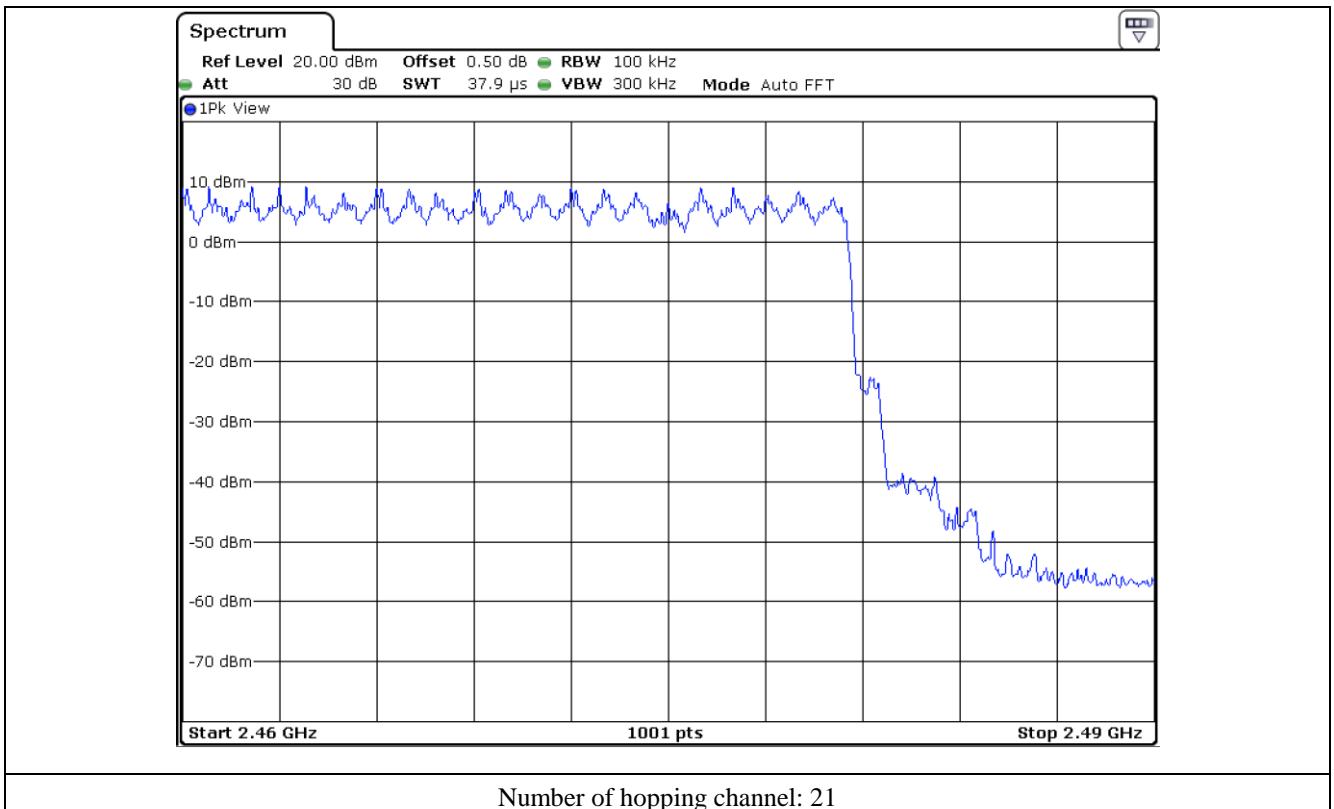




Number of hopping channel: 28



Number of hopping channel: 30



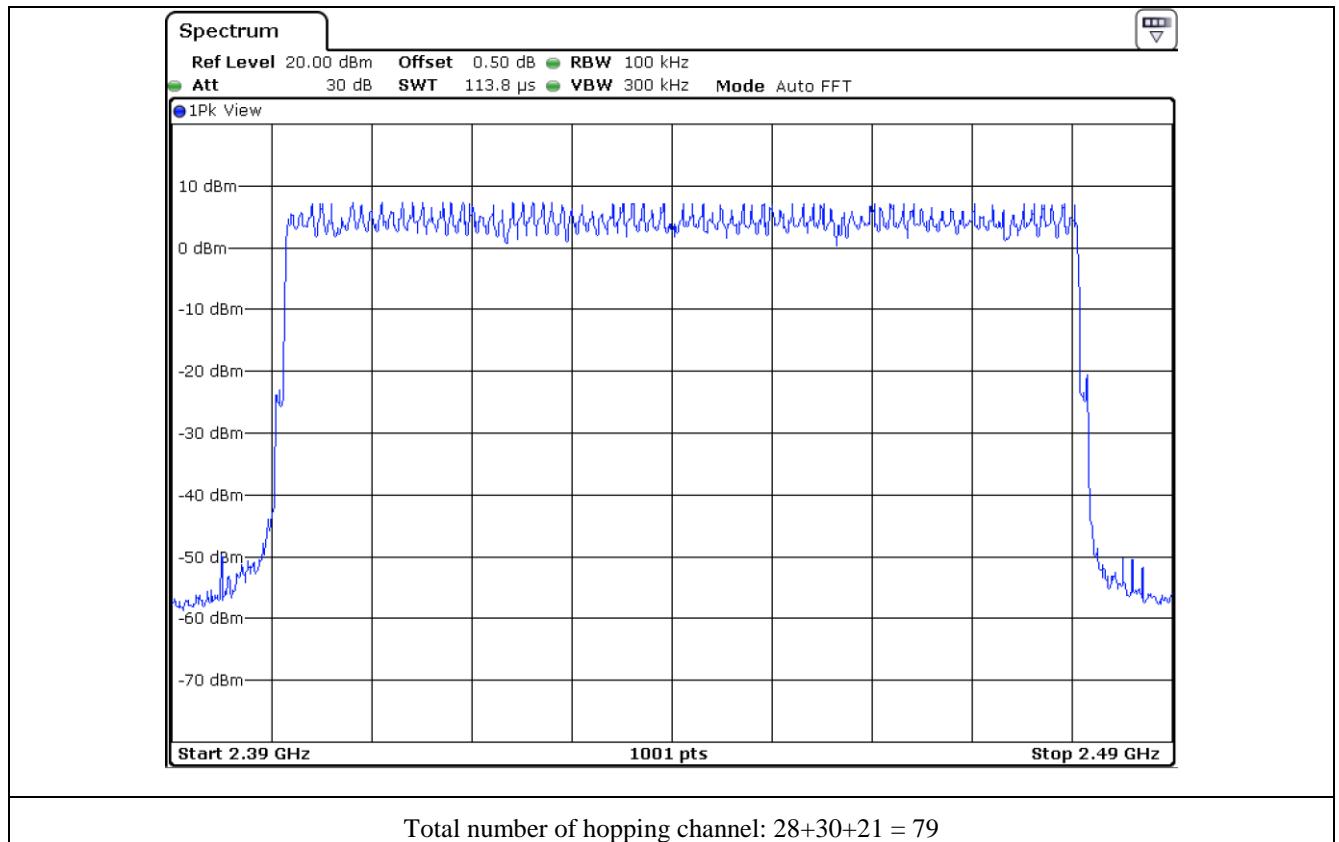
### 9.6 Test data for 3 Mbps

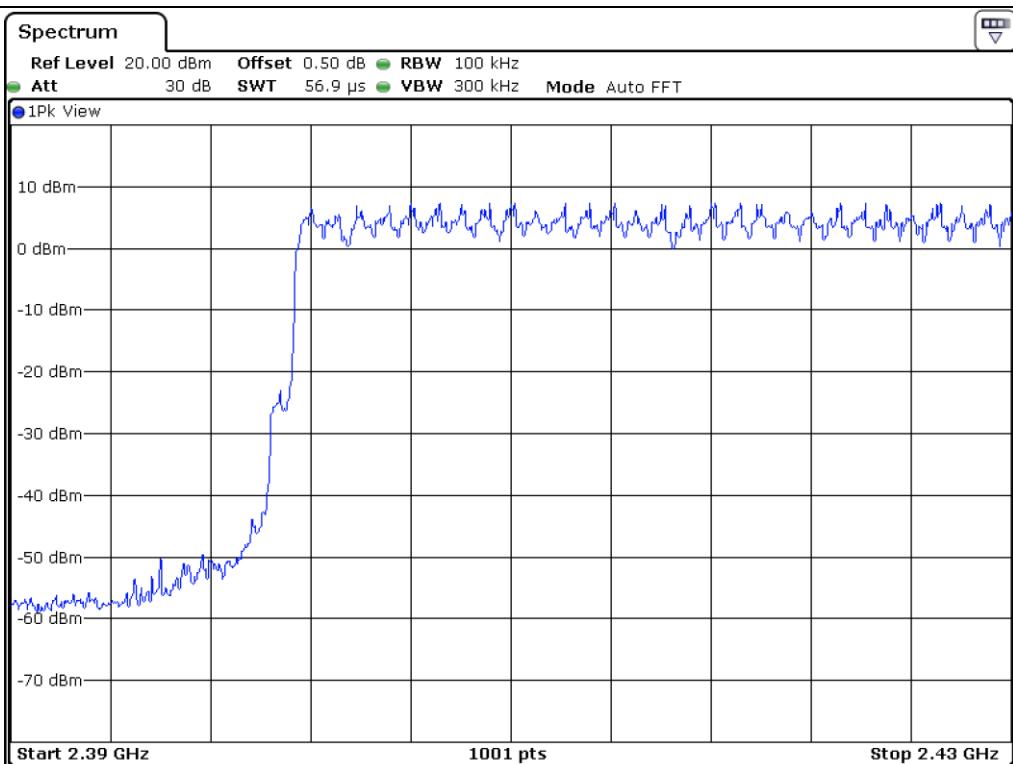
- Test Date : March 18, 2019

- Test Result : Pass

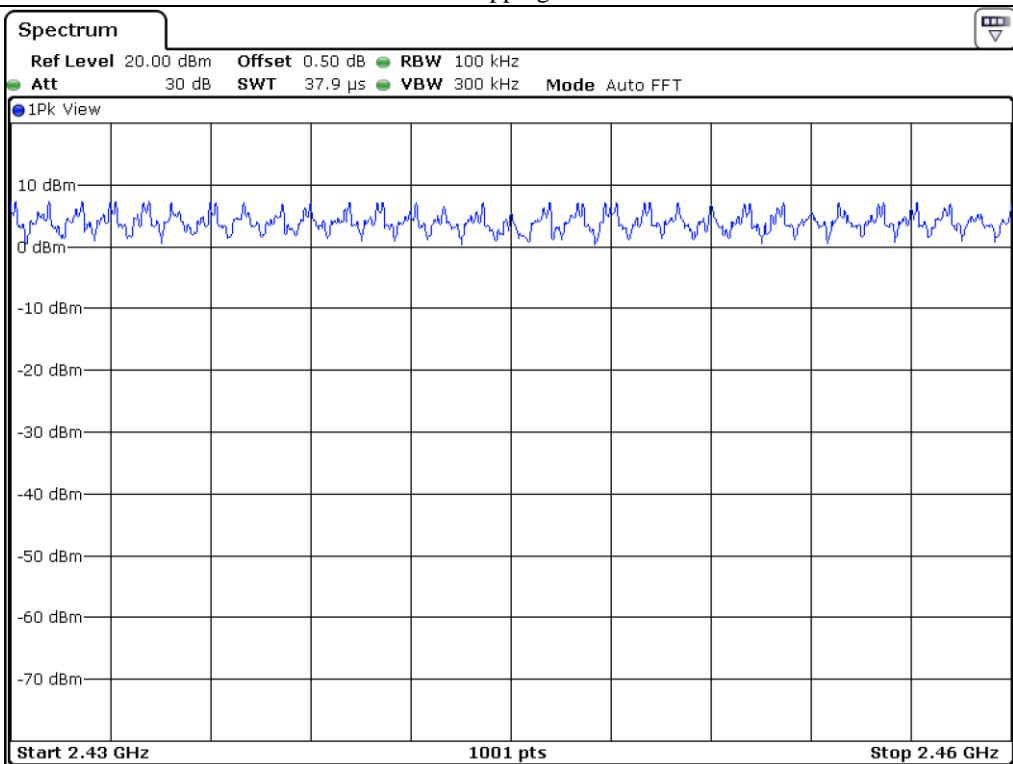
Data Transfer Rate	Measured value (Number)	Limit (Number)	Margin (Number)
3 Mbps	79	Minimum of 15	64

Tested by: Hyung-Kwon, Oh / Assistant Manager

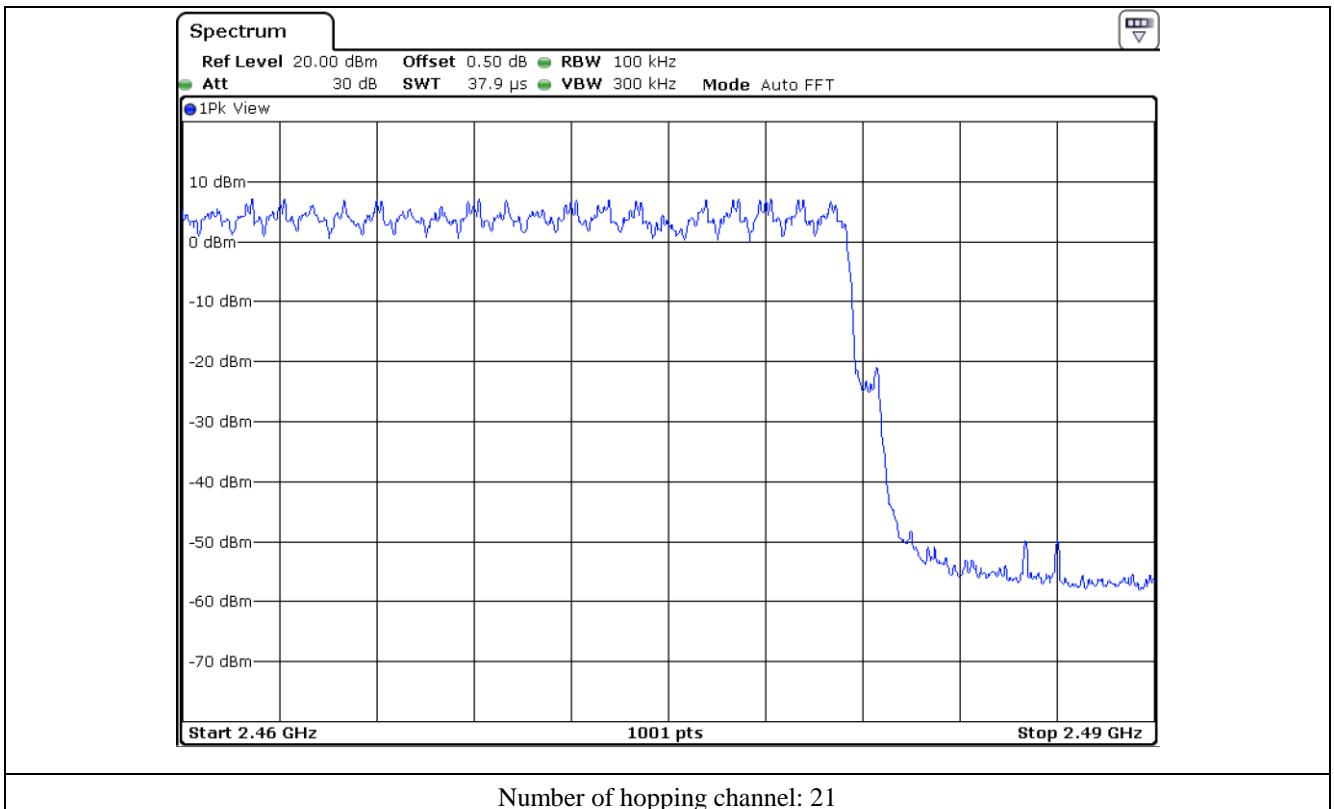




Number of hopping channel: 28



Number of hopping channel: 30



## 10. TIME OF OCCUPANCY

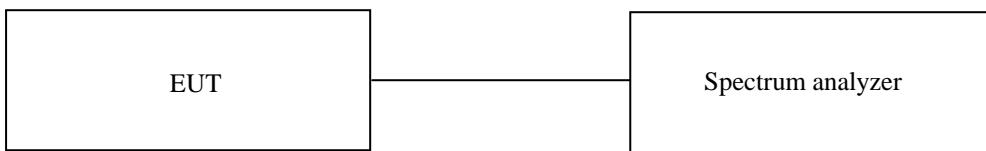
### 10.1 Operating environment

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)

All test equipment used is calibrated on a regular basis.

#### 10.4 Test data for 1 Mbps

- . Test Date : March 18, 2019

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

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

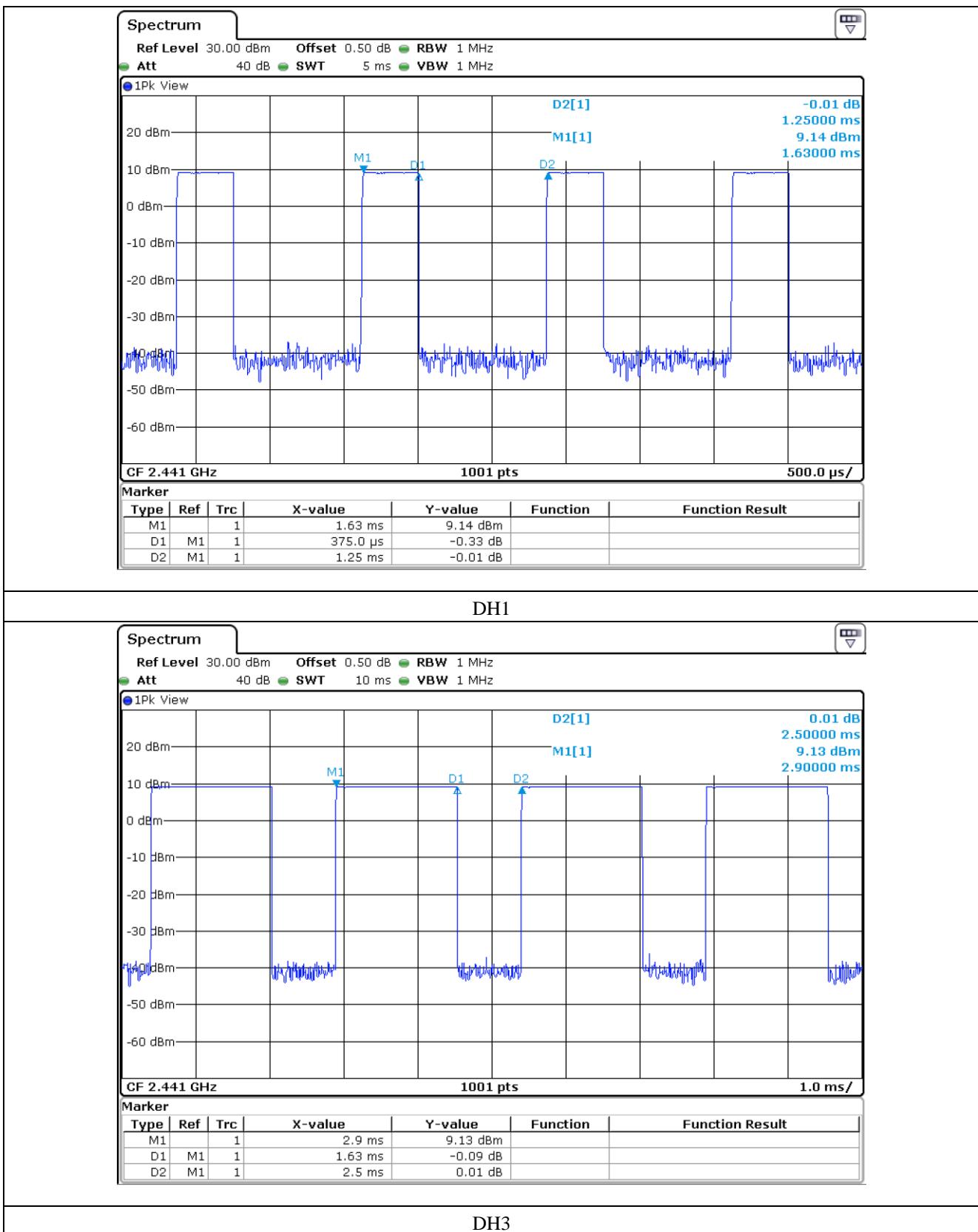
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.375	10.13	31.60	120.04	400	PASS
DH3	1.630	5.06	31.60	260.63	400	
DH5	2.900	3.38	31.60	309.74	400	

