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

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technological Development District, Guangzhou, China 510663
Telephone: +86 (0) 20 82155555
Fax: +86 (0) 20 82075059
Email: ee.guangzhou@sgs.com

TEST REPORT

Application No.:	GZEM1905012792CR
Applicant:	GeoMax AG
Address of Applicant:	Espenstrasse 135, ch-9443 Widnau, Switzerland
Manufacturer:	SUZHOU SUNWAY TECHNOLOGY CO., LTD
Address of Manufacturer:	No.892, Wusong Road, Guoxiang Street, Wuzhong District, Suzhou, China
Factory:	SUZHOU SUNWAY TECHNOLOGY CO., LTD
Address of Factory:	No.892, Wusong Road, Guoxiang Street, Wuzhong District, Suzhou, China
Equipment Under Test (EUT):	
EUT Name:	ZOOM10 Total Station
Model No.:	ZOOM10
Trade Mark:	GeoMax
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2019-05-15
Date of Test:	2019-06-04 to 2019-07-04
Date of Issue:	2019-10-28
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory 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.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2019-10-28		Original

Authorized for issue by:				
Tested By		Kevin Zhang **Kevin_Zhang /Project Engineer**		2019-06-04 to 2019-07-04 **Date**
Checked By		Ricky Liu **Ricky_Liu /Reviewer**		2019-10-28 **Date**

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

2 Test Summary

Radio Spectrum Technical Requirement				
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				
Item	**Standard**	**Method**	**Requirement**	**Result**
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 7.8.7	47 CFR Part 15, Subpart C 15.247a(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 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

3 Contents

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

4 General Information

4.1 Details of E.U.T.

Power Supply:	DC 7.2V by Li-ion battery Details of Li-ion battery: Model: ZBA10 Li-ion: 7.2V/3.1Ah/22.23Wh AC100-240V 50/60Hz for charging by Charger. Details of Charger: Model: ZCH10 Input: AC100-240V 50/60Hz Output:8.4V - 1200mAh
Test Voltage:	AC110V 60Hz
Cable:	AC mains (unshielded, 1.2m) Charger output cable (unshielded, 1m) USB data cable (unshielded, 1.5m) Micro-USB port SD card port 6pin port
Operation Frequency:	2402MHz to 2480MHz
Antenna Gain:	0dBi
Antenna Type:	Integrated Antenna
Modulation Type:	GFSK
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Channel Spacing:	1MHz
Number of Channels:	79

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±5.5 x 10-8
2	Duty cycle	±0.57%
3	Occupied Bandwidth	±3%
4	RF Conducted power	±0.68dB
5	RF Power Density	±1.50dB
6	Conducted Spurious Emissions	±1.04dB
7	RF Radiated Power	±4.5dB (below 1GHz)
		±4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-18GHz)
9	Temperature	±0.4℃
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

4.5 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., 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 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584，G-10449 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

Hopping Channel Number					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2019-02-24	2020-02-23
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2019-04-05	2020-04-04
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2017-07-26	2020-07-25
Power Meter	AgilentTechnologies	U2021XA_Ch2	SEM009-02	2018-09-20	2019-09-19
Power Meter	AgilentTechnologies	U2021XA_Ch3	SEM009-03	2018-09-20	2019-09-19
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2019-01-20	2020-01-19
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2019-01-20	2020-01-19
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2019-01-07	2020-01-08
Amplifier	HP	8447F	EMC2065	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2018-12-08	2019-12-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2019-01-20	2020-01-19
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2019-01-20	2020-01-19
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2019-01-07	2020-01-08
Amplifier	HP	8447F	EMC2065	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2018-12-08	2019-12-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2019-07-16	2020-07-15
DMM	Fluke	73	EMC0007	2019-07-16	2020-07-15

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

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)

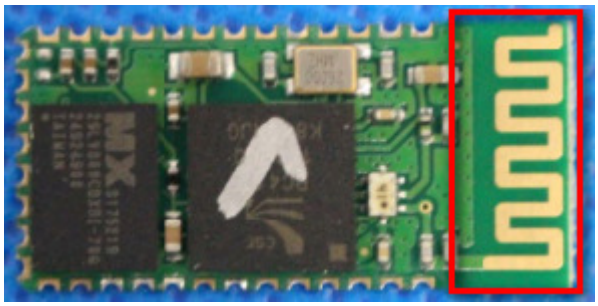
6.1.2 Conclusion

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 integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

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 bands

7 Radio Spectrum Matter Test Results

7.1 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)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

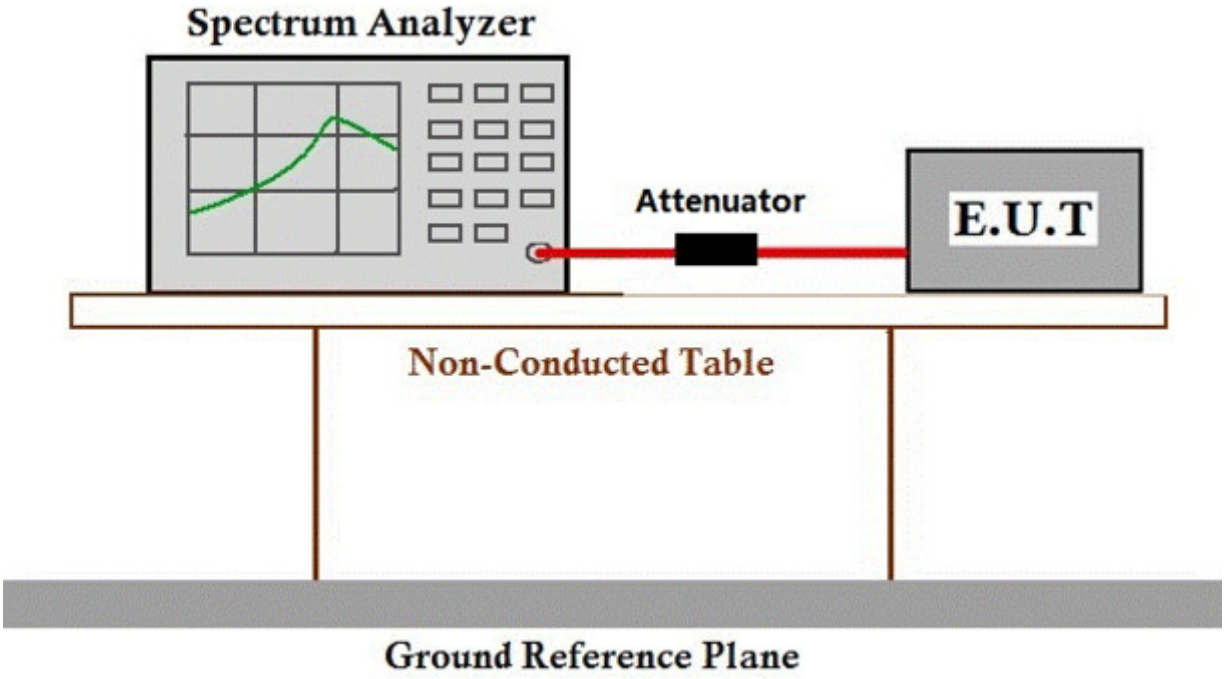
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.7

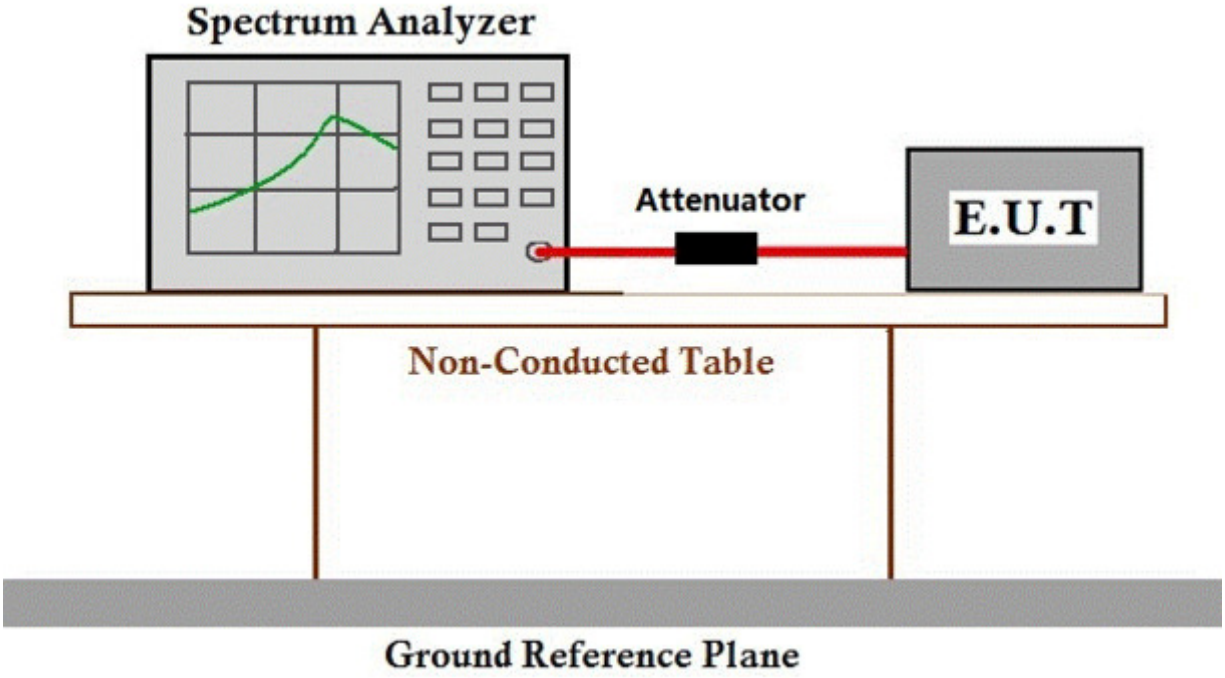
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.3 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

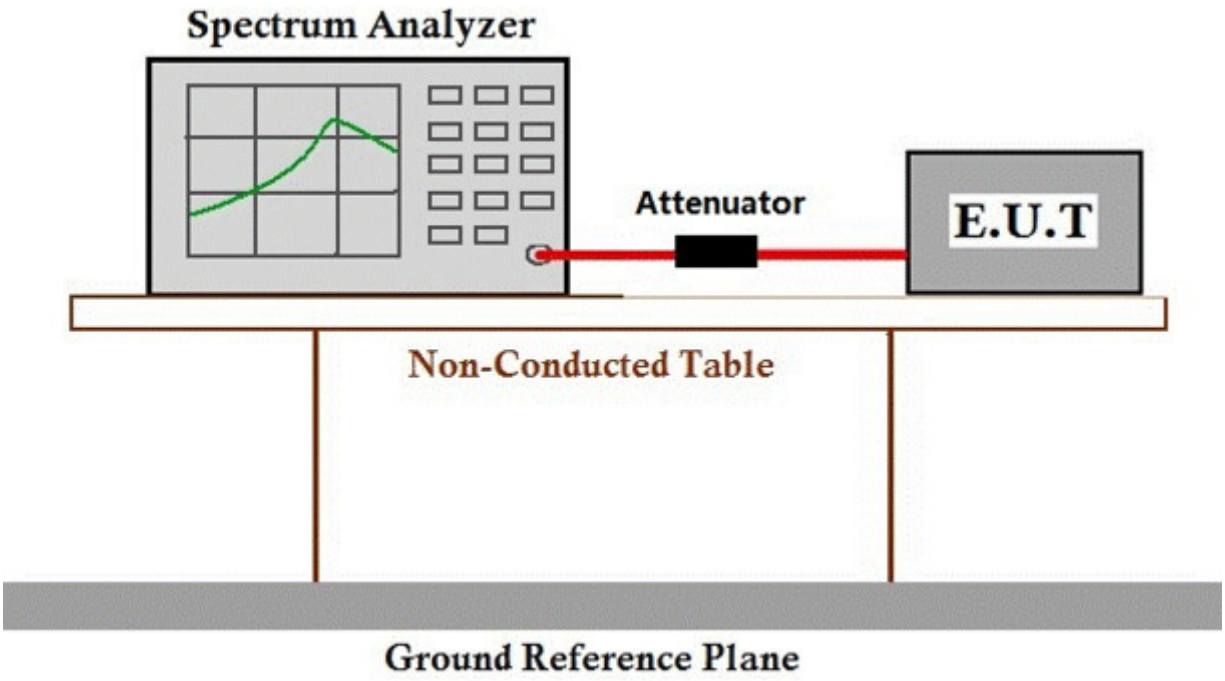
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode b:TX Hopping mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.4 Hopping Channel Number

Test Requirement 47 CFR Part 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)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

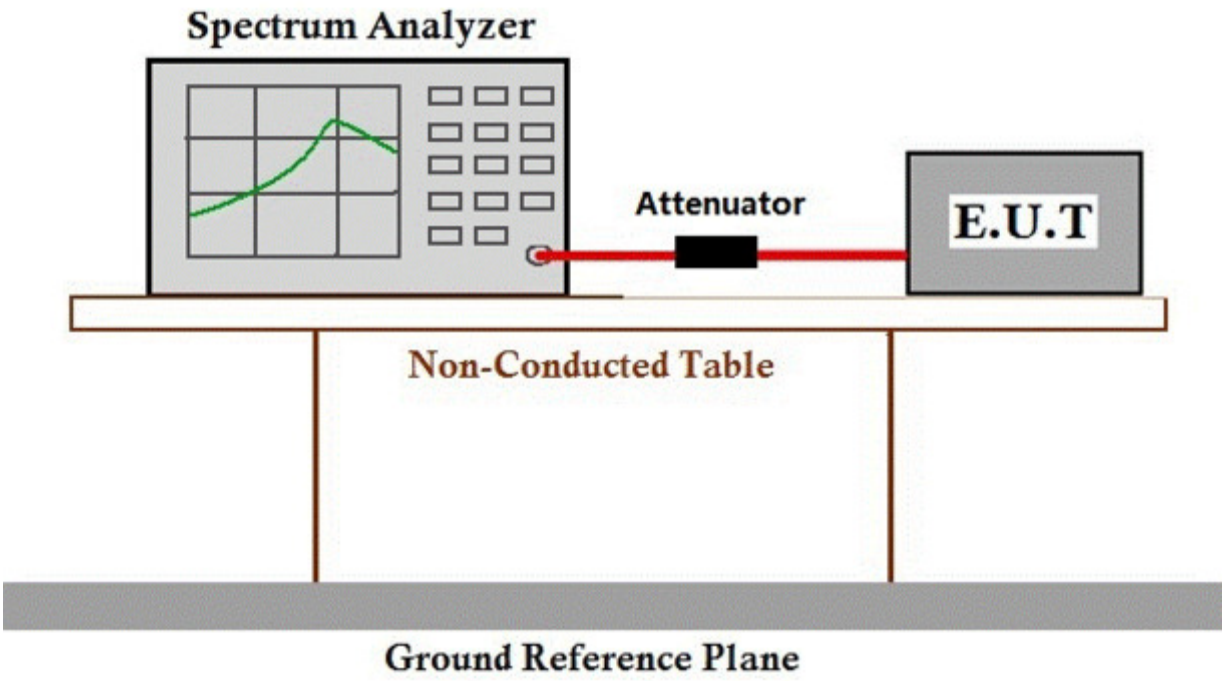
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode b:TX Hopping mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.5 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: 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)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

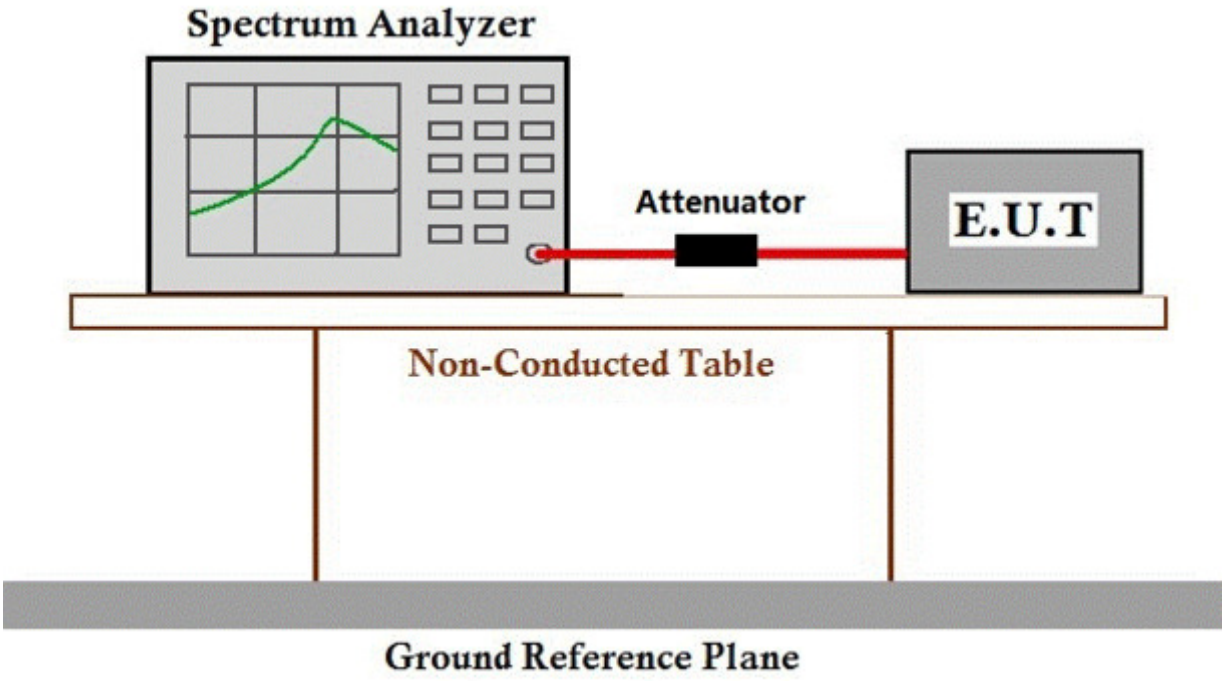
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode b:TX Hopping mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.6 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)

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

7.6.1 E.U.T. Operation

Operating Environment:

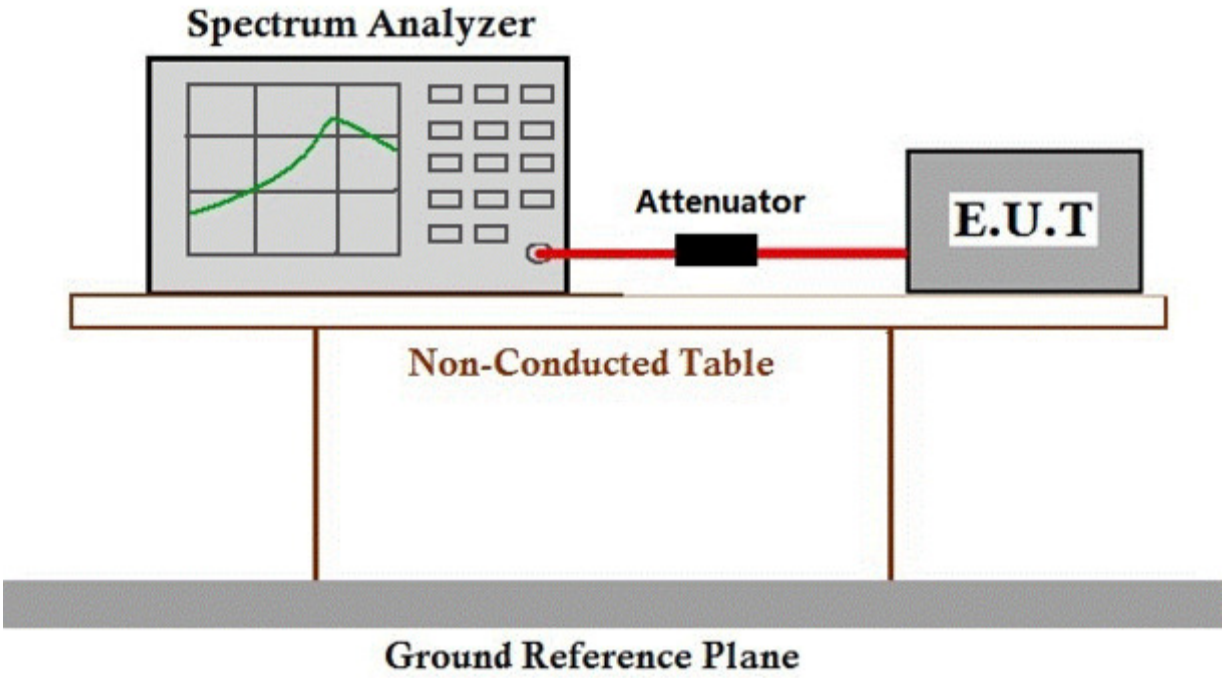
Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Pretest these modes to find the worst case:

a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

b:TX Hopping mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.7 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.8
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)

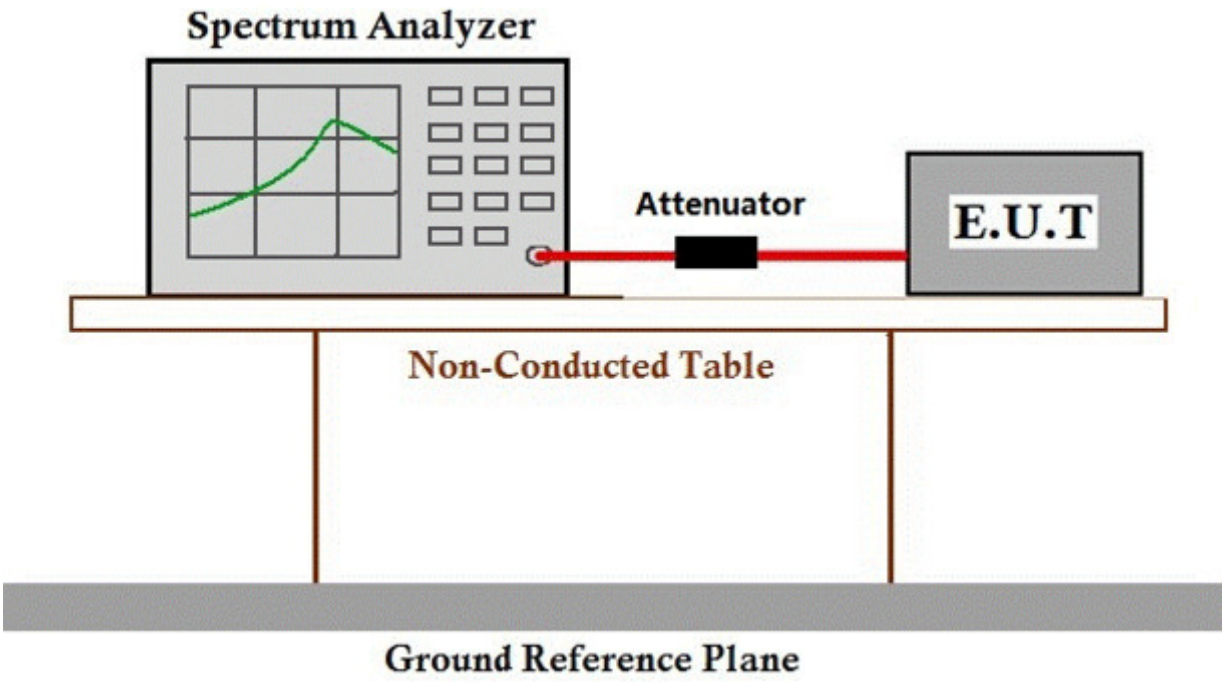
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 26 °C Humidity: 58 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.2 Test Setup Diagram



7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.8 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
Measurement Distance: 3m
Limit:

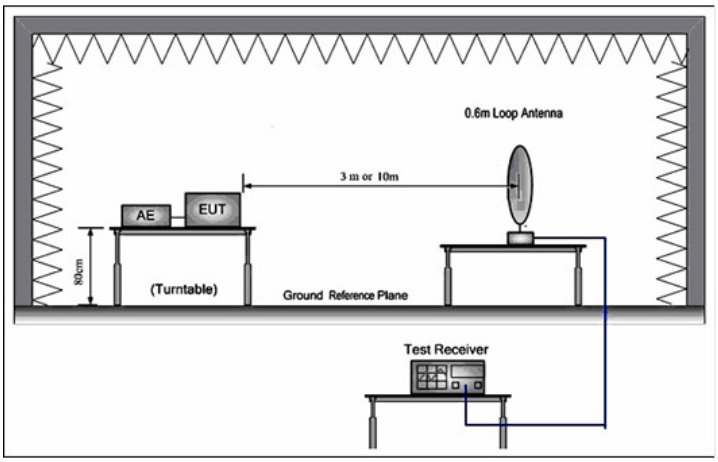
Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR 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.		

7.8.1 E.U.T. Operation

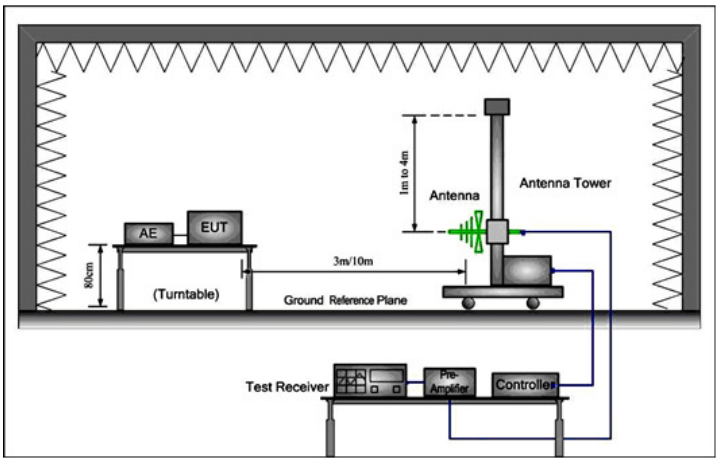
Operating Environment:
Temperature: 24 °C Humidity: 57 % RH Atmospheric Pressure: 1020 mbar
Test mode a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.2 Test Setup Diagram

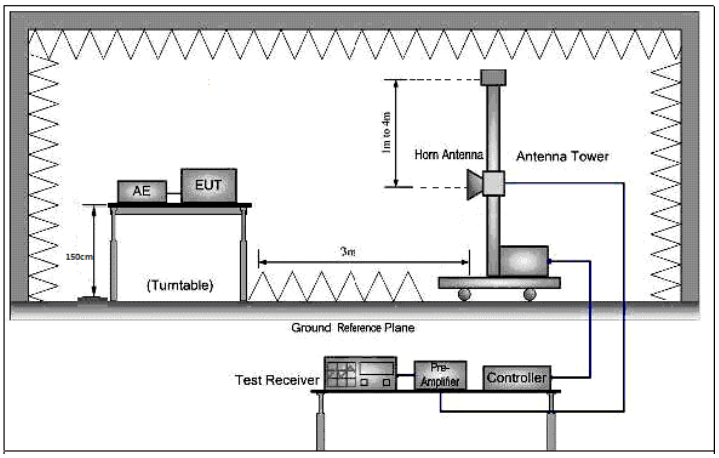
9kHz to 30MHz



30MHz to 1GHz



Above 1GHz



7.8.3 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.

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	33.29	26.25	5.03	37.44	27.13	54.00	-26.87	HORIZONTAL	Average
2	2310.000	47.84	26.25	5.03	37.44	41.68	74.00	-32.32	HORIZONTAL	Peak
3	2390.000	33.08	26.43	4.88	37.42	26.97	54.00	-27.03	HORIZONTAL	Average
4	2390.000	47.01	26.43	4.88	37.42	40.90	74.00	-33.10	HORIZONTAL	Peak
5	2483.500	30.94	26.58	5.23	37.40	25.35	54.00	-28.65	HORIZONTAL	Average
6	2483.500	46.22	26.58	5.23	37.40	40.63	74.00	-33.37	HORIZONTAL	Peak
7	2500.000	32.21	26.60	4.95	37.39	26.37	54.00	-27.63	HORIZONTAL	Average
8	2500.000	46.55	26.60	4.95	37.39	40.71	74.00	-33.29	HORIZONTAL	Peak

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	32.59	26.25	5.03	37.44	26.43	54.00	-27.57	VERTICAL	Average
2	2310.000	47.12	26.25	5.03	37.44	40.96	74.00	-33.04	VERTICAL	Peak
3	2390.000	32.79	26.43	4.88	37.42	26.68	54.00	-27.32	VERTICAL	Average
4	2390.000	47.11	26.43	4.88	37.42	41.00	74.00	-33.00	VERTICAL	Peak
5	2483.500	32.33	26.58	5.23	37.40	26.74	54.00	-27.26	VERTICAL	Average
6	2483.500	47.26	26.58	5.23	37.40	41.67	74.00	-32.33	VERTICAL	Peak
7	2500.000	32.15	26.60	4.95	37.39	26.31	54.00	-27.69	VERTICAL	Average
8	2500.000	47.13	26.60	4.95	37.39	41.29	74.00	-32.71	VERTICAL	Peak

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	34.96	26.25	5.03	37.44	28.80	54.00	-25.20	HORIZONTAL	Average
2	2310.000	46.90	26.25	5.03	37.44	40.74	74.00	-33.26	HORIZONTAL	Peak
3	2390.000	31.90	26.43	4.88	37.42	25.79	54.00	-28.21	HORIZONTAL	Average
4	2390.000	46.06	26.43	4.88	37.42	39.95	74.00	-34.05	HORIZONTAL	Peak
5	2483.500	46.24	26.58	5.23	37.40	40.65	54.00	-13.35	HORIZONTAL	Average
6	2483.500	58.80	26.58	5.23	37.40	53.21	74.00	-20.79	HORIZONTAL	Peak
7	2500.000	33.26	26.60	4.95	37.39	27.42	54.00	-26.58	HORIZONTAL	Average
8	2500.000	46.91	26.60	4.95	37.39	41.07	74.00	-32.93	HORIZONTAL	Peak

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	33.88	26.25	5.03	37.44	27.72	54.00	-26.28	VERTICAL	Average
2	2310.000	46.23	26.25	5.03	37.44	40.07	74.00	-33.93	VERTICAL	Peak
3	2390.000	32.09	26.43	4.88	37.42	25.98	54.00	-28.02	VERTICAL	Average
4	2390.000	46.86	26.43	4.88	37.42	40.75	74.00	-33.25	VERTICAL	Peak
5	2483.500	43.52	26.58	5.23	37.40	37.93	54.00	-16.07	VERTICAL	Average
6	2483.500	53.86	26.58	5.23	37.40	48.27	74.00	-25.73	VERTICAL	Peak
7	2500.000	31.95	26.60	4.95	37.39	26.11	54.00	-27.89	VERTICAL	Average
8	2500.000	46.73	26.60	4.95	37.39	40.89	74.00	-33.11	VERTICAL	Peak

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

7.9 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance: 3m
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

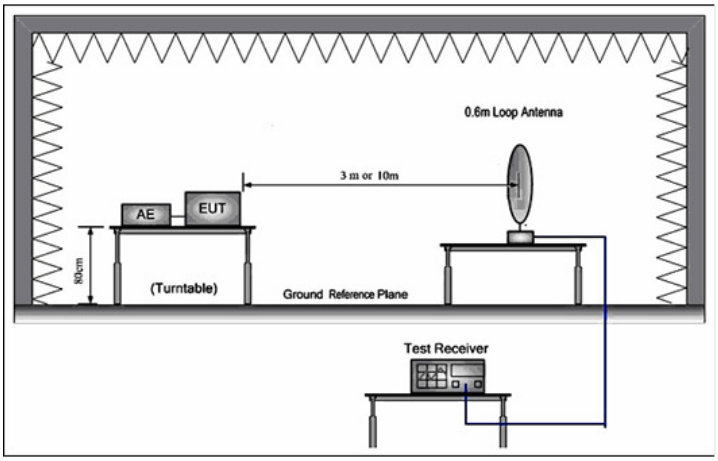
Operating Environment:

Temperature: 24 °C Humidity: 57 % RH Atmospheric Pressure: 1020 mbar

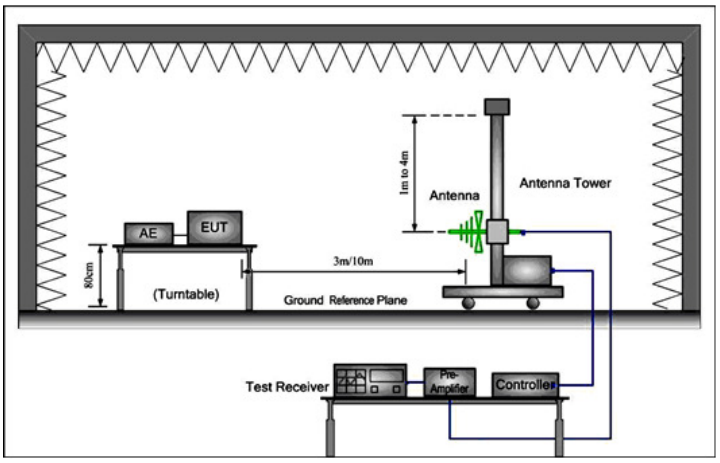
Test mode a:TX non-Hopping mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.9.2 Test Setup Diagram

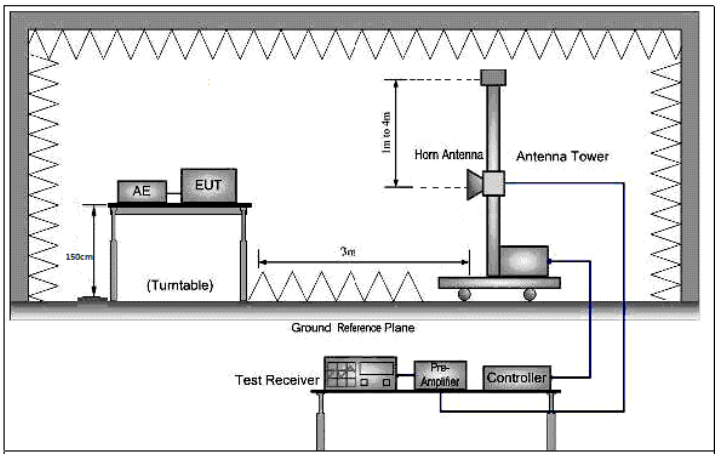
9kHz to 30MHz



30MHz to 1GHz



Above 1GHz



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) 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.

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	48.163	22.91	12.96	0.63	29.51	6.99	40.00	-33.01	HORIZONTAL	QP
2	56.197	23.97	12.43	0.59	29.49	7.50	40.00	-32.50	HORIZONTAL	QP
3	121.123	27.07	11.57	0.92	29.40	10.16	43.50	-33.34	HORIZONTAL	QP
4	151.067	26.66	13.29	1.19	29.40	11.74	43.50	-31.76	HORIZONTAL	QP
5	601.427	29.40	20.61	2.10	29.50	22.61	46.00	-23.39	HORIZONTAL	QP
6	869.130	29.63	23.70	2.94	29.00	27.27	46.00	-18.73	HORIZONTAL	QP

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4803.989	53.34	30.79	5.87	36.94	53.06	54.00	-0.94	HORIZONTAL	Average
2	4803.989	57.32	30.79	5.87	36.94	57.04	74.00	-16.96	HORIZONTAL	Peak
3	5763.617	30.51	32.12	7.10	37.00	32.73	54.00	-21.27	HORIZONTAL	Average
4	5763.617	43.96	32.12	7.10	37.00	46.18	74.00	-27.82	HORIZONTAL	Peak
5	7206.172	31.42	35.45	7.34	36.93	37.28	54.00	-16.72	HORIZONTAL	Average
6	7206.172	44.51	35.45	7.34	36.93	50.37	74.00	-23.63	HORIZONTAL	Peak
7	8738.852	30.86	36.30	7.98	36.96	38.18	54.00	-15.82	HORIZONTAL	Average
8	8738.852	45.25	36.30	7.98	36.96	52.57	74.00	-21.43	HORIZONTAL	Peak
9	9608.432	32.16	37.51	8.15	37.08	40.74	54.00	-13.26	HORIZONTAL	Average
10	9608.432	45.00	37.51	8.15	37.08	53.58	74.00	-20.42	HORIZONTAL	Peak
11	12010.390	28.14	39.50	10.67	37.20	41.11	54.00	-12.89	HORIZONTAL	Average
12	12010.390	42.15	39.50	10.67	37.20	55.12	74.00	-18.88	HORIZONTAL	Peak

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	43.506	25.48	12.72	0.69	29.54	9.35	40.00	-30.65	VERTICAL	QP
2	64.887	26.55	11.50	0.65	29.44	9.26	40.00	-30.74	VERTICAL	QP
3	130.837	28.01	12.48	0.97	29.40	12.06	43.50	-31.44	VERTICAL	QP
4	166.068	27.59	13.22	1.29	29.40	12.70	43.50	-30.80	VERTICAL	QP
5	609.922	29.47	20.66	2.10	29.50	22.73	46.00	-23.27	VERTICAL	QP
6	857.025	29.76	23.52	2.95	29.10	27.13	46.00	-18.87	VERTICAL	QP

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4804.016	49.78	30.79	5.87	36.94	49.50	54.00	-4.50	VERTICAL	Average
2	4804.016	53.67	30.79	5.87	36.94	53.39	74.00	-20.61	VERTICAL	Peak
3	6322.136	32.53	33.68	6.97	36.99	36.19	54.00	-17.81	VERTICAL	Average
4	6322.136	44.46	33.68	6.97	36.99	48.12	74.00	-25.88	VERTICAL	Peak
5	7206.857	30.27	35.45	7.34	36.93	36.13	54.00	-17.87	VERTICAL	Average
6	7206.857	44.20	35.45	7.34	36.93	50.06	74.00	-23.94	VERTICAL	Peak
7	8688.480	29.80	36.25	7.94	36.96	37.03	54.00	-16.97	VERTICAL	Average
8	8688.480	44.50	36.25	7.94	36.96	51.73	74.00	-22.27	VERTICAL	Peak
9	9608.980	30.28	37.51	8.15	37.08	38.86	54.00	-15.14	VERTICAL	Average
10	9608.980	43.65	37.51	8.15	37.08	52.23	74.00	-21.77	VERTICAL	Peak
11	12010.450	26.66	39.50	10.67	37.20	39.63	54.00	-14.37	VERTICAL	Average
12	12010.450	41.92	39.50	10.67	37.20	54.89	74.00	-19.11	VERTICAL	Peak

Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4882.102	52.30	30.95	6.86	36.95	53.16	54.00	-0.84	HORIZONTAL	Average
2	4882.102	55.19	30.95	6.86	36.95	56.05	74.00	-17.95	HORIZONTAL	Peak
3	6142.019	33.38	32.76	6.97	37.00	36.11	54.00	-17.89	HORIZONTAL	Average
4	6142.019	45.33	32.76	6.97	37.00	48.06	74.00	-25.94	HORIZONTAL	Peak
5	7326.015	31.14	35.74	7.39	36.92	37.35	54.00	-16.65	HORIZONTAL	Average
6	7326.015	44.82	35.74	7.39	36.92	51.03	74.00	-22.97	HORIZONTAL	Peak
7	8663.404	33.80	36.22	7.95	36.96	41.01	54.00	-12.99	HORIZONTAL	Average
8	8663.404	46.18	36.22	7.95	36.96	53.39	74.00	-20.61	HORIZONTAL	Peak
9	9768.151	33.11	37.74	8.37	37.09	42.13	54.00	-11.87	HORIZONTAL	Average
10	9768.151	45.01	37.74	8.37	37.09	54.03	74.00	-19.97	HORIZONTAL	Peak
11	12210.950	28.96	39.21	10.98	37.06	42.09	54.00	-11.91	HORIZONTAL	Average
12	12210.950	41.15	39.21	10.98	37.06	54.28	74.00	-19.72	HORIZONTAL	Peak

Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4882.050	50.19	30.95	6.86	36.95	51.05	54.00	-2.95	VERTICAL	Average
2	4882.050	53.85	30.95	6.86	36.95	54.71	74.00	-19.29	VERTICAL	Peak
3	6285.695	31.57	33.51	6.95	36.99	35.04	54.00	-18.96	VERTICAL	Average
4	6285.695	44.11	33.51	6.95	36.99	47.58	74.00	-26.42	VERTICAL	Peak
5	7326.833	29.99	35.74	7.39	36.92	36.20	54.00	-17.80	VERTICAL	Average
6	7326.833	43.95	35.74	7.39	36.92	50.16	74.00	-23.84	VERTICAL	Peak
7	8663.404	33.14	36.22	7.95	36.96	40.35	54.00	-13.65	VERTICAL	Average
8	8663.404	45.79	36.22	7.95	36.96	53.00	74.00	-21.00	VERTICAL	Peak
9	9764.149	31.75	37.70	8.33	37.09	40.69	54.00	-13.31	VERTICAL	Average
10	9764.149	44.45	37.70	8.33	37.09	53.39	74.00	-20.61	VERTICAL	Peak
11	12210.210	29.70	39.21	10.98	37.06	42.83	54.00	-11.17	VERTICAL	Average
12	12210.210	42.23	39.21	10.98	37.06	55.36	74.00	-18.64	VERTICAL	Peak

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4959.909	51.42	31.05	7.84	36.96	53.35	54.00	-0.65	HORIZONTAL	Average
2	4959.909	54.65	31.05	7.84	36.96	56.58	74.00	-17.42	HORIZONTAL	Peak
3	5932.638	33.35	32.26	7.32	37.00	35.93	54.00	-18.07	HORIZONTAL	Average
4	5932.638	45.45	32.26	7.32	37.00	48.03	74.00	-25.97	HORIZONTAL	Peak
5	7440.052	30.22	35.92	7.43	36.92	36.65	54.00	-17.35	HORIZONTAL	Average
6	7440.052	43.97	35.92	7.43	36.92	50.40	74.00	-23.60	HORIZONTAL	Peak
7	8647.272	30.61	36.20	7.96	36.95	37.82	54.00	-16.18	HORIZONTAL	Average
8	8647.272	43.64	36.20	7.96	36.95	50.85	74.00	-23.15	HORIZONTAL	Peak
9	9920.916	31.23	37.92	8.63	37.10	40.68	54.00	-13.32	HORIZONTAL	Average
10	9920.916	44.46	37.92	8.63	37.10	53.91	74.00	-20.09	HORIZONTAL	Peak
11	12400.760	29.71	38.93	11.17	36.90	42.91	54.00	-11.09	HORIZONTAL	Average
12	12400.760	42.21	38.93	11.17	36.90	55.41	74.00	-18.59	HORIZONTAL	Peak

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

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4959.993	48.77	31.05	7.84	36.96	50.70	54.00	-3.30	VERTICAL	Average
2	4959.993	52.06	31.05	7.84	36.96	53.99	74.00	-20.01	VERTICAL	Peak
3	6303.890	33.50	33.60	6.96	36.99	37.07	54.00	-16.93	VERTICAL	Average
4	6303.890	44.31	33.60	6.96	36.99	47.88	74.00	-26.12	VERTICAL	Peak
5	7440.092	28.20	35.92	7.43	36.92	34.63	54.00	-19.37	VERTICAL	Average
6	7440.092	44.06	35.92	7.43	36.92	50.49	74.00	-23.51	VERTICAL	Peak
7	8738.852	31.59	36.30	7.98	36.96	38.91	54.00	-15.09	VERTICAL	Average
8	8738.852	44.73	36.30	7.98	36.96	52.05	74.00	-21.95	VERTICAL	Peak
9	9920.588	30.97	37.92	8.63	37.10	40.42	54.00	-13.58	VERTICAL	Average
10	9920.588	43.66	37.92	8.63	37.10	53.11	74.00	-20.89	VERTICAL	Peak
11	12400.070	29.14	38.93	11.17	36.90	42.34	54.00	-11.66	VERTICAL	Average
12	12400.070	41.68	38.93	11.17	36.90	54.88	74.00	-19.12	VERTICAL	Peak

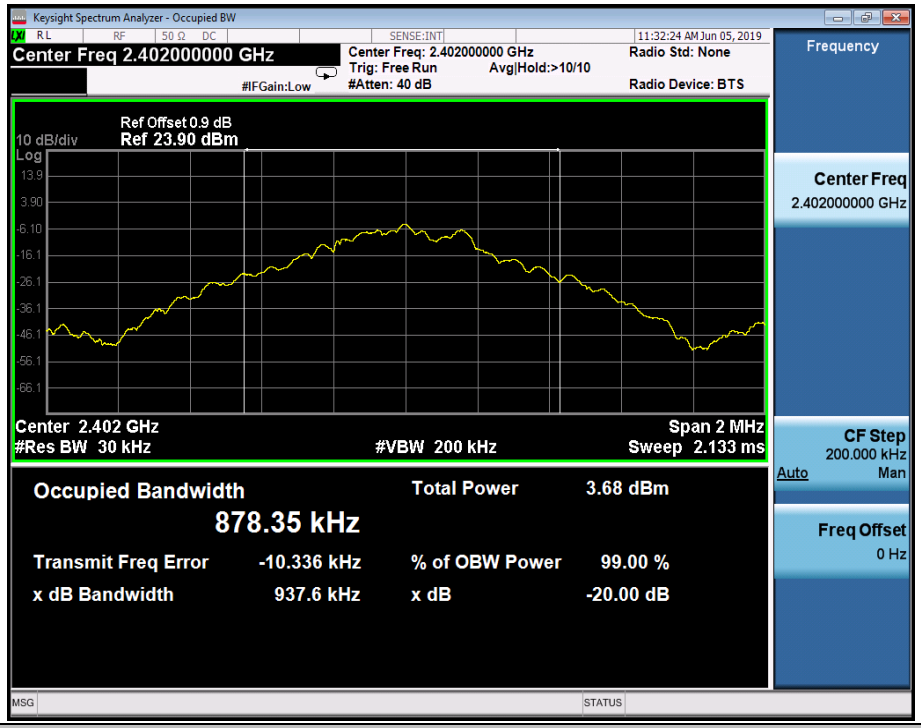
8 Appendix

8.1 Appendix 15.247

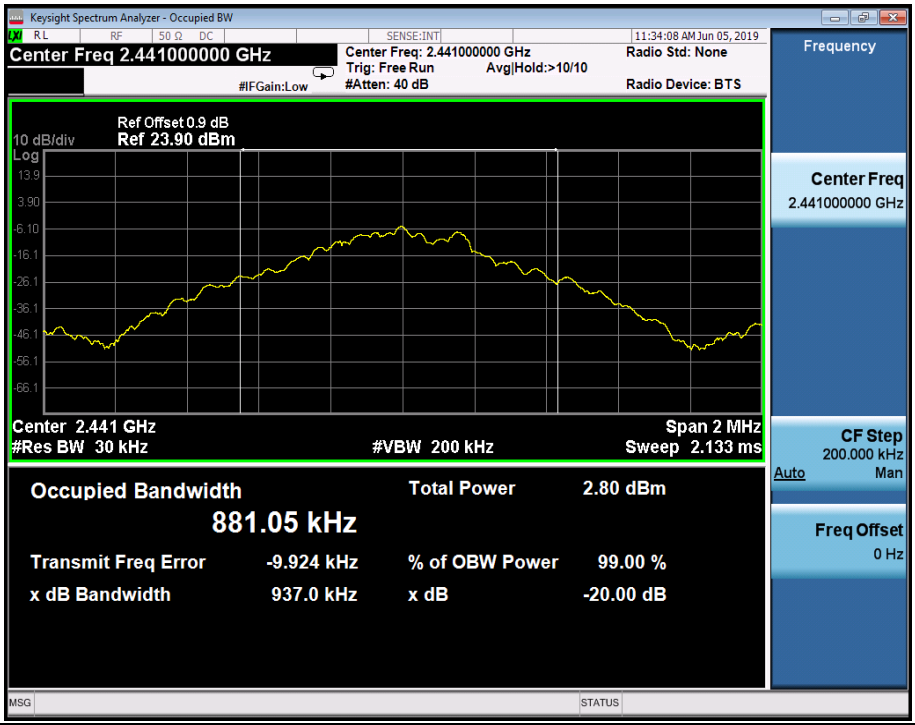
1.20 dB Bandwidth

Test Mode	Test Channel	OBW[MHz]	EBW[MHz]	Limit[MHz]	Verdict
DH5	2402	0.87835	0.9376	---	PASS
DH5	2441	0.88176	0.9370	---	PASS
DH5	2480	0.87983	0.9367	---	PASS

TEST PLOT
20 dB Bandwidth_DH5_2402



20 dB Bandwidth_DH5_2441



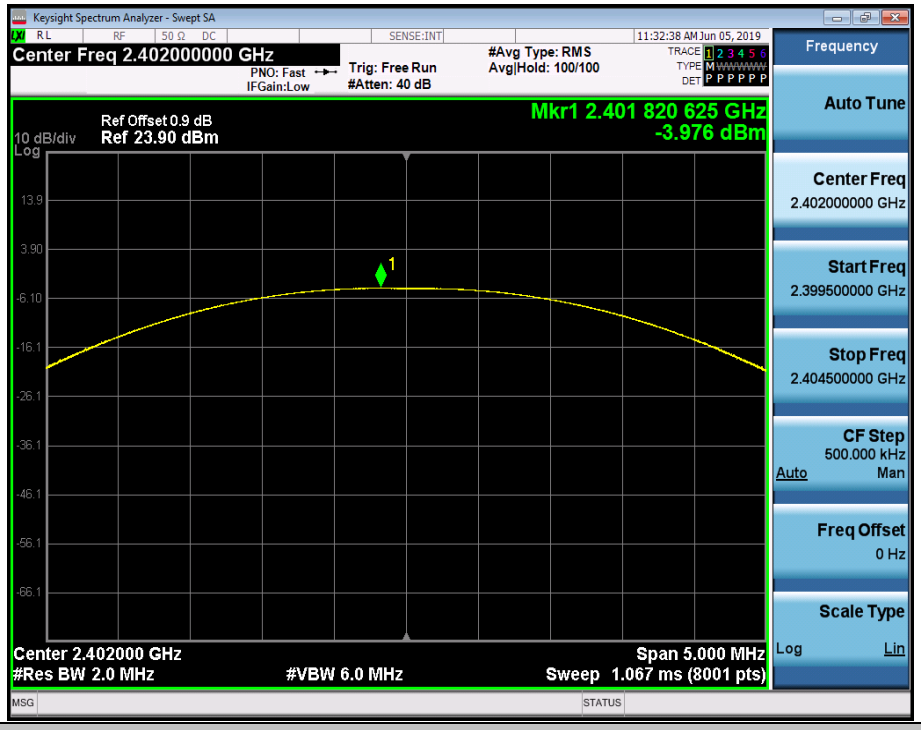
20 dB Bandwidth_DH5_2480

2.Conducted Peak Output Power

Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
DH5	2402	-3.976	20.9	PASS
DH5	2441	-4.788	20.9	PASS
DH5	2480	-4.554	20.9	PASS

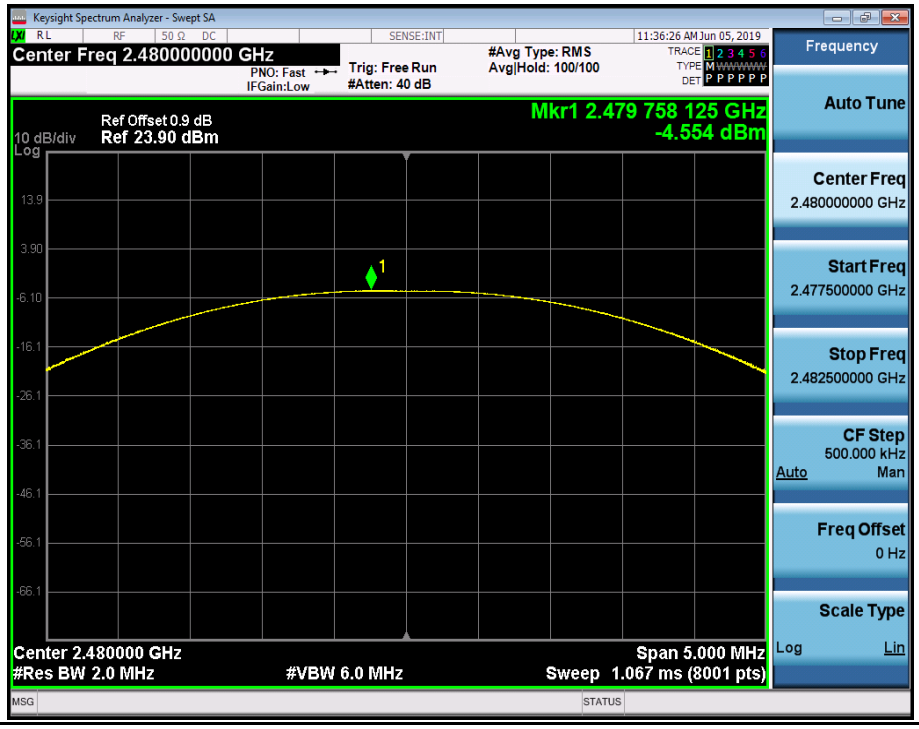
TEST PLOT

Conducted Peak Output Power_DH5_2402



Conducted Peak Output Power_DH5_2441

Conducted Peak Output Power_DH5_2480



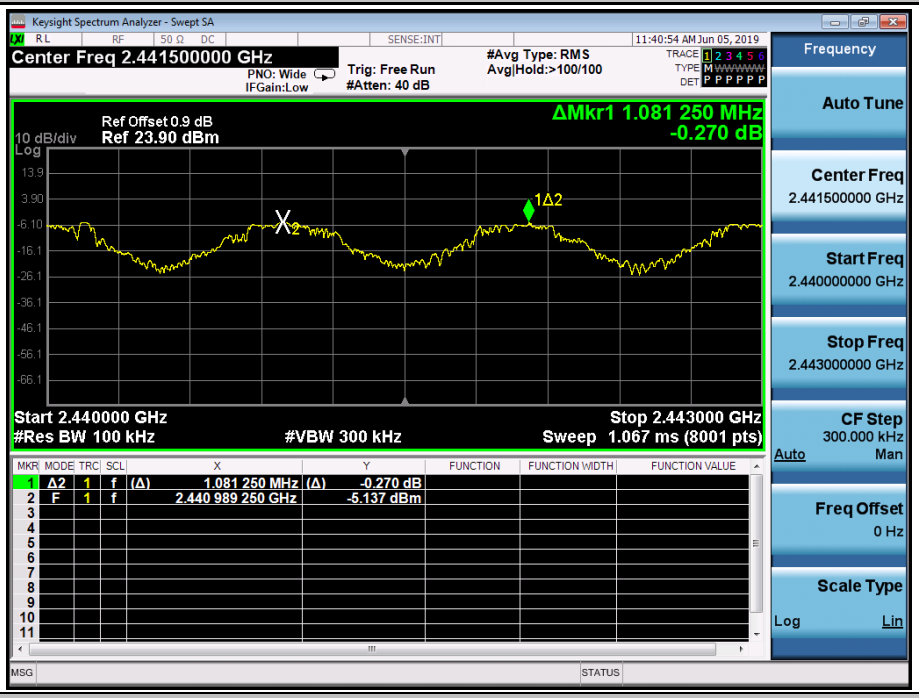
3.Carrier Frequency Separation

Test Mode	Test Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	2402	0.882	0.586	PASS
DH5	2441	1.081	0.588	PASS
DH5	2480	0.901	0.587	PASS

TEST PLOT

Carrier Frequency Separation_DH5_2402

Carrier Frequency Separation_DH5_2441

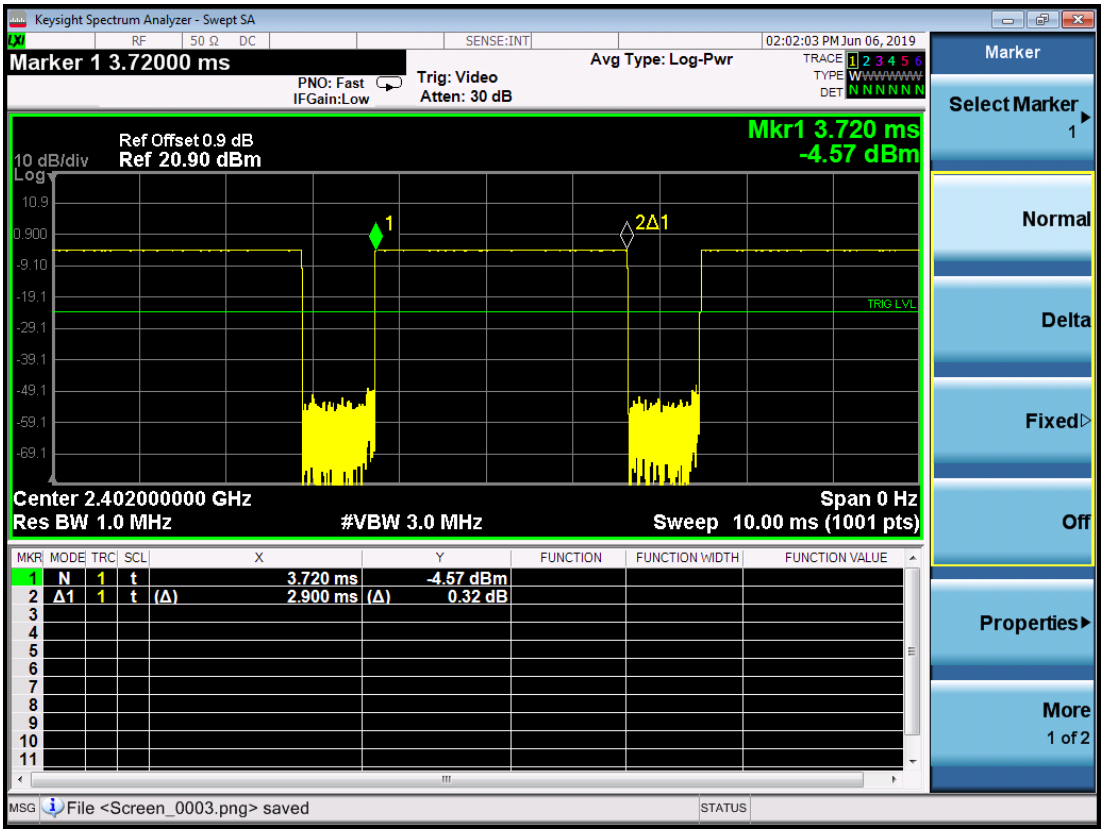


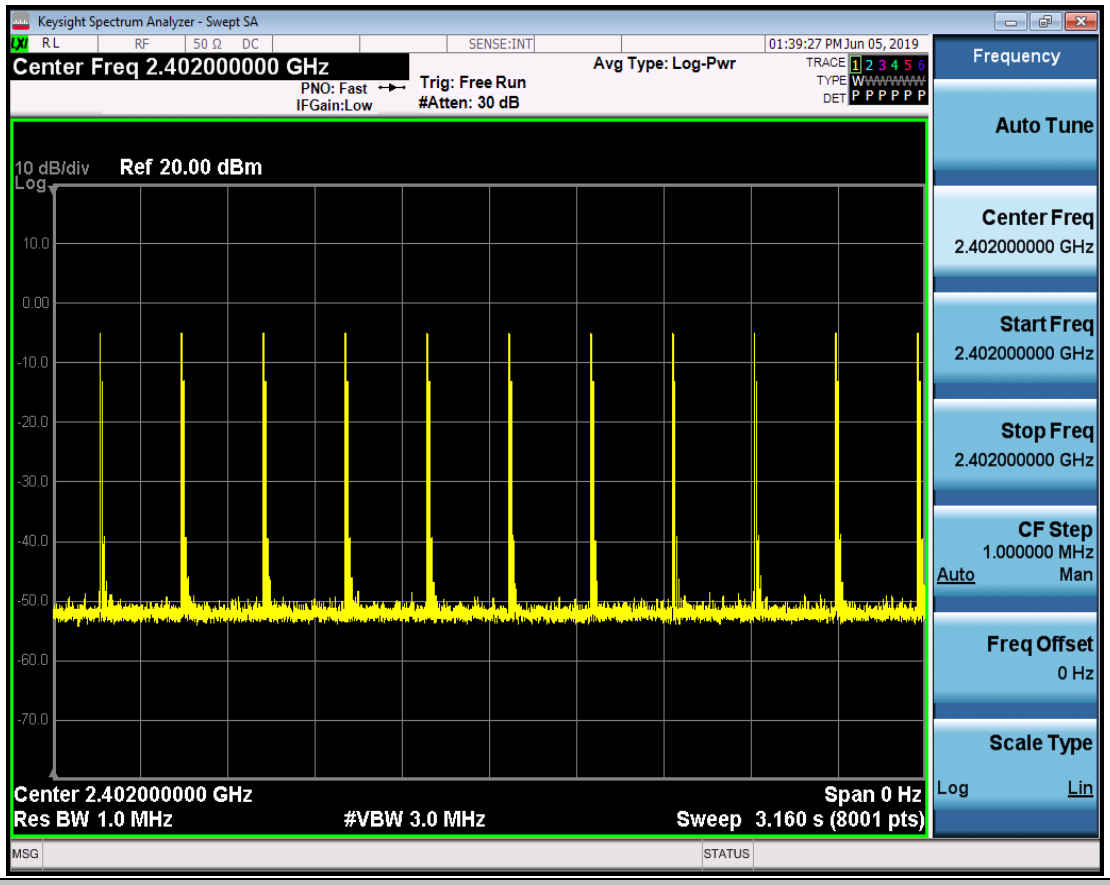
Carrier Frequency Separation_DH5_2480

4.Dwell Time

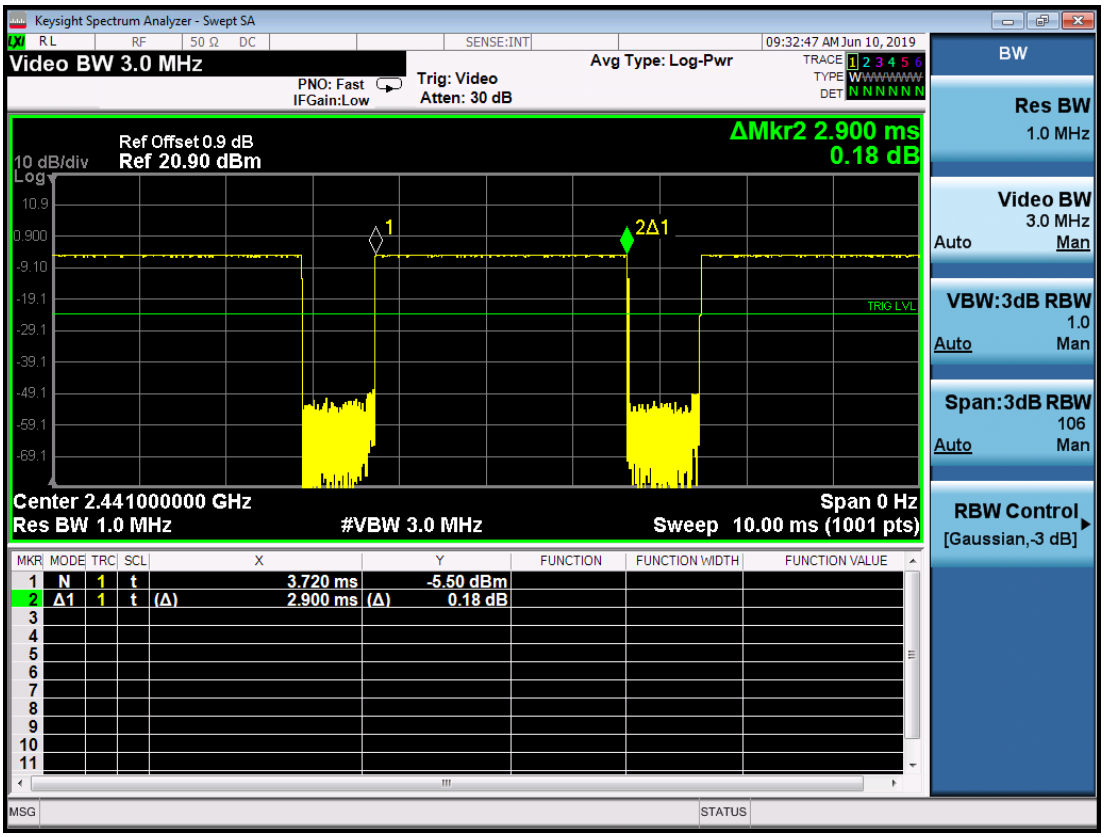
Test Mode	Test Channel	Burst Width[ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit[s]	Verdict
DH5	2402	2.90	110	0.32	0.4	PASS
DH5	2441	2.90	110	0.32	0.4	PASS
DH5	2480	2.90	100	0.29	0.4	PASS

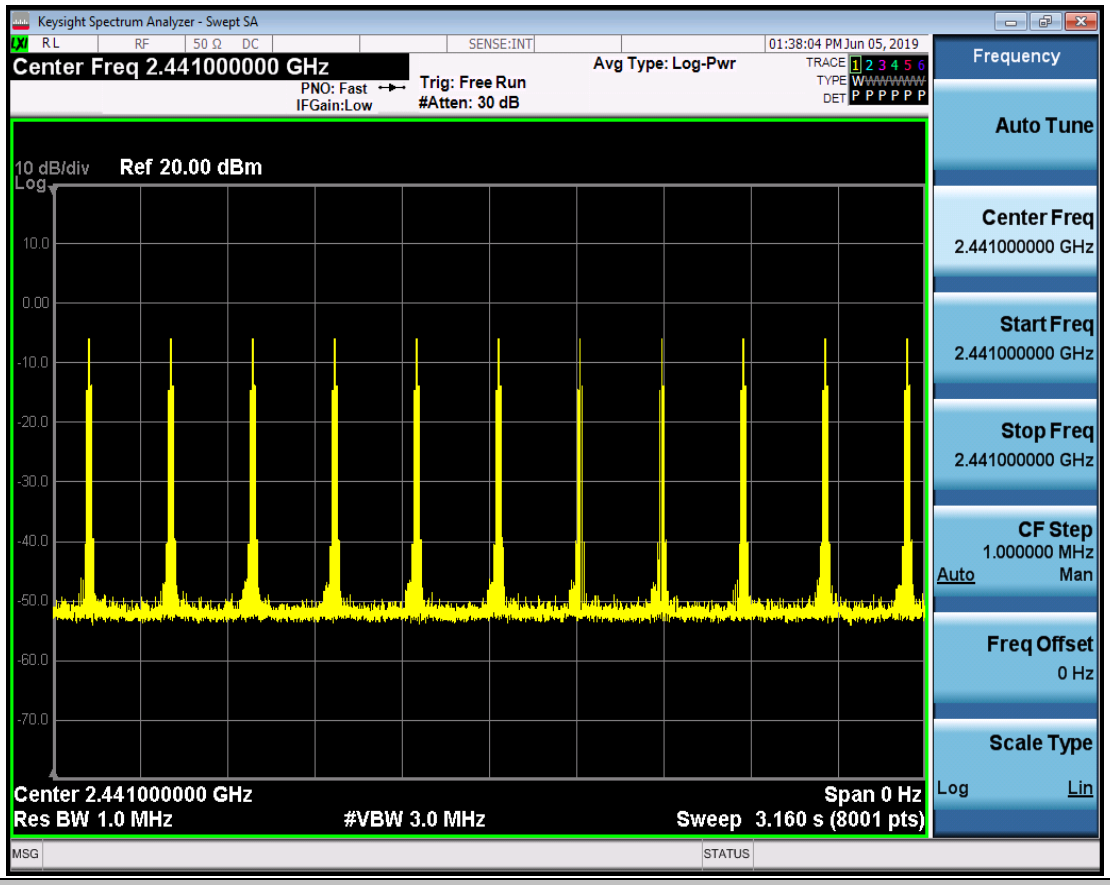
TEST PLOT
Dwell Time_DH5_2402



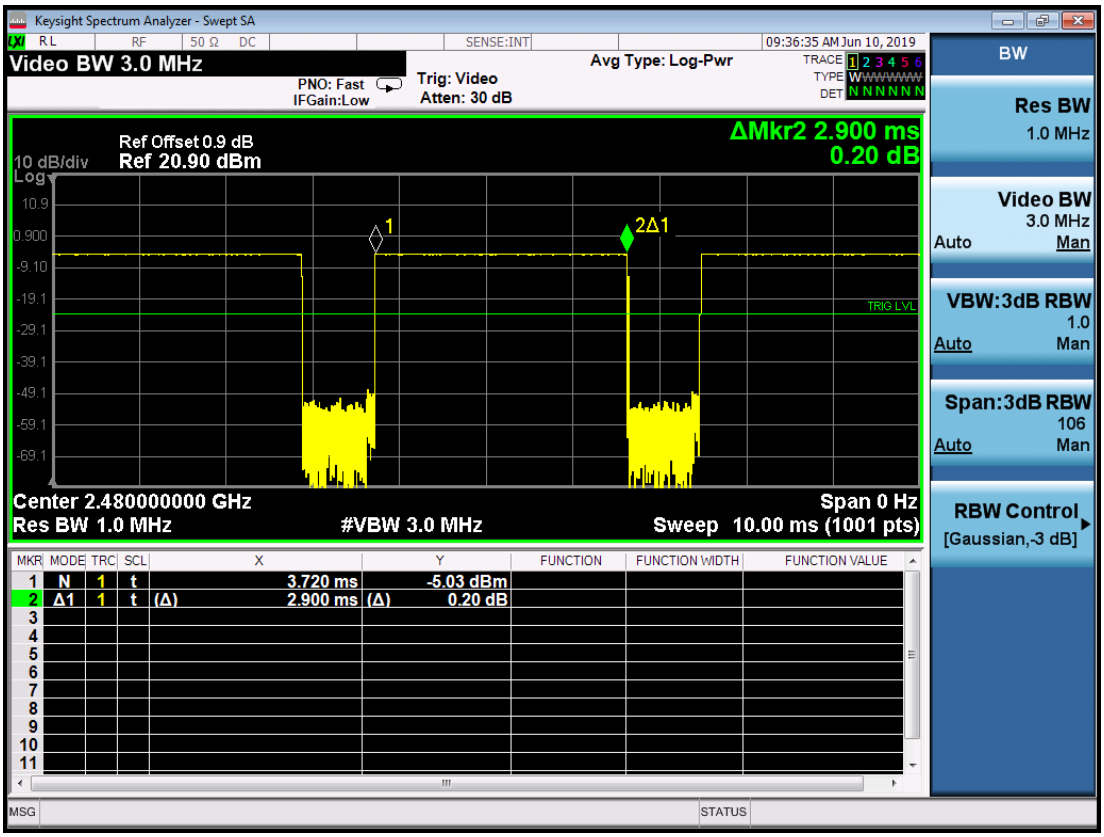


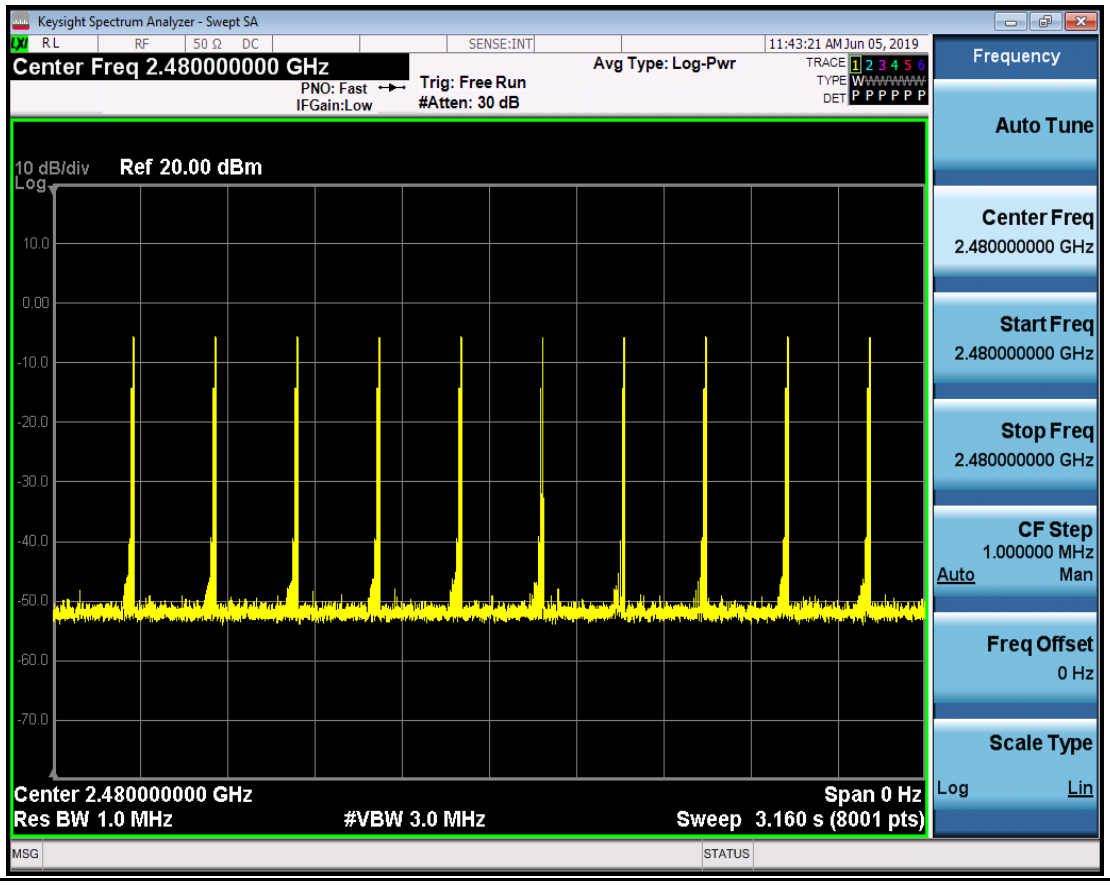
Dwell Time_DH5_2441





Dwell Time_DH5_2480

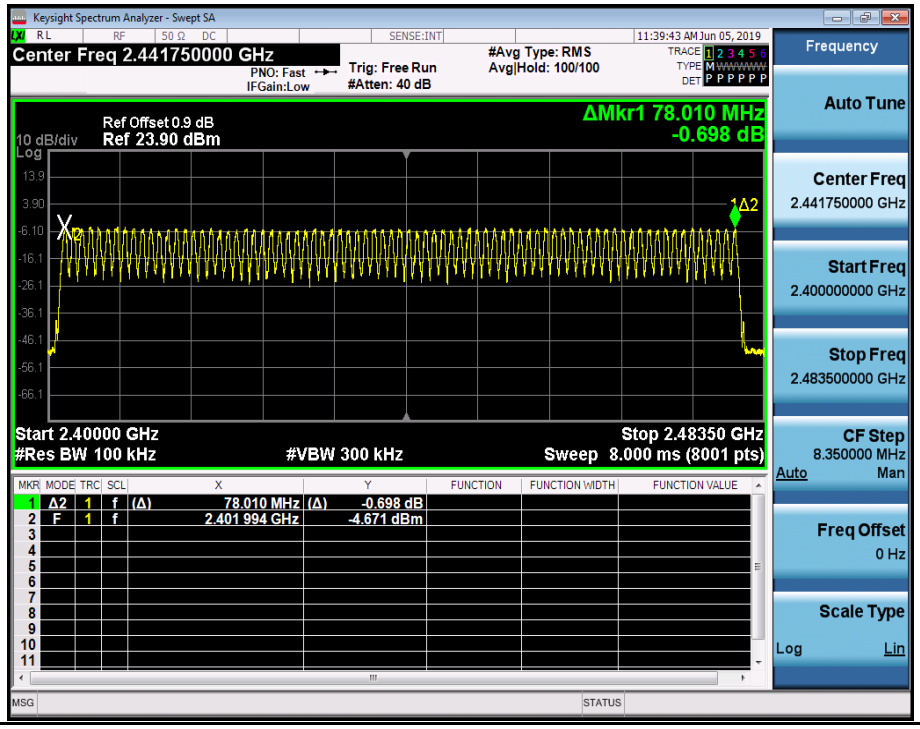




5.Hopping Channel Number

Test Mode	Number of Hopping Channel[N]	Limit[N]	Verdict
DH5	79	>=15	PASS

TEST PLOT
Hopping Channel Number_DH5

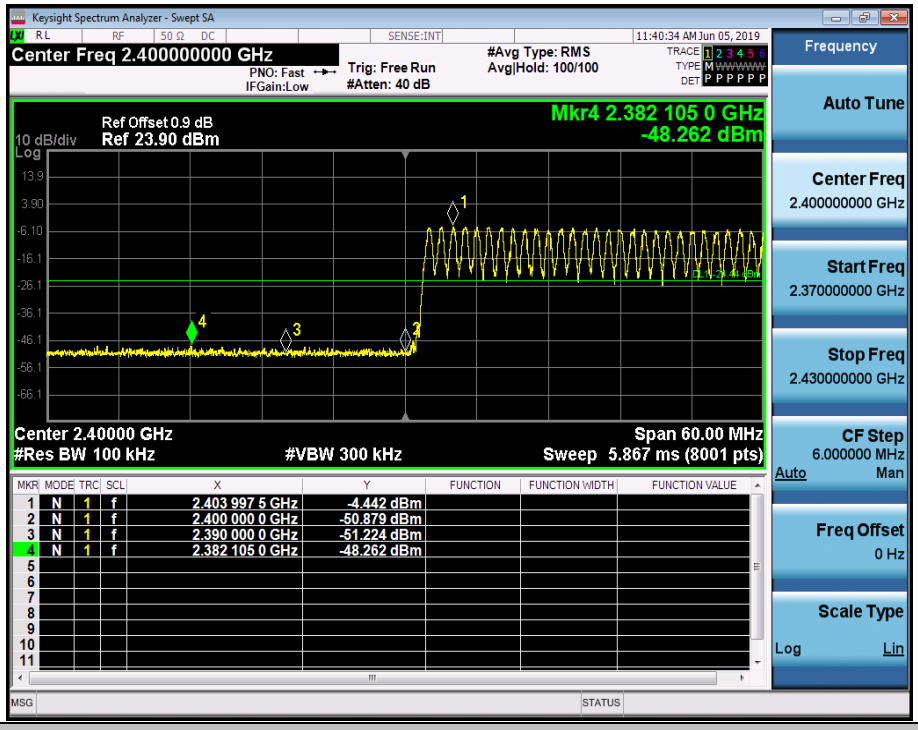


6.Band-edge for RF Conducted Emissions

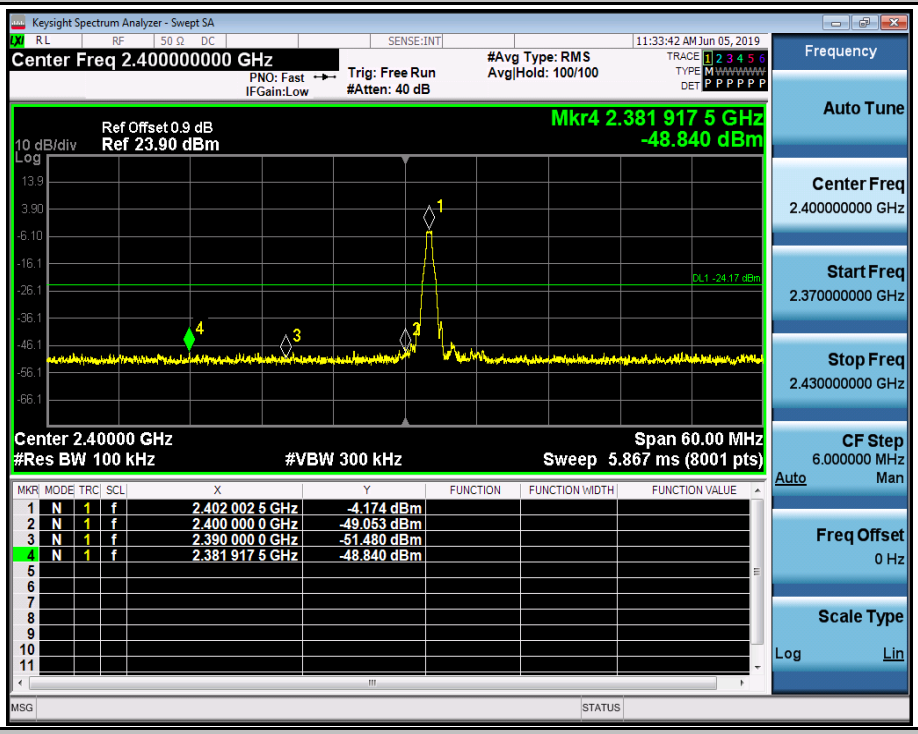
Test Mode	Test Channel	Hopping	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit[dBm]	Verdict
DH5	2402	On	-4.442	-48.262	-24.44	PASS
DH5	2402	Off	-4.174	-48.840	-24.17	PASS
DH5	2480	On	-4.641	-47.586	-24.64	PASS
DH5	2480	Off	-4.811	-47.245	-24.81	PASS

TEST PLOT

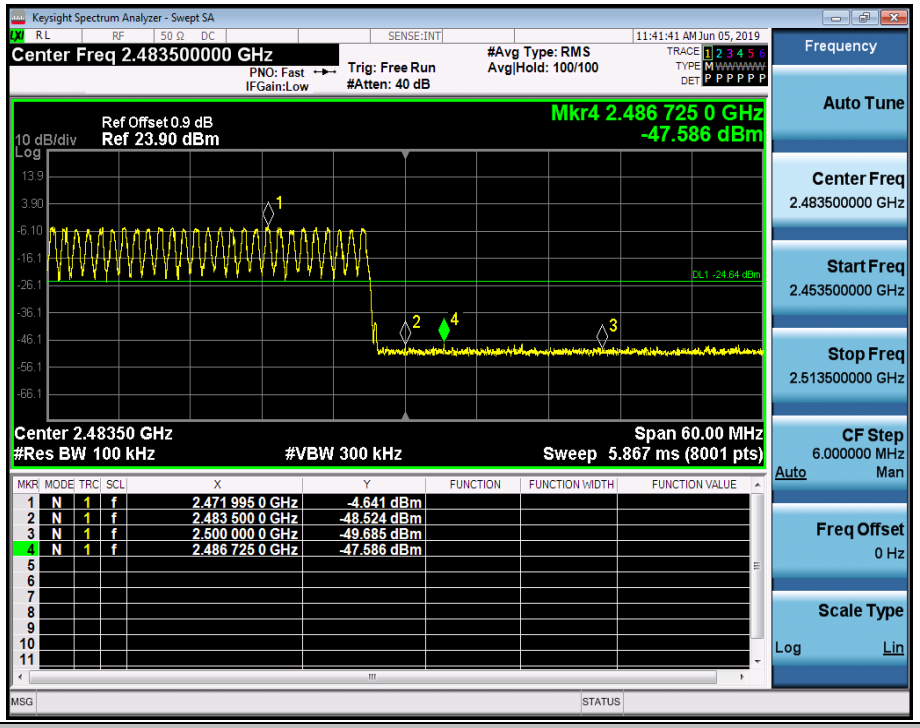
Band-edge for RF Conducted Emissions_DH5_2402_Hopping On



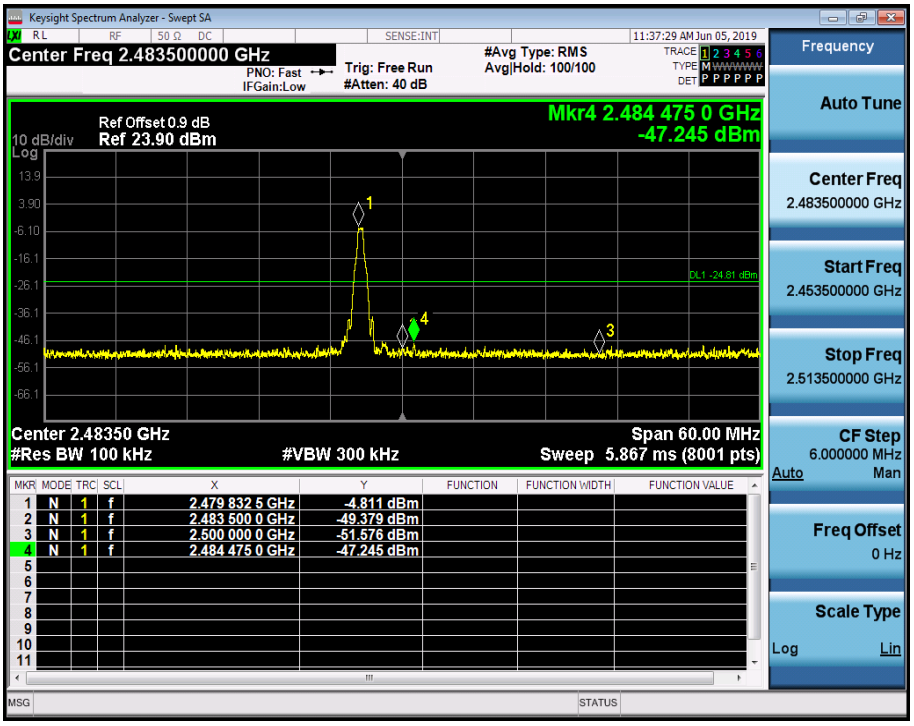
Band-edge for RF Conducted Emissions_DH5_2402_Hopping Off



Band-edge for RF Conducted Emissions_DH5_2480_Hopping On



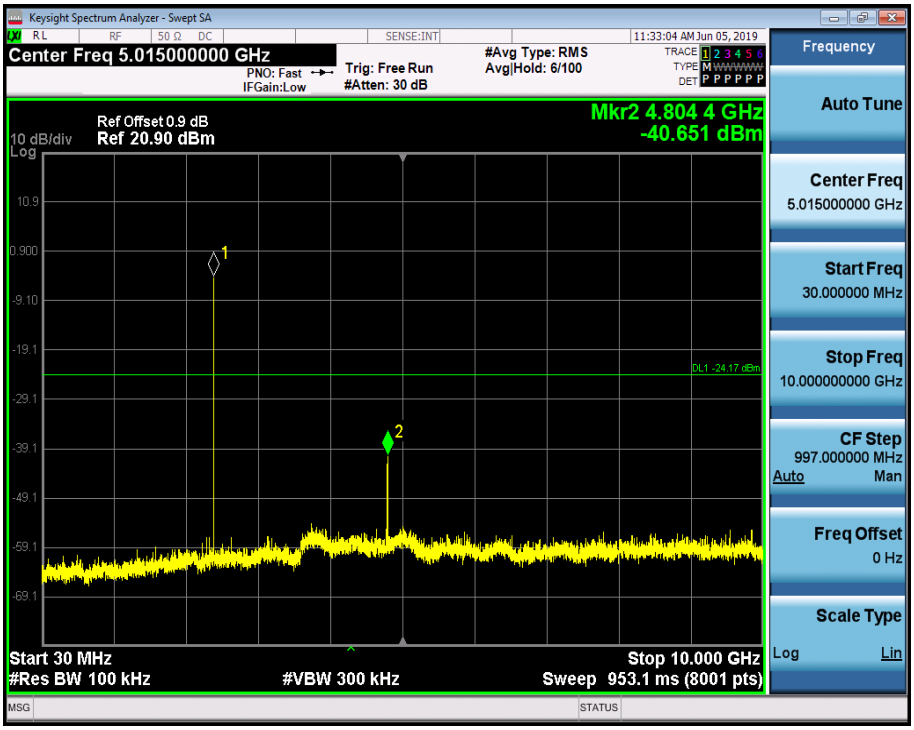
Band-edge for RF Conducted Emissions_DH5_2480_Hopping Off



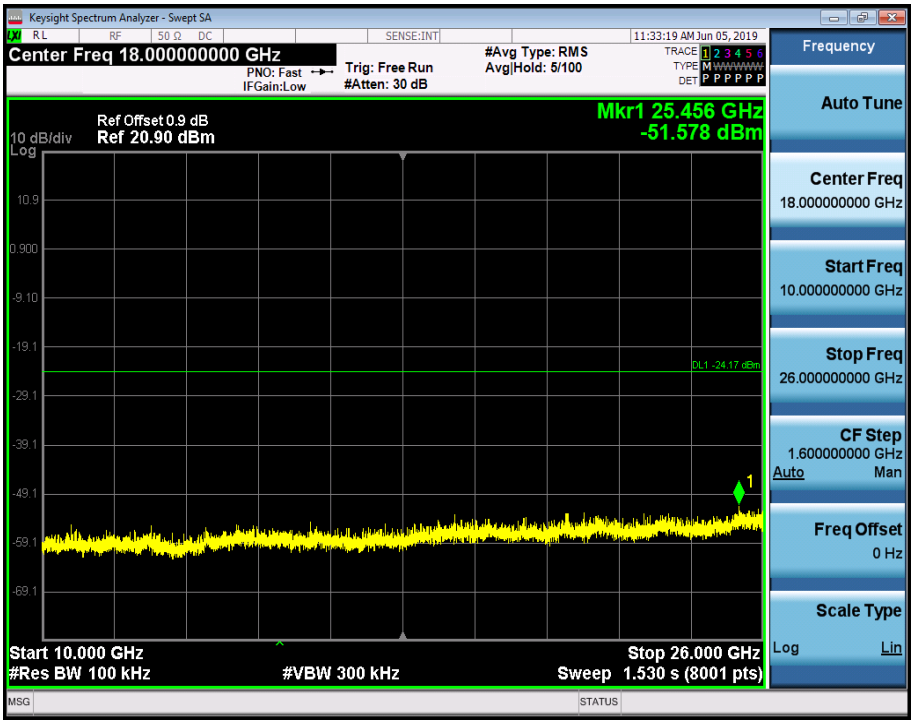
7.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
DH5	2402	30	10000	100	300	-4.174	-40.651	<-24.174	PASS
DH5	2402	10000	26000	100	300	-4.174	-51.578	<-24.174	PASS
DH5	2441	30	10000	100	300	-5.057	-41.069	<-25.057	PASS
DH5	2441	10000	26000	100	300	-5.057	-50.939	<-25.057	PASS
DH5	2480	30	10000	100	300	-4.806	-42.533	<-24.806	PASS
DH5	2480	10000	26000	100	300	-4.806	-51.707	<-24.806	PASS

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

TEST PLOT	
RF Conducted Spurious Emissions_DH5_2402	
Pref	
CSE_1	

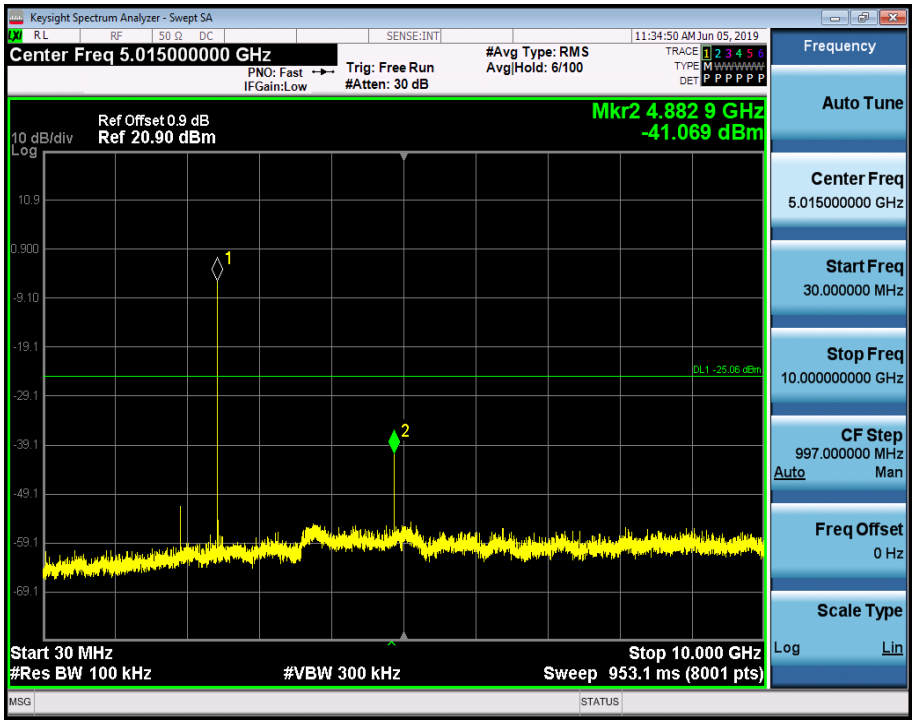
CSE_2



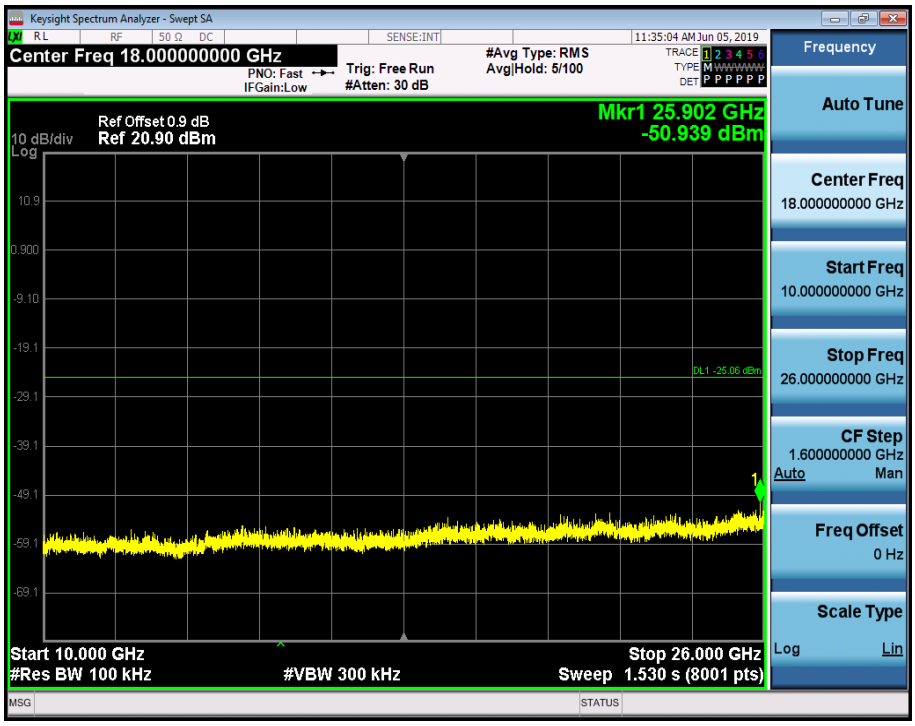
RF Conducted Spurious Emissions_DH5_2441

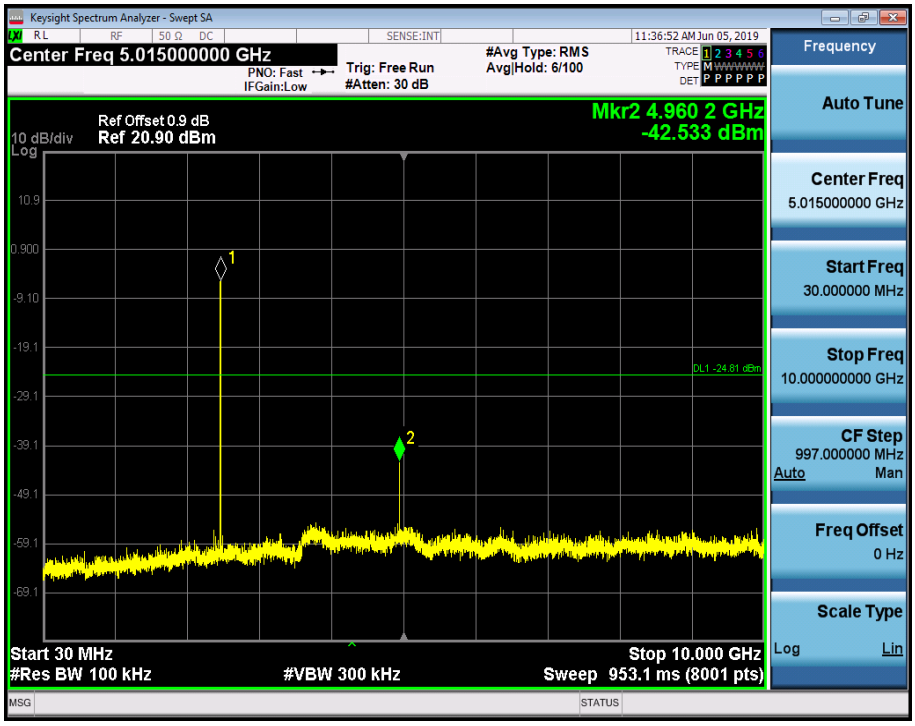
Pref

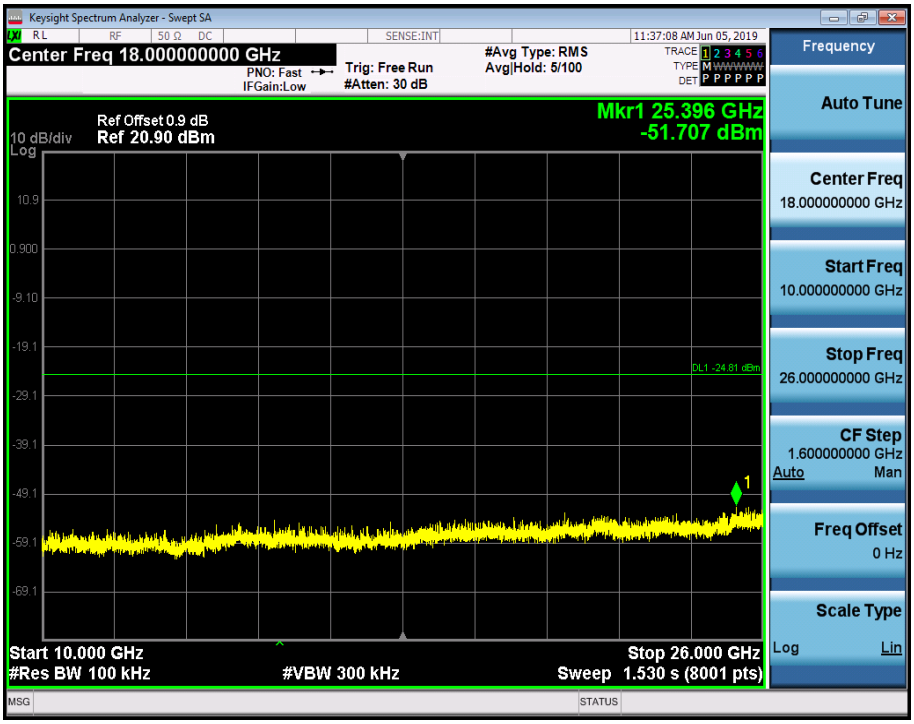
CSE_1



CSE_2



RF Conducted Spurious Emissions_DH5_2480	
Pref	
CSE_1	

CSE_2	

--End of Report--

SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch
No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86–20) 82155555 f (86–20) 82075058 www.sgsgroup.com.cn
中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com