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: DRTFCC2009-0	286			
2. Customer				
• Name : LG Electronics USA	Inc.			
• Address : 111 Sylvan Avenu	e, North Building Englewood Cliffs, NJ 07632			
3. Use of Report : FCC Original	Grant			
4. Product Name / Model Name FCC ID : ZNFOA2007	Mobile Phone / OA2007			
5. FCC Regulation(s): Part 15.24 Test Method Used : KDB5580	7 74 D01v05r02, ANSI C63.10-2013			
6. Date of Test : 2020.07.29 ~ 20	20.08.24			
7. Location of Test : 🛛 Permane	ent Testing Lab 🔲 On Site Testing			
8. Testing Environment : See app	pended test report.			
9. Test Result : Refer to the attac	hed Test Result			
The results shown in this test report	refer only to the sample(s) tested unless otherwise stated.			
Affirmation	Reviewed by			
Name : JaeHyeok Bang				
	2020.09.17.			
	DT&C Co., Ltd.			
Unconnected v	vith KS Q ISO / IEC 17025 and KOLAS accreditation			
If this report is required to confirmation of authenticity, please contact to report@dtnc.net				



Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2009-0286	Sep. 17, 2020	Initial issue	JaeHyeok Bang	JaeJin Lee



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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 & IC MRA Accredited Test Firm No. : KR0034

- ISED #: 5740A

www.dtnc.net			
Telephone	:	+ 82-31-321-2664	
FAX	:	+ 82-31-321-1664	

1.2 Testing Environment

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

1.3 Measurement Uncertainty

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

Test items	Measurement uncertainty
Transmitter Output Power	0.9 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	3.6 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.1 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	:	LG Electronics USA, Inc	
Address	:	111 Sylvan Avenue, North Building Englewood Cliffs, NJ 07632	
Contact person	:	Kyung-Su Han	

1.5 Description of EUT

EUT	Mobile Phone
Model Name	OA2007
Add Model Name	NA
Serial Number	Identical prototype
Power Supply	DC 3.87 V
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation Technique	GFSK, π/4DQPSK, 8DPSK
Number of Channels	79
Antenna Type	PIFA Antenna
Antenna Gain	PK : 0.17 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	19/12/16	20/12/16	MY50410357
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	20/06/24	21/06/24	US47360812
DC Power Supply	Agilent Technologies	66332A	20/06/24	21/06/24	MY43000211
Multimeter	FLUKE	17B	19/12/16	20/12/16	26030065WS
Signal Generator	Rohde Schwarz	SMBV100A	19/12/16	20/12/16	255571
Signal Generator	ANRITSU	MG3695C	19/12/16	20/12/16	173501
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-1
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-2
Thermohygrometer	BODYCOM	BJ5478	19/09/18	20/09/18	N/A
HYGROMETER	TESTO	608-H1	20/01/21	21/01/21	34862883
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
BILOG ANTENNA	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362
Horn Antenna	ETS-Lindgren	3115	20/01/30	22/01/30	6419
Horn Antenna	Schwarzbeck	BBHA 9120C	19/12/04	21/12/04	9120C-561
PreAmplifier	tsj	MLA-0118-B01-40	19/12/16	20/12/16	1852267
PreAmplifier	tsj	MLA-1840-J02-45	20/06/24	21/06/24	16966-10728
PreAmplifier	H.P	8447D	19/12/16	20/12/16	2944A07774
BlueTooth Tester	TESCOM	TC-3000B	19/12/16	20/12/16	3000B770243
Power Splitter	Anritsu	K241B	20/06/24	21/06/24	020611
High Pass Filter	Wainwright Instruments	WHKX12-935- 1000-15000-40SS	20/06/24	21/06/24	8
High Pass Filter	Wainwright Instruments	WHKX10-2838- 3300-18000-60SS	20/06/24	21/06/24	1
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5- 6SS	20/06/24	21/06/24	3
Attenuator	Hefei Shunze	SS5T2.92-10-40	20/06/24	21/06/24	16012202
Attenuator	SRTechnology	F01-B0606-01	20/06/24	21/06/24	13092403
Attenuator	Aeroflex/Weinschel	20515	20/06/24	21/06/24	Y2370
Attenuator	SMAJK	SMAJK-2-3	20/06/24	21/06/24	2
Power Meter &	Anritsu	ML2488B	20/01/02	21/01/02	0846002
Wide Bandwidth Sensor	Annou	MA2491A	20/01/02	21/01/02	0845295
EMI Test Receiver	ROHDE&SCHWARZ	ESR	19/12/17	20/12/17	101767
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	19/09/17	20/09/17	101333
LISN	SCHWARZBECK	NSLK 8128 RC	19/11/04	20/11/04	8128 RC-387
Cable	Junkosha	MWX241	20/01/13	21/01/13	G-04
Cable	Junkosha	MWX241	20/01/13	21/01/13	G-07
Cable	DT&C	Cable	20/01/13	21/01/13	G-13
Cable	DT&C	Cable	20/01/13	21/01/13	G-14
Cable	HUBER+SUHNER	SUCOFLEX 104	20/01/13	21/01/13	G-15
Cable	Radiall	TESTPRO3	20/01/16	21/01/16	M-01
Cable	Junkosha	MWX315	20/01/16	21/01/16	M-05
Cable	Junkosha	MWX221	20/01/16	21/01/16	M-06
Cable	DT&C	Cable	20/01/16	21/01/16	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)	Number of Hopping Frequencies	>= 15 hops		С
	20 dB Bandwidth	N/A		С
	Dwell Time	=< 0.4 seconds		С
15.247(b)	Transmitter Output Power	 < 1 Watt , if CHs >= 75 Others =< 0.125 W Others =< 0.125 W For Conducted Power. =< 0.5 Watt For e.i.r.p 	Conducted	С
15.247(d)	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
15.247(d) 15.205 & 209	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	C Note3,4
15.207	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.

Note 4 : This device supports wireless charging capability & Can use Dual Screen.

So per KDB648474 D03v01r04, the radiated test items were performed all not charging, charging and Dual Screen conditions. For wireless charging condition, the handset is placed on the representative charging pad under normal conditions and in a simulated call configuration.



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	2 402 ~ 2 480	2 402 ~ 2 480

- Hopping Function : Disable

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2 402	2 402
Middle Channel	2 441	2 441
Highest Channel	2 480	2 480



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 :

- §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 2 400 MHz - 2 483.5 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 2 400 2 483.5 MHz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 MHz 5 805 MHz band : 1 Watt. For all other frequency hopping systems in the 2 400 MHz 2 483.5 MHz band: 0.125 watts.

IC Requirements

 RSS-247(5.4) (b), For FHSS operating in the band 2 400 MHz – 2 483.5 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

 $RBW \ge 20 \text{ dB BW}$ $VBW \ge RBW$ Sweep = auto Detector function = peak Trace = max hold

2.4 Test Results

Modulation	Tested Channel		verage Power	Peak Out	put Power
Modulation	rested onamer	dBm	mW	dBm	mW
	Lowest	9.82	9.59	11.37	13.71
<u>GFSK</u>	Middle	10.98	12.53	12.14	16.37
	Highest	9.53	8.97	11.20	13.18
	Lowest	9.86	9.68	12.84	19.23
<u>π/4DQPSK</u>	Middle	10.94	12.42	13.84	24.21
	Highest	9.45	8.81	12.36	17.22
	Lowest	9.84	9.64	13.01	20.00
<u>8DPSK</u>	Middle	10.93	12.39	14.09	25.64
	Highest	9.43	8.77	12.51	17.82

Note 1: The burst 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

Center 2.480000 GHz #Res BW 2.0 MHz

Lowest Channel & Modulation : π/4DQPSK

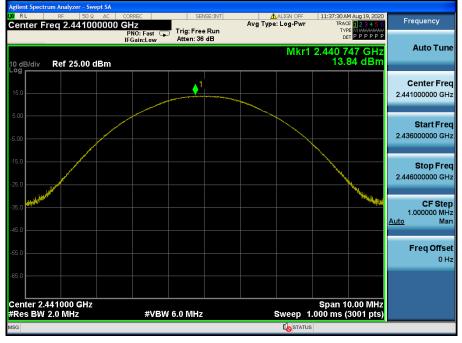
Span 10.00 MHz Sweep 1.000 ms (3001 pts)



#VBW 6.0 MHz



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 was 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

 $VBW \ge 3 \times RBW$

Span = between two times and five times the 20 dB bandwidth

Sweep = auto

Detector function = peak

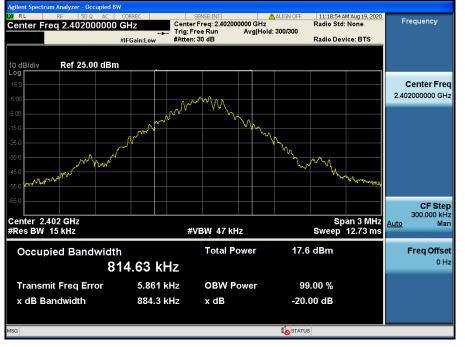
Trace = max hold

3.4 Test Results

Modulation	Tested Channel	20 dB BW (MHz)
	Lowest	0.884
<u>GFSK</u>	Middle	0.886
	Highest	0.883
	Lowest	1.335
<u>π/4DQPSK</u>	Middle	1.334
	Highest	1.346
	Lowest	1.339
<u>8DPSK</u>	Middle	1.332
	Highest	1.337



Lowest Channel & Modulation : GFSK



20 dB BW

Middle Channel & Modulation : GFSK



Highest Channel & Modulation : GFSK



20 dB BW

Lowest Channel & Modulation : π/4DQPSK 11:34:34 AM Aug 19, 202 Radio Std: None 🛕 ALIGN C Center Freq: 2.40200000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 36 dB Frequency Center Freq 2.402000000 GHz #IFGain:Low Radio Device: BTS Ref 25.00 dBm **Center Freq** 2 40200000 GH mumm month MA www. wyw CF Step 300.000 kHz Center 2.402 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Man <u>Auto</u> #VBW 47 kHz Total Power 18.1 dBm Occupied Bandwidth Freq Offset 0 Hz 1.2272 MHz 4.270 kHz **OBW Power** 99.00 % **Transmit Freq Error** x dB Bandwidth 1.335 MHz -20.00 dB x dB

