TEST REPORT

	DT&C Co., Ltd.		
Dt&C	42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042 Tel : 031-321-2664, Fax : 031-321-1664		
1. Report No : DRTFCC1810-025	3(1)		
2. Customer			
• Name (FCC): Sena Technologie	s,Inc.		
• Name (IC): Sena Technologies,	Inc.		
	o 569-gil, Gangnam-gu, Seoul, South Korea g, Seocho-gu Seoul 137-130 Korea (Republic Of)		
3. Use of Report : FCC & IC Origina	al Grant		
	otorcycle Bluetooth Communication System with Mesh itercom / SP57		
FCC ID : S7A-SP57 / IC : 8154A-	SP57		
5. Test Method Used : ANSI C63.10			
Test Specification : FCC Part 15 Subpart C.247 RSS-247 Issue 2 (2017-02), RSS-GEN Issue 5 (2018-04)			
	6. Date of Test : 2018.10.04 ~ 2018.10.19		
7. Testing Environment : See appen	nded test report.		
8. Test Result : Refer to the attache	d test result.		
[
Affirmation	Reviewed by		
Name : JaeHyeok Bang	Name : HyunSu 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, withou	ut the written approval of DT&C Co., Ltd.		
	2018.11.06.		
	I		

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
DRTFCC1810-0253	Oct. 24, 2018	Initial issue
DRTFCC1810-0253(1)	Nov. 06, 2018	Change Antenna gain

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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
FAX	:	+ 82-31-321-1664

1.2 Testing Environment

Ambient Condition	
 Temperature 	+22 °C ~ +25 °C
Relative Humidity	42 % ~ 44 %

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	0.9 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 %, $k = 2$)

1.4 Details of Applicant

Applicant(FCC)	:	Sena Technologies,Inc.
Applicant(IC)	:	Sena Technologies, Inc.
Address(FCC)	:	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea
Address(IC)		210 Yangjae-dong, Seocho-gu Seoul 137-130 Korea (Republic Of)
Contact person	:	Seunghyun Kim

1.5 Description of EUT

EUT	Motorcycle Bluetooth Communication System with Mesh Intercom	
Model Name	SP57	
Add Model Name	NA	
Hardware version	1.0	
Software version	1.0	
Power Supply	DC 3.7 V	
Frequency Range	2402 MHz ~ 2480 MHz	
Modulation Technique	GFSK, π/4-DQPSK, 8DPSK	
Number of Channels	79	
Antenna Type	PCB Pattern Antenna	
Antenna Gain	PK: 0.41 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 badwidths 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

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/07/09	19/07/09	MY50200834
Multimeter	FLUKE	17B+	17/12/26	18/12/26	36390701WS
DC Power Supply	Agilent	66332A	18/07/02	19/07/02	US37473422
Signal Generator	Rohde Schwarz	SMBV100A	17/12/27	18/12/27	255571
Signal Generator	Rohde Schwarz	SMF100A	18/06/07	19/06/07	102341
Thermohygrometer	BODYCOM	BJ5478	18/01/03	19/01/03	120612-1
HYGROMETER	TESTO	608-H1	18/02/10	19/02/10	34862883
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2411B	17/12/27	18/12/27	1338004 1306053
EMI TEST RECEIVER	Rohde Schwarz	ESCI7	18/02/12	19/02/12	100910
LISN	SCHWARZBECK	NNLK 8121	18/03/20	19/03/20	06183
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	18/09/27	19/09/27	101333
CABLE	DTNC	CABLE	18/07/05	19/07/05	RF-82
CABLE	DTNC	CABLE	18/06/25	19/06/25	RF-07

Note1: 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. =< 4 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		С
15.247(d) 15.205 & 209 RSS-247(5.5) RSS-Gen (8.9 & 8.10)	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	NT ^{Note2}
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 = Comp	NC = Not Comply $NT = Not T$	ested NA = Not Applicable	1	1
	n was performed in other laboratory accor to the Radiated Test Report	ding to applicant's request.		

Dt&C

1.10 Conclusion of worst-case and operation mode

The EUT has three type 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.
- §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.

IC Requirements

1. RSS-247(5.4), 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

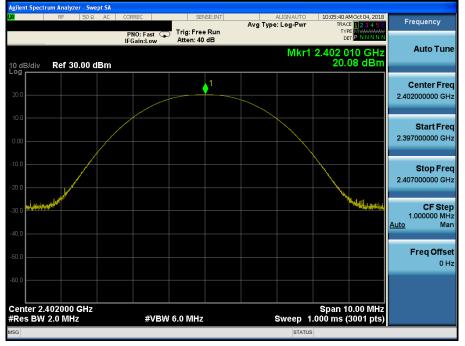
2.4 Test Results

Modulation	Tested Channel		Average Power	Peak Output Power			
Woddiation	resteu Ghannei	dBm	mW	dBm	mW		
	Lowest	18.47	70.31	20.08	101.86		
<u>GFSK</u>	Middle	18.92	77.98	20.45	110.92		
	Highest	18.78	75.51	20.39	109.40		
	Lowest	5.29	3.38	9.47	8.85		
<u>π/4DQPSK</u>	Middle	6.58	4.55	10.88	12.25		
	Highest	6.03	4.01	10.19	10.45		
	Lowest	5.29	3.38	10.10	10.23		
<u>8DPSK</u>	Middle	6.57	4.54	11.67	14.69		
	Highest	6.03	4.01	10.93	12.39		

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.

