TEST REPORT

Dt&C

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 : DRTFCC1905-0190(1)
- 2. Customer
 - Name : MobiFren Co., Ltd.
 - Address : 848-16 Gupyeong-Dong, Gyeongbuk, Gumi-City South Korea
- 3. Use of Report : FCC Original Grant
- 4. Product Name / Model Name : Bluetooth headset / MFB-NB5100S FCC ID : UZCMFB-NB5100S
- 5. Test Method Used : ANSI C63.10-2013 Test Specification : FCC Part 15 Subpart C.247
- 6. Date of Test : 2019.04.05 ~ 2019.05.17
- 7. Testing Environment : See appended test report.
- 8. Test Result : Refer to the attached test result.

Affirmation	Tested by		Reviewed by	WAX
	Name : JaeHyeok Bang	Rh	Name : Geunki Son	(Signature)

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.

2019.05.27.

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
DRTFCC1905-0190	May. 24, 2019	Initial issue
DRTFCC1905-0190(1)	May. 27, 2019	Update Test Equipment List



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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

www.dtnc.net		
Telephone	:	+ 82-31-321-2664
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1.2 Testing Environment

Ambient Condition		
 Temperature 	+21 ℃ ~ +25 ℃	
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	:	MobiFren Co., Ltd.
Address	:	848-16 Gupyeong-Dong, Gyeongbuk, Gumi-City, South Korea
Contact person	:	InKyu Kang

1.5 Description of EUT

EUT	Bluetooth headset
Model Name	MFB-NB5100S
Add Model Name	MFB-NB5100A
Serial Number	Identical prototype
Power Supply	DC 3.7 V
Frequency Range	2402 MHz ~ 2480 MHz
Modulation Technique	GFSK, π/4DQPSK, 8DPSK
Number of Channels	79
Antenna Type	Wire Antenna
Antenna Gain	PK : -1.1 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 sequenc e 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

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY50410357
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
DC Power Supply	Agilent Technologies	66332A	18/12/19	19/12/19	US37476998
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	BODYCOM	BJ5478	18/12/27	19/12/27	120612-2
Thermohygrometer	BODYCOM	BJ5478	18/07/09	19/07/09	N/A
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	19/01/11	21/01/11	9202-3820
Horn Antenna	Schwarzbeck	BBHA 9120C	17/12/04	19/12/04	9120C-561
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
PreAmplifier	H.P	8447D	18/12/18	19/12/18	2944A07774
Attenuator	SMAJK	SMAJK-2-3	18/07/02	19/07/02	3
Attenuator	SRTechnology	F01-B0606-01	18/07/02	19/07/02	13092403
Attenuator	Hefei Shunze	SS5T2.92-10-40	18/07/03	19/07/03	16012202
Attenuator	SMAJK	SMAJK-2-3	18/07/04	19/07/04	4
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5- 6SS	18/07/03	19/07/03	3
High Pass Filter	Wainwright Instruments	WHKX12-935- 1000-15000-40SS	18/07/02	19/07/02	8
High Pass Filter	Wainwright Instruments	WHKX10-2838- 3300-18000-60SS	18/07/02	19/07/02	1
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2411B	18/12/19	19/12/19	1338004 1306053
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	Radiall	TESTPRO3	18/07/06	19/07/06	M-01
Cable	Junkosha	MWX315	18/11/19	19/11/19	M-05
Cable	Junkosha	MWX221	18/11/19	19/11/19	M-06
Cable	Junkosha	MWX241	18/06/25	19/06/25	G-04
Cable	Junkosha	MWX241	18/06/25	19/06/25	G-07
Cable	DT&C	Cable	18/07/06	19/07/06	G-13
Cable	DT&C	Cable	18/07/06	19/07/06	G-14
Cable	HUBER+SUHNER	SUCOFLEX 104	18/07/06	19/07/06	G-15
Cable	DT&C	Cable	19/03/04	20/03/04	RF-18
Cable	DT&C	Cable	18/07/05	19/07/05	RF-82

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017 Note2: 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	
	Carrier Frequency Separation	>= 25 kHz or >= Two thirds of the 20 dB BW, whichever is greater.		С	
15.247(a) RSS-247(5.1)	Number of Hopping Frequencies	>= 15 hops		С	
100 247 (0.1)	20 dB Bandwidth	N/A		С	
	Dwell Time	=< 0.4 seconds		С	
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	Conducted	С	
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.		с	
RSS Gen(6.7)	Occupied Bandwidth (99 %)	N/A		NA	
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	С	
15.203	Antenna Requirements	FCC 15.203	-	С	
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, π /4DQPSK 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 ≥ 20 dB BW VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold

2.4 Test Results

Modulation	Tested Channel		Average t Power	Peak Output Power		
modulation	Tested onamer	dBm	mW	dBm	mW	
	Lowest	4.20	2.63	5.72	3.73	
<u>GFSK</u>	Middle	5.01	3.17	5.93	3.92	
	Highest	5.05	3.20	6.02	4.00	
	Lowest	1.15	1.30	3.52	2.25	
<u>π/4DQPSK</u>	Middle	2.09	1.62	3.93	2.47	
	Highest	2.16	1.64	3.97	2.49	
	Lowest	1.13	1.30	3.89	2.45	
<u>8DPSK</u>	Middle	2.10	1.62	4.27	2.67	
	Highest	2.14	1.64	4.31	2.70	

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.

