TEST REPORT

		Dt&C Co., Lt	d.
Dt&C		eon-gil, Cheoin-gu, Yongin-si, C el : 031-321-2664, Fax : 031-3	
1. Report No : DRTFCC2302-0017	7		
2. Customer			
• Name (FCC) : Pittasoft Co., Ltd. / Na	me (IC) : PITTASOF	T CO., LTD.	
 Address (FCC) : A 4th floor, ABN Tow South Korea 13488 	ver, 331, Pangyo-ro,	Bundang-gu Seongnam-si,	Gyeonggi-do
Address (IC) : A 4th floor, ABN Tower 08506 Korea (Republi		ndang-gu, Seongnam-s Gy	eonggi-do
3. Use of Report : FCC & IC Certifica	ation		
4. Product Name / Model Name : Ca FCC ID : YCK-DR770XBOX IC : 23402-DR770XBOX	ar Dashcam / DR77	70X Box	
5. FCC Regulation(s): Part 15.247 IC Standard(s): RSS-247 Issue 2, Test Method used: KDB558074 D		63.10-2013	
6. Date of Test : 2022.12.19 ~ 2023.	02.02		
7. Location of Test : 🛛 Permanent	Testing Lab	On Site Testing	
8. Testing Environment : See appen	ded test report.		
9. Test Result : Refer to the attached	d test result.		
The results shown in this test report refe This test report is not related to KOLAS		(s) tested unless otherwise	stated.
Tested by		Technical Manager	TH
Affirmation Name : SeungMin Gil	(Signature)	Name : JaeJin Lee	(Signature)
	2023.02.	28.	

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	Revised by	Reviewed by
DRTFCC2302-0017	Feb. 28, 2023	Initial issue	SeungMin Gil	JaeJin Lee



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1. General Information

1.1. Description of EUT

Equipment Class	DSS-Part 15 Spread Spectrum Transmitter
Product Name	Car Dashcam
Model Name	DR770X Box
Add Model Name	DR770X Box Truck, DR770X Box DMS, DR770X Box DMS Truck, DR970X Box, DR970X Box Truck, DR970X Box DMS, DR970X Box DMS Truck
Firmware Version Identification Number	v1.000
EUT Serial Number	Radiated: 77XBS3LCE00020, Conducted: 77XBS3LCE00019
Power Supply	DC 12 V, DC 24 V
Frequency Range	2 402 MHz ~ 2 480 MHz
Max. RF Output Power	7.15 dBm (0.005 W)
Modulation Technique (Data rate)	GFSK(1 Mbps), π/4DQPSK(2 Mbps), 8DPSK(3 Mbps)
Number of Channels	79
Antenna Specification	Antenna Type: Chip Antenna Gain: 2.75 dBi (PK)

1.2. Declaration by the applicant / manufacturer

- NA

1.3. 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 Part 2.948 according to ANSI C63.4-2014.

- FCC & IC MRA Designation No. : KR0034

- ISED#: 5740A

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

1.4. Testing Environment

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

1.5. 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.

Parameter	Measurement uncertainty
Antenna-port conducted emission	1.1 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz Below)	4.8 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz ~ 18 GHz)	5.0 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (18 GHz Above)	5.2 dB (The confidence level is about 95 %, k = 2)

1.6. 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.

1.7. 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).

EUT Operation test setup

Bluetooth tester was used to control the transmit parameters during test.

Tested frequency information

- Hopping Function : Enable

	Tested Frequency (MHz)
Hopping Band	2 402 ~ 2 480

- Hopping Function : Disable

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

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	22/12/16	23/12/16	MY48010133
Spectrum Analyzer	Agilent Technologies	N9020A	22/12/16	23/12/16	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	22/06/24	23/06/24	US47360812
DC Power Supply	Agilent Technologies	66332A	22/06/24	23/06/24	US37473627
DC Power Supply	SM techno	SDP30-5D	22/06/24	23/06/24	305DMG288
BlueTooth Tester	TESCOM	TC-3000C	22/06/24	23/06/24	3000C000563
Power Splitter	Anritsu	K241B	22/06/24	23/06/24	020611
Multimeter	FLUKE	17B+	22/12/16	23/12/16	36390701WS
Signal Generator	Rohde Schwarz	SMBV100A	22/12/16	23/12/16	255571
Signal Generator	ANRITSU	MG3695C	22/12/16	23/12/16	173501
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-1
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-2
Thermohygrometer	BODYCOM	BJ5478	22/06/24	23/06/24	N/A
Loop Antenna	ETS-Lindgren	6502	22/12/16	24/12/16	00226186
Hybrid Antenna	Schwarzbeck	VULB 9160	22/12/16	23/12/16	3362
Horn Antenna	ETS-Lindgren	3117	22/06/24	23/06/24	00143278
Horn Antenna	A.H.Systems Inc.	SAS-574	22/06/24	23/06/24	155
PreAmplifier	tsj	MLA-0118-B01-40	22/12/16	23/12/16	1852267
PreAmplifier	H.P	8447D	22/12/16	23/12/16	2944A07774
High Pass Filter	Wainwright Instruments	WHKX12-935-1000- 15000-40SS	22/06/24	23/06/24	8
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300- 18000-60SS	22/06/24	23/06/24	1
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	22/06/24	23/06/24	3
Attenuator	Hefei Shunze	SS5T2.92-10-40	22/06/24	23/06/24	16012202
Attenuator	Aeroflex/Weinschel	56-3	22/06/24	23/06/24	Y2370
Attenuator	SMAJK	SMAJK-2-3	22/06/24	23/06/24	3
Attenuator	SMAJK	SMAJK-2-3	22/06/24	23/06/24	2
Attenuator	Aeroflex/Weinschel	86-20-11	22/06/24	23/06/24	408
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2490A	22/12/16	23/12/16	1338004 1249303
Cable	Dt&C	Cable	23/01/04	24/01/04	G-2
Cable	HUBER+SUHNER	SUCOFLEX 100	23/01/04	24/01/04	G-3
Cable	Dt&C	Cable	20/01/04	24/01/04	G-4
Cable	OMT	YSS21S	22/06/08	23/06/08	G-5
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-01
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-02
Cable	Junkosha	MWX241/B	23/01/04	24/01/04	M-03
Cable	JUNFLON	J12J101757-00	23/01/04	24/01/04	M-07
Cable	HUBER+SUHNER	SUCOFLEX106	23/01/04	24/01/04	M-09
Cable	RADIALL	TESTPRO 3	23/01/04	24/01/04	RFC-44
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0147

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.



2. Antenna Requirement

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.

Conclusion: Comply

The antenna is permanently attached on the device. Therefore this E.U.T complies with the requirement of Part 15.203

3. Summary of Test Results

FCC part section(s)	RSS section(s)	Test Description	scriptionLimitTest(Using in 2 400~ 2 483.5 MHz)Condition		Status Note 1
15.247(a) 15.247(b)	RSS-247[5.1] RSS-247[5.4]	Maximum Peak Conducted Output PowerFor FCC =< 0.125 W(conducted)For IC =< 0.125 W(conducted) =< 4 Watt(e.i.r.p)			с
		20 dB Bandwidth	NA		С
15.247(a) RSS-247[5.1]	Carrier Frequency Separation	>= 25 kHz or >= Two thirds of the 20 dB BW, whichever is greater.		С	
	Number of Hopping Channels	>= 15 hops	Conducted	С	
		Time of Occupancy	=< 0.4 seconds		С
-	RSS-Gen[6.7]	Occupied Bandwidth (99 %)	NA		с
15.247(d)	RSS-247[5.5]	Unwanted Emissions (Conducted)	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 15.209	RSS-247[5.5] RSS-Gen[8.9] RSS-Gen[8.10]	Unwanted Emissions (Radiated)	Part 15.209 Limits (Refer to section 9)	Radiated	C Note3
15.207	RSS-Gen[8.8]	AC Power-Line Conducted Emissions			NA Note4
15.203	-	Antenna Requirement	Part 15.203 (Refer to section 2)	-	С

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 three orthogonal EUT positions and the worst case data was reported.

Note 4: This device is installed in a car. Therefore the power source is a battery of car.



4. Maximum Peak Conducted Output Power

4.1. Test Setup

Refer to the APPENDIX I.

