

CTC Laboratories, Inc.

1-27., June 1, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel: +86-755-27521059 Fax: +86-755-27521011 http://www.sz-ctc.org.cn

Т	EST REPORT			
I				
Report No. ·····:	CTC20230076E02			
FCC ID:	2A6MST80S			
Applicant:	Shenzhen Zhichuang All Technology Co., Ltd			
Address:	D401, Ganghong Complex Building, Building 2, No.7, Xiangye Road, Xialilang Community, Nanwan Street, Longgang District, Shenzhen China			
Manufacturer:	Shenzhen Zhichuang All Technology Co	o., Ltd		
Address:	D401, Ganghong Complex Building, Building 2, No.7, Xiangye Road, Xialilang Community, Nanwan Street, Longgang District, Shenzhen China			
Product Name:	Bluetooth Earbuds			
Trade Mark:	sanag			
Model/Type reference······:	T80S Pro			
Listed Model(s) ·····:	/			
Standard:	FCC CFR Title 47 Part 15 Subpart C	Section 15.247		
Date of receipt of test sample:	Jan. 12, 2023			
Date of testing	Jan. 12, 2023 to Feb. 14, 2023			
Date of issue	Feb. 14, 2023			
Result:	PASS			
Compiled by:		T. Jima		
(Printed name+signature)	Jim Jiang	Jim Jiong Zric zhang		
Supervised by:		7-1 shang		
(Printed name+signature)	Eric Zhang			
		Jamas		
Approved by:		Jacon		
(Printed name+signature)	Totti Zhao	/		
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# 1. TEST SUMMARY

# 1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

RSS-247 Issue 2: Standard Specifications for Frequency Hopping Systems (FHSs) and Digital Transmission Systems (DTSs) Operating in the Bands 902-928MHz, 2400-2483.5MHz and 5725-5850MHz. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

# **1.2. Report Version**

Revised No.	Date of issue	Description	
01	Feb. 14, 2023	Original	

# **1.3. Test Description**

FCC Part 15 Subpart C (15.247)/ RSS-247 Issue 2					
Test Item	Standard	Decult	Test Engi-		
rest nem	FCC IC		Result	neer	
Antenna Requirement	15.203	/	Pass	Jim Jiang	
Conducted Emission	15.207	RSS-Gen 8.8	Pass	Jim Jiang	
Restricted Bands	15.205	RSS-Gen 8.10	Pass	Jim Jiang	
Hopping Channel Separation	15.247(a)(1)	RSS-247 5.1 (b)	Pass	Jim Jiang	
Dwell Time	15.247(a)(iii)	RSS-247 5.1 (d)	Pass	Jim Jiang	
Peak Output Power	15.247(b)(1)	RSS-247 5.4 (b)	Pass	Jim Jiang	
Number of Hopping Frequency	15.247(a)(iii)	RSS-247 5.1 (d)	Pass	Jim Jiang	
Band Edge Emissions	15.247(d)	RSS-247 5.5	Pass	Jim Jiang	
Radiated Spurious Emission	15.247(d)&15.209	RSS-247 5.5& RSS-Gen 8.9	Pass	Jim Jiang	
20dB Bandwidth	15.247(a)	RSS-247 5.1 (b)	Pass	Jim Jiang	

Note: The measurement uncertainty is not included in the test result.

CTC Laboratories, Inc.



#### CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

### Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

### A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

### Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

### FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

# **1.5. Measurement Uncertainty**

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.



Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth		(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

# **1.6. Environmental Conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature:	21°C~27°C
Relative Humidity:	40%~60%
Atmospheric Pressure:	101kPa

ΕN

# 2. GENERAL INFORMATION

# 2.1. Client Information

Applicant:	Shenzhen Zhichuang All Technology Co., Ltd
Address:	D401, Ganghong Complex Building, Building 2, No.7, Xiangye Road, Xialilang Community, Nanwan Street, Longgang District, Shenzhen China
Manufacturer:	Shenzhen Zhichuang All Technology Co., Ltd
Address:	D401, Ganghong Complex Building, Building 2, No.7, Xiangye Road, Xialilang Community, Nanwan Street, Longgang District, Shenzhen China

# 2.2. General Description of EUT

Product Name:	Bluetooth Earbuds		
Trade Mark:	sanag		
Model/Type reference:	T80S Pro		
Listed Model(s):	/		
Model Difference:	/		
Power supply:	Popply: Charging bay: DC5V 200mA from External adapter DC3.7V 300mAh from Battery Earphone: DC5V 50mA from Charging bay DC3.7V 30mAh from Battery		
Hardware version:	V2		
Software version:	V1		
Bluetooth 5.2/ BR+EDR			
Modulation:	GFSK, π/4-DQPSK		
Operation frequency:	2402MHz~2480MHz		
Channel number:	79		
Channel separation:	1MHz		
Antenna type:	Chip Antenna		
Antenna gain:	1.7dBi		



# 2.3. Accessory Equipment Information

Equipment Information						
Name	Model	S/N	Manufacturer			
Notebook	ThinkPad T460s	1	Lenovo			
Cable Information	Cable Information					
Name	Shielded Type	Ferrite Core	Length			
USB Cable	Unshielded	NO	100cm			
Test Software Information						
Name	Version	/	/			
BT_Tool	v1.1.2	/	/			



# 2.4. Operation State

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT EDR, 79 channels are provided to the EUT. Channels 00/39/78 were selected for testing.

**Operation Frequency List:** 

Channel	Frequency (MHz)
00	2402
01	2403
:	:
38	2440
39	2441
40	2442
:	÷
77	2479
78	2480

Note: The display in grey were the channel selected for testing.

#### Test Mode:

For RF test items:

The engineering test program was provided and enabled to make EUT continuous transmit

For AC power line conducted emissions:

The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.

For Radiated spurious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.



# 2.5. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	MXA Signal An- alyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023
2	Spectrum Ana- lyzer	R&S	FSU26	100105	Dec. 16, 2023
3	Spectrum Ana- lyzer	R&S	FSV40-N	101331	Mar. 15, 2023
4	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 16, 2023
5	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 16, 2023
6	Power Sensor	Keysight	U2021XA	MY55130004	Mar. 15, 2023
7	Power Sensor	Keysight	U2021XA	MY55130006	Mar. 15, 2023
8	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 16, 2023
9	High and low temperature box	ESPEC	MT3035	/	Mar. 24, 2023
10	JS1120 RF Test system	TONSCEND	v2.6	/	/

Radia	Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-759	Mar. 30, 2024	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 01, 2024	
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023	
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023	
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023	
6	3m chamber 3	YIHENG	EE106	/	Sep. 09, 2023	



Condu	ucted Emission				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 16, 2023
2	LISN	R&S	ENV216	101113	Dec. 16, 2023
3	EMI Test Re- ceiver	R&S	ESCS30	100353	Dec. 16, 2023
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 16, 2023
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 16, 2023

Note:

1. The Cal. Interval was one year.

2. The Cal. Interval was three years of the antenna.



# 3.1. Conducted Emission

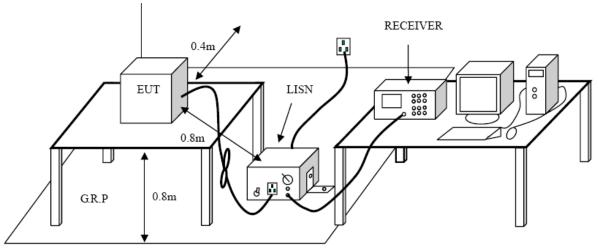
### <u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.207/ RSS - Gen 8.8

	Limit (d	lBuV)
Frequency range (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

## **Test Configuration**



### Test Procedure

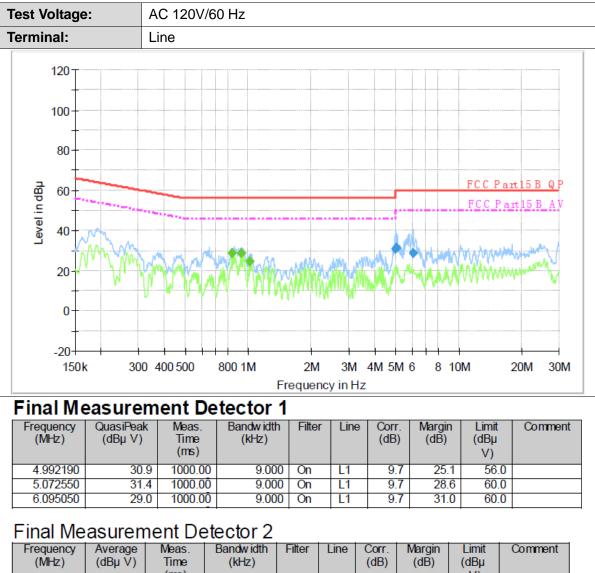
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 7. During the above scans, the emissions were maximized by cable manipulation.

