JQA File No. : 400-160207-2
Issue Date : May 26, 2017

TEST REPORT

Applicant	:	ESPERIA Corporation
Address	:	2-8-85, YOSHINODAI, KAWAGOE-CITY, SAITAMA-PREF, JAPAN
Products	:	MW, FM Radio with Bluetooth
Model No.	:	KRH-M202
Serial No.	:	01014 01011
Test Standard	:	CFR 47 FCC Rules and Regulations Part 15
Test Results	:	**Passed**
Date of Test	:	May 16, 2017 ~ May 22, 2017

H. Kajiwara

Hideki Kajiwara
Manager
Japan Quality Assurance Organization
SAFETY & EMC CENTER
Testing Dept.
Testing Div. 1
4-4-4, Minamiosawa, Hachioji-shi, Tokyo 192-0364, Japan

ilac-MRA VLAC Lab Accreditation VLAC-001-5

- The test results in this test report was made by using the measuring instruments which are traceable to national standards of measurement in accordance with ISO/IEC 17025.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
- The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
- This test report shall not be reproduced except in full without the written approval of JQA.
- VLAC does not approve, certify or warrant the product by this test report.

Table of Contents

Definitions for Abbreviation and Symbols Used In This Test Report

"EUT" means Equipment Under the Test.
"AE" means Associated Equipment.
"N/A" means that Not Applicable.
"N/T" means that Not Tested.

☑ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

1 Description of the Equipment Under Test

1	Manufacturer	:	ESPERIA Corporation 2-8-85, YOSHINODAI, KAWAGOE-CITY, SAITAMA-PREF, JAPAN
2	Products	:	MW, FM Radio with Bluetooth
3	Model No.	:	KRH-M202
4	Serial No.	:	01014 01011
5	Product Type	:	Pre-Production
6	Date of Manufacture	:	-
7	Power Rating	:	12~24 VDC (Operating voltage range)
8	Grounding	:	None
9	Transmitter Frequency	:	2402.0 MHz (00ch) – 2480.0 MHz (78ch)
10	Receiver Frequency	:	2402.0 MHz (00ch) – 2480.0 MHz (78ch)
11	MAX RF Output Power	:	-1.78 dBm (Measure Value)
12	Antenna Type	::	Pattern Antenna (Integral)
13	Antenna Gain	:	2.0 dBi
14	Category	:	Spread Spectrum Transmitter (FHSS)
15	EUT Authorization	:	Certification
16	Received Date of EUT	:	March 27, 2017

17 Channel Plan

The carrier spacing is 1 MHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Normal Mode:
Transmitting Frequency (in MHz) = 2402.0 + n
Receiving Frequency (in MHz) = 2402.0 + n
where, n : channel number ($0 \leq n \leq 78$)

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 15
Subpart C – Intentional Radiators

The EUT described in clause 1 was tested according to the applied standard shown above.
Details of the test configuration is shown in clause 6.
The conclusion for the test items of which are required by the applied standard is indicated under the test result.

☑ - The test result was passed for the test requirements of the applied standard.

☐ - The test result was failed for the test requirements of the applied standard.

☐ - The test result was not judged the test requirements of the applied standard.

In the approval of test results,
- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Yuichi Fukumoto
Advisor
SAFETY & EMC CENTER
Testing Dept.
Testing Div. 1

Tested by:

Naohiko Ueno
Assistant Manager
SAFETY & EMC CENTER
Testing Dept.
Testing Div. 1

3 Test Procedure

Test Requirements: §15.247, §15.207 and §15.209

Test Procedure : ANSI C63.10–2013
Testing unlicensed wireless devices.

FCC Public Notice DA 00-705, released March 30, 2000.

KDB414788(Publication Date : April 18, 2017)
Test Sites for Radiated Emission Measurements

KDB 447498
RF exposure and equipment authorization requirements

4 Test Location

Japan Quality Assurance Organization
SAFETY & EMC CENTER
Testing Dept.
Testing Div. 1
4-4-4, Minamiosawa, Hachioji-shi, Tokyo 192-0364, Japan

5 Recognition of Test Laboratory

Japan Quality Assurance Organization, Safety & EMC Center Testing Dept. Testing Div. 1.
Is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility of Testing Division is registered by the following bodies .

VLAC Code	: VLAC-001-5 (Effective through : March 30, 2018)
VCCI Registration Number	: A-0001 (Effective through : March 30, 2018)
FCC Registration Number	: 349652 (Effective through : March 30, 2018)
IC Registration Number	: 21462-1 (Effective through: May 24, 2019)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI. (Effective through : February 22, 2019)

6 Description of Test Setup

6.1 Test Configuration

The EUT consists of :

Sign	Item	Manufacturer	Model No.	Serial No.
A	MW, FM Radio with Bluetooth	ESPERIA Corporation	KRH-M202	01014 *1 01011 *2

*1) Used for Antenna Conducted Emission
*2) Used for Field Strength of Spurious Emission

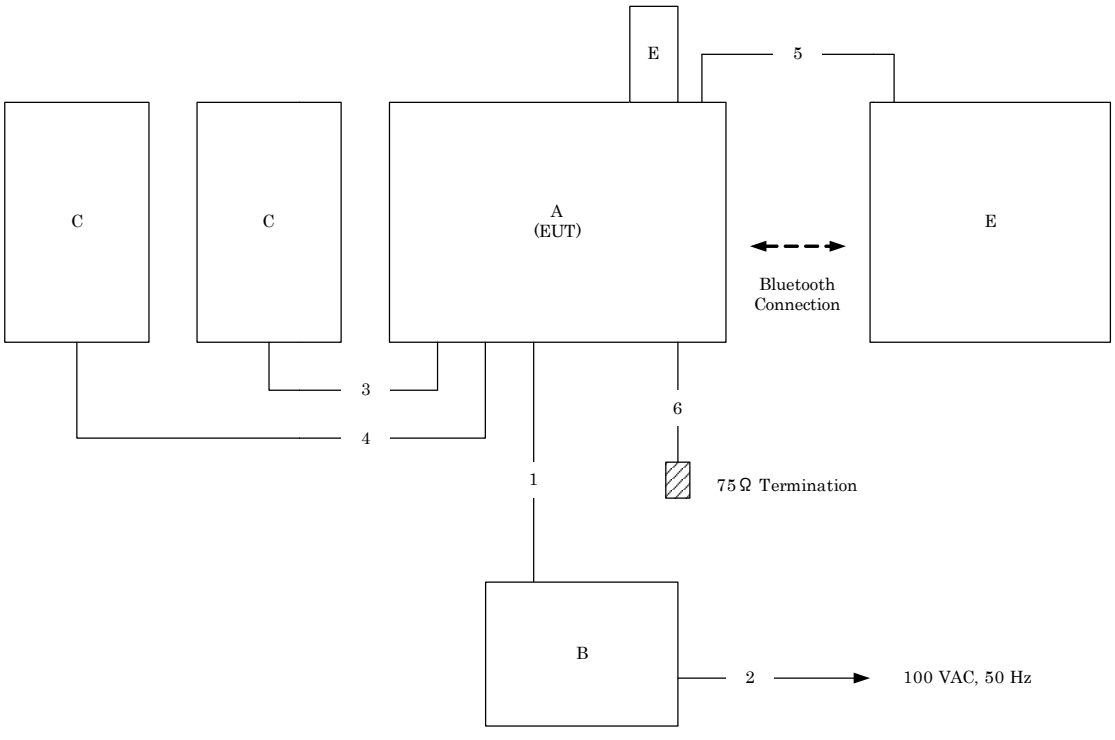
The AE used for testing :

Sign	Item	Manufacturer	Model No.	Serial No.	FCCID
B	DC Power Supply	Kikusui Electronics Co., Ltd.	PAN35-20A	GJ000984	N/A
C	Dummy Load	-	-	-	N/A
D	Tablet PC	Dell Inc	Venue Pro 5855	-	DoC
E	USB Memory	-	-	-	N/A

Type of Cable used for testing :

No.	Description	Identification (Manu. Etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	DC Power Cable	-	No	No	No	0.2
2	AC Power Cable	-	No	No	No	2.0
3	Speaker (Lch) Cable	-	No	No	No	0.2
4	Speaker (Rch) Cable	-	No	No	No	0.2
5	AUX In Cable	-	No	No	No	1.0
6	Antenna Cable	-	No	No	No	0.2

6.2 Test Arrangement (Drawings)



6.3 Operating Condition

Power Supply Voltage : 12/24 VDC

Transmitting/Receiving
Bluetooth 2.1 + EDR
Transmitting frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)
Receiver frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)

The test were carried under 2 mode shown as follows:
1) BDR
2) EDR
In Spurious Emissions(Conducted) and Radiated Emissions, the worst case is BDR mode.

Modulation Type
1. DH1/ DH3/ DH5 Packet (Modulation Type : GFSK)
2. 2DH1/ 2DH3/ 2DH5 Packet (Modulation Type : pi/4-DQPSK)
3. 3DH1/ 3DH3/ 3DH5 Packet (Modulation Type : 8DPSK)

The EUT with temporary antenna port was used in conducted measurement.

The test were carried out using the following test program supplied by applicant;
- Software Name: BK32xx RF Test
- Software Version: Version 1.5_en(JPN)
- Storage Location: Controller PC

7 Test Requirements

7.1 Summary of Test Results

Test Item	FCC Specification	Reference of the Test Report	Results	Remarks
Antenna Requirement	Section 15.203	Section 1.12	Passed	-
Channel Separation	Section 15.247(a)(1)	Section 7.2	Passed	-
Minimum Hopping Channel	Section 15.247(a)(1)(iii)	Section 7.3	Passed	-
Occupied Bandwidth	Section 15.247(a)(1)	Section 7.4	Passed	-
Dwell Time	Section 15.247(a)(1)(iii)	Section 7.5	Passed	-
Peak Output Power (Conduction)	Section 15.247(b)(1)	Section 7.6	Passed	-
Peak Power Density (Conduction)	Section 15.247(e)	Section 7.7	Not Applicable	-
Spurious Emissions (Conduction)	Section 15.247(d)	Section 7.8	Passed	-
AC Powerline Conducted Emission	Section 15.207	Section 7.9	Passed	-
Radiated Emission	Section 15.247(d)	Section 7.10	Passed	-
SAR Test Exclusion	Section 15.247(i)	Appendix A	Passed	-

7.2 Channel Separation

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.2.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Channel Separation is 1.001 MHz
Channel Separation (Inquiry) is - MHz

Uncertainty of measurement results +/- 0.131 %(2σ)

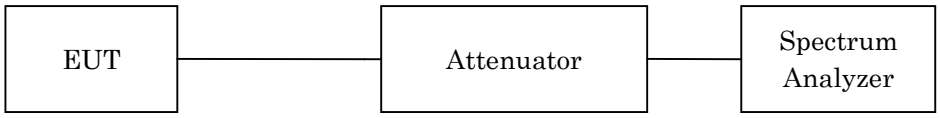
Remarks : Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

7.2.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.2.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	100 kHz
Video Bandwidth	300 kHz
Span	3 MHz / 5 MHz
Sweep Time	AUTO
Trace	Maxhold

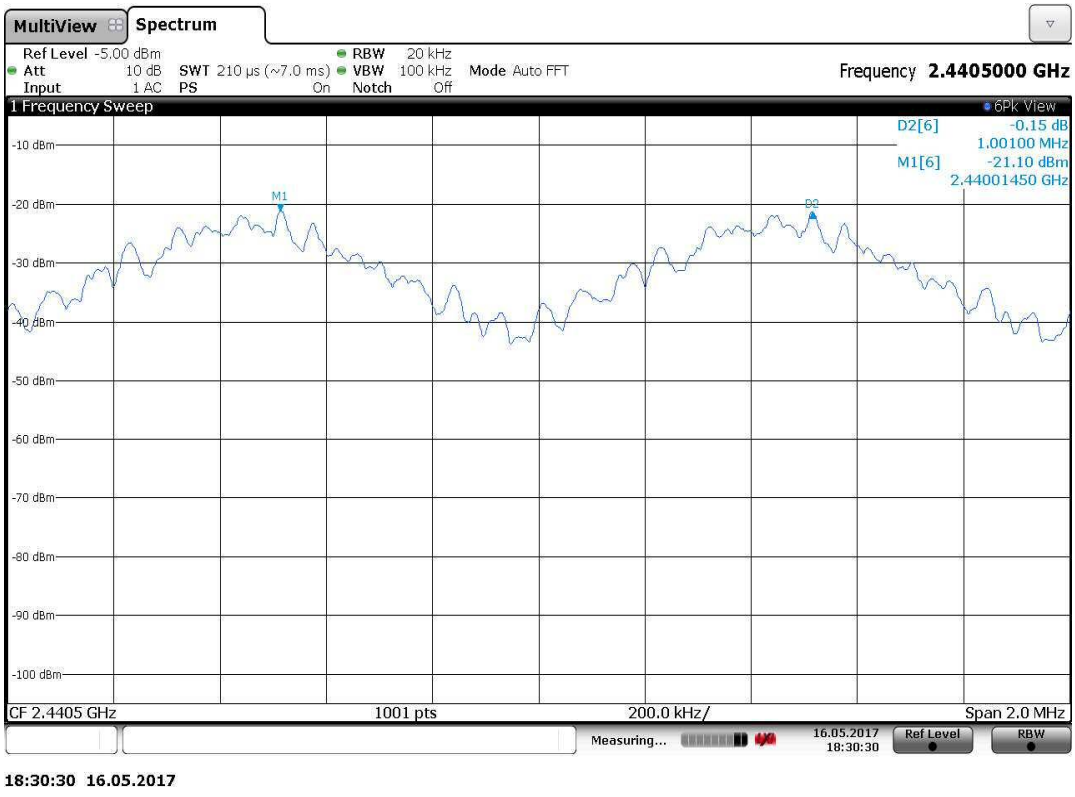
7.2.4 Test Data

Test Date :May 16, 2017
Temp.:22°C, Humi:48%

Mode of EUT	Channel Separation (MHz)	Limit* (MHz)
Hopping	1.001	0.917
Inquiry	-	-

Note: Two-thirds of the maximum 20 dB bandwidth of the hopping channel or 25 kHz (whichever is greater). Refer to the section 7.4.
Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

Mode of EUT : Hopping



7.3 Minimum Hopping Channel

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.3.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Number of Channel is	79
Number of Channel (Inquiry) is	-
Number of Channel (AFH) is	20

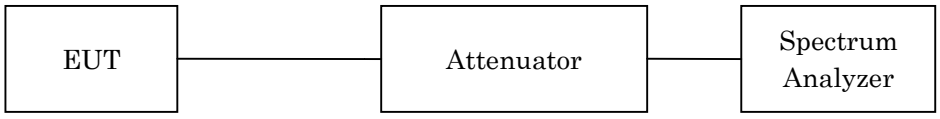
Remarks : Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

7.3.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.3.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	300 kHz
Video Bandwidth	300 kHz
Span	30 MHz
Sweep Time	AUTO
Trace	Maxhold

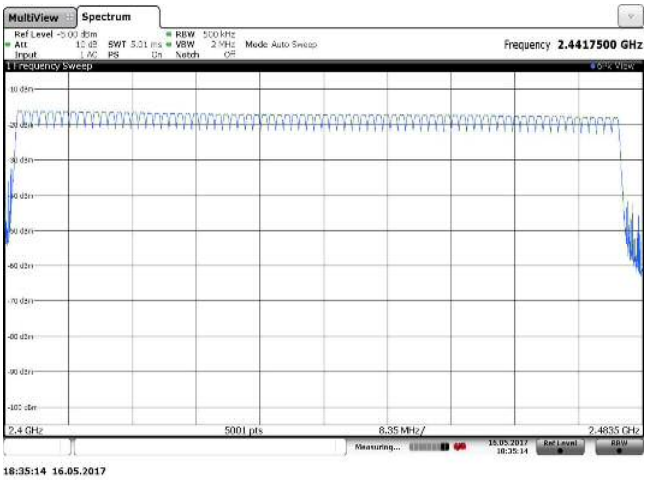
7.3.4 Test Data

Test Date :May 16, 2017
Temp.:22°C, Humi:48%

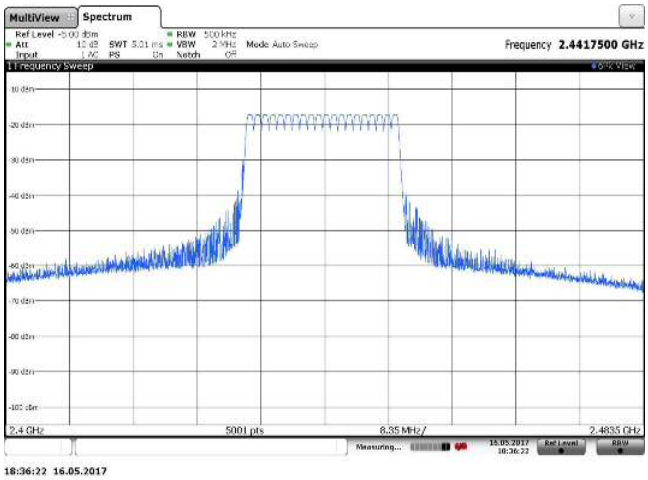
Mode of EUT	Minimum Hopping Channel	Limit
Hopping	79	15
Inquiry	-	15
AFH(minimum)	20	15

