



TEST REPORT

Application No.: GZCR2111021453HS
Applicant: Guilin Gemred Sensor Technology Co., Ltd
Address of Applicant: No.D-08, Information Industrial Park, Chaoyang Road Qixing District, Guilin City, Guangxi zhuang Autonomous Region
Manufacturer: The same as applicant
Address of Manufacturer: The same as applicant
Factory: The same as applicant
Address of Factory: The same as applicant
Equipment Under Test (EUT):
EUT Name: VII Digital Body Tape Measure
Model No.: 84114
Trade Mark: Gemred
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2021-12-01
Date of Test: 2021-12-04 to 2021-12-08
Date of Issue: 2021-12-16

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

Kobe Jian

Kobe Jian

EMC Laboratory Manager



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-12-16		Original

Authorized for issue by:				
		Kevin Zhang		
		Kevin Zhang/Project Engineer		
		Ricky Liu		
		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 Peak Output Power	47 CFR Part 15, Subpart C 15.247	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 Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

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

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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3 Contents

	Page
1 Cover Page	1
2 Test Summary	3
3 Contents.....	4
4 General Information	6
4.1 Details of E.U.T.	6
4.2 Description of Support Units.....	6
4.3 Measurement Uncertainty	6
4.4 Test Location	7
4.5 Test Facility	7
4.6 Deviation from Standards.....	8
4.7 Abnormalities from Standard Conditions	8
5 Equipment List	9
6 Radio Spectrum Technical Requirement	12
6.1 Antenna Requirement.....	12
6.1.1 Test Requirement.....	12
6.1.2 Conclusion	12
7 Radio Spectrum Matter Test Results	13
7.1 Conducted Peak Output Power	13
7.1.1 E.U.T. Operation	13
7.1.2 Test Mode Description	13
7.1.3 Test Setup Diagram	13
7.1.4 Measurement Procedure and Data	13
7.2 Minimum 6dB Bandwidth.....	14
7.2.1 E.U.T. Operation	14
7.2.2 Test Mode Description	14
7.2.3 Test Setup Diagram	14
7.2.4 Measurement Procedure and Data	14
7.3 Power Spectrum Density	15
7.3.1 E.U.T. Operation	15
7.3.2 Test Mode Description	15
7.3.3 Test Setup Diagram	15
7.3.4 Measurement Procedure and Data	15
7.4 Conducted Band Edges Measurement.....	16
7.4.1 E.U.T. Operation	16
7.4.2 Test Mode Description	16
7.4.3 Test Setup Diagram	16
7.4.4 Measurement Procedure and Data	16
7.5 Conducted Spurious Emissions.....	17
7.5.1 E.U.T. Operation	17
7.5.2 Test Mode Description	17
7.5.3 Test Setup Diagram	17
7.5.4 Measurement Procedure and Data	17



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7.6	Radiated Emissions which fall in the restricted bands.....	18
7.6.1	E.U.T. Operation	18
7.6.2	Test Mode Description	18
7.6.3	Test Setup Diagram	18
7.6.4	Measurement Procedure and Data	19
7.7	Radiated Spurious Emissions Below 1GHz.....	24
7.7.1	E.U.T. Operation	24
7.7.2	Test Mode Description	24
7.7.3	Test Setup Diagram	24
7.7.4	Measurement Procedure and Data	25
7.8	Radiated Spurious Emissions Above 1GHz	28
7.8.1	E.U.T. Operation	28
7.8.2	Test Mode Description	28
7.8.3	Test Setup Diagram	28
7.8.4	Measurement Procedure and Data	29
8	Test Setup Photo.....	36
9	EUT Constructional Details (EUT Photos)	37
10	Appendix.....	38
10.1	Appendix A: DTS Bandwidth	38
10.1.1	Test Result.....	38
10.1.2	Test Graphs	38
10.2	Appendix B: Maximum conducted output power	40
10.2.1	Test Result.....	40
10.2.2	Test Graphs	40
10.3	Appendix C: Maximum power spectral density.....	42
10.3.1	Test Result.....	42
10.3.2	Test Graphs	42
10.4	Appendix D: Band edge measurements.....	44
10.4.1	Test Result.....	44
10.4.2	Test Graphs	44
10.5	Appendix E: Conducted Spurious Emission	45
10.5.1	Test Result.....	45
10.5.2	Test Graphs	45



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4 General Information

4.1 Details of E.U.T.

Power supply: DC 3 V(1*CR2023)
Cable(s): None
Operation Frequency: 2402MHz to 2480MHz
Modulation Type: GFSK
Number of Channels: 40
Channel Spacing: 2MHz
Antenna Type: PCB Antenna
Antenna Gain: 2 dBi
Firmware Version: GRV1.0
Hardware Version: GRV1.5
Testing Software: RFTTester.exe
Sample NO.: GZ_SP_20211167752
Power Setting: Level 0 can not changed by user
Function: Digital Body Tape Measure with BLE function
Test Voltage: DC 3 V

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	$\pm 0.75\text{dB}$
Minimum 6dB Bandwidth	$\pm 3\%$
Power Spectrum Density	$\pm 2.84\text{dB}$
Conducted Band Edges Measurement	$\pm 0.75\text{dB}$
Conducted Spurious Emissions	$\pm 0.75\text{dB}$
Radiated Emissions which fall in the restricted bands	$\pm 5.00\text{dB}$ (30MHz-1GHz):3m; $\pm 4.38\text{dB}$ (30MHz-1GHz):10m; $\pm 5.08\text{dB}$ (1GHz-6GHz); $\pm 5.14\text{dB}$ (above 6GHz)
Radiated Spurious Emissions Below 1GHz	$\pm 5.00\text{dB}$ (30MHz-1GHz):3m $\pm 4.38\text{dB}$ (30MHz-1GHz):10m
Radiated Spurious Emissions Above 1GHz	$\pm 4.52\text{dB}$ (1GHz-6GHz) $\pm 4.54\text{dB}$ (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, Sciencetech 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



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5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-22	2022-06-21
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-22	2022-06-21
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Power Spectrum Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-22	2022-06-21
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Test Software	TST	V2.0	GZE100-78	N/A	N/A



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Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-22	2022-06-21
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-02	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2021-06-22	2022-06-21
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2021-08-30	2022-08-29
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2020-04-16	2022-04-15
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22

Radiated Spurious Emissions Above 1GHz					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28
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	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(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 2 dBi.

Please refer to internal photos.

7 Radio Spectrum Matter Test Results

7.1 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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C

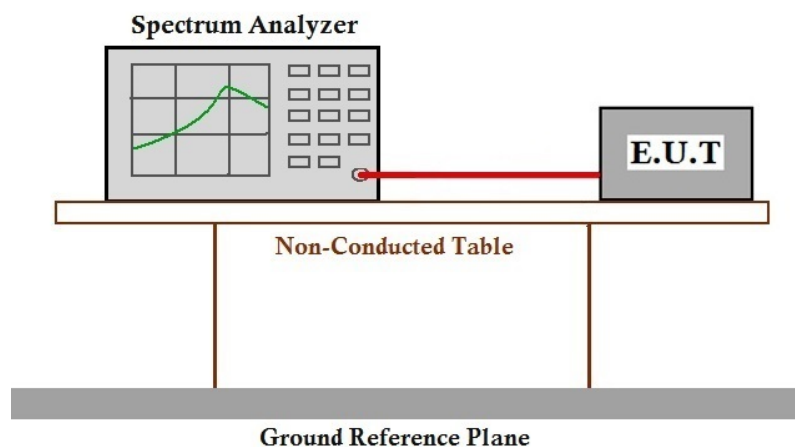
Humidity: 49.3 % RH

Atmospheric Pressure: 1022 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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

Please Refer to Appendix for Details

7.2 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

7.2.1 E.U.T. Operation

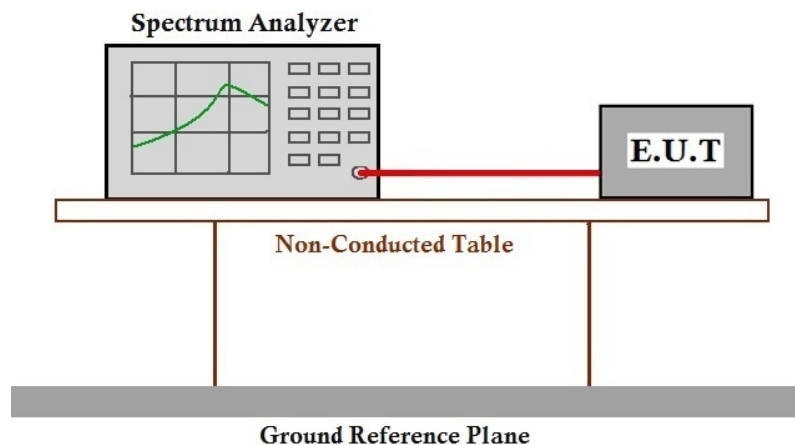
Operating Environment:

Temperature: 24.4 °C Humidity: 49.3 % RH Atmospheric Pressure: 1022 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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 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

7.3.1 E.U.T. Operation

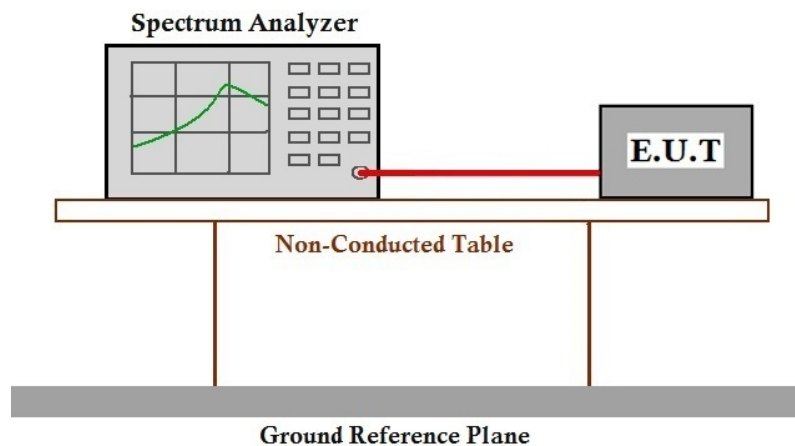
Operating Environment:

Temperature: 24.4 °C Humidity: 49.3 % RH Atmospheric Pressure: 1022 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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 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)).

7.4.1 E.U.T. Operation

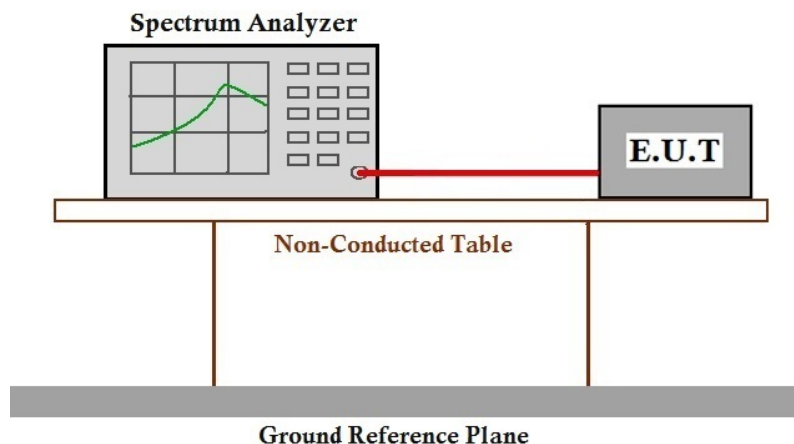
Operating Environment:

Temperature: 24.4 °C Humidity: 49.3 % RH Atmospheric Pressure: 1022 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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



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7.5 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)).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.4 °C

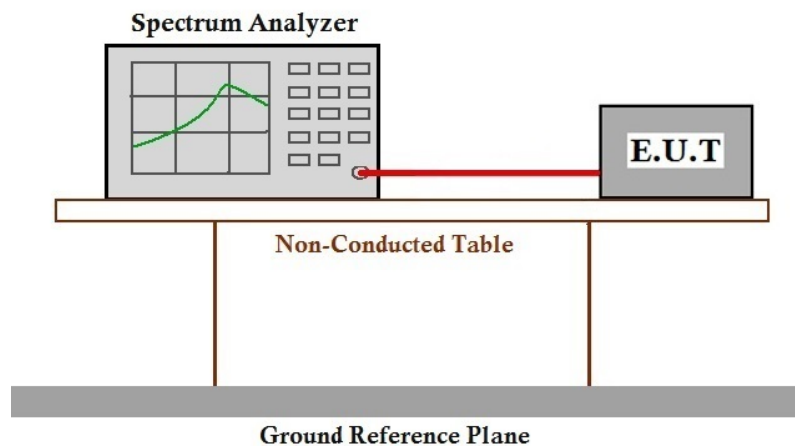
Humidity: 49.3 % RH

Atmospheric Pressure: 1022 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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



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7.6 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.

