

SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch

> Report No.: SHEM180200122801 Page: 1 of 46

# TEST REPORT

Application No.:	SHEM1802001228CR	
FCC ID:	2AFF6OG5IUAM	
Applicant:	Adam Hall GmbH	
Address of Applicant:	Adam-Hall-Str. 1, 61267 Neu-Anspach, Germany	
Manufacturer:	Adam Hall GmbH	
Address of Manufacturer:	Adam-Hall-Str. 1, 61267 Neu-Anspach, Germany	
Factory:	Speaker Electronic (Jia Shan) Co., Lltd	
Address of Factory:	No. 8 Development Zone Road, Huimin Sub-district, JiaShan County, Zhejiang, 314112, P.R. China	
Equipment Under Test (EUT):		
EUT Name:	Active PA Box	
Model No.:	MAUI® 5 GO	
Trade mark:	LD SYSTEMS	
Standard(s) :	47 CFR Part 15, Subpart C 15.247	
Date of Receipt:	2019-03-12	
Date of Test:	2019-03-12 to 2019-04-03	
Date of Issue:	2019-11-26	
Test Result:	Pass*	

\* In the configuration tested, the EUT complied with the standards specified above.

parlan shan

Parlam Zhan E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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NO.588 West Jir	ndu Road, Songjiang District, Shang	hai,China	201612
中国・上海・	松江区金都西路588号	邮编:	201612

t(86-21) 61915666 f(86-21) 61915678 www.sgsgroup.com.cn t(86-21) 61915666 f(86-21) 61915678 e sgs.china@sgs.com



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Revision Record			
Version	Description	Date	Remark
00	Original	2019-11-26	/

Authorized for issue by:		
	Bril Wu	
	Bill Wu / Project Engineer	
	parlam zhan	
	Parlam Zhan / Reviewer	

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## 2 Test Summary

Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h )	Pass

Radio Spectrum Matter Part				
ltem	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
99% Occupied Bandwidth	47 CFR Part 15, Subpart C 15.247	RSS-Gen section 6.6	RSS-Gen section 6.6	Pass



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## 4 General Information

## 4.1 Details of E.U.T.

Power supply:	100-120V AC / 50-60Hz
	200-240V AC / 50-60Hz
	Max. 300W
Test voltage:	AC 120V, 60Hz
Cable:	AC Cable: 150cm
Antenna Gain	1.54dBi
Antenna Type	PCB
Channel Spacing	1MHz
Modulation Type	GFSK, π/4DQPSK, 8DPSK
Number of Channels	79
Operation Frequency	2402MHz to 2480MHz
Spectrum Spread Technology	Frequency Hopping Spread Spectrum(FHSS)

## 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±8.4 x 10-8
2	Timeout	±2s
3	Duty cycle	±0.37%
4	Occupied Bandwidth	±3%
5	RF conducted power	±0.6dB
6	RF power density	±2.84dB
7	Conducted Spurious emissions	±0.75dB
8	PE Dedicted newsr	±4.6dB (Below 1GHz)
0	RF Radiated power	±4.1dB (Above 1GHz)
		±4.2dB (Below 30MHz)
9	Radiated Spurious emission test	±4.4dB (30MHz-1GHz)
9		±4.8dB (1GHz-18GHz)
		±5.2dB (Above 18GHz)
10	Temperature test	±1°C
11	Humidity test	±3%
12	Supply voltages	±1.5%
13	Time	±3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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#### 4.4 Test Location

All tests were performed at: SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch 588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China Tel: +86 21 6191 5666 Fax: +86 21 6191 5678 No tests were sub-contracted.

#### 4.5 Test Facility

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

#### • CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

#### NVLAP (Certificate No. 201034-0)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program(NVLAP). Certificate No. 201034-0.

#### • FCC – Designation Number: CN5033

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

Designation Number: CN5033. Test Firm Registration Number: 479755.

#### Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

IC Registration No.: 8617A-1. CAB Identifier: CN0020.

#### VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

## 4.6 Deviation from Standards

None

### 4.7 Abnormalities from Standard Conditions

None

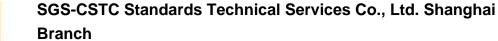


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#### 5 **Equipment List**

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Conducted Emission at AC	Power Line				
EMI test receiver	R&S	ESR7	SHEM162-1	2018-12-20	2019-12-19
LISN	Schwarzbeck	NSLK8127	SHEM061-1	2018-12-20	2019-12-19
LISN	EMCO	3816/2	SHEM019-1	2018-12-20	2019-12-19
Pulse limiter	R&S	ESH3-Z2	SHEM029-1	2018-12-20	2019-12-19
CE test Cable	/	CE01	/	2018-12-26	2019-12-25
Conducted Test			I		
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2018-12-20	2019-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2018-09-26	2019-09-25
Power meter	R&S	NRP	SHEM057-1	2018-12-26	2019-12-25
Power Sensor	R&S	NRP-Z22	SHEM136-1	2018-07-22	2019-07-21
Power Sensor	R&S	NRP-Z91	SHEM057-2	2018-12-26	2019-12-25
Signal Generator	R&S	SMR40	SHEM058-1	2018-07-03	2019-07-02
Signal Generator	Agilent	N5182A	SHEM182-1	2018-09-26	2019-09-25
Communication Tester	R&S	CMW270	SHEM183-1	2018-10-22	2019-10-21
Switcher	Tonscend	JS0806	SHEM184-1	2018-09-26	2019-09-25
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2018-09-26	2019-09-25
AC Power Stabilizer	WOCEN	6100	SHEM045-1	2018-12-26	2019-12-25
DC Power Supply	QJE	QJ30003SII	SHEM046-1	2018-12-26	2019-12-25
Conducted test Cable	/	RF01, RF 02	/	2018-12-26	2019-12-25
Radiated Test					
EMI test receiver	R&S	ESU40	SHEM051-1	2018-12-20	2019-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2018-12-20	2019-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2020-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2020-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2020-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2017-10-24	2020-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2020-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-12-03	2020-12-02
Pre-amplifier (9KHz-2GHz)	CLAVIIO	BDLNA-0001-412010	SHEM164-1	2018-08-22	2019-08-21
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118-352810	SHEM050-2	2018-08-22	2019-08-21
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2018-12-20	2019-12-19
Band filter	LORCH	9BRX-875/X150-SR	SHEM156-1	/	/
Band filter	LORCH	13BRX-1950/X500-SR	SHEM083-2	/	/
Band filter	LORCH	5BRX-2400/X200-SR	SHEM155-1	/	/
Band filter	LORCH	5BRX-5500/X1000-SR	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G-100SS	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700-3SS	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2020-07-21
RE test Cable	/	RE01, RE02, RE06	/	2018-12-26	2019-12-25





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## 6 Radio Spectrum Technical Requirement

#### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

#### 6.1.2 Conclusion

Standard Requirement:

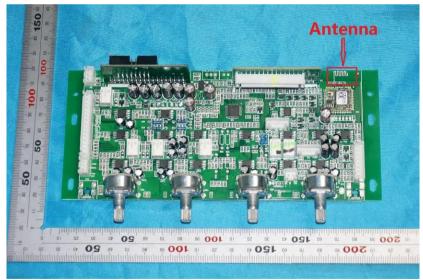
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is 1.54dBi.



