

CFR 47 FCC PART 15 SUBPART C(DSS)

TEST REPORT

For

Keyboard

MODEL NUMBER: Z83-LZ

REPORT NUMBER: E04A23080239F00101

ISSUE DATE: March 12, 2024

FCC ID: 2BEM3-A68

Prepared for

**Dongguan Leku Trading Co., Ltd
Room 101, Building 1, No. 5, Hongye North Third Road, Tangxia Town, Dongguan
City, Guangdong Province**

Prepared by

Guangdong Global Testing Technology Co., Ltd.

**Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park,
Dongguan city, Guangdong, People's Republic of China, 523808**

**This report is based on a single evaluation of the submitted sample(s) of the above mentioned
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Global Testing Technology Co., Ltd.**

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	March 12, 2024	Initial Issue	Jok Yang

Summary of Test Results

Test Item	Clause	Limit/Requirement	Result
Antenna Requirement	N/A	FCC Part 15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	ANSI C63.10-2013 Clause 6.2	FCC Part 15.207	Pass
Conducted Output Power	ANSI C63.10-2013 Clause 7.8.5	FCC Part 15.247 (b)(1)	Pass
20 dB Bandwidth and 99% Occupied Bandwidth	ANSI C63.10-2013 Clause 6.9.2	FCC Part 15.247 (a)(1)	Pass
Carrier Hopping Channel Separation	ANSI C63.10-2013 Clause 7.8.2	FCC Part 15.247 (a)(1)	Pass
Number of Hopping Frequency	ANSI C63.10-2013 Clause 7.8.3	FCC Part 15.247 (b)(1)	Pass
Time of Occupancy (Dwell Time)	ANSI C63.10-2013 Clause 7.8.4	FCC Part 15.247 (a)(1)	Pass
Conducted Bandedge and Spurious Emission	ANSI C63.10-2013 Clause 6.10.4 & Clause 7.8.8	FCC Part 15.247(d)	Pass
Radiated Band edge and Spurious Emission	ANSI C63.10-2013 Clause 6.3 & 6.5 & 6.6	FCC Part 15.205/15.209	Pass

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

*The measurement result for the sample received is <Pass> according to <CFR 47 FCC PART 15 SUBPART C(DSS)> when <Accuracy Method> decision rule is applied.

CONTENTS

1. ATTESTATION OF TEST RESULTS.....	5
2. TEST METHODOLOGY.....	6
3. FACILITIES AND ACCREDITATION.....	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	<i>7</i>
4.2. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>7</i>
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT</i>	<i>8</i>
5.2. <i>CHANNEL LIST</i>	<i>8</i>
5.3. <i>Maximum Peak Output Power.....</i>	<i>9</i>
5.4. <i>TEST CHANNEL CONFIGURATION.....</i>	<i>9</i>
5.5. <i>THE WORSE CASE POWER SETTING PARAMETER</i>	<i>9</i>
5.6. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	<i>9</i>
5.7. <i>ENVIROMENTAL CONDITIONS FOR TESTING.....</i>	<i>10</i>
5.8. <i>SUPPORT UNITS FOR SYSTEM TEST</i>	<i>10</i>
5.9. <i>SETUP DIAGRAM</i>	<i>10</i>
6. MEASURING EQUIPMENT AND SOFTWARE USED.....	11
7. ANTENNA PORT TEST RESULTS	13
7.1. <i>Conducted Output Power.....</i>	<i>13</i>
7.2. <i>20 dB Bandwidth and 99% Occupied Bandwidth.....</i>	<i>15</i>
7.3. <i>Carrier Hopping Channel Separation</i>	<i>16</i>
7.4. <i>Number of Hopping Frequency</i>	<i>18</i>
7.5. <i>Time of Occupancy (Dwell Time)</i>	<i>20</i>
7.6. <i>Conducted Bandedge and Spurious Emission</i>	<i>22</i>
8. RADIATED TEST RESULTS.....	24
8.1. <i>Radiated Band edge and Spurious Emission</i>	<i>30</i>
9. ANTENNA REQUIREMENT	42
10. AC POWER LINE CONDUCTED EMISSION	43
11. TEST DATA - Appendix A.....	46
APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION	74

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Dongguan Leku Trading Co., Ltd
Address: Room 101, Building 1, No. 5, Hongye North Third Road, Tangxia Town, Dongguan City, Guangdong Province

Manufacturer Information

Company Name: Dongguan Leku Trading Co., Ltd
Address: Room 101, Building 1, No. 5, Hongye North Third Road, Tangxia Town, Dongguan City, Guangdong Province

Factory Information

Company Name: Huizhou Jaguar Technology Co., Ltd
Address: 1st Floor, No. 24 Xinnan 1st Road, Yuanzhou Town, Boluo County, Huizhou City, Guangdong Province

EUT Information

Product Description: Keyboard
Model: Z83-LZ
Brand: /
Sample Received Date: September 25, 2023
Sample Status: Normal
Sample ID: A23080239 002
Date of Tested: October 12, 2023 to March 12, 2024

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C(DSS)	Pass

Prepared By:


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Project Engineer

Approved By:


Shawn Wen

Laboratory Manager

Checked By:


Alan He
Laboratory Leader

2. TEST METHODOLOGY

All tests were performed in accordance with the standard CFR 47 FCC PART 15 SUBPART C(DSS)

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 6947.01) Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1343) Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules ISED (Company No.: 30714) Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.
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Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Items	k	Uncertainty
DTS Bandwidth	1.96	±9.2 PPM
20dB Emission Bandwidth	1.96	±9.2 PPM
Carrier Frequency Separation	1.96	±9.2 PPM
Time of Occupancy	1.96	±0.57%
Conducted Output Power	1.96	±1.5 dB
Power Spectral Density Level	1.96	±1.9 dB
Conducted Spurious Emission	1.96	9 kHz-30 MHz: ± 0.95 dB 30 MHz-1 GHz: ± 1.5 dB 1GHz-12.75GHz: ± 1.8 dB 12.75 GHz-26.5 GHz: ± 2.1dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.		

Test Item	Measurement Frequency Range	K	U(dB)
Conducted emissions from the AC mains power ports (AMN)	150 kHz ~ 30 MHz	2	3.37
Radiated emissions	9 kHz ~ 30 MHz	2	4.16
Radiated emissions	30 MHz ~ 1 GHz	2	3.79
Radiated emissions	1 GHz ~ 18 GHz	2	5.62
Radiated emissions	18 GHz ~ 40 GHz	2	5.54
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name		Keyboard
Model		Z83-LZ
EUT Classification		Class B
Hardware Version		V1.0
Software Version		V1.0
Input Ratings		USB-C: 5V / Battery 3.7V
Battery Ratings		HYF 606090 3.7V 4000mAh 14.8Wh
Power Supply	DC	5V
	Battery	3.7V

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Maximum Peak Power:	-7.12 dBm
Antenna Type:	Internal antenna
Antenna Gain:	0.9 dBi
EUT Test software:	/

5.2. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442	31	2462
02	2404	12	2424	22	2444	32	2464
03	2406	13	2426	23	2446	33	2466
04	2408	14	2428	24	2448	34	2468
05	2410	15	2430	25	2450	35	2470
06	2412	16	2432	26	2452	36	2472
07	2414	17	2434	27	2454	37	2474
08	2416	18	2436	28	2456	38	2476
09	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

5.3. MAXIMUM PEAK OUTPUT POWER

Test Mode	Frequency (MHz)	Channel Number	Maximum Peak Output Power (dBm)
GFSK	2402 ~ 2480	1-40[40]	-7.12

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 1(Low Channel), CH 20(MID Channel), CH 40(High Channel)	2402 MHz, 2440 MHz, 2480 MHz

Note: The hop is hopping mode.

5.5. THE WORSE CASE POWER SETTING PARAMETER

WORST-CASE CONFIGURATIONS

Modulation Technology	Modulation Type
FHSS	GFSK

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

The Worst Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		/		
Modulation Type	Transmit Antenna Number	Test Software setting value		
		CH 1	CH 20	CH 40
GFSK	1	default	default	default

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2402-2480	Internal antenna	0.9

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

Note:

1.BLE & GFSK can't transmit simultaneously. (declared by client)

5.7. ENVIROMENTAL CONDITIONS FOR TESTING

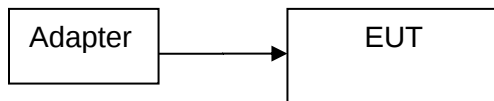
Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage	Relative Humidity (%)
NVNT	+15 to +35	5 V	20 to 75
Remark:			
1) NV: Normal Voltage; NT: Normal Temperature			

5.8. SUPPORT UNITS FOR SYSTEM TEST

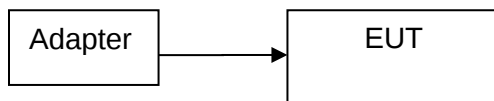
Equipment	Manufacturer	Model No.
Adapter	Lulian	CD170

5.9. SETUP DIAGRAM

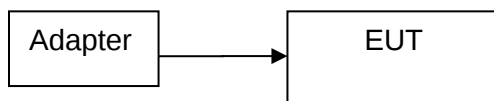
AC conducted emission :



Radiated Emission:



RF conducted:



6. MEASURING EQUIPMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2023/09/18	2024/09/17
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2023/09/18	2024/09/17
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/09/18	2024/09/17
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2023/09/18	2024/09/17
temperature humidity chamber	Espec	SH-241	SH-241-2014	2023/09/18	2024/09/17
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	HzEMC	HPA-9K0130	HYP A21001	2023/09/18	2024/09/17
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	A-INFO	HPA-1G1850	HYP A21003	2023/09/18	2024/09/17
Horn antenna	A-INFO	3117	246069	2022/03/11	2025/03/10
Pre-Amplifier	ZKJC	HPA-184057	HYP A21004	2023/09/18	2024/09/17

Horn antenna	ZKJC	3116C	246265	2022/03/29	2025/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

Test Equipment of Conducted emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Shielded Room	CHENG YU	8m*5m*4m	N/A	2022/10/29	2025/10/28
EMI Test Receiver	Rohde & Schwarz	ESR3	102647	2023/09/18	2024/09/17
LISN/AMN	Rohde & Schwarz	ENV216	102843	2023/09/18	2024/09/17
NNLK 8129 RC	Schwarzbeck	NNLK 8129 RC	5046	2023/09/18	2024/09/17
Test Software	Farad	EZ-EMC (Ver. EMC-con-3A1 1+)	N/A	N/A	N/A

7. ANTENNA PORT TEST RESULTS

7.1. CONDUCTED OUTPUT POWER

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3) ISED RSS-247 5.4 (d)	Peak Conduct Output Power	1 watt or 30 dBm	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.5.

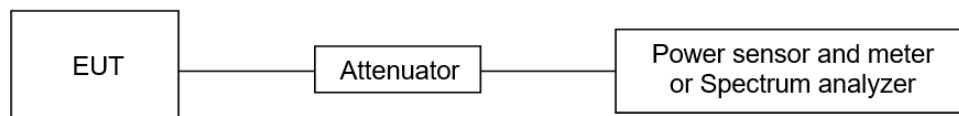
Connect the EUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	>20 dB bandwidth of the emission being measured
VBW	≥RBW
Span	Approximately five times the 20 dB bandwidth, centered on a hopping channel.
Trace	Max hold
Sweep time	Auto

Allow trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	45%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.2. 20 DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1)	20 dB Bandwidth	None; for reporting purposes only.	2400-2483.5

TEST PROCEDURE

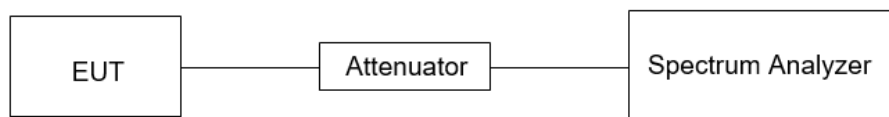
Refer to ANSI C63.10-2013 clause 6.9.2.

Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 20 dB Bandwidth: 1 % to 5 % of the 20 dB bandwidth For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 20 dB Bandwidth: approximately $3 \times \text{RBW}$ For 99 % Occupied Bandwidth: $\geq 3 \times \text{RBW}$
Span	Approximately 2 to 3 times the 20dB bandwidth
Trace	Max hold
Sweep	Auto couple

a) Use the occupied bandwidth function of the instrument, allow the trace to stabilize and report the measured 99 % occupied bandwidth and 20 dB Bandwidth.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	45%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.3. CARRIER HOPPING CHANNEL SEPARATION

LIMITS

CFR 47 FCC Part15 (15.247),			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1)	Carrier Frequency Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel.	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.2.

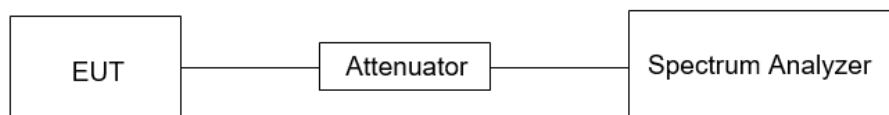
Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize and use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	45%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.4. NUMBER OF HOPPING FREQUENCY

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III	Number of Hopping Frequency	at least 15 hopping channels

TEST PROCEDURE

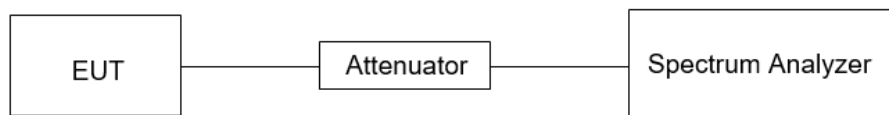
Refer to ANSI C63.10-2013 clause 7.8.3.

Connect the EUT to the spectrum Analyzer and use the following settings:

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW	≥RBW
Span	The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
Trace	Max hold
Sweep time	Auto couple

Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer, count the quantity of peaks to get the number of hopping channels.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	45%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.5. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III	Time of Occupancy (Dwell Time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed.

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.4.

Connect the EUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	Zero span, centered on a hopping channel
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel

Use the marker-delta function to determine the transmit time per hop (Burst Width). If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

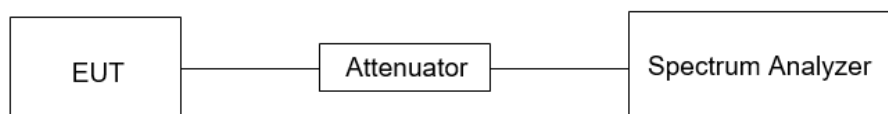
For FHSS Mode (40 Channel):

GFSK Dwell Time: Pulse Time * Burst Count

Note:1. Pulse Time: The time of a single pulse.