### Test Mode

Please refer to the clause 2.4.



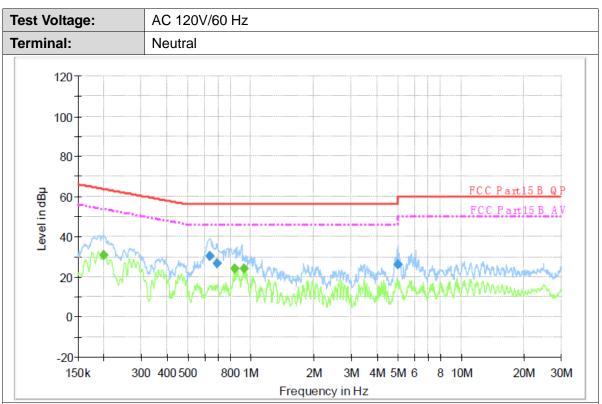
#### **Test Results**



	(MHz)	(dBµ V)	Time (ms)	(kHz)	Filler	LINE	(dB)	(dB)	(dBµ V)	Comment
Γ	0.841500	28.6	1000.00	9.000	On	L1	9.7	17.4	46.0	
Γ	0.929820	28.5	1000.00	9.000	On	L1	9.7	17.5	46.0	
	1.019230	24.8	1000.00	9.000	On	L1	9.7	21.2	46.0	

Emission Level= Read Level+ Correct Factor





# **Final Measurement Detector 1**

	Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
ł	0.636350	30.1	1000.00	9.000	On	N	10.0	25.9	56.0	
ſ	0.689240	26.6	1000.00	9.000	On	Ν	10.0	29.4	56.0	
ſ	4.992190	26.2	1000.00	9.000	On	Ν	10.0	29.8	56.0	

# Final Measurement Detector 2

	Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
ſ	0.199950	31.0	1000.00	9.000	On	N	10.0	22.6	53.6	
ſ	0.841500	24.1	1000.00	9.000	On	N	10.0	21.9	46.0	
	0.929820	24.0	1000.00	9.000	On	Ν	10.0	22.0	46.0	

Emission Level= Read Level+ Correct Factor



# 3.2. Radiated Emission

<u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.209/ RSS - Gen 8.9

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

	dB(uV/m)	) (at 3 meters)
Frequency (MHz)	Peak	Average
Above 1000	74	54

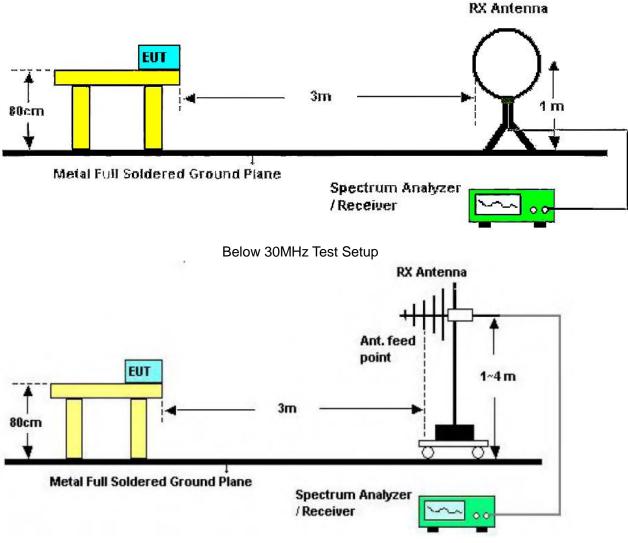
#### Note:

(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

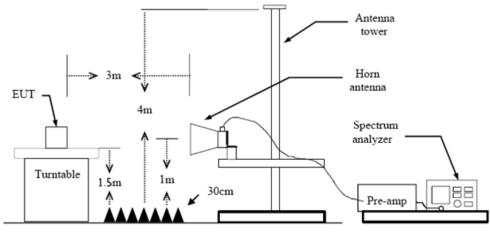
### **Test Configuration**





30-1000MHz Test Setup





Above 1GHz Test Setup

### Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013
- 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to  $10^{th}$  harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=3MHz RMS detector for Average value.

### Test Mode

Please refer to the clause 2.4.

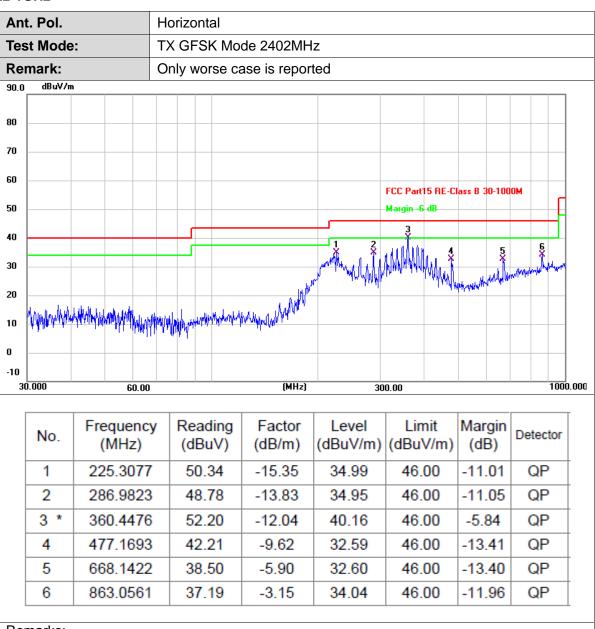
#### Test Result

#### 9 KHz~30 MHz

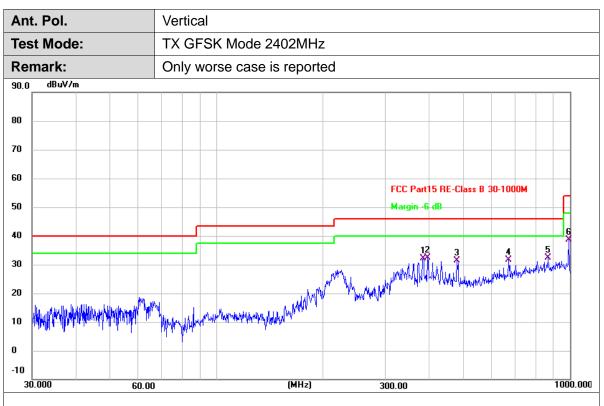
From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.









No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	383.9318	43.50	-11.46	32.04	46.00	-13.96	QP
2	394.8545	43.47	-11.18	32.29	46.00	-13.71	QP
3	478.8456	40.97	-9.59	31.38	46.00	-14.62	QP
4	670.4893	37.47	-5.88	31.59	46.00	-14.41	QP
5 *	866.0878	35.50	-3.11	32.39	46.00	-13.61	QP
6	993.0114	40.47	-1.74	38.73	54.00	-15.27	QP

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

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1 \*

2

Remarks:

4804.104

4804.121

2.Margin value = Level -Limit value

30.04

40.98

scribed limit.