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# 6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

#### 6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

#### 6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

#### Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band s



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#### **Radio Spectrum Matter Test Results** 7

#### 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement	47 CFR Part 15, Subpart C 15.207
Test Method:	ANSI C63.10 (2013) Section 6.2
Limit:	

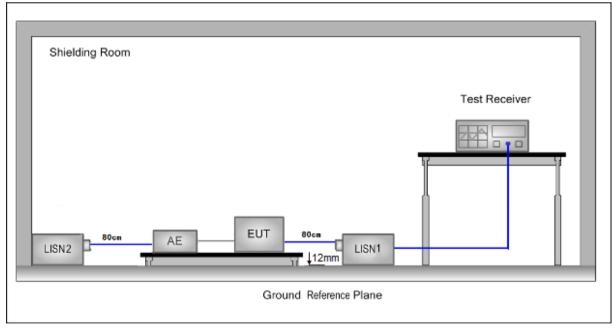
Execution of emission (MUT)	Conducted limit(dBµV)				
Frequency of emission(MHz)	Quasi-peak	Average			
0.15-0.5	66 to 56*	56 to 46*			
0.5-5	56	46			
5-30	60	50			
*Decreases with the logarithm of the frequency.					

#### 7.1.1 E.U.T. Operation

**Operating Environment:** 

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1001 mbar Test mode b:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.1.2 Test Setup Diagram



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#### 7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50 $\mu$ H + 50hm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

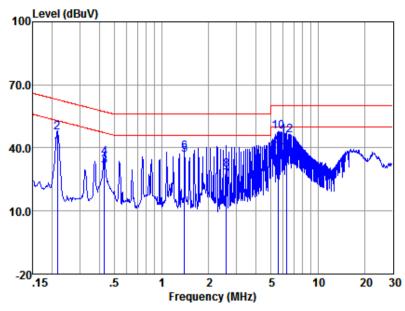
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor



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Mode:b; Line:Live Line



LISN : LINE EUT/Project No : 1229CR Test Mode : b

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.22	30.33	0.11	9.81	40.25	53.01	-12.76	Average
2	0.22	37.38	0.11	9.81	47.30	63.01	-15.71	QP
3	0.43	21.48	0.11	9.82	31.41	47.24	-15.83	Average
4	0.43	25.44	0.11	9.82	35.37	57.24	-21.87	QP -
5	1.40	26.77	0.11	9.84	36.72	46.00	-9.28	Average
6	1.40	28.27	0.11	9.84	38.22	56.00	-17.78	QP
7	2.59	14.69	0.12	9.85	24.66	46.00	-21.34	Average
8	2.59	19.82	0.12	9.85	29.79	56.00	-26.21	QP
9	5.59	30.48	0.11	9.86	40.45	50.00	-9.55	Average
10	5.59	37.87	0.11	9.86	47.84	60.00	-12.16	QP
11	6.35	27.81	0.11	9.86	37.78	50.00	-12.22	Average
12	6.35	36.15	0.11	9.86	46.12	60.00	-13.88	QP

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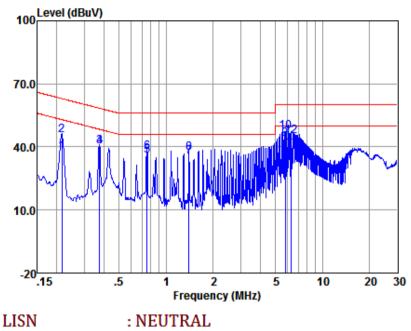
Notes: Emission Level = Read Level +LISN Factor + Cable loss



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Mode:b; Line:Neutral Line



EUT/Project No : 1229CR Test Mode : b

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.22	27.65	0.11	9.81	37.57	53.01	-15.44	Average
2	0.22	35.44	0.11	9.81	45.36	63.01	-17.65	QP
3	0.38	30.18	0.11	9.81	40.10	48.39	-8.29	Average
4	0.38	30.44	0.11	9.81	40.36	58.39	-18.03	QP
5	0.75	25.81	0.11	9.83	35.75	46.00	-10.25	Average
6	0.75	27.81	0.11	9.83	37.75	56.00	-18.25	QP
7	1.40	25.54	0.12	9.84	35.50	46.00	-10.50	Average
8	1.40	27.08	0.12	9.84	37.04	56.00	-18.96	QP
9	5.80	33.59	0.13	9.86	43.58	50.00	-6.42	Average
10	5.80	37.40	0.13	9.86	47.39	60.00	-12.61	QP
11	6.35	29.34	0.13	9.86	39.33	50.00	-10.67	Average
12	6.35	35.32	0.13	9.86	45.31	60.00	-14.69	QP



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#### 7.2 Conducted Peak Output Power

Test Requirement	47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.5
Limit:	

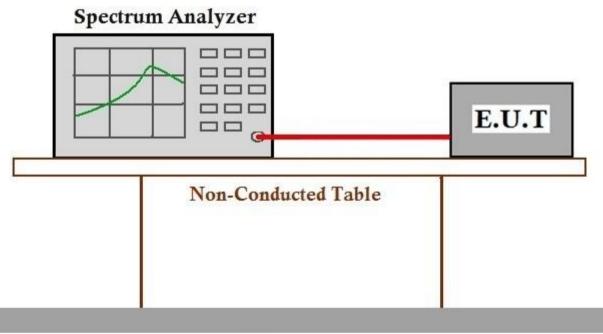
Frequency range(MHz)	Output power of the intentional radiator(watt)
	1 for ≥50 hopping channels
902-928	0.25 for 25≤ hopping channels <50
	1 for digital modulation
	1 for ≥75 non-overlapping hopping channels
2400-2483.5	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

#### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature:21 °CHumidity:45 % RHAtmospheric Pressure:1010 mbarTest modeb:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK<br/>modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been<br/>tested and only the data of worst case is recorded in the report.

#### 7.2.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.2.3 Measurement Procedure and Data





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#### 7.3 20dB Bandwidth

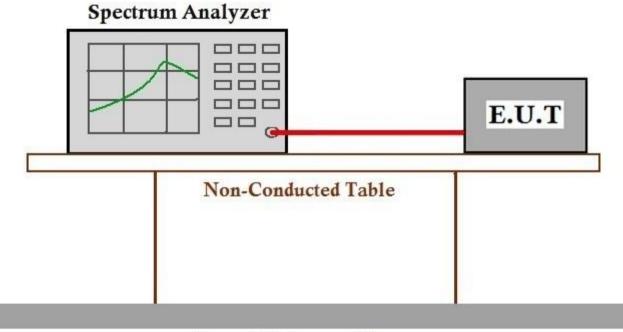
Test Requirement47 CFR Part 15, Subpart C 15.247(a)(1)Test Method:ANSI C63.10 (2013) Section 6.9

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: Test mode 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar b:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi$ /4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.3.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.3.3 Measurement Procedure and Data