4.2. 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 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.
- 2. §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[5.1] (b), For FHSs 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, FHSs operating in the band 2 400-2 483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.
- 2. 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)

4.3. 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

4.4. Test Results

- Power Supply: 24 V

Modulation	Tested Channel	Burst Average Output Power		Peak Output Power		Antenna Gain	e.i.r.p ^{Note3}
	Tested Ghanner	dBm	mW	dBm	mW	(dBi)	(dBm)
	Lowest	4.23	2.65	4.60	2.88	2.75	7.35
<u>GFSK</u>	Middle	3.98	2.50	4.75	2.99	2.75	7.50
	Highest	3.61	2.30	4.50	2.82	2.75	7.25
	Lowest	3.81	2.40	6.27	4.24	2.75	9.02
<u>π/4DQPSK</u>	Middle	3.67	2.33	6.54	4.51	2.75	9.29
	Highest	3.38	2.18	6.36	4.33	2.75	9.11
	Lowest	3.74	2.37	6.70	4.68	2.75	9.45
<u>8DPSK</u>	Middle	3.63	2.31	6.93	4.93	2.75	9.68
	Highest	3.36	2.17	6.71	4.69	2.75	9.46

- Power Supply: 12 V

Modulation	Tested Channel		Average t Power		Output wer	Antenna Gain	e.i.r.p ^{Note3}
		dBm	mW	dBm	mW	(dBi)	(dBm)
	Lowest	3.73	2.36	3.83	2.42	2.75	6.58
<u>GFSK</u>	Middle	3.55	2.26	4.01	2.52	2.75	6.76
	Highest	3.25	2.11	3.89	2.45	2.75	6.64
	Lowest	3.45	2.21	5.75	3.76	2.75	8.50
<u>π/4DQPSK</u>	Middle	3.26	2.12	6.05	4.03	2.75	8.80
	Highest	2.99	1.99	5.89	3.88	2.75	8.64
<u>8DPSK</u>	Lowest	3.41	2.19	6.16	4.13	2.75	8.91
	Middle	3.20	2.09	7.15	5.19	2.75	9.90
	Highest	2.92	1.96	6.93	4.93	2.75	9.68

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

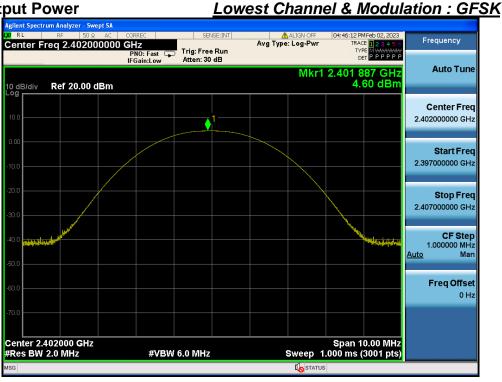
Note 2: See next pages for actual measured spectrum plots.

Note 3: e.i.r.p = $P_{cond} + G_{EUT}$

 P_{cond} = measured power at feedpoint of the EUT antenna, in dBm (Peak Conducted Output Power) G_{EUT} = gain of the EUT radiating element (antenna), in dBi



- Power Supply: 24 V Peak Output Power



Peak Output Power

Middle Channel & Modulation : GFSK



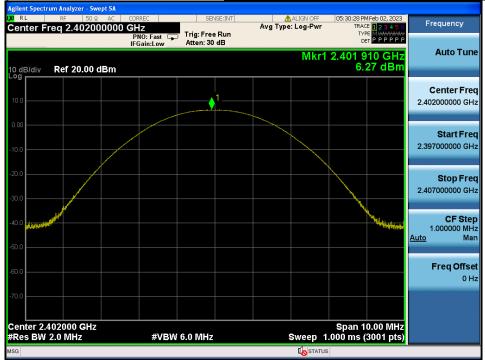


Highest Channel & Modulation : GFSK



Peak Output Power

Lowest Channel & Modulation : π/4DQPSK





Middle Channel & Modulation : π/4DQPSK



Peak Output Power

Highest Channel & Modulation : π/4DQPSK













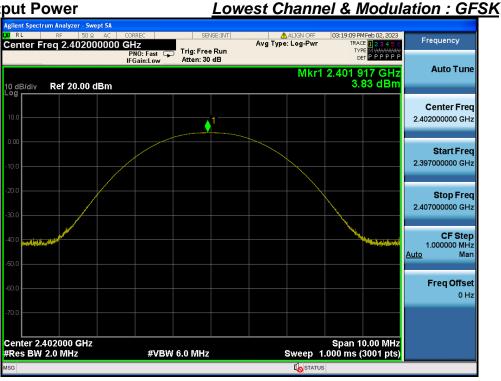


Highest Channel & Modulation : 8DPSK





- Power Supply: 12 V Peak Output Power



Peak Output Power

Middle Channel & Modulation : GFSK





Highest Channel & Modulation : GFSK



Peak Output Power

Lowest Channel & Modulation : π/4DQPSK



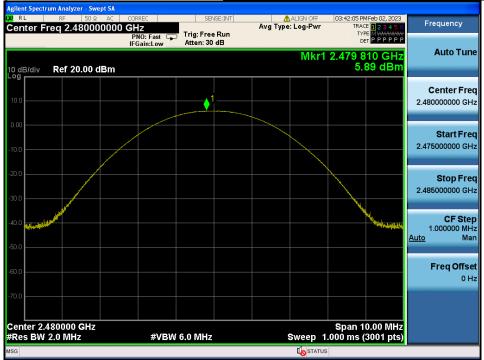


Middle Channel & Modulation : π/4DQPSK



Peak Output Power

Highest Channel & Modulation : π/4DQPSK













Highest Channel & Modulation : 8DPSK



5. 20 dB BW & Occupied BW

5.1. Test Setup

Refer to the APPENDIX I.

5.2. Limit

Limit : Not Applicable

5.3. 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 & 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

5.4. Test Results

- Power Supply: 24 V

Modulation	Tested Channel	20 dB BW (MHz)	Occupied BW (MHz)
	Lowest	0.930	0.844
<u>GFSK</u>	Middle	0.928	0.839
	Highest	0.928	0.841
<u>π/4DQPSK</u>	Lowest	1.279	1.176
	Middle	1.251	1.173
	Highest	1.252	1.170
	Lowest	1.260	1.176
<u>8DPSK</u>	Middle	1.250	1.171
	Highest	1.252	1.171



- Power Supply: 12 V

Modulation	Tested Channel	20 dB BW (MHz)	Occupied BW (MHz)
	Lowest	0.928	0.842
<u>GFSK</u>	Middle	0.928	0.842
	Highest	0.927	0.839
<u>π/4DQPSK</u>	Lowest	1.252	1.170
	Middle	1.225	1.169
	Highest	1.308	1.172
<u>8DPSK</u>	Lowest	1.251	1.173
	Middle	1.256	1.176
	Highest	1.255	1.171



- Power Supply: 24 V 20 dB BW & Occupied BW

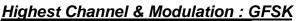




20 dB BW & Occupied BW



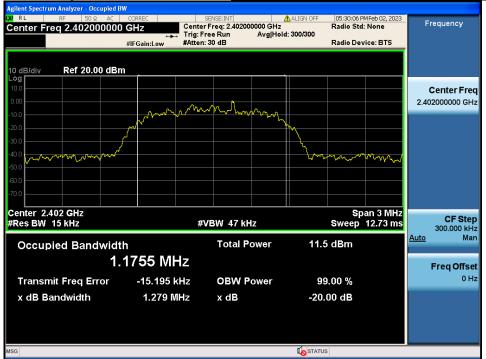




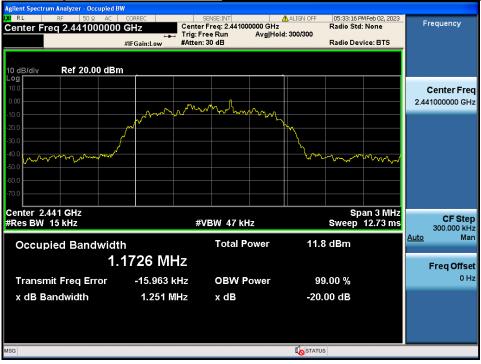


20 dB BW & Occupied BW

Lowest Channel & Modulation : π/4DQPSK







20 dB BW & Occupied BW

Highest Channel & Modulation : π/4DQPSK

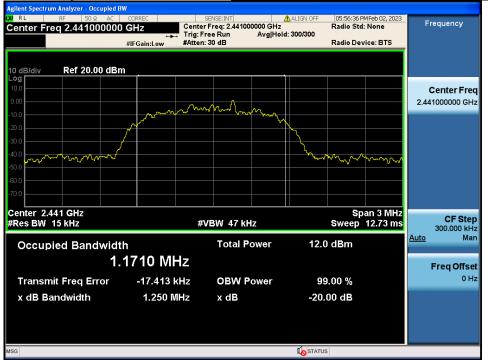






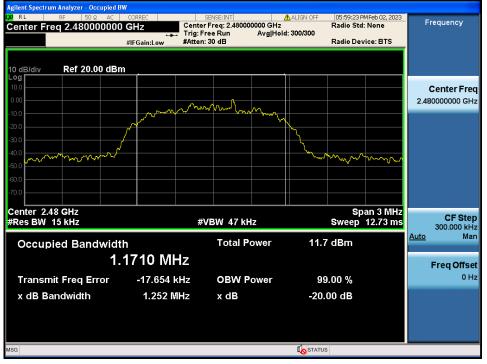
20 dB BW & Occupied BW





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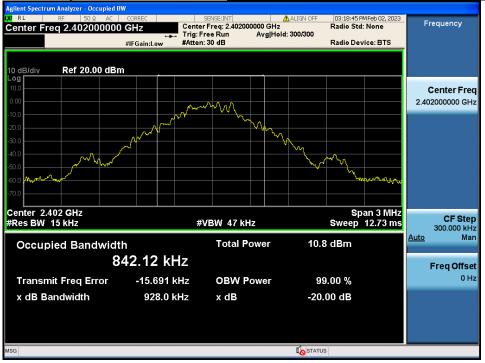