Note : Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

Mode of EUT : Hopping



Mode of EUT : AFH(minimum)



7.4 Occupied Bandwidth

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.4.1 Test Report

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

The 99% Bandwidth is	1345.6	kHz	at	2480.0	MHz
The 20dB Bandwidth is	1375.7	kHz	at	2441.0	MHz
Uncertainty of measurement results				+/- 0.131	%(2σ)

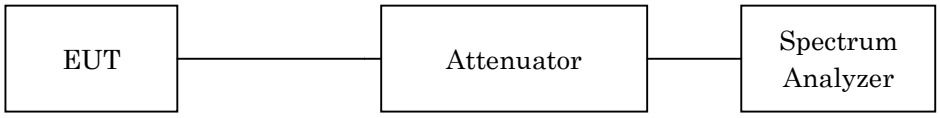
Remarks :

7.4.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.4.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	30 kHz
Video Bandwidth	91 kHz
Span	2 MHz / 3 MHz
Sweep Time	AUTO
Trace	Maxhold

7.4.4 Test Data

Date : May 16 ,2017
Temp. : 22 ℃
Humi. : 48 %

The resolution bandwidth was set to about 1% of emission bandwidth, -20dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

1) Packet Setting : DH5 (Modulation type : GFSK)

Cannel	Freqency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)	Two-thirds of the 20 dB bandwidth (kHz)
00	2402.0	965.0	1025.0	683.3
39	2441.0	965.0	1018.9	679.3
78	2480.0	965.0	1018.9	679.3

2) Packet Setting : 2DH5 (Modulation type : pi/4-DQPSK)

Cannel	Freqency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)	Two-thirds of the 20 dB bandwidth (kHz)
00	2402.0	1264.7	1372.7	915.1
39	2441.0	1270.7	1375.7	917.1
78	2480.0	1291.7	1375.7	917.1

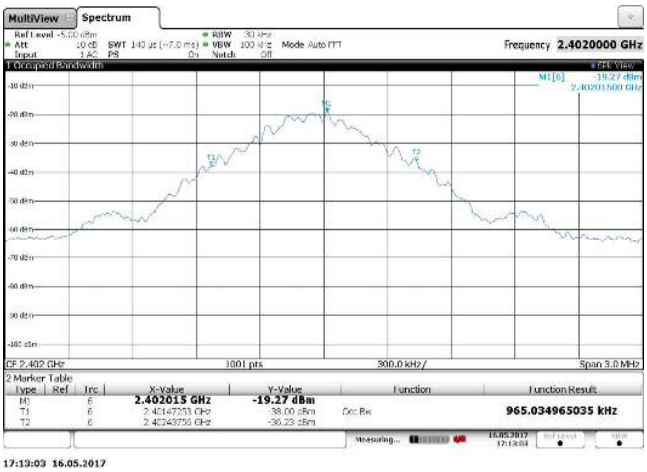
3) Packet Setting : 3DH5 (Modulation type : 8DPSK)

Cannel	Freqency (MHz)	99% Bandwidth (kHz)	-20dBc Bandwidth (kHz)	Two-thirds of the 20 dB bandwidth (kHz)
00	2402.0	1270.7	1363.7	909.1
39	2441.0	1237.7	1366.7	911.1
78	2480.0	1345.6	1369.7	913.1

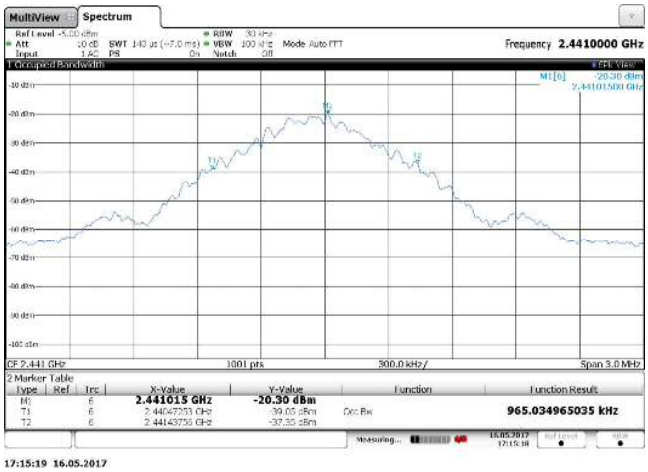
1) 99% Bandwidth

1.1) DH5 (Modulation type : GFSK)

Low Channel



Mid Channel

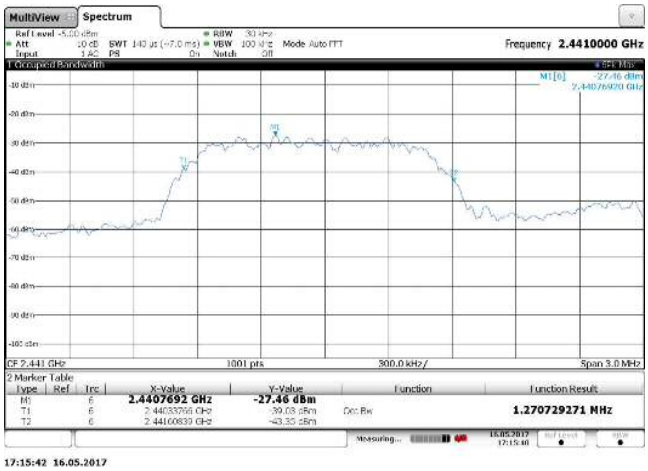


High Chanel

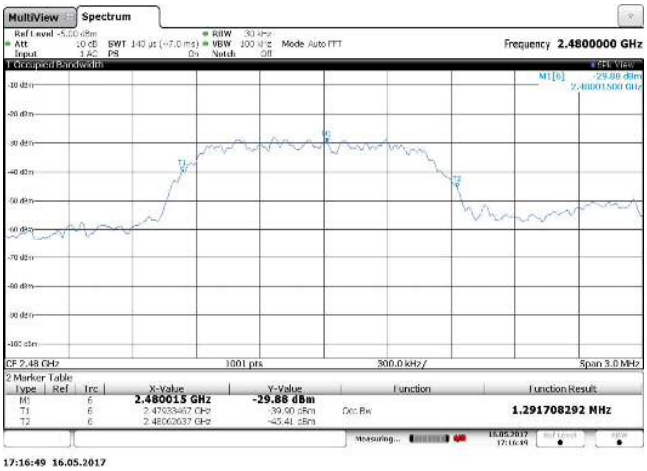
1.2)2DH5 (Modulation type : pi/4-DQPSK)

Low Channel

Mid Channel

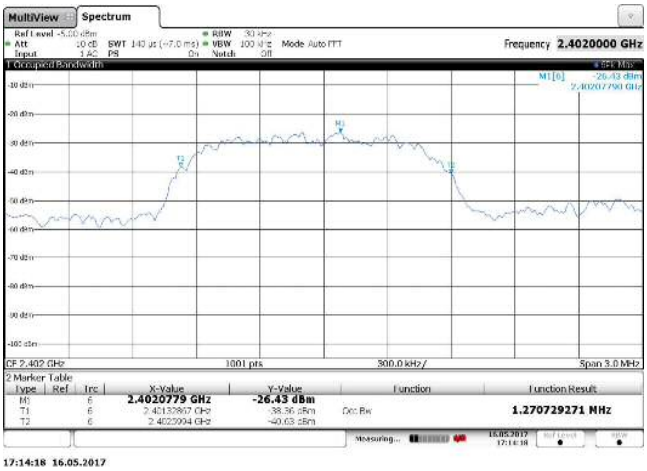


High Chanel

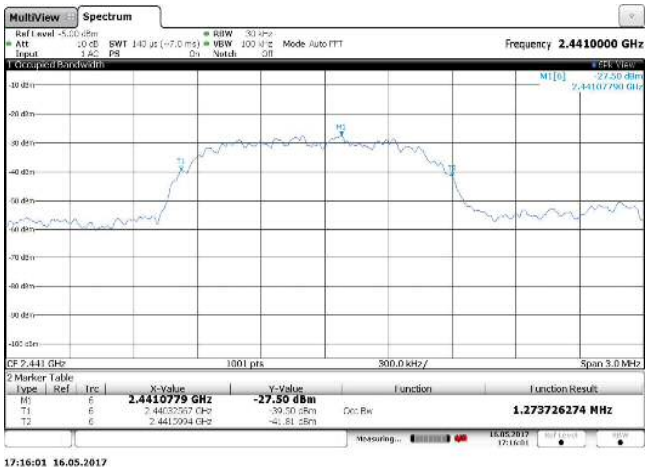


1.3) 3DH5 (Modulation type : 8DPSK)

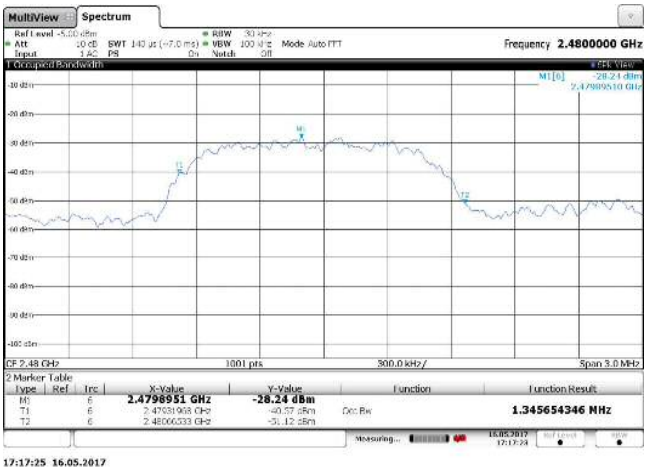
Low Channel



Mid Channel



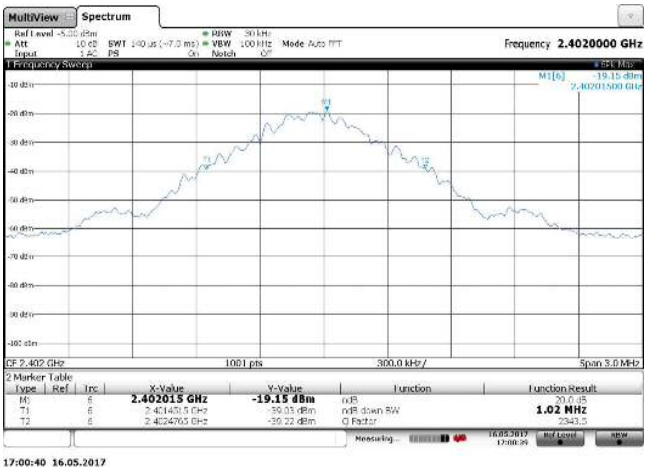
High Chanel



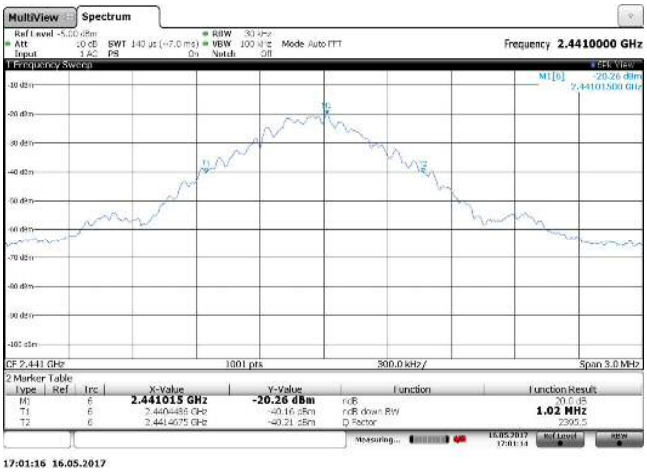
2) -20dBc Bandwidth

2.1) DH5 (Modulation type : GFSK)

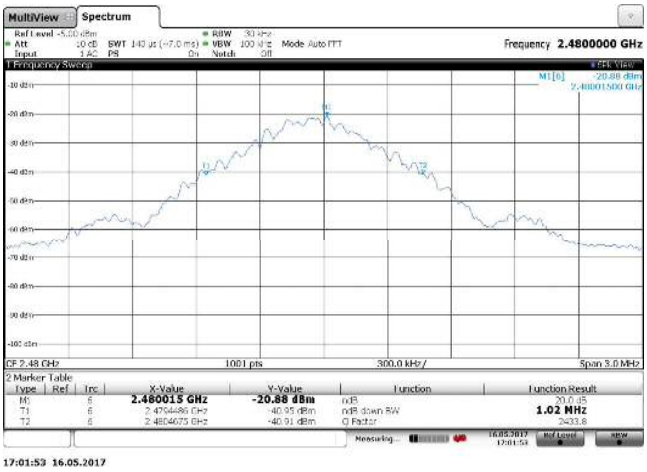
Low Channel



Mid Channel

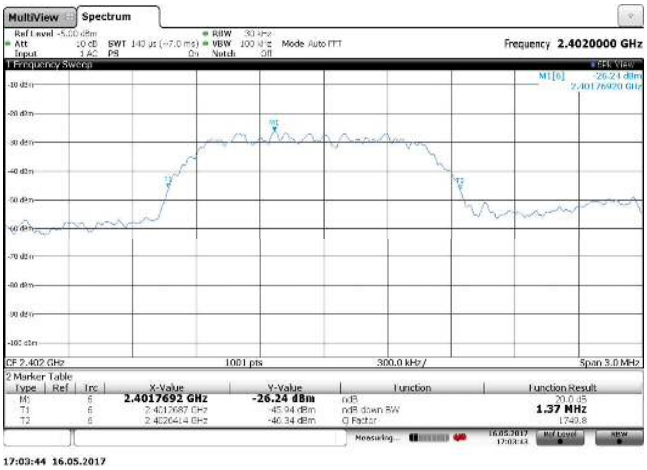


High Chanel

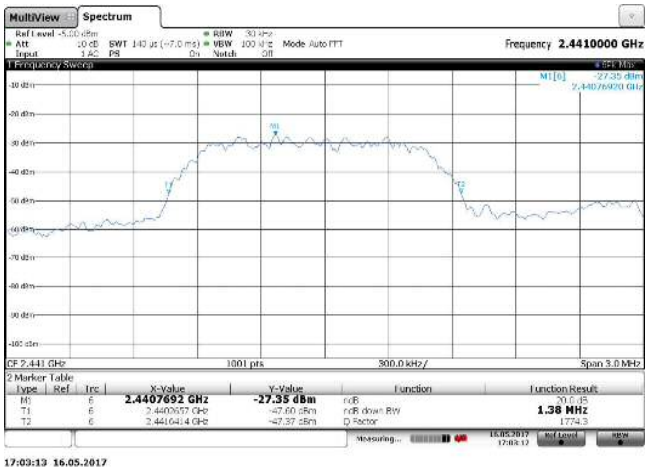


2.2) 2DH5 (Modulation type : pi/4-DQPSK)

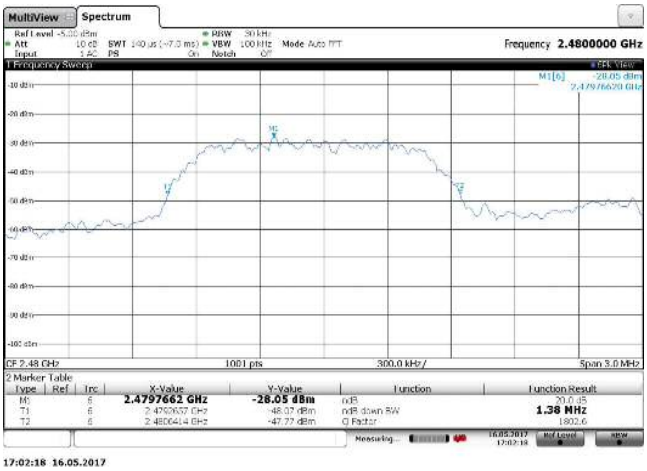
Low Channel



Mid Channel

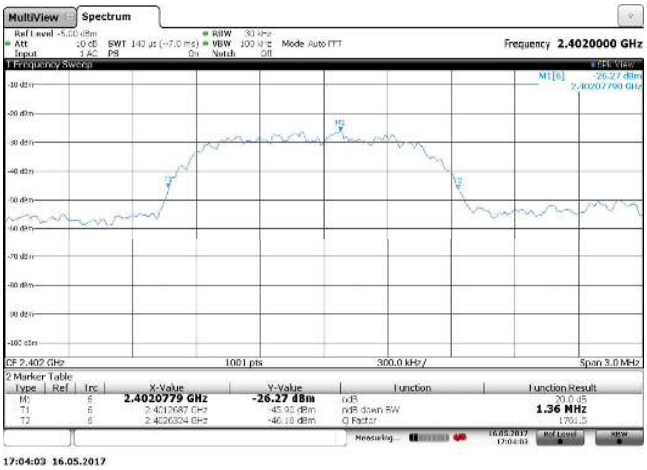


High Chanel

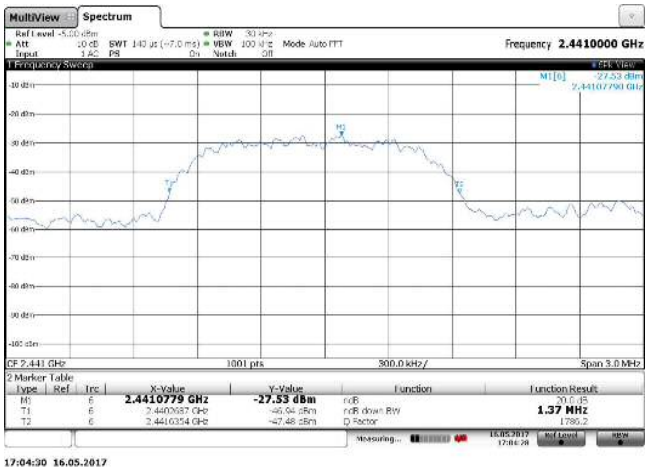


2.3) 3DH5 (Modulation type : 8DPSK)