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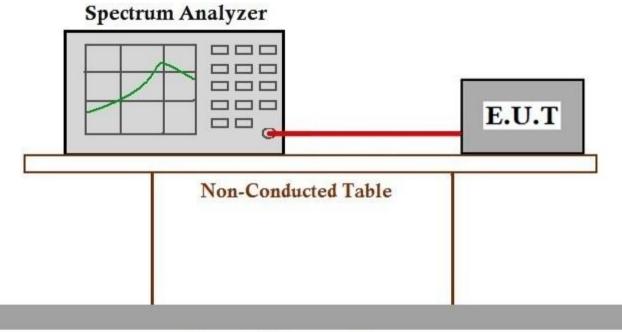
#### 7.4 Carrier Frequencies Separation

Test Requirement	47 CFR Part 15, Subpart C 15.247a(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.2
Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

#### 7.4.1 E.U.T. Operation

Operating Environment:

#### 7.4.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.4.3 Measurement Procedure and Data



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15

75

#### 7.5 Hopping Channel Number

2400-2483.5

5725-5850

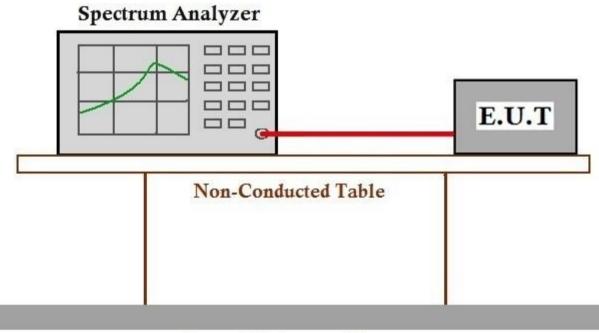
Test Requirement	47 CFR P	art 15, Subpart C 15.247a(1)(iii)		
Test Method:	ANSI C63.10 (2013) Section 7.8.3			
Limit:				
Frequency range(MHz)		Number of hopping channels (minimum)		
	(			
	(	50 for 20dB bandwidth <250kHz		
902-928	(2)			

#### 7.5.1 E.U.T. Operation

**Operating Environment:** 

Temperature:21 °CHumidity:45 % RHAtmospheric Pressure:1010 mbarTest modea:TX\_Hop mode: Keep the EUT in frequency hopping mode with GFSK<br/>modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been<br/>tested and only the data of worst case is recorded in the report.

#### 7.5.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.5.3 Measurement Procedure and Data



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#### 7.6 Dwell Time

**Test Requirement** Test Method:

47 CFR Part 15, Subpart C 15.247a(1)(iii) ANSI C63.10 (2013) Section 7.8.4

Limit:

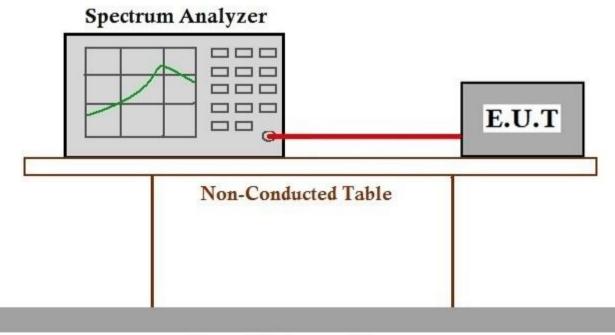
Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400 2402 5	0.4S within a period of 0.4S multiplied by the number
2400-2483.5	of hopping channels
5725-5850	0.4S within a 30S period

#### 7.6.1 E.U.T. Operation

**Operating Environment:** 

Humidity: 45 % RH Temperature: 21 °C Atmospheric Pressure: 1010 mbar a:TX Hop mode: Keep the EUT in frequency hopping mode with GFSK Test mode modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.6.2 Test Setup Diagram



## Ground Reference Plane

#### 7.6.3 Measurement Procedure and Data



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#### 7.7 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.6
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

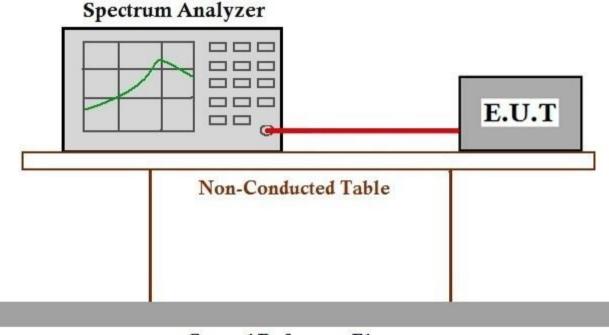
#### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature:	21 °C	Humidity:	45	% RH	Atmospheric Pressure: 1010 mbar
Pretest these mode to find the	modulation, τ	τ/4DQPSK mo	dulat	ion, 8DPS	cy hopping mode with GFSK K modulation. All modes have been
worst case:	tested and or	tested and only the data of worst case is recorded in the report.			
	h·TX non-Ho	n mode Keer	the l	ELIT in cor	tinuously transmitting mode with GESK

b:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.7.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.7.3 Measurement Procedure and Data

NO.588 West Jindu Road, Songjiang District, Shanghai, China 201612 198521)61915868 188-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|61915868 1986-21|619

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#### 7.8 Conducted Spurious Emissions

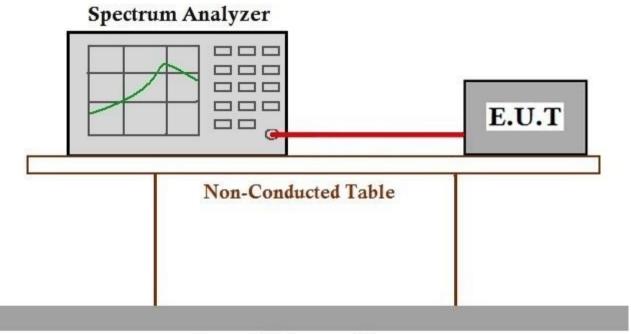
Test Requirement Test Method: Limit:	47 CFR Part 15, Subpart C 15.247(d) ANSI C63.10 (2013) Section 7.8.8 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)
	310.200(4) (000 310.200(0)

#### 7.8.1 E.U.T. Operation

Operating Environment:

Temperature:21 °CHumidity:45 % RHAtmospheric Pressure:1010 mbarTest modeb:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK<br/>modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been<br/>tested and only the data of worst case is recorded in the report.

#### 7.8.2 Test Setup Diagram



## **Ground Reference Plane**

#### 7.8.3 Measurement Procedure and Data



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#### 7.9 Radiated Emissions which fall in the restricted bands

Test Requirement	47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method:	ANSI C63.10 (2013) Section 6.10.5
Limit:	

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.9.1 E.U.T. Operation

Operating Environment:

Temperature:21 °CHumidity:45 % RHAtmospheric Pressure:1010 mbarTest modeb:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK<br/>modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been<br/>tested and only the data of worst case is recorded in the report.