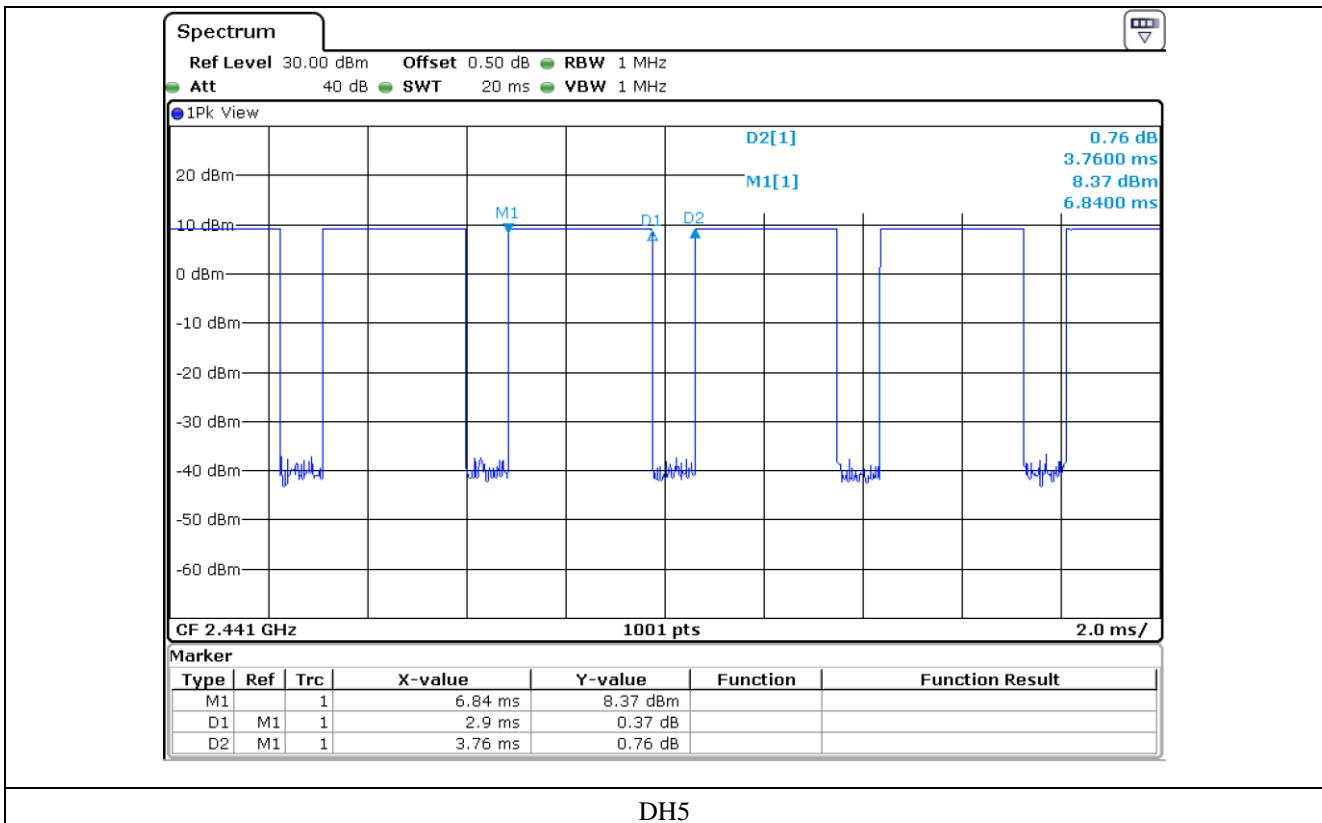
Total dwell time is calculated as following.

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: Hyung-Kwon, Oh / Assistant Manager





## 10.5 Test data for 2 Mbps

- Test Date : March 18, 2019

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.

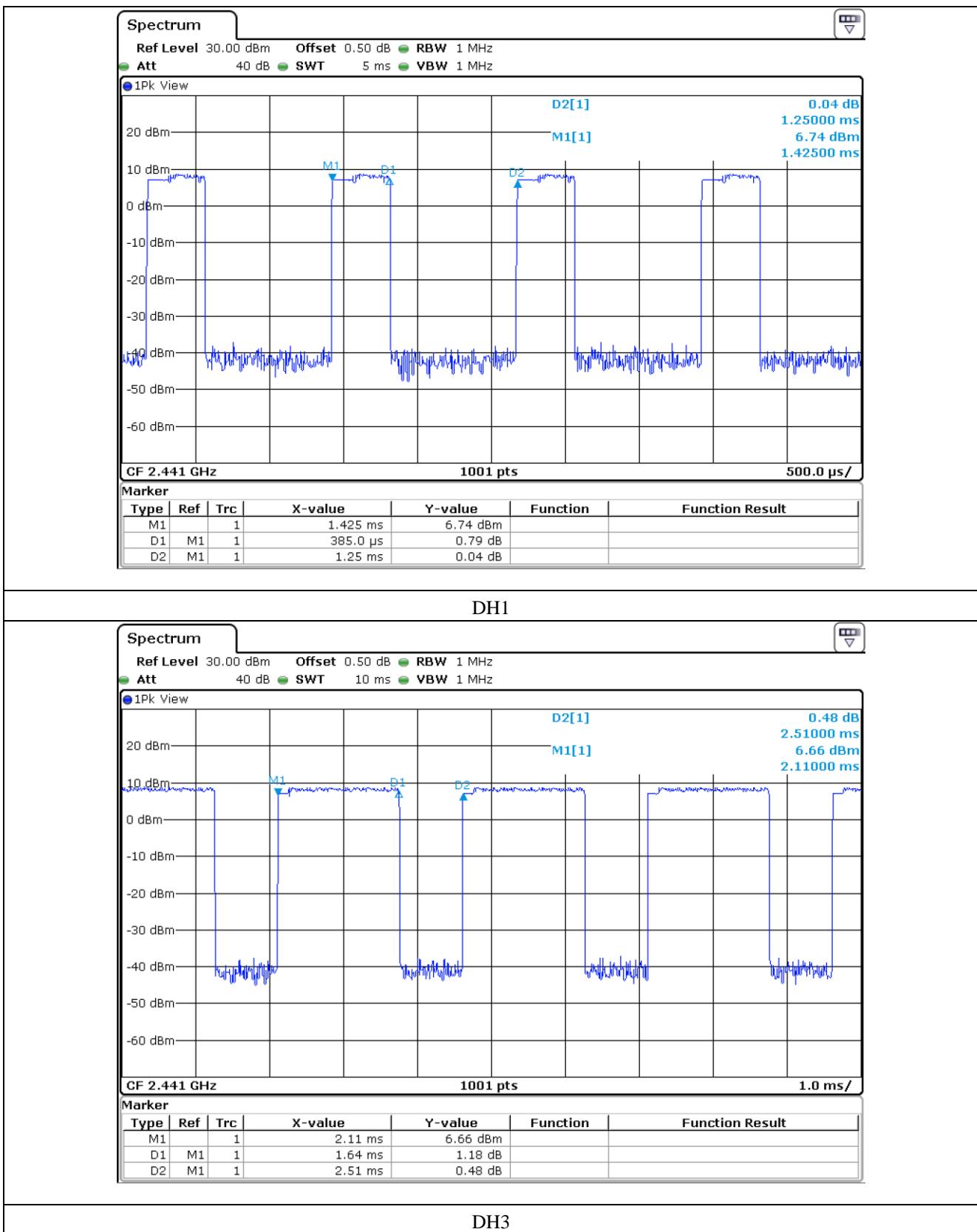
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.385	10.13	31.60	123.24	400	PASS
DH3	1.640	5.06	31.60	262.23	400	
DH5	2.900	3.38	31.60	309.74	400	

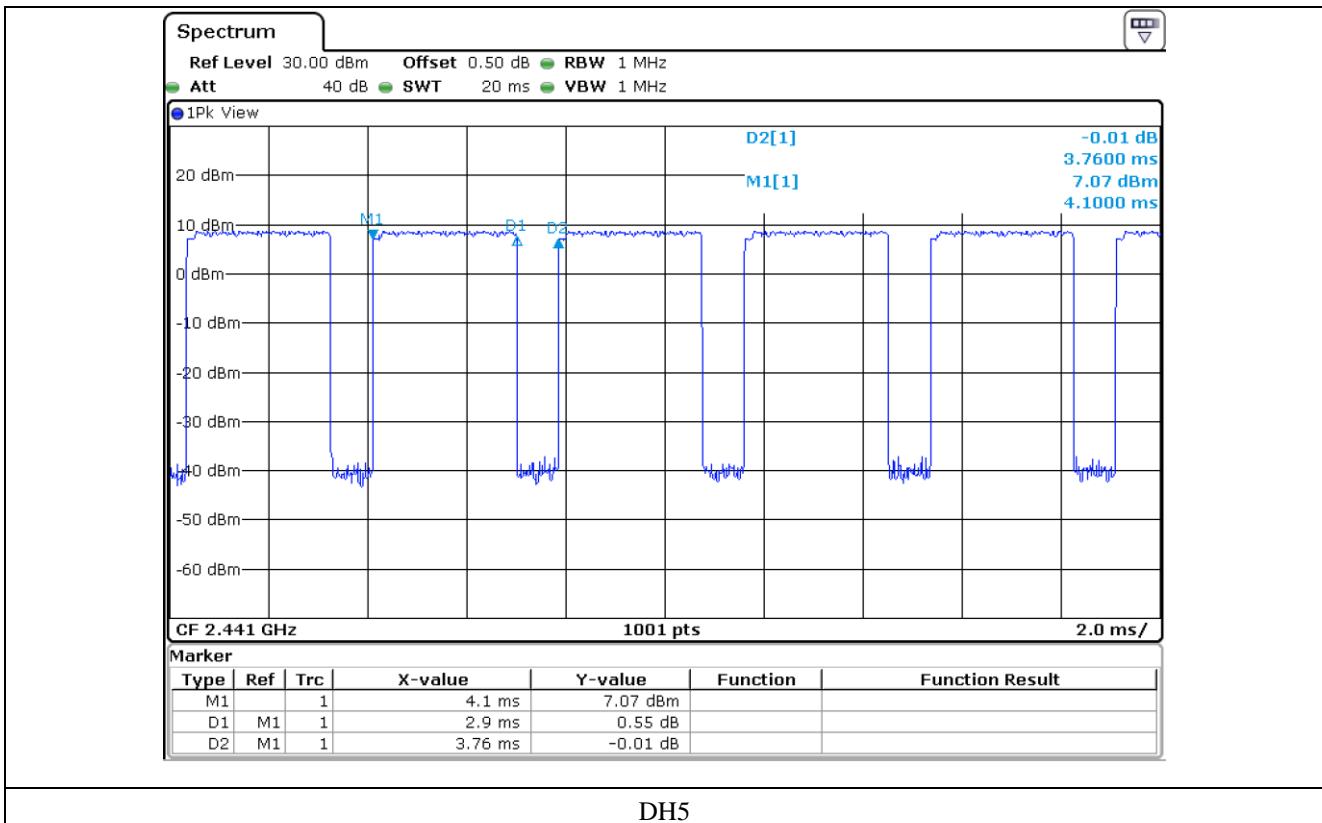
Total dwell time is calculated as following.

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: Hyung-Kwon, Oh / Assistant Manager





## 10.6 Test data for 3 Mbps

- . Test Date : March 18, 2019

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

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

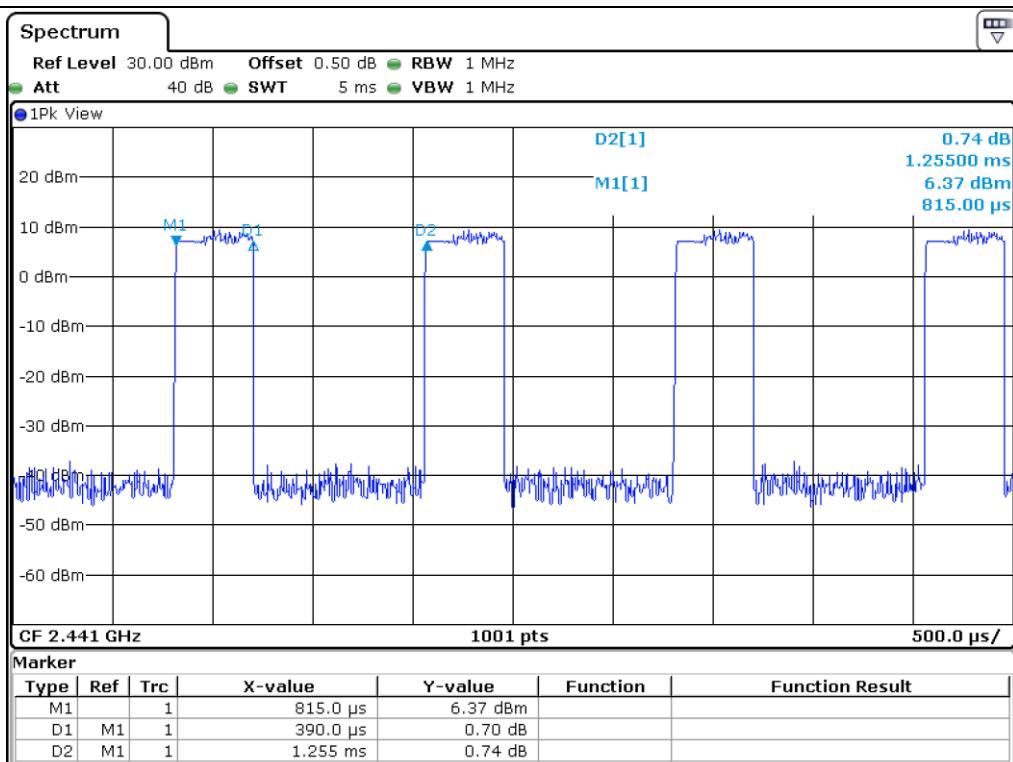
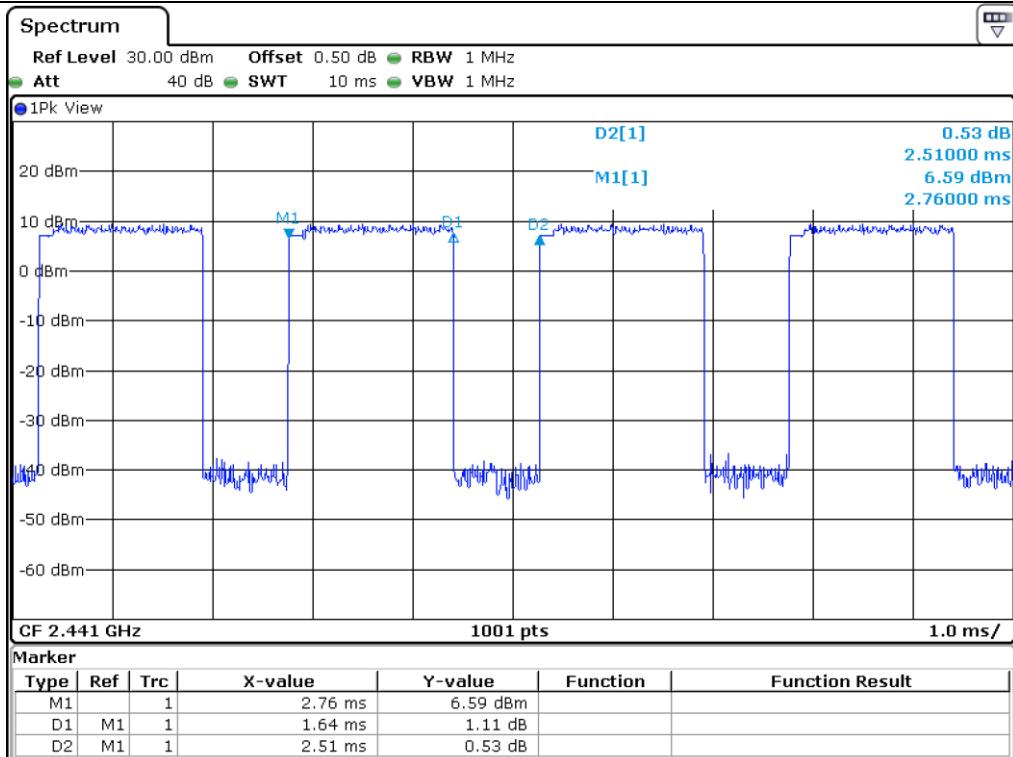
Packet Type	Pulse Time (ms)	Hops per second with channels	Period Time (ms)	Total Dwell Time (ms)	Limit (ms)	Test Result
DH1	0.390	10.13	31.60	124.84	400	PASS
DH3	1.640	5.06	31.60	262.23	400	
DH5	2.880	3.38	31.60	307.61	400	

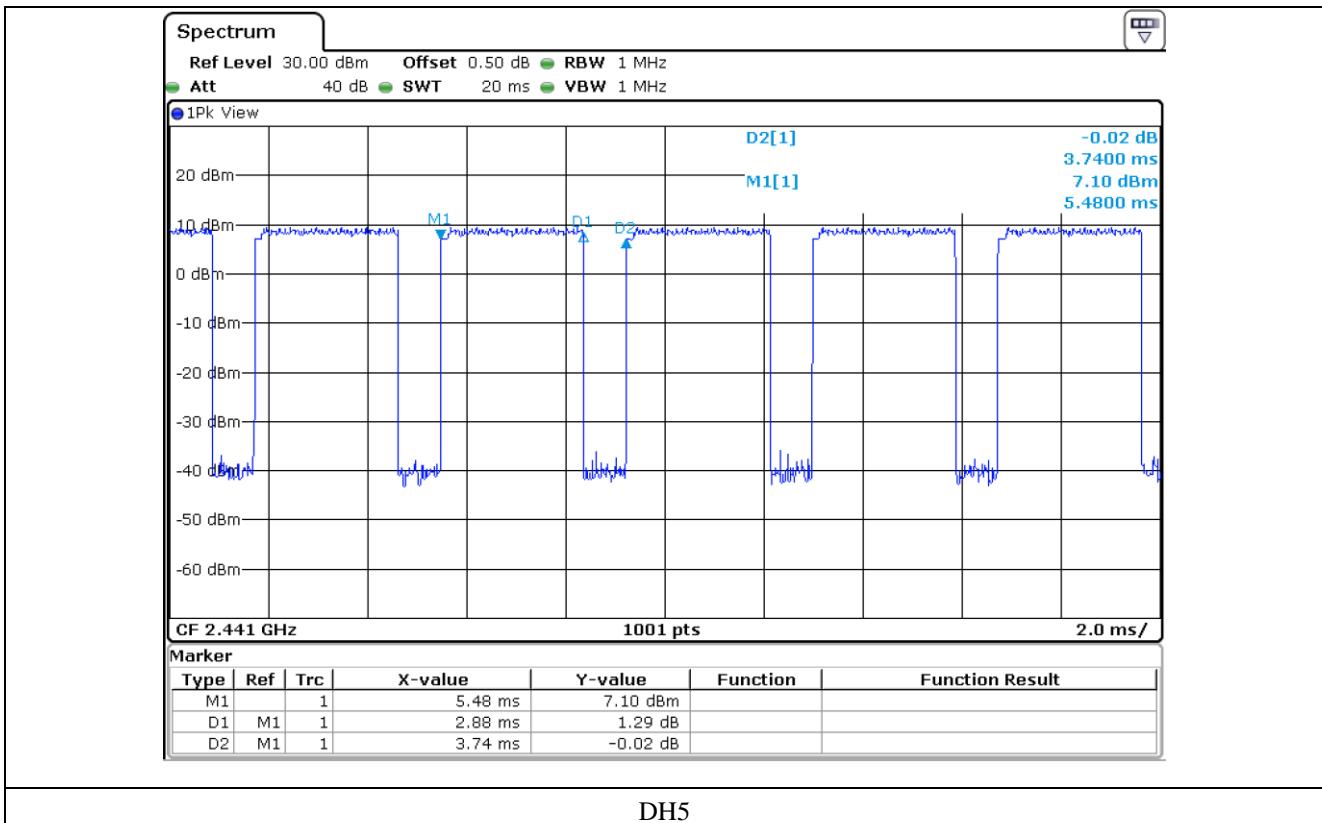
Total dwell time is calculated as following.

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: Hyung-Kwon, Oh / Assistant Manager

**DH1****DH3**



## 11. MAXIMUM PEAK OUTPUT POWER

### 11.1 Operating environment

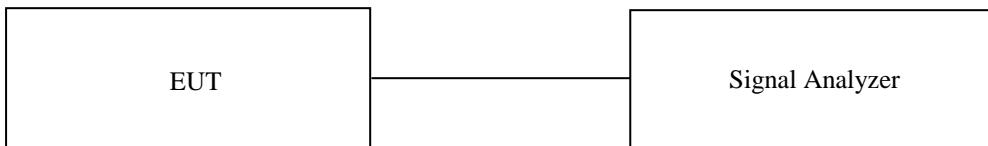
Temperature : 23 °C

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  $\geq$  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)

All test equipment used is calibrated on a regular basis.