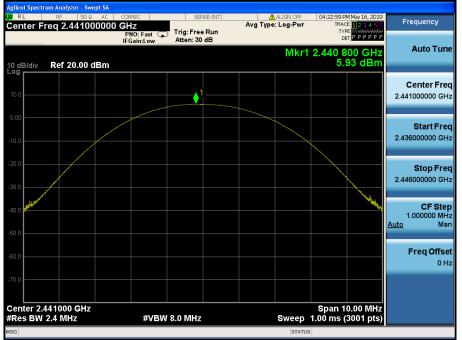


Lowest Channel & Modulation : GFSK



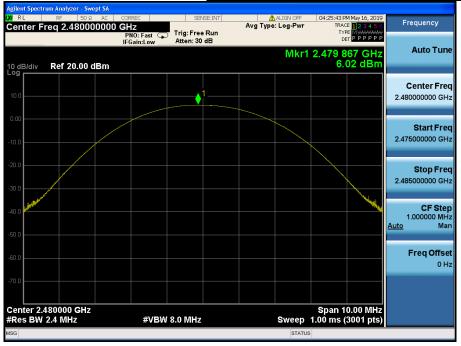
Peak Output Power

Middle Channel & Modulation : GFSK



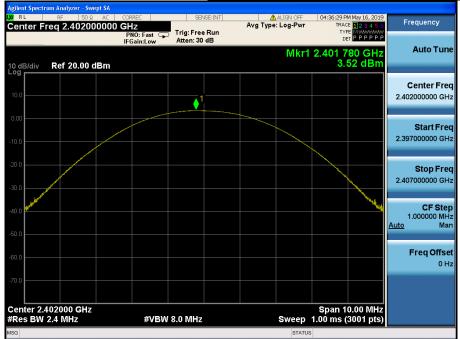


Highest Channel & Modulation : GFSK



Peak Output Power

Lowest Channel & Modulation : π/4DQPSK



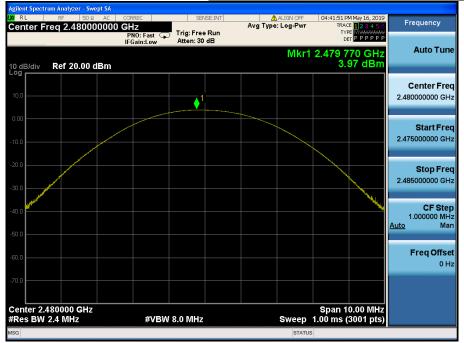


Middle Channel & Modulation : π/4DQPSK



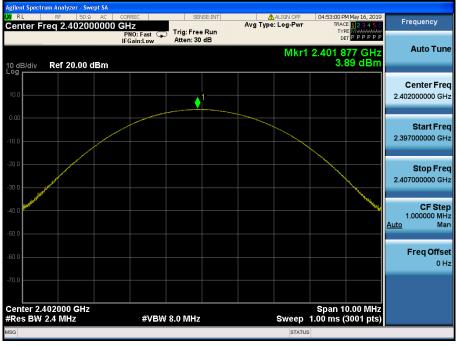
Peak Output Power

Highest Channel & Modulation : π/4DQPSK









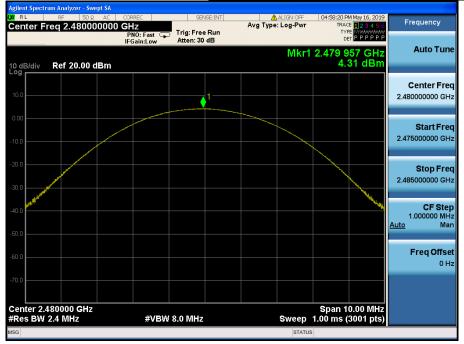
Peak Output Power

Middle Channel & Modulation : 8DPSK





Highest Channel & Modulation : 8DPSK





3. 20 dB 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
 - $VBW \ge 3 \times RBW$

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)
	Lowest	0.933
<u>GFSK</u>	Middle	0.929
	Highest	0.926
	Lowest	1.279
<u>π/4DQPSK</u>	Middle	1.311
	Highest	1.279
	Lowest	1.268
<u>8DPSK</u>	Middle	1.259
	Highest	1.269



