

TEST REPORT



DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1909-0249(1)
2. Customer
 - Name (FCC) : Point Mobile Co., LTD. / Name (IC) : POINTMOBILE CO.,LTD
 - Address (FCC) : B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709
 - Address (IC) : B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
3. Use of Report : FCC & IC Original Grant
4. Product Name / Model Name : Mobile Computer / PM90G
FCC ID : V2X-PM90G / IC : 10664A-PM90G
5. Test Method Used : ANSI C63.10-2013, KDB 558074D01v05r02
Test Specification : FCC Part 15 Subpart C.247
RSS-247 Issue 2, RSS-GEN Issue 5
6. Date of Test : 2019.06.18 ~ 2019.07.19
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by	 (Signature)	Reviewed by	 (Signature)
	Name : JaeJin Lee		Name : GeunKi Son	

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2019 . 10 . 24 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1909-0249	Sep. 24, 2019	Initial issue
DRTFCC1909-0249(1)	Oct. 24, 2019	Updated the section 1.8

Table of Contents

1. General Information	4
1.1 Testing Laboratory	4
1.2 Testing Environment	4
1.3 Measurement Uncertainty	4
1.4 Details of Applicant	5
1.5 Description of EUT	5
1.6 Declaration by the applicant / manufacturer	5
1.7 Information about the FHSS characteristics	6
1.8 Test Equipment List.....	7
1.9 Summary of Test Results.....	8
1.10 Conclusion of worst-case and operation mode.....	9
2. Maximum Peak Output Power Measurement	10
2.1 Test Setup	10
2.2 Limit.....	10
2.3 Test Procedure.....	10
2.4 Test Results	11
3. 20 dB BW & Occupied BW	17
3.1 Test Setup	17
3.2 Limit.....	17
3.3 Test Procedure.....	17
3.4 Test Results	17
4. Carrier Frequency Separation.....	23
4.1 Test Setup	23
4.2 Limit.....	23
4.3 Procedure.....	23
4.4 Test Results	23
5. Number of Hopping Frequencies	28
5.1 Test Setup	28
5.2 Limit.....	28
5.3 Procedure.....	28
5.4 Test Results	28
6. Time of Occupancy (Dwell Time).....	34
6.1 Test Setup	34
6.2 Limit.....	34
6.3 Test Procedure.....	34
6.4 Test Results	34
7. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission	39
7.1 Test Setup	39
7.2 Limit.....	39
7.3. Test Procedures.....	40
7.3.1. Test Procedures for Radiated Spurious Emissions	40
7.3.2. Test Procedures for Conducted Spurious Emissions.....	41
7.4. Test Results	42
7.4.1. Radiated Emissions.....	42
7.4.2. Conducted Spurious Emissions	45
8. Transmitter AC Power Line Conducted Emission	69
8.1 Test Setup	69
8.2 Limit.....	69
8.3 Test Procedures.....	69
8.4 Test Results	70
9. Antenna Requirement	72
APPENDIX I	73
APPENDIX II	74

1. General Information

1.1 Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014.		
- FCC MRA Accredited Test Firm No. : KR0034		
- IC Test site No. : 5740A		
www.dtnet.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2 Testing Environment

Ambient Condition	
▪ Temperature	+20 °C ~ +25 °C
▪ Relative Humidity	35 % ~ 45 %

1.3 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
Transmitter Output Power	0.7 dB (The confidence level is about 95 %, $k = 2$)
Conducted spurious emission	0.9 dB (The confidence level is about 95 %, $k = 2$)
AC conducted emission	2.4 dB (The confidence level is about 95 %, $k = 2$)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, $k = 2$)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, $k = 2$)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, $k = 2$)

1.4 Details of Applicant

Applicant (FCC) : Point Mobile Co., LTD.
 Applicant (IC) : POINTMOBILE CO.,LTD
 Address (FCC) : B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709
 Address (IC) : B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
 Contact person (FCC) : Wilson Park
 Contact person (IC) : Wilson Park

1.5 Description of EUT

EUT	Mobile Computer
Model Name(FCC, IC)	PM90G
Add Model Name	-
Hardware Version	4
Software Version	90.02
Serial Number	Identical prototype
Power Supply	DC 3.85 V
Frequency Range	2402 MHz ~ 2480 MHz
Modulation Technique	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79
Antenna Type	LDS Antenna
Antenna Gain	PK : 0.4 dBi

1.6 Declaration by the applicant / manufacturer

- NA

1.7 Information about the FHSS characteristics

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following :

A) The hopping sequence is pseudorandom

Note 1 : Pseudorandom Frequency Hopping Sequence Table as below:

Channel: 08, 24, 40, 56, 42, 54, 72, 09, 01, 11, 33, 41, 34, 42, 65, 73, 53, 69, 06, 22, 04, 20,
36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 41, 58, 44, 60, 76, 13, 03, 11, 35, 43,
37, 45, 69, 77, 52, 71, 08, 24, 06, 24, 48, 56, 45, 46, 70, 01, 72, 06, 25, 33, 12, 28,
49, 60, 45, 58, 74, 13, 05, 18, 37, 49 etc

The System receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchroniztation with the transmit ted signals.

B) All channels are used equally on average

C) The receiver input bandwidth equals the transmit bandwidth

D) The receiver hops in sequence with the transmit signal

- 15.247(g) : In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h) : In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection / hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h) : The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

1.8 Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/07/06	19/07/06	US47360812
			19/06/26	20/06/26	
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
DC Power Supply	Agilent Technologies	66332A	18/12/18	19/12/18	US37473833
Multimeter	FLUKE	17B	18/12/18	19/12/18	26030065WS
Signal Generator	Rohde Schwarz	SMBV100A	18/12/19	19/12/19	255571
Signal Generator	ANRITSU	MG3695C	18/12/10	19/12/10	173501
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-1
Thermohygrometer	SATO	PC-5000TRH-II	18/07/18	19/07/18	N/A
			19/07/18	20/07/18	
Thermohygrometer	BODYCOM	BJ5478	18/07/09	19/07/09	N/A
			19/07/03	20/07/03	
HYGROMETER	TESTO	608-H1	19/01/31	20/01/31	34862883
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
Horn Antenna	ETS-Lindgren	3115	18/01/30	20/01/30	6419
Horn Antenna	A.H.Systems Inc.	SAS-574	17/07/31	19/07/31	155
PreAmplifier	tsj	MLA-0118-J01-45	18/12/19	19/12/19	17138
PreAmplifier	tsj	MLA-1840-J02-45	18/07/06	19/07/06	16966-10728
			19/06/27	20/06/27	
PreAmplifier	tsj	MLA-10K01-B01-27	18/10/31	19/10/31	2005354
BlueTooth Tester	TESCOM	TC-3000B	18/12/18	19/12/18	3000B770243
Power Splitter	Anritsu	K241B	18/12/18	19/12/18	1301181
Attenuator	SMAJK	SMAJK-2-3	18/07/02	19/07/02	4
			19/06/25	20/06/25	
Attenuator	SMAJK	SMAJK-2-3	18/07/02	19/07/02	3
			19/06/27	20/06/27	
Attenuator	SRTechnology	F01-B0606-01	18/07/02	19/07/02	13092403
			19/06/27	20/06/27	
Attenuator	Hefei Shunze	SS5T2.92-10-40	18/07/03	19/07/03	16012202
			19/06/27	20/06/27	
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	18/07/03	19/07/03	3
			19/06/27	20/06/27	
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	18/07/02	19/07/02	8
			19/06/26	20/06/26	
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	18/07/02	19/07/02	1
			19/06/26	20/06/26	
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2411B	18/12/19	19/12/19	1338004 1306053
EMI Receiver	ROHDE&SCHWARZ	ESW44	18/08/06	19/08/06	101645
EMI Test Receiver	Rohde Schwarz	ESCI7	19/01/30	20/01/30	100910
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	18/09/27	19/09/27	101333
LISN	SCHWARZBECK	NNLK 8121	19/03/19	20/03/19	06183
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-1
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-2
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-3
Cable	HUBER+SUHNER	SUCOFLEX	18/12/21	19/12/21	C-4
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-04
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-07
Cable	DT&C	Cable	19/01/14	20/01/14	G-13
Cable	DT&C	Cable	19/01/14	20/01/14	G-14
Cable	HUBER+SUHNER	SUCOFLEX 104	19/01/14	20/01/14	G-15
Cable	DT&C	Cable	19/01/15	20/01/15	RF-55
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0177
Test Software	tsj	Noise Terminal Voltage Measurement	NA	NA	Version 2.00.0170

Note 1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.

Note 2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

1.9 Summary of Test Results

FCC Part RSS Std.	Parameter	Limit (Using in 2400~ 2483.5 MHz)	Test Condition	Status Note 1
15.247(a) RSS-247(5.1)	Carrier Frequency Separation	≥ 25 kHz or $\geq$ Two thirds of the 20 dB BW, whichever is greater.	Conducted	C
	Number of Hopping Frequencies	≥ 15 hops		C
	20 dB Bandwidth	N/A		C
	Dwell Time	≤ 0.4 seconds		C
15.247(b) RSS-247(5.4)	Transmitter Output Power	For FCC ≤ 1 Watt , if CHs ≥ 75 Others ≤ 0.125 W For IC if CHs ≥ 75 ≤ 1 Watt For Conducted Power ≤ 4 Watt For e.i.r.p, Others ≤ 0.125 W For Conducted Power. ≤ 0.5 Watt For e.i.r.p		C
15.247(d) RSS-247(5.5)	Conducted Spurious Emissions	The radiated emission to any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density.		C
RSS Gen(6.7)	Occupied Bandwidth (99 %)	N/A		C
15.247(d) 15.205 & 209 RSS-247(5.5) RSS-Gen (8.9 & 8.10)	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	C ^{Note3}
15.207 RSS-Gen(8.8)	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C
Note 1 : C = Comply NC = Not Comply NT = Not Tested NA = Not Applicable Note 2 : For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS. Note 3 : This test item was performed in each axis and the worst case data was reported.				

1.10 Conclusion of worst-case and operation mode

The EUT has three types of modulation (GFSK, $\pi/4$ DQPSK and 8DPSK).

Therefore all applicable requirements were tested with all the modulations.

And packet type was tested at the worst case(DH5).

The field strength of spurious emission was measured in three orthogonal EUT positions (X-axis, Y-axis and Z-axis).

Tested frequency information,

- Hopping Function : Enable

	TX Frequency (MHz)	RX Frequency (MHz)
Hopping Band	2402 ~ 2480	2402 ~ 2480

- Hopping Function : Disable

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2402	2402
Middle Channel	2441	2441
Highest Channel	2480	2480

2. Maximum Peak Output Power Measurement

2.1 Test Setup

Refer to the APPENDIX I.