2. Burst Count: The number of pulses observed during a 16s period.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	45%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d)	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.6 and 7.8.8.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

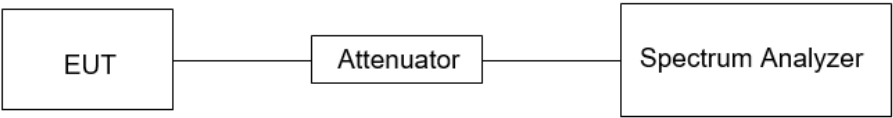
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4℃	Relative Humidity	54%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
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

FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST PROCEDURE

Below 30 MHz

The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω . For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

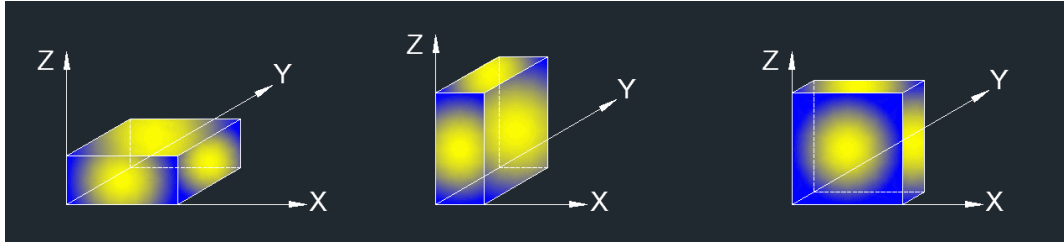
Above 1 GHz

The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

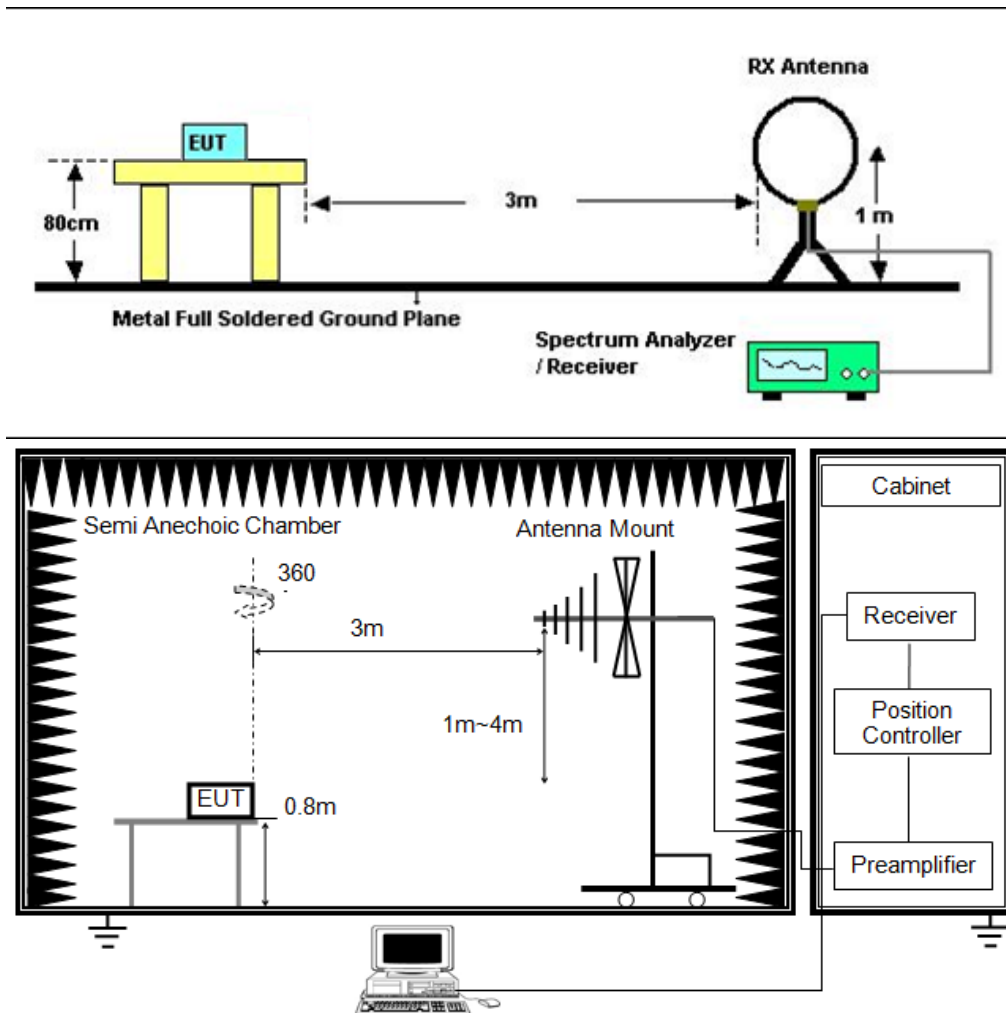
X axis, Y axis, Z axis positions:

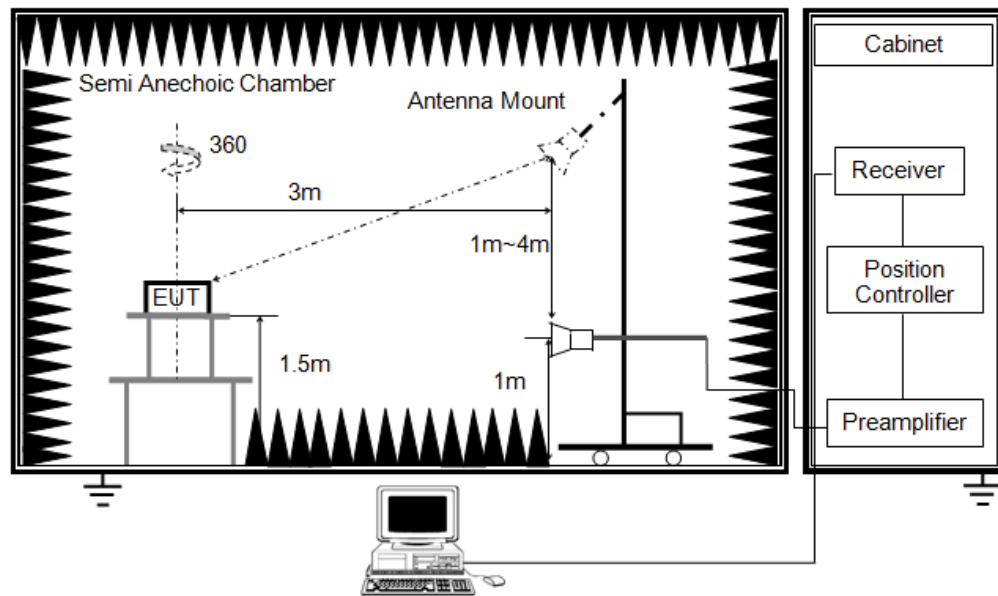


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

TEST SETUP





TEST ENVIRONMENT

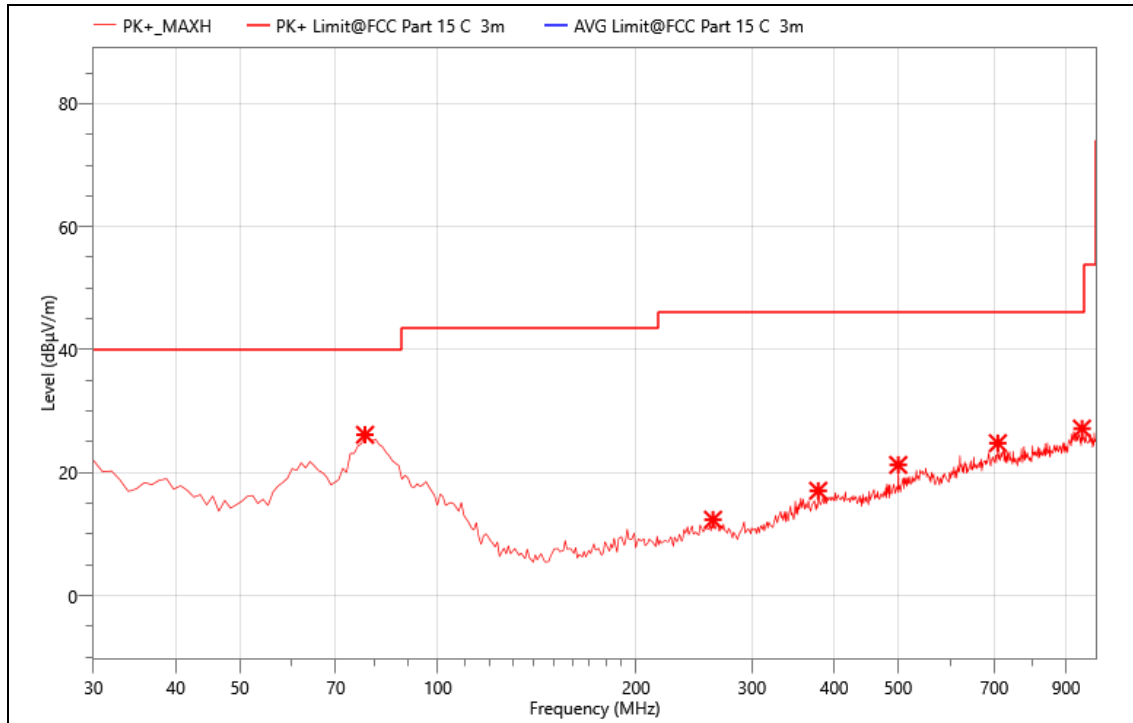
Temperature	24.3℃	Relative Humidity	54%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section 8.1.

8.1. RADIATED BAND EDGE AND SPURIOUS EMISSION

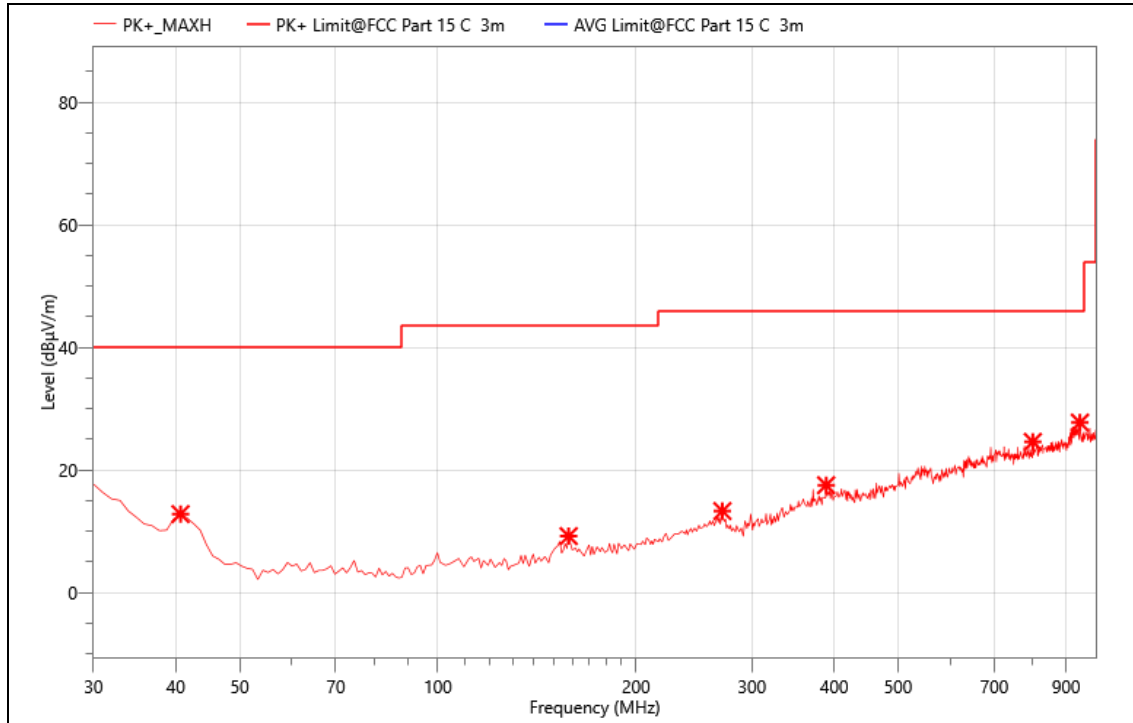
Mode:	GFSK 2402MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	77.530	51.48	26.17	40.00	13.83	PK+	100.0	V	-0.1	-25.31
2	261.830	30.86	12.37	46.00	33.63	PK+	100.0	V	-0.1	-18.49
3	378.230	32.03	17.07	46.00	28.93	PK+	100.0	V	-0.1	-14.96
4	500.450	33.38	21.27	46.00	24.73	PK+	100.0	V	-0.1	-12.11
5	709.000	31.97	24.81	46.00	21.19	PK+	100.0	V	-0.1	-7.16
6	951.500	30.65	27.18	46.00	18.82	PK+	100.0	V	-0.1	-3.47

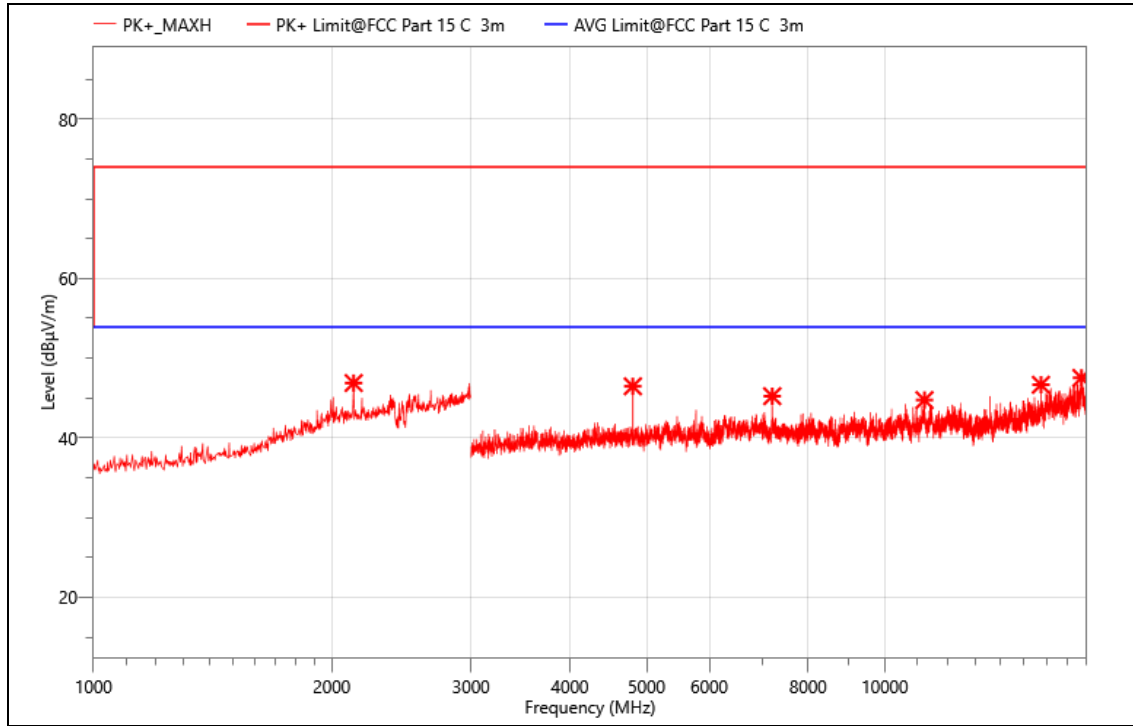
Mode:	GFSK 2402MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	40.670	33.20	12.79	40.00	27.21	PK+	100.0	H	360.1	-20.41
2	158.040	30.70	9.19	43.50	34.31	PK+	100.0	H	360.1	-21.51
3	270.560	31.90	13.29	46.00	32.71	PK+	100.0	H	360.1	-18.61
4	388.900	31.94	17.50	46.00	28.50	PK+	100.0	H	360.1	-14.44
5	801.150	30.94	24.58	46.00	21.42	PK+	100.0	H	360.1	-6.36
6	944.710	31.06	27.73	46.00	18.27	PK+	100.0	H	360.1	-3.33