20 dB BW

Lowest Channel & Modulation : GFSK



20 dB BW

Middle Channel & Modulation : GFSK unied BV Center Freq: 2.44100000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 30 dB 04:22:22 PM May 16, 2019 Radio Std: None Center Freq 2.441000000 GHz Frequency #IFGain:Low Radio Device: BTS Ref 20.00 dBm 10 dB/div .og **Center Freq** 2.441000000 GHz $\gamma \Lambda$ N CF Step 300.000 kHz Center 2.441 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Auto Mar #VBW 47 kHz Total Power 12.6 dBm Occupied Bandwidth Freq Offset 0 Hz 867.88 kHz Transmit Freq Error -8.199 kHz **OBW Power** 99.00 % x dB Bandwidth 929.3 kHz -20.00 dB x dB STATUS

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20 dB BW

Highest Channel & Modulation : GFSK

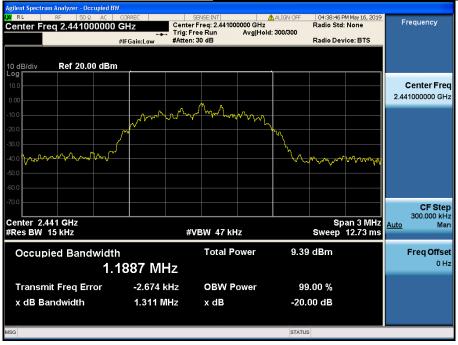


20 dB BW

Lowest Channel & Modulation : π/4DQPSK cunied BV Center Freq: 2.40200000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 30 dB 04:36:06 PM May 16, 2019 Radio Std: None Center Freq 2.402000000 GHz Frequency #IFGain:Low Radio Device: BTS Ref 20.00 dBm 10 dB/div .og **Center Freq** 2.402000000 GHz w.A Am n A .M NW CF Step 300.000 kHz Center 2.402 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Auto Mar #VBW 47 kHz Total Power 8.96 dBm Occupied Bandwidth Freq Offset 0 Hz 1.1800 MHz Transmit Freq Error -3.177 kHz **OBW Power** 99.00 % x dB Bandwidth 1.279 MHz -20.00 dB x dB STATUS

20 dB BW

Middle Channel & Modulation : π/4DQPSK



20 dB BW

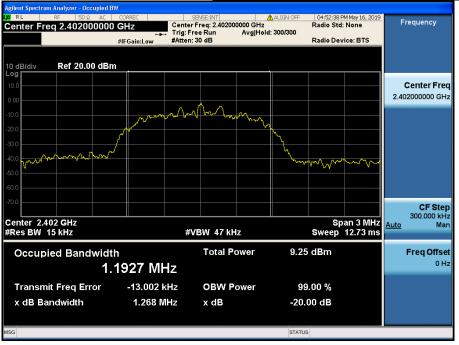
Highest Channel & Modulation : π/4DQPSK unied BV Center Freq: 2.48000000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 30 dB 04:41:27 PM May 16, 2019 Radio Std: None Center Freq 2.480000000 GHz Frequency #IFGain:Low Radio Device: BTS Ref 20.00 dBm 10 dB/div .og **Center Freq** 2.48000000 GHz mal A~~ \sim s.A. \sqrt{w} CF Step 300.000 kHz Center 2.48 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Auto Mar #VBW 47 kHz Total Power 9.41 dBm Occupied Bandwidth Freq Offset 0 Hz 1.1858 MHz Transmit Freq Error -3.138 kHz **OBW Power** 99.00 % x dB Bandwidth 1.279 MHz -20.00 dB x dB STATUS





20 dB BW

Lowest Channel & Modulation : 8DPSK



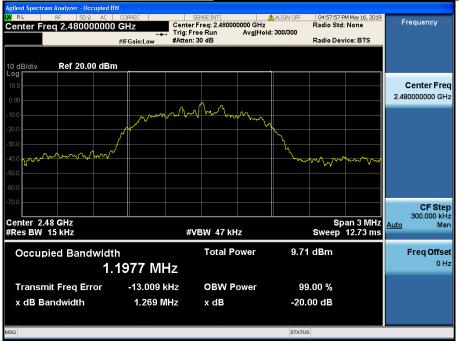
20 dB BW

Middle Channel & Modulation : 8DPSK unied BV Center Freq: 2.441000000 GHz → Trig: Free Run Avg|Hold: 300/300 #Atten: 30 dB 04:55:19 PM May 16, 2019 Radio Std: None Center Freq 2.441000000 GHz Frequency #IFGain:Low Radio Device: BTS Ref 20.00 dBm 10 dB/div .og **Center Freq** 2.441000000 GHz m Λ, ᠕᠕ $-\infty$ \mathcal{M} CF Step 300.000 kHz Center 2.441 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Auto Mar #VBW 47 kHz Total Power 9.67 dBm Occupied Bandwidth Freq Offset 0 Hz 1.1989 MHz Transmit Freq Error -13.286 kHz **OBW Power** 99.00 % x dB Bandwidth 1.259 MHz -20.00 dB x dB STATUS

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20 dB BW

Highest Channel & Modulation : 8DPSK





4. Carrier Frequency Separation

4.1 Test Setup

Refer to the APPENDIX I.

4.2 Limit

Limit : \geq 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 markerdelta 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.