### 11.4 Test data for 1 Mbps

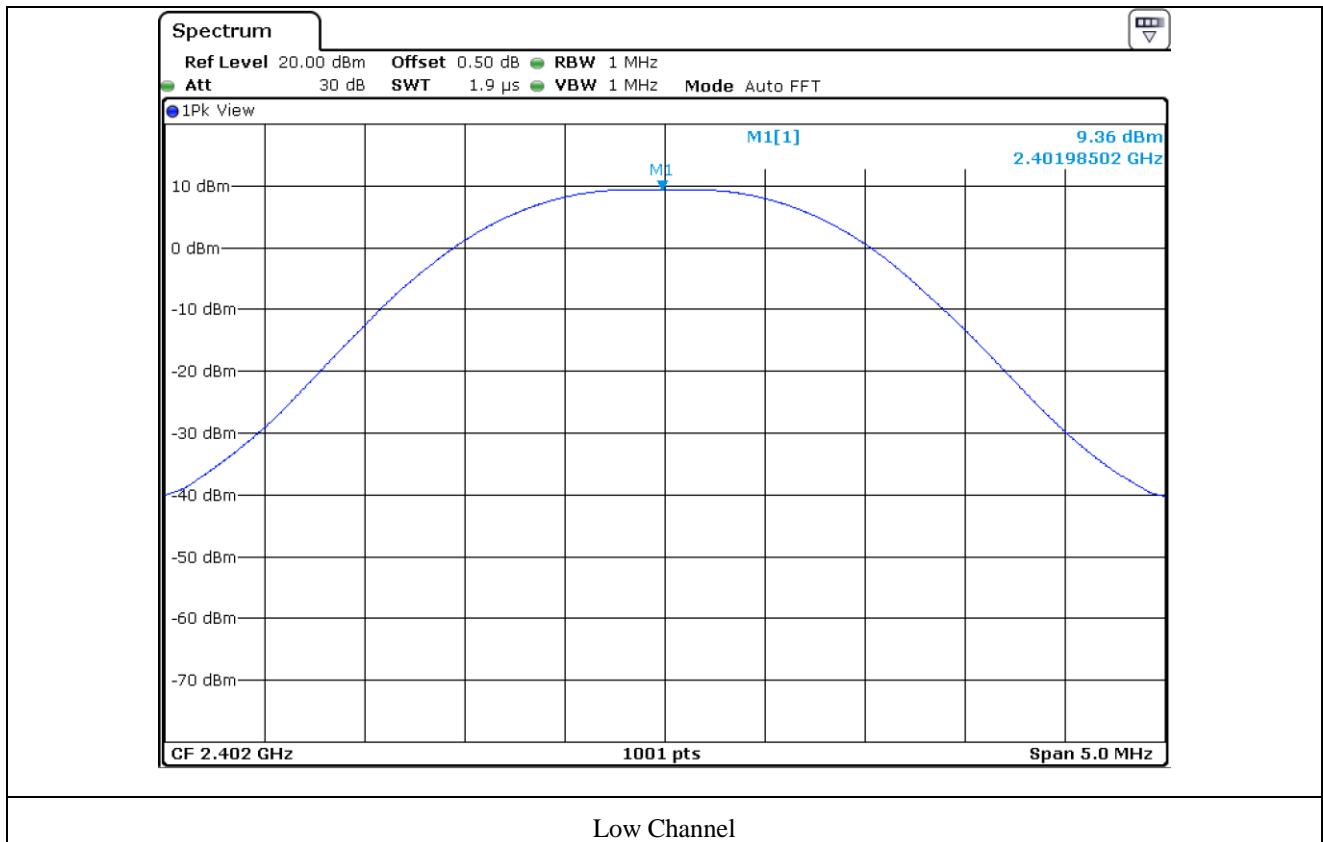
- . Test Date : March 18, 2019

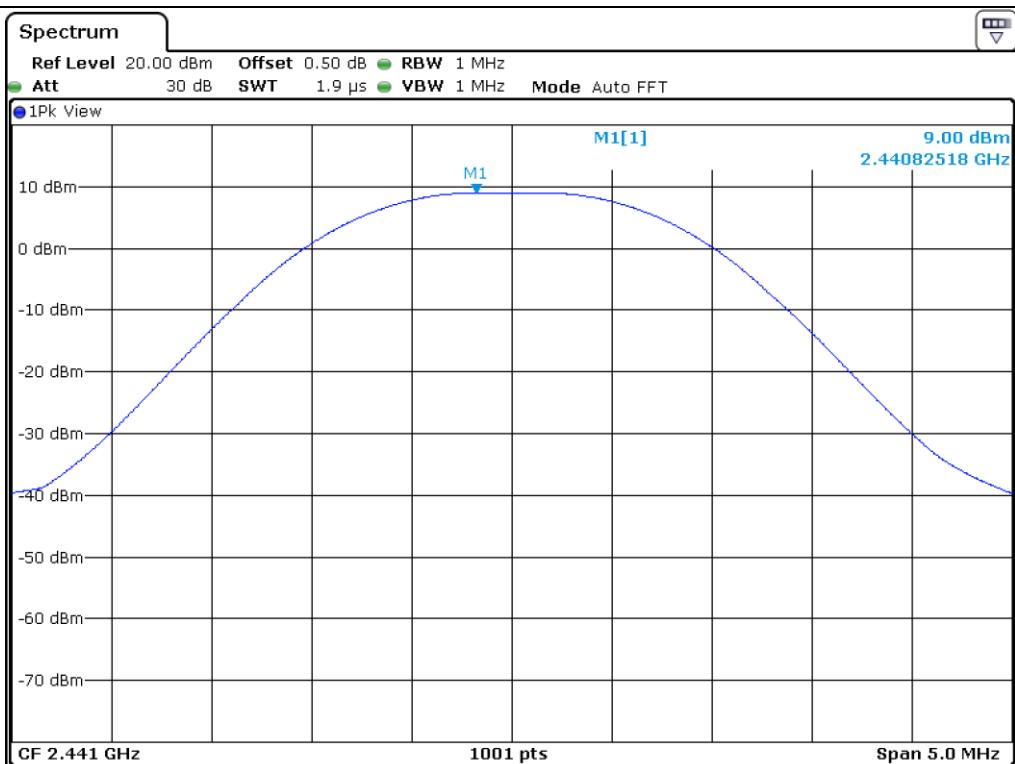
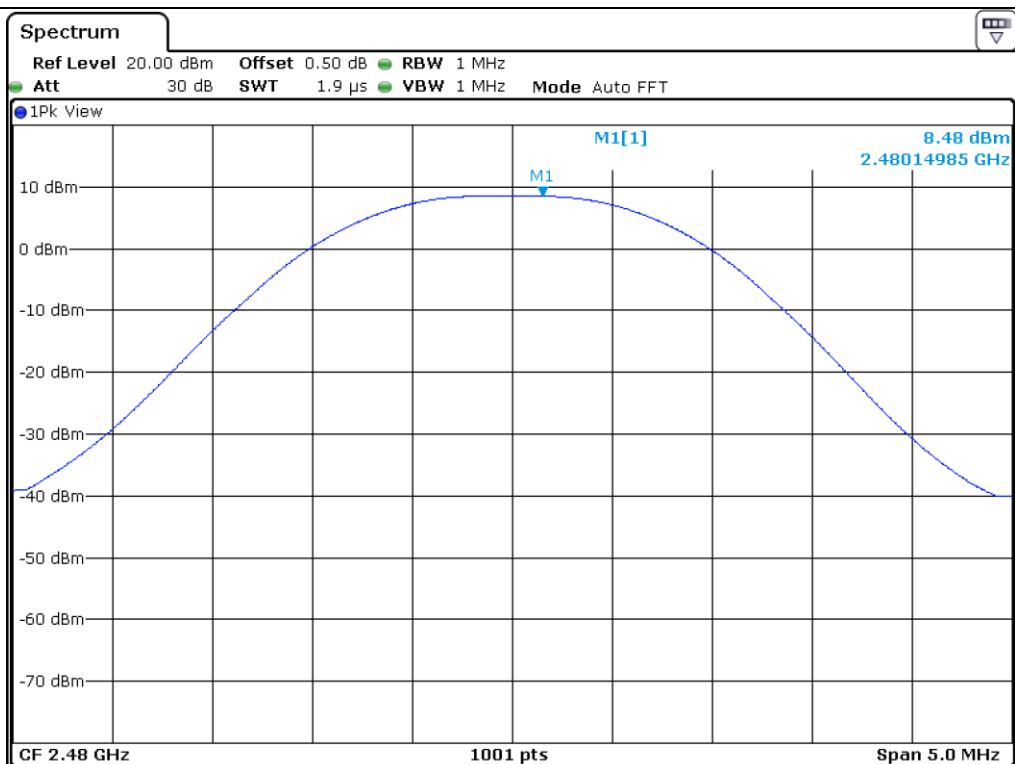
- . Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.36	30.00	20.64
MIDDLE	2 441.00	9.00	30.00	21.00
HIGH	2 480.00	8.48	30.00	21.52

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

Tested by: Hyung-Kwon, Oh / Assistant Manager



**Middle Channel****High Channel**

### 11.5 Test data for 2 Mbps

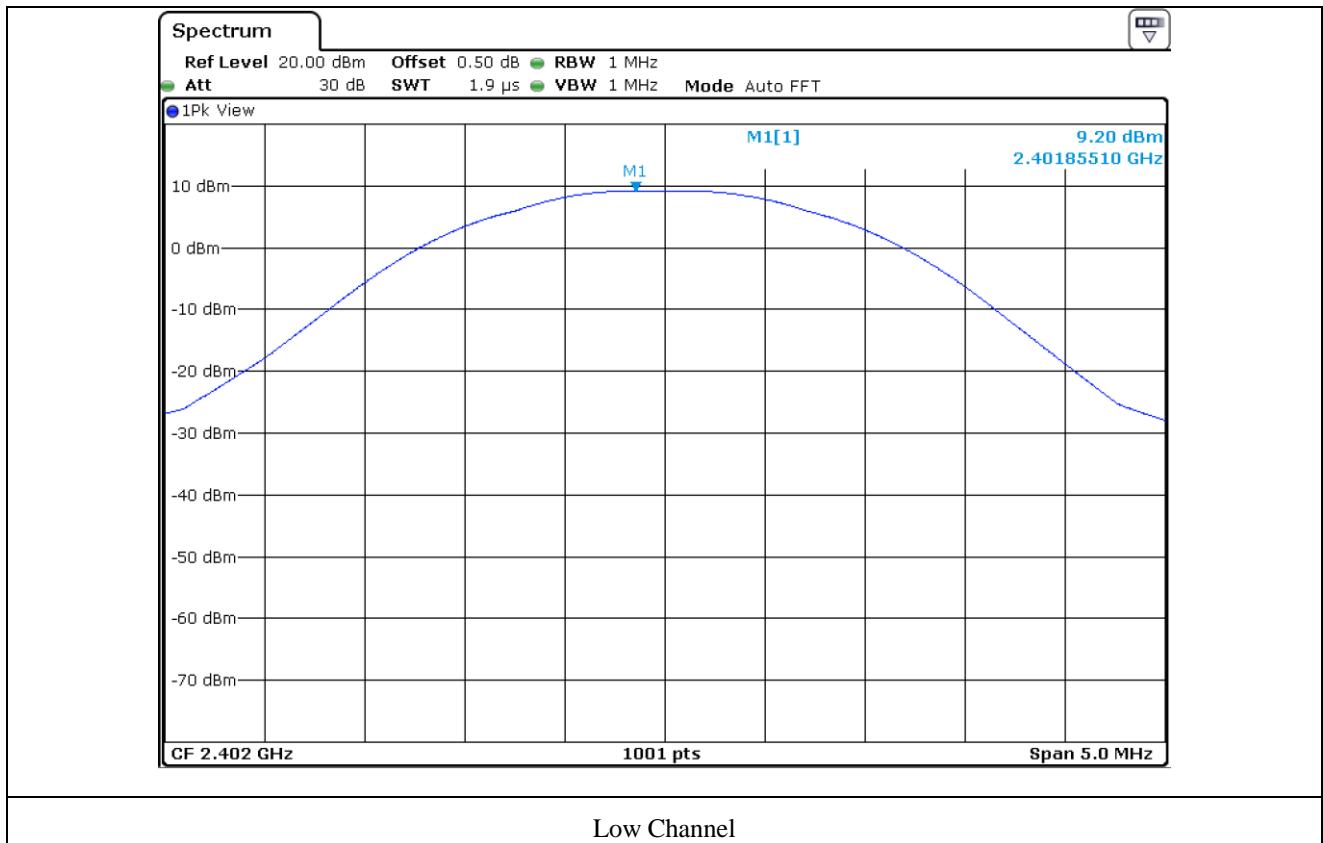
- . Test Date : March 18, 2019

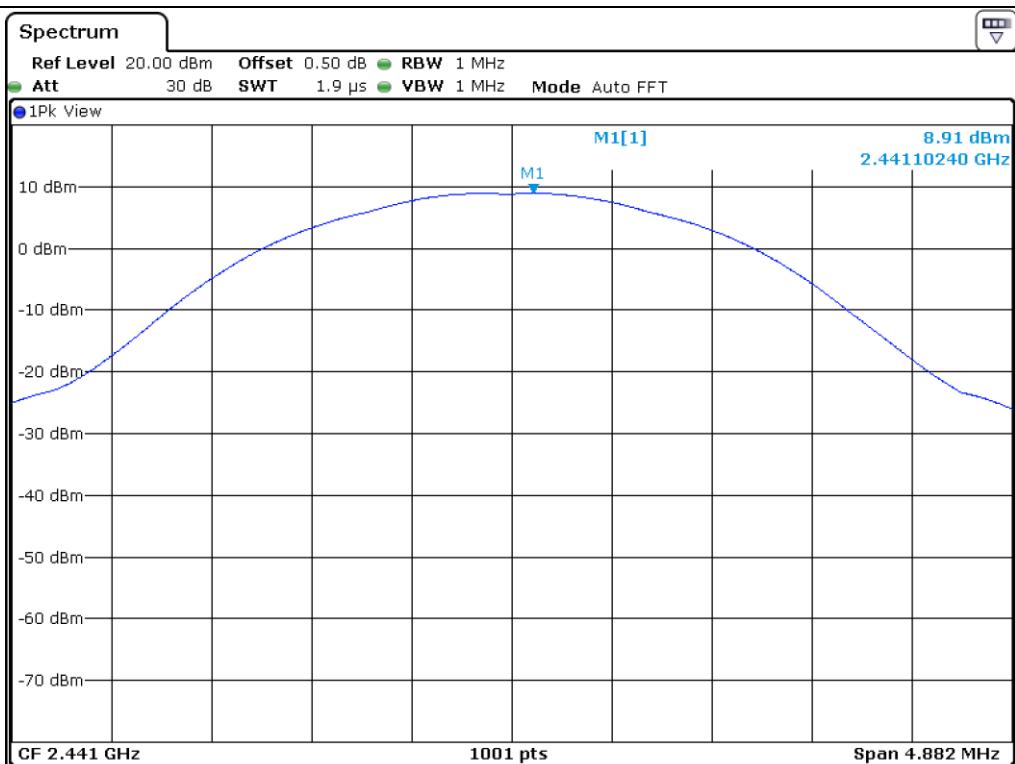
- . Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.20	30.00	20.80
MIDDLE	2 441.00	8.91	30.00	21.09
HIGH	2 480.00	8.55	30.00	21.45

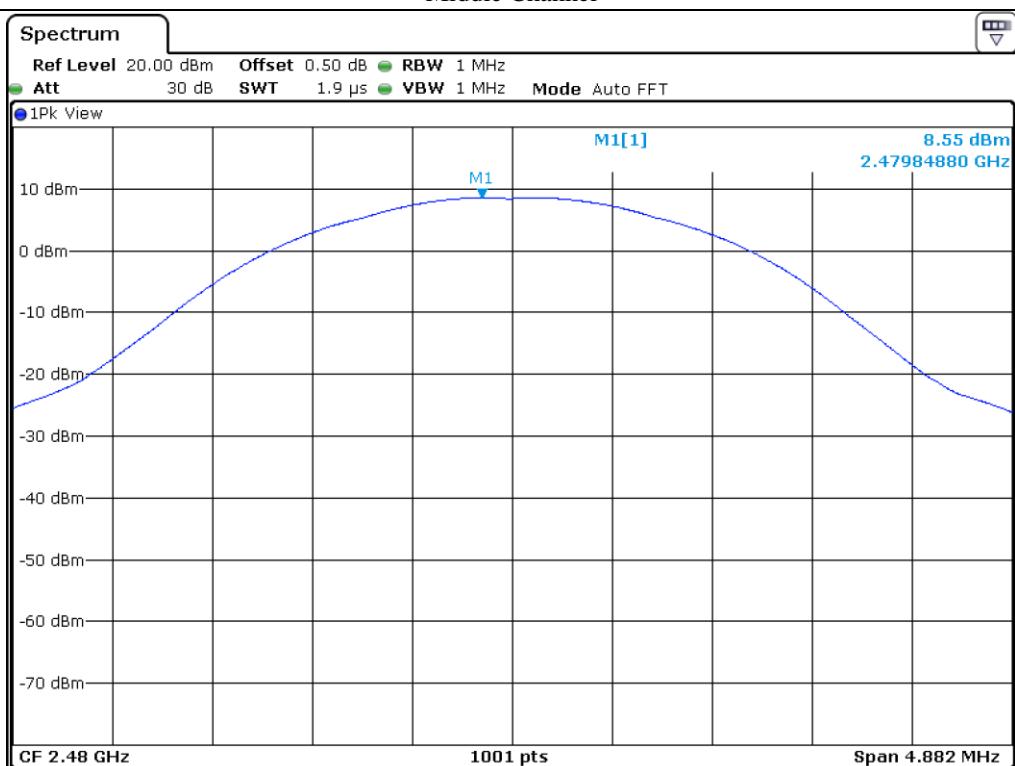
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Hyung-Kwon, Oh / Assistant Manager