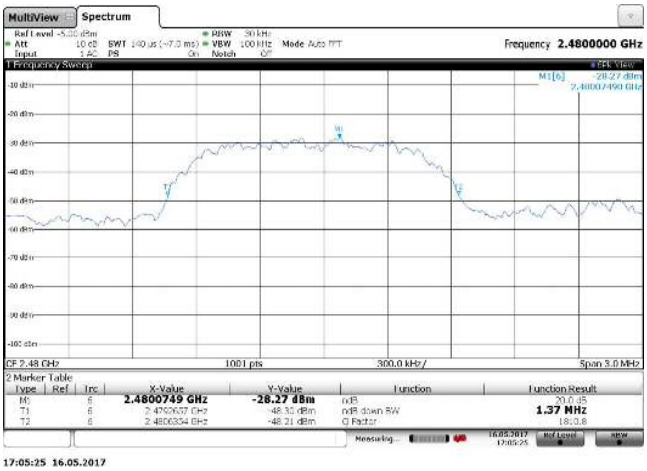
Low Channel



Mid Channel



High Chanel



7.5 Dwell Time

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.5.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Dwell Time is	301.96	msec
Dwell Time (Inquiry) is	-	msec
Dwell Time (AFH) is	300.89	msec
Uncertainty of measurement results	+/- 1.2	dB(2σ)

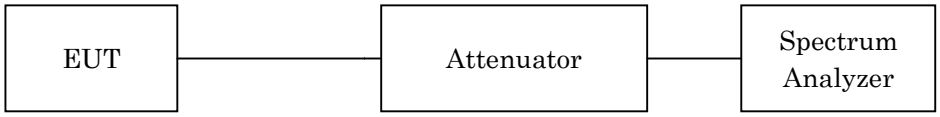
Remarks : Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

7.5.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.5.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

Res. Bandwidth	1 MHz
Video Bandwidth	1 MHz
Span	Zero Span

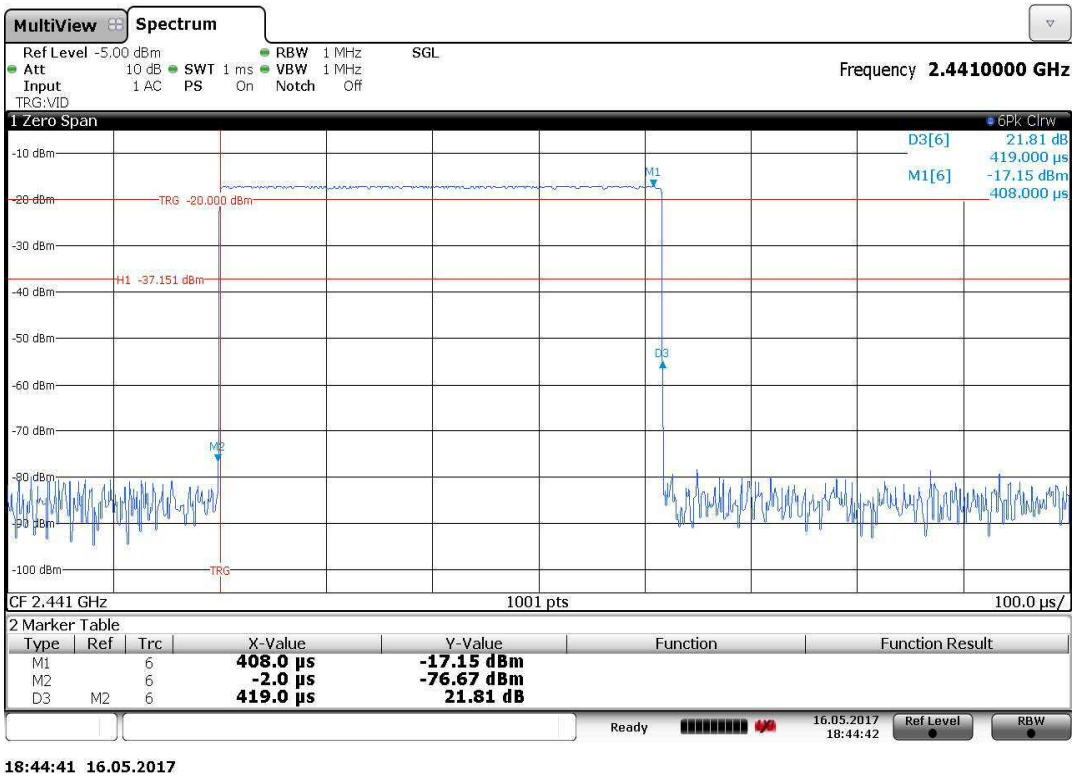
7.5.4 Test Data

Test Date :May 16, 2017
Temp.:22°C, Humi:48%

Mode of EUT	Dwell Time (msec)	Limit (msec)
DH1	134.08	400
DH3	258.08	400
DH5	301.96	400
Inquiry	-	400

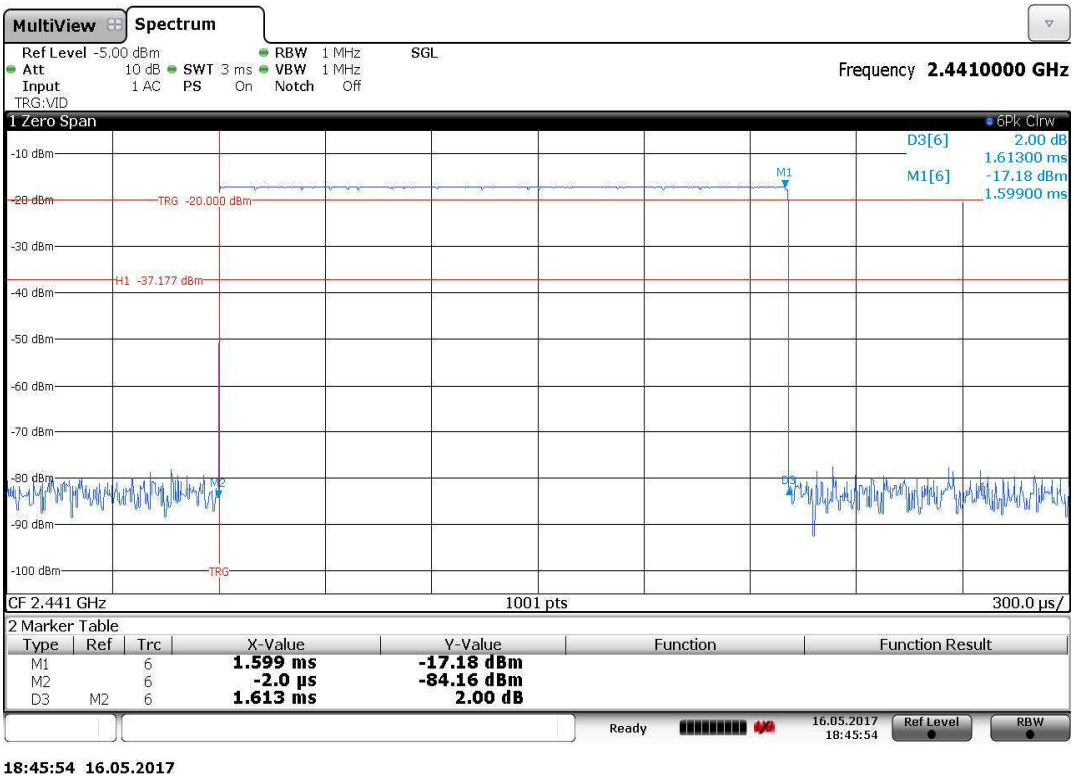
Since EUT is a Bluetooth slave device, it does not have Inquiry oscillation

DH1(Modulation type : GFSK)



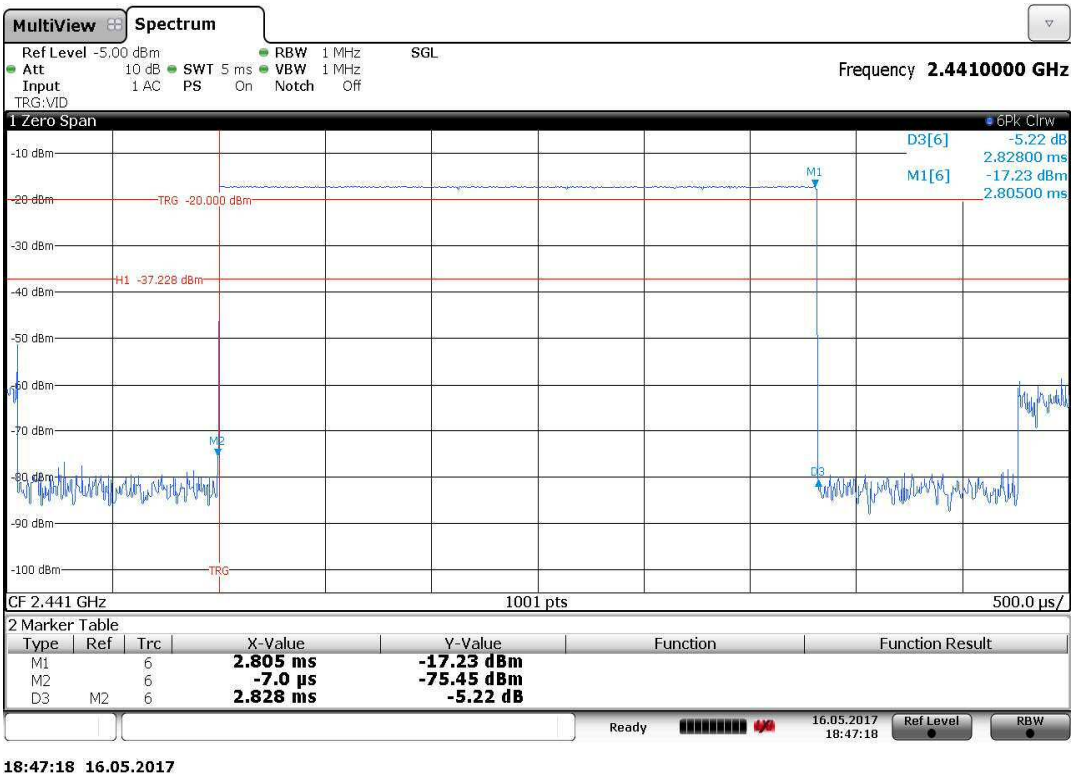
Note : The system makes worst case 1600 hops per second or 1 time slot has a length of 625 µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So the system has each channel 10.1266 times per second and so for 31.6 seconds the system have 320.0 times of appearance.
Each tx-time per appearance is 0.419 ms.
Dwell time = 320.0 * 0.419 = 134.08 ms

DH3(Modulation type : GFSK)



Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 79 channels. So the system have each channel 5.063 times per second and so for 31.6 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 1.613 ms.
Dwell time = 160.0 * 1.613 = 258.08 ms

DH5(Modulation type : GFSK)

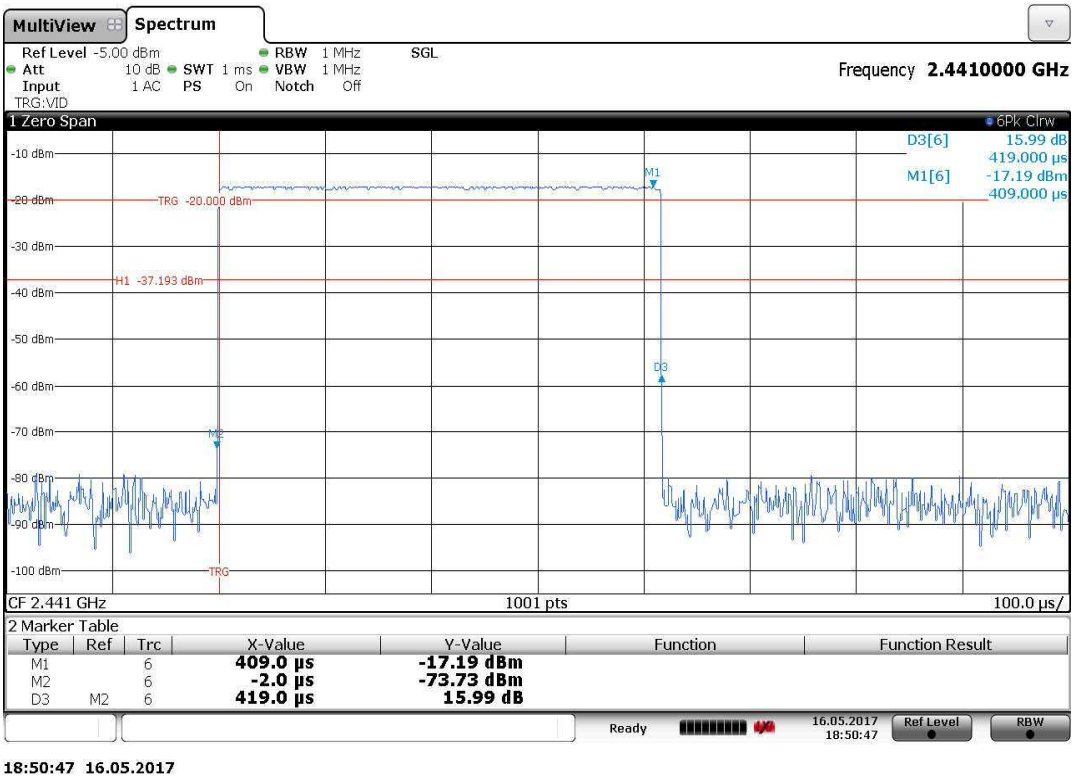


Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 266.667 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.7 times of appearance.
Each tx-time per appearance is 2.83 ms.
Dwell time = 106.7 * 2.83 = 301.96 ms

Test Date :May 16, 2017
Temp.:22°C, Humi:48%

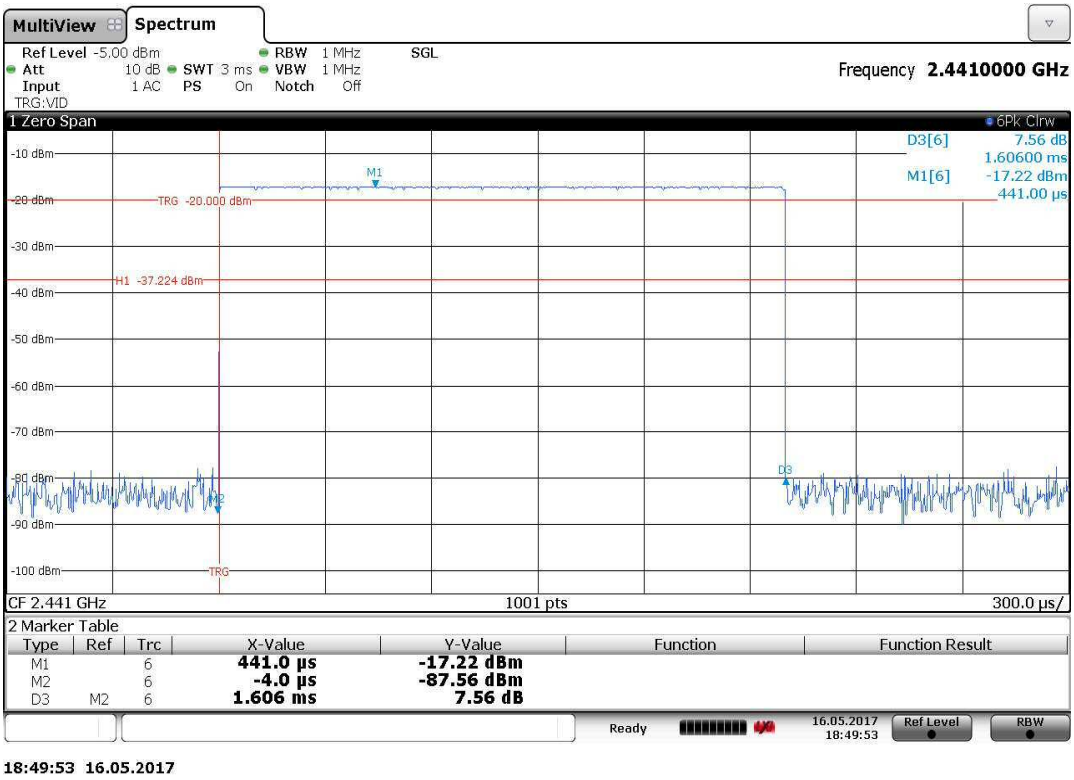
Mode of EUT	Dwell Time (msec)	Limit (msec)
DH1(AFH)	67.04	400
DH3(AFH)	128.48	400
DH5(AFH)	150.3	400