 $VBW \ge RBW$ 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)
	GFSK	2441.010	2442.010	1.000
Enable	π/4DQPSK	2441.008	2442.008	1.000
-	8DPSK	2441.008	2442.008	1.000

AFH mode

Hopping Mode	Modulation	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
	GFSK	2441.010	2442.010	1.000
Enable	π/4DQPSK	2441.007	2442.007	1.000
	8DPSK	2441.007	2442.007	1.000

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

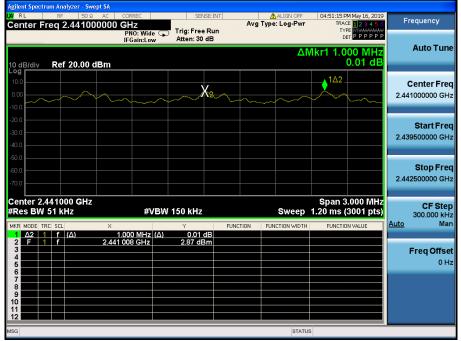


Carrier Frequency Separation (FH) <u>Hopping mode : Enable & GFSK</u>

Agilent Spectrum Analyzer - Swept SA						
RL RF 50 Ω AC Center Freg 2.441000000	CORREC GH7	SENSE:INT	Avg Type:	LIGN OFF	04:34:31 PM May 16, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Wide 🖵 IFGain:Low	Trig: Free Run Atten: 30 dB			DET P P P P P	
	II GUILLEUN			ΔM	kr1 1.000 MHz	Auto Tune
10 dB/div Ref 20.00 dBm					0.03 dB	
10.0					1∆2	Center Freq
0.00		~~~X2~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2.441000000 GHz
-10.0				~		
-20.0						Start Freq
-30.0						2.439500000 GHz
-40.0						
-60.0						Stop Freq
-70.0						2.442500000 GHz
Center 2.441000 GHz #Res BW 51 kHz	#VBW	150 kHz		Sweep 1	Span 3.000 MHz .20 ms (3001 pts)	CF Step 300.000 kHz
MKR MODE TRC SCL X				TION WIDTH	FUNCTION VALUE	Auto Man
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.000 MHz (∆) 1 010 GHz	0.03 dB 5.67 dBm				
						Freq Offset
5						0 Hz
7						
9						
10						
12						
MSG				STATUS		

Carrier Frequency Separation (FH)

Hopping mode : Enable & π/4DQPSK





Carrier Frequency Separation (FH)

Hopping mode : Enable & 8DPSK

Agilent Spectrum A X RL R Center Freq	F 50Ω AC	0 GHz			ALIGN OFF Type: Log-Pwr	05:08:42 PM May 16, 2019 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
	ef 20.00 dBm	PNO: Wide IFGain:Lov			ΔΝ	/kr1 1.000 MHz 0.03 dB	Auto Tune
10.0 0.00 -10.0	$\sim \sim \sim \sim$		~~~	(<u>2</u>	~~~^	1Δ2	Center Fred 2.441000000 GH;
-20.0 -30.0 -40.0							Start Fred 2.439500000 GH
-50.0							Stop Fred 2.442500000 GH
Center 2.441 #Res BW 51		#V	BW 150 kHz		Sweep	Span 3.000 MHz 1.20 ms (3001 pts)	300.000 kH
MKR MODE TRC SC 1 Δ2 1 f 2 F 1 f 3	(Δ)	1.000 MHz 141 008 GHz	(∆) 0.03 (2.86 dE		FUNCTION WIDTH	FUNCTION VALUE	Auto Mar Freq Offse 0 H:
6 7 8 9 10 11							
12					STATUS	5	



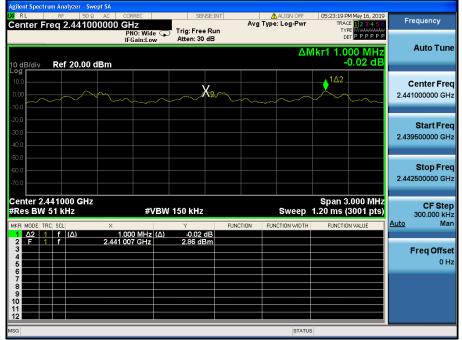
Carrier Frequency Separation (AFH)

Hopping mode : Enable & GFSK



Carrier Frequency Separation (AFH)

<u>Hopping mode : Enable & π/4DQPSK</u>





Carrier Frequency Separation (AFH)