## Middle Channel



## High Channel

### 11.6 Test data for 3 Mbps

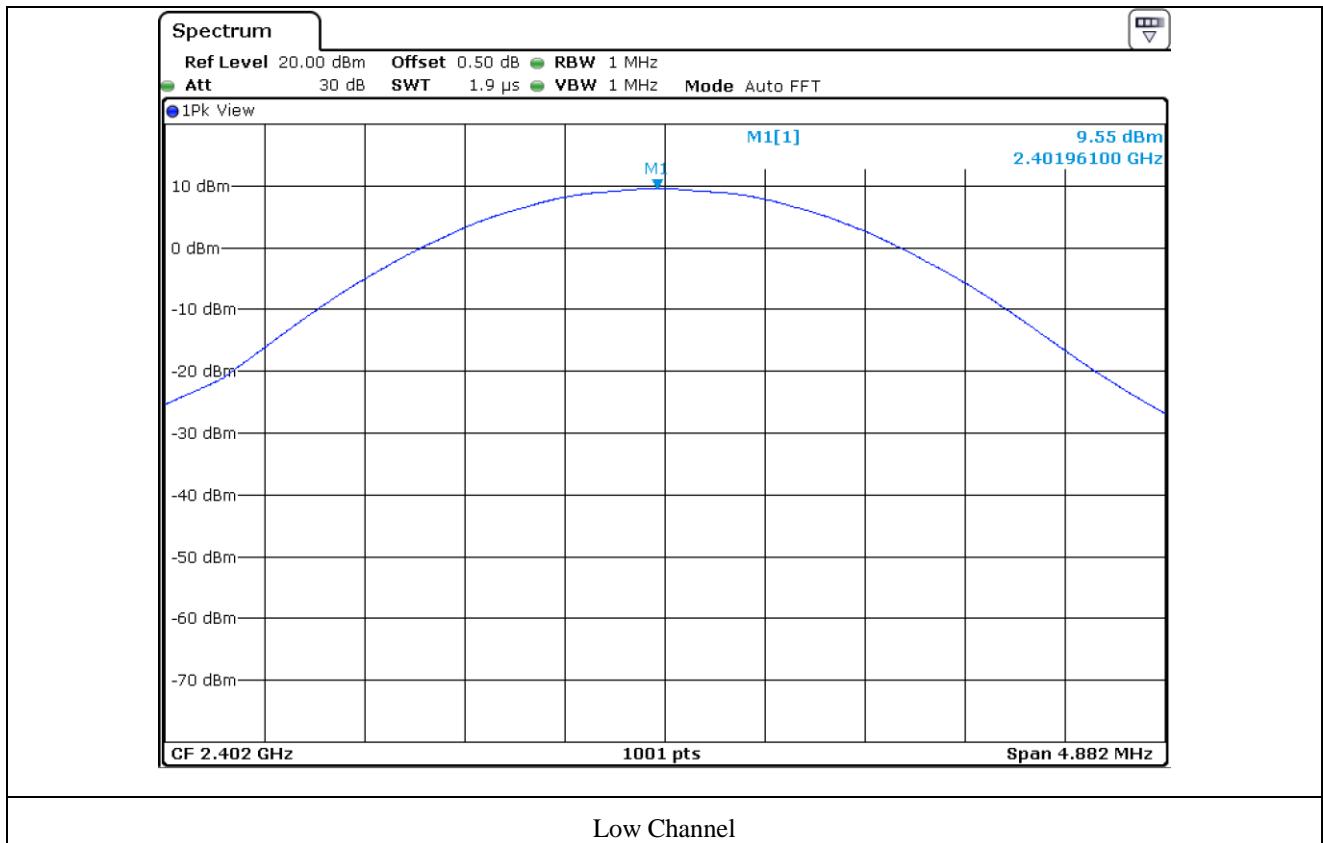
- . Test Date : March 18, 2019

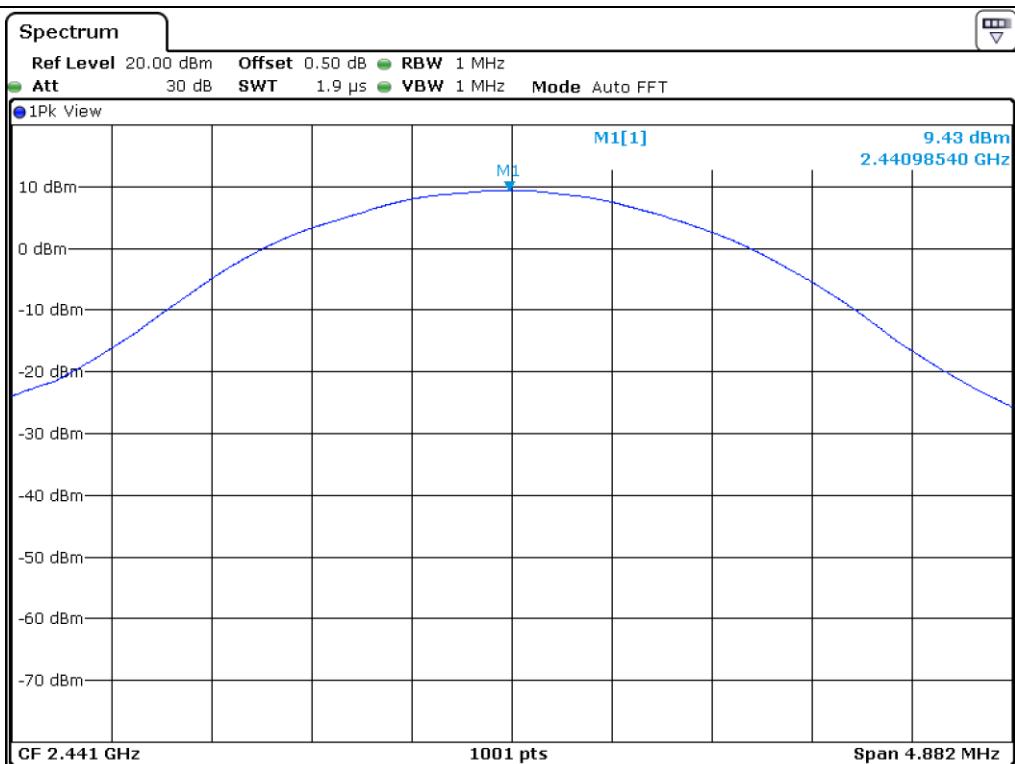
- . Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	9.55	30.00	20.45
MIDDLE	2 441.00	9.43	30.00	20.57
HIGH	2 480.00	9.05	30.00	20.95

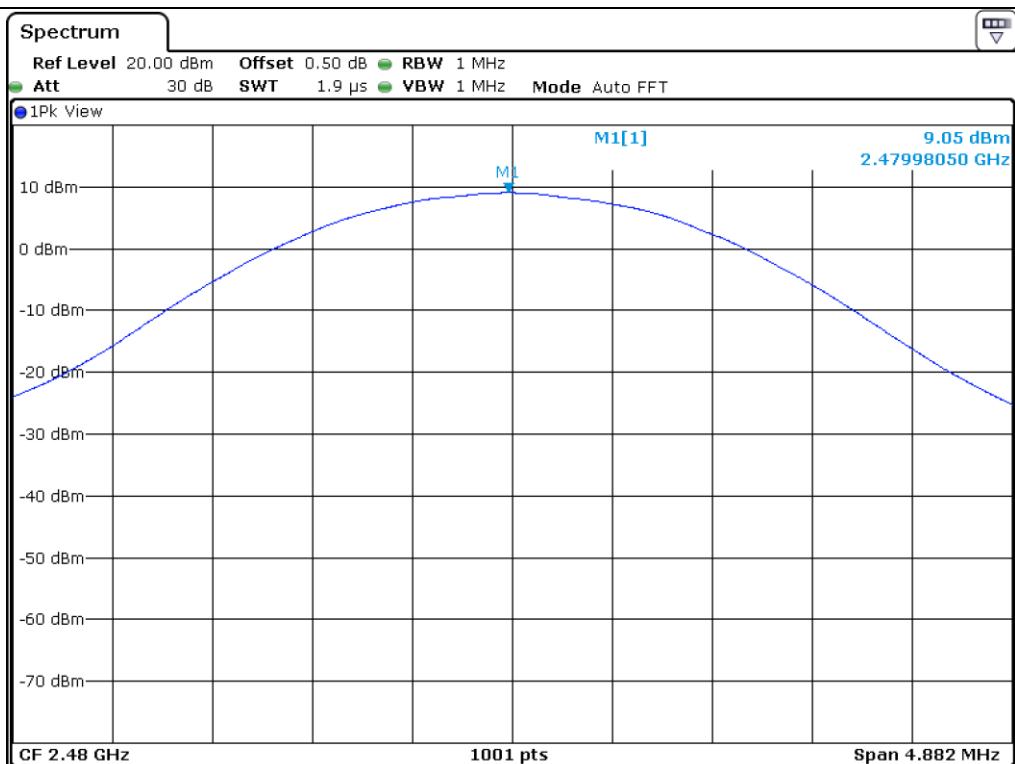
Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Tested by: Hyung-Kwon, Oh / Assistant Manager





## 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.

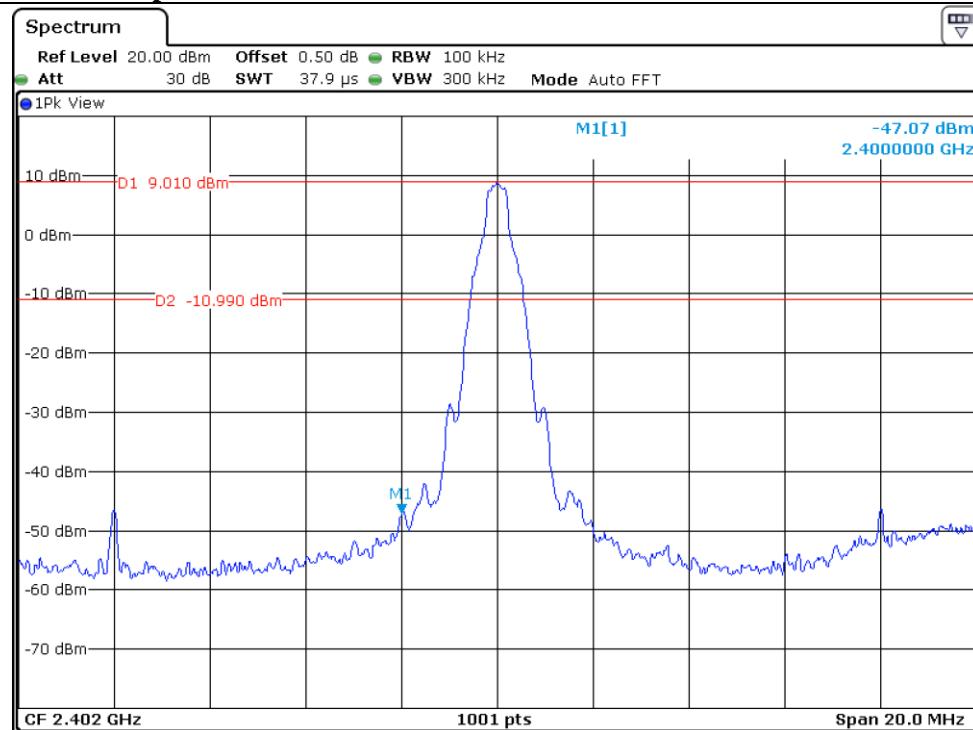
### 12.4 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Apr. 05, 2018 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2018 (1Y)
■ - BBV 9718 B	Schwarzbeck	Amplifier	009	Mar. 20, 2018 (1Y)
■ - SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 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	BBHA9120D295	Aug. 16, 2017 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

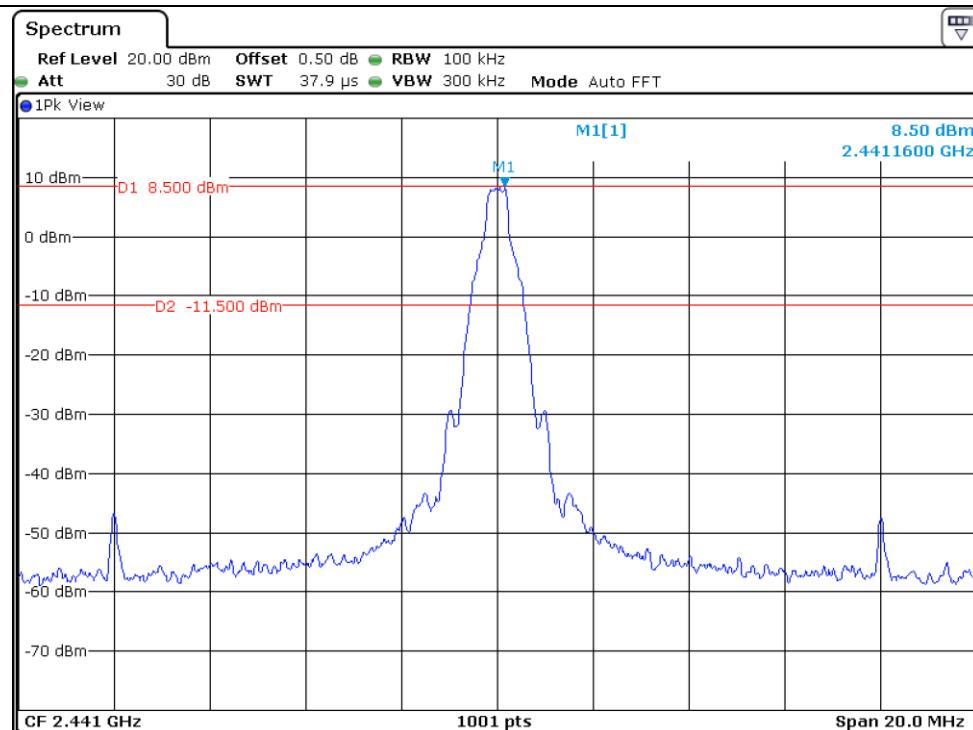
All test equipment used is calibrated on a regular basis.