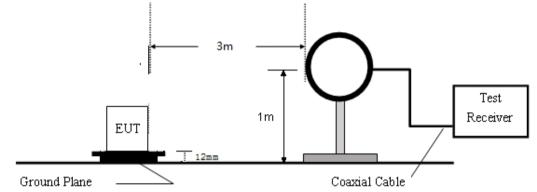


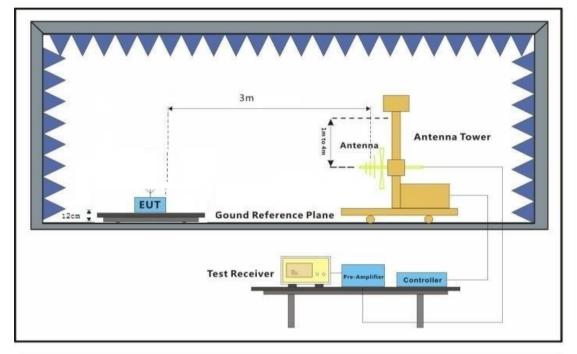
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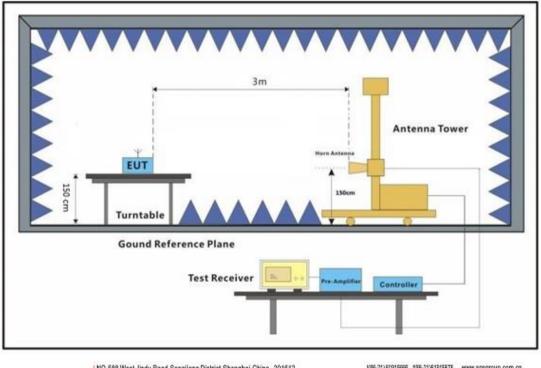
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7.9.2 Test Setup Diagram







1(86-21)61915666 1(86-21)61915678 www.sgsgroup.com.cn 1(86-21)61915666 1(86-21)61915678 e sgs.china@sgs.com

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#### 7.9.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

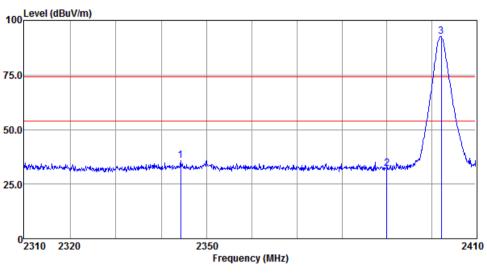
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Antenna Polarity :HORIZONTAL

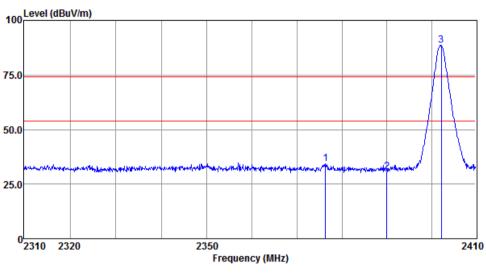
Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2344.22	40.67	25.97	6.40	37.37	35.67	74.00	-38.33	Peak
2 2390.00	36.80	26.03	6.47	37.36	31.94	74.00	-42.06	Peak
3 2402.25	97.40	26.05	6.50	37.35	92.60	74.00	18.60	Peak



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Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



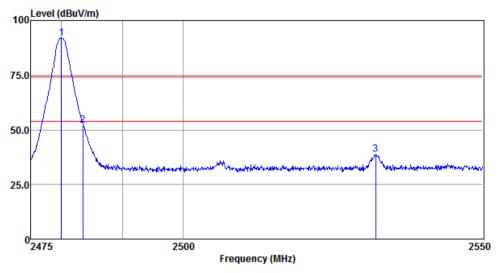
Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2376.23	39.31	26.01	6.45	37.36	34.41	74.00	-39.59	Peak
2 2390.00	35.51	26.03	6.47	37.36	30.65	74.00	-43.35	Peak
3 2402.25	93.26	26.05	6.50	37.35	88.46	74.00	14.46	Peak



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Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



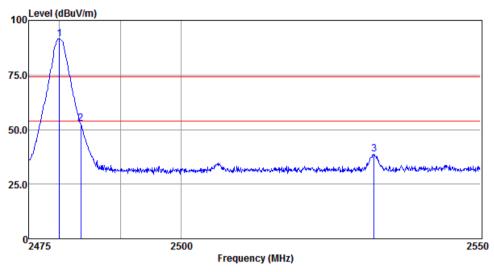
Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2479.96	96.50	26.17	6.74	37.49	91.92	74.00	17.92	Peak
2 2483.50	56.70	26.18	6.80	37.51	52.17	74.00	-21.83	Peak
3 2532.02	42.95	26.29	7.01	37.59	38.66	74.00	-35.34	Peak



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Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High



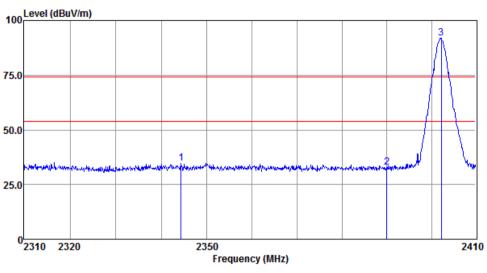
Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2479.96	96.04	26.17	6.74	37.49	91.46	74.00	17.46	Peak
2 2483.50	57.15	26.18	6.80	37.51	52.62	74.00	-21.38	Peak
3 2532.10	42.90	26.29	7.01	37.59	38.61	74.00	-35.39	Peak



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Mode:b; Polarization:Horizontal; Modulation:π/4 DQPSK; ; Channel:Low



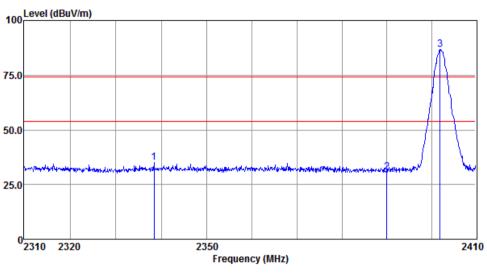
Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2344.32	39.81	25.97	6.40	37.37	34.81	74.00	-39.19	Peak
2 2390.00	37.60	26.03	6.47	37.36	32.74	74.00	-41.26	Peak
3 2402.25	96.78	26.05	6.50	37.35	91.98	74.00	17.98	Peak



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Mode:b; Polarization:Vertical; Modulation: $\pi/4$  DQPSK; ; Channel:Low



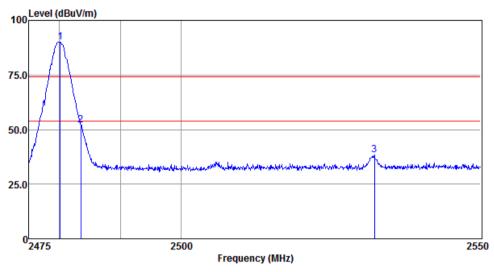
Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2338.37	40.10	25.96	6.40	37.37	35.09	74.00	-38.91	Peak
2 2390.00	35.44	26.03	6.47	37.36	30.58	74.00	-43.42	Peak
3 2401.95	91.41	26.05	6.50	37.35	86.61	74.00	12.61	Peak



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Mode:b; Polarization:Horizontal; Modulation:π/4 DQPSK; ; Channel:High