Hopping mode : Enable & 8DPSK

gilent Spectr 7 RL Center Fi	RF	50 Ω		RREC 12 NO: Wide 🗔	Trig: Free		Avg	ALIGN OFF	TRAC	M May 16, 2019 26 1 2 3 4 5 6 PE M WWWWWW T P P P P P P P	F	requency
0 dB/div	Ref 2	0.00 dE	IF	Gain:Low	Atten: 30	B		ΔN	1kr1 1.0	00 MHz 0.01 dB		Auto Tune
-og 10.0 0.00 10.0	_^	~~	<u>^</u>			12.		~~~^				Center Free 1000000 GH
20.0 30.0 40.0											2.43	Start Fre 9500000 GH
50.0 50.0 70.0											2.44	Stop Fre 2500000 GH
enter 2.4 Res BW	51 kHz			#VBV	/ 150 kHz			Sweep	Span 3 1.20 ms (.000 MHz 3001 pts)		CF Ste 300.000 k⊦
KR MODE TF 1 Δ2 1 2 F 1 3 4 4 5 5 5	f (4)	× 1.00 2.441 00	0 MHz (Δ) 7 GHz	Y -0.01 d 2.87 dB	в	CTION	FUNCTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u>	Ma FreqOffse 0 ⊢
6 7 8 9 0												
2 1								STATUS				



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 ind or the 20 dB bandwidth, w		less than 30% of the channel spacing
VBW ≥ RBW	Sweep = auto	
Detector function = peak	Trace = max hold	

5.4 Test Results

FH mode

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

AFH mode

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

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

- Minimum Standard :

At least 15 hopes



Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & GFSK

XV RL	Analyzer - Swept SA RF 50 Ω AC 2.416500000	CORREC GHZ PNO: Fast C Trig: F	SENSE:INT Av:	ALIGN OFF Type: Log-Pwr	04:31:04 PM May 16, 2019 TRACE 1 2 3 4 5 6 TYPE MWWWWWW	Frequency
10 dB/div	tef 20.00 dBm	IFGain:Low Atten	30 dB	Mkr2	2.441 000 GHz 5.65 dBm	A
10.0 0.00 -10.0			MAMAM	WWW		Center Freq 2.416500000 GHz
-20.0 -30.0 -40.0						Start Freq 2.391500000 GHz
-50.0 7000						Stop Freq 2.441500000 GHz
Start 2.3915 #Res BW 27	0 kHz	#VBW 820 ki			Stop 2.44150 GHz 1.00 ms (3001 pts)	5.000000 MHz
	f (Δ) 2.402		dBm dBm	FUNCTION WIDTH	FUNCTION VALUE	Auto Man Freq Offset 0 Hz
7 8 9 10 10 11 12 12						
MSG				STATUS	8	

Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & GFSK

gilent Spectrum Analyzer - Swept SA					-
RL RF 50Ω AC Center Freq 2.46650000		SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	04:32:16 PM May 16, 2019 TRACE 2 3 4 5 6 TYPE MWWWWW	Frequency
	PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 30 dB		DET	
			Mkr2	2.480 000 GHz 5.66 dBm	Auto Tun
0 dB/div Ref 20.00 dBm			2		
	WWW		+		Center Fre 2.466500000 GH
20.0					
30.0					Start Fre 2.441500000 GH
40.0				m	
50.0 60.0				had the second second strates	Stop Fre
70.0					2.491500000 GH
tart 2.44150 GHz Res BW 270 kHz	#VBW	820 kHz	Sweep	Stop 2.49150 GHz 1.00 ms (3001 pts)	CF Ste 5.000000 MH
KR MODE TRC SCL ×	42 000 GHz (Δ)	Y FUN 5.68 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
	80 000 GHz	5.66 dBm			Ener Offer
4					Freq Offse 0 H
6					
8					
12					
SG			STATUS	3	



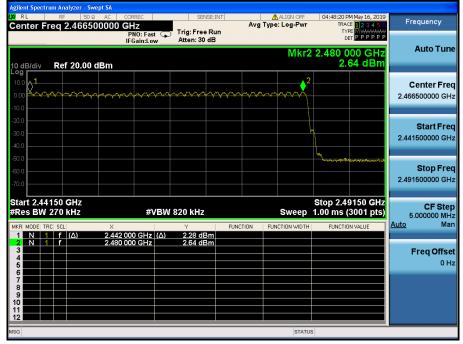
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & π/4DQPSK