## 12.5 Test data for conducted emission

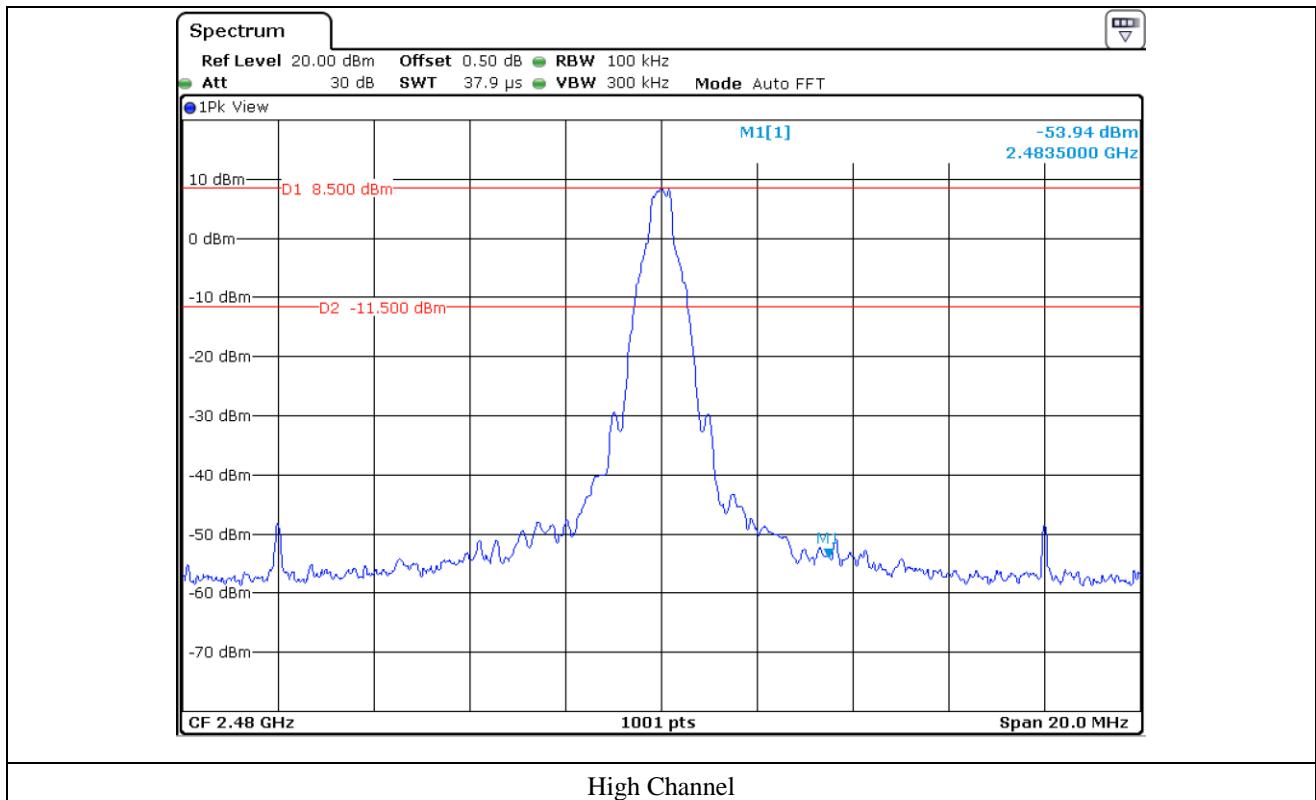
### 12.5.1 Test data for 1 Mbps

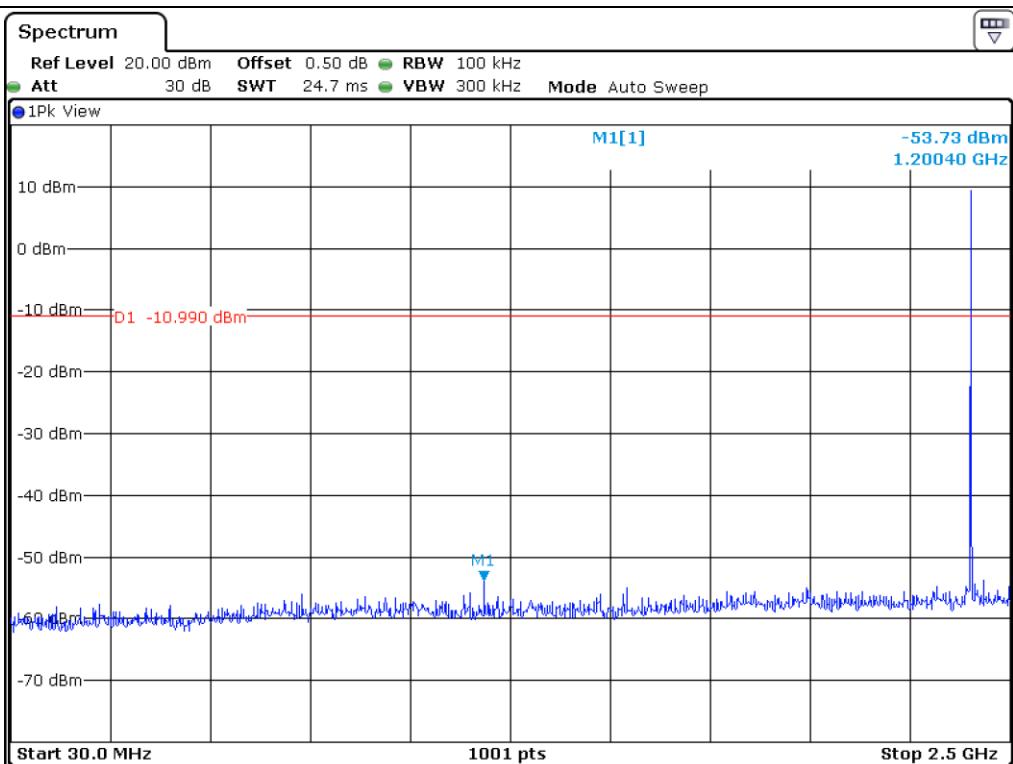


Low Channel

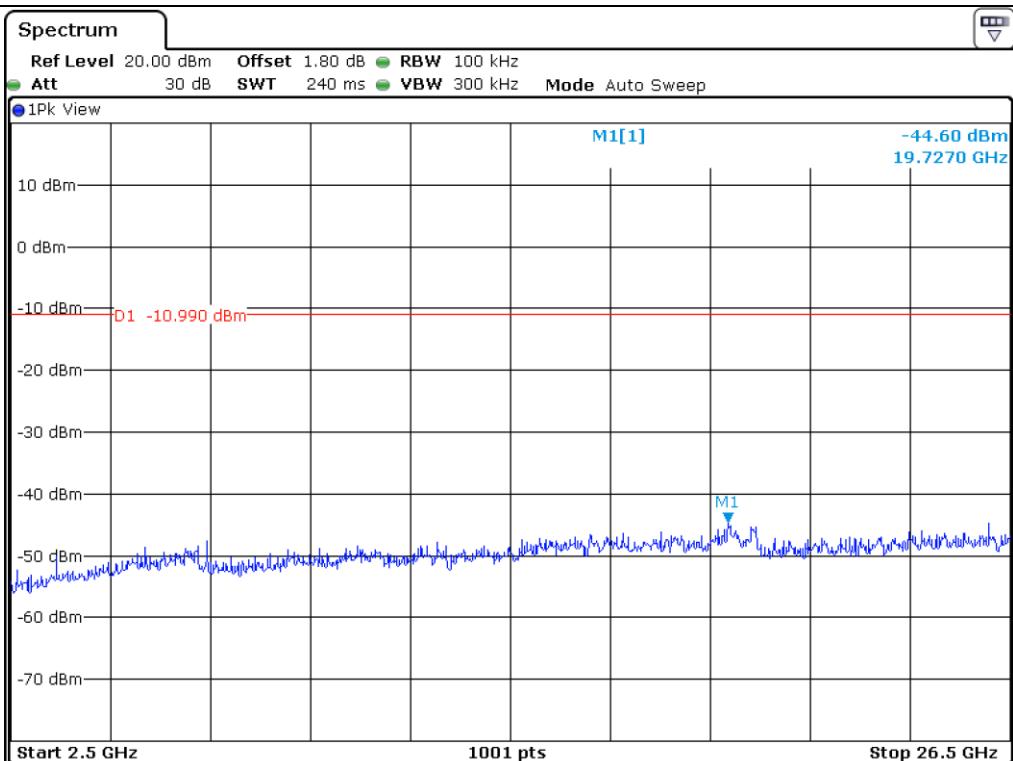


Middle Channel

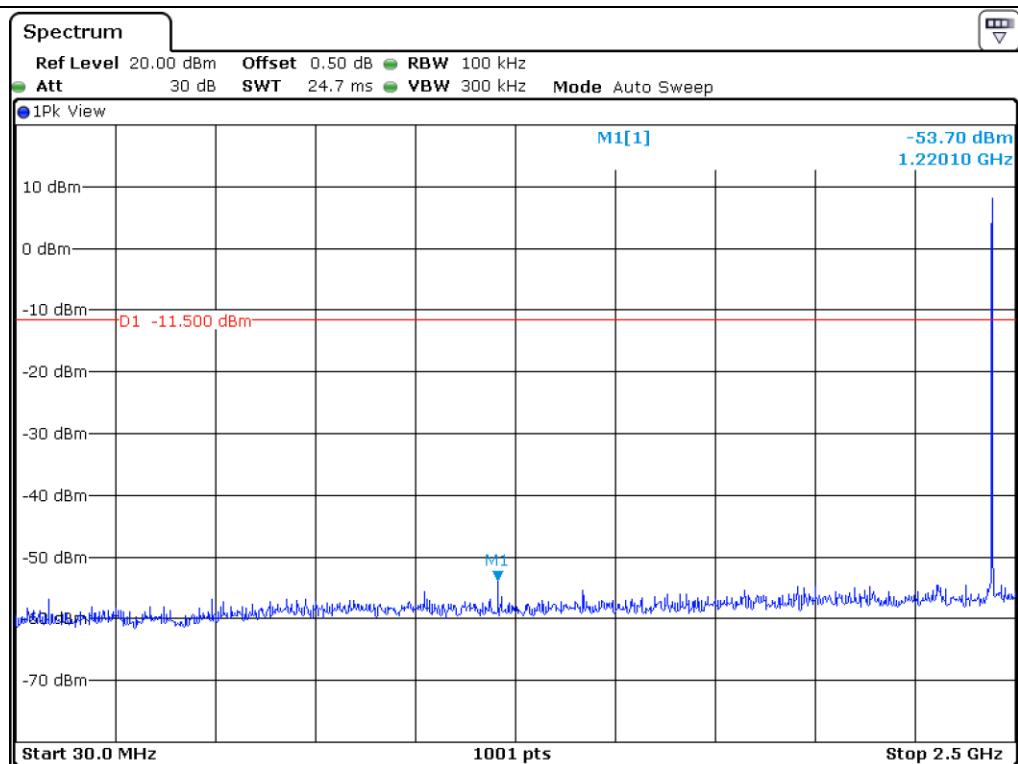




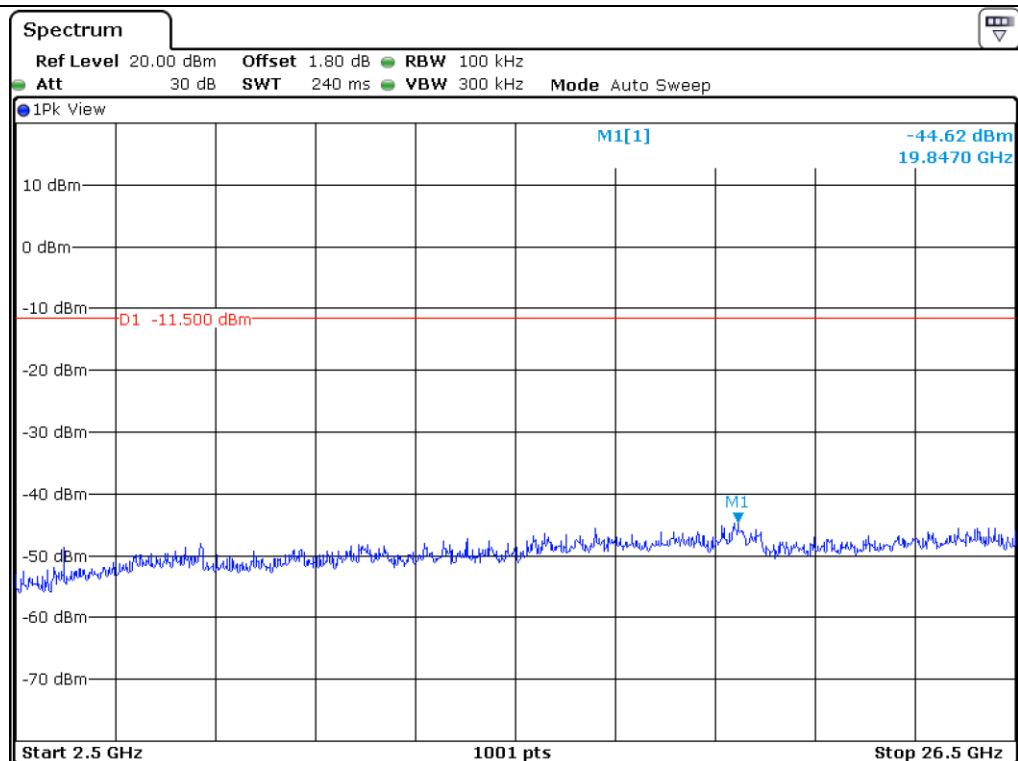
### Low Channel



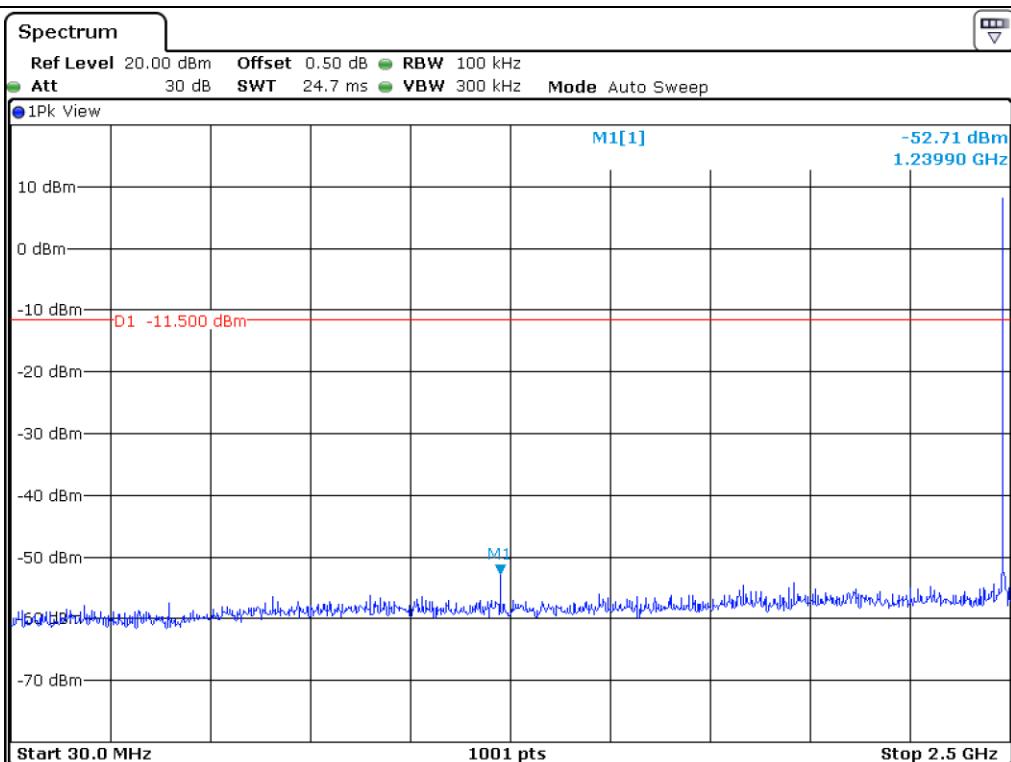
### Low Channel



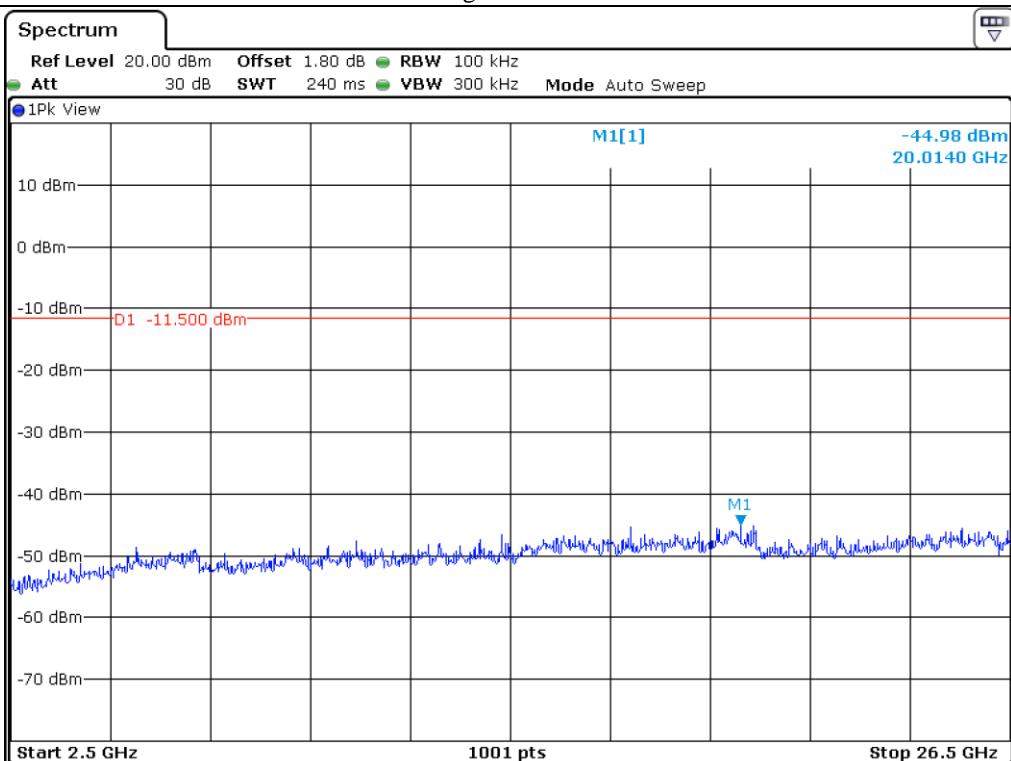
Middle Channel



Middle Channel

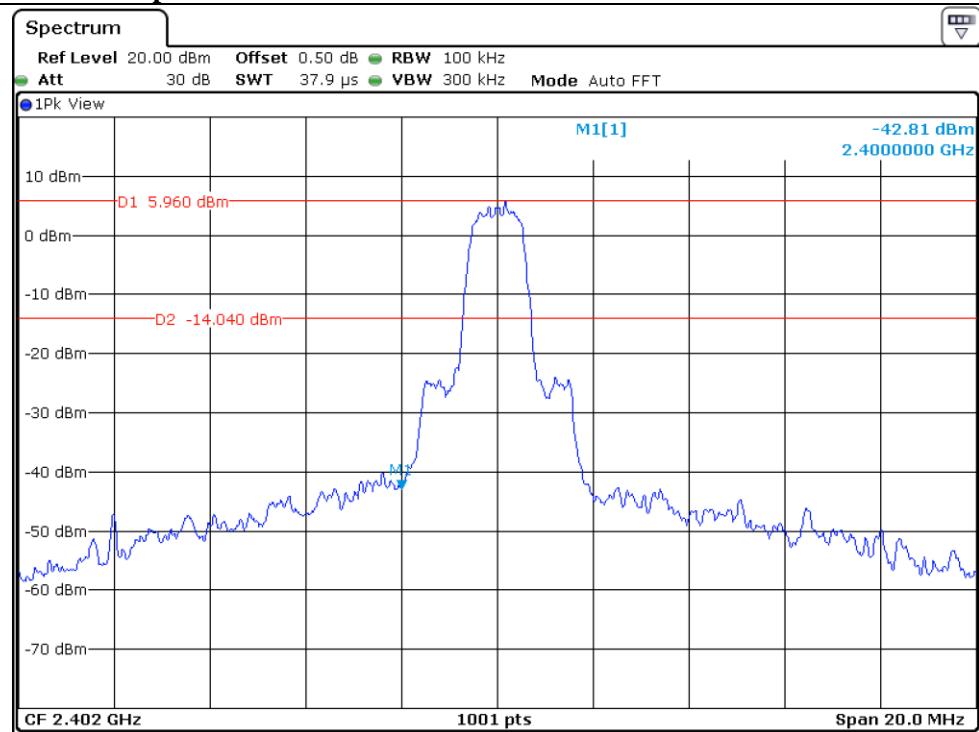


### High Channel

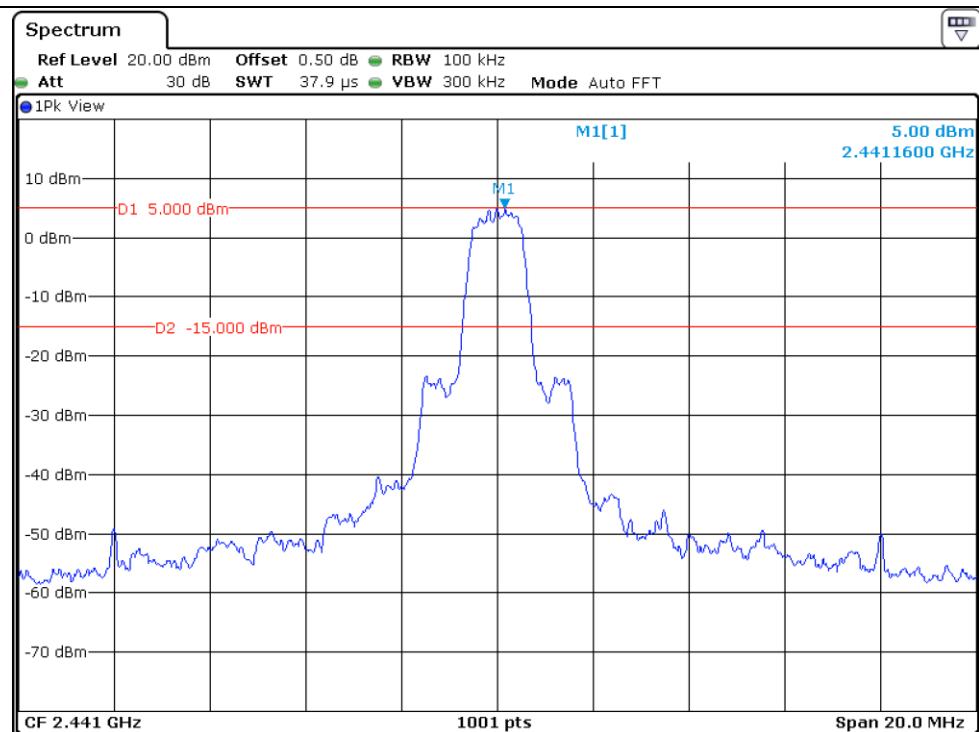


### High Channel

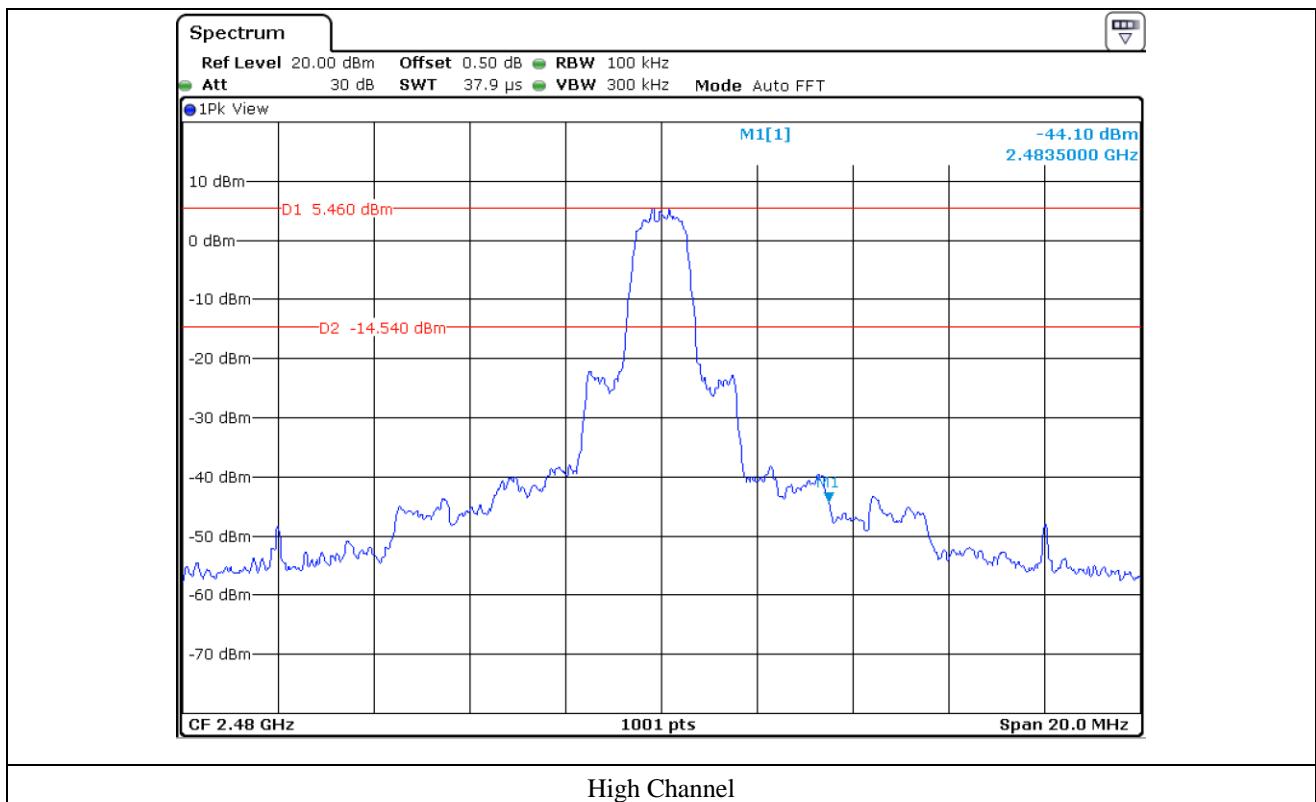
### 12.5.2 Test data for 2 Mbps

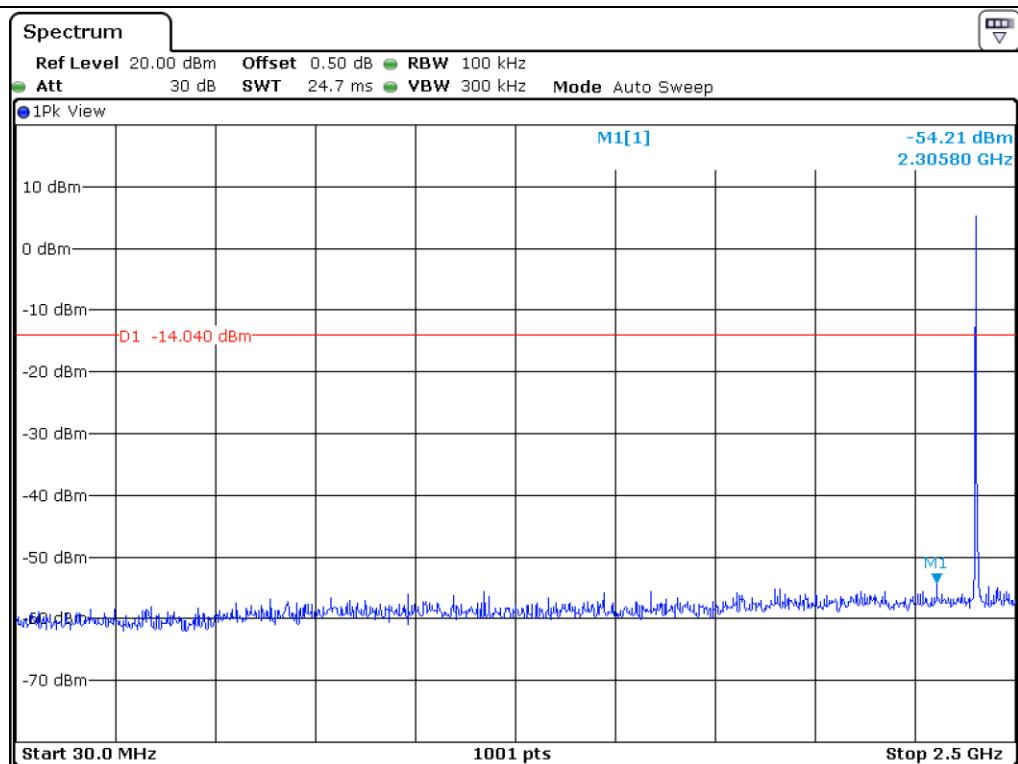


Low Channel

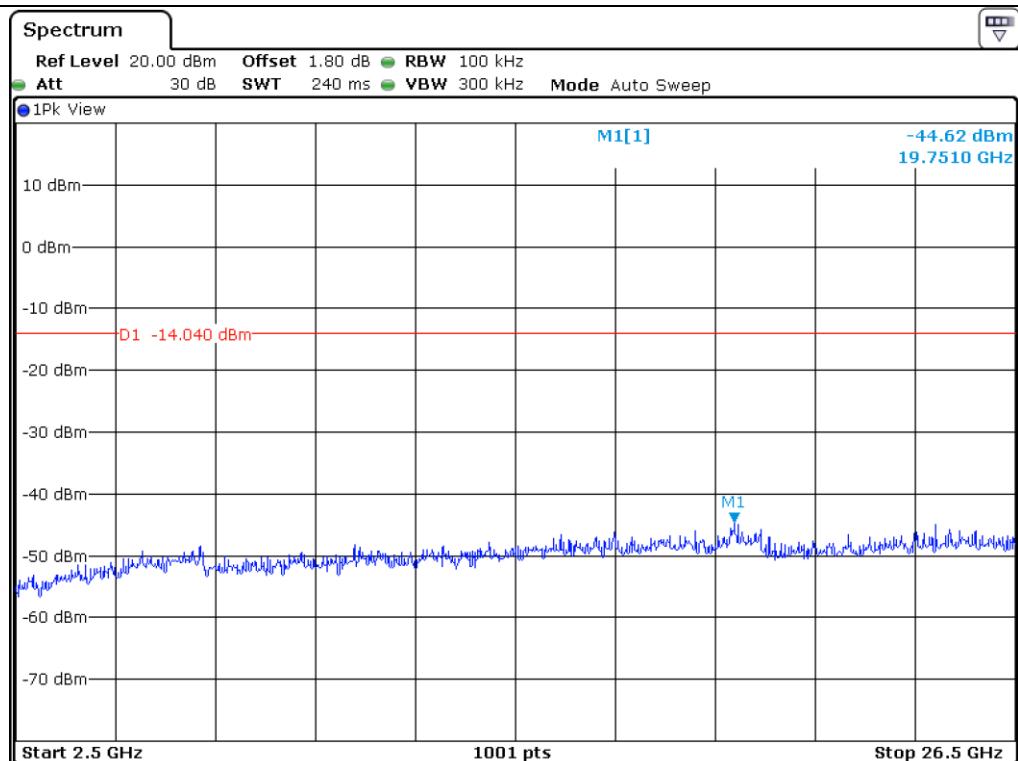


Middle Channel

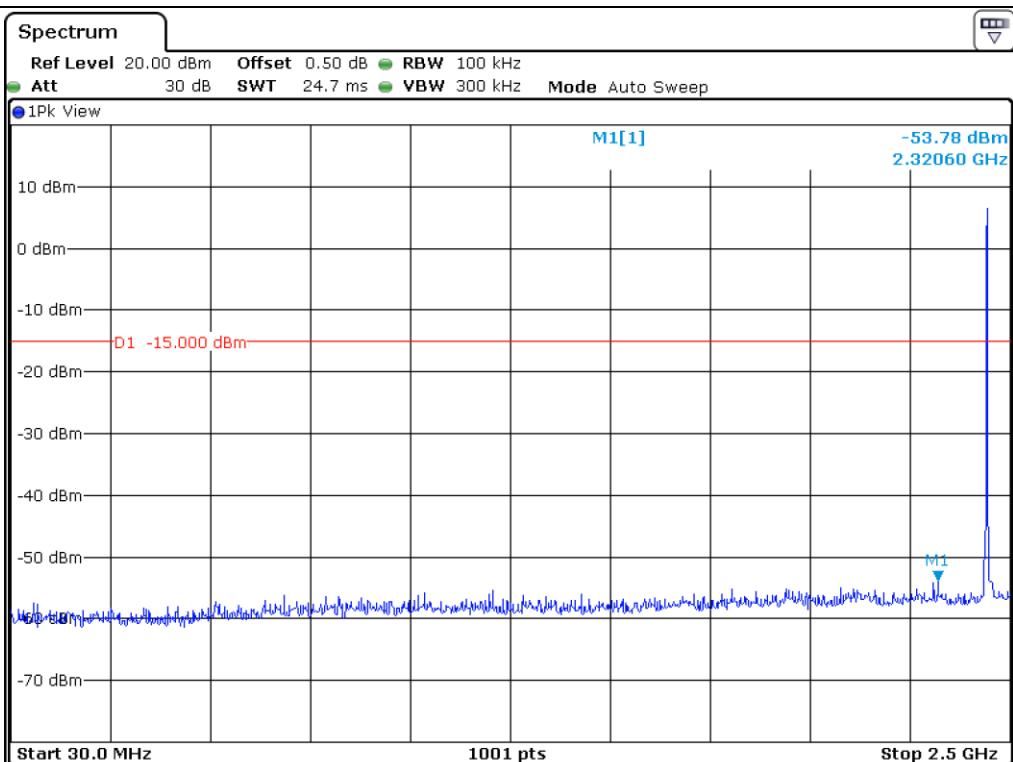




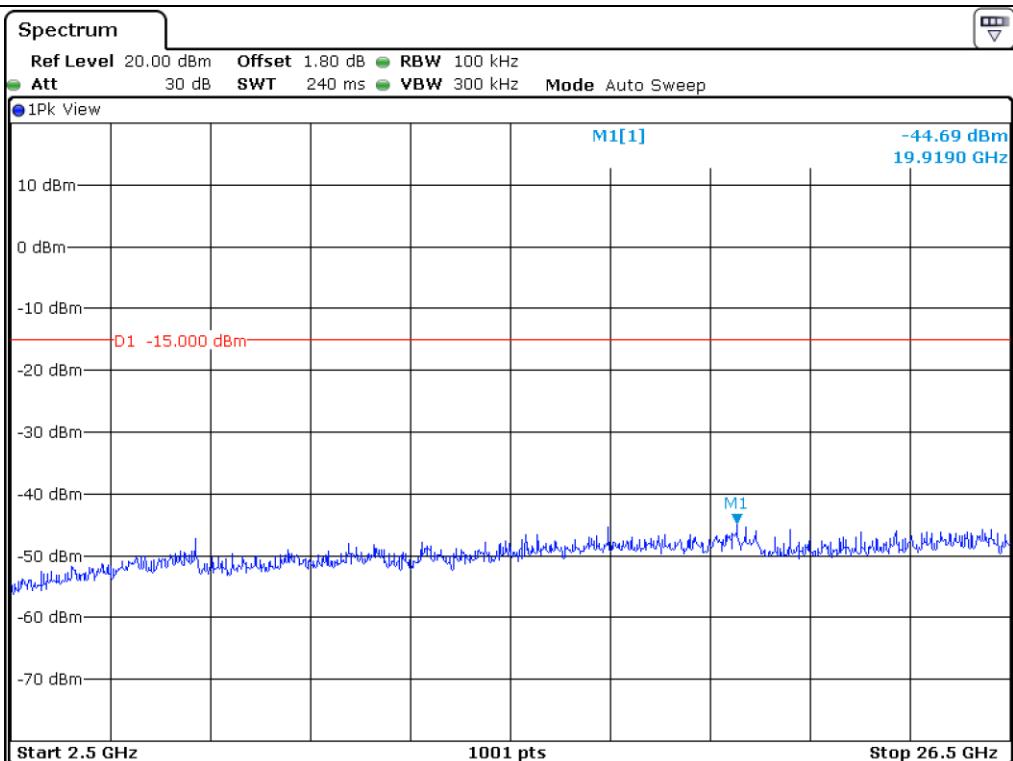
### Low Channel



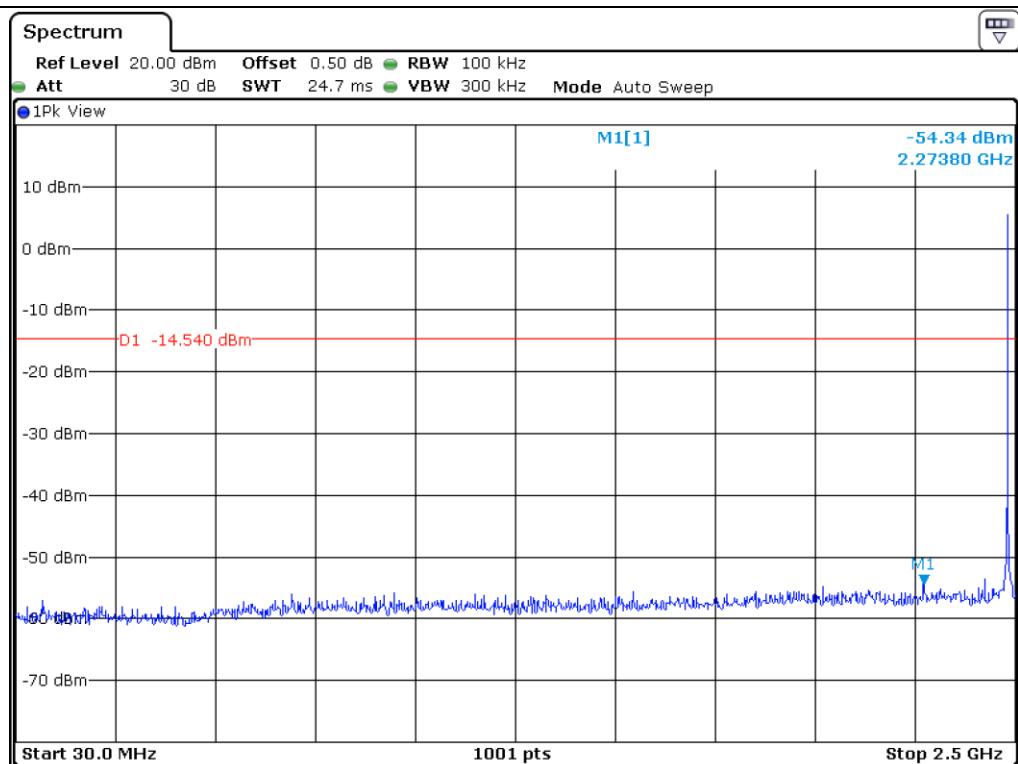
### Low Channel



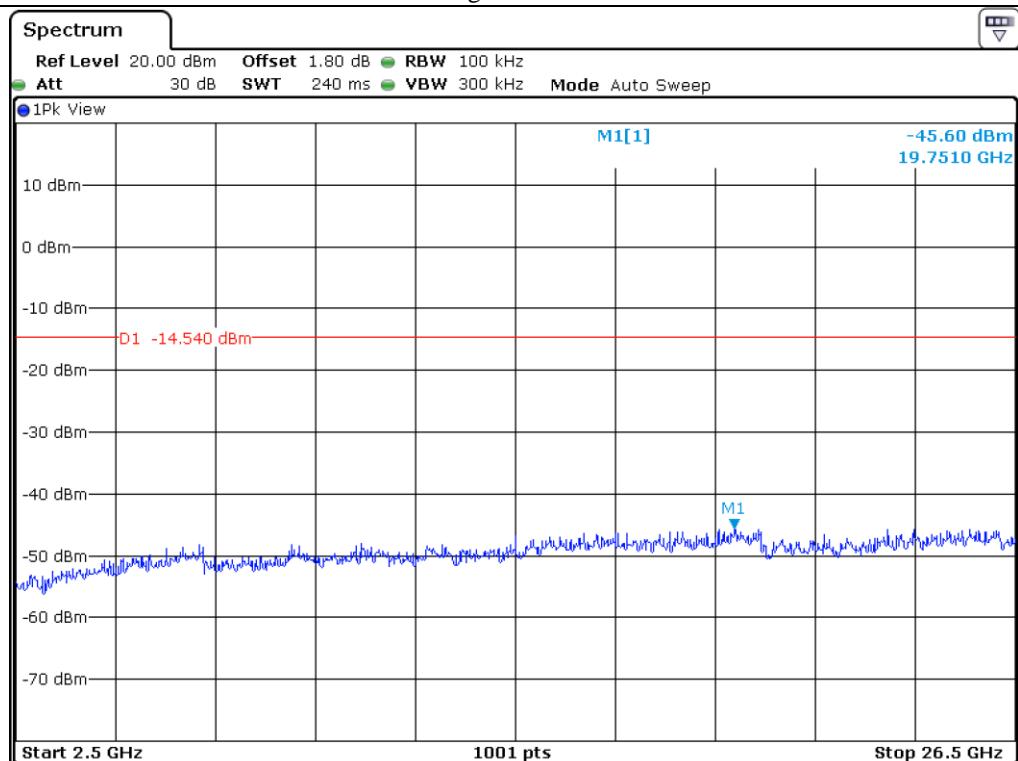
### Middle Channel



### Middle Channel

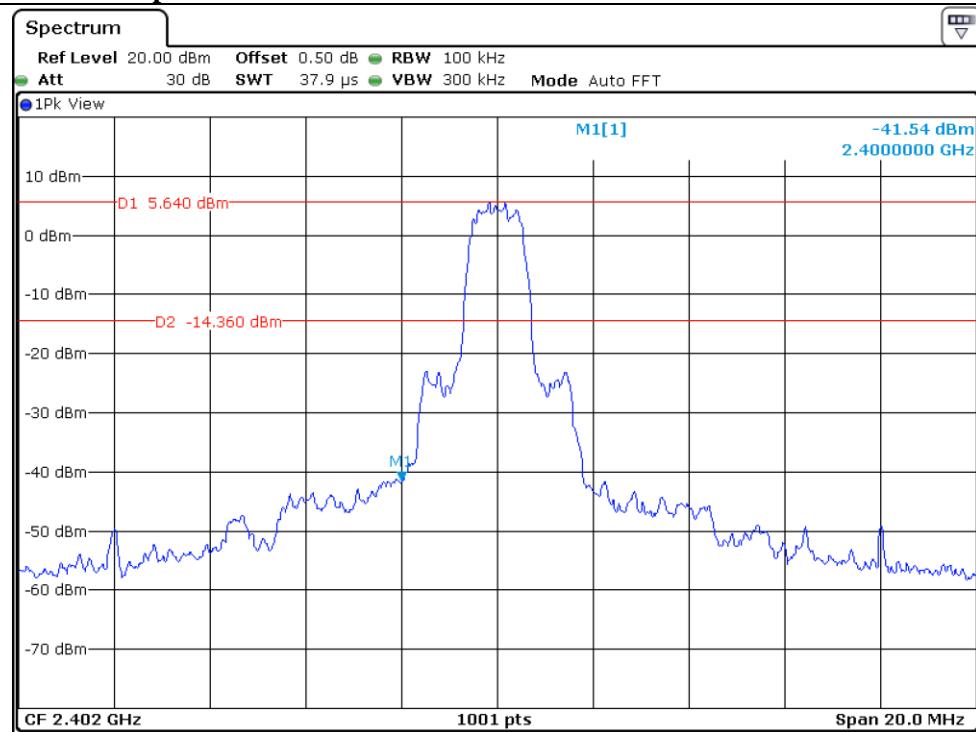


## High Channel

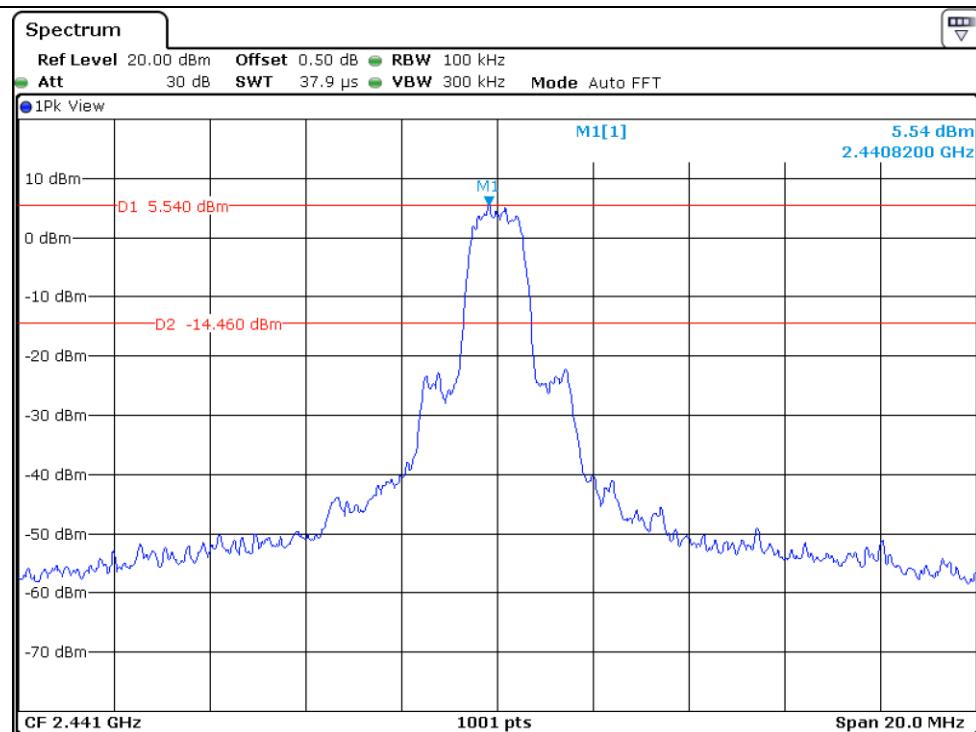


## High Channel

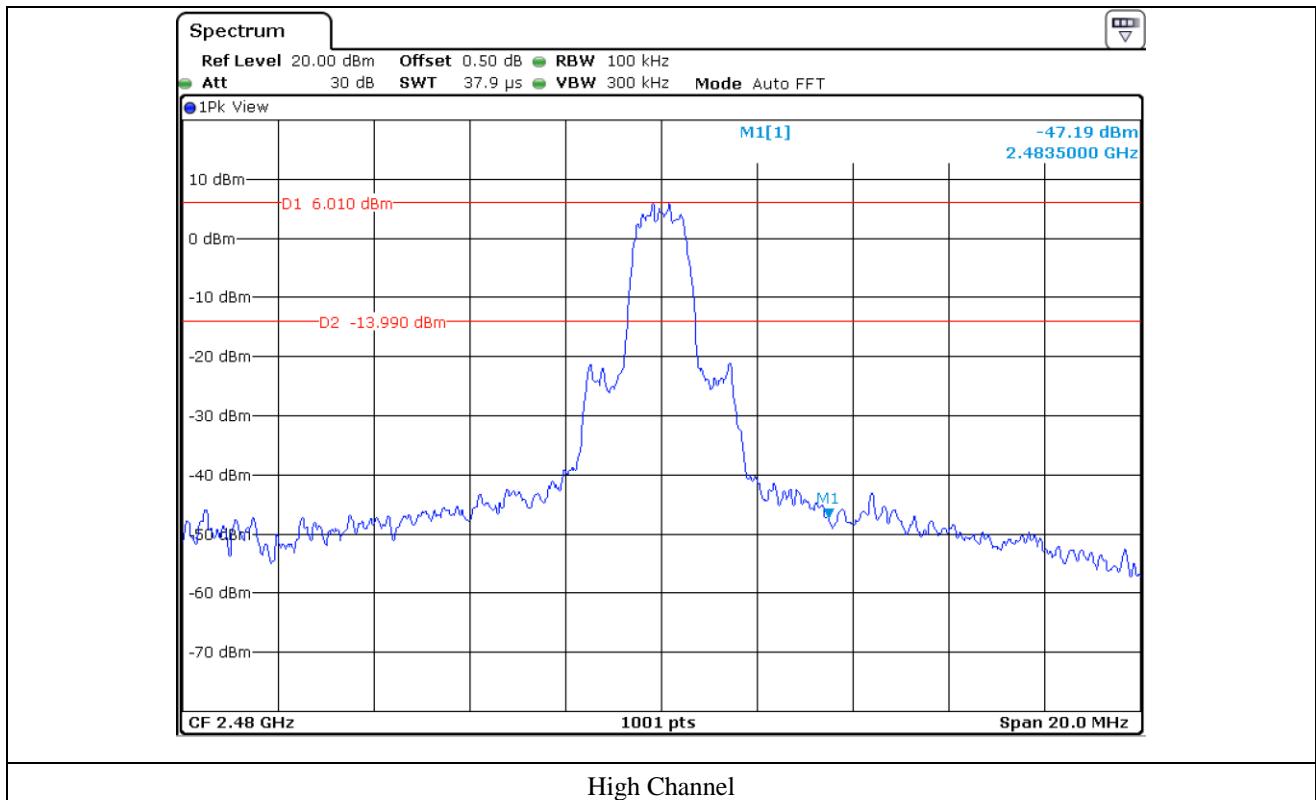
### 12.5.3 Test data for 3 Mbps

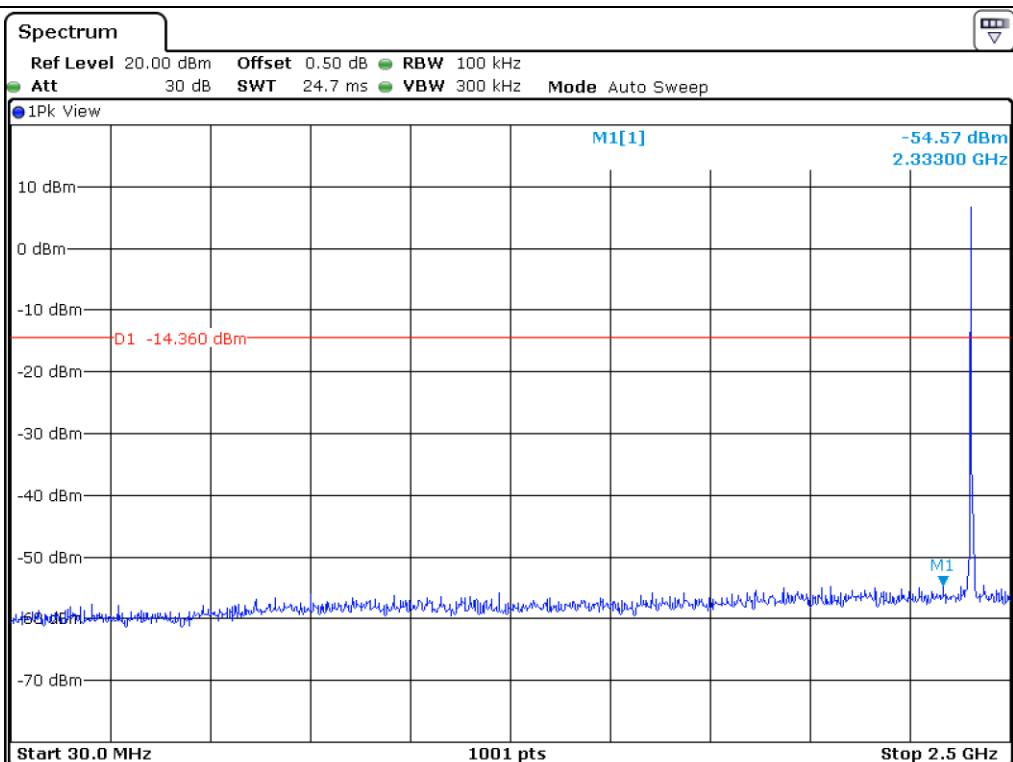


Low Channel

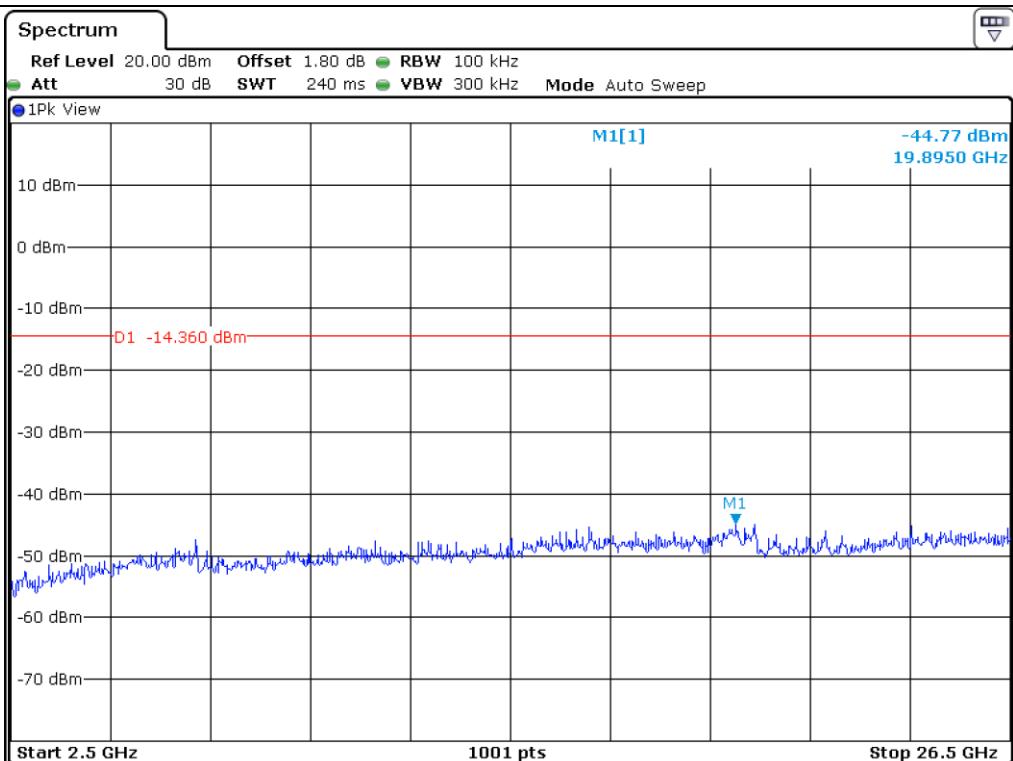


Middle Channel

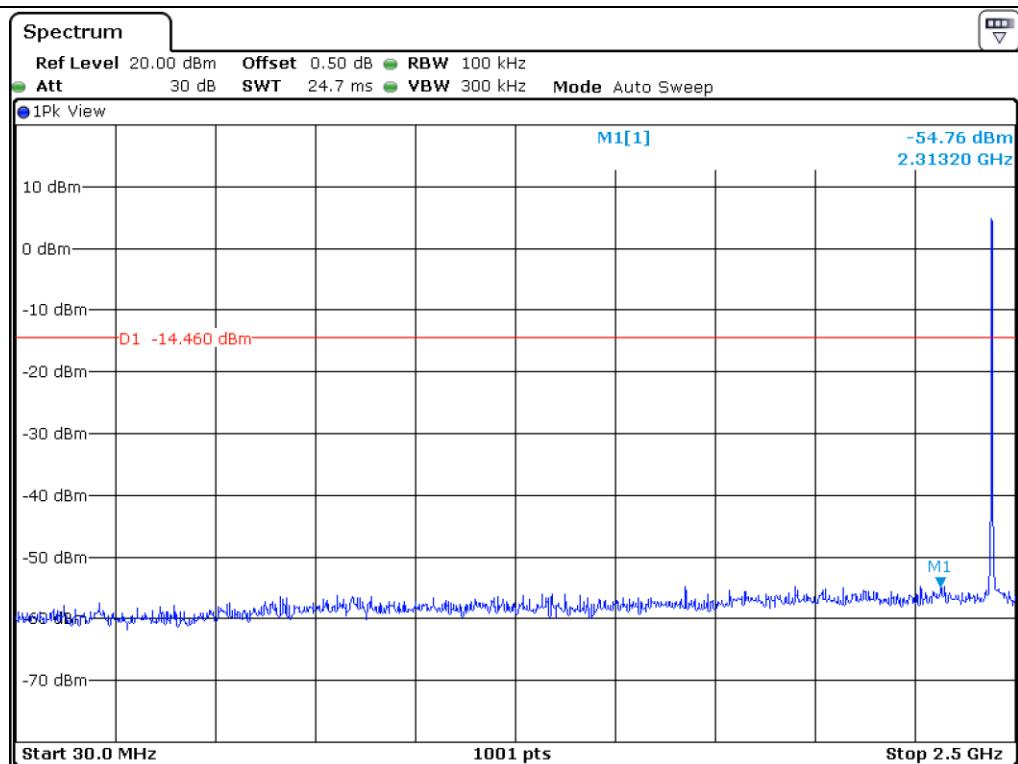




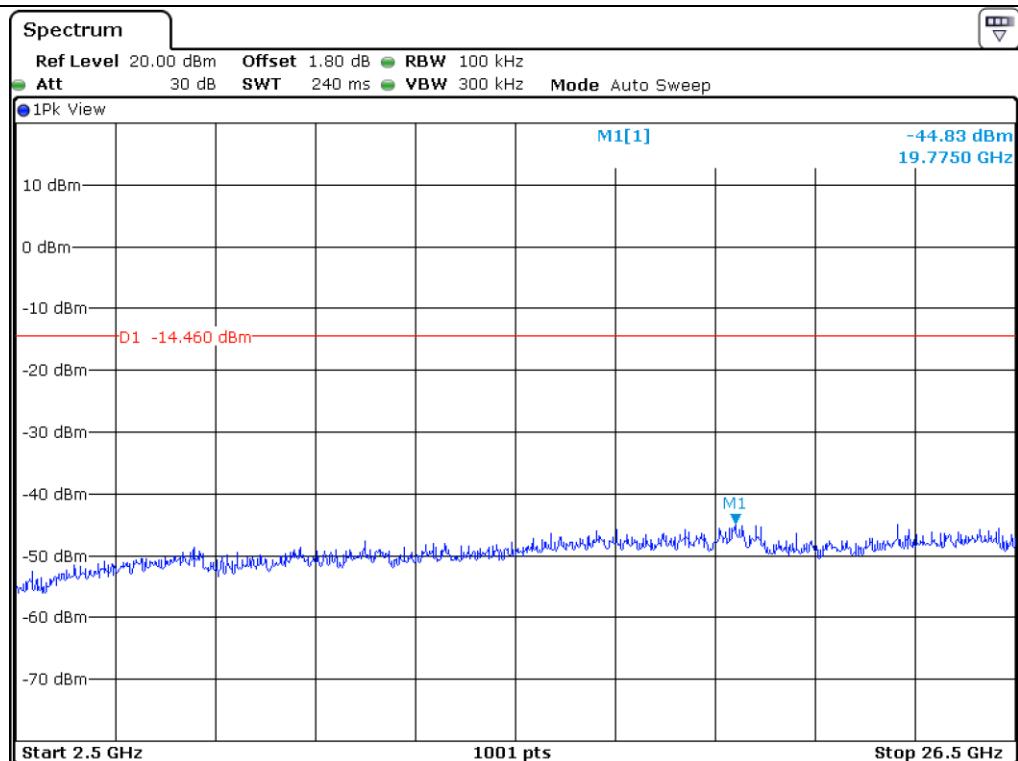
### Low Channel



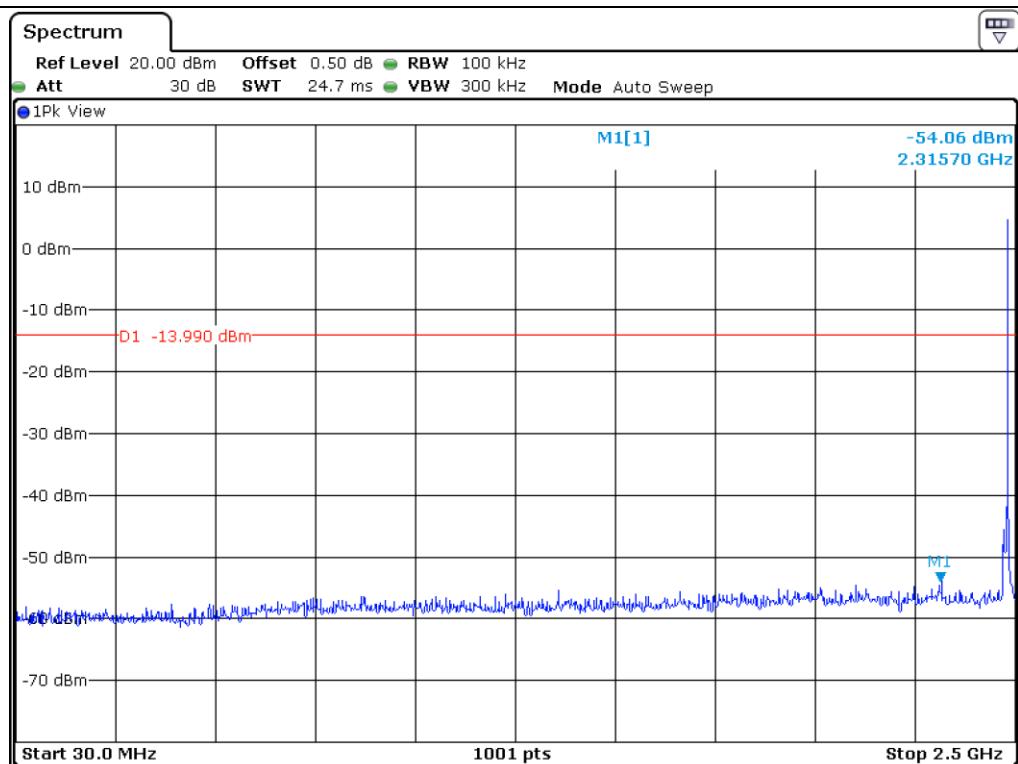
### Low Channel



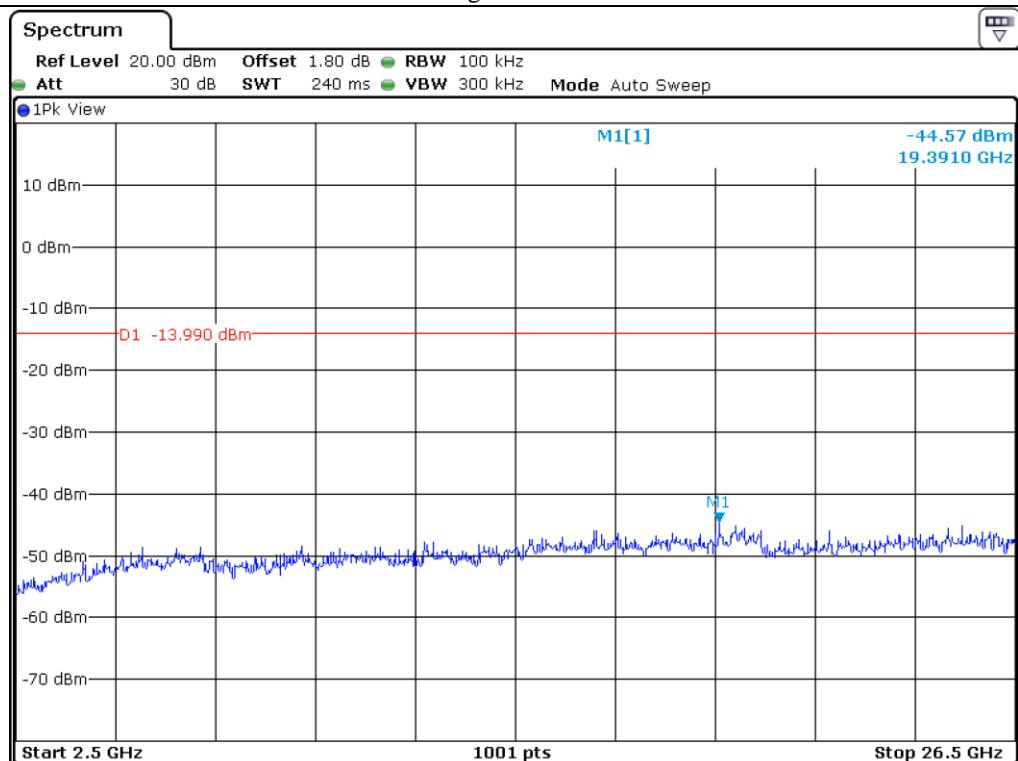
## Middle Channel



## 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 : March 18, 2019
- 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
- Result : PASSED

Frequency (MHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 319.151	47.44	Peak	H	26.91	9.17	34.76	48.76	74.00	25.24
2 345.604	35.40	Average	H	26.91	9.17	34.72	36.76	54.00	17.24
2 372.298	46.84	Peak	V	26.91	9.17	34.72	48.20	74.00	25.80
2 383.247	34.47	Average	V	26.91	9.17	34.72	35.83	54.00	18.17
<b>Test Data for High Channel</b>									
2 483.920	54.86	Peak	H	27.47	9.49	35.51	56.31	74.00	17.69
2 483.508	43.74	Average	H	27.47	9.49	35.51	45.19	54.00	8.81
2 499.283	51.18	Peak	V	27.47	9.49	35.52	52.62	74.00	21.38
2 489.624	40.13	Average	V	27.47	9.49	35.51	41.58	54.00	12.42

