

**CTC** Laboratories, Inc.

Room 101 Building B, No. 7, Lanqing 1st Road, Luhu Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

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т	EST REPORT	0			
Report No:	CTC20231665E02				
FCC ID:	2AR24-AIBOX500				
Applicant:	Shenzhen Absen Optoelectronic	Co.,Ltd			
Address:	18-20/F, Tower A, Building 3, Phase I, Tian An Cloud Park, N0.2018, Xuegang Rd, Bantian, Longgang District, Shenzhen, Guangdong, P.R. China				
Manufacturer	Shenzhen Absen Optoelectronic C	o.,Ltd			
Address	18-20/F, Tower A, Building 3, Phase N0.2018, Xuegang Rd, Bantian, Lo Guangdong, P.R. China				
Product Name:	LED Multimedia Processor				
Trade Mark:	Absen				
Model/Type reference:	AiBox 500				
Listed Model(s):	/				
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247				
Date of receipt of test sample:	Aug. 18, 2023				
Date of testing	Aug. 19, 2023 ~ Dec. 11, 2023				
Date of issue	Jul. 3, 2024				
Result	PASS				
Compiled by: (Printed name+signature)	Lucy Lan	luey lan			
Supervised by:		a. Aud			
(Printed name+signature)	Eric Zhang	Zric zhang Johnas			
Approved by:		1 Inas			
(Printed name+signature)	Totti Zhao	lo			
Testing Laboratory Name:	CTC Laboratories, Inc.				
Address	Room 101 Building B, No. 7, Langi	ng 1st Road, Lubu			
Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China					
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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 902–928MHz, 2400–2483.5MHz, and 5725-5850MHz.

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

# **1.2. Report Version**

Revised No.	Report No.	Date of issue	Description
01	CTC20231665E02	Jul. 3, 2024	Original

# **1.3. Test Description**

FCC Part 15 Subpart C (15.247)				
Test Item	Standard Section	Result	Test Engineer	
Antenna Requirement	15.203	Pass	Lucy Lan	
Conducted Emission	15.207	Pass	Lucy Lan	
Restricted Bands	15.205	Pass	Lucy Lan	
Hopping Channel Separation	15.247(a)(1)	Pass	Lucy Lan	
Dwell Time	15.247(a)(iii)	Pass	Lucy Lan	
Peak Output Power	15.247(b)(1)	Pass	Lucy Lan	
Number of Hopping Frequency	15.247(a)(iii)	Pass	Lucy Lan	
Conducted Band Edge and Spurious Emissions	15.247(d)	Pass	Lucy Lan	
Radiated Band Edge and Spurious Emissions	15.205&15.209& 15.247(d)	Pass	Lucy Lan	
Radiated Spurious Emission	15.247(d) &15.209	Pass	Lucy Lan	
20dB Bandwidth	15.247(a)	Pass	Lucy Lan	

Note:

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The measurement uncertainty is not included in the test result. 1.

2. N/A: means this test item is not applicable for this device according to the technology characteristic of device.



# 1.4. Test Facility

#### Address of the report laboratory

### CTC Laboratories, Inc.

Add: Room 101 Building B,Room 107, 108, 207, 208, 303 Building A, No. 7, Lanqing 1st Road, Luhu Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China (formerly 2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, High-Tech Park, Guanlan Sub-District, Longhua New District, 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 in our 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 in the measurement of mobile 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.

Test Items	Measurement Uncertainty	Notes
20dB Emission Bandwidth	±0.0196%	(1)
Carrier Frequency Separation	±1.9%	(1)
Number of Hopping Channel	±1.9%	(1)
Time of Occupancy	±0.028%	(1)
Max Peak Conducted Output Power	±0.743 dB	(1)
Band-edge Spurious Emission	±1.328 dB	(1)
Conducted RF Spurious Emission	9kHz-1GHz: ±0.746dB 1GHz-26GHz: ±1.328dB	(1)
Conducted Emissions 9kHz~30MHz	±3.08 dB	(1)
Radiated Emissions 30~1000MHz	±4.51 dB	(1)
Radiated Emissions 1~18GHz	±5.84 dB	(1)
Radiated Emissions 18~40GHz	±6.12 dB	(1)

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

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:	15 °C to 35 °C
Relative Humidity:	20 % to 75 %
Air Pressure:	101 kPa





# 2. GENERAL INFORMATION

# 2.1. Client Information

Applicant:	Shenzhen Absen Optoelectronic Co.,Ltd	
Address:	18-20/F, Tower A, Building 3, Phase I, Tian An Cloud Park, N0.2018, Xuegang Rd, Bantian, Longgang District, Shenzhen, Guangdong, P.R. China	
Manufacturer:	Shenzhen Absen Optoelectronic Co.,Ltd	
Address:	18-20/F, Tower A, Building 3, Phase I, Tian An Cloud Park, N0.2018, Xuegang Rd, Bantian, Longgang District, Shenzhen, Guangdong, P.R. China	
Factory:	Huizhou Absen Optoelectronic Limited.	
Address:	No. 03, Donghua South road, Dongjiang Hi-tech Industry Park, Huizhou. Guangdong, China	

# 2.2. General Description of EUT

Product Name:	LED Multimedia Processor
Trade Mark:	Absen
Model/Type reference:	AiBox 500
Listed Model(s):	/
Model Difference:	/
Power Supply:	AC 100-240V~2.5A 50/60Hz
RF Module Model:	AP6275S
Hardware Version:	/
Software Version:	/
Bluetooth 5.1 / BR+EDR	
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Operation Frequency:	2402MHz~2480MHz
Channel Number:	79
Channel Separation:	1MHz
Antenna Type:	External Antenna
Antenna Gain:	3.55dBi



# 2.3. Accessory Equipment Information

Equipment Information						
Name	Model	S/N	Manufacturer			
Notebook	ThinkPad T460s	/	Lenovo			
Cable Information	Cable Information					
Name	Shielded Type	Ferrite Core	Length			
USB Cable	Unshielded	NO	150cm			
Test Software Information						
Name	Version	/	/			
adb.exe	1	/	1			



# 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.

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## 2.5. Measurement Instruments List

RF Tes	RF Test System					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until	
1	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023	
2	High and low temperature test chamber	ESPEC	MT3035	/	Mar. 24, 2024	
3	Test Software	WCS	WCS-WCN	2023.08.04	/	

Radiate	Radiated Emission (3m chamber 3)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9163	01026	Dec. 18, 2024	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 01, 2024	
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023	
4	Broadband Amplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023	
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023	
6	3m chamber 3	YIHENG	EE106	/	Aug. 28, 2026	
7	Test Software	FARA	EZ-EMC	FA-03A2	/	

Conduc	Conducted 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 Receiver	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					
6	Test Software	R&S	EMC32	6.10.10	/					

Note: 1. The Cal. Interval was one year.

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

3. The cable loss has been calculated in test result which connection between each test instruments.

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# 3. TEST ITEM AND RESULTS

# 3.1. Conducted Emission

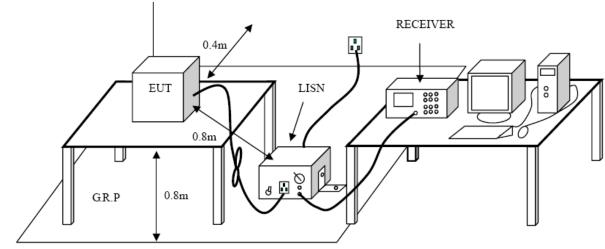
### <u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.207

	Conducte	ed Limit (dBμV)
Frequency (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.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting 2. 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 impedance stabilization 3 network (LISN). The LISN provides a 50 ohm / 50 µH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the 4. block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was 5. individually connected through a LISN to the input power source.