Ant. Pol		Horizontal						
Test Mo	le:	TX GFSK Mo	de 2402MH	z				
Remark:		No report for t scribed limit.	he emissio	n which mor	e than 20 dl	B below t	the pre-	
No.	Frequence (MHz)	y Reading (dBuV)	Factor (dB/m)		Limit (dBuV/m)	Margin (dB)	Detector	

32.20

43.14

54.00

74.00

-21.80

-30.86

AVG

peak

Ant. Pol.	Vertical
Test Mode:	TX GFSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the pre-

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.16

2.16

No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1 *	4804.110	28.69	2.56	31.25	54.00	-22.75	AVG
2	4804.201	40.24	2.56	42.80	74.00	-31.20	peak

Remarks:



Ant	. Pol.		Iorizontal					
Test Mode:		est Mode: TX GFSK Mode 2441MHz						
Remark:			No report for scribed limit.	the emissio	n which mo	re than 20 d	B below	the pre-
	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	No.		· · ·				-	Detector AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

An	t. Pol.		/ertical					
Tes	st Mode	:	TX GFSK Mode 2441MHz					
Re	mark:		No report for t scribed limit.	he emissior	n which mor	e than 20 o	B below	the pre-
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.						-	Detector AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



Ant	. Pol.	H	lorizontal					
Tes	t Mode	r: T	X GFSK Mo	de 2480MH	z			
Remark: No report for the emission which more than 20 dB below scribed limit.						the pre-		
	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	No.		· · ·				-	Detector AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

۱nt	t. Pol. Vertical							
es	t Mode	:	TX GFSK Mo	de 2480MH	Z			
≀er	mark:		No report for t scribed limit.	the emissior	n which mor	e than 20 c	B below	the pre-
[	No.	Frequenc (MHz)	y Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.	•	(dBm)				_ <u> </u>	Detector

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



An	t. Pol.		Horizontal						
Tes	st Mode	):	TX π/4-DQPSK Mode 2402MHz						
Re	Remark: No report for the emission which more than 20 dB below the pre- scribed limit.						the pre-		
					1		1		-
	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	-

2 \*

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.16

29.35

31.51

54.00

-22.49

AVG

2.Margin value = Level -Limit value

4804.110

An	t. Pol.	V	/ertical					
Tes	st Mode	: Т	X π/4-DQP	SK Mode 2	402MHz			
Re	mark:		lo report for t cribed limit.	he emission	n which moi	e than 20 o	B below	the pre-
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.		· · · ·				-	Detector AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



Ant.	. Pol.	F	lorizontal					
Test	t Mode	: T	X π/4-DQP	SK Mode 2	441MHz			
Remark: No report for the emission which more than 20 dB below the scribed limit.						the pre-		
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No.		· · · ·				-	Detector AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

An	t. Pol.	١	/ertical					
Te	st Mode	r: T	X π/4-DQP	SK Mode 2	441MHz			
Re	mark:		lo report for t cribed limit.	he emission	n which mor	e than 20 c	B below	the pre-
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	110.		(abiii)	· · ·				1
	1 *	4881.951	28.51	2.79	31.30	54.00	-22.70	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



An	t. Pol.	F	lorizontal						
Tes	st Mode	<b>:</b> 7	X π/4-DQP	SK Mode 2	480MHz				
Re	mark:		lo report for t cribed limit.	the emissio	n which moi	e than 20 o	dB below	the pre-	
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	
	No.						-	Detector AVG	

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

An	t. Pol.		/ertical					
Tes	t Mode	:	TX π/4-DQPSK Mode 2480MHz					
Re	mark:		No report for t scribed limit.	he emission	n which mor	e than 20 o	dB below	the pre-
ſ						I		
	No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
	No. 1 *		· · ·				-	Detector AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



# 3.3. Band Edge Emissions (Radiated)

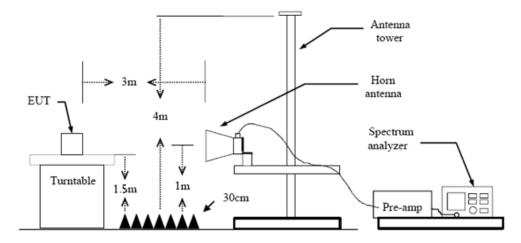
<u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

Restricted Frequency Band	(dBuV/n	n)(at 3m)
(MHz)	Peak	Average
2310 ~2390	74	54
2483.5 ~2500	74	54

Conducted band edge limit: The highest point of the operating frequency waveform down 20dB

## Test Configuration



### Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- The receiver set as follow: RBW=1MHz, VBW=3MHz Peak detector for Peak value. RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.10 Duty Cycle.

#### Test Mode

Please refer to the clause 2.4.



#### (1) Radiation Test

	Pol.		H	orizon	tal							
est	Mode	:	G	FSK M	lode 2	2402Mł	Ηz					
20.0	dBu¥/m	1		i		1					1	1
10 🗕												
00												
0												
0												
									FCC	Part15 RE-Cla	ss B Above 1G	РК
											1	
									FCC	Part15 RE-Cla	ss B Above 1G	AV
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0  -												
0												
0.0	6.200 22	298.20 2	310.20	2322.20	233	34.20	MHz)	235	8.20	2370.20	2382.20 23	94.20 24
0.0	6.200 22 No.	298.20 2 Frequ (MH	ency	2322.20 Rea (dB	ding	<sup>34.20</sup> Fac (dB/	tor	Le	vel	2370.20 Limit (dBuV/m	Margin	
).0 2280		Frequ	ency Iz)	Rea	ding uV)	Fac	tor m)	Le	vel V/m)	Limit	Margin	

Remarks:



nt. Pol.		Verti	cal					
st Mode	<b>)</b> :	GFS	K Mode 2	2402MHz				
).0 dBuV/n	a							
o								
0								
					FC	C Part15 RE-Class	B Above 1G	PK
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						C Part15 RE-Class		AV []
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.0								
	298.80 2310	.80 23	22.80 233	34.80 (MHz)	2358.80	2370.80 238	32.80 <b>2</b> 39	94.80 240
2286.800 2	298.80 2310	.80 23	22.80 233	14.80 (MHz)	2358.80	2370.80 238	2.80 239	94.80 24
No.	Frequen (MHz)		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
No.		(						Detector peak



t. Pol.		HC	Horizontal GFSK Mode 2480 MHz							
st Mode	<b>e</b> :	GF								
0 dBuV/ı	n		Î	1			1	1		
							<b>N H H</b>	DK		
					FU	2 Part15 RE-Class	B Above 16	РК		
1 X					FCC	Part15 RE-Class	B Above 1G	AV		
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475.200 2	2487.20 2499	.20	2511.20 253	23.20 (MHz)	2547.20	2559.20 25	71.20 25	B3.20 25		
No.	Frequen (MHz)	-	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		
1	2483.50	)0	26.89	31.24	58.13	74.00	-15.87	peak		
2 *	2483.50	00	14.56	31.24	45.80	54.00	-8.20	AVG		



t. Pol.		V	Vertical									
st Mod	e:	G	GFSK Mode 2480 MHz									
.0 dBuV/	m						1	1				
					FCC	CPart15 RE-Class	B Above 1G	PK				
$\land$												
1 X					FCC	CPart15 RE-Class	B Above 1G .	AV				
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) 2475.800	2487.80 2	499.80	2511.80 25	23.80 (MHz)	2547.80	2559.80 257	71.80 258	33.80 259				
	Frequ	ency	Reading	Factor	Level	Limit	Margin					
No.	(MH	-	(dBuV)	(dB/m)		(dBuV/m)	(dB)	Detector				
1	2483.	500	26.52	31.24	57.76	74.00	-16.24	peak				
2 *	2483.	500	14.58	31.24	45.82	54.00	-8.18	AVG				





	Horiz	Horizontal									
:											
1											
				FCC	Part15 RE-Class	B Above 1G	PK /)				
				FCC	Part15 BE-Class	1 B Above×16					
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298.20 2310.	20 23	22.20 233	84.20 (MHz)	2358.20	2370.20 238	32.20 239	94.20 2406.				
Frequen (MHz)	-	-	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector				
2390.00	0	26.21	30.84	57.05 74.00		-16.95	peak				
2390.00	0	14.83	30.84	45.67	54.00	-8.33	AVG				
	298.20 2310. Frequence (MHz) 2390.00	298.20 2310.20 23 Frequency R (MHz) ( 2390.000	Prequency Reading (dBuV) 2390.000 26.21	Image: Sector state in the sector s	Image: Sector (MHz)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (MHz)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)         Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)       Image: Sector (dB/m)	Frequency       Reading       Factor       Level       Limit         Frequency       Reading       Factor       Level       Limit         2390.000       26.21       30.84       57.05       74.00	Frequency (MHz)       Reading (dBuV)       Factor (dB/m)       Level (dBuV/m)       Limit (dBuV/m)       Margin (dB)         2390.000       26.21       30.84       57.05       74.00       -16.95				