DH1(Modulation type : GFSK)



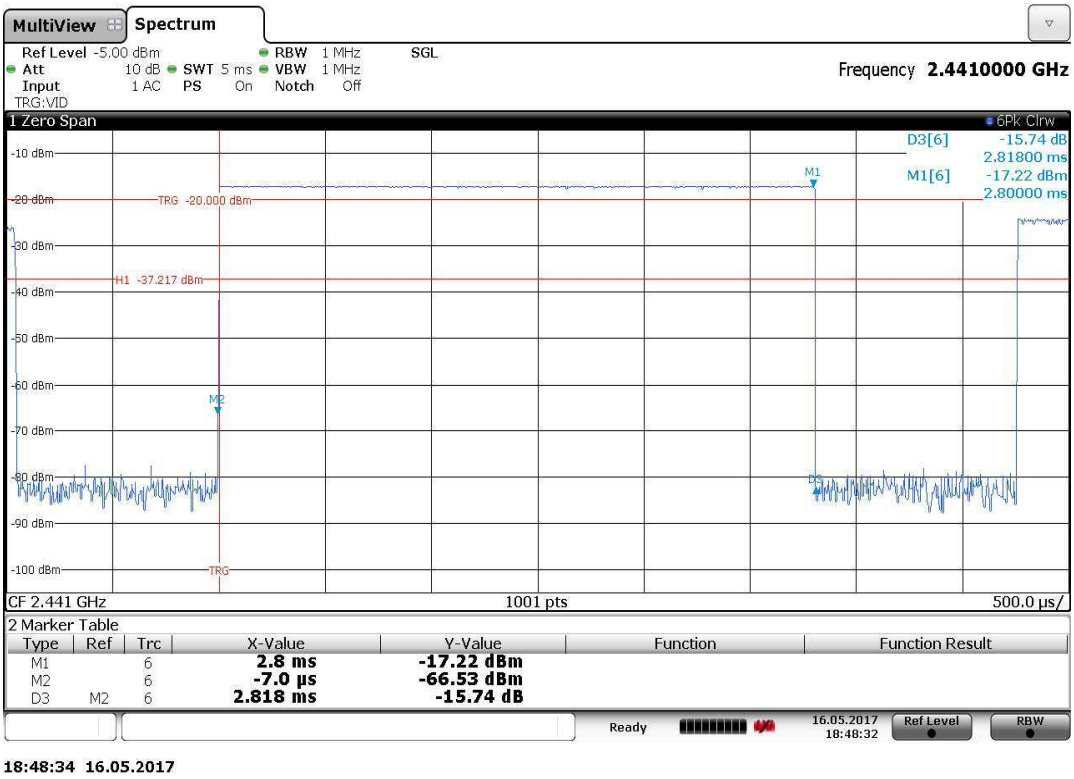
Note : A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 20 channels. So the system has each channel 40 times per second and so for 8 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 0.419 ms.
Dwell time = 160.0 * 0.419 = 67.04 ms

DH3(Modulation type : GFSK)



Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 200 hops per second with 20 channels. So the system have each channel 20 times per second and so for 8 seconds the system have 80.0 times of appearance.
Each tx-time per appearance is 1.606 ms.
Dwell time = 80.0 * 1.606 =128.48 ms

DH5(Modulation type : GFSK)



Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 133.333 hops per second with 20 channels. So the system have each channel 13.33335 times per second and so for 8 seconds the system have 53.3 times of appearance.
Each tx-time per appearance is 2.82 ms.
Dwell time = 53.3 * 2.82 = 150.3 ms

7.6 Peak Output Power (Conduction)

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.6.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Peak Output Power is _____ dBm, at _____ MHz

Uncertainty of measurement results +/- 0.7 dB(2σ)

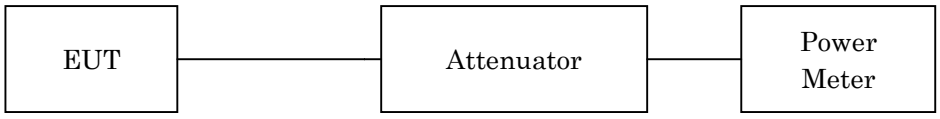
Remarks : _____

7.6.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Power Meter	ML2495A	Anritsu	PM01	2016/6	1 Year
Power Sensor	MA2491A	Anritsu	PM01-S1	2016/6	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.6.3 Test Method and Test Setup (Diagrammatic illustration)

The Conducted RF Power Output was measured with a power meter, one attenuator and a short, low loss cable.



7.6.4 Test Data

Mode of EUT : DH5 (Modulation type : GFSK)

Date : May 16 ,2017
Temp. : 22 ℃
Humi. : 48 %

Transmitting Freqency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
Ch	(MHz)	(dB)	(dBm)	(dBm)	(mW)	(dBm)	(dB)
01	2402	12.52	-14.30	-1.78	0.66	30.00	31.78
06	2441	12.52	-15.42	-2.90	0.51	30.00	32.90
11	2480	12.52	-15.90	-3.38	0.46	30.00	33.38

Calculated result at 2402 MHz, as the worst point shown on underline:

Correction Factor	=	12.52	dB		
+) Meter Reading	=	-14.30	dBm		
Result	=	-1.78	dBm	= 0.66	mW

Minimum Margin: 30.00 - -1.78 = 31.78 (dB)

Notes
1. The correction factor shows the attenuation pad loss including the cable loss.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W
Peak	OFF

**Although AC power supply voltage was changed from 10.2VDC to 27.6VDC, the Peak Output Power did not change.

Mode of EUT : 2DH5 (Modulation type : pi/4-DQPSK)

Date : May 16 ,2017
Temp. : 22 ℃
Humi. : 48 %

Transmitting Freqency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
Ch	(MHz)	(dB)	(dBm)	(dBm)	(mW)	(dBm)	(dB)
01	2412	12.52	-16.35	-3.83	0.41	30.00	33.83
06	2437	12.52	-17.69	-5.17	0.30	30.00	35.17
11	2462	12.52	-18.22	-5.70	0.27	30.00	35.70

Calculated result at 2412 MHz, as the worst point shown on underline:

Correction Factor	=	12.52	dB		
+) Meter Reading	=	-16.35	dBm		
Result	=	-3.83	dBm	= 0.41	mW

Minimum Margin: 30.00 - -3.83 = 33.83 (dB)

Notes
1. The correction factor shows the attenuation pad loss including the cable loss.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W
Peak	OFF

**Although AC power supply voltage was changed from 10.2VDC to 27.6VDC, the Peak Output Power did not change.

Mode of EUT : 3DH5 (Modulation type : 8DPSK)

Date : May 16 ,2017
Temp. : 22 ℃
Humi. : 48 %

Transmitting Freqency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
Ch	(MHz)	(dB)	(dBm)	(dBm)	(mW)	(dBm)	(dB)
01	2412	12.52	-15.87	-3.35	0.46	30.00	33.35
06	2437	12.52	-17.31	-4.79	0.33	30.00	34.79
11	2462	12.52	-17.82	-5.30	0.30	30.00	35.30

Calculated result at 2412 MHz, as the worst point shown on underline:

Correction Factor	=	12.52	dB		
+) Meter Reading	=	-15.87	dBm		
Result	=	-3.35	dBm	= 0.46	mW

Minimum Margin: 30.00 - -3.35 = 33.35 (dB)

Notes
1. The correction factor shows the attenuation pad loss including the cable loss.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W
Peak	OFF

**Although AC power supply voltage was changed from 10.2VDC to 27.6VDC, the Peak Output Power did not change.

7.7 Peak Power Density (Conduction)

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : _____

7.8 Sprious Emissions (Conduction)

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.8.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Uncertainty of Measurement Results

9 kHz – 1 GHz	± 1.4	dB(2σ)
1 GHz – 18 GHz	± 1.7	dB(2σ)
18 GHz – 40 GHz	± 2.3	dB(2σ)

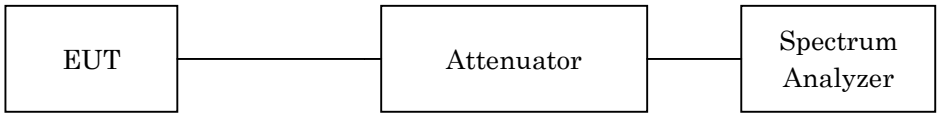
Remarks : _____

7.8.2 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
RF Cable	S 04272B	SUHNER	CS04	2016/5	1 Year
Attenuator	43KC-10	Anritsu	ATT01	2016/10	1 Year

7.8.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



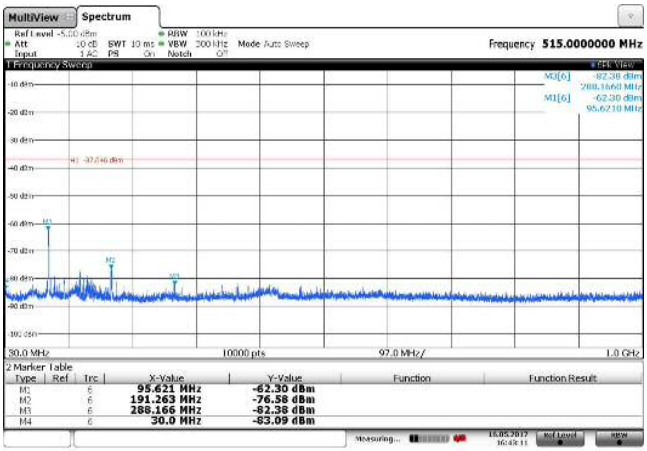
The setting of the spectrum analyzer are shown as follows:

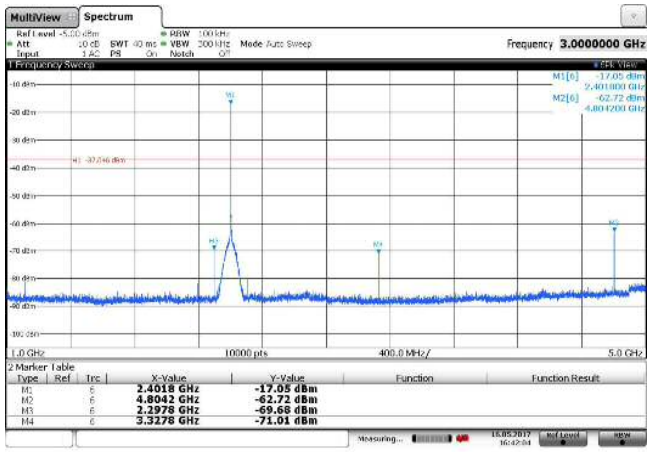
Frequency Range	30 MHz - 25 GHz	Band-Edge
Res. Bandwidth	100 kHz	100 kHz
Video Bandwidth	300 kHz	300 kHz
Sweep Time	AUTO	AUTO
Trace	Maxhold	Maxhold

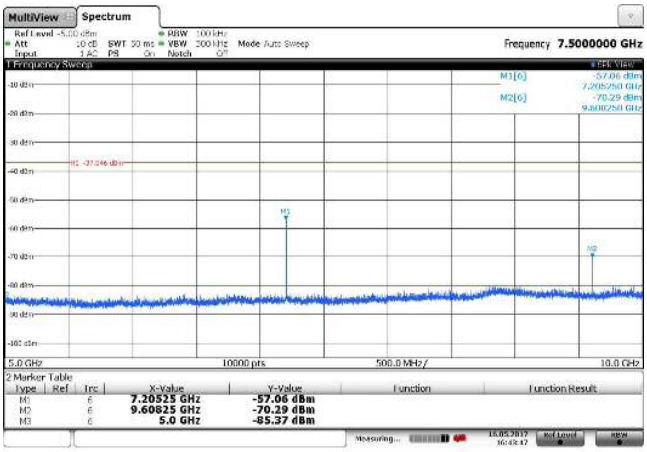
7.8.4 Test Data

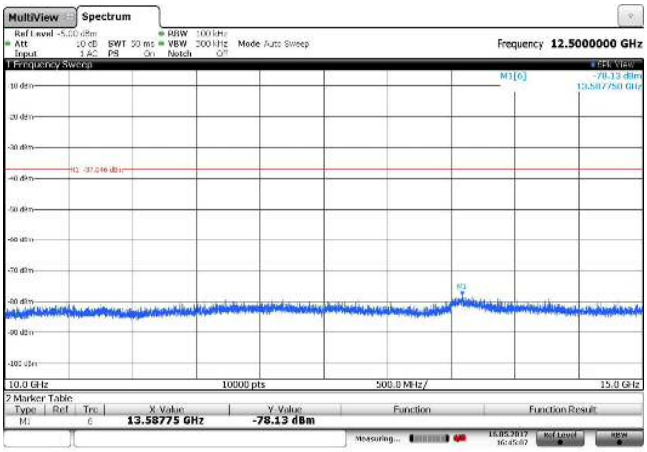
Test Date :May 16, 2017
Temp.:22°C, Humi:48%