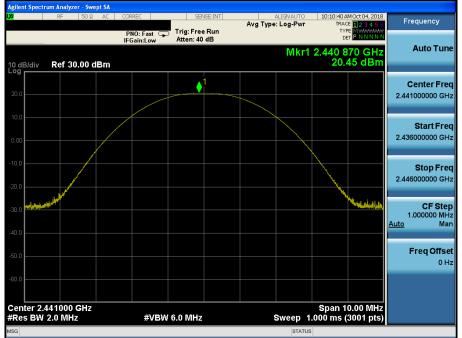


Lowest Channel & Modulation : GFSK



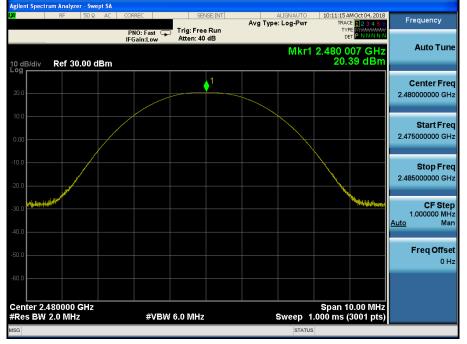
Peak Output Power

Middle Channel & Modulation : GFSK



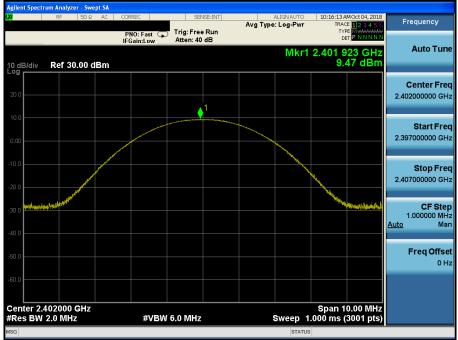


Highest Channel & Modulation : GFSK



Peak Output Power

Lowest Channel & Modulation : π/4DQPSK



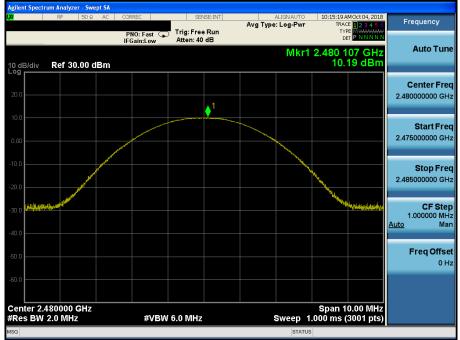


Middle Channel & Modulation : π/4DQPSK



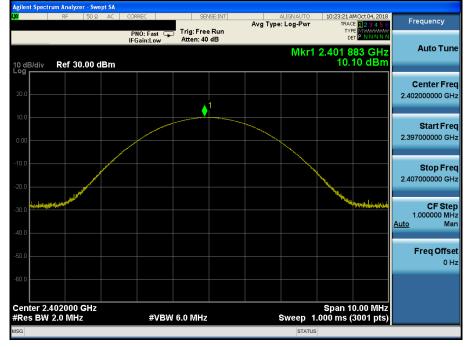
Peak Output Power

Highest Channel & Modulation : π/4DQPSK



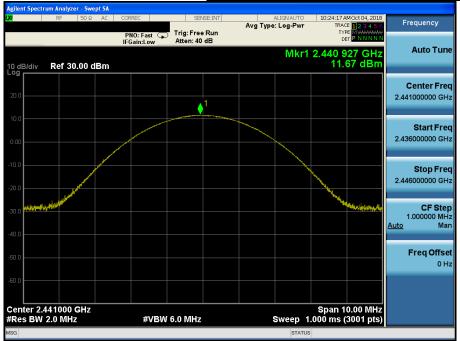


Lowest Channel & Modulation : 8DPSK



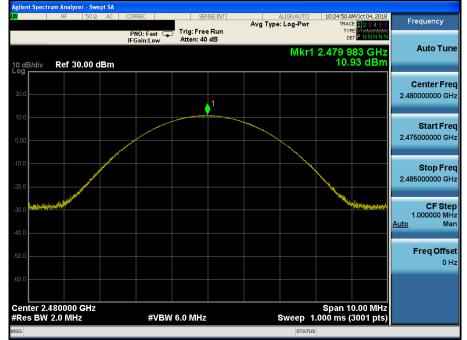
Peak Output Power

Middle Channel & Modulation : 8DPSK





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

 $VBW \ge 3 \times RBW$

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

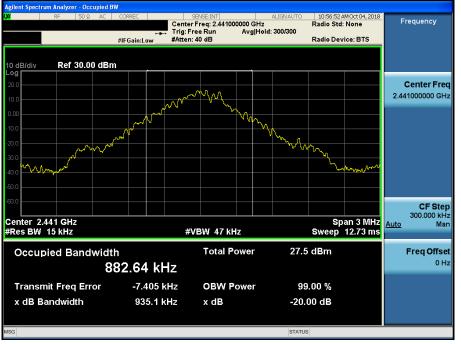
Modulation	Tested Channel	20 dB BW (MHz)	Occupied BW (MHz)				
	Lowest	Lowest 0.931					
<u>GFSK</u>	Middle	0.935	0.883				
	Highest	0.934	0.876				
	Lowest	1.286	1.168				
<u>π/4DQPSK</u>	Middle	1.256	1.169				
	Highest	Lowest 0.931 Middle 0.935 Highest 0.934 Lowest 1.286 Middle 1.256	1.170				
	Lowest	1.265	1.164				
<u>8DPSK</u>	Middle	1.263	1.164				
	Highest	1.263	1.165				

Lowest Channel & Modulation : GFSK

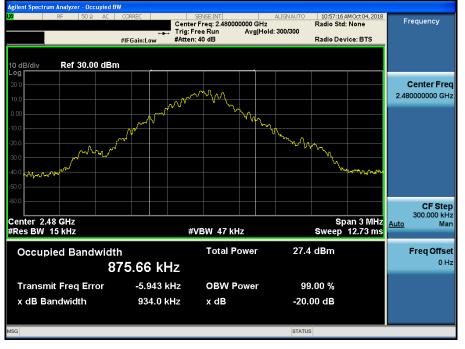


20 dB Bandwidth & Occupied BW









20 dB Bandwidth & Occupied BW







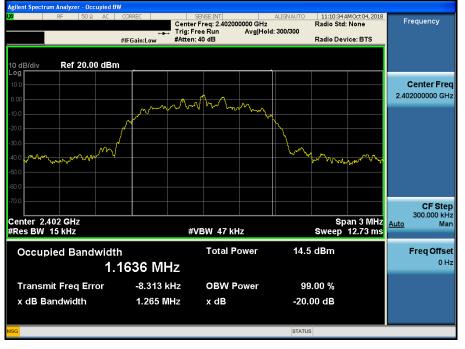


20 dB Bandwidth & Occupied BW

Highest Channel & Modulation : π/4DQPSK







20 dB Bandwidth & Occupied BW











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 ≥ 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	2440.997	2441.999	1.002		
	π/4-DQPSK	2441.000	2442.002	1.002		
	8DPSK	2440.997	2441.999	1.002		

AFH mode

Hopping Mode	Modulation	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)	
Enable	GFSK	2441.159	2442.158	0.999	
	π/4-DQPSK	2440.997	2441.996	0.999	
	8DPSK	2441.000	2441.999	0.999	

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

- 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



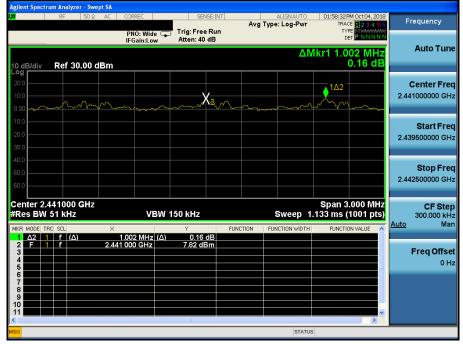
Hopping mode : Enable & GFSK

Carrier Frequency Separation (FH)