- Power Supply: 12 V 20 dB BW & Occupied BW

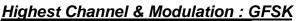




20 dB BW & Occupied BW



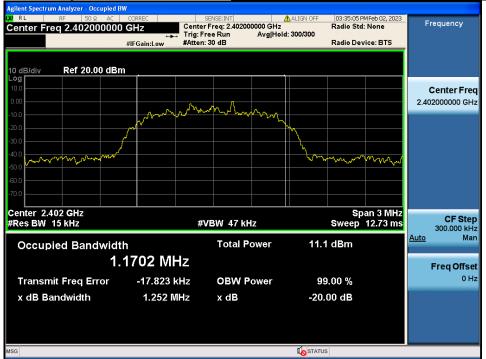




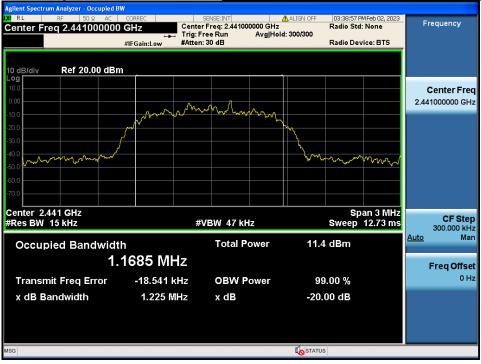


20 dB BW & Occupied BW

Lowest Channel & Modulation : π/4DQPSK





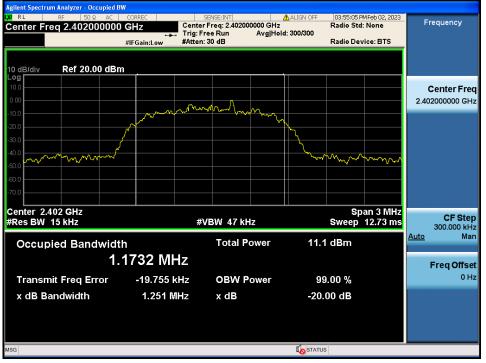


20 dB BW & Occupied BW

Highest Channel & Modulation : π/4DQPSK





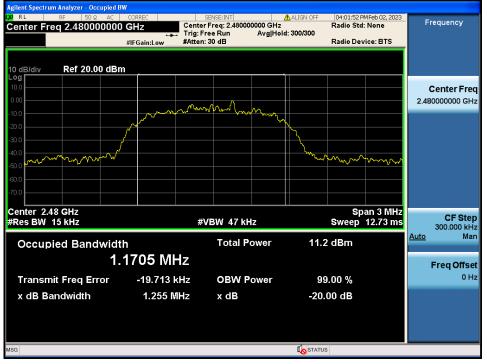


20 dB BW & Occupied BW











6. Carrier Frequency Separation

6.1. Test Setup

Refer to the APPENDIX I.

6.2. Limit

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

6.3. Test Procedure

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

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

The spectrum analyzer is set to :

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

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

 $VBW \ge RBW$ Sweep = auto Detector function = peak Trace = max hold

6.4. Test Results

- Power Supply: 24 V FH mode

Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
Enable	GFSK	2 441.152	2 442.153	1.001
	π/4DQPSK	2 441.149	2 442.148	0.999
	8DPSK	2 441.153	2 442.154	1.001

AFH mode

Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
Enable	GFSK	2 441.152	2 442.153	1.001
	π/4DQPSK	2 441.146	2 442.152	1.006
	8DPSK	2 441.151	2 442.155	1.004

- Power Supply: 12 V

FH mode

Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
Enable	GFSK	2 441.150	2 442.148	0.998
	π/4DQPSK	2 441.141	2 442.150	1.009
	8DPSK	2 441.151	2 442.152	1.001

AFH mode

Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
Enable	GFSK	2 441.150	2 442.152	1.002
	π/4DQPSK	2 441.148	2 442.154	1.006
	8DPSK	2 441.152	2 442.151	0.999

Note 1 : See next pages for actual measured spectrum



- Power Supply: 24 V

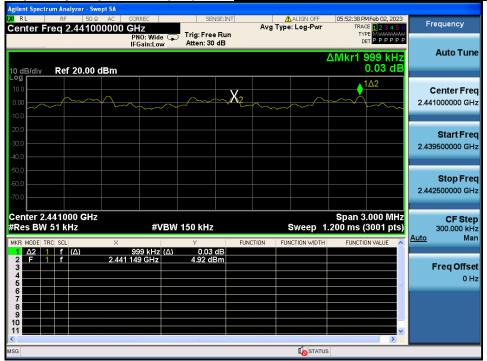
Carrier Frequency Separation (FH)

Hopping mode : Enable&GFSK

		ctrum		lyzer - Swe										
(XIR Cen		Ere	RF	50 Ω	AC CO 00000 G	RREC	S	ENSE:INT		ALIGN OFF		4Feb 02, 2023	Frequency	
00	. OI		92		F	NO: Wide Gain:Low				-		PE MWWWWW T P P P P P P		
		_				Gain:Low	Aden: v			A h	/lkr1 1.0		Auto Tur	ne
10 d	B/div		Ref	20.00 0	dBm							0.04 dB		
Log											^ .	1Δ2		
10.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			\sim	X2		\sim			Center Fre 2.441000000 Gi	· · ·
0.00 -10.0		~					7				, i i i i i i i i i i i i i i i i i i i		2.441000000 Gi	ΗZ
-20.0	~~~~					~~~			~~~			<u> </u>		
-20.0													Start Fre	1
-40.0													2.439500000 GI	Hz
-40.0														
-60.0													Stop Fre	eq
-70.0													2.442500000 GI	Hz
Cer #Re				00 GHz		-#\/	BW 150 kH	-		Curson 1	Span 3 200 ms (.000 MHz	CF Ste	
				12		#V							300.000 kl Auto Ma	HZ an
MKR	MODE	TRC 1		(Δ)	× 1.0	01 MHz	Υ (Δ) 0.0-	1 dB	CTION FU	NCTION WIDTH	FUNCTIO	IN VALUE		
23	F	1	f		2.441 1	52 GHz	4.40	lBm					Freq Offs	et
4														Hz
5 6												=		
7														
9 10														
11												~		
< MSG	_	_	_				111					>		
WOG	_	_	_							LO STATU:	3			

Carrier Frequency Separation (FH)

Hopping mode : Enable&π/4DQPSK





Carrier Frequency Separation (FH) <u>Hopping mode : Enable&8DPSK</u>

Agilent Spectr	um Ana													
Center F	RF	50 Ω 2 / / 10 0				SEN	ISE:INT	Ava T		LIGN OFF		MFeb 02, 2023 CE 1 2 3 4 5 6		Frequency
Center	eq 2			PNO: Wide IFGain:Lov		Trig: Free Atten: 30						PE MWWWWW ET P P P P P P		
10 dB/div	Ref	20.00	dBm							ΔN		01 MHz 0.00 dB		Auto Tune
10.0 0.00 -10.0		<u> </u>	<u> </u>	~~~	~~	<u></u>	<u>X</u> 2_	~~~	<u> </u>	~~~~		1Δ2	2	Center Freq .441000000 GHz
-20.0													2	Start Freq .439500000 GHz
-50.0 -60.0 -70.0													2	Stop Freq .442500000 GHz
Center 2. #Res BW	51 k			#\	/BW	150 kHz			S	weep 1	.200 ms (.000 MHz 3001 pts)	Aut	CF Step 300.000 kHz o Man
MKR MODE TH		(Δ)	× 1	001 MHz	(A)	Y 0.00		ICTION	FUNC	TION WIDTH	FUNCTI	ON VALUE	Aut	
2 F 1 3 4 5 5				153 GHz		5.17 dE								Freq Offset 0 Hz
6 7 8 9 10														
11						Ш						>		
MSG										I STATUS				