π	/4-DQPSK I	Mode 2402I	MHz			
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			FLU	Part15 RE-Class	B Above 16	PK Λ
			FCC	Part15 RE-Class		AV (
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0 2310.80	2322.80 233	34.80 (MHz)	2358.80	2370.80 238	2.80 239	34.80 240
requency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2390.000	25.31	30.84	56.15	74.00	-17.85	peak
2390.000	14.69	30.84	45.53	54.00	-8.47	AVG
	requency (MHz) 2390.000	requency (MHz) Reading (dBuV) 2390.000 25.31	requency Reading Factor (MHz) (dBuV) (dB/m) 2390.000 25.31 30.84	0       2310.80       2322.80       2334.80       (MHz)       2358.80         requency (MHz)       Reading (dBuV)       Factor (dB/m)       Level (dBuV/m)         2390.000       25.31       30.84       56.15	requency (MHz)         Reading (dBuV)         Factor (dB/m)         Level (dBuV/m)         Limit (dBuV/m)           2390.000         25.31         30.84         56.15         74.00	requency (MHz)         Reading (dBuV)         Factor (dB/m)         Level (dBuV/m)         Limit (dBuV/m)         Margin (dB)           2390.000         25.31         30.84         56.15         74.00         -17.85



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est Mode	:	π /4-	DQPSK	Mode 2480	MHz					
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2475.200 2	487.20 2499.	20 251	1.20 252	23.20 (MHz)	2547.20	2559.20 2	571.20 25	83.20 259		
No.	Frequen (MHz)		eading dBuV)	Factor (dB/m)	Level (dBuV/n	Limit n) (dBuV/m	Margin ) (dB)	Detector		
No.		(			1			Detector		



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X					F	CC Part15 RE-Class	B Above 1G	AV			
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.0											
No.	Frequen (MHz)	- 1	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m	Limit ) (dBuV/m)	Margin (dB)	Detector			
1	2483.50	00	26.09	31.24	57.33	74.00	-16.67	peak			
2 *	2483.50	00	14.45	31.24	45.69	54.00	-8.31	AVG			

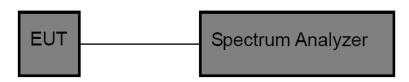


# 3.4. Band edge and Spurious Emissions (Conducted)

### Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

### **Test Configuration**



#### **Test Procedure**

- The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss 1. was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: 3. RBW = 100 kHz, VBW  $\geq$  RBW, scan up through 10<sup>th</sup> harmonic.
- Sweep = auto, Detector function = peak, Trace = max hold
- Measure and record the results in the test report. 4.

#### **Test Mode**

Please refer to the clause 2.4.

#### **Test Results**

#### (1) Band edge Conducted Test

Test Mode	Antenna	ChName	Frequency (MHz)	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5 Ant1	Low	2402	3.65	-50.43	≤-16.35	PASS	
	Ant1	High	2480	3.44	-54.35	≤-16.56	PASS
DHS	Anti	Low	Hop_2402	3.03	-51.79	≤-16.97	PASS
		High	Hop_2480	3.50	-40.21	≤-16.50	PASS
	2DH5 Ant1 -	Low	2402	3.35	-50.37	≤-16.65	PASS
2045		High	2480	3.35	-54.94	≤-16.65	PASS
2000		Low	Hop_2402	0.35	-52.29	≤-19.66	PASS
		High	Hop_2480	3.59	-40.61	≤-16.41	PASS





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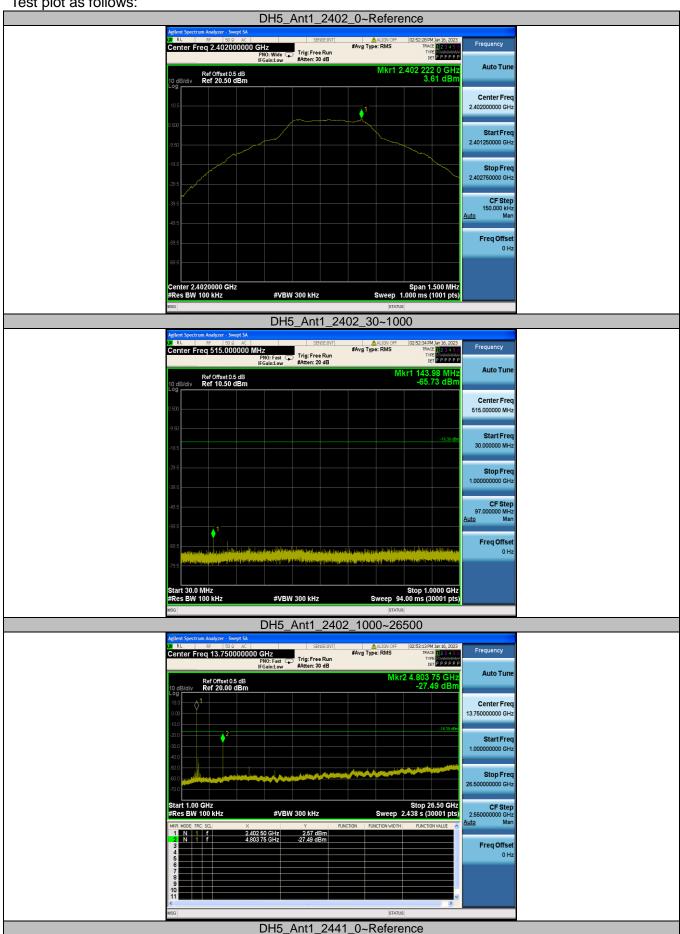


Agilent Spectrum Analyzer - Swept 0 RL 87 500 A Center Freq 2.3525000		ALIGN OFF 03:43:45 FM Jan 16, 2023 #Avg Type: RMS TRACE 128 45 5 Type	Frequency	
	PNO: Fast  Fig. Free Run IFGain:Low #Atten: 30 dB	Mkr5 2.315 225 GHz	Auto Tune	
10 dE/div Ref 20.00 dB/		-52.29 dBm	Center Freq 2.352500000 GHz	
		.1956.dBb	Start Freq 2.30000000 GHz	
-2000 -2000 <b>existing of the standard (M</b> -70.0	hann Marthan, an ann an Albadan Airdin	a ondeling the stand of the sta	Stop Freq 2.405000000 GHz	
Start 2.30000 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 2.40500 GHz Sweep 10.07 ms (1001 pts)	CF Step 10.500000 MHz Auto Man	
	2404 895 GHz 0.35 dBm 2400 000 GHz 65.15 dBm 2300 000 GHz 65.16 dBm 2.310 000 GHz 65.80 dBm 2.315 225 GHz 65.22 gdBm		Freq Offset 0 Hz	
		~		
MSG	2DH5_Ant1_Hig	status h Hop 2480		
Agilent Spectrum Analyzer Swept 1 20 R. R. 185 1900 A Center Freq 2.5100000	AC SENSE:INT	ALIGN OFF 03:56:36 0M Jan 16, 2023 #Avg Type: RMS TRACE 12:2:55 TYPE DET P D D P P	Frequency	
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dB	B m	Mkr4 2.550 00 GHz -40.61 dBm	Auto Tune	
100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		-16.41 dBt	Center Freq 2.510000000 GHz	
	A <sup>3</sup>	4 Jrstk	Start Freq 2.470000000 GHz	
60 0 60 0 -70 0	www.proving. And a start of the	valetanterlexitestestestestestestestestestestestestest	Stop Freq 2.550000000 GHz	
Start 2.47000 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 2.55000 GHz Sweep 7.667 ms (1001 pts)	CF Step 8.000000 MHz <u>Auto</u> Man	
MKR MODE TRC SCL 1 N 1 F 2 N 1 F	X Y FUNCTI 2.473 04 GHz 3.59 dBm 2.483 50 GHz 58.57 dBm 2.500 00 GHz 56.63 dBm	ON FUNCTION WIDTH FUNCTION VALUE	Freq Offset 0 Hz	
3 N 1 F 4 N 1 F	2.550 00 GHz -40.61 dBm			
3 1 1 7 4 1 1 7 6 6 1 1 7 7 1 1 7 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.550 00 GHz 40.61 dBm			

## (2) Conducted Spurious Emissions Test

Test Mode	Antenna	Frequency (MHz)	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
			Reference	3.61	3.61		PASS
		2402	30~1000	3.61	-65.73	≤-16.39	PASS
			1000~26500	3.61	-27.49	≤-16.39	PASS
			Reference	4.00	4.00		PASS
DH5	Ant1	2441	30~1000	4.00	-66.03	≤-16.00	PASS
			1000~26500	4.00	-28.12	≤-16.00	PASS
			Reference	3.41	3.41		PASS
	2480	2480	30~1000	3.41	-66.29	≤-16.59	PASS
				1000~26500	3.41	-28.43	≤-16.59
			Reference	3.52	3.52		PASS
		2402	30~1000	3.52	-65.59	≤-16.48	PASS
			1000~26500	3.52	-31.20	≤-16.48	PASS
			Reference	3.93	3.93		PASS
2DH5	H5 Ant1 24	2441	30~1000	3.93	-64.13	≤-16.07	PASS
	1	1000~26500	3.93	-28.13	≤-16.07	PASS	
			Reference	3.19	3.19		PASS
		2480	30~1000	3.19	-65.95	≤-16.81	PASS
			1000~26500	3.19	-31.03	≤-16.81	PASS