7.6.1 E.U.T. Operation

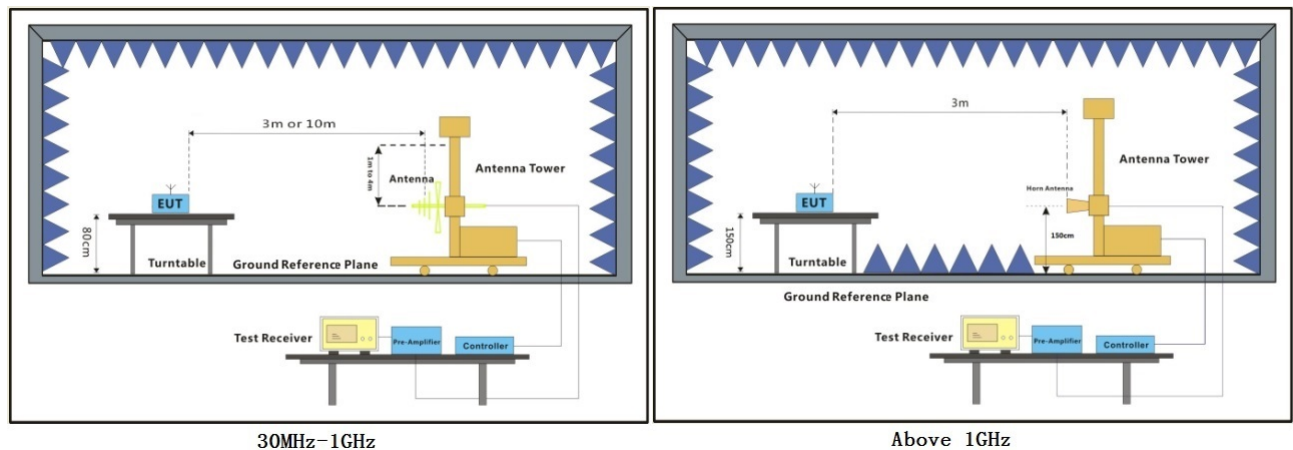
Operating Environment:

Temperature: 22.3 °C Humidity: 50.4 % RH Atmospheric Pressure: 1022 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

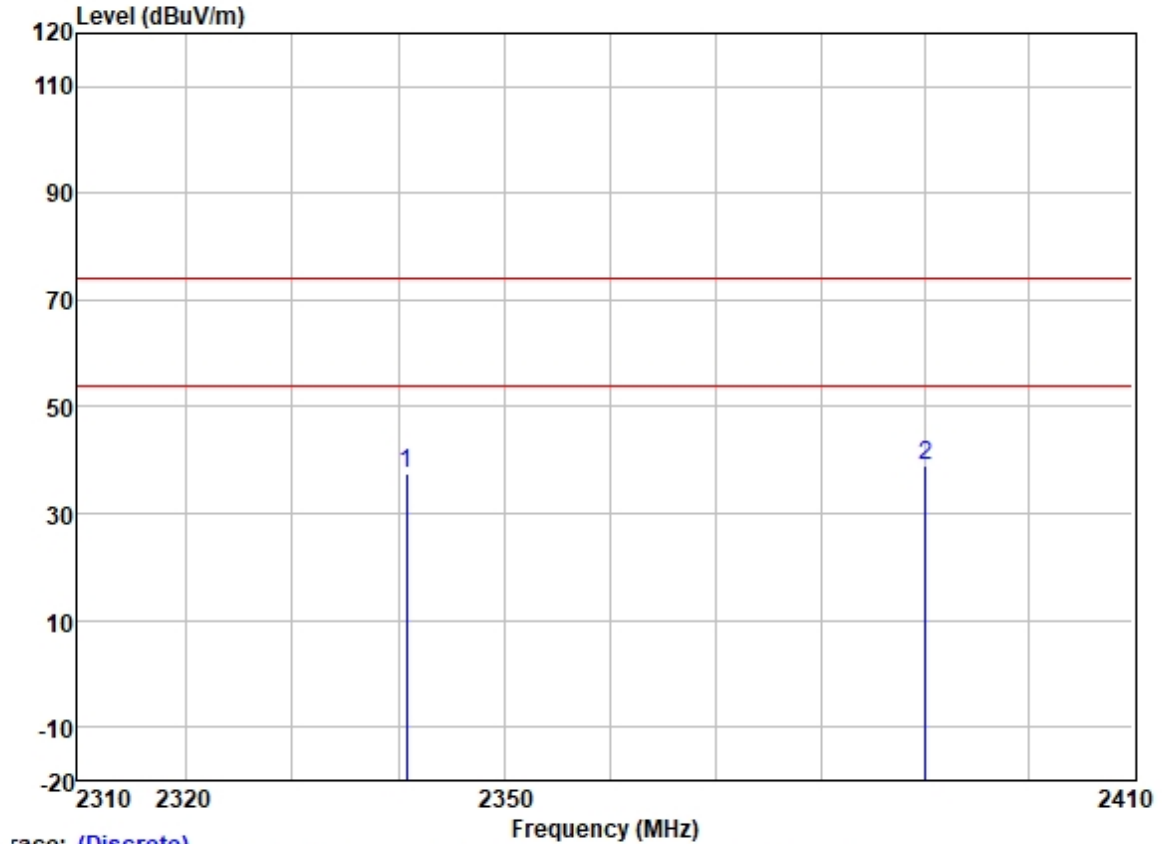
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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



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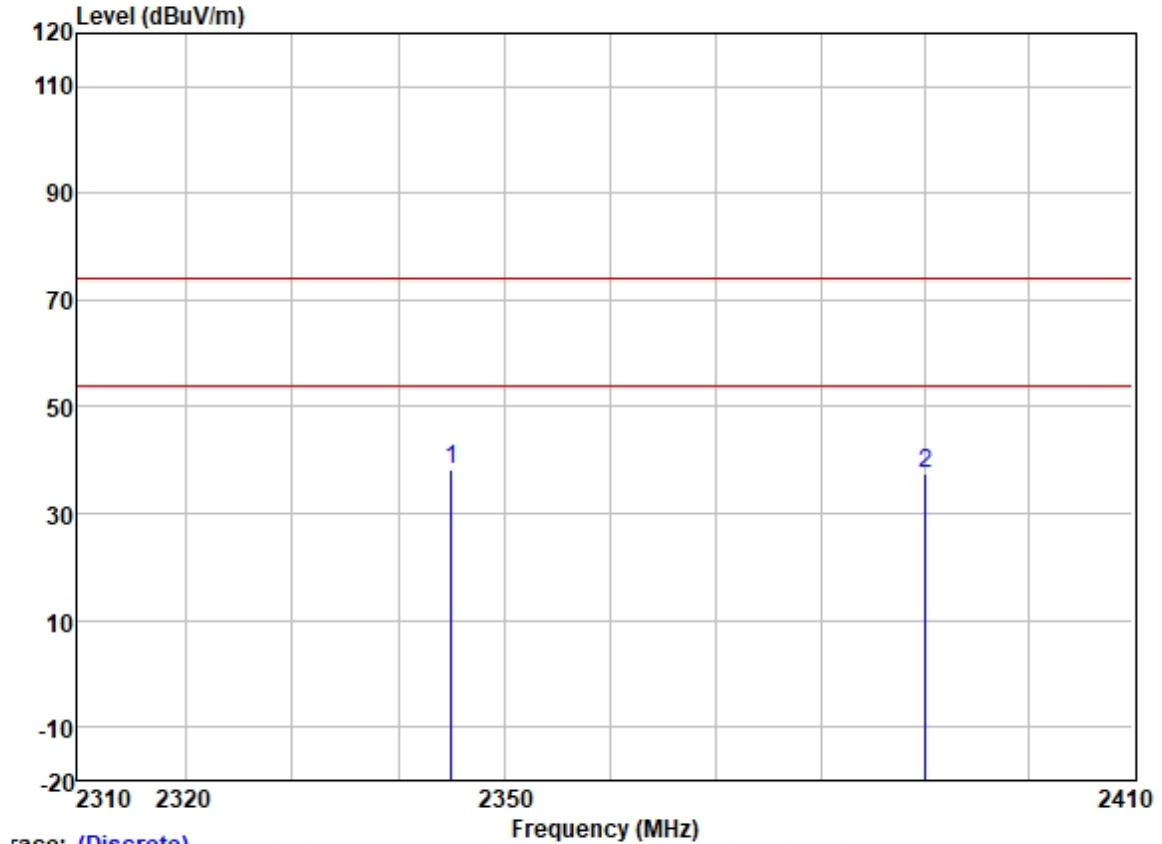
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



Trace: (Discrete)

	Read	Antenna	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	2340.746	44.51	27.22	3.47	37.61	37.59	74.00	-36.41	VERTICAL Peak
2	2390.000	45.60	27.33	3.50	37.59	38.84	74.00	-35.16	VERTICAL Peak

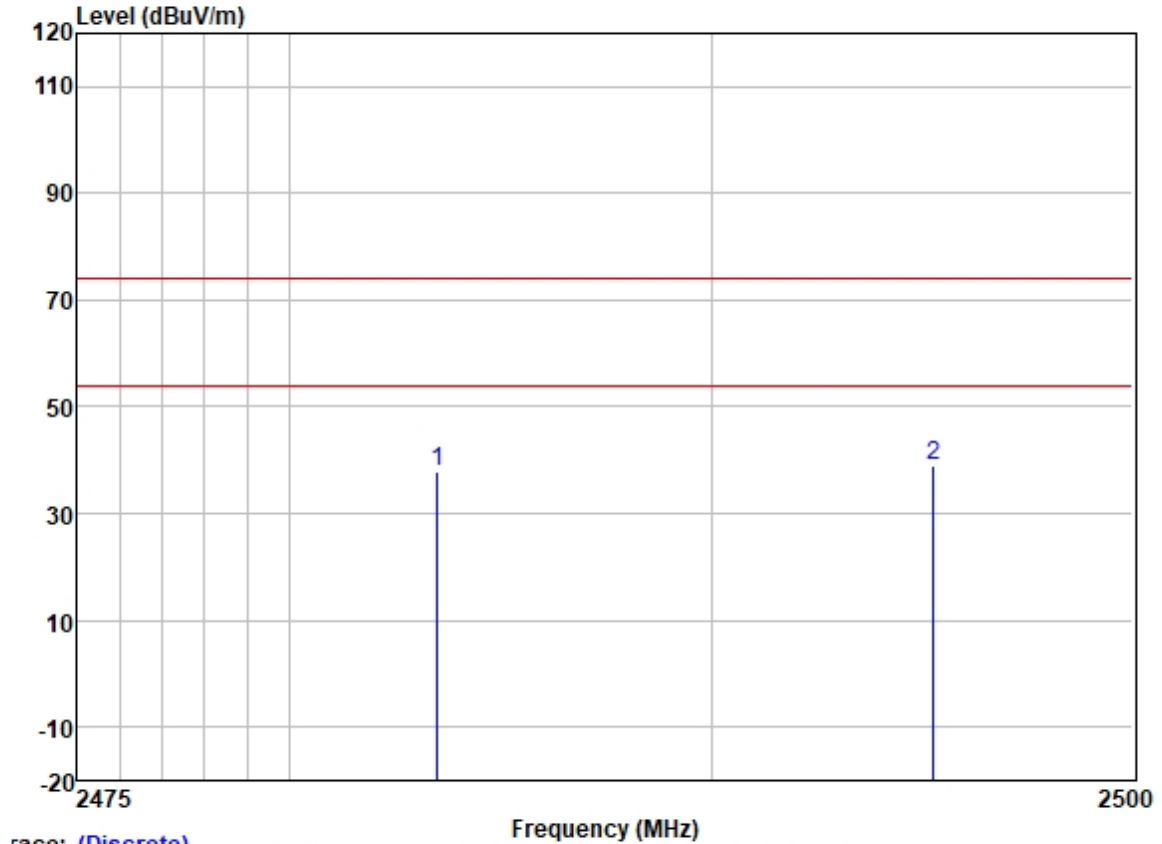
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Trace: (Discrete)

	Read	Antenna	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	2344.917	45.16	27.24	3.48	37.61	38.27	74.00	-35.73	HORIZONTAL Peak
2	2390.000	44.38	27.33	3.50	37.59	37.62	74.00	-36.38	HORIZONTAL Peak