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) <u>Hopping mode : Enable&8DPSK</u>

Agilent Spectrum Analyzer - Swept SA					
RL RF 50 Ω AC Center Freq 2.44100000		SENSE:INT Ava	ALIGN OFF Type: Log-Pwr	06:30:08 PMFeb 02, 2023 TRACE 123456	Frequency
Center Freq 2.44 100000	PNO: Wide 😱 Trig:	Free Run -	.,,		
	IFGain:Low Atter	n: 30 dB			Auto Tune
			ΔM	kr1 1.004 MHz	Autorune
10 dB/div Ref 20.00 dBm	<u>۱ </u>			0.03 dB	
10.0				1∆2	Center Freq
0.00		$\sim X_2$		\sim	2.441000000 GHz
-10.0					
-20.0					
-30.0					Start Freq
-40.0					2.439500000 GHz
-50.0					
					Stop Freq
-60.0					2.442500000 GHz
-70.0					
Center 2.441000 GHz				Span 3.000 MHz	CF Step
#Res BW 51 kHz	#VBW 150 k	Hz	Sweep 1.2	200 ms (3001 pts)	300.000 kHz
	X Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$.03 dB 0 dBm			
3	4411010112 0.1				Freq Offset
4 5				=	0 Hz
6					
8					
9					
11				×	
	ш		51	>	
MSG					



Frequency

8 kH;

Auto Tune

Center Freq

2.441000000 GHz

- Power Supply: 12 V

Carrier Frequency Separation (FH) Hopping mode : Enable&GFSK RL D4 PM TRACE ALIGN OFF Center Freq 2.441000000 GHz Trig: Free Run Atten: 30 dB TYPE MWWWWW DET P P P P P PNO: Wide 🖵 IFGain:Low ∆Mkr1 99 -0.10 dE Ref 20.00 dBm 0 dB/div 1Δ2 Х,

-20.0 -30.0 -40.0						2.43	Start Free 39500000 GH
-50.0 -60.0 -70.0						2.44	Stop Fre 42500000 GH
#Re	ter 2.441000 GI s BW 51 kHz	#V	/BW 150 kHz		Span 3.000 MHz .200 ms (3001 pts)		CF Stej 300.000 kH Mai
1 2 3 4 5	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	× 998 kHz 2.441 150 GHz	γ (Δ) -0.10 dB 3.82 dBm	FUNCTION WIDTH	FUNCTION VALUE		Freq Offse 0 H
6 7 9 10 11					~		
MSG			Ш				

Carrier Frequency Separation (FH)

Hopping mode : Enable&π/4DQPSK





Carrier Frequency Separation (FH)

Hopping mode : Enable&8DPSK

Agilent Spectru	m Analyzer	r - Swept SA								
Center Fre	RF	50 Ω AC		SEN	JSE:INT		ALIGN OFF e: Log-Pwr		MFeb 02, 2023 CE 1 2 3 4 5 6	Frequency
Genternit	5q 2.44		PNO: Wide					TY	PE MWWWWW ET P P P P P P	
			IFGain:Lov	Atten: 30	ab					Auto Tune
	D-6.00	00 10					ΔN		01 MHz 0.03 dB	
10 dB/div Log	Rel 20	.00 dBm						1	1∆2	
10.0								— •		Center Freq
0.00	_^	$\sim \sim$	~~~~	~~~~~	~ <u>X</u> 2_	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			2.441000000 GHz
-10.0										
-20.0										Start Freq
-30.0										2.439500000 GHz
-40.0										
-50.0										
-60.0										Stop Freq
-70.0										2.442500000 GHz
Center 2.4 #Res BW 5		GHZ	#\	/BW 150 kHz			Sween 1	Span 3	.000 MHz 3001 pts)	CF Step 300.000 kHz
										Auto Man
MKR MODE TRO	scL f (Δ)	×	1.001 MHz	γ (Δ) 0.03		CTION FUI	NCTION WIDTH	FUNCTI	DN VALUE	
2 F 1	f	2.44	1 151 GHz	5.37 dE						Freq Offset
4										0 Hz
5									=	0112
7										
9										
10									~	
<										
MSG								5		



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

Center Freq 2.441000000 GHz Trig: Free Run Avg Type: Log-Pwr Trace 2.3.4 str Frequency PNO: Wide Trig: Free Run Avg Type: Log-Pwr Trace 2.3.4 str PPPP 0 dB/div Ref 20.00 dBm -0.02 dB Center Freq 2.441000000 GHz Center Freq 10 dB/div Ref 20.00 dBm -0.02 dB Center Freq 2.44100000 GHz Center Freq 2.00 -0.02 dB -0.02 dB -0.02 dB Center Freq 2.44100000 GHz 2.00 -0.02 dB -0.02 dB -0.02 dB Center Freq 2.44100000 GHz 3.00 -0.02 dB -0.02 dB -0.02 dB Stop Freq 2.439500000 GHz 4.00 -0.02 dB -0.02 dB Span 3.000 MHz Stop Freq 2.44250000 GHz 700 -0.02 dB -0.02 dB Span 3.000 MHz Stop Freq 3.00.000 KHz 4.00 -0.02 dB -0.02 dB -0.02 dB -0.02 dB Stop Freq 3.00.000 KHz 4.00 -0.02 dB			trum		lyzer - S																		
PRO: Wide (FGain:Low) Trig: Free Run Atten: 30 dB Auto Tune 10 dE/div Ref 20.00 dBm -0.02 dB -0.02 dB 100 -0.02 dB -0.02 dB -0.02 dB 200 -0.02 dB -0.02 dB -0.02 dB 200 -0.02 dB -0.02 dB -0.02 dB 200 -0.02 dB -0.02 dB -0.02 dB 2.4100000 GHz -0.02 dB -0.02 dB -0.02 dB WRR MODE TRC SCL X Y FUNCTION FUNCTION VALUE 1 -0.02 dB -0.02 dB -0.02 dB -0.02 dB 1 -0.02 dB -0.02 dB -0.02 dB -0.02 dB 2 -0.02 dB -0.02 dB -0.02 dB -0.02 dB 2 -0.02 dB -0.02 dB -0.02 dB -0.02 dB 2 -0.02 dB -0.02 dB -0.02 dB -0.02 dB			- Fre	RF a 2										Avg			04:2	TRAC	E 1 2 3 4	5.6		Frequency	
AMKET 1.002 MHZ -0.02 dB -0.02 dB								PNO:	: Wide	P								TYP DE	E MWWW T P P P P	P P		Auto Tur	
100 1Δ2 Center Freq 100 400	10 d	B/div		Ref	20.00) dBi	m									ΔN	/kr1					Auto Tuni	e
S0.0 40.0 Start Freq 40.0 50.0 50.0 60.0 50.0 50.0 70.0 50.0 50.0 60.0 50.0 50.0 70.0 50.0 50.0 70.0 50.0 50.0 70.0 50.0 50.0 70.0 50.0 50.0 70.0 50.0 50.0 70.0 50.0 50.0 8.0 1.002 HZ 70.0 70.0 70.0 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 1.002 <td< td=""><td>10.0 0.00</td><td></td><td></td><td>~</td><td><u> </u></td><td>~^</td><td>the second</td><td></td><td></td><td></td><td></td><td><u> </u></td><td>X₂</td><td></td><td></td><td></td><td></td><td></td><td><u>Δ2</u></td><td></td><td>2</td><td></td><td></td></td<>	10.0 0.00			~	<u> </u>	~^	the second					<u> </u>	X ₂						<u>Δ2</u>		2		
60.0	-30.0 -40.0																				2		
#Res BW 51 kHz #VBW 150 kHz Sweep 1.200 ms (3001 pts) 300.000 kHz MKR MODE F f (Δ) 1.002 MHz (Δ) -0.02 dB Auto Man 1 Δ2 1 f (Δ) -0.02 dB F F C F f 2.441 150 GHz 4.62 dBm F F F F O Hz Man 3 F f 2.441 150 GHz 4.62 dBm F F F F O Hz F F O Hz	-60.0																				2		
MRR MODE TRC SEL X Y Y P EINCTION FUNCTION width FUNCTION value 1 Δ2 1 f (Δ) -0.02 dB - - - 2 F 1 f 2.441 150 GHz 4.62 dBm - - - 3 - - - - - - - - 4 - - - - - - - - 6 - - - - - - - - 7 - - - - - - - - 9 - - - - - - - - 11 - - - - - - -						z			#VE	3W ′	150 kHz				ę	Sweep 1	Sp .200	an 3. ms (:	000 M 3001 p	Hz ts)		300.000 kH	İz
2 F 1 f 2.441 150 GHz 4.62 dBm Freq Offset 3 4 4 4 4 6 7 7 7	MKR		TRC		(FUNC	CTION	FUN	ICTION WIDTH		FUNCTIO	N VALUE	^	<u>Aut</u>	<u>o</u> Mar	n
7 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	3 4 5		1	f	<u>(Δ)</u>		1. 2.441	150 (GHz (<u>A)</u>	-0.02 4.62 d	dB Bm								=			
	7 8 9 10																			~			
	MSG		_	-			_	_	_	-		_	_		_		S						