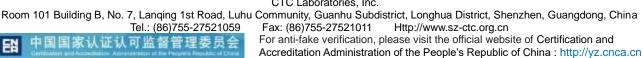
The excess length of the power cord between the EUT and the LISN receptacle were folded back and 6. forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a 7. receiver bandwidth of 9 kHz.

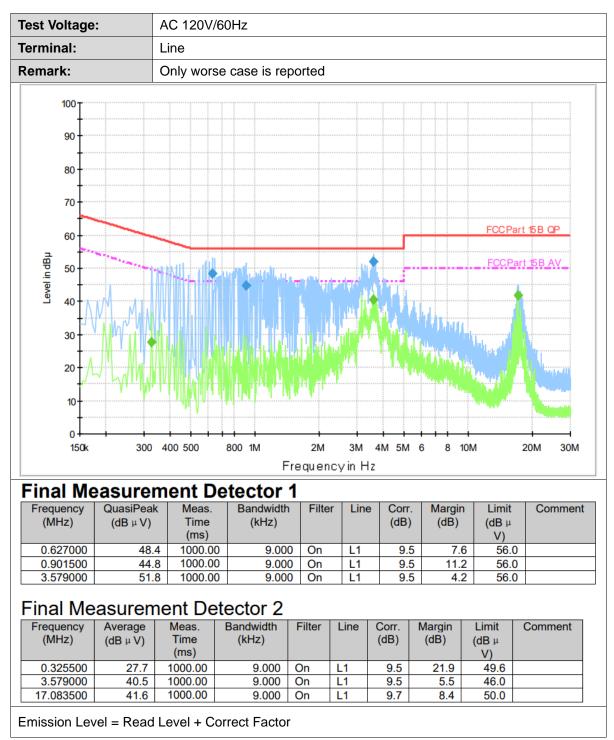
During the above scans, the emissions were maximized by cable manipulation. 8.

#### **Test Mode**

Please refer to the clause 2.4.





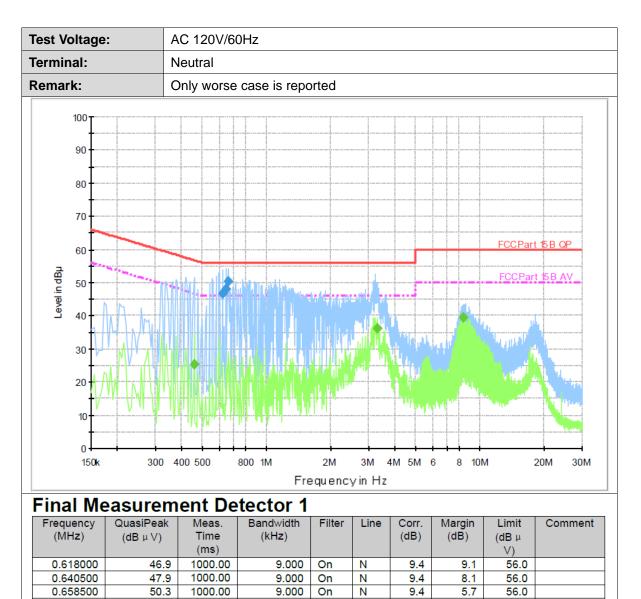


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# Final Measurement Detector 2

Frequency (MHz)	Average (dB µ ∨)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB µ ∨)	Comment
0.456000	25.2	1000.00	9.000	On	Ν	9.4	21.6	46.8	
3.277500	36.2	1000.00	9.000	On	Ν	9.4	9.8	46.0	
8.367000	39.5	1000.00	9.000	On	Ν	9.6	10.5	50.0	

Emission Level = Read Level + Correct Factor

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# 3.2. Radiated Emission

#### <u>Limit</u>

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

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

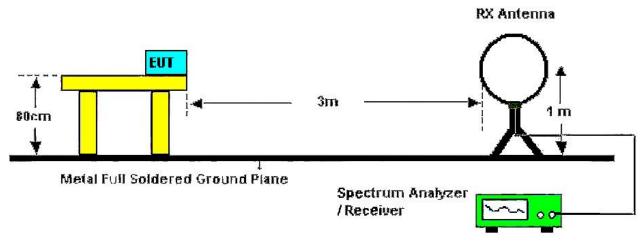
Frequency Pango (MHz)	dBµV/m (at 3 meters)				
Frequency Range (MHz)	Peak	Average			
Above 1000	74	54			

#### Note:

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

(2) Emission Level ( $dB\mu V/m$ )=20log Emission Level ( $\mu V/m$ ).

### **Test Configuration**



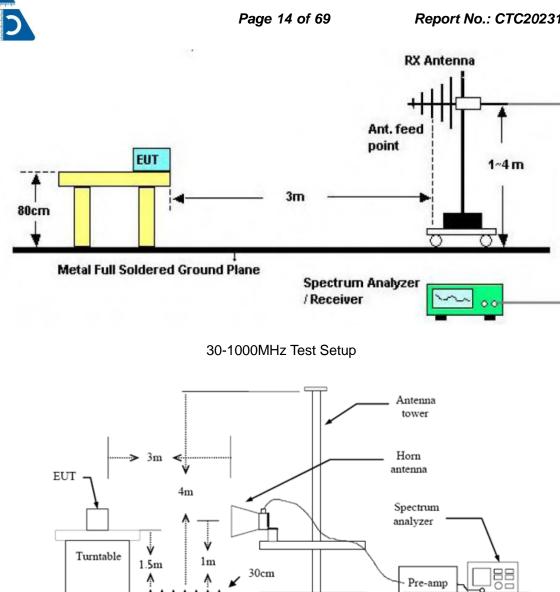
Below 30MHz Test Setup

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Above 1GHz Test Setup

## **Test Procedure**

1. The EUT was setup and tested according to ANSI C63.10:2013.

The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for 2. 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.

For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna 4. 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.
- Use the following spectrum analyzer settings 6.
- Span shall wide enough to fully capture the emission being measured; (1)
- (2) 9k 150kHz:

RBW=300 Hz, VBW=1 kHz, Sweep=auto, Detector function=peak, Trace=max hold (3) 0.15M – 30MHz:

RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold (4) 30M - 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

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peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(5) From 1 GHz to 10<sup>th</sup> harmonic:

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.