Middle Channel & Modulation : π/4DQPSK

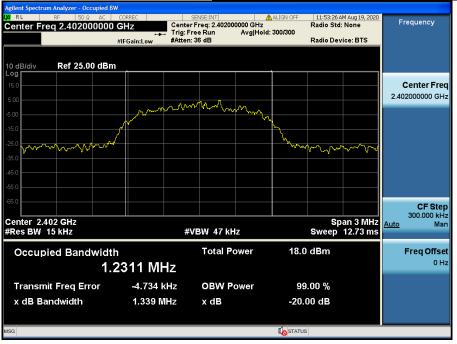


20 dB BW

Highest Channel & Modulation : π/4DQPSK 11:39:23 AM Aug 19, 202 Radio Std: None 🛕 ALIGN (Center Freq: 2.48000000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 36 dB Frequency Center Freq 2.480000000 GHz #IFGain:Low Radio Device: BTS 0 dB Ref 25.00 dBm **Center Freq** 2 48000000 GH www. Mm www m 1n ᠕᠕᠕ CF Step 300.000 kHz Center 2.48 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Man <u>Auto</u> #VBW 47 kHz Total Power 17.9 dBm Occupied Bandwidth Freq Offset 0 Hz 1.2903 MHz 4.672 kHz 99.00 % **Transmit Freq Error OBW Power** x dB Bandwidth 1.346 MHz -20.00 dB x dB



Lowest Channel & Modulation : 8DPSK



20 dB BW

Middle Channel & Modulation : 8DPSK Center Freq: 2.441000000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 36 dB 11:55:48 AM Aug 19, 202 Radio Std: None Frequency Center Freq 2.441000000 GHz #IFGain:Low Radio Device: BTS 0 dB/ Ref 25.00 dBm **Center Freq** 2 441000000 GHz N m CF Step 300.000 kHz Center 2.441 GHz #Res BW 15 kHz Span 3 MHz Sweep 12.73 ms Man <u>Auto</u> #VBW 47 kHz Total Power 19.0 dBm Occupied Bandwidth Freq Offset 0 Hz 1.2287 MHz -5.004 kHz **OBW Power** 99.00 % **Transmit Freq Error** x dB Bandwidth 1.332 MHz -20.00 dB x dB **I**STATUS

Highest Channel & Modulation : 8DPSK





4. Carrier Frequency Separation

4.1 Test Setup

Refer to the APPENDIX I.

4.2 Limit

Limit : ≥ 25 kHz or ≥ 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 = autoDetector function = peakTrace = 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	2 440.900	2 441.900	1.000
Enable	π/4DQPSK	2 440.998	2 441.998	1.000
	8DPSK	2 441.153	2 442.152	0.999

AFH mode

Hopping Mode	Modulation	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
	GFSK	2 440.905	2 441.911	1.006
Enable	π/4DQPSK	2 440.995	2 441.999	1.004
	8DPSK	2 441.150	2 442.158	1.008

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 2 400 MHz – 2 483.5 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)



Carrier Frequency Separation (FH)

Hopping mode : Enable & π/4DQPSK





Carrier Frequency Separation (FH)

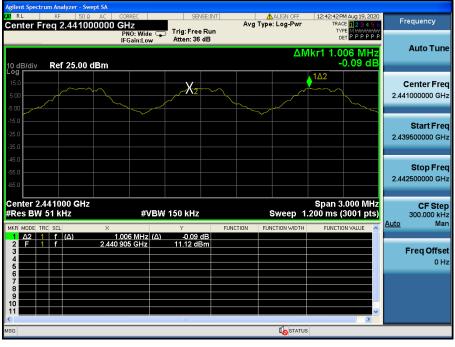
Hopping mode : Enable & 8DPSK

Agilent Spectr											
LXI RL	RF	50 Ω AC	CORREC	SEN	ISE:INT		ALIGN OFF		4 Aug 19, 2020	Frequency	
Center F	req 2.4	41000000		Trig: Free	Run	Avg Type	: Log-Pwr	TRAC	E M WAANAAAA	requeitcy	
			PNO: Wide IFGain:Low	Atten: 36				DE	E MWWWWW T P P P P P P		
	_		II GUILLOW					A BALLAR C		Auto Tu	ine
								ΔMkr1 §			
10 dB/div	Ref 2	5.00 dBm						().26 dB		
Log								<u> </u>	Δ2		
15.0	Δ	\sim		0-0-0	-X2					Center F	req
5.00	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~ ~ \	\sim			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\sim		mar and a second	2.441000000	Hz
-5.00											
-15.0										Start Fi	req
-25.0										2.439500000	Hz
-35.0											
-45.0											
										Stop Fr	rea
-55.0										2.442500000 0	1
-65.0										2.442300000 0	2
Center 2.4								Span 3.	000 MHz	CF St	ep
#Res BW	51 kHz		#VE	3W 150 kHz		5	Sweep 1	.200 ms (3001 pts)	300.000	
MKRI MODEL TR	eri sri i	X		Y	FUNC		ICTION WIDTH	FUNCTIO		Auto N	/lan
			999 kHz (Toneno	N VALUE		
2 F 1			1 153 GHz	11.33 di							
3					_					Freq Off	
4 5					_				_	0	Hz
6											
7					_						
8 9											
10											
11									~		
<				III	_				>		
MSG								5			
											-



Carrier Frequency Separation (AFH) <u>He</u>





Carrier Frequency Separation (AFH)

Hopping mode : Enable & π/4DQPSK

Agilent Spectrum Analyzer - Swept SA				
Center Freq 2.441000000 GHz	SENSE:INT	ALIGN OFF	12:47:50 PM Aug 19, 2020 TRACE 1 2 3 4 5 6	Frequency
PNO: Wide IFGain:Low			DET PPPPP	
		ΔΝ	1kr1 1.004 MHz	Auto Tune
10 dB/div Ref 25.00 dBm			-0.01 dB	
15.0				Center Freq
5.00	~~~^2~~~~			2.441000000 GHz
-5.00				
-15.0				Start Freq
-25.0				2.439500000 GHz
-45.0				
-55.0				Stop Freq 2.442500000 GHz
-65.0				2.442500000 GH2
Center 2.441000 GHz			Span 3.000 MHz	CF Step
#Res BW 51 kHz #V	BW 150 kHz	Sweep 1	.200 ms (3001 pts)	300.000 kHz
MKR MODE TRC SCL X 1 Δ2 1 f (Δ) 1.004 MHz	Y FUNCT (Δ) -0.01 dB	ION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 F 1 f 2.440 995 GHz	10.66 dBm			Freq Offset
4				0 Hz
8				
10				
11 <	THE SECOND SECOND		>	
MSG			5	



Carrier Frequency Separation (AFH)

Hopping mode : Enable & 8DPSK

^{v RL}	RF	/zer - Swe 50 Ω 44100				SE:INT	Avg	ALIGN OFF	TRAC	M Aug 19, 2020 E 1 2 3 4 5 6	Fre	quency
10 dB/div	Ref	25.00 c	IF	NO: Wide ⊂ Gain:Low	Trig: Free Atten: 36			ΔΝ	ت 1kr1 1.0	T P P P P P P	,	Auto Tune
15.0 5.00	^	~~~~	<u>^</u>			X2_	~~~	~~~~	~~~	1Δ2		enter Fred 000000 GH:
-15.0 -25.0 -35.0												Start Free 500000 GH
-45.0 -55.0 -65.0												Stop Fre 500000 GH
Center 2. #Res BW	51 kH		×	#VB1	N 150 kHz	FUN	CTION	Sweep 1	.200 ms (.000 MHz 3001 pts)	: <u>Auto</u>	CF Stej 800.000 kH Ma
1 Δ2 1 2 F 1 3 4 5 5 6 7		Δ)		8 MHz (Δ 0 GHz		1B	CHON		ronent		F	req Offse 0 H
8 9 9 10 10 11 10 10 10 10 10 10 10 10 10 10					iui			In STATUS	5	×		



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 2 400 MHz \sim 2 483.5 MHz were examined.

The spectrum analyzer is set to :		
Span for FH mode = 50 MHz	Start Frequency = 2 391.5 MHz,	Stop Frequency = 2 441.5 MHz
	Start Frequency = 2 441.5 MHz,	Stop Frequency = 2 491.5 MHz
Span for AFH mode = 30 MHz	Start Frequency = 2 426.0 MHz,	Stop Frequency = 2 456.0 MHz
RBW = To identify clearly the indiv or the 20 dB bandwidth, w		ess 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



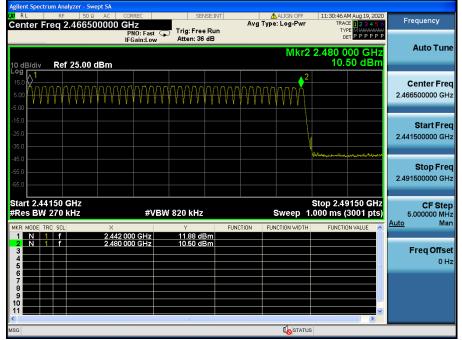
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & GFSK