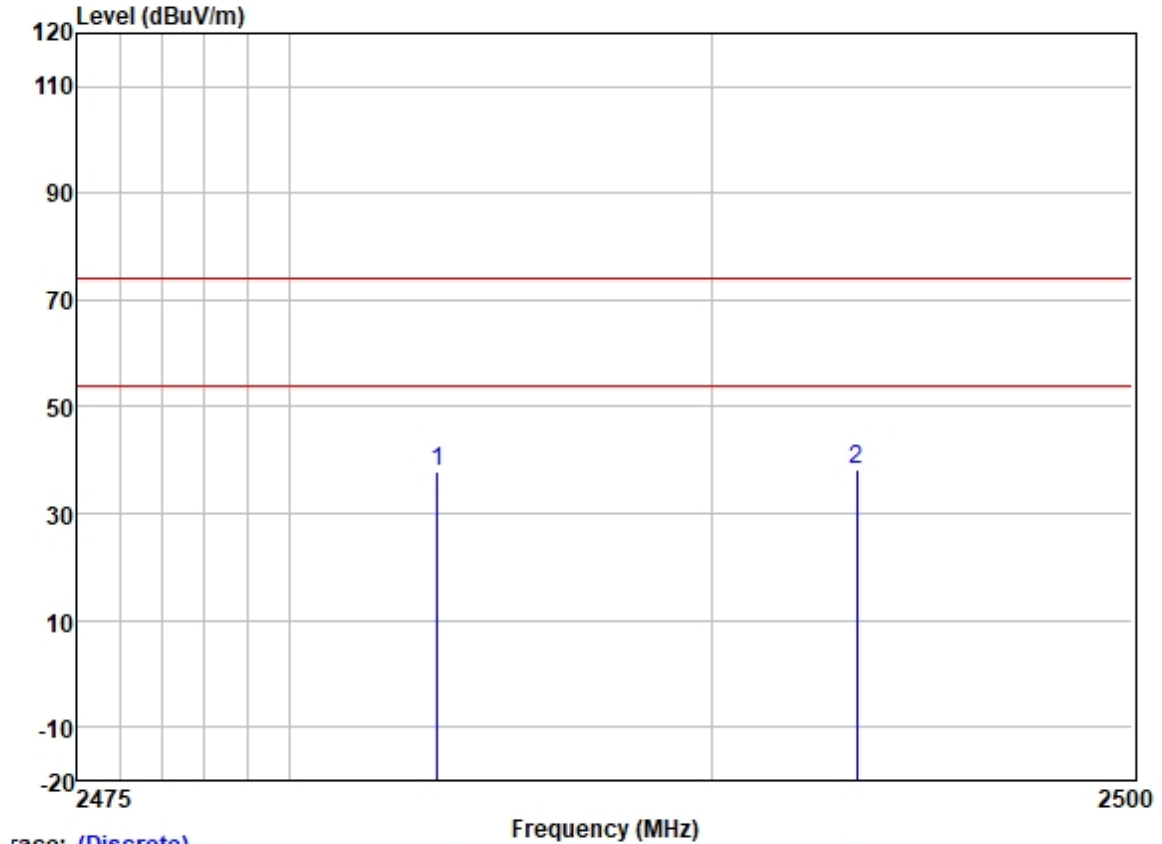
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



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	2483.500	44.24	27.48	3.54	37.57	37.69	74.00	-36.31	VERTICAL	Peak
2	2495.256	45.45	27.49	3.54	37.56	38.92	74.00	-35.08	VERTICAL	Peak

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Trace: (Discrete)

	Read	Antenna	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	2483.500	44.30	27.48	3.54	37.57	37.75	74.00	-36.25	HORIZONTAL Peak
2	2493.426	44.74	27.49	3.54	37.56	38.21	74.00	-35.79	HORIZONTAL Peak

7.7 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

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
960-1000	500	3

7.7.1 E.U.T. Operation

Operating Environment:

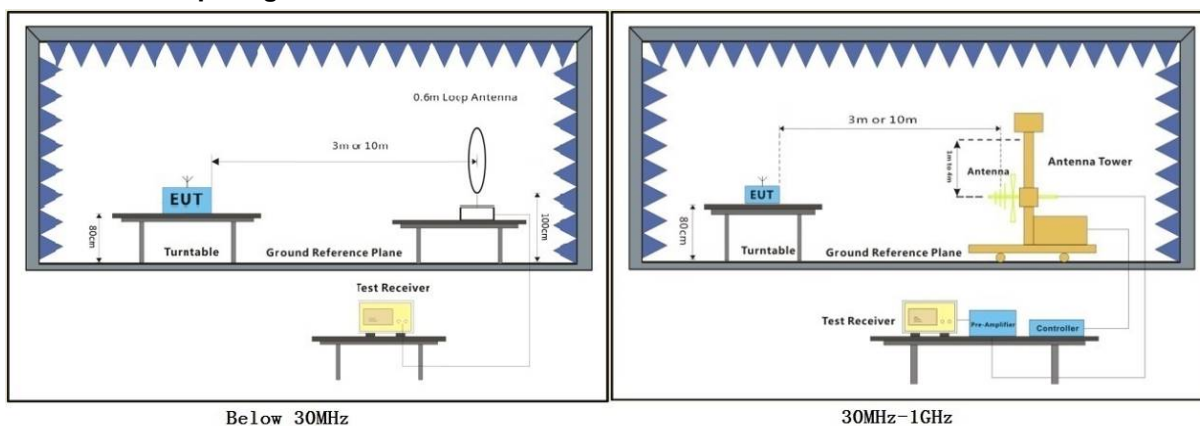
Temperature: 21.9 °C

Humidity: 36.7 % RH

Atmospheric Pressure: 1022 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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 quasi-peak method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

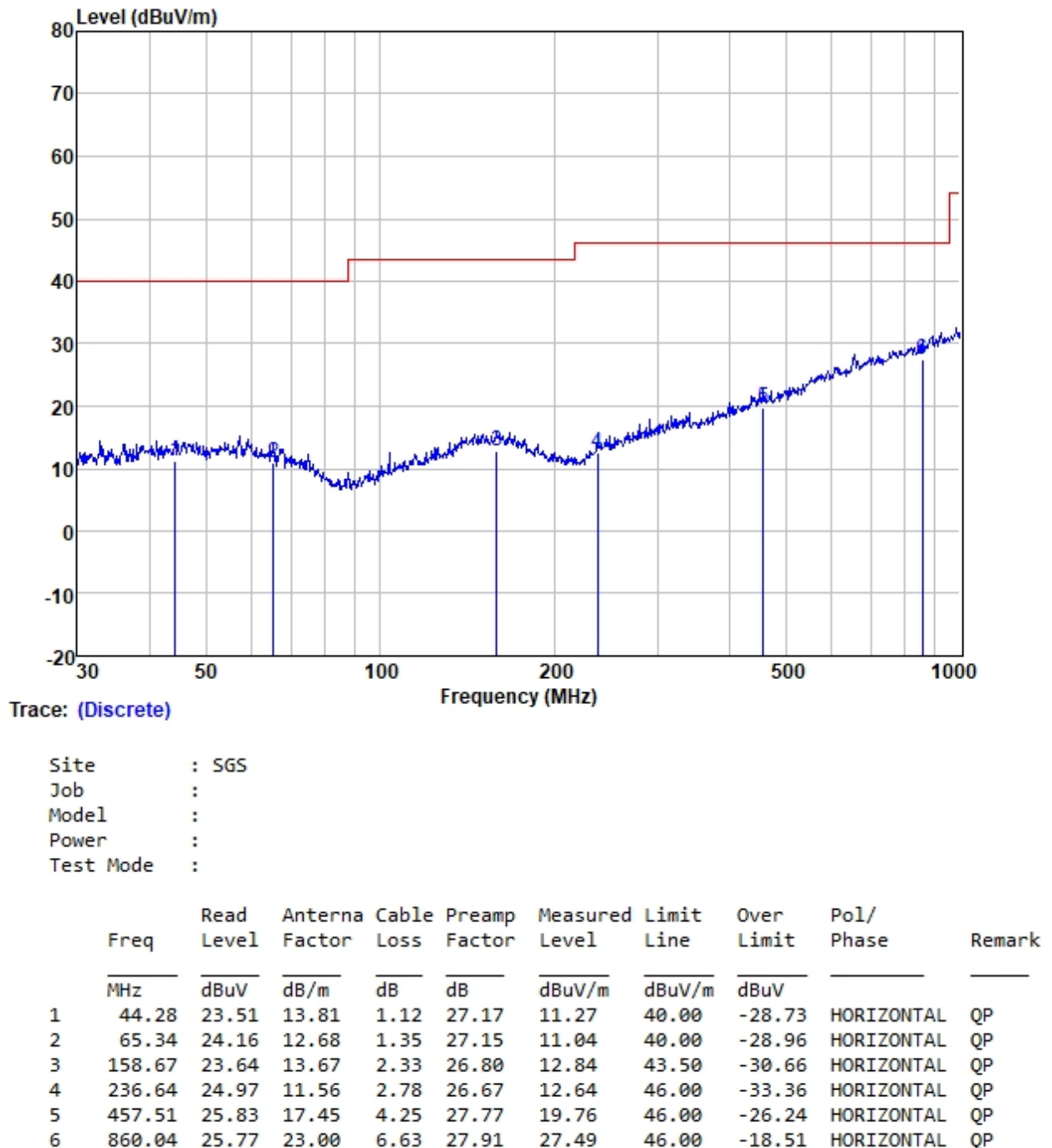
Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 9kHz to 30MHz, the disturbance 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.
3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

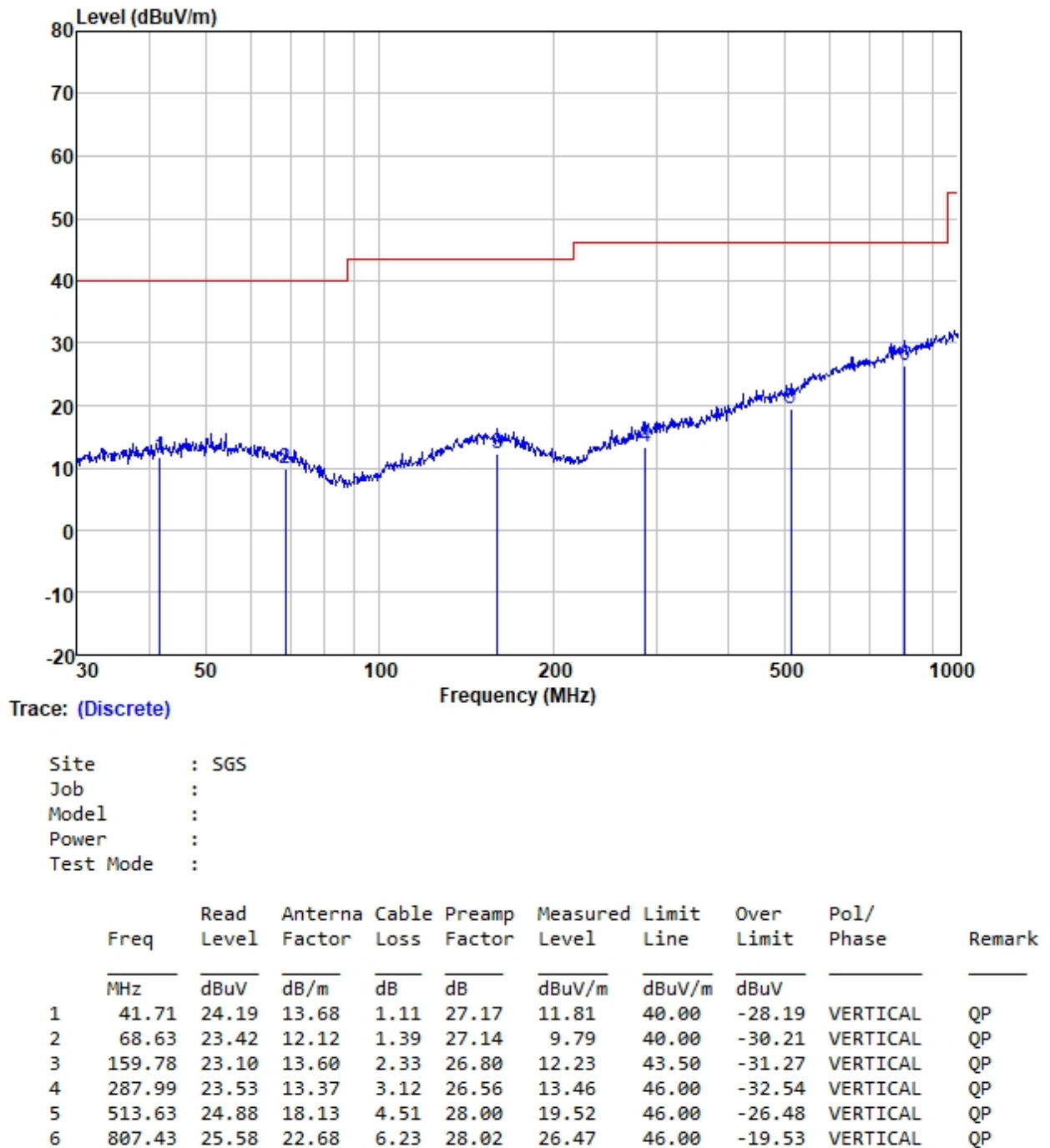


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Test Mode: 01; Polarity: Horizontal



Test Mode: 01; Polarity: Vertical



7.8 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 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

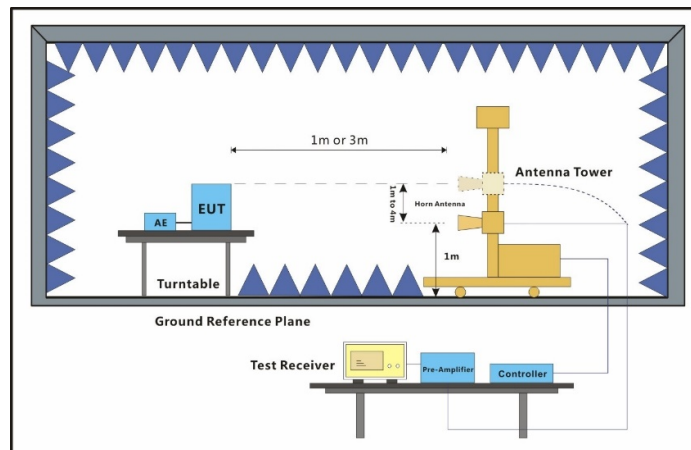
Operating Environment:

Temperature: 22.3 °C Humidity: 50.4 % RH Atmospheric Pressure: 1022 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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

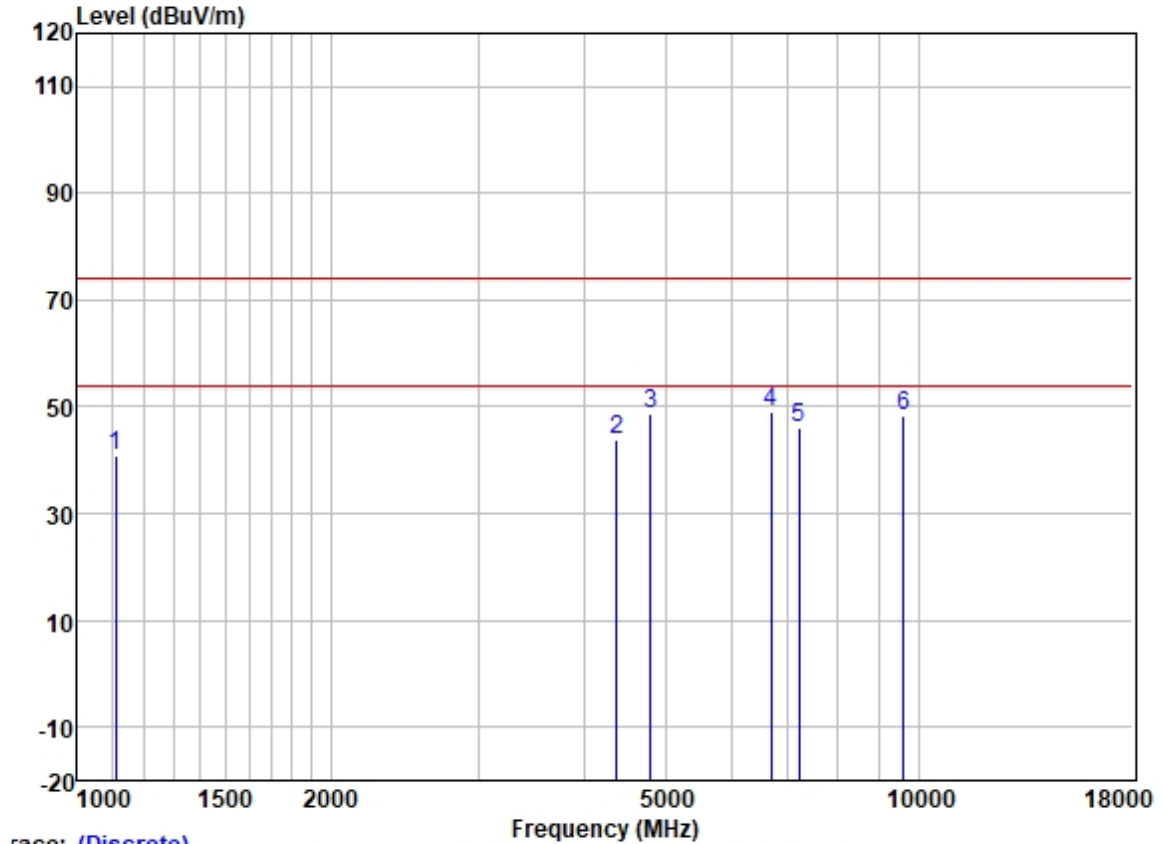
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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 or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.
3. As shown in this section, 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.



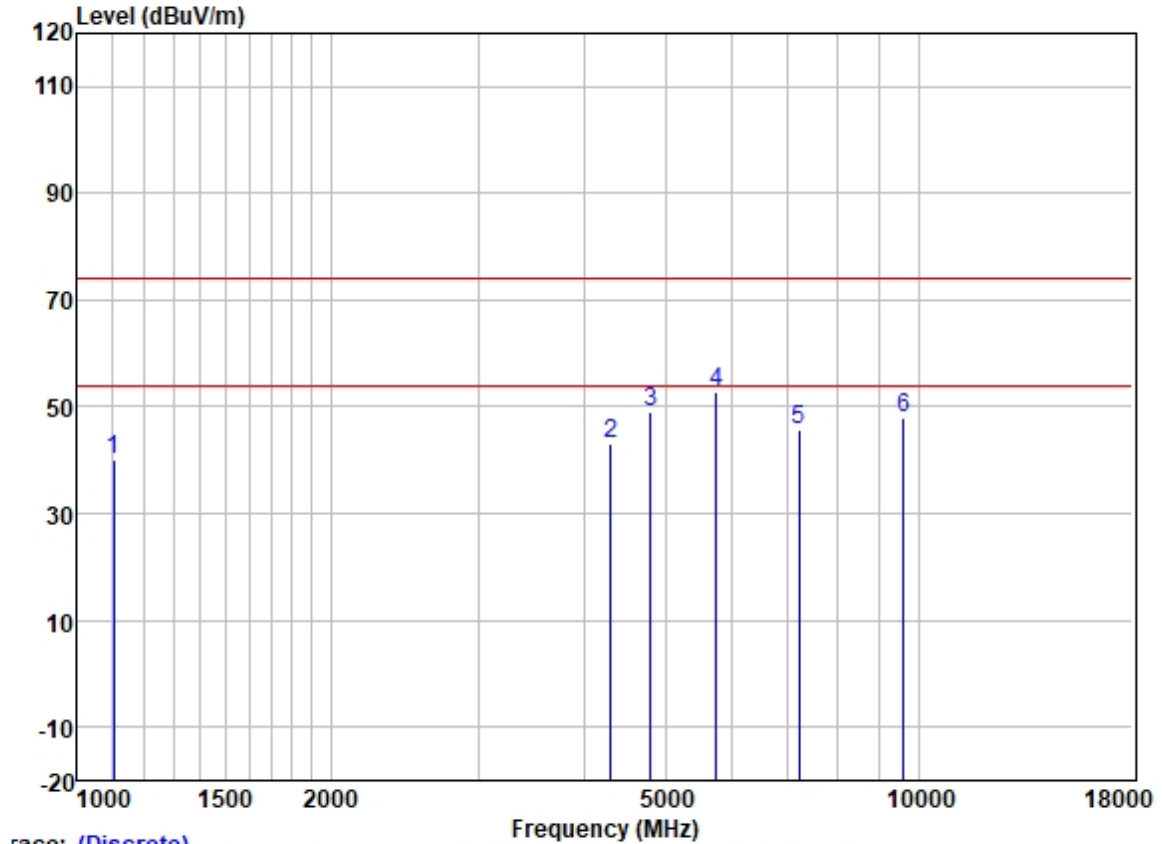
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



race: (Discrete)

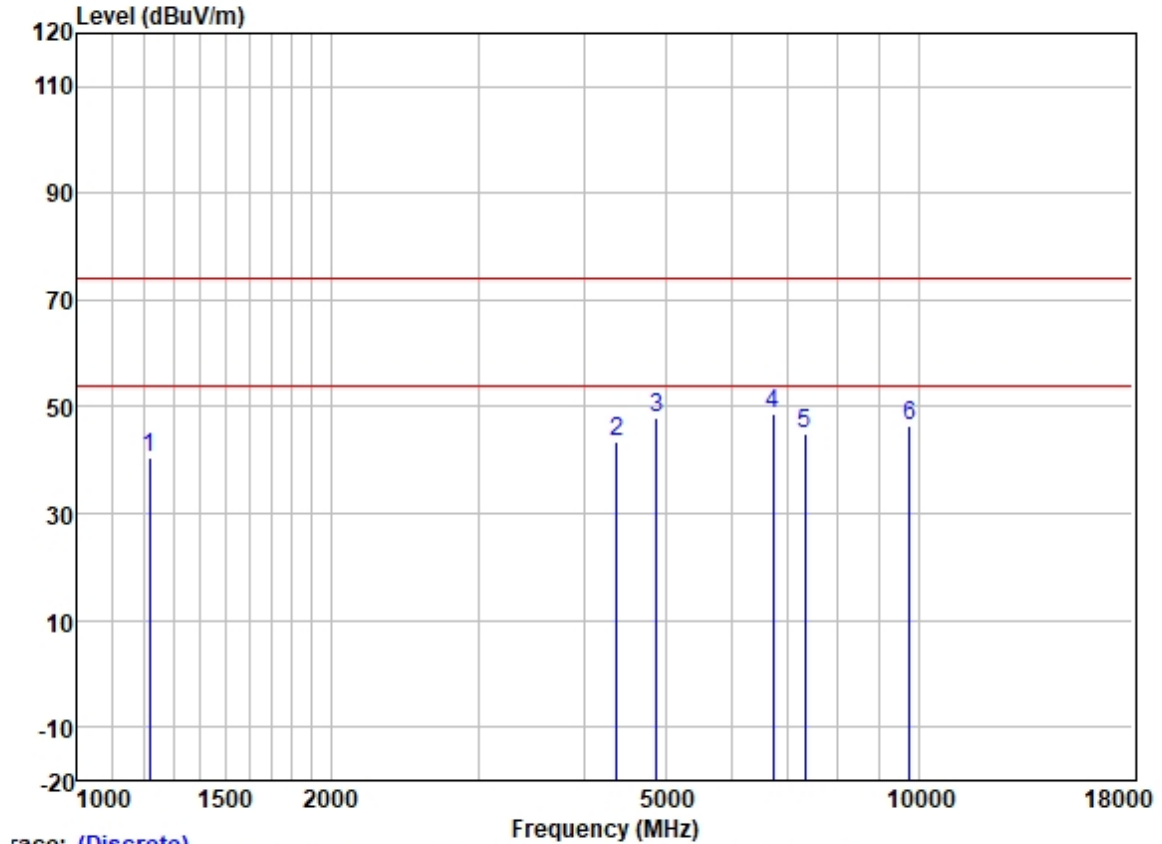
	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1109.660	47.58	24.39	7.51	38.45	41.03	74.00	-32.97	VERTICAL peak
2	4379.699	45.01	30.64	4.88	36.81	43.72	74.00	-30.28	VERTICAL peak
3	4804.000	48.82	31.42	5.20	36.83	48.61	74.00	-25.39	VERTICAL peak
4	6679.040	45.33	34.33	6.61	37.07	49.20	74.00	-24.80	VERTICAL peak
5	7206.000	41.26	35.54	6.68	37.38	46.10	74.00	-27.90	VERTICAL peak
6	9608.000	39.91	38.37	7.50	37.42	48.36	74.00	-25.64	VERTICAL peak

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low



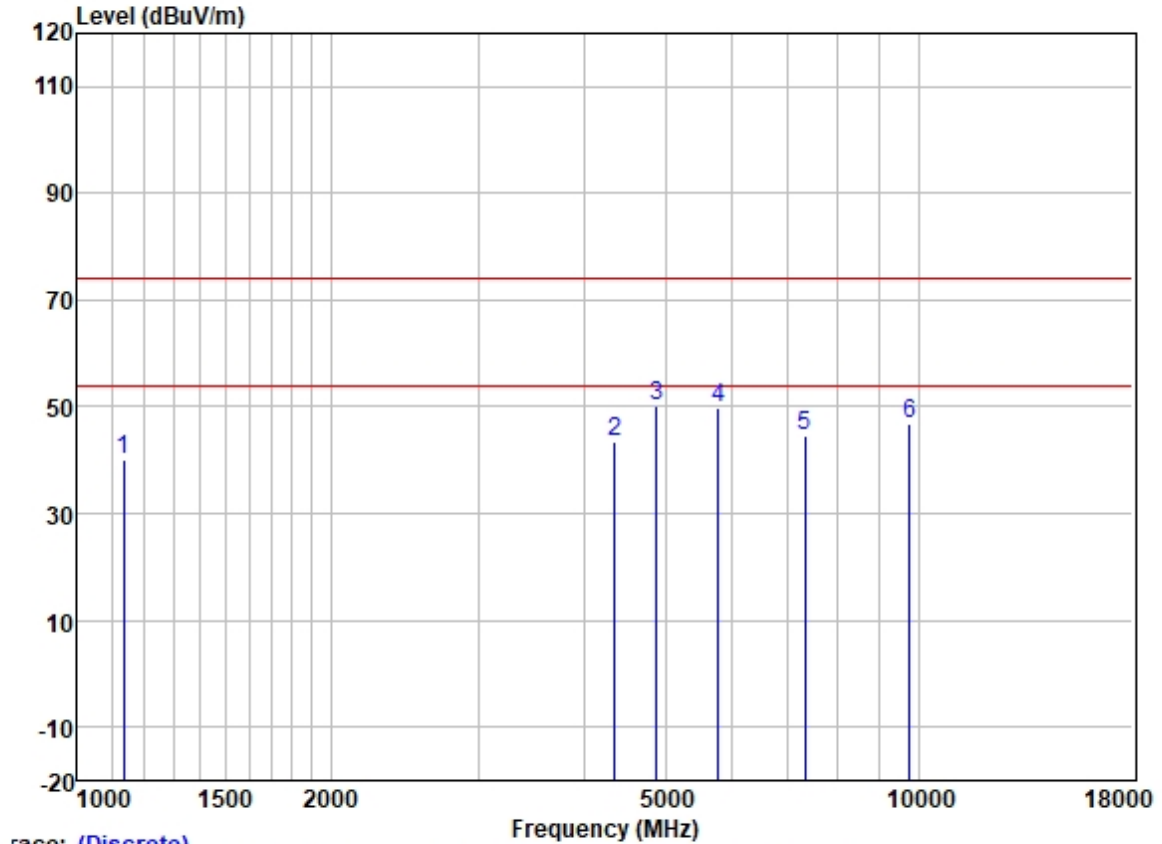
		ReadAntenna		Cable	Preamp		Limit	Over		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1103.264	46.47	24.37	7.56	38.45	39.95	74.00	-34.05	HORIZONTAL	peak
2	4304.400	44.44	30.48	4.90	36.81	43.01	74.00	-30.99	HORIZONTAL	peak
3	4804.000	49.27	31.42	5.20	36.83	49.06	74.00	-24.94	HORIZONTAL	peak
4	5746.982	51.81	32.10	5.80	36.89	52.82	74.00	-21.18	HORIZONTAL	peak
5	7206.000	40.88	35.54	6.68	37.38	45.72	74.00	-28.28	HORIZONTAL	peak
6	9608.000	39.65	38.37	7.50	37.42	48.10	74.00	-25.90	HORIZONTAL	peak

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: middle



		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	1217.190	47.67	24.79	6.26	38.37	40.35	74.00	-33.65	VERTICAL	peak
2	4379.699	44.58	30.64	4.88	36.81	43.29	74.00	-30.71	VERTICAL	peak
3	4880.000	47.94	31.54	5.27	36.84	47.91	74.00	-26.09	VERTICAL	peak
4	6717.762	44.63	34.44	6.63	37.09	48.61	74.00	-25.39	VERTICAL	peak
5	7320.000	39.91	36.00	6.61	37.43	45.09	74.00	-28.91	VERTICAL	peak
6	9760.000	37.86	38.50	7.62	37.41	46.57	74.00	-27.43	VERTICAL	peak

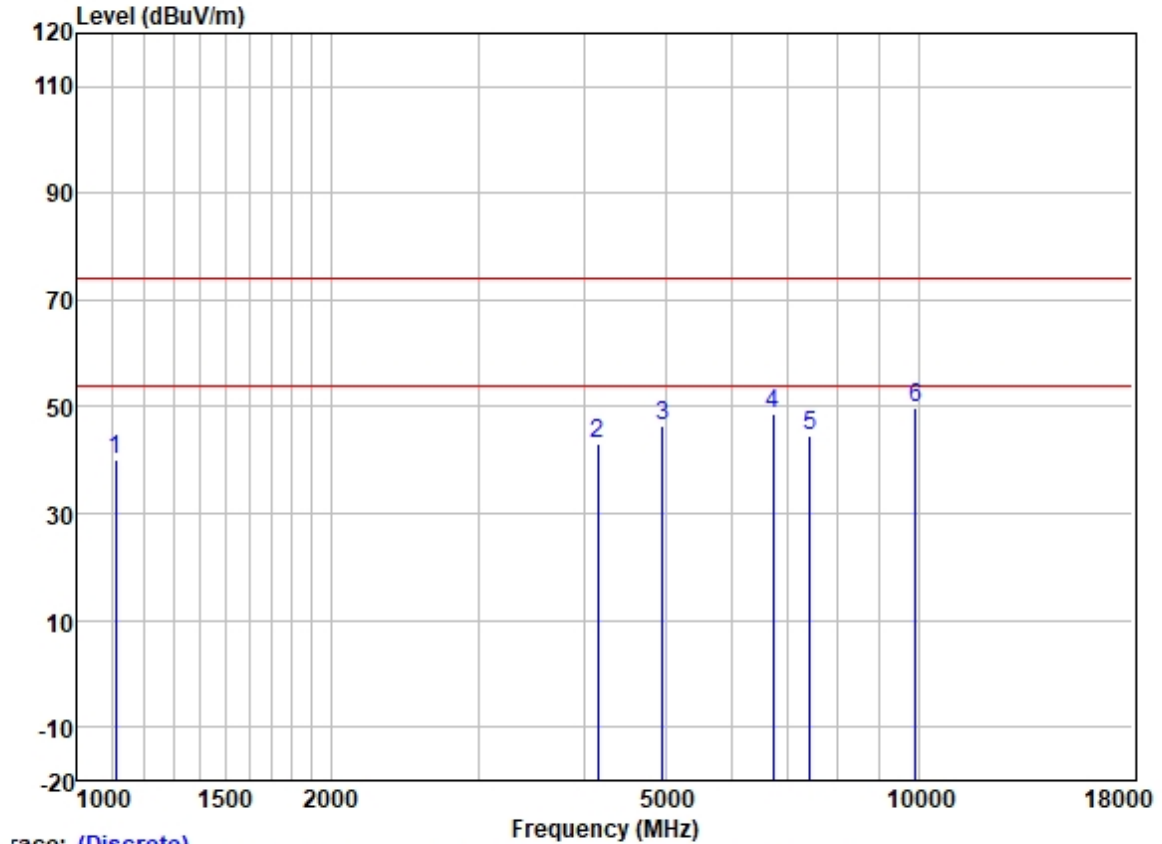
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



race: (Discrete)

	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	1135.617	46.94	24.45	7.29	38.43	40.25	74.00	-33.75	HORIZONTAL	peak
2	4354.454	44.63	30.59	4.88	36.81	43.29	74.00	-30.71	HORIZONTAL	peak
3	4880.000	50.11	31.54	5.27	36.84	50.08	74.00	-23.92	HORIZONTAL	peak
4	5780.300	48.62	32.16	5.84	36.89	49.73	74.00	-24.27	HORIZONTAL	peak
5	7320.000	39.57	36.00	6.61	37.43	44.75	74.00	-29.25	HORIZONTAL	peak
6	9760.000	38.25	38.50	7.62	37.41	46.96	74.00	-27.04	HORIZONTAL	peak

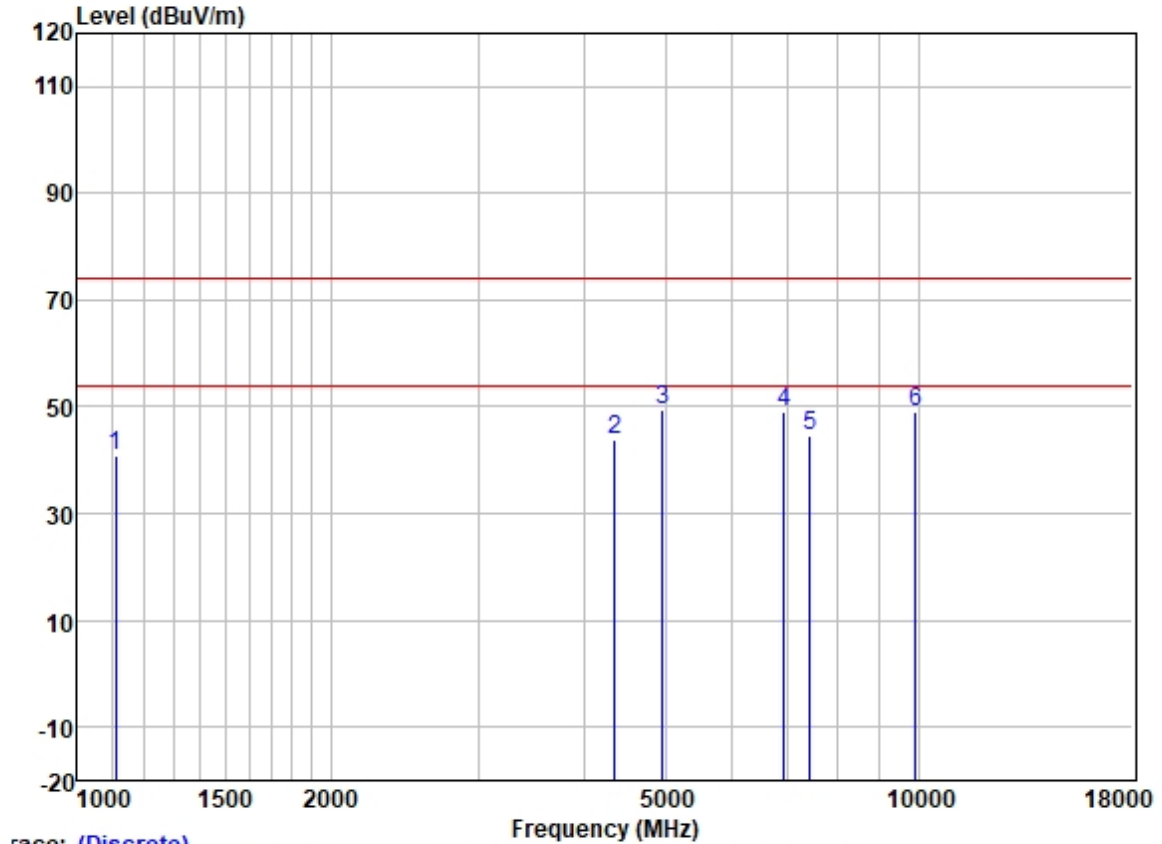
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



race: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Limit	Over			
	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1109.660	46.48	24.39	7.51	38.45	39.93	74.00	-34.07	VERTICAL peak
2	4157.664	44.97	30.06	4.97	36.80	43.20	74.00	-30.80	VERTICAL peak
3	4960.000	46.23	31.65	5.33	36.84	46.37	74.00	-27.63	VERTICAL peak
4	6717.762	44.63	34.44	6.63	37.09	48.61	74.00	-25.39	VERTICAL peak
5	7440.000	39.26	36.27	6.58	37.47	44.64	74.00	-29.36	VERTICAL peak
6	9920.000	40.73	38.65	7.78	37.40	49.76	74.00	-24.24	VERTICAL peak

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



		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	1109.660	47.27	24.39	7.51	38.45	40.72	74.00	-33.28	HORIZONTAL	peak
2	4354.454	45.09	30.59	4.88	36.81	43.75	74.00	-30.25	HORIZONTAL	peak
3	4960.000	49.39	31.65	5.33	36.84	49.53	74.00	-24.47	HORIZONTAL	peak
4	6914.763	44.55	34.89	6.73	37.19	48.98	74.00	-25.02	HORIZONTAL	peak
5	7440.000	39.02	36.27	6.58	37.47	44.40	74.00	-29.60	HORIZONTAL	peak
6	9920.000	40.15	38.65	7.78	37.40	49.18	74.00	-24.82	HORIZONTAL	peak

8 Test Setup Photo

Refer to Setup Photo GZCR211102145302.

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for GZCR2111021453HS



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10 Appendix

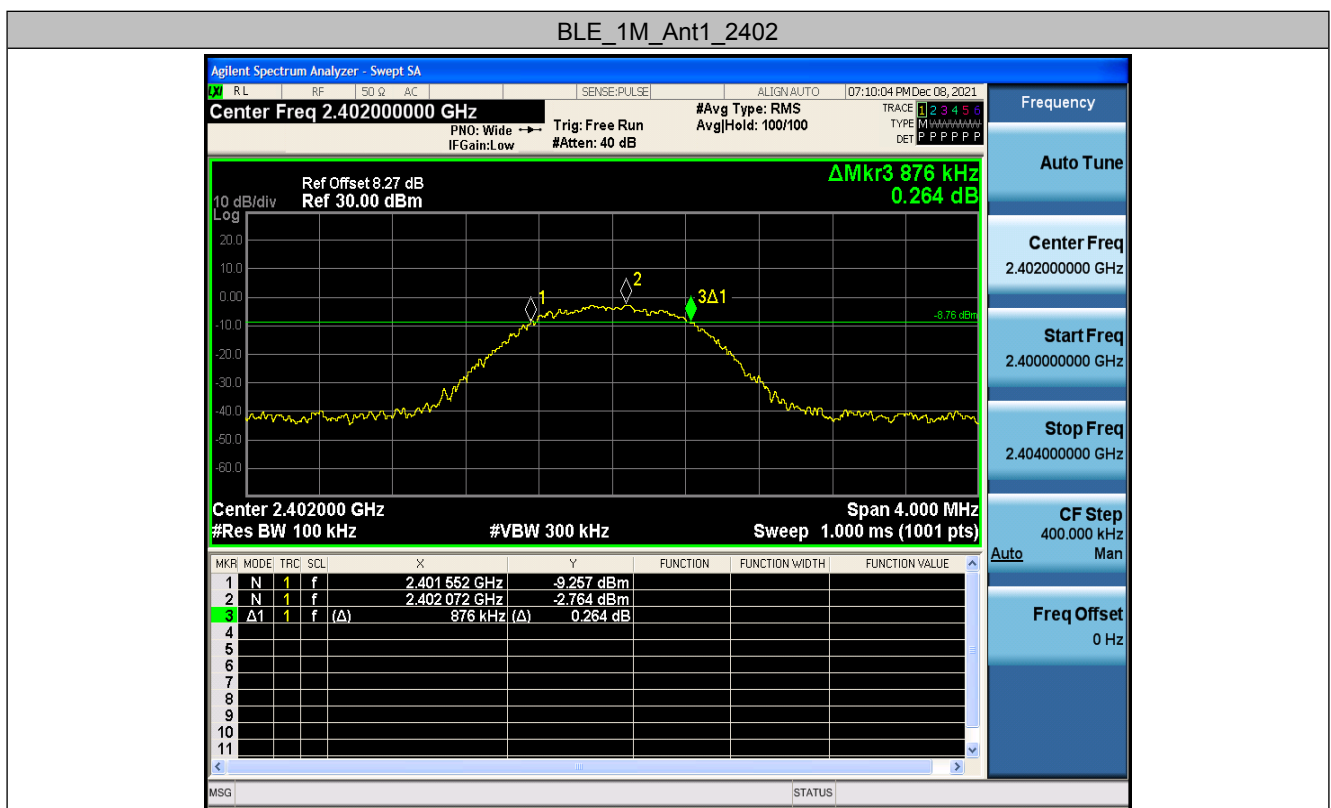
Cable Loss=0.9 dB

10.1 Appendix A: DTS Bandwidth

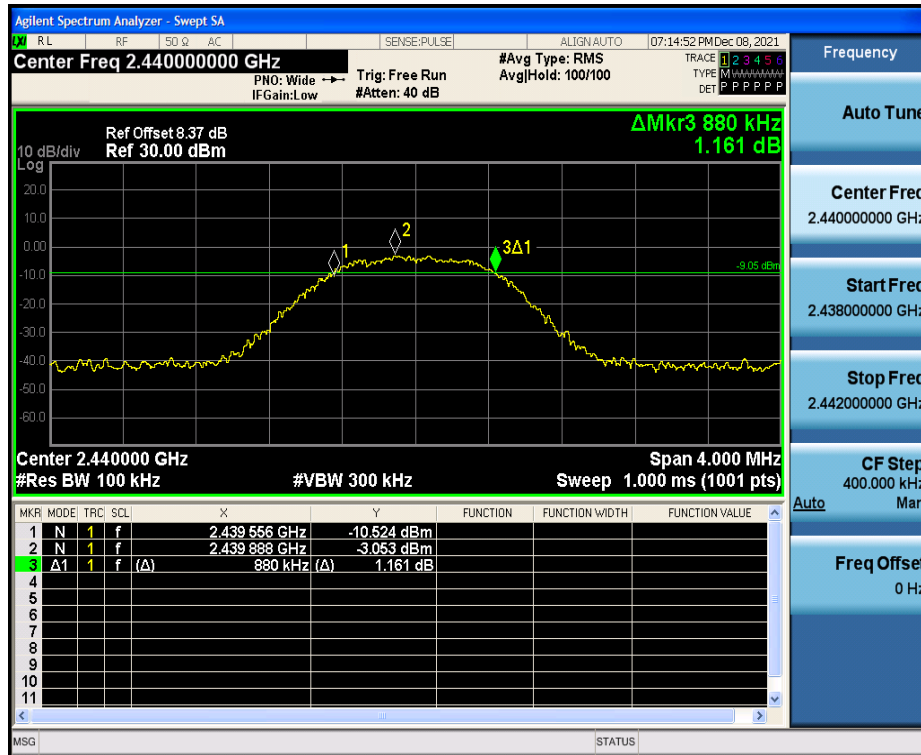
10.1.1 Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.876	2401.552	2402.428	>=0.5	PASS
		2440	0.880	2439.556	2440.436	>=0.5	PASS
		2480	0.904	2479.536	2480.440	>=0.5	PASS

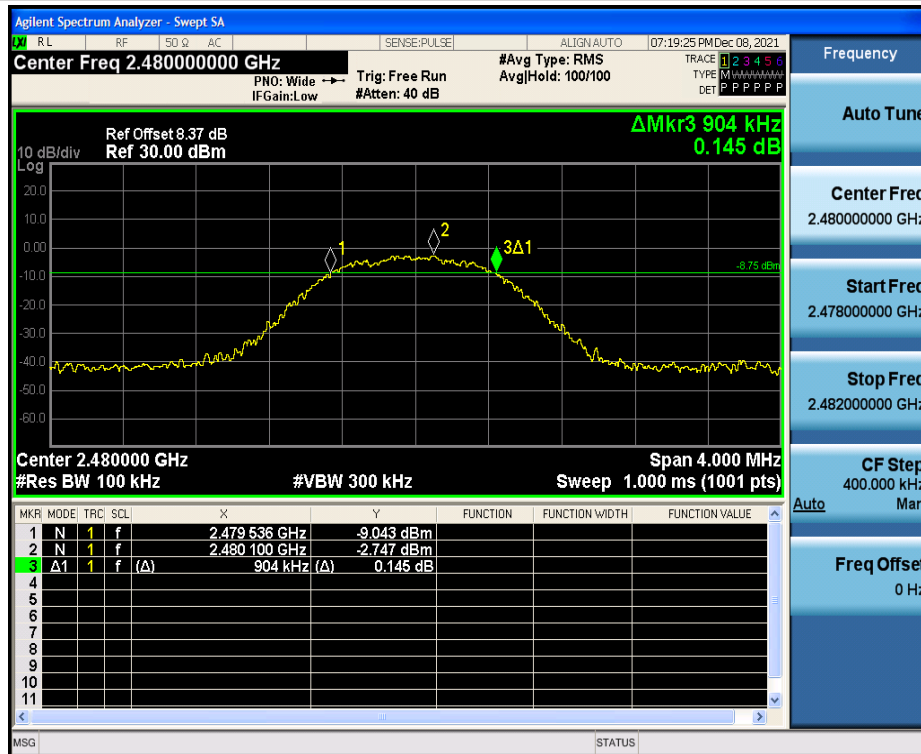
10.1.2 Test Graphs



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

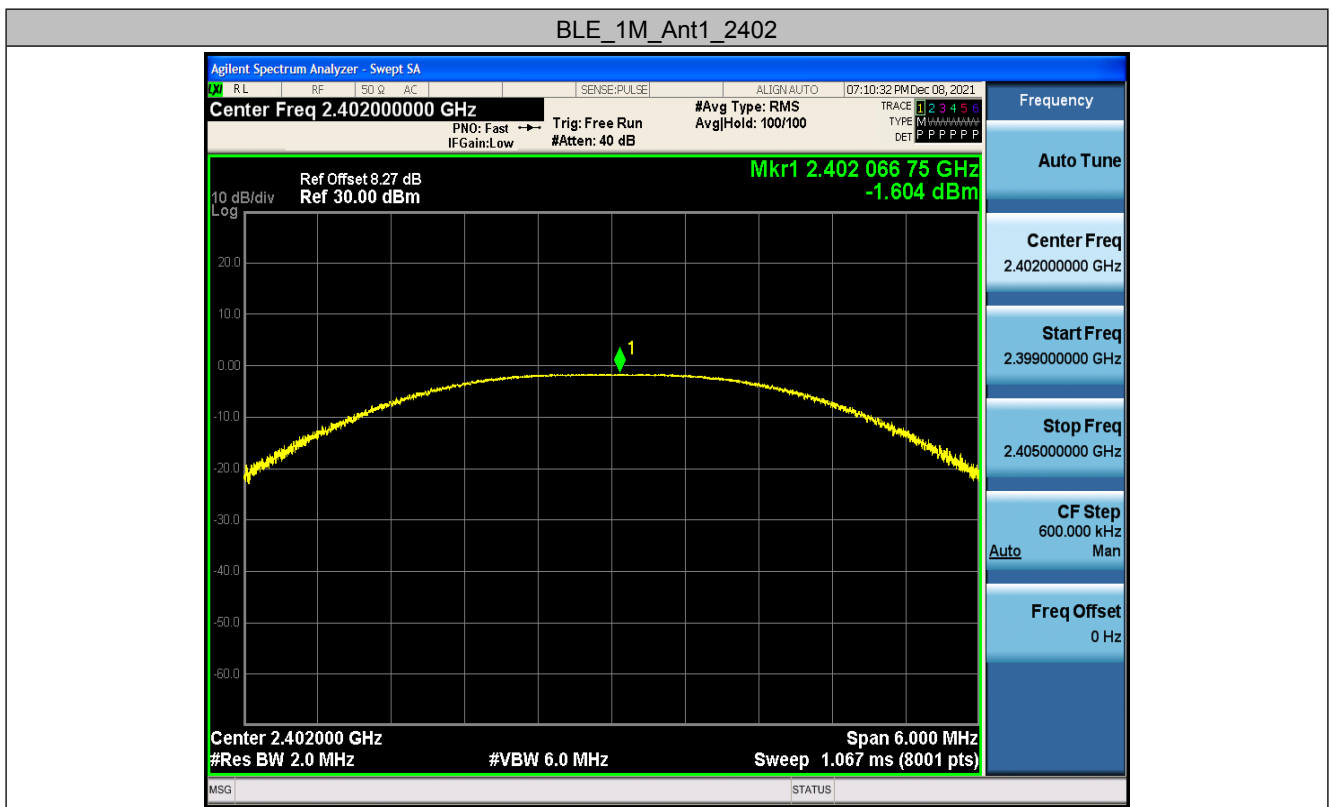


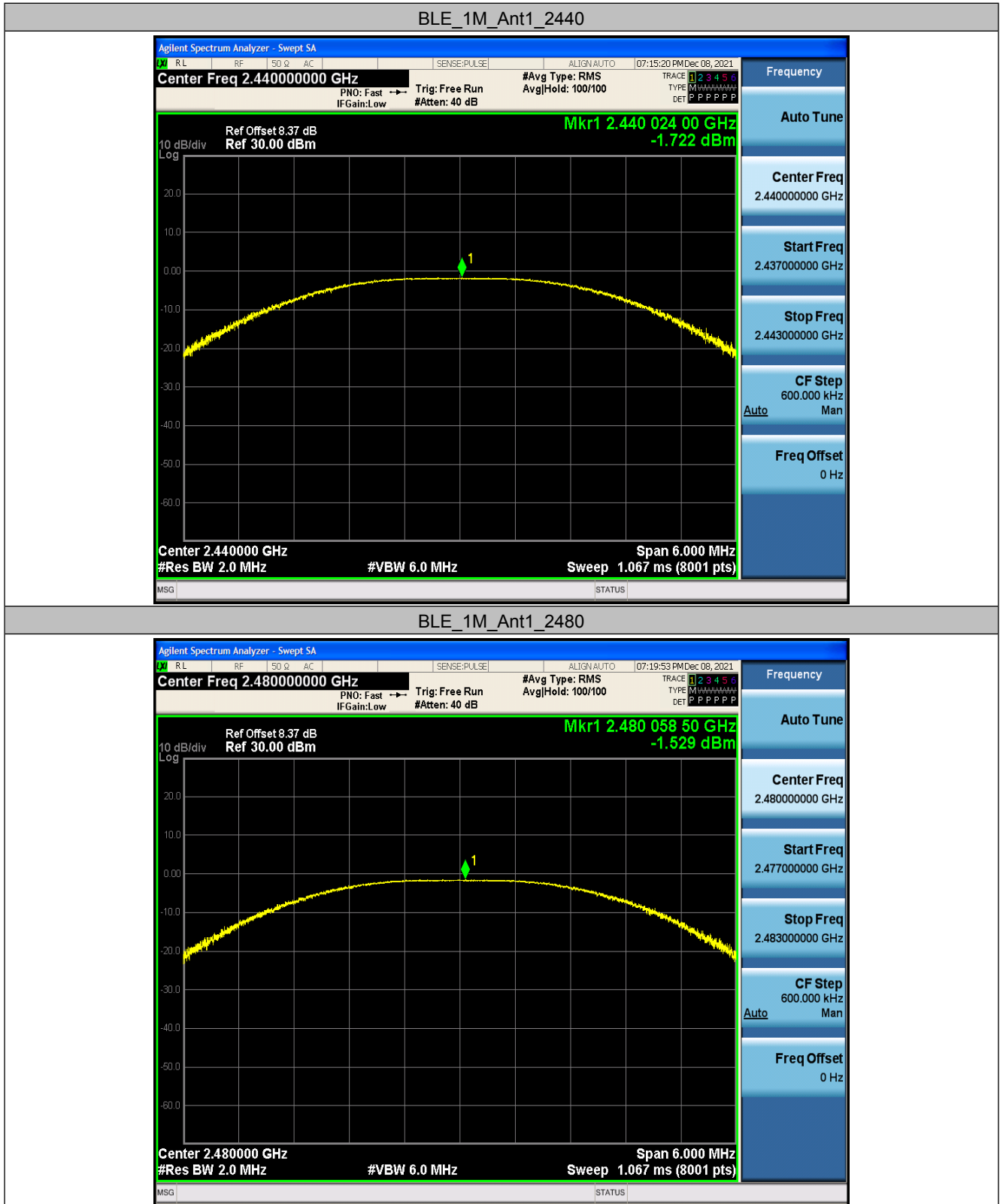
10.2 Appendix B: Maximum conducted output power

10.2.1 Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-1.6	<=30	PASS
		2440	-1.72	<=30	PASS
		2480	-1.53	<=30	PASS

10.2.2 Test Graphs



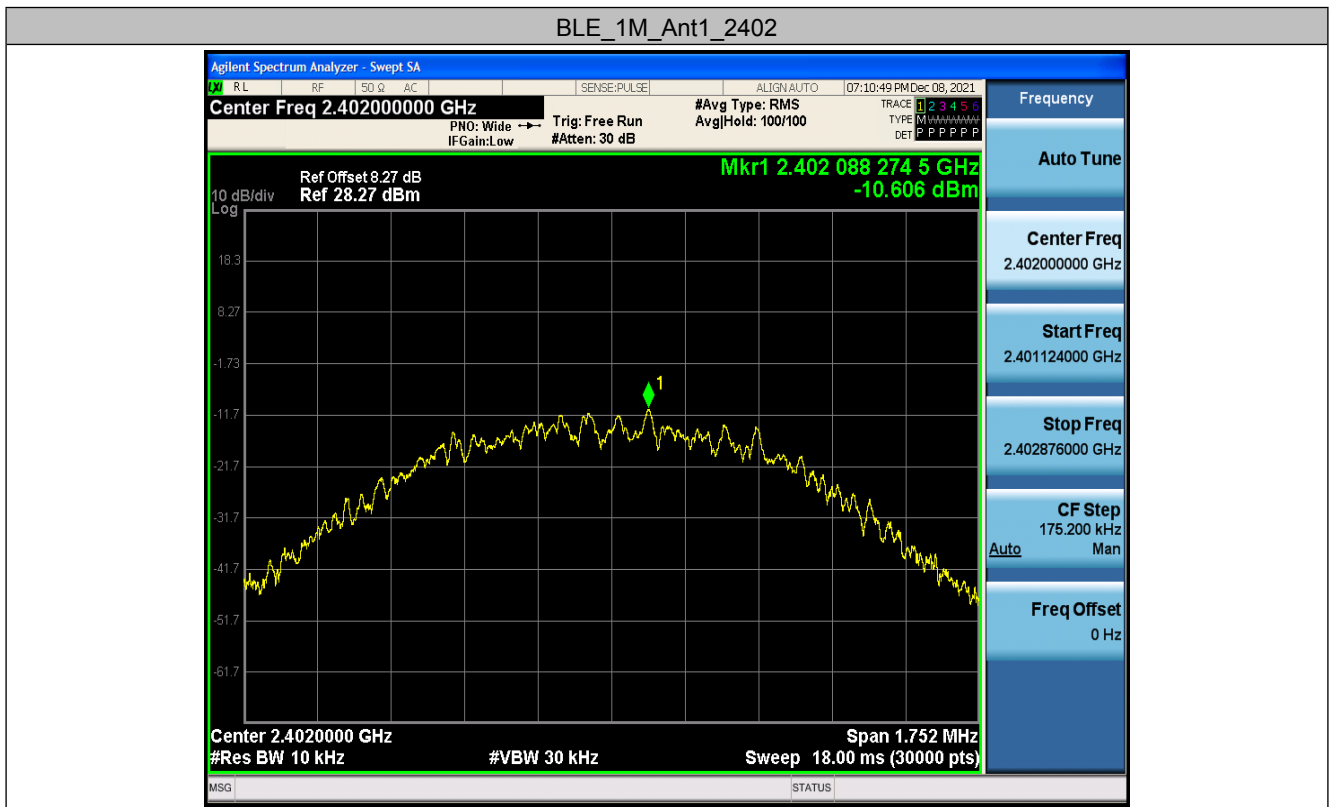


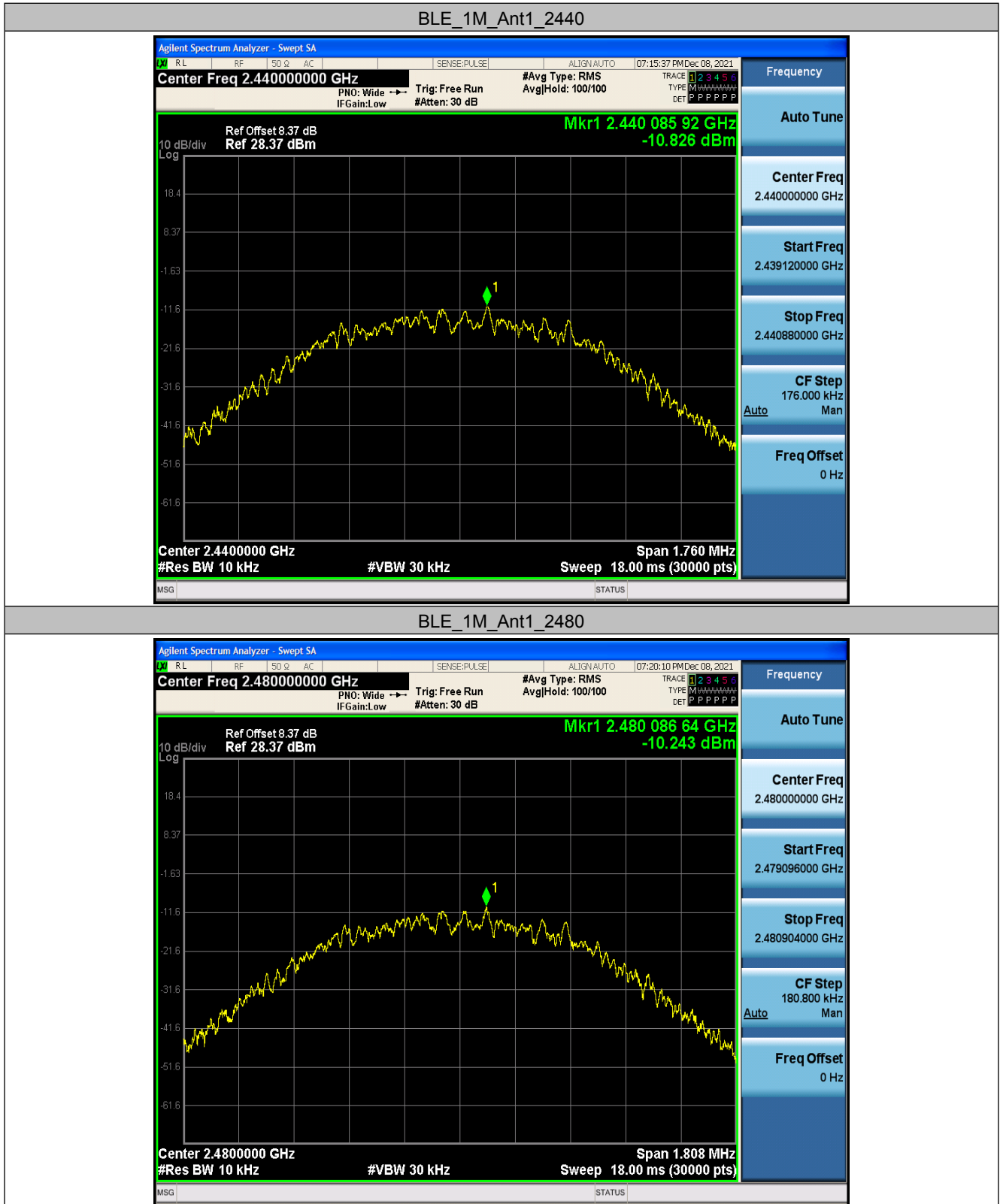
10.3 Appendix C: Maximum power spectral density

10.3.1 Test Result

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-10.61	<=8	PASS
		2440	-10.83	<=8	PASS
		2480	-10.24	<=8	PASS

10.3.2 Test Graphs



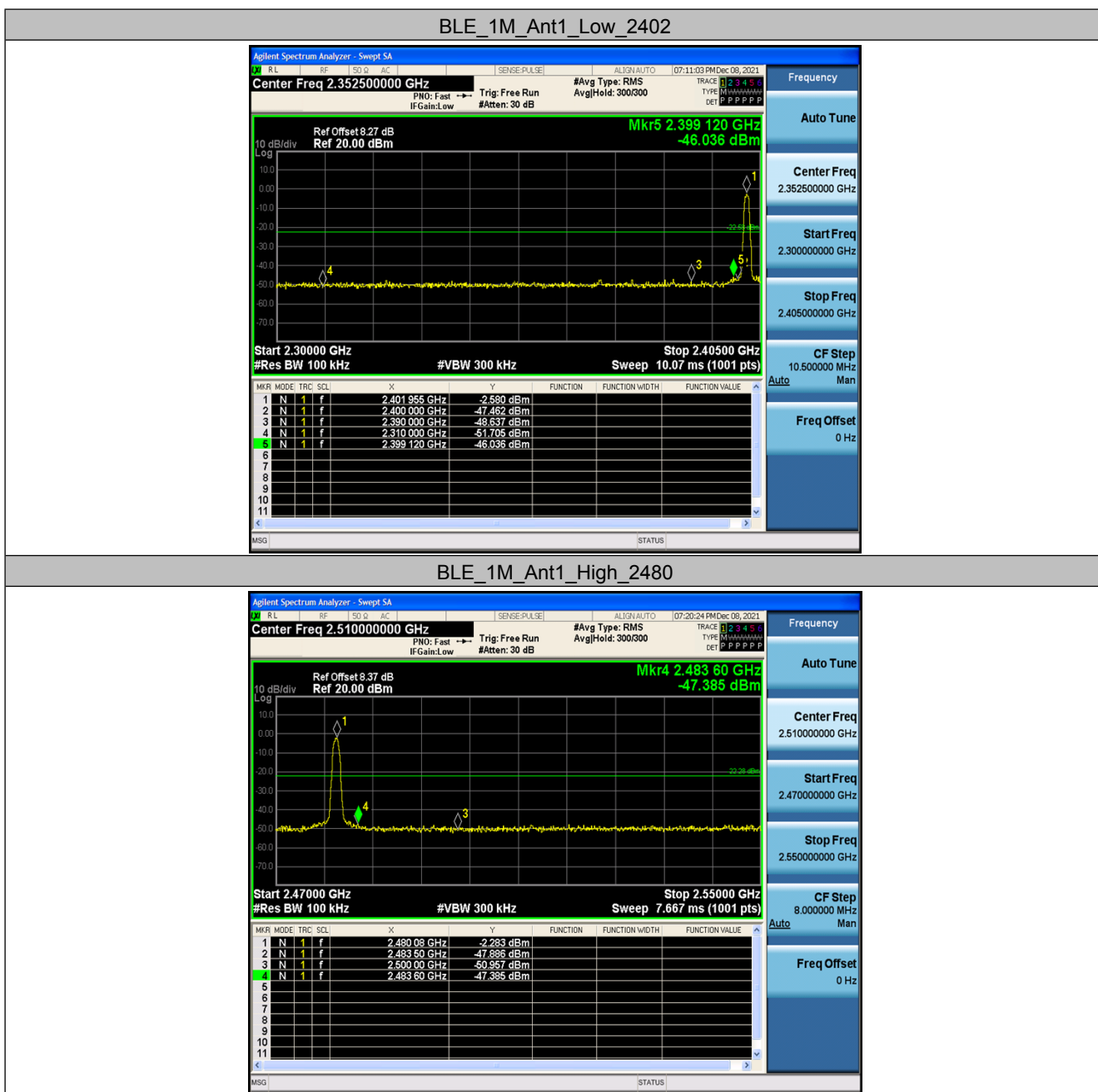


10.4 Appendix D: Band edge measurements

10.4.1 Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-2.58	-46.04	<=-22.58	PASS
		High	2480	-2.28	-47.39	<=-22.28	PASS

10.4.2 Test Graphs

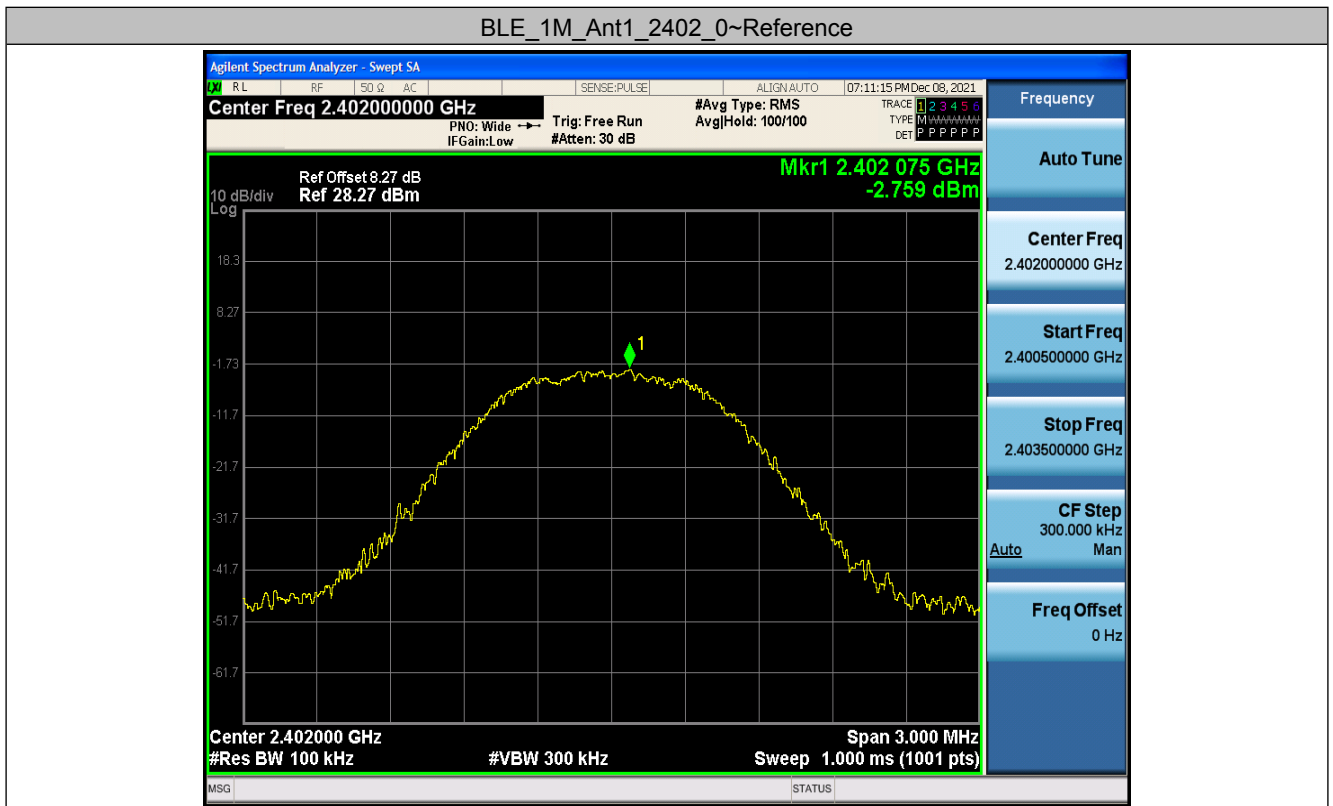


10.5 Appendix E: Conducted Spurious Emission

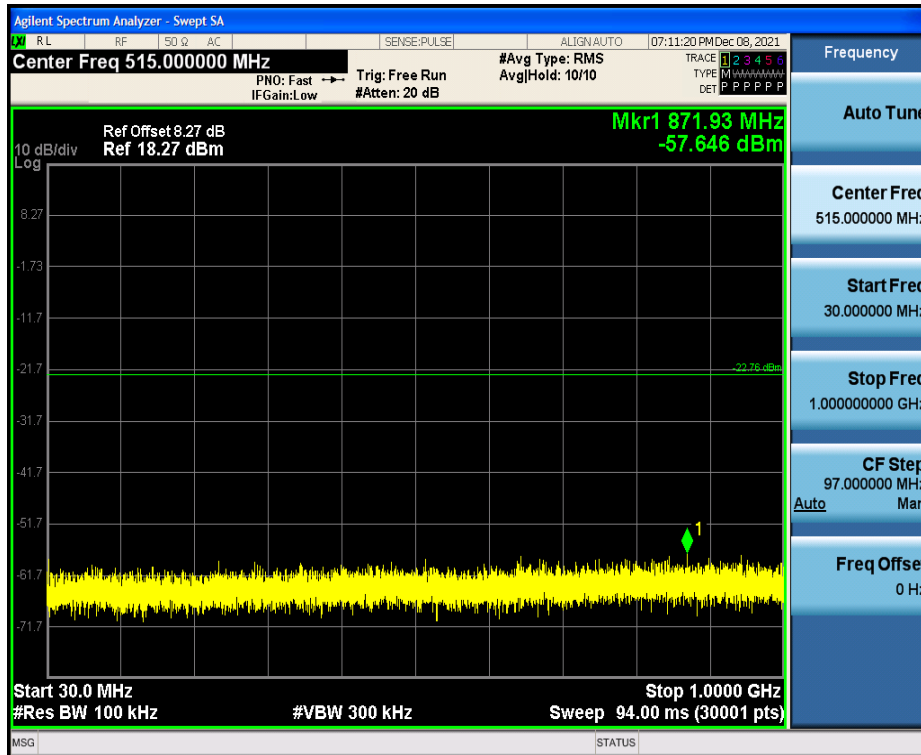
10.5.1 Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-2.76	-2.76	---	PASS
			30~1000	---	-57.646	<=-22.759	PASS
			1000~26500	---	-39.079	<=-22.759	PASS
		2440	Reference	-2.94	-2.94	---	PASS
			30~1000	---	-55.958	<=-22.935	PASS
			1000~26500	---	-39.744	<=-22.935	PASS
		2480	Reference	-2.82	-2.82	---	PASS
			30~1000	---	-57.316	<=-22.821	PASS
			1000~26500	---	-39.608	<=-22.821	PASS

10.5.2 Test Graphs



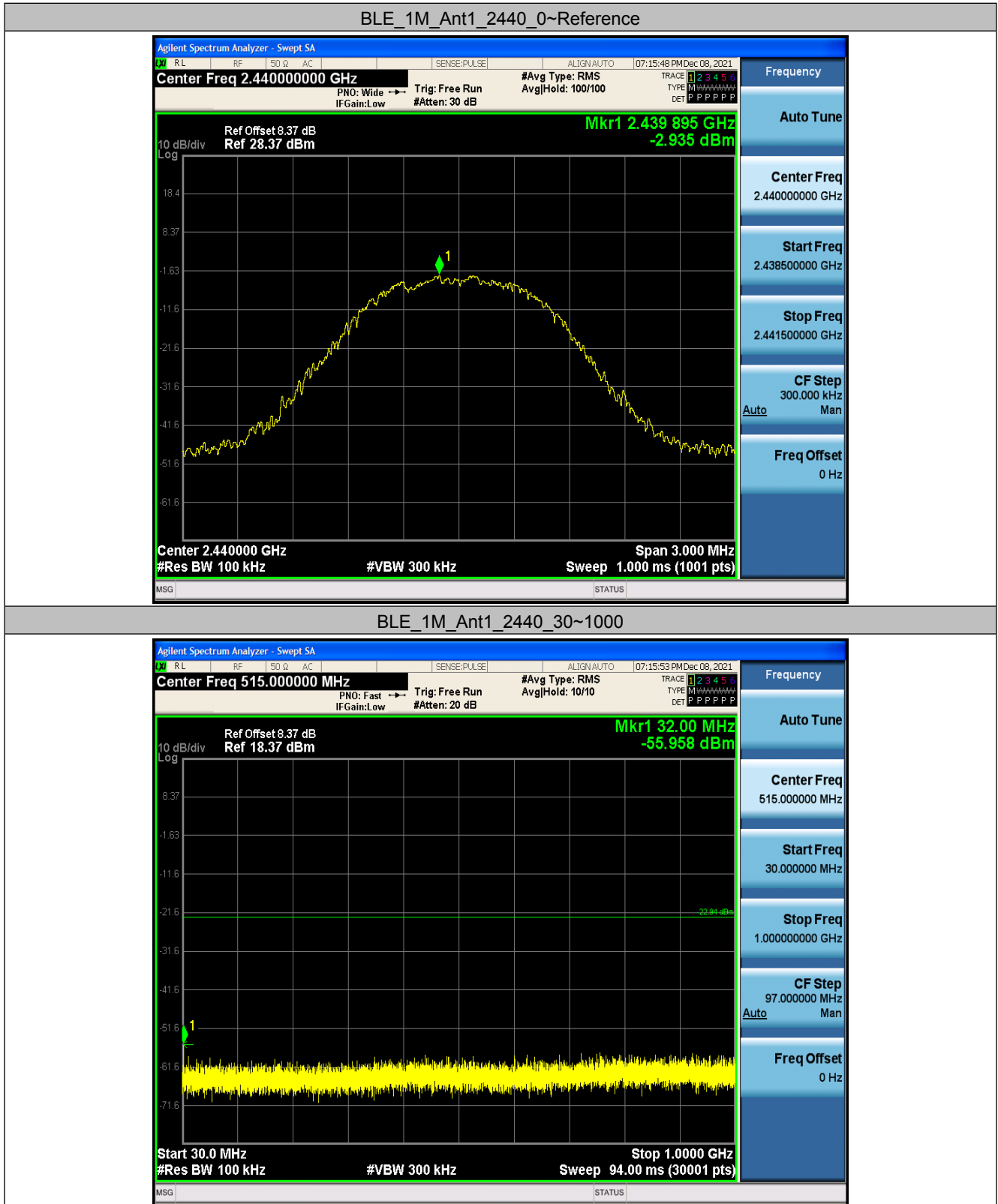
BLE_1M_Ant1_2402_30~1000

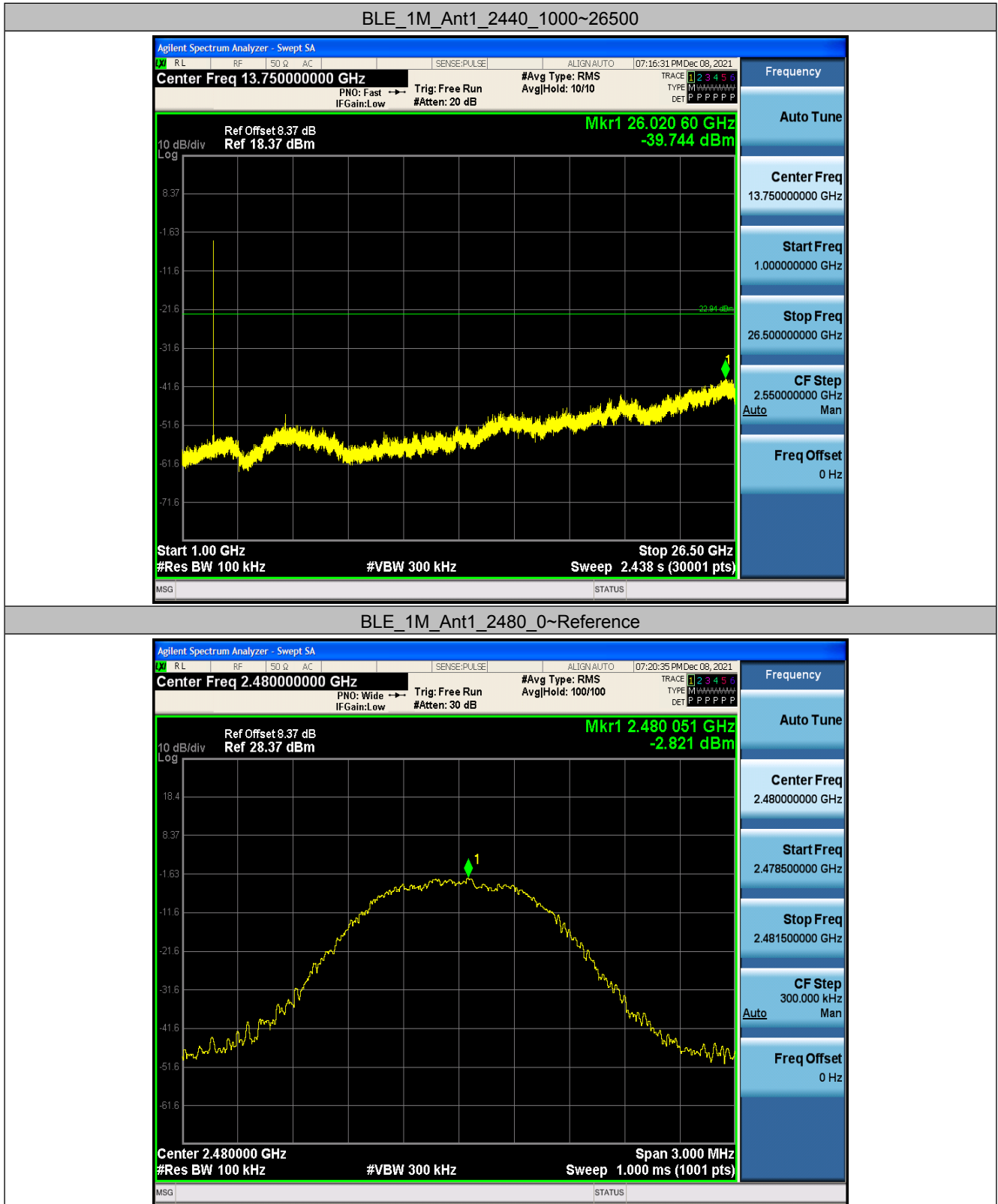


BLE_1M_Ant1_2402_1000~26500

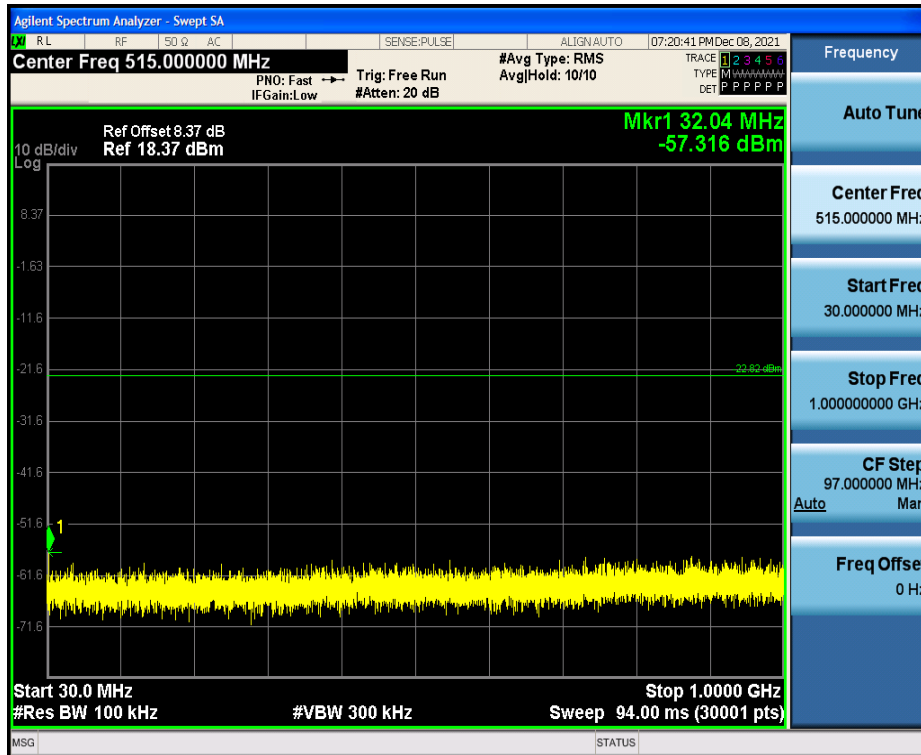


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BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



- End of the Report -