Tabulated test data for Restricted Band

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 12.6.1.2 Test data for 2 Mbps

- . Test Date : March 18, 2019
- . 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
- . Result : PASSED

Frequency (MHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 359.830	44.74	Peak	H	26.91	9.17	34.76	46.06	74.00	27.94
2 346.723	33.29	Average	H	26.91	9.17	34.72	34.65	54.00	19.35
2 361.429	44.53	Peak	V	26.91	9.17	34.72	45.89	74.00	28.11
2 363.986	33.43	Average	V	26.91	9.17	34.72	34.79	54.00	19.21
<b>Test Data for High Channel</b>									
2 483.657	52.92	Peak	H	27.47	9.49	35.51	54.37	74.00	19.63
2 483.508	41.69	Average	H	27.47	9.49	35.51	43.14	54.00	10.86
2 483.854	49.59	Peak	V	27.47	9.49	35.52	51.03	74.00	22.97
2 483.508	38.05	Average	V	27.47	9.49	35.51	39.50	54.00	14.50

Tabulated test data for Restricted Band

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 12.6.1.3 Test data for 3 Mbps

- . Test Date : March 18, 2019
- . 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
- . Result : PASSED

Frequency (MHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
2 387.163	44.28	Peak	H	26.91	9.17	34.76	45.60	74.00	28.40
2 333.057	33.27	Average	H	26.91	9.17	34.72	34.63	54.00	19.37
2 346.643	44.54	Peak	V	26.91	9.17	34.72	45.90	74.00	28.10
2 362.867	33.75	Average	V	26.91	9.17	34.72	35.11	54.00	18.89
<b>Test Data for High Channel</b>									
2 483.821	57.21	Peak	H	27.47	9.49	35.51	58.66	74.00	15.34
2 483.508	44.42	Average	H	27.47	9.49	35.51	45.87	54.00	8.13
2 483.838	53.39	Peak	V	27.47	9.49	35.52	54.83	74.00	19.17
2 483.937	40.37	Average	V	27.47	9.49	35.51	41.82	54.00	12.18

Tabulated test data for Restricted Band

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

## 12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

### 12.6.2.1 Test data for 1 Mbps

- Test Date : March 18, 2019
- 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
- Result : PASSED

Frequency (GHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 804.000	44.67	Peak	H	30.84	12.31	35.74	52.08	74.00	21.92
	34.65	Average	H				34.65	54.00	19.35
	44.21	Peak	V				44.21	74.00	29.79
	33.38	Average	V				33.38	54.00	20.62
<b>Test Data for Middle Channel</b>									
4 882.000	45.33	Peak	H	30.01	12.43	35.80	51.97	74.00	22.03
	34.38	Average	H				34.38	54.00	19.62