Agilent Spectrum Analyzer - Swept SA LXI RL RF 50 Ω AC	CORREC	SENSE:INT	ALIGN OFF	11:29:34 AM Aug 19, 2020	
Center Freq 2.41650000	0 GHz PNO: Fast 😱	Trig: Free Run	Avg Type: Log-Pwr	TRACE 123456 TYPE MWWWWWW	Frequency
	IFGain:Low	Atten: 36 dB		DETPPPP	Auto Tune
			Mkr2	2.441 000 GHz	Auto Tune
10 dB/div Ref 25.00 dBm				11.65 dBm	
15.0					Center Freq
5.00 AAA				AAAAAAAAA	2.416500000 GHz
-5.00	*******	1111111111	* * * * * * * * * *		
-15.0					Start Freq
-25.0					2.391500000 GHz
-35.0					2.0010000000112
-45.0 -45.0					
-55.0					Stop Freq
-65.0					2.441500000 GHz
Start 2.39150 GHz #Res BW 270 kHz	#\/B)//	820 kHz	Sween 1	Stop 2.44150 GHz .000 ms (3001 pts)	CF Step 5.000000 MHz
			-		Auto Man
MKR MODE TRC SCL X	02 000 GHz	Y FUNC 10.71 dBm	TION FUNCTION WIDTH	FUNCTION VALUE	
	41 000 GHz	11.65 dBm			Freq Offset
4					0 Hz
5 6				ΞΞ.	
7 8					
9					
10				~	
<		111	4	<u> </u>	
MSG					

Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & GFSK





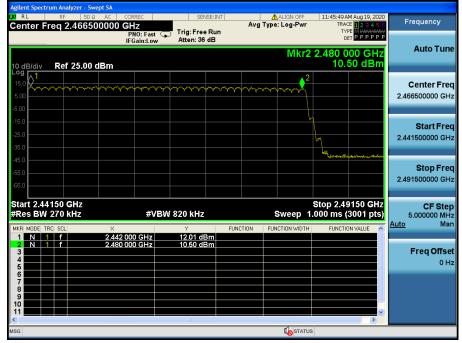
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & π/4DQPSK

RL enter l	_{RF} Freq 2.4	50 Ω AC 1650000	0 GHz			Run	Avg 1	ALIGN OFF	r TR/ T	AM Aug 19, 2020 ACE 123456 YPE MWANAAAA	Frequency
0 dB/div	Ref 2	5.00 dBm	IFGa	in:Low	Atten: 36	dB		Mkr	2 2.441	000 GHz	Auto Tune
5.00				᠂᠂᠂᠂		᠆᠂ᠰᠰ᠆ᠰᡝ	r-44		$\gamma \gamma $	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Center Fred 2.416500000 GH:
15.0 25.0 35.0											Start Free 2.391500000 GH:
45.0		<i>ل</i> و									Stop Fred 2.441500000 GHz
Res BV	9150 GH / 270 kH: TRC SCL	z	× 402 000 (V 820 kHz Y 10.26 de		NCTION	Sweep	1.000 ms	4150 GHz (3001 pts)	CF Step 5.000000 MHz <u>Auto</u> Mar
1 N 2 N 3 4 5 6		2.	441 000	GHz	10.26 dE 11.88 dE						Freq Offset 0 Hz
7 8 9 10 11											
< ISG					110			Г <mark>ю</mark> sta	rus		

Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & π/4DQPSK





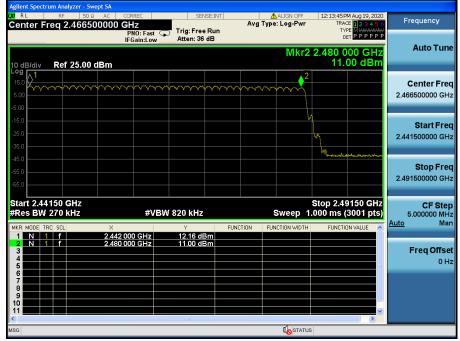
Number of Hopping Frequencies 1(FH)

Hopping mode : Enable & 8DPSK

Agilent Spectrum Analyzer - Swept SA				
LX/RL RF 50 Q AC				Aug 19, 2020 Frequency
Center Freq 2.416500000	GHz	Avg Type: L	Log-Pwr TRACE	123456 MWWWWW
	PNO: Fast Trig: Free IFGain:Low Atten: 36		DET	PPPPP
	IFGam:Low Atten. 30	40 		Auto Tune
			Mkr2 2.441 00	JUGHZ
10 dB/div Ref 25.00 dBm			11.8	5 dBm
15.0				Center Freq
5.00	M M M M M M M M M M M M M M M M M M M	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2.416500000 GHz
				2.416500000 GHz
-5.00				
-15.0				
				Start Freq
-25.0				2.391500000 GHz
-35.0				
-45.0 Another manufacture				
				Stop Freq
-55.0				
-65.0				2.441500000 GHz
Start 2.39150 GHz			Stop 2.44	150 GHz
#Res BW 270 kHz	#VBW 820 kHz	Su	weep 1.000 ms (3	150 GHz CF Step 5.0000 MHz 5.00000 MHz
	# VEW 020 KHZ			Auto Man
MKR MODE TRC SCL X	Y		FION WIDTH FUNCTION	VALUE A Man
	2 000 GHz 10.98 dB			
2 N 1 f 2.44	1 000 GHz 11.85 dB	m		Freq Offset
4				
5				0 Hz
6				
7				
8				
10				
11				→
<				
MSG			STATUS	

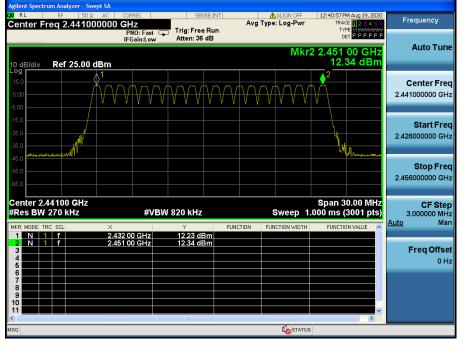
Number of Hopping Frequencies 2(FH)

Hopping mode : Enable & 8DPSK



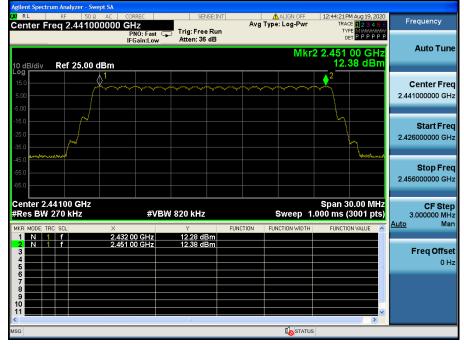
Number of Hopping Frequencies 1(AFH)

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

	F 50Ω AC 2.44100000		SENSI	Av Run	ALIGN OFF g Type: Log-Pwr	TYPE	123456	Frequency
0 dB/div R	ef 25.00 dBm	IFGain:Low	Atten: 36 d	В	Mk	r2 2.451 0	0 GHz dBm	Auto Tun
- og 15.0		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2		Center Fre 2.441000000 G⊦
15.0 25.0 35.0	\mathcal{A}					- \/		Start Fre 2.426000000 G⊦
45.0								Stop Fre 2.456000000 GH
Center 2.441 Res BW 270) kHz	x	3W 820 kHz Y	FUNCTION	Sweep	Span 30. 1.000 ms (30	001 pts)	CF Ste 3.000000 Mi Auto Mi
1 N 1 f 2 N 1 f 3 4 5		2.432 00 GHz 2.451 00 GHz	12.94 dBr 12.44 dBr					Freq Offs 0 F
6 7 8 9 9 10								
6G			Ш		STATL	JS		



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 :

Span = zero

Center frequency = 2 441 MHz 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)
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 × Hopping channel × Burst ON time ×

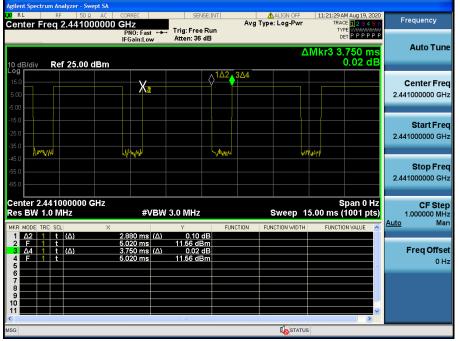
((Hopping rate ÷ Time slots) ÷ Hopping channel)

- 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.

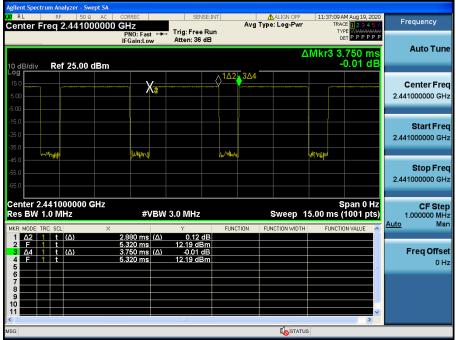


Time of Occupancy (FH)



Time of Occupancy (FH)

Hopping mode : Enable & 2-DH5





Hopping mode : Enable & 3-DH5

Time of Occupancy (FH)

enter Fr		50 Ω AC 1000000	CORREC CORREC O GHZ PNO: Fast IFGain:Lov	++- Trig: Fre			ALIGN OFF e: Log-Pwr	TRAC TYP	M Aug 19, 2020 E 123456 E WWWWWWW T P P P P P P	Frequency
0 dB/div	Ref 25.	.00 dBm	II OUIIIEOF				Δ	.Mkr3 3. (750 ms 0.08 dB	Auto Tun
og 15.0 5.00				X		14	2 3∆4			Center Fre 2.441000000 GH
15.0 25.0 35.0									attlenage	Start Fre 2.441000000 GH
45.0 55.0 65.0		herefyjitel								Stop Fre 2.441000000 G⊦
enter 2.4 es BW 1		00 GHz ×	#V	BW 3.0 MH2			Sweep 1	S 5.00 ms (1 FUNCTIO		CF Ste 1.000000 MH Auto Ma
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	t (Δ) t t (Δ) t		2.880 ms 6.953 ms 3.750 ms 6.953 ms	12.15 d	Bm dB					Freq Offs 0 F
6 7 8 9 0										
G				III			STATUS	1	>	



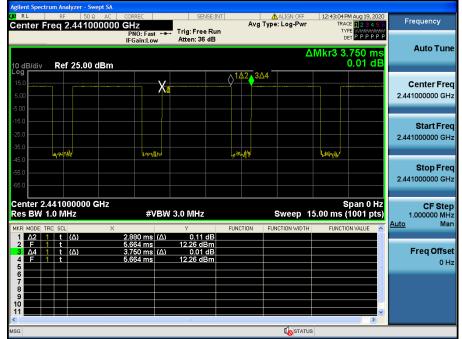
Hopping mode : Enable & DH5

Time of Occupancy (AFH)