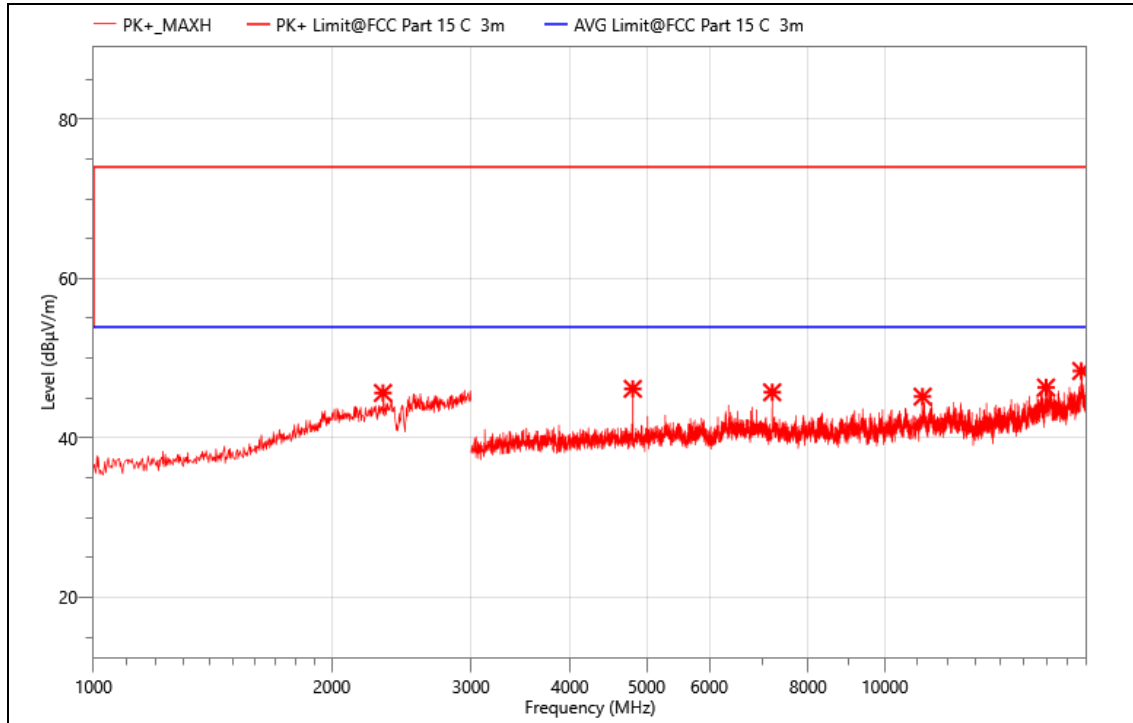
Mode:	GFSK 2402MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2132.000	55.94	46.89	74.00	27.11	PK+	150	H	237.8	-9.05
2	4803.000	57.86	46.48	74.00	27.52	PK+	150	H	242.2	-11.38
3	7207.500	53.00	45.24	74.00	28.76	PK+	150	H	99.8	-7.76
4	11224.500	48.47	44.76	74.00	29.24	PK+	150	H	94.4	-3.71
5	15753.000	48.65	46.67	74.00	27.33	PK+	150	H	206.3	-1.98
6	17722.500	47.06	47.53	74.00	26.47	PK+	150	H	158.9	0.47

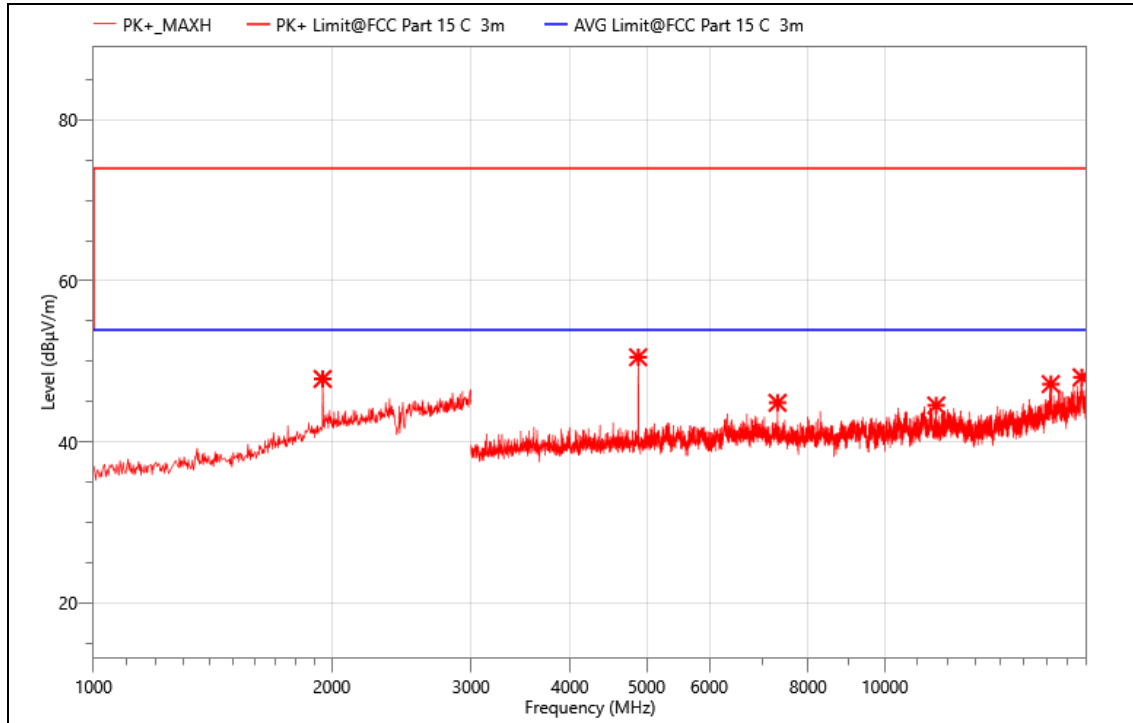
Mode:	GFSK 2402MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2322.000	54.44	45.64	74.00	28.36	PK+	150	V	253.8	-8.8
2	4803.000	57.54	46.16	74.00	27.84	PK+	150	V	182.1	-11.38
3	7206.000	53.51	45.73	74.00	28.27	PK+	150	V	52.2	-7.78
4	11163.000	49.11	45.18	74.00	28.82	PK+	150	V	133.8	-3.93
5	15988.500	48.08	46.33	74.00	27.67	PK+	150	V	288.9	-1.75
6	17718.000	48.02	48.40	74.00	25.60	PK+	150	V	276.2	0.38

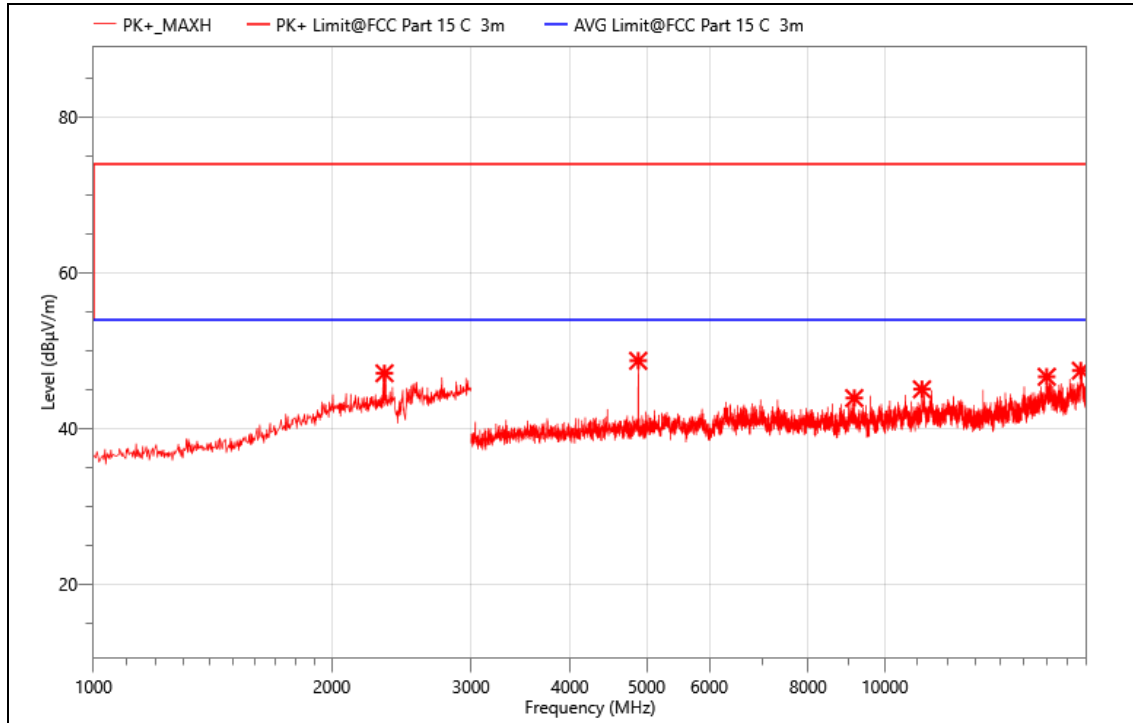
Mode:	GFSK 2440MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	1948.000	57.46	47.83	74.00	26.17	PK+	150	H	102.4	-9.63
2	4879.500	61.47	50.52	74.00	23.48	PK+	150	H	240.5	-10.95
3	7320.000	52.95	44.87	74.00	29.13	PK+	150	H	252.9	-8.08
4	11616.000	48.80	44.55	74.00	29.45	PK+	150	H	360	-4.25
5	16212.000	47.56	47.19	74.00	26.81	PK+	150	H	305.9	-0.37
6	17742.000	47.49	48.03	74.00	25.97	PK+	150	H	245.8	0.54

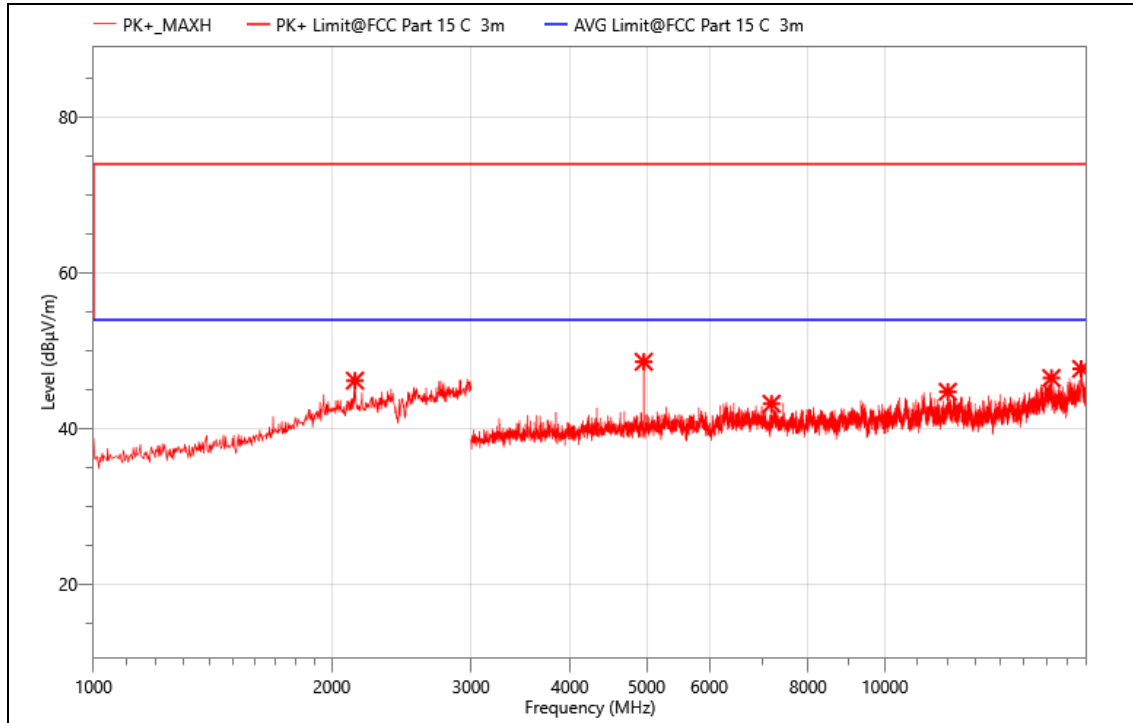
Mode:	GFSK 2440MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2332.000	55.88	47.12	74.00	26.88	PK+	150	V	170.6	-8.76
2	4879.500	59.67	48.72	74.00	25.28	PK+	150	V	71.1	-10.95
3	9150.000	50.61	43.93	74.00	30.07	PK+	150	V	9.9	-6.68
4	11142.000	49.28	45.06	74.00	28.94	PK+	150	V	330.8	-4.22
5	16021.500	48.38	46.67	74.00	27.33	PK+	150	V	-0.1	-1.71
6	17692.500	47.55	47.45	74.00	26.55	PK+	150	V	65.7	-0.1

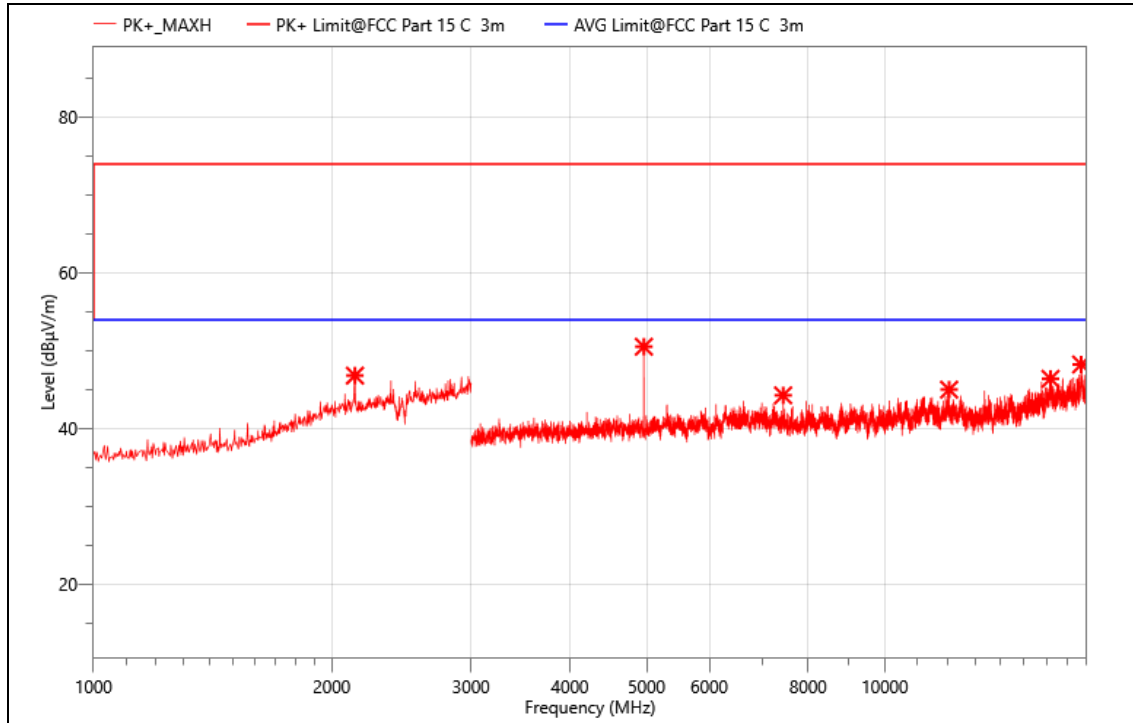
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Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2140.000	55.22	46.17	74.00	27.83	PK+	150	V	100.6	-9.05
2	4959.000	60.02	48.59	74.00	25.41	PK+	150	V	70.2	-11.43
3	7192.500	51.18	43.20	74.00	30.80	PK+	150	V	22.8	-7.98
4	12012.000	48.63	44.74	74.00	29.26	PK+	150	V	259.1	-3.89
5	16237.500	47.34	46.50	74.00	27.50	PK+	150	V	5.7	-0.84
6	17712.000	47.41	47.68	74.00	26.32	PK+	150	V	0.0	0.27