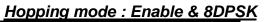
Carrier Frequency Separation (FH)

Hopping mode : Enable & π/4DQPSK





Carrier Frequency Separation (FH)



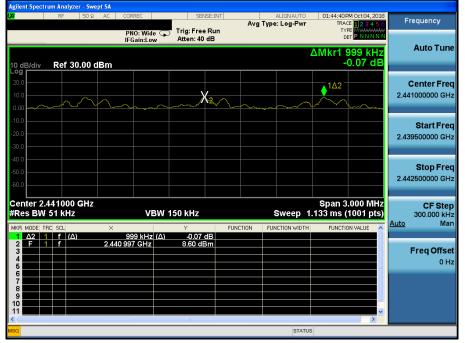
Agilent Spe														
L <mark>XI</mark>	RF	F	50 Ω	AC	CORREC		SEI	ISE:INT	0	ALIGNAUTO		PM Oct 04, 2018	F	requency
					PNO: Wide	0	Trig: Fre	Run	AVg	g Type: Log-Pwr	T	ACE 123456		- 1,
					IFGain:Lov	v L	Atten: 40					DET P N N N N N		
										٨	Mkr1 1 (002 MHz		Auto Tune
10 dB/div	. Da	ef 30.	00 4	Bm						_		-0.31 dB		
Log	v Ke	:I JU,	.00 u	ыш										
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-10.0														Start Freq
-20.0													2.43	9500000 GHz
-30.0														
-40.0														
-50.0														Stop Freq
													2.44	2500000 GHz
-60.0														
Center	2 44 10	000 0	2Hz								Snan	3.000 MHz		05.04++
#Res B			9112		VE	3W 1	50 kHz			Sween		(1001 pts)		CF Step 300.000 kHz
-													Auto	Man
MKR MODE		ι (Δ)		×	1.002 MHz	(A)	۲ -0.31		FUNCTION	FUNCTION WIDT	H FUNCT	ION VALUE		
2 E	1 f	((2))		2.44) 997 GHz	(0)	8.58 d	3m						
3	-													Freq Offset
5	\vdash													0 Hz
6														
8	+													
9														
10	\vdash											~		
<							Ш					>		
MSG		_								STAT	us			
		_	_			_								

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



Carrier Frequency Separation (AFH)

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



Carrier Frequency Separation (AFH)

Hopping mode : Enable & 8DPSK

Agilent Spectrum Analyzer - Swept SA					
LXI RF 50 Ω AC	CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	01:47:29 PM Oct 04, 2018 TRACE 123456 TYPE MWWWWWW	Frequency
10 dB/div Ref 30.00 dBm		g: Free Run ten: 40 dB		Mkr1 999 kHz -0.02 dB	Auto Tune
Log 20.0 10.0 0.00	~~~~~	~X2~_		<u>1Δ2</u>	Center Freq 2.441000000 GHz
-10.0					Start Freq 2.439500000 GHz
-40.0 -50.0 -60.0					Stop Freq 2.442500000 GHz
Center 2.441000 GHz #Res BW 51 kHz	VBW 150		Sweep 1.	Span 3.000 MHz 133 ms (1001 pts) FUNCTION VALUE	CF Step 300.000 kHz <u>Auto</u> Man
1 Δ2 1 f (Δ)	999 kHz (Δ)	-0.02 dB 8.82 dBm		FUNCTION VALUE	Freq Offset 0 Hz
10 11 MSG			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 = 40 MHz	Start Frequency = 2421.0 MHz,	Stop Frequency = 2461.0 MHz				
RBW = To identify clearly the ind or the 20 dB bandwidth, v		less than 30% of the channel spacing				
VBW ≥ RBW	Sweep = auto	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/4-DQPSK	79
	8DPSK	79

AFH mode

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

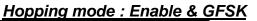
Note 1 : See next pages for actual measured spectrum plots.

- Minimum Standard :

At least 15 hopes



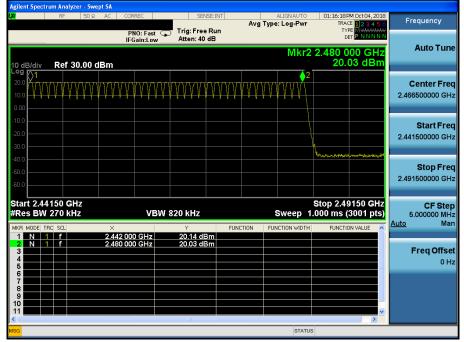
Number of Hopping Frequencies 1(FH)



Agrie LXI	n opec		RF	syzer -	50 Ω		0	ORRE	C			S	ENSE:	INT					ALIGN.			01:			t04,2			E au		
								DHO	: Fast	_	Tr	ig: Fro	ee R	un		A	/g T	ype	: Log	-Pwr			TY	PE M	2 3 4	innni		Fre	quen	cy
							I	FGai	: Fast in:Lov	v 🕈		ten: 4											D	DET P	NNN	N N			Auto	Tune
			_																N	lkr2	2 2				GF dB				Auto	Tune
10 c Log	B/div		Ref	30.0																			20.	24	aв					
20.0	\vdash						m	nn	mn	Λr	m	nn	W.	nn	nη	nr	in.	m	nn.	nn	m	m	w	w	vnr	X		C	enter	Freq
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-10.0																													Star	Freq
-20.0					1																						2	2.391	50000	0 GHz
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-40.0 -50.0																													Stop	Freq
-50.0 -60.0																											2			0 GHz
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				лп2					VE	owv					51 IN 10					_				`			Au		00000	0 MHz Man
1		1 1	f			× 2.4	020	00 (GHz		1	۲ 9.87 (lBm		FUNC	TION		FUN	CHON	WIDTH	1	F	UNCTI	UN VA	LUÉ					
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4																										=				0 Hz
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Number of Hopping Frequencies 2(FH)







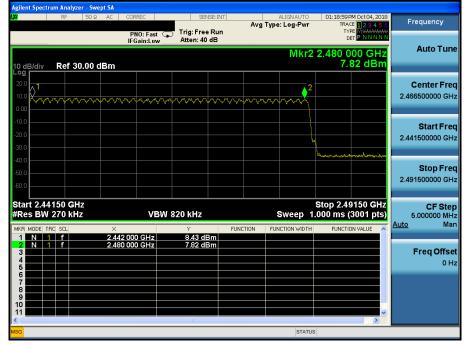
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & π/4DQPSK

glient Spectrum Analyzer - Sv RF 50 :	Ω AC CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	01:21:53PM Oct 04, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWWWW	Frequency
0 dB/div Ref 30.00	PNO: Fast IFGain:Low	Atten: 40 dB	Mkr2	2.441 000 GHz 7.88 dBm	Auto Tune
	∆ ¹	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Center Fred 2.416500000 GHz
10.0 20.0 30.0					Start Freq 2.391500000 GHz
-40.0 -50.0 -60.0					Stop Freq 2.441500000 GHz
Start 2.39150 GHz #Res BW 270 kHz	×		Sweep 1	Stop 2.44150 GHz .000 ms (3001 pts) FUNCTION VALUE	CF Step 5.000000 MHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 4 5	2.402 000 GHz 2.441 000 GHz	7.42 dBm 7.88 dBm			Freq Offset 0 Hz
6 7 8 9 10 11				~	
			STATU	3	

Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & π/4DQPSK





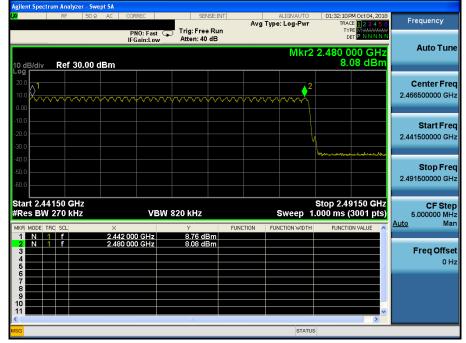
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & 8DPSK

ilent Spectrum Analyzer - Swep RF 50 Ω		SENSE:INT	ALIGNAUTO	01:29:02 PM Oct 04, 2018	
KF 30 2			Avg Type: Log-Pwr	TRACE 123456	Frequency
) dB/div Ref 30.00 dl	PNO: Fast (IFGain:Low 3M	Atten: 40 dB	Mkr2	2.441 000 GHz 8.81 dBm	Auto Tun
			Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y	www.www	Center Fre 2.416500000 GH
					Start Fre 2.391500000 G⊦
0.0					Stop Fre 2.441500000 GF
Res BW 270 GHz	VBV	V 820 KHz Y FUN		Stop 2.44150 GHz .000 ms (3001 pts)	CF Ste 5.000000 MH <u>Auto</u> Ma
1 N 1 f 2 N 1 f 3 4 5 5 6	2.402 000 GHz 2.441 000 GHz	7.48 dBm 8.81 dBm			Freq Offse 0 H
0 7 8 9 0 0 1					
3			STATUS		

Number of Hopping Frequencies 2(FH)

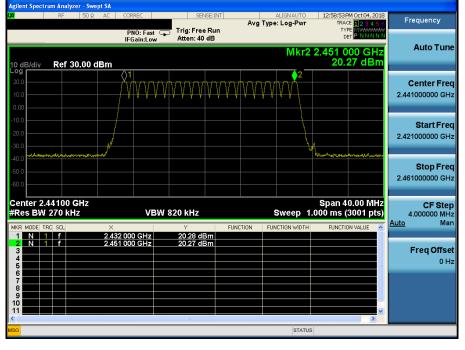
Hopping mode : Enable & 8DPSK





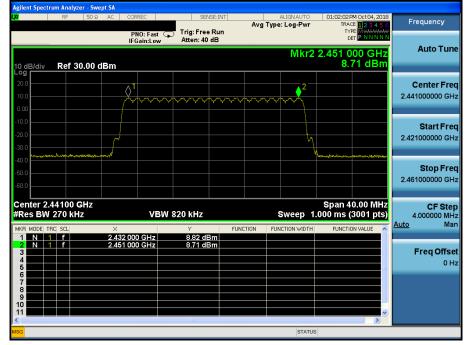
Number of Hopping Frequencies 1(AFH)

Hopping mode : Enable & GFSK



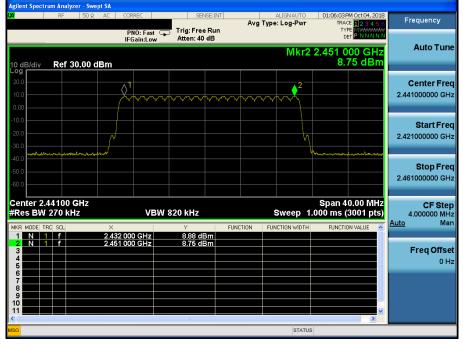
Number of Hopping Frequencies 1(AFH)

Hopping mode : Enable & π/4DQPSK



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 ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel) VBW ≥ 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 = $0.4 \times$ Hopping channel × Burst ON time ×

((Hopping rate ÷ Time slots) ÷ Hopping channel)

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

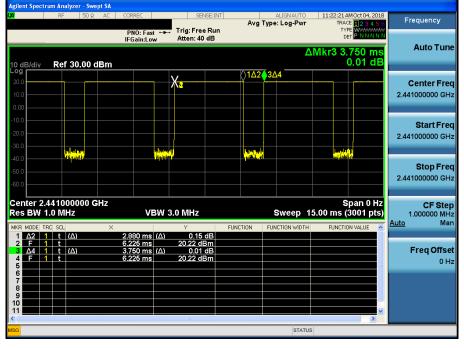
- Hopping Rate = 1600 for FH mode & 800 for AFH mode

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



Hopping mode : Enable & DH5

Time of Occupancy (FH)



Hopping mode : Enable & 2-DH5

Time of Occupancy (FH) Frequency Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB TYPI DE PNO: Fast +++ Auto Tune ΔMkr3 3.750 ms 0.00 dE Ref 20.00 dBm B/div X **Center Freq** 2.441000000 GHz Start Freq 2.441000000 GHz ių d Weiler a Stop Freq 2.441000000 GHz Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 15.00 ms (3001 pts) CF Step 1.000000 MHz Man VBW 3.0 MHz Auto FUNCTION $\Delta 2$ 1 t (Δ) 1 2 101 dF 8.71 dBm 0.00 dB 8.71 dBm Freq Offset (A) 0 Hz



Hopping mode : Enable & 3-DH5

Time of Occupancy (FH)