Time of Occupancy (AFH)

Hopping mode : Enable & 2-DH5





Time of Occupancy (AFH)

Hopping mode : Enable & 3-DH5

	um Analyzer - Swe									
⁷ RL	RF 50 ຊ req 2.44100	AC CORREC		SENSE			ALIGN OFF	TRA	M Aug 19, 2020 CE 123456	Frequency
		PNO: I IFGain:	ast ↔ Low	Trig: Free F Atten: 36 d			Δ	۲۷ D Mkr3 3.	ет ререре 750 ms	Auto Tune
0 dB/div -og 15.0 5.00	Ref 25.00 d	Bm		Xa	nahimi daga nahimi daga na	∆1 ∆ 2√3	3∆4 		0.08 dB	Center Fre 2.441000000 GH
15.0			4164							Start Fre 2.441000000 GH
-45.0 -55.0 -65.0	114 112 - 419					das udalda				Stop Fre 2.441000000 GH
Center 2. Res BW 1			#VBW	3.0 MHz	FUNC	CTION FL	Sweep 1	5.00 ms (pan 0 Hz 1001 pts)	CF Ste 1.000000 MH <u>Auto</u> Ma
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	t (Δ) t t (Δ) t	2.880 r 6.279 r 3.750 r 6.279 r	ns ns (∆)	0.42 dl 12.24 dBr -0.08 dl 12.24 dBr	1					Freq Offse 0 ⊢
6 7 8 9 10 11										
sg				10			I STATUS	1	>	



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	2 400 / F (kHz)	300
0.490 ~ 1.705	24 000 / F (kHz)	30
1.705 ~ 30.000	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 MHz - 72 MHz, 76 MHz - 88 MHz,

174 MHz - 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	8.414 25 ~ 8.414 75	108 ~ 121.94	1 300 ~ 1 427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1 435 ~ 1 626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.173 5 ~ 2.190 5	12.519 75 ~ 12.520 25	149.9 ~ 150.05	1 645.5 ~ 1 646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.576 75 ~ 12.577 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	8.025 ~ 8.5	22.01 ~ 23.12
4.177 25 ~ 4.177 75	13.36 ~ 13.41	156.7 ~ 156.9	1 718.8 ~ 1 722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.207 25 ~ 4.207 75	16.42 ~ 16.423	162.012 5 ~ 167.17	2 200 ~ 2 300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.694 75 ~ 16.695 25	167.72 ~ 173.2	2 310 ~ 2 390	10.6 ~ 12.7	36.43 ~ 36.5
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	240 ~ 285	2 483.5 ~ 2 500	13.25 ~ 13.4	Above 38.6
6.311 75 ~ 6.312 25	25.5 ~ 25.67	322 ~ 335.4	2 655 ~ 2 900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3 260 ~ 3 267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 332 ~ 3 339		
8.376 25 ~ 8.386 75	74.8 ~ 75.2	960 ~ 1 240	3 345.8 ~ 3 358		
			$3600 \sim 4400$		

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 1 000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 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.
- For measurements above 1 GHz 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 1 000 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 1 000 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.

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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 : 40 001

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 : 40 001

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 = 2 001 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 Emissions

Test Notes.

1. The radiated emissions were investigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found below listed frequencies.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor(-9.54 dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = $20 \log(1 \text{ m / } 3 \text{ m }) = -9.54 \text{ dB}$ When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. D.C.F Calculation. (D.C.F = Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.88 ms
- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 = 2
- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms
- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.76 / 100) = <u>-24.79 dB</u>

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL + HL + AL - AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss,

AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

9 kHz ~ 25 GHz Data (Modulation : <u>GFSK</u>)

Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 389.42	Н	Z	PK	50.85	4.80	N/A	N/A	55.65	74.00	18.35
2 389.42	Н	Z	AV	50.85	4.80	-24.79	N/A	30.86	54.00	23.14
4 804.42	V	Z	PK	49.11	0.78	N/A	N/A	49.89	74.00	24.11
4 804.42	V	Z	AV	49.11	0.78	-24.79	N/A	25.10	54.00	28.90

Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 881.74	V	Z	PK	50.56	1.36	N/A	N/A	51.92	74.00	22.08
4 881.74	V	Z	AV	50.56	1.36	-24.79	N/A	27.13	54.00	26.87

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.90	Н	Z	PK	52.12	5.26	N/A	N/A	57.38	74.00	16.62
2 483.90	Н	Z	AV	52.12	5.26	-24.79	N/A	32.59	54.00	21.41
4 960.02	V	Z	PK	49.31	1.61	N/A	N/A	50.92	74.00	23.08
4 960.02	V	Z	AV	49.31	1.61	-24.79	N/A	26.13	54.00	27.87



9 kHz ~ 25 GHz Data (Modulation : π /4DQPSK)

Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 389.59	Н	Х	PK	51.44	4.80	N/A	N/A	56.24	74.00	17.76
2 389.59	Н	Х	AV	51.44	4.80	-24.79	N/A	31.45	54.00	22.55
4 803.70	V	Z	PK	49.48	0.78	N/A	N/A	50.26	74.00	23.74
4 803.70	V	Z	AV	49.48	0.78	-24.79	N/A	25.47	54.00	28.53
	I									

Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 881.96	V	Z	PK	49.47	1.36	N/A	N/A	50.83	74.00	23.17
4 881.96	V	Z	AV	49.47	1.36	-24.79	N/A	26.04	54.00	27.96

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.61	Н	Х	PK	56.04	5.25	N/A	N/A	61.29	74.00	12.71
2 483.61	Н	Х	AV	56.04	5.25	-24.79	N/A	36.50	54.00	17.50
4 959.98	V	Z	PK	48.80	1.61	N/A	N/A	50.41	74.00	23.59
4 959.98	V	Z	AV	48.80	1.61	-24.79	N/A	25.62	54.00	28.38

9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>)

Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 389.45	Н	Х	PK	50.80	4.80	N/A	N/A	55.60	74.00	18.40
2 389.45	Н	Х	AV	50.80	4.80	-24.79	N/A	30.81	54.00	23.19
4 803.66	V	Z	PK	49.12	0.78	N/A	N/A	49.90	74.00	24.10
4 803.66	V	Z	AV	49.12	0.78	-24.79	N/A	25.11	54.00	28.89

Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 881.75	V	Z	PK	49.14	1.36	N/A	N/A	50.50	74.00	23.50
4 881.75	V	Z	AV	49.14	1.36	-24.79	N/A	25.71	54.00	28.29

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.59	Н	Х	PK	56.98	5.25	N/A	N/A	62.23	74.00	11.77
2 483.59	Н	Х	AV	56.98	5.25	-24.79	N/A	37.44	54.00	16.56
4 960.43	V	Z	PK	48.85	1.61	N/A	N/A	50.46	74.00	23.54
4 960.43	V	Z	AV	48.85	1.61	-24.79	N/A	25.67	54.00	28.33



9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>) With Wireless Charging

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.96	V	Х	PK	50.48	5.26	N/A	N/A	55.74	74.00	18.26
2 483.96	V	Х	AV	50.48	5.26	-24.79	N/A	30.95	54.00	23.05
4 960.22	Н	Х	PK	49.14	1.61	N/A	N/A	50.75	74.00	23.25
4 960.22	Н	Х	AV	49.14	1.61	-24.79	N/A	25.96	54.00	28.04

9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>) With Dual Display

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.66	Н	Х	PK	52.41	5.25	N/A	N/A	57.66	74.00	16.34
2 483.66	Н	Х	AV	52.41	5.25	-24.79	N/A	32.87	54.00	21.13
4 960.14	Н	Х	PK	49.36	1.61	N/A	N/A	50.97	74.00	23.03
4 960.14	Н	Х	AV	49.36	1.61	-24.79	N/A	26.18	54.00	27.82
7 440.26	Н	Х	PK	46.66	9.18	N/A	N/A	55.84	74.00	18.16
7 440.26	Н	Х	AV	46.66	9.18	-24.79	N/A	31.05	54.00	22.95

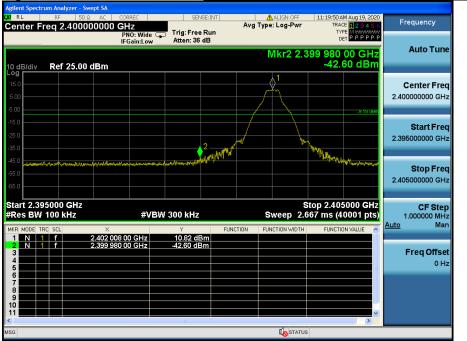
9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>) With Dual Display+WPC

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.57	Н	Х	PK	54.82	5.25	N/A	N/A	60.07	74.00	13.93
2 483.57	Н	Х	AV	54.82	5.25	-24.79	N/A	35.28	54.00	18.72
4 959.99	Н	Х	PK	49.30	1.61	N/A	N/A	50.91	74.00	23.09
4 959.99	Н	Х	AV	49.30	1.61	-24.79	N/A	26.12	54.00	27.88
7 439.79	Н	Х	PK	46.84	9.18	N/A	N/A	56.02	74.00	17.98
7 439.79	Н	Х	AV	46.84	9.18	-24.79	N/A	31.23	54.00	22.77