Agilent Spectrum Analyzer - Swept SA	SENSE:INT	ALIGN OFF	02:54:27 PM Jan 16, 2023	Frequency	
Center Freq 2.441000000 GHz PNO: Wide	Trig: Free Run #Atten: 30 dB		TRACE 123456 TYPE WWWWWWW DET PPPPPP	Auto Tune	
Ref Offset 0.5 dB 10 dB/div Ref 20.50 dBm		Mkr1 2.	440 886 0 GHz 4.00 dBm	Auto Tune	
10.5				Center Freq 2.441000000 GHz	
0.500	• <sup>1</sup>	~		21-15	
-9.50				Start Freq 2.440250000 GHz	
-19.5				Stop Freq	
-29.5			\	2.441750000 GHz	
-39.5				CF Step 150.000 kHz Auto Man	
-49.5				Freq Offset	
-69.5				0 Hz	
-63/5					
	300 kHz		Span 1.500 MHz 000 ms (1001 pts)		
DH5	5_Ant1_2441_	status 30~100	0		
Agilent Spectrum Analyzer - Swept SA	SENSE:INT	ALIGN OFF	12-54-33 DM Jan 16, 2023	Frequency	
Center Freq 515.000000 MHz PN0: Fast	#Avg	g Type: RMS	TRACE 123456 TYPE MWARMAN DET PPPPP		
Ref Offset 0.5 dB 10 dB/div Ref 10.50 dBm		Mk	r1 144.04 MHz -66.03 dBm	Auto Tune	
0.500				Center Freq 515.00000 MHz	
-9.50					
-19.5			-16.00 dBm	Start Freq 30.000000 MHz	
-29.5				Stop Freq	
-39.5				1.00000000 GHz	
-49.5				CF Step 97.000000 MHz	
-53.5				<u>Auto</u> Man	
69.5			and and the second s	Freq Offset 0 Hz	
-79.5 Tahla dai ya ada a a a a a a a a a a a a a a a a	an an fan in de stat wij e findelen for een de s	alexader. (it)			
Start 30.0 MHz #Res BW 100 kHz #VBW	300 kHz	Sweep 94.	Stop 1.0000 GHz 00 ms (30001 pts)		
MSG	Ant1_2441_1		500		
Agilent Spectrum Analyzer - Swept SA			02:55:12 PM Jan 16, 2023		
Center Freq 13.75000000 GHz PN0: Fast C IFGain:Low	#Avg Trig: Free Run #Atten: 30 dB	g Type: RMS	12:55:12 PM Jan 16, 2023 TRACE 1 2 3 4 5 6 TYPE MMMMM DET P P P P P P	Frequency	
Ref Offset 0.5 dB		Mkr2	4.881 95 GHz -28.12 dBm	Auto Tune	
				Center Freq	
-10.0			-16.00 dBn	13.750000000 GHz	
-20.0				Start Freq 1.00000000 GHz	
-40.0				Stop Fred	
-60.0				Stop Freq 26.50000000 GHz	
Start 1.00 GHz #Res BW 100 kHz #VBW	300 kHz	Sweep 2	Stop 26.50 GHz 438 s (30001 pts)	CF Step 2.55000000 GHz	
MKR MODE TRC SCL X 1 N 1 f 2.440 75 GHz	Y FUNCTION 3.60 dBm -28.12 dBm	FUNCTION WIDTH		<u>Auto</u> Man	
2 N 1 f 4.881 95 GHz 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	-20.12 aBM			Freq Offset 0 Hz	
6 7 8					
9 10 11			~		
 MSG	ш.	STATUS	>		
DH5_/	Ant1_2480_0	~Refere	nce		

CTC Laboratories, Inc. 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel.: (86)755-27521059 下a: (86)755-27521011 中国国家认证认可监督管理委员会 For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <u>yz.cnca.cn</u>

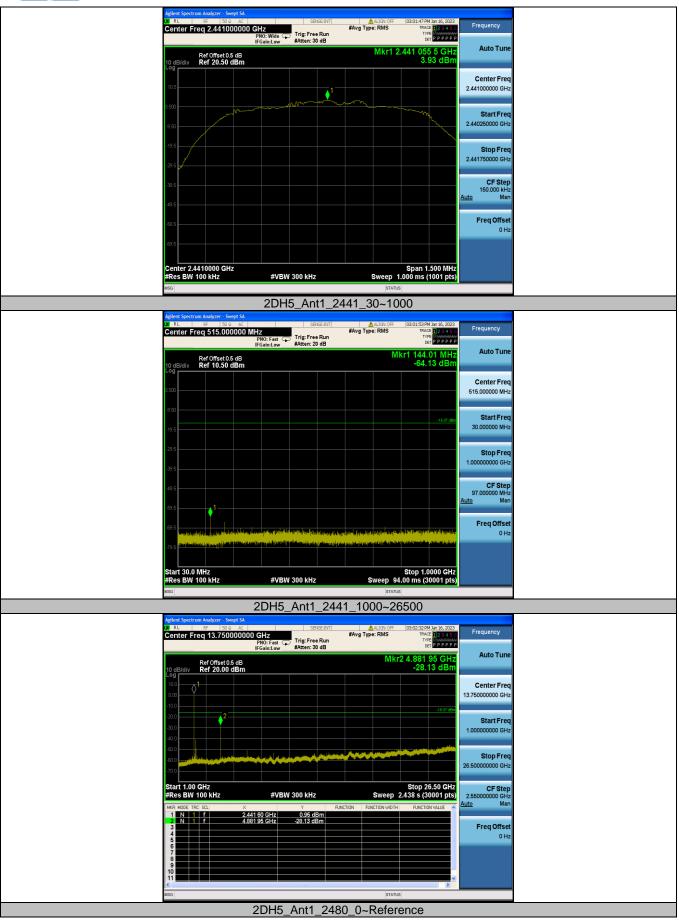


CD			
	Agilent Spectrum Analyzer - Swept SA	ALION OFF 02:56:40 PM Jan 16, 2023	
	Center Freq 2.480000000 GHz #Avg Type PNO: Wide Trig: Free Run #FoainLow #Atten: 30 dB	ERMS TRACE 2345 0 TYPE MANAGE 2345 0 TYPE MANAGE PPPPPP	
	Def Offent 0.5 dD	Mkr1 2.480 055 5 GHz Auto Tune 3.41 dBm	
	10 dB/div Ref 20.50 dBm		
	10.5	2.48000000 GHz	
	0.500	Start Freg	
	950	2.479250000 GHz	
	-19.6	Stop Freq	
	-29.5	2.480750000 GHz	
		CF Step 150.000 kHz	
	43.5	Auto Man	
	59.5	Freq Offset	
	-89.5		
	Center 2.4800000 GHz #Res BW 100 kHz #VBW 300 kHz S	Span 1.500 MHz Sweep 1.000 ms (1001 pts)	
	DH5_Ant1_2480_30	status 0~1000	
	Agilent Spectrum Analyzer - Swept SA 19 RL RF 50 Q AC SENSE:INT &		
	Center Freq 515.000000 MHz #Avg Type PN0: Fast Trig: Free Run #Stein: 0w #Atten: 20 dB	ALLIAN OFF U2:555-46 PM Jan 10, 2023 RMS TRACE 12:3:4:5:6 TYPE MAXWAANAA DET P. P. P. P. P. P.	
	Ref Offset 0.5 dB 10 dB/div Ref 10.50 dBm	Mkr1 144.01 MHz Auto Tune -66.29 dBm	
		Center Freq	
	0.500	515.000000 MHz	
	.9.50	JISSO dEm Start Freq	
	-19.5	30.000000 MHz	
	29.5	Stop Freq	
	-39.6	1.00000000 GHz	
	-49.5	CF Step 97.000000 MHz	
	.89.5	<u>Auto</u> Man	
		Freq Offset	
	270.5		
		Stop 1.0000 GHz weep 94.00 ms (30001 pts)	
	DH5_Ant1_2480_100	status 0~26500	
	Agilent Spectrum Analyzer - Swept SA 20 RL RF 50.0 AC SENSE:INT A	ALIGN OFF 02:57:25 PM Jan 16, 2023	
	Center Freq 13.750000000 CHz #Avg Type PR0: Fast Tris: Free Run F6aint.ow #Atten: 30 dB	ERMS TRACE 23456 TYPE WWWWWW DET P P P P P P	
	Ref Offset 0.5 dB	Mkr2 4.960 15 GHz -28.43 dBm	
	10 dB/div Ref 20.00 dBm	Center Freq	
		13.75000000 GHz	
	200	46.59 dBn Start Freq	
	-30.0	1.00000000 GHz	
		Stop Freq	
	-70.0	26.50000000 GHz	
	Start 1.00 GHz #Res BW 100 kHz #VBW 300 kHz	Stop 26.50 GHz CF Step Sweep 2.438 s (30001 pts) 2.550000000 GHz	
	MKR         MODE         TRC         SCL         X         Y         FUNCTION         FU	Auto Man	
	2 N 1 f 4.960 15 GHz -28.43 dBm 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Freq Offset	
	8 9 10		
	2DH5_Ant1_2402_0~F	status Reference	
	2010_/(II(1_2+02_0*1		