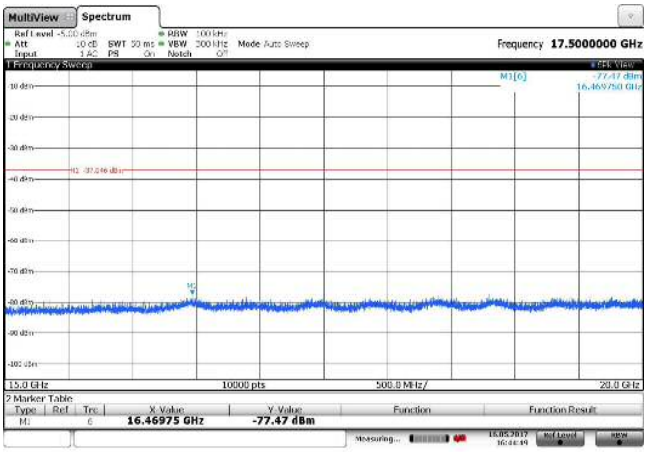
Low Channel

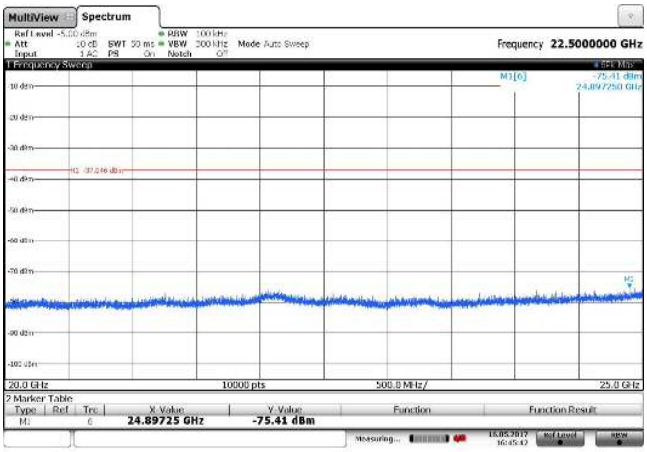




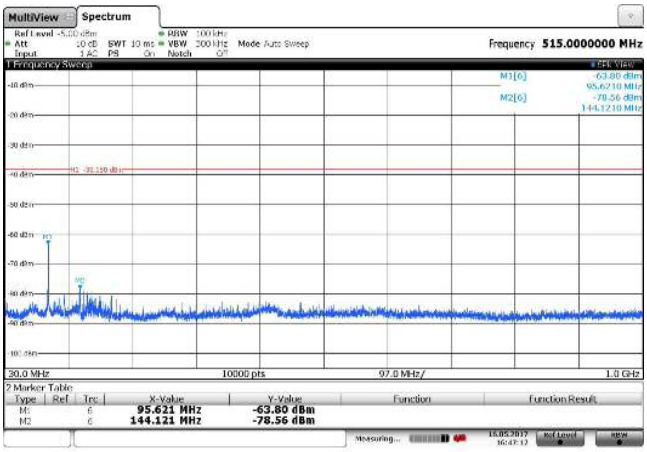


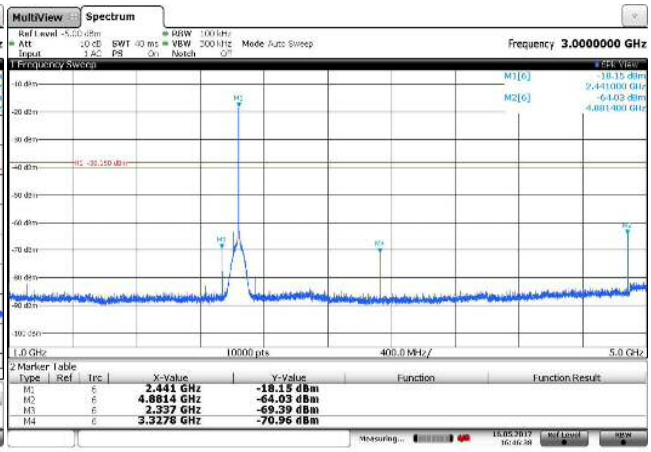


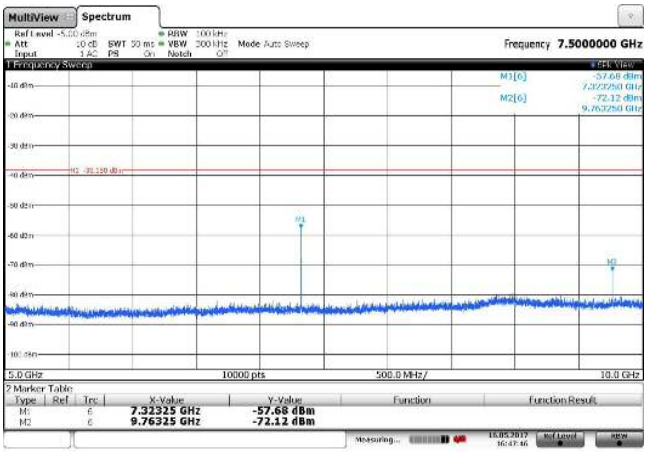


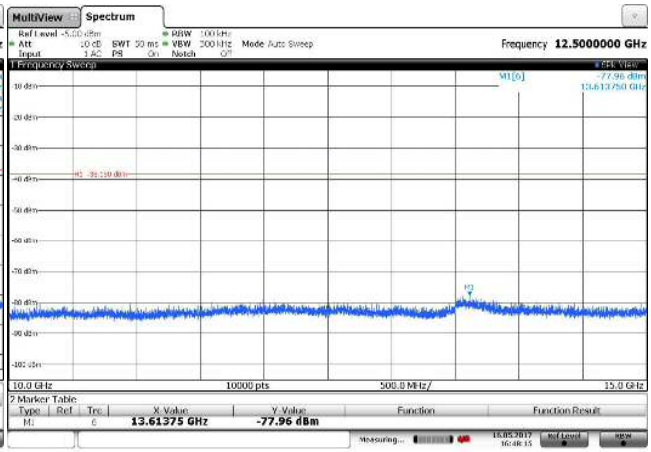


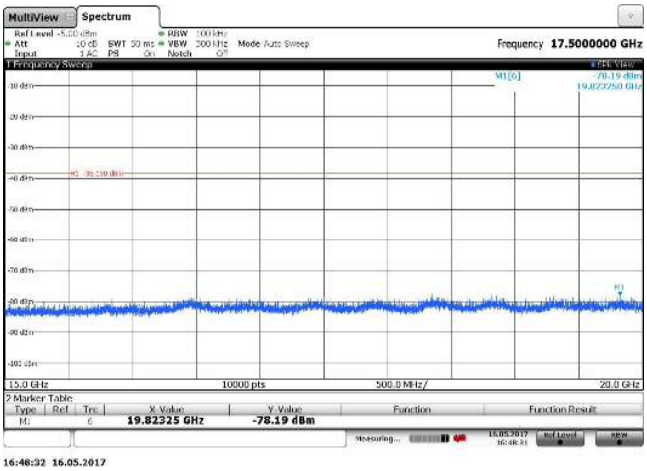
Mid Channel

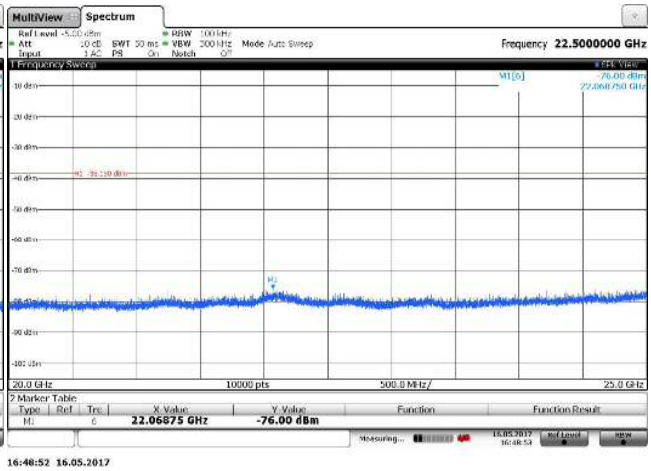

MultiView
Spectrum
Frequency 515.0000000 MHz
M1 95.621 MHz -63.80 dBm
M2 144.121 MHz -78.56 dBm
16:47:14 16.05.2017


MultiView
Spectrum
Frequency 3.0000000 GHz
M1 2.441 GHz -18.15 dBm
M2 4.8814 GHz -64.03 dBm
M3 2.337 GHz -69.39 dBm
M4 3.3278 GHz -70.96 dBm
16:46:38 16.05.2017

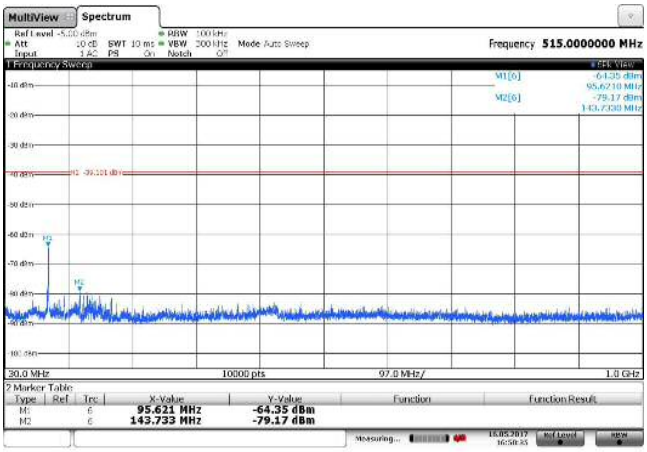

MultiView
Spectrum
Frequency 7.5000000 GHz
M1 7.32325 GHz -57.68 dBm
M2 9.76325 GHz -72.12 dBm
16:47:45 16.05.2017

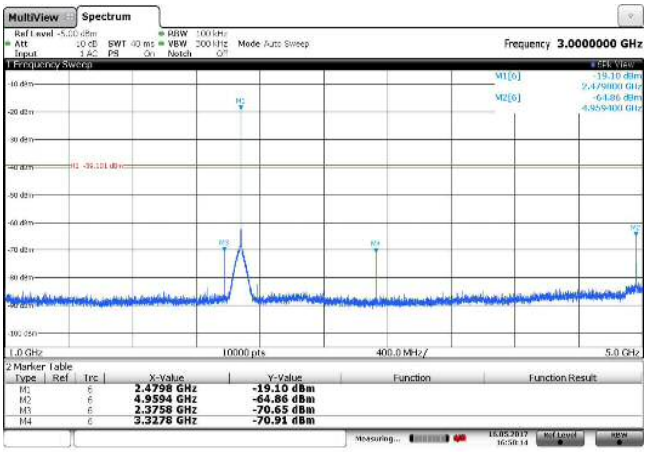

MultiView
Spectrum
Frequency 12.5000000 GHz
M1 13.61375 GHz -77.96 dBm
16:48:17 16.05.2017

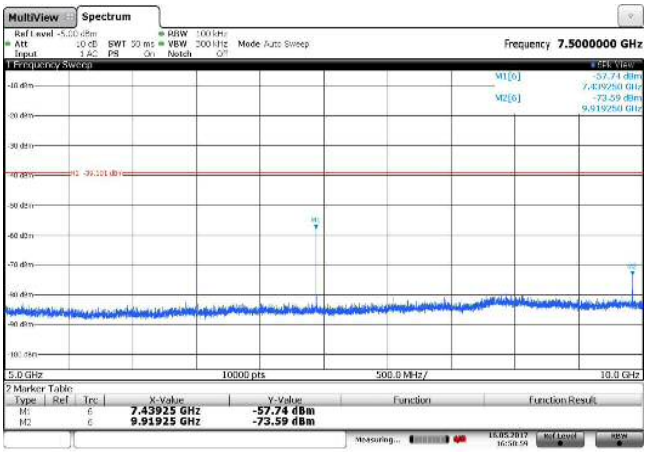

MultiView
Spectrum
Frequency 17.5000000 GHz
M1 19.82325 GHz -78.19 dBm
16:48:32 16.05.2017

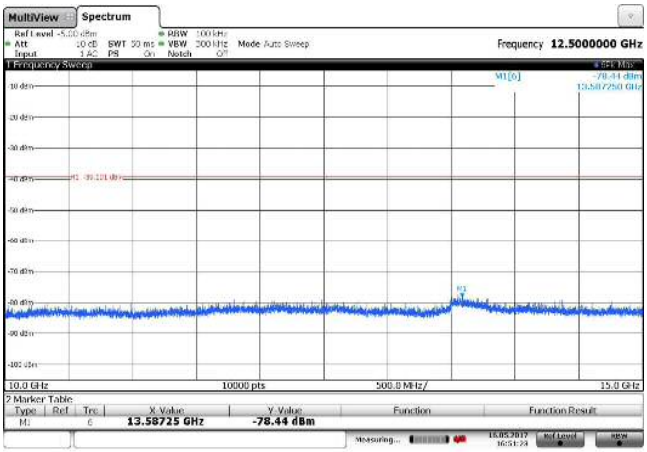

MultiView
Spectrum
Frequency 22.5000000 GHz
M1 22.06875 GHz -76.00 dBm
16:48:52 16.05.2017