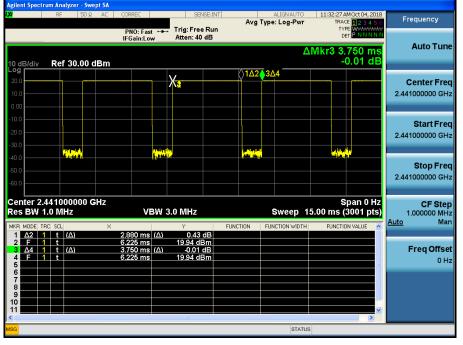
nem spectr	um Analyzer - Sv RF 50 s		RREC	SENS	E:INT			ALIGN AUTO	11:26:18	AM Oct 04, 2018	-
			NO: Fast 🔸 Gain:Low	Trig: Free Atten: 30 d		Avç	ј Туре	: Log-Pwr	T	CE 123456 (PE WAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	
dB/div	Ref 20.00		Gam.eow					Δ	Mkr3 3	.750 ms 0.01 dB	Auto Tur
				4) 1∆2	3∆4 ,//////				Center Fre 2.441000000 GH
0.0 0.0 0.0			Linter Jack						at it-fa		Start Fre 2.441000000 GF
0.0 0.0 0.0						l i at at a					Stop Fre 2.441000000 GH
enter 2.4 es BW 1	RC SCL	×		3.0 MHz Y		ICTION		Sweep 1	5.00 ms	Span 0 Hz (3001 pts)	CF Ste 1.000000 MH Auto Ma
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	t t	<u>5.9</u> 3.7	380 ms (Δ) 910 ms 750 ms (Δ) 910 ms	0.40 d 8.87 dB 0.01 d 8.87 dB	n B						Freq Offs 0 H
8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9										~	
							_	STATUS	3		



Hopping mode : Enable & DH5

Time of Occupancy (AFH)

Time of Occupancy (AFH)



Hopping mode : Enable & 2-DH5

Frequency Avg Type: Log-Pwr Trig: Free Run Atten: 40 dB TYPI DE PNO: Fast ++-Auto Tune ΔMkr3 3.750 ms -0.01 dE Ref 30.00 dBm 3/div **Center Freq** 2.441000000 GHz Start Freq 2.441000000 GHz i te dest Stop Freq 2.441000000 GHz Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 15.00 ms (3001 pts) CF Step 1.000000 MHz Man VBW 3.0 MHz Auto FUNCTION $\Delta 2$ 1 t (Δ) 1 2 0.01 dl 9.0 9.06 dBm -0.01 dB 9.06 dBm Freq Offset (A) 0 Hz



Hopping mode : Enable & 3-DH5

Time of Occupancy (AFH)





7. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

7.1 Test Setup

Refer to the Test Results.

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

- 1. 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.

Note: The radiated spurious emission was tested with below settings.

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.

2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth

is [1/(minimum transmitter on time)] for Average detection (AV) at frequency above 1GHz.



7.3.2. Test Procedures for Conducted Spurious Emissions

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
- 3. The conducted spurious emission was tested each ranges were set as below.

Frequency range : 9 kHz ~ 30 MHz RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

Frequency range : 30 MHz ~ 10 GHz, 10 GHz ~ 25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

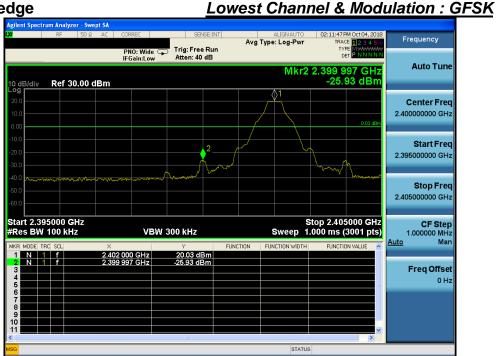
7.4. Test Results

7.4.1. Radiated Spurious Emissions

-NT



Low Band-edge



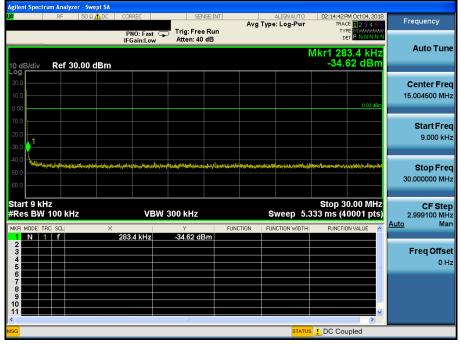
Low Band-edge

Hopping mode & Modulation : GFSK





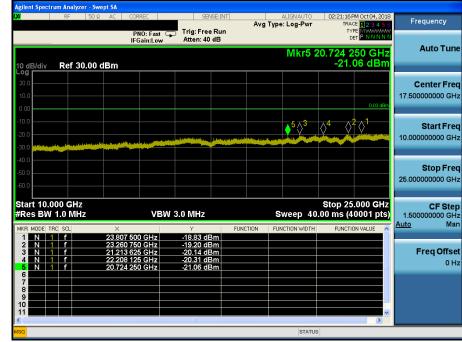
Lowest Channel & Modulation : GFSK



Agilent Spectr														
L <mark>XI</mark>	RF	50 Ω	AC	CORREC		SEN	ISE:INT	Avg		LIGNAUTO	TRA	PM Oct 04, 20 CE 12345	6	Frequency
				PNO: IFGain	Fast 🖵	Trig: Free Atten: 40				•	יד ו	PE MUMUMA	tini I N	
				IFGain	LUW	Accent 40				Mkr	4 4 940	23 GH		Auto Tune
10 dB/div	Ref	30.00 d								IVINI		40 dBr		
Log 20.0			<u> </u>											Center Freq
10.0														5.015000000 GHz
0.00												0.03 dE	Im	
-10.0														Otherst Error
-20.0				(2	_	4 <u>3</u>							Start Freq 30.000000 MHz
-30.0	-	and the second				All succession of the second					1	de la constante	į.	30.000000 MIHZ
-40.0		and its starting its a starting												
-50.0														Stop Freq
-60.0														10.00000000 GHz
Start 30 N	11.7										Stop 1	0.000 GH	-	
#Res BW		/IHz			VBW :	3.0 MHz			Sv	veep 18	.67 ms (4	0000 GH	s)	CF Step 997.000000 MHz
MKR MODE TH	RC SCL		×			Y		CTION	FUNC	TION WIDTH	FUNCT	ION VALUE	~	<u>Auto</u> Man
1 N 1 2 N 1	f			102 11 G 303 40 G		20.03 dE								
3 N 1	f		5.6	89 47 G	Hz	-26.23 dE -26.40 dE	3m							Freq Offset
5			4.3	40 23 G	n2	-20.40 GE	5111						Ξ	0 Hz
6 7														
8														
10														
<						ш						>	~	
MSG										STATUS	6			