Carrier Frequency Separation (AFH) <u>Hopping mode : Enable&π/4DQPSK</u>





Carrier Frequency Separation (AFH) <u>Hopping mode : Enable&8DPSK</u>

Agilent Spectrum Analyzer - Swept SA				
K RL RF 50 Ω AC Center Freq 2.441000000		E:INT ALIGN (Avg Type: Log-F		Frequency
Center Freq 2.44 100000	PNO: Wide 😱 Trig: Free	Run		
	IFGain:Low Atten: 30 o	B		Auto Tune
			∆Mkr1 999 kHz	Autorune
10 dB/div Ref 20.00 dBm			0.05 dB	
10.0			_1∆2	Center Freq
	\sim	$-X_2$	\sim	2.441000000 GHz
				2.441000000 GHZ
-10.0				
-20.0				Start Freq
-30.0				2.439500000 GHz
-40.0				
-50.0				
-60.0				Stop Freq
-70.0				2.442500000 GHz
Center 2.441000 GHz			Span 3.000 MHz	CF Step
#Res BW 51 kHz	#VBW 150 kHz	Swee	p 1.200 ms (3001 pts)	300.000 kHz Auto Man
MKR MODE TRC SCL X	Y AND	FUNCTION FUNCTION W	IDTH FUNCTION VALUE	Auto Man
	999 kHz (Δ) 0.05 d I1 152 GHz 5.40 dB			
3				Freq Offset
5				0 Hz
6				
8				
9				
11			v	
<	III.	~	>	
MSG		۲ <mark>0</mark> s	TATUS	

7. Number of Hopping Channels

7.1. Test Setup

Refer to the APPENDIX I.

7.2. Limit

Limit : >= 15 hops

7.3. Test 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 ~ 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
		ss than 30 % of the channel spacing
or the 20 dB bandwidth, v	vhichever is smaller.	
VBW ≥ RBW	Sweep = auto	
Detector function = peak	Trace = max hold	

7.4. Test Results

- Power Supply: 24 V 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



- Power Supply: 12 V

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.



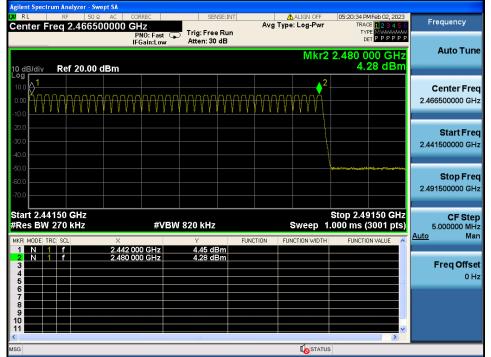
- Power Supply: 24 V Number of Hopping Channels 1(FH)

Hopping mode : Enable & GFSK

		ctrur	n An	alyzer - Sw	rept SA													
L XI R	L		RF	50 Ω		COR			SI	INSE:	INT			ALIGN OFF	05:19:22 F	MFeb 02, 2023		
Cer	nter	Fre	ea í	2.4165	0000	0 GH	z					Av	g Type	: Log-Pwr	TRA	CE 123456		Frequency
						P	10: Fast	9	Trig: Fre						T	PE MWWWWW ET P P P P P P		
						IFG	Gain:Low	۰ <u>۲</u>	Atten: 3	0 dB					0	et je ie ie ie ie		
														Milaro	0 444 0			Auto Tune
														IVIKTZ		00 GHz		
10 c	lB/di∖	,	Rei	f 20.00	dBm										4.	48 dBm		
Log																		
10.0					1											L~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Center Freq
					N _A		~~~	nn	0000	101	none	กก	<u></u>	00000	AAAAA			•
0.00	<u>⊢</u>				- { \} \}	-{{ {{ }}}		{ }	F \{ \{ \{ \} \}	₩₩	- V V V	₩₩₩	111	<i>∦ \} \} \</i> {	₩₩₩₩₩	₩ ₩ ₩ ₩ ₩		2.416500000 GHz
-10.0					111	ΥΥ		1	[]]]	Ĭ	ΥΨ	1 F Y	ΥY	* + * * * +	* 1 + 1 + 1	1 4 4 4 4		
-20.0																		Otort From
																		Start Freq
-30.0	' 																	2.391500000 GHz
-40.0	1 																	
-50.0	ور برایا (ang Maa	n-mallwowedd														
-60.0																		Stop Freq
-60.0																		2.441500000 GHz
-70.0																		2.44100000000112
eta	rt 2.3	204	50	CH2											Stop 24	4150 GHz		
													,					CF Step
#R6	s Bl	W 2	:7U	KHZ			#V	В₩	820 kH	Z				Sweep 1	.000 ms	(3001 pts)		5.000000 MHz
MED	MODE	TPC	SCI.	1	×				Y		ELIM	CTION	ELIN	ICTION WIDTH	FUNCT	ON VALUE	- <u> </u>	<u>Auto</u> Man
MNN	NUDE	Inc	SUL F			00.000) GHz		4.14 c		PUN	LIIUN	FUP	ICTION WIDTH	FUNCT			
2	N	1	F.		2.4	44 000) GHZ		4.14 0	IBm			_					
2	N				2.4	41 001	JGHZ		4.48 (1-111								Freq Offset
4																		
5																		0 Hz
ő																		
7																		
8																		
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<									ш							>		
MSG														STATU:	2			
NIGG		_	_					_		_				No statu:	3			

Number of Hopping Channels 2(FH)

Hopping mode : Enable & GFSK





Number of Hopping Channels 1(FH)

Hopping mode : Enable&π/4DQPSK

	um Analyzer								
Center Fi		50 Q AC		SENSE	Avg	ALIGN OFF Type: Log-Pwr	TRAC	MFeb 02, 2023 CE 1 2 3 4 5 6 PE M WWWWWW	Frequency
10 dB/div	Ref 20.0	00 dBm	PNO: Fast G	Atten: 30 dB		Mkr2	DI 2.441 0	T PPPPP	Auto Tune
Log 10.0 0.00		Å	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\gamma \gamma $		ᢞᠬ᠇᠆ᢧᠬ	V~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	Center Freq 2.416500000 GHz
-20.0 -30.0 -40.0									Start Freq 2.391500000 GHz
-50.0	ersoostaavsatselted	hw/							Stop Freq 2.441500000 GHz
Start 2.39 #Res BW	270 kHz	×		№ 820 kHz Y	FUNCTION	Sweep 1		150 GHz 3001 pts)	CF Step 5.000000 MHz <u>Auto</u> Man
1 N 1 2 N 1 3 4 5 6	f f		2 000 GHz 1 000 GHz	4.56 dBm 4.71 dBm					Freq Offset 0 Hz
7 8 9 10 11								~	
MSG				- 110		I o STATU:	S		

Number of Hopping Channels 2(FH)

Hopping mode : Enable &π/4DQPSK





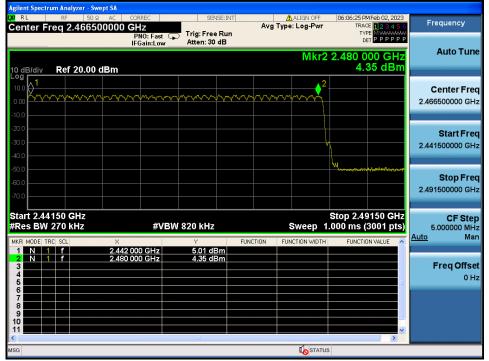
Number of Hopping Channels 1(FH)