Mode:	GFSK 2480MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



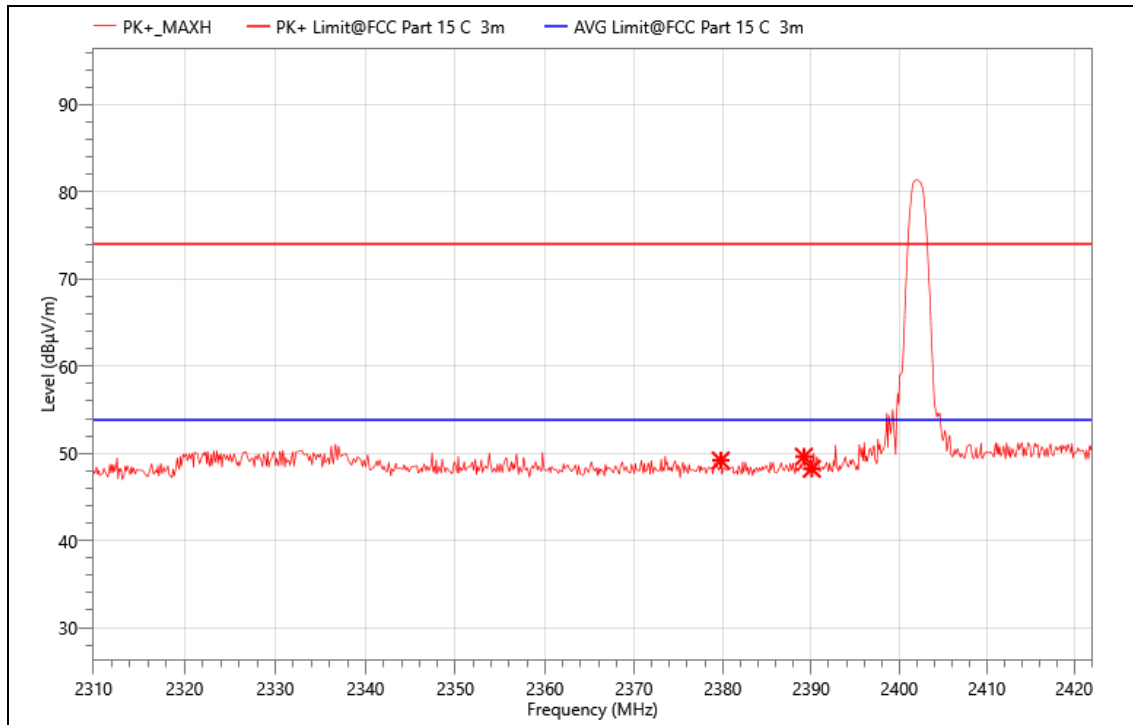
Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2140.000	55.87	46.82	74.00	27.18	PK+	150	H	96.2	-9.05
2	4960.500	61.94	50.53	74.00	23.47	PK+	150	H	247.5	-11.41
3	7440.000	52.18	44.29	74.00	29.71	PK+	150	H	193.8	-7.89
4	12061.500	49.49	45.02	74.00	28.98	PK+	150	H	360.1	-4.47
5	16200.000	46.77	46.41	74.00	27.59	PK+	150	H	360.1	-0.36
6	17712.000	47.98	48.25	74.00	25.75	PK+	150	H	17.0	0.27

Note:

1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.
5. The frequency, which started from 18 GHz to 26.5GHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

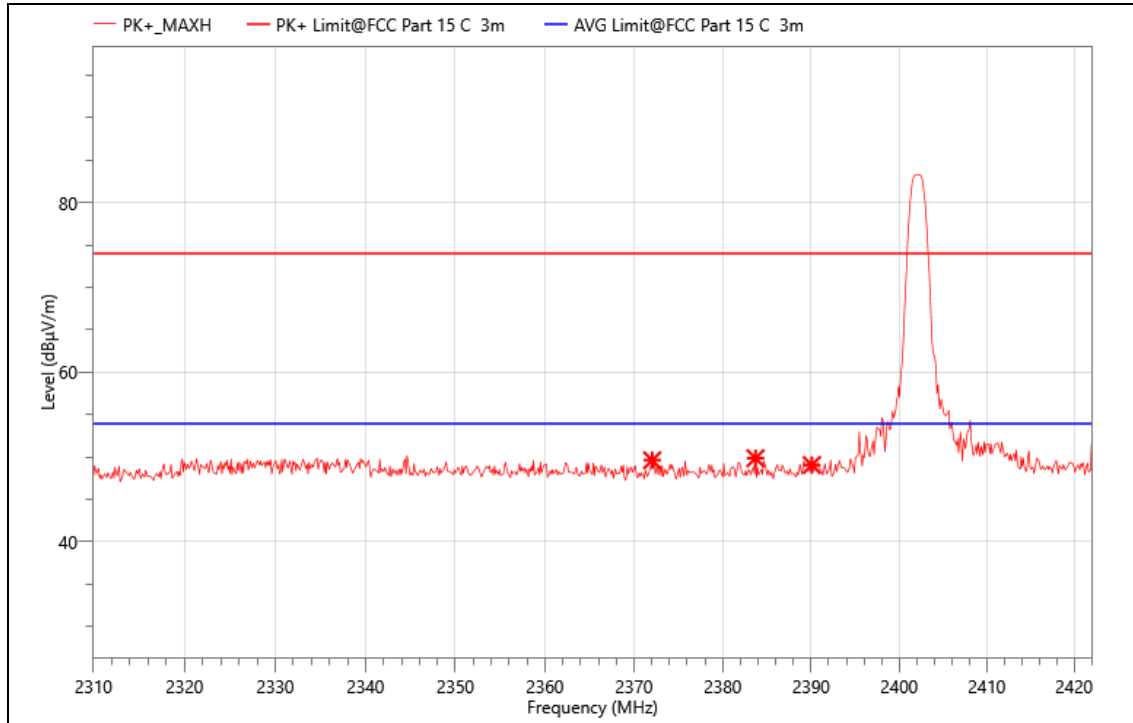
Mode:	GFSK 2402MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2379.776	26.65	49.18	74.00	24.82	PK+	150.1	V	-0.1	22.53
2	2389.184	26.93	49.63	74.00	24.37	PK+	150.1	V	-0.1	22.7
3	2390.080	25.51	48.23	74.00	25.77	PK+	150.1	V	-0.1	22.72

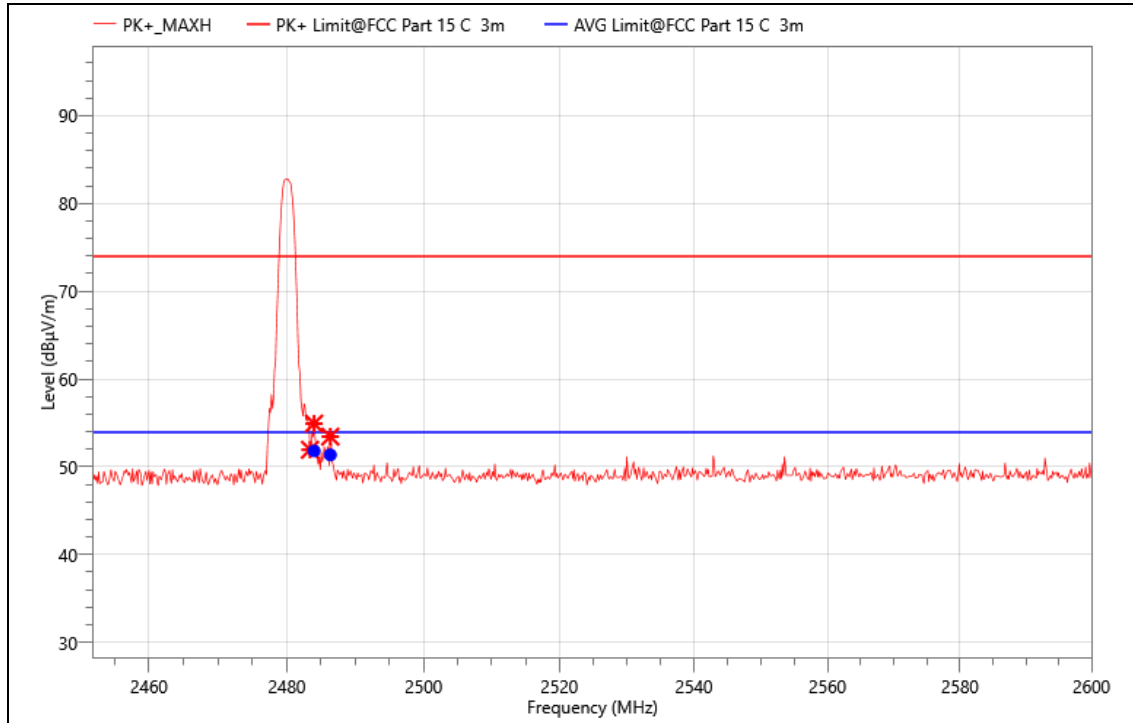
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Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2372.048	27.01	49.61	74.00	24.39	PK+	150.1	H	360.1	22.6
2	2383.696	27.25	49.85	74.00	24.15	PK+	150.1	H	360.1	22.6
3	2390.080	26.33	49.05	74.00	24.95	PK+	150.1	H	360.1	22.72

Mode:	GFSK 2480MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



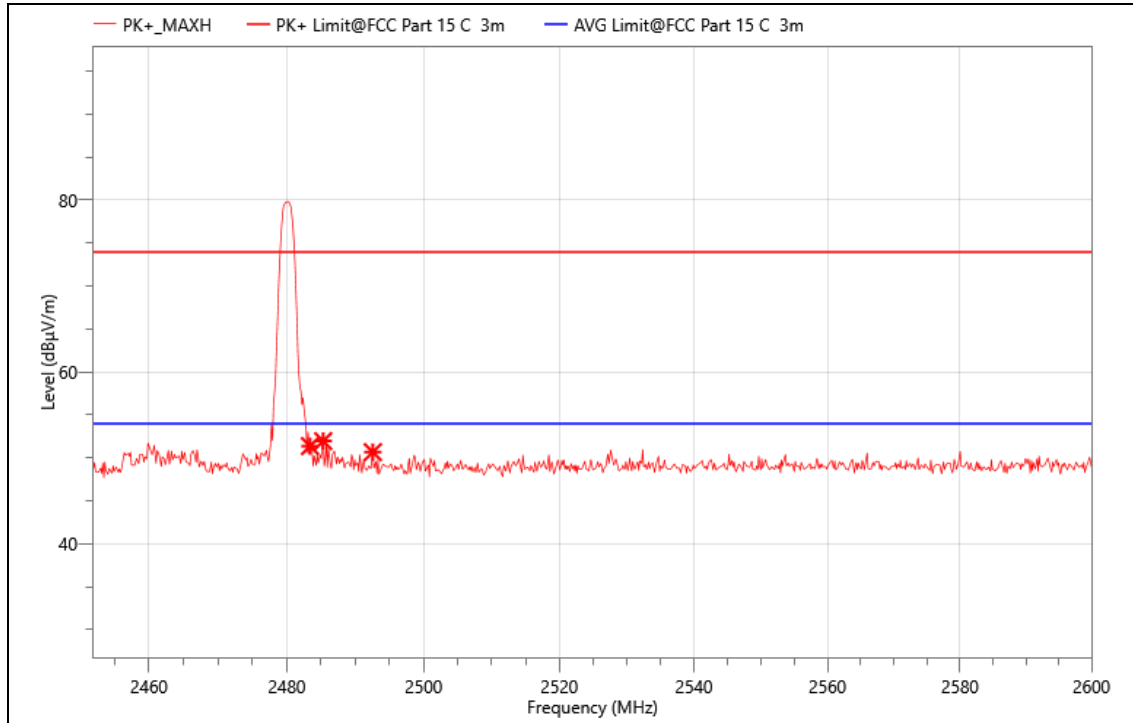
Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2483.376	28.79	51.94	74.00	22.06	PK+	150.1	H	-0.1	23.15
2	2483.968	31.78	54.93	74.00	19.07	PK+	150.1	H	-0.1	23.15
3	2486.336	30.30	53.44	74.00	20.56	PK+	150.1	H	-0.1	23.14

Final_Result

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Verdict
1	2483.968	28.66	51.81	53.90	2.09	AVG	150.1	H	-0.1	23.15	PASS
2	2486.336	28.22	51.36	53.90	2.54	AVG	150.1	H	-0.1	23.14	PASS

Mode:	GFSK 2480MHz
Power:	DC 5V
TE:	Vier
Date	2023/12/01
T/A/P	24.3°C/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	2483.376	28.22	51.37	74.00	22.63	PK+	150.1	V	360.1	23.15
2	2485.300	28.82	51.96	74.00	22.04	PK+	150.1	V	360.1	23.14
3	2492.552	27.54	50.67	74.00	23.33	PK+	150.1	V	360.1	23.13

9. ANTENNA REQUIREMENT

REQUIREMENT

Please refer to FCC §15.203

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 shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the GFSK, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

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.

DESCRIPTION

Pass

10. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a) .

FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

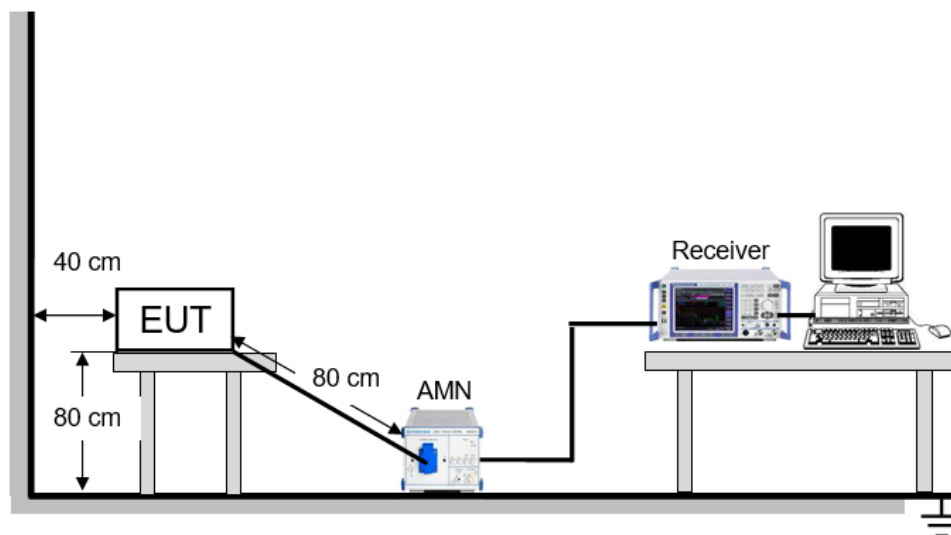
TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 6.2.

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver is used to test the emissions from the AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

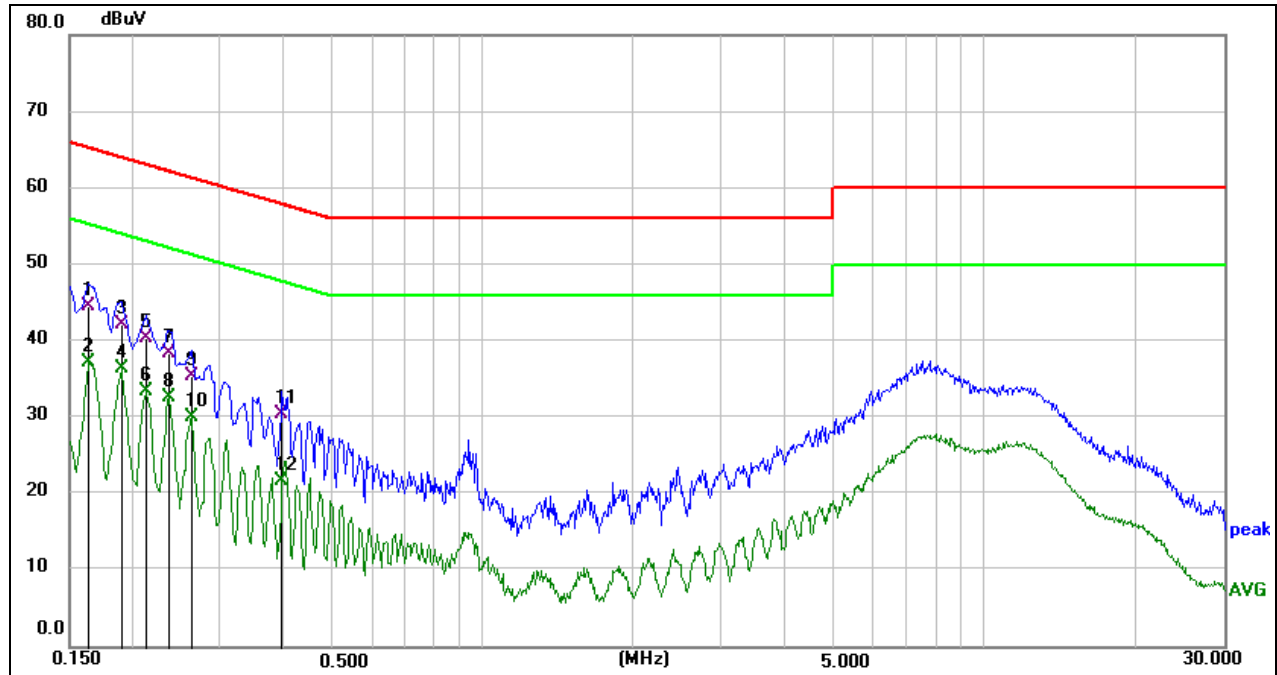
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP



TEST ENVIRONMENT

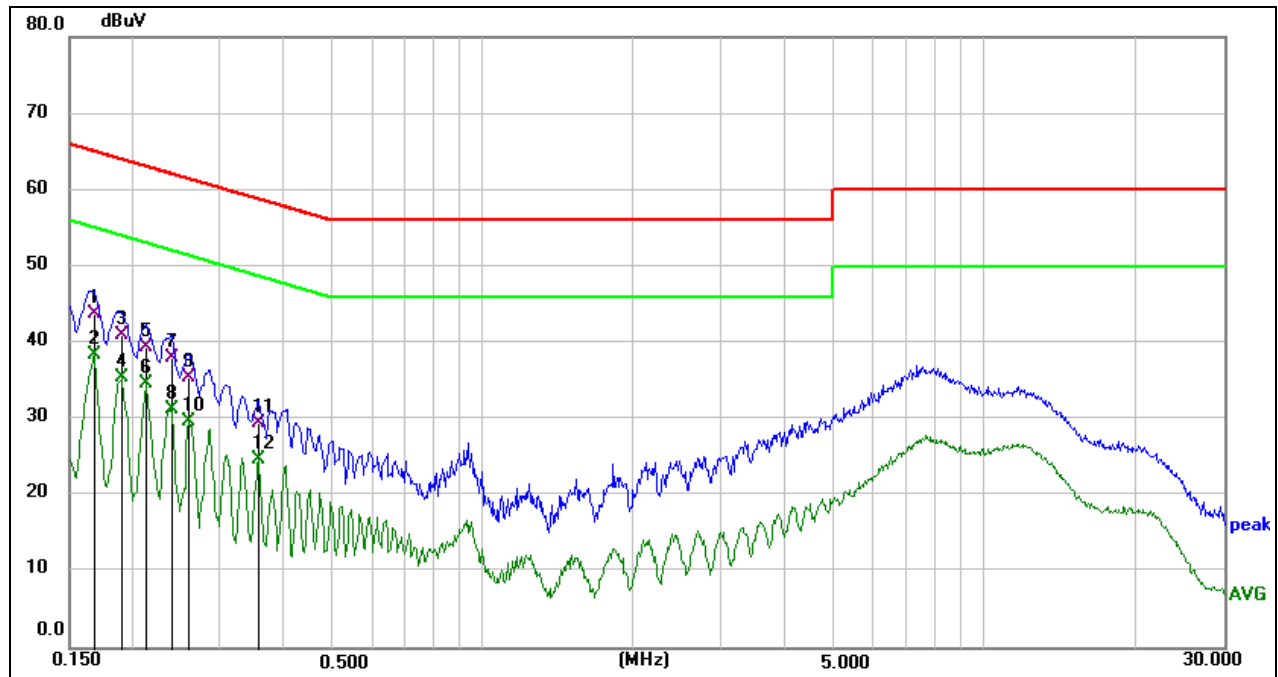
Temperature	26°C	Relative Humidity	54%
Atmosphere Pressure	101kPa		

TEST RESULTS

Phase: L1

Mode: GFSK 2402MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1635	34.83	9.77	44.60	65.28	-20.68	QP
2	0.1635	27.49	9.77	37.26	55.28	-18.02	AVG
3	0.1905	32.38	9.82	42.20	64.01	-21.81	QP
4	0.1905	26.56	9.82	36.38	54.01	-17.63	AVG
5	0.2130	30.57	9.78	40.35	63.09	-22.74	QP
6	0.2130	23.64	9.78	33.42	53.09	-19.67	AVG
7	0.2355	28.72	9.68	38.40	62.25	-23.85	QP
8	0.2355	22.99	9.68	32.67	52.25	-19.58	AVG
9	0.2625	25.76	9.69	35.45	61.35	-25.90	QP
10	0.2625	20.30	9.69	29.99	51.35	-21.36	AVG
11	0.3975	20.49	9.91	30.40	57.91	-27.51	QP
12	0.3975	11.75	9.91	21.66	47.91	-26.25	AVG



Phase: N

Mode: GFSK 2402MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1680	34.07	9.73	43.80	65.06	-21.26	QP
2	0.1680	28.64	9.73	38.37	55.06	-16.69	AVG
3	0.1905	31.25	9.75	41.00	64.01	-23.01	QP
4	0.1905	25.61	9.75	35.36	54.01	-18.65	AVG
5	0.2130	29.57	9.78	39.35	63.09	-23.74	QP
6	0.2130	24.87	9.78	34.65	53.09	-18.44	AVG
7	0.2400	28.09	9.83	37.92	62.10	-24.18	QP
8	0.2400	21.38	9.83	31.21	52.10	-20.89	AVG
9	0.2580	25.70	9.82	35.52	61.50	-25.98	QP
10	0.2580	19.78	9.82	29.60	51.50	-21.90	AVG
11	0.3570	19.64	9.76	29.40	58.80	-29.40	QP
12	0.3570	14.90	9.76	24.66	48.80	-24.14	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

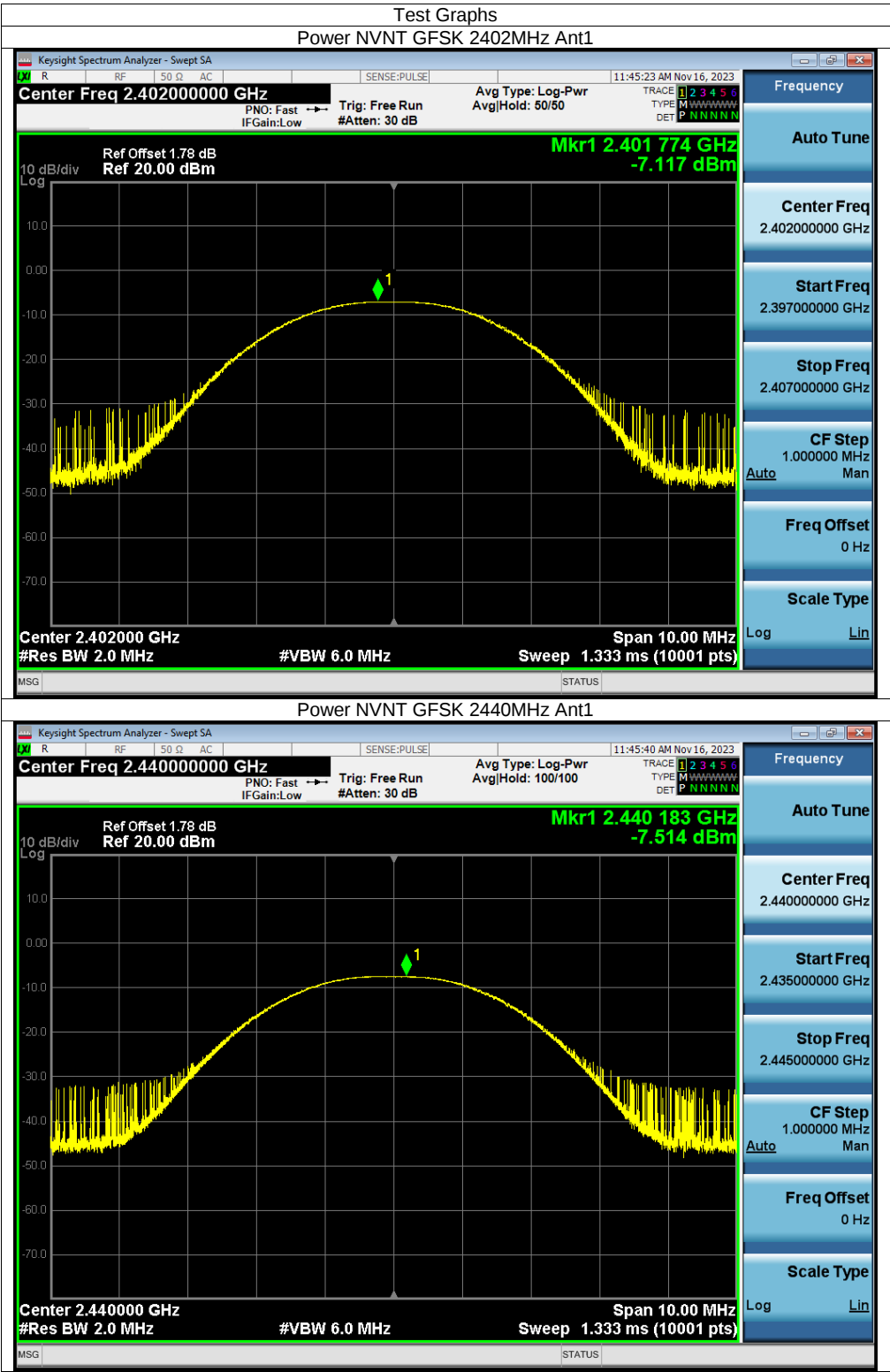
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

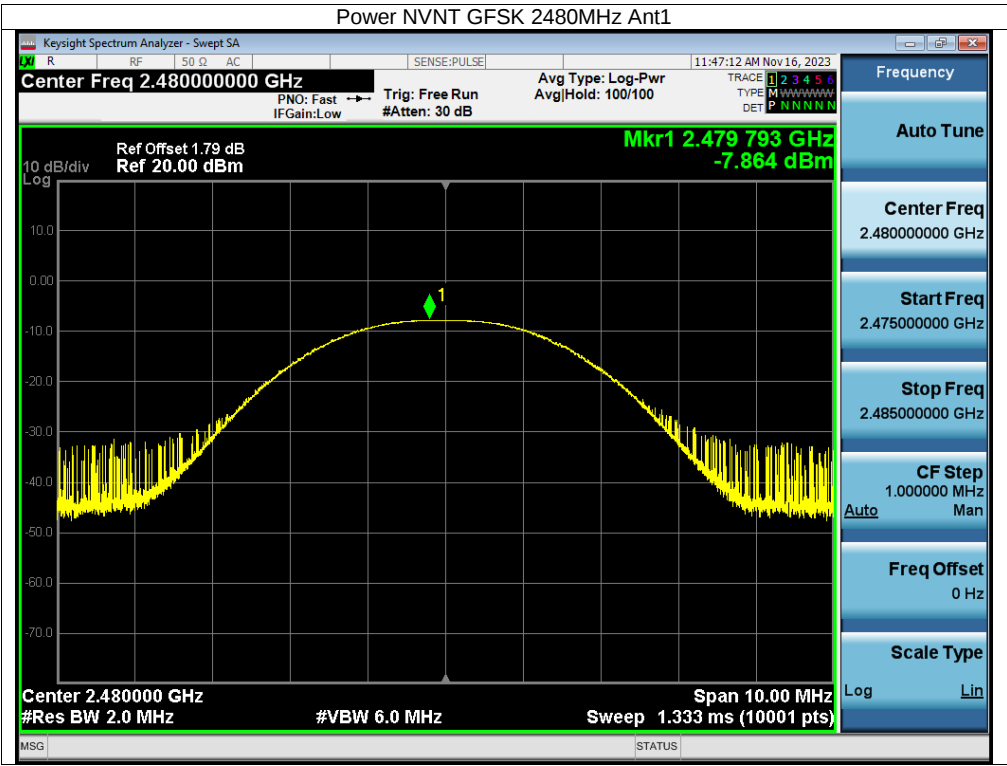
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

11. TEST DATA - Appendix A

Maximum Conducted Output Power

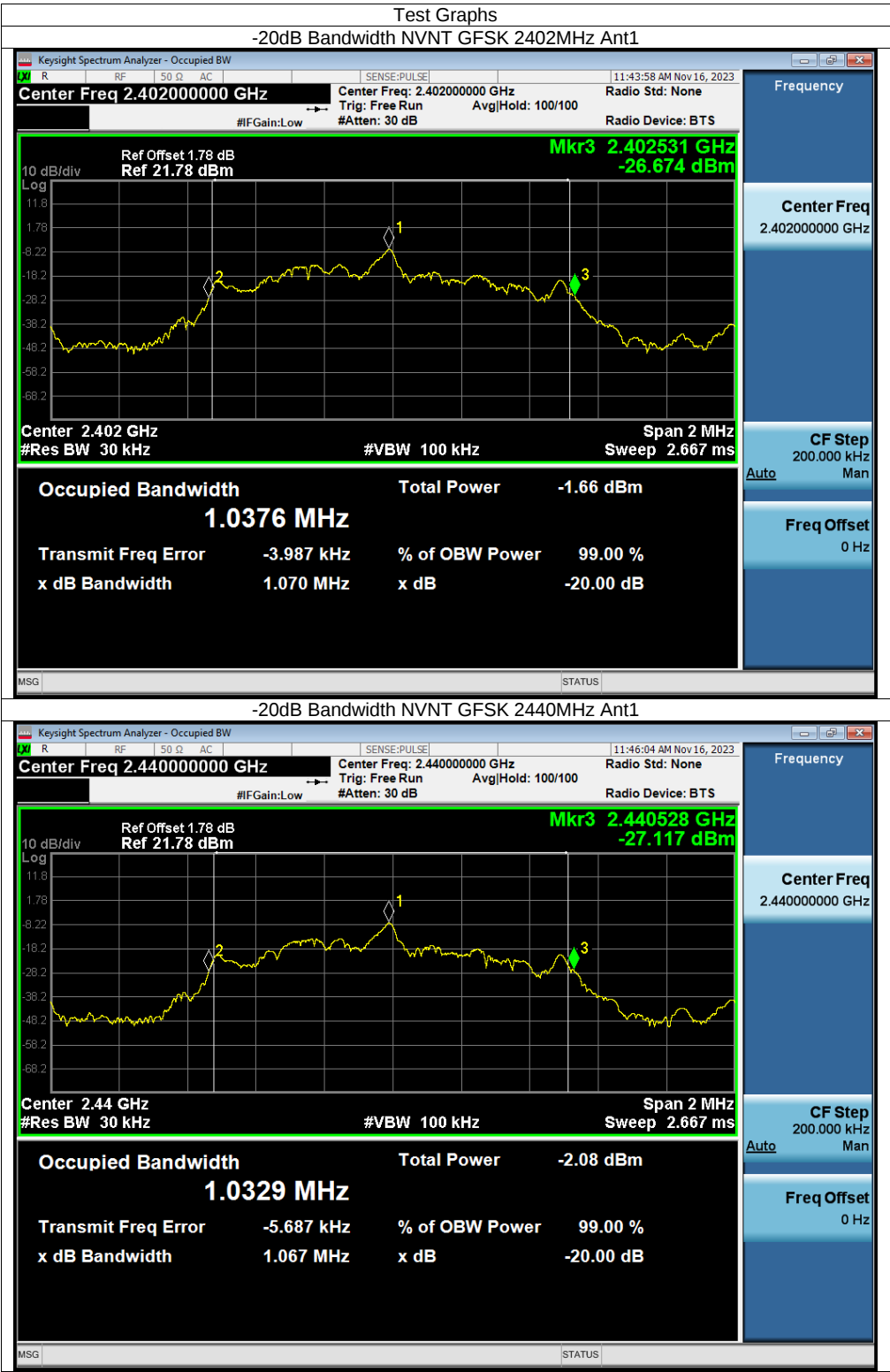
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	GFSK	2402	Ant1	-7.12	21	Pass
NVNT	GFSK	2440	Ant1	-7.51	21	Pass
NVNT	GFSK	2480	Ant1	-7.86	21	Pass





-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)
NVNT	GFSK	2402	Ant1	1.07
NVNT	GFSK	2440	Ant1	1.067
NVNT	GFSK	2480	Ant1	1.071