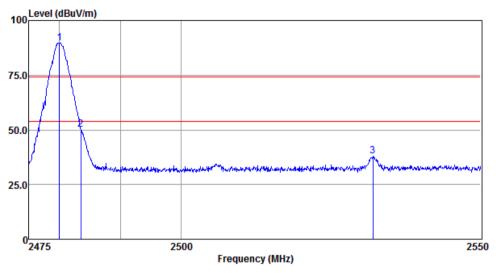
Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2480.10	94.61	26.17	6.74	37.49	90.03	74.00	16.03	Peak
2 2483.50	56.48	26.18	6.80	37.51	51.95	74.00	-22.05	Peak
3 2532.17	42.50	26.29	7.01	37.59	38.21	74.00	-35.79	Peak



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Mode:b; Polarization:Vertical; Modulation:π/4 DQPSK; ; Channel:High



Antenna Polarity :VERTICAL

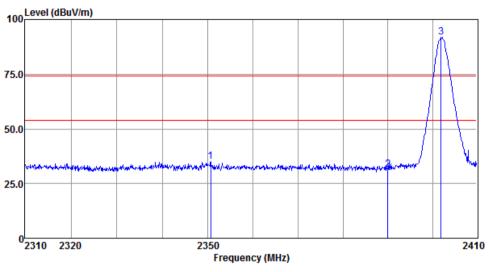
Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2479.96	94.38	26.17	6.74	37.49	89.80	74.00	15.80	Peak
2 2483.50	54.79	26.18	6.80	37.51	50.26	74.00	-23.74	Peak
3 2531.87	42.38	26.29	7.01	37.59	38.09	74.00	-35.91	Peak



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Mode:b; Polarization:Horizontal; Modulation:8DPSK; ; Channel:Low



Antenna Polarity :HORIZONTAL

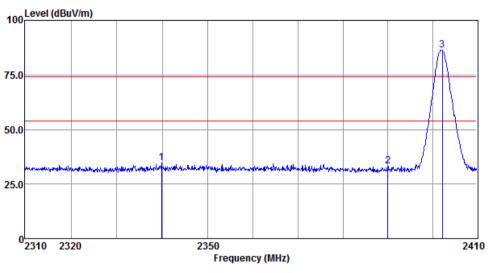
Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2350.59	39.88	25.98	6.40	37.36	34.90	74.00	-39.10	Peak
2 2390.00	36.41	26.03	6.47	37.36	31.55	74.00	-42.45	Peak
3 2401.95	96.77	26.05	6.50	37.35	91.97	74.00	17.97	Peak



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Mode:b; Polarization:Vertical; Modulation:8DPSK; ; Channel:Low



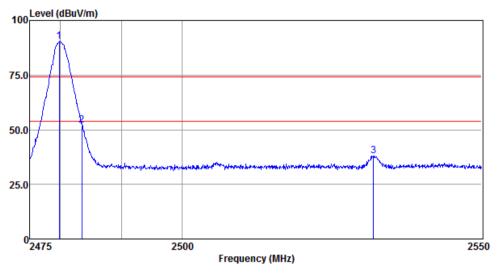
Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2339.76	39.60	25.96	6.40	37.37	34.59	74.00	-39.41	Peak
2 2390.00	38.07	26.03	6.47	37.36	33.21	74.00	-40.79	Peak
3 2402.25	91.32	26.05	6.50	37.35	86.52	74.00	12.52	Peak



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Mode:b; Polarization:Horizontal; Modulation:8DPSK; ; Channel:High



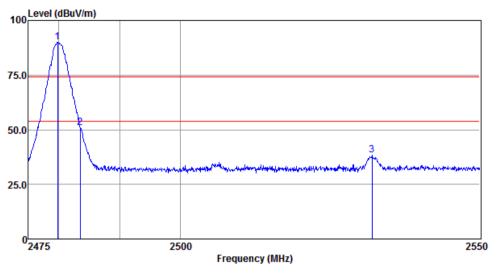
Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2479.81	94.94	26.17	6.74	37.49	90.36	74.00	16.36	Peak
2 2483.50	56.43	26.18	6.80	37.51	51.90	74.00	-22.10	Peak
3 2531.80	42.48	26.29	7.01	37.59	38.19	74.00	-35.81	Peak



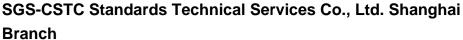
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Mode:b; Polarization:Vertical; Modulation:8DPSK; ; Channel:High



Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1 2479.81	94.57	26.17	6.74	37.49	89.99	74.00	15.99	Peak
2 2483.50	55.58	26.18	6.80	37.51	51.05	74.00	-22.95	Peak
3 2531.87	42.65	26.29	7.01	37.59	38.36	74.00	-35.64	Peak





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#### 7.10 Radiated Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method:	ANSI C63.10 (2013) Section 6.10.4
Limit:	

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.10.1 E.U.T. Operation

Operating Environment:

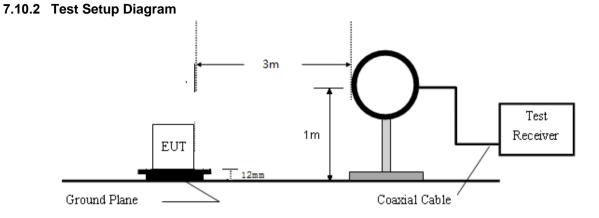
Temperature:21 °CHumidity:45 % RHAtmospheric Pressure:1010 mbarTest modeb:TX\_non-Hop mode: Keep the EUT in continuously transmitting mode with GFSK<br/>modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been<br/>tested and only the data of worst case is recorded in the report.

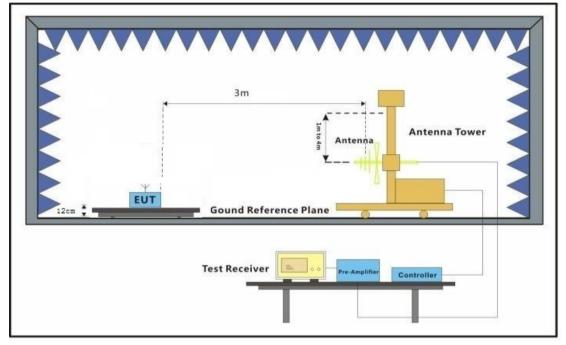


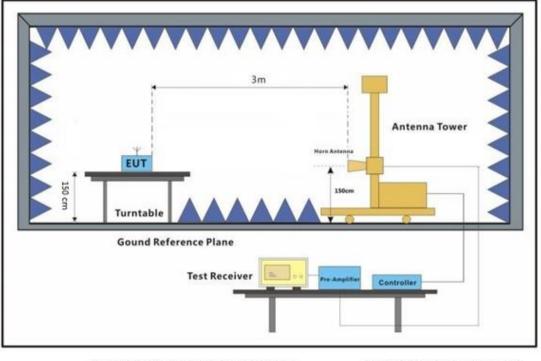
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NO.588 West Jindu Road, Songjiang District, Shanghai, China 201612 中国•上海•松江区金都西路588号 邮编: 201612 1(86-21)61915666 1(86-21)61915678 www.sgsgroup.com.cn 1(86-21)61915666 1(86-21)61915678 e sgs.china@sgs.com

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#### 7.10.3 Measurement Procedure and Data

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a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

#### Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

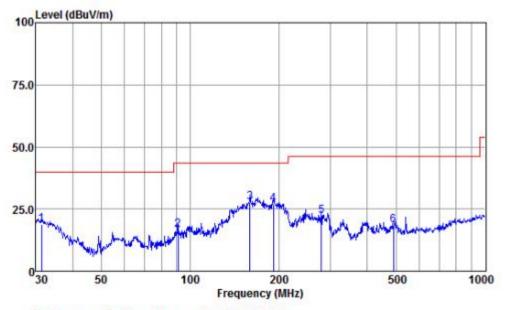
4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown



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30MHz-1GHz:



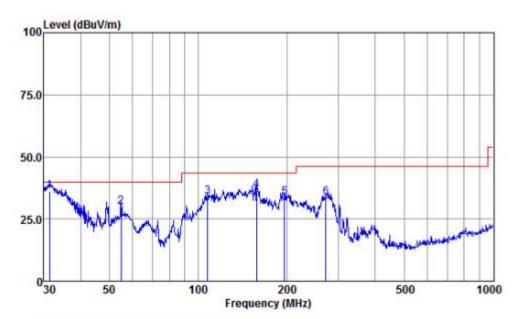
Antenna Polarity :HORIZONTAL

		Read	Antenna	Cable	Preamp	Emission	Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	31.40	45.85	15.46	0.19	42.60	18.90	40.00	-21.10	QP
2	91.17	50.74	8.29	0.42	42.68	16.77	43.50	-26.73	QP
3	159.78	56.58	13.10	0.63	42.59	27.72	43.50	-15.78	QP
4	191.75	58.52	10.12	0.68	42.54	26.78	43.50	-16.72	QP
5	279.04	51.39	12.51	0.81	42.42	22.29	46.00	-23.71	QP
6	489.03	42.36	17.00	1.16	42.14	18.38	46.00	-27.62	QP



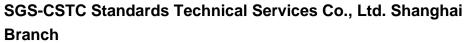
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Antenna Polarity :VERTICAL

		Read	Antenna	Cable	Preamp	Emission	Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	31.40	63.03	15.46	0.19	42.60	36.08	40.00	-3.92	QP
2	54.83	60.79	11.60	0.28	42.65	30.02	40.00	-9.98	QP
3	107.89	66.41	9.58	0.49	42.70	33.78	43.50	-9.72	QP
4	158.11	65.63	12.90	0.63	42.60	36.56	43.50	-6.94	QP
5	196.51	65.86	9.70	0.69	42.53	33.72	43.50	-9.78	QP
6	271.32	62.97	12.25	0.80	42.43	33.59	46.00	-12.41	QP





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Above 10 Mode:b:	GHz: Polarization:Ho	orizontal: Mo	odulation:	GFSK: : C	hannel:Low			
Mark	Frequency I		actor	Emission			Ant.Pos	
mark		dBuV d			dBuV/m	dB	cm	
	4804	38.00	6.18					peak
	7206	37.88	10.63					peak
*	9608	34.67	14.38					peak
	2000	5 1.07	11.50	17:05	51	1.95		peuk
	Polarization:Ve							
Mark	Frequency I	_	actor	Emission		Margin	Ant.Pos	
		dBuV d		dBuV/m		dB	cm	
	4804	36.96	6.18					peak
	7206	34.52				-8.85		peak
*	9608	35.65	14.38	50.03	54	-3.97		peak
Mode:b;	Polarization:Ho	orizontal; Mo	dulation:	GFSK; ; C	hannel:mide	dle		
Mark	Frequency I		actor	Emission			Ant.Pos	
	MHz o	dBuV d	В	dBuV/m	dBuV/m	dB	cm	
	4882	37.03	7.00	44.03	54	-9.97		peak
	7323	39.17	11.13	50.30	54	-3.70		peak
*	9764	32.71	14.36	47.07	54	-6.93		peak
Mode:b;	Polarization:Ve	ertical; Modu	lation:GF	- SK; ; Cha	nnel:middle			
Mark	Frequency I		actor	Emission		Margin	Ant.Pos	
	MHz o	dBuV di	В	dBuV/m		dB	cm	
	4882	34.72	7.00	41.72	54	-12.28		peak
*	7323	37.03	11.13	48.16	54	-5.84		peak
	9764	31.60	14.36	45.96	54	-8.04		peak
Mode.p.	Polarization:Ho	orizontal: Mo	odulation.	GESK · C	hannel High	ı		
	Frequency I				-		Ant.Pos	
		dBuV d			dBuV/m		cm	
	4960	35.59	7.49					peak
	7440	35.86	11.65			-6.49		peak
*	9920	30.03	14.40					peak
								F
	Polarization:Ve				-			
Mark		RX_R F			Limit	_	Ant.Pos	
		dBuV di			dBuV/m		cm	
ste	4960	39.17	7.49					peak
*	7440	36.95	11.65	48.60	54	-5.40		peak
	9920	33.06	14.40					peak