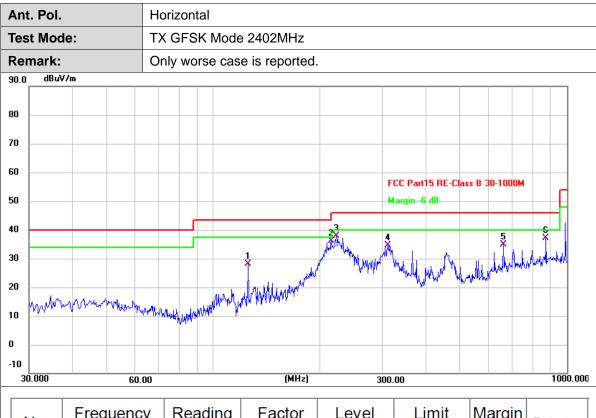
#### Test Result

#### 9 kHz~30 MHz

From 9 kHz to 30 MHz: The conclusion is 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	125.0600	46.90	-18.82	28.08	43.50	-15.42	QP
2 *	215.9167	51.67	-15.62	36.05	43.50	-7.45	QP
3	222.3833	53.21	-15.43	37.78	46.00	-8.22	QP
4	311.9467	47.82	-13.25	34.57	46.00	-11.43	QP
5	662.7633	40.79	-5.97	34.82	46.00	-11.18	QP
6	874.8700	40.14	-2.98	37.16	46.00	-8.84	QP

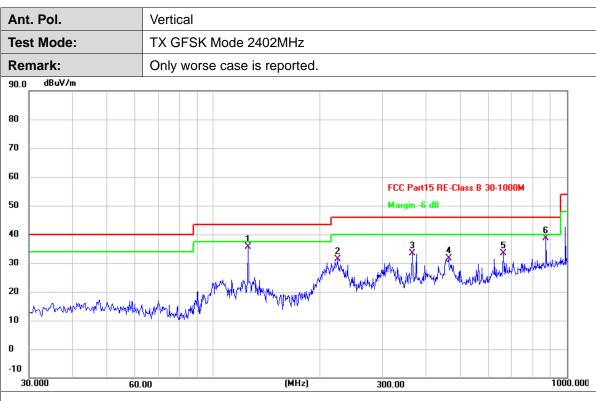
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国家认证认

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





No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	125.0600	54.33	-18.82	35.51	43.50	-7.99	QP
2	224.9700	46.62	-15.35	31.27	46.00	-14.73	QP
3	366.5900	45.29	-11.89	33.40	46.00	-12.60	QP
4	462.9433	41.47	-9.88	31.59	46.00	-14.41	QP
5	662.7633	39.23	-5.97	33.26	46.00	-12.74	QP
6 *	874.8700	41.55	-2.98	38.57	46.00	-7.43	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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Ant. Pol.	Horizontal
Test Mode:	TX GFSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4803.899	38.07	2.16	40.23	54.00	-13.77	AVG
2	4804.013	46.78	2.16	48.94	74.00	-25.06	peak

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

2.Margin value = Level -Limit value

Ant. Pol. Vertical							
Fest Mo	de:	TX GFSK Mode 2402MHz					
Remark:No report for the emission which more than 20 df limit.					han 20 dB be	elow the p	rescribed
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
No. 1		· · ·				-	Detector peak

Remarks:

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

2.Margin value = Level -Limit value



Ant. Pol.		Horizontal	Horizontal					
Test Mod	est Mode: TX GFSK Mode 2441MHz							
Remark:		No report for the emission which more than 20 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4881.927	46.41	2.31	48.72	74.00	-25.28	peak	
2 *	4881.955	39.07	2.31	41.38	54.00	-12.62	AVG	
							<u> </u>	

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

2.Margin value = Level -Limit value

Ant. Pol		Vertical					
est Mo	de:	TX GFSK Mo	de 2441MHz	2			
Remark		No report for limit.	the emission	which more t	han 20 dB be	elow the p	rescribed
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4881.974	50.23	2.31	52.54	74.00	-21.46	peak
2 *	4881.994	43.81	2.31	46.12	54.00	-7.88	AVG

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Ant. Pol.		Horizontal					
Test Mod	de:	TX GFSK Mo	de 2480MHz				
Remark: No report for the emission which more than 20 dB below the prescribe limit.				rescribed			
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4960.017	36.98	2.48	39.46	54.00	-14.54	AVG
2	4960.124	45.46	2.48	47.94	74.00	-26.06	peak
							. <u> </u>

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

2.Margin value = Level -Limit value

Ant. Pol.		Vertical					
Test Mod	le:	TX GFSK Mo	X GFSK Mode 2480MHz				
Remark:		No report for t limit.	the emission	which more t	han 20 dB be	low the p	rescribed
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4959.871	51.54	2.48	54.02	74.00	-19.98	peak
2 *	4960.001	44.72	2.48	47.20	54.00	-6.80	AVG
2	4900.001	44.72	2.40	47.20	54.00	-0.00	AVG
Domorko							
Remarks	: (dB/m) = Antenna						

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Ant. Pol.	Horizontal
Test Mode:	TX π/4-DQPSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4803.925	32.51	2.16	34.67	54.00	-19.33	AVG
2	4804.281	43.94	2.16	46.10	74.00	-27.90	peak

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

Ant. Pol.	Vertical
Test Mode:	TX π/4-DQPSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

Ν	۱o.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
-	1 *	4803.844	37.81	2.16	39.97	54.00	-14.03	AVG
	2	4804.082	48.45	2.16	50.61	74.00	-23.39	peak

Remarks:

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

2.Margin value = Level -Limit value

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Ant. Pol.		Horizontal						
Test Mod	le:	TX π/4-DQPSK Mode 2441MHz						
Remark:		No report for limit.	the emission	which more t	han 20 dB be	elow the p	rescribed	
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4881.821	47.09	2.31	49.40	74.00	-24.60	peak	
2 *	4882.021	37.10	2.31	39.41	54.00	-14.59	AVG	
	-						<u> </u>	

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

2.Margin value = Level -Limit value

A	nt. Pol.		Vertical					
T	est Mod	de:	TX π/4-DQPS	SK Mode 244	1MHz			
Remark: No report for the emission which more than 20 dB below the prescribe limit.					rescribed			
	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
ľ	1 *	4881.865	44.42	2.31	46.73	54.00	-7.27	AVG
ľ	2	4882.025	54.00	2.31	56.31	74.00	-17.69	peak
		-						<u> </u>
1		: (dB/m) = Antenn value = Level -L		n)+Cable Fac	tor (dB)-Pre-a	amplifier Fact	or	

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Ant. Pol.		Horizontal					
Test Moo	st Mode: TX π/4-DQPSK Mode 2480MHz						
Remark: No report for the emission which more than 20 dB below the prescrib limit.					rescribed		
No	Frequency	Reading	Factor	Level	Limit	Margin	Detector
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)		Limit (dBuV/m)	-	Detector
No. 1		· · ·				-	Detector peak

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

2.Margin value = Level -Limit value

Ant. Pol.		Vertical					
Test Mod	Test Mode:         TX π/4-DQPSK Mode 2480MHz						
Remark: No report for the emission which more than 20 dB below the prescrib limit.					rescribed		
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4959.809	42.66	2.48	45.14	54.00	-8.86	AVG
2	4960.079	51.65	2.48	54.13	74.00	-19.87	peak
<u>-</u>	-			-	-		
	: (dB/m) = Antenn value = Level -L	· ·	n)+Cable Fac	tor (dB)-Pre-a	amplifier Fact	or	

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Ant. Pol.	Horizontal
Test Mode:	TX 8-DPSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4803.943	43.74	2.16	45.90	74.00	-28.10	peak
2 *	4804.041	32.33	2.16	34.49	54.00	-19.51	AVG

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

Ant. Pol.	Vertical
Test Mode:	TX 8-DPSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4803.917	48.29	2.16	50.45	74.00	-23.55	peak
2 *	4804.045	38.11	2.16	40.27	54.00	-13.73	AVG

Remarks:

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

2.Margin value = Level -Limit value

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Ant. Pol.		Horizontal					
Test Mod	de:	TX 8-DPSK M	lode 2441M	Ηz			
Remark:		No report for limit.	the emission	which more t	han 20 dB be	elow the p	rescribed
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4881.951	47.34	2.31	49.65	74.00	-24.35	peak
2 *	4882.199	36.82	2.31	39.13	54.00	-14.87	AVG
				•			