Occupied Channel Bandwidth

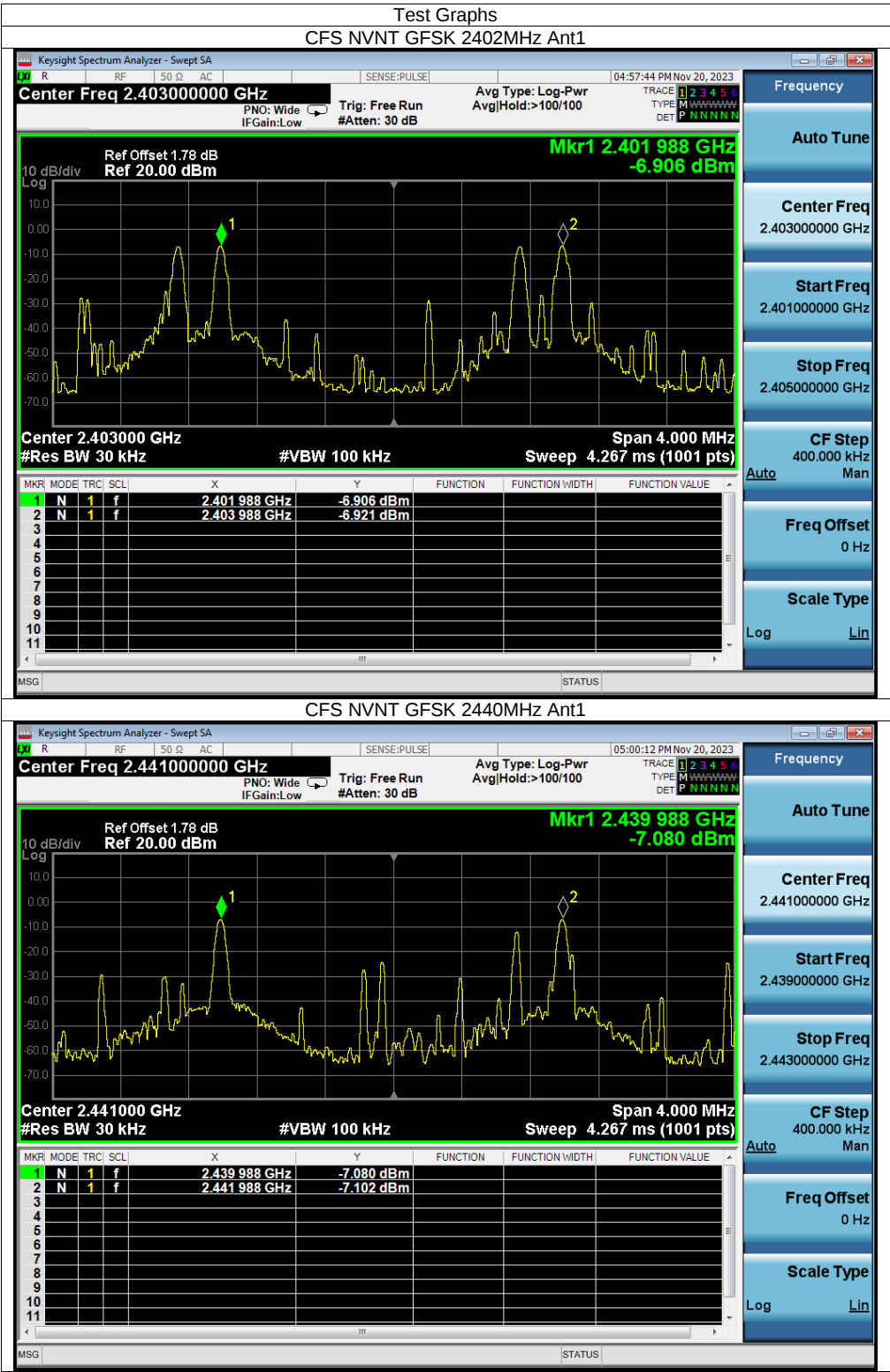
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	GFSK	2402	Ant1	1.039
NVNT	GFSK	2440	Ant1	1.036
NVNT	GFSK	2480	Ant1	1.034

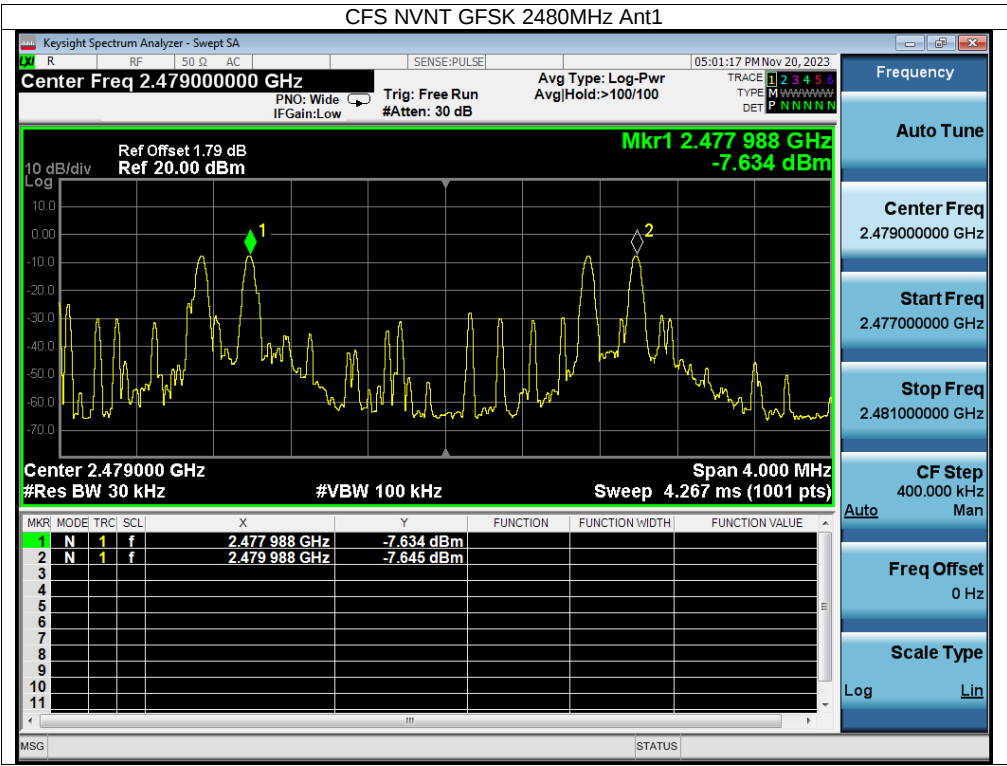




Carrier Frequencies Separation

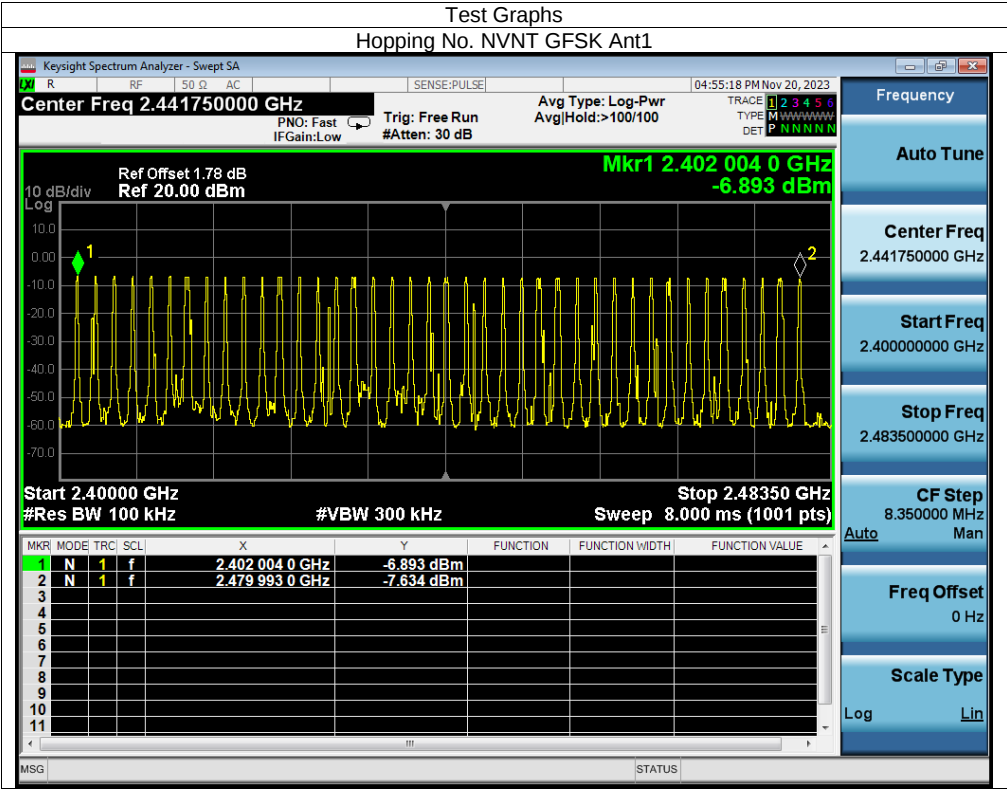
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	GFSK	Ant1	2401.988	2403.988	2	0.713	Pass
NVNT	GFSK	Ant1	2439.988	2441.988	2	0.711	Pass
NVNT	GFSK	Ant1	2477.988	2479.988	2	0.714	Pass





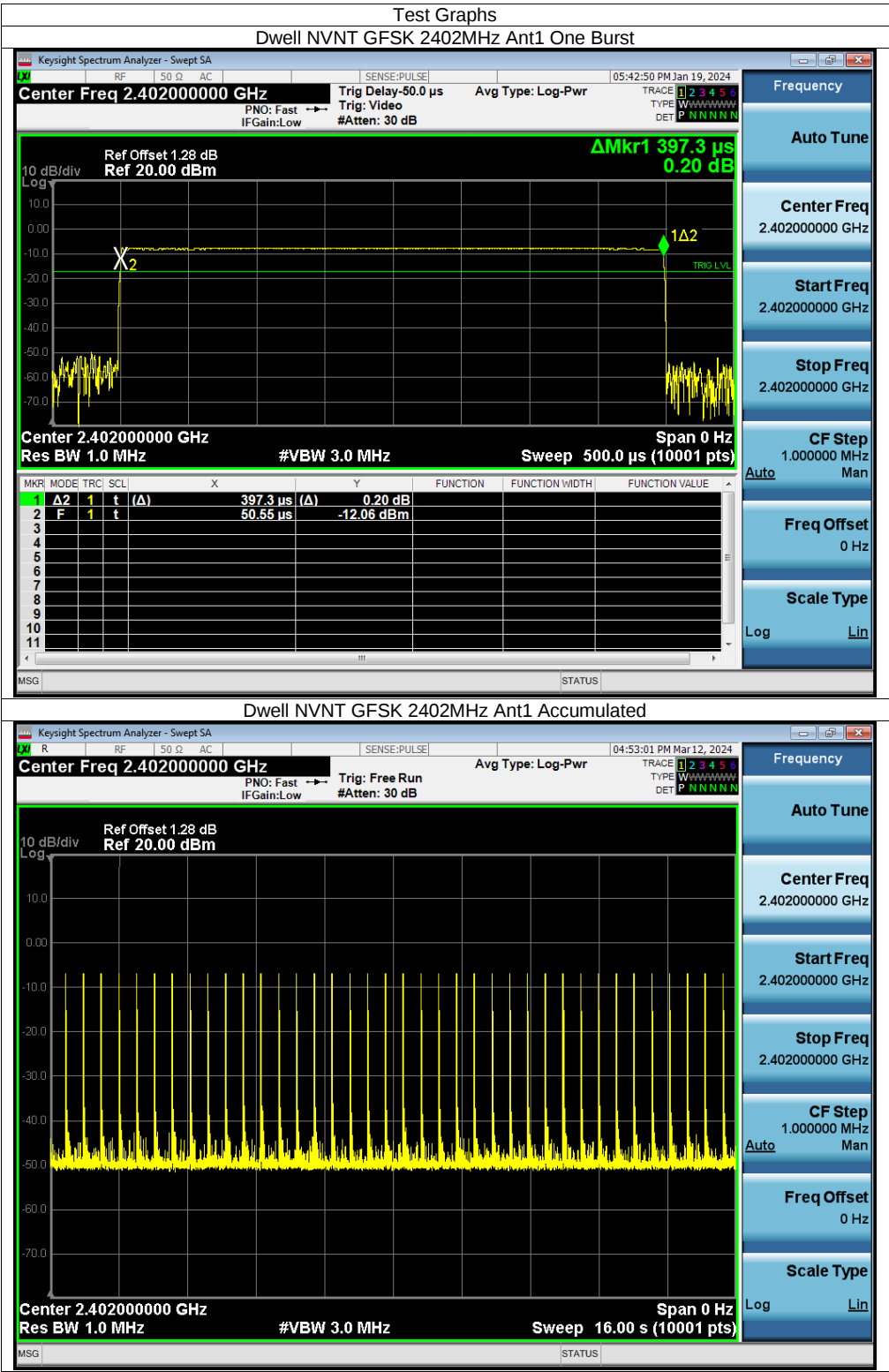
Number of Hopping Channel

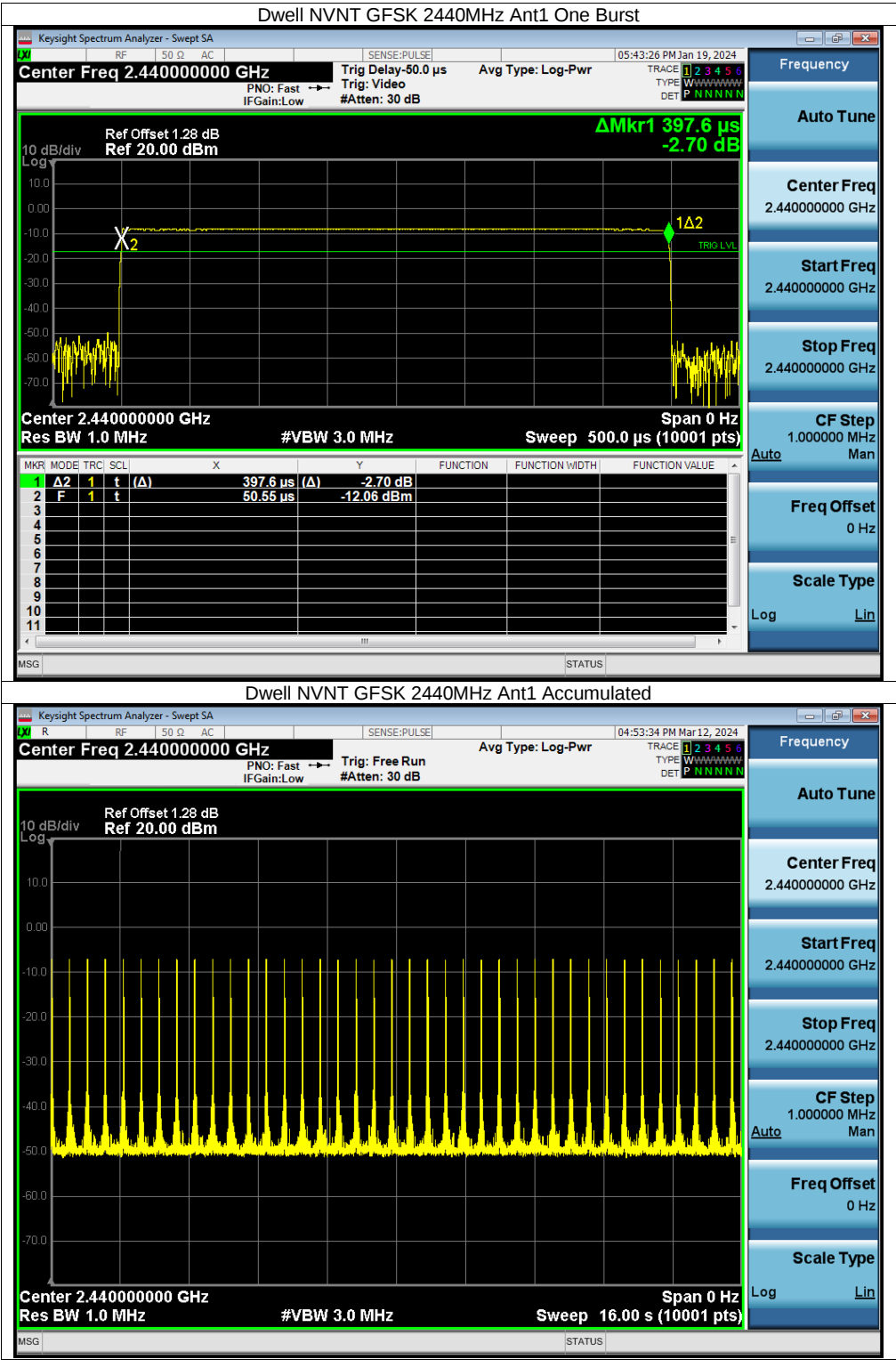
Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	GFSK	Ant1	40	15	Pass