2.2 Limit

■ FCC Requirements

The maximum peak output power of the intentional radiator shall not exceed the following :

1. §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
2. §15.247(b)(1), For frequency hopping systems operating in the 2400 – 2483.5 MHz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725 – 5805 MHz band : 1 Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

■ IC Requirements

1. RSS-247(5.4) (b), For FHSS operating in the band 2400 - 2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels, the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p shall not exceed 4 W, except as provided in section 5.4(e)

2.3 Test Procedure

1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.
2. The peak output power of the fundamental frequency was measured with the spectrum analyzer using ;
Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel
RBW $\geq$ 20 dB BW
VBW $\geq$ RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.4 Test Results

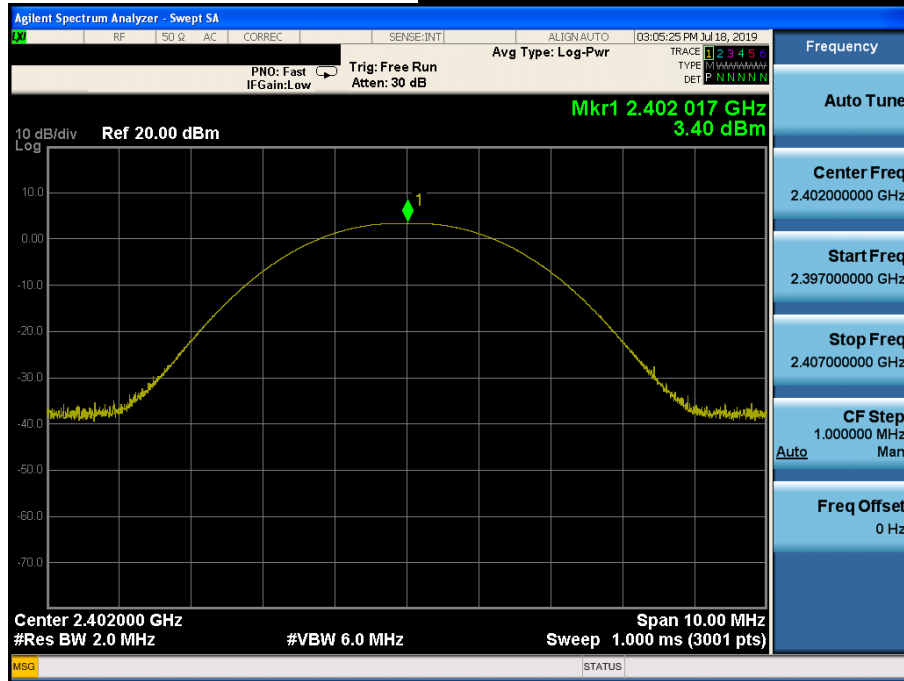
Modulation	Tested Channel	Frame Average Output Power		Peak Output Power	
		dBm	mW	dBm	mW
<u>GFSK</u>	Lowest	2.12	1.63	3.40	2.19
	Middle	2.93	1.96	4.78	3.01
	Highest	4.29	2.69	5.92	3.91
<u>$\pi/4$DQPSK</u>	Lowest	-1.20	0.76	2.48	1.77
	Middle	-0.55	0.88	3.71	2.35
	Highest	0.98	1.25	5.00	3.16
<u>8DPSK</u>	Lowest	-1.21	0.76	2.80	1.91
	Middle	-0.56	0.88	4.05	2.54
	Highest	0.97	1.25	5.37	3.44

Note 1 : The Frame average output power was tested using an average power meter for reference only.

Note 2 : See next pages for actual measured spectrum plots.

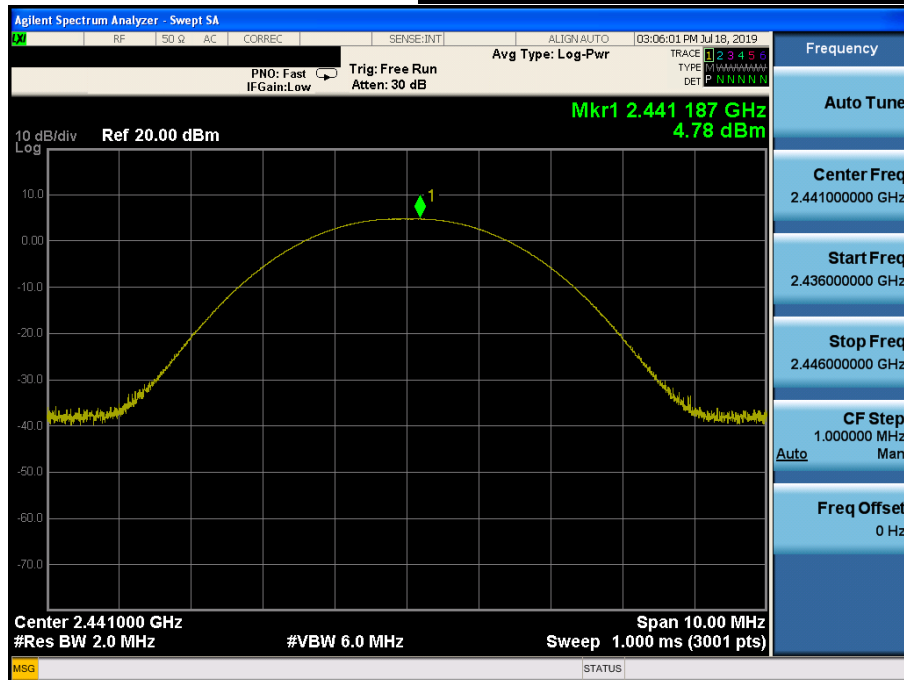
Peak Output Power

Lowest Channel & Modulation : GFSK



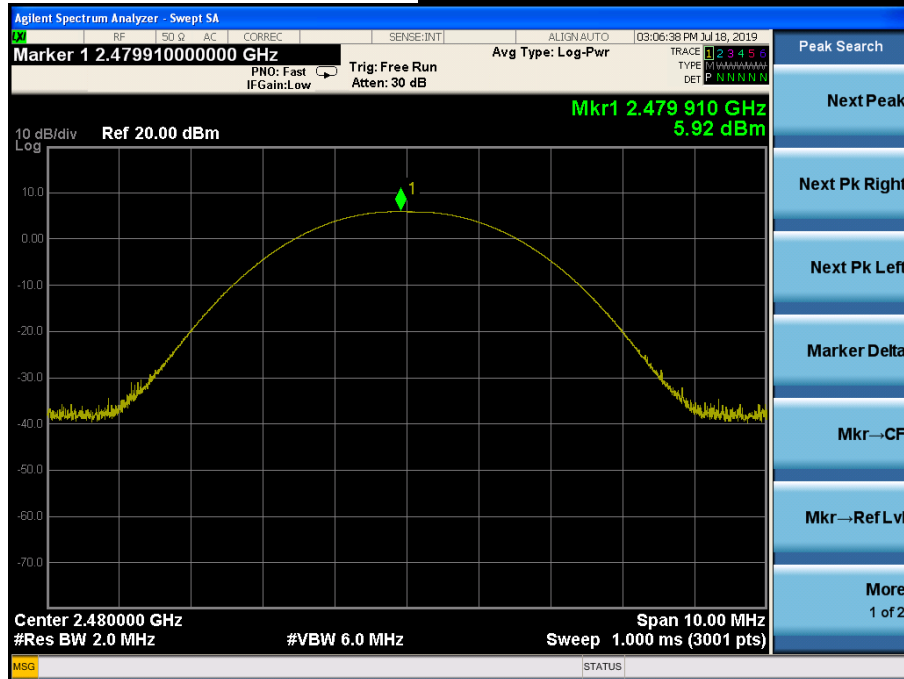
Peak Output Power

Middle Channel & Modulation : GFSK



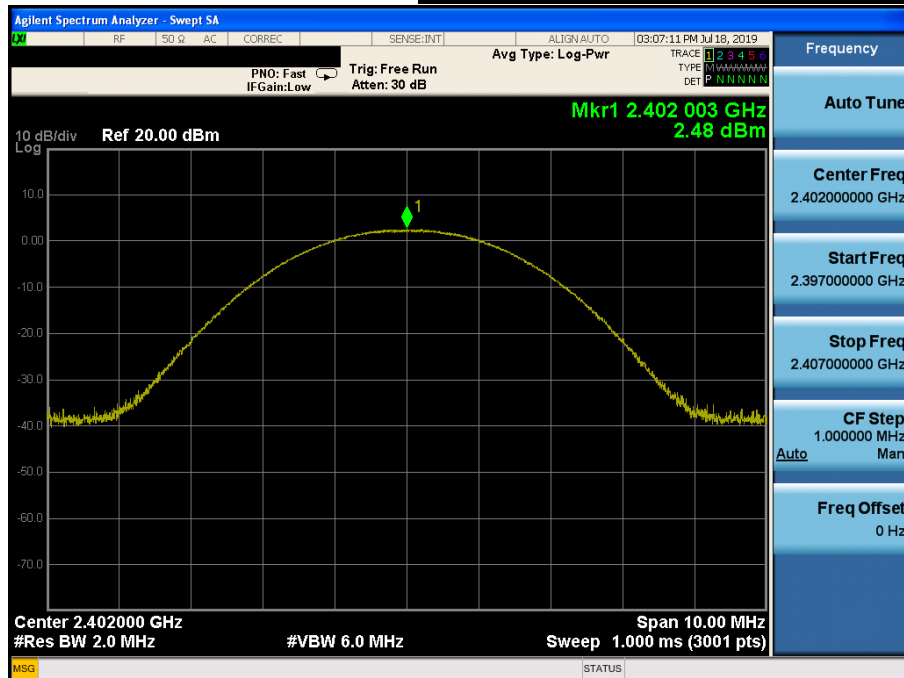
Peak Output Power

Highest Channel & Modulation : GFSK



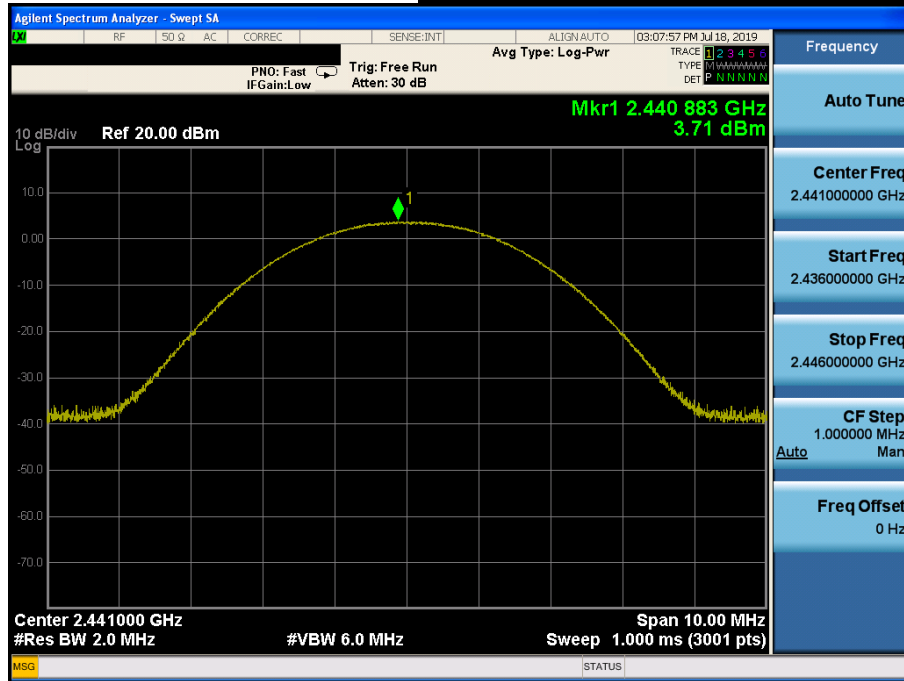
Peak Output Power

Lowest Channel & Modulation : $\pi/4$ DQPSK



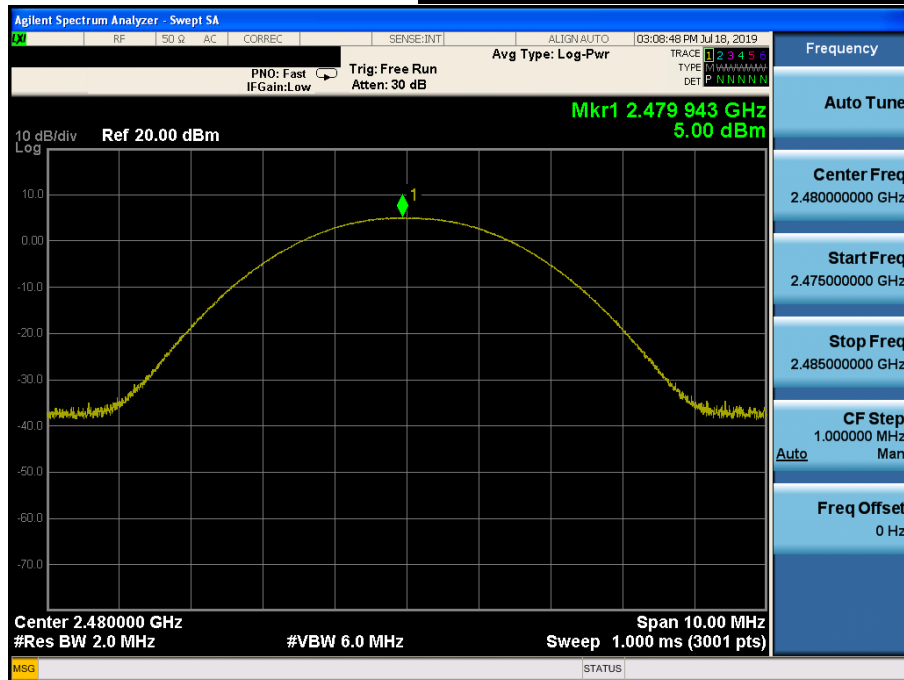
Peak Output Power

Middle Channel & Modulation : $\pi/4$ DQPSK



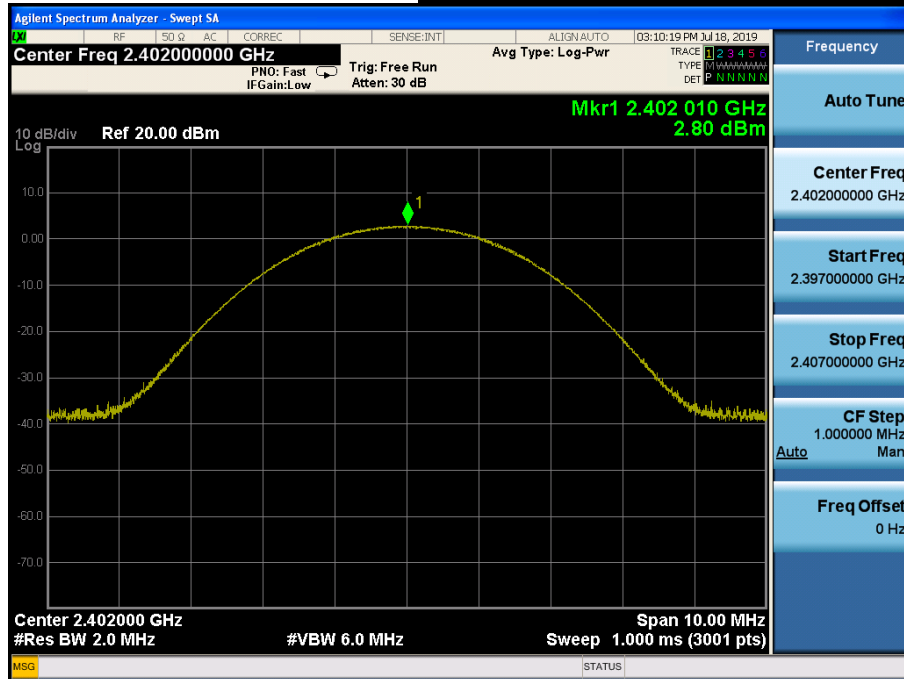
Peak Output Power

Highest Channel & Modulation : $\pi/4$ DQPSK



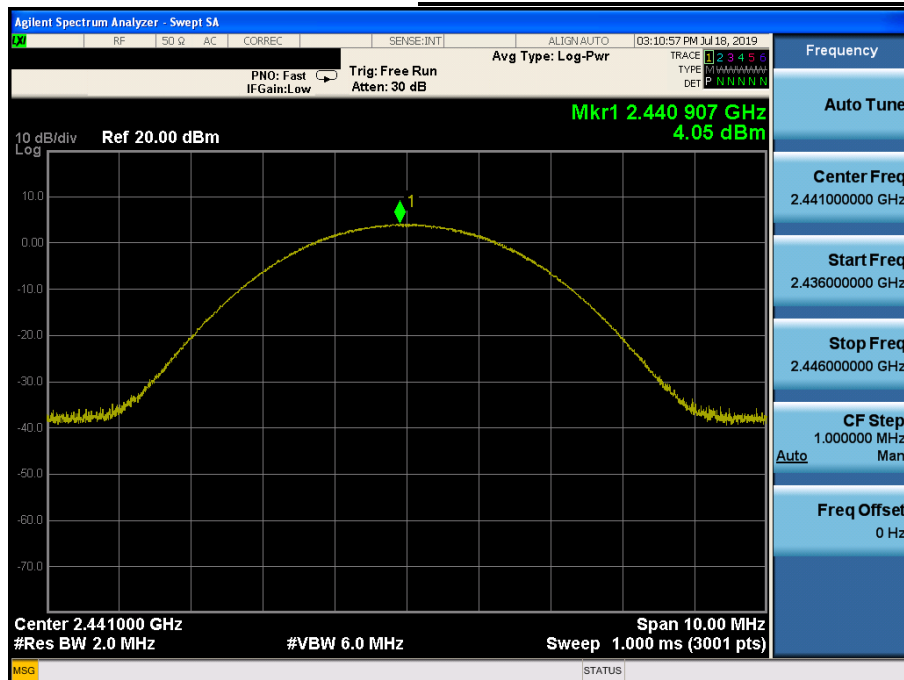
Peak Output Power

Lowest Channel & Modulation : 8DPSK



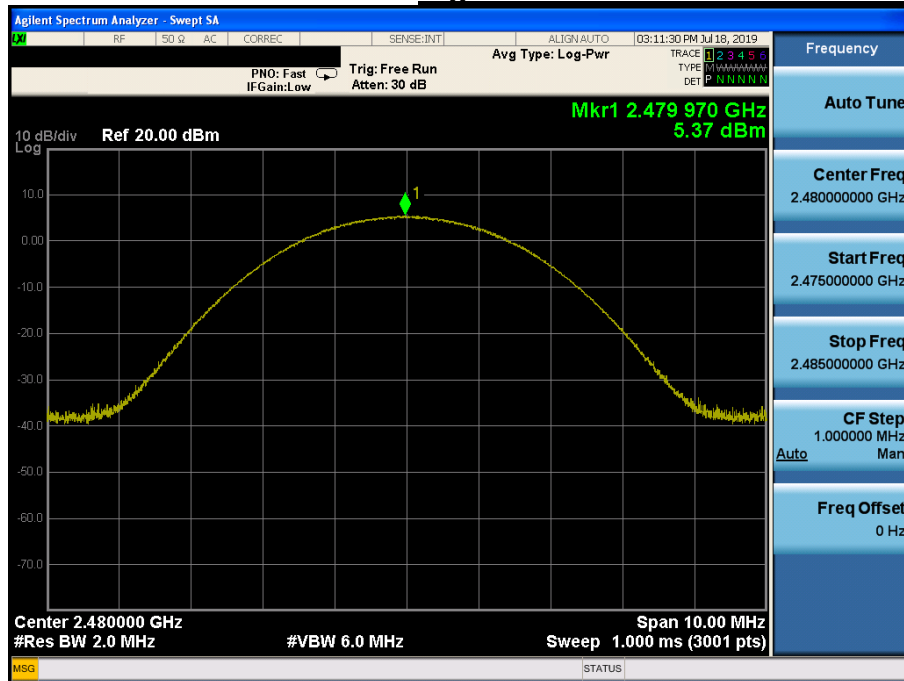
Peak Output Power

Middle Channel & Modulation : 8DPSK



Peak Output Power

Highest Channel & Modulation : 8DPSK



3. 20 dB BW & Occupied BW

3.1 Test Setup

Refer to the APPENDIX I.

3.2 Limit

Limit : Not Applicable

3.3 Test Procedure

1. The 20 dB bandwidth & Occupied bandwidth were measured with a spectrum analyzer connected to RF antenna Connector(conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using below setting:
RBW = 1% to 5% of the 20 dB BW & Occupied BW
VBW $\geq 3 \times$ RBW
Span = between two times and five times the 20 dB bandwidth & Occupied BW
Sweep = auto
Detector function = peak
Trace = max hold

3.4 Test Results

Modulation	Tested Channel	20 dB BW (MHz)	Occupied BW (MHz)
<u>GFSK</u>	Lowest	0.885	0.825
	Middle	0.885	0.828
	Highest	0.885	0.827
<u>$\pi/4$DQPSK</u>	Lowest	1.261	1.165
	Middle	1.316	1.169
	Highest	1.317	1.169
<u>8DPSK</u>	Lowest	1.281	1.174
	Middle	1.276	1.174
	Highest	1.286	1.175

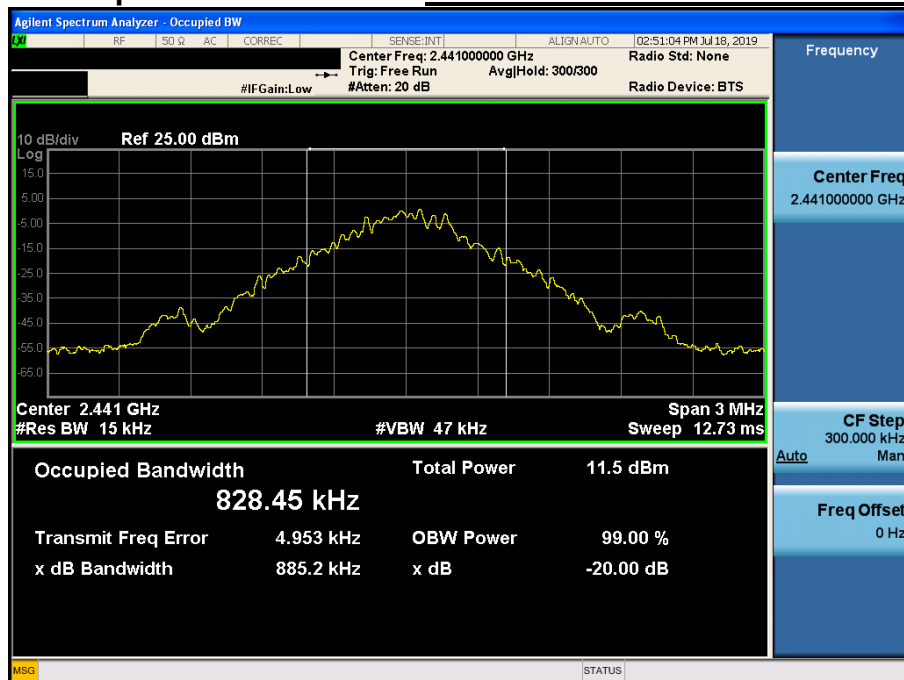
20 dB BW & Occupied BW

Lowest Channel & Modulation : GFSK



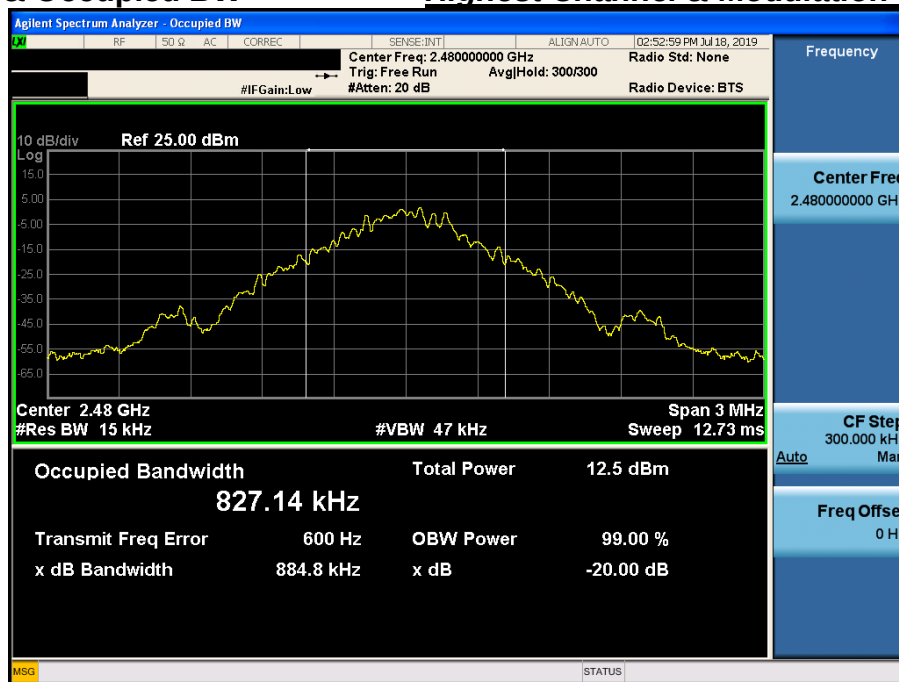
20 dB BW & Occupied BW

Middle Channel & Modulation : GFSK



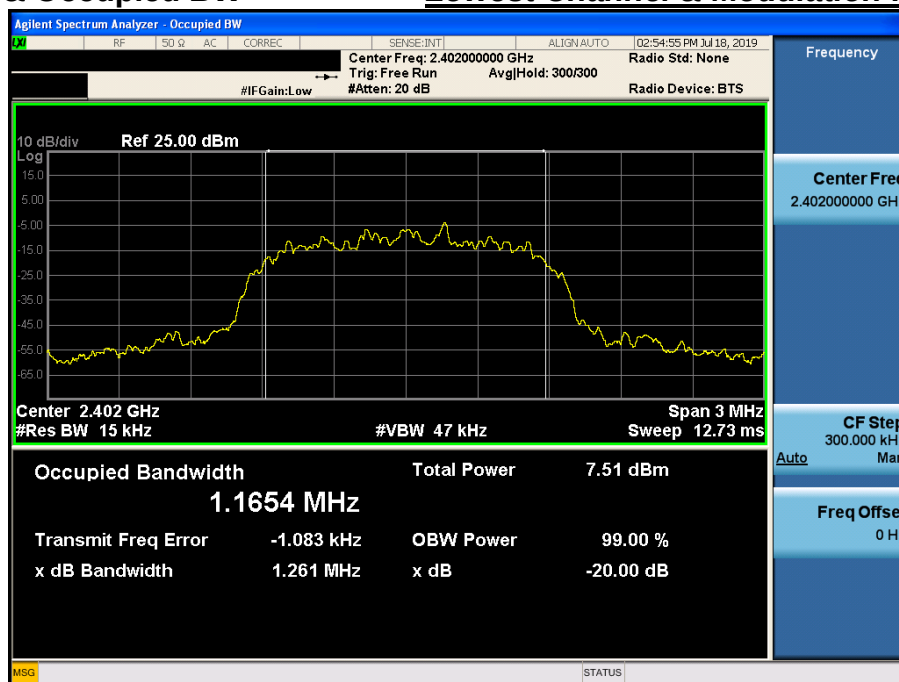
20 dB BW & Occupied BW

Highest Channel & Modulation : GFSK



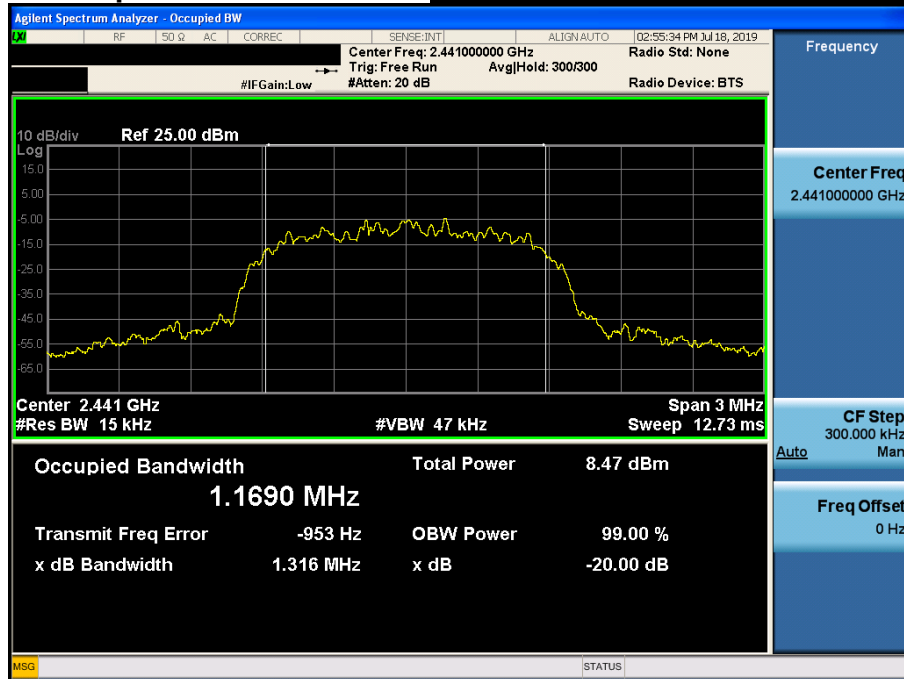
20 dB BW & Occupied BW

Lowest Channel & Modulation : $\pi/4$ DQPSK



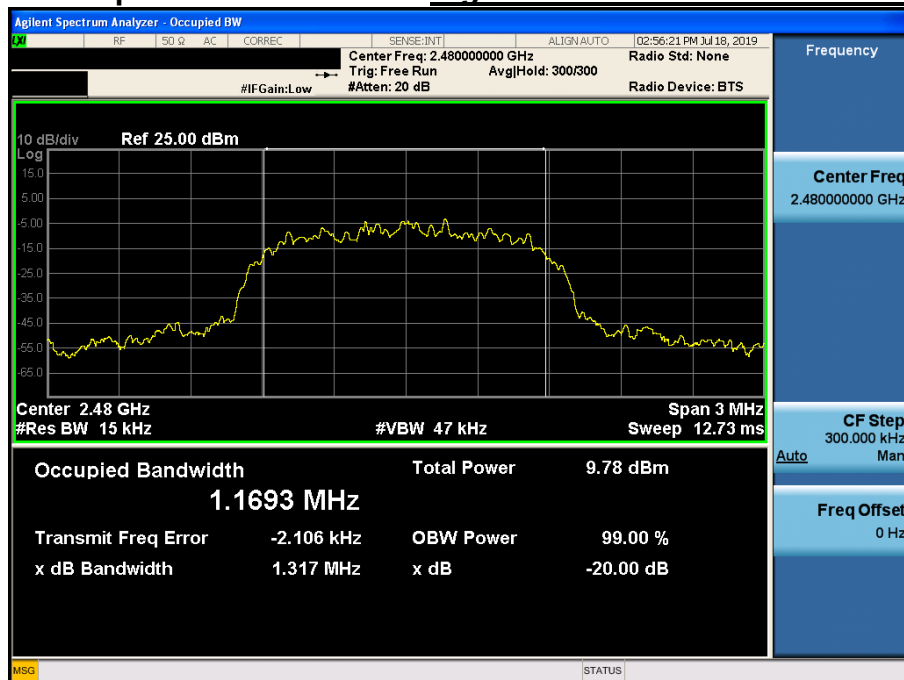
20 dB BW & Occupied BW

Middle Channel & Modulation : $\pi/4$ DQPSK



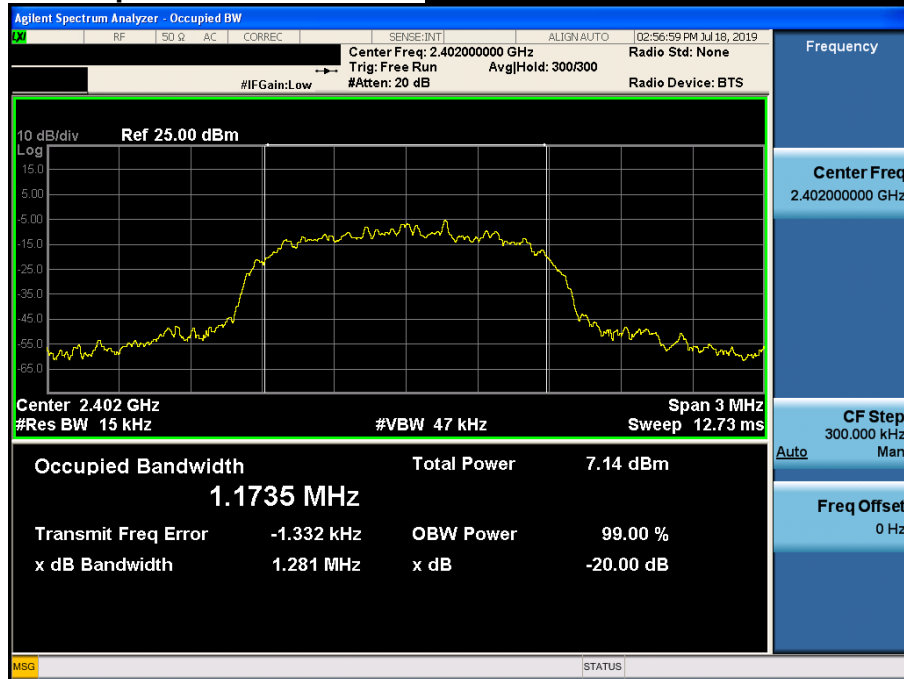
20 dB BW & Occupied BW

Highest Channel & Modulation : $\pi/4$ DQPSK



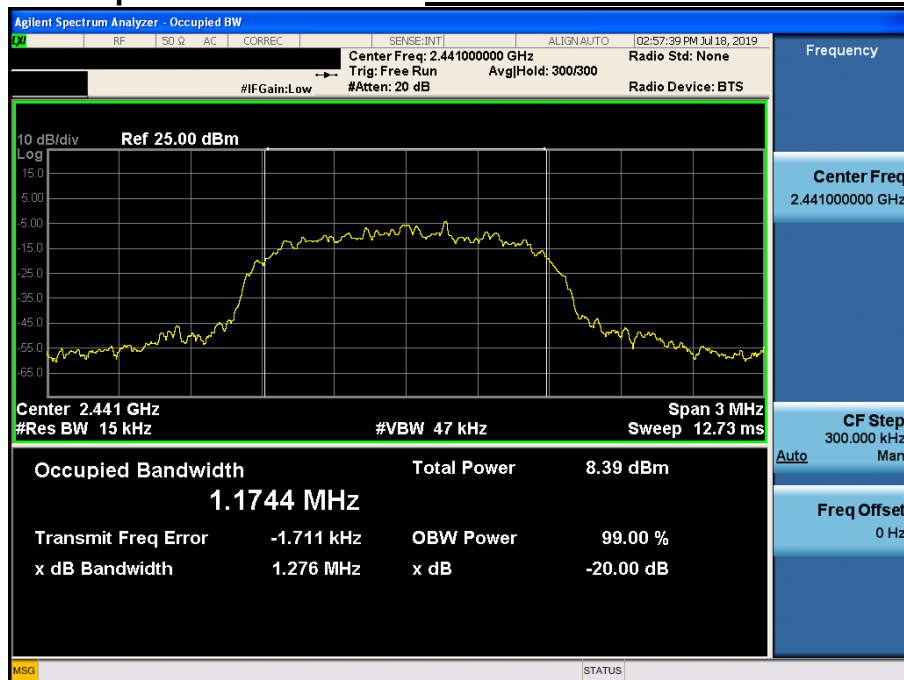
20 dB BW & Occupied BW

Lowest Channel & Modulation : 8DPSK



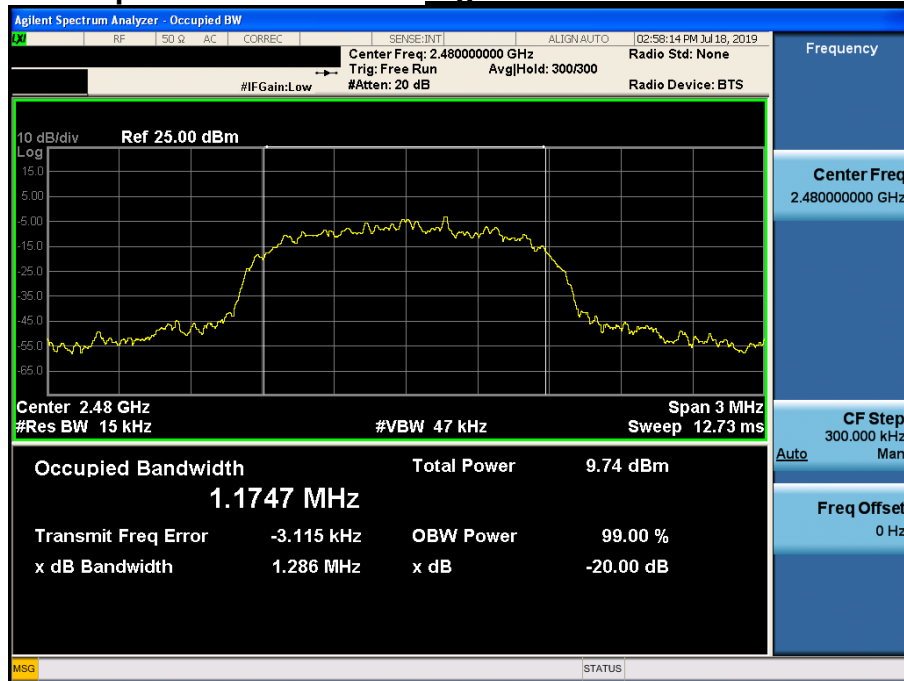
20 dB BW & Occupied BW

Middle Channel & Modulation : 8DPSK



20 dB BW & Occupied BW

Highest Channel & Modulation : 8DPSK



4. Carrier Frequency Separation

4.1 Test Setup

Refer to the APPENDIX I.

4.2 Limit

Limit : ≥ 25 kHz or $\geq$ Two-Thirds of the 20 dB BW whichever is greater.

4.3 Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to :

Span = wide enough to capture the peaks of two adjacent channels

RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

4.4 Test Results

FH mode

Hopping Mode	Modulation	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
Enable	GFSK	2440.897	2441.898	1.001
	$\pi/4$ DQPSK	2441.156	2442.155	0.999
	8DPSK	2441.000	2441.996	0.996

AFH mode

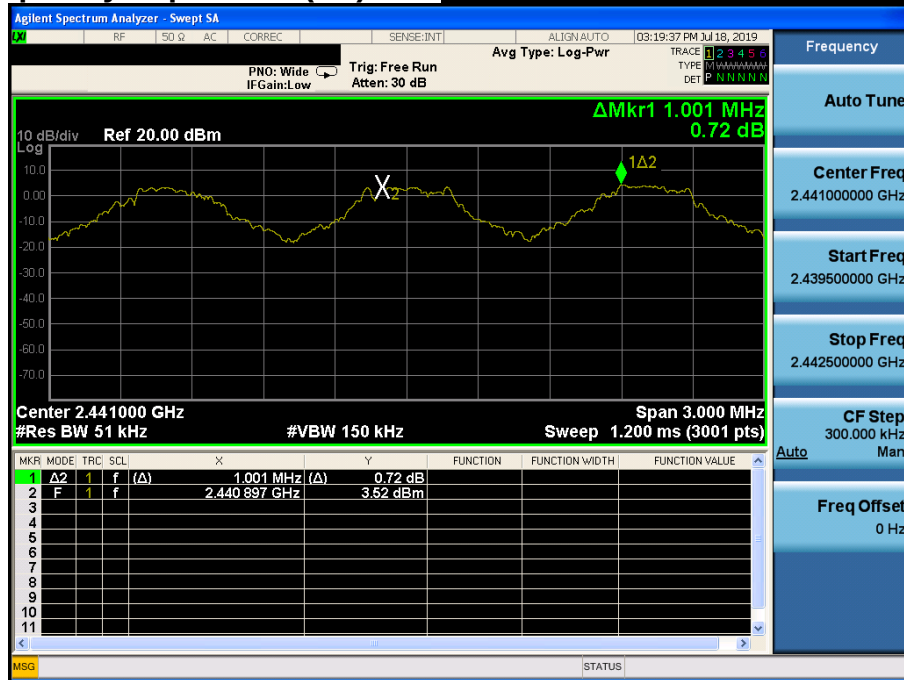
Hopping Mode	Modulation	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
Enable	GFSK	2440.847	2441.846	0.999
	$\pi/4$ DQPSK	2441.009	2442.011	1.002
	8DPSK	2441.135	2442.137	1.002

Note 1 : See next pages for actual measured spectrum

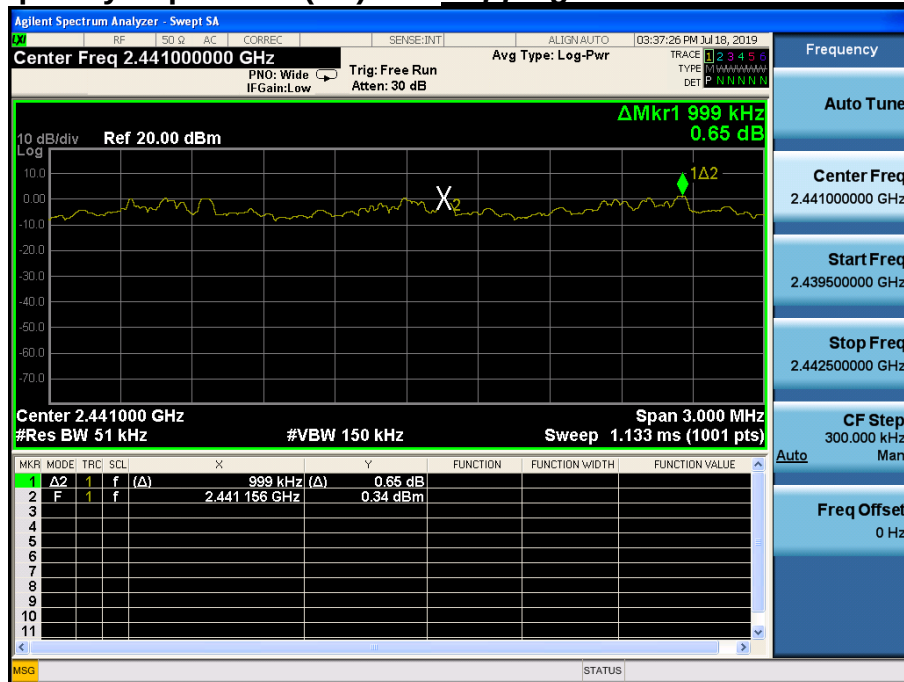
- Minimum Standard :

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
Alternatively, frequency hopping systems operating in the 2400 - 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

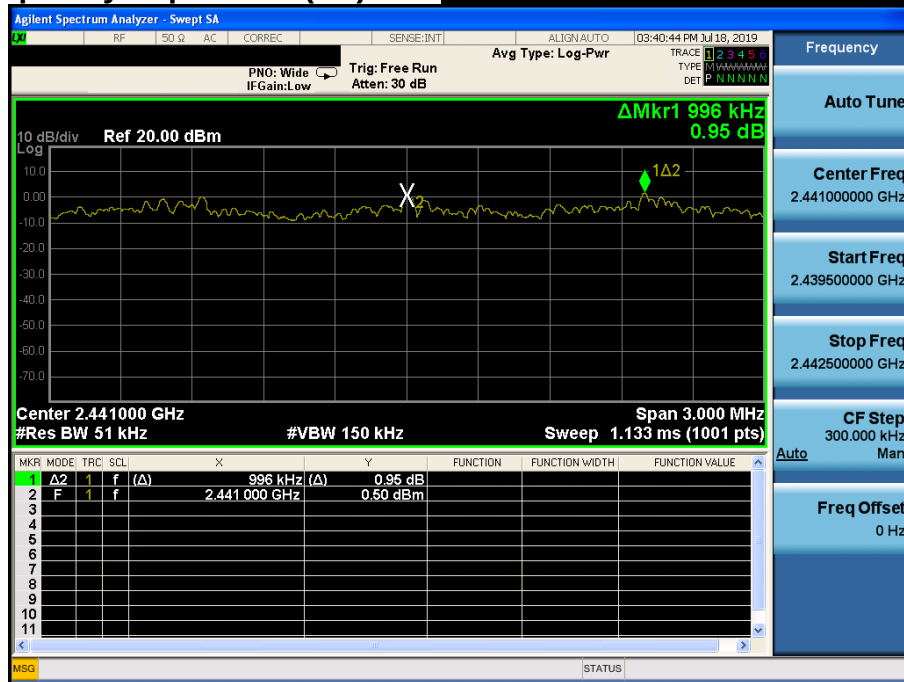
Carrier Frequency Separation (FH) *Hopping mode : Enable & GFSK*

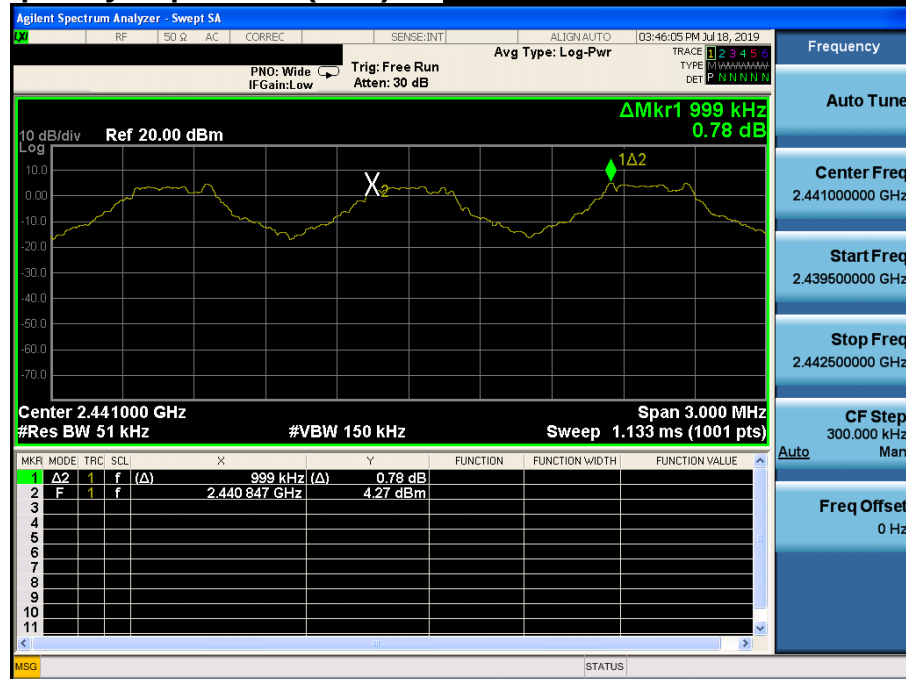
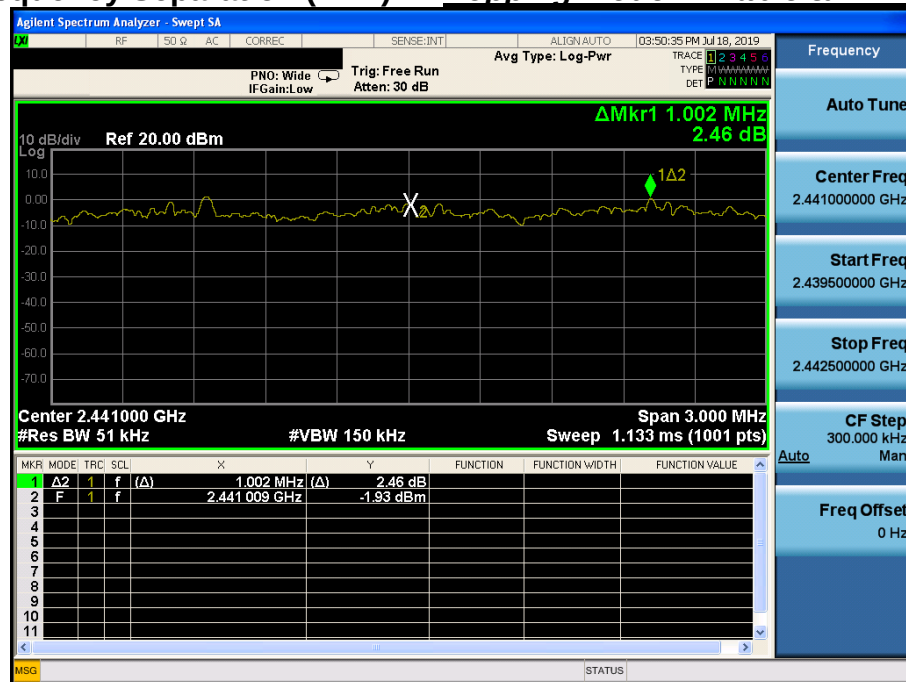


Carrier Frequency Separation (FH) *Hopping mode : Enable & π/4DQPSK*

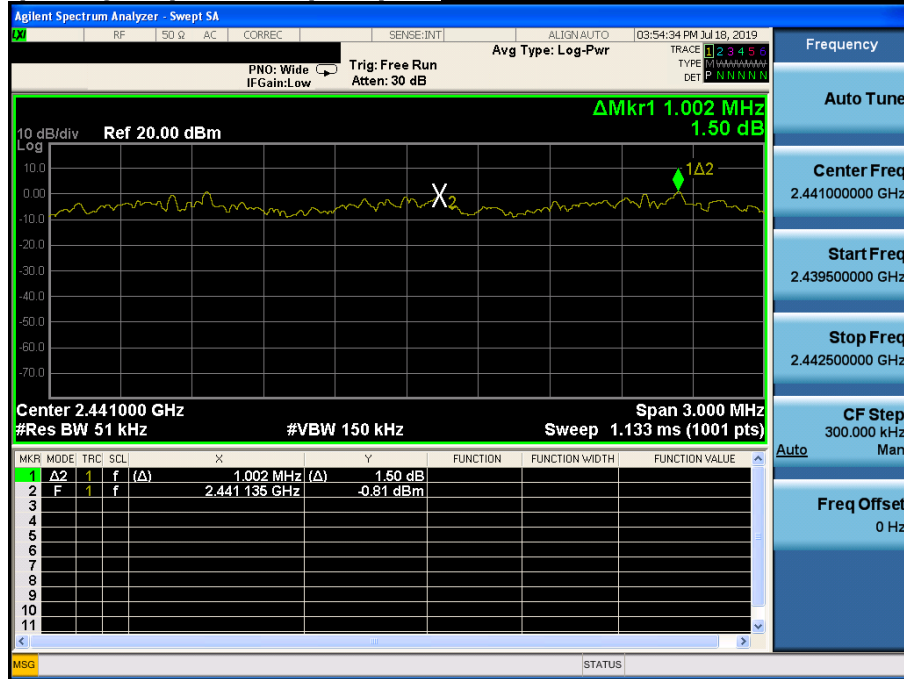


Carrier Frequency Separation (FH) *Hopping mode : Enable & 8DPSK*



Carrier Frequency Separation (AFH) *Hopping mode : Enable & GFSK***Carrier Frequency Separation (AFH) *Hopping mode : Enable & $\pi/4$ DQPSK***

Carrier Frequency Separation (AFH) *Hopping mode : Enable & 8DPSK*



5. Number of Hopping Frequencies

5.1 Test Setup

Refer to the APPENDIX I.

5.2 Limit

Limit : ≥ 15 hops

5.3 Procedure

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, two frequency ranges for FH mode within the 2400 ~ 2483.5 MHz were examined.

The spectrum analyzer is set to :

Span for FH mode = 50 MHz Start Frequency = 2391.5 MHz, Stop Frequency = 2441.5 MHz

Start Frequency = 2441.5 MHz, Stop Frequency = 2491.5 MHz

Span for AFH mode = 30 MHz Start Frequency = 2426.0 MHz, Stop Frequency = 2456.0 MHz

RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.4 Test Results

FH mode

Hopping mode	Modulation	Test Result (Total Hops)
Enable	GFSK	79
	$\pi/4$ DQPSK	79
	8DPSK	79

AFH mode

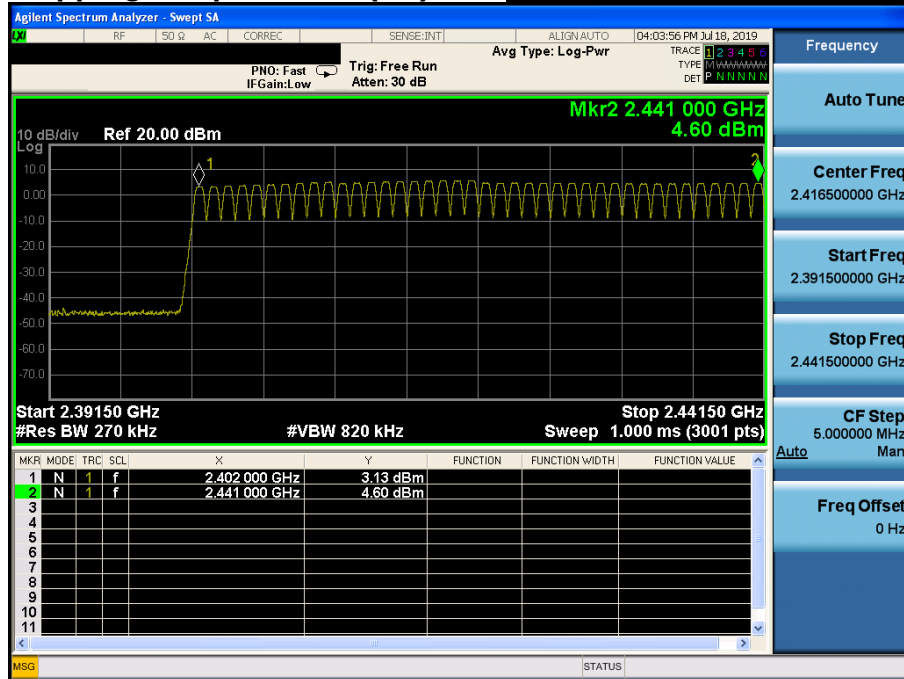
Hopping mode	Modulation	Test Result (Total Hops)
Enable	GFSK	20
	$\pi/4$ DQPSK	20
	8DPSK	20

Note 1 : See next pages for actual measured spectrum plots.

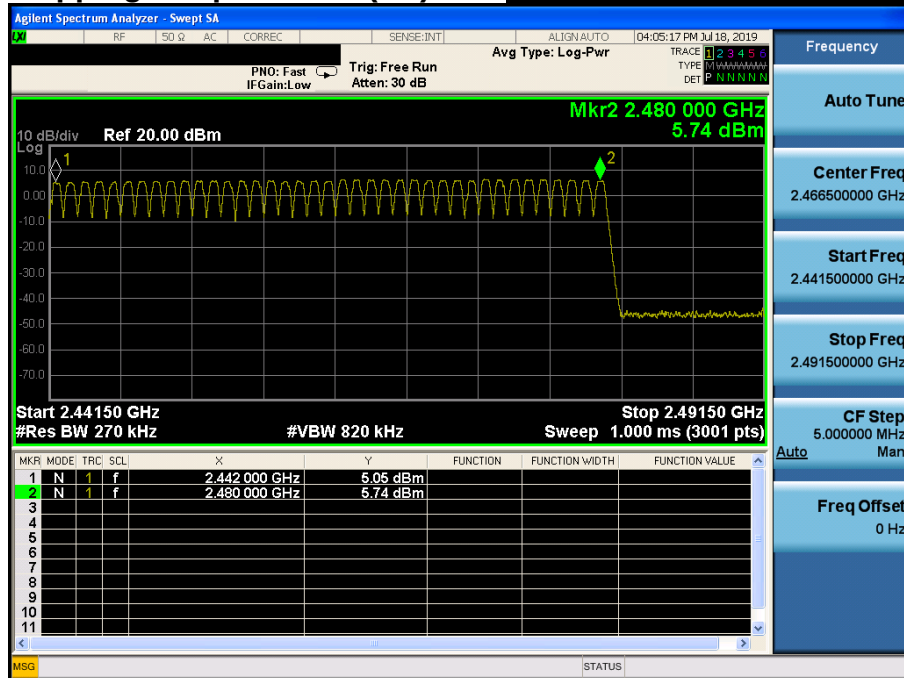
- Minimum Standard :

At least 15 hops

Number of Hopping Frequencies 1(FH) *Hopping mode : Enable & GFSK*

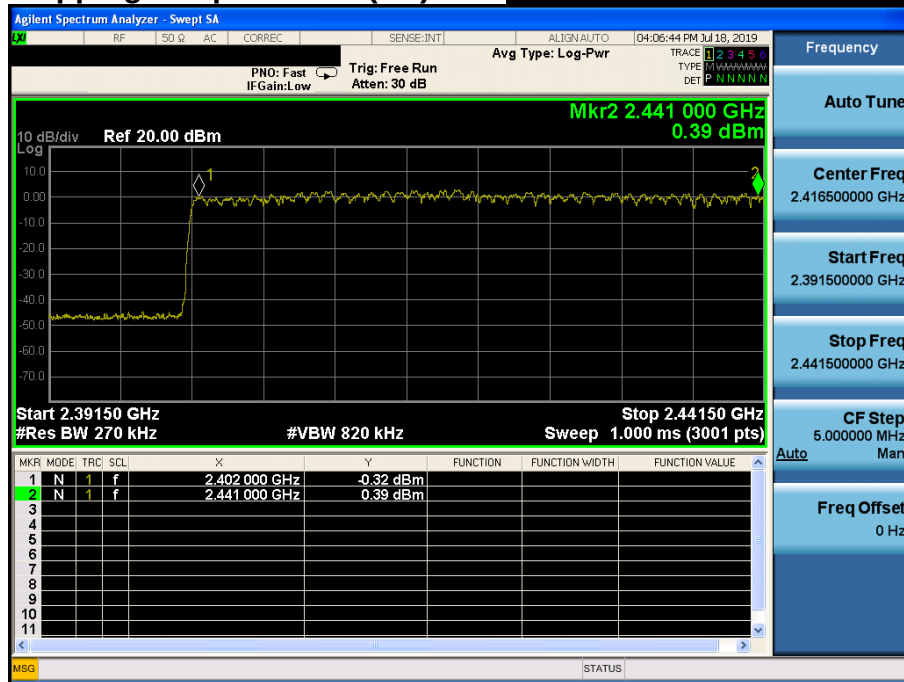


Number of Hopping Frequencies 2(FH) *Hopping mode : Enable & GFSK*



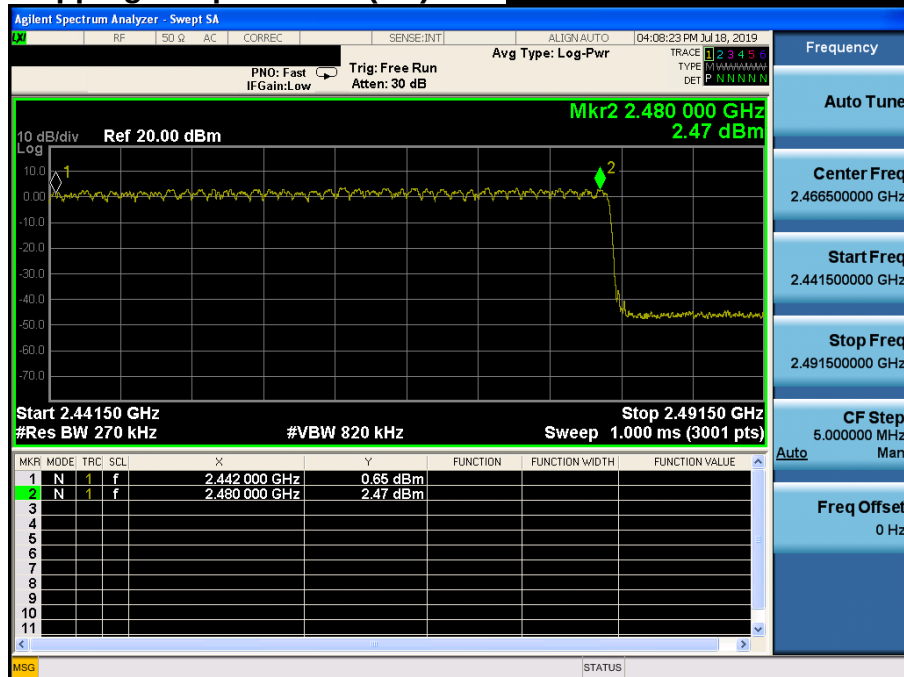
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & $\pi/4$ DQPSK

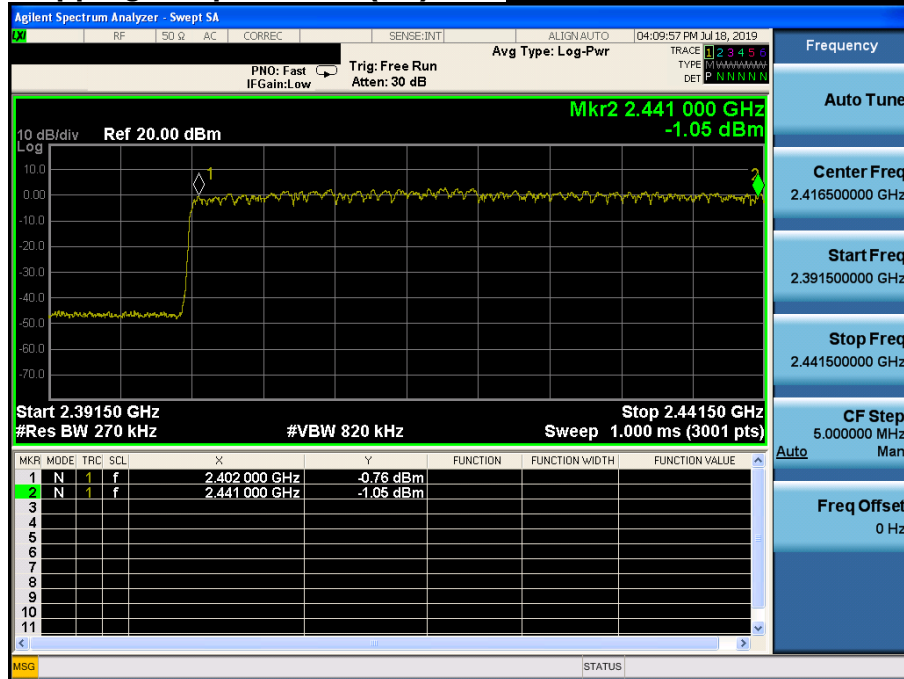


Number of Hopping Frequencies 2(FH)

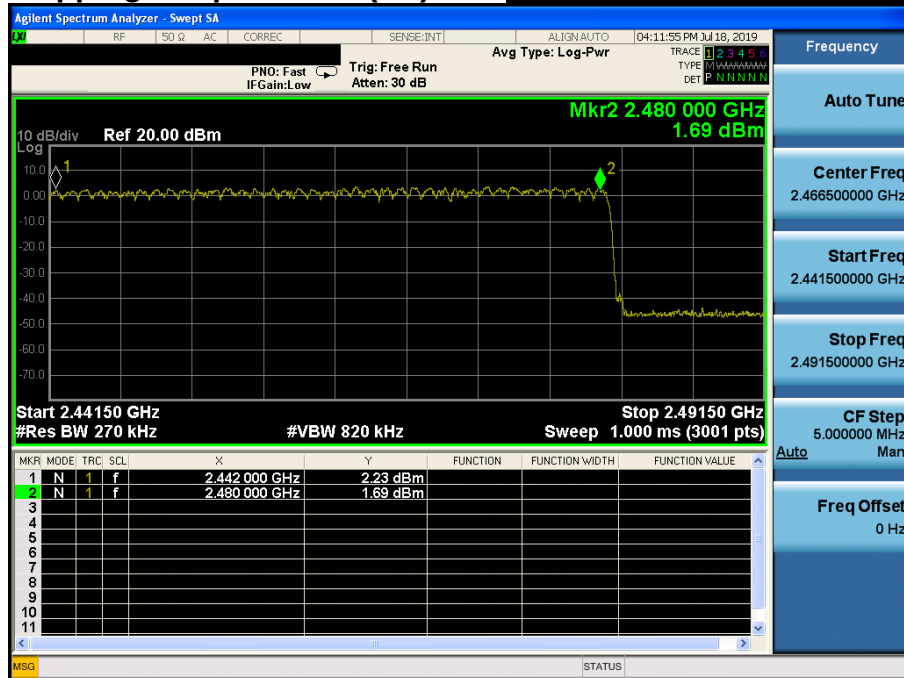
Hopping mode : Enable & $\pi/4$ DQPSK



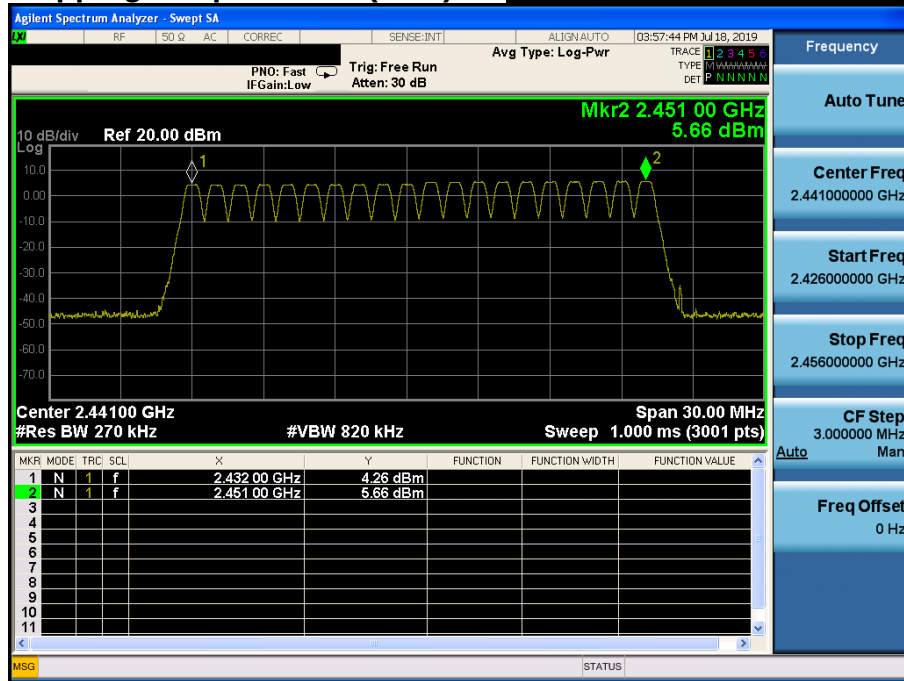
Number of Hopping Frequencies 1(FH) *Hopping mode : Enable & 8DPSK*



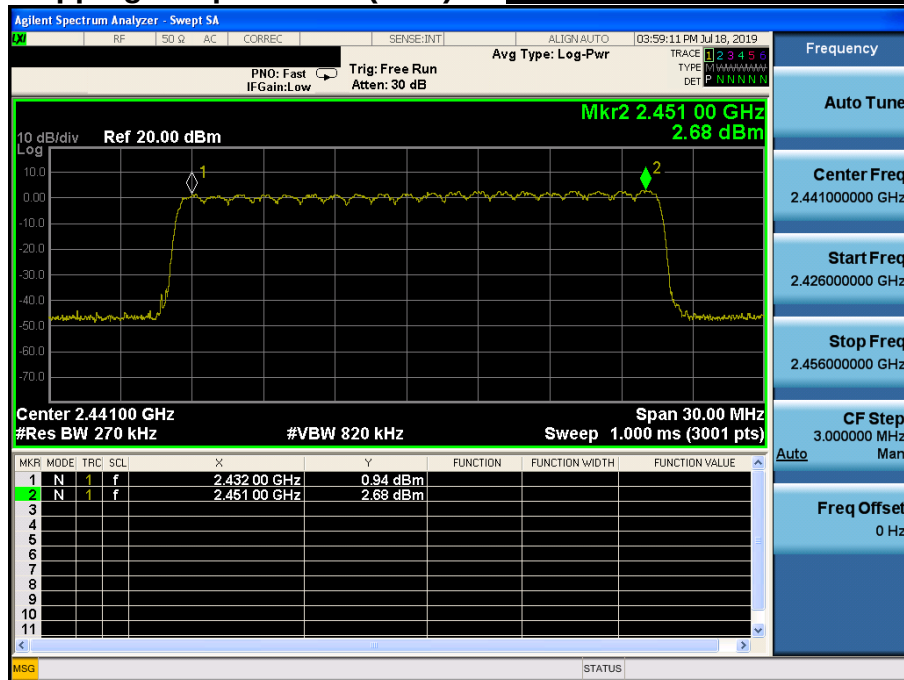
Number of Hopping Frequencies 2(FH) *Hopping mode : Enable & 8DPSK*



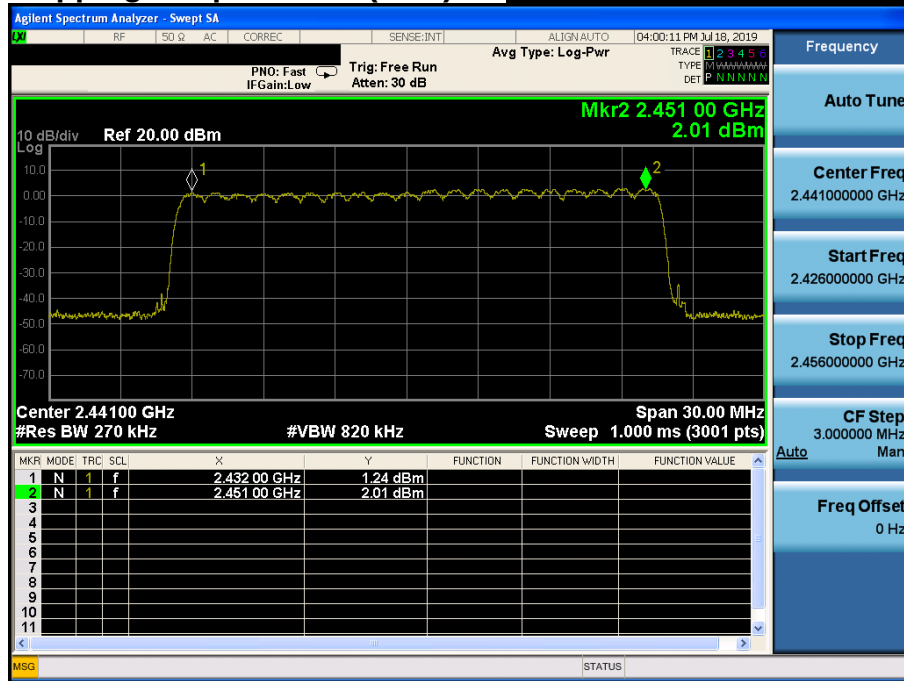
Number of Hopping Frequencies 1(AFH) Hopping mode : Enable & GFSK



Number of Hopping Frequencies 1(AFH) Hopping mode : Enable & $\pi/4$ DQPSK



Number of Hopping Frequencies 1(AFH) Hopping mode : Enable & 8DPSK



6. Time of Occupancy (Dwell Time)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

The maximum permissible time of occupancy is 400 ms within a period of 400 ms multiplied by the number of hopping channels employed.

6.3 Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

Center frequency = 2441 MHz

Span = zero

RBW = 1 MHz (RBW shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1/T$, where T is the expected dwell time per channel)

VBW $\geq$ RBW

Detector function = peak

Trace = max hold

6.4 Test Results

FH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
Enable	DH 5	79	2.880	3.750	0.307
	2 DH 5	79	2.880	3.750	0.307
	3 DH 5	79	2.880	3.750	0.307

AFH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
Enable	DH 5	20	2.880	3.750	0.154
	2 DH 5	20	2.880	3.750	0.154
	3 DH 5	20	2.880	3.750	0.154

Note 1 : Dwell Time = $0.4 \times \text{Hopping channel} \times \text{Burst ON time} \times$

$((\text{Hopping rate} \div \text{Time slots}) \div \text{Hopping channel})$

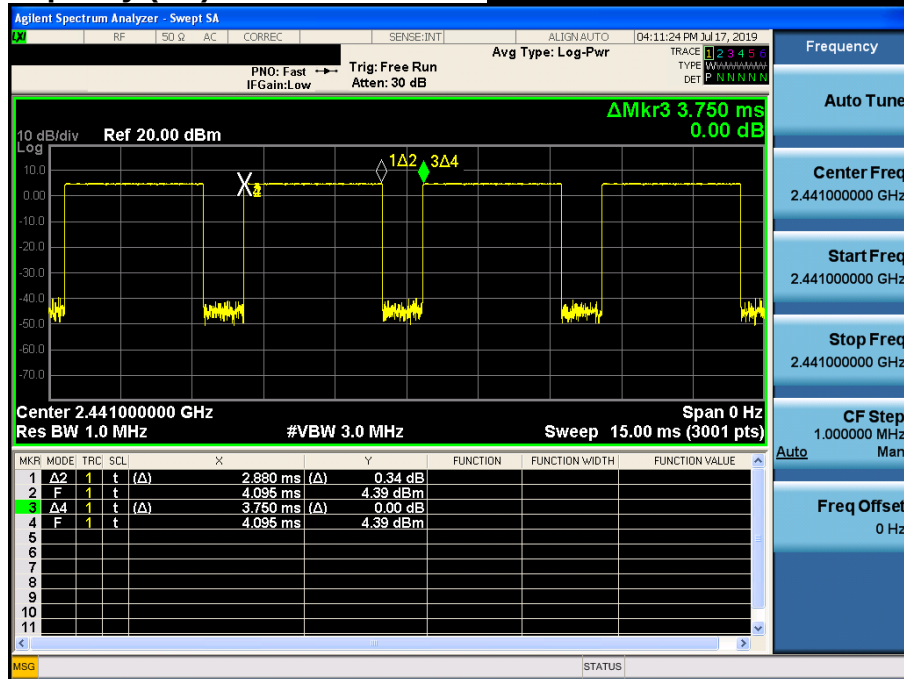
- Time slots for DH5 = 6 slots (TX = 5 slot / RX = 1 slot)

- Hopping Rate = 1600 for FH mode & 800 for AFH mode

Note 2 : See next pages for actual measured spectrum plots.

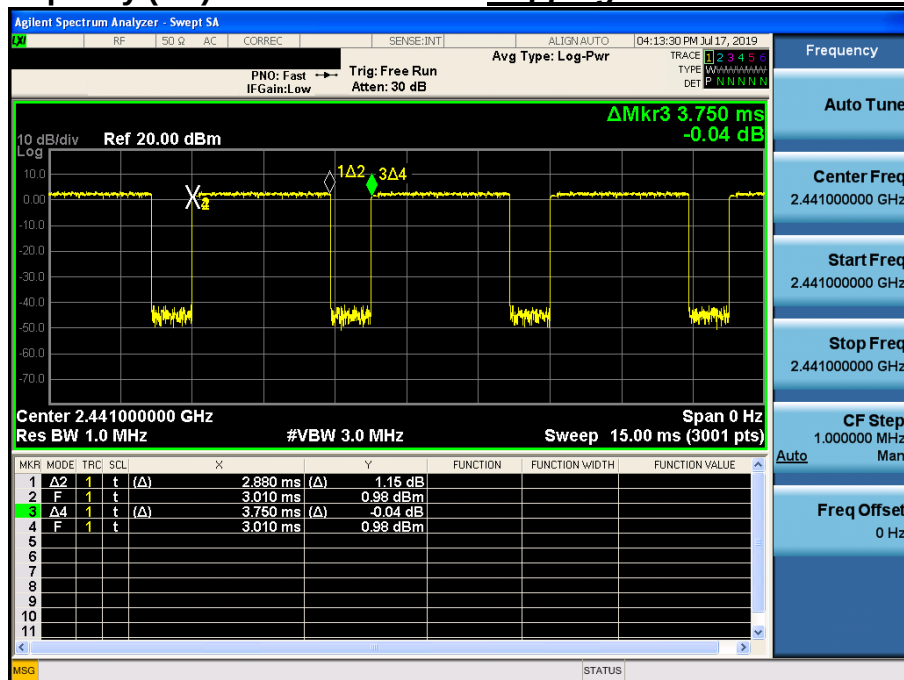
Time of Occupancy (FH)

Hopping mode : Enable & DH5



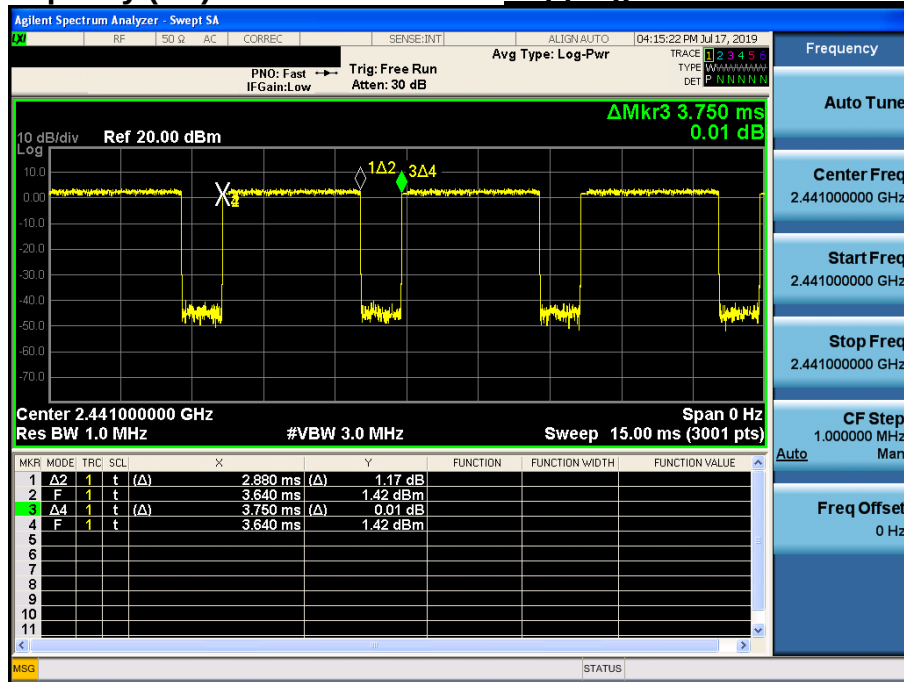
Time of Occupancy (FH)

Hopping mode : Enable & 2-DH5



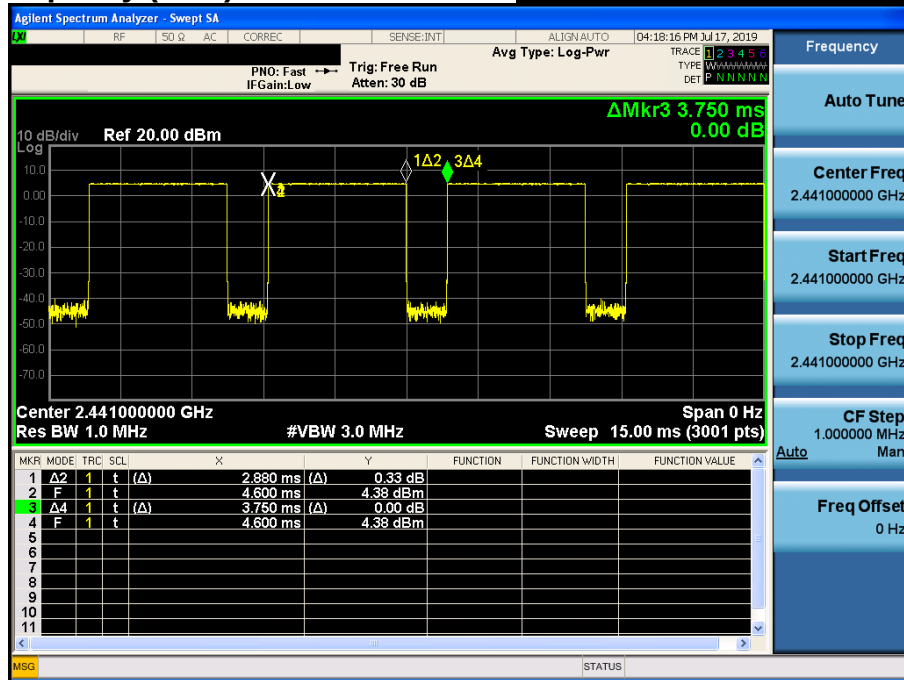
Time of Occupancy (FH)

Hopping mode : Enable & 3-DH5



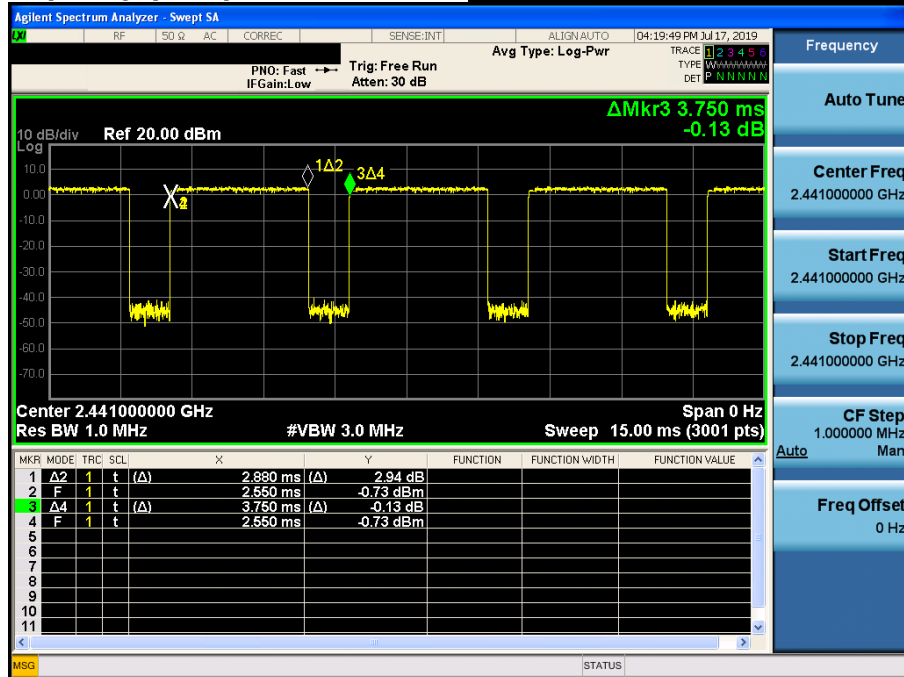
Time of Occupancy (AFH)

Hopping mode : Enable & DH5



Time of Occupancy (AFH)

Hopping mode : Enable & 2-DH5



Time of Occupancy (AFH)

Hopping mode : Enable & 3-DH5