MRC2 2.441 000 GH2 Center Freq 10 dB/div Ref 20.00 dBm 1.71 dBm 100 1.71 dBm 1.71 dBm	Agilent Spectrum								
If GainLow Atten: 30 dB Det [PP PP PP Auto Turn 10 dB/div Ref 20.00 dBm 1.71 dBm 1.71 dBm 2.41650000 GH 10 dB/div Ref 20.00 dBm 1.71 dBm 1.71 dBm 2.41650000 GH 2.41650000 GH 200 100<			000 GHz		Avg		TRACE	123456	Frequency
100 1 1 Center Freq 100 1 1 1 1 100 1 1 1 1 100 1 1 1 1 200 1 1 1 1 300 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 400 1 1 1 1 500 1 1 1 1 500 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 N 1 1 1 <td< td=""><td>10 dB/div R</td><td>tef 20.00 dB</td><td>IFGain:Low</td><td></td><td>3</td><td>Mkr2</td><td>DET</td><td>PPPPPP 00 GHz</td><td>Auto Tune</td></td<>	10 dB/div R	tef 20.00 dB	IFGain:Low		3	Mkr2	DET	PPPPPP 00 GHz	Auto Tune
300 400 Start Free Start Free	10.0 0.00		1	~uj~v~v~v~v~v~v~v	᠕᠆ᡣ᠆ᢩ᠕᠆		monan	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Center Freq 2.416500000 GHz
E00 Start 2.39150 GHz Stop Free	-30.0								Start Fred 2.391500000 GHz
#Res BW 270 kHz #VEW 820 kHz Sweep 1.00 ms (3001 pts) CF Step 5.00000 MHz MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE Auto Max 1 N 1 f (Δ) 2.402 000 GHz (Δ) 1.17 dBm Auto Max 2 N 1 f 2.401 000 GHz 1.71 dBm Freq Offsee Max 3 - - - - - - - Max 6 - <t< td=""><td>-60.0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Stop Freq 2.441500000 GHz</td></t<>	-60.0								Stop Freq 2.441500000 GHz
Indiana Indiana Freq Offset 1 N 1 F (A) 2.402 000 GHz (A) 1.17 dBm Freq Offset 6 Freq Offset 6 <td< td=""><td></td><td></td><td>#V</td><td>BW 820 kHz</td><td></td><td>Sweep</td><td></td><td>001 pts)</td><td>CF Step 5.000000 MHz</td></td<>			#V	BW 820 kHz		Sweep		001 pts)	CF Step 5.000000 MHz
2 N 1 f 2.441000 GHz 1.71 dBm 3 - - - - - - 0						FUNCTION WIDTH	FUNCTION	VALUE	Auto Mar
7 2 8 2 9 2 10 2	3 4 5								Freq Offset 0 Hz
	7 8 9 9 9 10 11 1								
MSG STATUS	MSG					STATU	IS		

Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & π/4DQPSK





Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & 8DPSK

		ctrur		alyzer - Sw												
l,XI R			RF	50 \$		CORREC		SEI	ISE:INT		A	ALIGN OFF		PM May 16, 2019	Frequence	ev.
Cer	nter	Fre	eq 2	2.4165	00000	CHZ PNO: Fas		Trig: Free	Run		AVg I	/pe: Log-Pwr	T)	CE 123456 (PE M WWWWW		
						IFGain:Lo	ar ∟ w	Atten: 30					[PPPPP		
												Miker	2 4 4 4	000 GHz	Auto	Tune
												IVINI 2		96 dBm		
10 d	B/div	/	Re	20.00	dBm									So a Bill		
10.0					. 1									2	0	
									m 10 0	-1 -0		~~~~~		1 m m m m	Center	•
0.00					1NY	~~~~~	ΥΨV	***	***	/~V~V	e se se se	***	* * Y Y Y	pro propo	2.41650000	0 GHz
-10.0																
-20.0					ļ											
-30.0				5											Start	Freq
				ſ											2.39150000	0 GHz
-40.0																
-50.0	1.000	No.ba.	-	man												
-60.C															Stop	Freq
															2.44150000	0 GHz
-70.0																
a4-		204	50	GHz									Otom 0.4	1450 011-		
	s Bl					-#*	/Dia	820 kHz				Sweep	510p 2.4	4150 GHz (3001 pts)		Step
#RC	5 D	VV 2	10	NΠZ		#		020 KHZ				Sweep	1.00 IIIS	(300 T pts)	5.00000	
MKR	MODE	TRC			×			Y		FUNC	TION I	FUNCTION WIDTH	FUNCTI	ON VALUE	Auto	Man
1	N	1	f	<u>(Δ)</u>		2 000 GHz	<u>(Δ)</u>	2.15 dl								
2	N	1	T.		2.44	<u>1 000 GHz</u>		1.96 di	3m						Front	-
4															FreqC	
5																0 Hz
6																
8																
9																
10																
12																
													-			
MSG												STATU	5			
			_													

Number of Hopping Frequencies 2(FH)

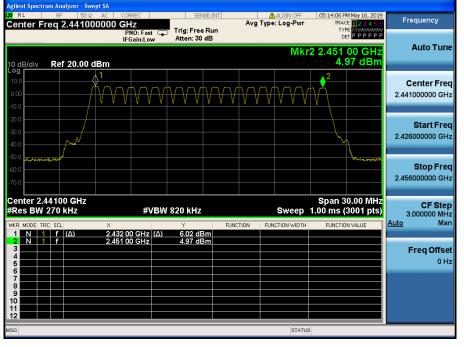
Hopping mode : Enable & 8DPSK

	um Analyzer -									
Center F		0Ω AC COF	REC	SENSE			ALIGN OFF	TRAC	M May 16, 2019 E <mark>1 2 3 4 5 6</mark>	Frequency
10 dB/div	Ref 20.0	Pi IFC	NO: Fast 🕞 Gain:Low	Trig: Free R Atten: 30 dE			Mkr2	2.480 0	00 GHz	Auto Tune
10.0 1 0.00 4	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<u>~~~</u> ~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~\~\~\~	2			Center Freq 2.466500000 GHz
-20.0 -30.0 -40.0								5		Start Freq 2.441500000 GHz
-60.0 -60.0 -70.0								- Jorgy-atheory	nysamaa(nadataty	Stop Freq 2.491500000 GHz
Start 2.44 #Res BW	270 kHz	×		7 820 kHz	FUNCTIO)N FUN		Stop 2.49 1.00 ms (3 FUNCTIO	3001 pts)	CF Step 5.000000 MHz <u>Auto</u> Man
1 N 1 2 N 1 3 4 5 6		2.442 000 2.480 000	D GHz (Δ) D GHz	2.48 dBm 2.60 dBm						Freq Offset 0 Hz
7 8 9 10 11 12										
MSG							STATUS			