Dwell Time

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	GFSK	2402	Ant1	0.397	15.086	38	16000	400	Pass
NVNT	GFSK	2440	Ant1	0.398	15.522	39	16000	400	Pass
NVNT	GFSK	2480	Ant1	0.397	15.086	38	16000	400	Pass





Dwell NVNT GFSK 2440MHz Ant1 Accumulated

Keysight Spectrum Analyzer - Swept SA

Center Freq 2.440000000 GHz

Trig: Free Run

Avg Type: Log-Pwr

04:53:34 PM Mar 12, 2024

RF

50 Ω

AC

SENSE:PULSE

TRIG: Free Run

TYPE: WWWW

DET: P NNNNN

Ref Offset 1.28 dB

Ref 20.00 dBm

10 dB/div

Log

Center 2.440000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 16.00 s (10001 pts)

Span 0 Hz

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.440000000 GHz

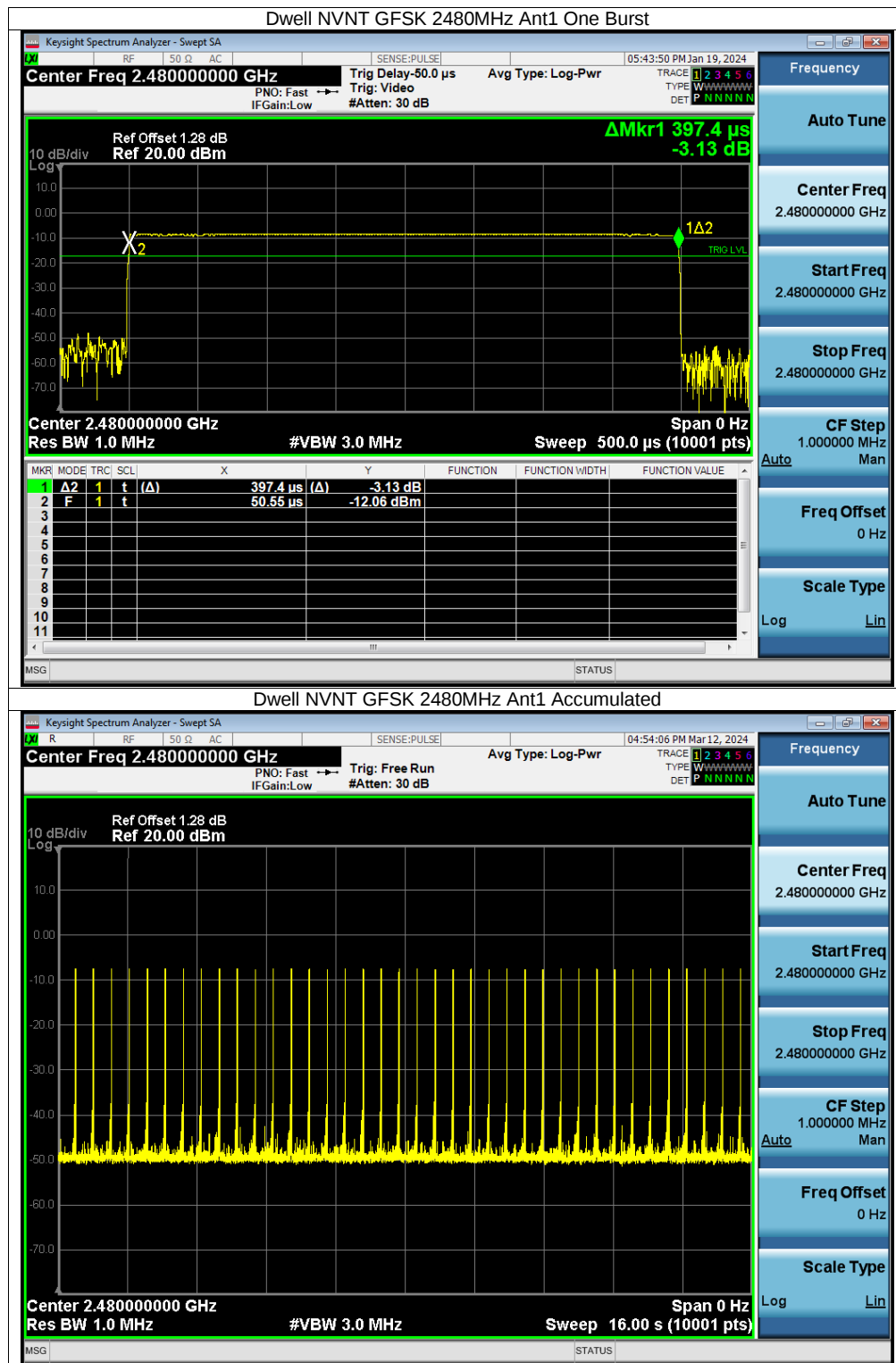
Start Freq 2.440000000 GHz

Stop Freq 2.440000000 GHz

CF Step 1.000000 MHz

Freq Offset 0 Hz

Scale Type Log Lin



Band Edge

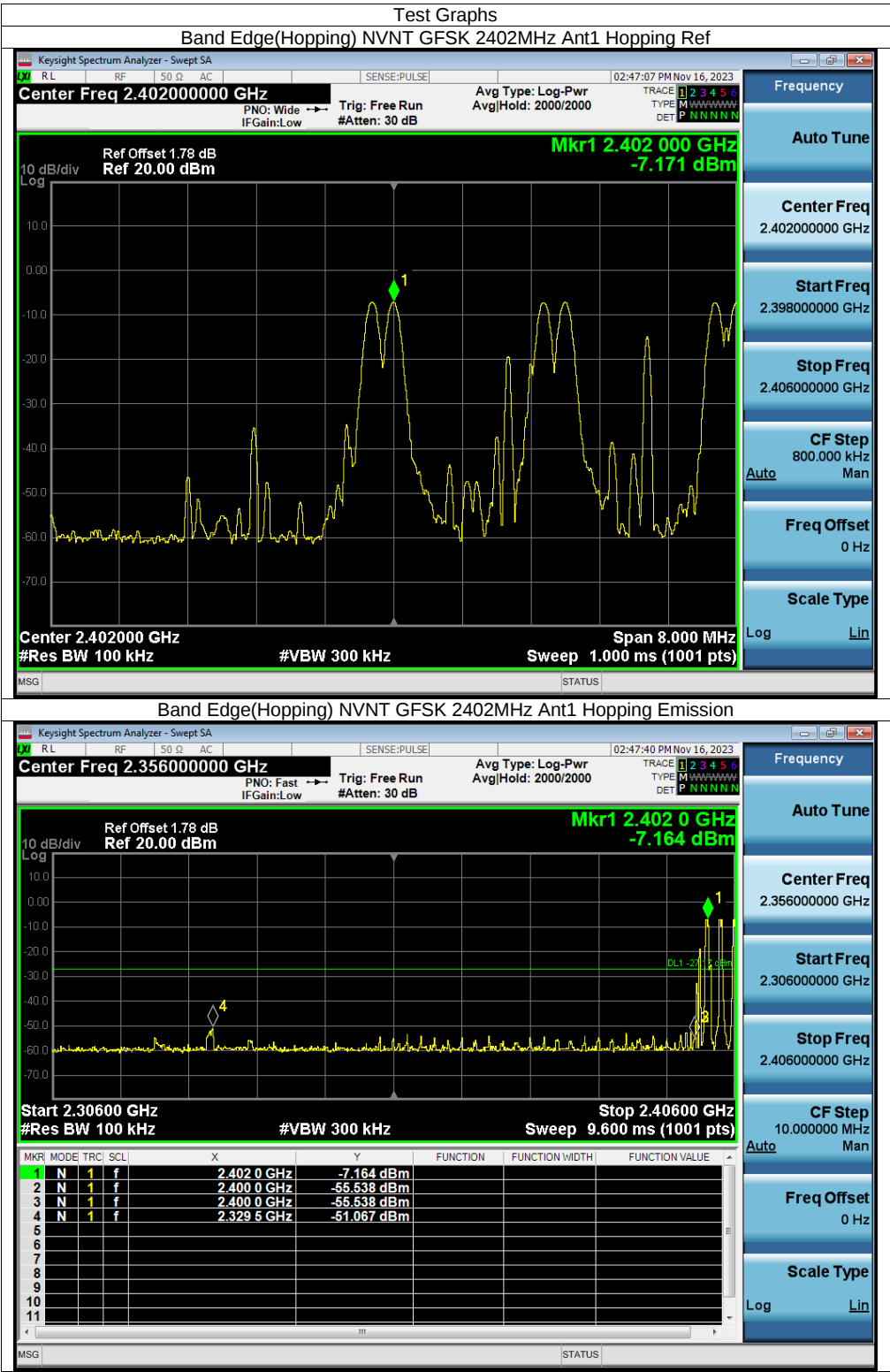
Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	GFSK	2402	Ant1	No-Hopping	-42.42	-20	Pass
NVNT	GFSK	2480	Ant1	No-Hopping	-41.88	-20	Pass





Band Edge(Hopping)

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	GFSK	2402	Ant1	Hopping	-43.89	-20	Pass
NVNT	GFSK	2480	Ant1	Hopping	-46.25	-20	Pass



Band Edge(Hopping) NVNT GFSK 2402MHz Ant1 Hopping Emission

Keysight Spectrum Analyzer - Swept SA

RLRF50ΩACSENSE:PULSE

02:47:40 PM Nov 16, 2023

Center Freq 2.356000000 GHz

PNO: Fast → Trig: Free Run

Avg Type: Log-Pwr

IF Gain: Low

#Atten: 30 dB

Avg Hold: 2000/2000

TRACE 1 2 3 4 5 6

TYPE M W W W W W W W

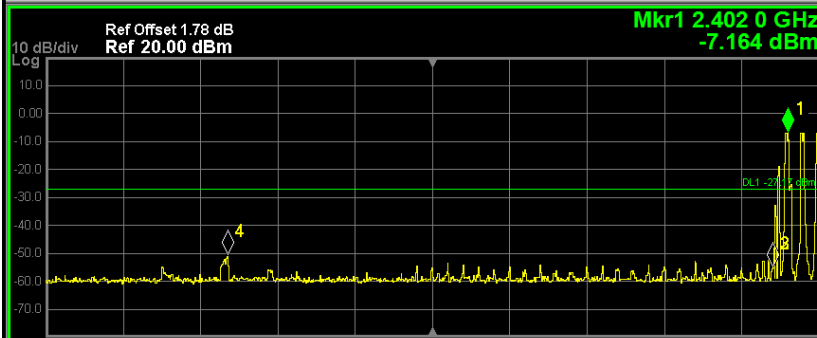
DET P N N N N N

Ref Offset 1.78 dB

Ref 20.00 dBm

Mkr1 2.402 0 GHz

-7.164 dBm



Start 2.30600 GHz

#Res BW 100 kHz

#VBW 300 kHz

Stop 2.40600 GHz

Sweep 9.600 ms (1001 pts)

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.356000000 GHz

Start Freq 2.306000000 GHz

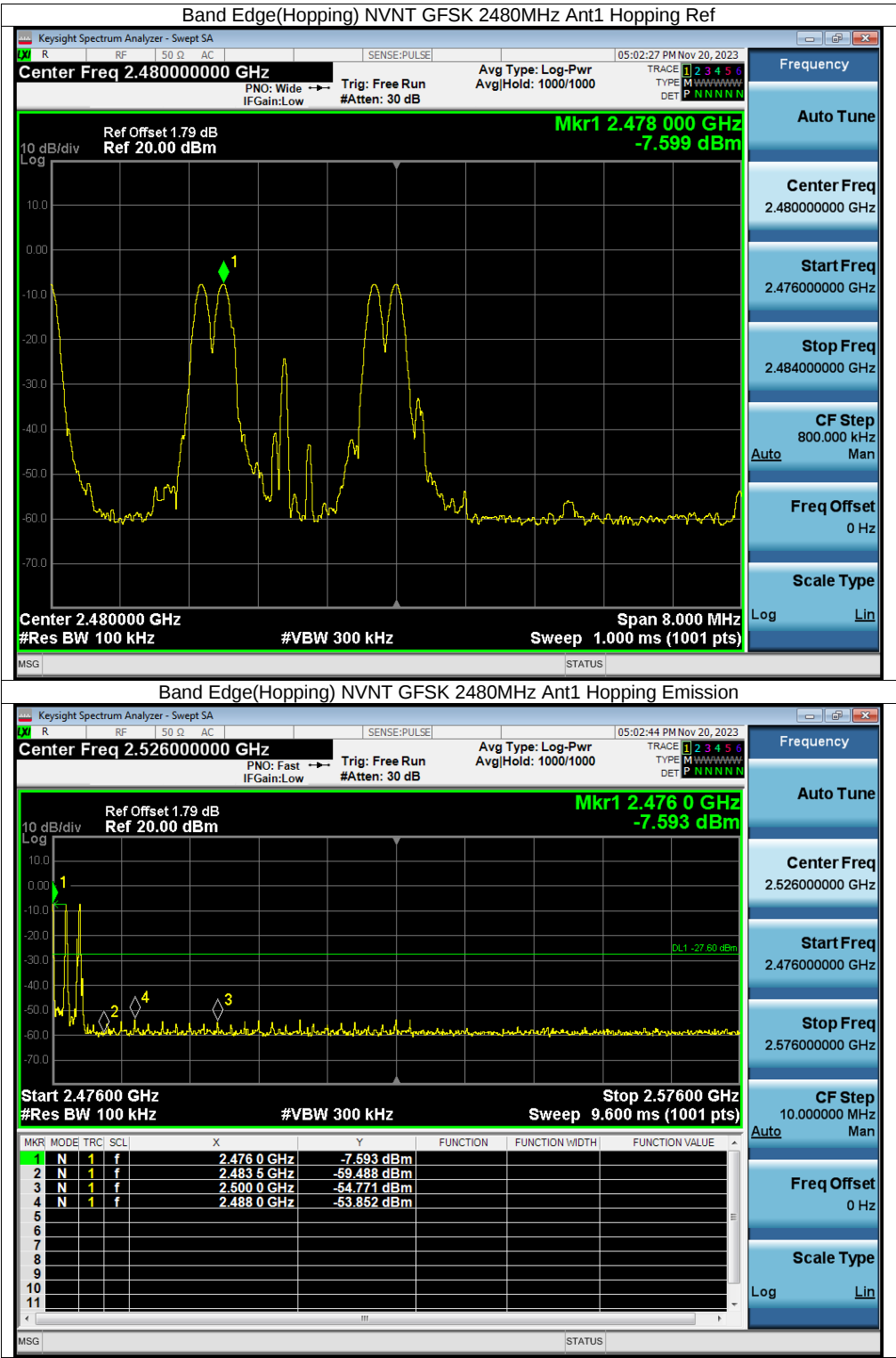
Stop Freq 2.406000000 GHz

CF Step 10.000000 MHz

Auto Man

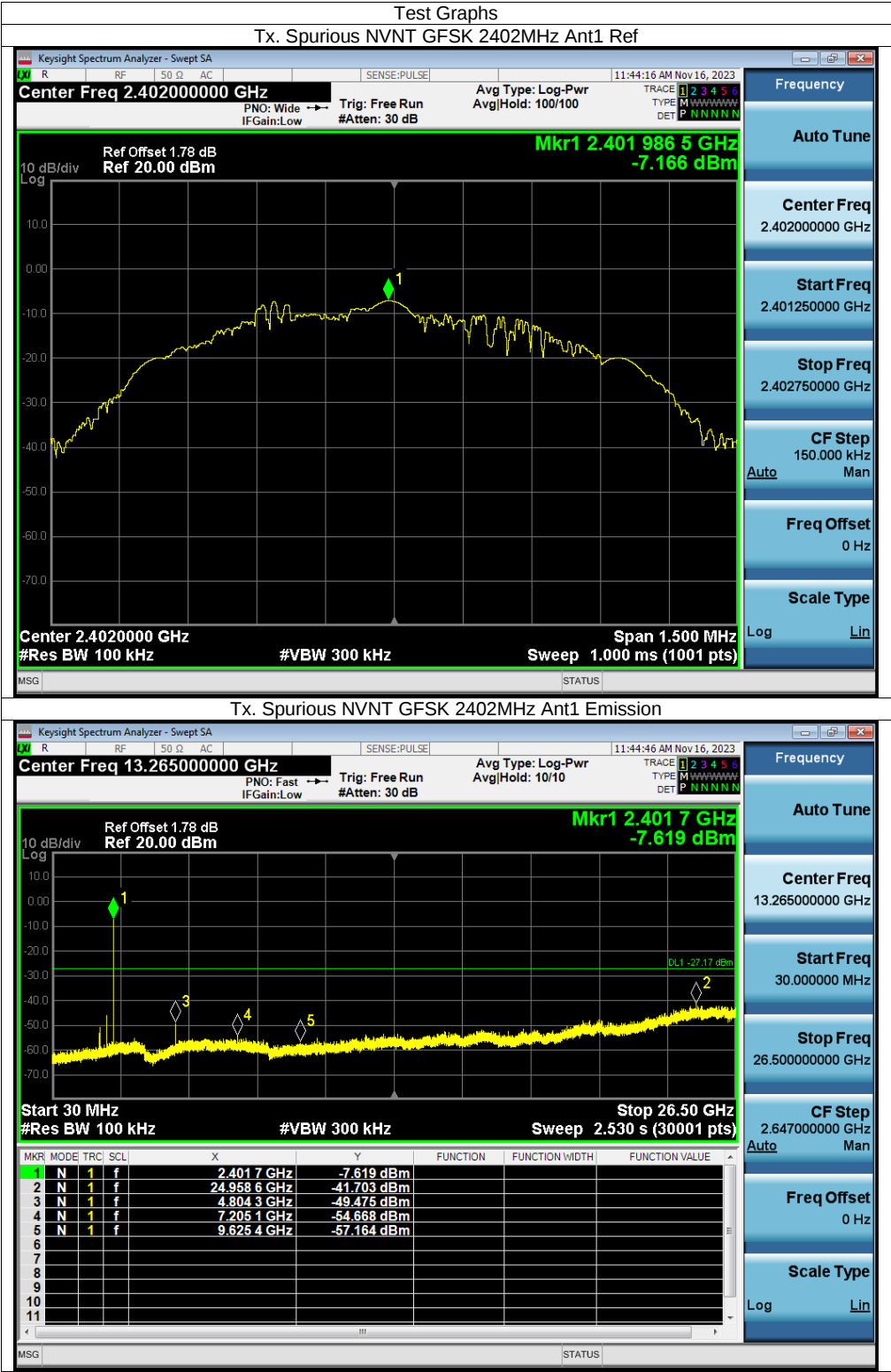
Freq Offset 0 Hz

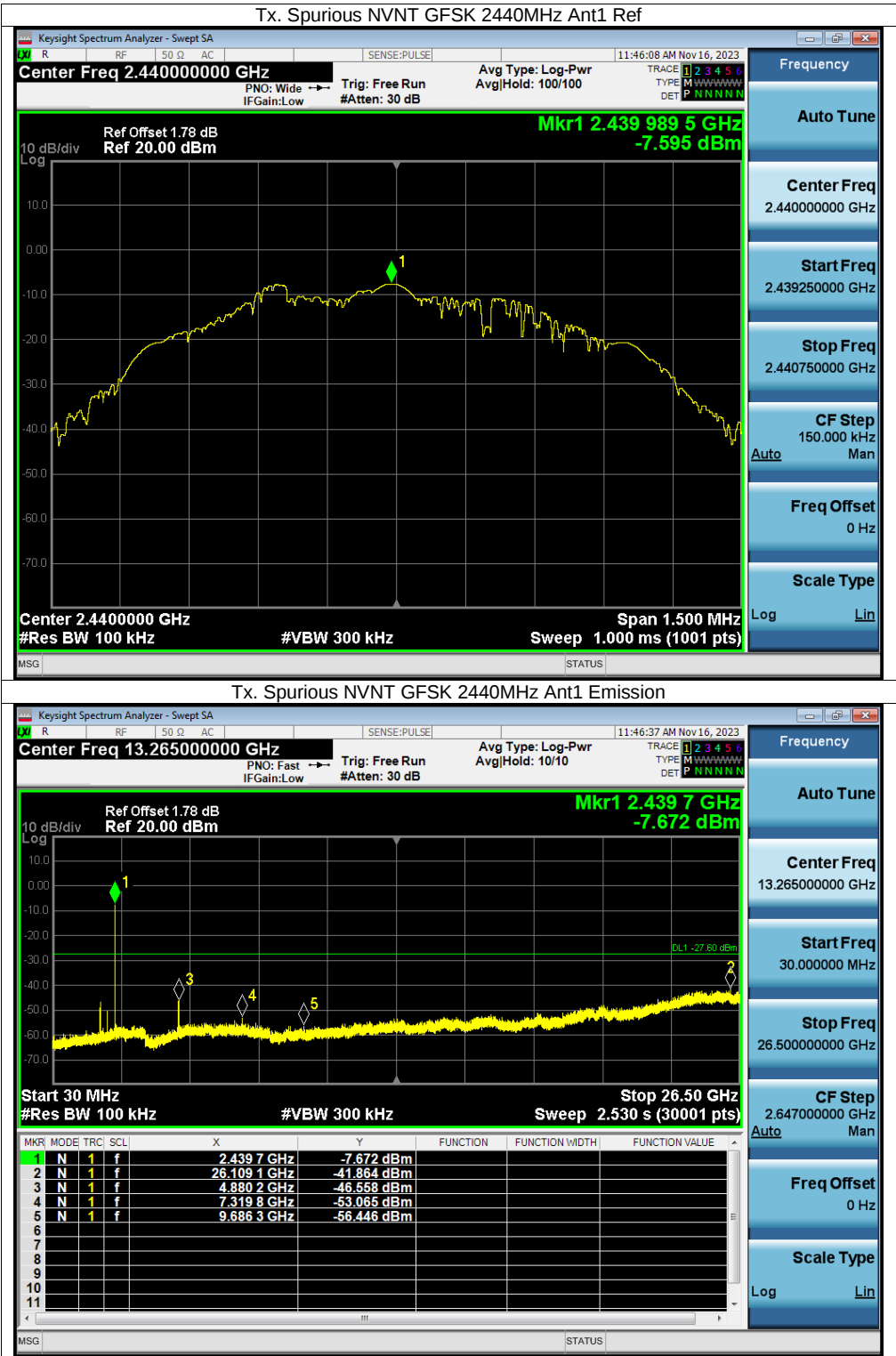
Scale Type Log Lin

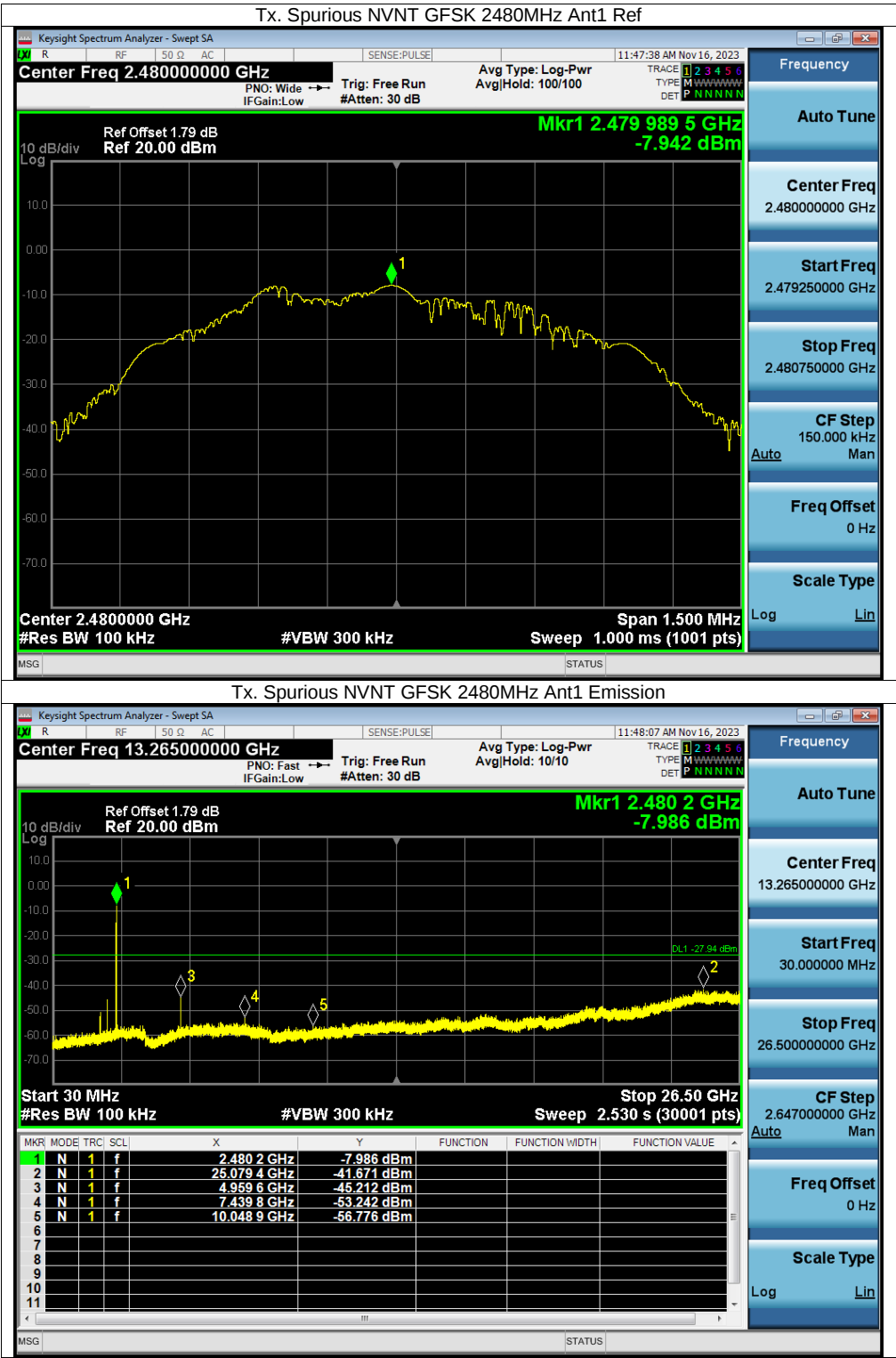


Conducted RF Spurious Emission

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	GFSK	2402	Ant1	-34.53	-20	Pass
NVNT	GFSK	2440	Ant1	-34.27	-20	Pass
NVNT	GFSK	2480	Ant1	-33.73	-20	Pass





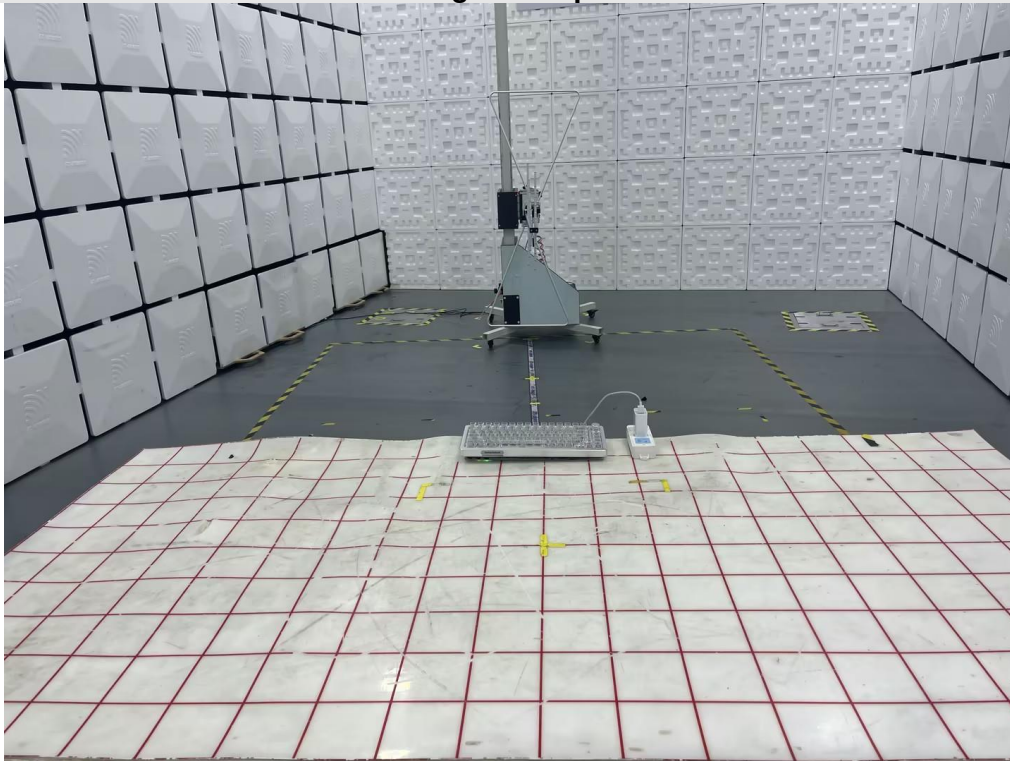


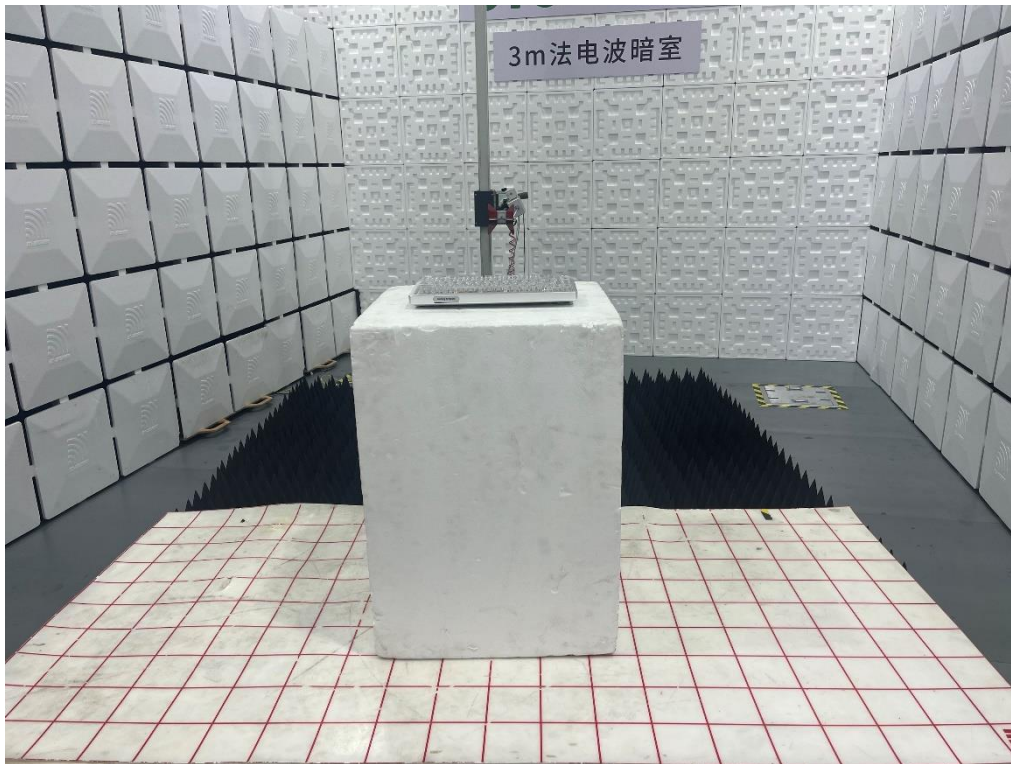
APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION

AC Power Line Conducted Emission



Radiated Band edge and Spurious Emission





END OF REPORT