Low Band-edge



Lowest Channel & Modulation : GFSK

Low Band-edge

Hopping mode & Modulation : GFSK





Lowest Channel & Modulation : GFSK

		/zer - Swept SA											
KI RL	RF	50 Ω 🔔 DC			SEN	SE:INT	Ave	ALIGN			AM Aug 19, 202 ACE 12345		Frequency
Senter F	-req 1:	5.004500	INIFIZ PNO: Fas		Trig: Free		~~9	гуре. сод	201	יד	PE M WARANA	AF .	
			IFGain:Lo		Atten: 36	dB					DET PPPP		Auto Turre
									Ν	/lkr1 29	96.2 kH	z	Auto Tune
10 dB/div	Ref 2	25.00 dBm	ı							-43.	88 dBn	n	
Log													
15.0													Center Freq
5.00													15.004500 MHz
-5.00											-9.18 dB		
-15.0													Start Freq
-25.0													9.000 kHz
-35.0 🛧 1 —													9.000 KH2
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Start 9 k	H7									Ston 2	30.00 MH	,	CE Otom
#Res BW		Hz	#	VBW 3	00 kHz			Swee	p 5.3		10001 pts		CF Step 2.999100 MHz
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	1 f	· · · · · ·	296.2 kHz		43.88 dB		INCTION	FUNCTION	WIDTH	FUNCT	ION VALUE		
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MSG								4	STATUS	LDC Co	upled		

Agilent Spectrum Analyzer - Swept SA							
RL RF 50 Ω AC Center Freq 5.01500000		SENSE:I	Avg	ALIGN OFF Type: Log-Pwr	11:20:36 AM	123456	Frequency
	PNO: Fast C IEGain:Low	Trig: Free Ru Atten: 36 dB	in		TYPE DET	М иллили РРРРРР	
				Mkr	5 5.772 2	2 GHz	Auto Tune
10 dB/div Ref 25.00 dBm						dBm	
Log	1						Center Freq
5.00							5.015000000 GHz
-5.00						-9.18 dBm	
-15.0						-9.10 UBN	
-25.0	2 <u>_3</u>		5				Start Freq
-35.0	$\Sigma \downarrow \Sigma$		La militation brandition				30.000000 MHz
-45.0		أكا الأقاعدين والم	and a state of the second s				
-55.0							Stop Freq
-65.0							10.00000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VB	W 3.0 MHz		Sweep 18	Stop 10.0 67 ms (40)	001 pts)	CF Step 997.000000 MHz
MKR MODE TRC SCL X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Man
2 N 1 f 2	.402 36 GHz .660 09 GHz	11.25 dBm -31.88 dBm					
	.266 76 GHz .567 82 GHz	-32.10 dBm -32.72 dBm					Freq Offset
5 N 1 f 5.	.772 22 GHz	-32.79 dBm				=	0 Hz
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11 <		Ш				>	
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Lowest Channel & Modulation : GFSK





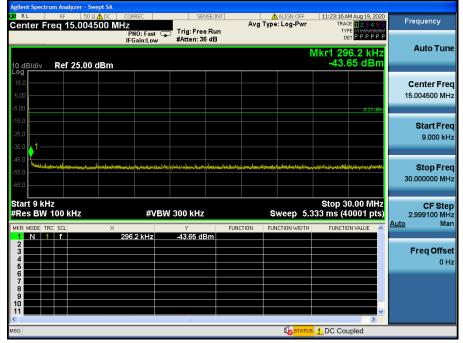
Reference for limit

Middle Channel & Modulation : GFSK



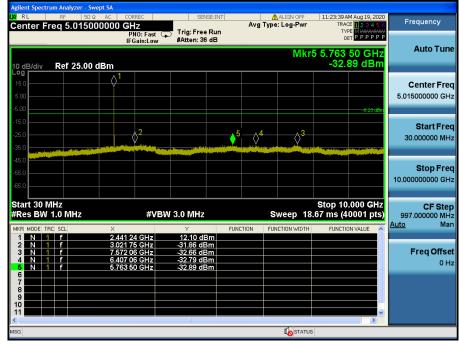
Conducted Spurious Emissions <u>M</u>

Middle Channel & Modulation : GFSK





Middle Channel & Modulation : GFSK



Agilent Spectr		yzer - Swe	pt SA											
LXIRL	RF	50 Ω		CORREC		SEN	SE:INT	A		ALIGN OFF : Log-Pwr		AM Aug 19, 202		Frequency
Center F	req 1	7.5000	00000	GHZ PNO: Fa	vet 🕠	Trig: Free	Run	Avg	туре	: Log-Pwr	Т	ACE 12345 YPE MW////////	÷	
				IFGain:L	ow	#Atten: 36	dB					DETPPPP		
										Mkr3 2		250 GHz		Auto Tune
10 dB/div	Ref	25.00 d	Bm								-25	.73 dBm		
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-45.0														
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Start 10.0	00 GH	lz									Stop 2	5.000 GHz		CF Step
#Res BW				#	¢VBW	3.0 MHz			S	weep 40		40001 pts		1.500000000 GHz
MKR MODE TH	RC SCL		х			Y	FU	NCTION	FUN	CTION WIDTH	FUNCT	ION VALUE	Au	i <u>to</u> Man
1 N 1 2 N 1	f		24.156			-23.06 dB -24.46 dB	m							
2 N 3 N 1	f		21.721	250 GH	z	-24.46 dB -25.73 dB	m							Freq Offset
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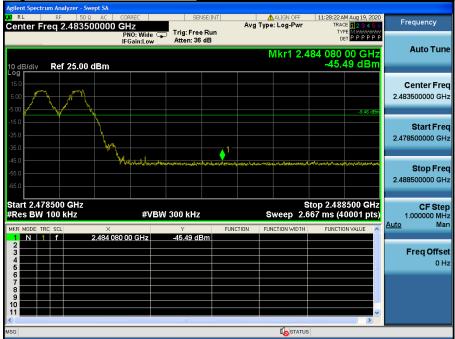
High Band-edge

Highest Channel & Modulation : GFSK



High Band-edge

Hopping mode & Modulation : GFSK





Highest Channel & Modulation : GFSK

	rum Analyz	er - Swept SA											
L <mark>XI</mark> RL	RF	50 Ω <u>Å</u> DC	CORREC		SEN	SE:INT			ALIGN OFF		AM Aug 19, 20		Frequency
Center F	req 15	.004500 N			rig: Free	Run	Avg	Туре	: Log-Pwr	IR T		6 	riequency
			PNO: Fas IFGain:Lo		Atten: 36						DET P P P P	Р	
										Mkr1 2	81.9 kH		Auto Tune
40 -10/-10-	Dof 3	5.00 dBm									.54 dBr		
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15.0													Center Freq
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-5.00											-9.46 dB		
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													30.000000 MHz
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Start 9 k										Oter	20.00 840		
#Res BW		7	#1	VBW 30	00 KM2			Ċ	ween 5'		30.00 MH 40001 pt		CF Step
		2			JO KHZ								2.999100 MHz Auto Man
MKR MODE T		X			Y		INCTION	FUN	CTION WIDTH	FUNC	FION VALUE	^ '	
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Agilent Spectr													
	RF rea 5.			RREC Z		ISE:INT	Avg		LIGN OFF	TRA	M Aug 19, 2020 E <mark>1 2 3 4 5</mark> (F	requency
Contor	oq o.	0 10 00	Р	NO: Fast Gain:Low	Trig: Free Atten: 36					TY D			
									Mkr		12 GHz	Ī	Auto Tune
10 dB/div Log	Ref	25.00 d	Bm							-32.	80 dBm		
15.0			\\ ¹										Center Freq
5.00													15000000 GHz
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-45.0													
-55.0												10.00	Stop Freq
-65.0												10.00	J000000 GHZ
Start 30 N	147									Stop 10	.000 GHz		
#Res BW		Hz		#VI	3W 3.0 MHz			Sw	eep 18.	.67 ms (4	0001 pts)		CF Step 7.000000 MHz
MKR MODE TH	RC SCL		х		Y	FU	NCTION	FUNCT	ION WIDTH	FUNCTIO	ON VALUE	Auto	Man
1 N 1 2 N 1	f		2.480 1 2.669 8	3 GHz	<u>11.19 dE</u> -31.68 dE								
3 N 1	f		7.506 7	75 GHz 6 GHz	-32.29 dE	3m							Freq Offset
4 N 1 5 N 1	f		5.805 1		-32.70 dE -32.80 dE						3		0 Hz
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Highest Channel & Modulation : GFSK

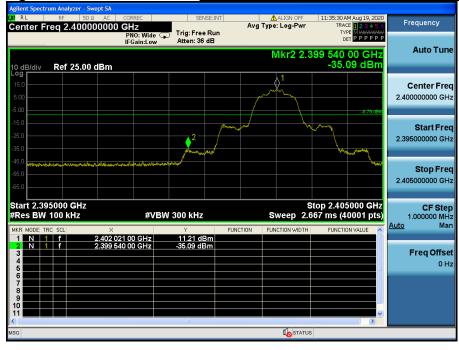






Low Band-edge

Lowest Channel & Modulation : π/4DQPSK



Low Band-edge

Hopping mode & Modulation : π/4DQPSK





Lowest Channel & Modulation : π/4DQPSK

	Analyzer - Swept SA						
	RF 50 Ω 🧘 DC	CORREC	SENSE:IM		ALIGN OFF	11:35:53 AM Aug 19, 202	
enter Fred	q 15.004500 l	PNO: Fast	👝 Trig: Free Ru		Type: Log-Pwr	TRACE 12345 TYPE MWWWWW DET P P P P P	
		IFGain:Low				DETPPPP	
						Mkr1 281.9 kH:	Auto Tune
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	ter 23.00 dBm						
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5.00							10.004000 1111
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							30.000000 MH
-65.0							
Start 9 kHz						Stop 30.00 MH	
Res BW 10	û kHz	#\/	BW 300 kHz		Sween 53	33 ms (40001 pts	
						· · ·	Auto Mar
MKR MODE TRC S	SCL >	281.9 kHz	∨ -44.30 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
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						- DO COupled	