Agglent Spectrum Analyzer - Swept SA         SERIGE INIT         ▲rulion OFF         (0300009 PM Jan 16, 202           CH         RL         RF         50 Q         AC         SERIGE INIT         ▲rulion OFF         (0300009 PM Jan 16, 202           Center Freq 2.4022000000         GHz         #Avg Type: RMS         TRUCE TO 3 4	<sup>3</sup> Frequency
IFGainLow #Atten: 30 dB DEFPPP	
Ref 0ffset 0.5 dB         WKT 2.40 2 216 0 GH           10 dB/div         Ref 20.50 dBm         3.52 dBr	
10.5	Center Freq 2.40200000 GHz
8.50	Start Freq
8.50	2.401250000 GHz
	Stop Freq 2.402750000 GHz
38.5	CFStep
49.5	150.000 kHz Auto Man
	Freq Offset 0 Hz
49.5	
Center 2.4020000 GHz Span 1.500 MH #Res BW 100 KHz #VBW 300 kHz Sweep 1.000 ms (1001 pt	IZ 5)
MSG STATUS	
2DH5_Ant1_2402_30~1000	3
Center Freq 515.0000000 MHz Setting at Avg Type: RMS Tree Parts of the Part of	P
Ref Offset 0.5 dB Mkr1 144.01 MH 10 dB/div Ref 10.50 dBm -65.59 dBr	z Auto Tune n
8 500	Center Freq 515.00000 MHz
4.50	
-16 4 (4)	Start Freq 30.000000 MHz
23.5	Stop Freq
-39.5	1.00000000 GHz
495	CF Step 97.000000 MHz Auto Man
	Freq Offset
2.22.2 International and provide a state of the second state of	0 Hz
Start 30.0 MHz Stop 1.0000 GH	7
#Res BW 100 kHz #VBW 300 kHz Sweep 94.00 ms (30001 pt usg	5)
2DH5_Ant1_2402_1000~26500	
Aglent Spectrum Analyzer - Srept SA 2) ■ L = 55 900 # 6 SENEEINT ▲ LINOT OFF 03000541541 Jan 16, 2020 Center Freq 13,750000000 GHz FN07 Fast PROF Fisst Content So dB cell P P P P	6 Frequency
	Auto Tune
Ref Offset 0.5 dB 10 dBldiv Ref 20.00 dBm -31.20 dBr Log	Center Freq
	13.750000000 GHz
200 300 300 ↓2	Start Freq 1.00000000 GHz
	Stop Freq 26.50000000 GHz
Start 1.00 GHz Stop 26.50 GH #Res BW 100 kHz #VBW 300 kHz Sweep 2.438 s (30001 pt:	5) 2.55000000 GHz
MRR MODE         TRC         SL         X         Y         FUNCTION         FUNCTION WIDTH         FUNCTION VALUE           1         N         1         f         2.40165         5.8 dBm         0.58 dBm         FUNCTION VALUE           2         N         1         f         2.40165         GHz         3.120 dBm         FUNCTION VALUE	Auto Man
	Freq Offset 0 Hz
	×
ass 2DH5_Ant1_2441_0~Reference	









EN

Agilent: Spectrum Analyzer - Swept SA         SENSE.IVT]           RL         №         900         AC         SENSE.IVT]           Center Freq 2.480000000 GHz         FR0: Wide provide the sense of t	ALIGN OFF 03:03:38 PM Jan 16, 2023 #Avg Type: RMS TRACE 12:3 + E0 TYPE OFF P P P P	Frequency
IFGain:Low #Atten: 30 dB 10 dB/div Ref 20.50 dBm Log	Mkr1 2.480 186 0 GHz 3.19 dBm	
10.5		Center Freq 2.48000000 GHz
850 Martin and a second		Start Freq 2.479250000 GHz
-19.5		<b>Stop Freq</b> 2.480750000 GHz
		CF Step 150.000 kHz <u>Auto</u> Man
-83.5		Freq Offset 0 Hz
63.5		
Center 2.4800000 GHz #Res BW 100 KHz #VBW 300 kHz MSG	Span 1.500 MHz Sweep 1.000 ms (1001 pts) status	
2DH5_Ant1_2	480_30~1000	
Aglert Spectrum Analyzer - Swegt SA R & Se Store Ac Sector Center Freq 515.000000 MHz PR0: Fast FGaint.cow FGaint.cow	ALIGN OFF 03:03:44 PM Jan 16, 2023 #Avg Type: RMS TRACE 2:2:3:45 G TYPE MUNICIPAL DET P P P P	
Ref Offset 0.5 dB 10 dB/div Ref 10.50 dBm Log	Mkr1 144.01 MHz -65.95 dBm	
. 500		Center Freq 515.000000 MHz
-19.6	-16.81 dBm	Start Freq 30.00000 MHz
39.5		Stop Freq 1.00000000 GHz
495		CF Step 97.00000 MHz <u>Auto</u> Man
ees 5 17 or 19 or 19 270 5 19 19 19 19 or 19		Freq Offset 0 Hz
Start 30.0 MHz	Stop 1.0000 GHz	
#Res BW 100 kHz #VBW 300 kHz	Sweep 94.00 ms (30001 pts) STATUS	
2DH5_Ant1_248	30_1000~26500	
Aglent Spectrum Analyzer - Swegt SA R R S S S A C SEREENT Center Freq 13.750000000 GHz IFGairco B Trig: Free Run IFGairco 30 dB	ALIGN OFF 03:04:23 PM Jan 16, 2023 #Avg Type: RMS TRACE 0 2:3 4 5 0 TYPE DET P P P P P	
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	Mkr2 4.960 15 GHz -31.03 dBm	Auto Tune
100 0.00 -100	-1681 dBa	Center Freq 13.75000000 GHz
-200 -300 -400		Start Freq 1.00000000 GHz
600 600 700		Stop Freq 26.50000000 GHz
Start 1.00 GHz         #VBW 300 kHz           #Res BW 100 kHz         #VBW 300 kHz           MRR MODE TRC SCL         X         Y         FU	Stop 26.50 GHz Sweep 2.438 s (30001 pts)	CF Step 2.55000000 GHz <u>Auto</u> Man
1         N         1         f         2.479 86 GHz         1.13 dBm           2         N         1         f         4.960 15 GHz         -31.03 dBm           4         -         -         -         -         -           5         -         -         -         -         -         -           6         -		Freq Offset 0 Hz
	STATUS	

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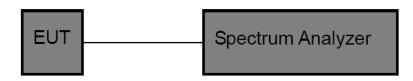


# 3.5. Bandwidth

## <u>Limit</u>

N/A

## Test Configuration



## Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. OCB and 20dB Spectrum Setting:
  - (1) Set RBW =  $1\% \sim 5\%$  occupied bandwidth.
  - (2) Set the video bandwidth (VBW)  $\geq$  3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

Note: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

## Test Mode

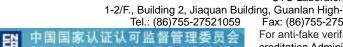
Please refer to the clause 2.4.

#### Test Results

Modulation type	Channel	Occupied Bandwidth (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth *2/3 (MHz)
	00	0.852	0.960	0.568
GFSK	39	0.835	0.960	0.557
	78	0.849	0.960	0.566
	00	1.174	1.320	0.783
$\pi$ /4-DQPSK	39	1.179	1.317	0.786
	78	1.175	1.317	0.783

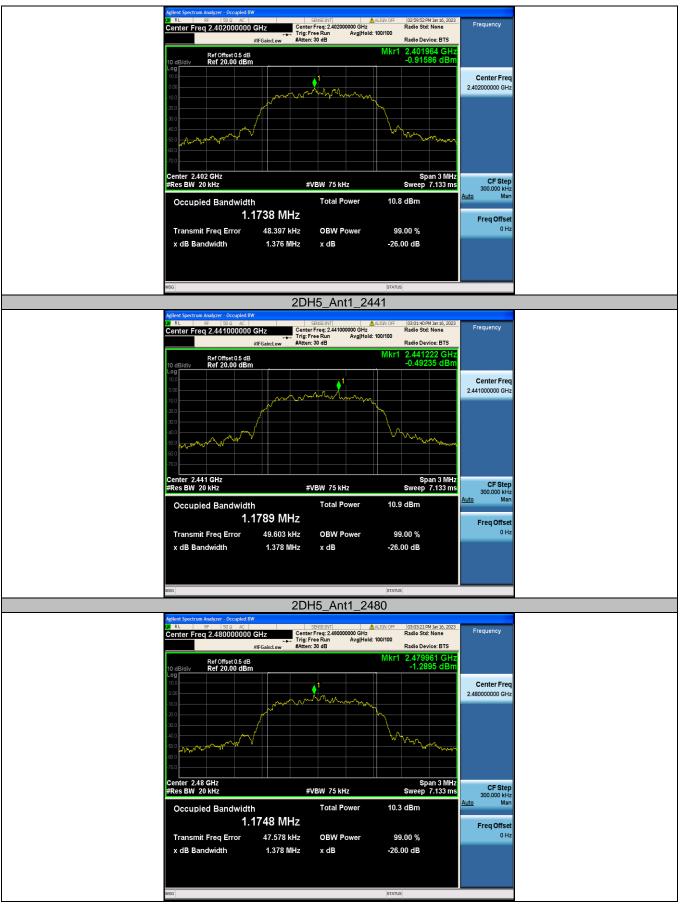






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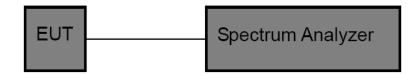
# 3.6. Channel Separation

<u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1)/ RSS-247 5.1 b :

Test Item	Limit	Frequency Range(MHz)
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5

## **Test Configuration**



#### Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

- 2. Spectrum Setting:
  - (1) Set RBW = 100 kHz.
  - (2) Set the video bandwidth (VBW)  $\ge$  3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

## Test Mode

Please refer to the clause 2.4.

## Test Results

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
GFSK	38 to 39	1.012	0.557	Pass
π /4-DQPSK	38 to 39	0.994	0.78	Pass



lest plot as follows:			
	DH5_Ant	1_Hop	
	Agilent Spectrum Analyzer - Swept SA           ØM         RL         RF         SO. Ω         AC         SENSE:INT	ALIGN OFF 03:39:15 PM Jan 16, 2023	
	Center Freq 2.441500000 GHz PNO: Wide Trig: Free Run IFGaint.ow #Atten: 40 dB	#Avg Type: RMS TRACE 12345 TYPE TYPE TRACE 12345	
		ΔMkr2 1.012 MHz Auto T	une
	Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm	0.40 dB	
		Center F	req
	20.0	2.441500000	GHz
	10.0	2Δ1 Start E	
		2.440500000 2.440500000	
	and the second s	N MA	
	-10.0 - return - retu	Stop F	
	-20.0	2.442500000	GHz
	.ano	CFS	tep
		200.000 Auto	kHz Man
	-40.0		
	-60.0	FreqOf	f <b>set</b> 0 Hz
	Start 2.440500 GHz	Stop 2.442500 GHz	
	#Res BW 100 kHz #VBW 300 kHz	Sweep 1.000 ms (1001 pts)	
	2DH5_An		
	Agilent Spectrum Analyzer - Swept SA		
	02 RL RF 50 Ω AC SENSE:INT Center Freq 2.441500000 GHz	ALIGN OFF 03:52:57 PM Jan 16, 2023 #Avg Type: RMS TRACE 02:34 5 6 Type Type Trace 02:34 5 6	
	PNO: Wide PNO: Wide #Atten: 40 dB	DETPPPPP	
	Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm	ΔMkr2 994 kHz -0.13 dB	une
	10 dB/div Ref 30.00 dBm		
	20.0	Center F 2.441500000	
		2Δ1 Start F	
	0.00	2.440500000	GHz
	-10.0	Stop F	Ter
	.200	2.442500000	
	-20.0		
	-30.0	CF S 200.000	kHz
	-40.0	Auto	Man
	50.0	FreqOf	fset
			0 Hz
	-60.0		
		Stop 2 442500 CHr	
	Start 2.440500 GHz	Stop 2.442500 GHz	
	#Res BW 100 kHz #VBW 300 kHz	Sweep 1.000 ms (1001 pts)	



# 3.7. Number of Hopping Channel

## <u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(iii)/ RSS-247 5.1 d:

Section	Test Item	Limit
15.247 (a)(iii)/ RSS-247 5.1 d:	Number of Hopping Channel	>15

## **Test Configuration**



#### Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

- 2. Spectrum Setting:
  - (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

#### Test Mode

Please refer to the clause 2.4.

#### Test Result

Modulation type	Channel number	Limit	Result
GFSK	79	≥15.00	Pass
π /4-DQPSK	79	215.00	Fass



st plot as follows:	DH5_Ant1_	_Нор	
	Agilent Spectrum Analyzer - Swept SA           M         RL         RF         50 Q         AC         SENSE:INT	ALIGN OFF 03:39:44 PM Jan 16, 2023	Frequency
	Center Freq 2.441750000 GHz #A PNO: Fast IFGainLow #Atter: 40 dB	Avg Type: RMS TRACE 123456 TYPE MWWWW DET PPPPP	Frequency
	Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm		Auto Tune
			Center Freq
	20.0		2.441750000 GHz
			Start Freq
	000 - <u>Analantianananananananananananananananananan</u>		2.40000000 GHz
			Stop Freq 2.483500000 GHz
	-20.0		
	30.0		CF Step 8.350000 MHz <u>Auto</u> Man
	40.0		
	50.0	<b>_</b>	Freq Offset 0 Hz
	-80.0		
	Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz	Stop 2.48350 GHz Sweep 8.000 ms (1001 pts)	
	MSG	STATUS	
	2DH5_Ant1	_Нор	
	Aglient Spectrum Analyzer – Swept SA	ALIGN OFF 03:53:35 PM Jan 16, 2023	Frequency
	PNO: Fast This: Free Kun IFGain:Low #Atten: 40 dB	TYPE MWHWW DET PPPPP	Auto Tune
	Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm		
	20.0		Center Freq 2.441750000 GHz
	10.0		
	000 <mark>- มาจากที่สุขารและสมัญญาต่างสุขารสุขารสุขารสุขารสุขารสุขารสุขารสุขาร</mark>	Madelikhadaaldahadaadaada	Start Freq 2.40000000 GHz
	-10.0		Stop Freq
	-20.0		2.483500000 GHz
	30.0		CF Step
	-40.0		8.350000 MHz <u>Auto</u> Man
	50.0		Freq Offset
	60.0		0 Hz
	Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz #SG	Stop 2.48350 GHz Sweep 8.000 ms (1001 pts)	

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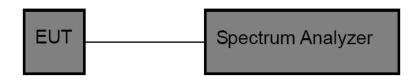


## 3.8. Dwell Time

<u>Limit</u>

Section	Test Item	Limit		
15.247(a)(iii)/ RSS-247 5.1 d	Average Time of Occupancy	0.4 sec		

#### **Test Configuration**



#### Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
  - (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
  - (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
  - (3) Sweep Time is more than once pulse time.
- (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
  - (5) Measure the maximum time duration of one single pulse.
  - (6) Set the EUT for packet transmitting.

#### Test Mode

Please refer to the clause 2.4.

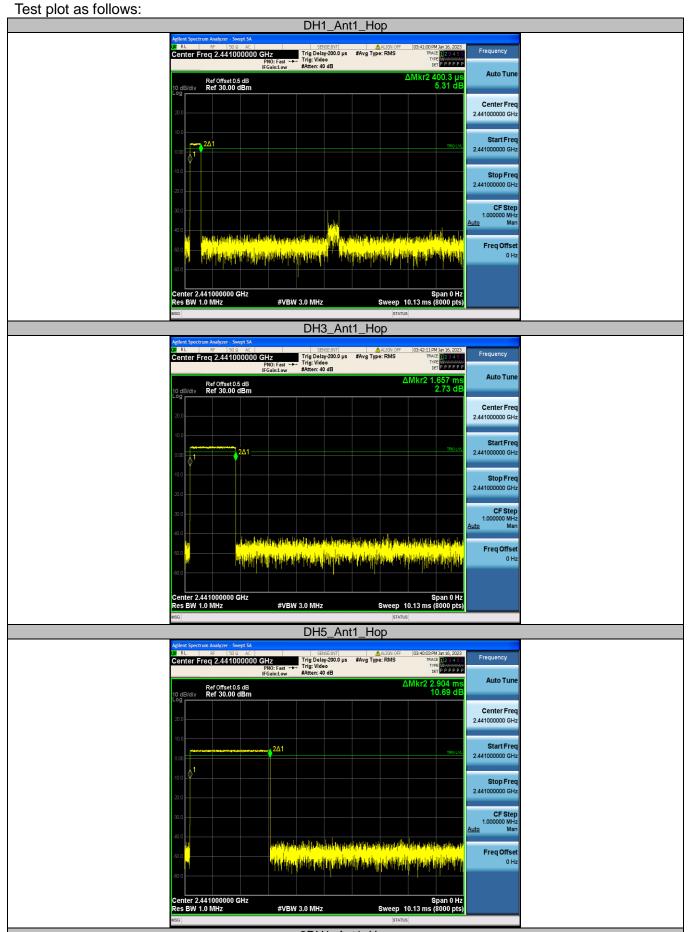


## Test Result

Modulation type	Channel	Channel (MHz)	Pulse Time (ms)	Total of Dwell (ms)	Period Time (ms)	Limit (Second)	Result
	DH1	2441	0.40	128.00	31.60		
GFSK	DH3	2441	1.66	265.60	31.60	≤ 0.40	Pass
	DH5	2441	2.90	309.33	31.60		
	2DH1	2441	0.41	131.20	31.60		
π /4-DQPSK	2DH3	2441	1.66	265.60	31.60	≤ 0.40	Pass
	2DH5	2441	2.91	310.40	31.60		

Note: 1DH1/2DH1/3DH1 Total of Dwell = Pulse Time\*(1600/2)\*31.6/79 1DH3/2DH3/3DH3 Total of Dwell = Pulse Time\*(1600/4)\*31.6/79 1DH5/2DH5/3DH5 Total of Dwell = Pulse Time\*(1600/6)\*31.6/79





2DH1\_Ant1\_Hop





Agilent Spectrum Analyzer - Swept SA	SENSE:INT		03:54:49 PM Jan 16, 2023		
Center Freq 2.441000000 GHz	Γrig Delay-200.0 μs Γrig: Video	#Avg Type: RMS	103.54.49 PM Jal 10, 2023 TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET P P P P P	Frequency	
	Atten: 40 dB	<i>L</i>	Mkr2 410.4 μs 3.69 dB	Auto Tune	
Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm			3.69 dB		
20.0				Center Freq 2.441000000 GHz	
10.0					
0.00			TRIG LVL	Start Freq 2.441000000 GHz	
10.0					
-10.0				Stop Freq 2.441000000 GHz	
-20.0				05.04.0	
-30.0				CF Step 1.000000 MHz <u>Auto</u> Man	
-40.0	antibah ang dikata dan atan k	A statistic and the second states of the second states of the second states of the second states of the second			
50.0			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Freq Offset 0 Hz	
	in the second of the late	.d. lille a tra	t end and en		
Center 2.441000000 GHz			Span 0 Hz		
Res BW 1.0 MHz #VBW 3.	0 MHz	Sweep 1 status	0.13 ms (8000 pts)		
M35	2DH3_Ant				
Agilent Spectrum Analyzer - Swept SA					
RL RF 50 Ω AC     Center Freq 2.441000000 GHz     PN0: Fast →→	SENSE:INT Frig Delay-200.0 µs Frig: Video	ALIGN OFF #Avg Type: RMS	03:55:46 PM Jan 16, 2023 TRACE 1 2 3 4 5 6 TYPE	Frequency	
IFGain:Low #	Atten: 40 dB	A	Mkr2 1.663 ms	Auto Tune	
Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm			1.00 dB		
20.0				Center Freq 2.441000000 GHz	
10.0				2.44100000 GH2	
			TRIG LVL	Start Freq 2.441000000 GHz	
0.00 <b>↓</b> 1 <b>2</b> Δ1				2.44100000 GH2	
-10.0				Stop Freq	
-20.0				2.441000000 GHz	
-30.0	In the second	n Malana		CF Step 1.000000 MHz	
-40.0 <mark>aj yang kalalakan na kalalaka</mark>	alle d totte		at a star	<u>Auto</u> Man	
50.0		lite in the second s	ali ng gangang ang ang ang ang ang ang ang	Freq Offset	
	ANNE AND A	a share	ut had states	0 Hz	
-00.0					
Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.	.0 MHz	Sweep 1	Span 0 Hz 0.13 ms (8000 pts)		
 MSG		STATUS			
	2DH5_Ant	1_Hop			
Agilent Spectrum Analyzer - Swept SA           RL         RF         50 Q         AC           Center Freq 2.441000000 GHz         Colspan="2">Colspan="2"	SENSE:INT Frig Delay-200.0 µs	ALIGN OFF	03:53:54 PM Jan 16, 2023	Frequency	
PNO: Fast +++	Frig: Video Atten: 40 dB		TRACE 23456 TYPE PPPP DET PPPPP		
Ref Offset 0.5 dB 10 dB/div Ref 30.00 dBm		Δ	Mkr2 2.911 ms 0.98 dB	Auto Tune	
Log				Center Freq	
20.0				2.441000000 GHz	
10.0			TRIG L.V.L	Start Freq	
			ING EVE	2.441000000 GHz	
-10.0				Stop Freq	
-20.0				2.441000000 GHz	
-30.0				CF Step	
100				1.000000 MHz <u>Auto</u> Man	
and the Maria	n julia da juli	Million Manufacture	an sa	Freq Offset	
-so.0 h	heli sologi tu histori i s	alta belgan di ma	kelter (kelte kelter	0 Hz	
-60.0					
Center 2.441000000 GHz			Span 0 Hz		
Res BW 1.0 MHz #VBW 3.	0 MHz	Sweep 1	0.13 ms (8000 pts)		
		0.4103			





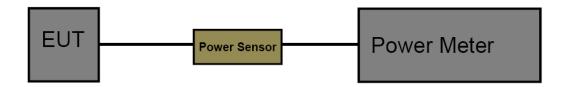
# 3.9. Peak Output Power

## <u>Limit</u>

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1) / RSS-247 5.4 b:

Test Item	Limit	Frequency Range(MHz)		
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125mW(21dBm)	2400~2483.5		

#### **Test Configuration**



#### Test Procedure

- 1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
- 2. Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
- 3. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
- 4. Record the measurement data.

#### Test Mode

Please refer to the clause 2.4.

#### Test Result

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
	00	4.26		
GFSK	39	4.62	< 21.00	Pass
	78	3.83		
π /4-DQPSK	00	6.33		
	39	6.65	< 21.00	Pass
	78	5.86		

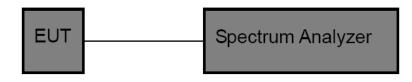


# 3.10. Duty Cycle

### <u>Limit</u>

None, for report purposes only.

### **Test Configuration**



#### Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.

3. Spectrum Setting:

Set analyzer center frequency to test channel center frequency. Set the span to 0Hz Set the RBW to 10MHz Set the VBW to 10MHz Detector: Peak Sweep time: Auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

## Test Mode

Please refer to the clause 2.4.

## Test Result

Test Mode	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
	2402	2.91	3.75	77.60	0.34	1
GFSK	2441	2.91	3.75	77.60	0.34	1
	2480	2.91	3.75	77.60	0.34	1
	2402	2.91	3.75	77.60	0.34	1
π /4-DQPSK	2441	2.91	3.75	77.60	0.34	1
	2480	2.91	3.75	77.60	0.34	1











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# 3.11. Antenna Requirement

## **Requirement**

## FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

## FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.