	43.98	Peak	V				43.98	74.00	30.02
	34.27	Average	V				34.27	54.00	19.73
<b>Test Data for High Channel</b>									
4 960.000	44.21	Peak	H	31.15	12.81	35.96	52.21	74.00	21.79
	34.65	Average	H				34.65	54.00	19.35
	44.70	Peak	V				44.70	74.00	29.30
	33.76	Average	V				33.76	54.00	20.24

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 12.6.2.2 Test data for 2 Mbps

- Test Date : March 18, 2019
- 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
- Result : PASSED

Frequency (GHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 804.000	43.81	Peak	H	30.84	12.31	35.74	51.22	74.00	22.78
	35.01	Average	H				42.42	54.00	11.58
	43.60	Peak	V				51.01	74.00	22.99
	33.24	Average	V				40.65	54.00	13.35
<b>Test Data for Middle Channel</b>									
4 882.000	46.31	Peak	H	30.01	12.43	35.80	52.95	74.00	21.05
	34.71	Average	H				41.35	54.00	12.65
	44.46	Peak	V				51.10	74.00	22.90
	33.81	Average	V				40.45	54.00	13.55
<b>Test Data for High Channel</b>									
4 960.000	44.21	Peak	H	31.15	12.81	35.96	52.21	74.00	21.79
	35.29	Average	H				43.29	54.00	10.71
	45.33	Peak	V				53.33	74.00	20.67
	33.71	Average	V				41.71	54.00	12.29

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 12.6.2.3 Test data for 3 Mbps

- Test Date : March 18, 2019
- 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
- Result : PASSED

Frequency (GHz)	Reading (dB $\mu$ V)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
<b>Test Data for Low Channel</b>									
4 804.000	45.55	Peak	H	30.84	12.31	35.74	52.96	74.00	21.04
	34.79	Average	H				42.20	54.00	11.80
	44.67	Peak	V				52.08	74.00	21.92
	33.84	Average	V				41.25	54.00	12.75
<b>Test Data for Middle Channel</b>									
4 882.000	46.03	Peak	H	30.01	12.43	35.80	52.67	74.00	21.33
	33.64	Average	H				40.28	54.00	13.72
	44.51	Peak	V				51.15	74.00	22.85
	34.98	Average	V				41.62	54.00	12.38
<b>Test Data for High Channel</b>									
4 960.000	44.16	Peak	H	31.15	12.81	35.96	52.16	74.00	21.84
	33.99	Average	H				41.99	54.00	12.01
	43.80	Peak	V				51.80	74.00	22.20
	33.25	Average	V				41.25	54.00	12.75

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band

Tested by: Hyung-Kwon, Oh / Assistant Manager

## 13. RADIATED EMISSION TEST

### 13.1 Operating environment

Temperature : 25 °C

Relative humidity : 46 % R.H.