Agilent Spectrum Analyzer	50 Ω AC CORREC	SENSE:INT	ALIGN OFF	11:36:16 AM Aug 19, 2020 TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 25.	PNO: Fast G IFGain:Low	Trig: Free Run Atten: 36 dB	Mkr	TYPE M P P P P P P DET P P P P P P P 5 5.767 49 GHz -33.05 dBm	Auto Tune
Log 15.0 5.00	 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓			-5.79 dBm	Center Freq 5.015000000 GHz
-15.0 -25.0 -35.0	2 3		54		Start Freq 30.000000 MHz
-45.0 -55.0 -65.0					Stop Freq 10.00000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBI	N 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6	2.402 11 GHz 2.670 06 GHz 3.048 42 GHz 7.554 61 GHz 5.767 49 GHz	12.37 dBm -32.00 dBm -32.06 dBm -32.91 dBm -33.05 dBm			Freq Offset 0 Hz
7 9 9 10 11				~	
MSG					



Lowest Channel & Modulation : π/4DQPSK





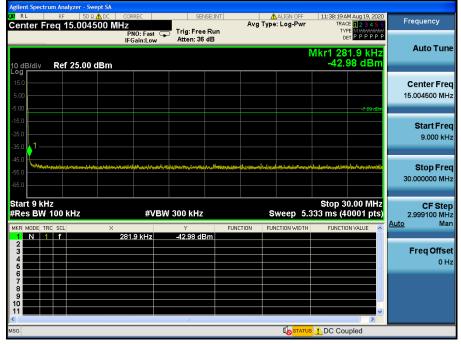
Reference for limit

Middle Channel & Modulation : π/4DQPSK



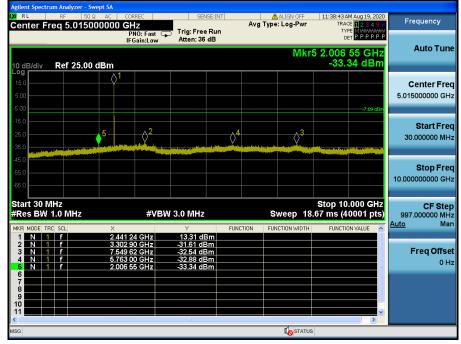
Conducted Spurious Emissions <u>Middle C</u>

Middle Channel & Modulation : π/4DQPSK





Middle Channel & Modulation : π/4DQPSK



Agilent Spectrum Analyzer - Si							
Center Freq 17.500		SENSE:INT		ALIGN OFF		Aug 19, 2020	Frequency
Center Freq 17.500	PNO: Fast IFGain:Low	Trig: Free Run Atten: 36 dB		ype. Log i ni	TYPE	PPPPPP	
10 dB/div Ref 25.00	dBm			Mkr3 2	22.250 50 -25.0	0 GHz 2 dBm	Auto Tune
Log 15.0 5.00						-7.69 dBm	Center Freq 17.500000000 GHz
-15.0 -25.0 -35.0				2 	3		Start Freq 10.000000000 GHz
-45.0 -65.0 -65.0							Stop Freq 25.000000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VI	BW 3.0 MHz		Sweep 40	Stop 25.0 .00 ms (40	001 pts)	CF Step 1.50000000 GHz Auto Man
MKR MODE TRC SCL	× 24.248 875 GHz	۲ -22.12 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Wan
2 N 1 f 3 N 1 f 4 5	24.248 875 GHz 21.096 625 GHz 22.250 500 GHz	-22.12 dBm -24.55 dBm -25.02 dBm					Freq Offset 0 Hz
6							
10 11						~	
MSG				STATU:	3		





High Band-edge

Highest Channel & Modulation : π/4DQPSK



High Band-edge

Hopping mode & Modulation : π/4DQPSK





Highest Channel & Modulation : π/4DQPSK

RL RF enter Freq 15	.004500 MHz	RREC	SENSE:IN		ALIGN OFF	TRACI	1 Aug 19, 2020	Frequency
0 dB/div Ref 2	25.00 dBm		Atten: 36 dB		ſ	DE //kr1 29	PPPPP	Auto Tune
5.00								Center Frec 15.004500 MHz
15.0 25.0 35.0 1							-8.81 dBm	Start Freq 9.000 kHz
-45.0 -65.0	janinen konstruktion (sollare die Lagense en einder	hainead bair an	ni biya kuunaa ng takan din aadar gili la g	******	folgintyfini fforjolinadiationation	99-98,3°,94,4-8,94994,49894	*****	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kl	Hz ×	#VBW 3	00 kHz	FUNCTION	Sweep 5.3			CF Step 2.999100 MHz <u>Auto</u> Mar
1 N 1 f 2 3 4 4 4	299	.2 kHz ·	44.27 dBm					Freq Offset 0 Hz
6 7 8 9 10 11								
ISG			III			LDC Cou	pled	

9	n Analyzer - Swep								
Center Fre	RF 50 Ω q 5.015000		RREC	SENSE	Avg	ALIGN OFF	TRAC	M Aug 19, 2020	Frequency
	q 0.0 10000	Р	NO: Fast C Gain:Low	Trig: Free R Atten: 36 dl	un 3		TYI Di		
10 dB/div	Ref 25.00 di	3m				Mkr	5 7.583 -33.:	02 GHz 26 dBm	Auto Tune
Log 15.0 5.00		^1						-8.81 aBm	Center Freq 5.015000000 GHz
-15.0 -25.0 -35.0		3	¢ ²		¢4	5-		و بالغار ب و عالم الم	Start Freq 30.000000 MHz
-45.0 -55.0 -65.0									Stop Freq 10.000000000 GHz
Start 30 MH #Res BW 1.			#VB	W 3.0 MHz		Sweep 18	Stop 10 .67 ms (4	.000 GHz 0001 pts)	CF Step 997.000000 MHz
MKR MODE TRC	SCL F	× 2.480 1	3 647	۲ 11.86 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	DN VALUE	<u>Auto</u> Man
2 N 1 3 N 1 4 N 1 5 N 1 6	f f f f		3 GHz 4 GHz 8 GHz	-31.32 dBm -31.78 dBm -33.19 dBm -33.26 dBm				=	Freq Offset 0 Hz
7 8 9 10 11									
MSG				Ш		To STATU:	3		





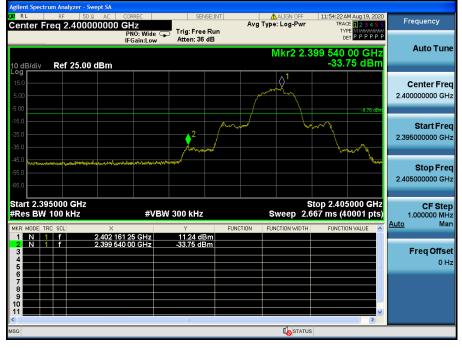
Highest Channel & Modulation : π/4DQPSK





Low Band-edge

Lowest Channel & Modulation : 8DPSK



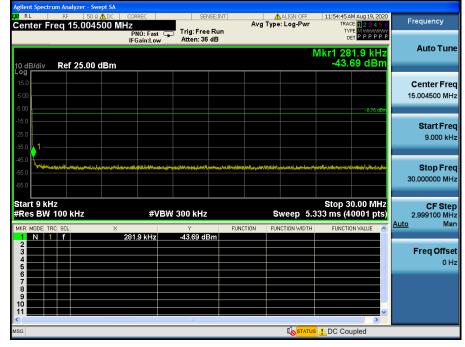
Low Band-edge

Hopping mode & Modulation : 8DPSK





Lowest Channel & Modulation : 8DPSK



Agilent Spectrum Analy					
Center Frea 5.	50 Ω AC CORREC 0150000000 GHz	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	11:55:08 AM Aug 19, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 36 dB		DET PPPP	
			Mkr	5 7.529 18 GHz	Auto Tune
	25.00 dBm			-32.33 dBm	
Log					Center Freq
5.00					5.015000000 GHz
-5.00				-8.76 dBm	
-15.0					Start Freq
-25.0			5		30.000000 MHz
-35.0				antie Stand Stelling and and an address	
-45.0					Oton From
-55.0					Stop Freq 10.00000000 GHz
-65.0					10.000000000 GHz
Start 30 MHz				Stop 10.000 GHz	CF Step
#Res BW 1.0 MI	Hz #VB	W 3.0 MHz	Sweep 18	.67 ms (40001 pts)	997.000000 MHz
MKR MODE TRC SCL	×		CTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 2 N 1 f	2.402 11 GHz 2.828 83 GHz	11.95 dBm -31.00 dBm			
3 N 1 f 4 N 1 f	3.132 17 GHz 5.286 43 GHz	-32.02 dBm -32.18 dBm			Freq Offset 0 Hz
5 N 1 f	7.529 18 GHz	-32.33 dBm		=	0 Hz
7					
8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					
10					
<		m	1	<u>></u>	
MSG					



Lowest Channel & Modulation : 8DPSK





Reference for limit

Middle Channel & Modulation : 8DPSK



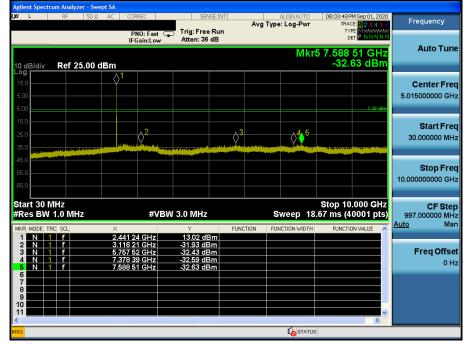
Conducted Spurious Emissions <u>Middle</u>

Middle Channel & Modulation : 8DPSK

RL RF 50 Ω ▲DC Center Freq 15.004500 MH			ALIGN OFF g Type: Log-Pwr	11:57:13 AM Aug 19, 2020 TRACE 1 2 3 4 5 6 TYPE Manual Aug	Frequency
0 dB/div Ref 25.00 dBm		: Free Run en: 36 dB	N	1kr1 281.9 kHz -43.07 dBm	Auto Tun
				7.26.dBm	Center Fre 15.004500 MH
25.0 1					Start Fre 9.000 kF
15.0	haten frankrik te stan stan stan stan stan stan stan stan	ปลไอร์การที่ _ย ู่สั่งการก่องสุขที่กรุงสองหมือเหลือไปอะ	ารระทู่เสียงสิต ¹ ปฏิเทพร่างใจสงกรูป	นการเปล่าสุขาร์ของกัดสาวสารเหลือการเป็นได้เคราย	Stop Fre 30.000000 Mi
tart 9 kHz	<i>"</i> » <i>(</i>))))))))))))))))))))))))))))))))))))			Stop 30.00 MHz	CF Ste
	#VBW 300		Sweep 5.3	33 ms (40001 pts)	2.999100 Mi Auto Ma
1 N 1 f	Y				2.999100 Mł <u>Auto</u> Mł Freq Offs
KR MODE TRC SCL X 1 N 1 F 3 4 4	Y	FUNCTION			2.999100 M