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

2.Margin value = Level -Limit value

Ant.	. Pol.		Vertical								
Test	t Mod	le:	TX 8-DPSK M	1ode 2441MH	Ηz						
Ren	nark:		No report for the emission which more than 20 dB below the prescribed limit.								
Ν	No. Frequency (MHz)		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			
	1	4881.939	54.40	2.31	56.71	74.00	-17.29	peak			
2	2 *	4882.104	44.54	2.31	46.85	54.00	-7.15	AVG			

2.Margin value = Level -Limit value

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Ant. Pol.		Horizontal				Margin						
Test Mod	le:	TX 8-DPSK M	lode 2480Mł	Ηz								
Remark:		No report for the limit.	No report for the emission which more than 20 dB below the prescri imit.									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	-	Detector					
1	4959.777	45.87	2.48	48.35	74.00	-25.65	peak					
2 *	4960.145	35.06	2.48	37.54	54.00	-16.46	AVG					
-												

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

2.Margin value = Level -Limit value

est Mode: emark:		No report for			han 20 dB be	low the p									
emark:		•	the emission	which more t	han 20 dB be	No report for the emission which more than 20 dB below the prescribe									
		No report for the emission which more than 20 dB below the prescribed limit.													
No. Frequency (MHz)		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector								
1 * 4	959.823	42.71	2.48	45.19	54.00	-8.81	AVG								
2 4	959.925	51.81	2.48	54.29	74.00	-19.71	peak								

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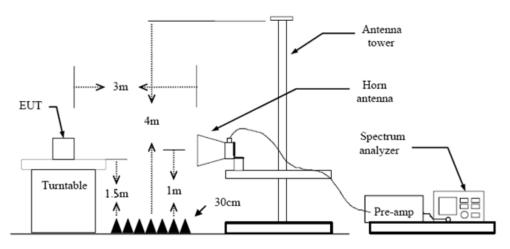
# 3.3. Band Edge Emissions (Radiated)

Limit

#### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d) / RSS-247 5.5

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

#### **Test Configuration**



#### **Test Procedure**

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 2. 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.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is 4. 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: 5.

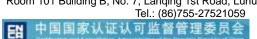
RBW=1MHz, VBW=3MHz Peak detector for Peak value.

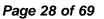
RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

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.







nt. Pol		H	orizontal					
est Mo	de:	G	FSK Mode 2	2402MHz				
20.0 dBu	V/m							
10								
)0								
·								
·						FCC Part15 C	- Above 16 Pi	
·								-
						FCC Part15 C	- Above 1G AV 1 X	<u> </u>
		terretertarian and	more and a second and a second	and the second	and a second			ment Y
1.0 2304.500	2314.50 232	4.50	2334.50 23	44.50 (MHz)	2364.50	2374.50 2384.	50 2394.5	0 2404.
	I				1	1		
No.	Frequence (MHz)	sy	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecto
1	2390.00	0	16.87	30.84	47.71	74.00	-26.29	peak
2 *	2390.00	0	5.41	30.84	36.25	54.00	-17.75	AVG
					<u>.</u>	-		

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

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Ant	. Pol.			Verti	cal											
Tes	t Mod	le:		GFS	K Mc	de 2	2402N	lHz								
120.0	) dBu\	//m		•	Ì											
110																
100															A	
90															Ш	
80																
70											FCC	Part15 C	- Above 1G	PK		
60																
50											FCC	Part15 C	- Above 1G	AV		
													Ŷ			
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30																
20																
10 0.0																
	05.000	2315.00	2325.00	) 233	35.00	23	45.00	(MHz)	236	5.00	2375.00	2385	.00 2395	5.00	2405.0	0
		Erog			odir	20	Fo	ctor		vel	Lie	nit	Morair			Т
N	<b>I</b> O.		uency Hz)		eadir IBu∖			8/m)	1	iVei IV/m)			Margir (dB)	'  De	etector	
_																+
	1		0.000		9.61			.84		.45		.00	-23.55	<u> </u>	eak	1
	2 *	239	0.000		5.09		30	.84	35	.93	54	.00	-18.07	'   A	٨VG	
Ren	narks															

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

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nt. Pol.		Horizontal					
est Mod	le:	GFSK Mode	2480MHz				
20.0 dBu <sup>1</sup>	√/m						
10							
00							
) <u> </u>							
)					FCC Part15 C	- Above 1G F	чK
י 🕂							
)					FCC Part15 C	- Above 16 A	v
	×						
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2477.000	2487.00 2497.00	2507.00 25	517.00 (MHz)	2537.00	2547.00 2557.	.00 2567.	.00 2577.0
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit	Margin (dB)	Detector
1							n a alí
	2483.500 2483.500	18.68	31.24	49.92	74.00	-24.08	· · · · · · · · · · · · · · · · · · ·
2 *		4.57	31.24	35.81	54.00	-18.19	AVG

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



nt. Pol.		,	Vertical									
est Mod	e:		GFSK Mc	de 2	2480MH	Ηz						
20.0 dBuV	/m							1				
10												
- 11 {												
									FCC	Part15 C	- Above 1G	РК
									FCC	Part15 C	- Above 1G a	AV
×												
2												Webstermath
	With the segment of the second	aspealer, down of provide	ungelegene and the second	<b></b>	**********		*********		*****	~?»	Ser a second and the	HHHAJ <sup>a</sup> rdand <b>id</b> -Pus
ı												
1.0												
2478.000	2488.00	2498.00	2508.00	25	18.00	(MHz)	253	8.00	2548.00	2558.	00 2568	.00 2578.
No.	Frequ (MF		Readir (dBu∖	- 1	Fac (dB/			vel IV/m)	1	nit V/m)	Margir (dB)	Detecto
1	2483.	500	19.50	)	31.	24	50	.74	74	.00	-23.26	peak
2 *	2483.	500	6.70		31.	24	37	.94	54	.00	-16.06	AVG
emarks:												

2.Margin value = Level -Limit value



Ant	. Pol.				Horiz	ontal											
Tes	t Moc	le:			π/4-D	DQPS	ΚM	lode 2	2402M	Hz							
120.0	) dBu\	//m															
110																	
100																	
90																_	
80												FCC	Davi15 C	- Above 1G	DY	$\mathbb{A}$	
70												FUU		- ADUYE TU	FK		
60												FCC	Port15 C	- Above 1G	AV	+	
50														1 X	AV		
40														x 2			
30	nd have	er den hen open van de spelled	n starrache	mm		4.38 <sup>4</sup> .87742 <sup>74</sup> .9	h-h-h-h-h-h-h-h-h-h-h-h-h-h-h-h-h-h-h-		tahong and a		yannaan ahafkame	and a second	and a second second second	er fan weren we	ANA CARLO	~ MU	
20																	
10																	
0.0 23	305.000	2315.00	232	25.00	233	5.00	234	45.00	(MHz)	236	5.00	2375.00	2385.	00 239	5.00	240	5.00
N	۱o.	Freq (M	uen IHz)			adin BuV)		Factor (dB/m)		Level (dBuV/m)		Limit (dBuV/m)		Margi (dB)	n c	Detector	
	1	239	0.00	0	1	4.17		30	.84	45	.01	74	00	-28.9	9	peal	ĸ
	2 *	239	0.00	0	4	1.68		30	.84	35	.52	54	.00	-18.48	3	AVG	3
Ren	narks									-		-		-	-		

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Remarks:

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



Ant. Pol.			Verti	cal														
Tes	t Moc				π/4-I	DQP	SK N	Node	2402	2Mł	Ηz							
120.0	) dBu <sup>1</sup>	//m												ĺ				
110																		_
100																	Λ	_
90																	Д	_
80																	$\square$	_
70													FCC	Part15 C	- Above 1G	PK	+	-
60																		
50													FCC	Part15 C	- Above 16 X	AV	+	
40															2		$\square$	Ų –
30		*****	n	******	مەرپەرسەرىيىرۇك. مۇ		na starona		مستقامتك	~~~	andre of the second	an free stand and a stand of the		mahandarand	2	with		
20																		
10																		
0.0																		
23	05.500	2315	i.50 i	2325.50	233	85.50	23	45.50	(MI	lz)	236	5.50	2375.50	2385.	50 239	5.50	2	405.50
	lo.	Fr	eque			eadir		Fa	acto	r		vel		mit	Margi		Dete	ctor
	NU.		(MHz	Z)	(C	Bu∖	/)	(dE	3/m	)	(dBu	ıV/m)	(dBu	V/m)	(dB)		Dele	
	1	2390.000		20.53		3	30.84			51.37		74.00		-22.63		peak		
2	2 *	2	390.0	000		5.29		30	).84		36	.13	54	.00	-17.8	7	AV	'G
																		<u> </u>
Ren	narks																	

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



Ant. Pol.			Horizontal												
est Mod	de:		π/4-DQPSK Mode 2480MHz												
20.0 dBu <sup>1</sup>	V/m														
10															
0															
· HA									FCC F	Part15 C	- Above 1G	РК			
									FCC I		41				
	i X										- Above 1G	A4			
	,														
V h	2	warnen an	man	water water and	will have a	www.www.www.	hompsoning	and any Anna manufal bet	Kannonarhab	noncologo	eren geter fart faktionsen	when at he when			
.0															
2477.000	2487.00	2497.00	250	7.00 2	517.00	(MHz)	253	7.00	2547.00	2557.	00 256	7.00 2577.			
No.		uency Hz)		ading BuV)	1	ctor 3/m)		vel IV/m)	Lin		Margii (dB)	Detecto			
			· ·				-								
1	2483	3.500	1	8.64	31	.24	49	.88	74.	00	-24.12	2 peak			
2 *	2483	3.500	4	.67	31	.24	35	.91	54.	00	-18.09	AVG			

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

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Ant. Pol.			Vertical													
est M	ode:			π/4-DQPSK Mode 2480MHz												
20.0 d	Bu¥∕m								1							
10																
)0																
ьЩ																
)										ECCI	Part15 C	- Above 1G	PK			
)												- ADOVE TO				
										FCC I	Part15 C	- Above 1G	AV			
	×															
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)																
) ).0																
2477.5	00 24	87.50	2497.50	2507.5	0 25	517.50	(MHz)	253	7.50	2547.50	2557	.50 256	7.50 2577			
	F	rea	lency	Read	lina	Fa	ctor		vel	Lin	nit	Margii	n			
No.			Hz)	(dBu	<u> </u>	1	3/m)			(dBu			Detecto			
1		2483	3.500	19.	76	31	.24	51	.00	74.	00	-23.00	) peak			
2 *		2483	3.500	6.4	.3	31	.24	37	.67	54.	00	-16.33	3 AVG			

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

2.Margin value = Level -Limit value

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Ant. Pol.			Horizontal											
est Moo	de:		8-DPSK Mod	e 2402MHz										
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.0														
2305.000	2315.00	2325.00	2335.00 23	45.00 (MHz)	2365.00	2375.00 2385.	.00 2395.0	<u>30 240</u> 5.						
	1				1	Γ								
No.	Frequ (MF		Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector						
1	2390	.000	16.61	30.84	47.45	74.00	-26.55	peak						
2 *	2390	.000	4.63	30.84	35.47	54.00	-18.53	AVG						

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

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Ant. P	ol.	,	Vertical											
Test M	ode:	;	8-DPSK I	Mod	e 2402M	Ηz								
120.0 d	Bu¥/m		Ì					1		1				
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50									FCCF	Part15 C	- Above 1G		+	
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2305.5	00 2315.50	2325.50	2335.50	23	:45.50 (N	IHz)	236	5.50	2375.50	2385.	50 2395	i.50	240	5.50
No.	Freque (MH		Readii (dBu\		Facto (dB/m			vel iV/m)	Lin (dBu		Margir (dB)	De	etecto	or
1	2390.	000	19.12	2	30.84	1	49	.96	74.	00	-24.04	- p	eak	(
2 *	2390.	000	5.07	'	30.84	1	35	.91	54.	00	-18.09	A	٩VG	;
Remar	ks:													<u>+</u>

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

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nt. Pol.		Hori	izontal					
est Moo	le:	8-DI	PSK Mod	e 2480MHz				
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2476.500	2486.50 2496	6.50 25	506.50 25	i16.50 (MHz)	2536.50 2	2546.50 2556.	.50 2566.	50 2576.9
No.			eading	Factor		Limit	Margin	Detector
1	(MHz) 2483.500		dBuV) 18.71	(dB/m) 31.24	(dBuV/m) 49.95	(dBuV/m) 74.00	(dB) -24.05	- noak
								· ·
2 *	2483.500		4.72	31.24	35.96	54.00	-18.04	AVG

Remarks:

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

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nt.	Pol.			Vert	ical										
est	Mod	e:		8-DI	PSK N	lode	e 2480N	ЛНz							
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-  .0															
_ L	7.000	2487.00	2497.0	)0 25	07.00	25	17.00	(MHz)	253	7.00	2547.00	2557.	00 256	7.00 257	7.0
N	0.		uency Hz)		eadir dBuV		Fac (dB/			vel iV/m)	1	mit ıV/m)	Margi (dB)	n Detecto	or
1			, 3.500		16.35		31.2			.59		.00	-26.4 <sup>-</sup>	1 peak	<
2	*	248	3.500		6.24		31.2	24	37	.48	54	.00	-16.52	2 AVG	)
	arks:														

2.Margin value = Level -Limit value

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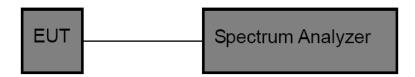
# 3.4. Band Edge and Spurious Emissions (Conducted)

## <u>Limit</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d) / RSS-247 5.5

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### **Test Configuration**



#### **Test Procedure**

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss 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: RBW = 100 kHz, VBW ≥ RBW, scan up through 10<sup>th</sup> harmonic. Sweep = auto, Detector function = peak, Trace = max hold.
- 4. Measure and record the results in the test report.

#### Test Mode

Please refer to the clause 2.4.

#### Test Result

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#### (1) Band Edge Conducted Test & Conducted Spurious Emissions Test