Lowest Channel & Modulation : GFSK



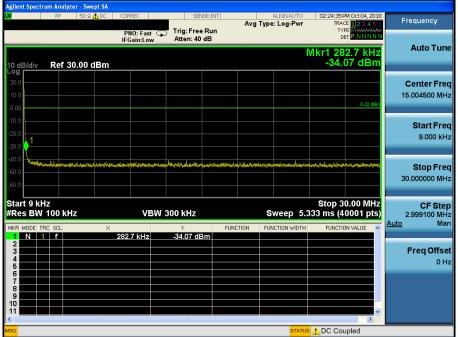


Reference for limit

Middle Channel & Modulation : GFSK

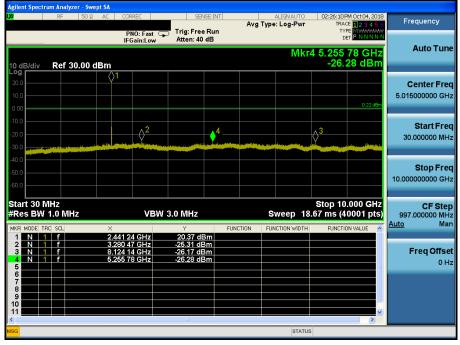


Conducted Spurious Emissions <u>Middle Channel & Modulation : GFSK</u>













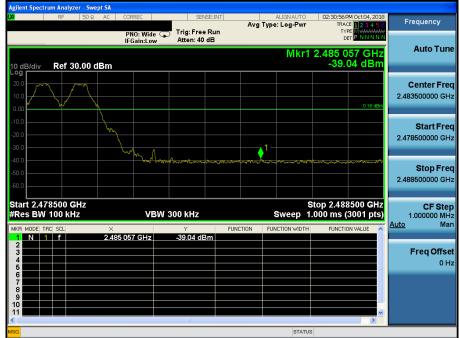
High Band-edge

Highest Channel & Modulation : GFSK



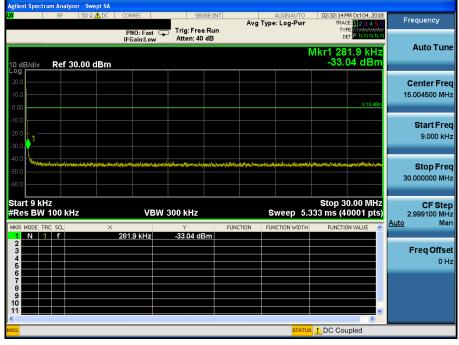
High Band-edge

Hopping mode & Modulation : GFSK



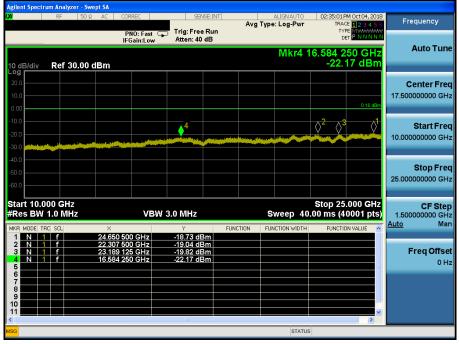


Highest Channel & Modulation : GFSK



Agilent Spectr														
L <mark>XI</mark>	RF	50 Ω	AC	CORREC			NSE:INT			ALIGNAUTO : Log-Pwr	TRA	PM Oct 04, 20: CE 12345	6	Frequency
				PNO: IFGaii	Fast G n:Low	Trig: Fre Atten: 40								Auto Tune
10 dB/div	Ref	30.00 c	lBm							Mkr		81 GH: 88 dBn		Auto Tune
Log 20.0														Center Freq
10.0												0.16 dB		5.015000000 GHz
-10.0												0.10 40		
-20.0						5								Start Freq 30.000000 MHz
-30.0												Y.		
-40.0														Stop Freq
-60.0														10.00000000 GHz
Start 30 N							<u> </u>				Stop 10	0.000 GH	z	CF Step
#Res BW		1Hz			VBW	3.0 MHz				weep 18		· ·		997.000000 MHz Auto Man
MKR MODE TR	C SCL		× 2.4	80 13 0	Hz	Y 20.36 d	Зm	FUNCTION	FUN	CTION WIDTH	FUNCTI	ION VALUE		
2 N 1 3 N 1	f			270 72 G 334 04 G		-25.72 d -26.47 d								Freq Offset
4 N 1	f		9.6	04 69 G	Hz	-27.68 d -27.88 d	Зm							0 Hz
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Highest Channel & Modulation : GFSK





Low Band-edge

Lowest Channel & Modulation : π/4DQPSK



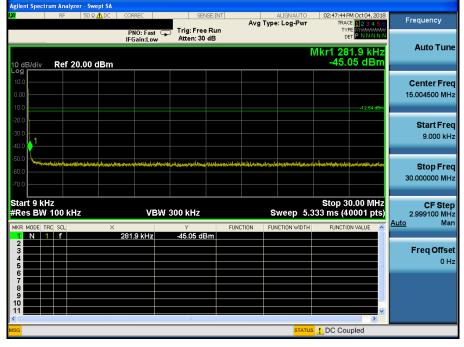
Low Band-edge

Hopping mode & Modulation : π/4DQPSK



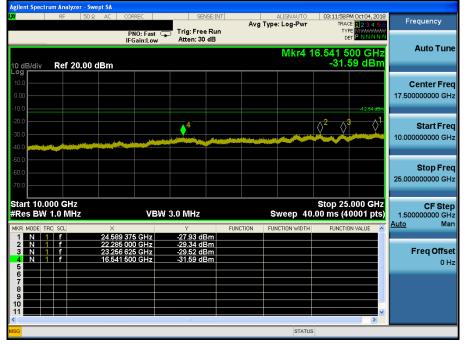


Lowest Channel & Modulation : π/4DQPSK



Agilent Spectr										
L)U	RF	50Ω AC CO	RREC		E:INT	Avg Ty	ALIGNAUTO pe: Log-Pwr	TRAG	PM Oct 04, 2018 CE <mark>1 2 3 4 5 6</mark>	Frequency
		P	NO:Fast ⊂ Gain:Low	Trig: Free Atten: 30 o				TY D	PE M WAAAAAAAAA ET P N N N N N	
			_				Mkr	2 5.759	76 GHz	Auto Tune
10 dB/div	Ref 20.	00 dBm							26 dBm	
Log 10.0										Center Free
0.00										5.015000000 GH
-10.0									-12.54 dBm	
-20.0										Start Fre
-30.0					∮ 2					30.000000 MH
-40.0					Jane Hiller					
-50.0										Stop Fre
-60.0										10.000000000 GH
-70.0										
Start 30 N								Stop 10	.000 GHz	CF Ste
#Res BW			VBW	3.0 MHz			Sweep 18	· ·		997.000000 MH Auto Ma
MKR MODE TH		× 2.402 3	6 GHz	۲ 8.73 dB		CTION F	UNCTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u> ind
2 N 1	f	5.759 7		-35.26 dB						Freq Offse
4										0 H
6										
8										
9										
11									~	
<mark>//SG</mark>							STATUS	3		