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Mode:b;	Polarization:Horiz	zontal; Moo	lulation:	π/4 DQPSk	K; ; Channe	el:Low		
Mark	Frequency RX	K_R Fa	ctor	Emission	Limit	Margin	Ant.Pos	
	MHz dB	uV dB		dBuV/m	dBuV/m	dB	cm	
	4804	38.87	6.18	45.05	54	-8.95		peak
	7206	40.12	10.63	50.75	54	-3.25		peak
*	9608	31.29	14.38	45.67	54	-8.33		peak
Mode:b;	Polarization:Verti	cal; Modula	ation:π/4	4 DQPSK;	; Channel:L	ow		
Mark	Frequency RX	K_R Fa	ctor	Emission	Limit	Margin	Ant.Pos	
	MHz dB	uV dB		dBuV/m	dBuV/m	dB	cm	
	4804	33.47	6.18	39.65	54	-14.35		peak
	7206	34.53	10.63	45.16	54	-8.84		peak
*	9608	33.61	14.38	47.99	54	-6.01		peak
Mode:b;	Polarization:Horiz	zontal; Moo	lulation:	π/4 DQPSk	K; ; Channe	el:middle		
Mark	Frequency RX	K_R Fa	ctor	Emission	Limit	Margin	Ant.Pos	
	MHz dB	uV dB		dBuV/m	dBuV/m	dB	cm	
	4882	38.47	7.00	45.47	54	-8.53		peak
	7323	36.18	11.13	47.31	54	-6.69		peak
*	9764	33.46	14.36	47.82	54	-6.18		peak
Mode:b;	Polarization:Verti	cal; Modula	ation:π/4	4 DQPSK;	; Channel:r	niddle		
<b>Mode:b;</b> Mark	Polarization:Vert		ation:π/4 ctor	4 DQPSK; Emission		niddle Margin	Ant.Pos	
	Frequency RX		ctor		Limit		Ant.Pos cm	
	Frequency RX	K_R Fa	ctor	Emission dBuV/m	Limit dBuV/m	Margin dB	cm	peak
	Frequency RX MHz dB	K_R Fa uV dB	ctor	Emission dBuV/m 43.56	Limit dBuV/m 54	Margin dB -10.44	cm	peak peak
Mark	Frequency RX MHz dB 4882	X_R Fac uV dB 36.56	ctor 7.00	Emission dBuV/m 43.56 48.50	Limit dBuV/m 54 54	Margin dB -10.44 -5.50	cm	-
Mark *	Frequency RX MHz dB 4882 7323	K_R Fac uV dB 36.56 37.37 32.73	7.00 7.00 11.13 14.36	Emission dBuV/m 43.56 48.50 47.09	Limit dBuV/m 54 54 54	Margin dB -10.44 -5.50 -6.91	cm	peak
Mark *	Frequency RX MHz dB 4882 7323 9764	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc	7.00 7.00 11.13 14.36	Emission dBuV/m 43.56 48.50 47.09	Limit dBuV/m 54 54 54 K; ; Channe	Margin dB -10.44 -5.50 -6.91	cm	peak
Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc	ctor 7.00 11.13 14.36 dulation: ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission	Limit dBuV/m 54 54 54 K; ; Channe	Margin dB -10.44 -5.50 -6.91 el:High Margin	cm	peak
Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac	ctor 7.00 11.13 14.36 dulation: ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSP Emission dBuV/m	Limit dBuV/m 54 54 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB	cm Ant.Pos cm	peak
Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB	X_R Fac uV dB 36.56 37.37 32.73 zontal; Moc X_R Fac uV dB	ctor 7.00 11.13 14.36 Julation: ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52	Limit dBuV/m 54 54 54 54 54 54 C; ; Channe Limit dBuV/m 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48	cm Ant.Pos cm	peak peak
Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03	ctor 7.00 11.13 14.36 dulation: ctor 7.49	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62	Limit dBuV/m 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38	cm Ant.Pos cm	peak peak peak
Mark * Mode:b; Mark	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960 7440	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62 49.85	Limit dBuV/m 54 54 54 54 54 54 Limit dBuV/m 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38 -4.15	cm Ant.Pos cm	peak peak peak peak
Mark * Mode:b; Mark	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960 7440 9920	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45 cal; Modula	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62 49.85	Limit dBuV/m 54 54 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38 -4.15	cm Ant.Pos cm	peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960 7440 9920 Polarization:Verti Frequency RX	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45 cal; Modula	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40 ation:π/4 ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62 49.85	Limit dBuV/m 54 54 54 54 54 54 Channe 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38 -4.15	cm Ant.Pos cm	peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960 7440 9920 Polarization:Verti Frequency RX	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45 cal; Modula K_R Fac	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40 ation:π/4 ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62 49.85 4 DQPSK; Emission dBuV/m	Limit dBuV/m 54 54 54 54 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38 -4.15 High Margin dB	cm Ant.Pos cm	peak peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX MHz dB 4882 7323 9764 Polarization:Hori: Frequency RX MHz dB 4960 7440 9920 Polarization:Verti Frequency RX MHz dB	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45 cal; Modula K_R Fac uV dB	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40 ation:π/4 ctor	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.62 49.85 4 DQPSK; Emission dBuV/m 45.17	Limit dBuV/m 54 54 54 54 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 el:High Margin dB -9.48 -4.38 -4.15 High Margin dB -8.83	cm Ant.Pos cm	peak peak peak peak
Mark * Mode:b; Mark * Mode:b; Mark	Frequency RX MHz dB 4882 7323 9764 Polarization:Horiz Frequency RX MHz dB 4960 7440 9920 Polarization:Verti Frequency RX MHz dB 4960	K_R Fac uV dB 36.56 37.37 32.73 zontal; Moc K_R Fac uV dB 37.03 37.97 35.45 cal; Modula K_R Fac uV dB 37.68	ctor 7.00 11.13 14.36 dulation: ctor 7.49 11.65 14.40 ation:π/4 ctor 7.49	Emission dBuV/m 43.56 48.50 47.09 π/4 DQPSF Emission dBuV/m 44.52 49.85 4 DQPSK; Emission dBuV/m 45.17 49.24	Limit dBuV/m 54 54 54 54 54 54 54 54 54 54 54 54 54	Margin dB -10.44 -5.50 -6.91 High Margin dB -9.48 -4.38 -4.15 High Margin dB -8.83 -4.76	cm Ant.Pos cm	peak peak peak peak peak