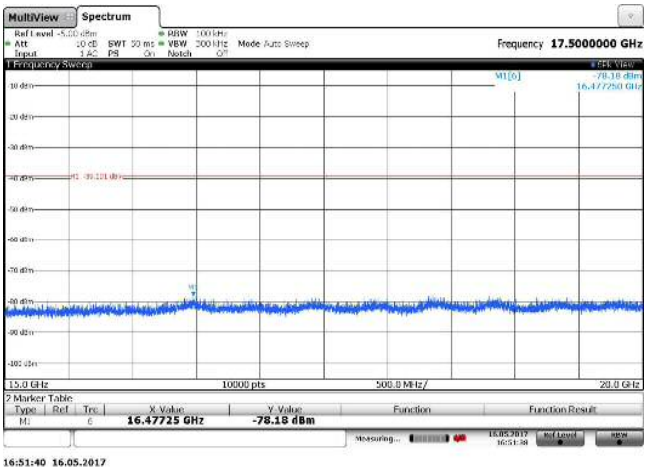
High Channel

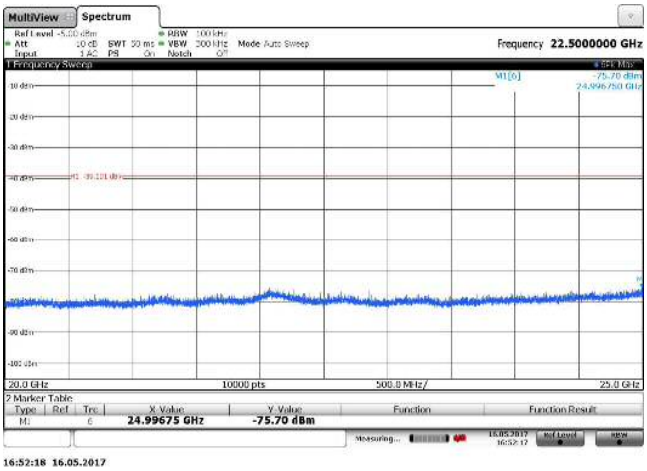






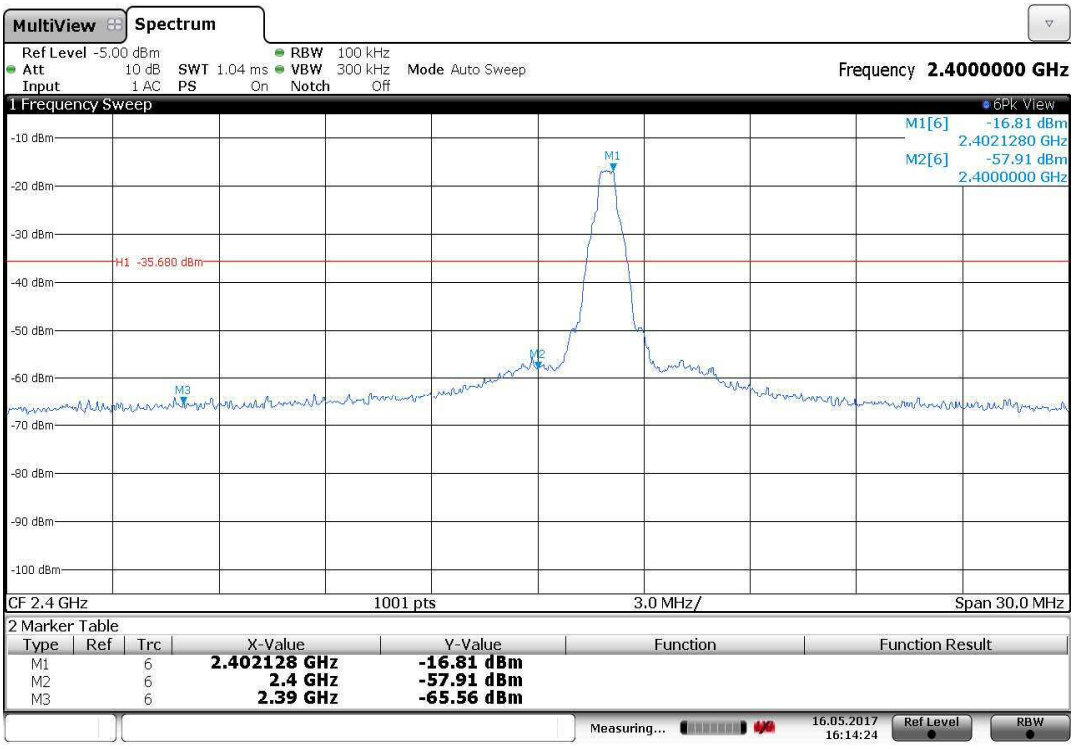






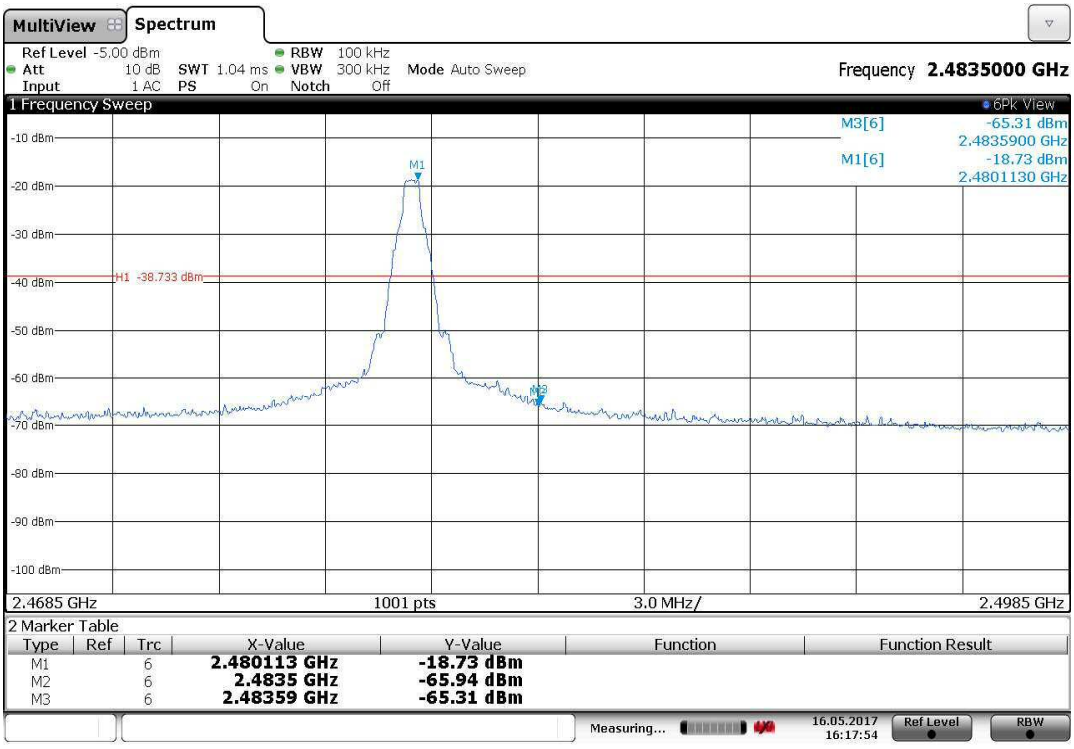
Band-Edge Emission

Low Channel(Hopping off), Band-Edge Emission



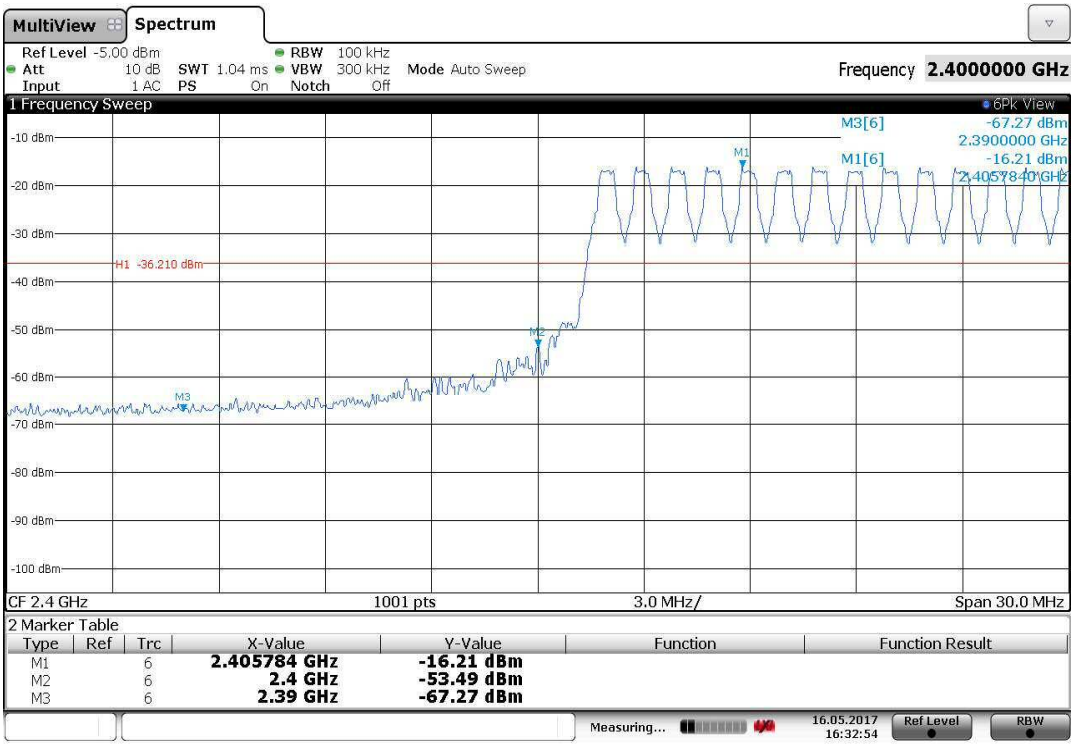
16:14:09 16.05.2017

High Channel(Hopping off), Band-Edge Emission



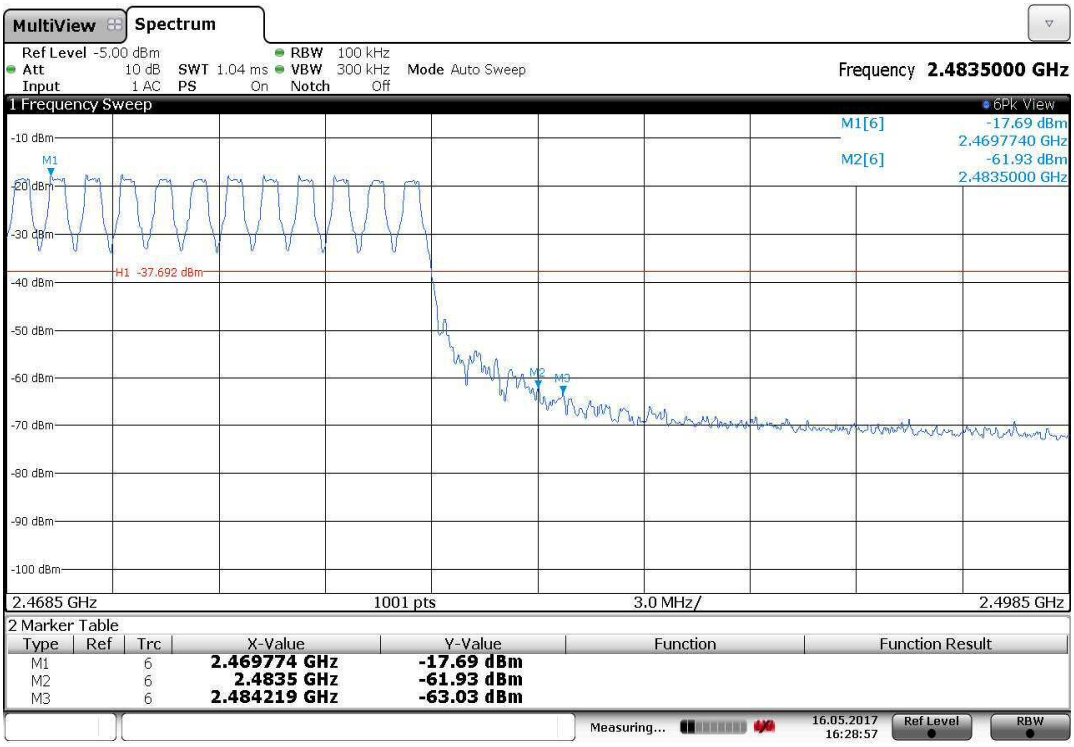
16:17:56 16.05.2017

Low Channel(Hopping on), Band-Edge Emission



16:32:55 16.05.2017

High Channel(Hopping on), Band-Edge Emission



16:28:57 16.05.2017

7.9 AC Powerline Conducted Emission

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : EUT was Battery use only

7.10 Radiated Emission

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.10.1 Test Results

9kHz – 1000 MHz

Min Limit Margin (Quasi-Peak)	13.7-	dB	at	816.5	MHz

Above 1GHz

Min Limit Margin (Peak)	17.3	dB	at	1866.5	MHz
Min Limit Margin (Average)	9.7	dB	at	7323.0	MHz

Uncertainty of measurement results	9kHz-30 MHz	±2.5	dB(2σ)
	30-300 MHz	±4.6	dB(2σ)
	300-1000 MHz	±4.5	dB(2σ)
	1 - 6 GHz	± 4.2	dB(2σ)
	6 - 18 GHz	± 4.6	dB(2σ)
	18 – 26.5 GHz	± 4.8	dB(2σ)
	26.5 - 40 GHz	± 4.8	dB(2σ)

7.10.2 Test Instrments

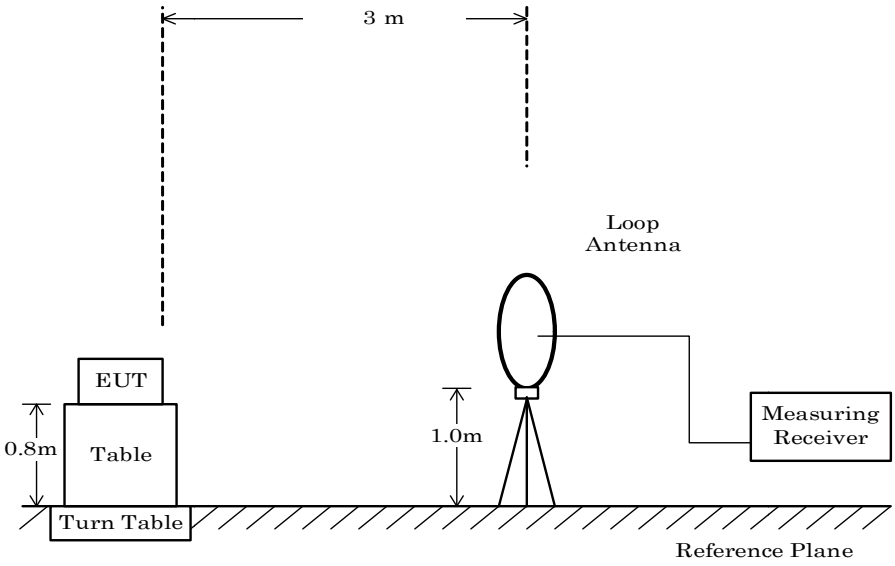
Type	Model	Manufacturer	ID No.	Last Cal.	Interval
Anechoic Chamber	-	TDK	A-1	2016/6	1 Year
Test Receiver	ESW44	Rohde & Schwarz	R04	2017/2	1 Year
Loop Antenna	HFH2-Z2	Rohde & Schwarz	ALP01	2017/2	1 Year
Biconical Antenna	BBA9106	Schwarzbeck	AB01	2016/7	1 Year
Log-periodic Antenna	UHALP9108A	Schwarzbeck	AB02	2016/7	1 Year
Log-periodic Antenna	HL050	Rohde & Schwarz	AL03	2017/2	1 Year
Horn Antenna	3160-09	ETS	AH02	2017/2	1 Year
Horn Antenna	3160-10	ETS	AH03	2017/2	1 Year
RF Cable	MWX122	Junkosha Inc.	CS01	2017/3	1 Year
RF Cable	MWX221	Junkosha Inc.	CS02	2017/3	1 Year
RF Cable	MWX221	Junkosha Inc.	CS10	2016/8	1 Year
RF Cable	KPS-1501-1181-KPS	INSULATED WIRE INC.	CK01	2016/10	1 Year
RF Amplifier	JS4-00102600-28-5A	MITEQ	PA05	2016/8	1 Year
RF Amplifier	JS4-26004000-27-8A	MITEQ	PA06	2016/11	1 Year

7.10.3 Test Method and Test Setup (Diagrammatic illustration)

7.10.3.1 Radiated Emission 9 kHz – 30 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
The measurement were performed about three antenna orientations (parallel, perpendicular, and ground-parallel).
According to KDB414788, a used anechoic chamber were equivalent to those on an open fields site based on comparison measurements.
This configurations was used for the final tests.

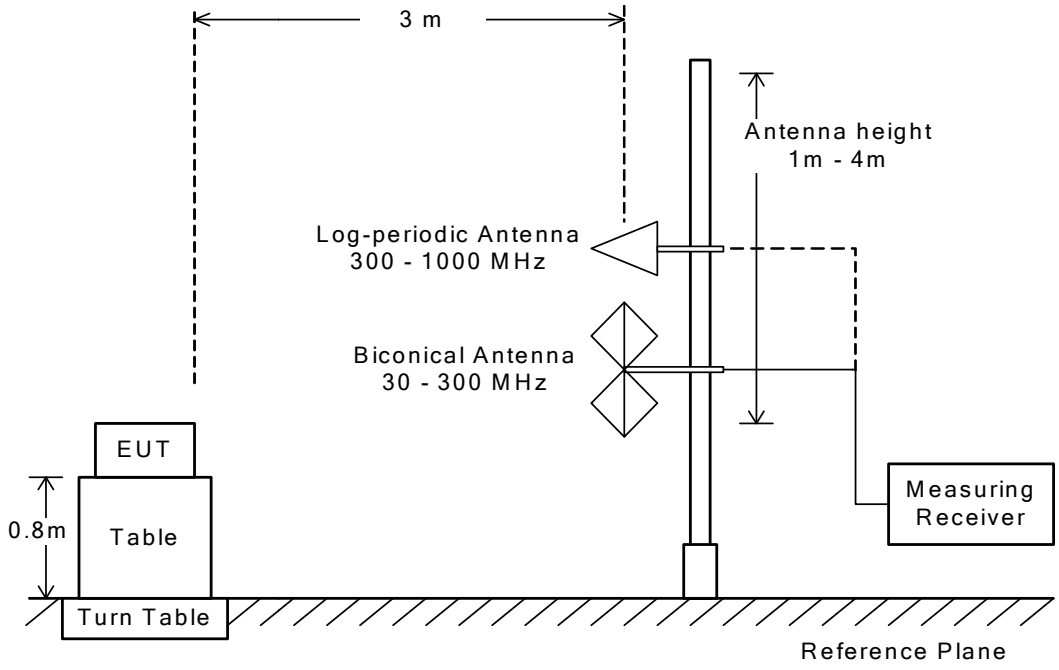
– Side View –



7.10.3.2 Radiated Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

– Side View –



7.10.3.3 Radiated Emission above 1 GHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

The setting of the measuring instruments are shown as follows:

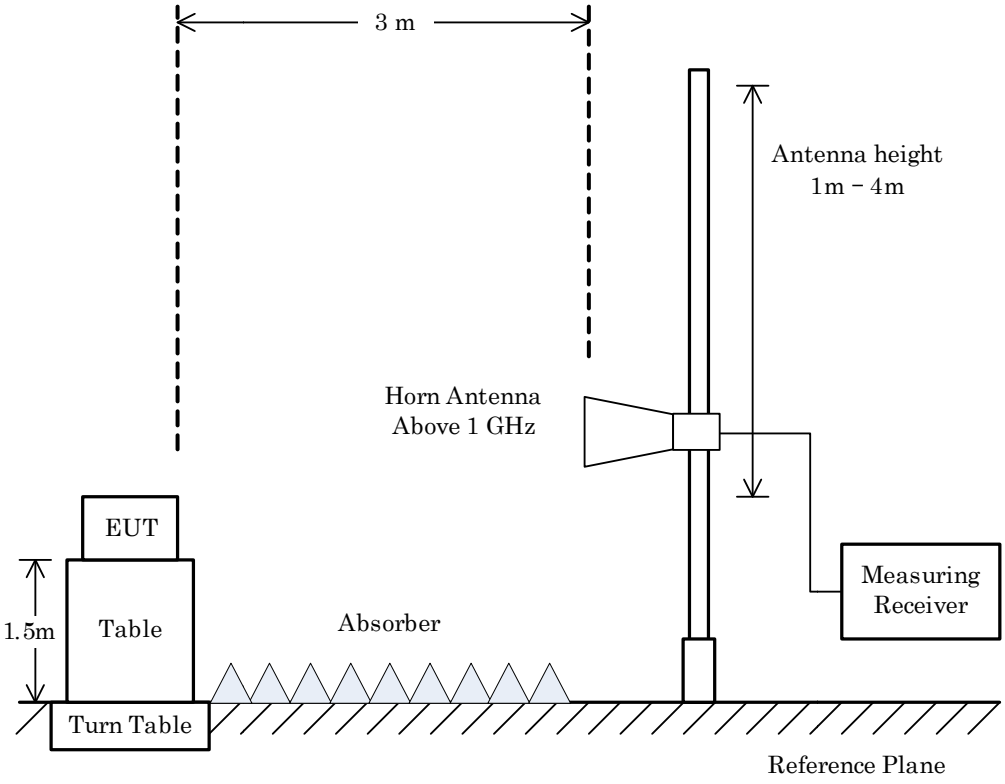
Type	Peak	Average
Detector Function	Peak	Peak
Res. Bandwidth	1 MHz	1 MHz
Video Bandwidth	3 MHz	≥ 1/T *1)
Video Filtering	Linear Voltage	Linear Voltage
Sweep Time	AUTO	AUTO
Trace	Max Hold	Max Hold

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

Mode	Interval (msec)	Cycle (msec)	Duty cycle (%)	Burst on period(T) (msec)	Min. VBW(1/T) (kHz)	VBW Setting (kHz)
BDR(DH5)	0.86	3.69	0.77	2.83	0.35	0.50

– Side View –



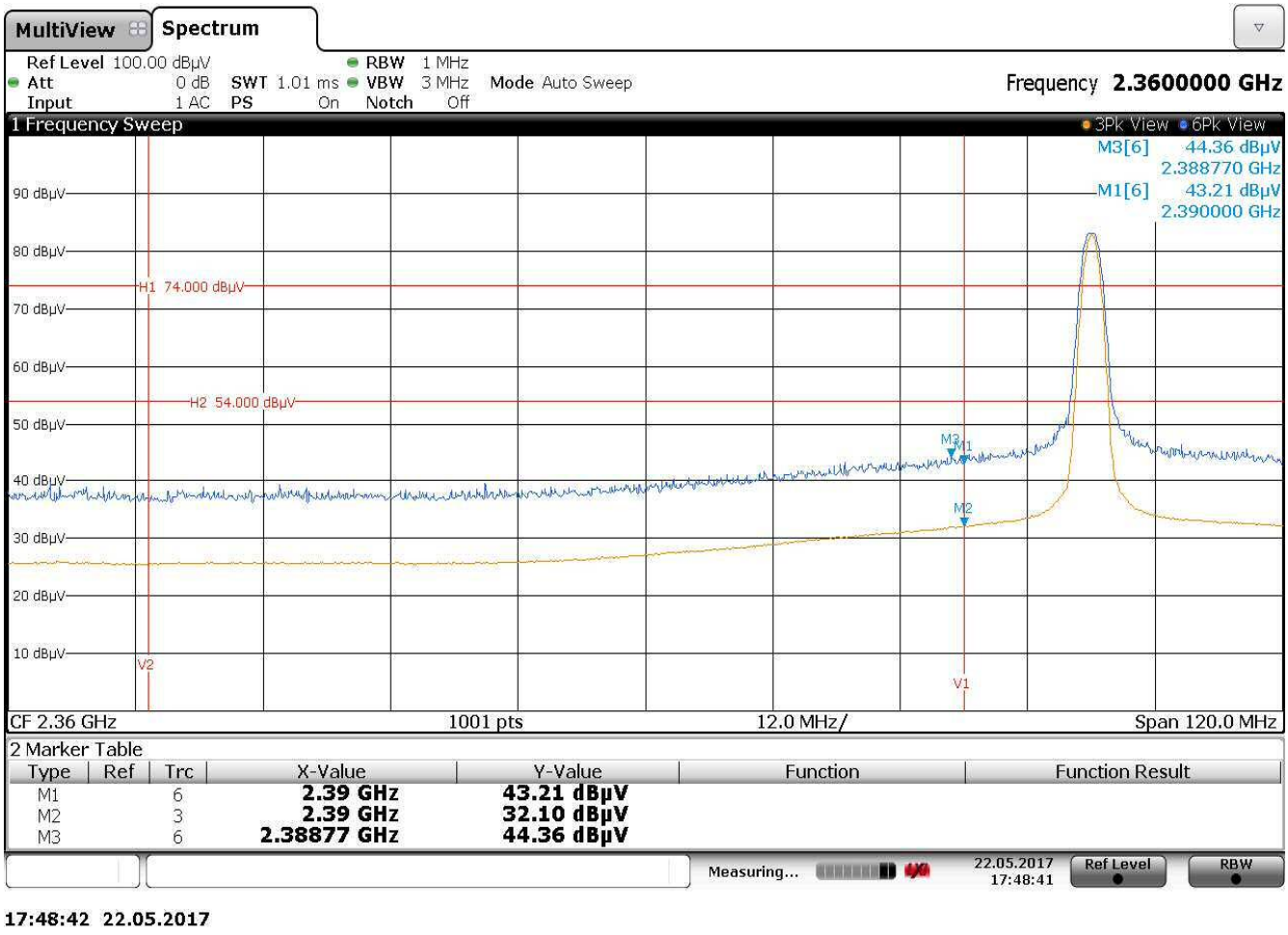
NOTE
When the EUT is manipulated through three different orientations, the scan height upper range for the measurement antenna is limited to 2.5 m or 0.5 m above the top of the EUT.