Lowest Channel & Modulation : π/4DQPSK



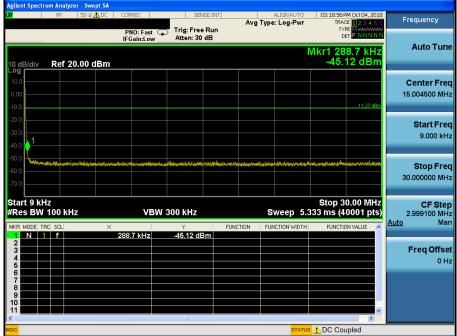


Reference for limit

Middle Channel & Modulation : π/4DQPSK



Conducted Spurious Emissions <u>Middle Channel & Modulation : π/4DQPSK</u>





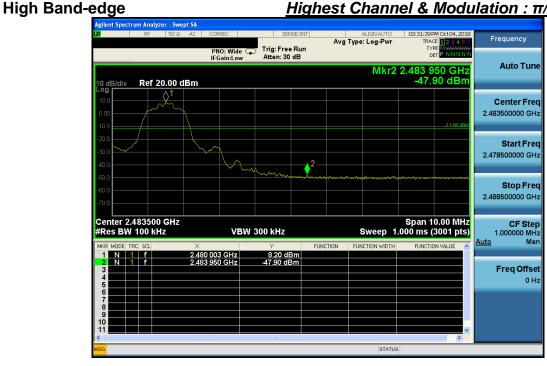
Middle Channel & Modulation : π/4DQPSK







Highest Channel & Modulation : π/4DQPSK



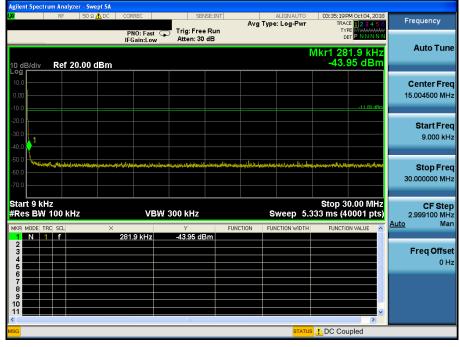
High Band-edge

Hopping mode & Modulation : π/4DQPSK





Highest Channel & Modulation : π/4DQPSK



Agilent Spectrum Analyzer	Swept SA				
LXU RF 5	50 Ω AC CORREC	SENSE:INT	ALIGNAUTO	03:37:24 PM Oct 04, 2018	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr	TRACE 23456 TYPE MWWWWW DET PNNNNN	
10 dB/div Ref 20.0	00 dBm		Mkr	5 8.138 60 GHz -37.89 dBm	Auto Tune
Log 10.0 0.00 -10.0				-11.80.dBm	Center Freq 5.015000000 GHz
-20.0 -30.0 -40.0			2 	534	Start Freq 30.000000 MHz
-50.0 -60.0 -70.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	VB	N 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz
MKR MODE TRC SCL	× 2.480 38 GHz	9.39 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f	6.303 12 GHz 9.069 80 GHz 9.692 67 GHz 8.138 60 GHz	-36.23 dBm -36.88 dBm -37.15 dBm -37.89 dBm		_	Freq Offset 0 Hz
7 8 9 10					
11 <				×	
MSG			STATUS		



Highest Channel & Modulation : π/4DQPSK





Low Band-edge

Lowest Channel & Modulation : 8DPSK



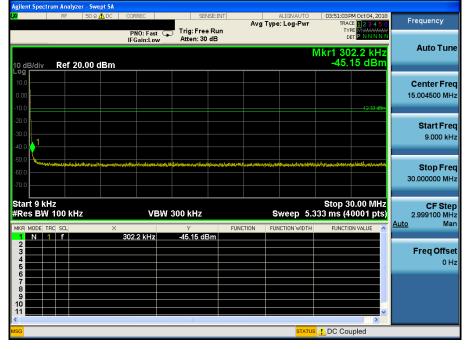
Low Band-edge

Hopping mode & Modulation : 8DPSK





Lowest Channel & Modulation : 8DPSK



		RF	50 Ω	AC	CORREC		SE	NSE:INT			ALIGNAUTO	03:53:21 P	M Oct 04, 2018	3
						Fast G	Trig: Fre			vg Typ	e: Log-Pwr	TY	CE 12345 6 PE M WWWWWWW ET P N N N N N	+
	_	Dof 1	0.00.4	Rm	IFGair	n:Low	Atten: 3				Mkr	5 9.597	71 GHz 55 dBm	Auto Tur
0 dB/di 99 10.0 10.0	v	Ref 2	0.00 d									-07.	12 33 dBm	Center Fre 5.015000000 GH
20.0	and Jacobson		192 22 47 10 10					t ostation di	¢² .	\rangle^4		17	5-	Start Fre 30.000000 Mi
50.0														Stop Fr 10.000000000 G
tart 30 Res B			z			VBW	3.0 MHz			s	weep 18	Stop 10 .67 ms (4	.000 GHz 0001 pts)	CF St 997.000000 M Auto M
KR MODE	TRC			Х			Y		FUNCTIO	N FU	NCTION WIDTH	FUNCTIO	ON VALUE	Auto
1 N 2 N 3 N	1 1 1	f f f		5.7	02 36 G 26 86 G 29 62 G	Hz	8.38 d -36.34 d -36.39 d	Bm Bm						Freq Offs
4 N	1	f f			94 15 G 97 71 G		-36.48 d -37.55 d						=	. 0
5 N														
5 N 6 7 8 9 9 0 1													~	



Lowest Channel & Modulation : 8DPSK



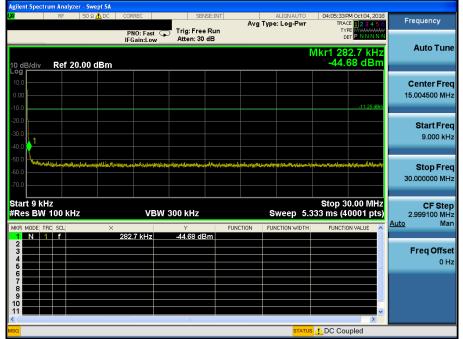


Reference for limit

Middle Channel & Modulation : 8DPSK

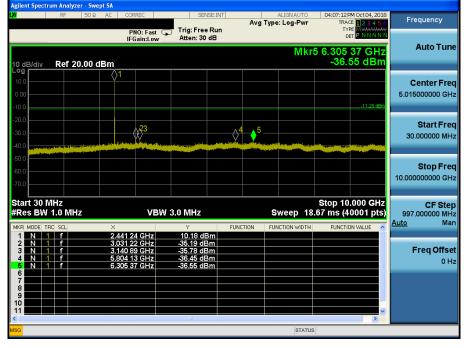


Conducted Spurious Emissions <u>Middle Channel & Modulation : 8DPSK</u>





Middle Channel & Modulation : 8DPSK







High Band-edge

Highest Channel & Modulation : 8DPSK



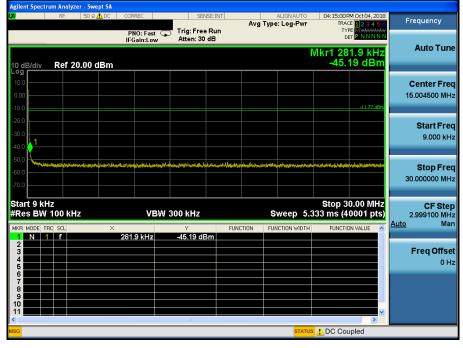
High Band-edge

Hopping mode & Modulation : 8DPSK





Highest Channel & Modulation : 8DPSK



Agilent Spectr	rum Analyz	er - Swep	t SA									
LXI	RF	50 Ω	AC CO	RREC	SE	NSE:INT	Δνα	ALIGNAU		51 PM Oct 04, 20 IRACE 1 2 3 4 5		Frequency
			P	NO: Fast	🖵 Trig: Fre		~Y9	Type. Log-	~		567 E	
			IF	Gain:Low	Atten: 30	dB						Auto Tune
								M		1 91 GH		Auto Tune
10 dB/div Log	Ref 2	0.00 dl							-3	6.22 dBn		
10.0												Center Freq
0.00												5.015000000 GHz
-10.0										-11.77 dB		0.01000000000112
-20.0												
				4⁄3			. 5					Start Freq
-30.0			N.	Ý		a data bat						30.000000 MHz
-40.0	Management of the second									100		
-50.0												Stop Fred
-60.0												10.000000000 GHz
-70.0												
Start 30 P	VIHZ								Ston	10.000 GH	7	CF Step
#Res BW		z		VB	W 3.0 MHz			Sweep	18.67 ms	(40001 pts	5	997.000000 MHz
MKR MODE T	RC SCL		×		Y	FL	JNCTION	FUNCTION WI	DTH FUN	CTION VALUE		<u>Auto</u> Man
1 N 1	1 f		2.479 8		9.35 d						1	
2 N 1 3 N 1	1 f 1 f		2.789 2 3.171 0		-35.80 d -36.09 d							Freq Offset
4 N 1	1 f		2.929 2 5.791 9	8 GHz	-36.19 d -36.22 d	Bm						0 Hz
5 N 1			5.7915	1 GHZ	-36.22 d	Bm						
7 8												
9												
10											~	
<					Ш					>	-	
MSG								ST	ATUS			



Highest Channel & Modulation : 8DPSK





8. Transmitter AC Power Line Conducted Emission

8.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

8.2 Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Pango (MHz)	Conducted Limit (dBuV)							
Frequency Range (MHz)	Quasi-Peak	Average						
0.15 ~ 0.5	66 to 56 *	56 to 46 *						
0.5 ~ 5	56	46						
5 ~ 30	60	50						

* Decreases with the logarithm of the frequency

8.3 Test Procedures

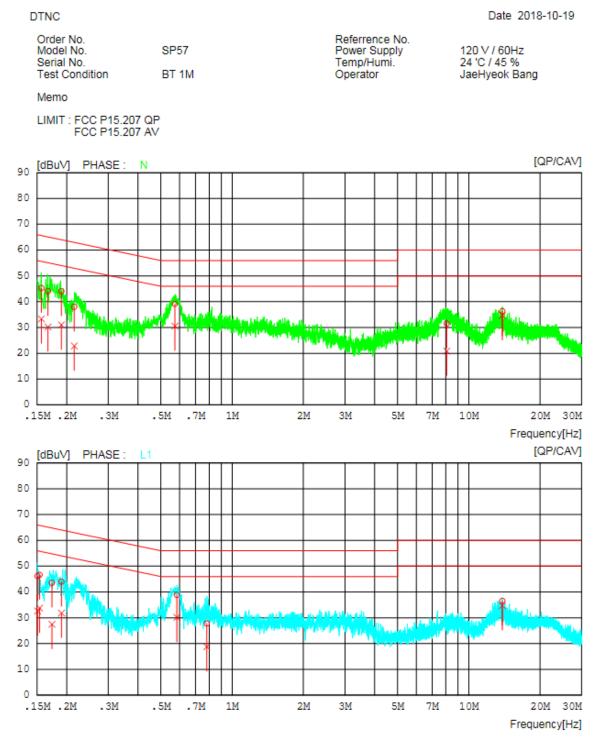
Conducted emissions from the EUT were measured according to the ANSI C63.10.

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4 Test Results

AC Line Conducted Emissions (Graph) = Modulation : <u>GFSK</u>

Results of Conducted Emission



DTNC

AC Line Conducted Emissions (List) = Modulation : <u>GFSK</u>

Results of Conducted Emission

Date 2018-10-19

Order No. Model No. Serial No. Test Condition	SP57 BT 1M	Referrence No. Power Supply Temp/Humi. Operator	120 V / 60Hz 24 'C / 45 % JaeHyeok Bang	
Memo				
LIMIT : FCC P15. FCC P15.				
NO FREQ [MHz]	READING C.FACTOR QP CAV [dBuV][dBuV] [dB]	QP CAV QP CAV	MARGIN PHASE QP CAV [dBuV][dBuV]	
2 0.16670 3 0.18992 4 0.21541 5 0.57350 6 8.06640 7 13.85460 8 0.15062 9 0.15363 10 0.17320 11 0.19002 12 0.58366	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	20.35 22.35 N 21.05 24.87 N 19.98 23.02 N 24.94 30.16 N 16.84 15.44 N 23.69 15.35 N 19.82 23.36 L1 19.17 22.04 L1 21.26 27.32 L1 20.04 22.21 L1 17.10 15.85 L1 28.20 27.23 L1	



9. Antenna Requirement

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that

it employs a unique antenna connector, for every antenna proposed for use with the EUT.

Conclusion: Comply

The external antenna is connected to the unique connecter. (Refer to Internal Photo file.) Therefore this E.U.T Complies with the requirement of §15.203

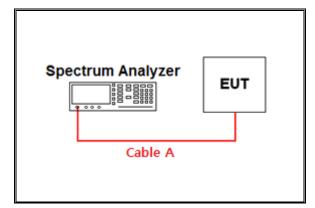
- Minimum Standard :

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.

APPENDIX I

Test set up diagrams

Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.67	15	1.66
1	0.71	20	3.15
2.402 & 2.441 & 2.480	1.04	25	3.62
5	1.23	-	-
10	1.61	-	-

Note 1: The path loss from EUT to Spectrum analyzer was measured and used for test. Path loss (S/A's correction factor) = Cable A