Middle Channel & Modulation : 8DPSK



Agilent Spectrum Analyzer - Swept SA				
X RL RF 50 Ω AC CORREC Center Freq 17.500000000 GHz PN0: Fa	st 🕞 Trig: Free Run	ALIGN OFF Avg Type: Log-Pwr	11:58:52 AM Aug 19, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
IFGain:L	Atten: 36 dB	Mkr3 :	22.304 500 GHz	Auto Tune
10 dB/div Ref 25.00 dBm			-25.49 dBm	0
5.00			7.26 dBm	Center Freq 17.500000000 GHz
-15.0			2 3	Start Freq 10.000000000 GHz
-35.0				Stop Freq
-65.0				25.000000000 GHz
	VBW 3.0 MHz	-	Stop 25.000 GHz 0.00 ms (40001 pts)	CF Step 1.50000000 GHz Auto Man
MKR MODE TRC SCL X 1 N 1 f 24.719 125 GHz		FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Man
2 N 1 f 21.771 250 GH; 3 N 1 f 22.304 500 GH; 4 5				Freq Offset 0 Hz
6 7 8 9 9				
	10		×	
MSG		STATU	s	



High Band-edge

Highest Channel & Modulation : 8DPSK



High Band-edge

Hopping mode & Modulation : 8DPSK





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

Image: Property of the second seco	RL RF 50 ହ enter Freq 15.0045		SENSE:IN	Avg	ALIGN OFF	12:00:33 PM Aug 19, 20 TRACE 1 2 3 4 5 TYPE MUMANN	Frequency
Center Free Center Free Center Free Control of the second seco	dB/div Ref 25.00 d	IFGain:Low			ſ	Det P P P P P	Auto Tune
60 1 </td <td>og 15.0 5.00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Center Fred 15.004500 MH</td>	og 15.0 5.00						Center Fred 15.004500 MH
50 Stop Free 30.00000 MHz 51 Stop Stop 30.00 MHz 52 Stop Stop 30.00 MHz 53 Stop Stop 30.00 MHz 54 Stop Stop Stop 30.00 MHz 23 Stop Stop Stop Stop 30.00 MHz 23 Stop Stop Stop Stop 30.00 MHz 23 Stop Stop Stop Stop Stop Stop Stop Stop	5.0 5.0 5.0 5.0 5.0					-9.38 dt	Start Freq 9.000 kHz
Res BW 100 kHz #VBW 300 kHz Sweep 5.333 ms (40001 pts) 2.99100 MH SR MODEL TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE Auto Mar 1 1 1 1 281.9 kHz -44.21 dBm Function Function width Function value Freq Offse 3 4 4 4 4 6	5.0	efesterische Alexandre verschemmen	a fa an amilia se an	erthoddoriogiaethybelliteoeney	yanting generkennisteration	latenia-etc.com/at/at/at/at/at/at/at/at/	Stop Freq 30.000000 MHz
N 1 f 281.9 kHz 44/21 dBm FUNCTION VIDIT		#VI	300 kHz		Sweep 5.3	33 ms (40001 pt	s) 2.999100 MH
				FUNCTION			Freq Offset 0 Hz

Agilent Spectr	um Analyzer - Swept S		SENSE:INT		ALIGN OFF	10:00:500	M Aug 19, 2020	
	req 5.0150000	00 GHz			Type: Log-Pwr	TRAC	M AUG 19, 2020 CE 1 2 3 4 5 6 PE M WAAWAAAA	Frequency
		PNO: Fast C IFGain:Low	Atten: 36 dB			D	T P P P P P	Auto Tune
10 dB/div	Ref 25.00 dBr	n			MKr		30 GHz 19 dBm	
Log 15.0								Center Freq
5.00								5.015000000 GHz
-5.00							-9.38 dBm	
-25.0		2		<mark>8</mark>		5		Start Freq 30.000000 MHz
-35.0				Y.	- Yu			
-45.0								Stop Freq
-65.0								10.00000000 GHz
Start 30 M	/IHz					Stop 10	.000 GHz	CF Step
#Res BW		#VB	N 3.0 MHz		Sweep 18			997.000000 MHz Auto Man
MKR MODE TF	f	× 2.480 13 GHz	۲ 11.45 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	DN VALUE	<u>Auto</u> mari
2 N 1 3 N 1	f	2.549 92 GHz 5.870 18 GHz	-31.77 dBm -32.53 dBm					Freq Offset
4 N 1 5 N 1		7.485 57 GHz 8.071 30 GHz	-32.90 dBm -33.19 dBm				=	0 Hz
6 7 8								
9								
11							>	
MSG						8		



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.

	Conducted Limit (dBuV)				
Frequency Range (MHz)	Quasi-Peak	Average			
0.15 ~ 0.5	66 to 56 *	56 to 46 *			
0.5 ~ 5.0	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.

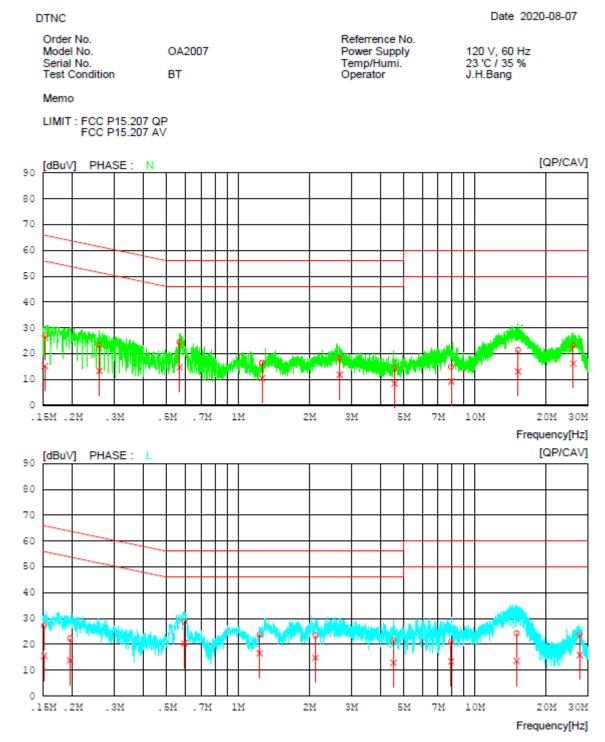
- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected 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>8DPSK</u>

Results of Conducted Emission



AC Line Conducted Emissions (List) = Modulation : <u>8DPSK</u>

Results of Conducted Emission

DTNC			Date 2020-08-07
Order No. Model No. Serial No. Test Condition	OA2007 BT	Referrence No. Power Supply Temp/Humi. Operator	120 V, 60 Hz 23 'C / 35 % J.H.Bang
Memo			
LIMIT : FCC P15 FCC P15			
NO FREQ [MHz]	READING C.FACTOR QP CAV [dBuV][dBuV] [dB]	RESULT LIMIT QP CAV QP CAV [dBuV][dBuV] [dBuV][dBuV]	MARGIN PHASE QP CAV] [dBuV][dBuV]
2 0.25970 3 0.56607 4 1.26164 5 2.68853 6 4.58185 7 7.95781 8 15.22173 9 26.01869 10 0.15172 11 0.19550	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	21.3913.11 60.00 50.00 23.2816.22 60.00 50.00 27.1715.50 65.91 55.91	38.74 40.62 N 38.10 38.10 N 31.52 31.22 N 39.52 35.47 N 37.68 34.11 N 41.66 37.54 N 38.61 36.89 N 36.72 33.78 N 38.74 40.41 L 41.57 40.12 L 27.44 25.67 L 32.31 29.52 L 32.68 31.26 L 39.09 36.67 L 39.09 36.67 L 35.84 36.47 L



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 antenna is attached on the device by means of unique coupling method (Spring Tension). Therefore this E.U.T Complies with the requirement of §15.203

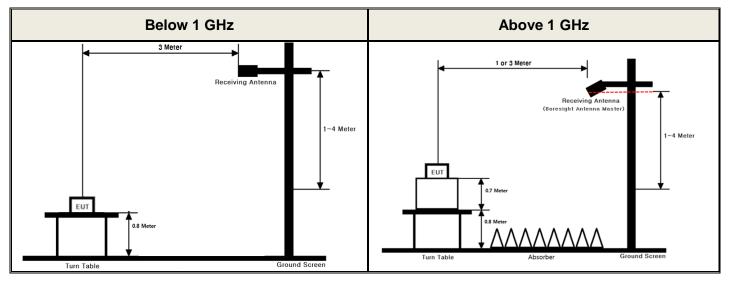
- Minimum Standard :

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.