7.10.4 Test Data

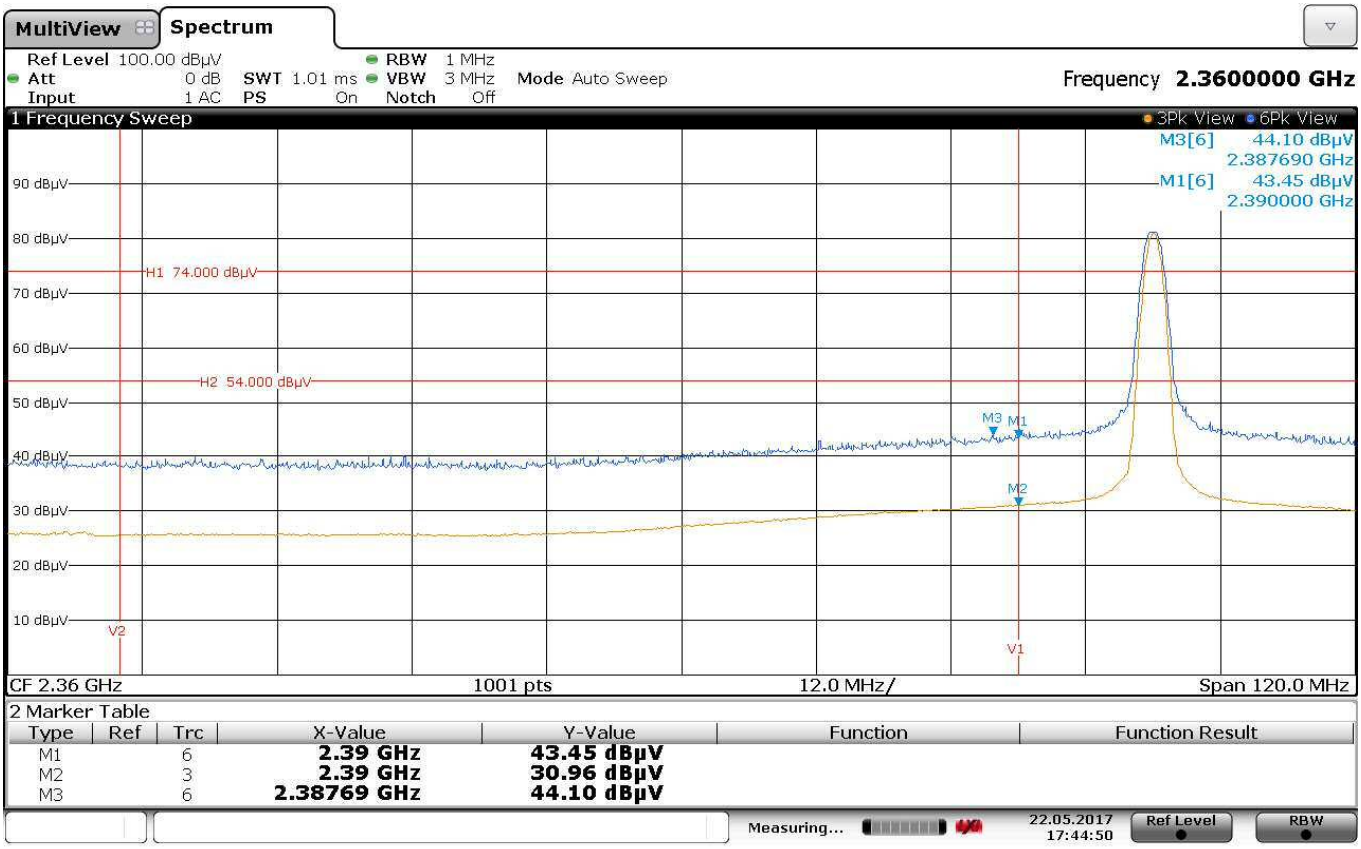
7.10.4.1 Band-Edge Compliance

Test Date :May 22, 2017
Temp.:24, Humi:52%

Mode of EUT : BDR, Hopping off (0ch: 2402 MHz) (worst case)
Antenna Polarization : Horizontal

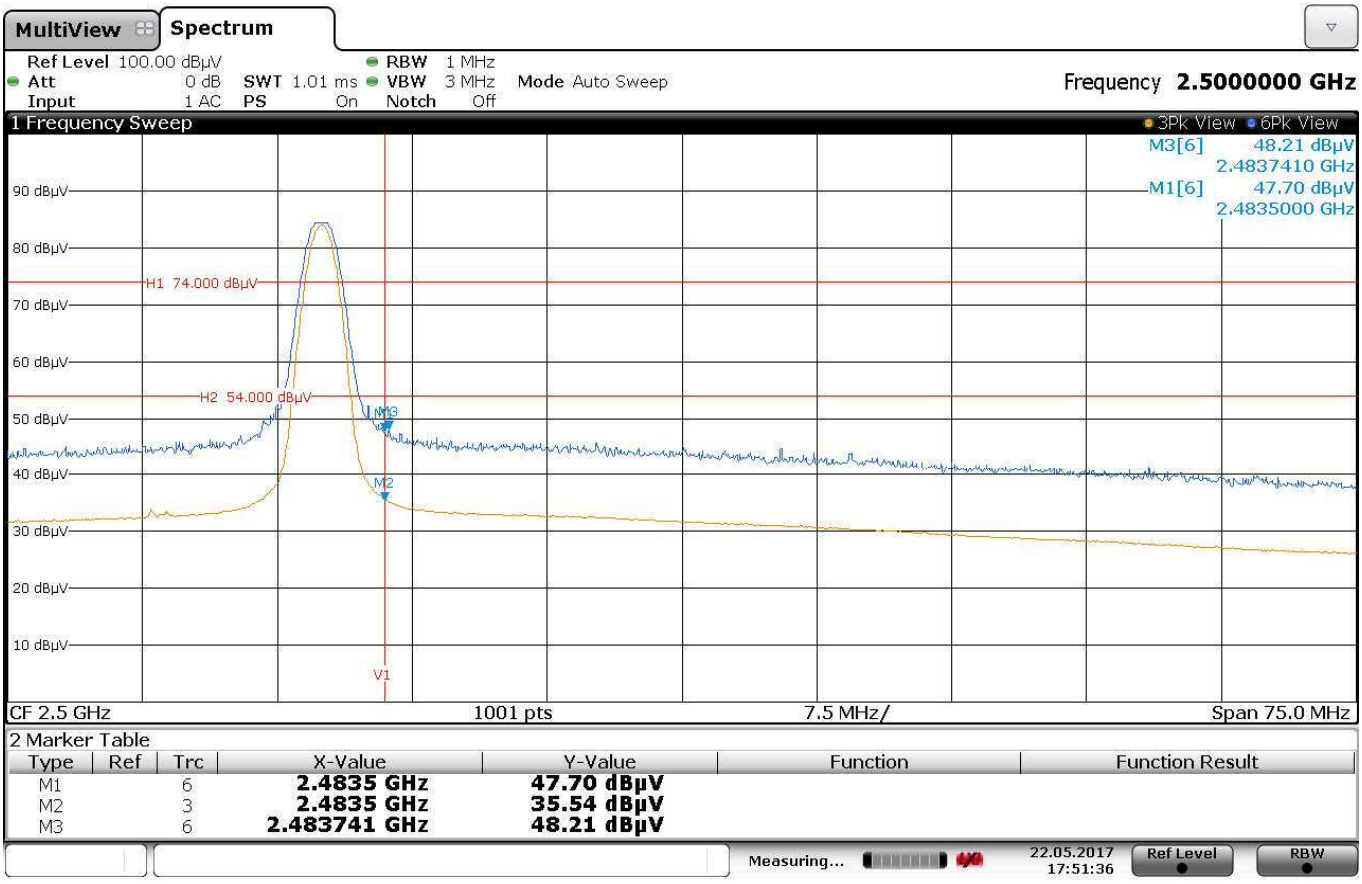


Mode of EUT : BDR, Hopping off (0ch: 2402 MHz) (worst case)
Antenna Polarization : Vertical



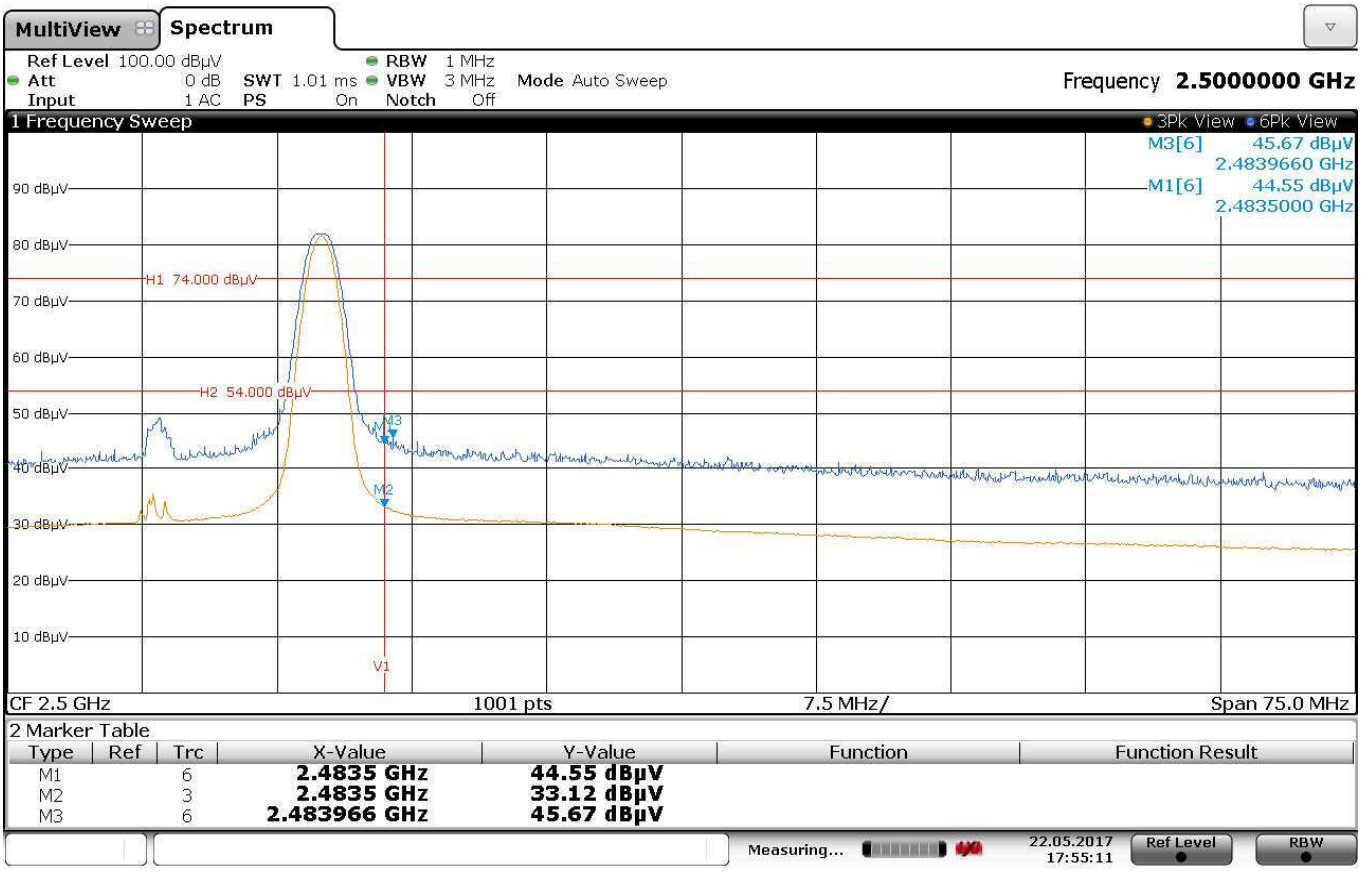
17:44:51 22.05.2017

Mode of EUT : BDR, Hopping off (78ch: 2480 MHz) (worst case)
Antenna Polarization : Horizontal



17:51:35 22.05.2017

Mode of EUT : BDR, Hopping off (78ch: 2480 MHz) (worst case)
Antenna Polarization : Vertical



17:55:13 22.05.2017

7.10.4.2 Other Sprious Emission (9kHz – 30 MHz)

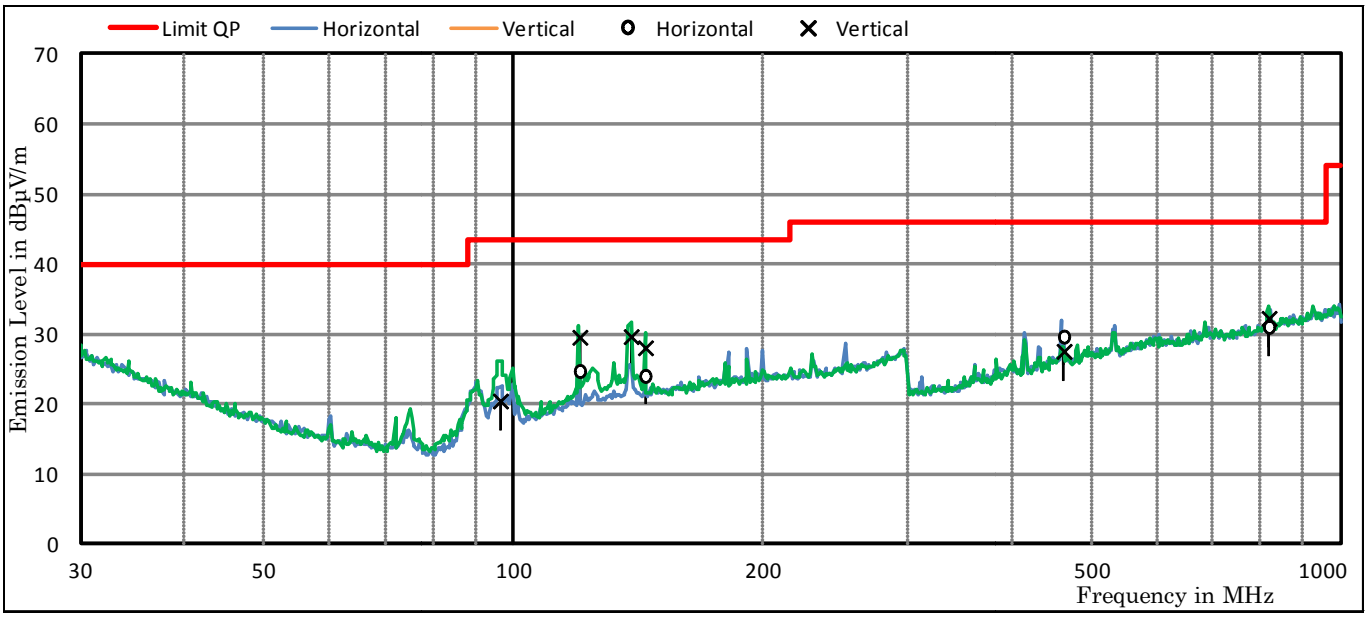
Test Date :May 23, 2017
Temp.:24, Humi:51%

Mode of EUT : All modes have been investigated and the worst case mode has been listed.
Results : No spurious emissions in the range 20dB below the limit.

7.10.4.3 Other Sprious Emission (30MHz – 1000 MHz)

Mode of EUT : All modes have been investigated and the worst case mode has been listed.