### 13.2 Test set-up

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

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

### 13.3 Test equipment used

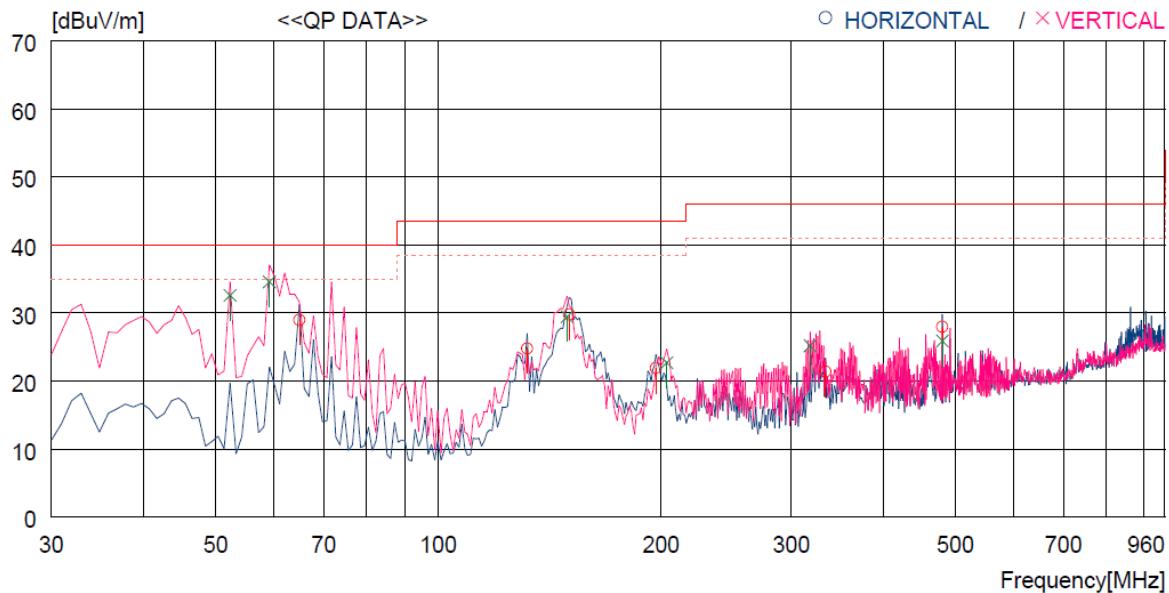
Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ - ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 22, 2018 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ - BBV 9718 B	Schwarzbeck	Amplifier	009	Mar. 20, 2018 (1Y)
■ - SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 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	BBHA9120D295	Aug. 16, 2017 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

### 13.4 Test data for Transmitting mode [BDR]

#### 13.4.1 Test data for 30 MHz ~ 960 MHz

- Test Date : March 20, 2019
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 960 MHz
- Measurement distance : 3 m



No.	FREQ [MHz]	READING QP	ANT FACTOR	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE	
									[dBuV]	[cm] [DEG]
<b>----- Horizontal -----</b>										
1	64.920	48.7	11.5	1.9	33.1	29.0	40.0	11.0	300	122
2	131.850	46.5	8.6	2.7	33.0	24.8	43.5	18.7	300	359
3	150.280	52.1	7.7	2.9	32.9	29.8	43.5	13.7	300	162
4	196.840	41.3	10.5	3.3	33.2	21.9	43.5	21.6	300	187
5	333.610	36.0	14.3	4.2	33.1	21.4	46.0	24.6	300	327
6	480.081	39.4	16.8	5.1	33.3	28.0	46.0	18.0	100	226
<b>----- Vertical -----</b>										
7	52.310	50.3	13.7	1.7	33.1	32.6	40.0	7.4	100	0
8	59.100	52.4	13.4	1.9	33.1	34.6	40.0	5.4	100	250
9	149.310	51.8	7.7	2.9	32.9	29.5	43.5	14.0	100	109
10	203.630	42.0	10.6	3.3	33.2	22.7	43.5	20.8	100	0
11	318.090	40.5	13.6	4.1	33.0	25.2	46.0	20.8	100	0
12	480.081	37.3	16.8	5.1	33.3	25.9	46.0	20.1	100	0

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 13.4.2 Test data for Below 30 MHz

- Test Date : March 20, 2019
- 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 (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

### 13.4.3 Test data for above 1 GHz

- Test Date : March 20, 2019
- 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

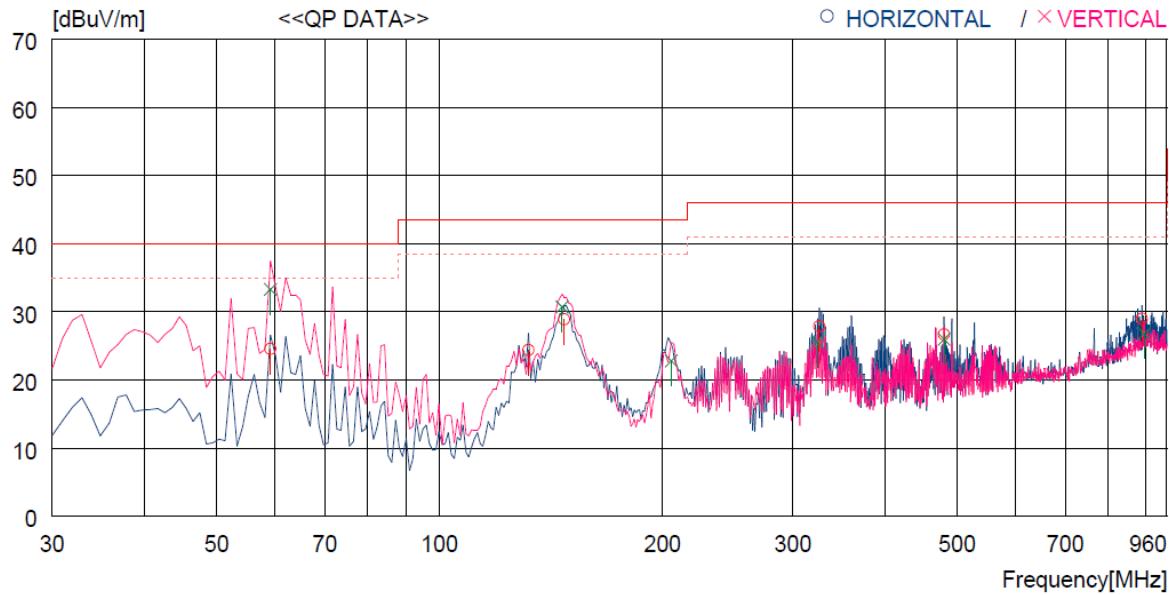
Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 13.5 Test data for Transmitting mode [EDR]

#### 13.5.1 Test data for 30 MHz ~ 960 MHz

- Test Date : March 20, 2019
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 960 MHz
- Measurement distance : 3 m



No.	FREQ [MHz]	READING QP	ANT FACTOR	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE	
									[cm]	[DEG]
<b>----- Horizontal -----</b>										
1	59.100	42.4	13.4	1.9	33.1	24.6	40.0	15.4	400	0
2	131.850	46.1	8.6	2.7	33.0	24.4	43.5	19.1	300	359
3	147.370	51.1	7.8	2.9	32.9	28.9	43.5	14.6	400	0
4	325.850	42.9	13.9	4.2	33.1	27.9	46.0	18.1	300	359
5	480.081	38.1	16.8	5.1	33.3	26.7	46.0	19.3	200	0
6	888.439	33.1	21.7	6.9	32.7	29.0	46.0	17.0	100	359
<b>----- Vertical -----</b>										
7	59.100	51.1	13.4	1.9	33.1	33.3	40.0	6.7	100	329
8	146.400	52.9	7.8	2.9	32.9	30.7	43.5	12.8	100	0
9	205.570	42.1	10.6	3.3	33.2	22.8	43.5	20.7	100	288
10	323.910	40.8	13.8	4.1	33.1	25.6	46.0	20.4	200	359
11	480.081	37.4	16.8	5.1	33.3	26.0	46.0	20.0	100	0
12	894.259	30.4	22.1	7.0	32.7	26.8	46.0	19.2	100	187

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 13.5.2 Test data for Below 30 MHz

- Test Date : March 20, 2019
- 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 (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

### 13.5.3 Test data for above 1 GHz

- Test Date : March 20, 2019
- 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

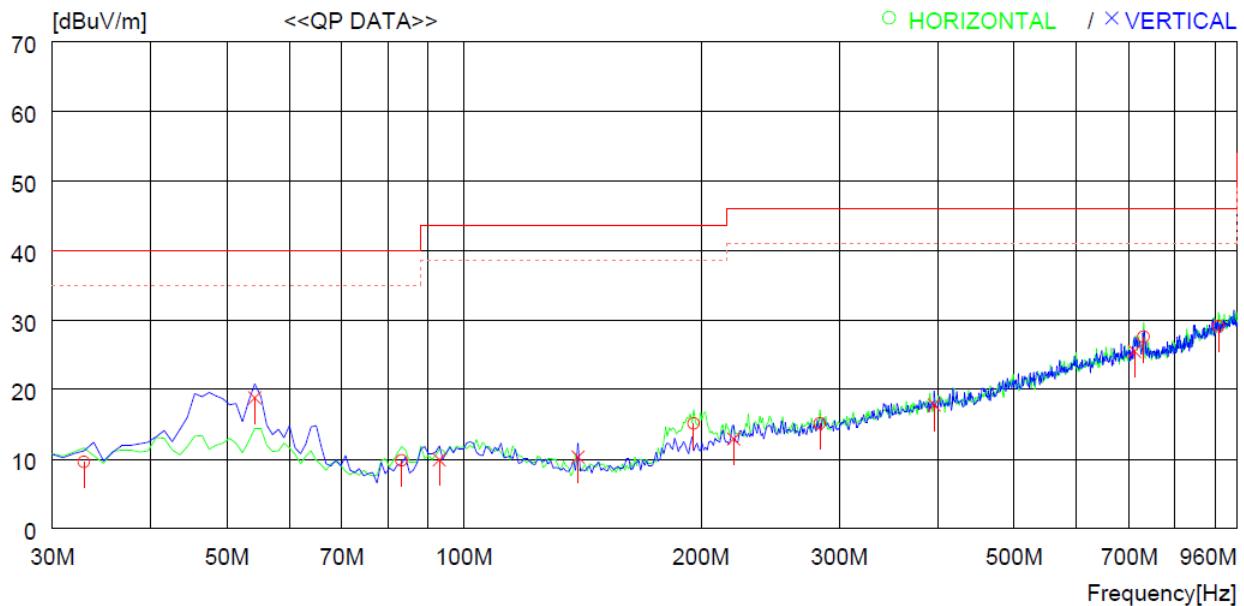
Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 13.6 Test data for Charging mode

#### 13.6.1 Test data for 30 MHz ~ 960 MHz

- Test Date : March 20, 2019
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 960 MHz
- Measurement distance : 3 m



No.	FREQ [MHz]	READING QP	ANT FACTOR	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE	
									[dBuV]	[cm]
<b>----- Horizontal -----</b>										
1	32.910	28.4	12.9	1.4	33.1	9.6	40.0	30.4	200	278
2	83.350	31.9	8.8	2.1	33.0	9.8	40.0	30.2	300	82
3	195.870	34.0	10.8	3.3	33.0	15.1	43.5	28.4	200	359
4	283.170	31.0	13.2	3.9	33.0	15.1	46.0	30.9	100	232
5	730.334	34.1	20.4	6.3	33.2	27.6	46.0	18.4	100	0
6	908.809	31.5	22.8	7.1	32.3	29.1	46.0	16.9	100	0
<b>----- Vertical -----</b>										
7	54.250	36.4	13.7	1.8	33.1	18.8	40.0	21.2	300	359
8	93.050	29.1	11.6	2.2	33.0	9.9	43.5	33.6	200	0
9	139.610	32.2	8.4	2.7	33.0	10.3	43.5	33.2	100	280
10	220.120	30.9	11.5	3.4	32.9	12.9	46.0	33.1	400	124
11	395.690	30.5	15.8	4.6	33.1	17.8	46.0	28.2	300	359
12	710.935	32.4	20.2	6.2	33.3	25.5	46.0	20.5	200	282

Tested by: Hyung-Kwon, Oh / Assistant Manager

### 13.6.2 Test data for Below 30 MHz

- Test Date : March 20, 2019
- 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 (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

### 13.6.3 Test data for above 1 GHz

- Test Date : March 20, 2019
- 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 (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Hyung-Kwon, Oh / Assistant Manager

## 14. CONDUCTED EMISSION TEST

### 14.1 Operating environment

Temperature : 25 °C

Relative humidity : 46 % R.H.

### 14.2 Test set-up

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

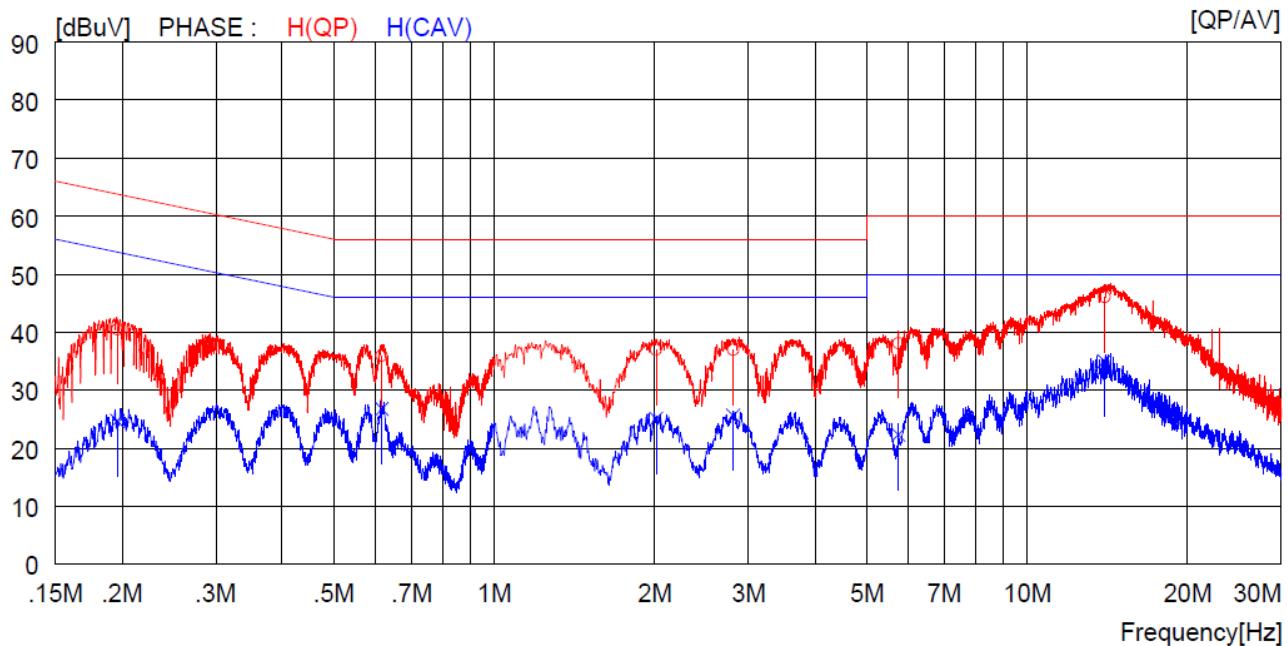
### 14.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2018 (1Y)
■ - NSLK8128	SCHWARZ BECK	LISN	8128-216	Mar. 20, 2018 (1Y)
□ - NNLK8121	SCHWARZ BECK	LISN	804	Oct. 22, 2018 (1Y)
■ - ESH3Z2	Rohde & Schwarz	Pulse Limiter	100655	Mar. 20, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

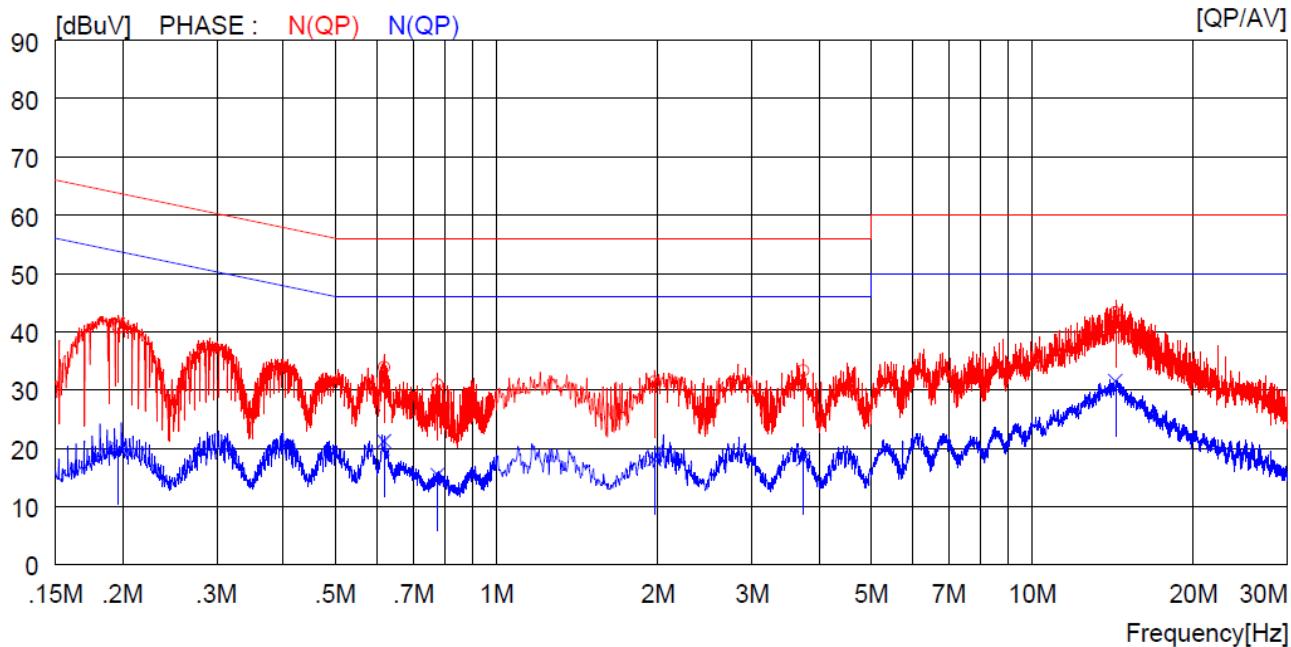
#### 14.4 Test data for Charging Mode

- Test Date : March 20, 2019
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19600	30.6	----	9.9	40.5	----	63.8	----	23.3	----	H (QP)
2	0.61500	26.0	----	9.9	35.9	----	56.0	----	20.1	----	H (QP)
3	2.01200	26.9	----	10.0	36.9	----	56.0	----	19.1	----	H (QP)
4	2.80800	27.0	----	10.0	37.0	----	56.0	----	19.0	----	H (QP)
5	5.73500	28.0	----	10.1	38.1	----	60.0	----	21.9	----	H (QP)
6	13.98000	35.9	----	10.2	46.1	----	60.0	----	13.9	----	H (QP)
7	0.19600	----	14.8	9.9	----	24.7	----	53.8	----	29.1	H (CAV)
8	0.61500	----	16.9	9.9	----	26.8	----	46.0	----	19.2	H (CAV)
9	2.01200	----	15.1	10.0	----	25.1	----	46.0	----	20.9	H (CAV)
10	2.80800	----	15.6	10.0	----	25.6	----	46.0	----	20.4	H (CAV)
11	5.73500	----	12.2	10.1	----	22.3	----	50.0	----	27.7	H (CAV)
12	13.98000	----	24.8	10.2	----	35.0	----	50.0	----	15.0	H (CAV)

- Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19700	30.8	----	9.9	40.7	----	63.7	----	23.0	----	N (QP)
2	0.61600	24.0	----	9.9	33.9	----	56.0	----	22.1	----	N (QP)
3	0.77500	21.0	----	9.9	30.9	----	56.0	----	25.1	----	N (QP)
4	1.97200	21.4	----	10.0	31.4	----	56.0	----	24.6	----	N (QP)
5	3.73600	23.2	----	10.1	33.3	----	56.0	----	22.7	----	N (QP)
6	14.31000	33.1	----	10.2	43.3	----	60.0	----	16.7	----	N (QP)
7	0.19700	----	9.9	9.9	----	19.8	----	53.7	----	33.9	N (CAV)
8	0.61600	----	11.3	9.9	----	21.2	----	46.0	----	24.8	N (CAV)
9	0.77500	----	5.5	9.9	----	15.4	----	46.0	----	30.6	N (CAV)
10	1.97200	----	8.1	10.0	----	18.1	----	46.0	----	27.9	N (CAV)
11	3.73600	----	8.0	10.1	----	18.1	----	46.0	----	27.9	N (CAV)
12	14.31000	----	21.3	10.2	----	31.5	----	50.0	----	18.5	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 / Assistant Manager