Hopping mode : Enable&8DPSK

Agilent Spe	ectrum Ana	alyzer - Sw	ept SA								
Center	RF	50 Ω	AC	CORREC	SEN	SE:INT		ALIGN OFF		MFeb 02, 2023	Frequency
Center	Freq 2	2.41650	00000	GHz		_	Avg Typ	e: Log-Pwr	TRA	^{CE} 123456	
				PNO: Fast G	Trig: Free				19	PE MWWWWW ET P P P P P P	
				IFGain:Low	Atten: 30	dB				ai <u>,</u>	
								Mkr2	2.441 0	00 GH7	Auto Tune
	_									76 dBm	
10 dB/di Log	v Rei	f 20.00 (dBm						<u>.</u>	70 uBill	
			1							2	
10.0			0								Center Freq
0.00			m	᠂ᡣ᠋ᡎ᠋ᡎᢉ᠉ᡝ		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\sim	\sim	\sim	$\sqrt{\sqrt{2}}$	2.416500000 GHz
-10.0											
-20.0			[
											Start Freq
-30.0		r (*									2.391500000 GHz
-40.0											
		w.									
-50.0 🚧	and the second	and the state of the									
-60.0											Stop Freq
											2.441500000 GHz
-70.0											
Start 2.	.39150	GHz							Stop 2.4	1150 GHz	CF Step
#Res B	W 270	kHz		#VBV	V 820 kHz			Sweep 1	1.000 ms (3001 pts)	5.000000 MHz
											Auto Man
	E TRC SCL		×		Y		NCTION FU	NCTION WIDTH	FUNCTI	DN VALUE	<u>rato</u> man
1 N	1 f			000 GHz	3.75 dE						
2 N	1 f		2.441	000 GHz	3.76 dE	m					Freq Offset
3											•
5										_	0 Hz
6	\vdash										
7											
8											
9											
10	\vdash					_					
11										~	
<u> </u>					Ш						
MSG								I o STATU	IS		
			_								

Number of Hopping Channels 2(FH)

Hopping mode : Enable & 8DPSK





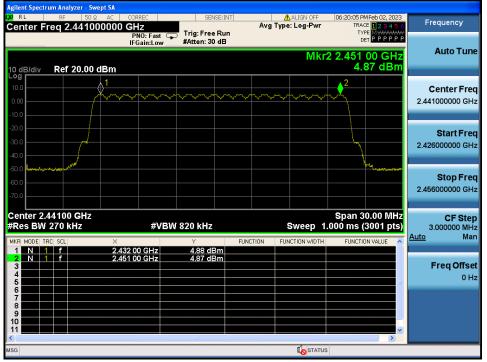
Number of Hopping Channels 1(AFH)

Hopping mode : Enable & GFSK

Agilent Spe											
IXI RL	RF			CORREC	SE	INSE:INT		ALIGN OFF		MFeb 02, 2023 CE 1 2 3 4 5 6	Frequency
Center	Freq	2.4410	000000	PNO: Fast	Trig: Fre	e Run	Avgilyp	e. Log-Fwr	TY	PE M WARANA AND A STATE	
				IFGain:Low	Atten: 3				D	ет РРРРР	
								Mb	2.2.451	00 GHz	Auto Tune
	_							IVINI		13 dBm	
10 dB/div Log r	Re	f 20.00) dBm						4.	15 UBIII	
10.0			1						▲2		
			Xa			~~~	~~~				Center Freq
0.00			+ $+$ $+$ $+$ $+$	W W M	VVV V	W W Y	$H \setminus H \setminus H$	HV V V			2.441000000 GHz
-10.0			∫ ¥ ¥	V V V	V V V V	Y Y V	V V V	V V V	V \		
-20.0											
		1									Start Freq
-30.0											2.426000000 GHz
-40.0		{							+		
-50.0		Jan Mary							L. L	de la come de	
											Stop Freq
-60.0											2.456000000 GHz
-70.0											2.40000000 0112
Center									Span 3	0.00 MHz	CF Step
#Res B	W 270	kHz		#VE	3W 820 kH:	Z		Sweep 1	1.000 ms ((3001 pts)	3.000000 MHz
MKR MODE	TBC SCI	1	×		Y	EUI	ICTION FU	NCTION WIDTH	EUNCTI	ON VALUE	<u>Auto</u> Man
1 N	1 f			32 00 GHz	4.27 c			Notion with the	ronen		
2 N	1 f		2.4	51 00 GHz	4.13 c						
3											Freq Offset
5											0 Hz
6											
7	\vdash										
8											
10											
11										~	
<					111						
MSG								🚺 STATU	s		

Number of Hopping Channels 1(AFH)

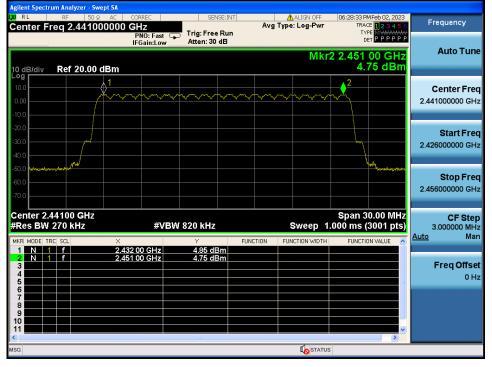
Hopping mode : Enable &π/4DQPSK





Number of Hopping Channels 1(AFH)

Hopping mode : Enable & 8DPSK



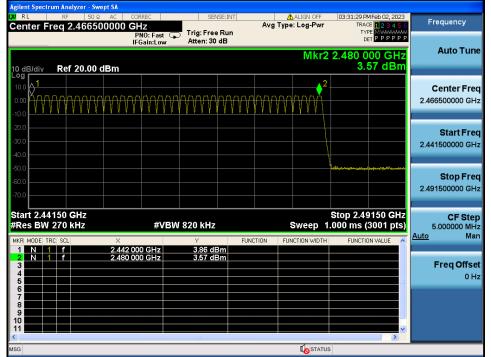
- Power Supply: 12 V Number of Hopping Channels 1(FH)

Hopping mode : Enable & GFSK

Agilent Spectru												
LXI RL	RF			CORR		SEI	VSE:INT		ALIGN OFF		MFeb 02, 2023	Frequency
Center Fr	eq	2.4165	00000) GHz	Z		-	Avg Typ	e: Log-Pwr	TRA	CE 123456	Frequency
				PNO	0:Fast 🔾	Trig: Free Atten: 30				IY D	PE MWWWWW ET P P P P P P	
				IFGa	ain:Low	Atten: 30	u D					Auto Tune
									Mkr2		000 GHz	Auto Tune
10 dB/div	Ref	f 20.00	dBm							3.	76 dBm	
Log												
10.0			<u>_</u>								<u> </u>	Center Freq
0.00			Ann	nn	ากกกก		ոդդոր	NAAAA	AAAAA	nnnnr	nnnnn	2.416500000 GHz
			111	VVV	Y	VVVVV	V V V V	* * * * * *	* * * * * *	VVVVV	V V V V V V	2.410500000 GHZ
-10.0				1 1	YFYY	1 1 1 1		1111	1 1 1 1	TY TY		
-20.0												
												Start Freq
-30.0			1									2.391500000 GHz
-40.0			/									
-50.0												
												Stop Freq
-60.0												2.441500000 GHz
-70.0												2.441500000 GHZ
Start 2.39	150	GHz								Stop 2.4	4150 GHz	CF Step
#Res BW					#VBV	V 820 kHz			Sweep 1		(3001 pts)	5.000000 MHz
												Auto Man
MKR MODE TR	C SCL		×			Y		CTION FU	NCTION WIDTH	FUNCTI	ON VALUE 🔼	
1 N 1 2 N 1	f			2 000		<u>3.71 dl</u> 3.76 dl						
3			2.44	1000	982	5.76 u	5111					Freq Offset
4												0 Hz
5											=	0 H2
6												
8												
9												
10												
11											~	
<											>	
MSG										S		
			And and a second se						and the second division of the second divisio			

Number of Hopping Channels 2(FH)

Hopping mode : Enable & GFSK





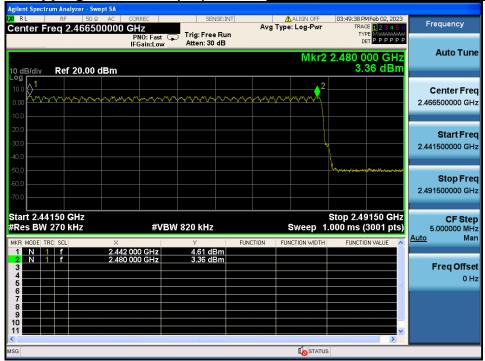
Number of Hopping Channels 1(FH)