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Mode:b;	Polarization:Horizontal	; Modulation	:8DPSK; ; (	Channel:Lov	w		
Mark	Frequency RX_R		Emission		e	Ant.Pos	
	MHz dBuV	dB	dBuV/m	dBuV/m		cm	
	4804 39.4					-	peak
sk	7206 36.4					-	peak
*	9608 35.	50 14.38	49.98	54	-4.02	I	peak
Mode:b;	Polarization:Vertical;	Nodulation:8	DPSK; ; Ch	annel:Low			
Mark	Frequency RX_R	Factor	Emission	Limit	Margin	Ant.Pos	
	MHz dBuV	dB	dBuV/m	dBuV/m	dB	cm	
	4804 35.			54	-12.02	I	peak
	7206 38.4	49 10.63				I	peak
*	9608 32.	12 14.38	46.50	54	-7.50	I	peak
Mode:b;	Polarization:Horizontal	; Modulation	:8DPSK; ; (	Channel:mic	ddle		
Mark	Frequency RX_R	Factor	Emission	Limit	Margin	Ant.Pos	
	MHz dBuV	dB	dBuV/m	dBuV/m	dB	cm	
	4882 37.	00 7.00	) 44.00	54	-10.00	I	peak
	7323 37.	30 11.13	48.43	54	-5.57	I	peak
*	9764 36.	59 14.36	50.95	54	-3.05	I	peak
Mode:b;	Polarization:Vertical;	Modulation:8	)PSK;;Ch	annel:middl	е		
Mode:b; Mark	Polarization:Vertical; I Frequency RX_R	Modulation:8E Factor	DPSK; ; Ch Emission			Ant.Pos	
						Ant.Pos cm	
	Frequency RX_R	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	cm	peak
	Frequency RX_R MHz dBuV	Factor dB 54 7.00	Emission dBuV/m ) 43.64	Limit dBuV/m 54	Margin dB -10.36	cm I	peak peak
Mark	Frequency RX_R MHz dBuV 4882 36.	Factor dB 54 7.00 26 11.13	Emission dBuV/m ) 43.64 5 50.39	Limit dBuV/m 54 54	Margin dB -10.36 -3.61	cm I	
Mark *	Frequency RX_R MHz dBuV 4882 36. 7323 39.	Factor dB 54 7.00 26 11.13 59 14.36	Emission dBuV/m ) 43.64 3 50.39 5 50.95	Limit dBuV/m 54 54 54	Margin dB -10.36 -3.61 -3.05	cm I	beak
Mark *	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36.	Factor dB 54 7.00 26 11.13 59 14.36 ; Modulation	Emission dBuV/m ) 43.64 3 50.39 5 50.95	Limit dBuV/m 54 54 54 Channel:Hig	Margin dB -10.36 -3.61 -3.05 gh	cm I	beak
Mark * Mode:b;	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36. Polarization:Horizontal	Factor dB 54 7.00 26 11.13 59 14.36 ; Modulation Factor	Emission dBuV/m ) 43.64 3 50.39 5 50.95 6 50.95 8DPSK; ; ( Emission	Limit dBuV/m 54 54 54 Channel:Hig	Margin dB -10.36 -3.61 -3.05 <b>gh</b> Margin	cm I I I	beak
Mark * Mode:b;	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36. Polarization:Horizontal Frequency RX_R	Factor dB 54 7.00 26 11.13 59 14.36 ; <b>Modulation</b> Factor dB	Emission dBuV/m ) 43.64 5 50.39 5 50.95 (BDPSK; ; ) Emission dBuV/m	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m	Margin dB -10.36 -3.61 -3.05 gh Margin dB	cm I I Ant.Pos cm	beak
Mark * Mode:b;	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36. Polarization:Horizontal Frequency RX_R MHz dBuV	Factor dB 54 7.00 26 11.13 59 14.36 ; <b>Modulation</b> Factor dB 04 7.49	Emission dBuV/m ) 43.64 5 50.39 5 50.95 8DPSK; ; ( Emission dBuV/m 0 45.53	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54	Margin dB -10.36 -3.61 -3.05 <b>ph</b> Margin dB -8.47	cm I Ant.Pos cm	peak peak
Mark * Mode:b; Mark	Frequency RX_R MHz dBuV 4882 36.4 7323 39.3 9764 36.3 Polarization:Horizontal Frequency RX_R MHz dBuV 4960 38.4	Factor dB 54 7.00 26 11.13 59 14.36 ; <b>Modulation</b> Factor dB 04 7.49 58 11.65	Emission dBuV/m ) 43.64 50.39 5 50.95 <b>BDPSK</b> ; ; 0 Emission dBuV/m 0 45.53 5 47.23	Limit dBuV/m 54 54 54 54 Channel:Hig Limit dBuV/m 54 54	Margin dB -10.36 -3.61 -3.05 <b>gh</b> Margin dB -8.47 -6.77	cm I Ant.Pos cm I	peak peak
Mark * Mode:b; Mark *	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36. Polarization:Horizontal Frequency RX_R MHz dBuV 4960 38. 7440 35. 9920 36.	Factor dB 54 7.00 26 11.13 59 14.36 ; Modulation Factor dB 04 7.49 58 11.65 42 14.40	Emission dBuV/m ) 43.64 5 50.39 5 50.95 3 <b>8DPSK</b> ; ; ( Emission dBuV/m 0 45.53 5 47.23 5 50.82	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54 54 54	Margin dB -10.36 -3.61 -3.05 <b>gh</b> Margin dB -8.47 -6.77	cm I Ant.Pos cm I	peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX_R MHz dBuV 4882 36.4 7323 39.3 9764 36.3 Polarization:Horizontal Frequency RX_R MHz dBuV 4960 38.4 7440 35.3 9920 36.4 Polarization:Vertical; R	Factor dB 54 7.00 26 11.13 59 14.30 ; Modulation Factor dB 58 11.65 42 14.40 Modulation:80	Emission dBuV/m ) 43.64 5 50.39 5 50.95 3 <b>8DPSK</b> ; ; ( Emission dBuV/m 0 45.53 5 47.23 5 50.82 <b>DPSK</b> ; ; <b>Ch</b>	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54 54 54 54	Margin dB -10.36 -3.61 -3.05 <b>ph</b> Margin dB -8.47 -6.77 -3.18	cm I Ant.Pos cm I I	peak peak peak peak
Mark * Mode:b; Mark *	Frequency RX_R MHz dBuV 4882 36. 7323 39. 9764 36. Polarization:Horizontal Frequency RX_R MHz dBuV 4960 38. 7440 35. 9920 36. Polarization:Vertical; I Frequency RX_R	Factor dB 54 7.00 26 11.13 59 14.30 ; Modulation Factor dB 04 7.49 58 11.65 42 14.40 Modulation:80 Factor	Emission dBuV/m 43.64 50.39 50.95 8DPSK; ; 6 Emission dBuV/m 45.53 50.82 DPSK; ; Ch Emission	Limit dBuV/m 54 54 Channel:Hig Limit dBuV/m 54 54 54 annel:High Limit	Margin dB -10.36 -3.61 -3.05 <b>h</b> Margin dB -8.47 -6.77 -3.18 Margin	cm I Ant.Pos cm I Ant.Pos	peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX_R MHz         dBuV           4882         36.4           7323         39.5           9764         36.5           Polarization:Horizontal Frequency RX_R MHz         dBuV           4960         38.4           7440         35.5           9920         36.5           Polarization:Vertical; I Frequency RX_R MHz         MU           4960         38.4           7440         35.5           9920         36.5	Factor dB 54 7.00 26 11.13 59 14.36 ; Modulation Factor dB 58 11.65 42 14.40 Modulation:8E Factor dB	Emission dBuV/m ) 43.64 5 50.39 5 50.95 3 <b>8DPSK</b> ; ; ( Emission dBuV/m ) 45.53 5 47.23 5 50.82 <b>DPSK</b> ; ; <b>Ch</b> Emission dBuV/m	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54 54 54 annel:High Limit dBuV/m	Margin dB -10.36 -3.61 -3.05 <b>ph</b> Margin dB -8.47 -6.77 -3.18 Margin dB	cm Ant.Pos cm Ant.Pos cm	peak peak peak peak
Mark * Mode:b; Mark * Mode:b;	Frequency RX_R MHz dBuV 4882 36.4 7323 39.2 9764 36.3 Polarization:Horizontal Frequency RX_R MHz dBuV 4960 38.4 7440 35.2 9920 36.4 Polarization:Vertical; I Frequency RX_R MHz dBuV 4960 37.	Factor dB 54 7.00 26 11.13 59 14.30 ; Modulation Factor dB 04 7.49 58 11.65 42 14.40 Modulation:80 Factor dB 10 7.49	Emission dBuV/m 43.64 50.39 50.95 8DPSK; ; 6 Emission dBuV/m 45.53 50.82 DPSK; ; Ch Emission dBuV/m 0 44.59	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54 54 annel:High Limit dBuV/m 54	Margin dB -10.36 -3.61 -3.05 <b>h</b> Margin dB -8.47 -6.77 -3.18 Margin dB -9.41	cm I Ant.Pos cm I Ant.Pos cm I	peak peak peak peak peak
Mark * Mode:b; Mark * Mode:b; Mark	Frequency RX_R MHz         dBuV           4882         36.4           7323         39.5           9764         36.5           Polarization:Horizontal Frequency RX_R MHz         dBuV           4960         38.4           7440         35.5           9920         36.5           Polarization:Vertical; I Frequency RX_R MHz         MU           4960         38.4           7440         35.5           9920         36.5	Factor dB 54 7.00 26 11.13 59 14.36 ; Modulation Factor dB 58 11.65 42 14.40 Modulation:80 Factor dB 10 7.49 89 11.65	Emission dBuV/m ) 43.64 5 50.39 5 50.95 8DPSK; ; 0 Emission dBuV/m 0 45.53 5 47.23 5 50.82 DPSK; ; Ch Emission dBuV/m 0 44.59 5 50.54	Limit dBuV/m 54 54 54 Channel:Hig Limit dBuV/m 54 54 annel:High Limit dBuV/m 54 54	Margin dB -10.36 -3.61 -3.05 <b>ph</b> Margin dB -8.47 -6.77 -3.18 Margin dB -9.41 -3.46	cm Ant.Pos cm Ant.Pos cm	peak peak peak peak



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# 8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

## 9 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -