



TEST REPORT

Application No.: GZCR2105020357HS
Applicant: Puzhen Life Co., Ltd.
Address of Applicant: Unit 1112-1116, 11/F, Delta House, 3 On Yiu Street, Shatin, Hongkong
Manufacturer: Puzhen Life Co., Ltd.
Address of Manufacturer: Unit 1112-1116, 11/F, Delta House, 3 On Yiu Street, Shatin, Hongkong
Factory: K-Star Plastic Mold (Shenzhen) Co. Ltd.
Address of Factory: Floor 1-4, Factory NO. 2, DongWangYang Industrial East, HuangTian Village, HangCheng Street, BaoAn District, ShenZhen, Guang Dong Province

Equipment Under Test (EUT):

EUT Name: Duet Diffuser
Model No.: PZ-PA051
Trade Mark:



Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2021-05-31
Date of Test: 2021-06-09 to 2021-06-19
Date of Issue: 2021-08-26

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
EMC Laboratory Manager



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SGS-CSTC Standards Technical Services Co., Ltd. No. 198 Kexu Road, Solentech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
Guangzhou Branch EMC Laboratory 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

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-08-26		Original

Authorized for issue by				
Tested By				
		Lily Kuang/Project Engineer		
Reviewed By				
		Ricky Liu/Reviewer		

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(b)(4)	Pass

Radio Spectrum Matter Part				
Item	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		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

N/A: Not applicable

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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4 General Information

4.1 Details of E.U.T.

Power supply: DC 5V powered by AC/DC adapter as below:
Model: E010-1L050200VUU
Input 100~240V, 50/60Hz, 0.3A
Output: 5V DC, 2A

Operation Frequency: 2402MHz to 2480MHz

Test Voltage: AC 120V, 60Hz

Function: Diffuser with BT function

Modulation Type: GFSK

Number of Channels: 40

Channel Spacing: 2MHz

Antenna Gain: 3.46dBi declared by manufacture

Antenna Type: Integrated Antenna

Hardware Version: PZ-PA0518A

Firmware Version: V1.1

S/N: SP-2021060501

Test Software Version: BT_Tool V1.2

Power setting level: 2 dBm can not be changed by user

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	IBM	T30	S/N78-3VMLX 06/01

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±3.12dB
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	±5.06dB (30MHz-1GHz; 3m); ±4.46dB (30MHz-1GHz; 10m) ±5.08dB (1GHz-6GHz); ±5.14dB (above 6GHz)
Radiated Spurious Emissions	±5.06dB (30MHz-1GHz; 3m); ±4.46dB (30MHz-1GHz; 10m) ±5.08dB (1GHz-6GHz); ±5.14dB (above 6GHz)

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciotech 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/New Zealand Regulatory Compliance Mark (RCM).

- **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 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.

- **ISED (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-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 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-20107 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 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(9kHz-2.75GHz)	Rohde & Schwarz	ESCS30	EMC0506	2020-11-13	2021-11-12
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-01-08	2022-01-06
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Power Spectrum Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01



Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020/9/9	2022/9/8
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2020-07-29	2021-07-28
Signal Analyzer (20Hz-26.5GHz)	Rohde & Schwarz	FISQ 26	EMC0069	2020/11/13	2021/11/12



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Radiated Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020/9/9	2022/9/8
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2020-07-29	2021-07-28
Signal Analyzer (20Hz-26.5GHz)	Rohde & Schwarz	FISQ 26	EMC0069	2020/11/13	2021/11/12

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2020-07-09	2021-07-08
DMM	Fluke	73	EMC0007	2020-07-09	2021-07-08



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Guangzhou branch Testing Services EEC Laboratory 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(b)(4)

6.1.2 Conclusion

Standard Requirement: Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer. 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 3.46dBi.

Please refer to internal photos.

7 Radio Spectrum Matter Test Results

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:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C

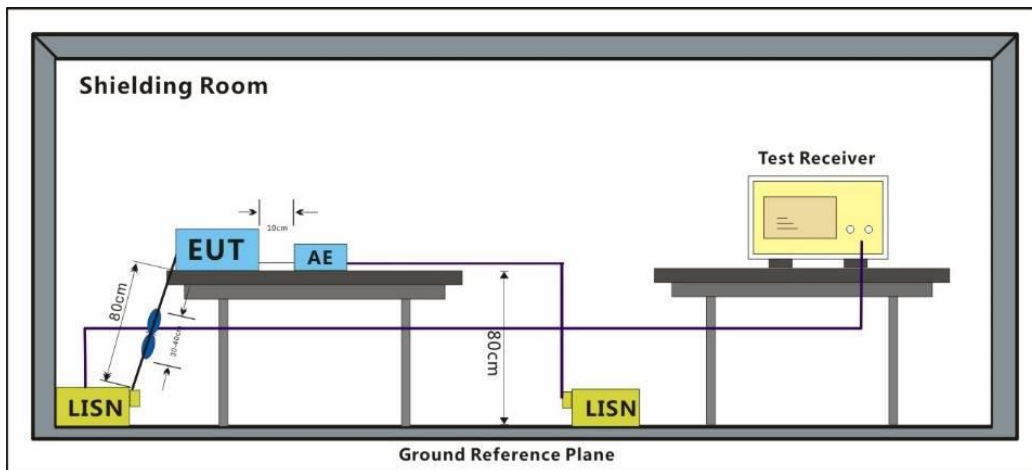
Humidity: 52 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram

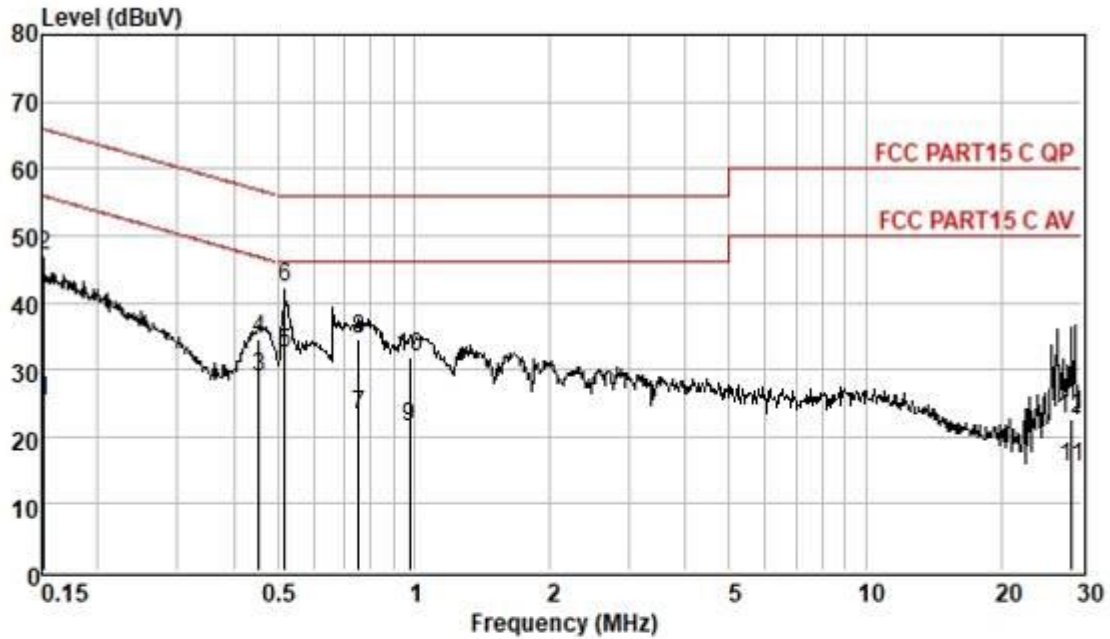


7.1.4 Measurement Procedure and Data

- 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/50μH + 5ohm 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.

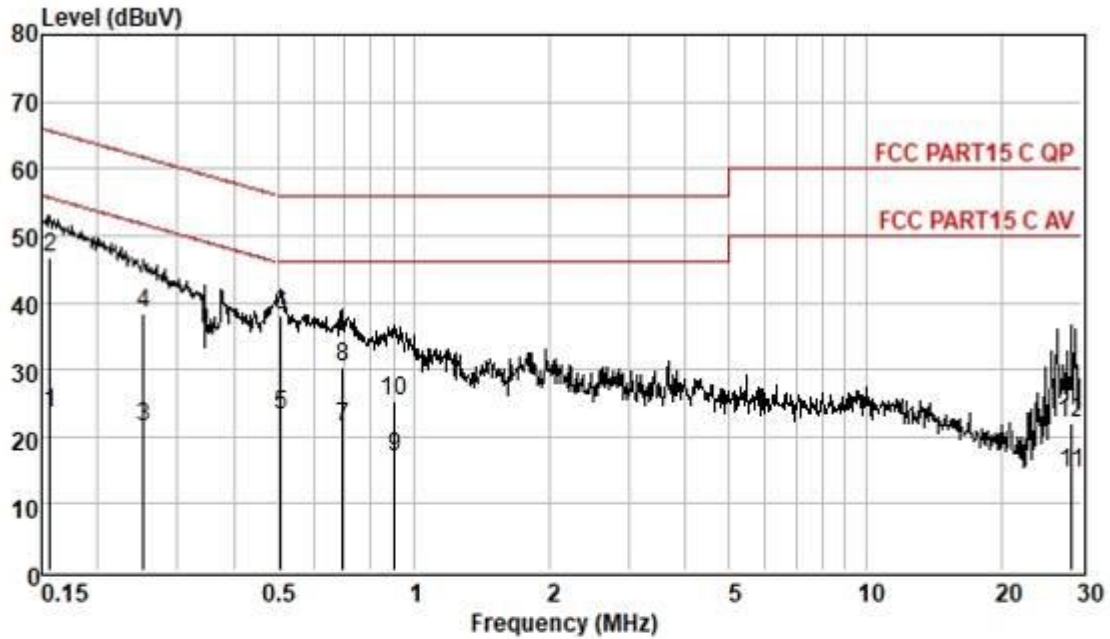
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Test Mode: 02; Line: Live line

Pol : LINE
Mode :
Model :

Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.15	15.58	0.06	9.62	25.26	55.91	-30.65	Average
0.15	37.35	0.06	9.62	47.03	65.91	-18.88	QP
0.45	19.22	0.06	9.63	28.91	46.80	-17.89	Average
0.45	24.85	0.06	9.63	34.54	56.80	-22.26	QP
0.52	22.58	0.07	9.63	32.28	46.00	-13.72	Average
0.52	32.46	0.07	9.63	42.16	56.00	-13.84	QP
0.75	13.46	0.07	9.63	23.16	46.00	-22.84	Average
0.75	24.71	0.07	9.63	34.41	56.00	-21.59	QP
0.98	11.69	0.07	9.62	21.38	46.00	-24.62	Average
0.98	22.24	0.07	9.62	31.93	56.00	-24.07	QP
28.60	4.93	0.43	9.96	15.32	50.00	-34.68	Average
28.60	12.15	0.43	9.96	22.54	60.00	-37.46	QP

Test Mode: 02; Line: Neutral Line

Pol : NEUTRAL
Mode :
Model :

Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.16	13.92	0.06	9.55	23.53	55.65	-32.12	Average
0.16	37.08	0.06	9.55	46.69	65.65	-18.96	QP
0.25	11.69	0.06	9.55	21.30	51.69	-30.39	Average
0.25	28.86	0.06	9.55	38.47	61.69	-23.22	QP
0.51	13.55	0.07	9.55	23.17	46.00	-22.83	Average
0.51	28.53	0.07	9.55	38.15	56.00	-17.85	QP
0.70	11.70	0.07	9.55	21.32	46.00	-24.68	Average
0.70	20.71	0.07	9.55	30.33	56.00	-25.67	QP
0.91	7.46	0.07	9.55	17.08	46.00	-28.92	Average
0.91	15.78	0.07	9.55	25.40	56.00	-30.60	QP
28.60	4.40	0.43	9.89	14.72	50.00	-35.28	Average
28.60	11.70	0.43	9.89	22.02	60.00	-37.98	QP

7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ 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

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.1 °C

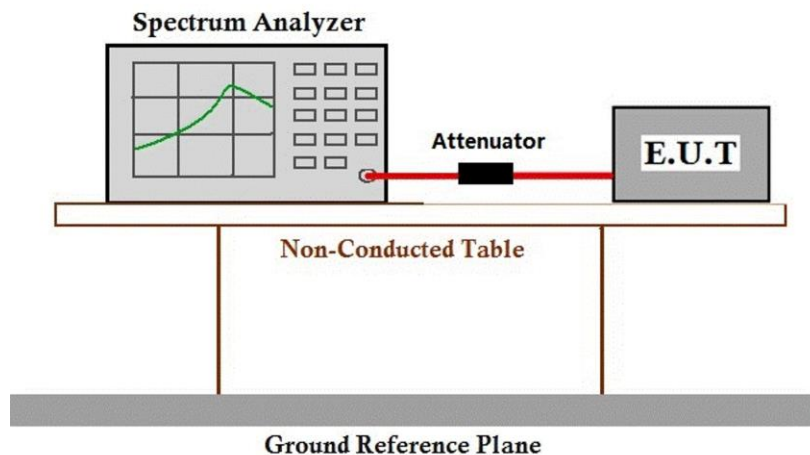
Humidity: 60.4 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.3 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ≥ 500 kHz

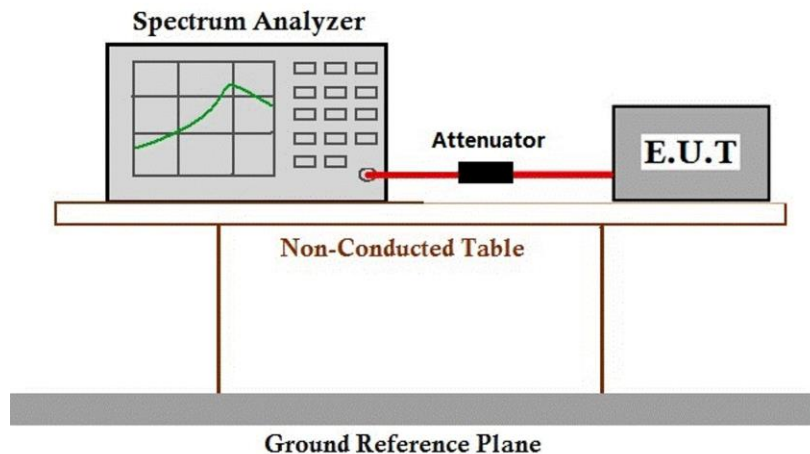
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 25.1 °C Humidity: 60.4 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.4 Power Spectrum Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

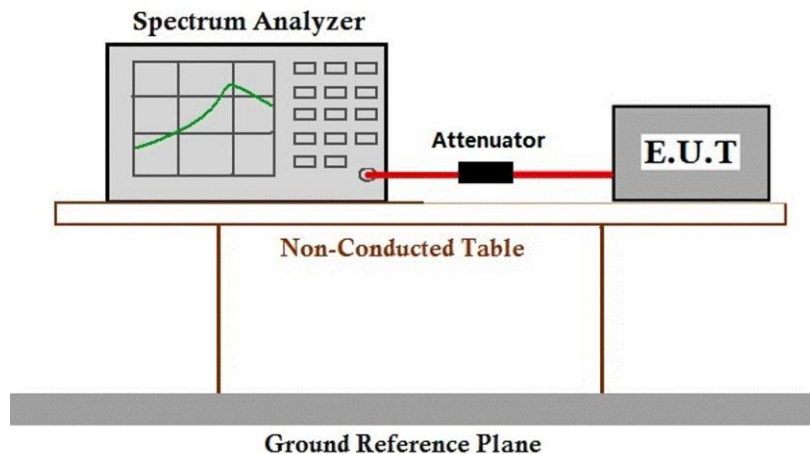
7.4.1 E.U.T. Operation

Operating Environment:			
Temperature:	25.1 °C	Humidity:	60.4 % RH
		Atmospheric Pressure:	1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.5 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2013) Section 11.13.3.2

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)).

7.5.1 E.U.T. Operation

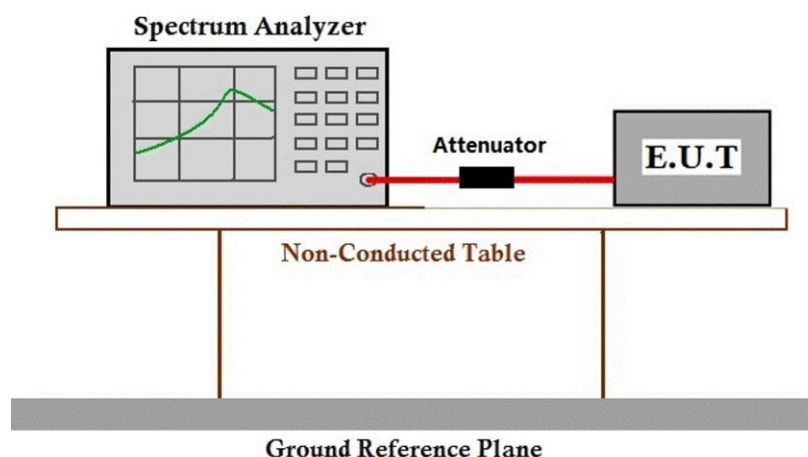
Operating Environment:

Temperature: 25.1 °C Humidity: 60.4 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.6 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) Section 11.11

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)).

7.6.1 E.U.T. Operation

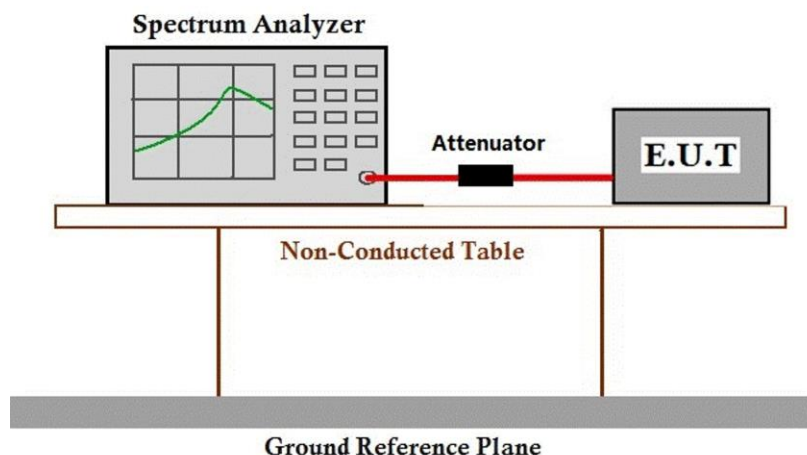
Operating Environment:

Temperature: 25.1 °C Humidity: 60.4 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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7.7 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.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 26.4 °C

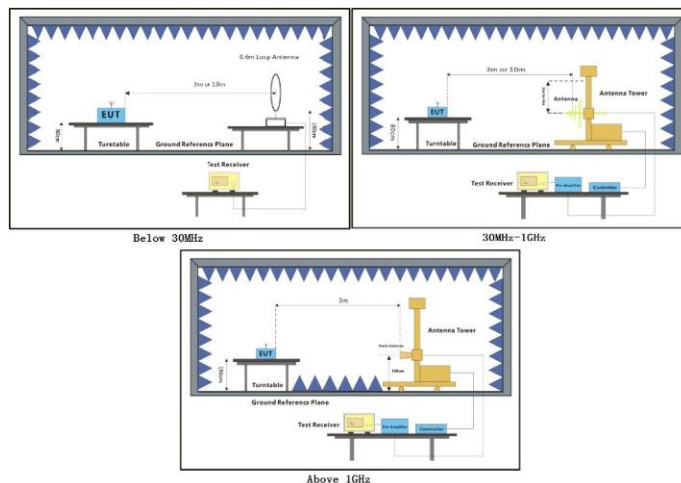
Humidity: 60.9 % RH

Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



7.7.4 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 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.

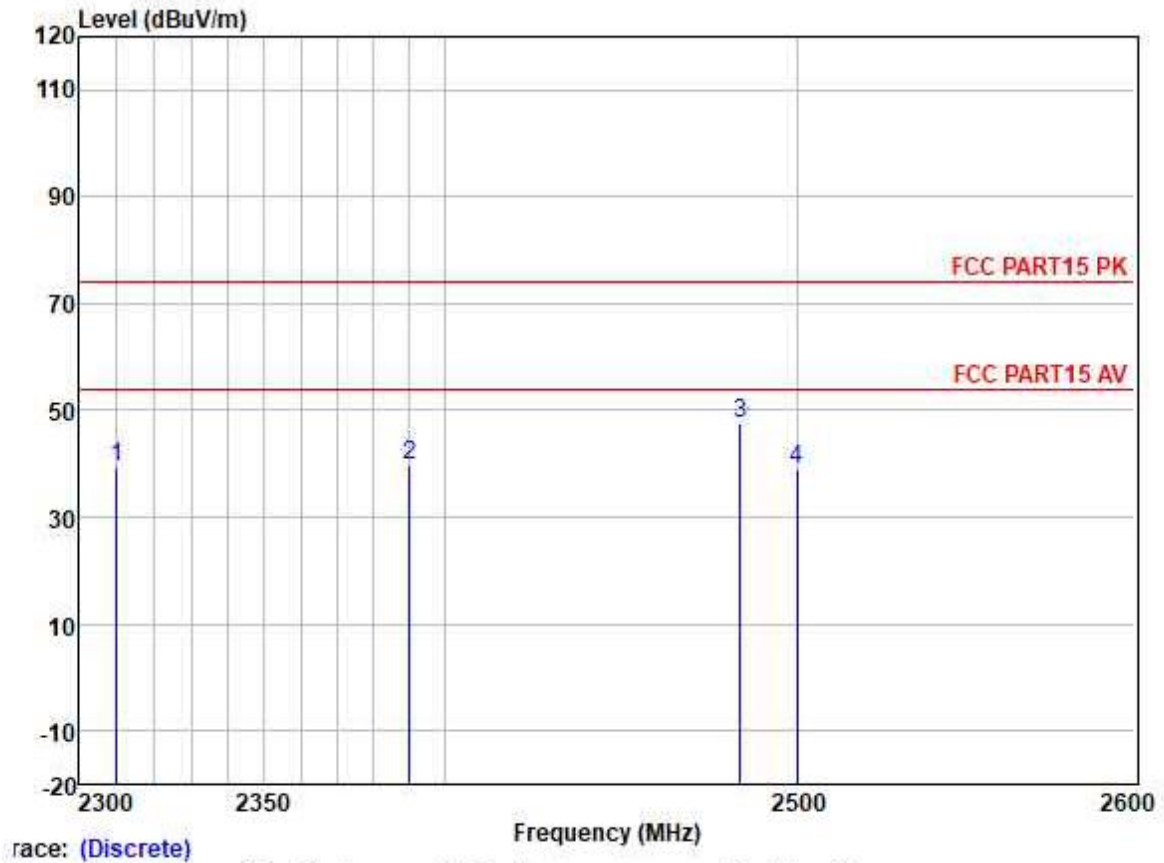
Remark 3: Antenna: 3 denotes the type of antenna for above 1000MHz.



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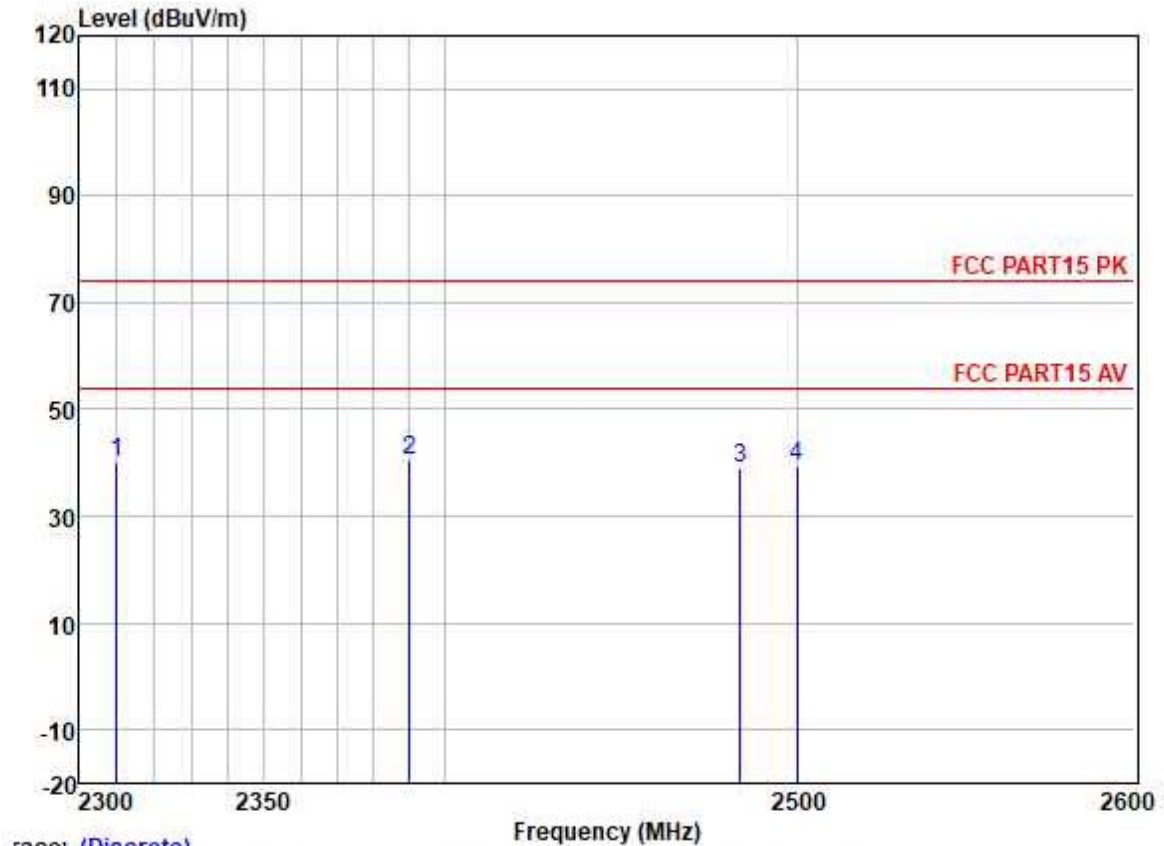
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:High; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	46.35	27.15	3.32	37.62	39.20	74.00	-34.80	HORIZONTAL	Peak
2	2390.000	46.64	27.33	3.48	37.59	39.86	74.00	-34.14	HORIZONTAL	Peak
3	2483.500	54.04	27.48	3.53	37.57	47.48	74.00	-26.52	HORIZONTAL	Peak
4	2500.000	45.66	27.50	3.40	37.56	39.00	74.00	-35.00	HORIZONTAL	Peak

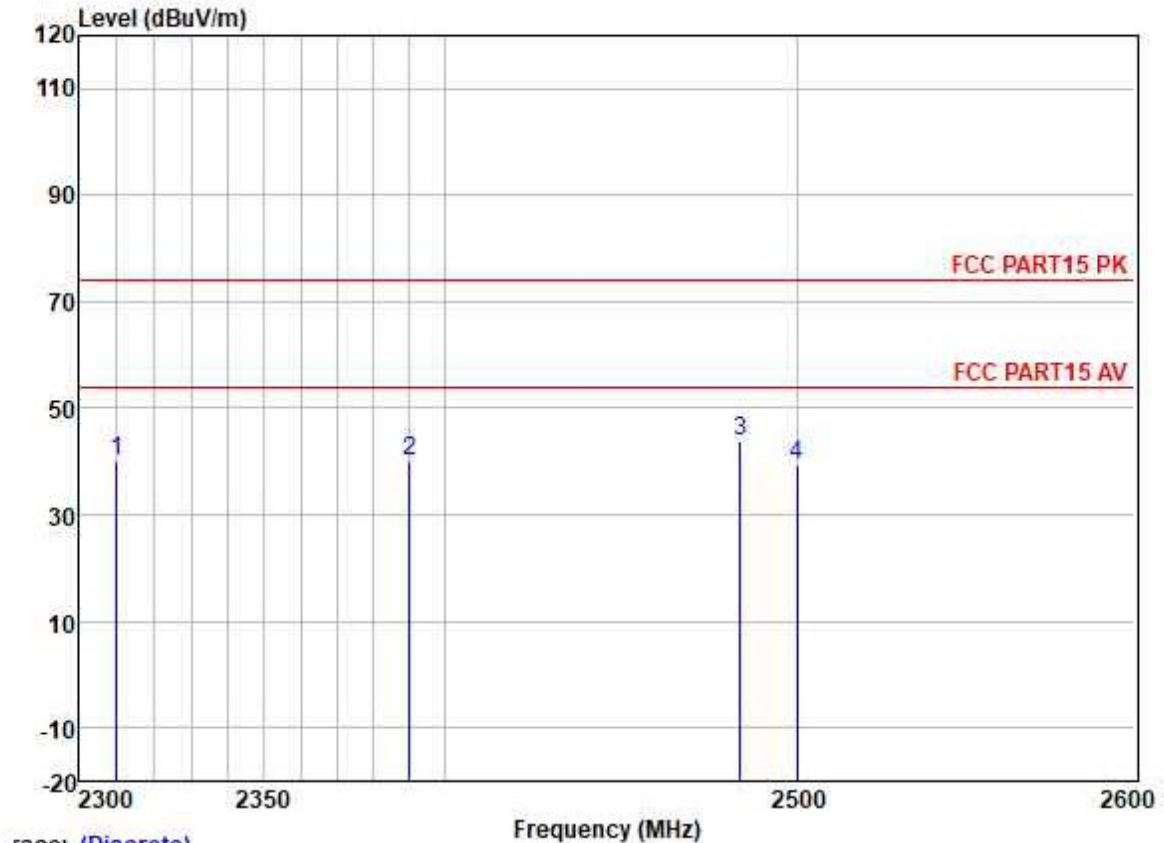
Test Mode: 02; Polarity: Horizontal; Modulation: GFSK; Channel: Low; Antenna: 3



Trace: (Discrete)

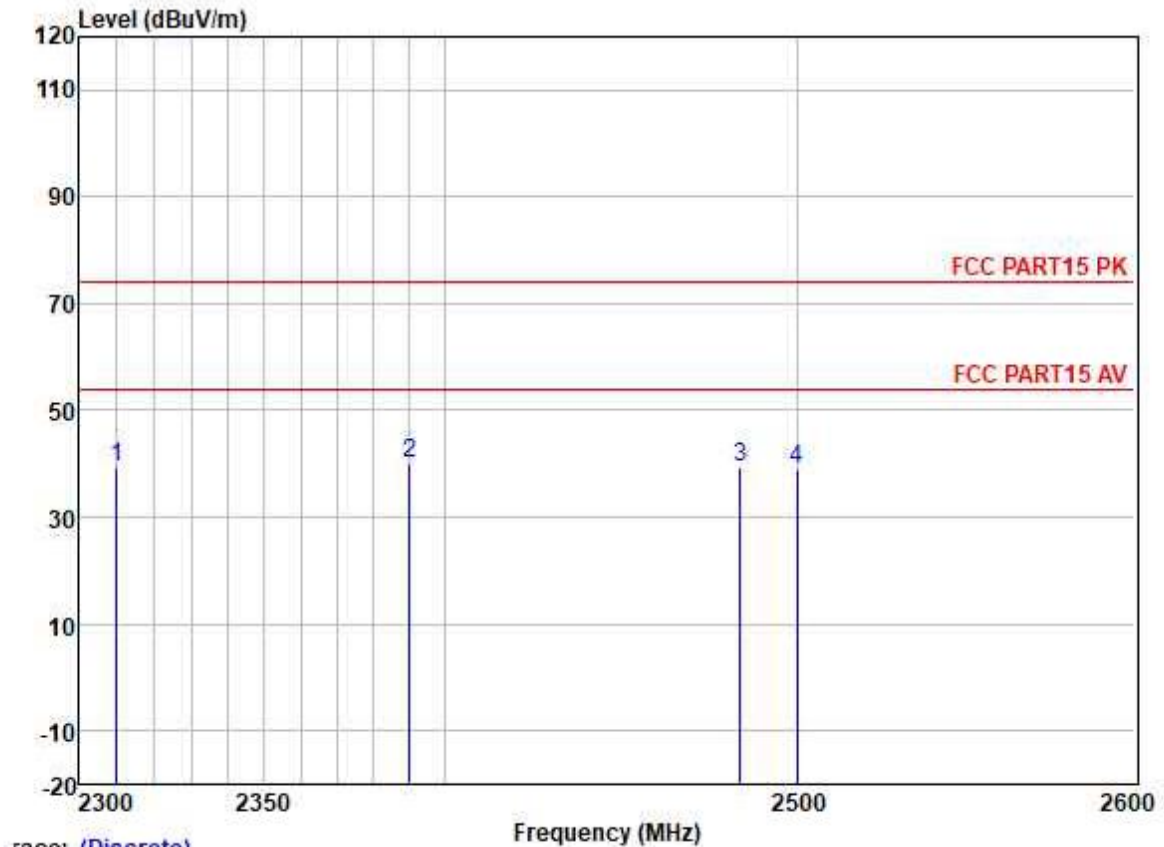
	ReadAntenna	Cable	Preamp		Limit	Over			
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	47.17	27.15	3.32	37.62	40.02	74.00	-33.98	HORIZONTAL Peak
2	2390.000	47.35	27.33	3.48	37.59	40.57	74.00	-33.43	HORIZONTAL Peak
3	2483.500	45.40	27.48	3.53	37.57	38.84	74.00	-35.16	HORIZONTAL Peak
4	2500.000	45.92	27.50	3.40	37.56	39.26	74.00	-34.74	HORIZONTAL Peak

Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: High; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	47.24	27.15	3.32	37.62	40.09	74.00	-33.91	VERTICAL Peak
2	2390.000	46.96	27.33	3.48	37.59	40.18	74.00	-33.82	VERTICAL Peak
3	2483.500	50.56	27.48	3.53	37.57	44.00	74.00	-30.00	VERTICAL Peak
4	2500.000	46.08	27.50	3.40	37.56	39.42	74.00	-34.58	VERTICAL Peak

Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: Low; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	46.36	27.15	3.32	37.62	39.21	74.00	-34.79	VERTICAL	Peak
2	2390.000	46.74	27.33	3.48	37.59	39.96	74.00	-34.04	VERTICAL	Peak
3	2483.500	46.10	27.48	3.53	37.57	39.54	74.00	-34.46	VERTICAL	Peak
4	2500.000	45.73	27.50	3.40	37.56	39.07	74.00	-34.93	VERTICAL	Peak

7.8 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

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: 26.4 °C

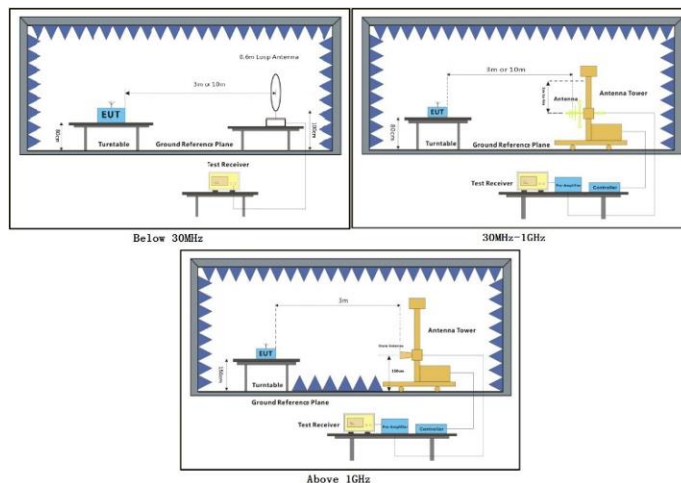
Humidity: 60.8 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

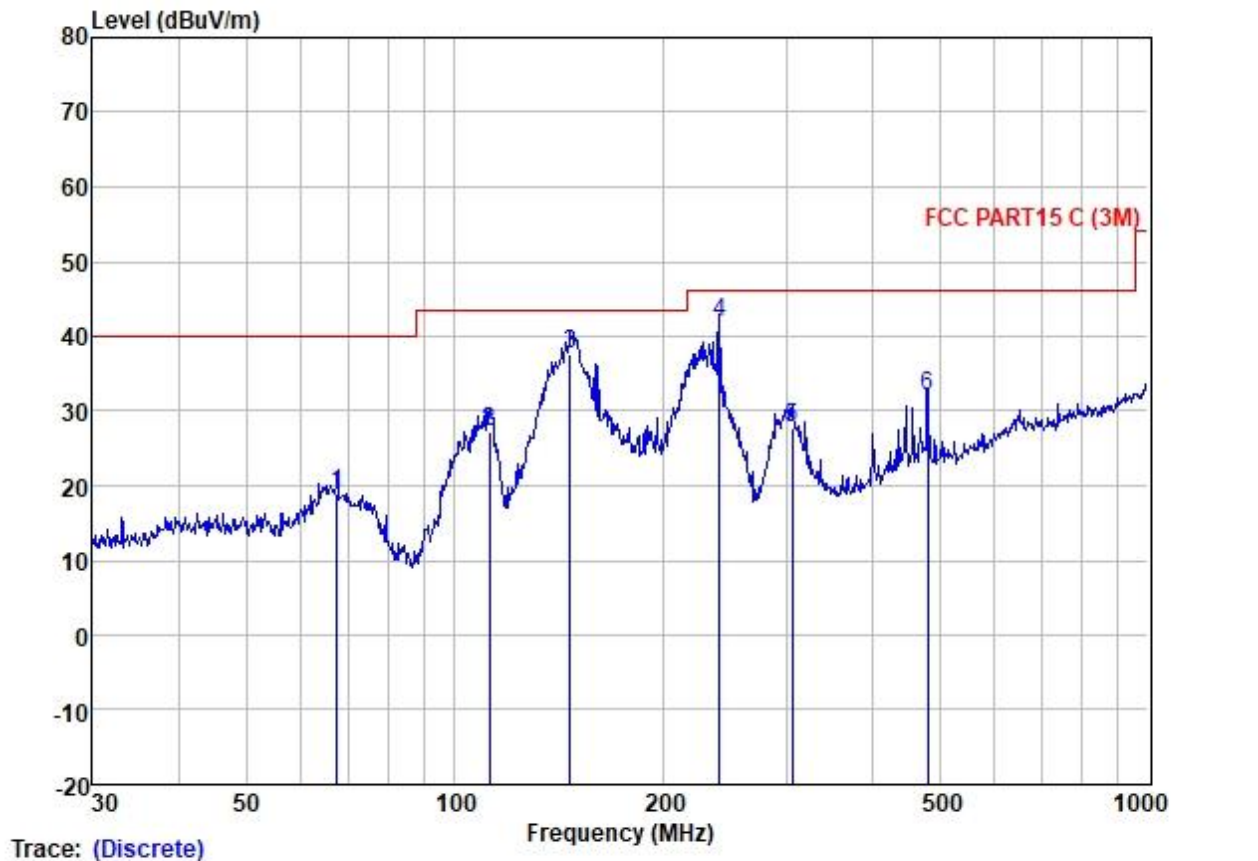
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 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 in the report.
- 5) Antenna: 2 denotes the type of antenna for 30-1000MHz; Antenna: 3 denotes the type of antenna for above 1000MHz.



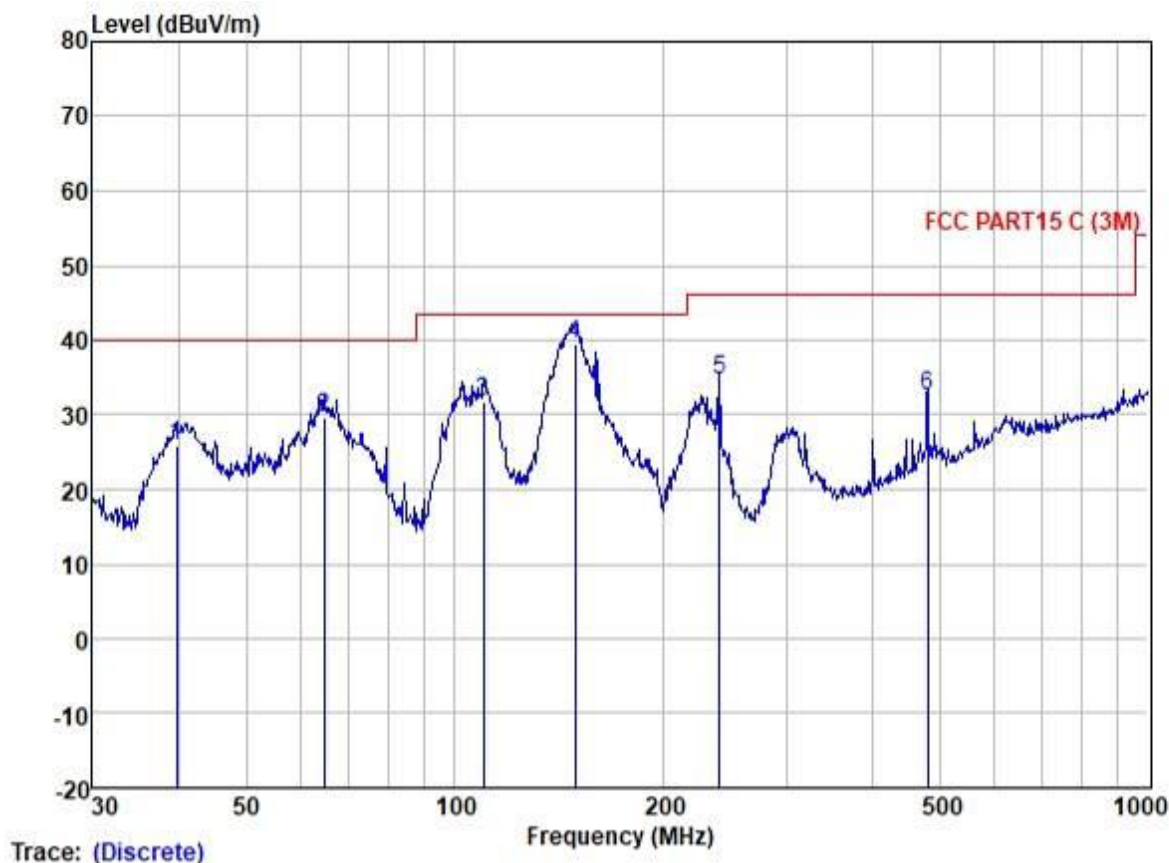
Test Mode: 02; Polarity: Horizontal; Modulation: GFSK; Channel: Low; Antenna: 2



Site : SGS
Condition : FCC PART15 C (3M) HORIZONTAL
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	67.68	32.44	12.24	1.38	27.14	18.92	40.00	-21.08	HORIZONTAL	QP
2	112.13	42.05	10.50	1.81	27.05	27.31	43.50	-16.19	HORIZONTAL	QP
3	146.37	48.57	13.70	2.20	26.86	37.61	43.50	-5.89	HORIZONTAL	QP
4	240.83	53.91	11.92	2.81	26.66	41.98	46.00	-4.02	HORIZONTAL	QP
5	306.75	37.47	13.76	3.21	26.58	27.86	46.00	-18.14	HORIZONTAL	QP
6	480.53	38.01	17.60	4.34	27.91	32.04	46.00	-13.96	HORIZONTAL	QP

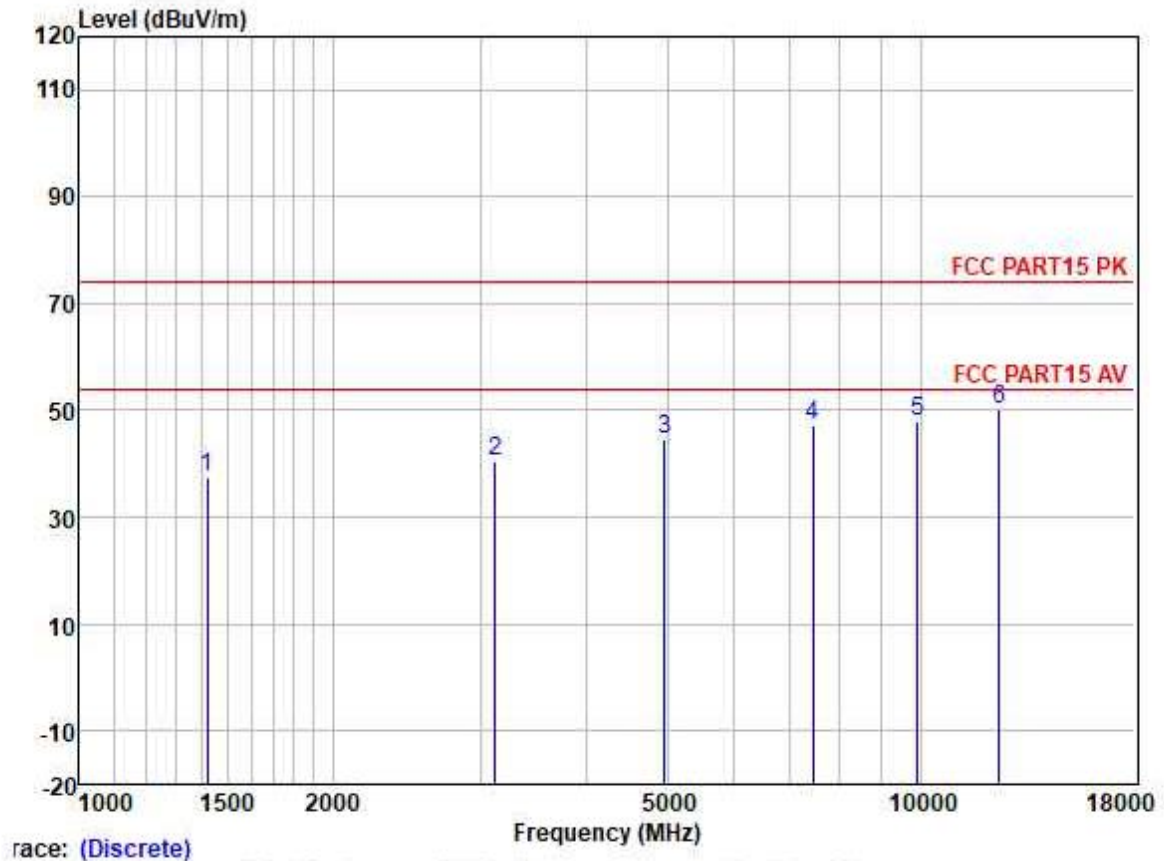
Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: Low; Antenna: 2



Site : SGS
Condition : FCC PART15 C (3M) VERTICAL
Job :
Model :
Power :
Test Mode :

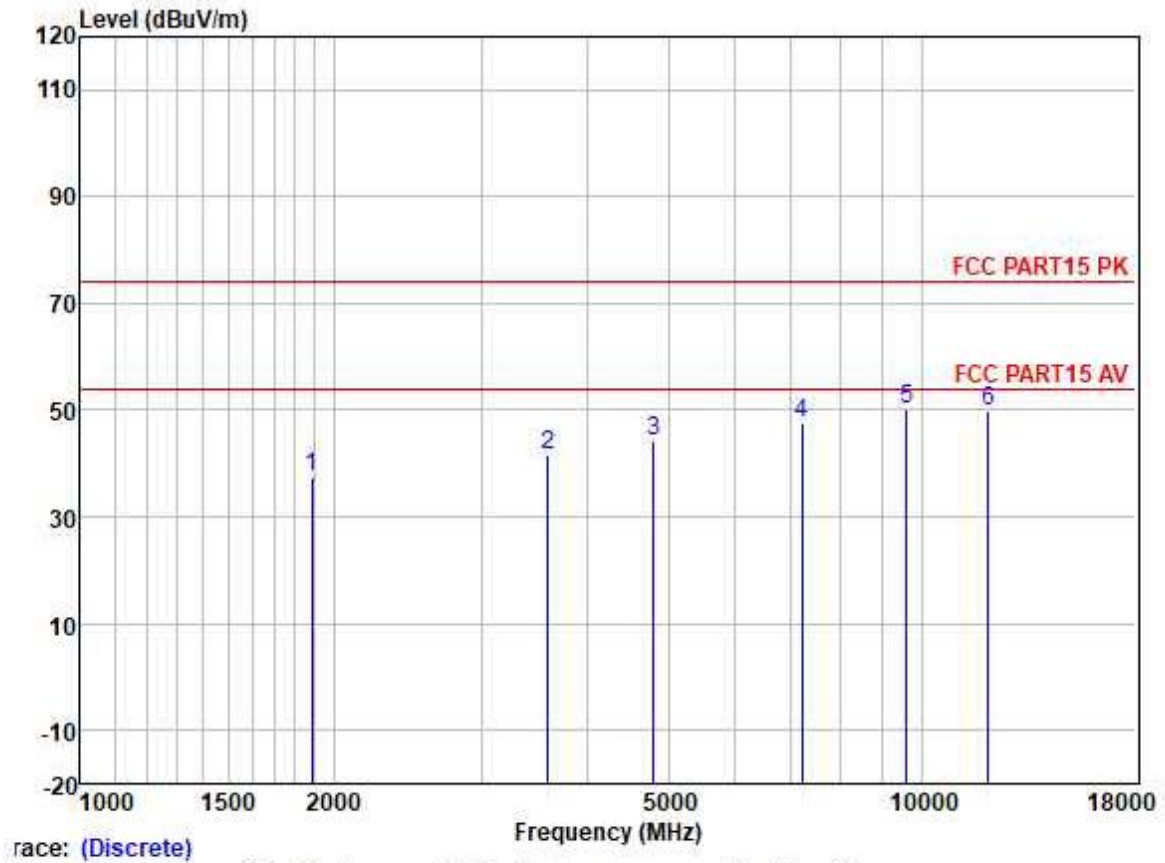
	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	39.71	38.59	13.48	1.10	27.18	25.99	40.00	-14.01	VERTICAL	QP
2	64.66	42.56	12.79	1.34	27.15	29.54	40.00	-10.46	VERTICAL	QP
3	109.80	46.50	10.38	1.79	27.06	31.61	43.50	-11.89	VERTICAL	QP
4	148.96	50.27	13.75	2.22	26.84	39.40	43.50	-4.10	VERTICAL	QP
5	240.83	46.71	11.92	2.81	26.66	34.78	46.00	-11.22	VERTICAL	QP
6	480.53	38.49	17.60	4.34	27.91	32.52	46.00	-13.48	VERTICAL	QP

Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:High; Antenna: 3



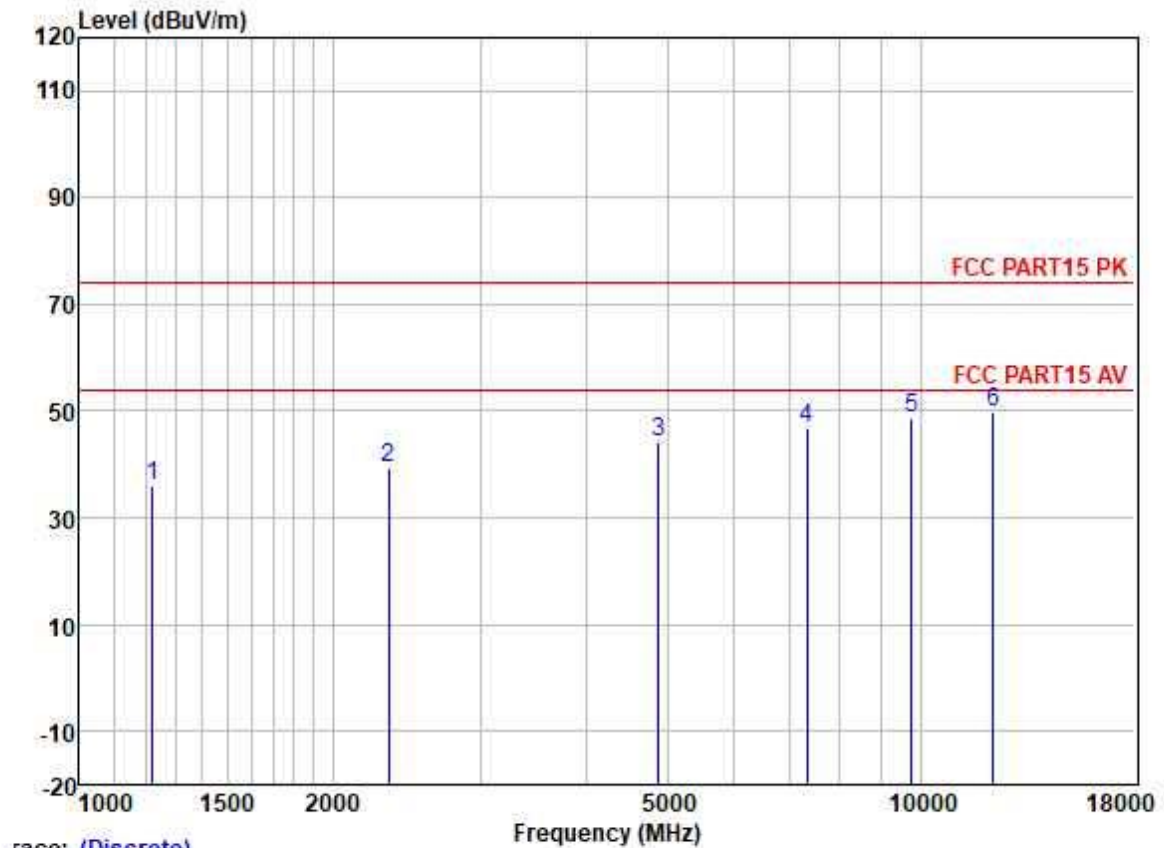
	ReadAntenna	Cable	Preamp		Limit	Over			
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1418.692	47.48	25.42	2.63	38.20	37.33	74.00	-36.67	HORIZONTAL Peak
2	3123.039	45.28	28.50	3.94	37.14	40.58	74.00	-33.42	HORIZONTAL Peak
3	4960.110	44.13	31.65	5.65	36.84	44.59	74.00	-29.41	HORIZONTAL Peak
4	7440.732	42.31	36.27	6.22	37.47	47.33	74.00	-26.67	HORIZONTAL Peak
5	9920.221	39.79	38.65	6.96	37.40	48.00	74.00	-26.00	HORIZONTAL Peak
6	12400.920	40.49	38.57	7.97	36.88	50.15	74.00	-23.85	HORIZONTAL Peak

Test Mode: 02; Polarity: Horizontal; Modulation: GFSK; Channel: Low; Antenna: 3



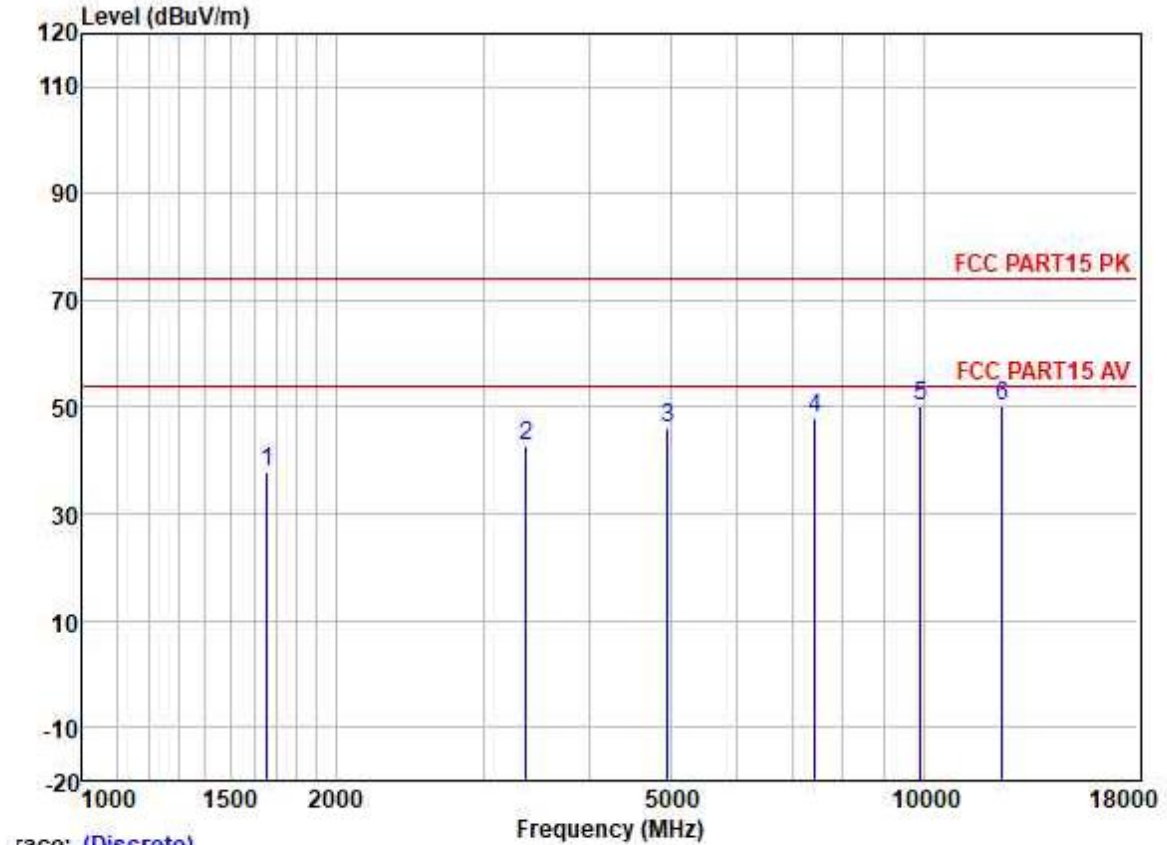
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1883.236	46.16	26.03	2.91	37.77	37.33	74.00	-36.67	HORIZONTAL	Peak
2	3598.203	44.86	29.04	4.50	36.91	41.49	74.00	-32.51	HORIZONTAL	Peak
3	4804.274	44.07	31.42	5.40	36.83	44.06	74.00	-29.94	HORIZONTAL	Peak
4	7206.551	43.58	35.54	5.98	37.38	47.72	74.00	-26.28	HORIZONTAL	Peak
5	9608.540	42.23	38.37	7.07	37.42	50.25	74.00	-23.75	HORIZONTAL	Peak
6	12010.510	39.93	38.90	8.19	37.10	49.92	74.00	-24.08	HORIZONTAL	Peak

Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:middle; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1220.714	47.30	24.82	2.32	38.37	36.07	74.00	-37.93	HORIZONTAL	Peak
2	2332.356	46.40	27.20	3.36	37.62	39.34	74.00	-34.66	HORIZONTAL	Peak
3	4884.185	44.07	31.56	5.52	36.84	44.31	74.00	-29.69	HORIZONTAL	Peak
4	7326.894	42.21	36.00	6.13	37.43	46.91	74.00	-27.09	HORIZONTAL	Peak
5	9768.390	40.59	38.53	7.01	37.41	48.72	74.00	-25.28	HORIZONTAL	Peak
6	12210.670	40.07	38.74	8.08	37.00	49.89	74.00	-24.11	HORIZONTAL	Peak

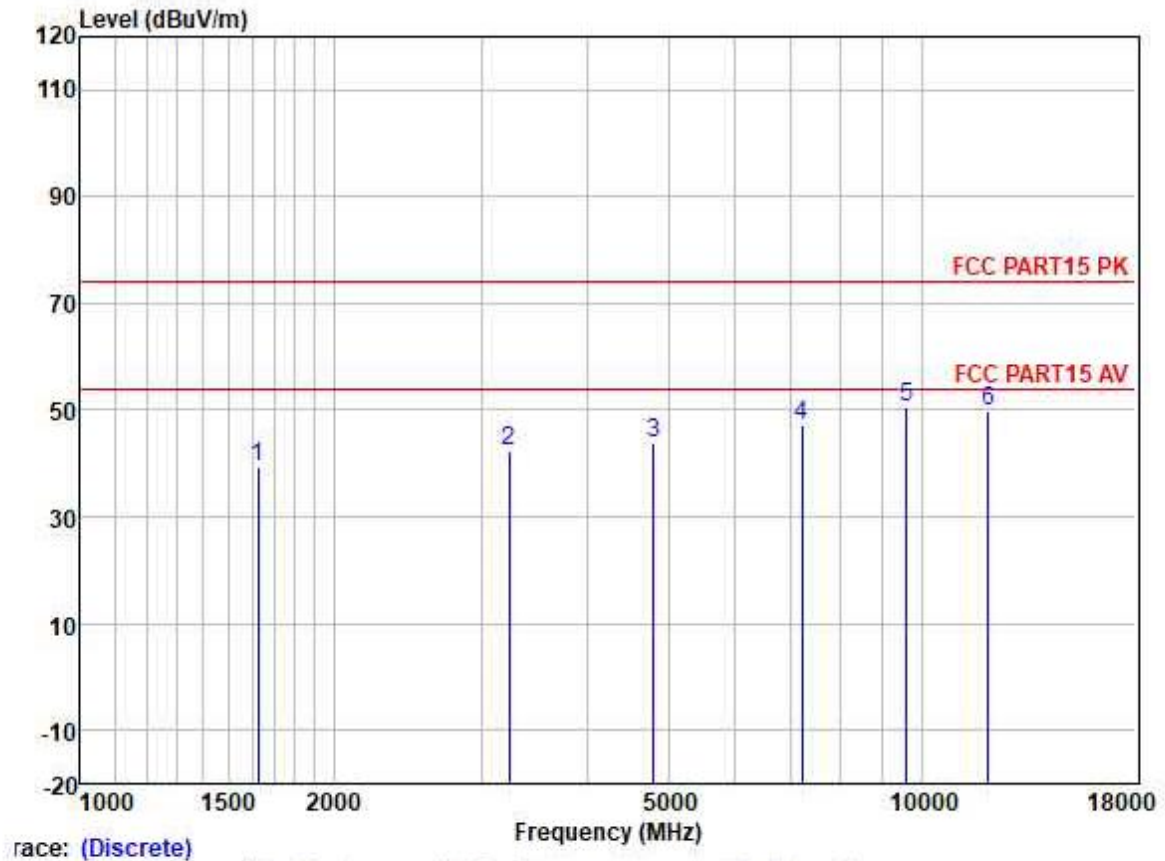
Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: High; Antenna: 3



Trace: (Discrete)

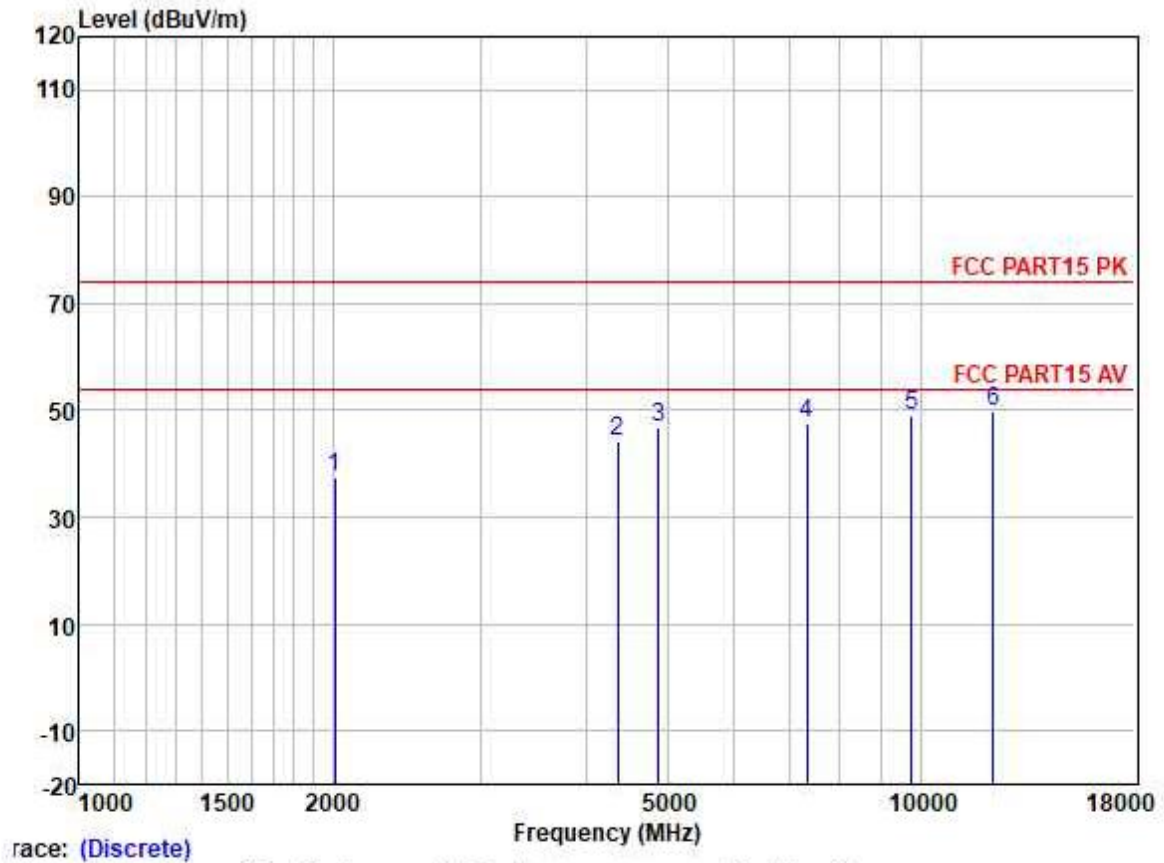
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1658.337	47.50	25.65	2.80	37.93	38.02	74.00	-35.98	VERTICAL Peak
2	3366.778	46.88	28.82	4.09	36.99	42.80	74.00	-31.20	VERTICAL Peak
3	4960.418	45.65	31.65	5.65	36.84	46.11	74.00	-27.89	VERTICAL Peak
4	7440.026	42.79	36.27	6.22	37.47	47.81	74.00	-26.19	VERTICAL Peak
5	9920.020	42.09	38.65	6.96	37.40	50.30	74.00	-23.70	VERTICAL Peak
6	12400.150	40.47	38.57	7.97	36.88	50.13	74.00	-23.87	VERTICAL Peak

Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: Low; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1625.121	49.04	25.61	2.80	37.95	39.50	74.00	-34.50	VERTICAL Peak
2	3233.260	46.74	28.65	4.02	37.07	42.34	74.00	-31.66	VERTICAL Peak
3	4804.315	43.79	31.42	5.40	36.83	43.78	74.00	-30.22	VERTICAL Peak
4	7206.026	43.21	35.54	5.98	37.38	47.35	74.00	-26.65	VERTICAL Peak
5	9608.530	42.50	38.37	7.07	37.42	50.52	74.00	-23.48	VERTICAL Peak
6	12010.860	39.91	38.90	8.19	37.10	49.90	74.00	-24.10	VERTICAL Peak

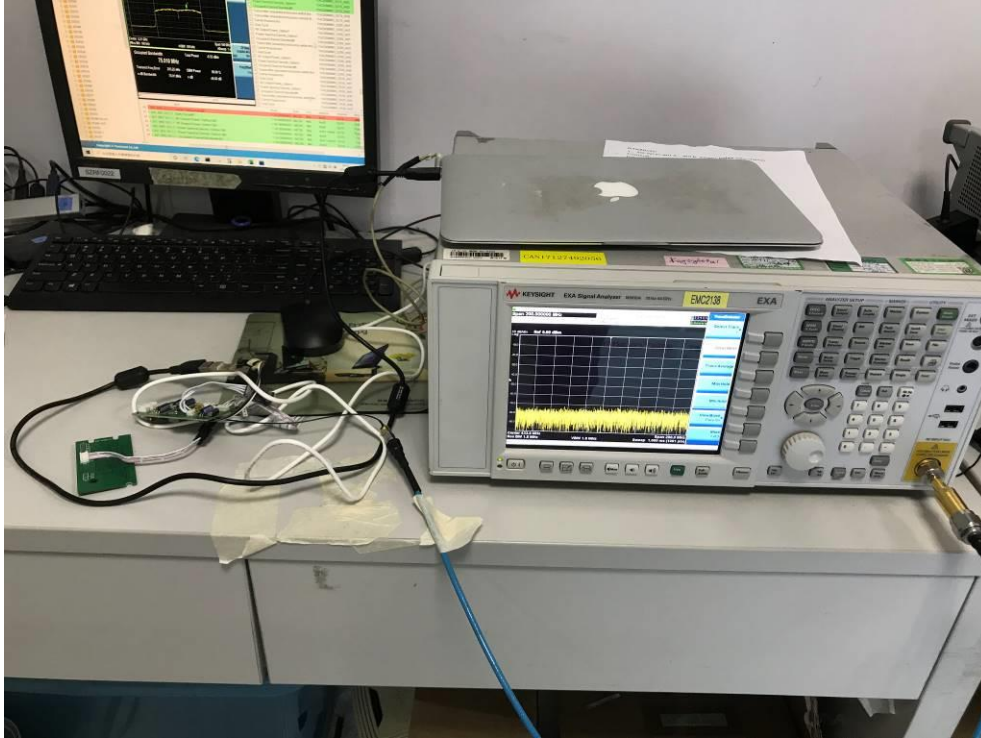
Test Mode: 02; Polarity: Vertical; Modulation: GFSK; Channel: middle; Antenna: 3



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2012.686	45.98	26.12	3.10	37.69	37.51	74.00	-36.49	VERTICAL	Peak
2	4367.058	45.74	30.62	4.68	36.81	44.23	74.00	-29.77	VERTICAL	Peak
3	4884.695	46.76	31.56	5.52	36.84	47.00	74.00	-27.00	VERTICAL	Peak
4	7326.265	42.92	36.00	6.13	37.43	47.62	74.00	-26.38	VERTICAL	Peak
5	9768.240	40.85	38.53	7.01	37.41	48.98	74.00	-25.02	VERTICAL	Peak
6	12210.100	39.92	38.74	8.08	37.00	49.74	74.00	-24.26	VERTICAL	Peak

8 Test Setup Photo

RF conducted test



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

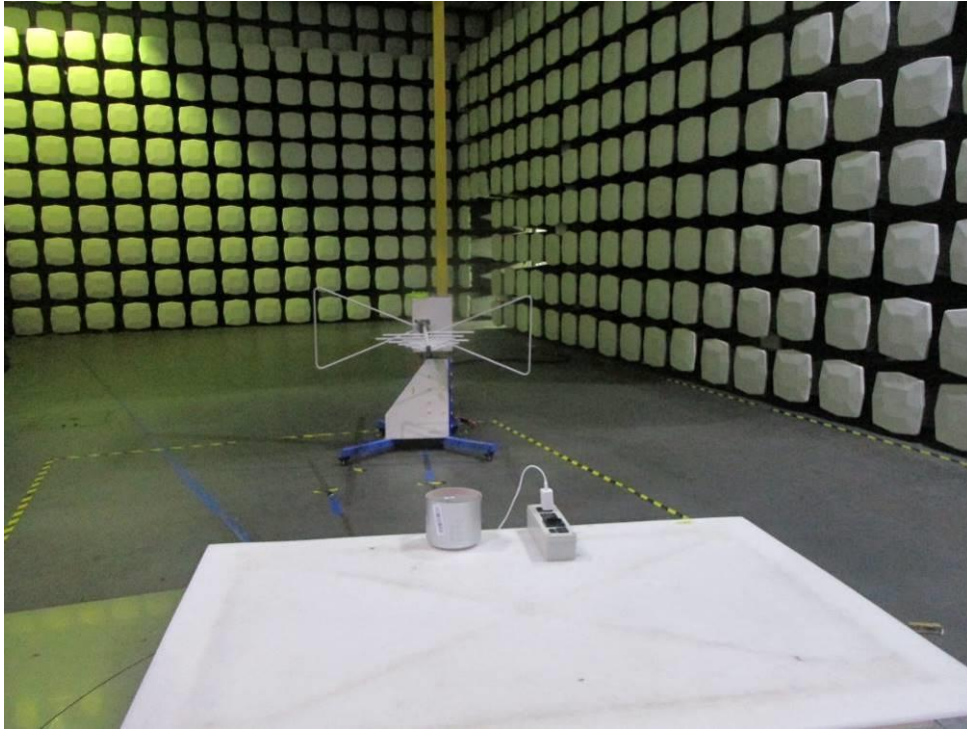


Radiated Emissions which fall in the restricted bands



Radiated Spurious Emissions





9 EUT Constructional Details (EUT Photos)

Refer to external and internal photos for GZCR2105020357HS

BLE_1M_Ant1_2442



BLE_1M_Ant1_2480

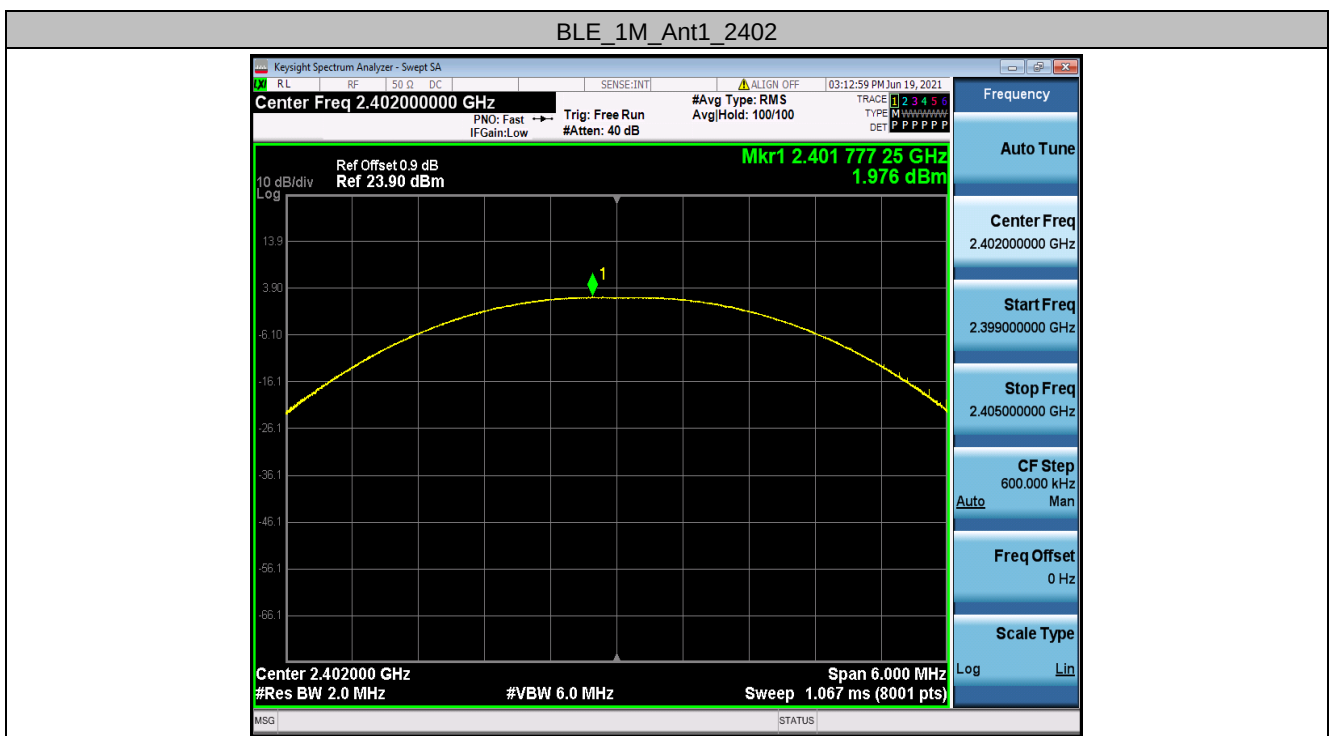


10.2 Appendix B: Maximum conducted output power

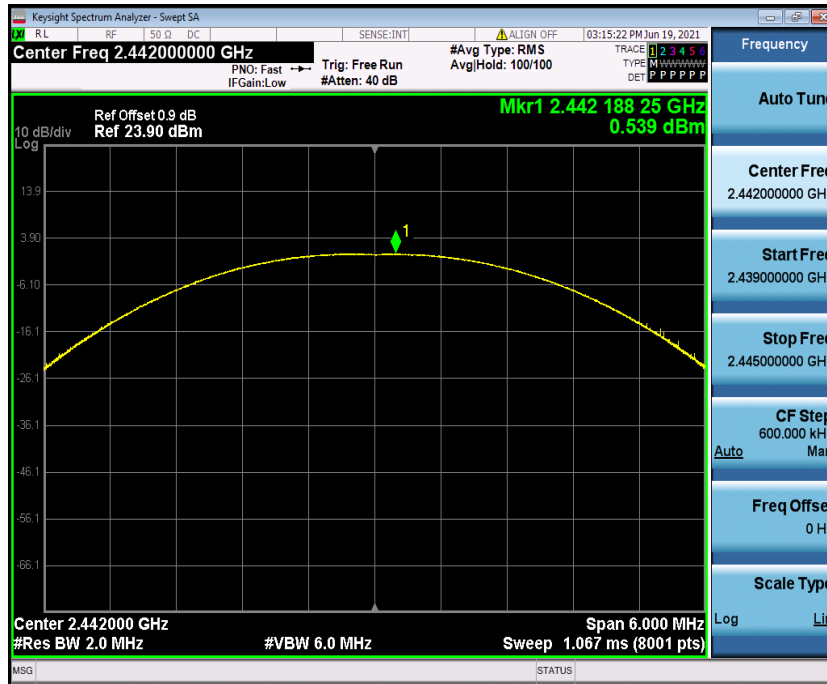
10.2.1 Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	1.98	<=30	PASS
		2442	0.54	<=30	PASS
		2480	-1.06	<=30	PASS

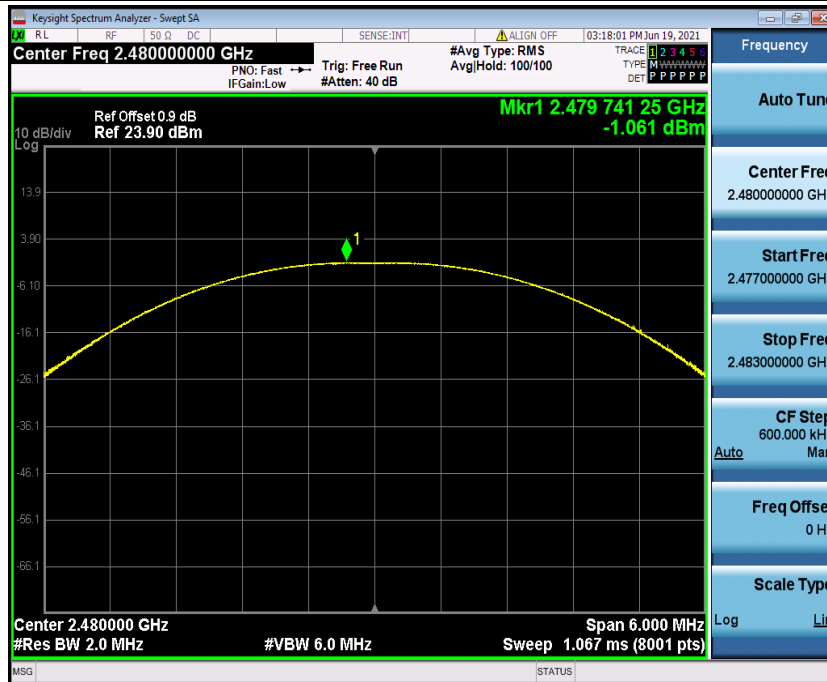
10.2.2 Test Graphs



BLE_1M_Ant1_2442



BLE_1M_Ant1_2480



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10.3 Appendix C: Maximum power spectral density