Hopping mode : Enable&π/4DQPSK

Agilent Spect									
Center F		50 Ω AC 6500000		SENSE	Avg 1	ALIGN OFF	TRA	MFeb 02, 2023 CE 1 2 3 4 5 6 PE MAAAAAAA	Frequency
10 dB/div	Ref 20.	00 dBm	PNO: Fast C IFGain:Low	Atten: 30 dE		Mkr2	□ 2.441 0	00 GHz 41 dBm	Auto Tune
Log 10.0 0.00		21 2~~~	ᠵᢇᢧᡊ᠕᠆ᠬ	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ψ	·	Center Freq 2.416500000 GHz
-20.0									Start Freq 2.391500000 GHz
-50.0	99999999999999999999999999999999999999	لیمی							Stop Freq 2.441500000 GHz
Start 2.39 #Res BW	270 kHz	×		W 820 kHz Y	FUNCTION	Sweep 1	.000 ms (4150 GHz 3001 pts)	CF Step 5.000000 MHz <u>Auto</u> Man
1 N 2 3 4 5 6			2 000 GHz 1 000 GHz	4.30 dBm 3.41 dBm					Freq Offset 0 Hz
7 8 9 10 11								v	
MSG						I o statu	S		

Number of Hopping Channels 2(FH)

Hopping mode : Enable &π/4DQPSK





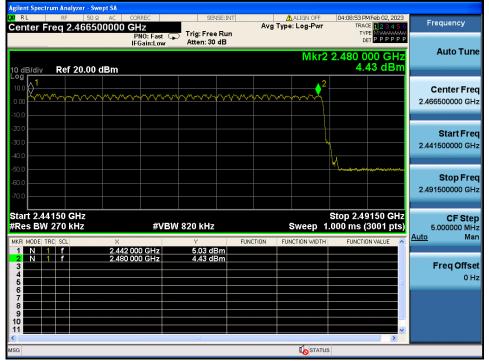
Number of Hopping Channels 1(FH)

Hopping mode : Enable&8DPSK

Agilent Spectrum Analyzer - Swept SA				
RL RF 50 Ω AC Center Freq 2.416500000	CORREC SENSE:IN	T ALIGN OFF Avg Type: Log-Pwr	04:07:40 PMFeb 02, 2023 TRACE 1 2 3 4 5 6	Frequency
	PN0: Fast Trig: Free Run IFGain:Low Atten: 30 dB		2.441 000 GHz 5.28 dBm	Auto Tune
10 dB/div Ref 20.00 dBm 10 dB/div Ref 20.00 dBm 10 0 10 10 10 10 10 10 10 10 10 10 10 10	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Center Freq 2.416500000 GHz
-20.0				Start Freq 2.391500000 GHz
-50.0				Stop Freq 2.441500000 GHz
Start 2.39150 GHz #Res BW 270 kHz	#VBW 820 kHz	Sweep 1.	Stop 2.44150 GHz .000 ms (3001 pts)	CF Step 5.000000 MHz Auto Man
	2 000 GHz 4.17 dBm 1 000 GHz 5.28 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG				

Number of Hopping Channels 2(FH)

Hopping mode : Enable & 8DPSK





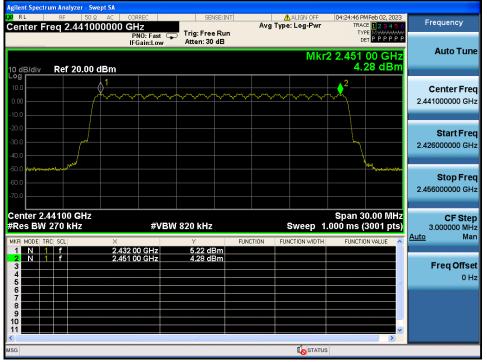
Number of Hopping Channels 1(AFH)

Hopping mode : Enable & GFSK

Agilent Spect											
Center F	RF	50 Ω			SE	NSE:INT		ALIGN OFF		MFeb 02, 2023	Frequency
Centerr	req z.	44 100	0000	PNO: Fast C	Trig: Fre		111.9 1.944		TY	PE M WWWWWW	
				IFGain:Low	Atten: 30	dB			D	T P P P P P P	
								Mki	2 2.451	00 GHz	Auto Tune
10 dB/div	Dof 1	20.00 c	1Bm							34 dBm	
Log	Kel 2	20.00 0									
10.0		(<u> </u>						<mark></mark> 2		Center Freq
0.00		[hmm	\mmm	mmm	h n n n			$h \land$		2.441000000 GHz
			VV	V V V V	/ V V V	\vee \vee \vee	V V V	V V V	V (2.441000000 GH2
-10.0				· · ·					+ · · ·		
-20.0											Start Freq
-30.0											•
-40.0											2.426000000 GHz
		1									
-50.0		e chil								Manna Manhandra	Oton From
-60.0											Stop Freq
-70.0											2.456000000 GHz
Center 2.	.44100	GHz							Span 3	0.00 MHz	CF Step
#Res BW				#VB	W 820 kHz			Sweep 1	.000 ms (3001 pts)	3.000000 MHz
						E IN			,		Auto Man
MKR MODE T	AL SUL		× 2.43	2 00 GHz	۲ 4.46 d		CTION FUN	NCTION WIDTH	FUNCTI	ON VALUE	
2 N	1 f		2.45	1 00 GHz	4.40 d	Bm					
3											Freq Offset
4 5										_	0 Hz
6										_	
7											
8											
10											
11										~	
<								4		>	
MSG									S		

Number of Hopping Channels 1(AFH)

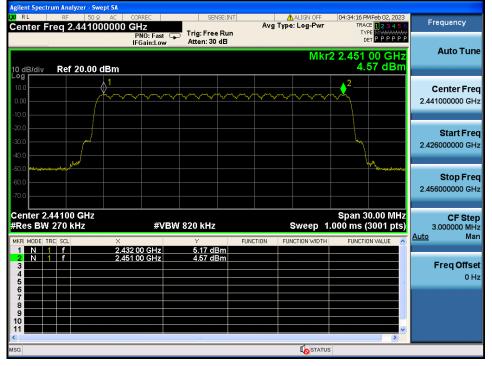
Hopping mode : Enable &π/4DQPSK





Number of Hopping Channels 1(AFH)

Hopping mode : Enable & 8DPSK



8. Time of Occupancy

8.1. Test Setup

Refer to the APPENDIX I.

8.2. Limit

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

8.3. 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

Detector function = peak

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

8.4. Test Results

- Power Supply: 24 V FH mode

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

AFH mode

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

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

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

- Time slots for DH5 = 6 slots (TX = 5 slots / RX = 1 slot)
- Hopping Rate = 1 600 for FH mode & 800 for AFH mode

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



- Power Supply: 12 V

FH mode

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

AFH mode

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

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

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

- Time slots for DH5 = 6 slots (TX = 5 slots / RX = 1 slot)
- Hopping Rate = 1 600 for FH mode & 800 for AFH mode

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

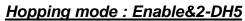


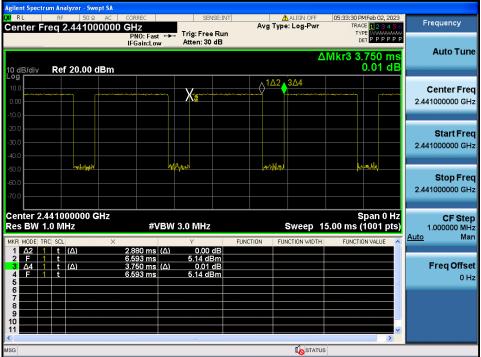
- Power Supply: 24 V Time of Occupancy (FH)

Hopping mode : Enable&DH5

gilent Spect				i SA																
U RL	RF			AC	CORREC			SE	NSE:INT				ALIGN				eb 02, 20		Frequency	
Center F	req	2.44	1000	000	GHZ PNO: F		T T	rig: Fre	e Run		Avg	Туре	: Log-	Pwr	1	TYPE	1234 w www	ALAL-	riequency	
					IFGain:			Atten: 30								DET	PPPP	ΡP		
														Δ	Mkr3	3.7	50 m	1S	Auto Tu	Ine
10 dB/div	Re	F 20 (00 dE	Rm													25 d			
Log				2111					140											
10.0									1Δ2	3∆4									Center F	req
0.00				-	<u> </u>														2.441000000	GHz
-10.0																				
-20.0																				
-30.0																			Start F	
																			2.441000000	GHz
-40.0																				
-50.0					Alador				dim i Mih)			ł	Mereta da						
-60.0																			Stop F	
-70.0																			2.441000000	SHz
Center 2.			10 GH	z													an 0 H		CF S	tep
Res BW	1.0 M	Hz				#VB۱	N 3.	0 MHz				5	Swee	ep 1:	5.00 m	s (1(001 pt	S)	1.000000	٨Hz
MKR MODE T	RC SCL			×				Y		FUNC	TION	FUN	CTION \	MIDTH	FUN	CTION	VALUE	^	Auto I	Man
1 <u>A</u> 2	1 t	(<u></u>)			2.880 n)	2.52												
2 F -	1 t 1 f	(A)			4.510 n 3.750 n		1	1.90 d -0.25	BM dR										Freq Off	set
4 E	1 t	, . ,			4.510 m	15	<u> </u>	1.90 d	Bm) Hz
5																		Ξ		
7																				
8																				
10																				
11																		~		
<	_	_	_	_		_	_		_			_	-1			_	>			
MSG													40	STATUS						

Time of Occupancy (FH)







Time of Occupancy (FH)

Hopping mode : Enable&3-DH5

Agilent Spectrum Analyzer - Swept SA X/ RL RF 50 Ω AC	CORREC	SENSE:INT		ALIGN OFF		1Feb 02, 2023	Frequency
Center Freq 2.441000000	PNO: Fast 🔸	Trig: Free Run Atten: 30 dB	Avgiy	pe: Log-Pwr	TVE	E 123456 E WWWWWW T P P P P P P	
	IFGain:Low	Atten: 30 dB		Δ	Mkr3 3.		Auto Tune
10 dB/div Ref 20.00 dBm						0.02 dB	
10.0							Center Fred
0.00	Xa						2.441000000 GHz
-10.0							
-20.0							Start Free
-40.0							2.441000000 GH:
-50.0 (4) 11	made.		weinte		perman		Oton Eng
-60.0							Stop Fred 2.441000000 GH;
-70.0							
Center 2.441000000 GHz Res BW 1.0 MHz	#VBM	3.0 MHz		Sweep 1	S 5 00 ms (pan 0 Hz	CF Step 1.000000 MHz
MKR MODE TRC SCL X		Y	FUNCTION F	UNCTION WIDTH		IN VALUE	Auto Mar
1 <u>Δ2</u> 1 t (Δ) 2 F 1 t	2.880 ms (∆) 5.365 ms	0.94 dB 5.12 dBm					
3 Δ4 1 t (Δ) 4 F 1 t	3.750 ms (∆) 5.365 ms	-0.02 dB 5.12 dBm					Freq Offse 0 Hi
5 6						=	011.
7							
9 10 10							
		III.				>	
MSG					5		

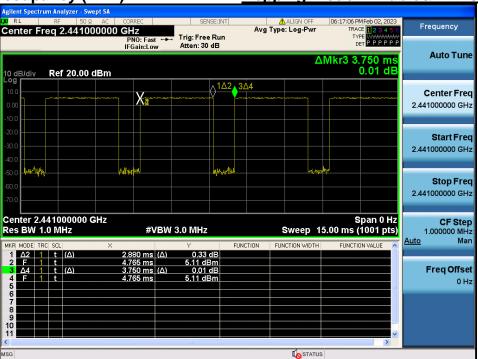


Time of Occupancy (AFH)

Hopping mode : Enable&DH5

Agilent Spect	rum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT		\Lambda ALIGN OFF	06/10/06 0	MFeb 02, 2023	
	req 2.4410000				pe: Log-Pwr	TRA	CE 1 2 3 4 5 6	Frequency
		PNO: Fast +++ IFGain:Low	Trig: Free Run Atten: 30 dB			L.		
					Δ	Mkr3 3	.750 ms	Auto Tune
10 dB/div	Ref 20.00 dBm	1					0.01 dB	
Log 10.0				<u>∧1∆2_3∆4</u>				Center Freq
0.00		X <u>a</u>		Y Y		n (***		2.441000000 GHz
-10.0								
-20.0								
-30.0								Start Freq 2.441000000 GHz
-40.0								2.441000000 GH2
-50.0	mana	Marphi		younger		hideway		
-60.0								Stop Freq
-70.0								2.441000000 GHz
Center 2	.441000000 GHz						Span 0 Hz	05.01
Res BW		#VBW	3.0 MHz		Sweep 1	5.00 ms	(1001 pts)	CF Step 1.000000 MHz
MKR MODE T	rrc scl >	×	Y	FUNCTION F	JNCTION WIDTH	FUNCT	ION VALUE	<u>Auto</u> Man
1 Δ2 2 F	1 t (Δ)	2.880 ms (∆) 5.529 ms	0.16 dB 4.31 dBm					
3 ∆4	1 t (Δ)	3.750 ms (∆)	0.01 dB					Freq Offset
5	1 t	5.529 ms	4.31 dBm					0 Hz
6								
8								
10								
<			III				>	
MSG					I o status	5		





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Time of Occupancy (AFH)

Hopping mode : Enable&3-DH5

Agnent Spectrum Maryzer - Swept SA IX RL RF 50 Q AC Center Freq 2.441000000	CORREC GHz PNO: Fast ↔ T	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	06:26:38 PMFeb 02, 2023 TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET P P P P P P	Frequency
10 dB/div Ref 20.00 dBm		atten: 30 dB	Δ	Mkr3 3.750 ms 0.00 dB	Auto Tune
	Xa		1.gr.unt/5.gr.m.tgt.unnatur	_mternetternette	Center Freq 2.441000000 GHz
-20.0 -30.0 -40.0					Start Freq 2.441000000 GHz
-50.0 400040 4000 -60.0	<u>uvh</u> ,	- Antopo	אקאנאלא		Stop Freq 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.(Y FUNCI		Span 0 Hz 5.00 ms (1001 pts) FUNCTION VALUE	CF Step 1.000000 MHz <u>Auto</u> Man
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.880 ms (Δ) 4.496 ms 3.750 ms (Δ) 4.496 ms	0.94 dB 5.13 dBm 0.00 dB 5.13 dBm			Freq Offset 0 Hz
7 8 8 9 9 10 11					
MSG			I o STATUS	>	



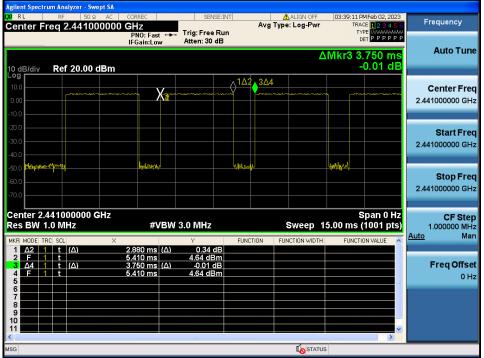
- Power Supply: 12 V Time of Occupancy (FH)

		ctrun		ılyzer -		t SA																		
	RL RF 50 Q AC CORREC Center Freq 2.441000000 GHz								SENSE:INT				Ava	ALIGN OFF 03:21:45 PM Feb 02 Avg Type: Log-Pwr TRACE								Frequency		
PNO: Fast IFGain:Low														TY										
							IFG	ain:Lo	W	Au	en: su						•	Milan		750			Auto Tun	е
40	dB/div			20.0	0.41	3											Δ	Mkr		750 0.00				
Log		/		20.0	JU UL	-111																		
10.	0										^{1∆} ¹	2 0 3,	<u> </u>								_		Center Free	q
0.0	₀┣╤					- '	14									}	f						2.441000000 GH	İz
-10.																								
-20.																							Start Free	a
-30.0																							2.441000000 GH	
-40.																								
-50.0	o <mark>w</mark>					-lpskiller,m					WIMA	ý,				hydren	N				htter			
-60.																							Stop Free	
-70.																							2.441000000 GH	z
	nter s BW			0000	0 Gł	Z		-#*	(D)A	3.0	MU						n 1	5.00 n		pan (CF Step	
_				12				#	ч Б үү													A	1.000000 MH Auto Mai	
MKR	MODE	TRC 1		<i>(</i> Δ)		X	2 88	30 ms	(A)	Ý	0.12	dB	FUN	CTION	FUN	CTION W	IDTH	FU	INCTIO	IN VALUE	<u>^</u>	-		
2	F	1	t				3.94	11 ms		3	.70 d	Bm											Freq Offse	
3 4	F	1	t	(Δ)				50 ms 11 ms		3	.70 d													
5															-						=		011	-
7																								
8																								
10									-			_			-									
<											113										>			
MSG																🚺 s	TATUS							

Time of Occupancy (FH)



Hopping mode : Enable&DH5





Time of Occupancy (FH)

Hopping mode : Enable&3-DH5