Non-Hopping

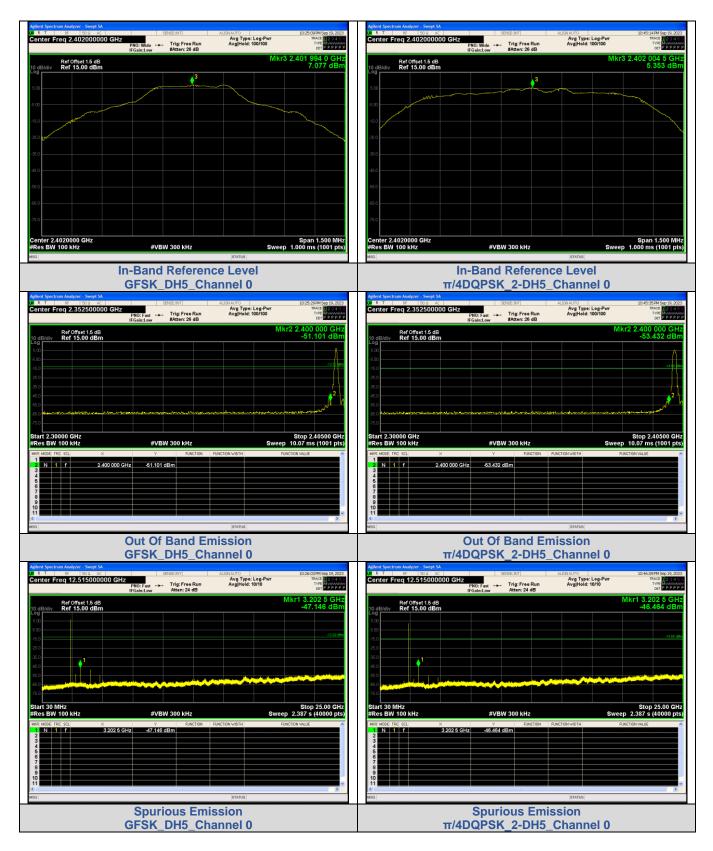
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
		0	2400.00	-51.101	-12.92	-38.181	PASS
		0	3202.52	-47.146	-12.92	-34.226	PASS
GFSK	DH5	39	3254.96	-50.511	-13.84	-36.671	PASS
		78	2483.50	-56.092	-13.98	-42.112	PASS
			3306.77	-52.416	-13.98	-38.436	PASS
	2-DH5	0	2400.00	-53.432	-14.65	-38.782	PASS
		0	3202.52	-46.464	-14.65	-31.814	PASS
π/4DQPSK		39	3254.96	-49.441	-15.25	-34.191	PASS
		78	2483.50	-58.424	-14.84	-43.584	PASS
		70	3306.77	-49.579	-14.84	-34.739	PASS
		0	2400.00	-52.421	-14.73	-37.691	PASS
		0	3202.52	-46.062	-14.73	-31.332	PASS
8DPSK	3-DH5	39	3254.96	-49.075	-15.15	-33.925	PASS
		78	2483.50	-56.946	-14.95	-41.996	PASS
		10	3306.77	-50.454	-14.95	-35.504	PASS

#### Hopping

Modulation	Packet	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Result
GFSK	DH5	2400.00	-51.580	-13.45	PASS
GFSK	DHC	2483.50	-60.282	-16.52	PASS
π/4DQPSK	2-DH5	2400.00	-57.606	-15.84	PASS
11/4DQP3K		2483.50	-62.347	-17.32	PASS
8DPSK	3-DH5	2400.00	-57.599	-16.32	PASS
ODASK	3-DD3	2483.50	-62.975	-17.0	PASS

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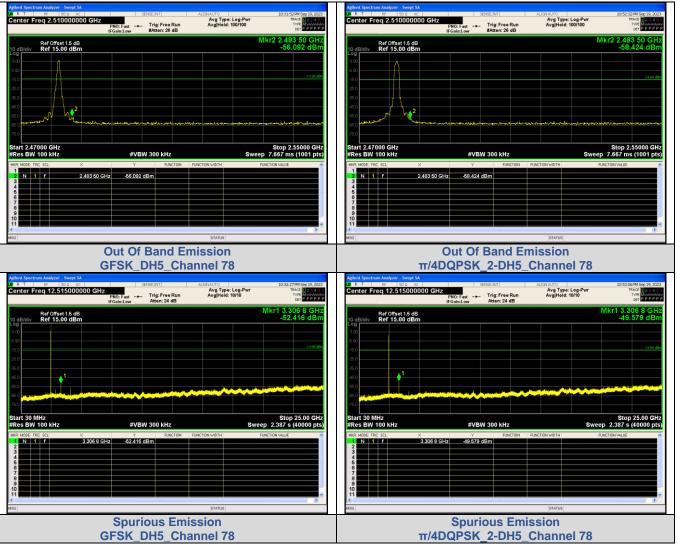


Agilent Spectrum Analyzer - Swept SA 10 R. T. ER 50 p. ac. SERVER ALIZY MATO 10.2204PH Sec 13.222	Agilent Spectrum Analyzer - Swept SA B R T FF 50 G AC SERVED/T1 AUXYA/JTO 1049-2019/560-19.2023
Center Freq 2.4441000000 GHz Stocker Avg Type: Log-Per The Development of the Context Freq 2.44410000000 GHz Trig:Free Run Avg Type: Log-Per The Development Freisint ev FAtter: 26 dB cet	Center Freq 2.441000000 GHz Sector Avg Type: Log-Pwr Tree Run Avg Type: Log
Ref Offset 1.5 dB Mkr3 2.440 995 5 GHz 10 dB/div Ref 15.00 dBm 6.158 dBm	Ref Offset 1.5 dB         Mkr3 2.440 979 0 GHz           10 dB/div         Ref 15.00 dBm           4.748 dBm
500	500 month and a second se
500 mm	5-00
350	350
450	450
55.0	55.0
65.0	46.0
750	750
Center 2.4410000 GHz Span 1.500 MHz	Center 2.4410000 GHz Span 1.500 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)
#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts) USG [STATUS]	#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts) MSG [STATUS]
In-Band Reference Level	In-Band Reference Level
GFSK_DH5_Channel 39 Agterst Spectrum Analyzer - Swept SA	π/4DQPSK_2-DH5_Channel 39 Agthent Spectrum Analyzer - Swept 3A
III         III         IIII         State         AUSKAND         DO2552745000,0027           Center Freq 12.515000000 GHz         PR0. Fail         →         Trig: Free Run         Avg Trpe: Log-Perr         Trig: Tr	INT         INT         SOS
Ref Offset 1.5 dB Mkr1 3.255 0 GHz	Ref Offset 1.5 dB Mkr1 3.255 0 GHz
10 dB/div Ref 15.00 dBm -50.511 dBm	10 dB/div Ref 15.00 dBm -49.44 1 CDM
500	500
30	
Start 30 MHz Stop 25.00 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.387 s (40000 pts)	Stop 25.00 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.387 s (40000 pts)
WRES BW 100 KHZ         #VBW 300 KHZ         SWEED 2.367 \$ (40000 µcs)           HKR MODE TRC: SCL         X         Y         RINCTION RUNCTION WOTH         RUNCTION WULLE           IN 1         f         32550 GHz         50.511 dBm         Constraint         Constraint	#Res BW 100 kHz         #VBW 300 kHz         Sweep 2.387 s (40000 pts)           INR MORE TRC SCL         X         Y         RANCTION MOTH         RANCTION WOTH         RANCTION WULL         V           IN         I         I         7 3255 0 GHz         49441 dBm         RANCTION WOTH         RANCTION WULL         V
5	
K STATUS	K Status
Spurious Emissions	Spurious Emissions
GFSK_DH5_Channel 39 Agterst Spectrum Analyzer - Swept SA	π/4DQPSK_2-DH5_Channel 39 Agthent Spectrum Analyzer - Swept 3A
IN         R         T         RF         SD2_AC         SENSEDIT         ALIGNAUTO         1031322M Se019, 2023           Center Freq 2.480000000 GHz         Avg Type: Log-Pwr         Tract IP2 and P           PH0: Wide         →         Trig: Free Run         Avg Type: Log-Pwr         Trig: Free Run	IN         R         T         RF         ISD & AC         SENSEINT         ALIGN AUTO         10:52:1278 Sep 19, 2023           Center Freq 2.450000000 GHz         RMC0         SENSEINT         ALIGN AUTO         10:52:1278 Sep 19, 2023           Rest of the sense of the
IFGaint.ow #Atten: 26 dB Mkr3 2.480 141 0 GHz	Ref Offset 1.5 dB Mkr3 2.479 980 6Hz
10 dB/div Ref 15.00 dBm 6.023 dBm	10 dB/div Ref 15.00 dBm 5.157 dBm
533	5:03
350	350
-60	450
	56.0
86.0	86.0
.750	750
Center 2.4300000 GHz Span 1.500 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)	Center 2.4800000 GHz Span 1.500 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)
#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts) US0 [STATUS]	#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts) 150 [STATUS]
In-Band Reference Level	In-Band Reference Level
GFSK_DH5_Channel 78	π/4DQPSK_2-DH5_Channel 78