Measurement Date	Ambient Temperature	Relative Humidity	Atmospheric pressure
May 23, 2017	24 ℃	51 %	996 hPa



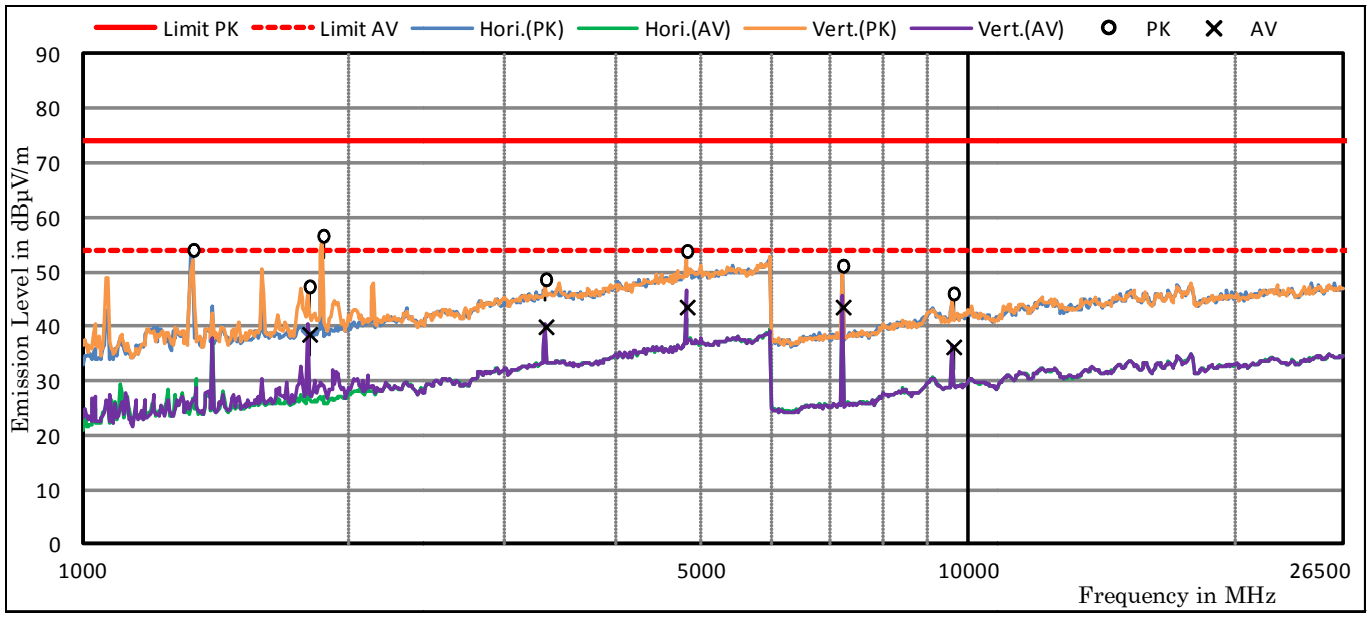
Frequency [MHz]	Polarity	Factor [dB/m]	Meter Reading [dBµV]	Limit [dBµV/m] QP	Emission Level [dBµV/m]	Margin [dB]	Azimuth / Ant.Height
96.2	Hori.	12.6	< - 2.0	43.5	< 10.6	> 32.9	
96.2	Vert.	12.6	7.9	43.5	20.5	23.0	57deg/1.00m
120.0	Hori.	16.4	8.4	43.5	24.8	18.7	257deg/1.65m
120.0	Vert.	16.4	13.2	43.5	29.6	13.9	173deg/1.00m
138.4	Hori.	17.7	< - 2.0	43.5	< 15.7	> 27.8	
138.4	Vert.	17.7	12.0	43.5	29.7	13.8	260deg/1.00m
144.0	Hori.	18.0	6.1	43.5	24.1	19.4	277deg/2.41m
144.0	Vert.	18.0	10.1	43.5	28.1	15.4	252deg/1.00m
461.6	Hori.	21.4	8.3	46.0	29.7	16.3	43deg/1.00m
461.6	Vert.	21.4	6.2	46.0	27.6	18.4	124deg/1.00m
816.5	Hori.	25.9	5.2	46.0	31.1	14.9	235deg/1.42m
816.5	Vert.	25.9	6.4	46.0	32.3	13.7	44deg/1.00m

Note
1) The testing location:Anechoic Chamber A-1
2) QP:Quasi-Peak
3) The symbol of '<' means 'or less' .
4) The symbol of '>' means 'or greater' .
5) The symbol of '-' means 'Not applicable' .
6) Factor includes Antenna factor, and a cable loss.
7) A sample calculation was made at 816.5MHz
Factor + Meter Reading = 25.9 + 6.4 = 32.3

7.10.4.4 Other Sprious Emission (Above 1GHz)

Mode of EUT : BDR Low Channel (worst case)

Measurement Date	Ambient Temperature	Relative Humidity	Atmospheric pressure
May 22, 2017	24 ℃	52 %	998 hPa

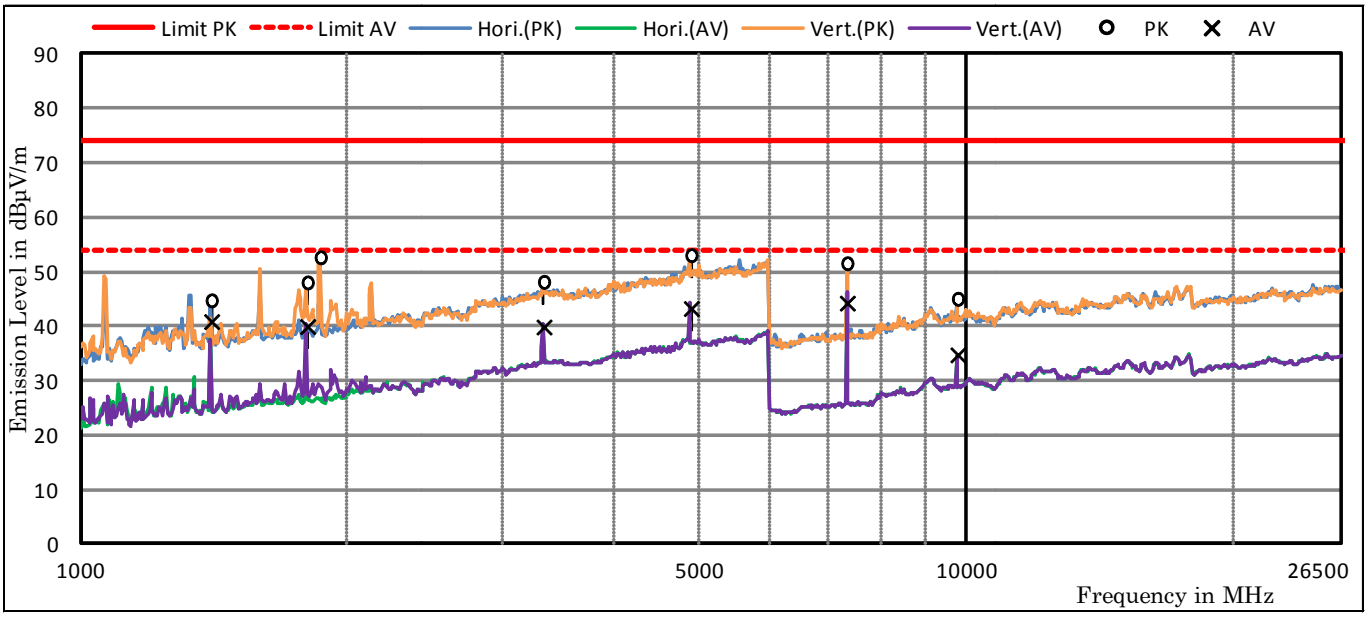


Frequency [MHz]	Polarity	Factor [dB/m]	Meter Reading [dBµV] PK	Meter Reading [dBµV] AV	Limit [dBµV/m] PK	Limit [dBµV/m] AV	Emission Level [dBµV/m] PK	Emission Level [dBµV/m] AV	Margin [dB] PK	Margin [dB] AV	Azimuth / Ant.Height
1330.8	Hori.	-1.8	55.9	< 30.0	74.0	54.0	54.1	< 28.2	19.9	> 25.8	186deg/1.50m
1330.8	Vert.	-1.8	54.2	< 30.0	74.0	54.0	52.4	< 28.2	21.6	> 25.8	251deg/1.56m
1800.0	Vert.	1.0	46.4	37.6	74.0	54.0	47.4	38.6	26.6	15.4	172deg/1.46m
1865.5	Vert.	1.2	55.5	< 30.0	74.0	54.0	56.7	< 31.2	17.3	> 22.8	181deg/1.42m
3328.0	Hori.	7.7	40.3	30.6	74.0	54.0	48.0	38.3	26.0	15.7	210deg/1.52m
3328.0	Vert.	7.7	41.0	32.3	74.0	54.0	48.7	40.0	25.3	14.0	343deg/1.50m
4804.0	Hori.	11.1	< 40.0	< 30.0	74.0	54.0	< 51.1	< 41.1	> 22.9	> 12.9	
4804.0	Vert.	11.1	42.8	32.5	74.0	54.0	53.9	43.6	20.1	10.4	350deg/1.50m
7206.0	Hori.	-0.3	48.5	39.4	74.0	54.0	48.2	39.1	25.8	14.9	255deg/1.52m
7206.0	Vert.	-0.3	51.5	43.9	74.0	54.0	51.2	43.6	22.8	10.4	307deg/1.55m
9608.0	Hori.	3.0	42.5	32.2	74.0	54.0	45.5	35.2	28.5	18.8	340deg/1.54m
9608.0	Vert.	3.0	43.1	33.3	74.0	54.0	46.1	36.3	27.9	17.7	346deg/1.54m

Note
1) The testing location:Anechoic Chamber A-1
2) PK:Peak, AV:Average
3) The symbol of '<' means 'or less' .
4) The symbol of '>' means 'or greater' .
5) The symbol of '-' means 'Not applicable' .
6) Factor includes Antenna factor,Amplifier gain, and a cable loss.
7) A sample calculation was made at 4804.0MHz
Factor + Meter Reading = 11.1 + 42.8 = 53.9

Mode of EUT : BDR Mid Channel (worst case)

Measurement Date	Ambient Temperature	Relative Humidity	Atmospheric pressure
May 22, 2017	24 ℃	52 %	998 hPa

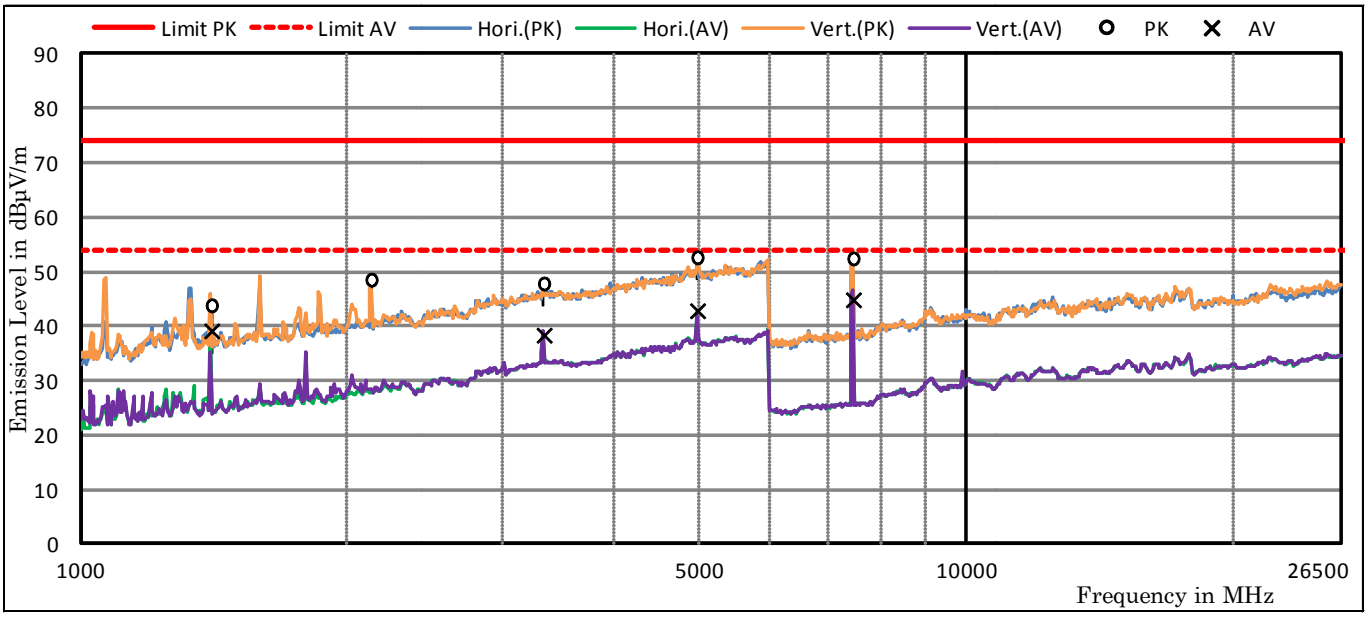


Frequency [MHz]	Polarity	Factor [dB/m]	Meter Reading [dBµV] PK	Meter Reading [dBµV] AV	Limit [dBµV/m] PK	Limit [dBµV/m] AV	Emission Level [dBµV/m] PK	Emission Level [dBµV/m] AV	Margin [dB] PK	Margin [dB] AV	Azimuth / Ant.Height
1402.3	Hori.	-1.2	46.0	42.1	74.0	54.0	44.8	40.9	29.2	13.1	101deg/1.61m
1402.3	Vert.	-1.2	43.8	37.4	74.0	54.0	42.6	36.2	31.4	17.8	188deg/1.50m
1800.0	Vert.	1.0	47.1	39.0	74.0	54.0	48.1	40.0	25.9	14.0	185deg/1.59m
1862.2	Vert.	1.2	51.5	< 30.0	74.0	54.0	52.7	< 31.2	21.3	> 22.8	186deg/1.43m
3328.0	Hori.	7.7	< 40.0	< 30.0	74.0	54.0	< 47.7	< 37.7	> 26.3	> 16.3	
3328.0	Vert.	7.7	40.5	32.2	74.0	54.0	48.2	39.9	25.8	14.1	18deg/1.00m
4882.0	Hori.	11.6	40.2	30.2	74.0	54.0	51.8	41.8	22.2	12.2	64deg/1.71m
4882.0	Vert.	11.6	41.5	31.7	74.0	54.0	53.1	43.3	20.9	10.7	2deg/1.49m
7323.0	Hori.	0.0	51.6	44.3	74.0	54.0	51.6	44.3	22.4	9.7	339deg/1.45m
7323.0	Vert.	0.0	51.6	44.3	74.0	54.0	51.6	44.3	22.4	9.7	41deg/1.55m
9764.0	Hori.	3.0	41.6	30.7	74.0	54.0	44.6	33.7	29.4	20.3	341deg/1.57m
9764.0	Vert.	3.0	42.1	31.8	74.0	54.0	45.1	34.8	28.9	19.2	347deg/1.48m

Note
1) The testing location:Anechoic Chamber A-1
2) PK:Peak, AV:Average
3) The symbol of '<' means 'or less' .
4) The symbol of '>' means 'or greater' .
5) The symbol of '-' means 'Not applicable' .
6) Factor includes Antenna factor,Amplifier gain, and a cable loss.
7) A sample calculation was made at 7323.0MHz
Factor + Meter Reading = 0.0 + 51.6 = 51.6

Mode of EUT : BDR High Channel (worst case)

Measurement Date	Ambient Temperature	Relative Humidity	Atmospheric pressure
May 22, 2017	24 ℃	52 %	998 hPa



Frequency [MHz]	Polarity	Factor [dB/m]	Meter Reading [dBµV] PK	Meter Reading [dBµV] AV	Limit [dBµV/m] PK	Limit [dBµV/m] AV	Emission Level [dBµV/m] PK	Emission Level [dBµV/m] AV	Margin [dB] PK	Margin [dB] AV	Azimuth / Ant.Height
1402.5	Hori.	-1.2	44.7	40.4	74.0	54.0	43.5	39.2	30.5	14.8	91deg/1.55m
1402.5	Vert.	-1.2	45.1	38.3	74.0	54.0	43.9	37.1	30.1	16.9	196deg/1.43m
2124.8	Hori.	2.9	< 40.0	< 30.0	74.0	54.0	< 42.9	< 32.9	> 31.1	> 21.1	
2124.8	Vert.	2.9	45.7	< 30.0	74.0	54.0	48.6	< 32.9	25.4	> 21.1	141deg/1.55m
3328.5	Hori.	7.8	< 40.0	< 30.0	74.0	54.0	< 47.8	< 37.8	> 26.2	> 16.2	
3328.5	Vert.	7.8	40.1	30.6	74.0	54.0	47.9	38.4	26.1	15.6	338deg/1.55m
4960.0	Hori.	11.6	40.5	30.1	74.0	54.0	52.1	41.7	21.9	12.3	67deg/1.55m
4960.0	Vert.	11.6	41.1	31.3	74.0	54.0	52.7	42.9	21.3	11.1	359deg/1.53m
7440.0	Hori.	0.4	50.8	43.3	74.0	54.0	51.2	43.7	22.8	10.3	341deg/1.46m
7440.0	Vert.	0.4	52.1	44.5	74.0	54.0	52.5	44.9	21.5	9.1	58deg/1.42m
9920.0	Hori.	3.7	< 40.0	< 30.0	74.0	54.0	< 43.7	< 33.7	> 30.3	> 20.3	
9920.0	Vert.	3.7	< 40.0	< 30.0	74.0	54.0	< 43.7	< 33.7	> 30.3	> 20.3	

Note
1) The testing location:Anechoic Chamber A-1
2) PK:Peak, AV:Average
3) The symbol of '<' means 'or less' .
4) The symbol of '>' means 'or greater' .
5) The symbol of '-' means 'Not applicable' .
6) Factor includes Antenna factor,Amplifier gain, and a cable loss.
7) A sample calculation was made at 7440.0MHz
Factor + Meter Reading = 0.4 + 52.1 = 52.5