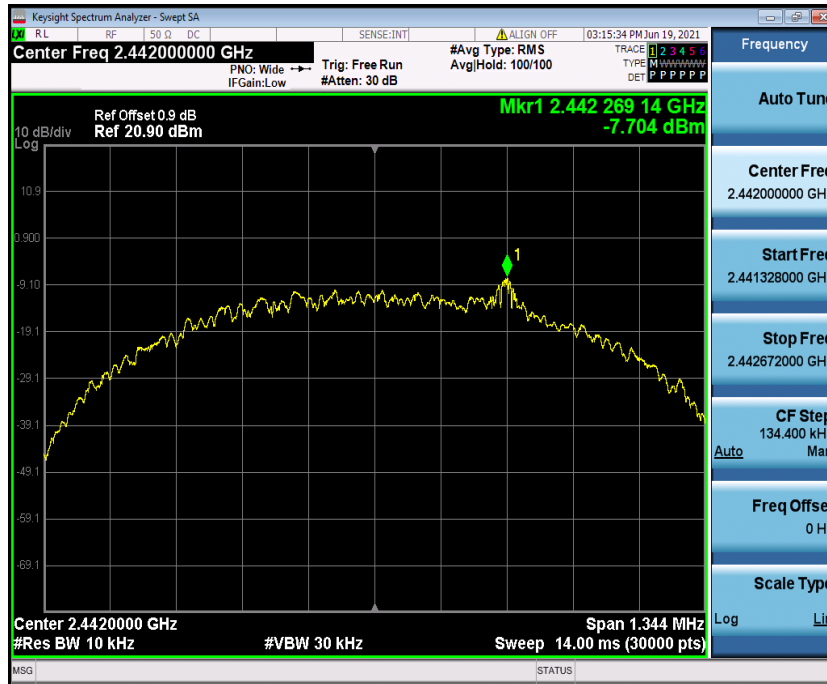
10.3.1 Test Result

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-6.61	<=8	PASS
		2442	-7.7	<=8	PASS
		2480	-9.44	<=8	PASS

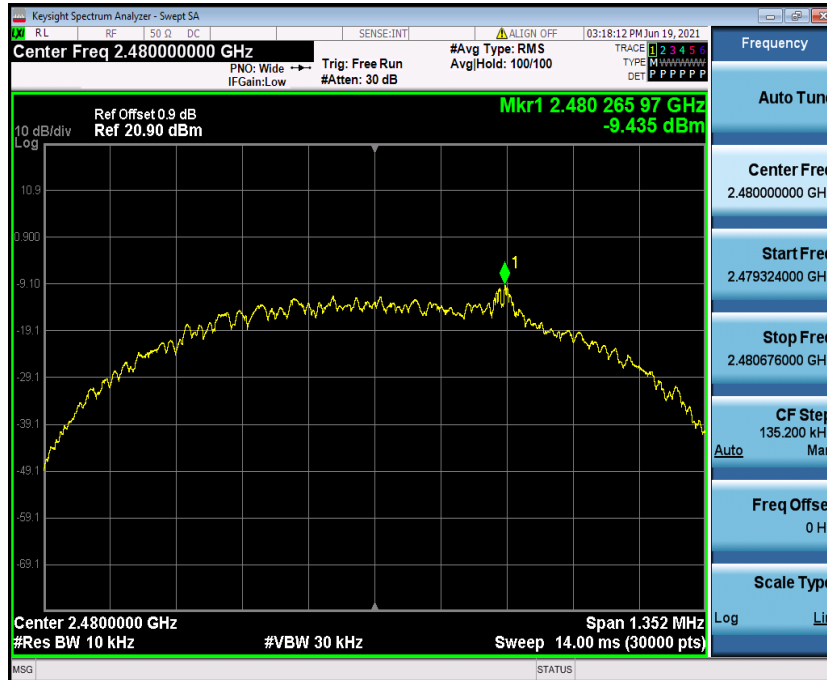
10.3.2 Test Graphs



BLE_1M_Ant1_2442



BLE_1M_Ant1_2480



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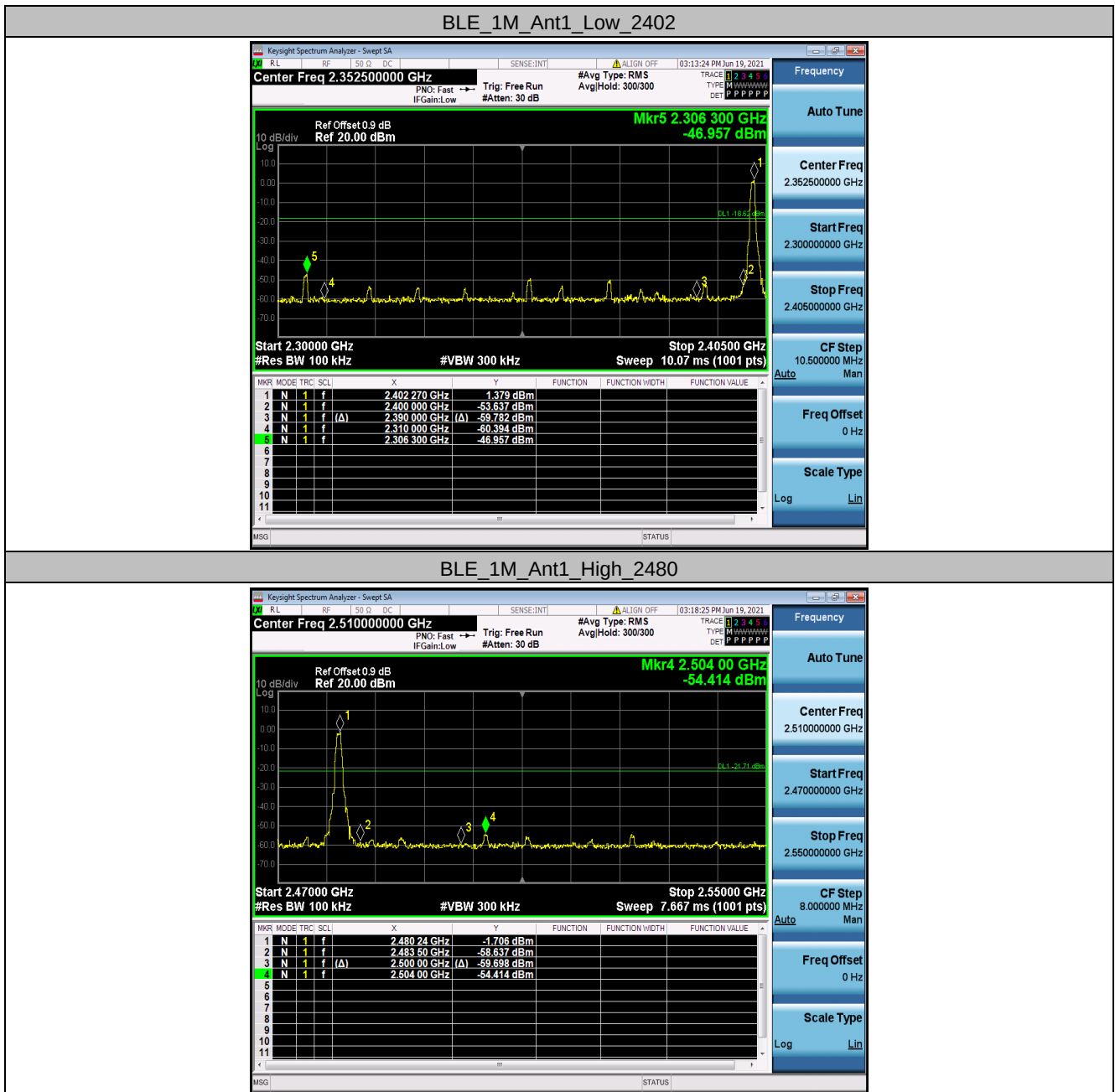
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10.4 Appendix D: Band edge measurements

10.4.1 Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.38	-46.96	<=-18.62	PASS
		High	2480	-1.71	-54.41	<=-21.71	PASS

10.4.2 Test Graphs

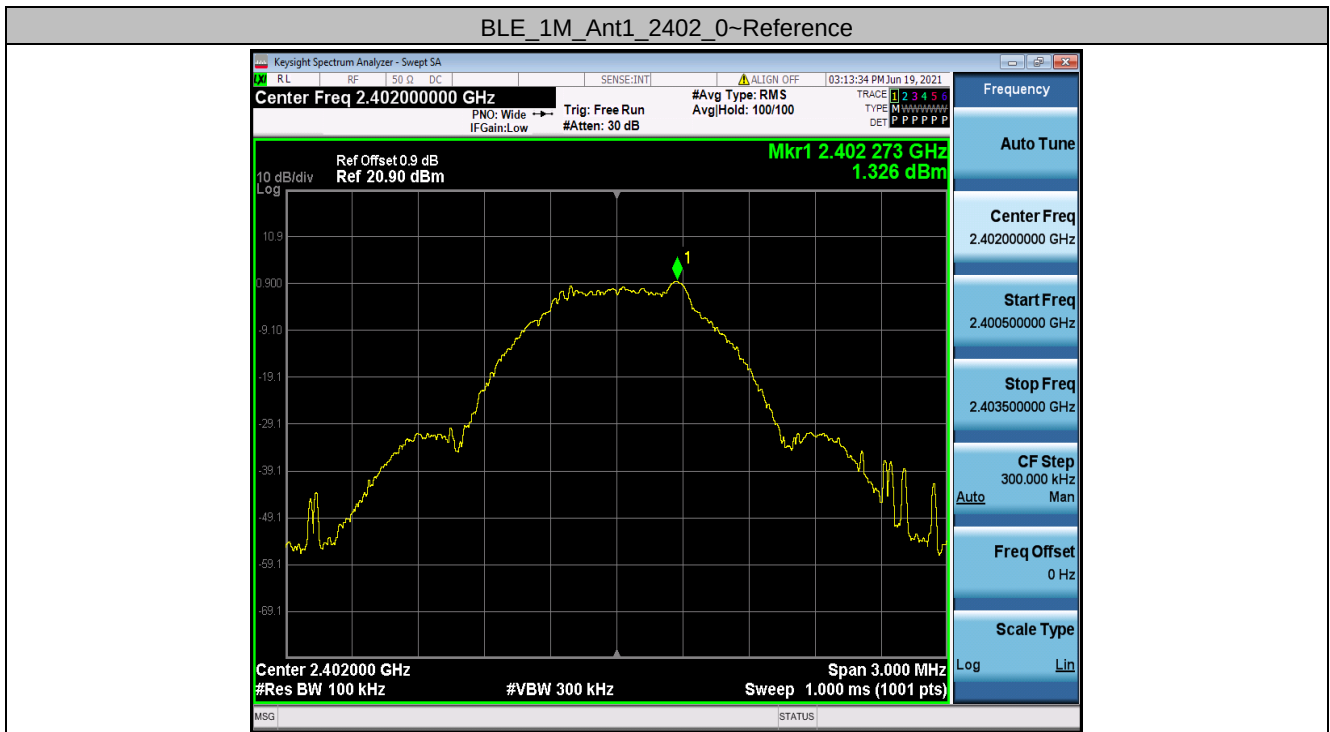


10.5 Appendix E: Conducted Spurious Emission

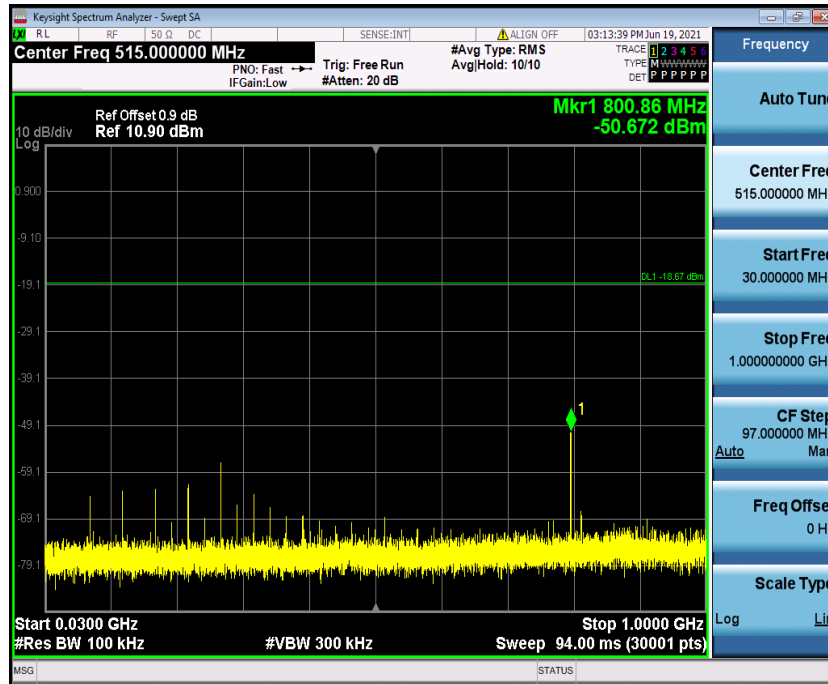
10.5.1 Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	1.33	1.33	---	PASS
			30~1000	30~1000	-50.672	<=-18.674	PASS
			1000~26500	1000~26500	-48.548	<=-18.674	PASS
		2442	Reference	-0.01	-0.01	---	PASS
			30~1000	30~1000	-52.109	<=-20.013	PASS
			1000~26500	1000~26500	-49.874	<=-20.013	PASS
		2480	Reference	-1.73	-1.73	---	PASS
			30~1000	30~1000	-54.389	<=-21.726	PASS
			1000~26500	1000~26500	-50.922	<=-21.726	PASS