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Agland Spectrum Andrycer Swept SA. 0 8 T pr   59.9 AC   590£871 AL324A070 1054307495919,2023 Center Freq 2.402000000 GHz → Trig: Free Run AvgType: Log-Pur Trict R23435 FG-situ: Free Run AvgType: Log-Pur Trict R23455 FG-situ: FG-situ: F	Address Syschum Analyzer, Swept SA.         State Environment         Australize         100/17/04 500 50, 2022           2         B. T.         BP         State Environment         Australize         1100/17/04 500 50, 2022           Center Freq 2.441000000 GHz         Freq Free Run         Avg Tyst: Log-Por         Title Free Run         AvgHold: 100/100         Tree Free Por           FW0: Wide         ++         Trigs Free Run         AvgHold: 100/100         Tree FP P P P
If Gainclow         #Atten: 26 dB         Mkr3 2.402 003 0 GHz           10 gBlidiv         Ref Offset 15 dB         5.259 dBm           5.259 dBm         5.259 dBm	Bit Genet Low         #Atten: 26 4B         Mkr3 2.440 992 5 GHz           Ref Offset 15 dB         Mkr3 2.440 992 5 GHz           10 dBldiv         Ref 15.00 dBm
500	500
5.00	
30	30
35.0	30
450	450
65.0	40
750 Carrier 2 402000 CBy	750 Conter 2 444000 OHr Soon 1 600 MHz
Center 2.4020000 GHz         Span 1.500 MHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 1.000 ms (1001 pts)           Usg         (status)	Center 2.4410000 GHz Span 1.500 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts) wsis
In-Band Reference Level 8DPSK_3-DH5_Channel 0	In-Band Reference Level 8DPSK_3-DH5_Channel 39
AgenetisesAndyter Segar 34 VER T RF S0 & AC SERVED/T ALIGNA/TO 10:54:50/HSep 19, 2023 Center Freq 2.352500000 GHz PND: Fast +→ Trig:Free Run AvgTrol: 100/100 THAT P20/E00 IFGenicative #Atten: 26 dB cc 2000	Agent Systema Allinger Swerte SA QH R T R SD 0 AC Center Freq 12.5150000000 GHz From Freq 12.5150000000 GHz From Freq SA C Selection From Freq
Ref Offset 15 dB Mkr2 2.400 000 GHz to dBidly Ref 15.00 dBm -52.421 dBm -52.421 dBm	Ref Offset 15 dB Mkr1 3.255 0 GHz 10 dBdiv Ref 15.00 dBm -49.075 dBm -49.075 dBm
500 500 150	500 350 350
250 550 450 450	80 80 40
Start 2.30000 GHz         Stop 2.40500 GHz           #Res BW 100 kHz         \$Weep 10.07 ms (1001 pts)	Start 30 MHz Stop 25.00 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.387 s (40000 pts)
NRT HODE TRC: SQL         X         Y         Punction	MRR MODE TRC: SCI.         X         Y         PARETION         PARETION WOTH         PARETION WALE           1         N         1         f         3.255 0 GHz         49.075 dBm         1
Band Emission	esa (strate) Spurious Emissions
8DPSK_3-DH5_Channel 0	8DPSK_3-DH5_Channel 39
Display         State = 1         State = 1 <th< td=""><td></td></th<>	
Reforment 1s dB Mkr1 3.202 5 GHz 10 dB/dlv Ref 15.00 dBm -46.062 dBm -46.062 dBm	
500	
50 Start 30 MHz Stop 25.00 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.387 s (40000 pts)	
Image: Start Tour KHZ         #VEW 3000 KHZ         Sweep 2.387 \$ (40000 pts)           1         N         1         f         3.202.5 GHz         48.052 dBm         Banction wtoTH         Banction wtoTH <t< td=""><td></td></t<>	
• 9 10 11	
Spurious Emission 8DPSK_3-DH5_Channel 0	



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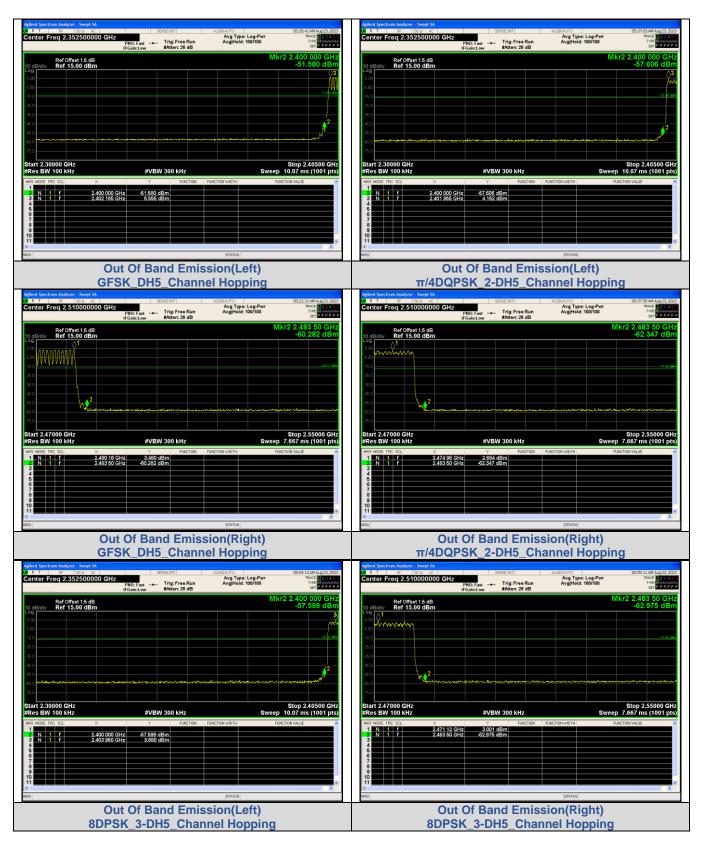