Number of Hopping Frequencies 1(AFH)

Hopping mode : Enable & GFSK



Number of Hopping Frequencies 1(AFH)

Hopping mode : Enable & π/4DQPSK

Agilent Spectrum Analyzer - Swept SA				
Center Freq 2.441000000	CORREC SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	05:19:42 PM May 16, 2019 TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 20.00 dBm	PNO: Fast 🖵 Trig: Free Run IFGain:Low Atten: 30 dB	Mkr	2 2.451 00 GHz 1.05 dBm	Auto Tune
10.0 10.0	γ		2	Center Freq 2.441000000 GHz
-20.0				Start Freq 2.426000000 GHz
-50.0				Stop Fred 2.456000000 GHz
Center 2.44100 GHz #Res BW 270 kHz	#VBW 820 kHz		Span 30.00 MHz 1.00 ms (3001 pts)	CF Step 3.000000 MHz <u>Auto</u> Mar
1 N 1 f (Δ) 2.43	32 00 GHz (Δ) 3.42 dBm 1 00 GHz 1.05 dBm			Freq Offset 0 Hz
ISG		STATU	s	



Number of Hopping Frequencies 1(AFH)

Hopping mode : Enable & 8DPSK

gilent Spectrum Analyzer - Sw RL RE 50 G			-				
RL RF 50 G		SENSE:IN	Avg	ALIGN OFF	TRAC	M May 16, 2019 E 1 2 3 4 5 6	Frequency
0 dB/div Ref 20.00	PNO: Fas IFGain:Lo			Mkr	DI 2 2.451	00 GHz	Auto Tun
0.00 10.0	1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2		Center Fre 2.441000000 GH
20.0 30.0 40.0					-		Start Fre 2.426000000 G⊦
50.0						May on and a second	Stop Fre 2.456000000 GH
enter 2.44100 GHz Res BW 270 kHz	#\	/BW 820 kHz		Sweep	Span 3 1.00 ms (0.00 MHz 3001 pts)	CF Ste 3.000000 MH
MKR MODE TRC SCL 1 N 1 f (Δ) 2 N 1 f (Δ) 3 - - - - 4 - - - - 5 - - - -	× 2.432 00 GHz 2.451 00 GHz	(Δ) <u>3.43 dBm</u> 1.77 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	IN VALUE	Auto Ma Freq Offso 0 H
6 7 7 8 9 9 10 1 11							
ŝG				STATUS			

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 ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel)

VBW ≥ RBW Trace = max hold Detector function = peak

6.4 Test Results

FH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
	DH 5	79	2.880	3.750	0.307
Enable	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)
	DH 5	20	2.880	3.750	0.154
Enable	2 DH 5	20	2.880	3.750	0.154
	3 DH 5	20	2.880	3.750	0.154

Note 1 : Dwell Time = $0.4 \times$ Hopping channel × Burst ON time ×

((Hopping rate ÷ Time slots) ÷ 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.



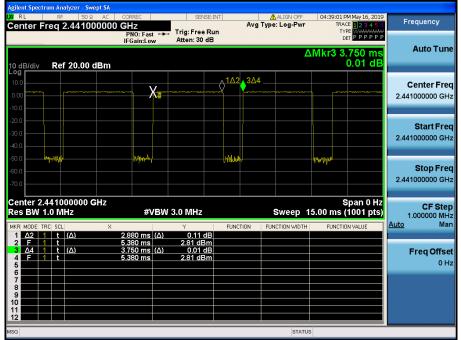
Hopping mode : Enable & DH5

Time of Occupancy (FH)

UXIL	um Analyzer - Swept SA RF 50 Ω AC req 2.44100000	CORREC D GHz PNO: Fast	SENSE:II	Avg Ty	ALIGN OFF	05:37:20 PM May 16, 2019 TRACE 12 3 4 5 6 TYPE WWWWWW	Frequency
10 dB/div	Ref 20.00 dBm	IFGain:Low	Atten: 30 dB		Δ	Mkr3 3.750 ms 0.02 dB	Auto Tune
10.0 0.00 -10.0			X2		3∆4		Center Freq 2.441000000 GHz
-20.0 -30.0 -40.0							Start Freq 2.441000000 GHz
-50.0 -60.0 -70.0						lasy MagNul	Stop Freq 2.441000000 GHz
Center 2.4 Res BW 1.		#VE	3W 3.0 MHz	FUNCTION	Sweep 1	Span 0 Hz 5.00 ms (1001 pts)	CF Step 1.000000 MHz Auto Man
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 5	t (Δ) t	2.880 ms(6.525 ms 3.750 ms(6.525 ms	∆) -0.04 dB 5.68 dBm	PONCTION	ONCTION WIDTH	FORCHON VALUE	Freq Offset
6 7 8 9 10 11							
12 1					STATUS		