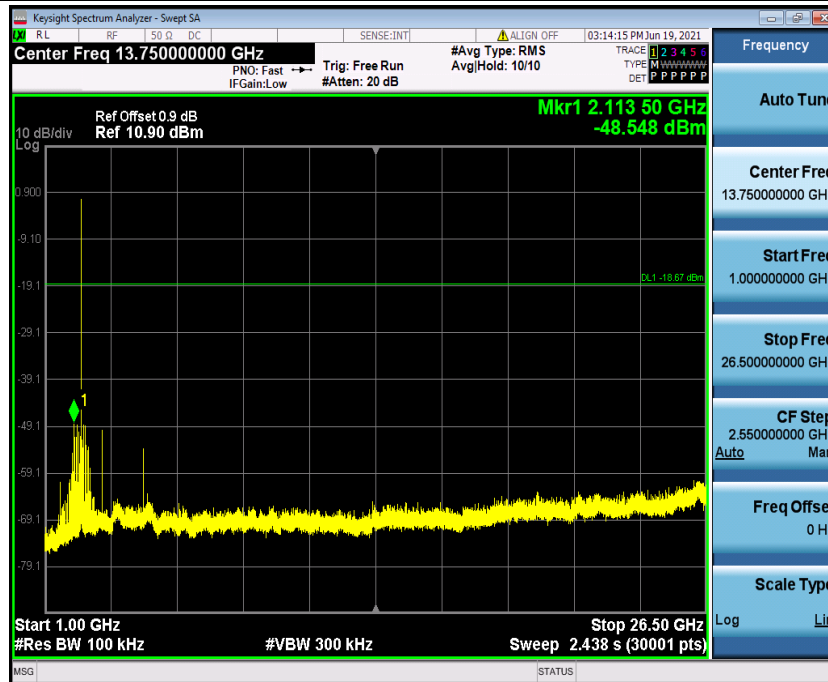
10.5.2 Test Graphs



BLE_1M_Ant1_2402_30~1000



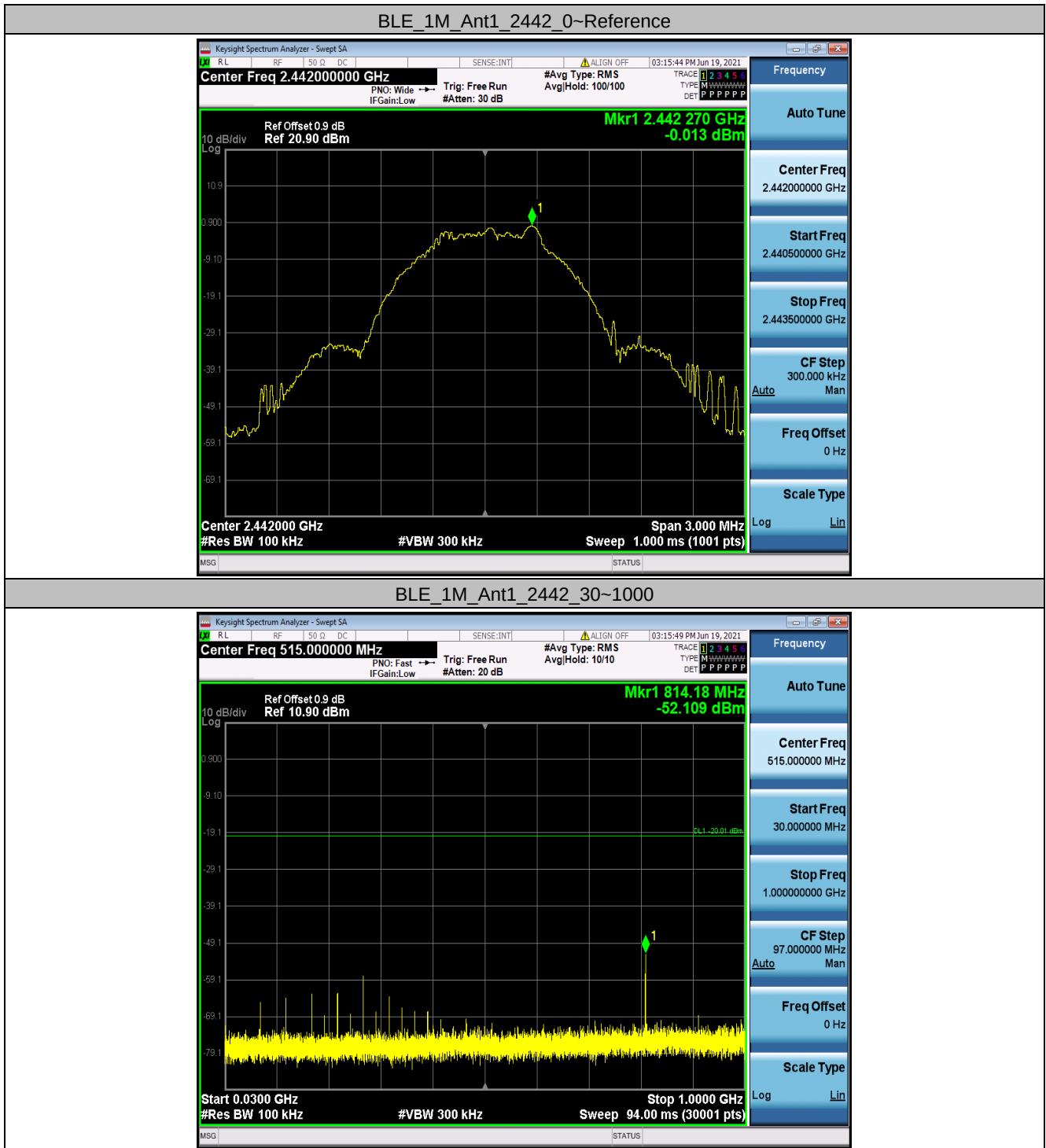
BLE_1M_Ant1_2402_1000~26500

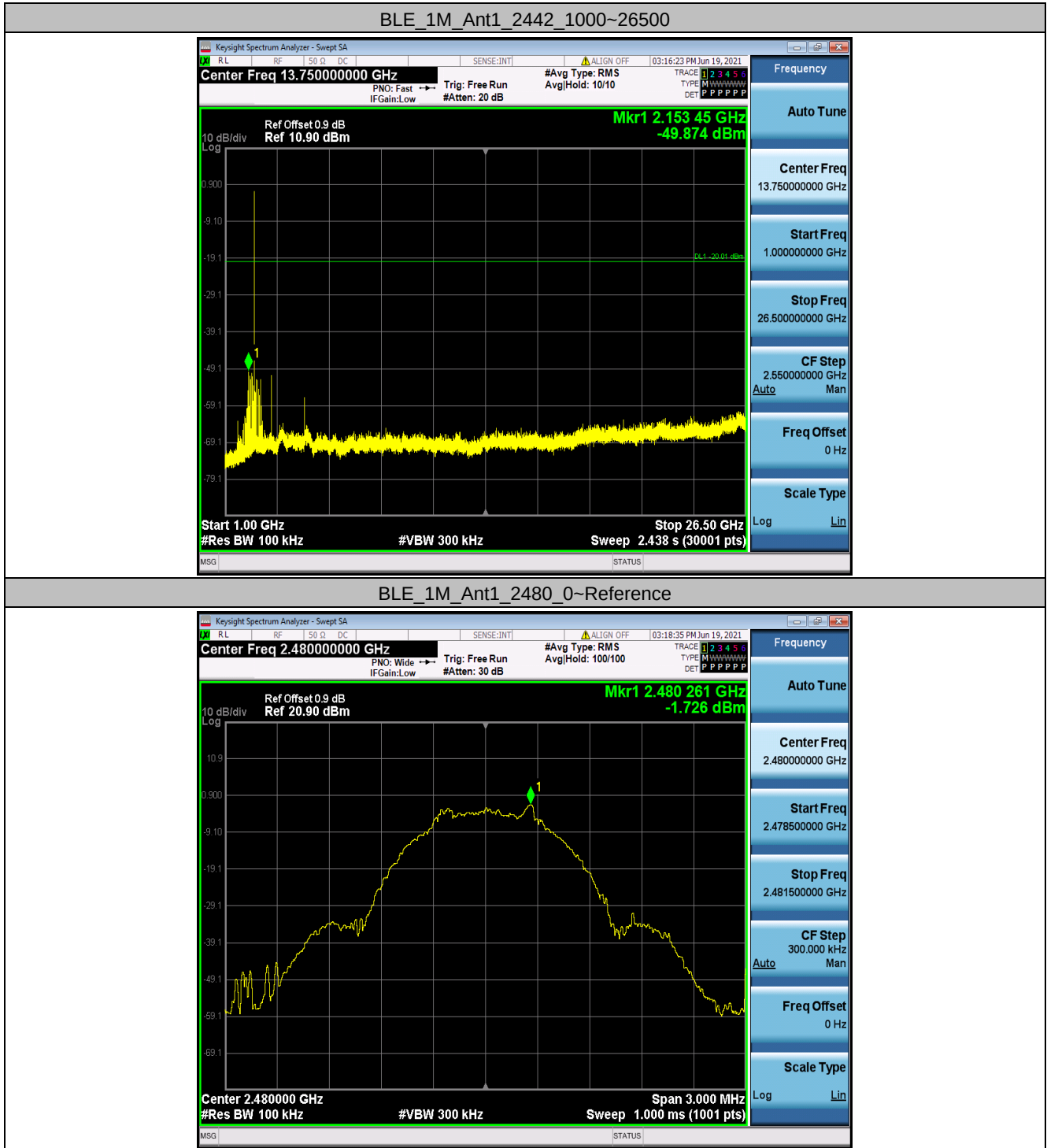


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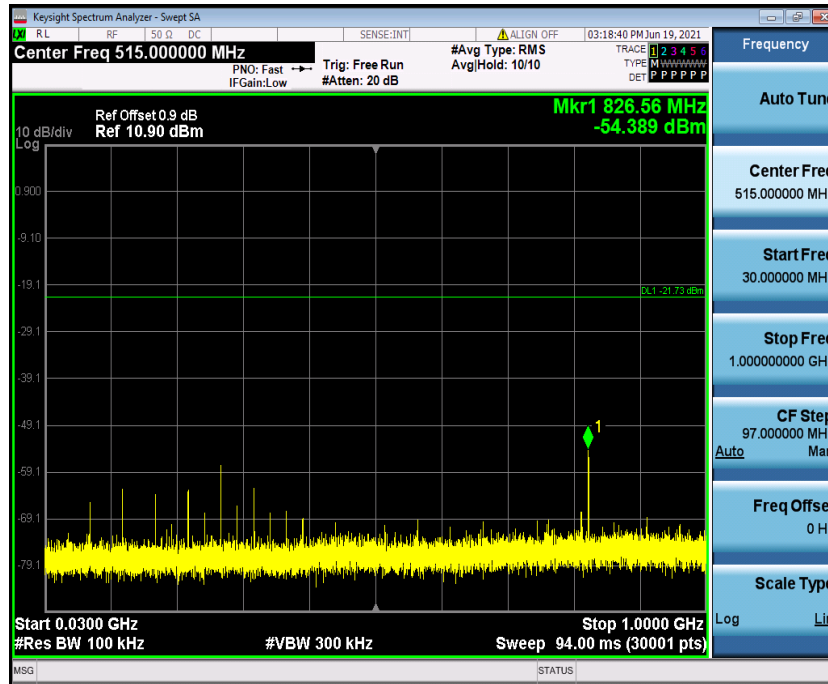
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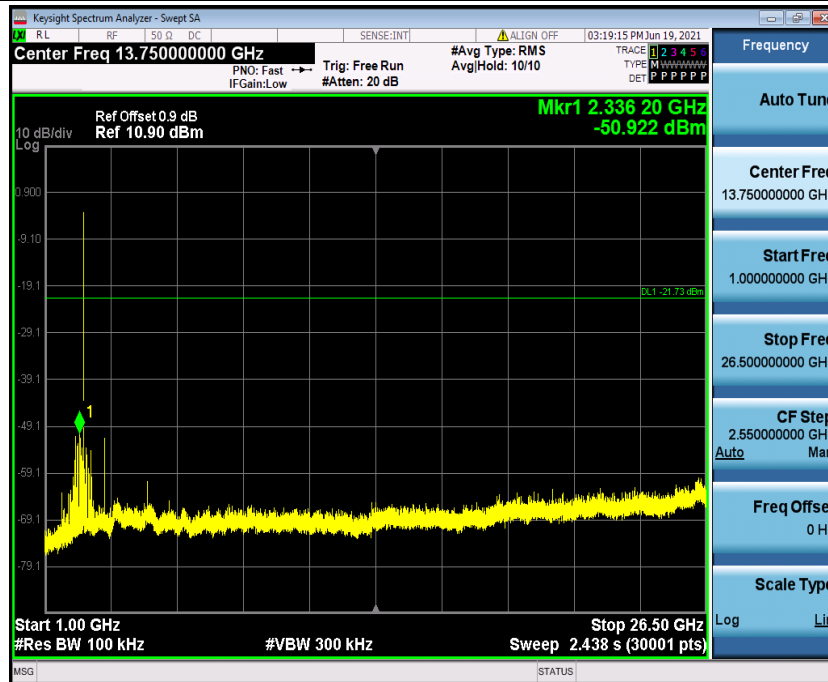




BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



- End of the Report -



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