Aginal Spectrum Analyzer - Swept SA         SBREE.BIT         ALSYLAUTO         1108-6PM Sep 15, 2023           Of R T RF         80 a. Ac,         SBREE.BIT         ALSYLAUTO         1108-6PM Sep 15, 2023           Center Freq 2.4800000000 GHz         Frig: Free Run         Avg Type: Log-Pwr         Texcil Ip 2.4 EG           PN0: Wide → Trig: Free Run         Avg Type: Log-Pwr         Texcil Ip 2.4 EG         center Free Run           FFGal.text         #Atten: 25 dB         center Free Run         Avg Type: Log-Pwr         Texcil Ip 2.4 EG	Agtent Spectrum Analyzer Swept SA Of 8 T BP 50 a. AC S BPEE.INT ALSYA UTO 1109:06HM 5ep 52, 223 Center Freq 2.5100000000 GHZ PR0: Fast →- Trig: Free Run Avg Hold: 100/100 cert Pre P P P P P IFGalate.cm #Atten: 26 dB
Ref Offset 15 dB 10 dBidiv Ref 15.00 dBm 500 500 500 500 500 500 500 50	Ref Offset 1.5 dB         Mkr2 2.483 50 GHz           10 dB/dv         Ref 15.00 dBm         -56,946 dBm           5 co         -56,946 dBm         -56,946 dBm           5 co         -56         -56,946 dBm           5 co         -56,946 dBm         -56,946 dBm
	Image: Start 2.47000 GHz         Start 2.47000 GHz         Start 2.47000 GHz         Start 2.47000 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 7.667 ms (1001 pts)           #Res Redet TRC SCI         X         Y         Function         Raction worth         Raction worth           1         1         1         2.483 50 GHz         56.946 dBm         6         6           3         N         1         1         2.483 50 GHz         56.946 dBm         6           3         N         1         1         2.483 50 GHz         56.946 dBm         6           3         N         1         1         2.483 50 GHz         56.946 dBm         6           3         N         1         1         2.483 50 GHz         56.946 dBm         6           3         1         1         2.483 50 GHz         56.946 dBm         6         6           10         1
Center 2.4800000 GH2 \$pan 1.500 MHz #Res BW 100 kH2 #VBW 300 kHz \$sweep 1.000 ms (1001 pts) In-Band Reference Level 8DPSK_3-DH5_Channel 78	Out Of Band Emission 8DPSK_3-DH5_Channel 78
Address Spectrums Analyser:         Support         Alignment         Alignment	Void
Spurious Emission 8DPSK_3-DH5_Channel 78	



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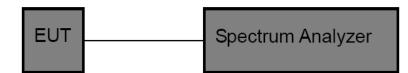


# 3.5. 20dB Bandwidth

Limit

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 Result**

Test Mode	Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth *2/3 (MHz)
	2402	0.88335	0.9860	0.657
GFSK	2441	0.86549	0.9684	0.646
	2480	0.87706	0.9968	0.665
	2402	1.1986	1.346	0.897
π/4-DQPSK	2441	1.2044	1.349	0.899
	2480	1.2004	1.346	0.897
	2402	1.1999	1.303	0.869
8-DPSK	2441	1.2003	1.307	0.871
	2480	1.2083	1.307	0.871

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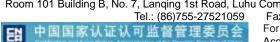


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Addent Spectrum Analyzer Dictopled RW Center Freq 2.402000000 GHz //FGainter Key 2.402000000 GHz //FGaint.tww 10 dB/div Ref Offset 1.5 dB 10 dB/div 8 40 m 115 10 0 135 0 10 0		0++4(68/MA(22),002) Radio Std: None Radio Davice: BTS Mkr2 2,4(2)25988 GHz -13,840 dBm	Addient Spectrum Analyzer - Occupied RW 12 B T RF 1003 AC Center Freq 2.441000000 GHz Ref Offset 16 dB 10 dB/div Ref 21.50 dBm 15 15 4 15 15 15 4 15 15 15 15 15 15 15 15 15 15 15 15 15 1	Carrie Free Run Carrie Free Run aint.ew #Atten: 40 dB	1914/05 04-605 04 4023, 2023 0 GHz AvgHold: 100100 Radie Stel: None Radie Device: BTS Mkr2 2,4415904 GHz -15,982 dBm
20 5 30 5 50 5 50 5 Center 2.402 GHz #Res BW 20 KHz	#VBW 62 kHz	Span 2 MHz Sweep 5.333 ms	Center 2.441 GHz	#VBW 62 kHz	Span 2 MHz Sweep 5.333 ms
Occupied Bandwidth	Total Power 11.8 dBm	Sweep 5.555 ms	Occupied Bandwidth	Total Power	9.88 dBm
1.1999 MHz			1.2003 N		
Transmit Freq Error -903 Hz				5 kHz OBW Power	99.00 %
x dB Bandwidth 1.379 MHz	x dB -26.00 dB		x dB Bandwidth 1.377	/MHz xdB	-26.00 dB
MSG	STATUS		MSG		STATUS
8DPSK	3-DH5 Channel 0		8DP	SK 3-DH5 Cha	nnel 39
Address Sectors Analyzer, Occupied BW Center Freq 2.480000000 GHz Center Freq 2.480000000 GHz Ref offset 1.5 dB 10 dBddv Ref offset 1.5 dB 10 dBddv 10 dBddv 1	#VBW 62 kHz	04-69-49.04 Aug 22, 2227 Raidio Stat: None Raidio Device: BTS Mkr: 22, 44905888 GHz -15, 865 dBm -2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		Void	
Occupied Bandwidth 1.2083 MHz Transmit Freq Error +15.931 kHz x dB Bandwidth 1.377 MHz	OBW Power 99.00 %				



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#### 20dB Bandwidth:



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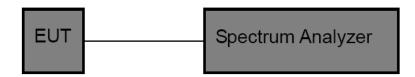
# 3.6. Channel Separation

Limit

## FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1)

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)  $\geq$  3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

#### Test Mode

Please refer to the clause 2.4.

#### Test Result

Test Mode	Frequency (MHz)	Carrier Frequencies Separation (MHz)	Limit (MHz)	Verdict
GFSK	Hop_2441	0.9910	>0.665	Pass
π/4-DQPSK	Hop_2441	1.0111	>0.899	Pass
8-DPSK	Hop_2441	1.0090	>0.871	Pass

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Test plot as follows:

glend Spectrum Analyzer Swept SA R T R <sup>2</sup> 50 2 AC GHZ PN0: Wide →→ Trig: Free Run FFGaint.ev #Atten: 30 dB	ALIGNAUTO 05:03:22 AM Aug 23, 2023 Avg Type: Log-Pwr Avg jHold: 100/100 1992 DEP P P P P P	Adlent Spectrum Analyzer - Swipt SA 27 R T RF \$502 AC Center Freq 2:440500000 GHz PN0: Wide → Trig: Free IFGaint.ow #Atten: 34	ALIGNAUTO 05:32:14 AM Aug 23, 2022 Avg Type: Log-Pwr TRACE Pool 5 Run Avg Hold: 100/100 Type
Ref Offset 1.5 dB 0 dB/div Ref 15.00 dBm	∆Mkr1 991.0 kHz 0.309 dB	Ref Offset 1.5 dB 10 dB/div Ref 15.00 dBm	ΔMkr1 1.011 1 MH: -0.279 dE
	φ <sup>1Δ2</sup>		
50 50 50		-350 	
60 60 50 enter 2.440500 GHz	Span 3.000 MHz	500 650 .550 Center 2.440500 GHz	Soar 2 00 Mi
Res BW 100 kHz #VBW 300 kHz	Sweep 1.333 ms (10000 pts)	#Res BW 100 kHz #VBW 300 kH:	Span 3.000 MH z Sweep 1.333 ms (10000 pts istatusi
GFSK		π/4D0	QPSK
slent Spectrum Analyzer - Swept SA R T F 500 SC Sector S	ALISVI AUTO 0549-43.4M Aug 23, 2023 Avg Type: Log-Pwr TRACE 122.4 Avg]Heid: 100/100 trace 12.42.42 Avg]Heid: 100/100		
D dB/dev Ref 30.00 dBm	ΔMkr1 1.009 0 MHz 0.049 dB		
20 Januar Manager Share	mandeline 102 mandeline manual manual manual manual	Void	
00 enter 2.440500 GHz Res BW 100 kHz #VBW 300 kHz	Span 3.000 MHz Sweep 1.333 ms (10000 pts)		
RES BW 100 KHZ #VBW J00 KHZ	STATUS		

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