Time of Occupancy (FH)

Hopping mode : Enable & 2-DH5





Hopping mode : Enable & 3-DH5

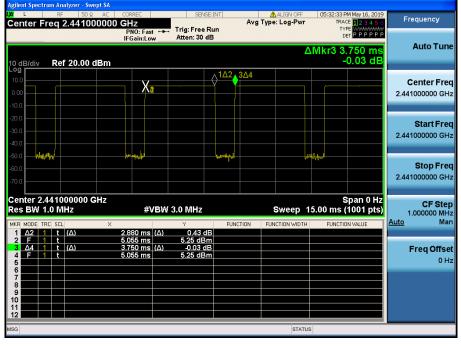
Time of Occupancy (FH)

Center F	^{RF} req 2.44	50 Ω AC 1000000	CORREC) GHz PNO: Fast IFGain:Lov		SENSI Trig: Free F Atten: 30 d	Run	Avg T	ALIGN OFF	TRAC	MMay 16, 2019 E 1 2 3 4 5 6 E WWWWWW T P P P P P P	Frequency	У
0 dB/div	Ref 20.	00 dBm						Δ	.Mkr3 3. -	750 ms 0.02 dB	Auto T	ſun
10.0 0.00 10.0			anthon a banda a san a banda a san a banda a san a banda a san		<u> </u>		<u>1∆2</u>	304		punteringt-whitest systems.	Center 2.441000000	
20.0 30.0 40.0											Start 2.441000000	
50.0 60.0 70.0		,		ko ^{II} bl _a tra ⁿ			<u>Villeve</u> j		i,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	W	Stop 2.441000000	
Center 2. Res BW 1	44100000 1.0 MHz	00 GHz	#V	BW :	3.0 MHz			Sweep 1	S 5.00 ms (pan 0 Hz 1001 pts)	CF \$ 1.000000	M
MKR MODE T 1 Δ2 2 2 F 4 3 Δ4 4 4 F 4	t (∆) t	X	2.880 ms 6.225 ms 3.750 ms 6.225 ms		Y 1.21 dl 2.23 dBr -0.02 dl 2.23 dBr	n 3	ION	FUNCTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u> Freq O	Mi ffs 0 I
6 7 8 9 10 11												
12 1								STATUS				



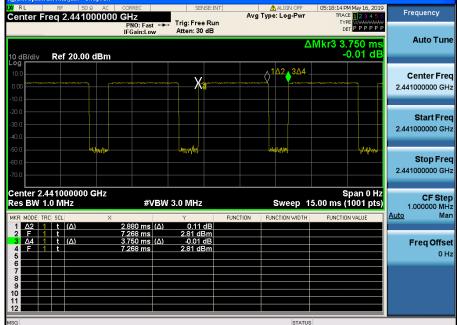
Hopping mode : Enable & DH5

Time of Occupancy (AFH)



Time of Occupancy (AFH)

Hopping mode : Enable & 2-DH5





Time of Occupancy (AFH)

Hopping mode : Enable & 3-DH5

enter Fr	RF 50 Ω req 2.44100			SENSE:INT	Avg T	ALIGN OFF	TYPE	May 16, 2019 1 2 3 4 5 6 WWWWWWWW P P P P P P	Frequenc
0 dB/div	Ref 20.00	IFGain:L dBm	ow Atten	:30 dB		Δ	.Mkr3 3.7		Auto
.og 10.0 0.00				angan an a	1∆2	3 ∆4	97.542.955.101.059		Center 2.44100000
20.0 30.0 40.0									Start 2.44100000
50.0 50.0 70.0			- hipnend				երթե¶եր 	pl	Stop 2.44100000
enter 2.4 tes BW 1	41000000 C .0 MHz		VBW 3.0 M	Hz		Sweep 1	Sp 5.00 ms (1		CF 1.000000
2 F 1 3 Δ4 1 4 F 1 5 5	C SCL t (Δ) t t (Δ) t t	× 2.880 m 6.405 m 3.750 m 6.405 m	s 2.8 s (Δ) -0	55 dB 7 dBm 01 dB 7 dBm	INCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Freq C
6 7 8 9 10 11									
12 1						STATUS			



7. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		
			3600 ~ 4400		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



7.3. Test Procedures

7.3.1. Test Procedures for Radiated Spurious Emissions

- The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 or 3 meter away from the interference-receiving antenna.
- 3. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
- 4. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 7. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Measurement Instrument Setting

- Frequencies less than or equal to 1000 MHz The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- Frequencies above 1000 MHz
 The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
 The result of Average measurement is calculated using PK result and duty correction factor.