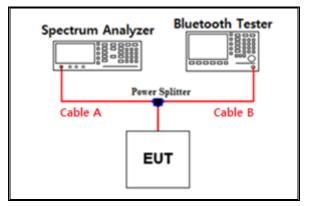
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	6.50	15	10.77
1	6.99	20	11.22
2.402 & 2.440 & 2.480	7.51	25	12.73
5	8.86	-	-
10	9.08	-	-

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

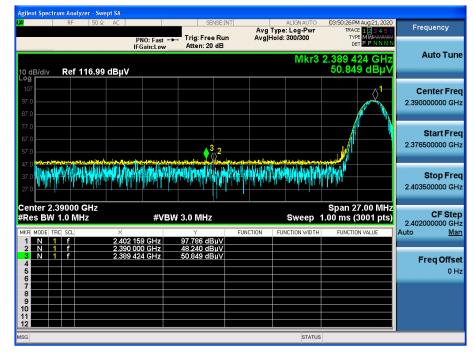


APPENDIX II

Unwanted Emissions (Radiated) Test Plot

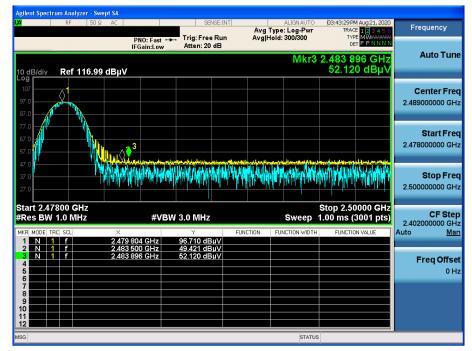
GFSK & Lowest & Z & Hor





Detector Mode : PK

GFSK & Highest & Z & Hor



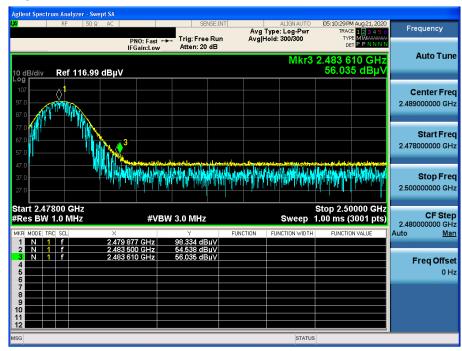
Detector Mode : PK



π /4DQPSK & Lowest & X & Hor

Agilent Spectrum Analyzer - Swept SA					
LX RF 50Ω AC		SENSE:INT	ALIGNAUT Avg Type: Log-Pw		Frequency
	PNO: Fast ↔↔ IFGain:Low	Trig: Free Run Atten: 20 dB	Avg Hold: 300/300	TYPE MWAAAAAA DET P P N N N N	
10 dB/div Ref 116.99 dBµV			Mkı	r3 2.389 586 GHz 51.439 dBμV	Auto Tune
97.0 87.0					Center Freq 2.390000000 GHz
77.0 67.0 57.0 47.0 mgd elfte egget i könsen, yn effets yn	an a state and the state of the	3 ²	e		Start Freq 2.376500000 GHz
37.0 10 10 10 10 10 10 10 10 10 10 10 10 10 1		had photon in the second s			Stop Freq 2.403500000 GHz
Center 2.39000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Span 27.00 MHz 5 1.00 ms (3001 pts)	CF Step 2.402000000 GHz
MKR MODE TRC SCL X	285 GHz	Y FU 99.494 dBuV	NCTION FUNCTION WID	TH FUNCTION VALUE	Auto <u>Man</u>
2 N 1 f 2.390	000 GHz	99.494 dBμV 49.001 dBμV 51.439 dBμV			Freq Offset 0 Hz
6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					0112
10 11 12					
MSG			STA	TUS	

π /4DQPSK & Highest & X & Hor





8DPSK & Lowest & X & Hor

Agilent Spectrum Analyzer - Swept SA						
(X) RF 50Ω AC	-	SENSE:INT	Avg Type	ALIGNAUTO	04:22:06 PM Aug 21, 2020 TRACE 123456 TYPE MWARAAAA	Frequency
		rig: Free Run tten: 20 dB	Avg Hold:		DET P P NNNN 2.389 451 GHz	Auto Tune
10 dB/div Ref 116.99 dBµV			_		50.798 dBµV	
97.0 87.0						Center Freq 2.390000000 GHz
77.0 67.0 57.0	مر منها المراجع	3 ²		La testa, anda a la defe		Start Freq 2.376500000 GHz
47.0 37.0 1999 1999 1999 1999 1999 1999 27.0	hallon an					Stop Freq 2.403500000 GHz
Center 2.39000 GHz #Res BW 1.0 MHz	#VBW 3.0) MHz		Sweep 1	Span 27.00 MHz .00 ms (3001 pts)	CF Step 2.402000000 GHz
MKR MODE TRC SCL X			ICTION FUN	NCTION WIDTH	FUNCTION VALUE	Auto <u>Man</u>
2 N 1 f 2.390	000 GHz 47	579 dBµV 196 dBµV 798 dBµV				Freq Offset
5						0 Hz
7 8 9						
10 11 12						
MSG				STATUS		

8DPSK & Highest & X & Hor

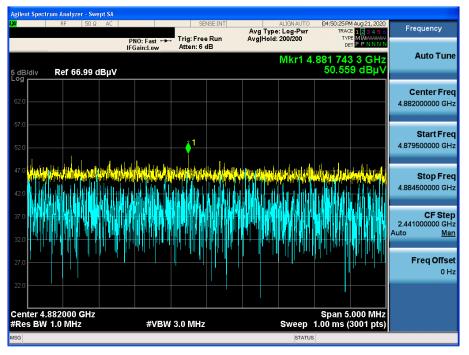
Spectrum Analyzer - Swept SA Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 20 dB TYPE MW DET P P N Auto Tune Mkr3 2.483 588 GHz 56.984 dBµV Ref 116.99 dBµV **Center Freq** 2.489000000 GHz Start Freq 2.478000000 GHz W/M/WW/W Stop Freq 2.50000000 GHz Start 2.47800 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (3001 pts) CF Step 2.402000000 GHz uto <u>Man</u> #VBW 3.0 MHz Sweep FUNCTION Auto 55.641 dBμ\ 56.984 dBμ\ Freq Offset 0 Hz STATUS

Detector Mode : PK

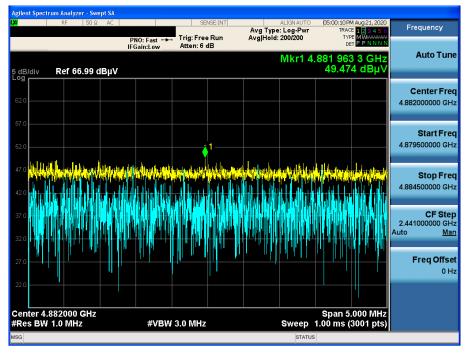
Detector Mode : PK



GFSK & Middle & Z & Ver

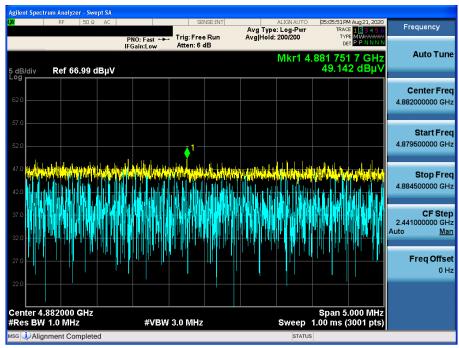


$\pi/4DQPSK$ & Middle & Z & Ver





Dt&C



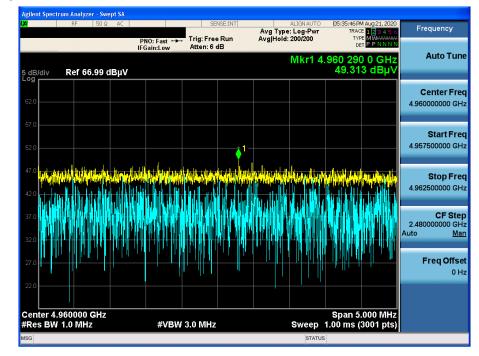
Detector Mode : PK

Unwanted Emissions (Radiated) Test Plot _ Wireless Charging

8DPSK & Highest & X & Ver

Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 PNO: Fast ---- Trig: Free Run IFGain:Low Atten: 20 dB TYPE DET Auto Tune Mkr3 2.483 595 GHz 51.946 dBµ\ Ref 116.99 dBµV **Center Freq** 2.489000000 GHz Start Freq 2.478000000 GHz hende selver and a service of the se Stop Freq 2.50000000 GHz Start 2.47800 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (3001 pts) CF Step 2.480000000 GHz uto <u>Man</u> #VBW 3.0 MHz Sweep FUNCTION Auto 50.796 dBµV 51.946 dBuV NN **Freq Offset** 0 Hz STATUS

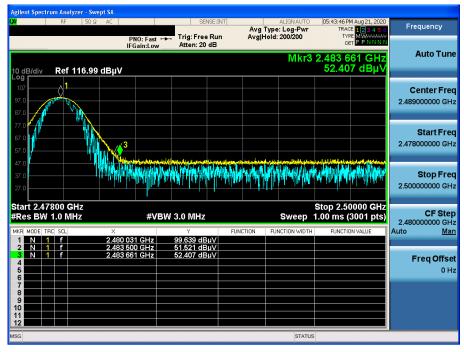
8DPSK & Highest & X & Hor



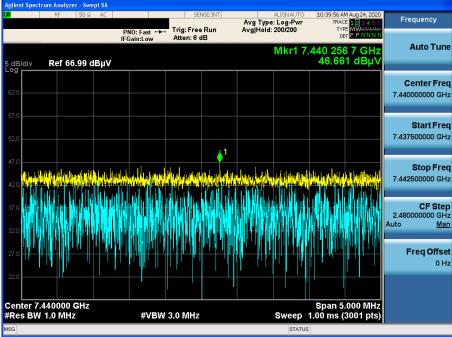
Unwanted Emissions (Radiated) Test Plot _ With Dual Display

8DPSK & Highest & X & Hor

Detector Mode : PK





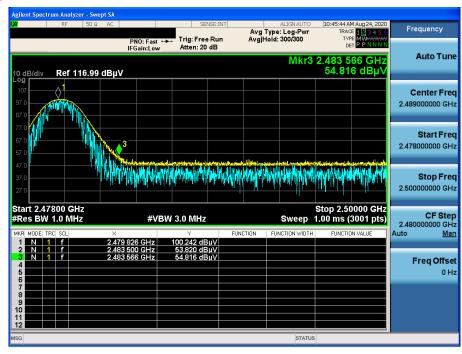




Unwanted Emissions (Radiated) Test Plot _ With Dual Display+WPC

8DPSK & Highest & X & Hor

Detector Mode : PK



8DPSK & Highest & X & Hor

